Chapter 10: Coastal

CONTENTS

Coastal

Briefly ....

The various activities and values that take place within Marlborough's coastal environment are not always compatible and can therefore create pressures, and even conflict, when they occur in the same location or near to each other. The Marlborough Sounds in particular, are a major focus for many uses and activities because of the sheltered nature of this extensive waterway. This means that it is also the place where the issues about how activities are provided for and coastal space is allocated, are apparent. Although the east Marlborough coast is significant for a variety of reasons, less use is made of this coastal area because it is not as accessible for people and is much more exposed.

ISSUES

- Discharges from a variety of sources affecting water quality.
- Making sure the community gets access to and within coastal areas.
- Aquaculture in the Marlborough Sounds.
- Ships travelling at speed or generating large waves.

PRESENT AND FUTURE MANAGEMENT

Coastal water quality

We generally enjoy good water quality in Marlborough's coastal areas, however a number of activities have the potential to adversely affect coastal marine water quality. Point source, discharges, contaminated run-off from land, stormwater, discharges from vessels and boat maintenance activities, can all affect water quality.

The 1994 State of the Environment Report for Marlborough identified 24 resource consents operating for the discharge of waste to coastal water (not including the discharge of stormwater or from septic tank systems). Today, there are just 6 consented discharges, with land based disposal being a preferred option in many cases.

Discharges of human sewage from vessels are controlled by central government marine pollution regulations. These require the discharge of human sewage to be further than 500 metres from the shore and marine farms and 200 metres in the case of a marine reserve. The Council's monitoring of coastal waters and shellfish at a number of sites shows an increase in bacterial contamination in coastal waters during summer months.

Water quality is monitored at 20 coastal sites for compliance with national bathing water standards. An overview of the monitoring from 1996 to 2008 shows that bathing water quality across Marlborough has not changed much since regular sampling began in 1996. Two open coastal water sites (Whites Bay and Marfells Beach) show 100% compliance for nearly the entire period from 1996 to 2008, with the exception of one non-compliant sample at Whites Bay in 2005.

In contrast, the Wairau Diversion and Wairau Bar sites are influenced by water quality from the Wairau River. Water quality at the Wairau Diversion has shown an improvement in the last 5 years but at the Wairau Bar site water quality has shown a slight deterioration in recent years.

Bathing water quality at the Picton and Waikawa sites shows very similar results for the past 10 years. Neither the percentage compliance or median enterococci numbers, show no significant trends for any of the sites for the sampling time period, however the maximum enterococci count at Picton Foreshore has been decreasing year by year.

Water quality in the inner Queen Charlotte Sound shows no significant trends since 2000, except for Momorangi, which has shown a steady decline in bathing water quality in recent years. Momorangi Bay has dropped from being 80-90% compliant from 2000 to 2003 with bathing water standards, to being just 62% compliant in 2007/2008. The cause for this deterioration has been investigated by the Council but no conclusive reasons have yet been found.

Shellfish sampling began in 1999 and currently there are 14 sites routinely monitored for compliance with national shellfish standards. Generally the results of monitoring shellfish water quality show for Queen Charlotte Sound, water quality is good enough to allow the recreational gathering of shellfish. However, monitoring results of shellfish flesh often indicate shellfish is unsafe for human consumption. None of the sites were 100% compliant with national standards and one site in Double Cove only showed compliance with the standards for only 23% of the time from 1999 to 2008. On average, compliance with the shellfish quality standard for Queen Charlotte Sound for the sampling period 1999 to 2008, was just 62%.

Responding to oil spills

The Council has responded to 70 oil spills since 2004, most of which have been diesel spills of a relatively small size. The Council has developed an Oil Spill Contingency Plan to make sure there is a planned and coordinated response if a spill does occur. Field exercises are carried out twice a year to make sure that people are prepared to respond to oil spills.

Aquaculture

There are 522 operating or consented marine farms in the Marlborough Sounds, covering a total of just over 3000 hectares of coastal space. Most farms are located in Pelorus Sound and the outer Marlborough Sounds, with some also in Croisilles Harbour, Port Underwood and outer Queen Charlotte Sound. Green lipped mussels are the main shellfish species grown, although some alternative shellfish and fish species (e.g. päua, oysters, salmon, kingfish) are also farmed.

Marine farming activity raises a number of issues for managing the coastal environment. These include occupying public space, nutrient availability, waste generated from farms, visual impacts, transport issues, recreational and navigation concerns, effects on the benthic environment etc. The Council dealt with these issues for a significant number of resource consent applications for marine farms made to the Council in the mid to late 1990s.

A moratorium issued by central government in 2002, prohibited all new applications for resource consents until new aquaculture legislation was developed. Under the legislative changes eventually made in 2005, no new marine farms were allowed unless they had been specifically provided for in aquaculture management areas (AMA's). To date however, other then the AMA's created for existing marine farms, no new AMA's have been created in Marlborough.

Shipping activity in the Marlborough Sounds

The start of fast ferries operating in the Marlborough Sounds in late 1994 saw a huge reaction from the community. The wake of the ferries was having a significant impact on people's lives and on the Sounds environment. Soon after the fast ferries started operating, the Council began monitoring to see what was happening to beaches and marine ecology along the ferry route. The Council then started carrying out other investigations, including a social impact assessment to find out how people were being affected by the fast ferries. This work eventually saw a bylaw introduced in late 2000 that slowed the fast ferries to around 18 knots - more or less the speed of conventional ferries operating in the mid 1990s.

The Council has continued to present day with its monitoring of beach profiles and the benthic environment. The beach profile surveys were extended to the Grove Arm when it was reported by some residents that ship wake was affecting beaches in that part of Queen Charlotte Sound. Since the introduction of the bylaw, studies have shown there to be an improvement in the benthic environment and in terms of the degree to which people are affected by the operation of the ferries.

Changes to the Marlborough Sounds Resource Management Plan have also been made to deal with wake issues. The changes, which finally became operative in 2008, provide for rules to limit energy produced for ship wake, identify the ferry route as a 'National Transportation Route', include ongoing monitoring, a partnership with Te Atiawa on shipping issues and the establishment of an advisory group to deal with shipping activities. The use of a rule to limit the amount of energy able to be produced from a ship's wake is an important aspect of the overall framework. The limit is based on environmental effects being experienced with the conventional ships operating before the introduction of the ferry 'Aratere' in 1999.

Coastal

In depth ....

The coastal marine area is defined by the Resource Management Act as the area from mean high water springs to the outer limits of the territorial sea (12 nautical mile limit) and includes the water, the foreshore, the seabed, and the airspace above the water. The Act restricts how people can use this area. Generally this means that no person can use the coastal marine area in any way, unless it is allowed for by a rule in a regional coastal plan or by a resource consent. This includes where people may want to reclaim land from the sea, build jetties or just swim.

Both the Council and the Minister of Conservation are responsible for managing Marlborough's coastal marine area. The Minister is responsible for approving regional coastal plans and making decisions on resource consent applications for restricted coastal activities. The Minister also administers the New Zealand Coastal Policy Statement, which has an important influence on how Marlborough's coastal areas are managed.

The Council's role in the coastal marine area follows from the way in which people's use of the coastal marine area is restricted under the Act. The Council allocates or allows people the right to use public resources for private benefit. The Council also has the role of promoting the sustainable management of the natural and physical resources of the coastal marine area. This carries the onus of ensuring that these resources and the qualities associated with them remain available for the use, enjoyment and benefit of future generations.

