PORT MACQUARIE HASTINGS

Recycled Water Management System

Annual Report 2021/22

Port Macquarie-Hastings Council

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1	21/11/22	First Draft	[redacted]
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1 Report purpose

This report is designed to address the reporting (Element 10), evaluation (Element 11) and review and continual improvement (Element 12) requirements of the Port Macquarie-Hastings Council Recycled Water Management System (RWMS). The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006 and the Department of Primary Industries and Environment Recycled Water Guidance document (2015) provide guidance on the implementation of the Recycled Water Management System.

- The Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) recommends review of the following areas:
- Performance of critical control points
- Recycled water quality review (raw, treated and distribution water quality including verification monitoring
- Levels of Service (including consumer complaints)
- Incident and emergencies (including follow up)
- Recycled Water Management System implementation
- Continuous improvement plan implementation

Review of system performance are measured against AGWR, PMHC levels of service, NSW Water Supply and Sewerage Performance Monitoring Reports and other regulatory requirements (Element 1). Shortcomings are captured in the Improvement Plan (Element 12).

2 Scheme Summary

Port Macquarie-Hasting Council (PMHC) is located on the mid north coast of NSW, covering an area of 3,686 km^2, the area is located adjacent to the Hastings River, the Pacific Highway, the Oxley Highway and the North Coast railway line. The areas major population centre is Port Macquarie, and includes the smaller townships of Wauchope, Camden Haven, Long Flat, Telegraph Point and Comboyne.

Port Macquarie-Hastings Council (PMHC) provides water, wastewater and stormwater services to the people of the Port Macquarie Hastings area. Due to high growth in the region, PMHC has been actively pursuing alternative sources of non-potable water to reduce the demand on the potable supply system.

The Port Macquarie Recycled Water Scheme has been operating since 2007 and can provide up to 2 ML/d of recycled water. The Port Macquarie recycled water is currently supplied to Council and commercial premises and for tankers for non-potable reuse.

In 2023 the Port Macquarie Recycled Water Scheme will be expanded to serve the residential and commercial areas at Thrumster (Area 13). Council is also in the process of commissioning the Bonny Hills Recycled Water Scheme (Area 14), which is anticipated to commence distribution of recycled water by May 2023. Both schemes will require Council to successfully complete and independent IPART Audit of the systems and obtain section 60 approval.

Area 13 and Area 14 have been developed as dual reticulation schemes to utilise both water sources (recycled and potable) in residential houses. The recycled water will be used for irrigation, laundry (washing machines cold water only), car washing and toilets flushing. All houses are dual plumbed with two separate meters.

This annual report provides an update of the Port Macquarie Recycled Water Scheme, for current uses only, and does not include any further details on the Area 13 and 14 Schemes, which have not been commissioned.

The Port Macquarie Recycled Water Supply System receives treated effluent from the Port Macquarie Wastewater Treatment Plant (PM WwTP). The effluent is treated at the Recycled Water Treatment Plant by ultrafiltration, reverse osmosis, UV disinfection, chlorination and re-mineralisation before being distributed out to consumers.

After treatment, recycled water is delivered to the storage reservoir in Morton Street and then distributed via a reticulation network to the users.

The table 2 - 1 below provides a summary of the Port Macquarie Recycled Water Supply System and figure 2-1 below provides a process flow diagram for Port Macquarie Hastings Councils Recycled Water Plant.

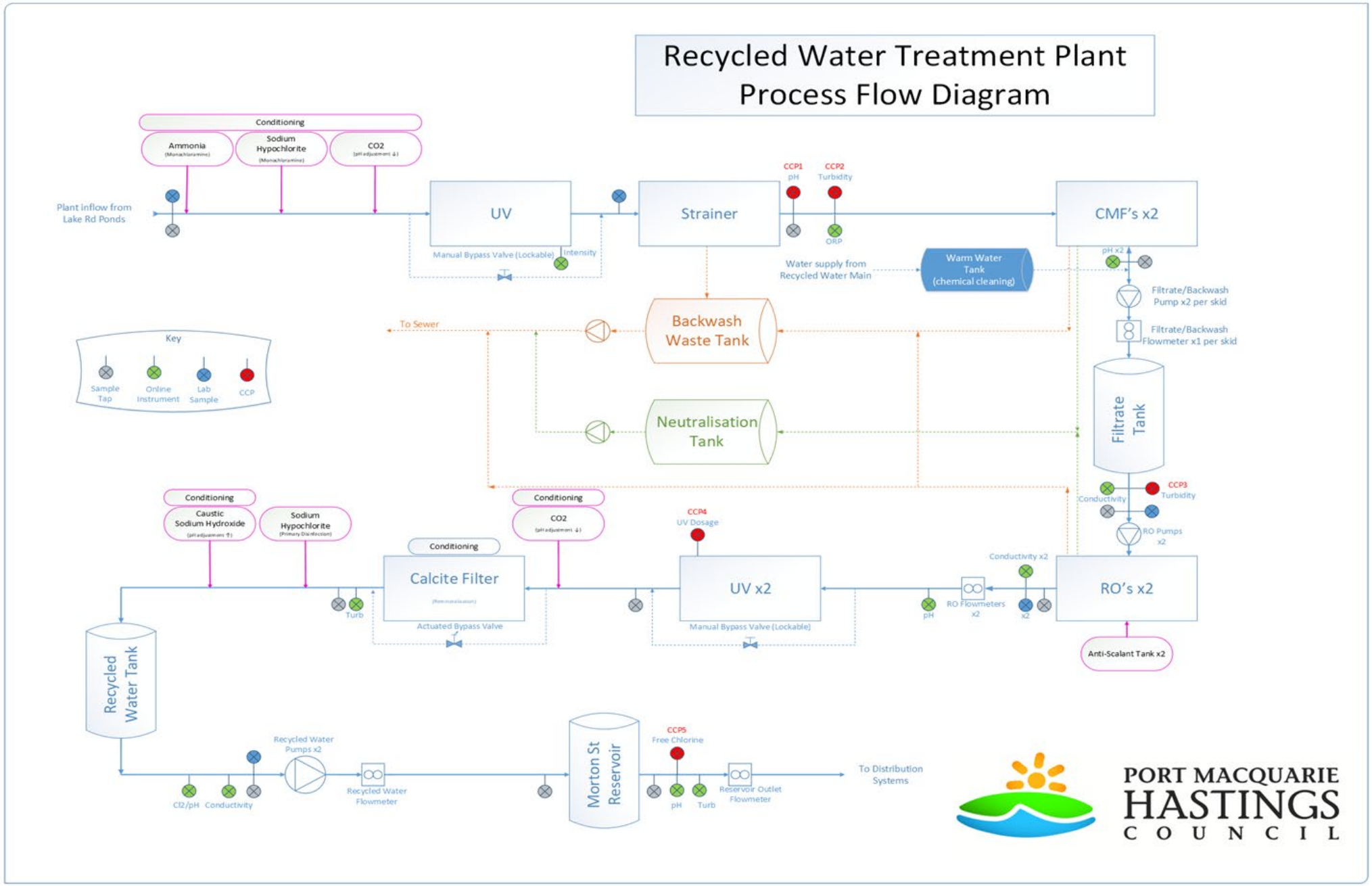
Table 2-1 Summary of Port Macquarie Recycled Water System

Recycled Water supply system name	Port Macquarie Recycled Water Supply
Recycled water source	Lake Road/Ocean Drive Effluent Ponds
Treatment unit processes	Straining, Ultrafiltration, Reverse Osmosis, UV Disinfection, Re-mineralisation using Calcite Filter, Sodium Hypochlorite Disinfection, Caustic Sodium Hydroxide and CO_2 for pH adjustment
Treatment capacity (ML/day)	2ML/day
Current Users	**Sports Fields:** Stuart Park, Wayne Richards Park, Town Green, Findlay Oval, Dixie Park **Council Building**: Glasshouse, Port Macquarie Wastewater Treatment Plant (PM WwTP), Council Building, Sewer Pump Stations (SPS's) **Carwashes:** Bellbowrie & Gordon Street **Businesses**: Caltex Petrol Station, St Joseph Primary School, Port Macquarie Racecourse, Douglas Vale Winery, John Patrick cars, Port Home Zone, Port City Bowling Club, Croquet Club, Community Garden
Towns supplied	Port Macquarie
System upgrades/improvements	An alternative supplier has been sourced for the remineralisation media, due to problem with the existing supply. The performance of the media used in the remineralisation system has improved significantly since it was installed. ……..

Council also provides recycled water for irrigation purposes, as summarised below. Due to the recent wet weather events, these schemes have not been supplied with recycled water during the current reporting period, and as such have not been included in the Annual report.

- Wauchope Effluent to adjacent Property and Wauchope Golf Course
- Kew Kendall Effluent to Kew Golf Course
- Camden Haven Effluent to Timbarra Estate - currently not operating

Figure 2-1 Process Flow Diagram for Port Macquarie Recycled Water Plant



3 Recycled Water Management System (RWMS) Document Review

There have been no changes to the RWMS or the Critical Control Points (CCP) in the current reporting year. The development of the revised RWMS is currently being undertaken by Council, as required for Section 60 approval for the Dual Reticulation schemes. A Recycled Water Risk workshop is planned for February 2023 to review both schemes which will lead into the review and finalisation of the Risk Register, CCPs and RWMS, for both Port Macquarie and Bonny Hills.

4 Critical Control Points

A Critical Control Point is defined as an “activity, procedure or process at which control can be applied, and which is essential to prevent a hazard or reduce it to an acceptable level” (NSW Ministry of Health 2013). These may be processes such as selective abstraction of raw water, filtration, disinfection or reservoir integrity. For each CCP, a parameter, such as chlorine residual, can be measured to verify the effectiveness of the process or identify when corrective action is required.

Target, alert, shutdown and critical limits are determined for each CCP parameter to identify normal and outside of normal operational conditions. The target limit identifies the normal operational conditions, the alert limit indicates that the parameter is outside the normal conditions and corrective action may be required. The critical limit, if exceeded, indicates that process control has been lost and safe recycled water quality can no longer be guaranteed.

Water Supply Operators (Operators) sample, test and monitor CCP parameters and operational performance for the pre and post treated recycled water supply. Monitoring includes sample collection and analysis using laboratory and field instruments and real-time monitoring using online instrumentation. Councils SCADA system also enables operators to remotely monitor the recycled water treatment plant and online instrumentation. Where online probes are used for monitoring, laboratory tests, calibration and routine maintenance are undertaken to ensure the online probes are reading correctly.

Operational data is stored in Water Outlook and is always accessible to the operators, supervisor and manager. Water Outlook uses dashboards for visual monitoring of CCP’s through graphs and traffic light warnings. If monitoring data (from both SCADA and Water Outlook) triggers the alert or critical limits for the CCP, the operators undertake corrective actions, as indicated in their CCP procedures, and in consultation with their supervisor. Operators also report these exceptions in Water Outlook using the Incident Report System. The Incident Report provides a record of the reason for the exceptions, the corrective actions undertaken and whether any further actions are required to reduce the likelihood of this exception occurring again.

A Summary table of the Port Macquarie recycled water scheme CCP’S is provided in Appendix A.

4.1 CCP Performance

Port Macquarie Hastings Council maintains a monitoring system of CCPs which includes online analysers as well as analysis of water samples. Water quality data obtained from both sources are captured in water outlook where operators can monitor for any CCP exceedances.

There was one (1) CCP exceedance detected where the electrical conductivity measured from a permeate sample taken on the 11th of April 2022 from reverse osmosis train 2. The data indicated a one-off reading of 625.7 uS/cm from the online instrumentation. Further investigation indicates this was a potential error in the instrument, as it was an isolated error, with normal results averaging 15 uS/cm. There were no other CCP exceedances for the reporting period. CCP trends are provided in Appendix B for reference.

The CCP procedures will be reviewed for the Port Macquarie Recycled water scheme, with the implementation of dual reticulation to Thrumster. There are several changes required, to reflect the operational capabilities of the treatment plant, as well as ensure the water quality meets the Dual recycled water guidelines.

The following criteria will also be implemented as part of the review.

- A lower limit for CCP 1 pH control at council's inlet to filtration membrane will be added to reflect the acceptable condition of water that can be treated.
- CCP 5 for UV Dosage control will need to be reviewed and improved upon to include an operating target and adjustment limit, through the review for the Dual Reticulation scheme. The shutdown limit and critical limit for CCP 5 will also be reviewed. Further consideration regarding the validation for virus removal is required to determine accurate critical limits for these systems.

5 Recycled Water Quality

Water quality monitoring is undertaken on a routine basis to ensure that Councils customers receive safe and acceptable recycled water quality. There are no specific guidelines which specifies the recycled water quality in the reticulation network. However, Council has implemented the following targets (see table 5- 1). Council's Operators collect samples from the recycled water plant, reservoir and reticulation system which are delivered to the Port Macquarie Hastings Environmental Laboratory for analysis.

The calcite filter at the Treatment plant was not operational from July 2021 to February 2022. This was due to problems with the performance of the calcite filter media. Beak through of the calcite occurred which impacted the turbidity of the water. Replacement of the media occurred in February 2022, once an alternative supplier was sourced. Since installation of the new media, the system had been performing well, improving the pH control in the reticulation water.

Table 5-1 Summary of Recycled Water Quality Targets for reticulation

Parameter	Specifically	Targets
Bacteria	E. coli	<1 per 100 mL
	Total Coliforms	<1 per 100 mL
Indicator for Cryptosporidium	Clostridial Spores	<1 per 100 mL
Turbidity	NTU	<2 NTU
Acidity/Alkalinity	pH	6.5 – 8.5
Disinfection	Free Chlorine	Between 0.2 –0 5 mg/L at point of use (in reticulation)

5.1 Non-compliant data

Laboratory results that are non-compliant are shown in the table 5-2 below.

Table 5-2 Non-Complaint Water Quality Results

Date	Location	Parameter	Target Limit	Unit	WQ Value
18/10/2021	Moreton St Reservoir	*Clostridium perfringens*	0	cfu/100mL	2
19/07/2021	Moreton St Reservoir	Turbidity	< 2	NTU	2.4
20/09/2021	Moreton St Reservoir	Turbidity	< 2	NTU	2.6
09/11/2021	Moreton St Reservoir	Turbidity	< 2	NTU	5.8
07/02/2022	Moreton St Reservoir	Turbidity	< 2	NTU	2.1
21/03/2022	Moreton St Reservoir	Turbidity	< 2	NTU	2.3
26/04/2022	Moreton St Reservoir	Turbidity	< 2	NTU	2.5
02/08/2021	Port Macquarie Racecourse	Free Chlorine	0.2 - 5.0	mg/L	0
04/01/2022	Port Macquarie Racecourse	Free Chlorine	0.2 - 5.0	mg/L	0.05
31/01/2022	Port Macquarie Racecourse	Free Chlorine	0.2 - 5.0	mg/L	0.09
07/02/2022	Port Macquarie Racecourse	Free Chlorine	0.2 - 5.0	mg/L	0.03
28/02/2022	Port Macquarie Racecourse	Free Chlorine	0.2 - 5.0	mg/L	0.03

5.1.1 Summary of Non-compliances

There were numerous pH exceedances of the recycled water produced from Port Macquarie Recycled Water Plant. There were 349 samples taken for pH analysis from the reservoir and reticulation network. Out of the 349 samples taken there were 165 exceedances, with 120 (70%) of these having a pH result greater than 8.5 and 45 (30%) of these having a pH result less than 6.5. This equates to almost 50% of all samples exceeding the acceptable limits.

The majority of the exceedances occurred prior to the calcite filter becoming operational (1st of February 2022). The graphs of pH exceedances by sample points are provided in Appendix C.

The Bellbowrie (Riverside) Car Wash sample point had a total of seven (7) pH exceedances, with all results being lower than 6.5. The Lord St Service Station sample point had 26 pH exceedances, with all results above 8.5. Morton St Reservoir had 17 pH exceedances with all results below 6.5. Port Macquarie Racecourse had 18 exceedances of pH below 6.5 and three (3) exceedances of pH above 8.5. The low exceedances occurred between September 2021 and February 2022, while the high exceedances occurred towards the end of the reporting period in June 2022.

