DRINKING WATER QUALITY MANAGEMENT PLAN

ANNUAL REPORT

FINANCIAL YEAR **2021-2022**

Mackay REGIONAL COUNCIL

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APPENDICES

1. INTRODUCTION

This is the Drinking Water Quality Management Plan (DWQMP) report for Mackay Regional Council for the financial year (FY) 2021 – 2022.

Mackay Regional Council is a registered service provider with identification (SPID) number 489. Council is operating under an approved DWQMP to ensure consistent supply of safe quality drinking water in order to protect public health. This is done through proactive identification and minimisation of public health related risks associated with drinking water.

This DWQMP report includes:

- the activities undertaken over the financial year in operating council's drinking water service;
- drinking water quality summary; and
- summary of council's performance in implementing the approved DWQMP.

This report is submitted to the Regulator to fulfil council's regulatory requirement, and is also made available to customers through council's website or for inspection upon request at council's administration office.

2. DRINKING WATER SUPPLY SYSTEM OVERVIEW

Mackay Regional Council's DWQMP applies to the operation and maintenance of the schemes tabulated in Table 2 - 1. The location of the water sources and water treatment facilities is shown in Figure 2 - 1 and Figure 2 - 2.

Table 2 - 1 Mackay Regional Council schemes

SCHEME	CURRENTLY UTILISED WATER SOURCE	OPERATIONAL WATER TREATMENT FACILITY	CAPACITY (ML/YEAR)	TOWNS SUPPLIED
Bloomsbury	Bloomsbury Bore (O'Connell River)	Bloomsbury Water Treatment Plant	22	Bloomsbury
Calen	Calen Bores	Calen Water Treatment Plant	100	Calen Kolijo
Eton	Eton Bores	Eton Water Treatment Plant	62	Eton
Finch Hatton	Finch Hatton Bore	Finch Hatton Treatment Facility	46	Finch Hatton
Gargett	Gargett Bores	Gargett Treatment Facility	60	Gargett Pinnacle
Koumala	Koumala Bores	Koumala Treatment Facility	25	Koumala
Mackay and Sarina	Dumbleton Weir (Pioneer River)	Nebo Road Water Treatment Plant	17,250	Mackay Walkerston Sarina Alligator Creek Freshwater Point Sarina Beach Armstrong Beach Grasstree Beach Hay Point
	Mackay Bores			
	Bally Keel Bore (only in emergency situations)	Bally Keel Bore Treatment Facility	150	
	Sarina Bores (only in emergency situations)	Sarina Bores Treatment Facility	300	
Marian	Marian Weir (Pioneer River)	Marian Water Treatment Plant	510	Marian Mirani
	Marian Bores (only in emergency situations)	Marian Bores Treatment Facility	95	
	Mirani Bore (only in emergency situations)	Mirani Bore Treatment Facility	100	
Midge Point	Crystal Brook Bores (Proserpine River)	Midge Point Treatment Facility	2700	Midge Point Laguna Quays

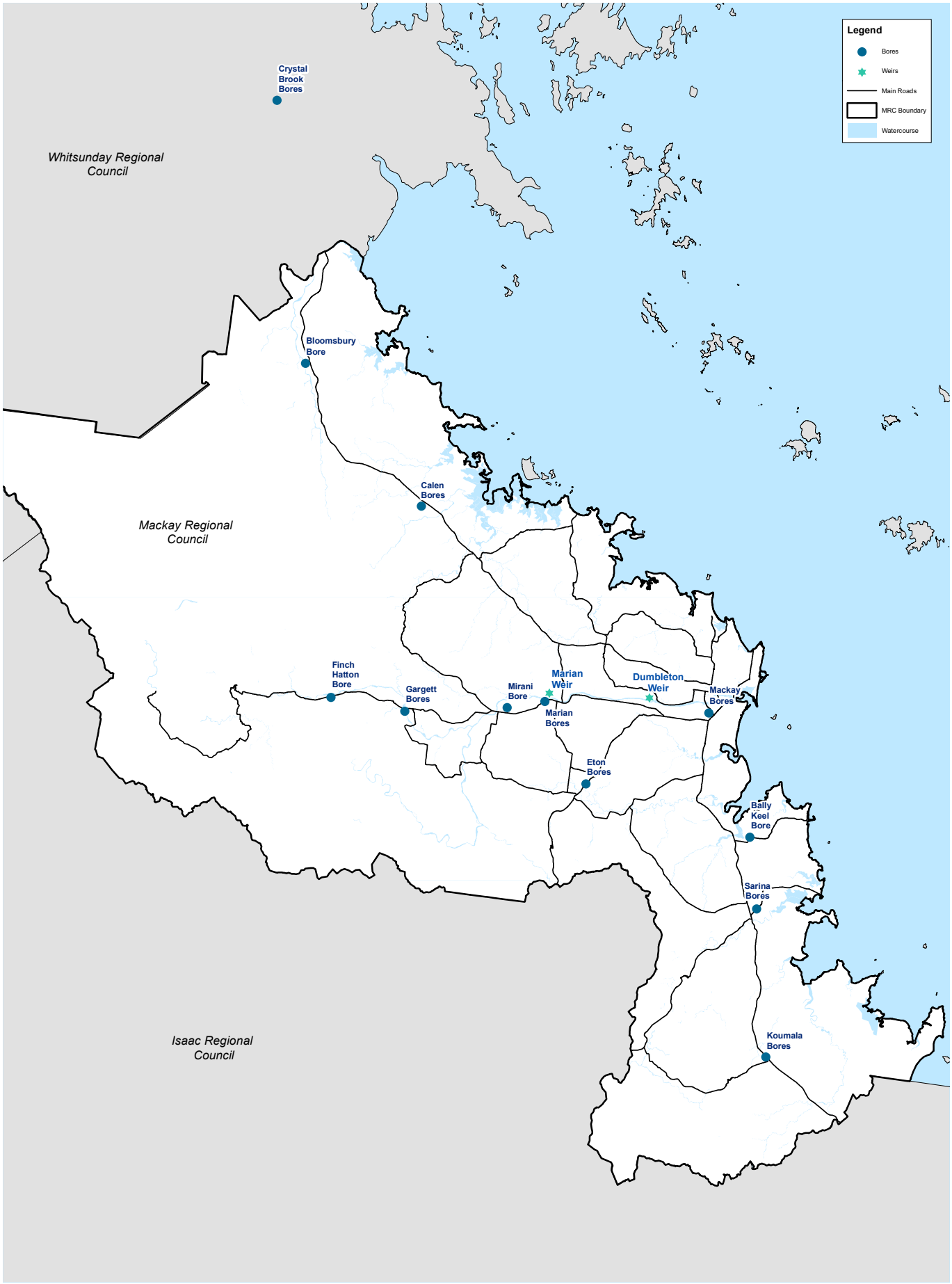


Figure 2 - 1 Currently utilised water source locations

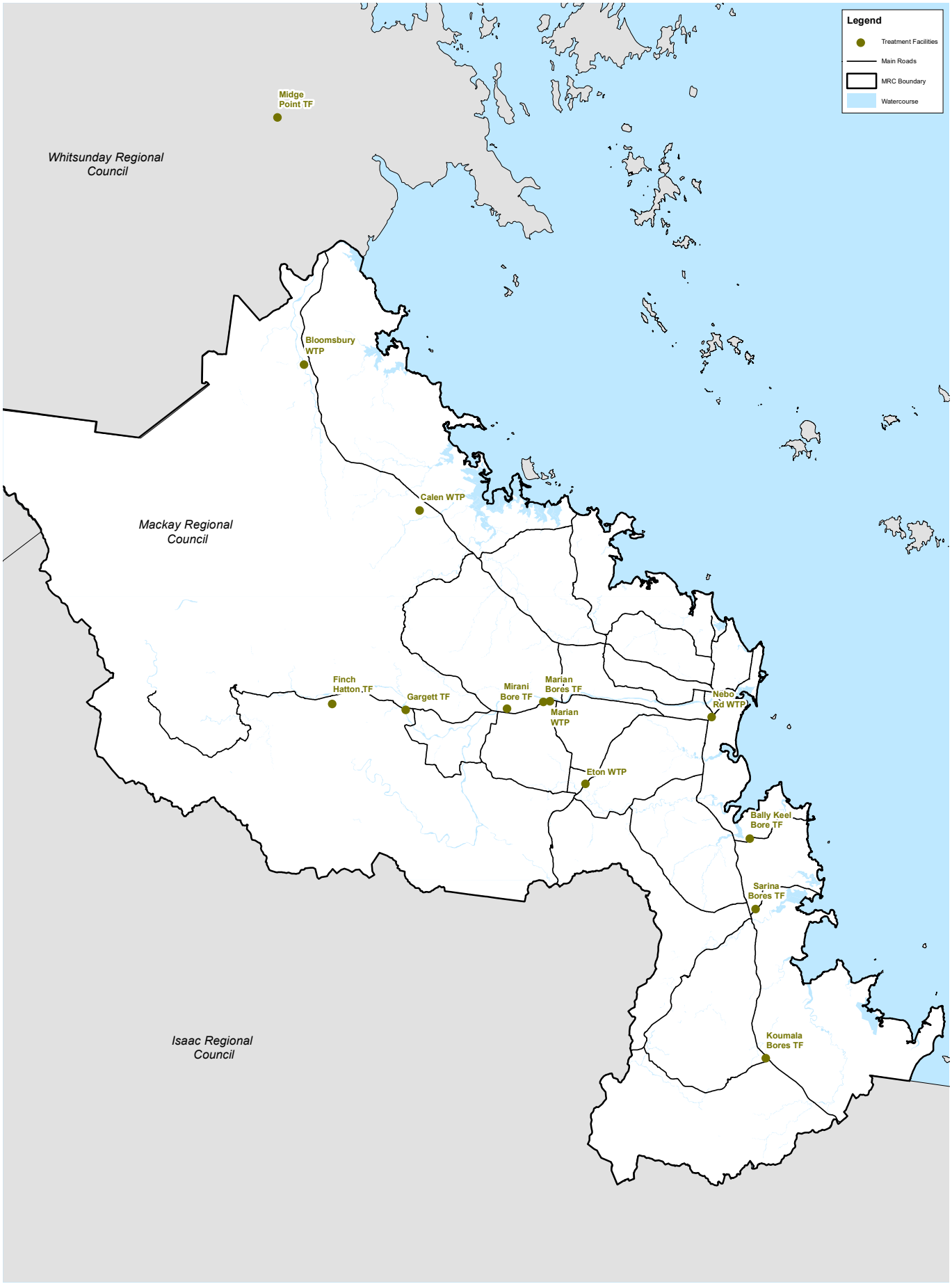


Figure 2 - 2 Operational primary water treatment facility locations

3. SOURCE WATER

3.1 SOURCE WATER USE

Mackay Regional Council's main sources of water are from the Dumbleton and Marian Weirs. These weirs are located on the Pioneer River and are owned and operated by SunWater. Council sources water from Dumbleton and Marian weirs under agreements / supply contracts with SunWater which are subject to announced allocations set by SunWater. All other sources of water for council's drinking water supply schemes come from groundwater bores. Council generally has authority to take water from these groundwater bores through water licences or water allocations set by the Department of Regional Development, Manufacturing and Water (RDMW). Council has authorisation to take water from groundwater bores located on the banks of Cattle Creek (Gargett Bores) and Proserpine River (Midge Point Crystal Brook Bores) through SunWater supply contracts.

The consumption and maximum volume of water available (under water licence/allocation) for Mackay Regional Council water sources for the FY 2021 – 2022 are shown in Figure 3 - 1. In addition, 4.32 ML of water was trucked into Bloomsbury in 2021 – 2022 from Mackay and Marian.

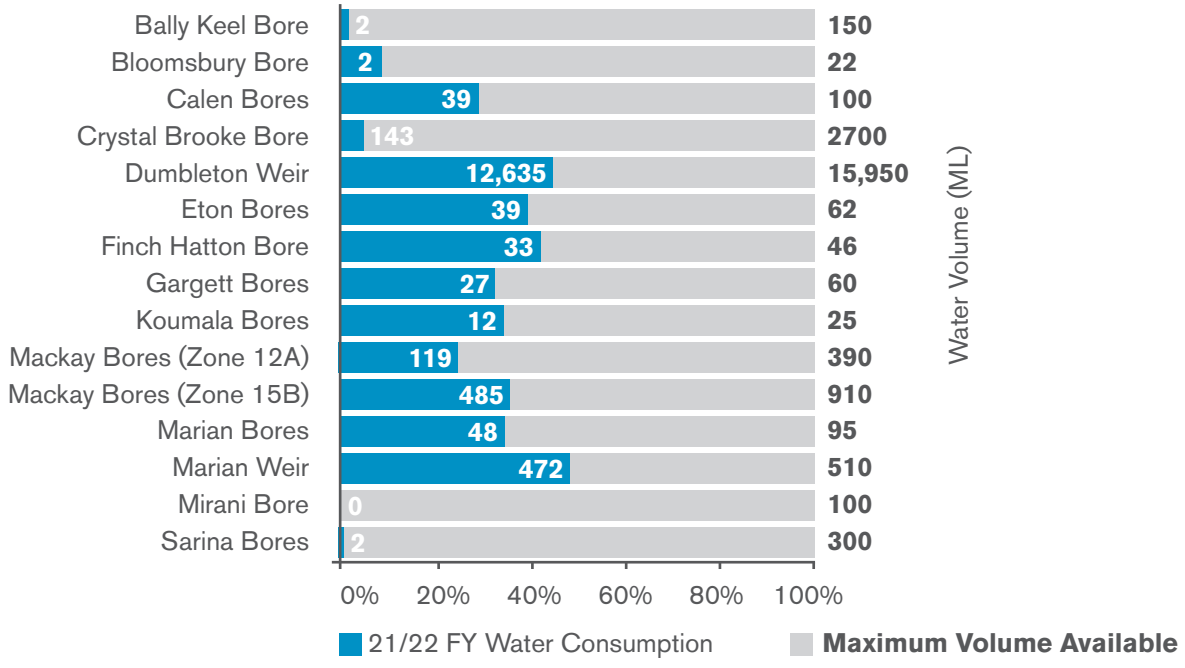


Figure 3 - 1 Water source consumption and maximum volume available for FY 2021 - 2022

3.2 SOURCE WATER QUALITY

Mackay Regional Council undertakes an extensive water sampling and analysis program to monitor water quality for its raw water sources. The raw water monitoring requirements are captured in the operating monitoring component of the drinking water monitoring program. The program adequately assesses the quality of source waters and helps to identify any issues that could affect the drinking water supply. The parameters routinely monitored within the raw water sources are detailed in Table 3 - 1. Key water quality parameters are further discussed in the sections below.

