ANNUAL REPORT 2023/2024 (FINANCIAL YEAR)

City of Townsville

Drinking Water Quality Management Plan

SPID	506
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Report contains	Activities undertaken over the 2023/2024 financial year in operating Townsville City Council's (Council) drinking water service. Summary of drinking water quality for Townsville's three drinking water schemes. Summary of Council's performance in implementing their approved Drinking Water Quality Management Plans (DWQMP).

1. Contents

Abbreviations and Acronyms

Acronym	Definition
ADWG	Australian Drinking Water Guidelines
BWA	Boil Water Advisory
CCP	Critical Control Point
DBP	Disinfection By Product
DO	Dissolved Oxygen
DW	Dirty water
DLGWV	Department of Local Government, Water and Volunteers
DWQMP	Drinking Water Quality Management Plan
GAC	Granular Activated Carbon
Hypo	Sodium Hypochlorite
LIMS	Laboratory Information Management System
DWS	Drinking Water Scheme
PBR	Picnic Bay Reservoir
MW	Milky water
NATA	National Association of Testing Authorities
OS	Owners Side
PAC	Powdered Activated Carbon
RMIP	Risk Management Improvement Program
RRD	Ross River Dam
THM	Trihalomethanes
TLS	Townsville Laboratory Services
T&O	Taste and Odour
TCC	Townsville City Council
WTP	Water Treatment Plant
TC	Tropical Cyclone

Approvals

In signing this approval:

I agree that the report meets the standards required and approve the report to be submitted to Water Supply Regulation, Department of Regional Development, Manufacturing and Water.

Travis Richards
General Manager Water Services
Townsville City Council

Water Supply in Townsville

2023/2024 Fast Facts

3
drinking water supply schemes

4
water treatment plants

27,453 ML
of residential drinking water supplied to 192,768 residents

Maximum daily water demand
204 ML

0.37
customer water quality complaints per 1,000 connections

$942
Typical water bill based on 200kL per annum

84,051
residential properties connected

2,783 km
of water mains

$54M
spent on capital improvements

$2.26bn
Replacement cost of Townsville's water supply assets

1. Executive Summary

Townsville City Council's (TCC) Drinking Water Quality Management Plan (DWQMP) was approved in August 2012 with the most recent review (2023) approved in 2024. Included in the approval notice was the requirement to submit an annual water quality report to outline the performance of Townsville Water Services against their DWQMP as required under the *Water Supply (Safety and Reliability) Act 2008*.

TCC has met all requirements under its DWQMP, the *Australian Drinking Water Guidelines 2011* (ADWG) and the *Public Health Regulation 2005* for the reporting period. The reporting period being the 2023/2024 financial year.

Council has three Drinking Water Schemes (DWS): Townsville DWS, Giru/Cungulla DWS and Paluma DWS. All three schemes fall under one DWQMP.

The Public Health Regulation 2005 (the regulation) for *Escherichia coli (E. coli)* requires that 98% of samples taken in a 12-month period should not detect *E.coli.* Annual compliance for the three schemes was met with 100% compliance for Townsville DWS, 100% compliance for Giru/Cungulla DWS and 100% compliance for Paluma DWS.

Five notifications of non-compliance and four events were submitted to the Office of the Water Supply Regulator (The Regulator) for the three schemes for the reporting period:

- 1 *E. coli* detections
- 4 disinfection by-product (DBP) exceedances
- 4 events

There were 61 customer complaints regarding drinking water quality:

- 21 Dirty water complaints
- 29 Taste/Odour complaints
- 2 Mily Water complaints
- 3 Suspected illness
- 5 Owner's side issues
- 1 High chlorine complaint

Townsville continues to experience harmful algal blooms in the Ross River Dam. Working together with Trility, the Office of Water Supply Regulation, Queensland Public Health and industry experts, TCC continues to provide treated water that meets the ADWG.

This DWQMP annual report is made available to our customers through our public website, upon request through email enquiries@townsville.qld.gov.au or for inspection upon request at the Customer Service Centre, 103 Walker Street, Townsville City.

2. Overview

The supply of safe and reliable drinking water is regulated by state legislation: *Water Supply (Safety and Reliability) Act 2008* and the *Public Health Act 2005* which are further enforced by the Department of Local Government, Water and Volunteers (DLGWV) and Queensland Health, respectively. State government regulates TCC to ensure drinking water services are conducted in accordance with an approved DWQMP and drinking water quality meets or exceeds the Australian Drinking Water Guidelines (ADWG) to protect public health.

TCC's Drinking Water Quality Policy provides guidelines and assigns responsibility for the management of drinking water quality in adherence to the Public Health Act 2005 and the Water Supply (Safety and Reliability) Act 2008. The Drinking Water Quality Policy and other TCC policies can be accessed here: Policies - Townsville City Council

The DWQMP outlines the management of Council's water supply system from "catchment to tap" in a risk-based approach. The DWQMP is framed to meet and exceed the ADWG by incorporating the following:

- Commitment and responsibility to provide safe and reliable drinking water,
- Assessment of drinking water supplies
- Operational procedures and process control
- Verification and monitoring of drinking water quality
- Management of incidents and emergencies
- Employee awareness and training
- Community involvement and awareness
- Information management
- Evaluation and audit
- Review and continual improvement

The DWQMP is made available to relevant employees through Council's corporate document management system.

Council's DWQMP was submitted to the Office of the Water Supply Regulator on 21st June 2011. It was approved with conditions on 29th August 2012. Townsville's first DWQMP Audit was undertaken in July of 2016. The plan was reviewed, with significant amendments made in January 2018. The amendments were approved with conditions on 23rd April 2018. The plan is reviewed every two years with an external audit undertaken every four years. The latest regulatory audit was undertaken in December 2020 and the plan review was approved in November 2021. The most recent review was undertaken with the expertise of Viridis and was approved with conditions in May 2024. The next external audit will take place September 2024.

Water Services (WS) is a significant business unit of TCC and is a registered service provider under the *Water Supply (Safety and Reliability) Act 2008*. WS is responsible for the management of the city's potable water supply network and provision of safe and reliable water to the residents of Townsville, Paluma Township and Cungulla Township. Public health is protected through proactive identification and minimisation of public health related risks associated with drinking water.

WS serves a population of approximately 192,768 with 84,051 connected properties, in three drinking water schemes: Townsville DWS, Paluma DWS and Giru/Cungulla DWS. This annual report relates to all three schemes.

Table 1. Summary of Townsville's Drinking Water Schemes

Scheme Name	Water Treatment Plant (WTP)	Water Source	Treatment Processes	Treatment Capacity	Towns Supplied
Townsville Drinking Water Scheme	Douglas WTP (Angus Smith Drive)	Ross River Dam (water supplemented from the Burdekin Dam through the Haughton Pipeline when required)	Conventional treatment with chlorine disinfection	232 ML/D	Townsville
	Northern Water Treatment Plant (Kinduro)	Paluma Dam/ Crystal Creek	Ultrafiltration with chlorine disinfection	40 ML/D	
Giru/Cungulla Drinking Water Scheme	Giru Water Treatment Plant (Cromarty Creek Road)	Haughton River	Conventional treatment with chlorine disinfection	2 ML/D	Cungulla township
Paluma Drinking Water Scheme	Paluma Water Treatment Plant (Lennox Crescent)	Paluma Weir	Ultrafiltration, UV and chlorine disinfection	90 KL/D	Paluma township

Giru Water Treatment Plant supplies water to Cungulla Township and Giru Township. Water is supplied to Giru Township through agreement with the Burdekin Shire Council. Management of Giru's drinking water quality is covered under the Burdekin Shire Council's DWQMP.

42,591 ML of potable water was produced in the 2023/2024 financial year. WS maintains and operates 2 major water storages (Ross River Dam and Paluma Dam), 2 weirs (Paluma Weir and Blacks Weir), 26 water pumping stations, 23 chlorinators, 41 reservoirs (treated water storage facilities) and 2,783 km of water distribution mains.

3. Actions Taken to Implement the DWQMP

3.1 Management of Council's DWQMP

WS employs experienced operators, scientists, engineers, technical specialists, and plumbers who work to monitor, regulate, and improve water quality for all Drinking Water Schemes. Collectively, they handle water quality non-compliances, water quality complaints and queries from customers, monitor all Critical Control Points (CCPs), the water sampling plan and closely monitor the subsequent data it generates. The team includes the Water Quality Officer (custodian of the DWQMP), Senior Water Systems Engineer, Water Resources Engineer, Coordinator Compliance Water, Coordinator Water Networks, Team Leader Water Treatment and the Water Operators.

The Water Quality Team hold weekly water quality meetings to discuss water quality issues. A weekly operations meeting is held with Townsville DWS's contractor TRILITY, who operate Douglas and Northern WTPs. A water quality governance meeting is held with management every two months and is chaired by the General Manager Water Services.

A Technical Team was established in February 2020 in response to the presence and persistence of cyanobacteria in the main raw water source for the Townsville drinking water scheme. The Technical Team provides expert advice and management of the risks associated with algae blooms to the treatment and supply of potable water to the Townsville community. The team includes representatives from Council, TRILITY, Townsville Laboratory Services and Beca/ Hunter H_2O.

3.2 Amendments made to the DWQMP

WS completed a full risk assessment and review of the DWQMP across all three schemes with the consultation of Viridis during the reporting period. The DWQMP was re-written and amended to reflect the following:

- All DWS data updated to current statistics
- Including all DWS into one plan
- Catchment assessment of all water supplies with regards to Health Based Targets
- Updates to new and upgraded infrastructure
- Updates to the risk register and risk management improvement plan
- Updated schematics and Critical Control Points

The next amendment of the DWQMP will take place in August 2025.

3.3 Training

All staff involved with water treatment and supply obtain the "Aquacard" which is managed through our internal Learning Management System (LMS). Aquacard is a QldWater course which gives an overview of water quality risks, particularly when working on or around water infrastructure. It provides a simple overview of what contaminants are, the risks that they pose, how they can enter a drinking water system and the responsibilities of those working on infrastructure to reduce that risk. It includes practical guidance on how to operate within work sites including good housekeeping and disinfection practices.

WS staff members continue to complete the Water Industry Worker Program. The Water Industry Worker Program was developed in partnership with QldWater, government, industry and training providers to help retain skilled staff and improve future opportunities for workers through industry specific training. The program is focussed on the formal recognition of skills and training employees within the construction and maintenance field in the water industry. A large component of this training is drinking water quality and the role of the worker in maintaining safe supply as a public health requirement of their role.

The Water Quality Officer attended a Best Practice Drinking Water Quality Management Course through University of Queensland's IWES educational program in July 2023. IWES is Australia's most successful continuing education program for professionals responsible for industry environmental performance.

In conjunction with the Australian Water Association (AWA), TCC hosted the North Queensland Water Industry Conference in August 2023: "Water in the North Driving Opportunity and Prosperity." This was an opportunity for water, wastewater, and associated suppliers of equipment in North Queensland to come together and share their knowledge and experiences within the water industry. TCC delivered two presentations: *Managing cyanobacteria – Utilising data to build resilience in plant and people* and *PFAS contamination in Townsville water and waste: A review of risks and impacts*; and two presentations in partnership with James Cook University: *A techno-economic analysis for biosolids pyrolysis* and *The path of most resistance: Characteristic antibiotic and emerging contaminant exposures from STP effluent discharges*.

3.4 Operation of Douglas Water Treatment Plant and Northern Water Treatment Plant

TRILITY operate the Douglas Water Treatment Plant and Northern Water Treatment Plant under contract for Council. Operational performance of the WTPs is managed by TRILITY in liaison with TCC via meetings and written communications; and contract matters are managed through formal meetings and contract notices.

3.5 Education

In the 23/24 financial year, 1,723 students were engaged across various water education tours and classroom engagements. While this figure is slightly lower than the previous financial year, there has been an increase in the number of schools re-engaging with Council's water education services. With the release of version 9.0 of the Australian Curriculum, there has been an increase in excursion bookings with Year 4 to the Water Treatment Plant and Wastewater Treatment Plants. The old laboratory at the Douglas Water Treatment Plant is being converted into a water education space. This will allow for increased visitation to the site where students will be emersed in learning about the Total Water Cycle for Townsville. Bookings for the space will commence in March 2025.

Council continues to support major school events, including St Benedict's Eco Fest and Kelso Under 8's Day. This year the Water Educator was also invited to Vincent State School Under 8's day and Kirwan State High School Science Week to promote the benefits of healthy waterways and catchment management, engaging over 360 students and parents across all events.

For National Water Week 2023, Townsville City Council held a school's drawing competition for the second time for the Giant Water Hunt Augmented Reality (AR) event. This year's event was held across three additional sites, Jezzine Barracks (The Strand), Elliot Springs Park, and Riverway during the school holidays. The winning entry had their artwork displayed and come to life using the Eye Jack AR app. Over 87 submissions were received, with the winning entry from a year 4 student from The Cathedral School. Over 240 users engaged with the AR event throughout October.

The Savewater Drinkwater Campaign launched in April 2024 at the NRL Cowboys & Titans game with a special activation booth to engage with patrons. Over 500 water-smart packs were given away to fans promoting the importance of water conservation. The campaign included a blend of LED displays, TV videos, banners and on-site activation to engage the public effectively. Patrons were educated through interactive experiences and informative materials, enhancing awareness about water conservation through meaningful conversations. To boost fan participation, we also distributed branded drink bottles and props to be used during the game. The campaigns gained significant traction, with targeted outreached across TV, radio, and newspaper channels. Web analytics showed the water-smart campaign saw a 411% increase in traffic to the webpage, with over 322 page views.

With the rising numbers in Blue-Green Algae (BGA) in Ross River Dam, a short educational video was produced to inform the public of the importance of managing BGA. Proactive measures, such as managing nutrient levels and community awareness, play a crucial role in addressing and preventing algal blooms. The video and other informative videos pertaining to the treatment and effects of BGA can be accessed here: Blue-Green Algae in Ross River Dam - Townsville City Council

3.6 Major Capital Projects

3.6.1 Ross River Dam to Douglas Water Treatment Plant Pipeline Duplication

The Ross River Dam to Douglas Water Treatment Plant (DWTP) raw water pipeline conveys approximately 85% of the city's water to the WTP, with no redundancy. Council has built a new pipeline to increase the resilience of this key asset and further enhance Townsville's water security. This project was delivered with funding support from the Queensland Government as part of the early works for the Riverway Drive duplication.

Council awarded two separate packages of work to local construction firm CivilPlus. Construction involved the installation of an OD 1290mm mild steel concrete lined pipe which crosses the Ross River downstream from the dam and then runs down the eastern side of Ross River through the Department of Defence's Mount Stuart Training Area to Douglas Water Treatment Plant. The pipeline was completed & operational in June 2024.

3.6.2 Haughton Pipeline Project

Construction of Stage Two of the Haughton Pipeline Project has commenced and will see the Stage 1 pipeline extended from the Haughton River to the Burdekin River near Clare. Once completed a new pump station is proposed to be built which will allow Council to draw bulk water supply directly from the Burdekin River and transport it to the Ross River Dam during extended dry periods.

3.6.3 Ross River Dam PAC Dosing

Design has commenced on a new Powdered Activated Carbon (PAC) dosing system for DWTP. The plant is proposed to be positioned downstream of Ross River Dam and designed to dose PAC directly into the raw water through the new pipeline. The facility will provide extended contact time with the raw water and be capable of dosing up to 60mg/L of PAC as the maximum dosage. The system is designed as an additional treatment barrier to address taste and odour compounds and algal toxins.

3.6.4 Recreation

TCC is proceeding with land-based recreation activities at the dam. A land-based fishing platform is being constructed along the dam wall to permit fishing. No boats or swimming will be permitted as part of the first stage. Following the completion of the project and depending on the success of the first stage, further recreation activities may be permitted in the future (raw water quality permitting).

3.7 Risk Management Improvement Program

A DWQMP Risk Assessment facilitated by consultant Viridis was undertaken in May and June 2023 with key staff. A new RMIP was generated and included in the latest DWQMP (2023).

The risk management improvement program (RMIP) is included in Appendix A.

3.8 Customer Service Standard

WS's Customer Service Standard is currently under review with Council approval expected February 2025. The outcome of the review will be published in the 2024/2025 Annual Report.

4. Information supplied to the Regulator Regarding Non-Compliances and Prescribed Incidents

There were five non-compliances with water quality criteria and four water supply events reported for the 2023/2024 financial year.

Table 2. Disinfection by-products in Paluma – Bromate September 2023.

DWI-506-23-10415 Disinfection By-Products in Paluma	
Scheme	Paluma
Incident Date	20/09/2023
Parameter	Bromate
Results	42 µg/L and 29 µg/L
Event description	Bromate values over the ADWG limit (20 µg/L) were detected at two treated water sample points in Paluma during routine monthly sampling occurring on 14/09/2024. Resamples collected the following day returned with exceedances (see Table 4). Bromate can be a contaminant formed in the manufacturing process of sodium hypochlorite (hypo).
Corrective and preventative actions	It was deduced the bromate exceedances were due to hypo contamination from the supplier and aging of the chemical. Hypo was replaced at the WTP which eliminated the issue. Dates of hypo batches and refills are recorded. A hypo-age calculator is used to keep track of aging and to inform WQ team potential DBP risk.

