

Is it safe to swim?

Recreational water quality monitoring
results for the 2014/15 summer



greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao



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The report may be cited as:

Keenan L, Morar, SR and Greenfield, S. 2015. *Is it safe to swim? Recreational water quality monitoring results for the 2014/15 summer*. Greater Wellington Regional Council, Publication No. GW/ESCI-T-15/35, Wellington.

Executive summary

This report summarises the results of weekly recreational water quality monitoring undertaken in the Wellington region over the 2014/15 summer bathing season (1 November 2014 to 31 March 2015). The recreational water quality monitoring programme is undertaken by Greater Wellington Regional Council along with Kapiti Coast District Council, Porirua City Council, Hutt City Council and Wellington City Council to identify risks to public health from disease-causing organisms and toxic cyanobacteria.

Over the 2014/15 bathing season recreational water quality was monitored at 24 river sites, one estuarine site and 62 coastal sites. At each site, water samples were taken for analysis of faecal indicator bacteria (*E. coli* at river and estuarine sites, enterococci at coastal sites and faecal coliforms at coastal shellfish gathering sites) and results were assessed against the Ministry for Environment (MfE)/Ministry of Health (MoH) (2003) national microbiological water quality guidelines. At river sites, filamentous algae, mat algae and benthic cyanobacteria (toxic algae) cover were assessed and results compared to the MfE (2000) nuisance periphyton guidelines and the MfE/MoH (2009) interim cyanobacteria guidelines. Water clarity was also assessed at river sites and results compared to the MfE (1994) guideline for recreational waters.

Of the 21 river and estuarine sites monitored weekly over the 2014/15 summer season, 10 sites (48%) had indicator bacteria counts above the MfE/MoH (2003) action guideline on at least one occasion. Most of the action guideline breaches coincided with significant rainfall in the 24 hours prior to sampling and/or elevated river flows. Of the 25 river and estuarine sites monitored overall, seven sites (28%) have 'all weather' Suitability for Recreation Grades (SFRGs) of 'good' or better while 17 sites (68%) now have 'dry weather' SFRGs of 'good' or better.

The MfE (2000) nuisance filamentous periphyton guideline was not met at several sites during the summer, most notably on 11 occasions at the site Wainuiomata River at Richard Prouse Park and five occasions at Ruamahanga River at Kokotau. The guideline for nuisance mat periphyton was met at all sites on all sampling occasions.

The action level of the MfE/MoH (2009) interim cyanobacteria guidelines was breached at four sites (Hutt River at Poets Park, Hutt River at Silverstream Bridge, Ruamahanga River at Te Ore Ore and Waipoua River at Colombo Road), due to the presence of significant amounts of detached cyanobacteria mats. There were no confirmed reports of human or dog illnesses in relation to toxic algae during the 2014/15 season.

The MfE (1994) guideline for water clarity was met most of the time (88% of sampling occasions). Poor water clarity following freshes accounted for the majority (68%) of occasions when the guideline was not met, while upstream river works accounted for a further 28% of water clarity guideline breaches.

Twenty-nine of the 62 coastal sites (47%) failed to meet the MfE/MoH (2003) action guideline for indicator bacteria on at least one occasion during the 2014/15 summer. Sites that most frequently went over the action guideline were Owhiro Bay, Petone Beach at Water Ski Club and Rona Bay at North End of Cliff Bishop Park. Some exceedances at these sites were not associated with significant rainfall prior to sampling.

As of the end of the 2014/15 bathing season, 28 (45%) coastal monitoring sites have SFRGs of 'good' or better. Twenty-six sites are graded 'fair' and the remaining eight sites are graded 'poor': South Beach at Plimmerton, Porirua Harbour at Rowing Club, Titahi Bay at South Beach Access Road, Island Bay at Surf Club, Island Bay at Reef Street Recreation Ground, Island Bay at Derwent Street, Owhiro Bay, and Rona Bay at Northern End of Cliff Bishop Park.

Of the seven coastal sites monitored to assess water quality for recreational shellfish gathering in 2014/15, only one (Mahanga Bay) fully complied with the MfE/MoH (2003) guidelines. The remaining six sites breached one or both guideline criteria.

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1. Introduction

Regional and territorial authorities monitor recreational water quality to identify risks to public health from disease-causing organisms and advise 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 during 2014/15 was once again a joint effort involving the Greater Wellington Regional Council (GWRC) and its constituent local councils, in particular the Kapiti Coast District Council, Porirua City Council, Hutt City Council, Wellington City Council as well as Wellington Water. Regional Public Health was consulted when the results of the monitoring indicated an increased likelihood of illness associated with recreational use. During the summer bathing season (mid-November 2014 to 31 March 2015), Suitability for Recreation Grades (SFRGs) as well as weekly water test results and cyanobacteria (toxic algae) warnings were displayed at www.gw.govt.nz/summer-check. Weekly test results and

other information are also displayed on a national website, Land and Water Aotearoa (www.lawa.org.nz).

This report summarises the results of weekly monitoring undertaken over the 2014/15 summer bathing season and presents updated SFRGs for the region based on these results. A more comprehensive assessment of recreational water quality is prepared on a five-yearly basis as part of GWRC's State of the Environment reporting (eg, see Greenfield et al. 2012a).



Oriental Bay at Freyberg Beach. This site is graded 'good' for contact recreation



2. Recreational water quality monitoring in the Wellington region

Recreational water quality monitoring in the Wellington region is a joint effort involving GWRC and its constituent local councils. The sites monitored reflect their use by the public for contact recreation; in particular, swimming, canoeing, rafting, surfing and boating.

2.1 Monitoring objectives

The aims of GWRC's recreational water quality monitoring programme are to:

- Determine the suitability of selected sites in coastal and fresh waters for contact recreation;
- Determine the suitability of coastal waters for the gathering of shellfish for human consumption;
- Assist in safeguarding public health and the environment;
- Provide information required to determine the effectiveness of regional plans and policies;
- Provide information to assist in determining spatial and temporal changes in the environment (State of the Environment (SoE) monitoring); and
- Provide information to assist in targeted investigations where remedial action or mitigation of poor water quality is desired.

2.2 Microbiological water quality indicators and 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 (eg, salmonella, campylobacter, cryptosporidium, giardia, etc). These organisms may pose a health hazard when the water is used for recreational activities such as swimming. The most common illness from swimming in contaminated water is gastroenteritis, but respiratory illness and skin infections are also quite common. 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 (Philip 1991). It is likely that many cases of illness contracted through contact recreation activities in contaminated water go unreported.

In 2003 the Ministry for the Environment (MfE) and the Ministry of Health (MoH) finalised microbiological water quality guidelines for recreational waters

that are based on an assessment of the risk from exposure to contaminated water. These guidelines use bacteriological indicators associated with the gut of warm-blooded animals to assess the risk of faecal contamination and therefore the potential presence of harmful pathogens¹. The indicators used are:

- Freshwater (including estuarine waters): *Escherichia coli* (*E. coli*)
- Marine (coastal) waters: Enterococci
- Recreational shellfish-gathering waters: Faecal coliforms

Compliance with the MfE/MoH (2003) microbiological water quality guidelines (from this point on referred to as the recreational water quality guidelines) should ensure that people using water for contact recreation are not exposed to significant health risks. The guideline values are outlined in Sections 3 (fresh waters), 4 (marine waters), and 5 (shellfish gathering waters) of this report. With regard to contact recreation in marine and fresh waters the guidelines consist of two components:

- (1) Faecal indicator bacteria trigger values to assess individual monitoring results throughout the bathing season and
- (2) Beach grades that describe the general condition of a site at any given time.

2.2.1 Trigger values

The MfE/MoH (2003) guidelines provide 'trigger' values for fresh and coastal waters to help water managers assess individual microbiological monitoring results and determine when management intervention is required. The 'trigger' values underpin a three-tier management framework analogous to traffic lights (Table 2.1).

Table 2.1: Three-tier management framework for recreational waters advocated by MfE/MoH (2003)

Mode	Management response
Green/Surveillance	Routine monitoring
Amber/Alert	Increased monitoring, investigation of source and risk assessment
Red/Action	Public warnings, increased monitoring and investigation of source

¹ Indicator bacteria are monitored because individual pathogenic organisms are often present in very low numbers, can be hard to detect and the analytical tests are expensive.

2.2.2 Suitability for recreation grades

The MfE/MoH (2003) guidelines outline a process to grade the suitability of fresh and coastal waters for recreational use from a public health perspective. The grades are intended to describe the general condition of the water at any given time with the potential for the water to be unsuitable for swimming increasing as the grades decline. A Suitability For Recreation Grade (SFRG) is determined by combining a qualitative assessment of the susceptibility of a recreational site to faecal contamination (the Sanitary Inspection Category (SIC) component) with measurements of the appropriate bacteriological indicator (the Microbiological Assessment Category (MAC) component). The MAC component of the SFRG is based on a 95th percentile of sample results from a five-year period (ie, typically 100 data points). There are five SFRGs ranging from 'very good' to 'very poor' with risk to human health increasing as the grades decline (Table 2.2). For ease of interpretation, grades are expressed as letters from A to F in summary cards accompanying this report. Summary cards can be accessed from www.gw.govt.nz/Annual-monitoring-reports.

In 2012, SIC grades for all recreational water quality monitoring sites in the Wellington region were reviewed (Greenfield et al. 2012b). These SICs have been combined here with MAC grades based on data from the five most recent bathing seasons (2010/11 –2014/15) to give updated SFRGs for each site.

It should be noted that because the MAC component of the SFRG is based on a 95th percentile calculated over five summer seasons, this value is heavily influenced by high indicator bacteria counts, often from wet weather sampling events. This means that from year to year a MAC (and therefore a SFRG) can fluctuate as high test results are added (from the latest bathing season) or removed (due to the first season of results being replaced by the most recent results) from the data set. In many cases changes in MAC/SFRG may simply reflect the difference between the addition or loss of a wetter summer season from the data set, rather than a significant shift in water quality. All grade changes are checked to assess whether further investigation is required.

Table 2.2: Suitability for Recreation Grades (SFRGs) and explanation of human health risk associated with each

SFRG	Summary card annotation	Explanation
Very good	A	Generally excellent water quality and very few potential sources of faecal pollution. Water is considered suitable for swimming almost all of the time.
Good	B	Suitable for swimming most of the time. Swimming should be avoided during of following heavy rain.
Fair	C	Generally suitable for swimming but extra care should be taken to avoid contact with the water during or following rainfall or if there are signs of pollution such as discoloured water, odour or debris in the water.
Poor	D	Susceptible to faecal pollution and water quality is not always suitable for swimming. During dry weather ensure that the site is free of signs of pollution such as discoloured water, odour or debris in the water and avoid swimming at all times during and for up to two days following rainfall.
Very poor	F	Very susceptible to faecal pollution and water quality may often be unsuitable for swimming. It is generally recommended to avoid swimming at these sites.



3. Recreational water quality in freshwaters

3.1 Introduction

Recreational water quality was monitored at 24 river sites and one estuarine site (Riversdale Lagoon) across the Wellington region over the 2014/15 bathing season (Figure 3.1, Appendix 1), as follows:

- Kapiti Coast District – 4 sites
- Hutt and Wainuiomata river catchments – 8 sites
- Wairarapa – 13 sites

The sites monitored reflect their use by the public for contact recreation; in particular, swimming and boating².

3.2 Monitoring protocol

Sites were sampled weekly – for 20 weeks – between mid-November 2014 and 31 March 2015. The exceptions were Otaki River at Pots (in Otaki Gorge on the Kapiti Coast), Akatarawa River at Hutt Confluence (Upper Hutt), Waiohine River at Gorge and Tauherenikau River at Websters (Wairarapa), which were sampled monthly under GWRC's Rivers State of the Environment (RSoE) monitoring programme³. On each sampling occasion a single water sample was collected 0.2 m below the surface in 0.5 m water depth and analysed for *E. coli* indicator bacteria.

