

Drinking Water Management system  
Bogan Shire Council

# Annual Report 2018



*Date: February 2019*

*Version: 1.0*

Document Status	<i>For comment</i>		
Document History:	<i>Draft 1 – Reviewed by Lisa Procter –Hunter H2O</i>	<i>Version 1.0</i>	<i>05/03/2018</i>
	<i>Final Document</i>	<i>Version 1.0</i>	<i>05/02/2019</i>
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File Reference:	<a href="H:\JAYANTHA\BC Ed\WATER\CCP MONITORING\Annual Reporting"><i>H:\JAYANTHA\BC Ed\WATER\CCP MONITORING\Annual Reporting</i></a>		

## Executive Summary

This report provides the performance of drinking water system and the review of DWMS implementation and is based on the current reporting requirements and guidelines in place with the Australian Drinking Water Guidelines (ADWG; 2011), and the reporting requirements of NSW Health.

### Critical Control Points (CCP)

	CCP1 Settling Process (Turbidity)	CCP1 Settling Process (pH)	CCP2 Filtering Process (Turbidity)	CCP3 Disinfection Process (Free Cl)	CCP4 Fluoridation Process (Fluoride)
Number Of Exceedances	0	0	78	0	0

### Critical Operating Points (COP)

	COP1 Turbidity in Raw Water (Turbidity)	COP2 Fluoride in Reticulation (Fluoride)	COP3 Free Chlorine in Reticulation (Free Cl)	COP4 pH in Reticulation (pH)	COP5 Turbidity in Reticulation (Turbidity)
Number Of Exceedances	0	0	0	0	0

### Water quality (NSW Health Comparison Report)

Characteristics	Sample Count	Number Of Characteristics	Number Of Characteristics Non-Compliant	Percent Compliant
Physical Characteristics	1	5	0	100%
Chemical Characteristics	3	21	0	100%
E coli	46	1	0	100%

### Action and improvement plan

	Completed	In progress	Short term not started	Long term	Total
Number of actions	30	20	0	12	62

### DWMS Reviews

Regular water quality committee meetings are held with Council as part of a broader Lower Macquarie Water Utilities Alliance project. Council prepares the water quality report which is used as the basis of discussion at these meetings. During these meetings, Hunter H2O reviews the

*Council's water quality data, critical control points and compliance, customer complaints and progress with implementation of continuous improvement plan actions.*

<i>Date</i>	<i>Reviewer</i>	<i>Scope</i>	<i>Summary of outcomes</i>	<i>Actions taken</i>
<i>19/02/2015</i>	<i>Glenn Frnandes</i>	<i>Reviewing Chlorination system</i>	<i>Calculation of C.t value</i>	<i>Confirm the effective disinfection</i>
		<i>Reviewing Chemical dosing system</i>	<i>Proposed an alternative dosing arrangement</i>	<i>If current process fails only</i>
	<i>Lisa Procter</i>	<i>Reviewing CCPs and introducing COPs. Health Based Targets (HBTs) Limits were reviewed to more closely align with ADWG.</i>	<i>Reviewed CCPs and new COPs.</i>	<i>Reviewed 4- CCPs and 5 new COPs</i>

## **Reservoir inspections**

*The entry hatch covers are not sealed and they need to be replaced with sealed hatch design. The existing hatches may cause to contaminate the drinking water. Upper cages on the internal ladder has to be removed to make the tank safe for diving.*

<i>Date</i>	<i>Reservoirs inspected</i>	<i>Recommendations</i>	<i>Category</i>	<i>Corrective actions</i>
<i>15/07/2014</i>	<i>Cobar St</i>	<i>Seal the entry hatch</i>	<i>Priority-1</i>	<i>Hatch has been sealed.</i>
		<i>Remove the upper cage of internal ladder</i>	<i>Priority-4</i>	<i>In progress</i>
<i>15/07/2014</i>	<i>Terangion St</i>	<i>Seal the entry hatch</i>	<i>Priority-1</i>	<i>Hatch has been sealed.</i>
		<i>Remove the upper cage of internal ladder</i>	<i>Priority-4</i>	<i>In progress</i>

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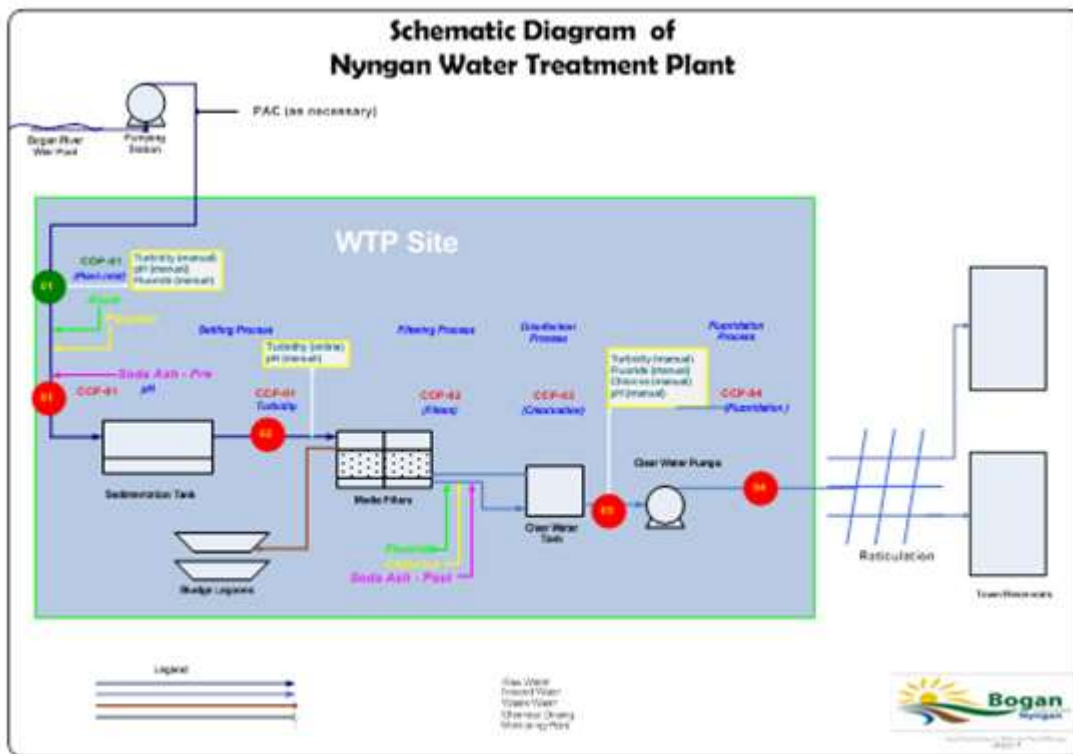
# 1 Report purpose

This reports documents DWMS implementation and drinking water performance for 2018 and satisfies the reporting (Element 10), evaluation (Element 11) and review and continual improvement (Element 12) requirements of Councils Drinking Water Management System (DWMS).

# 2 Scheme summary

The Bogan WTP pumps potable water to reticulation system and to two town reservoirs in reticulation system. Potable water is sourced from the Bogan River weir pool. The treatment plant consists of PAC dosing, coagulation, flocculation, sedimentation and filtration prior to disinfection and fluoridation. Fully automated new fluoridation plant was granted by NSW Health and commissioned in 2018. Nyngan WTP has been upgraded with new clear SCADA system in 2018 and treated water is tested and delivered via pumping into the distribution system to over 1091 connections in Nyngan town supply

Council has introduced new automated fluoride plant, new SCADA system, additional online chlorine, turbidity and pH monitoring systems as a part of treatment plant refurbishment in 2018. Additionally, the sodium hypochlorite dosing system was also upgraded, with new pumps.



Checklist	
Have there been any system upgrades within the reporting period?	<input checked="" type="checkbox"/>
Upgrade or system improvements details have been provided	<input checked="" type="checkbox"/>

### 3 DWMS document control

Any updates to DWMS documentation should be summarised here. Major changes should be submitted to NSW Health. The updated CCPs and new COPs are given below.

CCP number	Monitoring Parameter	Target criterion	Adjustment limit	Critical limit
1. Settling Process after Pre-Chemical Dosing Process	pH Turbidity	6 to 7 < 3 NTU	6 > pH > 7.8 5 > NTU > 3	5 > pH > 8 NTU > 10
2. Filtering Process After Duel Media Filters	Turbidity	0.2 NTU	0.2 > NTU > 0.5	NTU ≤ 0.2 for 95% pm NTU > 0.5 for 5% pm
3. Disinfection Process After Filtering	Chlorine (Free)	2.0 mg/L	2.5 > mg/L > 1.5	1 > mg/L > 4
4. Fluoridation Process After Filtering	Fluoride	1.0 mg/L	1.1 > mg/L < 0.9 (5% of lower and upper limits)	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
<b>COP - Critical Operating Points</b>				
1. Turbidity in Raw Water	Turbidity	N/A	N/A	NTU > 500
2.				
3. Fluoride in reticulation System	Fluoride	1.0 mg/L	1.1 > mg/L < 0.9 (5% of lower and upper limits)	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
4. Free Chlorine in Reticulation System	Chlorine (Free)	0.5 mg/L	2.5 > mg/L > 0.2	mg/L < 0.2
5. pH in Reticulation System	pH	6 to 7	6 > pH > 7.8	5 > pH > 8
6. Turbidity in Reticulation System	Turbidity	< 3 NTU	5 > NTU > 3	NTU > 10

Council is holding regular drinking water quality meetings, with the purpose of discussing water quality performance, customer complaints, progress with the improvement plan actions and identify new continuous improvement initiatives. Participants in these meetings include various Council employees such as operators, supervisors, technical support and managers as well as the local NSW Health representative and are facilitated by Hunter H2O. These meetings meet the requirements of a number of the Australian Drinking Water Guideline (ADWG) elements such as

- **Element 1** - commitment to drinking water quality management (e.g. management attending meetings)
- **Element 4** - Operational procedures and process control (e.g. review of results)
- **Element 5** - Verification of drinking water quality (e.g. review of sample locations, data, customer complaints)
- **Element 7** - Employee awareness and training (e.g. communication, participation, issue discussion)

Document	Version	Updates	Submitted to NSW Health and date submitted?
1 <sup>st</sup> Draft	Version-1	23/05/2018	22/05/2018



## 4 Critical control points

The initial CCPs were reviewed during year 2018 to work towards achieving the ADWG targets. Following changes were adopted

**Table 4-1. Summary of critical control points (CCP s) Changes**

CCP number	Monitoring Parameter	Initial Critical Limit	New Critical limit	Reasons
1. Settling Process after Pre-Chemical Dosing Process	Turbidity	NTU < 5	NTU < 10	pH and Turbidity parameters are monitored under one CCP 1 (Settling Process After Pre dosing )
2. Filtering Process After Duel Media Filters	Turbidity	NTU < 1.5 (Critical) 0.5 NTU (Target) 0.8 NTU (Adjustment)	NTU < 0.5 (Critical) 0.2 NTU (Target) 0.5 NTU (Adjustment)	Filtered water sampling point was changed to filter outlets and filtered water can be achieved lower turbidity value than earlier. However Health Based Targets cannot be achieved without any filter improvement. Filtering process is monitored as CCP 2
3. Disinfection Process After Filtering	Chlorine (Free)	> 3.5 mg/L	1 > mg/L >4	Free Chlorine level in Clear Water Sump is monitored to check the disinfection process as CCP 3.

Five (5) new **COPs** (Critical Operating Points) were added in 2017 and the latest CCPs (Critical Control Points) are shown in Table-4.2

**Table 4-2. Summary of critical control points (CCP s) and critical operating points (COP s)**

CCP number	Monitoring Parameter	Target criterion	Adjustment limit	Critical limit
5. Settling Process after Pre-Chemical Dosing Process	pH Turbidity	6 to 7 < 3 NTU	6 > pH > 7. 8 5 > NTU > 3	5 > pH > 8 NTU > 10
6. Filtering Process After Duel Media Filters	Turbidity	0.2 NTU	0.2 > NTU > 0.5	NTU <= 0.2 for 95% pm NTU > 0.5 for 5% pm
7. Disinfection Process After Filtering	Chlorine (Free)	2.0 mg/L	2.5 > mg/L > 1.5	1 > mg/L >4
8. Fluoridation Process After Filtering	Fluoride	1.0 mg/L	1.1 > mg/L < 0.9 (5% of lower and upper limits)	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
<b>COP - Critical Operating Points</b>				
7. Turbidity in Raw Water	Turbidity	N/A	N/A	NTU > 500
8.				
9. Fluoride in reticulation System	Fluoride	1.0 mg/L	1.1 > mg/L < 0.9 (5% of lower and upper limits)	1.5 > mg/L > 0.9 mg/L for grater than 72 hours
10. Free Chlorine in Reticulation System	Chlorine (Free)	0.5 mg/L	2.5 > mg/L > 0.2	mg/L < 0.2
11. pH in Reticulation System	pH	6 to 7	6 > pH > 7. 8	5 > pH > 8
12. Turbidity in Reticulation System	Turbidity	< 3 NTU	5 > NTU > 3	NTU > 10

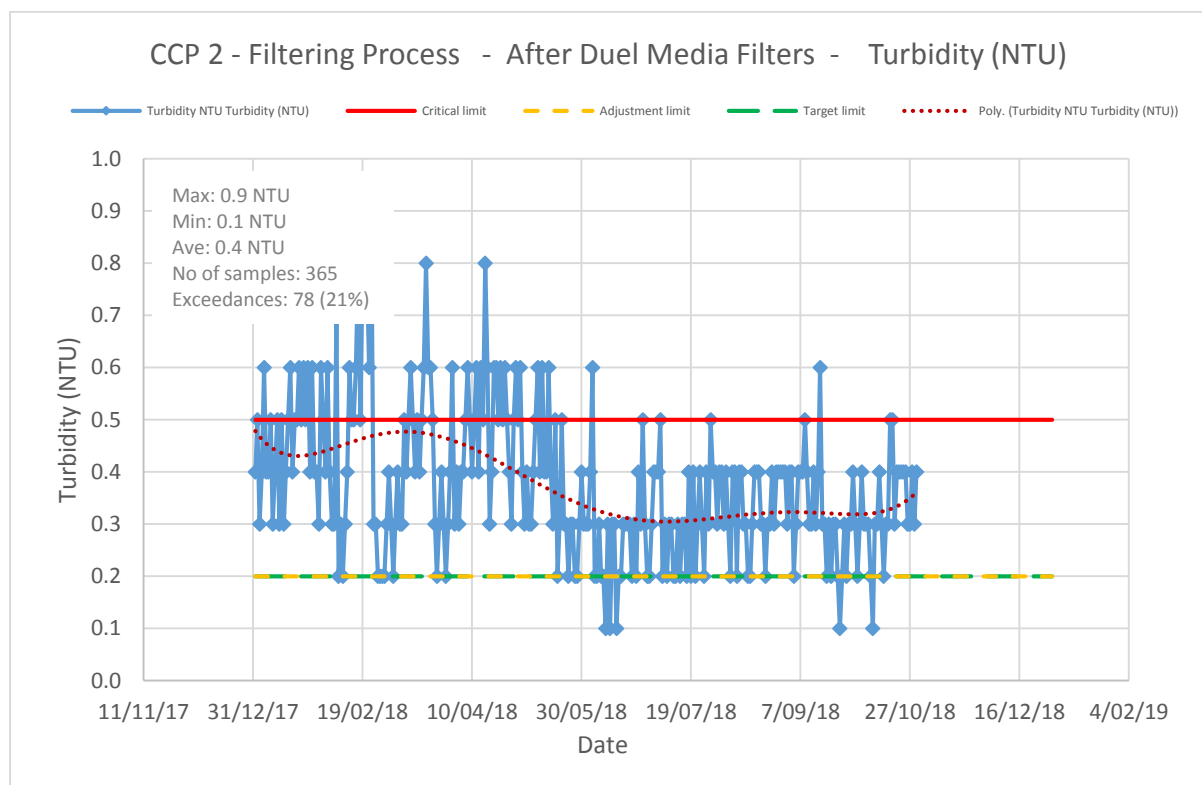
### 4.1 Critical limit exceedance

The performance of the critical control points should be reported in this section. A monitoring template is available that can be used to record and plot monitoring data.

