11 Coastal Water Quality

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11.1 Coastal Water Quality: Main Points

Pressures

- Oil spills, sewage overflows, and dumped refuse are the most common incidents recorded by the Council each year affecting coastal water quality.
- The major point sources of contaminants with the potential to adversely affect coastal water quality include sewage, stormwater and farm dairy effluent.
- At times of high rainfall, rivers and stormwater are the main source of contaminants discharging to the coast carrying runoff from urban and agricultural land.
- Untreated sewage discharges from boats has the potential to degrade coastal water quality.
- Boat maintenance facilities have been shown to be sources of heavy metals and toxic antifoulant residues in the Whangarei Harbour and Bay of Islands.

State

- The water quality at the majority of Northland's bathing sites is reasonably good for bathing purposes.
- Water quality, at virtually all sites monitored, is reduced to a reasonably poor level for several days following heavy rainfall.
- Sites in semi-enclosed estuaries/harbours and in the vicinity of river mouths have the highest proportion of unsafe sites.
- Many sites in harbours and estuaries may be at times unsuitable for shellfish gathering.

Response

- The Revised Proposed Regional Coastal Plan for Northland includes rules that control the extent and type of discharges to the coastal marine area.
- Resource consents and compliance monitoring programmes minimise the effects of discharges in the coastal marine area.
- State of the environment monitoring programmes include the study of harbour water quality and the suitability of water quality for bathing.
- The introduction of marine pollution regulations have made it illegal to discharge untreated sewage into shallow coastal waters.

11.2 Introduction to Coastal Water Quality in Northland

The maintenance and enhancement of coastal water quality is a major issue in Northland's coastal marine area. Not only is water quality a major component of the natural character of the coast, many activities located on the region's coast are dependent on the maintenance of high water quality standards.

High standards of coastal water quality are important for (amongst other things):

- Swimming and water sports.
- Marine farming.
- Shellfish gathering.
- Tourism.
- Cultural uses.

11.3 Regional Policy Statement Objectives

The Regional Policy Statement contains a range of objectives relating to coastal water quality. These objectives seek to maintain, and where possible improve, coastal water quality in the Northland region.

The Regional Policy Statement objectives are:

- **The maintenance and enhancement of the water quality of coastal waters in Northland to be suitable, in the long term, for the purposes listed below:**
  - **Estuaries and areas of inner harbours influenced by major river inflows – aquatic ecosystems, contact recreation and aesthetic purposes, cultural purposes.**
  - **Other harbour areas and open coastal beaches and bays – as above, plus the gathering of shellfish for human consumption, cultural purposes.**
  - **Open coastal waters – its natural state, cultural purposes.**

- **The reduction in the quantity of contaminants that impact on water quality entering coastal waters.**

- **The efficient and effective control and minimisation of the impact of oil pollution in the Coastal Marine Area.**

11.4 Coastal Water Quality Issues

Issues affecting coastal water quality involve contaminants from both land and marine-based activities.

Land-based discharges include:

- Point source discharges, which include discharges from outlets and drains. Examples: stormwater, cooling water, sewage.

- Diffuse source discharges, which include land-based runoff and aerial deposition. Examples: catchment runoff following rainfall, leaking septic tanks, dust from gravel roads.

These discharges are an issue as they may contain contaminants that can affect coastal water quality. Examples of contaminants include bacteria, metals, sediment, nutrients, and oil and grease.

Marine-based discharges include:

Discharge of effluent from boats:

- Recreational boating is a popular pastime in Northland's coastal waters.
- Many boats don't have adequate onboard effluent treatment systems.
- Untreated effluent contains disease-causing pathogens (bacteria and viruses).
  - When discharged this material may adversely affect coastal water quality.
  - This may affect other users of the coastal resource including the marine farming industry, swimmers and shellfish gatherers.

Discharge of ballast from ships

- Ballast is water that is stored in the hulls of large ships for ship stability.
- Ships discharge this water to maintain stability after moving into waters of different densities or loading cargo.
- This is an issue as ballast is sometimes discharged at port, and may contain contaminants including exotic marine organisms, effluent, leached paints and oil.

11.5 Pressures Affecting Coastal Water Quality

The coastal environment is not a closed system; pressures on the coastal environment are derived from many coastal, land and river-based sources. Sources of pressure include natural processes that are accelerated by human modifications of the land, and industrial and recreational use of the coastal environment's resources.

Various information held by the Northland Regional Council enables us to give a qualitative insight into the types of pressure the Northland coastal environment is facing.

11.5.1 Environmental Incidents

An environmental incident can be defined as "pollution or an unauthorised activity (an activity not permitted under the Resource Management Act) that may have an adverse effect on the environment". Environmental incidents are reported to the Northland Regional Council by members of the public, people in industry and Council staff.

The Northland Regional Council receives notification of approximately 100 environmental incidents in the coastal marine area each year. Of the types of incidents that are reported (for the period November 1993 – March 2001) oil spills are the most common, followed by incidents of sewage and refuse.

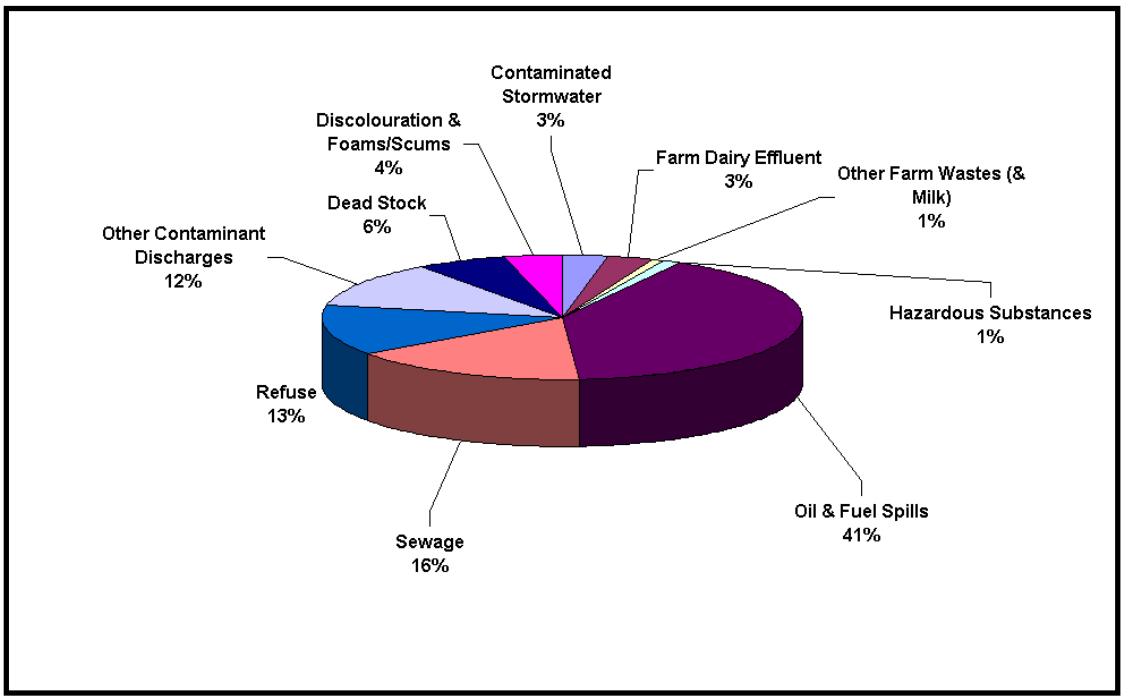


Figure 28: Proportion of environmental incidents reported for the coastal marine area and coastal waters (for the period November 1993 – March 2001)

By breaking the environmental incidents down into various categories, an indication of the type and proportion of pressures on Northland's coastal water quality can be obtained.

Generally, there is a high incidence of oil spills, sewage, refuse, various contaminated discharges and farm-related wastes. The proportion of these incidents reflects the high level of boat use (related to oil spills), development (contaminated discharges, farm-related wastes, dead stock) and humanisation (sewage, refuse, contaminated stormwater) of the Northland region.

However, the pressures represented by environmental incidents only include those that are detected by people. Hence, there is likely to be a great proportion of undetectable pressures that are not represented in the environmental incidents that are reported to Council.

11.5.2 Point Source Discharges

In 2001 there were a total of 73 authorised discharges (discharges permitted by a resource consent that was issued by the Northland Regional Council) to the coastal marine area.

Stormwater discharges are the most common **type** of authorised discharge to the coastal marine area (31), followed by the diversion of water (22) and then wastewater (20). The most common **source** of these discharges is coastal activities (44), followed by stormwater (21), with the remainder of discharges from miscellaneous sources including the food industry, agriculture, sewage and earthworks.

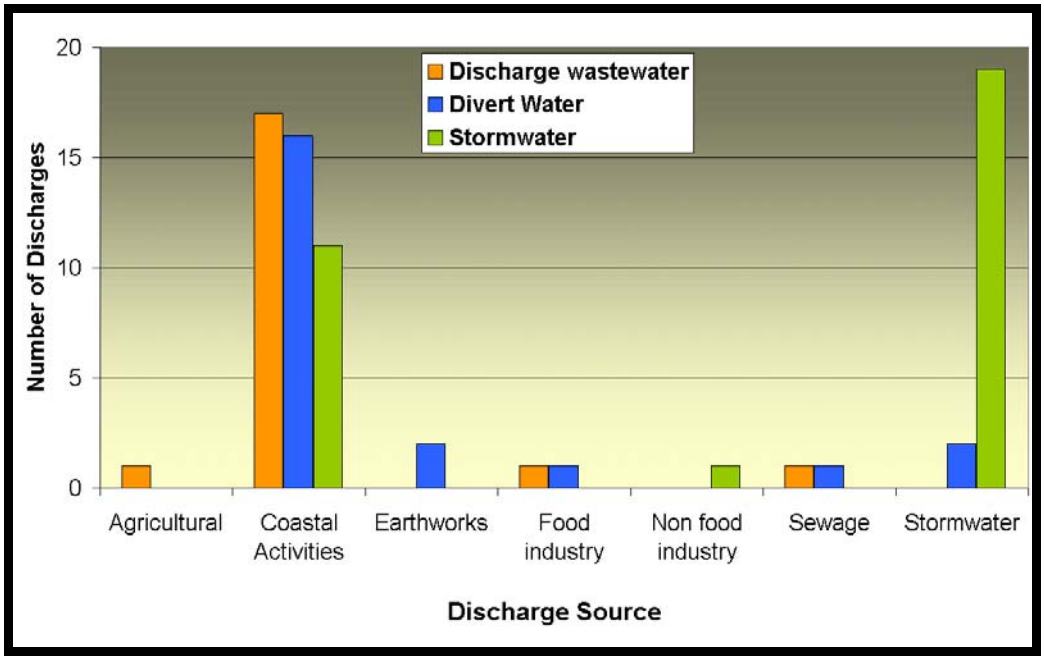


Figure 29: Type, source and number of discharges to the coastal marine area. Coastal activities and stormwater are by far the greatest source of discharges, whilst stormwater is the greatest type of all discharges.