Sunset Parade SPS 3 had 37 pH exceedances above 8.5, which. occurred predominately at the start of the reporting period. Wayne Richards Park had 36 pH exceedances above 8.5, which occurred throughout the full reporting period. Wood St Sports Fields had 22 pH exceedances with four (4) below 6.5 and 18 above 8.5. The pH results below 6.5 occurred during the earlier part of the reporting period before the calcite filter was installed, while most of the high pH exceedances occur during later part of the reporting period.

The Port Macquarie Racecourse had a total of five (5) exceedances of low free chlorine levels and one (1) detection of 2 cfu/100mL of *Clostridium perfringens*, which is used as a surrogate for Cryptosporidium. There was no *E. coli* detected.

There were six (6) exceedances for Turbidity in the Morton St reservoir.

5.1 Water Quality Discussion

The purpose of the calcite filter at the Port Macquarie Recycled Treatment Plant is to add alkalinity and increase the pH of the RO permeate water. The intention is to stabilise the water as it travels through the reticulation system. The calcite filter was installed as part of the 2017 upgrade. Numerous operational issues have been experienced since the installation mainly due to poor quality product. In 2019, the calcite filter was taken offline to ensure council could supply a consistent quantity of recycled water to the peat fires that were encountered near Port Macquarie Airport. The water has remained unstable while the filter has been offline.

In 2021/2022 the calcite filter was drained and Hunter H2O were engaged to investigate options for better operations. They recommended that Council source an alternative and more suitable product. Procurement issues and the pandemic delayed the acquisition of the new product and filter gravel. In January 2022, Council installed the new calcite and filter gravel and the system was brought on line on 1 February 2022. Improvements in pH and water stability have been noted since this installation occurred.

Prior to bringing the calcite filter back on line, the pH results were very unstable resulting in numerous exceedances. Sample points closer to the reservoir and recycled water plant typically showed lower pH values while sample points further away experienced higher pH values. The majority of these issues have ceased, since the calcite filter has been re-commissioned.

The Port Macquarie Racecourse, Wood St Sports Fields, Sunset Parade SPS 3 and Wayne Richards Park have continued to experience high pH exceedances, since the calcite filter was re-commissioned. This is likely to be due to high-water age associated with these locations, allowing ample time for the water to react with pipe and reservoir cement linings and thus increasing the pH. Most of these sites are irrigation sites, and there has been little irrigation during this reporting year, due to rainfall, and this has resulted in minimal turnover of the recycled water.

The Port Macquarie Racecourse had a total of five (5) exceedances of low free chlorine levels; which is also due to the water age. There was one (1) detection of 2 cfu/100mL of *Clostridium perfringens*, however a follow up sample for *Clostridium pefringens* analysis provided a result of <1 cfu/100mL, suggesting there

may have been some contamination that occurred during the sampling procedure. There were also a number of larger detections of HPC at the Port Macquarie Racecourse and some very low ones at Wood St Sports field. The presence of HPC indicates that low chlorine and water age are an issue for these irrigation sites, when the recycled water is not being used.

There were six (6) exceedances for Turbidity in the Morton St reservoir. It is not clear why this may have occurred, as all results from the treatment plant were below 0.15 NTU. Council had planned to undertake an inspection and clean of the reservoir in 2021, however, due to crane access issues on site, this clean was not undertaken. It is possible that there is some sediment build up in the base of the reservoir (due to the previous problems with the calcite filter), and on occasions this sediment has been stirred up in the reservoir resulting in elevated results. Although potable water top-up demand has been minimal in the past year, there were still times where this occurred. This process may have also contributed to an increase in Turbidity.

Per- and Polyfluoroalkyl Substances (PFAS) have been identified as an emerging contaminant of concern. In October 2022, Council commenced analysing the Recycled Water Intake and Recycled Plant - recycled water sample sites for PFAS on a monthly basis. The results from this program will be reported in the 2022/2023 annual report.

6 Customer Complaints

There were no customer complaints recorded during the reporting period. High quality recycled water was produced for its intended use (irrigation and car washing). This, along with the small number of customers supplied with recycled water (currently only commercial customers) has most likely contributed to nil complaints being made. Council's Customer Resource Management (CRM) system (program used to manage complaints) does not currently include a recycled water folder/section. This will be address in the near future, ensuring robust management of any customer complaints moving forward.

7 Recycled Water Quality Incidents or Emergency

There were no recycled water quality incidents or emergencies during the reporting period

8 Staff Development and Training

Council’s Community Utilities department includes the operations as well as the planning team for water and sewer. The operations team is comprised of well-trained water operators covering process, maintenance and construction. Approximately 70% of the water team (approx. 30 staff), have Cert II or Cert III in water operations, which was obtained in 2021.

9 Continuous Improvement Plan

The Improvement Plan (IP) was updated in March 2020, following a Risk workshop in 2019. As part of the review, the IP was altered to be a generic document for all recycled water systems, rather than a focus on the Port Macquarie Scheme. Many of the actions in the IP relate to the commissioning of the dual reticulation schemes, and hence are not relevant to this Annual Report.

Council intends to undertake a detailed risk review workshop of the Bonny Hills and the Port Macquarie Recycled Water schemes, prior to commencing dual recycled water supply. Following this, the CCP, RWMS and the IP will be updated to ensure currency, with a proposed completion date of March 2023.

There is one (1) high risk item in the current IP that is outstanding. The item relates to the implementation of additional resources and improved IT systems for managing Trade Waste. Council has undergone a recent restructure, which resulted in the addiction of staff to manage regulatory requirements, including trade waste, recycled water and Backflow prevention. Recruitment is expected to occur in early 2023. Council is also reviewing existing and alternative software options for managing regulatory inspections.

10 Review of DWMS Implementation

Council intends to undertake a detailed risk review workshop of the Bonny Hills and the Port Macquarie Recycled Water schemes, prior to commencing supply. Following this the CCP, RWMS and the IP will also be updated to ensure currency, with a proposed completion date of March 2023. Council will then undertake an IPART operational Audit, and once successfully completed, will apply for Section 60 approval for the Bonny Hills Recycled Water scheme. Following this, Council will progress with the implementation of the Port Macquarie dual reticulation scheme to Thrumster.

11 Reservoir Inspections

Reservoir integrity is included as a critical control point for Council's recycled water supply, as it is the last point of contact with the recycled water, prior to distribution. Maintaining reservoir integrity is critical to ensure that no contaminants, such as vermin, stormwater and bird faeces, can freely access the stored water. Cleaning and inspection of the reservoirs is crucial to ensuring the water quality is not contaminated or sediments are not disturbed.

Morton Street Reservoir is the only operational reservoir in the current recycled water distribution system. Monthly inspections of the reservoir are undertaken by operational staff and issues notified to the Headwork's Technical Officer who then delegates tasks to the appropriate staff. During the current reporting period there were no issues reported. Council has identified some potential issues with regards to records keeping of reservoir inspection results. There were no options in water outlook to allow operators to record their findings from the inspections. As a result of this finding, an extra data entry page in Water Outlook to allow for inspection results to be entered and recorded moving forward.

Council also procure the services of external contractors to inspect integrity of reservoirs. The latest round of external contractor's inspection was conducted prior to this reporting period and as such, has not been captured in this report.

12 References

NHMRC (2011) *Australian Drinking Water Guidelines,* National Water Quality Management Strategy, National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

NSW Ministry of Health (2013), *NSW Guidelines for Drinking Water Management Systems*, NSW Ministry of Health, 2013

NSW Government (2010), *Public Health Act 2010,* NSW Government Parliamentary Counsel's Office.

NSW Government (2012), *Public Health Regulation 2012,* NSW Government Parliamentary Counsel's Office

Water Directorate (2014), *Blue-Green Algae Management Protocols 2014,* Water Directorate, 2014

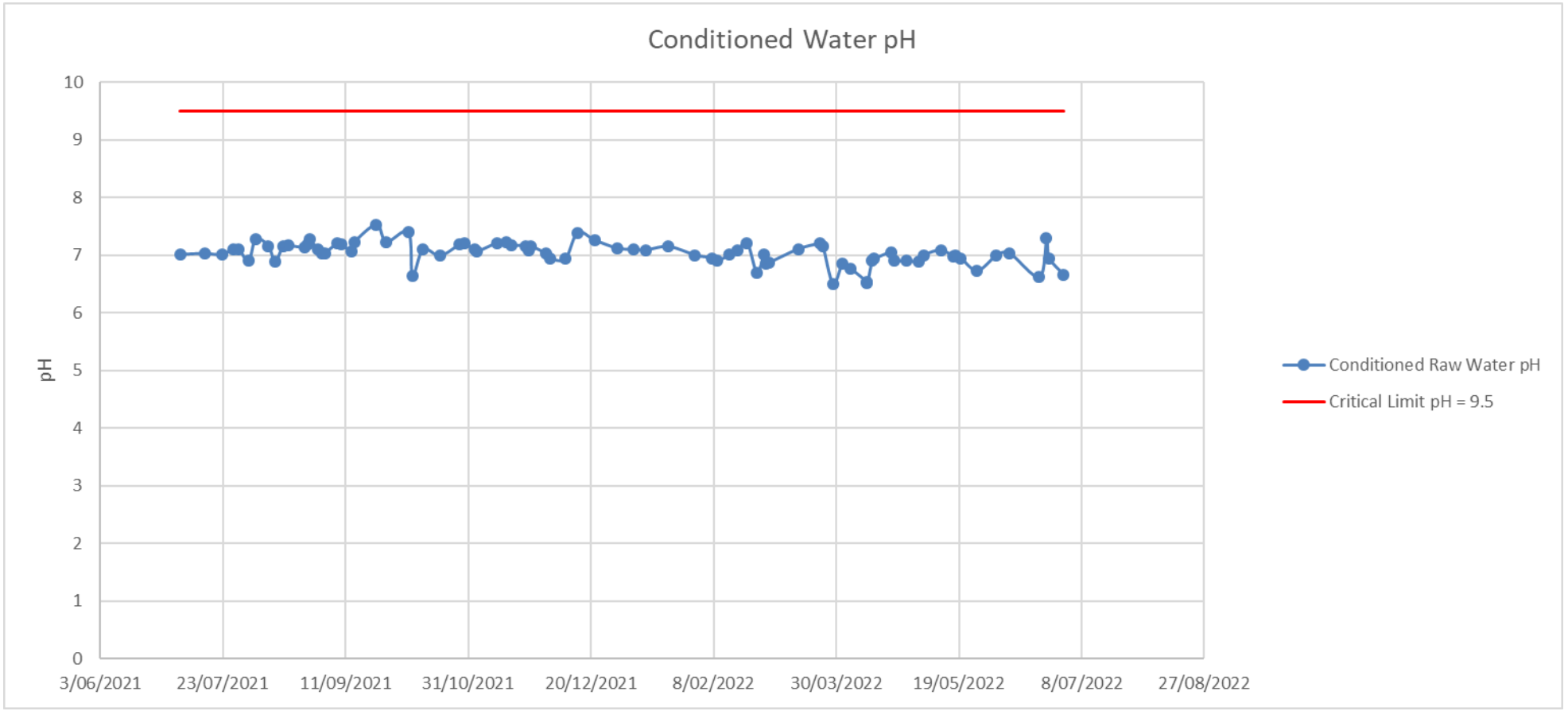
WQRA Research Report 74: *Management Strategies for Cyanobacteria (blue-green algae): a Guide for Water Utilities*

Appendix A Summary of CCP's for Port Macquarie Recycled Water Scheme

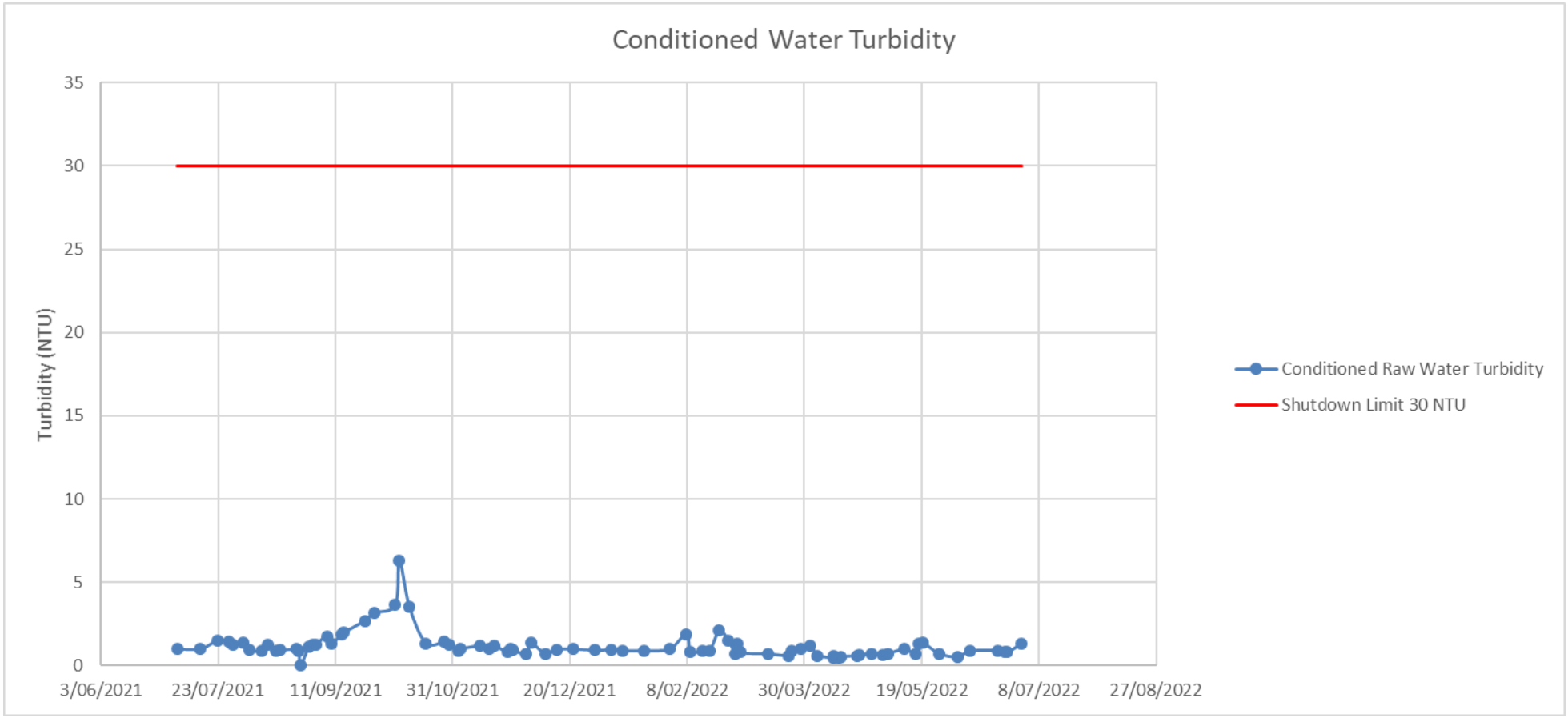
System	CCP ID	Critical Control Point	Hazard	Control Parameter	Operating Target	Adjustment Limit	Shutdown Limit	Critical Limit
Port Macquarie Recycled Water Supply System	CCP1	Inlet to Ultrafiltration Membranes	RO Membrane and Equipment Fatigue	pH	7 pH	6.5 - 8.5 pH	<6.5 pH or >8.5 pH for 5 minutes	>9.5 pH immediately
	CCP2	Inlet to Ultrafiltration Membranes	Particulates, Pathogens, Algae	Turbidity	<10 NTU	>10 NTU and <30 NTU	>30 NTU and < 150 NTU for 2 minutes	>150 NTU immediately
	CCP3	Ultrafiltration membranes	Particulates, Pathogens, Algal Toxins, Membrane Integrity	Turbidity	<0.15 NTU	>0.15 NTU for 5 minutes	>0.20 NTU for 5 minutes	>0.3 NTU for 5 minutes
	CCP3	Ultrafiltration Membranes	Membrane Integrity	Transmembrane Pressure (TMP)	<70 kPa	>70 kPa and <80 kPa	>80 kPa and <120 kPa	>120kPa
	CCP3	Ultrafiltration Membranes	Membrane Integrity	Pressure Decay Test (PDT)	<2 kPa/min	>2kPa/min	>10kPa/min	>20kPa/min
	CCP4	Reverse Osmosis Membrane	Particulates, Pathogens	Electrical Conductivity	< 15 µS/cm	>15 and <40 µS/cm for 5 minutes	>40 and <50 µS/cm	>50 µS/cm
	CCP5	UV Dosing System	UV Sensitive Pathogens	UV Dosage	< ?? mj/cm2	>?? mJ/cm2 for 5 minutes	<100mJ/cm2	<90 mJ/cm2
	CCP6	Distribution Reservoir	Pathogens	Reservoir Integrity	No breach of integrity	Signs of Integrity Breach, Items not properly maintained	Signs of Integrity Breach, items not properly maintained	Evidence of Contamination
	CCP6	Distribution Reservoir	Pathogens	Turbidity	<0.5 NTU	>0.5 and <1.0 NTU	>1.0 and <2.0 NTU	>2.0 NTU
	CCP6	Distribution Reservoir	Pathogens	Free Chlorine Residual	1.5mg/L - 2.0mg/L	<1.5mg/L or >2.0mg/L	<0.3mg/L or >2.5mg/L	<0.2mg/L or >5.0mg/L

