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Drinking Water Quality Management Plan Annual Report Dumaresq-Barwon Border Rivers Commission (BRC)

2021 - 2022

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An appropriate citation for this paper is:

Drinking Water Quality Management Plan Annual Report 2021-2022 for

Dumaresq-Barwon Border Rivers Commission (BRC), care of Sunwater.

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Water Supply Schemes covered by this plan:
Glenlyon Dam Drinking Water Scheme

This report has been prepared in accordance with the Queensland Government – Department of Regional Development, Manufacturing and Water 'Guideline for the preparation, review and audit of drinking water quality management plans, Including Supporting Information, Version 3, 1 October 2022'Drinking Water Quality Management Plan Report Guidance Note.

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Document Information

Title	Drinking Water Quality Management Plan Annual Report
Service provider	Dumaresq-Barwon Border Rivers Commission (BRC). SPID: 370
Reporting Period	1 July 2021 to 30 June 2022

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1 Introduction

This report documents the performance of the Border River Commission's Glenlyon Dam drinking water service with respect to water quality and performance in implementing the actions detailed in the Drinking Water Quality Management Plan (DWQMP) as required under the Water Supply (Safety and Reliability) Act 2008 (the Act). The report is for the period 1 July 2021 – 30 June 2022.

Dumaresq-Barwon Border Rivers Commission (BRC) is a registered service provider with identification (SPID) number 370. BRC is operating under an approved DWQMP to ensure the consistent supply of safe quality drinking water to protect public health.

Sunwater is contracted for the asset management, operation and maintenance of the dam, the associated water treatment facilities and mains reticulation system for the provision of drinking water services. Jacobs is engaged by Sunwater to provide specialist technical services to assist with the operation and management of drinking water plants including the preparation of this report.

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

2 Summary of scheme operated

The Glenlyon Dam drinking water scheme sources water from Glenlyon Dam. The dam is jointly owned by the State of QLD and the State of NSW and is managed by the Border Rivers Commission.

Sunwater is contracted for the asset management, operation and maintenance of the dam, the associated water treatment facilities and mains reticulation system for the provision of drinking water services to four houses, a small caravan park and day visitor / recreational areas together with associated toileting services (i.e. picnic area toilets).

The water treatment process comprises of a multi-barrier three step process of;

(i) Primary media filtration and storage

(ii) Secondary filtration with organics removal through activated carbon media (Note 1);

and

(iii) Disinfection by sodium hypochlorite and Ultra-Violet (UV).

The water treatment process, plant and equipment are essentially manually controlled by operations staff during day-light hours, with the exception of the automation of the sodium hypochlorite pump. This automatic chlorine dosing system maintains free chlorine residual levels above 0.5 mg/L in the clear water tanks as part of the water treatment process.

The treated drinking water is stored in above ground tanks for later use on a two- or three-day production cycle, depending on demand for drinking water at the caravan park and picnic facilities at Glenlyon Dam. Water is disinfected before reticulation.

The daily drinking water demand is seasonal, typically ranging from 0.5-3 kL/day during low season and 5-25 kL/day during high season.

A summary of this scheme is presented in Table 1.

Table 1 – Summary of schemes

Scheme name	Water Source	Treatment processes	Treatment capacity	Towns supplied
Glenlyon Dam WTP	Glenlyon Dam	Primary filtration, secondary filtration) and disinfection with dosing by sodium hypochlorite and UV (Note 1).	0.043 ML/d	Four houses, small caravan park and day visitor / recreational areas together with associated toileting services (i.e. picnic area toilets).

Note 1: A trial coagulant dosing system was installed during January 2022 but was suspended due to being unsuccessful and resulted in the installation of an Ultra-Filtration (UF) system during September 2022 (during FY2022-2023 reporting period).

3 DWQMP Implementation

The actions undertaken to implement the DWQMP are summarised below.

Sunwater has implemented the DWQMP by setting operational limits and investigation into non-compliances, as defined in the DWQMP operational and verification monitoring programmes, and site-specific work instructions.

Progress in implementing the risk management improvement program (RMIP)

Appendix C of the approved DWQMP outlines the RMIP Actions. A brief status report of the progress of these actions is included in Table 2.

