



**MARLBOROUGH  
DISTRICT COUNCIL**

# Recreational Water Quality Report 2012-13

**Technical Report No: 13-006  
June 2013**





## Recreational Water Quality Report 2012-13

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## Executive Summary

Twelve coastal beaches and nine river sites were monitored as part of the recreational water quality program in the summer months of 2012/2013. Weekly samples were taken from the beginning of November until the end of March. The samples were analysed for faecal indicator bacteria and the results compared to the Microbiological Water Quality Guidelines released by the Ministry for the Environment in 2003. This allowed decisions to be made regarding site safety for contact recreational use like swimming, surfing and fishing.

The majority of sites were safe for contact recreational use more than 90% of the time. Marfells Beach had the best microbiological water quality with no exceedances of the Recreational Water Quality Guidelines. The highest number of Guideline exceedances was observed in the Taylor River at Riverside. A catchment characterisation study planned for the coming year is likely to provide information which will help explain the high faecal bacteria levels observed.

Suitability for Contact Recreation Grades (SFR Grades) for sites that have been sampled for a minimum of five years were reviewed which resulted in a changed Grade for three river and two coastal sites. Microbiological water quality of the Opawa River at Elizabeth St, Waihopai River at Craiglochart #2, Wairau River at Blenheim Rowing Club and Picton Foreshore have improved significantly resulting in an improved SFR Grade. Ngakuta Bay was the only site that had to be downgraded and an investigation into possible reasons is recommended.

40% of the graded sites now have a SFR Grade of either "Very Good" or "Good" while 25% are graded "Poor" or "Very Poor".



## Table of Contents

<b>Executive Summary .....</b>	<b>i</b>
<b>1. Introduction .....</b>	<b>1</b>
<b>2. The Microbiological Water Quality Guidelines .....</b>	<b>1</b>
2.1. Guideline values .....	1
2.2. Suitability for Contact Recreation Grades .....	2
<b>3. Recreational Water Quality monitoring.....</b>	<b>3</b>
<b>4. Trends Analysis .....</b>	<b>4</b>
<b>5. Results .....</b>	<b>6</b>
5.1. Anakiwa.....	6
5.2. Mistletoe Bay .....	7
5.3. Momorangi, Ngakuta and Governors Bay .....	8
5.4. Picton Foreshore and Waikawa Bay .....	10
5.5. Whites Bay and Robin Hood Bay .....	11
5.6. Moetapu Bay.....	13
5.7. Marfells Beach.....	14
5.8. Rai River at Rai Falls and Pelorus River at Pelorus Bridge and Totara Flat.....	15
5.9. Wairau River at State Highway Six, Ferry Bridge and Blenheim Rowing Club .....	17
5.10. Waihopai River at Craiglochart #2 .....	19
5.11. Taylor River at Riverside and Opawa River at Elizabeth St Bridge .....	20
5.12. Result Summary.....	22
<b>6. Recommendations .....</b>	<b>25</b>
<b>7. References.....</b>	<b>26</b>
<b>Appendix 1: Management procedure for exceedances of bathing water guidelines. ....</b>	<b>27</b>
<b>Appendix 2: Locations of Recreational Water Quality Sites and their Suitability for Contact Recreation Grades .....</b>	<b>28</b>





## 1. Introduction

Marlborough has many beautiful beaches and rivers that are popular with visitors and local residents during the warmer months of the year. Swimming, boating, surfing and fishing are only a few of the many recreational activities in and around water. The Marlborough District Council has a Recreational Water Quality program that monitors the most popular beaches and river locations from the beginning of November until the end of March. Samples are taken weekly during this period and analysed for faecal indicator bacteria that are linked to waterborne diseases. Results are compared to national guidelines published by the Ministry for the Environment which enables a decision to be made on whether the water can be considered safe for contact recreational use.

This report presents the results for the samples taken during the summer season of 2012/2013 and investigates long term trends in the microbial water quality where possible. It is important to understand that the recreational water quality program is exclusively focused on health based risks associated with faecal contamination and results are not reflective of the general water quality of a site.

## 2. The Microbiological Water Quality Guidelines

In 2003 the Ministry for the Environment and the Ministry of Health published a Guideline document providing a framework for the monitoring of the microbiological water quality of coastal and river recreational water bodies. The Guideline values and assessment methods presented in this document are based on a 'reasonable risk' approach to the health-risk waterborne diseases pose to persons enjoying water-related recreational activities.

The Guideline document provides general recommendations in regard to the management of recreational water quality and guideline values allowing the assessment of results from individual samples as well as a method for the creation of a Beach Grade.

### 2.1. Guideline values

Measuring the concentrations of microorganisms that can impact on the health of water users is both difficult and expensive. A more cost effective approach to assessing the number of pathogens present is the use of indicator bacteria. These are comparatively easily measured and are generally present when water is contaminated with harmful organisms like Salmonella, Campylobacter, Giardia or Cryptosporidium. Scientific research has shown that high concentrations of indicator bacteria are a sign that there is an increased health risk associated with the use of a water body for contact recreation and the water is potentially contaminated with human sewage or animal faeces.

Two different indicator bacteria are used depending on the type of sample being analysed. Freshwater samples are analysed for the concentration of E. coli while Enterococci are the preferred indicator bacterium for coastal samples. There are two guideline values for each of the indicator bacteria. Based on these guidelines sample results are categorised into three "Modes" which then allow a decision to be made on whether the water can be considered safe for contact recreation. Table 1 outlines these "Modes" and their meaning as well as the actions that need to be taken as a result. In this report the lower limit for the Alert Mode is referred to as Alert Guideline, 260 E.coli/100mL and 140 Enterococci/100mL, while the upper limit for the Alert Mode (lower limit of the Action Mode) is referred to as the Action Guideline, 550 E.coli/100mL and 280 Enterococci/100mL.

Mode	Freshwater	Coastal	Meaning	Required Action
	E. coli/100mL	Enterococci/100mL		
Green Mode	<260	<140	Safe for contact recreation	Continue routine monitoring
	260	140	<b>Alert Guideline</b>	
Alert Mode	260 - 550	140 - 280	Increased risk for health	Investigate possible causes and increase sampling frequency if no cause can be found, otherwise continue routine sampling
	550	280	<b>Action Guideline</b>	
Action Mode	>550	>280*	Unsafe for contact recreation	Increase sampling frequency and warn the public that the beach is considered unsafe (Warning signs at site)

**Table 1: Modes and the corresponding Guidelines as outlined by the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (2003).**

\* For coastal samples the Action Mode is usually only applied after concentrations in two consecutive samples exceed 280 Enterococci/100mL; however if high numbers of people are expected to visit the beach (i.e. Holiday period), a precautionary approach is taken and warning signs are erected after only one Exceedance.

The process followed when samples are in the Alert or Action Mode is described in Chapter 3.

## 2.2. Suitability for Contact Recreation Grades

Suitability for Contact Recreation Grades (SFR Grades) provide an overall measure for the microbial water quality of a beach or river site. The Grades are based on a reasonable risk approach in regard to the possibility of contracting a water borne disease associated with faecal contamination when pursuing recreational activities in and around the water.

The SFR Grade is the combination of a catchment assessment (Sanitary Inspection Category, SIC) and an assessment of the Microbiological Water Quality (Microbiological Assessment Category, MAC).

The catchment assessment is primarily focused on potential sources of faecal contamination. Sanitary Inspection Categories (SIC) based on this assessment range from Very Low, Low, Moderate, High to Very High (Risk). Sites that are given a SIC of Very Low are surrounded by bush and forest. Low intensity agriculture in the catchment results in a SIC of Low. Categories of High and Very High are given to sites which are likely to directly receive treated or untreated sewage or run-off from high-intensity agriculture.

The Microbiological Assessment Category (MAC) is derived from the Enterococci or E. coli concentrations in routine samples taken from a site over five consecutive summers. MACs range from "A to D" and are based on the upper 95%ile calculated with the Hazen method (Table 2).

MAC (Microbiological Assessment Category)	Coastal	Freshwater
	Enterococci/100mL*	E. coli/100mL*
A	<41	<131
B	41 - 200	131 - 260
C	201 - 500	261 - 550
D	>500	>550

**Table 2: Microbiological Assessment Categories (MAC).**

\* upper 95%ile of routine sampling over 5 consecutive summers.

The Sanitary Inspection Category (SIC) and the Microbiological Assessment Category (MAC) for a site are then combined into the Suitability for Contact Recreation Grade (SFR Grade). The SFR Grades range from Very Good, Good, Fair, Poor to Very Poor. Table 3 outlines the definitions for the individual Grades.

SFR Grade (Suitability for Contact Recreation Grade)	Meaning
Very Good	Considered satisfactory for swimming at all times.
Good	Satisfactory for swimming most of the time with exceptions following rainfall.
Fair	Generally satisfactory for swimming. Caution should be taken during periods of high rainfall, and swimming avoided if water is discoloured.
Poor	Swimming should be avoided, particularly by the very young, the very old and those with compromised immunity.
Very Poor	Generally swimming is not recommended.

**Table 3: Suitability for Contact Recreation Grades and their meaning.**

SFR Grades are not indicative of the general water quality at a site as their assignment is purely based on the health risk posed by potential faecal bacteria contamination and does not take into consideration other water quality parameters.

### 3. Recreational Water Quality monitoring

This summer the recreational water quality of twelve coastal beaches and nine river sites was monitored from the beginning of November 2012 until the end of March 2013. Samples were taken weekly, usually at the beginning of each week independent of weather conditions and transported on ice in chilly bins. The local Blenheim Hill Laboratory was contracted to determine the E. coli or Enterococci concentrations in the samples. Bacteria levels were determined as MPN counts using Enterolert for Enterococci and Colilert for E.coli after 24 hour incubation at 41°C and 35°C respectively.

As soon as analysis results were received from the laboratory the Marlborough District Council website ([www.marlborough.govt.nz](http://www.marlborough.govt.nz)) was updated in order to provide the public with up-to-date information. If bacteria concentrations were above the Alert or Action Guideline (Chapter 2.1) possible causes were considered and the District Health Board was informed. A joint decision was then made on how to proceed. Warning signs were usually erected at the site if bacteria levels were above the Action guideline and the site was sampled more frequently until bacteria concentrations were at a low enough level for the water to be considered safe again. A flowchart outlining the process is shown in Appendix 1.

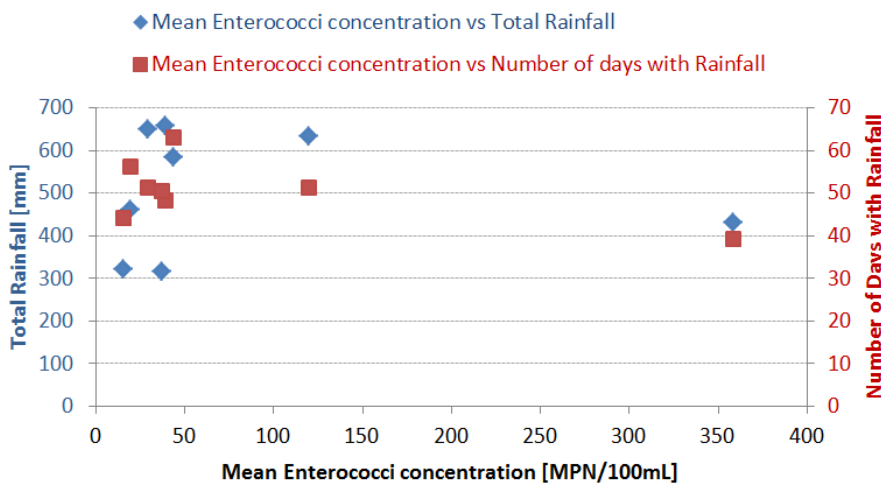
The Marlborough District Council is currently working on an automated E-Mail service to inform effected community groups if the Recreational Water Quality Guidelines are exceeded.

