

Annual Water Quality Monitoring Report

2021-22



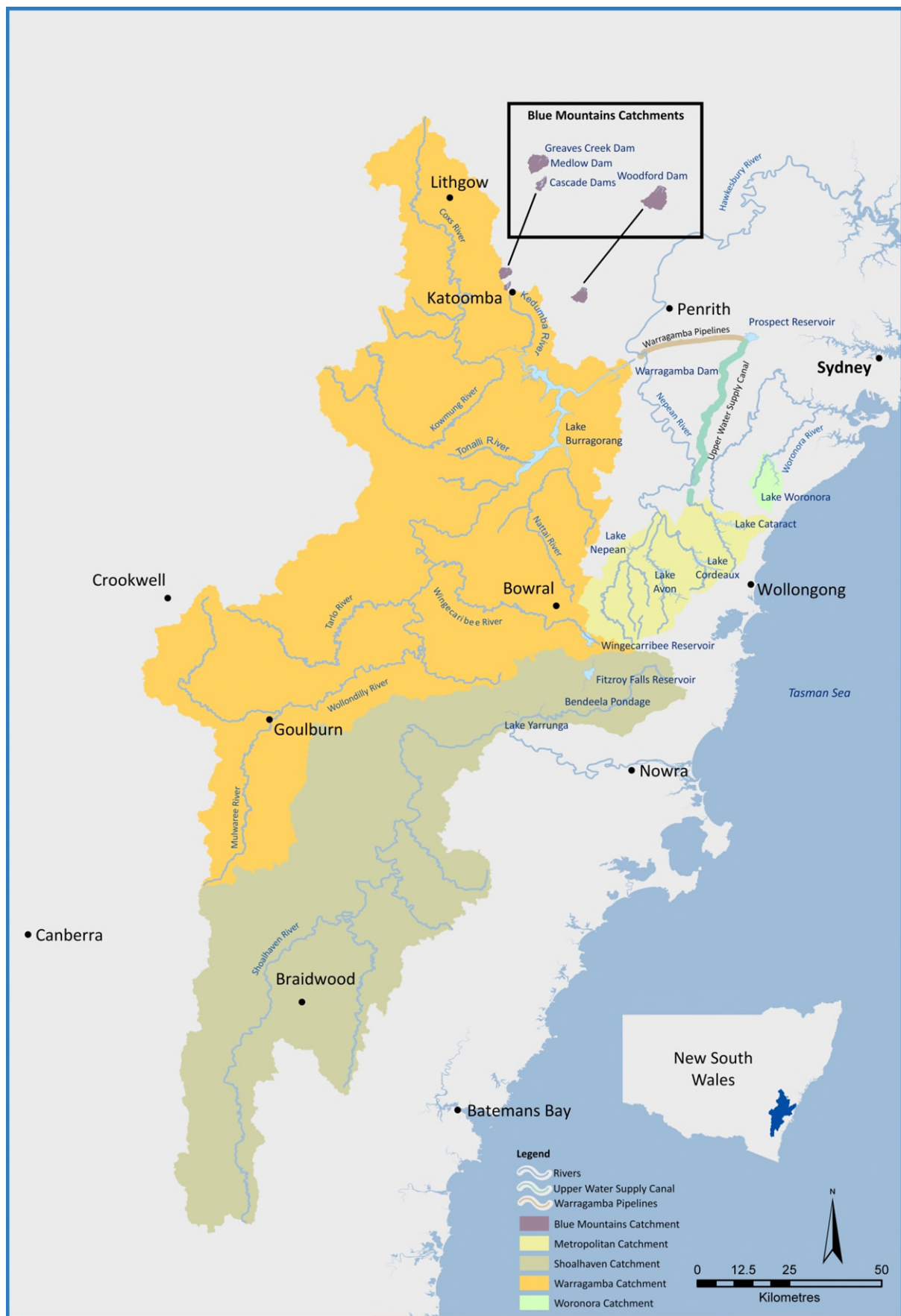


Figure 0.1: Sydney catchment area

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Executive Summary

WaterNSW's Water Monitoring Program Manual (WMP) for the Sydney catchment area details the comprehensive monitoring activities covering catchments, lakes, intakes to water filtration plants, picnic areas and downstream river sites. The WMP has been developed in collaboration with NSW Health, Sydney Water and other wholesale customers. The program incorporates locations, frequency and benchmarks or guideline values for more than 200 water quality characteristics. The WMP includes routine and event monitoring employing field sampling, laboratory testing and telemetered 'real-time' data collection from in-situ instruments. Monitoring provides timely water quality data and information to inform water quality risks, operational decisions and verification of water quality to demonstrate compliance.

This report describes the results of the water quality monitoring undertaken by WaterNSW during 2021-22. The report is prepared to meet WaterNSW's statutory obligations and supports the implementation of WaterNSW Water Quality Management System, providing valuable information for the assessment of water quality changes and early identification of potential trends that can adversely impact water quality. This allows WaterNSW to proactively develop mitigation strategies, required for the protection of our water sources and water supplied for treatment. In addition, it provides stakeholders, students, researchers and the general public with water quality information for waters managed by WaterNSW in the greater Sydney catchment area.

Highlights

The 2021-22 reporting period commenced with a total storage volume of 96.2% on 1 July 2021. The higher storage volumes across all storages were due to heavy rainfall and resulting inflows in August 2020. Frequently occurring minor inflow events from November 2021 to February 2022 maintained high storage levels. Large inflows were seen in March and April 2022 leading to significant spill across the Greater Sydney storages. Total storage volume at the end of June 2022 was still high at 96.3%.

Storage and catchment sample sites were less accessible due to catchment closures caused by multiple rainfall events. Some sites were not sampled due to safety reasons including catchment closures or access issues due to dam spills.

Guided by its Water Quality Management System, WaterNSW successfully delivered agreed quantities of high quality water to customers in full compliance with the Australian Drinking Water Guidelines (ADWG) for health-related characteristics.

A combination of recurring rainfall including some significant rainfall events after extended drought and widespread bushfire in the Warragamba catchment in 2019/2020 resulted in challenging water quality conditions. Multiple incident management teams were

implemented to manage water quality. Despite these significant challenges, through proactive modelling, monitoring and source selection, WaterNSW continued to deliver best available source water to our customers to ensure safety of the water supply was not compromised.

Water supplied to **water filtration plants** achieved near full compliance with site specific standards in raw water supply agreements. Exceptions were related to successive inflow events and included algal ASU (a measure of filter clogging potential), colour, hardness and metals (iron and aluminium). These issues were notified to customers and were managed in accordance with the Water Quality Incident Response Protocol.

WaterNSW continued to manage **picnic area supply** sites in accordance with the Quality Assurance Plans developed in line with NSW Private Water Supply Guidelines. Poor source water quality was an increasing challenge due to ongoing rain events particularly at Cataract and Cordeaux. This resulted in periods where potable water could not be supplied with picnic areas either closed to the public or signposted as not suitable for drinking. The efficacy of chlorine disinfection was demonstrated with high residuals achieved at the dosing plants, high chlorine contact times and the absence of *E. coli* and indicator bacteria in the supplies.

Consistent with recent years, nutrients often exceeded ANZECC benchmarks in catchment sites with significant agricultural or urban development, particularly within the Warragamba and Shoalhaven systems. Chlorophyll-a results across the catchment improved from 2020 – 2021 due to recurring rainfall across the catchment being unfavourable to phytoplankton growth.

Water quality in 2021-22 achieved
99.55% conformance with Raw Water Supply Agreements and
100% conformance with Australian Drinking Water Guidelines

Monitoring **downstream** of WaterNSW storages is part of the requirements of the Water Licences and Approvals package administered by Department of Planning and Environment. In the Nepean River system water quality remains poorer moving downstream due to uncontrolled catchment influences. Chlorophyll a was similar to the upstream storages with overall decreases observed relative to 2020 - 2021.

WaterNSW successfully managed eight major water quality incidents as triggered by and in accordance with our Water Quality Incident Response Protocol, including taste and odour in Prospect treated water supply in October 2021 and major flood events in March and April 2022.

Investigative monitoring was undertaken to assess the source of taste and odour compounds in Lake Burragorang in October 2021. Monitoring informed operational aspects in management of supply level, identified that the source was biological and characterised the specific compound through collaboration with external research agencies. Further

understandings of the development of taste and odour risk in lakes was obtained and will inform future selection of source water.

The annual **Macroinvertebrate Monitoring Program** scored 82 routine sites against the AUSRIVAS band grades. Of the 82 sites, 52 received a lower AUSRIVAS value while 29 recorded higher values, indicating overall a slight decline compared to the previous year; however, changes were not always large enough to cause a AUSRIVAS band grade change at each site.

1 Introduction

WaterNSW is a state-owned corporation whose responsibilities include, inter-alia, supplying water in compliance with appropriate standards of quality (Section 6(1)(b), Water NSW Act 2014) in the Sydney catchment area. WaterNSW undertakes extensive monitoring within its catchments, lakes and raw water supply system and in rivers downstream of storages to meet this objective.

WaterNSW's Water Monitoring Program Manual (WMP) sets out the location, frequency and analytes monitored for the Sydney catchment area and the regional area (WaterNSW, 2017). Specific and health-related characteristics are determined in consultation with our major customers and the program is developed to the satisfaction of NSW Health. Monitoring for operations and planning helps WaterNSW understand the threats to water quality throughout the supply system, including rivers, lakes and the delivery system. This information aids the selection of the best source water for our customers and the environment.

Data collected through the WMP is used to:

- provide early detection of possible contaminants to protect the health of consumers
- assist in proactive operational decisions
- ensure that the raw water delivered to our customers meets agreed standards and can be treated to meet the Australian Drinking Water Guidelines
- identify and target possible contamination sources in the catchments and storages
- prioritise monitoring to inform water quality risks and remedial actions
- identify emerging water quality issues and address them in forward configurational planning

WaterNSW's compliance monitoring activities are governed by the following key drivers:

- Operating Licence and Reporting Manual granted by the Governor of NSW and administered by Independent Pricing and Regulatory Tribunal (IPART)
- Water Licences and Approvals package granted by the Water Administration Ministerial Corporation and administered by Department of Planning and Environment (DPE – Water Division)
- Raw water supply agreements between WaterNSW and its customers
- Australian Drinking Water Guidelines
- NSW Private Water Supply Guidelines and Public Health Act 2010
- ANZECC benchmarks

This report describes the results of water quality monitoring undertaken by WaterNSW in the Sydney catchment area between 1 July 2021 and 30 June 2022 under the WMP. The report is a requirement of the Reporting Manual of the Operating Licence (2017-2022). The report also provides the community with information on water quality.

More specifically this report includes:

- a summary of the WMP, including objectives and applicable guidelines
- a summary of the results of the routine, event and investigative monitoring
- analysis of system performance relative to the criteria where relevant water quality or catchment health benchmarks are available
- information on the integrity of the data reported
- details of research activities
- summary of water quality incidents and actions taken to resolve, eliminate or mitigate the effect of those incidents, especially to protect public health during the incident

Source water quality in 2021-22 was largely affected by several minor and major rainfall events.

2 Overview of the Sydney catchment area water supply network

WaterNSW collects water from river catchments to the south and west of Sydney and stores it in lakes and reservoirs to supply more than five million people in the Greater Sydney region.

It is transported via a network of rivers, lakes, pipes and canals to water filtration plants, where it is treated for consumers in Sydney, Illawarra, Shoalhaven, Goulburn, Blue Mountains and the Southern Highlands. Water is also released from storages as environmental flows to maintain the health of the downstream river systems.

The catchments cover an area of approximately 16,000 square kilometres, extending from the headwaters of the Coxs River north of Lithgow, south to the source of the Shoalhaven River near Cooma, and from Woronora in the east to the Wollondilly River near Crookwell in the west (Figure 0.1). Raw water is collected from the river systems of five major catchments:

- Warragamba (including Prospect)
- Upper Nepean
- Woronora
- Shoalhaven
- Blue Mountains, including supplementary flows from the Fish River system.

The transfer routes for water around the system and approximate number of people supplied by that part of the system are shown in the water supply system schematic (Figure 2.1).

Greater Sydney's Water Supply System

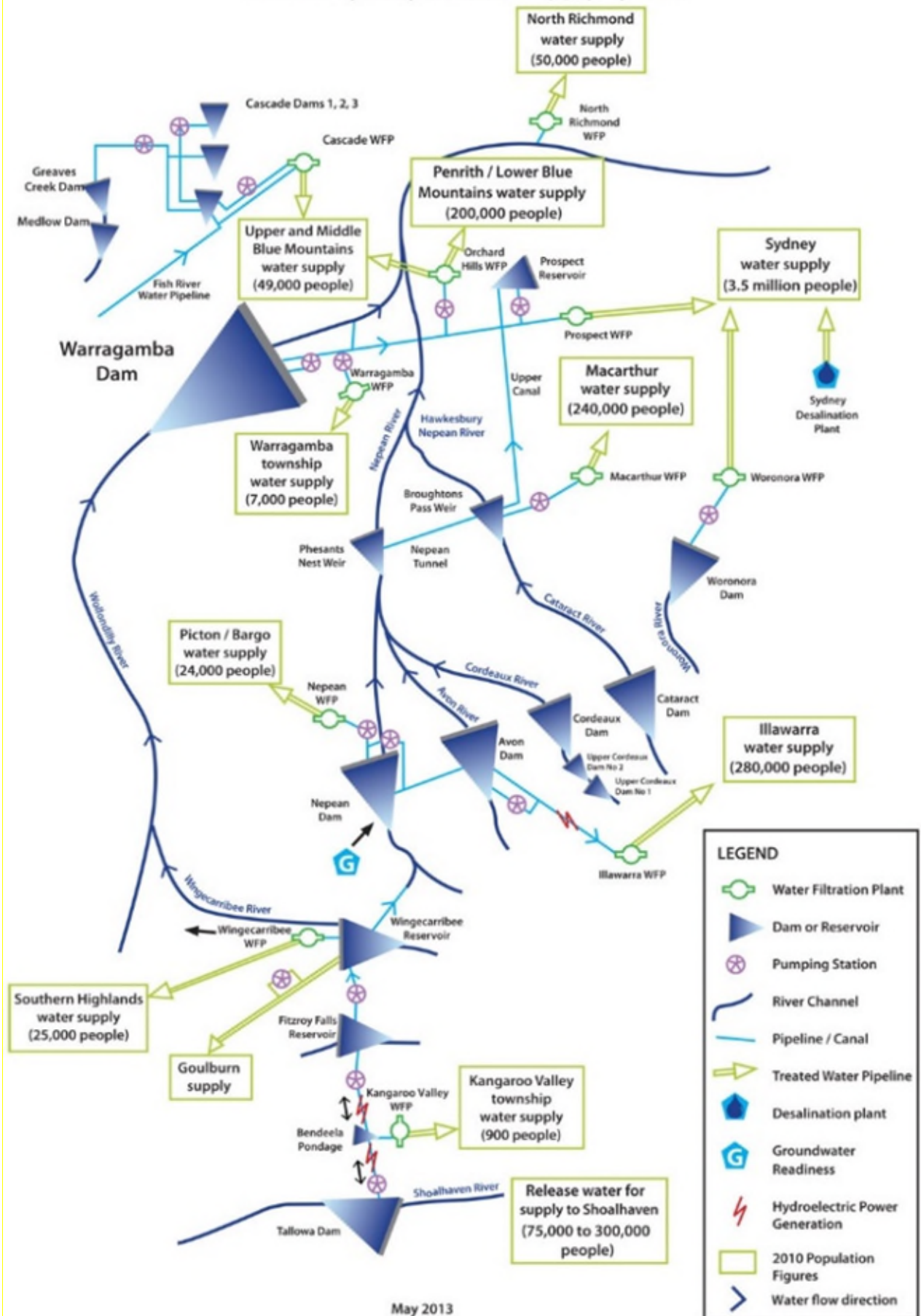


Figure 2.1: Schematic of the water supply system

3 Sydney catchment area water monitoring program

The Water Monitoring Program Manual (WMP) consists of operational, verification and investigative monitoring. The WMP covers catchments, storages, inlets to water filtration plants, picnic taps, transfer canals and pipelines, as well as rivers downstream of water supply dams and weirs. Monitoring includes physical, chemical, biological, radiological, hydrological and meteorological parameters through on-line instruments, field sampling and laboratory analysis. A key feature of the WMP is an agreed list of water quality characteristics. The list contains:

- those characteristics that cannot be managed by conventional treatment and for which Australian Drinking Water Guidelines (ADWG) must be met; and,
- those characteristics for which ADWG exist but are not applicable to raw water, where WaterNSW must endeavour to supply raw water so that it can be treated to meet the ADWG.

WaterNSW is subject to a range of statutory requirements and standards set by regulatory agencies. WaterNSW is also benchmarked against other raw water suppliers to maintain best practice service standards.

The principal documents that outline requirements on WaterNSW with respect to water monitoring are listed below.

- Water NSW Act 2014.
- Operating Licence (Part 2), Water NSW Act 2014 (Division 4)
- Water Licences and Approvals Package under Water Management Act 2000
- Memorandum of Understanding between NSW Health and WaterNSW (2022) (Parts 5-8)
- Raw Water Supply Arrangements
- Water Quality Incident Response Protocol
- Private Water Supply Guidelines and Public Health Act 2010
- Water Act 2007 (Commonwealth)

The WMP specifies the requirements for water sample collection and analysis. It describes sampling locations and frequencies, and the parameters to be analysed. Additional samples are collected and analysed for quality assurance and quality control (QA/QC) purposes and during events. The QA/QC program provides confidence in the data collected.

The collection and analysis of routine and QA/QC water samples is performed by WaterNSW monitoring staff and external service providers. Service contracts include requirements for quality assurance practices in the monitoring, sampling, testing and reporting processes. A chain of custody system allows individual samples to be tracked from field collection, through laboratory analysis, to the transfer of results to WaterNSW's database. Further details of the QA/QC monitoring for 2021-22 are included in Section 5.1.

4 Applicable guidelines and benchmarks

WaterNSW has adopted nationally recognised standards and guidelines for a range of water quality characteristics in each part of the water supply network. Different guidelines and standards apply to each part of the supply cycle as water passes from catchment waterways into lakes and then into the delivery network or downstream rivers.

4.1 Australian Drinking Water Guidelines (ADWG)

The Australian Drinking Water Guidelines (NHMRC, 2011 and later revisions) apply to any water intended for drinking, irrespective of the source or where it is consumed. The ADWG framework for managing drinking water quality advocates risk management and preventive measures at all barriers from catchment to consumer.

For water quality characteristics that have been specified as 'health related', including metals, pesticides and synthetic organic compounds (Table 4.1a-b), raw water must conform to the ADWG. As conventional water treatment methods are not designed to remove these compounds from raw water, it is preferable to avoid them in the raw water supply through catchment and storage management practices. Drinking water supply at picnic areas is managed in accordance with the ADWG.

Routine monitoring of radionuclides is performed at water filtration plants by screening for gross alpha and gross beta activity concentrations. Testing for individual radionuclides is performed in the case of a positive gross alpha or gross beta result. Gross alpha and gross beta screening is now carried out three-yearly in accordance with ADWG. Gross alpha and gross beta screening was conducted in this reporting period.

4.2 Raw water supply agreements

WaterNSW has established terms and conditions of supply with wholesale customers to ensure treated water is not harmful to consumers' health. WaterNSW maintains raw water supply agreements with Sydney Water, Wingecarribee Shire Council, Goulburn Mulwaree Council and Shoalhaven City Council. Raw water supplied for treatment is required to conform to site-specific standards specified in raw water supply agreements (Table 4.2). These standards are based on the treatment capabilities of the plants and the natural characteristics of the catchment. This ensures that raw water can be treated to meet ADWG requirements.

Table 4.1a: Health-related water quality characteristics: Synthetic Organics, Radiological and Pesticide Characteristics

	SPECIFIC WATER CHARACTERISTIC	DRIVER	ADWG (2011) Health Guideline
SYNTHETIC ORGANICS - RADIOLOGICAL - PESTICIDES	Synthetic Organic Compounds	Operating Licence ¹	
	Benzene		0.001 mg/L
	Vinyl chloride		0.0003 mg/L
	Pesticides		
	2,4-D (2,4-Dichlorophenoxyacetic acid)		0.03 mg/L
	Atrazine		0.02 mg/L
	Chlorfenvinphos		0.002 mg/L
	Chlorpyrifos		0.01 mg/L
	Diuron		0.02 mg/L
	Flupropanate		0.009 mg/L
	Glyphosate		1.0 mg/L
	Hexazinone		0.4 mg/L
	MCPA (2-methyl-4-chlorophenoxyacetic acid)		0.04 mg/L
	Picloram		0.3 mg/L
	Simazine		0.02 mg/L
	Triclopyr		0.02 mg/L
	Radiological	ADWG recommends screening level test for radiological parameters	
	Gross alpha		0.5 Bq/L
	Gross beta		0.5 Bq/L

¹ Section shaded yellow contains health related water quality characteristics. These characteristics must not exceed Australian Drinking Water Guidelines (NHMRC, 2011) in raw water supplied as treatment may not remove them. Minimising these in raw water effectively minimises risk to consumers.

Table 4.1b Health-related and aesthetic Water Quality Characteristics: (Physical, Chemical, Biological and Organic)

	SPECIFIC WATER CHARACTERISTIC	DRIVER	Guideline
PHYSICAL - CHEMICAL - BIOLOGICAL - ORGANIC	Arsenic Barium Beryllium Boron Iodide Manganese Mercury Molybdenum Selenium Silver Tin	ADWG (2011) ¹ Health Guideline	0.01mg/L 2 mg/L 0.06mg/L 4 mg/L 0.5 mg/L 0.5 mg/L 0.001 mg/L 0.05 mg/L 0.01 mg/L 0.1 mg/L N/A
	Antimony Cadmium Chromium (Cr ^{VI}) Copper Fluoride Lead Nickel Nitrate Nitrite	ADWG (2011) ² Health Guideline (NSW Private Water Supply Guidelines, 2016)	0.003 mg/L 0.002 mg/L 0.05 mg/L 2 mg/L 1.5 mg/L 0.01 mg/L 0.02 mg/L 50 mg/L 3 mg/L
	<i>E. coli</i> Enterococci <i>C. perfringens</i> <i>Cryptosporidium</i> <i>Giardia</i> Toxin producing cyanobacteria Toxicity Total cyanobacteria biovolume	ADWG (2011) Operating Licence ³	Seek advice from NSW Health
	Algae (ASU) Alkalinity Aluminium Hardness Iron Manganese Odour pH True colour Turbidity	Water Supply Agreements	Refer to Water Supply Agreements
	Total cyanobacteria biovolume Total toxin producing cyanobacteria Toxicity Enterococci	Water Licences and Approvals Package (WLAP) ⁴	Refer to <i>Guidelines for Managing Risks in Recreational Water</i> (NHMRC 2008)

1 Section shaded **yellow** contains health related water quality characteristics – these characteristics must not exceed Australian Drinking Water Guidelines (NHMRC, 2011) in treated waters or in raw water supplied as treatment may not remove them. Minimising these in raw water effectively minimises risk to consumers.

2 Section shaded **orange** contains health related water quality characteristics for private water supplies – these characteristics must not exceed Australian Drinking Water Guidelines (NHMRC, 2011) in treated waters.

3 Section shaded **blue** contains characteristics for which drinking water guidelines exist but these are not applicable for raw water. However, WaterNSW must endeavour to supply the best quality raw water available so that it can be treated to meet Australian Drinking Water Guidelines.

4 Section shaded **green** contains characteristics which apply for recreational waters and releases.

Table 4.2: Raw water supply agreements – Site specific standards

		Turbidity	True Colour @400 nm	Iron	Manganese	Aluminium	Hardness	Alkalinity	pH	Odour	Algae	
		NTU	CU	mg/ L	mg/L	mg/L	mg/L as CaCO3	mg/L as CaCO3	pH units	Rating	ASU	
Prospect WFP		40	60	3.50	1.40	2.6	25 – 70	15 - 60	NA	NA	1000 ⁽ⁱ⁾	
Warragamba WFP											2000	
Orchard Hills WFP												
Macarthur WFP Based on Demand (ML/day)	185 - <265	10	40	0.60	0.20	0.40	6 – 30	15		100 ⁽ⁱⁱ⁾		
	125 - <185	25		0.80	0.25	0.50	6 – 32.20					
	80 - <125	50		1.10	0.30	0.75				500 ⁽ⁱⁱ⁾		
	<80	60		1.30	0.35	0.95						
Illawarra WFP		10	50	1.1	0.4	1.4	30	10		Not objectionable	5000	
Woronora WFP			70	1	0.1	0.4	2 – 30	15				
Nepean WFP		150	60	5.0	1.5	1.0	2 – 35	0.5 – 25		NA	2000	
Cascade WFP		15		3.0	0.3	0.2	40	30				
Kangaroo Valley WFP		20	70	1.1	0.4	NA	36.5	29	6.5 – 8.5			5000
Wingecarribee WFP		40			NA							
Goulburn Mulwaree												

(i) Maximum for Prospect WFP is 1000 ASU, except if turbidity is greater than 10 NTU or true colour is greater than 30 CU, then the algae maximum will be 500 ASU.

(ii) Algal limits for Macarthur WFP (average of 3 samples): 500 ASU small individual cells (<10 µm) of filamentous or colonial species, typically *Chlorella*, *Dolichospermum*, *Monodus* and *Melosira*; or 100 ASU large (>10 µm) cells, branching species, and/or gelatinous species, typically *Asterionella*, *Tabellaria*, *Fragilaria*, *Synedra*, *Cyclotella*, *Dinobryan*, *Elakatothrix*, and *Volvox*.

(iii) Upper limits are shown for analytes where ranges are not provided.

4.3 ANZECC 2018

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) (ANZECC, 2018) provide a guide for setting water quality objectives required to sustain current or likely future environmental values for natural and semi-natural water resources in Australia and New Zealand. Water quality in WaterNSW Sydney catchment area waterways are compared against relevant sections of the ANZECC Guidelines.

Benchmarks for storages

Benchmarks for storages are derived from the guidelines for freshwater lakes and reservoirs (ANZECC, 2018) for the 95-99 percent level of species protection (Table 4.3). Site specific benchmarks are to be developed for temperature and conductivity, and as such are not included in the table below.

Table 4.3: Water quality benchmarks for storages

Analyte	Units	Benchmark range
pH	pH units	6.5 - 8.0
Chlorophyll a	µg/L	< 5
Dissolved oxygen	% sat	90 – 110
Total nitrogen	mg/L	< 0.35
Oxidised nitrogen	mg/L	< 0.01
Ammoniacal nitrogen	mg/L	< 0.01
Total phosphorus	mg/L	< 0.01
Filterable reactive phosphorus	mg/L	< 0.005
Turbidity	NTU	< 20.0
Total manganese	mg/L	< 1.9
Total aluminium	mg/L	< 0.055

Benchmarks for catchments

WaterNSW benchmarks water quality in metropolitan catchment streams against the ANZECC (2018) guideline ranges for upland rivers (Table 4.4).

Table 4.4: Water quality benchmarks for catchment streams

Analyte	Units	Benchmark range
pH	pH units	6.5 – 8.0
Chlorophyll a	µg/L	< 5
Dissolved oxygen	% sat	90 – 110
Total nitrogen	mg/L	< 0.25
Ammoniacal nitrogen	mg/L	< 0.013
Oxidised nitrogen	mg/L	< 0.015
Total phosphorus	mg/L	< 0.02
Filterable reactive phosphorus	mg/L	< 0.015
Turbidity	NTU	< 25
Total aluminium	mg/L	< 0.055
Total manganese	mg/L	< 1.9
Conductivity	mS/cm	< 0.35

4.4 Benchmarks for recreational areas

To minimise risks to public health, WaterNSW manages recreational exposure risk by benchmarking water quality against the Guidelines for Managing Risks in Recreational Waters (NHMRC, 2008) (Table 4.5).

Table 4.5: Water quality benchmarks for recreation areas

Analyte	Units	Primary Contact		Secondary Contact
		Minor Alert Threshold	Major Alert Threshold	Alert Threshold
<i>Enterococci</i>	cfu/100mL	40	200	200
<i>Microcystis aeruginosa</i>	cells/mL	5,000	50,000	50,000
Toxic cyanobacteria biovolume	mm ³ /L	0.4	4	4
Total cyanobacteria biovolume	mm ³ /L	-	10	10
Algal toxins (microcystin variants)	µg/L	NA	10	10

4.5 Benchmarks for downstream rivers

Benchmarks for water quality downstream of WaterNSW's dams and weirs are derived from ANZECC (2018) lowland rivers ecosystem types (Table 4.6).

Table 4.6: Water quality benchmarks downstream of storages

Analyte	Units	Benchmark range
pH	pH units	6.5 - 8.5
Chlorophyll a	µg/L	< 5
Dissolved oxygen	% sat	85 – 110
Total nitrogen	mg/L	< 0.5
Total phosphorus	mg/L	< 0.05
Turbidity	NTU	< 50

4.6 Benchmarks for picnic area supplies

Benchmarks for the picnic area supplies are based on ADWG (2011) threshold ranges, where relevant (Table 4.7). Some benchmarks are prompts for action, such as chlorophyll a, which triggers algal monitoring in the picnic area supply.

Table 4.7: Water quality guidelines for specific parameters at picnic areas

Analyte	Units	Threshold
Free chlorine residual	mg/L	> 0.5
pH	pH units	6.5 - 8.5
Turbidity	NTU	< 3
Total iron	mg/L	< 0.3
Total aluminium	mg/L	< 0.2
Total manganese	mg/L	< 0.1
<i>E. coli</i>	orgs/100 mL	Should not be detected
Algal toxins (microcystin variants)	µg/L	< 1.3
Chlorophyll a	µg/L	< 5
Potentially toxin producing algal cells	cells/mL	< 6,500 ⁽ⁱ⁾

(i) See cyanobacteria benchmarks in Table 4.8

4.7 Benchmarks for cyanobacteria

WaterNSW routinely monitors levels of algae in major storages to provide early warning of possible bloom conditions and to ensure that raw water supplied to customers can be treated to meet drinking water guidelines. Algal monitoring is also conducted to avoid contaminating downstream waterways through environmental releases or transfers.

While the ADWG stipulate cyanobacteria guidelines and alert levels for drinking water, WaterNSW applies those guidelines to the raw water supplied for treatment in Greater Sydney. At Lake Yarrunga and Fitzroy Falls Reservoir, the only WaterNSW storages in the Sydney catchment area with recreational access, the National Health and Medical Research Council Recreational Waters Guidelines (NHMRC, 2008) for catchments and lakes are applied (Table 4.8). The raw water and picnic areas benchmarks are from the ADWG.

Table 4.8: Cyanobacteria benchmarks throughout Sydney catchment area

Analyte		Units	Threshold
Catchment and lake sites⁽ⁱ⁾			
Cells	<i>Microcystis aeruginosa</i>	cells/mL	50,000
Toxicity	Microcystin variants	µg/L	10
Biovolume	Total cyanobacteria	mm ³ /L	4
Raw water and picnic area water supplies⁽ⁱⁱ⁾			
Cells	<i>Microcystis aeruginosa</i>	cells/mL	6,500
	<i>Raphidiopsis raciborskii</i>	cells/mL	15,000
	<i>Dolichospermum circinale</i>	cells/mL	20,000
Toxicity	Microcystin variants	µg/L	1.3
	Cylindrospermopsin	µg/L	1.0
	Saxitoxin	µg/L	3.0
Biovolume	Potentially microcystin-producing species	mm ³ /L	0.6
	Potentially cylindrospermopsin-producing species	mm ³ /L	0.6
	Potentially saxitoxin-producing species	mm ³ /L	5

(i) National Health and Medical Research Council Guidelines for Managing Risks in Recreational Water 2008.

(ii) These triggers are based on cell counts, toxin concentration and biovolume ADWG 2011 specify actions in response to various alert level ranges for *Microcystis aeruginosa*, *Dolichospermum circinale* and *Raphidiopsis raciborskii*, and the consolidated biovolumes of the species known to produce microcystin, saxitoxins and cylindrospermopsin toxins.

4.8 Benchmarks for *Cryptosporidium* and *Giardia*

The ADWG do not contain guideline values for *Cryptosporidium* and *Giardia* in raw or treated drinking water. However, ADWG (2011) recommends a multi-barrier approach to minimise the risks of these pathogens. Investigative testing is encouraged in response to events that could increase the risk of contamination. WaterNSW implements additional monitoring during high-risk events. *Cryptosporidium* and *Giardia* monitoring in the catchments is undertaken to provide early warning to enable optimal configuration of the raw water supply system in the event of high concentrations of protozoan pathogens within the storages. Catchment monitoring also contributes to the understanding of sources which can then improve the robustness of risk assessments and catchment actions.

5 Routine monitoring

Water quality monitoring was conducted as per the Water Monitoring Program. Samples were collected from catchment streams, lakes and delivery sites and analysed by National Association of Testing Authorities (NATA) accredited laboratories. Online instruments were used to supplement this monitoring. This report summarises the results of routine monitoring compared against appropriate guidelines or benchmarks.

Data from routine samples was extracted from the WaterNSW water quality database. Storage data was filtered so that surface samples were used. Routine data was compared to the relevant guideline, standards and benchmark value for each analyte. The number of guideline exceedances was calculated as a percentage of the total compliance samples taken in the reporting year. The appendices provide summary statistics for all samples collected on each routine sampling occasion.

Compliance was 100% with the ADWG and 99.55% with Raw Water Supply Agreements. Overall, the water quality monitoring of the reservoirs in the declared catchment areas indicated good water quality apart from impacts associated with the March and April 2022 inflow events. The impacts of the recent inflow events were managed by adjusting the supply system configuration (e.g., offtake depth changes and source selection) and raw water supply to water treatment plants was not adversely impacted.

5.1 Quality Assurance and Quality Control

The WaterNSW quality assurance and quality control (QA/QC) program ensures the sampling and analysis process is accurate and representative. Specific QA/QC samples are collected and analysed to provide confidence that errors are controlled in the sampling and analysis process. Field collected QA/QC samples include field duplicates and field blanks. Trip blanks are also prepared at the laboratory and taken on designated sampling trips. 2.3% of the number of routine samples were taken for QA/QC purposes in 2021-22 to ensure the validity and accuracy of the WaterNSW's water quality data. This was above the effort on QA/QC recommended by ISO 5667 at 2% of routine samples.

In addition to WaterNSW QA/QC samples, WaterNSW's analytical service providers have management systems that require them to maintain their own internal QA/QC program. These systems are accredited with the NATA and aligns with ISO17025. The analytical service providers conduct internal quality control analysis per each batch of samples including matrix spikes, internal and inter-laboratory duplicates, blanks, replicate analysis and inter-laboratory proficiency trials. The service provider QA/QC specialists analyse conformance with specified standards of accuracy and precision defined by WaterNSW to identify any contamination, outliers or errors (either random or systemic).

Trip blanks

A total of 36 trip blanks were taken in 2021-22 across the Sydney catchment area. Three trip blanks detected at least one analyte, representing an 8.3% anomaly rate per sample. Anomalous detections were recorded for dissolved and total organic carbon (2) and odour (1)). Odour being an interpretive analysis can be expected to show some bias. Organic detections were low on both occasions.

Field blanks

A total of 63 field blanks were taken in 2021-22. Ten field blanks returned positive results, equating to an anomaly rate of 15.9%. The detections were all low level and represented minor contamination in the sampling process. Analytes detected within the positive blank samples were dissolved organic carbon (5), iron (3), manganese (2), aluminium (2), total organic carbon (2) and odour (1). Recurring organic carbon samples showing a field blank detection, while consistently of a low level, reflects a minor bias in results and is factored into interpretation by water quality advisors. As noted above, odour being an interpretative analysis, is expected to show a bias towards a positive result and this bias is also considered in interpretation. For metal detections, due to the ultra-trace levels of reporting for these analytes, intermittent anomalies are to be expected.

Duplicates

Duplicate samples can identify any contamination or procedural errors in all elements of sampling and analysis. The samples are used as a pass/fail performance metric. Duplicate results are assessed on the acceptable performance criteria determined by WaterNSW and the respective laboratory. If the variation of the sample is outside the performance criteria the duplicate is reanalysed. During 2021-22, 96 duplicate samples were collected for which 48 samples showed significant percentage variation (>50%) in at least one of the analyses. Within these 48 samples, 49 analyses showed variation that warranted further investigation. The majority of these samples showed variation were related to algal analytes which are typically known to show some variation and low level nutrients. Two results required further investigation including *E. coli* and field analytes assigned to the incorrect duplicate.

5.2 Warragamba system

Sampling sites in the Warragamba system (including Prospect Reservoir) are shown in Figure 5.1 below.

