NSW GOVERNMENT

DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

State of the beaches 2019–2020

Illawarra region

Beachwatch

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Front cover: Stanwell Park Beach (Amanda Schipp/ Wollongong City Council)

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Contents

Recreational water quality has been monitored in the Illawarra region since 1996 by Sydney Water, and by Wollongong City Council and Kiama Municipal Council under the Department of Planning, Industry and Environment's Beachwatch Partnership Program. This report summarises the performance of 21 swimming sites in the Illawarra region of New South Wales, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches and a designated swimming site in Lake Illawarra.

In 2019–2020, 100% of swimming sites in the Illawarra region were graded as Good or Very Good. These sites were suitable for swimming for most or almost all of the time. This is an excellent result, similar in performance to previous years, reflecting the relatively dry conditions and despite a very wet February.

Illawarra region summary 2019–2020

Beach monitoring in NSW

Bellambi Beach
Photo: Beachwatch/EES, DPIE

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 (two to four 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 Illawarra region by Sydney Water since 1996, and Wollongong City Council and Kiama Municipal Council since 2011.

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

Rainfall impacts

During 2019–2020, 21 swimming sites were monitored including ocean beaches and a designated swimming site in Lake Illawarra.

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 2019–2020 are based on water quality data collected over the last two to four years. Rainfall over this period has been diverse:

- 2016–2017: the wettest March on record for many coastal areas and intense storm activity over summer

- 2017–2018: prolonged dry weather periods broken by heavy rain at times
- 2018–2019: extended dry weather conditions except for isolated wet months
- 2019–2020: long dry periods, with some isolated wet weather events and a very wet February.

See the section on **How to read this report** on page 41 for an explanation of the graphs, tables and Beach Suitability Grades.

The Illawarra coast experienced average to well below average rainfall during May 2019 to April 2020, except for a very wet February 2020.

While rainfall was average to well below the long-term average from May to January 2020, there were several isolated wet weather events bringing some heavy rain over several days, including 4–5 June 2019, at the end of August 2019 and 17–19 September 2019. Many months experienced weeks of dry weather, but December 2019 was notably dry. Bellambi received its lowest December total rainfall on record with 6 mm, and Kiama recorded only 2 mm for the month.

Heavy rain fell in February 2020, with well above average rainfall totals recorded in the Illawarra region. Bellambi and Port Kembla recorded more than two and half times the long-term monthly averages for February, with 400 mm and 380 mm recorded, respectively. Bellambi recorded its highest daily rain total for February on record with 137 mm.

The severe wet weather and king high tides in February 2020 led to extensive flooding. Beachwatch issued extreme wet weather alerts on the Illawarra daily beach pollution forecast during February 2020, advising stormwater pollution may be impacting ocean beaches for an extended period, with lifeguard reports of floating debris and discoloured water continuing after the rain had ceased.

The Illawarra coast experienced many isolated showers during March 2020, with a high number of wet days for the month. Rainfall totals for April 2020 were well below the long-term monthly average.

Bushfires and water quality

Bushfire ash and debris washed up on Stanwell Park Beach
Photo: Beachwatch/EES, DPIE

Catastrophic bushfires affected areas of the Illawarra region, particularly through the Southern Highlands, between October 2019 and January 2020. Despite the fires not directly impacting the coastal area, ash and debris were evident at many beaches.

Ash fallout from bushfires can add chemical contaminants to waterways and beaches. Rainfall-driven runoff from burnt areas can also impact water quality by washing suspended solids such as ash, charcoal, debris and soil particles, pathogens and dissolved materials into dams, streams and waterways. Dissolved materials can include nutrients, metals and organic matter. Increases in nutrients including phosphorus and nitrogen in the waterways can promote algal blooms.

Beachwatch issues daily **beach pollution forecasts** to enable beach goers to make informed decisions about where and when to swim.

Pollution forecasts for the Illawarra beaches can be accessed via the Beachwatch website, email subscription, Twitter and Facebook.

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 Illawarra region

Swimming site	Site type	Beach Suitability Grade	Change
Wollongong City Council			
Stanwell Park Beach	Ocean beach	VG	●
Coledale Beach	Ocean beach	VG	●
Austinmer Beach	Ocean beach	VG	●
Thirroul Beach	Ocean beach	G	●
Bulli Beach	Ocean beach	G	●
Woonona Beach	Ocean beach	VG	●
Bellambi Beach	Ocean beach	G	●
Corrimal Beach	Ocean beach	G	●
North Wollongong Beach	Ocean beach	G	●
Wollongong City Beach	Ocean beach	VG	●
Coniston Beach	Ocean beach	VG	●
Fishermans Beach	Ocean beach	VG	●
Port Kembla Beach	Ocean beach	G	●
Shellharbour City Council			
Entrance Lagoon Beach	Lake/Lagoon	G	●
Warilla Beach	Ocean beach	VG	●
Shellharbour Beach	Ocean beach	VG	●
Kiama Municipal Council			
Boyds Jones Beach	Ocean beach	VG	●
Bombo Beach	Ocean beach	VG	●
Surf Beach Kiama	Ocean beach	G	●
Werri Beach	Ocean beach	VG	●
Seven Mile Beach (Gerroa)	Ocean beach	VG	●

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

Wollongong City Council

Overall results

All 13 swimming sites were graded as Very Good or Good in 2019–2020. Excellent results have also been recorded in previous years.

Percentage of sites graded as Very Good or Good:

- 2019–2020: 100%
- 2018–2019: 100%
- 2017–2018: 100%
- 2016–2017: 100%.

See the section on **How to read this report** on page 41 for an explanation of the graphs, tables and Beach Suitability Grades.

Eleven locations were monitored by Sydney Water. Samples were collected every sixth day throughout the year at nine locations, and two locations were monitored every sixth day between October and April.

Two locations were monitored by Wollongong City Council. Samples were collected every sixth day (excluding weekends) between October and April and sampling and laboratory analysis was fully funded by the council.

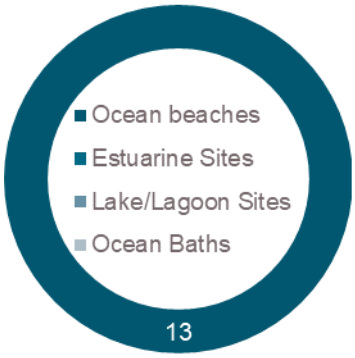
Best beaches

Stanwell Park Beach, Coledale Beach, Austinmer Beach, Woonona Beach, Wollongong City Beach, Coniston Beach and Fishermans Beach.

These sites had excellent water quality and were suitable for swimming almost all of the time.

Ocean beaches were the only site type monitored in the Wollongong region.

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



Site types in Wollongong City Council

Ocean beaches

Beach Suitability Grades for Wollongong City Council ocean beaches

All ocean beaches continued to be graded as Very Good or Good in 2019–2020.

Stanwell Park Beach, Coledale Beach, Austinmer Beach, Woonona Beach, Wollongong City Beach, Coniston Beach and Fishermans Beach were graded as Very Good. Water quality at these beaches has been of a very high standard for many years and is suitable for swimming almost all of the time.

Six beaches were graded as Good: Thirroul Beach, Bulli Beach, Bellambi Beach, Corrimal Beach, North Wollongong Beach and Port Kembla Beach. Water quality at these sites was frequently suitable for swimming during dry weather conditions. Elevated enterococci levels were occasionally recorded following rainfall, and generally increased with increasing rainfall. Many of these sites have several, or more significant, potential sources of pollution such as stormwater drains or discharges from creeks or lagoons. Discharges from storm sewage treatment plants (SSTPs) at Bellambi and Port Kembla may also affect the water quality at nearby beaches Bellambi, Corrimal and Port Kembla following heavy rainfall.

It is recommended that swimming be avoided at these beaches during and for up to one day following rainfall, or if there are signs of pollution such as discoloured water, flowing drains or floating debris.

Management

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

A **Coastal Management Program** (CMP) outlines a long-term strategy for managing the coast, in line with the *Coastal Management Act 2016*.

The NSW Government provides guidance and funding through the Coastal and Estuary Grants Program for local councils to prepare and implement CMPs.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

Wollongong City Council

The Lake Illawarra Coastal Management Program (CMP) has been prepared in partnership by Wollongong City Council, Shellharbour City Council and the Department of Planning, Industry and Environment (DPIE), with funding provided under the NSW Government's Coastal and Estuary Grants Program. The CMP has been adopted by both councils and has been submitted to the NSW Government for certification and is currently being assessed. The CMP outlines the strategic aims for managing Lake Illawarra and includes prioritised actions for managing specific threats to estuary health. In recognition of land-use pressures and threats, and in response to the values held by the community, water quality is a key consideration within the CMP. Water quality management actions within the CMP relate to stormwater infrastructure improvements, restoring and maintaining riparian corridors and coastal wetlands, strategic land-use planning, and water quality monitoring.

Wollongong City Council has previously installed several stormwater quality improvement devices and is continuing to maintain these. This includes devices in waterways that drain to the patrolled beaches in the Wollongong local government area. Council is planning to install a device at Port Kembla Beach and design a new device for installation at Belmore Basin, located between Wollongong City and North Wollongong patrolled beaches.

As part of an ongoing program with Corrective Services NSW, council undertakes weekly litter collection along the foreshore, beaches and creeks, as well as collection after coastal storms. Material collected includes plastics, cans, paper, polystyrene and large litter items. Clean Up Australia Day activities in March 2020 included major clean-ups along most Wollongong beaches and Wollongong Harbour.

Riparian work is continuing along Hargraves Creek, Stanwell Creek, Whartons Creek, Slacky Creek, Collins Creek, Bellambi Creek, Bellambi lagoon, Towradgi Creek and Fairy Creek, aimed at improving water quality and overall catchment health.

Council is undertaking ongoing works in the dunes at nine priority beaches: Stanwell Park, Bulli, Woonona, Bellambi, Corrimal, Towradgi, Fairy Meadow, City and Port Kembla, as identified in the Wollongong Dune Management Strategy. Works undertaken in the dunes included weed control, planting of low growing native vegetation and rubbish collection to improve sightlines for lifesavers and lifeguards and the amenity of beach users. Dune reshaping works at

Coledale Beach
Photo: Amanda Schipp/
Wollongong City Council

Woonona, Corrimal, Towradgi, Fairy Meadow and Port Kembla have also been implemented to improve beach amenity, access and safety.

