

5.4. WATER AND WASTEWATER QUARTERLY REPORT FOR PERIOD ENDING 31 MARCH 2020

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DEPARTMENT Water and Wastewater

RECOMMENDATION

It is recommended that the Quarterly Report of the Water and Wastewater Department for the period ending 31 March 2020 be received and noted.

EXECUTIVE SUMMARY

This report documents progress on key operational and service delivery areas as well as the Regulatory compliance status within the Water and Wastewater Department for the period 01 January to 31 March 2020.

Whilst the results are generally positive the areas for improvement are noted and will be the focus of the branch over the next quarter. Notable capital improvements include the completion of the Mowbray River Road water main renewal, water treatment plant pump overhauls, Daintree water treatment plant backup generator structural renewal, new permanent sewer pump station generators, sewer pump station lid replacement and sluice valve renewals.

BACKGROUND

This report is the third Quarterly Report submitted by the Water and Wastewater Department during the 2019/2020 Financial Year. This report highlights progress against key performance areas required by the Department of Natural Resources, Mines and Energy (DNRME) and required compliance levels by the Department of Environment and Science (DES).

COMMENT

This report enables Councillors and the community to obtain a strategic view of activities within the Water and Wastewater Department.

The Quarterly Report documents progress on key operational and service delivery aspects and regulatory compliance levels.

The Water and Wastewater Quarterly Report does not include comprehensive progress reporting in terms of the Capital Works Programs, Operational Plan and financial statements as these are dealt with in separate Quarterly Reports to Council.

FINANCIAL/RESOURCE IMPLICATIONS

Failure to comply with required standards and to respond quickly and effectively to water and wastewater incidents may result in harm to the community and substantial penalties.

RISK MANAGEMENT IMPLICATIONS

Council as a registered water service provider has a statutory obligation to ensure it is able to provide water and wastewater services to customers. Council's reputation would suffer if it is unable to maintain service levels at prescribed standards.

This Quarterly Water and Wastewater report provides information on strategies implemented by the Water and Wastewater Department to minimise occupational health and safety risks and risks to Council infrastructure.

SUSTAINABILITY IMPLICATIONS

Economic: It is essential to adequately maintain water and wastewater infrastructure in order to provide satisfactory services in support of economic development in the Shire.

Environmental: Failing to provide adequate and compliant water and wastewater services can lead to environmental harm and breaching of licence conditions.

Social: The Community expects fully operational and compliant water and wastewater services.

CORPORATE/OPERATIONAL PLAN, POLICY REFERENCE

This report has been prepared in accordance with the following:

Corporate Plan 2019-2024 Initiatives:

Theme 3 - Leading Environmental Stewardship

Goal 2 - We will implement programs that reduce and offset our environmental footprint.

Goal 3 - We will continue to build water infrastructure so that the Douglas Shire may enjoy water security and water quality.

Goal 4 - We will partner with the community to educate and monitor.

Theme 5 - Robust Governance and Efficient Service Delivery

Goal 3 - We will make sound financial decisions by ensuring robust strategic planning, financial management and reporting.

Goal 4 – We will work with our communities to ensure they are informed, empowered and supported so that they are resilient to the impacts of disaster events. Through our leadership and capabilities we will plan, prepare, respond and recover from events so as to minimise the impact on people, property, the environment, and our economic stability.

Operational Plan 2019-2020 Actions:

3.2.4 - Conduct a solar energy feasibility study for the Port Douglas Waste Water Treatment Plant.

3.3.1 - Continue upgrades to sewer network.

3.3.2 - Implement smart meters for water trial.

3.3.3 - Complete improvements to the Daintree water intake.

5.3.4 - Develop a Water Leaks policy.

5.4.1 - Install new infrastructure throughout Shire to allow for increased intelligence on rainfall and transport.

COUNCIL'S ROLE

Council can play a number of different roles in certain circumstances and it is important to be clear about which role is appropriate for a specific purpose or circumstance. The implementation of actions will be a collective effort and Council's involvement will vary from information only through to full responsibility for delivery.

The following areas outline where Council has a clear responsibility to act:

Builder/Owner Council makes a significant investment every year in the infrastructure that underpins the Shire through its capital works program. Council will manage its assets with appropriate frameworks and deliver its projects through robust project management.

Regulator Council has a number of statutory obligations detailed in numerous regulations and legislative Acts. Council also makes local laws to ensure that the Shire is well governed. In fulfilling its role as regulator, Council will utilise an outcomes based approach that balances the needs of the community with social and natural justice.

CONSULTATION

Internal: Nil

External: Water and wastewater quality parameters are tested by an accredited laboratory and test results and service levels are required to be reported to the Department of Energy and Water Supply and the Department of Environment and Science.

Community: Nil

ATTACHMENTS

1. Water and Wastewater Quarterly Report for the period ending 31 March 2020 [5.4.1 - 20 pages]

1 January – 31 March 2020

The aim of the Water and Wastewater Quarterly Report is to inform Councillors and the community on the progress of key operational and service delivery areas as well as regulatory compliance status within the Water and Wastewater Department.

The Water and Wastewater quarterly report does not include comprehensive progress reporting in terms of Capital Works or Operational Plan; these are dealt with in separate quarterly reports to Council.

This report highlights certain aspects of the activities of the Water and Wastewater Department that are industry benchmark indicators as well as key performance areas and compliance monitoring parameters as required by the Department of Natural Resources, Mines and Energy (DNRME) and the Department of Environment and Science (DES).

Water

1. Water reticulation services

General maintenance was carried out on all schemes for this quarter including all intakes. Hydrant and valve maintenance was performed two days each week to identify their locations, ensure accessibility and attend to any maintenance issues. The water reticulation team have recording the number of water service renewals; there were 30 new water service renewals in this reporting period. Water service renewals involve replacing water services, which have reached their life expectancy and are at risk of failing. Water flushing programs were implemented due to the maintenance and functionality of hydrants, water quality complaints that related to aesthetic issues and for maintaining acceptable chlorine residuals within the schemes. Response/reaction time for all water reticulation incidents was within the customer service standards. See table 1 showing results on water reticulation maintenance activities across all schemes.

Regular reservoir and pump station checks and intake maintenance was performed on all three schemes.

Table 1. Water reticulation services maintenance activities undertaken across all schemes

Douglas Shire Reticulation (all schemes)	
Settlement Meter Reads	239
New Water Services Connections	5
Service Repairs	159
Water Mains Repairs	19
Water service renewals	30
Water Quality Notifications (Complaints)	2(0)
Dial before you dig	174
Flushing Events: Mossman/Port Douglas/Cooya/ Newell	20
Flushing Events: Whyanbeel/Wonga	3
Flushing Events: Daintree	3

There were two water quality notifications during the reporting period. All water quality notifications were handled under customer service standards. Issues were rectified by investigating the situation, testing the water quality and flushing of the reticulation system.

Water and Wastewater team views all water quality notifications and complaints seriously and endeavour to achieve outcomes where customer satisfaction is priority.

Table 2 below details the nature of the notification, how it was resolved and the response time. All water quality parameters measured were within the health guideline limits in the Australian Drinking Water Guidelines (ADWG).

Table 2. Water Notifications

Address	CRM No & Date	Nature of water complaint	How it was resolved	Response Time
Mowbray River Road, Mowbray	79285/2020 06/01/2020	Tap water had an odour	Water main was flushed and customer had no further issues with drinking water and was happy with the outcome.	30 mins
Mossman Daintree Road, Newell	79206/2020 03/01/2020	Tap water was milky	Air in water main, water main flushed. Customer was happy with the outcome.	10 mins

The 2019/2020 capital works programme for water quality and reticulation is progressing well with some projects completed and most projects expected to be under budget and anticipated completion to be within the set time. Completed projects such as the Mowbray River Road water main renewal, water treatment plants air compressor renewals and pump overhauls and the Daintree water treatment plant backup generator structural renewal.

2. Water schemes and potable water consumption

Water Restrictions

In this reporting period, Council moved from level 3 to level 1 water restrictions on 8 January 2020. On 21 January 2020 level 1 water restrictions were removed leaving Douglas Shire on no water restrictions. See table 3 below. The Rex Creek intake water level has progressively increased due to the onset of rainfall events over the month of December 2019 and January 2020, the level as at 21 January 2020 was 580mm.

Table 3. Water restrictions

Level	Start of Restriction	End of Restriction	Number of Days
1	23/09/2019	13/11/2019	52
2	14/11/2019	21/11/2019	8
3	22/11/2019	7/01/2020	47
1	8/01/2020	21/01/2020	14

The average water consumption for the Mossman/Port Douglas scheme for the months January to March 2020 was 6.7 ML/day for Port Douglas and 3.6 ML/day for Mossman. On 30 January and 23 February 2020, heavy rainfall events occurred which created high turbidity at the Rex Creek intake, the water treatment plant was temporarily shut down and water was supplied from the Crees Road Reservoir to Port Douglas water users.

The graph below displays the comparison use between Mossman and Port Douglas residents and Rex Creek intake levels.

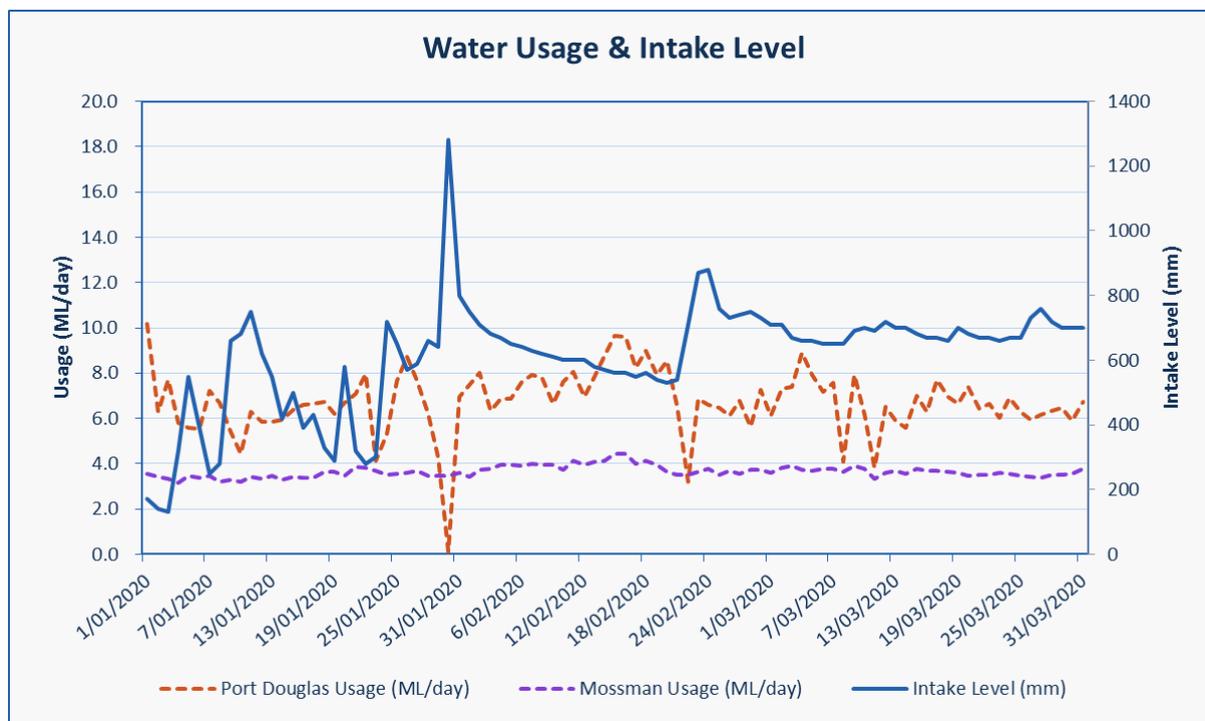


Fig 1. Mossman and Port Douglas water usage and Rex Creek intake levels for the period 1 January 2020 – 31 March 2020

All Schemes

Raw water quality has been good throughout this reporting period with turbidity averaging below 1 NTU.

