

Drinking Water Service Annual Report 2022 – 2023

Service Provider: The State of
Queensland – Department of Regional
Development, Manufacturing and
Water.

SPID: 638

Operating Agent: Sunwater Limited

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LGA covered by this plan:

Southern Downs Regional Council

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.

Delivering value through water solutions for today and tomorrow

Sunwater is Queensland's largest bulk water service provider, currently owning and managing water infrastructure assets with a replacement value of around \$13 billion and supplying approximately 40 per cent of all water used commercially in Queensland.

Sunwater owns and manages a regional network of bulk water supply infrastructure, supporting more than 5000 customers in the agriculture, local government, mining, power and industrial sectors.

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1 Introduction

This report documents the performance of The State of Queensland – Department of Regional Development, Manufacturing and Water (DRDMW) 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 2022 – 30 June 2023.

DRDMW is a registered service provider with identification (SPID) number 638. DRDMW is operating under an approved DWQMP to ensure the consistent supply of safe quality drinking water to protect public health.

Sunwater is contracted as an operating agent 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 Department of Regional Development, Manufacturing and Water – Water Supply Regulator (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 Queensland (QLD) and the State of New South Wales (NSW) and is managed between Sunwater and DRDMW on behalf of the State of QLD as a controlling authority for the Dumaresq-Barwon Border Rivers Commission.

Sunwater is contracted as an operating agent 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 a Ultra-Filtration (UF) unit [\(Note 1\)](#)
- 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 with an UF unit and disinfection with dosing by sodium hypochlorite and UV.	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: The UF unit was installed during September 2022. Prior to the install of the UF unit, the secondary filtration process included organics removal through activated carbon media.

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

Appendix C of the approved DWQMP outlines the RMIP Actions. The RMIP identifies a total of four open actions.

Please refer to the summary below regarding the four RMIP actions and progress during FY2022/2023:

- Action No. 1 is in progress. The following items were completed in FY2022/2023:
 - UF installation was completed in September 2022.
 - Jacobs were engaged to undertake an assessment to compare the feasibility of an automated WTP package plant vs ad-hoc upgrades and modernisation of the existing WTP. A draft feasibility assessment was prepared in June 2023.

The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy.

- Action No. 2 is in progress. The following items were completed in FY2022/2023:
 - Jacobs were engaged to undertake an assessment to compare the feasibility of an automated WTP package plant vs ad-hoc upgrades and modernisation of the existing WTP. This includes an option to more appropriately collect and treat backwash water from the sand filter and UF unit. A draft feasibility assessment was prepared in June 2023.

The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy.

- Action No. 3 is in progress. The following items were completed in FY2022/2023:
 - Sunwater conducted a review of information provided by the equipment supplier and completed an investigation to check the UV system performance is verified (in accordance with USEPA UV Disinfection Manual), complies to HBT requirements and provides UV dose output (as Reduction Equivalent Dose – RED). The review identified that the system UV unit was not a validated unit, and a UV intensity sensor was required to determine whether appropriate pathogen inactivation was being achieved.
 - Currently, Sunwater are reviewing the option to refurbish or replace the existing WTP. It has been decided to replace the UV unit with a validated unit during the refurbishment or replacement of the WTP. The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy including the identification of replacement options for the UV unit.
- Action No. 4 is in progress. During FY2022/2023:
 - Operators will undergo the following training modules (as per the new UF and UV system installed at Glenlyon Dam WTP):
 - NWPTRT020 – Operate and control membrane filters
 - NWPTRT023 – Monitor and operate ultraviolet processes

Additional detail regarding the progress of these actions is included in Table 2.

