Chapter 6
Special Studies

Introduction

The routine monitoring of bacterial water quality undertaken by the Beachwatch and Harbourwatch programs has established a good understanding of how receiving waters respond to changing pressures from adjacent catchments. However, targeted studies are from time to time required to investigate specific causes of poor water quality that may have aroused community concerns.

The study presented in this chapter addresses chronic poor water quality at Darling Harbour.

Darling Harbour

Introduction

Since 1996, Darling Harbour has frequently been the most polluted of the Sydney Harbour sites monitored as part of the Harbourwatch Program. This was again the case in 2007–2008, with Darling Harbour frequently having elevated faecal coliform and enterococci levels.

Darling Harbour has a naturally low flushing rate, so pollution that enters the bay is not diluted or dissipated as readily as in other areas of the Harbour. Sources of pollution in Darling Harbour are sewage overflows, leaky sewerage systems and stormwater discharges. Illegal waste discharges from recreational vessels may also contribute.

Swimming by the general public is not permitted in Darling Harbour. Despite this, the public is still vulnerable to pollution via secondary contact. As well, authorised water-based events involving primary contact recreation, such as water skiing, are occasionally held.

Darling Harbour and Cockle Bay are the responsibility of the Sydney Harbour Foreshore Authority, which is currently developing strategies that will improve Darling Harbour in many aspects, with improved environmental performance a priority.

Sampling sites

The site from which water samples were collected is indicated in the map on page 246.

Method

Water samples were collected by boat every six days as part of the routine Harbourwatch sampling program.

Samples were collected at a depth of approximately 30 centimetres by using aseptic technique, placed immediately on ice, and then transported to the laboratory for analysis. Samples were analysed for faecal coliform and enterococci densities.

Primary contact recreation guidelines

Primary contact recreation includes activities such as swimming and diving, where there is likely to be full immersion of the body and some ingestion of water.

Beachwatch considers that waters are suitable for swimming if, for the five samples collected each month:

1. the median faecal coliform density is equal to or less than 150 colony forming units per 100 millilitres (cfu/100 mL), or
2. the second-highest sample contains less than 600 cfu/100 mL (faecal coliforms), or
3. the median enterococci density is equal to or less than 35 cfu/100 mL, or
4. the second-highest sample contains less than 100 cfu/100 mL (enterococci) for five samples taken at regular intervals not exceeding one month.

Beachwatch uses a rolling median (and rolling second-highest sample) to calculate the seasonal compliance estimates for each beach.

Secondary contact recreation guidelines

Secondary contact recreation includes activities such as boating, fishing and sailing, where there is some direct contact with water but less probability of the water being swallowed. The guideline levels for the indicator organisms are therefore higher than those for primary contact recreation. Secondary contact guidelines, based on NHMRC (1990) and ANZECC (1992), require a minimum of five samples to be taken at regular intervals not exceeding one month. The guidelines are:

- **for faecal coliforms**, the median not exceeding 1000 cfu/100 mL, and four out of five samples less than 4000 cfu/100 mL
- **for enterococci**, the median not exceeding 230 cfu/100 mL, and four out of five samples less than 700 cfu/100 mL.

Results

The results of water quality monitoring at Darling Harbour are shown on page 305. The site page includes:

- a brief description of the site
- pollution sources
- compliance with primary and secondary contact water quality guidelines
- response of bacterial density to rainfall
- a season graph showing data from the 2007–2008 season.

Compliances were calculated by using both the primary and secondary contact recreation guidelines.

Discussion

Compliance – primary contact

Faecal coliform levels at Darling Harbour have frequently exceeded the guidelines for primary contact. The compliance results have ranged between 23% and 59% during the last five years and have been variable between seasons and years.

During the last five years, enterococci compliances have varied between 32% and 74%. Similarly, enterococci seasonal compliance shows variability over the past five years.

Compliance – secondary contact

Darling Harbour complied with the faecal coliform guidelines for secondary contact recreation 100% of the time during winter 2007, and 65% during summer 2007–2008. Over the last five years, compliances have ranged from 65% to 100%.

Darling Harbour complied with the enterococci criteria for secondary contact 100% of the time during winter 2007 and 68% of the time during summer 2007-2008. The range of enterococci compliances over the last five years was 60% to 100%.

Response to rainfall

Although high counts of both faecal coliform and enterococci were common in dry weather, there was a general trend towards increased counts with increasing rainfall in the previous 24 hours. The primary contact recreation median guideline limits were often exceeded after no rain, and regularly exceeded in response to light rain in the previous 24 hours.

Specific actions in the Darling Harbour Catchment

SewerFix Program

Urban drainage systems constructed in the Victorian era commonly combined both stormwater and sewage. This situation has led to chronic poor harbour water quality near old suburbs in the inner city.

Sydney Water Corporation's 'SewerFix' program has rehabilitated old sewers and identified improper connections in the Darling Harbour catchment.

Stormwater management

The City of Sydney council continues to raise awareness of water pollution and other environmental issues through information, education and enforcement.

Activities also include regular maintenance and cleaning of stormwater quality improvement devices, channels and gully pits.

The Council regularly conducts environmental training of its outdoor staff.

