

On the Beaches

Recreational Water Quality of the Wellington Region, 2003–2004

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Aotea Lagoon

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INTRODUCTION

Will I get sick if I swim?

Regional councils and local authorities monitor recreational water quality to identify risks to public health from disease-causing organisms and inform the public of these risks. People can then make informed decisions about where, when, and how they use rivers and the marine environment for recreation.

Recreational water quality monitoring in the Wellington Region for 2003–2004 has been a joint effort involving the Greater Wellington Regional Council and its constituent local councils, in particular the Kapiti Coast District Council, Porirua City Council, Hutt City Council, and Wellington City Council. Choice Health and Hutt Valley Health have been consulted on occasions when the results of the monitoring indicated a serious health risk might exist.

During the bathing season, weekly water test results were collated by the Greater Wellington Regional Council and displayed at www.gw.govt.nz/on-the-beaches. Water test results from the Wairarapa monitoring sites were published weekly by the “Wairarapa Times-Age” newspaper.



Waingawa River at Kaituna

The Recreational Water Quality Monitoring Programme

Aims of the Programme

The aims of the programme are to:

1. Determine the suitability of the selected marine and freshwater sites for contact recreation;
2. Assist in safeguarding public health and the environment;
3. Provide a mechanism to determine the effectiveness of plans;
4. Provide information to assist in the determination of spatial and temporal changes in the environment (State of the Environment Monitoring); and
5. Provide information to assist in targeted investigations where remedial action or mitigation of poor water quality is desired.

Bacteriological Guidelines

Water contaminated by human or animal excreta may contain a diverse range of pathogenic (disease-causing) micro-organisms such as bacteria, viruses, and protozoa. These organisms may pose a health hazard when the water is used for recreational activities. In most cases, the ill-health effects from exposure to contaminated water are minor and short-lived, although the potential for more serious diseases such as Hepatitis A, Giardiasis, Cryptosporidiosis, Campylobacteriosis, and Salmonellosis cannot be discounted.

The Ministry for the Environment and the Ministry of Health have jointly produced national recreational water quality guidelines which are based on an assessment of the risk from exposure to contaminated water (MfE/MoH 2002). These guidelines use bacteriological indicators to assess the risk of faecal contamination and therefore the potential for the presence of pathogens. Compliance with the guidelines in respect of the concentration of these indicator bacteria should ensure that people using water for contact recreation are not exposed to significant health risks. The Wellington Region's monitoring programme follows the national guidelines.

The recreational water quality guidelines use bacteriological "trigger" values to help water managers determine when management intervention is required. The "trigger" values underpin a three-tier management framework analogous to traffic lights.

Fresh Water

Mode	Guideline (<i>E. coli</i> concentration in colony-forming units per 100mL)	Management Response
Green/Surveillance	Single sample ≤ 260	Routine monitoring
Amber/Alert	Single sample > 260 and ≤ 550	Increased monitoring, investigation of source and risk assessment
Red/Action	Single sample > 550	Closure, public warnings, increased monitoring and investigation of source

Marine

Mode	Guideline (Enterococci concentration in colony-forming units per 100mL)	Management Response
Green/Surveillance	Single sample \leq 140	Routine monitoring
Amber/Alert	Single sample $>$ 140	Increased monitoring, investigation of source and risk assessment
Red/Action	Two consecutive samples within 24 hours $>$ 280	Closure, public warnings, increased monitoring and investigation of source

Periphyton Guideline

As part of the monitoring of recreational water quality in fresh waters, the presence of periphyton (algae) in the river is also assessed. Excessive amounts of periphyton can reduce the amenity value of waterways by decreasing their aesthetic appearance, reducing visibility, and being a physical nuisance to swimmers. The Ministry for the Environment recommends a maximum threshold of 30% periphyton cover, above which the recreation values of the waterway are considered to be impaired. The Wellington Region's monitoring programme follows this guideline.

Methodology

Ninety-nine sites (23 fresh water, 76 marine) were monitored during the 2003–2004 bathing season, which is taken as the period between 1 November and 31 March. The sites were selected on the basis of their use by the public for contact recreation; in particular, swimming, canoeing, rafting, surfing, and boating.

Fresh water: The sites in the western part of the Region were the same as those monitored in the 2002–2003 bathing season. In the Wairarapa, the site at Riversdale Lagoon was returned to the programme after not being monitored in 2002–2003. Other sites in the Wairarapa were the same as those monitored in the last bathing season.

Marine: The sites in the western part of the Region were the same as those monitored in the 2002–2003 bathing season. The sites in the Wairarapa were the same as those monitored in the last four bathing seasons.

Sites were visited weekly during the bathing season. On each occasion a single water sample was collected 0.2 metres below the surface in 0.5 metres water depth and analysed for the bacteria *Escherichia coli* (fresh water) or enterococci (marine) using membrane filtration. The methods give a result in 24 hours. Measurements of water temperature and turbidity, and visual estimates of periphyton cover, were made at each freshwater site. Observations of weather and the state of the tide, and visual estimates of seaweed cover, were made at each marine site. An estimate of the daily rainfall in the catchment adjoining each site over the bathing season was made by obtaining records from the nearest rain gauge.