Throughout the water schemes, all pump stations performed well with no incidents.

Rainfall throughout this reporting period has not been a typical wet season, particularly compared to the previous two wet seasons with below average rainfall experienced. There were minimal disruptions to water production due to high turbidity at Daintree, Whyanbeel and Mossman water treatment plants occurred in January and February. The disruptions to water production did not create any concerns to consumer demand and adequate supplies were maintained in reservoir levels throughout this reporting periods.

Craiglie reservoir is currently offline to allow capital project works to continue. This reservoir is expected to be back online in August 2020.

During the reporting period, general maintenance works and service inspections were performed at all water treatment plants. Communication systems have been upgraded to an Ethernet system at all three water treatment plants.

Cert IV water industry training continued for two Water and Wastewater plant operators.

In March 2020, eight staff within the Water Quality and Water Reticulation teams have started the first stage of the Certificate 3 course in water treatment and water operations. This training is delivered by Simmonds and Bristow and will continue in the next reporting period in May. See photos below.

All Water staff participated in the mandatory code of conduct course and COVID-19 training and awareness.



Image 1 & 2: Wastewater and Water staff in training

Mossman/Port Douglas Scheme

All Ultra Filtration (UF) racks were operational and maintenance works continued with cartridge repairs to ensure compliance with UF rack integrity test limits. To maintain UF filter efficiency, clean-in-place operations were undertaken as well as all general service works and maintenance within the Mossman/Port Douglas Scheme.

Mossman water treatment plant met all consumer demand requirements throughout this reporting period.

There were no water quality reportable incidents in the Mossman water scheme within this reporting period. To prevent falling vegetation/debris damaging infrastructure and to maintain efficient solar panel energy on critical control equipment, vegetation clearing works were performed at various sites.

Mossman Water Supply

The total monthly consumption of water in Mossman, Cooya Beach and Newell Beach areas can be seen in Figure 2.

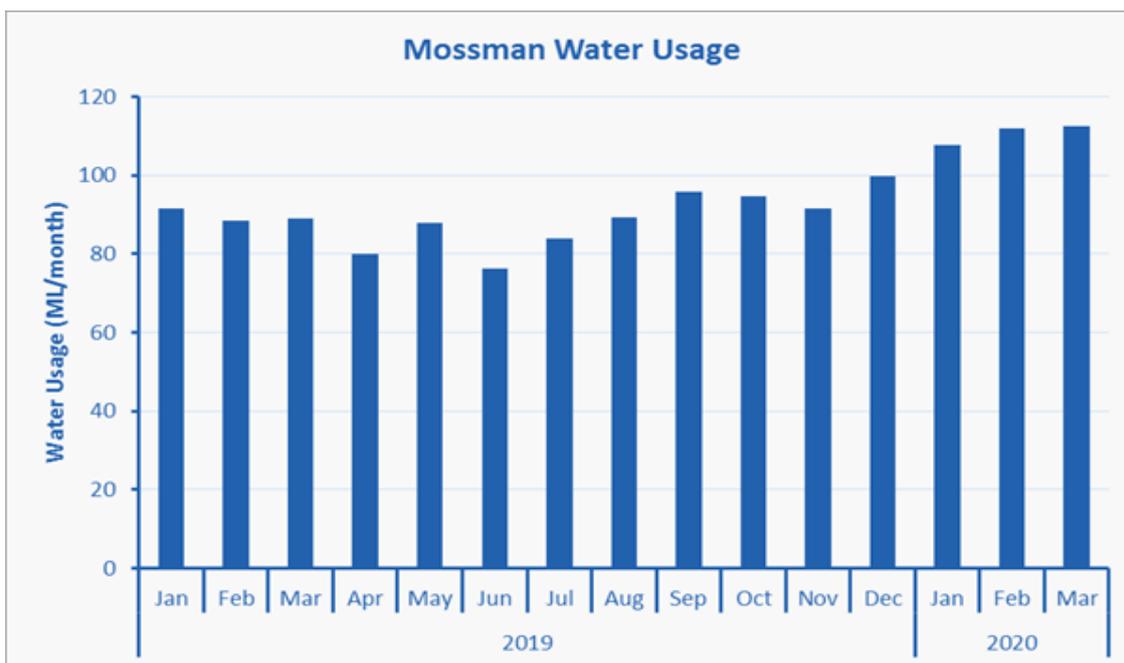


Fig 2. Mossman Scheme Total Monthly Consumption Figures

Port Douglas Water Supply

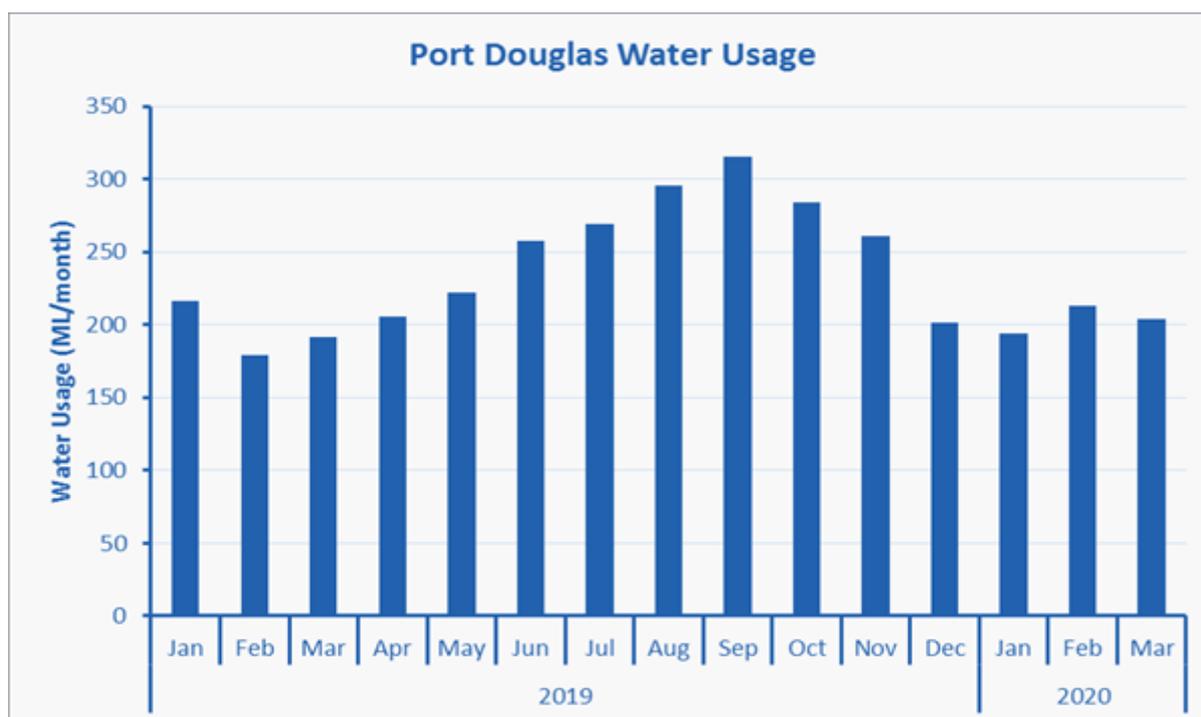


Fig 3. Port Douglas Scheme Total Monthly Consumption Figures

Whyanbeel Scheme

Whyanbeel Water Treatment Plant met all demand requirements during the reporting period.

The UF rack was operational during the reporting period. To maintain UF filter efficiency chemical clean-in-place operations were undertaken, general service and maintenance works continued.

There were no water quality reportable incidents in the Whyanbeel water scheme for the reporting period.

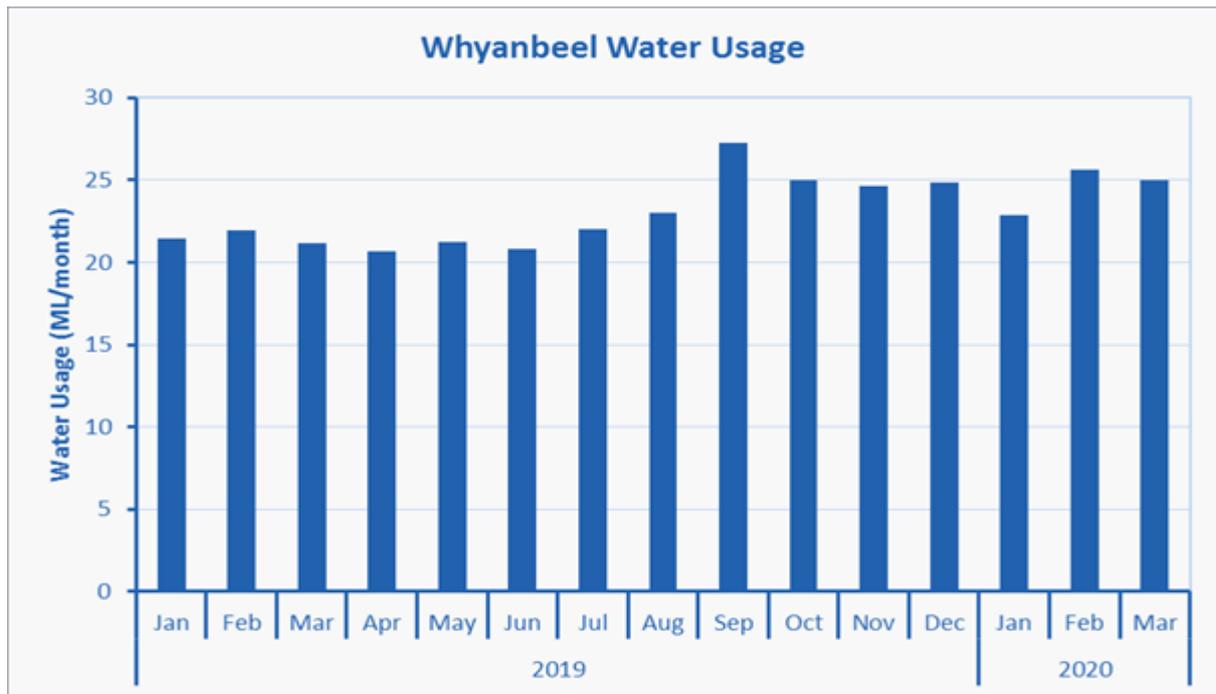


Fig 4. Whyanbeel Scheme Total Monthly Consumption Figures

Daintree Scheme

Daintree Water Treatment Plant met all demand requirements during the reporting period.

To maintain UF filter efficiency chemical clean-in-place operations were undertaken and general maintenance and service works continued.

There were no water quality reportable incidents in the Daintree water scheme for the reporting period.