Remembering that the coastal environment is not a closed system (as it is influenced by inputs from the land and rivers) it is important to take into account that there are approximately 1000 authorised discharges to land or freshwater.

The greatest environmental pressure on coastal water quality attributable to point source discharges is the cumulative effect of farm dairy effluent and stormwater

discharges. These make up the greatest number of authorised discharges to freshwater and the coastal marine area (Figure 30).

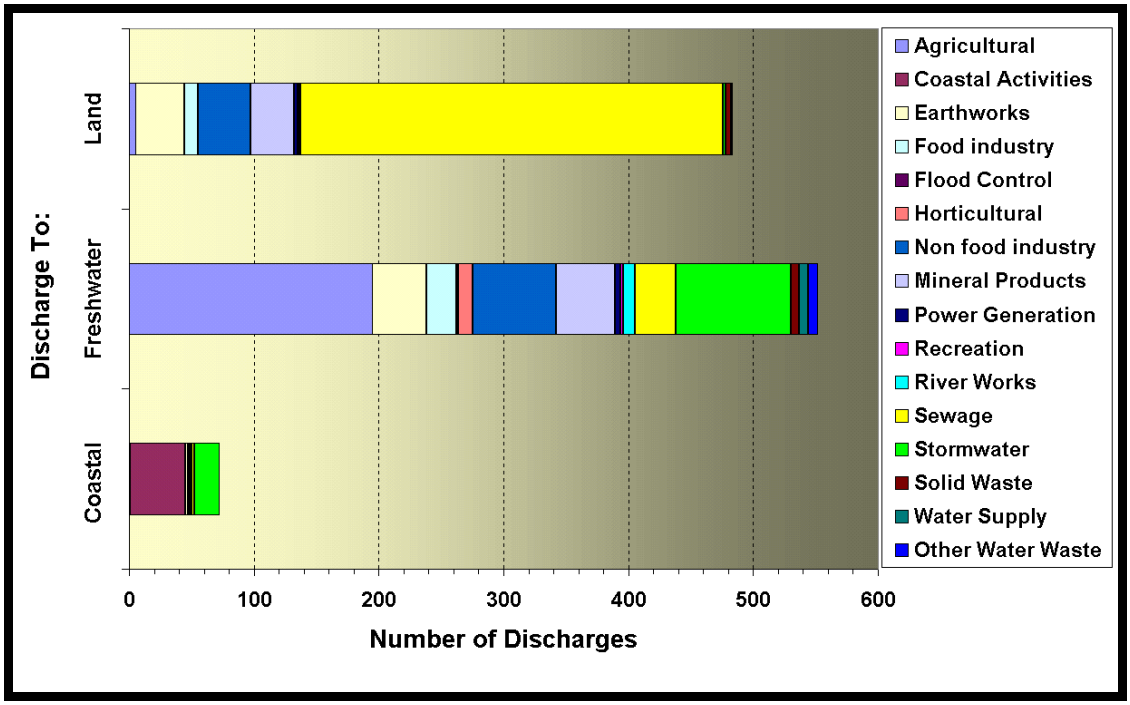


Figure 30: Authorised discharges. Includes types of discharges to land, freshwater, and the coastal marine area.

At present there are 14 sewage treatment plants which discharge either directly into Northland's coastal waters or into rivers and streams within 1km of the coast. All discharge to harbour or estuarine areas.

The volumes discharged vary widely; ranging from less than 50 cubic metres per day (e.g. Tutukaka, Whangaroa) to over 12,000 cubic metres per day (**see Case Study - Whangarei Wastewater Treatment Plant**). However, most treatment plants serve relatively small population areas and as a consequence discharge less than 1,000 cubic metres per day.

11.5.3 Non-Point Source Discharges

The Northland region was developed on an economy based largely on production from the land. Consequently, significant modifications of native land cover have occurred.

The modification of the land cover has significant implications for the coastal environment and coastal water quality. The most significant implication is the increased concentration and volume of runoff to the coastal marine area following heavy rainfall events, and the increased quantity of contaminants being discharged to the coastal marine area.

The contaminants contained in the runoff include sediment that has been eroded from the land, nutrients from the fertilisers applied to pastoral land, and bacteria from animal excrement.

This affects coastal water quality by:

- Reducing the aesthetics of coastal waters (i.e. water is discoloured).
- Increased sedimentation in semi-enclosed coastal water.
- Reduced abundance and diversity of marine species.
- Problematic marine plant growth caused by excessive nutrients.
- Contamination of coastal waters by disease-causing organisms.

11.5.4 Shipping

The majority of Northland's commercial shipping activity is based at Whangarei Harbour. Around 500 commercial ship visits per year are made to the upper harbour port facilities, 350 oil tanker visits are made to the Marsden Point oil refinery jetty facility and a further 55 commercial ship visits per year are made to the Portland cement out-loading facility. There are also 20-30 commercial cruise liners from overseas that visit the Bay of Islands.

The effect of commercial shipping on coastal water quality may include:

- Contamination from discharged ballast waters, anti-fouling hull paints and the discharge of wastes.
- The potential for oil and fuel spills.
- Spillage of cargo when onloading and offloading at port.

Port Whangarei

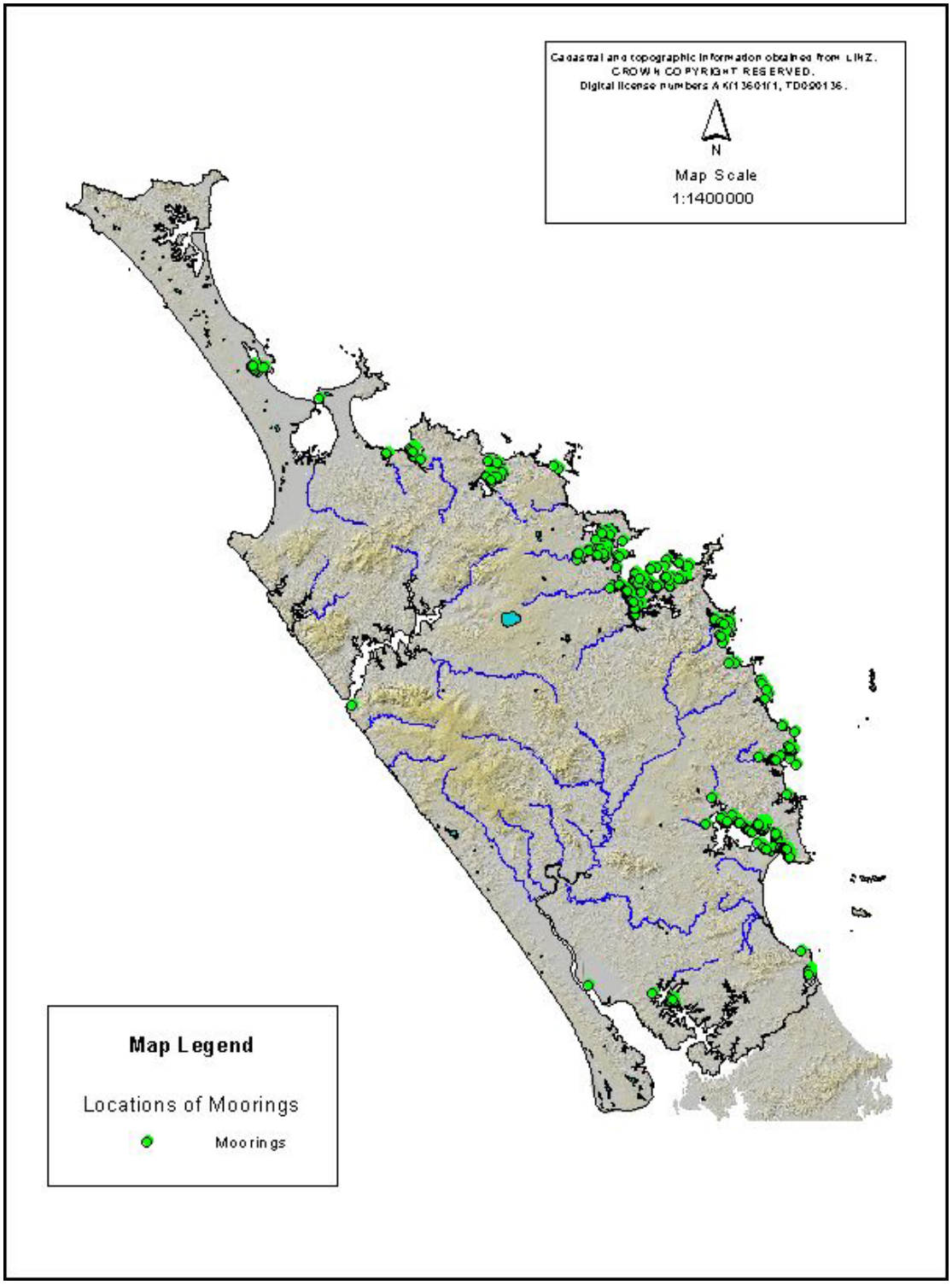
11.5.5 Recreational Boating

The effect of recreational boating on the water quality of open coast waters is limited by the relatively small group of resource users, the dynamic mixing of the surface waters by waves and the transportation of coastal water by far-reaching coastal currents.

