Beachwatch

State of the beaches 2021–22

North Coast Region

Department of Planning and Environment

NSW GOVERNMENT

Front cover: Seven Mile Beach (Ballina Shire Council)

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Contents

Recreational water quality has been monitored in the North Coast region since 2002 by Ballina Shire Council and Richmond Valley Council under the Department of Planning and Environment's Beachwatch Partnership Program. This report summarises the performance of 18 swimming sites on the north coast of NSW, providing a long-term assessment of how suitable a site is for swimming. Monitored sites include ocean beaches, estuarine areas in Shaws Bay, North Creek and Evans River, and swimming sites in Lake Ainsworth.

In 2021–2022, 72% of swimming sites in the North Coast region were graded as Good or Very Good, including all ocean beaches. These sites were suitable for swimming for most or almost all of the time. This is a very good result despite the very wet summer and extreme wet weather events and flooding impacting the region. The overall slight improvement from the previous year largely reflects the recent changes in the monitoring program, with 4 swimming sites no longer monitored by Byron Shire Council under the Beachwatch Partnership Program.

North Coast region summary 2021–2022

Beach monitoring in NSW

Shelly Beach, Ballina
Photo: Ballina Shire Council

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

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

Recreational water quality has been monitored in the North Coast region by Ballina Shire Council since 2002, and Richmond Valley Council since 2006.

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

During 2021–2022, 18 swimming sites were monitored including ocean beaches, estuarine areas in Shaws Bay, North Creek and Evans River, and swimming sites in Lake Ainsworth.

Rainfall impacts

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 2021–2022 are based on water quality data collected over the last 2–4 years. Rainfall over this period has been diverse:

- 2018–2019: rainfall was average to below average, except for a wet spring and isolated rain events

- 2019–2020: average to below average rainfall except for the wettest summer on record
- 2020–2021: rainfall was average to below average except for a very wet summer
- 2021–2022: average to well above average rainfall in spring and a very wet summer, and significant flood events

See the section on **How to read this report** on page 36 for an explanation of the graphs, tables and Beach Suitability Grades.

Rainfall on the North Coast was well below the long-term monthly averages for winter 2021, with August 2021 particularly dry in the Northern Rivers region.

Monthly rainfall totals during spring on the North Coast were average to above average, with October 2021 recording the heaviest rainfall. Rainfall totals for October 2021 were one and a half to double the long-term monthly average, with 150 mm and 200 mm recorded at Ballina and Evans Head respectively.

Many areas of the Northern Rivers region experienced their wettest summer on record, with Ballina recording its highest summer rainfall total on record with 1,231 mm of rainfall and highest February daily rainfall total on record of 195 mm. Significantly wet weather conditions continued through to March 2022, with close to 3 times the long-term monthly average rainfall recorded at Evans Head with 682 mm, and 3 and half times the long-term monthly average rainfall at Ballina with 812 mm.

Consecutive days of significantly heavy rainfall in late February and during March 2022 caused major flooding of the rivers and coastal waterways on the North Coast, with record flood peaks experienced in the Richmond River in early March 2022. An extreme wet weather event in late March 2022 triggered significant flooding to the region for the second time in the month. Council and Beachwatch issued extreme wet weather pollution alerts advising that floodwaters may be impacting swimming sites and to avoid swimming. Significant debris and discolouration continued to impact the North Coast while floodwaters discharged to the ocean.

Average to below average rainfall fell during April 2022.

Debris at Lighthouse Beach following extreme wet weather and flooding in March 2022

Photo: Ballina Shire Council

Flooding and water quality

Monitoring by councils on the North Coast showed flooding events impacted swimming sites beyond the flood zones, making microbial water quality unsuitable for swimming. The most affected areas were in estuaries, lakes and lagoons, which have a lower level of flushing and took longer to recover from the floodwater events than the ocean beaches.

While microbial levels returned to normal at many swimming sites, there was still a large amount of debris or other hazards, such as murky water, which posed a risk to recreational activities.

Algal blooms

Blue-green algal bloom present in the water

Photo: Rachael Jenner/ Ballina Shire Council

Water NSW and Ballina Shire Council reported the occurrence of freshwater blue-green algal blooms, *Dolichospermum circinale* impacting Lake Ainsworth in October to December 2021. Water NSW also issued a caution alert for *Trichodesmium* sp. in the Richmond River and its tributaries and on the coast in October and November 2021.

While freshwater and marine algae occur naturally, there were times of heightened risk to recreational users due to rapid increases in abundance causing blooms.

The appearance of **algae** is sometimes mistaken for **sewage contamination** due to a strong odour and thick green scum or discolouration in the water caused by the blooms.

Algae advisories were issued on the Ballina Shire Council, Beachwatch and Water NSW websites, as well as onsite signage during blooms.

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 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	G	○
Lake Ainsworth South	Lake/Lagoon	G	○
Lake Ainsworth West	Lake/Lagoon	P	○
Shelly Beach	Ocean beach	VG	○
Lighthouse Beach	Ocean beach	VG	○
Shaws Bay North	Estuarine	P	○
Shaws Bay East	Estuarine	G	○
Shaws Bay East Arm	Estuarine	G	○
Shaws Bay East Beach	Estuarine	G	○
Shaws Bay West	Estuarine	P	○
The Serpentine	Estuarine	G	○
Richmond Valley Council			
Airforce Beach	Ocean beach	G	○
Main Beach	Ocean beach	G	○
Shark Bay	Ocean beach	VG	○
Evans River	Estuarine	P	○
Elm Street Bridge North (Evans River)	Estuarine	G	○

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

Ballina Shire Council

100%
ocean beaches graded Good or Very Good

Overall results

Nine of the 13 swimming sites were graded as Very Good or Good in 2021–2022, a similar performance to the previous year.

Percentage of sites graded as Very Good or Good

	2019–2020	2020–2021	2021–2022	Trend
Ocean beaches (3 sites)	100%	100%	**100%**	
Estuarine sites (6 sites)	100%	67%	**67%**	
Lake/ lagoon sites (4 sites)	50%	50%	**50%**	

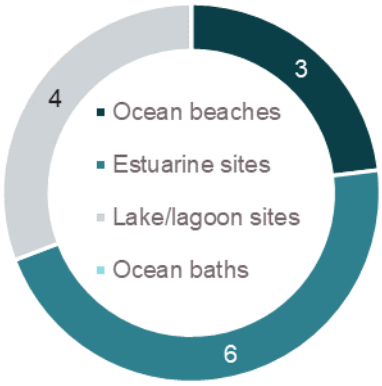
Thirteen swimming sites were monitored by Ballina Shire Council. Samples were collected weekly between November and February and sampling and laboratory analysis was fully funded by the council.

See the section on **How to read this report** on page 36 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Seven Mile Beach, Shelly Beach and Lighthouse Beach.

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



Site types in Ballina Shire Council

Swimming sites monitored in the Ballina region include ocean beaches, estuarine areas in Shaws Bay and North Creek and lake/lagoon swimming sites in Lake Ainsworth, with each site type having a different response to rainfall-related impacts.

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

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

Ocean beaches

Beach Suitability Grades for Ballina Shire Council ocean beaches

Seven Mile Beach, Shelly Beach and Lighthouse Beach continued to be graded as Very Good in 2021–2022. These beaches had excellent water quality and were suitable for swimming almost all of the time.

Estuarine beaches

Beach Suitability Grades for Ballina Shire Council estuarine beaches

Four of the 6 estuarine swimming locations were graded as Good in 2021–2022: Shaws Bay East, Shaws Bay East Arm, Shaws Bay East Beach and The Serpentine. Water quality at these sites was frequently suitable for swimming in dry weather, with 91% or greater of dry weather samples within the safe swimming limit.

Shaws Bay North and Shaws Bay West were graded Poor in 2021–2022, similar to the previous year. While these sites were mostly suitable for swimming during dry weather, elevated bacterial levels were regularly recorded following light rainfall. Further investigation is required to show the scale and extent of the problem, and the source of microbial contamination.

The estuarine swimming locations occasionally recorded elevated enterococci levels after light rainfall and more often

after heavy rainfall. Water quality at these sites can be impacted by upstream sources and can take longer to recover due to lower levels of flushing.

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

Lake/lagoon swimming sites

Beach Suitability Grades for Ballina Shire Council lake/lagoon swimming sites

Lake Ainsworth East and Lake Ainsworth South continued to be graded as Good in 2021–2022. These sites were frequently suitable for swimming during dry weather, with 93% and 94% of dry weather samples within the safe swimming limit respectively. Elevated enterococci levels were regularly recorded at these sites after heavy rainfall.

Lake Ainsworth North and Lake Ainsworth West were graded as Poor, a result consistent with previous years. Elevated bacteria levels were recorded at these lake swimming sites during dry and wet weather conditions. Despite the poor grades, between 72% and 81% of dry weather samples were within the safe swimming limit. These sites may be impacted by a number of significant potential sources of faecal contamination, including stormwater, and have low levels of flushing. During 2019, council investigated the source of microbial contamination by testing additional samples for faecal sterols at sites within Lake Ainsworth. The results found that the main contributors to elevated bacteria levels are from avian (bird) sources.

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

Management

Ballina Shire Council

Ballina Shire Council finalised the Lake Ainsworth Coastal Management Program (CMP) in late 2020 and it was the first CMP to be certified in NSW, in February 2021. Council has also received funding and technical support from the NSW Government's Coastal and Estuary Grants Program to implement CMP actions, including riparian vegetation enhancement, erosion control, educational signage works, and trial modifications to artificial aeration and water quality monitoring to improve lake water quality, especially with respect to blue-green algae issues. The implementation of these projects has been hampered by the flood at the lake due to the high rainfall received in the first half of 2022. In addition, the CMP has received $250,000 through the Crown

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.

Reserves improvement fund to assist with foreshore stabilisation, erosion repair, refining access points for swimmers and enhancing habitat around the lake. These works complement previous work done by Council such as the removal of a road adjacent to the lake, which was replaced with a pedestrian accessway and parklands, providing further swimming and recreational opportunities in and around the lake. Future CMP actions include further measures to address water quality issues, protect and preserve lake ecological values, reduce impacts from recreational use, better understand Aboriginal cultural heritage values, and address transport issues at the popular swimming spot over the next 10 years.

Council has completed Stage 1 of a CMP for North Creek with funding and technical support provided through the NSW Government's Coastal and Estuary Grants Program to undertake hydrological modelling and water quality studies that were identified as critical knowledge gaps to be addressed under Stage 2 of the CMP. Stage 2 will also include the development of a source catchment model of surface and groundwater pathways using outputs from the hydrodynamic model and water quality monitoring program to assess pollutant pathways through the catchment.

