Beachwatch

State of the beaches 2023–24

Mid-North Coast region

Department of Climate Change,
Energy, the Environment and Water

NSW GOVERNMENT

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the Traditional Custodians of the lands where we work and live.

We pay our respects to Elders past, present and emerging.

This resource may contain images or names of deceased persons in photographs or historical content.

Artist and designer Nikita Ridgeway from Aboriginal design agency Boss Lady Creative Designs created the People and Community symbol.

Cover photo: Hungry Head Beach, Bellingen. Beachwatch/DCCEEW

Published by:
Environment and Heritage
Department of Climate Change,
Energy, the Environment and Water
Locked Bag 5022, Parramatta NSW 2124
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment and Heritage enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email info@environment.nsw.gov.au
Website www.environment.nsw.gov.au

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Contents

Recreational water quality has been monitored in the Mid-North Coast region since 2022 by Bellingen Shire Council under the Department of Climate Change, Energy, the Environment and Water's Beachwatch Partnership Program. This report summarises the performance of 7 sites on the Mid-North Coast of New South Wales, providing an assessment of how suitable a site is for swimming. Monitored sites include ocean beaches, estuarine areas in Bellinger River and Kalang River, a lagoon, and a freshwater site in Never Never River.

In 2023–2024, 29% of swimming sites in the Mid-North Coast region were graded as Good, including the 2 ocean beaches. These sites were suitable for swimming for most of the time. The Beach Suitability Grades are provisional due to incomplete data available for the microbial assessment, the sanitary inspection or both. Further monitoring is required to obtain a definite classification in accordance with national guidelines.

However, this assessment provides an indication of sites with greater potential for swimming, and sites where water quality is more susceptible to faecal contamination. In general, freshwater and estuarine swimming sites do not perform as well as ocean beaches, due to lower levels of flushing increasing the time needed to disperse and dilute pollution inputs, taking longer to recover from stormwater events.

Mid-North Coast region summary 2023–2024

Lavenders Bridge

Photo: Beachwatch/DCCEEW

Monitoring water quality for swimming in New South Wales

The water quality of beaches and other swimming locations is monitored under the NSW Government's Beachwatch programs to provide the community with accurate information on the cleanliness of the water and to enable individuals to make informed decisions about where and when to swim. Routine assessment also measures the impact of pollution sources, enables the effectiveness of stormwater and wastewater management practices to be assessed and highlights areas where further work is needed.

Swimming sites in New South Wales are graded as Very Good, Good, Fair, Poor or Very Poor in accordance with the National Health and Medical Research Council's 2008 *Guidelines for Managing Risks in Recreational Waters*. These Beach Suitability Grades provide a long-term assessment of how suitable a beach is for swimming. The grades are determined from the most recent 100 water quality results (2–4 years' worth of data depending on the sampling frequency) and a risk assessment of potential pollution sources.

See the section on **Quality assurance** in the Statewide Summary for results of the quality assurance program.

Recreational water quality has been monitored in the Mid-North Coast region by Bellingen Shire Council since 2022.

A **quality assurance** program ensures the information collected and reported by Beachwatch and its partners is accurate and reliable.

The Beach Suitability Grades provided for monitored sites in Bellingen Shire are provisional and subject to change. **Provisional classifications** are provided where the data available for the microbial assessment, the sanitary inspection or both are

incomplete. Further monitoring is required to obtain the necessary data to provide a definite classification in accordance with national guidelines.

Rainfall impacts

During 2023–2024, 7 swimming sites were monitored including ocean beaches, estuarine areas in Bellinger River and Kalang River, and a freshwater site in Never Never River.

Rainfall is the major driver of pollution to recreational waters, generating stormwater runoff and triggering untreated discharges from the wastewater treatment and transport systems. Changes in rainfall patterns are reflected in beach water quality over time due to variation in the frequency and extent of stormwater and wastewater inputs.

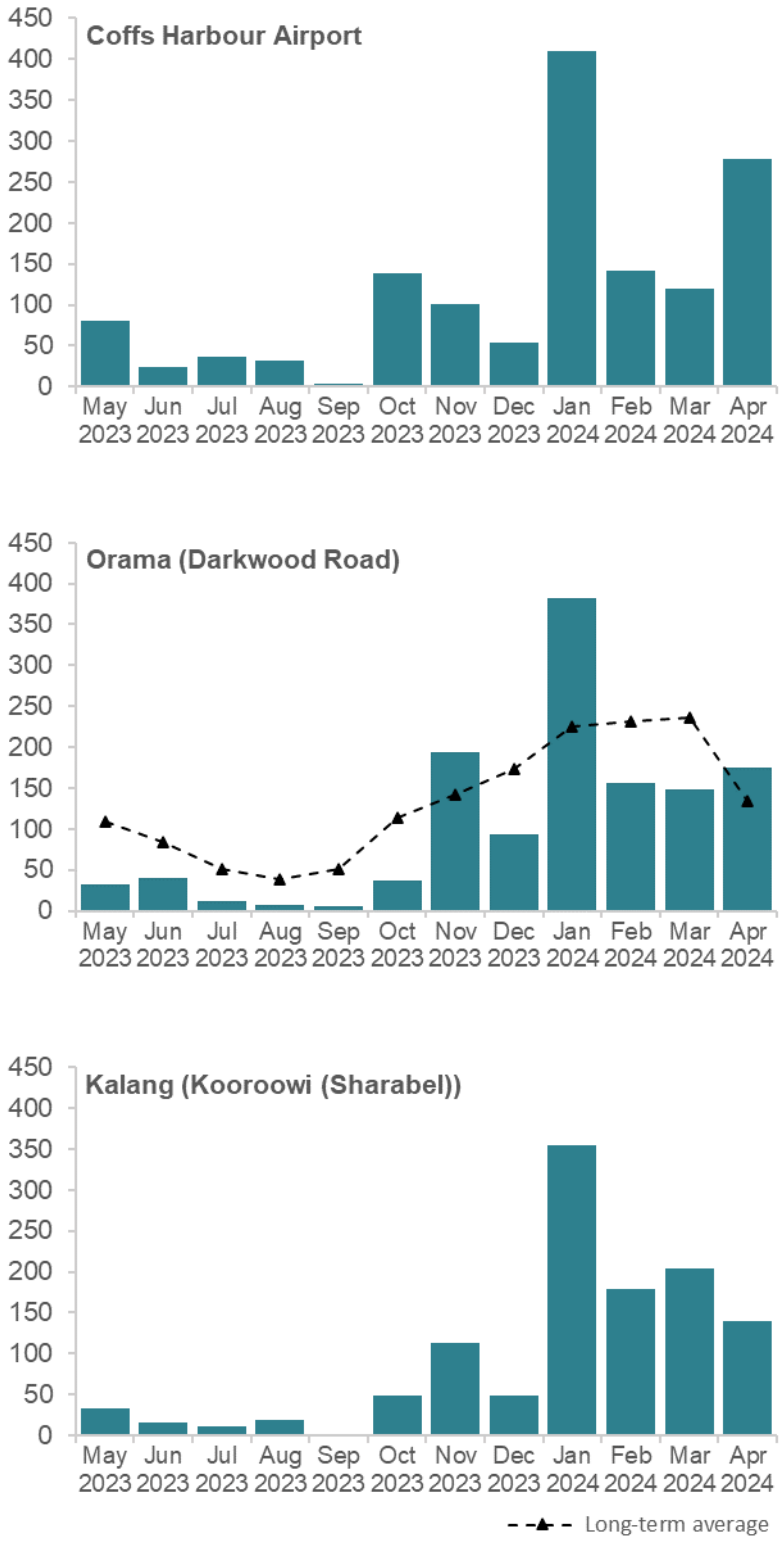
The Beach Suitability Grades for 2023–2024 are based on water quality data collected over the last 2–4 years (since September 2022). Rainfall over this period has been diverse:

- 2022–2023: below average, with lengthy dry periods during November, and some isolated wet weather events. Drier than average conditions in spring continued in summer and autumn
- 2023–2024: below average rainfall and isolated wet months in summer and autumn.

