

Annual Coastal Water Quality Report for the Wellington Region 2000-2001

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Executive Summary

This report summarises the results of the coastal water quality monitoring undertaken by the Wellington Regional Council and several of the territorial authorities in the Wellington Region during the period 1 March 2000 to 30 June 2001. The period covered by the report therefore represents a departure from previous years. The change is made to bring the reporting year into line with the financial year, thereby enabling more efficient planning and co-ordination of changes in the monitoring programmes with budget-setting and contracting procedures.

Results from three monitoring programmes are presented. First, there is an analysis of the Region's general coastal water quality using baseline enterococci data collected throughout the March 2000 – June 2001 period by the Wellington Regional Council. Second, there is an analysis of the suitability of coastal water in designated areas for the recreational gathering of shellfish for human consumption using faecal coliform data collected by the Wellington Regional Council. Thirdly, there is an analysis of the suitability of coastal water in designated areas for contact recreation during the bathing season using enterococci data collected by four territorial authorities in the western Wellington Region and the Wellington Regional Council in the Wairarapa.

Baseline enterococci monitoring identified a number of sites in the Region with reduced coastal water quality. The sites were:

- Te Horo Beach at the mouth of the Mangaone Stream
- Waikanae Beach at Tutere Street
- Paraparaumu Beach at MacLean Park
- Paraparaumu Beach at Wharemauku Road
- Taupo Stream mouth
- Porirua Harbour at Te Hiko Street
- Hataitai Beach
- Petone Wharf
- Motuwaireka (Riversdale) Lagoon

Changes in median enterococci concentrations from the 1999–00 to the 2000–01 period were small at most monitoring sites in the Region, with some sites showing increases and others decreases in concentrations.

Eight of the 13 sites monitored in designated shellfish gathering areas recorded faecal coliform concentrations above the water quality guidelines for recreational shellfish gathering. The sites were:

- Peka Peka Beach
- Pukerua Bay at Corner
- Pukerua Bay at Sealed Road
- Mahanga Bay
- Princess Bay
- East Sirens Rocks
- Burdans Gate
- Inconstant Point

Two of the 53 sites monitored in areas designated for contact recreation recorded seasonal median enterococci concentrations above the water quality guidelines for contact recreation. The sites were:

- Plimmerton Beach at the Taupo Stream mouth
- Plimmerton Beach 25 m south of Taupo Stream

A review of the Wellington Regional Council's coastal water quality monitoring programmes has identified a number of issues relating to the baseline programme, including:

- the duplication of monitoring effort between the Wellington Regional Council and the territorial authorities
- inadequacies in the design of the programme
- failure to address other risk factors influencing coastal water quality.

To improve Council's ability to deliver the environmental outcomes stated in the Regional Policy Statement and Regional Coastal Plan a more holistic and integrated monitoring programme is proposed based on the "Annapolis Protocol". This is essentially a site classification system based on bacteriological history *and* catchment characteristics. The resulting "suitability for recreation" classes could provide a basis for state of the environment reporting.

A new monitoring programme targeting the accumulation of hazardous substances and human pathogens in marine food chains is also recommended to replace the current recreational shellfish gathering coastal water quality monitoring programme.

1. Introduction

1.1 Legislative Responsibility

The Wellington Regional Council has a number of legislative responsibilities in relation to the coastal marine area.

- Section 30 of the Resource Management Act 1991 (RMA) requires regional councils (in conjunction with the Department of Conservation) to be responsible for the control of discharges to the coastal marine environment.
- Section 35 of the RMA requires regional councils and territorial authorities to monitor the state of the whole or any part of the environment of their region or district to the extent that is appropriate for them to effectively carry out their functions under the Act.
- Section 64 of the RMA sets out a requirement for the preparation of a Regional Coastal Plan.

The Wellington Regional Council's Regional Coastal Plan outlines a number of environmental objectives for the coast. These include:

- The intrinsic values of the coastal marine area and its components are preserved and protected from inappropriate use and development.
- The adverse effects new activities may have on existing legitimate activities in the coastal marine area are avoided, remedied or mitigated as far as is practicable.
- Land, water and air in the coastal marine area retains its life-supporting capacity.
- Public health is not endangered through the effects of previous, present or future activities in the coastal marine area.

The Regional Coastal Plan also designates specific areas of the coastline to be managed for contact recreation or the recreational gathering of shellfish for human consumption.

Although the RMA, and also Section 23 of the Health Act 1956, define a requirement for recreational water quality monitoring, neither Act explicitly defines responsibilities for beach water quality monitoring and reporting. However, Section 57 of the RMA provides for a New Zealand Coastal Policy Statement (NZCPS) with policies that are mandatory.

- Policy 5.1.1 of the NZCPS directs regional councils to make rules with the object of enhancing water quality.
- Policy 5.1.7 of the NZCPS directs regional councils and territorial authorities to make provisions to warn the public about poor water quality.

1.2 Health Risks

Coastal water contaminated by human or animal excreta may contain a diverse range of pathogenic (disease-causing) micro-organisms such as bacteria, viruses, and protozoa. These organisms may pose a health hazard when the coastal water is used for recreational activities. In most cases, the ill-health effects from exposure to contaminated coastal 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. To manage the health issues associated with faecal contamination of coastal water, New Zealand authorities have adopted a "maximum acceptable" level of risk of 19 swimming-related illnesses per 1000 bathers, the same risk value used by the U.S. Environmental Protection Agency.

Pathogens from sources other than human or animal excreta, toxins derived from algal blooms, and heavy metals and harmful organic substances carried to the sea by rivers, streams, wastewater discharges, and urban stormwater drains, can also pose a health hazard in coastal water that is used for contact recreation or the recreational gathering of shellfish for human consumption.

1.3 Water Quality Indicators and Guidelines

The Ministry for the Environment and the Ministry of Health have jointly produced national recreational water quality guidelines (MfE/MoH 1999). These guidelines use bacteriological indicators to indicate the risk of faecal contamination with the potential for the presence of pathogens. In coastal waters the preferred indicator for contact recreation is enterococci, while for recreational shellfish gathering the preferred indicator is faecal coliforms. Compliance with the guidelines in respect of the concentration of these indicator bacteria should ensure that people using coastal water for contact recreation, or the collection of shellfish for eating, are not exposed to significant health risks.

In the case of contact recreation, the recreational water quality guidelines use both medians and single sample maxima. Seasonal medians provide the basic means to assess the risk to health over time. Single sample maxima help water managers determine when management intervention is required. The bacteriological "trigger" values underpin a three-tier management framework analogous to traffic lights (for further details see Appendix 1).

Mode	Guideline (enterococci per 100mL)	Management Response
Green/Surveillance	Running median ≤ 35	Routine monitoring
Amber/Alert	Running median ≤ 35 and no single sample > 136 OR single sample > 136 irrespective of running median	Increased monitoring, investigation of source and risk assessment
Red/Action	Two consecutive single samples within 24 h > 277 irrespective of running median	Closure, public warnings, increased monitoring and investigation of source

In the case of recreational shellfish gathering, the bacteriological guidelines are a median faecal coliform concentration for samples taken over a shellfish gathering season of 14/100mL and not more than 10% of samples with concentrations greater than 43/100mL. The guidelines apply only to coastal waters in a catchment where a prior sanitary survey has shown that there are no point sources of pollution of public health concern. It is also important to note that the guidelines do not cover toxic algal blooms, which at certain times and in certain places can pose a significant health risk to recreational shellfish gatherers.

1.4 The Annapolis Protocol

The coastal marine aspects of the MfE/MoH recreational water quality guidelines are currently under review by the Marine Bathing Working Group. The Working Group are looking at moving away from the sole focus on bacteriological threshold data and incorporating information about a beach's catchment (McBride 2000). The Group has proposed adopting an approach such as the Annapolis Protocol (WHO 1999), where the suitability of a beach for contact recreation is classified from "excellent" to "very poor" based on the bacteriological data *and* catchment characteristics. In effect it is a decision support system that classifies the risk to the user of faecal contamination within the bathing area, and provides guidance (by way of the catchment assessment checklist) to potential sources of pollution in the event of a breach of the guidelines.

A preliminary classification of the Wairarapa bathing beaches monitored by the Wellington Regional Council was carried out this year using the Annapolis Protocol approach (Watts & Sevicke-Jones 2001).