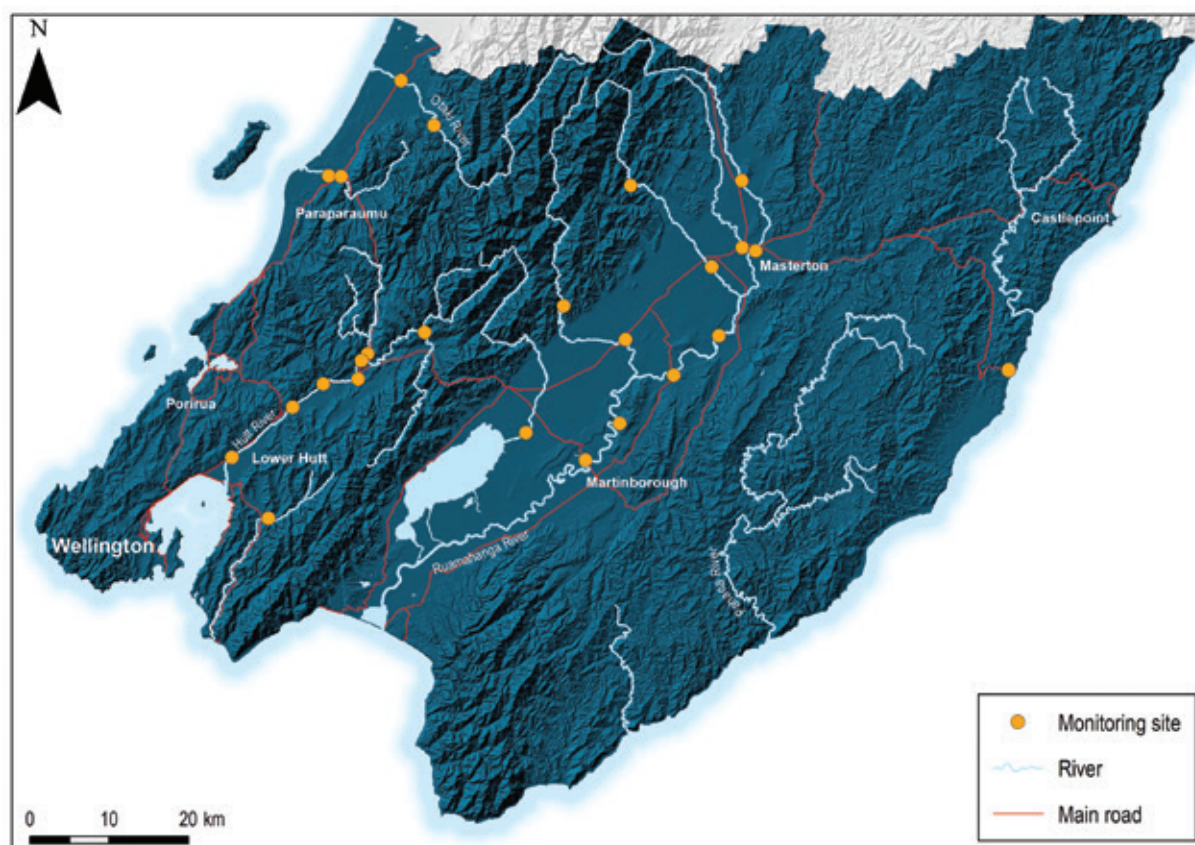


Figure 3.1: Freshwater recreation sites monitored over summer 2014/15

² The recreational water quality monitoring programme does not include monitoring of artificial water-bodies such as Henley Lake in Masterton or water-bodies on private land such as Lake Waitawa on the Kapiti Coast. Riversdale Lagoon is not recommended for swimming (permanent health warning signs are in place) but is monitored in response to community interest.

³ Historically Otaki River at Pots and Waiohine River at Gorge were sampled separately under two GWRC water quality monitoring programmes: recreational water quality and RSoE water quality. As both river sites have a 'very low' to 'low' risk of microbiological contamination and a high level of compliance with recreational water quality guidelines, Milne & Wyatt (2006) recommended that routine weekly sampling under the recreational water quality monitoring programme cease; the monthly microbiological water quality results obtained from these sites under the RSoE monitoring programme are now used to assess recreational water quality. Assessment of recreational water quality at the Akatarawa River at Hutt Confluence and Tauherenikau River at Websters is also based on monthly data from the RSoE monitoring programme.

Measurements of water temperature were also collected at each site. Visual estimates of water clarity and periphyton (algae) and cyanobacteria cover were made at all river sites. Daily rainfall records were obtained for the nearest rain gauge for each site (Appendix 2), to give an indication of rainfall in the upstream catchment. Rainfall can have a significant impact on water quality, as a result of runoff from rural or urban land and re-suspension of riverbed sediments.

A list of field and laboratory methods can be found in Appendix 3.

3.3 Guidelines

3.3.1 Microbiological water quality guidelines

(a) Compliance with trigger values

As outlined in Section 2.2, the MfE/MoH (2003) guidelines use bacteriological 'trigger' values to help water managers assess individual monitoring results and determine when management intervention is required. The 'trigger' values underpin a three-tier management framework analogous to traffic lights (Table 3.1).

When water quality falls in the 'surveillance mode', this indicates that the risk of illness from bathing is acceptable (for freshwaters the accepted level of risk is 8 in every 1,000 bathers). If water quality falls into the 'alert' category, this indicates an increased risk of illness from bathing, but still within an acceptable range. However, if water quality enters the 'action' category, then the water poses an unacceptable health

Table 3.1: MfE/MoH (2003) surveillance, alert and action levels for fresh waters

Mode	Guideline <i>E. coli</i> (cfu/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	Public warnings, increased monitoring and investigation of source

risk from bathing (MfE/MoH 2003). At this point, warning signs are erected at the bathing site, and the public is informed that it is unsafe to swim at that site. The only time a warning is unlikely to be issued is when an action level result is preceded by rainfall; it is widely known that rainfall is highly correlated with elevated bacteria counts in rivers (see Section 3.5.1). For this reason GWRC and Regional Public Health advise avoiding swimming and other contact recreation activities in freshwaters during and for up to two days after heavy rainfall.

(b) Suitability for Recreation Grades

The SIC and MAC categories used to identify SFRGs for fresh waters are shown in Table 3.2.

Table 3.2: MfE/MoH (2003) Suitability for Recreation Grades (SFRGs) for fresh waters

Susceptibility to faecal influence		Microbiological Assessment Category (MAC) ¹			
		A	B	C	D
		≤130 <i>E. coli</i> /100mL	131–260 <i>E. coli</i> /100mL	261–550 <i>E. coli</i> /100mL	>550 <i>E. coli</i> /100mL
Sanitary Inspection Category (SIC)	Very Low	Very Good	Very Good	Follow Up ³	Follow Up ³
	Low	Very Good	Good	Fair	Follow Up ³
	Moderate	Follow Up ²	Good	Fair	Poor
	High	Follow Up ²	Follow Up ²	Poor	Very Poor
	Very High	Follow Up ²	Follow Up ²	Follow Up ²	Very Poor

¹ 95th percentile value calculated using the Hazen percentile method from five years of data obtained from routine weekly monitoring during the bathing season.

² Indicates unexpected results requiring investigation (reassess SIC and MAC).

³ Implies non-sewage sources of indicator bacteria that require verification.



Greenfield et al. (2012b) derived two SFRGs for each river site: one based on all flow conditions and one based on 'dry weather' conditions only (defined as median flow or less). Two grades were derived as it has been identified that SFRGs for many freshwater sites are heavily influenced by a small number of elevated *E. coli* results recorded following heavy rainfall. The additional 'dry weather' SFRGs are intended to better represent microbiological water quality during conditions when people are most likely to be swimming or undertaking other types of primary contact recreation⁴. Microbiological risk factors and corresponding SIC values, together with MAC values, were derived under both conditions and combined to obtain the two grades.

3.3.2 Nuisance periphyton guidelines

Excessive amounts of periphyton⁵ can reduce the amenity value of waterways by decreasing their aesthetic appearance, reducing visibility, and being a physical nuisance to swimmers.

The MfE (2000) periphyton guidelines provide two maximum thresholds for periphyton cover in gravel/cobble bed streams managed for aesthetic and recreational values: 30% filamentous algae >2 cm long, and 60% cover for diatoms/cyanobacteria >0.3 cm thick. These thresholds relate to the visible areas of stream bed only.

3.3.3 Interim cyanobacteria guidelines

Growth of benthic cyanobacteria (toxic algae) in rivers can pose a health risk as some species produce toxins which are harmful to humans and animals, particularly dogs (eg, Milne & Watts 2007; MfE/MoH 2009).

In 2009, interim New Zealand guidelines for cyanobacteria in recreational lakes and rivers were released (MfE/MoH 2009) for trial by monitoring and health agencies. The interim guidelines for rivers identify a three-tiered alert level framework for benthic cyanobacteria (Table 3.3).

Table 3.3: Alert-level framework for benthic cyanobacteria cover in rivers
(Modified from MfE/MoH 2009)

Alert level	Guideline	Management action
Green/Surveillance	≤20% coverage of potentially toxic cyanobacteria attached to substrate.	Undertake routine monitoring.
Amber/Alert	20–50% coverage of potentially toxic cyanobacteria attached to substrate.	Notify public health, erect signs with information on appearance of mats and potential risks and consider testing for cyanotoxins.
Red/Action	>50% cyanobacteria coverage or cyanobacteria are visibly detaching from substrate and accumulating on the river's edge or becoming exposed on river's edge and the river level drops.	Notify public health unit, notify the public of potential risk to health, and consider testing for cyanotoxins.

In the Wellington region, the response to toxic algal blooms in rivers is managed by a working party of Regional Public Health, Territorial Authority and GWRC staff. Close monitoring of 'flushing' river flows⁶ and the potential for occurrence of cyanobacteria blooms is a critical part of this process. Warnings based on latest weekly results are displayed on www.gw.govt.nz/summer-check. The information sign used to advise the public of the risk from benthic cyanobacteria is shown in Figure 3.2.

⁴ The MfE/MoH (2003) guidelines allow for modification of a SFRG grade in this way if the modified grade better reflects the water quality conditions the public are usually exposed to and is verified by the Regional Medical Officer of Health. The caveat is that modified grades should only be used where occasional and predictable contamination events are identified (eg, heavy rainfall) and interventions can be demonstrated to be effective in discouraging recreational use during these times. This requires adequate communication to river users of the increased risk of microbial contamination through such things as signage at affected sites, media releases and website postings.

⁵ Periphyton refers to the slime coating on a riverbed, composed largely of algae and cyanobacteria.

⁶ A 'flushing' flow is a high river flow (usually defined as 3x the median river flow) that generally follows a heavy rainfall event and can 'scour' periphyton from the riverbed.

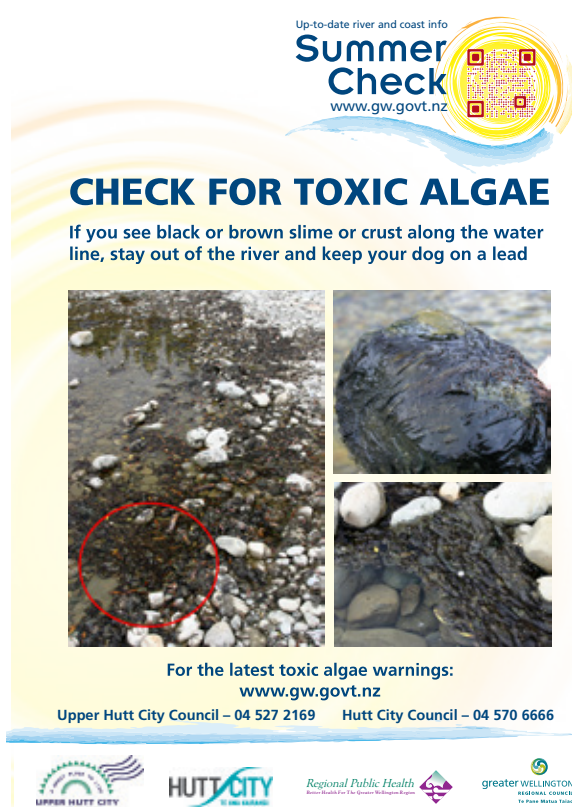


Figure 3.2: Sign used to inform the public of the health risk from cyanobacteria in rivers in the Wellington region

3.3.4 Water clarity guidelines

Smith et al. (1991) and Smith and Davies-Colley (1992) demonstrated that the perception of water clarity at a freshwater site markedly affected a site's overall suitability for swimming when clarity was poor. As well as being aesthetically pleasing, clear water is important for recreational users to be able to estimate depth and spot any submerged hazards. In 1994, MfE developed guidelines for the management of water colour and clarity in New Zealand waters (MfE 1994). The guidelines state that water clarity should be greater than 1.6 m (measured horizontally through the water column) if the waters are being managed for contact recreation.

3.4 Data analysis

All results were assessed in accordance with the MfE/MoH (2003) recreational water quality guidelines for freshwaters (Tables 3.1 and 3.2), the nuisance periphyton guidelines outlined in Section 3.3.2, the interim national cyanobacteria guidelines (Table 3.3) and the water clarity guideline outlined in Section 3.3.4.

During data processing, any *E. coli* counts reported as less than or greater than detection limits were replaced by values one half of the detection limit or the detection limit, respectively (ie, counts of <4 cfu/100mL and >400 cfu/100mL were treated as 2

cfu/100mL and 400 cfu/100mL, respectively). Rainfall was calculated for the 24, 48 and 72 hours prior to the day of sampling by summing up the rainfall for each 24 hour period ending at 9 am of each day. Any rainfall between 9 am and 3 pm on the day of sampling was defined as rainfall 'on the day' (samples were rarely collected after 3pm).