Rainfall on the Mid-North Coast was below the long-term monthly averages from May to September 2023. Monthly rainfall totals were much higher than the previous 6 months across the region between October 2023 and April 2024, with January 2024 notably wet. Coffs Harbour recorded more than two and half times the long-term January average rainfall.

See the section on **How to read this report** on page 19 for an explanation of the graphs, tables and Beach Suitability Grades.

Mid-North Coast region rainfall



Health risks

Contamination of recreational waters with faecal material from animal and human sources can pose significant health problems to beach users owing to the presence of pathogens (disease-causing micro-organisms) in the faecal material. The most common groups of pathogens found in recreational waters are bacteria, protozoans and viruses.

Exposure to contaminated water can cause gastroenteritis, with symptoms including vomiting, diarrhoea, stomach-ache, nausea, headache and fever. Eye, ear, skin and upper respiratory tract infections can also be contracted when pathogens come into contact with small breaks and tears in the skin or ruptures of the delicate membranes in the ear or nose.

Certain groups of users may be more vulnerable to microbial infection than others. Children, the elderly, people with compromised immune systems, tourists, and people from culturally and linguistically diverse backgrounds are generally most at risk.

Beach Suitability Grades for Mid-North Coast region

Swimming site	Site type	Beach Suitability Grade	Change
Bellingen Shire Council			
Arthur Keough Reserve (Never Never River)	Freshwater	P ^	○
Lavenders Bridge (Bellinger River)	Estuarine	P ^	○
Dalhousie Creek	Lagoon	Follow Up ^	○
Hungry Head Beach	Ocean beach	G ^	↑
Urunga Lido (Kalang River)	Estuarine	P ^	○
Mylestom Baths (Bellinger River)	Estuarine	Follow Up ^	○
North Beach	Ocean beach	G ^	○

Beach Suitability Grade					Change		
VG	G	F	P	VP	↑	○	↓
Very Good	Good	Fair	Poor	Very Poor	Improved	Stable	Declined

^ Provisional: Information required for the analysis is incomplete due to limited bacterial data or limited information on potential pollution sources in the catchment.

Follow Up: Sanitary inspection and water-quality data produce potentially incongruent results; further assessment will be required.

Bellingen Shire Council

100%
ocean beaches graded Good or Very Good

Overall results

Two of the 7 sites were graded as Very Good or Good in 2023–2024, and 2 of the 7 sites could not be graded and follow up is required. However, the grades for all monitored sites are provisional with incomplete data available for the microbial assessment, the sanitary inspection or both.

While further monitoring is required to obtain the necessary data to provide a definite classification, this assessment provides an indication of sites with greater potential for safe swimming, and sites where water quality is more susceptible to faecal contamination.

Bellingen Shire Council has monitored these swim sites since 2022.

Percentage of sites graded as Very Good or Good

	2021–2022	2022–2023	2023–2024	Trend
Ocean beaches (2 sites)	–	50%	**100%**	↗
Estuarine (3 sites)	–	0%	**0%**	—
Lagoon (1 site)	–	0%	**0%**	—
Freshwater (1 site)	–	0%	**0%**	—

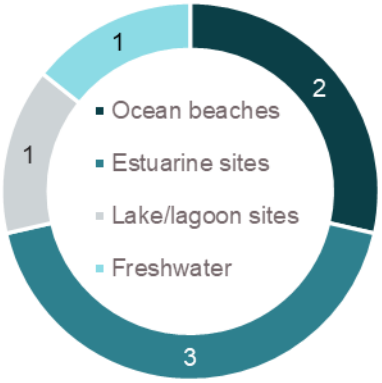
Seven sites were monitored by Bellingen Shire Council. Samples were collected weekly between September and April and sampling and laboratory analysis was fully funded by the council.

See the section on **How to read this report** on page 19 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Hungry Head Beach and North Beach.

These sites had good water quality and were suitable for swimming most of the time.



Site types in Bellingen Shire Council

Swimming sites monitored in the Bellingen region include ocean beaches, estuarine areas in Bellinger River and Kalang River, a lagoon, and a freshwater site in Never Never River, with each site type having a different response to rainfall-related impacts.

Estuarine, lagoon and freshwater swimming sites generally did not perform as well as ocean beaches, due to lower levels of flushing increasing the time needed to disperse and dilute pollution inputs, taking longer to recover from stormwater events.

As a general precaution swimming should be avoided during and for at least one day after heavy rain at ocean beaches, and for up to 3 days in lagoons, rivers and estuarine areas, or if there are signs of stormwater pollution such as discoloured water or floating debris.

Ocean beaches

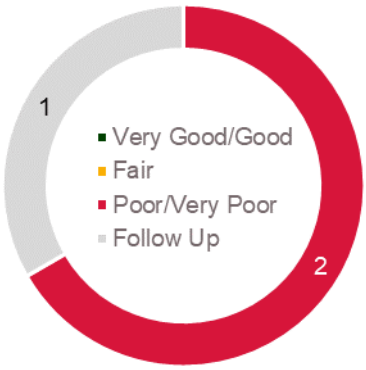
Beach Suitability Grades for Bellingen Shire Council ocean beaches

Hungry Head Beach and North Beach were graded as Good in 2023–2024. Hungry Head Beach improved to Good from Poor in the previous year. Water quality at these beaches was suitable for swimming most of the time, with 83% and 94% of dry weather samples within the safe swimming limit at Hungry Head Beach and North Beach respectively.

The Beach Suitability Grades for these sites are provisional due to limited bacterial data. It is recommended that swimming should be avoided during and for up to one day after rainfall at ocean beaches or if there are signs of stormwater pollution such as

discoloured water, flowing drains or outflow from creeks or lagoons, due to the possibility of pollution.

Estuarine sites



Beach Suitability Grades for Bellingen Shire Council estuarine sites

Lavenders Bridge and Urunga Lido were graded as Poor in 2023–2024, similar to the previous year. These grades are provisional and subject to change as the assessment is based on limited bacterial data. Despite the Poor grades, microbial water quality at these sites has shown trends of improved microbial assessments from the previous year.

Mylestom Baths was graded as Follow Up in 2023–2024, due to incongruent results from the sanitary inspection and microbial water quality. Water quality at this site was generally suitable for swimming in dry weather conditions, with 76% of dry weather samples within the safe swimming limit, but was impacted by stormwater pollution following rainfall.