However, in semi-enclosed coastal waters the opposite applies. Semi-enclosed waters are often popular areas of concentrated boat use. These areas have small waves and limited mixing of surface waters, coupled with restricted circulation controlled by ebb and flood-dominated tidal currents that re-circulate water in and out of semi-enclosed areas. In Northland there are many semi-enclosed areas that are popular for recreational boating. Most of these areas are located on the east coast and include the Bay of Islands and the many harbours and estuaries along the length of the coast. The popularity of boating in Northland is highlighted by the fact that there are over 3000 permanent moorings (nearly 1 mooring per 45 permanent Northland inhabitants) and 5 marinas, with increasing demand for more mooring facilities. Most of these facilities are located in semi-enclosed locations.

Concentrated boat use in semi-enclosed waters can become an environmental pressure due to the restricted circulation of water and multiple effluent discharges. Pathogens (disease causing bacteria and viruses) contained in the discharged effluent may affect other resource users, including the aquaculture industry, shellfish gatherers and swimmers.

Outer Whangarei Harbour

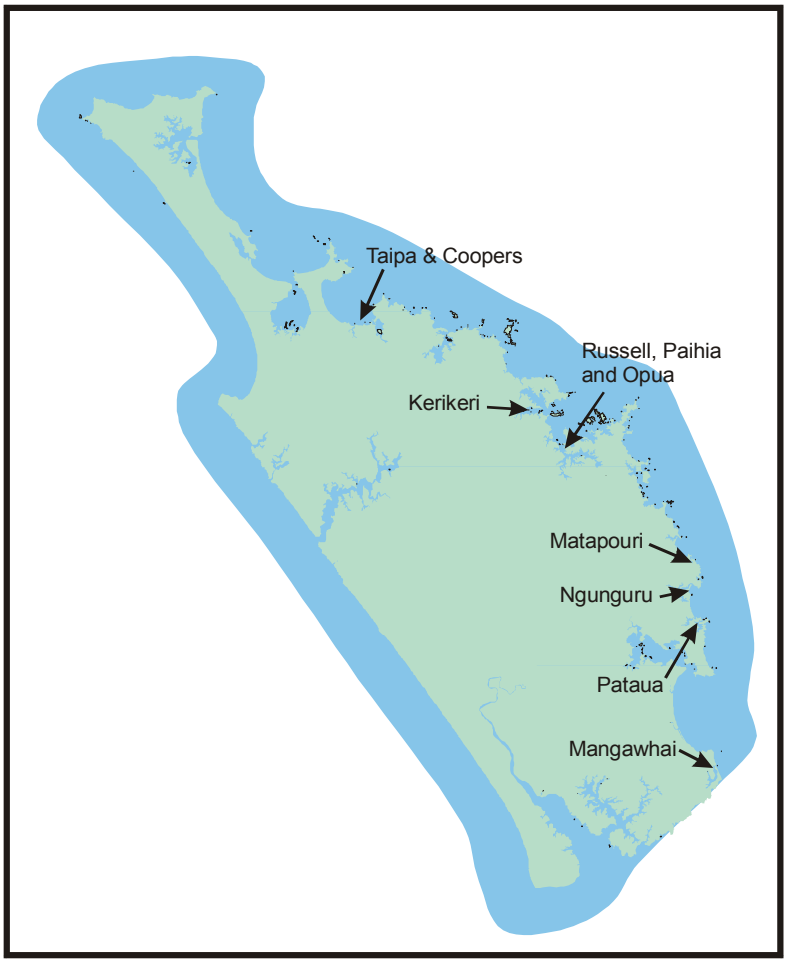


Map 17: Location of authorised Northland mooring areas.

11.6 State of Coastal Water Quality

11.6.1 Marine Bathing Water Quality

Since 1999 the Northland Regional Council has undertaken annual water quality monitoring surveys at popular bathing areas along the Northland Coast to assess the suitability of these areas for bathing. Over summer 2000/2001 several sites were surveyed at Mangawhai, Pataua, Ngunguru, Matapouri, Coopers Beach, Taipa, Opua, Russell, Paihia and Kerikeri. Whangarei Harbour and the Bay of Islands water quality are dealt with separately in this report.



Map 18: Location of the areas surveyed in 2000/2001 in terms of suitability for bathing.

The monitoring surveys involve the collection of water samples for analysis of pollution indicating bacteria. The analysis checks for levels of faecal coliform and enterococci bacteria. The results from the analysis give an indication of the level of faecal contamination from animal and sewage contamination.

A “traffic light” three-tier management framework (Table 21), based on the median level of indicator bacteria at the end of the sampling season, is used to assess the water quality of each site.

Table 21: "Traffic light" three-tier management framework for coastal water quality.

Colour	Enterococci[1]		Faecal coliform[2]	
	Number per 100 ml	Classification	Number per 100 ml	Classification
Green	Median < 35.	Probably Safe	Median < 150.	Probably Safe
Amber	Median 35<277.	Possibly Unsafe	Median 150<600.	Possibly Unsafe
Red	Median > 277.	Probably Unsafe	Median > 600.	Probably Unsafe

[1] Enterococci levels have been adopted from the Ministry for the Environment and Ministry of Health 1998 suggested marine bathing guidelines. Levels are based on not fewer than 5 samples within any 30-day period.

[2] Faecal coliform levels are taken from the Northland Regional Council *Revised Proposed Regional Coastal Plan* Contact Recreation Standard CB. Levels are based on not fewer than 5 samples within any 30-day period, where the median is <150 n/100mL and an 80%ile of <600 n/100mL.

NB: The Northland Regional Council believe that both **Faecal Coliform** and **Enterococci** are important indicators of potential water quality, and that they should be used together. A high level of **both** enterococci and faecal coliforms occurring at one site is considered more indicative of a significant water quality issue than one or the other being elevated.

The traffic light status of both bacterial indicators (Table 21) is used to assess the suitability of a site for bathing (Table 22), from which a classification of "probably safe, possibly unsafe or probably unsafe" is given. The likelihood of contracting a mild illness (i.e. gastroenteritis, skin rashes) is greatest for a site considered "probably unsafe" and least for a site considered "probably safe".

Table 22: Recommended classification in response to bacteriological levels.

"Traffic Light" Combination	Bathing Classification
FC[1] & ENT[2]	Probably Safe
FC & ENT Or FC & ENT	Possibly unsafe
FC & ENT	Possibly unsafe
FC & ENT Or FC & ENT	Possibly unsafe
FC & ENT Or FC & ENT	Probably unsafe
FC & ENT	Probably unsafe

1 FC = Faecal Coliform bacteria
2 ENT = Enterococci bacteria

What is the quality of Northland's coastal waters for bathing purposes?

- The water quality at the majority of Northland's popular bathing sites is reasonably good for bathing purposes.
- Water quality, at virtually all sites monitored, is reduced to a reasonably poor level following heavy rainfall.
- Similar levels of water quality at individual sites are observed between consecutive years.

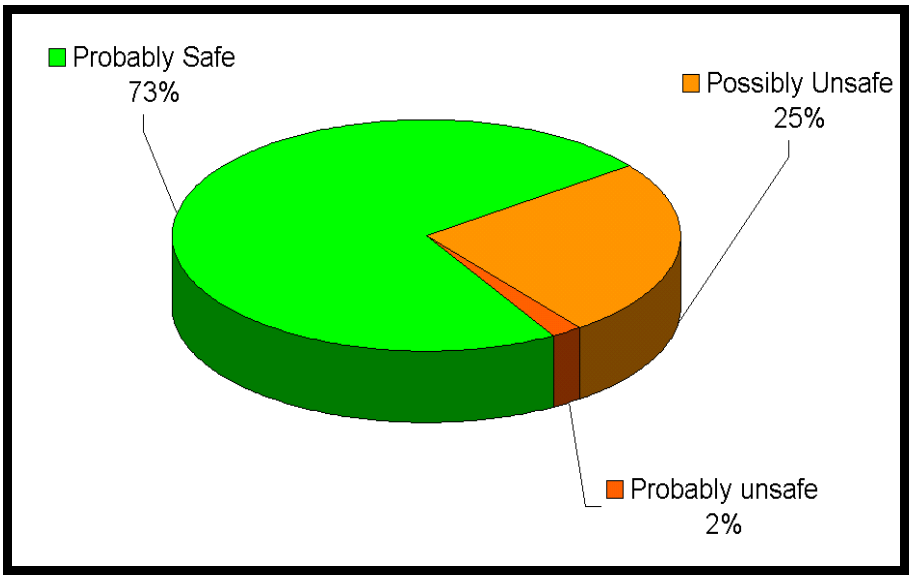


Figure 31: Proportion of sites classified as 'probably safe', 'possibly unsafe' or 'probably unsafe' for bathing purposes (From a total of 64 popular bathing sites monitored during summer 2000/2001).

Water Quality for bathing purposes is generally much higher at open coast locations than semi-enclosed locations:

- The sites in semi-enclosed locations such as estuaries or harbours had the highest proportion of possibly unsafe or probably unsafe sites.
- This is due to the effect of runoff remaining more concentrated in semi-enclosed locations than at open coast sites. This occurs due to the limited surface mixing and circulation of semi-enclosed locations.