**Table 4.3 CCP2 (Filtered Water Turbidity) Critical Control Point (CCP) Exceedances**

Critical Control Process	Parameter	Min	Ave	Max	Lower Critical Limit	Upper Critical Limit	Number of Exceedances	No. of Samples	% Compliance
CCP 1 Settling Process	Turbidity (NTU)	1.3	2.6	4.4		10.0	0	365	100%
	pH	5.9	6.9	7.5	5	8	0	365	100%
<b>CCP 2 Treated Water Filters</b>	<b>Turbidity (NTU)</b>	<b>0.1</b>	<b>0.4</b>	<b>0.9</b>		<b>0.5</b>	<b>78</b>	<b>365</b>	<b>79%</b>
CCP 3 Disinfection Process	Free Cl (mg/L)	1.5	2.2	2.9	1.0	4.0	0	365	100%
CCP 4 Fluoridation Process	Fluoride (mg/L)	0.9	1.0	1.1	0.8	1.5	0	150	100%

The more stringent upper critical limit for turbidity of <0.5 NTU was introduced in October 2017. The compliance results are based on assessment against this more stringent limit.



**Figure-2: CCP-2- Turbidity in Filtered Water**

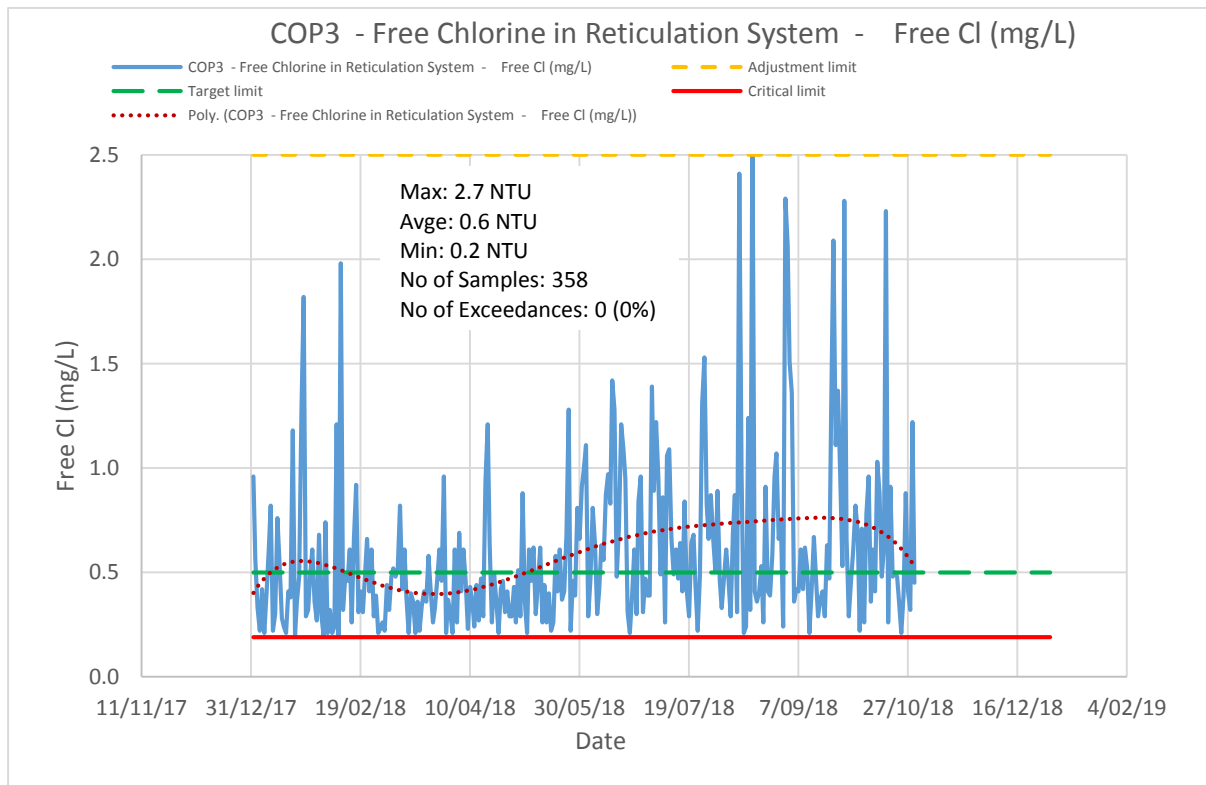
According to the ADWG, the filtered water turbidity of individual filters should be  $\leq 0.2$  NTU for 95% of the month and should not  $> 0.5$  NTU for 15 consecutive minutes. However, the 84% of the turbidity values in filtered water were above the 0.2 NTU value and 11% of turbidity values are above 0.5 NTU.

The following actions are in progress to under safe and secure funds (SSWP) to overcome this situation.

1. Automation of the backwash system
2. replacing of filter valves and filter media

Critical Operating Process	Parameter	Min	Ave	Max	Lower Critical Limit	Upper Critical Limit	Number of Exceedances	No. of Samples	% Compliance
COP 1 Raw Water Plant Inlet	Turbidity (NTU)	4	16	121	N/A	500	0	365	100%
COP 2 Fluoride in Reticulation System	Fluoride (mg/L)	0.9	1.0	1.1	0.9	1.5	0	136	100%
COP 3 Free Chlorine in Reticulation System	Free Cl (mg/L)	0.2	0.6	2.7	0.2	3.5	0	358	100%
COP 4 pH in Reticulation System	pH	7.2	7.7	7.9	5	8	0	358	100%
COP 5 Turbidity in Reticulation System	Turbidity (NTU)	0.2	0.6	1.0	N/A	5	0	358	100%

**Table 4.4 Critical Operating Point (COP 3) Exceedance =0 -COP-3- Free Chlorine in Reticulation .System**



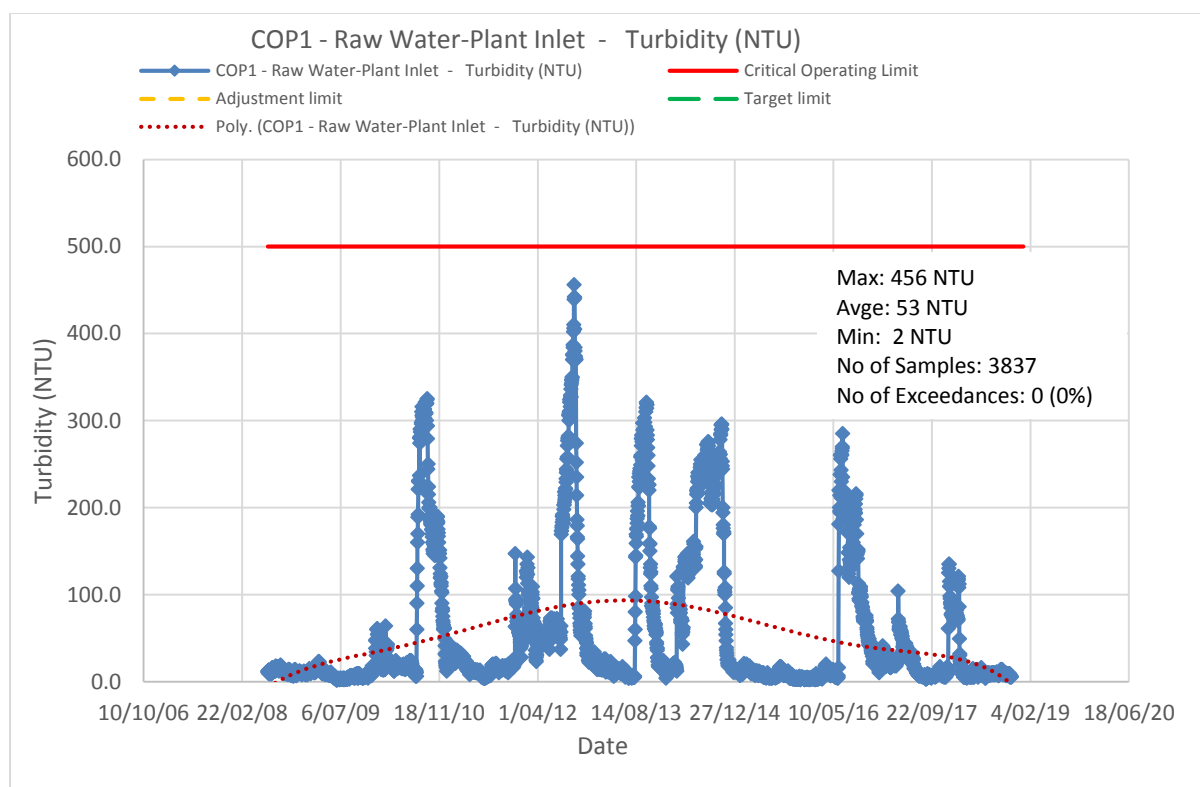
**Figure-2: COP-3- Free Chlorine in Reticulation System**

As per the Australian Drinking Water Guidelines (ADWG) it is hard to maintain the free chlorine level at 0.2 mg/l throughout the reticulation system. Therefore Council put more chlorine to town reservoirs boost the free chlorine level. However, it was noticed that the cause of low chlorine level was due to the aged water in reservoirs.

Therefore, aged water mixing systems for reservoirs and Chlorine booster system for reticulation system were identified to maintain the 0.2 mg/l free chlorine level through-out the reticulation system. Funding has been requested under Safe and Secure Water Program (SSWP).

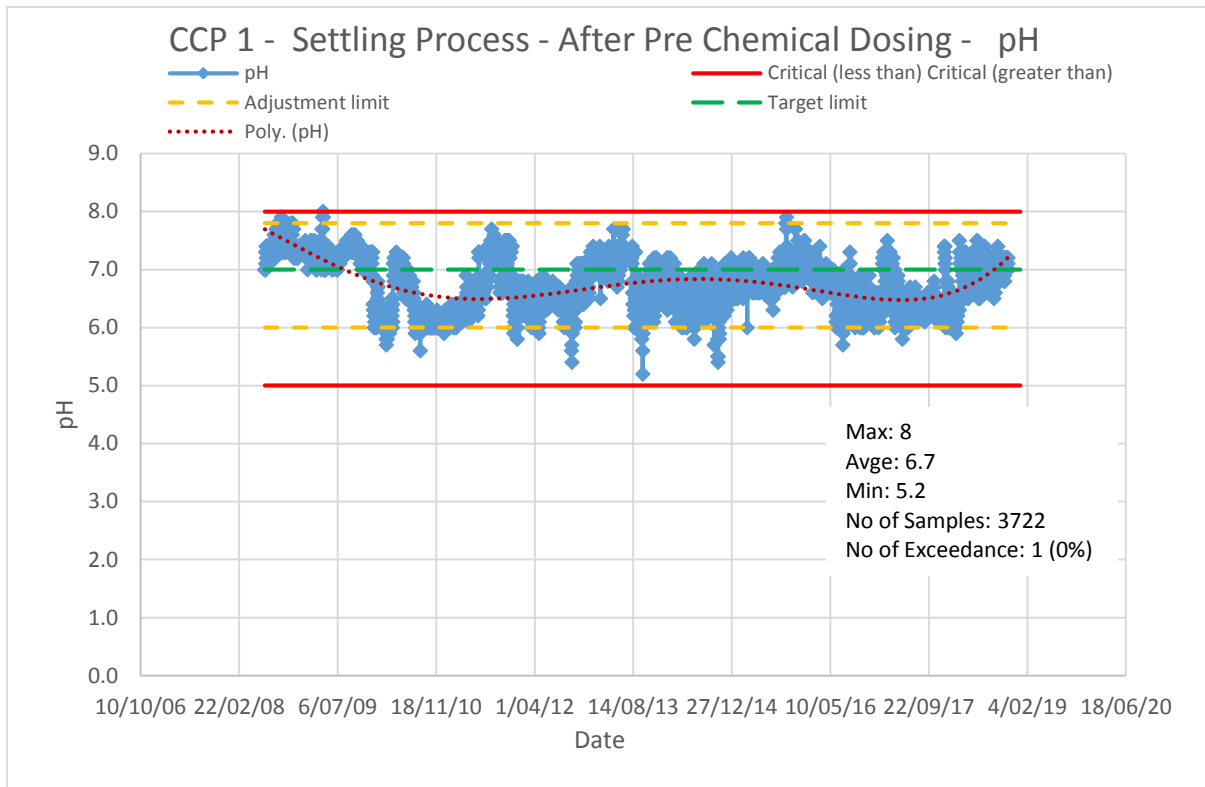
## 5 Water Quality

Reviewing of water quality data and longer term trends from 2008 to 2018.



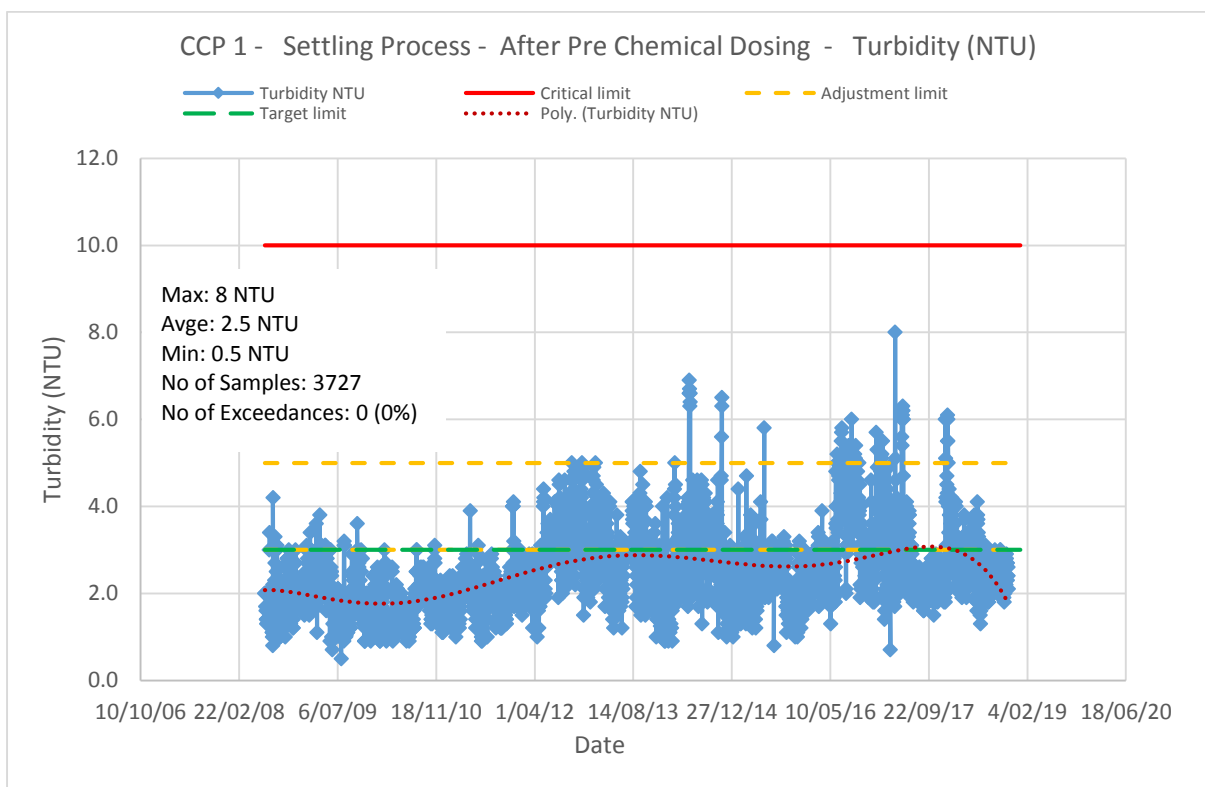
**Figure 5.1: COP1 – Turbidity in Raw Water**

Generally, Nyngan gets heavy rains in spring time from September to November. During this season Bogan river flows with high turbid water. However, there was no river flow in 2018 due to the current drought condition and Nyngan had received only the low turbid water from Albert Priest Chanel.