Environment Management

Wellington Regional Map
How do I know it's safe?

- Introduction
- Policy and Plans
- Resource Consents
- Pollution Response
- Environmental Monitoring
- River Flows
- On the Beaches
- Harbours
- Hazard Maps
- Take Care
- Search
- Home

On the beaches

On the Beaches



Will I get sick if I swim?



A **guide** to recreational water quality monitoring in the Wellington Region.

Click an area on the map to access GWRC recreational water quality monitoring sites or select a site from the drop down list below.

Opening screen at www.gw.govt.nz/on-the-beaches

RECREATIONAL WATER QUALITY IN FRESH WATERS, 2003–2004

Results

A total of 21 samples were taken at each freshwater site on the Kapiti Coast, 22 samples at each site on the Hutt River system, and 20 samples at each site in the Wairarapa. The locations of the sites are shown in Fig. 1.

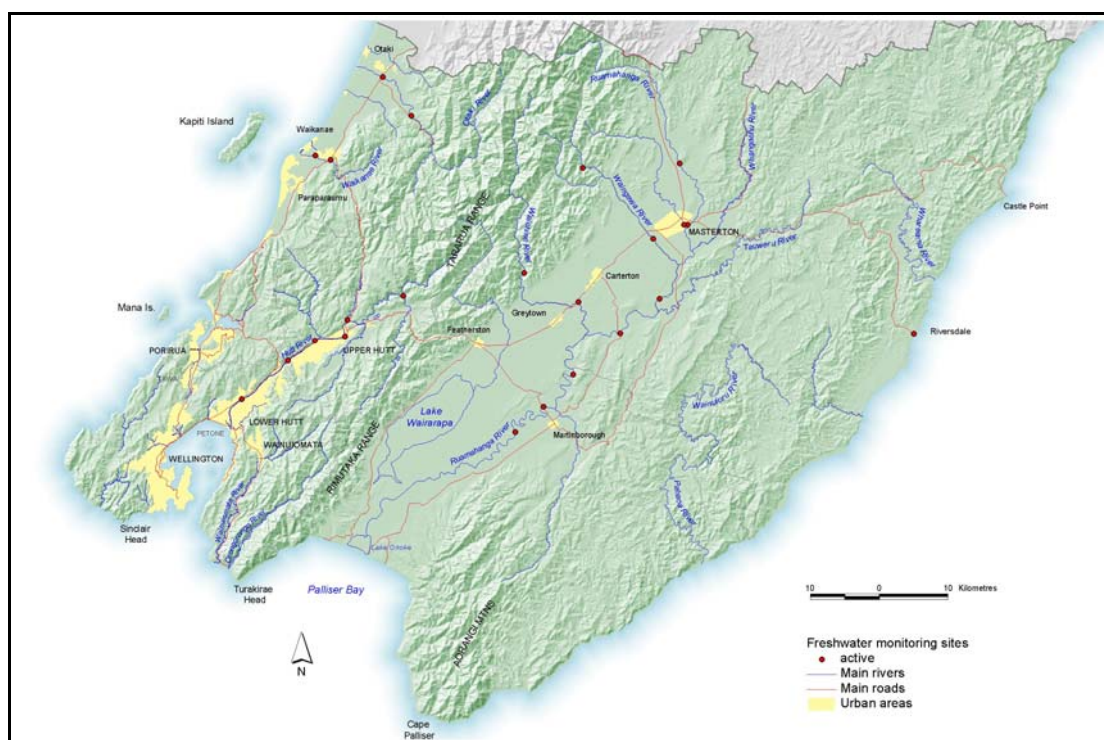


Fig. 1. Wellington Region freshwater recreational water quality monitoring sites, 2003–2004.

Kapiti

Results from the two sites monitored on the Otaki River were below the *E. coli* guideline of 550 cfu/100mL throughout the bathing season. Results from the two sites monitored on the Waikanae River exceeded the guideline on three occasions. These were:

- 3 February 2004
- 12 February 2004
- 17 February 2004

The high *E. coli* counts each followed more than 60 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Kapiti Coast District Council.

None of the four freshwater sites monitored on the Kapiti Coast exceeded the threshold of 30% periphyton cover during the bathing season.

Hutt

Results from each of the six sites monitored on the Hutt River system exceeded the *E. coli* guideline of 550 cfu/100mL on two or three occasions during the bathing season. These were:

- Maoribank on 25 November 2003
- Birchville on 23 December 2003
- Silverstream Bridge on 13 January 2004
- All six sites on 20 January 2004 and 17 February 2004

With the exception of Maoribank on 25 November 2003 (6 mm) and Silverstream Bridge on 13 January 2004 (0 mm), the high *E. coli* counts each followed more than 20 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Greater Wellington Regional Council.