Ballina Shire Council will soon complete a CMP Stage 1 scoping study for the Ballina open coast and lower part of the Richmond River estuary with funding and technical support provided through the NSW Government's coastal management framework. The CMP will identify and address risks associated with coastal hazards, as well as focus on improvements to environmental values within the coastal zone. It is anticipated that Stage 2 of the CMP will commence later this year.

Shaws Bay
Photo: Ballina Shire Council

Over the next year, council will begin work on transitioning the Shaws Bay Coastal Zone Management Program (CZMP) to a CMP, which will allow Shaws Bay to be managed under the new coastal management framework. Council has implemented all identified works within the Shaws Bay CZMP. The improvements have included dredging within the bay, significant construction works to stabilise bank erosion, development of a formal carpark, construction of a shared pathway along with shower and picnic facilities and the upgrade of stormwater infrastructure. Beach nourishment or sand replacement to access points within the bay has also been undertaken along with the implementation of a boardwalk style path that meanders within remnant vegetation and allows for saltmarsh to establish in an ecological zone.

The foreshore improvement and dredging works in Shaws Bay aim to address long-term sedimentation issues and assist tidal circulation and flushing to improve water quality

within the bay. The works have created improved swimming and recreational areas within Shaws Bay.

In March 2021, Rous County Council commenced the Stage 1 scoping study for the Richmond River CMP on behalf of the local councils located within the Richmond River catchment with funding and technical support provided through the NSW Government's coastal management framework. The aim of this program is to update the CZMP for the Richmond River estuary in line with the new framework and establish a whole-of-catchment management approach that will identify coastal management issues throughout the Richmond River catchment, to address these in a strategic and integrated manner. There are likely to be several actions identified within the Richmond River CMP that will continue the work identified in the Richmond River CZMP. The CZMP implemented a number of actions including consideration of governance within the catchment, riparian planting along creeks and the river, and upgrading the water quality monitoring equipment and program. Rous County, Ballina Shire, Lismore City, Richmond Valley, Kyogle and Byron Shire councils are working with the NSW Government to deliver the CMP. It is anticipated that the implementation of CMP actions will lead to a gradual improvement in water quality in the Richmond River, and subsequently improvements to the associated recreational swimming sites and beaches.

Lighthouse Beach
Photo: Ballina Shire Council

The Ballina Shire Council local government area experienced 2 significant flood events following unprecedented wet weather during February and March 2022. The floodwaters devastated the local communities, resulting in loss of life and destroying homes and businesses. Council is focused on the recovery of the region and is supporting the affected communities, alongside the state and federal governments. Council is also continuing to prioritise and repair major infrastructure, including repair and rebuilding of roads and buildings, waste, water and sewer infrastructure, and erosion repairs.

While council's Beachwatch monitoring had concluded in February 2022, council undertook additional water quality monitoring and issued warnings to advise the community of the risks of water recreation due to the floods. The additional monitoring showed the water quality did not return to levels suitable for swimming until mid-June 2022 and coincided with the ceasing of rainfall in the region. Council's swimming sites were also impacted by significant debris and discolouration while floodwaters continued to discharge to the ocean.

Ballina Shire Council completed the $1.8 million Lake Ainsworth Precinct project several years ago. The project included construction of sealed roadways including the

recently upgraded and sealed access road to Camp Drewe and Seven Mile Beach, improved water sensitive stormwater design features, new access pathways and landscaping on the eastern, southern and western foreshores of the lake. The project enhancements have improved the public amenity and are aimed at positively affecting water quality by improving erosion control, upgrades to stormwater management, landscaping, grassed areas, bank rehabilitation, erosion control and impervious parking areas.

Council has also prohibited dogs on the eastern side of Lake Ainsworth to maintain and preserve the environmental health and amenity of the sensitive ecological location by reducing the amount of dog faeces within the vicinity of the lake.

In 2019, Ballina Shire Council undertook additional sampling to identify the source of faecal contamination within Lake Ainsworth. The results of the faecal sterol analysis showed that avian (bird) faecal matter is the main contributor to faecal contamination in the lake.

Lake Ainsworth West
Photo: Ballina Shire Council

Lake Ainsworth is occasionally affected by blue-green algal blooms. From October to May the lake is constantly sampled and when sampling indicates an algal bloom, council places precautionary signage at the lake advising users that the area may be affected. The signage is only displayed when algal levels are elevated and when necessary in accordance with Water NSW algae guidelines.

Council has implemented and maintains modern wastewater treatment works located at West Ballina and Lennox Head. The treatment works provide recycled wastewater via dual reticulation to properties in Lennox Head, Skennars Head, East Ballina and Cumbalum. Ballina's wastewater treatment plant (WWTP) is also currently supplying bulk recycled water for irrigation purposes to sports fields, Ballina Racecourse and the Ballina Golf Course. The treatment and use of recycled water greatly reduces the release of treated wastewater to the environment.

Council has also recently completed significant sewage pumping station upgrades that include emergency storage tanks to pump stations located at Shelly Beach and The Serpentine. The emergency storage tanks will reduce the possibility of accidental release of untreated sewage into the local waterways by capturing unforeseen surcharges or spills in the event of power outage, pump or mains failure.

Despite this, occasional sewage overflows or spills can also result in pollution entering watercourses and beaches. Although uncommon, if contamination is suspected at a swimming site, warnings are displayed advising the area is unsuitable for swimming. Warnings remain in place until testing indicates the water quality is again suitable for

swimming. Media releases are issued and council's website is updated during periods of heavy rain and minor flooding to advise which swimming sites are likely to be contaminated and impacted by stormwater runoff.

Council has developed and implements an onsite sewage management (OSSM) strategy and guidelines. The OSSM strategy and guidelines aim to ensure OSSM systems are effectively managed, and there are no adverse effects to public and environmental health in the design, installation and maintenance of these systems.

Sampling sites and Beach Suitability Grades in Ballina Shire Council

Seven Mile Beach

Beach grade: VG

Seven Mile Beach extends for over 8 km and is patrolled over the summer period.

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

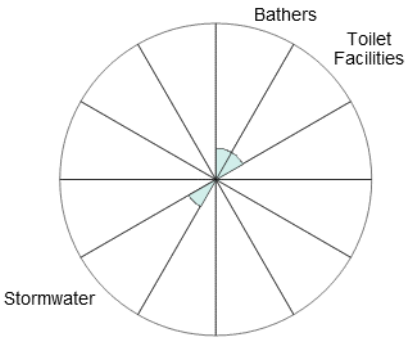
Enterococci levels increased slightly with increasing rainfall but remained below the safe swimming limit across all rainfall categories.

The site has been monitored since 2002.

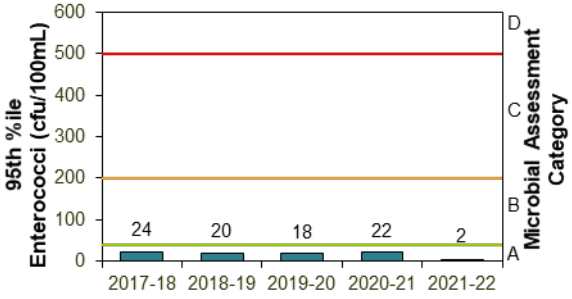
See ‘How to read this report’ for key to map.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2017 to Feb 2022	100%	98	Stable

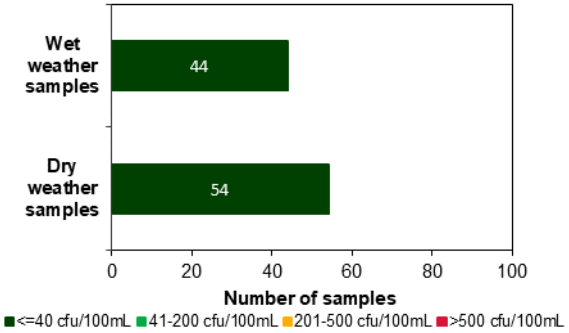
Sanitary inspection: Low



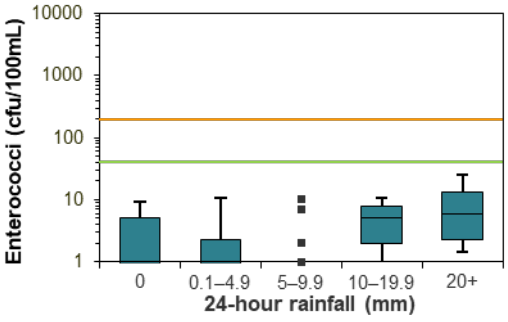
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth North

Beach grade: P

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

Lake Ainsworth North is located at the northern end of Lake Ainsworth.

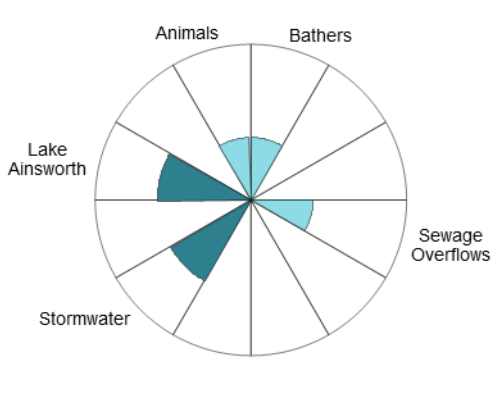
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from stormwater and elsewhere within the lake.

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

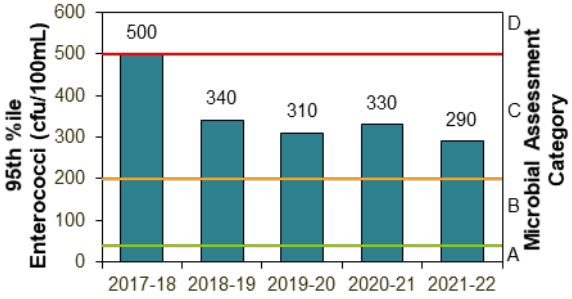
The site has been monitored since 2016.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Jan 2018 to Feb 2022	81%	100	Stable

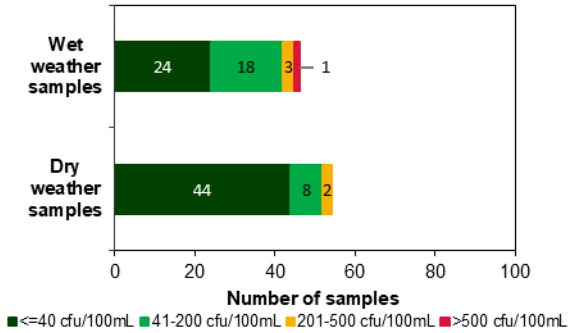
Sanitary inspection: Moderate



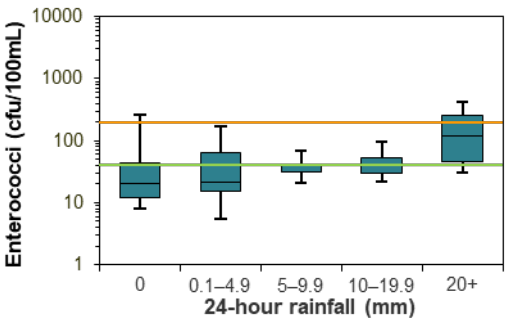
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth East

Beach grade: G

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

Lake Ainsworth East is located on the eastern shore of Lake Ainsworth, a coastal freshwater lake.

