



*Photo credit: Thomas Plunkett, 2021. Big Brock Reservoir.*

## DWMS Annual Report 20-21

August 2021



Greater  
Hume  
Council

# Contents

Executive Summary .....	1
1. Introduction .....	2
2. Supply Scheme .....	3
3. Scheme Changes.....	4
3.1. Culcairn Supply.....	4
3.2. Villages Supply .....	4
4. Critical Control Points.....	5
4.1. CCP 1 – Primary Disinfection.....	5
4.2. CCP 2 - Reservoirs .....	8
5. Incidents Reported to NSW Health .....	10
6. Verification Monitoring Performance.....	11
6.1. Reticulation Water Quality Monitoring.....	11
6.2. Communications with ACC .....	12
6.3. Water Quality Customer Complaints.....	12
7. Improvement Plan Implementation.....	14
7.1. Status .....	14
7.2. New Additions .....	14
8. DWMS Review Outcomes .....	15
9. DWMS Audit Outcomes.....	16
Glossary .....	17

## Tables

Table 1 CCPs.....	5
Table 2 Summary of Reservoir Inspections.....	8
Table 3 Water Quality Complaints.....	13
Table 4 Review Participants .....	15
Table 5 Culcairn Verification Data .....	20
Table 6 Villages Scheme Verification Data .....	22

## Figures

Figure 1 Culcairn WTP Free Chlorine.....	6
Figure 2 Culcairn Bore Water Turbidity .....	6
Figure 3 Culcairn WTP pH .....	7
Figure 4 Reticulation pH Verification Monitoring for Village Scheme .....	12

## Appendices

A. Reticulation Verification Data.....	19
B. Improvement Plan Status .....	24

## EXECUTIVE SUMMARY

Water suppliers in New South Wales (NSW) are required to establish and adhere to a 'quality assurance program', referred to as a Drinking Water Management System (DWMS). An annual review of the DWMS is recommended to ensure that it is valid and being implemented effectively. Furthermore, an annual report is required to be prepared and submitted to the local Public Health Unit (PHU), NSW Health.

Viridis Consultants P/L (Viridis) was engaged by Greater Hume Council (Council) to prepare the DWMS Annual Report for the 2020-21 reporting period, which covers a 12-month period from 1 July 2020 to 30 June 2021.

Council is responsible for two water supply schemes - Culcairn and Villages supplies. For the Villages, bulk treated water is obtained from Albury City Council (ACC) and reticulated to customers. There were no significant process changes to the schemes to impact the risk profile.

The water quality verification monitoring results showed 100% compliance against the Australian Drinking Water Guidelines (ADWG) health-based values. There were very few instances of water quality related customer complaints, indicating good customer satisfaction overall. In addition, there were no Critical Control Point (CCP) critical limit breaches which required reporting to the local Public Health Unit (PHU).

An Improvement Plan is part of a management system and demonstrates the continual improvement process in place for an organisation. Council has a DWMS Improvement Plan. The Improvement Plan was reviewed and updated during the preparation of this Report. Implementation of actions has progressed, but some have been impacted by COVID-19.

A review of key DWMS areas was undertaken via a teleconference on 12 August 2021. The register for incident contacts and stakeholders was updated to reflect staff changes at ACC.

The overall outcome of the review was that the DWMS did not require an update. Council continues to maintain and implement their DWMS in order to provide safe quality water to its customers.



## **1. INTRODUCTION**

Water suppliers in New South Wales (NSW) are required to establish and adhere to a 'quality assurance program', referred to as a Drinking Water Management System (DWMS). The DWMS is a risk-based approach to managing drinking water quality.

An annual review of the DWMS is recommended by NSW Health to ensure that it is valid and is being implemented effectively. In addition, an Annual Report is required to be prepared and submitted to the local Public Health Unit (PHU), NSW Health.

Greater Hume Council (Council) has engaged Viridis Consultants P/L (Viridis) to prepare the DWMS Annual Report for the 2020-21 reporting period, which covers a 12-month period from 1 July 2020 to 30 June 2021.

This Report summarises Council's drinking water quality performance for the reporting period, outcomes of the DWMS annual review undertaken and progress on the implementation of the improvement plan.

## 2. SUPPLY SCHEME

Council is responsible for two water supply schemes:

- Culcairn supply - urban area only. Raw water is sourced from a bore and treated at the Culcairn water treatment plant (WTP) through aeration and disinfection prior to distribution to customers.
- Villages supply (Jindera, Burrumbuttock, Brocklesby, Gerogery, Gerogery West and some connected rural areas). Bulk treated water is obtained from Albury City Council (ACC) and reticulated to villages. Council undertakes re-chlorination at the service reservoirs to provide an additional barrier against potential recontamination.

Water supply for the townships of Henty, Holbrook, Morven, Walla Walla, Walbundrie and Woomargama is provided by Riverina Water (outside the scope of Council's DWMS).

### **3. SCHEME CHANGES**

#### **3.1. Culcairn Supply**

There were no significant changes to the Culcairn water supply scheme including source, treatment processes and distribution network to impact upon the risk profile.

Works are planned for installation of online monitoring of chlorine by end of 2021.

#### **3.2. Villages Supply**

There were no significant changes to the Villages supply in relation to the distribution of the bulk treated water from ACC to impact upon the risk profile.

## 4. CRITICAL CONTROL POINTS

The Critical Control Point (CCP) implementation is discussed in this section. A review of the CCPs was undertaken in February 2020.

The current CCPs are presented in Table 1.

Table 1 CCPs

Control Point	Hazard	Control Parameter	Operational Target	Adjustment Limit	Critical Limit
<b>Culcairn Water Supply</b>					
<b>CCP1 – Primary Disinfection - chlorination</b>	Chlorine sensitive pathogens	Free chlorine	0.5 mg/L to 1.5 mg/L	<0.5 or >1.5 mg/L at Relift Pump discharge	<0.3 mg/L or >5 mg/L at Relift Pump discharge
<b>CCP2 – Reservoirs</b>	Pathogens	Integrity	Secure, vermin proof and rainwater runoff proof	Evidence of breaches or potential breaches	Evidence of vermin
<b>Village Water Supply</b>					
<b>CCP 1 – Primary Disinfection</b>	Not applicable - treated water received from ACC				
<b>CCP2 – Reservoirs</b>	Pathogens	Integrity	Secure, vermin proof and rainwater runoff proof	Evidence of breaches or potential breaches	Evidence of vermin

### 4.1. CCP 1 – Primary Disinfection

During the reporting period, there was no critical limit breach for CCP 1 which required notification to the Public Health Unit (PHU), see Figure 1. On instances when the result was outside the target range, adjustments were undertaken to ensure the process maintained its effectiveness.