PRESSURES ON THE COASTAL ENVIRONMENT

Everybody has different expectations about being able to use public resources. Many pressures on the coastal environment arise therefore because people try to use the same areas of this public resource, often at the same time.

The Marlborough Sounds are obviously a major focus for many uses and activities given the extensive nature of this sheltered waterway. This means that it is also the place where the issues about how activities are provided for and coastal space is allocated, are apparent. Although the east Marlborough coast is significant for a variety of reasons, there is less use made of this coastal area as it is much less accessible for people and is also an open coastline exposed to a variety of weather conditions. The focus therefore in this chapter is heavily on the Marlborough Sounds because of its accessibility and significance for a wide range of uses and values.

People value and/or use the natural resources of the Marlborough Sounds for many reasons including:

- as sites or areas of cultural significance, e.g. waahi tapu;
- as a source of kaimoana;
- as areas of indigenous vegetation, fauna or habitats;
- for recreation - both passive and active;
- for commercial production - through marine farming and commercial fishing;
- as a means of transport and travel; and
- for enjoyment of landscapes and seascapes.

Because the Sounds environment is one of great diversity, there are many conflicting expectations in how it should be used. There are many uses that simply use the coastal marine area as it is and are temporary or non-exclusive. General boating, swimming, boat anchoring overnight all fall into this category. Other uses are more interactive, and while still being temporary and/or non-exclusive, can have significant impacts. The impacts of wake from large or fast ships and discharges from boats are uses that fall into this category. The Sounds also has a large number of physical structures or occupations that are permanent, and to a considerable extent, are exclusive. There are some 3,000 moorings and nearly 1,600 jetties, slipways, boatsheds and other structures (retaining walls, pipelines, sub-aqueous cables, boat ramps etc) dotted around the Sounds. This is in addition to the presence of 522 marine farms and substantial port and marina infrastructure at Picton/Waikawa, Shakespeare Bay and Havelock.

THE COAST IS A PUBLIC RESOURCE

The Foreshore and Seabed Act 2004 provides for Crown ownership of the public foreshore and seabed, on behalf of all New Zealanders. The Act is based on four main principles:

- **Guaranteeing public access, now and in the future.**
- **Regulating the rights and interests of all New Zealanders.**
- **Protecting existing customary rights and interests.**
- **Ensuring certainty in respect of rights and interests in the public foreshore and seabed.**

There is an expectation by many people that the resources of the Marlborough Sounds will be used and or developed. This is enabling for the community in that they are able to provide for their social, economic and cultural wellbeing. However, it is also important that the uses and forms of development appropriate for the Sounds are identified so that adverse effects and conflicts between users are minimised and that efficient and beneficial use occurs.

With increasing use of coastal areas for both recreational and commercial pursuits, it is likely that the following pressures may become more significant in the coming years. Many issues facing coastal waters also come directly from activities occurring on land.

Water quality can be affected by discharges

While water quality in Marlborough's coastal areas is generally good, a number of activities have the potential to affect this. Contaminated coastal water can in turn, adversely affect public health, visual aesthetics, coastal ecosystems, iwi values, and industries dependent on uncontaminated water (including tourism and aquaculture).

Point source discharges

Point source discharges are those that involve the discharge of contaminants into the environment at a discrete point, such as a pipe or an outfall. Discharges directly into water, as opposed to into or onto land, have greater potential to affect the quality of water in coastal areas.

The number of point source discharges into coastal water, with the exception of stormwater discharges, has been reducing in Marlborough since 1995. The 1994 State of the Environment Report for Marlborough identified 24 resource consents operating for the discharge of waste to coastal water. This did not include discharge of stormwater to the coast or individual discharges from small septic tank systems. Most discharges were either from community sewerage schemes (e.g. Picton and Waikawa) or from the many resorts or camping grounds around the Sounds.

The current much lower number of discharge permits, probably reflects the direction of existing policy to reduce the amount and concentration of contaminants, as well as to improve coastal water quality. As in the case for freshwater resources, it is also important to acknowledge that Marlborough's climate makes land disposal a viable option, especially with low rainfall and high evapo-transpiration over summer months.

Treated sewage from most of Marlborough's larger communities and several resorts is still discharged into freshwater or coastal water. Table 10.1 identifies those discharges into coastal water. Although these discharges are authorised by resource consent, (which require the monitoring of effluent quality and the effect of the discharges on the surrounding environment), this may not continue in the future. The current review of the Marlborough Regional Policy Statement will provide the community with the opportunity to reconsider the desirability of continuing to discharge contaminants into water. However, it is important to recognise that most of the discharges in Table 10.1 service large communities, and are essential for the ongoing social and economic wellbeing, and health, of those communities. It is simply not possible or desirable to stop these discharges over-night.

If Marlborough's population and industries continue to grow, this could result in a need for more point source discharges, either for residential, commercial or industrial development. In cases where small Sounds communities have established, it may not be sustainable to rely on on-site disposal of domestic wastewater. This could see the development of community sewerage schemes with the discharge of treated effluent into coastal water being an option to be considered.

Urban stormwater discharges

As described in the Freshwater chapter of this report, Marlborough's urban areas generate stormwater from rainfall running off buildings, industrial and commercial yards, car parks, roads etc. This stormwater has the potential to flood properties and infrastructure, so stormwater services have been (and continue to be) provided to collect the stormwater, and carry it to the nearest appropriate disposal point. In Picton and Waikawa, stormwater is discharged to the Waitohi Stream, Waikawa Stream or into coastal waters. In other townships stormwater is discharged into rivers or streams.

Urban stormwater picks up contaminants as its runs over hard surfaces. Contaminants can include sediment, solids, organic matter, nutrients, heavy metals, petroleum product residues and bacteria. Stormwater receives little or no treatment prior to being discharged, and monitoring of coastal water quality has shown there are times when stormwater discharges are degrading water quality. This often happens in times of high rainfall when contaminants from the land are washed into the stormwater system.

TABLE 10.1: POINT SOURCE DISCHARGES INTO COASTAL WATER IN MARLBOROUGH

Discharge	Receiving Environment
Havelock municipal sewage	Upper Pelorus Sound
Portage Resort Hotel	Kenepuru Sound
Picton/Waikawa municipal sewage	Queen Charlotte Sound
Furneaux Lodge	Endeavour Inlet
Blenheim, Woodbourne and Renwick municipal sewage	Lower Opawa River
Spring Creek municipal sewage	Lower Wairau River

Stormwater can also pick up sewage through cross connections between sewerage pipes and stormwater pipes, which has been a problem in Picton. This also causes periodic contamination of coastal water during rainfall events.

Managing non-point source discharges from land use activities

Most non-point source discharges occur through run-off where rain water picks up contaminants from the land. This means that non-point source discharges occur as a consequence of particular land use activities. Discharges of this type are more difficult to deal with as there is no particular point, such as an outfall, that treatment or management can be applied to.

In terms of sources of non-point source contamination adjacent to coastal areas in Marlborough, the two main types are from failing on-site wastewater management systems and from land disturbance activities.