Table 3. Disinfection by-products in Paluma - Bromate February 2024.

DWI-506-24-10874 Disinfection By-Products in Paluma	
Scheme	Paluma
Incident Date	27/02/2024
Parameter	Bromate
Results	20 µg/L and 21 µg/L
Event description	Bromate values over the ADWG limit (20 µg/L) were detected at two treated water sample points in Paluma. Resample results are listed in Table 2.
Corrective and preventative actions	It was deduced the bromate exceedances were due to hypo contamination from the supplier, aging of the chemical and the heat causing further degradation. Hypo was replaced at the WTP which eliminated the issue. Dates of hypo batches and refills are recorded. A hypo-age calculator is used to keep track of aging. Paluma treated water is tested weekly for bromate.

Table 4. Bromate results from DWI-506-23-10415 and DWI-506-24-10874 in Paluma.

DWI-506-23-10415		
Sample Point	Sample Date	Bromate (µg/L)
55 Mt Spec Road	14/09/2023	42
Storage Facility	14/09/2023	29
55 Mt Spec Road	21/09/2023	39
Storage Facility	21/09/2023	33
55 Mt Spec Road	04/10/2023	14
Storage Facility	04/10/2023	13
55 Mt Spec Road	10/10/2023	13
Storage Facility	10/10/2023	12
55 Mt Spec Road	12/10/2023	13
Storage Facility	12/10/2024	12
DWI-506-24-10874		
Sample Point	Sample Date	Bromate (µg/L)
55 Mt Spec Road	22/02/2024	20
Storage Facility	22/02/2024	21
55 Mt Spec Road	29/02/2024	13
Storage Facility	29/02/2024	16
55 Mt Spec Road	05/03/2024	<10
Storage Facility	05/03/2024	<10
55 Mt Spec Road	12/03/2024	<10
Storage Facility	12/03/2024	<10
55 Mt Spec Road	19/03/2024	<10
Storage Facility	19/03/2024	<10

Table 5. Disinfection By-Products in Townsville – Bromate.

DWI-506-24-10221 Disinfection By-Products in Townsville	
Scheme	Townsville
Incident Date	17/01/2024
Parameter	Bromate
Results	21 µg/L
Event description	On the 17th of January 2024, bromate exceedances were detected within the Townsville network from samples collected on the 11th of January. Bromate exceedances were also detected at Douglas WTP from samples collected on the 15th of January. Flushing and resampling was organised at the affected locations. Results located in Figure 1.
Correction and preventative actions	At the time of the incident the chlorine set point was 3.4 mg/L for Dougals WTP to ensure disinfection across the network as the water demand was quite low. Potential contamination of the hypo has triggered the supplier to regularly test for bromate in their hypo batches. All hypo tanks were cleaned out to eliminate the possibility of tank contamination.

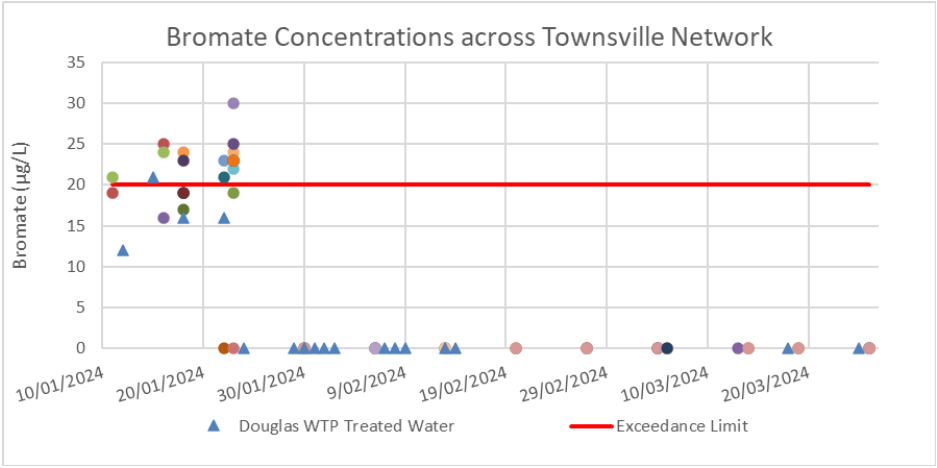

Figure 1. Bromate values across Townsville through the incident period. Round markers represent various reservoir and house sample points across the network.

Table 6. Picnic Bay Reservoir roof collapse

DWI-506-24-10803 – Picnic Bay Reservoir roof collapse	
Scheme	Townsville
Event	Compromised reservoir
Incident date	22/01/2024
Event description	Drone footage depicting Picnic Bay Reservoir (PBR) with a collapsed roof was submitted to the TCC Operations Centre. The reservoir was sampled the following day for free and total chlorine and E.coli. Free and total chlorine were 1.03 mg/L and 1.20 mg/L, respectively and no E.coli was detected. PBR is sampled on a weekly basis for general water quality parameters (chlorine, metals, E.coli, etc.) and all results prior to the incident have indicated the water in the reservoir is potable.
Corrective and preventative actions	Magnetic Island was put on a boil water advisory on 23/01/2024 due to risk of ingress. A bypass pipeline was commissioned and operational by 28/01/2024. Nelly Bay Reservoir was brought online to provide adequate water storage to the island. Magnetic Island was taken off the boil water advisory on 29/01/2024. Residents of Cockle Bay were kept on boil water advisory as they were still required to be fed from PBR. In June 2024, an interconnection was completed from the bypass to the residents to allow for roof replacement works to commence on PBR. Works are targeted to begin in 2024/2025.

Table 7. Tropical Cyclone Kirrily disaster response

DWI-506-24-10806 Tropical Cyclone Kirrily	
Scheme	Paluma, Giru/Cungulla, Townsville
Event	TC Kirrily
Event Date	25/01/2024
Paluma Response	Paluma WTP suffered no damage or issues. The WTP remained online with a generator for power supply until the power returned. No water quality or supply issues.
Giru/Cungulla Response	Giru WTP was offline until 27/01/2024 when Ergon restored power. Potable water trucks filled from Douglas WTP supply were deployed to fill Cungulla and Giru Reservoirs. No water quality or supply issues.
Townsville Response	A significant portion of Townsville lost power, impacting the ability to pump water to and from reservoirs. Townsville's residents were asked to conserve water usage to drinking and hygiene purposes only. This was lifted on 31/01/2024. Northern WTP was taken offline pre-emptively as the Crystal Creek intake screens can block up quickly in high rainfall events. The screens and WTP were inspected prior to bringing back online on 30/01/2024. Three of Townsville's reservoirs suffered roof damage. Douglas 2 Reservoir was isolated, repaired and brought back online in May 2024. Top City Reservoir was isolated and is being rebuilt with an expected commissioning date in late 2024. Squatter's Tank was brought online to assist in distribution and storage while Top City is offline. Belgian Gardens Reservoir was unable to be isolated so the reservoir was manually dosed with sodium hypochlorite until the temporary repairs were completed on 28/01/2024. Chlorine residuals were checked twice daily and E.coli was tested daily until after the repairs were completed. Chlorine residuals remained at disinfection levels and no E.coli was detected. Douglas WTP maintained a target chlorine residual of 3.6 mg/L to ensure adequate disinfection across the network to account for the period of low demand. Sample sites with low residual chlorine results were proactively managed by flushing the site to allow for fresh water through the network.

Table 8. Disinfection by-products in Townsville - Chlorate

DWI-506-24-10819 – Disinfection By-Products in Townsville	
Scheme	Townsville
Incident date	31/01/2024
Parameter	Chlorate
Results	2095 µg/L, 1715 µg/L, 2050 µg/L, 1705 µg/L
Event description	Chlorate values over the exceedance limit (800µg/L) were detected throughout the network and Douglas WTP for the duration of the 2024 summer. Low demand coupled with high temperatures are the main factors contributing to high chlorate values. See Figure 2 for chlorate results through the duration of the incident.
Corrective and preventative actions	TCC and Trility have DBP management strategies which include the following: • Close monitoring of sodium hypochlorite age and replace it regularly to minimise DBPs from DWTP through to reticulation. • Trility receive their hypo in smaller and frequent batches that are always tested for chlorine demand and chlorate. • Regular flushing occurs at all end points in the reticulation to pull fresh water through. • Coogee, the hypo supplier, now have a batching plant based in Townsville to decrease transport time. • TCC maintains appropriately sized hypo tanks that are kept out of the sun. • A dual tank system is used where possible. • Chlorine residual is kept as low as possible without compromising disinfection.

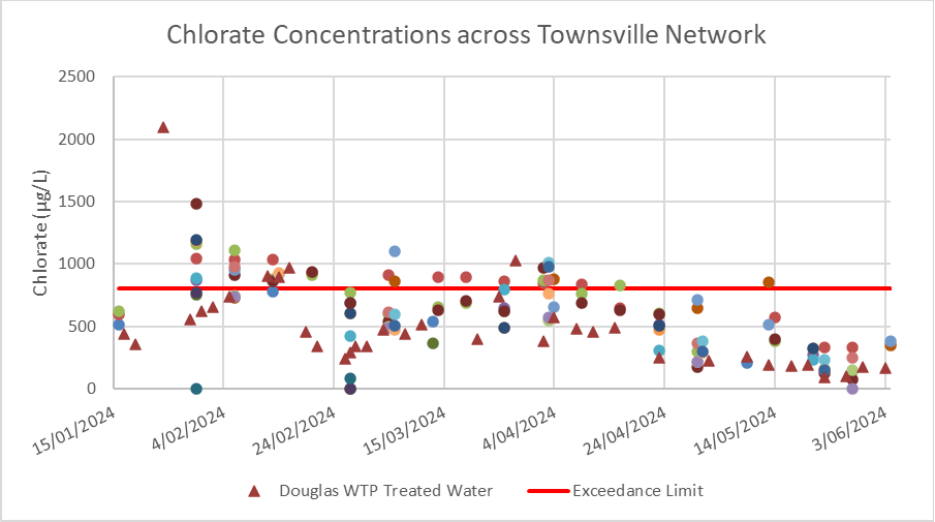

Figure 2. Chlorate concentrations across the Townsville network. Round markers represent various reservoirs and house sample points throughout the network.

Table 9. E.coli detection in Mt Margaret Reservoir

DWI-506-24-10876 *E.coli* Detection in Mt Margaret Reservoir	
Scheme	Townsville
Incident Date	01/03/2024
Parameter	E.coli
Results	~1 CFU/100ml
Event description	~1 CFU/100ml E.coli was detected in Mt Margaret Reservoir. No E.coli was detected in the following sample.
Correction and preventative actions	The day the sample was taken, relevant staff were informed the chlorine residual was 0.09 mg/L in the reservoir. This triggered an immediate response to flush and manually dose the reservoir with hypo. Public health was not compromised due to this response. Mt Margaret Reservoir is currently being assessed as a potential re-chlorination site.

Table 10. Pipeline break in Cungulla

DWI-506-24-10987 – Pipeline Break in Cungulla	
Scheme	Giru/Cungulla
Event date	13/05/2024
Event	Pipeline break
Event description	Two main pipeline breaks occurred on 12/05/2024 between Giru WTP and the Cungulla Balance Tank.
Corrective and preventative actions	Cungulla Balance Tank was isolated and water trucks filled from Douglas supply were utilised to for two days until the pipe was repaired and the tank was at operating level (2m). Water conservation messaging was communicated to the Cungulla community. Repairs were completed on 14/05/2024 and the line was flushed for two and a half hours prior to deisolating the balance tank.

Table 11. Ross River Dam to Douglas WTP Pipeline Cut-in

DWI-506-24-10987 – Pipeline Break in Cungulla	
Scheme	Townsville
Event Date	13/05/2024
Event	Ross River Dam to Douglas WTP pipeline cut-in
Event description	The new raw water pipeline from Ross River Dam (RRD) to Douglas WTP required four cut-ins to connect the pipeline to RRD, the RRD booster pump station and Douglas WTP. To allow the cut-ins to proceed, it was essential Douglas WTP sourced raw water from the Black School Weir emergency supply for the duration of the project. Douglas WTP used the Black School Weir offtake from 21/05/2024 to 17/06/2024

5. Compliance with Water Quality Criteria for Drinking Water

WS has a comprehensive sampling regime "*from catchment to tap*" which covers catchments, raw water supply, water treatment and water distribution. Over 100,000 tests are taken weekly, monthly, quarterly and annually for various parameters including (but not limited to) chlorine, pH, turbidity, alkalinity, metals, chemical, pesticides, disinfection by products, per- and polyfluoroalkyl substances and microbiologicals.

Treated water samples are taken from dedicated sample points in council owned parks and open spaces. These sample points are housed in secure vandal proof casings called "Ned Kelly's".

All samples are taken and analysed by Townsville Laboratory Services, a National Association of Testing Authorities (NATA) accredited lab. Results are emailed to the water quality team as soon as they are verified and finalised by the laboratory. The water quality team also have access to the Laboratory Information Management System (LIMS) to obtain results as required. All results above ADWG limits are phoned and emailed through immediately to the water quality team. Exceedance reports are generated weekly. All water quality data is monitored, and trends analysed throughout the year by the Water Quality Officer.

WS has been largely compliant with the water quality criteria for the financial year navigating five water quality incidents and four water supply events.

One reportable incident was due to *E. coli* detection and four were for disinfection by-products above the ADWG limit (DWQMP limits for chlorates). Details for the incidents and events are included in section 4 above.

TCC were compliant with the Public Health Regulation 2005 which requires "nil cfu/100ml found in 98% of the samples taken for a 12-month period" for all three schemes for the period.

There was one *E. coli* incident for Townsville Drinking Water Scheme with a 100% compliance rate for the reporting year. There were no E.coli detected at Giru/ Cungulla DWS or Paluma DWS, both with a 100% compliance rate for the reporting year.

Table 12: Number of E. coli Incidents and Percentage Annual Compliance with the Public Health Regulation 2005.

DWS	No. of samples taken	Number of Incidents	% Annual Compliance
Townsville	3262	1	100.00%
Paluma	142	0	100.00%
Giru/ Cungulla	213	0	100.00%

There have been no failures to meet sampling frequencies, and all locations were sampled.

Drinking water quality performance (verification monitoring) is included in Appendix B. This is a snapshot of the most relevant water quality parameters for the three schemes. If further detailed information is required residents (or businesses) are asked to contact the Water Quality Officer through email enquiries@townsville.qld.gov.au or by calling Customer Service on 13 48 10.

6. Details of Complaints Made to the Provider About the Drinking Water Service Supplied to the Customers

All customer water quality complaints are lodged through Council's 24-hour Operations Centre, with all information regarding the complaint and how it was rectified recorded in Councils Customer Request management system. Each complaint has a unique identification number which enables the complaint to be tracked from initial request to completion. There were 61 drinking water quality complaints for the reporting period.

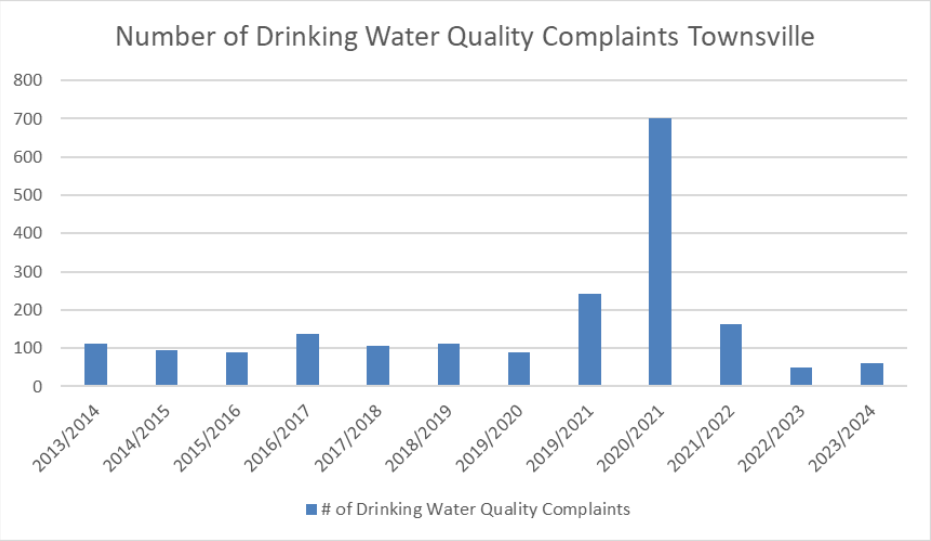

Figure 3: Number of drinking water quality complaints per financial year. The spike in customer complaints in 2020/2021 was due to the water discolouration event.

Table 13: Number of complaints from 1 July 2023 to 30 June 2024 by type.