Table 3 - 1 Parameters routinely monitored in raw water sources

MICROBIOLOGICAL	PHYSICAL	CHEMICAL
E. coli	Temperature	Alkalinity
Total Coliforms	pH	Chlorophyll-a**
Heterotrophic Plate Count	Conductivity	Anions and Cations
*Enterococci**	Turbidity	Semi Volatile Organic Compounds (SVOCs)
Algae (incl. cyanobacteria)**	Dissolved Oxygen	Total Metals
	Colour - True	Nutrients (e.g. Ammonia, NOx, Ortho-Phosphate)
	Total Organic Carbon	

* for surface water sources only
** for Pioneer River water sources only

3.2.1 Turbidity

Turbidity is a measure of the light-scattering property of water caused by the presence of fine suspended matter such as clay, silt, plankton and other microscopic organisms. The turbidity of surface waters increases during wet weather when particles from the soil surface are washed into waterways and waterway bed sediment is re-suspended.

An increase in turbidity for raw surface water sources for Nebo Road Water Treatment Plant (WTP) and Marian WTP (i.e. water taken from weirs along the Pioneer River) was noted in FY 2021 – 2022 during wet weather events. When the turbidity in the raw surface water source for Nebo Road WTP reaches a certain level, it is difficult to treat the water. In these instances, Nebo Road WTP switched to using the Mackay bores as the raw water source. When the turbidity in the raw surface water source for Marian WTP reaches levels difficult to treat operators have the option to temporarily shut down the WTP and instead supply the reticulation with water from the Marian Bores and/or Mirani Bore treatment facilities.

3.2.2 Cyanobacteria

Cyanobacteria (blue-green algae) occurs in all natural waters and becomes a problem only when present in excessive numbers (blooms). Blooms are likely to occur when temperatures are high, with long sunny days, high levels of plant nutrients in the water, low stream flows, and calm conditions that permit the cells to migrate to the surface. In addition, eutrophication (nutrient enrichment) associated with increased agriculture and urbanisation can increase the occurrence of cyanobacterial blooms. Dumbleton and Marian Weir, located along the Pioneer River, occasionally experience blue green algae blooms. Council undertakes regular monitoring of blue-green algae in Nebo Road WTP Raw River Water and Marian WTP Raw Water samples which represent raw water sourced from these weirs.

Concentrations of blue-green algae (cyanobacteria total cells) for FY 2021 – 2022 are graphed in Figure 3 - 2. Cyanobacteria total cell results for Nebo Rd WTP Raw River Water were generally less than 1000 cells/mL (similar to those for FY 2020 – 2021 and FY 2019 – 2020), except for May 2022 where there was a small increase to 1947 cells/mL. The results did not indicate blue-green algae blooms occurred at Dumbleton Weir. Cyanobacteria total cell results for Marian WTP Raw Water indicate there was a significant bloom in October 2021, with results reaching 689,423 cells/mL. A bloom also occurred in October of the previous year. There were other results above 1000 cells/mL detailed in the table below.

Table 3 - 1 Parameters routinely monitored in raw water sources

MONTH	CYANOBACTERIAL TOTAL CELL RESULT (CELLS/ML)
October 2021	689,423
January 2022	1,020
April 2022	2,333
May 2022	3,484

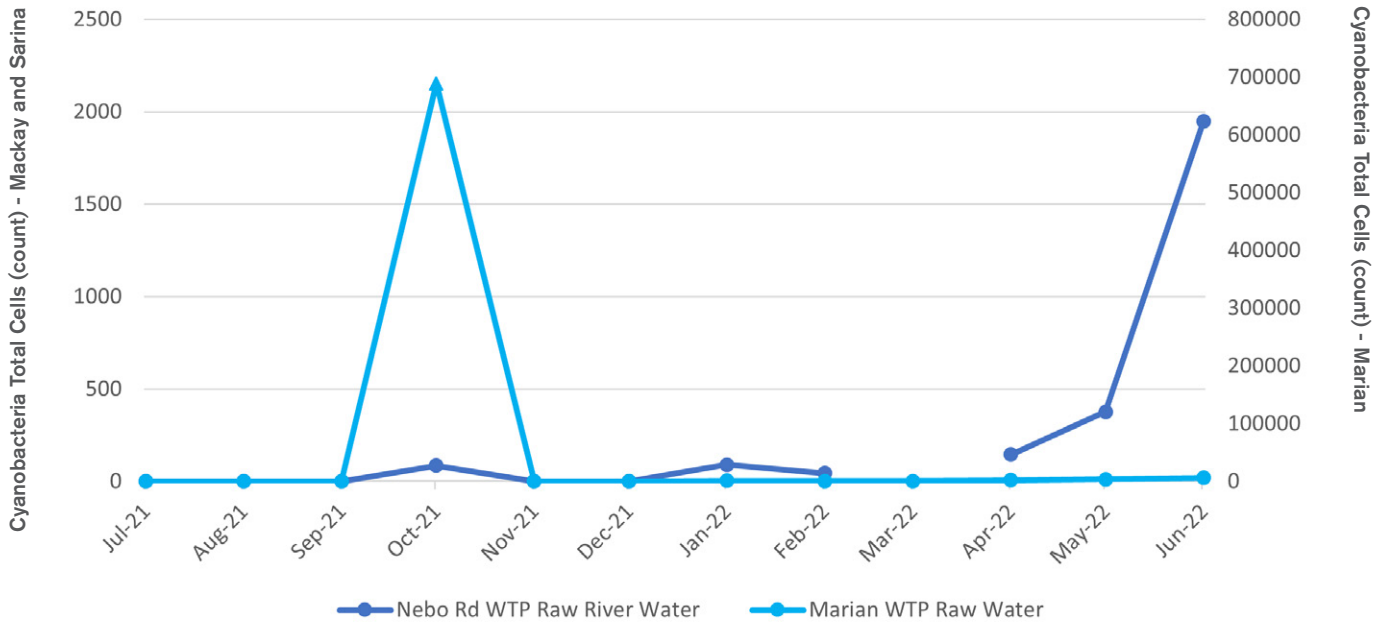


Figure 3 - 2 Raw water cyanobacteria results FY 2021 – 2022

3.2.3 Semi Volatile Organic Compounds

A large portion of the council area is utilised for sugarcane agriculture. The application of herbicides and pesticides as part of sugarcane cultivation is common practice. The potential for herbicides and pesticides to flow into waterways or leach into aquifers has been identified as a drinking water risk. Council undertakes regular Semi Volatile Organic Compound (SVOC) monitoring across source water and treated water samples. The parameters which form part of the SVOC analytical suite are detailed in Table 3 - 3. This analytical suite covers a range of herbicides and pesticides which are used in the Mackay region.

Table 3 - 3 Semi Volatile Organic Compounds (SVOCs)

2.3.4.6-tetrachlorophenol	Anthracene	Dinoseb	Naphthalene
2.4.5-Trichlorophenol	Atrazine	Diuron	Naphthalene, 1-methyl-
2.4.6-Trichlorophenol	Azinphos methyl	Endosulphan alpha	Naphthalene, 2-methyl-
2.4-Dichlorophenol	Benz(a)anthracene	Endosulphan beta	Omethoate
2.4-Dimethylphenol	Benzo(a)pyrene	Endosulphan Sulphate	Pentachlorophenol
2.4-Dinitrophenol	Benzo(b)fluoranthene	Endrin	Phenanthrene
2.6-Dichlorophenol	Benzo(g.h.i)perylene	Endrin aldehyde	Phenol
2-Chlorophenol	Benzo(k)fluoranthene	Endrin ketone	Pirimiphos methyl
2-Methylphenol	Beta-BHC	Ethion	Profenofos
2-Nitrophenol	Bromacil	Fluoranthene	Prometryn
3- & 4-Methylphenol	Caffeine	Fluorene	Propazine
4.4`.DDD	Chlordane cis	Heptachlor	Propyzamide
4.4`-DDE	Chlordane trans	Heptachlor Epoxide	Prothiofos
4.4`-DDT	Chlorpyrifos	Hexazinone	Pyrazophos
4.6-Dinitro-2-methylphenol	Chrysene	Indeno(1.2.3.cd)pyrene	Pyrene
4-Chloro-3-Methylphenol	delta-BHC	Lindane	Simazine
4-Nitrophenol	Demeton-S-methyl	Malathion	Tebuthiuron
Acenaphthene	Diazinon	Methamidophos	Terbutryn
Acenaphthylene	Dibenz(a.h)anthracene	Methidathion	Tolclofos-methyl
Aldrin	Dichlorvos	Methoxychlor	Trifluralin
Alpha-BHC	Dieldrin	Metolachlor	
Ametryn	Dimethoate	Metribuzin	

During FY 2021 - 2022 SVOCs were detected at times in the Nebo Road WTP and Marian WTP Raw Water source waters samples. The SVOCs detected were Atrazine, Diuron and Hexazinone. As shown in Table 3 - 4 and Table 3 - 5 below the levels detected in the Nebo Road WTP Raw River and Marian WTP Raw Water source waters samples were all well below the Australian Drinking Water Guidelines (ADWG) health values. Note that these guideline values are not actually applicable to raw water samples and only apply to verification monitoring sample points (i.e., treated water, reticulation or reservoir sample points).

Table 3 - 4 Marian WTP Raw Water SVOC results FY 2021-2022

SAMPLE POINT	MONTH	ATRAZINE (µg/L)	DIURON (µg/L)
Marian WTP Raw Water	Jul-21	<0.0001	<0.0001
	Aug-21	<0.0001	<0.0001
	Sep-21	<0.0001	<0.0001
	Oct-21	<0.0001	<0.0001
	Nov-21	<0.0001	<0.0001
	Dec-21	<0.0001	<0.0001
	Jan-22	0.3579-0.5685	<0.0001-0.2038
	Feb-22	<0.0001	<0.0001
	Mar-22	<0.0001	<0.0001
	Apr-22	<0.0001	<0.0001
	May-22	<0.0001	<0.0001
	Jun-22	<0.0001	<0.0001
	ADWG HEALTH VALUE	≤20	≤20

Table 3 - 5 Nebo Road WTP Raw Water SVOC results FY 2021-2022

SAMPLE POINT	MONTH	ATRAZINE (µg/L)	DIURON (µg/L)	HEXAZINONE (µg/L)
Nebo Road WTP Raw Water	Jul-21	<0.0001	<0.0001	<0.0001
	Aug-21	<0.0001	<0.0001	<0.0001
	Sep-21	<0.0001	<0.0001	<0.0001
	Oct-21	<0.0001	<0.0001	<0.0001
	Nov-21	<0.0001 – 0.6935	<0.0001- 0.714	<0.0001
	Dec-21	0.4083-2.5967	0.5183-2.1498	<0.0001-0.9031
	Jan-22	<0.0001 -2.6078	0.3262-1.8943	<0.0001
	Feb-22	0.1349	<0.0001	<0.0001
	Mar-22	<0.0001	<0.0001	<0.0001
	Apr-22	<0.0001	<0.0001	<0.0001
	May-22	<0.0001	<0.0001	<0.0001
	Jun-22	<0.0001	<0.0001	<0.0001
	ADWG HEALTH VALUE	≤20	≤20	≤400

During FY 2021 - 2022 no SVOC's were detected in the treated water from Marian WTP. For the same period, there were some SVOCs detected in the Nebo Road WTP treated water. Atrazine was detected in Nebo Rd treated water samples during FY 2021-2022 (two event and one routine sample). As shown in Table 3 - 6 the levels detected in the Nebo Road WTP waters samples were all well below the Australian Drinking Water Guidelines (ADWG) health values.

Table 3 - 6 Nebo Road WTP Water SVOC results FY 2021-2022

SAMPLE POINT	MONTH	ATRAZINE (µg/L)
Nebo Road WTP	Jul-21	<0.0001
	Aug-21	<0.0001
	Sep-21	<0.0001
	Oct-21	<0.0001
	Nov-21	<0.0001 – 0.2606
	Dec-21	<0.0001 –0.7729
	Jan-22	<0.0001 –0.2832
	Feb-22	<0.0001
	Mar-22	<0.0001
	Apr-22	<0.0001
	May-22	<0.0001
	Jun-22	<0.0001
	ADWG HEALTH VALUE	≤20

4. WATER TREATMENT

4.1 MACKAY AND SARINA TREATMENT

4.1.1 Mackay and Sarina Water Supply Scheme History

Previous DWQMP reports have split out Mackay and Sarina into separate water supply schemes. Historically Mackay was a standalone scheme which supplied the communities of Mackay and Walkerston with water from the Nebo Road WTP. Sarina was also historically a standalone scheme which supplied the communities in the Sarina region with water from the Sarina WTP and a number of rural groundwater bores.