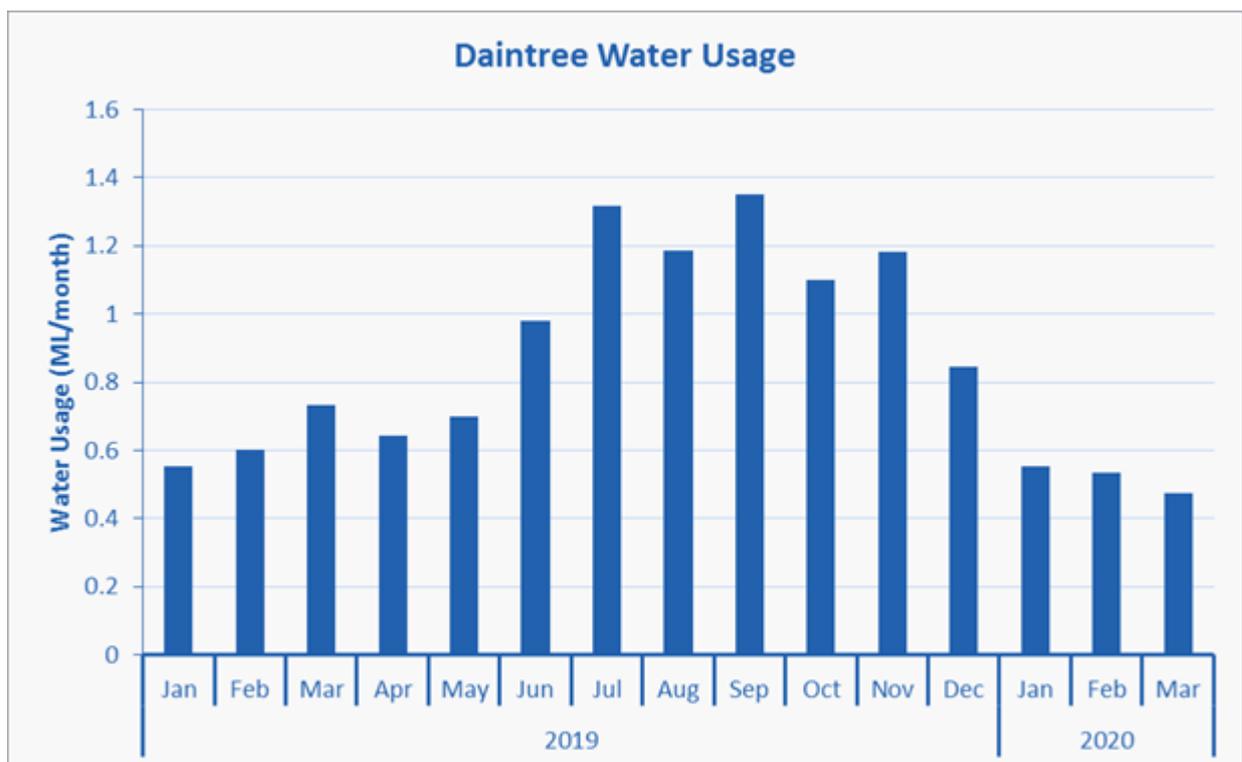


Fig 5. Daintree Scheme Total Monthly Consumption Figures

3. Water quality monitoring and results

Drinking water sampling occurs at intakes, reservoirs and in the reticulation network to ensure compliance with the ADWG.

Water quality verification monitoring includes regular testing of individual reticulation zones with monthly sampling at the reservoirs. Supporting programs for the verification of drinking water quality include;

- Water treatment plants and reservoirs that have SCADA alarms for action and critical limits and are operated under critical control points;
- Reservoir inspections that are done regularly to ensure that the reservoirs are intact and that any points of ingress are repaired; and
- Network operations that have a flushing program that ensures the chlorine residual is above 0.2 mg/L.

For the reporting period, a total of 71 treated water E.coli compliance samples were taken in the three drinking water schemes. A total of 29 E.coli samples were tested in the Douglas water laboratory and 42 in a NATA accredited laboratory. Other parameters monitored allow the Water and Wastewater Department to observe trends in water quality through the schemes. All tested parameters in drinking water samples during the reporting period were compliant with ADWG health guideline values and standards required by the Water Supply Regulator and Queensland Health.

In addition, raw water quality was monitored at all of the intakes and Daintree bore site, including 24 raw water E.coli samples. Raw water sampling assists us to understand the treatment plant needs and the health based targets.

Mossman/Port Douglas Supply Scheme

Average monthly values for key operational and compliance parameters are detailed in Tables 4 and 5 for treated water at Port Douglas Reservoirs and Port Douglas/Mossman Reticulation network respectively. Figure 6 indicates the daily turbidity trends at the intake and treated water as recorded at the Mossman Water Treatment Plant for the period January to March 2020.

Table 4. Average monthly values for key operational and compliance parameters in the Port Douglas Reservoirs.

Month	pH	Temp °C	Total Alkalinity mg CaCO ₃ /L	Free Cl mg/L	Total Cl mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0 - 200	0.2 - 5.0	<5	<1
Jan-20	7.4	28.7	12.5	1.1	1.2	<1
Feb-20	6.8	28.0	11	0.8	0.9	<1
Mar-20	7.1	28.5	6.4	1.1	1.1	<1

Table 5. Average monthly values for key operational and compliance parameters in the Mossman/Port Douglas Reticulation Network.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-20	6.7	28.8	0.7	0.7	<1	0.025	0.017	0.0002	<1
Feb-20	6.8	29.5	0.7	0.7	<1	0.014	0.01	<0.0002	<1
Mar-20	6.9	28.4	0.7	0.7	1	0.019	<0.008	<0.0002	<1

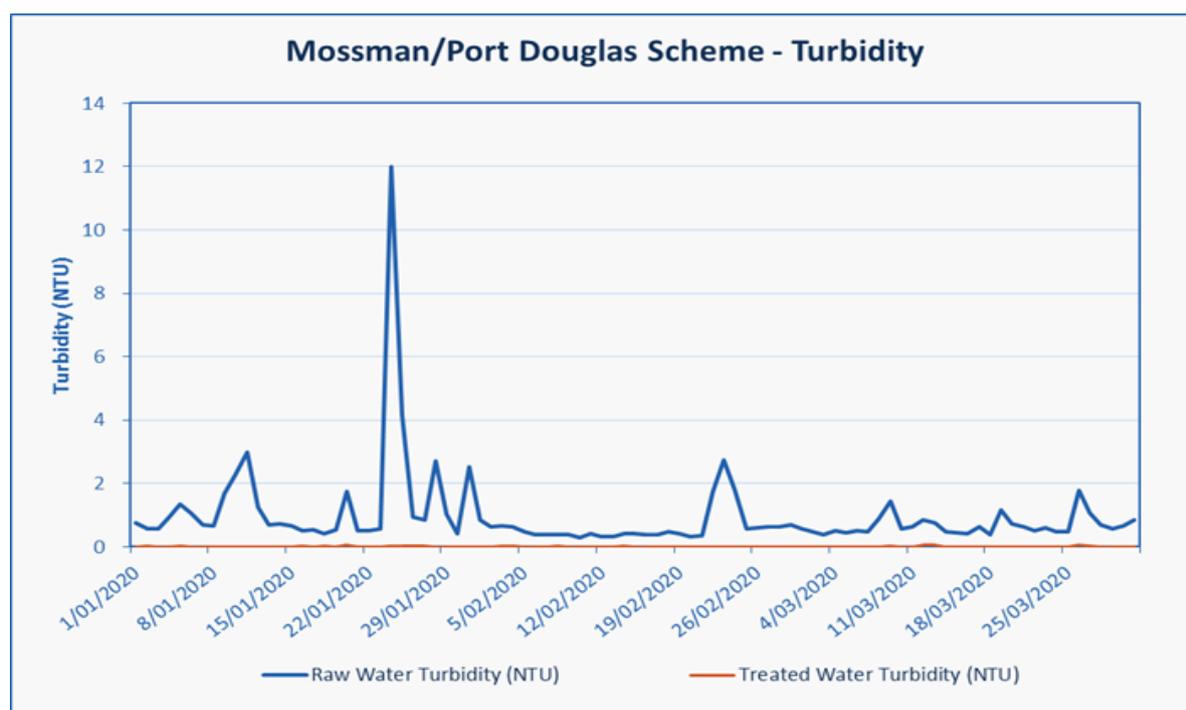


Fig 6. Turbidity trends at the Rex Creek intake and treated water at the Mossman Water Treatment Plant

Whyanbeel Supply Scheme

Average monthly values for key operational and compliance parameters are detailed in Tables 6 and 7 for treated water at the Whyanbeel Reservoir and Whyanbeel Reticulation Network respectively. Figure 7 indicates the daily turbidity trends at the intake and treated water as recorded at the Whyanbeel Water Treatment Plant for the period January to March 2020.

Table 6. Average monthly values for key operational and compliance parameters in the Whyanbeel Reservoir.

Month	pH	Temp °C	Total Alkalinity mg CaCO ₃ /L	Free Cl mg/L	Total Cl mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0 - 200	0.2 - 5.0	<5	<1
Jan-20	8.1	30.5	15	1.1	1.1	<1
Feb-20	8.2	30.9	13	0.9	1.0	<1
Mar-20	7.8	28.9	11	0.9	1.0	<1

Table 7. Average monthly values for key operational and compliance parameters in the Whyanbeel Reticulation Network.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-20	7.8	29.5	0.7	0.8	<1	0.003	0.021	0.0003	<1
Feb-20	7.8	29.8	0.8	0.9	<1	0.003	0.008	0.00025	<1
Mar-20	7.8	29.5	0.7	0.7	<1	0.003	0.011	0.0006	<1

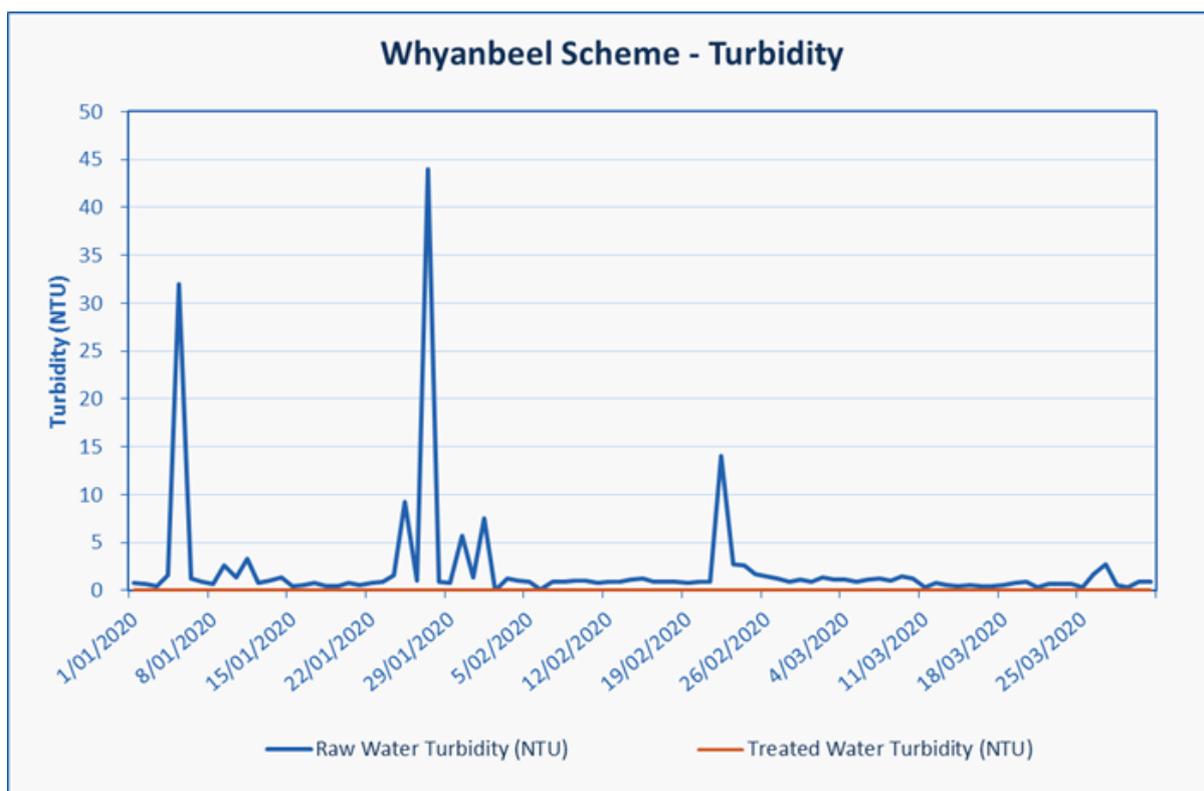


Fig 7. Turbidity trends at the Little Falls Creek intake and treated water at the Whyanbeel Water Treatment Plant.