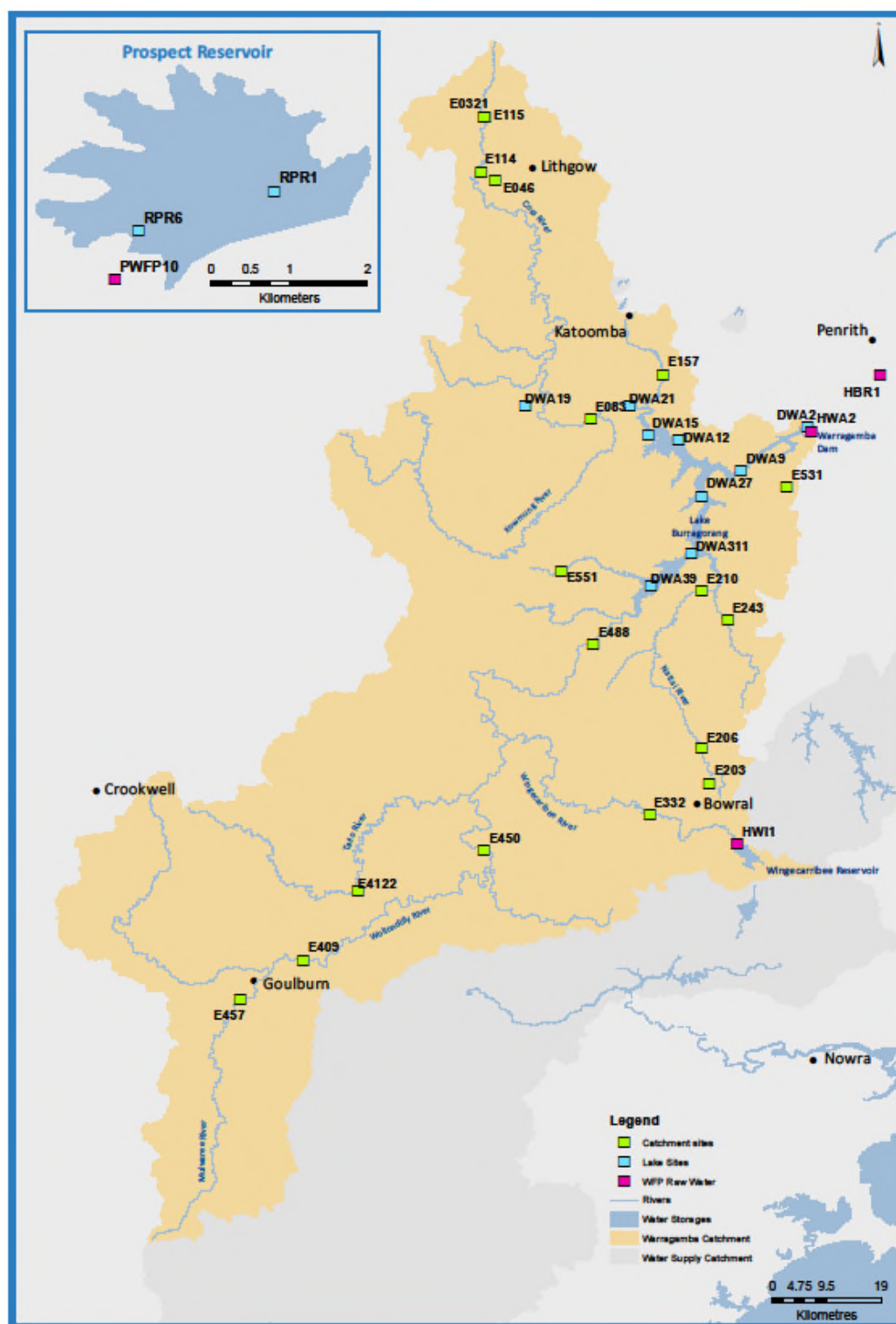


Figure 5.1: Sampling sites in the Warragamba system (Prospect Reservoir inset)

Table 5.1: Warragamba system catchments - percentage of routine samples outside benchmarks

Site	Station Code	Physico-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Catchments (ANZECC guidelines refer Table 4.4, where there is no applicable benchmark the cells are greyed out).																		
Coxs River D/S Lake Lyell	E0114		42%	58%	33%			0%	42%	100%	100%	0%	42%	82%		0%		25%
Coxs River U/S Lake Lyell	E0115		55%	36%	9%			0%	18%	91%	100%	0%	36%	64%		0%		20%
Coxs River at Lithgow (next to the Power Station)	E0321		90%	40%	0%			0%	60%	90%	90%	0%	60%	90%		0%		0%
Farmers Creek (Mt Walker)	E046		0%	30%	30%			20%	50%	100%	100%	20%	80%	100%		0%		40%
Coxs River at Glenroy Bridge	E073		0%	20%	40%			10%	60%	100%	100%	10%	60%	90%		0%		40%
Coxs River @ Kelpie Point	E083		0%	0%	9%			18%	27%	82%	64%	18%	64%	73%		0%		9%
Kowmung River @ Cedar Ford	E130		0%	0%	0%			0%	17%	100%	42%	0%	17%	83%		0%		0%
Kedumba River @ Maxwells Crossing	E157		0%	0%	0%			8%	25%	100%	42%	0%	8%	67%		0%		0%
Gibbergunyah Creek 400m d/s of Mittagong STP discharge	E203		17%	33%	0%			8%	100%	100%	100%	17%	92%	100%		0%		17%
Nattai River at the Craggs	E206		0%	17%	0%			0%	8%	100%	100%	25%	67%	83%		0%		17%
Nattai River @ Smallwoods Crossing	E210		0%	8%	0%			17%	75%	100%	67%	0%	42%	75%		0%		8%
Little River @ Fireroad W4I	E243		0%	0%	0%			0%	0%	83%	0%	0%	0%	42%		0%		0%
Mittagong Creek downstream WPCP																		
Bowral	E306		33%	100%	0%			17%	92%	100%	100%	33%	83%	100%		0%		8%
Whites Ck 350m d/s of Moss Vale STP discharge	E3151		92%	100%	0%			0%	75%	92%	92%	50%	92%	91%		0%		9%
Wingecarribee River @ Berrima	E332		0%	67%	0%			8%	75%	92%	100%	8%	100%	100%		0%		100%
Wollondilly River @ Murrays Flat	E409		83%	75%	0%			0%	82%	100%	100%	55%	100%	100%		0%		83%
Wollondilly River @ Upper Tarlo	E4122		50%	83%	0%			8%	75%	67%	100%	8%	58%	100%		0%		8%
Wollondilly River at ford 1km u/s Paddys River	E433		0%	83%	25%			0%	58%	58%	75%	8%	58%	100%		0%		8%

Site	Station Code	Physico-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Catchments (ANZECC guidelines refer Table 4.4, where there is no applicable benchmark the cells are greyed out).																		
Wollondilly River @ Golden Valley	E450		67%	17%	0%			8%	83%	100%	100%	33%	100%	100%		0%		73%
Mulwaree River @ Towers Weir	E457		92%	75%	8%			8%	92%	58%	100%	92%	92%	92%		0%		83%
Wollondilly River @ Joorilands	E488		25%	0%	17%			25%	42%	83%	100%	25%	75%	92%		0%		25%
Wollondilly River @ u/s Goulburn Weir	E490		67%	92%	0%			0%	67%	67%	100%	25%	92%	100%		0%		83%
Werriberri Creek @ Werombi	E531		33%	42%	0%			0%	67%	75%	67%	0%	42%	75%		0%		25%
Wollondilly River at ford 1km u/s Paddys River	E433		0%	83%	25%			0%	58%	58%	75%	8%	58%	100%		0%		8%
Wollondilly River @ Golden Valley	E450		67%	17%	0%			8%	83%	100%	100%	33%	100%	100%		0%		73%

Site	Station Code	Physico-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Storages (ANZECC guidelines refer Table 4.3)																		
Lake Burrarorang 9km d/s of DWA15	DWA12			43%	9%			0%	9%	100%	100%	13%	83%	74%		0%		0%
Lake Burrarorang @ 4km u/s of Butchers Creek	DWA15			40%	20%			0%	20%	100%	100%	20%	60%	80%		0%		60%
Lake Burrarorang @ Kedumba River arm	DWA19			60%	0%			0%	20%	100%	100%	0%	100%	80%		0%		40%
Lake Burrarorang @ 500m u/s of Dam Wall	DWA2			43%	4%			0%	22%	100%	100%	22%	65%	87%		0%		23%
Lake Burrarorang @ Coxs River arm 37km u/s of Dam Wall	DWA21			60%	0%			0%	20%	100%	100%	0%	100%	80%		0%		60%

Site	Station Code	Physico-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Storages (ANZECC guidelines refer Table 4.3)																		
Lake Burragorang @ Wollondilly arm River arm 23km u/s of Dam Wall	DWA27			61%	17%			0%	22%	100%	100%	26%	87%	96%		0%		30%
Lake Burragorang @ Wollondilly arm River arm 300m u/s of Nattai River	DWA311			80%	0%			0%	40%	100%	100%	40%	80%	100%		0%		0%
Lake Burragorang @ Wollondilly arm River arm 40km u/s of Dam Wall	DWA39			80%	0%			0%	60%	100%	100%	60%	100%	100%		0%		20%
Lake Burragorang @ 14km u/s of Dam Wall	DWA9			48%	0%			0%	13%	100%	100%	22%	74%	87%		0%		26%
Lake Prospect @ midlake	RPR1			17%	0%			0%	67%	92%	25%	0%	0%	83%		0%		76%
Lake Prospect @ inlet to RWPS	RPR6			14%	14%			0%	40%	100%	40%	0%	0%	100%		0%		80%
Raw Water (raw water supply agreement site specific standards refer Table 4.2)																		
Orchard Hills WFP raw water	HBR1	0%				0%	0%	0%						0%	0%	0%	0%	
Warragamba WFP raw water	HWA1	0%				0%	0%	0%						0%	0%	0%	0%	
Prospect WFP Inlet - Channel 2, 2nd dosing bridge	PWFP10	0%				0%	0%	0%						0%	0%	0%	0%	

5.2.1 Catchments

Water quality in Lake Burragorang's river catchments in 2021-22 showed similar characteristics to previous years, with catchments dominated by agricultural and urban land uses regularly exceeding ANZECC benchmarks. Water monitoring sites in the upstream parts of all the catchments continued to frequently exceed benchmarks, particularly for nutrients, aluminium and conductivity.

Nitrogen and aluminium continued to be elevated throughout the catchment streams.

Highly protected natural catchments such as the Kowmung, Kedumba and Little River returned fewer exceedances for most parameters when compared to upstream sites, though continued to show exceedances for nitrogen and aluminium.

Upstream sites in the Wollondilly catchment once again showed significant numbers of exceedances for chlorophyll a.

The Coxs River continues to show significant effects of pollution sources in the upper catchment, showing notable improvements in the lower Coxs River catchment where the river enters protected areas. The Coxs River near the Lithgow Power Station continues to show high numbers of exceedances for conductivity.

5.2.2 Storages

The lake again showed a high number of exceedances for nitrogen and aluminium at all sites.

The lake was significantly impacted by storm events in March/April 2022. Water quality in Lake Burragorang for the period and impacts to the supply were minimised through active monitoring and offtake selection.

Chlorophyll a continued to show a number of exceedances in the Coxs River arm of the lake. There were no associated algal issues or impacts downstream.

Water quality in Prospect Reservoir returned a significant number of exceedances for nitrogen and aluminium, but was of generally good quality and posed few challenges for treatment to the Prospect Water Filtration Plant.

5.2.3 Water Filtration Plants

Water supplied for filtration remained of high quality throughout the period with no exceedances recorded.

5.3 Upper Nepean system

Sampling sites in the Upper Nepean system are shown in Figure 5.2 below.

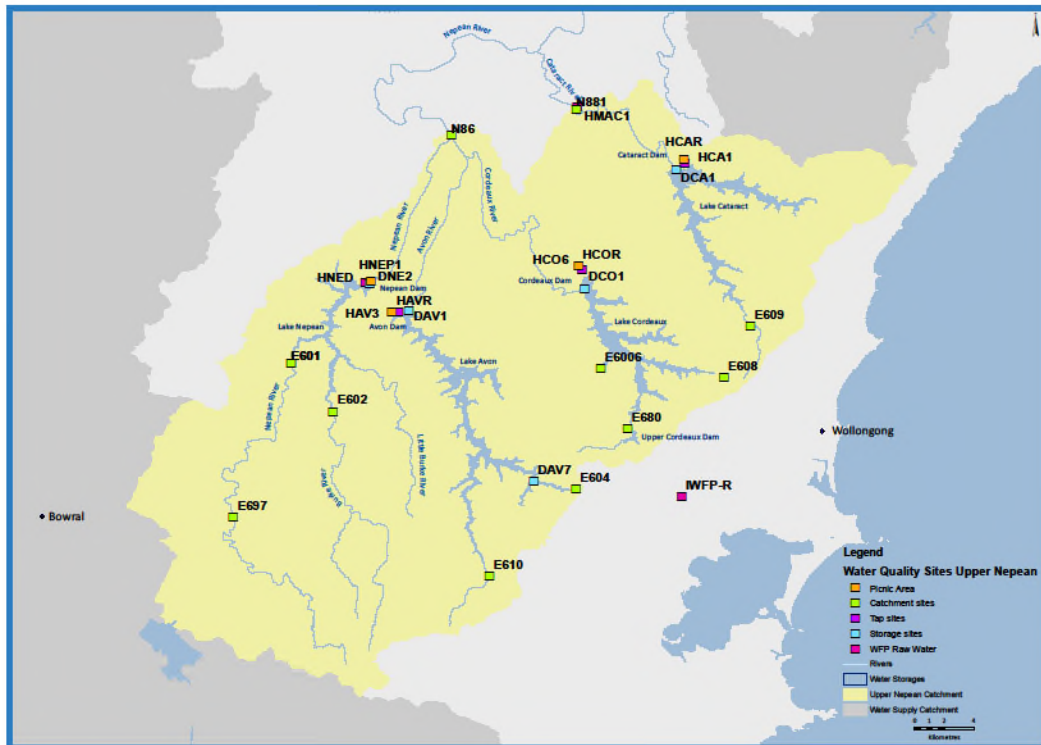


Figure 5.2: Sampling sites in the Upper Nepean system.

5.3.1 Catchments

Water quality across the Upper Nepean catchment sites varies according to land use and natural catchment characteristics. Catchment water quality in 2021-22 showed similar patterns to the previous year.

All Upper Nepean catchment sampling locations showed recurring nitrogen results outside benchmarks. Phosphorus results exceeding guidelines were very infrequent when compared to previous years. The reduction in phosphorus which fuels phytoplankton growth meant that chlorophyll a was low in the rivers throughout most of the year.

Natural geology and rainfall events are factors which influence water quality. Aluminium was above benchmark at catchment sites which reflects wetter conditions throughout the year. pH was also impacted at many sites due to transport of organics after rainfall. Increasing organics and cooler temperatures also influenced dissolved oxygen saturation in rivers with results often below the benchmark of 90% saturation. Turbidity increases during rain events then steadily declines with sampling not always achievable during high flow. Routine monitoring after inflow events showed no elevated turbidity results in the Nepean catchment.

Table 5.2: Upper Nepean catchments - percentage of routine samples outside benchmarks

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Catchments (ANZECC guidelines refer Table 4.4). Where there is no applicable benchmark cells are greyed out.																		
Sandy Creek inflow	E6006		0%	33%	100%			0%	17%	8%	0%	0%	25%	92%		0%		0%
Nepean River at inflow to Lake Nepean	E601		0%	0%	0%			0%	10%	100%	100%	0%	20%	100%		0%		0%
Burke River at inflow to Lake Nepean	E602		0%	0%	42%			0%	33%	8%	0%	0%	0%	83%		0%		0%
Little Burke River at inflow to Lake Nepean	E603		0%	17%	92%			0%	25%	8%	8%	0%	0%	58%		0%		0%
Flying Fox #3 Creek	E604		0%	33%	0%			0%	17%	100%	8%	0%	0%	25%		0%		8%
Goondarin Creek inflow	E608		0%	42%	8%			0%	25%	100%	0%	0%	8%	83%		0%		0%
Cataract River inflow	E609		0%	83%	83%			0%	92%	100%	0%	0%	0%	92%		0%		0%
Avon River - Summit Tank	E610		0%	36%	9%			0%	0%	0%	0%	0%	0%	64%		0%		9%
Loddon River Inflow	E676		0%	33%	100%			0%	38%	0%	11%	0%	0%	100%		0%		0%
Cordeaux River at causeway between Upper Cordeaux #1 and #2	E680		0%	25%	17%			0%	25%	33%	0%	0%	0%	50%		0%		25%
Nepean River at Macguires Crossing	E697		0%	8%	0%			0%	67%	100%	92%	8%	92%	100%		0%		8%
Storages (ANZECC guidelines refer Table 4.3)																		
Lake Avon at Dam Wall	DAV1			42%	83%			0%	50%	75%	8%	0%	0%	33%		0%		8%
Lake Avon @ 3 km D/S Gallahers Ck Jn	DAV16			29%	29%			0%	43%	57%	0%	0%	0%	29%		0%		0%
Lake Avon at Upper Avon Valve Chamber	DAV7			43%	36%			0%	25%	50%	8%	0%	8%	33%		0%		25%
Lake Cataract at Dam Wall	DCA1			42%	92%			0%	67%	58%	0%	0%	8%	100%		0%		0%
Lake Cataract @ Cataract arm 5km U/S	DCA2			33%	100%			0%	33%	67%	0%	0%	17%	100%		0%		0%
Lake Cataract @ Loddon arm 4.5km U/S	DCA3			0%	100%			0%	50%	50%	0%	0%	0%	100%		0%		0%
Lake Cordeaux at Dam Wall	DCO1			33%	25%			0%	50%	58%	0%	0%	25%	67%		0%		83%

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO ₃ /L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Lake Cordeaux @ Jn. of Kentish & Cord. R.	DCO3			29%	29%			0%	33%	50%	0%	0%	33%	50%		0%		50%
Lake Nepean @ 300m u/s of Dam Wall	DNE2			38%	38%			0%	50%	100%	50%	0%	38%	100%		0%		38%
Lake Nepean @ junction of Burke arm at thermistor chain	DNE6			58%	50%			0%	42%	100%	50%	0%	67%	100%		0%		58%
Raw Water (raw water supply agreement site specifications refer Table 4.2)																		
Macarthur WFP raw water	HMAC1	0%				8%	25%	0%						8%	33%	0%	58%	
Nepean WFP raw water	HNED	0%				0%	0%	0%						0%	0%	0%	0%	
Illawarra WFP raw water	IWFP-R	0%				0%	0%	0%						0%	0%	0%	0%	

5.3.2 Storages

Water quality in the Upper Nepean lakes was impacted in early 2022. Heavy rain fell in March and April 2022, creating significant wet weather intrusions of new water into the lakes. Transport of increased organics and sediment related metals entered the lakes and adversely impacted water quality.

Overall for the year, the lakes recorded a high compliance against most ANZECC benchmarks, aside from samples collected during inflow events. Turbidity was low in all routine samples with no exceptions to the ANZECC benchmark. High turbidity recorded during rain events generally does not persist in the lakes for an extended period.

Manganese concentrations remained low and achieved full compliance against the ANZECC benchmark. Aluminium continued to remain above benchmarks in the Upper Nepean storages due to both impacts from rainfall last reporting year and continued rainfall this year.

There were rises in different forms of nitrogen and phosphorus in Lake Nepean and Lake Cordeaux which is likely to have entered with inflows. Chlorophyll-a performance against benchmarks was generally good excepting these two storages with the highest percentage of exceedance recorded in Lake Nepean. No significant cyanobacterial blooms were identified during this reporting period in either of these lakes.

5.3.3 Water Filtration Plants

Full compliance with the raw water standards was achieved for Nepean and Illawarra WFPs. Macarthur WFP had infrequent exceedances of these standards in March and April 2022 due to spill from Cataract Dam and downstream tributaries impacting the supply point. All three plants had 100% compliance with health related characteristics.

Wet weather events in March and April 2022 resulted in minor and major incident level exceedances in the supply to these WFPs, however these were in special samples collected during incidents and are excluded from the routine compliance table above.

Elevated turbidity, metals and resultant high true colour are common during heavy wet weather, with metals and organic matter leached from the catchment. During these events the treated water produced by the WFPs continued to meet the Australian Drinking Water Guidelines.

5.4 Woronora system

Sampling sites in the Woronora system are shown in Figure 5.3 below.

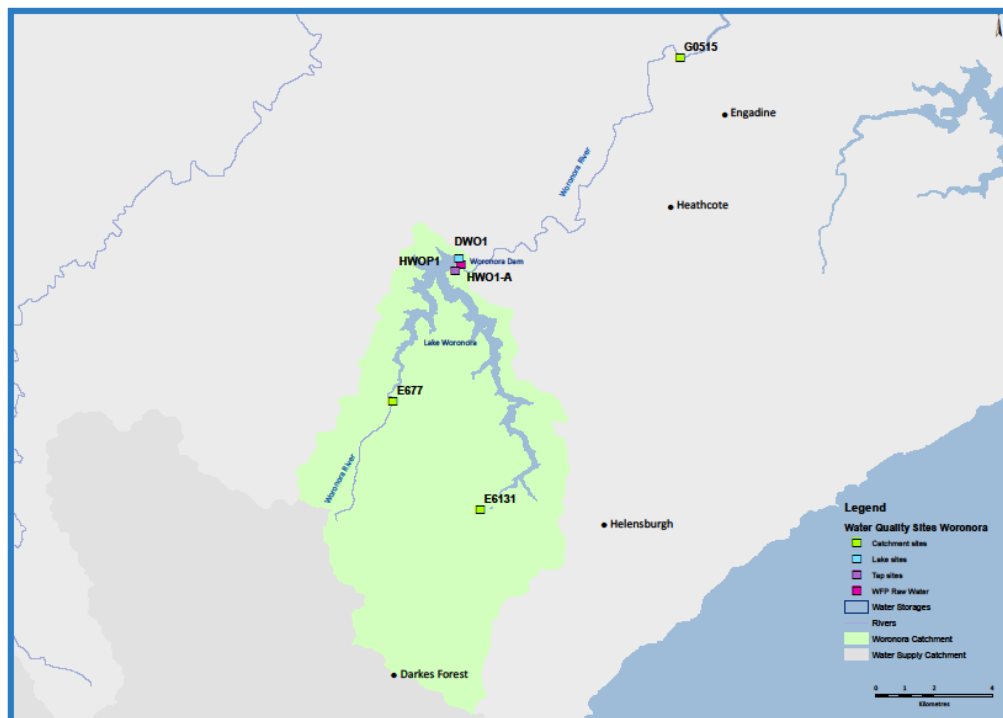


Figure 5.3: Sampling sites in the Woronora system.

Table 5.3: Woronora system catchments - percentage of routine samples outside benchmarks

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mg CaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Conductivity @25 C - Field (mS/cm)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Catchments (ANZECC guidelines refer Table 4.4). Where there is no applicable benchmark cells are greyed out.																		
Waratah Rivulet d/s of Flatrock Crossing	E6131		67%	17%		0%	0%	33%	8%	8%	0%	0%	50%		0%		0%	
Woronora River	E677		55%	91%		0%	0%	0%	0%	0%	0%	0%	82%		0%		0%	
Storages (ANZECC guidelines refer Table 4.3)																		
Lake Woronora @ Honeysuckle Ck Junction	DWO_THMD		22%	33%		0%		33%	100%	17%	0%	0%	100%		0%		67%	
Lake Woronora at Dam Wall	DWO1		33%	42%		0%		50%	100%	8%	0%	0%	100%		0%		33%	
Raw Water (raw water supply agreement site specific specifications refer Table 4.2)																		
Woronora WFP raw water	HWO1-A	0%			0%	0%	0%						33%	0%	0%	0%		

5.4.1 Catchments

Water quality in the Waratah Rivulet and Woronora River showed a slight deterioration throughout the year. The largely natural bushland catchment resulted in most water quality characteristics being within ANZECC benchmarks. Aluminium and indices reflecting increases in organic loading (pH and dissolved oxygen) showed increased exceedances mainly due to increased inflows.

Nitrogen indices showed occasional exceedances in Waratah Rivulet but not the Woronora River. Phosphorus monitoring showed full compliance. These results showed phosphorus is a key driver for biological growth in both river systems and reflected in the high chlorophyll-a compliance.

Aluminium exceedances are directly related to the transport of sandstone particles from the catchment. Recurring rainfall over the reporting period indicates exceedances are likely to occur during hydrologically active periods.

Increasing organic transport from a natural catchment with increased productivity during a wet cycle reflects shifts to lower pH and lower dissolved oxygen saturation as stream biological activity increases. This is part of the natural chemistry for most river systems and does not represent poor water quality.

5.4.2 Storage

Water quality in Lake Woronora showed decreasing compliance with ANZECC benchmarks compared to previous years. Lake water quality changed post wet-weather inflows, particularly with rises in true colour and organic carbon, which are not included in the ANZECC catchment assessment. Aluminium concentrations remained elevated following large inflows in 2022.

Nitrogen increases in Lake Woronora were apparent but there was no cyanobacterial response due to low phosphorus. There was an increase in chlorophyll a in comparison to 2020-21.

5.4.3 Water Filtration Plant

Near full compliance with the raw water standards was achieved for supply to Woronora WFP with total aluminium the only exception. Aesthetic qualities, such as true colour, had increased significantly post wet weather. All samples complied with ADWG for health-related characteristics.

5.5 Blue Mountains system

Sampling sites in the Blue Mountains system are shown in Figure 5.4 below.

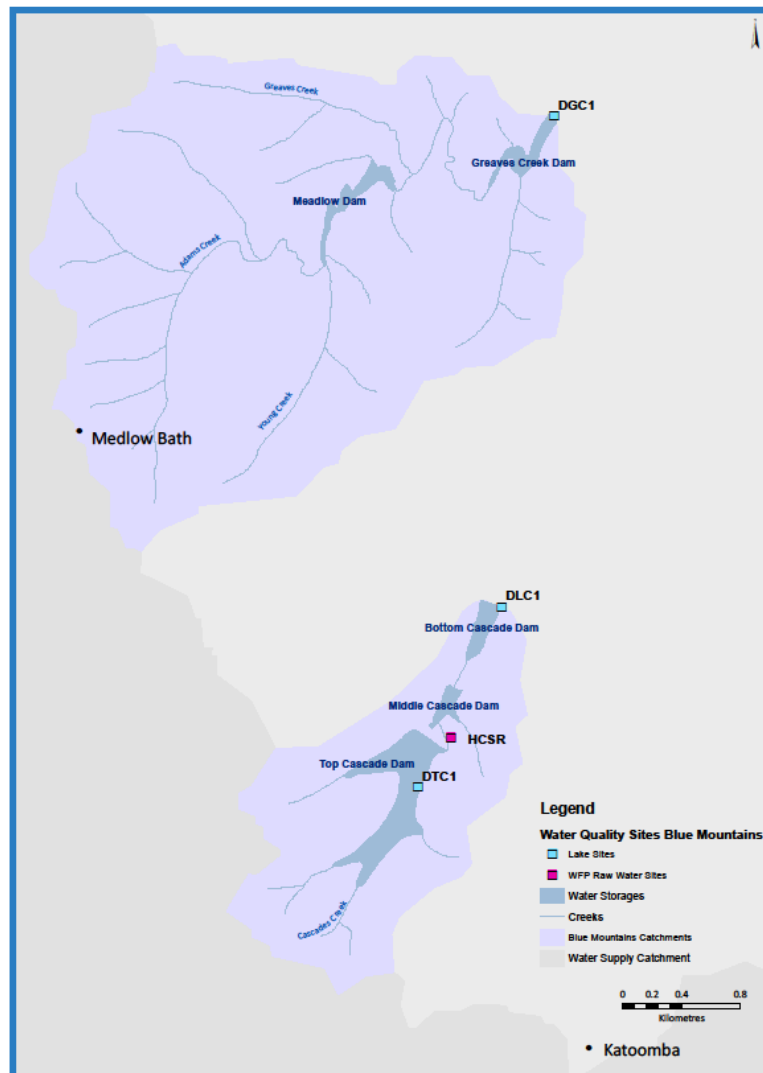


Figure 5.4: Sampling sites in the Blue Mountains system.

Table 5.4: Blue Mountains system storages - percentage of routine samples outside benchmarks

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mg CaCO3/L)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mg CaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Conductivity @25 C - Field (mS/cm)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ua/L)
Storages (compliance with ANZECC guidelines – refer Table 4.3). Where there is no applicable benchmark cells are greyed out.																		
Lake Greaves at Dam Wall	DGC1		25%	50%			0%	0%	9%	45%	0%	0%	18%	100%		0%		55%
Lake Lower Cascades @ 50m u/s	DLC1		50%	17%			0%	0%	33%	100%	17%	0%	0%	50%		0%		33%
Lake Top Cascades @ 100m u/s Dam Wall	DTC1		25%	25%			0%	0%	25%	33%	0%	0%	8%	92%		0%		58%
Raw Water (compliance with raw water supply agreement site specific standards - refer Table 4.2)																		
Cascade WFP raw water	HCSR	0%			0%	0%	0%							0%	0%	0%	25%	

5.5.1 Catchments

The Blue Mountains catchments are very small (<20 km² in total) and inflow quality is represented by water quality in the lakes. There are no routine monitoring sites in the Blue Mountains catchments.

5.5.2 Storages

Water quality in the Blue Mountains lakes experienced some impacts from wet weather events during the year. Both the Cascades and Greaves sub-catchments experienced increases in metals and organics from localised runoff.

Aluminium remains frequently non-compliant with ANZECC guidelines in both the Cascades and Greaves Creek Lakes. This change is likely to be related to the frequency of rainfall and inter-basin transfers.

Dissolved oxygen levels were kept high through use of destratification fans in the lakes however increasing organic loads have had a minor impact. Most samples this year were within the ANZECC benchmark range, which is a slight deterioration from last year.

Increases in nitrogen but not phosphorus were recorded in the Blue Mountains. These slightly elevated nutrient concentrations may have sustained algal growth. Chlorophyll a frequently remained above the benchmark at Top and Lower Cascades Lake and Greaves Creek. Phosphorus levels remaining low is a key reason why the phytoplankton assemblage that drove chlorophyll a results was mainly green alga and diatoms.

5.5.3 Water Filtration Plant

Water supplied to the Cascade WFP was of a high standard throughout the year, however filter clogging algal concentrations were elevated periodically. There were three occasions where the algal ASU exceeded the site specific standard. Water supplied for treatment had 100% conformance with ADWG health characteristics.

5.6 Shoalhaven system

Sampling sites in the Shoalhaven system are shown in Figure 5.5 below.



Figure 5.5: Sampling sites in the Shoalhaven system

Table 5.5: Shoalhaven system catchments - percentage of routine samples exceeding benchmarks

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mgCaCO3/L)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Conductivity @25 C - Field (mS/cm)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Catchments (ANZECC guidelines refer Table 4.4). Where there is no applicable benchmark cells are greyed out.																		
Yarrunga Creek @ Wildes Meadow	E300		92%	33%			0%	0%	67%	100%	100%	8%	58%	92%		0%		33%
Caalang Ck @ Maugers	E301		50%	8%			0%	0%	42%	100%	100%	0%	8%	83%		0%		0%
Bundanoon Creek at the Rocks	E520		27%	9%			9%	0%	73%	100%	64%	9%	36%	100%		0%		27%
Brogers Creek at Clinton Park	E7021		25%	25%			8%	0%	82%	82%	55%	18%	91%	100%		0%		18%
Kangaroo River at Hampden Bridge	E706		9%	18%			18%	0%	70%	100%	100%	30%	100%	100%		0%		10%
Kangaroo River at Oakdale	E7061		17%	17%			8%	0%	58%	100%	17%	8%	42%	100%		0%		8%
Mongarlowe River at Mongarlowe	E822		42%	17%			0%	0%	8%	100%	0%	0%	17%	92%		0%		0%
Corang River at Meengora	E8311		0%	17%			8%	0%	50%	8%	17%	0%	0%	100%		0%		0%
Shoalhaven River at Fossickers Flats	E847		0%	0%			17%	0%	55%	82%	64%	0%	82%	100%		0%		18%
Shoalhaven River at Mountview	E860		0%	0%			0%	0%	8%	50%	33%	0%	92%	100%		0%		17%
Shoalhaven River at Hillview	E861		8%	8%			8%	0%	67%	75%	33%	0%	75%	100%		0%		17%
Boro Creek at Marlowe	E890		100%	25%			8%	0%	75%	42%	100%	0%	83%	100%		0%		25%
Gillamatong Creek at Braidwood	E891		67%	0%			8%	75%	58%	75%	100%	50%	92%	50%		0%		83%

Site	Station Code	Physio-Chemical							Nutrients					Metals			Cyanobacteria	
		Alkalinity (mgCaCO3/L)	Dissolved Oxygen (%Sat)	pH (Field)	Total Hardness (mgCaCO3/L)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	Conductivity @25 C - Field (mS/cm)	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)
Storages (ANZECC guidelines refer Table 4.3)																		
Bendeela Pondage	DBP1		22%	0%				86%	100%	86%	14%	86%	100%		0%			88%
Lake Fitzroy Falls @ Midlake	DFF6		9%	0%				83%	100%	100%	0%	100%	100%		0%			96%
Lake Yarrunga@ 100m from Dam Wall	DTA1		27%	0%				83%	92%	92%	25%	100%	100%		0%			29%
Lake Yarrunga @ Shoalhaven River	DTA5		27%	0%		18%		75%	92%	58%	17%	92%	100%		0%			10%
Lake Yarrunga @ Kangaroo R at Bendeela PS	DTA8		46%	31%				83%	100%	50%	42%	100%	100%		0%			55%
Wingecaribee Lake at outlet	DWI1		18%	0%				58%	83%	100%	0%	83%	92%		0%			98%
Raw Water (raw water supply agreement site specifications refer Table 4.2)																		
Kangaroo Valley WFP Inlet	HKV1	0%		0%	0%	0%	0%							0%			0%	
Wingecaribee WFP raw water	HWI1	0%		8%	0%	0%	0%							8%			0%	

5.6.1 Catchments

Similar to previous years, nitrogen and aluminium returned a significant number of exceedances throughout the catchments.

Water quality in the upper catchment sites such as Boro Ck in the Shoalhaven and Wildes Meadow Creek and Caalang Creek in the Kangaroo River remain poor, with regular exceedances for dissolved oxygen, nutrients and aluminium.

5.6.2 Storages

Monitoring of the storages in the Shoalhaven system continued to return high exceedance rates for chlorophyll a and nutrients. This is typical of the Shoalhaven system and reflects the agricultural land use in the catchment.

Aluminium concentrations continued to be high across the Shoalhaven storages, with all lake sites regularly exceeding the guidelines. The high levels of aluminium are typical of the geology of the region.

Bendeela Pondage, Wingecaribee Reservoir and Fitzroy Falls Reservoir once again returned a significant number of exceedances for chlorophyll a, with potentially toxin producing species present on a number of occasions, particularly in the Wingecaribee Reservoir.

5.6.3 Water Filtration Plants

Raw water supplied to Kangaroo Valley Water Filtration Plant met the relevant standards in all samples, an improvement on the previous year.

Sampling at the inlet of Wingecaribee WFP returned a small number of exceedances for iron and pH. The plant effectively managed the risk of algal cells and toxins through the use of dissolved air floatation and powdered activated carbon in the treatment process. Cyanobacterial blooms were managed in accordance with Water Quality Incident Response Protocol throughout the monitoring period and details of incidents involving potentially toxin producing cyanobacteria in Wingecaribee Reservoir are reported in section 8.1.

5.6.4 Recreational Monitoring

Fitzroy Falls did not exceed either the minor or major alert benchmarks for enterococci. The minor alert benchmark for potentially toxic cyanobacteria was exceeded 6% of the time. Cyanobacteria in the lake was primarily dominated by benign species.

Lake Yarrunga exceeded the minor alert benchmark for enterococci in 8% of samples. All exceedances were in March and April 2022 following significant rainfall. Algal activity was low through the reporting period with no minor or major benchmarks for cyanobacteria exceeded.

Table 5.6: Recreational monitoring - percentage of samples exceeding benchmarks

Site	Station Code	Primary Contact Minor Alert Benchmark Percentage Exceedance				Secondary Contact & Primary Contact Major Alert Benchmark Percentage Exceedance			
		Enterococci (cfu/100 mL)	Microcystin LR+ YR + RR (µg/L)	Toxic Cyanobacterial biovolume (m m3/L)	Toxic Cyanobacterial cell count (cells/mL)	Enterococci (cfu/100 mL)	Microcystin LR+ YR + RR (µg/L)	Toxic Cyanobacterial biovolume (m m3/L)	Toxic Cyanobacterial cell count (cells/mL)
Recreational monitoring (NHMRC guidelines – refer Table 4.5).									
Lake Fitzroy Falls @ Midlake	DFF6	0%	0%	6%	0%	0%	0%	0%	0%
Lake Yarrunga @ Kangaroo R at Bendeela PS	DTA8	8%	0%	0%	0%	0%	0%	0%	0%

5.7 Algal monitoring

All routine catchment and lake samples are analysed for algae if chlorophyll *a* exceeds 5 µg/L. Selected lake sites, which are the closest point to supplying water filtration plants have unconditional algae counts and speciation undertaken regardless of chlorophyll *a*. At locations with a history of algal activity, seasonal monitoring is conducted more frequently in the warmer months between October and May to facilitate early detection of emerging algal events. Routine algal monitoring is also undertaken in raw water supplied to water filtration plants. Statistical summaries are provided in Appendix A. Refer to section 4.7 for relevant benchmarks.

5.7.1 Warragamba system

A slight improvement is noted in the Coxs River catchment with regard to chlorophyll *a* exceptions, particularly in the Coxs River sites below Lake Lyell and in the Kowmung River.

Exceedances for chlorophyll *a* were reduced in the Wollondilly catchment samples this year except at the Wingecaribee River at Berrima which exceeded benchmarks in 100% of samples. Both the Mulwaree River at Towers weir and the Wollondilly River at Rossi Weir show frequent chlorophyll *a* results triggering speciation.

Potentially toxic cyanobacterial species were detected at Lake Lyell downstream (one sample), Wingecaribee River at Berrima (three samples), Wollondilly River at Murrays Flat (one sample), Mulwaree River at Towers (two samples) and Wollondilly River at Towers (one sample) suggesting that inflows into Warragamba have improved in terms of toxic cyanobacterial presence compared to previous years.

In the major arms of Lake Burragorang, frequent low numbers of potentially toxin producing cyanobacteria persisted in the counts throughout the lake from October onwards, peaking with only 25,054 cells/mL of Microcystis sp. Being detected in the Coxs River Arm (DWA12) in February.

Downstream in the gorge, sporadic positive detections of potentially toxin producing cyanobacteria occurred throughout the year, with a minor bloom occurring from March to April of 2022. Though the counts generally returned low populations of these organisms, one notable sample returned a count of 13,412 cells/mL of *Dolichospermum circinale* at DWA9 (the far end of the Gorge). Noting the incident as discussed in section 8.1.2., impacts from cyanobacteria to supply were avoided by supplying water from deep in the water column.

Chlorophyll a concentrations in Prospect Reservoir exceeded the benchmarks less frequently this year, with 79% of the samples at both the mid lake site and at the inlet to the Raw Water Pumping Station recording results above the threshold. Low to moderate concentrations of potentially toxin producing algal species were periodically recorded but remained well below levels of concern. No algal toxins (combined microcystin) were detected during the reporting period.

Algal ASU did not exceed Raw Water Supply Agreement standards at Prospect, Orchard Hills or Warragamba WFPs.

5.7.2 Upper Nepean system

Catchment sites in the Upper Nepean system continue to record very low chlorophyll a concentrations where only 5% of samples across all locations reached the level of speciation. The Nepean and Cordeaux catchments typically have the highest chlorophyll a in rivers. Unusually, this year, Flying Fox #3 Creek in the Lake Avon catchment recorded the maximum across the Upper Nepean storages with a sample showing 21.1 ug/L (median of 0.5 ug/L). No cyanobacteria were detected in that sample.

Only one sample showed the presence of potentially toxic cyanobacteria during the reporting period and that was at the Nepean River (Macguires Crossing) where 12,080 cells/mL of potentially toxic cyanobacteria were detected (showing both *Radiocystis* and *Microcystis* sp.) in April 2022.

All of the lakes in the Upper Nepean showed reductions in chlorophyll a. Concentrations were highest in Lake Cordeaux, with elevated concentrations sustained from January to April 2022. No potentially toxic cyanobacteria were detected at any of the Upper Nepean lakes during the reporting year. ASU remained low in source waters in all Upper Nepean storages reflecting the reduction in chlorophyll a.

There was no impact on raw water supplied to Illawarra, Nepean and Macarthur water filtration plants. Macarthur WFP being above thresholds for algal ASU in 58% of samples (mainly green alga and diatoms) and reported no impacts.

5.7.3 Woronora system

Chlorophyll a remained below the threshold for algal speciation in the Waratah Rivulet and Woronora River throughout the year. Chlorophyll a in Lake Woronora remained low throughout

the reporting year. Algal concentrations remained low and reflected the chlorophyll a in the lake throughout the year. There was no impact on raw water supplied to Woronora WFP as algal ASU remained low in waters sourced for supply.

5.7.4 Blue Mountains system

Chlorophyll a concentrations recorded a reduction this year in Top Cascade Lake. As is typical for the cooler climate, chlorophyll a showed its maximum between the months of January and April. This was due to a diatom bloom of *Aulacoseira* and *Synedra* sp. which reflected in a peak ASU of 6,196 ASU/mL in March, 2022. Cyanobacterial growth also reflected this timeline with most samples during this period showing small concentrations of benign picoplankton. There were no detections of potentially toxin producing cyanobacteria during 2021 – 2022 in the Cascades lakes.

Chlorophyll a was lower this year in Lake Greaves Creek than in previous years. Overall, there were improvements in algal concentrations compared to last year, however, larger cell green algal such as *Kirchneriella* sp. were frequently detected leading to elevated ASU. No potentially toxic cyanobacteria were observed in Lake Greaves during the reporting period.

5.7.5 Shoalhaven system

Improvement in chlorophyll a exceedances is noted throughout the Shoalhaven catchment when compared to last year's results.

The Upper Shoalhaven River sites showed lower numbers of exceedances compared to last year, with one-third of samples exceeding the benchmark at Gillamatong Creek, and infrequent exceedances at the other two sites.

Chlorophyll a concentrations were lower in the Kangaroo River sites compared to last year, with the Hampden Bridge site recording only one samples above the benchmark and Caalang Creek showing no exceedances. Wildes Meadow Creek had a late season green algal bloom which showed exceedances from April to June.

All storages in the Shoalhaven system once again exceeded the chlorophyll a benchmark regularly throughout the year. Low numbers of potentially toxin producing cyanobacteria were present in most samples in Bendeela pondage, peaking in February 2022 with a result of 8,420 cells/mL. Likewise, Fitzroy Falls returned low to moderate detections of potentially toxin producing cyanobacteria throughout the year, peaking at DFF6 recording 30,530 cells/mL in May 2022 with the assemblage showing *Microcystis* sp. and *Radiocystis* sp.

Once again, potentially toxin producing cyanobacteria blooms persisted in Wingecaribee Reservoir throughout the year, though the cyanotoxin microcystin toxin was not detected during the year.

Raw water supplied to Kangaroo Valley Water Filtration Plant did not exceed the site specific standard for algal filter clogging potential (ASU) in 2021 - 2022. Supply to Wingecaribee WFP complied with the guidelines throughout the reporting period with no ASU exceedances.