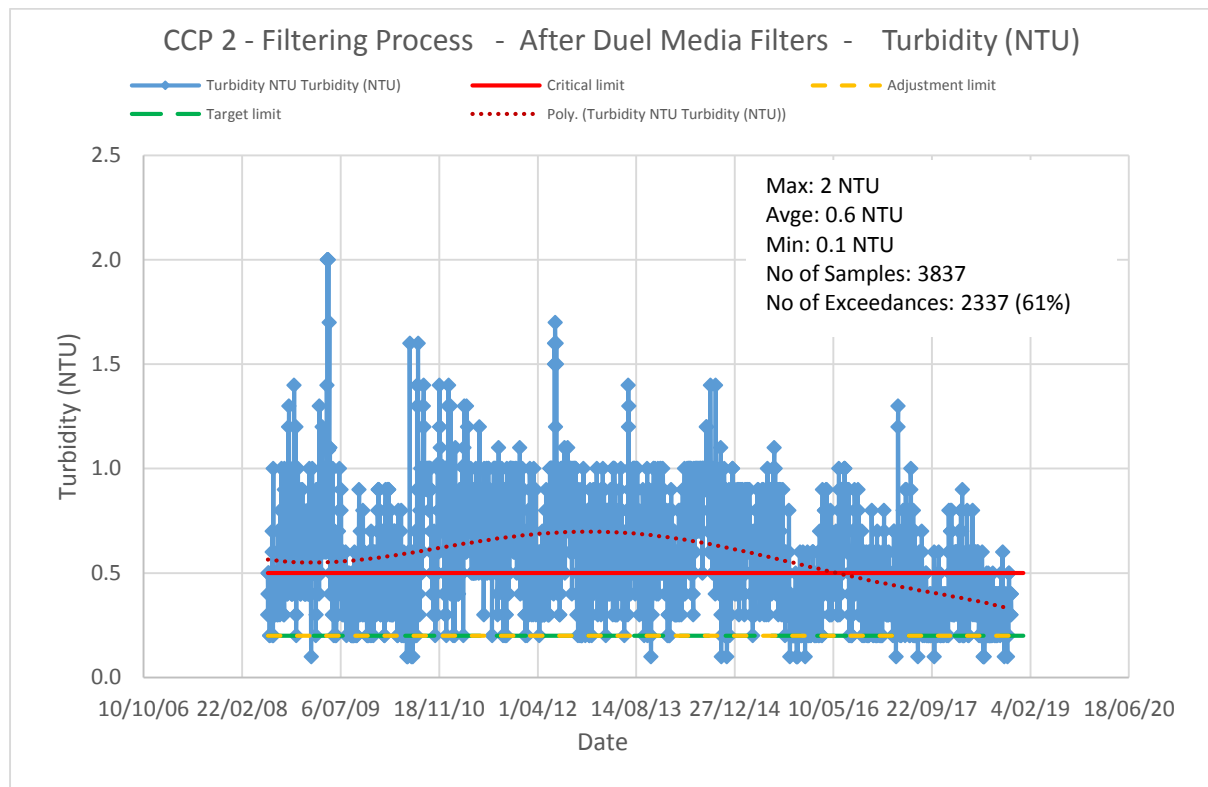
**Figure 5 2 - CCP-1 – Settling Process - pH**

*Pre dose soda ash dosing system does operate reliably within the adjustment limits since 2008. There were no incidents recorded since 2008 and pH correction is consistence and uniform over the period.*



**Figure 5.3 - CCP- 1 – Settling Process -Turbidity**

Water flocculation and sedimentation process is within the critical control limits over a period of 8 years. Trend line shows that this system produces average of 2.5 NTU water.

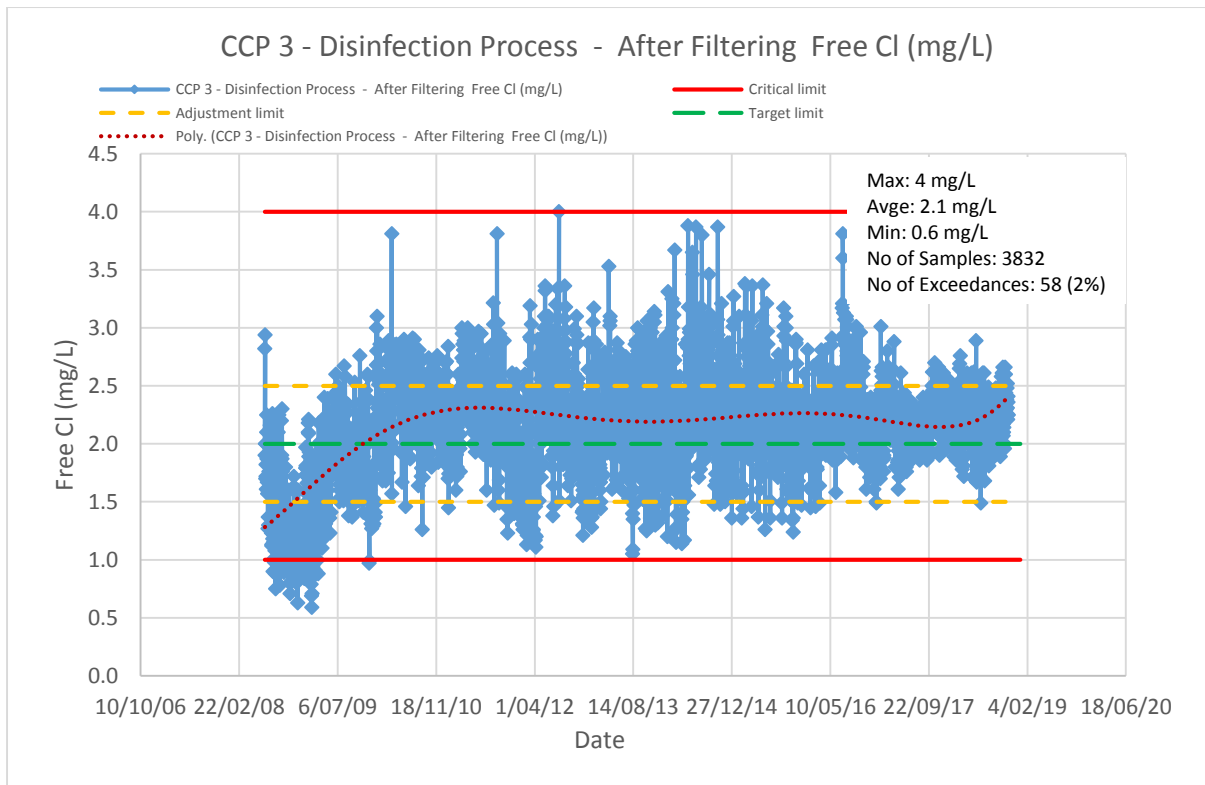


**Figure 5.4 - CCP -2 – Filtering Process - Turbidity**

There was an error of sampling procedure .Samples have been taken out from the distribution line to monitor the filtered water turbidity since 2008.This error was rectified by taking samples from filter outlets from mid of 2015.

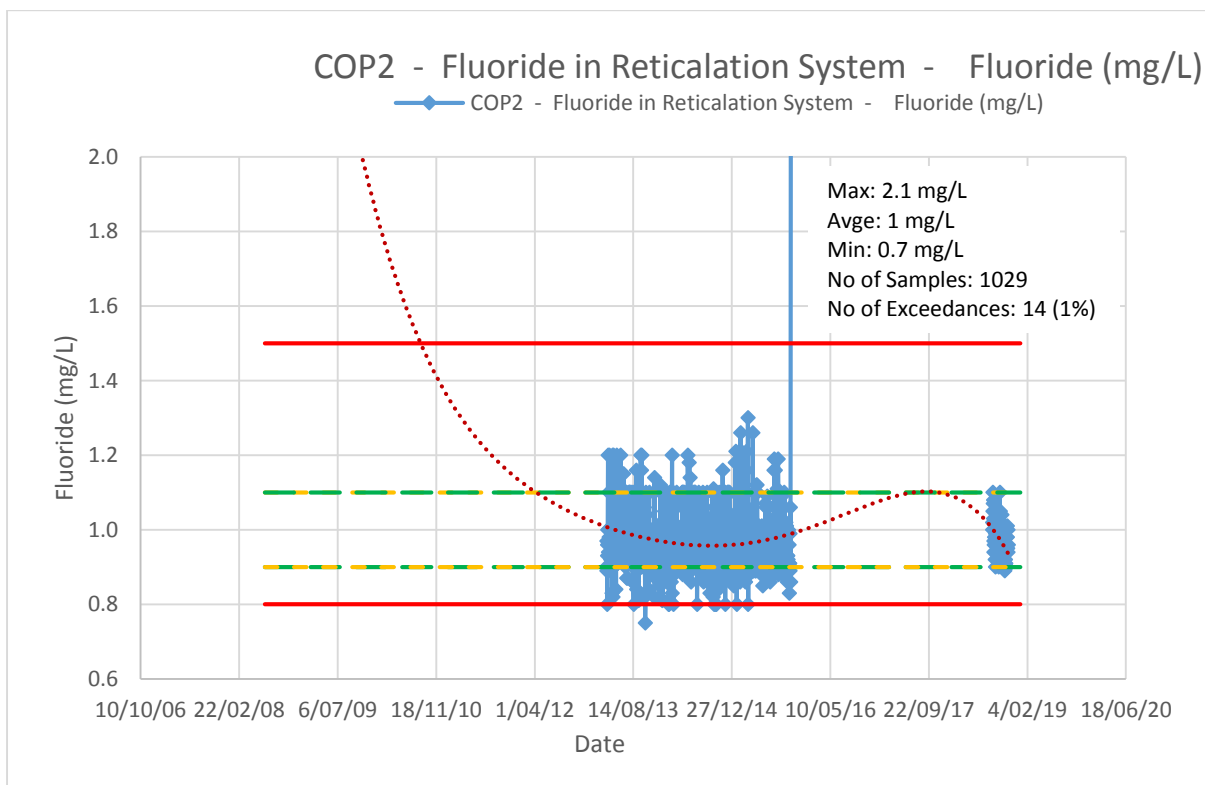
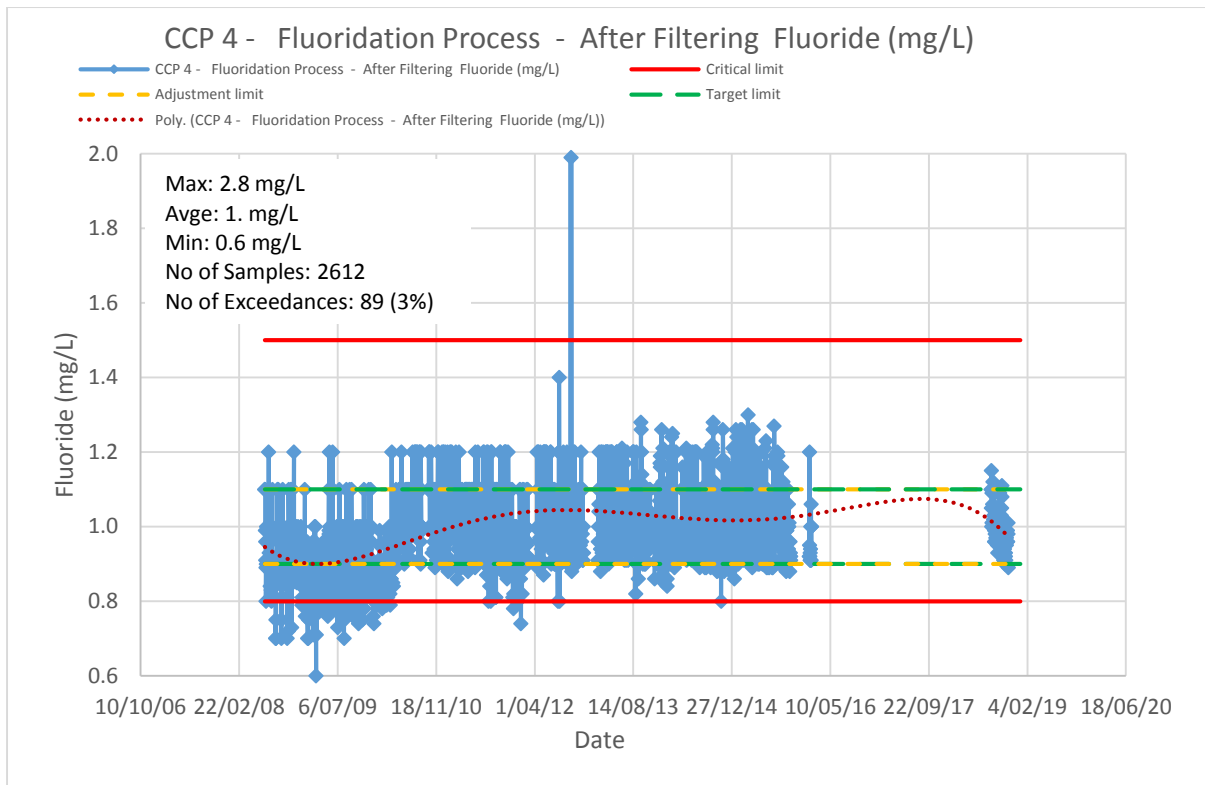
Accordance with the Health Based Targets (HBT), the Nyngan filtered water does not achieve the target of 0.2 NTU for 100% of its operations.

It was noted that 61% of events were not complying with the HBT upper limits of 0.5 NTU in filtering process.



**Figure 5.5 - CCP-3– Disinfection Process- Chlorine**

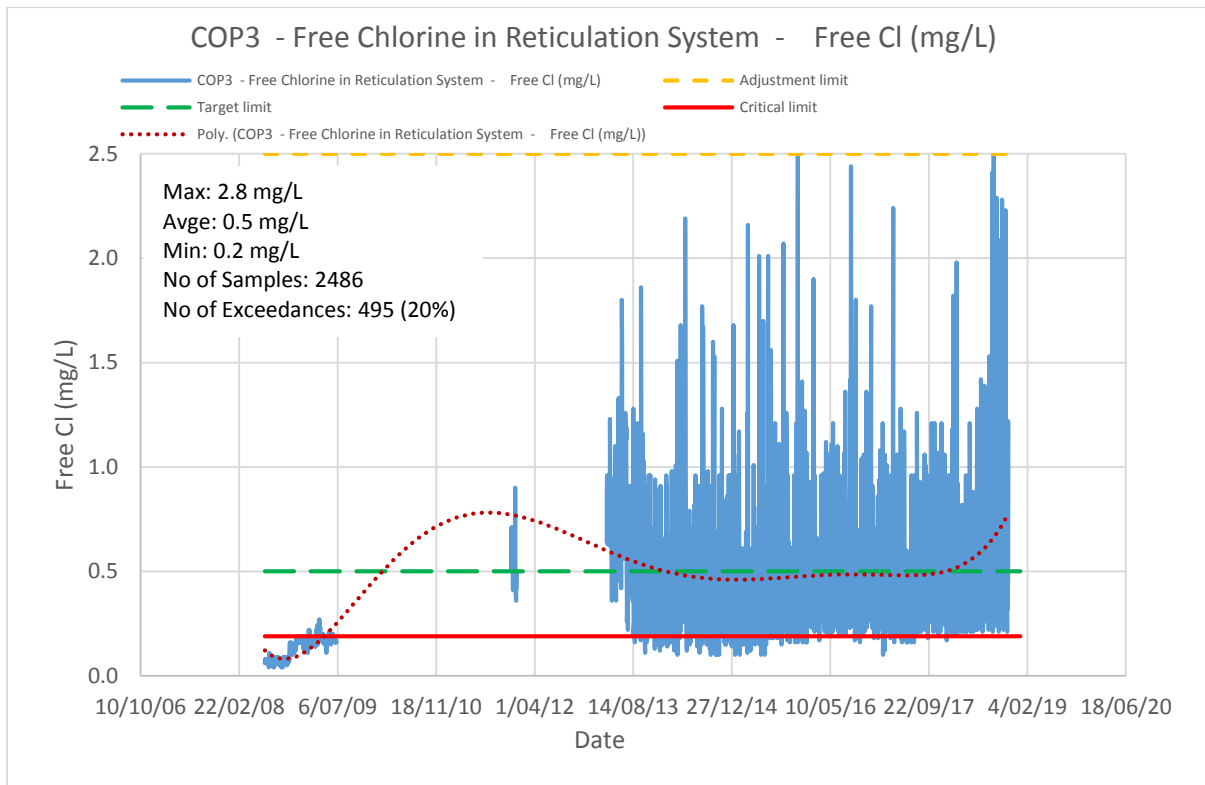
There were 58 exceedance events were recorded in 2008 and after 2008, hypochlorite dosing process operates within the critical control limits. Trend shows that the free chlorine level of treated water has been gradually increased and approximately fluctuating around 2.5 mg/L to maintain the free chlorine level in reticulation.