Daintree Supply Scheme

Average monthly values for key operational and compliance parameters are detailed in Table 8 for treated water at Daintree Reticulation network. Daintree reticulation network experienced some low chlorine events due to low water usage within the network. Low chlorine results initiated a flushing program, which reduce water age and elevated the chlorine concentration to prescribed levels. Figure 8 indicates the daily turbidity trends at the intake and treated water as recorded at the Daintree water treatment plant for the period January to March 2020.

Month	pH	Temp °C	Free Cl mg/L	Total Cl mg/L	Colour PCU	Cu mg/L	Fe mg/L	Mn mg/L	E.coli MPN
Standard	6.5 - 8.5	10 - 30	0.2 - 5.0	<5	<15	<1	<0.3	<0.1	<1
Jan-20	8.1	28.1	0.3	0.3	5.9	0.008	0.015	<0.0005	<1
Feb-20	8.3	29.3	0.1	0.1	<1	0.004	0.028	0.0003	<1
Mar-20	8.4	28.0	0.4	0.4	<1	0.004	0.011	0.0002	<1

Table 8. Average monthly values for key operational and compliance parameters in the Daintree Reticulation Network.

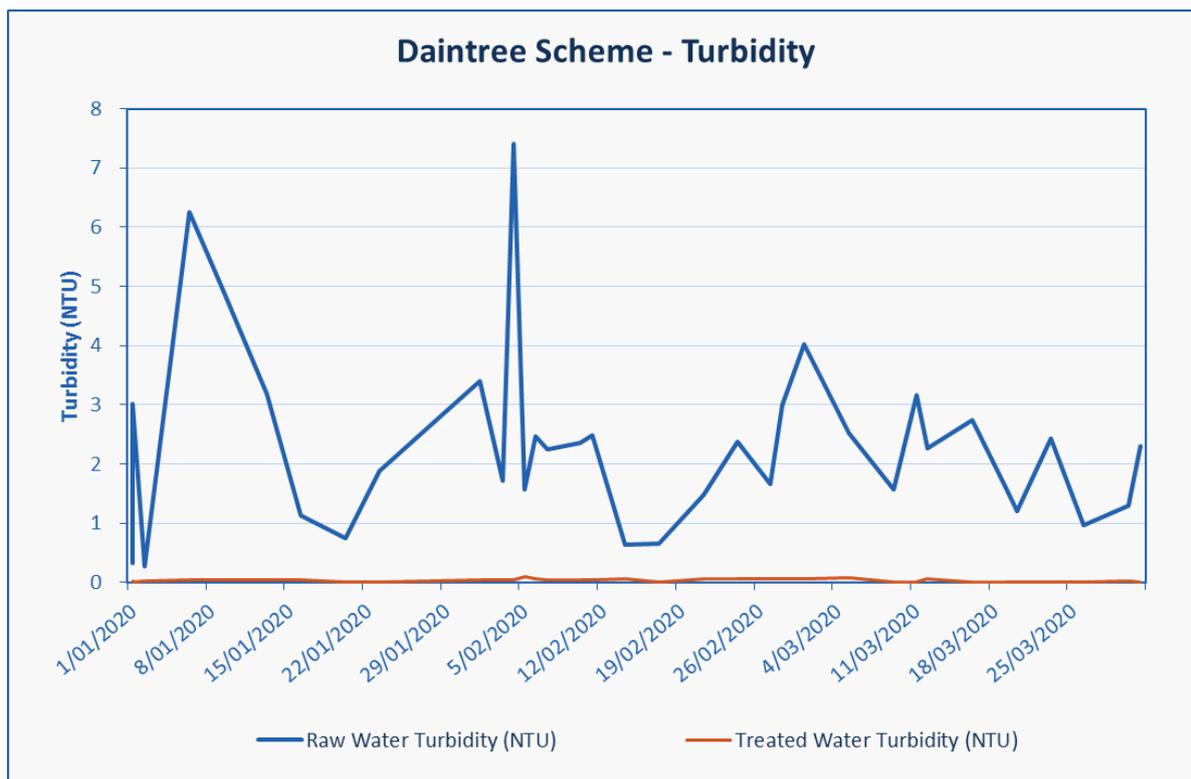


Fig 8. Turbidity trends at the Intake/Martin Creek intake and treated water at the Daintree Water Treatment Plant.

Wastewater

4. Wastewater reticulation services

General maintenance programs continued on the reticulation networks and 32 pump stations in the Mossman and Port Douglas catchments. Wastewater Treatment Plants operated within license requirements throughout this period. In this quarter, the completed 2019/2020 wastewater capital works projects were the new fixed generators at sewer pump stations, sewer pump station lid renewal, sluice valve renewals and mapping requests. The commencement of projects such as a new crossover for the delivery of leachate at the Port Douglas Wastewater Treatment Plant and the outfall flow meter pit are both progressing well. In this reporting period, wastewater completed 76 of the identified manholes that required raising to surface level and re-sealing of the sewer manholes.

Table 9 below shows the number of maintenance activities undertaken across all schemes.

	Port Douglas Catchment	Mossman Catchment
Pump Blockages	2	8
Sewer Chokes	0	0
Sewer Main Breaks	0	0
HCB Repairs (House Connection Branch)	2	2
Odour Complaints	0	1

Table 9. Wastewater Reticulation Services

Influent and irrigation flows

Port Douglas Wastewater Treatment Plant

A total of 257,550 kL of influent entered the Port Douglas Wastewater Treatment Plant during the reporting period. The average daily flow was 2,830 kL/day. Tanker truck contractors delivered 597 kL of septage to the plant and 1,200 kL of Leachate from the Killaloe Landfill and Transfer Station. Influent is treated in a Sequencing Batch Reactor (SBR) which produced compliant effluent during the reporting period. A total of 36% of the treated effluent was pumped to two resort golf courses for irrigation purposes and the remaining discharged into the Dickson Inlet. The Sheraton Mirage received 88,659 kL and Palmer Sea Reef received 4,245 kL of treated effluent during this period. Total rainfall on site during the reporting period was measured as 945.50mm. On 22nd February 2020, the highest rainfall on a day was recorded as 125 mm at Port Douglas Wastewater Treatment Plant.

Daily inflows and total monthly flows for the reporting period are presented in Fig 9 and 10 respectively.