Appendix B CCP Trends

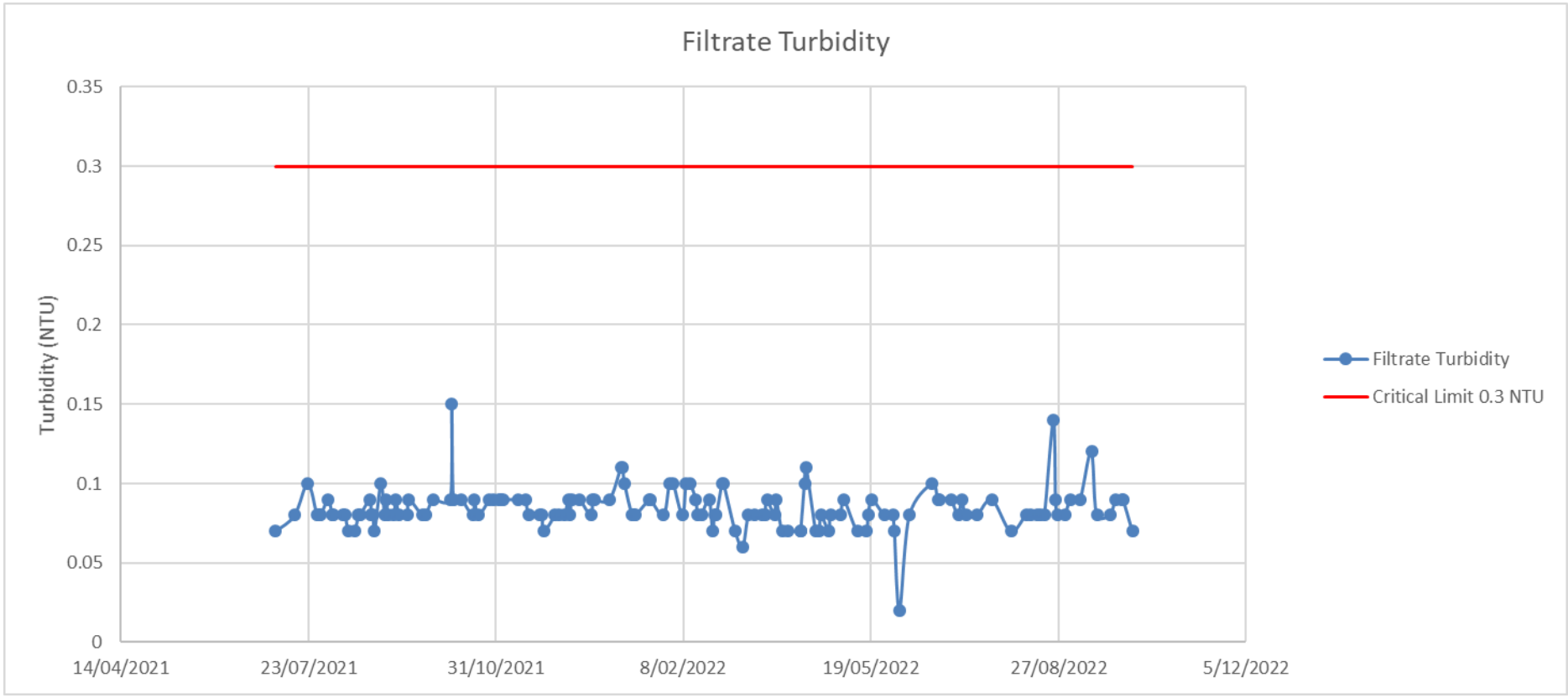
B.1 CCP 1 - Conditions Raw Water pH (Feed to CMF)



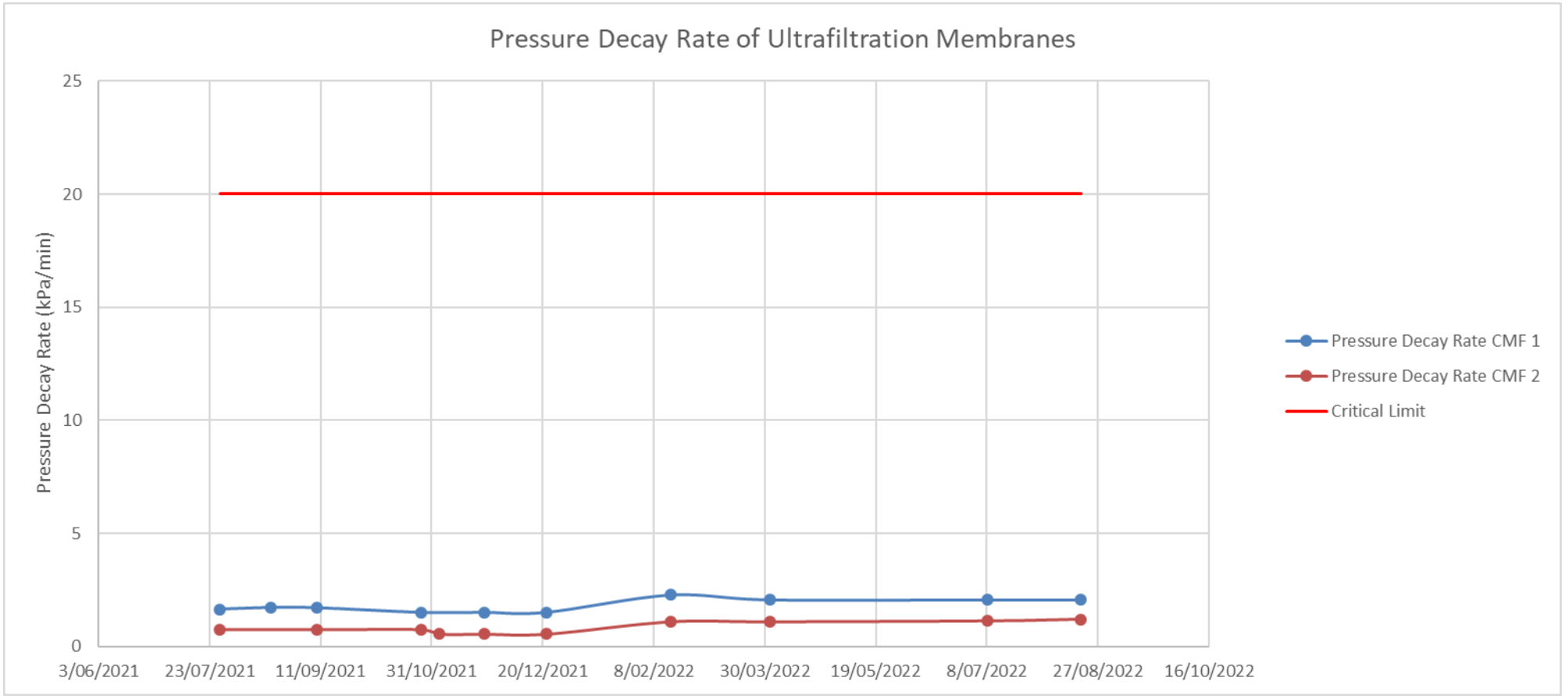
B.2 CCP2 - Conditioned Raw Water Turbidity (After CO2 Dosing)



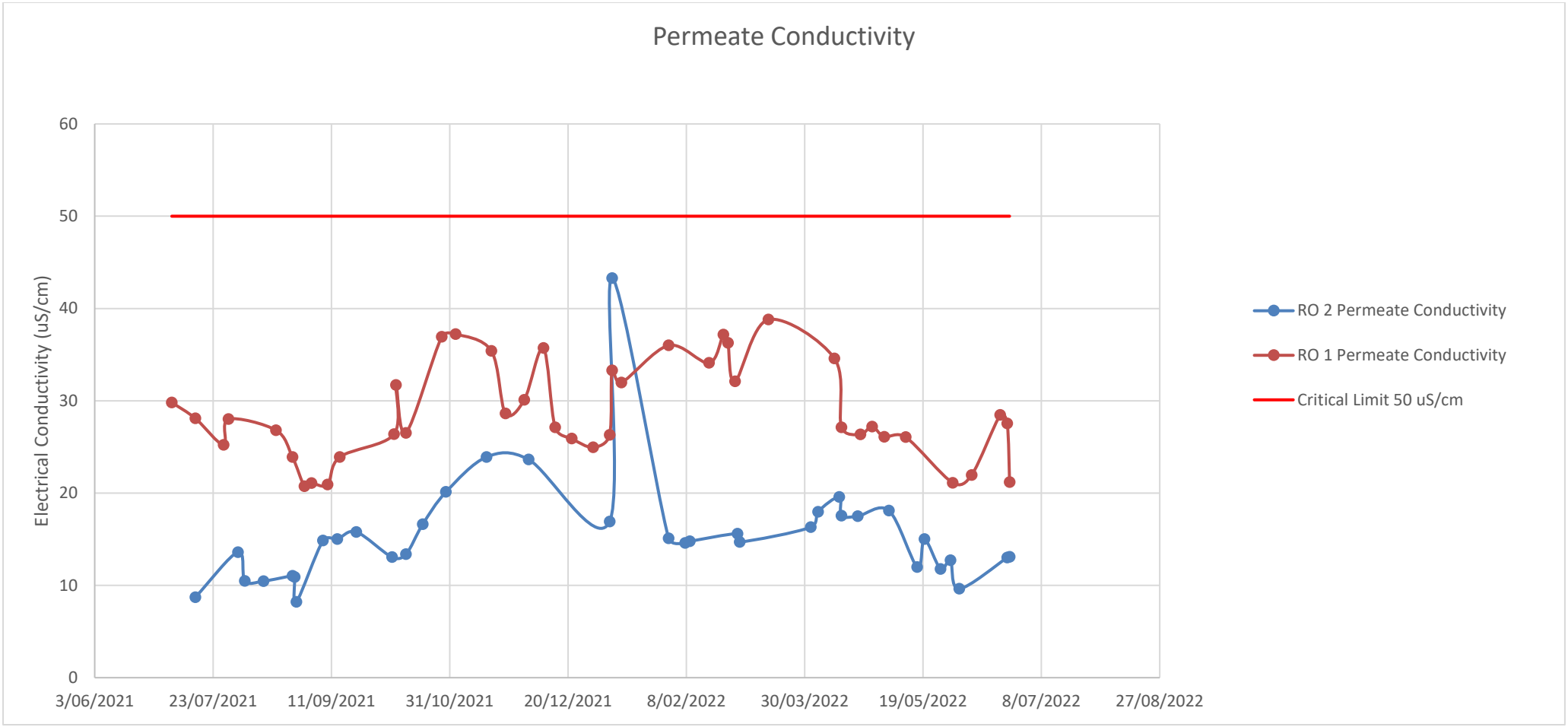
B.3 CCP 3 - Membrane Filtration Turbidity



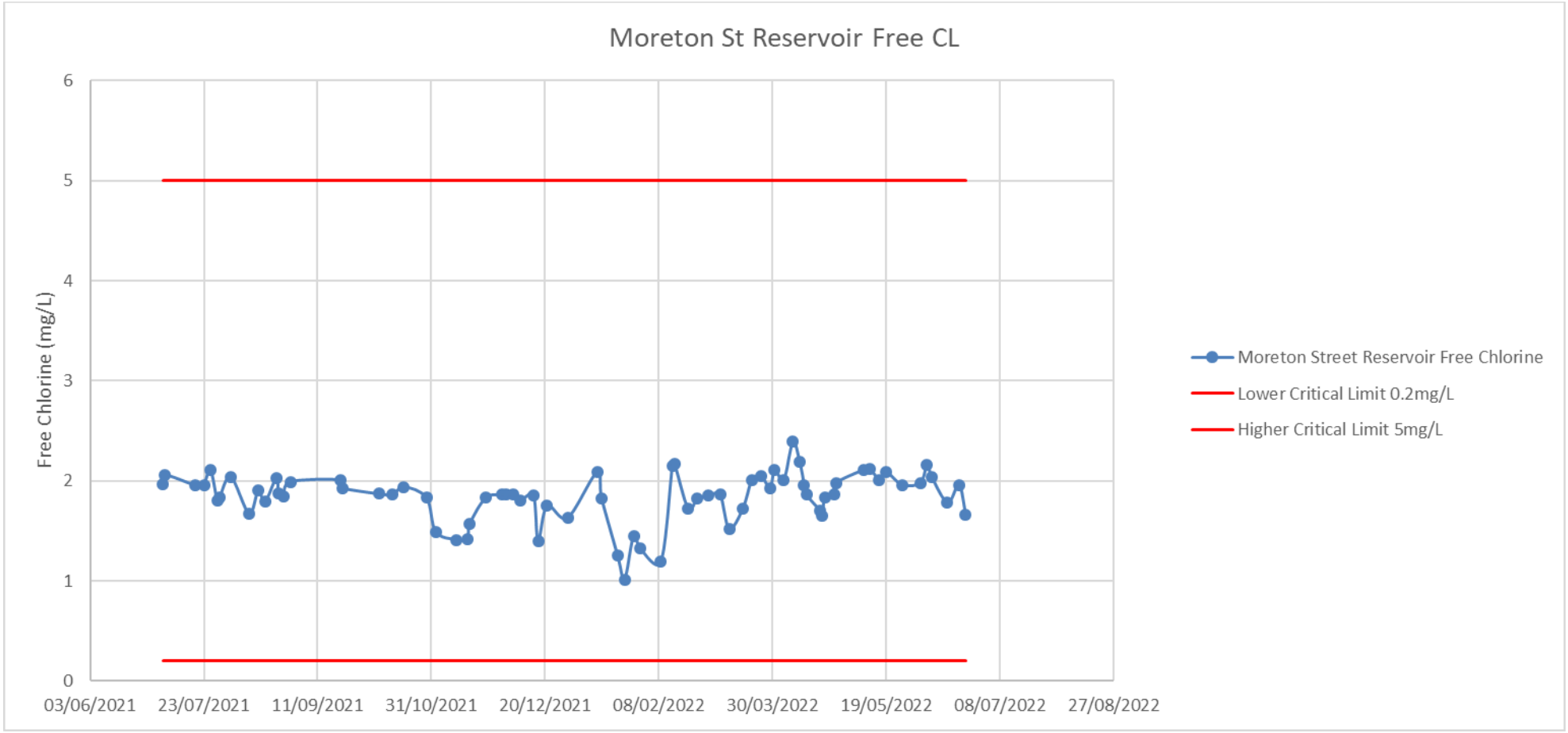
B.4 CCP 3 - Membrane Filtration Pressure Decay Test (PDT)