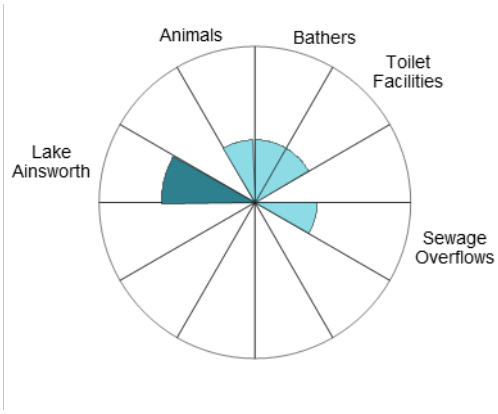
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including from elsewhere within the lake.

Enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain, and regularly after 20 mm or more.

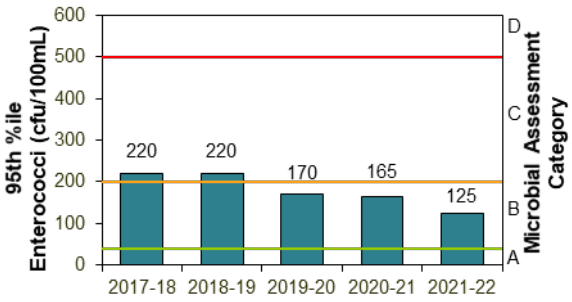
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Jan 2018 to Feb 2022	93%	100	Stable

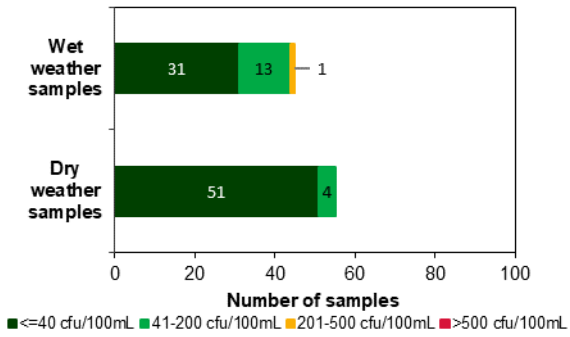
Sanitary inspection: Moderate



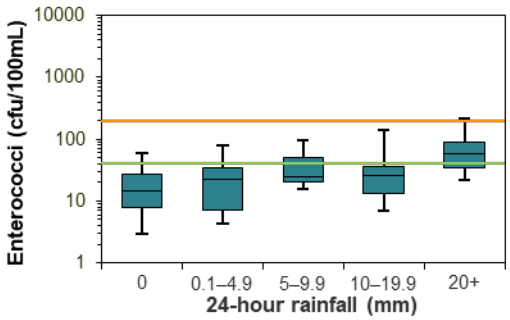
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth South

Beach grade: G

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

Lake Ainsworth South is located on the southern shore of Lake Ainsworth, a coastal freshwater lake.

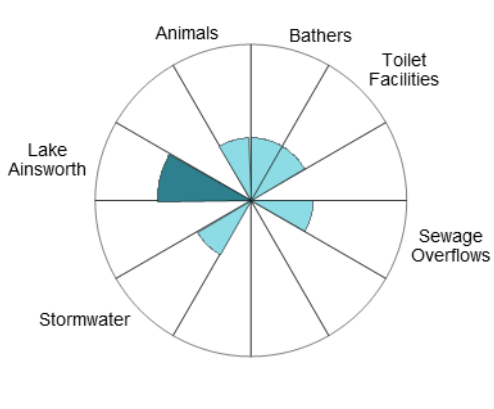
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including from elsewhere within the lake.

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

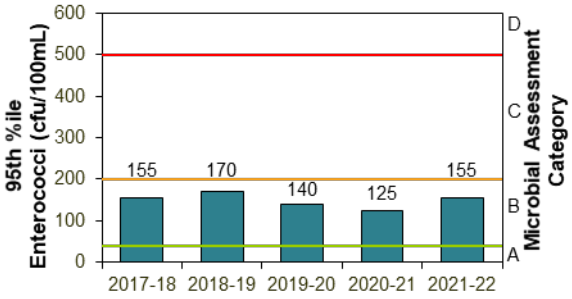
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Jan 2018 to Feb 2022	94%	100	Stable

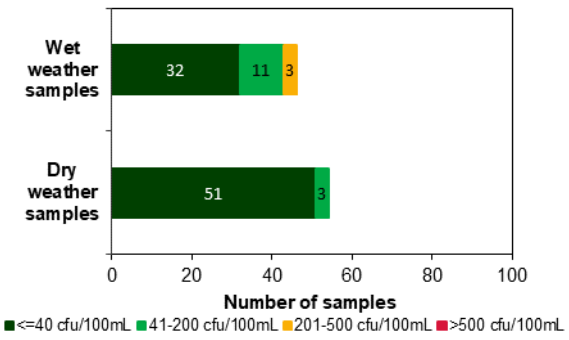
Sanitary inspection: Moderate



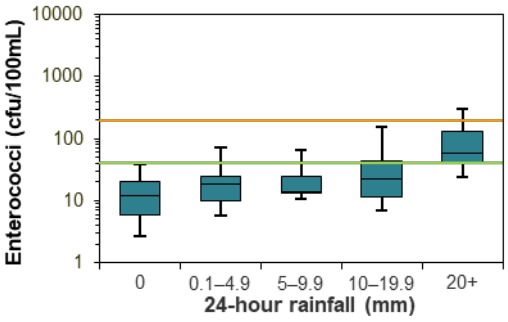
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Lake Ainsworth West

Beach grade: P

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

Lake Ainsworth West is located on the western shore of Lake Ainsworth, a coastal freshwater lake.

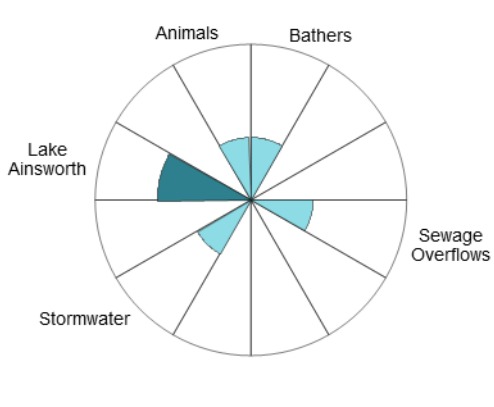
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and often during dry weather conditions, with potential faecal contamination from elsewhere within the lake.

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

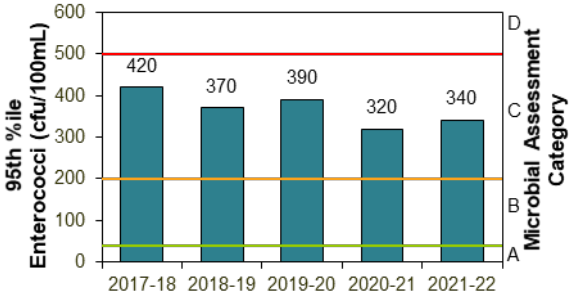
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Lake/Lagoon	Jan 2018 to Feb 2022	72%	100	Stable

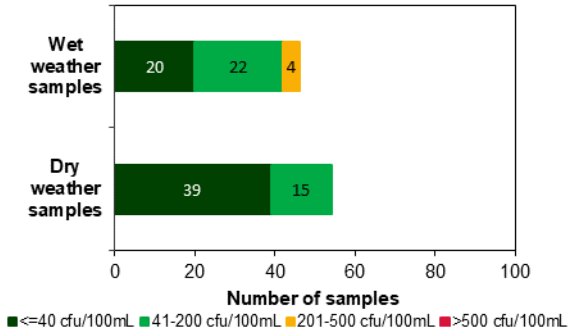
Sanitary inspection: Moderate



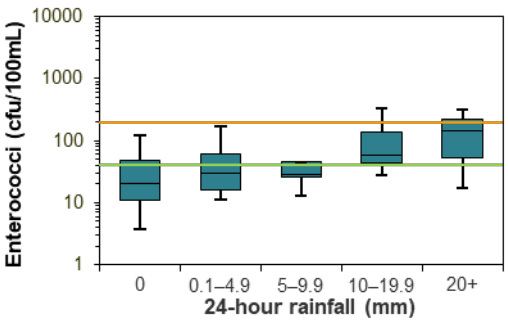
Microbial Assessment Category: C



Dry and wet weather water quality



Water quality in response to rainfall



Shelly Beach

Beach grade: VG

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

Shelly Beach is a 700 m long beach located between Black Head and Richmond River Lighthouse, and is patrolled during holiday periods.

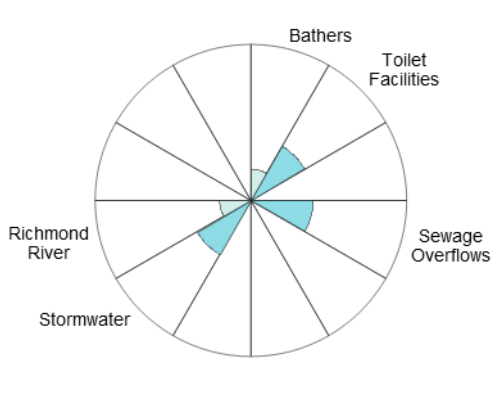
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of significant faecal contamination.

Enterococci levels increased slightly with increasing rainfall, but usually remained below the safe swimming limit across all rainfall categories.