Type of Water Quality Complaint	Dirty Water	Milky Water	Taste/ Odour	Suspected illness/ Customer Concern	Owners Side
Number of complaints 2023/2024	21	2	29	3	5

There were 5 main types of water quality complaints in Townsville as outlined below:

6.1 Dirty Water (DW)

There were 21 dirty water (DW) complaints. DW results when sediments from the bottom of the pipes are stirred up due to works occurring in the area such as pipe repairs, water trucks filling from hydrants and construction works with heavy machinery. It can also be caused by changing velocities in pipes stirring up the sediment. When a DW complaint is lodged, a water reticulation crew is dispatched to flush the area until the DW is removed, and the chlorine residuals are back within specification. Customers are advised to flush their side by running sprinklers. Customers receive a call the following day to ensure water remains clear before their complaint is closed out.

6.2 Milky Water (MW)

There were 2 Milky Water (MW) complaints. MW is caused when air becomes trapped in the water under pressure, forming tiny air bubbles. As these air bubbles escape, they cause the water to look milky. MW occurs following large main repairs or when new mains are commissioned. The issue generally resolves itself over time as the air bubbles escape but if not, the mains are flushed by work crews.

6.3 Taste and Odour (T&O)

There were 29 taste and odour (T&O) complaints. T&O complaints in Townsville are generally caused by:

- DW events
- MIB/Geosmin
- High chlorine (or sudden changes in chlorine concentration)
- Old or new pipework on customer's side of the meter
- Old hot water systems.

2-Methylisoborneol (MIB) and Geosmin are taste and odour compounds that give water an earthy, pond-like or dirty taste and odour. MIB in particular is produced by various species of blue-green algae that are in abundance in Ross River Dam and is usually detected at levels above the average taste threshold (~10 ng/L) during summer periods in Townsville drinking water. MIB and Geosmin are not dangerous to consume and cannot be filtered out of water. Boiling water will concentrate the taste. It is recommended to drink water with a squeeze of lemon or chilled to mask the flavour.

WS liaises with all customers for all T&O complaints, flush where required and take samples for further investigation if warranted.

6.4 Owners Side Issues

Owners side issues of which there were 5 are caused by:

- Fuel/hydrocarbons/paint/VOC spills – Spillages of hydrocarbons, BTEX and volatile organic compounds on residents' lawns can seep into the soil and permeate polyethylene piping causing taste and odour issues. Compounds of note can include: paint, petrol and fuels.
- Hot water systems - nearing the end of their life and the breakdown of the anode inside. WS analyse samples through TLS where required and communicate with customers through these issues.
- New or old internal pipework
- Newly installed irrigation systems without backflow prevention.

6.5 Suspected Illness

There were three suspected illness complaints this year. These were the results of the water tasting "off". Residents were contacted and water from their residence analysed through TLS showing that water met the ADWG limits and was safe to drink. MIB was suspected as the cause of the "off" taste.

7. Outcome and Recommendations of Audit

The regulatory audit will be undertaken by Water Futures in September 2024.

The outcome of the audit will be outlined in the 2024/2025 DWQMP Annual Report and findings will be managed through the RMIP.

8. Ongoing Harmful Algal Blooms

RRD harbours two types of harmful algae blooms (HABs): Cyanobacteria (also known as blue green algae) and Diatoms. Cyanobacteria were first detected in RRD in 2018. Since then, a significant bloom has developed and treatment has required ongoing management. Since the onset of cyanobacteria blooms within RRD, significant improvements have been made to the water treatment process at Douglas WTP including: an improved monitoring program, pre-chlorination on all filters, PAC dosing on Modules 1 and 2 and the addition of clarification on modules 3 and 4. Additionally, the design for a permanent, more effective PAC dosing system covering all modules is in progress since completion of the raw water pipeline replacement. Finally, filter media replacement in modules 3 and 4 are under investigation with the aim to improve filtered water quality.

Every summer the bloom duration and biovolume increases. The average cyanobacteria biovolume in 2023/2024 FY (7.23 mm^3/L) increased by 44% from the previous FY (5.02 mm^3/L). The weather conditions of long hot days and wash-in of nutrients from rainfall provide optimal conditions for growth. The dominant species is *Raphidiopsis raciborskii* which produces a toxin called Cylindrospermopsin. This toxin is mitigated through the treatment process and has not been detected in the treated water.

Diatoms were first detected in significant concentrations within RRD in 2021. Since this detection, several significant blooms have occurred, the worst of which occurred between September 2023 and November 2023. Due to their size, this bloom reduced the effective capacity of Douglas WTP to supply treated water. TCC continues to work with Trility, the Office of Water Supply Regulation, Queensland Health and industry experts to address the risks associated with HAB's and assess and implement management and treatment strategies at a catchment, dam and treatment level. Despite continued implementation of these strategies and measures, risks associated with HAB's remain a concern. A part of managing these risks includes the implementation of water conservation and restriction measures, particularly during high demand periods and significant HAB's to ensure that clean, safe and high quality drinking water is consistently provided to the Townsville community.

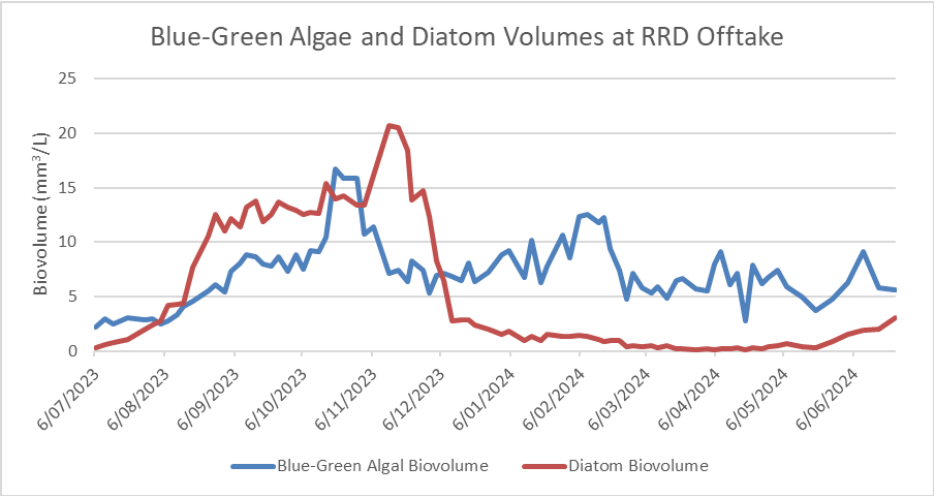

Figure 4: Average algae biovolumes at offtake level within the RRD for the 2023/2024 FY.

Appendix A.
Risk Management Improvement Program

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
DWQMP	Schematics need to be updated from the last review and follow infrastructure updates.	DWTP and NWTP Plant schematics need to be updated (increased dosing including PAC at Douglas WTP)	Trility were in the process of updating these.	1/03/2023	Complete	Revised 2023 Workshops	Updated as part of review	Commercial Compliance Officer	Aug-23
DWQMP	Schematics need to be updated form the last review and follow infrastructure updates.	Schematics to be updated for Paluma (latest schematics are not in the DWQMP)		1/03/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP	Schematics need to be updated form the last review and follow infrastructure updates.	Schematics to be updated for Giru/Cungulla (latest schematics are not in the DWQMP)		1/03/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP	Source details for each scheme must be provided in the plan – water source/s and source infrastructure.	Clearly show on Northern WTP schematic that there is an air gap and raw water from Crystal Creek cannot be sent straight to	There is a double block and bleed on the raw water pipe. Raw water cannot bypass the water treatment plant.	1/03/2023	Complete	Complete	Complete	Commercial Compliance Officer	Aug-23
DWQMP	The Giru/Cungulla scheme run by Townsville City Council supplies water outside of the Council area. It is best practice for these stakeholders to be involved the Risk Assessment process.	Invite Representatives from the Burdekin Shire Council to the risk assessment workshops.	Representative attended recent workshop and will be invited to all further workshops	1/03/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP		Paluma WTP Schematic needs to be updated to show all dosing, monitoring points and bypasses correctly (e.g. Bypassing screen filter).		1/03/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP	A description of any variations to process operation (for example, bypassing a process step) must be included in the plan).	Giru needs to show where Turbidity monitoring is in relation to filters.	Update P&ID to show location of turbidity monitoring.	1/01/2025		Revised 2023 Workshops		Senior Water Systems Engineer	
DWQMP	A schematic(s) representing the treatment process(es) must be included in the plan.			1/12/2023	Complete	Revised 2023 Workshops	Updated as part of review	Senior Water Systems Engineer	Aug-23
DWQMP	Trility and Queensland Health attended the workshop on both days. BSC representative was not invited. (This was an oversight not intentional)	Invite relevant staff to the next DWQMP review from Burdekin Shire Council for the Giru/Cungulla risk assessment.	Ensure Water Treatment Team Leader invites relevant staff from Burdekin Shire Council (BSC)	By next review and ongoing	Complete	Revised 2023 Workshops	Completed as part of review	Water Quality Officer	Aug-23
DWQMP	Water quality parameters analysed and reviewed up to 2022.	Updated the DWQMP including Appendices with the latest Water Quality information.	Sampling plan to be checked and updated as minor changes have occurred.	1/01/2025		Revised 2023 Workshops		Water Quality Officer	Aug-23

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
DWQMP	Separate monitoring programs to investigate the likelihood of Naegleria fowleri did not find a significant detection.			1/12/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP	The catchment characteristics for each scheme's water source must be documented in the plan – catchment area or groundwater recharge area, topography, main geological features, climatic features and land use.	Minor changes required. Complete HBT Assessments for Giru and Cungulla.	Regulator requested summary of HBT assessment.	1/12/2023	Complete	Revised 2023 Workshops and Regulator RFI	-	Water Quality Officer	Aug-23
DWQMP	Improvements to treatment infrastructure (e.g. completion of additional clarifiers at Douglas WTP, duplication of raw water supply lines, additional dosing options such as PAC) have been noted for improvement.	Update the risk assessment once infrastructure upgrades have been completed, commissioned, and are operating at Douglas WTP e.g. Clarifiers, raw water pipeline, PAC	Optimisation of the clarifiers is in process. Schematic needs to be updated to show filter to waste on modules 3/4 and not just coming off the backwash. Duplication of water supply line in progress. Permanent PAC dosing system in design phase.	1/07/2025	New Clarifiers have been installed at Douglas WTP.			Senior Water Engineer	
DWQMP	The plan must detail the risk assessment methodology used for each scheme.	New DWQMP Developed in accordance with guidelines		1/12/2023	Complete	Revised 2023 Workshops	Updated as part of review	Water Quality Officer	Aug-23
DWQMP	The plan must contain details of the operational monitoring program	Place CCP Wall charts at the Giru WTP. Changed noted in Risk Assessment.	Organise CCP Meeting. Determine if changes required since previous update and reprint posters and ensure placed at all locations.	1/06/2023	Complete	Revised 2023 Workshops	Updated as part of review	Senior Water Engineer	Aug-23
DWQMP	The plan must contain details of the verification monitoring program.	To be updated - Minor changes have occurred over time		12/01/2024		Revised 2023 Workshops		Water Quality Officer	Aug-23
Monitoring	Include radiological monitoring in source water monitoring as per ADWG and MIB/Geosmin/ BGA monitoring across all schemes and source waters (Including Giru and Paluma)		Monitoring program updated as part of review.	1/07/2023	Included in the sampling program. No results yet.	In progress	In progress	Water Quality Officer	Aug-23
Monitoring	Check that Hydrocarbon results present a breakdown for Benzene, Toluene, Ethylbenzene and Xylene as well as Hydrocarbon fractions	Has been included in laboratory sampling program.		1/07/2023	Included in the sampling program. No results yet.	In progress	In progress	Water Quality Officer	Aug-23

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Northern Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia) (Open unprotected catchment, cattle grazing. High Raw Water Turbidity above 5NTU. Reservoir contamination. Fires, storms, flooding)	Confirm if plant shuts down on high PDT result.	Confirm with Trility.	7/01/2024				Senior Water System Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia) (Open unprotected catchment, cattle grazing. High Raw Water Turbidity above 5NTU. Reservoir contamination. Fires, storms, flooding)	Complete installation of UV system (Crypto requires Log 6 reduction, currently 4).		2026/2027	Design Phase	In progress	Can be completed with available resources/funding.	Team Manager WS Dam Safety	
Northern Water Treatment Plant Townsville Supply Scheme	Cyanobacteria (Cyanobacterial toxins from toxic algal blooms)	Check Trility BGA response procedures		1/12/2025			Priority based on residual risk level determined from the risk assessment.	Water Quality Officer	
Northern Water Treatment Plant Townsville Supply Scheme	Aesthetic (Colour above the ADWG of 15 HU causing dirty water complaints)	Change operational procedures so that jar testing is completed at least once a week.		1/07/2025				Senior Water System Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Infrastructure Damage (Alkalinity)	Building Data around Crystal Creek to assist in stabilisation discussions.	Use raw water quality data to inform stabilisation plant operation.	1/07/2025			Can be completed with available resources/funding.	Senior Water System Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Northern Water Treatment Plant Townsville Supply Scheme	Loss of supply (Asset failure (raw water main or pump failure))	Develop levels of service framework	Commitment from council to continue implementing water security. Two pipes and can shut one off going into plant. Run at a lower rate - loss of supply is rare.	1/07/2027			Priority based on residual risk level determined from the risk assessment.	Senior Water System Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Aluminium (Overdose coagulant chemicals) Chemical (SBS overdosing returning to feed and consuming chlorine before disinfection)	Change operational procedures so jar testing is completed on the thickener. Complete testing Aluminium on Thickener.		1/07/2025	Aluminium monitoring in treated water. Supernatant return turbidity. Most ACH to the plant goes to the thickener. Online monitoring in the raw water. Membranes will reduce total aluminium.		Can be completed with available resources/funding.	Senior Water System Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Northern Water Treatment Plant Townsville Supply Scheme	Fluoride (Overdose of fluoride form old infrastructure still in place at the plant)	Confirm old pipework has been removed.		1/07/2025			Priority based on residual risk level determined from the risk assessment.	Senior Water System Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Bacteria/Virus (Gross membrane failure, potting or O-ring failure)	Investigate the possibly of a UV system to add redundancy to the system. Consider sonic testing for picking up O-rings failures.		1/07/2027	In progress		Priority based on residual risk level determined from the risk assessment.	Senior Water System Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Bacteria/Virus (Underdose, insufficient chlorine contact time, or high turbidity)	Confirm the C.t (max flow, min level, Chlorine minimum (1)). Review the minimum set point required (both northern and Douglas) to achieve the TC required.	The major disinfection point is after filtration. To ensure adequate disinfection, turbidity at the point of disinfection needs to be <1 NTU. There is online turbidity and chlorine residual monitoring after the filters and after the reservoir. Chlorine contact time is required 15 mins.	1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	
Northern Water Treatment Plant Townsville Supply Scheme	Fluoride dosing CCP	Include in CCPs		1/12/2024	Complete	Complete	Complete	Complete	Aug-23
Northern Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia)	Confirm the control around returning supernatant including a turbidity target	Poor performance of thickener increases challenge on membranes. Check the return isn't greater (not written in SCADA). Reduce to 5% this is a no discharge site that is heritage listed. have turbidity monitoring on return. Check limit of NTU	1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia/ Naegleria fowleri) (Open unprotected catchment with grazing activity High raw turbidity event, high is well above the ADWG of 5 NTU, Recreational Activities, Fires, storms, flooding, agriculture)	Update schematics to show high trigger for CCP is 0.28NTU auto shut down.	Updated during Review Process	Complete	Updated during the review process.	Complete	Complete	Water Quality Officer	Jun-23
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia/ Naegleria fowleri) (Open unprotected catchment with grazing activity High raw turbidity event, high is well above the ADWG of 5 NTU, Recreational Activities, Fires, storms, flooding, agriculture)	Complete recommendations from GHD report Cryptosporidium Modelling Report (Additional Clarifier to feed Module 3 and 4 in treatment process	Currently due for operation end March 2023	1/06/2023	Complete	Complete	Complete	Team Manager WS Dam Safety	Mar-23