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 <85%, Ph> 8.5 & <6.5, Turbidity >15 NTU, 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	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	FY2021/2022	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. During FY2022/2023: • UF installation was completed in September 2022. • Jacobs were engaged to undertake an assessment to compare the feasibility of an automated WTP package plant vs ad-hoc upgrades and modernisation of the existing WTP. A draft feasibility assessment was prepared in June 2023. The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy.	Action open. FY2023/2024	General Manager South

RMIP Action No.	Component	Hazard/Event	Improvement actions	Target date	Actions taken to date	Status (and revised target date)	Responsible Officer / Position
		water quality (heavy rainfall & drought conditions)					
2	Water Treatment Plant	Discharge of backwash waste (from filters) to evaporation trench. Frequent backwash events from filters (sand and UF filters)	Investigation of other options to contain and dispose of backwash waste.	FY2021/2022	Continue investigation for a permanent storage and disposal solution in the short- to medium term. Currently there is a temporary disposal solution to capture backwash waste from the sand filter and UF filter. During FY2022/2023: Jacobs were engaged to undertake an assessment to compare the feasibility of an automated WTP package plant vs ad-hoc upgrades and modernisation of the existing WTP. This includes an option to more appropriately collect and treat backwash water from the sand filter and UF unit. A draft feasibility assessment was prepared in June 2023. The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy.	Action open. FY2023/2024	General Manager South

RMIP Action No.	Component	Hazard/Event	Improvement actions	Target date	Actions taken to date	Status (and revised target date)	Responsible Officer / Position
3	Water Treatment Plant	Ultraviolet disinfection system not providing sufficient UV dose (in accordance with Health Based Target (HBT) assessment)	Undertake process to verify the UV disinfection system is in compliance to HBT manual and ongoing verification of UV performance	FY2022/2023	The manufacturer was unable to provide USEPA validation for the UV unit as this is not typical for units of this scale. Sunwater conducted a review of information provided by the equipment supplier and completed an investigation to check the UV system performance is verified (in accordance to USEPA UV Disinfection Manual), complies to HBT requirements and provides UV dose output (as Reduction Equivalent Dose – RED). The review identified that the system UV unit was not a validated unit, and a UV intensity sensor was required to determine whether appropriate pathogen inactivation was being achieved. Currently, Sunwater are reviewing the option to refurbish or replace the existing WTP. It has been decided to replace the UV unit with a validated unit during the refurbishment or upgrade of the WTP. The feasibility assessment will be finalised in FY2023/2024 to inform the WTP strategy including the identification of replacement options for the UV unit.	Action open. FY2023/2024	Storage Supervisor Glenlyon Dam
4	Water Treatment Plant	Operators not adequately	Sunwater to review additional	FY2023/2024	Operators to undergo the following training modules (as per the new UF	Action open. FY2023/2024	General Manager South

RMIP Action No.	Component	Hazard/Event	Improvement actions	Target date	Actions taken to date	Status (and revised target date)	Responsible Officer / Position
		trained to operate and undertake corrective actions of the UV and UF system	training requirements (as part of their drinking water training course module)		and UV system installed at Glenlyon Dam WTP): - NWPTRT020 – Operate and control membrane filters - NWPTRT023 – Monitor and operate ultraviolet processes		

Water quality monitoring program to maintain compliance with water quality criteria¹

During the FY2022/2023 reporting period, the following changes were made to the operational monitoring program:

- Trihalomethane (THM) sampling is required to be tested quarterly as per the verification monitoring program, however the sampling frequency was increased from quarterly to monthly as a result of increased THM concentrations in the treated water. THM sampling will continue to be tested monthly until concentrations consistently remain below critical limits, and until the THM event is subsequently resolved.
- Chlorate sampling is required to be tested quarterly as per the verification monitoring program, however sites were sampled more frequently in the period when the chlorate critical limit had been exceeded to assist in investigating and resolving the exceedances. Chlorate is being tested monthly however testing frequencies will revert to quarterly once a sufficient dataset has been obtained indicating that concentrations consistently remain below critical limits.

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 routine weekly testing (every 3 – 4 days) at the WTP for water chemistry (pH and turbidity) and total/residual chlorine, monthly testing of microbiology, and quarterly testing of heavy metals, chlorates and THMs at a NATA accredited Laboratory. As noted above, THM and chlorate testing frequencies have been increased to monthly however these parameters will revert to a quarterly testing frequency once a sufficient dataset has been obtained indicating that concentrations consistently remain below critical limits.