The sanitary inspection at Mylestom Baths indicates low risk, but microbial water quality assessment data indicate times of poor quality water, which suggests that there are sources of diffuse pollution that have not been identified. This swimming site is in a well flushed section of the estuary however the large catchment upstream has many potential sources of faecal contamination. Follow up is needed with further assessment required to assign a definite Beach Suitability Grade.

In this case, specific studies demonstrating the relative levels of human and nonhuman contamination may be appropriate. Confirmation that contamination is primarily from nonhuman sources may allow reclassification to a more favourable level, but care will be needed because the risk will depend on the type of nonhuman pollution and because the nonhuman source may still be a source of important pathogens.

It is recommended that swimming at estuarine sites should be avoided during and for up to 3 days following rainfall, or if there are signs of pollution such as discoloured water or floating debris.

Lagoon sites

Beach Suitability Grades for Bellingen Shire Council lagoon site

Dalhousie Creek was graded as Follow Up in 2023–2024, due to incongruent results from the sanitary inspection and microbial water quality. While this grade is provisional, microbial water quality was mostly suitable for swimming during dry weather conditions, with 74% of dry weather samples within the safe swimming limit. Elevated bacterial levels increased with increasing rainfall, and frequently exceeded the safe swimming limit after moderate rainfall.

Dalhousie Creek is in a small lagoon with an intermittently closed/open entrance. The lagoon entrance was open several times during the assessment period. Coastal lagoons can have low levels of flushing, and so pollution inputs can accumulate at these sites when they are not open to the ocean, taking longer to recover from stormwater events.

The sanitary inspection at Dalhousie Creek indicates low risk, but microbial water quality assessment data indicate times of poor quality water, which suggests there are sources of diffuse pollution that have not been identified. Follow up is needed with further assessment required to assign a definite Beach Suitability Grade.

In this case, specific studies demonstrating the relative levels of human and nonhuman contamination may be appropriate. Confirmation that contamination is primarily from nonhuman sources may allow reclassification to a more favourable level, but care will be needed because the risk will depend on the type of nonhuman pollution and because the nonhuman source may still be a source of important pathogens.

It is recommended that swimming should be avoided during and for up to 3 days following rainfall, particularly if the lagoon entrance is closed, or if there are signs of pollution such as discoloured water or floating debris.

Freshwater sites

Beach Suitability Grades for Bellingen Shire Council freshwater site

Arthur Keough Reserve was graded as Poor in 2023–2024, similar to the previous year. This grade is provisional and subject to change as data available for the microbial assessment is incomplete.

Microbial water quality was frequently elevated during dry weather conditions and after rainfall. The swim site is known to have low flows, higher water temperatures and high visitation.

Bellingen Shire Council is investigating the source of poor water quality, including testing 4 tributaries to the Never Never River to find sources of diffuse pollution that have not been identified. Further investigation will help address issues of concern and explore potential management solutions.

It is recommended that swimming should be avoided during and for up to 3 days following rainfall, or if there are signs of pollution such as discoloured water or floating debris.

Information about Bellingen Shire Council's **Water Quality Management Plan** is available on council's website.

Sampling sites and Beach Suitability Grades in Bellingen Shire Council

North Beach

Beach grade: G^

See ‘How to read this report’ for key to map.

North Beach is an open ocean beach, along a pristine stretch of coastline. The beach features powerful surf breaks and is patrolled during school holidays and weekends between October and April.

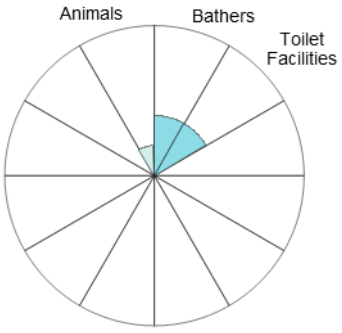
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time, with few potential sources of faecal contamination.

Enterococci levels had little response to rainfall and mostly remained below the safe swimming limit across all rainfall categories.

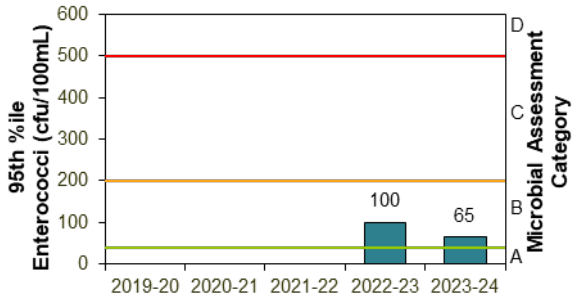
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2022 to Apr 2024	94%	56	Stable

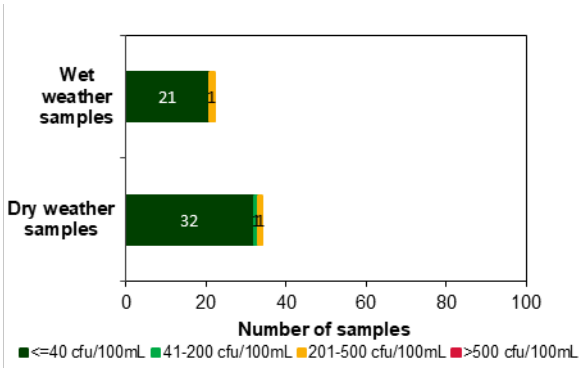
Sanitary inspection: Low



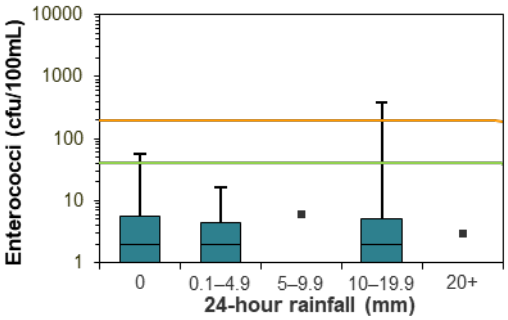
Microbial Assessment Category: B



Dry and wet weather water quality

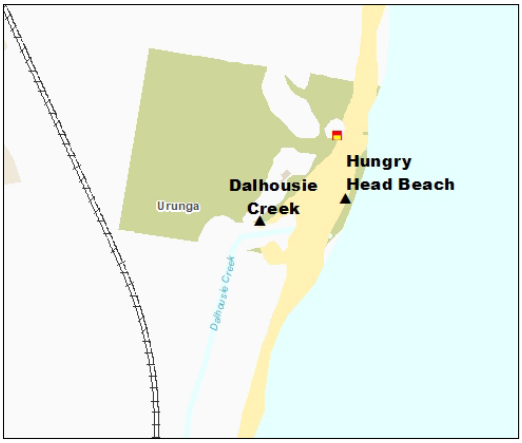


Water quality in response to rainfall



Hungry Head Beach

Beach grade: G^



See 'How to read this report' for key to map.

Hungry Head Beach extends 2 km south from Hungry Head. The entrance to Dalhousie Creek is located at the northern end of the beach.

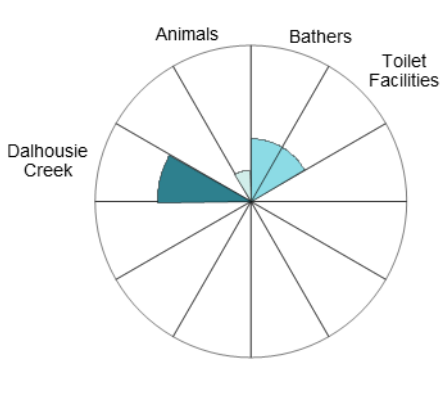
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time, with potential faecal contamination from Dalhousie Creek when the lagoon entrance is open.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain.