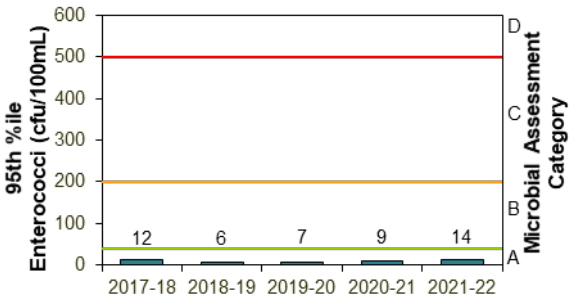
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2017 to Feb 2022	98%	98	Stable

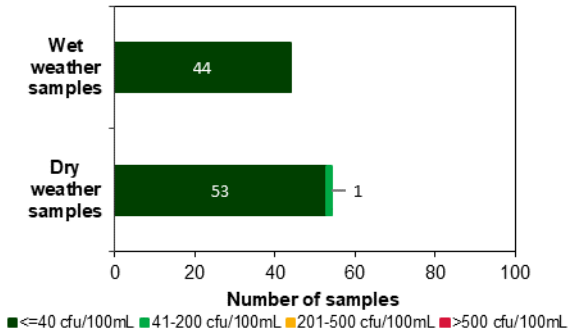
Sanitary inspection: Low



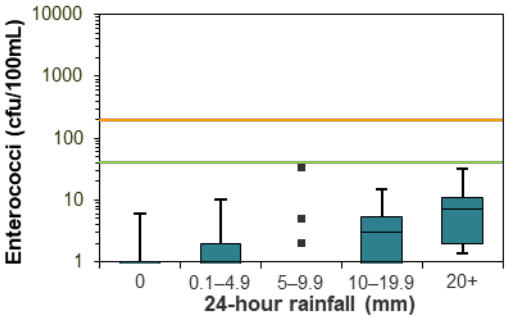
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Lighthouse Beach

Beach grade: VG

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

Lighthouse Beach is situated north of the sea wall at the mouth of the Richmond River and is patrolled during holiday periods.

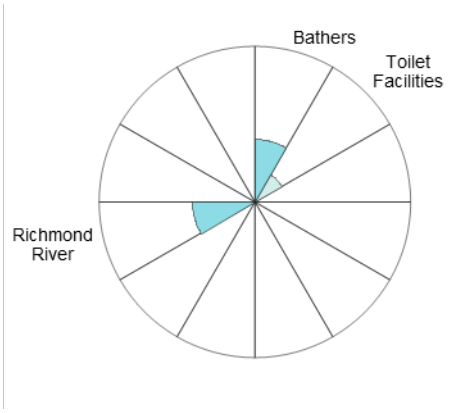
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

Enterococci levels increased slightly with increasing rainfall, but usually remained below the safe swimming limit across all rainfall categories.

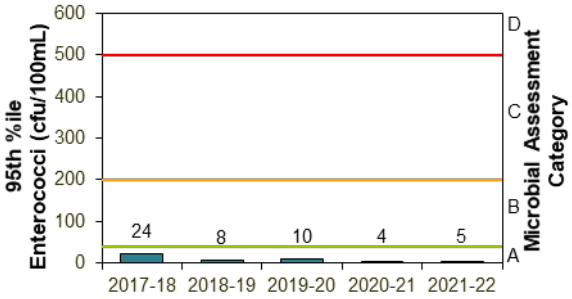
The site was monitored from 2002 until 2003, and since 2009.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Nov 2017 to Feb 2022	98%	98	Stable

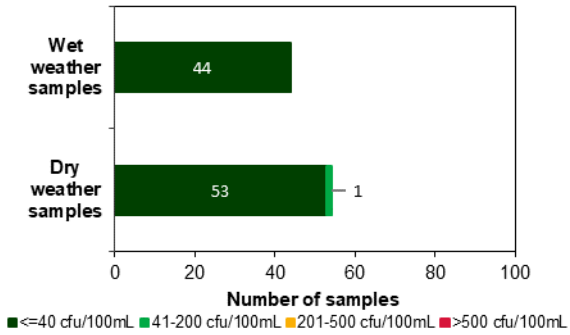
Sanitary inspection: Low



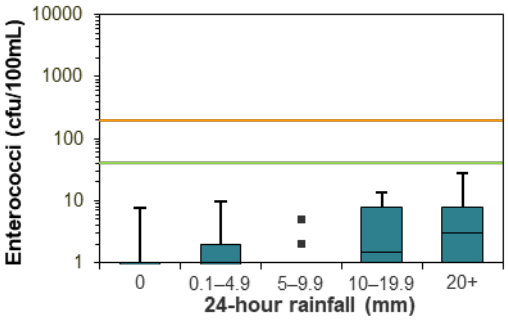
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Shaws Bay North

Beach grade: P

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

Shaws Bay North is located on the northern side of Shaws Bay, an inlet near the mouth of the Richmond River.

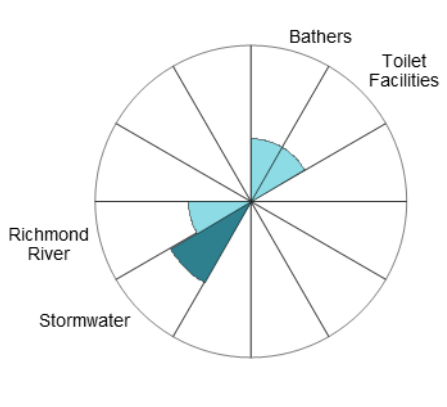
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and often during dry weather conditions, with potential faecal contamination from elsewhere within the lake.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and regularly after 5 mm or more.

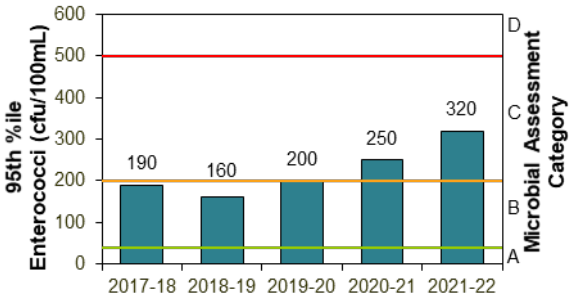
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Nov 2017 to Feb 2022	85%	100	Stable

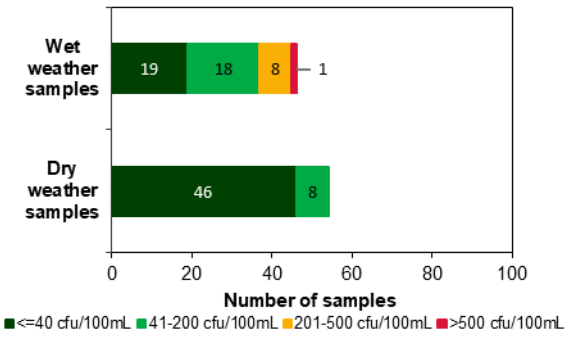
Sanitary inspection: Moderate



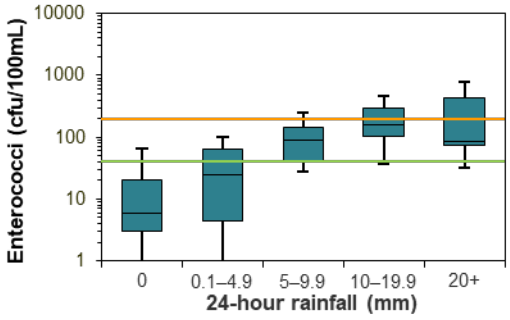
Microbial Assessment Category: C



Dry and wet weather water quality

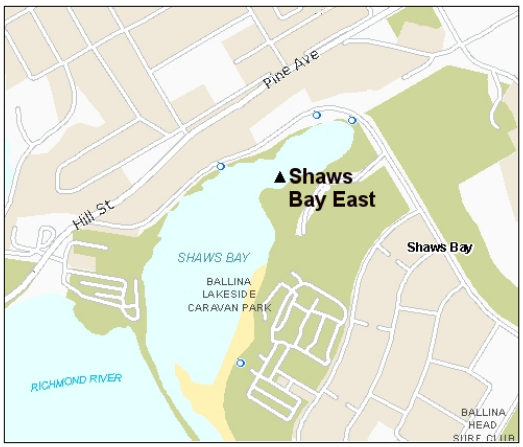


Water quality in response to rainfall



Shaws Bay East

Beach grade: G



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

Shaws Bay East is located on the eastern side of Shaws Bay, an inlet near the mouth of the Richmond River.

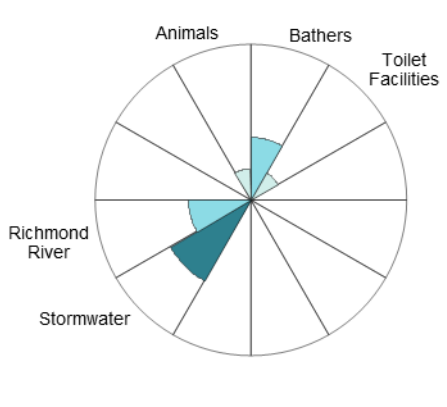
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

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

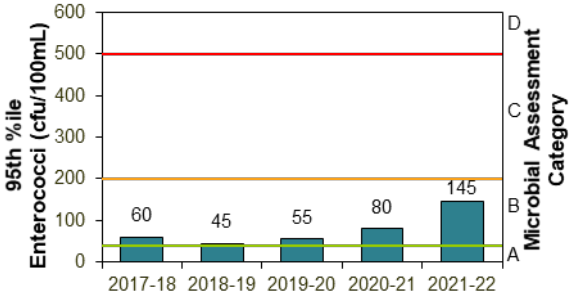
The site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Nov 2017 to Feb 2022	91%	100	Stable

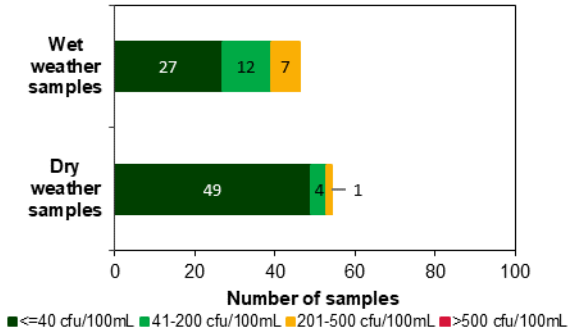
Sanitary inspection: Moderate



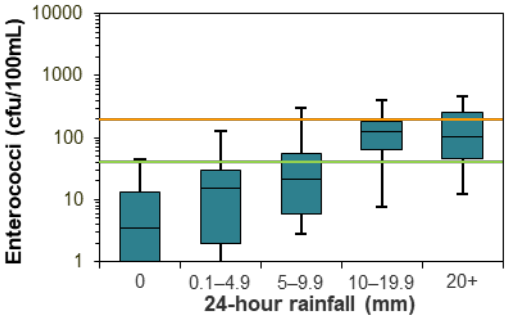
Microbial Assessment Category: B



Dry and wet weather water quality

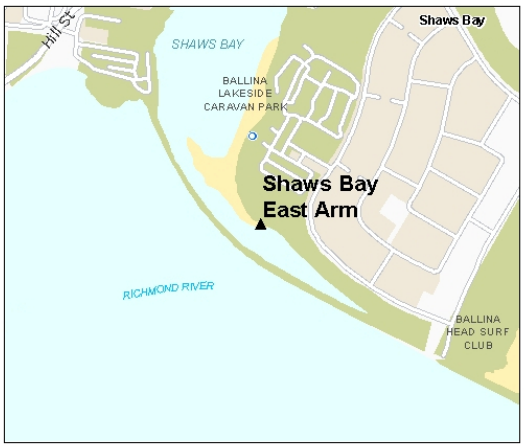


Water quality in response to rainfall



Shaws Bay East Arm

Beach grade: G



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

Shaws Bay East Arm is a sandy beach located on the southern side of Shaws Bay, an inlet near the mouth of the Richmond River.