Sydney Water

To reduce the incidence of wet weather sewage overflows in beach catchments from Austinmer to Port Kembla, Sydney Water increased the capacity of pipes and pumps and included storage tanks. Sydney Water has also inspected, cleaned and repaired those sewer mains in beach catchments from Austinmer to Port Kembla that have a high likelihood of discharging sewage to waterways if they become blocked. When significant tree root intrusion to the public sewer from the private sewer was identified, property owners were asked to remedy the problem.

Sampling sites and Beach Suitability Grades in Wollongong City Council

Stanwell Park Beach

Beach grade: VG

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

The beach is 700 metres long and is backed by dunes and a reserve. Lifeguards patrol the beach from September to April.

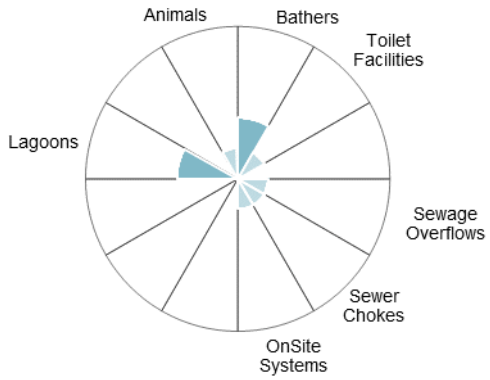
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 5 mm or more of rain.

The site has been monitored since 2011.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2015 to Mar 2020	98%	100	Stable

Sanitary inspection: Low



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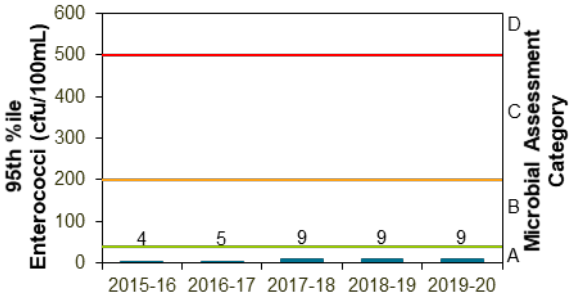

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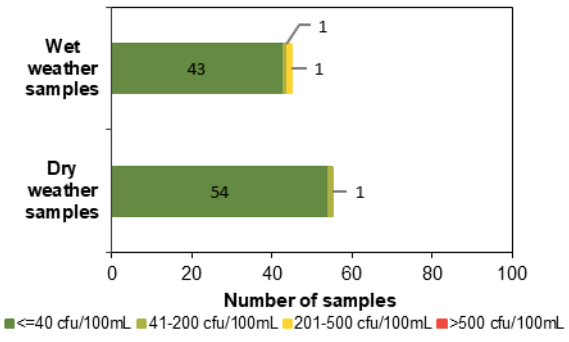
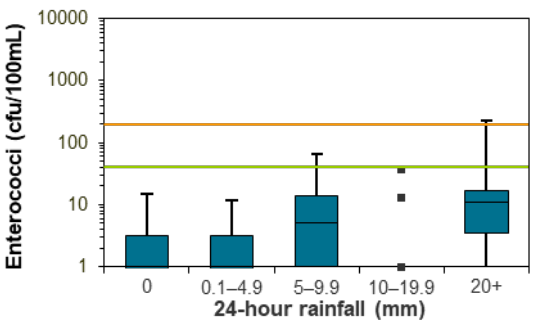


Water quality in response to rainfall



Coledale Beach

Beach grade: VG

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

Coledale Beach is 300 metres long and is backed by a small grass reserve and campsite. Lifeguards patrol the beach from September to April.

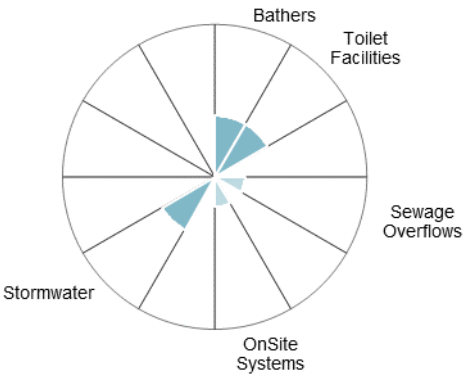
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit after 10 mm or more of rain.

The site has been monitored since 2011.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2015 to Mar 2020	96%	100	Stable

Sanitary inspection: Low



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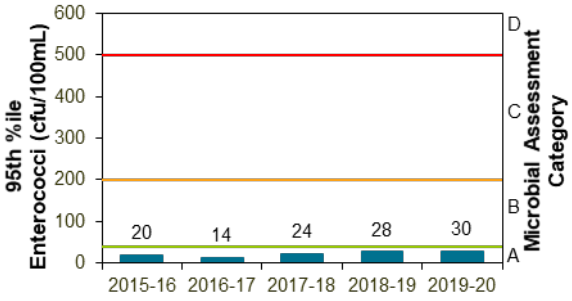
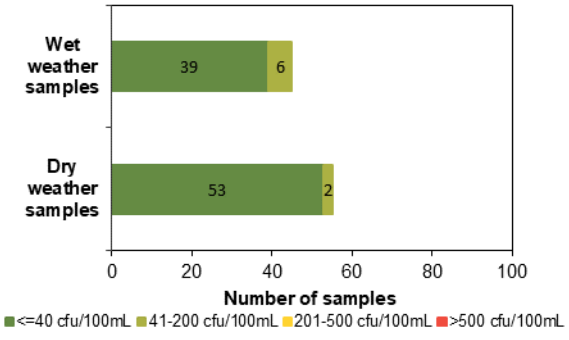
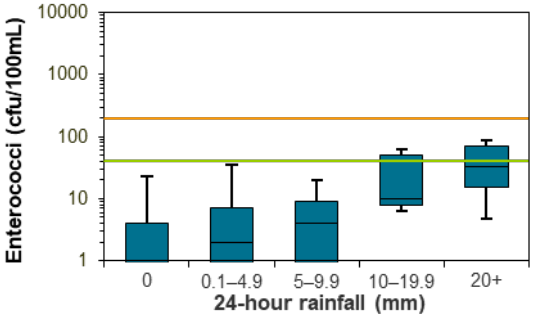


Dry and wet weather water quality



Water quality in response to rainfall



Austinmer Beach

Beach grade: VG

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

Austinmer is a small beach with ocean baths on the southern rock platform. Lifeguards patrol the beach from September to April.

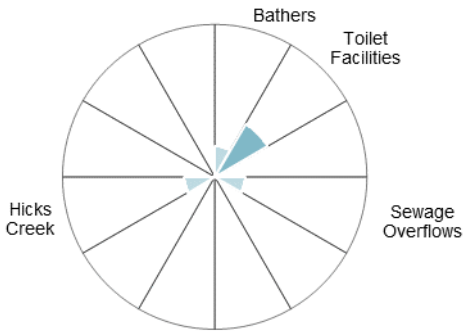
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 5 mm or more of rain.

The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2017 to Apr 2020	100%	100	Stable

Sanitary inspection: Low



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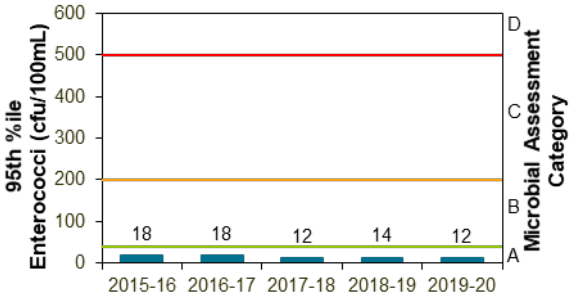
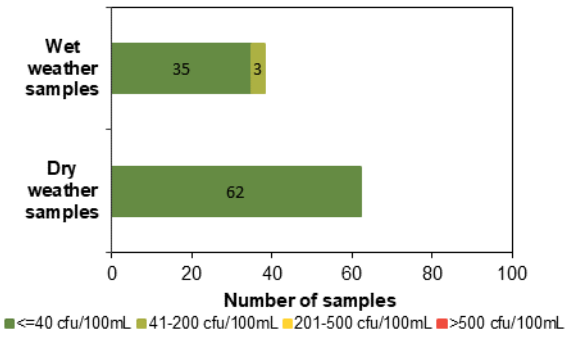
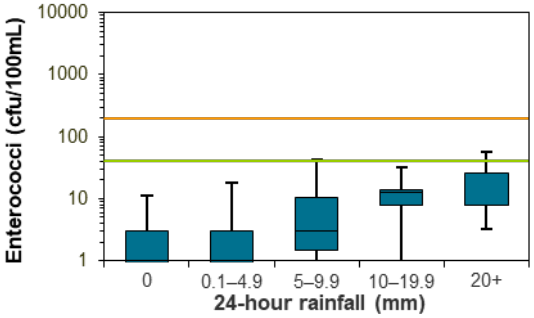


Dry and wet weather water quality



Water quality in response to rainfall



Thirroul Beach

Beach grade: G

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

Thirroul Beach is one kilometre long and backed by a grassed reserve. Lifeguards patrol the beach from September to April.

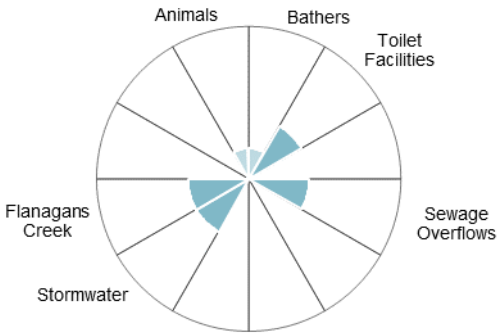
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but can be susceptible to pollution after rain, from several potential sources of faecal contamination including stormwater and Flanagans Creek.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to light rain, and often after 20 mm or more.