In 2006, a pipeline connecting the Mackay scheme to the Sarina scheme at Alligator Creek was constructed by the then Sarina Shire Council. The pipeline's purpose was to provide an alternate water source for water security purposes e.g. during drought and poor water quality. The pipeline was commissioned but never used.

In 2015 the pipeline was recommissioned after reviewing the best way to provide water for Sarina from a cost, quality, and water security perspective.

There was insufficient surface water allocation in Plane Creek Weir to be able to economically run the Sarina Mt Blarney WTP, and the plant was in need of significant upgrades to meet ADWG. It was therefore decided in 2017 to end use of the Sarina WTP. The plant and raw water pump station are due to be fully decommissioned by 2025.

The pipeline provides all the water to Sarina with only the Bally Keel and Sarina Bores used as emergency backup and the Marwood bores decommissioned.

As the Nebo Road WTP supplies both Mackay and Sarina it was decided to combine the two schemes into the one water supply scheme.

4.1.2 Nebo Road Water Treatment Plant

The Nebo Road Water Treatment Plant (WTP) is located approximately three kilometres to the south-west of the Mackay CBD on land adjoining the Mackay Regional Botanic Gardens. It is council's largest WTP. The WTP has the design capacity to treat 75 ML of water per day. The plant treats raw water sourced from the Dumbleton Weir on the Pioneer River and water from groundwater bores located in close proximity to the plant. In FY 2021-2022 approximately 95 per cent of the water was sourced from the weir. The remaining 5 per cent was sourced from bores. Water from the Nebo Road WTP supplies the Mackay and Sarina water supply scheme. The treatment process used at Nebo Road WTP is shown in Figure 4 - 1.

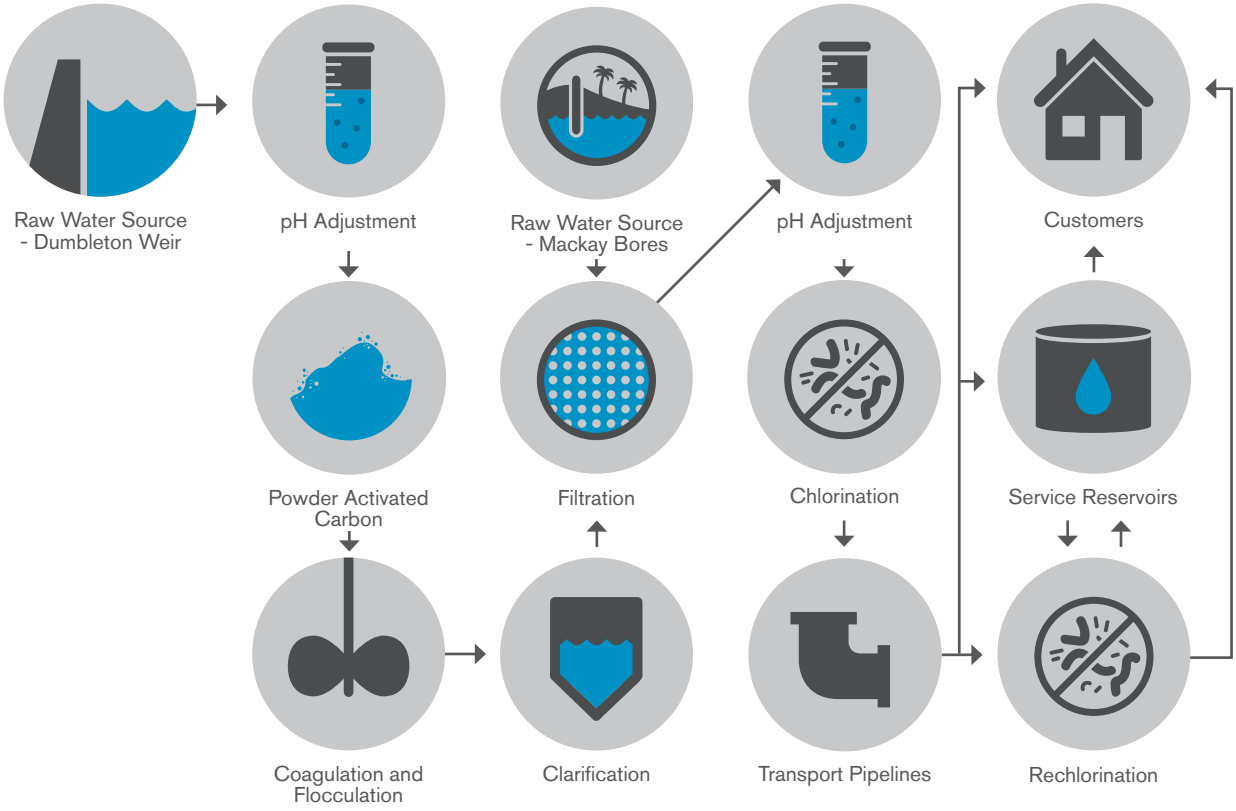


Figure 4 - 1 Water supply process from raw water source to Nebo Road WTP to customers' taps

4.1.3 Bally Keel Bore and Sarina Bores Treatment

The only treatment for the Bally Keel Bore and Sarina Bores is disinfection. The treatment processes for Bally Keel Bore and Sarina Bores treatment facilities are shown in Figure 4 - 2 and Figure 4 - 3.

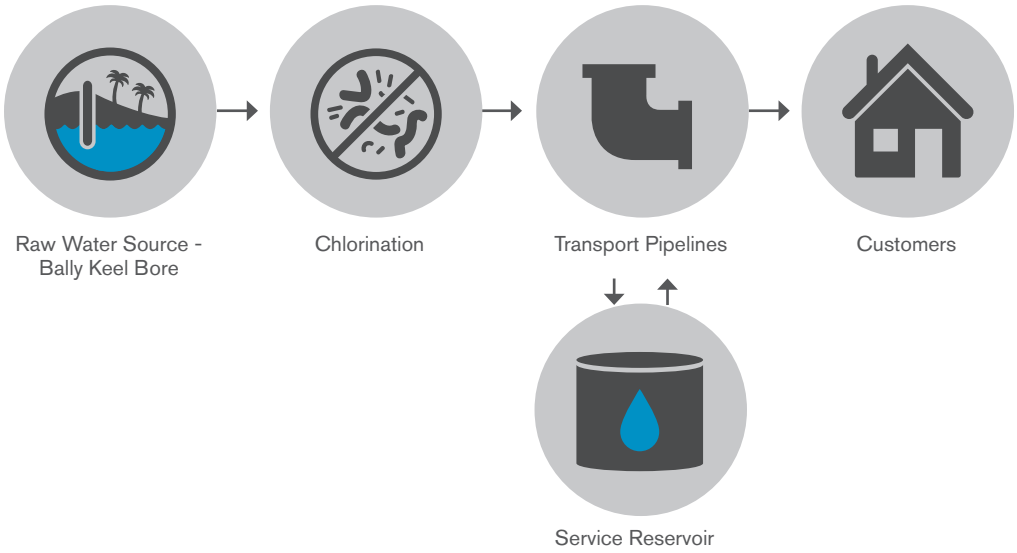


Figure 4 - 2 Water supply process from raw water source to Bally Keel Bore Treatment Facility to customers' taps

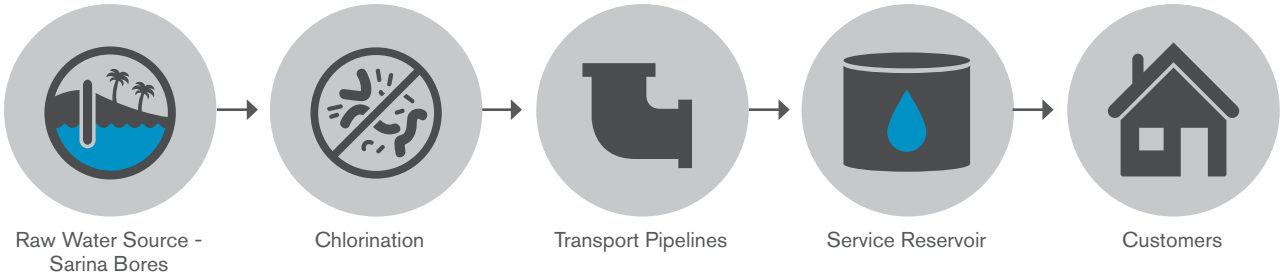


Figure 4 - 3 Water supply process from raw water source to Sarina Bores Treatment Facility to customers' taps

4.2 MARIAN TREATMENT

4.2.1 Marian Water Treatment Plant

Marian WTP is located on Anzac Avenue approximately 30 kilometres west of Mackay. The WTP was commissioned in February 2015 and has the capacity to treat 4 ML of water per day. The Marian WTP supplies the townships of Marian and Mirani.

The treatment processes used at Marian WTP are shown in Figure 4 - 4.

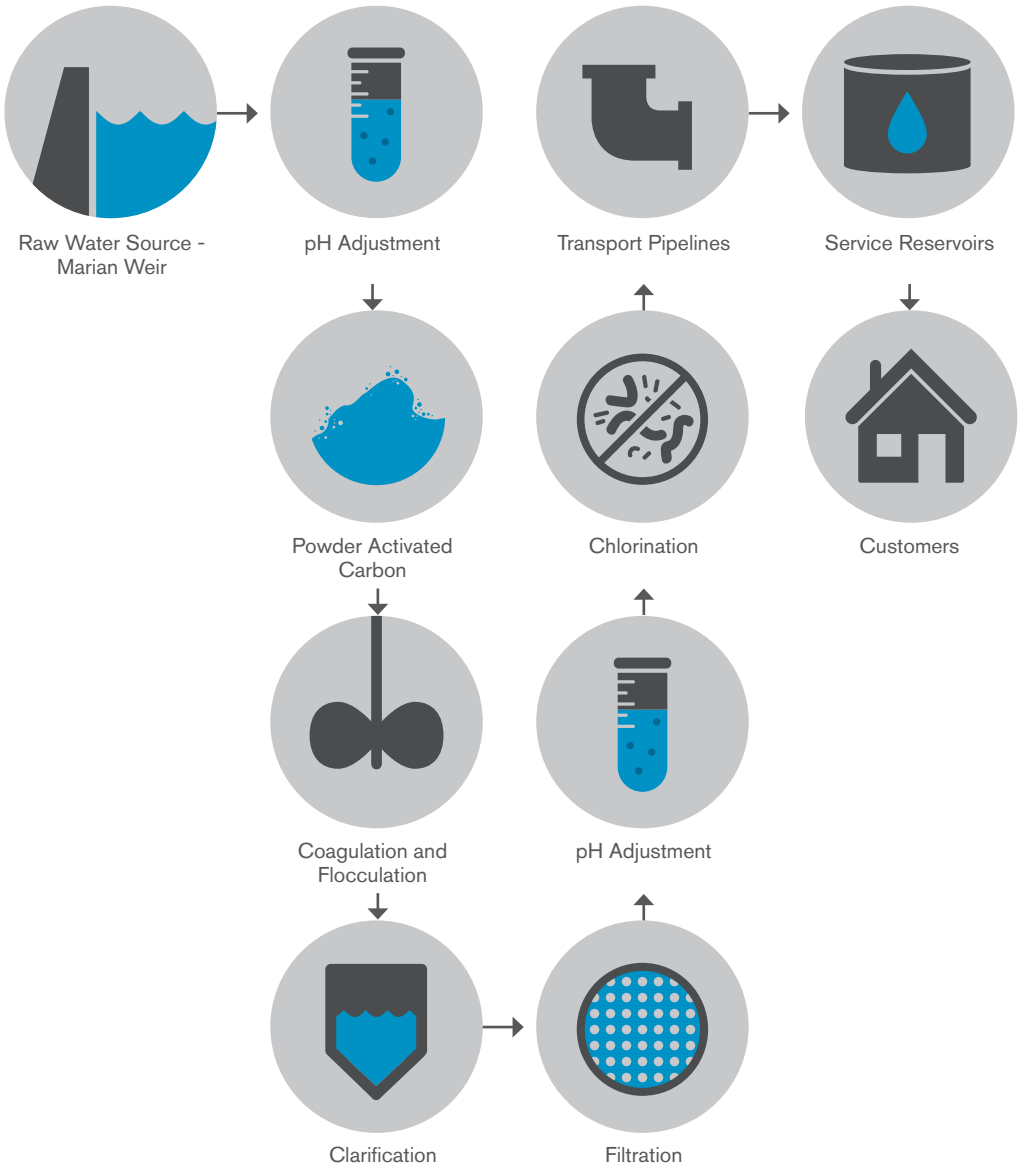


Figure 4 - 4 Water supply process from raw water source to Marian WTP to customers' taps

4.2.2 Marian and Mirani Bores Treatment

Prior to commissioning of the Marian WTP, the sole source of raw water for Marian and Mirani was from groundwater bores. The groundwater bores are now only used as an emergency backup during high demand or event circumstances.

The treatment process for Marian and Mirani bores is shown in Figure 4 - 5 and Figure 4 - 6.