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Douglas Water Treatment Plant Townsville Supply Scheme	Trihalomethanes (High raw levels of organics leads to formation of THMs in the disinfection step greater than 250 ug/L)	Weekly testing		7/01/2023	Complete	Complete	Complete	Water Quality Officer	Jul-23
Douglas Water Treatment Plant Townsville Supply Scheme	Cyanobacterial toxins (Cyanobacterial bloom releases toxins in water)	Review the risk throughout the plant based on various toxin levels compared to algal cell count and species.	Trility has a BGA management plan that details increased monitoring, chemical changes based on jar testing (frequency of which increases with alert level), response to toxin levels. Last Updated October 2023. TCC reviewed so it aligns with the TCC BGA EMP.	1/01/2022	Complete	Complete	Complete	Water Quality Officer	Jan-22
Douglas Water Treatment Plant Townsville Supply Scheme	Loss of supply (Insufficient supply, drought, natural changes)	Complete project underway to double up raw water supply line. Eel screens need to be replaced.	Intake values at Ross dam fouling and Eel screen block.	1/07/2024	Crane available within less than 24 hours to adjust levels if required (move to second line). Pipeline duplication project complete.		In progress	Team Manager WS Dam Safety	
Douglas Water Treatment Plant Townsville Supply Scheme	Loss of supply (Raw water main break)	Permanent emergency pump station at DWTP.	DWTP currently has a temporary emergency intake to draw water from Black's weir. The intake has three diesel power pumps on hire, the pumps must be moved when the RRD gates are opened.	1/07/2027				Team Manager WS Dam Safety	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Douglas Water Treatment Plant Townsville Supply Scheme	Loss of supply (Raw water main break)	Review and update the overall plant flow ranges. Trility to write modification proposal / new performance standards for Clarifiers. Needs to be formalised through the contract with Trility.		1/07/2026	Have emergency river pumps (TKL and CD500) and spares on site if existing pipeline breaks. Internal water modelling shows 232 MLD as a maximum for a short period of time. Reduction to 200 MLD capacity to improve water quality production through the plant during periods of poor water quality		Can be completed with available resources/funding.	Team Manager WRR Dam Safety	
Douglas Water Treatment Plant Townsville Supply Scheme	Cyanobacterial Toxins (Insufficient PAC dosing, pump failure)	Duty/standby, consider selection of pumps. Needs to be updated and reviewed. Review Turbidity monitoring and alarming are appropriate.	PAC dosing currently available on Modules 1 & 2. Streaming current used to detect changes in water quality. Algal management plan in place to address risk introduced by algal toxins.	1/07/2026	Design Phase			Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Pathogens (Equipment failure or incorrect dose rate)	Get data on reactivator supernatant to confirm "optimised". Performance trials are planned.Get data on reactivator supernatant to confirm "optimised"	Lime + CO@, ACH and Polydadmac addition plus a filter aid.Up to the design capacity of the system as currently proven - NOT OMP 5 which includes higher turbidity's, essentially up to 35 NTU. All dosing pump other than Poly have flow meters and all have targets with deviation alarms.	1/06/2025				Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/ Giardia) (High raw water turbidity event, high is well above the ADWG of 5 NTU up to the design capacity of the system)	Confirm design envelope of the clarifiers (OMP 5)	Lime + CO2, ACH and Polydadmac addition. Reactivator Clarifier design is to reduce flow as turbidity increases to maintain quality.	1/06/2025				Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia) (Open unprotected catchment, cattle grazing, projected recreation on Ross River Dam)	Complete design and installation of UV system (Crypto requires Log 6 reduction).	In order to accommodate opening the dam for recreation, UV is required to achieve the necessary Log reduction.	1/07/2026					