Only one of the six freshwater sites monitored on the Hutt River system exceeded the threshold of 30% periphyton cover during the bathing season. This was:

- Boulcott on 30 March 2004

Wairarapa

The Waingawa River was monitored at two sites. Results from these sites exceeded the *E. coli* guideline of 550 cfu/100mL on one or two occasions during the bathing season. These were:

- Kaituna on 11 February 2004
- South Road on 21 January 2004 and 4 February 2004

The high *E. coli* counts each followed more than 30 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Greater Wellington Regional Council.

The Waiohine River was monitored at two sites. Results from Waiohine River at Gauge were below the *E. coli* guideline of 550 cfu/100mL throughout the bathing season. Results from Waiohine River at State Highway 2 exceeded the guideline on two occasions. These were:

- 21 January 2004
- 11 February 2004

The high *E. coli* counts each followed more than 35 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Greater Wellington Regional Council.

Results from the Waipoua River at Colombo Road exceeded the *E. coli* guideline of 550 cfu/100mL on seven occasions during the bathing season. These were:

- 26 November 2003
- 10 December 2003
- 21 January 2004
- 4 February 2004
- 11 February 2004
- 18 February 2004
- 3 March 2004

With the exception of 26 November 2003 (3 mm in 24 hours), the high *E. coli* counts each followed more than 10 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Greater Wellington Regional Council.

The Ruamahanga River was monitored at seven sites. Results from Double Bridges, Te Ore Ore and Morrisons Bush exceeded the *E. coli* guideline of 550 cfu/100mL on two occasions during the bathing season. Results from The Cliffs, Kokotau, and Waihenga exceeded the guideline on three occasions, while results from Bentley's Beach exceeded the guideline on four occasions. These were:

- All sites on 21 January 2004
- Double Bridges, The Cliffs, Kokotau, and Bentley's Beach on 4 February 2004
- Waihenga and Bentley's Beach on 11 February 2004
- Te Ore Ore, The Cliffs, Kokotau, Morrisons Bush, Waihenga, and Bentley's Beach on 18 February 2004

The high *E. coli* counts each followed more than 40 mm of rain in the catchment in the preceding 72 hours. No follow-up samples were taken by the Greater Wellington Regional Council.

Riversdale Lagoon was the only site monitored in the eastern Wairarapa. Results from this site exceeded the *E. coli* guideline of 550 cfu/100mL on four occasions during the bathing season. These were:

- 2 December 2003
- 27 January 2004
- 10 February 2004
- 17 February 2004

On two occasions the high *E. coli* counts followed rain in the catchment in the preceding 72 hours, while the remainder were not associated with rainfall. No follow-up samples were taken by the Greater Wellington Regional Council.

Periphyton levels were generally low in the major Wairarapa rivers throughout the bathing season. Three sites exceeded the threshold of 30% periphyton cover during the bathing season. These were:

- Waipoua River at Colombo Road on 11 February and 17 March 2004

- Ruamahanga River at The Cliffs on 10 March and 17 March 2004
- Waiohine River at Gauge on 17 March 2004

Discussion

Recreational water quality in rivers of the Region was reasonably good considering that January, and more particularly February, were wetter than average. Of the 23 freshwater sites monitored, 20 (87%) had *E. coli* concentrations above the “action” guideline at some time during the bathing season. Despite the high proportion of sites with results above the guideline, these “action” concentrations only represent 56 (12%) of the 476 freshwater samples taken in the course of the bathing season. The distribution of the samples in terms of their geographic origin and the number of times a site exceeded the guideline are shown in Table 1.

Table 1. Distribution of water samples with *E. coli* concentrations > 550 cfu/100mL in terms of their geographic origin and the number of times a site exceeded the guideline

Times site exceeded guideline	Number of sites in category in					Total no. of sites in category	Percentage of sites in category
	Kapiti	Porirua	Hutt	Wellington	Wairarapa		
0	2		0		1	3	13.04
1	0		0		1	1	4.35
2	0		3		5	8	34.78
3	2		3		3	8	34.78
4	0		0		2	2	8.70
5	0		0		0	0	0
6	0		0		0	0	0
7	0		0		1	1	4.35
Total	4		6		13	23	100

Fifty-three (95%) of the cases where freshwater sites exceeded the “action” guideline were associated with rainfall in the preceding 72 hours and, in nearly all of these cases, *E. coli* levels fell back below the guideline within a week. On the few occasions that the *E. coli* levels remained elevated, there was further rain in the period between the water samples. The observations are consistent with high *E. coli* levels in fresh water typically being related to runoff and re-suspension of sediments during rainfall events.

RECREATIONAL WATER QUALITY IN MARINE WATERS, 2003–2004

Results

A total of 21 samples were taken at each site in the western part of the Region with the exception of Oriental Bay at Freyberg Beach, where sampling began on 12 January 2004 following the completion of shoreline restoration works. A total of 20 samples were taken at each of the sites in the Wairarapa. The locations of the sites are shown in Fig. 2.