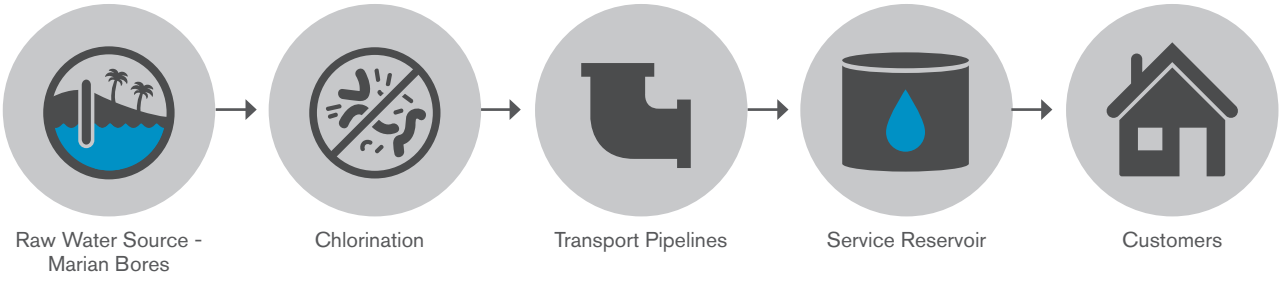


Figure 4 - 5 Water supply process from raw water source to Marian Bores Treatment Facility to customers' taps

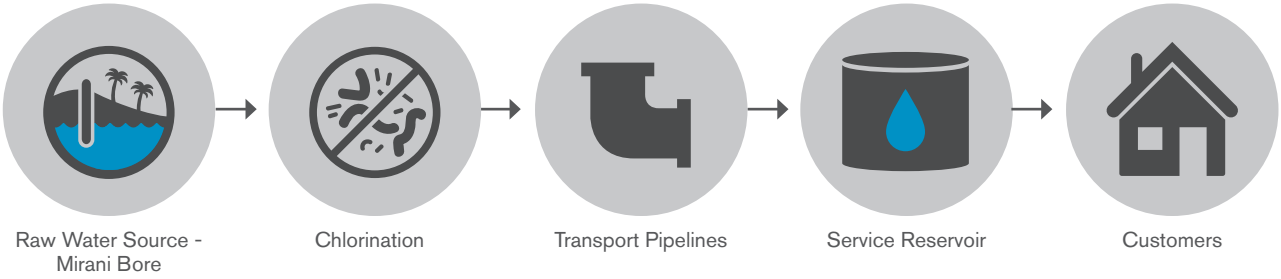


Figure 4 - 6 Water supply process from raw water source to Mirani Bore Treatment Facility to customers' taps

4.3 BLOOMSBURY TREATMENT

The treatment process at Bloomsbury WTP involves chlorination and filtration as shown in Figure 4 - 7.

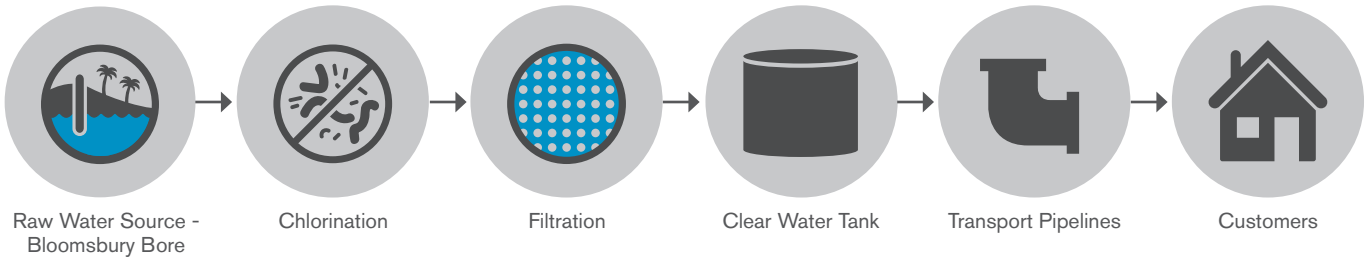


Figure 4 - 7 Water supply process from raw water source to Bloomsbury WTP to customers' taps

4.4 CALEN TREATMENT

The groundwater pumped from the Calen bores may either flow through the ion exchange softener or flow down the softener bypass. The two streams, the softened water and the bypass water, are combined after the softener and undergo chlorination. The treatment process for Calen WTP is shown in Figure 4 - 8.

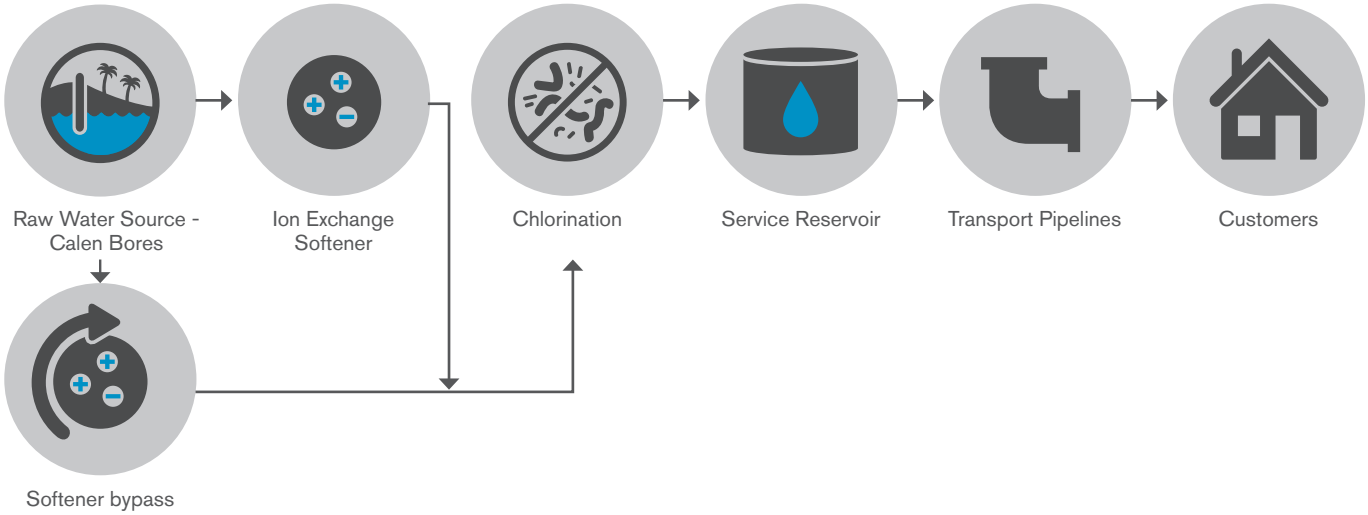


Figure 4 - 8 Water supply process from raw water source to Calen WTP to customers' taps

4.5 ETON TREATMENT

The treatment process for Eton involves chlorination, pH adjustment and the use of an ion exchange softener (see Figure 4 -9).

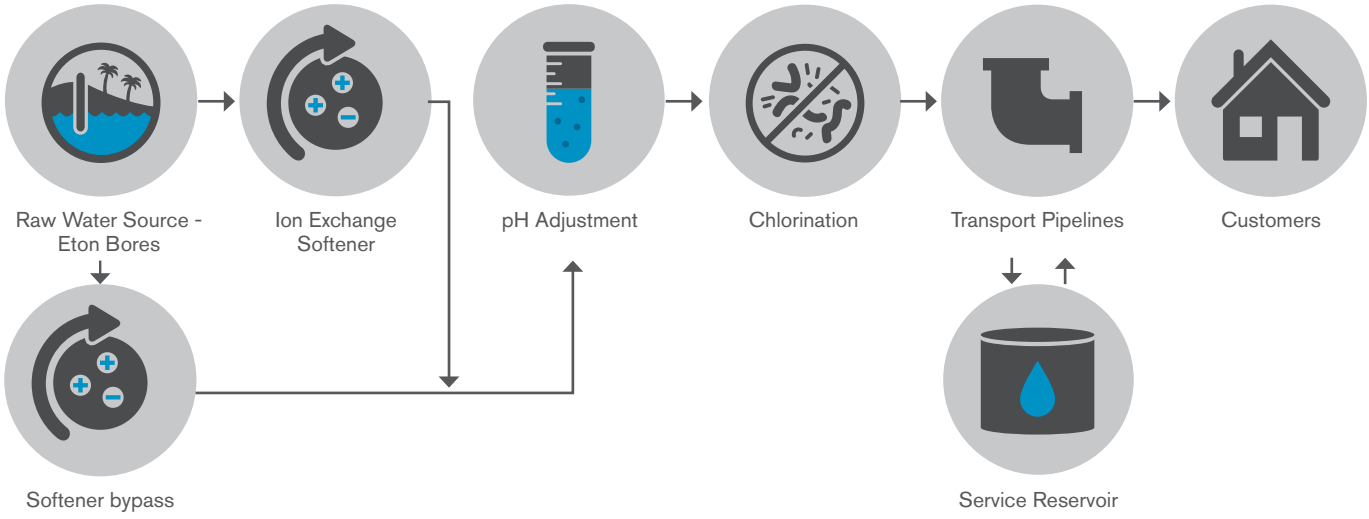


Figure 4 - 9 Water supply process from raw water source to Eton WTP to customers' taps

4.6 FINCH HATTON TREATMENT

Finch Hatton's only treatment process is chlorination as presented in Figure 4 - 10.

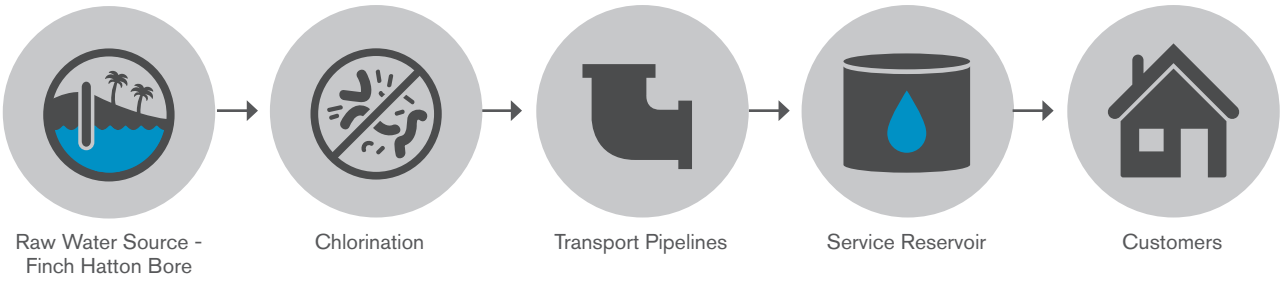


Figure 4 - 10 Water supply process from raw water source to Finch Hatton Treatment Facility to customers' taps

4.7 GARGETT TREATMENT

Gargett's only treatment process is chlorination as presented in Figure 4 - 11.

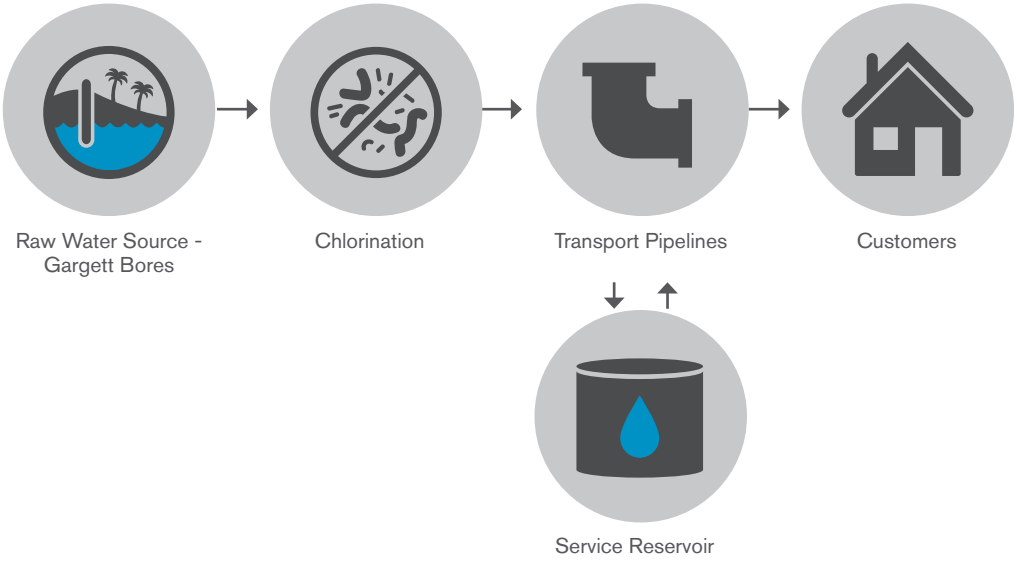


Figure 4 - 11 Water supply process from raw water source to Gargett Treatment Facility to customers' taps

4.8 KOUMALA TREATMENT

Koumala's only treatment process is chlorination as presented in Figure 4 - 12.

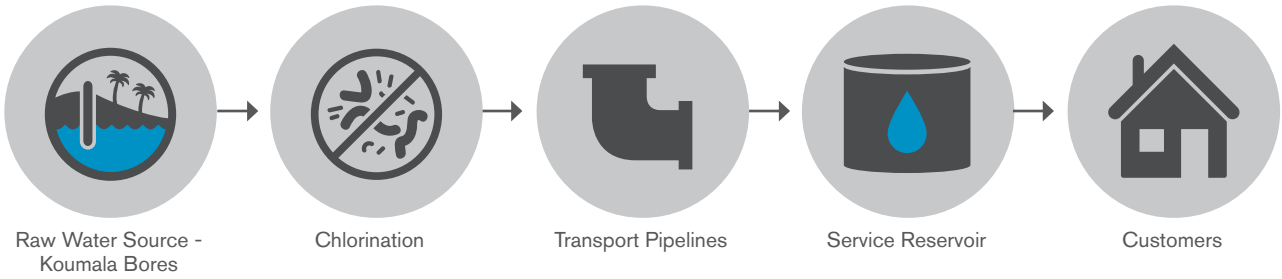


Figure 4 - 12 Water supply process from raw water source to Koumala Treatment Facility to customers' taps

4.9 MIDGE POINT TREATMENT

Midge Point's only treatment process is chlorine gas dosing for disinfection and oxidisation of the iron and manganese in the source water. Figure 4 - 13 provides an overview of the Midge Point treatment process.