The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2017 to Apr 2020	97%	100	Stable

Sanitary inspection: Moderate



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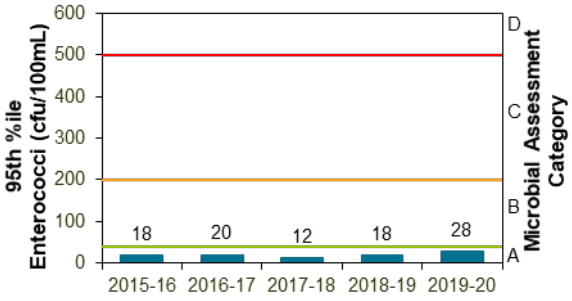
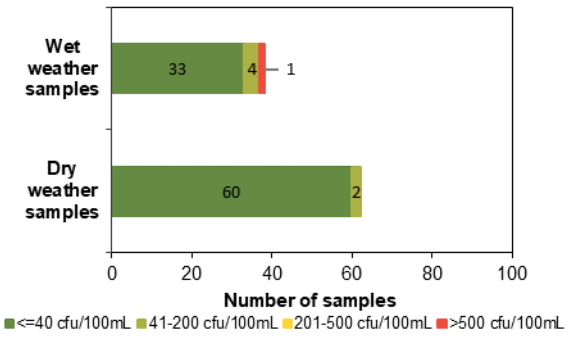
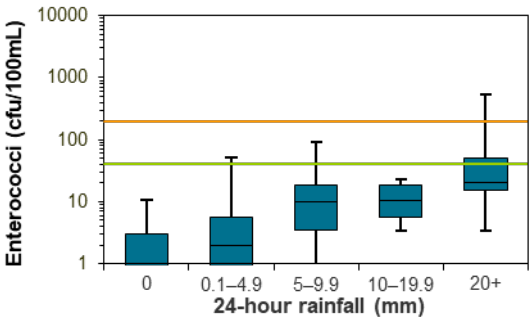


Dry and wet weather water quality



Water quality in response to rainfall



Bulli Beach

Beach grade: G

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

Bulli beach is at the northern end of a 900 metre long beach. The beach is patrolled from September to April.

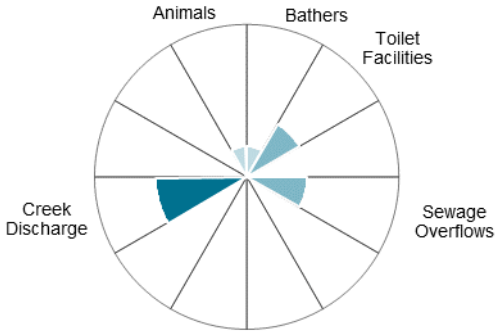
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination, including discharge from Whartons Creek.

Enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit after 5 mm or more of rain, and regularly after 20 mm or more.

The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

Sanitary inspection: Moderate



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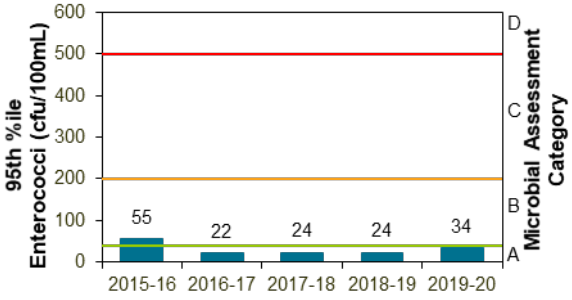
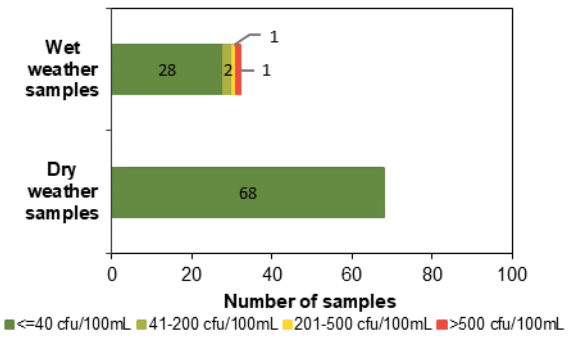
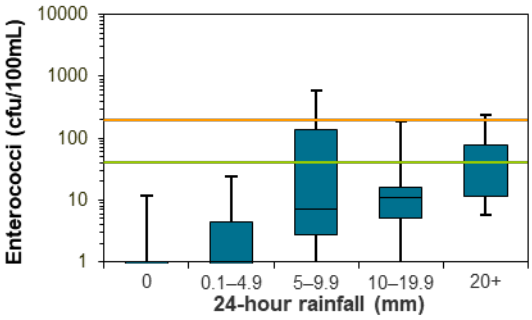


Dry and wet weather water quality

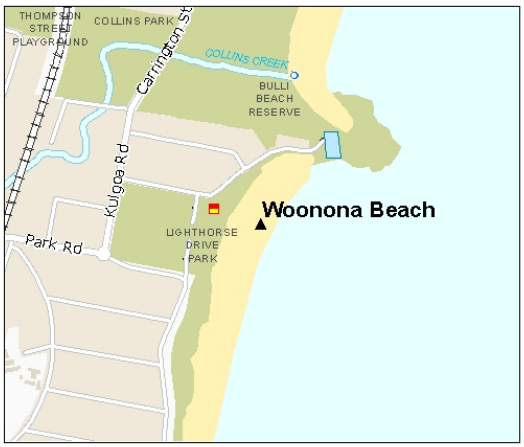


Water quality in response to rainfall



Woonona Beach

Beach grade: VG



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

Woonona Beach is at the northern end of a two kilometre stretch of beach. Lifeguards patrol the beach from September to April.

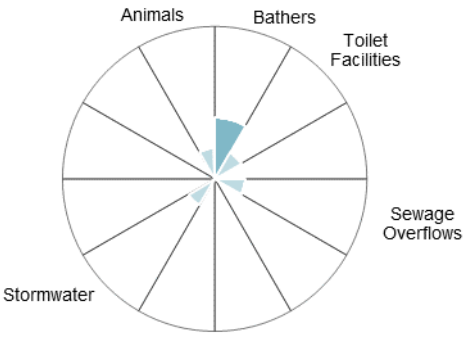
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, often exceeding the safe swimming limit in response to 20 mm or more of rain.

The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

Sanitary inspection: Low



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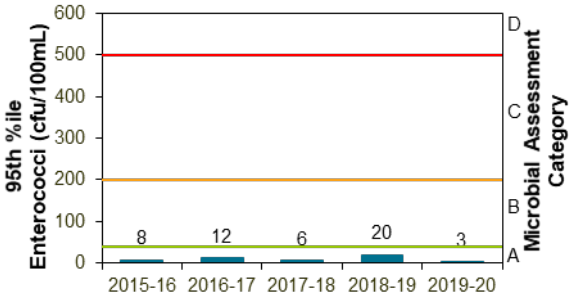
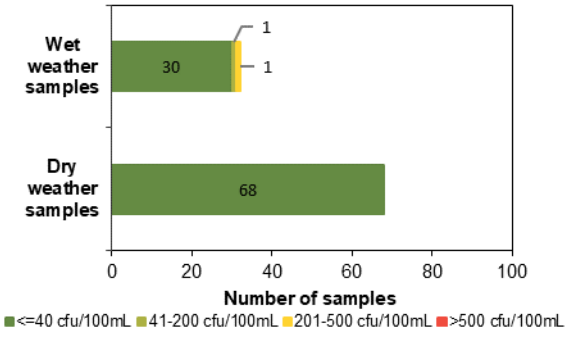
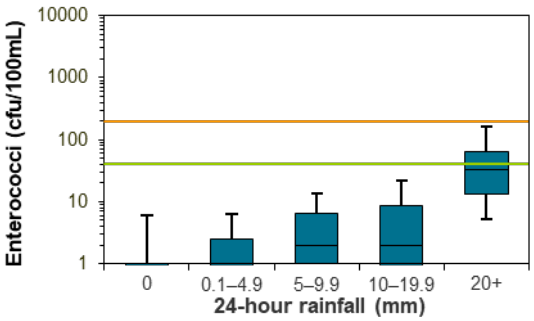


Dry and wet weather water quality



Water quality in response to rainfall



Bellambi Beach

Beach grade: G

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

Bellambi Beach is at the southern end of a two kilometre stretch of beach. Lifeguards patrol the beach from September to April.

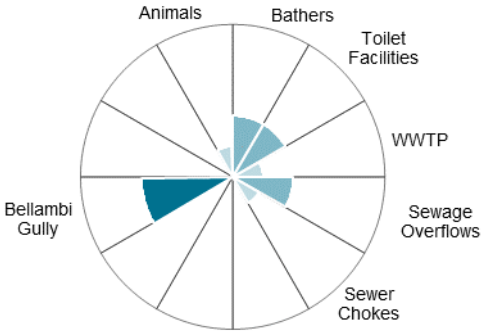
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination, including discharge from Bellambi Gully.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after light rain, and often after 5 mm or more.

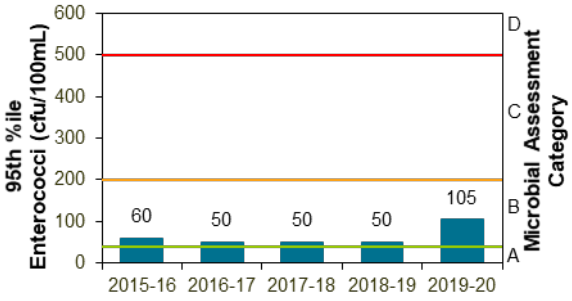
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	94%	100	Stable

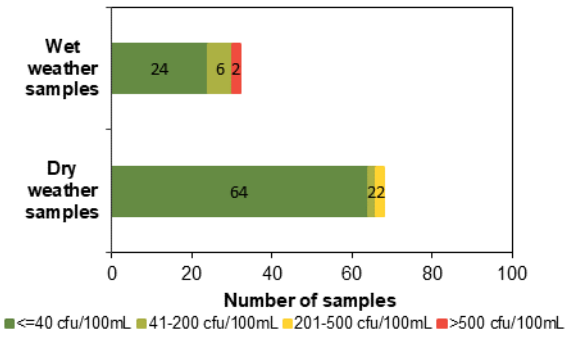
Sanitary inspection: Moderate



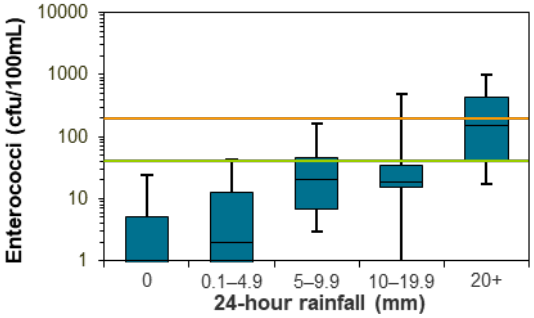
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Corrimal Beach

Beach grade: G

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

The beach is 1.4 kilometres long and is backed by a reserve and caravan park. Lifeguards patrol the beach from September to April.

The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination, including Towradgi Creek.