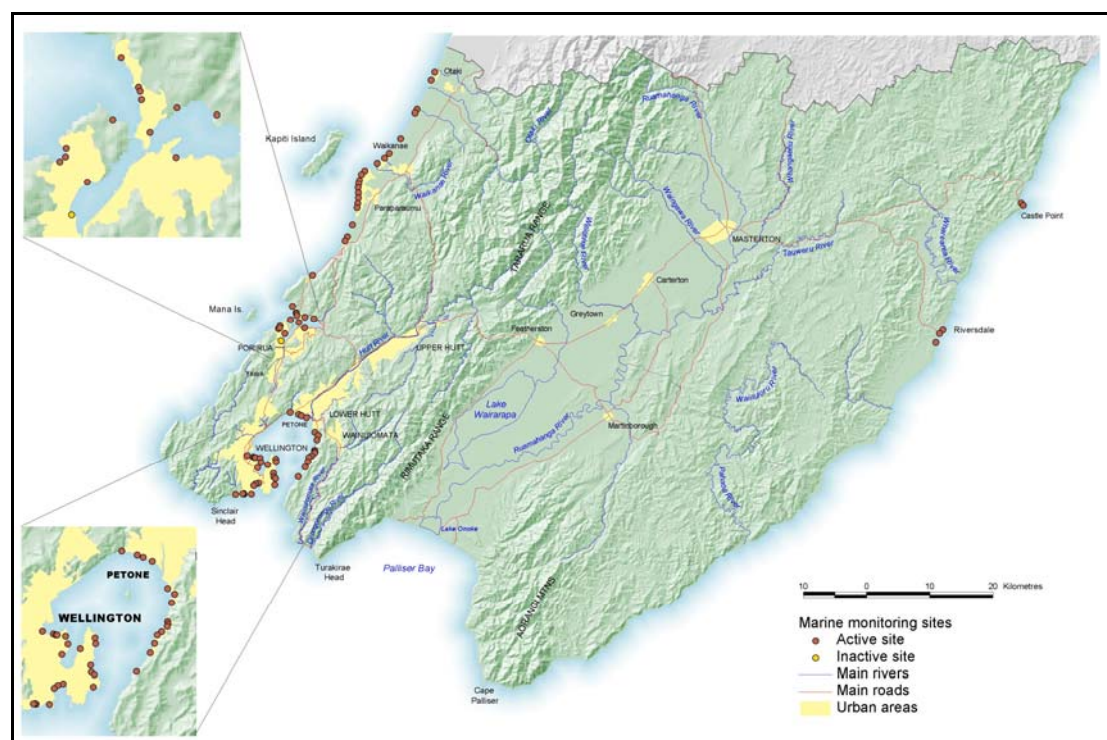


Fig. 2. Wellington Region marine recreational water quality monitoring sites, 2003–2004.

Kapiti

Results from four of the 20 marine sites monitored along the Kapiti Coast were below the enterococci guideline of 280 cfu/100mL throughout the bathing season. Nine sites each exceeded the guideline on one occasion, six sites exceeded the guideline twice, and one site exceeded the guideline three times. These were:

- Raumati Beach at Tainui Street on 3 February 2004
- Te Horo Beach South of Mangaone Stream and Te Horo Beach at Kitchener Street on 4 February 2004
- Te Horo Beach South of Mangaone Stream on 11 February 2004
- Waikanae Beach at William Street, Waikanae Beach at Tutere Street Tennis Courts, and Waikanae Beach at Ara Kuaka Carpark on 12 February 2004
- Waikanae Beach at Tutere Street Tennis Courts, and Waikanae Beach at Ara Kuaka Carpark on 17 February 2004

- Paraparaumu Beach at Nathan Avenue, Paraparaumu Beach at Maclean Park, Paraparaumu Beach at Toru Road, Paraparaumu Beach at Wharemauku Road, Raumati Beach at Tainui Street, Raumati Beach at Marine Gardens, Raumati Beach at Aotea Road, and Raumati Beach at Hydes Road on 18 February 2004
- Otaki Beach at Surf Club, Otaki Beach at Rangiuru Road, Te Horo Beach South of Mangaone Stream, Te Horo Beach at Kitchener Street, and Peka Peka Beach at Road End on 19 February 2004
- Raumati Beach at Aotea Road and Raumati Beach at Hydes Road on 24 February 2004

The high enterococci counts each followed rain in the 72 hours preceding the collection of the sample. For the 3 February, 11 February, and 24 February incidents, follow-up samples were taken by the Kapiti Coast District Council.

3 February incident: The result from a sample taken at Raumati Beach at Tainui Street on 4 February was above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. It continued to rain and no further management action was taken.

11 February incident: The result from a sample taken at Te Horo Beach South of Managone Stream on 12 February was above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. It continued to rain and no further management action was taken.

24 February incidents: Results from samples taken at Raumati Beach at Aotea Road and Raumati Beach at Hydes Road on 26 February indicated no further management action was required.