5.8 *Cryptosporidium* and *Giardia* monitoring

Routine monitoring is undertaken in catchments, storages and delivery networks at varying frequencies as agreed between WaterNSW, Sydney Water and NSW Health. Statistical summaries are provided in Appendix A.

5.8.1 Catchments

Routine monitoring for *Cryptosporidium* and *Giardia* is undertaken at seven selected streams in the Warragamba catchment as part of the pathogen monitoring program. The sampling schedule is monthly, except for Werriberri Creek (E531) which is weekly. This section discusses routine monitoring for *Cryptosporidium* and *Giardia*, refer to Section 7.1 for wet weather monitoring.

During the reporting period *Cryptosporidium* oocysts were detected in 26% over all sites (ranging from 8 – 58%), mostly at alert levels (<10/10 L], with only four samples at minor incident level (10-100/10 L). *Giardia* cysts were detected in 45% over all sites (ranging from 8 – 83%), also mostly at alert levels (<10/10 L], with only ten samples at minor incident level. The occurrence of pathogens increased generally compared to the previous year, which was expected given the number of heavy rain events associated with the La Niña climate pattern.

5.8.2 Storages

Routine monitoring was conducted weekly at Wingecaribee (DWI1) reservoir and Warragamba Dam (DWA2/1) and twice per week at Prospect Reservoir (RPR1, RPR6). Monthly sampling of water from Lake Oberon (DOBR01) commenced in November. Sampling was also done in storages at a higher frequency during events.

Of the 339 routine samples collected during the reporting period, *Cryptosporidium* and *Giardia* were detected in 18 (5%) and 40 (12%) samples respectively, with three in the minor incident range for both *Cryptosporidium* and *Giardia* in the Nepean and Oberon storages.

5.8.3 Water Filtration Plants

A joint monitoring program for raw water at the inlet to the water filtration plants is undertaken by Sydney Water and results are provided to WaterNSW and NSW Health. Larger sample volumes (up to ~100 L) are used to improve the detection limit and assist in quantifying catchment risk.

There were no incident level detections (i.e. ≥ 10 oocysts/10 L) of *Cryptosporidium* from routine monitoring of water at inlet of filtration plants during the reporting period. Four *Giardia* minor

incidents occurred; all were from Nepean raw water (HNED), where up to 31 cysts/10 L were detected during the heavy rain event in March and its aftermath.

5.9 Picnic area monitoring

WaterNSW undertakes routine monitoring at picnic taps where the water is supplied directly from the storages or where potable water is carted in, both water sources undergo chlorination prior to distribution. Annual monitoring is also done at the picnic areas which receive reticulated town water.

Table 5.9: Picnic areas - percentage of samples exceeding benchmarks

Site	Station Code	pH (Field)	Turbidity Field (NTU)	Aluminium Total (mg/L)	Iron Total (mg/L)	Manganese Total (mg/L)	Free Chlorine Residual (mg/L)	Chlorophyll-a (ug/L)	Toxic Cyanobacterial Count (cells/mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)
Picnic taps (PWS guidelines refer Table 4.6).											
Avon Picnic Area Tap	HAV3	11%	0%	0%	9%	0%	100%	0%		2%	0%
Cataract Picnic Area Tap/Fountain	HCA1/ HCA2	44%	0%	25%	32%	8%	100%	0%		12%	10%
Cordeaux Picnic Area Tap	HCO6	6%	0%	17%	100%	33%	96%	0%		12%	2%
Fitzroy Falls Picnic Area Tap	HFFR2	0%	0%	17%	2%	0%	8%	0%		6%	0%

Closures of the picnic areas increased through the reporting period. Wet weather impacts at Cataract and Cordeaux resulted in high turbidity, above critical limits, for extended periods of time. Where the critical limit was exceeded picnic areas were closed to the public or signposted as not suitable for drinking.

During these closures minor E. coli detections were recorded with Cataract recording 10% and Cordeaux 2%. Prior to returning to supply clear sample results were recorded.

At Cordeaux exceedances for metals increased through the year. This was due to poor water quality in the lake as well as corrosive water in the reticulation resulting in high rates of leeching. Cataract has previously seen high exceedance for this reason although conformance has improved following the installation of drinking water fountains with point source filtration.

Similar to previous years, chlorine residuals were low at the picnic area sampling taps for Avon, Cataract and Cordeaux. Due to high residence times and low water usage chlorine decay occurs. As such, effective chlorine disinfection is measured at the dosing plant. High chlorine contact times and the absence of indicator bacteria are also used to ensure adequate disinfection.

Low pH at Cataract picnic area resulted in 44% of samples outside of operational targets. This is largely due to source waters and the absence of any pH adjustment in the treatment chain. Filtration at drinking water points helps limit the impacts of low pH and leaching from the reticulation.

6 Monitoring for the Water Licences

6.1 Water quality

Sampling of downstream storages is undertaken in accordance with the requirements of the Water Licences. Table 6.1 reports the results of downstream sampling against the ANZECC benchmarks.

Table 6.1: Downstream of storages - percentage of samples exceeding benchmarks

Site	Station Code	Number of samples	pH (Field)	Turbidity Field (NTU)	Dissolved Oxygen (%Sat)	Nitrogen Total (mg/L)	Phosphorus Total (mg/L)	Chlorophyll-a (ug/L)
Wingecaribee River								
Wingecaribee River @ Sheepwash Bridge	E303	12	0%	0%	83%	25%	0%	100%
Shoalhaven River								
Shoalhaven R @ d/s Tallowa Dam	E851	12	8%	0%	33%	33%	0%	25%
Woronora River								
Woronora River @ the Needles	G0515	13	15%	0%	15%	0%	0%	8%
Nepean River								
Nepean River @ Yarramundi	N44	12	8%	0%	17%	100%	8%	75%
Nepean River at Penrith Weir	N57	12	0%	0%	25%	100%	8%	42%
Nepean River 500m D/S of confluence of Warragamba River	N64	12	0%	0%	25%	100%	9%	36%
Warragamba River U/S of confluence of Nepean River	N641	12	0%	0%	42%	100%	0%	8%
Nepean River @ Wallacia Bridge	N67	12	0%	8%	17%	100%	42%	67%
Nepean River @ Sharpes Weir	N75	12	0%	0%	0%	75%	25%	50%
Nepean River @ Menangle Br	N85	12	8%	8%	8%	17%	8%	33%
Pheasant's Nest Weir Pool	N86	7	0%	0%	0%	0%	0%	0%
Cataract River @ Broughtons Pass	N881	12	17%	0%	0%	0%	0%	0%
Nepean River @ Maldon Weir	N92	12	17%	0%	8%	8%	0%	25%

Wingecaribee River nitrogen concentrations have improved with only 25% of samples exceeding guidelines compared with 42% of samples from last year. pH at the Sheepwash Bridge site was within targets in all samples collected. Dissolved oxygen has decreased in the system due to increasing organic concentrations. Although overall river health has improved chlorophyll a continues to exceed ANZECC guidelines.

The downstream Shoalhaven River site was accessible for sampling for the whole year. Water quality has improved from last year with nitrogen exceeding guidelines in 33% of samples. Chlorophyll a concentrations have decreased this year likely due to lower phosphorus and increased flow.

The Woronora River downstream site saw improved water quality to last year due to several spill events flushing the downstream river. Chlorophyll a concentrations reduced compared to last year where only one sample exceeded 5 µg/L.

Water quality in the Nepean River system typically declines distance from source waters samples are collected. Increases in nutrient loads have been observed at most sites which is likely related to run-off from tributaries not managed by WaterNSW. Chlorophyll a concentrations have decreased in the system due to higher flows. Dissolved oxygen concentrations have improved due to increased flows while only infrequent exceedances in turbidity were recorded.

7 Targeted and investigative monitoring

WaterNSW undertakes targeted and investigative monitoring to understand and assess impacts that are not addressed by the routine monitoring program. The results of the monitoring are discussed in greater detail in the sections below.

A summary of water quality incidents during the reporting period is included in Section 8.

7.1 Wet weather inflow monitoring

WaterNSW conducts wet weather sampling to assist in evaluating impacts on water quality from runoff during significant rainfall events. A key component of the wet weather monitoring program is the use of autosampler stations at strategic catchment sites which are programmed to automatically take samples once a river height trigger has been reached.

Wet weather monitoring is used to quantify the water quality risks from inflows to storages. During high rainfall events, catchments are often closed to operational traffic and storages closed to boat traffic to protect the health and safety of staff and members of the public. Using autosamplers helps to acquire valuable water quality information on the water quality effects of rainfall events.

Autosamplers are programmed to collect samples for:

- total organic carbon, suspended solids, total phosphorus, total nitrogen, total aluminium, total iron and total manganese (Type 1).
- *Cryptosporidium* and *Giardia* (Type 2), plus total nitrogen, total phosphorus (site E203 only).
- Or both Type 1 and Type 2.

Where specific water quality issues have been identified, additional characteristics are analysed on request. At high priority reservoir inflow locations, both autosampler types have been installed. Given the differing sampling mechanisms, trigger values may differ between the two autosampler types. Type 2 samples are reserved for locations identified as potentially significant pathogen sources, requiring a much larger sample volume (hence the lower number of samples). Appendix B tabulates the number of samples collected from Type 1 and Type 2 autosamplers for each site during the year.

7.2 Catchment Risk Characterisation

The average pathogen risk for catchments supplying each storage lake was determined from an assessment of catchment hazards and historical water quality monitoring data based on the Health Based Targets (HBT) procedure developed by Water Services Association of Australia (WSAA).

It is recognised that the greatest challenges to water treatment occur during heavy rain events when contaminants from the catchment and higher river flows result in poor water quality. At such times water quality monitoring is increased at raw water intakes and selected catchment and storage sites. The Pathogen Campaign Monitoring Program was instituted to enhance pathogen monitoring during high inflow events at selected catchment sites to allow the pathogen risk to be refined during events.

Cryptosporidium hazard assessment is conducted weekly and more frequently during events, to inform any decisions on potential advisory for boil water if filtration plants fail their turbidity targets. The assessments are based on a range of pathogen risk factors such as the condition of the storages and catchments, rainfall, inflow volumes, reports of overflows from sewage treatment plants, dairy effluent ponds and stormwater overflows, and turbidity and pathogen data.

During the reporting period there were eight events that triggered autosamplers, resulting in 33 samples tested for pathogens, of which *Cryptosporidium* oocysts and *Giardia* cysts were detected in 10 and 17 samples respectively. However, while many of the auto-samplers were triggered during the major event in March, the catchments were inaccessible so the samples could not be collected in time to be tested.

7.3 Macroinvertebrate monitoring

Macroinvertebrates are monitored annually under the Macroinvertebrate Monitoring Program (MMP) as a catchment health indicator across the Sydney Drinking Water Declared Catchment. In 2021-22, 82 of 86 scheduled sites were sampled, with site access issues preventing sampling at the remaining four sites. Many streams across the catchment experienced sustained high flows during the 2021 Spring AUSRIVAS sampling season due to high rainfall from La Nina conditions. Several sites had to be sampled at higher than baseflow conditions, or within two weeks of the most recent high flow event peak (noted in Table 7.1). These sampling conditions may have contributed to lower AUSRIVAS OE50 scores at some sites in 2021.

Figure 7.1 shows the distribution of 2020 and 2021 AUSRIVAS band grade ratings for each individual catchment. Of the 82 sites monitored in both 2020 and 2021, 52 received a lower AUSRIVAS score in 2021, and 29 received a higher AUSRIVAS score. This suggests there was an

overall decline in macroinvertebrate health across the declared catchment, although the change in OE50 score value at each site was not always large enough to result in a change of AUSRIVAS band grade.

Across the Warragamba, Tallowa, Metropolitan and Woronora catchments, most sites in 2021 were rated as below reference, and fell within the AUSRIVAS band B. Macroinvertebrate health declined slightly in the Warragamba catchment in 2021, with seven sites decreasing and four sites increasing by one band grade. In the Tallowa catchment, five sites decreased, and one site increased by one band grade. Across the Metropolitan catchment, two sites increased, and two sites decreased by one band grade. One Woronora catchment site declined by one band grade, and there was no change in the other. The Blue Mountains catchment site remained in the same band grade as 2020. Further site information and site-averaged AUSRIVAS scores are presented in Table 7.1.

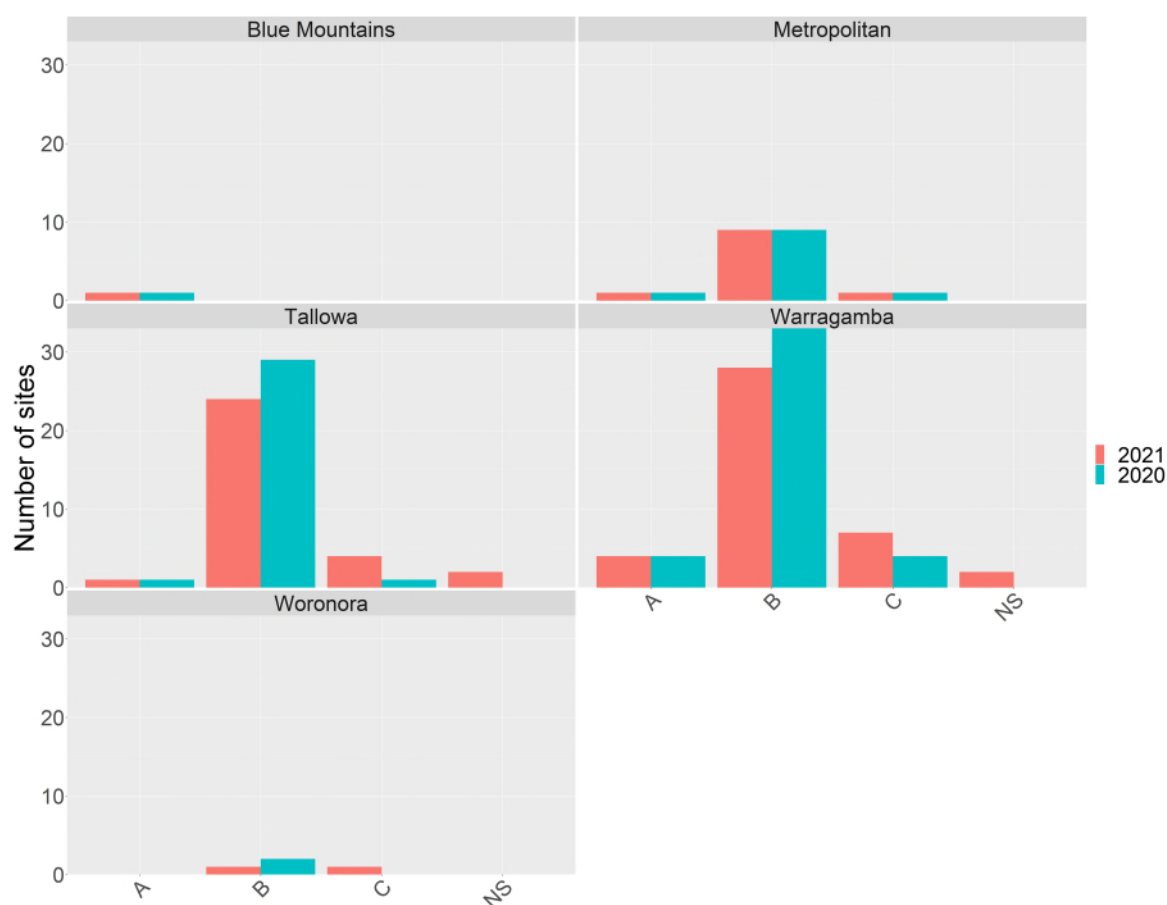


Figure 7.1: Distribution of AUSRIVAS band grades for sites monitored in 2020 and 2021. Band grades are Above Reference (X), Reference (A), Below Reference (B), Well Below Reference (C), Outside experience of the AUSRIVAS model (OEM) or Not Sampled (NS).

Table 7.1: Mean AUSRIVAS scores for sites monitored in 2021, compared to 2020 results. Band grades are Reference (A), Below Reference (B), Well Below Reference (C), Outside experience of the AUSRIVAS model

(OEM) or Not Sampled (NS). AUSRIVAS band thresholds are adjusted to the mean edge and riffle band value for sites where both edge and riffle habitats were sampled. * shows sites sampled during high flow conditions in 2021.

Sub-catchment	Site	Site Name	OE50		Band Grade	
			2021	2020	2021	2020
Warragamba Dam catchment						
Kowmung	E130	Kowmung River at Cedar Ford	0.77	0.84	B	A
Lake Burragorang	MMP59	Butchers Creek u/s of Lake Burragorang	0.91	0.57	A	B
Little River	E243	Little River at Fire Trail W4I	*0.45	0.59	*B	B
Lower Cox's	E153	Leura Falls Creek at FT W7F	0.57	0.69	B	B
Lower Cox's	E157	Kedumba River at Kedumba Crossing	0.99	0.75	A	B
Mid Cox's	E0114	Cox's River d/s Lake Lyell	0.79	0.82	B	B
Mid Cox's	E083	Cox's River at Kelpie Point	0.91	0.85	A	A
Mid Cox's	MMP276	Lowther Creek @ Ecclesbourne	0.60	0.74	B	B
Mid Cox's	MMP55	Little River at Six Foot Track	0.81	0.80	B	B
Mulwaree	A5	Mulwaree River at Lake Bathurst	0.64	0.68	B	B
Mulwaree	E457	Mulwaree River at Towers Weir	0.76	0.68	B	B
Mulwaree	MMP188	Mulwaree River @ Currawang Rd	0.56	0.60	B	B
Nattai	E203	Gibbergunyah Creek at Welby	0.29	0.42	C	C
Nattai	E206	Nattai River at The Craggs	0.53	0.68	B	B
Nattai	E210	Nattai River at the causeway	0.57	0.79	B	B
Nattai	MMP277	Drapers Creek at Colo Vale Firetrail	*0.26	0.57	*C	B
Nattai	MMP278	Nattai Creek @ Wombeyan Caves Rd	0.60	0.76	B	B
Nattai	MMP279	Nattai River d/s Mittagong pool	0.62	0.56	B	B
Upper Cox's	A16	Cox's River at Lidsdale	0.53	0.49	B	B
Upper Cox's	E0115	Cox River u/s Lake Lyell	0.93	0.86	A	A
Upper Cox's	E0321	Coxs River at Lithgow	0.59	0.58	B	B
Upper Cox's	E046	Farmers Creek d/s of Lithgow STP	0.50	0.50	B	B
Upper Cox's	MMP280	Farmers Creek u/s STP at Geordie St	0.35	0.60	C	B
Upper Wollondilly	MMP27	Wollondilly River at Goonagulla	0.56	0.57	B	B
Upper Wollondilly	MMP281	Mount Wayo Creek @ Fenwicks Ck Rd	0.77	0.51	B	B
Upper Wollondilly	MMP282	Sooley Creek @ Crookwell Rd	0.60	0.56	B	B
Upper Wollondilly	Uwol1	Wollondilly River at Baw Baw Bridge	0.64	0.50	B	B
Werri Berri	E531	Werri Berri Creek at Serenity Park	0.80	0.67	B	B
Wingecarribee	E301	Caalang Creek @ Maugers	*0.52	0.68	*B	B
Wingecarribee	MMP283	Medway Rivulet at Cosh Park	0.65	0.80	B	A
Wingecarribee	MMP284	Whites Creek @ Cosgrove Park	0.07	0.17	C	C
Wingecarribee	MMP285	Mittagong Creek @ Mount Rd	0.22	0.50	C	B
Wingecarribee	U10	Wingecarribee River at Berrima	0.46	0.51	C	B
Wingecarribee	Winge2	Wingecarribee River at Greenstead	0.38	0.64	C	B
Wollondilly	E409	Wollondilly River d/s Goulburn STP	0.51	0.36	B	C
Wollondilly	E4122	Wollondilly River at Upper Tarlo	0.49	0.56	B	B
Wollondilly	E450	Wollondilly River at Golden Valley	NS	0.46	NS	B
Wollondilly	E488	Wollondilly River at Jooriland	0.51	0.74	B	B
Wollondilly	E5001	Wollondilly River u/s Goulburn STP	0.74	0.63	B	B
Wollondilly	MMP130	Tarlo River at Swallowtail Pass	NS	0.51	NS	B
Wollondilly	MMP226	Long Swamp Creek u/s Paddy's River	0.65	0.58	B	B

Sub-catchment	Site	Site Name	OE50		Band Grade	
			2021	2020	2021	2020
Tallowa Dam catchment						
Back and Round	MMP17	Shoalhaven River at Farringdon Crossing	*0.45	0.75	*B	B
Boro	E890	Boro Creek at Marlowe	0.36	0.63	C	B
Boro	MMP33	Kings Creek upstream of Boro Creek	0.44	0.79	B	B
Braidwood	E860	Shoalhaven River at Mount View	0.56	0.69	B	B
Braidwood	E891	Gillamatong Creek at Braidwood	0.57	0.57	B	B
Braidwood	MMP62	Jembaicumbene Creek at Bendoura	*0.47	0.50	*C	B
Bungonia	A8	Bungonia Creek at Bungonia	0.65	0.78	B	B
Bungonia	E847	Shoalhaven River at Fossickers Flat	NS	0.45	NS	C
Endrick	MMP12	Endrick River at Nerriga	0.71	0.48	B	B
Jerrabattagulla	MMP09	Jerrabattgulla Creek at Warragandra	0.61	0.53	B	B
Jerrabattagulla	MMP168	Jerrabattagulla Ck @ Hereford Hall Rd	*0.54	0.64	*B	B
Jerrabattagulla	MMP273	Shoalhaven River at Wyanbene Rd	0.80	0.67	B	B
Jerrabattagulla	MMP67	Stoney Creek @ Cooma Rd	*0.45	0.63	*B	B
Kangaroo	E300	Yarrunga Creek @ Wildes Meadow	*0.44	0.75	*B	B
Kangaroo	E520	Bundanoon Creek at the Rocks	0.70	1.02	B	A
Kangaroo	E7021	Brogers Creek at Clinton Park	0.63	0.56	B	B
Kangaroo	E706	Kangaroo River at Hampden Bridge	0.75	0.75	B	B
Kangaroo	E7061	Kangaroo River at Oakdale	0.52	0.76	B	B
Mid Shoalhaven	E8311	Corang River at Meangora	0.57	0.61	B	B
Mid Shoalhaven	E861	Shoalhaven River at Hillview	0.81	0.58	A	B
Mongarlowe	E822	Mongarlowe River at Mongarlowe	0.56	0.74	B	B
Mongarlowe	MONG1	Mongarlowe River at Charleyong	0.74	0.77	B	B
Mongarlowe	R13	Mongarlowe River at Monga	*0.62	0.63	*B	B
Nerrimunga	E8361	Nerrimunga Creek at Minshull Trig	NS	0.67	NS	B
Nerrimunga	MMP51	Jacqua Creek at Lumley Road	0.53	0.77	B	B
Nerrimunga	MMP52	Nadgigomar Creek at Oallen Ford	0.57	0.61	B	B
Reedy	MMP194	Manar Creek at The Dip	0.36	0.72	C	B
Reedy	MMP258	Durran Durra Creek at Nerriga Road	0.51	0.65	B	B
Reedy	R7	Mulloon Creek at Tawarri	0.43	0.50	C	B
Reedy	REED1	Reedy Creek at Mayfield Road	0.56	0.72	B	B
Upper Shoalhaven	MMP06	Shoalhaven River at Yarra Glen	0.63	0.62	B*	B
Metropolitan Dams catchment						
Upper Nepean	E6006	Sandy Creek at Fire Road 15	0.44	0.38	B	C
Upper Nepean	E601	Nepean River at Nepean Dam inflow	*0.82	0.71	*A	B
Upper Nepean	E602	Burke R @ Nepean Dam Inflow	0.40	0.62	C	B
Upper Nepean	E604	Flying Fox Creek No.3 U/S of Gauge	0.58	0.53	B	B
Upper Nepean	E608	Goondarrin Creek @ Kemira 'D' cast	0.53	0.53	B	B
Upper Nepean	E609	Cataract River D/S Angles Creek	0.55	0.50	B	B
Upper Nepean	E610	Avon River at Summit Tank	0.52	0.48	B	B
Upper Nepean	E680	Cordeaux River b/w upper Cordeaux 1&2	0.58	0.70	B	B
Upper Nepean	E697	Nepean River at Maguires Crossing	0.46	0.89	B	A
Upper Nepean	MMP100	Wongawilli Creek DS of Fire Road 6	0.53	0.58	B	B
Blue Mountains and Woronora Dam catchments						
Grose	MMP246	Woodford Creek u/s Woodford Dam	0.81	0.81	A	A
Woronora	E677	Woronora River at Fire Road 9F	0.77	0.57	C	B
Woronora	E678	Waratah River at Flatrock Crossing	0.41	0.73	B	B

Sub-catchment	Site	Site Name	OE50		Band Grade	
			2021	2020	2021	2020
Warragamba Dam catchment						
Kowmung	E130	Kowmung River at Cedar Ford	0.77	0.84	B	A
Lake Burragorang	MMP59	Butchers Creek u/s of Lake Burragorang	0.91	0.57	A	B
Little River	E243	Little River at Fire Trail W4I	*0.45	0.59	*B	B
Lower Cox's	E153	Leura Falls Creek at FT W7F	0.57	0.69	B	B
Lower Cox's	E157	Kedumba River at Kedumba Crossing	0.99	0.75	A	B
Mid Cox's	E0114	Cox's River d/s Lake Lyell	0.79	0.82	B	B
Mid Cox's	E083	Cox's River at Kelpie Point	0.91	0.85	A	A
Mid Cox's	MMP276	Lowther Creek @ Ecclesbourne	0.60	0.74	B	B
Mid Cox's	MMP55	Little River at Six Foot Track	0.81	0.80	B	B
Mulwaree	A5	Mulwaree River at Lake Bathurst	0.64	0.68	B	B
Mulwaree	E457	Mulwaree River at Towers Weir	0.76	0.68	B	B
Mulwaree	MMP188	Mulwaree River @ Currawang Rd	0.56	0.60	B	B
Nattai	E203	Gibbergunyah Creek at Welby	0.29	0.42	C	C
Nattai	E206	Nattai River at The Craggs	0.53	0.68	B	B
Nattai	E210	Nattai River at the causeway	0.57	0.79	B	B
Nattai	MMP277	Drapers Creek at Colo Vale Firetrail	*0.26	0.57	*C	B
Nattai	MMP278	Nattai Creek @ Wombeyan Caves Rd	0.60	0.76	B	B
Nattai	MMP279	Nattai River d/s Mittagong pool	0.62	0.56	B	B
Upper Cox's	A16	Cox's River at Lidsdale	0.53	0.49	B	B
Upper Cox's	E0115	Cox River u/s Lake Lyell	0.93	0.86	A	A
Upper Cox's	E0321	Coxs River at Lithgow	0.59	0.58	B	B
Upper Cox's	E046	Farmers Creek d/s of Lithgow STP	0.50	0.50	B	B
Upper Cox's	MMP280	Farmers Creek u/s STP at Geordie St	0.35	0.60	C	B
Upper Wollondilly	MMP27	Wollondilly River at Goonagulla	0.56	0.57	B	B
Upper Wollondilly	MMP281	Mount Wayo Creek @ Fenwicks Ck Rd	0.77	0.51	B	B
Upper Wollondilly	MMP282	Sooley Creek @ Crookwell Rd	0.60	0.56	B	B
Upper Wollondilly	Uwol1	Wollondilly River at Baw Baw Bridge	0.64	0.50	B	B
Werri Berri	E531	Werri Berri Creek at Serenity Park	0.80	0.67	B	B
Wingecarribee	E301	Caalang Creek @ Maugers	*0.52	0.68	*B	B
Wingecarribee	MMP283	Medway Rivulet at Cosh Park	0.65	0.80	B	A
Wingecarribee	MMP284	Whites Creek @ Cosgrove Park	0.07	0.17	C	C
Wingecarribee	MMP285	Mittagong Creek @ Mount Rd	0.22	0.50	C	B
Wingecarribee	U10	Wingecarribee River at Berrima	0.46	0.51	C	B
Wingecarribee	Winge2	Wingecarribee River at Greenstead	0.38	0.64	C	B
Wollondilly	E409	Wollondilly River d/s Goulburn STP	0.51	0.36	B	C
Wollondilly	E4122	Wollondilly River at Upper Tarlo	0.49	0.56	B	B
Wollondilly	E450	Wollondilly River at Golden Valley	NS	0.46	NS	B
Wollondilly	E488	Wollondilly River at Jooriland	0.51	0.74	B	B
Wollondilly	E5001	Wollondilly River u/s Goulburn STP	0.74	0.63	B	B
Wollondilly	MMP130	Tarlo River at Swallowtail Pass	NS	0.51	NS	B
Wollondilly	MMP226	Long Swamp Creek u/s Paddy's River	0.65	0.58	B	B
Sub-catchment	Site	Site Name	OE50		Band Grade	
			2021	2020	2021	2020
Tallowa Dam catchment						
Back and Round	MMP17	Shoalhaven River at Farrington Crossing	*0.45	0.75	*B	B
Boro	E890	Boro Creek at Marlowe	0.36	0.63	C	B

Boro	MMP33	Kings Creek upstream of Boro Creek	0.44	0.79	B	B
Braidwood	E860	Shoalhaven River at Mount View	0.56	0.69	B	B
Braidwood	E891	Gillamatong Creek at Braidwood	0.57	0.57	B	B
Braidwood	MMP62	Jembaicumbene Creek at Bendoura	*0.47	0.50	*C	B
Bungonia	A8	Bungonia Creek at Bungonia	0.65	0.78	B	B
Bungonia	E847	Shoalhaven River at Fossickers Flat	NS	0.45	NS	C
Endrick	MMP12	Endrick River at Nerriga	0.71	0.48	B	B
Jerrabattagulla	MMP09	Jerrabattgulla Creek at Warragandra	0.61	0.53	B	B
Jerrabattagulla	MMP168	Jerrabattagulla Ck @ Hereford Hall Rd	*0.54	0.64	*B	B
Jerrabattagulla	MMP273	Shoalhaven River at Wyanbene Rd	0.80	0.67	B	B
Jerrabattagulla	MMP67	Stoney Creek @ Cooma Rd	*0.45	0.63	*B	B
Kangaroo	E300	Yarrunga Creek @ Wildes Meadow	*0.44	0.75	*B	B
Kangaroo	E520	Bundanoon Creek at the Rocks	0.70	1.02	B	A
Kangaroo	E7021	Brogers Creek at Clinton Park	0.63	0.56	B	B
Kangaroo	E706	Kangaroo River at Hampden Bridge	0.75	0.75	B	B
Kangaroo	E7061	Kangaroo River at Oakdale	0.52	0.76	B	B
Mid Shoalhaven	E8311	Corang River at Meangora	0.57	0.61	B	B
Mid Shoalhaven	E861	Shoalhaven River at Hillview	0.81	0.58	A	B
Mongarlowe	E822	Mongarlowe River at Mongarlowe	0.56	0.74	B	B
Mongarlowe	MONG1	Mongarlowe River at Charleyong	0.74	0.77	B	B
Mongarlowe	R13	Mongarlowe River at Monga	*0.62	0.63	*B	B
Nerrimunga	E8361	Nerrimunga Creek at Minshull Trig	NS	0.67	NS	B
Nerrimunga	MMP51	Jacqua Creek at Lumley Road	0.53	0.77	B	B
Nerrimunga	MMP52	Nadgigomar Creek at Oallen Ford	0.57	0.61	B	B
Reedy	MMP194	Manar Creek at The Dip	0.36	0.72	C	B
Reedy	MMP258	Durran Durra Creek at Nerriga Road	0.51	0.65	B	B
Reedy	R7	Mulloon Creek at Tawarri	0.43	0.50	C	B
Reedy	REED1	Reedy Creek at Mayfield Road	0.56	0.72	B	B
Upper Shoalhaven	MMP06	Shoalhaven River at Yarra Glen	0.63	0.62	B*	B
Metropolitan Dams catchment						
Upper Nepean	E6006	Sandy Creek at Fire Road 15	0.44	0.38	B	C
Upper Nepean	E601	Nepean River at Nepean Dam inflow	*0.82	0.71	*A	B
Upper Nepean	E602	Burke R @ Nepean Dam Inflow	0.40	0.62	C	B
Upper Nepean	E604	Flying Fox Creek No.3 U/S of Gauge	0.58	0.53	B	B
Upper Nepean	E608	Goondarrin Creek @ Kemira 'D' cast	0.53	0.53	B	B
Upper Nepean	E609	Cataract River D/S Angles Creek	0.55	0.50	B	B
Upper Nepean	E610	Avon River at Summit Tank	0.52	0.48	B	B
Upper Nepean	E680	Cordeaux River b/w upper Cordeaux 1&2	0.58	0.70	B	B
Upper Nepean	E697	Nepean River at Maguires Crossing	0.46	0.89	B	A
Upper Nepean	MMP100	Wongawilli Creek DS of Fire Road 6	0.53	0.58	B	B
Blue Mountains and Woronora Dam catchments						
Grose	MMP246	Woodford Creek u/s Woodford Dam	0.81	0.81	A	A
Woronora	E677	Woronora River at Fire Road 9F	0.77	0.57	C	B
Woronora	E678	Waratah River at Flatrock Crossing	0.41	0.73	B	B

7.4 Investigative monitoring

WaterNSW's investigative monitoring program is designed to target known risks, emerging issues and inform management options. Investigative monitoring can be used for identifying pollution sources, understanding pollutant fate and transport in a variety of flow conditions and investigating the risk of pollutants reaching inflows and raw water offtake points.

Investigative monitoring is also one means of evaluating the effectiveness of actions to address pollutants in the catchments and lakes.

7.4.1 Monitoring to inform the cause of elevated Geosmin in source waters in Warragamba Dam.

In early October 2021, operational changes were made at Warragamba Dam in response to a change in source waters generating higher concentrations of the odour causing compound geosmin ((4S,4aS,8aR)-4,8a-Dimethyloctahydronaphthalen-4a(2H)-ol). Geosmin is a commonly attributed compound for causing earthy/musty odours in water and is routinely monitored for within the WMP. No obvious cause was identified for the increase in odour in surface waters at that time despite all monitoring being undertaken as per the WMP.

Operational responses are detailed in section 8.1.2 regarding this incident. To further understand the causes of the elevated geosmin in surface waters in Lake Burragorang, collaboration was undertaken with both the Australian Water Quality Centre (AWQC) in South Australia and the University of New South Wales (UNSW) Nuisance and Harmful Algae Science-Practice Partnership. Odorous samples from Lake Burragorang were sent to both collaborators to better understand whether the cause of the compound was either of bacterial or phytoplankton origin and to better understand whether geosmin alone was the cause of the odour or whether a combination of geosmin with other compounds were magnifying the odour.

AWQC undertook a series of 16s rDNA profiles to assess the genetic assemblage of the samples looking for known bacteria that can produce geosmin. Actinobacteria were shown to be present in all samples collected and *Actinomyces* sp. (of the Actinobacteria genus) are a known geosmin producer but expert opinion suggested that the relative abundance was too low to be direct link and the same abundance was shown to be present in samples not showing an odour profile. What was identified via the genetic profiling was a higher than expected abundance of bacteria known to degrade geosmin suggesting that the bacterial assemblage had shifted to take advantage of higher geosmin concentrations.

UNSW undertook chemical sensory analysis where the purpose is to isolate all the specific volatile compounds specifically through the use of Gas Chromatography and Mass

Spectrometry with each compound sent for direct olfactory analysis and characterisation. Geosmin was detected at high concentrations but a number of other odours not normally associated with geosmin were detected. These additional compounds were unable to be isolated and characterised directly. Their work suggested that geosmin was the most likely cause of the odour but odour elevation from other odorous compounds present could not be ruled out.

UNSW also confirmed the WNSW's labs results of the algal assemblage present in all samples and covariate analysis was undertaken between the algal assemblage and other physicochemical data collected during the incident. Results were not conclusive but suggest the odour was of a phytoplankton origin and of the possible candidates, the concentrations present were not normally identified as being of concern. There is some evidence with other water utilities that low concentrations of certain phytoplankton can generate increased geosmin in short periods. These candidate species are now used operationally to assess the need for additional vigilance when present at low concentrations and if discovered, operational responses have been developed to ensure they do not impact supply. Learnings from this work have also led to a baseline dataset for comparison and rapid monitoring response to better understand the drivers for this event if it recurs.

8 Incidents and events

Water quality incidents are managed in accordance with the WaterNSW Water Quality Incident Response Protocol. The protocol sets out agreed water quality trigger levels for various actions and notifications. Any issue that poses a potential risk to public health is reported to NSW Health immediately and incident responses are developed in consultation with NSW Health and relevant customers.

The Water Monitoring Program also specifies monitoring required in anticipation of events which pose potential threats to raw water quality, such as large inflow events and seasonal turnover in lakes. The pre-planned monitoring during periods leading to and during such events allows operational changes to be made proactively and prevents such events manifesting into incidents.

During 2021–22, 8 major and 35 minor water quality incidents were recorded in the Greater Sydney catchment area (see Appendix C for details of these incidents).

8.1 Major and significant water quality incidents

There were eight major incidents relating to water quality during 2021-22. Details of all incidents and their management are provided in Appendix C. Prompt notifications and effective incident response ensured no interruptions in the supply of high quality treated drinking water to customers. Incident management responses for major and significant incidents are discussed in detail below.

8.1.1 Exceedance of Raw Water Supply Agreement site specific standards

There were twelve results outside Raw Water Supply Agreement standards during the year. Three of these were due to elevated algal ASU (an indicator of filter clogging potential) in raw water supplied to Cascades Water Filtration Plant for treatment, from January to March 2022. Successive inflow events resulted in elevated metals and colour in raw water that could not be avoided through source selection, particularly in the Macarthur and Woronora supply systems.

Total iron exceeded site specific standards at Macarthur in March and April 2022 and at Wingecarribee in April 2022 and total aluminium at Woronora in May and June 2022. True colour exceeded site specific standard in the supply to Macarthur in May and June 2022. Total hardness was below the standard range at Macarthur in April and May 2022. Each instance was reported to the water filtration plant operators and supply configuration options discussed. When requested, WaterNSW provided additional raw water samples to allow the plant to perform testing to optimise treatment processes.

8.1.2 October 2021 Geosmin / taste and odour event

In early October, Sydney Water received a high number of taste and odour customer complaints. The odour was believed to be associated with elevated geosmin in the surface waters of the lake. Sampling results confirmed elevated geosmin (associated with taste and odour). The major incident was managed in consultation with Sydney Water and NSW Health. Extensive monitoring was undertaken to track algae and odour compounds in the surface waters. The supply was moved deeper in the water column within hours of receiving customer complaints and there were no further issues with geosmin in the raw water supply.

8.1.3 March 2022 Intense rainfall event

During March a major rain event triggered establishment of an Incident Management Team to oversee flood operations in liaison with the Bureau of Meteorology, State Emergency Services, Sydney Water and NSW Health. Several dams in Greater Sydney spilled, including Warragamba dam with a peak outflow of 315 Gigalitres per day, which contributed to major flooding of the

Hawkesbury River. There was also moderate flooding along the Nepean River. Water quality impacts included high turbidity in the upper part of the water column at Warragamba and turbid intrusions at Woronora and Nepean dams. Warragamba pipelines were reconfigured to preserve supply for Warragamba and Orchard Hills water filtration plants and samples were provided to Sydney Water for jar testing to optimise treatment processes.

8.1.4 April 2022 Intense rainfall event

Raw water quality continued to be impacted by the March 2022 flood event when another major rainfall event occurred in April 2022. Further major flood warnings were issued for the Hawkesbury, Nepean, Georges and Woronora rivers. Spills were recorded at Cataract, Cordeaux, Avon, Nepean, Woronora, Warragamba, Tallowa and Greaves Creek dams. Water quality was impacted at Macarthur, Nepean, Woronora and Warragamba and Sydney Water issued a temporary request for customers to reduce water usage to mitigate stress on treatment plants. Supply configuration was optimised where possible in consultation with Sydney Water and samples were again supplied for jar testing to optimise treatment processes.