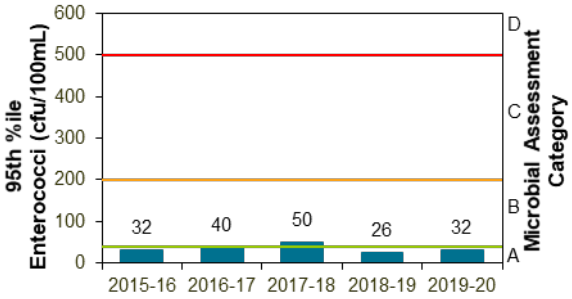
Enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 5 mm or more of rain, and regularly after 20 mm or more.

The site has been monitored since 1996.

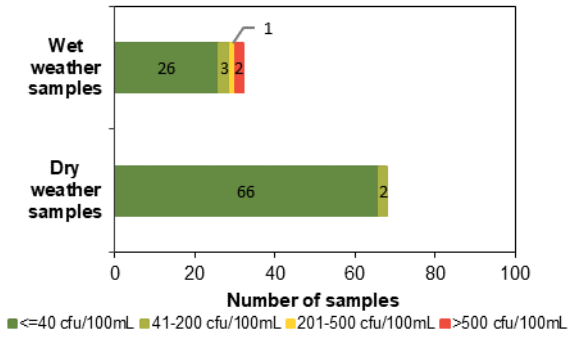
Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	97%	100	Stable

Sanitary inspection: Moderate

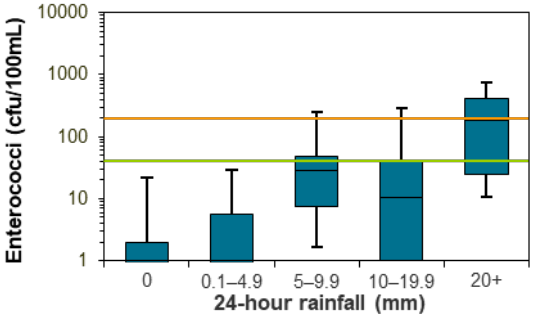
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



North Wollongong Beach

Beach grade: G

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

North Wollongong Beach is 500 metres long and is backed by steep bluffs, a reserve and a picnic area. Lifeguards patrol the beach all year round.

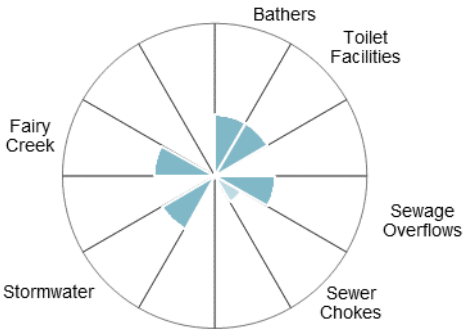
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after heavy rain, with several potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, often exceeding the safe swimming limit after 20 mm or more of rain.

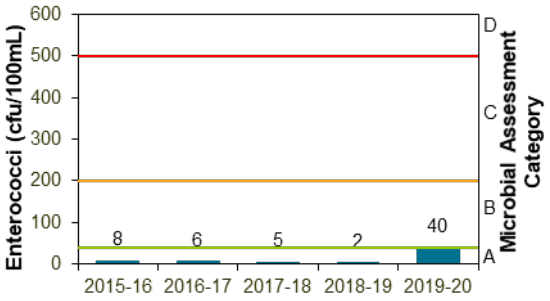
The site has been monitored since 1996, excluding 1997–1998.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	97%	100	Stable

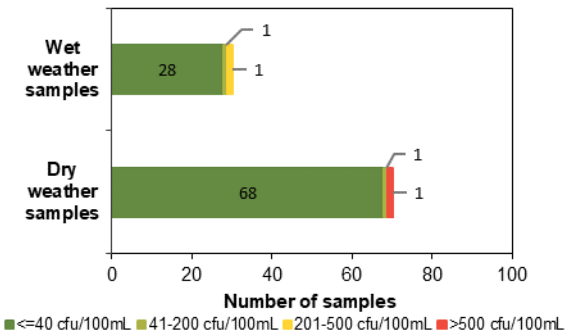
Sanitary inspection: Moderate



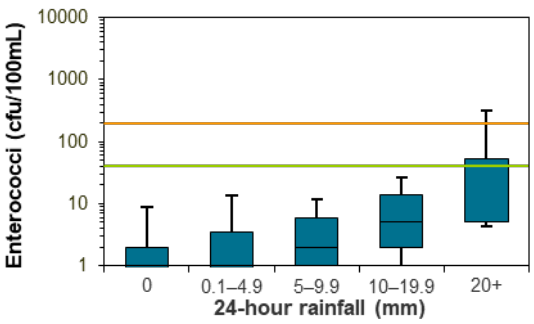
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Wollongong City Beach

Beach grade: VG

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

Wollongong City Beach is at the northern end of a four kilometre stretch of beach. Lifeguards patrol the beach from September to April.

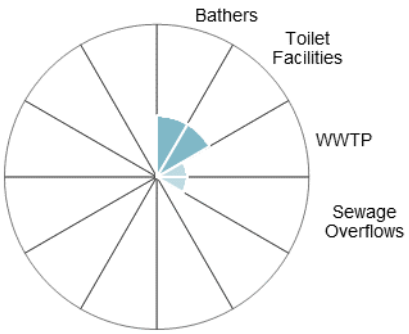
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after 20 mm or more of rain.

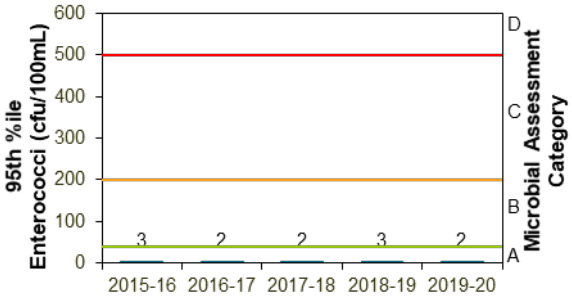
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

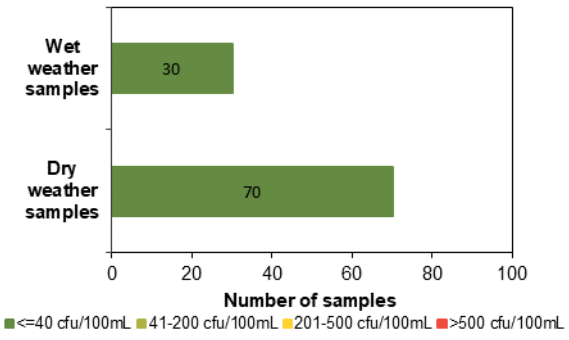
Sanitary inspection: Low



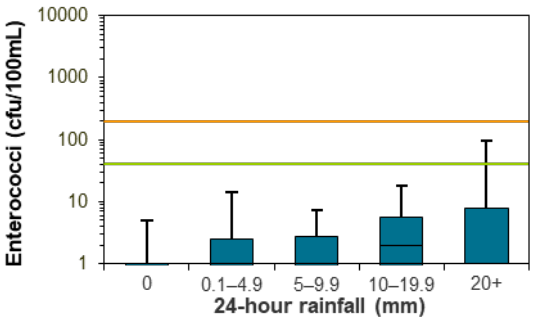
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Coniston Beach

Beach grade: VG

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

Coniston Beach is in the middle of a four kilometre stretch of sand, to the north of Port Kembla, and backed by a golf course.

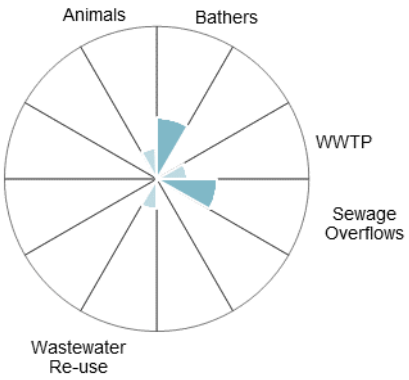
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm or more of rain.

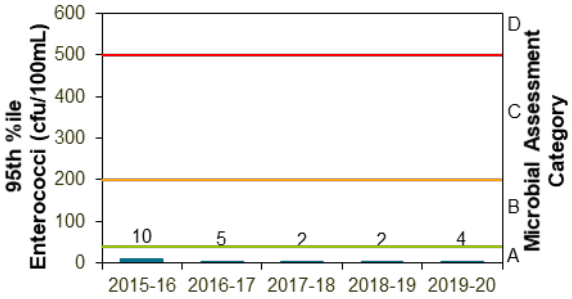
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	99%	100	Stable

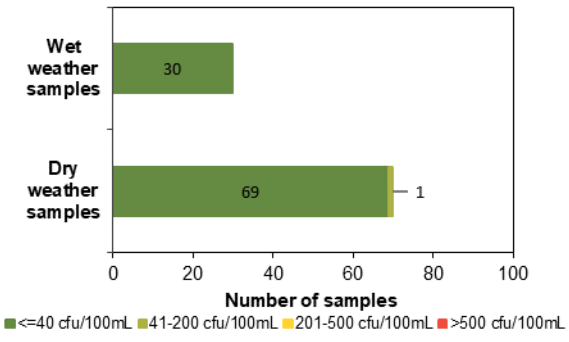
Sanitary inspection: Low



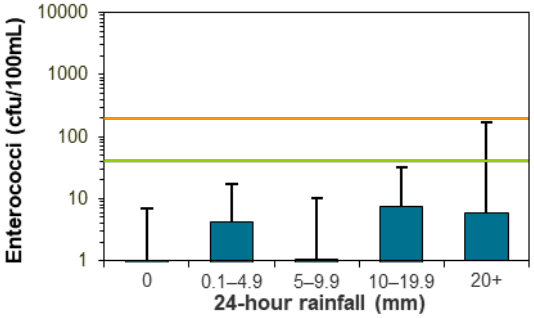
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Fishermans Beach

Beach grade: VG

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

Fishermans Beach is a small, north-east facing beach backed by high cliffs.

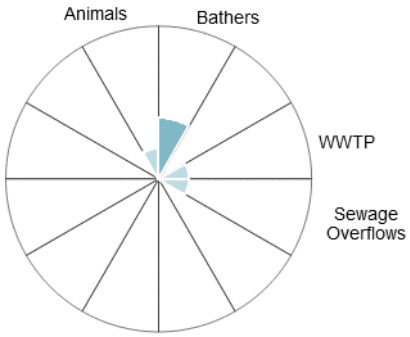
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm or more of rain, and often after 20 mm or more.