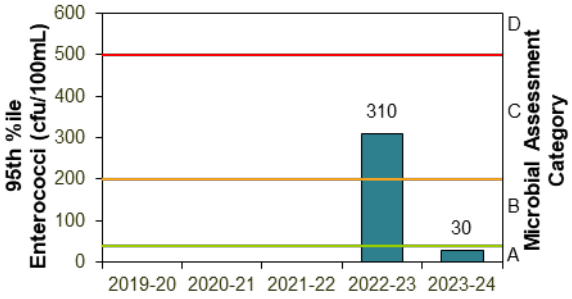
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2022 to Apr 2024	83%	57	Improved ↑

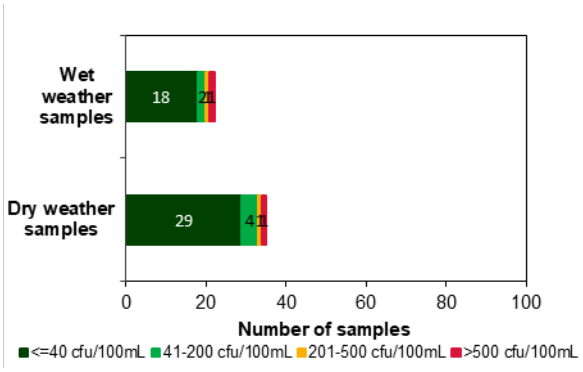
Sanitary inspection: Moderate



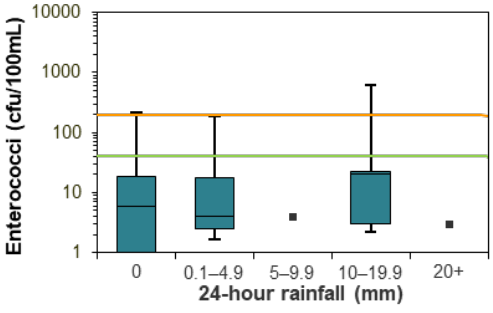
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Mylestom Baths

Beach grade: Follow Up

See ‘How to read this report’ for key to map.

Mylestom Baths is a protected swimming area in the Bellinger River. The enclosed area offers a calm environment for leisurely swims, while the surrounding parklands provide space for picnics and relaxation.

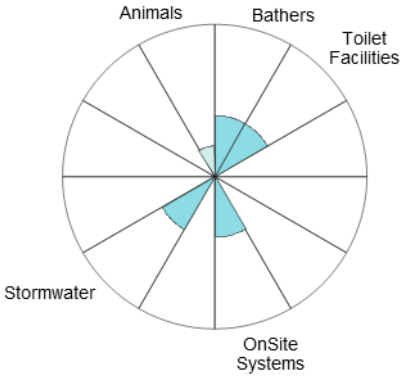
The Beach Suitability Grade of Follow Up indicates sanitary inspection and water quality data produce potentially incongruent results, and further assessment will be required. The large catchment area upstream of the baths has many potential sources of faecal contamination.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and often after rain.

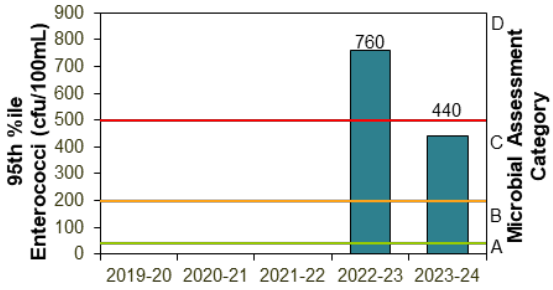
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Sep 2022 to Apr 2024	76%	61	Stable

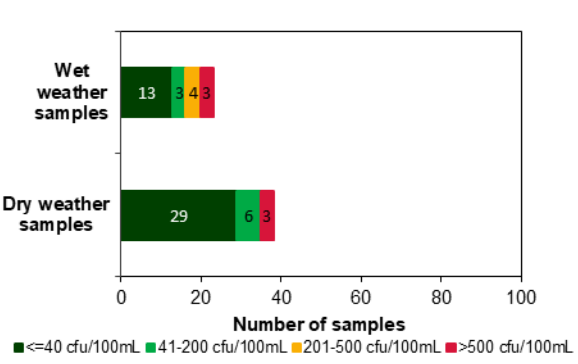
Sanitary inspection: Low



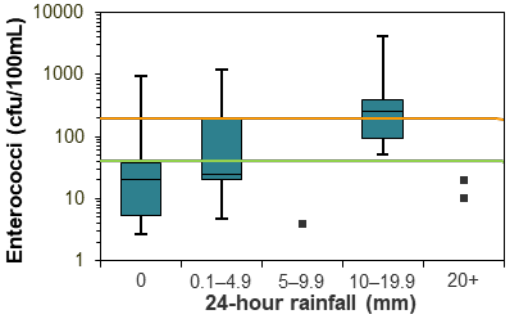
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Urunga Lido

Beach grade: P^

See 'How to read this report' for key to map.

Urunga Lido is a sandy beach with calm waters located in the Kalang River Estuary. The beach is backed by a holiday park and features a recently upgraded boardwalk.

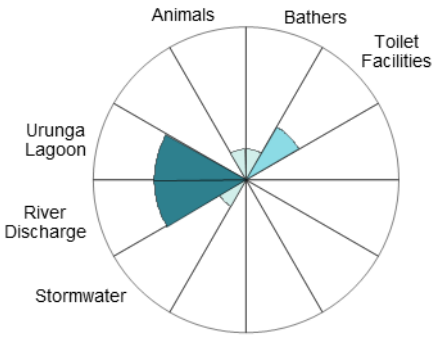
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall, with potential contamination from Urunga Lagoon and river discharge.

Enterococci levels increased slightly with increasing rainfall, often exceeding the safe swimming limit in dry and wet weather conditions.

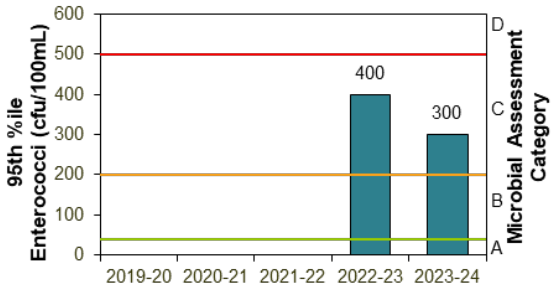
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Sep 2022 to Apr 2024	71%	58	Stable ◯