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WaterNSW – Sydney Catchment Area

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Appendix A Statistical summaries

1. Warragamba system

Table A1 Warragamba system – catchments – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (nS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
E0114	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	40	0.2	4	86.6	7.95	7.2	32	1	7.76	52	4.2	11	24	0.27	0.149
	Median	63	0.3085	7.2	89.7	9.345	7.75	48	2	13.963	69.5	7.15	20	44	1.255	0.207
	Max	90	0.362	9.5	100.5	11.3	8.33	70	22	20.155	80	9.4	39	76	7.66	0.335
	Above Guideline	-	5	-	0	-	4	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	7	-	0	-	-	-	-	-	-	-	-	-
E0115	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	40	0.261	4	85.2	8.04	6.66	48	1	4.98	64	3.6	9	19	0.4	0.126
	Median	55	0.364	7.5	90.4	9.52	7.82	73	3	13.164	91	7.5	17	38	3.56	0.214
	Max	76	0.52	16.1	97.7	11.17	8.13	142	11	20.431	135	16.6	38	84	8.62	0.432
	Above Guideline	-	6	-	0	-	1	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	4	-	0	-	-	-	-	-	-	-	-	-
E0321	n	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Min	48	0.309	2.8	73	6.92	6.97	63	2	7.01	86	2.9	6	14	2.42	0.101
	Median	68.5	0.54	6.3	91.25	9.265	7.65	128.5	3	14.308	145	6.4	16.5	37	4.185	0.2055
	Max	112	0.764	11.5	98.2	11.52	7.82	246	9	20.35	215	11.2	40	89	8.03	0.506
	Above Guideline	-	9	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	4	-	0	-	-	-	-	-	-	-	-	-
E046	n	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Min	23	0.103	2.1	84.8	8.28	7.49	9	3	6.34	28	1.9	6	14	2.72	0.074
	Median	40.5	0.17	3.4	91.3	9.625	7.81	21	7.5	13.2395	46	3.35	10	23.5	3.885	0.104
	Max	47	0.252	6.5	98.9	11.99	8.19	37	66	17.273	51	6	21	47	33.44	0.356
	Above Guideline	-	0	-	0	-	3	-	-	-	-	-	-	-	2	-
	Below Guideline	-	-	-	3	-	0	-	-	-	-	-	-	-	-	-
E073	n	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Min	38	0.181	4.2	88	8.35	7.39	24	2	6.86	55	4	14	30	1.43	0.161
	Median	57	0.301	7.3	91.5	9.67	7.83	44.5	4	13.378	68.5	7.3	22	48.5	3.625	0.2285
	Max	83	0.35	11.1	96.2	11.72	8.18	61	41	18.917	80	9.7	38	88	25.69	0.47
	Above Guideline	-	0	-	0	-	4	-	-	-	-	-	-	-	1	-
	Below Guideline	-	-	-	2	-	0	-	-	-	-	-	-	-	-	-
E083	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	26	0.117	3	99.7	8.94	7.19	7	1	9.82	34	3.1	9	21	0.59	0.093
	Median	42	0.174	5.1	103.3	9.83	7.72	17	6	17.2	48	5.1	16	36	5.05	0.189
	Max	62	0.284	7.9	107.6	12.06	8.06	55	25	20.8	64	7.6	30	66	43.3	0.46
	Above Guideline	-	0	-	0	-	1	-	-	-	-	-	-	-	2	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E130	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	21	0.069	1.5	97.6	8.9	7.26	1	<1	8.8	21	1.4	6	13	0.9	0.053
	Median	27	0.089	2.65	103.55	10.145	7.49	2	4	15.75	28.5	2.65	10	23	2.645	0.089
	Max	35	0.099	4.3	108	12.02	7.75	3	17	20.6	36	4	17	39	17.8	0.207
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E157	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	14	0.067	1.3	95.7	8.87	6.82	3	<1	7	18	1.3	6	14	0.54	0.055
	Median	17	0.0955	3.05	99.75	9.975	7.075	6	2.5	15.65	22	3.1	16	35.5	3.67	0.139
	Max	24	0.141	7	103.8	11.16	7.46	18	16	20.7	38	6.3	35	80	26.3	0.352
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	1	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E203	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	42	0.225	4	83.8	7.8	7.3	7	2	7.977	55	4.3	13	28	4.06	0.155
	Median	53.5	0.2565	5.85	91.65	9.52	7.415	15	7	14.5165	67	6.25	21	46.5	9.875	0.2585
	Max	64	0.467	7.4	108.4	10.93	7.65	59	40	19.003	113	7.8	29	64	27.84	0.354
	Above Guideline	-	2	-	0	-	0	-	-	-	-	-	-	-	1	-

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
	Below Guideline	-	-	-	4	-	0	-	-	-	-	-	-	-	-	-
E206	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	27	0.137	3.1	89	8.41	7.48	5	<1	7.102	31	3	10	23	0.85	0.114
	Median	38.5	0.261	5.7	98.6	10.34	7.755	9.5	2.5	14.76	63	5.7	21.5	47	4.93	0.2465
	Max	48	0.297	8.8	113.3	12.45	7.96	21	4	19.947	68	9	46	89	13.47	0.426
	Above Guideline	-	0	-	1	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	1	-	0	-	-	-	-	-	-	-	-	-
E210	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	26	0.158	2.2	88.2	7.98	6.84	8	<1	8.9	36	2.6	10	23	1.9	0.112
	Median	34.5	0.2225	5	100.15	9.535	7.42	13	8	16.55	51.5	5.15	20	45	10.44	0.2065
	Max	46	0.315	7.6	103	11.23	7.72	37	69	22.8	91	7.5	32	72	65.4	0.486
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	2	-
	Below Guideline	-	-	-	1	-	0	-	-	-	-	-	-	-	-	-
E243	n	12	12	12	12	12	12	9	12	12	11	12	11	12	12	12
	Min	3	0.061	1	95	8.35	6.52	1	<1	7.303	8	1	1	1	0.16	0.018
	Median	5	0.1105	1.75	99.05	9.8	6.79	2	1	16.2945	11	1.7	4	8.5	0.61	0.0455
	Max	8	0.139	3.4	101.9	12.03	7.43	2	2	21.878	19	3.4	10	22	4.77	0.126
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E306	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	62	0.204	2.4	54.8	5.04	7.08	3	2	5.082	68	3.2	10	21	5.98	0.149
	Median	87	0.3015	7.05	77.4	7.735	7.385	6	10.5	13.6185	92.5	7.2	19	42	16.575	0.337
	Max	160	0.54	11.5	85.9	10.46	7.61	14	51	19.658	186	11.3	47	87	46.27	0.629
	Above Guideline	-	4	-	0	-	0	-	-	-	-	-	-	-	2	-
	Below Guideline	-	-	-	12	-	0	-	-	-	-	-	-	-	-	-
E3151	n	11	12	11	12	12	12	11	11	12	11	11	11	11	12	11
	Min	94	0.326	4	43.2	3.96	6.96	15	2	6.579	112	3.9	12	26	3.33	0.151
	Median	108	0.5345	7.9	69.05	7.365	7.36	40	10	13.448	147	8.2	18	40	10.205	0.277
	Max	138	0.66	17.6	79.9	9.78	7.64	65	31	19.571	159	17.6	54	110	17.37	0.65
	Above Guideline	-	11	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	12	-	0	-	-	-	-	-	-	-	-	-
E332	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	32	0.141	6.7	50.8	4.45	6.85	3	6	6.853	34	6.1	17	38	8.54	0.251
	Median	52.5	0.242	9.8	79.7	7.625	7.37	6.5	11.5	17.0605	64	9.9	36	81	16.54	0.4435
	Max	64	0.274	16.8	107.6	11.36	7.96	8	34	22.342	89	17.3	68	137	25.26	0.764
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	1	-
	Below Guideline	-	-	-	8	-	0	-	-	-	-	-	-	-	-	-
E409	n	10	12	10	12	12	12	10	10	12	10	10	10	10	12	10
	Min	52	0.18	10.6	49.1	4.2	6.78	3	4	8.224	61	10.8	39	88	3.7	0.435
	Median	90	0.5085	15.4	76.15	7.18	7.51	13.5	9.5	15.7915	138	15.35	50	111	9.35	0.556
	Max	111	0.724	22.5	96.7	10.59	7.81	22	14	23.084	179	22.8	132	282	18.1	1.33
	Above Guideline	-	10	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	9	-	0	-	-	-	-	-	-	-	-	-
E4122	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	31	0.19	7.2	71.5	6.82	6.93	5	2	6.3	50	6.4	23	51	2.89	0.258
	Median	64.5	0.3445	12.4	83.65	8.465	7.32	8.5	7.5	14.5015	87	12.7	48	108.5	10.905	0.614
	Max	109	0.88	20.2	93.97	11.25	7.99	29	78	21.026	150	18.4	86	188	66.5	0.876
	Above Guideline	-	6	-	0	-	0	-	-	-	-	-	-	-	1	-
	Below Guideline	-	-	-	10	-	0	-	-	-	-	-	-	-	-	-
E433	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	15	0.131	4.1	50.7	4.49	6.16	3	1	5.819	29	4.1	8	18	1.71	0.149
	Median	21.5	0.2025	12.2	71	6.74	6.74	4.5	3	15.3365	42	11.5	45.5	111	5.91	0.5175
	Max	99	0.233	17.8	93.4	10.76	7.4	13	9	21.343	185	16.7	84	165	9.8	0.864
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	10	-	3	-	-	-	-	-	-	-	-	-
E450	n	11	12	11	12	12	12	11	11	12	11	11	11	11	12	11
	Min	39	0.199	9.4	87.3	7.97	7.27	5	7	7.295	58	9	36	79	3.87	0.401
	Median	72	0.3815	14.6	93.85	9.395	7.65	7	19	14.7075	93	14.8	65	141	13.38	0.719
	Max	110	0.616	18.4	97	11.22	7.92	18	112	22.583	173	18	115	270	40.59	1.07
	Above Guideline	-	8	-	0	-	0	-	-	-	-	-	-	-	1	-

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
	Below Guideline	-	-	-	2	-	0	-	-	-	-	-	-	-	-	-
E457	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	45	0.306	10.8	52.3	5.53	7.01	9	1	7.544	70	10.9	37	80	1.98	0.429
	Median	82	0.7245	16.2	83.15	8.185	7.59	20.5	6.5	16.237	185.5	16.35	60.5	127	6.795	0.65
	Max	109	1.052	23.4	96.9	11.12	8.09	38	24	23.088	268	23.1	143	319	36.8	1.3
	Above Guideline	-	11	-	0	-	1	-	-	-	-	-	-	-	1	-
	Below Guideline	-	-	-	9	-	0	-	-	-	-	-	-	-	-	-
E488	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	42	0.204	7.9	96.3	8.17	7.54	5	2	8.7	59	7.7	24	53	1.5	0.252
	Median	67	0.295	10.65	101.5	9.76	7.795	8.5	5.5	17.25	84.5	10.05	44	97.5	8.245	0.465
	Max	100	0.527	18.4	104	11.88	8.06	14	52	23.2	154	17.9	108	235	56.8	0.965
	Above Guideline	-	3	-	0	-	2	-	-	-	-	-	-	-	3	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E490	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	62	0.247	9	43	3.7	6.86	3	2	6.772	82	9.2	35	75	4.48	0.412
	Median	90.5	0.368	13.25	77.4	7.525	7.475	5	5.5	15.6605	110	13.2	52.5	114.5	9.815	0.589
	Max	101	0.474	17.8	119.4	11.26	7.84	10	54	22.857	135	17.7	108	245	21.85	0.998
	Above Guideline	-	8	-	1	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	10	-	0	-	-	-	-	-	-	-	-	-
E531	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	12	0.175	1.9	65.5	1.7	6.66	2	<1	9.1	30	2	2	5	2.74	0.096
	Median	19.5	0.295	4.85	92.45	8.51	6.89	3	2	16.05	45.5	5	16	36	5.15	0.2385
	Max	27	0.41	6.7	99.2	11.17	7.19	4	11	22.99	60	6.6	26	57	17.7	0.32
	Above Guideline	-	4	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	5	-	0	-	-	-	-	-	-	-	-	-

Table A2 Warragamba system – catchments – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
E0114	n	12	12	12	12	12	12	12
	Min	<0.005	0.071	0.26	0.39	<0.001	<0.005	1.02
	Median	0.014	0.124	0.38	0.5	0.005	0.014	3.455
	Max	0.032	0.253	0.46	0.7	0.009	0.033	8.03
	Above Guideline	5	12	-	12	0	5	-
	Below Guideline	-	-	-	-	-	-	-
E0115	n	11	11	11	11	11	11	11
	Min	>0.005	0.009	0.27	0.31	>0.001	>0.005	2.04
	Median	0.0125	0.032	0.36	0.4	0.003	0.015	5.53
	Max	0.018	0.059	0.54	0.6	0.005	0.029	7.56
	Above Guideline	2	10	-	11	0	4	-
	Below Guideline	-	-	-	-	-	-	-
E0321	n	10	10	10	10	10	10	10
	Min	0.006	0.007	0.18	0.23	0.002	0.011	4.47
	Median	0.0165	0.0435	0.3	0.36	0.0045	0.0245	6.135
	Max	0.056	0.062	0.6	0.64	0.007	0.038	8.2
	Above Guideline	6	9	-	9	0	6	-
	Below Guideline	-	-	-	-	-	-	-
E046	n	10	10	10	10	10	10	10
	Min	<0.005	0.388	0.06	0.52	0.006	0.019	5.41
	Median	0.024	0.677	0.18	1.07	0.0095	0.0395	7.58
	Max	0.202	1.6	0.45	1.67	0.025	0.209	9.83

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Above Guideline	5	10	-	10	2	8	-
	Below Guideline	-	-	-	-	-	-	-
E073	n	10	10	10	10	10	10	10
	Min	<0.005	0.047	0.27	0.33	<0.001	<0.005	2.38
	Median	0.0165	0.1035	0.375	0.565	0.006	0.022	5.54
	Max	0.039	0.233	0.59	0.81	0.016	0.087	12.2
	Above Guideline	6	10	-	10	1	6	-
	Below Guideline	-	-	-	-	-	-	-
E083	n	11	11	11	11	11	11	11
	Min	<0.005	<0.002	0.13	0.16	0.002	0.01	4.88
	Median	0.0115	0.1365	0.23	0.29	0.009	0.022	9.75
	Max	0.028	0.389	0.39	0.73	0.016	0.067	13.5
	Above Guideline	3	9	-	7	2	7	-
	Below Guideline	-	-	-	-	-	-	-
E130	n	12	12	12	12	12	12	12
	Min	<0.005	0.023	0.05	0.14	<0.001	0.008	6.02
	Median	0.0095	0.173	0.09	0.24	0.007	0.0165	9.1
	Max	0.026	0.399	0.14	0.53	0.01	0.036	11.4
	Above Guideline	2	12	-	5	0	2	-
	Below Guideline	-	-	-	-	-	-	-
E157	n	12	12	12	12	12	12	12
	Min	<0.005	0.038	0.01	0.13	<0.001	<0.005	3.5
	Median	0.008	0.1085	0.06	0.215	0.003	0.011	5.67
	Max	0.024	0.388	0.15	0.42	0.006	0.024	7.17
	Above Guideline	3	12	-	5	0	1	-
	Below Guideline	-	-	-	-	-	-	-
E203	n	12	12	12	12	12	12	12
	Min	0.031	0.282	0.11	0.59	0.002	0.019	4.34
	Median	0.094	0.6775	0.455	1.2	0.008	0.0455	7.29
	Max	0.534	3.64	1.21	4.69	0.029	0.556	8.65
	Above Guideline	12	12	-	12	2	11	-
	Below Guideline	-	-	-	-	-	-	-
E206	n	12	12	12	12	12	12	12
	Min	<0.005	0.219	0.11	0.47	<0.001	0.013	1.7
	Median	0.01	0.395	0.235	0.715	0.014	0.0355	4.605
	Max	0.014	1.1	0.52	1.32	0.026	0.051	7.27
	Above Guideline	1	12	-	12	3	8	-
	Below Guideline	-	-	-	-	-	-	-
E210	n	12	12	12	12	12	12	12
	Min	0.007	0.019	0.12	0.2	<0.001	0.006	2.13
	Median	0.019	0.1395	0.18	0.29	0.004	0.017	5.905
	Max	0.041	0.484	0.38	0.86	0.009	0.068	8.27
	Above Guideline	9	12	-	8	0	5	-
	Below Guideline	-	-	-	-	-	-	-
E243	n	12	12	12	12	12	12	12
	Min	<0.005	0.006	<0.01	0.03	<0.001	<0.005	4.44
	Median	0.007	0.0395	0.04	0.07	0.002	0.01	4.835
	Max	0.009	0.096	0.09	0.15	0.006	0.011	5.39
	Above Guideline	0	10	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E306	n	12	12	12	12	12	12	12
	Min	0.007	0.034	0.15	0.33	<0.001	0.012	3.16
	Median	0.0985	0.2725	0.495	0.845	0.01	0.0515	7.885
	Max	0.488	0.625	0.87	1.42	0.043	0.119	11.5
	Above Guideline	11	12	-	12	4	10	-
	Below Guideline	-	-	-	-	-	-	-
E3151	n	12	12	12	12	12	12	12
	Min	<0.005	0.792	0.51	1.92	0.003	0.036	1.08
	Median	0.0375	1.91	0.63	2.58	0.023	0.068	7.34
	Max	0.058	4.4	1.57	5.24	0.079	0.184	11

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Above Guideline	9	11	-	11	6	11	-
	Below Guideline	-	-	-	-	-	-	-
E332	n	12	12	12	12	12	12	12
	Min	0.011	<0.002	0.49	0.7	<0.001	0.027	0.62
	Median	0.0385	0.21	0.78	1.035	0.005	0.0695	4.455
	Max	0.095	0.558	1.5	1.53	0.028	0.108	7.83
	Above Guideline	9	11	-	12	1	12	-
	Below Guideline	-	-	-	-	-	-	-
E409	n	11	11	11	11	11	11	11
	Min	0.011	<0.002	0.68	0.87	<0.001	0.026	3.92
	Median	0.025	0.209	0.92	1.21	0.016	0.044	7.75
	Max	0.066	0.341	1.94	2.04	0.143	0.231	16.5
	Above Guideline	9	11	-	11	6	11	-
	Below Guideline	-	-	-	-	-	-	-
E4122	n	12	12	12	12	12	12	12
	Min	0.009	<0.002	0.35	0.35	<0.001	<0.005	1.67
	Median	0.021	0.056	0.755	0.83	0.008	0.05	7.865
	Max	0.044	0.138	1.15	1.27	0.043	0.096	10.2
	Above Guideline	9	8	-	12	1	7	-
	Below Guideline	-	-	-	-	-	-	-
E433	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.12	0.12	<0.001	0.008	0.69
	Median	0.023	0.044	0.525	0.565	0.007	0.034	5.235
	Max	0.039	0.115	0.83	0.9	0.016	0.072	7.57
	Above Guideline	7	7	-	9	1	7	-
	Below Guideline	-	-	-	-	-	-	-
E450	n	12	12	12	12	12	12	12
	Min	0.006	0.018	0.67	0.72	<0.001	0.026	2.15
	Median	0.0215	0.104	0.81	0.935	0.012	0.0635	7.035
	Max	0.066	0.264	1.51	1.59	0.031	0.095	9.76
	Above Guideline	10	12	-	12	4	12	-
	Below Guideline	-	-	-	-	-	-	-
E457	n	12	12	12	12	12	12	12
	Min	0.013	<0.002	0.84	0.85	0.004	0.019	0.43
	Median	0.069	0.05	1.44	1.555	0.062	0.105	4.52
	Max	0.329	0.379	2.38	2.38	0.132	0.245	10.2
	Above Guideline	11	7	-	12	11	11	-
	Below Guideline	-	-	-	-	-	-	-
E488	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.41	0.51	<0.001	0.011	2.73
	Median	0.012	0.154	0.56	0.715	0.009	0.034	8.62
	Max	0.064	0.275	1.3	1.4	0.022	0.099	12.2
	Above Guideline	5	10	-	12	3	9	-
	Below Guideline	-	-	-	-	-	-	-
E490	n	12	12	12	12	12	12	12
	Min	0.006	<0.002	0.62	0.67	0.002	0.019	4.8
	Median	0.02	0.048	0.855	0.9	0.011	0.04	8.065
	Max	0.041	0.141	1.51	1.53	0.029	0.123	11.1
	Above Guideline	8	8	-	12	3	11	-
	Below Guideline	-	-	-	-	-	-	-
E531	n	12	12	12	12	12	12	12
	Min	<0.005	0.005	0.08	0.1	<0.001	<0.005	2.49
	Median	0.0175	0.066	0.26	0.34	0.002	0.014	4.145
	Max	0.058	0.259	0.34	0.58	0.006	0.032	5.26
	Above Guideline	8	9	-	8	0	5	-
	Below Guideline	-	-	-	-	-	-	-

Table A3 Warragamba system – catchments – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
E0114	n	11	11	11	11	11	11	11	11	11	11
	Min	0.01	0.05	11	0.04	0.06	6	0.005	0.007	4	17
	Median	0.04	0.09	16	0.06	0.2	8	0.008	0.014	5	36
	Max	0.12	0.27	18	0.27	0.5	9	0.023	0.046	5	41
	Above Guideline	3	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E0115	n	11	11	11	11	11	11	11	11	11	11
	Min	<0.01	0.02	14	0.04	0.08	7	0.014	0.021	4	17
	Median	0.03	0.08	20	0.1	0.26	10	0.023	0.046	5	32
	Max	0.1	0.42	31	0.27	0.75	15	0.038	0.142	8	47
	Above Guideline	1	7	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E0321	n	10	10	10	10	10	10	10	10	10	10
	Min	<0.01	0.05	18	0.1	0.41	10	0.178	0.203	5	20
	Median	0.02	0.12	28	0.205	0.49	18	0.2125	0.245	6.5	55.5
	Max	0.1	0.4	45	0.38	0.87	25	0.366	0.389	9	69
	Above Guideline	2	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E046	n	10	10	10	10	10	10	10	10	10	10
	Min	0.02	0.1	8	0.07	0.26	2	0.019	0.027	2	6
	Median	0.04	0.16	12	0.145	0.44	4	0.027	0.0575	3.5	16
	Max	0.14	1.49	14	0.32	2.47	4	0.052	0.113	5	27
	Above Guideline	3	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E073	n	10	10	10	10	10	10	10	10	10	10
	Min	<0.01	0.05	12	0.1	0.21	6	0.009	0.014	3	13
	Median	0.05	0.15	15	0.2	0.38	7.5	0.017	0.025	4	26.5
	Max	0.12	1.1	19	0.44	2.25	8	0.032	0.111	5	38
	Above Guideline	4	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E083	n	11	11	11	11	11	11	11	11	11	11
	Min	<0.01	0.02	7	0.03	0.09	4	0.003	0.01	2	10
	Median	0.06	0.2	11	0.19	0.46	5	0.008	0.022	2	13
	Max	0.22	0.92	15	0.31	1.46	7	0.013	0.059	3	27
	Above Guideline	5	8	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E130	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.03	5	0.06	0.11	2	0.004	0.005	<1	4
	Median	0.03	0.1	6.5	0.1	0.23	3	0.0075	0.012	1	6
	Max	0.18	0.66	8	0.19	0.65	4	0.014	0.024	1	8
	Above Guideline	5	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E157	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.02	4	0.1	0.19	2	0.01	0.012	<1	6
	Median	0.045	0.08	5	0.255	0.43	2	0.014	0.0165	1	8
	Max	0.21	0.79	7	0.44	1	5	0.022	0.025	2	10
	Above Guideline	4	8	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E203	n	12	12	12	12	12	12	12	12	12	12
	Min	0.03	0.15	12	0.07	0.19	6	0.04	0.056	3	20
	Median	0.08	0.305	14.5	0.555	1.11	7.5	0.0605	0.074	4	23.5
	Max	0.19	1.69	27	0.79	1.59	11	0.133	0.149	15	49
	Above Guideline	9	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E206	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.04	6	0.11	0.17	4	0.005	0.007	2	14
	Median	0.09	0.205	12	0.385	0.59	8	0.0095	0.0145	4	24.5
	Max	0.23	0.51	14	0.73	1.06	8	0.012	0.02	5	29
	Above Guideline	8	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E210	n	12	12	12	12	12	12	12	12	12	12

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Min	<0.01	0.02	6	0.23	0.46	5	0.008	0.02	2	16
	Median	0.08	0.2	9	0.37	0.655	7	0.0175	0.031	3	19
	Max	0.16	1.11	15	0.52	2.07	13	0.067	0.086	4	27
	Above Guideline	6	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E243	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.01	<1	0.03	0.06	<1	0.004	0.005	<1	10
	Median	0.04	0.04	1	0.08	0.14	2	0.0065	0.009	1	15
	Max	0.15	0.3	1	0.15	0.24	4	0.013	0.015	2	19
	Above Guideline	2	5	-	-	-	-	0	0	-	-
E306	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.09	14	0.08	0.62	8	0.038	0.041	2	14
	Median	0.11	0.445	19	0.475	1.235	11.5	0.072	0.0895	3	25
	Max	0.26	1.13	35	0.83	1.96	24	0.177	0.261	4	35
E3151	Above Guideline	7	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	11	11	11	11	11	11	11	11	11	11
	Min	0.02	0.05	25	0.04	0.13	12	0.026	0.029	7	26
	Median	0.05	0.33	34	0.11	0.49	15	0.07	0.084	8	42
E332	Max	0.36	0.78	39	0.39	1.37	19	0.199	0.254	15	63
	Above Guideline	4	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
	Min	0.1	0.34	7	0.31	0.66	4	0.013	0.036	2	8
E409	Median	0.205	0.535	14	0.71	1.185	7	0.0435	0.0805	4	18
	Max	0.72	1.45	19	1.11	2.29	10	0.082	0.128	5	24
	Above Guideline	12	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	11	11	11	11	11	11	11	11	11	11
E4122	Min	0.02	0.12	13	0.29	0.55	7	0.012	0.022	3	7
	Median	0.11	0.34	22	0.56	1.15	20	0.047	0.057	4	48
	Max	0.43	1.84	32	1.21	1.92	24	0.108	0.127	11	68
	Above Guideline	7	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E433	n	12	12	12	12	12	12	12	12	12	12
	Min	0.03	0.08	7	0.19	0.11	8	0.02	0.004	1	6
	Median	0.115	0.385	14.5	0.77	1.37	14	0.028	0.0385	2	23.5
	Max	0.43	2.22	31	1.28	2.26	22	0.045	0.063	3	39
	Above Guideline	8	12	-	-	-	-	0	0	-	-
E433	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
	Min	0.03	0.07	5	0.32	0.58	4	0.014	0.016	1	14
	Median	0.05	0.14	6	0.7	1.7	6	0.033	0.0405	2	21
	Max	0.17	0.42	28	1.79	3.23	28	0.045	0.063	2	49
E450	Above Guideline	5	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
	Min	0.04	0.18	10	0.24	0.82	8	0.009	0.026	3	18
	Median	0.145	0.605	17	0.775	1.605	13.5	0.02	0.0625	4	35
E457	Max	0.56	1.62	28	1.19	2.97	25	0.046	0.12	4	59
	Above Guideline	10	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.05	13	0.12	0.23	9	0.01	0.036	2	27
E488	Median	0.08	0.175	33.5	0.245	0.54	24.5	0.0405	0.0735	5	68.5
	Max	0.54	1.32	48	1.36	1.75	36	0.085	0.139	13	101
	Above Guideline	6	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12
E488	Min	0.01	0.04	12	0.12	0.19	7	0.004	0.018	2	16
	Median	0.18	0.385	17	0.515	0.905	11	0.014	0.029	3	22
	Max	0.62	1.56	27	0.99	2.47	21	0.028	0.077	5	44

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Above Guideline	9	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E490	n	12	12	12	12	12	12	12	12	12	12
	Min	0.03	0.11	13	0.5	0.84	12	0.018	0.031	2	20
	Median	0.12	0.275	17	0.83	1.455	16.5	0.04	0.057	3	29.5
	Max	0.34	1.13	21	1.28	2.19	20	0.138	0.178	5	39
	Above Guideline	11	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-
E531	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.04	4	0.19	0.72	5	0.039	0.058	3	20
	Median	0.085	0.17	5.5	0.66	1.26	8	0.0685	0.083	3	34.5
	Max	0.14	0.55	6	1.18	2.22	11	0.122	0.164	4	50
	Above Guideline	6	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-

Table A4 Warragamba system – catchments – cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
E0114	n	3	3	3	3	12	3	3	3	3
	Min	0.706	4140	251.8	9.1	1.7	207	0.005	0	0
	Median	3.35	4610	1144	18	3.45	3380	0.008	0	0
	Max	3.54	28470	1280	602.4	11.8	25710	0.633	0.619	14920
	Above Guideline	-	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
E0115	n	2	2	2	2	10	2	2	2	2
	Min	0.395	379	116	0	1.8	0	0	0	0
	Median	0.537	809.5	230.45	0.65	2.95	138.5	0	0	0
	Max	0.679	1240	344.9	1.3	15.6	277	0	0	0
	Above Guideline	-	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
E0321	n	0	0	0	0	10	0	0	0	0
	Min	0	0	0	0	1.1	0	0	0	0
	Median	0	0	0	0	1.65	0	0	0	0
	Max	0	0	0	0	3.6	0	0	0	0
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
E046	n	4	4	4	4	10	4	4	4	4
	Min	0.206	656	146.2	0	1.7	0	0	0	0
	Median	0.2315	737	181.35	0	4.35	0	0	0	0
	Max	0.375	1110	419.3	0	10.9	0	0	0	0
	Above Guideline	-	-	-	-	4	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
E073	n	4	4	4	4	10	4	4	4	4
	Min	0.1	553	140.4	0	1.7	0	0	0	0
	Median	0.498	971	265.8	0	4.65	0	0	0	0
	Max	1.57	2930	1121	1.95	12.7	415	0	0	0
	Above Guideline	-	-	-	-	4	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-
E083	n	1	1	1	1	11	1	1	1	1
	Min	0.14	490	361.5	0	0.7	0	0	0	0
	Median	0.14	490	361.5	0	2	0	0	0	0
	Max	0.14	490	361.5	0	9	0	0	0	0

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E130	n	0	0	0	0	12	0	0	0	0
	Min	0	0	0	0	0.2	0	0	0	0
	Median	0	0	0	0	1.35	0	0	0	0
	Max	0	0	0	0	2.9	0	0	0	0
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E157	n	0	0	0	0	12	0	0	0	0
	Min	0	0	0	0	0.2	0	0	0	0
	Median	0	0	0	0	0.45	0	0	0	0
	Max	0	0	0	0	0.8	0	0	0	0
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E203	n	2	2	2	2	12	2	2	2	2
	Min	0.15	1680	167.2	9.12	0.9	691	0.003	0	0
	Median	0.28	2195	193.1	20.96	2.55	1485.5	0.0105	0	0
	Max	0.41	2710	219	32.8	5.5	2280	0.018	0	0
	Above Guideline	-	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E206	n	2	2	2	2	12	2	2	2	2
	Min	0.372	500	187.8	0	0.9	0	0	0	0
	Median	0.499	865	261.25	0	2.2	0	0	0	0
	Max	0.626	1230	334.7	0	7.6	0	0	0	0
	Above Guideline	-	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E210	n	1	1	1	1	12	1	1	1	1
	Min	0.152	1380	145.3	7.12	0.4	485	0.002	0	0
	Median	0.152	1380	145.3	7.12	1.75	485	0.002	0	0
	Max	0.152	1380	145.3	7.12	6.1	485	0.002	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E243	n	0	0	0	0	12	0	0	0	0
	Min	0	0	0	0	<0.2	0	0	0	0
	Median	0	0	0	0	0.4	0	0	0	0
	Max	0	0	0	0	0.6	0	0	0	0
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E306	n	1	1	1	1	12	1	1	1	1
	Min	0.197	1710	155.5	11	0.9	968	0.005	0	0
	Median	0.197	1710	155.5	11	2.75	968	0.005	0	0
	Max	0.197	1710	155.5	11	5.2	968	0.005	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E3151	n	1	1	1	1	11	1	1	1	1
	Min	1.53	1350	430	0	1.4	0	0	0	0
	Median	1.53	1350	430	0	2.3	0	0	0	0
	Max	1.53	1350	430	0	8.3	0	0	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E332	n	12	12	12	12	12	12	12	12	12
	Min	0.171	4790	170.5	0	5.6	0	0	0	0
	Median	3.835	14920	1895	13	18.6	2860	0.0045	0	0
	Max	11.21	42400	5802	105.9	44.3	25250	0.041	0.033	1080
	Above Guideline	-	-	-	-	12	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E409	n	10	10	10	10	12	10	10	10	10
	Min	0.258	674	119.4	0	1.1	0	0	0	0
	Median	0.7765	5230	458.1	7.215	6.4	1320	0.002	0	0

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Max	13.37	24890	5438	92.2	22.7	22920	0.035	0.009	415
	Above Guideline	-	-	-	-	10	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E4122	n	2	2	2	2	12	2	2	2	2
	Min	1.71	6660	877.2	0	<0.2	0	0	0	0
	Median	1.765	10775	1002.1	22.65	1.9	1520	0.017	0	0
	Max	1.82	14890	1127	45.3	7.8	3040	0.034	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E433	n	1	1	1	1	12	1	1	1	1
	Min	1.54	13760	830.9	8.98	0.7	1350	0.002	0	0
	Median	1.54	13760	830.9	8.98	2.3	1350	0.002	0	0
	Max	1.54	13760	830.9	8.98	5.7	1350	0.002	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E450	n	8	8	8	8	11	8	8	8	8
	Min	0.279	1920	212.9	0	3.5	0	0	0	0
	Median	1.7	8885	917.45	6.475	9.1	1521.5	0.0015	0	0
	Max	9.14	25060	2735	65.7	66.4	14740	0.025	0	0
	Above Guideline	-	-	-	-	8	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E457	n	10	10	10	10	12	10	10	10	10
	Min	0.217	760	140.2	0	1.3	0	0	0	0
	Median	1.495	5040	763.25	13.55	9.7	1625	0.0045	0	0
	Max	5.01	73770	4017	239.9	37	43640	0.107	0.058	1040
	Above Guideline	-	-	-	-	10	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E488	n	3	3	3	3	12	3	3	3	3
	Min	1.27	2580	737.9	0	0.8	0	0	0	0
	Median	1.43	3770	929.8	0.62	3.65	207	0	0	0
	Max	1.83	10860	2095	2.49	11.9	830	0	0	0
	Above Guideline	-	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E490	n	10	10	10	10	12	10	10	10	10
	Min	0.312	1070	181.6	0	3	0	0	0	0
	Median	0.88	7620	719.55	13.95	6.4	2095	0.004	0	0
	Max	5.83	11950	1974	63.9	17.4	4840	0.032	0.032	260
	Above Guideline	-	-	-	-	10	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E531	n	3	3	3	3	12	3	3	3	3
	Min	1.3	7970	630	14	1.7	3600	0.005	0	0
	Median	1.42	16980	808.4	27	4.05	5610	0.01	0	0
	Max	1.47	26940	933.8	66.6	8.5	6330	0.026	0	0
	Above Guideline	-	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-

Table A5 Warragamba system – catchments – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
E0114	n	11	11	11
	Min	<1	2	4
	Median	6	10	27
	Max	21	110	160
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E0115	n	11	11	11
	Min	<1	5	3
	Median	9.5	52	72
	Max	37	250	280
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E0321	n	10	10	10
	Min	<1	5	6
	Median	9	215	27
	Max	50	650	280
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E046	n	10	10	10
	Min	16	3	2
	Median	97.5	205	99
	Max	2000	11000	1300
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E073	n	10	10	10
	Min	<1	18	3
	Median	9	84	67.5
	Max	32	4300	350
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E083	n	11	11	11
	Min	<1	1	2
	Median	3	41	30
	Max	60	640	1900
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E130	n	12	12	12
	Min	<1	3	4
	Median	3	22	18
	Max	5	150	110
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E157	n	12	12	12
	Min	<1	3	6
	Median	4	27.5	26.5
	Max	240	330	330
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E203	n	12	12	12
	Min	3	10	16
	Median	97	240	115
	Max	920	2200	1800
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E206	n	12	12	12
	Min	3	2	3
	Median	15.5	29.5	24
	Max	90	200	280
	Above Guideline	-	-	-

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Below Guideline	-	-	-
E210	n	12	12	12
	Min	<1	<1	2
	Median	2	30	28
	Max	70	2400	510
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E243	n	12	12	12
	Min	<1	<1	1
	Median	1	9	11
	Max	2	36	28
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E306	n	12	12	12
	Min	3	33	6
	Median	58.5	205	50
	Max	260	2400	1400
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E3151	n	11	11	11
	Min	23	14	2
	Median	56	230	43
	Max	86	820	620
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E332	n	12	12	12
	Min	7	2	<1
	Median	18	25	28
	Max	98	1600	200
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E409	n	11	11	11
	Min	3	10	8
	Median	17	63	19
	Max	80	3800	960
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E4122	n	12	12	12
	Min	2	<1	8
	Median	8.5	41	40
	Max	84	340	950
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E433	n	12	12	12
	Min	<1	10	1
	Median	6.5	35.5	23
	Max	35	1700	680
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E450	n	12	12	12
	Min	5	4	6
	Median	21.5	73	46
	Max	67	160	120
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E457	n	12	12	12
	Min	<1	<1	<1
	Median	12	31	13
	Max	34	790	550
	Above Guideline	-	-	-

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Below Guideline	-	-	-
E488	n	12	12	12
	Min	<1	<1	3
	Median	4	52	38.5
	Max	120	2000	560
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E490	n	12	12	12
	Min	1	3	1
	Median	4	22.5	12.5
	Max	33	1100	430
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E531	n	12	12	12
	Min	1	8	15
	Median	5.5	43	38
	Max	21	700	170
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-

Table A6 Warragamba system – catchments – *Cryptosporidium* and *Giardia*

	Statistic	Crypto oocysts IFA (Adj for Recovery for 10L)	Giardia cysts IFA (Adj for Recovery to 10L)
E083	n	11	11
	Min	<1	<2
	Median	4	3.5
	Max	4	8
	Above Guideline	-	-
	Below Guideline	-	-
		-	-
E130	n	12	12
	Min	<1	<1
	Median	2	9
	Max	11	37
	Above Guideline	-	-
	Below Guideline	-	-
		-	-
E157	n	12	12
	Min	<1	<1
	Median	2	2
	Max	18	4
	Above Guideline	-	-
	Below Guideline	-	-
		-	-
E210	n	12	12
	Min	<1	<2
	Median	3.5	2.5
	Max	8	8
	Above Guideline	-	-
	Below Guideline	-	-
		-	-
E243	n	12	12
	Min	<1	<2

	Statistic	Crypto oocysts IFA (Adj for Recovery for 10L)	Giardia cysts IFA (Adj for Recovery for 10L)
	Median	2.5	2
	Max	4	2
	Above Guideline	-	-
	Below Guideline	-	-
E488	n	12	12
	Min	<1	<1
	Median	4	22
	Max	30	48
	Above Guideline	-	-
	Below Guideline	-	-
E531	n	51	51
	Min	<1	<1
	Median	3.5	2.5
	Max	50	22
	Above Guideline	-	-
	Below Guideline	-	-