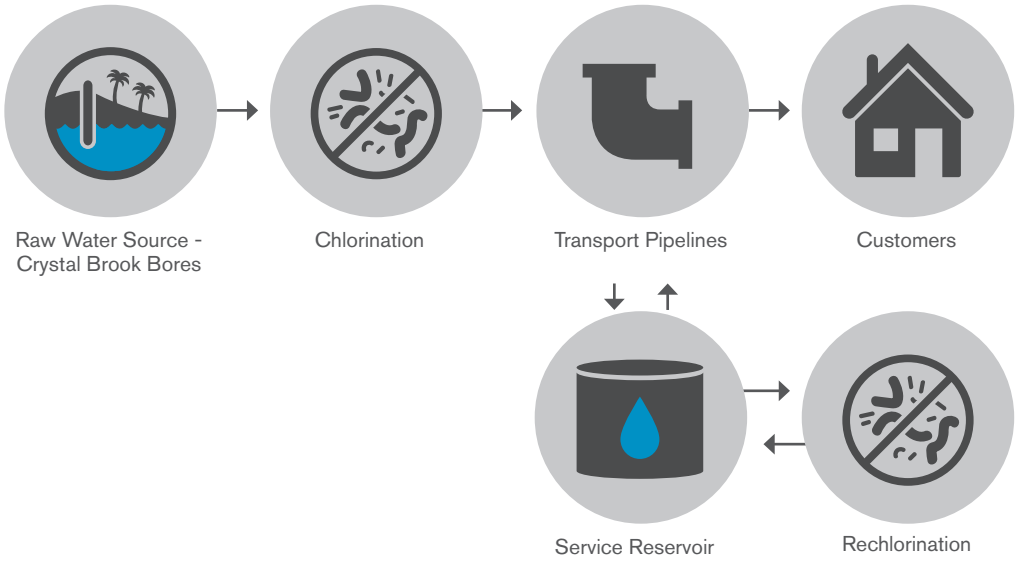


Figure 4 - 13 Water supply process from raw water source to Midge Point Treatment Facility to customers' taps

4.10 WATER TREATMENT PLANT PERFORMANCE

Extensive monitoring of process operations is required to ensure systems are operating within performance limits. Nebo Road WTP, Marian WTP, Bloomsbury WTP, Calen WTP, Eton WTP and a number of council's treatment facilities contain online analysers to enable continuous monitoring of key water quality parameters. This allows changes in water quality to be quickly identified and addressed. In addition, on-site bench tests and regular NATA laboratory monitoring for treated water is performed and involves analysis of a range of parameters including, but not limited to *E. coli*, chlorine, pH, turbidity and colour.

Table 4 - 1 shows a comparison of ADWG values and the average treated water quality values for key parameters at council's WTPs and treatment facilities from laboratory analysis conducted during FY 2021 – 2022. The ADWG includes two different types of guideline values:

- a health value, which is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption
- an aesthetic value, which is the concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer; for example, appearance, taste and odour.

Key treated water quality parameters are further discussed in the sections below.

Table 4 - 1 Average final treated water quality at operational primary water treatment facilities FY 2021 – 2022

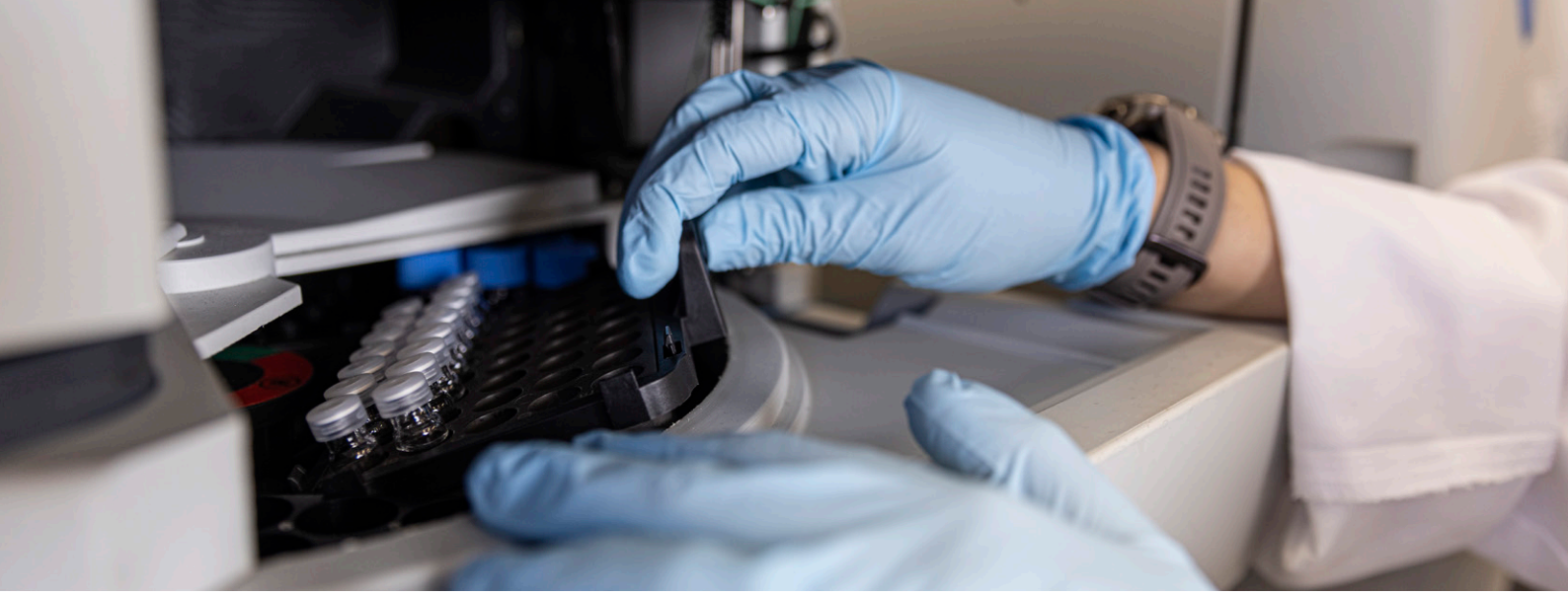
PRIMARY WATER TREATMENT FACILITY*	*E. coli* (MPN/ 100mL)	Free Residual Chlorine (mg/L)	Total Chlorine (mg/L)	pH (pH units)	Turbidity (NTU)	Colour - True (TCU)
ADWG Aesthetic Value	-	-	*≤0.6*	*6.5-8.5*	*≤5*	*≤15*
ADWG Health Value	*0*	-	*≤5*	-	-	-
Nebo Road WTP	<1	1.69	1.79	7.48	0.17	<1
Marian WTP	<1	1.66	1.76	7.46	0.17	<1
Bloomsbury WTP	<1	0.87	0.92	7.74	0.37	<1
Calen WTP	<1	1.09	1.19	7.26	0.15	<1
Eton WTP	<1	1.07	1.17	7.62	0.21	<1
Finch Hatton Treatment Facility	<1	0.85	0.89	7.26	0.13	<1
Gargett Treatment Facility	<1	1.16	1.20	6.84	0.31	<1
Koumala Treatment Facility	<1	1.29	1.36	7.66	0.17	<1
Midge Point Treatment Facility	<1	1.99	2.19	7.14	3.20	1.33

- no current ADWG aesthetic or health guideline value
* final treated water quality for Bally Keel Bore, Sarina Bores Marian Bores and Mirani Bore treatment facilities is not available for FY 2021 – 2022 as treated water samples were not taken due to lack of use.

Mackay Regional Council has in fact been recognised in recent years on a State, National and International level for the great taste of our tap water supplied to customers.

Awards received include:

- Top drop at the 2018 Ixom Best of the Best Queensland Water Taste Test for water from Nebo Road WTP
- Australia's best at the 2019 Ixom Best Tasting Tap Water Competition for water from Marian WTP
- Silver in the municipal water category at the 2020 Berkeley Springs International Water Tasting for water from the Marian WTP
- Top drop at the 2021 Ixom Best of the Best Queensland Water Taste Test for water from Marian WTP.



4.10.1 *E. coli*

Microbiological quality is the most important factor in determining the ongoing safety of water supplies for human consumption. The microbiological indicator bacterium *E. coli* is used as a marker for the presence of faecal contamination and the possible presence of microbiological pathogens.

The ADWG states that *E. coli* should not be detected in any 100 mL sample of drinking water. If detected in drinking water, immediate action should be taken including investigation of potential sources of faecal contamination.

During FY 2021 – 2022 *E. coli* was detected on one occasion in the treated water leaving council's WTPs or treatment facilities. This detection was in a Calen treated water sample. Investigations undertaken showed that during some operational modes, chlorine dosing did not always occur and led to some low chlorine reading at the treatment plant.

4.10.2 Chlorine

All drinking water treated by council's WTPs and treatment facilities is disinfected with chlorine. Chlorine is a common drinking water disinfectant used to kill bacteria and inactivate viruses. The ADWG health guideline for total chlorine is 5 mg/L. The ADWG aesthetic guideline for total chlorine is 0.6 mg/L and is based on an odour threshold.

The average total chlorine for treated water leaving council's WTPs and treatment facilities in FY 2021-2022 ranged from 0.87 mg/L to 1.99 mg/L. The highest average treated water total chlorine for FY 2021-2022 was at Midge Point Treatment Facility. A high target for chlorine is set for a number of council's treatment plants and disinfection facilities so that an effective disinfectant residual is maintained throughout the outer extremities of the distribution network. This protects against recontamination from pipeline breaks and other causes.

4.10.3 pH

The average pH of treated water from council's WTPs and treatment facilities ranged from 6.84 to 7.74 during FY 2021-2022. The ADWG states chlorine disinfection efficiency is impaired above pH 8.0 and that when pH is below 6.5 water may corrode plumbing fitting and pipes.

Sodium hydroxide can be used, if needed, to increase the pH of the river and/or filtered water at Nebo Rd WTP and Marian WTP. Increasing the pH of the river water can help achieve optimum coagulation conditions prior to clarification. Increasing the pH of the filtered water can reduce the corrosivity of the water, improving stability.

4.10.4 Turbidity

Turbidity measures the cloudiness of water caused by fine suspended matter. As a guide, water with a turbidity of 5 NTU appears slightly muddy or milky whilst “crystal-clear” water usually has a turbidity of less than 1 NTU.

Continuous monitoring of turbidity at Nebo Road WTP and Marian WTP is undertaken and is used as an indicator of filter performance. Filtration is an essential part of the treatment process at Nebo Road WTP and Marian WTP as it is the last physical solids removal step in the treatment train, thus it is important for removing contaminants such as pathogens which are resistant to chlorine such as Giardia and Cryptosporidium cysts.

The ADWG states “Where filtration alone is used as the water treatment process to address identified risks from Cryptosporidium and Giardia, it is essential that filtration is optimised and consequently the target for the turbidity of water leaving individual filters should be less than 0.2 NTU, and should not exceed 0.5 NTU at any time”. During FY 2021 – 2022 the average turbidity of treated water from Nebo Road WTP and Marian WTP was 0.17 NTU for both sites.

4.11 WATER PRODUCTION

The volume of water produced during FY 2021 – 2022 across council’s WTPs and treatment facilities is presented in Table 4 2. The majority of the water produced in FY 2021 - 2022 (12,300 ML or 94 per cent) was produced by Nebo Road WTP.

Table 4 - 2 Water production volumes FY 2021 - 2022

SCHEME	TREATMENT FACILITY	WATER PRODUCED (ML)
Bloomsbury	Bloomsbury WTP	5
Calen	Calen WTP	29
Eton	Eton WTP	38
Finch Hatton	Finch Hatton Treatment Facility	33
Gargett	Gargett Treatment Facility	27
Koumala	Koumala Treatment Facility	4
Mackay and Sarina	Nebo Road WTP	12,300
	Bally Keel Bore Treatment Facility	2
	Sarina Bores Treatment Facility	2
Marian	Marian WTP	477
	Marian Bores/Mirani Bore Treatment Facilities	48
Midge Point	Midge Point	143

5. THE RETICULATION NETWORK

Mackay Regional Council operates and maintains 40 service reservoirs, 36 water pump stations and over 1200 kilometres of water pipelines within the reticulation network. This infrastructure is maintained and closely monitored to ensure the community receives high quality drinking water at their tap. Ensuring safe and aesthetically pleasing water is delivered to customers is a priority for council.

5.1 DISINFECTION IN THE RETICULATION NETWORK

Re-chlorination systems are implemented within Mackay Regional Council's Mackay and Sarina and Midge Point reticulation networks to ensure that disinfection of drinking water is maintained and safe drinking water is supplied to customers. Re-chlorination systems are set up at locations within the reticulation network where historical water quality data has provided evidence of low-to-nil free chlorine residual in the drinking water. The presence of free chlorine residual in drinking water indicates that the water has been fully disinfected. Lack of or low free chlorine residual increases the risk to consumers if contamination does occur, as the water does not have the capacity to disinfect additional contamination. Re-chlorination systems are operated to ensure the free chlorine residual in the drinking water is maintained at a level which confirms full disinfection to the extremities of the water network. The average free chlorine residual recorded in each reticulation network for FY 2021-2022 is presented in Figure 5 - 1.

