



DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

State of the beaches 2018-2019

Statewide summary and how to read this report

Beachwatch



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Recreational water quality has been monitored in New South Wales by the Department of Planning, Industry and Environment's Beachwatch Program since 1989, and in partnership with coastal councils since 2002 under the Beachwatch Partnership Program. This report summarises the performance of 228 swimming sites along the NSW coast in 2018–2019, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches, estuarine areas, lake and lagoon swimming sites and ocean baths.

In 2018–2019 swimming sites in New South Wales performed well with 86% of monitored swimming sites graded as Good or Very Good. These sites were suitable for swimming for most or almost all of the time. While this is an excellent result, reflecting prolonged dry weather conditions in many coastal areas, significant rainfall events impacted water quality at some swimming sites. Many estuarine and lake and lagoon swimming sites did not perform as well as the ocean beaches, being more susceptible to the impacts from wet weather conditions.

State of the beaches statewide summary 2018–2019



North Cronulla Beach
Photo: Beachwatch/EES,
DPIE

Beach monitoring in NSW

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.

Recreational water quality has been monitored in New South Wales by the Department of Planning, Industry and Environment's Beachwatch Program since 1989, and in partnership with coastal councils since 2002 under the Beachwatch Partnership Program.

Rainfall impacts

During 2018–2019, 228 swimming sites were monitored including ocean beaches, estuarine areas, lake and lagoon swimming sites and ocean baths.

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 2018–2019 are based on water quality data collected over the last two to four years. Rainfall over this period has been diverse:

- 2015–2016: wet summer, with well above average rainfall during January, including heavy rain and flooding in coastal areas

- 2016–2017: the wettest March on record for many coastal areas and intense storm activity over summer
- 2017–2018: prolonged dry periods broken by heavy rain at times, including widespread rainfall along the NSW coast in the last week of summer
- 2018–2019: extended dry conditions, with several wet months on the coast.

See the section on **How to read this report** on page 23 for an explanation of the graphs, tables and Beach Suitability Grades.

Winter 2018 was the eighth driest for New South Wales on record, with average to well below average rainfall recorded for most coastal areas. Despite this, more than double the long-term monthly average rainfall impacted the Hunter and Central Coast regions in June 2018, and above average rainfall was recorded in Sydney during the same month. July and August 2018 were very dry along the coast, with most areas recording very low monthly rainfall totals.

Well above average rainfall fell during October 2018 across all coastal regions, with many areas receiving two to three times the long-term monthly average totals.

Dry weather conditions prevailed in the North Coast and Hunter regions from November to April 2019, with almost all monthly rainfall totals below the long-term averages. Some sites in these regions received record low summer rainfall totals. The 2018–2019 summer season was the 10th driest summer on record in New South Wales.

Relatively average to below average rainfall fell from the Central Coast region down to the South Coast during November 2018 to April 2019, except for a very wet March 2019. Heavy rain fell over consecutive days in mid-March, triggering flash flooding to these coastal areas.

During the warmer months several significant wet weather events occurred in all NSW coastal regions and brought heavy rain at times.

See the section on **Quality assurance** on page 33 for an explanation and results of the quality assurance program.

Beach Suitability Grades at nine swimming sites improved in 2018–2019. These sites included ocean beaches and estuarine swimming sites which had improved microbial water quality from the previous year. Beach Suitability Grades at nine swimming sites were downgraded from the previous year. While most of these swimming sites were downgraded from Very Good to Good, two ocean beaches and two lake/lagoon sites crossed the threshold from Good to Poor.

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

Limitations of the classification matrix

Using the National Health and Medical Research Council’s **Beach Suitability Grade** classification matrix (on page 25) 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.

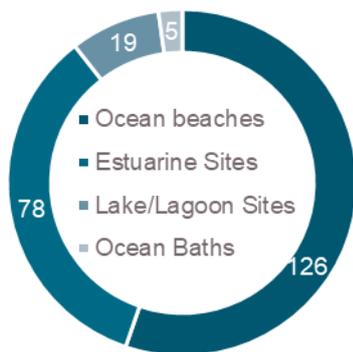


Overall beach performance for 2018–2019

In 2018–2019, 196 of the 228 monitored swimming sites in New South Wales were graded as Very Good or Good, indicating they were suitable for swimming for most or almost all of the time, an improvement from 2017–2018 when 85% of swimming sites were graded as Very Good or Good. The overall number of sites monitored declined from the previous year with the addition of a new site on the South Coast and withdrawal of 14 swimming sites in the Hunter region.

Percentage of sites graded as Very Good or Good:

- 2018–2019: 86%
- 2017–2018: 85%
- 2016–2017: 84%
- 2015–2016: 83%.



Site types monitored in NSW by Beachwatch and partnership councils

While this is an excellent result, many lake/lagoon and estuarine swimming locations did not perform as well as ocean beaches, primarily due to lower levels of flushing increasing the time needed to disperse and dilute pollution inputs. As ocean beaches, estuarine beaches, lake/lagoon swimming sites and ocean baths have very different responses to rainfall-related impacts, the results for each type of swimming area are discussed separately.

In October 2018, Lake Macquarie City Council withdrew from the Beachwatch Partnership Program. Consequently, recreational water quality for 14 sites (one ocean beach and 13 designated lake swimming sites) is no longer reported by Beachwatch.

Bega Valley Shire Council commenced monitoring Mogareeka Lions Park in November 2018 as part of the Beachwatch Partnership Program. The site was previously monitored between 2004 and 2010.

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 monitored ocean beaches in NSW

Ocean beaches

New South Wales' open ocean beaches have excellent water quality with 98% of 126 monitored ocean beaches graded as Very Good or Good. This indicates they were suitable for swimming most or almost all of the time. This performance is similar to the 2017–2018 result, when 98% of 127 ocean beaches were graded as Very Good or Good. Catherine Hill Bay in the Hunter region was withdrawn from the Beachwatch Partnership Program in 2018.

The impacts of rainfall on water quality are least apparent at ocean beaches with tidal flushing rapidly dispersing and diluting pollution inputs.

Five ocean beaches were upgraded to Very Good in 2018–2019, due to improvement in microbial water quality. These beaches were Dee Why Beach, Shelly Beach (Manly), and Maroubra Beach in Sydney, and Horseshoe Bay and Aslings Beach on the South Coast.

