Sydney Estuarine Beaches region

Waterways and councils

Sydney has a large number of estuarine swimming locations. Many are netted or enclosed for safety, but most are backed by a strip of sandy beach and are therefore referred to collectively as beaches in this report. Results are presented by waterway (Figure 24):

- Pittwater (Pittwater Council)
- Sydney Harbour (Manly, Mosman, North Sydney, Willoughby, Canada Bay, Lane Cove, Leichhardt, Hunters Hill and Woollahra councils)
- Botany Bay and lower Georges River (Botany Bay, Randwick, Rockdale, Hurstville, Kogarah and Sutherland Shire councils)
- Port Hacking (Sutherland Shire Council).

The programs

A total of 55 estuarine beaches are monitored in the Sydney region under the Harbourwatch Program (Table 20).

Monitoring in Sydney Harbour, Botany Bay, the lower Georges River and Port Hacking commenced during the 1994–1995 swimming season, with monitoring in Pittwater commencing in the following year. All sites have been tested for enterococci throughout this period.

Sydney's estuarine beaches are monitored by boat, with samples collected just outside the swimming enclosure or as close to shore as possible if there are no nets.

Samples are collected every sixth day during the swimming season (October to April), with monthly surveillance sampling between May and September. Prior to May 2009, Sydney estuarine beaches were sampled every sixth day throughout the year.

To ensure that the data collected and reported under the Harbourwatch Program are accurate and reliable, quality assurance of sampling, microbial analysis and reporting is undertaken. The findings of the quality assurance program are described in quality assurance section of this report.

Table 20: Monitoring of Sydney Estuarine Beaches region

Waterway	Sampling frequency	Number of sites					
		Ocean beaches	Ocean baths	Estuarine	Lagoon/ lake	Freshwater river	Total
Pittwater	Every 6 days (Oct–Apr). Monthly (May–Sept)	–	–	10	–	–	10
Sydney Harbour	Every 6 days (Oct–Apr). Monthly (May–Sept)	–	–	25	–	–	25
Botany Bay and lower Georges River	Every 6 days (Oct–Apr). Monthly (May–Sept)	–	–	15	–	–	15
Port Hacking	Every 6 days (Oct–Apr). Monthly (May–Sept)	–	–	5	–	–	5

2011–2012 results

Of the 55 estuarine beaches in the Sydney region 36 were graded as Good or Very Good (Tables 21 and 22).

Pittwater

Pittwater was the best-performing waterway in Sydney, with all ten swimming locations graded as Very Good or Good.

The highest-rated swimming locations were Barrenjoey Beach, Elvina Bay and Great Mackerel Beach. These sites were graded as Very Good and had consistently excellent microbial water quality and few potential sources of faecal contamination.

Beaches graded as Good were Paradise Beach Baths, Clareville Beach, Taylors Point Baths, Bayview Baths, North Scotland Island, South Scotland Island and The Basin. These sites had generally very good water quality, but may be susceptible to pollution from a number of potential pollution sources in their catchments.

Sydney Harbour

Sixteen of the 25 swimming locations in Sydney Harbour were graded as Very Good or Good.

The highest-rated swimming site was Nielsen Park. This site was graded as Very Good, and had consistently excellent microbial water quality and few potential sources of faecal contamination.

The 15 Sydney Harbour beaches graded as Good were Watsons Bay, Parsley Bay, Rose Bay Beach, Redleaf Pool, Dawn Fraser Pool, Woodford Bay, Greenwich Baths, Clifton Gardens, Balmoral Baths, Edwards Beach, Chinamans Beach, Forty Baskets Pool, Fairlight Beach, Manly Cove and Little Manly Cove. Microbial water quality is generally good at these sites, but there are a number of potential pollution sources in their catchments which could cause contamination.

Three swimming locations were graded as Fair: Cabarita Beach, Gurney Crescent Baths and Clontarf Pool. These sites are generally suitable for swimming during dry weather conditions, but owing to the presence of significant sources of microbial contamination, they are susceptible to pollution following rainfall.

Five swimming locations were graded as Poor: Woolwich Baths and Tambourine Bay in the lower Lane Cove River, Chiswick Baths in the lower Parramatta River, Northbridge Baths in the upper reaches of Middle Harbour and Hayes Street Beach in Port Jackson. These sites are very susceptible to microbial contamination, and water quality is often unsuitable for swimming following light rainfall.

Davidson Reserve was graded as Very Poor. Although microbial water quality was often suitable for swimming during dry weather conditions, the site is very susceptible to faecal contamination from sewage overflows and river discharge (poor-quality water flowing down from upstream sources of pollution), especially after rainfall.

Botany Bay and lower Georges River

Eight of the 15 swimming locations in Botany Bay and lower Georges River were graded as Good. No swimming locations were graded as Very Good.

Beaches graded as Good were Silver Beach, Jew Fish Bay Baths, Sandringham Baths, Dolls Point Baths, Monterey Baths, Brighton-Le-Sands Baths, Yarra Bay and Congwong Bay. These sites had generally good water quality but may be susceptible to pollution from a number of potential sources of faecal contamination.

No swimming locations were graded as Fair.

Como Baths, Oatley Bay Baths, Carss Point Baths, Ramsgate Baths, Kyeemagh Baths and Frenchmans Bay were graded as Poor, indicating that water quality was often affected by microbial contamination. Enterococci levels may be elevated following light rainfall.

Foreshores Beach was graded as Very Poor. Enterococci levels are frequently unsuitable for swimming and the site is affected by sewage overflows into Mill Pond Creek, which discharges adjacent to the site.

Port Hacking

Two of the five swimming locations in Port Hacking were graded as Very Good or Good. The highest-graded site was Jibbon Beach (Very Good), which had consistently excellent water quality and few potential sources of microbial contamination.

Lilli Pilli Baths was graded as Good. It had generally good water quality but may be susceptible to pollution from a number of potential sources of contamination.

Gunnamatta Bay Baths was graded as Fair. Although the site had generally good water quality during dry weather conditions, elevated bacterial levels were frequently measured following rainfall and there are several potential sources of faecal contamination in the catchment.

Gymea Bay Baths and Horderns Beach were graded as Poor. These sites are susceptible to

microbial contamination and water quality is often unsuitable for swimming following light rainfall because of stormwater impacts.

Table 21: Beach Suitability Grades in Pittwater and Sydney Harbour, 2011–2012

	Site	Site type	Sanitary Inspection Category	Microbial Assessment Category	Beach Suitability Grade
Pittwater	Barrenjoey Beach	Estuarine	Low	Category A	Very Good
	Paradise Beach Baths	Estuarine	Low	Category B	Good
	Clareville Beach	Estuarine	Moderate	Category B	Good
	Taylors Point Baths	Estuarine	Moderate	Category B	Good
	Bayview Baths	Estuarine	Moderate	Category B	Good
	Elvina Bay	Estuarine	Low	Category A	Very Good
	North Scotland Island	Estuarine	Moderate	Category B	Good
	South Scotland Island	Estuarine	Moderate	Category A	Good
	The Basin	Estuarine	Moderate	Category A	Good
	Great Mackerel Beach	Estuarine	Low	Category A	Very Good
Sydney Harbour	Watsons Bay	Estuarine	Moderate	Category A	Good
	Parsley Bay	Estuarine	Moderate	Category B	Good
	Nielsen Park	Estuarine	Low	Category A	Very Good
	Rose Bay Beach	Estuarine	Moderate	Category B	Good
	Redleaf Pool	Estuarine	Moderate	Category B	Good
	Dawn Fraser Pool	Estuarine	Moderate	Category B	Good
	Chiswick Baths	Estuarine	Moderate	Category C	Poor
	Cabarita Beach	Estuarine	High	Category B	Fair
	Woolwich Baths	Estuarine	High	Category C	Poor
	Tambourine Bay	Estuarine	High	Category C	Poor
	Woodford Bay	Estuarine	Moderate	Category B	Good
	Greenwich Baths	Estuarine	Moderate	Category B	Good
	Hayes St Beach	Estuarine	Moderate	Category C	Poor
	Clifton Gardens	Estuarine	Moderate	Category B	Good
	Balmoral Baths	Estuarine	Moderate	Category B	Good
	Edwards Beach	Estuarine	Moderate	Category B	Good
	Chinamans Beach	Estuarine	Moderate	Category B	Good
	Northbridge Baths	Estuarine	High	Category C	Poor
	Davidson Reserve	Estuarine	High	Category D	Very Poor
	Gurney Crescent Baths	Estuarine	High	Category B	Fair
	Clontarf Pool	Estuarine	High	Category B	Fair
	Forty Baskets Pool	Estuarine	Moderate	Category B	Good
	Fairlight Beach	Estuarine	Moderate	Category B	Good
	Manly Cove	Estuarine	Moderate	Category A	Good
	Little Manly Cove	Estuarine	Moderate	Category B	Good

Table 22: Beach Suitability Grades in Botany Bay, lower Georges River and Port Hacking, 2011–2012

	Site	Site type	Sanitary Inspection Category	Microbial Assessment Category	Beach Suitability Grade
Botany Bay and lower Georges River	Silver Beach	Estuarine	Moderate	Category B	Good
	Como Baths	Estuarine	Moderate	Category C	Poor
	Jew Fish Bay Baths	Estuarine	Moderate	Category B	Good
	Oatley Bay Baths	Estuarine	Moderate	Category C	Poor
	Carss Point Baths	Estuarine	High	Category C	Poor
	Sandringham Baths	Estuarine	Moderate	Category B	Good
	Dolls Point Baths	Estuarine	Moderate	Category B	Good
	Ramsgate Baths	Estuarine	Moderate	Category C	Poor
	Monterey Baths	Estuarine	Moderate	Category B	Good
	Brighton-Le-Sands Baths	Estuarine	Moderate	Category B	Good
	Kyeemagh Baths	Estuarine	High	Category C	Poor
	Foreshores Beach	Estuarine	High	Category D	Very Poor
	Yarra Bay	Estuarine	Moderate	Category B	Good
	Frenchmans Bay	Estuarine	Moderate	Category C	Poor
	Congwong Bay	Estuarine	Low	Category B	Good
Port Hacking	Jibbon Beach	Estuarine	Low	Category A	Very Good
	Horderns Beach	Estuarine	Moderate	Category C	Poor
	Gymea Bay Baths	Estuarine	High	Category C	Poor
	Lilli Pilli Baths	Estuarine	Moderate	Category B	Good
	Gunnamatta Bay Baths	Estuarine	High	Category B	Fair

Pittwater

Figure 25: Sampling locations and Beach Suitability Grades in Pittwater

Overview of the area

Description

Pittwater is located 40 kilometres north of Sydney, near the mouth of the Hawkesbury River. The waterway is approximately 10 kilometres long and covers 17.5 square kilometres. Due to the calm, sheltered waters, Pittwater is popular for boating and has the greatest concentration of boats in NSW.

The Barrenjoey Head Aquatic Reserve extends around the headland from Shark Point in Pittwater to the northern end of Palm Beach.

Pittwater's catchment covers approximately 50 square kilometres, with residential development along the eastern and southern shores. Much of the western shore is located in the Ku-Ring-Gai Chase National Park. Scotland Island also contains residential development.

Rainfall

There were several significant rain and flooding events in the Sydney region during 2011–2012 (BOM 2012):

- High rainfall levels in November resulted in more than twice the average total rainfall recorded for the month.
- Storms during January resulted in particularly heavy rain on the Northern Sydney Beaches with 30-minute rainfall totals as high as 36 mm in Avalon.
- Rainfall was heaviest during February, which was the wettest since 2001, with more than double the monthly average rainfall received. During this time localised storms with heavy rainfall caused flooding of the Hawkesbury River.
- Wet weather continued during March and April 2012, with an extremely wet period recorded in the middle of April when more than 212 mm of rain fell over three days.

Assessment

Microbial water quality

Since May 2009, enterococci samples at nine swimming locations in Pittwater have been collected by boat every sixth day during the swimming season and monthly between May and September, providing approximately 40 samples each year. This number is well above NHMRC's recommended 20 samples per year. Prior to May 2009, samples were collected by boat approximately every sixth day throughout the year.

The Microbial Assessment Category for 2011–2012 was calculated from the most recent 100 data points up until the end of the 2011–2012 swimming season (January 2010 until April 2012) for all sites except Taylors Point Baths. Taylors Point Baths has been monitored since February 2010 and as there are fewer than 100 data points currently available for analysis, the Microbial Assessment Category for 2011–2012 is regarded as provisional. As more data become available in following years, the beach grade will become final and response to rainfall trend more defined.

Sanitary inspections

Sanitary inspections have been completed for all swimming locations in Pittwater in consultation with Pittwater Council. The sanitary inspections will be reviewed during 2012–2013.

Beach Suitability Grades

All ten swimming locations in Pittwater were graded as Good or Very Good during the 2011–2012 swimming season (Figure 25).

Very Good

Three swimming locations were graded as Very Good: Barrenjoey Beach, Elvina Bay and Great Mackerel Beach. These sites all had excellent water quality (Microbial Assessment Category A) and few potential sources of microbial contamination (Sanitary Inspection Category of Low).

Good

Seven swimming locations were graded as Good: Paradise Beach Baths, Clareville Beach, Taylors Point Baths, Bayview Baths, North Scotland Island, South Scotland Island and The Basin.

These sites had mostly good water quality (Microbial Assessment Category A or B), but had several, or more significant, potential sources of microbial contamination, such as urban stormwater runoff, on-site systems or river discharge. These pollution sources may affect water quality following heavy rainfall.

Fair

No beaches were classified as Fair.

Poor

No beaches were classified as Poor.

Very Poor

No beaches were classified as Very Poor.

Management

Wastewater management

The vast majority of households in the Pittwater catchment are connected to Sydney Water's reticulated sewerage system, which transports sewage for treatment at the Warriewood Wastewater Treatment Plant (WWTP).

Warriewood WWTP discharges approximately 17 million litres of secondary-treated and disinfected effluent each day from a shoreline outfall at Turimetta Head (EPA NSW 2012).

Scotland Island and small areas of urban development along the western shore of Pittwater are not connected to reticulated sewerage and rely on on-site sewage management systems for sewage treatment and/or disposal. Pittwater Council inspects these systems to ensure they are operating correctly and to identify risks to human health or the environment.

Sydney Water is inspecting, cleaning and repairing those sewers that have a high likelihood of discharging sewage to waterways if they become blocked. When significant tree root intrusion to the public sewer from the private sewer is identified, property owners are requested to remedy the problem.

Sydney Water also conducts dry weather monitoring of main stormwater drains to identify sewer leaks. Leaks from the public sewer are repaired by Sydney Water and private sewer leaks are referred to the local council.

Sewage pump-out facilities for boats are provided at Quays Marina, Bayview (NSW Maritime 2012).

Stormwater management

Pittwater Council's Stormwater Management Plan, Estuary Management Plan and Scotland Island Stormwater Drainage Management Plan address a range of water quality issues and include actions to identify pollution sources, reduce the impact of stormwater pollution, and raise community awareness through education.

Pittwater Council adopted the Pittwater Estuary Management Plan, which is a coastal zone management plan for the Pittwater estuary, in December 2010. The plan recommends priority actions to improve water quality and reduce stormwater pollution in the estuary and its catchment. Targeted water pollution control measures have been included and implementation of these actions is scheduled to commence in 2012.

Pittwater Council's Stormwater Management Service Charge helped fund investigations and activities identified in the Stormwater Management Plan. These include various stormwater harvesting schemes and the construction and maintenance of stormwater quality improvement devices throughout the Pittwater area. Currently there are 47 gross pollutant traps preventing around 110 tonnes of sediment and floating debris from entering the waterways each year.

Barrenjoey Beach

Beach Suitability Grade: **Very Good**

See page 21 for key to map

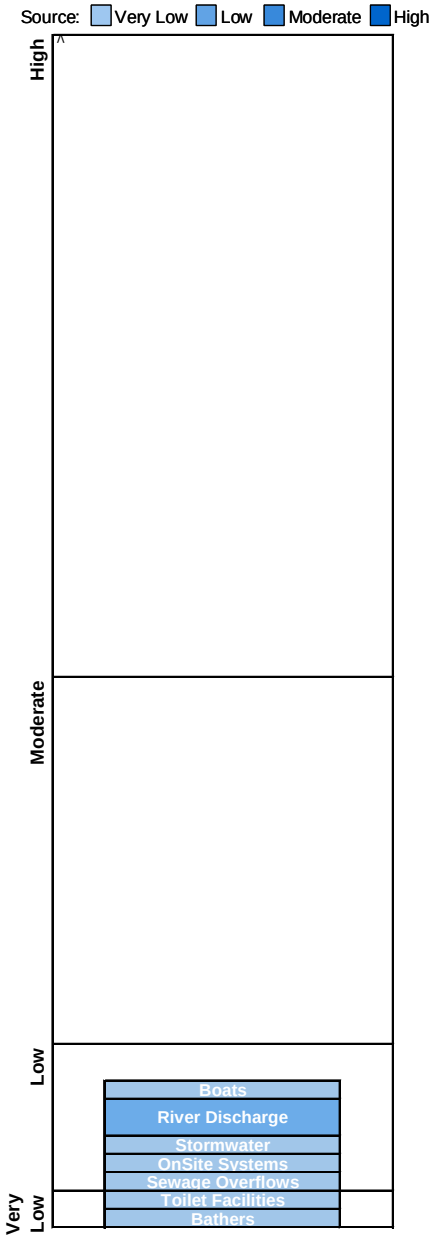
Barrenjoey Beach is approximately 1.5 kilometres long and located on the north-eastern foreshore of Pittwater. The beach is backed by Palm Beach Reserve.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm of rainfall or more.

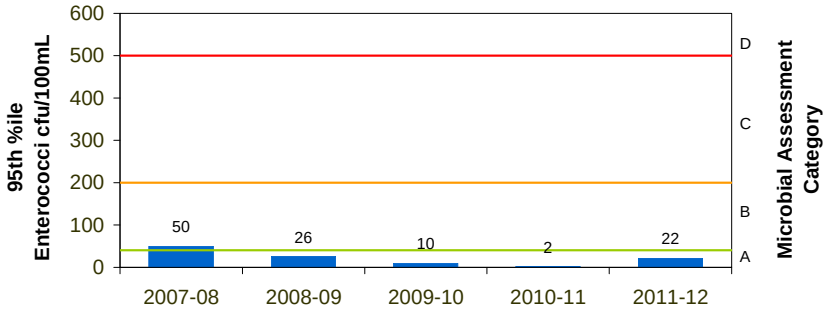
The site has been monitored since 1996. Microbial water quality improved in 2000 when the toilet facilities at the beach were connected to the reticulated sewerage system. Since then, microbial water quality has been consistently high.

Sanitary Inspection: **Low**



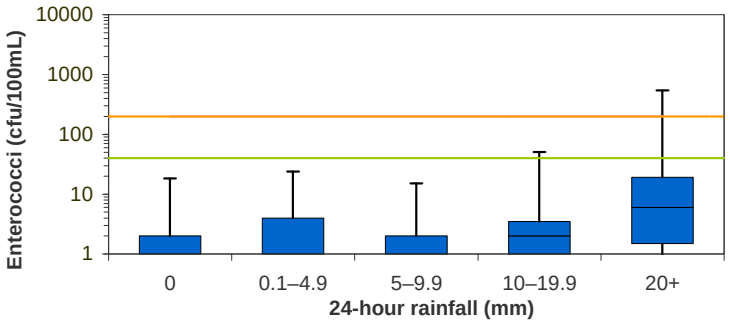
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

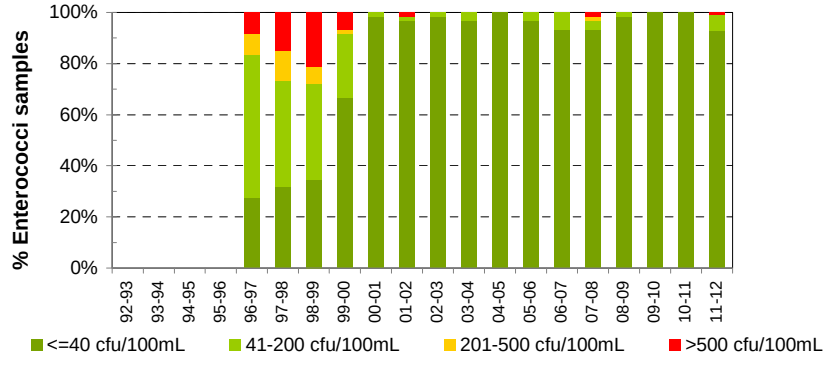


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Paradise Beach Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

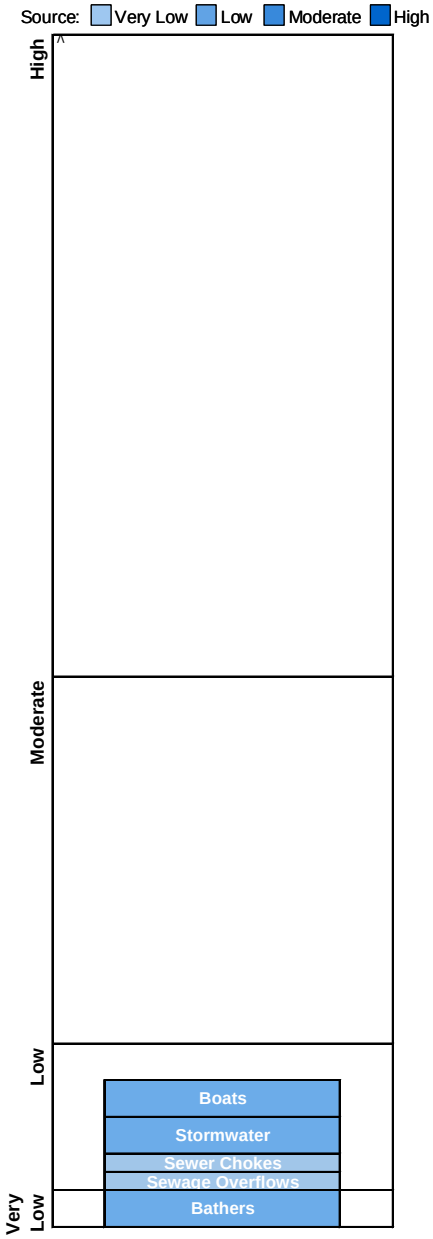
Paradise Beach Baths are a 30 by 20 metre netted swimming enclosure located on the eastern foreshore of Pittwater, backed by a narrow sandy beach and a small park area.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 20 mm of rainfall or more.

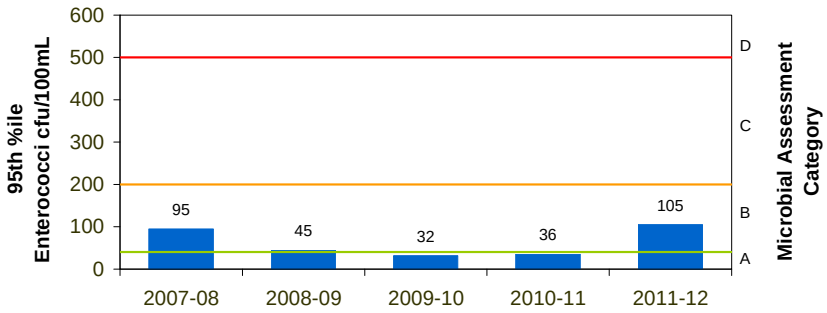
The site has been monitored since 1996. Microbial water quality improved slightly in 2000–2001 when much of the catchment was connected to reticulated sewerage. Since then, variation in microbial water quality among years has been the result of variations in rainfall patterns.

Sanitary Inspection: **Low**



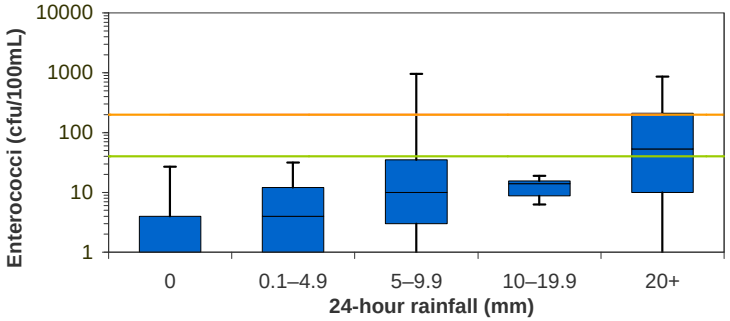
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

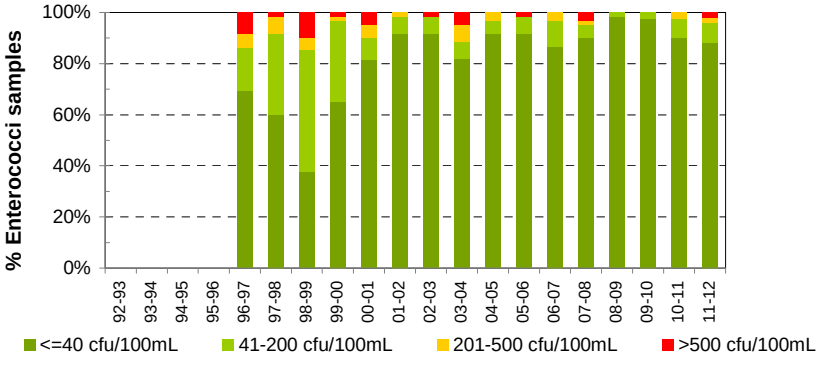


Response to rainfall

Rainfall from Avalon rain gauge

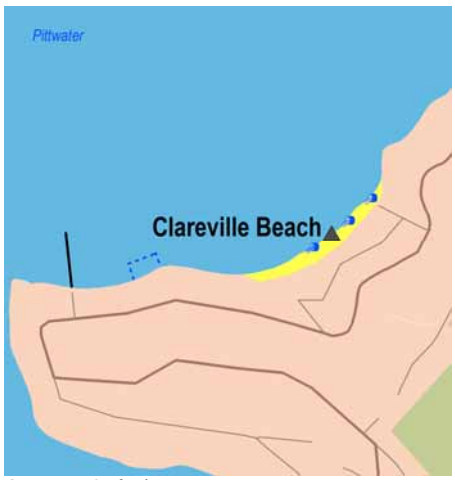


Trends in enterococci data through time



Clareville Beach

Beach Suitability Grade: **Good**



See page 21 for key to map

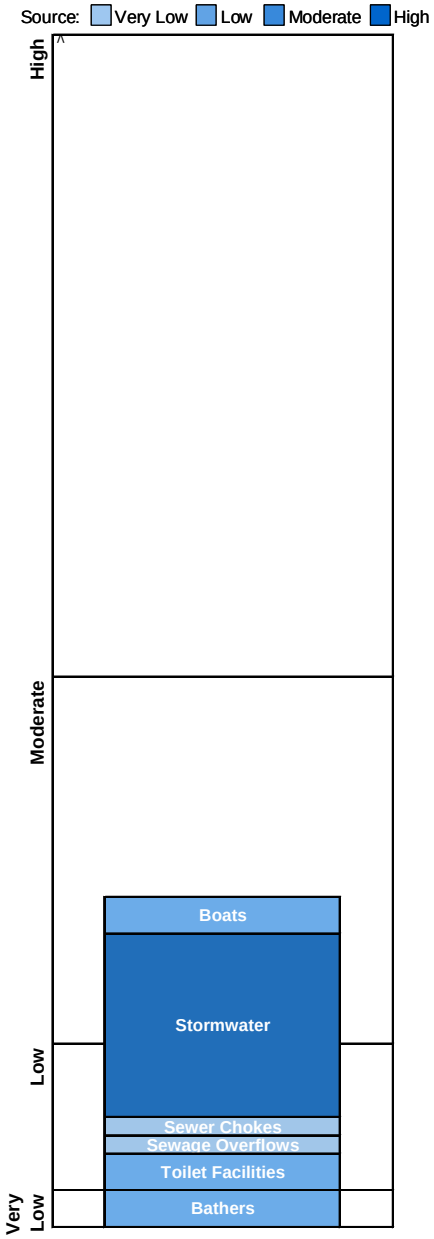
Clareville Beach is a narrow 250 metre long beach located on the eastern foreshore of Pittwater. A grassy park area backs the beach, with picnic facilities at the northern end.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 20 mm of rainfall or more.

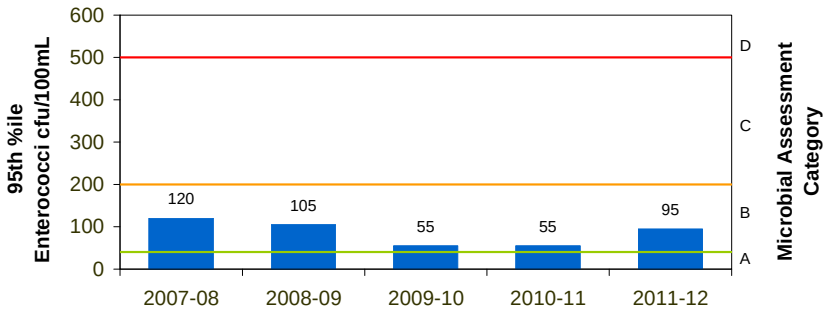
The site has been monitored since 1995. Microbial water quality improved in 2000–2001 when much of the catchment was connected to reticulated sewerage. Since then, variation in microbial water quality among years has been the result of variations in rainfall patterns.

Sanitary Inspection: **Moderate**



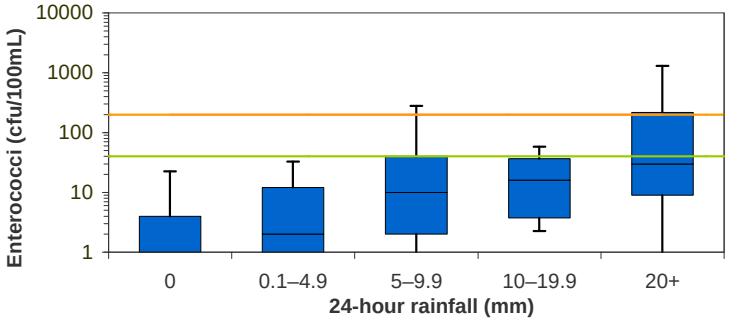
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

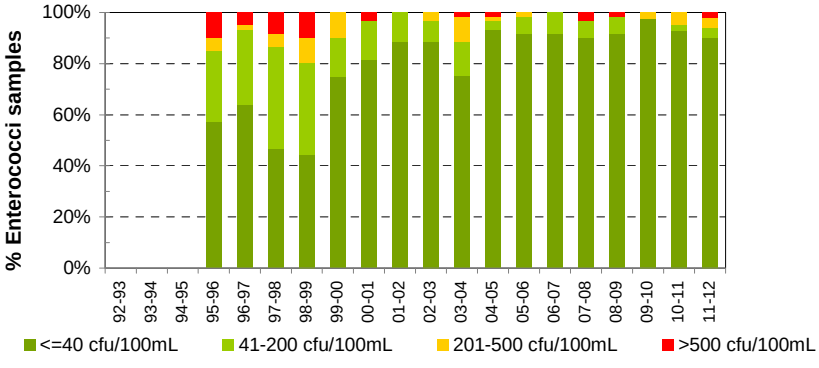


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Taylors Point Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

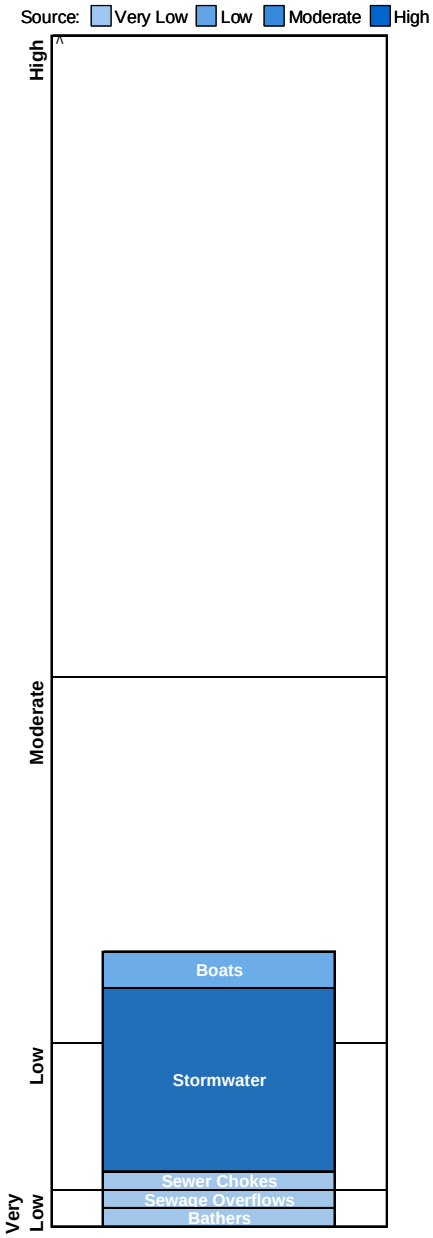
Taylors Point Baths are a 15 by 20 metre netted swimming enclosure located on the eastern foreshore of Pittwater. The baths are backed by a narrow beach with a small grassed area.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 5 mm of rainfall or more.

The site has been monitored since 2010 and water quality has generally been of a high standard.

Sanitary Inspection: **Moderate**



Microbial Assessment: **B**

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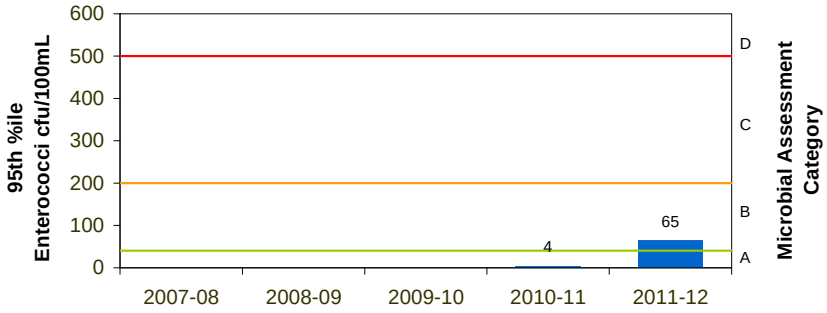
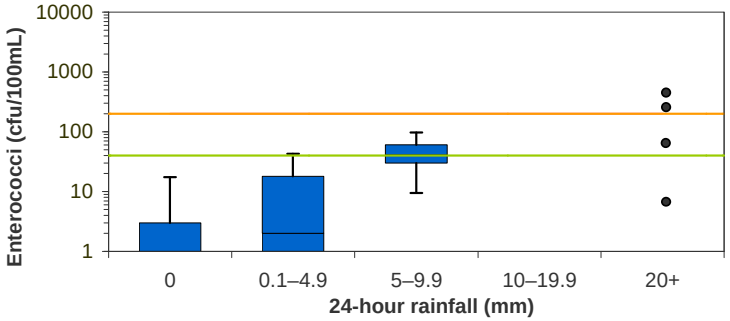
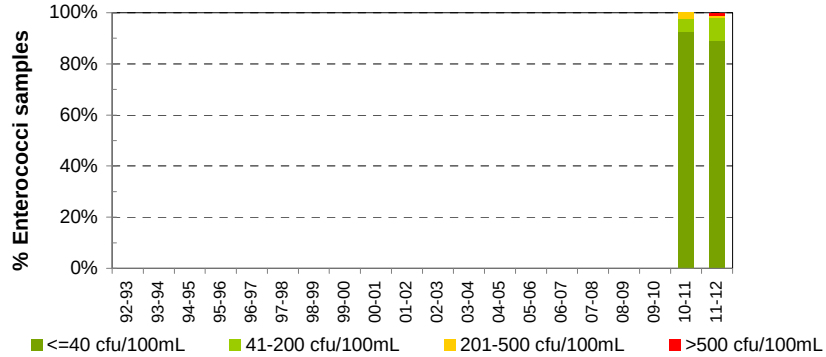


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Bayview Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

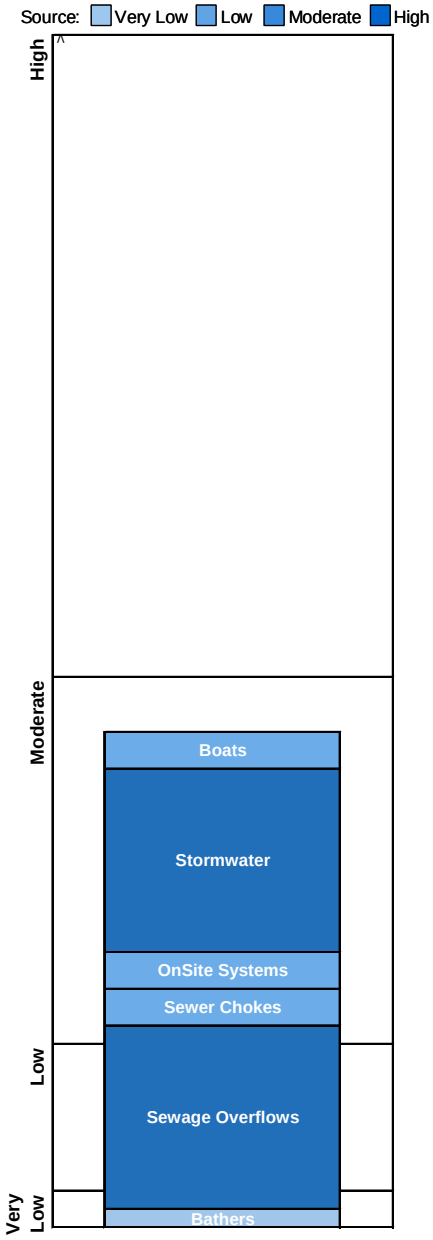
Bayview Baths are a 20 by 40 metre netted swimming enclosure located on the southern foreshore of Pittwater. The baths are backed by a narrow beach with small park area. The baths are considerably silted up.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

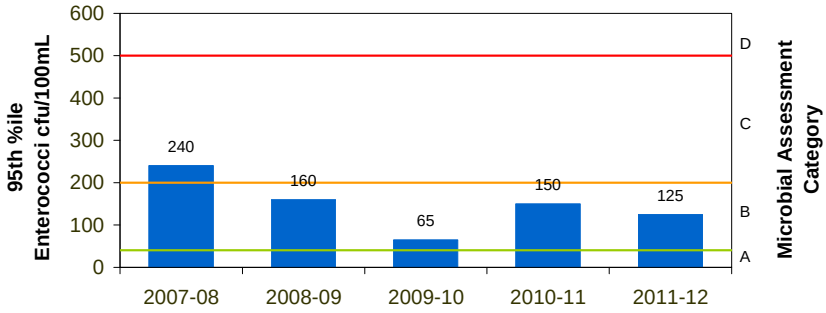
The site has been monitored since 1995. Microbial water quality improved in 2000–2001 when much of the catchment was connected to reticulated sewerage.

Sanitary Inspection: **Moderate**



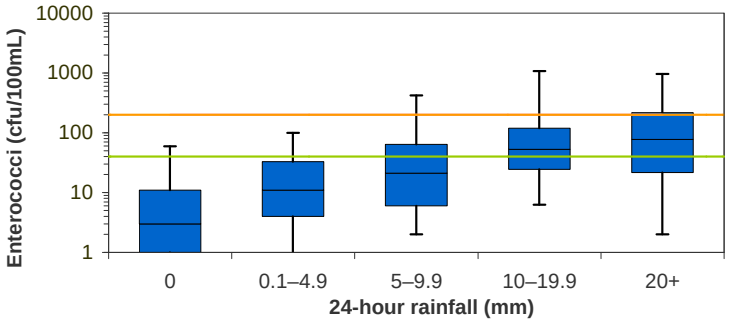
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

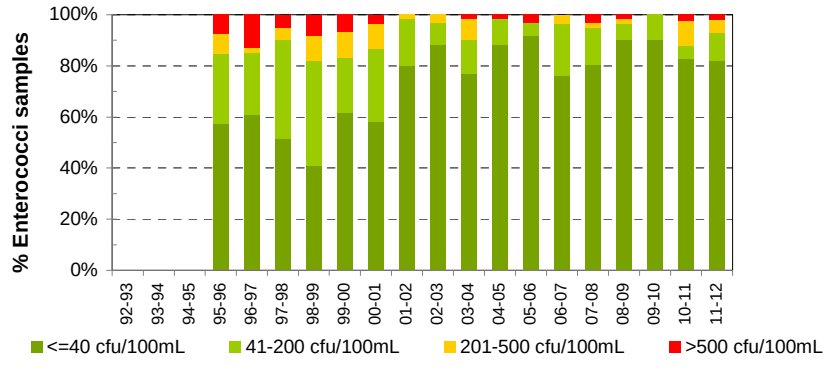


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Elvina Bay

Beach Suitability Grade: **Very Good**

See page 21 for key to map

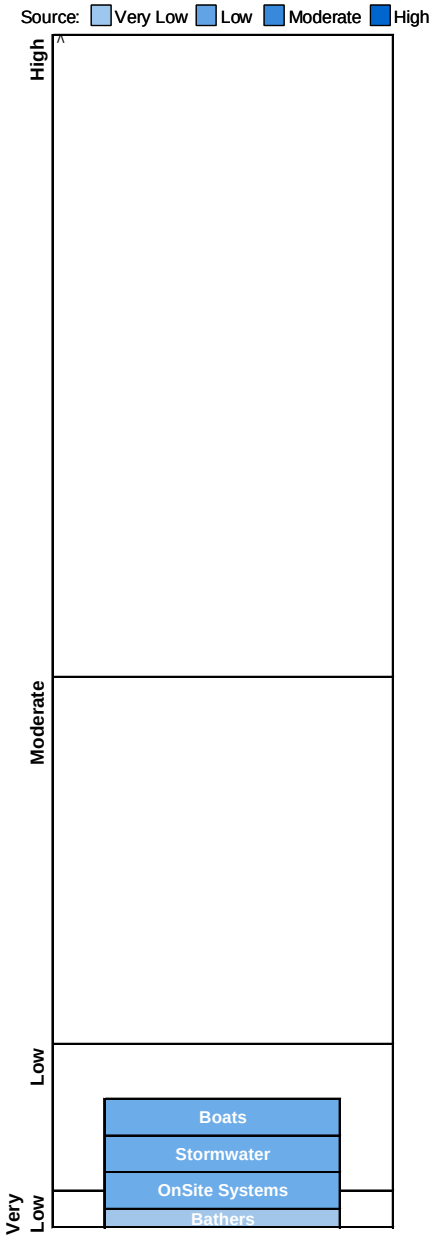
Elvina Bay is located on the south-western foreshore of Pittwater. The swimming area is not netted. Water quality samples are collected from Elvina South Wharf on the southern side of Elvina Bay.