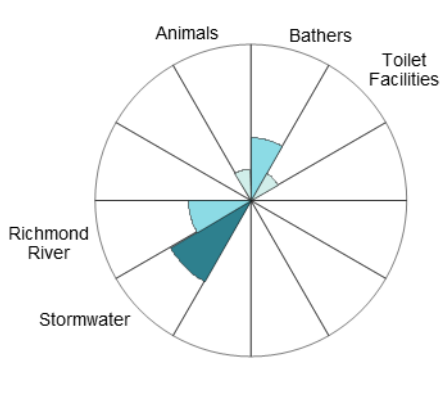
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but can be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

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

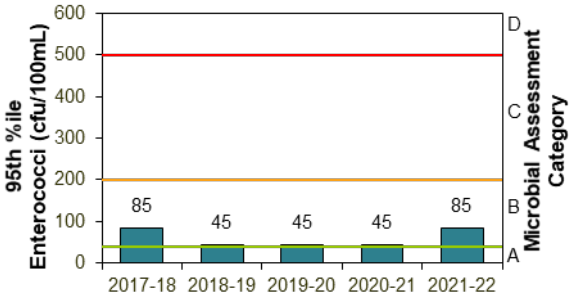
The site has been monitored since 2014.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Jan 2018 to Feb 2022	96%	100	Stable

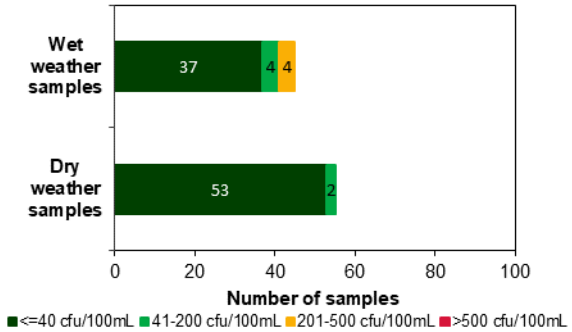
Sanitary inspection: Moderate



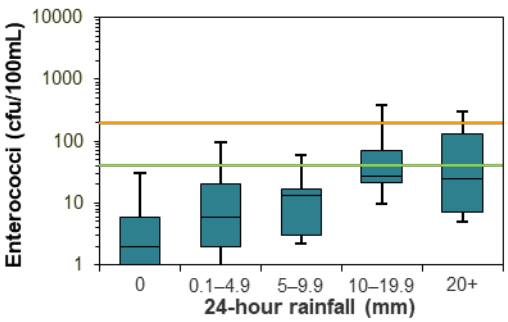
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Shaws Bay East Beach

Beach grade: G

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

Shaws Bay East Beach is a sandy beach located on the eastern side of Shaws Bay, an inlet near the mouth of the Richmond River.

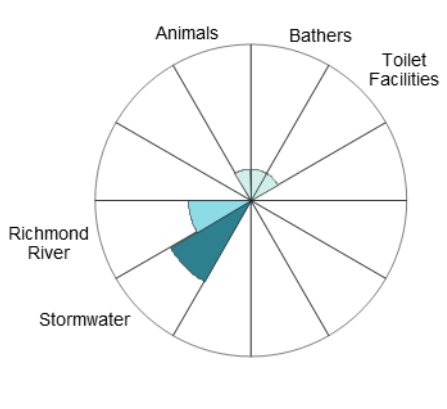
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but can be susceptible to pollution after rain, with several potential sources of faecal contamination including stormwater.

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

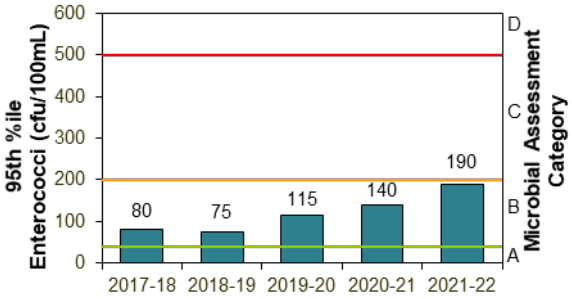
The site has been monitored since 2014.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Nov 2017 to Feb 2022	98%	100	Stable

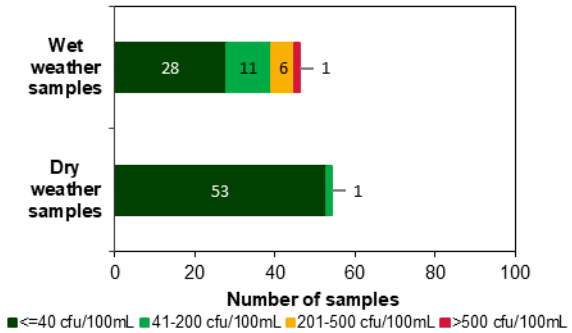
Sanitary inspection: Moderate



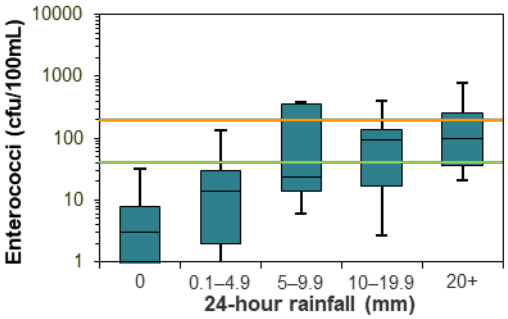
Microbial Assessment Category: B



Dry and wet weather water quality

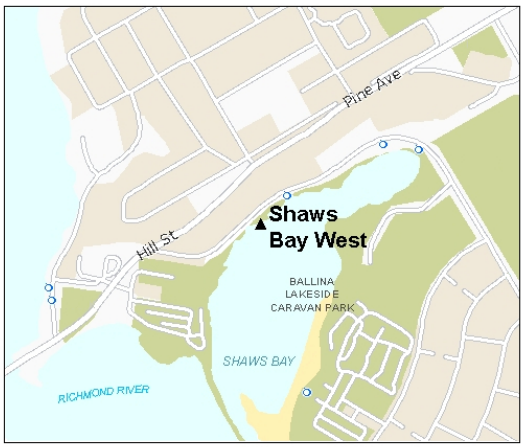


Water quality in response to rainfall



Shaws Bay West

Beach grade: P



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

Shaws Bay West is located on the western side of Shaws Bay, an inlet near the mouth of the Richmond River.

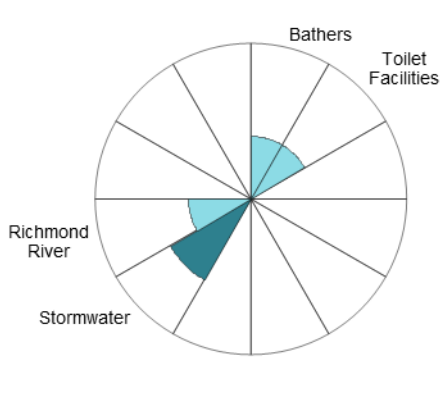
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from stormwater and elsewhere within the lake.

Enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after little or no rain, and regularly after 5 mm or more.

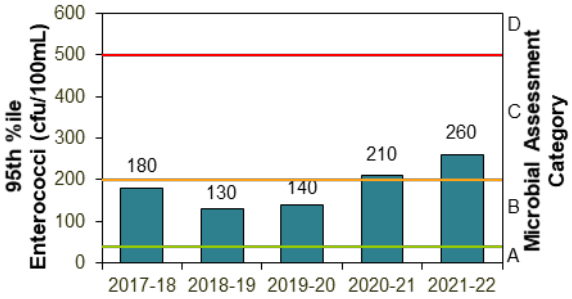
The site was monitored from 2002 until 2009, and since 2012.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Jan 2018 to Feb 2022	85%	100	Stable ◯

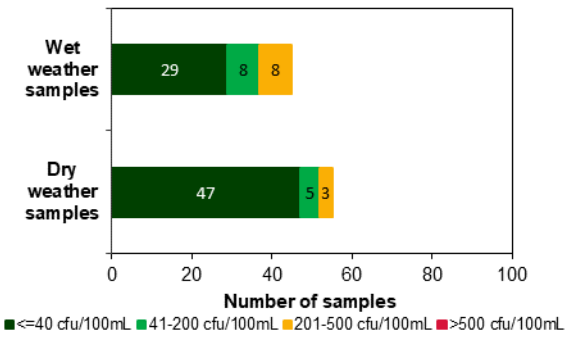
Sanitary inspection: Moderate



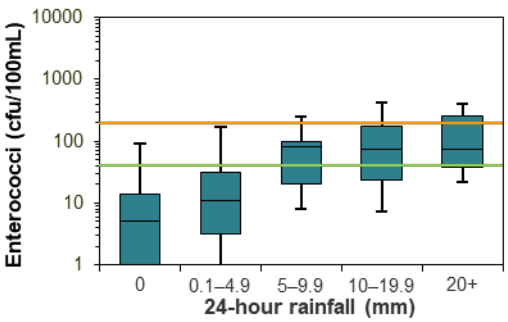
Microbial Assessment Category: C



Dry and wet weather water quality

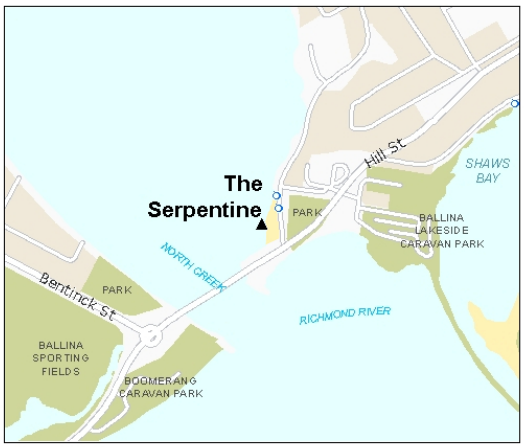


Water quality in response to rainfall



The Serpentine

Beach grade: G



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

The Serpentine is adjacent to Missingham Bridge in North Creek, a tributary of the Richmond River.