Porirua

All 14 sites monitored in Porirua had results above the enterococci guideline of 280 cfu/100mL on one or more occasions during the bathing season. These were:

- Titahi Bay at Toms Road, Titahi Bay at South Beach Access Road, Paremata Beach at Pascoe Avenue, and Pauatahanui Inlet at Browns Bay on 7 January 2004
- Titahi Bay at Bay Drive, Porirua Harbour at Rowing Club, Plimmerton Beach at Bath Street, Plimmerton Beach at Queens Avenue, South Beach at Plimmerton, and Pauatahanui Inlet at Water Ski Club on 22 January 2004
- Onehunga Bay, South Beach at Plimmerton, Paremata Beach at Pascoe Avenue, and Pauatahanui Inlet at Browns Bay on 3 February 2004
- Pauatahanui Inlet at Browns Bay on 10 February 2004
- All sites on 18 February 2004
- Pauatahanui Inlet at Browns Bay on 9 March 2004
- Onehunga Bay, Titahi Bay at Bay Drive, Titahi Bay at Toms Road, Titahi Bay at South Beach Access Road, Porirua Harbour at Rowing Club, Pukerua Bay, Plimmerton Beach at Bath Street, Pauatahanui Inlet at Water Ski Club, and Pauatahanui Inlet at Browns Bay on 17 March 2004

The high enterococci counts on 7 January, 10 February, and 17 March followed 4, 5, and 16 mm of rain respectively in the preceding 24 hours. The high enterococci

counts on 22 January, 3 February, and 18 February each followed more than 20 mm of rain in the preceding 72 hours. The high enterococci count at Pauatahanui Inlet at Browns Bay on 9 March was not associated with rainfall. For all but the 18 February incidents, follow-up samples were taken by the Porirua City Council the next day.

7 January incidents: Results from samples taken at all four sites on 8 January were above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. It continued to rain for several more days and no management action was taken.

22 January incidents: Results from samples taken at all six sites on 23 January indicated no further management action was required.

3 February incidents: Results from samples taken at Onehunga Bay and Pauatahanui Inlet at Browns Bay on 4 February were above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. It continued to rain and the Porirua City Council placed health-warning signs at Onehunga Bay and at the three sites in Pauatahanui Inlet on 5 February.

10 February incident: The result from a sample taken at Pauatahanui Inlet at Browns Bay on 11 February was above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. It continued to rain and health-warning signs remained in place at Onehunga Bay and at the three sites in Pauatahanui Inlet.

18 February incidents: Although no follow-up samples were taken, the heavy rain prompted the Porirua City Council to place health-warning signs at all monitored sites on 19 February. These were removed on 2 March after results from further samples taken at all sites were found to be below the guideline.

9 March incident: The result from a sample taken at Pauatahanui Inlet at Browns Bay on 10 March was above the enterococci guideline. There was no rain in the period between the initial and follow-up samples. The Porirua City Council placed health-warning signs at Browns Bay on 12 March.

17 March incidents: Results from samples taken at Porirua Harbour at Rowing Club, Pauatahanui Inlet at Water Ski Club, and Pauatahanui Inlet at Browns Bay on 18 March were above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. The Porirua City Council placed health-warning signs at the sites on 19 March. These were removed on 25 March after results from samples taken at the sites on 23 March were found to be below the guideline.

Hutt

Results from six of the 15 marine sites monitored in Hutt City were below the enterococci guideline of 280 cfu/100mL throughout the bathing season. Four sites each exceeded the guideline on one occasion, two sites exceeded the guideline on two occasions, two sites exceeded the guideline on three occasions, and one site exceeded the guideline on five occasions. These were:

- Petone Beach at Sydney Street on 4 November 2003

- Petone Beach at Sydney Street on 16 December 2003
- Petone Beach at Sydney Street, Petone Beach at Kiosk, Lowry Bay at Cheviot Road, and Robinson Bay at HW Shortt Recreation Ground on 22 December 2003
- Petone Beach at Sydney Street on 27 January 2004
- Rona Bay at Cliff Bishop Park, Robinson Bay at HW Shortt Recreation Ground, and Robinson Bay at Nikau Street on 10 February 2004
- Lowry Bay at Cheviot Road, Rona Bay at Cliff Bishop Park, and Robinson Bay at Nikau Street on 18 February 2004
- Petone Beach at Water Ski Club, Petone Beach at Sydney Street, Sorrento Bay, Lowry Bay at Cheviot Road, York Bay, and Rona Bay at Cliff Bishop Park on 2 March 2004

The high enterococci counts on 18 February (3 sites) and 2 March (6 sites) followed 95 mm and 13 mm of rain respectively in the preceding 72 hours. The high enterococci counts on 4 November, 16 December, 22 December (4 sites), and 27 January, also followed rain, although in these cases only 1 mm fell in the preceding 24, 48, or 72 hours. The high enterococci counts on 10 February (3 sites) were not associated with rainfall. For the incidents on 4 November, 16 December, 22 December, 27 January, 10 February, and 2 March, follow-up samples were taken by the Hutt City Council. No follow-up samples were taken for the incidents on 18 February.