Please refer to the summary below regarding the two improvement actions:

- Action No. 1 has been actioned and is currently ongoing. The following items were completed in FY2021/2022:
    - A condition assessment was undertaken of the existing WTP equipment during August 2021 which identified items for resolution including replacement of raw and clear water tanks, re-calibration of the turbidity analyser and replace the differential pressure gauge on the sand filter to allow automatic backwash. The turbidity analyser was recalibrated during October 2021. The raw water tank was replaced during May 2022. The replacement of the clear water tanks was actioned in FY2022/2023 (i.e. September 2022) and the differential pressure gauge is due for installation during FY2022/2023.
    - A scope of work and technical specification was completed recommending treatment option(s) which initially addressed the install of a coagulant dosing system unit (during October - November 2021) but was later updated to include the installation of an Ultrafiltration (UF) system (during April - May 2022).
    - Installation of a trial coagulant dosing system to assist with the reduction of turbidity in the raw water (prior to the sand filters). The trial coagulant dosing system was installed during January 2022 and operated well initially but was collecting coagulated water in the intermediate storage tank. Therefore, the trial was suspended as there was insufficient residence time for the coagulant dosing to be effective.
    - The existing UV system was replaced with a new UV disinfection system (with UV monitoring unit) during February 2022 to monitor the transmittance (%) and dose rate (mJ/cm2) to verify adequate disinfection performance.
- Action No. 2 is ongoing. Additional investigation of other containment/disposal options regarding the backwash process to be considered once the UF system is installed and commissioned.

Table 2 Risk management improvement program implementation status

RMIP Action No.	Component	Hazard/Event	Improvement actions	Target date	Actions taken to date	Status (and revised target date)	Responsible Officer / Position
1	Source Water	Chemical & physical hazards [source water parameters outside the design limits of WTP treatment capabilities - Low DO 8.5 & 15, Colour >15 HU, Odour including high levels of organic matter, & other key parameters such as High Mn & Fe levels] Climatic and seasonal variations in raw water quality (heavy rainfall & drought conditions).	Detailed investigation of options for a new treatment process or chemical dosing system for additional treatment during higher raw water turbidity/colour events to improve turbidity removal capability	FY2019/2020	Condition assessment undertaken, scope of work/technical specification completed for preferred treatment options, installation of a trial coagulant dosing system and replacement of the existing UV system. UF system to be installed FY2022/2023 to provide additional protection barrier in treatment and reduce the high turbidity (Note 1).	Ongoing FY2022/2023	General Manager South
2	Source Water	Discharge of backwash waste (from filters) to evaporation trench. Frequent backwash events from filters (sand and activated carbon filters).	Investigation of other options to contain and dispose of backwash waste.	N/A	To continue investigation of other containment/disposal options once UF system is installed and commissioned.	Ongoing FY2022/2023	General Manager South

Note 1: A trial coagulant dosing system was installed during January 2022 but was suspended due to being unsuccessful and resulted in the installation of an Ultra-Filtration (UF) system during September 2022 (during FY2022-2023 reporting period).

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

Changes were made to the monitoring program during this reporting period as per the amended DWQMP approved by the Regulator on the 14 December 2021. The changes to the monitoring program included implementation of quarterly testing of heavy metals (including iron and manganese), Trihalomethanes (THMs) and chlorates which commenced in January 2022. Note: Heavy metals and THMs were previously tested annually.

Drinking water quality is tested in accordance with ADWG limits on a number of key parameters and monitored for water quality and microbiological characteristics to ensure safe drinking water for consumers. The drinking water quality tests involve weekly testing at the WTP for water chemistry (aesthetics) and residual chlorine, monthly testing of microbiology and quarterly testing of heavy metals, chlorates and THMs at a NATA accredited Laboratory.

Three water quality sampling locations (test points) within the distribution system are utilised to provide high levels of overall confidence, guarantee and surety in the provision of safe drinking water quality to consumers.

The sampling points are selected based on providing the highest probability of finding non-compliant drinking water to prevent a worst-case scenario for a public health incident. The water quality sampling points are located at the Water Treatment Plant (Clear Water Tanks) and at the end of the reticulation mains at the Caravan Park (Office) and Haigh Cottage (kitchen tap).

Amendments made to the DWQMP

The DWQMP was amended during the reporting period.

An amendment to the BRC DWQMP was submitted to the Director-General of the Department of Regional Development, Manufacturing and Water (the Regulator) on 24 September 2020 to address the DWQMP review outcomes (Refer section 7). Subsequently, comments were received by the Regulator for further amendments and provision of additional information on the 22 February 2021. These comments were addressed and a revised DWQMP amendment re-submitted on the 8 April 2021. Additional comments were received by the Regulator on the 8 July 2021 for further amendments and provision of additional information. These additional comments were addressed and a revised DWQMP submitted to the Regulator on the 3 September 2021. The Regulator approved the amended DWQMP on the 14 December 2021.