2. Objectives and Methods

2.1 The Baseline Coastal Water Quality Monitoring Programme

The objectives of the baseline coastal water quality monitoring programme are to:

- Provide information on the quality of coastal water around the Wellington Region
- Provide information to assist in the determination of trends in coastal water quality
- Assess compliance with the Council's coastal water quality objectives
- Identify areas where enhancement of coastal water quality is necessary
- Provide information which contributes to the evaluation of the effectiveness of the Council's policies and strategies relevant to coastal water quality
- Provide data that can be used for appropriate effects-based decisions on coastal permit applications
- Identify and monitor potential stresses on the quality of coastal water throughout the Region.

The Wellington Regional Council monitored enterococci concentrations at 66 sites around the Region's coast during the period 1 March 2000 to 30 June 2001 in a programme primarily designed for state of the environment reporting. Coastal water samples were taken at monthly intervals throughout this period. The samples from the western Wellington Region were analysed for enterococci by the Council's laboratory, and the samples from the Wairarapa by Wairarapa Laboratory Services, in both cases using a 48-hour membrane filtration method (APHA 20th Edition 9230C).

2.2 The Recreational Shellfish Gathering Coastal Water Quality Monitoring Programme

The objectives of the recreational shellfish gathering coastal water quality monitoring programme are to:

- Determine the suitability of coastal water in designated areas for the gathering of shellfish for human consumption.
- Assist in safeguarding public health and the environment.
- Provide a mechanism to determine the effectiveness of plans.
- Provide information to assist in targeted investigations where remediation or mitigation of poor water quality is sought.

The Wellington Regional Council monitored faecal coliform concentrations at 13 sites in areas around the Region's coast which have been designated for shellfish gathering during the period 1 March 2000 to 30 June 2001. Coastal water samples were taken at monthly intervals throughout this period at sites in the western Wellington Region. In the Wairarapa, coastal water samples were taken at monthly intervals from March 2000 to November 2000. The samples from the western Wellington Region were analysed for faecal coliforms by the Council's laboratory,

and the samples from the Wairarapa by Wairarapa Laboratory Services, in both cases using a 24-hour membrane filtration method (APHA 20th Edition 9222D).

2.3 The Contact Recreation Coastal Water Quality Monitoring Programme

The objectives of the contact recreation coastal water quality monitoring programme are to:

- Determine the suitability of coastal water in designated areas for contact recreation.
- Assist in safeguarding public health and the environment.
- Provide a mechanism to determine the effectiveness of plans.
- Provide information to assist in targeted investigations where remediation or mitigation of poor water quality is sought.

Contact recreation water quality monitoring in the western Wellington Region is carried out by four territorial authorities, and in the Wairarapa by the Wellington Regional Council's Wairarapa Division.

Kapiti Coast District Council

The Kapiti Coast District Council sampled coastal water at 11 bathing beach sites at weekly intervals from 9 November 2000 to 20 March 2001. The samples were analysed for enterococci by the Council's own laboratory using a 24-hour membrane filtration method (EPA 1600).

Porirua City Council

The Porirua City Council sampled coastal water at 12 bathing beach sites at weekly intervals from 8 November 2000 to 30 March 2001. The samples were analysed for enterococci by the Council's own laboratory using a 48-hour membrane filtration method (APHA 20th Edition 9230C).

Wellington City Council

The Wellington City Council sampled coastal water at 16 bathing beach sites at weekly intervals from 2 November 2000 to 26 March 2001. The samples were analysed for enterococci by Wellington Pathology Limited using a 24-hour membrane filtration method (EPA 1600).

Hutt City Council

The Hutt City Council sampled coastal water at eight bathing beach sites from 13 November 2000 to 20 March 2001. Samples were taken weekly at Petone and Days Bay beaches, while fortnightly samples were taken at Lowry Bay and Eastbourne. The samples were analysed for enterococci by Environmental Laboratory Services Limited using the EnterolertTM method.

Wairarapa Division, Wellington Regional Council

The Wairarapa Division of the Wellington Regional Council sampled coastal water at six bathing beach sites at weekly intervals from 27 November 2000 to 26 February 2001. The samples were analysed for enterococci by Wairarapa Laboratory Services using a 48-hour membrane filtration method (APHA 20th Edition 9230C).

3. Results

3.1 Kapiti Coast

3.1.1 Description of Monitored Area

The Kapiti Coast extends from Otaki to Paekakariki and the shoreline consists predominantly of sandy beaches (Figure 1). Rivers and streams discharging to the sea along the coast generally flow through urban areas in their lower to middle reaches and pastoral lands in their middle to upper reaches. Their headwaters generally extend into forested uplands. The major freshwater inputs come from the Waitohu Stream, Otaki River, Mangaone Stream, and Waikanae River. These rivers and streams influence four of the six main beach areas: Otaki, Te Horo, Waikanae, and Paraparaumu. The other two main beach areas, Raumatī and Paekakariki, lie to the south of the smaller Wharemauku Stream and Whareroa Stream respectively.

Bathing is popular along all of the Kapiti Coast beaches, whilst shellfish gathering is most popular at the Otaki, Te Horo, Peka Peka, and Paekakariki Beaches.

3.1.2 Baseline

High median enterococci concentrations were recorded at Te Horo Beach at the Mangaone Stream mouth, Waikanae Beach at Tutere Street, Paraparaumu Beach at MacLean Street, and Paraparaumu Beach at Wharemauku Road (Table 1). Increases in median enterococci concentrations were recorded at all but two sites compared with the 1999–00 period.

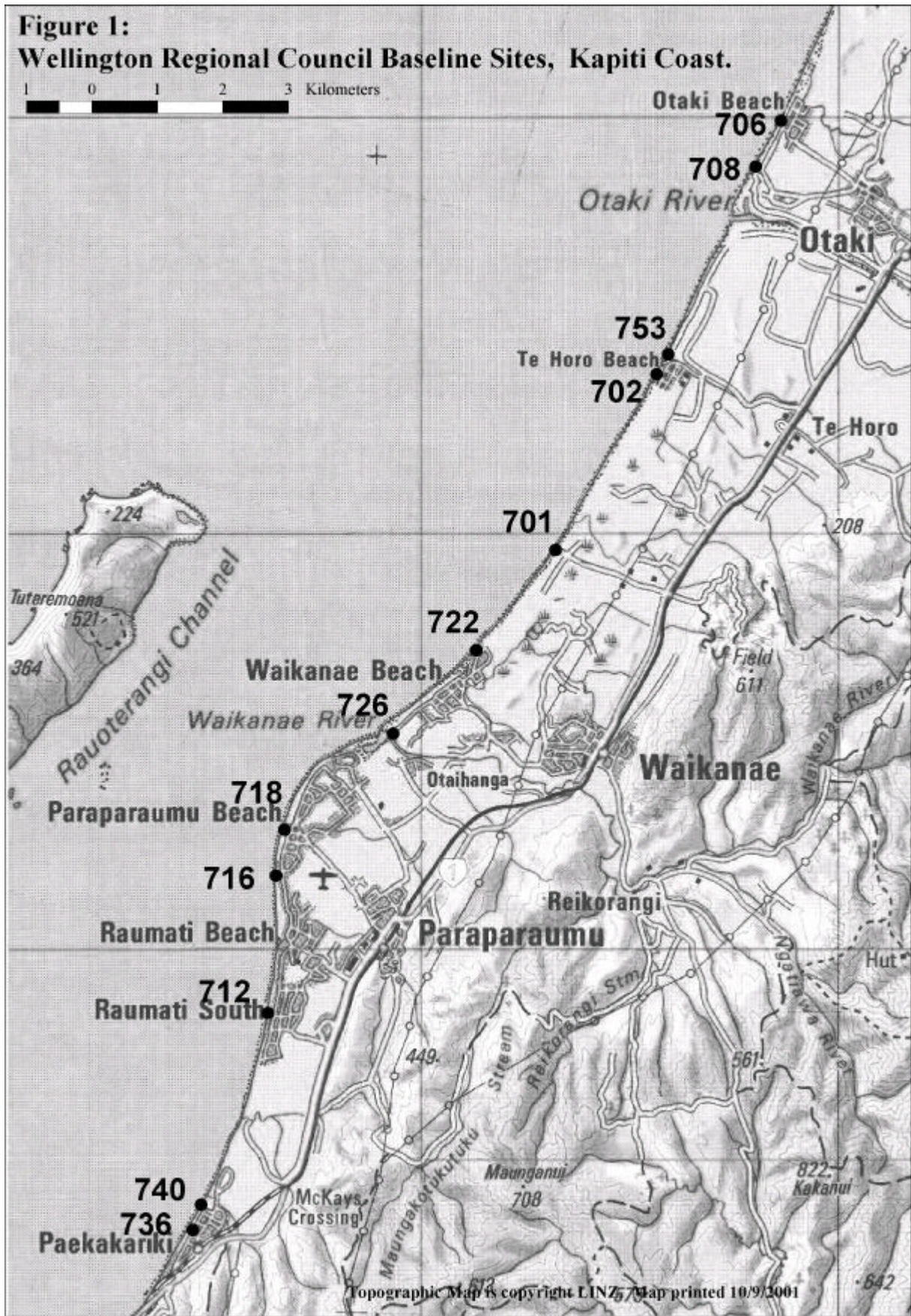


Table 1: Wellington Regional Council baseline enterococci data for the Kapiti Coast, March 2000 – June 2001.