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

The response to rainfall graph indicates that enterococci levels increase with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm of rainfall or more.

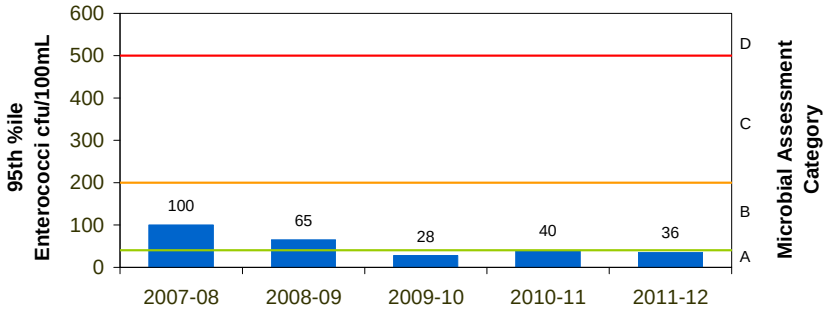
The site has been monitored since 1995. Microbial water quality improved slightly in 2000–2001 when much of the eastern side of Pittwater was connected to reticulated sewerage. Since then, variation in microbial water quality among years has been the result of rainfall patterns.

Sanitary Inspection: **Low**



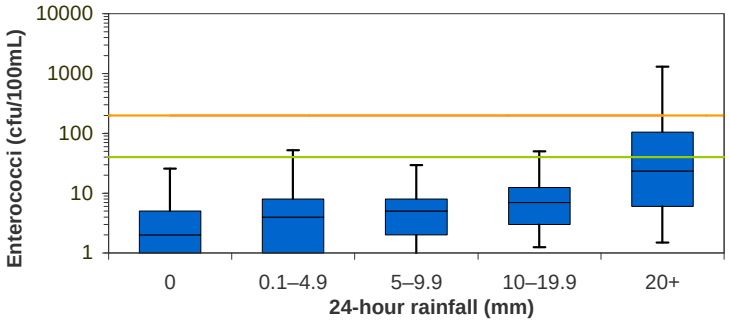
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

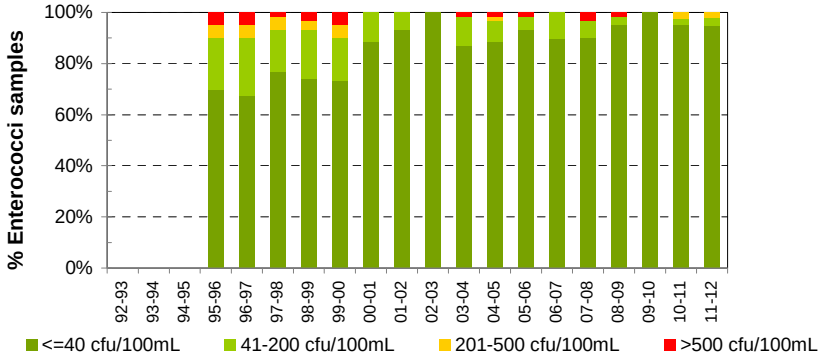


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



North Scotland Island

Beach Suitability Grade: **Good**

See page 21 for key to map

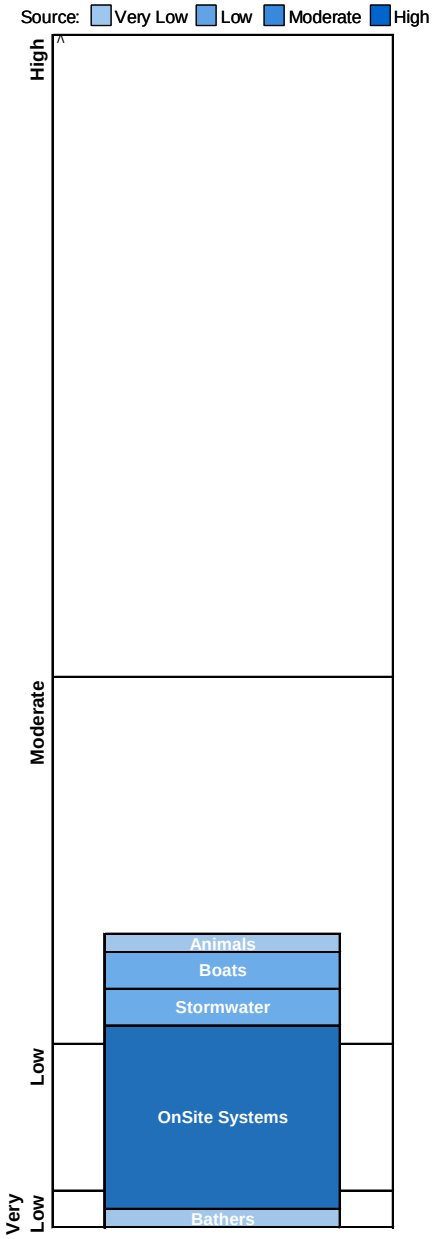
The North Scotland Island swimming site is a 15 by 50 metre netted enclosure located on the north side of Scotland Island in Pittwater. A park with picnic facilities backs the swimming area.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination including on-site sewage management systems.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm of rainfall or more.

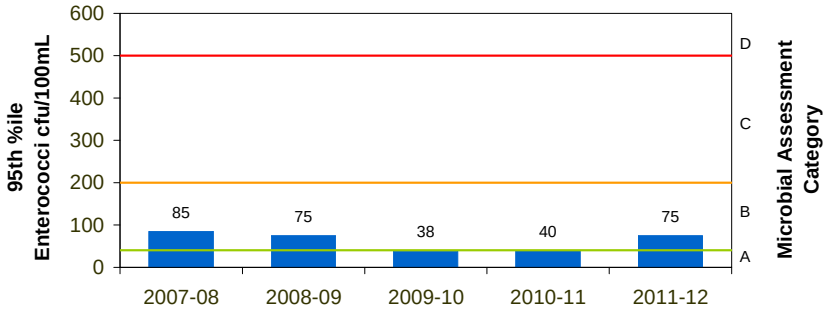
The site has been monitored since 1995. Microbial water quality improved slightly in 2000–2001 when much of the eastern side of Pittwater was connected to reticulated sewerage. Since then, variation in microbial water quality among years has been the result of rainfall patterns.

Sanitary Inspection: **Moderate**



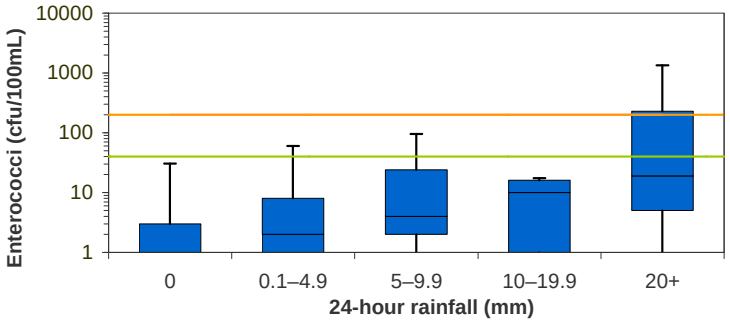
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

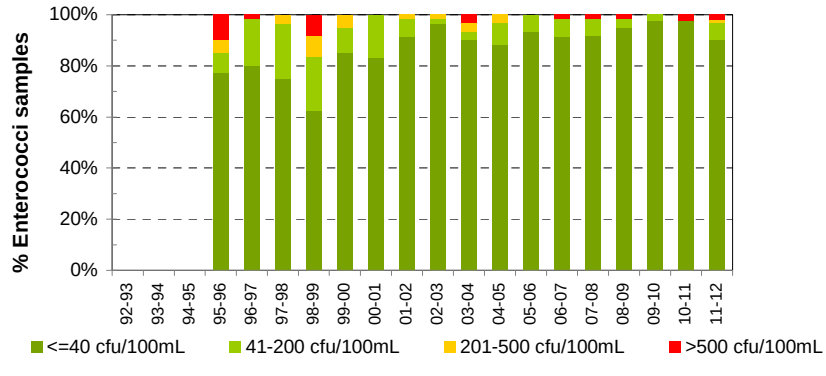


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



South Scotland Island

Beach Suitability Grade: **Good**

See page 21 for key to map

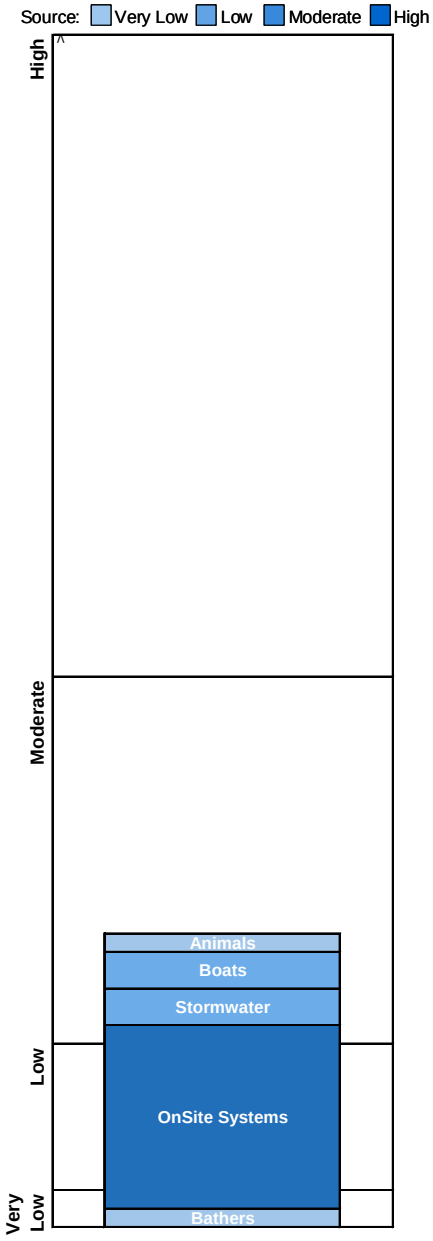
The South Scotland Island swimming site is located at Carols Wharf on the southern side of Scotland Island. The location is not netted and is backed by a reserve.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination including on-site sewage management systems.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, sometimes exceeding the safe swimming limit in response to 20 mm of rainfall or more.

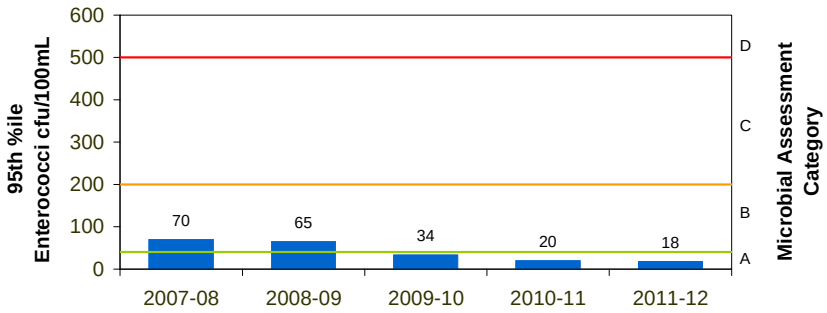
The site has been monitored since 1996. Microbial water quality improved slightly in 2000–2001 when much of the eastern side of Pittwater was connected to reticulated sewerage. Since then, variation in microbial water quality among years has been the result of rainfall patterns.

Sanitary Inspection: **Moderate**



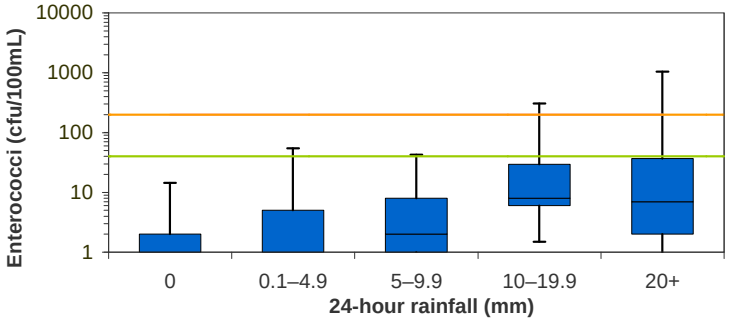
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

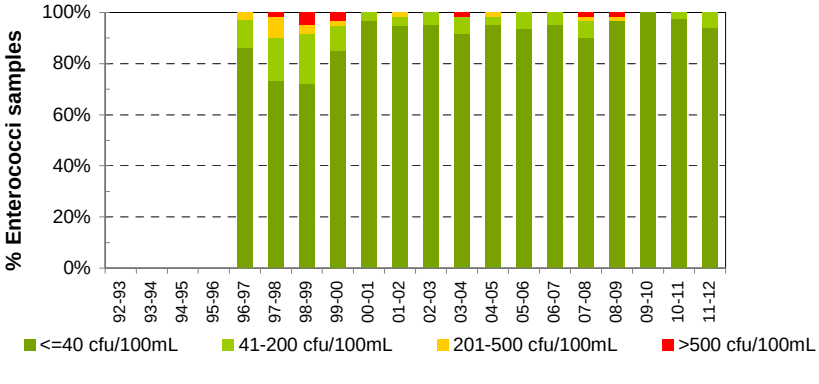


Response to rainfall

Rainfall from Avalon rain gauge

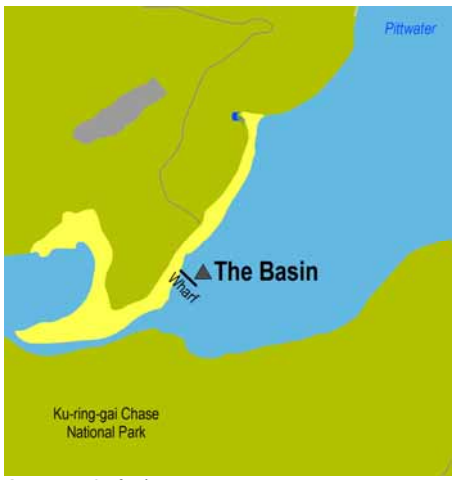


Trends in enterococci data through time



The Basin

Beach Suitability Grade: **Good**



See page 21 for key to map

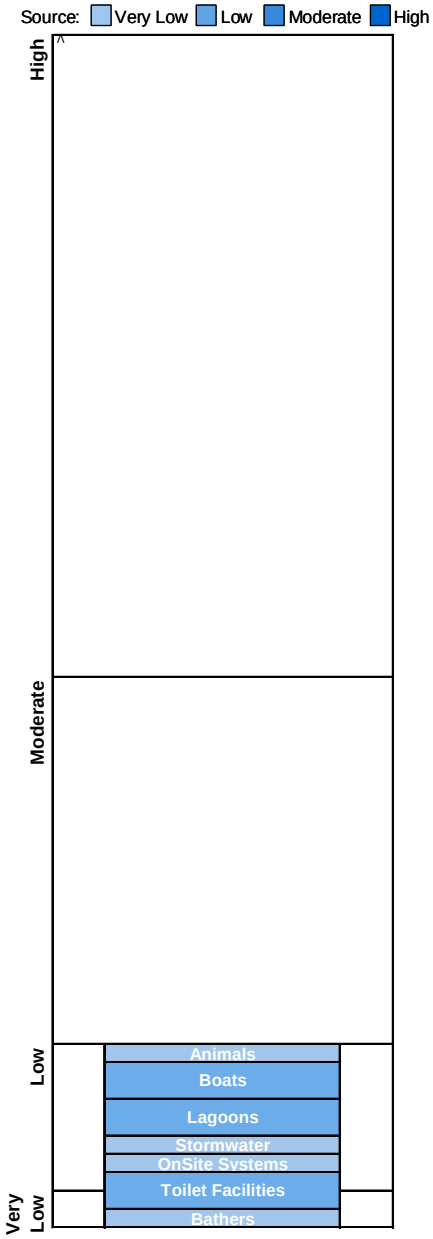
The Basin is a 500 metre sandy beach on the western side of Pittwater, backed by Ku-ring-gai Chase National Park. The sampling site is located at The Basin Wharf. The area is very popular and is also known as Coasters Retreat.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination including discharge from boats and the lagoon.

The response to rainfall graph indicates that enterococci levels are not affected by rainfall, remaining generally low and mostly below the safe swimming limit across all rainfall categories.

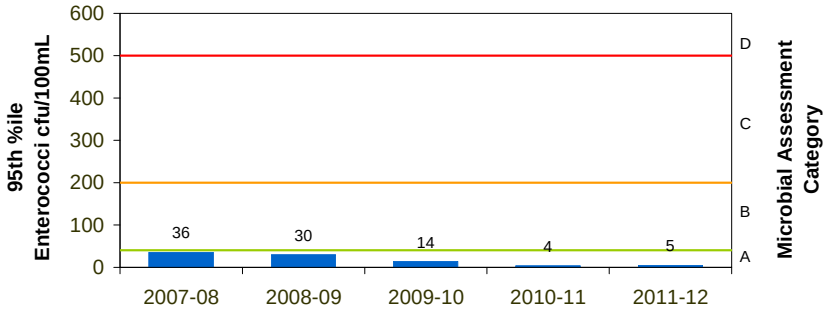
The site has been monitored since 1999. Water quality has generally been of a very high standard, with variation in results due to rainfall.

Sanitary Inspection: **Moderate**



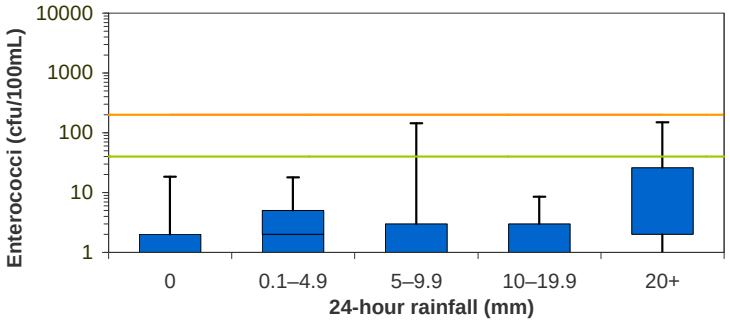
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

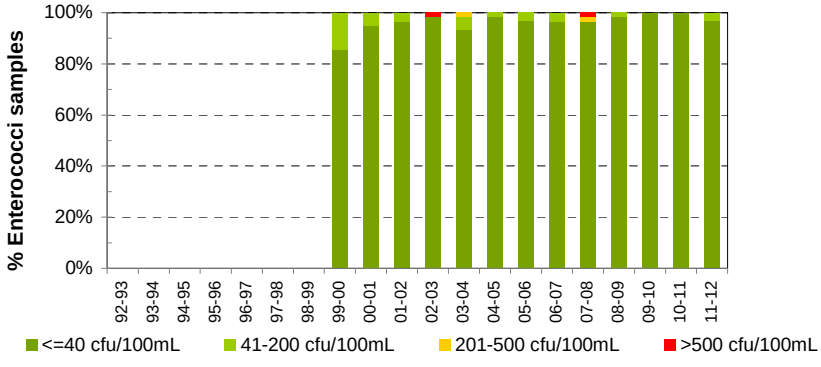


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Great Mackerel Beach

Beach Suitability Grade: **Very Good**

See page 21 for key to map

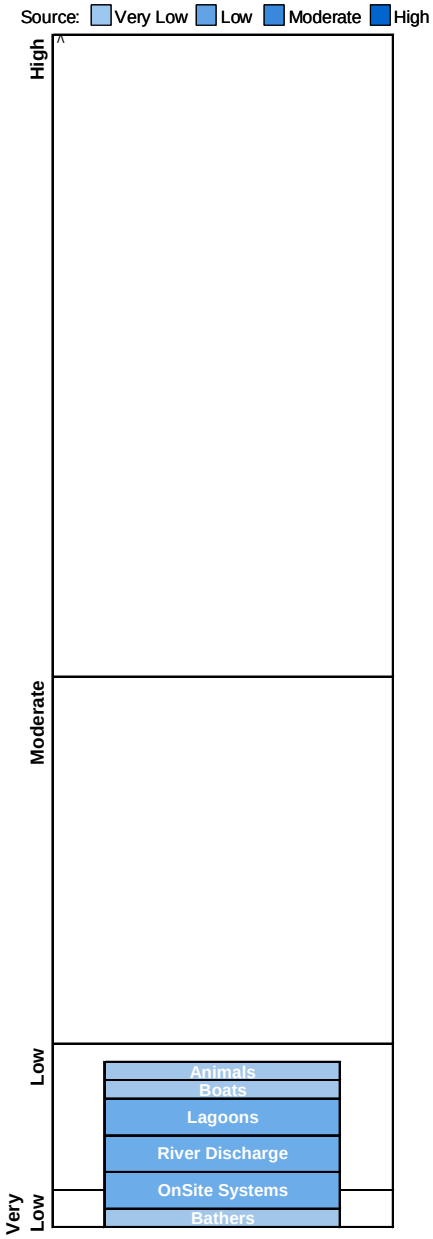
Great Mackerel Beach is a 500 metre long sandy beach on the north-western side of Pittwater. The northern end is backed by Ku-ring-gai Chase National Park and the southern end by a residential area. Samples are collected in the centre of the beach near Mackerel Beach Wharf.

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

The response to rainfall graph indicates that enterococci levels increased slightly with increasing rainfall, sometimes exceeding the safe swimming limit in response to 20 mm of rainfall or more.

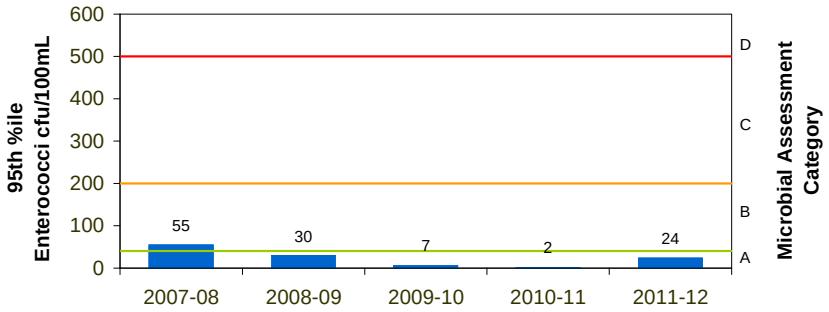
The site has been monitored since 1999. Water quality has generally been of a very high standard, with variation in results due to rainfall.

Sanitary Inspection: **Low**



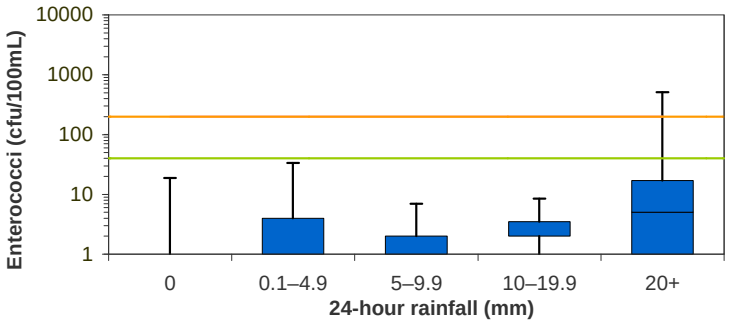
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

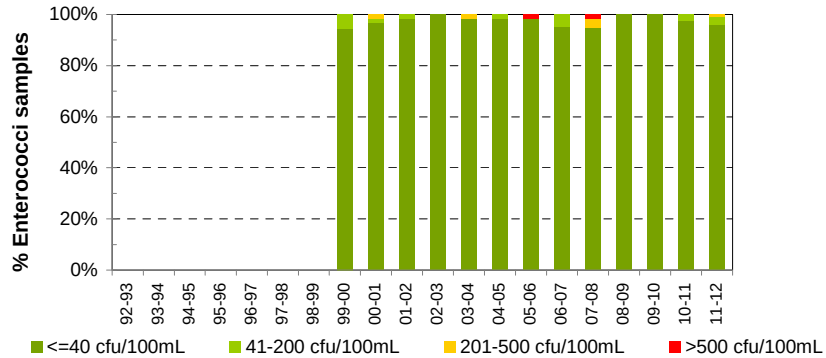


Response to rainfall

Rainfall from Avalon rain gauge



Trends in enterococci data through time



Sydney Harbour

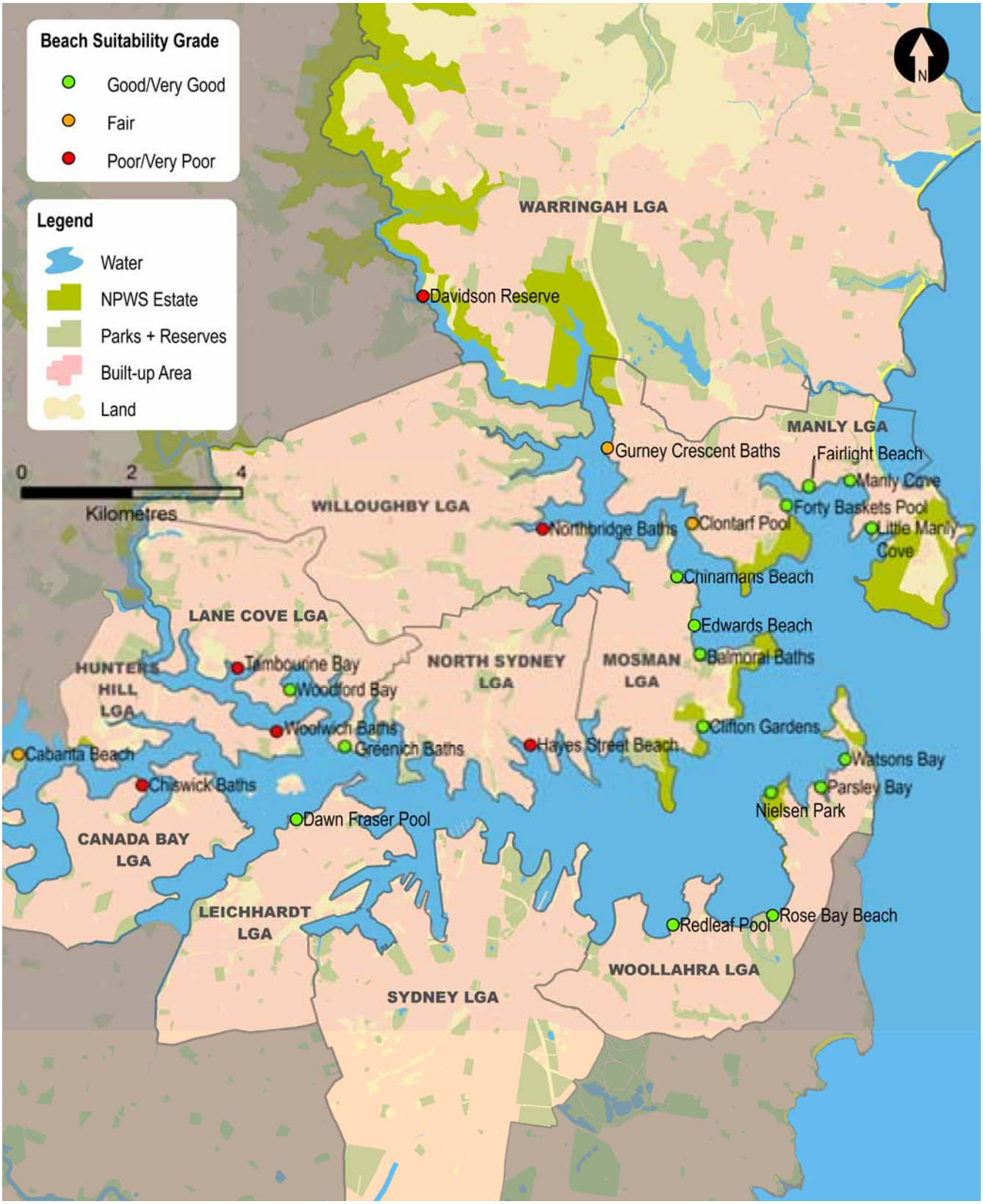


Figure 26: Sampling locations and Beach Suitability Grades in Sydney Harbour

Overview of the area

Description

Sydney Harbour is a working port but is also used for swimming, recreational boating, fishing and aesthetic enjoyment.

The Sydney Harbour catchment covers an area of 530 square kilometres and has a population of approximately 1.2 million people. It includes the central business district of Sydney as well as commercial districts in North Sydney, Chatswood and Parramatta. While almost 90 per cent of the catchment is urbanised, there are areas of national park on the northern shore, including the Lane Cove National Park, Garigal National Park and Sydney Harbour National Park.

Sydney Harbour has two main tributaries (Parramatta River and Lane Cove River) and includes the waters of Port Jackson, Middle Harbour and North Harbour. Many of the creek systems draining to the harbour's many bays have been modified to concrete-lined channels.

The North Harbour Aquatic Reserve extends over a large section of North Harbour.

Management of the waterway is complex, with responsibilities spread among the Sydney Metropolitan Catchment Authority, several state government agencies, numerous local councils and Sydney Water Corporation.

Rainfall

There were several significant rain and flooding events in the Sydney region during 2011–2012 (BOM 2012):

- In November, high rainfall levels resulted in more than twice the average total rainfall recorded for the month.
- Rainfall was above average in Sydney during January, which was the wettest since 2001.
- Wet weather continued during March, the wettest since 1984, with heavy rainfall (109 mm in 24 hours) resulting in widespread flash flooding in the metropolitan area. Particularly heavy rain was recorded in the city with falls of up to 42 mm in 60 minutes.
- Another extremely wet period was recorded in the middle of April when more than 105 mm of rain fell over two days. This event triggered flooding of the Parramatta River as well as flash flooding throughout the city, particularly in the coastal suburbs.

Assessment

Microbial water quality

Since May 2009, enterococci samples at the 25 swimming locations in Sydney Harbour have been collected every sixth day during the swimming season and monthly between May and September, providing approximately 40 samples each year. This number is well above NHMRC's recommended 20 samples per year. Prior to May 2009, samples were collected approximately every sixth day throughout the year.

The Microbial Assessment Category for 2011–2012 was calculated from the most recent 100 data points up until the end of the 2011–2012 swimming season (January 2010 until April 2012).

Sanitary inspections

Sanitary inspections have been completed for all swimming locations in Sydney Harbour. The sanitary inspections will be reviewed during 2012–2013.

Beach Suitability Grades

Sixteen of the 25 swimming locations in Sydney Harbour were graded as Good or Very Good during the 2011–2012 swimming season (Figure 26).

Very Good

One swimming location was graded as Very Good: Nielsen Park in Port Jackson.

This site had excellent water quality (Microbial Assessment Category A) and few potential sources of microbial contamination (Sanitary Inspection Category of Low).

Good

Fifteen swimming locations were graded as Good: Watsons Bay, Parsley Bay, Rose Bay Beach, Redleaf Pool, Dawn Fraser Pool, Woodford Bay, Greenwich Baths, Clifton Gardens, Balmoral Baths, Edwards Beach, Chinamans Beach, Forty Basket Pool, Fairlight Beach, Manly Cove and Little Manly Cove.

These sites had mostly good water quality (Microbial Assessment Category A or B) but had several, or more significant, potential sources of microbial contamination – commonly urban stormwater runoff or sewage overflows.

Fair

Three swimming locations were graded Fair: Cabarita Beach, Gurney Crescent Baths and Clontarf Pool.

These sites had generally good water quality (Microbial Assessment Category B), but had several or more significant potential sources of microbial contamination, such as urban stormwater runoff, sewage overflows, sewage chokes or river discharge (poor quality water flowing down from upstream sources of pollution).

Poor

Five swimming locations were graded as Poor: Chiswick Baths in the lower Parramatta River, Woolwich Baths and Tambourine Bay in the lower Lane Cove River, Northbridge Baths in the upper reaches of Middle Harbour and Hayes Street Beach in Port Jackson.

Although microbial water quality at these sites is generally suitable for swimming during dry weather conditions, elevated enterococci levels are frequently measured following light rainfall. Tambourine Bay and Northbridge Baths also have relatively low levels of tidal flushing.

Lane Cove Council has currently closed Tambourine Bay Baths. The long-term future of the swimming baths is yet to be determined by Council.

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

Very Poor

Davidson Reserve in the upper reaches of Middle Harbour was graded as Very Poor. Although microbial water quality was often suitable for swimming during dry weather conditions, the site is very susceptible to faecal contamination from sewage overflows and river discharge (poor quality water flowing down from upstream sources of pollution). To reduce the risk of contracting a swimming related illness at this site, carefully follow the pollution advisories in the Beachwatch daily bulletin (www.environment.nsw.gov.au/beach) and avoid swimming during and for up to three days following light rainfall and at times when there are signs of stormwater pollution, such as discoloured water or odour or floating debris.

Management

Wastewater management

The vast majority of households in the Sydney Harbour catchment are connected to Sydney Water's reticulated sewerage system.

The North Head Wastewater Treatment Plant (WWTP) services households on the northern side of Sydney Harbour, as well as those in the catchment west of Silverwater. The WWTP discharges approximately 308 million litres of high-rate primary-treated effluent each day from a deep ocean outfall located 3.7 kilometres offshore at a depth of 65 metres (EPA NSW 2012).

The Bondi WWTP services households on the southern side of Sydney Harbour, east of Drummoyne. The WWTP discharges approximately 127 million litres of high-rate primary-treated effluent each day from a deep ocean outfall located 2.2 kilometres offshore at a depth of 63 metres (EPA NSW 2012).

The Malabar WWTP services households on the southern side of Sydney Harbour, between Silverwater and Drummoyne. It is the largest sewage treatment plant in the southern hemisphere and discharges approximately 498 million litres of high-rate primary-treated effluent each day from a deep ocean outfall located 3.6 kilometres offshore at a depth of 82 metres (EPA NSW 2012).

The Northside Storage Tunnel was constructed in 2000 and captures wet weather overflows from the four major overflow sites at Lane Cove, Quakers Hat Bay, Tunks Park and Scotts Creek. The tunnel has reduced the frequency of sewage overflows to less than 20 in an average 10-year period. Since the commissioning of the tunnel, about 62 billion litres of diluted sewage has been prevented from entering Sydney Harbour (Sydney Water 2012).

To reduce the incidence of wet weather sewage overflows in the catchment of Hayes Street Beach, Sydney Water has constructed a new pumping station and transfer tunnel.

The old, combined sewer–stormwater systems in the Sydney CBD and at Wattle Street in Ultimo have been separated to improve the water quality during wet weather at Circular Quay, Darling Harbour and Blackwattle Bay. Although there are no swimming locations in these bays, these works have reduced the pollution load entering the harbour.

Sydney Water is inspecting, cleaning and repairing sewer mains on the northern side of Port Jackson that have a high likelihood of discharging sewage to waterways if they become blocked. Work is also

occurring on the southern side of the harbour but does not cover the Dawn Fraser Pool and Rose Bay catchments. Where significant tree root intrusion to the public sewer from the private sewer is identified, property owners are requested to remedy the problem.

Sydney Water undertakes dry weather monitoring of main stormwater drains to identify sewer leaks. Leaks from public sewers are repaired by Sydney Water and leaks from private sewers are referred to local councils. Sydney Water is working with Manly Council to trial a more intense program to reduce leakage. Under this program, all stormwater drains discharging to beaches on North Harbour are being investigated.

Sewage pump-out facilities for boats are provided at the Cruising Yacht Club at Darling Point, the D'Albora Marinas at Rushcutters Bay and Cabarita Point, Gladesville Bridge Marina, Middle Harbour Yacht Club and Neutral Bay Marina (NSW Maritime 2012).

Stormwater management

Stormwater management plans have been developed for the lower Parramatta River, Lane Cove River, Middle Harbour, North Port Jackson and South Port Jackson. The plans contain initiatives to improve the quality of stormwater entering Sydney Harbour, including stormwater education campaigns, drain stencilling, reviews of street sweeping practices, water quality monitoring programs and a range of structural controls. Stormwater quality improvement devices have been installed throughout the Sydney Harbour catchment by local councils as actions under the plans.

Mosman Council's Botanic Road Stormwater Re-use Scheme involves the capture and harvesting of stormwater from the catchment. The underground storage system captures and treats stormwater through UV disinfection prior to being pumped to Balmoral oval for irrigation.

Mosman Council has installed educational signage at beaches in the area advising not to swim up to three days after heavy rain due to the potential for pollution from stormwater. Stormwater quality improvement devices are installed at Balmoral Beach, Clifton Gardens, Edwards Beach and Chinamans Beach to capture sediment and floating debris. Council has also conducted stormwater education programs at Balmoral for school groups, been involved in drain stencilling, and has implemented a Caring for our Coast campaign. An audit and condition assessment of all stormwater assets has also been undertaken to improve stormwater management.

North Sydney Council's Stormwater Re-use Project aims to save 90 million litres of potable water each year by harvesting, treating and re-using stormwater for the irrigation of sports fields and recreational parks, including St Leonards Park, Cammeray Park, Forsyth Park, Primrose Park and Tunks Park. This reduces the amount of stormwater entering the waterways. A local school helped Council to paint a mural depicting the project on the storage tanks located at Forsyth Park as part of Council's Sustainability Education Program.

North Sydney Council continued to maintain stormwater quality improvement devices throughout the catchment, reducing the amount of litter entering the harbour. On average, 258 tonnes of waste is removed from 26 gross pollutant traps each year. Mechanical sweeping of footpaths and plazas in business areas also contributed to litter being removed from the stormwater system. Material collected from footpaths is recycled through Council's Greenwaste Program.

City of Canada Bay maintains over 20 stormwater quality improvement devices on the stormwater network draining to Parramatta River including Five Dock Bay and Kendall Bay, where Chiswick Baths and Cabarita Beach are located. These devices prevent over 80 tonnes of pollutants (sediments, leaves and litter) from reaching our waterways each year. Stormwater harvesting, rainwater re-use and rain gardens have been constructed in the Drummoyne Oval precinct to reduce stormwater and pollutant loads reaching Five Dock Bay.

Woollahra Council's Environmental and Infrastructure Levy funds a number of projects aimed at restoring aging infrastructure and protecting the local environment. Projects include installation of stormwater quality improvement devices; upgrading infrastructure and gross pollutant traps; installing flow diversion structures to reduce sediment loads; bio-retention systems to remove contaminants from stormwater; porous paving infiltration systems; and harvesting stormwater for irrigation of sports fields and use in toilet facilities. Further stormwater management projects carried out by Woollahra Council include: water sensitive urban design at Bellevue Hill shops; a bio-retention system at O'Sullivan Road; dredging and installation of a stormwater litter boom at Double Bay; and stormwater pollution control devices for Rose Bay pipes.

Additional stormwater projects carried out by Woollahra Council include Cooper Park Sustainable Water Project and Cooper Park Stormwater Harvesting and Re-Use System. Council received $250,000 between 2009 and 2011 from the NSW Environmental Trust to restore the bushland within Cooper Park to improve water quality in the creek.

This included work with local residents to create sustainable gardens to reduce their impact on the creek system and park, as well as macrophyte plantings in Cooper Creek. In addition, stormwater is harvested from Cooper Creek before entering the culvert which drains into Sydney Harbour. The water is stored in tanks, screened and treated through UV disinfection. The harvesting system will be connected to an irrigation system during 2012 for irrigation of Cooper Park playing fields and will save on average 3.3 million litres of water each year.

Sydney Water maintains stormwater quality improvement devices on stormwater systems draining to Rushcutters Bay, Double Bay and Rose Bay, and it also maintains a stormwater treatment wetland within Woollahra Golf Course on the channel draining to Rose Bay. Sydney Water also maintains stormwater quality improvement devices at Dobroyd Canal, Hawthorne Canal, Whites Creek, Johnstons Creek, Haslams Creek, St Lukes Park and Powells Creek, though these stormwater systems do not discharge near recognised swimming sites.

The Sydney Metropolitan Catchment Management Authority is currently developing a Sydney Harbour Catchment Water Quality Improvement Plan (SHCWQIP). The overarching objective is to improve the ecological health of the Sydney Harbour and catchments through reducing quantities of stormwater-borne pollutants. The plan will involve several stages over four years and will require partnerships from the 25 local councils, 11 NSW Government agencies and two Commonwealth Government agencies that manage land draining into the harbour.