Table A7 Warragamba system – storages – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)
DWA12	n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	Min	28	0.129	4.9	4.7	0.179	57.4	5.89	6.77	5	1	12.99	36	16	36	0.54
	Median	38	0.165	6.2	6.1	0.234	90.3	8.26	7.42	7	2	18.39	43	22	48	4.01
	Max	50	0.175	8.1	10.5	0.395	108.2	9.46	8.23	9	5	27.35	52	37	87	11.23
	Above Guideline	-	-	-	-	-	0	-	2	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	10	-	0	-	-	-	-	-	-	-
DWA15	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Min	29	0.128	4.9	4.6	0.167	66.6	6.9	6.9	4	2	13.34	36	14	30	0.71
	Median	36	0.161	5.8	6.2	0.222	93.4	8.27	7.33	6	3	17.8	41	20	47	4.77
	Max	41	0.171	7	6.8	0.26	104.2	9.47	8.14	8	3	26.87	47	25	57	8.12
	Above Guideline	-	-	-	-	-	0	-	1	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	2	-	0	-	-	-	-	-	-	-
DWA19	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Min	30	0.127	4.4	4.3	0.149	63.8	6.31	6.84	4	2	13.3	36	13	29	1
	Median	35	0.15	5.3	5.3	0.187	88.2	7.74	7.21	6	3	17.7	36	19	43	2.9
	Max	38	0.166	6.3	6.3	0.254	98.4	8.84	7.79	8	5	27.3	43	26	58	6.74
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	3	-	0	-	-	-	-	-	-	-
DWA2	n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	Min	28	0.132	5.3	5.3	0.184	60.7	5.81	6.59	4	1	13.47	34	18	40	0.59
	Median	36	0.165	6.5	6.5	0.25	93.7	8.26	7.47	7	2	18.6	43	23	50	3.24
	Max	46	0.185	9.9	9.5	0.438	108	9.45	8.15	8	4	26.29	52	43	95	13.54
	Above Guideline	-	-	-	-	-	0	-	1	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	10	-	0	-	-	-	-	-	-	-
DWA21	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Min	30	0.126	4.3	4.4	0.145	65.2	6.25	6.96	4	2	13.22	36	13	28	0.99
	Median	39	0.155	5.9	5.9	0.202	89.4	7.9	7.27	6	3	17.35	41	20	46	3.03
	Max	40	0.167	6.4	6.3	0.253	100.3	8.93	7.94	8	5	27.2	43	26	60	6.84
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	3	-	0	-	-	-	-	-	-	-

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)
DWA27	n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	Min	32	0.142	5.7	5.5	0.207	57.1	5.41	6.67	4	1	13.08	39	21	46	1.19
	Median	38	0.17	6.7	6.7	0.29	93.9	8.51	7.43	6	3	19.15	47	27	61	4.43
	Max	48	0.204	15.6	15.4	0.541	119.9	9.88	8.42	8	8	28.44	63	52	119	14.66
	Above Guideline	-	-	-	-	-	3	-	4	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	11	-	0	-	-	-	-	-	-	-
DWA311	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Min	35	0.16	6	5.9	0.222	58.9	5.58	6.87	4	2	13.2	40	22	48	2.31
	Median	38	0.174	6.4	6.2	0.3	76.8	7.56	7.16	5	3	17.53	46	28	65	6.77
	Max	51	0.215	10.5	9.9	0.499	97.3	9.14	7.57	7	5	24.17	54	49	108	13.5
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	4	-	0	-	-	-	-	-	-	-
DWA39	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Min	38	0.161	6.4	6.3	0.226	62.2	5.92	6.88	4	3	12.63	43	22	49	3.12
	Median	41	0.202	6.4	6.4	0.302	78.9	8.23	7.25	6	3	17.39	52	28	66	8.19
	Max	52	0.219	11.9	11	0.508	99.5	8.84	7.65	7	4	24.36	59	50	114	13.27
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	4	-	0	-	-	-	-	-	-	-
DWA9	n	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
	Min	30	0.134	5.9	5.8	0.189	62.3	5.94	6.65	4	1	13	36	19	41	0.7
	Median	37	0.166	6.9	6.8	0.251	93.1	8.08	7.45	7	2	18.43	43	24	54	3.85
	Max	44	0.187	9.8	9.6	0.449	104.3	9.22	7.96	8	5	26.04	56	43	95	14.34
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	11	-	0	-	-	-	-	-	-	-
RPR1	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	16	0.124	4.4	4.3	0.106	85.6	8.06	6.94	3	2	12.45	22	6	15	1.27
	Median	20	0.1305	4.8	4.9	0.1325	98.2	9.135	7.28	4	3	20.51	25	9	21	2.195
	Max	33	0.139	5.2	5.2	0.186	108	10.28	7.83	6	4	25.47	31	12	27	5.32
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	2	-	0	-	-	-	-	-	-	-
RPR6	n	5	7	5	5	5	7	7	7	5	5	7	5	5	5	7
	Min	18	0.124	4.4	4.6	0.11	1.8	0.19	6.44	3	2	12.8	22	8	16	1.55
	Median	19	0.129	4.8	4.9	0.124	97.7	8.79	7.22	4	3	20.29	25	9	20	2.55
	Max	21	0.189	5	5.1	0.155	108.9	9.97	7.62	4	4	25.19	31	12	26	11.03
	Above Guideline	-	-	-	-	-	0	-	0	-	-	-	-	-	-	0
	Below Guideline	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-

Table A8 Warragamba system – storages – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
DWA12	n	23	23	23	23	23	23	23
	Min	<0.005	0.077	0.22	0.44	0.002	0.009	3.9
	Median	0.008	0.25	0.29	0.57	0.004	0.016	5.57
	Max	0.016	0.359	0.41	0.64	0.008	0.031	8.77
	Above Guideline	2	23	-	23	3	19	-
	Below Guideline	-	-	-	-	-	-	-
DWA15	n	5	5	5	5	5	5	5
	Min	<0.005	0.096	0.26	0.48	0.002	0.009	3.72
	Median	0.0115	0.257	0.28	0.57	0.003	0.012	6.11
	Max	0.018	0.352	0.38	0.61	0.006	0.022	8.43
	Above Guideline	1	5	-	5	1	3	-
	Below Guideline	-	-	-	-	-	-	-
DWA19	n	5	5	5	5	5	5	5
	Min	<0.005	0.06	0.26	0.38	0.002	0.011	3.46

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Median	0.01	0.221	0.28	0.54	0.003	0.015	5.78
	Max	0.021	0.308	0.34	0.58	0.005	0.021	8.62
	Above Guideline	1	5	-	5	0	5	-
	Below Guideline	-	-	-	-	-	-	-
DWA2	n	23	23	23	23	23	23	23
	Min	<0.005	0.091	0.2	0.47	0.002	0.006	3.55
	Median	0.008	0.29	0.3	0.59	0.004	0.014	5.19
	Max	0.024	0.378	0.48	0.71	0.008	0.033	8
	Above Guideline	5	23	-	23	5	15	-
	Below Guideline	-	-	-	-	-	-	-
DWA21	n	5	5	5	5	5	5	5
	Min	<0.005	0.071	0.2	0.4	0.001	0.012	4.09
	Median	0.006	0.281	0.28	0.52	0.0025	0.015	5.99
	Max	0.022	0.322	0.33	0.64	0.005	0.022	8.54
	Above Guideline	1	5	-	5	0	5	-
	Below Guideline	-	-	-	-	-	-	-
DWA27	n	23	23	23	23	23	23	23
	Min	<0.005	0.059	0.25	0.55	0.002	0.006	3.74
	Median	0.009	0.308	0.33	0.63	0.004	0.017	5.54
	Max	0.023	0.369	0.85	0.94	0.01	0.059	8.79
	Above Guideline	5	23	-	23	6	20	-
	Below Guideline	-	-	-	-	-	-	-
DWA311	n	5	5	5	5	5	5	5
	Min	<0.005	0.107	0.26	0.61	0.002	0.01	4.04
	Median	0.011	0.318	0.32	0.68	0.005	0.023	5.83
	Max	0.033	0.362	0.6	0.71	0.008	0.038	8.82
	Above Guideline	2	5	-	5	2	4	-
	Below Guideline	-	-	-	-	-	-	-
DWA39	n	5	5	5	5	5	5	5
	Min	<0.005	0.099	0.31	0.62	0.002	0.011	3.16
	Median	0.011	0.3	0.36	0.69	0.006	0.019	5.82
	Max	0.017	0.348	0.63	0.73	0.008	0.037	8.75
	Above Guideline	3	5	-	5	3	5	-
	Below Guideline	-	-	-	-	-	-	-
DWA9	n	23	23	23	23	23	23	23
	Min	<0.005	0.087	0.23	0.45	0.001	0.007	3.71
	Median	0.009	0.276	0.3	0.59	0.003	0.015	5.56
	Max	0.02	0.383	0.48	0.72	0.006	0.033	8.19
	Above Guideline	3	23	-	23	5	17	-
	Below Guideline	-	-	-	-	-	-	-
RPR1	n	12	12	12	12	12	12	12
	Min	<0.005	0.008	0.11	0.19	0.001	0.005	0.47
	Median	0.024	0.09	0.22	0.28	0.001	0.0075	1.035
	Max	0.046	0.165	0.27	0.38	0.002	0.01	2.63
	Above Guideline	8	11	-	3	0	0	-
	Below Guideline	-	-	-	-	-	-	-
RPR6	n	5	5	5	5	5	5	5
	Min	<0.005	0.013	0.21	0.25	0.002	0.008	0.47
	Median	0.017	0.106	0.25	0.32	0.002	0.0085	0.64
	Max	0.048	0.571	0.35	0.92	0.002	0.009	2.46
	Above Guideline	2	5	-	2	0	0	-
	Below Guideline	-	-	-	-	-	-	-

Table A9 Warragamba system – storages – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
DWA12	n	23	23	23	23	23	23	23	23	23	23
	Min	<0.01	0.02	8	0.07	0.1	4	<0.001	0.002	2	10
	Median	0.085	0.18	9	0.2	0.34	5	0.003	0.006	2	14
	Max	0.3	0.46	11	0.42	0.56	6	0.047	0.072	3	16
	Above Guideline	16	17	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA15	n	5	5	5	5	5	5	5	5	5	5
	Min	0.01	0.02	8	0.05	0.09	4	<0.001	0.004	2	10
	Median	0.08	0.16	9	0.17	0.29	5	0.0055	0.007	2	12
	Max	0.12	0.27	10	0.25	0.41	6	0.01	0.017	2	13
	Above Guideline	3	4	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA19	n	5	5	5	5	5	5	5	5	5	5
	Min	0.01	0.03	8	0.08	0.11	4	<0.001	0.006	2	10
	Median	0.05	0.12	8	0.17	0.29	4	0.011	0.022	2	12
	Max	0.11	0.23	9	0.23	0.39	5	0.022	0.033	2	12
	Above Guideline	2	4	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA2	n	23	23	22	23	23	22	23	23	22	22
	Min	0.01	0.03	7	0.08	0.13	4	<0.001	0.002	2	11
	Median	0.1	0.18	9	0.2	0.31	5	0.004	0.005	3	13
	Max	0.28	0.78	11	0.47	0.74	6	0.07	0.093	3	16
	Above Guideline	18	20	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA21	n	5	5	5	5	5	5	5	5	5	5
	Min	0.01	0.02	8	0.06	0.1	4	<0.001	0.006	2	10
	Median	0.07	0.1	9	0.16	0.26	4	0.009	0.016	2	12
	Max	0.11	0.28	10	0.26	0.45	5	0.024	0.034	2	13
	Above Guideline	3	4	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA27	n	23	23	23	23	23	23	23	23	23	23
	Min	0.03	0.05	8	0.14	0.19	4	<0.001	0.003	2	10
	Median	0.1	0.17	10	0.24	0.38	6	0.003	0.008	3	14
	Max	0.44	0.77	12	0.6	1.03	8	0.057	0.078	3	16
	Above Guideline	19	22	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA311	n	5	5	5	5	5	5	5	5	5	5
	Min	0.08	0.1	8	0.21	0.27	5	0.002	0.002	2	12
	Median	0.12	0.33	10	0.23	0.45	5	0.003	0.011	3	13
	Max	0.27	0.58	11	0.48	0.85	7	0.033	0.044	3	16
	Above Guideline	5	5	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA39	n	5	5	5	5	5	5	5	5	5	5
	Min	0.08	0.14	9	0.23	0.3	5	0.003	0.011	2	13
	Median	0.14	0.37	11	0.32	0.55	6	0.008	0.017	3	15
	Max	0.26	0.53	12	0.47	0.88	7	0.033	0.045	3	17
	Above Guideline	5	5	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA9	n	23	23	23	23	23	23	23	23	23	23
	Min	0.02	0.03	8	0.09	0.12	4	<0.001	0.002	2	10
	Median	0.1	0.2	9	0.2	0.32	5	0.004	0.006	3	13
	Max	0.29	0.88	11	0.46	0.76	7	0.057	0.09	3	15
	Above Guideline	17	20	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
RPR1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.03	4	0.03	0.09	3	<0.001	0.006	1	11
	Median	0.06	0.125	5	0.11	0.205	3	0.002	0.0115	2	12.5
	Max	0.1	0.24	6	0.19	0.37	4	0.006	0.043	2	14
	Above Guideline	6	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
RPR6	n	5	5	5	5	5	5	5	5	5	5
	Min	0.03	0.06	4	0.06	0.13	3	0.002	0.008	1	11
	Median	0.05	0.11	5	0.09	0.17	3	0.002	0.014	2	12
	Max	0.09	0.23	6	0.18	0.36	4	0.003	0.032	2	14
	Above Guideline	2	5	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A10 Warragamba system – storages – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
DWA12	n	5	5	5	5	23	5	5	5	5	-
	Min	0.878	4750	432.7	7.34	0.4	2830	0	0	0	-
	Median	1.88	81300	1335	300.7	3.8	78960	0.139	0.047	1090	-
	Max	3.86	206200	1443	923.4	8.7	198500	0.975	0.963	27670	-
	Above Guideline	-	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA15	n	3	3	3	3	5	3	3	3	3	-
	Min	1.43	5070	849.9	1.86	1.4	1040	0	0	0	-
	Median	4.19	6880	1321	42.2	6	2740	0.025	0.016	664	-
	Max	6.63	95100	3396	309.5	11.3	91850	0.24	0.206	3450	-
	Above Guideline	-	-	-	-	3	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA19	n	2	2	2	2	5	2	2	2	2	-
	Min	1.05	4340	489.1	24.4	1.7	2420	0.018	0.017	684	-
	Median	1.905	5445	716.5	39.05	4	3210	0.056	0.0555	722	-
	Max	2.76	6550	943.9	53.7	8.4	4000	0.094	0.094	760	-
	Above Guideline	-	-	-	-	2	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA2	n	32	32	32	32	31	32	32	32	32	26
	Min	0.039	66	20.7	0	0.2	0	0	0	0	<0.3
	Median	1.43	4570	540.6	51.05	3.55	2595	0.0305	0.019	643.5	<0.3
	Max	17.7	106100	1602	302.6	12.9	103500	0.522	0.522	4790	<0.3
	Above Guideline	-	-	-	-	7	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA21	n	3	3	3	3	5	3	3	3	3	-
	Min	0.773	2010	369.8	0.49	1.8	138	0	0	0	-
	Median	1.78	2860	728.8	0.55	5.8	277	0	0	0	-
	Max	3.79	3470	1093	3.71	12.1	553	0.003	0.003	138	-
	Above Guideline	-	-	-	-	3	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA27	n	7	7	7	7	23	7	7	7	7	-
	Min	1.65	3410	740.9	0	0.3	0	0	0	0	-
	Median	4.31	74970	1989	363.5	3.8	70140	0.23	0.176	3740	-
	Max	6.89	172700	4676	4370	14.2	172100	4.54	4.47	150400	-
	Above Guideline	-	-	-	-	7	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA311	n	0	0	0	0	5	0	0	0	0	-
	Min	-	-	-	-	0.7	-	-	-	-	-
	Median	-	-	-	-	2.7	-	-	-	-	-
	Max	-	-	-	-	4.5	-	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA39	n	1	1	1	1	5	1	1	1	1	-
	Min	2.09	3120	720.7	11.2	1.8	415	0.01	0.01	415	-
	Median	2.09	3120	720.7	11.2	4	415	0.01	0.01	415	-
	Max	2.09	3120	720.7	11.2	7	415	0.01	0.01	415	-
	Above Guideline	-	-	-	-	1	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWA9	n	17	17	17	17	23	17	17	17	17	10
	Min	0.13	590	78.7	0	0.2	0	0	0	0	<0.3
	Median	1.55	3640	644.4	24.3	3.2	1870	0.015	0.005	207	0.6
	Max	4.22	201700	1743	1001	7.4	198000	1.71	1.71	15660	0.6
	Above Guideline	-	-	-	-	6	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
RPR1	n	38	38	38	38	38	38	38	38	38	-
	Min	0.689	4360	472.8	0	1.2	0	0	0	0	-
	Median	1.69	58980	1298	110.2	8.4	50650	0.025	0	0	-
	Max	3.74	224700	3291	471.3	13.8	216000	0.108	0.05	1990	-
	Above Guideline	-	-	-	-	29	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
RPR6	n	5	5	5	5	5	5	5	5	5	1

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
	Min	0.722	5100	892.1	0.99	2.4	553	0	0	0	<0.3
	Median	1.73	85180	1552	183.5	8.7	73640	0.04	0.007	277	<0.3
	Max	3.93	118600	2914	252	12.8	108700	0.055	0.019	747	<0.3
	Above Guideline	-	-	-	-	4	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A11 Warragamba system – storages – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100m)
DWA12	n	23	23	23
	Min	<1	<1	<1
	Median	1.5	1	1
	Max	2	1	1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA15	n	5	5	5
	Min	<1	<1	<1
	Median	1	2	4
	Max	3	2	4
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA19	n	5	5	5
	Min	<1	<1	<1
	Median	2	2	2
	Max	2	9	3
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA2	n	23	23	23
	Min	<1	<1	<1
	Median	1	1	1
	Max	1	29	15
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA21	n	5	5	5
	Min	<1	<1	<1
	Median	1	3	1.5
	Max	1	11	3
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA27	n	23	23	23
	Min	<1	<1	<1
	Median	1.5	2	1
	Max	3	3	3
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA311	n	5	5	5
	Min	<1	<1	<1
	Median	1	<1	1
	Max	1	<1	1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA39	n	5	5	5

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Min	<1	<1	<1
	Median	3.5	1.5	1
	Max	5	2	1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWA9	n	23	23	23
	Min	<1	<1	<1
	Median	1	1	1
	Max	5	2	2
	Above Guideline	-	-	-
RPR1	Below Guideline	-	-	-
	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	32.5
	Max	8	50	64
RPR6	Above Guideline	-	-	-
	Below Guideline	-	-	-
	n	5	5	5
	Min	<1	<1	<1
	Median	1	2.5	1.5
	Max	1	59	34
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A12 Warragamba system – storages – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DWA1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.02	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.021	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.022	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	0	0	0	0	0	0	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A13 Warragamba system – storages – *Cryptosporidium* and *Giardia*

	Statistic	Crypto oocysts IFA (Adj for Recovery for 10L)	Giardia cysts IFA (Adj for Recovery for 10L)
COMP2	n	55	56
	Min	<0.3	<0.3
	Median	<0.3	<0.3
	Max	3	3
	Above Guideline	-	-
	Below Guideline	-	-
RPR1	n	22	22

	Statistic	Crypto oocysts IFA (Adj for Recovery for 10L)	Giardia cysts IFA (Adj for Recovery to 10L)
	Min	<1	<1
	Median	<1	<1
	Max	2	2
	Above Guideline	-	-
	Below Guideline	-	-

Table A14 Warragamba system – water filtration plants – physicochemical

	Statistic	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Alkalinity (mgCaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Temperature (Deg C)	Total Hardness (mgCaCO ₃ /L)	Turbidity Field (NTU)
HBR1	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5.2	5.1	0.215	15	31	34	0.152	20	2.1	6.82	12.6	43	4.97
	Median	6.1	5.85	0.2385	18.5	42	38	0.178	54.05	5.555	6.87	13.7	48.5	8.63
	Max	7.7	7.4	0.279	21	47	47	0.201	88.7	9.03	6.97	15	54	11.2
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
HWA2	n	12	12	12	12	12	12	12	12	12	12	12	12	11
	Min	5.4	5.1	0.221	17	39	32	0.151	22.1	2.17	6.33	12.78	43	4.77
	Median	6.15	5.9	0.243	20.5	46	39.5	0.1785	49.7	4.935	6.915	14.62	48.5	8.37
	Max	7.6	7.3	0.307	27	62	46	0.198	90.5	9.08	7.22	19	54	10.9
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
PWFP10	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5.2	5.1	0.198	14	31	28	0.145	100.4	9.74	6.88	13.7	34	4.94
	Median	6	6	0.2175	16	36	32.5	0.17	106.65	10.2	7.14	16.845	43	7.14
	Max	6.7	7.1	0.247	20	44	38	0.183	109.4	10.95	7.43	19.2	50	10.6
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A15 Warragamba system – water filtration plants – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HBR1	n	12	12	12	12	12	12
	Min	0.05	0.17	0.16	0.33	0.001	0.008
	Median	0.095	0.26	0.24	0.445	0.009	0.0195
	Max	0.15	0.52	0.29	0.55	0.512	0.596
	Above Guideline	-	-	-	-	-	-
HWA2	n	12	12	12	12	12	12
	Min	0.05	0.15	0.16	0.3	0.001	0.005
	Median	0.11	0.225	0.24	0.4	0.0045	0.012
	Max	0.15	0.44	0.28	0.53	0.527	0.612
	Above Guideline	-	-	-	-	-	-
PWFP10	n	12	12	12	12	12	12
	Min	0.06	0.12	0.16	0.27	0.002	0.004
	Median	0.1	0.285	0.2	0.375	0.005	0.027
	Max	0.23	0.44	0.25	0.53	0.111	0.13

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A16 Warragamba system – water filtration plants - cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Algal Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
HBR1	n	12	12	12	12	12	12	12
	Min	0	80	2.23	0	0	0	0
	Median	0.041	541	34.15	171.5	0	0	0
	Max	0.717	14840	211.3	14550	0.043	0.02	125
	Above Guideline	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-
HWA2	n	12	12	12	12	12	12	12
	Min	0	0	0	0	0	0	0
	Median	0.0255	206	12.9	148.5	0	0	0
	Max	0.234	5150	135.6	4880	0.031	0.012	90
	Above Guideline	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-
PWFP10	n	12	12	12	12	12	12	12
	Min	0.066	546	59.5	0	0	0	0
	Median	0.2715	2330	229.55	933	0.0005	0	0
	Max	0.558	20300	426.4	19350	0.01	0.009	353
	Above Guideline	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-

Table A17 Warragamba system – water filtration plants – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
HBR1	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	1
	Max	1	3	1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
HWA2	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	1
	Max	1	2	1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
PWFP10	n	12	12	12
	Min	<1	<1	<1
	Median	2	1	2
	Max	2	20	14
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A18 Warragamba system – water filtration plants – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)	Uranium Total (mg/L)
HBR1	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.02	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.003	<0.001
	Median	<0.001	0.02	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.003	<0.001
	Max	<0.001	0.02	<0.001	0.02	<0.001	<0.0001	<0.001	<0.001	<0.001	0.003	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-
HWA2	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.02	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.02	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.02	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-
PWFP10	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.02	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	0.0025	0.02	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	0.003	0.02	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-

Table A19 Warragamba system – water filtration plants – pesticides

	Statistic	"2,4-D (ug/L)"	Atrazine (ug/L)	Chlorfenvinphos (E+Z) (ug/L)	Chlorpyrifos (ug/L)	Diuron (ug/L)	Fluproprate (ug/L)	Glyphosate (ug/L)	Hexazinone (ug/L)	MCPA (ug/L)	Picloram (ug/L)	Simazine (ug/L)	Triclopyr (ug/L)
HBR1	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
HWA2	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
PWFP10	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A20 Warragamba system – water filtration plants – synthetic organic compounds & radionuclides

	Statistic	Benzene (ug/L)	Gross Alpha	Gross Beta	Vinyl chloride (ug/L)
HBR1	n	4	1	1	4
	Min	<0.1	<0.05	<0.01	<0.3
	Median	<0.1	<0.05	<0.01	<0.3
	Max	<0.1	<0.05	<0.01	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
HWA2	n	4	1	1	4

	Min	<0.1	<0.05	<0.01	<0.3
	Median	<0.1	<0.05	<0.01	<0.3
	Max	<0.1	<0.05	<0.01	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
PWFP10	n	4	1	1	4
	Min	<0.1	<0.05	<0.01	<0.3
	Median	<0.1	<0.05	<0.01	<0.3
	Max	<0.1	<0.05	<0.01	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

2. Upper Nepean System

Table A22 Upper Nepean system – catchments – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
E6006	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	2	0.054	1	81.6	7.65	5.23	2	1	8.569	4	1.2	<1	<1	0.99	0.048
	Median	4	0.0925	2.45	92.65	9.43	6.035	5	3	14.198	11.5	2.65	6.5	15	1.81	0.128
	Max	6	0.129	6.3	94.5	10.94	6.43	15	4	18.464	21	6.4	27	60	7.34	0.251
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	4	-	12	-	-	-	-	-	-	-	-	-
E601	n	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Min	16	0.084	1.9	91.9	8.7	7.23	<1	<1	7.612	20	1.8	6	14	2.02	0.112
	Median	20	0.097	4	96	10.22	7.41	1.5	3	12.4	23	3.85	16.5	37	3.245	0.1595
	Max	31	0.122	6.2	100.1	11.52	7.73	3	5	18.924	29	6.2	38	85	8.75	0.33
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-
E602	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	3	0.048	1.6	90.8	8.63	6.2	<1	<1	7.402	<1	1.6	8	17	1.08	0.092
	Median	4	0.07	4	96.4	9.805	6.525	1	2	14.8575	8	4.1	18	42	2.015	0.184
	Max	8	0.082	7.2	102.4	11.6	7.95	1	3	20.871	11	7.3	36	79	4.43	0.305
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	0	-	5	-	-	-	-	-	-	-	-	-
E603	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	<1	0.047	1.3	89.3	8.17	5.26	<1	<1	7.35	<1	1.3	1	3	0.56	0.05
	Median	3	0.085	2.5	93.8	9.495	5.865	1.5	2	14.275	8	2.65	7	17	0.935	0.102
	Max	17	0.098	4.8	99	11.11	6.54	2	2	19.7	8	4.8	16	36	3.45	0.163
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	2	-	11	-	-	-	-	-	-	-	-	-
E604	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	9	0.096	1	86.6	8.62	6.58	2	<1	7.167	20	0.9	2	6	0.26	0.029
	Median	13	0.128	1.65	93.65	9.48	6.765	3	6	13.78	26	1.5	4	8.5	0.525	0.045
	Max	18	0.14	4.2	95	11.05	7.25	4	10	18.017	26	4.1	15	32	2.15	0.142
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	4	-	0	-	-	-	-	-	-	-	-	-
E608	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	9	0.084	0.7	87.2	8.77	6.47	2	<1	7.247	17	0.7	3	6	0.63	0.044
	Median	23	0.13	2.6	90.95	9.6	6.815	3	2	13.1815	29.5	2.5	9	21	3.04	0.103
	Max	55	0.182	8.8	95.8	10.59	7.2	5	5	16.022	46	9.2	60	134	5.07	0.439
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	5	-	1	-	-	-	-	-	-	-	-	-
E609	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5	0.09	1.8	85	8.4	5.41	2	<1	7.502	13	1.8	4	9	1.71	0.088
	Median	10	0.1115	4	87.35	9.015	6.325	3.5	2	13.779	17	3.85	15	33	3.06	0.1695
	Max	16	0.129	7.6	90.3	10.48	6.7	5	4	17.071	22	7.4	34	73	5.95	0.321
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	10	-	10	-	-	-	-	-	-	-	-	-
E610	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	8	0.06	1	81.6	7.72	6.46	2	<1	7.478	13	1.2	3	6	0.23	0.035

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
	Median	18	0.086	2.2	91.1	9.71	6.78	3	1	11.991	20	2.2	10	17	0.7	0.07
	Max	31	0.129	4.8	94.8	10.79	7.2	5	1	18.438	48	4.6	19	40	1.48	0.164
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	4	-	1	-	-	-	-	-	-	-	-	-
E676	n	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9
	Min	2	0.052	4.5	88.3	8.13	5.04	1	1	7.93	4	4.4	15	32	0.09	0.165
	Median	2	0.077	7.4	91.8	8.83	5.34	2	2	17.097	7	8.3	35	77	2.34	0.376
	Max	5	0.113	14.7	96.1	11.09	5.86	2	9	20.091	13	15.2	79	177	3.5	0.776
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	3	-	9	-	-	-	-	-	-	-	-	-
E680	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5	0.054	2.2	87.1	7.77	6.4	1	<1	8.304	11	2.5	8	18	0.27	0.101
	Median	14	0.099	3.7	95.05	9.02	6.845	2	2	16.9545	20	3.75	18	40	1.51	0.1645
	Max	20	0.11	7.7	96	11.21	7.12	4	4	21.131	26	8.1	43	99	3.96	0.35
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	3	-	2	-	-	-	-	-	-	-	-	-
E697	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	13	0.072	1.7	85.6	8.4	6.99	<1	1	7.553	16	1.7	5	11	2.58	0.102
	Median	17	0.0845	3.65	93.55	9.415	7.24	1	2	13.9705	20	3.75	13.5	30	4.285	0.176
	Max	24	0.101	4.8	97.6	11.19	7.46	2	8	18.843	26	4.9	23	50	10.58	0.256
	Above Guideline	-	0	-	0	-	0	-	-	-	-	-	-	-	0	-
	Below Guideline	-	-	-	1	-	0	-	-	-	-	-	-	-	-	-

Table A23 Upper Nepean system – catchments - nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
E6006	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	<0.01	<0.01	<0.001	0.008	3.22
	Median	0.0105	0.0085	0.025	0.025	0.003	0.0165	3.955
	Max	0.014	0.023	0.06	0.08	0.004	0.041	4.59
	Above Guideline	2	1	-	0	0	3	-
	Below Guideline	-	-	-	-	-	-	-
E601	n	10	10	10	10	10	10	10
	Min	0.006	0.11	0.03	0.34	<0.001	0.007	2.87
	Median	0.009	0.24	0.155	0.385	0.0035	0.0135	4.315
	Max	0.015	0.446	0.28	0.5	0.005	0.023	7.64
	Above Guideline	1	10	-	10	0	2	-
	Below Guideline	-	-	-	-	-	-	-
E602	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	<0.01	<0.01	0.002	<0.005	3.61
	Median	0.012	0.008	0.08	0.085	0.003	0.01	4.68
	Max	0.017	0.022	0.15	0.15	0.006	0.012	5.31
	Above Guideline	4	1	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E603	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	<0.01	<0.01	<0.001	<0.005	3.82
	Median	0.015	0.0045	0.04	0.04	0.0015	0.008	4.525
	Max	0.032	1.15	0.11	1.2	0.002	0.013	5.69
	Above Guideline	3	1	-	1	0	0	-

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Below Guideline	-	-	-	-	-	-	-
E604	n	12	12	12	12	12	12	12
	Min	<0.005	0.074	0.02	0.12	<0.001	<0.005	2.64
	Median	0.01	0.1075	0.065	0.15	0.002	0.008	3.995
	Max	0.02	0.133	0.13	0.26	0.003	0.01	5.58
	Above Guideline	2	12	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E608	n	12	12	12	12	12	12	12
	Min	<0.005	0.031	<0.01	0.08	0.002	0.006	4.67
	Median	0.01	0.056	0.05	0.135	0.003	0.01	5.845
	Max	0.033	0.145	0.18	0.21	0.006	0.021	6.97
	Above Guideline	3	12	-	0	0	1	-
	Below Guideline	-	-	-	-	-	-	-
E609	n	12	12	12	12	12	12	12
	Min	0.013	0.02	0.02	0.04	0.001	0.006	4.24
	Median	0.0185	0.0265	0.06	0.095	0.0025	0.0125	4.715
	Max	0.03	0.093	0.1	0.16	0.004	0.018	5.77
	Above Guideline	11	12	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E610	n	11	11	11	11	11	11	11
	Min	<0.005	<0.002	<0.01	<0.01	0.002	<0.005	3.78
	Median	0.009	0.0045	0.04	0.04	0.002	0.007	4.39
	Max	0.012	0.005	0.06	0.06	0.004	0.01	5.3
	Above Guideline	0	0	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E676	n	8	8	8	9	8	9	9
	Min	<0.005	<0.002	0.03	0.03	<0.001	<0.005	2.52
	Median	0.016	<0.002	0.12	0.12	0.003	0.011	3.04
	Max	0.028	<0.002	0.3	0.3	0.005	0.012	3.38
	Above Guideline	3	0	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E680	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.05	0.05	<0.001	<0.005	1.78
	Median	0.012	0.008	0.12	0.13	0.002	0.013	4.14
	Max	0.045	0.03	0.17	0.18	0.004	0.017	4.93
	Above Guideline	3	4	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E697	n	12	12	12	12	12	12	12
	Min	0.007	0.185	<0.01	0.33	0.002	<0.005	2.94
	Median	0.011	0.3815	0.14	0.525	0.003	0.02	5.87
	Max	0.03	0.712	0.32	0.84	0.006	0.031	8.73
	Above Guideline	8	12	-	11	1	11	-
	Below Guideline	-	-	-	-	-	-	-

Table A24 Upper Nepean system – catchments - metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
E6006	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.03	<1	0.42	0.63	1	0.075	0.079	<1	8
	Median	0.05	0.095	1.5	0.85	1.49	2.5	0.2345	0.2415	<1	11
	Max	0.21	0.28	2	2.32	3.41	4	0.837	0.807	<1	12

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Above Guideline	5	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E601	n	10	10	10	10	10	10	10	10	10	10
	Min	0.02	0.08	3	0.26	0.48	3	0.004	0.008	<1	8
	Median	0.06	0.14	3.5	0.455	0.815	3.5	0.008	0.0165	1	9
	Max	0.25	0.42	5	0.66	1.21	4	0.009	0.029	1	12
	Above Guideline	7	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E602	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.03	<1	0.27	0.6	<1	0.01	0.012	<1	6
	Median	0.06	0.09	1	0.38	0.72	2	0.013	0.018	<1	9
	Max	0.2	0.29	1	0.94	1.58	2	0.02	0.029	<1	11
	Above Guideline	7	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E603	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.01	<1	0.1	0.26	<1	0.015	0.016	<1	7
	Median	0.04	0.07	<1	0.145	0.365	2	0.022	0.0255	<1	12
	Max	0.14	0.23	<1	0.36	0.8	2	0.029	0.034	<1	14
	Above Guideline	2	7	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E604	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.01	3	0.01	0.02	3	0.002	0.003	<1	11
	Median	0.02	0.035	4	0.02	0.05	4	0.004	0.0065	<1	14
	Max	0.1	0.16	4	0.12	0.26	4	0.008	0.024	<1	15
	Above Guideline	1	3	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E608	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.05	2	0.09	0.15	3	0.005	0.006	<1	10
	Median	0.055	0.135	4.5	0.175	0.33	4.5	0.015	0.0185	1	14
	Max	0.32	0.44	7	0.4	0.62	7	0.058	0.061	1	17
	Above Guideline	6	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E609	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.05	2	0.18	0.57	2	0.056	0.061	<1	11
	Median	0.09	0.18	3	0.335	0.715	2	0.0695	0.0755	<1	13
	Max	0.23	0.3	4	0.5	1.1	3	0.129	0.153	<1	15
	Above Guideline	9	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E610	n	11	11	11	11	11	11	11	11	11	11
	Min	<0.01	0.01	2	0.06	0.15	2	0.008	0.008	<1	6
	Median	0.05	0.06	3	0.12	0.2	3	0.012	0.014	<1	8
	Max	0.11	0.15	7	0.22	0.37	8	0.027	0.029	<1	9
	Above Guideline	4	7	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E676	n	9	9	8	9	9	8	9	9	8	8
	Min	0.13	0.24	<1	0.16	0.38	1	0.01	0.011	<1	9
	Median	0.25	0.36	1	0.71	0.86	1	0.017	0.019	<1	14
	Max	0.52	0.58	2	1.15	2.3	2	0.02	0.022	<1	15
	Above Guideline	9	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E680	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.02	1	0.28	0.45	2	0.013	0.026	<1	8
	Median	0.035	0.055	3	0.425	0.68	3	0.024	0.033	<1	10
	Max	0.22	0.32	4	0.69	1.14	4	0.053	0.056	<1	11
	Above Guideline	4	6	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E697	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.12	3	0.16	0.49	2	0.009	0.014	<1	7
	Median	0.065	0.18	3	0.49	0.87	3	0.017	0.0245	1	8
	Max	0.19	0.51	4	0.76	1.34	4	0.02	0.045	1	11
	Above Guideline	9	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A25 Upper Nepean system – catchments - cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
E6006	n	-	-	-	-	12	-	-	-	-
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.25	-	-	-	-
	Max	-	-	-	-	0.5	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E601	n	-	-	-	-	10	-	-	-	-
	Min	-	-	-	-	0.9	-	-	-	-
	Median	-	-	-	-	2	-	-	-	-
	Max	-	-	-	-	3.9	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E602	n	-	-	-	-	12	-	-	-	-
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.5	-	-	-	-
	Max	-	-	-	-	0.8	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E603	n	-	-	-	-	12	-	-	-	-
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.35	-	-	-	-
	Max	-	-	-	-	0.9	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E604	n	1	1	1	1	12	1	1	1	1
	Min	0.428	847	234.8	0	<0.2	0	0	0	0
	Median	0.428	847	234.8	0	0.5	0	0	0	0
	Max	0.428	847	234.8	0	21.1	0	0	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E608	n	-	-	-	-	12	-	-	-	-
	Min	-	-	-	-	<0.22	-	-	-	-
	Median	-	-	-	-	0.3	-	-	-	-
	Max	-	-	-	-	0.8	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E609	n	-	-	-	-	12	-	-	-	-
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.4	-	-	-	-
	Max	-	-	-	-	0.6	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E610	n	1	1	1	1	11	1	1	1	1
	Min	0.737	277	167.5	0	<0.2	0	0	0	0
	Median	0.737	277	167.5	0	0.3	0	0	0	0
	Max	0.737	277	167.5	0	8.4	0	0	0	0
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E676	n	-	-	-	-	9	-	-	-	-
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.5	-	-	-	-
	Max	-	-	-	-	1.1	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E680	n	3	3	3	3	12	3	3	3	3
	Min	1.09	5510	324.3	13.3	1.1	2550	0.004	0	0
	Median	1.93	10310	1035	15.6	3.4	3800	0.005	0	0
	Max	2.71	12470	1077	16.5	11.1	4430	0.005	0	0

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Above Guideline	-	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E697	n	1	1	1	1	12	1	1	1	1
	Min	1.7	37320	1200	457.4	1	32620	0.392	0.346	12080
	Median	1.7	37320	1200	457.4	2.7	32620	0.392	0.346	12080
	Max	1.7	37320	1200	457.4	8.9	32620	0.392	0.346	12080
	Above Guideline	-	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-	-

Table A26 Upper Nepean system – catchments - indicator bacteria

	Statistic	Costridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
E6006	n	12	12	12
	Min	<1	<1	<1
	Median	1	12	5
	Max	1	72	65
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E601	n	10	10	10
	Min	<1	2	7
	Median	2.5	10.5	28.5
	Max	11	29	67
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E602	n	12	12	12
	Min	<1	1	1
	Median	1	11	16.5
	Max	9	520	80
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E603	n	12	12	12
	Min	<1	<1	1
	Median	1	26	20.5
	Max	6	120	63
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E604	n	12	12	12
	Min	<1	<1	<1
	Median	1	10	9.5
	Max	1	84	51
	Above Guideline	-	-	-
	Below Guideline	-	-	-
		-	-	-
E608	n	12	12	12
	Min	<1	<1	<1
	Median	2	17	10
	Max	6	170	51
	Above Guideline	-	-	-

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100mL)
	Below Guideline	-	-	-
E609	n	12	12	12
	Min	<1	<1	3
	Median	1	26	14
	Max	7	99	65
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E610	n	11	11	11
	Min	<1	1	2
	Median	1	6	8
	Max	3	44	65
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E676	n	9	9	9
	Min	<1	8	3
	Median	1.5	63	12
	Max	4	770	75
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E680	n	12	12	12
	Min	<1	3	<1
	Median	3	20	11
	Max	6	78	42
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E697	n	12	12	12
	Min	1	11	7
	Median	3.5	41.5	24
	Max	16	250	120
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A27 Upper Nepean system – storages – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	UV Absorbing constituents (organic)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
DAV1	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	2	0.05	3.5	3.6	6	12	0.08	70.3	6.56	5.78	<1	<1	12.43	4	0.24
	Median	5	0.063	4.15	4.15	7.5	16	0.0935	94.15	8.68	6.27	2	1	17.875	4	0.495
	Max	10	0.064	5.8	5.7	19	43	0.19	109.4	10.05	6.78	2	2	22.72	7	1.32
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	5	-	10	-	-	-	-	-
DAV16	n	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Min	2	0.049	3.6	3.7	6	11	0.082	76.2	7.12	5.77	<1	<1	13.82	4	0.26
	Median	4	0.063	4.2	4.2	6	13	0.087	100.6	8.6	6.64	2	1	18.8	4	0.66
	Max	6	0.064	5.1	5.1	17	39	0.172	109.5	10.02	6.94	2	2	24.67	7	1.11
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-
DAV7	n	12	14	12	12	12	12	12	14	14	14	12	12	14	12	14
	Min	4	0.052	3.7	3.7	6	13	0.085	78.3	7.53	5.94	1	1	11.98	4	0.32