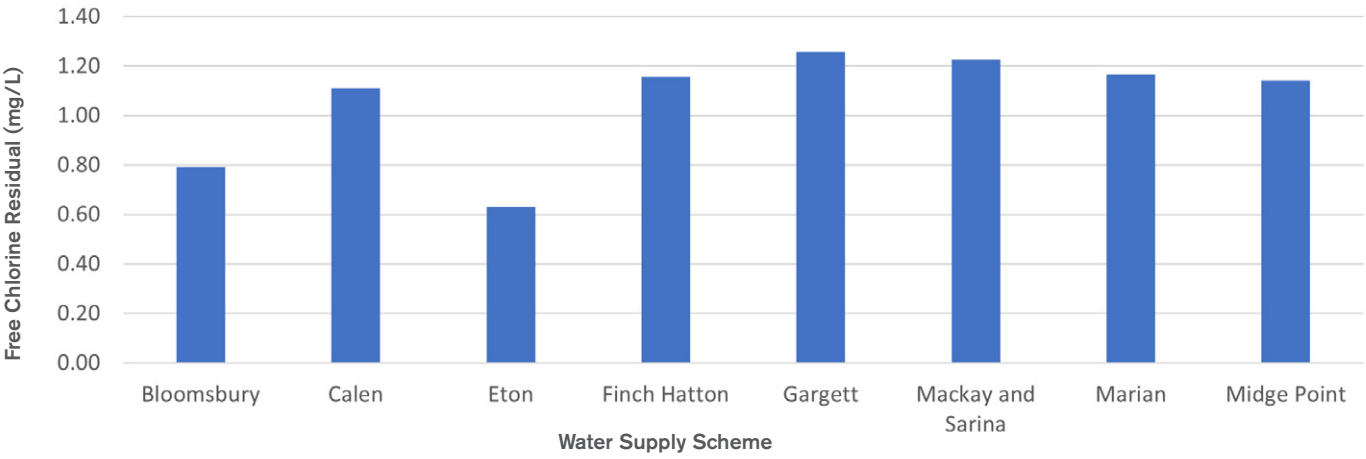


Figure 5 - 1 Average free chlorine residual FY 2021-2022

5.2 MONITORING WATER QUALITY IN TREATED WATER, RESERVOIRS AND THE RETICULATION NETWORK

As part of council's commitment to providing high quality water to the community, council undertakes a comprehensive drinking water monitoring program. During FY 2021 – 2022, 57 drinking water sites located across treated water, reservoir and reticulation networks for all nine of council's drinking water schemes were sampled. Designated sample taps and boxes have been installed for the majority of the drinking water sites (see Figure 5 - 2). Samples collected from treated water, reservoirs and reticulation networks as part of the drinking water monitoring program are analysed for a range of microbiological, chemical and physical parameters as detailed in Table 5 - 1. Results for all parameters monitored throughout council's treated water, reservoirs and reticulation networks in FY 2021 – 2022 are discussed in Section 6.

Figure 5 - 2 Water sample box

Table 5 - 1 Parameters routinely monitored in council's treated water, reservoirs and reticulation networks

MICROBIOLOGICAL	PHYSICAL	CHEMICAL
E. coli	Temperature	Alkalinity
Total Coliforms	pH	Anions and Cations
Heterotrophic Plate Count	Conductivity	Total Metals
Cyanobacteria*	Turbidity	Trihalomethanes
	Dissolved Oxygen	Oxyhalides
	Colour - True	Semi Volatile Organic Compounds (SVOCs)
	Free Chlorine Residual	
	Total Chlorine	
	Total Organic Carbon	

* for Nebo Road WTP and Marian WTP treated water only

6. VERIFICATION MONITORING

The purpose of drinking water verification monitoring is to assess that the barriers and preventive measures implemented to safeguard public health are working effectively. Verification monitoring confirms water quality at the point of supply, compliance with water quality criteria and identifies deficiencies in existing preventative or control measures.

Council's verification monitoring requirements are captured in the drinking water monitoring program included as an appendix to the DWQMP. Council's NATA accredited laboratory (MRC Laboratory) arranges for the collection and analysis of drinking water samples required as part of the verification monitoring program. Except for cyanobacteria (which is analysed by Ecoscope), all verification monitoring analysis is undertaken by MRC Laboratory.

The results of council's verification monitoring during the FY 2021 - 2022 reporting period are summarised below. A detailed data report in an excel format is provided in Enclosure 1 to this report.

6.1 MICROBIOLOGICAL COMPLIANCE

Testing for *E. coli* as part of the verification monitoring program allows for assessment against drinking water standards outlined in the *Public Health Regulation 2005*. The *Public Health Regulation 2005* requires that 98 per cent of samples taken in a 12 month period should contain no *E. Coli*. This requirement is referred to as the 'annual value' in Schedule 3A of the regulation.

All of council's drinking water supply schemes in the FY 2021 – 2022 met the required annual value as shown in Table 6 - 1. The annual value calculation sheets for each scheme have been supplied in Appendix 1.

Table 6 - 1 Rolling 12 month annual value E. coli compliance FY 2021 – 2022

MONTH	% of samples which comply with the nil *E. coli* standard								
	BLOOMSBURY	CALEN	ETON	FINCH HATTON	GARGETT	KOUMALA	MACKAY AND SARINA	MARIAN	MIDGE POINT
July - 21	100%	100%	100%	100%	100%	100%	99.9%	100%	99.2%
August - 21	100%	100%	100%	100%	100%	100%	99.9%	100%	99.2%
September - 21	100%	100%	100%	100%	100%	100%	99.9%	100%	99.2%
October - 21	100%	100%	100%	100%	100%	100%	99.9%	100%	99.2%
November - 21	100%	100%	100%	100%	100%	100%	99.9%	100%	99.2%
December - 21	100%	98.1%	100%	100%	100%	100%	100%	100%	99.2%
January - 22	100%	98.1%	100%	100%	100%	100%	100%	100%	100%
February - 22	100%	98.1%	100%	100%	100%	100%	100%	100%	100%
March - 22	100%	98.1%	100%	100%	100%	100%	100%	100%	100%
April - 22	100%	98.1%	100%	100%	100%	100%	100%	100%	100%
May - 22	100%	98%	100%	100%	100%	100%	100%	100%	100%
June - 22	100%	98%	100%	100%	100%	100%	100%	100%	100%

6.2 ADWG COMPLIANCE

Table 6-2 below provides the results of the assessment of water quality data from the verification monitoring undertaken between July 1, 2021 and June 30, 2022 against ADWG health and aesthetic guideline values. A breakdown of ADWG health and aesthetic guideline value exceedances (excluding dissolved oxygen and total chlorine exceedances) per water supply scheme is provided in Figure 6 - 1 and Table 6 - 3.

Table 6 - 2 Results of the assessment of water quality data - summary

SCHEME	NUMBER OF SAMPLES COLLECTED	NUMBER OF ANALYSES PERFORMED	NUMBER OF INDIVIDUAL ADWG HEALTH GUIDELINE VALUE EXCEEDANCES	NUMBER OF INDIVIDUAL ADWG AESTHETIC GUIDE-LINE VALUE EXCEEDANCES*
Bloomsbury	43	1,425	0	0
Calen	55	2,574	1	0
Eton	96	2,561	0	46
Finch Hatton	25	649	0	1
Gargett	39	1,730	0	1
Koumala	28	1,411	0	24
Mackay and Sarina	1346	39,257	2	18
Marian	303	15,935	1	3
Midge Point	344	12,492	22	62

* not including Dissolved Oxygen or Total Chlorine exceedances

Table 6 - 3 Results of the assessment of water quality data – exceedance breakdown

	NUMBER OF INDIVIDUAL ADWG HEALTH GUIDELINE VALUE EXCEEDANCES						NUMBER OF INDIVIDUAL ADWG AESTHETIC GUIDELINE VALUE EXCEEDANCES*						
SCHEME	*E. coli*	Chloroform	Manganese	Mercury	THMs	Lead	Aluminium	Hardness	Iron	Manganese	Turbidity	pH	Sodium
Bloomsbury													
Calen	1												
Eton								2					44
Finch Hatton													
Gargett												1	
Koumala								24					
Mackay and Sarina						2	4	1	6		1	6	
Marian						1			2		1		
Midge Point		1	2	2	17		2		3	41	11	5	

* not including Dissolved Oxygen or Total Chlorine exceedances

Mackay and Sarina had 4 exceedances of Aluminium; 382, 562, 721 and 1425 µg/L. The samples that produced the results of 562 and 1425 µg/L were taken on the same day however were sampled at different locations.

Turbidity results over 1 NTU can shield pathogen disinfection. The following schemes had turbidity samples above 1 NTU:

Table 6 - 4 Number of Filtered Water Samples which Exceeded 1 NTU at point of disinfection

SCHEME	TURBIDITY ABOVE 1 NTU
Bloomsbury	0
Calen	0
Eton	0
Finch Hatton	0
Gargett	0
Koumala	0
Mackay and Sarina	1
Marian	1
Midge Point	33

Figure 6 - 1 Results of the assessment of water quality data – exceedance breakdown


Axiolab 5
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7. CAPITAL UPGRADES

7.1 FIREFIGHTING AUGMENTATIONS

In FY 2021 - 2022, council completed two fire augmentation projects across the region. The projects involved augmentations to stations at Fursden Street, Glenella and David Muir Street, Slade Point. At Fursden Street a new 378.5m long, DN150 mPVC main to augment existing DN100 AC main on Fursden St was completed. At David Muir Street, a new 394m long DN150 mPVC main to augment existing DN100 AC main on Lester Hansen St and a DN150 AC main on David Muir St was completed.

7.2 WATER PUMP STATION RENEWALS

Council operates several water pump stations (WPSs) across the region and has a WPS upgrades / improvements program aimed at renewing equipment and addressing performance and service level requirements. Renewal of two water booster pump stations, Alligator Creek WPS and Hill Street WPS, were completed in FY 2021 – 2022. The renewals on Alligator Street involved replacing the pump and motor assembly for Pumps 1, 2, 3 and 4 whilst creating new assets for Pumps 1, 2, 3 and 4. The renewals on Hill Street involved replacing the pump skid and control panel, upgrading the metering panel and creating new assets for Pumps 1 and 2 (Normal Duty Flow), Pump 3 (fire flow) and pipework inside the WPS Building.

7.3 RAW WATER BORES RENEWAL

Council operates Bore Water Supply Schemes serving a number of small regional townships and has a renewals program aimed at replacing equipment and addressing performance and service level requirements. Bore equipment refurbishment and renewals were completed at two sites by the end of FY 2021 – 2022, including Sarina Bore 1 and Gargett Bores 1 and 2. Works included:

Sarina Bore 1

- Replace all surface pipework including:
- Isolation Gate Valve.
- Non-return valve (with counterweight)
- Bore Cap
- All associated pipework
- Replace original submersible pump
- Install new Drop Cable and Pump Termination
- Install Submersible Pressure Transducer and connect to council's SCADA system.
- Install VSD and Sine Wave Filter to match the replacement pump.
- Install MODBUS TCP Converter for VSD.
- Install air valve on bore outlet pipework.
- Provision for 2 X 1/2" fittings on outlet pipework for pressure gauge/miscellaneous fittings.

Gargett Bore 1

- Installation of a new DN100 Flowmeter on the Bore Outlet Pipework. Flowmeter shall be NMI approved.
- Connection of the new flowmeter to MRC's internal SCADA Network.
- Sealing of the shunted gap on bore cap to vermin proof the casing and internals.

Gargett Bore 2

- Installation of a new DN100 Flowmeter on the Bore Outlet Pipework. Flowmeter shall be NMI approved.
- Connection of the new flowmeter to MRC's internal SCADA Network.

7.4 WATER MAIN AND METERS RENEWALS

In the FY 2021 - 2022, council completed seven water main renewal projects across the region. The projects involved water mains on:

- Anzac Avenue – new DN250 mPVC to augment existing DN200 AC main
- Ian Reddacliff Drive – renewed existing main with DN63 PE main
- Midge Point Network – new 1062.4 m long DN250 mPVC main from Kunapipi road to Reservoir
- Hume Street in West Mackay – renewed existing main with DN200 mPVC main
- Range Road in Sarina – reconfiguration of reticulation network
- Brisbane Street in Mackay – renewed existing DN100 Cl main with DN150 m PVC main
- Bedford Road in Andergrove – renewed existing DN200 AC with DN200 mPVC

Council also completed water meter renewals across the region, with 1645 domestic water meters renewed and 101 commercial water meters renewed.

8. INCIDENTS REPORTED TO THE REGULATOR

Mackay Regional Council's DWQMP has been approved through an information notice given under the *Water Supply (Safety and Reliability) Act 2008.* As per the standard conditions of the notice, council is required to report to the regulator the following:

- a detection of *E. coli*
- an exceedance of a health guideline value in the ADWG
- detection of parameters with no guideline value in the ADWG
- a drinking water 'event', considered to be anything which has happened to council or council's water supply service that has escalated beyond the ability of council to control and there are concerns that public health may be adversely impacted as a result.