For most sites MAC grades were calculated using weekly *E. coli* data from samples collected over the past five summer bathing seasons (2010/11 to 2014/15). The exceptions were the four sites sampled monthly as part of GWRC's RSoE programme for which a longer data period was used. The MAC values for Otaki River at Pots and Waiohine River at Gorge were calculated from weekly data collected during bathing seasons from 2003/04 to 2005/06 and monthly data from 2006/07 onwards, while interim MAC values for Akatarawa River at Hutt Confluence and Tauherenikau River at Websters (n=60) were calculated from the results of monthly sampling during bathing seasons (November to March) between 2003/04 and 2014/15. All 95th percentiles were calculated using the Hazen method.

3.5 Results

3.5.1 Compliance with trigger values

Of the 20 river sites and one estuarine site monitored weekly over the 2014/15 summer bathing season, 10 sites (48%) went above the MfE/MoH (2003) action guideline on at least one occasion (Table 3.4, Appendix 4).

Table 3.4: Summary of action guideline breaches from routine weekly monitoring at 20 river sites and one estuarine site over the 2014/15 summer bathing season¹

No. of times site breached the action guideline	No. of sites			Total no. of sites (21)	% of sites
	Kapiti (3 sites)	Hutt & Wainuiomata (7 sites)	Wairarapa (11 sites)		
0	3	4	4	11	52
1	0	1	6	7	33
2	0	1	1	2	10
3	0	1	0	1	5

¹ This analysis excludes Otaki River at The Pots (Kapiti), Akatarawa River at Hutt Confluence, Waiohine River at Gorge and Tauherenikau River at Websters (Wairarapa); these sites are only sampled monthly under GWRC's RSoE water quality monitoring programme.

Out of a total of 420 routine water samples, 14 (3.3%) returned *E. coli* counts above the MfE/MoH (2003) action guideline (Table 3.5). This was slightly less than the 2013/14 season, when 3.8% of samples exceeded the action guideline (Morar & Greenfield 2014).



Twelve of the 14 action guideline breaches were associated with significant rainfall (≥ 5 mm in 24 hours prior to sampling or ≥ 10 mm in 72 hours prior). These findings are consistent with previous observations; elevated *E. coli* counts in fresh water are typically related to diffuse-source runoff, urban stormwater (including sewer overflows), and re-suspension of sediments during rainfall events (Greenfield et al. 2012a & 2012b).

The cause of the 'dry weather' action guideline breaches at Hutt River at Melling Bridge on 27 January 2015 and Riversdale Lagoon on 28 January 2015 is unclear. Inspection of the Hutt River at Melling by Hutt City Council staff found no obvious source of contamination and a follow up water sample was within the surveillance guideline so no health warning was issued. No follow up samples were taken at Riversdale Lagoon as permanent health warning signs are in place at this site.

On most occasions, only one follow-up sample was required before *E. coli* counts dropped back below the surveillance guideline. The exceptions were the Hutt River (at Silverstream Bridge and Melling Bridge) and Ruamahanga River at Kokotau where two follow-up samples were required following the exceedance of the action guideline on 16 March 2015.

3.5.2 Suitability for recreation grades

Updated SFRGs (as at the end of March 2015) for all river and estuarine sites, based on the combined SIC and MAC values at all flows and during dry weather (excluding Riversdale Lagoon), are summarised in Figure 3.3. In total, seven sites (28%) have SFRGs of 'good' or better for 'all weather' flows and 17 sites (68%) have 'dry weather' SFRGs of 'good' or better.

Ruamahanga River sites from Te Ore Ore downstream and Waipoua River at Colombo Road carry the

Table 3.5: Summary of action guideline breaches during routine monitoring at freshwater sites over the 2014/15 bathing season¹. Rainfall prior to sampling and the number of follow-up samples required before compliance with the surveillance guideline was achieved are also summarised

Date	Site name	E. coli count (cfu/100mL)	Rainfall (mm)					Follow-up tests required
			Rainfall station ²	72–49 hrs before sampling	48–25 hrs before sampling	Up to 24 hrs before sampling	On the day (9am-3pm)	
Hutt & Wainuiomata								
22/12/2014	Wainuiomata R at RP Park	2,400	Wainui Reservoir	0.3	11.2	2	0	1
27/01/2015	Hutt R at Melling Bridge	600	Birch Lane	0	0	0	0	1
24/02/2015	Hutt R at Melling Bridge	760	Birch Lane	0	0	5	0	1
16/03/2015	Hutt R at Silverstream Bridge	560	Birch Lane	0	0	1	10	2
	Hutt R at Melling Bridge	3,520						2
		Wainuiomata R at RP Park	1,760	Wainui Reservoir	0	0.5	0.5	11
Wairarapa								
28/01/2015	Riversdale Lagoon	960	Castlepoint	0	0	1.2	0	n/a
02/02/2015	Ruamahanga R at Double Br.	760	Angle Knob	6	2	39.5	35.5	1
	Ruamahanga R at Te Ore Ore	960						1
	Ruamahanga R at The Cliffs	780						1
23/02/2015	Waipoua R at Colombo Road	2,800	Mt Bruce	0	0	0	9	1
	Waingawa R at South Road	840	Angle Knob	0.5	2.5	4	9	1
16/03/2015	Waipoua R at Colombo Road	640	Mt Bruce	0	0	9.5	1.5	1
	Ruamahanga R at Kokotau	640	Angle Knob	0	0	16.5	4.5	2

¹ This analysis excludes the four sites sampled monthly under GWRC's RSoE water quality monitoring programme.

² See Appendix 2 for more details on rainfall stations.

highest risk of microbiological contamination across all flow conditions – these sites are all graded ‘very poor’. During dry weather conditions, when contact recreation is most likely, the highest risk of microbiological contamination is present at Hutt River at Melling Bridge, Wainuiomata River at Richard Prouse Park and Ruamahanga River at the Cliffs; these sites have dry weather SFRGs of ‘poor’.

Runoff from agricultural land use during heavy or prolonged rainfall has been identified as the key contributor to ‘very poor’ all weather grades at Waipoua River at Colombo Road and Ruamahanga River sites (Greenfield et al. 2012b). Contamination from rural runoff is also likely to be a factor in ‘poor’ all weather grades at Hutt River at Birchville and at sites on the Akatarawa, Tauherenikau and Waingawa rivers, and Riversdale Lagoon. Urban runoff is likely to be the key contributor to the ‘poor’ all weather and dry weather grades at Hutt River at Melling and the ‘poor’ all weather grade at Hutt River at Silverstream. ‘Poor’ grades during both all weather and dry weather conditions at Wainuiomata River at Richard Prouse Park are likely to be linked to contamination from rural land use and on-site wastewater systems in upstream tributaries (Morar & Greenfield 2014).

The lack of information on pathogen removal efficiency of the municipal wastewater treatment plants that discharge to the Ruamahanga River mean that ‘dry weather’ SFRGs at sites downstream of these discharges (The Cliffs, Kokotau, Morrisons Bush and Waihenga Bridge) have conservatively been set at ‘poor’ or ‘fair’ and are regarded as interim grades (Greenfield et al. 2012b). However, Masterton District

Council (MDC) for the first time began discharging treated wastewater from Masterton to land, rather than to the Ruamahanga River, during low flow conditions in 2014/15. In light of this change, the SIC component of dry weather grades for Ruamahanga River sites downstream of Masterton will be reassessed in 2015/16 to reflect any reduction in risk to human health from contact recreation. SFRGs at Akatarawa River at Hutt Confluence, Hutt River at Melling and Tauherenikau River at Websters are also considered interim grades due to the limited data set available at these sites (n=60 at Akatarawa and Tauherenikau river sites and 80 at Hutt River at Melling).

All weather SFRGs changed at seven sites in the 2014/15 bathing season compared with those reported at the end of the 2013/14 season by Morar and Greenfield (2014). Pakuratahi River at Hutt Forks and Hutt River at Poets Park improved from ‘fair’ to ‘good’, and Hutt River at Maoribank Corner improved from ‘poor’ to ‘fair’. Otaki River at SH1 deteriorated from ‘good’ to ‘fair’ and three sites (Akatarawa River at Hutt Confluence, Hutt River at Silverstream and Waingawa River at South Road) deteriorated from ‘fair’ to ‘poor’. ‘Dry weather’ SFRGs generally did not change in 2014/15 compared to 2013/14, other than an improvement in the interim ‘dry weather’ SFRG for Tauherenikau River at Websters (from ‘good’ to ‘very good’).

For a full list of all flow and ‘dry weather’ SFRGs for the 2014/15 season, as well as their respective SIC and MAC grades, see Appendix 4.

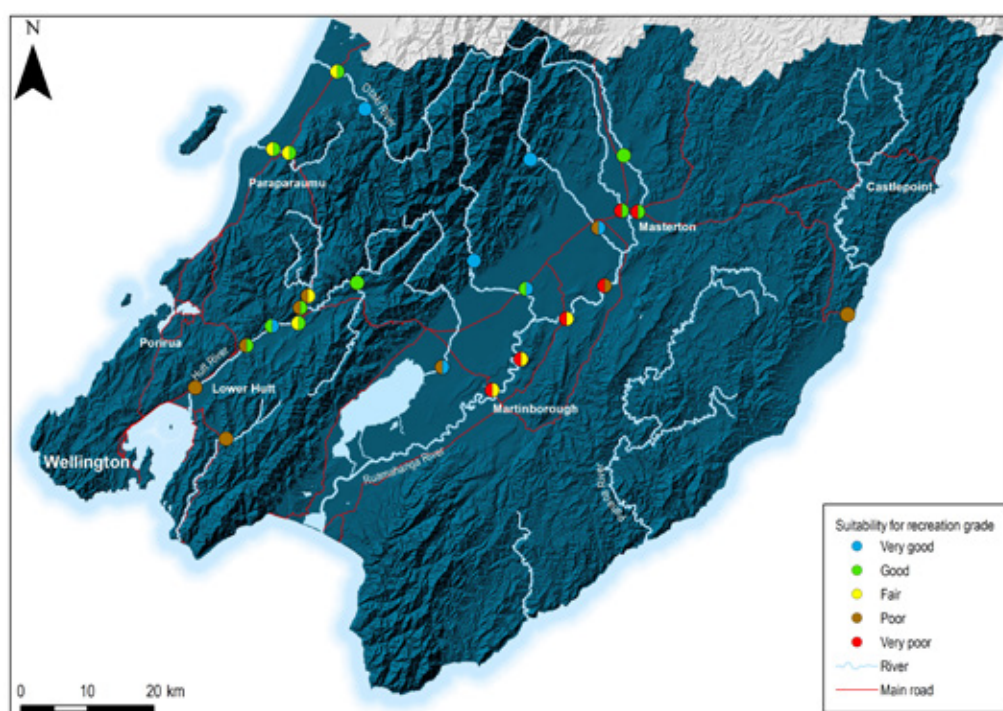


Figure 3.3: Suitability for Recreation Grades (SFRGs) for freshwater monitoring sites in the Wellington region as at the end of the 2014/15 bathing season. The left side of the symbol shows the ‘all weather’ SFRG while the right side of the symbol shows the ‘dry weather’ SFRG based on *E. coli* counts from samples collected during median flows or less

3.5.3 Compliance with nuisance periphyton and cyanobacteria guidelines

The number of weekly periphyton cover assessments able to be made at freshwater monitoring sites ranged from 14 for Ruamahanga River at Kokotau to 20 for both Waikanae River sites, Pakuratahi River at Hutt Forks, Hutt River at Birchville and Maoribank Corner, and Wainuiomata River at Richard Prouse Park. On most occasions, non-assessment of algal cover was due to poor water clarity and/or high flows following freshes.

The MfE (2000) nuisance filamentous periphyton cover guideline (>30%) was breached during the 2014/15 bathing season on 11 occasions at Wainuiomata River at Richard Prouse Park, five occasions at Ruamahanga River at Kokotau, two occasions at Ruamahanga River at Waihenga Bridge, and one occasion at several other sites (Table 3.6). Filamentous periphyton cover at Wainuiomata River at Richard Prouse Park reached 72% on 3 March 2015. Cover was around 50% at the Ruamahanga River sites Kokotau and Waihenga Bridge in late February and early March 2015 following an extended period of dry weather and low flows.