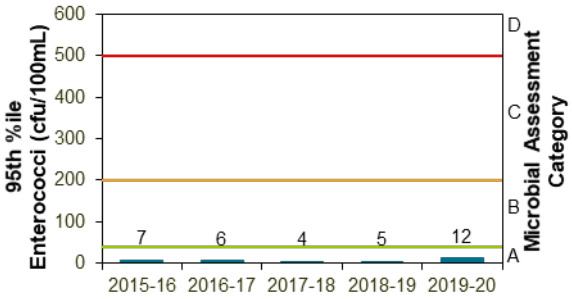
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	99%	100	Stable

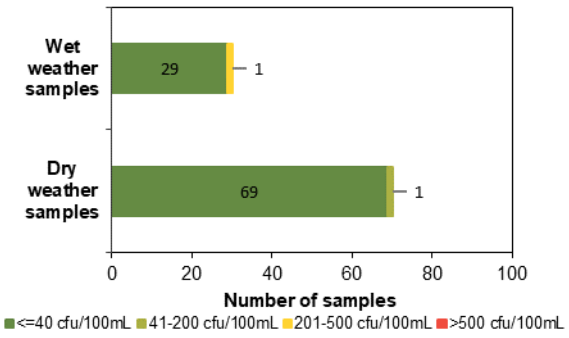
Sanitary inspection: Low



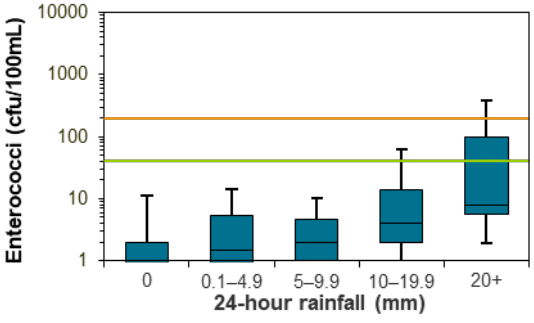
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Port Kembla Beach

Beach grade: G

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

Port Kembla Beach is in the northern corner of a long stretch of beach. Lifeguards patrol the beach from September to April.

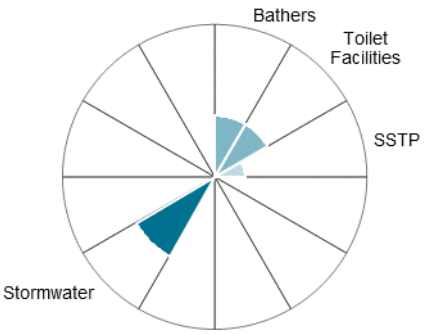
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after rain.

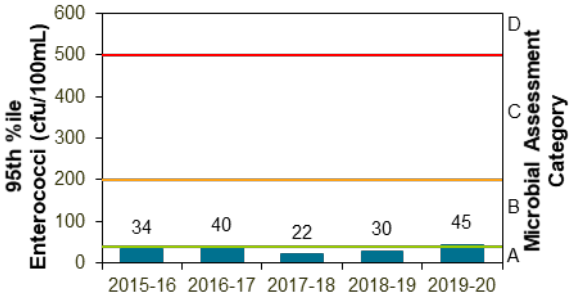
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	97%	100	Stable

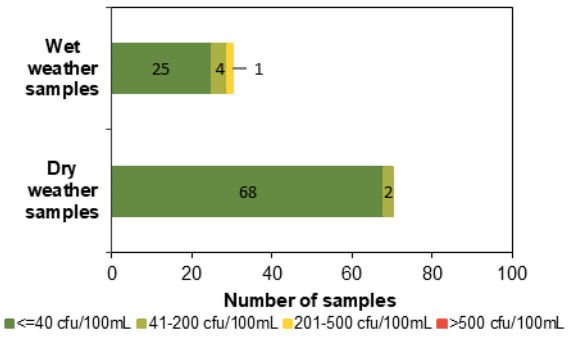
Sanitary inspection: Moderate



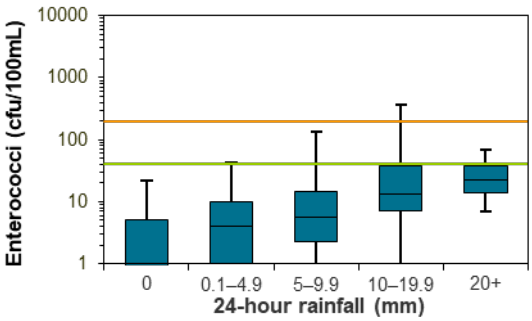
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Shellharbour City Council

100%
swimming sites graded Good or Very Good

Overall results

All three swimming sites were graded as Very Good or Good in 2019–2020. This is an excellent result and consistent with previous years.

Percentage of sites graded as Very Good or Good:

- 2019–2020: 100%
- 2018–2019: 100%
- 2017–2018: 100%
- 2016–2017: 100%.

Three swimming sites were monitored in the Shellharbour local government area.

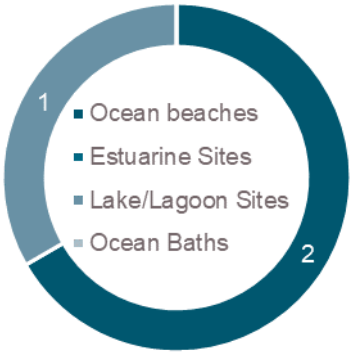
All three locations were monitored by Sydney Water. Samples were collected every sixth day throughout the year.

See the section on **How to read this report** on page 41 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Warilla Beach and Shellharbour Beach.

These sites had excellent water quality and were suitable for swimming almost all of the time.



Site types in Shellharbour City Council

Swimming sites monitored in the Shellharbour region include ocean beaches and a lake/lagoon swimming site in Lake Illawarra, with each site type having a different response to rainfall-related impacts.

In general, lake/lagoon 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.

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 three days in lake/lagoon areas, or if there are signs of stormwater pollution such as discoloured water or floating debris.

Ocean beaches

Beach Suitability Grades for Shellharbour City Council ocean beaches

Warilla and Shellharbour beaches have continued to be graded Very Good in 2019–2020 as in previous years. These beaches had excellent water quality and were suitable for swimming almost all of the time.

Lake/lagoon swimming sites

Beach Suitability Grades for Shellharbour City Council lake/lagoon swimming sites

Entrance Lagoon Beach was graded Good in 2019–2020, similar to previous years. Water quality at this site was mostly suitable for swimming during dry weather conditions, with 86% of dry weather samples within the safe swimming limit when there has been no rain in the previous 24 hours. Enterococci levels increased following rainfall, with levels often unsuitable for swimming after light rain. The swimming site is located within the entrance of Lake Illawarra and has lower levels of flushing. Due to this, the site can retain pollution inputs and take longer to recover from the impacts of stormwater. Water quality at this site may be impacted by contaminants discharged from Lake Illawarra, and stormwater during and following rainfall.

Swimming should be avoided during and for up to three days following rainfall, or if there are signs of pollution such as discoloured water, flowing drains or floating debris.

Management

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

A **Coastal Management Program** (CMP) outlines a long-term strategy for managing the coast, in line with the *Coastal Management Act 2016*.

The NSW Government provides guidance and funding through the Coastal and Estuary Grants Program for local councils to prepare and implement CMPs.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

Shellharbour City Council

The Lake Illawarra Coastal Management Program (CMP) has been prepared in partnership by Wollongong City Council, Shellharbour City Council and DPIE, with funding provided under the NSW Government's Coastal and Estuary Grants Program. The CMP has been adopted by both councils and has been submitted to the NSW Government for certification and is currently being assessed. The CMP outlines the strategic aims for managing Lake Illawarra and includes prioritised actions for managing specific threats to estuary health. In recognition of land-use pressures and threats, and in response to the values held by the community, water quality is a key consideration within the CMP. Water quality management actions within the CMP relate to stormwater infrastructure improvements, restoring and maintaining riparian corridors and coastal wetlands, strategic land-use planning, and water quality monitoring.

Shellharbour City Council continues to implement a city-wide stormwater improvement program. The program incorporates the delivery of engineered stormwater quality solutions, environmental rehabilitation projects, water monitoring of major waterways and community education.

Shellharbour City Council has collaborated with the University of Wollongong, Wollongong City Council, Shoalhaven City Council, Kiama Municipal Council and Lendlease on the Smart Water Management Project that is in its final stages of installation. The project has installed water quality sensors to monitor stormwater and gross pollutant traps within waterways remotely and will send information to council when service is required. It will also provide a live data stream of the quality of waterways without the need for staff to be in the field. The project demonstrates how smart technology is used to enhance the natural environment, community liveability and build resilient communities and urban infrastructure. The collaborating councils and the University of Wollongong are now in discussion on how to develop and enhance the project in the next stage.

Stormwater monitoring continued under the stormwater management program. The monitoring assists with assessing the environmental health of the city's major waterways, evaluating the effectiveness of stormwater treatment measures, and identifying any water quality concerns. Environmental assessments of businesses are also completed to identify improvements to operations to reduce potential for water pollution incidents. Ongoing bush regeneration works along riparian corridors across the city also contribute to improving water quality and overall catchment health.

Shellharbour Beach
Photo: Beachwatch/EES, DPIE

Significant negotiations have occurred with developers to ensure water sensitive urban design features under their management jurisdictions are being satisfactorily maintained and enhanced to improve water quality. Council continues to improve conditions of consent for development applications to ensure best practice water quality measures are being implemented into developments.

Sydney Water

Sydney Water has inspected, cleaned and repaired sewer mains that have a high likelihood of discharging sewage to Shellharbour Beach if they become blocked. When significant tree root intrusion to the public sewer from the private sewer was identified, property owners were asked to remedy the problem.

Sampling sites and Beach Suitability Grades in Shellharbour City Council

Entrance Lagoon Beach

Beach grade: G

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

Entrance Lagoon Beach is on the southern shore of the entrance to Lake Illawarra and is partly enclosed by a rock breakwater.

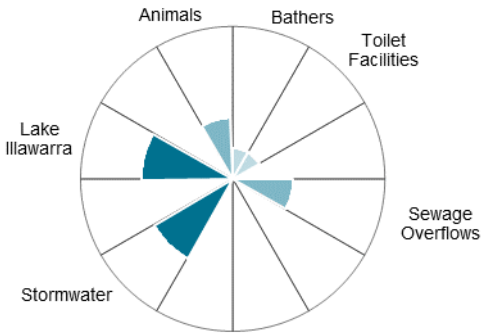
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including outflow from Lake Illawarra and stormwater.