A beach usage survey was conducted in December 2011. As a result sites with low usage were removed from the program, while four new coastal and one river site were added. The new sites have not been regularly sampled previously and recreational water quality information is limited. This means SFR Grades could not be established for those sites, especially as data for a minimum of five consecutive years is required for a complete Grade. All other sites have sufficient data for the assignment of a SFR Grade and have been re-assessed in preparation for this report.

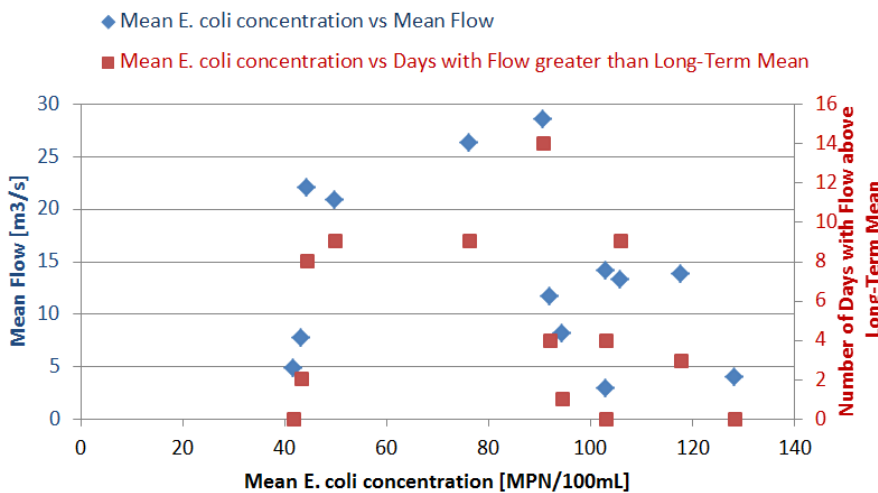
A map showing all sites sampled during the summer of 2012/213 and their SFR Grades can be found in Appendix 2.

## 4. Trends Analysis

The range of bacterial concentrations measured at any one site is usually very large (between <2 and >2000) compared to the number of samples taken during a summer season (20). Because the data consists of weekly spot samples rather than a continuous dataset the timing of the sampling in relation to rainfall and flood events has a great effect. The result is that yearly statistics can show great variability especially at sites that regularly exceed the Recreational Water Quality Guidelines. That this large variation is not the result of differences in total rainfall amounts or flow patterns is supported by the fact that even at sites that have high bacterial counts only during and shortly after rainfall no correlation could be found between the average bacteria concentration and the total Rainfall during the season (Figure 1). Other statistics like mean flow, the number of days with Rainfall, the number of days with flows above the long term Mean do not show a correlation with bacterial levels during the same period either (Figure 1 and Figure 2).



**Figure 1: Scatter plot of Mean (average) Enterococci concentration at Ngakuta Bay and Total Rainfall as well as Number of Days with Rainfall during the sampling season at Waikawa at Boons Valley.**



**Figure 2: Scatter plot of Mean (Average) E. coli concentration in the Pelorus River at Pelorus Bridge and Mean Flow as well as Number of Days with Flow above the Long-Term Mean Flow at Pelorus at Bryants.**

In order to identify trends more easily five consecutive seasons were combined and the upper 95<sup>th</sup> percentile was calculated from this larger dataset. The increased size of the dataset results in a smoother graph which is easier to interpret. The upper 95<sup>th</sup>ile was used because we are generally more

interested in the health risks associated with high concentrations of faecal bacteria. Also, the high number of non-detects skews the dataset which makes the use of the more commonly used statistics like mean and median less interpretable.

For the calculation of the upper 95%ile results below the detection limit were replaced with half the detection limit (e.g. <10 was replaced with 5). Results above the detection limit were replaced with the detection limit + 1 (e.g. >2000 was converted to 2001). This is consistent with the approach used for the calculation of the MAC (bacterial grade). A recent change in laboratory increased the upper detection limit from 2000 to 10000. Since very high result have a much greater effect on the value of the upper 95%ile than the values replacing the lower detection limits, results greater than 2000 were replaced with 2001 in order to allow a more consistent calculation.

Only results for seasons with at least 19 samples were used for the analysis.

## 5. Results

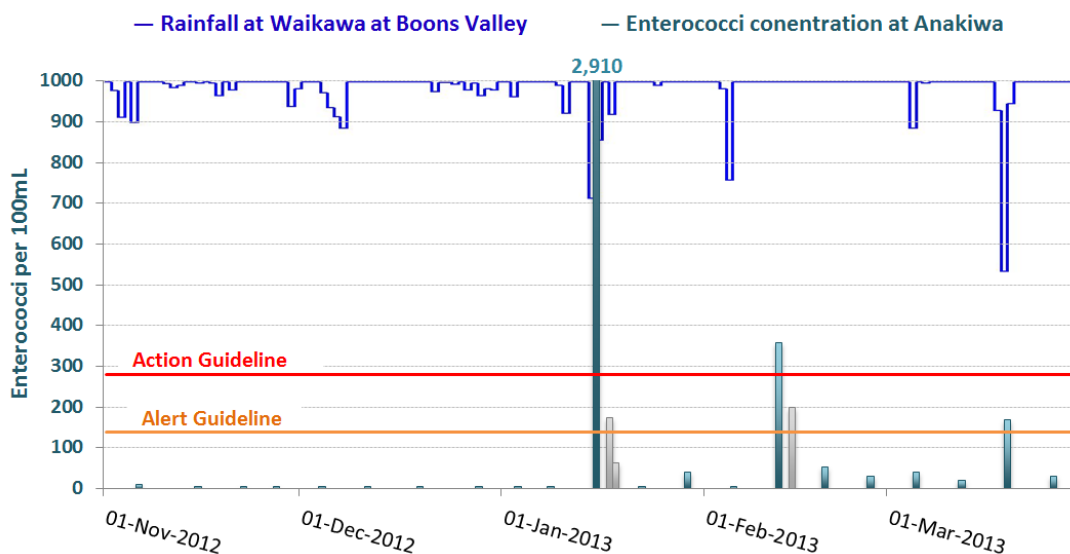
This chapter provides a short outline of the results for all the sites sampled as part of the program. Each section shows a graph presenting the results for the samples taken during the summer season of 2012/2013. The graphs are scaled so that lower results and exceedences of both Guidelines are easily identified; however, the highest concentration of indicator bacteria measured are frequently in excess of the maximum value chosen for the vertical axis. In these cases the actual result is displayed on top of the graph.

For sites that have been monitored for more than seven or eight years a graph showing the 5-yearly upper 95%ile indicator bacterium concentrations is also shown to provide an indication of the long term trends for faecal bacterial levels at the site. The Methodology is described in Chapter 0.

Descriptions of the sites as well as site photos and the results from previous sampling seasons can be found on the Marlborough District Council website ([www.marlborough.govt.nz](http://www.marlborough.govt.nz))

### 5.1. Anakiwa

Anakiwa is located at the innermost part of the Queen Charlotte Sound. The microbiological water quality is influenced by the surrounding residential development, but most likely also by Duncan Stream which drains farm land and flows into the Sound 1.2km from the site. There have been two exceedences of the Action Guideline and one exceedence of the Alert Guideline in Anakiwa this summer. Sampling has shown that high Enterococci concentrations at this site only occur during and shortly after rainfall in the area.



**Figure 3: Enterococci concentrations measured in Anakiwa (results that are not from routine samples are shown in grey) and Rainfall at Waikawa at Boons Valley.**

The microbiological water quality has been improving significantly over the years (Figure 4) and the site has now a SFR Grade of “Good”.

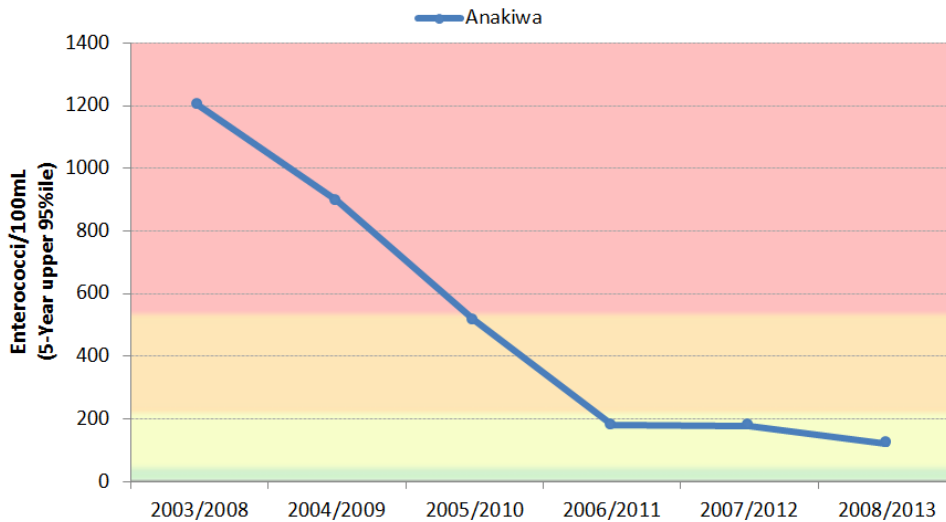


Figure 4: 5-Yearly upper 95%ile of Enterococci concentrations in Anakiwa. The Background colouring is based on the Microbiologica Assessment Categories.

## 5.2. Mistletoe Bay

Mistletoe Bay is surrounded by bush-clad hills with the Mistletoe resort and only a few houses in the wider bay. The water was considered unsafe for contact recreation on only one occasion following heavy rainfall in the area (Figure 5).

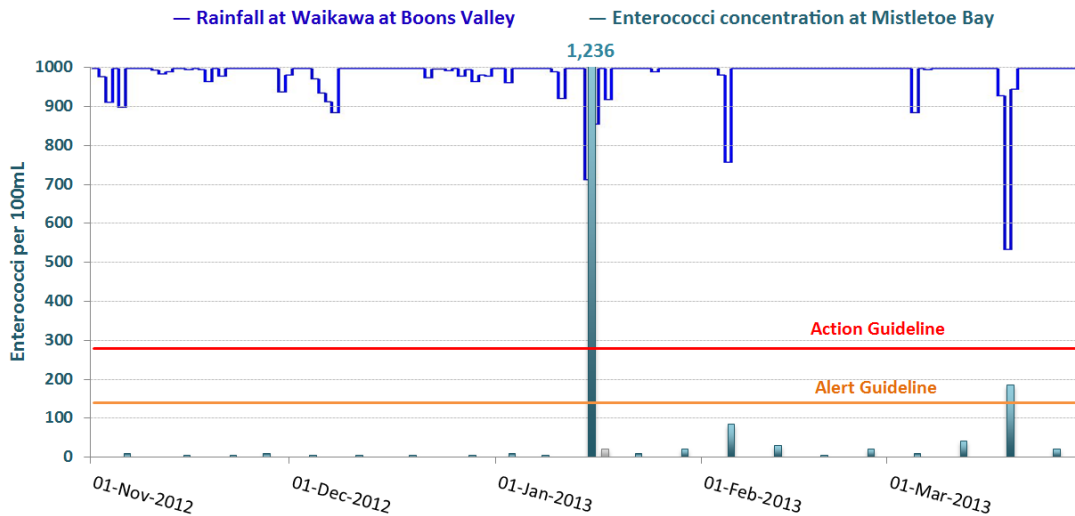


Figure 5: Enterococci concentrations in Mistletoe Bay during the summer months of 2012/2013 and Rainfall at Waikawa at Boons Valley.