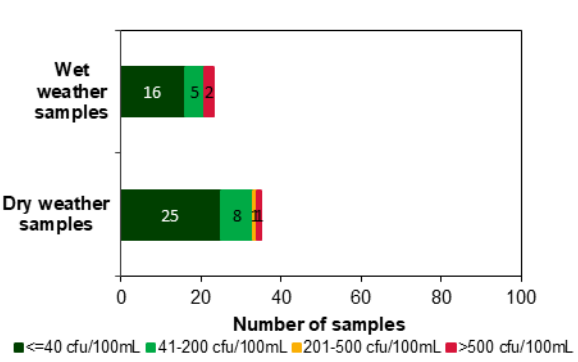
Sanitary inspection: Moderate



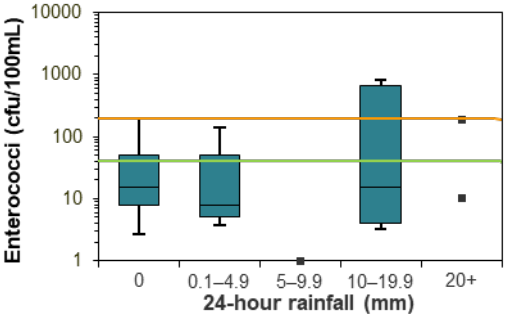
Microbial Assessment Category: C



Dry and wet weather water quality

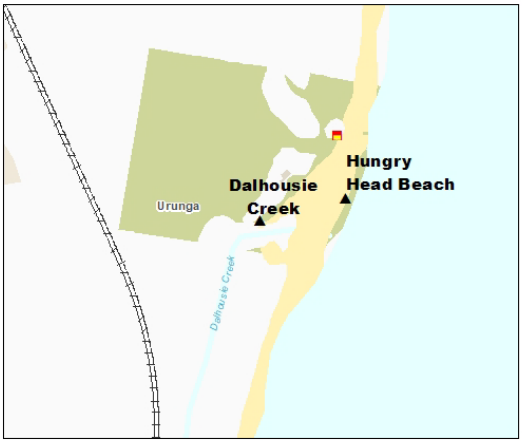


Water quality in response to rainfall



Dalhousie Creek

Beach grade: Follow Up



See 'How to read this report' for key to map.

Dalhousie Creek is located in a small coastal lagoon with an intermittently closed/open entrance which lies just to the south of Hungry Head.

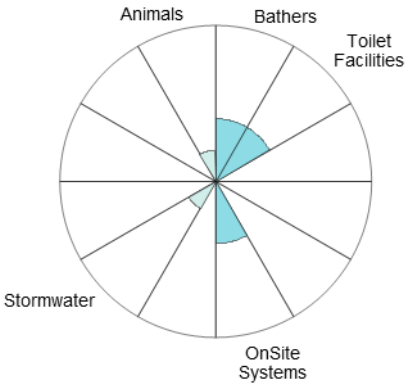
The Beach Suitability Grade of Follow Up indicates sanitary inspection and water quality data produce potentially incongruent results, and further assessment will be required.

Enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit after little or no rain and frequently after 10 mm or more of rainfall.

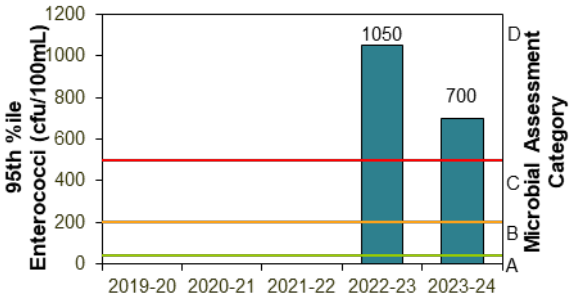
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lagoon	Sep 2022 to Apr 2024	74%	58	Stable

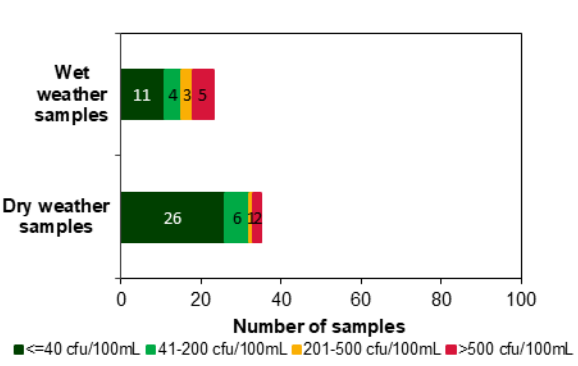
Sanitary inspection: Low



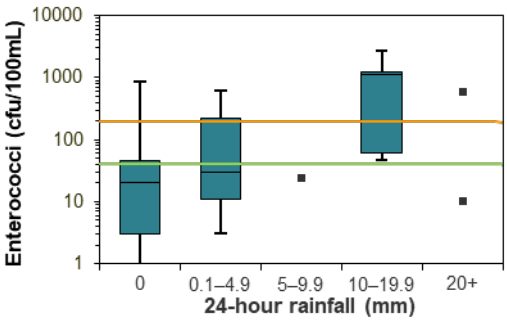
Microbial Assessment Category: D



Dry and wet weather water quality

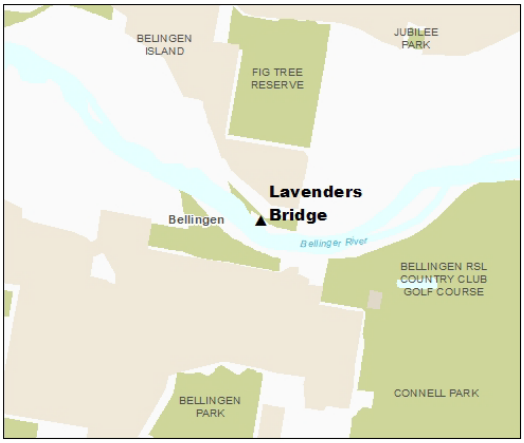


Water quality in response to rainfall



Lavenders Bridge

Beach grade: P^



See 'How to read this report' for key to map.

Lavenders Bridge is a riverside beach in the Bellinger River in the centre of Bellingen.

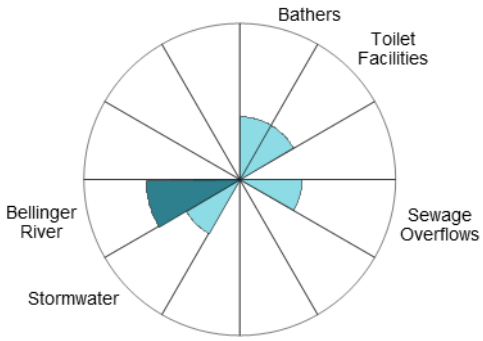
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from upstream sources in Bellinger River and bathers.

Enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit across all rainfall categories.

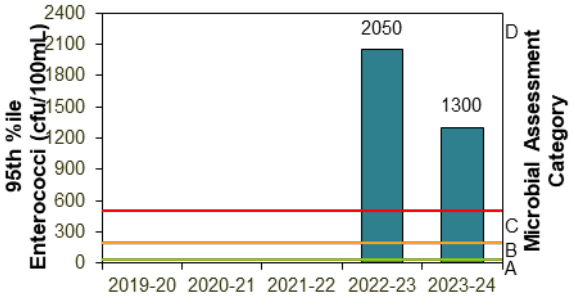
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Sep 2022 to Apr 2024	40%	59	Stable