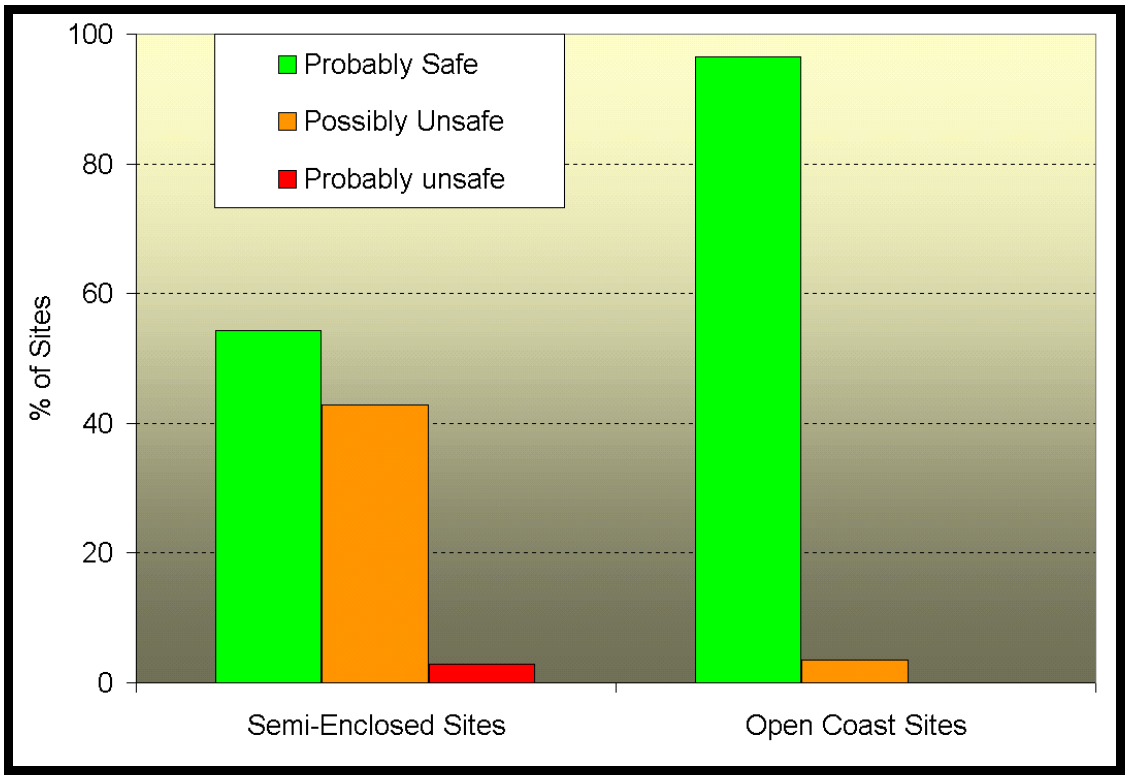


Figure 32: Proportion of open coast sites and semi-enclosed sites and their bathing classification. Note the higher proportion of semi-enclosed sites that are considered potentially unsafe for bathing.

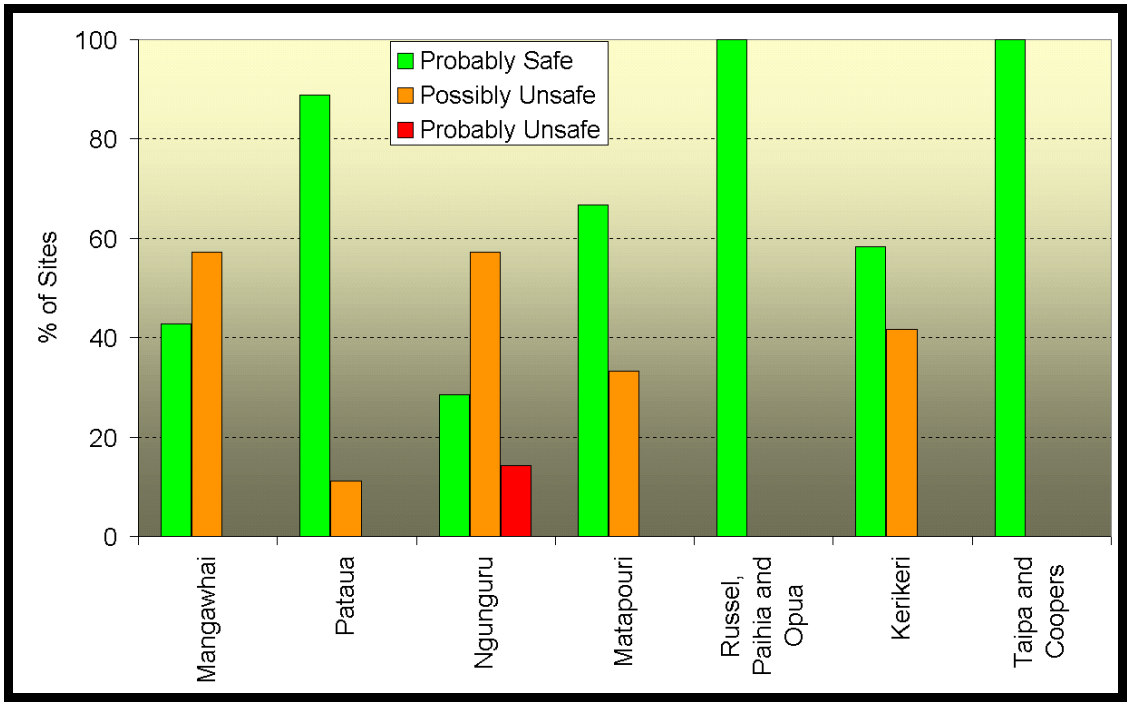


Figure 33: Traffic light classification of bathing sites as a proportion of all sites within each area for end of season median indicator bacteria results of summer 2000/2001.

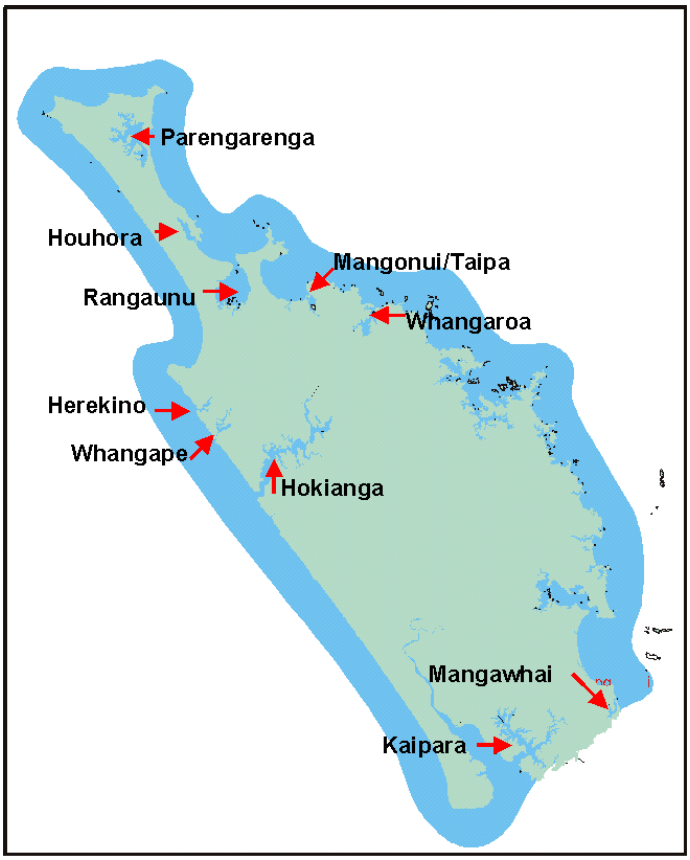
11.6.2 Harbour Water Quality

During 1998 the Northland Regional Council implemented a monitoring programme to assess the baseline nutrient and bacterial status of Northland's harbours. In 1998/1999 Parengarenga, Rangaunu, Houhora, Whangaroa, Whangape, Mangonui, Hokianga and Herekino Harbours were monitored. In 2000 the Mangawhai Harbour and two northern arms of the Kaipara Harbour (Arapaoa and Otamatea) were monitored. Whangarei Harbour and the Bay of Islands water quality are referred to later in this report.

Each harbour was sampled on an ebb tide for indicator bacteria, nutrients, ammonia and chlorophyll-a.

The indicator bacteria sampled for were faecal coliform and enterococci. These are associated with humans, mammals and birds, and the level of these bacteria in water provides an indication as to the level of contamination from animal excrement and sewage.

Phosphorus, nitrogen and ammonia play a major role in the primary production of coastal ecosystems. As well as a role in primary production, ammonia may be toxic to aquatic life in certain concentrations dependent on water temperature and pH. The measurement of these nutrients provides an insight into the impact of adjacent land use practices on harbour water quality, and the likely effect of these nutrients on harbour water quality.



Map 19: Location of harbours sampled.

Nutrients

In Table 23 a range of nutrient concentrations is given. At levels above these concentrations problematic plant growth may occur. However, many factors (e.g. light, turbidity, water temperature and attachment substrates), interact to determine if nutrient levels will result in nuisance algal growth.

Table 23: Guideline values for possible adverse effects due to nutrients. (ANZECC, 2000)

Nutrient	Form	Estuaries (g/m^3)	Coastal Waters (g/m^3)
Nitrogen	NO_3-N	0.015	0.005
Phosphorous	TP	0.03	0.025

Note: New Zealand trigger values are yet to be developed, however ANZECC (2000) suggests using the south-eastern Australia values for slightly disturbed ecosystems in the interim. Trigger values are used to assess risk of adverse effects due to nutrients, biodegradable organic matter and pH in various ecosystem types.

What were the results from the nutrient sampling?

- Seasonal variation was observed in some nutrient levels.
- Significant increases in the concentration of nitrogen occur in winter. This is probably due to the effect of increased nutrient loading associated with catchment runoff during winter.
- Phosphorous levels remain similar between seasons.
- Several sites displayed an increased concentration of ammonia in summer.
- However, in all cases the median concentrations of ammonia were below the threshold levels known to be toxic to marine organisms.

These results indicate that:

- The median nutrient levels were generally low and typical for harbour waters surrounded by catchments with modified land cover.
- Human modifications to the land are having an impact on the water quality of the harbours.
- However, the nutrient status of the harbour waters is unlikely to be problematic under most circumstances.