Recreational water quality monitoring in Mistletoe Bay began in 2008 and there have only been three exceedances of the Alert Guideline including the one observed this summer. Consequently the SFR Grade for this site is “Very Good”.

### 5.3. Momorangi, Ngakuta and Governors Bay

Momorangi Bay, Ngakuta Bay and Governors Bay are neighbouring bays in the Queen Charlotte Sound. Ngakuta Bay is the largest and most enclosed bay in this group and has the greatest residential development in its catchment with nearly 100 houses and holiday homes. Although Momorangi Bay is much smaller than Ngakuta Bay it has a very popular campground along the beach which attracts more visitors during the warmer months of the year than the other two bays combined. A pipe system for the sewage was put in place in 2006 and sewage is irrigated into the bush above the settlement. Governors Bay has no residential development in the catchment.

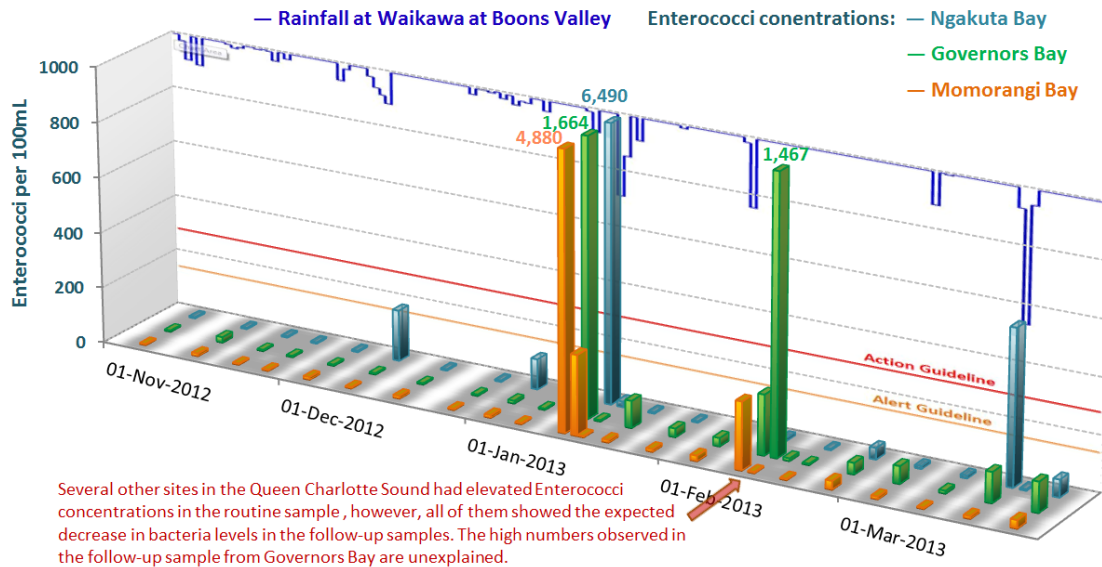


**Figure 6: Aerial Photo of Momorangi Bay, Ngakuta Bay and Governors Bay.**

Ngakuta and Governors Bay had Enterococci concentrations exceeding the Action Guideline in two samples taken during the summer of 2012/2013, while Momorangi Bay exceeded this Guideline only on one occasion. Exceedances in Momorangi Bay and Ngakuta Bay were linked to rainfall.

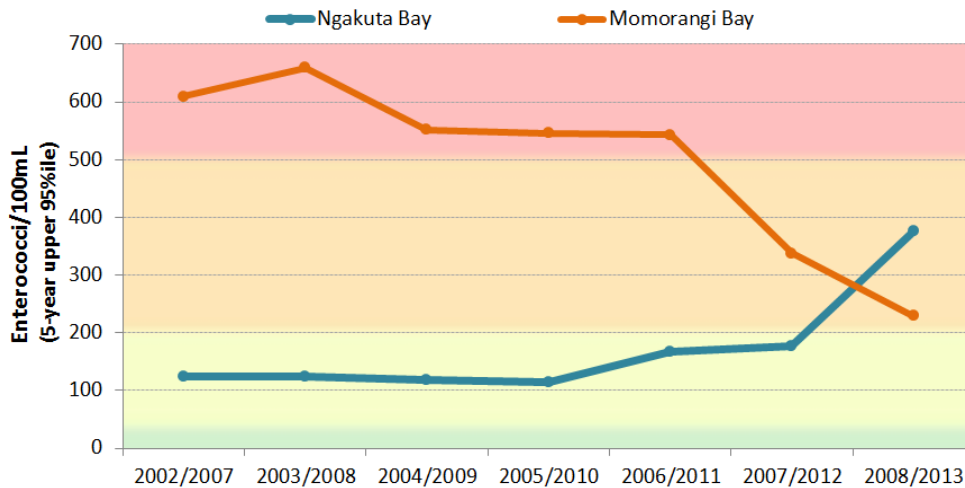
Although the January exceedance of the Action Guideline in Governors Bay was clearly linked to rainfall the second exceedance in mid February was not as easily explained (see Figure 7). The routine sample showed slightly elevated levels which were clearly linked with a recent rainfall event because samples from other sites in the Queen Charlotte Sound (Anakiwa, Picton Foreshore) had increased Enterococci concentrations as well. While the follow-up samples from the other effected sites taken two days later showed a decrease in Enterococci concentrations, bacteria levels in Governors Bay had increased substantially and exceeded the Action Guideline despite no further rainfall in the area. The water was clear and calm when the sample was taken and there was no obvious source of contamination. Governors Bay was added to the program last summer and has not been sampled previously. Further sampling will show whether this is a regular occurrence.





**Figure 7: Enterococci concentrations in Ngakuta Bay, Governors Bay and Momorangi Bay during the summer months of 2012/2013 and Rainfall at Waikawa at Boons Valley.**

The long term trend shows an improvement in the microbiological water quality of Momorangi Bay (Figure 8). Microbial Source Tracking carried out in 2011 showed that faecal contamination was neither of human nor ruminant origin and it was concluded that wildfowl might be a major source of faecal bacteria. Large numbers of Ducks have been observed in the Bay in the past and the Department of Conservation has erected signs discouraging the feeding of Ducks which, together with the upgrade of the sewage system, might have contributed to the improvement in microbiological water quality.

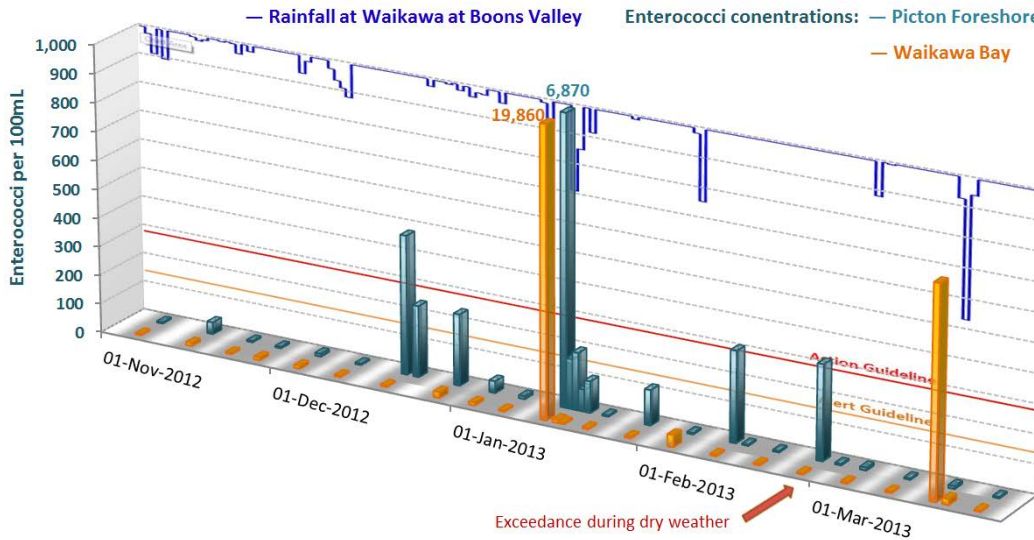


**Figure 8: 5-Yearly upper 95%ile of Enterococci concentrations in Ngakuta Bay and Momorangi Bay. The Background colouring is based on the Microbiologica Assessment Categories.**

In contrast to Momorangi Bay the Enterococci concentrations in Ngakuta Bay have increased significantly and the Suitability for Contact Recreation Grade had to be adjusted from “Very Good” to “Fair” – the same Grade as Momorangi Bay. Sampling of Streams flowing into Ngakuta Bay in 2007/2008 showed high E. coli concentrations in some of them. However, the streams with the highest bacteria levels drain into the eastern part of Ngakuta Bay while the main beach is located on the western part of the bay. The stream draining into the eastern bay showed the lowest E. coli concentrations. Microbial Source Tracking as well as a repeat sampling of some of the western stream flowing into the Bay might give an indication for the reasons behind the deterioration in microbial water quality.

### 5.4. Picton Foreshore and Waikawa Bay

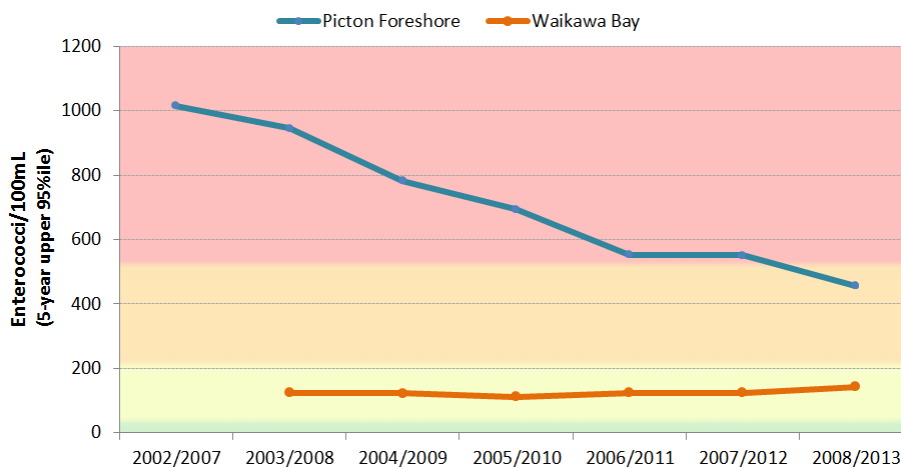
The water quality of the Picton Foreshore and Waikawa Bay are both influenced by the urban environment that surrounds both sites. Despite their relatively close proximity to each other, the microbiological water quality of both sites is very different. Waikawa Bay has a SFR Grade of “Good” while Picton Foreshore is graded as “Poor”. This is reflected in the Enterococci concentrations observed last summer. Bacteria levels in Waikawa Bay exceeded the Action Guideline on only two occasions following heavy rainfall in the area. Enterococci counts at Picton Foreshore, on the other hand, were elevated even during dry weather and were considered unsafe for recreational activity four times (Figure 9). An investigation into possible causes for the dry weather exceedance was carried out last summer and results will be published in a separate report.



**Figure 9: Enterococci concentrations at Picton Foreshore and Waikawa Bay during the summer months of 2012/2013 and Rainfall at Waikawa at Boons Valley.**

Nevertheless, continued upgrades and maintenance of the storm water and sewage network have resulted in a steady decline of Enterococci concentrations observed at Picton Foreshore (Figure 10). The improvement in recreational water quality has been so significant that the SFR Grade was able to be changed from “Very Poor” to “Poor”.

The microbiological water quality in Waikawa Bay has been consistently good.