4 November incident: The result from a sample taken at Petone Beach at Sydney Street on 5 November indicated no further management action was required.

16 December incident: The result from a sample taken at Petone Beach at Sydney Street on 17 December indicated no further management action was required.

22 December incidents: Results from samples taken at Petone Beach at Sydney Street and Petone Beach at Kiosk on 26 December, and the result from a sample taken at Robinson Bay at HW Shortt Recreation Ground on 27 December, indicated no further management action was required. The result from a sample taken at Lowry Bay at Cheviot Road on 26 December was above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. The result from a further sample taken on 27 December was below the enterococci guideline.

27 January incident: The result from a sample taken at Petone Beach at Sydney Street on 28 January indicated no further management action was required.

10 February incidents: Results from samples taken at Robinson Bay at HW Shortt Recreation Ground and Robinson Bay at Nikau Street on 11 February indicated no further management action was required. The results of samples taken at Rona Bay at Cliff Bishop Park on 11 February and 13 February were above the enterococci guideline. Rain fell in the period between the initial and follow-up samples. No further management action was taken.

18 February incidents: Although no follow-up samples were taken, severe flooding of the Waiwhetu Stream prompted the Hutt City Council to place health-warning signs at all monitored sites along the eastern side of Wellington Harbour. These remained in place for several weeks while repairs to the sewerage system were carried out, even

though results from samples taken at all sites on 24 February were found to be below the enterococci guideline.

2 March incidents: Results from samples taken at all six sites on 4 March indicated no further management action was required.

Wellington

Results from 11 of the 22 marine sites monitored in Wellington City were below the enterococci guideline of 280 cfu/100mL throughout the bathing season. Eight sites each exceeded the guideline on one occasion, two sites exceeded the guideline on two occasions, and one site exceeded the guideline on four occasions. These were:

- Oriental Bay at Band Rotunda and Balaena Bay on 19 November 2003
- Princess Bay on 29 December 2003
- Oriental Bay at Wishing Well on 12 January 2004
- Island Bay at Surf Club, Island Bay at Reef Street, and Owhiro Bay on 20 January 2004
- Seatoun Beach at Inglis Street on 26 January 2004
- Princess Bay and Island Bay at Old Bait Shed on 3 February 2004
- Oriental Bay at Wishing Well and Oriental Bay at Band Rotunda on 18 February 2004
- Hataitai Beach and Lyall Bay at Tirangi Road on 1 March 2004
- Oriental Bay at Wishing Well on 8 March 2004
- Oriental Bay at Wishing Well on 22 March 2004

The high enterococci counts on 19 November, 29 December, 20 January, 3 February, 18 February, and 1 March each followed more than 15 mm of rain in the preceding 72 hours. The high enterococci counts on 12 January, 26 January, 8 March, and 22 March were not associated with rainfall. Except for the 12 January incident, follow-up samples were taken by the Wellington City Council one or two days later. Results from all follow-up samples indicated no further management action was required.

Wairarapa

Two sites were sampled on Castlepoint Beach and three sites on Riversdale Beach. Results from Riversdale Beach at Between the Flags and Riversdale Beach South were below the enterococci guideline of 280 cfu/100mL throughout the bathing season. Results from the remaining three sites exceeded the guideline on one occasion at each site. These were:

- Castlepoint Beach at Smelly Creek on 20 January 2004
- Castlepoint Beach at Castlepoint Stream and Riversdale Beach at Lagoon Mouth on 17 February 2004

The high enterococci counts each followed more than 30 mm of rain in the adjoining catchment in the 72 hours preceding the collection of the sample. No follow-up samples were taken by the Greater Wellington Regional Council.

Discussion

Recreational water quality was good at the majority of the Region's coastal beaches throughout the 2003–2004 bathing season. Of the 76 marine sites monitored, 53 (70%) had enterococci concentrations above the “action” guideline at some time during the bathing season. However, these “action” concentrations only represent 101 (6.4%) of the 1581 marine water samples taken in the course of the bathing season. The distribution of the samples in terms of their geographic origin and the number of times a site exceeded the guideline are shown in Table 2.

Table 2. Distribution of water samples with enterococci concentrations > 280 cfu/100mL in terms of their geographic origin and the number of times a site exceeded the guideline

Times site exceeded guideline	Number of sites in category in					Total no. of sites in category	Percentage of sites in category
	Kapiti	Porirua	Hutt	Wellington	Wairarapa		
0	4	0	6	11	2	23	30.26
1	9	2	4	8	3	26	34.21
2	6	2	2	2	0	12	15.79
3	1	9	2	0	0	12	15.79
4	0	0	0	1	0	1	1.32
5	0	0	1	0	0	1	1.32
6	0	1	0	0	0	1	1.32
Total	20	14	15	22	5	76	100

Ninety-three (92%) of the cases where marine sites exceeded the “action” guideline were associated with rainfall, especially rainfall in the preceding 48 hours, supporting the GWRC/Ministry of Health advice not to swim during, and for up to two days after, heavy rain. The observations are consistent with urban stormwater, and diffuse-source runoff into rivers and streams, being the major contributors to faecal contamination of coastal water.