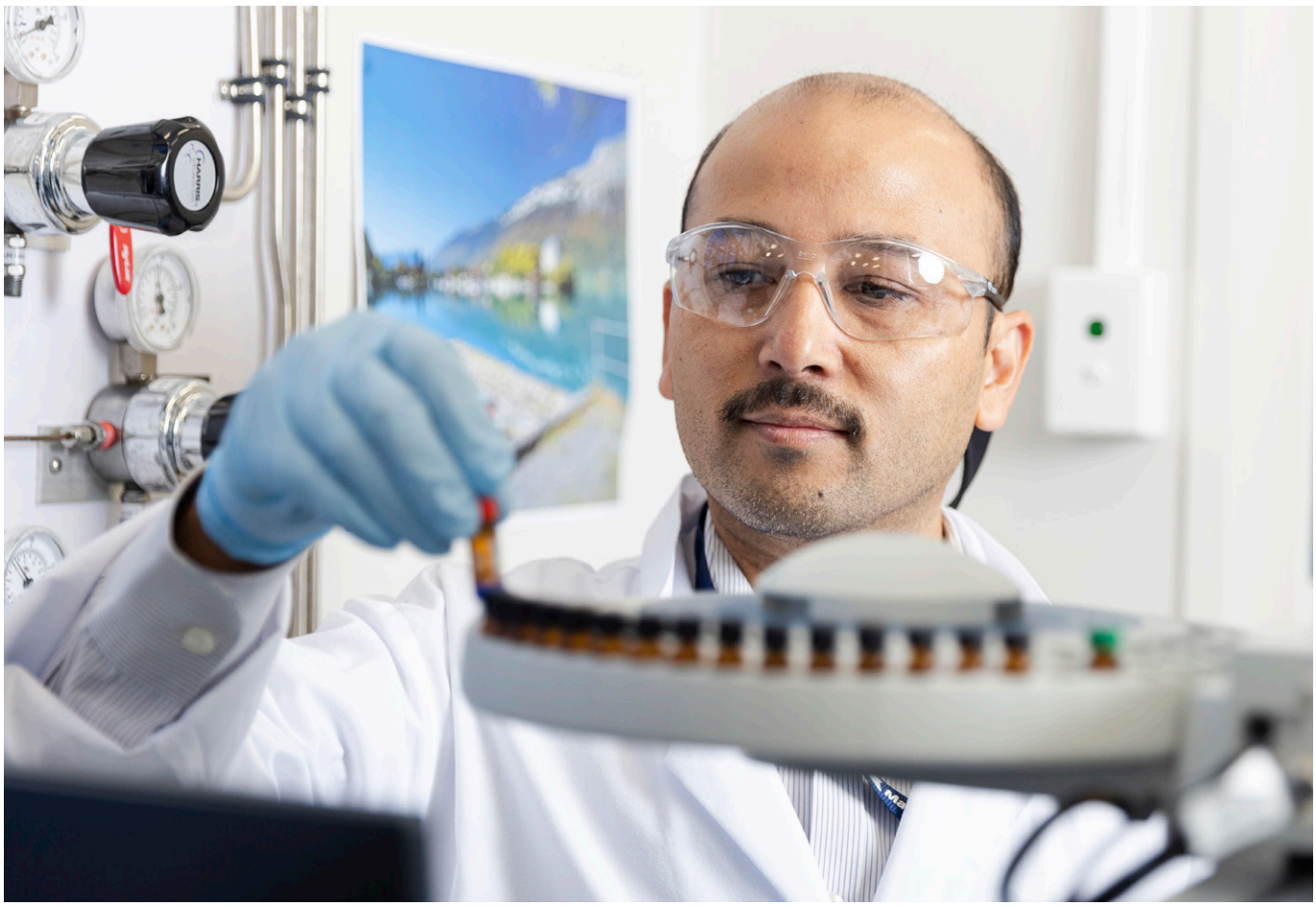
Council defines the above as drinking water incidents. There were ten drinking water incidents reported by council to the regulator in the FY 2021 – 2022. Of these ten incidents, eight related to ADWG health guideline breaches and two related to detection of a parameter without an ADWG guideline value. All the ADWG health guideline breach incidents were considered verified ADWG breaches. Details of drinking water incidents reported by council to the regulator in the FY 2021 - 2022 have been tabulated in Table 8 - 1.

Table 8 - 1 Drinking water incidents reported in the FY 2021 – 2022

INCIDENT DATE	SCHEME	SCHEME COMPONENT	INCIDENT TYPE	PARAMETER
Jul 26, 2021	Mackay and Sarina	Mackay reticulation	ADWG health guideline breach	Lead
INCIDENT DETAILS AND ACTIONS TAKEN	Lead was detected during routine sampling a Walkerston 1 - Skate Park, above the ADWG heath guideline value of 0.01mg/L. Elevated turbidity and iron results were also identified. A sample taken on the same day from a nearby drinking monitoring point returned a compliant result, indicating the breach was localised. Additional sampling at the Skate Park on 3 August 2021, the Walkerston Reservoir and nearby drinking water sample points returned results that were compliant with the ADWG guidelines. An inspection of the Walkerston 1 - Skate Park sample tap identified that there was degradation of the tap. The sample box also had obvious signs of maintenance work, with the latch having been recently repaired. It is likely that the cause of the high lead, turbidity and iron levels are related to the degradation of the sample tap and the repairs to the sample box. No immediate corrective actions were undertaken as water quality results from nearby sample points and follow up sampling from 3 August 2021 did not indicate any ongoing issues.			
Aug 5, 2021	Eton	Eton treated water	ADWG health guideline breach	Low chlorine
INCIDENT DETAILS AND ACTIONS TAKEN	The Water Treatment Operators remotely shut down the Eton WTP in response to a low chlorine alarm. The operators changed out the sodium hypochlorite at the plant in case degraded chlorine was affecting disinfection. The Water Network team flushed the Eton reticulation network to remove residual low chlorine waters in the network. Supply to the town was recommenced once it was confirmed the treated water free chlorine residual was within the CCP target range. Council's Water Treatment Team and SCADA Engineers met and agreed that the critical limits for free chlorine residual would remain at <0.5 mg/L and >5.0 mg/L. Additional safeguards were implemented for the automatic shutdown of the Eton WTP when SCADA operation setpoints are breached.			
Nov 4, 2021	Midge Point	Midge Point reticulation	ADWG health guideline breach	Manganese
INCIDENT DETAILS AND ACTIONS TAKEN	Routine drinking water monitoring taken on at the Laguna Quays sample point within the Midge Point Water Supply Scheme (WSS) reticulation network returned a manganese result that breached the ADWG health guideline. Other samples collected on the day of the incident from within the Midge Point WSS and Reservoir were within the ADWG health guidelines, indicating the incident was localised to the Laguna Quays section. In response to the incident, the balance tank at the Midge Point facility was drained and flushed out to removed a build up of sediment which was identified at the bottom of the tank. This sediment is believed to be a potential source of manganese in the reticulation network.			
Dec 7, 2021	Calen	Calen treated water	ADWG health guideline breach	*E. coli*
INCIDENT DETAILS AND ACTIONS TAKEN	*E. coli* was detected in a routine sample collected from the Calen treated water sample point. Samples collected on the following day and from reticulation sample points detected no *E. coli.* Low chlorine levels were detected in the original sample. The plant only typically operates during the night, therefore, in order to collect samples it is run in manual mode. In field testing identified that when Bore 2 was operated in manual mode, or when regenerations occurred, chlorine dosing did not always occur. When the Calen reservoir was full, chlorine dosing was not occurring during the regeneration cycle. This could explain the low free chlorine readings recorded that were recorded at the treatment plant, and not throughout the reticulation system. During the regenerations, chlorine levels in the treated water are elevated as the chlorine dosing rate is constant but the flow rate to distribution is reduced. If the Calen reservoir is full, chlorine dosing will be suspended during the regeneration period. The regeneration cycle typically occurs once a week for a period of 90 minutes. A review of the Calen Water Treatment Plant operational code identified that along with the conflict in the code when pump 2 was run in manual mode, there were other errors in the code which may cause issues with chlorine dosing when the raw water tanks were in operation. Amendments to the code have been made.			
Dec 20, 2021	Koumala	Koumala treated water	Detection of a parameter with no water quality criteria	Chlorate
INCIDENT DETAILS AND ACTIONS TAKEN	A routine sample from Koumala Water Supply Scheme detected chlorate (a parameter with no water quality criteria) at levels above the Qld Health preferred guideline value of 800 µg/L. The chlorate result is believed to be related to the degradation of sodium hypochlorite which is used to treat the raw water. Council staff replaced the sodium hypochlorite stored at the treatment plant with a batch of fresh sodium hypochlorite which was stored in an air conditioned building. Follow-up sampling returned a result that was within the Qld Health preferred guidelines. MRC is in the process of upgrading the Koumala WTP, which includes changing the disinfection system from sodium hypochlorite to chlorine gas.			

INCIDENT DATE	SCHEME	SCHEME COMPONENT	INCIDENT TYPE	PARAMETER
Jan 14-19, 2022	Midge Point	Midge Point Reticulation & Re-chlorination	ADWG health guideline breach	Total Trihalomethanes (THMs)
INCIDENT DETAILS AND ACTIONS TAKEN	Routine monitoring results from Midge Point Park, Midge Point SES and Midge Point Balance Tank, returned Total Trihalomethanes (THM) results above the ADWG health guideline values. In response to iron and manganese issues at Midge Point Water Supply Scheme, chlorine dose rates had been increased prior to the THM exceedance. This may have contributed to the increased THMs. Ongoing THM exceedances occurred between 14 January 2022 and 6 April 2022. Investigations found the exceedances were related to an increase in the Total Organic Carbon (TOC) levels of the raw water supplied through the Crystal Brook Bores. The water supplier confirmed the water source body had been impacted by an aquatic weed outbreak. Minor adjustments were made to the chlorine operating limits to minimise the level of THM's generated. More frequent water quality monitoring was implemented between January and April 2022, and network operators continued regularly monitoring of chlorine levels.			
Mar 16, 2022	Bloomsbury	Bloomsbury Reticulation	Detection of a parameter with no water quality criteria	Chlorate
INCIDENT DETAILS AND ACTIONS TAKEN	Routine monitoring of the reticulation network at the Bloomsbury School sample point returned chlorate (a parameter with no water quality criteria) at levels above the Qld Health preferred guideline value of 800 µg/L. Due to a failure of the raw water groundwater bore at Bloomsbury, potable water has been transferred from Mackay since August 2021, averaging between 300 and 400 KL /month. After the exceedance occurred, additional water quality sampling of two treated water storage tanks on on 31 March 2022 identified there was ongoing impact from chlorate within the treatment tanks. The water in these tanks was removed and replaced with water transported from the Mackay scheme. Follow up sampling confirmed that this immediately reduced the overall chlorate levels in the treated water storage tanks. In response to this incident, sodium hypochlorite at Bloomsbury is changed over monthly, ensuring the old sodium hypochlorite in storage is removed and the storage tank cleaned, before a delivery of fresh sodium hypochlorite is received.			
Mar 23, 2022	Marian	Marian reticulation	ADWG health guideline breach	Nickel
INCIDENT DETAILS AND ACTIONS TAKEN	A nickel result above the ADWG health guideline value was detected during routine sampling from Mirani 2 - Patricia Court sample point. On the same day, a compliant result was recorded from Mirani 1 - Alice St, suggesting that the breach was localised. Inspection of the Mirani 2 - Patricia Court sample point and sampling procedures did not identify any cause. No immediate action was taken as the Alice St samples from the same day did not indicate any water quality issues. Resampling was carried out on the 29 March 2022 at Patricia Court and Alice Street, returning compliant results. No further action was taken.			
April 27, 2022	Mackay and Sarina	Mackay reticulation	ADWG health guideline breach	Lead
INCIDENT DETAILS AND ACTIONS TAKEN	Routine monitoring of the Mount Bassett Reservoir returned a lead result above the ADWG health guideline limit of 0.01 mg/L. Downstream results from Slade Point on the same day return a compliant result for lead, indicating it was a localised incident. Follow-up sampling on 6 May 2022, from two alternative sample points (Emergency Shower at the Reservoir and the top of the reservoir tank) did not record any exceedances. An inspection of the sample tap pipework identified that there was a brass tapping band connected to the off take connection from the water main to the sample tap. The age of this tapping band is unknown. It is believed that the high lead reading is most likely caused by of degradation of the sample tap off take connection. This has been removed and a new off take was established on an alternative main pipe.			
May 30, 2022	Marian	Marian reticulation	ADWG health guideline breach	Lead
INCIDENT DETAILS AND ACTIONS TAKEN	A lead result above the ADWG health guideline values was detected during routine sampling at Mirani 2 - Patricia Court. On the same day, a compliant result was recorded from Mirani 1 - Alice Street, suggesting that the breach was localised. As the sample point is at the end on the line, the reticulation system was flushed and resampling conducted. As the sample tap was only installed in 2021, the result is most likely caused by the tap being unused for extended periods, allowing sedimentation to form in the line, which is then disturbed when the water sample is taken, rather than contamination of the drinking water supply. The sampling procedure for this site now includes a preliminary flush of the main through a 50mm offtake tap prior to sampling. Routine monitoring on the 6 June 2022 and follow up sampling on 10 June 2022 at Patricia Court and Alice Street, returned compliant results.			