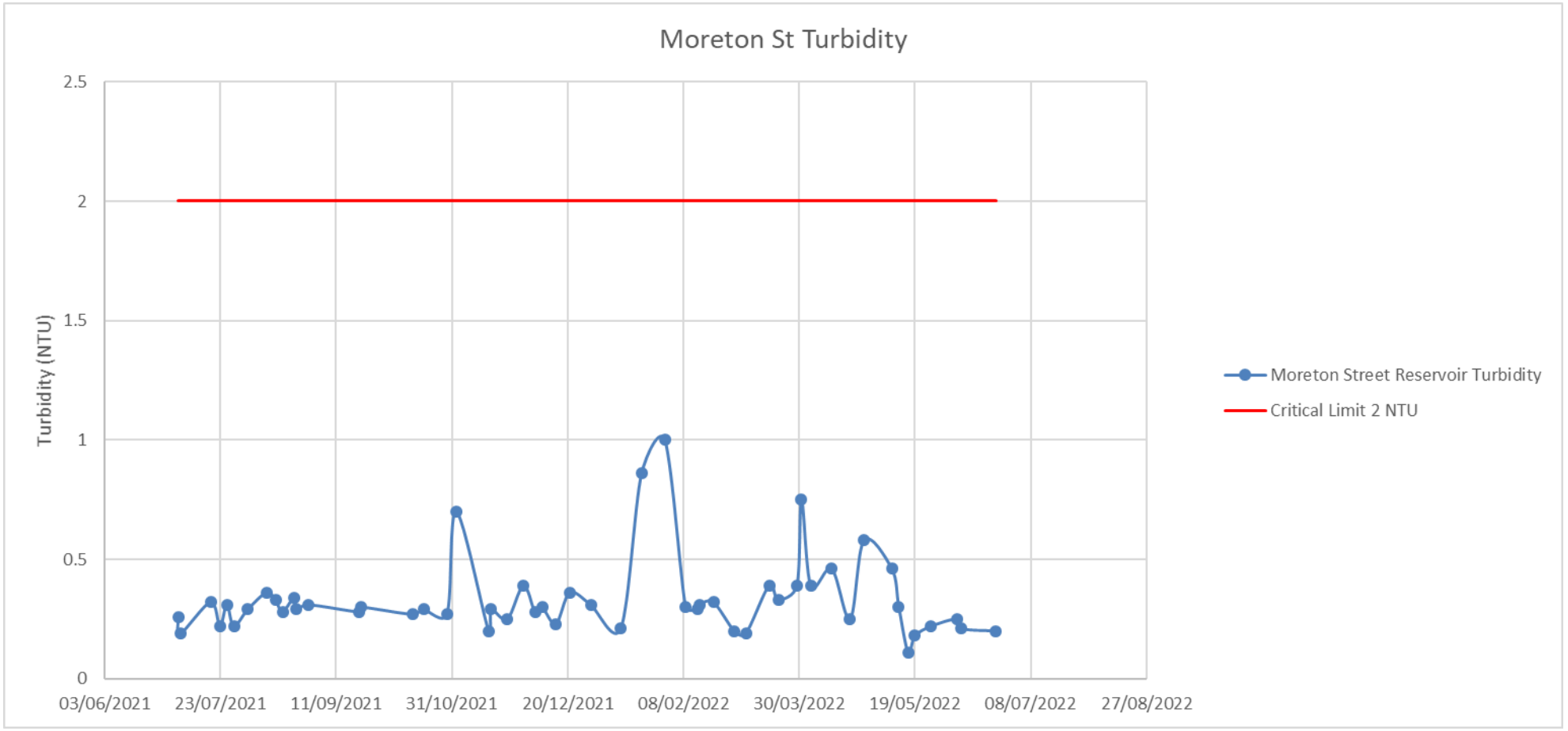
B.5 CCP 4 - Reverse Osmosis (Permeate) Conductivity



B.6 CCP 6 - Distribution Reservoir (Morton Street) Free Chlorine

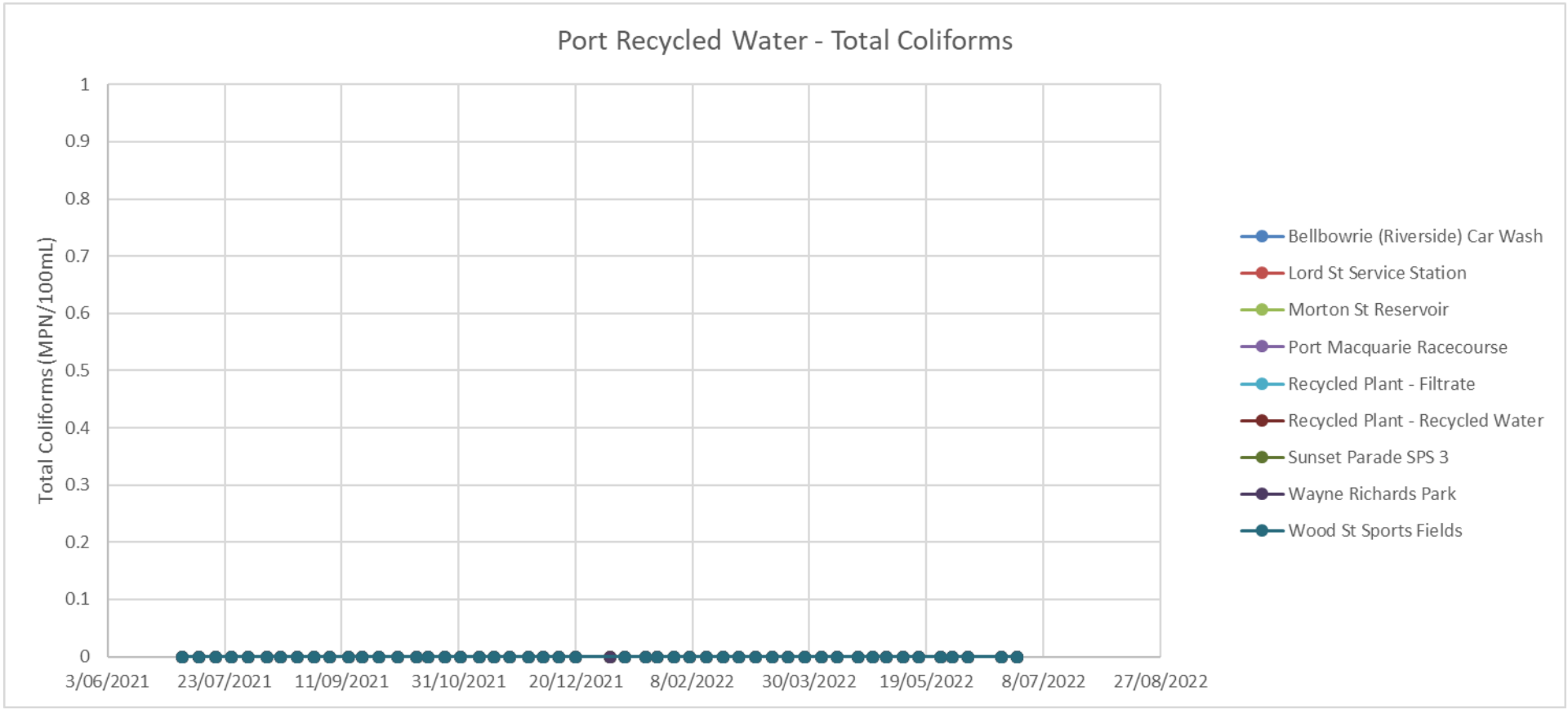


B.7 CCP 6 - Distribution Reservoir (Morton Street) Turbidity

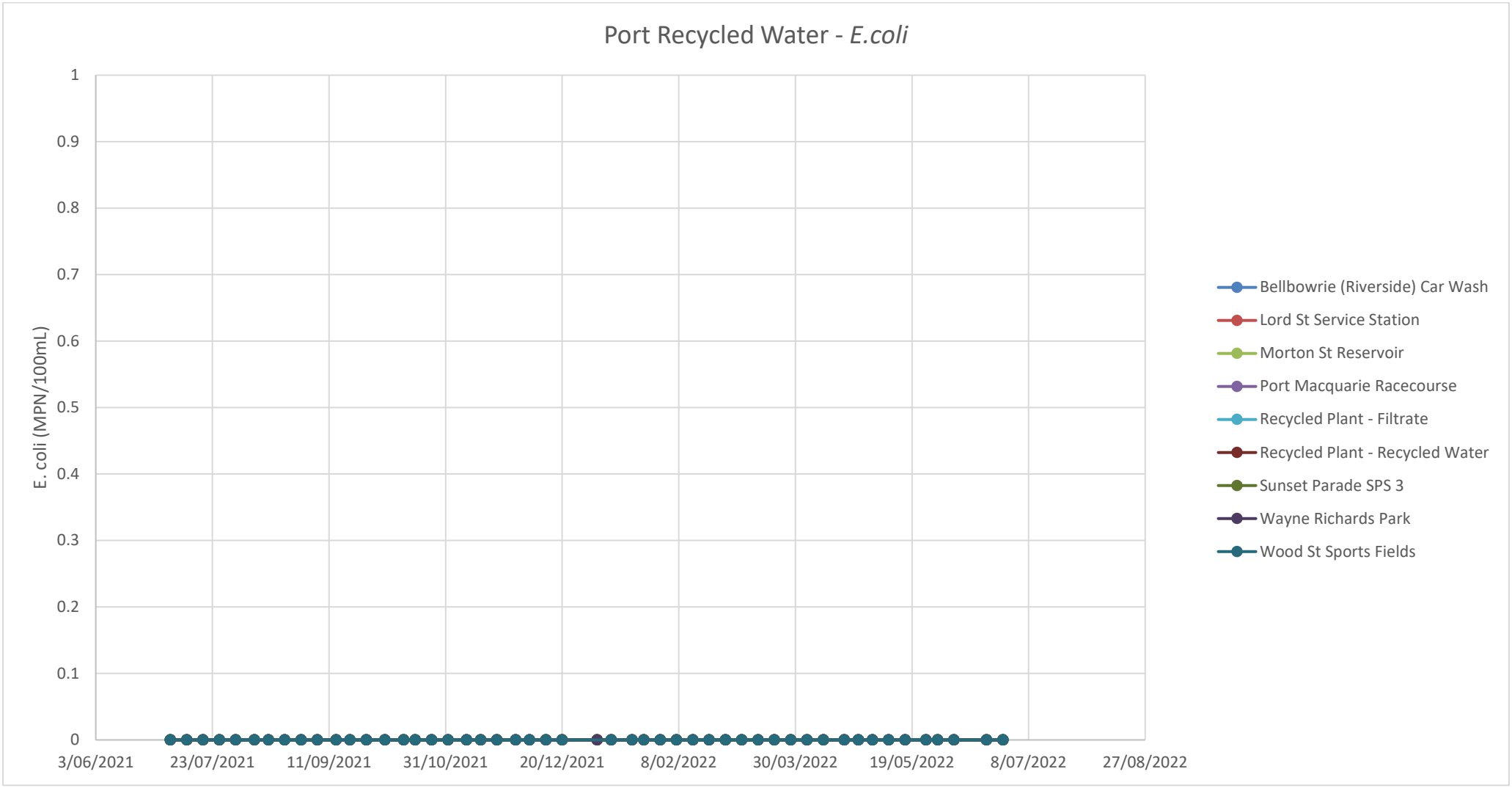


Appendix C Water Quality Trends

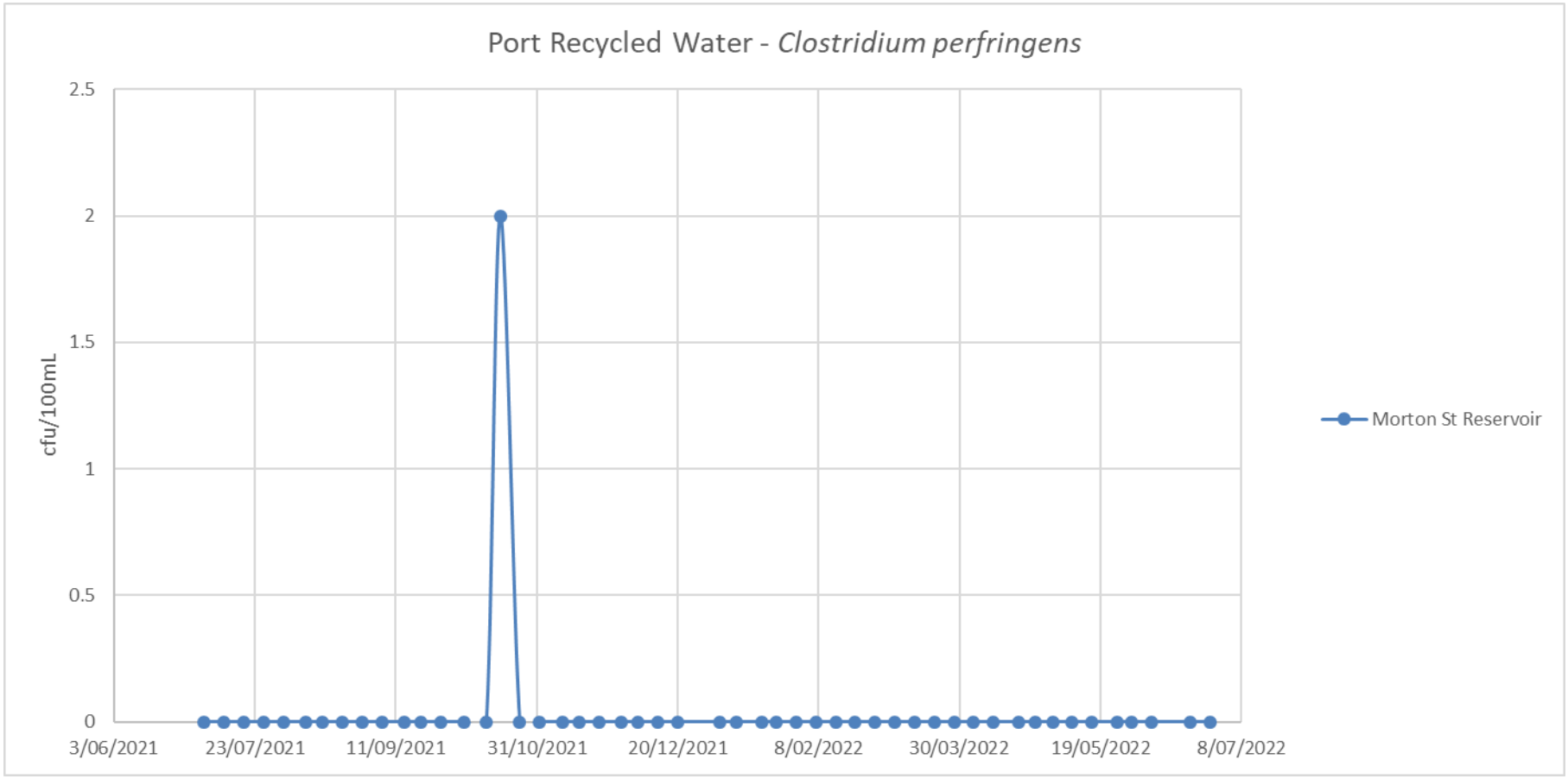
C.1 Port Macquarie Recycled Water Total Coliforms