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

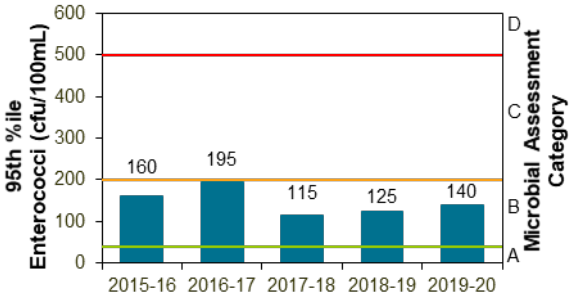
The site has been monitored since 2007.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Sep 2018 to Apr 2020	86%	100	Stable

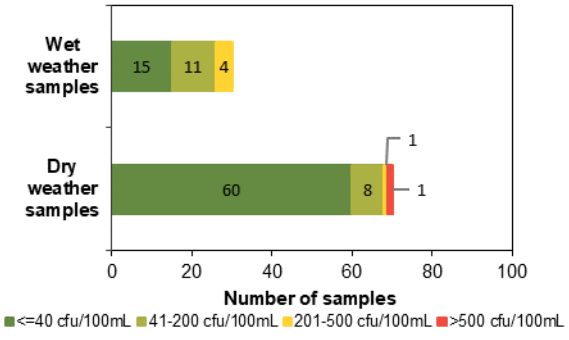
Sanitary inspection: Moderate



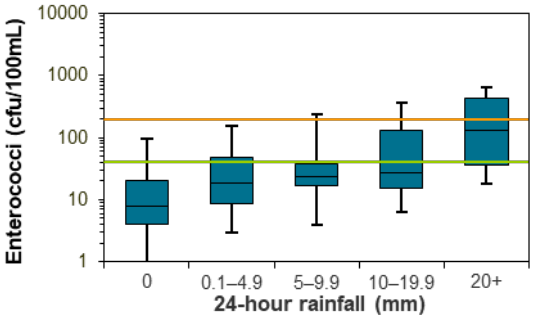
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Warilla Beach

Beach grade: VG

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

Warilla beach is almost two kilometres long, protected by prominent headlands. Lifeguards patrol the beach from September to April.

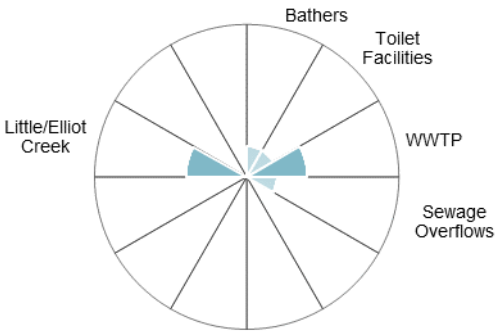
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after light rain, and often after 20 mm or more.

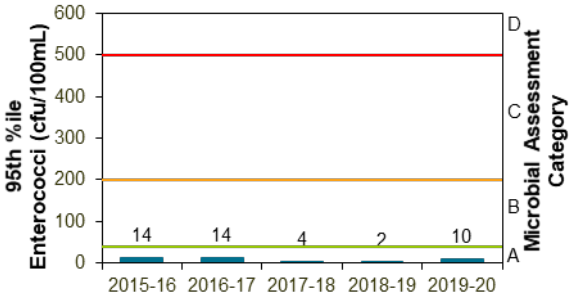
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

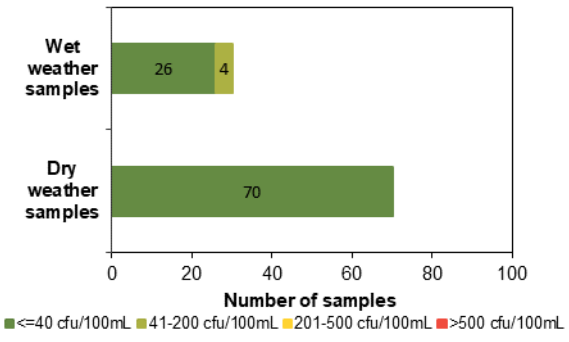
Sanitary inspection: Low



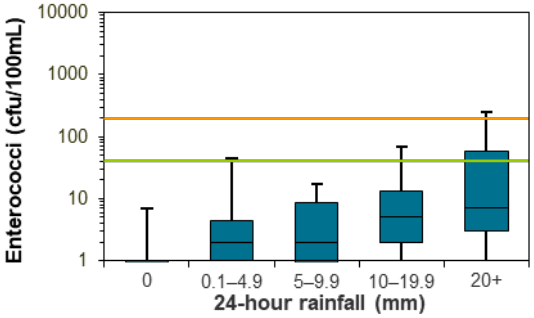
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Shellharbour Beach

Beach grade: VG

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

Shellharbour Beach is at the southern end of a small, east facing beach. Lifeguards patrol the beach from October to April.

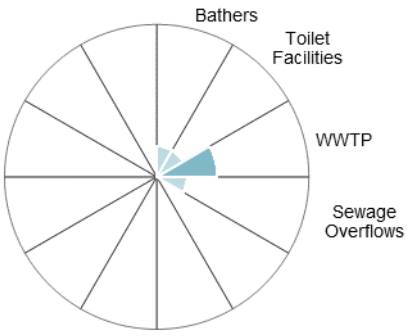
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm or more of rain.

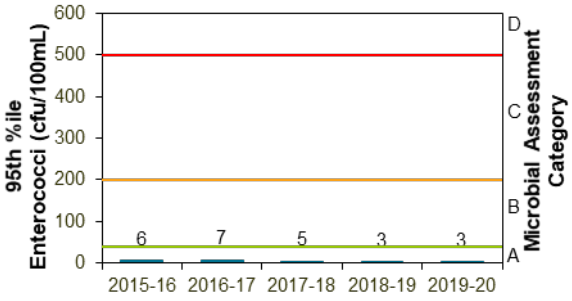
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

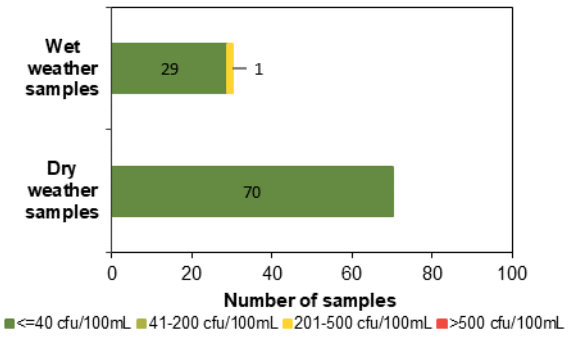
Sanitary inspection: Low



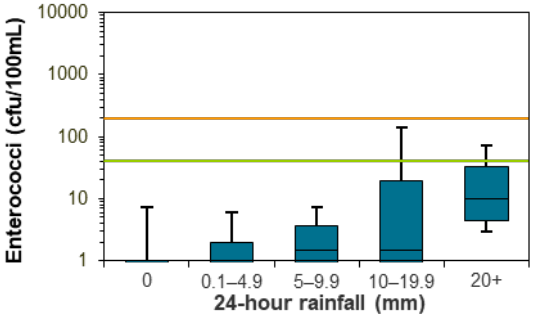
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall

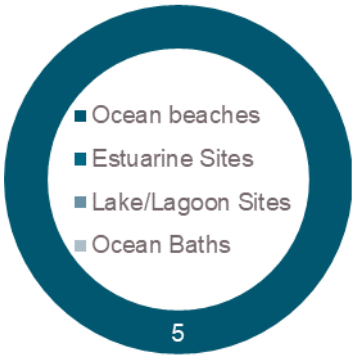


Kiama Municipal Council

Five swimming sites were monitored in the Kiama local government area.

Four locations were monitored by Sydney Water with samples collected every sixth day. Three of these locations were monitored throughout the year. One location was monitored between October and April.

One location was monitored by Kiama Municipal Council. Samples were collected weekly between October and April and sampling and laboratory analysis was fully funded by the council.



Site types in Kiama Municipal Council

Overall results

All five swimming sites were graded as Very Good or Good in 2019–2020. Excellent results have also been recorded in previous years.

Percentage of sites graded as Very Good or Good:

- 2019–2020: 100%
- 2018–2019: 100%
- 2017–2018: 100%
- 2016–2017: 100%.

See the section on **How to read this report** on page 41 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Boyds Jones Beach, Bombo Beach, Werri Beach and Seven Mile Beach (Gerroa).

These sites had excellent water quality and were suitable for swimming almost all of the time.

Ocean beaches were the only site type monitored in the Kiama region.

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

Ocean beaches

Beach Suitability Grades for Kiama Municipal Council ocean beaches

All ocean beaches were graded as Very Good or Good in 2019–2020.

Boyds Jones Beach, Bombo Beach, Werri Beach and Seven Mile Beach (Gerroa) were graded Very Good, consistent with previous years. Water quality at these sites was suitable for swimming almost all of the time.

Surf Beach Kiama was graded as Good, similar to previous years. While water quality at this beach is frequently suitable for swimming during dry weather conditions, elevated enterococci levels are occasionally recorded following light rainfall. It is recommended to avoid swimming during and for at least one day following rainfall or if there are signs of stormwater pollution such as discoloured water and floating debris.

Management

Patrolled ocean beach
Photo: Beachwatch/EES, DPIE

A **Coastal Management Program** (CMP) outlines a long-term strategy for managing the coast, in line with the *Coastal Management Act 2016*.

The NSW Government provides guidance and funding through the Coastal and Estuary Grants Program for local councils to prepare and implement CMPs.

Under the previous *Coastal Protection Act 1979*, councils developed a **Coastal Zone Management Plan** (CZMP) to address coastal issues. Councils can continue to implement priority actions from certified CZMPs with funding assistance from the NSW Government's Coastal and Estuary Grants Program until 2021.

Kiama Municipal Council

Kiama Municipal Council in partnership with DPIE is preparing a coastal management program (CMP) for the open coast, with funding provided under the NSW Government's Coastal and Estuary Grants Program. The CMP will identify catchment pressures and prioritise management initiatives to protect and enhance coastal environments and manage risks from coastal hazards. Water quality management actions such as stormwater infrastructure improvements, restoring and maintaining coastal ecosystems, and strategic land-use planning will be considered during the process.