Terrigal Beach was upgraded to Good in 2018–2019 from a Poor grade in the previous year. The improvement in water quality reflects a slightly higher proportion of samples collected during dry weather conditions compared to the 2017–2018 assessment period. While water quality is mostly suitable for swimming during dry weather, the beach can be

impacted by significant pollution sources including contaminants discharged from Terrigal Lagoon and stormwater following rainfall. As a result, microbial water quality at the beach remains close to the threshold between Good and Poor.

Three ocean beaches were graded as Poor in 2018–2019:

- Toowoong Bay on the Central Coast
- Malabar Beach in Sydney
- Surf Beach on the South Coast.

Toowoong Bay was graded as Poor, downgraded from Good in the previous year. While water quality at this site is mostly suitable for swimming in dry weather conditions, elevated enterococci levels were often recorded after little or no rain.

Malabar Beach continued to be graded as Poor, a similar result to previous years. Water quality at this site is occasionally impacted during dry weather and often following light rainfall. This beach takes longer to recover from stormwater events than nearby areas, with elevated bacteria levels often recorded up to two days after rainfall.

Surf Beach was downgraded to Poor from a Good grade in the previous year. Water quality at this site is occasionally impacted during dry weather and often after rainfall. While the microbial water quality has declined, it is only slightly above the threshold between Good and Poor.

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

Estuarine beaches



Beach Suitability Grades for monitored estuarine beaches in NSW

Sixty-four (82%) of the 78 estuarine swimming sites were graded as Very Good or Good. This is a slight improvement in performance from 2017–2018 when 81% of estuarine beaches were graded as Very Good or Good. While water quality at these sites was suitable for swimming most of the time, it was occasionally impacted by stormwater pollution following rainfall. These estuarine swimming sites are generally located in the well-flushed sections of the estuaries or had few potential sources of faecal contamination.

Jibbon Beach in Port Hacking was upgraded in 2018–2019 to Very Good from Good, and Hayes St Beach in Sydney Harbour was upgraded to Good from Poor. This was due to improved microbial water quality, reflecting a higher number of samples collected in dry weather conditions compared to the previous year.

Three estuarine beaches were graded as Fair: Northbridge Baths and Gurney Crescent Baths in Sydney Harbour and Gymea Bay Baths in Port Hacking. Gymea Bay Baths was upgraded to Fair from Poor in the previous year. These sites generally had good water quality during the assessment period, with almost all dry weather samples suitable for swimming. Elevated bacterial levels were measured during and after rainfall. Several potential sources of faecal contamination have been identified as significant risks in the sanitary inspection, including stormwater and impacts from upstream sources

Ten of the estuarine beaches continued to be graded as Poor in 2018–2019 from the previous year:

- Evans River on the North Coast
- Bagnalls Beach in Port Stephens in the Hunter
- Davistown Baths, Pretty Beach Baths, Woy Woy Baths and Yattalunga Bath in Brisbane Water on the Central Coast
- Rose Bay Beach and Davidson Reserve in Sydney Harbour, and Oatley Bay Baths and Carss Point Baths in the lower Georges River in Sydney.

Water quality at these sites is often suitable for swimming in dry weather conditions, with elevated levels of bacteria measured following light rainfall. These sites were typically located in less well-flushed sections of the estuaries or had more significant pollution sources.

Foreshores Beach in Botany Bay continued to be graded as Very Poor, as in previous years. While water quality was often suitable for swimming during dry weather, with 81% of dry weather samples within the safe swimming limit during the assessment period, water quality was significantly impacted during and following rainfall. This site is very susceptible to pollution from sewage overflows discharging to nearby Mill Stream. To reduce the risk of illness, always follow the advisories in the Beachwatch pollution forecast and avoid swimming if there are signs of pollution such as discoloured water, odours or floating debris.

Estuarine sites are generally not as well-flushed as ocean beaches, and so the time for pollution to disperse and dilute is longer. Pollution inputs are retained at some swimming sites when they are located in the upper reaches away from the main channels. As a precaution, avoid swimming in estuaries during and for up to three days following rainfall, or if there are signs of pollution such as discoloured water, flowing stormwater drains or floating debris.

Lake/lagoon swimming sites



Beach Suitability Grades for monitored lake/lagoon swimming sites in NSW

Five (26%) of the 19 lake and lagoon swimming sites were graded as Very Good or Good. While this is a decline in performance from the previous year, it largely reflects the withdrawal of a number of lake swimming sites from the monitoring program. Thirteen swimming sites located in Lake Macquarie in the Hunter, of which eight were graded Good in 2017–2018, are no longer monitored under the Beachwatch Partnership Program.

Mogareeka Lions Park on the South Coast was added to the Beachwatch Partnership Program in 2018 and was graded as Very Good. Water quality was suitable for swimming almost all the time during the assessment period, with nearly all samples within the safe swimming limit; however, the grade is provisional as it is based on limited bacterial data. Continued monitoring will provide a clearer indication of water quality at this site.

Water quality was suitable for swimming at these sites most of the time:

- Lake Ainsworth South on the North Coast
- Birdwood Park in Narrabeen Lagoon in Northern Sydney
- Entrance Lagoon Beach in Lake Illawarra in the Illawarra
- Mogareeka Inlet north of Tathra on the South Coast.

Fourteen lake and lagoon swimming sites were graded as Poor. These included three sites in Lake Ainsworth on the North Coast, 10 swimming sites on the Central Coast (including four coastal lagoons) and Bilarong Reserve in Narrabeen Lagoon in Northern Sydney.

Summerland Point Baths in Lake Macquarie on the Central Coast, and Bilarong Reserve in Narrabeen Lagoon in Northern Sydney were downgraded to Poor, from Good in the previous year. Water quality at these sites was often suitable for swimming during dry weather conditions and in very light rain, however they are highly susceptible to the impacts of wet weather during and for up to three days after rain.

The water quality at lake/lagoon sites often depends on how close the swimming area is to the ocean and whether the entrance is open to the ocean. When the entrance is open and the site is near that opening, the site can be well-flushed by clean ocean water, and water quality is often of a high standard. If the site is not near the entrance, or the entrance is closed, pollution inputs are retained and the water quality can be affected by contamination from stormwater runoff to the lake/lagoon. As a general precaution, it is recommended that swimming at lake and lagoon swimming sites be avoided

during and for up to three days after rainfall or if there are signs of stormwater pollution such as discoloured water or floating debris.



Beach Suitability Grades for monitored ocean baths in NSW

Ocean baths

Four ocean baths were graded Good in 2018–2019: The Entrance Ocean Baths and Pearl Beach Rockpool on the Central Coast, South Maroubra Rockpool in Sydney and Big Blue Pool on the South Coast. Big Blue Pool was downgraded from Very Good in the previous year. Water quality at these sites was suitable for swimming most of the time, with elevated bacterial levels regularly recorded during and following higher levels of rainfall.