Site	Site No.	Number of samples	Minimum	Maximum	1999-00 Median	2000-01 Median
Otaki Beach at Surf Club	706	17	0	80	10	4 ↓
Otaki Beach at Rangiuru Road	708	17	1	210	8	10 ↑
Te Horo Beach at Mangaone Stream	753	17	40	21 000	200	210 ↑
Te Horo Beach at Sea Road	702	17	2	88	10	15 ↑
Peka Peka Beach	701	17	2	80	8	14 ↑
Waikanae Beach at William Street	722	17	2	204	10	18 ↑
Waikanae Beach at Tutere Street	726	17	50	800	100	220 ↑
Paraparaumu Beach at Maclean Street	718	17	2	1 000	70	66 ↓
Paraparaumu Beach at Wharemauku Rd.	716	17	4	820	36	60 ↑
Raumati Beach at Tiromoana Road	712	17	0	520	20	30 ↑
Paekakariki Beach at Road End	740	16	2	132	13	24 ↑
Paekakariki Beach at Beach Street	736	16	0	156	7	11.5 ↑

↑ Indicates an increase in median value compared with the 1999–00 period
 ↓ Indicates a decrease in median value compared with the 1999–00 period

3.1.3 Recreational Shellfish Gathering

The only site monitored in relation to recreational shellfish gathering along the Kapiti Coast was Peka Peka Beach. The median faecal coliform concentration of 16/100mL recorded at the site in 2000–01 exceeded the water quality guidelines for shellfish gathering. A median of 16 faecal coliforms/100mL was also recorded in the 1999–00 period.

3.1.4 Contact Recreation

All of the bathing beach sites monitored by the Kapiti Coast District Council complied with the water quality guidelines for contact recreation, although the MacLean Park site had a seasonal median concentration very close to the limit of 35 enterococci/100mL (Table 2).

Table 2: Kapiti Coast bathing beach compliance, November 2000 – March 2001.

Site	Number of samples	Seasonal median	Alert Mode I Running median >35/100mL	Alert Mode II 1 sample >136/100mL	Action Mode 2 consecutive samples >277/100mL
Otaki Beach at Surf Club	20	5	0	1	Not resampled within 24 h
Te Horo Beach	20	10	0	1	Not resampled within 24 h
Peka Peka Beach	20	5	0	0	0
Tutere Street North at Toilets, Waikanae	20	16.5	0	0	0
Ara Kuaka Carpark, Waikanae	20	5.5	0	1	0
MacLean Park, Paraparaumu	20	34.5	1	1	Not resampled within 24 h
69 Marine Parade, Paraparaumu	20	30	0	3	Not resampled within 24 h
Raumati Beach at Pool	20	21.5	0	1	Not resampled within 24 h
Aotea Street, Raumati	20	19.5	0	1	0
QEII Park Toilets, Paekakariki	20	5	0	0	0
Surf Club, Paekakariki	20	5	0	0	0

3.2 Porirua

3.2.1 Description of Monitored Area

The Porirua area extends from just south of Paekakariki to the vicinity of Rock Point (Figure 2). The coastline is predominantly rocky from Pukerua Bay to Karehana Bay, around the Whitireia Peninsula, and south of Titahi Bay. Sandy beaches are present at Plimmerton, Onehunga Bay, and Titahi Bay. Porirua Harbour, comprised of the Onepoto Arm and the Pauatahanui Arm, lies in the centre of the area.

Freshwater inputs influence water quality at many of the Porirua beaches. Wairaka Stream drains into the sea at Pukerua Bay. The upper and lower reaches of this stream receive runoff from farms and reserve areas, whilst the middle reaches adjoin the Pukerua Bay urban area. Stormwater from the western Pukerua Bay urban area is discharged into the stream. Taupo Stream drains rural areas, the Taupo Wetland, and urban Plimmerton, and discharges to the sea on Plimmerton Beach. This stream is likely to receive faecal inputs from animals living in all of these areas. The Kakaho, Horokiri, Ration Point, and Pauatahanui Streams, and Duck Creek, enter the Pauatahanui Arm of the Porirua Harbour. The Duck Creek catchment is largely urbanised. The other streams drain land used mainly for agricultural purposes and forestry. Porirua Stream discharges into the head of the Onepoto Arm of the Porirua Harbour. This stream receives runoff from agricultural, commercial, industrial, and urban areas. Major urban stormwater outlets discharge into the Onepoto Arm in the vicinity of Semple Street and Te Hiko Street in Porirua City. A small stream draining



Whitireia Park discharges to the sea at Onehunga Bay. The Porirua Sewerage Treatment Plant outfall is located at Rukutane Point to the south of Titahi Bay.

Bathing is popular at Titahi Bay and Plimmerton Beach. Surfing is also popular at Titahi Bay. Windsurfing is popular in the Pauatahanui Arm of Porirua Harbour and at Plimmerton Beach. The Onepoto Arm of Porirua Harbour is used mainly for boating. Shellfish are collected from Porirua Harbour and some of the more isolated parts of the coastline.

3.2.2 Baseline

High median enterococci concentrations were recorded at the Taupo Stream mouth and Porirua Harbour at Te Hiko Street (Table 3). Historically both of these sites have consistently produced high bacteria counts. Most of the increases and decreases in median enterococci concentrations from the 1999–00 to the 2000–01 period were small.

Table 3: Wellington Regional Council baseline enterococci data for the Porirua area, March 2000 – June 2001.

Site	Site No.	Number of samples	Minimum	Maximum	1999-00 Median	2000-01 Median
Paekakariki Highway at Third Carpark	733	16	0	70	2	2
Pukerua Bay at Corner	731	17	2	80	6	4 ↓
Pukerua Bay at Sealed Road	728	17	2	600	21	20 ↓
Karehana Bay	150	17	0	600	10	36 ↑
Taupo Stream mouth	148	17	9	800	95	110 ↑
Paremata Bridge	147	17	1	58	5	4 ↓
Pauatahanui Inlet at Water Ski Club	151	16	0	216	15	24 ↑
Porirua Harbour at Te Hiko Street	146	17	2	3 000	150	270 ↑
Porirua Harbour at Rowing Club	145	17	2	7 000	24	30 ↑
Onehunga Bay	144	17	1	100	39	12 ↓
Titahi Bay	143	17	2	5 000	21	16 ↓

↑ Indicates an increase in median value compared with the 1999–00 period
 ↓ Indicates a decrease in median value compared with the 1999–00 period

3.2.3 Recreational Shellfish Gathering

Three sites were monitored in relation to recreational shellfish gathering in the Porirua area (Table 4). The Third Carpark at Paekakariki site complied with the water quality guidelines for shellfish gathering, but the Pukerua Bay at Corner and Pukerua Bay at Sealed Road sites did not comply.

Porirua Harbour is not specified in the Regional Coastal Plan as an area to be managed for recreational shellfish gathering purposes. Nevertheless, shellfish gathering occurs there, and for this reason several sites in the harbour were monitored by the Wellington Regional Council for faecal coliforms (Table 5). None of the sites complied with the water quality guidelines for recreational shellfish gathering and for this reason it is recommended that people do not consume shellfish taken from the Porirua Harbour inshore of Mana.

Table 4: Wellington Regional Council faecal coliform data for the Porirua area, March 2000 – June 2001.

Site	Number of samples	Minimum	Maximum	% above 43/100mL	1999-00 Median	2000-01 Median
Third Carpark at Paekakariki	16	0	118	6.25	3	2
Pukerua Bay at Corner	17	2	148	23.53	8	4
Pukerua Bay at Sealed Road	17	3	600	41.18	35	24

Table 5: Wellington Regional Council faecal coliform data for the Porirua Harbour, March 2000 – June 2001.