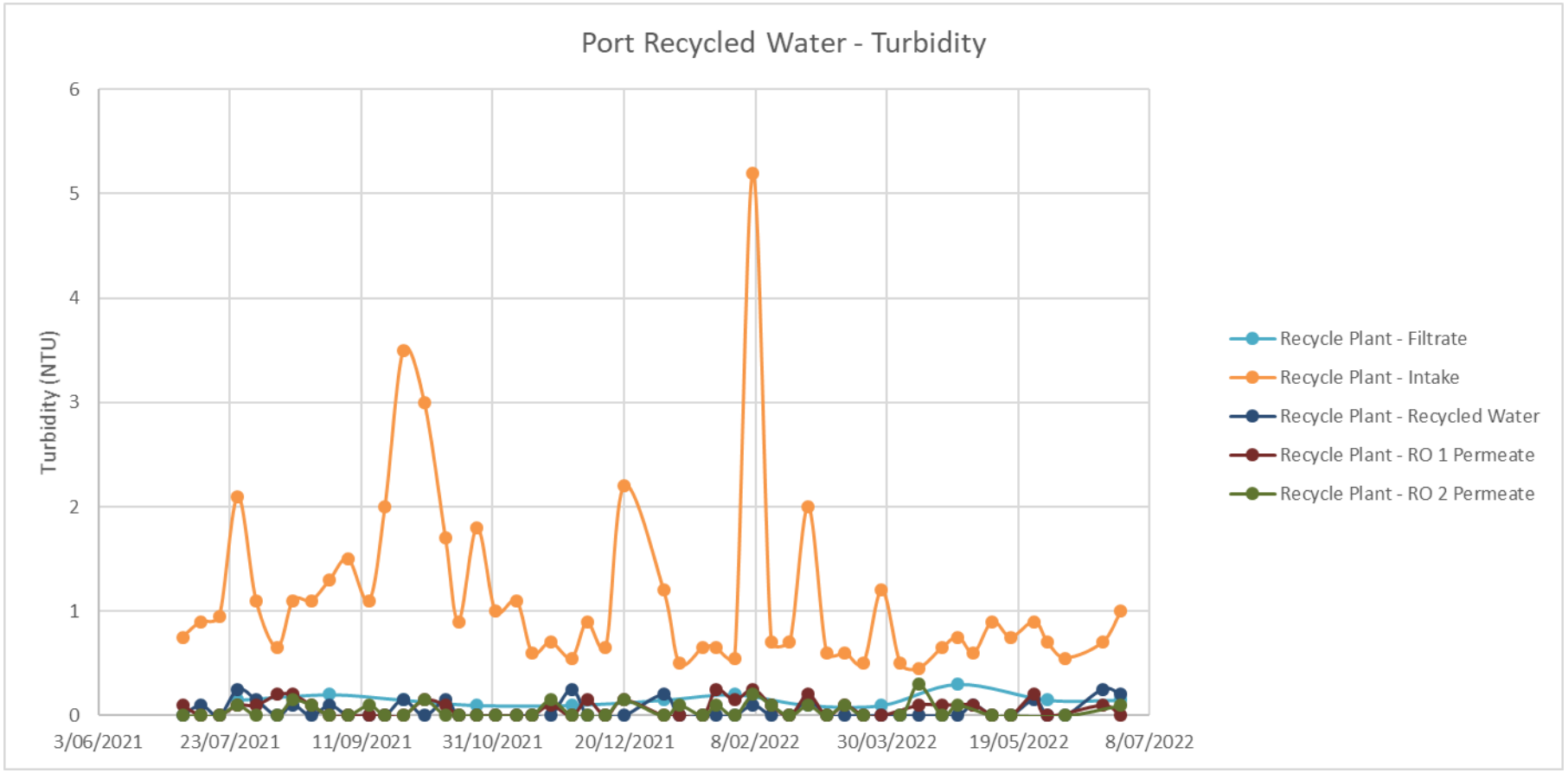
C.2 *Port Macquarie Recycled Water E. Coli*



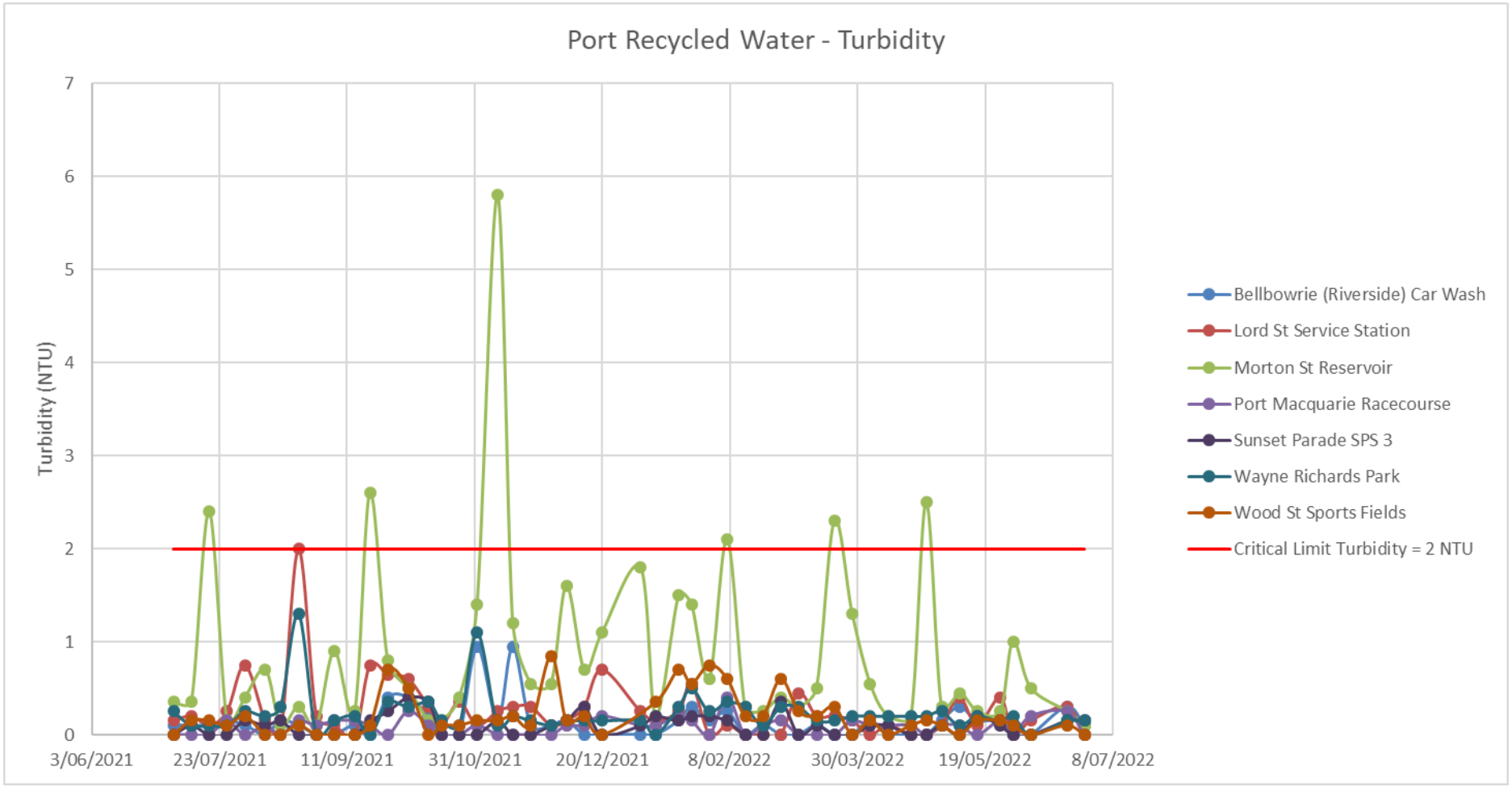
C.3 Port Macquarie Recycled Water Clostridium Perfringens



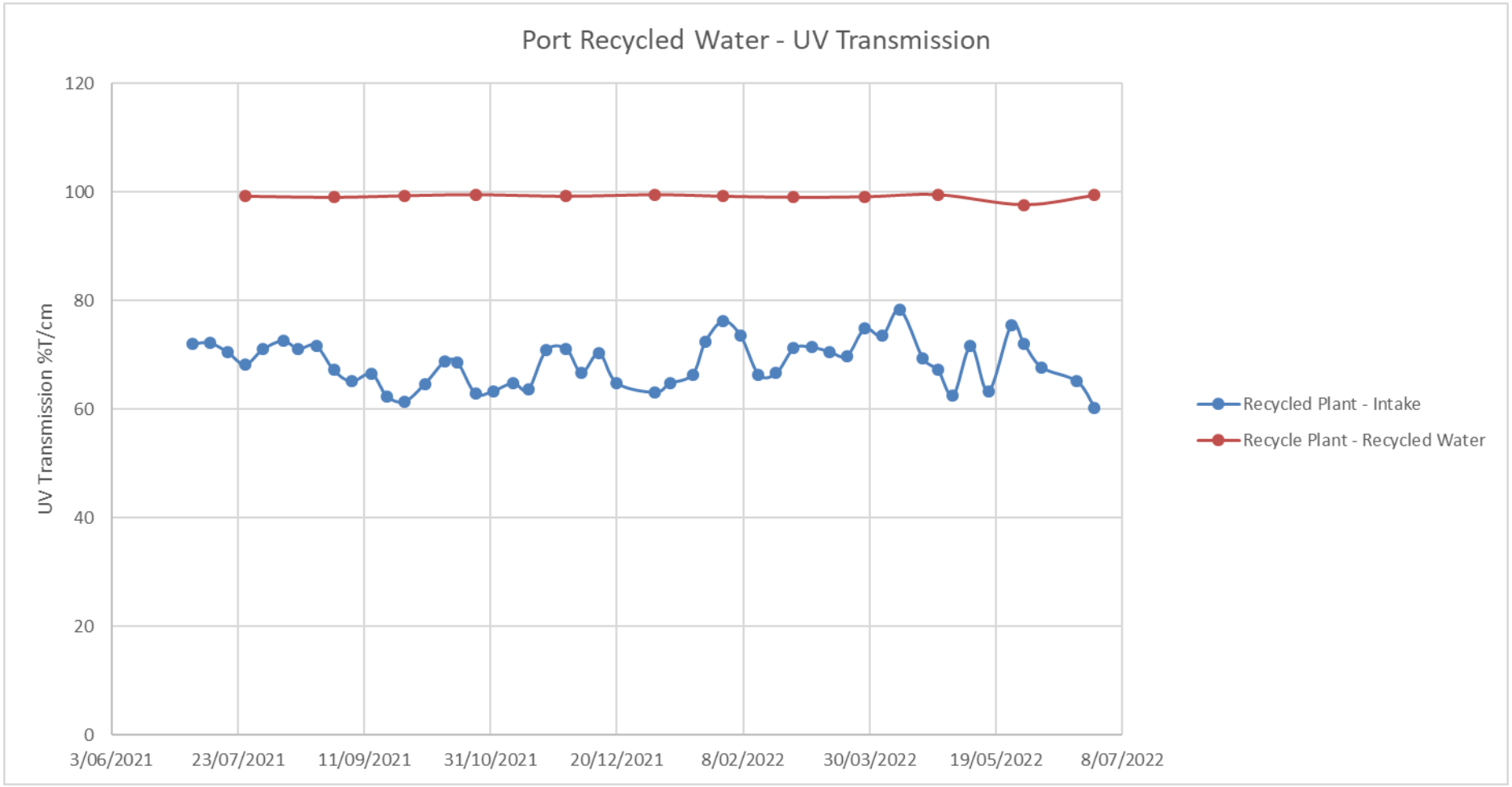
C.4 Port Macquarie Recycled Water Turbidity



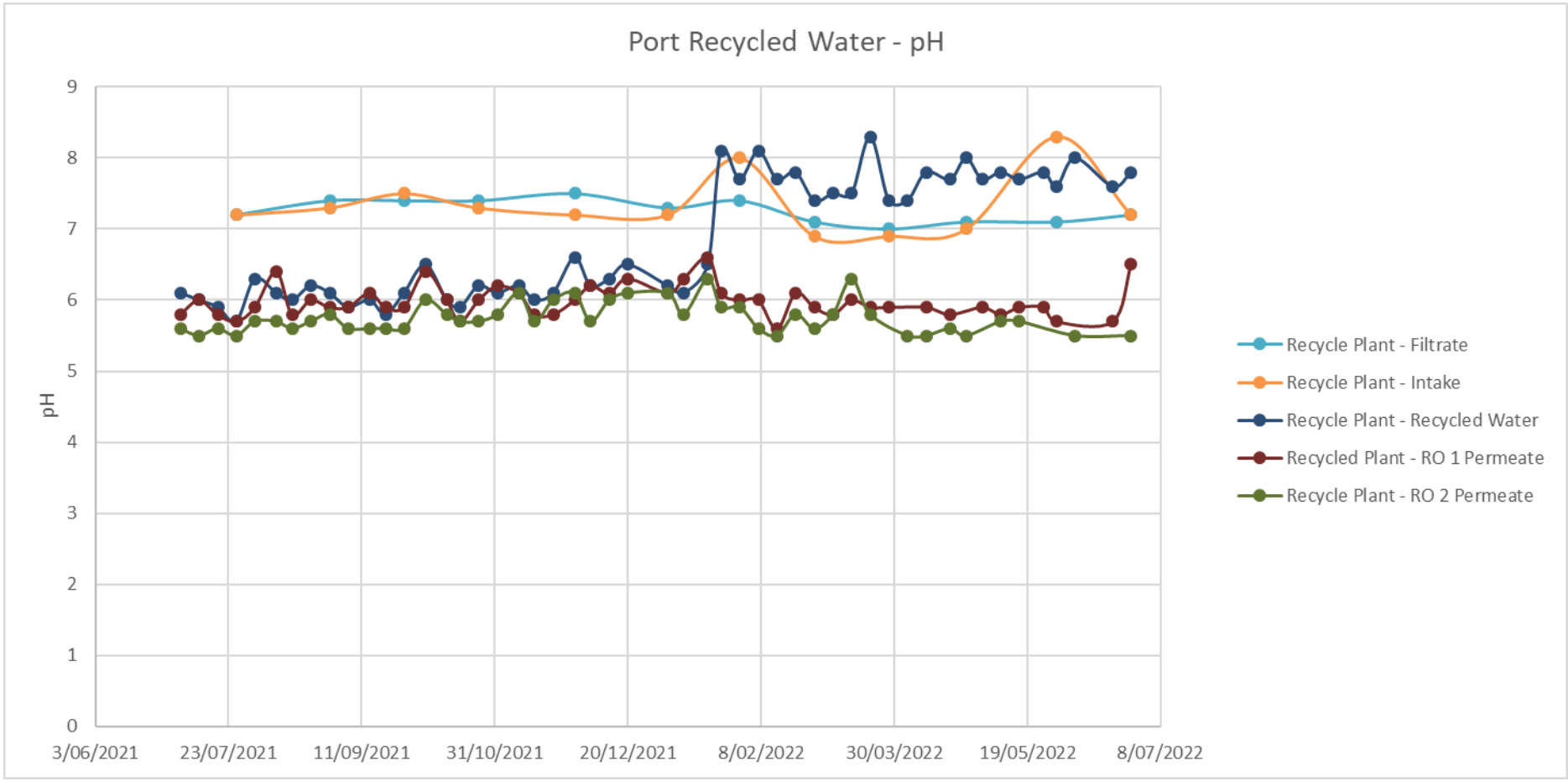
C.5 Port Macquarie Recycled Water Turbidity Reservoir and Reticulation