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 were 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). Further details are provided in section '4 Operational and verification monitoring – water quality information and summary'.

Inspections of WTP infrastructure

During the FY2022/2023 reporting period, operators completed inspections of the scheme infrastructure in accordance with the relevant weekly/monthly, quarterly, bi-annual and annual work instructions located in the asset management system database.

Amendments made to the DWQMP

The DWQMP was amended during the reporting period.

An amendment to the DWQMP was submitted to the regulator on the 15 August 2022.

Subsequently, the regulator issued an information requirement notice to Sunwater on the 11 November 2022 requesting additional information be provided in the amended DWQMP. The additional information requested was incorporated and an amended DWQMP was submitted to the regulator on the 3 February 2023. The regulator approved the amended DWQMP on the 11 May 2023.

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. These parameters are tested at three 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
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
Filtered water turbidity	Continuous online monitoring	< 0.15 NTU (>0.15 NTU for no more than 15 minutes)
Treated Water Turbidity ^(Note 2)	Every 3 – 4 days	<1 NTU
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

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 treated water 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.

Table 4. Microbiological Control

Parameter	Monitoring Frequency	Acceptable Limits
E.Coli	Monthly	<1 CFU (no detections)
Total Coliforms	Monthly	N/A – significant changes will be investigated
Total Plate Count	Monthly	N/A – significant changes will be investigated

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.

Table 5. Trihalomethanes, Heavy Metal and Chlorate Testing

Parameter	Monitoring Frequency	Acceptable Limits
Trihalomethanes (THM)	Quarterly ^(Note 1)	<0.25 mg/L
Chlorate	Quarterly ^(Note 2)	<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
Copper (Cu)	Quarterly	<2 mg/L
Nickel (Ni)	Quarterly	<0.02 mg/L
Lead (Pb)	Quarterly	<0.01 mg/L

Parameter	Monitoring Frequency	Acceptable Limits
Zinc (Zn)	Quarterly	<3 mg/L (Note 3)
Iron (Fe)	Quarterly	<0.3 mg/L (Note 4)
Manganese (Mn)	Quarterly	<0.5 mg/L

Note 1: Trihalomethane samples were collected monthly during the reporting period due to results above the ADWG Health limit of 0.25 mg/L.

Note 2: Chlorate samples were collected more frequently during the reporting period due to results above the Queensland Health's interim health guideline of <0.8 mg/L.

Note 3: 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 4: 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

There were several events where water quality characteristics exceeded the Sunwater operational critical limits/acceptable limits. These events are summarised below:

Turbidity

There were two events whereby turbidity exceeded the operational critical limit of >1 NTU:

- 12/03/2021 – This was an ongoing event during period 12/02/2021 – 18/09/2022 whereby turbidity >1 NTU. This event was initially notified to the regulator on the 12/03/2021 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. This event was subsequently resolved due to the installation of a UF system which resulted in treated water turbidity measured <1 NTU from the 19/09/2022. An incident investigation report was submitted to the regulator on the 13/12/2022. Refer to section 5 for details.
- 26/02/2023 – Turbidity data indicated results in the range of 1.01 – 5.47 NTU during the period 26/02/2023 to 11/05/2023 at the WTP outlet, caravan park, haigh cottage and filtered water sample locations. The cause of the increased turbidity was due to the oxidation of dissolved manganese when sodium hypochlorite was dosed. This event was notified to the regulator on 26/02/2023 and an incident investigation report was submitted to the regulator on the 28/07/2023. Refer to section 5 for details.