Table 3.6: Summary of compliance with MfE (2000) nuisance periphyton guidelines and MfE/MoH (2009) interim cyanobacteria guidelines at 20 river sites, based on routine weekly monitoring over the 2014/15 summer bathing season¹. Values in bold indicate a guideline breach

Site	Total site visits (n)	Assessments made (n)	Filamentous		Mat		Cyanobacteria		
			Max (%)	>30% (n)	Max (%)	>60% (n)	Max	20–50% (Alert) ² (n)	>50% (Action) ³ (n)
Kapiti									
Otaki R at SH1	20	17	34	1	0	0	2	0	0
Waikanae R at SH1	20	20	7	0	0	0	2	0	0
Waikanae R at Jim Cooke Pk	20	20	5	0	0	0	2	0	0
Hutt & Wainuiomata									
Pakuratahi R at Hutt Forks	20	20	30	0	0	0	2	0	0
Hutt R at Birchville	20	20	1	0	0	0	3	0	0
Hutt R at Maoribank Cnr	20	20	2	0	0	0	8	0	0
Hutt R at Poets Pk	20	19	2	0	0	0	7	0	2
Hutt R at Silverstream Br.	20	19	12	0	0	0	20	1	2
Hutt R at Melling Br.	20	19	42	1	0	0	1	0	0
Wainuiomata R at RP Pk	20	20	72	11	2	0	8	0	0
Wairarapa									
Ruamahanga R at Double Br.	20	19	10	0	5	0	10	0	0
Ruamahanga R at Te Ore Ore	20	19	8	0	7	0	13	0	1
Waipoua R at Colombo Rd	20	19	4	0	17	0	18	0	2
Waingawa R at Kaituna	20	20	2	0	0	0	0	0	0
Waingawa R at South Rd	20	19	15	0	2	0	10	0	0
Ruamahanga R at The Cliffs	20	17	31	1	1	0	4	0	0
Ruamahanga R at Kokotau	20	14	52	5	7	0	24	1	0
Waiohine R at SH2	20	18	17	0	0	0	2	0	0
Ruamahanga R at Morrisons B.	20	16	37	1	0	0	2	0	0
Ruamahanga R at Waihenga Br.	20	18	51	2	0	0	1	0	0

¹ This analysis excludes the four sites sampled monthly under GWRC's RSoE water quality monitoring programme, and Riversdale Lagoon.

² As in Table 3.3, 'alert' level is when there is 20-50% coverage of potentially toxic cyanobacteria attached to substrate.

³ As in Table 3.3, 'action' level is when there is >50% coverage OR cyanobacteria are visibly detaching from substrate or becoming exposed on river's edge.

The MfE (2000) nuisance mat periphyton cover guideline (60%) was not breached at any site during the 2014/15 bathing season.

The coverage of potentially toxic cyanobacteria breached the alert level of the MfE/MoH (2009) interim cyanobacteria guidelines (>20% coverage) at two sites on one occasion: Hutt River at Silverstream Bridge (on 24 February 2015) and Ruamahanga River at Kokotau (on 26 January 2015). However, the action level threshold of these guidelines was breached slightly more frequently and at more sites, due to the presence of significant amounts of detached mats. The following bullet points explain the actions taken by GWRC and territorial authorities at specific sites:

- At Waipoua River at Colombo Road, detached mats were noted on 8 December 2014 and the following day toxic algae information signs were put up by MDC along the river and a media release issued. Toxic algae information signs stayed up for the rest of the summer season.
- The action level was exceeded at Hutt River at Poets Park and Silverstream Bridge and Ruamahanga River at Te Ore Ore during the week of 26 January 2015 due to significant amounts of detached mats (the same week as the alert level was exceeded at Ruamahanga River at Kokotau). Toxic algae information signs were put up along the river by local councils (Hutt City Council, Masterton District Council and Carterton District Council) in these areas and a media release was issued on 28 January. Information signs stayed up for the rest of the summer season.

- As with the exceedances above, exceedances later in the season were reported at www.gw.govt.nz/summer-check and www.gw.govt.nz/is-it-safe-to-swim/. These webpages were advertised on radio and noted on toxic algae information signs as providing up-to-date toxic algae warning information. Warnings were also posted on the Land Air Water Aotearoa (LAWA) website www.lawa.org.nz. Toxic algae information signs stayed up until mid-April 2015.

There were no confirmed reports of human or dog illnesses in relation to toxic algae during the 2014/15 season.



Cyanobacteria mats growing on the river bed at Hutt River at Silverstream on 18 February 2015

3.5.4 Compliance with water clarity guideline

Of the 400 occasions water clarity was assessed, the MfE (1994) water clarity guideline of more than 1.6 m was met 88% of the time (353 occasions) (Table 3.7).

Table 3.7: Summary of compliance with the MfE (1994) water clarity guideline for contact recreation at 20 river sites, based on routine weekly monitoring over the 2014/15 summer bathing season¹

Site	Assessments made (n)	Guideline >1.6 m not met (n)
Kapiti		
Otaki R at SH1	20	15
Waikanae R at SH1	20	19
Waikanae R at Jim Cooke Pk	20	17
Hutt & Wainuiomata		
Pakuratahi R at Hutt Forks	20	20
Hutt R at Birchville	20	20
Hutt R at Maoribank Cnr	20	20
Hutt R at Poets Pk	20	19
Hutt R at Silverstream Br.	20	18
Hutt R at Melling Br.	20	18
Wainuiomata R at RP Pk	20	17

Table 3.7 cont: Summary of compliance with the MfE (1994) water clarity guideline for contact recreation at 20 river sites, based on routine weekly monitoring over the 2014/15 summer bathing season¹

Site	Assessments made (n)	Guideline >1.6 m not met (n)
Wairarapa		
Ruamahanga R at Double Br.	20	18
Ruamahanga R at Te Ore Ore	20	18
Waipoua R at Colombo Rd	20	19
Waingawa R at Kaituna	20	19
Waingawa R at South Rd	20	17
Ruamahanga R at The Cliffs	20	17
Ruamahanga R at Kokotau	20	13
Waiohine R at SH2	20	18
Ruamahanga R at Morrisons B.	20	14
Ruamahanga R at Waihenga Br.	20	17

¹ This analysis excludes the four sites sampled monthly under GWRC's RSoE water quality monitoring programme and Riversdale Lagoon.

Of the 47 occasions the guideline was not met, 32 (68%) were due to poor water clarity following freshes, while 13 (28%) were attributed to turbid water created by river works upstream⁷. In general, river works were linked to poor water clarity on one or two occasions each at lower sites on the Otaki, Waikanae, Waipoua, Waingawa and Waiohine rivers and middle and lower sites on the Hutt and Ruamahanga rivers⁸. Reasons for poor water clarity at Ruamahanga River at Te Ore Ore on 5 January 2015 and Wainuiomata River at Richard Prouse Park on 10 March 2015 are unclear.

3.6 Summary

Of the 20 river sites and one estuarine site monitored weekly over the 2014/15 summer season, 10 sites (48%) exceeded the MfE/MoH (2003) action guideline on at least one occasion. Most of these exceedances coincided with significant rainfall in the 24 hours prior to sampling and/or elevated river flows. Of the total 25 sites monitored overall, seven sites (28%) have 'all weather' SFRGs of 'good' or better while 17 sites (68%) have 'dry weather' SFRGs of 'good' or better. The 'dry weather' SFRGs for the Ruamahanga River downstream of Masterton, which are currently 'fair' or 'poor', will be reviewed in 2015/16 and any reduction in risk to human health as a result of municipal wastewater being discharged to land during low flows will be reflected in the SIC component of the grade.

The MfE (2000) nuisance filamentous periphyton guideline was not met at several sites on several occasions, most notably on 11 occasions at the site Wainuiomata River at Richard Prouse Park and five occasions at Ruamahanga River at Kokotau. The filamentous periphyton guideline breaches mostly occurred in February and early March 2015, following

a prolonged period of low, stable river flows. The guideline for nuisance mat periphyton was met at all sites on all sampling occasions.

The action level of the MfE/MoH (2009) interim cyanobacteria guidelines was breached at four sites (Hutt River at Poets Park, Hutt River at Silverstream Bridge, Ruamahanga River at Te Ore Ore and Waipoua River at Colombo Road), due to the presence of significant amounts of detached cyanobacteria mats. Toxic algae information signs were put up at these sites by local councils and up-to-date warnings posted on GWRC and LAWA websites. There were no confirmed reports of human or dog illnesses in relation to toxic algae during the 2014/15 season.

The MfE (1994) guideline for water clarity was met most of the time (88% of sampling occasions). Poor water clarity following freshes accounted for the majority (68%) of occasions when the guideline was not met, while upstream river works accounted for a further 28% of water clarity guideline breaches.



Waingawa River at Kaituna. This site is graded 'very good' for contact recreation during both 'all weather' and 'dry weather' conditions

⁷ In some cases upstream river works were observed by samplers, in others river works were not observed but were scheduled to occur in the area.

⁸ These works were undertaken by GWRC's Flood Protection Department in accordance with their resource consent.

4. Recreational water quality in coastal waters

4.1 Introduction

Recreational water quality was monitored at 62 coastal sites across the Wellington region over the 2014/15 bathing season (Figure 4.1, Appendix 1), as follows:

- Kapiti Coast District – 14 sites
- Porirua City – 10 sites
- Hutt City – 13 sites
- Wellington City – 22 sites
- Wairarapa – 3 sites

The site 'Wellington Harbour at Taranaki St dive platform' was monitored for the first time during 2014/15 (by Wellington Water on behalf of Wellington City Council).

A further site, Onehunga Bay in Porirua, was not monitored in 2014/15 but is included in the SFRG summary based on data collected between 2006/07 and 2010/11 as water quality at this site is consistently good. Weekly water quality sampling will be undertaken again at this site in 2015/16 to ensure that no degradation in water quality has occurred.

4.2 Monitoring protocol

Sites were sampled weekly for 20 weeks between mid-November 2014 and 31 March 2015. On each sampling occasion a single water sample was collected 0.2 m below the surface in 0.5 m water depth and analysed for enterococci indicator bacteria.

Observations of weather, the state of the tide and visual estimates of seaweed cover were also made at each site to assist with interpretation of the monitoring results. For example:

- Rainfall may increase enterococci counts by flushing accumulated debris from urban and agricultural areas into coastal waters.
- Wind direction can influence the movement of currents along the coastline and can therefore affect water quality at a particular site.
- In some cases, an increase in enterococci counts may be due to the presence of decaying seaweed. There is evidence that some strains of enterococci are able to replicate or persist in decaying seaweed (Anderson 2000).

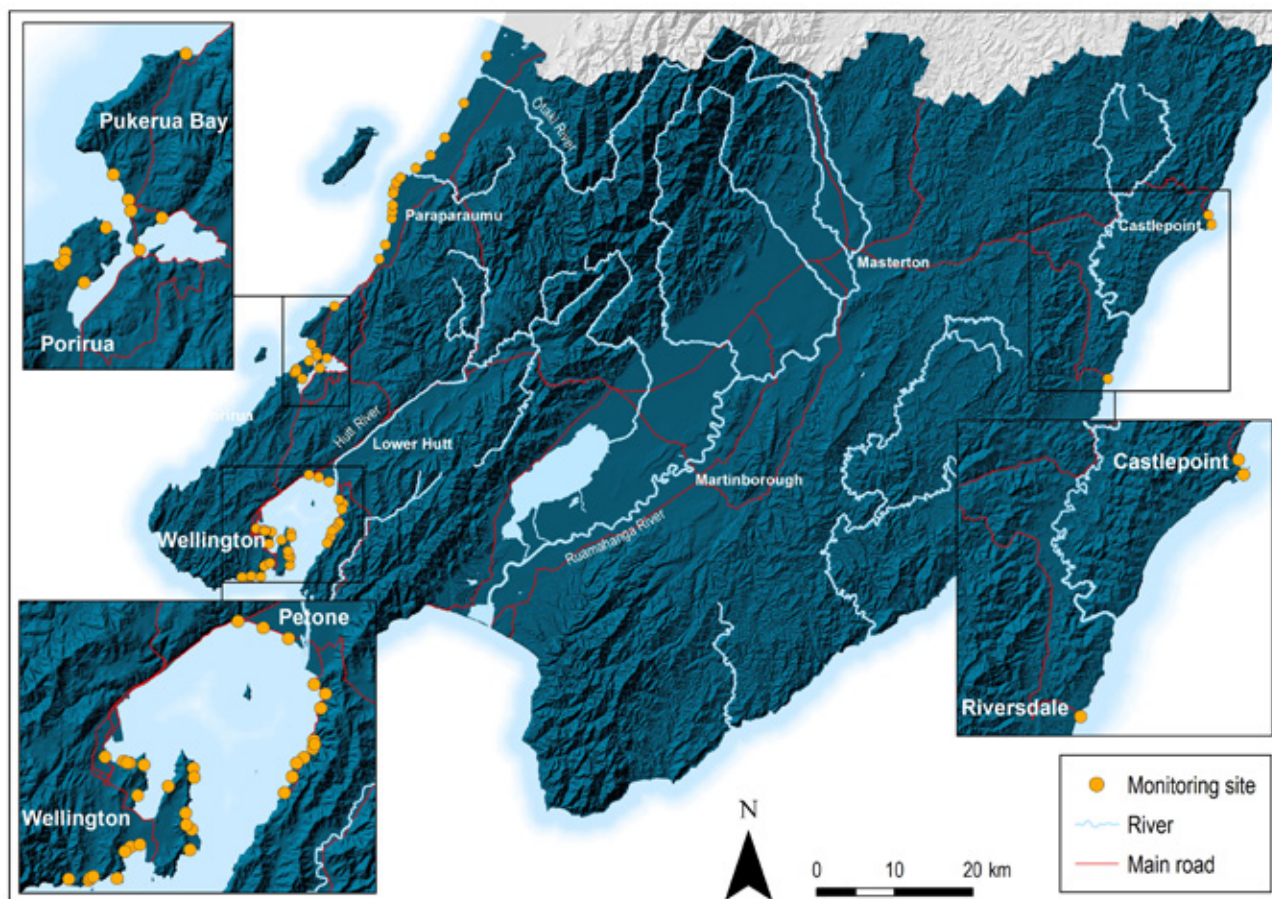


Figure 4.1: Coastal recreation sites monitored over summer 2014/15

Daily rainfall records were obtained from the rain gauge nearest to each bathing site to give an indication of rainfall in the catchment adjoining each site (see Appendix 2).