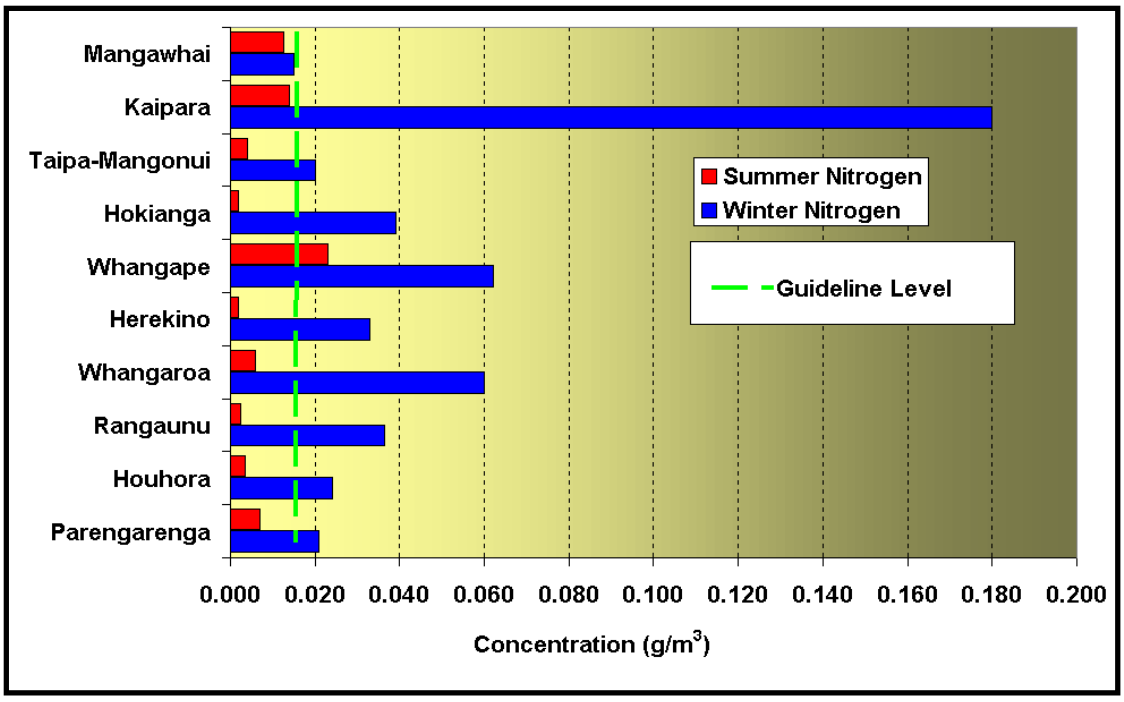


Figure 34: Median nitrogen concentration for a selection of Northland harbours for summer and winter. In winter, most harbours exceeded the guideline for problematic plant growth. Whangape Harbour exceeded the guideline in both summer and winter surveys.

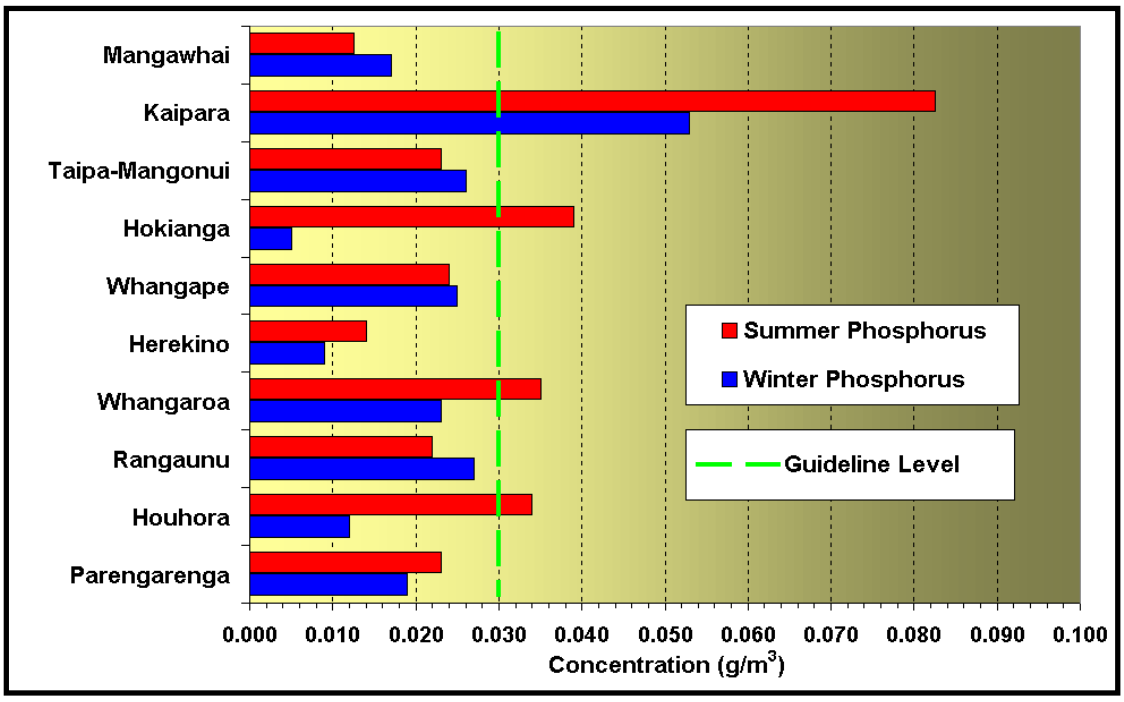


Figure 35: Median phosphorus concentrations for a selection of Northland harbours in summer and winter. Several harbours exceed the guideline level of phosphorus concentration known to result in problematic plant growth in summer. Kaipara Harbour exceeded the guideline value in both summer and winter surveys.

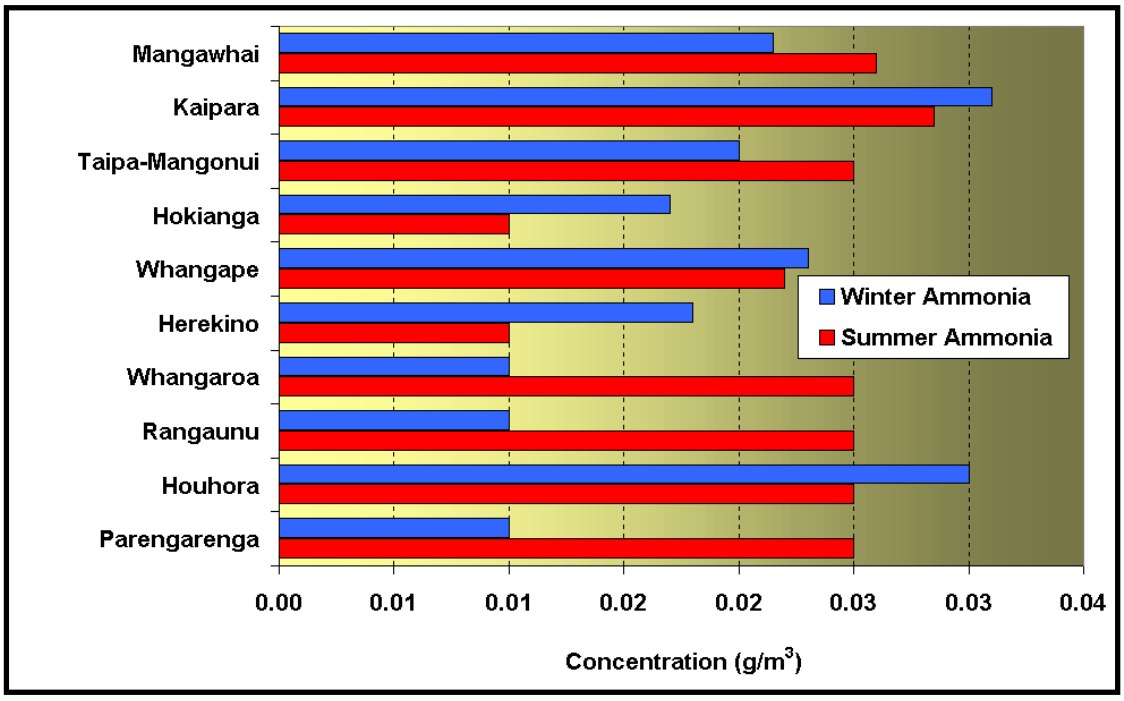


Figure 36: Median ammonia concentrations for a selection of Northland harbous in summer and winter. All concentrations were below the thresholds of ammonia known to be toxic to aquatic organisms.

Bacteria

Faecal coliform and enterococci bacteria are associated with humans, mammals and birds, and the level of these in water provides an indication to the level of contamination of a waterway from animal excrement and sewage. As to be expected the median bacterial levels were slightly elevated for most harbours. This reflects the modified land use of the catchments draining to Northland's harbours.

Levels of median faecal coliform bacteria generally increased in winter as a result of increased catchment runoff associated with rainfall. However, Mangawhai Harbour was an exception to this, with higher summer concentrations than winter. This is probably a result of the influx of summer residents and holiday makers, which overload the capacity of effluent treatment facilities (i.e. causes septic tanks to overflow).

Enterococci levels tended to increase in winter, although a number of sites had similar concentrations for both summer and winter. Species of enterococci can occur naturally through the breakdown of plant material. This may be causing the similarity in concentrations of enterococci between seasons.