The turbidity of the bore water was <1 NTU, as required to ensure effective disinfection (see Figure 2). There was a reading of 0.89 NTU on 9/4/21, which could have been due to iron oxidization prior to testing. The weekly bore turbidity (and pH) testing commenced in September 2020.

pH, another parameter important to ensure the effectiveness of chlorination, was consistent over the reporting period within the range of 6.5 and 8.5 (see Figure 3). pH <8.5 ensures effectiveness of chlorination is maintained.



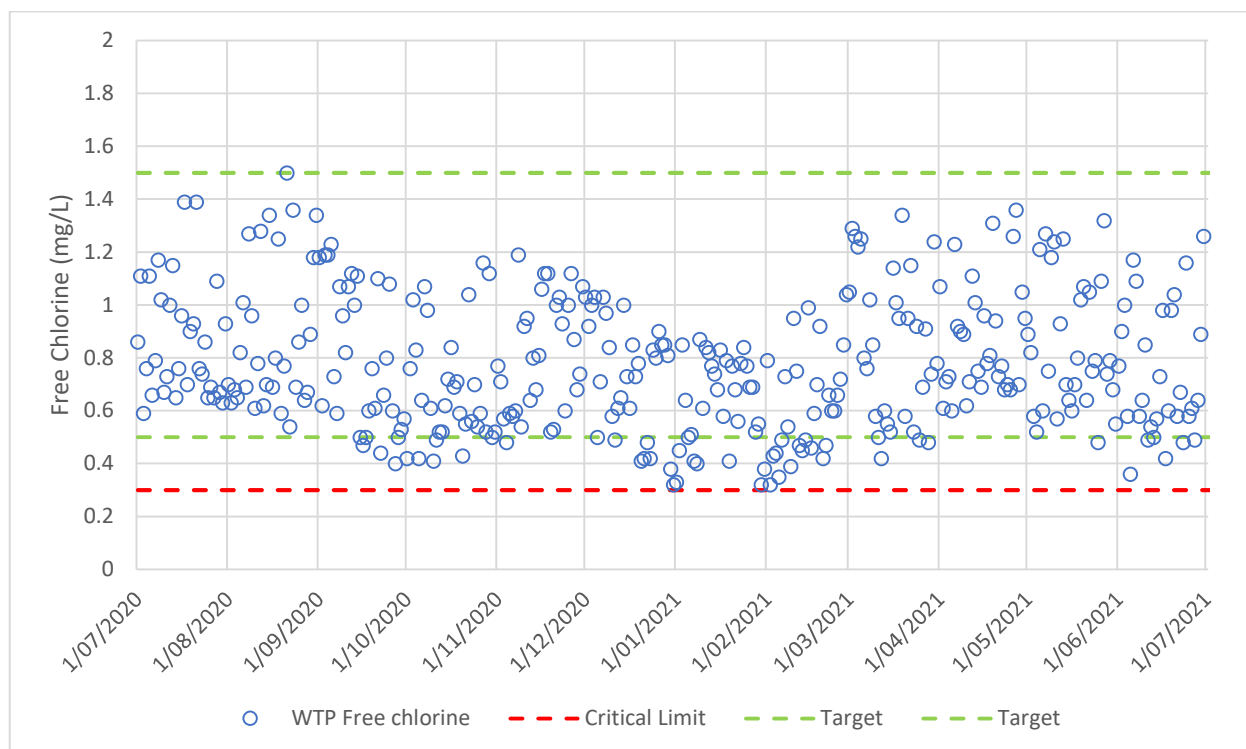


Figure 1 Culcairn WTP Free Chlorine

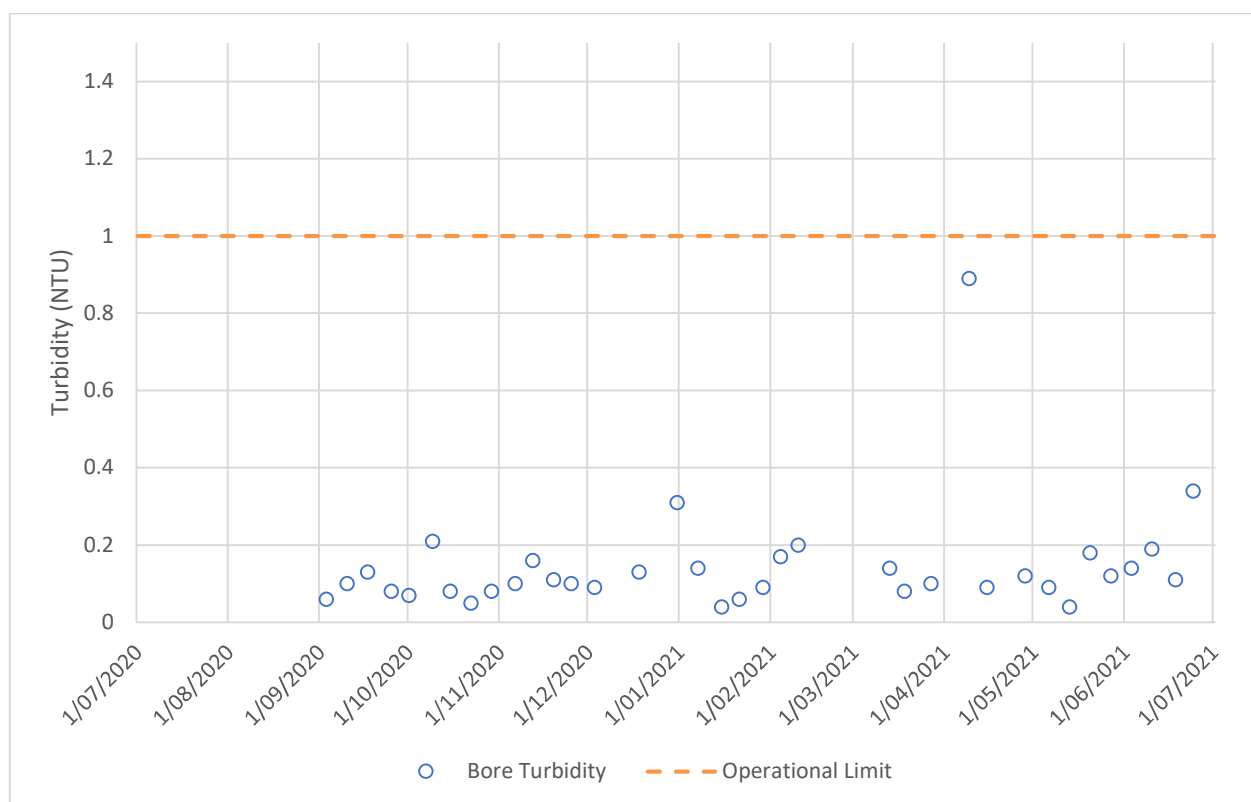


Figure 2 Culcairn Bore Water Turbidity

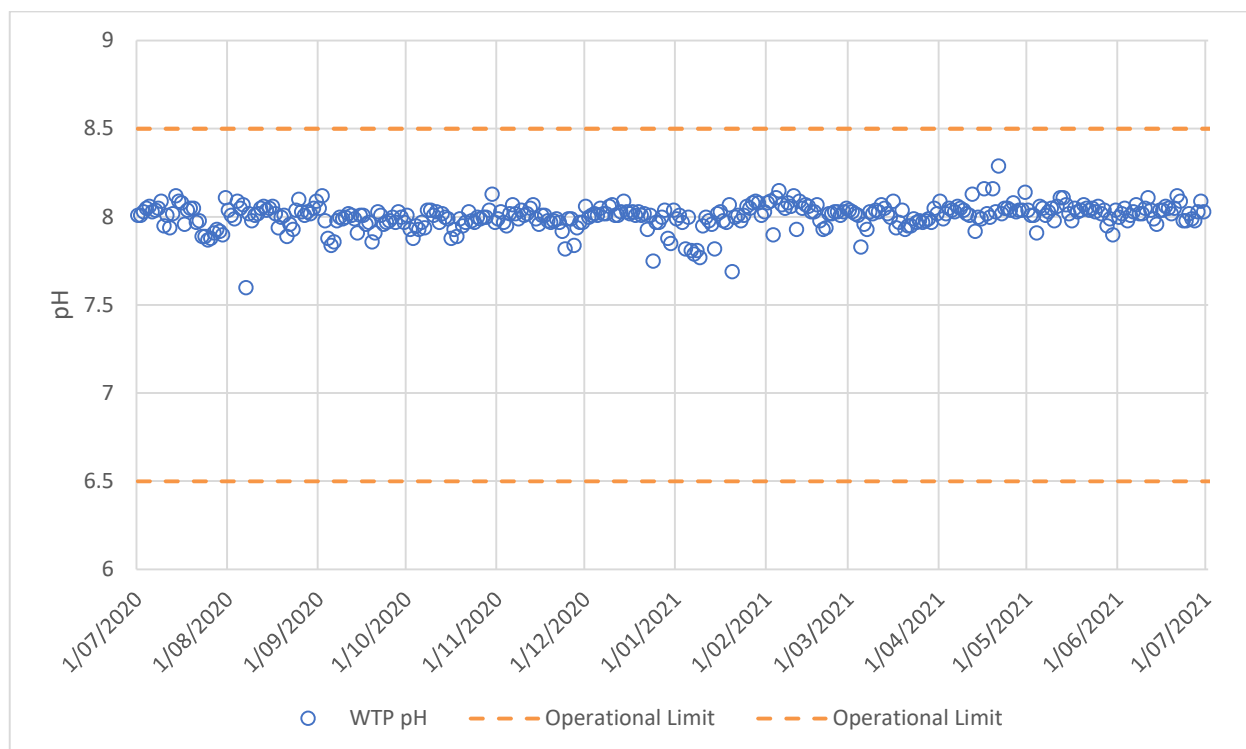


Figure 3 Culcairn WTP pH

## 4.2. CCP 2 - Reservoirs

The operators do a general check and observation of the reservoirs weekly during their monitoring rounds and a detailed inspection using the reservoir inspection checklist is undertaken every 6 months.

In addition, Council engages external contractors to clean and thoroughly inspect its service reservoirs and undertake actions on items brought to attention. The external engagement is undertaken every 4 years, an external cleaning is scheduled for 2021. However, due to COVID-19 impacts and restrictions this may be delayed to 2022, if unable to be arranged before end of 2021.

Table 2 provides a summary of the in-house reservoir inspections and related works undertaken during the reporting period.

*Table 2 Summary of Reservoir Inspections*

Reservoir	Inspection Date	Inspection Findings and Related Works
<b>Little Brockelsby</b>	06 Nov 20	No integrity breaches found. All weeds sprayed. Scour valves cleaned-out, posts installed with outlet sign on them.