Watsons Bay

Beach Suitability Grade: **Good**

See page 21 for key to map

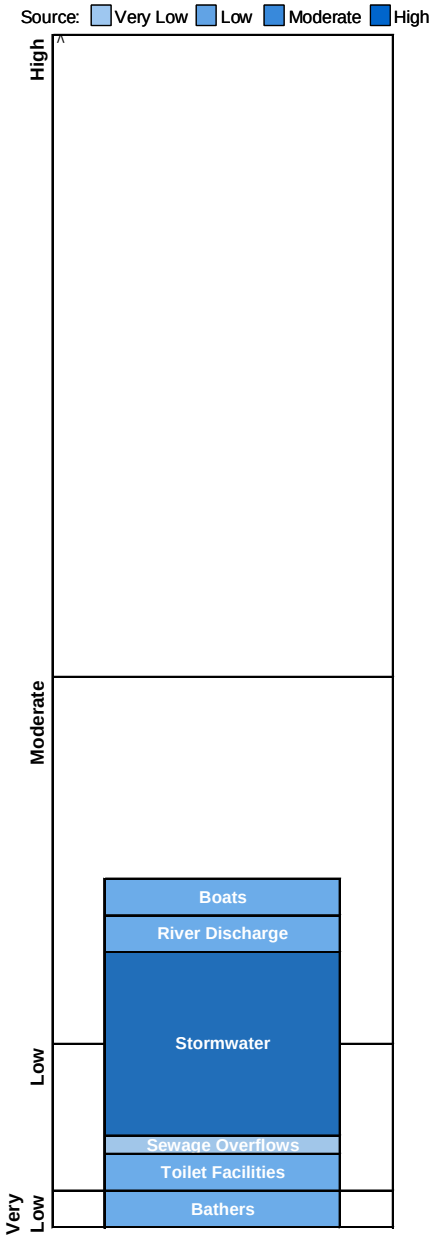
The swimming site is a 20 by 40 metre enclosed tidal swimming area located adjacent to the Vaucluse Yacht Club. The baths are backed by a narrow sandy beach and parklands with picnic facilities.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

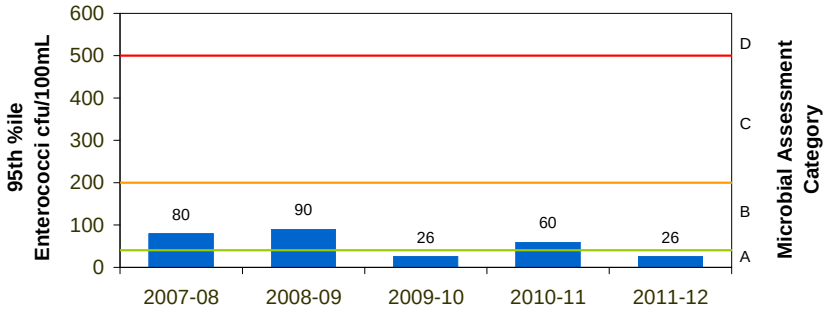
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



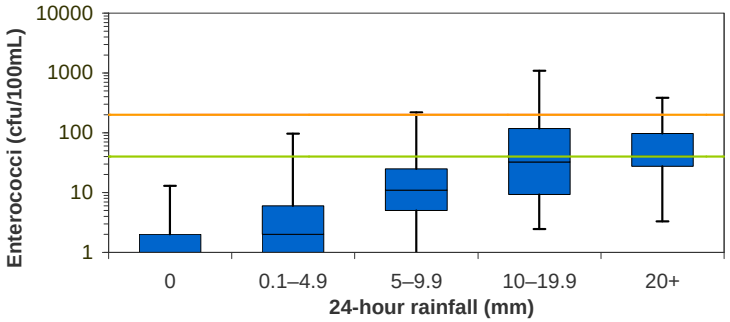
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

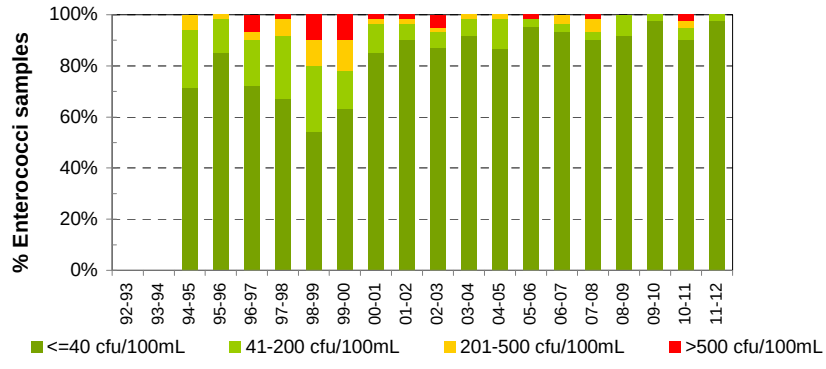


Response to rainfall

Rainfall from Mosman rain gauge

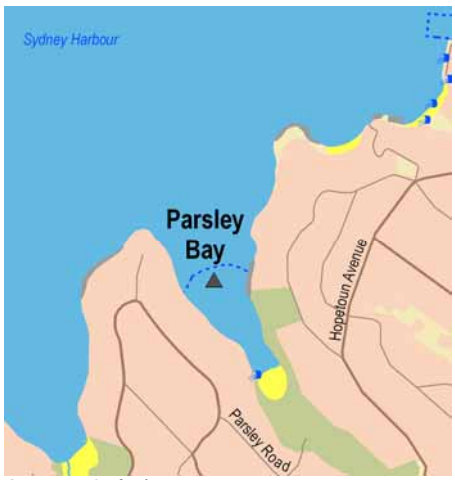


Trends in enterococci data through time



Parsley Bay

Beach Suitability Grade: **Good**



See page 21 for key to map

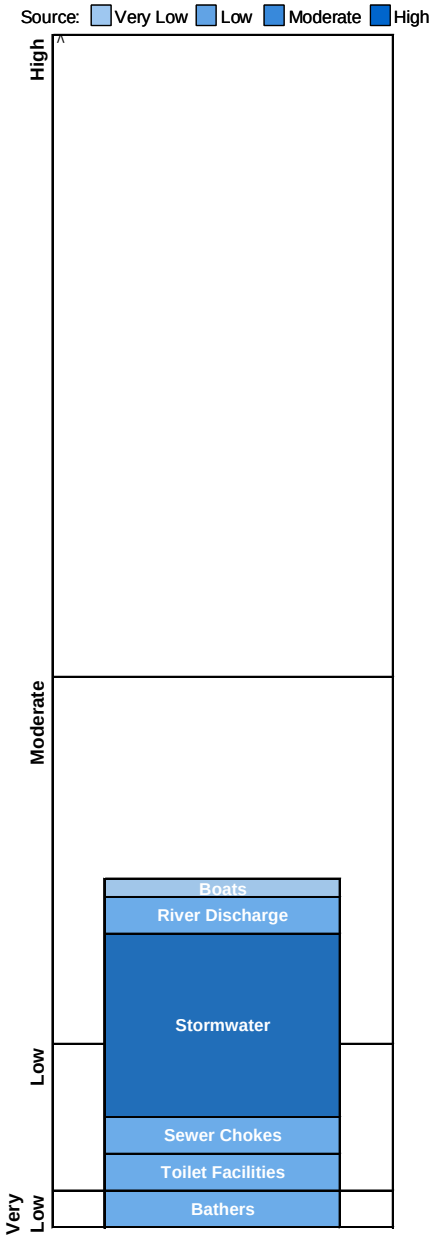
The southern end of Parsley Bay is netted to provide a large and safe swimming area. The sandy beach is backed by Parsley Bay Reserve, which contains picnic facilities and a playground.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 5 mm of rainfall or more.

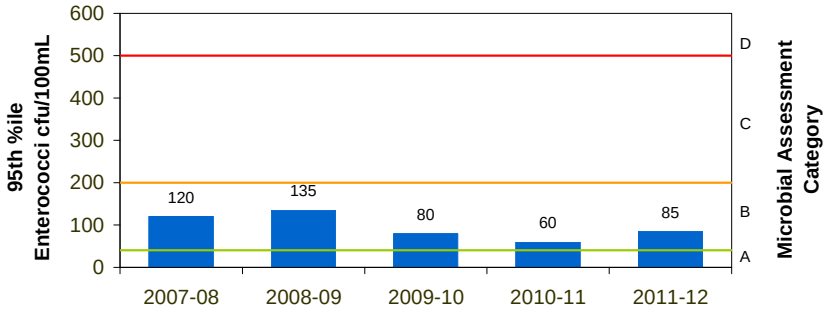
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



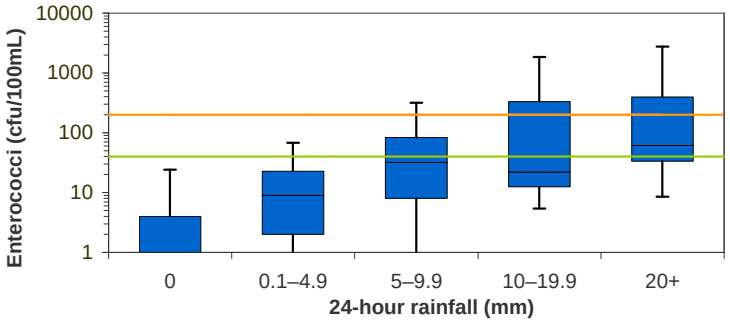
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

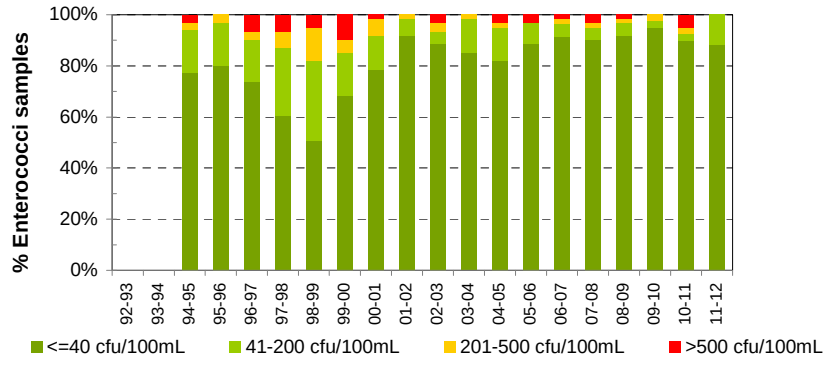


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Nielsen Park

Beach Suitability Grade: **Very Good**

See page 21 for key to map

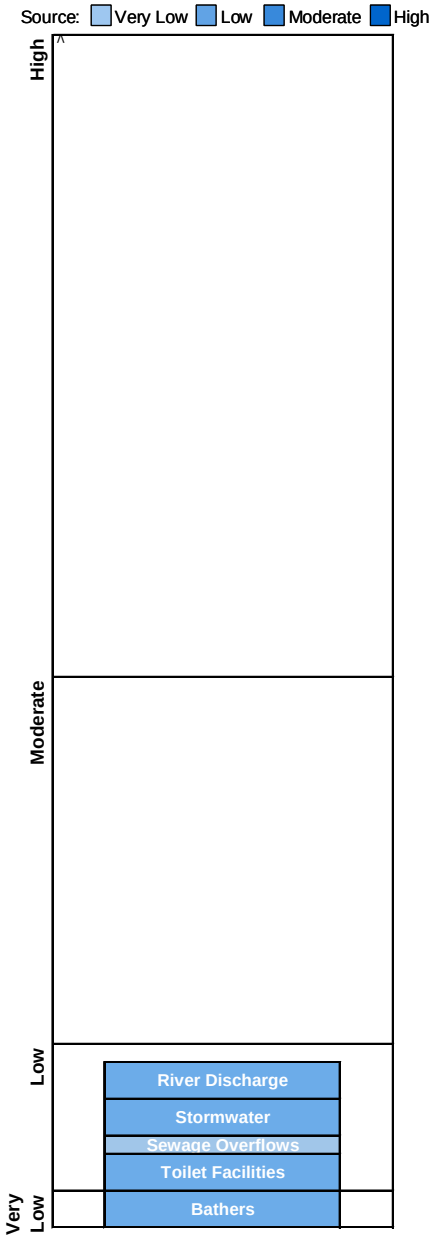
The Nielsen Park swimming area is approximately 150 metres long and enclosed by a shark net between October and April. The sandy beach and adjacent parklands are part of Sydney Harbour National Park. There are toilet and shower facilities, a café and a restaurant.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm of rainfall or more.

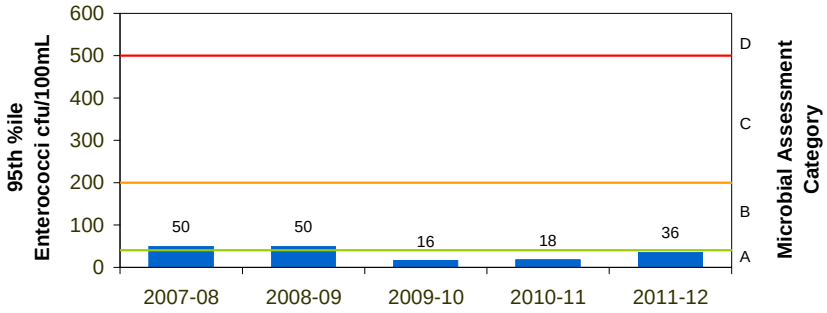
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Low**



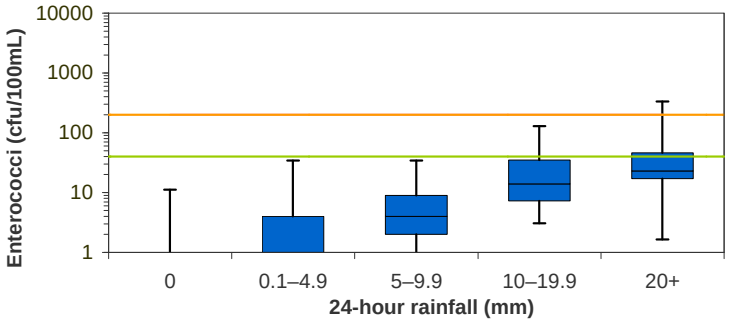
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

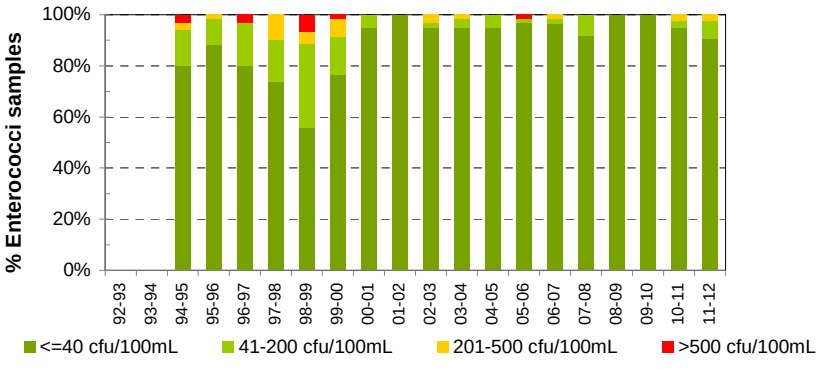


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Rose Bay Beach

Beach Suitability Grade: **Good**

See page 21 for key to map

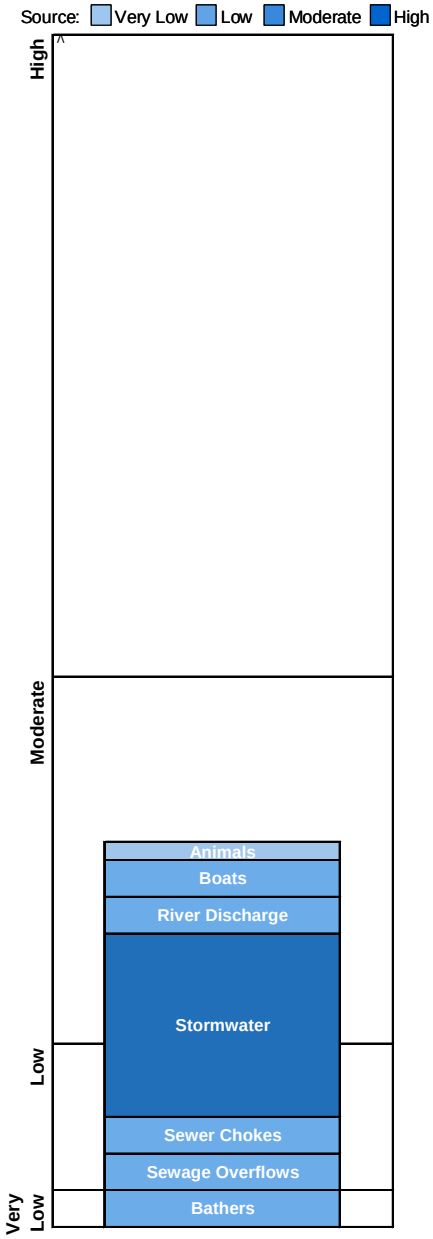
Rose Bay Beach is approximately 500 metres long and the swimming area is not netted. The bay is popular for recreational boating, and a sailing school and sailboat hire company operate in the area. A park with picnic and playground facilities is located adjacent to the beach.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

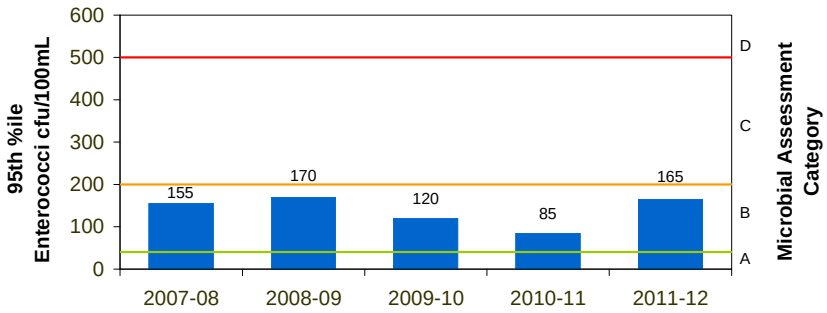
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



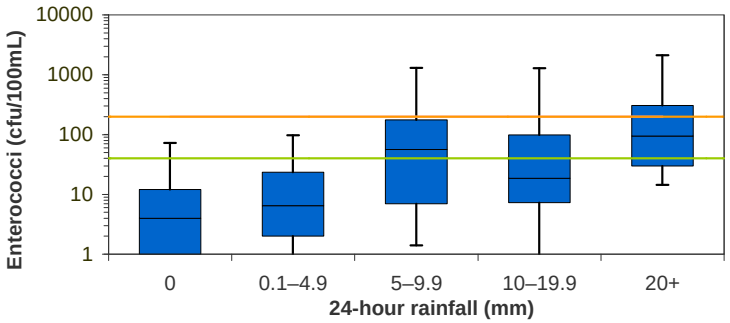
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

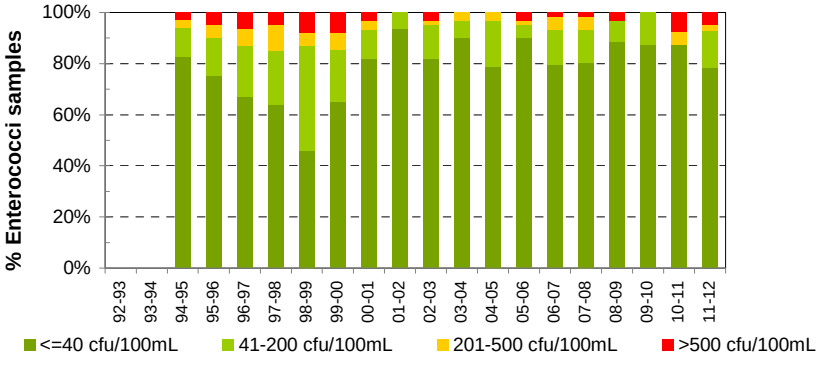


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Redleaf Pool

Beach Suitability Grade: **Good**

See page 21 for key to map

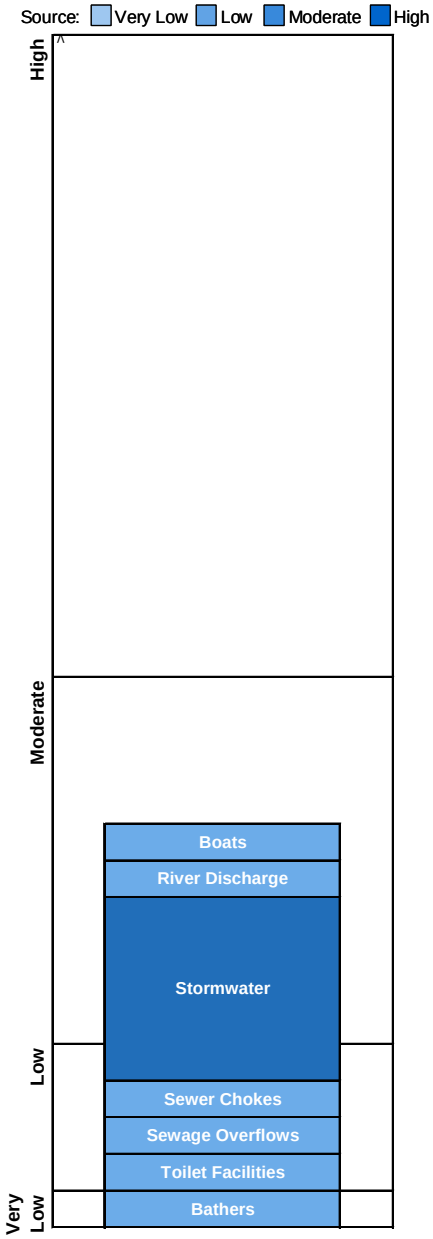
Redleaf Pool is a netted swimming enclosure located in Double Bay, at the end of Seven Shillings Beach. The pool is bordered on three sides by a narrow sun deck and is backed by a park and Woollahra Council office.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

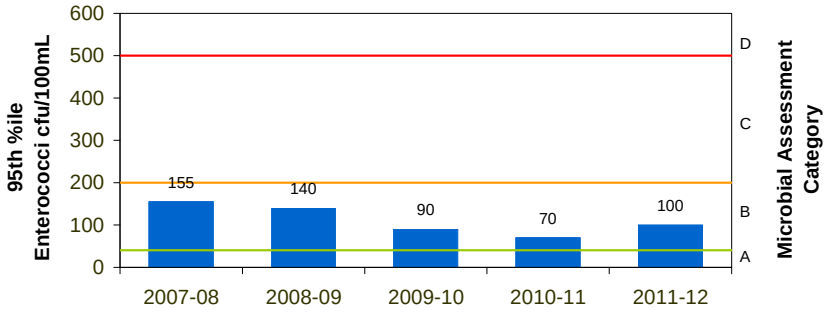
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



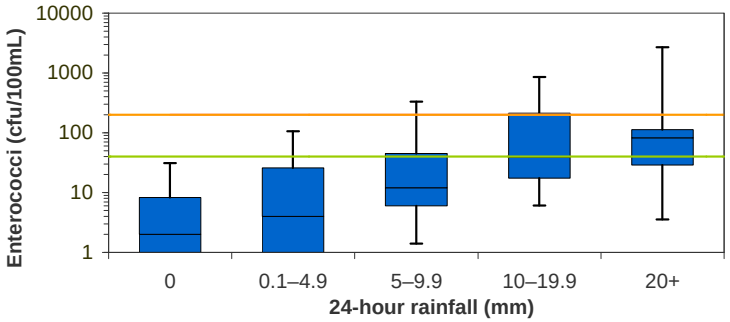
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

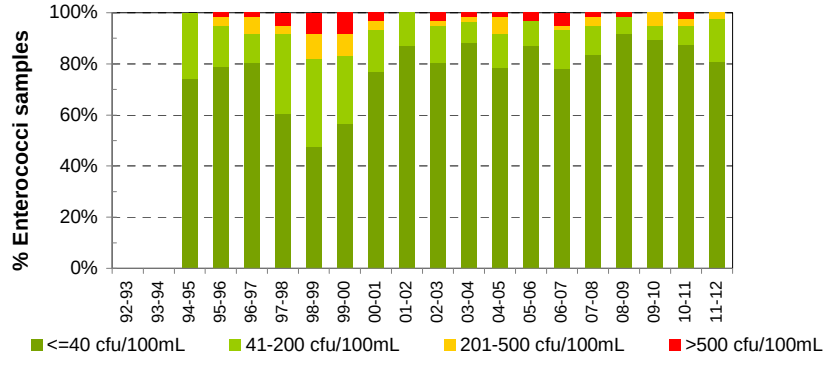


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Dawn Fraser Pool

Beach Suitability Grade: **Good**

See page 21 for key to map

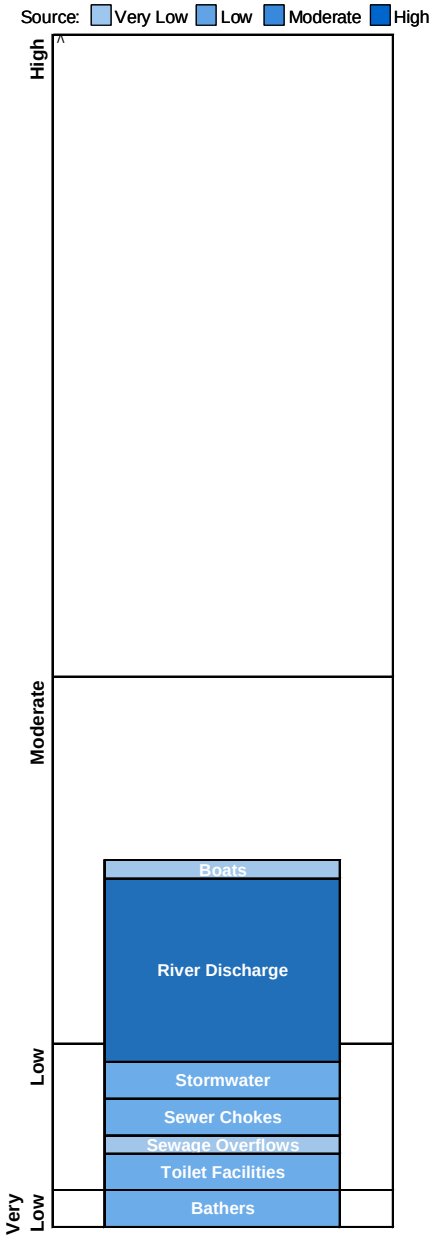
Dawn Fraser Pool in Balmain is the oldest pool and swimming club in Australia and is listed on the NSW State Heritage Register. Boardwalks and a pavilion surround the enclosed tidal swimming area. The pool is open between October and April each year.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination including upstream sources in the Parramatta River.

The response to rainfall graph indicates that enterococci levels increase with increasing rainfall, occasionally exceeding the safe swimming limit in response to 5 mm of rainfall or more.

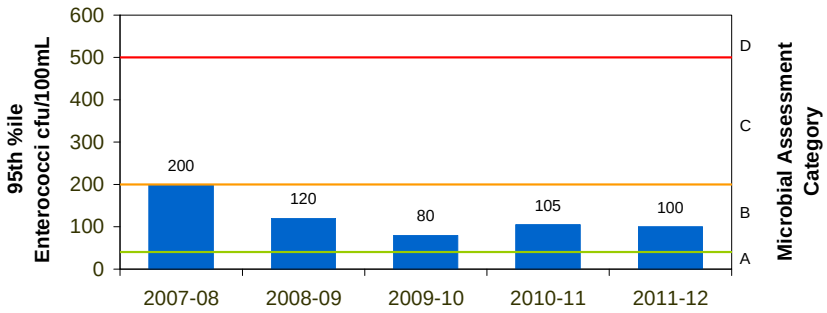
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



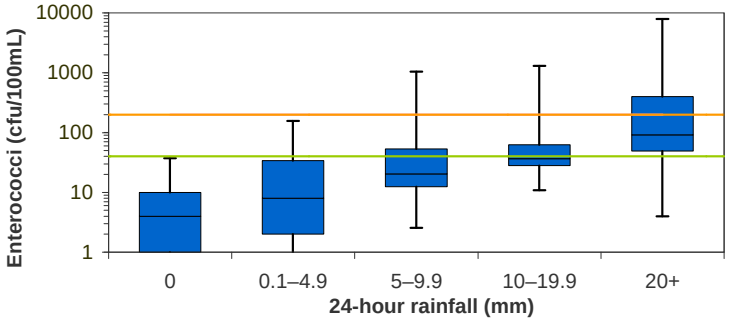
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

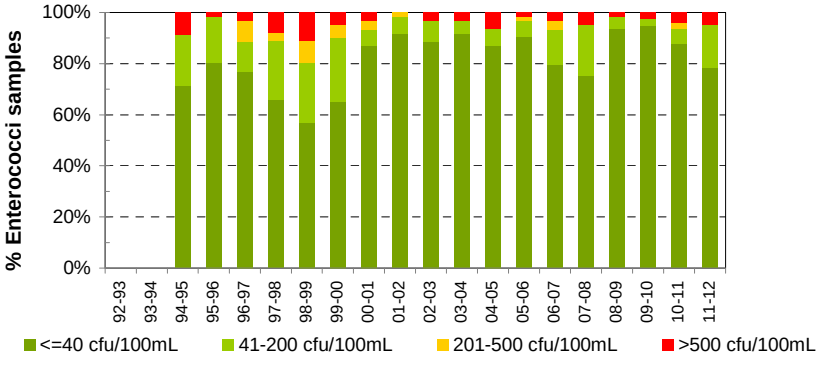


Response to rainfall

Rainfall from Lilyfield rain gauge

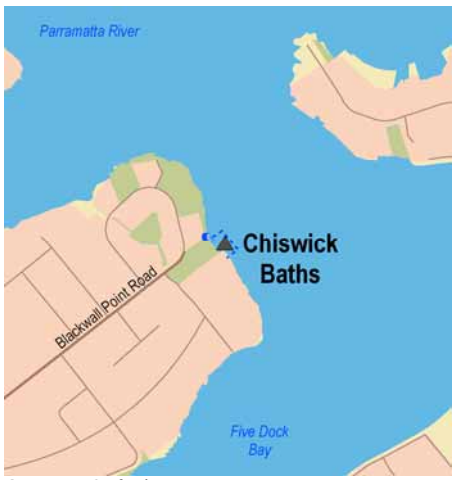


Trends in enterococci data through time



Chiswick Baths

Beach Suitability Grade: **Poor**



See page 21 for key to map

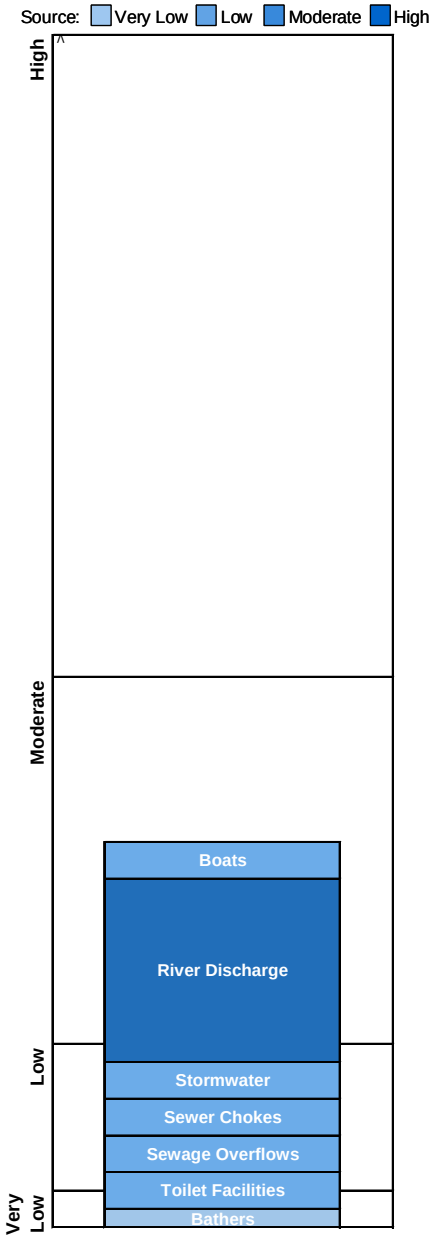
Chiswick Baths are located in Five Dock Bay. The swimming enclosure is netted and is backed by a narrow sandy beach and a park with picnic and barbeque facilities.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from stormwater and upstream sources in the Parramatta River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 5 mm of rainfall or more.

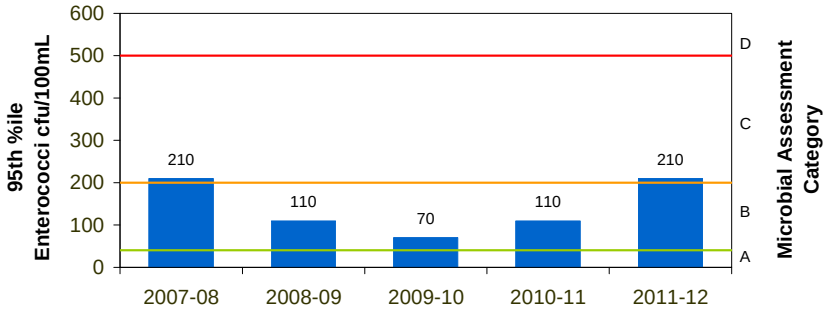
The site has been monitored since 1998. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



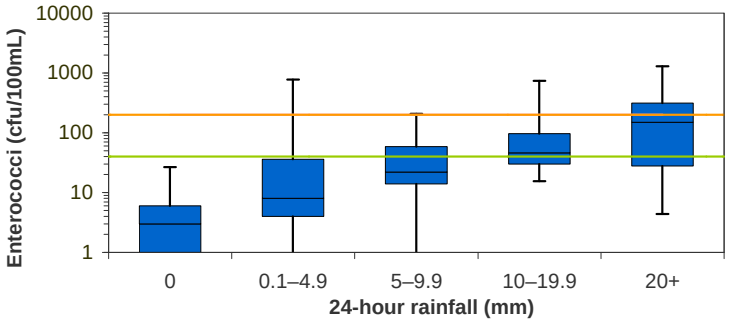
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

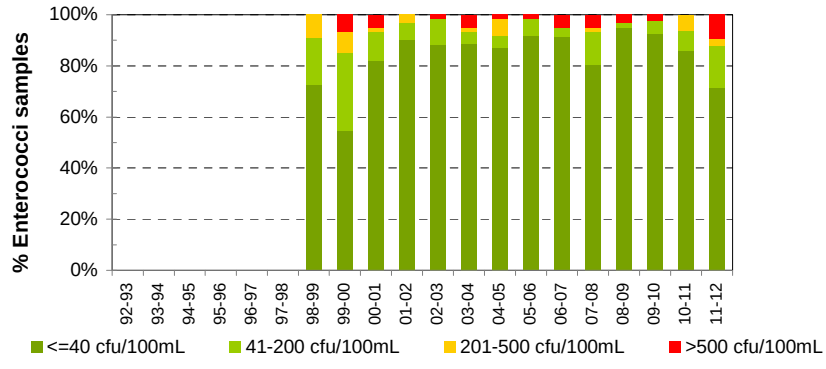


Response to rainfall

Rainfall from Gladesville rain gauge



Trends in enterococci data through time



Cabarita Beach

Beach Suitability Grade: **Fair**

See page 21 for key to map

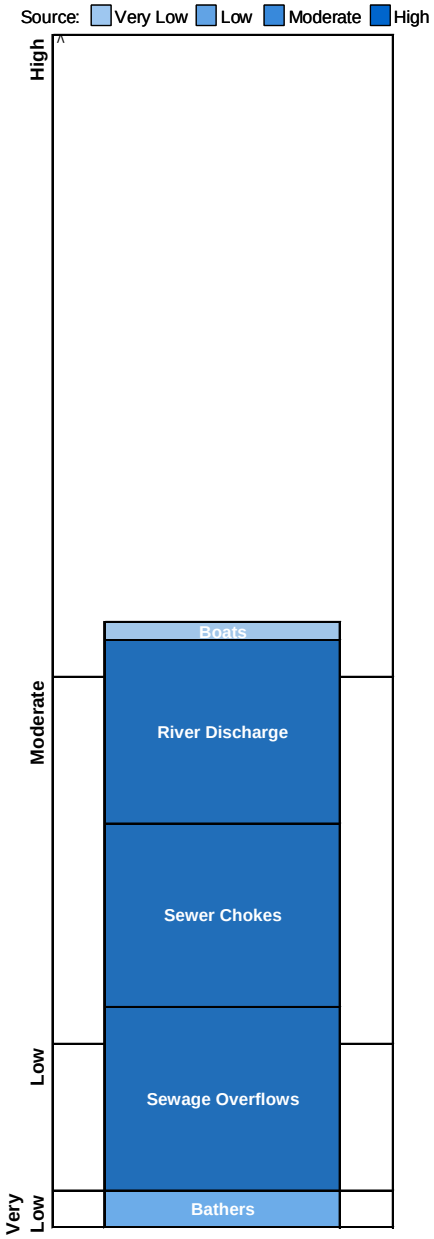
Cabarita Beach is located at the end of Cabarita Point. The beach is 120 metres long and is backed by parklands with picnic and barbeque facilities and a playground.

The Beach Suitability Grade of Fair indicates that microbial water quality is occasionally susceptible to faecal pollution, usually triggered by rainfall, with potential faecal contamination from sewer chokes and sewage overflows in the Parramatta River catchment.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

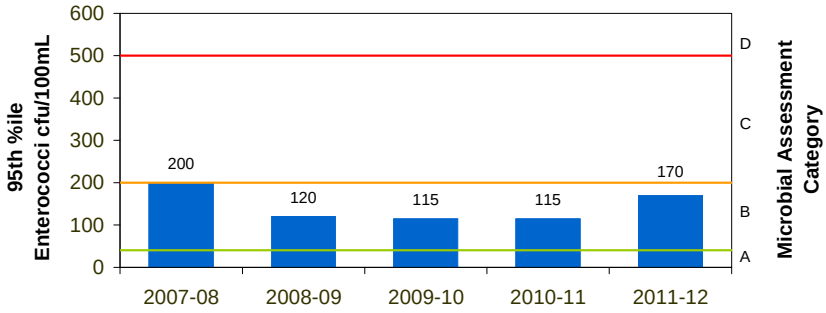
The site has been monitored since 1996. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **High**



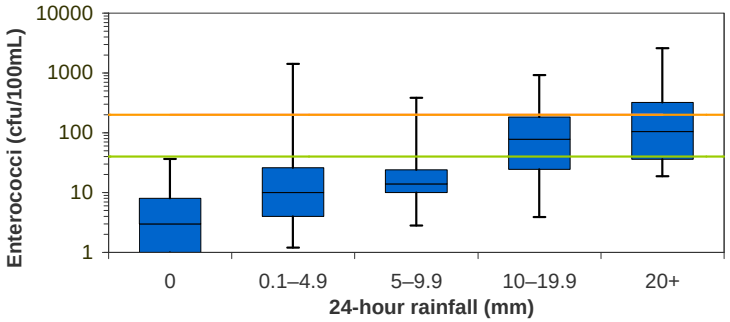
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

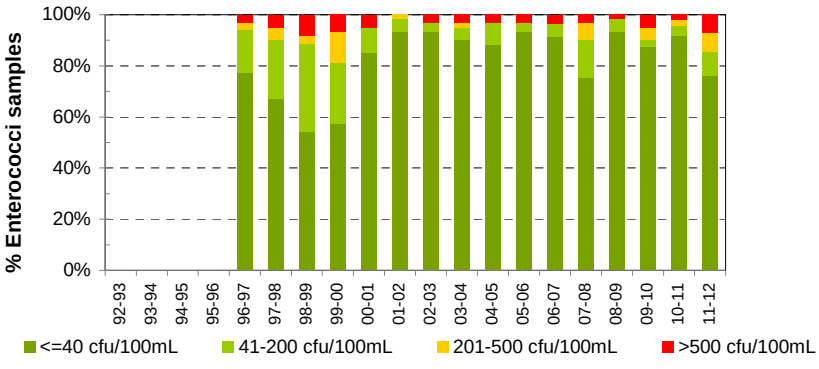


Response to rainfall

Rainfall from Gladesville rain gauge



Trends in enterococci data through time



Woolwich Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

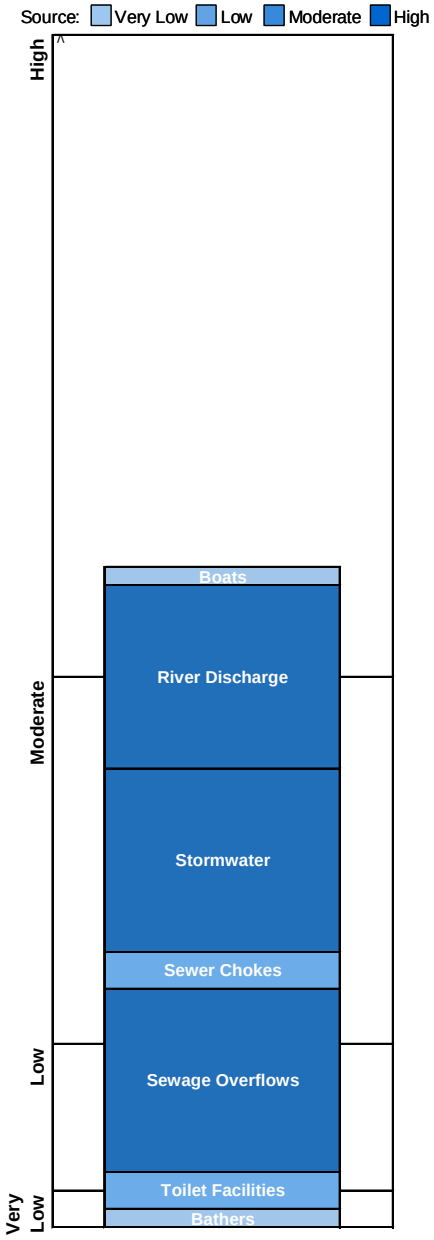
Woolwich Baths are a 20 by 30 metre netted swimming area located in the lower Lane Cove River. The baths are backed by a narrow sandy beach and are adjacent to a reserve.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from stormwater, sewer chokes and sewage overflows in the Lane Cove River catchment.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, frequently exceeding the safe swimming limit in response to 10 mm of rainfall or more.