Site	Number of samples	Minimum	Maximum	% above 43/100mL	1999-00 Median	2000-01 Median
Porirua Harbour at Rowing Club	9	10	210	44.44	42	10
Porirua Harbour at Te Hiko Street	17	0	3 000	70.59	242	250
Paremata Bridge	9	2	98	11.11	8	2
Pauatahanui Inlet at Bradeys Bay	16	0	1 440	43.75	35	34

3.2.4 Contact Recreation

All but two of the bathing beach sites monitored by the Porirua City Council complied with the water quality guidelines for contact recreation (Table 6). The exceptions were Plimmerton Beach at Taupo Stream mouth and Plimmerton Beach 25 m south of Taupo Stream, where the running median enterococci concentrations remained above the guideline throughout the bathing season.

Table 6: Porirua bathing beach compliance, November 2000 – March 2001.

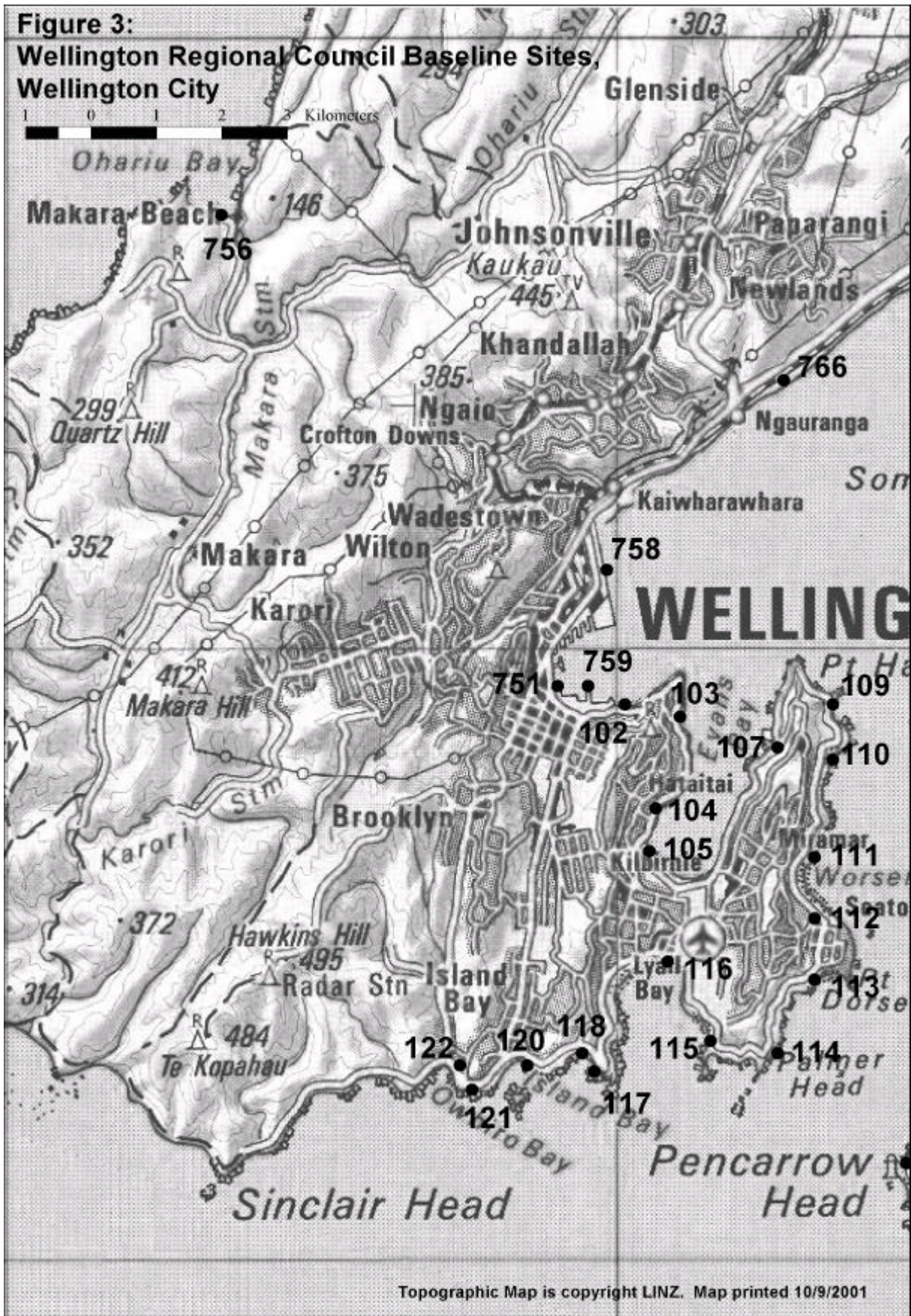
Site	Number of samples	Seasonal median	Alert Mode I Running median >35/100mL	Alert Mode II 1 sample >136/100mL	Action Mode 2 consecutive samples >277/100mL
Pukerua Bay Beach at eastern end Ocean Pde	19	3	0	0	0
Karehana Bay Beach opposite Airlie Road	19	25	0	3	Not resampled within 24 h
Karehana Bay Beach opp. 42 Moana Road	19	3	0	0	0
Plimmerton Beach at Bath Street	19	3	0	0	0
Plimmerton Beach at mouth of Taupo Stream	19	600	15	15	Not resampled within 24 h
Plimmerton Beach 25 m south of Taupo Stream	19	72	15	4	Not resampled within 24 h
Paremata Beach at Pascoe Avenue	19	18	0	0	0
Grays Road Picnic Area at Motukaraka Point	19	19	0	1	Not resampled within 24 h
Beside SH58 0.5 km east of Duck Creek	18	10.5	0	0	0
Shelly Beach, Whiteria Park	19	6	0	0	0
Titahi Bay Beach at Bay Drive	19	21	0	0	0
Titahi Bay Beach at South Beach Access Rd	19	11	0	0	0

3.3 Wellington City

3.3.1 Description of Monitored Area

The Wellington City area extends from Rock Point to Korokoro (Figure 3). The coastline is predominantly rocky with a number of small, embayed, gravelly or sandy beaches, particularly along the outer coast east of Sinclair Head and within Wellington Harbour. Between Oriental Bay and Korokoro, however, the shoreline is almost entirely made up of artificial structures associated with the port and arterial transport systems.

The Ohariu/Makara Stream system discharges to the sea at Ohariu Bay. Its catchments are predominantly pastoral. The Karori Stream discharges west of Sinclair Head and receives stormwater from the suburb of Karori. Treated sewage is also discharged adjacent to the stream mouth. Owhiro Stream discharges into Owhiro Bay and receives stormwater from the suburb of Brooklyn. Several landfills are located in this catchment. Stormwater enters Island Bay and Lyall Bay from



adjoining suburbs and a long outfall discharges treated sewage at Moa Point, just to the east of Lyall Bay. Beaches within Wellington Harbour are influenced by stormwater from adjoining suburbs, and in the case of Oriental Bay, from as far inland as Brooklyn. Major stormwater drains associated with the central business district of Wellington City discharge into the harbour within the port area. The Kaiwharawhara Stream receives stormwater and runoff from the suburbs of Karori, Northland, and Ngaio, as well as from a small industrial area in its lower reaches. The Ngauranga Stream receives stormwater from industrial areas and the suburbs of Johnsonville and Newlands, as well as leachate from the closed Raroa landfill.

Many of the beaches in the vicinity of Wellington City are popular for swimming. Wellington Harbour is used for windsurfing and boating. Surfing occurs on the south coast, particularly at Lyall Bay. Diving is popular along the coast between Sinclair Head and the entrance to Wellington Harbour. Shellfish gathering takes place at many locations along the south coast.

3.3.2 Baseline

The highest median enterococci concentrations were recorded at Hataitai Beach and Makara Beach (Table 7). Generally, changes in median enterococci concentrations were small, and decreases outnumbered increases, perhaps reflecting the reduced stormwater inputs associated with an unusually dry summer and autumn.

3.3.3 Recreational Shellfish Gathering

Five sites were monitored in relation to recreational shellfish gathering in the Wellington City area (Table 8). The Palmer Bay and West Huetetaka Peninsula sites complied with the water quality guidelines for this purpose, the remaining sites did not comply.

3.3.4 Contact Recreation

All of the bathing beach sites monitored by the Wellington City Council complied with the water quality guidelines for contact recreation (Table 9).