A list of field and laboratory methods can be found in Appendix 3.

4.3 Guidelines

4.3.1 Microbiological water quality trigger values

As outlined in Section 2.2, the MfE/MoH (2003) recreational water quality guidelines use bacteriological 'trigger' values to help water managers assess individual monitoring results and determine when management intervention is required. The 'trigger' values underpin a three-tier management framework analogous to traffic lights (Table 4.1).

Table 4.1: MfE/MoH (2003) surveillance, alert and action levels for marine (coastal) waters

Mode	Guideline Enterococci (cfu/100mL)	Management response
Green/Surveillance	Single sample ≤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	Public warnings, increased monitoring and investigation of source

When water quality falls in the 'surveillance mode', this indicates that the risk of illness from bathing is acceptable (for coastal waters the accepted level of risk is 19 in every 1,000 bathers). If water quality falls into the 'alert' category, this indicates an increased risk of illness from bathing, but still within an acceptable range. However, if the water quality enters the 'action' category, then the water poses an unacceptable health risk from bathing (MfE/MoH 2003). At this point, warning signs are erected at the bathing site, and the public is informed that it is unsafe to swim at that site. The only time a warning is unlikely to be issued is when an action level result is preceded by heavy rainfall. This is because it is widely known that rainfall is associated with elevated bacteria counts in coastal waters. For this reason GWRC and Regional Public Health advise avoiding swimming and other contact recreation activities in coastal waters during and for up to two days after heavy rainfall.

In accordance with the MfE/MoH (2003) recreational water quality guidelines, sampling frequency is increased to daily at sites where a routine sample has exceeded the alert or action guideline. However, in some instances when an exceedance has coincided with significant and on-going rainfall, follow-up sampling may be delayed until rainfall has eased.

4.3.2 Suitability for recreation grades

The SIC and MAC categories used to identify SFRGs for coastal waters are shown in Table 4.2.

Table 4.2: MfE/MoH (2003) Suitability for Recreation Grades (SFRG) for marine (coastal) waters

		Microbiological Assessment Category (MAC) ¹			
		A	B	C	D
Susceptibility to faecal influence		≤40 Enterococci/100mL	41–200 Enterococci/100mL	201–500 Enterococci/100mL	>500 Enterococci/100mL
Sanitary Inspection Category (SIC)	Very Low	Very Good	Very Good	Follow Up ³	Follow Up ³
	Low	Very Good	Good	Fair	Follow Up ³
	Moderate	Follow Up ²	Good	Fair	Poor
	High	Follow Up ²	Follow Up ²	Poor	Very Poor
	Very High	Follow Up ²	Follow Up ²	Follow Up ²	Very Poor

¹ 95th percentile value calculated using the Hazen percentile method from five years of data obtained from routine weekly monitoring during the bathing season.

² Indicates unexpected results requiring investigation (reassess SIC and MAC).

³ Implies non-sewage sources of indicator bacteria that require verification.

4.4 Data analysis, limitations and cautionary notes

All results have been assessed in accordance with the MfE/MoH (2003) recreational water quality guidelines. However, it is not possible to accurately specify the number of true exceedances of the red/action mode of the guidelines. The guidelines state that a coastal bathing site only enters the action mode when two consecutive samples exceed 280 enterococci/100mL but, in practice, there can be delays in collecting a second sample (eg, due to bad weather). Therefore, to ensure that recreational water quality is assessed on an equal basis across all 62 coastal sites, the approach taken by GWRC is to treat any single result greater than 280 enterococci/100mL obtained from routine weekly sampling as an exceedance of the red/action mode of the guidelines. This has also been the approach taken by the Ministry for the Environment in its annual national recreational water quality reporting and means that a second consecutive action result is simply used to confirm the appropriate management response (eg, erection of public warnings) (MfE 2005).

The MfE/MoH (2003) recreational water quality guidelines do not cover toxic algal blooms, which in certain places and under certain conditions may pose a significant risk to contact recreation. Such blooms have occurred in coastal waters in the Wellington region in the past.

During data processing, any enterococci counts reported as less than or greater than detection limits were replaced by values one half of the detection limit or the detection limit, respectively (ie, counts of <4 cfu/100mL and >400 cfu/100mL were treated as 2 cfu/100mL and 400 cfu/100mL, respectively). Rainfall was calculated for the 24, 48 and 72 hours prior to the day of sampling by summing up the rainfall for each 24 hour period ending at 9 am each day. Any rainfall in the three hours after 9 am on the day of sampling was defined as rainfall 'on the day' (samples were rarely collected after midday). All 95th percentiles associated with the MAC category of the SFRG were calculated using the Hazen method.

4.5 Results

4.5.1 Compliance with trigger values

Twenty-nine of the 62 coastal sites (47%) exceeded the MfE/MoH (2003) action guideline during routine monitoring over the 2014/15 bathing season. Most of these sites (26) exceeded the guideline on two occasions or less (Table 4.3, Appendix 4).

A total of 43 out of 1,240 (3.5%) routine sample results exceeded the MfE/MoH (2003) action guideline of 280 cfu/100mL (Table 4.4). This was less than in the last two bathing seasons; 5.8% and 7.6% of samples exceeded the action guideline in 2013/14 and 2012/13, respectively (Morar & Greenfield 2014, Morar & Greenfield 2013).

Table 4.3: Summary of action guideline breaches from routine weekly monitoring at 62 coastal sites over the 2014/15 summer bathing season

No. of times site breached the action guideline	No. of sites					Total no. of sites (62)	% of sites
	Kapiti (14 sites)	Porirua (10 sites)	Wellington (22 sites)	Hutt (13 sites)	Wairarapa (3 sites)		
0	9	5	11	5	3	33	53.2
1	4	4	8	3	0	19	30.6
2	1	1	2	3	0	7	11.3
3	0	0	0	2	0	2	3.2
4	0	0	1	0	0	1	1.6
5	0	0	0	0	0	0	0.0



Table 4.4: Summary of action guideline breaches during routine monitoring at coastal sites over the 2014/15 bathing season. Rainfall prior to sampling and the number of follow up samples required before compliance with the surveillance guideline was achieved are also summarised

Date	Site name	Enterococci count (cfu/100mL)	Rainfall (mm)					Follow -up tests required
			Rainfall station ¹	72–49 hrs before sampling	48–25 hrs before sampling	Up to 24 hrs before sampling	On the day (9am-12pm)	
Kapiti								
26/11/2014	Otaki Beach at Surf Club	445	Otaki Depot	0	3.5	11	0	1
	Te Horo Beach at Sea Rd	420						1
20/01/2015	Paraparaumu Beach at Ngapotiki St	302	Paraparaumu Aerodrome	0	0	0	0	1
03/02/2015	Paraparaumu Beach at Ngapotiki St	790	Paraparaumu Aerodrome	2.5	9.6	3.4	0	1
	Paraparaumu Beach at Toru Rd	325						1
	Raumatī Beach at Marine Gardens	290						1
Porirua								
02/12/2014	Plimmerton Beach at Bath St	520	Whenua Tapu	0.5	0.5	6.5	0	1
30/12/2014	Titahi Bay at South Beach Access Rd	680	Whenua Tapu	0	0	0	0	1
13/01/2015	Plimmerton Beach at Bath St	300	Whenua Tapu	0	0.3	0.8	0	1
	South Beach at Plimmerton	1,600						3
03/02/2015	Pukerua Bay	330	Whenua Tapu	2	5	3	0	1
24/02/2015	Porirua Harbour at Rowing Club	370	Seton Nossiter Park	0	1	1.4	0	1
Wellington City								
08/12/2014	Balaena Bay	1,200	Wellington Airport	0	0	1.4	0	2
23/02/2015	Island Bay at Surf Club	600	Wellington Airport	0	0.2	1.2	0	1
	Owhiro Bay	480						1
		Wellington Harbour at Taranaki St Dive Platform	350	RCC	0	1	4.2	0.2
09/03/2015	Owhiro Bay	310	Wellington Airport	8.5	17.4	0	0	1

Table 4.4 cont: Summary of action guideline breaches during routine monitoring at coastal sites over the 2014/15 bathing season. Rainfall prior to sampling and the number of follow up samples required before compliance with the surveillance guideline was achieved are also summarised

Date	Site name	Enterococci count (cfu/100mL)	Rainfall (mm)					Follow -up tests required
			Rainfall station ¹	72–49 hrs before sampling	48–25 hrs before sampling	Up to 24 hrs before sampling	On the day (9am-12pm)	
16/03/2015	Oriental Bay at Band Rotunda	300	RCC	0.2	0	0	8.3	2
	Balaena Bay	610	Wellington Airport	0	0	0.6	5.7	1
	Hataitai Beach	510						1
	Shark Bay	920						1
	Lyll Bay at Tirangi Rd	560						2
	Lyll Bay at Onepu Rd	640						1
	Lyll Bay at Queens Drive	570						1
	Island Bay at Reef St Recreation Ground	2,300						2
	Island Bay at Surf Club	1,700						1
	Owhiro Bay	6,000						2
23/03/2015	Owhiro Bay	2,300	Wellington Airport	0	4.7	9.8	0	1
Hutt								
17/11/2014	Petone Beach at Kiosk	430	Shandon	0.5	0	0	0	1
	Rona Bay at N end of Cliff Bishop Park	800						1
	Rona Bay at Wharf	920						1
02/02/2015	Rona Bay at N end of Cliff Bishop Park	420	Shandon	0	0.5	2.5	3	1
17/02/2015	Petone Beach at Water Ski Club	410	Shandon	0	0	0	0	3
23/02/2015	Lowry Bay at Cheviot Rd	310	Shandon	0	0	0	0.5	1
	Days Bay at Wellesley College	600						1
02/03/2015	Petone Beach at Water Ski Club	960	Shandon	0	0	0	0	1
09/03/2015	Petone Beach at Sydney St	300	Shandon	7	25	1	0	1
16/03/2015	Petone Beach at Water Ski Club	290	Shandon	0	0	0.5	4	2
	Sorrento Bay	460						1
	Lowry Bay at Cheviot Rd	550						1
	Rona Bay at N end of Cliff Bishop Park	320						3
23/03/2015	Petone Beach at Sydney St	1,200	Shandon	0	0.5	5.5	0	1
	Petone Beach at Kiosk	560						1

¹ See Appendix 2 for more details on rainfall stations.



Fifty-three percent (23) of the 43 action events were associated with significant rainfall (defined as at least 5 mm of rainfall in the 24 hours prior to sampling or 10 mm or more in the three days prior) (Table 4.4). Elevated enterococci counts in coastal waters during or shortly after rainfall events are common in many parts of the region due to urban stormwater (including sewer overflows), diffuse-source runoff into rivers and streams, and re-suspension of bottom sediments (Greenfield et al. 2012a).

Twenty action guideline breaches occurred following little or no rainfall prior to sampling. The greatest number of dry weather action guideline breaches occurred at Petone Beach at Water Ski Club and Rona Bay at Northern End of Cliff Bishop Park (three each). Warning signs were erected at Petone Beach at Water Ski Club by Hutt City Council after action guideline breaches on 17 February and 2 March 2015. Warning signs were not put up immediately following dry weather exceedances at these sites on 16 March 2015 as heavy rainfall occurred the following day. However, a health warning was issued for Rona Bay at Northern End of Cliff Bishop Park on 21 March 2015 after three follow-up samples also exceeded the alert or action guideline, despite rainfall having stopped. Sanitary surveys were undertaken by Wellington Water at both sites but did not identify any sources of contamination.

At South Beach at Plimmerton, warning signs were put up and a media release issued after two consecutive breaches of the action guideline during dry weather on 13 and 14 January. Porirua City Council and Wellington Water undertook an investigation of the source of contamination and found a blocked sewer and a sewer leak in the area which are likely to have contributed to the high counts at South Beach (Nick Macdonald⁹, pers. comm.). These were subsequently fixed.