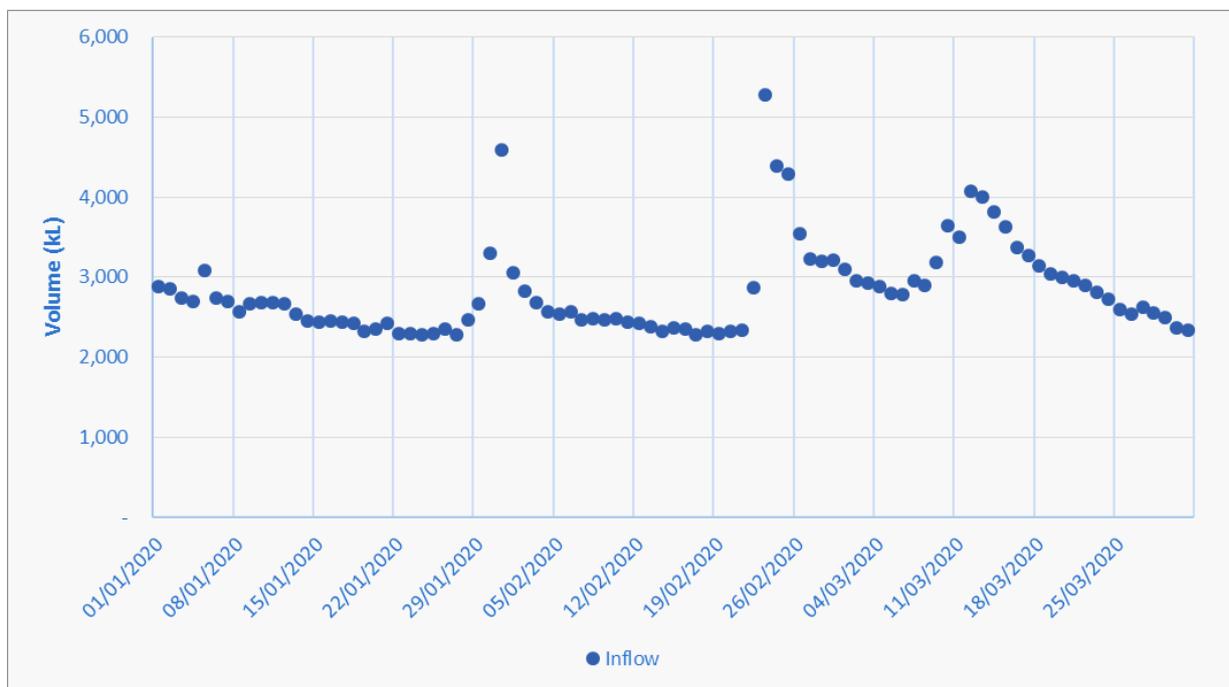


Fig 9. Port Douglas Daily Inflow

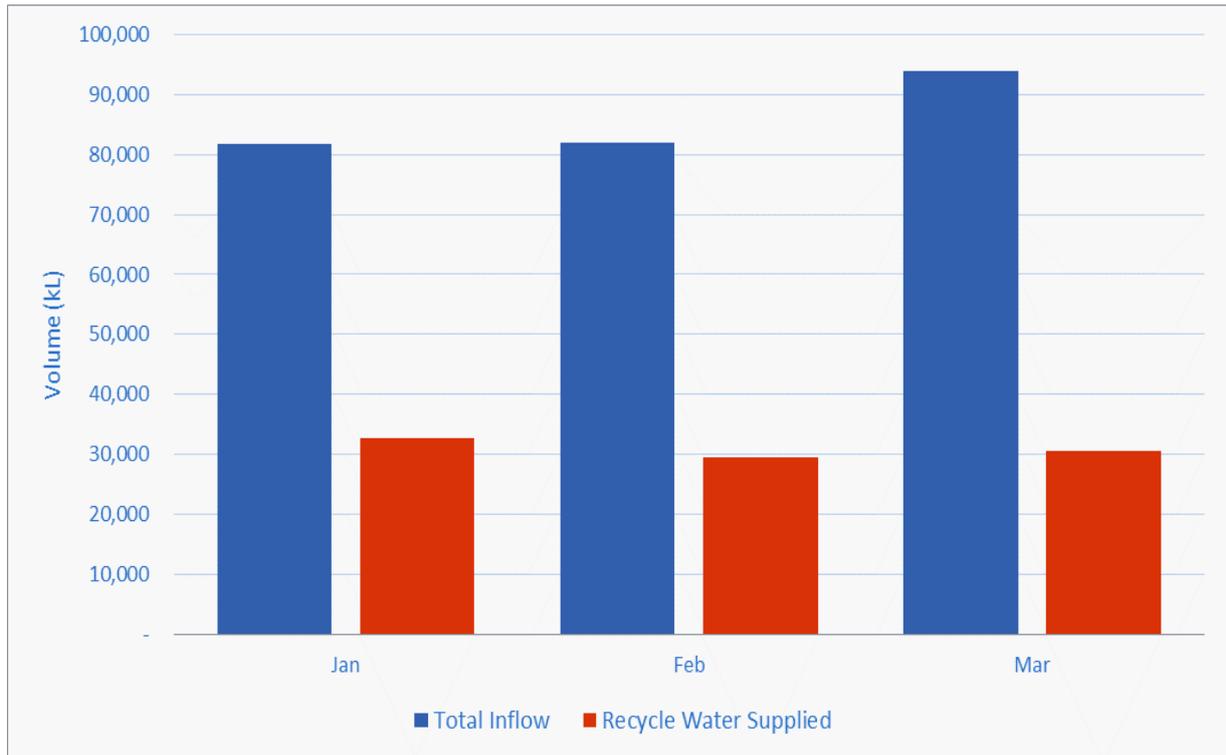


Fig 10. Port Douglas Total Monthly Flow 2020

Mossman Wastewater Treatment Plant

The Mossman Wastewater Treatment Plant received a total influent flow of 110,661 kL during the reporting period. The average daily flow was 1,216 kL/day. Influent is treated in an Oxidation Ditch system and compliant effluent is discharged into the Mossman River. A total of 989.50mm of rain fell on site for the reporting period with the highest daily rainfall measured at 102 mm on 23rd of February 2020 at Mossman Wastewater Treatment Plant.

Outflow and Inflow data for the reporting period are shown in Fig 11 and 12 respectively.

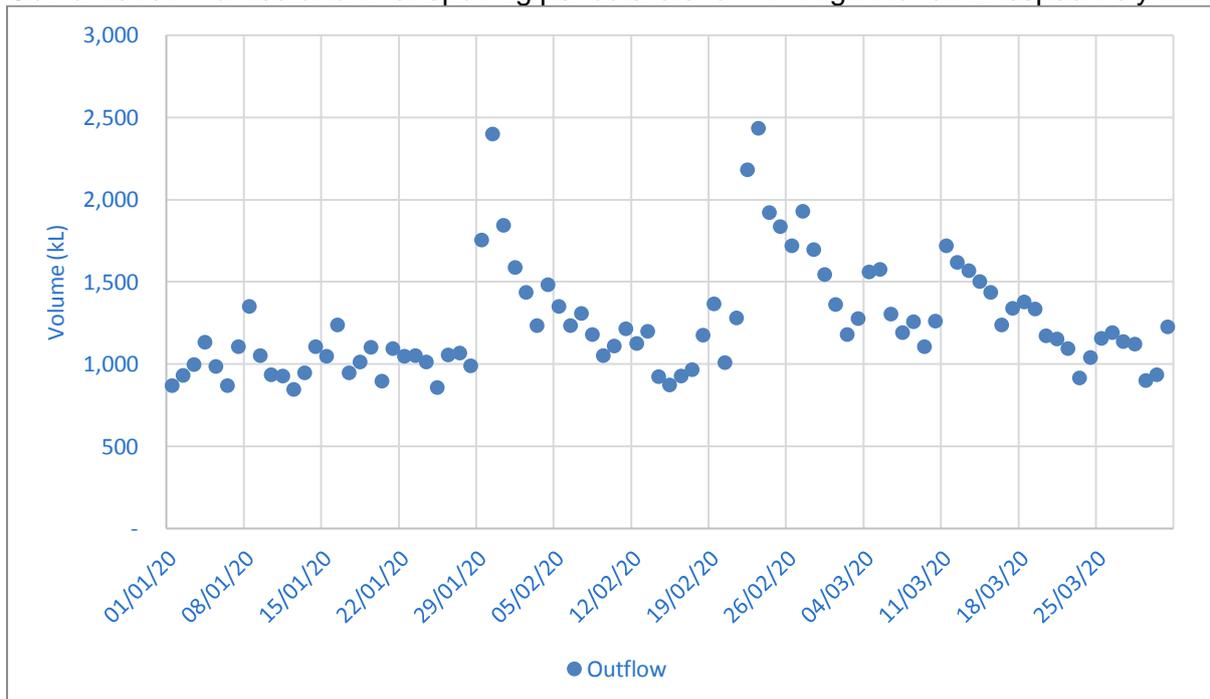


Fig 11. Mossman Wastewater Treatment Plant Daily Outflow

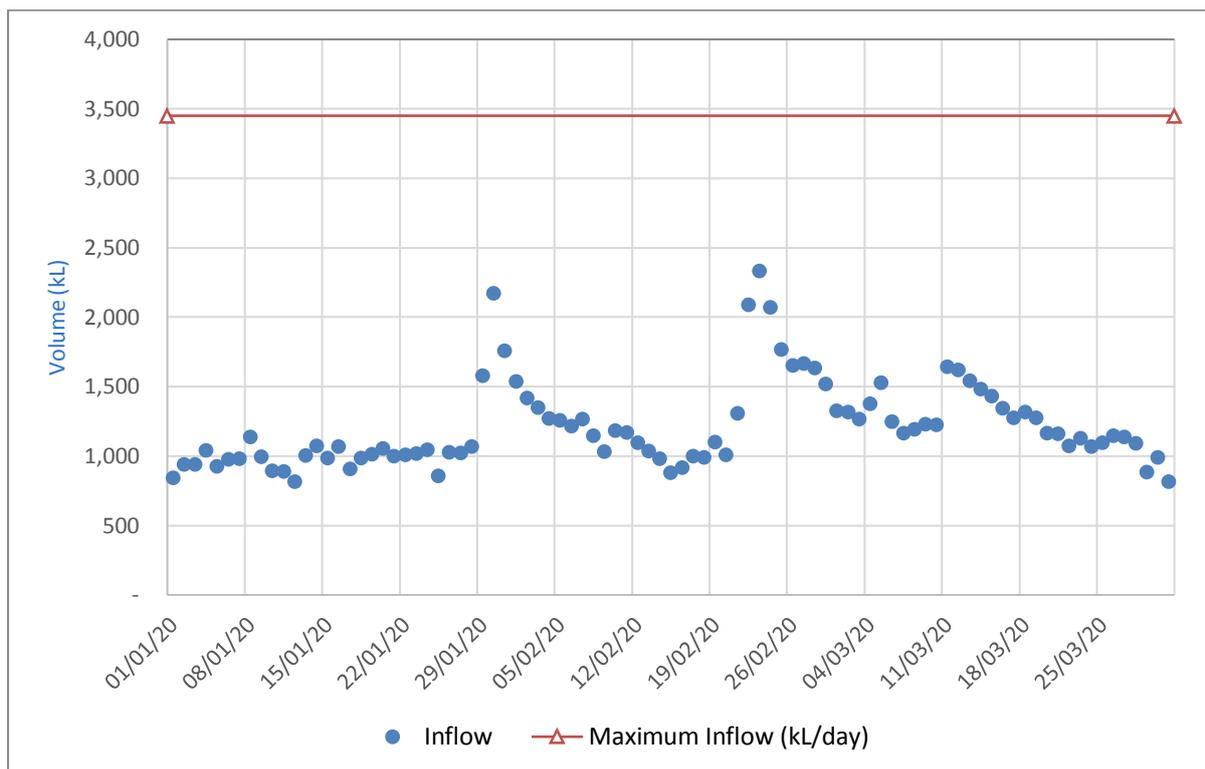


Fig 12. Mossman Wastewater Treatment Plant Total Daily Inflow 2020

5. Bio-solids Production

Bio-solids were only produced at the dewatering plant at Port Douglas Wastewater Treatment Plant (11.86% solids) this quarter and Mossman Wastewater Treatment Plant (11.65%). Bio-solids were transported by Arkwood Organics to Edmonton Farms, Tablelands Regional Farms and Spring Mount Waste Facility for further treatment and beneficial land application as organic fertiliser and soil conditioner.

Port Douglas Wastewater Treatment Plant

At Port Douglas Wastewater Treatment Plant, 296.86 tonnes of wet bio-solids were produced during the reporting period and sent to farms for beneficial reuse. This amount of wet bio-solids equates to 35.34 dry tonnes.

The monthly bio-solids production trends can be seen in Figure 13.

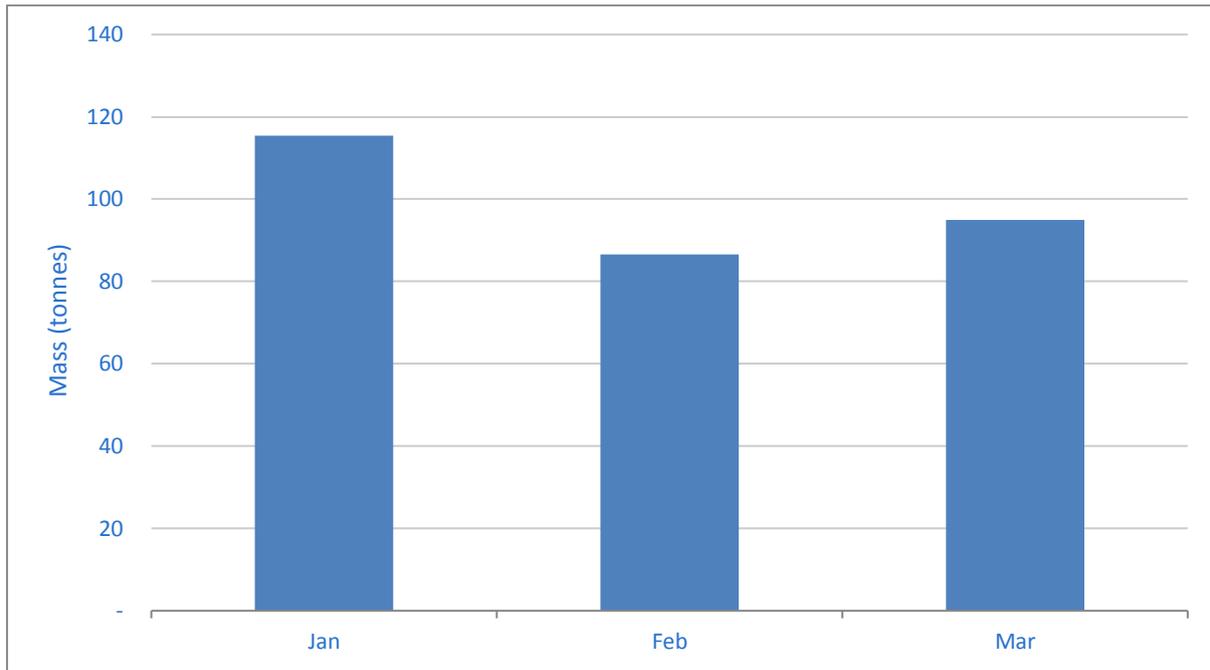


Fig 13. Port Douglas Wastewater Treatment Plant monthly bio-solids production 2020

Mossman Wastewater Treatment Plant

At Mossman Wastewater Treatment Plant, 43.9 tonnes of wet bio-solids was produced during the reporting period and sent to farms for beneficial reuse. This amount of wet bio-solids equates to 5.11 dry tonnes. The monthly bio-solids production trends can be seen in Figure 14.