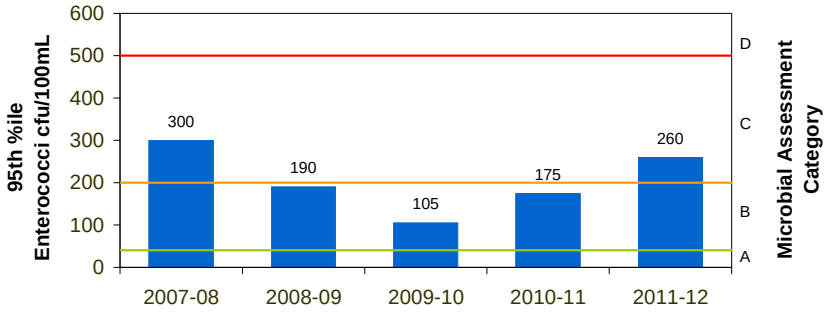
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **High**



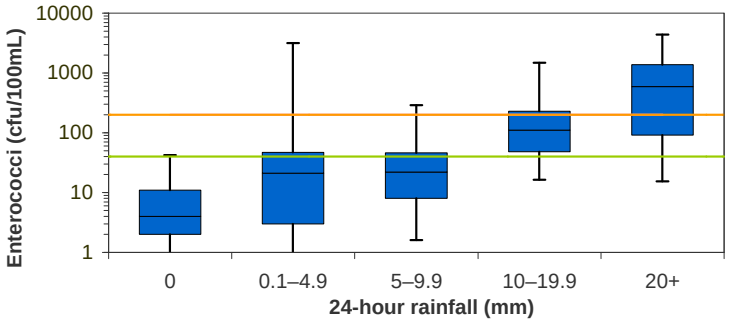
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

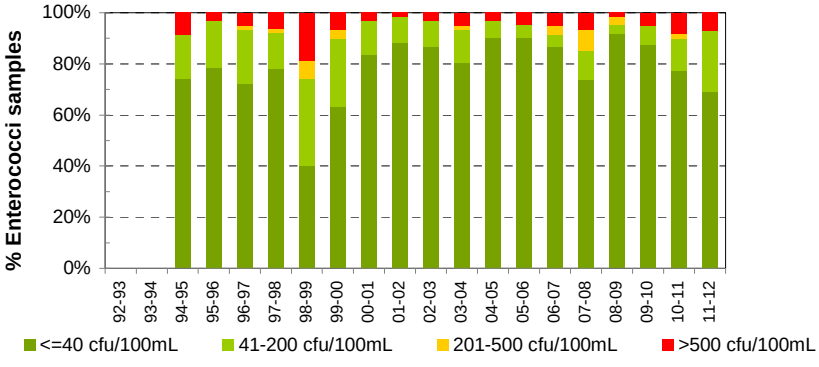


Response to rainfall

Rainfall from Gladesville rain gauge



Trends in enterococci data through time



Tambourine Bay

Beach Suitability Grade: **Poor**

See page 21 for key to map

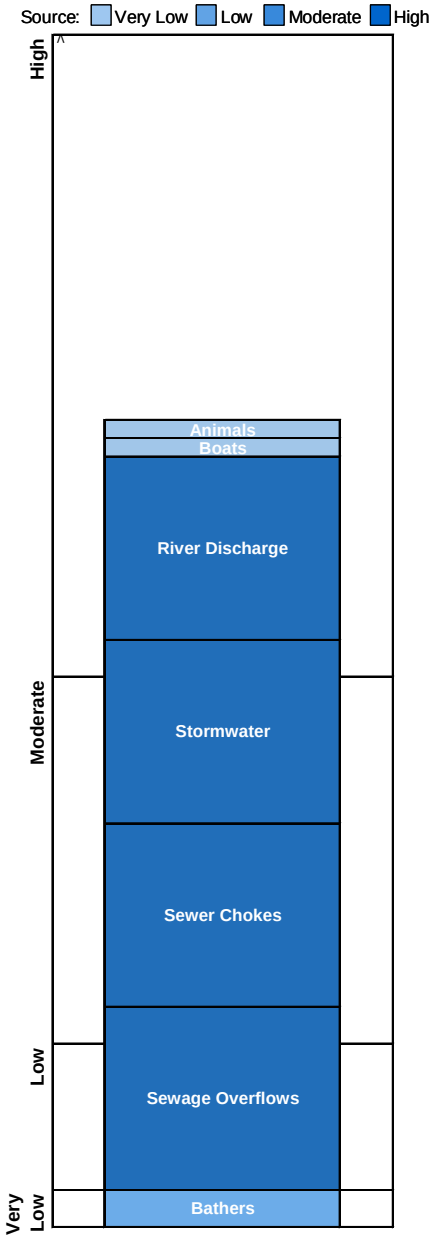
The pool is located at the end of Tambourine Bay in the lower Lane Cove River. It is backed by parklands with picnic and barbeque facilities and a playground. Lane Cove Council has currently closed the baths and the long-term future of the site is yet to be determined.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from stormwater, sewer chokes and sewage overflows in the Lane Cove River catchment.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

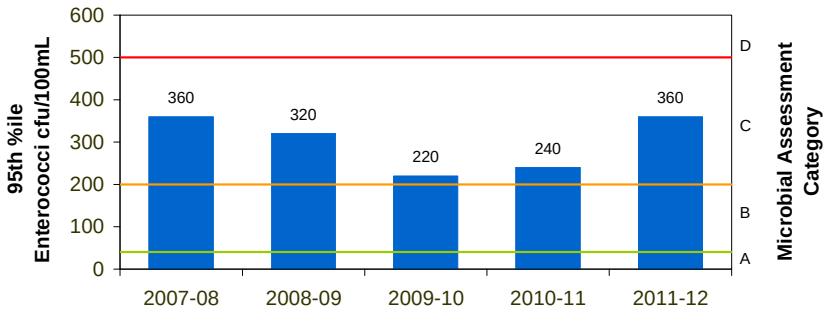
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **High**



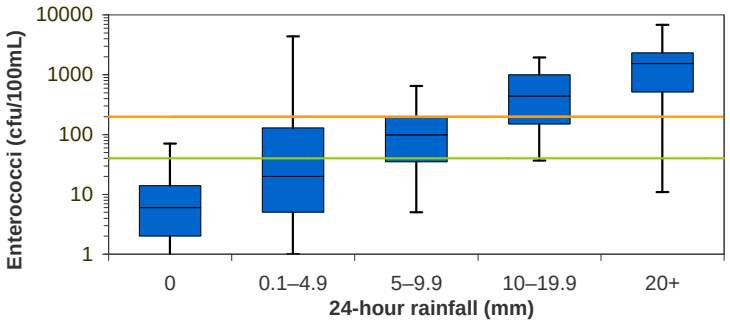
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

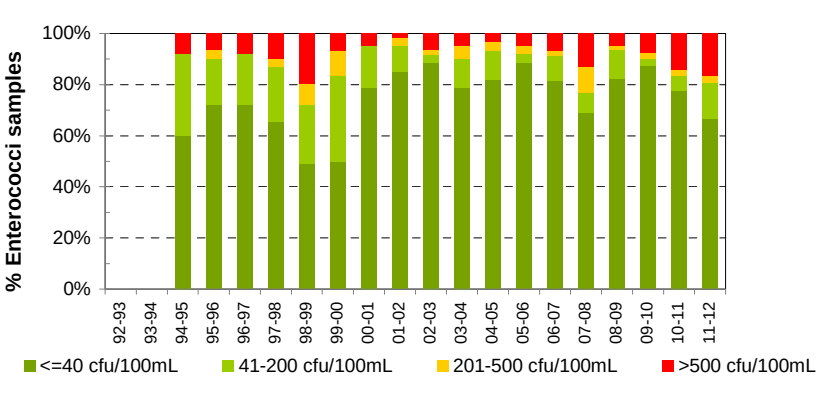


Response to rainfall

Rainfall from Gladesville rain gauge



Trends in enterococci data through time



Woodford Bay

Beach Suitability Grade: **Good**

See page 21 for key to map

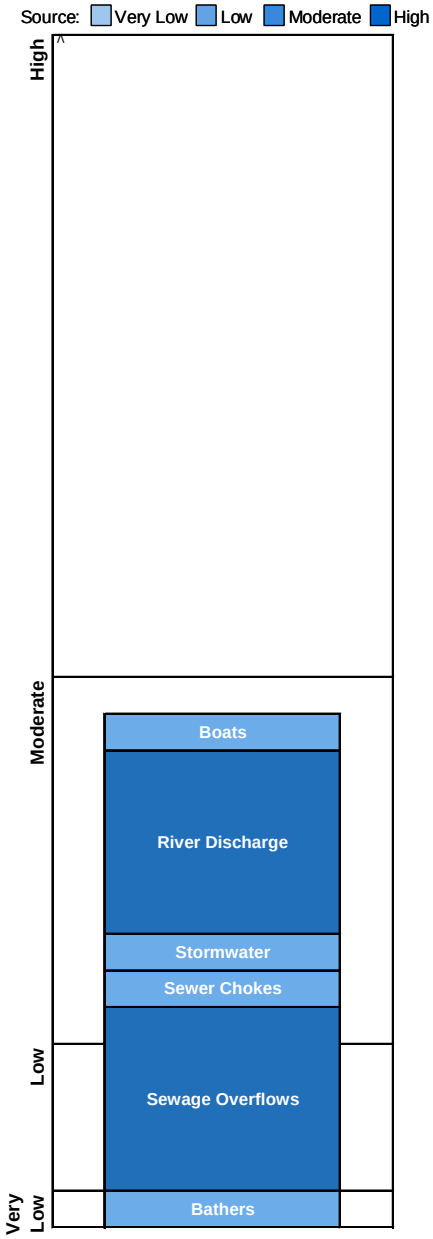
This site is a 20 by 25 metre enclosed swimming area located on the western side of Woodford Bay in the lower Lane Cove River. The swimming area is backed by a narrow sandy beach and park.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination including sewage overflows in the Lane Cove River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

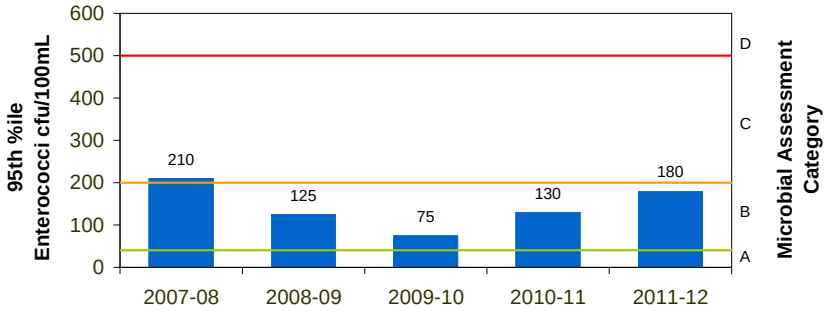
The site has been monitored since 1994. Microbial water quality has improved slightly since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



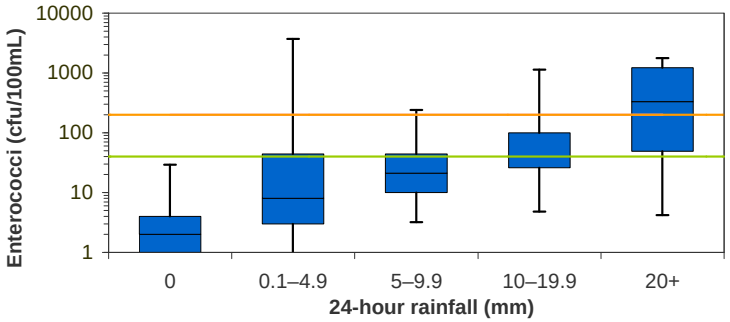
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

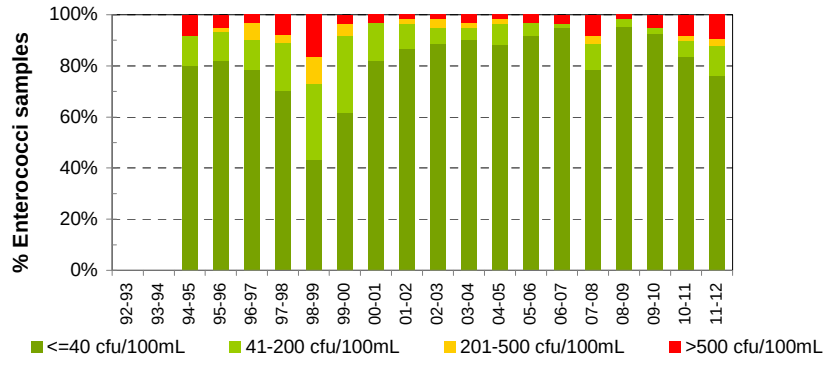


Response to rainfall

Rainfall from Gladesville rain gauge



Trends in enterococci data through time



Greenwich Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

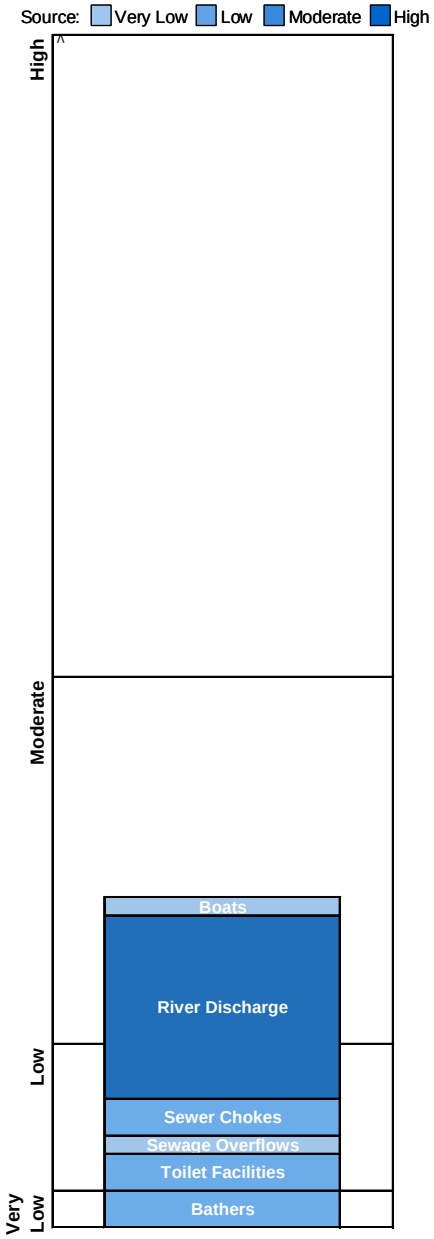
Greenwich Baths are a 40 metre long netted swimming area backed by a sandy beach. The baths are adjacent to a park and are open during the swimming season. There are toilet and shower facilities and a kiosk.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of faecal contamination, including discharge from Lane Cove River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

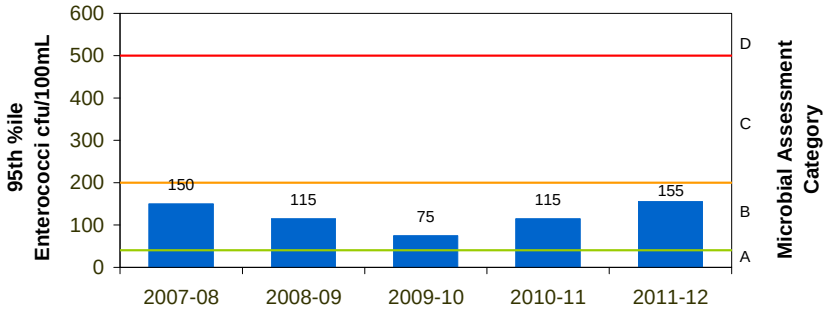
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



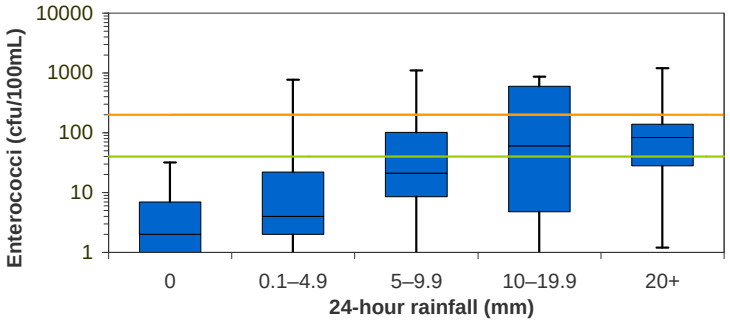
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

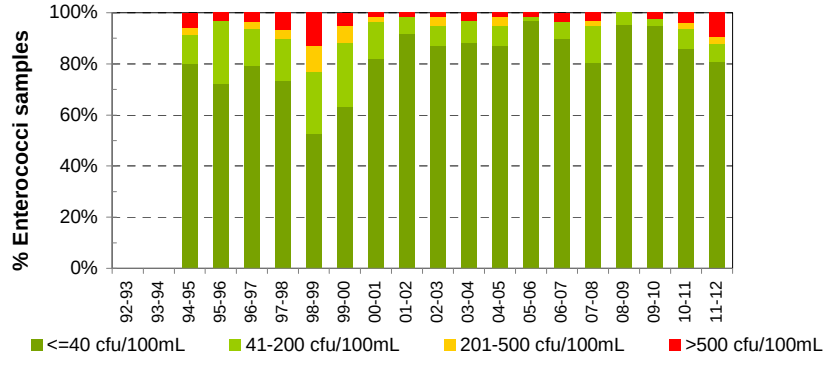


Response to rainfall

Rainfall from Lilyfield rain gauge



Trends in enterococci data through time



Hayes Street Beach

Beach Suitability Grade: **Poor**

See page 21 for key to map

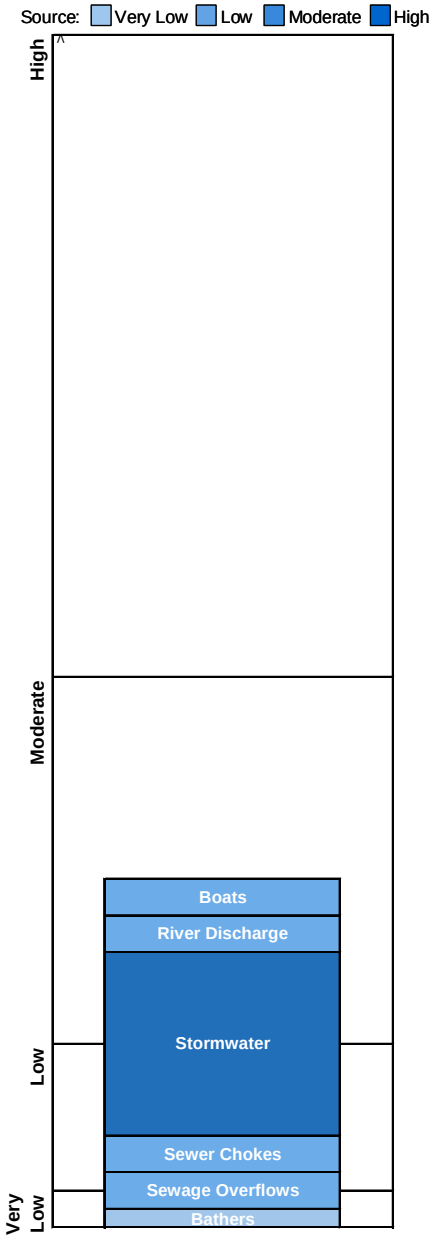
Hayes Street Beach is approximately 50 metres long and is located adjacent to the Hayes Street Ferry Wharf in Neutral Bay. The area is not netted.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from sources including stormwater, sewer chokes and sewage overflows.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, frequently exceeding the safe swimming limit in response to 5 mm of rainfall or more.

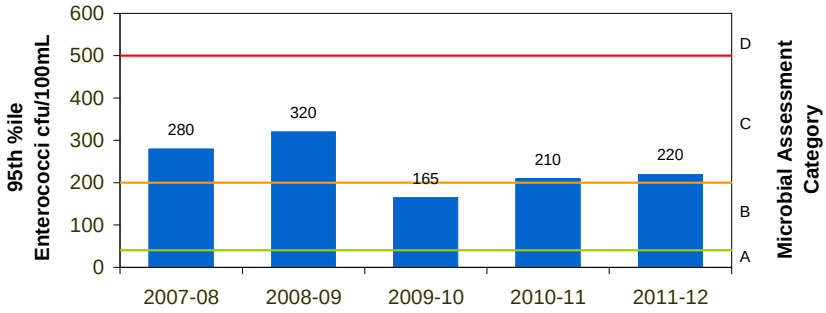
The site has been monitored since 1994.

Sanitary Inspection: **Moderate**



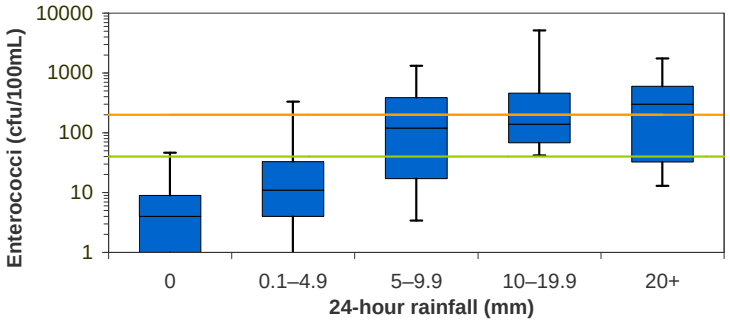
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

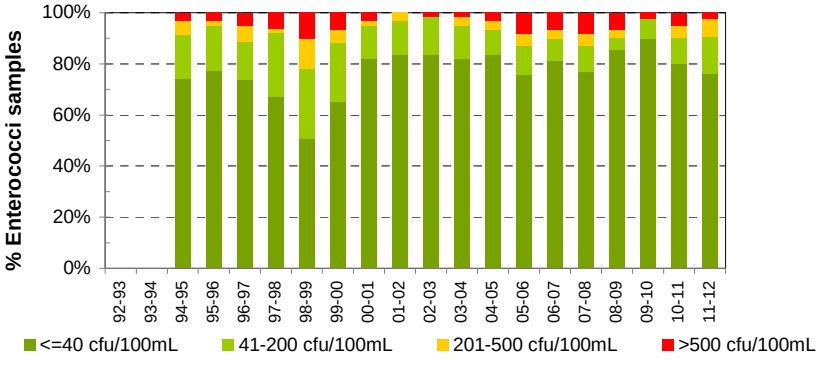


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Clifton Gardens

Beach Suitability Grade: **Good**

See page 21 for key to map

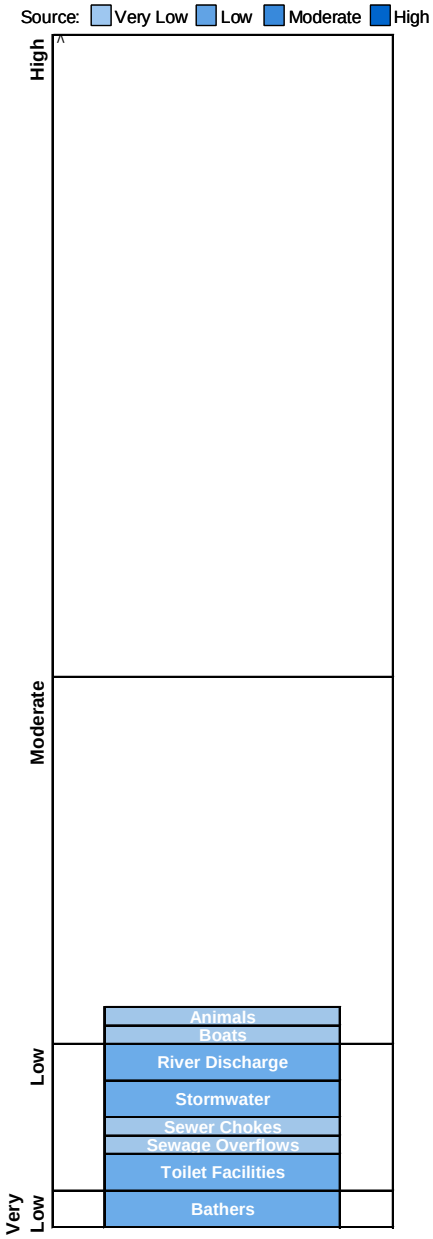
Clifton Gardens is a large netted swimming area located at the western end of a 250 metre long beach in Chowder Bay. The beach is backed by Sydney Harbour National Park and a park with picnic and toilet facilities.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from several potential sources of minor faecal contamination.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, frequently exceeding the safe swimming limit in response to 10 mm of rainfall or more.

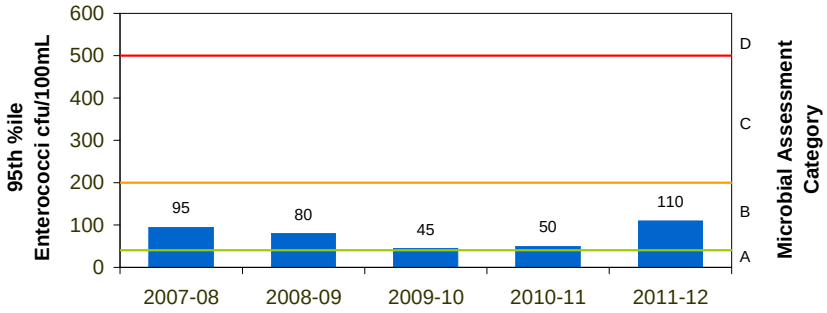
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



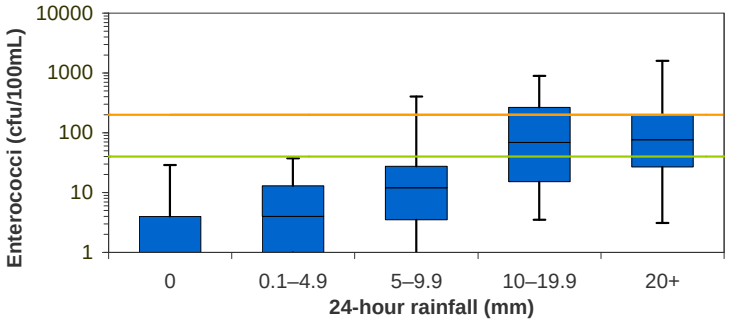
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

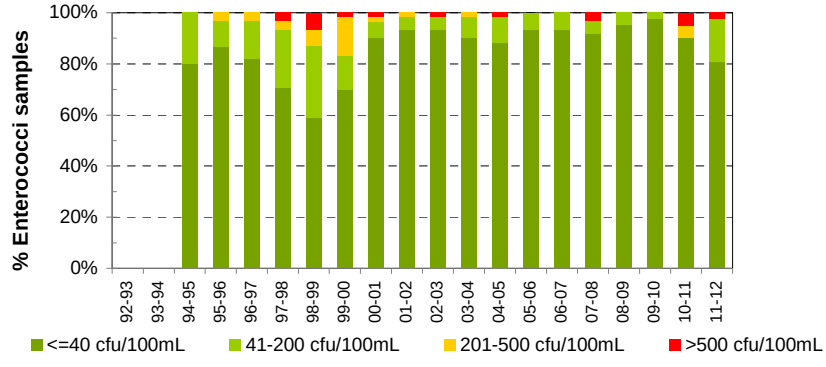


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Balmoral Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

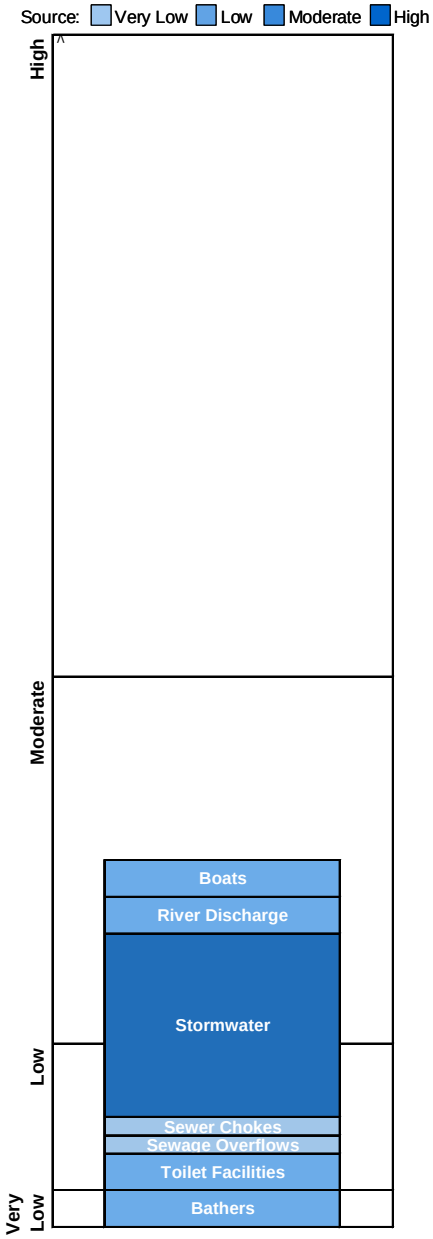
Balmoral Baths are a netted swimming area located towards the eastern end of Balmoral Beach, adjacent to a park with picnic and toilet facilities.

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

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

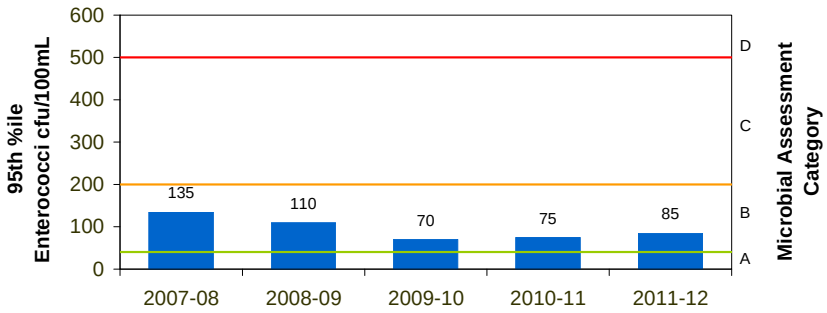
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



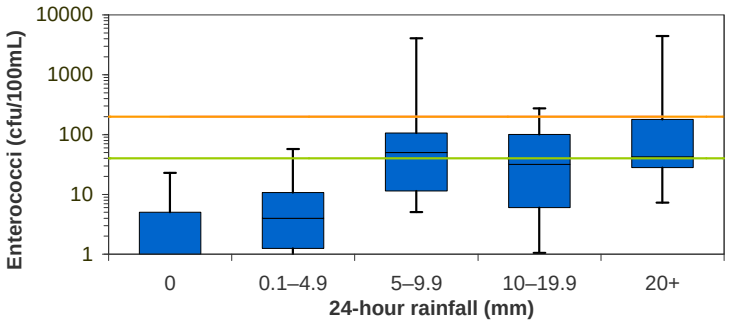
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

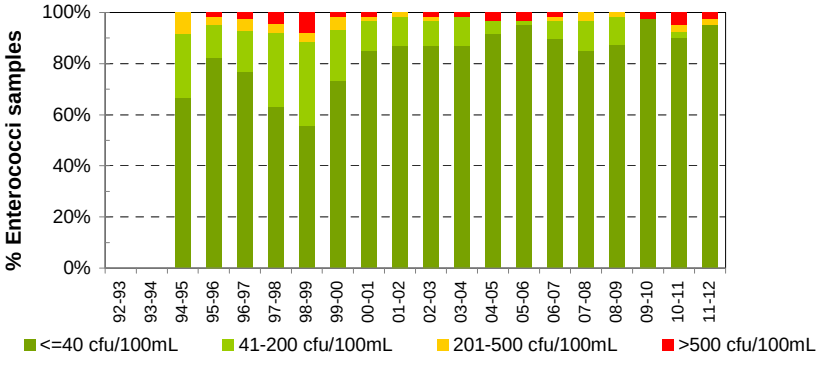


Response to rainfall

Rainfall from Mosman rain gauge

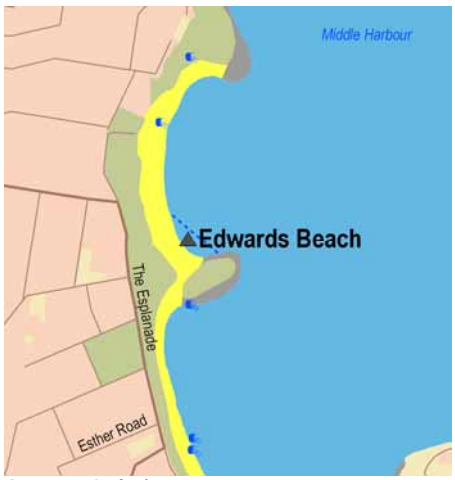


Trends in enterococci data through time



Edwards Beach

Beach Suitability Grade: **Good**



See page 21 for key to map

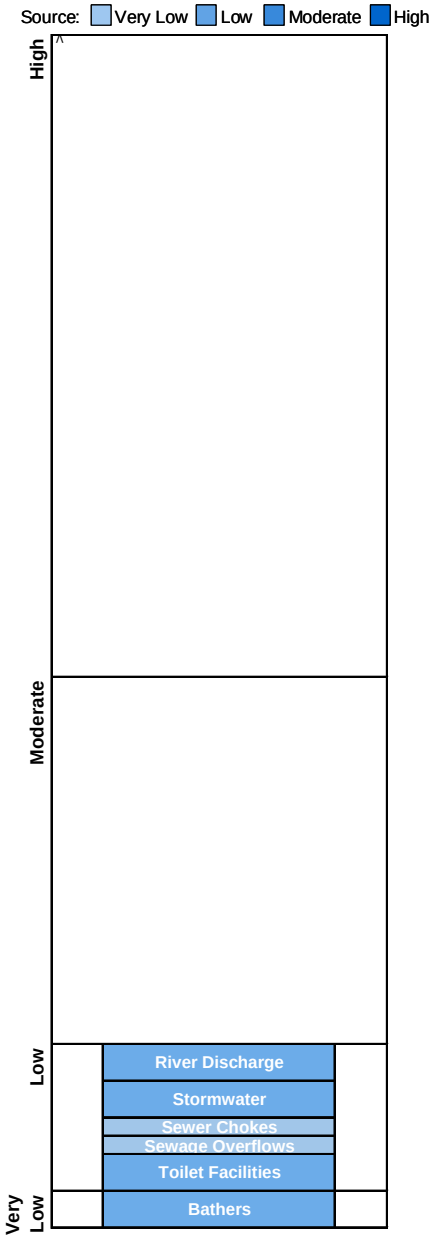
Edwards Beach is a popular swimming area located at the southern end of the beach adjacent to a promenade, park and café facilities.

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

The response to rainfall graph indicates that enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm of rainfall or more.

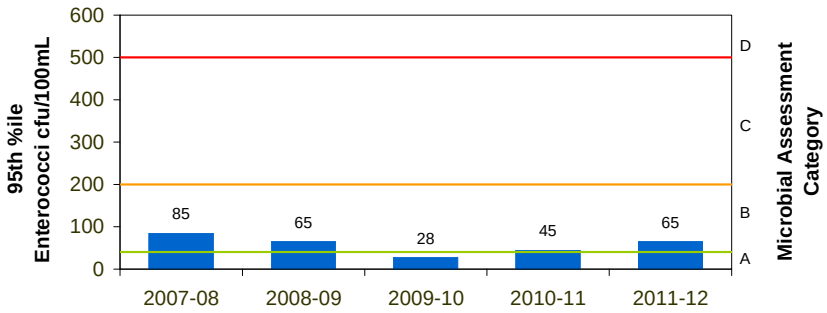
The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



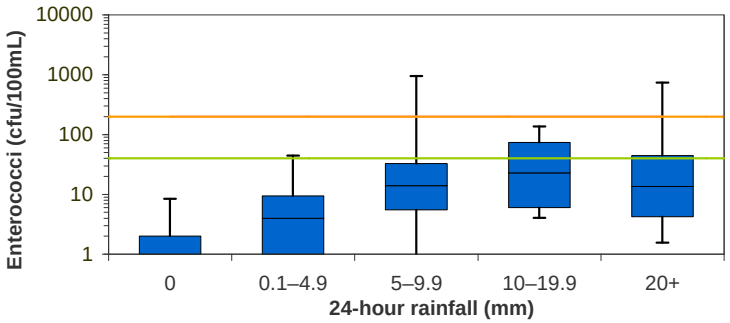
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

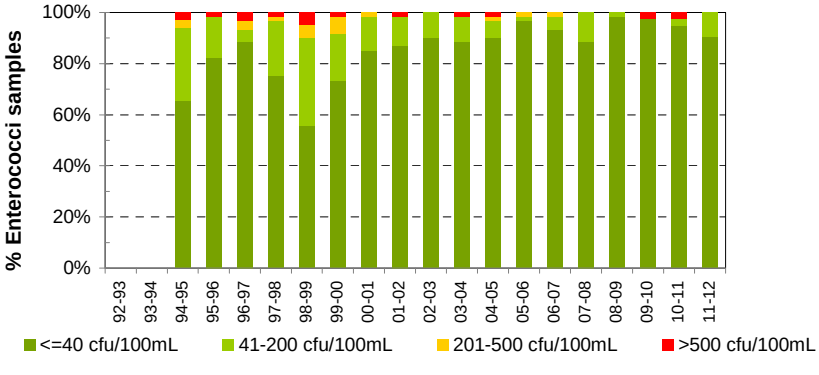


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Chinamans Beach

Beach Suitability Grade: **Good**

See page 21 for key to map

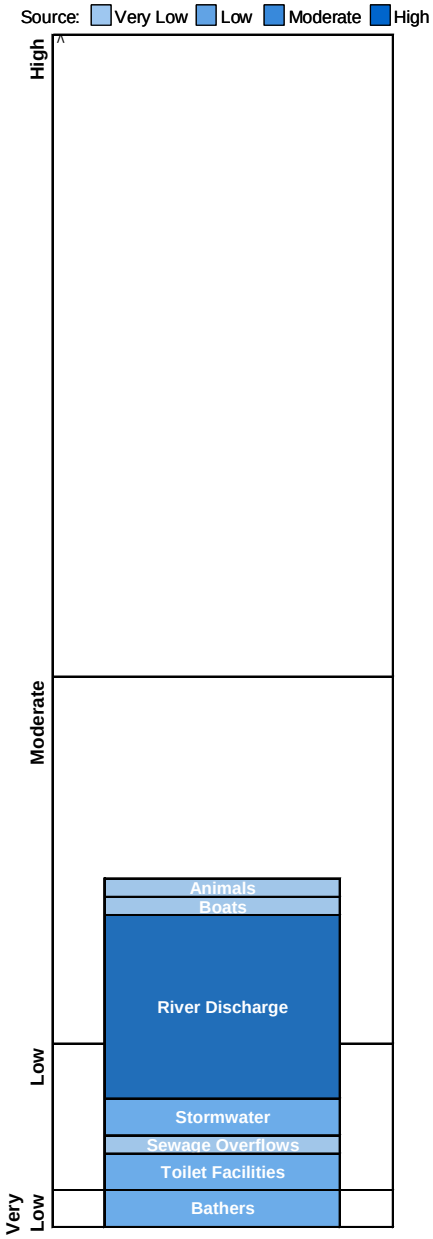
Chinamans Beach is approximately 250 metres long and is a popular swimming area in Middle Harbour. It is backed by Rosherville Reserve.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rainfall or more.