- On-site wastewater management systems use the soil to treat domestic wastewater. A problem can occur however, if the rate of discharge is greater than the ability of the soil to assimilate the wastewater. The domestic wastewater will break out onto the ground surface and if this happens on a slope, then the wastewater will make its way downslope and could enter a stream or coastal water. (More on this issue can be found in the Land' chapter.)

  In the Marlborough Sounds, failing on-site wastewater management systems are suspected to contribute to water quality issues at some locations, usually where there is a dense concentration of residential properties.

- Activities like excavation, cropping and forest harvesting that disturb land surface, can expose soils to the elements and result in sediment laden water running into the sea during and after rainfall events. This can then affect the clarity and turbidity of water and smother aquatic or marine flora and fauna. The Council has been looking at some instances where there is the potential for forestry harvesting to smother aquatic life - see the box 'Forest harvesting in the Marlborough Sounds'.

Although not common in Marlborough's coastal environment, grazing stock results in faeces and urine being discharged onto the ground surface. Along with other inputs applied to pasture as part of normal farming operations, such as fertiliser and lime, run-off during and after rainfall events can pick up this material, resulting in the input of nutrients and bacteria into nearby water bodies.

Discharges from vessels

The Marlborough Sounds is a playground for many Marlborough residents and holiday makers. Much of this recreational activity is water based and relies upon the use of various watercraft. These range in size from kayaks and dinghies right up to cruise ships. The larger vessels, especially those that have live on facilities, including toilets, have holding tanks for human sewage and other wastewater.

Discharges from vessels are controlled by national regulations (the Resource Management [Marine Pollution] Regulations 1998). These allow the discharge of human sewage into the coastal marine area provided it is not discharged within set distances of certain features, including the coast (500 metres), marine farms (500 metres) and marine reserves (200 metres) (shown in red in Figure 10.1). There are partial exemptions for these setbacks where vessels have specified treatment systems.

The Council's monitoring of coastal waters and shellfish indicate that there is an increase in bacterial contamination in coastal waters over the summer months. This could indicate that holding tanks are being emptied closer to the shore than the required 500 metres. There have also been several occasions where vessels have been caught discharging within 500 metres from the shore.

FOREST HARVESTING IN THE MARLBOROUGH SOUNDS

The Council has previously identified sedimentation arising from harvesting of forestry, as one of the potential risks to the Marlborough Sounds' environment, particularly to water quality - both fresh and coastal. Siltation has the potential to degrade water quality and to impact detrimentally on aquatic life. Whilst there was a general body of science around the effects of siltation, the Council sought some specific information about the Sounds' situation, so an understanding of local circumstances could be achieved.

Three areas in Tory Channel became the focus for a study. The Hitaua Bay catchment had, at the time of the study, been recently logged and the adjacent marine environment supported a variety of ecologically important habitats and species. Deep Bay was due to be logged and supported species and habitats that were representative of the high turbidity areas present in Tory Channel. Ngaruru Bay had a similar habitat to that of Hitaua Bay but the catchment area is scenic reserve and clad in regenerating forest. By comparing Ngaruru Bay and Hitaua Bay over a period of time, the aim of the study was to provide information on the impact of sedimentation from logging activities in the sheltered bay head environments of the Marlborough Sounds.

The approach taken was to focus on coastal water, and to conduct a survey to assess the condition of the seabed adjacent to the harvested forest in Hitaua Bay following a rain event. The seabeds of Ngaruru Bay and Deep Bay were also surveyed.

Data collected did not show there to be major differences between the type and numbers of species present at the sites that could be attributed to sediment input from forest harvesting. Visually, it was clearly obvious that there was fine sediment amongst the cobbles in the stream entering Hitaua Bay. In contrast, the bed of the stream in Ngaruru Bay and the two streams entering Deep Bay were free of fine sediment. These data will provide valuable control information should other areas be affected by similar logging events.

Fine sediment between and on cobbles in stream entering Hitaua Bay

Absence of fine sedimentation in stream entering Ngaruru Bay

For these reasons, the Council runs awareness campaigns for "boaties" over the summer months, about the limitations on discharging sewage from vessels.

Recreational use of the coastal waters, especially for swimming and fishing, and the significant marine farming industry, all rely upon good coastal water quality. The contamination of coastal water and shellfish could create significant public health effects. It is therefore essential that coastal water quality is kept at a level that allows contact recreation and the consumption of shellfish.

The combination of the enclosed nature of the Marlborough Sounds and the prevalence of marine farming throughout the Sounds, mean that there are actually very limited opportunities to discharge sewage to coastal waters in a manner that complies with the Regulations - see Figure 10.1. The desirability of discharging human sewage within such valued and significant enclosed waters has been questioned by some Marlborough Sounds residents.

There are alternatives to discharging at sea, with Port Marlborough New Zealand Limited operating pump-out facilities at Waikawa,

Picton and Havelock marinas. There is also a private pump-out facility operated by Bay of Many Coves Resort. The Regulations 1998 do allow greater separation distances for discharging waste from boats. However, these need to be introduced through regional coastal plans and to date the Council has not opted to increase the distances from those prescribed in the Regulations.

Release of anti-fouling chemicals into coastal waters

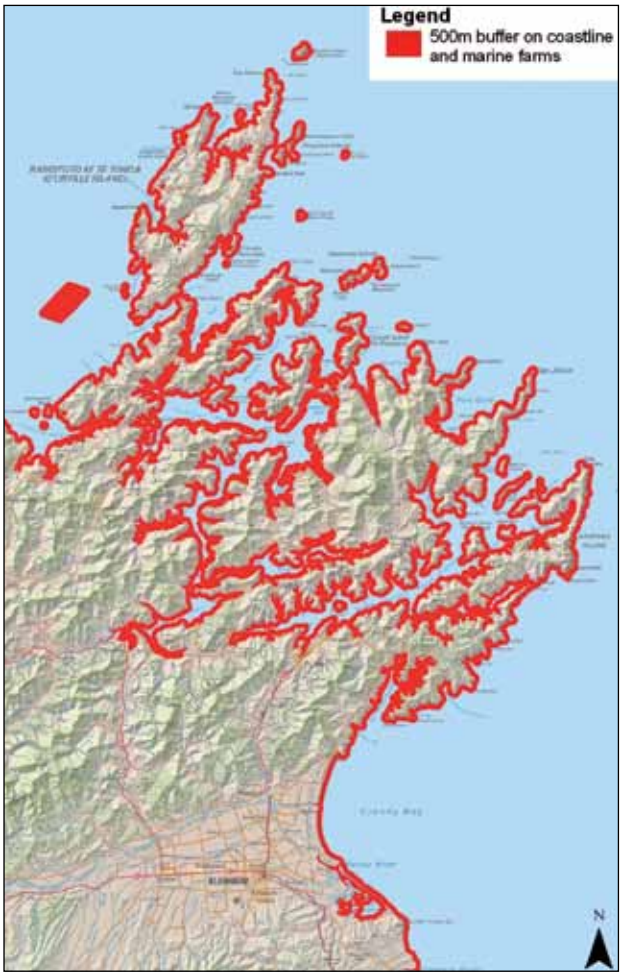
Anti-fouling paints are applied to the hulls of ships and boats to prevent the growth of algae, barnacles, mussels and other material on submerged surfaces, which result in reduced vessel speed and manoeuvrability. Various chemicals have been added to marine paints over time to act as biocides, particularly copper and tin based compounds. Some of these are very toxic to aquatic life and have been phased out as they were affecting the wider marine environment. More recently, co-biocides have been developed to deal with resistant algae.