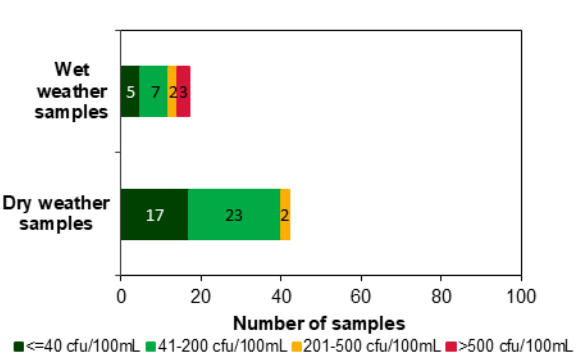
Sanitary inspection: Moderate



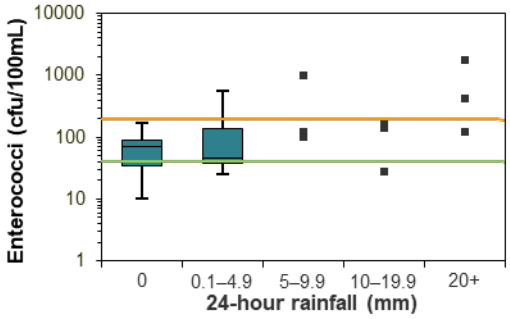
Microbial Assessment Category: D



Dry and wet weather water quality

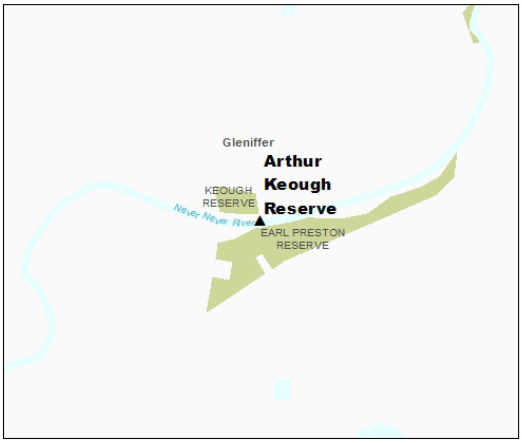


Water quality in response to rainfall



Arthur Keough Reserve

Beach grade: P ^



See ‘How to read this report’ for key to map.

Arthur Keough Reserve is a riverside picnic spot offering space for recreation and relaxation along the Never Never River.

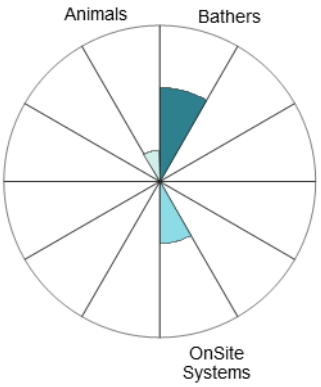
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from bathers and onsite systems.

Enterococci levels increased with increasing rainfall, frequently exceeding the safe swimming limit across all rainfall categories.

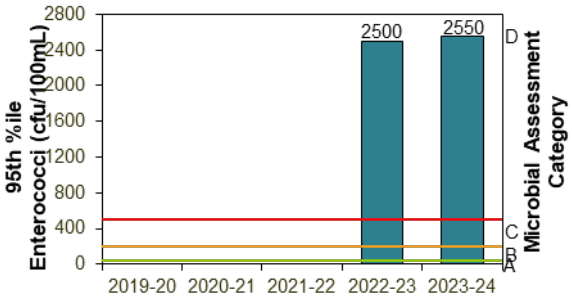
The site has been monitored since 2022.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Freshwater	Sep 2022 to Apr 2024	19%	59	Stable ◯

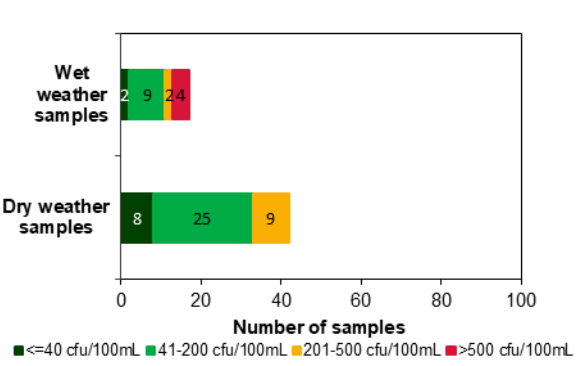
Sanitary inspection: Moderate



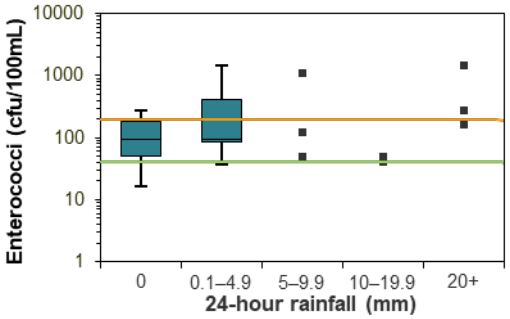
Microbial Assessment Category: D



Dry and wet weather water quality



Water quality in response to rainfall



How to read this report

Beach Suitability Grades

Beach Suitability Grades provide an assessment of the suitability of a swimming location for recreation over time and are based on a combination of sanitary inspection (identification and rating of potential pollution sources at a beach) and microbial assessment (water quality measurements gathered over previous years). There are 5 grades ranging from Very Good to Very Poor:

VG Very Good

Location has generally excellent microbial water quality and very few potential sources of faecal pollution. Water is considered suitable for swimming almost all of the time

G Good

Location has generally good microbial water quality and water is considered suitable for swimming most of the time. Swimming should be avoided during and for up to one day following heavy rain at ocean beaches and up to 3 days at estuarine sites

F Fair

Microbial water quality is generally suitable for swimming, but because of the presence of significant sources of faecal contamination, extra care should be taken to avoid swimming during and for up to 3 days following rainfall or if there are signs of pollution such as discoloured water or odour or debris in the water

Some Beach Suitability Grades in this report are **provisional**, as the information required for the analysis is incomplete due to limited bacterial data or limited information on potential pollution sources in the catchment.

P Poor

Location is susceptible to faecal pollution and microbial water quality is not always suitable for swimming. During dry weather conditions, ensure that the swimming location is free of signs of pollution, such as discoloured water, odour or debris in the water, and avoid swimming at all times during and for up to 3 days following rainfall

VP Very Poor

Location is very susceptible to faecal pollution and microbial water quality may often be unsuitable for swimming. It is generally recommended to avoid swimming at these sites almost all of the time.

Follow Up

Sometimes a location's sanitary inspection and water quality data produce incongruent results. These locations are classified as 'Follow Up'. Further assessment will be required to obtain the necessary data to provide a definite classification in accordance with national guidelines.

The guidelines

The National Health and Medical Research Council's guidelines for managing risks in recreational water (NHMRC 2008) were adopted for use in New South Wales in May 2009. These guidelines have been adopted in all Australian states and territories and are supported by guidance notes developed by the Department of Health Western Australia (WA Department of Health 2007).

Enterococci

The national guidelines advocate the use of enterococci as the single preferred faecal indicator in recreational waters.

These bacteria are excreted in faeces and are rarely present in unpolluted waters. Enterococci have shown a clear dose–response relationship to disease outcomes in

marine waters in the northern hemisphere. In accordance with the guidelines, Beachwatch tests for enterococci only. The enterococci density in water samples is analysed in the laboratory using method AS/NZS 4276.9:2007 (Standards Australia 2007).

Enterococci are measured in colony forming units per 100 mL of sample (cfu/100 mL).