Cabbage Tree Bay Rockpool on the Central Coast was graded as Poor, same as the previous year. While water quality was mostly suitable for swimming during dry weather conditions, elevated enterococci levels were often recorded following moderate rainfall.

The water quality at ocean baths often depends on the flushing regime. While The Entrance Ocean Baths is regularly cleaned by council, other ocean baths are flushed irregularly, relying on the natural exchange of ocean water over the rocks and pool walls. It is recommended that swimming be avoided during and for up to one day after rainfall, or if there are signs of pollution such as discoloured water or floating debris.

The Beachwatch programs

Beachwatch

The Beachwatch Program was established in 1989 to monitor Sydney's ocean beaches and was expanded to ocean beaches in the Hunter and Illawarra regions in 1996.

Monitoring of estuarine beaches commenced in 1994, with the addition of Sydney Harbour, Botany Bay and lower Georges River to the program. Pittwater was added in 1996 and most sites in Port Hacking were added in 1999.



Sampling in Sydney Harbour
Photo: Beachwatch/EES,
DPIE

Beachwatch Partnership Program

Hunter Water Corporation and Sydney Water monitor ocean beaches in the Hunter and Illawarra regions respectively.

The Beachwatch Partnership Program was established as a pilot in 2002 and included nine local councils monitoring 96 swimming sites along the NSW coast during 2018–2019:

| | |
|-------------------------|---------------------------|
| Ballina Shire Council | Kiama Municipal Council |
| Richmond Valley Council | Shoalhaven City Council |
| Port Stephens Council | Eurobodalla Shire Council |
| Central Coast Council | Bega Valley Council. |
| Wollongong City Council | |

The water quality sampling and laboratory analysis are fully funded by each local council. The Department of Planning, Industry and Environment provides quality assurance support and assistance with community reporting.

Beach pollution forecasts

Beachwatch issues daily pollution forecasts to enable beach goers to make informed decisions about where and when to swim. The forecasts are available before 7:30am during the swimming season (October to April) and before 8am between May and September, and cover swimming sites in the Sydney, Hunter, Central Coast and Illawarra regions.

Beach pollution forecasts can be accessed via the Beachwatch website, mobile website, [email subscription](#), [Twitter](#) and [Facebook](#).

environment.nsw.gov.au/beachwatch



Sampling sites and areas monitored in New South Wales under the Beachwatch programs

Beach Suitability Grades for North Coast region

| Swimming site | Site type | Beach Suitability Grade | Change |
|---------------------------------------|-------------|-------------------------|--------|
| Ballina Shire Council | | | |
| Seven Mile Beach | Ocean beach | VG | ● |
| Lake Ainsworth North | Lake/Lagoon | P [^] | ● |
| Lake Ainsworth East | Lake/Lagoon | P | ● |
| Lake Ainsworth South | Lake/Lagoon | G | ● |
| Lake Ainsworth West | Lake/Lagoon | P | ● |
| Shelly Beach | Ocean beach | G | ● |
| Lighthouse Beach | Ocean beach | VG | ● |
| Shaws Bay North | Estuarine | G | ● |
| Shaws Bay East | Estuarine | G | ● |
| Shaws Bay East Arm | Estuarine | G | ● |
| Shaws Bay East Beach | Estuarine | G | ● |
| Shaws Bay West | Estuarine | G | ● |
| The Serpentine | Estuarine | G | ● |
| Richmond Valley Council | | | |
| Airforce Beach | Ocean beach | VG | ● |
| Main Beach | Ocean beach | VG | ● |
| Shark Bay | Ocean beach | VG | ● |
| Evans River | Estuarine | P | ● |
| Elm Street Bridge North (Evans River) | Estuarine | G | ● |

| Beach Suitability Grade | | | | | Change | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| 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 a beach catchment.

Beach Suitability Grades for Hunter region

| Swimming site | Site type | Beach Suitability Grade | Change |
|------------------------------------|-------------|-------------------------|--------|
| Port Stephens Council | | | |
| Zenith Beach | Ocean beach | VG | ● |
| Box Beach | Ocean beach | VG | ● |
| Fingal Beach | Ocean beach | G | ● |
| One Mile Beach | Ocean beach | VG | ● |
| Birubi Beach | Ocean beach | VG | ● |
| Little Beach | Estuarine | G | ● |
| Dutchmans Beach | Estuarine | G | ● |
| Bagnalls Beach | Estuarine | P | ● |
| Georges Reserve | Estuarine | G | ● |
| Lemon Tree Passage Tidal Pool | Estuarine | G | ● |
| Karuah Tidal Pool | Estuarine | G | ● |
| Newcastle City Council | | | |
| South Stockton Beach | Ocean beach | VG | ● |
| Nobbys Beach | Ocean beach | VG | ● |
| Newcastle Beach | Ocean beach | VG | ● |
| Bar Beach | Ocean beach | VG | ● |
| Merewether Beach | Ocean beach | VG | ● |
| Burwood North Beach | Ocean beach | VG | ● |
| Burwood South Beach | Ocean beach | VG | ● |
| Lake Macquarie City Council | | | |
| Glenrock Lagoon Beach | Ocean beach | VG | ● |
| Dudley Beach | Ocean beach | VG | ● |
| Redhead Beach | Ocean beach | G | ● |
| Blacksmiths Beach | Ocean beach | VG | ● |
| Swansea Heads Little Beach | Ocean beach | G | ● |

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|---|---|
| Lake Macquarie City Council (continued) | | | |
| Caves Beach | Ocean beach |  |  |

| Beach Suitability Grade | | | | | Change | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| Very Good | Good | Fair | Poor | Very Poor | Improved | Stable | Declined |