**Figure 10: 5-Yearly upper 95%ile of Enterococci concentrations at Picton Foreshore and Waikawa Bay. The Background colouring is based on the Microbiological Assessment Categories.**

## 5.5. Whites Bay and Robin Hood Bay

Whites Bay is one of the most popular coastal beaches in Marlborough. This was confirmed in a beach user survey carried out in 2011. The same survey also identified Robin Hood Bay, 3.5km north of Whites Bay, as a popular destination for recreational activity. No previous data was available for Robin Hood Bay and two sites on the opposite ends of the Bay were added to the program. Robin Hood Bay West is a popular surfing beach, while Robin Hood Bay East is primarily used for swimming and launching boats.



**Figure 11: Aerial photo of Robin Hood Bay.**

The microbiological water quality in Robin Hood Bay is potentially impacted by Stace Creek which has pastoral land in its catchment close to the mouth. This might explain the higher Enterococci concentrations observed during smaller rainfall events compared to Whites Bay. However, following a heavy rainfall event in March bacterial counts in Robin Hood Bay were considerably less than in Whites Bay. Nevertheless, all three sites were considered unsafe for contact recreation on that occasion (Figure 12).

It is still unclear which of the two sites in Robin Hood Bay should be permanently sampled as part of the Recreational Water Quality program. Although Robin Hood Bay West had generally higher Enterococci concentrations after rainfall, bacteria counts in Robin Hood Bay East exceeded the Alert Guideline on one occasion when bacteria levels in Robin Hood Bay West and Whites Bay were low.

It is recommended that both sites in Robin Hood Bay are sampled for at least one more summer before a decision is made on which site to choose for the program.

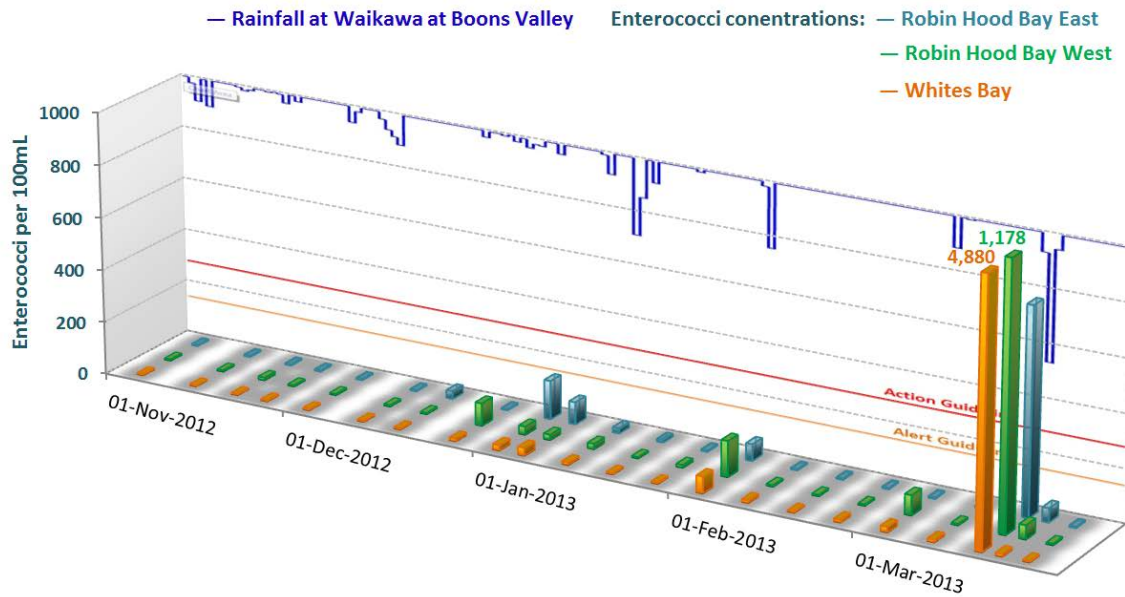


Figure 12: Enterococci concentrations in Robin Hood Bay and Whites Bay during the summer months of 2012/2013. Also shown is the rainfall recorded at Waikawa at Boons Valley.

Despite a huge increase in visitor numbers during the summer, recreational water quality in Whites Bay has been very good and the water was considered safe for contact recreation for more than 97% of the time since weekly monitoring started in 2004. There has been little change in the microbiological water quality over the years (Figure 13).

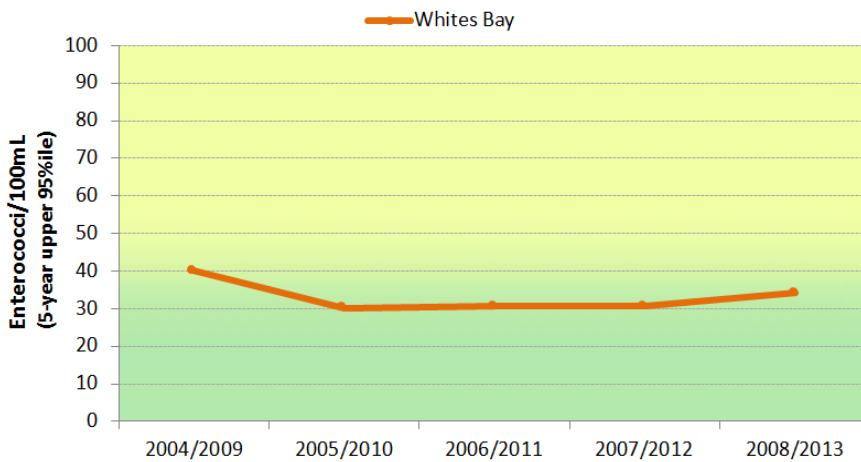
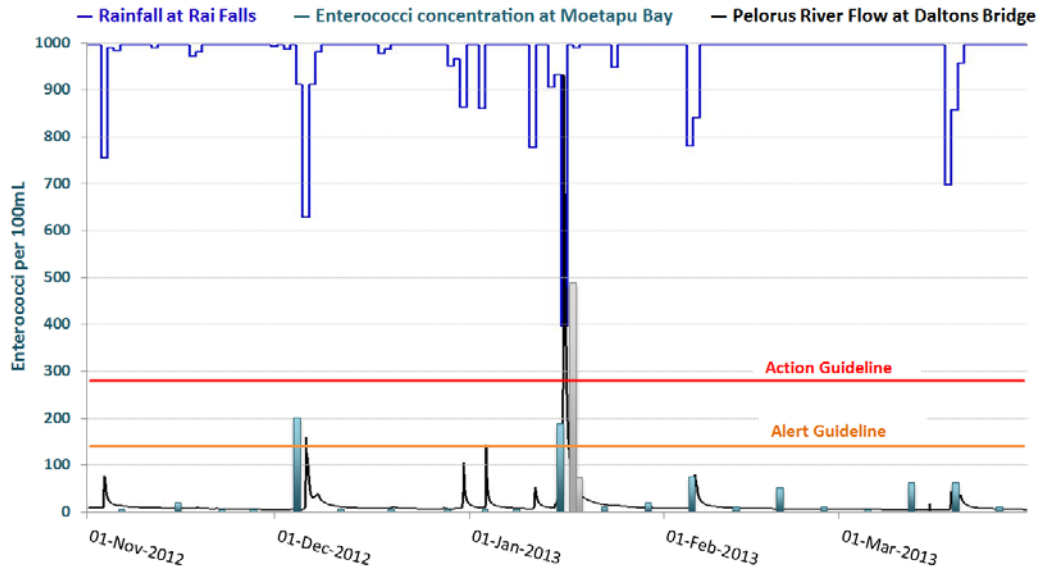


Figure 13: 5-Yearly upper 95%ile of Enterococci concentrations at Whites Bay. The Background colouring is based on the Microbiological Assessment Categories.

## 5.6. Moetapu Bay

Moetapu Bay is the only beach in the Pelorus Sound currently sampled and was added to the Recreational Water Quality program after a beach survey in 2011 identified it as a bay with significant recreational use. It has some residential development in the surrounding catchment and a campground.



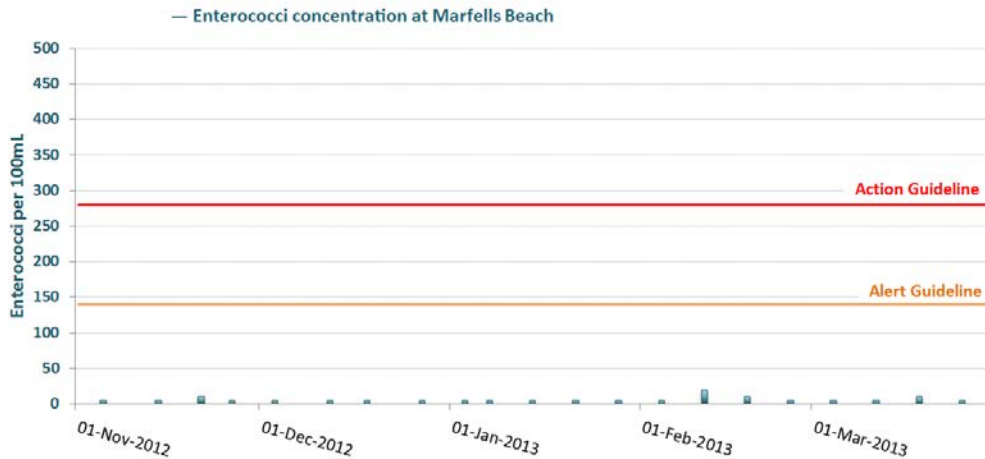
**Figure 14: Enterococci concentrations in Moetapu Bay in the summer months of 2012/2013 (results that are not from routine samples are shown in grey). Also shown are the simulated Flow of the Pelorus River at Daltons Bridge (calculated from the flow of the Rai River at Rai Falls and the Pelorus River at Bryants) as well as the Rainfall recorded at Rai Falls.**

Microbiological water quality in Moetapu Bay is strongly influenced by the water quality of the Pelorus River flowing into the Pelorus Sound. High Enterococci concentrations in the Bay appear to be linked to high flows in the Pelorus River (Figure 14). A routine sample taken in mid-February had elevated bacterial levels following heavy rainfall in the Rai and Pelorus catchments. Although bacteria concentrations in the routine sample did not exceed the Action Guideline another sample was taken as the Pelorus River was still rising when the initial sample was taken. If the River was indeed a major source of bacterial contamination Enterococci levels were expected to rise. This was confirmed when the bacteria concentrations in the second sample were high enough to exceed the Action Guideline. Sites in the Queen Charlotte Sound (i.e. nearby Mistletoe Bay) were sampled on the same dates, but had high Enterococci concentrations in the initial samples and low bacteria numbers in the second sample. The recreational water quality of these sites is mainly influenced by local sources as there are not large rivers draining into the Queen Charlotte Sound.

Microbial source tracking in samples from nearby Moenui has shown that the faecal contamination in the water there originated from bovine sources. It is likely that this is also the case for Moetapu Bay. Continued sampling will show if the Pelorus River is the only source of faecal contamination.

## 5.7. Marfells Beach

Marfells Beach has been one of the sites with the best microbiological water quality in the past and again had very low Enterococci concentration during the whole summer period. Unlike other coastal beaches sampled it is a large open beach. This is why the low intensity pastoral agriculture in the catchment and large seagull numbers have little effect on Enterococci concentrations.