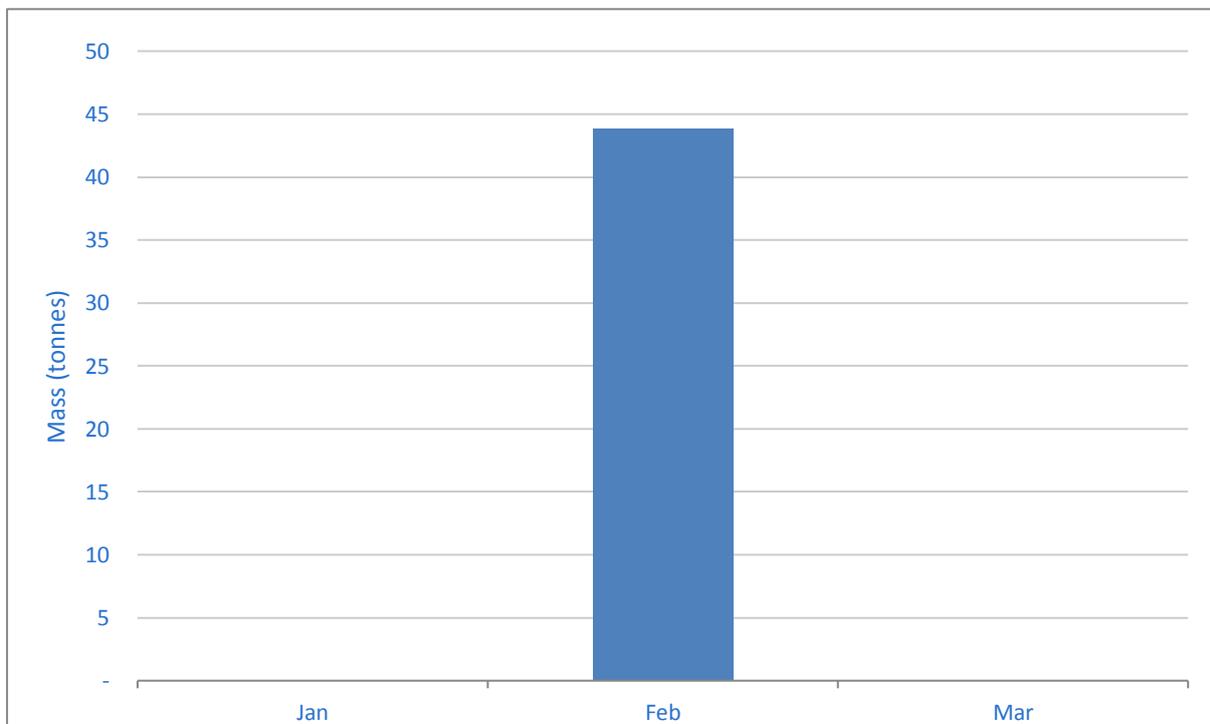


Fig 14. Mossman Wastewater Treatment Plant monthly bio-solids production 2020

Effluent quality and compliance

During the reporting period compliance sampling was performed as per EPPR01790513 license conditions, see Table 10.

Table 10. Monitoring of contaminant releases to waters as per Environmental Authority EPPR01790513

Characteristics Determination	PDWWTP Frequency	MWWTP Frequency
5-day Biochemical Oxygen Demand	weekly	fortnightly
Suspended Solids	weekly	fortnightly
pH	weekly	weekly
Dissolved Oxygen	weekly	weekly
Ammonia Nitrogen	fortnightly	fortnightly
Total Nitrogen	fortnightly	fortnightly
Total Phosphorus as P	fortnightly	fortnightly
Oil and Grease	fortnightly	fortnightly
Faecal Coliforms (Organisms/100ml)	fortnightly	fortnightly
Free residual chlorine	-	fortnightly

Additionally, more samples are taken from the treatment processes, bio-solids, receiving waters and bores. Samples are tested by a NATA accredited laboratory for physical, chemical and microbiological parameters. All parameters tested during the reporting period from the Port Douglas and Mossman wastewater treatment plants were compliant.

The process and compliance is monitored each day by in-house analyses of samples at the wastewater treatment plants. Process settings, effluent quality, flow rates, pump stations performance and maintenance aspects are monitored and controlled with SCADA Citect via an extensive Telemetry network.

Port Douglas Wastewater Treatment Plant

The results for final effluent key licence compliance parameters (Ammonia, Total Phosphorous, Total Suspended Solids, BOD₅ & Total Nitrogen) are shown in Figure 15, 16, 17, 18 & 19.

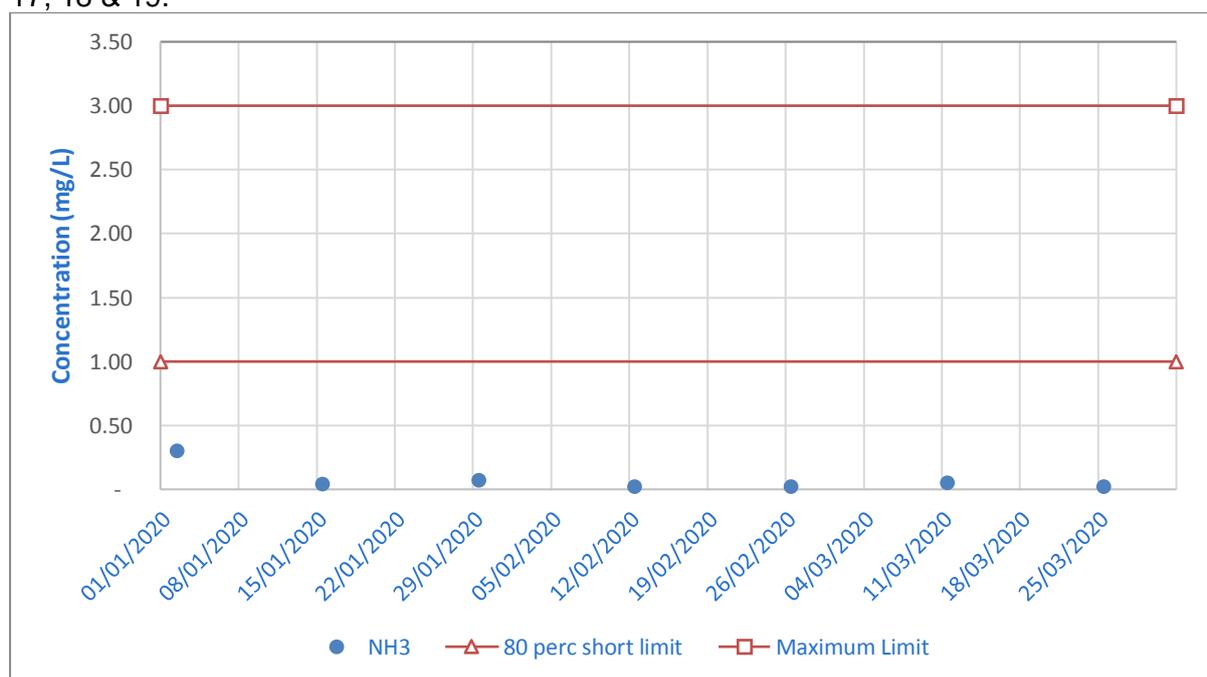


Fig 15. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Ammonia

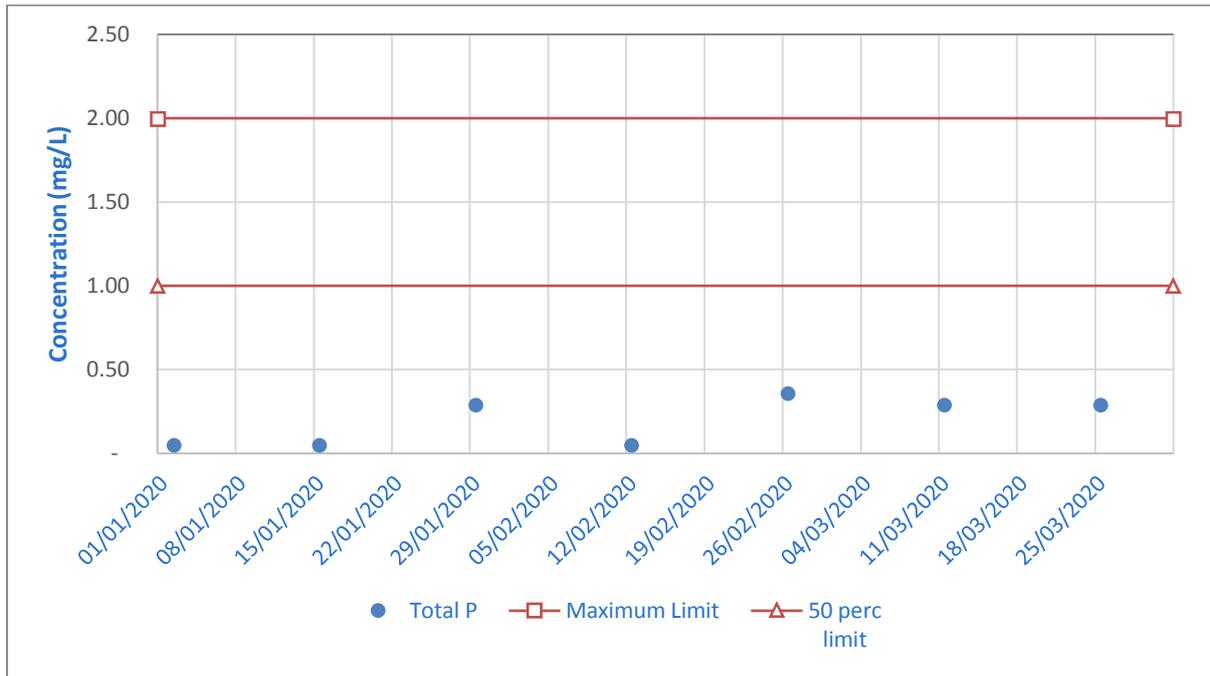


Fig 16. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Total Phosphorous

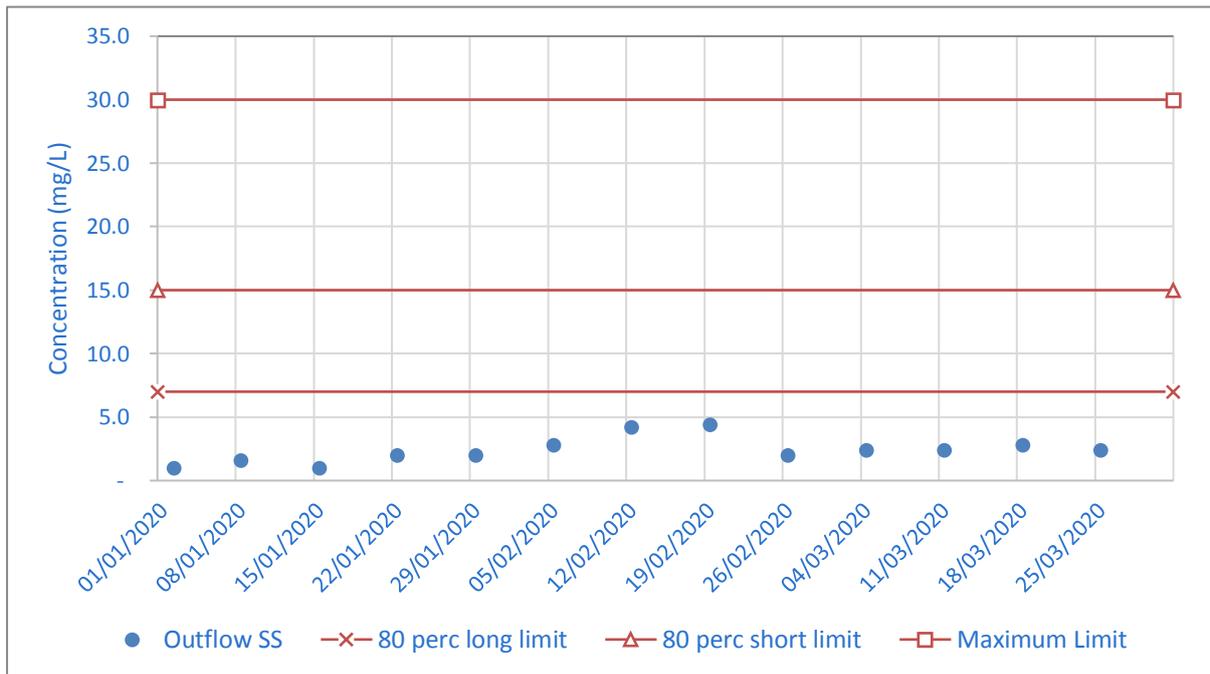


Fig 17. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for Total Suspended Solids