**Figure 5.6 - COP-2– Fluoride in Reticulation System**

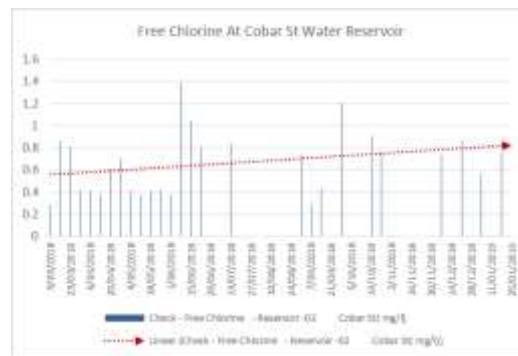
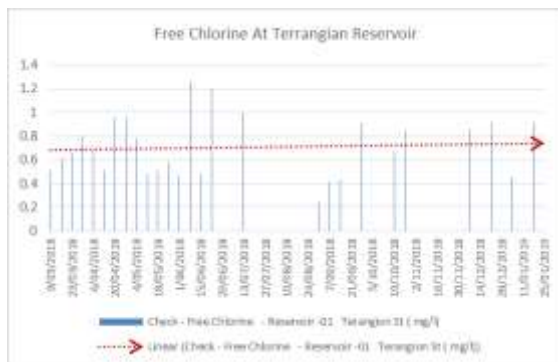
The previous Fluoridation system was not compliant with the NSW guidelines and it was shut down on 23<sup>rd</sup> of October 2015, due to reporting of high concentration of fluoride in reticulation system. However, fully automated new fluoride plant was constructed and commissioned with the funding assistance from NSW Health in Aug 2018.

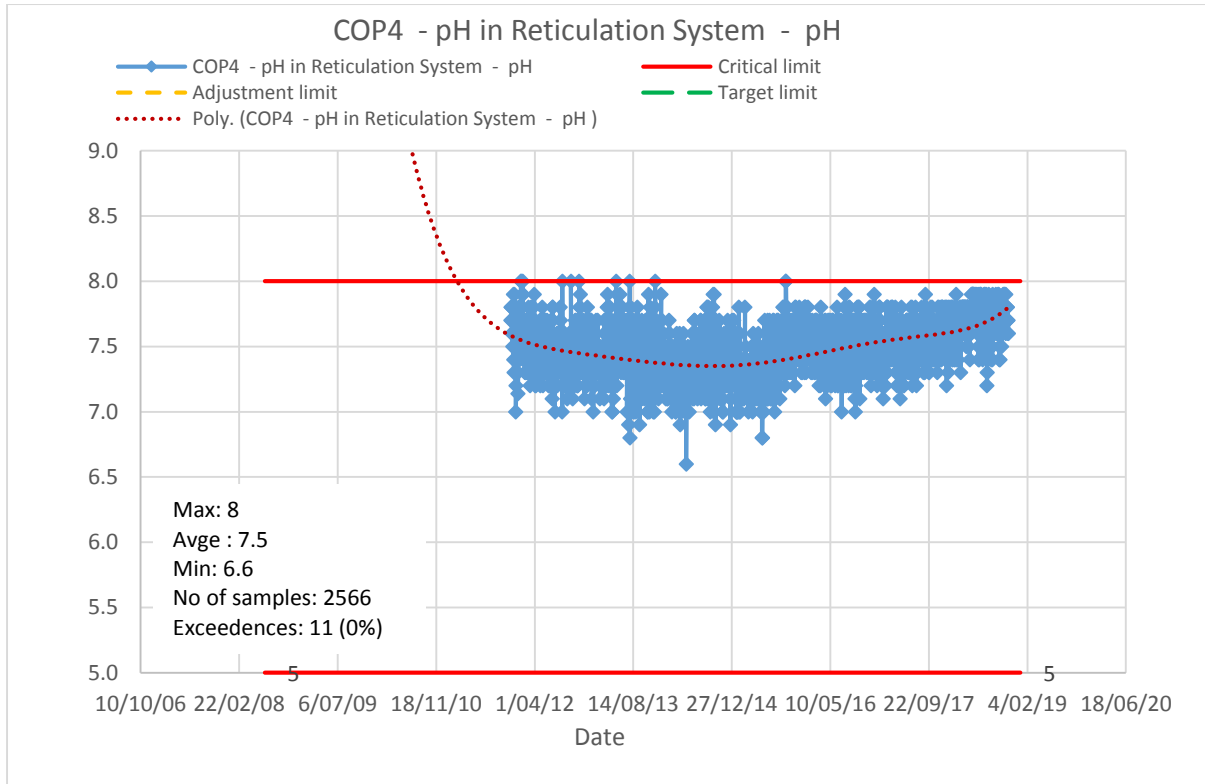




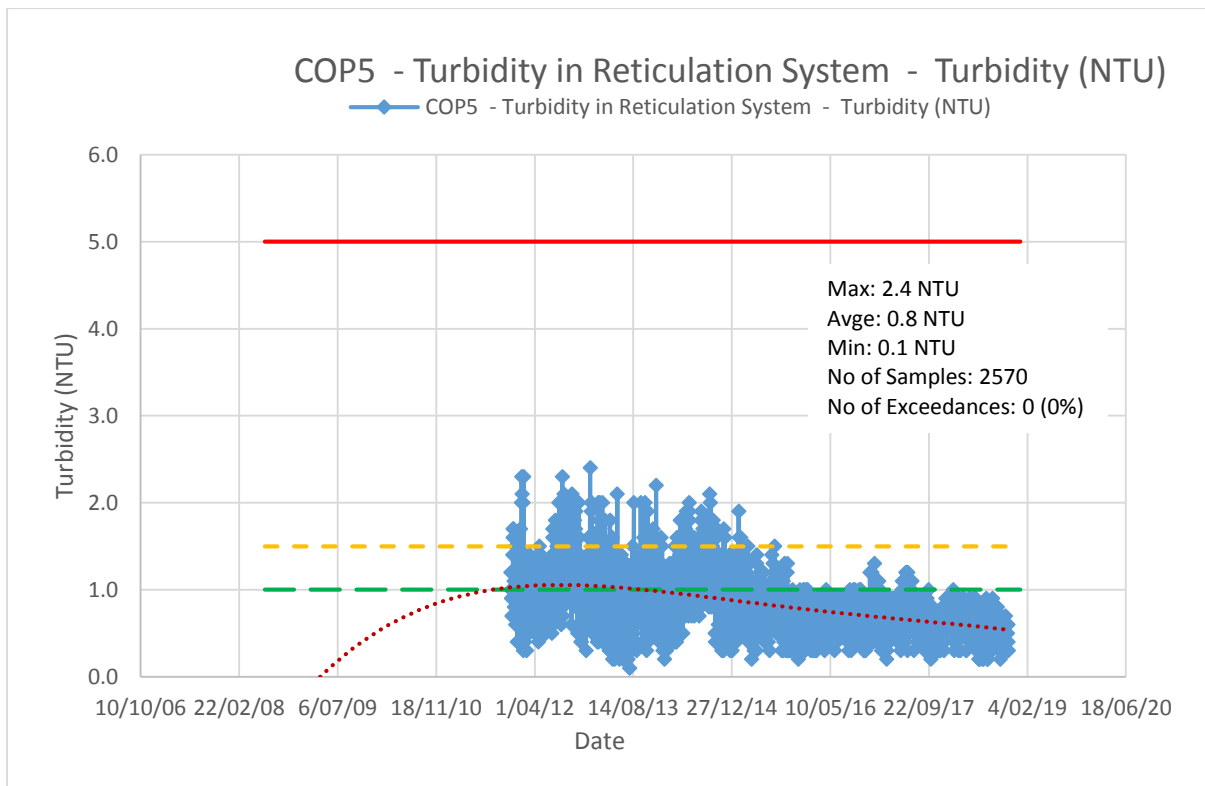
**Figure 5.7 - COP -3 – Free chlorine in Reticulation system.**

Data available only for four year period since 2012. There were 138 incidents recorded as exceedances in last four years. The major issue is to maintain the minimum free chlorine concentration above the 0.2 mg/L level in reticulation system. Trend line shows that average level of free chlorine level is increasing approximately from 0.5 to 1. Therefore, aged water mixing systems for reservoirs and Chlorine booster system for reticulation system were identified to maintain the 0.2 mg/l water through-out the reticulation system. Funding has been requested under Safe and Secure Water Program (SSWP).





**Figure 5.8 - COP -4 – pH in Reticulation system.**



**Figure 5.9 - COP -5 – Turbidity in Reticulation system.**

## 5.1 Data collection

Nyngan water supply system has established daily data collection and weekly data entering system. Four data sheets provide the all relevant data for critical control point monitoring. Each data sheet provides following information.

### Water Data Sheet 1

- Weather condition (temperature) , River water levels and Channel operations

### Water Data Sheet 2

- Raw water quality (Turbidity, Colour, pH, Fluoride)
- Treated water quality (Turbidity, Colour, pH, Free Chlorine, Total Chlorine, Fluoride)
- Clarifier water quality (Turbidity, pH)
- Chemical usage ( Alum, Soda Ash ( pre),Soda Ash (post),Polyelectrolyte, Pre– Chloride, Post-Chloride, Fluoride)

### Water Data Sheet 3

- Raw water flow rate, rated water flow rate, backwash flow rate, Sludge pumping rate

### Water Data Sheet 4

- Water quality of reticulation system (pH, Free Chlorine, Total chlorine, Fluoride, Turbidity)

Water data collection procedure is given bellow.

---



## WATER PROCEDURES DATA ENTRY

### Weekly Water Data Inputs

#### Water 1 - Water & Filtration Plant Report – Blue Sheet

In the first section:

Find this data off the internet by going into the site:

<http://www.bom.gov.au/climate/dwo/201309/html/IDCJDW2103.201309.shtml>

Select the month and enter off the data

All the rest follow the sheets as the setup is the same as the document you are entering off just look for the tabs and columns that correspondence.



#### Water 1 – Water & Filtration Plant

#### Water 2 – Filtration Plant Water Quality – Green Sheet

#### Water 3 – Water Consumption Report – Pink Sheet

#### Water 4 – Reticulation System Quality Samples – White Sheet



All in one excel documents under different tabs down the bottom.

**Where to find it to enter:**

<S:\Engineering\Water and Sewerage\REGISTER - WATER.xlsx>

## 5.2 Non-compliant data

Except the recorded eight incidents with high total coliform in reticulation system no any non-compliant data findings or water quality issues in addition to critical limit exceedances during the reporting year.

**Table 5-1. Summary of non-compliant water quality data (Source of data: NSW Health)**

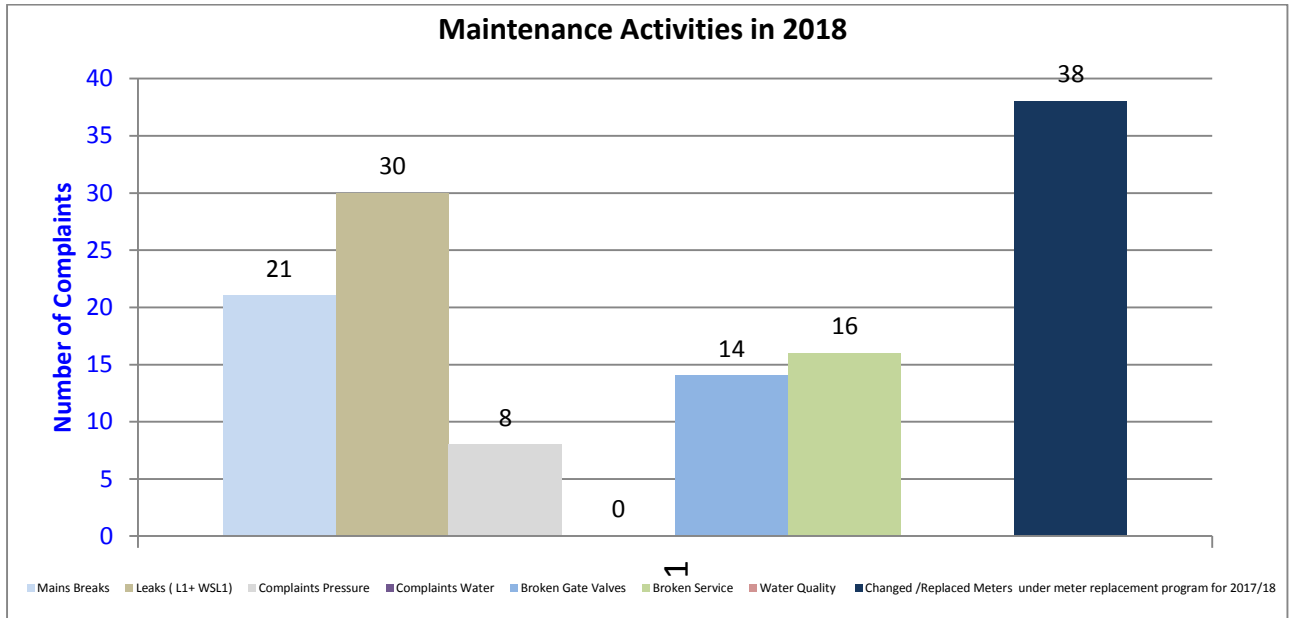
Date	Location	Parameter	Exceedance	Correction	Corrective action	Notes
21/08/2018	Reticulation	Aluminium	4 mpn/ 100 ml	Flushing, retest	Review of maintenance schedule	Sudden increase of raw water turbidity and high dosage of alum
21/10/2018	Reticulation	Fluoride (daily WU)	0.88 mg/l	Flushing, retest	Review of maintenance schedule	During the testing time of the new plant
14/11/2018	Reticulation	Total Coliforms	1 mpn / 100 ml	Flushing, retest	Review of maintenance schedule	Pipe break

Report Type: Results Summary		Nyngan WSS											
Program: Drinking Water Monitoring Program		Collected Date Range: 01-01-2018 - 31-12-2018											
Sample Count: 81													
Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline
Chemistry	Aluminium	0.2000	mg/L	0.2600	0.2600	0.0000	0.26	0.26	1	1	0.26	0.26	0.00
	Antimony	0.0030	mg/L	0.0005	0.0005	0.0000	0.0005	0.0005	1	0	0.0005	0.0005	100.00
	Arsenic	0.0100	mg/L	0.0010	0.0010	0.0000	0.001	0.001	1	0	0.001	0.001	100.00
	Barium	2.0000	mg/L	0.0770	0.0770	0.0000	0.077	0.077	1	0	0.077	0.077	100.00
	Boron	4.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	Cadmium	0.0020	mg/L	0.0003	0.0003	0.0000	0.00025	0.00025	1	0	0.00025	0.00025	100.00
	Calcium	#####	mg/L	29.7000	29.7000	0.0000	29.7	29.7	1	0	29.7	29.7	100.00
	Chloride	250.0000	mg/L	58.0000	58.0000	0.0000	58	58	1	0	58	58	100.00
	Chromium	0.0500	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	1	0	0.0025	0.0025	100.00
	Copper	2.0000	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	1	0	0.0025	0.0025	100.00
	Fluoride	1.5000	mg/L	0.5700	0.5700	0.0000	0.57	0.57	1	0	0.57	0.57	100.00
	Iodine	0.5000	mg/L	0.0300	0.0300	0.0000	0.03	0.03	1	0	0.03	0.03	100.00
	Iron	0.3000	mg/L	0.0050	0.0050	0.0000	0.005	0.005	1	0	0.005	0.005	100.00
	Lead	0.0100	mg/L	0.0010	0.0010	0.0000	0.001	0.001	1	0	0.001	0.001	100.00
	Magnesium	#####	mg/L	16.0900	16.0900	0.0000	16.09	16.09	1	0	16.09	16.09	100.00
	Manganese	0.5000	mg/L	0.0080	0.0080	0.0000	0.008	0.008	1	0	0.008	0.008	100.00
	Mercury	0.0010	mg/L	0.0001	0.0001	0.0000	0.00005	0.00005	1	0	0.00005	0.00005	100.00
	Molybdenum	0.0500	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	1	0	0.0025	0.0025	100.00
	Nickel	0.0200	mg/L	0.0050	0.0050	0.0000	0.005	0.005	1	0	0.005	0.005	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	1	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	1	0	0.05	0.05	100.00
	pH	6.5 - 8.5		8.0000	8.0000	0.0000	8	8	1	0	8	8	100.00
	Selenium	0.0100	mg/L	0.0010	0.0010	0.0000	0.001	0.001	1	0	0.001	0.001	100.00
	Silver	0.1000	mg/L	0.0010	0.0010	0.0000	0.001	0.001	1	0	0.001	0.001	100.00
	Sodium	180.0000	mg/L	42.0000	42.0000	0.0000	42	42	1	0	42	42	100.00
	Sulfate	500.0000	mg/L	23.0000	23.0000	0.0000	23	23	1	0	23	23	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	229.0000	229.0000	0.0000	229	229	1	0	229	229	100.00
	Total Hardness as CaCO3	200.0000	mg/L	140.4000	140.4000	0.0000	140.4	140.4	1	0	140.4	140.4	100.00
	True Colour	15.0000	Hazen Units (HU)	1.0000	1.0000	0.0000	1	1	1	0	1	1	100.00
	Turbidity	5.0000	NTU	1.0000	1.0000	0.0000	1	1	1	0	1	1	100.00
	Uranium	0.0170	mg/L	0.0025	0.0025	0.0000	0.0025	0.0025	1	0	0.0025	0.0025	100.00
	Zinc	3.0000	mg/L	0.0200	0.0200	0.0000	0.02	0.02	1	0	0.02	0.02	100.00
Fluoride Barcode	Fluoride	1.5000	mg/L	0.8100	0.8100	0.0141	0.8	0.82	2	0	0.82	0.8	100.00
	Fluoride (WU result)	1.5000	mg/L	0.9250	0.9250	0.0071	0.92	0.93	2	0	0.93	0.92	100.00
	Fluoride Ratio	0.8 - 1.2		1.1400	1.1400	0.0283	1.12	1.16	2	0	1.16	1.12	100.00
Microbiology	E. coli	0.0000	cfu/100 mL	0.0000	0.0000	0.0000	0	0	46	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.8113	0.7800	0.3209	0.31	1.51	47	0	1.32	0.33	100.00
	pH	6.5 - 8.5		7.7239	7.8000	0.1433	7.4	8	46	0	7.9	7.4	100.00
	Total Chlorine	5.0000	mg/L	1.1551	1.0700	0.3566	0.54	1.9	47	0	1.8	0.6	100.00
	Total Coliforms	0.0000	cfu/100 mL	0.0217	0.0000	0.1474	0	1	46	1	0	0	97.83
	Turbidity	5.0000	NTU	0.5460	0.6000	0.1880	0.2	0.9	47	0	0.8	0.3	100.00
Operational Monitoring	Fluoride (daily WU)	0.9 - 1.5	mg/L	0.9506	0.9600	0.0365	0.88	1.01	31	1	1.01	0.9	96.77