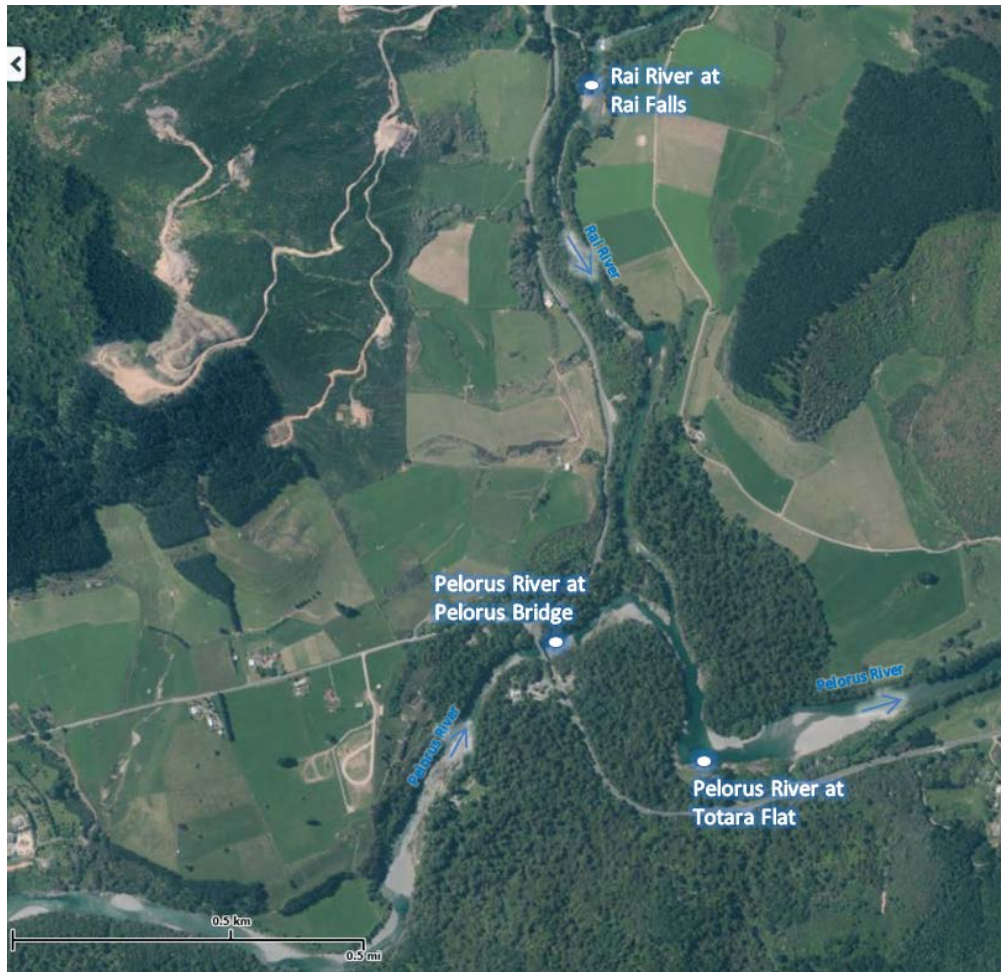


**Figure 15: Enterococci concentrations at Marfells Beach in the summer months of 2012/2013.**

Marfells Beach was first sampled weekly in the summer months of 1997/1998, but samples had been taken only intermittently in the following years. Weekly sampling commenced in 2007 and the site has been sampled as part to the Recreational Water Quality program since. There has only been one exceedance of the Action Guideline during this period.

## 5.8. Rai River at Rai Falls and Pelorus River at Pelorus Bridge and Totara Flat

The Pelorus River has two popular swimming spots upstream and downstream of the confluence with the Rai River. Both sites as well as a site on the Rai River are sampled as part of the recreational water quality program. Pelorus River at Pelorus Bridge is located upstream of the confluence with the Rai river while Totara Flat is located approximately 300m downstream of the point where the rivers join (Figure 16). Consequently E. coli concentrations in the Pelorus River at Totara Flat are strongly influenced by the microbiological water quality of the Rai River.

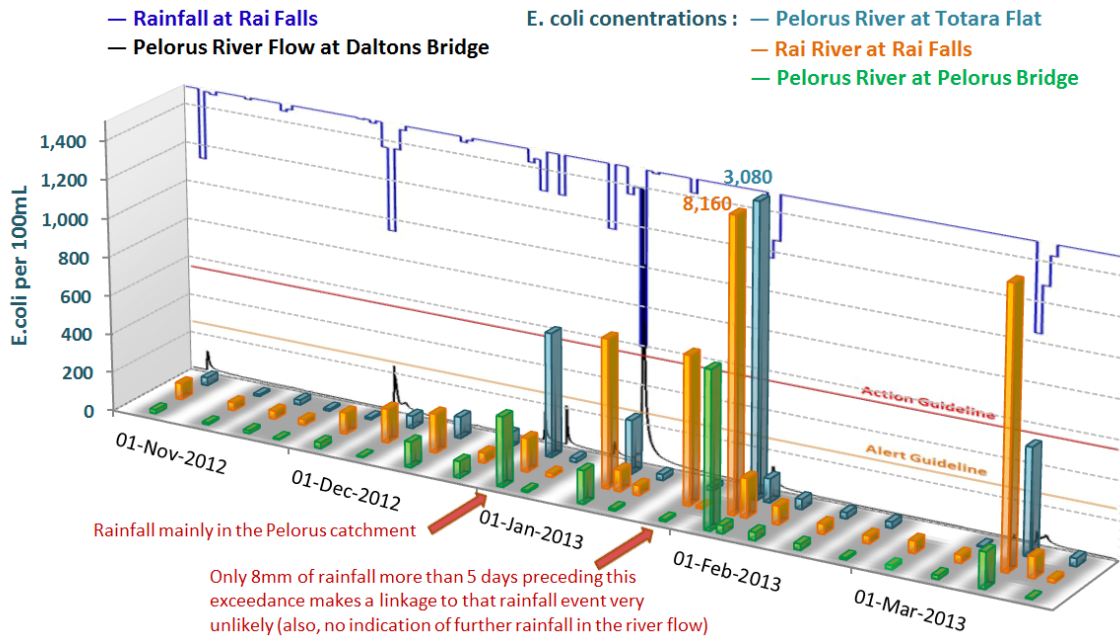


**Figure 16: Aerial Photo of the Recreational Water Quality sites on the Pelorus River and Rai River.**

Elevated E. coli concentrations in the Pelorus River at Pelorus Bridge exclusively occur after heavy rainfall in the Pelorus catchment. In the last 5 years the Action Guideline was exceeded in only two samples from this site with one of the occurrences this summer. The Suitability for Contact Recreation Grade for the Pelorus River at Pelorus Bridge is "Good".

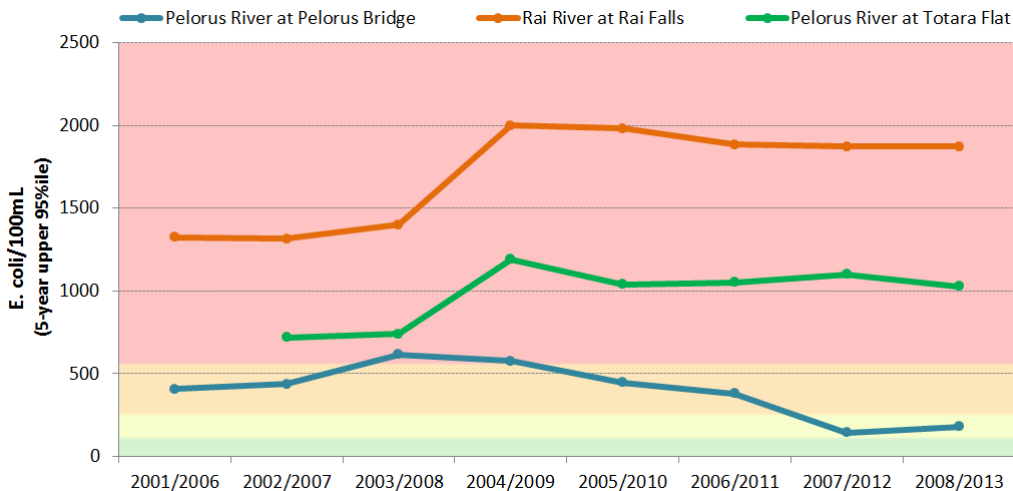
High E. coli levels in samples from the Rai River at Rai Falls are not always linked to rainfall. One exceedance of the Action Guideline during dry weather was again observed during the 2012/213 summer (see Figure 17).

Microbial source tracking of E. coli in samples taken from the Rai River at Rai Falls in 2011 found that up to 100% of faecal contamination originates from ruminant sources. The presence of bovine markers indicated that cows might be the main source of that contamination (Cornelisen et al., 2012). This is not surprising as there are a number of Dairy farms in the river catchment.



**Figure 17: E. coli concentrations at Rai River at Rai Falls and Pelorus River at Pelorus Bridge and Totara Flat during the summer of 2012/2013. Also shown are rainfall recorded at Rai Falls and the simulated flow of the Pelorus River at Daltons Bridge (calculated as the sum of the flows measured at Pelorus River at Bryants and Rai River at Rai Falls).**

The long term trend shows a slight improvement of microbiological water quality in the Pelorus River at Pelorus Bridge. The trend in E. coli concentrations in the Pelorus River at Totara Flat follows closely the pattern observed for the Rai River at Rai Falls (Figure 17), but concentrations are usually lower. This indicates that the majority of faecal contamination in the Pelorus River at Totara Flat originates from the Rai River and the generally good microbiological water quality of the Pelorus River upstream of the Rai River provides significant dilution. As a result the SFR Grade of the Pelorus River at Totara Flat is “Poor”, but is better than the “Very Poor” SFR Grade for the Rai River at Rai Falls. Both sites showed a steep increase in E. coli levels until 2008/09, but concentrations appear to have stabilized and are even slightly decreasing in the Rai River.



**Figure 18: 5-Yearly upper 95%ile of E.coli concentrations in Rai River at Rai Falls and Pelorus River at Pelorus Bridge and Totara Flat. The Background colouring is based on Microbiological Assessment Categories.**



## 5.9. Wairau River at State Highway Six, Ferry Bridge and Blenheim Rowing Club

In the summer months of 2012/2013 the Wairau River was sampled at three locations. The Wairau River at Ferry Bridge and Wairau River at Blenheim Rowing Club have been monitored as part of the Recreational Water Quality Program for many years. A Beach survey carried out in 2011 identified that the River is also very popular around the State Highway Six Bridge with several swimming spots in close proximity.



Figure 19: Aerial photo showing the sampling sites along the Wairau River.

Last summer microbiological water quality was deemed unsafe for contact recreation at all three sites on only one occasion during a flood event in early January. Flows were high and the water very turbid when those samples were taken.