Beach Suitability Grades for Central Coast region

| Swimming site | Site type | Beach Suitability Grade | Change |
|------------------------------|-------------|-------------------------|--------|
| Central Coast Council | | | |
| Lakes Beach | Ocean beach | G | ↓ |
| Cabbage Tree Bay Rockpool | Ocean baths | P [^] | ● |
| Soldiers Beach | Ocean beach | G | ↓ |
| North Entrance Beach | Ocean beach | G | ↓ |
| The Entrance Beach | Ocean beach | G | ● |
| The Entrance Ocean Baths | Ocean baths | G [^] | ● |
| Toowoan Bay | Ocean beach | P | ↓ |
| Shelly Beach | Ocean beach | G | ● |
| Gwandalan | Lake/Lagoon | P | ● |
| Summerland Point Baths | Lake/Lagoon | P [^] | ↓ |
| Chain Valley Bay | Lake/Lagoon | P | ● |
| Mannering Park Baths | Lake/Lagoon | P [^] | ● |
| Lake Munmorah Baths | Lake/Lagoon | P | ● |
| Canton Beach | Lake/Lagoon | P | ● |
| Wamberal Beach | Ocean beach | G | ● |
| Wamberal Lagoon | Lagoon | P | ● |
| Terrigal Beach | Ocean beach | G | ↑ |
| Terrigal Lagoon | Lagoon | P | ● |
| North Avoca Beach | Ocean beach | G | ● |
| Avoca Beach | Ocean beach | G | ● |
| Avoca Lagoon | Lagoon | P | ● |
| Copacabana Beach | Ocean beach | G | ● |
| Cockrone Lagoon | Lagoon | P | ● |
| MacMasters Beach | Ocean beach | VG | ● |
| Killcare Beach | Ocean beach | VG | ● |

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|---|---|
| Central Coast Council (continued) | | | |
| Ocean beach | Ocean beach |  |  |
| Umina Beach | Ocean beach |  |  |
| Pearl Beach Rockpool | Ocean baths |  |  |
| Davistown Baths | Estuarine |  |  |
| Pretty Beach Baths | Estuarine |  |  |
| Woy Woy Baths | Estuarine |  |  |
| Yattalunga Baths | Estuarine |  |  |

| Beach Suitability Grade | | | | | Change | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| 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 a beach catchment.

Beach Suitability Grades for Sydney region

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|-------------------------|--------|
| Northern Sydney – Ocean beaches | | | |
| Palm Beach | Ocean beach | VG | ● |
| Whale Beach | Ocean beach | VG | ● |
| Avalon Beach | Ocean beach | VG | ● |
| Bilgola Beach | Ocean beach | VG | ● |
| Newport Beach | Ocean beach | VG | ● |
| Bungan Beach | Ocean beach | VG | ● |
| Mona Vale Beach | Ocean beach | VG | ● |
| Warriewood Beach | Ocean beach | G | ● |
| Turimetta Beach | Ocean beach | G | ● |
| North Narrabeen Beach | Ocean beach | G | ● |
| Narrabeen Lagoon (Birdwood Park) | Lagoon | G | ● |
| Bilarong Reserve | Lagoon | P | ↓ |
| Collaroy Beach | Ocean beach | G | ● |
| Long Reef Beach | Ocean beach | G | ● |
| Dee Why Beach | Ocean beach | VG | ↑ |
| North Curl Curl Beach | Ocean beach | G | ● |
| South Curl Curl Beach | Ocean beach | VG | ● |
| Freshwater Beach | Ocean beach | G | ● |
| Queenscliff Beach | Ocean beach | G | ● |
| North Steyne Beach | Ocean beach | G | ● |
| South Steyne Beach | Ocean beach | G | ● |
| Shelly Beach | Ocean beach | VG | ↑ |
| Northern Sydney – Pittwater | | | |
| Barrenjoey Beach | Estuarine | G | ● |
| Paradise Beach Baths | Estuarine | G | ● |

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|-------------------------|--------|
| Northern Sydney – Pittwater (continued) | | | |
| Clareville Beach | Estuarine | G | ● |
| Taylors Point Baths | Estuarine | G | ● |
| Bayview Baths | Estuarine | G | ● |
| Elvina Bay | Estuarine | G | ● |
| North Scotland Island | Estuarine | G | ● |
| South Scotland Island | Estuarine | G | ● |
| The Basin | Estuarine | VG | ● |
| Great Mackerel Beach | Estuarine | VG | ● |
| Central Sydney – Ocean beaches | | | |
| Bondi Beach | Ocean beach | G | ● |
| Tamarama Beach | Ocean beach | G | ● |
| Bronte Beach | Ocean beach | G | ● |
| Clovelly Beach | Ocean beach | VG | ● |
| Gordons Bay | Ocean beach | G | ● |
| Coogee Beach | Ocean beach | G | ● |
| Maroubra Beach | Ocean beach | VG | ▲ |
| South Maroubra Beach | Ocean beach | G | ● |
| South Maroubra Rockpool | Ocean baths | G | ● |
| Malabar Beach | Ocean beach | P | ● |
| Little Bay Beach | Ocean beach | G | ● |
| Central Sydney – Sydney Harbour | | | |
| Camp Cove | Estuarine | VG | ● |
| Watsons Bay | Estuarine | G | ● |
| Parsley Bay | Estuarine | G | ● |
| Nielsen Park | Estuarine | VG | ● |
| Rose Bay Beach | Estuarine | P | ● |

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|-------------------------|--------|
| Central Sydney – Sydney Harbour (continued) | | | |
| Murray Rose Pool | Estuarine | G | ● |
| Dawn Fraser Pool | Estuarine | G | ● |
| Chiswick Baths | Estuarine | G | ● |
| Cabarita Beach | Estuarine | G | ● |
| Woolwich Baths | Estuarine | G | ● |
| Tambourine Bay | Estuarine | G | ● |
| Woodford Bay | Estuarine | G | ● |
| Greenwich Baths | Estuarine | G | ● |
| Hayes St Beach | Estuarine | G | ▲ |
| Clifton Gardens | Estuarine | G | ● |
| Balmoral Baths | Estuarine | G | ● |
| Edwards Beach | Estuarine | G | ● |
| Chinamans Beach | Estuarine | G | ● |
| Northbridge Baths | Estuarine | F | ● |
| Davidson Reserve | Estuarine | P | ● |
| Gurney Crescent Baths | Estuarine | F | ● |
| Clontarf Pool | Estuarine | G | ● |
| Forty Baskets Pool | Estuarine | G | ● |
| Fairlight Beach | Estuarine | G | ● |
| Manly Cove | Estuarine | G | ● |
| Little Manly Cove | Estuarine | G | ● |
| Southern Sydney – Ocean beaches | | | |
| Boat Harbour | Ocean beach | G | ● |
| Greenhills Beach | Ocean beach | VG | ● |
| Wanda Beach | Ocean beach | VG | ● |
| Elouera Beach | Ocean beach | VG | ● |