Sydney Harbour Foreshore Authority maintains an aquatic boom to block debris from entering Cockle Bay and conducts regular on-water sweeps of Cockle Bay to collect floating rubbish.

Water Harvesting Program

Sydney Harbour Foreshore Authority will implement a new water harvesting/recycling project at Darling Harbour. This will capture stormwater and reuse it for irrigation and other purposes, with the added bonus of reducing run-off into Cockle Bay.

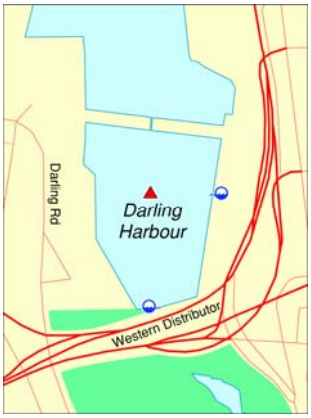
Plans include water harvesting and recycling and investigating the use of grey (recycled) water. The first part of the scheme, sub-surface irrigation at Tumbalong Park is already in place. The water harvesting will use purpose-built tanks in the Sydney Entertainment Centre car park. The tanks will store water collected from the

roofs of both the Sydney Entertainment Centre car park and the Sydney Convention and Exhibition Centre, covering a combined total of 25 000 square metres. A total reduction in water usage of 41 kilolitres per day over ten years is estimated.

Sydney Water Corporation has backed the Foreshore Authority's plans and has provided a grant of $45,000 towards the scheme.

Darling Harbour

See page 246 for key to map



Description

The sample site is in the centre of Cockle Bay, directly in front of the Harbourside Festival Market Place.

Pollution sources

A large proportion of the stormwater drains of the southern Sydney CBD and parts of Ultimo discharge to Darling Harbour. Sewage overflows in the Darling Harbour catchment and illegal sewage discharges from visiting recreational vessels may affect water quality in the bay.

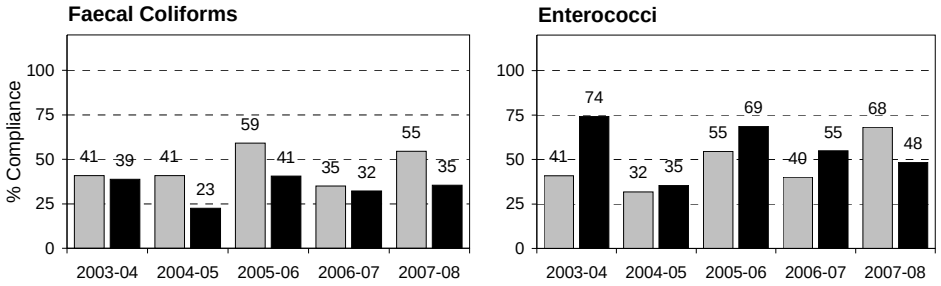
Actions

DECC, Sydney Water, the City of Sydney, the Sydney Harbour Foreshore Authority, NSW Maritime and Sydney Ports Authority are addressing possible sources of faecal contamination in Darling Harbour.

Compliance

Primary contact

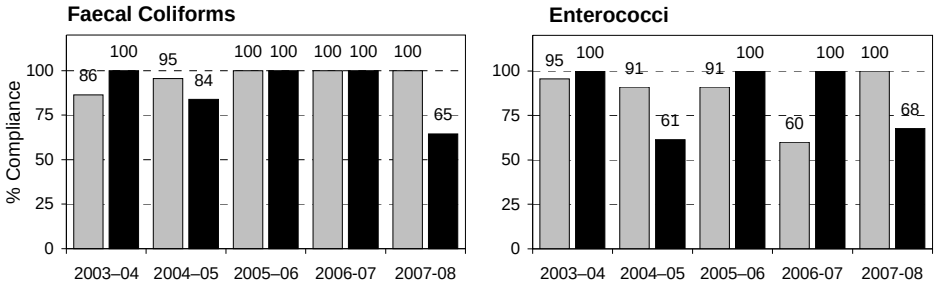
winter season
summer season



Compliance

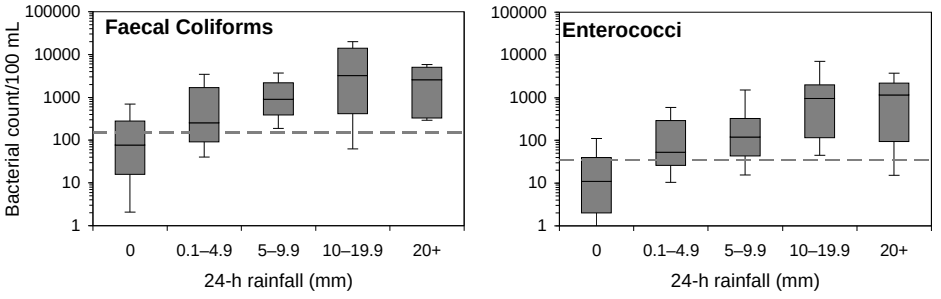
Secondary contact

winter season
summer season



Response to rainfall

median threshold (primary contact)



Season Data

rainfall
individual result
rolling median
rolling 80th percentile

Guidelines
(see page 7 for details)
median threshold
80th percentile threshold