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia) (Filter breakthrough)	Compare performance against ADWG value of 0.20 and HBT guideline of 0.15NTU as 95 percentiles.	Effective filtration will significantly reduce the turbidity and has been demonstrated to reduce bacteria and virus when used in conjunction with coagulation. Tigger on head lost or time. Module 3 and 4 have filter to waste to ripen filters. Annual inspections of filters. Check size deformity. Filter top up process with assets management process.	1/07/2025			Priority based on residual risk level determined from the risk assessment.	Water Quality Officer	
Douglas Water Treatment Plant Townsville Supply Scheme	Fluoride (Fluoride major overdosing greater than ADWG Health limit) Fluoride (High fluoride above QLD code (0.70 mg/L) but under health target (below ADWG health target of 1.5 mg/L) through failure of dosing system)	Check CCP Procedures. Two CCP's for Fluoride, on both filtered and treated water. CCP limits have been readjusted to be closer to 0.9 mg/L shutdown.		1/12/2025			Can be completed quickly with available resources/ funding.	Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Bacteria/Virus (Chlorine underdose, insufficient chlorine contact time or high turbidity, dosing pump failure)	Investigate dedicated C.T. chlorine analyser prior to trim dose.		1/12/2025			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Bacteria/Virus (Chlorine underdose, insufficient chlorine contact time or high turbidity, dosing pump failure)	Review disinfection control plan to ensure control philosophy is locked in.		1/12/2025			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Disinfection by-products (Organics reacting with the chlorine dose creating THMs above 250 ug/L)	Test weekly in the monitoring program.	Chlorination is managed for disinfection only. Disinfection is the priority though the chlorine level is managed so as to not be excessive to reduce THM formation potential.	7/01/2025	Complete	DBPs tested weekly.	Priority based on residual risk level determined from the risk assessment.	Water Quality Officer	Jan 2023
Douglas Water Treatment Plant Townsville Supply Scheme	Pathogen (Recirculation) (Poor performance of residuals handling and return of organics)	Confirm the control around returning supernatant including a turbidity target	Poor performance of thickener increases the number of organisms in the feed to the WTP. ACH dose into the thickener feed. Nothing returned back to the front of the plant	1/07/2025	Supernatant not returned to head of plant currently due to cyanotoxin risk.			Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Douglas Water Treatment Plant Townsville Supply Scheme	Protozoa (Crypto/Giardia) (recirculation) (Gross failure of sludge thickener; poor control of sludge handling)	The amount of time available to 'stop' recycle should be confirmed to ensure that criticality is appropriate.	Supernatant turbidity monitoring, 10% by volume maximum return. Ability to buffer some period of time. Opportunity to return E.coli / pathogens	1/07/2026	Construction for new sludge treatment system, may include additional centrifuge, bio solids chare. Construction for retreatment of supernatant may include piping to STP and constructing membrane filter at Douglas Water Treatment Plant.		Ability to achieve recirculation of supernatant and adequate sludge treatment/handling.	Senior Water Systems Engineer	
Douglas Water Treatment Plant Townsville Supply Scheme	Soluble Manganese (Oxidising at end of plant resulting in discoloured water)	Temporary pre-chlorination facilities at head of plant implemented after the 2021 brown water event.	Require a permanent pre-chlorination solution to oxidise manganese at the head of the plant.	1/07/2024			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Organics removal - Disinfection By Products	Investigate the use of ACH to extend the life of GAC and overall decrease organics and THMs. Confirm impact of fouling of the membranes. ACH can be used to target colour and organic removal.	ACH being used.	1/07/2027	Complete	Complete	Complete	Senior Water Engineer	Complete
Paluma Drinking Water Scheme	Cyanobacteria	Include Cyanobacteria testing in raw water (Paluma Weir)		1/06/2023	Complete	Complete	Complete	Water Quality Officer	Complete
Paluma Drinking Water Scheme	Raw Water Valve Failure (If valve leaks, raw water can gravitate through WTP)	Verify operation of inlet valve and outlet valve	Cannot occur	1/06/2024	Complete	Complete	Complete	Senior Water Engineer	Complete
Paluma Drinking Water Scheme	Aesthetic (Colour above the ADWG of 15 HU causing dirty water complaints)	Investigate the impact of coagulation on the membrane fouling rate and cleaning interval.	Coagulation is not always used due to fear of membrane fouling	1/06/2025			Not high risk. Priority based on residual risk	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Aesthetic (High colour causing dirty water complaints if GAC exhausted)	Consider replacing GAC in the lead up to summer to ensure that GAC is adsorbing the maximum amount when the organics challenge and the THM formation potential is the highest. GAC needs to be replaced when the membrane UVT and GAC UVT start to come together	Trend UVT to confirm GAC.Adsorbs organics/ colour. TOC and DOC monitoring. GAC can be backwashed manually when required. DOC is reviewed to determine when required.	1/07/2025	GAC replaced in leadup to wet season to combat extra organic load associated with rainfall events in catchment.	Complete	Complete	Senior Water Systems Engineer	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Paluma Drinking Water Scheme	Disinfection by-products (Organics lead to formation of THMs in the disinfection step greater than 250 ug/L causing health issue after long term exposure.)	Review the performance of the GAC. Firefighting requires a high level of water. Need to investigate and look at optimisation of the system. Review the process including DOC and ACH dosing.		1/07/2025	GAC replaced in leadup to wet season to combat extra organic load associated with rainfall events in catchment.		Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Aesthetic (Increase in turbidity following backwashing and media replacement)	Record the turbidity profile following a GAC backwash to confirm that it will not set off the turbidity alarm.		1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Bacteria/Virus (Incorrect control of pH correction, high pH, poor quality of hypochlorite)	Confirm C.t. (max flow, min level, chlorine minimum) for Paluma Storage.	Disinfection with chlorine at a pH ~ 7.5. Sodium Hypochlorite pushes pH up typically to be within the optimum range of 7 to 8. With caustic dosing turned off, hypo increases pH as a side effect to disinfection to a level of 7 to 8. Previous results as high as 11.3 in Raw.	1/07/2025		Complete	Complete	Senior Water Systems Engineer	Complete
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (recirculation) (Recirculated water increases risk of protozoan breakthrough)	Check the process and develop a procedure to target return at 5% of process flow. Develop OCP Procedure.	Boil up of sludge placing a high challenge onto the process. Accumulation may occur in the sludge. At less than 10% dilution effect is sufficient to ensure that return does not impact treated water quality. ACH dosing into the feed to the clarifier. Optimising back end of process is important for water quality as well as ensuring the amount of waste produced is	1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (recirculation) (Recirculated water increases risk of protozoan breakthrough)	Review the return volumes across the process and review the ratio of return to the production volume and Turbidity limit downstream	Zero liquid discharge site. World Heritage Site.	1/07/2027			Some planning and project establishment/ resources required	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (recirculation) (Recirculated water increases risk of protozoan breakthrough)	Monitor turbidity of supernatant and include a turbidity target as Operational Control Point (OCP)	New turbidity meter	1/01/2025			Not high risk. Priority based on residual risk.	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Paluma Drinking Water Scheme	Iron (Total iron returning to the plant is more than 10x the raw water)	Consider monitoring for soluble iron in the supernatant	Organise to test for this	1/07/2023	Complete	Complete	Complete	Water Quality Officer	Complete
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (Agriculture, cattle in the catchment. Septic tanks)	Project to upgrade so the plant can be operated remotely.	Spikes up to over 100NTU (based on intensity of rainfall). Crypto/Giardia have been found in the water.	1/07/2025	In progress		Can be completed with available resources/funding.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Spikes up to over 100NTU (based on intensity of rainfall). Crypto/Giardia have been found in the water.	Turbidity monitoring Raw Water to come back on SCADA (HMI only).	Spikes up to over 100NTU (based on intensity of rainfall). Crypto/Giardia have been found in the water.	1/07/2027			Long term project required. Funding not established.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Loss of supply (Raw water main break)	Levels on tanks to be integrated into SCADA. Alarm levels to be included.		1/07/2027			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Chemical / High Soluble Iron	Consider aeration into the raw water storage tank.	Caustic can increase pH which can help oxidation of soluble iron. However hypo added to the treated water also increases pH and together the treated water pH ends up too high. Weekly sample to the lab and then lab also takes another lab person monthly.	1/07/2027	Complete	Complete	Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	Complete
Paluma Drinking Water Scheme	Virus (Gross membrane failure, potting or O-ring failure)	Validate shutdown on High Turbidity. This is to be tested to confirm. Turbidity limits to be reduced to 0.5 NTU critical limit. New Operators to be trained on identification and repair of broken fibres.	Integrity Testing with High and High High limits of 3 and 5 kPa/ min Turbidity alert and critical limit as well. Module isolation is possible. PDT is set for TMP trigger, resistance trigger and a	1/07/2025	Complete	Complete	Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	Complete
Paluma Drinking Water Scheme	Disinfection by-products (High Organics as precursors for THMs No coagulation and so all DOC passes through the membrane, very small amount of TOC removed)	Investigate DOC removal through the process.	In combination with coagulation (converts some DOC to TOC) which can be captured No impact on dissolved Organic Carbon that reaches the membrane. Total and dissolved levels are very similar suggesting nearly all OC is dissolved.	1/07/2027	Ultrafiltration membranes are effective in removing DOC. GAC filtration provides extra layer of removal to minimise potential of disinfection by-product formation.	Complete	Some planning and project establishment/ resources required.	Senior Water Systems Engineer	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Paluma Drinking Water Scheme	Disinfection by-products (Risk of GAC being exhausted and not adsorbing any organics. Organics that are not adsorbed may form THMs) Disinfection by-products (Organics reacting with the chlorine dose creating THMs above 250 ug/L)	Review THM monitoring. When THM potential is being done vs THM monitoring. Confirm what is analysed when the operators take the samplers vs laboratory staff.	Disinfection is the priority though the chlorine level is managed as a priority. Levels are not set excessively to reduce THM formation potential. Maximum result 2013-2022 is 371 ug/L and 95% is 272.2 ug/L.	1/07/2025	Complete	Complete	Complete	Water Quality Officer	Complete
Paluma Drinking Water Scheme	Disinfection by-products (Risk of GAC being exhausted and not adsorbing any organics. Organics that are not adsorbed may form THMs) Disinfection by-products (Organics reacting with the chlorine dose creating THMs above 250 ug/L)	Review THM and THM potential monitoring pre and post GAC for a period of time to look at GAC performance.	THMFP is tested weekly on GAC and Membrane filtered water (operators). THMs tested monthly on treated water (laboratory)	1/07/2025		In progress	Timing based on other tasks that need to be completed first.	Water Quality Officer	
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (Failure of UV)	UV Fault Alarm to be included in SCADA project to see data.	UV disinfection is effective at 63 mJ/cm2 for 2 log cysts and more than 4 log of the Trophozoite. Self Cleaning. Operators/ maintenance pick up failed lamps and replace.	1/07/2027			Some planning and project establishment/ resources required.	Senior Water Systems Engineer	
Paluma Drinking Water Scheme	Chlorate (High Chlorate above the QLD Health guideline level of 0.8 mg/L for prolonged periods)	Start collecting and reviewing batch certificates for Hypo. Start a random testing process.	Only one supplier of Hypo. Summertime Chlorate levels have been Higher. 2017/2019 levels have been below 0.8 mg/L, apart from one result. 95% from 2015-2022 is 0.76mg/L	1/07/2026	3 monthly QA samples organised with Coogee. Water Engineer to follow up.		Some planning and project establishment/ resources required.	Water Quality Officer	
Paluma Drinking Water Scheme	Chlorate (High Chlorate above the QLD Health guideline level of 0.8 mg/L for prolonged periods)	Investigate changing the chlorine disinfection to gas or electro generation.		31/12/2028			Significant planning and project establishment/ resources and funding required.	Water Quality Officer	
Paluma Drinking Water Scheme	Protozoa (Crypto/Giardia) (recirculation)	Monitoring of turbidity of supernatant and the inclusion of a turbidity target is recommended.	Supernatant turbidity is monitored and compared to previous plant performance to flag potential issue	1/07/2025	In progress			Water Quality Officer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Paluma Drinking Water Scheme	Pathogen (Recirculation) (Poor performance of residuals handling and return of organics)	Check updated log sheet include supernatant turbidity operational Control Point (OCP). Opportunity to fill waste tank and not be able to drain the sludge thickener. Can sludge transfer pumps fail without alarming? Check the process and develop a procedure to target return at 5% of process flow.	Boil up of sludge placing a high challenge onto the process. Accumulation may occur in the sludge. At less than 10% dilution effect is sufficient to ensure that return does not impact treated water quality. ACH dosing into the feed to the clarifier. Optimising back end of process is important for water quality as well as ensuring the amount of waste produced is minimal.	1/07/2026				Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity well above ADWG of 5 NTU. Sugar mills and waste in open catchment. Farmers in area. Category 4 catchment in HBT assessment) Loss of supply (Insufficient supply, drought, natural changes)	Need to write an emergency supply plan that includes carting water. Council may require own truck because there are only two local companies cart water. Need to document who trucks the water (from Townsville?) to Clear Water Storage Tank and then dosing Chlorine. Burdekin Shire Council will need to issue conserve water notices.	Typically ~10, spikes with rainfall and can stay high (>40) for more than a week so plant has to run. Open catchment - Crypto risk present, high inflow periods. Surface water catchment with human inputs. High raw levels of organics may lead to formation of THMs in the disinfection step greater than 250 ug/L causing health issue after long term exposure. Turbidity is alarmed and auto lock down in place. Operators not there all the time. Transfer if needed. There is a risk to council as only two tanker suppliers in the area. However, to put them on the Contractor system and maintain their status requires work. Need to make sure tankers are up to date before the wet season and complaint trucking list. Burdekin SC complete yearly and keep up to date.	1/12/2026			Significant planning and project establishment/ resources and funding required.	Senior Water Systems Engineer	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity well above ADWG of 5 NTU. Sugar mills and waste in open catchment. Farmers in area. Category 4 catchment in HBT assessment)	Complete HBT assessment for Giru		1/12/2028			Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity well above ADWG of 5 NTU. Sugar mills and waste in open catchment. Farmers in area. Category 4 catchment in HBT assessment)	Catchment is likely category 4 and log 4 required (therefore deficient) Current Turbidity set at 1 NTU. UV likely required from the HBT assessment.		1/12/2030			Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Giru Drinking Water System	Bacteria/Virus (Source Water) (Potentially some septics, open catchment, cattle and farms within catchment. Human activity (swimming) Category 4 catchment in HBT assessment)	Optimise pH Control. Maintain pH when it comes to Coagulation.	Minimum C.T. available maybe impacted by high pH	31/12/2028			Timing based on other tasks that need to be completed first.	Senior Water Systems Engineer	
Giru Drinking Water System	Manganese (Seasonally elevated levels of manganese in source water)	Document the process to increase monitoring if elevated metals are detected in the raw water supply. This may other parameters e.g. Geosmin MIB. Also if found in the raw water then test the network.	Maximum result of 5.9 mg/L. 95% is below aesthetic level (0.0815 mg/L)	1/06/2023	Complete	Complete	Complete	Water Quality Officer	Complete
Giru Drinking Water System	Aluminium (Naturally occurring high aluminium (Maximum of 33 mg/L)	Conduct a review into Aluminium exceedances in Treated Water above aesthetic limits	Maximum raw water 10.3 mg/L last 5 years. Treated water result from 20062022 is 0.4mg/L and 0.98mg/L in reservoir, which is still above the aesthetic value of 0.2 mg/L. If treatment is required, investigate pre-chlorination.	7/01/2024		Aluminium levels under aesthetic limits for last 2 years.	Timing based on other tasks that need to be completed first.	Water Quality Officer	
Giru Drinking Water System	Radiologicals naturally occurring in raw water. Low confidence as never tested.	Include radiological sampling in raw water monitoring program as per ADWG	Burdekin Shire Council have completed radiological monitoring and not found anything.	1/06/2024	Complete		Can be completed with available resources/funding.	Water Quality Officer	Complete
Giru Drinking Water System	Disinfection by-products (High raw levels or organics leads to formation of THMs with chlorine disinfection)	Improve chemical management including catch monitoring, (chlorates and strength testing randomly). Burdekin Shire Council also test batches of hypo twice a month.	Total THM greater than 250 ug/L causing health issues only after long term exposure. Organics can cause minor aesthetic impact	1/07/2025				Senior Water Systems Engineer	
Giru Drinking Water System	Cyanobacteria	Include cyanobacteria sampling in the Haughton River. When data is obtained develop a BGA response plan		1/12/2023	Complete	Complete	Complete	Water Quality Officer	Complete
Giru Drinking Water System	pH correction (Soda ash) (Low alkalinity, high alum dose)	Need to incorporate triggers for the turning on/off soda ash	Review - Soda ash is primarily used to control pH. Typically not required/used, around 6.5. Utilised after rain event and low alkalinity water. pH CCP 1.	1/07/2025			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Giru Drinking Water System	pH correction (Soda ash) (Low alkalinity, high alum dose) Alum/Polymer Chemical Dosing (Overdose of chemical) Protozoa (Crypto/Giardia) (Upset sludge blanket and carryover of solids)	Monitoring pH in sedimentation tank to get better control. Improve code on flow paced dosing.	Typically not required/ used, around 6.5. Utilised after rain event and low alkalinity water. pH CCP 1.	1/07/2027			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Giru Drinking Water System	Alum/Polymer Chemical Dosing (Overdose of chemical)	Develop procedures for jar testing and development of chemical dosing rates based on source water events and turbidity.	Development of chemical dosing rates based on source water events and turbidity levels.	1/07/2025	Complete	Complete	Complete	Senior Water Systems Engineer	Complete
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity event well above the ADWG of 5 NTU up to the design capacity of the system)	Update Jar Testing Procedure to look at targeted pH range.		1/07/2026			Not high risk. Priority based on residual risk.	Senior Water Systems Engineer	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity event well above the ADWG of 5 NTU up to the design capacity of the system)	Incorporate routine supernatant monitoring to add certainty to the performance.		1/07/2027			Not high risk. Priority based on residual risk.	Senior Water Systems Engineer	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (Upset sludge blanket and carryover of solids)	Develop OCP procedure for supernatant monitoring. Coagulation Control needs to be documented to ensure that everyone is targeting the same thing.	Turbidity of supernatant is uncertain.	1/07/2026				Senior Water Systems Engineer	
Giru Drinking Water System	Disinfection by-products (Presence of organics in raw water)	Suggest measuring true colour of filtered water on jar testing will assist in managing coagulation.	Opportunity to dose acid, soda ash, Polydadmac with main coagulant Alum for enhanced coagulation. Clarifier was designed for tube settlers which have been removed (for over 20 years). But are still able to cope. Turbidity of supernatant is uncertain. Colour not monitored Jar testing undertaken with a target of 'good floc settling' and filtered turbidity.	31/12/2028			Not high risk. Priority based on residual risk.	Senior Water Systems Engineer	
Giru Drinking Water System	Aluminium (Overdose coagulant chemicals)	Ensure that coagulation pH targets are recorded and utilised	pH CCP. Acid and soda ash available to correct pH.	1/07/2025				Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Giru Drinking Water System	Aluminium (Overdose coagulant chemicals)	pH in sedimentation tank and possibly turbidity. Review of Aluminium in treated water and coagulation removing and pH and alkalinity.	Downstream Turbidity CCP.	1/07/2025				Senior Water Systems Engineer	
Giru Treatment - Filtration	Protozoa (Crypto/Giardia) (Filter Breakthrough)	Check alarms for filtered water turbidity. Install individual filter turbidity analysers Automatic shutdown of plant on high high turbidity of 0.8NTU	Critical set point - Combined turbidity meter set at critical limit of 0.40 (5 minute). Alarm only no auto action. High High at 0.8 NTU (0 time).	1/07/2027			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (High raw turbidity event, up to a turbidity of 10 - 15 NTU. (Raw water is almost certain to have pathogens))	CCP Wall charts at Giru WTP to be updated. Check critical set points for combined turbidity. Need both filter turbidity monitoring and operational alarms. Meter location and alignment of filter. Critical limits should align with best practice. Continuous on-line monitoring of filters is recommended target of 0.2 NTU.		1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	
Giru Drinking Water System	Protozoa (Crypto/Giardia) (Gross failure of sludge thickener or poor control of sludge handling) Microbial (overloading of the washwater lagoon with solids returning increased sludge with high turbidity (pathogens))	Develop OCP with procedure to target 5% and alarm at 7.5%. Look at the hydraulic relationship so the fixed rate return pump cannot pump more than 10% at plant minimum flow rate (determine and state in document).	Runs between 6 L/s and 10 L/s based on operator experience. determine and state the operating window so operators know not to run flow rate in below this rate or interlock the pump flow rates.	1/07/2026			Some planning and project establishment/ resources required	Senior Water Systems Engineer	
Giru Drinking Water System	Formation of Chlorate at Primary Disinfection.	Include chlorate monitoring at Cungulla reservoir and house samples to ensure it remains low risk		1/01/2023	Complete	Complete	Complete	Water Quality Officer	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Giru Drinking Water System	Disinfection by-products (Organics reacting with the chlorine dose creating THMs above 250 ug/L)	Optimise the treatment process.	Maximum THM result in Cungulla Reservoir 130 ug/L; Reticulation Maximum 164 ug/L.	1/07/2027			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Giru Drinking Water System	Microbial (Equipment or chemical failure leads to underdosing of chlorine)	Program in place for SCADA visibility for continuous monitoring between the two organisations/councils.		2024/2025			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Giru Drinking Water System	Disinfection by-products (High chlorate above the QLD health guidelines level of 0.8 mg/L for prolonged periods)	Review risk after more Chlorate Results are obtained from the Cungulla Reticulation Network.	Burdekin had a high chlorate more than 5 years go it was 0.83mg/L then its been ok.	7/01/2024	In progress		Timing based on other tasks that need to be completed first.	Water Quality Officer	
Giru Drinking Water System	Microbial (Equipment or chemical failure leads to underdosing of chlorine) Chlorine (High chlorine exceeding the ADWG health target (above 5 mg/L)	BSC improvement plan includes putting analysers on the on the outlet of the high tank from Giru.	More than 5 years ago issue with low chlorine. No issues with high chlorine in the last 5 years.	1/07/2027			Not high risk therefore not a high priority.	BSC	
Giru Drinking Water System	All Hazards	TCC and BSC to exchange contract lists for emergencies.		7/01/2024			Can be completed quickly with available resources/ funding.	BSC/TCC	
Giru Drinking Water System	Bacteria/ Virus (Chlorine sensitive pathogens) (pH too high or too low for effective chlorination)	SCADA visibility for both sites.		31/12/2028			Significant planning and project establishment/ resources and funding required.	BSC	
Storage and Distribution	Ned Kelly GIS Coordinates and add to mapping layer			1/12/2024	Complete	Complete	Can be completed with available resources/funding.	Water Quality Officer	Complete
Storage and Distribution Systems	Manual dosing of reservoirs occurs. There is some variation in the concentration of chlorine used.	Immediately develop/ update procedure for manual dosing in to reservoirs. Include calculations with new concentration of hypo, dilution rates and quantity.	Mt Margaret No manual handling as have pump system. New inlet main by 2024/2025. Ponti Road, design for recirc system design finish 24/25, construct 25/26, Arcadia same as Ponti, Brookhill same again	1/12/2026	Mt Margaret No manual handling as have pump system. New inlet main by 2024/2025. Ponti Road, design for recirc system design finish 24/25, construct 25/26, Arcadia same as Ponti, Brookhill same again	Dosing with hypo 6%. Risk of THM formation if higher. Procedure has a trigger not to dose if the risk overdosing too high. Sampling before and after dosing points. Flush the areas and then monitor if low. The reservoir having dosing equipment delivered.	Some planning and project establishment/ resources required	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Storage and Distribution Systems	Manual dosing of reservoirs occurs. There is some variation in the concentration of chlorine used.	Complete program of works for Brookhill, Arcadia, Mt Margaret and all hand dosed reservoirs to install chemical doing system. Remove the need to manually dose reservoirs.	Develop a procedure with a look up table, volume, increase in residual and plug in strength of hypo. Complete hypo strength test in the morning. Pumps on tanks need to be running when dosing.	1/12/2026			Some planning and project establishment/ resources required	Senior Water Systems Engineer	
Storage and Distribution Systems	Loss of supply	Giru/ Cungulla preparation procedures (potential to isolate high reservoir)	Procedure already developed	Complete	Complete	Complete	Complete	Senior Water Systems Engineer	Complete
Storage and Distribution Systems	Backflow Prevention	Need to ensure that standpipe users are following code and document which hydrants they can take water from.		Complete	Complete	Complete	Complete	Water Quality Officer	Complete
Storage and Distribution Systems	Contractors undertake testing of RPZs annually. All meters have backflow prevention			Complete	Complete	Complete	Complete	Assets	Complete
Storage and Distribution Systems	Reuse (Recycled water) connection to potable network.	Tallis Street at the Stadium has at least one for the water and recycled water network. Ensure these are included in the list for annual checks. Develop a RW commissioning plan for the dual reticulation network.	Stadium irrigation infrastructure is recycled pipework . Connection to network. This needs to be formalised. This is a cross connection that needs to be accounted for.	1/07/2026			Recycled water plant yet to be commissioned. Some planning and project establishment/ resources required.	Team Manager Network Services	
Storage and Distribution Systems	Backflow Prevention	As constructed record the asset and then it is put on the schedule. However non Council owned backflows are not on GIS. These may be recorded somewhere (planning?) Process needs to be checked and where they are recorded in the event of an incident.	Check with hydraulics- TJ Paul Johnson	1/07/2026			Can be completed with available resources/funding.		
Storage and Distribution Systems	Warm water temperatures in summer throughout Townsville supply Protozoa (N. fowleri)	Review the need for temperature monitoring in source water. Ongoing sampling for review at next DWQMP review. Investigate prevalence of N. fowleri. Investigate options to maintain chlorine residual above 0.5mg/L (reservoirs, lines and dead ends)	Temperature is monitored in source water and throughout distribution.	Completed	Completed	Completed	Completed	Compliance Coordinator	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Storage and Distribution Systems	Contamination of the network due to works on distribution system.	Add to the Isolation procedure the chlorine residual recorded on paperwork when it's taken onsite for new mains in new developments.	This needs to be written in the project Brief. Procedure in draft. Need to be signed off by safety.	1/07/2025	Under planning in DA approval conditions, inspections occur. When the asset team say the new main is ready, water unit start with flush and take residuals and put vales etc in place. Pipes are capped but not	Internal issue with safety requiring eyewash stations need to be rectified. Need to disinfect pipes after replacement. Need to test downstream for suitable parameters after new main installation.	Priority based on residual risk level determined from the risk assessment.	Team Manager WS Dam Safety	
Storage and Distribution Systems	Contamination of the network due to installation of new mains.	Procedures around installation of new main (both by contractors for acceptance by Council and Council installed mains upgrade projects) need to be improved.	Chlorine only is being sampled for a new main when they are commissioned. A full water quality suite should be tested for all bulk network mains that are planned completed including by Project Department (Mains renewals program).	1/07/2025			Can be completed with available resources/funding.	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Storage and Distribution Systems	New main installations cause contamination of the network.	Add to the Isolation procedure the chlorine residual recorded on site when its taken to the paper work for new mains in new developments. Put in place a process for DA to make Water and Resource Recovery aware once DA approved. The process for bringing a new main online needs to change. Need to be able to see on GIS where infrastructure is and uploaded as soon as possible following construction. Improvements are required to put on GIS straight away. Adequate resources Assets Area to allow for as constructed drawings to be uploaded into GIS within a month of As Constructed drawings are uploaded in to the system.	Inspectors only find out about a new development with a meter application. PMO needs to send paper work back for sign off. Must go to WQ group for sign off before bringing on line. Inspectors have signed off on the valves. adequate resources Assets Area to allow for as constructed drawings to be uploaded into GIS within a month of As Constructed drawings are uploaded into the system.	1/07/2025		Under planning in DA approval conditions, inspections occur. When the asset team say the new main is ready water unit start with flush and take residuals when the put valves etc. In place. Chlorine only is being sampled for a new main when they are commissioned. For bulk network mains that are planned completed by Project Department (Mains renewal program)	Priority based on residual risk level determined from the risk assessment.	Bulk Water Engineer/ Team Manager Network Services	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Storage and Distribution Systems	Inadequate mapping of the network leads to contamination during network repair or installations.	Mapping system improvements showing valves and live information on which valves are open (OC and operators can see).		1/07/2025			Priority based on residual risk level determined from the risk assessment.	Team Manager WS Dam Safety	
Storage and Distribution Systems	Continue ongoing program review of network water quality deterioration at the ends of the network. Continue to reduce water age to prevent THM formation.	Procedure must document to test for Chlorine Residual after flushing. Update the flushing program to reduce THM Formation.	Water model for the network complete but needs some calibration. Can be greater than 9 days old in Northern part of TVE Network (in Arcadia). Trying to balance re-chlorination with THM formation. Flushing program to be informed by the model. Issue from Douglas WTP. Cleaning and asset inspections completed. Picnic Bay Res	1/07/2025	Need to document flushing program		Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Storage and Distribution Systems	Annual external assessment of reservoirs including roof. Drones and submersibles used. Sites with ladders have a cage with bottom locked or the site is fenced. West End Reservoir is built in the hill but offline currently.	Improve security measures when bringing disused reservoirs back online. Ensure the documented process for bringing disused reservoirs back on-line included risk assessment, improved security measures and water quality testing.		12/01/2024		Look for procedure and add to paradigm	Can be completed with available resources.	Senior Water Officer	
Storage and Distribution Systems	Reservoirs - Contamination due to cleaning/ maintenance	Review the contract for companies working in reservoirs to have completed "Aquacard" before working on reservoirs and obligation to disinfect before work and maintain water quality. This should be written into scope of work.		1/06/2023	Complete	Complete	Complete	Compliance Coordinator	Complete
Storage and Distribution Systems	Water Age/Sedimentation in Reservoirs	Develop a list of reservoirs that have common inlet/ outlet .		Complete	Complete	Complete	Complete	Complete	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Storage and Distribution Systems	THM Chlorate Open issue. Can see that Chlorate is moving through the network. Flush to pull water through needs a management approach bringing the water back in when required. Most probable source is Sodium Hypochlorite.	Complete program for Reservoirs that are filled and emptied through the same outlet to be upgraded with separate apertures. Documentation of system optimisation. Essentially targeting a reduced water age.	Water model for the network complete but needs some calibration. Can be greater than 9 days old in Northern part of TVE Network (in Arcadia). Trying to balance re-chlorination with THM formation. Flushing program to be informed by the model. Issue from Douglas WTP. Cleaning and asset inspections completed. Picnic Bay Res	31/12/2028	Trility rotate hypo storage tanks and visibility of data and keep sampling program for chlorates.		Significant planning and project establishment, resources and funding required.	Senior Water Systems Engineer	
Storage and Distribution Systems	Water age at end of lines likely to result in taste odour issues.	Increase visibility on network analysers. Some chlorine analyser locations (can't be seen on GIS) also previous issue manual dosing.	Flushing crews have handheld chlorine analysers. Network monitoring detects breaks (more likely to have break that requires isolation.) Interacting zone may have to adjust. Rechlorination points not mapped.	31/12/2028		Trility have a contract fly drone over rooves on an annual basis. Flow based on operation CWT at Douglas and Northern. Annual maintenance cleaned out of CWTs.	Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	
Monitoring Program	Lead in Raw Water	Check where this is coming through in the system. Lead needs to be added to the raw water monitoring program again. Lead not being completed in sampling. Needs to be added into raw and product water program again.	Result of 0.2mg/L Lead in last 5 years found in Townsville Reservoir. Paluma Always present, average ~ 80% soluble, 0.3 to 1 mg/L typical. Maximum of 2 mg/L total.	1/07/2024	Complete	Complete	Complete	Water Quality Officer	Complete
Operation of storage and distribution	Supply to areas outside of Council's jurisdiction (Burdekin Shire Council).	Review the information BSC needs to see (e.g. flow rates) and check if agreement needs updating.	Burdekin Shire Council operate the pumps to Giru. BSC dose at point of sale. Dual access via daisy chain locks to get access to property. Operators not based in Giru (Ayr) . Representatives from BSC water unit invited and attended risk assessment workshop.	1/07/2025			Can be completed with available resources/funding.	Water Quality Officer	
Operation of storage and distribution	Taste and odour issues with older water. Additional chlorination increases THM levels. Documentation of system optimisation. Essentially targeting a reduced water age. No detailed water age model .Giru/Cungulla no complaints.	Documentation of system optimisation. Graphs to be drawn up for Douglas + Mt Louisa, Low turnover. Wulguru, bottom city. Essentially targeting a reduced water age. Very similar to Douglas WTP		31/12/2028			Significant planning and project establishment, resources and funding required.	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Operation of storage and distribution	Loss of Supply due to single supply line between Giru and Cungulla.	Giru/Cungulla review cyclone preparation procedures (potential to Isolate high reservoir). Develop a procedure for what to do during high raw water turbidity. This includes levels in reservoirs for shutting down the plant during high turbidity events. Document what must occur before the plant is shut down. Then this does not have to report this as an Event to the regulator.	Currently losing the line only sits in normal repair procedures. Army flew in generator since Yasi. System has been upgraded since then. Trucking Water to Giru is the back up plan. High turbidity into Giru in to WTP and its shut down. Storages must be filled before the high turbidity event.	1/07/2026			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	
Operation of storage and distribution	All Hazards	Need to ensure that licenced water carters are following code and document which hydrants they can take water from (for incident investigations). Investigate if SES/Rural Fire Service Standpipe has back flow prevention. Connection is straight to hydrant.	Meters with Backflow prevention on Sugar Mill. Giru and Paluma have no shops. Where customers can fill need to be put back on GIS Map or they call Rob to find out where they can fill from. All taking water are registered and use Council fill points. Drop with air gap. Filling stations have bollard around parking area but no swipe card with meter. Way is to hire a stand pipe. Council Roads will take and rural fire will take water from a standpipe. They hire stand pipes which have non return valves. Rural Fire is an unmetered stand pipe but comfortable. New truck and cleaned.	1/07/2026			Priority based on residual risk level determined from the risk assessment.	Senior Water Systems Engineer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Operation of storage and distribution	All Hazards	As constructed, record the asset and then put on the schedule. Non council owned RPZ are not on GIS. This may be recorded somewhere (Planning?) Need to check the process and where they are recorded so its know in the event of an incident.	All BFP tested every 12 months. Plumbing inspectors check with grease traps etc as part of their inspections. All tested on Magnetic Island in the last 3/4 weeks and closed out in TechOne system. Food, restaurants, industrial, sun metals has one. Previous issue with some customers removing parts inside the meter to get more water (so its not pressure limiting). Known issues in low pressure area being rectified. Meter replacement program. All applications come in to DA picks up through the system if needs a RPZ.	1/07/2026			Priority based on residual risk level determined from the risk assessment.		
Operation of storage and distribution	All Hazards	As constructed, record the asset and then put on the schedule. Non council owned RPZ are not on GIS. This may be recorded somewhere (Planning?) Need to check the process and where they are recorded so its know in the event of an incident.	All BFP tested every 12 months. Plumbing inspectors check with grease traps etc as part of their inspections. All tested on Magnetic Island in the last 3/4 weeks and closed out in TechOne system. Food, restaurants, industrial, sun metals has one. Previous issue with some customers removing parts inside the meter to get more water (so its not pressure limiting). Known issues in low pressure area being rectified. Meter replacement program. All applications come in to DA picks up through the system if needs a RPZ.	1/07/2026			Priority based on residual risk level determined from the risk assessment.		