| Swimming site | Site type | Beach Suitability Grade | Change |
|---|-------------|-------------------------|--------|
| Southern Sydney – Ocean beaches (continued) | | | |
| North Cronulla Beach | Ocean beach | VG | ● |
| South Cronulla Beach | Ocean beach | VG | ● |
| Shelly Beach | Ocean beach | VG | ● |
| Oak Park | Ocean beach | VG | ● |
| Southern Sydney – Botany Bay and lower Georges River | | | |
| Silver Beach | Estuarine | G | ● |
| Como Baths | Estuarine | G | ● |
| Jew Fish Bay Baths | Estuarine | G | ● |
| Oatley Bay Baths | Estuarine | P | ● |
| Carss Point Baths | Estuarine | P | ● |
| Sandringham Baths | Estuarine | G | ● |
| Dolls Point Baths | Estuarine | G | ● |
| Ramsgate Baths | Estuarine | G | ● |
| Monterey Baths | Estuarine | G | ● |
| Brighton-Le-Sands Baths | Estuarine | G | ● |
| Kyeemagh Baths | Estuarine | G | ● |
| Foreshores Beach | Estuarine | VP | ● |
| Yarra Bay | Estuarine | G | ● |
| Frenchmans Bay | Estuarine | G | ● |
| Congwong Bay | Estuarine | G | ● |
| Southern Sydney – Port Hacking | | | |
| Jibbon Beach | Estuarine | VG | ↑ |
| Horderns Beach | Estuarine | G | ● |
| GyMEA Bay Baths | Estuarine | F | ↑ |

| Swimming site | Site type | Beach Suitability Grade | Change |
|---|-----------|---|---|
| Southern Sydney – Port Hacking (continued) | | | |
| Lilli Pilli Baths | Estuarine |  |  |
| Gunnamatta Bay Baths | Estuarine |  |  |

| Beach Suitability Grade | | | | | Change | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| Very Good | Good | Fair | Poor | Very Poor | Improved | Stable | Declined |

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 | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| Very Good | Good | Fair | Poor | Very Poor | Improved | Stable | Declined |

Beach Suitability Grades for South Coast region

| Swimming site | Site type | Beach Suitability Grade | Change |
|----------------------------------|-------------|-------------------------|--------|
| Shoalhaven City Council | | | |
| Shoalhaven Heads Beach | Ocean beach | VG | ● |
| Tilbury Cove | Ocean beach | VG | ● |
| Warrain Beach | Ocean beach | VG | ● |
| Collingwood Beach | Ocean beach | VG | ● |
| Cudmirrah Beach | Ocean beach | VG | ● |
| Mollymook Beach | Ocean beach | VG | ● |
| Rennies Beach | Ocean beach | VG | ● |
| Racecourse Beach | Ocean beach | G | ● |
| Bawley Point Beach | Ocean beach | VG | ● |
| Merry Beach | Ocean beach | VG | ● |
| Eurobodalla Shire Council | | | |
| Cookies Beach | Ocean beach | VG | ● |
| Caseys Beach | Ocean beach | G | ● |
| Surf Beach | Ocean beach | P | ↓ |
| Malua Bay Beach | Ocean beach | VG | ● |
| Broulee Beach | Ocean beach | G | ● |
| Bengello Beach | Ocean beach | VG | ● |
| Shelley Beach (Moruya Heads) | Ocean beach | G | ● |
| Tuross Main Beach | Ocean beach | G | ● |
| Brou Beach | Ocean beach | VG | ● |
| Wagonga Inlet | Estuarine | G | ● |
| Narooma Main Beach | Ocean beach | VG | ● |
| Bega Valley Shire Council | | | |
| Camel Rock Beach | Ocean beach | VG [^] | ● |
| Bruce Steer Pool | Estuarine | G [^] | ● |
| Horseshoe Bay | Ocean beach | VG [^] | ↑ |

| Swimming site | Site type | Beach Suitability Grade | Change |
|--|-------------|-------------------------|--------|
| Bega Valley Shire Council (continued) | | | |
| Big Blue Pool | Ocean baths | G [^] | ↓ |
| Beares Beach | Ocean beach | VG [^] | ● |
| Mogareeka Inlet | Lake/Lagoon | G [^] | ● |
| Mogareeka Lions Park* | Lake/Lagoon | VG [^] | - |
| Tathra Beach | Ocean beach | VG [^] | ● |
| Short Point Beach | Ocean beach | G [^] | ↓ |
| Bar Beach | Estuarine | G [^] | ● |
| Main Beach (Merimbula) | Ocean beach | VG [^] | ● |
| Pambula Beach | Ocean beach | VG [^] | ● |
| Pambula River Mouth | Estuarine | G [^] | ● |
| Aslings Beach | Ocean beach | VG [^] | ↑ |
| Cocora Beach | Ocean beach | G [^] | ● |

| Beach Suitability Grade | | | | | Change | | |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |
| Very Good | Good | Fair | Poor | Very Poor | Improved | Stable | Declined |

* New site

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

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:

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

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

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

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

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 Australia².

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

²Department 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 17/06/19.

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 100mL of sample (cfu/100mL).

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 percentile¹.

Risk of illness associated with Microbial Assessment Categories

| Category | Enterococci (cfu/100mL) | 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.

¹Wyer 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), 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:

http://ww2.health.wa.gov.au/Articles/A_E/Environmental-waters-publications under *Forms and templates* [accessed 17/06/19].

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available at:

www.environment.nsw.gov.au/topics/water/beaches/reporting-beach-water-quality/guidelines/sanitary-inspection.

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.

Where there is a known history or evidence of sewage overflows or sewer chokes in the catchment they are identified as sources of potential faecal contamination, particularly if they are located close to the swimming location. In these instances, the risk posed by stormwater is adjusted accordingly to ensure the overall risk to public health is not overestimated.

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:

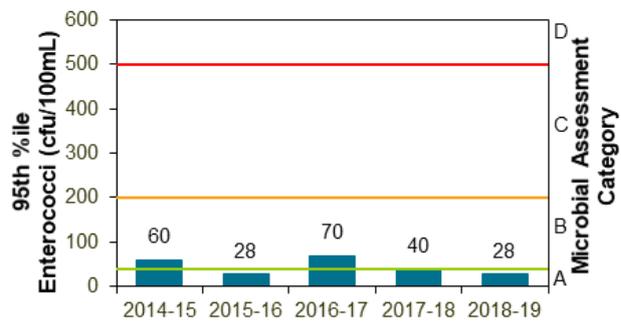
-  Stable
-  Improved
-  Declined

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

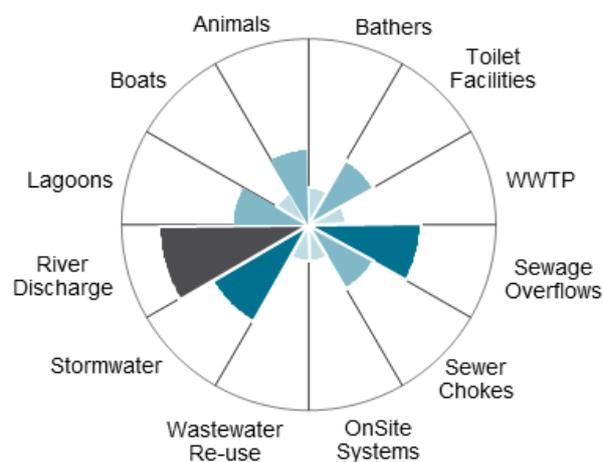
Microbial Assessment Category (MAC) chart

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.