International studies have established the potential effects of anti-fouling chemicals on the marine environment. Perhaps not surprisingly, given the purpose for which they are designed, anti-fouling chemicals have the potential to be very toxic to marine plants and animals if they accumulate in significant concentrations in either coastal water or seabed sediments.

Boating is a significant recreational pursuit in the Marlborough Sounds and has led to the development of an important boat building and boat maintenance industry at Havelock, Picton and Waikawa. The maintenance and/or repainting of boats often involves the removal of existing anti-fouling paints. If these are not collected and dealt with appropriately, the chemicals can run off into the surrounding environment. Most boat maintenance facilities are located close to coastal waters for ease of access and therefore flakes of paint and anti-fouling chemicals are readily washed into the sea and place the marine environment at greatest risk.

Testing of waters and sediments in Havelock, Picton and Waikawa has found elevated levels of anti-fouling chemicals. Some parts of Picton Harbour have amongst the highest recorded levels of copper, mercury and tributyltin ever recorded in New Zealand. These were found to be associated with the point source discharge from a boat maintenance facility - see box 'Contamination of Picton seabed'.

FIGURE 10.1: DISCHARGES CANNOT OCCUR WITHIN THE RED ZONE IN ACCORDANCE WITH THE MARINE POLLUTION REGULATIONS



Sampling marine water quality

CONTAMINATION OF PICTON SEABED

A wide range of different products have been used over the years to combat fouling of the hulls of ships and boats. These include tar, bitumen, heavy metals, DDT and organometallic compounds such as tributyltin. It is now known that many of these products are ecotoxic, persistent in the environment and can accumulate in sediments and marine organisms.

In 2003, as part of a survey evaluating the distribution of antifouling chemicals in sediments in various harbours around New Zealand, it was found there were high concentrations of some types of antifouling chemicals in Picton's inner harbour. To determine the nature and extent of this contamination, and the mobility and availability of these chemicals to marine organisms, the Council commissioned several investigations at the Picton site.

It was found that adjacent to the then Carey's Boatyard in Picton, an area of seabed of about 3,100 square metres, contained sediments that were contaminated with the heavy metals mercury, copper, lead and zinc, the organotin compounds tributyltin and triphenyltin and polyaromatic hydrocarbons. A strong point source distribution around the boatyard was found, and it was suggested that discharges of untreated hull-washing wastewaters, containing spent antifouling coatings, as well as runoff from this site, were responsible for the sediment contamination.

It was also found that contaminants were clearly available to be taken up by some marine organisms, accumulating in the bodies of mussels. However, there is evidence of a decrease in the amount of contaminants that were being accumulated over time - although the reasons at this stage are unclear.

In a food web study, the highest organotin concentrations were found in two fish species, which are considered to be at the upper end of the food chain. This indicates that there is some accumulation through the food chain of these contaminants. It was found there were strong differences between species in accumulation of the heavy metals copper and mercury. However, in general there was a strong decreasing gradient in accumulation of contaminants away from the impact zone adjacent to Carey's Boatyard.

A range of management options have been proposed to mitigate the risks posed by contaminated sediment at the site, including dredging of sediment, capping of sediment and monitored natural recovery. However, there is currently a proposal for the Picton foreshore to be developed, and until the scope of this work has been finalised, recommendations for the management of the Picton seabed can not be made.

Slipway at the former Carey's Boatyard site in Picton

Access to and within coastal areas

New Zealanders have a long history of, and expectation of, being able to access and use the coast. These expectations are no less in Marlborough, which has about 1,800 kilometres of New Zealand's total coastline. Public access is also important in Resource Management Act terms where, as a matter of national importance, the Council has to recognise and provide for, the enhancement and maintenance of public access to and along the coast marine area.

Marlborough's east coast has a relatively low usage compared to the Marlborough Sounds. This is mainly because of its wild rugged nature and in some cases a lack of access e.g. south of Marfells Beach. The main use of the coast is for recreation, the most popular areas being the Wairau Lagoons and Bar, Marfells and Ward beaches. The offshore area however, is not used to a great extent for recreational fishing or diving.

In complete contrast, the Marlborough Sounds with its enclosed and relatively sheltered waters, has a high degree of public use for a variety of both recreational and commercial uses. There are also many points of access to the Sounds for the general public. There are some situations though where public access is restricted, for example there are natural restrictions such as the coastal cliffs on the western side of d'Urville Island. Public access can also be restricted in some areas because of private ownership (riparian rights). Other circumstances exist where access is limited or needs to be limited.

Where there is no road access to Sounds properties, the only way in is by water transport. This has led to the following:

- Construction of jetties so people can safely and efficiently setdown and load passengers and associated cargo.
- Installation of moorings to provide safe anchorage of boats.
- Construction of boat sheds to store boats and boating related equipment that cannot be easily stored elsewhere on land.

Even in cases where there is road access, property owners still expect to be able to enhance their access to the Sounds by having jetties and moorings as well.

It is important to recognise these coastal structures do provide property owners and visitors access to existing residential properties. This needs to be weighed against the potential however, for coastal structures to intrude visually into the landscape/seascape. Similar to the trend of developing larger houses and holiday homes, the nature and scale of jetties and boatsheds has changed in the last 10 to 20 years. Previously a narrow fixed finger jetty was all that most property owners required. Today, it is much more common to see larger structures incorporating a floating pontoon as part of the overall jetty structure. This trend is partly related to the increasing size of boats. They require deeper waters in which to berth, necessitating longer jetties and the larger the boat, the larger the boat shed. This trend of increasing scale obviously has the potential to create greater visual intrusion into the landscape/seascape.

Jetties, boatsheds, moorings and other structures also occupy part of the public resource and can detract from the use and enjoyment of that resource by other people. Some structures can have quite an impact on access, while others may change its nature. For example, structures ranging in scale from private jetties to public marinas and port facilities, essentially take away part of the foreshore and adjoining waters from public use, although they do provide access to both private and public property. Other activities such as marine farming, not only physically impede access over water, but may have greater psychological impacts in limiting people's interest in using an area for recreation.

Aquaculture in the Marlborough Sounds

From the earliest days of aquaculture in New Zealand, the sheltered waters of the Marlborough Sounds were identified as an ideal location for marine farm development. Initially, marine farms were developed on a hobby/part-time basis by fishermen

The New Zealand Coastal Policy Statement and the current Marlborough Regional Policy Statement allow public access to and along the coastal marine area to be restricted to:

- **Protect areas of significant flora and significant habitats of indigenous fauna, (e.g. Maud and Stephens Islands).**
- **Protect Maori and heritage values.**
- **Protect public health and safety (e.g. port operations restrict public access in order to provide for the safety of people and at marinas to maintain security for marina tenants).**
- **Ensure a level of security consistent with the purpose of a resource consent.**
- **In other exceptional circumstances sufficient to justify the restriction notwithstanding the national importance of maintaining that access.**

and farmers, who undertook farming as an extension of their day to day activities. Green lipped mussels were the pioneer shellfish species farmed.

There are currently 522 operating or consented marine farms in the Marlborough Sounds, covering a total of just over 3,000 hectares of coastal space. The majority of these are located in Pelorus Sound and the outer Marlborough Sounds, with some marine farms also located in Croisilles Harbour, Port Underwood and outer Queen Charlotte Sound. Green lipped mussels are still the predominant shellfish species grown, although some marine farmers are diversifying and are now growing alternative shellfish and fish species (e.g. päua, oysters, salmon, kingfish).