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Operation of storage and distribution	All Hazards	Procedure must document to test for Chlorine Residual after flushing.	Pipes are capped but not disinfected. Internal issue with sterilisation spray needs to be rectified. Need to disinfect pipes after replacement. Need to test downstream for suitable parameters after new main installation. Fittings must be disinfected. WHS Best practice sampling as well industry standards for disinfection require installer to carry tablets to make up the bottles and a correctly labelled 1000mgbottle solution to disinfect. Needs	1/07/2026	Contractors just flush but don't test. No sample results from downstream points. Flush to visible clear, don't take chlorine residual normally. Julian to develop procedure for flushing, confirming contact time. Bulk Mains handed same as repairs. Issues with aseptic sampling. Check chlorine and turbidity. Must check residual and contact		Can be completed with available resources/funding.	Senior Water Systems Engineer	
Operation of storage and distribution	Generally have ring mains if possible. Dead ends identified are driving the flushing program. All new developments are ring mains. Networks reprioritise areas with water quality issues in a normal replacement program (including putting in ring mains to join up at a road crossing etc)	Continue on going program review of network for removal of dead ends. Next to 12 - 18 monthly need age modelling in the network with additional analysers in the network to optimise disinfection and formation of DBP.	In progress	1/07/2026	In progress	In progress	Some planning and project establishment/ resources required.	Team Manager WS Dam Safety	
Operation of storage and distribution	Bacteria/Viruses	Roof replacement program. Picnic Bay Reservoir Priority need bypass to replace the roof. Within 5 years will get drone inspections rolling for all reservoirs. Develop OCP Procedures for Reservoir Integrity. Need to document a works order process so works orders are issued for temporary repairs but also an escalation process for larger scale works to ensure these are prioritised.	Tanks/Reservoirs are sealed, no adjacent trees. Inspections completed quarterly due to short staff maintenance person. Cleaned yearly. Reported in TechOne. Trility complete E.coli and total check list. All documented. Trility also take samples.	1/12/2028			Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Operation of storage and distribution	Bacteria/Viruses	Review the contract for companies working in reservoirs to require providers to have Qld Water Blue Card before working on reservoirs and obligation to disinfect before work and maintain water quality. This should be written into the scope of work.	If an issue is raised with an internal clean, this may also raise further inspection to be completed. Reservoir cleaning contract has potentially caused incident after cleaning.Post storm inspections completed. Use external plumbers for whirly birds repair quickly. Trility take own reservoirs offline and then use divers and then sterilize and have procedures for bringing online. Test hydrocarbon fractions and BTEX before brining on line.	1/07/2027			Priority based on residual risk level determined from the risk assessment.		
Operation of storage and distribution	DBP Formation	The detail water model needs to be reviewed and updated to allowed for optimised water levels in reservoirs reducing THM formation and to assist targeted flushing program. Provide adequate resourcing for keeping the model current and up to date and allow linkages to water quality data.	Some small reservoir steel in the tank. Riverside ridge. Usage demand is too high. Need to ground truth the water model and allow for it to be improved over time.	31/12/2028			Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	
Operation of storage and distribution	All Hazards	Formalise discussion with operations /strategic planning. Strategic Planning to consider Water Quality Issues as a high priority developing or making changes to long term plans. Needs to be included in 10 year	Planning needs to consider water quality as part of development approvals.	31/12/2028			Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	
Whole of system	Terrorism/ sabotage	Complete project to have all reservoir sites secured. Review security arrangements and reconsider risk.	All treatment plants are fenced. Most reservoirs are fenced. All reservoirs have locked cages around ladders and hatches. Locks in daisy chains when used by other utilities.	Complete	Complete	Complete	Complete	Bulk Water Engineer	Complete

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Whole of system	Pathogens	Water Operations only work within the mapping system. Response needs to include a process step where they can check construction drawings during an incident. New development mapping into the GIS should be completed within a month to reduce the risk	The process is currently taking 2 years. Need to be immediately able to see infrastructure on the ground. Team that looks after this only have a few FTE's... not under the control of Water Operations	1/07/2026			Very High priority based on residual risk level determined from the risk assessment.	General Manager WS	
Whole of system	Giru and Paluma in remote areas. Call outs occur to Giru and Paluma WTP out of hours or in a rain event.	Dedicated Rangers live in Paluma and have been trained how to shut down plant safely. Giru can be shut down remotely via SCADA	Improve SCADA - Remote access Paluma - Two servers - Callum	Complete	Complete	Complete	Complete	Senior Water Systems Engineer	Complete
Whole of system	Loss of integrity in pipes/ treatment systems not working correctly due to aging assets and infrastructure. Have 24 hour capacity in reservoirs (localised storage in some reservoirs will be higher). Assets replacement program and asset management plan. Weekly inspection checklists. Regular review/team leader meetings including with Trility. Maintenance Co-Ordinator position. Renewals are risk based.	Mapping system improvements showing valves and live information on which valves are currently open. (So OC and operators can see)	Massive undertaking - Nice to have but not feasible. Critical valves are on GIS. Valve boxes are painted red (closed) blue (open) on the ground so that crews and operators can determine if they are open and closed	31/12/2028			Significant planning and project establishment/ resources and funding required.	Bulk Water Engineer	Parked
Whole of system	Inappropriately skilled Water Operators	Succession planning- Some information is not documented and is kept with individuals. Develop a recruitment plan to include succession planning.	WS involved in projects with Qld Water directorate to look at this as an industry.	31/12/2027	Realignment of WS with new positions added. However there are issues within the industry for recruitment and retention of trained water operators, trades peoples and Engineers.		Priority based on residual risk level determined from the risk assessment.	General Manager WS	Ongoing

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Whole of system	Many reservoir roofs allow ingress	Reservoir Roof Renewal program requires involvement from Water Operations to drive the repair/ replacement of high priority reservoirs for water quality risk	Condition assessments of reservoirs is underway. Prioritisation will need input from Water Operations. Priority will be driven by reduced water quality in Reservoirs.	1/12/2028	Several reservoir roof renewal programs in works organised by priority.	In progress		Senior Water Engineer/ Bulk Water Engineer	
Whole of system	Decay of reservoir structure leads to water quality incident.	Reservoirs require general renewal works		1/12/2028	In progress, reservoir renewal program in place based on risk/ priority.				
Whole of system	E.coli Detected at Magnetic Island Reservoirs	Picnic Bay and Arcadia Reservoir Roofs require temporary fix and permanent fix		1/07/2025	In progress; Picnic Bay Reservoir with temporary fix			Senior Water Systems Engineer	
Whole of system	E.coli Detected at Rollingstone Reservoir	Rollingstone Whirly bird requires replacement.	Whirly bird repaired. Permanent repair required, but not urgent based on risk.	1/12/2028			Significant planning and project establishment/ resources and funding required.	Senior Water Systems Engineer	
Whole of system	Poor communication leads to a water quality incident.	Optus problems have impacted Giru remote connection. Project to investigate microwave link (would also be good for security cameras at Giru). Riot Solutions looking at Sunwater and Trility. Firewall upgrades required.	All equipment reviewed (e.g. Douglas has some equipment that is coming to end of life. Program to replace. Giru Cungulla internet connections need improvement.	1/12/2028	SCADA and PLC all backed up. SCADA Historian used.	All equipment on maintenance and calibration schedules. Clear SCADA to GeoSCADA. Fix has been a bit clunky.	Significant planning and project establishment/ resources and funding required.	General Manager WS	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Whole of system	Heavy Metal/Chemical Contamination/Delivery of Wrong Chemical	Trility processes to contain minimum weekly jar testing. Process to also include Jar Test following Lime delivery for Crystal Creek.	Batch certificates provided. Random samples taken for fluoride (per code of practice). Sample on delivery for hypo per batch. Operators on site for all deliveries except Crystal Creek Lime (only chemical there). Truck driver must call up and then remotely open the front gate. Need a specific connection for pressurised delivery system. Jar testing to pick up wrong chemical?	12/01/2024			Can be completed quickly with available resources/ funding.	Senior Water Systems Engineer	
Whole of system	Cybersecurity (loss of process control, loss of data) - Recently departed staff, external cybersecurity threats	HR process for terminated employees needs to inform the SCADA system for removal from the system.	TCC Cybersecurity team. Trility has a Security Management Plan.	1/07/2026			High priority based on residual risk level determined from the risk assessment.	General Manager WS	
Whole of system	Actions by disgruntled employees or contractors leading to malicious damage resulting in poor water quality.	Need to review and reduce the number of keys in the system or switch to electronic key system.		1/12/2024	Trility has Electronic Key system. TCC review the key register.		Can be completed quickly with available resources/ funding.	General Manager WS	
Whole of system	Supply to areas outside of Councils jurisdiction (Burdekin Shire Council).	Document in both DWQMP's to have meetings twice a year between water unit staff (once before and once after wet season.	Document formalised meetings	1/07/2025			Can be completed quickly with available resources/ funding.	Water Quality Officer	
Management of Incidents and Emergencies	Monitoring program in place has not detected Cyanobacteria in the catchment	Ensure BGA Plan is in place, including Trility BGA Response procedures.		1/07/2025	Complete	Complete	Complete	Water Quality Officer	Complete
Management of Incidents and Emergencies	Cyanobacterial toxins and algal bloom outbreaks have now been included in the Risk Assessment.	Ensure there are cyanobacterial outbreak response plans for each drinking water scheme. Check Trility BGA Response Procedures.	BGA plan has been developed for Ross River Dam. Separate plan for Paluma Dam, Paluma Weir and Giru WTP needs to be developed.	7/01/2026			Can be completed with available resources.	Water Quality Officer	

Scheme Component Name	Description of Risk or Hazardous Event.	Improvement Action	Comments	Target Date	Actions taken to Date	Status and revised Target Date	Rationale for Implementation	Responsible Officer	Complete
Management of Incidents and Emergencies	Water carting to Cungulla is currently restricted because there are only two local companies in the area.	Include in the emergency response plans, emergency supply options for Cungulla in the event that water cannot be safely supplied from the WTP. This may require Council to have their own water truck available or enter into specific agreements with other companies.	Two companies with 6 trucks provides redundancy. Only licensed potable water carriers are used but this needs to be formalised in a Work Instruction/ procedure.	1/07/2025	Need to write an emergency supply plan that includes carting water. Council may require own truck because there are only two local companies cart water.	Need to document who trucks the water (from Townsville?) to Clear Water Storage Tank and then dosing Chlorine. Burdekin Shire Council will need to issue conserve water notices.	Can be completed with available resources.	Water Quality Officer	
Management of Incidents and Emergencies	During a water quality emergency, a timely response is required. This often involves the need to immediately see infrastructure on the ground to respond appropriately and assist investigations. It was noted that the GIS mapping which was relied upon was often out of date or insufficient.	New development water infrastructure mapping into the GIS system should be completed within a month to reduce the risk.	Need to be able to immediately see infrastructure on the ground to respond. Operations don't have maps. 24 hour call system. Water quality complains all got through to Water Quality Area (incl after hours on call). Townsville PH unit have on call have hours. If someone doesn't answer automatically escalates.	1/12/2024	Operations only work on updating the mapping system. New development mapping into the GIS system should be completed within a month to reduce the risk.	Needs Improvement. In a response incident response procedure may need to include a step where they can check construction drawings during an incident.	Very High priority based on residual risk level determined from the risk assessment.	Team Manager WS Dam Safety	
Management of Incidents and Emergencies	Inadequate response time to an incident leads to further complications or increases the severity of the incident.	Include a process step in emergency response plans to check construction drawings.	2-3 year wait for Council mapping system to update	1/12/2024			Very High priority based on residual risk level determined from the risk assessment.	Team Manager WS Dam Safety	
Management of Incidents and Emergencies	Inadequate response time to an incident leads to further complications or increases the severity of the incident.	Investigation possible emergency accommodation facilities in the Magnetic Island Depot and having a vehicle with gear on the island so that a crew can stay.	Car Ferris can be booked up 2 -3 days in advance and then it can be hard to get vehicles across. No 24 hours access to island form the Ferry.	1/12/2028		There is a depot on the Island. Could be upgraded to included emergency accommodation? Magnetic island can have events and there is no accommodation on the island so crews/workers cannot stay and have to get off before the last Ferry 11pm. Last Ferry to the island is 9:30pm. First one over is 5:30am.	Significant planning and project establishment/ resources and funding required.	Team Manager WS Dam Safety	

Appendix B.
Drinking Water Quality Performance

Verification Monitoring

Townsville Water and Resource Recovery would like to thank all the employees of Townsville Laboratory Services (TLS) for their ongoing hard work and constant support with source and drinking water verification monitoring. In the 2023/2024 FY, TLS achieved National Association of Accreditation Authorities (NATA) accreditation to test the following:

- Total Phosphorous by CFA (Skalar Continuous Flow Analyser)
- Free Reactive Phosphate by CFA (Skalar Continuous Flow Analyser)
- Total Nitrogen by CFA (Skalar Continuous Flow Analyser)
- NOx (Nitrate + Nitrite) by CFA (Skalar Continuous Flow Analyser)
- Nitrite by CFA (Skalar Continuous Flow Analyser)
- Ammonia by CFA (Skalar Continuous Flow Analyser)
- Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene in water by GCMS-HS

TLS continues to perform above and beyond in their constant dedication in advancing their capabilities and providing excellent service for WS and the community.