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

4 Operational and verification monitoring – water quality information and summary

The drinking water quality control parameters were developed from recommendations outlined in ADWG (2011). Key parameters for operator testing and water quality acceptance are identified in Table 3: Drinking Water Quality Control Parameters. These parameters are tested at the WTP at the three different water quality sampling points (WTP (Clear Water Tanks), Haigh Cottage and Caravan Park).

Table 3– Drinking Water Quality Control Parameters

Parameter	Monitoring Frequency	Acceptable Limits
Residual chlorine (free) (Note 1)	Every 3 – 4 days	>0.5 mg/L after 30 mins
Total chlorine	Every 3 – 4 days	<5 mg/L
Raw Water pH	Every 3 – 4 days	N/A
Raw Water Turbidity	Every 3 – 4 days	N/A
Treated Water pH	Every 3 – 4 days	6.5 – 8.5
Treated Water Turbidity (Note 2)	Every 3 – 4 days	<1 NTU

Note 1: The minimum acceptable residual chlorine (free) limit of 0.5 mg/L is not a specific requirement of the ADWG and has been applied by Sunwater as an internal operational check for disinfection performance. Although residual chlorine (free) is outlined in the DWQMP as a drinking water quality control parameter to monitor operational performance, verification of the treatment process and particularly disinfection is verified by the monthly micro bacteriological sampling.

Note 2: The acceptable limit of <1 NTU for turbidity is based on effective chlorination as described in the ADWG and has been applied by Sunwater as an internal critical limit to verify the treatment performance and check disinfection.

Microbiological control testing is also required to ensure compliance with ADWG and the standards in the Public Health Regulation 2005. The parameters and frequency of the monitoring is shown in Table 4: Microbiological control.

Table 4 – Microbiological Control

Parameter	Monitoring Frequency	Acceptable Limits
E.Coli	Monthly (Note 1)	<1 CFU
Total Coliforms	Monthly (Note 1)	N/A – significant changes will be investigated
Total Plate Count	Monthly (Note 1)	N/A – significant changes will be investigated

Note 1: 84 Microbiological samples were collected during the reporting period (FY 2021-2022) due to the ongoing turbidity event.

Trihalomethanes and heavy metals are tested annually to ensure compliance with ADWG and the standards in the Public Health Regulation 2005. The parameters and frequency of the monitoring is shown below in Table 5: Trihalomethanes, Heavy Metal and Chlorate Testing.

Table 5: Trihalomethanes, Heavy Metal and Chlorate Testing

Parameter	Monitoring Frequency (Note 1)	Acceptable Limits
Trihalomethanes (THM)	Quarterly (Note 2)	<0.25 mg/L
Chlorate	Quarterly (Note 3)	<0.80 mg/L
Arsenic (As)	Quarterly	<0.01 mg/L
Cadmium (Cd)	Quarterly	<0.002 mg/L
Chromium (Cr)	Quarterly	<0.05 mg/L

Parameter	Monitoring Frequency (Note 1)	Acceptable Limits
Copper (Cu)	Quarterly	<2 mg/L
Nickel (Ni)	Quarterly	<0.02 mg/L
Lead (Pb)	Quarterly	<0.01 mg/L
Zinc (Zn)	Quarterly	<3 mg/L (Note 4)
Iron (Fe)	Quarterly	<0.3 mg/L (Note 5)
Manganese (Mn)	Quarterly	<0.05 mg/L

Note 1: Trihalomethane, chlorate and heavy metal testing frequency was previously annually but amended to quarterly commencing from January 2022. Hence, there are two reporting results available for these tests during the reporting period (i.e. January/February and April 2022).

Note 2: Trihalomethane samples were collected monthly from January to April 2022 due to January 2022 results above the ADWG Health limit of 0.25 mg/L.

Note 3: Chlorate samples were collected monthly from January 2022 to June 2022 due to results above the Queensland Health's interim guideline of <0.8 mg/L.

Note 4: The acceptable limit of <3 mg/L for zinc is not a Health limit and is rather an Aesthetic Limit of the ADWG that has been applied by Sunwater as an internal operational check for WTP performance.

Note 5: The acceptable limit of <0.3 mg/L for iron is not a Health limit and is rather an Aesthetic Limit of the ADWG that has been applied by Sunwater as an internal operational check for WTP performance.