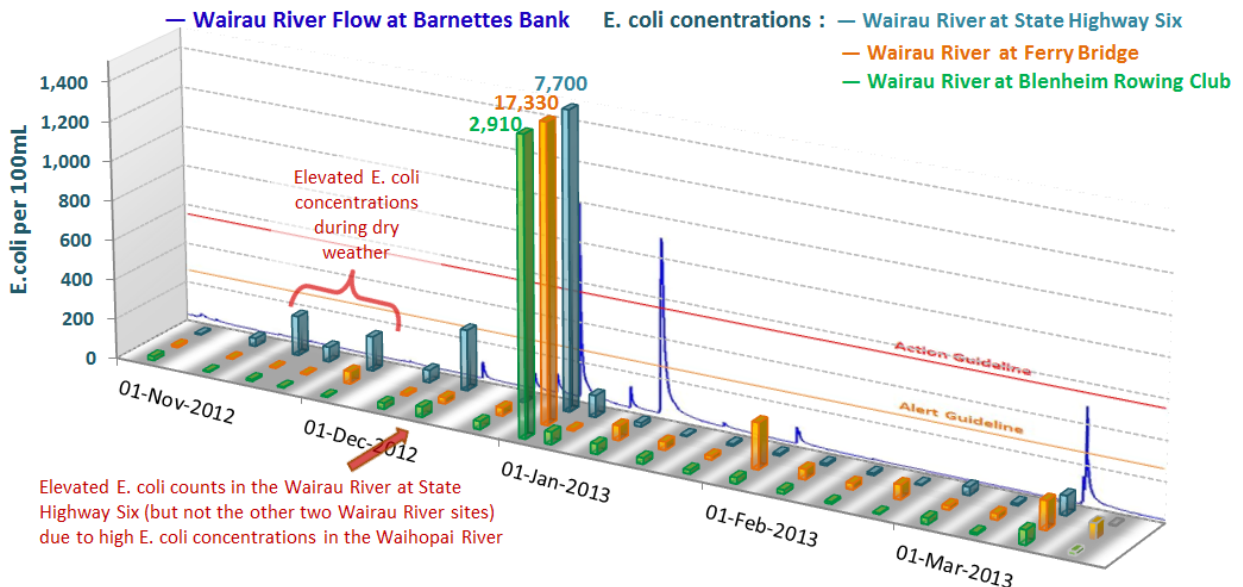
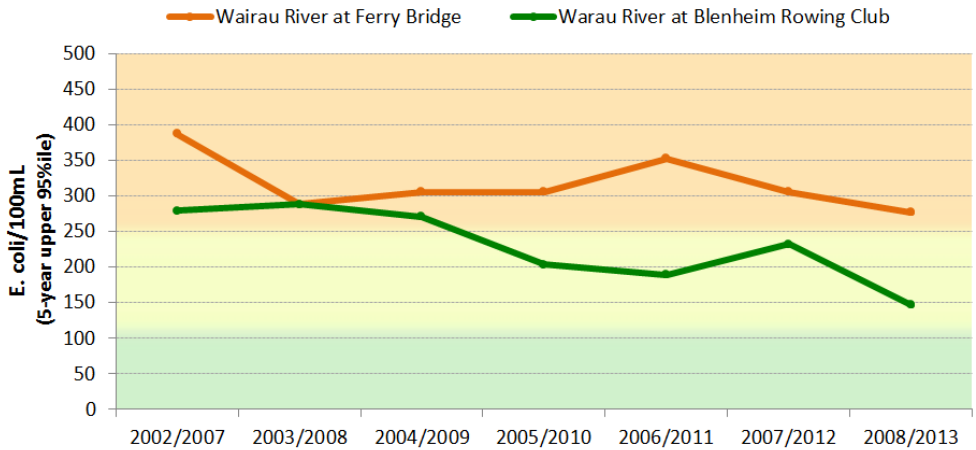


Figure 20: E. coli concentrations at the three Wairau River sites during the summer of 2012/2013. Also shown is the flow in the Wairau River at Barnett's Bank (close to State Highway One).

The microbial water quality of the Wairau River at State Highway Six is influenced by the Waihopai River due to its proximity to the confluence only 8.5km upstream. An exceedance of the Alert Guideline in late December was due to high E.coli concentrations in the Waihopai which was unsafe for contact recreation during this time. However, elevated faecal bacteria levels were also observed during very low flows when E.coli concentrations in the Waihopai River and the other two Wairau River sites were low. This might

show the impact of the Onamalutu River which drains into the Wairau River 2.5km upstream of the State Highway Six Bridge. The Onamalutu River is monitored monthly as part of the State of the Environment program and results show that faecal bacteria levels are generally elevated.

E. coli concentration in the Wairau River at Ferry Bridge and Blenheim Rowing Club generally only exceed the Recreational Water Quality Guidelines during high flows. Microbiological water quality at the Blenheim Rowing Club has improved over the years, but there has been little change at the Ferry Bridge (Figure 21). The SFR Grade for the Wairau River at Ferry Bridge is “Fair” while the SFR Grade for the Wairau River at Blenheim Rowing Club was able to be raised from “Fair” to “Good”.



**Figure 21: 5-Yearly upper 95%ile of E.coli concentrations in the Wairau River at Ferry Bridge and Blenheim Rowing Club. The Background colouring is based on Microbiological Assessment Categories.**

### 5.10. Waihopai River at Craiglochart #2

E. coli concentration in the Waihopai River at Craiglochart #2 exceeded the Action Guideline on four occasions during last summer. All Exceedances were observed during or shortly after rainfall and the water was very turbid when samples were taken.

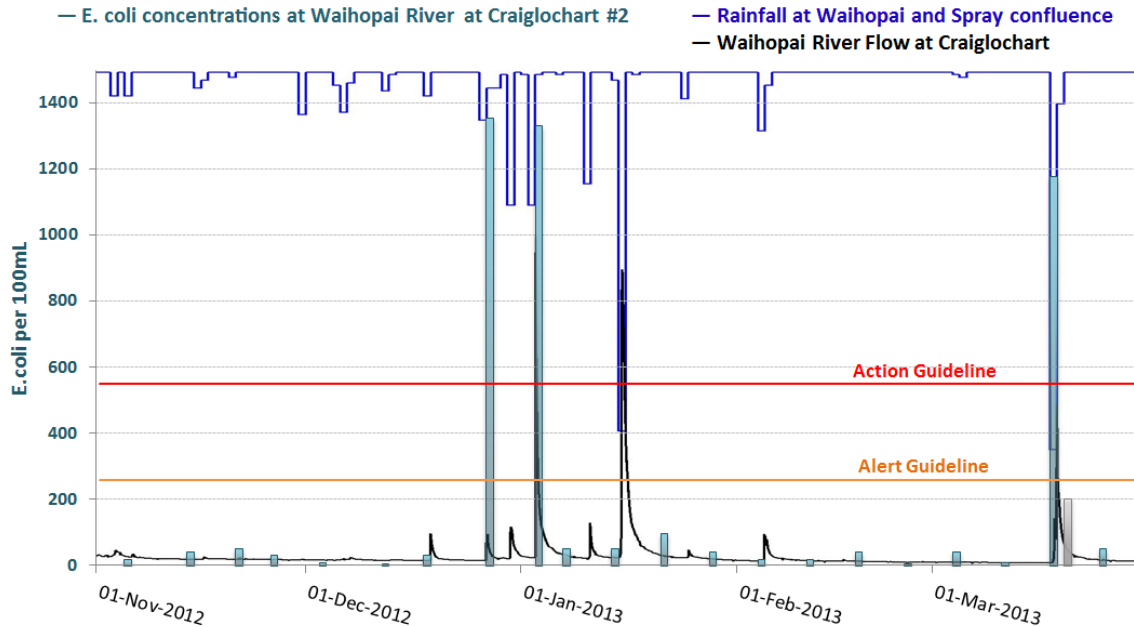


Figure 22: E. coli concentrations in the Waihopai River at Craiglochart #2 during the summer of 2012/2013. Also shown is the flow of the Waihopai River at Craiglochart (#1) and the rainfall recorded at the confluence of Waihopai River and Spray.

The long term trend shows a substantial improvement in microbiological water quality over the years (Figure 23) and the change has been significant enough to justify a change of the SFR Grade of the site from “Poor” to “Fair”.

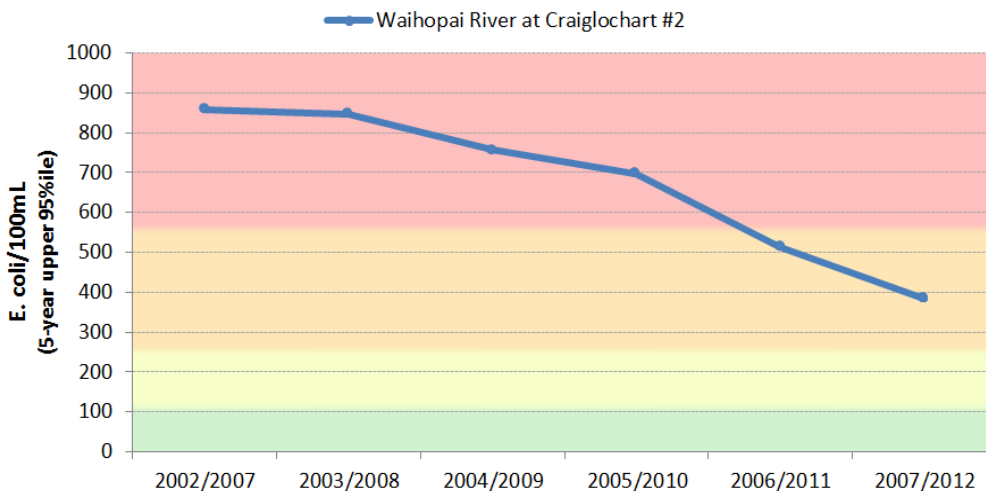
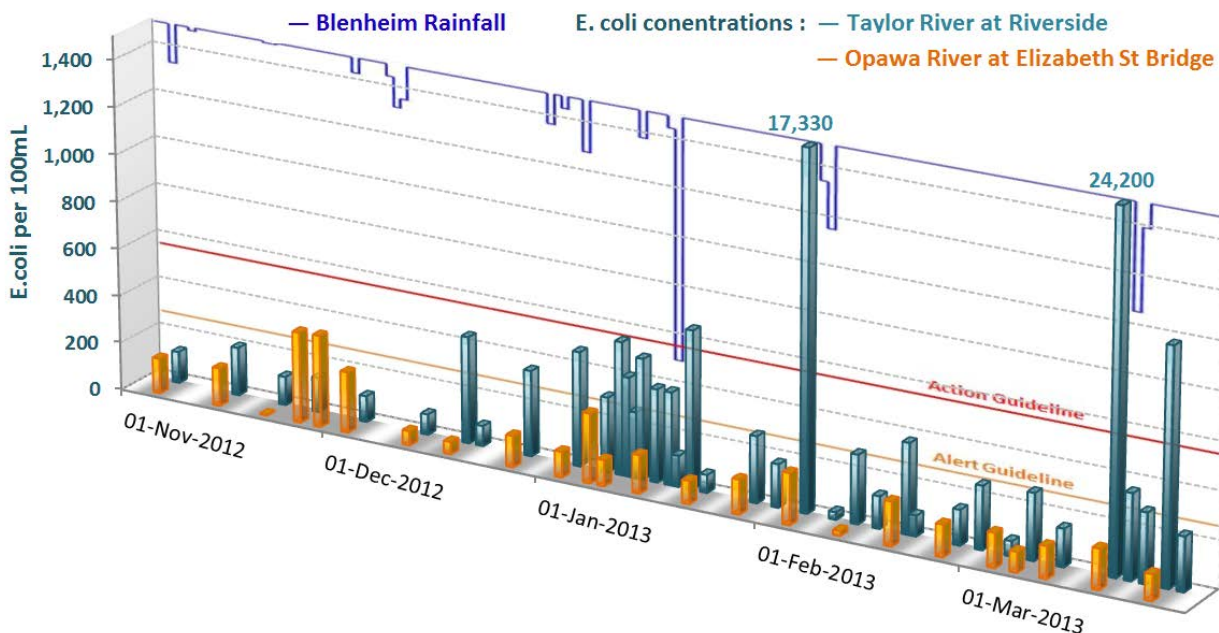


Figure 23: 5-Yearly upper 95%ile of E.coli concentrations in the Waihopai River at Craiglochart #2. The Background colouring is based on Microbiological Assessment Categories.