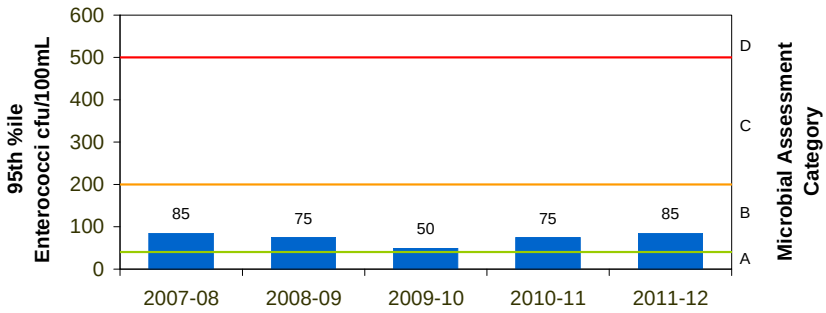
The site has been monitored since 1998. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



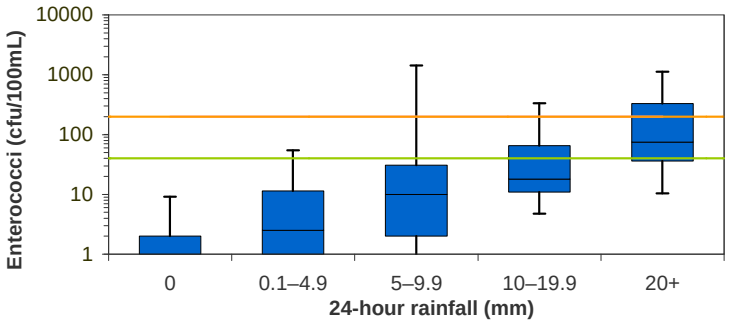
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

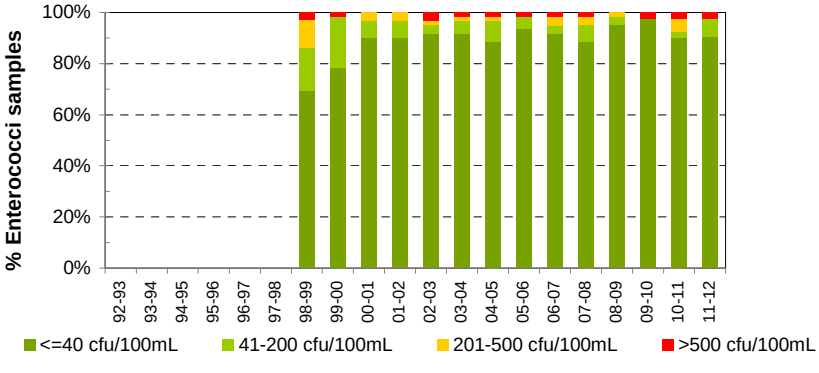


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Northbridge Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

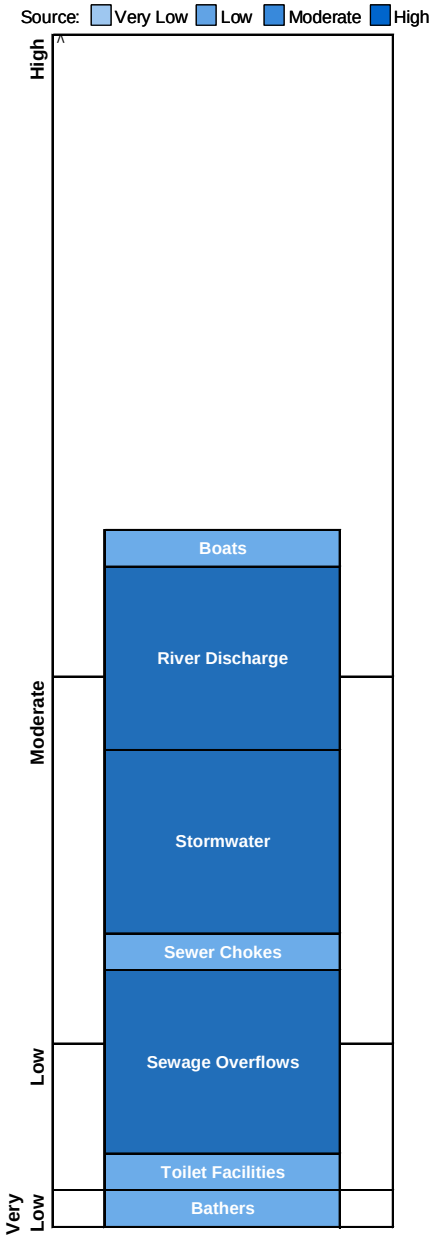
Northbridge Baths are a 30 by 65 metre enclosed swimming area in Sailors Bay, Middle Harbour. The baths are open year round; however, installed signage advises that swimming is not recommended during rain and up to 48 hours after rainfall.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater, sewage overflows and upstream sources in Middle Harbour.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

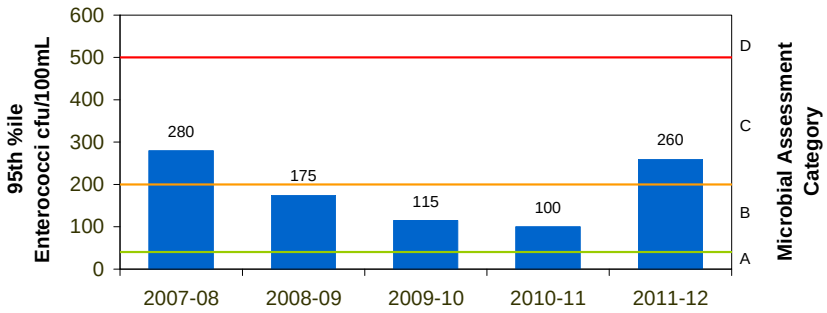
The site has been monitored since 1994. Microbial water quality has improved slightly since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **High**



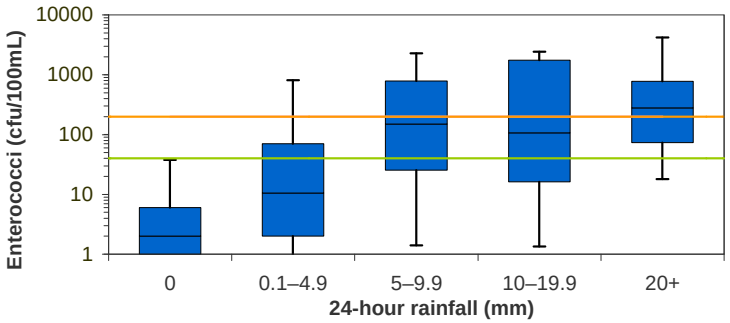
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

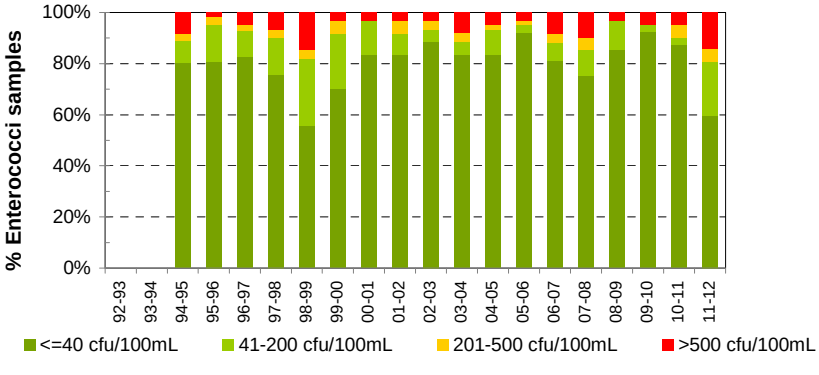


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Davidson Reserve

Beach Suitability Grade: **Very Poor**

See page 21 for key to map

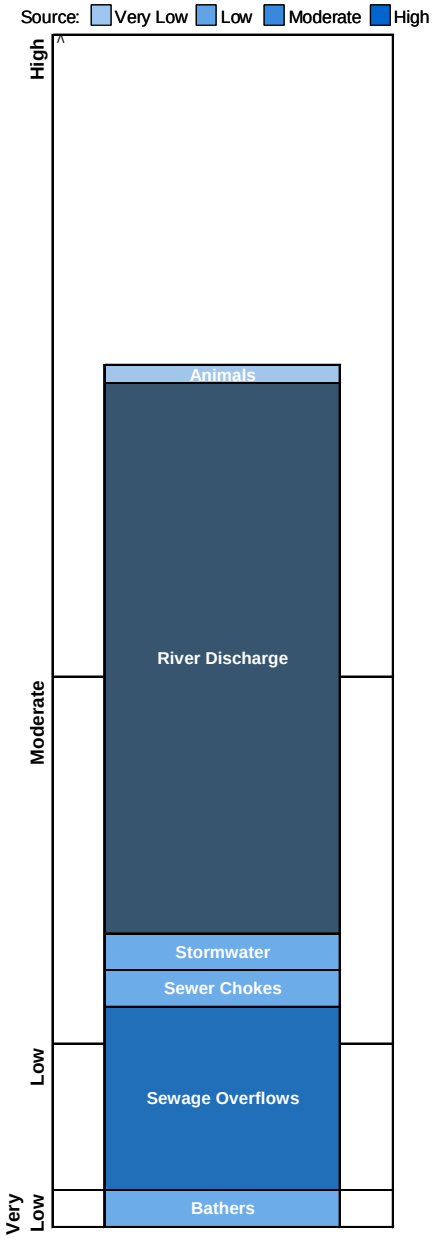
Davidson Reserve is a 25 metre long netted swimming area situated within Garigal National Park. The beach is backed by a reserve with picnic facilities.

The Beach Suitability Grade of Very Poor indicates that microbial water quality is highly influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from sewer chokes and sewage overflows and upstream sources in Middle Harbour. Swimming should be avoided up to three days after rainfall, and at times when there are signs of stormwater pollution, such as discoloured water or odour or floating debris.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to low levels of rainfall.

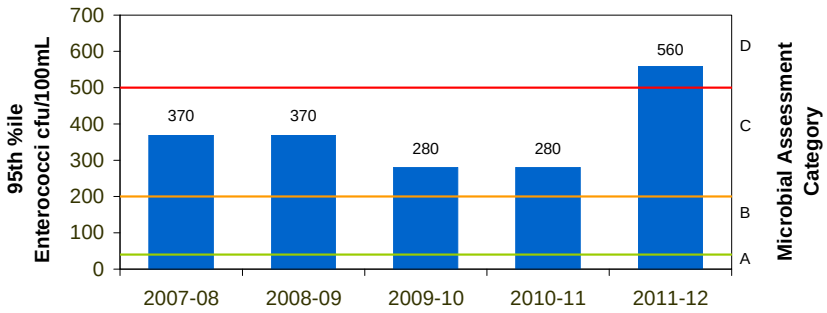
The site has been monitored since 1994.

Sanitary Inspection: **High**



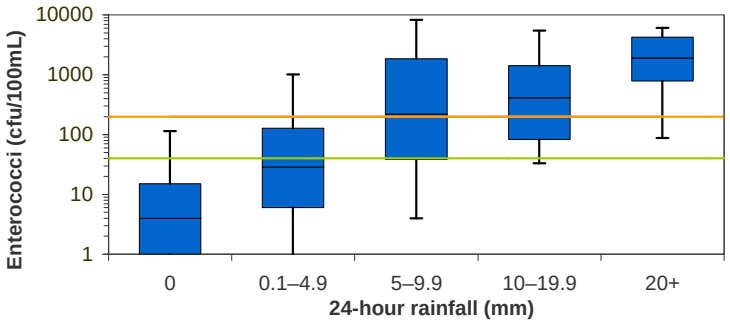
Microbial Assessment: **D**

Monitoring period for 2011–12 result is January 2010 to April 2012.

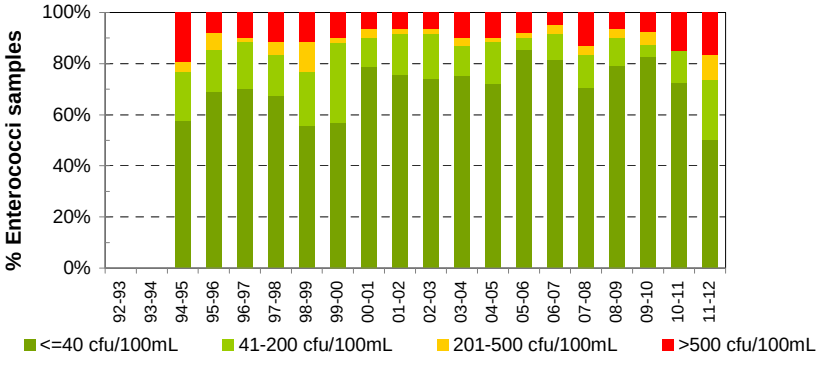


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Gurney Crescent Baths

Beach Suitability Grade: **Fair**

See page 21 for key to map

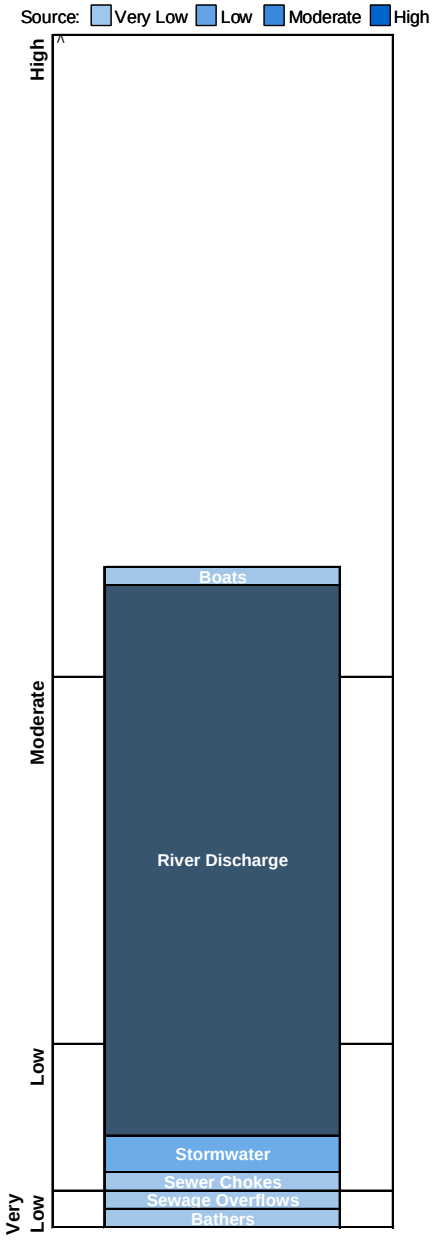
Gurney Crescent Baths are a 20 metre square netted swimming area located at Pickering Point, Middle Harbour. The baths are backed by a bush reserve and are not a popular swimming location.

The Beach Suitability Grade of Fair indicates that microbial water quality is occasionally influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from river discharge.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 5 mm of rainfall or more.

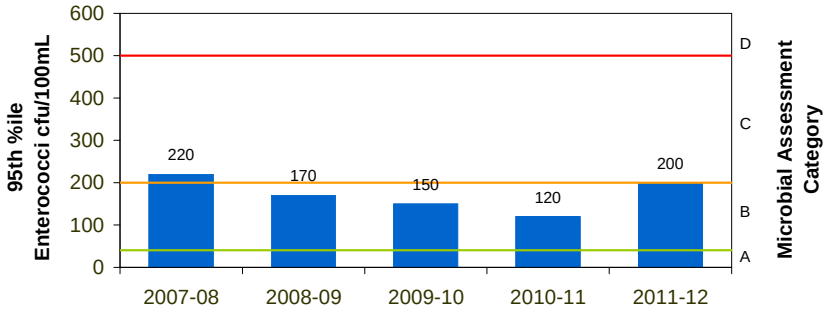
The site has been monitored since 1996.

Sanitary Inspection: **High**



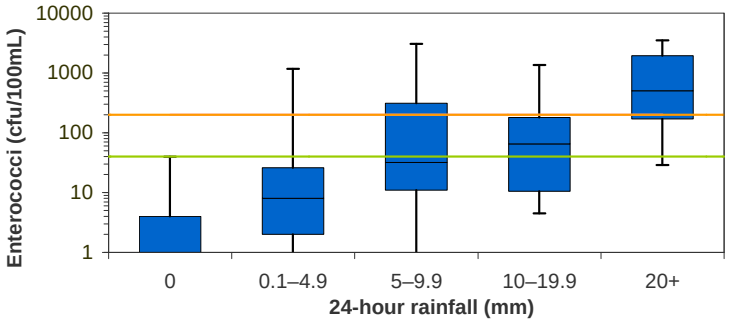
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

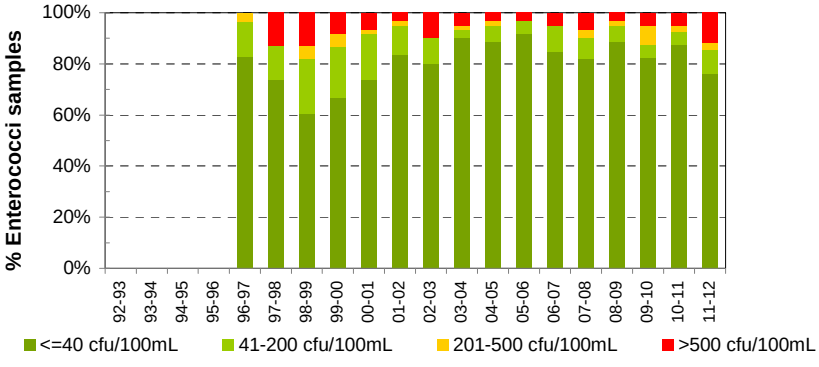


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Clontarf Pool

Beach Suitability Grade: **Fair**

See page 21 for key to map

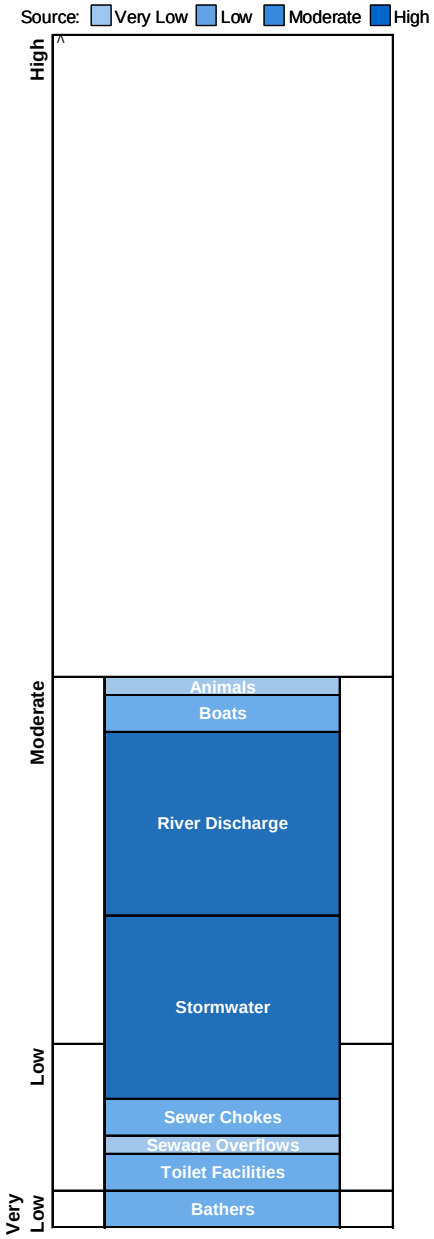
Clontarf Pool is a small netted swimming area accessed via Clontarf Reserve. The pool is backed by a narrow sandy beach and a park with a picnic area, barbeque facilities and a playground.

The Beach Suitability Grade of Fair indicates that microbial water quality is occasionally influenced by faecal pollution, usually triggered by rainfall, with several potential sources of faecal contamination including river discharge and stormwater.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

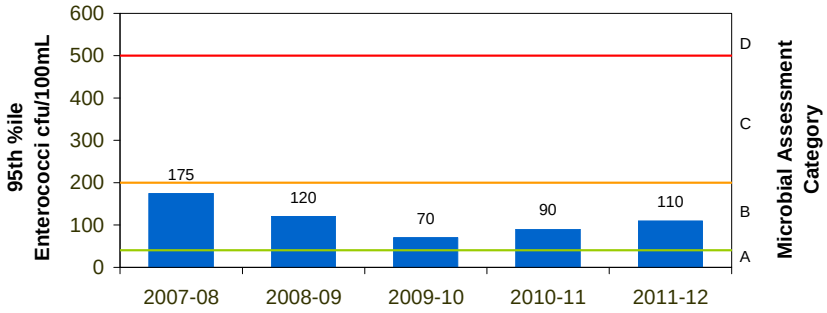
The site has been monitored since 1994. Microbial water quality has improved slightly since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **High**



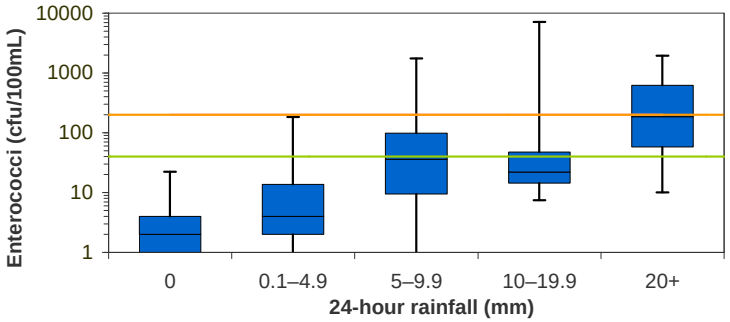
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

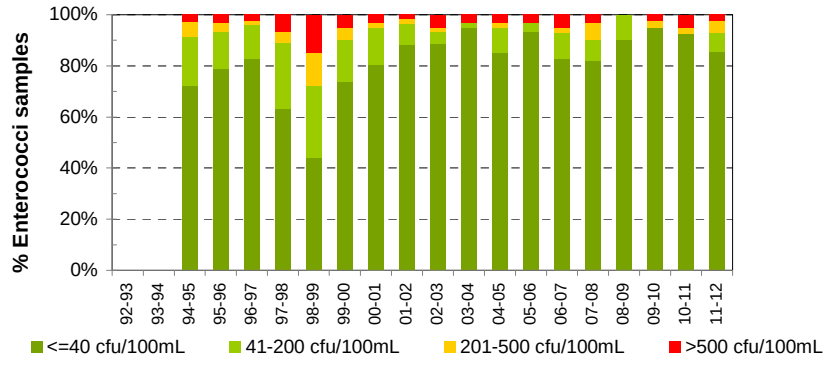


Response to rainfall

Rainfall from Mosman rain gauge



Trends in enterococci data through time



Forty Baskets Pool

Beach Suitability Grade: **Good**

See page 21 for key to map

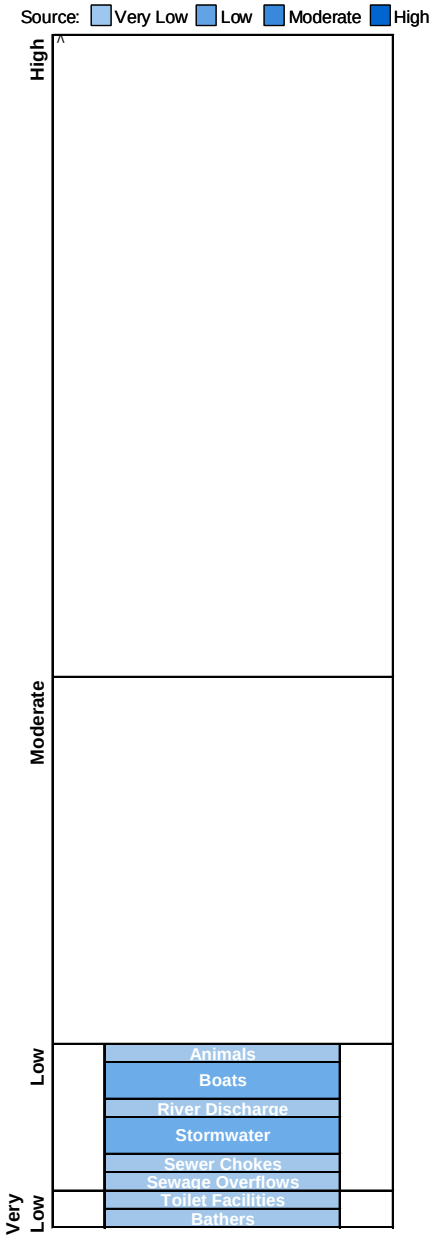
Forty Baskets Pool is a 20 by 40 metre netted swimming area at the northern end of Forty Baskets Beach in North Harbour. The beach is backed by boat storage and a small park with barbeque facilities.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of minor faecal contamination.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm of rainfall or more.

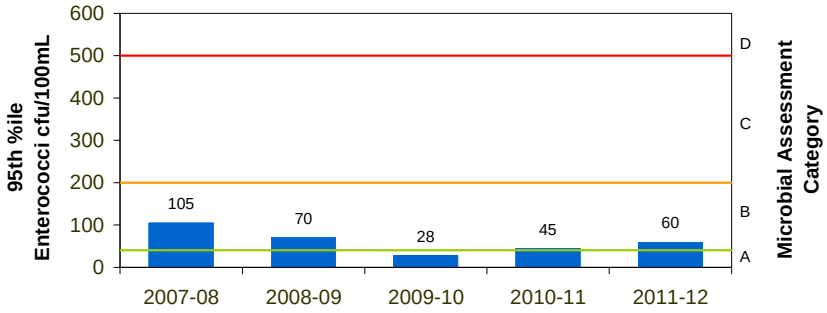
The site has been monitored since 1994. Microbial water quality has improved slightly since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



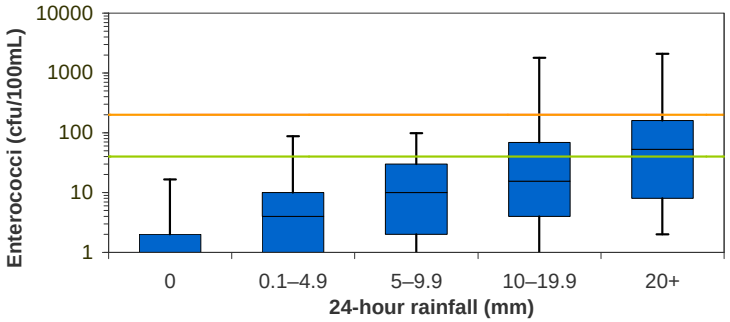
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

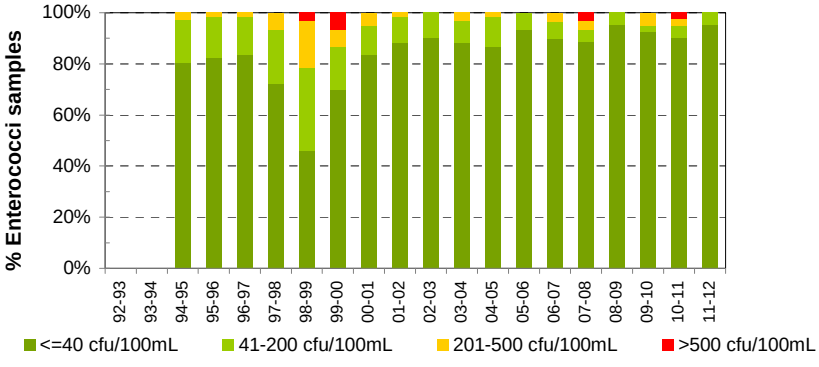


Response to rainfall

Rainfall from Manly rain gauge



Trends in enterococci data through time



Fairlight Beach

Beach Suitability Grade: **Good**

See page 21 for key to map

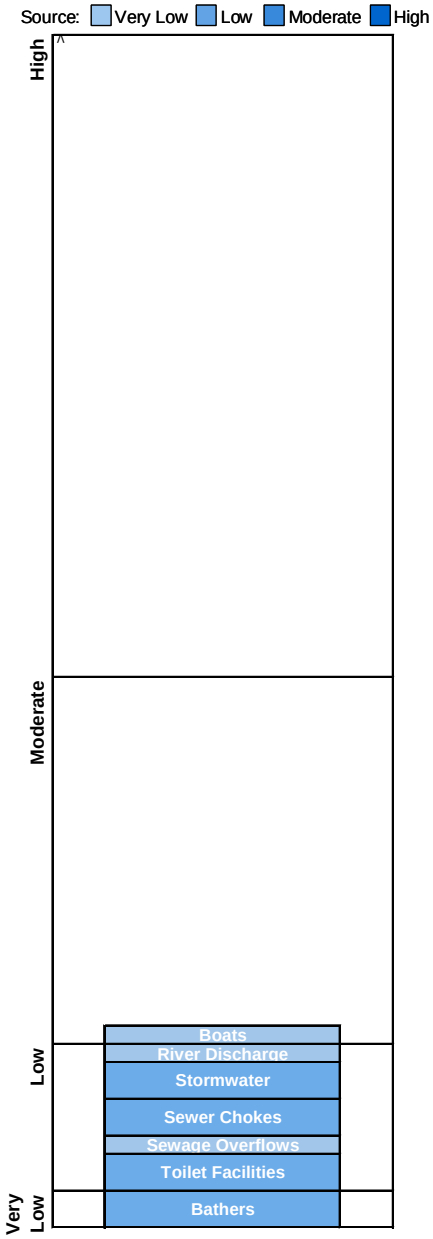
Fairlight Beach is a narrow beach located in North Harbour. The beach is backed by a small reserve and picnic area. A 25 metre pool filled with water from the harbour is adjacent to the beach.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination.

The response to rainfall graph indicates that enterococci levels generally increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm of rainfall or more.

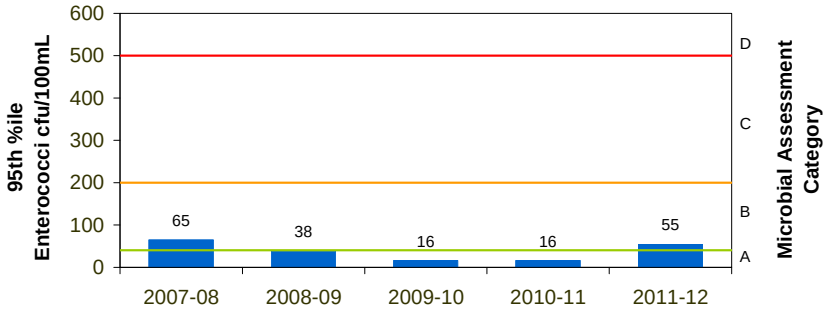
The site has been monitored since 1996. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



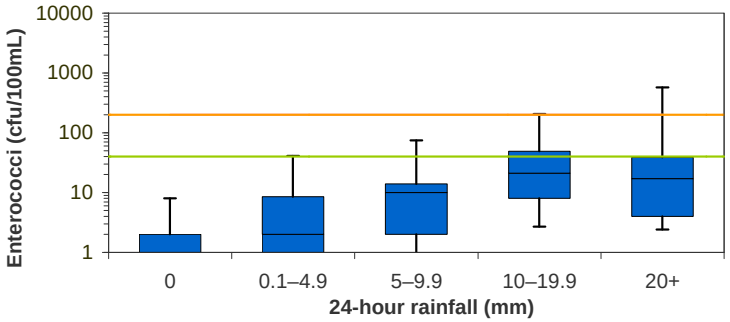
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

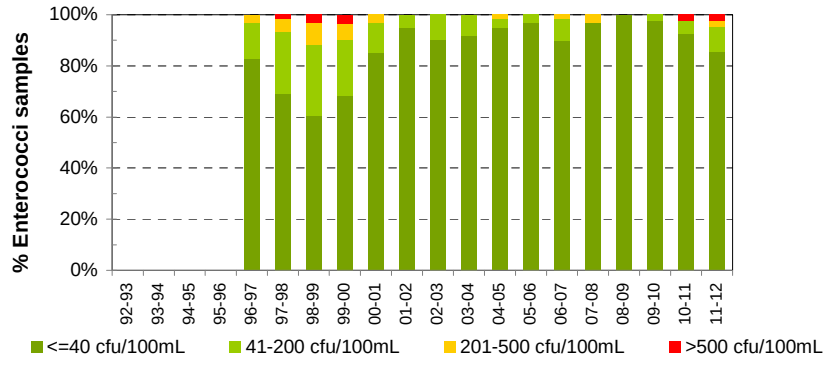


Response to rainfall

Rainfall from Manly rain gauge



Trends in enterococci data through time



Manly Cove

Beach Suitability Grade: **Good**

See page 21 for key to map

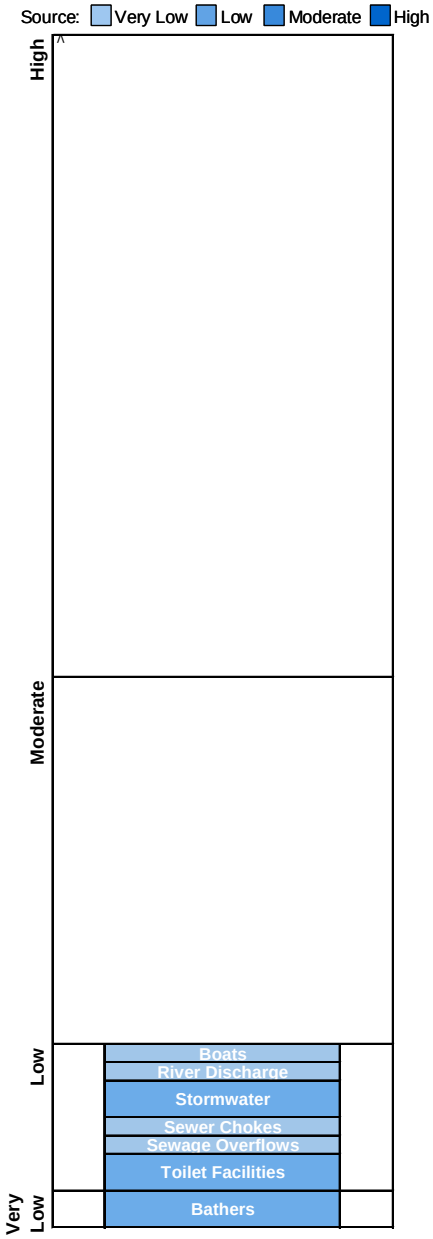
Manly Cove is a netted swimming enclosure located near the centre of the 250 metre long beach that stretches to the west of the Manly Ferry Terminal. The beach is backed by a promenade and a park.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm of rainfall or more.

The site has been monitored since 1994. Microbial water quality has generally improved since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



Microbial Assessment: **A**

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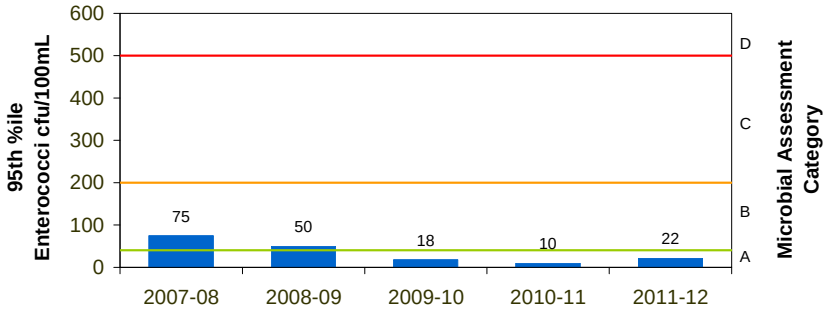
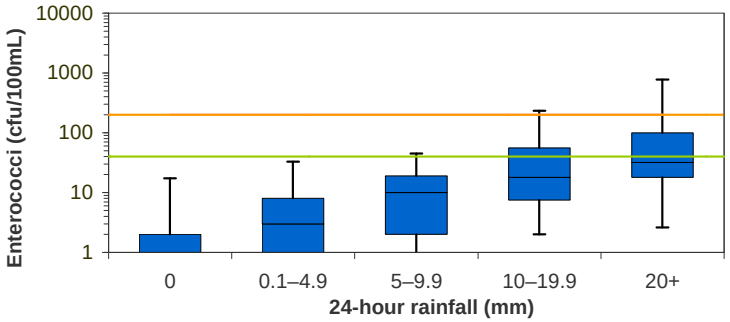
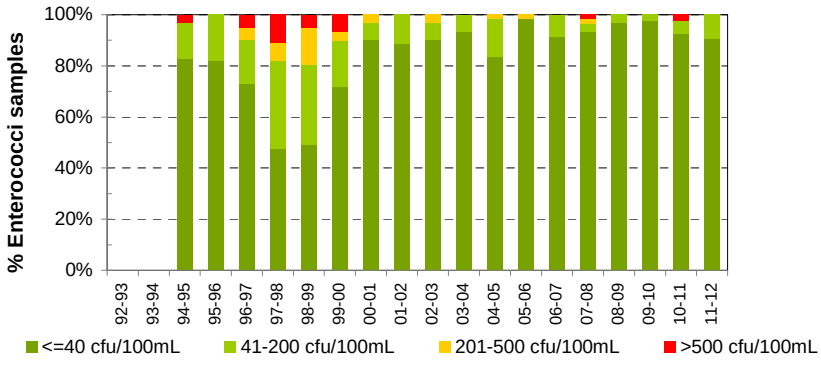


Response to rainfall

Rainfall from Manly rain gauge



Trends in enterococci data through time



Little Manly Cove

Beach Suitability Grade: **Good**

See page 21 for key to map

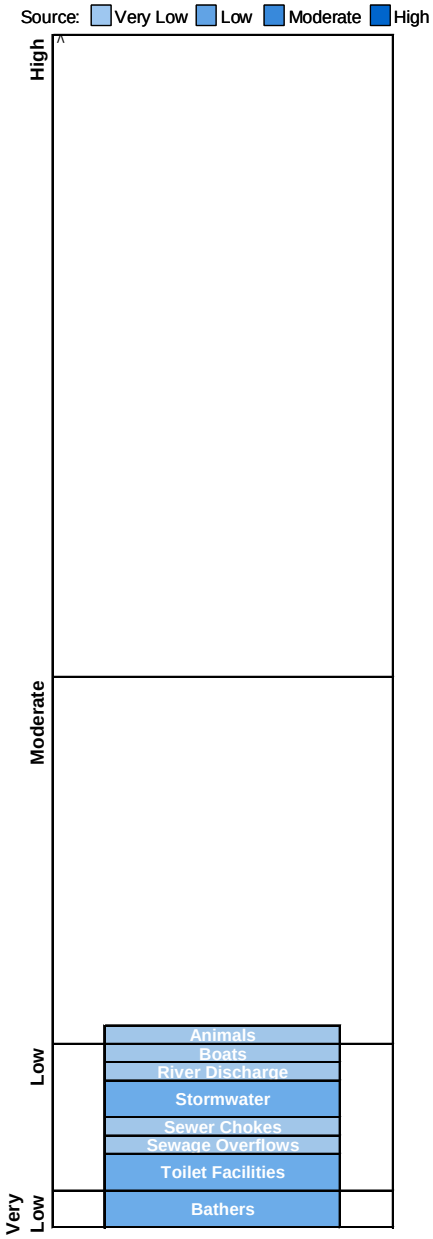
The 30 metre square swimming enclosure is located at the eastern end of the beach in Little Manly Cove. The beach is backed by a small reserve and boat launching facilities are located at the western end of the beach.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 10 mm of rainfall or more.

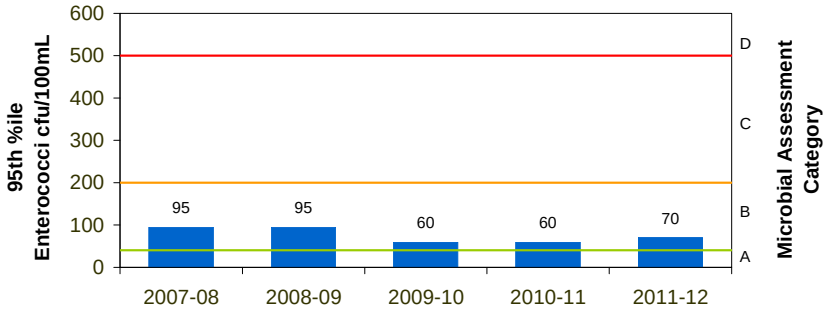
The site has been monitored since 1994. Microbial water quality has improved slightly since 2000–2001 owing to licensing of discharges from the sewerage system and improved management of stormwater.

Sanitary Inspection: **Moderate**



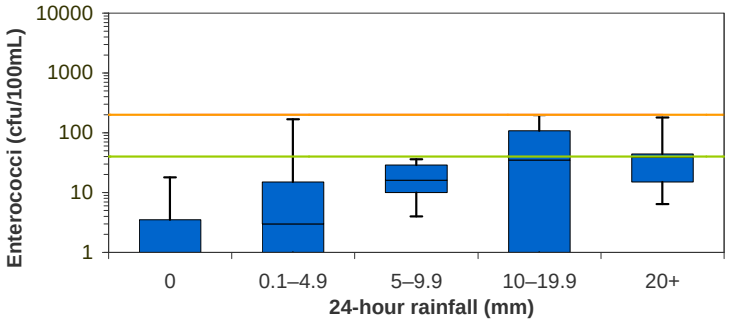
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

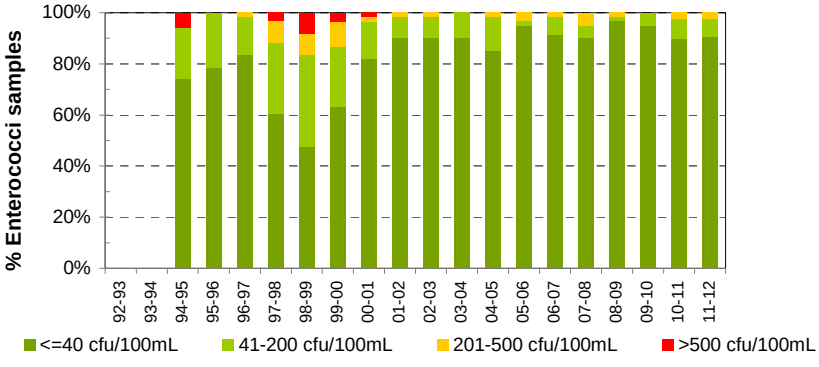


Response to rainfall

Rainfall from Manly rain gauge



Trends in enterococci data through time



Botany Bay and lower Georges River

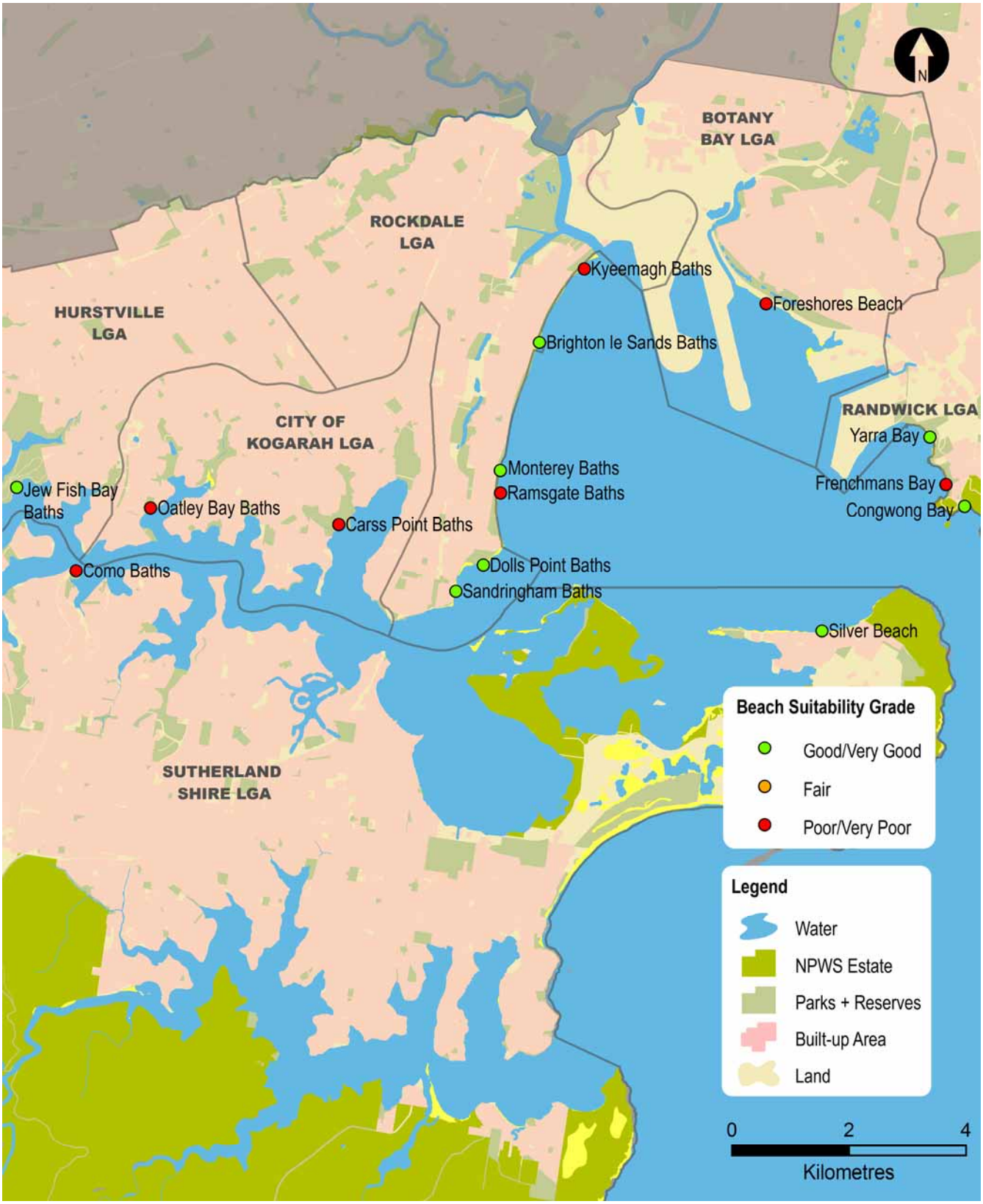


Figure 27: Sampling locations and Beach Suitability Grades in Botany Bay and lower Georges River

Overview of the area

Description

Botany Bay is a wide, shallow embayment located approximately 10 kilometres south of Sydney. The Bay is a working port and is also used for swimming, recreational boating, fishing and aesthetic enjoyment. The major tributaries are the Georges River, Cooks River and Woronora River.