Iron

There was one instance where iron exceeded the operational critical limit/ADWG Aesthetic limit of 0.3 mg/L for samples collected on the 11/07/2022 (i.e. 0.605 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 represented an aesthetic issue (rather than a health issue). 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 health guideline of 0.8 mg/L. This was an ongoing event from 2021/2022 which occurred initially on 24/01/2022 whereby monthly chlorate results exceeded the critical limit of 0.8 mg/L during January to June 2022 (previous reporting period). Samples continued to be collected monthly during July 2022 to March 2023, twice during April 2023, 5 times during May 2023 and 3 times during June 2023. The chlorate concentrations >0.8 mg/L were reported in the range of 0.83 – 2.9 mg/L during the period July to September 2022 and November 2022 to April 2023. 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 chlorate results. An incident investigation report was submitted to the regulator on the 04/07/2023. Refer to section 5 for details.

Trihalomethanes

There was one event where THM's exceeded the operational critical limit/ADWG Health limit of 0.25 mg/L for samples collected on the 10/10/2022 and 17/10/2022 (sample results for 17/10/2022 received on the 25/10/2022). Sampling frequency increased to monthly during the period November 2022 to June 2023. The THM concentrations >0.25 mg/L were reported in the range of 0.27 – 0.39 mg/L during the period October 2022 to February 2023 and April 2023. This event was notified to the regulator on the 25/10/2022 and is still ongoing. Refer to section 5 for details.

Table 6. Drinking water quality performance for Glenlyon Dam Scheme – verification monitoring

Treated Water Parameter	Sampling Points	Units	No. of samples required to be collected (as per approved DWQMP)	No. of samples 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	256 total samples across 3 sampling points.	6.5-8.5	7.00	7.80	7.47	0	
Turbidity	WTP, Haigh Cottage, Caravan Park (Note 2)	NTU	Every 3-4 days	259 total samples across 3 sampling points.	<1	0.08	8.10	1.83	97 (Note 1)	March 2021 event: Regulator was notified on the 12/03/2021 regarding turbidity >1 NTU during period 12/02/2021 – 18/09/2022. Refer to section 4 and 5. February 2023 event: Regulator was notified on the 26/02/2023 regarding turbidity >1 NTU during the 26/02/2023 – 11/05/2023. Refer to section 4 and 5.
Total chlorine	WTP, Haigh Cottage, Caravan Park (Note 2)	mg/L	Every 3-4 days	255 total samples across 3 sampling points.	<5	0.60	2.53	1.20	0	
Residual chlorine (free)	WTP, Haigh Cottage, Caravan Park (Note 2)	mg/L	Every 3-4 days	259 total samples across 3 sampling points.	>0.5 after 30 mins	0.33	2.22	0.89	1	There was one instance on the 19/08/2022 (i.e. 0.33 mg/L) where free chlorine was reported below the action limit (<0.5 mg/L). In response, the operators followed the 'WTP Wall Chart' and increased chlorine dosing which subsequently increased free chlorine. Free chlorine was not lower than the critical limit (<0.2 mg/L) and there was no identified risk to public health. As a result, the free chlorine concentrations recorded did not represent an event. Notification to the regulator was not required.
E. coli	WTP, Haigh Cottage, Caravan Park	CFU/100ml	Monthly	60 total samples across 3	<1	<1	<1	<1	0	

Treated Water Parameter	Sampling Points	Units	No. of samples required to be collected (as per approved DWQMP)	No. of samples 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)			sampling points.						
Arsenic (As)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 0.01	<0.001	0.0017	0.0012	0	
Cadmium (Cd)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 0.002	<0.0001	<0.0001	<0.0001	0	
Chromium (Cr)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 0.05	<0.001	0.0005	0.0005	0	
Copper (Cu)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 2	0.0052	0.0100	0.0067	0	
Lead (Pb)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 0.01	<0.001	0.0004	0.0003	0	
Nickel (Ni)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 0.02	<0.001	0.0012	0.0009	0	
Zinc (Zn)	WTP	mg/L	Quarterly	4 total samples across 1 sampling point.	< 3	<0.005	0.0520	0.0225	0	