Beach Suitability Grades are determined by using the following matrix:

		Microbial Assessment Category			
		A	**B**	**C**	**D**
Sanitary Inspection Category	**Very Low**	Very Good	Very Good	Follow Up	Follow Up
	Low	Very Good	Good	Follow Up	Follow Up
	Moderate	Good	Good	Poor	Poor
	High	Good	Fair	Poor	Very Poor
	Very High	Follow Up	Fair	Poor	Very Poor

* Follow up occurs when sanitary inspection and water quality data produce potentially incongruent results; further assessment will be required.

Using the Beach Suitability Grade classification matrix, sites assigned a moderate Sanitary Inspection Category can only be rated as Good or Poor, with no option of Fair grades. This can create the impression of a large change in water quality when in fact there need only be a slight increase in bacterial counts to push it over the threshold, with no significant increase in the risk to public health.

Microbial Assessment Category (MAC)

There are 4 Microbial Assessment Categories (A to D) and these are determined from the 95th percentile of an enterococci dataset of at least 100 data points. Each MAC is associated with a risk of illness determined from epidemiological studies. The risks of illness shown below are not those associated with a single data point but are the overall risk of illness associated with an enterococci dataset with that 95th percentile (Wyer et al. 1999).

Risk of illness associated with Microbial Assessment Categories

Category	Enterococci (cfu/100 mL)	Illness risk*
A	≤40	GI illness risk: <1% AFR illness risk: <0.3%
B	41–200	GI illness risk: 1–5% AFR illness risk: 0.3–1.9%
C	201–500	GI illness risk: >5–10% AFR illness risk: >1.9–3.9%
D	>500	GI illness risk: >10% AFR illness risk: >3.9%

* GI = gastrointestinal illness; AFR = acute fever and rash

Calculating the MAC

The 95th percentile is a useful statistic for summarising the distribution of enterococci data at a site. It embodies elements of both the location of the distribution (how high/low the enterococci counts are) and the scale of the distribution (how variable the enterococci counts are).

The 95th percentile values for each of the 4 Microbial Assessment Categories were determined by the World Health Organization using enterococci data collected from swimming locations across Europe. These values will represent different probabilities of illness if the distribution of enterococci data from swimming locations in New South Wales differs from the European distribution.

In recognition of this issue, Dr Richard Lugg (Department of Health, Western Australia) has developed a Microsoft® Excel tool for calculating a modified 95th percentile that takes into account the distribution of data. The WA Department of Health recommends a minimum of 65 samples, collected from a particular site over 5 consecutive years, to provide sufficient confidence and reliability in the 95th percentile data output. This tool has been used to calculate the 95th percentile values

presented in this report and has been adopted for use by other state governments in Australia.

The tool can be downloaded from the WA Government's 'Environmental waters publications' webpage, under *Forms and templates*.

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available in the Beachwatch Protocol for assessment and management of microbial risks in recreational waters, found on the department's website.

The aim of a sanitary inspection is to identify all sources of faecal contamination that could affect a swimming location and assess the risk to public health posed by these sources. It is an assessment of the likelihood of bacterial contamination from identified pollution sources and should, to some degree, correlate with the bacterial water quality results obtained from sampling.

The main sources of faecal contamination considered in the sanitary inspection are: bathers, toilet facilities, wastewater treatment plants (WWTPs), sewage overflows, sewer chokes, onsite systems, wastewater re-use, stormwater, river discharge, lagoons, boats and animals.

Rivers, lakes and estuaries themselves can be potential sources of faecal contamination to sites located in these waterbodies, with contaminated water from upstream or surrounding areas impacting water quality at the swimming location. This source is captured in river discharge or lagoon category, and shown as the waterbody in the sanitary inspection charts.

Through the sanitary inspection process, beaches are categorised to reflect the overall likelihood of faecal contamination. There are 5 categories: Very Low, Low, Moderate, High and Very High.

Stormwater drain flow

Photo: Beachwatch/DCCEEW

Stormwater in urban areas often contains sewage from leakages, overflows or sewer chokes when the sewerage system fails.

Sewage overflows can occur in wet weather when the network has exceeded capacity due to rainwater entering the system. The mix of sewage and rainwater discharges from designated overflow points and drains to waterways, usually via the stormwater system. Overflows from the sewerage system can also occur in dry weather due to mechanical failure or power outage.

Sewer chokes occur due to blockages in the pipes usually due to tree roots, oil, grease or debris. This causes sewage to back up and escape via sewer inspection points, designed overflow structures or cracks in the pipes, then drain to waterways, usually via the stormwater system.

Explanation of tables

Each region contains tables listing all monitored swimming sites including site type, beach grade and change in grade from the previous year.

The following symbols are used to show the change in beach grade from the previous year:

○ Stable

▲ Improved

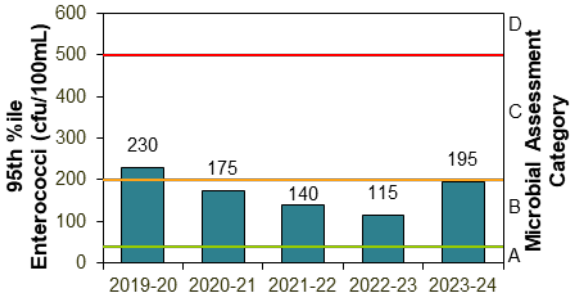
▼ Declined

A provisional grade indicates the assessment is based on limited data collected during the assessment period and should not be compared to the beach grade from the previous year.

Explanation of graphs, charts, and information bars on beach pages

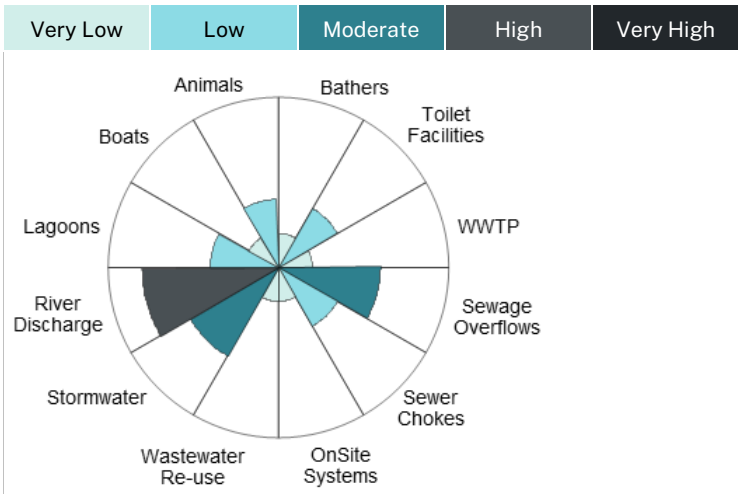
Microbial Assessment Category (MAC) chart

On each beach page, the MACs for the last 5 years are displayed on a simple bar chart. The MAC for the current year is based on enterococci data collected during the assessment period. The bars are labelled with the 95th percentile value for each year and the thresholds dividing the A, B, C and D categories are marked in green, amber and red for reference.