3.4 Eastern Wellington Harbour

3.4.1 Description of Monitored Area

The Eastern Wellington Harbour area stretches from Korokoro to Windy Point (Figure 4). Petone Beach lies at the head of the harbour and the Korokoro Stream and Hutt River discharge to the sea at its western and eastern ends respectively. The lower part of the Hutt River catchment is urban, while the upper portion has agricultural lands and native and exotic forests. The eastern shoreline of the harbour is predominantly rocky, but includes a number of sandy beaches and a more extensive sandy shore in Fitzroy Bay. Small streams and stormwater drains discharge into the sea as far south as Eastbourne. At Pencarrow Head a short outfall discharges treated sewage from the Hutt Valley area. East of Baring Head the Wainuiomata and Orongorongo Rivers enter the sea. The upper part of the Wainuiomata catchment is used for water collection purposes. The river then passes through the Wainuiomata urban area where a sewage treatment plant discharges to the river. The remaining

Table 7: Wellington Regional Council baseline enterococci data for the Wellington City area, March 2000 – June 2001.

Site	Site No.	Number of samples	Minimum	Maximum	1999-00 Median	2000-01 Median
Makara Beach	756	16	1	442	8	34 ↑
Owhiro Bay	122	17	0	73	10	10
Sirens Rocks	121	17	1	79	10	8 ↓
Island Bay	120	17	2	54	20	10 ↓
Houghton Bay	118	17	0	200	6	2 ↓
Princess Bay	117	17	1	99	4	2 ↓
Lyllal Bay	116	17	0	37	10	2 ↓
Huetetaka Peninsula	115	17	0	85	2	2
Palmer Bay	114	17	0	30	6	2 ↓
Breaker Bay	113	17	0	32	10	2 ↓
Seatoun Wharf	112	17	0	2 200	10	10
Worser Bay	111	17	1	29	6	8 ↑
Scorching Bay	110	17	0	47	2	4 ↑
Mahanga Bay	109	17	0	14	2	2
Shelley Bay	107	17	0	35	8	2 ↓
Evans Bay	105	16	2	1 230	100	21 ↓
Hataitai Beach	104	17	2	382	42	40 ↓
Balaena Bay	103	17	0	33	6	2 ↓
Oriental Bay	102	17	2	370	28	8 ↓
Overseas Terminal	759	17	5	260	19	22 ↑
Aotea Lagoon	751	17	1	182	18	6 ↓
Container Terminal	758	17	1	1 490	10	21 ↑
Ngauranga North	766	10	0	24	10	2 ↓

↑ Indicates an increase in median value compared with the 1999–00 period
 ↓ Indicates a decrease in median value compared with the 1999–00 period

Table 8: Wellington Regional Council faecal coliform data for the Wellington City area, March 2000 – June 2001.

Site	Number of samples	Minimum	Maximum	% above 43/100mL	1999-00 Median	2000-01 Median
Mahanga Bay	17	0	87	11.76	2	2
Palmer Bay	17	0	124	5.88	4	2
West Huetetaka Peninsula	17	0	16	0	2	2
Princess Bay	17	2	217	11.76	6	2
East Sirens Rocks	17	2	310	17.65	14	10

Table 9: Wellington City bathing beach compliance, November 2000 – March 2001.

Site	Number of samples	Seasonal median	Alert Mode I Running median >35/100mL	Alert Mode II 1 sample >136/100mL	Action Mode 2 consecutive samples >277/100mL
Oriental Bay Beach	24	2	0	0	0
Balaena Bay Beach	24	2	0	2	0
Hataitai Beach	24	12	3	4	0
Scorching Bay Beach	24	2	0	0	0
Worser Bay Beach	24	2	0	0	0
Seatoun Beach at Wharf	24	4	0	2	0
Breaker Bay Beach	24	2	0	0	0
Lyllall Bay Beach	24	2	0	1	0
Princess Bay Beach	24	2	0	0	0
Island Bay Beach	24	2	0	2	0

portion of the catchment is pastoral. The Orongorongo catchment is mainly in native forest.

Beaches from Petone to Eastbourne are popular for bathing. Shellfish gathering and diving are popular in the Pencarrow area south of Eastbourne.

3.4.2 **Baseline**

High median enterococci concentrations were recorded at Petone Wharf (Table 10). However, this site showed a decrease in median value compared with the 1999–00 period, perhaps reflecting the reduced stormwater inputs associated with an unusually dry summer and autumn.

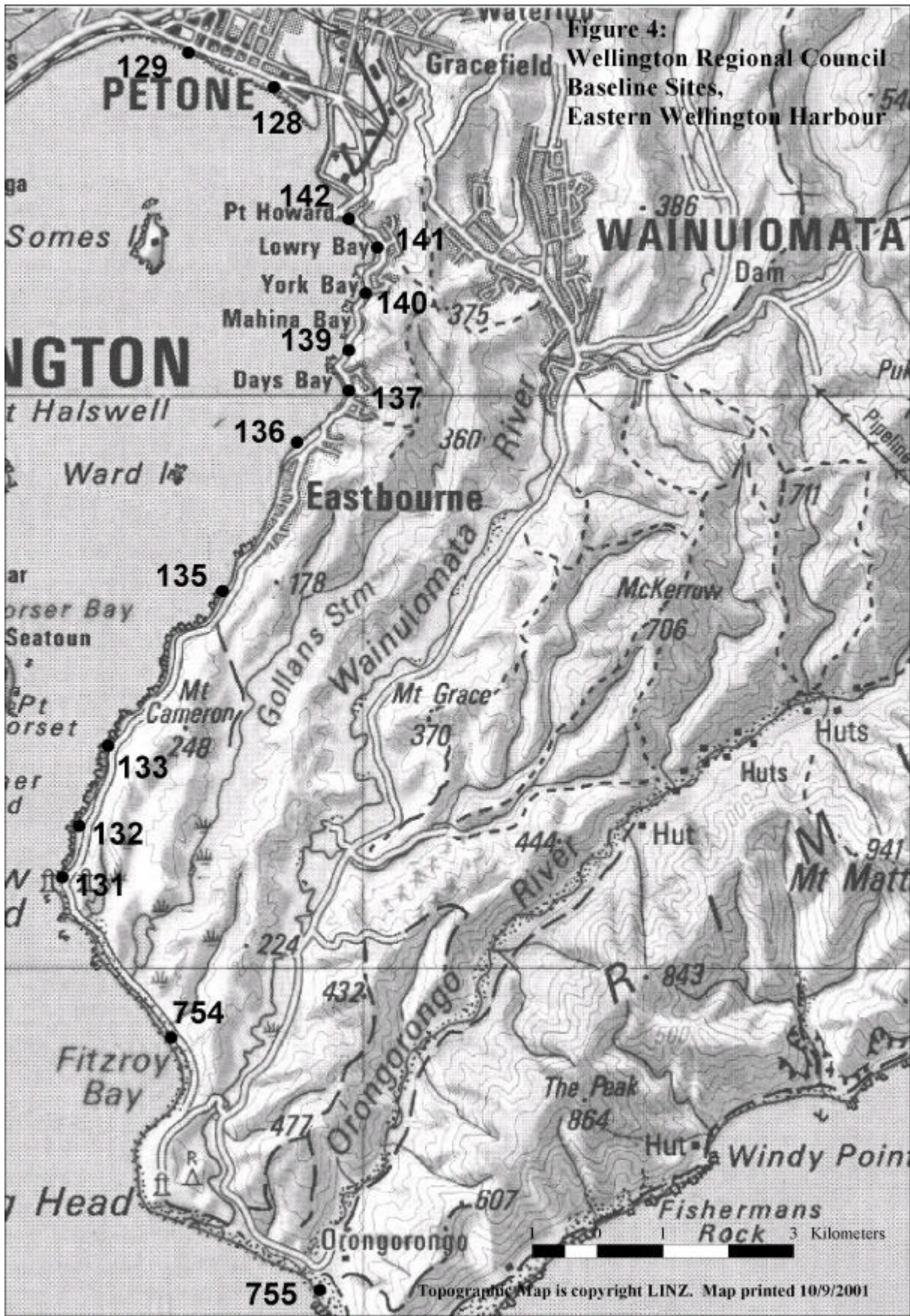


Table 10: Wellington Regional Council baseline enterococci data for the Eastern Wellington Harbour area, March 2000 – June 2001.