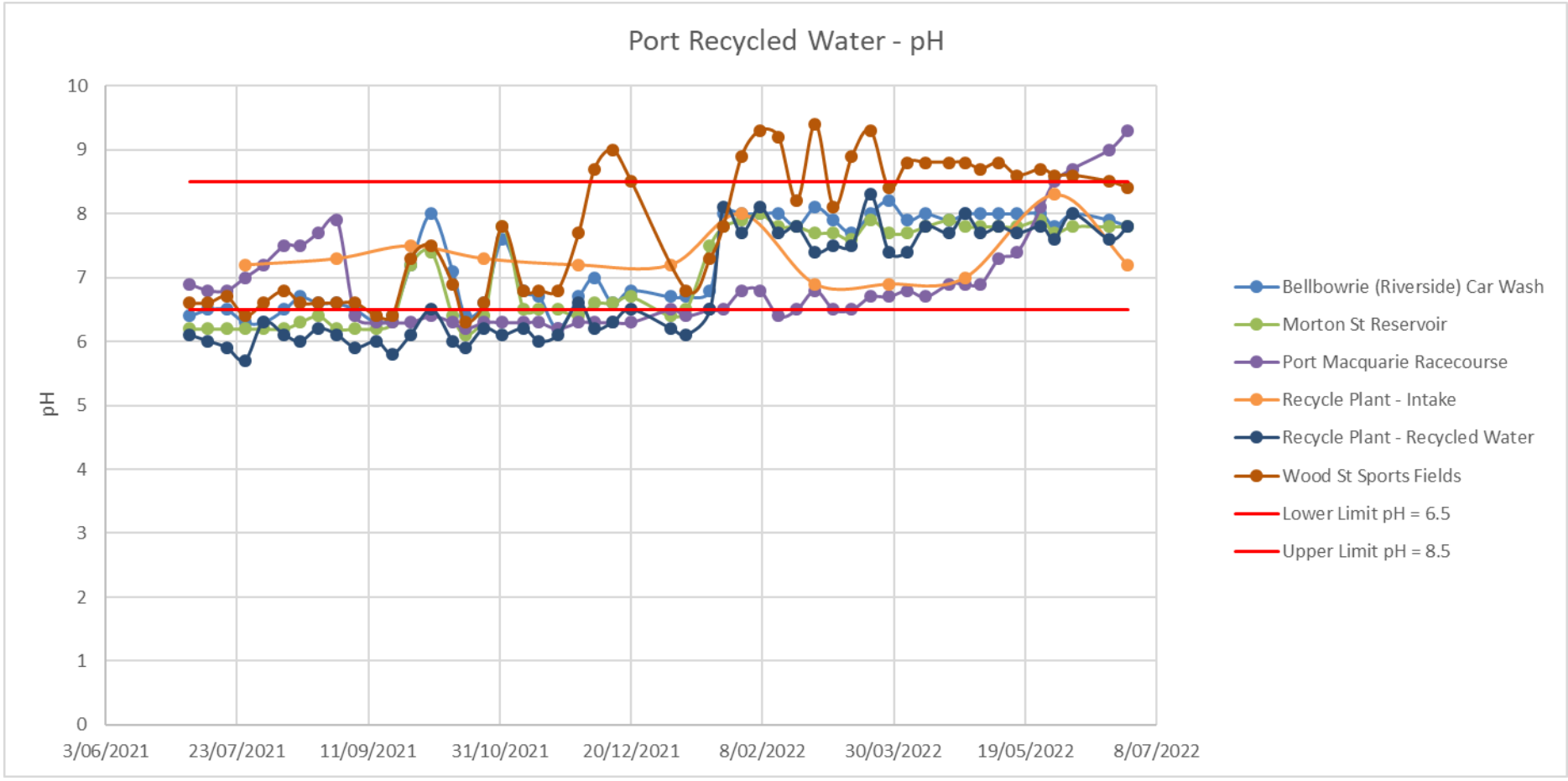
C.6 Port Macquarie Recycled Water UV Transmission



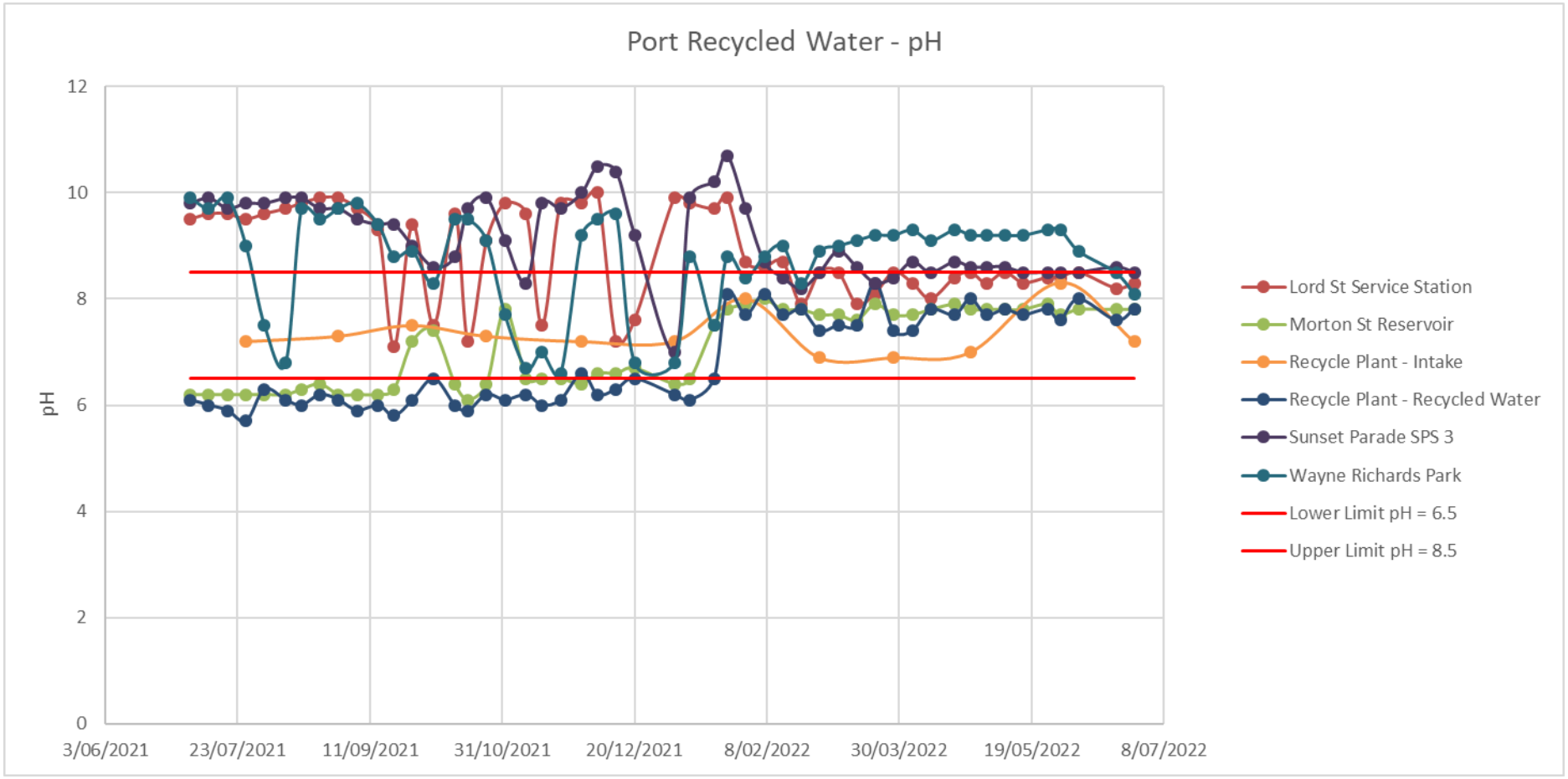
C.7 Port Macquarie Recycled Water pH at Recycled Water Plant



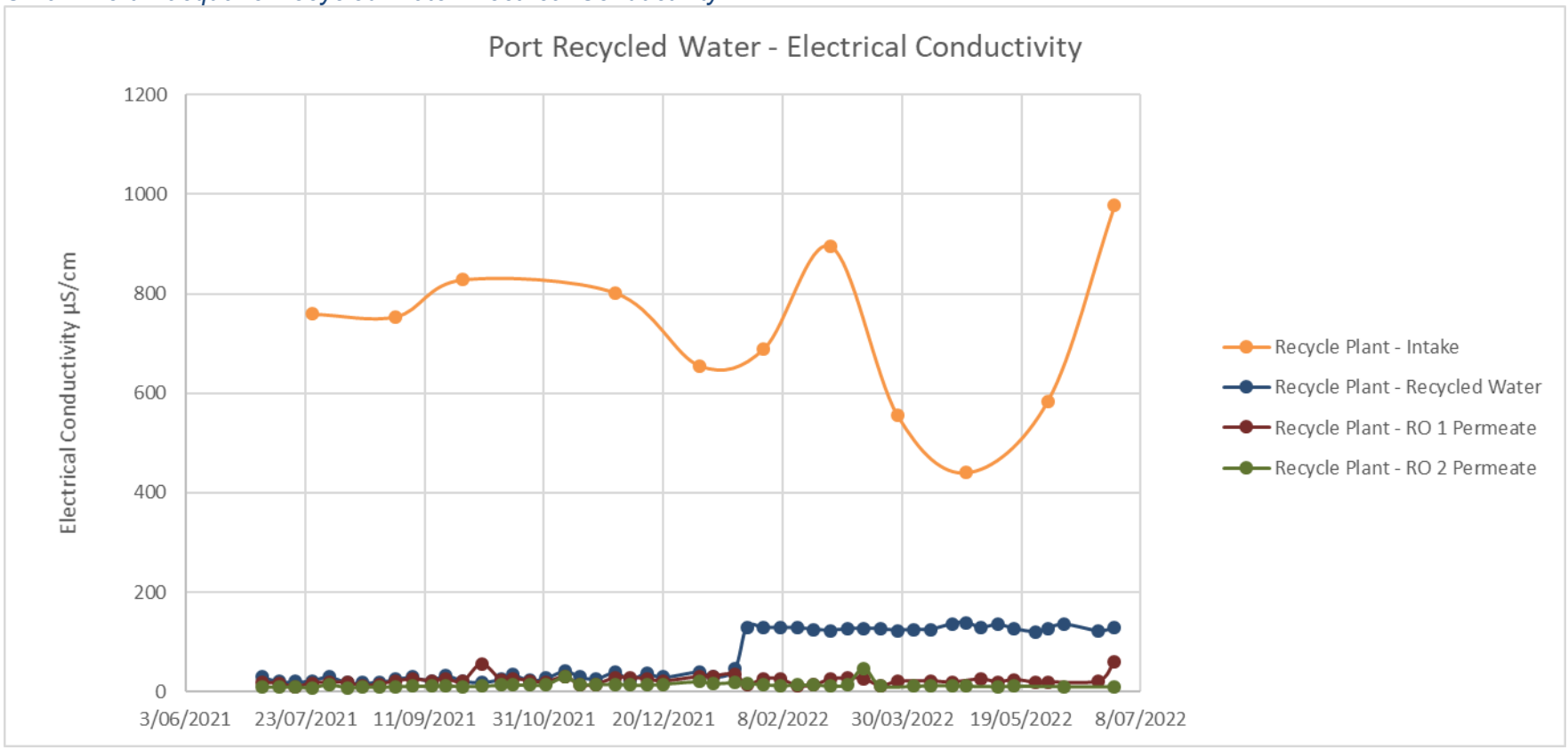
C.8 Port Macquarie Recycled Water pH in Reticulation 1



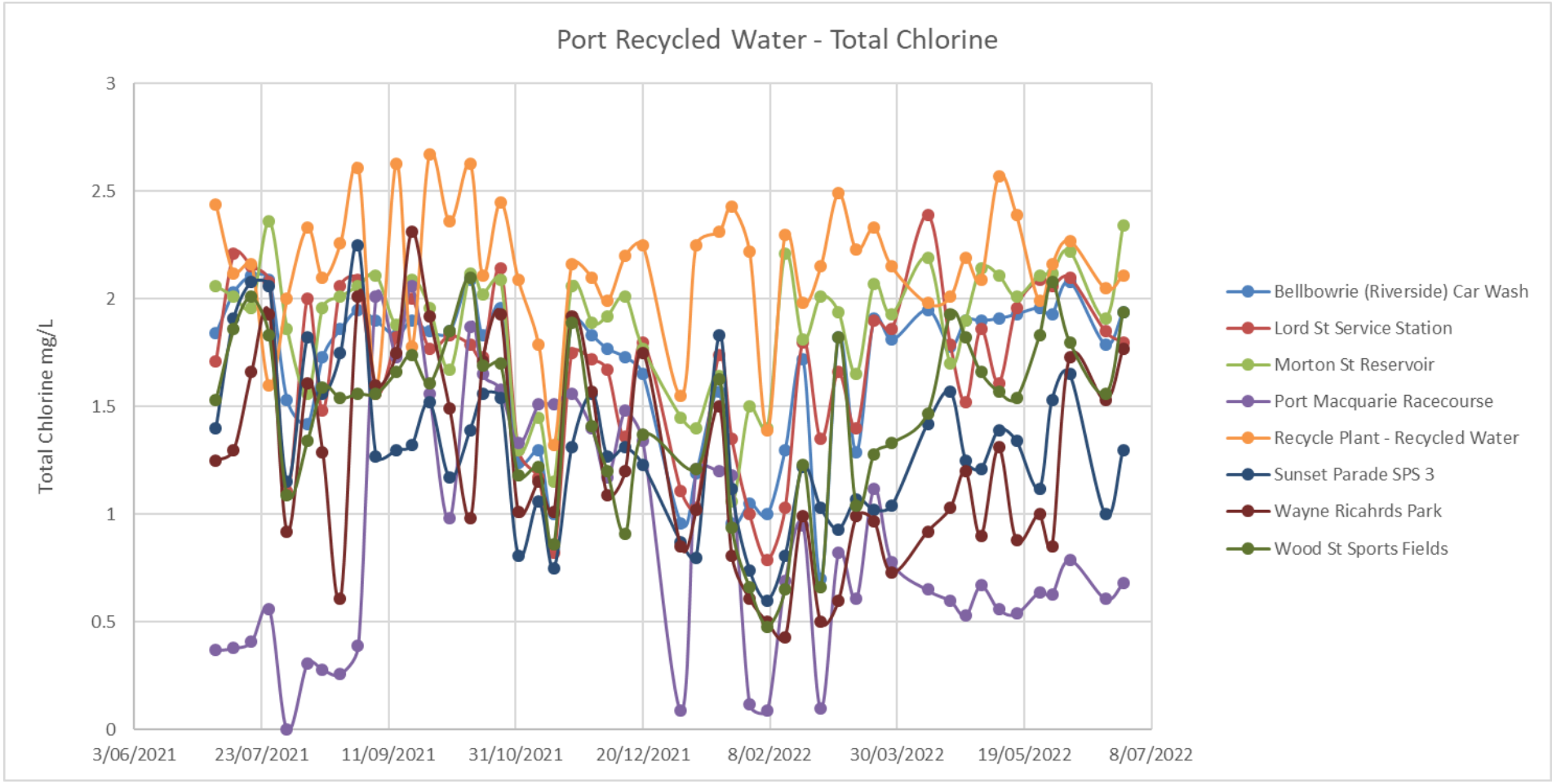
C.9 Port Macquarie Recycled Water pH in Reticulation 2



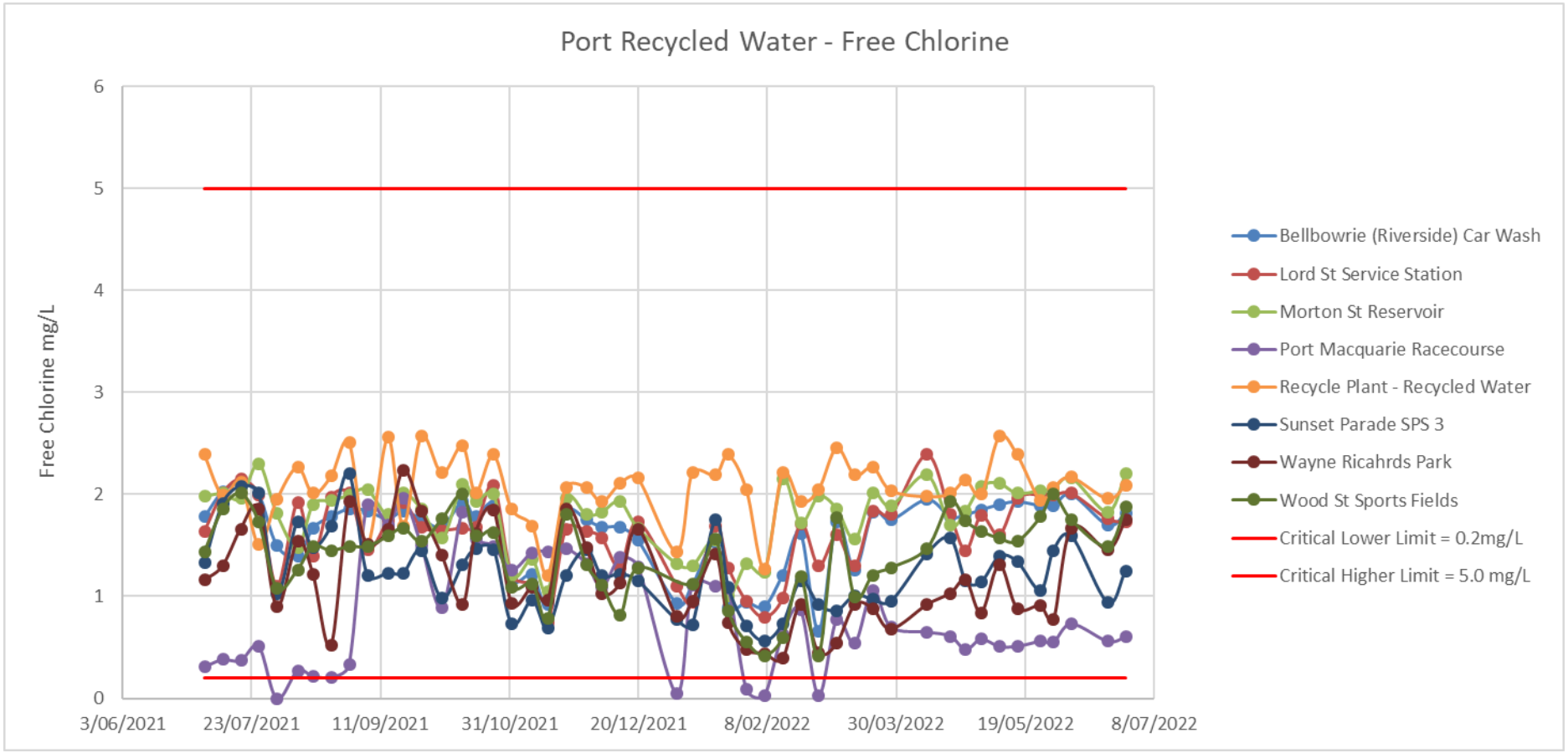
C.10 Port Macquarie Recycled Water Electrical Conductivity