A summary of compliance with water quality criteria is displayed in Table 6 and Table 7. This includes the following information:

- parameter
- unit of measure
- total number of samples collected
- number of samples that did not meet the water quality criteria
- maximum concentration or count

Turbidity

There was one (1) event, which commenced on 12/02/2021, where the treated water turbidity exceeded the operational critical limit of 1 NTU during the reporting period of 01/07/2021-30/06/2022, across 109 separate samples at the WTP, 109 separate samples at the Haigh Cottage, and 109 separate samples at the Caravan Park:

- 327 samples in total at three sampling points (109 at WTP, 109 at Haigh Cottage and 109 at the Caravan Park) exceeded the limit of 1 NTU. The maximum turbidity recorded during this period was 33.4 NTU, 35 NTU, and 33.9 NTU at the WTP, Haigh Cottage and Caravan Park respectively. This event was initially notified to the regulator on the 13/03/2021 due to manganese results above the operational action limit/ADWG aesthetic limit resulting in a discolouration of the water and attributing to increased turbidity. The elevated manganese concentrations eventually subsided however increasing turbidity persisted due to higher raw water turbidity due to subsequent inflows into Glenlyon Dam. Overall, elevated turbidity measurements occurred throughout the 2022/2023 reporting period. Refer to Section 5 for details.

Trihalomethanes

There was one event where Trihalomethanes exceeded the operational critical limit/ADWG Health limit of 0.25 mg/L for samples collected on the 17/01/2022 (sample results received on the 03/02/2022). Additional samples were collected on the 07/02/2022, 14/02/2022, 08/03/2022, 04/04/2022 and 09/05/2022 with all THM results achieving the ADWG Health limit of <0.25 mg/L. This event was notified to the regulator on the 03/02/2022 and was closed out on the 09/05/2022. Refer to Section 5 for details.

Iron

There was one instance where Iron marginally exceeded the operational critical limit/ADWG Aesthetic limit of 0.3 mg/L for samples collected on the 04/04/2022 (i.e. 0.31 mg/L). The taste threshold for iron is 0.3 mg/L and high concentrations can stain laundry and fittings. There is no ADWG Health limit for iron. No action was required as the exceedance was marginal and the exceedance represented an aesthetic issue (rather than a health issue). In addition, there was a 'Precautionary Water Quality Notice' already in place at Glenlyon Dam. This event was not reportable to the regulator as the result exceeded the Aesthetic limit.

Chlorate

There was one event where chlorate exceeded the operational critical limit/QLD Health interim guideline of 0.8 mg/L initially on 24/01/2022. Monthly samples were collected during January – June 2022 and all results exceeded the QLD Health interim guideline of 0.8 mg/L. Following receipt of department correspondence on the 06/05/2022 regarding chlorate notification requirements, Sunwater notified the regulator on the 06/05/2022 regarding the monthly chlorate results. Refer to Section 5 for details.

Table 6: Drinking water quality performance for Glenlyon Dam Scheme - verification monitoring

Parameter	Sampling Points	Units	No. of samples required to be collected (as per the approved DWQMP) (Note 1)	No. of samples actually collected and tested	Water quality criteria (i.e. DWQMP or ADWG health guideline value)	Min	Max	Average (Mean)	No. of non-compliant samples	Comments
pH	WTP, Haigh Cottage, Caravan Park (Note 2)	-	Every 3-4 days	323 Total at 3 sampling points	6.5-8.5	7	7.9	7.4	0	
Turbidity		NTU		109 at 3 sampling points (327 Total)	<1	1.27	35	10.37	327	March 2021 event: Regulator was notified on the 13/03/2021 regarding the turbidity >1 NTU. Refer to Section 5.
Residual Chlorine (Free)		mg/L			>0.5 after 30 mins	0.51	2.54	1.02	0	
Total Chlorine					<5	0.72	7	2.99	0	
E.Coli	Haigh Cottage, Caravan Park	CFU/100ml	Monthly (Note 3)	42 at 2 sampling points (84 Total)	<1	< 1	< 1	< 1	0	