Council also coordinates the implementation of Coastal Zone Management Plans (CZMPs) for the Minnamurra and Crooked River estuaries. Part of this is working with other agencies and stakeholders to improve riparian management and quality of runoff from land, which impacts the creeks, rivers and open coast waters. During 2019–2020 council received funding under the NSW Government's Coastal and Estuary Grants Program to complete a bank stabilisation and rehabilitation options assessment for Blue Angle Creek, a priority action within the Crooked River CZMP. This project is in the late stages of finalising the designs for the high priority bank stabilisation sites. Following the completion of these detailed designs council will consider which stabilisation projects it will seek funding for in the following rounds of the Coastal and Estuary Grants Program.

Council maintains stormwater filtration units in the Surf Beach catchment and around the townships of Minnamurra, Gerringong, Gerroa and Jamberoo, which prevent gross pollutants, sediments, oil and grease from entering the waterways and beaches.

Council undertakes a scheduled program of inspections for all the onsite sewage management facilities in the local government area. Systems are risk rated and inspected annually for high risk systems and every four years for low risk systems. The vast majority of onsite sewage management facilities are located on rural land in the upper catchments.

Council responds to and investigates stormwater pollution complaints and takes action under the *Protection of the Environment Operations Act 1997*, *Local Government Act 1993* or other means depending on the issue. Many reported issues relate to erosion and sediment controls for development sites, pollutants in stormwater drains and concerns raised by the public relating to activities which could pollute the stormwater system and associated coastal waters.

Bombo Beach
Photo: Beachwatch/EES, DPIE

Kiama Municipal Council has been implementing a leachate management program at the Minnamurra Waste and Recycling Facility to manage high ammonia levels detected in the groundwater at the site. These bores are commissioned and have been test pumping to establish trends in ammonia and salinity within the extracted groundwater under different tidal and pumping regimes. The optimal extraction and aeration regime has been identified and this has been implemented over 2019–2020. This will prevent any leachate from impacting the water quality at Rocklow Creek leading to the Minnamurra River. Council is in the process of negotiating an extension of this licence to extract groundwater.

Sampling sites and Beach Suitability Grades in Kiama Municipal Council

Boyds Jones Beach

Beach grade: VG

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

Boyds Jones Beach is one kilometre long, east facing and backed by dunes. Lifeguards patrol the beach from October to April.

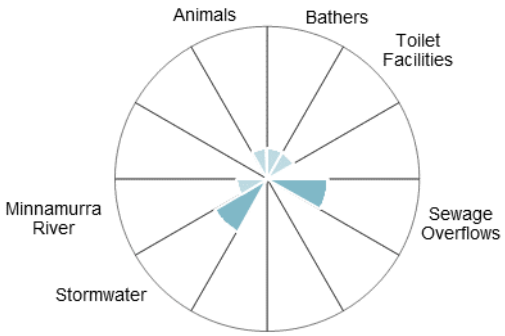
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit after 10 mm or more of rain.

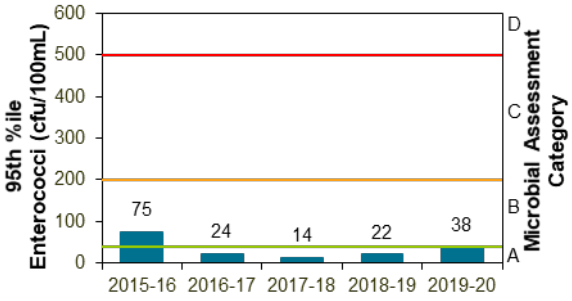
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	99%	100	Stable

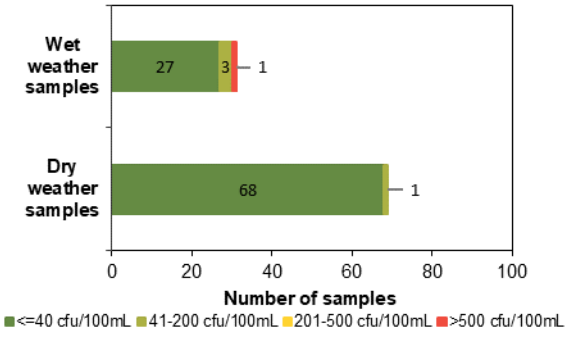
Sanitary inspection: Low



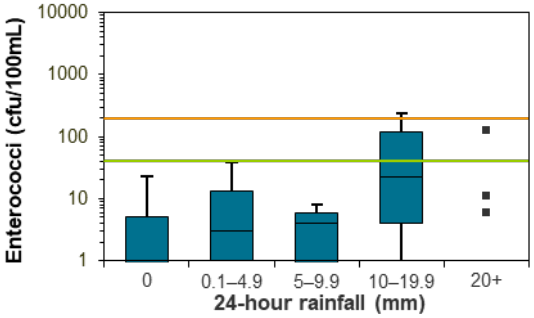
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Bombo Beach

Beach grade: VG

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

Bombo Beach is backed by a narrow reserve, railway and freeway. Lifeguards patrol the beach over the summer school holidays.

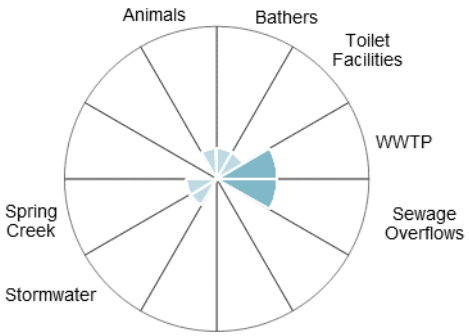
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm or more of rain.

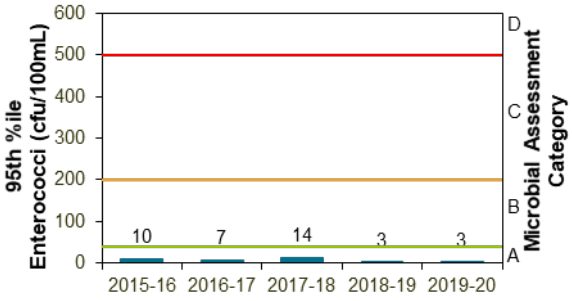
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

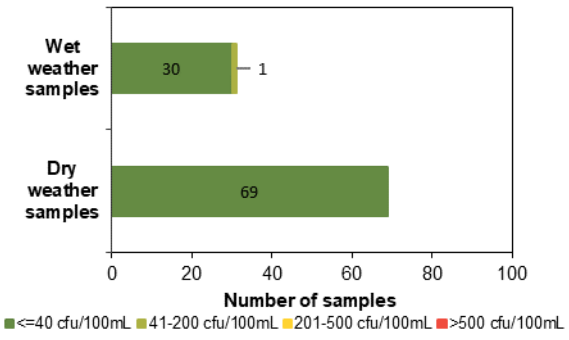
Sanitary inspection: Low



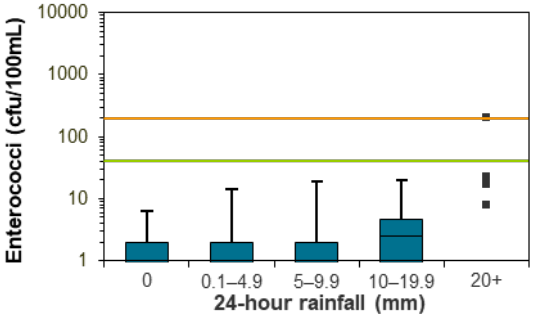
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Surf Beach Kiama

Beach grade: G

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

Surf Beach in Kiama is 250 metres long and backed by a park and surf club. Lifeguards patrol the beach from September to April.

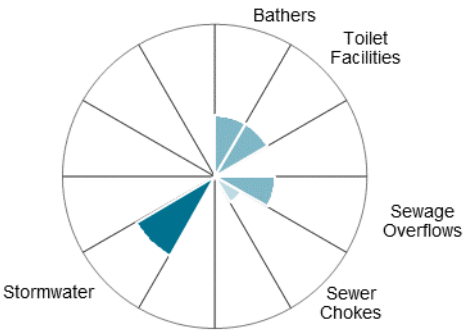
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after light rain, and often after 5 mm or more.

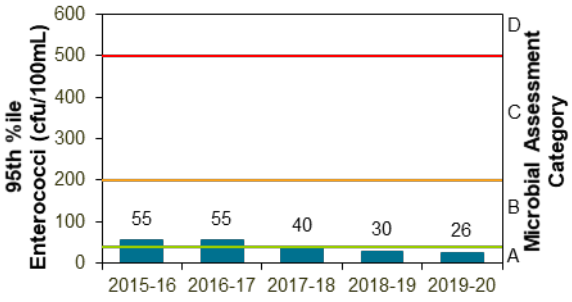
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2017 to Apr 2020	97%	100	Stable

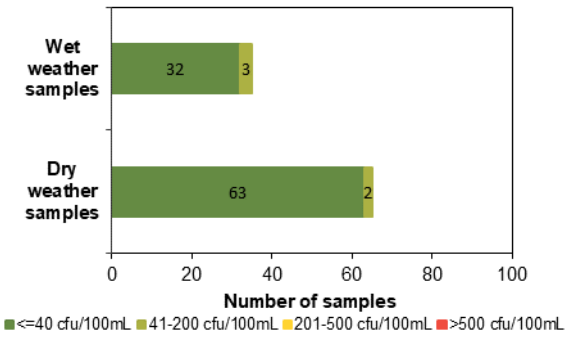
Sanitary inspection: Moderate



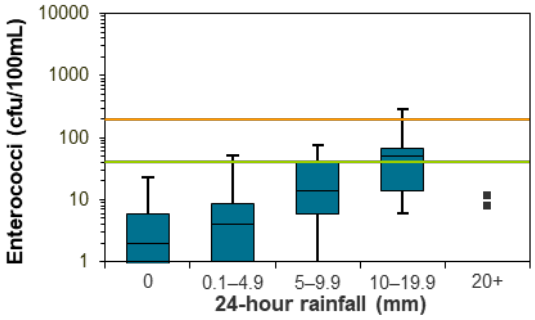
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Werri Beach

Beach grade: VG

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

Werri Beach is 1.7 kilometres long with an ocean pool on the southern rock platform. It is patrolled over the summer school holidays.