Treated Water Parameter	Sampling Points	Units	No. of samples required to be collected (as per approved DWQMP)	No. of samples collected and tested	Water quality criteria (i.e DWQMP or ADWG health guideline value)	Min	Max	Average (Mean)	No. of non-compliant samples	Comments
Iron (Fe)	WTP	mg/L	Quarterly	5 total samples across 1 sampling point.	<0.3	0.0080	0.6050	0.1518	1	There was one instance on the 11/07/2022 (i.e. 0.605 mg/L) where iron was reported above the critical limit (<0.3 mg/L). The critical limit represents the aesthetic limit as there is no health limit for iron. No action was required noting this single exceedance was an aesthetic issue (rather than a health issue). Notification to the regulator was not required.
Manganese (Mn)	WTP	mg/L	Quarterly	5 total samples across 1 sampling point.	<0.5	0.0000	0.2020	0.1045	0	
Chlorate	WTP, Haigh Cottage, Caravan Park (Note 2)	mg/L	Quarterly (Note 3)	56 total samples across 3 sampling points.	<0.8	0.09	2.90	0.99	21	May 2022 event: Regulator notified on the 06/05/2022 regarding chlorate >0.8 mg/L during January – June 2022 which continued during the current 2022-2023 reporting period. Refer to section 4 and 5.
Trihalomethanes (THM)	WTP, Haigh Cottage, Caravan Park (Note 2)	mg/L	Quarterly	36 total samples across 3 sampling points.	<0.25	0.024	0.390	0.231	17	October 2022 event: Regulator notified on the 25/10/2022 regarding THM's >0.25 mg/L during October 2022 to February 2023 and April 2023. Refer to section 4 and 5.

Note 1: Sample result statistics are primarily comprised of routine operational monitoring results and typically do not include additional monitoring results collected during incident events unless this data is entered into the database.

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: Chlorate samples were collected more frequently during the reporting period due to results above the Queensland Health's interim health guideline of <0.8 mg/L.

Drinking water scheme: Glenlyon Dam Drinking Water Scheme*Table 7. E. coli compliance with annual value*

Year 2022 – 2023												
Month	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
No. of samples collected	4	12	10	5	2	3	3	6	6	3	3	3
No. of samples collected in which E. coli is detected (i.e., a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12-month period (Note 2)	84	82	86	84	83	79	74	71	65	63	62	59
No. of failures for previous 12-month period	0											
% of samples that comply	100%											
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) incidents/events were reported to the regulator between 1 July 2022 and 30 June 2023. There were also two (2) events that continued during the reporting period that were previously reported to the regulator. Refer to Table 8 for further detail regarding the incidents reported to the regulator.

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 was one (1) prescribed event reported to the regulator.

- 26/02/2023 – Turbidity >1 NTU.

For previous reporting periods, there was one (1) prescribed event reported to the regulator.

- 12/03/2021 – Turbidity >1 NTU.

Non-compliances with the water quality – drinking water criteria

For this reporting period, there was one (1) prescribed event reported to the regulator.

- 25/10/2022 – THM's >0.25 mg/L.

For previous reporting periods, there was one (1) prescribed event reported to the regulator.

- 6/05/2022 – Chlorate >0.8 mg/L.

Table 8. Incidents / Events reported to the regulator

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
Event 12/03/2021 (ongoing from FY2020/2021)	Glenlyon Dam WTP	Turbidity > 1NTU	Turbidity at the WTP initially exceeded the critical limit of 1 NTU (1.72 NTU on the 12/02/2021). This was an ongoing event during period 12/02/2021 - 18/09/2022 whereby turbidity >1 NTU. This event was initially notified to the regulator on the 12/03/2021 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 resulting from subsequent inflows into Glenlyon Dam. A precautionary water quality notice (to not drink the tap water) was issued to residents and customers on the 12/03/2021. Subsequent notifications were issued to the community, residents and customers on the 30/06/2021 and 13/01/2022 with a continuing directive to not drink the tap water due to elevated turbidity identified in the water supply, including the actions being taken by Sunwater to restore the potable 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. The notice stayed in effect until the 27/10/2022. A number of corrective actions were implemented during previous reporting periods (2020/2021 and 2021/2022) as documented in previous annual reports. The following actions were identified and implemented during the 2022/2023 reporting period to ensure resolution of the event. <u>Corrective actions</u> - Continued assessment of raw water intake point level in dam to determine whether adjustments were required to the raw water intake positions. - Completion of additional filter backwashing (prior to start up and shutdown sequences) and increased the frequency of inspection/cleaning of the raw water and treated water storage tanks to quarterly. - Replacement of the old treated water tanks 2 and 3 with new treated water polyethylene tanks which were installed on the 15/09/2022 and 16/09/2022.