Giru/Cungulla Drinking Water Scheme

	Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of Samples Detected	# Exceed ADWG Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Giru	**Source Water** Giru Raw Water (Haughton River)	Thermotolerant Coliforms	Total Coliform	MPN/100ml	1	49	47	0	<LOR	4720	353	938	
		Thermotolerant Coliforms	E.coli	MPN/100ml	1	50	8	0	<LOR	31	2	10	
		Turbidity	Turbidity	NTU	0.1	50	50	0	0.8	120	7.5	15.4	
		pH	pH	pH Units	1	50	50	0	7.08	8.27	7.63	8.03	
		Metals	Iron, Total	mg/L	0.002	50	50	0	0.02	2.4	0.32	0.94	
		Metals	Manganese, Total	mg/L	0.0003	50	50	0	0.006	0.1	0.02	0.05	
		Pesticides	Pesticides	µg/L	Varied by pesticide	12	0	0	<LOR	<LOR	<LOR	<LOR	
		PFAS/ PFOA	PFAS/ PFOA	µg/L	Varied by compound	1	0	0	<LOR	<LOR	<LOR	<LOR	
		Radionulides	Radionuclides suite including gross Alpha & gross Beta activity	Bq/L	Various by radionuclide	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Water Treatment Plant Giru Clear Water Storage	Thermotolerant Coliforms	Total Coliform	CFU/100ml	1	49	1	0	<LOR	2	<LOR	<LOR	
		Thermotolerant Coliforms	E.coli	CFU/100ml	1	50	0	0	<LOR	<LOR	<LOR	<LOR	
		Turbidity	Turbidity	NTU	0.1	50	47	0	<LOR	6	0.82	2	
		pH	pH	pH Units	1	50	50	0	6.84	7.33	7.08	7.23	
		Colour	Colour, Apparent	Pt-Co Units	1	50	24	0	<LOR	6	<LOR	2	
		Metals	Aluminium, Total	mg/L	0.01	50	49	0	<LOR	0.196	0.056	0.115	
		Metals	Calcium, Total	mg/L	0.7	50	50	0	6.5	18.6	12.790	17.21	
		Metals	Copper, Total	mg/L	0.002	50	0	0	<LOR	<LOR	<LOR	<LOR	
		Metals	Iron, Total	mg/L	0.002	50	25	0	<LOR	0.05	0.004	0.016	
		Metals	Lead, Total	mg/L	0.0006	50	0	0	<LOR	<LOR	<LOR	<LOR	
		Metals	Magnesium, Total	mg/L	0.5	50	50	0	2.6	11	6.500	9.9	
		Metals	Manganese, Total	mg/L	0.0003	50	50	0	0.0004	0.007	0.0018	0.005	
		Metals	Zinc, Total	mg/L	0.001	50	7	0	<LOR	0.015	0.001	0.002	

Giru/Cungulla Drinking Water Scheme

	Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of Samples Detected	# Exceed ADWG Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Cungulla	**Transmission** Cungulla Reservoir	Thermotolerant Coliforms	Total Coliform	CFU/100ml	1	49	1	0	<LOR	1	<LOR	<LOR	
		Thermotolerant Coliforms	E.coli	CFU/100ml	1	49	0	0	<LOR	<LOR	<LOR	<LOR	
		Turbidity	Turbidity	NTU	0.1	49	48	0	<LOR	0.4	0.2	0.3	
		pH	pH	pH Units	1	49	49	0	6.72	7.85	7.53	7.78	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	49	49	0	1.01	2.05	1.41	1.74	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	49	49	0	1.02	2.06	1.46	1.80	
		Alkalinity	Alkalinity	mg CaCO3/L	5	49	49	0	11.05	64.01	43.52	62.470	
		Colour	Colour, Apparent	Pt-Co Units	1	49	30	0	<LOR	2	<LOR	2.000	
		Metals	Aluminium, Total	mg/L	0.01	49	49	0	0.017	0.134	0.046	0.077	
		Metals	Calcium, Total	mg/L	0.7	49	49	0	6.1	17.4	12.43	16.380	
		Metals	Copper, Total	mg/L	0.002	49	11	0	<LOR	0.005	<LOR	0.005	
		Metals	Iron, Total	mg/L	0.002	49	32	0	<LOR	0.01	0.002	0.005	
		Metals	Lead, Total	mg/L	0.0006	49	0	0	<LOR	<LOR	<LOR	<LOR	
		Metals	Magnesium, Total	mg/L	0.5	49	49	0	2.3	10.4	6.4	9.5	
		Metals	Manganese, Total	mg/L	0.0003	49	42	0	<LOR	0.008	0.0008	0.002	
		Metals	Zinc, Total	mg/L	0.001	49	48	0	<LOR	0.01	0.003	0.01	
		Disinfection By products	Chlorates	µg/L	50	13	13	0	157	649	369	602	
		Disinfection By products	Trihalomethanes	µg/L	8	49	49	0	26	56	41	55	
		MIB	MIB	ng/L	2	49	1	0	<LOR	3	<LOR	<LOR	
		Geosmin	Geosmin	ng/L	2	49	1	0	<LOR	2	<LOR	<LOR	

Giru/Cungulla Drinking Water Scheme

Scheme Component		Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of Samples Detected	# Exceed ADWG Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Cungulla	**Reticulation** Cungulla Houses	Thermotolerant Coliforms	Total Coliform	CFU/100ml	1	99	1	0	<LOR	4	<LOR	<LOR	
		Thermotolerant Coliforms	*E.coli*	CFU/100ml	1	99	0	0	<LOR	<LOR	<LOR	<LOR	
		Turbidity	Turbidity	NTU	0.1	99	97	0	<LOR	2.4	0	0.41	
		pH	pH	pH Units	1	99	99	0	6.11	7.72	7.38	7.58	
		Disinfection Residual	Chlorine (free)	mg/L	0.05	99	99	0	0.66	1.83	1.23	1.6	
		Disinfection Residual	Chlorine (Total)	mg/L	0.05	99	99	0	0.78	1.84	1.29	1.68	
		Alkalinity	Alkalinity	mg CaCO3/L	5	49	49	0	14.89	64.41	44.12	62.32	
		Colour	Colour, Apparent	Pt-Co Units	1	50	31	0	<LOR	11	1.00	3.00	
		Metals	Aluminium, Total	mg/L	0.01	49	49	0	0.016	0.312	0.048	0.09	
		Metals	Calcium, Total	mg/L	0.7	49	49	0	6.7	18.9	13.01	17.02	
		Metals	Copper, Total	mg/L	0.002	49	40	0	<LOR	0.008	0.003	0.01	
		Metals	Iron, Total	mg/L	0.002	49	40	0	<LOR	0.16	0.007	0.02	
		Metals	Lead, Total	mg/L	0.0006	49	4	0	<LOR	0.0006	<LOR	0.0006	
		Metals	Magnesium, Total	mg/L	0.5	49	49	0	2.1	10.1	6.2	9.20	
		Metals	Manganese, Total	mg/L	0.0003	49	30	0	<LOR	0.04	0.002	0.006	
		Metals	Zinc, Total	mg/L	0.001	49	48	0	<LOR	0.015	0.007	0.01	
		MIB	MIB	ng/L	2	49	0	0	<LOR	<LOR	<LOR	<LOR	
		Geosmin	Geosmin	ng/L	2	49	1	0	<LOR	2	<LOR	<LOR	

<LOR - Less than Limit of Reporting
ND - Not Detected

Paluma Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Laboratory Limit of Reporting (LOR)	Count	# of Samples Detected	# Exceed ADWG Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Source Water Paluma Weir	Thermotolerant Coliforms	Thermotolerant Coliforms	CFU/100ml	1	12	12	0	50	4500	680	3114	
	Thermotolerant Coliforms	*E.coli*	MPN/100ml	1	12	12	0	30	1210	198	677	
	pH	pH	pH Units	1	12	12	0	5.61	7.65	6.72	7.63	
	Metals	Iron, Total	mg/L	0.002	12	12	0	0.34	1.2	0.68	1.09	
	Metals	Manganese, Total	mg/L	0.0003	12	12	0	0.01	0.04	0.02	0.03	
	Turbidity	Turbidity	NTU	0.1	12	12	0	2.5	26.0	7.6	23.4	
	Cryptosporidium	Cryptosporidium	cells/10 Li	1	2	0	0	<LOR	<LOR	<LOR	<LOR	
	Giardia	Giardia	cells/10 Li	1	2	1	0	<LOR	2	1	1.9	
Water Treatment Plant (Membrane Filtered Water)	pH	pH	pH Units	1	47	47	0	6.33	7.41	6.87	7.15	
	Turbidity	Turbidity	NTU	0.1	47	43	0	<LOR	1	0.2	0.4	
	Colour	Colour, true	Pt-Co Units	1	47	31	0	<LOR	13	3	10	
	Colour	Colour, apparent	Pt-Co Units	1	47	44	0	<LOR	13	4	11	
Transmission Paluma Reservoir	Thermotolerant Coliforms	Total Coliform	CFU/100ml	1	12	0	0	<LOR	<LOR	<LOR	<LOR	
	Thermotolerant Coliforms	*E.coli*	CFU/100ml	1	60	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection Residual	Chlorine (free)	mg/L	0.05	48	48	0	0.71	2.43	1.34	1.92	
	Disinfection Residual	Chlorine (total)	mg/L	0.05	48	48	0	0.83	2.48	1.44	2.04	
	pH	pH	pH Units	1	60	60	0	6.3	8.1	7.19	7.92	
	Turbidity	Turbidity	NTU	0.1	60	60	0	0.1	1.9	0.44	1.31	
	Colour	Colour, apparent	Pt-Co Units	1	60	51	0	<LOR	27	5	19	
	Alkalinity	Alkalinity	mg CaCO3/L	5	12	12	0	15.2	21.5	17.5	20.1	
	Metals	Aluminium, Total	mg/L	0.01	60	34	0	<LOR	0.06	0.01	0.04	
	Metals	Calcium, Total	mg/L	0.7	12	12	0	1.5	5.2	2.9	4.21	
	Metals	Copper, Total	mg/L	0.002	12	9	0	<LOR	0.038	0.008	0.025	
	Metals	Iron, Total	mg/L	0.002	60	60	0	0.003	0.130	0.040	0.080	
	Metals	Magnesium, Total	mg/L	0.5	12	7	0	<LOR	0.80	0.340	0.750	
	Metals	Manganese, Total	mg/L	0.0003	60	60	0	0.0006	0.08	0.011	0.050	
	Metals	Lead, Total	mg/L	0.0006	60	1	0	<LOR	0.0006	<LOR	<LOR	
	Metals	Zinc, Total	mg/L	0.001	12	12	0	0.003	0.028	0.012	0.023	
	Disinfection By-product	Bromate	µg/L	10	34	12	2	<LOR	29	<LOR	<LOR	Incidents reported to Water Supply Regulation: DWI-506-23-10415 & DWI-506-24-10874
	Disinfection By-product	Chlorates	µg/L	50	12	12	0	239	637	358	596	
	Disinfection By-product	Trihalomethanes	µg/L	8	12	12	0	13	74	38	72	

Paluma Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Laboratory Limit of Reporting (LOR)	Count	# of Samples Detected	# Exceed ADWG Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Reticulation Paluma Houses	Thermotolerant Coliforms	*E.coli*	CFU/100ml	1	71	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection Residual	Chlorine (free)	mg/L	0.05	59	59	0	0.29	2.05	1.21	1.79	
	Disinfection Residual	Chlorine (total)	mg/L	0.05	59	59	0	0.3	2.31	1.26	1.85	
	pH	pH	pH Units	1	71	71	0	6.76	9.15	8.04	8.79	
	Turbidity	Turbidity	NTU	0.1	71	71	0	0.1	1.9	0.40	1.3	
	Alkalinity	Alkalinity	mg CaCO3/L	5	24	24	0	18.71	28.8	22.26	28.64	
	Colour	Colour, apparent	Pt-Co Units	1	71	59	0	<LOR	27	4.00	18	
	Metals	Aluminium, Total	mg/L	0.01	71	66	0	<LOR	0.05	0.02	0.05	
	Metals	Calcium, Total	mg/L	0.7	24	24	0	2.5	8.9	5.40	7.9	
	Metals	Copper, Total	mg/L	0.002	24	20	0	<LOR	0.022	0.01	0.02	
	Metals	Iron, Total	mg/L	0.002	71	70	0	<LOR	0.15	0.07	0.12	
	Metals	Magnesium, Total	mg/L	0.5	24	1	0	<LOR	0.5	0.20	<LOR	
	Metals	Manganese, Total	mg/L	0.0003	71	71	0	0.0007	0.07	0.0093	0.0400	
	Metals	Lead, Total	mg/L	0.0006	24	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Zinc, Total	mg/L	0.001	24	24	0	0.002	0.015	0.007	0.014	
	Fluoride	Fluoride (naturally occuring)	mg/L	0.02	24	24	0	0.05	0.11	0.09	0.11	
	Disinfection By-product	Bromate	µg/L	10	38	13	2	<LOR	42	<LOR	18.3	Incidents reported to Water Supply Regulation: DWI-506-23-10415 & DWI-506-24-10874
	Disinfection By-product	Trihalomethanes	µg/L	8	24	24	0	18	129	55	100	
	Disinfection By-product	Chlorates	µg/L	50	16	16	0	242	633	353		

<LOR - Less than Limit of Reporting
ND - Not Detected

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Source Water Ross River Dam	Thermotolerant Coliforms	Total Coliforms	MPN/100ml	1	234	234	0	10	4610	843	1983	
	Thermotolerant Coliforms	*E.coli*	MPN/100ml	1	275	21	0	<LOR	62	1	10	
	Turbidity	Turbidity	NTU	0.1	912	912	0	3.4	63.8	9.90	17.2	
	pH	pH	pH Units	1	895	895	0	6.67	9.5	7.81	9.19	
	Metals	Iron, Total	mg/L	0.002	1481	1481	0	0.01	2.7	0.25	0.42	
	Metals	Manganese, Total	mg/L	0.0003	1481	1481	0	0.02	0.63	0.07	0.16	
	Metals	Mercury, Total	mg/L	0.0003	275	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Lead, Total	mg/L	0.0006	1481	31	0	<LOR	0.013	<LOR	<LOR	
	Anions	Oxidised Nitrogen as N	mg/L	0.01	911	19	0	<LOR	0.04	<LOR	<LOR	
	Cyanobacteria	Blue-Green Algae Biovolume	mm3/L	0.01	773	773	0	1.46	17.85	7.02	12.25	
	Radionulides	Radionuclides suite including gross Alpha & gross Beta activity	Bq/L	Various by radionuclide	1	0	0	<LOR	<LOR	<LOR	<LOR	
Source Water Paluma Dam	Thermotolerant Coliforms	Total Coliforms	MPN/100ml	1	159	159	0	146	24200	2501	12100	
	Thermotolerant Coliforms	*E.coli*	MPN/100ml	1	159	25	0	<LOR	145	4	20	
	Turbidity	Turbidity	NTU	0.1	171	171	0	0.9	17.4	2.1	3.8	
	pH	pH	pH Units	1	171	171	0	5.12	8.22	6.04	7.18	
	Metals	Iron, Soluble	mg/L	0.002	159	159	0	0.05	0.56	0.33	0.52	
	Metals	Manganese, Soluble	mg/L	0.0003	159	159	0	0.002	0.05	0.02	0.04	
	Anions	Oxidised Nitrogen as N	mg/L	0.01	171	101	0	<LOR	0.08	<LOR	0.05	
	Radionulides	Radionuclides suite including gross Alpha & gross Beta activity	Bq/L	Various by radionuclide	1	0	0	<LOR	<LOR	<LOR	<LOR	