DRAIN




DANGER

9. CUSTOMER COMPLAINTS

Mackay Regional Council provides treated water services to more than 100,000 customers across its nine water supply schemes. Occasionally customers experience issues with their water supply and contact council. Any issue raised by the community is investigated to determine the likely cause and, if required, corrective actions are taken. Customer issues and corrective actions are recorded by council's Customer Service Centre. Some issues with water quality and supply relate to maintenance work undertaken within the water supply system. Where customers are likely to be affected by planned maintenance activities, council endeavours to notify customers in advance. Customers are urged to contact council's 24-hour Customer Service Centre on 1300 MACKAY (1300 622 529) if they have any queries or concerns regarding water supply or quality. During FY 2021 – 2022 a total of 489 complaints were received, of which 57 per cent related to water leaks. A summary of the complaint types received in FY 2021 – 2022 are detailed in Table 9 1 and Figure 9 - 1.

Table 9 - 1 Summary of FY 2021 – 2022 water complaints

COMPLAINT TYPE	NUMBER OF COMPLAINTS	COMMENTS
Alleged illness due to water	11	Very rarely customers raise concerns that an alleged illness has been caused by drinking water. These types of complaints are taken very seriously and are investigated thoroughly. As part of these investigations drinking water samples are often collected and tested at MRC Laboratory (a NATA accredited laboratory) to ensure compliance with the Australian Drinking Water Guidelines
No supply	52	Interruptions to water supply may occur for some customers as part of scheduled maintenance work. In these instances, customers will be notified in advance. Interruptions to water supply outside of scheduled maintenance work periods are investigated and necessary repair work undertaken as soon as possible.
Dirty/cloudy	60	Dirty / discoloured water is often associated with maintenance work but may also be related to internal plumbing. Dirty / discoloured water caused by maintenance work generally clears within a short period, however if a customer continues to experience problems council may flush the mains to clear the water. Occasionally, drinking water may have a slight brown tinge to it. This is largely due to elevated concentrations of iron and manganese. There is no cause for alarm as the water is still perfectly safe to drink. Drinking water may sometimes appear cloudy due to air bubbles generated by the flushing of mains, hot water units or aerators on taps. This is not harmful in any way. The appearance of the water may range from a light cloudiness to a very milky/ opaque colour. After a while, the bubbles will disperse and the water will become clear. If this does not occur or if there are concerns, the customer is invited to contact council for further advice.
Odour/taste	11	Odour / taste enquiries are investigated individually. These problems are usually short-term. Council will sometimes flush the mains in response to an odour / taste complaint or arrange for sample collection and testing at MRC Laboratory to ensure compliance with the Australian Drinking Water Guidelines.
Pressure	78	During normal operating periods, water will be provided to the meter at a pressure of 22 m of head (220 kPA), and at rate of 20 L/min. Properties that are part of a Tank Replenishment Scheme are subject to different water service conditions, particularly pressure of supply. Water pressure issues may be caused by water meter problems, internal plumbing issues at the costumer's property or blockages within water meters or mains. Council will often undertake pressure testing in response to a pressure complaint. Actions taken to rectify water pressure problems can include clearage of blockages and repair/replacement of water infrastructure.
Water Leaks	277	Water leak enquiries are investigated individually. These problems are usually short term. Councils' response involves repairing pipework, meters and valves or replacing and tightening parts.
TOTAL	489	

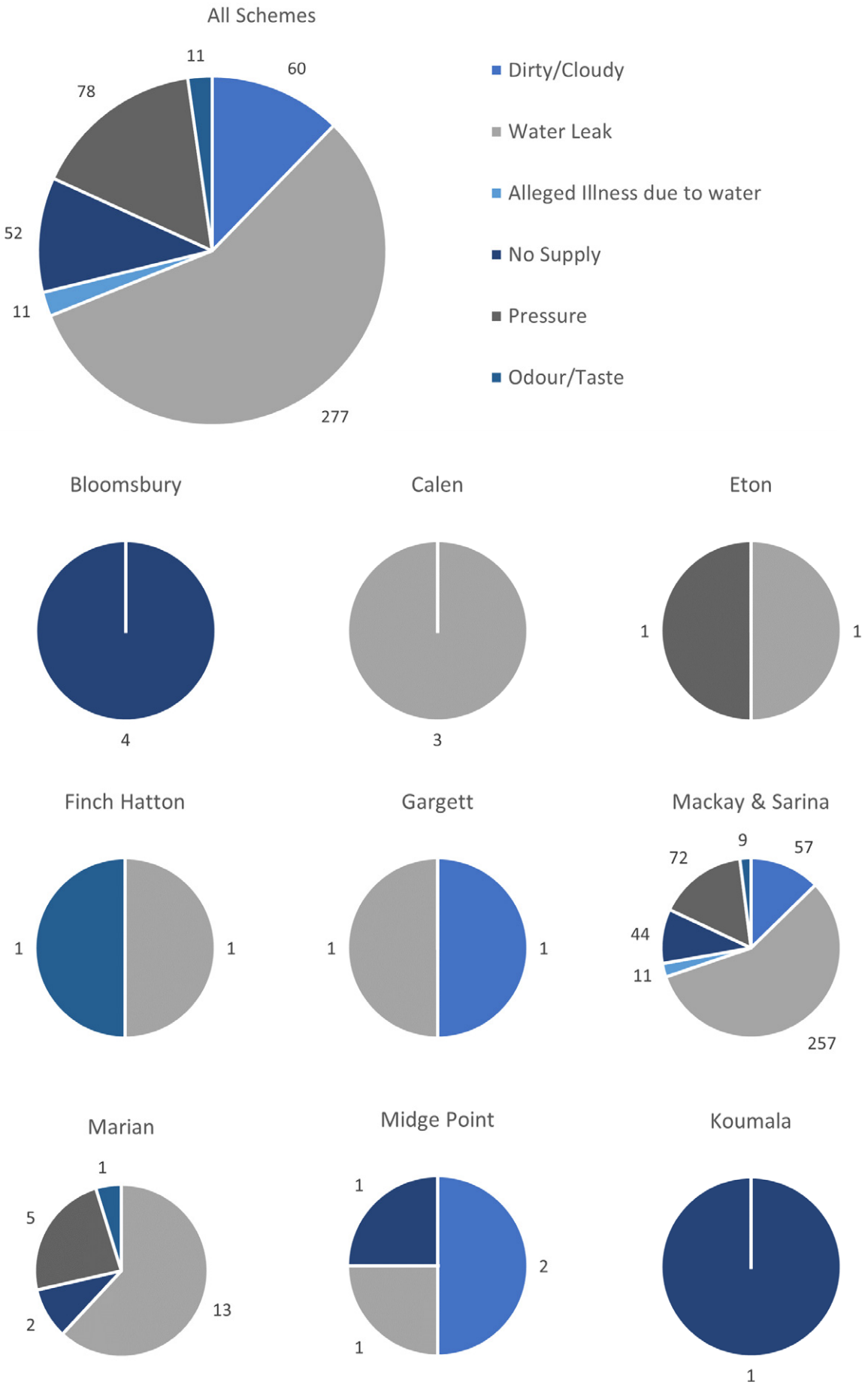


Figure 9 - 1 Summary of FY 2021 – 2022 water complaints

10. DWQMP IMPLEMENTATION

A key part of a DWQMP is the identification and assessment of the hazards that may affect water quality. A detailed drinking water quality risk assessment was undertaken for council in November 2010. The latest risk assessment update was undertaken in May 2022, following a risk review workshop facilitated by City Water Technology. The results of the risk assessment process give an indication of the types of risks that need to be managed across the service. The Risk Management Improvement Program (RMIP) is a mechanism used to demonstrate how the risks will be managed.

Council's RMIP was re-written in August 2022 so that it corresponded to the updated risk assessment. This RMIP was submitted to the regulator in August 2022 as part of council's DWQMP amendment application. The RMIP has since been updated to include a target date for completion, a status update and an allocation of responsibility for each improvement action. This updated RMIP was provided as an appendix to the DWQMP FY 2017 – 2018 Annual Report. Council undertook another update of the RMIP as part of the 2021-2022 DWQMP review. This updated RMIP was submitted to the regulator in August 2022 as part of council's last DWQMP amendment application.

11. DWQMP REVIEW

The last review of the DWQMP was completed August 2022. Based on the findings of this review it was clear a DWQMP amendment application was required. The DWQMP amendment application was submitted to the regulator on 17 August 2022 and is in the process of being finalised and approved. The next DWQMP review will be completed by August 17, 2022.

12. DWQMP AUDIT

An audit of the DWQMP was undertaken by Daniel Alun Deere, Director of Water Futures (certified under the Drinking Water-Quality Management System Auditor Certification Scheme) in February 2021. The audit was completed February 19, 2021, with a compliant audit finding made. The overview of observations from the 2021 audit report was as follows:
The assets and systems inspected and audited were found to range from marginal to excellent in terms of their standard and the quality of their maintenance. Council has made multiple significant improvements in the reliability of its water quality management system and shown some leadership in a range of areas. The depth and breadth of improvements made in recent years has greatly enhanced the ability of council to reliably ensure good water quality and to keep up with the rising expectations of its stakeholders and tougher industry standards. The results are paying dividend in that council is getting excellent treated water quality results despite very challenging source water conditions. Areas of marginal infrastructure condition or performance were scheduled for resolution under extant work orders or were already underway.
The next external audit of the DWQMP is scheduled to be conducted by May 28, 2025.

13. REFERENCES

- NHMRC, NRMMC (2011) Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.
- *Public Health Regulation 2018.*
- *Water Supply (Safety and Reliability) Act 2008.*

14. ABBREVIATIONS

TERM	DEFINITION
<	Less than
>	Greater than
°C	Degrees Celsius
% Sat	Percentage saturation
µS/cm	Micro siemens per centimetre
µg/L	Micrograms per litre
ADWG	Australian Drinking Water Guidelines (2011)
CCP	Critical Control Point
cfu/100mL	Colony forming units per 100 millilitre
cfu/mL	Colony forming units per millilitre
DNRME	Department of Regional Development, Manufacturing and Water
DWQMP	Drinking Water Quality Management Plan
E. coli	*Escherichia coli*
FY	Financial year
IPWEAQ	Institute of Public Works Engineering Australasia Queensland
kPA	Kilopascal
LI	Larson Index
m	Meter
mg/L	Milligrams per litre
min	Minute
ML	Megalitre
mL	Millilitre
MPN	Most probable number
MRC	Mackay Regional Council
NATA	National Association of Testing Authorities, Australia
NHMRC	National Health and Medical Research Council
NQBP	North Queensland Bulk Ports Corporation Limited
NRMMC	Natural Resource Management Ministerial Council
NTU	Nephelometric turbidity units
PAC	Powdered Activated Carbon
RMIP	Risk Management Improvement Program
RPZD	Reduced Pressure Zone Device
SVOCs	Semi Volatile Organic Compounds
TCU	True Colour Units
TF	Treatment Facility
UV	Ultraviolet light
WPS	Water Pump Station
WTP	Water Treatment Plant

APPENDIX 1 – *E. COLI* COMPLIANCE WITH ANNUAL VALUE

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Bloomsbury

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	2	2	1	1	2	2	2	2	2	2	2	2
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	24	24	23	22	22	22	22	22	22	22	22	22
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Calen

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	4	4	4	4	4	8	4	4	4	4	3	4
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	1	0	0	0	0	0	0
No. of samples collected in previous 12 month period	47	48	49	50	50	54	54	54	54	52	51	51
No. of failures for previous 12 month period	0	0	0	0	0	1	1	1	1	1	1	1
% of samples that comply	100%	100%	100%	100%	100%	98.1%	98.1%	98.1%	98.1%	98.1%	98%	98%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:

Calculation of 12 month 'rolling' annual value

Drinking water scheme: Eton

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	1	5	3	3	3	3	3	3	3	1	5	3
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	45	44	44	43	42	41	40	39	38	35	37	36
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Finch Hatton

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	2	2	2	2	2	2	2	2	2	1	3	1
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	24	24	24	24	24	24	24	24	24	23	24	23
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Gargett

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	3	3	3	3	3	3	3	3	3	1	5	3
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	36	36	36	36	36	36	36	36	36	34	36	36
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Koumala

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	2	2	2	2	2	2	2	2	2	2	2	2
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	25	25	25	24	24	24	24	24	24	24	24	24
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Mackay and Sarina

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	69	80	71	66	82	73	67	78	70	70	70	67
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	838	851	842	840	854	849	849	864	856	859	862	863
No. of failures for previous 12 month period	1	1	1	1	1	0	0	0	0	0	0	0
% of samples that comply	99.9%	99.9%	99.9%	99.9%	99.9%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Marian

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	23	23	30	23	23	28	27	19	21	19	23	19
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	302	302	304	302	290	296	300	296	292	287	287	278
No. of failures for previous 12 month period	0	0	0	0	0	0	0	0	0	0	0	0
% of samples that comply	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

ESCHERICHIA COLI HEALTH COMPLIANCE:
Calculation of 12 month 'rolling' annual value

Drinking water scheme: Midge Point

YEAR	2021 TO 2022											
MONTH	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
No. of samples collected	20	8	8	9	8	8	14	9	9	10	9	14
No. of samples collected in which *E. coli* is detected (i.e. a failure)	0	0	0	0	0	0	0	0	0	0	0	0
No. of samples collected in previous 12 month period	131	131	131	130	130	125	122	121	121	121	121	126
No. of failures for previous 12 month period	1	1	1	1	1	1	0	0	0	0	0	0
% of samples that comply	99.2%	99.2%	99.2%	99.2%	99.2%	99.2%	100%	100%	100%	100%	100%	100%
Compliance with 98% annual value	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

DRINKING WATER QUALITY MANAGEMENT PLAN

ANNUAL REPORT

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