REFERENCE

Ministry for the Environment and Ministry of Health 2002. “Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas.” Ministry for the Environment, Wellington. [Publication ME Number 447]

APPENDICES

Appendix 1: Laboratory and Field Methods

Determinant	Method	Detection Limit
<i>Escherichia coli</i> at 44°C	APHA Standard Methods (20 th Edition) 9213D, Membrane filter on mTEC agar, Urea substrate	1/100 mL
Enterococci at 41°C	US EPA Method 1600, Membrane filter on mEI agar	1/100 mL
Water temperature	Western: Dissolved oxygen meter (YSI 55) Wairarapa: Conductivity meter (YSI 33)	0.1°C
Turbidity	APHA Standard Methods (20 th Edition) 2130B	0.1 NTU
Periphyton cover	Mean % from 10 estimates taken along a transect using a 20 cm diameter hoop	1%
Seaweed cover	Visual estimate within 5 m radius around sample point, including both floating and attached	5%

Appendix 2: List of Recreational Water Quality Monitoring Sites

Area	Site Name	NZ Map Grid		Type
		Easting	Northing	
Hutt	Petone Beach @ Water Ski Club	2665765	5996304	Marine
Hutt	Petone Beach @ Sydney Street	2667067	5995961	Marine
Hutt	Petone Beach @ Settlers Museum	2667577	5995770	Marine
Hutt	Petone Beach @ Kiosk	2668348	5995425	Marine
Hutt	Sorrento Bay	2669654	5993098	Marine
Hutt	Lowry Bay @ Cheviot Road	2670228	5992605	Marine
Hutt	York Bay	2669999	5991874	Marine
Hutt	Days Bay @ Wellesley College	2669639	5990243	Marine
Hutt	Days Bay @ Wharf	2669677	5990027	Marine
Hutt	Days Bay @ Moana Road	2669605	5989834	Marine
Hutt	Rona Bay @ N end of Cliff Bishop Park	2669132	5989367	Marine
Hutt	Rona Bay @ Wharf	2668753	5989084	Marine
Hutt	Robinson Bay @ HW Shortt Rec Ground	2668542	5988387	Marine
Hutt	Robinson Bay @ Nikau Street	2668154	5987569	Marine
Hutt	Camp Bay	2667013	5986001	Marine
Hutt	Hutt River @ Silverstream Bridge	2677619	6004887	Freshwater
Hutt	Hutt River @ Boulcott	2670941	5999283	Freshwater
Kapiti	Otaki Beach @ Surf Club	2688639	6050044	Marine
Kapiti	Otaki Beach @ Rangioru Road	2688028	6048783	Marine
Kapiti	Te Horo Beach S of Mangaone Stream	2685797	6044192	Marine
Kapiti	Te Horo Beach @ Kitchener Street	2685513	6043648	Marine
Kapiti	Peka Peka Beach @ Road End	2683233	6039620	Marine
Kapiti	Waikanae Beach @ William Street	2681406	6037299	Marine
Kapiti	Waikanae Beach @ Tutere St Tennis Courts	2680673	6036577	Marine
Kapiti	Waikanae Beach @ Ara Kuaka Carpark	2679532	6035693	Marine
Kapiti	Paraparaumu Beach @ Ngapotiki Street	2677561	6034477	Marine
Kapiti	Paraparaumu Beach @ Nathan Avenue	2677051	6033889	Marine
Kapiti	Paraparaumu Beach @ Maclean Park	2676712	6032982	Marine
Kapiti	Paraparaumu Beach @ Toru Road	2676595	6032430	Marine
Kapiti	Paraparaumu Beach @ Wharemauku Road	2676521	6031785	Marine
Kapiti	Raumati Beach @ Tainui Street	2676549	6030944	Marine
Kapiti	Raumati Beach @ Marine Gardens	2676535	6030156	Marine
Kapiti	Raumati Beach @ Aotea Road	2676433	6029244	Marine
Kapiti	Raumati Beach @ Hydes Road	2676337	6028550	Marine
Kapiti	Paekakariki Beach @ Whareroa Road	2675617	6025843	Marine
Kapiti	Paekakariki Beach @ Surf Club	2674810	6023988	Marine
Kapiti	Paekakariki Beach @ Memorial Hall	2674452	6023305	Marine
Kapiti	Otaki River @ The Pots	2695461	6040455	Freshwater
Kapiti	Otaki River @ State Highway 1	2691326	6046120	Freshwater
Kapiti	Waikanae River @ State Highway 1	2683770	6034011	Freshwater
Kapiti	Waikanae River @ Greenaway Road	2681549	6034626	Freshwater
Porirua	Pukerua Bay	2669309	6017968	Marine
Porirua	Karehana Bay @ Cluny Road	2666113	6013074	Marine
Porirua	Plimmerton Beach @ Bath Street	2666726	6012030	Marine
Porirua	Plimmerton Beach @ Queens Avenue	2666790	6011888	Marine
Porirua	South Beach @ Plimmerton	2666830	6011588	Marine
Porirua	Pauatahanui Inlet @ Water Ski Club	2668094	6011307	Marine
Porirua	Pauatahanui Inlet @ Motukaraka Point	2669506	6011052	Marine