The Botany Bay catchment covers an area of 1165 square kilometres and has a population of approximately two million people. Approximately 50 per cent of the catchment is urbanised, with large sections of bushland in the south-west of the catchment, including the water catchment for Woronora Dam and Heathcote National Park.

The waterway is home to many endangered species and communities and includes Towra Point Nature Reserve (a RAMSAR-listed wetland) and the Cape Banks Aquatic Reserve.

Rainfall

There were several significant rain and flooding events in the Sydney region during 2011–2012 (BOM 2012):

- Rainfall was above average in Sydney during December, January (the wettest since 2001) and February.
- Wet weather continued during March, the wettest since 1984, with heavy rainfall (24-hour total of 106 mm at Oatley) resulting in widespread flash flooding.
- Another extremely wet period was recorded in the middle of April when some areas in the Botany Bay and lower Georges River catchment received more than 100 mm of rainfall in two days. This event triggered widespread flash flooding and sewage overflows, particularly in Mill Pond Creek, Cooks River and lower Georges River.

Assessment

Microbial water quality

Since May 2009, enterococci samples at the 15 swimming locations in Botany Bay and the lower Georges River have been collected every sixth day during the swimming season and monthly between May and September, providing approximately 40 samples each year. This number is well above NHMRC's recommended 20 samples per year. Prior to May 2009, samples were collected approximately every sixth day throughout the year.

The Microbial Assessment Category for 2011–2012 was calculated from the most recent 100 data points up until the end of the 2011–2012 swimming season (January 2010 until April 2012).

Sanitary inspections

Sanitary inspections have been completed for all swimming locations in Botany Bay and lower Georges River. The sanitary inspections will be reviewed during 2012–2013.

Beach Suitability Grades

Eight of the 15 swimming locations in Botany Bay and lower Georges River were graded as Good during the 2011–2012 swimming season (Figure 27).

Very Good

No Botany Bay or lower Georges River swimming locations were graded as Very Good.

Good

Eight swimming locations were graded as Good: Silver Beach, Jew Fish Bay Baths, Sandringham Baths, Dolls Point Baths, Monterey Baths, Brighton-Le-Sands Baths, Yarra Bay and Congwong Bay.

These sites had mostly good water quality (Microbial Assessment Category B) but had several or significant potential sources of microbial contamination, such as urban stormwater runoff or sewage overflows.

Fair

No swimming locations were classified as Fair.

Poor

Six swimming locations were graded as Poor: Como Baths, Oatley Bay Baths, Carss Point Baths, Ramsgate Baths, Kyeemagh Baths and Frenchmans Bay.

Water quality at these sites was suitable for swimming during dry weather only. Elevated enterococci levels were frequently measured during and following rainfall as a result of many significant sources of microbial contamination, such as urban stormwater runoff, sewage overflows or river discharge (poor quality water flowing down from upstream sources of pollution). Swimming should be avoided during and for up to three days following rainfall or if there are signs of stormwater pollution, such as discoloured water or odour or floating debris.

Very Poor

Foreshores Beach was graded as Very Poor. Although microbial water quality was often suitable for swimming during dry weather conditions, the site is very susceptible to faecal contamination from the sewage overflows which discharge into Mill Pond Creek. To reduce the risk of contracting swimming related illnesses at this site, carefully follow the pollution advisories in the Beachwatch Daily Bulletin (www.environment.nsw.gov.au/beach), avoid swimming during and up to three days following light rainfall, and check Sydney Water's website for sewage overflow notifications (www.sydneywater.com.au).

Management

Wastewater management

The vast majority of households in the Botany Bay and lower Georges River catchments are connected to Sydney Water's reticulated sewerage system.

The Malabar WWTP services the northern catchment of Botany Bay and lower Georges River. It is the largest wastewater treatment plant in the southern hemisphere and discharges approximately 498 million litres of high-rate primary-treated effluent each day from a deep ocean outfall located 3.6 kilometres offshore at a depth of 82 metres (EPA NSW 2012).

The Cronulla WWTP services the southern catchment of Botany Bay and lower Georges River. The plant discharges approximately 53 million litres of tertiary-treated and disinfected effluent each day from the shoreline outfall at Potter Point in Bate Bay.

To reduce the incidence of wet weather sewage overflows in the catchments of Lime Kiln Bay, Jew Fish Bay, Gungal Bay, Oatley Bay and Neverfail Bay, Sydney Water has amplified sewer pipes and pumps and included storage tanks.

Sydney Water is inspecting, cleaning and repairing sewer mains that have a high likelihood of discharging sewage to waterways if they become blocked in the catchment of Brighton-Le-Sands and Oatley Bay Baths. When significant tree root intrusion to the public sewer from the private sewer is identified, property owners are requested to remedy the problem.

Sydney Water also conducts dry weather monitoring of main stormwater drains to identify sewer leaks. Leaks from the public sewer are repaired by Sydney Water and private sewer leaks are referred to local councils.

Sewage pump-out facilities for boats are provided at Blakehurst Marina and St George Motor Boat Club.

Stormwater management

Stormwater management plans have been developed for Mill Pond Creek, lower Georges River and Cooks River. These plans contain many structural and non-structural actions to improve water quality in these waterways and in Botany Bay.

Stormwater quality improvement works such as the installation of gross pollutant traps and construction of wetlands have been carried out in the Carss Point Baths, Oatley Bay Baths, Sandringham Baths, Dolls Point Baths, Ramsgate Baths and Brighton-Le-Sands Baths catchments.

Randwick City Council commenced a water quality study at Frenchmans Bay and Yarra Bay in June 2012, with an aim to improve water quality at these swimming locations. The investigation will evaluate microbial contamination levels to assist in determining the potential primary and contributing sources of pollution. A major kerb, gutter, stormwater pit and pipe network expansion was also undertaken in 2011–2012, capturing stormwater along Bunnerong Road and directing it into the natural watercourse that feeds into the Phillip Bay catchment and Yarra Bay.

In July 2012, Randwick City Council completed the installation of a stormwater harvesting system in Bicentennial Park which captures stormwater from the Phillip Bay catchment for treatment and re-use. This water is used to irrigate the surrounding parks and vegetation as well as for toilet flushing in the amenities building located within Bicentennial Park. This will reduce the amount of stormwater entering Yarra Bay.

Kogarah City, Hurstville, Sutherland and Rockdale councils have received $1.9 million in funding from the NSW Environmental Trust to develop the lower Georges River Sustainability Initiative. The grant will fund the development of a sustainability plan as well as works such as the installation of stormwater improvement devices in the catchment.

Kogarah City Council received funding from the NSW Environmental Trust to install a stormwater harvesting plant on the Carlton Industrial site. Water from the plant is used by businesses on the estate for cleaning and other uses.

Kogarah City Council has developed the Carss Bush Park Landscape Master Plan which involves infrastructure renewal and development increasing public access to the park and foreshore, and improving stormwater entry to Kogarah Bay and the baths. Other projects include the Moore Reserve

wetlands restoration and monitoring project which involves an assessment and management works program to revitalise the wetland environment and ensure continued growth of this high biodiversity area while improving the quality of water entering Oatley Bay.

Sutherland Shire Council's stormwater levy funds projects such as the installation of pipes, drains and stormwater quality improvement devices, as well as riparian revegetation works to alleviate flooding and improve water quality in creeks and rivers. The levy also funds stormwater infrastructure maintenance.

Sutherland Shire Council has installed more than 20 systems to improve stormwater quality in the local government area, including artificial wetlands, gross pollutant traps, continuous deflective separators and natural sand drainage systems. They have also undertaken education programs, drain stencilling and water quality monitoring of the drainage system.

Estuary management

Estuary management plans have been developed for Oatley Bay, Kogarah Bay, the Woronora Estuary and the Botany Wetlands. These plans identify and prioritise actions to improve the water quality in these estuaries. An estuary management plan is also being developed for the entire Georges River as part of the commitment by the Georges River Combined Councils Committee (GRCCC) to improve the health and management of the Georges River.

Silver Beach

Beach Suitability Grade: **Good**

See page 21 for key to map

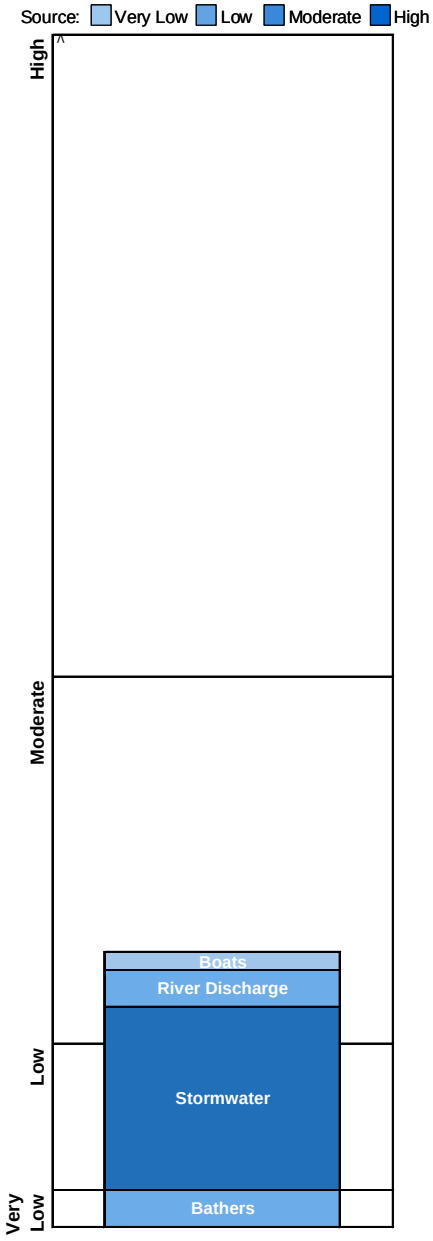
Silver Beach is approximately 2.8 kilometres long and is located on the southern shore of Botany Bay. The netted swimming area is 150 by 100 metres and is situated near the centre of the beach.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination including stormwater.

The response to rainfall graph indicates that enterococci levels increased slightly with increasing rainfall, occasionally exceeding the safe swimming limit after 20 mm of rainfall or more.

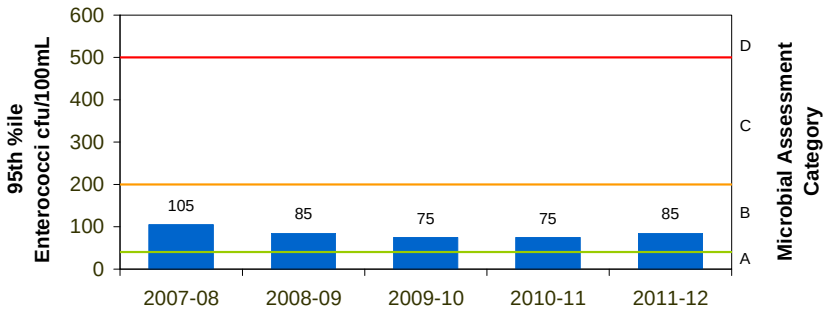
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



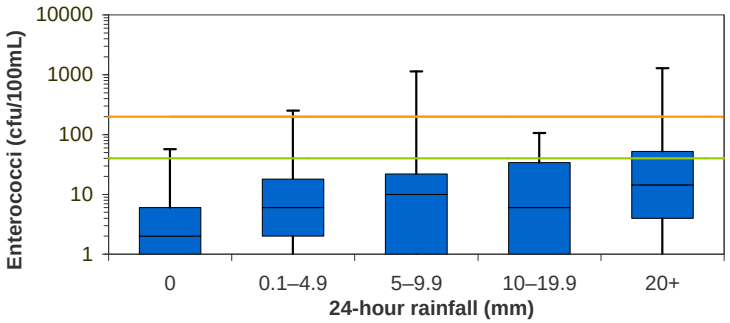
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

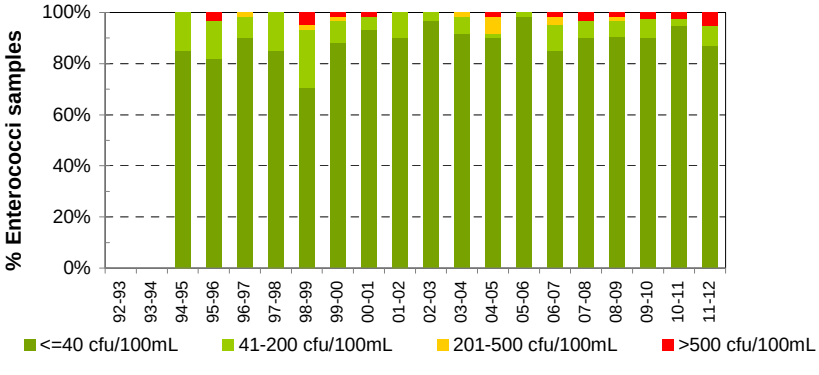


Response to rainfall

Rainfall from Malabar WWTP rain gauge

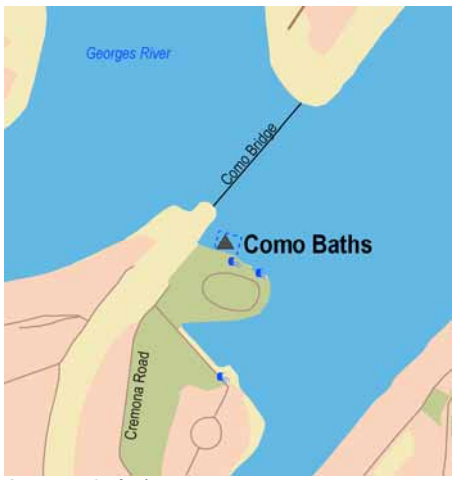


Trends in enterococci data through time



Como Baths

Beach Suitability Grade: **Poor**



See page 21 for key to map

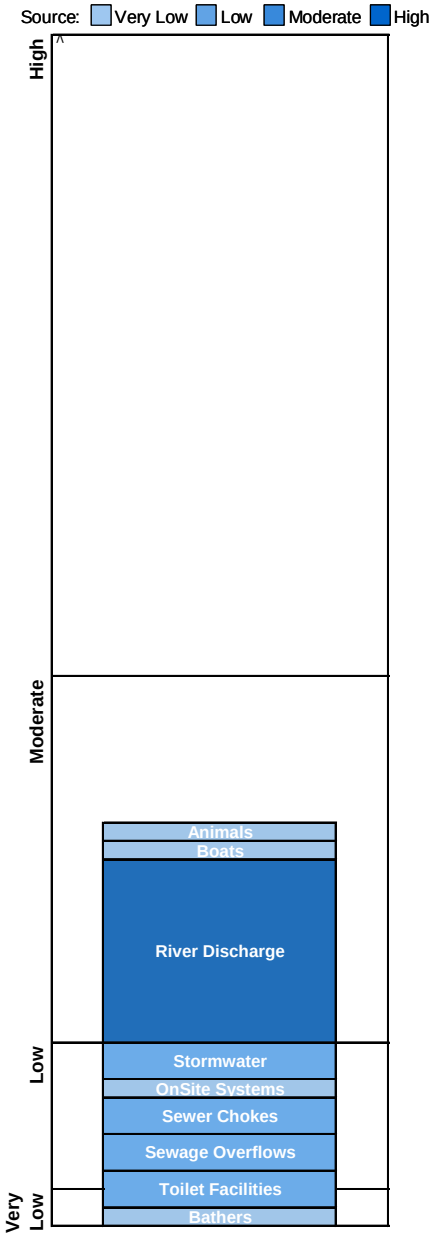
Como Baths are approximately 25 metres wide and backed by a narrow sandy beach in the lower Georges River. Adjacent to the baths is Como Pleasure Grounds, a heritage-listed park established in the 1880s.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater and sewage overflows and sources upstream in the Georges River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to low levels of rainfall.

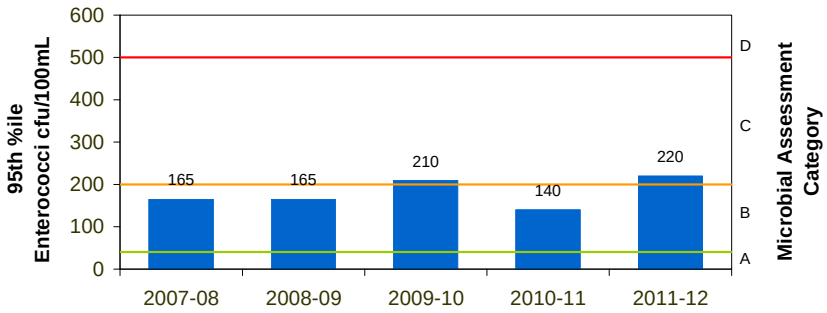
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



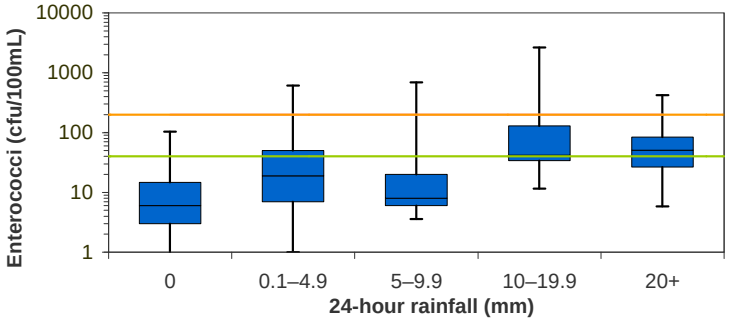
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

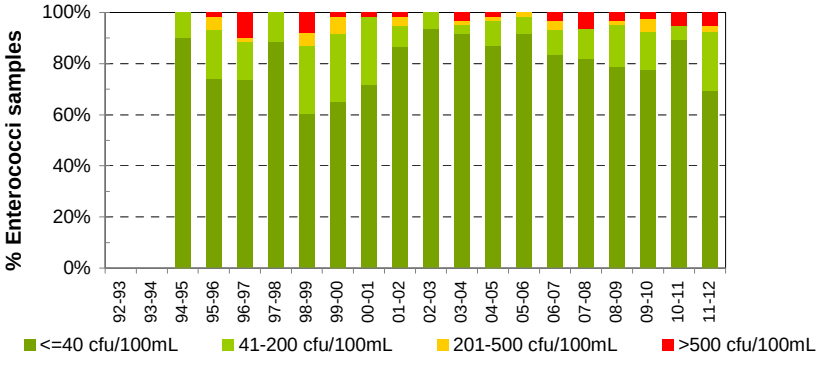


Response to rainfall

Rainfall from Kyle Bay rain gauge



Trends in enterococci data through time



Jew Fish Bay Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

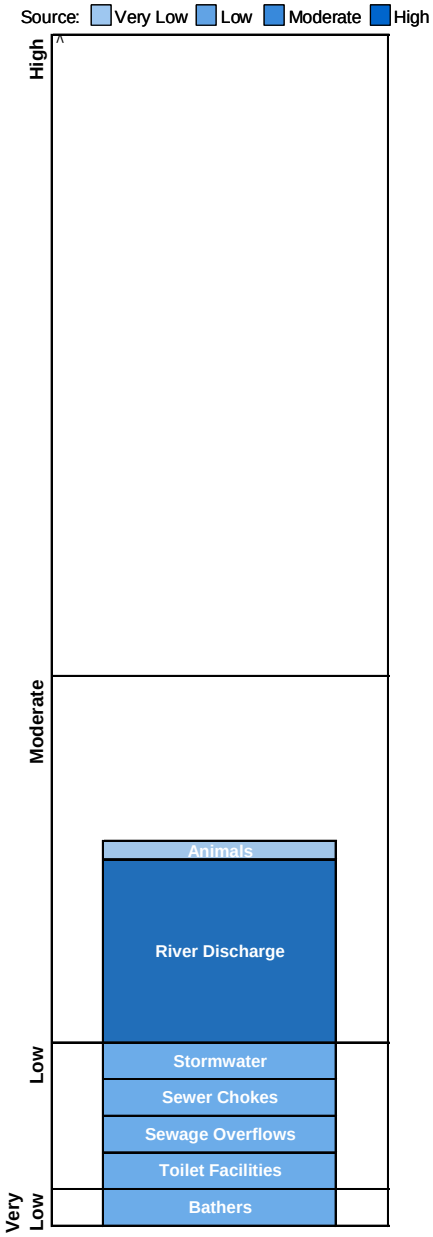
The baths are a 200 metre long netted swimming area located in Jew Fish Bay in the lower Georges River. The swimming area is backed by a narrow sandy beach and the extensive bushland of Oatley Park.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination including discharge from the Georges River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 5 mm of rainfall or more.

The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



Microbial Assessment: **B**

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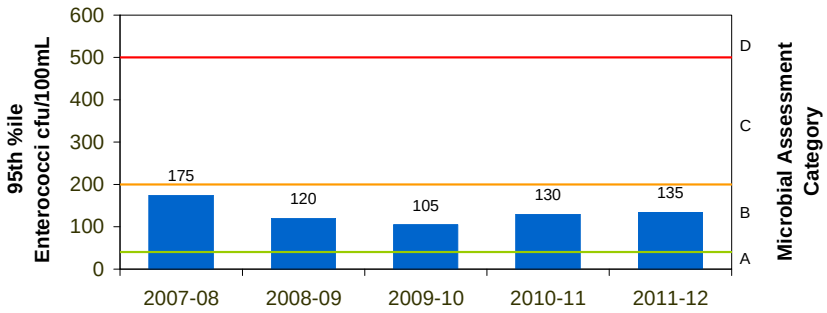
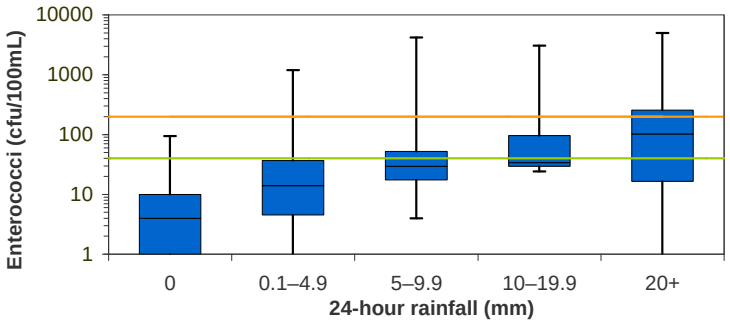
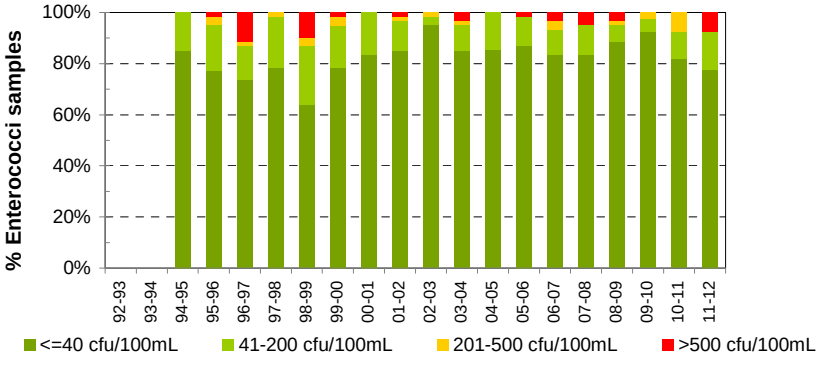


Response to rainfall

Rainfall from Kyle Bay rain gauge



Trends in enterococci data through time



Oatley Bay Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

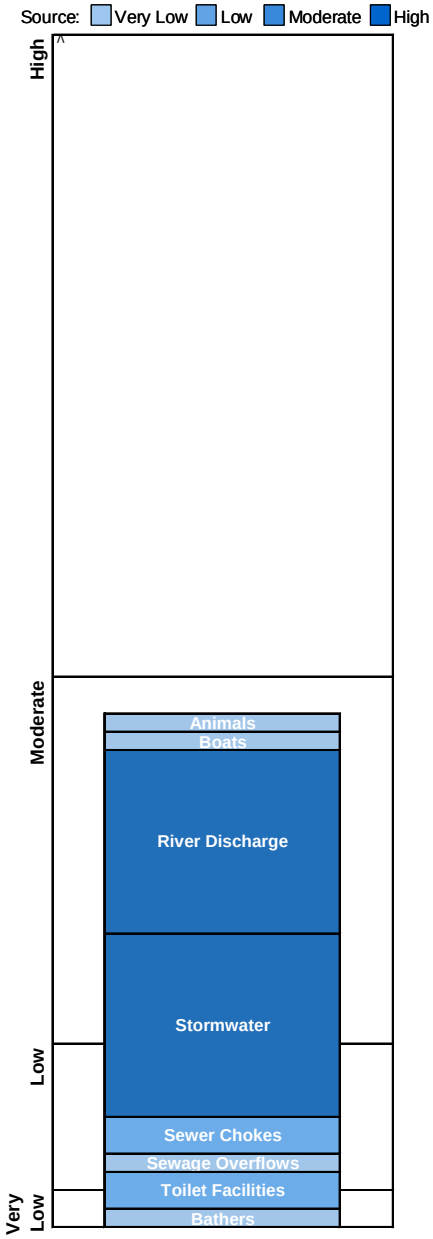
Oatley Bay Baths are located on the western shore of Oatley Bay in the lower Georges River. The netted swimming area is approximately 50 metres long and backed by a small beach and Oatley Pleasure Grounds.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater and sources upstream in the Georges River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit after low levels of rain.

The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



Microbial Assessment: **C**

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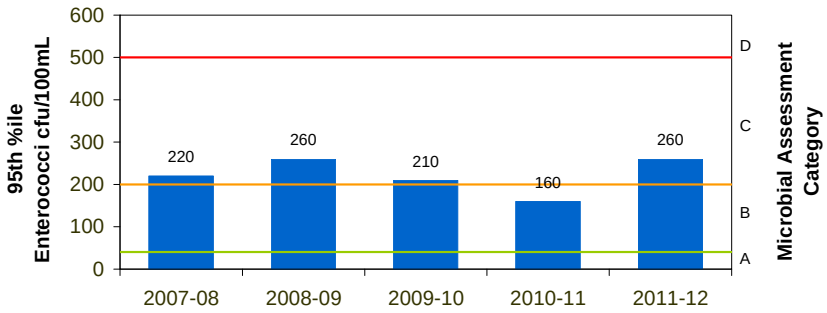
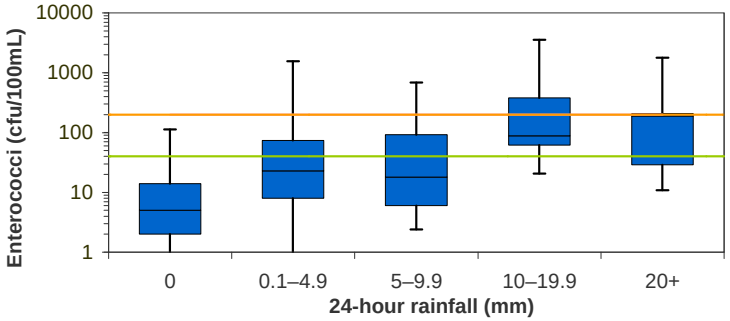
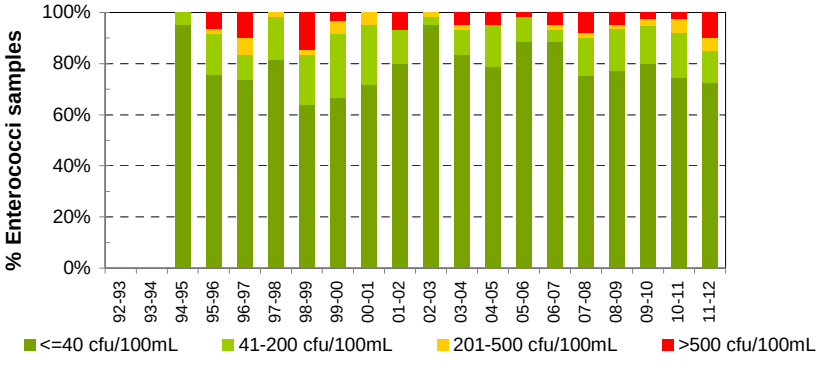


Response to rainfall

Rainfall from Kyle Bay rain gauge



Trends in enterococci data through time



Carss Point Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

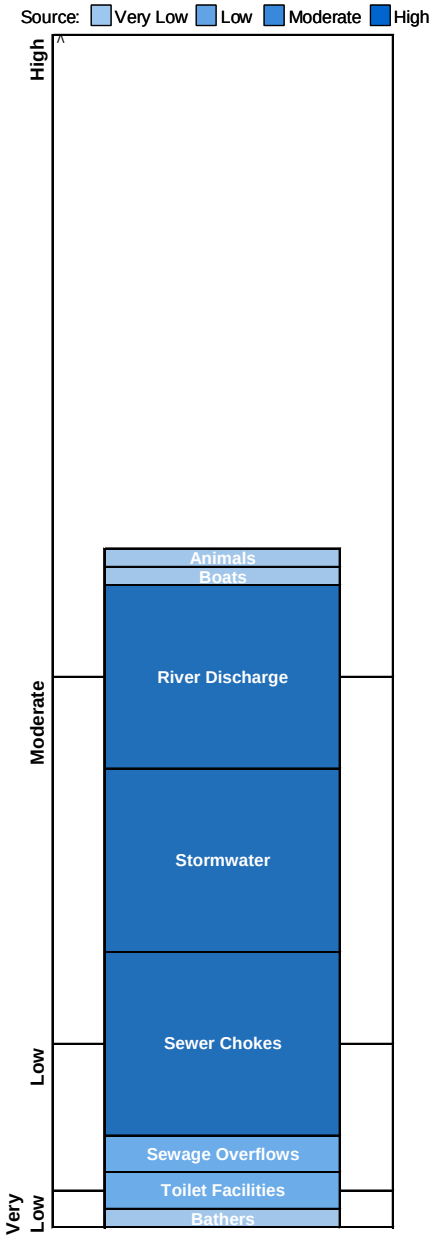
Carss Point Baths are a 100 by 60 metre netted swimming enclosure located on the western shore of Kogarah Bay in the lower Georges River. The swimming area is backed by a narrow beach and Carss Bush Park.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater and sewer chokes and sources upstream in the Georges River.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to low levels of rainfall and frequently doing so after 5 mm of rainfall or more.

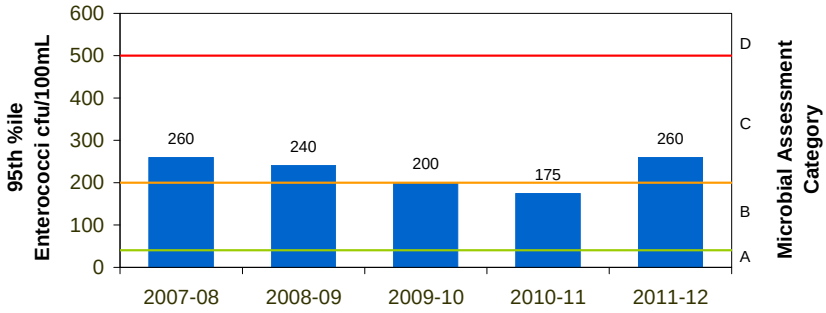
The site has been monitored since 1994. Microbial water quality has varied considerably among years with variations in rainfall.

Sanitary Inspection: **High**



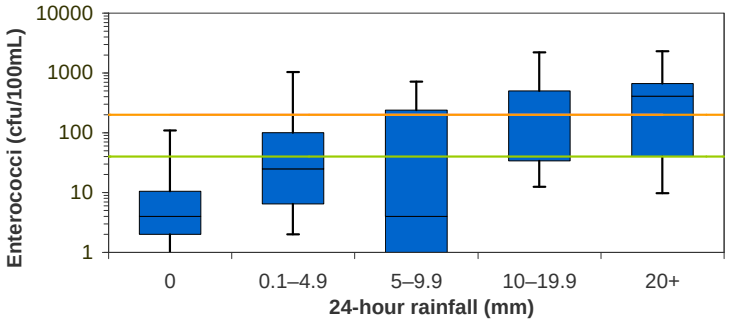
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

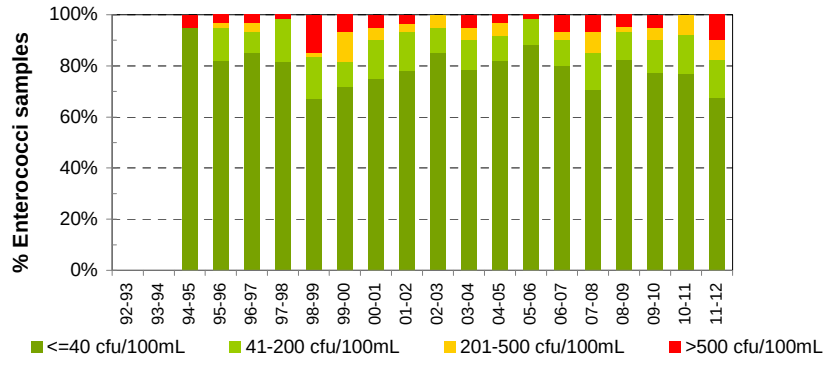


Response to rainfall

Rainfall from Kyle Bay rain gauge



Trends in enterococci data through time



Sandringham Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

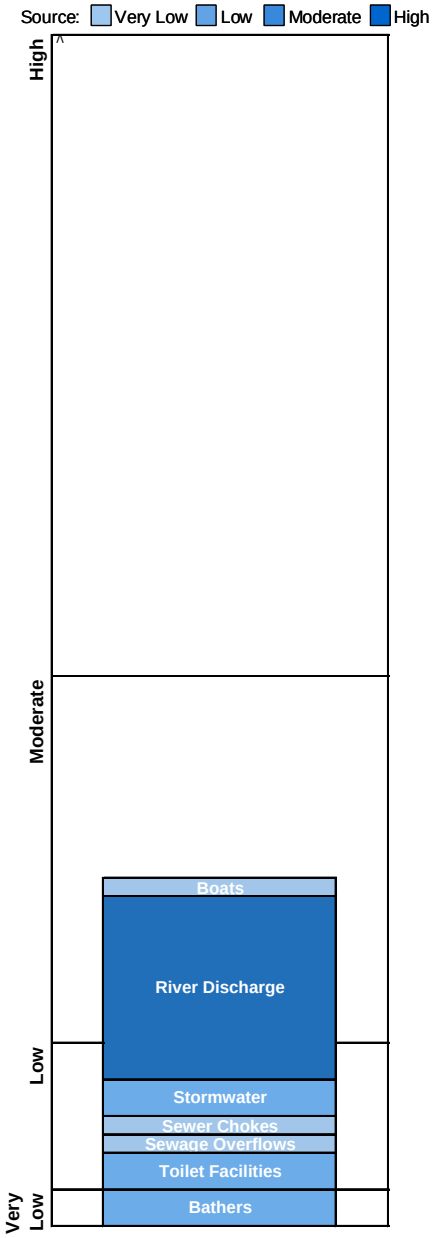
Sandringham Baths are a 30 by 40 metre netted swimming area located near the mouth of the Georges River, next to a beach with a walkway.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution following heavy rain, with potential faecal contamination from river discharge and stormwater.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, regularly exceeding the safe swimming limit in response to 10 mm of rain or more.

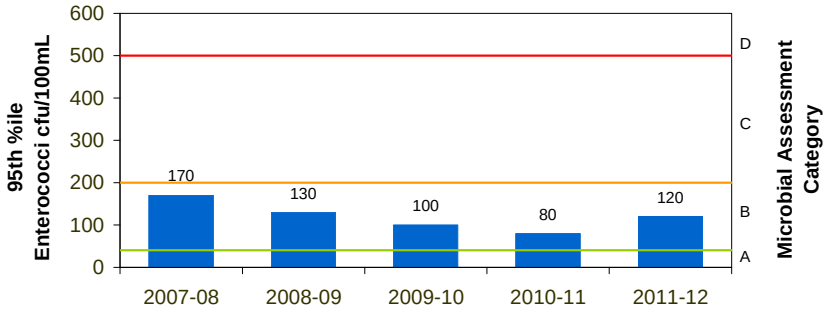
The site has been monitored since 1994. Microbial water quality has varied between years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



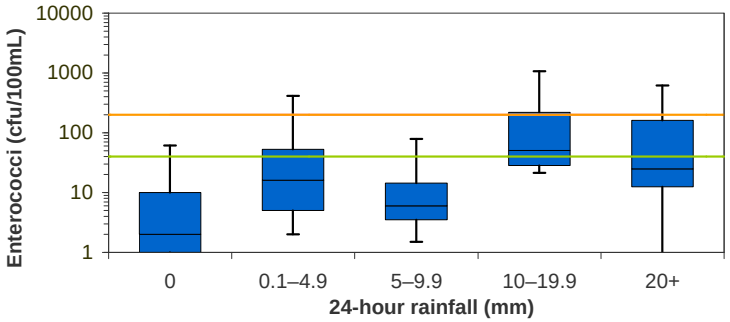
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

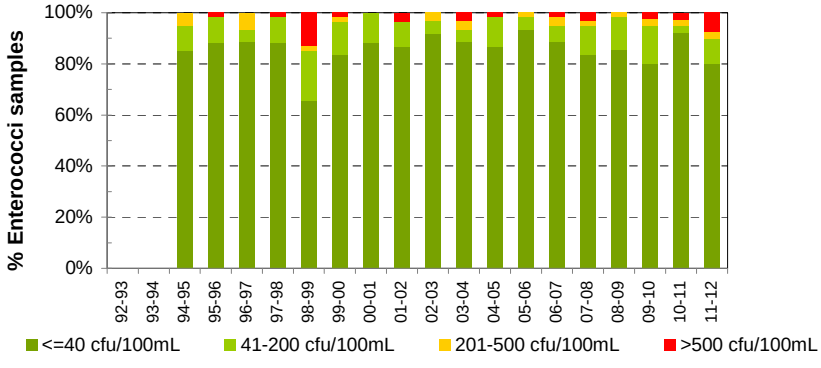


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Dolls Point Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

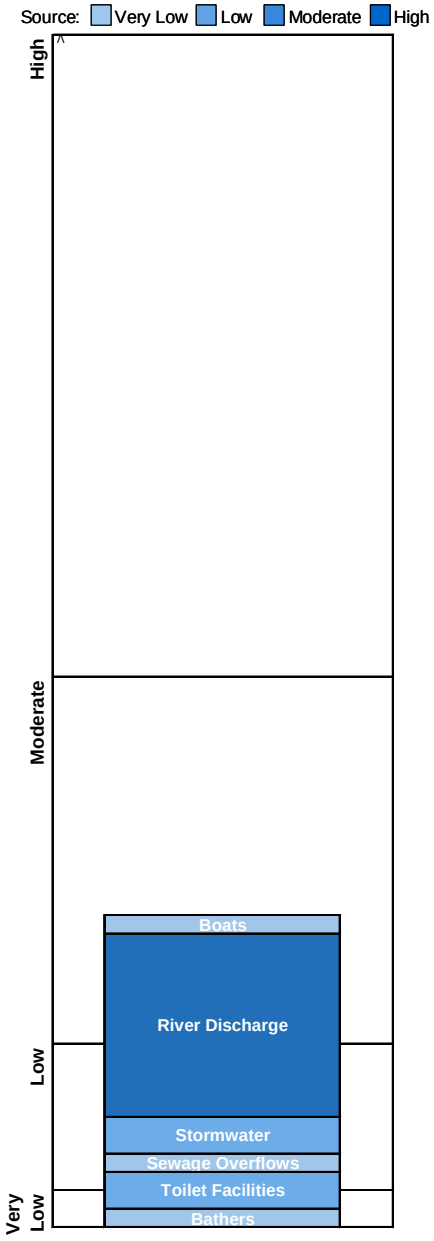
Dolls Point Baths are a 50 by 30 metre netted swimming area located at the southern end of Lady Robinsons Beach in Botany Bay. The baths are backed by a sandy beach and park with barbeque and picnic facilities.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution after heavy rain, with potential faecal contamination from river discharge and stormwater.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 20 mm of rainfall or more.