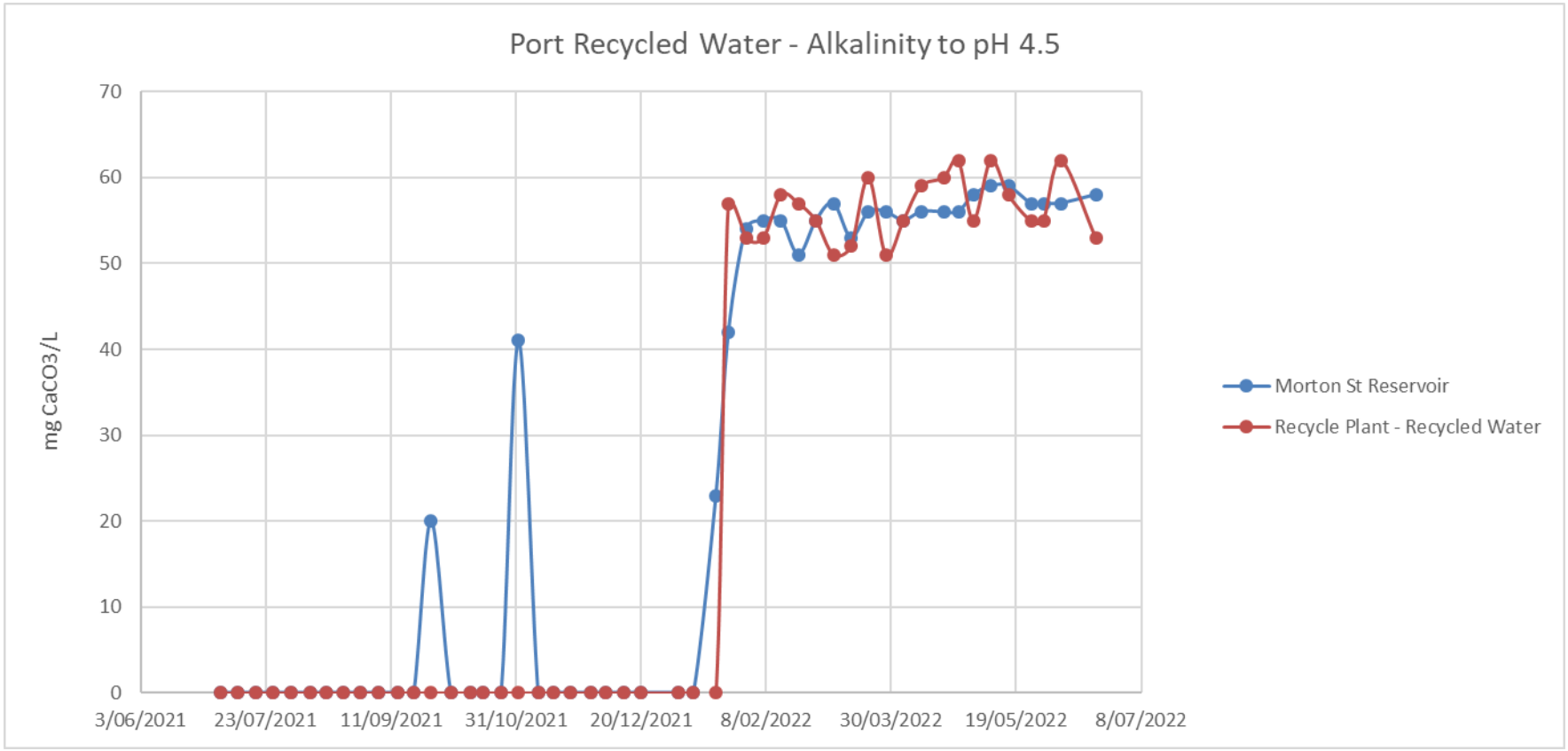
C.11 Port Macquarie Recycled Water Total Chlorine



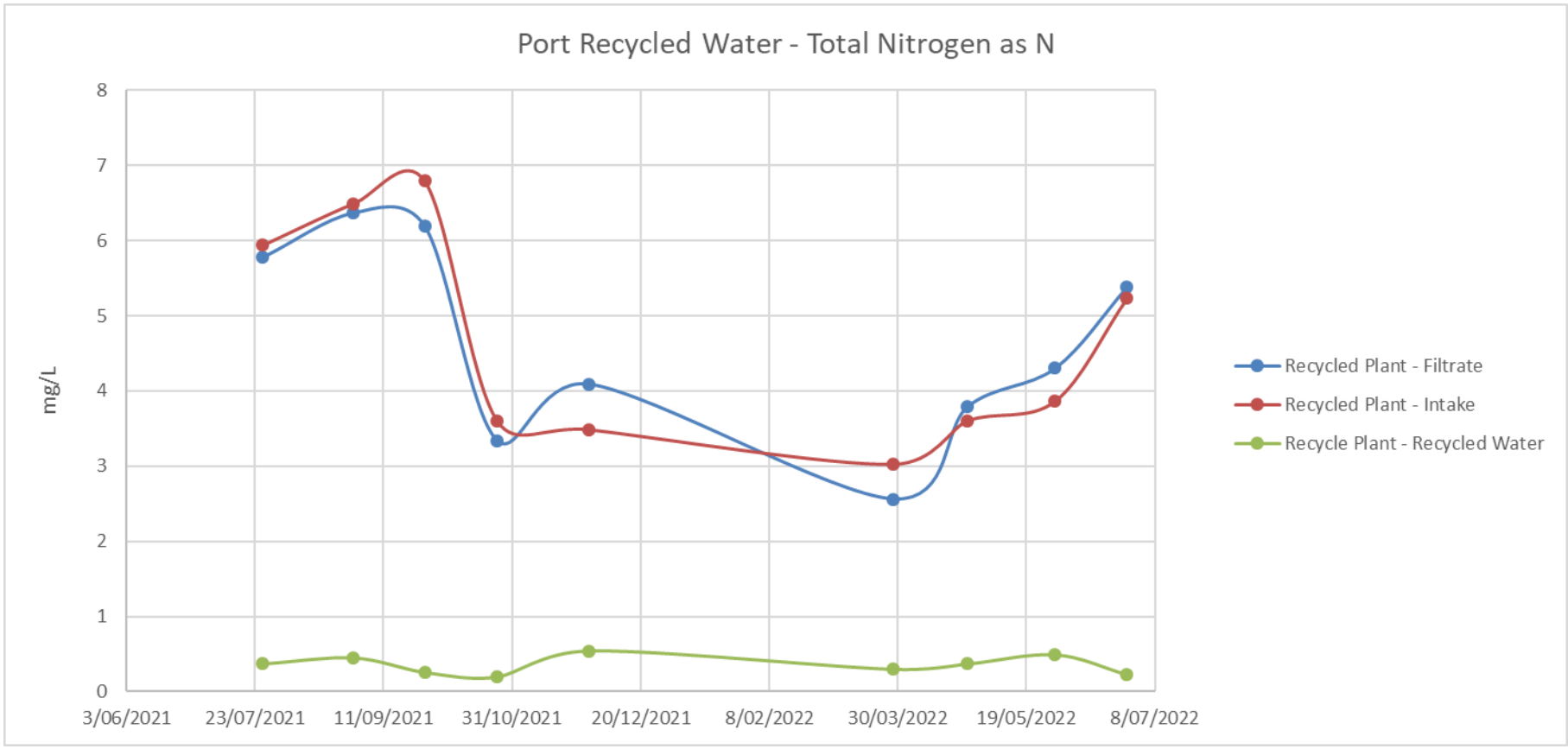
C.12 Port Macquarie Recycled Water Free Chlorine



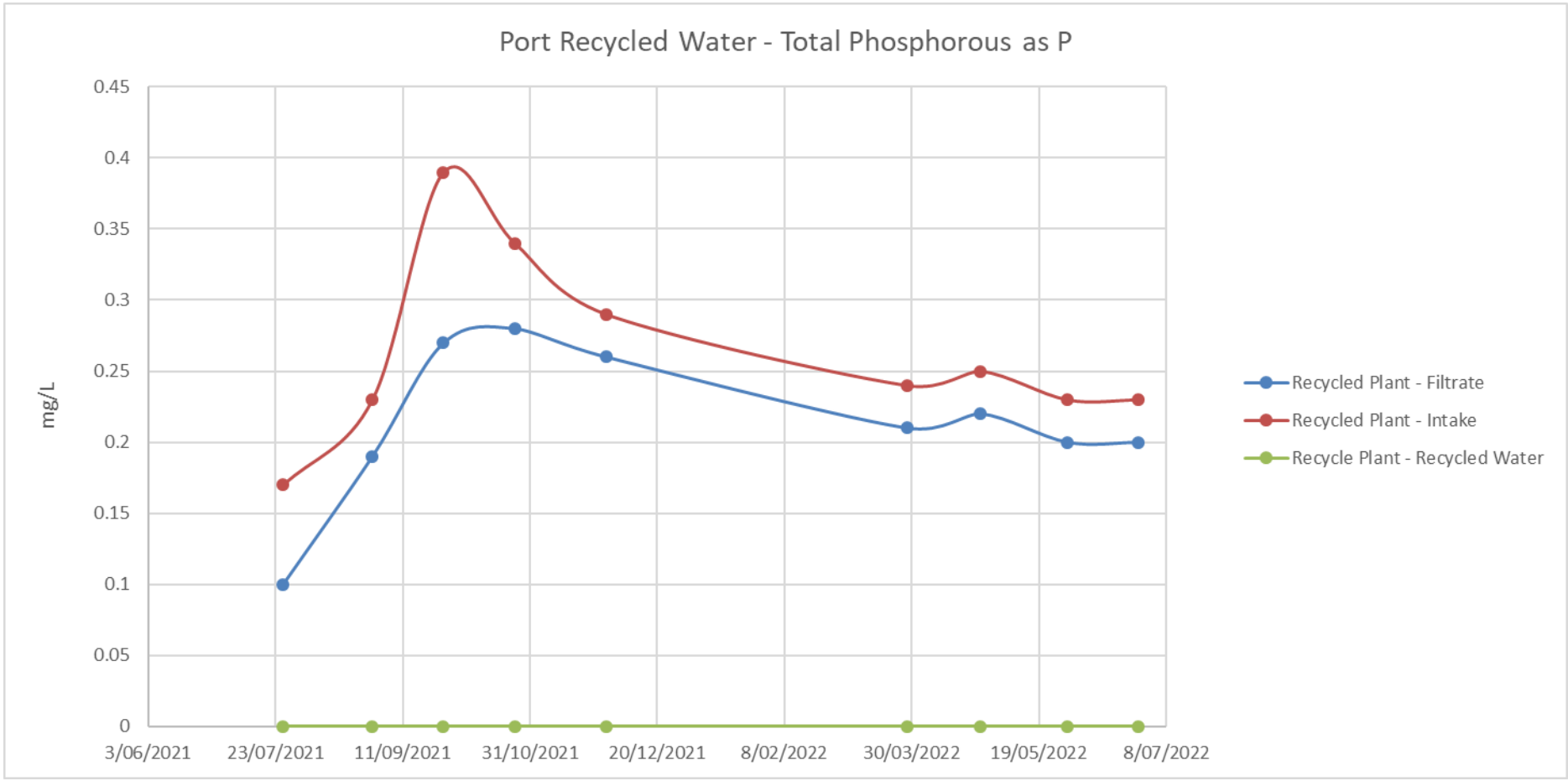
C.13 Port Macquarie Recycled Water Alkalinity



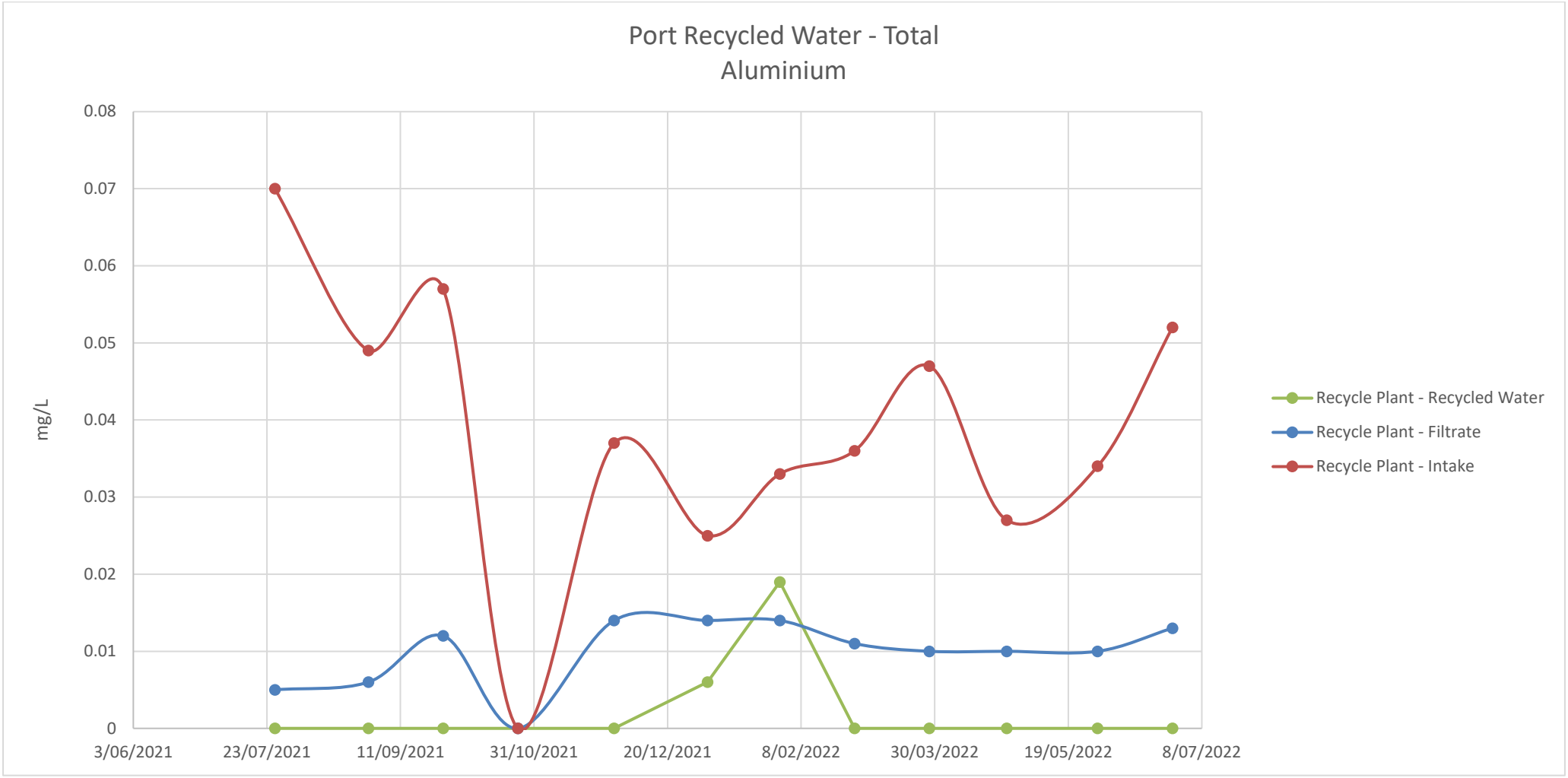
C.14 Port Macquarie Recycled Water Total Nitrogen