Parameter	Sampling Points	Units	No. of samples required to be collected (as per the approved DWQMP) (Note 1)	No. of samples actually collected and tested	Water quality criteria (i.e. DWQMP or ADWG health guideline value)	Min	Max	Average (Mean)	No. of non-compliant samples	Comments
	(Note 2)									
Trihalomethanes	WTP, Haigh Cottage, Caravan Park (Note 2)	µg/L	Quarterly (Note 4)	10 total at 3 sampling points	<250	95	342	203	3	January 2022 event: Regulator was notified on the 3/02/2022 regarding the THM Result >250 µg/L. Refer to section 5.
Arsenic (As)	WTP	mg/L	Quarterly	2 at 1 sampling point (2 Total)	<0.01	0.0014	0.0016	0.0015	0	
Cadmium (Cd)					<0.002	<0.0001 (Note 5)			0	
Chromium (Cr)					<0.05	<0.0005 (Note 5)			0	
Copper (Cu)					<2	0.0052	0.0076	0.0064	0	
Lead (Pb)					<0.01	0.00015	0.00058	0.00037	0	
Nickel (Ni)					<0.02	0.0006	0.0012	0.0009	0	
Zinc (Zn)					<3	<0.005	0.0082	0.0054	0	
Iron (Fe)				2 at 1 sampling point (2 Total)	<0.3	0.169	0.31	0.2395	1	<0.24 mg/L is desirable. However, the ADWG states that 0.3 mg/L is the aesthetic limit. Not reportable to the regulator.

Parameter	Sampling Points	Units	No. of samples required to be collected (as per the approved DWQMP) (Note 1)	No. of samples actually collected and tested	Water quality criteria (i.e. DWQMP or ADWG health guideline value)	Min	Max	Average (Mean)	No. of non-compliant samples	Comments
Manganese (Mn)				2 at 1 sampling point (2 Total)	<0.5	0.012	0.054	0.033	0	<0.05 mg/L is desirable. However, the ADWG states that 0.1 mg/L is the aesthetic limit (causes staining/taste) and 0.5 mg/L is the health limit.
Chlorate	WTP, Haigh Cottage, Caravan Park (Note 2)	mg/L	Quarterly (Note 6)	6 at 3 sampling points (18 Total)	<0.8	1.2	4.9	3.05	18	May 2022 event: Regulator was notified on the 06/05/2022 regarding the chlorate results >0.8 mg/L. Refer to section 5.

Note 1: Trihalomethane, chlorate and heavy metal testing frequency was previously annually but amended to quarterly commencing from January 2022. Hence, there are two reporting results available for these tests during the reporting period (i.e. January and April 2022).

Note 2: Samples from different locations at the site were combined for reporting (Refer to water quality parameters including pH, turbidity, residual chlorine (free), total chlorine, E.Coli, Trihalomethanes (THM) and Chlorates).

Note 3: 84 Microbiological samples were collected during the reporting period due to the ongoing turbidity event.

Note 4: Trihalomethane samples were collected monthly from January to April 2022 due to January 2022 results above the ADWG Health limit of 0.25mg/L.

Note 5: Heavy metals results were reported as less than the laboratory method Limit of Reporting (LOR). Minimum, maximum and average results are not applicable.

Note 6: Chlorate samples were collected monthly from January 2022 to June 2022 due to results above the Queensland Health's interim guidelines of <0.8mg/L.

Table 7: E. coli compliance with annual value

Drinking water scheme: Glenlyon Dam Drinking Water Scheme

Year	2021 – 2022											
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	6	8	12	6	6	8	6	12	8	4	6	2
No. of samples collected in which E. coli is detected (i.e., a failure)	0											
No. of samples collected in previous 12-month period (Note 2)	38	44	54	58	62	64	68	76	82	84	84	84
No. of failures for previous 12-month period	0											
% of samples that comply	100.0%											
Compliance with 98% annual value (Note 1)	Yes											

Note 1: The Public Health Regulation 2005 (the regulation) requires that 98 per cent of samples taken in a 12-month period should contain no E. Coli. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

Note 2: This requirement comes into effect once you have 12 months data and should be assessed every month

5 Incidents Reported to the Regulator

Two (2) notifications to the regulator were reported between 1 July 2021 and 30 June 2022. These notifications are summarised below:

- 03/02/2022 – THM levels >250 µg/L on 17 January 2022
- 06/05/2022 – Chlorate >0.8 mg/L from January 2022 – June 2022

There was 1 event that continued during the reporting period as summarised below:

- 1/03/2021 – Manganese >0.1 mg/L followed by ongoing Turbidity >1 NTU throughout February 2021 – June 2022

All microbiological testing undertaken during the financial year revealed that there were no instances where Escherichia coli (E. Coli) exceeded the acceptable limit of <1 CFU/100ml.