Site	Site No.	Number of samples	Minimum	Maximum	1999-00 Median	2000-01 Median
Petone Wharf	129	16	4	1 410	210	80 ↓
Petone Beach	128	16	1	490	14	15 ↑
Sorrento Bay	142	16	0	86	9	12 ↑
Lowry Bay	141	16	1	196	8	6.5 ↓
York Bay	140	16	1	106	4	4
Sunshine Bay	139	16	1	50	2	2
Days Bay	137	16	2	820	7	26 ↑
Eastbourne Wharf	136	16	1	136	6	13 ↑
Burdans Gate	135	16	2	92	4	10 ↑
Hinds Point	133	16	0	15	38	2 ↓
Inconstant Point	132	16	0	104	10	2 ↓
Pencarrow Bluff	131	16	0	297	38	14.5 ↓
Fitzroy Bay	754	16	2	264	14	14.5 ↑
Orongorongo Beach	755	16	1	52	2	6 ↑

↑ Indicates an increase in median value compared with the 1999–00 period
 ↓ Indicates a decrease in median value compared with the 1999–00 period

3.4.3 Recreational Shellfish Gathering

Three sites were monitored in relation to recreational shellfish gathering in the Eastern Wellington Harbour area (Table 11). Only the Hinds Point site complied with the water quality guidelines for this purpose.

3.4.4 Contact Recreation

All of the bathing beach sites monitored by the Hutt City Council complied with the water quality guidelines for contact recreation (Table 12). Seven of the sites had a median of 10 enterococci/100mL as this is the lower level detection limit for the Enterolert™ method used by Hutt City Council.

3.5 Wairarapa

3.5.1 Description of Monitored Area

Coastal water quality monitoring is conducted at two localities in the Wairarapa, these being Riversdale and Castlepoint. Both locations have a sandy beach influenced by discharges from streams and are popular for swimming, surfing and boating.

Two streams discharge onto Castlepoint Beach. Castlepoint Stream has a predominantly agricultural catchment, but also receives wastewater from the Castlepoint wetland sewage treatment facility. However, treated sewage runoff to the

Table 11: Wellington Regional Council faecal coliform data for the Eastern Wellington Harbour area, March 2000 – June 2001.

Site	Number of samples	Minimum	Maximum	% above 43/100mL	1999-00 Median	2000-01 Median
Burdans Gate	16	2	216	25	10	11
Hinds Point	16	0	82	6.25	7	3
Inconstant Point	16	2	430	25	20	13.5

Table 12: Eastern Wellington Harbour bathing beach compliance, November 2000 – March 2001.

Site	Number of samples	Seasonal median	Alert Mode I Running median >35/100mL	Alert Mode II 1 sample >136/100mL	Action Mode 2 consecutive samples >277/100mL
Petone Beach opposite Rowing Club	18	10	0	1	Not resampled within 24 h
Petone Beach opposite Settlers Museum	18	10	0	0	0
Petone Beach opposite Kiosk	18	10	0	1	Not resampled within 24 h
Lowry Bay Beach opposite Cheviot Road	10	10	0	0	0
Days Bay Beach opposite end of Carpark	18	10	0	1	Not resampled within 24 h
Days Bay Beach at Changing Rooms	18	10	2	1	Not resampled within 24 h
Days Bay Beach opposite 16 Marine Pde	18	10	0	1	Not resampled within 24 h
Eastbourne Beach opposite 97 Marine Pde	10	20	0	2	Not resampled within 24 h

stream only occurs for 3–4 months of the year. This does not usually coincide with the swimming season and therefore the most likely source of faecal contamination of the Castlepoint Stream during summer is from agricultural runoff (Watts & Sevicke-Jones 2001).

Smelly Creek flows onto Castlepoint Beach at its southern end. Its catchment includes agricultural areas (predominantly sheep farming) and the Castlepoint settlement. The stream is ephemeral, with stormwater from Castlepoint being its main source of flow.

At Riversdale, the Motuwaireka Stream flows into the Motuwaireka Lagoon (more commonly known as the Riversdale Lagoon) before entering the sea. The stream has its headwaters in the Ngamu Forest and Riversdale areas and follows a course that is predominantly surrounded by pastoral farming. High background bacteria levels due to this agricultural activity, particularly following periods of high rainfall, have the potential to adversely impact coastal water quality near the lagoon mouth. The water quality of the Motuwaireka Lagoon is also affected by possible septic tank seepage, and leachate from a decommissioned landfill entering a tributary of the Motuwaireka Stream (Stansfield 2000).

The other stream to discharge at Riversdale Beach is to the south. Its catchment is predominantly in pastoral farming. A composting public toilet is located near the stream in its lower reaches behind the sand dunes. Stormwater from Riversdale settlement is collected in a drain and discharged onto the beach about 1 km south of the lagoon mouth, near the 'flagged' swimming area.

3.5.2 Baseline

A high median enterococci concentration was recorded in the Motuwaireka Lagoon (Table 13). All the other medians were low. Median concentrations were comparable with the 1999–00 period.

Table 13: Wellington Regional Council baseline enterococci data for the Wairarapa area, March 2000 – June 2001.

Site	Site No.	Number of samples	Minimum	Maximum	1999-00 Median	2000-01 Median
Castlepoint Beach at Castlepoint Stream	C1	14	1	842	8.5	5.5 ↓
Castlepoint Beach at Smelly Creek	C2	14	1	702	6	13.5 ↑
Riversdale Beach at lagoon mouth	C3	14	0	24	2.5	3.5 ↑
Riversdale Lagoon	C4	14	5	3 240	90	77.5 ↓
Riversdale Beach between the flags	C5	14	0	724	2.5	2 ↓
Riversdale Beach south	C5x	14	1	97	8.5	4 ↓

↑ Indicates an increase in median value compared with the 1999–00 period
 ↓ Indicates a decrease in median value compared with the 1999–00 period

3.5.3 Recreational Shellfish Gathering

The Motuwaireka Lagoon mouth was the only site monitored in relation to recreational shellfish gathering in the Wairarapa. This site complied with the water quality guidelines for this purpose, recording a median of one faecal coliforms/100mL.

3.5.4 Contact Recreation

On the basis of their enterococci results all of the sites monitored at the Castlepoint and Riversdale Beaches complied with the water quality guidelines for contact recreation except for the Motuwaireka Lagoon (Table 14). However, Motuwaireka Lagoon has been reclassified as a freshwater site (Watts & Sevicke-Jones 2001), and since high enterococci counts in fresh water can arise from natural sources (MfE/MoH 1999), *Escherichia coli* is the preferred indicator for this site. Assessed on *E. coli* results Motuwaireka Lagoon complied with the water quality guidelines for contact recreation.

Table 14: Wairarapa bathing beach compliance, November 2000 – February 2001.

Site	Number of samples	Seasonal median	Alert Mode I Running median >35/100mL	Alert Mode II 1 sample >136/100mL	Action Mode 2 consecutive samples >277/100mL
Castlepoint Beach at Castlepoint Stream	13	6	0	0	0
Castlepoint Beach at Smelly Creek	13	16	0	0	0
Riversdale Lagoon	13	40	8	6	Not resampled within 24 h
Riversdale Beach at Lagoon mouth	13	2	0	0	0
Riversdale Beach between the flags	13	2	0	0	0
Riversdale Beach south	13	4	0	0	0

3.6 Regional Summary

3.6.1 Baseline

Nine sites around the Wellington Region recorded median enterococci concentrations for the monitoring period which were indicative of poor coastal water quality. The sites were Te Horo Beach at the Mangaone Stream mouth, Waikanae Beach at Tutere Street, Paraparaumu Beach at MacLean Park, Paraparaumu Beach at Wharemauku Road, Taupo Stream mouth, Porirua Harbour at Te Hiko Street, Hataitai Beach, Petone Wharf, and the Motuwaireka (Riversdale) Lagoon.

3.6.2 Recreational Shellfish Gathering

Eight sites in designated shellfish gathering areas of the Wellington Region did not comply with the water quality guidelines for recreational shellfish gathering. These sites were Peka Peka Beach, Pukerua Bay at Corner, Pukerua Bay at Sealed Road, Mahanga Bay, Princess Bay, East Sirens Rocks, Burdans Gate, and Inconstant Point.

3.6.3 Contact Recreation

Compliance of the Region's beaches with the water quality guidelines for contact recreation was good. Only two sites recorded a seasonal median enterococci concentration above the guideline. These sites were Plimmerton Beach at Taupo Stream mouth and Plimmerton Beach 25 m south of Taupo Stream.