### 5.3 Water quality discussion

There were no positive microbiological results recorded in this reporting year  
 A summary of water quality data available as an Appendix.

## 6 Consumer complaints (Day today Operational and Maintenance Activities)



## 7 Water quality incidents

No Incidents

## 8 Action plan/Improvement plan

A summary of the action/improvement plan activities that have been implemented during the period 2012/2018 is included in Table 8-1. The full action and improvement plan is included in Appendix B.

**Table 8-1. Action/improvement plan activities that have been completed during the period 2012/2018**

Action no.	Item	Status
4.1	<i>Develop and implement a reticulation monitoring program to ensure the free chlorine residual in the distribution system is in-line with the NSW office of Water guidance (greater than 0.2 mg/L throughout the system).</i>	<i>Implemented as COP 3</i>
4.2	<i>Develop procedures and log sheets for the calibration of chemical dosing systems</i>	<i>Instrument calibration LMWUA s project- In progress</i>
5.4	<i>Document daily testing procedures including the review of the water quality results at the water treatment plant.</i>	<i>Implemented</i>
5.5	<i>The DWMS document must be updated to state who is responsible for reviewing the results in the NSW Drinking Water Database. Reviews must be conducted after the results of each microbial sample and monthly for trends and water quality implications.</i>	<i>Implemented- In progress</i>
5.6	<i>Document daily testing procedures including who undertakes the daily review of the water quality results at the water treatment plant.</i>	<i>Implemented</i>
6.8	<i>Develop a contact list of key people, agencies and businesses for a water quality emergency in line with the NSW Guidance.</i>	<i>Part of IRP</i>
6.9	<i>Document in the DWMS where controlled copies of the emergency contact list is kept.</i>	<i>controlled</i>
6.10	<i>Document which agencies should be notified and under what circumstances and who is authorised to notify.</i>	<i>Part of IRP</i>
11.9	<i>C.t should be calculated.</i>	<i>Done by Public Work</i>
1.13	<i>Ensure Staff and Councillors are aware of the National Health Guidelines which include the development of a Drinking Water Quality Management Plan.</i>	<i>Implemented</i>
2.14	<i>Prepare relevant SOPs and make sure they are practised by the operators.</i>	<i>Implemented</i>
3.15	<i>Ensure Critical Control Points are documented.</i>	<i>Implemented</i>
3.16	<i>Ensure Critical Control Points are monitored.</i>	<i>Implemented</i>
4.17	<i>Implement the operational procedures that were developed</i>	<i>Implemented</i>
4.18	<i>Include these procedures in the O&amp;M manual and ensure they are also located where the activity is undertaken</i>	<i>Displayed in the plant room</i>
4.19	<i>Document corrective actions for critical control points</i>	<i>Implemented</i>
5.20	<i>Document all operational procedures</i>	<i>Implemented</i>
6.21	<i>Formalise how incidents and emergencies and reviewed and protocols updated.</i>	<i>Implemented</i>
1.22	<i>Ensure regular (weekly or fortnightly) toolbox style meetings are held with technical and operational staff to ensure staff understands the practical implications and application of formal and regulatory requirements and to allow two way communication of issues. Minutes should be kept of these meetings.</i>	<i>Implemented</i>



Action no.	Item	Status
2.23	Develop a formal maintenance schedule for sludge rake and other equipment in the water supply system.	Implemented
2.25	Consider daily recording of weather conditions and river flows with raw water turbidity.	Implemented
2.26	Consider installing an on-line turbidity meter to measured filtered water	Implemented
2.27	Consider automating filter backwash	Tender Calling under Safe & Secure
2.28	Monitor filtered water turbidity data over a filter run to determine filter characteristics	Implemented
2.29	Formalise reticulation testing program and log all results. Test for chlorine prior to flushing.	Implemented
4.30	Ensure these procedures are held in an operations and maintenance manual	In progress
4.31	Extend the documentation to include the daily monitoring;	Implemented
4.32	Document all corrective actions and formalise associated communication protocol	In Progress
5.33	Ensure turbidity, Cl, pH and F are added to the daily log sheet.	Implemented
5.34	Formalise water quality monitoring schedule for the distribution.	Implemented
5.35	Improve complaint recording through TRIM	In progress
6.36	Document what information is assessed for the NOW performance reporting forms	Implemented
7.37	Regular (weekly or fortnightly) toolbox style meetings should be held with technical and operational staff to ensure two way communication of issues. Minutes should be kept.	Implemented
7.38	Develop and maintain a formalised training program for the employees.	Implemented- In progress
7.39	Share knowledge among the members of LMWUA and other neighbour Councils.	Implemented- In progress
8.40	Ensure water quality is considered during the community consultation as planned under objectives 6 and 7 of SBP 2007/08.	Implemented- In progress
9.42	Participate in research programs and technical/operational workshops organised by LMWUA.	Implemented - In progress
9.43	Undertaking investigative work to determine suitable upgrading method for the existing Nyngan WTP	SCADA system-In progress
11.44	Long term water quality and performance data logs including trends and results should be kept in a designated electronic file location	Implemented SCADA system- Implemented
4.50	Ensure sufficient funds are available to fund asset maintenance and replacement, through the development of the management plan or strategic business plan	Implemented \$80,000 budget allocated for main replacement in 2018
5.52	Document how customer complaints are used to inform system maintenance programs (e.g. flushing programs or pipeline replacement).	Implemented- Mainly on breaks and asset life – In progress
5.53	Document internal and external reporting measures for water quality monitoring.	Implemented
5.54	Document corrective procedures and communication systems for other non-conformances.	Implemented- In progress

Action no.	Item	Status
6.55	<i>Develop formal incident log sheets for recording of incident and management actions undertaken and for use in debriefing sessions</i>	<i>Implemented- In progress</i>
6.56	<i>Develop and incident and emergency response plan which contains information to guide staff in an incident and emergency. Ensure hard copies are controlled and available.</i>	<i>Part of IRP</i>
8.57	<i>Review Council's involvement in the Save Water alliance to improve communication with consumers.</i>	<i>Implemented with LMWUA</i>
11.61	<i>Establish procedures for long term performance evaluation of the water business within LMWUA.</i>	<i>Involved in the Water Security Program – In progress</i>
12.62	<i>Formalise management review of the water business</i>	<i>Involved in the Water Security Program – In progress</i>
4.67	<i>Replace the existing fluoridation system with a new system that complies with the NSW Code of Practice for Fluoridation of Public Water Supplies.</i>	<i>New Fluoridation Plant –in operation</i>

## 9 Review of DWMS implementation

NSW Public Works has done a review on 19h February 2015

**Table 9-1. Summary of internal reviews**

Element	Component	Finding	Action
N/A	N/A	N/A	N/A

**Table 9-2. Summary of external reviews**

Date	Reviewer	Scope	Summary of outcomes	Actions taken
19/02/2015	Glenn Frnandes	Reviewing Chlorination system	Calculation of C.t value	Confirm the effective disinfection
		Reviewing Chemical dosing system	Proposed an alternative dosing arrangement	If current process fails only
05/03/2018	Lisa Procter	Reviewing CCPs and introducing COPs.	New CCPs and new COPs.	Established 4- CCPs and 3- COPs
		Health Based Targets (HBTs) Limits were reviewed to more closely align with ADWG	Level of Turbidity of filtered water	

Additionally, Council commenced holding regular drinking water quality committee meetings in November 2016 and these meetings include an agenda item to identify any actions that can improve the management of and quality of drinking water supplied to the community. Actions identified in these meetings are shown in Table 9 1.

Action number	Update/action	Due	Action By	Progress	Status
<b>NynSC Sept16.1</b>	Review of water quality data to include June – Sept and Sept – Dec	December 2016	Bogan SC	Mar 17: this assessment has been undertaken	Complete
<b>NynSC Sept16.2</b>	Review Gap Improvement Items and provide update	December 2016	Bogan SC		Ongoing
<b>NynSC Sept16.3</b>	Provide the Risk Assessment improvement plan for review next meeting	December 2016	Bogan SC		
<b>NynSC Sept16.4</b>	Update the Turbidity limits to reflect the ADWG levels on the reporting sheets	December 2016	Bogan SC	Mar 17: Council is considering lowering the critical limit to 1NTU July 2017: Target and alert limits have been lowered. Still to consider whether to adjust the critical limit	Complete
<b>NynSC Dec16.1</b>	Review the CCPs: <ul style="list-style-type: none"> <li>The CCP for the Clear Water Tank could be reduced to 1 NTU</li> <li>There was discussion on the reservoir arrangement, and potentially the need to set a Critical operational target (COP) for the reservoirs inspections and reticulation for turbidity and chlorine</li> <li>The CCP for Fluoride required checking against the NSW Fluoridation Code of practice</li> </ul>	Mar 2016	Bogan SC	July 17: NSW Health requirements for fluoride are as follows: <ul style="list-style-type: none"> <li>Daily results should be as close as possible to 1 mg/L, and in the range of 0.9 mg/L to 1.5 mg/L</li> <li>Any fluoride monitoring (calculated or tested) returns a result of greater than 1.5 mg/L needs to be notified via a form 5 to NSW Health</li> <li>Three consecutive daily monitoring results are less than 0.9 mg/L needs to be notified via a form 5 to NSW Health</li> </ul>	Complete
<b>NynSC Mar17.1</b>	Council to provide the latest copy of CCP's for the next meeting	July 2017	Bogan SC	July 17: Latest CCP's included in the quarterly report	Complete
<b>NynSC Mar17.1</b>	Consider modifying for CCP for filtered water turbidity: <ul style="list-style-type: none"> <li>Operational target 0.2 to 0.5 NTU (current value &lt;0.5 NTU)</li> <li>Adjustment Limit 0.5 to 1 NTU (current value &gt;0.8 NTU)</li> <li>Critical Limit 1 NTU (current value &gt;1.5 NTU)</li> </ul>	July 2017	Bogan SC	July 17: Filtered water turbidity operational target and adjustment limit have been modified Oct 17: Additional text added to fluoride CCP	Complete

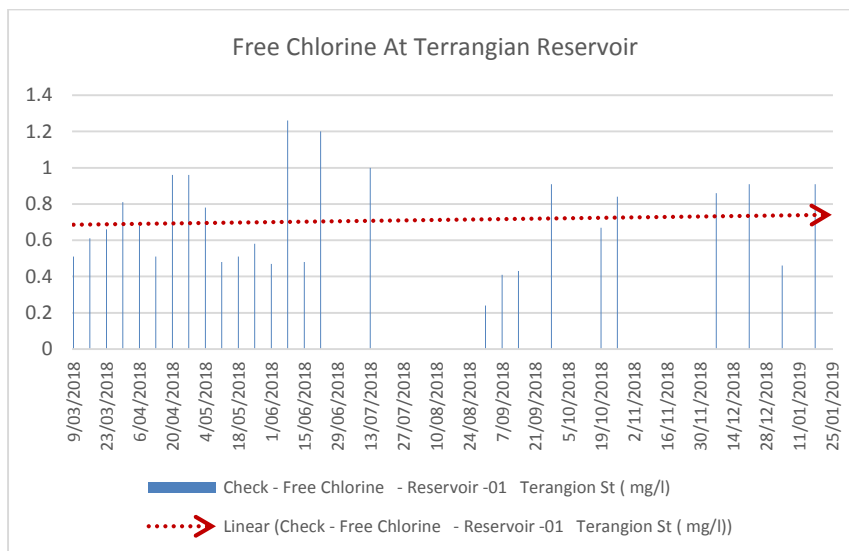
Action number	Update/action	Due	Action By	Progress	Status
	The CCP limits for fluoride were discussed. It was suggested that the target limit be 1mg/L, in line with NSW Health requirements. Also, it is recommended that the lower alert limit has the following added " <i>for greater than 72 hours</i> ".				
<b>NynSC Jul17.1</b>	It is recommended that the following changes be adopted for the CCPs and COPs: <ul style="list-style-type: none"> <li>• CCP2 – reduce the filtered water turbidity critical limit from 1.5NTU to 1 NTU in line with the ADWG for effective disinfection</li> <li>• CCP4 – modify the target criteria to 1mg/L in line with NSW Health requirements</li> <li>• CCP4 – modify the lower adjustment limits from &lt;1.1mg/L to &lt;0.9mg/L</li> <li>• CCP4 – modify the low critical limit from &gt;0.9mg/L to &lt;0.9mg/L for 72 hours</li> </ul>	December 2017	Bogan SC	Oct 17: Complete	Complete
<b>NynSC Jul17.2</b>	It is recommended that the scape on graph COP4 (pH in the reticulation system) be adjusted from 0-14 to 5-9.	December 2017	Bogan SC	October 17: Graph changed in quarterly report	Complete
<b>NynSC Oct17.1</b>	It is recommended that the following changes be adopted for CCP2 – reduce the filtered water turbidity critical limit from 1.5NTU to 1 NTU in line with the ADWG for effective disinfection	March 2018	Bogan SC		
<b>NynSC Oct17.2</b>	Council advised that there are regularly inspecting the reservoirs. Recommend including evidence of inspection in the next quarterly (eg copies of checklists, list of identified issues and rectification actions taken).	March 2018	Bogan SC		