Aquaculture has now grown into a major industry in the Marlborough Sounds. In 2006, farmed mussels generated export earnings for New Zealand of $182 million. Salmon export earnings were approximately $42 million. As Marlborough is a leading aquaculture area in the country (with 69% of New Zealand's mussel production and 75% of salmon production), a majority of those export earnings would be sourced back to marine farms in the Marlborough Sounds. As such, the aquaculture industry is vital to the ongoing social and economic wellbeing of Marlborough.

However, for all of the social and economic benefits of aquaculture, there has been significant opposition to the setting up of marine farms in the Marlborough Sounds. Marine farming activity raises a number of issues for managing the coastal environment. These include occupying public space, nutrient availability, waste generated from farms, visual impacts, recreational and navigation concerns, effects on the benthic environment etc.

Marine farm in Marlborough Sounds

Aquaculture requires structures to be fixed to the seabed, to occupy the water column, and for ropes, floats and cages to be located on the surface of the water. These structures, unless sensitively located, have the potential to cause problems for boats navigating through the Sounds and detrimentally affect the scenic and visual amenity for residents and other users of the Sounds. Harvesting and transporting of the produce can also impact on local jetties and the roading infrastructure. An example of this is with the transporting of harvested mussels from Oyster Bay in Port Underwood to Picton over the steep narrow winding Hakahaka/Port Underwood Road. There have been problems on this road, with the size of trucks carrying mussels affecting the road surface, as well as safety issues with other traffic.

Structures and waste products from marine farms can also affect the seabed and marine ecosystem if farms are not well sited. Shell drop and waste products collecting on the seabed below marine farms, and the structures themselves, can affect the feeding and migration of marine mammals and seabirds.

Marine farms are also perceived by some members of the community to be an industrialisation and privatisation of the coast. This perception, especially in terms of the public feeling excluded from some areas of the Sounds, is significant because of the clear direction in the Resource Management Act about public access to and along the coast being a matter of national importance.

Ships travelling at speed or generating large waves

One of the most significant impacts felt both locally and nationally in the Marlborough Sounds in the last 10-15 years, arose when fast ferries started operating on the inter-island run between Picton and Wellington. Although providing a faster journey for people travelling across Cook Strait, the fast ferries produced larger and more powerful waves than had been ever experienced in the Sounds previously. The amount of energy contained in these waves was adding substantially to natural energy levels in the Sounds. These increased energy levels created a range of adverse effects including changes to shoreline morphology, sub-tidal and inter-tidal zone habitats, impacts on public safety on the shore, public access and enjoyment of the coastal environment. The speed at which some ships travelled was also creating safety concerns for some people using the Sounds.

Prior to the fast ferries commencing in 1994, there had long been concern over the effects of waves generated from conventional inter-island ferries operating through the Sounds, especially

NEW AQUACULTURE LEGISLATION

A significant boom in aquaculture in the late 1990s and early 2000s, meant the Council received a large number of applications for new marine farms. A level of community unease subsequently arose over the impacts, number, size and location of the new farm applications. At the same time, the marine farming industry became increasingly disgruntled with the joint central government/ Council system of regulating marine farming. This required a resource consent from the Council and then a fisheries permit from the Ministry of Fisheries before marine farming could commence. Central government responded by imposing a moratorium in 2002, prohibiting all new applications for resource consents until new aquaculture legislation was developed.

The moratorium lasted for four years with new legislation coming into force in 2005. The legislation restricted all new applications for marine farming to specifically created zones called Aquaculture Management Areas (AMAs). While all existing marine farms are deemed to be in AMAs, any future expansion of marine farming requires new AMAs to be created.

through Tory Channel and parts of Queen Charlotte Sound. The earliest recorded complaints about the effects of waves from the ferries were made back in 1974 to the then Marlborough Harbour Board. The effects described in those earlier years included erosion and damage to the foreshore, damage to structures and risks to safety residents and boaties. However, the introduction of the fast ferries in 1994 elevated the level of effects to an intensity that had not been experienced before.

The community reaction to the size of the waves generated from these vessels, and to the increased amounts of energy contained in these waves, was huge. There were calls for the Council to take some action to slow the ferries. Court action was taken by some groups in an attempt to slow the ferries from their cruising speeds of around 40 knots, but this was unsuccessful.

Soon after the fast ferries began operating the Council started to gather information on the effects the ferries were having along the route through the Sounds. The early monitoring focused on what was happening to the beaches and marine ecology. For most people, the beaches and marine life were initially where the most visible effects were apparent. The Council then started carrying out other investigations, which included a social impact assessment of Sounds residents and property owners and other people using the Sounds. This eventually resulted in the introduction of a bylaw in late 2000 that effectively slowed the fast ferries to around 18 knots - the speed that conventional ferries were more or less operating at before the fast ferries started operating.

The focus of the bylaw was on safety, not the wider environmental effects being experienced. While the bylaw did have positive benefits, the Council was still concerned about the other effects that the ferries had on the Sounds environment and wanted to be able to manage all of these effects, not just those related to safety or navigation. The more recently added conventional ferries to the inter-island service were also creating issues with speed and wake, most notably the 'Kaitaki'. For this reason and because expected future trends for shipping are for larger and faster ships, the Council continued to look at how the effects of all shipping should be managed. (Fast ferries ceased operating on the inter-island route in 2005 but the bylaw remains in place.)

Wash from the Kaitaki

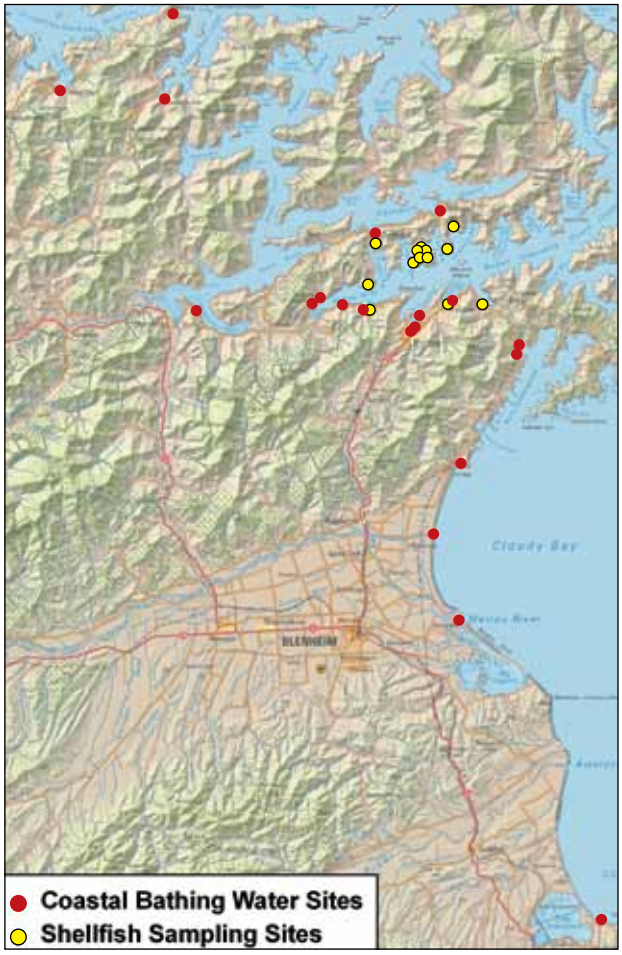
RESPONDING TO PRESSURES ON MARLBOROUGH'S COASTAL ENVIRONMENT

Monitoring coastal water quality

What the Council knows about the state of coastal water quality in Marlborough, is based on the monitoring of bathing water and shellfish at a number of sites within the Marlborough Sounds, and along the open east Marlborough coast. Monitoring of bathing water quality began in 1996 with sites initially chosen based on local knowledge of perceived use and risk. Since then, sites have been added to the monitoring network, so that today 20 coastal sites are monitored for compliance with national bathing water standards.