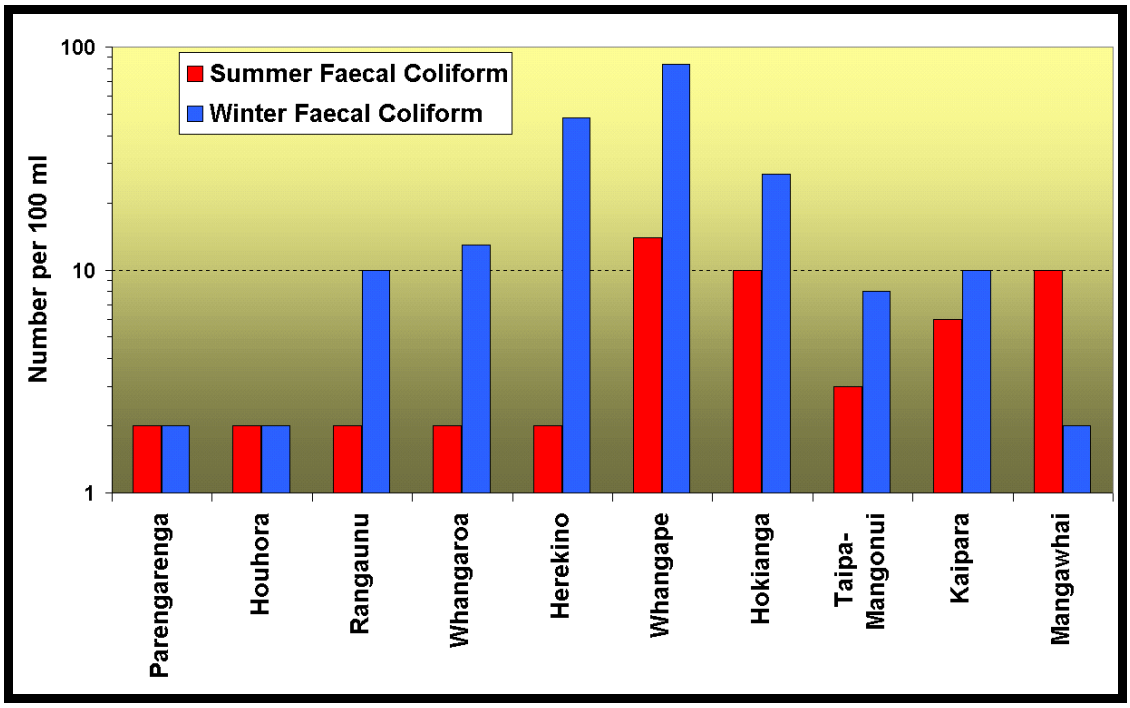


Figure 37: Median levels of indicator bacteria for summer and winter. On the basis of these results, all harbours would be considered safe for contact recreation. It should be noted that these are not nearshore samples (results may differ from bathing water quality surveys).

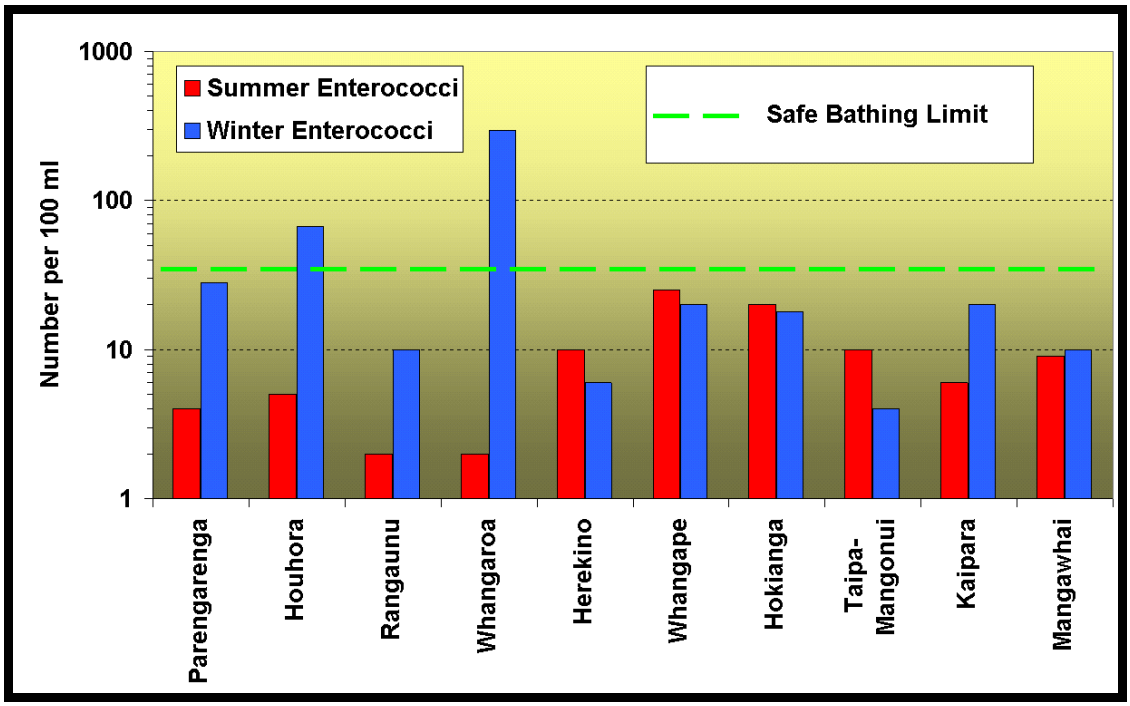


Figure 38: Median levels of indicator bacteria for summer and winter. On the basis of these results, all harbours would be considered safe for contact recreation in summer, but some would exceed the safety levels in winter. It should be noted that these are not nearshore samples (results may differ from bathing water quality surveys).

11.6.3 Whangarei Harbour

The Whangarei Harbour and catchment are the most developed of the region's twelve harbours, with urban and industrial areas covering 15% of its 300 km^2 catchment area.

Water quality in Whangarei Harbour has been regularly monitored since the beginning of 1986. The monitoring programme consists of an "Upper Harbour" boat run (15 sites between Onerahi and the Town Basin), and a "Mid to Lower Harbour" boat run (33 sites between Onerahi and Whangarei Heads). Salinity, temperature and dissolved oxygen concentration are recorded at each site and a sample is taken and tested for faecal coliform bacteria. Since 1999 analysis has also been conducted for enterococci bacteria.

Aerial view of Whangarei Harbour

From 1986 to 1998, the Upper Harbour boat run was carried out at two-weekly intervals. Since then it has been carried out at about four-weekly intervals. The mid to lower Harbour boat run has been carried out at about eight-weekly intervals since September 1989. In addition, since 1999, 20 Whangarei Harbour coastal settlement sites have been monitored over the summer period for bathing water quality.

Significant changes at most sites in the Upper Harbour have been detected during the course of this monitoring. The most dramatic change detected in water quality occurred between 1989 and 1990 at sampling sites in the vicinity of the Upper Harbour's confluence with Limeburners Creek **(see case study: Improvement in Whangarei Harbour water quality)**. During this period, the Whangarei Main Wastewater Treatment Plant, which discharges to Limeburners creek, was upgraded. This resulted in up to 100-fold reductions in the annual median faecal coliform concentrations at those sampling sites.

Significant improvements in water quality have continued to be recorded between 1995-2001 in sampling sites near the confluence of Limeburners Creek and the Upper Harbour. All other Upper Harbour sites have shown no change over a similar period.

Historically, monitoring has shown that the water quality in the Upper Whangarei Harbour has generally been unsuitable for swimming, whereas water quality in the mid to lower Whangarei Harbour has been generally suitable for swimming. This was again the case during 2000/01 (as shown in Figure 39). However, almost all samples (especially those collected near the Whangarei Harbour settlement sites such as Taurikura, Parua Bay, McLeod Bay and Urquart's Bay) show elevated levels of bacteria if collected on days immediately following high rainfall events.

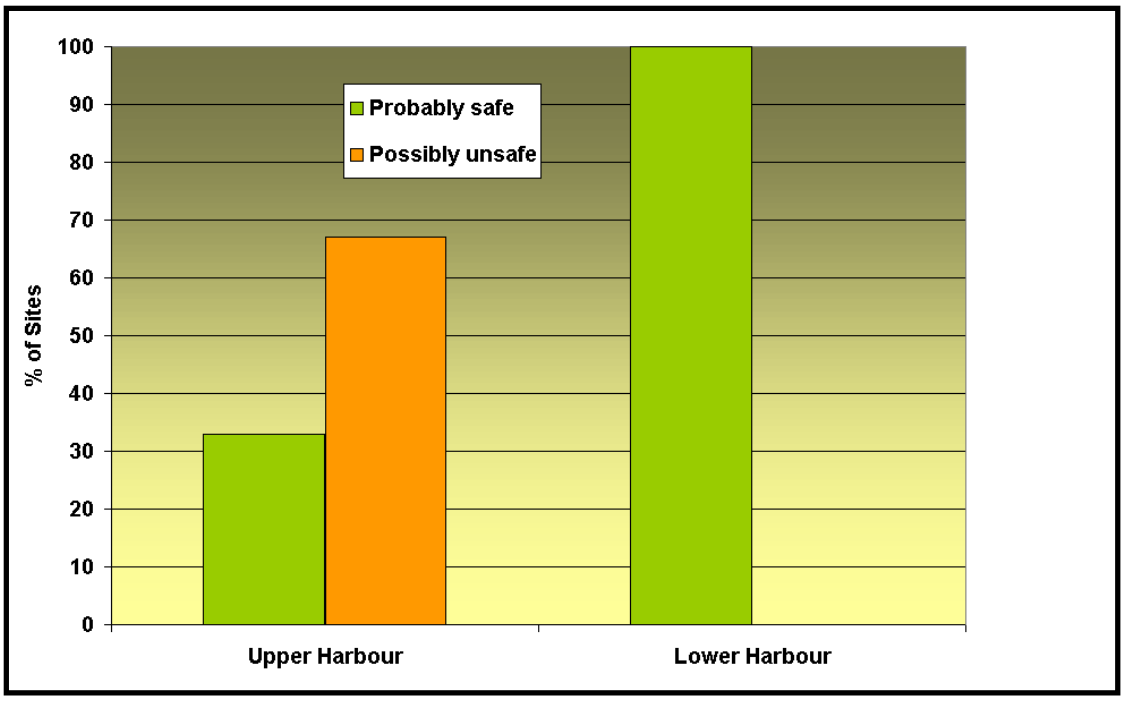


Figure 39: Proportion of Whangarei Harbour sites classified as probably safe or possibly unsafe

11.6.4 Bay of Islands

The Bay of Islands harbour is a large coastal embayment consisting of four major estuarine inlets, Te Puna, Kerikeri, Kawakawa and Waikare. The harbour covers an area of some 500 km^2, with an 18km wide harbour entrance opening to the South Pacific ocean.