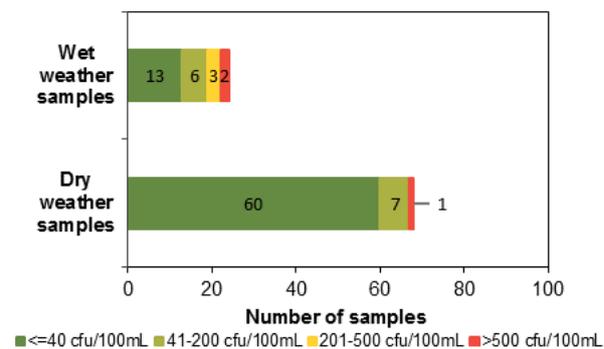
Sanitary Inspection Category (SIC) chart

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

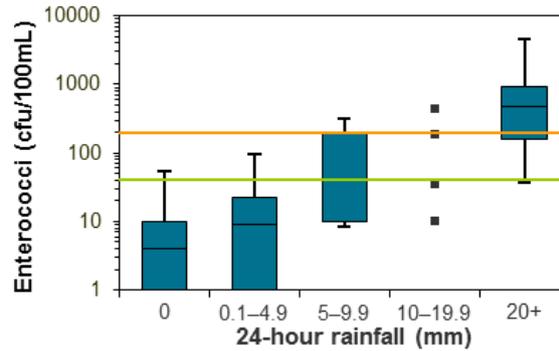
Enterococci levels in wet and dry weather conditions are presented for each swimming location as a bar graph. All data collected during the assessment period is included in the analysis. Dry weather is defined as no rainfall recorded in the previous 24 hours. Each bar is colour coded to show the number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



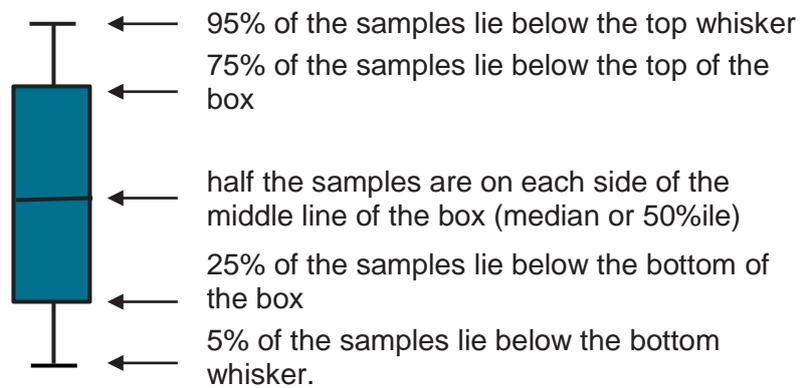
It is expected that swimming sites with lower levels of flushing show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of stormwater 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 40cfu/100mL and 200cfu/100mL are indicated with a green and orange line, respectively. The 40cfu/100mL 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 (1cfu/100mL), 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:



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 40cfu/100mL. 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.

| Key to maps | |
|---|--------------------------------------|
|  | Sampling Site |
|  | Surf Life Saving Club |
|  | Wastewater Treatment Plant |
|  | Sewage Pumping Station |
|  | Sewage Overflow |
|  | Stormwater Drain |
|  | Water |
|  | Baths |
|  | National Park/Reserve/ Other Park |
|  | Built-up Area |
|  | Sand |
|  | Roads |
|  | Major Roads |
|  | Baths – Netted Area |
|  | Breakwater/Wharf |

Quality assurance

The quality assurance program



Water sample collection
Photo: Beachwatch/EES,
DPIE

To ensure that data reported by Beachwatch is accurate and reliable, quality assurance is included in all parts of the program:

- field sampling (equipment preparation, sample collection, sample storage and sample transport)
- laboratory analysis
- data management
- community reporting.

Field sampling

Hunter Water, Sydney Water and Beachwatch collect samples throughout the year and are audited quarterly. Councils in the Beachwatch Partnership Program usually sample for part or all of the swimming season (October to April) and are audited once during this period. Sample locations can be found on the individual beach maps.

Audits include an assessment of field officer performance according to established Beachwatch Programs sampling protocols, including aseptic sampling techniques, sample collection, sample storage and documentation of field observations. These protocols are based on internationally recognised methods for the collection of water samples in recreational bathing areas¹.

¹Standard methods for the examination of water and wastewater, 20th edition, 1998, American Public Health Association, Washington.

Sample collection by Beachwatch, Hunter Water and Sydney Water complied well with established sampling protocols, with a compliance of 100%. Councils in the Beachwatch Partnership Program achieved an overall compliance of 98% with Beachwatch sampling protocols.

Minor non-compliance was noted during the field audits of two partner councils. On both occasions, the non-compliance was due to not using best practice; water samples were collected in a two-step process (the water sample was collected in a larger container then transferred to the sample jar), and field observations were not recorded during the sampling. While these techniques did not jeopardise the integrity of the samples collected (the larger sample container was rinsed three times before each use), collecting



samples without decanting and recording field observations is best practice. These concerns were raised with the sampling officers during the audits.

Who samples where?

Beachwatch

Collects samples at 97 ocean and harbour beaches in Sydney.

Hunter Water

Collects samples at 17 ocean beaches in Port Stephens, Newcastle and Lake Macquarie.

Sydney Water

Collects samples at 18 ocean beaches in Wollongong, Shellharbour and Kiama.

Partner councils

Ballina Shire Council, Richmond Valley Council, Port Stephens Council, Central Coast Council, Wollongong City Council, Kiama Municipal Council, Shoalhaven City Council, Eurobodalla Shire Council and Bega Valley Shire Council collect samples at popular swimming locations in their respective local government areas.