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			- Installation of a UF unit on the 07/09/2022 with turbidity analysers on each UF module. - Additional monitoring of turbidity, chlorine (free and total), microbiological and iron/manganese analysis was undertaken until the event was resolved. Treated water turbidity returned to <1 NTU from the 19/09/2022, and chlorine disinfection was maintained at all times. All monthly microbiological samples collected during the event indicated nil detection of E. coli. Manganese results for samples collected on the 11/07/2022 and 05/10/2022 were below the critical limit. <u>Preventative actions</u> - Installation of a pressure differential gauge at the sand filter for automatic backwash. - UF unit installed with individual turbidity analysers for each UF module to allow alarming to notify operator when turbidity limits have been exceeded - Continue to complete quarterly manganese and iron testing in accordance with DWQMP and 'Wall Chart' to monitor iron and manganese concentrations. - Investigate development of pre-dosing chlorine trial procedure to allow the potential dosing of sodium hypochlorite upstream of the filters if future manganese oxidation issues occur. - Investigating treatment options to mitigate oxidation of iron and manganese as a component to the Glenlyon Dam WTP feasibility assessment currently being completed. Following consultation with the regulator, the 'do not drink notice was rescinded on the 27/10/2022 and the potable water supply was considered suitable for customer consumption as a result of compliant water quality results and acceptable WTP performance. This event was subsequently resolved, and the event was closed on the 13/12/2022 following submission of the investigation report to the regulator.
Event 06/05/2022 (ongoing from FY2021/2022)	Glenlyon Dam WTP	Chlorate > 0.8mg/L	Chlorate concentrations exceeded the QLD Health Interim Health Guideline of 0.8mg/L from samples initially collected on the 24/01/2022 and for remainder of previous reporting period (January to June 2022). The regulator was initially notified of this event on the 06/05/2022 (following confirmation to notify). This

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			was an ongoing event that continued during the current reporting period whereby chlorate exceedances were reported in the range of 0.83 – 2.9 mg/L during the period July to September 2022 and November 2022 to April 2023. Sodium hypochlorite is used as part of the treatment process to ensure adequate disinfection, noting that the use of sodium hypochlorite can result in chlorate formation due to the breakdown and degradation of sodium hypochlorite. Sunwater developed a recovery plan which outlined a number of actions required to be implemented to reduce chlorate concentrations. The actions involved the optimisation of operational practices in the management of sodium hypochlorite resulting in a substantial reduction in chlorate concentrations <0.8 mg/L. The following actions were identified and implemented regarding this event. <u>Corrective actions</u> • Following consultation with the regulator, a 'do not consume' notice was issued to residents and visitors of Glenlyon Dam on the 21/04/2023. Bottled water was provided to consumers whilst this advisory was in effect. • Operators initially requested the original chemical supplier change the drum colour from clear to black to minimise UV exposure, which occurred. • Reviewing the supply chain and sourcing suppliers who turn over sodium hypochlorite more frequently to ensure shelf life is not compromised. • Actively managing product inventory by ordering smaller quantities of product more frequently from suppliers to reduce sodium hypochlorite age. • Consuming and replacing sodium hypochlorite with a new container each time (i.e. preventing top up of existing containers or decanting into containers). • Cleaning and flushing of dosing recirculation lines/pipework, dosing pump and associated equipment (i.e. dosing containers/storage tanks) more frequently to remove residual chlorine and built-up crystalline chlorine. • Dilution of sodium hypochlorite to approx. 7.5% on delivery to reduce degradation of the product.