	Statistic	Alkalinity (mg CaCO3/L)	Conductivity Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	UV Absorbing constituents (organic)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO3/L)	Turbidity Field (NTU)
	Median	5.5	0.0625	4.25	4.25	8	16.5	0.097	97	9.035	6.56	2	1	17.038	4	0.62
	Max	8	0.065	5.2	5.4	16	36	0.166	120.5	10.7	7.34	2	3	23.043	11	1.05
	Above Guideline	-	-	-	-	-	-	-	1	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	5	-	5	-	-	-	-	-
		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCA1	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	2	0.048	4.2	4.3	13	28	0.123	68.7	6.47	5.25	2	<1	11.19	4	0.36
	Median	3.5	0.0845	5	5.15	18	40	0.168	93.05	8.635	6.08	2	1	17.765	9	0.675
	Max	8	0.089	11.3	10	54	119	0.446	104.6	10.2	6.58	3	2	24.3	11	2.48
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
DCA2	Below Guideline	-	-	-	-	-	-	-	5	-	11	-	-	-	-	-
	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Min	2	0.053	4.2	4.3	13	28	0.136	85.9	7.33	5.77	2	<1	12.91	7	0.45
	Median	2.5	0.0865	4.65	4.7	16.5	36	0.1515	96.15	8.595	6.22	2	1	20.005	11	0.895
	Max	4	0.089	8.4	8.5	44	99	0.381	103.8	9.29	6.32	3	2	24.09	11	1.91
DCA3	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	6	-	-	-	-	-
	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Min	2	0.085	4.2	4.1	13	28	0.126	91.9	7.94	6.18	2	<1	18.15	11	0.44
	Median	3	0.086	4.35	4.35	14.5	32.5	0.139	94.6	8.305	6.185	2	2	21.17	11	0.995
DCO1	Max	4	0.087	4.5	4.6	16	37	0.152	97.3	8.67	6.19	2	2	24.19	11	1.55
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	0	-	2	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	6	0.064	4.9	5	11	24	0.135	68	6.66	6.15	1	<1	11.21	11	0.49
DCO3	Median	11	0.087	5.4	5.6	20.5	45.5	0.192	94.55	8.425	6.8	2	2	18.495	13	1.265
	Max	13	0.088	9.2	8.6	40	92	0.344	109.4	9.9	7.59	3	4	23.8	13	6.02
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	4	-	3	-	-	-	-	-
	n	6	7	6	6	6	6	6	7	7	7	6	6	7	6	7
DNE2	Min	8	0.067	4.9	5	11	25	0.139	67.9	6.68	6.05	2	1	12.25	13	0.64
	Median	10.5	0.086	5.55	5.7	15.5	34	0.1605	96	8.55	6.94	2	2	18.19	13	1.17
	Max	13	0.088	7	7.1	39	89	0.333	108.2	9.54	7.44	2	3	23.96	13	6.07
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-
DNE6	n	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Min	7	0.062	4.5	4.7	17	38	0.17	73	7.6	6.19	1	<1	11.55	13	0.81
	Median	11	0.0715	4.95	5.05	21.5	47.5	0.1895	95.9	9.225	6.585	1.5	2	15.4	13	1.455
	Max	12	0.083	6.5	6.6	29	68	0.263	106.7	10.37	7.16	2	2	20.91	13	5.04
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	7	0.048	4.6	4.6	19	41	0.169	71.8	6.8	5.79	1	1	11	7	1.02
	Median	10.5	0.07	5.55	5.6	25.5	58.5	0.2375	88.25	8.49	6.47	1.5	2	16.68	13	2.73
	Max	12	0.085	7.9	7.8	38	86	0.363	113.6	10.09	7.06	2	4	22.29	13	9.19
	Above Guideline	-	-	-	-	-	-	-	1	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	6	-	6	-	-	-	-	-

Table A28 Upper Nepean system – storages – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
DAV1	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.11	0.16	<0.001	<0.005	0.82
	Median	0.021	0.023	0.155	0.175	0.002	0.008	1.175
	Max	0.046	0.052	5.46	5.48	0.003	0.008	1.84
	Above Guideline	6	9	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
DAV16	n	7	7	7	7	7	7	7
	Min	<0.005	<0.002	0.12	0.14	<0.001	<0.005	0.92
	Median	0.02	0.023	0.17	0.17	0.001	0.006	1.04
	Max	0.034	0.032	0.23	0.23	0.001	0.006	1.72
	Above Guideline	3	4	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
DAV7	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.11	0.12	<0.001	<0.005	0.88
	Median	0.009	0.0155	0.165	0.175	0.002	0.006	1.13
	Max	0.019	0.089	0.93	1.02	0.002	0.012	1.88
	Above Guideline	3	6	-	1	0	1	-
	Below Guideline	-	-	-	-	-	-	-
DCA1	n	12	12	12	12	12	12	12
	Min	<0.005	0.002	0.1	0.12	<0.001	<0.005	1.36
	Median	0.023	0.027	0.165	0.2	0.002	0.008	1.9
	Max	0.043	0.114	0.25	0.26	0.002	0.014	2.32
	Above Guideline	8	7	-	0	0	1	-
	Below Guideline	-	-	-	-	-	-	-
DCA2	n	6	6	6	6	6	6	6
	Min	<0.005	<0.002	0.11	0.11	<0.001	<0.005	1.51
	Median	0.01	0.027	0.145	0.17	0.002	0.007	1.815
	Max	0.038	0.043	0.19	0.2	0.002	0.011	2.21
	Above Guideline	2	4	-	0	0	1	-
	Below Guideline	-	-	-	-	-	-	-
DCA3	n	2	2	2	2	2	2	2
	Min	0.007	<0.002	0.14	0.14	<0.001	<0.005	1.49
	Median	0.0105	0.024	0.175	0.185	0.001	0.009	1.6
	Max	0.014	0.024	0.21	0.23	0.001	0.009	1.71
	Above Guideline	1	1	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-
DCO1	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.18	0.2	<0.001	0.006	0.33
	Median	0.033	0.0175	0.225	0.24	0.0015	0.0075	1.505
	Max	0.085	0.035	0.25	0.27	0.003	0.017	2.85
	Above Guideline	6	7	-	0	0	3	-
	Below Guideline	-	-	-	-	-	-	-
DCO3	n	6	6	6	6	6	6	6
	Min	<0.005	<0.002	0.18	0.2	<0.001	0.009	0.33
	Median	0.052	0.015	0.225	0.225	0.002	0.0095	0.555
	Max	0.069	0.017	0.28	0.28	0.002	0.016	2.78
	Above Guideline	2	3	-	0	0	2	-
	Below Guideline	-	-	-	-	-	-	-
DNE2	n	8	8	8	8	8	8	8
	Min	<0.005	0.091	0.13	0.32	<0.001	0.005	1.77
	Median	0.013	0.1545	0.205	0.35	0.002	0.01	3.505
	Max	0.038	0.214	0.25	0.4	0.004	0.019	4.34
	Above Guideline	4	8	-	4	0	3	-
	Below Guideline	-	-	-	-	-	-	-
DNE6	n	12	12	12	12	12	12	12
	Min	<0.005	0.033	0.12	0.3	<0.001	0.008	1.45
	Median	0.009	0.113	0.25	0.345	0.002	0.0175	3.87
	Max	0.07	0.216	0.32	0.46	0.003	0.025	4.23

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Above Guideline	5	12	-	6	0	8	-
	Below Guideline	-	-	-	-	-	-	-

Table A29 Upper Nepean system – storages – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
DAV1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.02	<1	0.02	0.06	1	0.001	0.004	<1	6
	Median	0.025	0.03	1	0.055	0.105	1	0.0055	0.0105	1	8
	Max	0.11	0.15	1	0.13	0.24	1	0.056	0.076	1	10
	Above Guideline	4	4	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DAV16	n	7	7	7	7	7	7	7	7	7	7
	Min	0.01	0.02	<1	0.02	0.06	1	0.001	0.004	<1	6
	Median	0.02	0.03	1	0.04	0.1	1	0.007	0.009	<1	7
	Max	0.1	0.15	1	0.13	0.22	1	0.058	0.07	<1	8
	Above Guideline	2	2	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DAV7	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.02	<1	0.04	0.09	1	0.002	0.004	<1	5
	Median	0.02	0.045	1	0.075	0.15	1	0.0055	0.011	<1	8
	Max	0.09	0.13	1	0.13	0.25	2	0.045	0.047	<1	8
	Above Guideline	3	4	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCA1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.05	0.07	<1	0.26	0.34	1	0.021	0.023	<1	6
	Median	0.08	0.11	1	0.315	0.455	1	0.0465	0.0505	<1	10.5
	Max	0.28	0.37	2	0.63	0.71	2	0.06	0.064	<1	14
	Above Guideline	11	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCA2	n	6	6	6	6	6	6	6	6	6	6
	Min	0.06	0.08	1	0.3	0.4	1	0.026	0.029	<1	7
	Median	0.075	0.095	1	0.345	0.515	2	0.054	0.0595	<1	11
	Max	0.2	0.3	1	0.54	0.82	2	0.071	0.081	<1	12
	Above Guideline	6	6	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCA3	n	2	2	2	2	2	2	2	2	2	2
	Min	0.05	0.07	1	0.26	0.34	2	0.047	0.052	<1	11
	Median	0.06	0.095	1	0.265	0.42	2	0.052	0.058	<1	11
	Max	0.07	0.12	1	0.27	0.5	2	0.057	0.064	<1	11
	Above Guideline	1	2	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCO1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.03	1	0.12	0.19	2	0.002	0.01	<1	8
	Median	0.055	0.07	2	0.305	0.465	2	0.03	0.04	1	10
	Max	0.2	0.33	2	0.8	0.98	2	0.144	0.192	1	11
	Above Guideline	6	8	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCO3	n	6	6	6	6	6	6	6	6	6	6
	Min	0.02	0.03	2	0.14	0.21	2	0.002	0.014	<1	8
	Median	0.03	0.05	2	0.28	0.355	2	0.005	0.0235	1	10

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Max	0.19	0.29	2	0.55	1.14	2	0.136	0.179	1	11
	Above Guideline	2	3	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DNE2	n	8	8	8	8	8	8	8	8	8	8
	Min	0.05	0.07	2	0.17	0.24	2	0.002	0.006	<1	7
	Median	0.07	0.105	2	0.215	0.355	2	0.006	0.011	1	8
	Max	0.15	0.33	2	0.38	0.77	2	0.064	0.08	1	9
	Above Guideline	5	8	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DNE6	n	12	12	12	12	12	12	12	12	12	12
	Min	0.06	0.07	1	0.17	0.28	1	0.003	0.006	<1	6
	Median	0.15	0.235	2	0.32	0.5	2	0.006	0.0135	1	8
	Max	0.59	0.54	2	0.52	0.72	2	0.056	0.064	1	9
	Above Guideline	12	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A30 Upper Nepean system – storages – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Microcystin LR+RR+YR (ug/L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)
DAV1	n	-	-	-	12	-	-	-	-	-
	Min	-	-	-	1	-	-	-	-	-
	Median	-	-	-	3.75	-	-	-	-	-
	Max	-	-	-	6.3	-	-	-	-	-
	Above Guideline	-	-	-	1	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DAV16	n	-	-	-	7	-	-	-	-	-
	Min	-	-	-	1.3	-	-	-	-	-
	Median	-	-	-	3.2	-	-	-	-	-
	Max	-	-	-	3.8	-	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DAV7	n	12	12	12	12	12	12	3	12	12
	Min	0.491	1630	389	2.1	0	0	<0.3	0	0
	Median	1.535	4620	882.75	4.5	656.5	0	<0.3	0	0
	Max	5.46	11100	1726	8.4	4310	0.012	<0.3	0	0
	Above Guideline	-	-	-	3	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DCA1	n	-	-	-	12	-	-	-	-	-
	Min	-	-	-	0.4	-	-	-	-	-
	Median	-	-	-	2.25	-	-	-	-	-
	Max	-	-	-	3.1	-	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DCA2	n	-	-	-	6	-	-	-	-	-
	Min	-	-	-	1.8	-	-	-	-	-
	Median	-	-	-	2.5	-	-	-	-	-
	Max	-	-	-	3.6	-	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Area Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Microcystin LR+RR+YR (ug/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
DCA3	n	-	-	-	2	-	-	-	-	-
	Min	-	-	-	3.1	-	-	-	-	-
	Median	-	-	-	3.8	-	-	-	-	-
	Max	-	-	-	4.5	-	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DCO1	n	-	-	-	12	-	-	-	-	-
	Min	-	-	-	2.1	-	-	-	-	-
	Median	-	-	-	5.85	-	-	-	-	-
	Max	-	-	-	16.4	-	-	-	-	-
	Above Guideline	-	-	-	10	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DCO3	n	-	-	-	6	-	-	-	-	-
	Min	-	-	-	2.7	-	-	-	-	-
	Median	-	-	-	5.3	-	-	-	-	-
	Max	-	-	-	14.2	-	-	-	-	-
	Above Guideline	-	-	-	3	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DNE2	n	-	-	-	8	-	-	-	-	-
	Min	-	-	-	0.9	-	-	-	-	-
	Median	-	-	-	4	-	-	-	-	-
	Max	-	-	-	12.5	-	-	-	-	-
	Above Guideline	-	-	-	3	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DNE6	n	-	-	-	12	-	-	-	-	-
	Min	-	-	-	0.8	-	-	-	-	-
	Median	-	-	-	6.9	-	-	-	-	-
	Max	-	-	-	16.9	-	-	-	-	-
	Above Guideline	-	-	-	7	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-

Table A31 Upper Nepean system – storages – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
DAV1	n	12	12	12
	Min	<1	<1	<1
	Median	1	3	4
	Max	1	6	6
	Above Guideline	-	-	-
	Below Guideline	-	-	-
	Below Guideline	-	-	-
DAV16	n	7	7	7
	Min	<1	<1	<1
	Median	<1	1	<1
	Max	<1	2	<1
	Above Guideline	-	-	-
	Below Guideline	-	-	-
	Below Guideline	-	-	-
DAV7	n	12	12	12
	Min	<1	<1	<1
	Median	<1	1	2
	Max	<1	3	7

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DCA1	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	1
	Max	1	4	2
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DCA2	n	6	6	6
	Min	<1	<1	<1
	Median	1	1	1
	Max	1	13	3
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DCA3	n	2	2	2
	Min	<1	15	1
	Median	<2	15	4
	Max	<3	15	7
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DCO1	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	1.5
	Max	1	10	2
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DCO3	n	6	6	6
	Min	<1	<1	<1
	Median	1	4	2
	Max	1	6	2
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DNE2	n	8	8	8
	Min	<1	<1	<1
	Median	1	3	3
	Max	1	4	14
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DNE6	n	12	12	12
	Min	1	1	1
	Median	5.5	3	2
	Max	10	29	25
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A32 Upper Nepean system – storages – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DAV1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.007	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.008	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.009	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DAV7	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.009	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0145	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	0.001
	Max	<0.001	0.02	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCA1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.006	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.007	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.008	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DCO1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.017	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.024	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.031	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DNE1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.009	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0095	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A33 Upper Nepean system – water filtration plants – physicochemical

	Statistic	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Temperature (Deg C)	Total Hardness (mg CaCO3/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	Alkalinity (mg CaCO3/L)	Conductivity @25 C - Field (mS/cm)
HMAC1	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	4.2	4.2	0.147	96.8	8.97	6.08	9.794	4	14	31	0.56	2	0.037
	Median	4.7	4.8	0.193	100.05	9.67	6.71	16.861	13	22	48.5	1.435	6.5	0.0825
	Max	8.2	8.1	0.432	104.7	11.32	7.69	20.888	13	52	120	9.65	11	0.096
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
HNED	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	4.5	4.5	0.172	76.7	7.21	6.36	11.1	9	17	37	1.2	7	0.049
	Median	5.5	5.45	0.2145	84.75	8.445	6.48	15.85	13	25	57	2.65	10	0.0745
	Max	8.5	8.2	0.417	99.7	9.6	6.79	19.83	13	41	92	18.53	17	0.084
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
IWFP-R	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	3.7	3.7	0.083	93.9	8.42	5.85	11.756	4	6	13	0.43	4	0.052
	Median	3.9	4	0.093	98.35	9.625	6.27	17.2095	4	7	15	0.79	5	0.063
	Max	5	5.3	0.16	102.3	10.66	7.15	20.68	11	15	34	2.55	10	0.07
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A34 Upper Nepean system – water filtration plants - metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HMAC1	n	12	12	12	12	12	12
	Min	0.04	0.06	0.28	0.4	0.009	0.014
	Median	0.115	0.135	0.385	0.475	0.015	0.0215
	Max	0.33	0.6	0.6	1.39	0.054	0.072
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
HNED	n	13	13	13	13	13	13
	Min	0.06	0.1	0.23	0.35	0.004	0.011
	Median	0.12	0.22	0.3	0.51	0.016	0.04
	Max	0.47	0.99	0.49	1.02	0.076	0.107
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
IWFP-R	n	12	12	12	12	12	12
	Min	0.01	0.03	0.03	0.1	0.002	0.005
	Median	0.025	0.045	0.07	0.165	0.0035	0.015
	Max	0.08	0.17	0.12	0.63	0.016	0.055
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A35 Upper Nepean system – water filtration plants – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
HMAC1	n	12	12	12	12	12	12	12	-
	Min	0.061	155	41.4	0	0	0	0	-
	Median	0.137	1078	104.55	69	0	0	0	-
	Max	1.23	3230	293.9	2340	0.001	0	0	-
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
HNED	n	13	13	13	13	13	13	13	1
	Min	0.082	317	75.1	0	0	0	0	<0.3
	Median	0.326	2020	181.3	345	0	0	0	<0.3
	Max	2.75	19900	1229	19120	0.089	0.085	2770	<0.3
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
IWFP-R	n	12	12	12	12	12	12	12	-
	Min	0.655	1420	358	0	0	0	0	-
	Median	1.55	3410	785.55	182	0	0	0	-
	Max	6.48	7630	1912	4150	0.021	0	0	-
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A36 Upper Nepean system – water filtration plants – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
HMAC1	n	12	12	12	12
	Min	<1	170	1	<1
	Median	1	650	4.5	13
	Max	1	2400	13	46
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
HNED	n	13	13	13	13
	Min	<1	4	<1	<1
	Median	3.5	22	10.5	1.5
	Max	12	3900	190	16
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
IWFP-R	n	12	12	12	12
	Min	<1	51	<1	<1
	Median	1	125	1	1
	Max	1	390	2	2
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A37 Upper Nepean system – water filtration plants – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)	Uranium Total (mg/L)
HMAC1	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.012	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.012	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.012	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-
HNED	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.01	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.01	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-
IWFP-R	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-

Table A38 Upper Nepean system – water filtration plants – pesticides

	Statistic	"2,4-D (ug/L)"	Atrazine (ug/L)	Chlorfenvinphos (E+Z) (ug/L)	Chlorpyrifos (ug/L)	Diuron (ug/L)	Fluproprate (ug/L)	Glyphosate (ug/L)	Hexazinone (ug/L)	MCPA (ug/L)	Picloram (ug/L)	Simazine (ug/L)	Triclopyr (ug/L)
HMAC1	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
HNED	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
IWFPR	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A39 Upper Nepean system – water filtration plants – Synthetic organic compounds & radionuclides

	Statistic	Benzene (ug/L)	Gross Alpha	Gross Beta	Vinyl chloride (ug/L)
HMAC1	n	4	1	1	4
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
HNED	n	4	1	1	4
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
IWFPR	n	4	1	1	4
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

3. Woronora system

Table A40 Woronora system – catchments – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
E6131	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	3	0.06	0.9	1	0.044	2	4	83	7.84	5.25	<1	1	8.73	7	0.12
	Median	24.5	0.1645	3.6	3.3	0.147	12.5	28.5	88.9	9.435	6.975	4.5	2	15.57	34	1.925
	Max	51	0.237	13.9	14.2	0.611	72	160	98.4	11.04	7.2	7	4	20.531	58	5.85
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	8	-	2	-	-	-	-	-
E677	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	1	0.078	1.4	1.6	0.029	<1	2	81.7	7.63	4.87	<1	1	7.50	4	0.12
	Median	2	0.172	3	3.3	0.081	4	8	88.8	9.61	5.17	3	2	14.54	15	0.59
	Max	3	0.194	10.6	10.6	0.389	33	71	97.2	11.04	6.93	4	3	19.22	21	4.76
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	6	-	10	-	-	-	-	-

Table A41 Woronora system – catchments – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
E6131	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	<0.01	<0.01	<0.001	<0.005	2.77
	Median	0.0155	0.004	0.05	0.05	0.002	0.009	4.62
	Max	0.02	0.05	0.3	0.35	0.004	0.017	4.81
	Above Guideline	4	1	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
E677	n	11	11	11	11	11	11	11
	Min	<0.005	<0.002	<0.01	<0.01	<0.001	<0.005	3.86
	Median	0.007	<0.002	0.06	0.06	0.002	0.008	4.65
	Max	0.012	<0.002	0.23	0.23	0.003	0.011	5.07
	Above Guideline	0	0	-	0	0	0	-
	Below Guideline	-	-	-	-	-	-	-

Table A42 Woronora system – catchments - metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
E6131	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	<0.01	1	0.05	0.28	1	0.026	0.026	<1	9
	Median	0.035	0.07	7	0.43	0.73	4	0.037	0.0435	1	20
	Max	0.36	0.66	15	0.64	1.82	5	0.132	0.143	1	22
	Above Guideline	2	6	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E677	n	11	11	11	11	11	11	11	11	11	11
	Min	0.04	0.04	<1	0.04	0.06	1	0.029	0.027	<1	11
	Median	0.07	0.1	1	0.1	0.22	3	0.036	0.038	<1	23

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Max	0.4	0.68	2	0.47	0.72	4	0.081	0.085	<1	27
	Above Guideline	7	9	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A43 Woronora system – catchments – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)
E6131	n	0	0	0	0	12	0	0	0	0
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.35	-	-	-	-
	Max	-	-	-	-	4.6	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
E677	n	0	0	0	0	11	0	0	0	0
	Min	-	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	-	0.4	-	-	-	-
	Max	-	-	-	-	0.7	-	-	-	-
	Above Guideline	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-

Table A44 Woronora system – catchments – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
E6131	n	12	12	12
	Min	<1	2	1
	Median	1	20	16
	Max	7	170	30
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E677	n	11	11	11
	Min	<1	<2	<3
	Median	1	12	9
	Max	1	170	51
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A45 Woronora system – storage – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
DWO_THMD	n	6	9	6	6	6	6	6	9	9	9	6	6	9	6	9
	Min	2	0.068	5.6	5.5	0.165	15	33	75.7	6.61	5.88	2	<1	12.92	7	0.49
	Median	7.5	0.11	5.8	5.9	0.173	17.5	37	99.9	9.03	6.58	3.5	1.5	18.61	13	0.88
	Max	8	0.113	9.1	7.9	0.38	42	98	107.8	9.73	6.87	4	2	23.67	13	2.89
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	3	-	-	-	-	-
DWO1	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5	0.064	5.4	5.5	0.166	16	34	61.4	5.78	5.64	2	<1	13.09	7	0.43
	Median	6	0.1075	6.05	6.15	0.1985	20	43.5	98.15	8.735	6.51	3	2	19.185	13	0.91
	Max	9	0.113	10.4	10.3	0.428	52	114	109.6	9.75	7.07	4	2	24.37	13	3.98
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	4	-	5	-	-	-	-	-

Table A46 Woronora system – storage – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
DWO_THMD	n	6	6	6	6	6	6	6
	Min	<0.005	0.016	0.15	0.2	<0.001	<0.005	2.25
	Median	0.022	0.062	0.175	0.24	<0.001	<0.005	2.565
	Max	0.033	0.079	0.34	0.39	<0.001	<0.005	2.92
	Above Guideline	2	6	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
DWO1	n	12	12	12	12	12	12	12
	Min	<0.005	0.015	0.08	0.14	<0.001	<0.005	2.12
	Median	0.02	0.064	0.18	0.24	0.002	0.006	2.585
	Max	0.035	0.094	0.46	0.51	0.004	0.009	2.84
	Above Guideline	6	12	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-

Table A47 Woronora system – storage – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
DWO_THMD	n	6	6	6	6	6	6	6	6	6	6
	Min	0.06	0.09	1	0.22	0.33	1	0.008	0.016	<1	9
	Median	0.08	0.12	2	0.225	0.36	2	0.0105	0.0195	1	13
	Max	0.28	0.42	2	0.33	0.59	2	0.035	0.041	1	14
	Above Guideline	6	6	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWO1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.06	0.09	1	0.18	0.32	1	0.008	0.016	<1	8

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Median	0.095	0.145	2	0.245	0.39	2	0.0155	0.022	1	13.5
	Max	0.39	0.48	2	0.49	0.66	2	0.046	0.048	1	15
	Above Guideline	12	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A48 Woronora system – storage – cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
DWO_THMD	n	0	0	0	6	0	0	0	0	0
	Min	-	-	-	0.5	-	-	-	-	-
	Median	-	-	-	5.9	-	-	-	-	-
	Max	-	-	-	7.3	-	-	-	-	-
	Above Guideline	-	-	-	4	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-
DWO1	n	0	0	0	12	0	0	0	0	0
	Min	-	-	-	0.5	-	-	-	-	-
	Median	-	-	-	4.25	-	-	-	-	-
	Max	-	-	-	11.4	-	-	-	-	-
	Above Guideline	-	-	-	4	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-

Table A49 Woronora system – storage – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
DWO_THMD	n	6	6	6
	Min	<1	<1	<1
	Median	1	8	2
	Max	1	8	3
	Above Guideline	-	-	-
	Below Guideline	-	-	-
DWO1	n	12	12	12
	Min	<1	<1	<1
	Median	1	2	1
	Max	2	9	6
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A50 Woronora system – storage – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DWO1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.013	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0155	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.018	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A51 Woronora system – water filtration plant – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
HWO1-A	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	1	0.065	5.5	5.6	0.167	16	34	81.3	6.98	5.64	13.53	4	0.6
	Median	5.5	0.108	6	5.95	0.1995	21	46.5	91.15	8.75	6.375	17.98	13	1.255
	Max	8	0.116	10.7	11.5	0.443	52	118	99.4	9.52	6.64	22.5	23	4.7
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A52 Woronora system – water filtration plant - metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HWO1-A	n	12	12	12	12	12	12
	Min	0.06	0.09	0.21	0.35	0.01	0.019
	Median	0.11	0.165	0.255	0.39	0.0175	0.0235
	Max	2.08	0.49	0.59	0.65	0.044	0.049
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A53 Woronora system – water filtration plant - cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
HWO1-A	n	12	12	12	12	12	12	12	0
	Min	0.021	35	10.7	0	0	0	0	-
	Median	0.2215	1920	155.7	318	0	0	0	-
	Max	1	4190	539.6	1380	0.004	0	0	-
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A54 Woronora system – water filtration plant - indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
HWO1-A	n	12	12	12	12
	Min	<1	8	<1	<1
	Median	1	46	4	1
	Max	1	440	10	1
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A55 Woronora system – water filtration plant – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)	Uranium Total (mg/L)
HWO1-A	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.012	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.012	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.012	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-

Table A56 Woronora system – water filtration plant - pesticides

	Statistic	"2,4-D (ug/L)"	Atrazine (ug/L)	Chlorfenvinphos (E+Z) (ug/L)	Chlorpyrifos (ug/L)	Duron (ug/L)	Fluproponate (ug/L)	Glyphosate (ug/L)	Hexazinone (ug/L)	MCPA (ug/L)	Picloram (ug/L)	Simazine (ug/L)	Triolopyr (ug/L)
HWO1-A	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A57 Woronora system – water filtration plant – synthetic organic compounds & radionuclides

	Statistic	Benzene (ug/L)	Gross Alpha	Gross Beta	Vinyl chloride (ug/L)
HWO1-A	n	4	1	1	4
	Min	<0.1	<0.05	<0.10	<0.3
	Median	<0.1	<0.05	<0.10	<0.3
	Max	<0.1	<0.05	<0.10	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

4. Blue Mountains System

Table A58 Blue Mountains system – storages – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
DGC1	n	12	12	12	12	12	12	12	12	12	12	11	12	12	12	12
	Min	<1	0.024	2.7	3.1	0.118	10	24	85.3	7.33	4.28	<1	<1	6.84	<1	0.93
	Median	2	0.0285	4.35	4.35	0.204	22.5	51.5	91.9	8.795	5.085	1	2	14.155	<1	1.48
	Max	5	0.031	7.5	7.6	0.313	37	83	99.9	10.67	5.54	1	5	18.71	<1	3.44
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	3	-	6	-	-	-	-	-
DLC1	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Min	9	0.042	2.3	2.4	0.091	9	21	85.3	7	6.23	<1	<1	8.27	10	0.7
	Median	13.5	0.055	3.25	3.35	0.12	13	28.5	94.7	8.85	6.715	<1	2	16.055	13.5	1.345
	Max	17	0.064	5.9	5.8	0.179	18	39	111.9	10.04	7.24	<1	4	20.32	15	2.7
	Above Guideline	-	-	-	-	-	-	-	1	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-
DTC1	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	5	0.033	3.7	3.7	0.114	11	24	80.8	7.3	6.18	<1	<1	7.59	2	0.47
	Median	6.5	0.038	4.3	4.35	0.132	13	28	94.3	8.505	6.545	1	1	15.095	5	1.02
	Max	16	0.049	5.8	5.9	0.183	19	43	104.4	10.3	6.78	1	3	20.56	12	1.74
	Above Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-

Table A59 Blue Mountains system – storages – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
DGC1	n	11	11	11	11	11	11	11
	Min	<0.005	<0.002	0.06	0.08	<0.001	<0.005	3.32
	Median	0.008	0.012	0.11	0.12	0.003	0.008	4.29
	Max	0.011	0.017	0.18	0.18	0.003	0.012	4.58
	Above Guideline	1	5	-	0	0	2	-
	Below Guideline	-	-	-	-	-	-	-
DLC1	n	6	6	6	6	6	6	6
	Min	<0.005	0.012	0.08	0.12	<0.001	0.005	2.29
	Median	0.009	0.037	0.12	0.14	0.002	0.0075	3.72
	Max	0.023	0.067	0.35	0.42	0.003	0.01	4.68
	Above Guideline	2	6	-	1	0	0	-
	Below Guideline	-	-	-	-	-	-	-
DTC1	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.12	0.12	<0.001	<0.005	2.05
	Median	0.007	0.016	0.165	0.17	0.002	0.007	3.01
	Max	0.02	0.047	0.27	0.31	0.002	0.011	4.21
	Above Guideline	3	4	-	0	0	1	-
	Below Guideline	-	-	-	-	-	-	-

Table A60 Blue Mountains system – storages – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
DGC1	n	12	12	11	12	12	11	12	12	11	11
	Min	0.07	0.13	<1	0.1	0.27	<1	0.009	0.01	<1	2
	Median	0.14	0.23	<1	0.2	0.45	<1	0.014	0.014	<1	4
	Max	0.24	0.31	<1	0.33	0.6	<1	0.021	0.021	<1	4
	Above Guideline	12	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DLC1	n	6	6	6	6	6	6	6	6	6	6
	Min	0.02	0.04	4	0.14	0.3	<1	0.002	0.048	<1	3
	Median	0.035	0.055	5.5	0.23	0.37	<1	0.0745	0.082	<1	4
	Max	0.06	0.12	6	0.38	0.6	<1	0.153	0.169	<1	4
	Above Guideline	1	3	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DTC1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.05	1	0.12	0.18	<1	0.003	0.011	<1	2
	Median	0.065	0.085	2	0.145	0.245	1	0.009	0.0165	<1	4
	Max	0.08	0.12	3	0.23	0.4	1	0.044	0.061	<1	5
	Above Guideline	10	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A61 Blue Mountains system – storages – cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Areal Standard Unit (Cyano)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
DGC1	n	0	0	0	0	11	0	0	0	0	0
	Min	-	-	-	-	0.8	-	-	-	-	-
	Median	-	-	-	-	5.4	-	-	-	-	-
	Max	-	-	-	-	8.3	-	-	-	-	-
	Above Guideline	-	-	-	-	6	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DLC1	n	0	0	0	0	6	0	0	0	0	0
	Min	-	-	-	-	1.5	-	-	-	-	-
	Median	-	-	-	-	2.2	-	-	-	-	-
	Max	-	-	-	-	17.7	-	-	-	-	-
	Above Guideline	-	-	-	-	2	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DTC1	n	0	0	0	0	12	0	0	0	0	0
	Min	-	-	-	-	2.2	-	-	-	-	-
	Median	-	-	-	-	5.95	-	-	-	-	-
	Max	-	-	-	-	12.7	-	-	-	-	-
	Above Guideline	-	-	-	-	7	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A62 Blue Mountains system – storages – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
DGC1	n	11	8	11	11
	Min	<1	140	<1	<1
	Median	3	595	14	9
	Max	12	2400	55	40
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DLC1	n	6	4	6	6
	Min	<1	62	<1	<1
	Median	1.5	450	6.5	3
	Max	2	870	14	7
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DTC1	n	12	9	12	12
	Min	<1	18	<1	<1
	Median	1	460	3	3
	Max	2	6900	41	15
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A63 Blue Mountains system – storages – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DTC1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.006	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.006	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.006	<0.001	<0.05	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A64 Blue Mountains system – water filtration plant – physicochemical

	Statistic	Alkalinity (mg CaCO3/L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Temperature (Deg C)	Total Hardness (mg CaCO3/L)	Turbidity Field (NTU)
HCSR	n	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	6	0.034	3.6	3.6	0.112	11	24	83.1	7.44	6.1	8.2	2	0.98
	Median	8	0.04	4.35	4.35	0.1325	13	28.5	94.75	8.55	6.68	14.98	5	1.565
	Max	12	0.049	6	5.9	0.182	19	43	103.3	10.4	7.34	19.76	12	2.79
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A65 Blue Mountains system – water filtration plant – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HCSR	n	12	12	12	12	12	12
	Min	0.02	0.05	0.12	0.19	0.001	0.012
	Median	0.06	0.09	0.145	0.24	0.0065	0.019
	Max	0.08	0.12	0.22	0.34	0.035	0.064
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A66 Blue Mountains system – water filtration plant - cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)
HCSR	n	12	12	12	12	12	12	12
	Min	0.187	898	104	0	0	0	0
	Median	0.902	7750	390	2040	0.002	0	0
	Max	10.45	20920	6154	10370	0.011	0	0
	Above Guideline	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-

Table A67 Blue Mountains system – water filtration plant - indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
HCSR	n	12	12	12	12
	Min	<1	20	<1	<1
	Median	1.5	150	5	4
	Max	3	10000	11	13
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A68 Blue Mountains system – water filtration plant – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)	Uranium Total (mg/L)
HCSR	n	4	1	1	1	1	4	1	4	1	1	1
	Min	<0.001	0.009	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.009	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.009	<0.001	0.02	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-

Table A69 Blue Mountains system – water filtration plant - pesticides

	Statistic	"2,4-D (ug/L)"	Atrazine (ug/L)	Chlorfenvinphos (E+Z) (ug/L)	Chlorpyrifos (ug/L)	Diuron (ug/L)	Fluproprionate (ug/L)	Glyphosate (ug/L)	Hexazinone (ug/L)	MCPA (ug/L)	Picloram (ug/L)	Simazine (ug/L)	Triclopyr (ug/L)
HCSR	n	4	4	4	4	4	4	4	4	4	4	4	4
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A70 Blue Mountains system – water filtration plant – synthetic organic compounds & radionuclides

	Statistic	Benzene (ug/L)	Gross Alpha	Gross Beta	Vinyl chloride (ug/L)
HCSR	n	4	1	1	4
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

5. Shoalhaven system

Table A71 Shoalhaven system – catchments – physicochemical

	Statistic	Alkalinity (mg CaCO3/L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO3/L)	Turbidity Field (NTU)
E300	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	10	0.074	0.4	0.6	0.035	2	4	81	7.52	6.2	<1	<1	7.253	16	1.56
	Median	14	0.0785	1.6	1.8	0.082	4.5	11	85	8.835	6.92	1.5	6	13.185	20	3.8
	Max	16	0.091	10.6	10.4	0.262	16	38	91.8	10.77	12.2	2	14	20.382	22	13.89

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
	Above Guideline	-	0	-	-	-	-	-	0	-	2	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	11	-	2	-	-	-	-	-
E301	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	11	0.075	0.4	0.4	0.035	2	4	71.99	8.3	6	<1	<1	6.862	16	1.8
	Median	14	0.0775	1.15	1.25	0.066	4	8.5	89.75	9.17	6.82	1	2	14.179	19	3.46
	Max	18	0.095	3.6	3.4	0.103	8	18	95.9	10.33	7.71	2	4	18.981	22	6.72
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	6	-	1	-	-	-	-	-
E520	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	12	0.085	2.6	2.6	0.102	10	21	86.5	7.73	6.26	4	2	8.971	22	1.13
	Median	20	0.137	5.8	5.6	0.253	26	59	100.2	9.81	6.94	6	4	17.527	37	9.2
	Max	27	0.192	12.8	12.8	0.371	41	93	104.6	11.76	7.49	9	8	20.905	44	42.88
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	3	-	1	-	-	-	-	-
E7021	n	11	12	11	11	11	11	11	12	12	12	11	11	12	11	12
	Min	11	0.058	2.4	<1	0.13	<1	28	78.3	7.54	6.4	<1	2	7.021	9	1.9
	Median	17	0.0955	4.8	4.9	0.269	31	73	93.6	9.7	6.69	2	3	15.41	18	3.93
	Max	19	0.107	11.9	13.4	1.03	104	238	102.22	11.36	6.85	3	218	22.317	29	111.95
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-
E706	n	10	11	10	10	10	10	10	11	11	11	10	10	11	10	11
	Min	12	0.068	1.6	<1	0.087	<1	17	83.7	7.88	5.04	<1	2	6.767	16	2.12
	Median	23	0.11	3.4	3.1	0.152	16	36	97.1	9.52	6.9	2.5	3	15.545	25	3.26
	Max	26	0.124	11.6	13.3	0.991	85	190	105.32	11.97	7.39	4	159	23.374	36	122.51
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	2
	Below Guideline	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-
E7061	n	11	12	11	11	11	11	11	12	12	12	11	11	12	11	12
	Min	13	0.061	1.3	1.3	0.068	5	11	86.4	7.51	6.2	<1	<1	7.021	16	1.34
	Median	16	0.0905	3.7	3.8	0.145	14	31	93.15	9.4	6.715	2	2	16.324	18	3.545
	Max	18	0.121	9.3	9.8	1.16	66	147	101.11	11.49	7.11	3	163	27.304	25	156.78
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-
E822	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	12	0.049	1.1	1	0.055	5	11	84.8	7.97	5.77	<1	<1	5.82	11	1.55
	Median	14	0.0585	2.1	1.95	0.102	11	25.5	90.7	9.4	6.915	<1	2	13.615	13	2.15
	Max	19	0.096	4.2	4.5	0.202	22	52	95.6	11.41	7.5	<1	5	18.317	13	5.1
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	5	-	2	-	-	-	-	-
E8311	n	12	12	12	12	12	12	12	12	12	12	11	11	12	11	12
	Min	5	0.043	2.3	2.4	0.087	7	15	91.2	8.18	6.18	<1	<1	5.507	4	1.8
	Median	9	0.074	4.25	4.15	0.212	20	45	94.6	8.96	6.795	2	2	15.962	13	2.92
	Max	34	0.102	8.8	9	0.41	50	101	98.1	12.37	7.64	3	19	22.32	31	26.1
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	0	-	2	-	-	-	-	-
E847	n	11	12	11	11	11	11	11	12	12	12	11	11	12	11	12
	Min	23	0.061	3.8	3.5	0.179	18	41	97.5	8.6	6.58	1	2	8.545	22	3.12
	Median	31	0.111	7.6	7.9	0.342	38	85	100.35	9.91	7.275	3	8	15.838	34	6.385
	Max	39	0.172	18.9	17.8	1.12	127	306	105.6	11.67	7.69	6	23	24.332	47	30.57
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	2
	Below Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-
E860	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	25	0.07	2.8	3	0.139	14	33	92.6	8.31	6.88	<1	1	5.493	18	2.46
	Median	29.5	0.0825	5.25	5.3	0.2625	27.5	60.5	95.45	9.7	7.245	2	4.5	15.375	23	5.48
	Max	32	0.128	10.2	10.1	0.554	50	108	98.7	11.98	7.53	2	14	20.679	36	17.46
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-
E861	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
	Min	22	0.069	3.2	3.1	0.158	16	37	92	8.28	6.92	<1	1	6.746	25	2.58
	Median	30	0.1	5.45	5.3	0.259	25.5	57.5	96.7	9.635	7.43	1	4.5	16.827	27	4.675
	Max	41	0.127	14.6	13.8	0.691	76	165	138.6	14.88	8.81	2	30	22.665	34	28.11
	Above Guideline	-	0	-	-	-	-	-	1	-	1	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-
E890	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	23	0.162	11.2	11.4	0.415	32	72	35.9	3.28	6.07	<1	1	5.605	30	4.06
	Median	33.5	0.204	16.05	15.85	0.834	80	171	64	6.42	6.72	2	2.5	14.909	42	5.475
	Max	54	0.336	25.4	25.1	1.39	163	360	85.5	10.32	7.18	2	18	21.044	49	31.39
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	1
E891	Below Guideline	-	-	-	-	-	-	-	12	-	3	-	-	-	-	-
	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Min	97	0.268	4.5	4.6	0.2	18	38	44.6	4.24	7.05	3	<1	5.621	112	0.79
	Median	129	0.408	11.05	11.1	0.4605	40	85	76.2	7.945	7.33	5	8	15.572	136	5.81
	Max	141	0.446	22.8	22.3	1.11	114	258	109.6	12.18	7.77	7	29	20.351	152	40.18
	Above Guideline	-	9	-	-	-	-	-	0	-	0	-	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	8	-	0	-	-	-	-	-