Shellfish sampling began in 1999 and currently there are 14 sites that are routinely monitored for compliance with national shellfish standards. The shellfish monitoring programme has two objectives: to assess compliance with the Ministry for the Environment's recreational shellfish water standards; and to identify sources of pollution in the Marlborough Sounds.

FIGURE 10.2: COASTAL WATER QUALITY MONITORING SITES



Coastal water quality standards

Bathing water standards

Coastal bathing water quality is described in terms of enterococci numbers (or E. coli). Enterococci are known as indicator organisms, i.e. the enterococci themselves may not cause illness or infection but their presence in a water sample gives an indication of the likelihood that other, more serious, pathogens (or diseases) are present. Sources of enterococci can be from humans (septic tanks, municipal sewage etc), animals (cattle, dogs, possums etc), birds (ducks, seagulls, swans etc.), in fact any warm blooded animal.

Heavy rainfall is associated with poor bathing water quality as runoff from land can contain high bacteria numbers (including enterococci), which are transported by streams and overland to bathing areas.

Shellfish water standards

Shellfish water quality is described in terms of faecal coliform numbers, the source of which can also be associated with faecal matter from warm blooded animals. Shellfish flesh quality is described in terms of enterococci numbers (or E. coli). The New Zealand Food Safety Authority state that a limit of 230 E. coli/100g of shellfish flesh should not be exceeded for shellfish harvested for commercial production. This standard can also be applied to shellfish gathered for recreational purposes.

Further details on both the coastal bathing water standards and shellfish water standards are available at www.mfe.govt.nz/publications/water/microbiological-quality-jun03/ and www.nzfsa.govt.nz/.

Coastal water quality monitoring network

Bathing water sites and shellfish water sites are sampled on a weekly basis from November to March inclusive. Figure 10.2 shows the locations of the coastal water quality sites.

Each week monitoring results are assessed against the relevant Ministry for the Environment's national guideline standards. The current guideline standards were published in 2003 and are shown in the diagram on the following page.

Each week, during the bathing water season, the coastal bathing water results are posted on the Council's website. At the end of the summer, a report is published that summarises the results of bathing water quality and shellfish water quality across Marlborough. These annual reports are also available on the Council's website.

COASTAL BATHING WATER STANDARD				
Acceptable 'Green Mode'	A single sample < 140 Enterococci/100mL	Highly likely to be uncontaminated	Routine monitoring	Safe
Alert 'Amber Mode'	A single sample > 140 Enterococci/100mL	Potentially contaminated	Investigate likely causes	OK
Action 'Red Mode'	A single sample > 280 Enterococci/100mL	Highly likely to be contaminated	Further investigation, inform relevant interested parties	Unsafe
SHELLFISH WATER STANDARD				
The median faecal coliform content of samples taken over a shellfish-gathering season shall not exceed a Most Probable Number (MPN) of 14/100 mL, and not more than 10% of samples should exceed an MPN of 43/100 mL.				

The results from the last available report (2006/2007 season), are shown in Figure 10.3. This shows the percentage of time the sites were suitable for contact recreation and are ranked accordingly.

Coastal bathing water quality results 1996 - 2008

An overview of the monitoring of coastal bathing water from 1996 to 2008, shows that bathing water quality across Marlborough has not changed much since sampling began in 1996. Two open coastal water sites (Whites Bay and Marfells Beach) show 100% compliance for nearly the entire period from 1996 to 2008, with the exception of one non-compliant sample at Whites Bay in 2005. Open coastal waters, particularly where no high density population exists, are likely to be the safest bathing beaches in terms of water quality.

In contrast, bathing water sites in Cloudy Bay (the Wairau Diversion and Wairau Bar sites), whilst being regarded as open coastal water sites, are influenced by water quality from the Wairau River. The Wairau Bar site is also downstream of two major point source discharges (the Spring Creek and Blenheim wastewater treatment works). Additionally, diffuse (or non-point source) runoff from agricultural areas in the Wairau catchment will also contribute to bacteria numbers. Water quality at the Wairau Diversion has shown an improvement in the last 5 years - see Figure 10.4.

Bathing water quality at the Picton and Waikawa sites shows very similar results for the past 10 years with no obvious trends in bathing water quality. The percentage compliance and the median enterococci numbers, show no significant trends for any of the sites for the sampling time period, however the maximum enterococci count at Picton Foreshore has been decreasing year

FIGURE 10.3: COASTAL WATER BATHING SITES - PERCENTAGE OF TIME SUITABLE FOR CONTACT RECREATION (2006/2007)

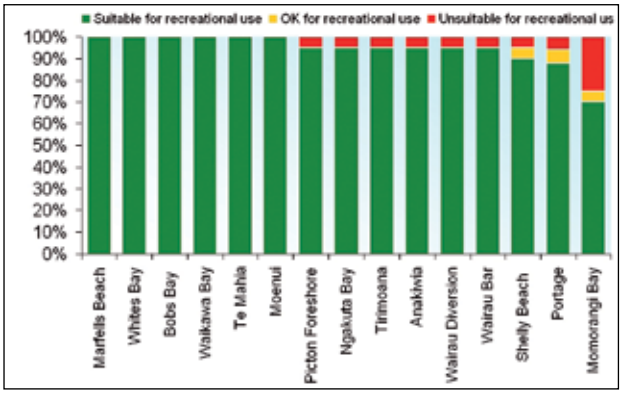
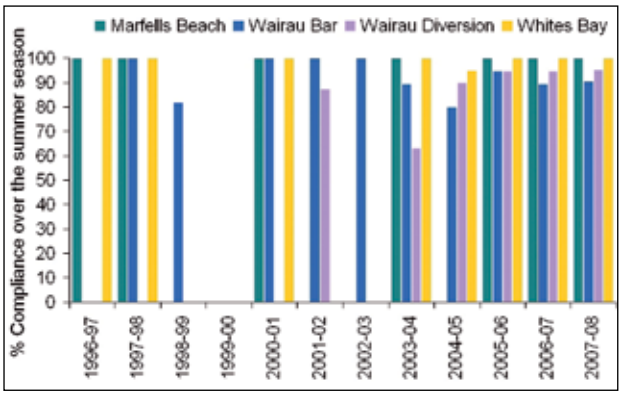


FIGURE 10.4: PERCENTAGE COMPLIANCE FOR THE BATHING WATER BEACHES LOCATED ON OPEN COASTAL WATER AREAS



by year. Work done by the Council to eradicate cross connections in the sewer system in Picton and Waikawa is likely to have improved bathing water quality in this area.