# 10 Reservoir inspections

## Weekly reservoir inspection reports

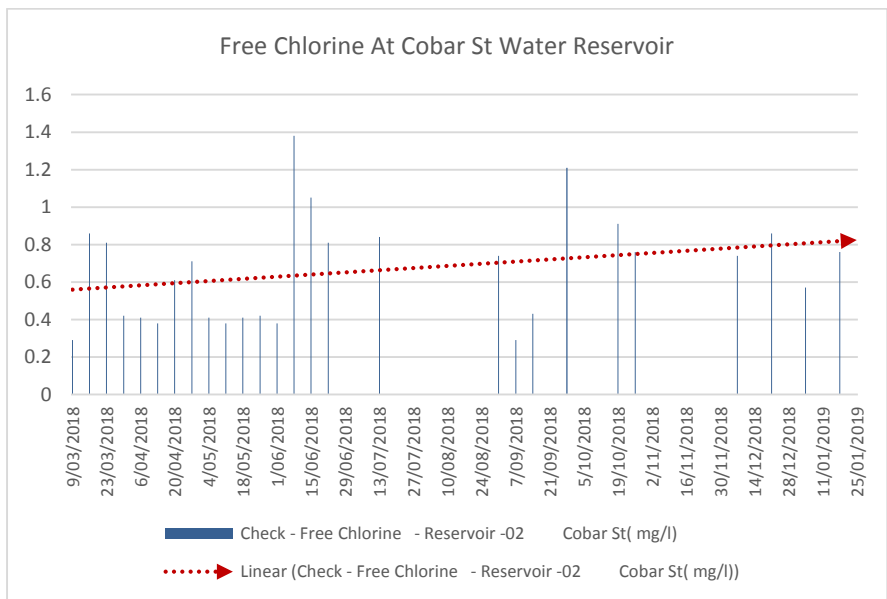
Reservoir in Terangion Street

Date	Check - Free Chlorine - Reservoir - 01 Terangion St ( mg/l)	Inspection of security at reservoir			Inspection of reservoir grounds					Inspection of reservoir - walk all the way around					Inspection of roof					Inspected By
		Check gate is closed and padlocked	Check ladders	Check ladder cages are padlocked	Check for overhanging branches	Overgrown grass	Other plants	Check ground for thrown items, such as big rocks,	Check ground for any animal poo or other signs of animals	Check for any signs of leaks (staining, damp patches,	Check for damage to the walls from rocks or other	Check mesh/netting (if installed) for any holes	Check for any signs of animal entry	Check hatch is closed and locked	Check for any damage to the roof from rocks or other items	Check for any signs of animals, particularly birds	Check for floating debris and feathers	Check for water pooling		
9/03/2018	0.51	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
16/03/2018	0.61	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
23/03/2018	0.66	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
30/03/2018	0.81	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan		
6/04/2018	0.68	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan		
13/04/2018	0.51	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan		
20/04/2018	0.96	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
27/04/2018	0.96	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
4/05/2018	0.78	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
11/05/2018	0.48	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
18/05/2018	0.51	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
25/05/2018	0.58	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
1/06/2018	0.47	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
8/06/2018	1.26	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
15/06/2018	0.48	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
22/06/2018	1.2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
13/07/2018	1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
31/08/2018	0.24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
7/09/2018	0.41	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
14/09/2018	0.43	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
28/09/2018	0.91	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
19/10/2018	0.67	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		
26/10/2018	0.84	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
7/12/2018	0.86	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke		
21/12/2018	0.91	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright		



Reservoir in Cobar Street

Date	Check - Free Chlorine - Reservoir - 02 Cobar St( mg/l)	Inspection of			Inspection of reservoir grounds				Inspection of reservoir -				Inspection of roof				Inspected By	
		Check gate is closed and padlocked	Check ladders	Check ladder cages are padlocked	Check for overhanging branches	Overgrown grass	Other plants	Check ground for thrown items, such as big rocks, smashed glass	Check ground for any animal poo or other signs of animals	Check for any signs of leaks (staining, damp patches, puddles)	Check for damage to the walls from rocks or other items	Check mesh/netting (if installed) for any holes	Check for any signs of animal entry	Check hatch is closed and locked	Check for any damage to the roof from rocks or other items	Check for any signs of animals, particularly birds nesting		Check for floating debris and feathers
9/03/2018	0.29	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
16/03/2018	0.86	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
23/03/2018	0.81	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
30/03/2018	0.42	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan
6/04/2018	0.41	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan
13/04/2018	0.38	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	T Milligan
20/04/2018	0.61	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
27/04/2018	0.71	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
4/05/2018	0.41	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
11/05/2018	0.38	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
18/05/2018	0.41	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
25/05/2018	0.42	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
1/06/2018	0.38	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
8/06/2018	1.38	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
15/06/2018	1.05	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
22/06/2018	0.81	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
13/07/2018	0.84	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
31/08/2018	0.74	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
7/09/2018	0.29	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
14/09/2018	0.43	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
28/09/2018	1.21	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
19/10/2018	0.91	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright
26/10/2018	0.76	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
7/12/2018	0.74	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C Bourke
21/12/2018	0.86	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	L Wright



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*Progress of four year Reservoir inspection Program*

<b>Date</b>	<b>Reservoirs inspected</b>	<b>Issue</b>	<b>Corrective actions</b>
<i>15/07/2014</i>	<i>Cobar St</i>	<i>Entry hatch is not sealed</i>	<i>Hatch has been sealed.</i>
		<i>Upper cage of internal ladder needs to be removed</i>	<i>In progress</i>
<i>15/07/2014</i>	<i>Terangion St</i>	<i>Entry hatch is not sealed</i>	<i>Hatch has been sealed.</i>
		<i>Upper cage of internal ladder needs to be removed</i>	<i>In progress</i>

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## Appendix A Water quality data

### A.1 Water quality graphs

- *Provided in Section-5*

### A.2 Water quality data summary

*This section includes the summary of available water quality data over the reporting period:*

- *Raw water – Council reported data*
- *Treated water - Council reported data*
- *Reticulation - Council reported data*
- *Verification – NSW Health reported data*

#### A.2.1 Raw Water

Parameter	Min	5 <sup>th</sup> per-centile	Median	95 <sup>th</sup> per-centile	Critical Limits	No. samples
Turbidity (NTU)	4	5	8	76	500	365
Colour (HU)	20	20	50	500	N/A	365
pH	7	7	7.2	7.3	8	365
Fluoride (mg/L)	0.11	0.16	0.19	0	1.5	150

#### A.2.2 Treated Water

Parameter	Min	5 <sup>th</sup> per-centile	Median	95 <sup>th</sup> per-centile	Critical Limits	No. samples
Turbidity (NTU)	0.1	0.2	0.3	0.6	0.5	365
Colour (HU)	0	0	0	0	0	365
pH	7.2	7.4	7.7	7.9	8	365
Fluoride	0.89	0.91	0.99	1.1	0.9-1.5	143
Free Chlorine (mg/L)	1.48	1.89	2.25	2.54	4.0 -1.0	365

#### A.2.3 Reticulation

Parameter	Min	5 <sup>th</sup> per-centile	Median	95 <sup>th</sup> per-centile	Critical Limits	No. samples
Turbidity (NTU)	0.2	0.3	0.6	0.9	1.5	365
pH	7.1	7.4	7.7	7.9	8	365
Fluoride	0.89	0.9	0.96	1.03	0.8-1.5	136
Free Chlorine (mg/L)	0.2	0.21	0.48	1.4	1.5	365

## A.2.4 Verification monitoring (optional)

A summary of NSW Health's Drinking Water Quality Monitoring Program data is included here.

Parameter	Location	Min	5 <sup>th</sup> percentile	Median	95 <sup>th</sup> percentile	ADWG Limit	Unit	No. exceedances	No. samples
E. coli	Reticulation	0	0	0	0	0	cfu /100ml	0	48
Free Chlorine	Reticulation	0.31	0.33	0.78	1.32	0.2-5	mg/L	0	47
pH	Reticulation	7.4	7.4	7.8	7.9	6.5-8.5		0	46
Turbidity	Reticulation	0.2	0.3	0.6	0.8	5	NTU	0	47

## NSW Health Performance comparison report for Nyngan water supply system

**Program:** NSW Health Drinking Water Monitoring Program

**Date Range:** 01-01-2018 - 31-12-2018

Barcode	Characteristic	Guideline Value	Units	Value	Date Collected	Sample Comments
118BG0100001	E. coli	0	cfu/100 mL	< 1	10-01-2018	
118BG0100001	Free Chlorine	0.2 - 5	mg/L	0.9400	10-01-2018	
118BG0100001	pH	6.5 - 8.5		7.6000	10-01-2018	
118BG0100001	Total Chlorine	5	mg/L	1.8000	10-01-2018	
118BG0100001	Total Coliforms	0	cfu/100 mL	< 1	10-01-2018	
118BG0100001	Turbidity	5	NTU	0.8000	10-01-2018	
118BG0100002	E. coli	0	cfu/100 mL	< 1	16-01-2018	
118BG0100002	Free Chlorine	0.2 - 5	mg/L	0.9000	16-01-2018	
118BG0100002	Total Chlorine	5	mg/L	1.7200	16-01-2018	
118BG0100002	Total Coliforms	0	cfu/100 mL	< 1	16-01-2018	
118BG0100002	Turbidity	5	NTU	0.6600	16-01-2018	
118BG0100003	Free Chlorine	0.2 - 5	mg/L	1.1300	24-01-2018	,Not tested - late
118BG0100003	pH	6.5 - 8.5		7.4000	24-01-2018	,Not tested - late
118BG0100003	Total Chlorine	5	mg/L	1.9000	24-01-2018	,Not tested - late
118BG0100003	Turbidity	5	NTU	0.6000	24-01-2018	,Not tested - late
118BG0100004	E. coli	0	cfu/100 mL	< 1	13-02-2018	
118BG0100004	Free Chlorine	0.2 - 5	mg/L	0.7100	13-02-2018	
118BG0100004	pH	6.5 - 8.5		7.5000	13-02-2018	
118BG0100004	Total Chlorine	5	mg/L	0.9800	13-02-2018	
118BG0100004	Total Coliforms	0	cfu/100 mL	< 1	13-02-2018	
118BG0100004	Turbidity	5	NTU	0.6000	13-02-2018	
118BG0100005	E. coli	0	cfu/100 mL	< 1	13-02-2018	

118BG0100005	Free Chlorine	0.2 - 5	mg/L	0.9600	13-02-2018	
118BG0100005	pH	6.5 - 8.5		7.4000	13-02-2018	
118BG0100005	Total Chlorine	5	mg/L	1.3100	13-02-2018	
118BG0100005	Total Coliforms	0	cfu/100 mL	< 1	13-02-2018	
118BG0100005	Turbidity	5	NTU	0.3000	13-02-2018	
118BG0100007	E. coli	0	cfu/100 mL	< 1	27-02-2018	
118BG0100007	Free Chlorine	0.2 - 5	mg/L	0.6100	27-02-2018	
118BG0100007	pH	6.5 - 8.5		7.8000	27-02-2018	
118BG0100007	Total Chlorine	5	mg/L	0.9300	27-02-2018	
118BG0100007	Total Coliforms	0	cfu/100 mL	< 1	27-02-2018	
118BG0100007	Turbidity	5	NTU	0.3000	27-02-2018	
118BG0100008	E. coli	0	cfu/100 mL	< 1	06-03-2018	
118BG0100008	Free Chlorine	0.2 - 5	mg/L	0.3300	06-03-2018	
118BG0100008	pH	6.5 - 8.5		7.7000	06-03-2018	
118BG0100008	Total Chlorine	5	mg/L	0.5400	06-03-2018	
118BG0100008	Total Coliforms	0	cfu/100 mL	< 1	06-03-2018	
118BG0100008	Turbidity	5	NTU	0.6000	06-03-2018	
118BG0100009	E. coli	0	cfu/100 mL	< 1	06-03-2018	
118BG0100009	Free Chlorine	0.2 - 5	mg/L	0.4100	06-03-2018	
118BG0100009	pH	6.5 - 8.5		7.7000	06-03-2018	
118BG0100009	Total Chlorine	5	mg/L	0.8600	06-03-2018	
118BG0100009	Total Coliforms	0	cfu/100 mL	< 1	06-03-2018	
118BG0100009	Turbidity	5	NTU	0.8000	06-03-2018	
118BG0100010	E. coli	0	cfu/100 mL	< 1	20-03-2018	
118BG0100010	Free Chlorine	0.2 - 5	mg/L	0.4100	20-03-2018	
118BG0100010	pH	6.5 - 8.5		7.8000	20-03-2018	
118BG0100010	Total Chlorine	5	mg/L	0.8600	20-03-2018	
118BG0100010	Total Coliforms	0	cfu/100 mL	< 1	20-03-2018	
118BG0100010	Turbidity	5	NTU	0.9000	20-03-2018	
118BG0100011	E. coli	0	cfu/100 mL	< 1	10-04-2018	
118BG0100011	Free Chlorine	0.2 - 5	mg/L	0.4400	10-04-2018	
118BG0100011	pH	6.5 - 8.5		7.8000	10-04-2018	
118BG0100011	Total Chlorine	5	mg/L	0.8800	10-04-2018	
118BG0100011	Total Coliforms	0	cfu/100 mL	< 1	10-04-2018	
118BG0100011	Turbidity	5	NTU	0.7000	10-04-2018	
118BG0100012	E. coli	0	cfu/100 mL	< 1	10-04-2018	
118BG0100012	Free Chlorine	0.2 - 5	mg/L	0.6800	10-04-2018	
118BG0100012	pH	6.5 - 8.5		7.6000	10-04-2018	
118BG0100012	Total Chlorine	5	mg/L	0.9300	10-04-2018	

118BG0100012	Total Coliforms	0	cfu/100 mL	< 1	10-04-2018	
118BG0100012	Turbidity	5	NTU	0.5000	10-04-2018	
118BG0100013	E. coli	0	cfu/100 mL	< 1	17-04-2018	
118BG0100013	Free Chlorine	0.2 - 5	mg/L	1.2100	17-04-2018	
118BG0100013	pH	6.5 - 8.5		7.7000	17-04-2018	
118BG0100013	Total Chlorine	5	mg/L	1.7300	17-04-2018	
118BG0100013	Total Coliforms	0	cfu/100 mL	< 1	17-04-2018	
118BG0100013	Turbidity	5	NTU	0.6000	17-04-2018	
118BG0100014	E. coli	0	cfu/100 mL	< 1	01-05-2018	
118BG0100014	Free Chlorine	0.2 - 5	mg/L	0.6000	01-05-2018	
118BG0100014	pH	6.5 - 8.5		7.9000	01-05-2018	
118BG0100014	Total Chlorine	5	mg/L	1.0700	01-05-2018	
118BG0100014	Total Coliforms	0	cfu/100 mL	< 1	01-05-2018	
118BG0100014	Turbidity	5	NTU	0.6000	01-05-2018	
118BG0100015	E. coli	0	cfu/100 mL	< 1	01-05-2018	
118BG0100015	Free Chlorine	0.2 - 5	mg/L	0.4100	01-05-2018	
118BG0100015	pH	6.5 - 8.5		8.0000	01-05-2018	
118BG0100015	Total Chlorine	5	mg/L	0.8600	01-05-2018	
118BG0100015	Total Coliforms	0	cfu/100 mL	< 1	01-05-2018	
118BG0100015	Turbidity	5	NTU	0.7000	01-05-2018	
118BG0100017	E. coli	0	cfu/100 mL	< 1	15-05-2018	
118BG0100017	Free Chlorine	0.2 - 5	mg/L	0.8800	15-05-2018	
118BG0100017	pH	6.5 - 8.5		7.7000	15-05-2018	
118BG0100017	Total Chlorine	5	mg/L	0.9600	15-05-2018	
118BG0100017	Total Coliforms	0	cfu/100 mL	< 1	15-05-2018	
118BG0100017	Turbidity	5	NTU	0.5000	15-05-2018	
118BG0100018	E. coli	0	cfu/100 mL	< 1	15-05-2018	
118BG0100018	Free Chlorine	0.2 - 5	mg/L	0.6400	15-05-2018	
118BG0100018	pH	6.5 - 8.5		7.9000	15-05-2018	
118BG0100018	Total Chlorine	5	mg/L	0.8700	15-05-2018	
118BG0100018	Total Coliforms	0	cfu/100 mL	< 1	15-05-2018	
118BG0100018	Turbidity	5	NTU	0.6000	15-05-2018	
118BG0100019	E. coli	0	cfu/100 mL	< 1	22-05-2018	
118BG0100019	Free Chlorine	0.2 - 5	mg/L	0.5500	22-05-2018	
118BG0100019	pH	6.5 - 8.5		7.8000	22-05-2018	
118BG0100019	Total Chlorine	5	mg/L	0.8300	22-05-2018	
118BG0100019	Total Coliforms	0	cfu/100 mL	< 1	22-05-2018	
118BG0100019	Turbidity	5	NTU	0.9000	22-05-2018	
118BG0100020	E. coli	0	cfu/100 mL	< 1	29-05-2018	