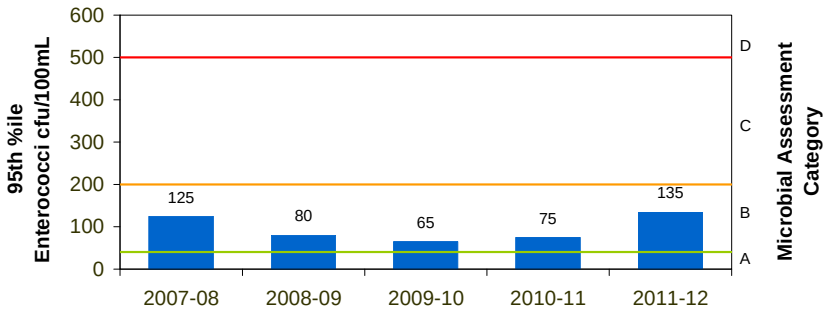
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



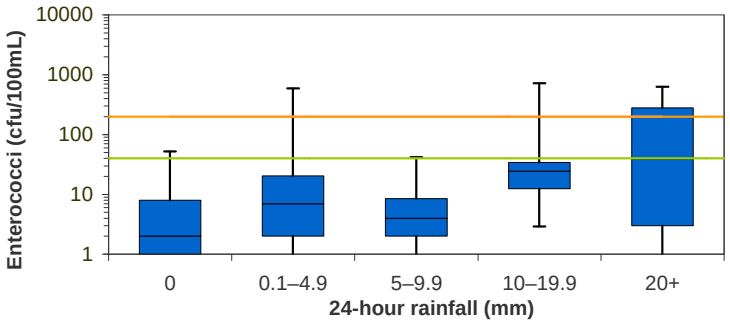
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

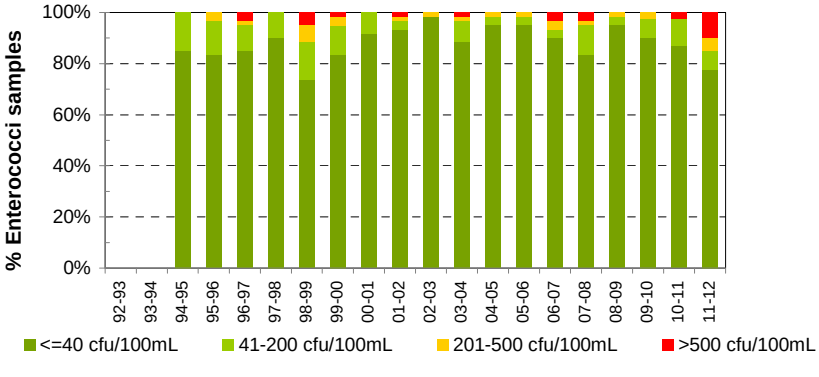


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Ramsgate Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

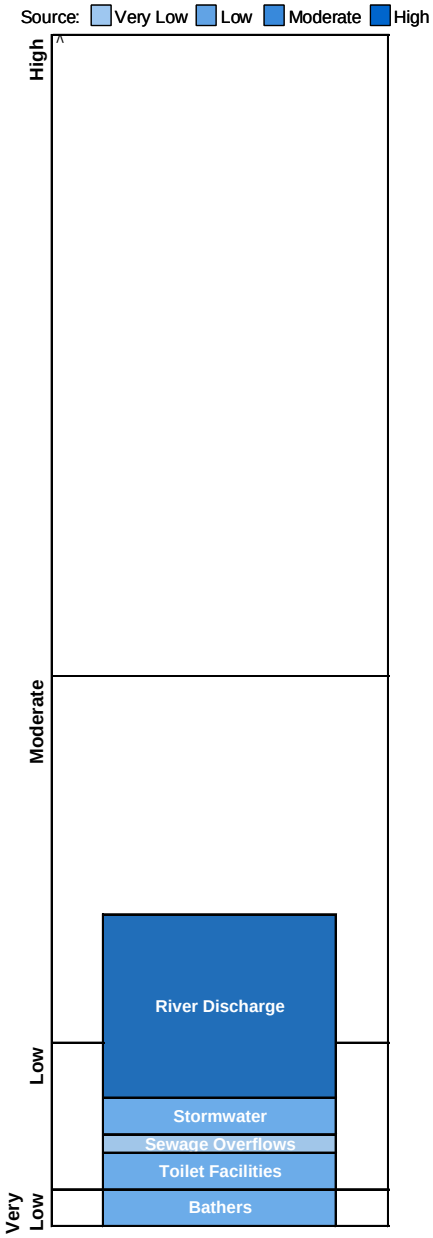
Ramsgate Baths are a 50 metre square swimming enclosure located near the southern end of Lady Robinsons Beach in Botany Bay. The baths are backed by a sandy beach, a promenade and a small park.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater and river discharge.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit in response to 10 mm of rainfall or more.

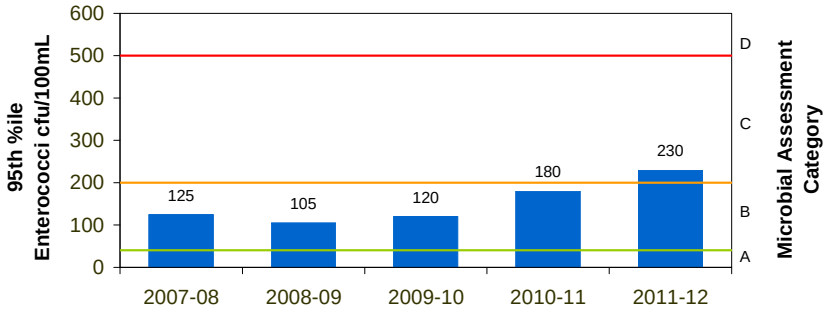
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



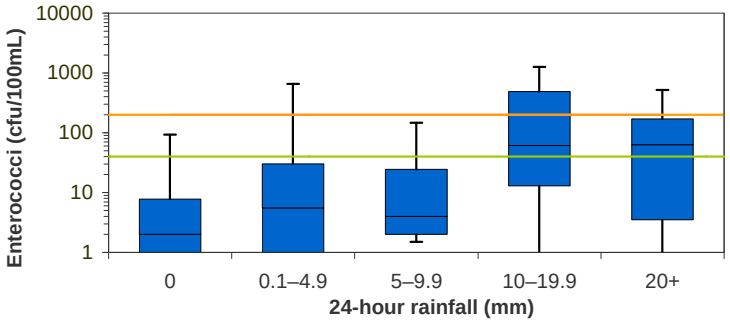
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

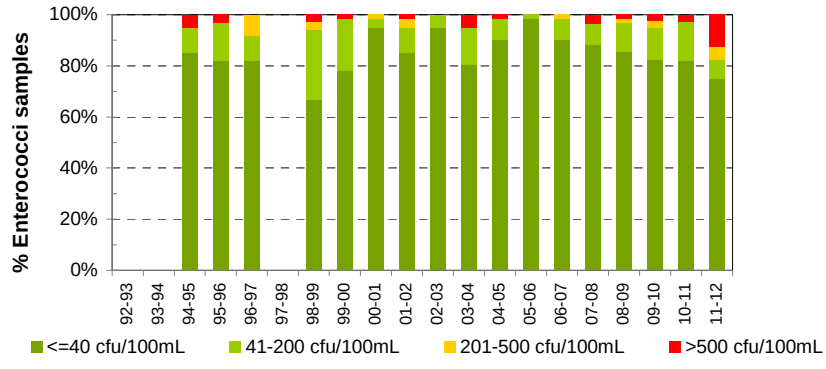


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Monterey Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

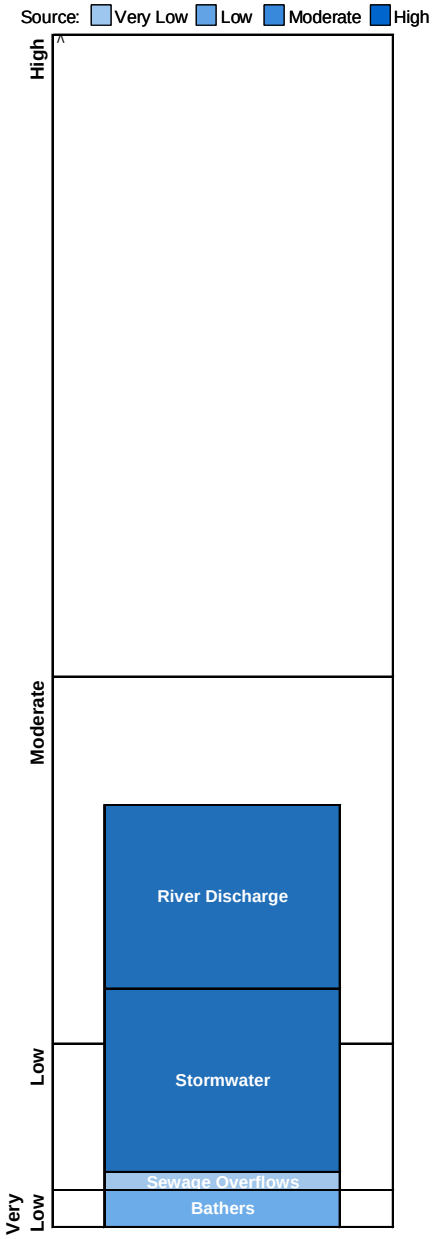
Monterey Baths are located towards the southern end of Lady Robinsons Beach in Botany Bay. The baths are not netted and are backed by a sandy beach and a small reserve.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution after heavy rain, with potential faecal contamination from river discharge and stormwater.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to 20 mm of rainfall or more.

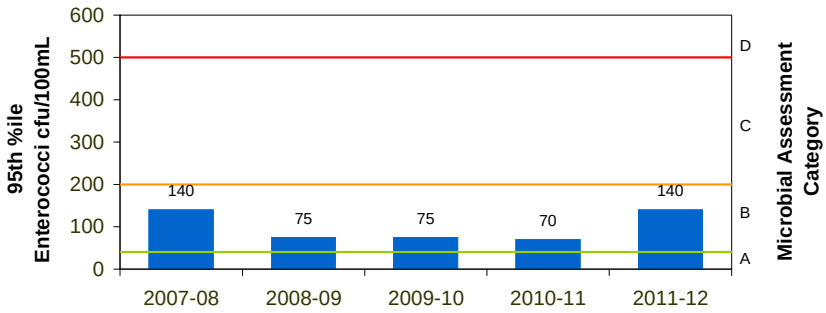
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



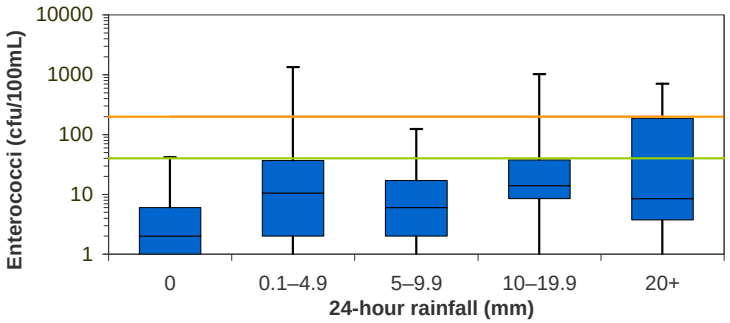
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

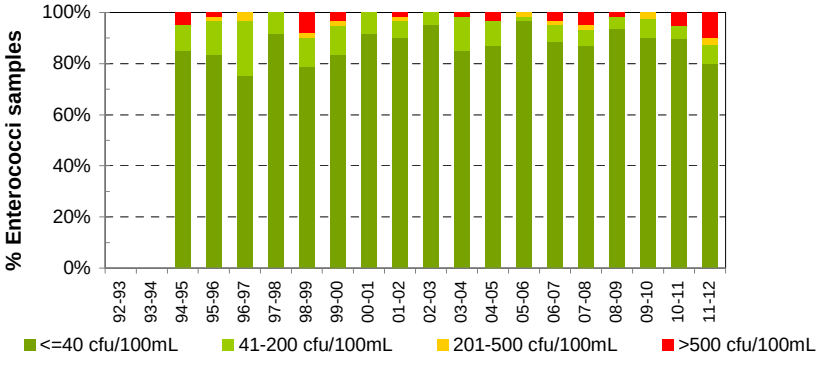


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Brighton-Le-Sands Baths

Beach Suitability Grade: **Good**

See page 21 for key to map

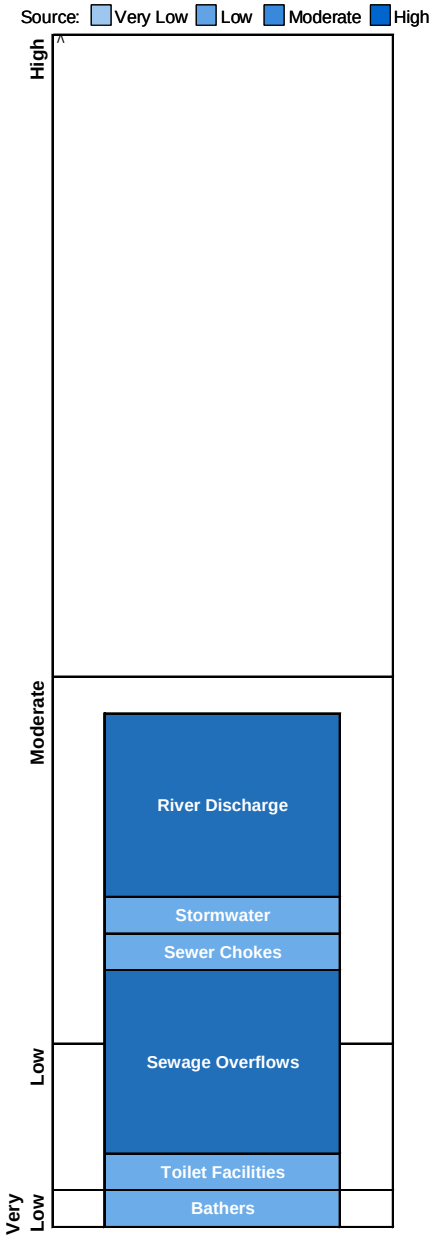
Brighton-Le-Sands Baths are located towards the centre of Lady Robinsons Beach. The baths are netted and backed by a sandy beach and restaurant.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination including sewage overflows and river discharge.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, often exceeding the safe swimming limit in response to 10 mm of rainfall or more.

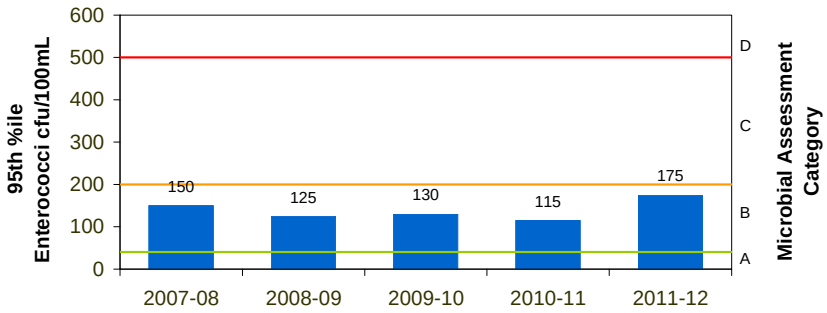
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



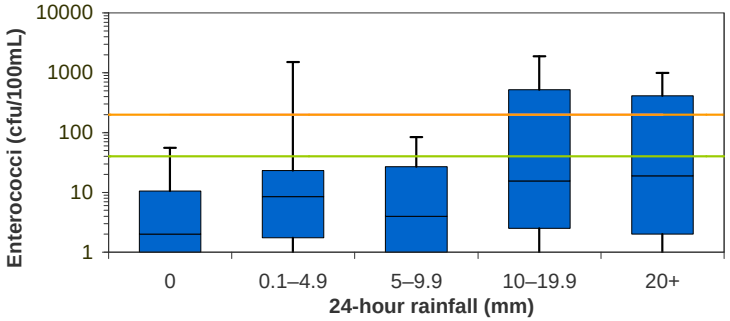
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

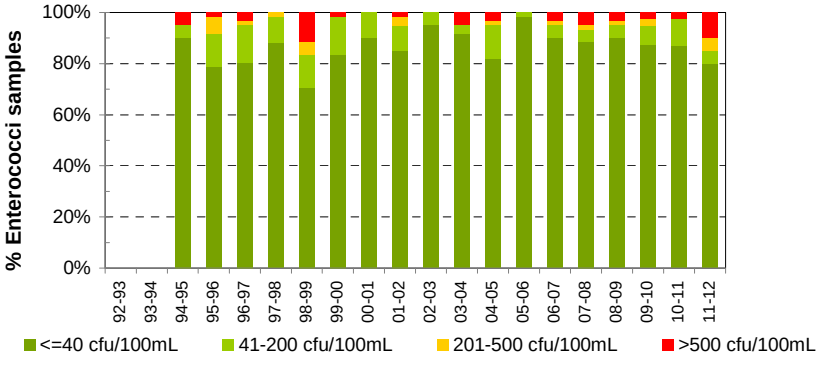


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Kyeemagh Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

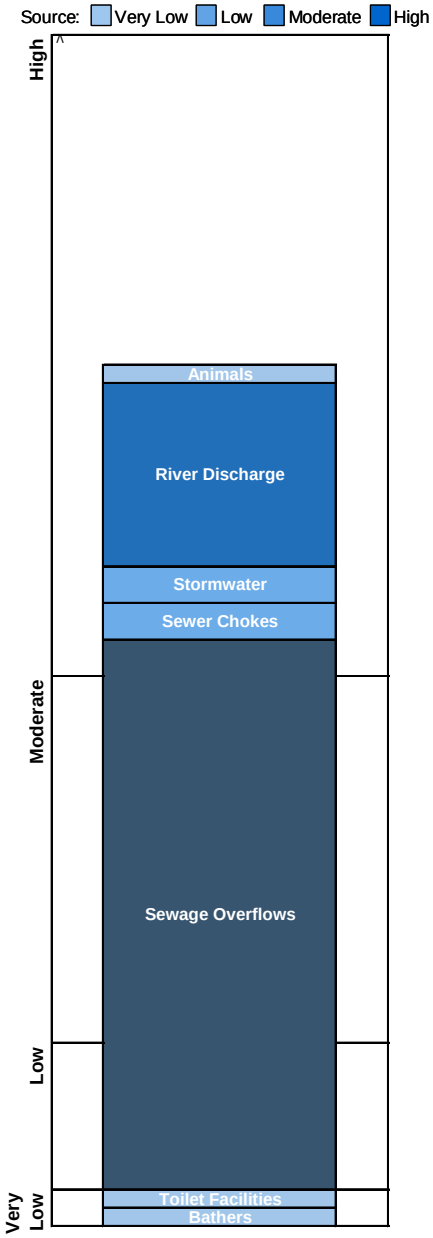
Kyeemagh Baths are located at the northern end of Lady Robinsons Beach. The baths are netted and backed by a sandy beach and reserve.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from the Cooks River, stormwater and sewage overflows.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit following 10 mm of rainfall or more.

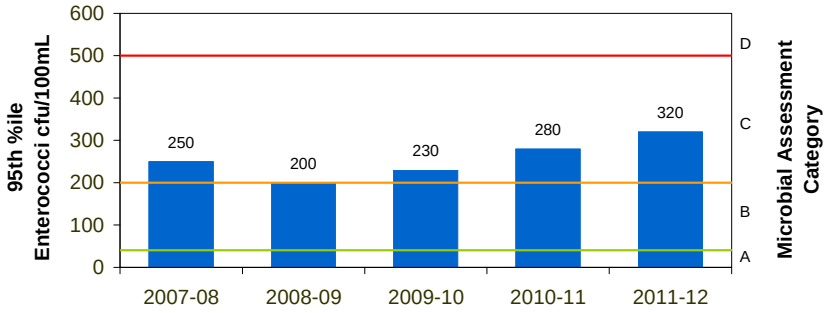
The site has been monitored since 1994. Microbial water quality has varied between years owing to variations in rainfall.

Sanitary Inspection: **High**



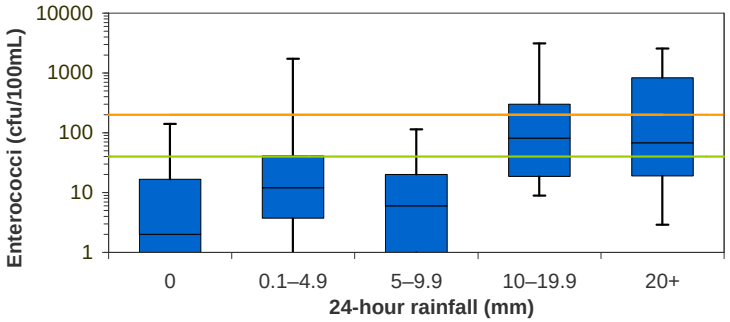
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

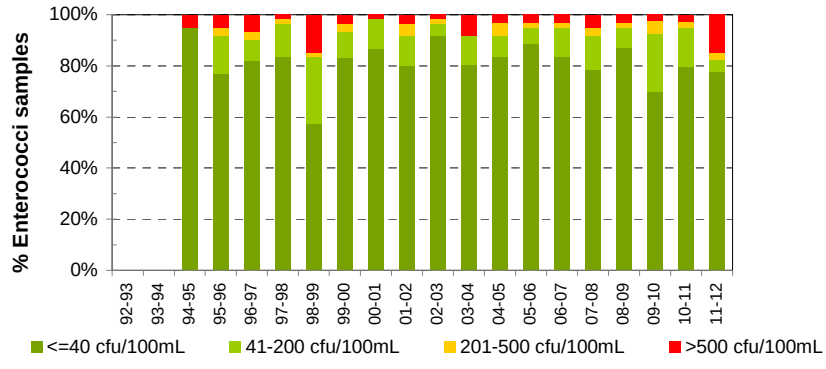


Response to rainfall

Rainfall from Kyeemagh rain gauge



Trends in enterococci data through time



Foreshores Beach

Beach Suitability Grade: **Very Poor**

See page 21 for key to map

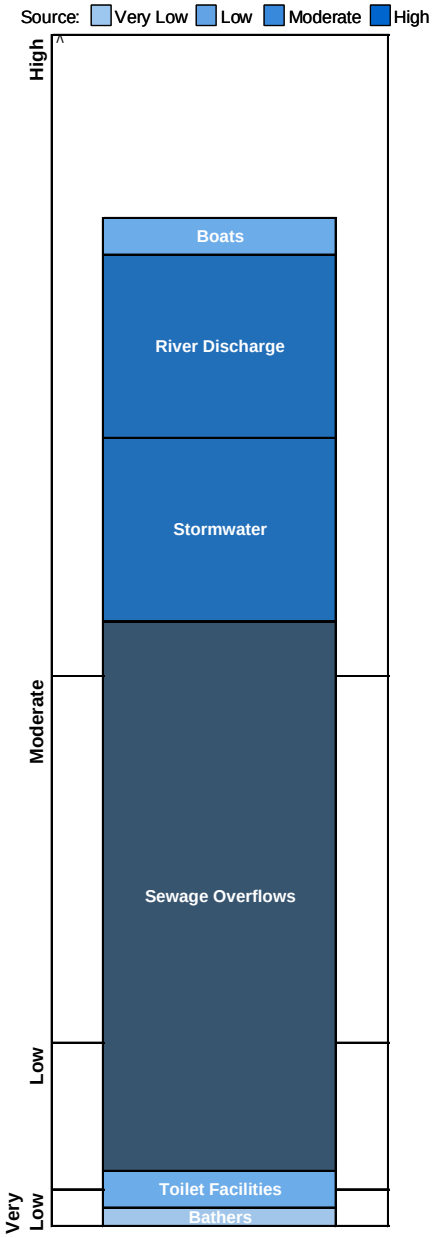
Foreshores Beach is located adjacent to Sydney Airport's third runway and the Port Botany Terminal 3 due for completion in 2013. The swimming area is not netted and has recently been redeveloped to include toilet facilities, a car park and boat launching facilities.

The Beach Suitability Grade of Very Poor indicates that microbial water quality is highly influenced by faecal pollution, particularly after rainfall, and is very susceptible to faecal contamination from the sewage overflows which discharge into Mill Pond Creek.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, occasionally exceeding the safe swimming limit in response to low levels of rainfall.

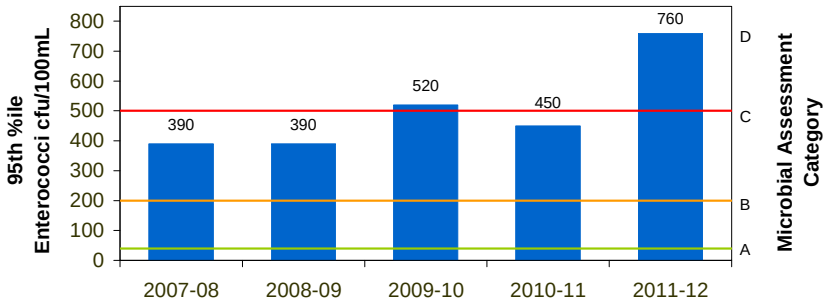
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **High**



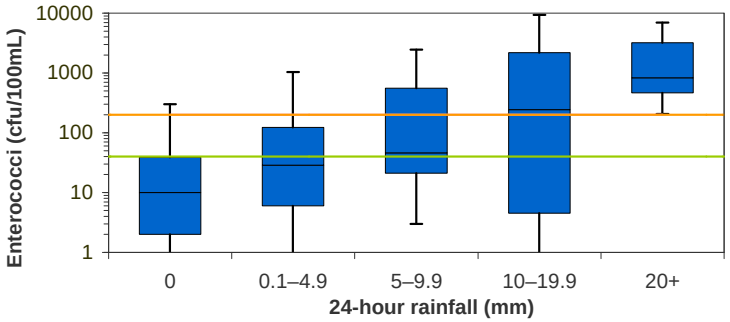
Microbial Assessment: **D**

Monitoring period for 2011–12 result is January 2010 to April 2012.

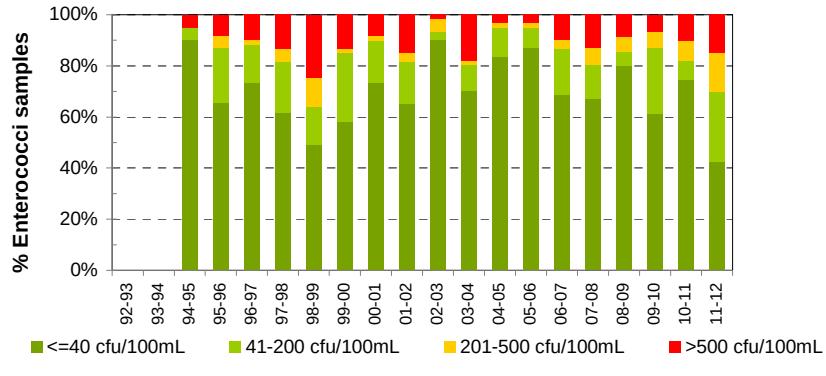


Response to rainfall

Rainfall from Malabar WWTP rain gauge



Trends in enterococci data through time



Yarra Bay

Beach Suitability Grade: **Good**

See page 21 for key to map

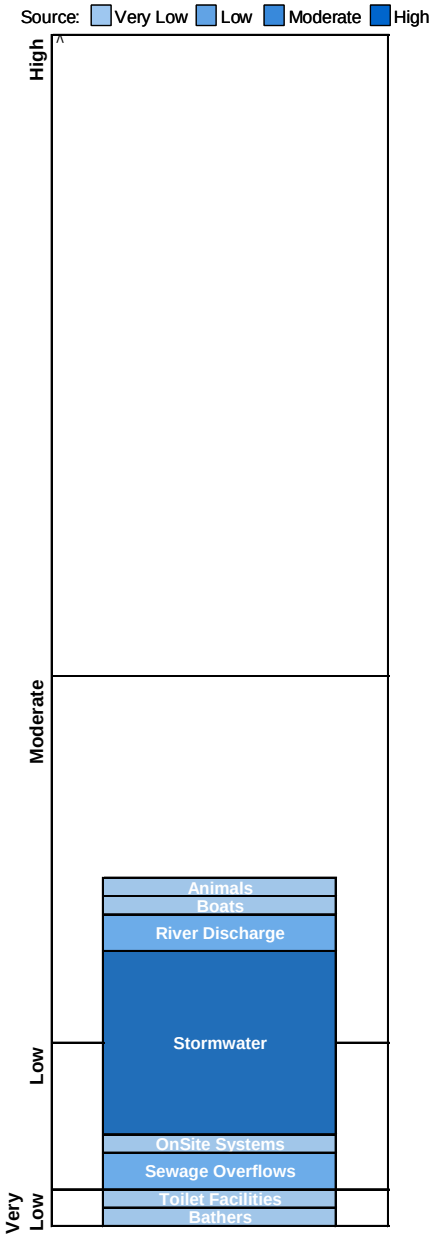
Yarra Bay is approximately 750 metres long, with a rock groyne 100 metres from the southern end. The swimming area is not netted. The southern half of the beach is bordered by Yarra Bay Bicentennial Park and Yarra Bay Sailing Club.

The Beach Suitability Grade of Good indicates that microbial water quality is suitable for swimming most of the time but the water may be susceptible to pollution from a number of potential sources of faecal contamination including stormwater.

The response to rainfall graph indicates that enterococci levels generally increased with increasing rainfall, sometimes exceeding the safe swimming limit after low levels of rainfall.

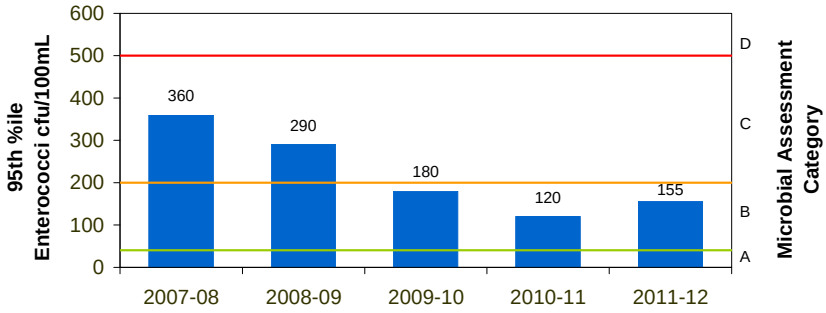
The site has been monitored since 1994. Microbial water quality has varied among years owing to variations in rainfall.

Sanitary Inspection: **Moderate**



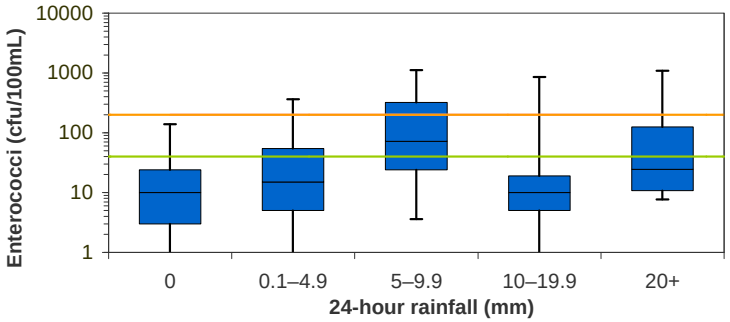
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

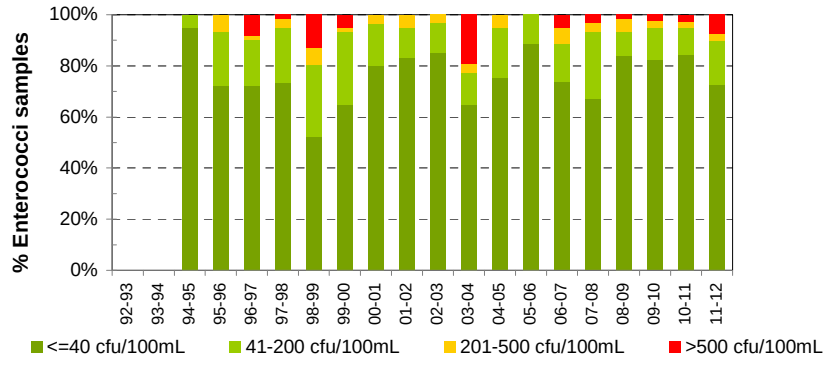


Response to rainfall

Rainfall from Malabar WWTP rain gauge



Trends in enterococci data through time



Frenchmans Bay

Beach Suitability Grade: **Poor**

See page 21 for key to map

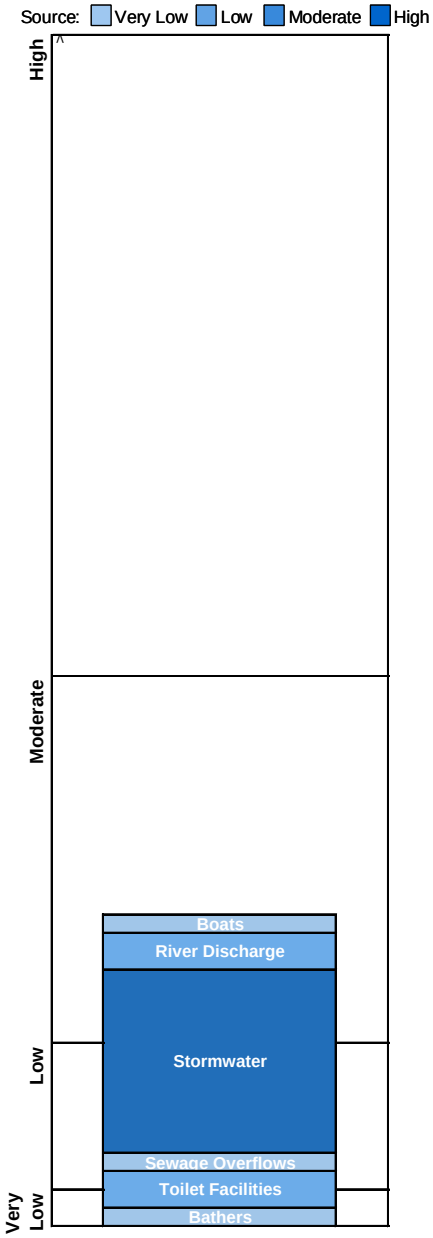
Frenchmans Bay is approximately 500 metres long, with a rock wall towards the northern end. The swimming area is not netted. A small recreational reserve is located behind the southern end of the beach.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, from a number of potential sources of faecal contamination including stormwater.

The response to rainfall graph indicates that enterococci levels increase slightly with increasing rainfall, sometimes exceeding the safe swimming limit after low levels of rainfall.

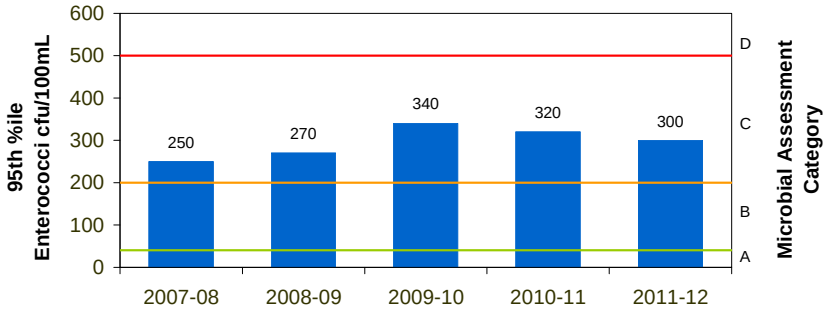
The site has been monitored since 1994.

Sanitary Inspection: **Moderate**



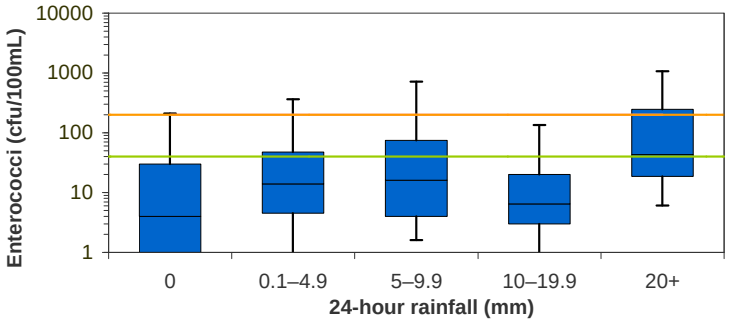
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

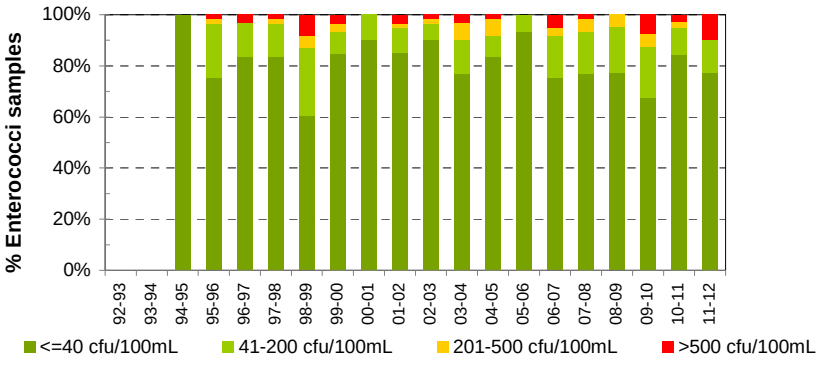


Response to rainfall

Rainfall from Malabar WWTP rain gauge



Trends in enterococci data through time



Congwong Bay

Beach Suitability Grade: **Good**

See page 21 for key to map

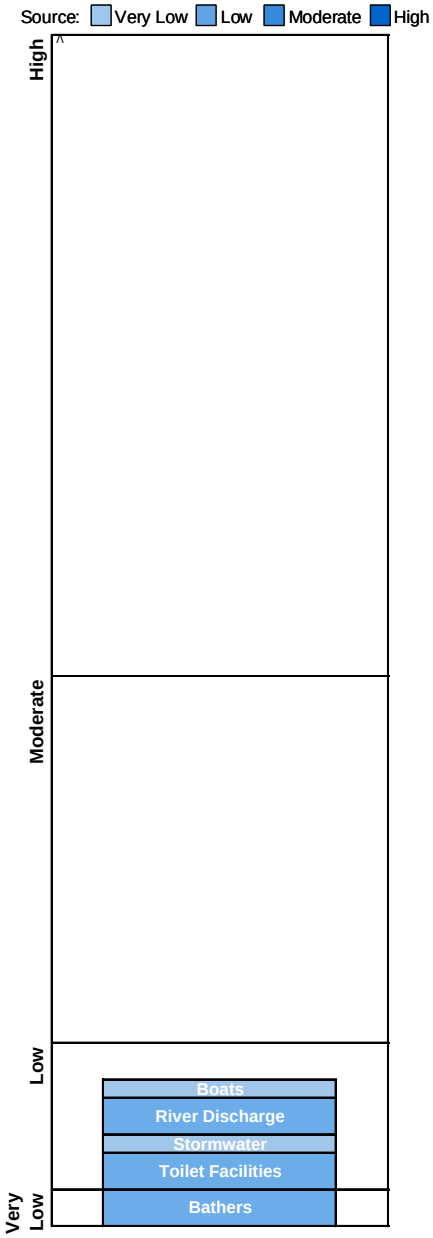
Congwong Bay is located near the mouth of Botany Bay and is backed by the Botany Bay National Park. The beach is approximately 150 metres long and the swimming area is not netted.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 20 mm of rainfall or more.

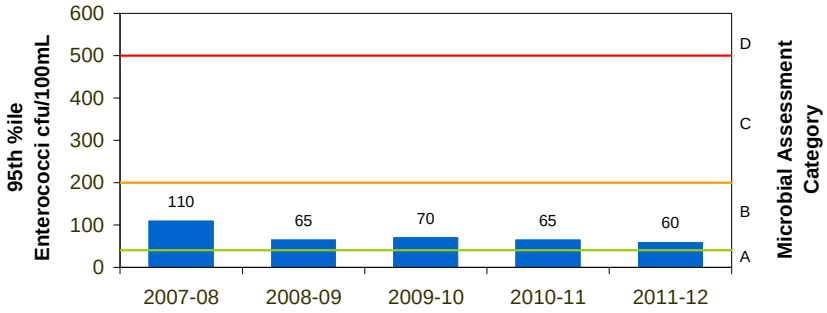
The site has been monitored since 1994. Microbial water quality improved after 2000, but a small increase in the percentage of elevated enterococci results has been recorded over the last five years.