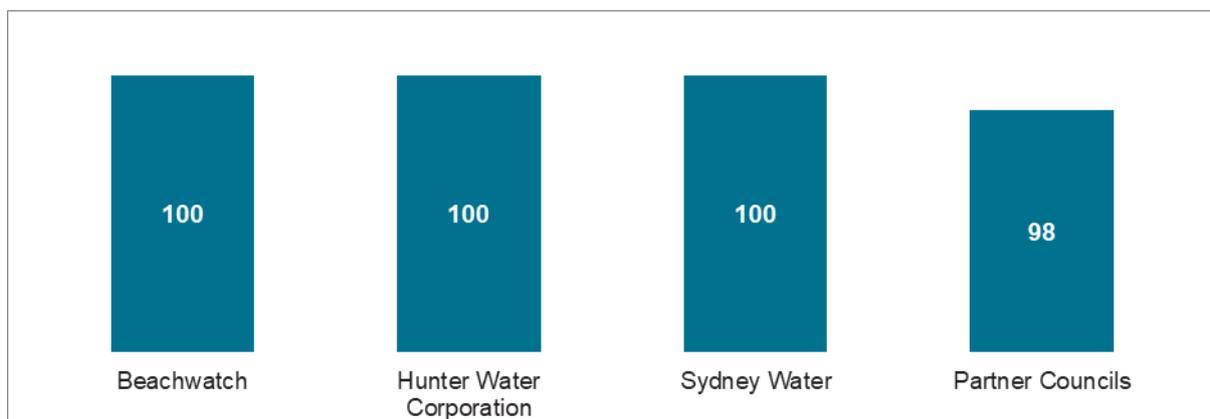


Figure 1 Percentage compliance with Beachwatch sampling protocols in 2018–2019

Laboratory analysis

Beachwatch program



To assess the reliability of laboratory data, Beachwatch sends duplicate water samples to our contracted microbiological laboratory, which is accredited by the National Association of Testing Authorities (NATA). Duplicate samples are collected from the same site at the same time and the laboratory is unaware that the samples are collected from a single location. The results are expected to be similar.

Due to the inherent variability of bacterial levels in environmental samples, duplicate results that are within 0.3 log-units of each other (equivalent to a halving or doubling of density on a linear scale) are considered to be acceptable. The majority of duplicate samples were within the acceptable limits; however, some enterococci results were outside this range, with most of these at very low bacterial densities that were below the safe swimming limit. Where values were outside this range, the site result was more often higher than the replicate, indicating that results were rarely underestimated.

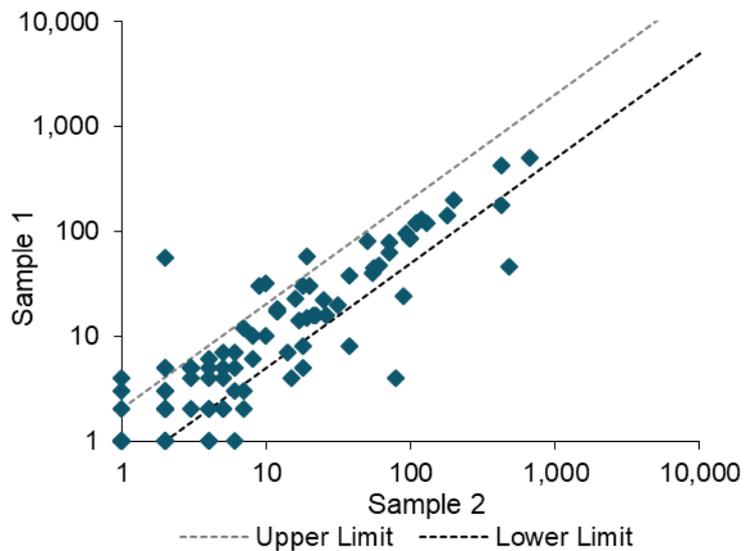


Figure 2 Distribution of duplicate enterococci (cfu/100mL) results for the contracted laboratory, May 2018 to April 2019

Beachwatch Partnership Program



Water sample
Photo: Beachwatch/EES,
DPIE

Council laboratories were invited to take part in proficiency testing in November 2018 to determine the reliability of data. Laboratories with NATA accreditation or which could provide evidence of regular proficiency testing were not included in the program as they already comply with strict assessments. This year laboratories for Ballina Shire Council, Richmond Valley Council and Bega Valley Shire Council were proficiency tested.

The proficiency testing for Ballina, Richmond Valley and Central Coast councils' laboratories was conducted by IFM Quality Services Pty Ltd. IFM Quality Services despatches samples in freeze dried form that require reconstitution prior to testing.

Ballina Shire and Richmond Valley councils' laboratory undertook proficiency testing once per month from November 2018 to January 2019. The laboratory recorded excellent results with enterococci counts reported within defined limits. Confidence can be placed in the accuracy of data from this laboratory and water quality results reported in the North Coast region.

Central Coast Council's laboratories undertook proficiency testing monthly from October 2018 to April 2019. The laboratories performed very well, with all results within the defined limits. Confidence can be placed in the water quality data reported for the Central Coast region.

Bega Valley Shire Council collected duplicate samples on three occasions during the summer season. Bega laboratory analysed one sample while the duplicate was sent to a NATA accredited laboratory for testing. Comparison of results showed five of the six samples were within the acceptable limits. Bega laboratory reported one result outside the lower limit, and slightly lower than the bacterial count reported by the NATA accredited laboratory (Figure 3); however, this outlier is well below the safe swimming limit. Bega laboratory microbial analysis has continued to show much improvement in performance over the last three years, and confidence can be placed in data reported for council's swimming sites.