4. Review of Monitoring and Reporting

4.1 Monitoring

The Annual Coastal Water Quality Report for 1999–2000 was the first occasion that all of the coastal water quality monitoring in the Wellington Region was reported in a single document. No attempt was made in the report to analyse the results of the baseline and contact recreation monitoring programmes as a single data set even though the two programmes have a considerable number of monitoring sites in common. The duplication of monitoring effort between the Wellington Regional Council and the territorial authorities was recognised, however, and a recommendation to develop an integrated coastal water quality monitoring programme was made (Robertson 2000). This has not yet occurred, but even such integration would do little to address inadequacies in the baseline (state of the environment) monitoring programme.

4.1.1 Baseline Coastal Water Quality Monitoring Programme

There are several problems with the baseline programme which collectively result in the objectives not being supported in a comprehensive and definitive manner.

- (1) Lack of spatial controls. At each site only a single coastal water sample is taken, and given that bacterial concentrations are known to vary at scales of metres, the question arises as to just how typical the sample might be of the general area it is being used to represent. Without replication of samples at relevant spatial scales the use of a numerical value such as median concentration is not statistically robust.
- (2) Lack of temporal controls. Bacterial concentrations are known to vary at scales of hours and days and to undergo marked changes in relation to rainfall as a result of discharges to coastal water by rivers, streams, wastewater treatment plants, and stormwater drains. Given such variability, it appears unlikely that samples taken on just 12 days per year will provide a true picture of the bacteriological status of coastal waters. Sampling on shorter time scales is also required.
- (3) Incomplete coverage of risk factors. The baseline programme does not address other risk factors influencing coastal water quality, such as pathogens from sources other than human or animal excreta, toxins derived from algal blooms, and heavy metals and harmful organic substances carried to the sea by rivers, streams, wastewater discharges, and urban stormwater drains. These can also pose a health hazard in coastal water that is used for contact recreation or the recreational gathering of shellfish for human consumption.

The failure to implement spatial and temporal controls (either prior to the selection of sampling positions or in the early stages of the programme) means that the validity of any conclusions based on the data has been compromised. The problems also suggest that a move away from reliance on the use of numerical values (bacterial concentrations) as the basis for the Wellington Regional Council's state of the environment reporting is necessary. A system with a more holistic approach has recently been developed which appears to offer an alternative. This is the "Annapolis

Protocol", which is outlined in Appendix 1 of this report. It is essentially a site classification system based on bacteriological history *and* catchment characteristics. The resulting "suitability for recreation" classes could provide a basis for state of the environment reporting.

Application of the Protocol to the Region's beaches would also assist the territorial authorities and the Wellington Regional Council's Wairarapa Division with their contact recreation coastal water quality monitoring, since it provides guidance (by way of a catchment assessment checklist) to potential sources of pollution in the event of a breach of the water quality guidelines. Further support for the new programme could be provided by:

- (1) Weather-related time-series sampling of coastal water and discharges to coastal water at selected monitoring sites and analysis of these samples for indicator bacteria and/or pathogens and/or other contaminants.
- (2) Targeted investigations of the nature and concentrations of heavy metals and harmful organic substances entering coastal water from rivers, streams, wastewater discharges, and urban stormwater drains.

4.1.2 Recreational Shellfish Gathering Coastal Water Quality Monitoring Programme

This programme has similar weaknesses to the baseline coastal water quality monitoring programme (lack of temporal and spatial controls). In addition, it lacks the support of shellfish collection and analysis to establish if or how the bacterial concentrations recorded in the water column relate to bacterial concentrations in shellfish tissue. The programme also does not address the risks to the public from toxins, heavy metals and harmful organic substances accumulating in shellfish tissues. All of this information is essential to determine the *actual* risks associated with consuming shellfish.

4.1.3 Contact Recreation Coastal Water Quality Monitoring Programme

The recreational water quality guidelines for contact recreation require that water should be re-sampled within 24 hours if a result over 136 enterococci/100mL is obtained. In Porirua and the Wairarapa the method used for processing bacteriological samples takes 48 hours, and hence re-sampling within 24 hours was not possible.

The recreational water quality guidelines for contact recreation also state that at least 20 samples should be collected during the bathing season (or 10 at sites identified as low risk) to enable conclusions to be drawn on the suitability of a beach for bathing. The number of samples taken at beaches in the Porirua, Eastern Wellington Harbour, and Wairarapa areas in the 2000–2001 bathing season did not meet this criterion or the sites had been identified as low risk.

4.2 Reporting

In its present form the Annual Coastal Water Quality Report contains both material of immediate public interest (in the form of the contact recreation coastal water

quality monitoring results) and material directed at state of the environment, policy, planning, and consent issues for the regulatory authorities. This produces conflicts with respect to the format and level of detail that are difficult to reconcile. Separation of the material into two reports is a practical solution, with the contact recreation coastal water quality monitoring results published as soon as possible after the end of the bathing season. This report should be in a format suitable for dissemination to the territorial authorities and public libraries as a paper-based document, and in electronic form on the Wellington Regional Council's internet site. Results of both the freshwater and coastal water quality monitoring programmes for contact recreation could be reported together, as was done for 2000–2001 in the Wairarapa (Watts & Sevicke-Jones 2001).

Other results related to coastal water quality could then be reported at the end of the financial year in a format designed for use by the monitoring agencies and water managers.

5. Recommended Action

The following actions are recommended to address the issues raised in the 2000–2001 Annual Coastal Water Quality Report for the Wellington Region.

That the contact recreation coastal water quality monitoring programme carried out by the territorial authorities and the Wellington Regional Council's Wairarapa Division be continued.

That the Wellington Regional Council work with the territorial authorities in the Wellington Region to improve, standardise, and where necessary augment, the contact recreation coastal water quality monitoring programme to meet the requirements of the national guidelines for such programmes issued by the Ministry for the Environment and the Ministry of Health.

That the Wellington Regional Council assist the territorial authorities in the Wellington Region to publicise the contact recreation coastal water quality monitoring programme at the monitored sites, through the media, and on the internet.

That the current "baseline" coastal water quality monitoring programme carried out by the Wellington Regional Council be replaced by a new "ambient" coastal water quality monitoring programme, incorporating:

- bacteriological data from the contact recreation coastal water quality monitoring programme
- weather-related time-series sampling of coastal water and discharges to coastal water at selected monitoring sites, and analysis of these samples for enterococci
- targeted investigations of the nature and concentrations of heavy metals and harmful organic substances entering coastal water from rivers, streams, wastewater discharges, and urban stormwater drains
- catchment-based risk assessment of all contact recreation coastal water quality monitoring programme sites, and classification of the sites according to their "suitability for recreation" (Annapolis Protocol)
- the adoption of the "suitability for recreation" classes as the Wellington Regional Council's measure of coastal water quality for state of the environment reporting

That the current recreational shellfish gathering coastal water quality monitoring programme carried out by the Wellington Regional Council be replaced by a new monitoring programme targeting the accumulation of hazardous substances and human pathogens in marine food chains, including:

- routine collection of bivalve (shellfish) tissue samples from recreational shellfish gathering areas, and analysis of these samples for faecal coliforms, heavy metals, and harmful organic substances

That the results of the contact recreation coastal water quality monitoring programme be reported annually to Council in May in a format suitable for dissemination to the territorial authorities and public libraries as a paper-based document, and in electronic form on the Wellington Regional Council internet site.

That the results of the "ambient" coastal water quality monitoring programme and the programme targeting the accumulation of hazardous substances and human pathogens in marine food chains be reported annually to Council in September, in a format primarily intended for use by the monitoring agencies and water managers.

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Appendix 1:

Recreational Water Quality Guidelines for Marine Waters

SURVEILLANCE ("GREEN") MODE

Running median less than 35 enterococci/100mL.

- Continue routine monitoring (usually weekly) to check that water quality stays at a level that does not pose an unacceptable risk to public health.

ALERT ("AMBER") MODE

Running median greater than 35 enterococci/100mL and no single bacteriological sample greater than 136 enterococci/100mL (Alert Mode I).

- Increase sampling to at least twice weekly to improve information base.
- Prepare a report on potential health risks and causes of elevated bacteriological levels.

Single bacteriological sample greater than 136 enterococci/100mL irrespective of the running median (Alert Mode II).

- Increase sampling to daily.
- Undertake a sanitary survey and identify the sources of contamination.

ACTION ("RED") MODE

Two consecutive single bacteriological samples (within 24 hours) greater than 277 enterococci/100mL irrespective of the running median.

- Increase sampling to daily.
- Undertake a sanitary survey and identify the sources of contamination.
- Erect warning signs.
- Inform public through the media that a public health problem exists.