Event or detection of a parameter with no water quality criteria

For this reporting period, there were no prescribed events reported to the regulator.

Non-compliances with the water quality – drinking water criteria

For this reporting period, there were three (3) prescribed events reported to the regulator as displayed in Table 8.

Table 8: Incidents / Events reported to the regulator

Incident / Event date	Scheme / location	Parameter / issue	Preventive actions
Event 01/03/2021	Glenlyon Dam Water Treatment Plant	Manganese > 0.1 mg/L (Aesthetic Limit) Turbidity > 1 NTU	Turbidity at the WTP exceeded the critical limit of 1 NTU (1.72 NTU on 12/02/2021) but this did not represent a notification to the regulator at the time. Operator collected sample for Iron/Manganese testing on the 1/03/2021. Manganese (below the ADWG Health limit, but above the Aesthetic limit) was detected in the treated water from event-based sampling following increased turbidity after the treated water tanks and a discolouration of the water. It was identified that the Manganese was possibly oxidising in the treated water tank when exposed to the sodium hypochlorite resulting in high turbidity results in the treated water. Increase in Manganese in raw water suspected to have been caused by low dam levels. Regulator was notified of this event on the 13/03/2021. A Precautionary Water Quality Notice was issued to residents and customers on the 12/03/2021 to not drink the potable water. The elevated manganese eventually subsided however increasing turbidity persisted for the remainder of the reporting period due to higher raw water turbidity due to subsequent inflows into Glenlyon Dam. Overall, elevated turbidity occurred throughout February – June 2022. The drinking water advisory remained in place as a precaution. The precautionary water quality notice was updated and issued to customers on the 1/07/2021 regarding the increasing turbidity. The following actions were completed regarding this event: • Precautionary Water Quality Notice was in place for Glenlyon Dam residents. The precautionary water quality notice advised all residents and visitors to not use the tap water for drinking, cooking and brushing teeth following higher than normal levels of turbidity in the water supply. Residents and visitors were urged to bring potable water to the recreation area. Limited bottled water was available for purchase from the Glenlyon Dam Tourist Park Office. • Operator continued to monitor turbidity, pH, Total and Free Chlorine at the Treated Water Storage (WTP), Haigh Cottage and Caravan Park. • Bacteriological testing is undertaken to monitor effectiveness of chlorine disinfection. Total and Free Chlorine residual in treated water was still detected above target limit and nil E. coli detections indicate adequate disinfection protocols. • A treatment options assessment was completed in June 2021. The report identified potential treatment options for consideration including investigation of a coagulant dosing system and new UF membrane system.

Incident / Event date	Scheme / location	Parameter / issue	Preventive actions
			• A condition assessment was undertaken on existing WTP equipment during August 2021 and the report identified some recommended actions for resolution. Most of these actions were addressed and any outstanding items are proposed to be completed as required. • A technical specification was completed recommending treatment option(s) which initially addressed the install of a coagulant dosing system unit (October - November 2021) but was later updated to include the installation of an Ultrafiltration (UF) system (April - May 2022). • A trial coagulant dosing system was installed to assist with the reduction of turbidity in the raw water (prior to the sand filters). The trial coagulant dosing system was installed during January 2022 and operated well initially but was collecting coagulated water in the intermediate storage tank. Therefore, the trial was suspended as there was insufficient residence time for the coagulant dosing to be effective (Note 1). • The existing UV system was replaced with a new UV disinfection system (with UV monitoring unit) during February 2022 to monitor the transmittance (%) and dose rate (mJ/cm^2) to verify adequate disinfection performance.
Event 03/02/2022	Glenlyon Dam Water Treatment Plant	THM > 250 µg/L	Total Trihalomethane (THM) exceedance of WTP, Caravan Park and Haigh Cottage samples at Glenlyon Dam WTP collected on 17/01/2022. Elevated THM's were likely due to the organics passing through the treatment process at elevated levels (associated with turbidity levels) and oxidising when reacting with sodium hypochlorite (used for disinfection). The treated water recorded high turbidity since February 2021 due to elevated raw water turbidity in the dam water supply. A Precautionary Water Quality Notice was still in place for Glenlyon Dam advising residents and visitors not to drink the water. A rental coagulant dosing system was installed on 28/01/2022, which was anticipated to reduce turbidity levels/organic matter and THMs based on recent results. However, the coagulant dosing system was subsequently suspended. The following actions were completed regarding this event: • Weekly backwashing of filters and flushing the storage tanks and network reticulation lines as required to ensure that turbid water and sediments in the tanks did not further contribute to high THM detected at the WTP • Ensuring free chlorine residual was maintained >0.5 mg/L • Investigation into the installation of a UF system to reduce turbidity and thereby the THMs in the treated water