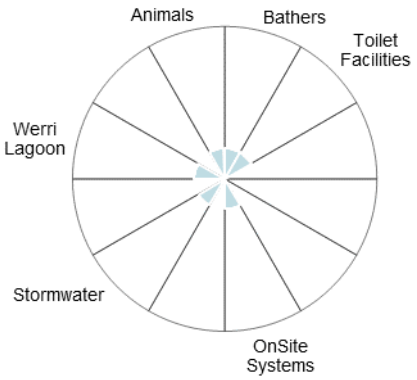
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few significant sources of faecal contamination.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after 5 mm or more of rain, and often after 10 mm or more.

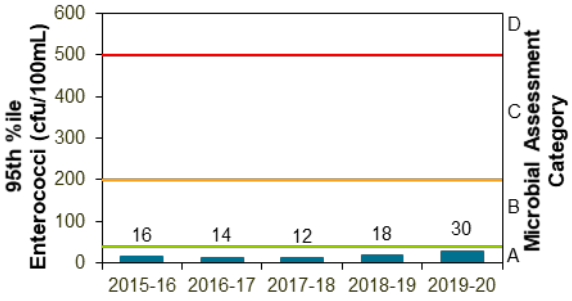
The site has been monitored since 1996.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Sep 2018 to Apr 2020	100%	100	Stable

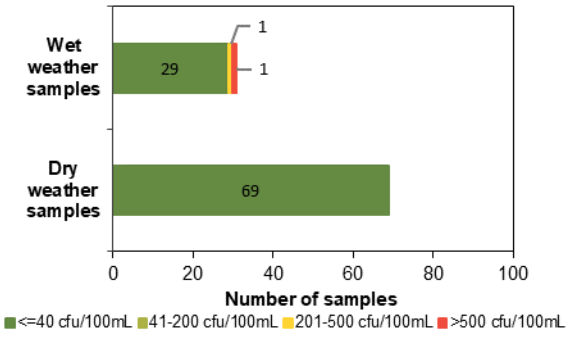
Sanitary inspection: Low



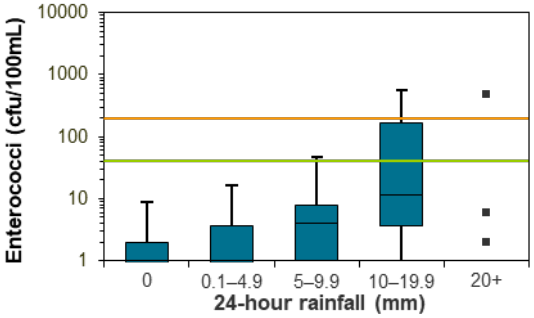
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Seven Mile Beach (Gerroa)

Beach grade: VG

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

Seven Mile Beach at Gerroa is at the northern end of a long open beach. Lifeguards patrol during the summer school holidays.

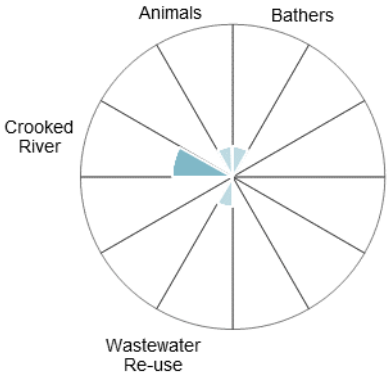
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 5 mm or more of rain.

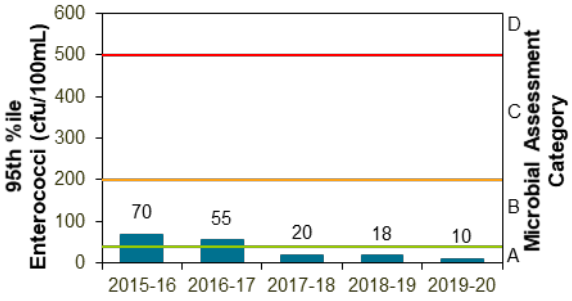
The site has been monitored since 2011.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2017 to Apr 2020	98%	100	Stable

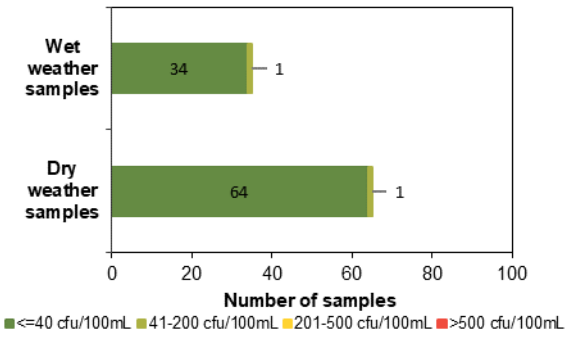
Sanitary inspection: Low



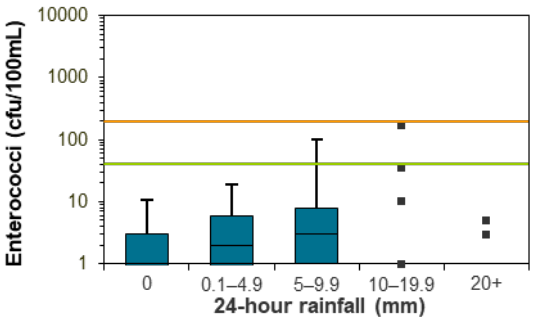
Microbial Assessment Category: A



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 five 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 three 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 three days following rainfall or if there are signs of pollution such as discoloured water or odour or debris in the water

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 three 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

Some of the 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 a beach catchment.

The guidelines

The National Health and Medical Research Council's *Guidelines for managing risks in recreational water*[1] 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[2].

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

[2]Department of Health, Western Australia 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, available at ww2.health.wa.gov.au/Articles/A_E/Environmental-waters-publications, accessed on 10/06/20.

Enterococci

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

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.

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

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 four 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[1].

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 four 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.

[1] 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*, vol.33(3), pp.715–722.

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. 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* [accessed 10/06/20].

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available on the DPIE webpage:

Sanitary inspection of beaches

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 five categories: Very Low, Low, Moderate, High and Very High.

Stormwater at Coogee Beach
Photo: Beachwatch/EES, DPIE

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

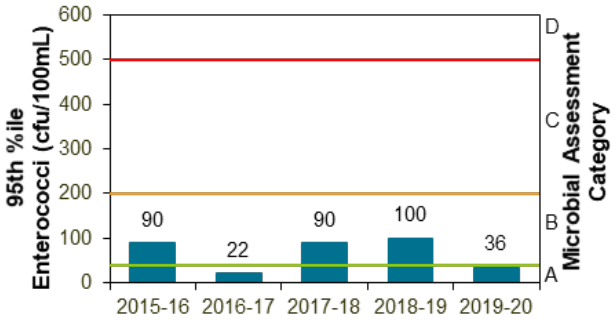
A provisional grade indicates the assessment is based on limited data collected during the assessment period and should not be compared to the beach grade from the previous year.

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

Microbial Assessment Category (MAC) chart

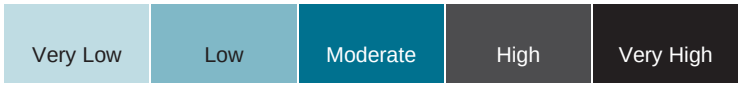
On each beach page, the MACs for the last five years are displayed on a simple bar chart. The MAC for the current year is based on enterococci data collected during the assessment period. The bars are labelled with the 95th percentile value for each year and the thresholds dividing the

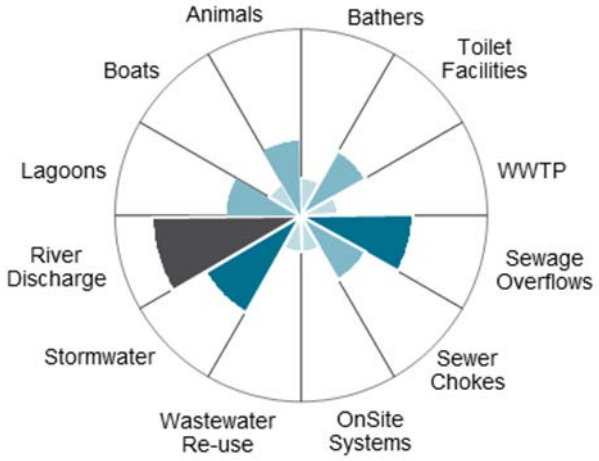
A, B, C and D categories are marked in green, amber and red for reference.



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.

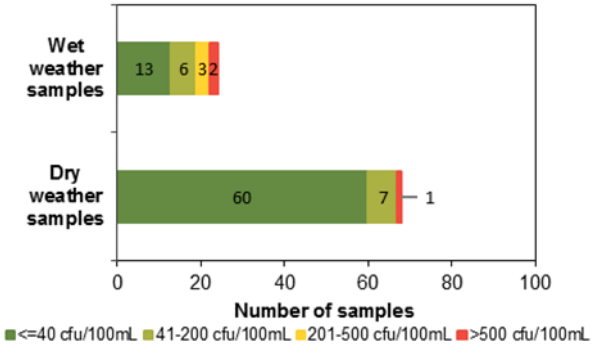




Wet and dry weather water quality chart

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

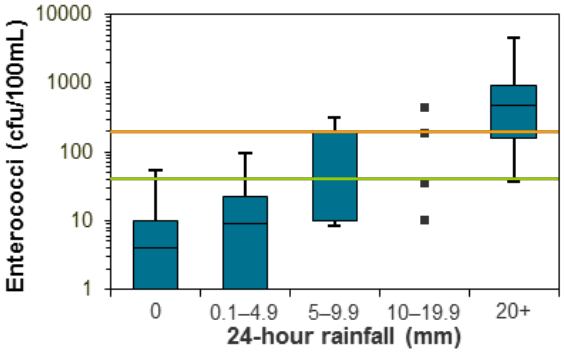
and greater than 500 cfu/100 mL. These categories reflect the Microbial Assessment Category thresholds and are coloured on the graph as dark green, light green, amber and red respectively.



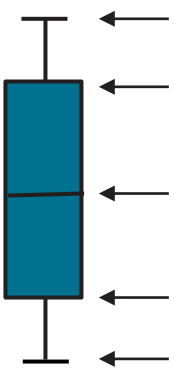
It is expected that swimming sites with lower levels of flushing will show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of stormwater pollution on beach water quality may be detected up to three 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 five years of monitoring. Rainfall data were obtained from rain gauges situated close to the sample site and are 24-hour totals to 9am on the day of sampling. If there are fewer than five 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 five-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 three 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.