Overall, Petone Beach at Sydney Street recorded the lowest level of compliance with the surveillance guideline of all coastal sites monitored during the 2014/15 bathing season, with six routine samples exceeding the guideline. Owhiro Bay had the second lowest level of compliance with the surveillance guideline (five exceedances) and the highest number of action guideline breaches (four). The poor results at these sites are discussed further in Section 4.5.2.



Health warning sign at Petone Beach at Waterski Club on 4 March 2015 following an action guideline exceedance on 2 March. Signs were taken down on 5 March after bacteria counts returned to safe levels

4.5.2 Suitability for recreation grades

Updated SFRGs (as at the end of the 2014/15 bathing season) for 62 coastal recreational water quality monitoring sites in the Wellington region range from 'very good' to 'poor' (Figure 4.2, Appendix 4)¹⁰. In total, 28 (45%) monitoring sites now have SFRGs of 'good' or better while 34 coastal sites have SFRGs of 'fair' or 'poor'. The eight sites graded 'poor' are South Beach at Plimmerton, Porirua Harbour at Rowing Club, Titahi Bay at South Beach Access Road (all Porirua), Island Bay at Surf Club, Island Bay at Reef Street Recreation Ground, Island Bay at Derwent Street, Owhiro Bay (all on the South Coast of Wellington City) and Rona Bay at Northern end of Cliff Bishop Park (Eastbourne). At all of these sites, urban stormwater discharges, some with potential sewage contamination, have been identified as a principal source of faecal contamination (Greenfield et al. 2012b).

Wellington Water has programmes to find and fix sewer faults in catchments of each of the 'poor' sites. In 2014/15 a number of faults were found and fixed in the sewer network in the Island Bay catchment. In March/April 2015 the sewer main was replaced in the vicinity of the Rona Bay at Northern End of Cliff Bishop Park catchment (Michelle Chew¹¹, pers. comm.).

SFRGs improved at two sites and deteriorated at two sites in 2014/15 compared to the 2013/14 grades reported by Morar and Greenfield (2014). SFRGs improved from 'fair' to 'good' at Karehana Bay at Cluny Road and Robinson Bay at HW Shortt Recreation Ground. SFRGs deteriorated from 'good' to 'fair' at Hataitai Beach and Worser Bay. See Appendix 4 for more information on current SFRGs.

⁹ Nick Macdonald, Senior Environmental Health Officer, Porirua City Council.

¹⁰ There are insufficient data to assign a SFRG to Wellington Harbour at Taranaki St Wharf Dive Platform. Onehunga Bay is assigned a SFRG even though it was not monitored in 2014/15, as explained in Section 4.1.

¹¹ Michelle Chew, Investigations Engineer, Wellington Water.

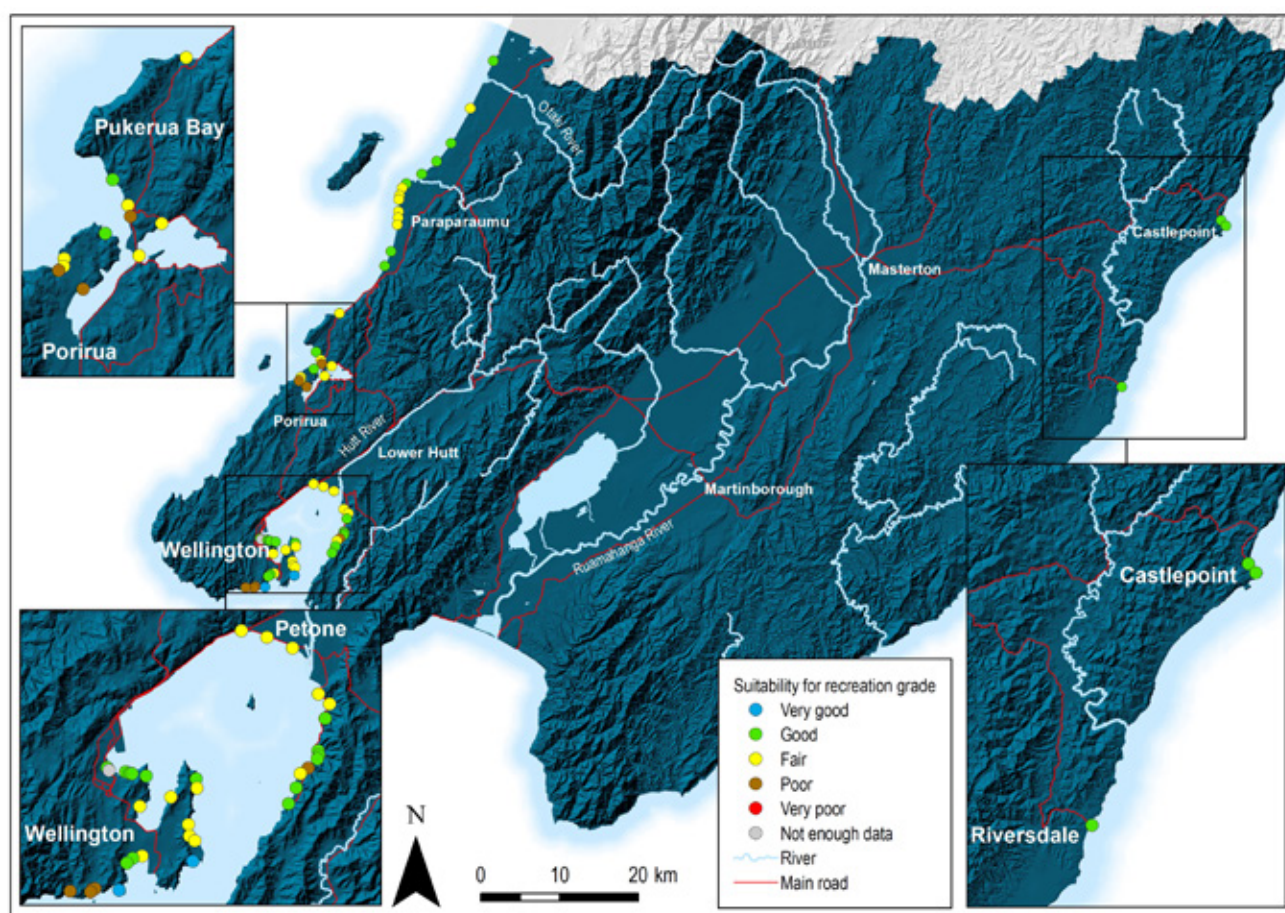


Figure 4.2: Suitability for Recreation Grades (SFRGs) for coastal recreational water quality monitoring sites in the Wellington region as at the end of the 2014/15 bathing season

The drop in grade at Hataitai Beach may be linked to faults recently found in both the public and private sewer network in this area (Michelle Chew, pers. comm.). These faults are currently being fixed. The reason for the drop in grade at Worsley Bay is unclear. Results collected from all sites where SFRGs have deteriorated will be closely scrutinised.

4.6 Summary

Twenty-nine of the 62 coastal sites (47%) monitored weekly during the 2014/15 bathing season exceeded the MfE/MoH (2003) action guideline on at least one occasion. Sites that most frequently exceeded the action guideline were Owhiro Bay, Petone Beach at Water Ski Club and Rona Bay at Northern End of Cliff Bishop Park; some exceedances at these sites were not associated with significant rainfall prior to sampling.

As of the end of the 2014/15 bathing season, 28 (45%) coastal monitoring sites have SFRGs of 'good' or better. Twenty-six sites are graded 'fair' and the remaining eight sites are graded 'poor': South Beach at Plimmerton, Porirua Harbour at Rowing Club, Titahi Bay at South Beach Access Road, Island Bay at Surf Club, Island Bay at Reef Street Recreation Ground, Island Bay at Derwent Street, Owhiro Bay and Rona Bay at Northern End of Cliff Bishop Park.

Wellington Water is undertaking investigations within the catchments of all sites graded 'poor' to identify specific sources of contamination.



5. Recreational shellfish gathering water quality

5.1 Introduction

Recreational shellfish gathering water quality was monitored at seven coastal sites across the Wellington region in 2014/15 (Figure 5.1, Appendix 1), as follows:

- Kapiti Coast District – 3 sites
- Porirua City – 1 site¹²
- Hutt City – 1 site
- Wellington City – 2 sites

5.2 Monitoring protocol

Sites were sampled weekly for 20 weeks between mid-November 2014 and 31 March 2015 at the same time as coastal recreational water quality sampling (all seven sites are also coastal bathing sites). On each sampling occasion a single water sample was collected 0.2 m below the surface in 0.5 m water depth and analysed for faecal coliform indicator bacteria using membrane filtration. Although the MfE/MoH

(2003) guidelines recommend the five-tube decimal dilution test (known as the Most Probable Number (MPN) method), membrane filtration produces an equivalent result in colony forming units (cfu) and is a faster test, providing a result in 24 hours.

5.3 Guidelines

As outlined in Section 2.2, the MfE/MoH (2003) recreational water quality guidelines use faecal coliform bacteria as an indicator of microbiological contamination in shellfish-gathering waters. The guidelines state:

- The median faecal coliform content of samples taken over a shellfish-gathering season shall not exceed 14 MPN/100mL; and
- Not more than 10% of samples collected over a shellfish gathering season should exceed 43 MPN/100mL.

The MfE/MoH (2003) guidelines also state that the guideline values above should be applied in conjunction with a sanitary survey. Sanitary surveys

¹² This site, introduced in July 2007, is not recommended for shellfish gathering but is monitored in response to community interest.

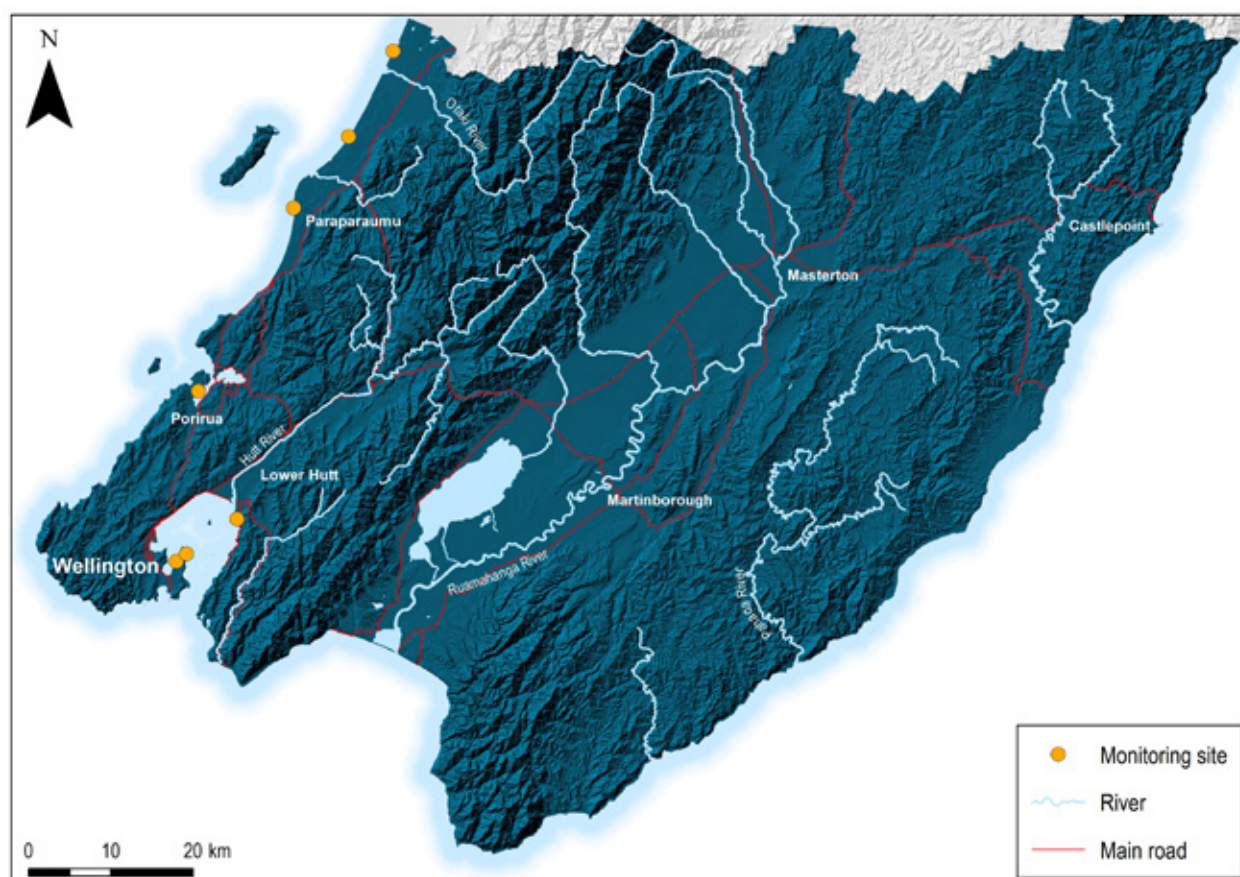


Figure 5.1: Recreational shellfish gathering water quality monitoring sites, 2014/15

are presented for each site in Appendix 4 in the form of the Sanitary Inspection Categories (SICs) which indicate the susceptibility of these sites to faecal contamination. More information on how these SICs were assigned can be found in Greenfield et al. (2012b).