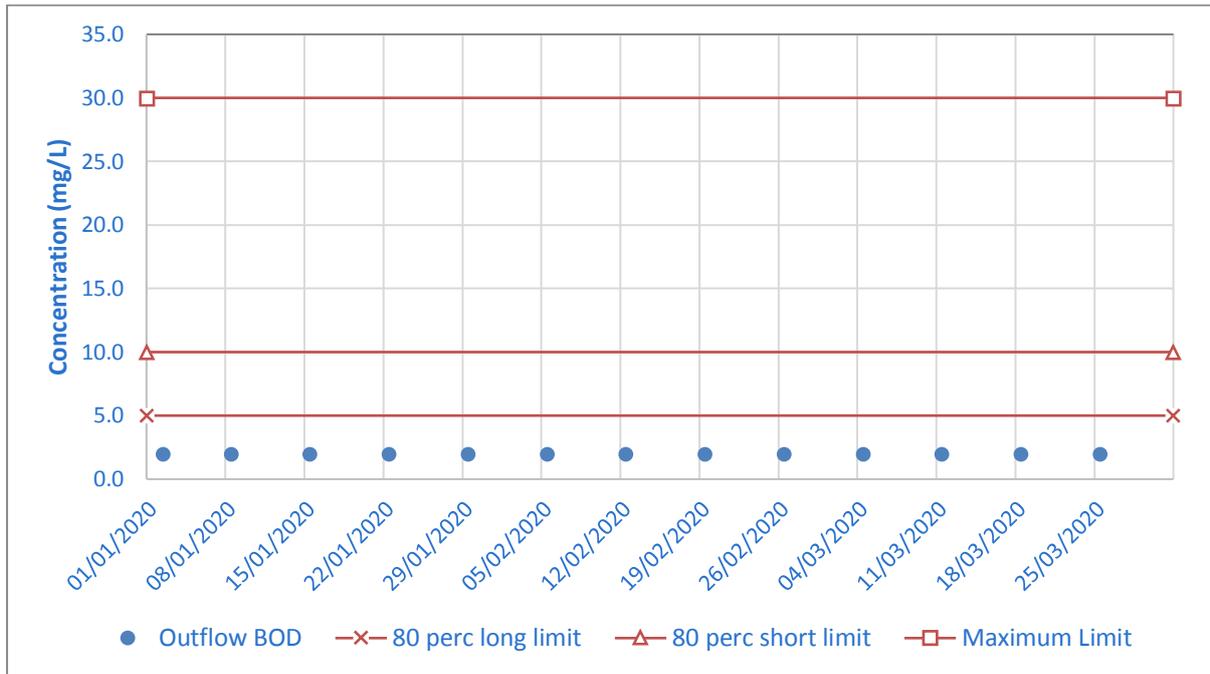


Fig 18. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for BOD₅ (Biochemical Oxygen Demand)

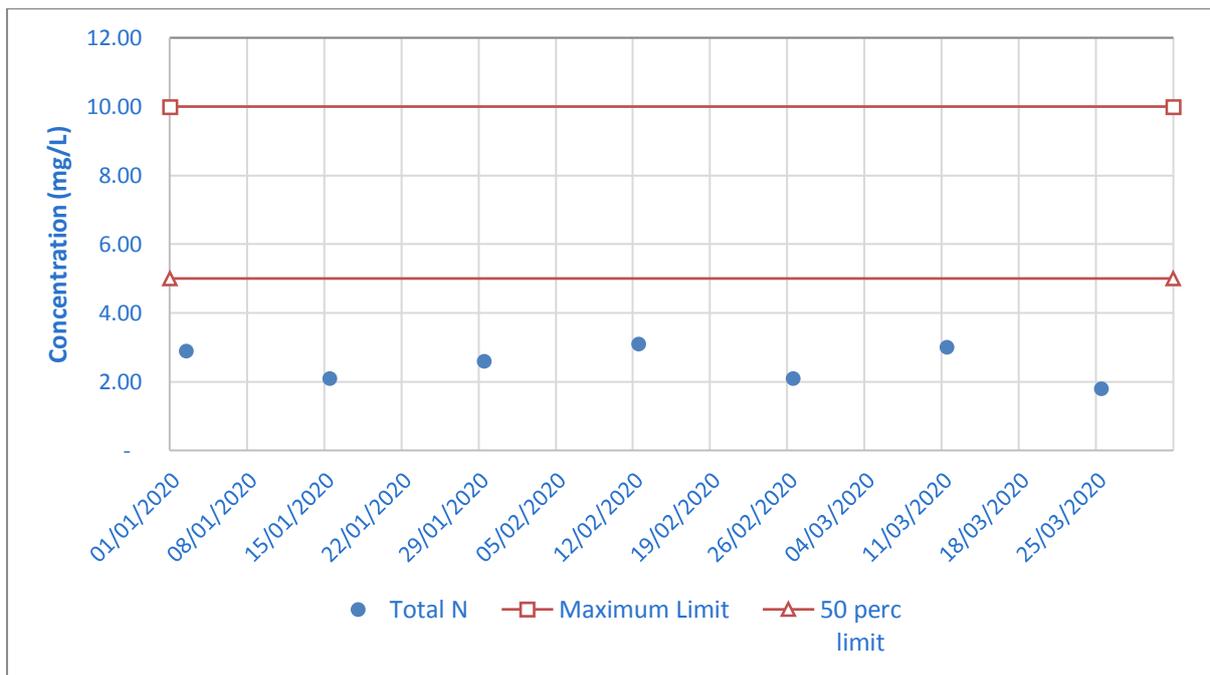


Fig 19. Port Douglas Wastewater Treatment Plant Final Effluent Test Results for total Nitrogen

Mossman Wastewater Treatment Plant

The results for final effluent key licence compliance parameters (Ammonia, Total Phosphorous, Total Suspended Solids, BOD₅ & Total Nitrogen) are shown in Figures 20, 21, 22, 23 & 24.

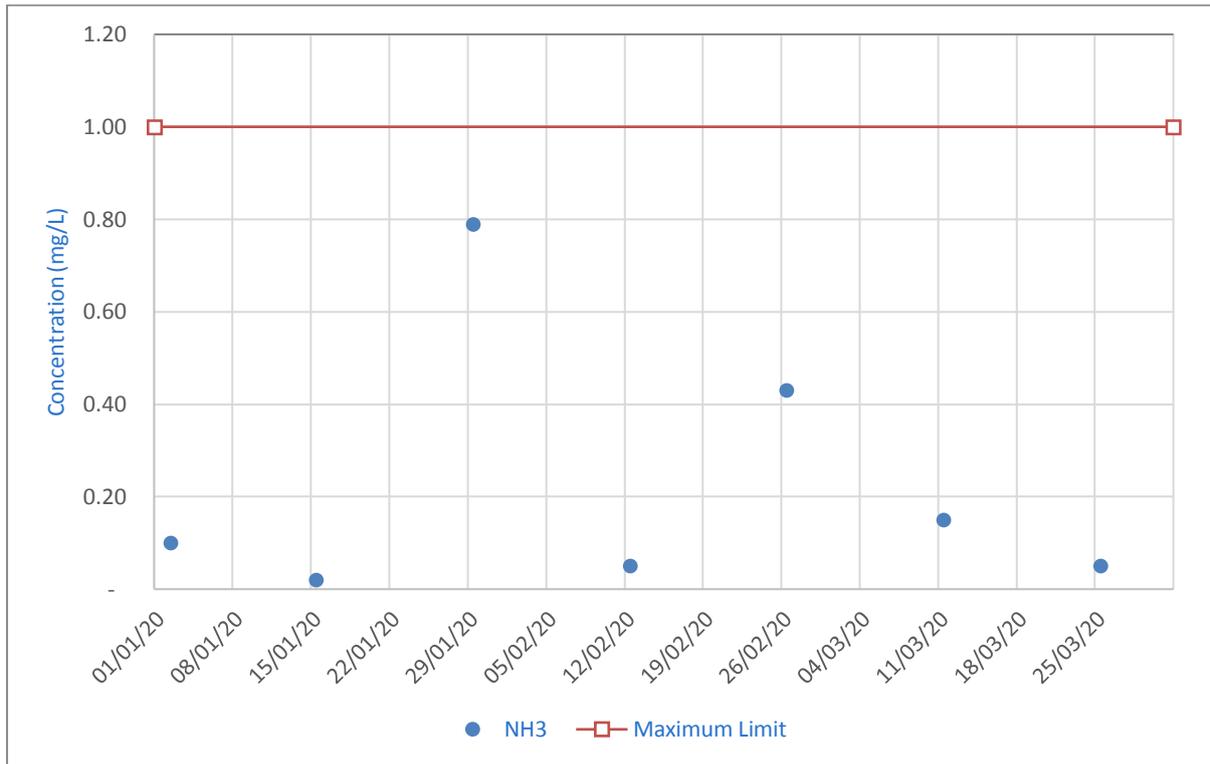


Fig 20. Mossman Wastewater Treatment Plant Final Effluent Test Results for Ammonia