Sanitary Inspection: **Low**



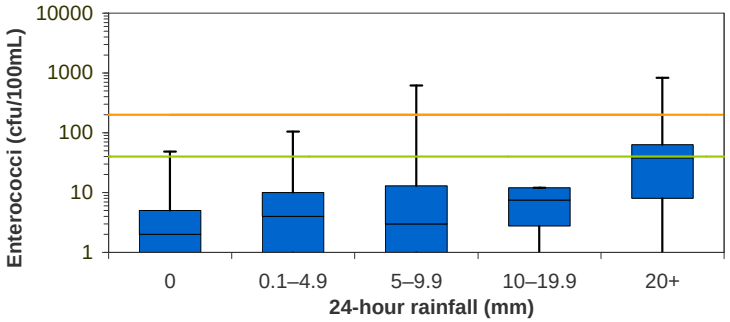
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

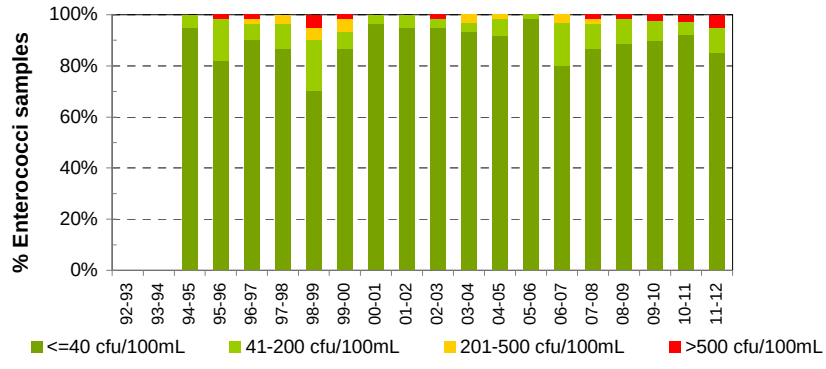


Response to rainfall

Rainfall from Malabar WWTP rain gauge



Trends in enterococci data through time



Port Hacking

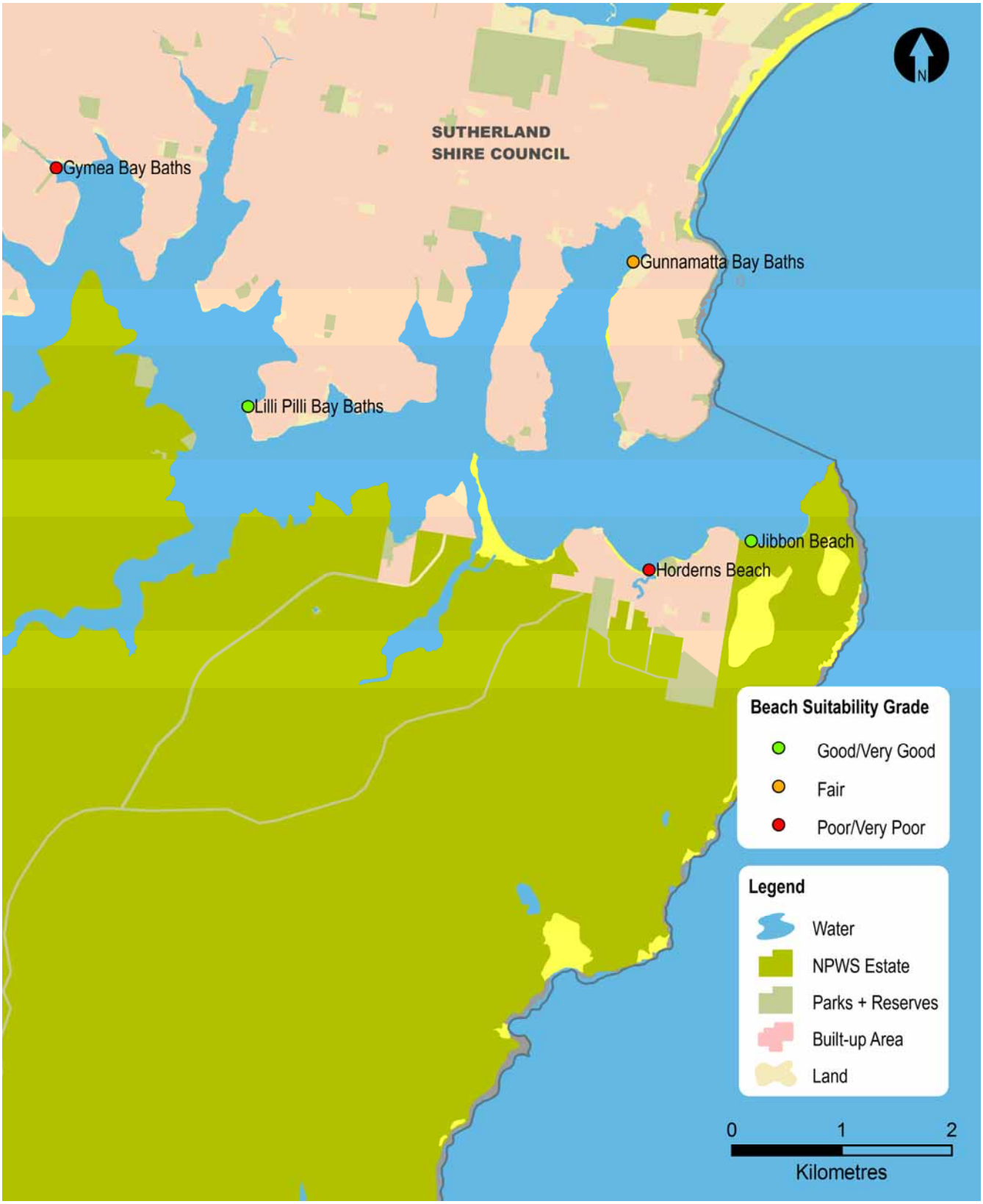


Figure 28: Sampling locations and Beach Suitability Grades in Port Hacking

Overview of the area

Description

Port Hacking is located approximately 30 kilometres south of Sydney and is the downstream reach of the Hacking River, before it meets Bate Bay. The waterway is used for swimming, recreational boating, fishing and aesthetic enjoyment.

The Port Hacking catchment covers an area of 208 square kilometres. Approximately 73 per cent of the catchment is open space or natural bushland and includes the Royal National Park and Garawarra State Conservation Area. Urban development is largely contained to the northern shore, with only the small communities of Maianbar and Bundeena on the southern side.

The waterway contains mangrove, seagrass and saltmarsh communities. The Shiprock Aquatic Reserve is located around the headland between Burraneer Bay and Dolans Bay.

Rainfall

There were several significant rain and flooding events in the Port Hacking region during 2011–2012 (BOM 2012):

- November was a particularly wet month at Cronulla with rainfall recorded on 15 days.
- Wet weather continued during December with rain falling on 16 days during the month.
- Particularly heavy rainfall was recorded in March with Cronulla receiving a daily total of 112 mm of rain.
- More heavy rainfall was recorded in the middle of April when more than 81 mm of rain fell in one day.

Assessment

Microbial water quality

Since May 2009, enterococci samples at the five swimming locations in Port Hacking have been collected every sixth day during the swimming season and monthly between May and September, providing approximately 40 samples each year. This number is well above NHMRC's recommended 20 samples per year. Prior to May 2009, samples were collected approximately every sixth day throughout the year.

The Microbial Assessment Category for 2011–2012 was calculated from the most recent 100 data points up until the end of the 2011–2012 swimming season (January 2010 until April 2012).

Sanitary inspections

Sanitary inspections have been completed for all swimming locations in Port Hacking in consultation with Sutherland Shire Council. The sanitary inspections will be reviewed during 2012–2013.

Beach Suitability Grades

Two of the five swimming locations in Port Hacking were graded as Good or Very Good in the 2011–2012 swimming season (Figure 28).

Very Good

Jibbon Beach was graded as Very Good. The site had excellent water quality (Microbial Assessment Category A) and few potential sources of microbial contamination (Sanitary Inspection Category of Low).

Good

Lilli Pilli Baths were graded as Good. This site had good water quality almost all of the time (Microbial Assessment Category B) but had several potential sources of microbial contamination, including sewer chokes and river discharge (poor quality water flowing down from upstream sources of pollution).

Fair

Gunnamatta Bay Baths were graded as Fair. The site had generally good water quality (Microbial Assessment Category B) but had several potential sources of microbial contamination, such as urban stormwater runoff, sewage overflows, sewer chokes and river discharge (poor quality water flowing down from upstream sources of pollution).

Poor

Gymea Bay Baths and Horderns Beach were graded as Poor. Although microbial water quality was suitable for swimming during dry weather conditions, enterococci levels increased with increasing rainfall and often became unsuitable for swimming following light rainfall. These swimming locations are very susceptible to pollution from stormwater runoff, and these impacts are amplified at Gymea Bay Baths by the relatively low level of flushing at the site. Swimming should be avoided during and for up to three days following rainfall or if there are signs of stormwater pollution, such as discoloured water or odour or floating debris.

Very Poor

No beaches were classified as Very Poor.

Management

Wastewater management

Sydney Water manages the public sewer in the area, including the Cronulla Wastewater Treatment Plant (WWTP). The plant services an estimated population of 200,000 and discharges approximately 54 million litres of tertiary-treated and disinfected effluent each day from the shoreline outfall at Potter Point (EPA NSW 2012).

There are 614 registered on-site sewage management systems in the Port Hacking catchment. The majority of these systems dispose of the sewage by pumping it to the sewer main. Sutherland Shire Council inspects these systems to ensure they are operating correctly and to identify risks to human health or the environment.

To reduce the incidence of wet weather sewage overflows in the catchments of Gunnamatta Bay Baths, Sydney Water has amplified pipes and pumps and included storage tanks across the Cronulla Peninsula.

Sydney Water is inspecting, cleaning and repairing sewer mains on the northern side of Port Hacking that have a high likelihood of discharging sewage to waterways if they become blocked. When significant tree root intrusion to the public sewer from the private sewer is identified, property owners are requested to remedy the problem.

Sydney Water also undertakes dry weather monitoring of main stormwater drains to identify sewer leaks. Leaks from public sewers are repaired by Sydney Water and leaks from private sewers are referred to local councils.

Sewage pump-out facilities for boats are provided at Burraneer Bay Marina, Cronulla Marina and Yowie Bay Marina (NSW Maritime 2012).

Stormwater management

The Hacking River Stormwater Management Plan was developed by Wollongong and Sutherland councils and identifies and prioritises actions to improve stormwater quality and reduce flooding in the Port Hacking catchment.

Sutherland Shire Council's stormwater levy funds projects such as the installation of pipes, drains and stormwater quality improvement devices, as well as riparian revegetation works to alleviate flooding and improve water quality in creeks and rivers. The levy also funds stormwater infrastructure maintenance.

Sutherland Shire Council has installed more than 20 systems to improve stormwater quality in the local government area, including artificial wetlands, gross pollutant traps, continuous deflective separators and natural sand drainage systems. Council has also undertaken education programs, drain stencilling and water quality monitoring of the drainage system.

Estuary management

Sutherland Shire Council has also developed estuary management plans for the Gunnamatta and Gymea Bay estuaries that recommend specific actions to protect water quality in the bays. Council adopted the Port Hacking Integrated Environmental Management Plan in 2009. The plan provides guidelines and an investment strategy which will assist with the sustainable management and development of Port Hacking.

Jibbon Beach

Beach Suitability Grade: **Very Good**

See page 21 for key to map

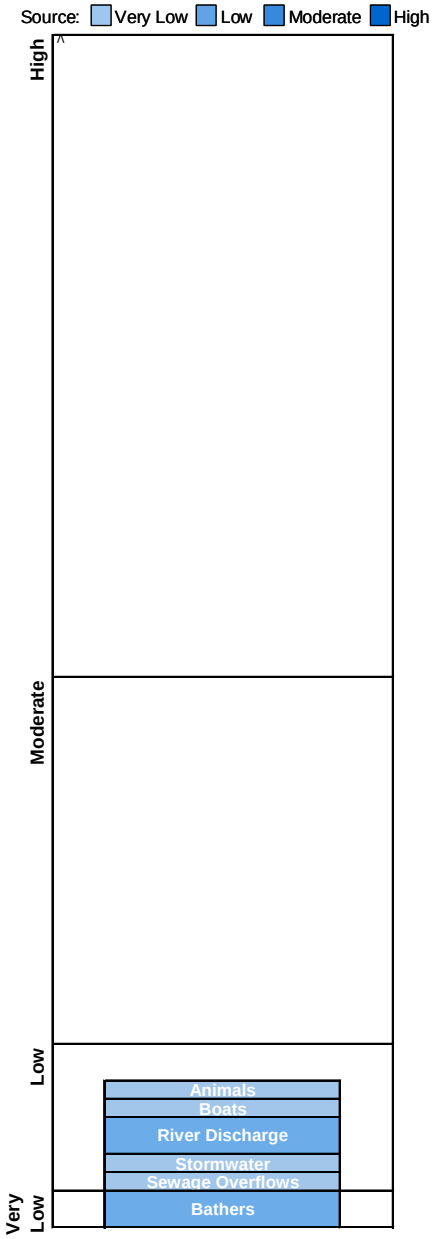
Jibbon Beach is located at the entrance to Port Hacking. The beach is backed by the Royal National Park and accessed from Bundeena. The water is deep, making it a popular boating destination. Beach conditions are safest in the eastern corner.

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

The response to rainfall graph indicates that enterococci levels increased slightly with rainfall, but rarely exceeded the safe swimming limit.

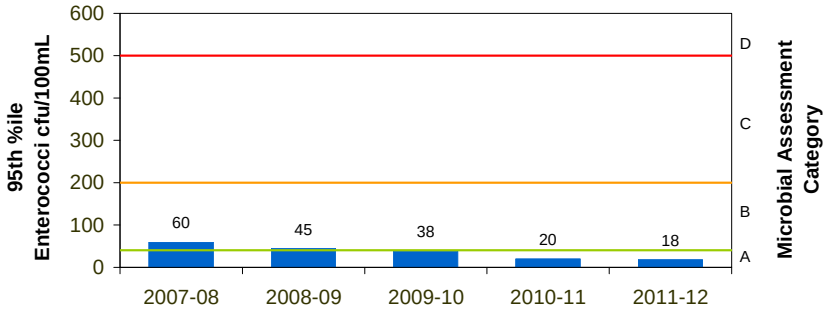
The site has been monitored since 1999. Microbial water quality improved slightly in 2001, possibly because of the extension of reticulated sewerage to the area. Variation among years is likely to be the result of variations in rainfall patterns.

Sanitary Inspection: **Low**



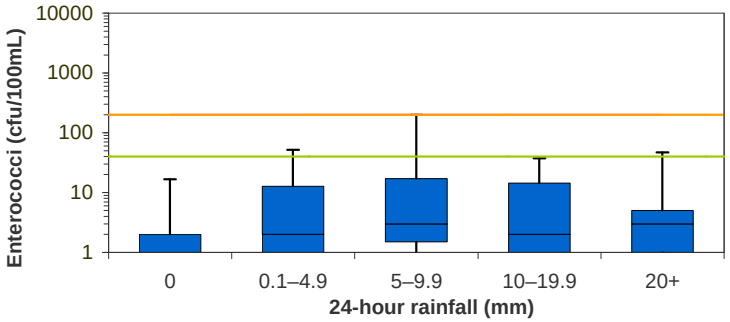
Microbial Assessment: **A**

Monitoring period for 2011–12 result is January 2010 to April 2012.

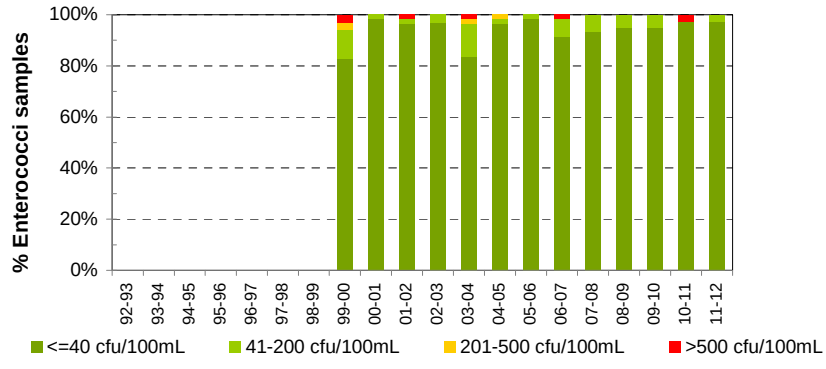


Response to rainfall

Rainfall from South Cronulla rain gauge



Trends in enterococci data through time



Horderns Beach

Beach Suitability Grade: **Poor**

See page 21 for key to map

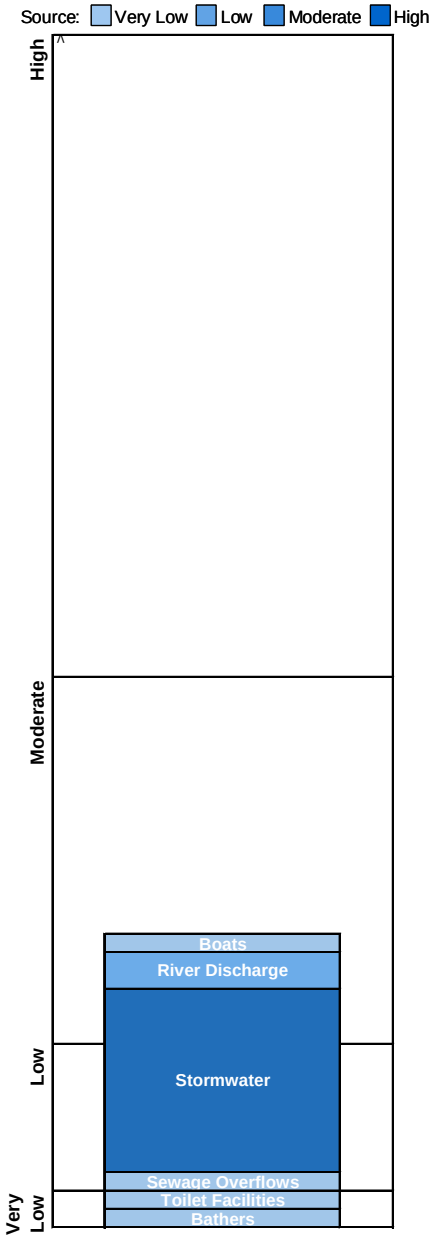
Horderns Beach is located on the southern shore of Port Hacking and is backed by the town of Bundeena. The Cronulla–Bundeena wharf is located at the eastern end of the beach.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater and river discharge.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit after 10 mm of rainfall or more, and occasionally after little or no rain.

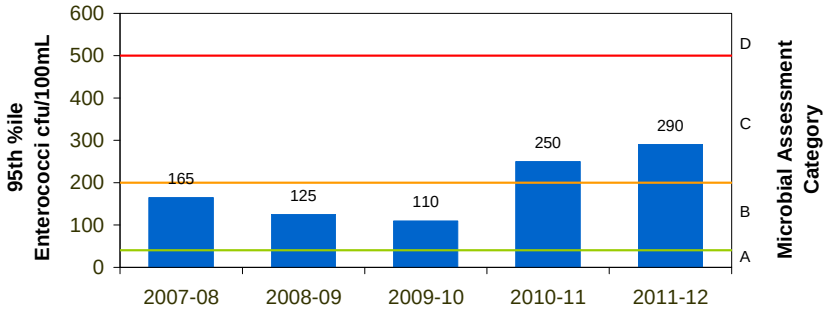
The site has been monitored since 1999. Microbial water quality improved slightly in 2001, possibly because of the extension of reticulated sewerage to the area. Variation among years is likely to be the result of variations in rainfall patterns.

Sanitary Inspection: **Moderate**



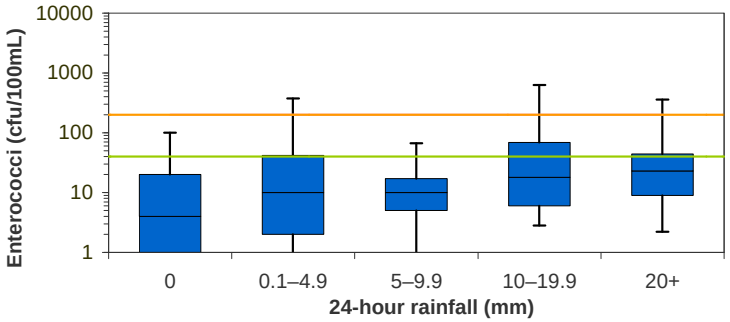
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

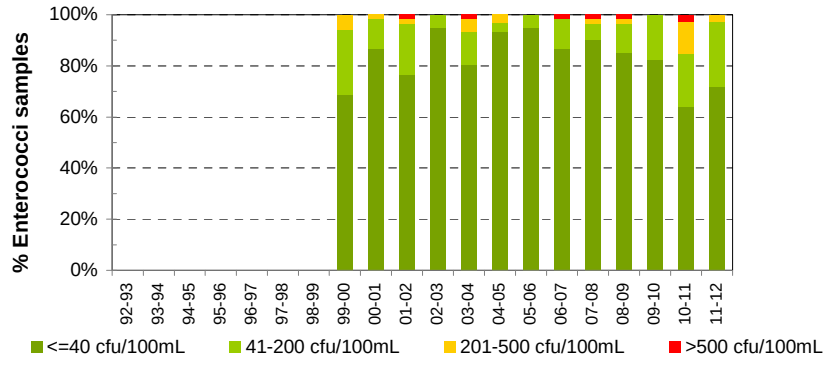


Response to rainfall

Rainfall from South Cronulla rain gauge



Trends in enterococci data through time



Gymea Bay Baths

Beach Suitability Grade: **Poor**

See page 21 for key to map

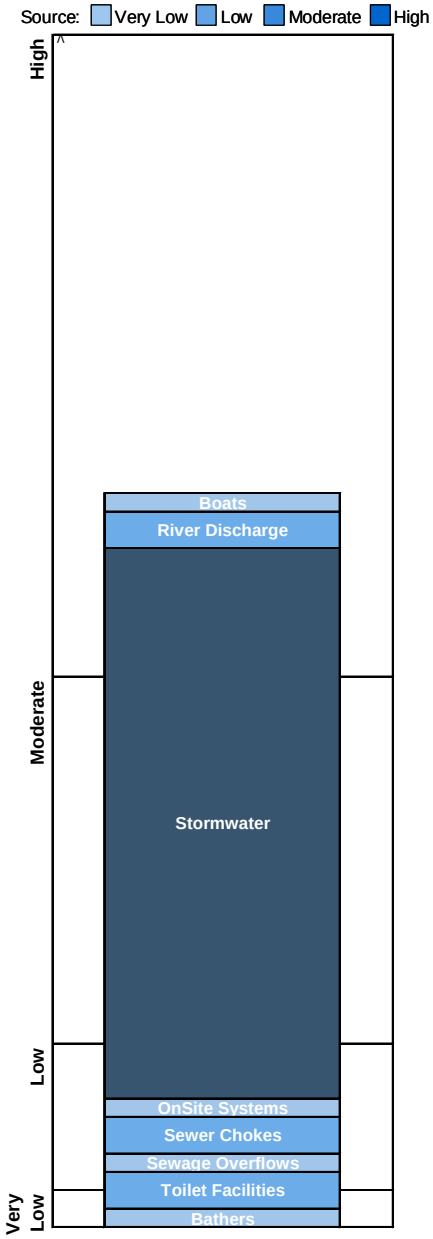
Gymea Bay Baths are an enclosed tidal swimming area backed by a narrow sandy beach in the upper reaches of Port Hacking. Two small recreation reserves lead to the beach.

The Beach Suitability Grade of Poor indicates that microbial water quality is influenced by faecal pollution, particularly after rainfall, with potential faecal contamination from stormwater.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit after low levels of rainfall.

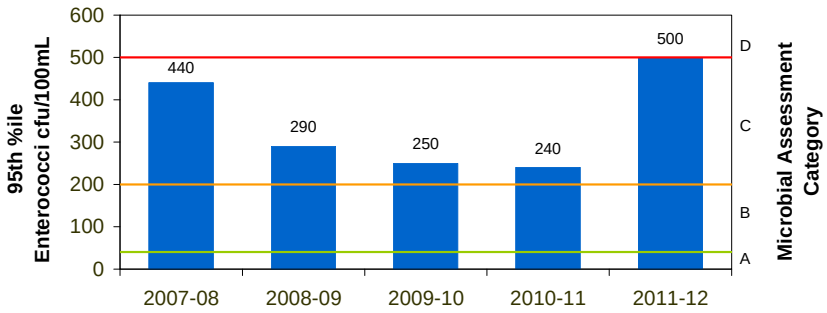
The site has been monitored since 1999. Microbial water quality has varied among years, most likely because of variations in rainfall.

Sanitary Inspection: **High**



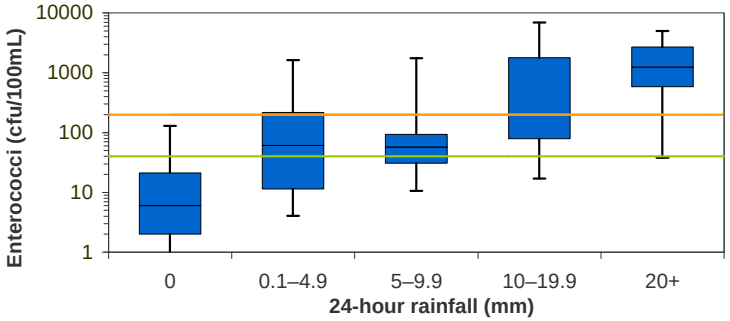
Microbial Assessment: **C**

Monitoring period for 2011–12 result is January 2010 to April 2012.

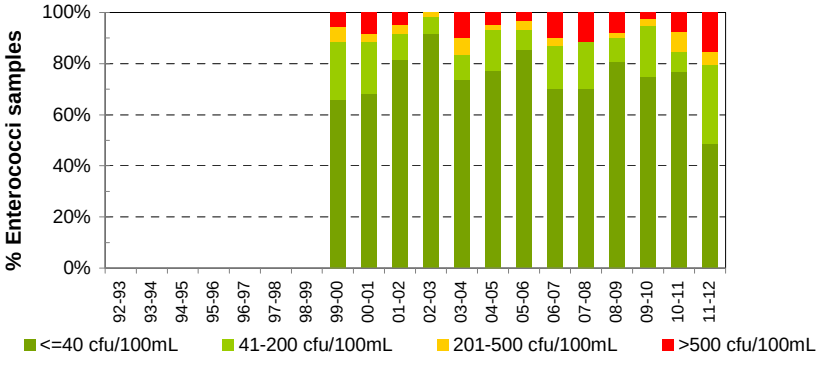


Response to rainfall

Rainfall from Caringbah rain gauge

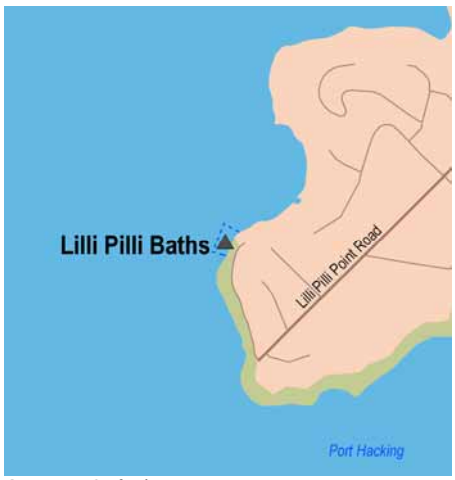


Trends in enterococci data through time



Lilli Pilli Baths

Beach Suitability Grade: **Good**



See page 21 for key to map

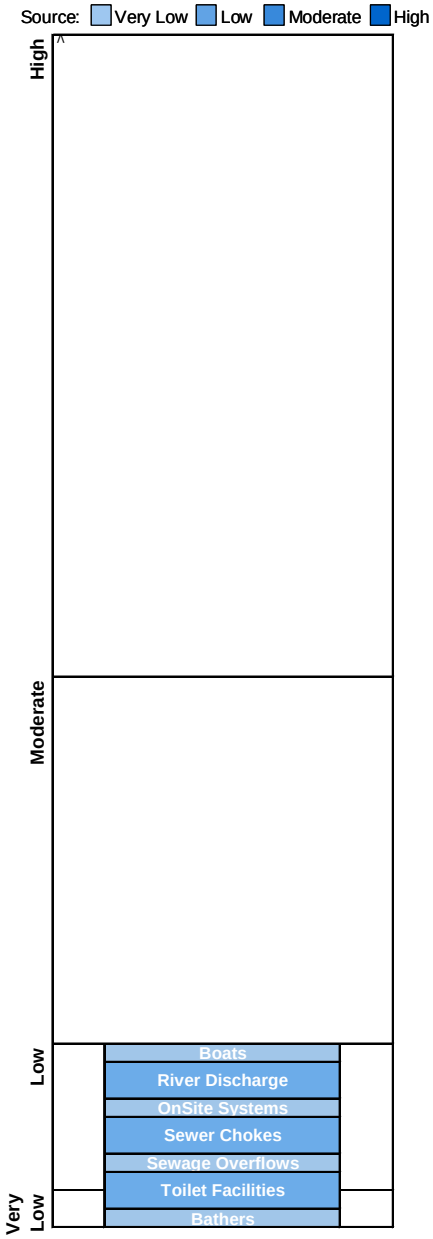
Lilli Pilli Baths is a tidal swimming area located on the western side of Lilli Pilli Point in the middle reaches of Port Hacking. The pool is netted and is backed by a narrow strip of recreation reserve.

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

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit after 10 mm of rainfall or more.

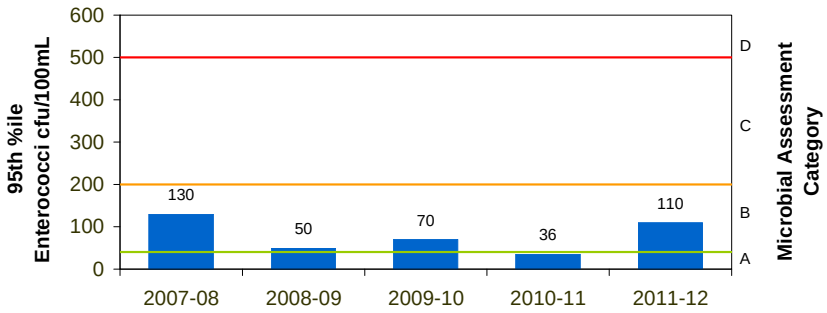
The site has been monitored since 1999. Microbial water quality has varied among years, most likely because of variations in rainfall.

Sanitary Inspection: **Moderate**



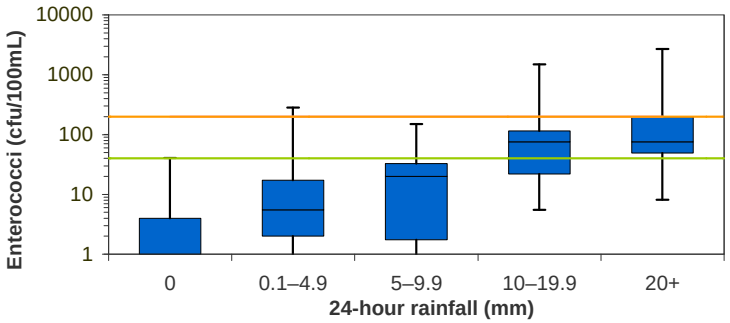
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

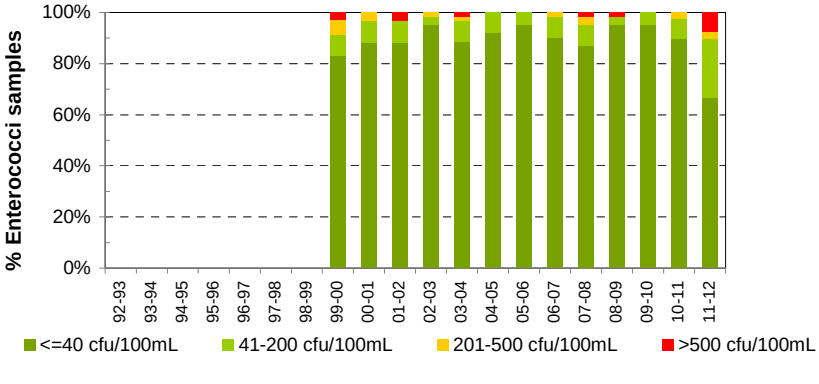


Response to rainfall

Rainfall from Caringbah rain gauge



Trends in enterococci data through time



Gunnamatta Bay Baths

Beach Suitability Grade: **Fair**

See page 21 for key to map

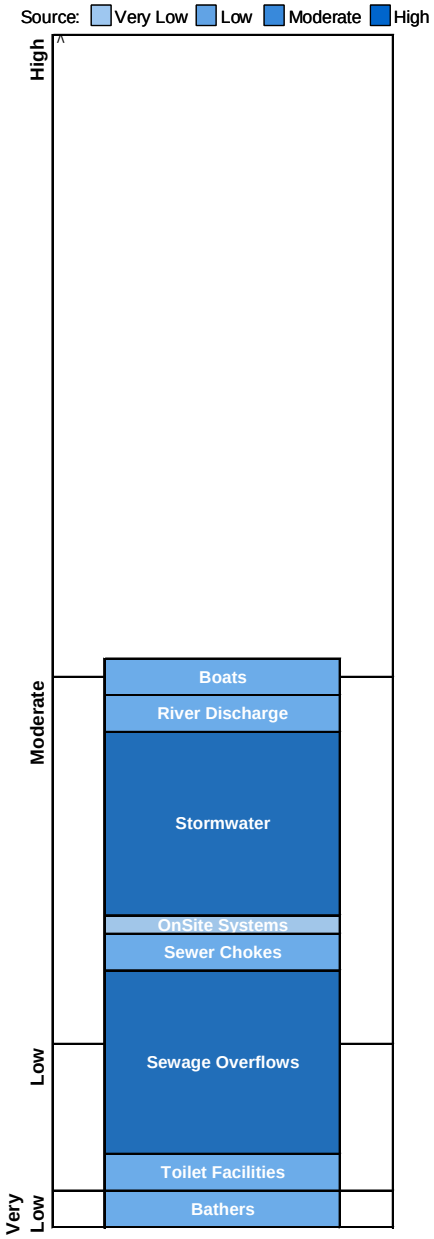
Gunnamatta Bay Baths are an enclosed tidal swimming area located in Gunnamatta Bay. The baths are backed by a narrow sandy beach and a large reserve with picnic facilities.

The Beach Suitability Grade of Fair indicates that microbial water quality is occasionally influenced by faecal pollution, usually triggered by rainfall, with potential faecal contamination from stormwater and sewage overflows.

The response to rainfall graph indicates that enterococci levels increased with increasing rainfall, often exceeding the safe swimming limit in response to 10 mm of rainfall or more.

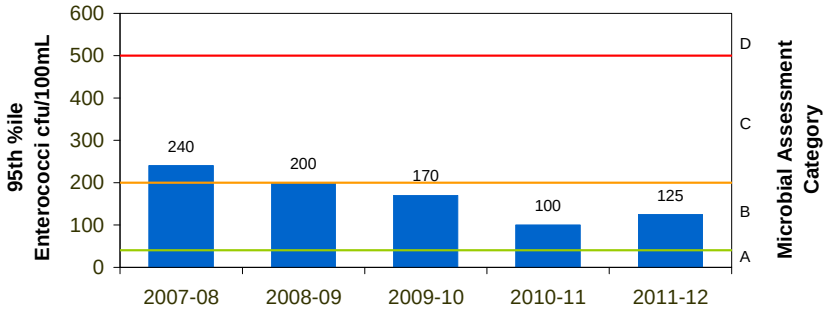
The site has been monitored since 1994. Microbial water quality improved in 2000 because of sewage overflow remediation in the catchment and improved stormwater management.

Sanitary Inspection: **High**



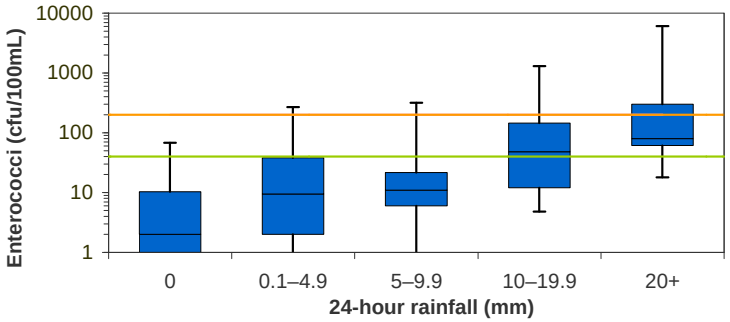
Microbial Assessment: **B**

Monitoring period for 2011–12 result is January 2010 to April 2012.

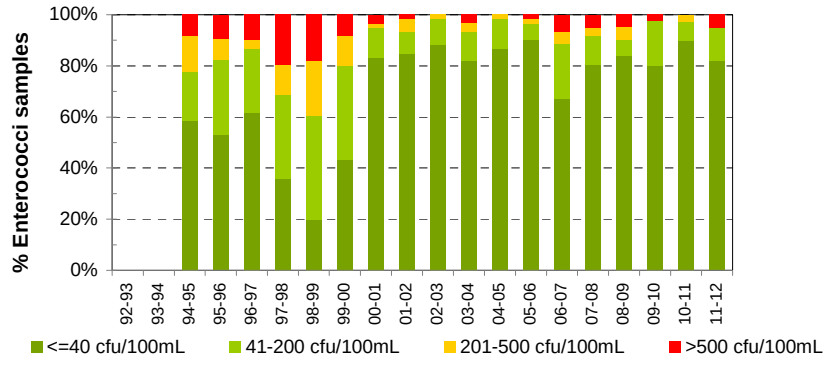


Response to rainfall

Rainfall from South Cronulla rain gauge



Trends in enterococci data through time



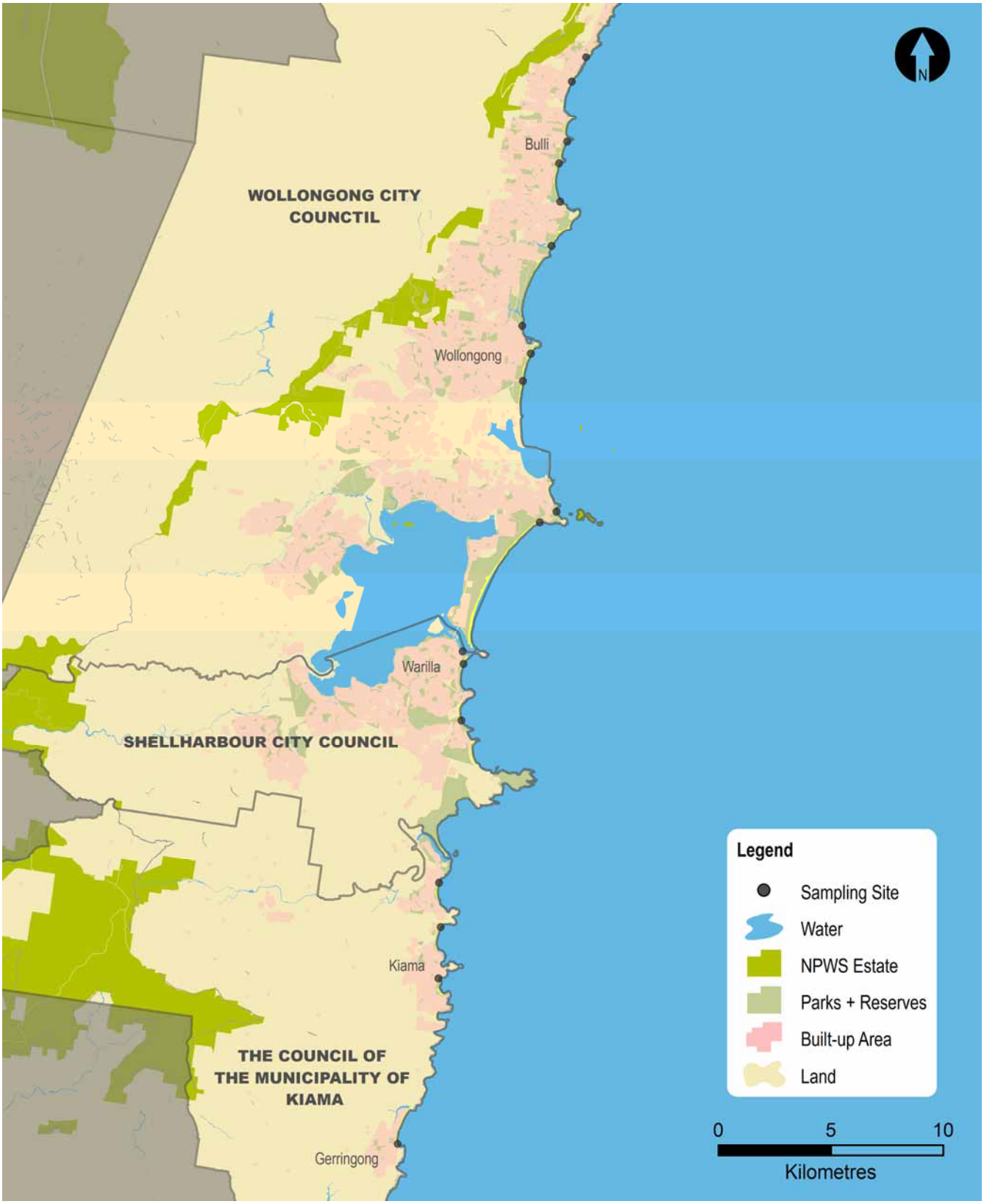


Figure 29: Councils and sampling locations in the Illawarra region