5.3.1 Cautionary note

The MfE/MoH (2003) guidelines only address microbiological contamination. They do not address marine biotoxins, heavy metals, or harmful organic contaminants which in certain places and locations can pose a significant risk to people gathering shellfish. In addition the guidelines often don't accurately represent the risk of contact with viruses. For this reason, the guidelines cannot be used to determine whether shellfish are actually safe to eat. Monitoring of microbiological contaminants in shellfish flesh is needed to provide a direct measure of the risks associated with consuming shellfish. GWRC periodically undertakes shellfish flesh monitoring; the last such monitoring was undertaken in early 2006 (Milne 2006). In general, GWRC and Regional Public Health recommend that shellfish collection be avoided close to urban areas and mouths of rivers and streams that receive significant agricultural runoff.

5.4 Data analysis and limitations

All sampling and evaluation of results have been undertaken in accordance with the MfE/MoH (2003) recreational water quality guidelines where possible. However, the guidelines do not define a shellfish gathering season, nor do they provide any guidance on the minimum number of samples that should be used to calculate compliance with the median

guideline. In the absence of such guidance, the approach taken in this report is to align the shellfish gathering season with the summer bathing season (ie, mid-November to 31 March inclusive), even though it is acknowledged that shellfish gathering is likely to occur year round at many sites to some degree.

In some cases, additional sampling was undertaken in conjunction with re-sampling of bathing sites following an exceedance of the alert or action levels of the recreational water quality guidelines for coastal waters. The results of these follow-up samples were excluded from the calculation of compliance with the recreational shellfish gathering water quality guidelines (ie, only routine weekly sampling results are discussed here).

During data processing, any faecal coliform counts reported as less than or greater than detection limits were replaced by values one half of the detection limit or the detection limit, respectively (ie, counts of <4 cfu/100mL and >400 cfu/100mL were treated as 2 cfu/100mL and 400 cfu/100mL, respectively). Rainfall was calculated for the 24, 48 and 72 hours prior to the day of sampling by summing up the rainfall for each 24 hour period ending at 9 am of each day. Rainfall was also calculated for the period between 9 am and 12 pm on the day of sampling.

5.5 Results

Only one site, Mahanga Bay, was fully compliant with shellfish gathering water quality guidelines over the 2014/15 summer period (Table 5.1). All other sites breached one or both of the guideline criteria. This result differs from the 2013/14 season when Peka Peka Beach at Road End and Shark Bay were the only sites to comply with the guideline. Reasons for the improvement at Mahanga Bay and deterioration at Peka Peka Beach and Shark Bay are unclear.

Table 5.1: Analysis of faecal coliform counts obtained from routine weekly monitoring during the 2014/15 summer months against the MfE/MoH (2003) guideline criteria for recreational shellfish-gathering waters. Values in bold font indicate non-compliance with guideline criteria

Site	Median (cfu/100mL)	Maximum (cfu/100mL)	No. (and percentage) of results >43 cfu/100mL	Total no. of samples
Kapiti				
Otaki Beach – Surf Club	10	1,260	4 (20%)	20
Peka Peka Beach – Road End	13	360	3 (15%)	20
Raumati Beach – Tainui St	19	3,850	4 (20%)	20
Porirua				
Porirua Harbour – Rowing Club	20	740	7 (35%)	20
Wellington City				
Shark Bay	4	770	3 (15%)	20
Mahanga Bay	2	12	0 (0%)	20
Hutt				
Sorrento Bay	4	420	6 (30%)	20

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¹³ Published June 2002, updated June 2003.

Acknowledgements

Mike Gordon and Mike Harkness assisted with the provision and analysis of hydrological data. Juliet Milne peer reviewed a draft version of this report.

There are many people that play an important role in the Wellington region's recreational water quality monitoring programme, particularly in terms of water sample collection, analysis and/or reporting. Special thanks to:

- Anne Robertson and Julie Lloyd (Kapiti Coast District Council)
- Oksana Bartlett, Nicholas MacDonald, and David Redmayne (Porirua City Council)
- Paul Schuchmann and Dean Bentley (Hutt City Council)
- Iqbal Idris and Michelle Chew (Wellington Water)
- Terry Manning, Rob Deacon, Sunita Raju and the microbiological team at Eurofins ELS
- Jill McKenzie, Mike Fisher and Jonathan Lambert (Regional Public Health)
- Samwell Warren, Emily Martin, Joanna McVeagh and Wendy Purdon (Greater Wellington Regional Council)



Appendix 1: Monitoring sites

Area	Site type	Site name	NZTM coordinates	
			Easting	Northing
Kapiti	Freshwater	Otaki River at Pots ¹	1785444	5478749
		Otaki River at SH1	1781309	5484406
		Waikanae River at SH1	1773752	5472296
		Waikanae River at Jim Cooke Park	1772155	5472377
	Coastal	Otaki Beach at Surf Club ²	1778622	5488330
		Te Horo Beach at Sea Road	1775692	5482324
		Peka Peka Beach at Road End ²	1773215	5477905
		Waikanae Beach at William Street	1771388	5475584
		Waikanae Beach at Ara Kuaka Carpark	1769514	5473978
		Paraparaumu Beach at Ngapotiki Street	1767543	5472762
		Paraparaumu Beach at Nathan Avenue	1767033	5472174
		Paraparaumu Beach at Maclean Park	1766694	5471267
		Paraparaumu Beach at Toru Road	1766577	5470715
		Raumati Beach at Tainui Street	1766531	5469229
		Raumati Beach at Marine Gardens	1766516	5468441
		Raumati Beach at Aotea Road	1766414	5467529
		Paekakariki Beach at Whareroa Road	1765598	5464128
		Paekakariki Beach at Surf Club	1764791	5462273
Porirua	Coastal	Pukerua Bay	1759058	5456278
		Karehana Bay at Cluny Road	1756093	5451360
		Onehunga Bay ³	1755796	5449181
		Plimmerton Beach at Bath Street	1756706	5450316
		South Beach at Plimmerton	1756810	5449874
		Pauatahanui Inlet at Water Ski Club	1758074	5449593
		Pauatahanui Inlet at Paremata Bridge	1757153	5448284
		Porirua Harbour at Rowing Club ²	1754891	5446947
		Titahi Bay at Bay Drive	1754132	5448169
		Titahi Bay at Toms Road	1754110	5447857
		Titahi Bay at South Beach Access Road	1753906	5447682

Area	Site type	Site name	NZTM coordinates	
			Easting	Northing
Wellington City	Coastal	Aotea Lagoon	1748985	5427683
		Wellington Harbour at Taranaki St Dive Platform	1749092	5427538
		Oriental Bay at Freyberg Beach	1749920	5427464
		Oriental Bay at Wishing Well	1750118	5427386
		Oriental Bay at Band Rotunda	1750243	5427375
		Balaena Bay	1750958	5427267
		Hataitai Beach	1750632	5425730
		Shark Bay ²	1752211	5426197
		Mahanga Bay ²	1753468	5427115
		Scorching Bay	1753517	5426647
		Worser Bay	1753074	5424823
		Seatoun Beach at Wharf	1753129	5424234
		Seatoun Beach at Inglis Street	1753405	5423994
		Breaker Bay	1753312	5422970
		Lyllall Bay at Tirangi Road	1750747	5423230
		Lyllall Bay at Onepu Road	1750286	5423116
		Lyllall Bay at Queens Drive	1749990	5422868
		Princess Bay	1749586	5421504
		Island Bay at Reef Street Recreation Grd	1748229	5421542
		Island Bay at Surf Club	1748377	5421590
		Island Bay at Derwent Street	1748155	5421415
		Owhiro Bay	1747122	5421463
Hutt	Freshwater	Pakuratahi River at Forks	1784288	5452620
		Akatarawa River at Hutt Confluence ¹	1776183	5449184
		Hutt River at Birchville	1776196	5449091
		Hutt River at Maoribank Corner	1775882	5446696
		Hutt River at Poets Park	1771461	5446092
		Hutt River at Silverstream Bridge	1767598	5443172
		Hutt River at Melling Bridge	1759906	5436831
		Wainuiomata River at Richard Prouse Park	1764536	5429141



Area	Site type	Site name	NZTM coordinates	
			Easting	Northing
Hutt	Coastal	Petone Beach at Water Ski Club	1755744	5434591
		Petone Beach at Sydney Street	1757045	5434248
		Petone Beach at Kiosk	1758326	5433711
		Sorrento Bay ²	1759632	5431384
		Lowry Bay at Cheviot Road	1760206	5430891
		York Bay	1759977	5430160
		Days Bay at Wellesley College	1759616	5428529
		Days Bay at Wharf	1759654	5428313
		Days Bay at Moana Road	1759582	5428120
		Rona Bay at Northern end of Cliff Bishop Park	1759109	5427654
		Rona Bay at Wharf	1758730	5427371
		Robinson Bay at HW Shortt Recreation Ground	1758519	5426674
		Robinson Bay at Nikau Street	1758131	5425856
Wairarapa	Freshwater	Ruamahanga River at Double Bridges	1824350	5471775
		Ruamahanga River at Te Ore Ore	1825529	5462917
		Waipoua River at Colombo Road	1824996	5462889
		Waingawa River at Kaituna	1810326	5471149
		Waingawa River at South Road	1820550	5460878
		Ruamahanga River at The Cliffs	1821476	5452180
		Ruamahanga River at Kokotau	1815756	5447191
		Waiohine River at Gorge ¹	1801853	5455936
		Waiohine River at SH2	1809665	5451711
		Ruamahanga River at Morrisons Bush	1808918	5441108
		Ruamahanga River at Waihenga	1804610	5436461
		Tauherenikau River at Websters ¹	1797082	5439942
		Riversdale Lagoon	1858304	5447128
	Coastal	Castlepoint Beach at Castlepoint Stream	1871366	5467559
		Castlepoint Beach at Smelly Creek	1871670	5467202
		Riversdale Beach Between the Flags	1858435	5446948

¹ Site sampled monthly under GWRC's Rivers State of the Environment water quality programme.

² Water quality is also monitored for recreational shellfish gathering purposes.

³ As water quality at this site is consistently good, weekly sampling is not currently undertaken.
The overall grade is based on data collected between 2006/07 and 2010/11

Appendix 2: Rainfall stations

Freshwater recreational sites

- Kapiti Coast District – Taungata Peak (Otaki River) and Waikanae Water Treatment Plant (Waikanae River)
- Hutt – Centre Ridge (Pakuratahi River), Te Marua (Hutt River), Birch Lane (lower Hutt River sites) and Wainuiomata Reservoir (Wainuiomata River)
- Wairarapa – Mount Bruce (Ruamahanga River), Angle Knob (located in the upper Waingawa catchment and used as indicator of rainfall high in Tararua Range – Waipoua River, Waingawa River, and mid Ruamahanga River sites) and Waiohine Gorge (Waiohine River and lower Ruamahanga River sites).

Coastal recreational sites

- Kapiti Coast District – Otaki Depot (Otaki Beach, Te Horo Beach), Waikanae Water Treatment Plant (Peka Peka Beach, Waikanae Beach) and Paraparaumu Aerodrome* (Paraparaumu Beach, Raumati Beach, Paekakariki Beach)
- Porirua City – Whenua Tapu and Seton Nossiter Park
- Hutt City – Shandon
- Wellington City – Regional Council Centre (Aotea Lagoon and Oriental Bay) and Wellington Airport* (remaining Wellington City sites)
- Wairarapa – Castlepoint*

*NIWA rainfall stations

Note: Some GWRC rainfall data used in the preparation of this report were raw/processed data that were yet to be formally quality checked and archived in GWRC's Hilltop Database.



Appendix 3: Laboratory and field methods

Kapiti Coast District Council collected and analysed water samples collected in their district. Water samples collected in Porirua, Wellington City, Hutt City and the Wairarapa were analysed by Eurofins ELS.