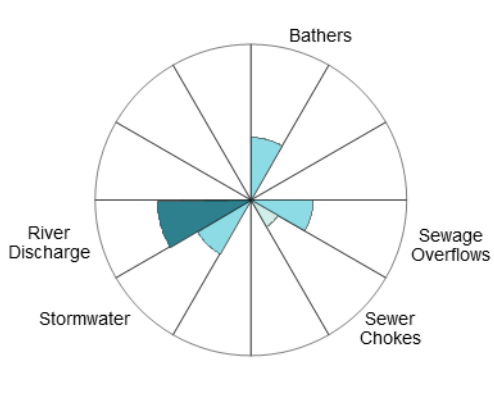
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including upstream river sources.

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

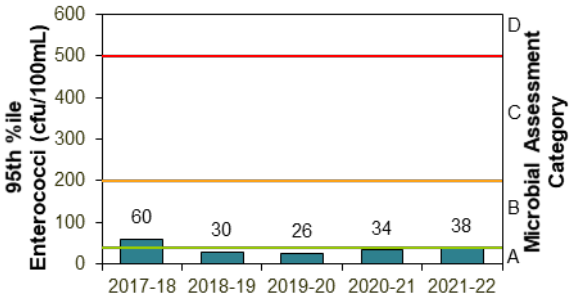
This site has been monitored since 2002.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Nov 2017 to Feb 2022	98%	98	Stable

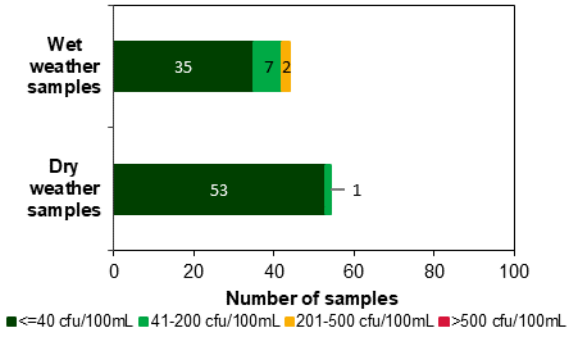
Sanitary inspection: Moderate



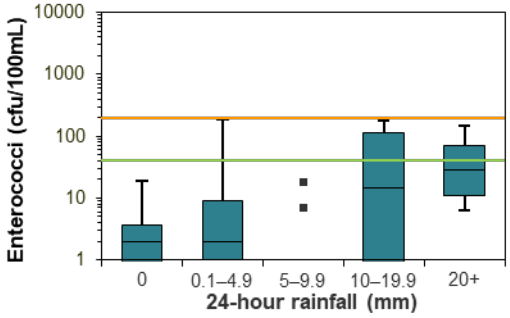
Microbial Assessment Category: A



Dry and wet weather water quality



Water quality in response to rainfall



Richmond Valley Council

100%
ocean beaches graded Good or Very Good

Overall results

Four of the 5 swimming sites were graded as Very Good or Good in 2021–2022. This result is a similar performance to previous years.

Percentage of sites graded as Very Good or Good

	2019-2020	2020-2021	2021-2022	Trend
Ocean beaches (3 sites)	100%	100%	**100%**	—
Estuarine sites (2 sites)	50%	50%	**50%**	—

Five swimming sites were monitored by Richmond Valley Council. All sampling and laboratory analysis was fully funded by the council.
The 3 ocean beaches and Elm Street Bridge North were sampled weekly from October to March. Evans River is sampled weekly throughout the year.

See the section on **How to read this report** on page 36 for an explanation of the graphs, tables and Beach Suitability Grades.

Best beaches

Shark Bay.

This site had excellent water quality and was suitable for swimming almost all of the time.

Site types in Richmond Valley Council

Swimming sites monitored in the Richmond Valley Council region include ocean beaches and estuarine areas in Evans River, with each site type having a different response to rainfall-related impacts.

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

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

Ocean beaches

Beach Suitability Grades for Richmond Valley Council ocean beaches

Shark Bay was graded as Very Good in 2021–2022. Water quality at this beach has been consistently excellent for many years and is suitable for swimming almost all of the time.

Airforce Beach and Main Beach continued to be graded as Good in 2021–2022, a similar result to the previous year. While water quality at these beaches was suitable for swimming most of the time, elevated results were occasionally recorded in dry and wet weather conditions.

Estuarine beaches

Beach Suitability Grades for Richmond Valley Council estuarine beaches

Elm Street Bridge North in the Evans River was graded as Good in 2021–2022, a similar result to previous years. Water quality was mostly suitable for swimming during dry weather, with 85% of samples within the safe swimming limit. Elevated bacterial levels were often recorded following rainfall.

Evans River, located downstream of Elm Street Bridge North, continued to be graded as Poor in 2021–2022, consistent with previous years. Elevated bacterial levels were recorded in dry weather and were regularly elevated during and following moderate to heavy rainfall. Despite this, water quality was often suitable for swimming during dry weather, with 64% of dry weather samples within the safe swimming limit. Discharge from a nearby large stormwater drain is also likely to impact water quality at this site when flowing. Further investigation is required to show the scale and extent of the problem, and the source of microbial contamination.

Management

Richmond Valley Council

In March 2021, a scoping study commenced to transition the Richmond River CZMP to a CMP. In the meantime, Richmond Valley Council, in collaboration with all local governments within the Richmond River catchment, implemented a number of actions from the CZMP, including consideration of governance within the catchment, riparian planting along creeks and the river, and upgrading the water quality monitoring equipment and program. Councils have worked both collaboratively and individually on these projects. Unfortunately, much of the on-ground work completed was decimated by floodwaters in early 2022.

Richmond Valley Council is considering an Evans River Estuary and coastline CMP in the future to outline a long-term strategy for managing this coastline.

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.

The Richmond Valley local government area experienced devastating and unprecedented impacts from significant wet weather and flooding during February and March 2022. The floodwaters destroyed homes and farms, and livestock were lost. Council has been working closely with the flood-affected communities and government agencies to provide support to clean up and rebuild the region. More than 80,000 tonnes of waste was collected after the flood. Council is focused on the recovery of the region and is supporting the affected communities, including the repair and rebuilding of roads and properties, and waste, water and sewer infrastructure.

Richmond Valley Council's Beachwatch monitoring continued after the floods until early April 2022. The ocean beaches were impacted by significant debris and discolouration as the floodwaters continued to discharge from the Evans River for the following weeks.

Prior to the 2022 floods, a number of Marine Estate Management Strategy projects were implemented within the catchment as the Richmond Valley was identified as a pilot project location for farm planning, riparian revegetation and a road sealing program. This work complemented the work undertaken by farmers, recreational fishers and councils. Over time, it is anticipated the implementation of these actions will lead to gradual improved water quality in the Richmond River, and subsequently improvements to the associated recreational swimming sites and beaches.

Richmond Valley Council is responsible for 4 WWTPs, at Casino, Coraki, Evans Head and Rileys Hill. All these plants were impacted by the floodwaters in some way including the entire sewer network. Woodburn and Broadwater were

impacted the most. The plants in Evans Head and Rileys Hill are fitted with UV disinfection. The Evans Head treatment system continues to service the Broadwater area.

Shark Bay

Photo: Richmond Valley Council

Richmond Valley Council runs a comprehensive audit program of 3,800 onsite sewage management systems, inspecting approximately 150 each year to ensure they are operating effectively not polluting the environment or creating a health risk. The recent floodwaters have caused significant damage to many of the onsite sewage management systems, which will be repaired in time. High risk sites with systems close to sensitive receiving environments such as waterways are prioritised. Pre-purchase inspections of these systems are also undertaken upon request from the purchaser/vendor.

Richmond Valley Council has been proactive in the Evans Head area by investigating, educating and in some instances issuing prevention notices regarding poor land-use practices on or near the riverbank, which will help to improve the water quality of the Evans River and its tributaries. While council has targeted the Evans River as a priority, these programs extend throughout the local government area including the Richmond River catchment.

Sampling sites and Beach Suitability Grades in Richmond Valley Council

Airforce Beach

Beach grade: G

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

Airforce Beach is located on a 31 km stretch of beach and is not patrolled by lifeguards.

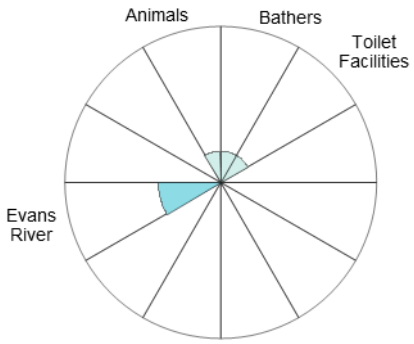
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, from several potential sources of faecal contamination including stormwater.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and after 10 mm or more of rain.

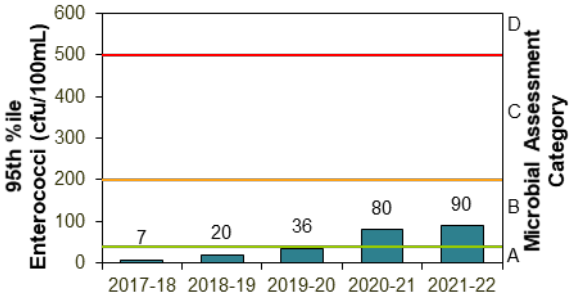
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2018 to Apr 2022	87%	100	Stable

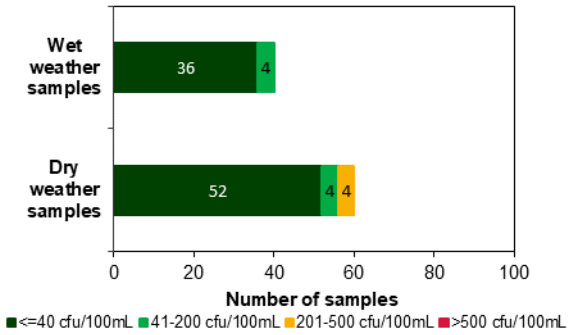
Sanitary inspection: Low



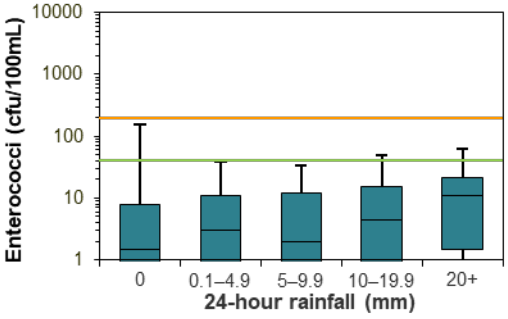
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Main Beach

Beach grade: G

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

Main Beach is located at the southern end of a 31 km stretch of beach and is patrolled during holiday periods.