Table A72 Shoalhaven system – catchments – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
E300	n	12	12	12	12	12	12	12
	Min	0.006	0.782	<0.02	0.84	0.002	0.008	4.54
	Median	0.0225	1.66	0.195	1.89	0.003	0.024	5.65
	Max	0.251	2.28	1.12	3.01	0.141	0.317	6.56
	Above Guideline	8	12	-	12	1	7	-
E301	Below Guideline	-	-	-	-	-	-	-
	n	12	12	12	12	12	12	12
	Min	<0.005	0.641	<0.01	0.6	0.001	<0.005	4.13
	Median	0.012	0.863	0.03	0.875	0.003	0.015	5.745
	Max	0.028	1.95	0.11	2.02	0.005	0.023	6.83
E520	Above Guideline	5	12	-	12	0	1	-
	Below Guideline	-	-	-	-	-	-	-
	n	11	11	11	11	11	11	11
	Min	<0.005	0.023	0.08	0.14	0.001	0.009	6.47
	Median	0.027	0.09	0.18	0.29	0.004	0.019	7.13
E7021	Max	0.052	0.143	0.69	0.72	0.019	0.078	9.14
	Above Guideline	8	11	-	7	1	4	-
	Below Guideline	-	-	-	-	-	-	-
	n	11	11	11	11	11	11	11
	Min	<0.005	0.01	0.07	0.11	0.005	0.017	6.85
E706	Median	0.022	0.044	0.25	0.26	0.01	0.035	13
	Max	0.041	0.102	0.79	0.87	0.072	0.254	15.8
	Above Guideline	9	9	-	6	2	10	-
	Below Guideline	-	-	-	-	-	-	-
	n	10	10	10	10	10	10	10
	Min	<0.005	0.077	0.04	0.27	0.004	0.021	6.6
	Median	0.03	0.179	0.13	0.34	0.0105	0.031	9.8
	Max	0.086	0.256	0.67	0.77	0.093	0.209	11.6

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
	Above Guideline	7	10	-	10	3	10	-
	Below Guideline	-	-	-	-	-	-	-
E7061	n	12	12	12	12	12	12	12
	Min	<0.005	0.02	0.02	0.07	0.002	0.01	7.15
	Median	0.015	0.049	0.08	0.14	0.003	0.018	8.425
	Max	0.072	0.142	0.49	0.56	0.03	0.182	9.84
	Above Guideline	7	12	-	2	1	5	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E822	n	12	12	12	12	12	12	12
	Min	<0.005	0.02	0.02	0.07	0.002	0.007	7.69
	Median	0.01	0.0495	0.06	0.11	0.005	0.0135	9.525
	Max	0.018	0.098	0.14	0.21	0.008	0.024	11
	Above Guideline	1	12	-	0	0	2	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E8311	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.06	0.06	<0.001	<0.005	3.05
	Median	0.017	0.003	0.125	0.125	0.003	0.011	4.79
	Max	0.033	0.059	0.26	0.26	0.005	0.017	8.87
	Above Guideline	6	1	-	2	0	0	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E847	n	11	11	11	11	11	11	11
	Min	0.006	0.006	0.13	0.17	0.004	0.006	7.98
	Median	0.016	0.043	0.22	0.29	0.008	0.03	10.2
	Max	0.05	0.098	1.1	1.14	0.013	0.088	12.3
	Above Guideline	6	9	-	7	0	9	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E860	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.09	0.12	0.005	0.019	9.6
	Median	0.011	0.017	0.185	0.21	0.01	0.0325	14.2
	Max	0.019	0.056	0.61	0.67	0.013	0.059	16.8
	Above Guideline	1	6	-	4	0	11	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E861	n	12	12	12	12	12	12	12
	Min	0.006	0.009	0.1	0.13	0.004	0.016	6.09
	Median	0.0175	0.028	0.195	0.23	0.007	0.0255	12.75
	Max	0.034	0.06	0.7	0.73	0.01	0.04	14.6
	Above Guideline	8	9	-	4	0	9	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E890	n	12	12	12	12	12	12	12
	Min	0.006	<0.002	0.42	0.48	0.002	0.015	4.55
	Median	0.023	0.0225	0.755	0.77	0.0065	0.04	7.05
	Max	0.036	0.055	1.23	1.28	0.009	0.079	9.92
	Above Guideline	9	5	-	12	0	10	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-
E891	n	12	12	12	12	12	12	12
	Min	0.005	0.005	0.24	0.59	<0.001	0.011	1.63
	Median	0.016	0.114	0.71	1.175	0.022	0.067	19.35
	Max	0.044	1.08	1.81	1.86	0.032	0.112	25.9
	Above Guideline	7	9	-	12	6	11	-
	Below Guideline	-	-	-	-	-	-	-
		-	-	-	-	-	-	-

Table A73 Shoalhaven system – catchments – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
E300	n	12	12	12	12	12	12	12	12	12	12
	Min	0.01	0.03	3	0.08	0.26	2	0.012	0.018	<1	2
	Median	0.04	0.15	3	0.225	0.64	3	0.0405	0.054	2	6
	Max	0.11	0.6	4	0.61	1.45	3	0.066	0.118	2	7
	Above Guideline	3	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E301	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	0.03	3	0.08	0.18	2	0.012	0.013	<1	1
	Median	0.02	0.075	3.5	0.2	0.575	2	0.023	0.03	<1	6
	Max	0.06	0.16	5	0.32	0.92	3	0.051	0.056	<1	7
	Above Guideline	1	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E520	n	11	11	11	11	11	11	11	11	11	11
	Min	0.04	0.06	4	0.26	0.44	3	0.006	0.012	1	9
	Median	0.09	0.2	5	0.4	0.63	6	0.021	0.045	1	15
	Max	0.2	0.42	6	1.09	1.57	7	0.054	0.093	2	18
	Above Guideline	8	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E7021	n	11	11	11	11	11	11	11	11	11	11
	Min	<0.005	0.08	2	0.21	0.47	1	0.012	0.014	<1	7
	Median	0.1	0.22	4	0.44	0.66	2	0.016	0.022	1.5	10
	Max	0.51	4.51	5	0.54	5.22	4	0.046	0.245	2	12
	Above Guideline	10	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E706	n	10	10	10	10	10	10	10	10	10	10
	Min	<0.005	0.06	3	0.2	0.42	2	0.013	0.015	<1	6
	Median	0.06	0.15	5	0.415	0.695	3	0.019	0.025	2	10
	Max	0.41	3.18	6	0.61	4.13	5	0.04	0.129	3	12
	Above Guideline	6	10	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E7061	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.06	3	0.17	0.32	2	0.013	0.014	<1	5
	Median	0.06	0.2	4	0.33	0.59	2	0.017	0.024	2	9
	Max	0.38	4.21	5	0.64	5.15	3	0.079	0.183	2	10
	Above Guideline	7	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E822	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.05	1	0.11	0.22	2	0.003	0.004	<1	6
	Median	0.035	0.08	2	0.22	0.455	2	0.0065	0.011	<1	6
	Max	0.07	0.23	2	0.34	0.8	2	0.011	0.022	<1	9
	Above Guideline	4	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E8311	n	12	12	12	12	12	12	12	12	12	12
	Min	0.02	0.08	<1	0.14	0.28	1	0.002	0.006	<1	5
	Median	0.09	0.19	1	0.29	0.56	2.5	0.0065	0.0095	1	8
	Max	0.31	0.52	6	0.44	0.66	4	0.012	0.021	1	12
	Above Guideline	10	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E847	n	11	11	11	11	11	11	11	11	11	11
	Min	0.05	0.07	4	0.25	0.42	3	0.004	0.008	1	7
	Median	0.14	0.26	6	0.57	0.92	4	0.012	0.024	1	11
	Max	0.9	1.67	9	0.96	1.99	6	0.086	0.049	2	16
	Above Guideline	10	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E860	n	12	12	12	12	12	12	12	12	12	12
	Min	0.04	0.12	4	0.31	0.57	2	0.004	0.016	<1	6
	Median	0.09	0.215	5	0.465	1.035	2.5	0.015	0.028	1	7.5
	Max	0.29	0.69	8	0.65	1.28	4	0.021	0.04	2	12
	Above Guideline	11	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E861	n	12	12	12	12	12	12	12	12	12	12

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
	Min	0.02	0.11	4	0.33	0.58	3	0.004	0.011	<1	7
	Median	0.08	0.205	6	0.45	0.88	3.5	0.0125	0.0215	1	9.5
	Max	0.54	0.85	7	0.84	1.29	4	0.018	0.033	1	12
	Above Guideline	10	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
E890	n	12	12	12	12	12	12	12	12	12	12
	Min	0.04	0.07	4	0.56	0.83	5	0.016	0.022	1	19
	Median	0.09	0.15	7	0.985	1.69	6	0.0625	0.0725	2	23.5
	Max	0.48	1.3	8	2.72	3.87	7	1.56	1.66	3	32
	Above Guideline	9	12	-	-	-	-	0	0	-	-
E891	n	12	12	12	12	12	12	12	12	12	12
	Min	<0.01	<0.01	22	0.03	0.08	14	0.005	0.009	2	22
	Median	0.03	0.09	29	0.525	1.47	16	0.1	0.1505	3	29
	Max	0.18	0.96	33	1.08	5.2	18	0.189	0.974	4	32
	Above Guideline	1	6	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A74 Shoalhaven system – catchments – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)
E300	n	4	4	4	12	4	4	4	4
	Min	0.667	1730	190	1.1	606	0.008	0	0
	Median	0.7645	4865	307	2.95	2870	0.0085	0	0
	Max	1.24	11200	751.3	23.5	4710	0.01	0.01	468
	Above Guideline	-	-	-	4	-	-	-	-
E301	n	0	0	0	12	0	0	0	0
	Min	-	-	-	0.8	-	-	-	-
	Median	-	-	-	1.3	-	-	-	-
	Max	-	-	-	2.8	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
E520	n	3	3	3	11	3	3	3	3
	Min	1.64	5700	817.6	0.6	0	0	0	0
	Median	1.96	6830	832.1	2	2900	0.004	0	0
	Max	5.39	10210	2543	38.5	5890	0.011	0	0
	Above Guideline	-	-	-	3	-	-	-	-
E7021	n	2	2	2	11	2	2	2	2
	Min	0.083	1090	53.7	0.6	590	0.004	0	0
	Median	0.1245	2975	98.25	1.2	2545	0.0135	0	0
	Max	0.166	4860	142.8	18	4500	0.023	0	0
	Above Guideline	-	-	-	2	-	-	-	-
E706	n	1	1	1	10	1	1	1	1
	Min	0.718	345	167.9	1.1	0	0	0	0
	Median	0.718	345	167.9	2.55	0	0	0	0
	Max	0.718	345	167.9	17.3	0	0	0	0
	Above Guideline	-	-	-	1	-	-	-	-
E7061	n	1	1	1	12	1	1	1	1
	Min	1.04	3230	407.3	0.4	2520	0.039	0.036	312

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Area Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Median	1.04	3230	407.3	0.7	2520	0.039	0.036	312
	Max	1.04	3230	407.3	14.8	2520	0.039	0.036	312
	Above Guideline	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E822	n	0	0	0	12	0	0	0	0
	Min	-	-	-	0.5	-	-	-	-
	Median	-	-	-	0.75	-	-	-	-
	Max	-	-	-	2.9	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E8311	n	0	0	0	12	0	0	0	0
	Min	-	-	-	0.4	-	-	-	-
	Median	-	-	-	1.1	-	-	-	-
	Max	-	-	-	2.7	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E847	n	2	2	2	11	2	2	2	2
	Min	0.454	5120	415.9	0.7	138	0	0	0
	Median	0.747	8015	525.8	1.5	724	0.0005	0	0
	Max	1.04	10910	635.7	5.2	1310	0.001	0	0
	Above Guideline	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E860	n	2	2	2	12	2	2	2	2
	Min	0.389	552	247.9	1	0	0	0	0
	Median	0.7795	2226	432.2	1.35	303.5	0.0025	0	0
	Max	1.17	3900	616.5	9.6	607	0.005	0	0
	Above Guideline	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E861	n	2	2	2	12	2	2	2	2
	Min	0.089	899	83.4	0.9	0	0	0	0
	Median	0.446	1039.5	202.35	2.85	0	0	0	0
	Max	0.803	1180	321.3	7.3	0	0	0	0
	Above Guideline	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E890	n	3	3	3	12	3	3	3	3
	Min	1.71	4360	587.8	0.9	2080	0.004	0	0
	Median	2.39	5890	795.4	2.35	3730	0.008	0	0
	Max	3.37	11660	1240	9.2	8980	0.018	0	0
	Above Guideline	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E891	n	10	10	10	12	10	10	10	10
	Min	0.377	794	185.6	2.5	0	0	0	0
	Median	1.38	2880	708.35	10.95	294	0.0015	0	0
	Max	3.12	5920	1484	57.9	1730	0.014	0.01	104
	Above Guideline	-	-	-	10	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A75 Shoalhaven system – catchments – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
E300	n	12	12	12
	Min	<1	11	2
	Median	9	295	31
	Max	88	24000	1600
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E301	n	12	12	12
	Min	<1	3	6
	Median	9	113.5	32.5
	Max	40	310	260
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E520	n	11	11	11
	Min	<1	1	2
	Median	3	11	8.5
	Max	5	610	300
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E7021	n	11	11	11
	Min	1	47	18
	Median	9	310	90
	Max	230	2800	3600
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E706	n	10	10	10
	Min	2	160	28
	Median	5	630	97.5
	Max	280	8700	5700
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E7061	n	12	12	12
	Min	1	19	14
	Median	6	66	77.5
	Max	140	3400	5400
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E822	n	12	12	12
	Min	1	10	4
	Median	4	26	38
	Max	10	820	680
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E8311	n	12	12	12
	Min	<1	1	1
	Median	5	33.5	21
	Max	14	870	340
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E847	n	11	11	11
	Min	<1	<1	2
	Median	10	50	28
	Max	80	460	230
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E860	n	12	12	12
	Min	2	10	7
	Median	4	38	56.5
	Max	43	2900	600
	Above Guideline	-	-	-

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Below Guideline	-	-	-
E861	n	12	12	12
	Min	<1	1	<1
	Median	5	13	19
	Max	27	2000	360
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E890	n	12	12	12
	Min	<1	4	7
	Median	5.5	26	33
	Max	40	5200	2400
	Above Guideline	-	-	-
	Below Guideline	-	-	-
E891	n	12	12	12
	Min	1	2	<1
	Median	5	61.5	51.5
	Max	68	3400	650
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Table A76 Shoalhaven system – storages – physicochemical

	Statistic	Alkalinity (mg CaCO3/L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO3/L)	Turbidity Field (NTU)
DBP1	n	7	9	7	7	7	7	7	9	9	9	7	7	9	7	9
	Min	14	0.079	3.3	3.3	0.105	10	21	78.9	7.14	6.68	2	2	10.339	18	2.83
	Median	18	0.099	4.3	4.7	0.181	18	41	96.2	8.71	7.02	2	8	17.374	18	5.39
	Max	22	0.107	6.2	5.9	0.264	35	80	103.3	10.84	7.44	4	8	24.323	25	9.64
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	0	-	-	-	-	-
DFF6	n	12	11	12	12	12	12	12	11	11	11	12	12	11	12	11
	Min	11	0.059	3.8	3.9	0.098	7	15	89.4	8.3	6.84	1	4	7.958	16	3.01
	Median	14	0.075	5.05	5.3	0.141	9.5	20.5	94.2	9.64	7.29	2	6	14.48	16	4.39
	Max	17	0.081	12.8	13.3	0.192	17	39	101.8	11.43	7.62	3	8	22.871	18	8.65
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	1	-	0	-	-	-	-	-
DTA1	n	13	11	12	12	12	12	12	11	11	11	13	12	11	12	11
	Min	13	0.082	4.9	4.7	0.248	24	54	85	7.83	6.78	2	2	10.111	18	2.21
	Median	28	0.123	7.45	7.35	0.3245	36	80.5	93	8.77	7.11	3	3.5	16.745	31	7.76
	Max	39	0.16	9.6	10.6	0.406	47	102	104	10.24	7.58	6	5	26.428	47	11.21
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	3	-	0	-	-	-	-	-
DTA5	n	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
	Min	22	0.002	4.2	3.7	0.147	14	30	70.3	6.6	6.6	2	3	9.193	27	2.43
	Median	32	0.119	8	8.2	0.39	40	88	96.5	9.22	7.25	2	4	15.273	31	5.9
	Max	48	0.144	17.5	16.7	0.901	93	211	101.1	11.29	7.53	5	62	26.376	49	87.43
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	2
	Below Guideline	-	-	-	-	-	-	-	3	-	0	-	-	-	-	-
DTA8	n	12	13	12	12	12	12	12	13	13	13	12	12	13	12	13
	Min	14	0.088	1.9	2	0.117	12	28	69.2	6.22	6.41	2	3	9.978	18	2.67
	Median	18	0.102	4.1	4	0.189	18.5	42	91.4	8.3	6.82	3	5	19.754	22	4.31
	Max	22	0.117	16.9	16.4	0.392	46	105	100.4	10.8	7.18	5	13	24.97	31	8.24

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Suspended Solids (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	6	-	4	-	-	-	-	-
DWI1	n	13	11	13	13	13	13	13	11	11	11	13	13	11	13	11
	Min	8	0.06	4.5	4.8	0.149	13	28	89.3	8	6.85	1	3	7.769	16	2.37
	Median	13	0.065	5.1	5.4	0.176	15	33	93.8	9.55	7.28	2	5	15.742	16	3.42
	Max	17	0.072	8.6	8.9	0.301	30	66	105.1	10.95	7.89	2	6	23.332	20	6.03
	Above Guideline	-	0	-	-	-	-	-	0	-	0	-	-	-	-	0
	Below Guideline	-	-	-	-	-	-	-	2	-	0	-	-	-	-	-

Table A77 Shoalhaven system – storages – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
DBP1	n	7	7	7	7	7	7	7
	Min	0.01	0.049	0.11	0.23	<0.001	0.01	0.34
	Median	0.022	0.136	0.25	0.41	0.003	0.026	4.26
	Max	0.06	0.257	0.36	0.5	0.006	0.037	8.02
	Above Guideline	6	7	-	6	1	6	-
	Below Guideline	-	-	-	-	-	-	-
DFF6	n	12	12	12	12	12	12	12
	Min	0.006	0.05	0.25	0.49	<0.001	0.013	0.06
	Median	0.0325	0.19	0.38	0.58	0.002	0.019	0.3
	Max	0.107	0.309	0.52	0.64	0.002	0.033	1.38
	Above Guideline	10	12	-	12	0	12	-
	Below Guideline	-	-	-	-	-	-	-
DTA1	n	12	12	12	12	12	12	12
	Min	0.008	0.02	0.06	0.21	0.002	0.012	4
	Median	0.022	0.086	0.33	0.405	0.004	0.0245	8.06
	Max	0.05	0.146	0.48	0.53	0.009	0.048	10
	Above Guideline	10	11	-	11	3	12	-
	Below Guideline	-	-	-	-	-	-	-
DTA5	n	12	12	12	12	12	12	12
	Min	<0.005	0.018	0.11	0.13	<0.001	0.014	7.72
	Median	0.0215	0.051	0.36	0.45	0.004	0.025	9.08
	Max	0.065	0.23	0.86	0.9	0.009	0.11	13.1
	Above Guideline	9	11	-	7	2	11	-
	Below Guideline	-	-	-	-	-	-	-
DTA8	n	12	12	12	12	12	12	12
	Min	<0.005	0.064	0.07	0.24	0.003	0.018	4.19
	Median	0.029	0.144	0.17	0.36	0.005	0.034	8.66
	Max	0.076	0.278	0.34	0.42	0.013	0.053	12
	Above Guideline	10	12	-	6	5	12	-
	Below Guideline	-	-	-	-	-	-	-
DWI1	n	12	12	12	12	12	12	12
	Min	<0.005	<0.002	0.27	0.36	<0.001	<0.005	0.1
	Median	0.02	0.0525	0.385	0.44	0.002	0.018	0.2
	Max	0.04	0.317	0.45	0.64	0.003	0.036	1.34
	Above Guideline	7	10	-	12	0	10	-
	Below Guideline	-	-	-	-	-	-	-

Table A78 Shoalhaven system – storages – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Calcium Filtered (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Magnesium Filtered	Manganese Filtered (mg/L)	Manganese Total (mg/L)	Potassium Filtered (mg/L)	Sodium Filtered (mg/L)
DBP1	n	7	7	7	7	7	7	7	7	7	7
	Min	0.04	0.06	4	0.08	0.23	2	<0.001	0.017	<1	6
	Median	0.09	0.23	4	0.26	0.6	2	0.0145	0.039	1	8
	Max	0.14	0.42	5	0.42	1.11	3	0.022	0.058	1	10
	Above Guideline	6	7	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DFF6	n	12	12	12	12	12	12	12	12	12	12
	Min	0.04	0.06	3	0.02	0.15	2	<0.001	0.012	<1	5
	Median	0.1	0.17	3	0.135	0.265	2	0.002	0.0205	1	7
	Max	0.25	0.35	4	0.39	0.74	2	0.021	0.028	1	8
	Above Guideline	9	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DTA1	n	12	12	12	12	12	12	12	12	12	12
	Min	0.08	0.15	4	0.36	0.5	2	0.003	0.014	1	9
	Median	0.175	0.295	6	0.43	0.64	4	0.015	0.0265	1	11.5
	Max	0.32	0.54	9	0.64	1.08	6	0.042	0.06	2	13
	Above Guideline	12	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DTA5	n	11	11	11	11	11	11	11	11	11	11
	Min	0.04	0.07	5	0.23	0.45	3	0.007	0.013	1	6
	Median	0.12	0.3	6	0.52	0.86	4	0.011	0.027	2	10
	Max	0.63	2.83	8	0.77	3.22	7	0.091	0.117	2	13
	Above Guideline	10	11	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DTA8	n	12	12	12	12	12	12	12	12	12	12
	Min	0.03	0.08	4	0.25	0.49	2	0.003	0.023	<1	9
	Median	0.08	0.21	4	0.365	0.7	3	0.0225	0.038	1	10
	Max	0.21	0.51	6	0.48	0.96	4	0.036	0.056	1	12
	Above Guideline	10	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWI1	n	13	13	13	13	13	13	13	13	13	13
	Min	0.04	0.05	3	0.13	0.23	2	0.001	0.011	<1	5
	Median	0.11	0.12	3	0.25	0.45	2	0.002	0.027	1	6
	Max	0.2	0.23	3	0.67	0.96	3	0.006	0.045	1	7
	Above Guideline	9	12	-	-	-	-	0	0	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A79 Shoalhaven system – storages – cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
DBP1	n	37	37	37	43	37	37	37	37
	Min	0.373	1620	257.1	2.1	207	0	0	0
	Median	2.58	33450	1448	12.1	24920	0.252	0.009	353
	Max	7.19	391600	4925	42.3	383300	5.08	0.307	8420
	Above Guideline	-	-	-	38	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
DFF6	n	37	37	37	49	37	37	37	37
	Min	0.799	14650	579.4	4.8	6690	0.215	0	0
	Median	2.64	57490	1927	9.9	50530	0.654	0.101	3390
	Max	6.97	510700	4420	28.3	497100	3.24	0.856	30530
	Above Guideline	-	-	-	47	-	-	-	-

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophylla (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Below Guideline	-	-	-	-	-	-	-	-
DTA1	n	2	2	2	24	2	2	2	2
	Min	1.89	47260	1299	0.7	41830	0.018	0	0
	Median	2.04	51095	1305	3.8	43055	0.021	0	0
	Max	2.19	54930	1311	15.7	44280	0.024	0	0
	Above Guideline	-	-	-	7	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
DTA5	n	0	0	0	21	0	0	0	0
	Min	-	-	-	0.5	-	-	-	-
	Median	-	-	-	2.1	-	-	-	-
	Max	-	-	-	8.5	-	-	-	-
	Above Guideline	-	-	-	2	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
DTA8	n	37	37	37	49	37	37	37	37
	Min	0.062	155	43.4	0.5	0	0	0	0
	Median	1.04	10410	592.7	5.7	4830	0.026	0	0
	Max	6.66	166200	3680	14.8	156100	2.48	0.054	2020
	Above Guideline	-	-	-	27	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
DWI1	n	37	37	37	50	37	37	37	37
	Min	1	17390	794	3.8	6570	0.024	0.004	225
	Median	2.18	60280	1577	9.1	49310	0.58	0.273	9300
	Max	7.83	290400	6117	24.5	280900	2.47	2.36	37780
	Above Guideline	-	-	-	49	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A80 Shoalhaven system – storages – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
DBP1	n	7	5	7	7
	Min	<1	160	16	4
	Median	5.5	610	29	8
	Max	16	2000	140	100
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DFF6	n	12	9	12	12
	Min	<1	110	<1	<1
	Median	2.5	360	2	2
	Max	27	3900	65	24
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DTA1	n	12	8	12	12
	Min	<1	86	1	<1
	Median	1.5	830	3.5	4
	Max	5	16000	30	15
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DTA5	n	12	9	12	12
	Min	<1	170	2	<1
	Median	12	730	31	38

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
	Max	12	24000	810	86
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DTA8	n	12	9	12	12
	Min	2	350	2	1
	Median	4	2900	61.5	14
	Max	14	26000	500	400
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
DWI1	n	12	10	12	12
	Min	<1	59	<1	<1
	Median	2	275	2.5	7
	Max	3	2400	11	38
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A81 Shoalhaven system – storages – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
DTA1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.019	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0205	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.022	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-
DWI1	n	2	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.009	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0095	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-

Table A82 Shoalhaven system – storages – *Cryptosporidium* and *Giardia*

	Statistic	Crypto oocysts IFA (Adj for Recovery for 10L)	Giardia cysts IFA (Adj for Recovery to 10L)
DWI1	n	51	51
	Min	<1	<1
	Median	2.5	2
	Max	3	2
	Above Guideline	-	-
	Below Guideline	-	-

Table A83 Shoalhaven system – water filtration plants – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Total Organic Carbon (mg/L)	True Colour at 400nm (PES filter)	True Colour at 420nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
HKV1	n	13	13	12	12	12	12	13	13	13	13	12	13
	Min	14	2.4	75	7.14	6.61	10.339	16	2.5	9	20	2.39	0.103
	Median	18	4.4	96.3	9.105	7.095	17.172	18	4.7	17	39	5.35	0.182
	Max	21	7.2	103.3	10.9	7.44	23.904	31	6.7	34	79	9.64	0.255
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
HWI1	n	13	13	13	13	13	13	13	13	13	13	13	13
	Min	10	4.7	80.4	7.59	6.46	7.655	16	4.7	13	27	2.63	0.157
	Median	14	5.05	89.7	9.07	7.21	15.191	16	5.35	15	34	4.72	0.176
	Max	16	6.8	94.2	11	7.57	21.667	20	7	30	68	8.36	0.309
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A84 Shoalhaven system – water filtration plants - metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HKV1	n	13	13	13	13	13	13
	Min	0.03	0.09	0.08	0.28	<0.001	0.017
	Median	0.08	0.17	0.25	0.54	0.0065	0.038
	Max	0.13	0.35	0.41	0.88	0.022	0.055
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
HWI1	n	12	12	12	12	12	12
	Min	0.04	0.07	0.13	0.26	<0.001	0.012
	Median	0.1	0.15	0.265	0.515	0.006	0.039
	Max	0.17	0.33	0.73	1.14	0.039	0.085
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A85 Shoalhaven system – water filtration plants – cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
HKV1	n	13	13	13	13	13	13	13	2
	Min	0.814	4390	545.4	830	0.004	0	0	<0.3
	Median	1.99	16840	1481	8540	0.081	0	0	<0.3
	Max	4.03	409800	3572	399600	1.43	0.133	5110	<0.3
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
HWI1	n	12	12	12	12	12	12	12	8

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Area Standard Unit (algae)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)	Microcystin LR+RR+YR (ug/L)
	Min	1	18080	690.2	8920	0.073	0.016	294	<0.3
	Median	2.54	41515	1617.5	32690	0.33	0.14	5205	<0.3
	Max	4.05	151800	2396	146200	1.8	0.74	28020	<0.3
	Above Guideline	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A86 Shoalhaven system – water filtration plants - indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)	Enterococci (cfu/100mL)
HKV1	n	13	13	13	13
	Min	<1	89	3	2
	Median	3	880	28	11
	Max	6	16000	170	84
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
HWI1	n	12	12	12	12
	Min	<1	13	<1	<1
	Median	1	93	2	2.5
	Max	6	920	4	5
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

Table A87 Shoalhaven system – water filtration plants – health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Boron Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)	Uranium Total (mg/L)
HKV1	n	5	1	1	1	1	5	1	5	1	1	1
	Min	<0.001	0.013	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.013	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.013	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-
HWI1	n	3	1	1	1	1	3	1	3	1	1	1
	Min	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.01	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-

Table A88 Shoalhaven system – water filtration plants - pesticides

	Statistic	"2,4-D (ug/L)"	Atrazine (ug/L)	Chlorfenvinphos (E+Z) (ug/L)	Chlorpyrifos (ug/L)	Duron (ug/L)	Fluproprate (ug/L)	Glyphosate (ug/L)	Hexazinone (ug/L)	MCPA (ug/L)	Picloram (ug/L)	Simazine (ug/L)	Triclopyr (ug/L)
HKV1	n	5	5	5	5	5	5	5	5	5	5	5	5
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-
HWI1	n	3	3	3	3	3	3	3	3	3	3	3	3
	Min	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Median	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Max	<0.01	<0.005	<0.02	<0.005	<0.005	<2.0	<1	<0.005	<0.01	<0.05	<0.005	<0.01
	Above Guideline	-	-	-	-	-	-	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	-	-	-	-

Table A89 Shoalhaven system – water filtration plants – synthetic organic compounds & radionuclides

	Statistic	Benzene (ug/L)	Gross Alpha	Gross Beta	Vinyl chloride (ug/L)
HKV1	n	4	1	1	4
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-
HWI1	n	3	1	1	3
	Min	<0.1	<0.05	<0.1	<0.3
	Median	<0.1	<0.05	<0.1	<0.3
	Max	<0.1	<0.05	<0.1	<0.3
	Above Guideline	-	-	-	-
	Below Guideline	-	-	-	-

6. Picnic Areas

Table A90 Picnic areas – physicochemical

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
HAV3	n	12	47	12	12	12	12	47	47	47	4	47	12	47
	Min	11	0.081	2	2.3	0.047	3	73.3	6.75	6.57	1	10.5	12	0.01
	Median	16.5	0.11	2.75	2.7	0.068	5	95	8.74	7.74	1.5	16.48	19	0.54
	Max	28	0.134	3.5	3.6	0.086	7	101.2	10.6	9.01	3	23.2	24	1.5
	Above Guideline	-	-	-	-	-	-	-	-	5	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
HAVR	n	-	47	-	-	-	-	47	47	47	-	47	-	47
	Min	-	0.059	-	-	-	-	94	8.37	6.64	-	10	-	0.16
	Median	-	0.101	-	-	-	-	100.1	9.46	7.29	-	15.67	-	0.43
	Max	-	0.128	-	-	-	-	1012	10.84	7.72	-	21.9	-	3.43
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	1

	Statistic	Alkalinity (mg CaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Total Organic Carbon (mg/L)	UV Absorbing constituents (organic)	True Colour at 400nm (PES filter)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Sulphate (mg/L)	Temperature (Deg C)	Total Hardness (mg CaCO ₃ /L)	Turbidity Field (NTU)
	Below Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
HCA1/HCA2	n	12	50	12	12	12	12	50	50	50	4	50	12	50
	Min	4	0.042	<0.2	<0.2	0.012	2	27.2	2.36	6.08	<1	7.6	2	0.01
	Median	8.5	0.1195	0.45	0.4	0.024	5	89.2	8.48	6.555	2	15.8	9	0.06
	Max	28	0.165	8.6	8.8	0.496	50	98.7	10.19	7.92	2	23	16	10.23
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	22	-	-	-	-
HCAR	n	-	50	-	-	-	-	50	50	50	-	50	-	50
	Min	-	0.067	-	-	-	-	96.4	8.29	6.18	-	10.5	-	0.36
	Median	-	0.117	-	-	-	-	99.75	9.265	6.79	-	16.55	-	0.77
	Max	-	0.145	-	-	-	-	103.7	10.9	7.47	-	21.9	-	8.87
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	9
	Below Guideline	-	-	-	-	-	-	-	-	10	-	-	-	-
HCO6	n	12	51	12	12	12	12	51	51	51	4	51	12	51
	Min	12	0.083	3.5	3.5	0.118	13	55.5	5.45	6.47	2	8.5	13	0.81
	Median	16	0.112	4	4.05	0.1705	16	83.1	7.62	6.85	2	15.6	18	2.55
	Max	19	0.155	6	6.2	0.281	30	96.7	10.8	7.23	2	21.9	25	21.4
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	3	-	-	-	-
HCOR	n	-	51	-	-	-	-	51	51	51	-	51	-	51
	Min	-	0.086	-	-	-	-	9.9	6.38	6.49	-	10.2	-	0.55
	Median	-	0.107	-	-	-	-	95.1	8.93	6.92	-	16.4	-	1.07
	Max	-	0.133	-	-	-	-	99.5	10.63	7.31	-	21.9	-	6.26
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	10
	Below Guideline	-	-	-	-	-	-	-	-	1	-	-	-	-
HFFR	n	-	50	-	-	-	-	50	50	50	-	50	-	50
	Min	-	0.181	-	-	-	-	88.9	7.91	7.6	-	5.245	-	0.09
	Median	-	0.214	-	-	-	-	93.8	9.525	7.98	-	15.229	-	0.635
	Max	-	0.257	-	-	-	-	102.3	12.34	8.21	-	22.638	-	3.2
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	1
	Below Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
HFFR2	n	12	51	12	12	12	12	51	51	51	2	51	12	51
	Min	44	0.124	1.7	1.6	0.028	<1	87	8.04	7.51	14	7.587	68	0.13
	Median	51	0.21	2.4	2.3	0.0305	<1	93.1	9.44	7.92	17.5	14.484	79.5	0.52
	Max	71	0.253	6.1	6	0.044	<1	100.7	11.3	8.18	21	21.792	97	3.94
	Above Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-	0	-	-	-	-

Table A91 Picnic areas - cyanobacteria

	Statistic	Algal biovolume (mm ³ /L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial biovolume (mm ³ /L)	Toxic Cyanobacterial Count (cells/mL)
HAV3	n	-	-	-	12	-	-	-	-
	Min	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	<0.2	-	-	-	-
	Max	-	-	-	<0.24	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
HCA1/HCA2	n	-	-	-	12	-	-	-	-
	Min	-	-	-	<0.2	-	-	-	-

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Area Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Median	-	-	-	<0.2	-	-	-	-
	Max	-	-	-	0.9	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
HCO6	n	-	-	-	12	-	-	-	-
	Min	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	0.3	-	-	-	-
	Max	-	-	-	0.4	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
HFFR2	n	1	1	1	11	1	1	1	1
	Min	0	0	0	<0.2	0	0	0	0
	Median	0	0	0	1.95	0	0	0	0
	Max	0	0	0	3.6	0	0	0	0
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A92 Picnic areas – metals

	Statistic	Aluminium Total (mg/L)	Copper Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Lead Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
HAV3	n	12	13	47	47	15	47	47
	Min	0.03	<0.001	0.04	0.1	<0.001	<0.001	0.003
	Median	0.035	0.0965	0.1	0.19	0.002	0.003	0.005
	Max	0.12	0.57	0.18	0.64	0.015	0.008	0.051
	Above Guideline	0	0	0	4	1	0	0
	Below Guideline	-	-	-	-	-	-	-
HAVR	n	-	2	47	47	1	47	47
	Min	-	0.015	0.04	0.09	<0.001	<0.001	0.002
	Median	-	0.0295	0.08	0.14	<0.001	0.002	0.004
	Max	-	0.044	0.19	1.29	<0.001	0.009	0.035
	Above Guideline	-	0	0	1	0	0	0
	Below Guideline	-	-	-	-	-	-	-
HCA1/HCA2	n	12	15	50	50	15	50	50
	Min	0.01	0.002	<0.01	0.02	<0.001	<0.001	0.001
	Median	0.035	0.012	0.21	0.26	0.002	0.01	0.0105
	Max	0.52	2.34	0.81	1.83	0.006	0.087	0.605
	Above Guideline	3	2	13	16	0	0	4
	Below Guideline	-	-	-	-	-	-	-
HCAR	n	-	1	50	50	1	50	50
	Min	-	0.005	0.23	0.39	0.001	0.003	0.006
	Median	-	0.005	0.35	0.515	0.001	0.008	0.0155
	Max	-	0.005	0.82	1.48	0.001	0.083	0.114
	Above Guideline	-	0	36	50	0	0	2
	Below Guideline	-	-	-	-	-	-	-
HCO6	n	12	26	51	51	13	51	51
	Min	0.03	0.214	0.2	0.43	<0.001	0.007	0.017
	Median	0.06	1.8	0.43	0.81	0.002	0.016	0.05
	Max	0.36	4.23	0.98	2.96	0.007	0.234	0.744
	Above Guideline	2	11	45	51	0	8	17
	Below Guideline	-	-	-	-	-	-	-
HCOR	n	-	1	51	51	1	51	51
	Min	-	0.005	0.23	0.32	<0.001	0.004	0.011
	Median	-	0.005	0.34	0.53	<0.001	0.012	0.026