Historically, a comprehensive 'State of the Environment' water quality monitoring programme was undertaken within the Bay of Islands between 1988-90, in order to provide a classification of these waters.

Recent monitoring of the marine water quality within the Bay of Islands has concentrated across the summer period, with focus on popular bathing areas and those areas used by boats for mooring. In all, 28 sites are monitored over the summer bathing period in the Kerikeri and Waipapa Rivers, Kerikeri and Te Puna Inlets, and near the settlements of Russell, Paihia and Opua.

Figure 40 shows the percentage of bathing sites in each classification for the 1999/2000 and 2000/01 bathing seasons combined.

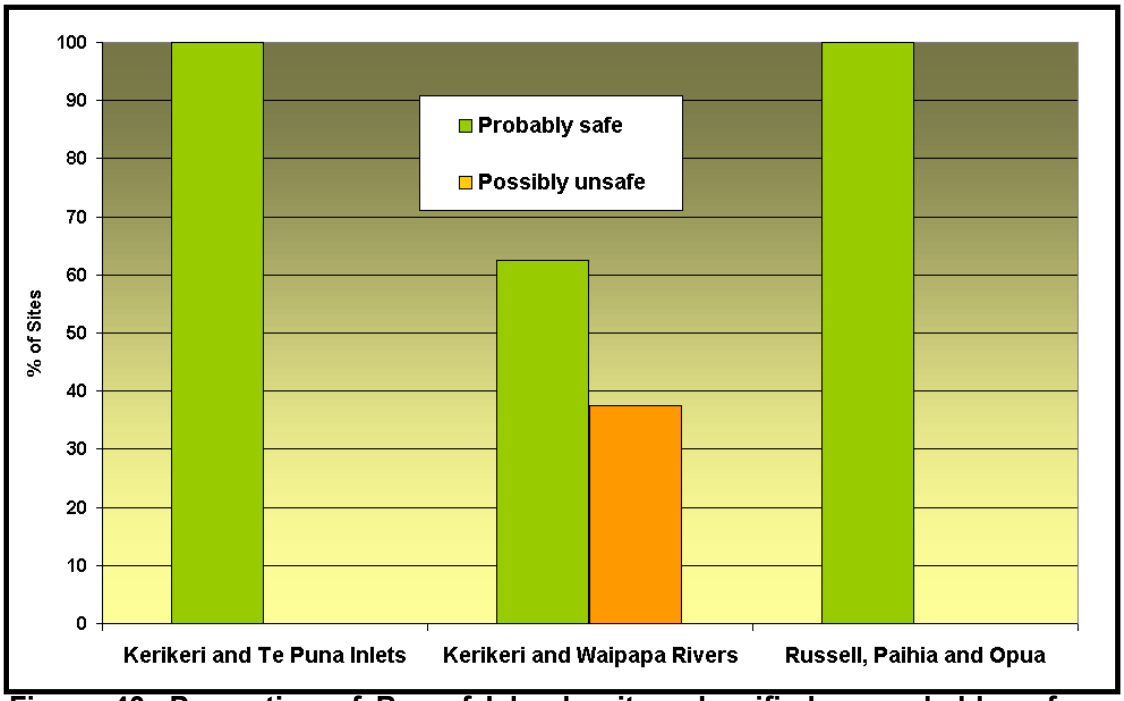


Figure 40: Proportion of Bay of Islands sites classified as probably safe or possibly unsafe

All sites sampled around the Russell, Paihia and Opua foreshore were considered safe for bathing. A site adjacent to the Paihia wharf has some elevated levels of contamination, but not high enough to be classed as 'possibly unsafe'. Sites sampled within the Kerikeri and Te Puna Inlet's were also considered safe for bathing.

The two upper most sites in the upper sections of the Kerikeri River were considered 'possibly unsafe' for bathing, as both had both elevated faecal coliform and enterococci bacteria medians across the bathing season. The two upper most sites,

in the upper section of the Waipapa River, showed elevated enterococci levels and could also be potentially unsafe for bathing.

11.7 Other Water Quality

11.7.1 Water quality for shellfish gathering

Many shellfish feed by filtering hundreds of litres of water per day, removing small particles of food (plankton and detritus) from the water. Due to their method of feeding, the shellfish also tend to accumulate pathogens (i.e. bacteria and viruses) that are present in the water. People who eat contaminated shellfish (i.e. shellfish that have accumulated pathogens) may then become sick.

The Northland Regional Council does not have a regional bacteria water quality monitoring programme for recreational shellfish gathering. Nevertheless, the results from the beach bathing surveys and harbour water quality surveys provides an insight into the state of Northland's coastal water for shellfish gathering.

Faecal coliform bacteria correlates well with the presence of pathogens in water. Therefore this indicator is used to assess the safety status of an area for shellfish gathering. For safe shellfish gathering, guidelines require that the median faecal coliform content of water samples taken over a shellfish-gathering season are below 14 per 100 ml and that not more that ten percent of the water samples have a count in excess of 43 per 100 ml.

THE FOLLOWING RESULTS ARE **INDICATIVE ONLY**

- The faecal coliform indicator does not account for marine biotoxins or some viruses.
- A sanitary survey of these areas has not been done to identify that there are no point sources of pollution of concern to public health.
- The following data was not collected over a specific shellfish-gathering season or at specific gathering locations.

General trends (from harbour survey data)

- The winter water quality at almost all harbours surveyed was at a level marginally worst than the guidelines for recreational shellfish gathering.
- The summer water quality was generally better than winter, although the water quality at some harbours was still considered unsafe for shellfish gathering (Figure 41).

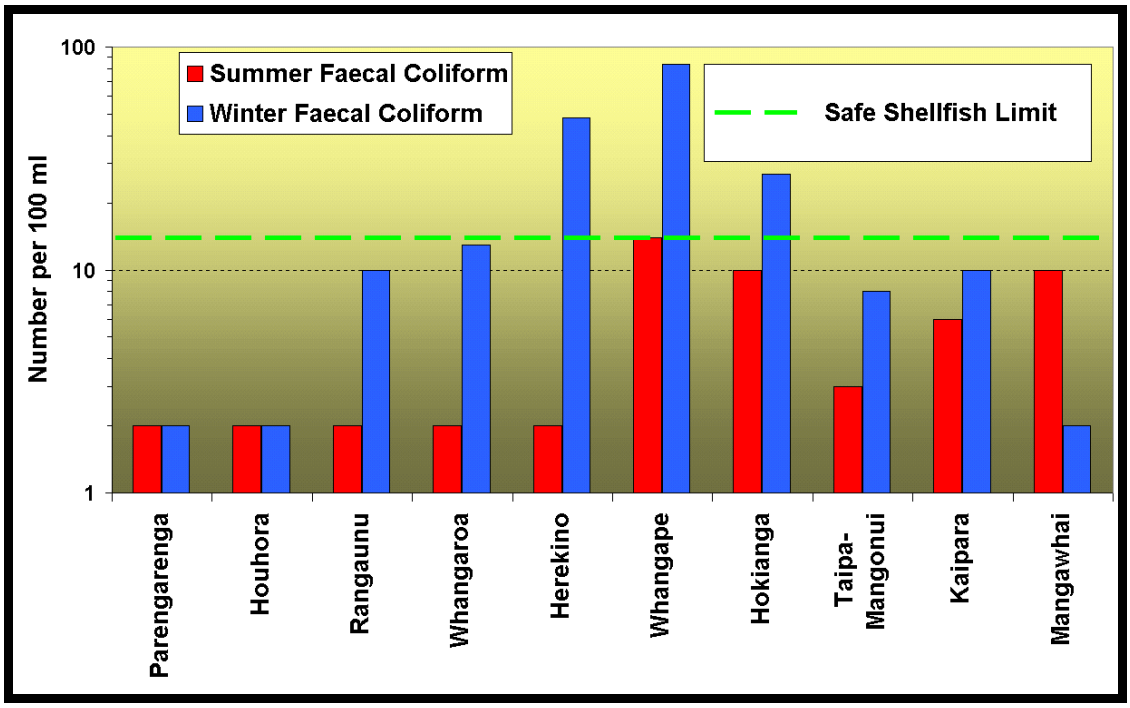


Figure 41: Median faecal coliform concentrations at a selection of Northland Harbours. The summer values are all within the bacteria limits for "safe" shellfish gathering. However, several of the harbours exceed the bacteria limits for "safe" shellfish gathering in winter.