<b>Big Brockelsby</b>	06 Nov 20	No integrity breaches found. All weeds sprayed and grass cut. Access ladders compliant. Scour valves cleaned and post with sign installed. Works to access ladders and stairs completed as scheduled.
<b>Burrumbuttock</b>	06 Nov 20	No integrity breaches found. All weeds sprayed and grass cut. Access ladders compliant. Works to access ladders and stairs completed as scheduled. Outlet sign and post installed and cleaned.
<b>Gerogery</b>	06 Nov 20	No integrity breaches found. Loose screws on west side of roof were discovered and fixed down. Access ladders compliant. Works to access ladders and stairs completed as scheduled, along with scour valves cleaned and posts installed with "outlet" sign.
<b>Jindera Gap</b>	06 Nov 20	No integrity breaches found. All weeds sprayed and grass cut. Access ladders compliant (minor work done to make ladders compliant). Outlet sign and post installed. Area cleaned.  The tank was cleaned and new monitoring equipment installed in Dec 2020.
<b>Culcairn WTP</b>	25 Mar 21	No integrity breaches found. However, slight leak to reservoir to be investigated. Scour valves cleaned and post with sign installed. Works to access ladders and stairs completed as scheduled.
<b>Little Brockelsby</b>	22 June 21	No integrity breaches found.
<b>Big Brockelsby</b>	22 June 21	No integrity breaches found.
<b>Burrumbuttock</b>	22 June 21	No integrity breaches found.
<b>Gerogery</b>	22 June 21	No integrity breaches found.
<b>Jindera Gap</b>	22 June 21	No integrity breaches found.
<b>Gordon Street</b>	22 June 21	No integrity breaches found.