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			- Installation of air conditioning in the sodium hypochlorite storage room. - The frequency of chlorate testing was increased throughout the duration of the event to validate chlorate concentrations. Chlorate results for samples collected during the 29/04/2023 – 27/06/2023 were reported <0.8 mg/L as a result of the implementation of the corrective actions. <u>Preventative actions</u> - Continued implementation of the corrective actions as per the recovery plan. - Internal documentation was reviewed and updated to include refined trigger limits for chlorate so that corrective actions are undertaken prior to chlorate concentrations exceeding the QLD Health interim health guideline of 0.8 mg/L. - Continued to undertake chlorate monitoring and increased the frequency of testing as required in response to situations that required additional data to verify and monitor chlorate concentrations. Following consultation with the regulator, the ‘do not consume’ notice was rescinded on the 19/05/2023 as a result of chlorate concentrations consistently measured <0.8 mg/L. This event was subsequently resolved, and the event was closed on the 04/07/2023 following submission of the investigation report to the regulator.
Event 25/10/2022	Glenlyon Dam WTP	THM > 250 µg/L	Total Trihalomethane (THM) result exceeded the >0.25 mg/L ADWG Health Limit at the caravan park and haigh cottage sample points collected on the 10/10/2022 and 17/10/2022. Subsequent THM concentrations >0.25 mg/L were reported in the range of 0.27 – 0.39 mg/L during the period October 2022 to February 2023 and April 2023 at the WTP, caravan park and haigh cottage sample points. The regulator was notified of this event on the 25/10/2022. The suspected cause of the THM concentrations 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 following actions were identified and implemented regarding this event.

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			<u>Corrective actions</u> - Sampling frequency for THMs was increased from quarterly to monthly during November 2022 to June 2023 to monitor THM concentrations in the treated water. THM concentrations were reported equal to or <0.25 mg/L during May and June 2023. - Water storage tanks were flushed to ensure sediment in the tanks did not contribute to the THM concentrations. The sand filter and UF system were also backwashed. - Investigate immediate treatment options that can be implemented to reduce THM concentrations (i.e. installation of sink top carbon filters at the reticulation supply points). <u>Preventative actions</u> - Investigating treatment options to reduce THM formation as a component to the Glenlyon Dam WTP feasibility assessment currently being completed. This event remained open as of 30 June 2023 and was not closed. This event will remain open until THM results continue to be consistently reported <0.25 mg/L. (Note 1)
Event 26/02/2023	Glenlyon Dam WTP	Turbidity > 1NTU	Treated water turbidity >1 NTU on the 26/02/2023 at the treated water storage tank. In-situ field tests identified that turbidity was 1.54 NTU at the WTP outlet, 1.05 NTU at the caravan park and 1.11 NTU at haigh cottage. The regulator was notified of this event on the 26/02/2023. Additional field tests confirmed that turbidity in the filtered water was within specification indicating the turbidity issue was originating further downstream of the filters. Additional sampling was undertaken to test for total and dissolved iron and manganese at each treatment stage of the WTP. These sampling results indicated that the cause of the increased turbidity was the oxidation of dissolved manganese to a precipitate when sodium hypochlorite was dosed for disinfection. The following actions were identified and implemented regarding this event.