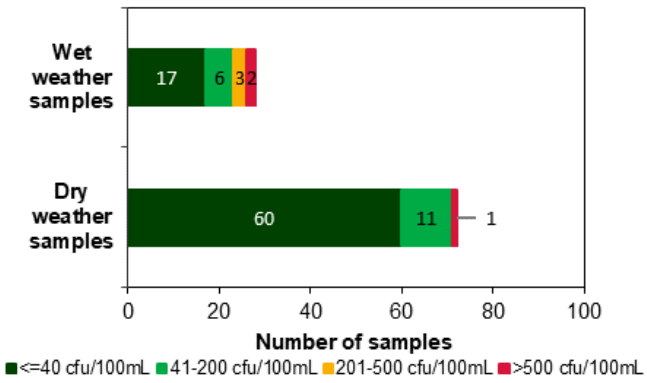
Sanitary Inspection Category (SIC) chart

The results of the sanitary inspection for each swimming location are presented in a radar pie chart. The chart shows the likelihood that each identified pollution source will contribute to faecal contamination at a swimming site, as indicated by the size and colour of the segment, ranging from very low (lightest colour) to very high (darkest colour) as shown below. The sum of these contributions is the overall likelihood, or Sanitary Inspection Category.



Wet and dry weather water quality chart

Enterococci levels in wet and dry weather conditions are presented for each swimming location as a bar graph. All data collected during the assessment period is included in the analysis. Dry weather is defined as no rainfall recorded in the previous 24 hours. Each bar is colour coded to show the number of enterococci results up to 40 cfu/100 mL, between 41 and 200 cfu/100 mL, between 201 and 500 cfu/100 mL and greater than 500 cfu/100 mL. These categories reflect the Microbial Assessment Category thresholds and are coloured on the graph as dark green, light green, amber and red respectively.

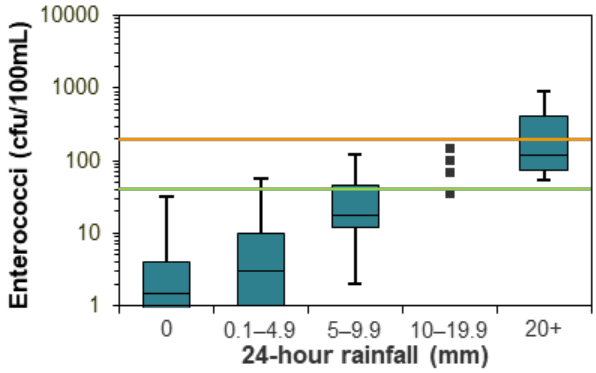


It is expected that swimming sites with lower levels of flushing will show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of stormwater pollution on beach water quality may be detected up to 3 days after rainfall.

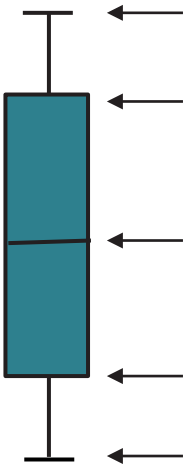
Water quality in response to rainfall

Trends in enterococci levels in response to rainfall are shown using a box plot. For reference, enterococci levels of 40 cfu/100 mL and 200 cfu/100 mL are indicated with a green and orange line, respectively. The 40 cfu/100 mL level is referred to as the ‘safe swimming limit’. The enterococci data were obtained from the last 5 years of monitoring. Rainfall data were obtained from rain gauges situated close to the sample site and are 24-hour totals to 9 am on the day of sampling. If there are fewer than 5 enterococci data points in a rainfall category, individual data points are presented instead of a box plot. At sites

where many results are below the detection limit (1 cfu/100 mL), only the upper portion of the box plots will be visible.



Each part of the box plot represents a significant percentile value of the sample population:



95% of the samples lie below the top whisker

75% of the samples lie below the top of the box

half the samples are on each side of the middle line of the box (median or 50%ile)

25% of the samples lie below the bottom of the box

5% of the samples lie below the bottom whisker.

Information bars

Information bars on each beach page provide a summary of details about the swimming site.

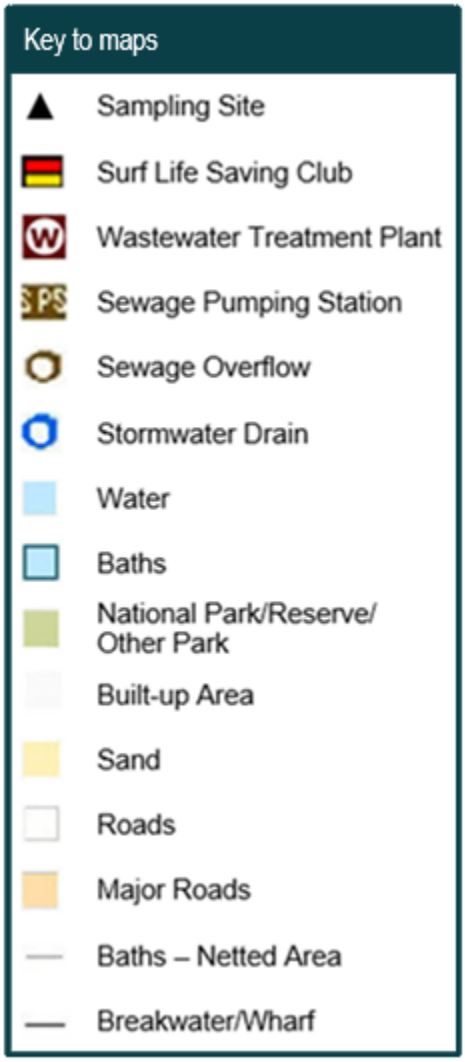
The **assessment period** shows the timeframe in which the water samples were collected. The NHMRC guidelines state beach grades should be determined from the most recent 100 water quality results collected within a 5-year period. The assessment period varies between sites depending on sampling frequency.

Dry weather samples suitable for swimming (**dry weather swimmability**) shows the percentage of water samples with enterococci levels below 40 cfu/100 mL. Dry weather is defined as no rainfall in the previous 24 hours.

Swimming sites with lower levels of flushing often have a lower percentage of dry weather samples within the safe swimming limit due to the impacts of rainfall detected up to 3 days after the event.

Explanation of maps

A map of individual swimming locations is presented on each beach page. The scale of the maps is 1:10,000. Each map shows the location of the sampling site, land use and features such as surf lifesaving clubs. Potential pollution sources such as stormwater drains, sewage pumping stations, wastewater treatment plants, lagoons, rivers and creeks, are shown where accurate data is held.



References

NHMRC (2008) *Guidelines for managing risks in recreational water*, National Health and Medical Research Council, Australian Government Publishing Service, Canberra, ACT.

Standards Australia (2007) *AS/NZS 4276.9:2007, Water microbiology Method 9: Enterococci – Membrane filtration method (ISO 7899-2:2000, MOD)*, Standards Australia International Ltd, Sydney and Standards New Zealand, Wellington.

WA Department of Health (2007), *Microbial quality of recreational water guidance notes in support of chapter 5 of the National Health and Medical Research Council guidelines for managing risks in recreational water, 2006*, Department of Health, Western Australia and The University of Western Australia, October 2007, ww2.health.wa.gov.au/Articles/A_E/Environmental-waters-publications, accessed 10/07/23.

Wyer MD, Kay D, Fleisher JM, Salmon RL, Jones F, Godfree AF, Jackson G and Rogers A (1999) 'An experimental health related classification for marine waters', *Water Research*, 33(3):715–722.

More information

- Beachwatch webpage
- Coastal management program progress
- Sanitary inspection of beaches
- WA Government environmental water publications
- Bellingen Shire Council's Water Quality Management Plan