Reservoir	Inspection Date	Inspection Findings and Related Works
<b>Black Street</b>	22 June 21	<p>Visible holes and cracks as per Valuation Report. 2017 Business Case awarded to consultants 2020. Reservoir to be replaced, part of DWMS Improvement Plan – business case has been awarded June 2020.</p> <p>Additional inspection on 07/07/2021 as part of monthly monitoring of external concrete structure found perimeter fence to be safe and secure. Grass mowed.</p>
<b>Culcairn WTP</b>	22 June 21	<p>No integrity breaches found. However, slight leak to reservoir - also identified in March 2021. Investigation to identify and fix issue will need to be completed by divers. This will be planned, COVID-19 may impact timing.</p>

## **5. INCIDENTS REPORTED TO NSW HEALTH**

There were no critical limit exceedances or non-compliances against the ADWG health-based guidelines. Section 6 includes more details on verification monitoring.

## 6. VERIFICATION MONITORING PERFORMANCE

Verification of drinking water quality provides an assessment of the overall performance of the system and the ultimate quality of drinking water being supplied to consumers. This incorporates monitoring drinking water quality as well as assessment of consumer satisfaction.

### 6.1. Reticulation Water Quality Monitoring

Drinking water quality monitoring is a wide-ranging assessment of the quality of water in the reticulation or distribution system and importantly, as supplied to the consumer. It includes regular sampling and testing to assess whether water quality is complying with ADWG guideline values. Monitoring of drinking water is regarded as the final check that, overall, the barriers and preventive measures implemented to protect public health are working effectively.

The reticulation drinking water quality data for the schemes for the reporting period is presented in Appendix A. There was a 100% compliance against the ADWG health-based guidelines for the Culcairn and Villages schemes.

There are still some issues with high pH within the Villages scheme with verification results generally higher than the guidelines (mean = 8.75, median = 8.90), weekly data exceeded the maximum guideline value of 8.5, 35 times for the 2020-21 reporting period (only 32.7% within guidelines) – Appendix A.

Further analysis of available data showed that pH at the Jindera Gap pump station was 7.5 (average result – operational data spreadsheet). Also, Figure 4 shows that pH at Tabletop Road Jindera was generally <8.0 (although higher at Urana Street Jindera). pH was also generally <8.5 at Main Street Brocklesby.

It appears that ACC in general have improved the pH of the bulk treated water being supplied. pH may be increasing again in the distribution due to rechlorination (using tablets) and concrete reservoirs.

Maintenance of chlorine residual was excellent with 100% of results for both schemes within 0.2-5 mg/L – Appendix A.



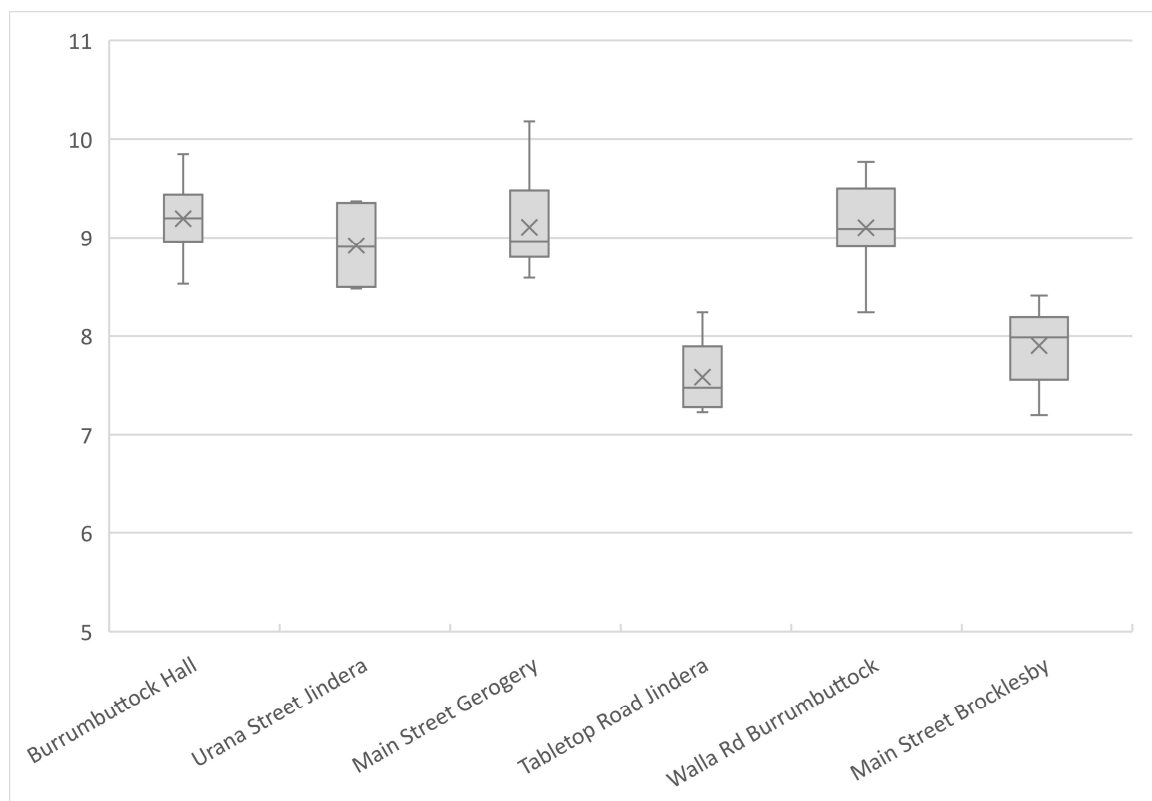


Figure 4 Reticulation pH Verification Monitoring for Village Scheme

## 6.2. Communications with ACC

On 23/2/2021 Council received communication from ACC about water quality issues. It was notified later that the issue was due to the quality of the raw water released from Lake Hume. Manganese was the main issue. ACC worked with stakeholders (NSW Health, DPIE Water) to rectify the issue.

This issue, however, did not cause any distress or customer complaints on Council's side and Council did not need to initiate any additional monitoring or response.

Refer also to Section 6.3.