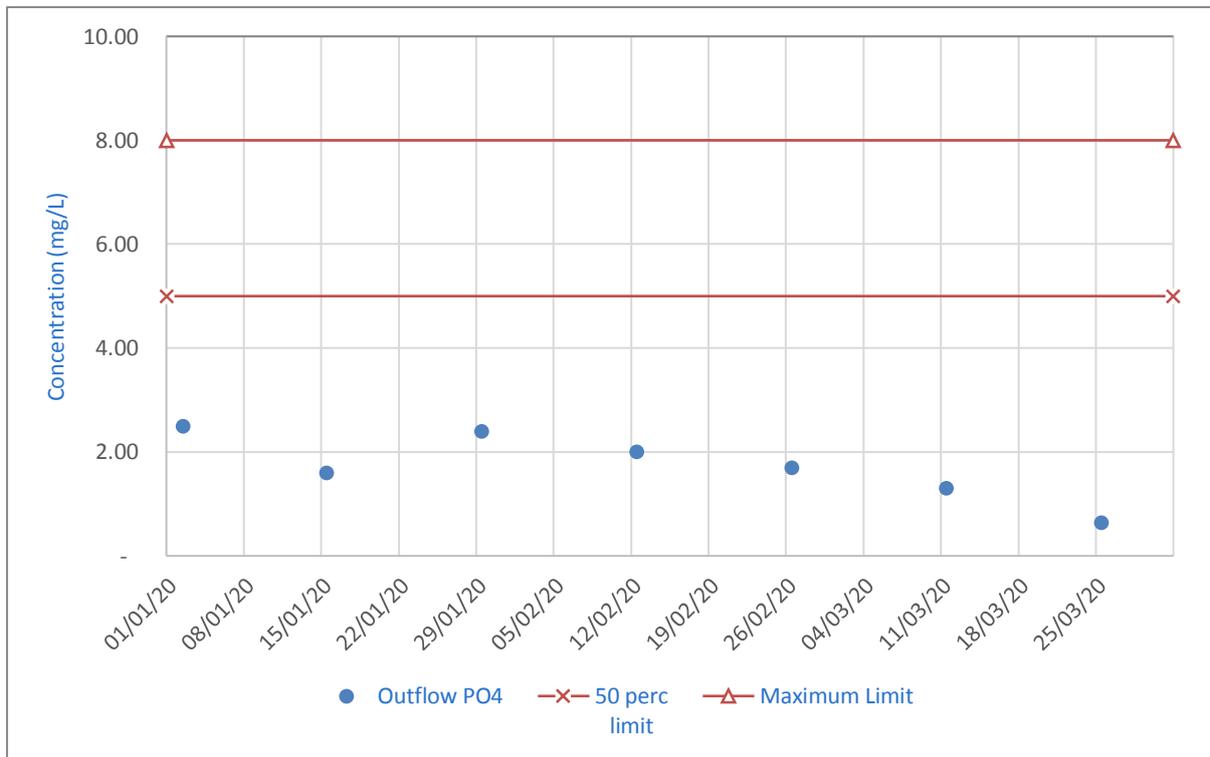


Fig 21. Mossman WWTP Final Effluent Test Results for Total Phosphorous CHECK

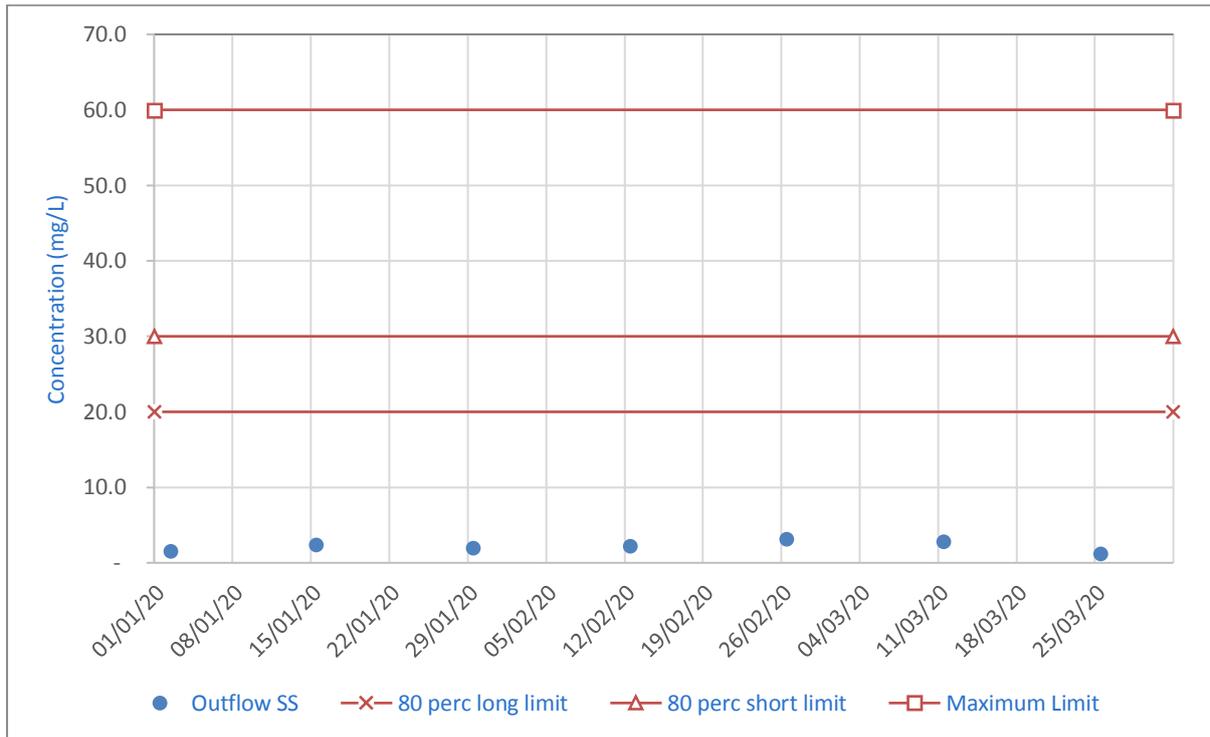


Fig 22. Mossman WWTP Final Effluent Test Results for Total Suspended Solids

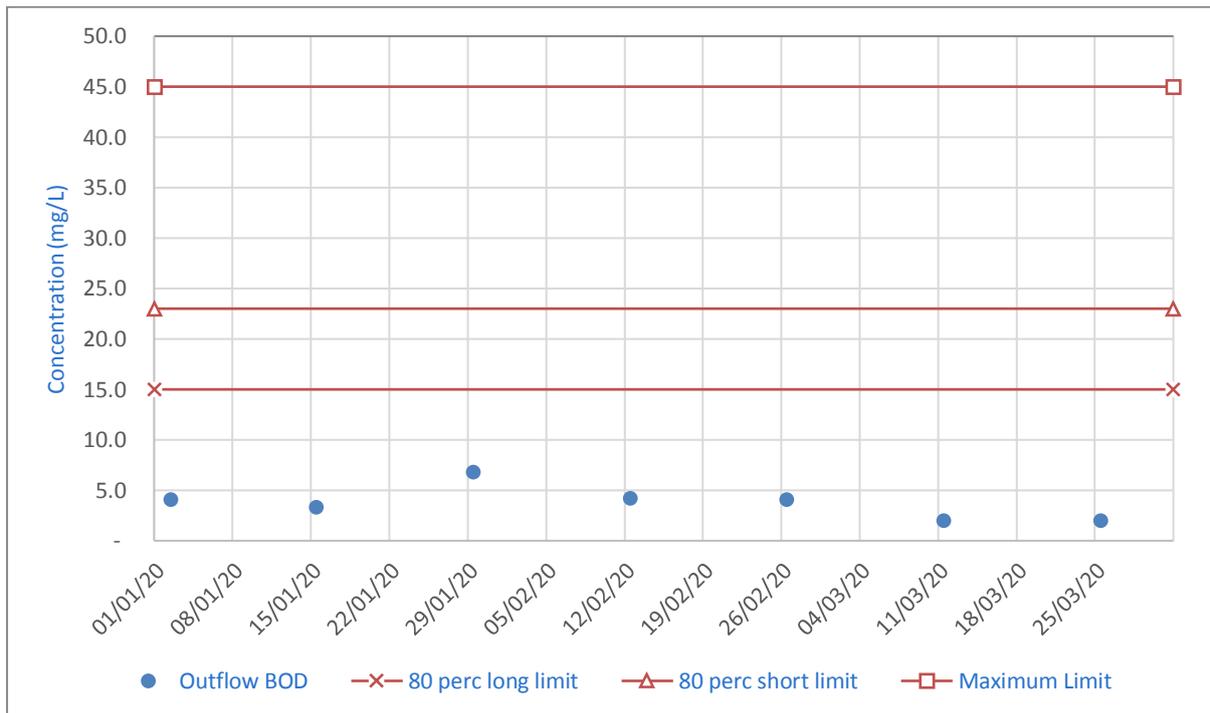


Fig 23. Mossman Wastewater Treatment Plant Final Effluent Test Results for BOD₅ (Biochemical Oxygen Demand)

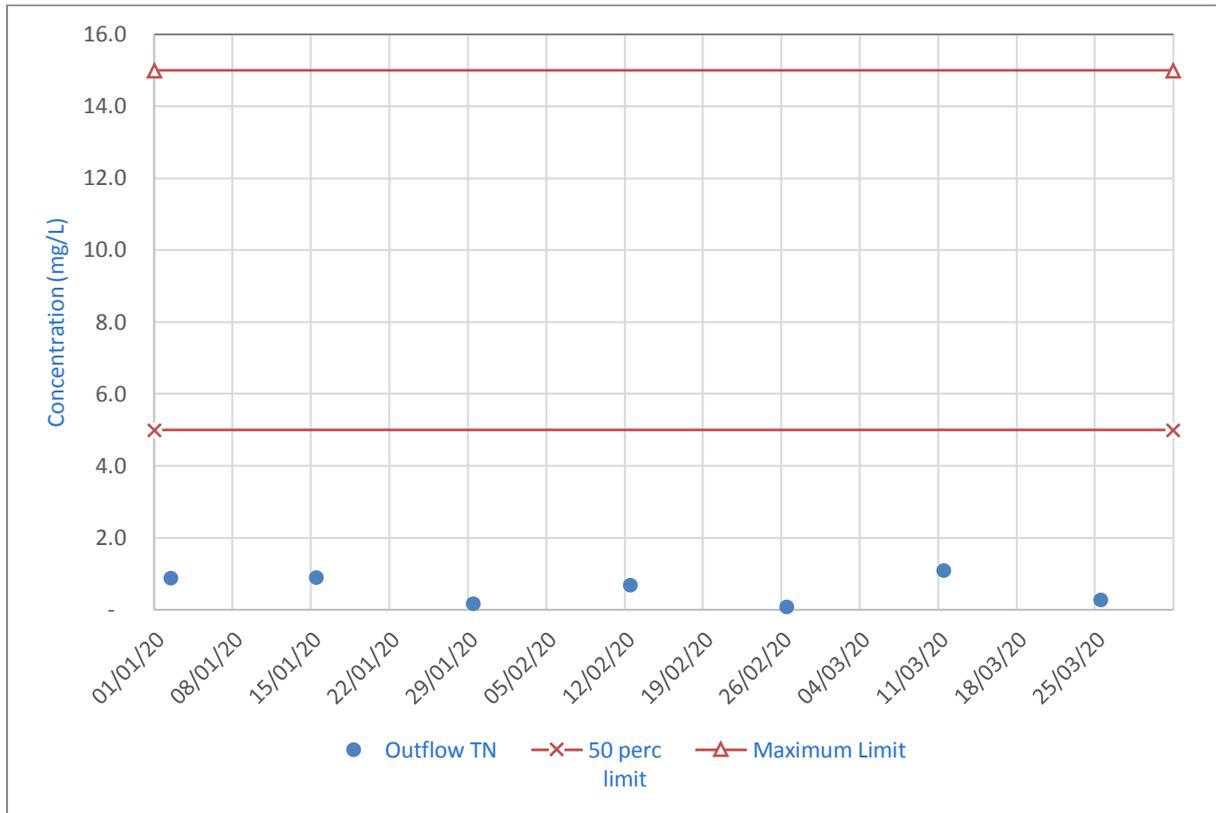


Fig 24. Mossman Wastewater Treatment Plant Final Effluent Test Results for total Nitrogen