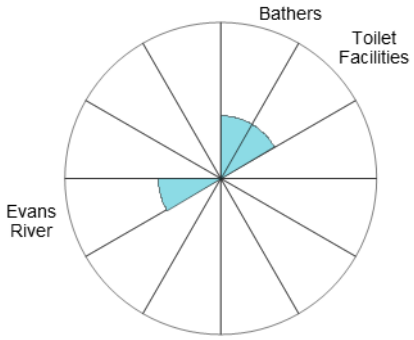
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, from several potential sources of faecal contamination including stormwater.

Enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after no rain, and after 10 mm or more of rain.

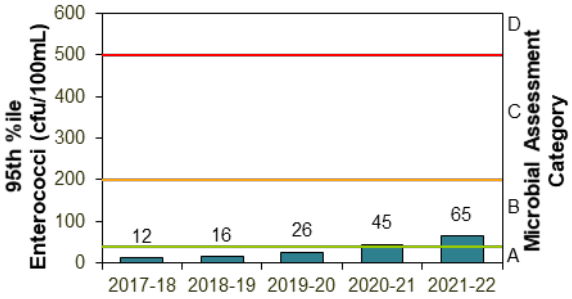
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Oct 2018 to Apr 2022	92%	100	Stable

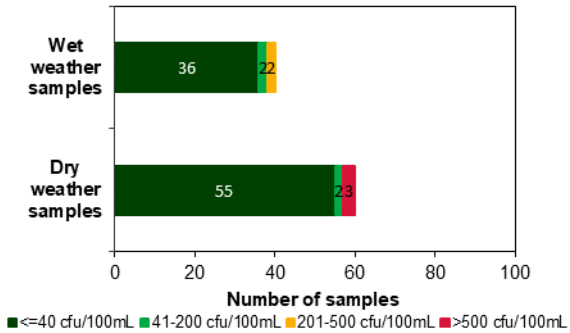
Sanitary inspection: Low



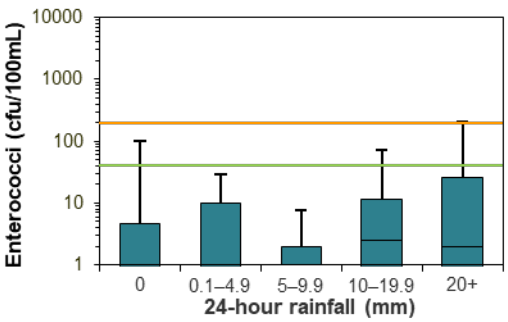
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



Shark Bay

Beach grade: VG

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

Shark Bay is a small beach located between the southern entrance wall to the Evans River and the cliffs below Razorback Lookout and is not patrolled by lifeguards.

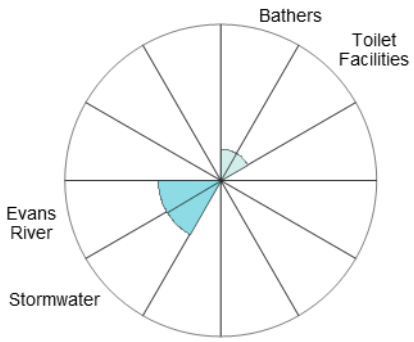
The Beach Suitability Grade of Very Good indicates microbial water quality is considered suitable for swimming almost all of the time, with few potential sources of faecal contamination.

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

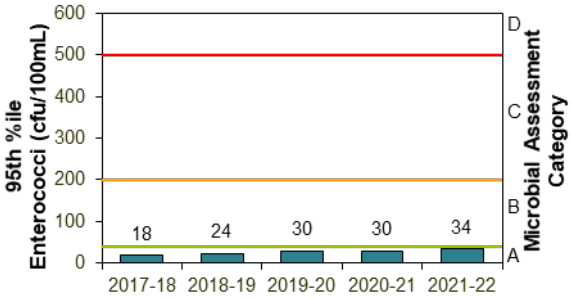
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Ocean beach	Mar 2018 to Apr 2022	95%	100	Stable

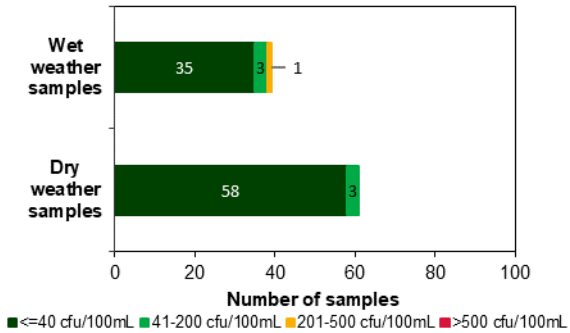
Sanitary inspection: Low



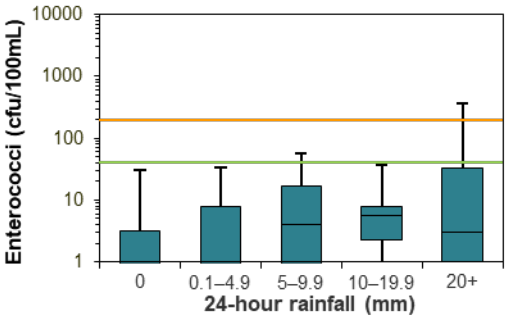
Microbial Assessment Category: A



Dry and wet weather water quality

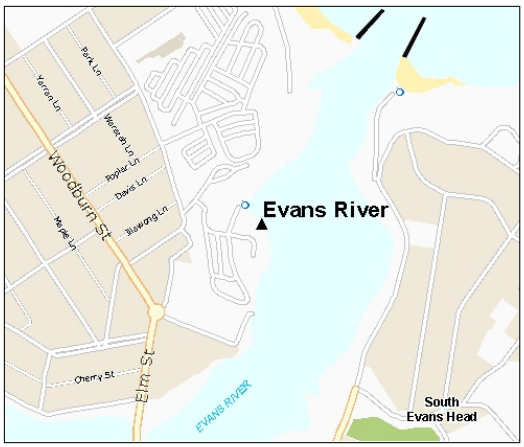


Water quality in response to rainfall



Evans River

Beach grade: P



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

Evans River sampling site is located upstream of the river mouth and near the caravan park.

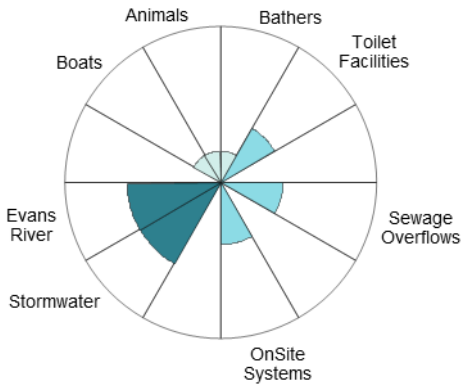
The Beach Suitability Grade of Poor indicates microbial water quality is susceptible to faecal pollution, particularly after rainfall and occasionally during dry weather conditions, with potential faecal contamination from upstream river sources and stormwater.

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

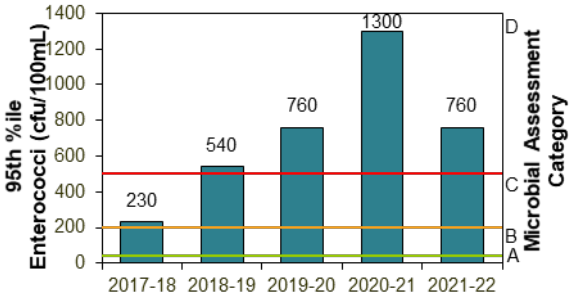
The site has been monitored since 2006.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Apr 2020 to Apr 2022	64%	100	Stable

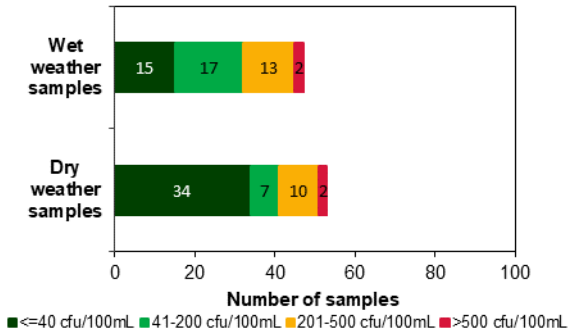
Sanitary inspection: Moderate



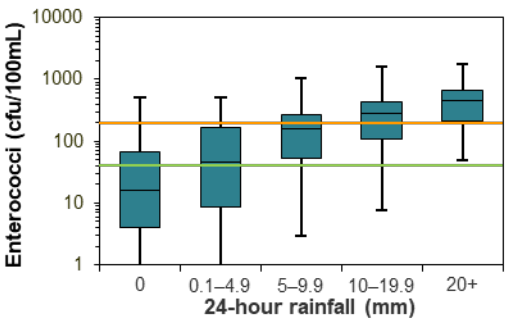
Microbial Assessment Category: D



Dry and wet weather water quality



Water quality in response to rainfall



Elm Street Bridge North (Evans River)

Beach grade: G

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

Elm Street Bridge North (Evans River) is located on the eastern side of Elm Street Bridge in the Evans River.

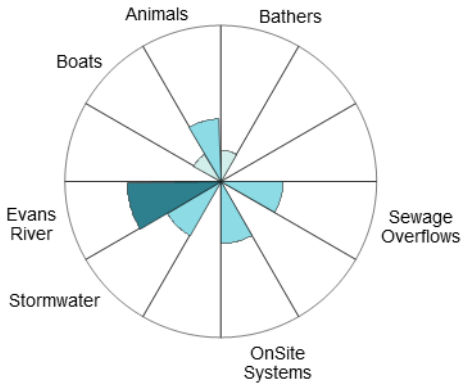
The Beach Suitability Grade of Good indicates microbial water quality is considered suitable for swimming most of the time but may be susceptible to pollution after rain, with several potential sources of faecal contamination including upstream river sources.

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

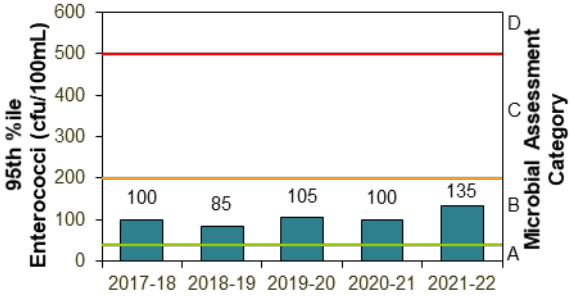
The site has been monitored since 2015.