## 6.3. Water Quality Customer Complaints

Monitoring of consumer complaints can provide valuable information on potential problems that may not have been identified by performance monitoring of the water supply system. Consumer satisfaction with drinking water quality is largely based on a judgment that the aesthetic quality of tap water is 'good', which usually means that it is colourless, free from suspended solids and has no unpleasant taste or odour.

There were six water quality complaints over the reporting period as discussed in Table 3. The complaints were not indicative of any major or secondary issues which could impact public health at large.

Table 3 Water Quality Complaints

Date	Scheme / Town	Issue	Action Taken
16/09/2020	Villages Scheme / Glenellen	Poor taste	Chlorine water test carried out. Tested ok. At the time of visit, customer was happy with water quality.
11/11/2020	Villages Scheme / Burrumbuttock	Taste	Flushed service - chlorine test ok. Internal plumbing causing issue (galvanised pipes).
23/11/2020	Villages Scheme / Jindera	Dirty water	Service flushed & chlorine tested - all ok.
25/02/2021	Villages Scheme / Jindera	Dirty water	Problem had cleared up on inspection. Service flushed.
5/03/2021	Villages Scheme / Jindera	Dirty water	Main & service flushed - all ok.
24/04/2021	Villages Scheme / Gerogery West	Chlorine smell	Chlorine tested, 0.75 mg/L, not too high.

## **7. IMPROVEMENT PLAN IMPLEMENTATION**

An Improvement Plan is part of a management system and demonstrates the continual improvement process in place for an organisation. Council has an Improvement Plan, which is part of their DWMS.

### **7.1. Status**

The Improvement Plan was reviewed and updated during the preparation of this Annual Report. Refer to Appendix B for detailed progress of the Improvement Plan, including commentary.

### **7.2. New Additions**

One new action (#24) was added to the Improvement Plan. This was in relation to setting up record keeping for the 3-monthly check on top of aerator (e.g. note in plant log or diary on inspection date and any findings) and using the updated reservoir inspection checklist to complete the inspections.

## 8. DWMS REVIEW OUTCOMES

The annual review of the DWMS was undertaken as part of the preparation of this Report. A teleconference was facilitated by Viridis on 12 August 2021 to discuss key DWMS areas, as captured in Table 4.

The teleconference participants included:

- Tom Plunkett, Manager Water and Wastewater - Greater Hume Council
- Tasleem Hasan, Drinking Water Manager - Viridis

*Table 4 Review Participants*

Review area	Discussions	Related action/s, as relevant
Any changes to the regulatory and formal requirements table in the DWMS	This was reviewed in the DWMS document, no changes were required.	NA
Any changes to the Incident Contacts and Stakeholders register	This was reviewed, staff changes at ACC.	Update contact detail for ACC in the contact and stakeholders register – completed during teleconference.
Supply system details, including schematics.	Discussed in Section 3. No changes to impact risk profile.	NA
Drinking water quality performance	Discussed in Section 6.1. No major issues noted.	NA
CCP performance	Discussed in Section 4. No major issues noted. Old reservoir inspection checklist still in use.	Use the updated reservoir checklist (2020 version) - added to Improvement Plan action #24.
Outcomes of drinking water quality incidents and emergencies	Discussed in Section 5. No incidents.	NA
Any significant changes to the risk register	Last detailed review and update undertaken in 2020. No major changes or issues to impact risk profile.	NA
Concerns of consumers (customer complaints)	Discussed in Section 6.3. No major issues noted.	NA
Audit outcomes	Discussed in Section 9. Audits have not commenced in NSW yet.	NA
Improvement plan progress	Discussed in Section 7. One new action #24 added.	NA
Any concerns from NSW Health and DPIE Water	No concerns.	NA

Outcomes from the review concluded that there is no need to update the DWMS. The Improvement Plan and incident and stakeholders contacts register have been reviewed and updated as relevant.

## **9. DWMS AUDIT OUTCOMES**

There was no formal audit undertaken for DWMS implementation over the reporting period. The external audit frequency will be implemented as guided by NSW Health.

## GLOSSARY

Word	Description
ACC	Albury City Council
ADWG	Australian Drinking Water Guidelines
CCP	Critical Control Point
DPIE Water	Department of Planning, Industry and Environment - Water
DWMS	Drinking Water Management System
NSW	New South Wales
NTU	Nephelometric Turbidity Units
pH	An expression of the intensity of the basic or acid condition of a liquid. Natural waters usually have a pH between 6.5 and 8.5
PHU	Public Health Unit
WTP	Water Treatment Plant



## DOCUMENT HISTORY AND TRACKING

### Document History

Version	Section/s Modified	Brief Description of Amendment	Author	Approver	Issue Date
0.1	NA	For internal review	Tasleem Hasan	Tasleem Hasan	13/08/2021
0.2	NA	For client review	Tasleem Hasan	Tasleem Hasan	18/08/2021
1.0	Table 2	Minor edits following review by Tom Plunkett.	Tasleem Hasan	Tasleem Hasan	27/08/2021

### Document Tracking

Document Name	DWMS Annual Report 20-21
Prepared By	Tasleem Hasan
Reviewed by	Tom Plunkett - GHC
Approved by	Tasleem Hasan
Date Approved	27/08/2021
Status	Final
Document Number	REC-21-181
Version Number	1.0
Review Date	24/08/2021

Viridis Consultants Pty Ltd  
 PO Box 131  
 Bulimba Qld 4171  
 Australia

1300 799 310

www.viridis.net.au  
 ABN: 49 129 185 271

© Viridis Consultants Pty Ltd 2021

Viridis Consultants Pty Ltd has produced this document in accordance with instructions from Greater Hume Council for their use only. The concepts and information contained in this document are the copyright of Viridis Consultants Pty Ltd. Use or copying of this document in whole or in part without written permission of Viridis Consultants Pty Ltd constitutes an infringement of copyright.

Viridis Consultants Pty Ltd does not warrant this document is definitive nor free from error and does not accept liability for any loss caused, or arising from, reliance upon the information provided herein.