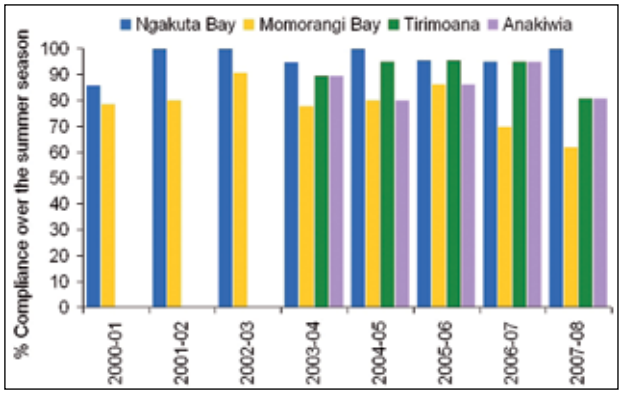
Water quality in the inner Queen Charlotte Sound shows no significant trends since 2000, with perhaps the exception of Momorangi, which has shown a steady decline in bathing water quality in recent years. This decline in water quality, as shown in Figure 10.5, is reflected in the percentage compliance with the Ministry for the Environment's bathing water standards.

Momorangi Bay has dropped from being 80-90% compliant from 2000 to 2003, to being just 62% compliant in 2007/2008. The cause for this deterioration has been investigated by the Council but no conclusive reasons have yet been found. A faecal source identification study carried out for the Council, identified wildfowl as being significant contributors to the bacteria numbers in the bay. Humans were also identified as a source, however the limited number of samples analysed for the study showed that their contribution was likely to be minor. (See the box 'Investigations into bathing water contamination at Momorangi Bay' for more information.)

Ngakuta Bay has the best bathing water quality of the inner Queen Charlotte Sound sites, with 95-100% compliance with the standards since 2001. Ngakuta also has the lowest maximum enterococci count and the lowest median enterococci count for sites sampled in the inner Queen Charlotte Sound.

Bathing water quality at Portage and Te Mahia in the Mahau Sound shows a gradual improvement in recent years. This may be as a result of improvements made to the wastewater systems at these sites. However, Moenui, despite having historically good

FIGURE 10.5: PERCENTAGE COMPLIANCE FOR THE BATHING WATER BEACHES IN THE INNER QUEEN CHARLOTTE SOUND



INVESTIGATIONS INTO BATHING WATER

The source of bacterial contamination to seawater and shellfish in Momorangi Bay was unclear. Current sampling identifies the presence of bacterial contamination, but cannot distinguish between different sources i.e. the faecal contamination may be from birds, wildlife, domestic animals, and/or humans. Investigations were therefore carried out to see if, and how, faecal source identification tools could be used to help identify the source of bacterial contamination. Having more information about the source of contamination will help to more accurately assess the risk to the public from pathogen contaminated waters/shellfish, and to assess the efficiency and effectiveness of current monitoring programmes.

During the summer of 2007/2008, an intensive survey of Momorangi Bay was carried out to determine the cause of the poor water quality in the bay. The survey included:

- weekly water sampling of the two streams and of the bay for indicator bacteria;
- an evaluation of the pump stations and pipe network at the campground; and
- a faecal source tracking investigation.

Weekly water quality sampling

Summer sampling showed that high bacteria numbers in the two main streams entering Momorangi Bay were linked with poor water quality in the bay. Poor water quality was also mainly associated with high tides, although on occasion exceedances were also recorded at low tide. Stream water quality showed a gradual deterioration from upstream to downstream, with the worst stream water quality being recorded north of the main road for both streams.

Possible sources for the contamination were identified as the pump stations and associated pipe network, wildfowl, possums and illegal effluent dumping from boats.

Wastewater pipe network investigation

An inspection of the campgrounds wastewater pipe network was carried out. Two pump stations and the associated pipe network were inspected using dye tracers and cameras. No obvious damage or leakages were detected. It was concluded that the pump stations and associated pipe network were sound. Inspections were limited to the lower sections of pipework as water quality sampling of the streams at these locations had the highest bacteria counts.

CONTAMINATION AT MOMORANGI BAY

LOCATIONS OF THE SAMPLING SITES AT MOMORANGI BAY FOR THE SUMMER BATHING WATER SEASON 2007/2008

Faecal source tracking investigation

An investigation into possible sources of faecal contamination was carried out. Scientists use molecular and chemical techniques to help identify the source of faecal contamination of water, whether it is from farm, domestic or feral animals, humans or birds. The tools used in 'faecal source identification' are still very much in the developmental stages, but considerable progress has been made into being able to identify specific sources of faecal contamination.

A range of microorganisms is present in faeces, which are specific to their animal hosts. One of the tools used therefore is to extract total DNA from a water sample with the sample examined for the presence of certain microorganisms, which indicates the source of the faecal contamination.

In another test, fluorescent whitening agents (FWAs) are looked for, because these are common constituents of washing powders used to brighten clothing. Most household plumbing systems mix effluent from toilets with 'grey water' from washing machines. Consequently, FWAs are usually associated with human faecal contamination in both septic tanks and community wastewater systems. The presence of FWAs indicates human effluent.

The report prepared on the investigations at Momorangi, 'Bacterial contamination of seawater and shellfish', concluded that wildfowl and possum inputs are present and significant, but there was not a significant human input in the samples tested.

Conclusions

Despite the investigations, the exact cause of the poor bathing water quality at Momorangi Bay is unknown. It is likely to be complex, comprising of wildfowl, possum and human (potentially land based and from boats) sources. It has been suggested from the investigations that Enterococci sampling be included as conditions of consent for the campground wastewater system. In addition, the septic tanks, which are currently not connected to the wastewater system, should be inspected to ensure they are performing adequately. This would help eliminate these as possible human sources of the pollution. Results from the faecal source tracking investigation show that wildfowl remain a significant source of faecal contamination pollution at Momorangi Bay, however the survey was unable to quantify their exact contribution.

bathing water quality (>95 % compliance), saw a sharp decline (67% compliance) in bathing water quality during the 2007/2008 summer. The majority of the non-compliance in 2007/2008 was associated with heavy rainfall, but this is not a reason in itself for deterioration in bathing water quality.

Shellfish water quality results 1999 - 2008

Generally the results of monitoring shellfish water quality show that water quality in Queen Charlotte Sound is of a high enough standard to allow the recreational gathering of shellfish. The shellfish water quality sampling guidelines state that 'A sufficient number of samples should be gathered throughout the gathering season to provide reasonable statistical power in testing for compliance for both the median limit and the 90% samples limit'. However, there are insufficient samples each year from 1999 to 2008 to adequately test for compliance year by year. Therefore the data shown in Table 10.2 looks at compliance with the standards for the entire sampling period from 1999 to 2008, rather than year by year.

The median number for all sites comply with the standards, whilst only three sites have more than 10% of samples greater than 43 faecal coliforms/100mL. These sites, Waikawa Bay, Whatamango Bay and Ngakuta Bay, only just exceed the 10% criteria. Periodic high numbers of faecal coliforms are still a cause for concern, especially when they occur during dry weather. Illegal discharges of sewage from boats can also seriously degrade water quality and make it unsafe to gather shellfish or swim in the area.

Water quality at Waikawa Bay, Whatamango Bay and Ngakuta Bay has improved in recent years, with the most recent water quality showing that the waters are suitable for the harvesting of shellfish.