Incident / Event date	Scheme / location	Parameter / issue	Preventive actions
			• Collection of additional samples on the 07/02/2022, 14/02/2022, 08/03/2022, 04/04/2022 and 09/05/2022 with all THM results achieving the ADWG guideline of <250 µg/L. • Continuation of quarterly testing to monitor THM results This event was subsequently resolved, and the event closed on the 09/05/2022 following receipt of additional samples indicating THM <250 µg/L.
Event 06/05/2022	Glenlyon Dam Water Treatment Plant	Chlorate > 0.8mg/L	Chlorate exceedance of WTP, Caravan Park and Haigh Cottage samples at Glenlyon Dam WTP since January 2022. Sodium hypochlorite is used an additional method of disinfection (downstream of UV system). Cause of elevated chlorate levels is yet to be determined as the treatment plant consumes a typical 20 L drum of Sodium Hypochlorite within a month and a new 20L drum is replaced each time. Sodium hypochlorite is stored in a shed (when the Glenlyon Water Treatment Plant is located) and is located out of direct sunlight. Operators have undertaken a full flush and cleaned the dosing pump & pipework to clear out and flush any chlorine residual that may contribute to chlorate in the treated water. Sodium hypochlorite is purchased from a known WTP disinfectant chemical supplier. The following actions were completed regarding this event: • Collection of monthly samples during January – June 2022 and all results exceeded the interim QLD health guideline of 0.8 mg/L • Ensuring free chlorine residual was maintained >0.5 mg/L • Regularly flushing the sodium hypochlorite dosing pumps and pipework to minimise chlorine residual build up in the water supply network • Ensuring sodium hypochlorite in 20 L drums are consumed and replaced with a new 20 L drum (instead of topping existing drum which may lead to chlorate build-up) • Continuation of monthly testing to monitor chlorate results Note: Following the installation of the UF system in September 2022 (during FY2022-2023 reporting period), chlorate concentrations reduced significantly <0.8 mg/L QLD Health interim guideline. Event to remain open until chlorate results are consistently <0.8 mg/L QLD Health interim guideline.

Note 1: A trial coagulant dosing system was installed during January 2022 but was suspended due to being unsuccessful and resulted in the installation of an Ultra-Filtration (UF) system during September 2022 (during FY2022-2023 reporting period).

6 Customer complaints

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

Throughout the 2021/2022 reporting period, one complaint regarding water quality was received as follows:

- 07/01/2022 - Customers raised concerns regarding the ongoing clarity issues of the water. Sunwater responded by directly contacting the customer to inform them of the actions being taken to resolve the turbidity issue. In addition, Sunwater issued an updated notification on the 13 January 2022 via Sunwater website and social media outlet channels (Facebook and Twitter) regarding the Precautionary Water Quality Notice. The notification also informed residents and visitors regarding the investigation progress and actions Sunwater was taking to restore the treatment capability and performance of the WTP.

During 2021/2022 reporting period, there were no suspected or confirmed cases of illness arising from the water supply system.

7 DWQMP review outcomes

During the reporting period (01/07/2021 to 30/06/2022), a DWQMP review was conducted by Jacobs and Sunwater during June 2022, and a finalised report submitted to the regulator on the 1 July 2022. The review considered four categories of the DWQMP and identified areas where the DWQMP requires update to remain relevant for the safe management of the drinking water supply. There were several review outcomes and subsequent actions identified following the completion of this review. A summary of these review outcomes and actions are referenced in Table 9.

Table 9: DWQMP Review - Summary of review outcomes and actions

Item No.	Description	Category	DWQMP reference	Action (Note 1)	Due date
1	Implementation of key recommendation items from the DBBRC DWQMP Audit Report 2021	DWQMP Audit Report	Section 2 and 2.1	Update DWQMP and associated documents and/or processes (as referenced in Table 10 based on the Audit recommendation items)	Variable – Refer Table 10.
2	Inclusion of new UV disinfection system (with UV monitoring) and new Ultra Filtration (UF) membrane system (once installed & operational)	Details of Infrastructure	Section 2 and 2.1	Update the DWQMP to reflect changes to assets on site.	15/08/2022
3	Raw water quality data is included up to the end of 2022 when the DWQMP was updated	Details of Infrastructure	Section 2.1	Update the DWQMP to include additional raw water quality data from 2020-2022	15/08/2022
4	Of the 4 actions on the RMIP, 3 actions have been completed and 1 item is still ongoing	Risk Management Improvement Plan	Appendix C, RMIP	Review and update the RMIP to include the status of Action no.1. Update the RMIP to include additional actions for continual improvement.	15/08/2022

The DWQMP Annual Report for the 2022-2023 reporting year will include an update regarding the actions taken to address the review items.