### 5.11. Taylor River at Riverside and Opawa River at Elizabeth St Bridge

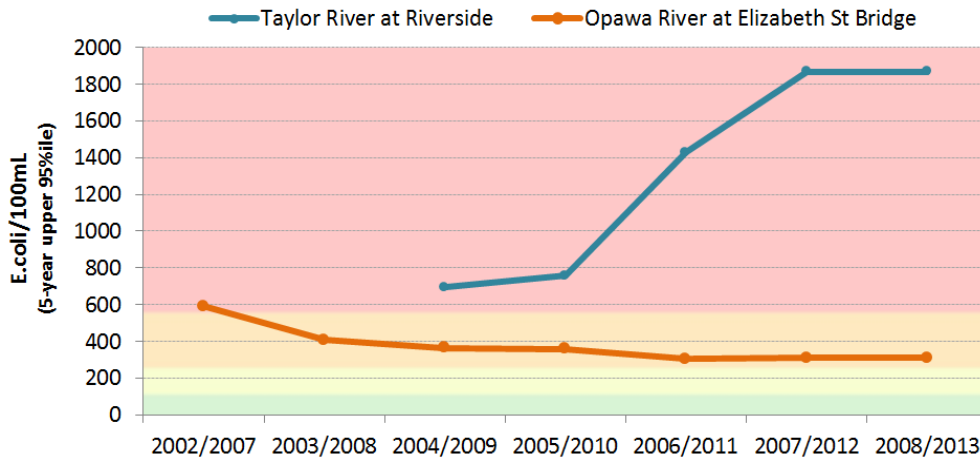
The Taylor River at Riverside and Opawa River at Elizabeth St Bridge are recreational river sites that are located in Blenheim and are heavily influenced by their urban environment.



**Figure 24: E. coli concentrations at Taylor River at Riverside and Opawa River at Elizabeth St Bridge during the summer of 2012/2013 and the Rainfall measured in Blenheim.**

Both sites had elevated levels of E. coli in most of the samples taken during the summer. Nevertheless, the Opawa River only exceeded the Alert Guideline at the start of the season and was considered safe for contact recreation for the remaining time. A similar pattern of generally elevated E. coli counts, but rare guideline exceedances has been observed in previous years. The two exceedances seen last season were not related to rainfall. Generally bacteria levels in the Opawa River have decreased slightly over the years (see Figure 25). The site has a SFR Grade of “Fair”.

The Taylor River had the poorest microbiological water quality of the sites sampled as part of the program. E. coli concentrations were above the Alert Guideline most of the time and exceeded the Action Guideline on 5 occasions. Subsequently, warning signs were placed around the site for a total of 28 days. While some of the exceedances were clearly the result of rainfall a number of them occurred during dry weather. This is reflected in the SFR Grade of “Very Poor”. This summer the highest number of routine samples had E. coli concentrations above both Guideline values since the site was added to the program in 2004 and the long term trend shows a steep increase in E. coli concentrations (Figure 25).



**Figure 25: 5-Yearly upper 95%ile of E.coli concentrations in Taylor River at Riverside and Opawa River at Elizabeth St Bridge. The Background colouring is based on Microbiological Assessment Categories.**

The Taylor River is of great importance for Blenheim and the poor microbiological water quality has sparked an investigation into possible sources. Results for this investigation will be presented in a separate report. Also, a catchment characterisation and storm water study is planned for the coming year. This should increase our knowledge of the system significantly and result in the drafting of management options for the improvement of the water quality of the Taylor River.

### 5.12. Result Summary

Apart from the Taylor River at Riverside, all sites were safe for contact recreational use for at least 80% of the time, 100% at Marfell's Beach. Figure 26 and Figure 27 show the sites ranked based on the number of routine samples in the "Modes" defined by the Recreational Water Quality Guidelines (Chapter 2.1). Also shown are the Suitability for Contact Recreation Grades (SFR Grades) for the sites and it can be seen that the microbiological water quality this summer has been better than usual for some sites and worse for others. This underlines the great variability observed between different years. The SFR Grades provide a long term measure of recreational water quality while the results of individual samples are relevant for a particular day.

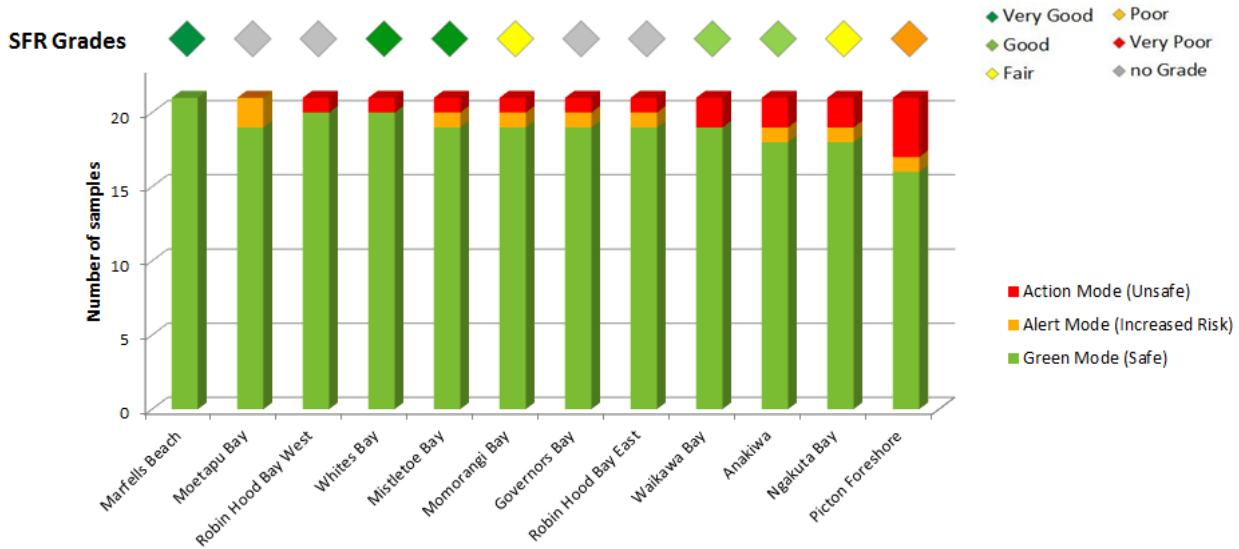


Figure 26: Coastal sites ranked based on the number of routine samples within the different Modes outlined by the Recreational Water Quality Guidelines. Shown above are the SFR Grades for the sites.

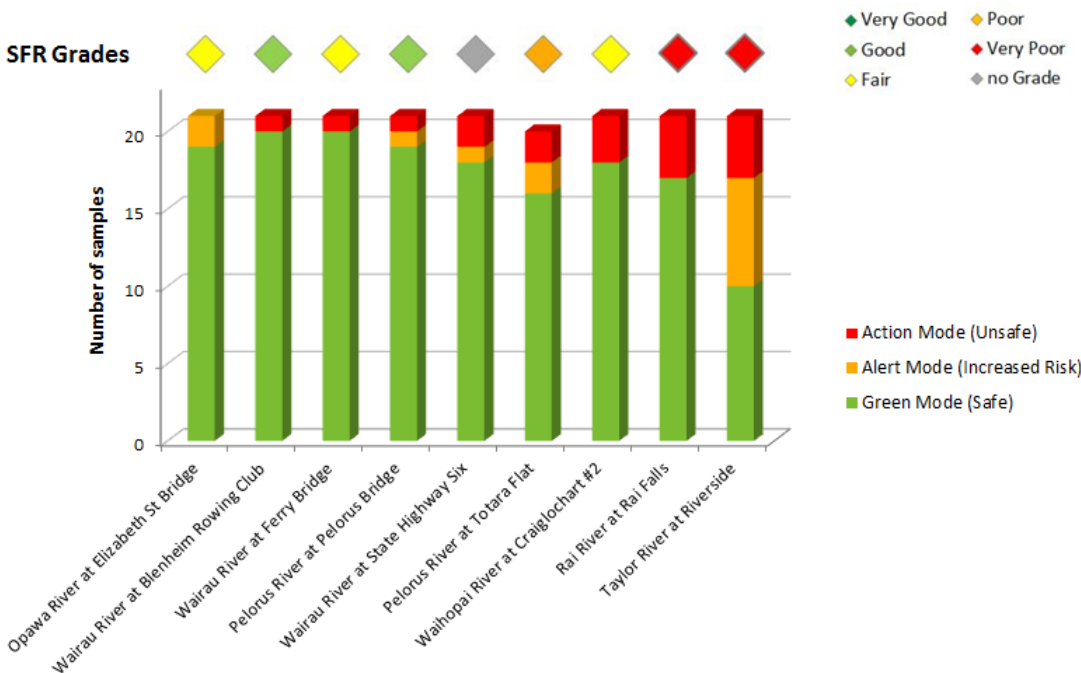


Figure 27: River sites ranked based on the number of routine samples within the different Modes outlined by the Recreational Water Quality Guidelines. Shown above are the SFR Grades for the sites.

Most coastal sites had unsafe concentrations of faecal bacteria on only one occasion during the summer and were safe for contact recreation the remaining time.

The River sites with the best microbiological water quality were the Opawa River at Elizabeth St Bridge, the two lower sites of the Wairau River and the Pelorus River at Pelorus Bridge.

The majority of sites were unsafe for contact recreation only during or shortly after rainfall which is why it is recommended contact recreation is avoided for at least two days after rainfall. The most common sources for the faecal contamination during events were run-off from pastoral land in the surrounding catchment, overflowing septic tanks or other contamination of stormwater with sewage.

All samples with high E.coli counts from the Wairau and Waihopai River were taken when the water was very turbid. This suggests that turbidity is a good indicator for unsafe recreational water quality in these rivers.

The Suitability for Contact Recreation Grades (SFR Grades) for the sites sampled this summer were reviewed at the end of the season. Table 4 shows the SFR Grades as well as the MAC and SIC for each site. Improvements of the microbiological water quality of the Pelorus River at Totara Flat, Waihopai River at Craiglochart, Wairau River at Blenheim Rowing Club and Picton Foreshore were significant enough for a higher SFR Grade to be assigned. Ngakuta Bay was the only site that had to be downgraded.

#### Coastal sites

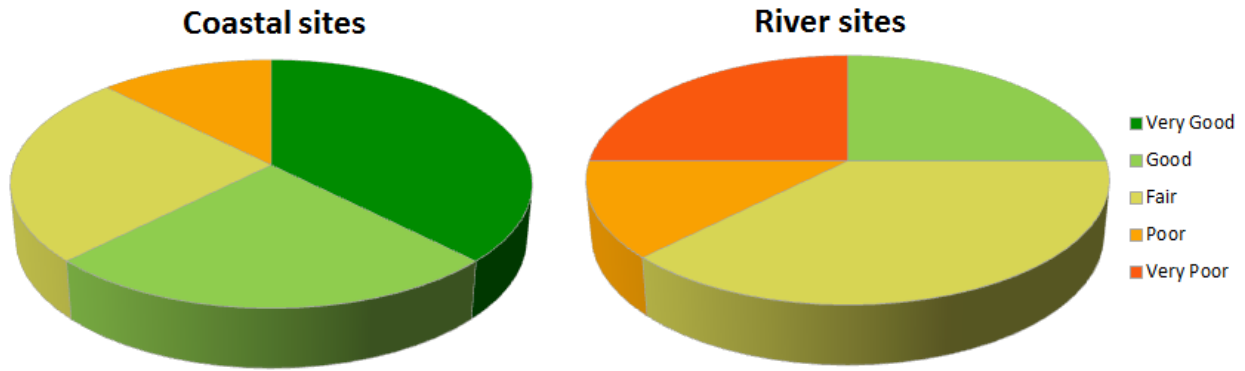
Site	Easting	Northing	SIC	MAC	New SFR Grade	Old SFR Grade
			(Sanitary Inspection Category)	(Microbiological Assessment Category)	(Suitability for Contact Recreation Grade)	(Suitability for Contact Recreation Grade)
Anakiwa	1677073	5431495	Moderate	B	Good	Good
Mistletoe Bay	1681470	5436007	Very Low	B	Very Good	Very Good
Momorangi Bay	1678817	5430879	Moderate	C	Fair	Fair
Ngakuta Bay	1680514	5430489	Moderate	C	Fair	Very Good
Governors Bay	1681310	5431030	new site (insufficient data)			
Picton Foreshore	1684298	5428815	High	C	Poor	Very Poor
Waikawa Bay	1687695	5431090	Low	B	Good	Good
Moetapu Bay	1671600	5432100	new site (insufficient data)			
Robin Hood Bay East	1690115	5421285	new site (insufficient data)			
Robin Hood Bay West	1689595	5420930	new site (insufficient data)			
Whites Bay	1688425	5417793	Very Low	A	Very Good	Very Good
Marfells Beach	1700194	5380089	Very Low	A	Very Good	Very Good