This document is and shall remain the property of Viridis Consultants Pty Ltd. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

## A. RETICULATION VERIFICATION DATA

Table 5 Culcairn Verification Data

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry													
	Aluminium	0.2000	mg/L	0.0075	0.0075	0.0035	0.005	0.01	2	0	0.01	0.005	100.00
	Antimony	0.0030	mg/L	0.0001	0.0001	0.0000	0.00005	0.00005	2	0	0.00005	0.00005	100.00
	Arsenic	0.0100	mg/L	0.0010	0.0010	0.0000	0.001	0.001	2	0	0.001	0.001	100.00
	Barium	2.0000	mg/L	0.0454	0.0454	0.0004	0.0451	0.0456	2	0	0.0456	0.0451	100.00
	Boron	4.0000	mg/L	0.0338	0.0338	0.0033	0.0314	0.0361	2	0	0.0361	0.0314	100.00
	Cadmium	0.0020	mg/L	0.0001	0.0001	0.0000	0.00005	0.00005	2	0	0.00005	0.00005	100.00
	Calcium	10000.0000	mg/L	12.9500	12.9500	1.0607	12.2	13.7	2	0	13.7	12.2	100.00
	Chloride	250.0000	mg/L	74.0000	74.0000	2.8284	72	76	2	0	76	72	100.00
	Chromium	0.0500	mg/L	0.0005	0.0005	0.0000	0.0005	0.0005	2	0	0.0005	0.0005	100.00
	Copper	2.0000	mg/L	0.0035	0.0035	0.0021	0.002	0.005	2	0	0.005	0.002	100.00
	Fluoride	1.5000	mg/L	0.5850	0.5850	0.0212	0.57	0.6	2	0	0.6	0.57	100.00
	Iodine	0.5000	mg/L	0.0900	0.0900	0.0000	0.09	0.09	2	0	0.09	0.09	100.00
	Iron	0.3000	mg/L	0.0050	0.0050	0.0000	0.005	0.005	2	0	0.005	0.005	100.00
	Lead	0.0100	mg/L	0.0001	0.0001	0.0000	0.0001	0.0001	2	0	0.0001	0.0001	100.00
	Magnesium	10000.0000	mg/L	11.0850	11.0850	1.0677	10.33	11.84	2	0	11.84	10.33	100.00
	Manganese	0.5000	mg/L	0.0002	0.0002	0.0001	0.00015	0.0003	2	0	0.0003	0.00015	100.00
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0000	0.0004	0.0004	2	0	0.0004	0.0004	100.00
	Molybdenum	0.0500	mg/L	0.0005	0.0005	0.0001	0.0004	0.0005	2	0	0.0005	0.0004	100.00
	Nickel	0.0200	mg/L	0.0005	0.0005	0.0004	0.0002	0.0007	2	0	0.0007	0.0002	100.00
	Nitrate	50.0000	mg/L	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		8.0000	8.0000	0.0000	8	8	2	0	8	8	100.00
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0000	0.0035	0.0035	2	0	0.0035	0.0035	100.00
	Silver	0.1000	mg/L	0.0001	0.0001	0.0000	0.0001	0.0001	2	0	0.0001	0.0001	100.00
	Sodium	180.0000	mg/L	65.5000	65.5000	6.3640	61	70	2	0	70	61	100.00
	Sulfate	500.0000	mg/L	20.5000	20.5000	0.7071	20	21	2	0	21	20	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	231.5000	231.5000	10.6066	224	239	2	0	239	224	100.00
	Total Hardness as CaCO3	200.0000	mg/L	78.0000	78.0000	7.0711	73	83	2	0	83	73	100.00
	True Colour	15.0000	Hazen Units (HU)	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
	Turbidity	5.0000	NTU	0.2750	0.2750	0.3182	0.05	0.5	2	0	0.5	0.05	100.00
	Uranium	0.0170	mg/L	0.0009	0.0009	0.0001	0.0008	0.0009	2	0	0.0009	0.0008	100.00
	Zinc	3.0000	mg/L	0.0600	0.0600	0.0283	0.04	0.08	2	0	0.08	0.04	100.00
Microbiology													
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	52	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.6079	0.6050	0.2284	0.23	1.08	52	0	0.96	0.3	100.00
	pH	6.5 - 8.5		8.1340	8.1200	0.1146	7.87	8.46	52	0	8.36	7.96	100.00
	Temperature	30.0000	C	18.3769	18.1000	5.4444	11	27.3	52	0	26.6	11.1	100.00
	Total Chlorine	5.0000	mg/L	0.6639	0.7000	0.2410	0.31	1.12	51	0	1.04	0.33	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	52	0	0	0	100.00
	Turbidity	5.0000	NTU	0.1362	0.1000	0.1323	0.05	0.8	52	0	0.35	0.05	100.00