Site type	Assessment period	Dry weather samples suitable for swimming	Water samples	Beach grade status
Estuarine	Jul 2018 to Apr 2022	85%	100	Stable

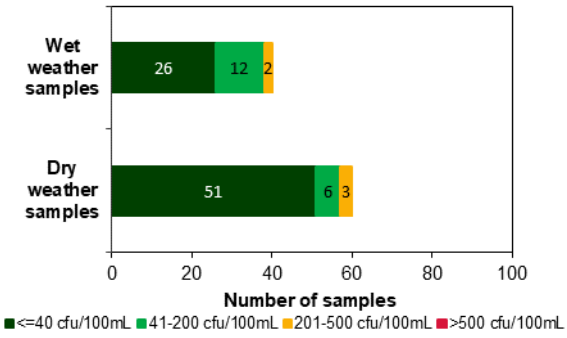
Sanitary inspection: Moderate



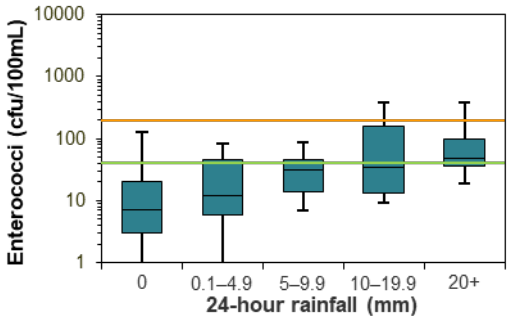
Microbial Assessment Category: B



Dry and wet weather water quality



Water quality in response to rainfall



How to read this report

Beach Suitability Grades

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

VG Very Good

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

G Good

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

F Fair

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

P Poor

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

VP Very Poor

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

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 (NHMRC 2008) were adopted for use in NSW in May 2009. These guidelines have been adopted in all Australian states and territories and are supported by guidance notes developed by the Department of Health Western Australia (WA Department of Health 2007).

Enterococci

The national guidelines advocate the use of enterococci as the single preferred faecal indicator in 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 (Standards Australia 2007).

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

Beach Suitability Grades are determined by using the following matrix:

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

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

Microbial Assessment Category (MAC)

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

Risk of illness associated with Microbial Assessment Categories

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

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

Calculating the MAC

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

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

In recognition of this issue, Dr Richard Lugg (Department of Health, Western Australia) has developed a Microsoft® Excel tool for calculating a modified 95th percentile that takes into account the distribution of data. This tool has been used to calculate the 95th percentile values presented in this report and has been adopted for use by other state governments in Australia.

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

Sanitary Inspection Category (SIC)

More information about the **sanitary inspection** process is available on the DPE 'Sanitary inspection of beaches' webpage.

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

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

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

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

Stormwater drain flow
Photo: Beachwatch/DPE

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

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

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

Explanation of tables

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

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

Stable

Improved

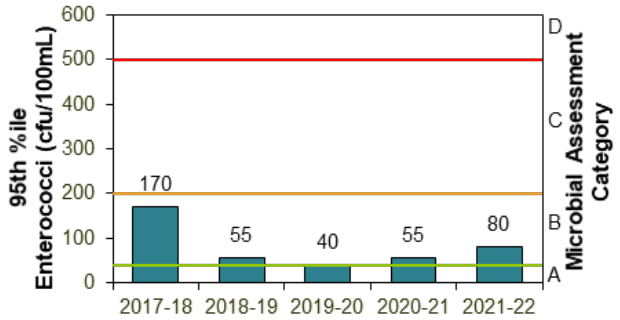
Declined

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

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

Microbial Assessment Category (MAC) chart

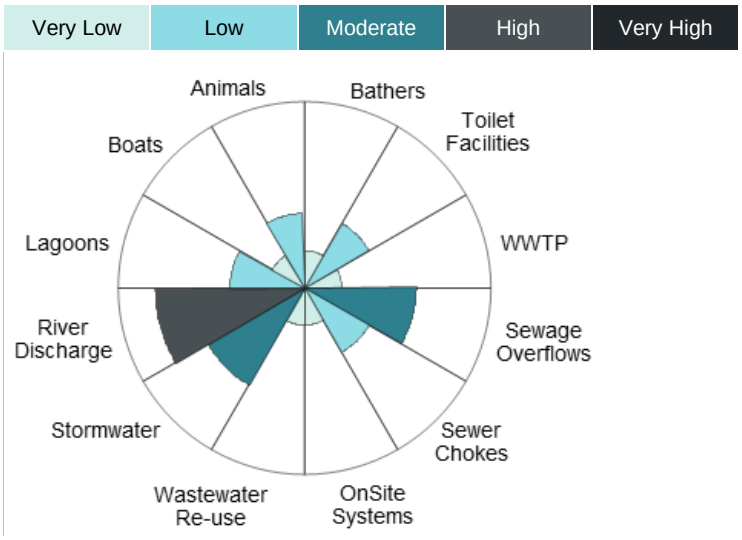
On each beach page, the MACs for the last 5 years are displayed on a simple bar chart. The MAC for the current year is based on enterococci data collected during the assessment period. The bars are labelled with the 95th percentile value for each year and the thresholds dividing the A, B, C and D categories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



Sanitary Inspection Category (SIC) chart

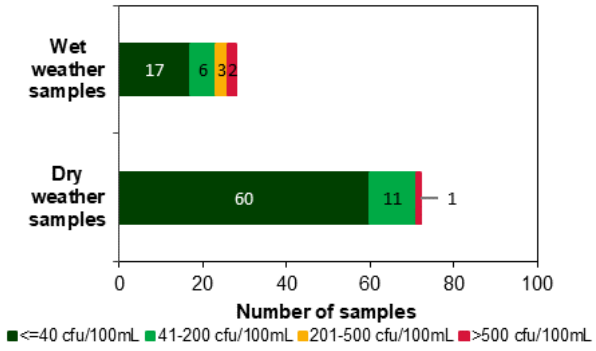
The results of the sanitary inspection for each swimming location are presented in a radar pie chart. The chart shows the likelihood that each identified pollution source will contribute to faecal contamination at a swimming site, as indicated by the size and colour of the segment, ranging from

very low (lightest colour) to very high (darkest colour) as shown below. The sum of these contributions is the overall likelihood, or Sanitary Inspection Category.



Wet and dry weather water quality chart

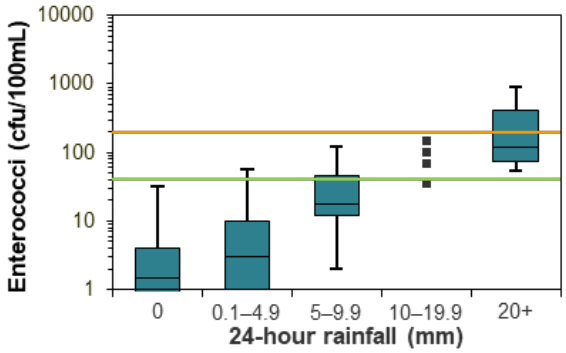
Enterococci levels in wet and dry weather conditions are presented for each swimming location as a bar graph. All data collected during the assessment period is included in the analysis. Dry weather is defined as no rainfall recorded in the previous 24 hours. Each bar is colour coded to show the number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



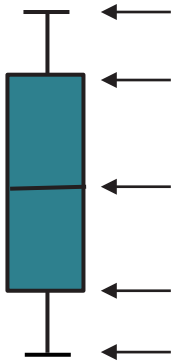
It is expected that swimming sites with lower levels of flushing will show some elevated bacterial results in dry weather samples (no rainfall in the previous 24 hours) due to the longer time needed to recover from a rainfall event. At some estuarine and lake/lagoon swimming locations the impacts of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

Water quality in response to rainfall

Trends in enterococci levels in response to rainfall are shown using a box plot. For reference, enterococci levels of 40 cfu/100 mL and 200 cfu/100 mL are indicated with a green and orange line, respectively. The 40 cfu/100 mL level is referred to as the ‘safe swimming limit’. The enterococci data were obtained from the last 5 years of monitoring. Rainfall data were obtained from rain gauges situated close to the sample site and are 24-hour totals to 9am on the day of sampling. If there are fewer than 5 enterococci data points in a rainfall category, individual data points are presented instead of a box plot. At sites where many results are below the detection limit (1 cfu/100 mL), only the upper portion of the box plots will be visible.



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



95% of the samples lie below the top whisker

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

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

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

5% of the samples lie below the bottom whisker.

Information bars

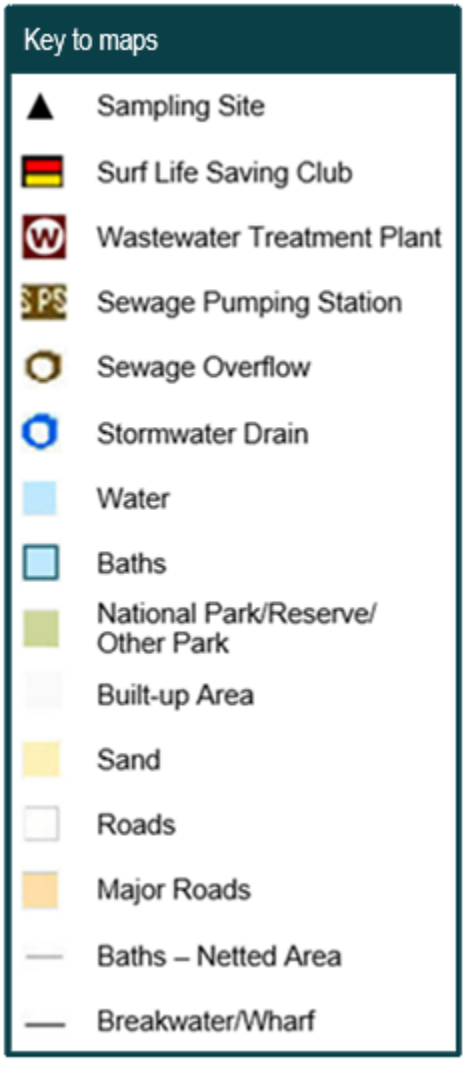
Information bars on each beach page provide a summary of details about the swimming site.

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

Dry weather samples suitable for swimming (**dry weather swimmability**) shows the percentage of water samples with enterococci levels below 40 cfu/100 mL. Dry weather is defined as no rainfall in the previous 24 hours. Swimming sites with lower levels of flushing often have a lower percentage of dry weather samples within the safe swimming limit due to the impacts of rainfall detected up to 3 days after the event.

Explanation of maps

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



References

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

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

More information

- Beachwatch webpage
- Coastal management program progress
- Sanitary inspection of beaches
- Subscribe to environment and heritage newsletters
- WA Government environmental water publications