Area	Site Name	NZ Map Grid		Type
		Easting	Northing	
Porirua	Pauatahanui Inlet @ Browns Bay	2668059	6009547	Marine
Porirua	Paremata Beach @ Pascoe Avenue	2667137	6010447	Marine
Porirua	Porirua Harbour @ Rowing Club	2664911	6008661	Marine
Porirua	Titahi Bay @ Bay Drive	2664152	6009883	Marine
Porirua	Titahi Bay at Toms Road	2664130	6009571	Marine
Porirua	Titahi Bay @ South Beach Access Road	2663926	6009396	Marine
Porirua	Onehunga Bay	2665816	6010895	Marine
Upper Hutt	Pakuratahi River @ Forks	2694308	6014337	Freshwater
Upper Hutt	Hutt River @ Birchville	2686216	6010807	Freshwater
Upper Hutt	Hutt River @ Maoribank Corner	2685902	6008412	Freshwater
Upper Hutt	Hutt River @ Poets Park	2681482	6007807	Freshwater
Wairarapa	Ruamahanga River @ Double Bridges	2734363	6033494	Freshwater
Wairarapa	Ruamahanga River @ Te Ore Ore	2735543	6024638	Freshwater
Wairarapa	Waipoua River at Colombo Road	2735010	6024610	Freshwater
Wairarapa	Waingawa River @ Kaituna	2720341	6032867	Freshwater
Wairarapa	Waingawa River @ South Road	2730565	6022599	Freshwater
Wairarapa	Ruamahanga River @ The Cliffs	2731492	6013902	Freshwater
Wairarapa	Ruamahanga River @ Kokotau	2725774	6008913	Freshwater
Wairarapa	Waiohine River @ Gauge	2711871	6017655	Freshwater
Wairarapa	Waiohine River @ State Highway 2	2719683	6013431	Freshwater
Wairarapa	Ruamahanga River @ Morrisons Bush	2718938	6002829	Freshwater
Wairarapa	Ruamahanga River @ Waihenga	2714631	5998182	Freshwater
Wairarapa	Ruamahanga River @ Bentleys Beach	2710556	5994533	Freshwater
Wairarapa	Riversdale Lagoon	2768314	6008860	Freshwater
Wairarapa	Castlepoint Beach @ Castlepoint Stream	2781366	6029287	Marine
Wairarapa	Castlepoint Beach @ Smelly Creek	2781670	6028931	Marine
Wairarapa	Riversdale Beach @ Lagoon Mouth	2768974	6009275	Marine
Wairarapa	Riversdale Beach Between the Flags	2768445	6008680	Marine
Wairarapa	Riversdale Beach South	2767844	6007246	Marine
Wellington	Aotea Lagoon	2659007	5989395	Marine
Wellington	Oriental Bay @ Freyberg Beach	2659942	5989176	Marine
Wellington	Oriental Bay @ Wishing Well	2660140	5989098	Marine
Wellington	Oriental Bay @ Band Rotunda	2660265	5989087	Marine
Wellington	Balaena Bay	2660980	5988979	Marine
Wellington	Kio Bay	2661163	5988311	Marine
Wellington	Hataitai Beach	2660654	5987442	Marine
Wellington	Shark Bay	2662233	5987909	Marine
Wellington	Mahanga Bay	2663490	5988828	Marine
Wellington	Scorching Bay	2663539	5988360	Marine
Wellington	Worser Bay	2663097	5986535	Marine
Wellington	Seatoun Beach @ Wharf	2663152	5985946	Marine
Wellington	Seatoun Beach @ Inglis Street	2663428	5985706	Marine
Wellington	Breaker Bay	2663335	5984682	Marine
Wellington	Lyll Bay @ Tirangi Road	2660770	5984942	Marine
Wellington	Lyll Bay @ Onepu Road	2660309	5984828	Marine
Wellington	Lyll Bay @ Queens Drive	2660013	5984580	Marine
Wellington	Princess Bay	2659609	5983216	Marine
Wellington	Island Bay @ Old Bait Shed	2658484	5983228	Marine
Wellington	Island Bay @ Surf Club	2658400	5983302	Marine
Wellington	Island Bay @ Reef St Recreation Ground	2658252	5983254	Marine
Wellington	Owhiro Bay	2657145	5983174	Marine
	<i>Inactive Site</i>			
Porirua	Porirua Harbour @ Te Hiko Street	2664347	6007493	Marine