Table 6 Villages Scheme Verification Data

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Chemistry	Aluminium	0.2000	mg/L	0.1700	0.1700	0.0283	0.15	0.19	2	0	0.19	0.15	100.00
	Antimony	0.0030	mg/L	0.0001	0.0001	0.0000	5E-05	5E-05	2	0	0.00005	0.00005	100.00
	Arsenic	0.0100	mg/L	0.0008	0.0008	0.0004	0.0005	0.001	2	0	0.001	0.0005	100.00
	Barium	2.0000	mg/L	0.0101	0.0101	0.0005	0.0097	0.0104	2	0	0.0104	0.0097	100.00
	Boron	4.0000	mg/L	0.0009	0.0009	0.0007	0.0004	0.0014	2	0	0.0014	0.0004	100.00
	Cadmium	0.0020	mg/L	0.0001	0.0001	0.0000	5E-05	5E-05	2	0	0.00005	0.00005	100.00
	Calcium	10000.0000	mg/L	9.9000	9.9000	0.0000	9.9	9.9	2	0	9.9	9.9	100.00
	Chloride	250.0000	mg/L	6.0000	6.0000	1.4142	5	7	2	0	7	5	100.00
	Chromium	0.0500	mg/L	0.0005	0.0005	0.0000	0.0005	0.0005	2	0	0.0005	0.0005	100.00
	Copper	2.0000	mg/L	0.0013	0.0013	0.0011	0.0005	0.002	2	0	0.002	0.0005	100.00
	Fluoride	1.5000	mg/L	0.7550	0.7550	0.0778	0.7	0.81	2	0	0.81	0.7	100.00
	Iodine	0.5000	mg/L	0.0100	0.0100	0.0000	0.01	0.01	2	0	0.01	0.01	100.00
	Iron	0.3000	mg/L	0.0200	0.0200	0.0141	0.01	0.03	2	0	0.03	0.01	100.00
	Lead	0.0100	mg/L	0.0002	0.0002	0.0001	0.0001	0.0002	2	0	0.0002	0.0001	100.00
	Magnesium	10000.0000	mg/L	1.4850	1.4850	0.1344	1.39	1.58	2	0	1.58	1.39	100.00
	Manganese	0.5000	mg/L	0.0109	0.0109	0.0076	0.0055	0.0163	2	0	0.0163	0.0055	100.00
	Mercury	0.0010	mg/L	0.0004	0.0004	0.0000	0.0004	0.0004	2	0	0.0004	0.0004	100.00
	Molybdenum	0.0500	mg/L	0.0001	0.0001	0.0000	5E-05	0.0001	2	0	0.0001	0.00005	100.00
	Nickel	0.0200	mg/L	0.0002	0.0002	0.0000	0.0002	0.0002	2	0	0.0002	0.0002	100.00
	Nitrate	50.0000	mg/L	0.7500	0.7500	0.3536	0.5	1	2	0	1	0.5	100.00
	Nitrite	3.0000	mg/L	0.0500	0.0500	0.0000	0.05	0.05	2	0	0.05	0.05	100.00
	pH	6.5 - 8.5		7.3500	7.3500	0.0707	7.3	7.4	2	0	7.4	7.3	100.00
	Selenium	0.0100	mg/L	0.0035	0.0035	0.0000	0.0035	0.0035	2	0	0.0035	0.0035	100.00
	Silver	0.1000	mg/L	0.0001	0.0001	0.0000	0.0001	0.0001	2	0	0.0001	0.0001	100.00
	Sodium	180.0000	mg/L	4.0000	4.0000	0.0000	4	4	2	0	4	4	100.00
	Sulfate	500.0000	mg/L	14.5000	14.5000	0.7071	14	15	2	0	15	14	100.00
	Total Dissolved Solids (TDS)	600.0000	mg/L	45.5000	45.5000	3.5355	43	48	2	0	48	43	100.00

Analysis Type	Characteristic	Guideline Value	Units	Mean	Median	Standard Deviation	Min	Max	Sample Count	Exception Count	95th Percentile	5th Percentile	% meeting guideline values
Microbiology	Total Hardness as CaCO <sub>3</sub>	200.0000	mg/L	30.8000	30.8000	0.5657	30.4	31.2	2	0	31.2	30.4	100.00
	True Colour	15.0000	Hazen Units (HU)	0.5000	0.5000	0.0000	0.5	0.5	2	0	0.5	0.5	100.00
	Turbidity	5.0000	NTU	0.6750	0.6750	0.8839	0.05	1.3	2	0	1.3	0.05	100.00
	Uranium	0.0170	mg/L	0.0001	0.0001	0.0000	5E-05	5E-05	2	0	0.00005	0.00005	100.00
	Zinc	3.0000	mg/L	0.0700	0.0700	0.0141	0.06	0.08	2	0	0.08	0.06	100.00
	E. coli	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	52	0	0	0	100.00
	Free Chlorine	0.2 - 5	mg/L	0.7452	0.7650	0.2026	0.2	1.07	52	0	1.04	0.39	100.00
	pH	6.5 - 8.5		8.7463	8.8950	0.7309	7.2	10.18	52	35	9.77	7.3	32.69
	Temperature	30.0000	C	17.4627	17.6000	4.6068	11.1	25.8	51	0	24.1	11.4	100.00
	Total Chlorine	5.0000	mg/L	0.8967	0.9100	0.2345	0.38	1.38	52	0	1.27	0.58	100.00
	Total Coliforms	0.0000	mpn/100 mL	0.0000	0.0000	0.0000	0	0	52	0	0	0	100.00
	Turbidity	5.0000	NTU	0.3472	0.3550	0.0976	0.09	0.58	50	0	0.52	0.2	100.00



## **B. IMPROVEMENT PLAN STATUS**

## Improvement Plan

March 2020 onwards

Review frequency: As required and at least annually with the DWMS Annual Report

Date Last Reviewed: 12 August 2021

No.	Source	Scheme Component	Improvement Actions	Priority	Responsibility	Initial Date	Revised Date	Status	Comments/Outcomes
1	DWMS development 2014	Culcairn	Council to undertake an inspection of bore 2 (emergency bore) to determine cause for turbidity at startup.	Medium	Manager Water and Waste Water	Dec-21	Dec-22	To Start	Due to Covid impacts this will not happen by Dec 21. Timeframe revised.
2	DWMS development 2014	Villages	Council to consider implementing online water quality measurement at the two points where water is received from Albury City Council: at Jindera Gap WSPS and from the ACC Trunk Main from ACC's Table Top Reservoir.	Medium	Manager Water and Waste Water	Dec-21	Dec-22	In Progress	This has been discussed at the IWCM meeting which ACC attended. There has also been some staff changes at ACC. Further discussions will continue when the IWCM strategy has been finalised. Timeframe revised.
3	DWMS Review 2016	Whole of System	Develop a calibration schedule for monitoring equipment, and ensure records of calibration undertaken are maintained.	Medium	Overseer / Manager Water and Waste Water	Dec-20	Dec-22	To Start	Still needs to be done. Viridis will discuss with Paul on a quote (sewage to be included also). May be best to time this after completion of the online monitoring at Culcairn WTP happening in 2021. Timeframe revised.
4	Risk Assessment Feb 2020 (ref V1)	Villages	Document the communication details between ACC and GHG, including current contact persons/positions and hierarchy for calls.	High	Manager Water and Waste Water (with ACC)	Jun-20	NA	Completed	This has been done - in the incident contacts and stakeholders register.
5	Risk Assessment Feb 2020 (ref V1)	Villages	Establish a 6-monthly meeting between ACC and GHC to discuss general issues with water quality and quantity (face-to-face or teleconference). At these meetings, verify the currency of the communication contact positions/persons and details, update as required.	Medium	Manager Water and Waste Water	Dec-20	Dec-22	To Start	Has not been established formally yet. But GHC and ACC have been meeting e.g. at the IWCM discussions. There have been staff changes at ACC and GHC Manager Water and Wastewater will retire end of 2021. Timeframe revised. Will be more practical to look into this when new staff are onboard.
6	Risk Assessment Feb 2020 (ref V1)	Villages	Create a water email group with relevant ACC and GHC staff to follow up on communication needed or undertaken, as relevant.	Low	Manager Water and Waste Water	Dec-20	Dec-22	To Start	This is related to action #5 above, timeframe revised to match that.
7	Risk Assessment Feb 2020 (ref V1-V3)	Villages	Review and update the bulk water agreement to include water quality criteria/specifications and communications, including pH and potentially alkalinity (among other key parameters). Ensure the review of the bulk supply agreement includes appropriate details on water supply (e.g. continuity, reliability, emergency, restrictions).	High	Director Engineering / Manager Water and Waste Water	Sep-21	Dec-22	To Start	There have been staff changes at ACC and GHC Manager Water and Wastewater will retire end of 2021. Timeframe revised. Will be more practical to look into this when new staff are onboard.
8	Risk Assessment Feb 2020 (ref V4)	Villages	Underdosing of chlorine - Review in 2 years with recent data set.	Medium	Manager Water and Waste Water	Jun-22	NA	In Progress	Data is being collected as part of routine monitoring and will be analysed when the risk register is next reviewed.
9	Risk Assessment Feb 2020 (ref C-1)	Culcairn	Undertake weekly testing of bore raw water for turbidity and pH to enable long term data trends.	High	Manager Water and Waste Water	Jun-20	NA	Completed	Testing started in July 2020. Appropriate columns have been added into the monitoring spreadsheet.
10	Risk Assessment Feb 2020 (ref C-2)	Culcairn	Review any relevant findings from the IWCM project regarding aquifer vulnerability and re-assess risk profile as relevant.	Medium	Manager Water and Waste Water	Dec-21	Mar-22	In Progress	IWCM project is underway, supposed to finished in March 22.
11	Risk Assessment Feb 2020 (ref C-3)	Culcairn	Undertake pesticide testing for both bores every 5 years. Alternate the testing for the bores to have a 2.5 year testing interval between them (testing can be done through the PHU).	Medium	Manager Water and Waste Water	Nov-20	Dec-22	To Start	Tom sent email to James (PHU). Due to Covid, follow up from PHU on this has been delayed. Will be checked with PHU in 2022.
12	Risk Assessment Feb 2020 (ref C-7)	Culcairn	Include the cleaning of aerator filters in the yearly tasks calendar.	Medium	Overseer	Dec-20	NA	Completed	Cleaning has been done and will be undertaken annually going forward.