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			<u>Corrective actions</u> - Following consultation with the regulator, a 'boil water alert' notice was issued to customers and the community who receive drinking water from the water supply. The boil water notice was in place from the 26/02/2023 to 21/04/2023 and 19/05/2023 to 14/07/2023. The 'boil water alert' notice advised all residents and visitors to boil their tap water used for drinking following an issue at the Glenlyon Dam water supply which resulted in water being produced with elevated turbidity. - Treated water storage tanks were flushed, drained and refilled. Temporary recirculation pipework located between the treated water tank and recirculation pump was replaced. Operators undertook a citric acid clean of the UF system to remove any inorganic buildup. These actions did not rectify the issue. - Sunwater and Jacobs developed a trial procedure for dosing sodium hypochlorite upstream of the filters to ensure the removal of dissolved manganese by the filters. This trial was put on hold noting that the turbidity returned to <1 NTU at the WTP and in the network. It was suspected that the improvement in turbidity was due to reduced dissolved manganese concentrations in the raw water. - Additional monitoring of turbidity, chlorine (free and total) and microbiological analysis was undertaken until the event was resolved. Treated water turbidity returned to <1 NTU from the 12/05/2023, and chlorine disinfection was maintained at all times. All monthly microbiological samples collected during March – June 2023 indicated nil detection of E. coli. <u>Preventative actions</u> - Should turbidity >1 NTU increase downstream of the sodium hypochlorite dosing point while the filtered water turbidity is <1 NTU, sampling of total and dissolved manganese and iron at each treatment stage will be repeated. - If the cause is determined to be the oxidation of manganese and/or iron by sodium hypochlorite, the trial procedure for dosing sodium hypochlorite upstream of the filters will be undertaken.

Incident / Event date	Scheme / location	Parameter / issue	Summary and Preventive actions
			Investigating treatment options to mitigate oxidation of iron and manganese as a component to the Glenlyon Dam WTP feasibility assessment currently being completed. Following consultation with the regulator, the 'boil water alert' notice was rescinded on the 14/07/2023 and the potable water supply was considered suitable for customer consumption as a result of compliant water quality results and acceptable WTP performance. This event was subsequently resolved, and the event was closed on the 28/07/2023 following submission of the investigation report to the regulator.

Note 1: As of December 2023, monthly sampling has indicated THM concentrations equal to or <0.25 mg/L in the treated water during July – November 2023. Additionally, sink top carbon filters were installed at the reticulation supply points during October 2023. Initial results indicate THM concentrations <0.25 mg/L, and additional sample results will be obtained to validate effectiveness of the sink top carbon filters. The drinking water service annual report for the 2023-2024 reporting year will include an update regarding the actions taken to address this incident.

6 Customer complaints

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

Throughout the 2022/2023 reporting period, no complaints were received.

During the 2022/2023 reporting period, there were no suspected or confirmed cases of illness arising from the water supply system.

7 DWQMP review outcomes

No review was completed during the reporting period (01/07/2022 to 30/06/2023).

A DWQMP review was previously completed by Jacobs and Sunwater during the previous FY2021/2022 reporting period. A finalised report was submitted to the regulator on the 1 July 2022.

An update is provided in Table 9 regarding the status of the actions to address the review items noting that these items were due for completion during the 2022/2023 reporting period.

Table 9. DWQMP Review – Summary of review outcomes and actions

Item No.	Description	Category	DWQMP reference	Action (Note 1)	Due Date	Status (Completed/Open)
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	Completed
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	Completed
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	Completed

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). The regulator approved the amended DWQMP on the 11 May 2023.

8 DWQMP Audit findings

No DWQMP audit was completed during the reporting period (01/07/2022 to 30/06/2023).

A DWQMP audit was previously completed by an independent auditor during the previous FY2021/2022 reporting period. The audit identified a number of recommendations and actions.

An update is provided in Table 10 regarding the status of the actions to address the audit items noting that these items were due for completion during the 2022/2023 reporting period.

Table 10. DWQMP Audit – Summary of Recommendations and Actions

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date	Status (Completed/ Open)
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	Completed

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date	Status (Completed/ Open)
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 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. (Note 3)	FY2022-2023	Open
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	Completed

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date	Status (Completed/ Open)
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	Completed
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	Completed
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). (Note 4)	FY2022-2023	Completed

Item No.	Description	Recommendation /Opportunity for Improvement (OFI)	Action (Note 1)	Due Date	Status (Completed/ Open)
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	Completed

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).

Note 3: Audit action REC-21-002 regarding investigation of a new automated WTP package is ongoing and to be completed in FY2023-2024 as noted in section 3 RMIP – Action No. 1 and 2.

Note 4: Audit action OFI-21-001: Internal refresher training for sampling and equipment calibration was completed in May 2023.