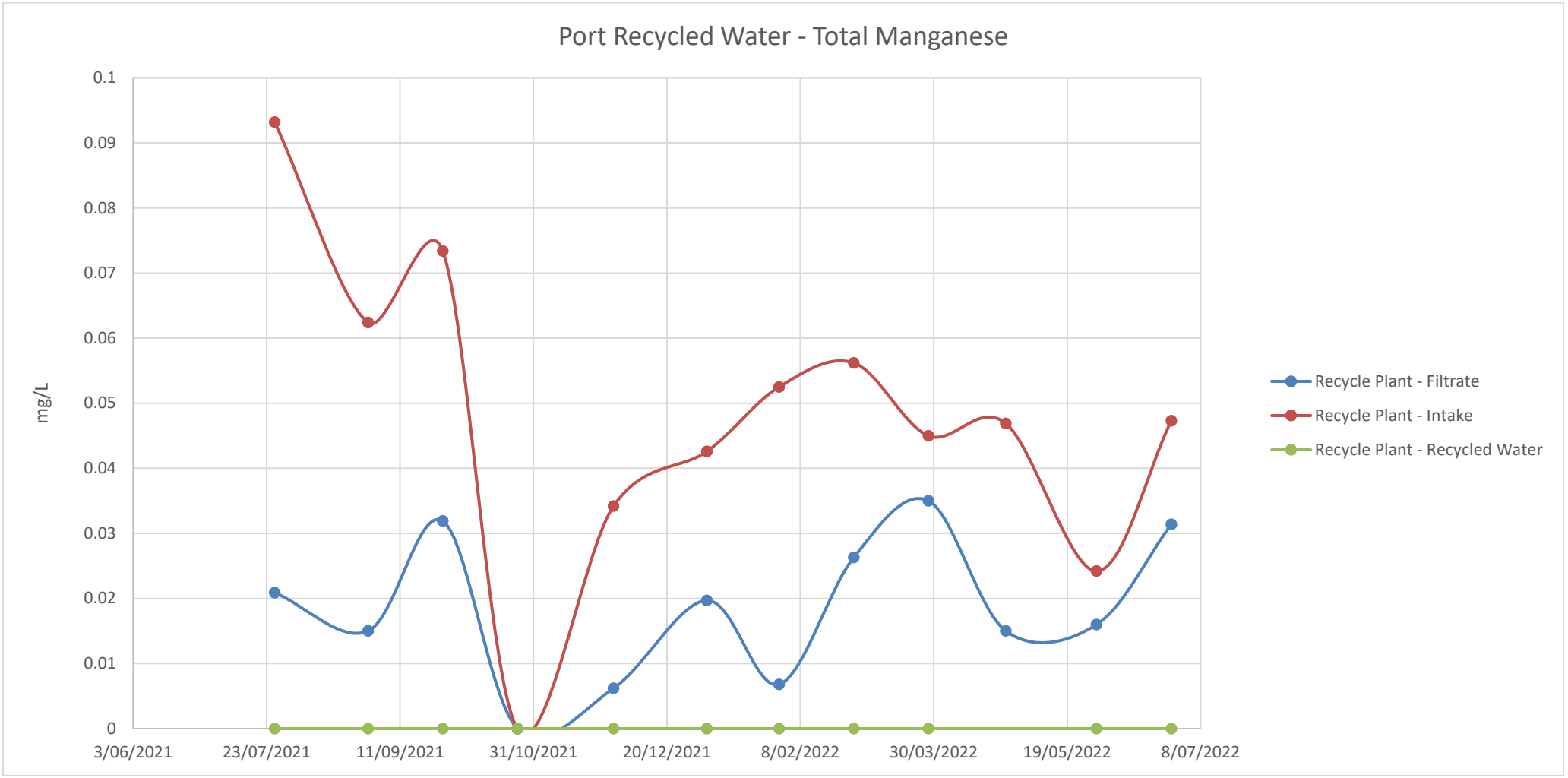
C.15 Port Macquarie Recycled Water Total Phosphorous



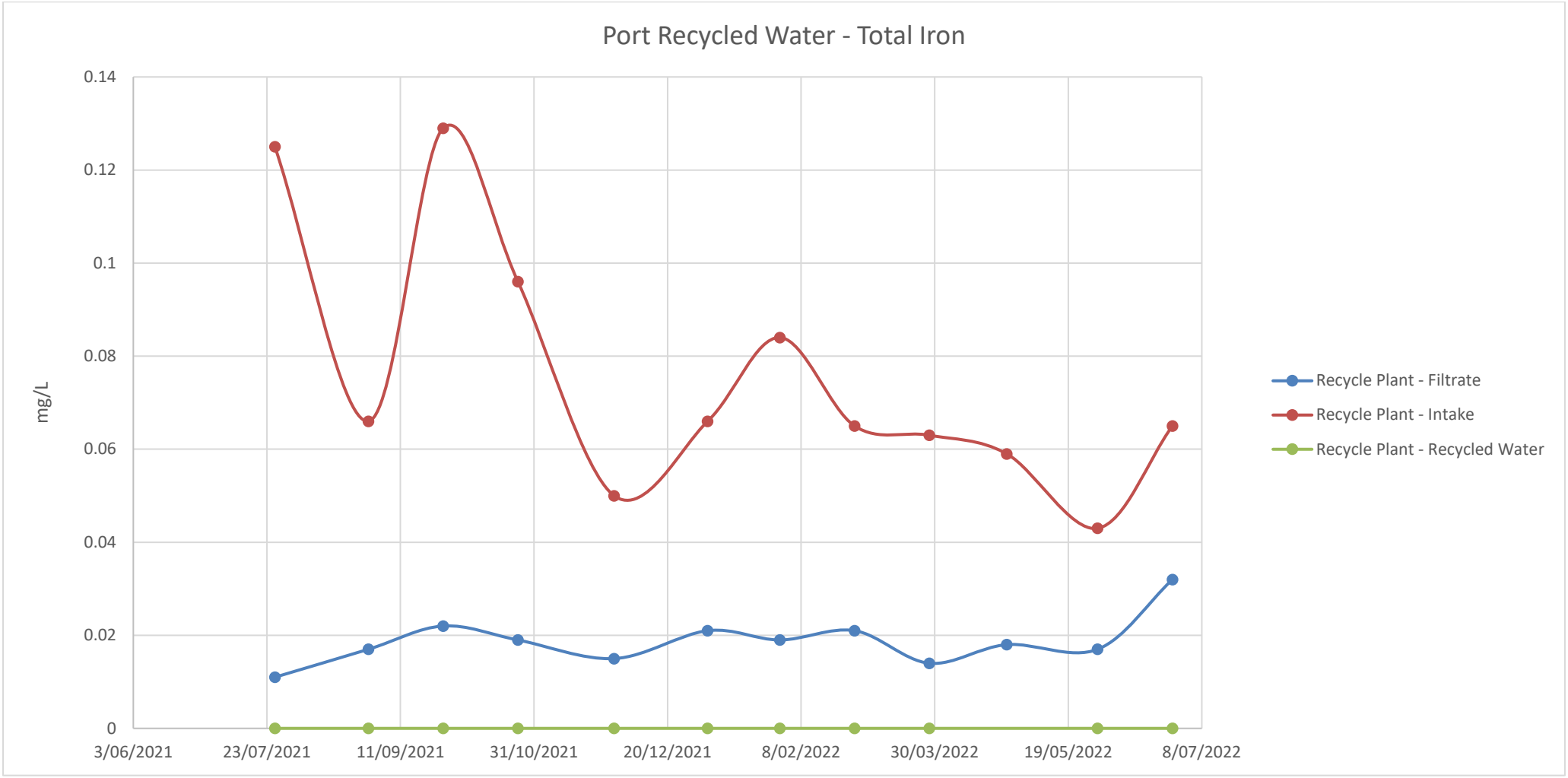
C.16 Port Macquarie Recycled Water Total Aluminium



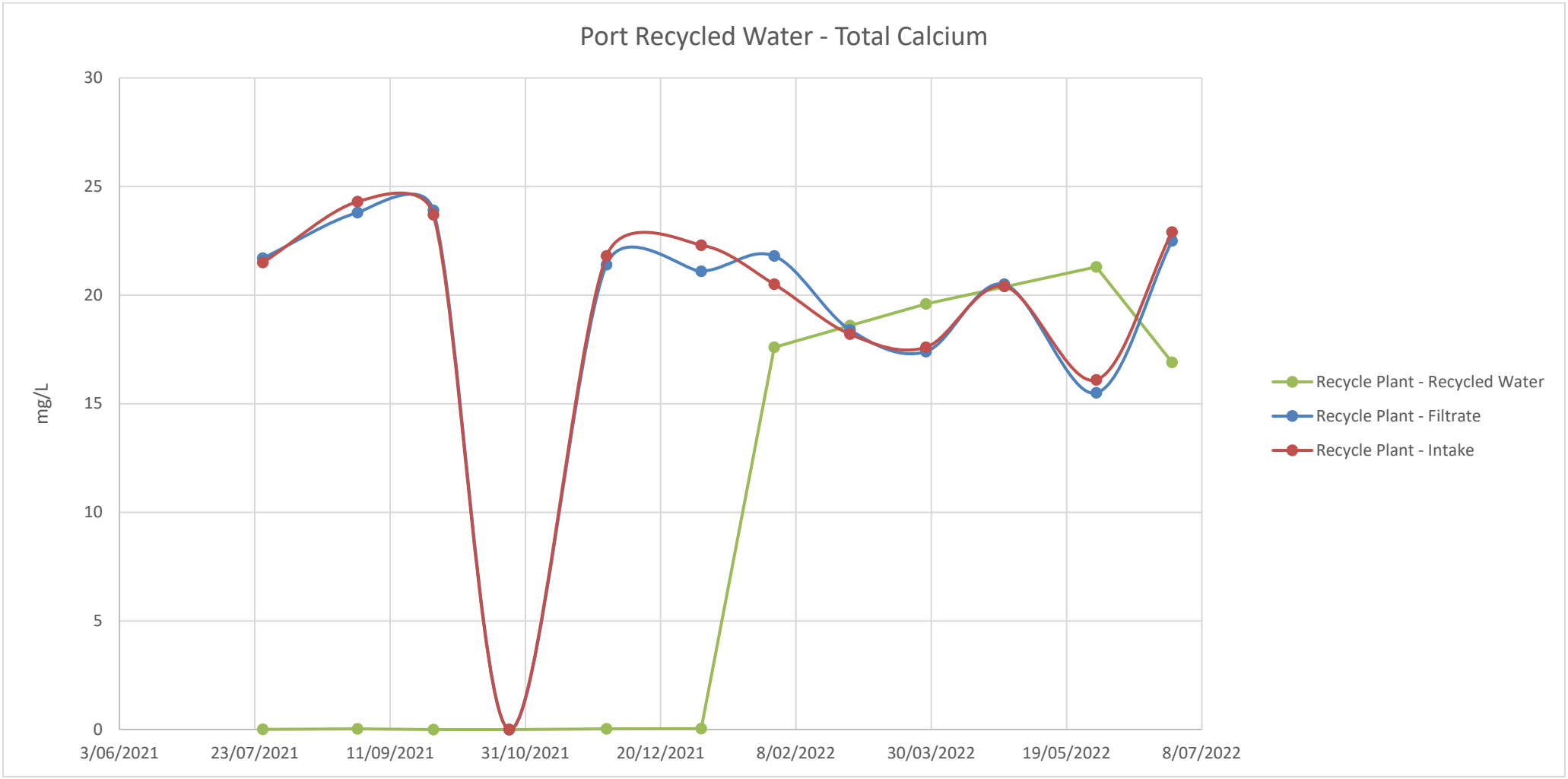
C.17 Port Macquarie Recycled Water Total Manganese



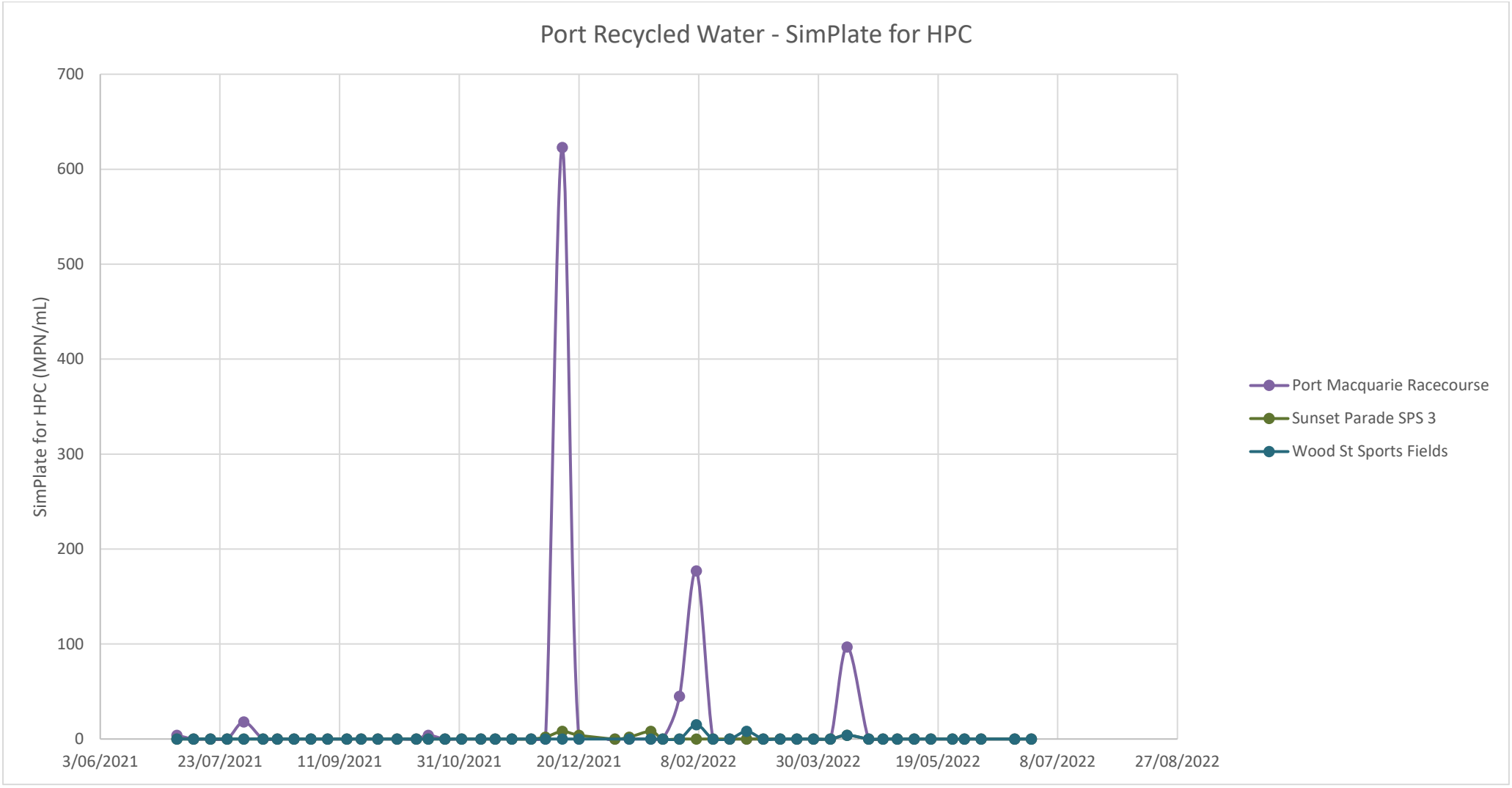
C.18 Port Macquarie Recycled Water Total Iron



C.19 Port Macquarie Recycled Water Total Calcium



C.20 Recycled Water Reticulation HPC



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