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Douglas WTP Raw Water	Thermotolerant Coliforms	Total Coliforms	MPN/100ml	1	95	91	0	<LOR	111000	3864	24200	
	Thermotolerant Coliforms	*E.coli*	MPN/100ml	1	95	11	0	<LOR	20	1	10	
	Turbidity	Turbidity	NTU	0.1	360	360	0	1.9	22.3	6.9	11.4	
	pH	pH	pH Units	1	359	359	0	6.97	9.26	7.76	9.04	
	Anions	Sulphate	mg/L	0.5	12	12	0	0.97	2.6	1.60	2.11	
	Metals	Iron, Total	mg/L	0.002	50	50	0	0.02	0.57	0.190	0.32	
	Metals	Manganese, Total	mg/L	0.0003	50	49	0	<LOR	0.4	0.06	0.11	
	Geosmin/ MIB	Geosmin	ng/L	2	52	50	0	<LOR	13	4	9	
	Geosmin/ MIB	MIB	ng/L	2	52	52	0	3	57	13	40	
	Fluoride	Fluoride (Naturally occuring)	mg/L	0.02	50	50	0	0.06	0.29	0.11	0.18	
	Metals	Arsenic, Total	mg/L	0.001	4	4	0	0.001	0.002	0.002	0.002	
	Metals	Selenium, Total	mg/L	0.001	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury, Total	mg/L	0.0006	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium, Total	mg/L	0.0001	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel, Total	mg/L	0.001	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium,Total	mg/L	0.001	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Cyanobacteria Toxin	Cylindrospermopsin	µg/L	0.03	129	127	0	<LOR	1.80	0.53	1.29	
	Giardia	Giardia	cysts/100ml	1	4	0	0	<LOR	<LOR	<LOR	<LOR	
	Cryptosporidium	Cryptosporidium	oocysts/10L	1	4	0	0	<LOR	<LOR	<LOR	<LOR	

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Douglas WTP Treated Water	Thermotolerant Coliforms	Total Coliforms	cfu/100ml	1	102	0	0	ND	ND	ND	ND	
	Thermotolerant Coliforms	*E. coli*	cfu/100ml	1	103	0	0	ND	ND	ND	ND	
	Disinfection Residual	Chlorine, Free	mg/L	0.05	590	590	0	1.13	3.67	2.97	3.4	
	Turbidity	Turbidity	NTU	0.1	595	589	0	<LOR	0.5	<LOR	0.2	
	pH	pH	pH Units	1	591	591	0	7.35	7.80	7.57	7.67	
	Anions	Sulphate	mg/L	0.5	14	14	0	0.79	2.5	1.22	2.24	
	Anions	Oxidised Nitrogen as N	mg/L	0.01	16	16	0	0.03	0.14	0.08	0.13	
	Metals	Iron, Total	mg/L	0.002	143	43	0	<LOR	0.02	<LOR	0.01	
	Metals	Manganese, Total	mg/L	0.0003	82	79	0	<LOR	0.007	0.0015	0.006	
	Metals	Aluminium	mg/L	0.01	543	542	0	<LOR	0.104	0.028	0.052	
	Fluoride	Fluoride	mg/L	0.02	532	528	0	<LOR	0.78	0.45	0.71	
	Metals	Copper	mg/L	0.002	15	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Zinc	mg/L	0.001	15	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Arsenic	mg/L	0.001	5	5	0	<LOR	0.001	<LOR	0.001	
	Metals	Selenium	mg/L	0.001	5	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury	mg/L	0.0006	5	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium	mg/L	0.0001	5	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel	mg/L	0.001	5	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium	mg/L	0.001	5	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection By-product	Trihalomethanes	ug/L	8	57	57	0	17	119	59	104	
	Disinfection By-product	Chlorates	ug/L	50	40	39	0	<LOR	776	396	689	

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Northern WTP Raw Water	Thermotolerant Coliforms	Total Coliforms	MPN/100ml	1	43	43	0	1	687	71.00	211	
	Thermotolerant Coliforms	*E. coli*	MPN/100ml	1	46	30	0	ND	55	5.00	23	
	Turbidity	Turbidity	NTU	0.1	323	323	0	0.34	10.43	1.35	2.80	
	pH	pH	pH Units	1	324	324	0	0.66	96	10.14	10.68	
	Anions	Sulphate	mg/L	0.5	4	4	0	1.1	1.6	1.30	1.56	
	Metals	Iron, Total	mg/L	0.002	47	47	0	0.004	0.54	0.15	0.50	
	Metals	Manganese, Total	mg/L	0.0006	47	47	0	0.002	0.01	0.005	0.0087	
	Geosmin/ MIB	Geosmin	ng/L	2	44	17	0	<LOR	5.29	<LOR	<LOR	
	Geosmin/ MIB	MIB	ng/L	2	44	2	0	<LOR	5.2	<LOR	<LOR	
	Fluoride	Fluoride	mg/L	0.02	45	43	0	<LOR	0.18	0.04	0.11	
	Metals	Arsenic	mg/L	0.001	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Selenium	mg/L	0.001	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury	mg/L	0.0006	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium	mg/L	0.0001	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel	mg/L	0.001	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium	mg/L	0.001	1	0	0	<LOR	<LOR	<LOR	<LOR	
	Giardia	Giardia	cysts/100ml	1	2	0	0	ND	ND	ND	ND	
	Cryptosporidium	Cryptosporidium	oocysts/10L	1	2	0	0	ND	ND	ND	ND	

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Northern WTP Treated Water	Thermotolerant Coliforms	Total Coliforms	cfu/100ml	1	134	0	0	<LOR	<LOR	<LOR	<LOR	
	Thermotolerant Coliforms	*E.coli*	cfu/100ml	1	134	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection Residual	Chlorine, free	mg/L	0.05	665	665	0	0.84	4.07	2.87	3.68	
	Turbidity	Turbidity	NTU	0.1	669	667	0	<LOR	0.3	0.10	0.2	
	pH	pH	pH Units	1	665	665	0	7.36	7.74	7.56	7.66	
	Anions	Sulphate	mg/L	0.5	19	19	0	0.94	2.8	1.74	2.08	
	Anions	Oxidised Nitrogen as N	mg/L	0.01	19	15	0	<LOR	0.12	0.04	0.11	
	Metals	Iron, Total	mg/L	0.002	144	31	0	<LOR	0.01	<LOR	0.005	
	Metals	Manganese, Total	mg/L	0.0003	74	70	0	<LOR	0.003	0.0008	0.0023	
	Metals	Aluminium, Total	mg/L	0.01	501	498	0	<LOR	0.45	0.04	0.09	
	Fluoride	Fluoride	mg/L	0.02	651	637	0	<LOR	0.82	0.52	0.70	
	Metals	Copper, Total	mg/L	0.002	19	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Zinc, Total	mg/L	0.001	19	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Arsenic, Total	mg/L	0.001	6	6	0	0.001	0.002	0.001	0.002	
	Metals	Selenium, Total	mg/L	0.001	6	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury, Total	mg/L	0.0006	6	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium, Total	mg/L	0.0001	6	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel, Total	mg/L	0.001	6	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium, Total	mg/L	0.001	6	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection By-product	Trihalomethanes	ug/L	8	71	71	0	28	210	48	64	
	Disinfection By-product	Chlorates	ug/L	50	112	112	5	85	2095	354	747	Incident reported to Water Supply Regulation: DWI-506-24-10819
	Geosmin/ MIB	MIB	ng/L	2	103	99	0	<LOR	47	10	34	
	Geosmin/ MIB	Geosmin	ng/L	2	103	76	0	<LOR	14	3	7	
	Cyanobacteria Toxin	Cylindrospermopsin	ug/L	0.03	132	0	0	<LOR	<LOR	<LOR	<LOR	

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Northern WTP Raw Water	Thermotolerant Coliforms	Total Coliforms	MPN/100ml	1	46	38	0	<LOR	930	73.00	357	
	Thermotolerant Coliforms	*E.coli*	MPN/100ml	1	48	8	0	<LOR	31	4.00	30	
	Turbidity	Turbidity	NTU	0.1	335	335	0	0.5	25.2	1.5	2.5	
	pH	pH	pH Units	1	335	335	0	9.95	10.95	10.51	10.76	
	Anions	Sulphate	mg/L	0.5	11	10	0	<LOR	2	1.20	1.90	
	Metals	Iron, Total	mg/L	0.002	48	48	0	0.003	0.75	0.23	0.49	
	Metals	Manganese, Total	mg/L	0.0006	48	48	0	0.0007	0.01	0.0062	0.0100	
	Geosmin/ MIB	Geosmin	ng/L	2	11	5	0	<LOR	7	2	6	
	Geosmin/ MIB	MIB	ng/L	2	11	1	0	<LOR	3	<LOR	2	
	Fluoride	Fluoride	mg/L	0.02	48	37	0	<LOR	0.11	0.03	0.05	
	Metals	Arsenic, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Selenium, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury, Total	mg/L	0.0006	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium, Total	mg/L	0.0001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Giardia	Giardia	cysts/100ml	1	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Cryptosporidium	Cryptosporidium	oocysts/10L	1	3	0	0	<LOR	<LOR	<LOR	<LOR	

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Water Treatment Plant Northern WTP Treated Water	Thermotolerant Coliforms	Total Coliforms	cfu/100ml	1	46	0	0	<LOR	<LOR	<LOR	<LOR	
	Thermotolerant Coliforms	*E.coli*	cfu/100ml	1	46	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection Residual	Chlorine, free	mg/L	0.05	335	335	0	1.55	2.37	1.88	2.03	
	Turbidity	Turbidity	NTU	0.1	335	0	0	<LOR	<LOR	<LOR	<LOR	
	pH	pH	pH Units	1	335	335	0	7.41	7.70	7.54	7.61	
	Anions	Sulphate	mg/L	0.5	11	11	0	1.2	2.8	2.0	2.8	
	Anions	Oxidised Nitrogen as N	mg/L	0.01	11	10	0	<LOR	0.15	0.10	0.14	
	Metals	Manganese, Total	mg/L	0.0003	24	24	0	0.0005	0.005	0.0015	0.0046	
	Metals	Iron, Total	mg/L	0.002	97	24	0	<LOR	0.03	0.002	0.012	
	Metals	Aluminium, Total	mg/L	0.01	329	204	0	<LOR	0.149	0.015	0.046	
	Fluoride	Fluoride	mg/L	0.02	328	302	0	<LOR	0.75	0.62	0.71	
	Metals	Copper, Total	mg/L	0.002	11	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Zinc, Total	mg/L	0.001	11	6	0	<LOR	0.013	0.002	0.009	
	Metals	Arsenic, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Selenium, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Mercury, Total	mg/L	0.0006	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Cadmium, Total	mg/L	0.0001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Nickel, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Metals	Chromium, Total	mg/L	0.001	3	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection By-product	Trihalomethanes	µg/L	8	46	46	0	8	60	20	46	

Townsville Drinking Water Scheme

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Transmission Reservoirs	Thermotolerant Coliforms	Total Coliforms	CFU/100ml	1	1104	6	0	<LOR	9	<LOR	<LOR	
	Thermotolerant Coliforms	*E.coli*	CFU/100ml	1	1104	1	1	<LOR	1	<LOR	<LOR	Incident reported to Water Supply Regulation: DWI-506-24-10876
	Disinfection residual	Chlorine, free	mg/L	0.05	1084	1080	0	<LOR	2.93	1.30	2.06	
	Disinfection residual	Chlorine, total	mg/L	0.05	1073	1071	0	<LOR	3.06	1.45	2.23	
	Turbidity	Turbidity	NTU	0.1	1102	1095	0	<LOR	1.5	0.2	0.3	
	pH	pH	pH Units	1	1104	1104	0	6.97	8.3	7.62	7.94	
	Electrical Conductivity	Electrical Conductivity	µS/cm	1	1104	1104	0	85	372	178	222	
	Alkalinity	Alkalinity	mg CaCO3/L	5	1104	1104	0	24.06	62.6	43.57	53.45	
	Colour	Colour, Apparent	Pt-Co Units	1	1104	681	0	<LOR	9	<LOR	2	
	Metals	Aluminium, Total	mg/L	0.01	1104	1047	0	<LOR	0.221	0.039	0.083	
	Metals	Calcium, Total	mg/L	0.7	1102	1102	0	5.2	17.2	9.80	12.8	
	Metals	Copper, Total	mg/L	0.002	1104	380	0	<LOR	0.035	0.002	0.008	
	Metals	Iron, Total	mg/L	0.002	1104	587	0	<LOR	0.11	0.005	0.02	
	Metals	Magnesium, Total	mg/L	0.5	1100	1041	0	<LOR	4.4	2.50	3.7	
	Metals	Manganese, Total	mg/L	0.0003	1104	999	0	<LOR	0.02	0.001	0.004	
	Metals	Lead, Total	mg/L	0.0006	1104	29	0	<LOR	0.0096	<LOR	<LOR	
	Metals	Zinc, Total	mg/L	0.001	1104	834	0	<LOR	0.043	0.003	0.012	
	Geosmin/ MIB	Geosmin	ng/L	2	1008	629	0	<LOR	18	2	5	
	Geosmin/ MIB	MIB	ng/L	2	1008	799	0	<LOR	49	7	28	
	Disinfection By-product	Trihalomethanes	µg/L	8	1103	1100	0	<LOR	186	78	132	
	Disinfection By-product	Bromate	µg/L	10	241	66	14	<LOR	30	<LOR	21	Incident reported to Water Supply Regulation: DWI-506-24-10796
	Disinfection By-product	Chlorates	µg/L	50	227	204	18	<LOR	1183	355	883	Incident reported to Water Supply Regulation: DWI-506-24-10819
	Cyanobacteria Toxin	Cylindrospermopsin	µg/L	0.03	102	0	0	<LOR	<LOR	<LOR	<LOR	
	Cyanobacteria Toxin	Anatoxin	µg/L	0.04	102	0	0	<LOR	<LOR	<LOR	<LOR	

Scheme Component	Parameter Category	Parameter	Unit of Measure	Limit of Reporting (LOR)	Count	# of samples detected	# DW Guidelines Value	Min Value	Max Value	Avg Value	95th %tile	Comments
Reticulation Houses	Thermotolerant Coliforms	Total Coliforms	CFU/100ml	1	2128	16	0	<LOR	46	<LOR	<LOR	
	Thermotolerant Coliforms	*E.coli*	CFU/100ml	1	2128	0	0	<LOR	<LOR	<LOR	<LOR	
	Disinfection residual	Chlorine, free	mg/L	0.05	2125	2098	0	<LOR	3.26	1.11	1.82	
	Disinfection residual	Chlorine, total	mg/L	0.05	2108	2096	0	<LOR	3.57	1.24	2.01	
	Turbidity	Turbidity	NTU	0.1	2117	2089	0	<LOR	1.5	0.2	0.3	
	pH	pH	pH Units	1	2125	2125	0	6.31	8.41	7.58	8.01	
	Electrical Conductivity	Electrical Conductivity	µS/cm	1	2119	2119	0	65	320	177	227	
	Alkalinity	Alkalinity	mg CaCO3/L	5	538	538	0	23.66	83.95	45.03	57.11	
	Colour	Colour, Apparent	Pt-Co Units	1	444	266	0	<LOR	6	<LOR	2	
	Metals	Aluminium, Total	mg/L	0.01	435	409	0	<LOR	0.27	0.03	0.07	
	Metals	Calcium, Total	mg/L	0.7	538	538	0	5.4	17.3	10.7	14.8	
	Metals	Copper, Total	mg/L	0.002	435	413	0	<LOR	0.119	0.008	0.018	
	Metals	Iron, Total	mg/L	0.002	435	262	0	<LOR	0.16	0.004	0.01	
	Metals	Magnesium, Total	mg/L	0.5	435	366	0	<LOR	4.1	2.0	3.4	
	Metals	Manganese, Total	mg/L	0.0003	435	398	0	<LOR	0.060	0.002	0.005	
	Metals	Lead, Total	mg/L	0.0006	435	162	0	<LOR	0.009	<LOR	0.001	
	Metals	Zinc, Total	mg/L	0.001	435	423	0	<LOR	0.03	0.01	0.01	
	Geosmin/ MIB	Geosmin	ng/L	2	254	183	0	<LOR	7	<LOR	4	
	Geosmin/ MIB	MIB	ng/L	2	254	237	0	<LOR	56	8	28	
	Fluoride	Fluoride	mg/L	0.02	434	433	0	<LOR	0.76	0.52	0.72	
	Disinfection By-product	Trihalomethanes	µg/L	8	539	538	0	<LOR	186	84	135	
	Disinfection By-product	Bromate	µg/L	10	83	24	2	<LOR	24	4	19	Incident reported to Water Supply Regulation: DWI-506-24-10796
	Disinfection By-product	Chlorates	µg/L	50	77	65	6	<LOR	1189	334	864	Incident reported to Water Supply Regulation: DWI-506-24-10819

<LOR - Less than Limit of Reporting
ND - Not Detected


City of
Townsville