Note 1: All review items identified were addressed by updating the DWQMP and an amended DWQMP was submitted to the regulator on the 15 August 2022 (during the FY2022-2023 reporting period).

8 DWQMP Audit findings

An independent auditor conducted the regular audit of the approved DWQMP for the Glenlyon Dam Water Supply Scheme during the reporting period. The auditor conducted a system assessment and audit interviews on 20 September 2021 and attended site on 22 September 2021 to conduct the audit. The audit included inspection of the supply scheme, interviews with relevant staff and observation of documentation and records. A summary of these actions are included in Table 10.

Table 10: DWQMP Audit - Summary of Recommendations and Actions

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date
REC-21-001	Review the risk assessment to include assessment of protozoan risk and the adequacy of the current controls and critical limits. Where the risk is unacceptable, raise an improvement item to reduce the risk.	Recommendation	Review and update risk assessment to include assessment of protozoan risk utilising desktop catchment assessments already undertaken and raise an improvement item to reduce the risk if required for each site. To be updated in the DWQMP. The following updates are also relevant with due regard to protozoa risk: A new UV disinfection unit (with UV monitoring) was installed in February 2022 to replace the old UV disinfection unit. A UF membrane system & associated UF feed pumps have been procured and are proposed for installation and commissioning (Note 2).	15/08/2022
REC-21-002	Investigate options for improving filter performance where filtered water turbidity is regularly above 0.5 NTU.	Recommendation	Continue the current investigation to improve filter performance (where filtered water turbidity is regularly above 0.5 NTU) and update action item#1 in the Risk Improvement Management Plan (RMIP) noting that the action Item#1 currently in the RMIP relates to the investigation of a new treatment process to improve filter performance and the overall water treatment process. The following updates are also relevant with due	FY2022-2023

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date
			regard to improving filter performance: A UF membrane system & associated UF feed pumps have been procured and are proposed for installation and commissioning (Note 2). Investigation of a new automated WTP package pending the findings and overall performance of the UF system.	
REC-21-003	Document the procedures for calibration of monitoring equipment and ensure the program includes internal and external calibrations at appropriate intervals.	Recommendation	Calibration procedure and associated requirements to be documented in the appropriate work instructions and made available to appropriate operations staff.	15/08/2022
REC-21-004	Document the chemical procurement process to ensure there is a quality assurance process to confirm that chemicals used in drinking water are suitable and do not introduce a hazard.	Recommendation	Chemical procurement process to be documented in the DWQMP to ensure chemical quality assurance.	15/08/2022
REC-21-005	Assess the risk of mains breaks and the potential for contamination from works on the treated water mains. Establish a documented procedure or standard for working on mains that includes hygienic practices, flushing, and verifying the adequacy of the practices through taking a chlorine residual reading.	Recommendation	Risk of main breaks to be assessed as part of the Risk Assessment and documented in the DWQMP.	15/08/2022

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date
OFI-21-001	Consider implementing a program for refresher training on sampling and equipment calibration to ensure monitoring results are reliable.	Opportunity for Improvement	Implement refresher training (on sampling and equipment calibration for each site).	FY2022-2023
OFI-21-002	Consider converting the Risk Management Improvement Program into a living document that is kept up to date throughout the year and includes actions from processes such as incidents, reviews, audits and risk assessments.	Opportunity for Improvement	Convert the Risk Management Improvement Program into a live document.	15/08/2022

The DWQMP Annual Report for the 2022-2023 reporting year will include an update regarding the actions taken to address the audit items identified by the auditor.

Note 1: The following audit items (REC-21-001, REC-21-003, REC-21-004, REC-21-005 and OFI-21-002) were addressed by updating the DWQMP and an amended DWQMP was submitted to the regulator on the 15 August 2022 (during the FY2022-2023 reporting period).

Note 2: The Ultra-Filtration (UF) system was installed during September 2022 (during FY2022-2023 reporting period).