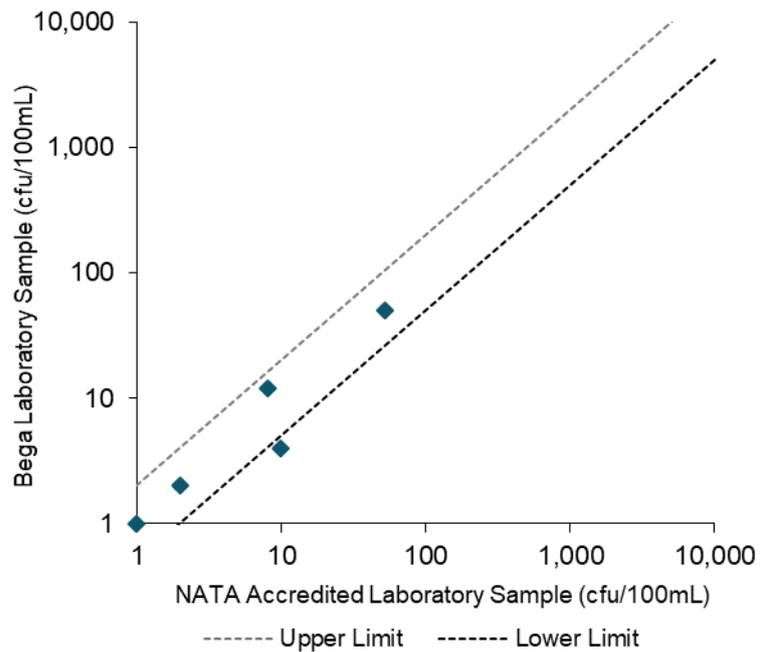


Figure 3 Distribution of duplicate enterococci (cfu/100mL) results for Bega and NATA accredited laboratories

Data management

Download data

Beachwatch data online:
www.environment.nsw.gov.au/beachapp/report_enterococci.aspx

Water quality results for swimming sites in the Sydney, Hunter and Illawarra regions are regularly forwarded electronically to the Beachwatch program from the contracted laboratory, and by Hunter Water and Sydney Water laboratories. The water quality data are uploaded to the Beachwatch water quality database (BACTO) for storage and data evaluation.

All partnership councils transferred water quality data to Beachwatch on a regular basis, for centralised storage on the BACTO database. In some cases, data were emailed directly from the analysing laboratory.

Quality assurance procedures for the storage of data on the centralised database followed a rigorous protocol that was developed as part of the Beachwatch program. This includes data validation procedures to identify anomalous results, restricting user access to the database, using fixed templates for upload of data, and database settings to prevent duplicate entries.

Beachwatch data is uploaded to our website and can be downloaded online:
www.environment.nsw.gov.au/beachapp/report_enterococci.aspx.

Community reporting

Subscribe

Daily beach pollution forecast emails at:
www.environment.nsw.gov.au/whatsnewarchive/subscribe.htm

Providing the community with current beach water quality information is a core function of the Beachwatch programs, so reporting has been incorporated into the quality assurance program. This enables Beachwatch to measure the accuracy, consistency of content (quality) and punctuality (timeliness) of all reports released. When necessary, this information is used to improve the reporting process.

There are two main types of Beachwatch reports: Beach pollution forecasts and star rating reports.

Beach pollution forecasts

Beach pollution forecasts provide advice to assist beach users on deciding when and where to swim. The forecasts are generated daily to report on the likelihood of bacterial contamination at swimming sites in the Hunter, Central Coast, Sydney and Illawarra regions. This information can be accessed by the public through the Beachwatch website (<http://www.environment.nsw.gov.au/beachwatch>), and is reported on Twitter (@BeachwatchNSW) and Facebook (www.facebook.com/BeachwatchNSW). The information is also sent by email to subscribers, stakeholders and media.

The forecasts are based on telemetered rainfall data and any reported pollution incidents that could affect beach water quality. The forecasts include a prediction of the likelihood of pollution at ocean beaches and harbour swimming areas, as well as daily weather, tides and coastal conditions, based on the Australian Bureau of Meteorology's Metropolitan Forecast and Coastal Waters Forecast. Forecasts are updated throughout the day if conditions change, using information provided by the Bureau of Meteorology, local councils, lifeguards, the Environment Protection Authority or Sydney Water. During summer, forecast updates are also issued to advise of beach conditions such as dangerous surf, marine stingers, lagoon openings, closures and other information reported by council lifeguards.

Accuracy of beach pollution forecast predictions

The daily pollution forecast scenarios are analysed against bacterial data to track the accuracy of predictions. During 2018–2019, 95% of overall predictions were correct. The Hunter and Illawarra forecasts were the most accurate during the assessment period, with 96% and 98% of forecast scenarios correctly predicted, respectively.

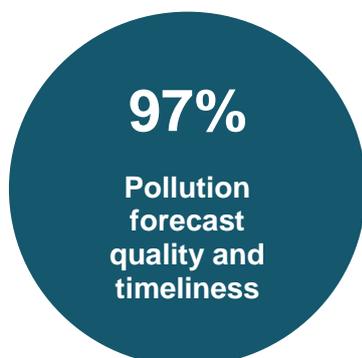
When the accuracy of the pollution predictions for a swimming site declines, the prediction models are reassessed and adjusted to incorporate the changes in water

95%

Pollution
forecast
prediction
accuracy

quality. Regular tracking of the accuracy of pollution scenarios ensures a high level of overall accuracy is maintained.

Quality and timeliness of beach pollution forecast reports



Forecast reports are audited weekly to assess the quality and punctuality of information issued on the Beachwatch website and in emails:

- The quality of the forecasts is checked for formatting, spelling, punctuation and incorrect pollution scenarios or weather information to ensure the information provided is clear and concise.
- The timeliness of the forecasts issued to the website and sent by email is assessed to ensure punctuality of our service.

In 2018–2019 an overall compliance of 97% was achieved with the beach pollution forecast reporting protocols for quality and timeliness. The breakdown of compliance performance for forecast reports on the Beachwatch website and by email is shown in Figure 4.

Minor quality non-compliance included some minor punctuation, and incorrect pollution scenarios for some sites on some occasions. The timeliness of forecasts was impacted on a couple of occasions and was usually caused by technical problems with the Beachwatch website or email provider.

The results from the quality assurance audits are stored in an electronic database, with a weekly summary of any detected errors distributed to Beachwatch staff for their attention and action, if necessary.



Figure 4 Percentage compliance with beach pollution forecast reporting protocols in 2018–2019

Star ratings reports

The star ratings provide an indication of recent bacterial water quality results, based on NHMRC (2008) guidelines, with one star indicating poor water quality, through to a four-star rating indicating excellent water quality. The star ratings are calculated using a spreadsheet, and are quality assured prior to reporting on the Beachwatch website, with any errors in calculations detected before publishing. Star ratings are published under each region on the Beachwatch websites (www.environment.nsw.gov.au/topics/water/beaches/reporting-q-beach-water-quality/about-weekly-star-ratings).

Most star ratings are updated weekly throughout the year for swimming sites in the Sydney, Hunter and Illawarra regions and during the summer season for regional partner councils where the frequency of sampling is reduced for some swimming sites that are not used during winter. All historical enterococci water quality data is available on the Beachwatch website.



Beach warning signs
Photo: Beachwatch/EES,
DPIE