#### River sites

Site	Easting	Northing	SIC	MAC	New SFR Grade	Old SFR Grade
			(Sanitary Inspection Category)	(Microbiological Assessment Category)	(Suitability for Contact Recreation Grade)	(Suitability for Contact Recreation Grade)
Rai River at Rai Falls	1648018	5429266	High	D	Very Poor	Very Poor
Pelorus River at Pelorus Bridge	1648077	5428091	Low	B	Good	Good
Pelorus River at Totara Flat	1648262	5427731	Moderate	D	Poor	Very Poor
Wairau River at State Highway Six	1667780	5408150	new site (insufficient data)			
Wairau River at Ferry Bridge	1681274	5410163	Moderate	C	Fair	Fair
Wairau River at Blenheim Rowing Club	1684319	5406605	Moderate	B	Good	Fair
Waihopai River at Craiglochart #2	1655029	5391098	Moderate	C	Fair	Poor
Taylor River at Riverside	1680023	5403987	High	D	Very Poor	Very Poor
Opawa River at Elizabeth St Bridge	1680393	5404310	Moderate	C	Fair	Fair

**Table 4: Suitability for Contact Recreation Grades (SFR Grades) and the associated Sanitary Inspection Categories (SIC) and Microbiological Assessment Categories (MAC).**

Over 50% of the coastal sites have a SFR Grade of either "Very Good" or "Good" and only one site, Picton Foreshore has a Grade of "Poor". The majority of river sites are either "Good" or "Fair". (Figure 28). When combining the SFR Grades for coastal and river sites, more than 40% of the sites have a Grade of "Very Good" or "Good" and 25% are graded "Poor" or "Very Poor".



**Figure 28: Distribution of SFR Grades for Coastal and River sites.**

SFR Grades for freshwater sites are usually lower than SFR Grades for coastal beaches. This is a pattern observed nationally. One of the reasons is the overall greater water volume present at coastal sites.



## 6. Recommendations

1. That sampling be continued at all sites (including the two Robin Hood Bay sites)
2. An investigation into the deterioration of microbial water quality in Ngakuta Bay be carried out
3. That high E. coli counts in the Wairau River at State Highway Six during dry weather be investigated

## 7. References

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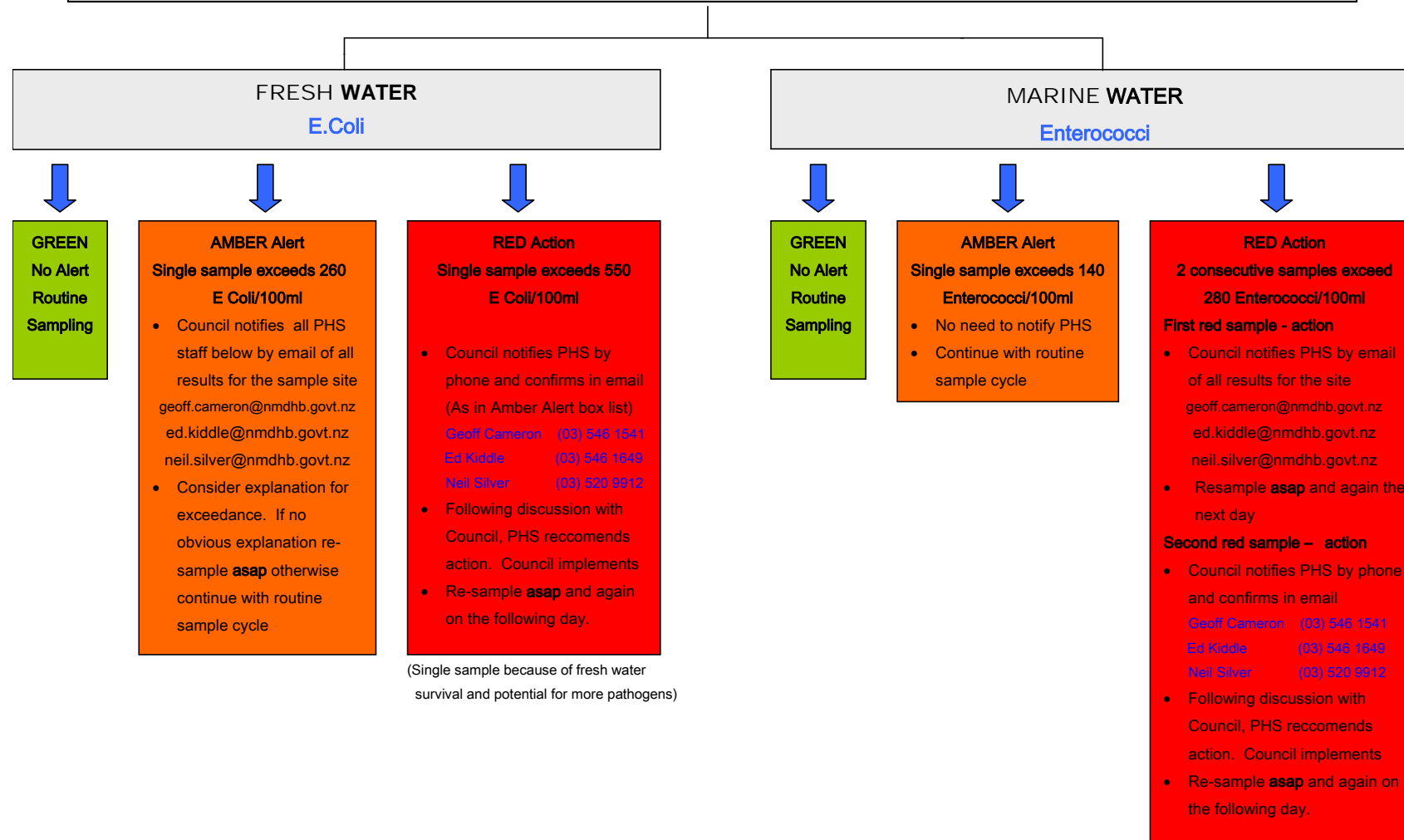
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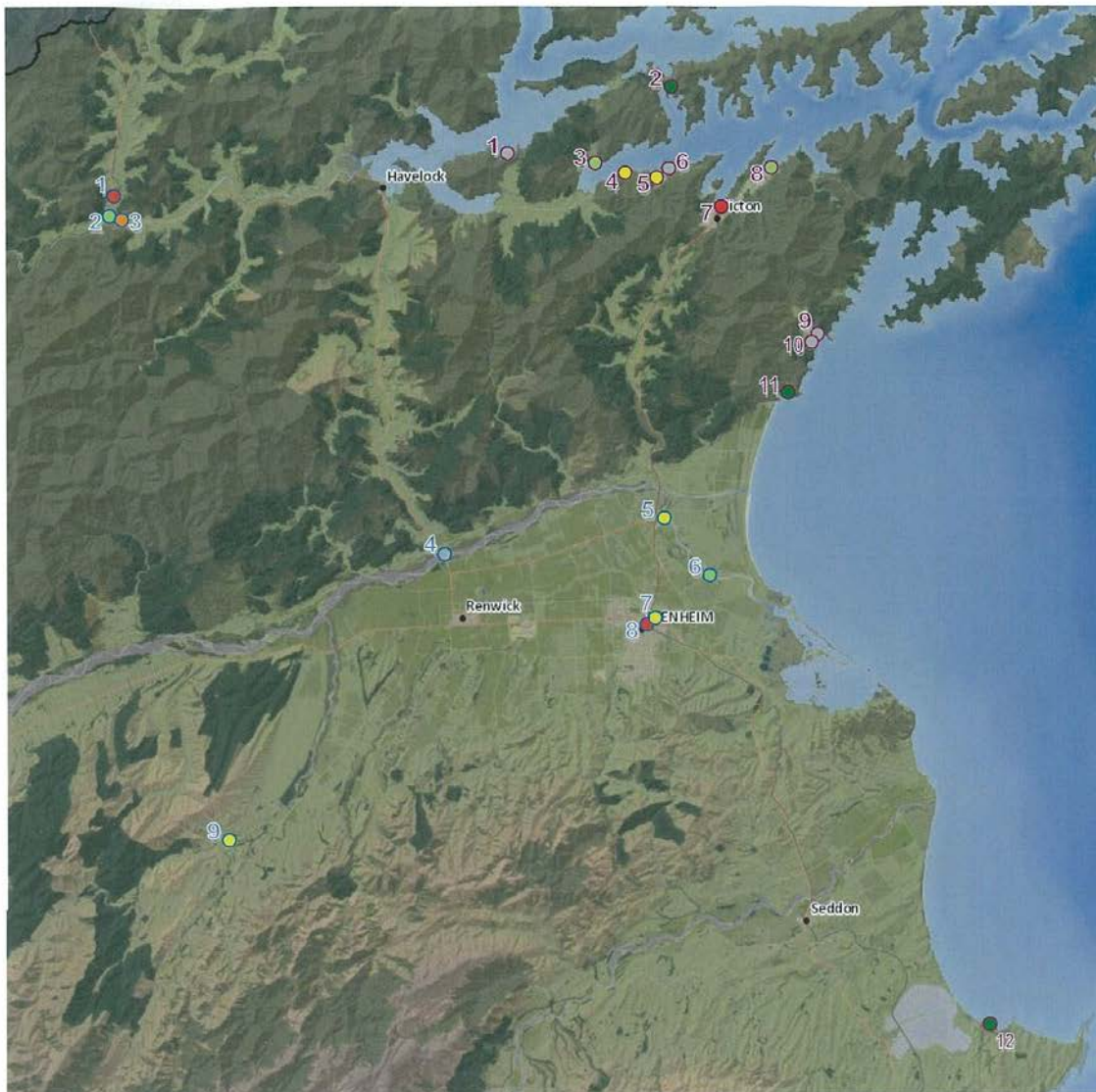
## Appendix 1: Management procedure for exceedances of bathing water guidelines.

### RECREATIONAL WATER SAMPLE EXCEEDANCES – RESPONSE PROCEDURE

Based on Microbial water Quality Guidelines Page D9 (Box 1) and E9 (Box 2)



## Appendix 2: Locations of Recreational Water Quality Sites and their Suitability for Contact Recreation Grades



### River sites

- 1 Rai River at Rai Falls
- 2 Pelorus River at Pelorus Bridge
- 3 Pelorus River at Totara Flat
- 4 Wairau River at State Highway Six
- 5 Wairau River at Ferry Bridge
- 6 Wairau River at Blenheim Rowing Club
- 7 Opawa River at Elizabeth St Bridge
- 8 Taylor River at Riverside
- 9 Waihopai River at Craiglochchart #2

### Coastal sites

- 1 Moetapu Bay
- 2 Mistletoe Bay
- 3 Anakiwa Bay
- 4 Momorangi Bay
- 5 Ngakuta Bay
- 6 Governors Bay
- 7 Picton Foreshore
- 8 Waikawa Bay
- 9 Robin Hood Bay East
- 10 Robin Hood Bay West
- 11 Whites Bay
- 12 Marfells Beach

### Beach Grades

- Very Good
- Good
- Fair
- Poor
- Very Poor