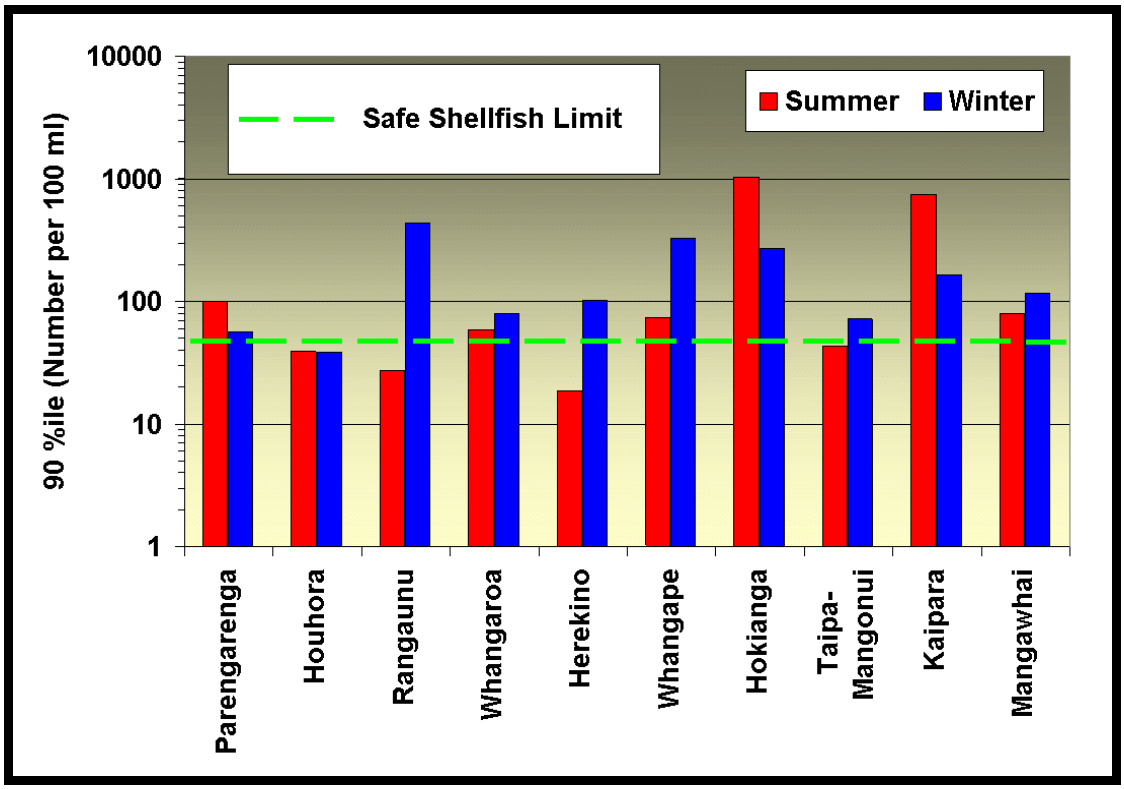


Figure 42: 90th percentile faecal coliform concentrations at a selection of Northland Harbours. In summer approximately two thirds of the harbours surveyed had bacteria levels that exceeded the standards for "safe" shellfish

gathering. In winter almost all harbours exceeded the standards for "safe" shellfish gathering.

11.7.2 Heavy Metals and Sediments

Urban stormwater runoff (carrying contaminants from roads) and boat maintenance facilities are the greatest potential sources of heavy metals to Northland's coastal area. Investigations of commercial boat maintenance facilities in both the Whangarei Harbour and the Bay of Islands have shown marked contamination of sediments within the immediate coastal marine area. In the Whangarei Harbour, sediment levels of copper, lead, mercury, zinc and some hydrocarbon species were found to exceed those known to adversely affect aquatic life. Sediments around boatyards in the Bay of Islands also contain high levels of copper, lead, mercury and zinc.

Boat maintenance facilities can act as 'hotspots' of heavy metal contamination

Some major commercial boat maintenance facilities have various degrees of treatment systems in place, however many smaller boat maintenance facilities do not.

As well as commercial facilities there are also known to be approximately 35 public and private grids which are used for boat maintenance work. Sediment quality has been assessed around several of these grids; Whangaroa Bay, Tutukaka Marina, Doves Bay (Bay of Islands), Mill Bay (Mangonui) and Kissing Point (Whangarei Harbour). All show some degree of sediment contamination by heavy metals and in the case of the Doves Bay grid shellfish in the adjacent area are also contaminated.

Some beaches around Northland's coast are also known to be used for hauling out to renew antifouling.

A study of Whangarei Harbour in the mid 1980s demonstrated elevated concentrations of heavy metals in the upper harbour with decreasing concentration out to the harbour entrance. Several recent investigations have demonstrated that high levels of heavy metals exist in the vicinity of some large stormwater and industrial discharges (when compared to background sites).

11.8 Response to Coastal Water Quality Issues

11.8.1 Northland Regional Council

Policies and Plans

The Northland Regional Council is required to prepare a **Regional Policy Statement for Northland.** This document provides an overview of resource management issues in Northland, including those in the coastal marine area.

The Regional Policy Statement also defines objectives for the management of the coastal resource. These objectives seek to maintain or enhance water quality for the purposes of aquatic ecosystems, contact recreation, and cultural and aesthetic purposes for estuaries and inner harbours and for cultural purposes and its natural state for open coastal waters.

To achieve this objective the Northland Regional Council has adopted a suite of policy-based rules that are documented in regional plans.

The (**Revised Proposed) Regional Coastal Plan for Northland** includes rules that control the extent and type of discharges to the coastal marine area. These rules exist to help minimise the potentially adverse environmental affects of discharges on coastal water quality. This plan also sets out "Management Areas", in an effort to avoid conflict between uses in the coastal environment. The "Management Areas" of the coast are divided into five categories "protection, conservation, marine farming, moorings or port facilities", ensuring appropriate use of the coastal resource.

The **Revised Proposed Regional Water and Soil Plan for Northland** and the **Regional Air Plan for Northland** includes rules that help minimise potentially adverse affects on coastal water quality resulting from cross boundary issues, such as subdivisions, earthworks and discharges to air in the vicinity of the coastal marine area.

Monitoring

Most industrial discharges, municipal waste discharges and point source discharges to the coastal marine area require **resource consent** from the Northland Regional Council. Attached to the resource consent are **conditions**. These conditions may include provisions for effective waste treatment systems, management plans for the use of treatment systems, limits for the concentration of contaminants that are allowed to be discharged and monitoring programmes that assess the effect of the discharges on the environment.

State of the environment monitoring programmes are implemented to measure the quality of Northland's coastal waters for Northland's resource users and to assess the effectiveness of policy. Several recently implemented state of the environment monitoring programmes include the study of harbour water quality and the suitability of water quality for bathing purposes. Future state of the environment monitoring programmes may include investigations into the level of heavy metal contamination and rates of sedimentation. Targeted monitoring of the water quality of shellfish gathering areas may also be included.

Most responses for improvements to coastal water quality have evolved as a result of policy and plans. Examples of several policy-based responses that may improve coastal water quality are listed below:

- Preference for discharges to land rather than the coastal marine area.
- Upgrading of wastewater treatment and collection facilities.
- Provision of sewage pump out facilities at marinas.
- The recent introduction of marine pollution regulations making it illegal to discharge untreated sewage into shallow coastal waters (< 5 m deep) in the vicinity of the shore (< 500 m from shore) or marine farms (< 500 m from marine farms).

11.9 Case study: Improvement in Whangarei Harbour water quality

A case study example of how a response to environmental pressure has improved the state of Whangarei Harbour's water quality.

Whangarei Harbour is one of Northland's most extensively modified harbours. Near the shores of the harbour there is a shipping port, oil refinery, and Northland's largest urban and industrial centre, Whangarei City. With such extensive modifications to the harbour margins and catchment, the state of the harbour's water quality could be expected to be in decline.

The Whangarei Main Wastewater Treatment Plant (operated by the Whangarei District Council), which receives and processes the majority of Whangarei's wastewater, is an example of a pressure on the state of Whangarei Harbour's water quality.

The raw wastewater receives treatment at the plant and is then discharged to a wetland for further biological treatment. After filtering through the wetland the treated effluent is then discharged to Limeburners Creek, an upper tributary of Whangarei Harbour.

The wastewater treatment facilities of the plant were upgraded between 1989 – 1990 to improve the quality of the discharged wastewater. Improvements in the water quality of the harbour waters in the vicinity of Limeburners Creek were soon noticeable shortly after the upgrade of the treatment facilities.

In some cases indicator bacteria levels (faecal coliform) of the harbour waters were reduced by up to 100 fold. Since the upgrade of the plant the annual median concentrations of indicator bacteria have generally remained well below the higher levels seen prior to 1990.

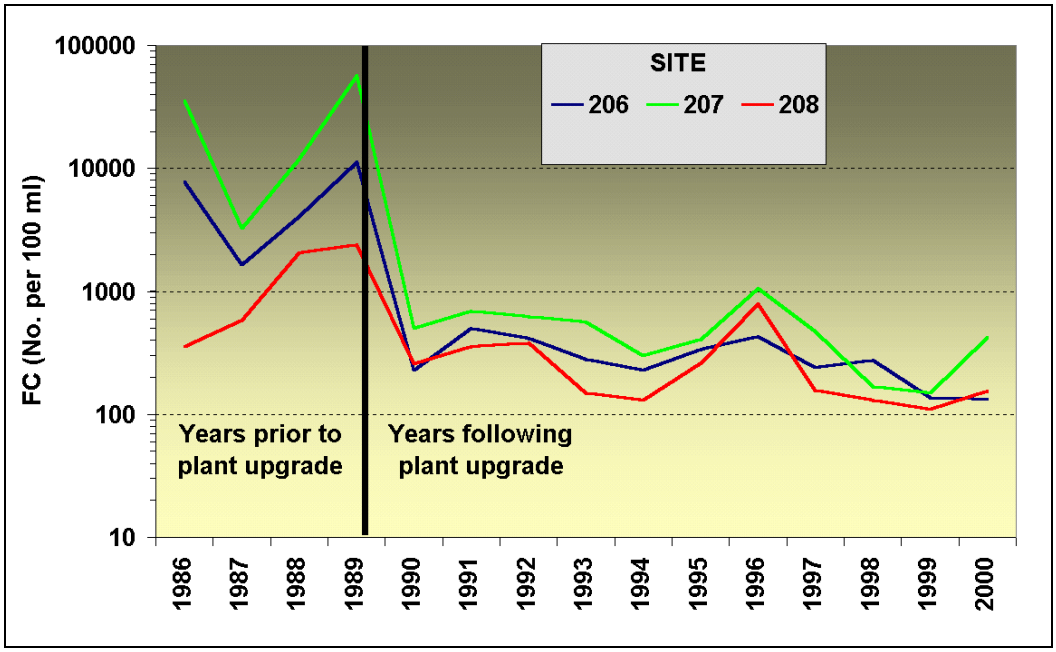


Figure 43: Faecal coliform bacteria level at several Whangarei Harbour monitoring sites in the vicinity of Limeburners Creek. The reduction in the level of indicator bacteria is obvious following the upgrade of the wastewater treatment plant in 1989.