No.	Source	Scheme Component	Improvement Actions	Priority	Responsibility	Initial Date	Revised Date	Status	Comments/Outcomes
13	Risk Assessment Feb 2020 (ref C-7)	Culcairn	Investigate what the small line on aerator T pipe is, which goes into the clear water tank (electrical or acting as an air release).	Medium	Overseer	Dec-20	NA	Completed	Release of air only at start to prevent water hammer, then it closes and not raw water is transferred in CWT.
14	Risk Assessment Feb 2020 (ref C-8)	Culcairn	Establish a 3-monthly check on top of aerator for any issues.	Medium	Overseer / Manager Water and Waste Water	Dec-20	NA	Completed	This has started. It was discussed that records should be kept on when the inspection was undertaken. Tom will follow up.
15	Risk Assessment Feb 2020 (ref C-9)	Culcairn	Investigate and install a flow sensor on the chlorine dosing pump/line to indicate dosing or pump failure. This should be linked to a fault alarm.	High	Manager Water and Waste Water	Dec-20	NA	Completed	Investigation completed. It has been decided to install online chlorine analyser.
16	Risk Assessment Feb 2020 (ref C-9)	Culcairn	Develop a SOP for chlorine chemical management (e.g. obtaining certificate of analysis, stock rotation)	Medium	Manager Water and Waste Water	Jun-20	NA	Completed	Has been developed by Viridis and included in the CCPs and SOPs document.
17	Risk Assessment Feb 2020 (ref D-1)	Distribution	Include twice/week operational monitoring in Culcairn scheme in the reticulation and reservoirs (or closest site to reservoirs).	High	Overseer / Manager Water and Waste Water	Jun-20	NA	Completed	Started in July 2020.
18	Risk Assessment Feb 2020 (ref D-1)	Distribution	Replace Black Street Reservoir.	High	Director Engineering / Manager Water and Waste Water	Sep-21	Dec-22	In Progress	Safe and Secure - business case has been funded through it. Awarded to contractors, GHD doing report. Timeframe revised.
19	Risk Assessment Feb 2020 (ref D-2)	Distribution	Include in the reservoir inspection SOP and checklist, and undertake: incidental checks of reservoirs following storms; and periodic checks of stormwater/reservoir scour drain outlets.	Medium	Manager Water and Waste Water	Jun-20	NA	Completed	Viridis has updated the reservoir checklist to include these as part of the support project
20	Risk Assessment Feb 2020 (ref D-5)	Distribution	Undertake internal discussions to ensure that the backflow policy is implemented and procedures/processes are in place (including consideration for existing high risk properties e.g. rural farms with cattle troughs)	High	Director Engineering / Manager Water and Waste Water	Dec-20	NA	Completed	Internal discussions completed with Planning section. Register being kept by Planning. Checks done on all new developments. For rural farms - these have dual check valves. Implementation is with Planning section going forward. Marked as completed here.
21	Risk Assessment Feb 2020 (ref WS-1)	Whole of System	Investigate DPIE Part 1 course for staff who don't have any formal water qualification.	High	Manager Water and Waste Water	Sep-21	Jun-23	In Progress	Paul is going to do Part 2 by end of 2021. The others will do it as courses become available. Timeframe revised.
22	DWMS Update Mar 2020	Whole of System	Review the DWQ Policy and ensure that it is current.	Medium	Manager Water and Waste Water	Jun-20	NA	Completed	Reviewed in Oct 2019 and new one uploaded on website now.
23	DWQ IERP Update Mar 2020	Whole of System	Undertake a scenario-based test or exercise of the Drinking Water Quality Incident and Emergency Response Plan.	Medium	Manager Water and Waste Water	Jun-22	NA	To Start	To be planned, PHU and DPIE Water should be invited.
24	DWMS Annual Report 20-21 discussions	- Culcairn - Reservoirs	- Set up record keeping for the 3-monthly check on top of aerator (e.g. note in plant log or diary on inspection date and any findings). - Use the updated reservoir inspection checklist to complete the inspections.	Medium	Overseer	Dec-21	NA	To Start	