118BG0100020	Free Chlorine	0.2 - 5	mg/L	0.8700	29-05-2018	
118BG0100020	pH	6.5 - 8.5		7.9000	29-05-2018	
118BG0100020	Total Chlorine	5	mg/L	1.2600	29-05-2018	
118BG0100020	Total Coliforms	0	cfu/100 mL	< 1	29-05-2018	
118BG0100020	Turbidity	5	NTU	0.7000	29-05-2018	
118BG0100021	E. coli	0	cfu/100 mL	< 1	05-06-2018	,Late but tested
118BG0100021	Free Chlorine	0.2 - 5	mg/L	0.6300	05-06-2018	,Late but tested
118BG0100021	pH	6.5 - 8.5		7.7000	05-06-2018	,Late but tested
118BG0100021	Total Chlorine	5	mg/L	0.9600	05-06-2018	,Late but tested
118BG0100021	Total Coliforms	0	cfu/100 mL	< 1	05-06-2018	,Late but tested
118BG0100021	Turbidity	5	NTU	0.2000	05-06-2018	,Late but tested
118BG0100022	E. coli	0	cfu/100 mL	< 1	12-06-2018	
118BG0100022	Free Chlorine	0.2 - 5	mg/L	0.3800	12-06-2018	
118BG0100022	pH	6.5 - 8.5		7.8000	12-06-2018	
118BG0100022	Total Chlorine	5	mg/L	0.5700	12-06-2018	
118BG0100022	Total Coliforms	0	cfu/100 mL	< 1	12-06-2018	
118BG0100022	Turbidity	5	NTU	0.3000	12-06-2018	
118BG0100023	E. coli	0	cfu/100 mL	< 1	19-06-2018	
118BG0100023	Free Chlorine	0.2 - 5	mg/L	1.0700	19-06-2018	
118BG0100023	pH	6.5 - 8.5		7.8000	19-06-2018	
118BG0100023	Total Chlorine	5	mg/L	1.2600	19-06-2018	
118BG0100023	Total Coliforms	0	cfu/100 mL	< 1	19-06-2018	
118BG0100023	Turbidity	5	NTU	0.2000	19-06-2018	
118BG0100024	E. coli	0	cfu/100 mL	< 1	26-06-2018	
118BG0100024	Free Chlorine	0.2 - 5	mg/L	0.7300	26-06-2018	
118BG0100024	pH	6.5 - 8.5		7.7000	26-06-2018	
118BG0100024	Total Chlorine	5	mg/L	1.0600	26-06-2018	
118BG0100024	Total Coliforms	0	cfu/100 mL	< 1	26-06-2018	
118BG0100024	Turbidity	5	NTU	0.4000	26-06-2018	
118BG0100025	E. coli	0	cfu/100 mL	< 1	03-07-2018	
118BG0100025	Free Chlorine	0.2 - 5	mg/L	0.8600	03-07-2018	
118BG0100025	pH	6.5 - 8.5		7.8000	03-07-2018	
118BG0100025	Total Chlorine	5	mg/L	1.0200	03-07-2018	
118BG0100025	Total Coliforms	0	cfu/100 mL	< 1	03-07-2018	
118BG0100025	Turbidity	5	NTU	0.6000	03-07-2018	
118BG0100026	E. coli	0	cfu/100 mL	< 1	10-07-2018	,Late but tested
118BG0100026	Free Chlorine	0.2 - 5	mg/L	1.2600	10-07-2018	,Late but tested
118BG0100026	pH	6.5 - 8.5		7.7000	10-07-2018	,Late but tested

118BG0100026	Total Chlorine	5	mg/L	1.5000	10-07-2018	,Late but tested
118BG0100026	Total Coliforms	0	cfu/100 mL	< 1	10-07-2018	,Late but tested
118BG0100026	Turbidity	5	NTU	0.4000	10-07-2018	,Late but tested
118BG0100027	E. coli	0	cfu/100 mL	< 1	17-07-2018	
118BG0100027	Free Chlorine	0.2 - 5	mg/L	0.8100	17-07-2018	
118BG0100027	pH	6.5 - 8.5		7.6000	17-07-2018	
118BG0100027	Total Chlorine	5	mg/L	1.0900	17-07-2018	
118BG0100027	Total Coliforms	0	cfu/100 mL	< 1	17-07-2018	
118BG0100027	Turbidity	5	NTU	0.3000	17-07-2018	
118BG0100028	E. coli	0	cfu/100 mL	< 1	24-07-2018	
118BG0100028	Free Chlorine	0.2 - 5	mg/L	0.6800	24-07-2018	
118BG0100028	pH	6.5 - 8.5		7.8000	24-07-2018	
118BG0100028	Total Chlorine	5	mg/L	0.9300	24-07-2018	
118BG0100028	Total Coliforms	0	cfu/100 mL	< 1	24-07-2018	
118BG0100028	Turbidity	5	NTU	0.5000	24-07-2018	
118BG0100029	E. coli	0	cfu/100 mL	< 1	31-07-2018	
118BG0100029	Free Chlorine	0.2 - 5	mg/L	0.7400	31-07-2018	
118BG0100029	pH	6.5 - 8.5		7.4000	31-07-2018	
118BG0100029	Total Chlorine	5	mg/L	1.0900	31-07-2018	
118BG0100029	Total Coliforms	0	cfu/100 mL	< 1	31-07-2018	
118BG0100029	Turbidity	5	NTU	0.4000	31-07-2018	
118BG0100030	E. coli	0	cfu/100 mL	< 1	07-08-2018	
118BG0100030	Free Chlorine	0.2 - 5	mg/L	0.7800	07-08-2018	
118BG0100030	pH	6.5 - 8.5		7.8000	07-08-2018	
118BG0100030	Total Chlorine	5	mg/L	1.2900	07-08-2018	
118BG0100030	Total Coliforms	0	cfu/100 mL	< 1	07-08-2018	
118BG0100030	Turbidity	5	NTU	0.5000	07-08-2018	
118BG0100031	E. coli	0	cfu/100 mL	< 1	14-08-2018	
118BG0100031	Free Chlorine	0.2 - 5	mg/L	0.8200	14-08-2018	
118BG0100031	pH	6.5 - 8.5		7.6000	14-08-2018	
118BG0100031	Total Chlorine	5	mg/L	1.1400	14-08-2018	
118BG0100031	Total Coliforms	0	cfu/100 mL	< 1	14-08-2018	
118BG0100031	Turbidity	5	NTU	0.3000	14-08-2018	
118BG0100032	E. coli	0	cfu/100 mL	< 1	28-08-2018	
118BG0100032	Free Chlorine	0.2 - 5	mg/L	1.2800	28-08-2018	
118BG0100032	pH	6.5 - 8.5		7.9000	28-08-2018	
118BG0100032	Total Chlorine	5	mg/L	1.6600	28-08-2018	
118BG0100032	Total Coliforms	0	cfu/100 mL	< 1	28-08-2018	
118BG0100032	Turbidity	5	NTU	0.8000	28-08-2018	

118BG0100033	E. coli	0	cfu/100 mL	< 1	21-08-2018	
118BG0100033	Free Chlorine	0.2 - 5	mg/L	0.5200	21-08-2018	
118BG0100033	pH	6.5 - 8.5		7.8000	21-08-2018	
118BG0100033	Total Chlorine	5	mg/L	0.7900	21-08-2018	
118BG0100033	Total Coliforms	0	cfu/100 mL	< 1	21-08-2018	
118BG0100033	Turbidity	5	NTU	0.6000	21-08-2018	
118BG0100034	E. coli	0	cfu/100 mL	< 1	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100034	Free Chlorine	0.2 - 5	mg/L	1.2100	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100034	pH	6.5 - 8.5		7.8000	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100034	Total Chlorine	5	mg/L	1.3600	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100034	Total Coliforms	0	cfu/100 mL	< 1	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100034	Turbidity	5	NTU	0.6000	04-09-2018	,Barcode could not be scanned. Site code illegible - enter 999
118BG0100035	E. coli	0	cfu/100 mL	< 1	11-09-2018	,Site code not provided - enter 999
118BG0100035	Free Chlorine	0.2 - 5	mg/L	1.3600	11-09-2018	,Site code not provided - enter 999
118BG0100035	pH	6.5 - 8.5		7.9000	11-09-2018	,Site code not provided - enter 999
118BG0100035	Total Chlorine	5	mg/L	1.5800	11-09-2018	,Site code not provided - enter 999
118BG0100035	Total Coliforms	0	cfu/100 mL	< 1	11-09-2018	,Site code not provided - enter 999
118BG0100035	Turbidity	5	NTU	0.8000	11-09-2018	,Site code not provided - enter 999
118BG0100036	E. coli	0	cfu/100 mL	< 1	18-09-2018	
118BG0100036	Free Chlorine	0.2 - 5	mg/L	0.3200	18-09-2018	
118BG0100036	pH	6.5 - 8.5		7.6000	18-09-2018	

118BG0100036	Total Chlorine	5	mg/L	0.8100	18-09-2018	
118BG0100036	Total Coliforms	0	cfu/100 mL	< 1	18-09-2018	
118BG0100036	Turbidity	5	NTU	0.6000	18-09-2018	
118BG0100037	E. coli	0	cfu/100 mL	< 1	25-09-2018	
118BG0100037	Free Chlorine	0.2 - 5	mg/L	0.6100	25-09-2018	
118BG0100037	pH	6.5 - 8.5		7.8000	25-09-2018	
118BG0100037	Total Chlorine	5	mg/L	1.0700	25-09-2018	
118BG0100037	Total Coliforms	0	cfu/100 mL	< 1	25-09-2018	
118BG0100037	Turbidity	5	NTU	0.6000	25-09-2018	
118BG0100038	E. coli	0	cfu/100 mL	< 1	09-10-2018	
118BG0100038	Free Chlorine	0.2 - 5	mg/L	0.3100	09-10-2018	
118BG0100038	pH	6.5 - 8.5		7.8000	09-10-2018	
118BG0100038	Total Chlorine	5	mg/L	0.6000	09-10-2018	
118BG0100038	Total Coliforms	0	cfu/100 mL	< 1	09-10-2018	
118BG0100038	Turbidity	5	NTU	0.7000	09-10-2018	
118BG0100039	E. coli	0	cfu/100 mL	< 1	09-10-2018	
118BG0100039	Free Chlorine	0.2 - 5	mg/L	0.4700	09-10-2018	
118BG0100039	pH	6.5 - 8.5		7.8000	09-10-2018	
118BG0100039	Total Chlorine	5	mg/L	0.7300	09-10-2018	
118BG0100039	Total Coliforms	0	cfu/100 mL	< 1	09-10-2018	
118BG0100039	Turbidity	5	NTU	0.4000	09-10-2018	
118BG0100040	E. coli	0	cfu/100 mL	< 1	16-10-2018	
118BG0100040	Free Chlorine	0.2 - 5	mg/L	1.2200	16-10-2018	
118BG0100040	pH	6.5 - 8.5		7.8000	16-10-2018	
118BG0100040	Total Chlorine	5	mg/L	1.4800	16-10-2018	
118BG0100040	Total Coliforms	0	cfu/100 mL	< 1	16-10-2018	
118BG0100040	Turbidity	5	NTU	0.8000	16-10-2018	
118BG0100042	E. coli	0	cfu/100 mL	< 1	23-10-2018	
118BG0100042	Free Chlorine	0.2 - 5	mg/L	0.6200	23-10-2018	
118BG0100042	pH	6.5 - 8.5		7.6000	23-10-2018	
118BG0100042	Total Chlorine	5	mg/L	0.8800	23-10-2018	
118BG0100042	Total Coliforms	0	cfu/100 mL	< 1	23-10-2018	
118BG0100042	Turbidity	5	NTU	0.5000	23-10-2018	
118BG0100043	E. coli	0	cfu/100 mL	< 1	23-10-2018	
118BG0100043	Free Chlorine	0.2 - 5	mg/L	1.5100	23-10-2018	
118BG0100043	pH	6.5 - 8.5		7.7000	23-10-2018	
118BG0100043	Total Chlorine	5	mg/L	1.7200	23-10-2018	
118BG0100043	Total Coliforms	0	cfu/100 mL	< 1	23-10-2018	
118BG0100043	Turbidity	5	NTU	0.6000	23-10-2018	



118BG0100045	E. coli	0	cfu/100 mL	< 1	30-10-2018	
118BG0100045	Free Chlorine	0.2 - 5	mg/L	0.6500	30-10-2018	
118BG0100045	pH	6.5 - 8.5		7.6000	30-10-2018	
118BG0100045	Total Chlorine	5	mg/L	0.9300	30-10-2018	
118BG0100045	Total Coliforms	0	cfu/100 mL	< 1	30-10-2018	
118BG0100045	Turbidity	5	NTU	0.5000	30-10-2018	
118BG0100046	E. coli	0	cfu/100 mL	< 1	06-11-2018	
118BG0100046	Free Chlorine	0.2 - 5	mg/L	1.2000	06-11-2018	
118BG0100046	pH	6.5 - 8.5		7.8000	06-11-2018	
118BG0100046	Total Chlorine	5	mg/L	1.3800	06-11-2018	
118BG0100046	Total Coliforms	0	cfu/100 mL	< 1	06-11-2018	
118BG0100046	Turbidity	5	NTU	0.8000	06-11-2018	
118BG0100047	E. coli	0	cfu/100 mL	< 1	14-11-2018	
118BG0100047	Free Chlorine	0.2 - 5	mg/L	1.2800	14-11-2018	
118BG0100047	pH	6.5 - 8.5		7.4000	14-11-2018	
118BG0100047	Total Chlorine	5	mg/L	1.5800	14-11-2018	
118BG0100047	Total Coliforms	0	cfu/100 mL	1.0000	14-11-2018	
118BG0100047	Turbidity	5	NTU	0.3000	14-11-2018	
118BG0100048	E. coli	0	cfu/100 mL	< 1	27-11-2018	
118BG0100048	Free Chlorine	0.2 - 5	mg/L	0.8600	27-11-2018	
118BG0100048	pH	6.5 - 8.5		7.8000	27-11-2018	
118BG0100048	Total Chlorine	5	mg/L	1.0900	27-11-2018	
118BG0100048	Total Coliforms	0	cfu/100 mL	< 1	27-11-2018	
118BG0100048	Turbidity	5	NTU	0.3000	27-11-2018	
118BG0100049	E. coli	0	cfu/100 mL	< 1	27-11-2018	
118BG0100049	Free Chlorine	0.2 - 5	mg/L	1.0800	27-11-2018	
118BG0100049	pH	6.5 - 8.5		7.8000	27-11-2018	
118BG0100049	Total Chlorine	5	mg/L	1.3300	27-11-2018	
118BG0100049	Total Coliforms	0	cfu/100 mL	< 1	27-11-2018	
118BG0100049	Turbidity	5	NTU	0.4000	27-11-2018	
118BG0100050	E. coli	0	cfu/100 mL	< 1	04-12-2018	
118BG0100050	Free Chlorine	0.2 - 5	mg/L	0.8700	04-12-2018	
118BG0100050	pH	6.5 - 8.5		7.8000	04-12-2018	
118BG0100050	Total Chlorine	5	mg/L	1.2800	04-12-2018	
118BG0100050	Total Coliforms	0	cfu/100 mL	< 1	04-12-2018	
118BG0100050	Turbidity	5	NTU	0.3000	04-12-2018	
118BG0100052	E. coli	0	cfu/100 mL	< 1	27-03-2018	
118BG0100052	Free Chlorine	0.2 - 5	mg/L	1.3200	27-03-2018	
118BG0100052	pH	6.5 - 8.5		7.7000	27-03-2018	