	Statistic	Aluminium Total (mg/L)	Copper Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Lead Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
	Max	-	0.005	0.68	1.15	<0.001	0.495	0.525
	Above Guideline	-	0	32	51	0	9	10
	Below Guideline	-	-	-	-	-	-	-
HFFR	n	-	-	51	51	-	51	51
	Min	-	-	<0.01	0.02	-	<0.001	0.002
	Median	-	-	0.01	0.05	-	0.001	0.007
	Max	-	-	0.01	0.33	-	0.002	0.056
	Above Guideline	-	-	0	1	-	0	0
	Below Guideline	-	-	-	-	-	-	-
HFFR2	n	12	12	51	51	12	51	51
	Min	0.07	0.004	<0.01	0.02	<0.001	<0.001	0.001
	Median	0.14	0.0055	0.01	0.04	0.002	0.0015	0.005
	Max	0.27	0.02	0.02	0.32	0.002	0.002	0.063
	Above Guideline	2	0	0	1	0	0	0
	Below Guideline	-	-	-	-	-	-	-

Table A93 Picnic areas - health related physical chemical

	Statistic	Arsenic Total (mg/L)	Barium Total (mg/L)	Beryllium-Total (mg/L)	Iodide (mg/L)	Mercury Total (mg/L)	Molybdenum Total (mg/L)	Selenium Total (mg/L)	Silver Total (mg/L)	Tin Total (mg/L)
HAV3	n	4	4	4	4	4	4	4	4	4
	Min	<0.001	0.005	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.009	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	0	0	0	0	0	0	0	0	0
	Below Guideline	-	-	-	-	-	-	-	-	-
HCA1/HCA2	n	4	4	4	4	4	4	4	4	4
	Min	<0.001	0.006	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0255	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.064	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	0	0	0	0	0	0	0	0	0
	Below Guideline	-	-	-	-	-	-	-	-	-
HCO6	n	4	4	4	4	4	4	4	4	4
	Min	<0.001	0.014	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0175	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.032	<0.001	>0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	0	0	0	0	0	0	0	0	0
	Below Guideline	-	-	-	-	-	-	-	-	-
HFFR2	n	2	2	2	2	2	2	2	2	2
	Min	<0.001	0.009	<0.001	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Median	<0.001	0.0095	<0.001	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Max	<0.001	0.01	<0.001	<0.01	<0.0001	<0.001	<0.001	<0.001	<0.001
	Above Guideline	0	0	0	0	0	0	0	0	0
	Below Guideline	-	-	-	-	-	-	-	-	-

Table A94 Picnic areas – indicator bacteria

	Statistic	Coliforms Total (cfu/100mL)	E. coli (orgs/100mL)
HAV3	n	47	47
	Min	<1	<1
	Median	1	<1
	Max	1	<1
	Above Guideline	1	0
	Below Guideline	-	-
HAVR	n	47	47
	Min	<1	<1
	Median	1	<1
	Max	1	<1
	Above Guideline	1	0
	Below Guideline	-	-
HCA1/HCA2	n	50	50
	Min	<1	<1
	Median	2.5	1
	Max	19	4
	Above Guideline	6	5
	Below Guideline	-	-
HCAR	n	50	50
	Min	<1	<1
	Median	2	<1
	Max	2	<1
	Above Guideline	3	0
	Below Guideline	-	-
HCO6	n	51	51
	Min	<1	<1
	Median	2.5	1
	Max	170	1
	Above Guideline	6	1
	Below Guideline	-	-
HCOR	n	51	51
	Min	<1	<1
	Median	<1	<1
	Max	<1	<1
	Above Guideline	0	0
	Below Guideline	-	-
HFFR	n	51	51
	Min	<1	<1
	Median	2	<1
	Max	2	<1
	Above Guideline	2	0
	Below Guideline	-	-
HFFR2	n	51	51
	Min	<1	<1
	Median	1	<1
	Max	15	<1
	Above Guideline	3	0
	Below Guideline	-	-

7. Downstream of storages

Table A95 Downstream of storages – physicochemical

	Statistic	Alkalinity (mgCaCO ₃ /L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Suspended Solids (mg/L)	Temperature (Deg C)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
E303	n	12	12	12	12	12	12	12	12	12	12	12
	Min	15	0.064	3.8	65.9	6.04	6.52	3	6.47	10	2	0.143
	Median	24	0.0885	5.2	81.05	8.545	6.685	5.5	15.368	13.5	4.66	0.165
	Max	31	0.109	6.4	91.7	10.2	6.99	8	20.507	28	6.25	0.293
	Above Guideline	-	0	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	10	-	0	-	-	-	-	-
E851	n	12	12	12	12	12	12	12	12	12	12	12
	Min	18	0.08	5.2	47.4	4.24	6.32	2	10.446	24	1.51	0.247
	Median	25	0.13	6.7	94.55	9.06	7.185	4.5	17.4675	31.5	8.48	0.3045
	Max	32	0.156	15.1	110	11.81	7.76	18	25.547	77	16.35	0.691
	Above Guideline	-	0	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	4	-	1	-	-	-	-	-
G0515	n	13	13	13	13	13	13	13	13	13	13	13
	Min	6	0.081	4.3	83.3	6.88	6.17	<1	8.996	9	0.05	0.124
	Median	9	0.142	6.3	91.8	8.96	6.57	1	17.756	18	2.2	0.196
	Max	13	0.162	10.8	98.6	10.91	6.87	2	24.756	56	5.42	0.479
	Above Guideline	-	0	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	2	-	2	-	-	-	-	-
N44	n	12	12	12	12	12	12	12	12	12	12	12
	Min	29	0.148	5.1	93.9	8.29	6.83	4	12.3	15	5.2	0.175
	Median	38	0.194	6.85	100.15	9.495	7.3	6	19.15	24.5	7.625	0.253
	Max	52	0.315	9.1	122.9	10.75	8.89	15	24.21	40	17.37	0.429
	Above Guideline	-	0	-	2	-	1	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N57	n	12	12	12	12	12	12	12	12	12	12	12
	Min	26	0.148	4.8	97.3	8.83	6.88	2	12.2	11	4.83	0.14
	Median	37.5	0.1875	7.1	104.4	9.72	7.275	6.5	19.13	26	10.025	0.2605
	Max	50	0.312	9.4	112.8	11.3	8	20	24.81	40	20	0.458
	Above Guideline	-	0	-	3	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N64	n	12	12	12	12	12	12	12	12	12	12	12
	Min	28	0.145	4	96.1	8.68	6.84	1	10.7	10	2.27	0.142
	Median	40	0.191	6.2	107	10	7.32	4	19	21	5.08	0.245
	Max	80	0.485	9.9	117	11.8	7.74	8	22.12	41	21.8	0.48
	Above Guideline	-	4	-	3	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N641	n	12	12	12	12	12	12	12	12	12	12	12
	Min	31	0.139	5	92.8	9.14	6.82	1	11.8	19	1.53	0.206
	Median	40	0.176	6.75	107.95	10.405	7.32	2	18.65	23.5	7.39	0.26
	Max	61	0.217	9.9	126.8	11.9	7.67	7	21.83	42	21.9	0.516
	Above Guideline	-	0	-	5	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N67	n	12	12	12	12	12	12	12	12	12	12	12
	Min	22	0.175	3.9	74.6	6.1	6.77	2	10.2	10	3.93	0.136
	Median	43	0.3425	5.5	94.8	8.825	7.16	7	18.1	19	9.435	0.221
	Max	92	0.499	11.6	102.2	10.92	7.36	55	25.83	48	63.41	0.636
	Above Guideline	-	6	-	0	-	0	-	-	-	1	-
	Below Guideline	-	-	-	2	-	0	-	-	-	-	-
N75	n	12	12	12	12	12	12	12	12	12	12	12
	Min	23	0.136	4.2	85	7.42	6.53	<1	10.317	13	1.82	0.156
	Median	33.5	0.2435	6.05	92.6	8.78	7.1	8	18.3875	18.5	8.665	0.253
	Max	70	0.623	9.3	99.7	10.93	7.34	98	24.945	37	49.05	0.481
	Above Guideline	-	2	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N85	n	12	12	12	12	12	12	12	12	12	12	12
	Min	8	0.062	4	75	6.4	6.48	<1	10.218	14	1.5	0.161

	Statistic	Alkalinity (mgCaCO3/L)	Conductivity @25 C - Field (mS/cm)	Dissolved Organic Carbon (mg/L)	Dissolved Oxygen (%Sat)	Dissolved Oxygen (mg/L)	pH (Field)	Suspended Solids (mg/L)	Temperature (Deg C)	True Colour at 400nm (PES filter)	Turbidity Field (NTU)	UV Absorbing constituents (organic)
	Median	28	0.1605	5.85	93.3	9.08	7.1	4	18.1315	20	3.77	0.1995
	Max	48	0.206	12.4	102.2	11.42	7.66	104	24.036	63	70.72	0.775
	Above Guideline	-	0	-	0	-	0	-	-	-	1	-
	Below Guideline	-	-	-	1	-	1	-	-	-	-	-
N86	n	7	7	7	7	7	7	7	7	7	7	7
	Min	8	0.072	4.2	97.6	8.7	6.7	<1	9.885	13	0.51	0.138
	Median	10	0.084	4.8	100.7	9.84	7.23	1	15.428	18	1.16	0.158
	Max	12	0.086	5.4	104.2	11.79	7.65	2	21.461	24	2.3	0.21
	Above Guideline	-	0	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	0	-	-	-	-	-
N881	n	12	12	12	12	12	12	12	12	12	12	12
	Min	2	0.048	4.5	97.4	8.98	6.23	<1	8.037	15	0.62	0.149
	Median	7	0.083	5.15	101	9.885	7.08	2	15.9905	22	1.585	0.192
	Max	10	0.09	8	106.2	11.53	7.67	5	21.271	52	9.35	0.433
	Above Guideline	-	0	-	0	-	0	-	-	-	0	-
	Below Guideline	-	-	-	0	-	2	-	-	-	-	-
N92	n	12	12	12	12	12	12	12	12	12	12	12
	Min	10	0.069	3.1	88.9	7.5	6.49	<1	9.99	10	0.67	0.131
	Median	42.5	0.1655	5.45	98.5	9.55	7.57	2.5	18.541	18.5	5.605	0.212
	Max	244	0.711	8.8	112.5	11.14	8.76	11	24.34	36	21.2	0.393
	Above Guideline	-	4	-	1	-	1	-	-	-	0	-
	Below Guideline	-	-	-	0	-	1	-	-	-	-	-

Table A96 Downstream of storages – nutrients

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO2 mg/L)
E303	n	12	12	12	12	12	12	12
	Min	0.014	0.039	0.09	0.37	<0.001	0.009	0.54
	Median	0.032	0.1035	0.345	0.445	0.002	0.0215	0.815
	Max	0.139	0.347	0.55	0.74	0.003	0.031	1.88
	Above Guideline	-	-	-	3	-	0	-
	Below Guideline	-	-	-	-	-	-	-
E851	n	12	12	12	12	12	12	12
	Min	0.008	<0.002	0.07	0.15	0.003	0.015	7.49
	Median	0.024	0.103	0.35	0.44	0.005	0.0255	8.065
	Max	0.075	0.176	0.7	0.79	0.009	0.044	9.31
	Above Guideline	-	-	-	4	-	0	-
	Below Guideline	-	-	-	-	-	-	-
G0515	n	13	13	13	13	13	13	13
	Min	0.006	<0.002	0.1	0.12	<0.001	<0.005	1.76
	Median	0.008	0.023	0.15	0.18	0.0025	0.0085	2.9
	Max	0.019	0.086	0.23	0.23	0.005	0.014	3.58
	Above Guideline	-	-	-	0	-	0	-
	Below Guideline	-	-	-	-	-	-	-
N44	n	12	12	12	12	12	12	12
	Min	<0.005	0.212	0.25	0.54	0.002	0.013	0.94
	Median	0.016	0.355	0.355	0.73	0.004	0.0245	5.225
	Max	0.052	0.759	0.5	1.05	0.013	0.053	7.5
	Above Guideline	-	-	-	12	-	1	-
	Below Guideline	-	-	-	-	-	-	-

	Statistic	Nitrogen Ammoniacal (mg/L)	Nitrogen Oxidised (mg/L)	Nitrogen TKN (mg/L)	Nitrogen Total (mg/L)	Phosphorus Soluble Reactive (mg/L)	Phosphorus Total (mg/L)	Silicate Reactive (SiO ₂ mg/L)
N57	n	12	12	12	12	12	12	12
	Min	<0.005	0.186	0.24	0.57	<0.001	0.011	1.76
	Median	0.009	0.3265	0.36	0.655	0.004	0.023	5.23
	Max	0.181	0.578	0.56	0.91	0.02	0.058	7.39
	Above Guideline	-	-	-	12	-	1	-
	Below Guideline	-	-	-	-	-	-	-
N64	n	11	11	11	11	11	11	11
	Min	<0.005	0.193	0.24	0.61	<0.001	0.01	1.14
	Median	0.026	0.312	0.37	0.73	0.005	0.016	5.26
	Max	0.055	1.58	0.48	1.82	0.017	0.052	7.41
	Above Guideline	-	-	-	11	-	1	-
	Below Guideline	-	-	-	-	-	-	-
N641	n	12	12	12	12	12	12	12
	Min	<0.005	0.166	0.21	0.55	<0.001	<0.005	4.89
	Median	0.012	0.3375	0.345	0.655	0.004	0.017	5.39
	Max	0.027	0.689	0.49	0.92	0.01	0.036	8.06
	Above Guideline	-	-	-	12	-	0	-
	Below Guideline	-	-	-	-	-	-	-
N67	n	12	12	12	12	12	12	12
	Min	<0.005	0.234	0.18	0.72	<0.001	0.012	1.57
	Median	0.063	0.902	0.475	1.415	0.026	0.026	3.72
	Max	2.82	1.6	3.96	4.68	0.411	0.535	5.96
	Above Guideline	-	-	-	12	-	5	-
	Below Guideline	-	-	-	-	-	-	-
N75	n	12	12	12	12	12	12	12
	Min	0.017	0.137	0.1	0.48	<0.001	0.01	2.19
	Median	0.0605	0.4195	0.355	0.765	0.003	0.0245	3.025
	Max	0.316	0.947	0.68	1.48	0.025	0.126	4.04
	Above Guideline	-	-	-	9	-	3	-
	Below Guideline	-	-	-	-	-	-	-
N85	n	12	12	12	12	12	12	12
	Min	<0.005	0.032	0.09	0.21	<0.001	0.005	1.57
	Median	0.018	0.1035	0.215	0.315	0.003	0.015	2.735
	Max	0.052	0.17	0.53	0.58	0.008	0.152	3.7
	Above Guideline	-	-	-	2	-	1	-
	Below Guideline	-	-	-	-	-	-	-
N86	n	7	7	7	7	7	7	7
	Min	<0.005	0.097	0.1	0.22	<0.001	<0.005	1.95
	Median	0.006	0.134	0.14	0.29	0.002	0.01	2.93
	Max	0.026	0.19	0.19	0.34	0.002	0.016	4.03
	Above Guideline	-	-	-	0	-	0	-
	Below Guideline	-	-	-	-	-	-	-
N881	n	12	12	12	12	12	12	12
	Min	<0.005	0.013	0.1	0.12	<0.001	0.006	1.62
	Median	0.024	0.096	0.145	0.245	0.002	0.007	2.355
	Max	0.048	0.166	0.23	0.32	0.003	0.013	3.65
	Above Guideline	-	-	-	0	-	0	-
	Below Guideline	-	-	-	-	-	-	-
N92	n	12	12	12	12	12	12	12
	Min	<0.005	0.054	0.1	0.26	<0.001	<0.005	1.28
	Median	0.014	0.155	0.21	0.345	0.0025	0.015	2.9
	Max	0.03	0.444	0.33	0.77	0.014	0.026	3.72
	Above Guideline	-	-	-	1	-	0	-
	Below Guideline	-	-	-	-	-	-	-

Table A97 Downstream of storages –cyanobacteria

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
E303	n	12	12	12	12	12	12	12	12
	Min	0.757	10910	492.1	5.2	7230	0.031	0	0
	Median	1.435	33970	1164.5	7.1	25465	0.173	0.09	3570
	Max	3.36	80360	2534	15.9	72780	0.905	0.789	26690
	Above Guideline	-	-	-	12	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
E851	n	3	3	3	12	3	3	3	3
	Min	1.4	7900	746.7	1.4	1380	0.002	0	0
	Median	1.79	24010	981.4	2.95	20280	0.028	0	0
	Max	2.26	35040	1251	6.8	29620	0.044	0	0
	Above Guideline	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
G0515	n	1	1	1	13	1	1	1	1
	Min	0.914	8830	590.4	0.4	3100	0.008	0	0
	Median	0.914	8830	590.4	1.7	3100	0.008	0	0
	Max	0.914	8830	590.4	6.5	3100	0.008	0	0
	Above Guideline	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N44	n	9	9	9	12	9	9	9	9
	Min	0.941	2040	431.1	2.4	0	0	0	0
	Median	1.78	15530	1138	5.85	8810	0.021	0	0
	Max	8.94	301000	6729	28	278600	0.553	0.051	416
	Above Guideline	-	-	-	9	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N57	n	5	5	5	12	5	5	5	5
	Min	1.59	7070	698	2.6	2960	0.012	0	0
	Median	1.98	11940	911.9	4.6	8190	0.015	0	0
	Max	4.49	46170	3051	12.3	36360	0.096	0.062	2350
	Above Guideline	-	-	-	5	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N64	n	4	4	4	11	4	4	4	4
	Min	0.709	4120	286.3	1.8	2610	0.01	0	0
	Median	1.3575	16225	905.45	3.4	6020	0.0185	0	0
	Max	5.45	65160	4194	15.4	28040	0.062	0	0
	Above Guideline	-	-	-	4	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N641	n	1	1	1	12	1	1	1	1
	Min	0.896	708	266.6	0.5	0	0	0	0
	Median	0.896	708	266.6	2.95	0	0	0	0
	Max	0.896	708	266.6	7.5	0	0	0	0
	Above Guideline	-	-	-	1	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N67	n	8	8	8	12	8	8	8	8
	Min	0.479	10100	686.5	1	138	0	0	0
	Median	1.775	42735	1069.15	8.9	26265	0.0655	0	0
	Max	8.88	84840	4251	33.8	71380	0.2	0.125	5560
	Above Guideline	-	-	-	8	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N75	n	7	7	7	12	7	7	7	7
	Min	0.749	7320	751.8	1.3	1490	0.003	0	0
	Median	2.14	17590	1406	5.1	7210	0.016	0	0
	Max	5.7	96340	3114	11.8	94410	0.145	0	0
	Above Guideline	-	-	-	6	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N85	n	5	5	5	12	5	5	5	5
	Min	0.197	727	189.4	1.6	0	0	0	0
	Median	1.15	12020	645.7	4.6	5660	0.015	0	0
	Max	3.85	71620	1904	6.8	69910	0.108	0	0

	Statistic	Algal biovolume (mm3/L)	Algal Total Count (cells/mL)	Areal Standard Unit (algae)	Chlorophyll-a (ug/L)	Cyanobacteria Total Count (cells/mL)	Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial biovolume (mm3/L)	Toxic Cyanobacterial Count (cells/mL)
	Above Guideline	-	-	-	4	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N86	n	-	-	-	7	-	-	-	-
	Min	-	-	-	0.6	-	-	-	-
	Median	-	-	-	1.1	-	-	-	-
	Max	-	-	-	2.9	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N881	n	-	-	-	12	-	-	-	-
	Min	-	-	-	<0.2	-	-	-	-
	Median	-	-	-	1	-	-	-	-
	Max	-	-	-	1.6	-	-	-	-
	Above Guideline	-	-	-	0	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-
N92	n	3	3	3	12	3	3	3	3
	Min	2.24	6670	1007	0.7	208	0.001	0	0
	Median	2.6	25220	2880	2.65	1470	0.021	0	0
	Max	3.7	734800	3528	10.6	728500	0.974	0	0
	Above Guideline	-	-	-	3	-	-	-	-
	Below Guideline	-	-	-	-	-	-	-	-

Table A98 Downstream of storages – metals

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
E303	n	12	12	12	12	12	12
	Min	0.04	0.07	0.14	0.31	0.013	0.024
	Median	0.06	0.17	0.26	0.55	0.039	0.0655
	Max	0.1	0.32	0.69	1.33	0.199	0.279
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
E851	n	12	12	12	12	12	12
	Min	0.06	0.14	0.29	0.37	0.005	0.014
	Median	0.175	0.365	0.405	0.705	0.015	0.028
	Max	0.32	0.84	0.68	1.11	0.059	0.087
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
G0515	n	13	13	13	13	13	13
	Min	0.03	0.04	0.16	0.32	0.005	0.006
	Median	0.12	0.21	0.32	0.54	0.008	0.012
	Max	0.34	0.57	0.42	0.68	0.013	0.02
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N44	n	12	12	12	12	12	12
	Min	0.01	0.12	0.06	0.31	0.002	0.019
	Median	0.07	0.225	0.23	0.535	0.0235	0.041
	Max	0.26	0.83	0.49	1.08	0.074	0.089
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N57	n	12	12	12	12	12	12
	Min	0.02	0.07	0.07	0.22	0.002	0.017
	Median	0.1	0.28	0.225	0.495	0.01	0.029
	Max	0.35	0.93	0.46	1.01	0.053	0.078

	Statistic	Aluminium Filtered (mg/L)	Aluminium Total (mg/L)	Iron Filtered (mg/L)	Iron Total (mg/L)	Manganese Filtered (mg/L)	Manganese Total (mg/L)
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N64	n	11	11	11	11	11	11
	Min	0.02	0.06	0.04	0.2	0.003	0.01
	Median	0.09	0.15	0.32	0.49	0.023	0.034
	Max	0.33	0.81	0.58	1.07	0.131	0.14
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N641	n	12	12	12	12	12	12
	Min	0.05	0.11	0.14	0.22	0.001	0.005
	Median	0.095	0.275	0.245	0.435	0.005	0.0155
	Max	0.31	1.17	0.44	0.72	0.068	0.089
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N67	n	12	12	12	12	12	12
	Min	0.01	0.09	0.05	0.26	0.005	0.053
	Median	0.035	0.21	0.305	0.805	0.0495	0.101
	Max	0.3	1.57	0.91	2.71	0.165	0.228
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N75	n	12	12	12	12	12	12
	Min	0.04	0.1	0.12	0.34	0.008	0.04
	Median	0.09	0.325	0.365	0.84	0.0325	0.0705
	Max	0.3	1.98	0.53	3.64	0.144	0.262
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N85	n	12	12	12	12	12	12
	Min	0.03	0.09	0.17	0.38	0.004	0.024
	Median	0.085	0.195	0.375	0.63	0.0225	0.0385
	Max	0.6	1.97	0.68	2.52	0.128	0.182
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N86	n	7	7	7	7	7	7
	Min	0.04	0.05	0.21	0.31	0.006	0.012
	Median	0.08	0.1	0.31	0.42	0.008	0.015
	Max	0.14	0.2	0.4	0.53	0.011	0.018
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N881	n	12	12	12	12	12	12
	Min	0.04	0.06	0.28	0.4	0.008	0.014
	Median	0.115	0.135	0.38	0.48	0.0125	0.019
	Max	0.33	0.45	0.54	1.46	0.046	0.064
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-
N92	n	12	12	12	12	12	12
	Min	0.03	0.05	0.06	0.21	0.001	0.008
	Median	0.08	0.225	0.275	0.53	0.01	0.0245
	Max	0.3	0.71	0.4	0.84	0.024	0.032
	Above Guideline	-	-	-	-	-	-
	Below Guideline	-	-	-	-	-	-

Table A99 Downstream of storages – indicator bacteria

	Statistic	Clostridium perfringens (cfu/100 mL)	E. coli (orgs/100mL)	Enterococci (cfu/100ml)
N86	n	7	7	7
	Min	<1	2	3
	Median	1	6	13
	Max	1	19	36
	Above Guideline	-	-	-
	Below Guideline	-	-	-

Appendix B Wet Weather Auto-Samples

Table A100: Number of wet-weather samples and events from Type 1 auto-samplers 2021-22

Station Code	System	Number of Samples	Number of events
E488	Warragamba	18	2
E531	Warragamba	63	7

* Refer to catchment maps in Section 5 in report for location of auto-sampler sites.

** An event is classed as successive samples being less than two days apart.

Table A101: Wet-weather samples analysed for *Cryptosporidium* and *Giardia* from Type 2 auto-samplers and grab samples during 2021-22

Station Code	System	Autosampler Type 2 and Wet Weather grab samples		Positive Pathogen Results	
		Number of samples	Number of events	<i>Cryptosporidium</i>	<i>Giardia</i>
E488	Warragamba	11	2	2	7
E531	Warragamba	21	7	8	10

Appendix C Incidents

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
MAJOR						
September 2021	Contamination	Cataract Picnic Area	Elevated nickel concentrations (0.082mg/L) were detected greater than ADWG values (0.02 mg/L) at Cataract Picnic Area	Long term exposure to high concentrations can result in health impacts	Possibly due to long residence time with park being closed	Review historic data at site. Advised NSW Health of results and sought advice. Contacted manufacturer for information. Confirmation and investigative monitoring. Picnic area was closed so no risk to public.
October 2021	Supply Agreement	Prospect WFP	Prospect Inlet Geosmin breached major incident threshold (27ng/L)	Aesthetic issues (taste and odour) resulting in increased customer complaints	Naturally occurring organisms in upper part of the water column associated with algae	Liaised with Sydney Water. Higher level offtake closed and resampling for a comprehensive suite of analytes undertaken to facilitate outlet configuration
March 2022	CCP	Macarthur WFP	Elevated turbidity at Macarthur WFP Inlet of 52.98 NTU	Elevated turbidity may indicate inadequate disinfection	Issue related to widespread rainfall around the catchment. Plant operations impacted.	Major Flood Incident being managed by Incident Management Team. Issue related to widespread rainfall around the catchment
March 2022	Supply Agreement	Macarthur WFP	Elevated levels of Geosmin recorded at Macarthur WFP Inlet at 17.1 ng/L	Aesthetic issues (taste and odour) resulting in increased customer complaints	Due to rain event, Upper Nepean lakes are spilling with fluctuating inflows in the Broughtons Pass catchment.	Sydney Water and NSW Health notified via Incident Management Team. Monitoring for MIB and Geosmin in the upper Nepean system already in place with Macarthur sampled today.
May 2022	Supply Agreement	Woronora WFP	Major and minor incident levels at Woronora WFP for Total Aluminium at 0.54 mg/L (threshold > 0.4 mg/L) and Total Hardness (4mg/L)	Elevated aluminium may pose aesthetic issues (metallic taste)	Aluminium was elevated in Lake Woronora following wet weather. Mixing of the intrusion layer up higher in the water column.	Notified key stakeholders. Rescheduled sampling to confirm and assessed opportunities for improvement.
May 2022	Supply Agreement	Macarthur WFP	Minor and major incident levels of total iron at 4 mg/L and total hardness at 0.88 mg/L at Macarthur WFP	Aesthetic issue causing discoloured water and taste	Ongoing raw water quality issues due to successive rain events.	Notified all key external stakeholders. Reviewed opportunities for water quality improvement options in light of Nepean Tunnel outage. Confirmed resampling undertaken at Macarthur/Broughtons Pass and Cataract Dam.

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
June 2022	Supply Agreement	Macarthur WFP	Macarthur WFP Inlet - True Colour at major incident trigger levels of 44CU (400nm) from 07/06 Sample	Potential to cause inconvenience to water filtration plant and aesthetic issues	Ongoing raw water quality issues due to successive rain events.	Stakeholders and NSW Health verbally notified and in writing. Sydney Water advised that Macarthur WFP was treating adequately within current warranted capacity
June 2022	Supply Agreement	Prospect WFP	Prospect WFP inlet low alkalinity and elevated algal ASU	Potential to cause inconvenience to water filtration plant, reducing filter run times	Ongoing raw water quality issues due to successive rain events and change in supply source from Warragamba to Upper Canal supply.	Sampling is being undertaken three times per week, and Sydney Water conducted jar testing and pilot plant testing to inform treatment during difficult raw water quality conditions.
MINOR						
July 2021	CCP	Cordeaux Picnic Area	High turbidity (8.55NTU) in Cordeaux picnic area tap	Elevated turbidity may indicate inadequate disinfection	On 17/07 the pumps failed resulting in the reservoir emptying. When pumps were reset turbidity at the dosing plant reached 23 NTU.	Notified NSW Health. Plant was isolated overnight and returned to < 3 NTU. Advised maintenance team to flush reticulation. Routine flushing to remain in place as currently very low usage is increasing residence time. An auto flushing system is planned for the site. Request confirmation sampling at the end tap.
September 2021	Algae	Warragamba Dam	Cell count and biovolume minor incident threshold	Potential toxin producing species detected.	Naturally occurring organism in waterways.	Managers notified. Sampling increased including toxin analysis and full algal count with rapid results. Flushing of the deeper outlet requested to commence supply from deeper in the water column in consultation with Sydney Water. Algae returned to background levels in December.
October 2021	Pathogens	Fitzroy Falls Dam	Total coliforms 2 cfu/100mL at Fitzroy Falls dosing plant	<i>Coliform bacteria</i> can cause severe gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	No Exceedances or detections. No further investigation required
November 2021	CCP	Fitzroy Falls Dam	Fitzroy Falls Turbidity exceedance at treatment plant (1.25 NTU)	Elevated turbidity may indicate inadequate disinfection	Carted treated water from Wingecarribee Shire.	Falls within adjustment range and Free chlorine residuals within targets. Follow up sampling to be carried out next week
November 2021	Asset	Prospect Reservoir	Instrument calibration deficiencies	Incorrect readings	Inconsistent management of instruments under different projects	WQ team conducted frequent monitoring with no significant discrepancy with turbidity instrumentation and request for calibration was undertaken ASAP.

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
November 2021	Algae	Wingecarribee Dam	Wingecarribee inlet potentially toxin producing cyanobacterial biovolume exceeded minor incident threshold	Potential toxin producing species. No toxins detected.	Naturally occurring organism in waterways, typical in this system from Spring to late Autumn	Incident raised. Informed line managers and stakeholders in Wingecarribee Shire Council.
November 2021	Supply Agreement	Macarthur WFP	Macarthur raw water minor incident algae (293.9 ASU/mL) and total hardness (7mg/L)	Potential to cause inconvenience to water filtration plant, reducing filter run times	Naturally occurring organism in waterways	Notified Macarthur WFP controller who had not identified any issues with the plant
December 2021	CCP	Fitzroy Falls Dam	Fitzroy Falls elevated turbidity - 1.06 NTU, within adjustment range (1-3 NTU)	Elevated turbidity may indicate inadequate disinfection	Discrepancy between SCADA and contractor monitoring	Routine contractor monitoring recorded values within adjustment range. Turbidity in SCADA showing as ~0.6NTU, turbidity at end tap was 0.59NTU. Turbidity < 1 NTU in repeat sample.
December 2021	Supply Agreement	Prospect Reservoir	Prospect Inlet WFP Algal ASU above minor incident threshold	Potential to cause inconvenience to water filtration plant, reducing filter run times. No toxin producing species were identified.	Naturally occurring organism in waterways, common in this system in summer	Thrice weekly sampling of input sites being undertaken under the Prospect acceptance criteria.
December 2021	Supply Agreement	Prospect WFP	Prospect WFP Turbidity - exceeded minor incident threshold (11.2 NTU)	Elevated turbidity may indicate inadequate disinfection	On-line data (SCADA) did not indicate any turbidity issues	No actions required
January 2022	Supply Agreement	Cascades Dam	Elevated algal ASU in Cascades above major incident threshold	Potential to cause inconvenience to water filtration plant, reducing filter run times	Naturally occurring organism in waterways.	Incident raised. Sydney Water and WaterNSW stakeholders notified. Seasonal weekly algal monitoring implemented.
January 2022	Pathogens	Prospect Reservoir	Upper Canal returned a result for <i>E.coli</i> within the minor incident threshold. Result 610 cfu/100mL	<i>E.coli</i> can cause severe gastrointestinal illness but is easily disinfected with chlorine during treatment.	Recent wet weather events	No notification required and 3 consecutive results returned below minor incident level
January 2022	Contamination	Cordeaux Picnic Area	Cordeaux picnic area recorded elevated copper on 05/01 - 2.37 mg/L.	Long term exposure to high concentrations can result in health impacts	Possibly due to long residence time with picnic area closed.	Notified NSW Health. Arrange confirmation sampling and confirmed below health guideline value. Auto-flushing system installed to reduce residence time in the reticulation.

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
January 2022	CCP	Cataract Picnic Area	Cataract Picnic Area, Contractor monitoring on 12/01 recorded low free chlorine at the dosing plant - 0.03 mg/L.	Low free chlorine indicates inadequate disinfection	Possible instrument error	Operator monitoring has shown free chlorine within targets. Contractor's resampling arranged and recorded 1.07mg/L at the dosing plant on 19/01
January 2022	CCP	Cataract Picnic Area	Elevated turbidity at Cataract Picnic Area at 1.14 NTU within adjustment range	Elevated turbidity may indicate inadequate disinfection	Single result in adjustment range only	Chlorine contact time was high and resampling was within operational target
February 2022	CCP	Fitzroy Falls Picnic Area	On 01/02 Fitzroy Falls dosing plant recorded 1.59 NTU which falls within the adjustment range.	Elevated turbidity may indicate inadequate disinfection	Likely discrepancy in field measurement	No significant turbidity change in SCADA, 0.36 NTU at end tap. Resampling showed no further action needed. Water Monitoring Team notified
February 2022	Supply agreement	Prospect WFP	Elevated algal ASU (518.4 ASU/mL) above the minor incident threshold at Prospect WFP inlet	Potential to cause inconvenience to water filtration plant, reducing filter run times	Naturally occurring organism in waterways	Thrice weekly sampling and reporting undertaken. No impact on supply.
February 2022	CCP	Avon Picnic Area	Trace total coliform detection at Avon picnic area dosing plant of 1 cfu/100mL	Coliforms can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	Site resampled with no detections. No <i>E coli</i> detected. Free chlorine concentrations within operational targets.
February 2022	CCP	Cordeaux Picnic Area	Trace total coliform detection at Cordeaux picnic area dosing plant of 1 cfu/100mL	Coliforms can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	Notified MTL. No issues reported and the system continues to operate as required. Follow up sampling clear for total coliforms.
February 2022	Contamination	Cordeaux Picnic Area	Elevated Total Copper detected at Cordeaux Picnic Area at 2.26mg/L	Long term exposure to high concentrations can result in health impacts	Possibly due to long residence time with picnic area closed.	Auto flushing unit has been installed and initiated on 02/02. Checked performance of the unit and increased flushing time. Arrange for special request sampling of total copper. Notified NSW Health
February 2022	Pathogens	Cataract Picnic Area	Trace total coliform detection at Cataract picnic area dosing plant of 3 cfu/100mL	Coliforms can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	Maintenance team reported free chlorine residuals are good. No total coliforms recorded in follow up monitoring.

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
February 2022	Algae	Warragamba Dam	Potentially toxin producing biovolume at Lake Burragorang at 0.228 mm ³ /L	Potential toxin producing species. No toxins detected	Naturally occurring organism in waterways	Twice weekly sampling already being undertaken.
February 2022	Algae	Bendeela Pondage	Potentially toxin producing biovolume at Bendeela Pondage at 0.216 mm ³ /L.	Potential toxin producing species. No toxins detected	Naturally occurring organism in waterways	Weekly sampling continuing and no impact for treatment
February 2022	Pathogens	Fitzroy Falls Picnic Area	Trace total coliform detection at Fitzroy Falls picnic area dosing plant of 1 cfu/100mL	Coliforms can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	Nil <i>E. coli</i> detected at the plant or end tap. SCADA shows turbidity is stable and free chlorine remains within operational targets. Routine monitoring also showed low turbidity and a free chlorine residual of 1.3 mg/L at the plant and end tap
March 2022	Pathogens	Avon Picnic Area	Trace total coliform detection at Avon picnic area dosing plant of 1 cfu/100mL	Coliforms can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Naturally occurring organism in waterways	Picnic Area is closed. No <i>E. coli</i> detected. Plant operating within operational targets. No <i>E. coli</i> or total coliforms at plant
March 2022	Algae	Warragamba Dam	Potentially toxin producing biovolume at Lake Burragorang at 0.35 mm ³ /L	Potential toxin producing species. No toxins detected. Algae are also producing the taste and odour producing compound geosmin.	Naturally occurring organism in waterways. Algal risk is elevated with high nutrients present in the lake due to inflows	Results emailed to Sydney Water and, Health with the Warragamba WQ update from Incident Management Team. Sample collected 0-6 m and the supply offtake was from 41-49 m below the surface, well below the point where any algae would impact supply. Intensive special monitoring (3x per week) during incident and regular updates provided to customers and Health.
April 2022	CCP	Cataract Picnic Area	Elevated turbidity at Cataract Picnic Area at 5NTU more than critical limit	Elevated turbidity may indicate inadequate disinfection.	Significant wet weather event in April	Advise Catchment Assets to signpost as not suitable for drinking. Notified NSW Health. Made arrangements for alternate water sources for the weekend event.
April 2022	Pathogens	Cataract Picnic Area	Cataract Picnic Area <i>E. coli</i> detection (2 orgs /100mL) and total coliforms detection (2 cfu/100mL)	<i>Coliforms/E. coli</i> can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Significant wet weather event in April	Picnic area was already signposted for not suitable for drinking due to elevated turbidity. Notified NSW Health. Confirmation of plant performance, system flushing and follow up sampling required before removing signage.

Date	Sub-type	Location	Details	Potential Consequences	Root Cause Analysis	Actions Taken
April 2022	Pathogens	Cordeaux Picnic Area	Trace total coliform detection at Cordeaux picnic area dosing plant of 1 cfu/100mL	<i>Coliforms</i> can cause gastrointestinal illness but is easily disinfected with chlorine during treatment	Significant wet weather event in April	Picnic area is currently sign posted for not to drink due to high copper concentrations. Turbidity has increased over the past few days. Chlorine residuals are within operational targets.
May 2022	Algae	Warragamba Dam	Potentially Toxin Producing Cyanobacteria at Warragamba breached the minor incident threshold for biovolume at 0.274 mm ³ /L	Potential toxin producing species. No toxins detected.	Naturally occurring organism in waterways	Thrice weekly sampling already being undertaken for a comprehensive suite at multiple depths. The offtake is set deep in the water column well below the zone of algal ingress.
May 2022	CCP	Fitzroy Falls picnic area	Routine monitoring at Fitzroy Falls reservoir recorded at 3.2 NTU	Elevated turbidity may indicate inadequate disinfection.	Discussions with the carter and council suggests the increase in turbidity is due to aeration. Elevated turbidity coincided with delivery of potable water from water carter	Maintenance team conducted tank cleaning on 12/05
May 2022	Algae	Prospect WFP	Prospect WFP Inlet exceeded the minor threshold for Algal ASU (899.4) and Alkalinity (18 mg/L CaCO ₃)	Potential to cause inconvenience to water filtration plant, reducing filter run times.	Naturally occurring organism in waterways	Sampling at this point is being undertaken three times per week under the prospect acceptance criteria, and these problems are identified and being managed at the plant.
June 2022	Contamination	Fitzroy Falls Picnic Area	Fitzroy Falls dosing plant recorded 1.17 NTU at the dosing plant on 31/05 during routine operator monitoring.	Elevated turbidity may indicate inadequate disinfection.	Wingecarribee Council has confirmed the water is within spec, possible disturbance of sediment following tanker delivery	Water from Wingecarribee Council has been aerated for the last few weeks. The raw water reservoir has recently been drained and cleaned. Current turbidity at the plant is 1.02 NTU. Turbidity at the end tap on 31/05 was 0.52 NTU.
June 2022	CCP	Avon picnic area	Elevated turbidity at Avon Picnic Area Reservoir ~ 3 NTU	Elevated turbidity may indicate inadequate disinfection.	Elevated raw water turbidity in lake	Raw water from Lake Avon is ~ 1.3 NTU. Field operator results have been consistent at 1.3-1.77 NTU. Resampling reservoir recorded around 1.3 NTU.
June 2022	Contamination	Avon Dam	Elevated lead in supply recorded during routine monitoring at Avon dam picnic area recorded at 0.010 mg/L	Long term exposure to high concentrations can result in health impacts	Elevated lead is likely due to increased residence time in the reticulation with picnic area closures.	Notified NSW Health. Requested maintenance team to flush system and arrange for resampling for total lead.