Methods and detection limits

Determinant	Method	Detection limit
<i>Escherichia coli</i> at 44.5°C	APHA Standard Methods (22nd Ed.) 9213D, Membrane filter on mTEC agar, Urea substrate	1–4/100mL
Enterococci at 41°C	US EPA Method 1600, Membrane filter on mEI agar	1–5 cfu/100mL
Faecal coliforms at 44.5°C	APHA Standard Methods (22nd Ed.) 9222D, Membrane filter on mFC agar	1–5 cfu/100mL
Water temperature	Field meter or digital thermometer	0.1°C
Visual clarity	Modified version of the horizontal black disc method (Davies-Colley 1988). Instead of measuring the distance at which the 200 mm black disc disappears from view, a 'yes' or a 'no' was recorded depending on whether the disc was visible at 1.6 m.	–
Periphyton cover (including filamentous and mat-forming algae as well as cyanobacteria)	Cyanobacteria cover was assessed using the method outlined in Section 4.4.3 of the interim Cyanobacteria Guidelines (MfE & MoH 2009). Assessment of filamentous and mat-forming algae was undertaken using the same method	5%
Seaweed cover	Visual estimate within 5 m radius around sample point, including both floating and attached seaweed	5%

Appendix 4: Summary statistics and SFRGs

Microbiological water quality data for the 2014/15 summer are summarised in the tables below. The Microbiological Assessment Category (MAC) values and Suitability for Recreation Grades (SFRGs) determined by Greenfield et al. (2012b) have been updated using the 2010/11–2014/15 microbiological water quality results. Up and down arrows beside grades indicate positive and negative changes, respectively, in SFRGs from those assigned at the end of the 2013/14 bathing season (as presented in Morar & Greenfield (2014)).

(A) Fresh waters

Bathing site	n	No. sample results (<i>E. coli</i> /100mL)			Beach grading (2010/11 – 2014/15 data)					
		Surveillance (≤ 260)	Alert (261–550)	Action (>550)	All flows			Dry weather flows		
					SIC Grade	MAC Grade (95th%-ile value)	2014/15 SFRG	SIC Grade	MAC Grade (95th%-ile value)	2014/15 SFRG
Kapiti										
Otaki R – Pots ¹	5	4	1	0	Low	A (85) ²	Very good	Very Low	A (81) ²	Very Good
Otaki R – SH1	20	19	1	0	Moderate	C (263)	Fair↓	Low	B (150)	Good
Waikanae R – SH1	20	20	0	0	Moderate	C (363)	Fair	Low	B (230)	Good
Waikanae R – Jim Cooke Pk	20	20	0	0	Moderate	C (328)	Fair	Low	B (258)	Good
Hutt & Wainuiomata										
Pakuratahi R – Hutt Forks	20	20	0	0	Moderate	B (243)	Good↑	Low	B (160)	Good
Akatarawa R – Hutt Confl. ¹	5	4	0	1	Moderate	D (640) ³	Poor↓	Low	C (400) ³	Fair
Hutt R – Birchville	20	19	1	0	Moderate	D (580)	Poor	Moderate	B (165)	Good
Hutt R – Maoribank Cr	20	19	1	0	Moderate	C (550)	Fair↑	Low	B (178)	Good
Hutt R – Poets Park	20	20	0	0	Low	B (214)	Good↑	Low	A (109)	Very Good
Hutt R – Silverstream	20	19	0	1	Moderate	D (590)	Poor↓	Moderate	B (205)	Good
Hutt R – Melling Br. ⁴	20	17	0	3	Moderate	D (920)	Poor	Moderate	D (1,178)	Poor
Wainuiomata R – RP Park	20	16	2	2	Moderate	D (680)	Poor	Moderate	D (580)	Poor
Wairarapa										
Ruamahanga R – Double Br.	20	19	0	1	Moderate	B (194)	Good	Moderate	B (138)	Good
Ruamahanga R – Te Ore Ore	20	18	1	1	High	D (750)	Very poor	Moderate	B (233)	Good
Waipoua R – Colombo Rd	20	18	0	2	High	D (880)	Very poor	Moderate	B (247)	Good
Waingawa R – Kaituna	20	20	0	0	Low/ moderate	A (118)	Very good	Low	A (58)	Very Good
Waingawa R – South Rd	20	19	0	1	Low/ moderate	D (760)	Poor↓	Low	A (81)	Very Good
Ruamahanga R – The Cliffs	20	19	0	1	High	D (760)	Very poor	High	A (85)	Poor ⁵
Ruamahanga R – Kokotau	20	19	0	1	High	D (1,040)	Very poor	Moderate	B (135)	Fair ⁵
Waiohine R – Gauge ¹	5	5	0	0	Low	A (103) ²	Very good	Very Low	A (56) ²	Very Good



(A) Fresh waters continued

Bathing site	n	No. sample results (<i>E. coli</i> /100mL)			Beach grading (2010/11 – 2014/15 data)					
		Surveillance (≤ 260)	Alert (261–550)	Action (>550)	All flows			Dry weather flows		
					SIC Grade	MAC Grade (95th %-ile value)	2014/15 SFRG	SIC Grade	MAC Grade (95th %-ile value)	2014/15 SFRG
Waiohine R – SH2	20	19	1	0	Low/ moderate	A (125)	Good*	Low	A (47)	Very Good
Ruamahanga R – Morrisons B.	20	19	1	0	High	D (1,130)	Very poor	Moderate	B (145)	Fair ⁵
Ruamahanga R – Waihenga	20	20	0	0	High	D (1,140)	Very poor	Moderate	A (113)	Fair ⁵
Tauherenikau R – Websters ¹	5	5	0	0	High	C (395) ³	Poor ³	Low/ moderate	A (117)	Very good ^{†3}
Riversdale Lagoon	20	19	0	1	Moderate	D (1,060)	Poor	N/A	N/A	N/A

¹ Sampled monthly under GWRC's Rivers State of the Environment (RSOE) water quality programme.

² Based on summer-time data collected weekly from 2003/04–2005/06 and monthly from 2006/07–2014/15.

³ Interim MAC grade (n=60) based on summer-time data collected monthly under GWRC's RSOE water quality programme (2003/04–2014/15).

⁴ Interim grading (SIC grading based on that for historic site at Boulcott and MAC based on three years of data (n=80 for 'all flows' and n=63 for 'dry flows')).

⁵ Interim grades altered to reflect the uncertainty associated with the effects of upstream municipal wastewater treatment plant discharges on public health.

(B) Coastal waters

Bathing site	n	No. sample results (Enterococci/100mL)			Beach grading (2010/11–2014/15 data)		
		Surveillance (≤ 140)	Alert (141–280)	Action (>280)	SIC Grade	MAC Grade (95th %-ile value)	2014/15 SFRG
Kapiti							
Otaki – Surf Club	20	19	0	1	Moderate	B (102)	Good
Te Horo Beach – Sea Road ¹	20	19	0	1	Moderate	C (250)	Fair
Peka Peka	20	19	1	0	Low	B (72)	Good
Waikanae – William St	20	20	0	0	Moderate	B (73)	Good
Waikanae – Ara Kuaka	20	20	0	0	Moderate	B (98)	Good
Paraparaumu – Ngapotiki St	20	18	0	2	Moderate	B (193)	Good
Paraparaumu – Nathan Ave	20	20	0	0	Moderate	C (228)	Fair
Paraparaumu – Maclean Pk	20	18	2	0	Moderate	C (251)	Fair
Paraparaumu – Toru Rd	20	19	0	1	Moderate	C (313)	Fair
Raumati – Tainui St	20	19	1	0	Moderate	C (253)	Fair
Raumati – Marine Gdns	20	19	0	1	Moderate	C (298)	Fair
Raumati – Aotea Rd	20	18	2	0	Moderate	C (229)	Fair
Paekakariki – Whareroa Rd	20	20	0	0	Low	B (76)	Good
Paekakariki – Surf Club	20	20	0	0	Low	B (69)	Good

(B) Coastal waters continued

Bathing site	n	No. sample results (Enterococci/100mL)			Beach grading (2010/11–2014/15 data)		
		Surveillance (≤ 140)	Alert (141–280)	Action (>280)	SIC Grade	MAC Grade (95th%-ile value)	2014/15 SFRG
Porirua							
Pukerua Bay	20	19	0	1	Moderate	C (255)	Fair
Karehana – Cluny Rd	20	20	0	0	Moderate	B (115)	Good†
Plimmerton – Bath St	20	18	0	2	Moderate	C (430)	Fair
South – Plimmerton	20	19	0	1	Moderate	D (1,050)	Poor
Pauatahanui – Water Ski Club	20	19	1	0	Moderate	C (260)	Fair
Pauatahanui – Paremata Br	20	20	0	0	Moderate	C (321)	Fair
Porirua – Rowing	20	16	3	1	Moderate	D (820)	Poor
Onehunga Bay ²	NA	NA	NA	NA	Low	B (70)	Good
Titahi – Bay Dr	20	18	2	0	Moderate	C (280)	Fair
Titahi – Toms Rd	20	18	2	0	Moderate	C (370)	Fair
Titahi Bay – Access Rd	20	18	1	1	Moderate	D (625)	Poor
Wellington City							
Aotea Lagoon	20	20	0	0	Moderate	B (105)	Good
Oriental – Freyberg	20	20	0	0	Moderate	B (105)	Good
Oriental – Well	20	20	0	0	Moderate	B (130)	Good
Oriental – Rotunda	20	19	0	1	Moderate	B (135)	Good
Balaena Bay	20	18	0	2	Low	B (72)	Good
Hataitai Beach	20	19	0	1	Moderate	C (315)	Fair↓
Shark Bay	20	19	0	1	Moderate	C (460)	Fair
Mahanga Bay	20	20	0	0	Low	B (130)	Good
Scorching Bay	20	17	3	0	Low	C (315)	Fair
Worser Bay	20	18	2	0	Moderate	C (245)	Fair↓
Seatoun – Wharf	20	20	0	0	Moderate	C (225)	Fair
Seatoun – Inglis St	20	19	1	0	Moderate	C (250)	Fair
Breaker Bay ³	20	19	1	0	Low	A (28)	Very Good
Lyll – Tirangi Rd	20	19	0	1	Moderate	C (335)	Fair
Lyll – Onepu Rd	20	19	0	1	Moderate	B (140)	Good
Lyll – Queens Dr	20	18	1	1	Moderate	B (160)	Good
Princess Bay	20	20	0	0	Low	A (40)	Very Good
Island – Reef St	20	17	2	1	Moderate	D (2,300)	Poor
Island – Surf Club	20	18	0	2	Moderate	D (1,170)	Poor
Island – Derwent St	20	20	0	0	Moderate	D (700)	Poor
Owhiro Bay	20	15	1	4	Moderate	D (2,650)	Poor
Taranaki St Dive Platform	20	19	0	1	N/A ⁴	N/A ⁴	N/A ⁴



(B) Coastal waters continued

Bathing site	n	No. sample results (Enterococci/100mL)			Beach grading (2010/11–2014/15 data)		
		Surveillance (≤ 140)	Alert (141–280)	Action (>280)	SIC Grade	MAC Grade (95th %-ile value)	2014/15 SFRG
Hutt							
Petone – Water Ski Club	20	17	0	3	Moderate	C (370)	Fair
Petone – Sydney St	20	14	4	2	Moderate	C (380)	Fair
Petone – Kiosk	20	17	1	2	Moderate	C (330)	Fair
Sorrento Bay	20	18	1	1	Low	C (375)	Fair
Lowry – Cheviot Rd	20	16	2	2	Moderate	C (430)	Fair
York Bay	20	20	0	0	Low	B (115)	Good
Days – Wellesley	20	19	0	1	Moderate	B (155)	Good
Days – Wharf	20	19	1	0	Moderate	B (120)	Good
Days – Moana Rd	20	20	0	0	Moderate	B (155)	Good
Rona – CB Pk	20	17	0	3	Moderate	D (545)	Poor
Rona – Wharf	20	19	0	1	Moderate	C (375)	Fair
Robinson – HWS Rec Gd	20	19	1	0	Moderate	B (140)	Good†
Robinson – Nikau St	20	20	0	0	Moderate	B (190)	Good
Wairarapa							
Castlepoint – Castlepoint Stm	20	20	0	0	Moderate	B (48)	Good
Castlepoint – Smelly Crk	20	20	0	0	Low	B (72)	Good
Riversdale – Flags	20	20	0	0	Low	B (46)	Good

¹ Interim grade (SIC based on that from historic site at Mangaone Stream outflow, MAC grade based on three years of data (n=80)).

² Not sampled in 2014/15, grade based on data collected between 2006/07 and 2010/11.

³ Sampled fortnightly between 2007/08 & 2010/11 and weekly from 2011/12 onwards.

⁴ Insufficient data available to assign a SIC grade, MAC grade, and SFRG at this stage.



The Greater Wellington Regional Council's purpose is to enrich life in the Wellington Region by building resilient, connected and prosperous communities, protecting and enhancing our natural assets, and inspiring pride in what makes us unique

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July 2015

GW/ESCI-T-15/35
ISBN (on-line): 978-1-927217-71-9
ISBN (print): 978-1-927217-70-2



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