118BG0100052	Total Chlorine	5	mg/L	1.8200	27-03-2018	
118BG0100052	Total Coliforms	0	cfu/100 mL	< 1	27-03-2018	
118BG0100052	Turbidity	5	NTU	0.6000	27-03-2018	
318BG0100001	Fluoride	1.5	mg/L	0.8200	06-11-2018	
318BG0100001	Fluoride (WU result)	1.5	mg/L	0.9200	06-11-2018	
318BG0100001	Fluoride Ratio	0.8 - 1.2		1.1220	06-11-2018	
318BG0100002	Fluoride	1.5	mg/L	0.8000	04-12-2018	
318BG0100002	Fluoride (WU result)	1.5	mg/L	0.9300	04-12-2018	
318BG0100002	Fluoride Ratio	0.8 - 1.2		1.1625	04-12-2018	
718BG0100002	Aluminium	0.2	mg/L	0.2600	21-08-2018	,No client F result
718BG0100002	Antimony	0.003	mg/L	< 0.001	21-08-2018	,No client F result
718BG0100002	Arsenic	0.01	mg/L	0.0010	21-08-2018	,No client F result
718BG0100002	Barium	2	mg/L	0.0770	21-08-2018	,No client F result
718BG0100002	Boron	4	mg/L	< 0.1	21-08-2018	,No client F result
718BG0100002	Cadmium	0.002	mg/L	< 0.0005	21-08-2018	,No client F result
718BG0100002	Calcium	10000	mg/L	29.7000	21-08-2018	,No client F result
718BG0100002	Chloride	250	mg/L	58.0000	21-08-2018	,No client F result
718BG0100002	Chromium	0.05	mg/L	< 0.005	21-08-2018	,No client F result
718BG0100002	Copper	2	mg/L	< 0.005	21-08-2018	,No client F result
718BG0100002	Fluoride	1.5	mg/L	0.5700	21-08-2018	,No client F result
718BG0100002	Iodine	0.5	mg/L	0.0300	21-08-2018	,No client F result
718BG0100002	Iron	0.3	mg/L	< 0.01	21-08-2018	,No client F result
718BG0100002	Lead	0.01	mg/L	< 0.002	21-08-2018	,No client F result
718BG0100002	Magnesium	10000	mg/L	16.0900	21-08-2018	,No client F result
718BG0100002	Manganese	0.5	mg/L	0.0080	21-08-2018	,No client F result
718BG0100002	Mercury	0.001	mg/L	< 0.0001	21-08-2018	,No client F result
718BG0100002	Molybdenum	0.05	mg/L	< 0.005	21-08-2018	,No client F result
718BG0100002	Nickel	0.02	mg/L	< 0.01	21-08-2018	,No client F result
718BG0100002	Nitrate	50	mg/L	< 1	21-08-2018	,No client F result
718BG0100002	Nitrite	3	mg/L	< 0.1	21-08-2018	,No client F result
718BG0100002	pH	6.5 - 8.5		8.0000	21-08-2018	,No client F result
718BG0100002	Selenium	0.01	mg/L	< 0.002	21-08-2018	,No client F result
718BG0100002	Silver	0.1	mg/L	< 0.002	21-08-2018	,No client F result
718BG0100002	Sodium	180	mg/L	42.0000	21-08-2018	,No client F result
718BG0100002	Sulfate	500	mg/L	23.0000	21-08-2018	,No client F result
718BG0100002	Total Dissolved Solids (TDS)	600	mg/L	229.0000	21-08-2018	,No client F result

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718BG0100002	Total Hardness as CaCO <sub>3</sub>	200	mg/L	140.40 00	21-08-2018	,No client F result
718BG0100002	True Colour	15	Hazen Units (HU)	1.0000	21-08-2018	,No client F result
718BG0100002	Turbidity	5	NTU	1.0000	21-08-2018	,No client F result
718BG0100002	Uranium	0.017	mg/L	< 0.005	21-08-2018	,No client F result
718BG0100002	Zinc	3	mg/L	0.0200	21-08-2018	,No client F result

## Appendix B Improvement / Action Plan

Element 1	Commitment to Drinking Water Quality Management
Element 2	Assessment of the Drinking Water Supply System
Element 3	Preventive Measures for Drinking Water Quality Management
Element 4	Operational Procedures and Process Control
Element 5	Verification of drinking water quality
Element 6	Management of incidents and emergencies
Element 7	Employee awareness and training
Element 8	Community involvement and awareness
Element 9	Research and development
Element 10	Documentation and record keeping
Element 11	Evaluation and audit
Element 12	Review and continual improvement

Task No	Element	To Do Actions	Time	By whom	By when	Completed
1	4	Develop and implement a reticulation monitoring program to ensure the free chlorine residual in the distribution system is in line with NSW Office of Water (NOW)	DWMS			A typical format has been provided
2	4	Develop procedures and log sheets for the calibration of chemical dosing systems	DWMS			
3	4	Council must develop procedures for the delivery of chemicals	DWMS			Council to develop procedures based on the templates provided in the DWMS
4	5	Document daily testing procedures including the review of the water quality results at the water treatment plant.	DWMS		30/09/12	Has been prepared. Operators implement
5	5	The DWMS document must be updated to state who is responsible for reviewing the results in the NSW Drinking Water Database. Reviews must be conducted after the results of each microbial sample and monthly for trends and water quality implications.	DWMS			
6	5	Document daily testing procedures including who undertakes the daily review of the water quality results at the water treatment plant.	DWMS			Procedure to be developed

7	5	Document communication system to deal with unexpected water quality results at the water treatment plant.	DWMS			Not completed
8	6	Develop a contact list of key people, agencies and businesses for a water quality emergency in line with the NSW Guidance.	DWMS			Part of the IRP
9	6	Document in the DWMS where controlled copies of the emergency contact list is kept.	DWMS			Control
10	6	Document which agencies should be notified and under what circumstances and who is authorised to notify.	DWMS			As shown in the IRP
11	9	C.t should be calculated.	DWMS			NSW PW
12	11	An internal and external audit schedule should be developed in consultation with NSW Health and NOW.	DWMS			NSW Health
13	1	Ensure Staff and Councillors are aware of the National Health Guidelines which include the development of a Drinking Water Quality Management Plan.	Immediate			Complete
14	2	Prepare relevant SOPs and make sure they are practised by the operators.	Immediate		30/09/12	Have been prepared. Operators implement
15	3	Ensure Critical Control Points are documented.	Immediate		30/09/12	Have been prepared. Operators implement
16	3	Ensure Critical Control Points are monitored.	Immediate		30/09/12	Have been prepared. Operators implement
17	4	Implement the operational procedures that were developed	Immediate			
18	4	Include these procedures in the O&M manual and ensure they are also located where the activity is undertaken.	Immediate		30/09/12	These are displayed in the plant room.
19	4	Document corrective actions for critical control points	Immediate		30/09/12	Have been prepared. Operators implement
20	5	Document all operational procedures	Immediate		30/09/12	Have been prepared.

						Operators implement
21	6	Formalise how incidents and emergencies and reviewed and protocols updated.	Immediate		30/09/12	Have been prepared. Operators implement
22	1	Ensure regular (weekly or fortnightly) toolbox style meetings are held with technical and operational staff to ensure staff understands the practical implications and application of formal and regulatory requirements and to allow two way communication of issues. Minutes should be kept of these meetings.	Short term			Minutes to be kept.
23	2	Develop a formal maintenance schedule for sludge rake and other equipment in the water supply system.	Short term			The sludge rake is identified as critical. This needs to be addressed

24	2	Consider participating in CMA catchment management programs.	Short term			
25	2	Consider daily recording of weather conditions and river flows with raw water turbidity.	Short term			Done
26	2	Consider installing an on-line turbid meter to measure filtered water turbidity.	Short term		2017	Test chlorine sample on site rather than bring back to lab. There is a common turbid meter on-line, however it would be more beneficial to add individual turbid meters with the SCADA upgrade.
27	2	Consider automating filter backwash	Short term		2018	Included in SCADA upgrade
28	2	Monitor filtered water turbidity data over a filter run to determine filter characteristics.	Short term		2017	Included in SCADA upgrade
29	2	Formalise reticulation testing program and log all results. Test for chlorine prior to flushing.	Short term		2018	In progress
30	4	Ensure these procedures are held in an operations and maintenance manual;	Short term			

31	4	Extend the documentation to include the daily monitoring;	Short term		2017	Done
32	4	Document all corrective actions and formalise associated communication protocol.	Short term			
33	5	Ensure turbidity, Cl, pH and F are added to the daily log sheet.	Short term			This may be element 4 rather than 5.
34	5	Formalise water quality monitoring schedule for the distribution.	Short term			Done
35	5	Improve complaint recording through TRIMS.	Short term			Currently only a spreadsheet.
36	6	Document what information is accessed for the NOW performance Reporting Forms	Short term			
37	7	Regular (weekly or fortnightly) toolbox style meetings should be held with technical and operational staff to ensure two way communication of issues. Minutes should be kept.	Short term			Done
38	7	Develop and maintain a formalised training program for the employees.	Short term			Done
39	7	Share knowledge among the members of LMWUA and other neighbour Councils.	Short term			Done
40	8	Ensure water quality is considered during the community consultation as planned under objectives 6 and 7 of SBP 2007/08.	Short term			on-going
41	8	Council must develop an education program to ensure consumers understand the quality difference between the raw water and potable system.	Short term			Village water is non-potable. Advising rental agencies in currently in progress
42	9	Participate in research programs and technical/operational workshops organised by LMWUA.	Short term			Done
43	9	Undertake investigative work to determine suitable upgrading method for the existing Nyngan WTP	Short term		2017	Included in the SCADA upgrade
44	11	Long-term water quality and performance data logs, including trends and results should be kept in a designated electronic file location.	Short term		2017	Included in the SCADA upgrade
45	12	Implement the actions identified in the drinking water quality management improvement plan (Reference 3)	Short term			

46	1	When the Water Strategic Business Plan is updated ensure that levels of service include public health/water quality objectives	Medium term		Not Yet	The next WSBP will be in 2016
47	1	When the Water Strategic Business Plan is updated document public health/water quality implications of the operating environment review	Medium term		Not Yet	The next WSBP will be in 2016
48	1	When the Water Strategic Business Plan is updated ensure the operating review captures responsibilities in other documents such as Codes of Practice and Standards.	Medium term		Not Yet	The next WSBP will be in 2016
49	2	Ensure the risk assessment is reviewed every five years or if conditions or system knowledge changes.	Medium term		Not Yet	The next WSBP will be in 2016
50	4	Ensure sufficient funds are available to fund asset maintenance and replacement, through the development of the management plan or strategic business plan	Medium term			Mains replacement program in is progress. \$80k/year for pipe replacement work. 2014/15 there has been 500m of AC pipe replaced.
51	4	Formally document the maintenance program.	Medium term			
52	5	Document how customer complaints are used to inform system maintenance programs (e.g. flushing programs or pipeline replacement).	Medium term			Mainly on breaks and asset life
53	5	Document internal and external reporting measures for water quality monitoring.	Medium term			Done - Every Monday put onto Council database
54	5	Document corrective procedures and communication systems for other non-conformances.	Medium term			CCP report quarterly
55	6	Develop formal incident log sheets for recording of incident and management actions undertaken and for use in debriefing sessions	Medium term			Done
56	6	Develop and incident and emergency response plan which contains information to guide staff in an incident and emergency. Ensure hard copies are controlled and available.	Medium term			IRPs

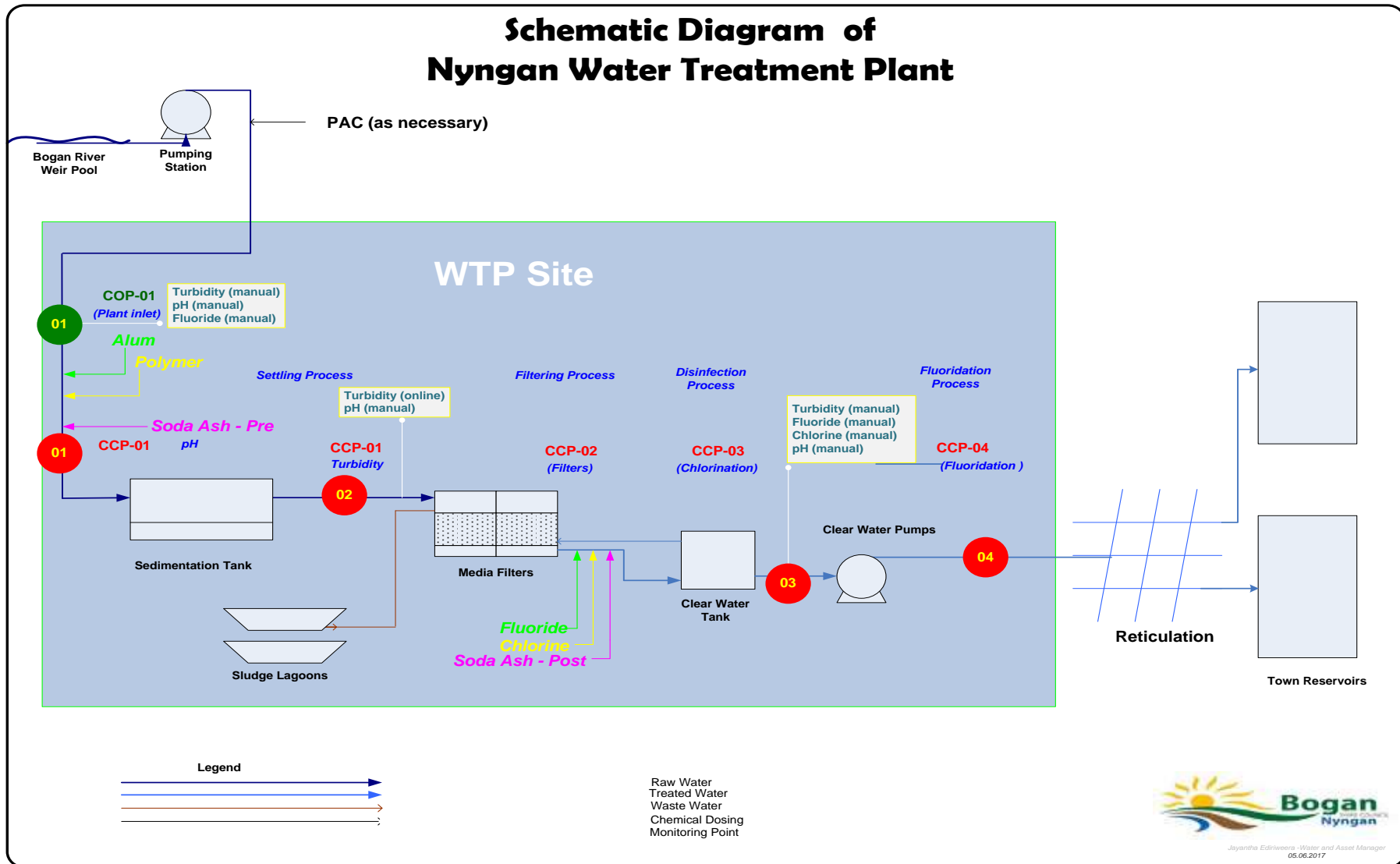


57	8	Review Council's involvement in the Save Water alliance to improve communication with consumers.	Medium term			15 December - TV ads, school programs, info inserts with customer bills. \$5k/year allocated
58	9	Replace or upgrade the WTP with affordable appropriate technology.	Medium term		2017	
59	10	Formalise document control system.	Medium term		2017	On-going - formalised with the SCADA upgrade
60	10	Formalise documentation review system.	Medium term		2017	On-going - formalised with the SCADA upgrade
61	11	Establish procedures for long term performance evaluation of the water business within LMWUA.	Medium term			Involved in the Water Security Program - \$10M grant for 2000ML off-river storage

62	12	Formalise management review of the water business	Medium term		Not Yet	
63	4	Provide a calibration cylinder for the sodium hypochlorite dosing pumps	Immediate			
64	4	Rearrange the chemical dosing points as shown in this report and assess the performance.	Immediate			
65	4	After completion of switchboard replacement and SCADA upgrade, flowpace all chemical dosing systems with the starting and stopping of the plant.	Immediate			
66	5	Measure chlorine residual at the outlet of the town reservoir from the sample point recommended by NSW Public Works.	Immediate			
67	4	Replace the existing fluoridation system with a new system that complies with the NSW Code of Practice for Fluoridation of Public Water Supplies.	Immediate			
68	4	Investigate replacing Alum with PACI for coagulation.	Medium term		Not Yet	
69	4	Consider diluting sodium hypochlorite to 6% for storage. Calculate the sodium hypochlorite	Medium term		Not Yet	

		dosage (for 6% solution strength) and check if the dosing pump capacity is suitable				
70	4	Install on-line turbidimeter and backwash filters on turbidity breakthrough once SCADA upgrade is completed.	Medium term		Not Yet	
71	4	Interlock starting and stopping of the fluoride dosing system with the operation and flowrate of the plant.	Medium term		Not Yet	

Figure: 4.1 CCP (Critical Control Points) –Nyngan Water Treatment Plant





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