Appendix 2:

The Annapolis Protocol (after WHO 1999)

1. Catchment Assessment Checklist (CAC) to identify the presence of risk factors in a catchment undergoing initial assessment.
2. Sanitary Inspection Category (SIC) allows identification of principal contamination source and assigns category.
3. Microbiological Assessment Category (MAC) based on collection of data and pre-existing data.
4. Suitability for Recreation Class (SFRC) uses the SIC and MAC together with the primary classification matrix in the Annapolis Protocol to provide the beach classification.

1. **Catchment Assessment Checklist** (adapted from Lewis 2001)

Site/Area Name:

Type of Site: *Open Coastal Beach* _____ *Estuarine* _____ *Enclosed Bay* _____ *Other* _____

Location:

Map References: *Easting* _____ *Northing* _____ *NZMS Number* _____ *Sheet Number* _____

Name of Local Authority (specify authority responsible)

Name of Person Completing Checklist _____

Part A: Land Use

Type of land or human activity surrounding the recreational site.

LAND COVER/GEOGRAPHY

Forest/Bush	<input type="checkbox"/>	Pasture	<input type="checkbox"/>	Urban	<input type="checkbox"/>
Swamp/Mangroves	<input type="checkbox"/>	River/Stream/ Irrigation	<input type="checkbox"/>	Sand dunes	<input type="checkbox"/>
Hilly	<input type="checkbox"/>	Flat	<input type="checkbox"/>		

URBAN

Residential (population density)	<input type="checkbox"/>	Commercial	<input type="checkbox"/>	Industry (specify)	<input type="checkbox"/>
Hotel	<input type="checkbox"/>	Harbour	<input type="checkbox"/>	Airport	<input type="checkbox"/>
Road/Rail	<input type="checkbox"/>	Military/Prison (restricted areas)	<input type="checkbox"/>	Other potentially polluting activity (please specify)	<input type="checkbox"/>
Sanitary Landfills/ Old dumps	<input type="checkbox"/>				
Disposal of human wastes (degree and type of treatment applied – please specify)	<input type="checkbox"/>	_____			

Part B: Rural Landuse

Indicate the presence of the following for agricultural landuse.

Sheep	<input type="checkbox"/>	Dairy/Beef	<input type="checkbox"/>	Horses	<input type="checkbox"/>
Pigs	<input type="checkbox"/>	Deer	<input type="checkbox"/>		
Poultry	<input type="checkbox"/>	Feral	<input type="checkbox"/>		
Is there disposal of animal wastes?	<input type="checkbox"/>	_____			
Please specify		_____			

Part C: Water Uses

Indicate the presence of the following for the marine area.

Marina	<input type="checkbox"/>	Fishing boat berths	<input type="checkbox"/>
Permanent boat moorings	<input type="checkbox"/>	Harbour	<input type="checkbox"/>
Temporary boat moorings	<input type="checkbox"/>		
Ferry Berth	<input type="checkbox"/>		

Part D: Additional Influencing Factors

Size of bathing area:	
Area	___ m ²
Length	___ m
Mean width	___ m
Is there a beach?	<input type="checkbox"/>
Average area	___ m ²
Length	___ m
Width at low tide	___ m
Width at high tide	___ m

Are there lagoons used for bathing?

Is the beach subject to above average seasonal/holiday loading?

Direction of prevailing onshore winds _____

Direction of prevailing water currents _____

Shoreline configuration/geomorphology/erosion gullies: _____

Presence of sandbars:

Presence of surf: Average wave heights _____

Total annual rainfall: _____ mm

Seasonal patterns _____

Part E: Microbiological Hazards

SEWAGE AND ANIMAL WASTE

Is the water quality in the recreational area affected, or likely to be affected by discharges from:

	Is it present	Is it causing effect
1 Direct discharge of human or animal effluent onto or adjacent to a recreational area	<input type="checkbox"/>	<input type="checkbox"/>
2 Stormwater outlets with potential sewage contamination/combined stormwater outlet onto or adjacent to a recreational area	<input type="checkbox"/>	<input type="checkbox"/>
3 Urban stormwater protected from sewage ingress?	<input type="checkbox"/>	<input type="checkbox"/>
4 On-site or other private sewage disposal systems (e.g., septic tank or package plant)	<input type="checkbox"/>	<input type="checkbox"/>
5 Communal sewage disposal or treatment facilities	<input type="checkbox"/>	<input type="checkbox"/>
6 Agricultural use in immediate catchment and potential for run-off (note types of animals and densities, piggeries, milking sheds, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
7 The incidence and density of bird life (particularly where lagoons or estuarine conditions exist)	<input type="checkbox"/>	<input type="checkbox"/>
8 A river or a stream discharging in the area (including a piped stream)	<input type="checkbox"/>	<input type="checkbox"/>
9 Water craft mooring or use (for boats: proximity, densities and pump outs)	<input type="checkbox"/>	<input type="checkbox"/>

RIVER/STREAM DISCHARGE INFLUENCES

Is the water quality of any river or stream discharging into the area affected or likely to be affected by point or non-point discharges from:

		Is it present	Is it causing effect
10	Municipal storm drains or combined sewer overflows	<input type="checkbox"/>	<input type="checkbox"/>
11	High intensity agricultural/rural activities	<input type="checkbox"/>	<input type="checkbox"/>
12	Focal points of drainage, as runoff from low intensity agriculture/urban/rural catchment	<input type="checkbox"/>	<input type="checkbox"/>
13	Dense forest or bush (subsequent potential for run-off from feral animals)	<input type="checkbox"/>	<input type="checkbox"/>

OTHER INFLUENCES

		Is it present	Is It causing effect
14	Are sea currents likely to carry polluted water into the recreational area?	<input type="checkbox"/>	<input type="checkbox"/>
15	Are onshore winds likely to carry polluted water into the recreational area?	<input type="checkbox"/>	<input type="checkbox"/>
16	Are tides likely to affect water quality in the recreational area?	<input type="checkbox"/>	<input type="checkbox"/>
17	Does rainfall trigger contamination events?	<input type="checkbox"/>	<input type="checkbox"/>
18	Does microbiological water quality data exceed the national guidelines (median or exceedance levels) on any occasion?	<input type="checkbox"/>	<input type="checkbox"/>
19	Is there additional information implying risk (such as notified illness related to recreational water activities)?	<input type="checkbox"/>	<input type="checkbox"/>

2. Sanitary Inspection Category (SIC)

Source of faecal contamination	Primary cause of effects in the recreational area	SIC
Direct discharge to recreational water of stormwater or wastewater	Untreated/primary treated discharge to beach or adjacent area; treated discharge to beach; on-site waste treatment systems	Very high
	Tertiary treated wastewater discharge to beach or adjacent area	High
	Urban stormwater, marinas or moorings	High
	Urban stormwater not contaminated by sewage	Moderate
River/Stream discharge	Receives wastewater treatment plant discharge; combined sewer discharges; sewer overflows; on-site waste treatment systems	High
	Receives runoff from intensive use agricultural/urban catchment; significant feral animal/bird population	Moderate
	Receives runoff from low intensity agricultural/urban/ rural catchment	Low
	Bush	Very low
No significant source		Very low

3. Microbiological Assessment Category (MAC)

Microbiological data for at least five years is obtained, and assigned a category A–E. The programme Tryanna uses six schemes to do this (*see* McBride 2000); the RAG3 scheme shown below complies with the current MfE/MoH guidelines.

Microbiological Assessment Category	Seasonal enterococci criteria (using RAG3 scheme)
A	Median \leq 5, none $>$ 136
B	Median \leq 35, none $>$ 277
C	Median \leq 35, at least one $>$ 277
D	Median \leq 35, 2 results in 24 hours $>$ 277
E	Median $>$ 35

4. Suitability for Recreation Class

A "primary classification matrix" is used to determine a beach's Suitability for Recreation Class, as follows:

Suitability for Recreation Class		Microbiological Assessment Category (indicator counts)				
		A	B	C	D	E
Sanitary Inspection Category	Very Low	Excellent	Excellent	Good	Good	Fair*
	Low	Excellent	Good	Good	Fair	Fair*
	Moderate	Good*	Good	Fair	Fair	Poor
	High	Good*	Fair*	Fair	Poor	Very Poor
	Very High	Fair*	Fair*	Poor*	Very Poor	Very Poor

* indicates unexpected result requiring verification. The contradiction between the high quality MAC and the lower quality SIC requires scrutiny and re-evaluation of the MAC and/or SIC data.