Shellfish flesh quality results 1999 - 2008

In contrast to the water quality results, shellfish flesh quality is often unsafe for human consumption. Figure 10.6 shows the percentage of time in which shellfish from each of the sites has been deemed fit for human consumption. None of the sites were 100% compliant with the standards and the 'Shag Tree' site

TABLE 10.2: SUMMARY OF SHELLFISH WATER QUALITY RESULTS FROM 1999 - 2008

SITE NAME	SITE ID	No. of samples	Maximum	Median	% samples > 43
Head of East Bay (Double Cove)	DCO-1	85	920	2	6
Shag Tree (Double Cove)	DCO-2	89	9200	2	8
East Bay Reserve (Double Cove)	DCO-3	86	2400	2	8
Lochmara Lodge (Double Cove)	DCO-4	90	2400	2	4
Fish Feeding Site (Double Cove)	DCO-5	76	3500	2	4
Grey (Green) Boatshed (Double Cove)	DCO-6	80	330	2	1
Western Entrance (Double Cove)	DCO-7	75	3500	2	9
Flipper Bay (near west entrance to Onahau Bay)	FLB-1	61	350	2	5
Anakiwa	GRO-001	49	240	2	10
Ngakuta @ Beach	NGK-001	53	920	2	11
Ngakuta @ Jetty	NGK-2	64	920	2	9
Ngakuta @ Moorings	NGK-003	53	540	2	8
Mistletoe Bay (Onahau Bay)	OB-2	75	2400	2	5
Tirimoana Terrace	TIR-5	49	1600	2	10
Waikawa Bay	WKB-8A	64	2400	2	13
Whatamango Bay	WMB-1	64	2400	2	14

FIGURE 10.6: PERCENTAGE COMPLIANCE WITH THE FOOD STANDARDS AUTHORITY STANDARD 230 E. COLI/100G OF SHELLFISH FLESH FOR EACH SITE (SAMPLING PERIOD FROM 1999 - 2008)

in Double Cove only showed compliance with the standards for 23% of the time from 1999 to 2008. On average, compliance with the shellfish quality standard for Queen Charlotte Sound for the sampling period 1999 to 2008, was just 62%.

Like the shellfish water quality monitoring, there were no obvious trends detected in shellfish flesh quality at Waikawa or Whatamango. However, shellfish flesh quality has improved at Ngakuta Bay over recent years.

The inconsistency in the sampling results between shellfish water quality and shellfish flesh reinforces the fact that even if water quality is clean, caution needs to be exercised when harvesting shellfish in areas located beside dwellings and/or streams. Both are potential sources of faecal contamination, as is the presence of birds. Nesting birds in particular, can be a significant contributor to faecal matter in coastal areas.

Shellfish filter water from their surrounding environment and over time will accumulate a bacteria load from the overlying water column. In addition, bacteria survival rates (and in particular E. coli), will be greater in the gut of shellfish than in the overlying water column. So although pollution might quickly be dispersed and diluted in the water column, shellfish will tend to accumulate and magnify the extent of pollution.

Although analysis of shellfish flesh can give an indication of recent pollution, it cannot identify the source of the pollution i.e. whether it is human, animal or bird. Recent advances in laboratory techniques are beginning to allow for some discrimination between different sources and initial studies for the Queen Charlotte Sound have identified shags as a significant source at a site in east Double Cove (DCO-2). In contrast at the western entrance to Double Cove (DCO-7), human sewage has been identified as a significant source of pollution. There are no obvious nearby sources of human sewage at the western entrance site, although possibly the source could be from the illegal discharge of sewage from boats. More information about this study can be found in the box 'Shellfish water investigations in Double Cove'. Further investigations are planned to identify the source of pollution at the western entrance to Double Cove.

Aquaculture

Perceptions of the Marlborough Sounds and the impacts of marine farms

With the large number of marine farm resource consent applications the Council was processing in the late 1990s, many people commented on the importance of the Marlborough Sounds in a national context. Because of this, the Council commissioned a nationwide survey in 2000 to establish:

- To what extent and in what ways do the Marlborough Sounds contribute to the wellbeing of people living in Marlborough and to New Zealanders as a whole.
- To what extent do marine farms detrimentally affect people's ability to provide for their own social and cultural wellbeing.

To help answer these questions the survey sought information on the following:

- The extent to which the Marlborough Sounds can be considered a recreation area of national importance.
- The level of importance people attach to the Sounds as a national icon.
- The particular qualities that people value about the Sounds.
- The types of development that people believe posed a threat to the qualities they especially value about the Sounds.

Over 1,100 hundred people were surveyed and on a scale of 1 to 5 (where 1 is the least important and 5 the most important), 60% of people considered that the Sounds were very important in terms of their sense of national identity, or what New Zealand means to them. Just over 72% of people thought the Sounds were important as a recreational resource for all New Zealanders. Scenic beauty was one of the main characteristics that people associated with the Sounds and this was also one of the qualities of the Sounds that people valued the most. Excellent water quality, tranquillity and fishing were also said to be important qualities.

Those surveyed were asked to name any activity they thought could have negative impacts on the qualities of the Sounds they most valued. The most often mentioned threat was that of the fast ferry operations, cited by 308 of 828 respondents who thought there were threats of some type. The next most commonly cited threats were residential activity (99 respondents or 12%) and resort development (85 respondents or 10%).

For people who thought that residential activity, marine farming and/or forestry could have a negative impact on the qualities of the Sounds they most valued, the survey sought to identify the impacts these activities were thought to have. Six percent of people (52) thought that marine farming was a threat to a range of values. The most commonly mentioned negative impact of marine farms was adverse effects on marine life followed by visual impacts. Marine farms were also seen as likely to affect

SHELLFISH WATER INVESTIGATIONS IN DOUBLE COVE

Historic sampling shows that coastal water quality is generally safe for shellfish gathering and shellfish sampling shows that shellfish are generally safe for human consumption. However, there are exceptions:

- During and after heavy rainfall bacterial contamination of the waters and shellfish are elevated and the consumption of shellfish should be avoided.
- Shellfish sampling at Double Cove has been consistently poor since sampling began in 1999, even in dry weather.

Shellfish samples from Shag Tree, Western Entrance, East Bay and the Fish Feeding Site were sent for laboratory testing on three occasions during the summer of 2007/2008. These sites are located in an area where there are a large number of boat moorings, as well as permanent and summer dwellings. In addition, the area has one of the largest nesting shag populations in the Sounds. Work carried out by the Ornithological Society of New Zealand during October to December 2006, showed that during the summer of 2006/2007 there were particularly high numbers of nesting shags. Although numbers were not as high during the summer of 2007/2008, they were still significant. The shag population of Double Cove varies, as migratory spotted shags will tend to move between nesting sites from year to year.

In contrast, the Western Entrance site has no boat moorings, no houses in the vicinity, no streams entering, no nesting shags and no appreciable bird population. For these reasons this site was originally chosen as a control site, as it was assumed that faecal contamination at this site would be negligible. However, historically this site is one of the most poorly performing sites.

Faecal source identification carried out on samples collected during the summer of 2007/2008, showed that shags were identified as a source for the Shag Tree, East Bay and the Fish Feeding sites. The analysis was not able to discern the exact contribution of this source and other unidentifiable sources were also found in these shellfish. In contrast, the faecal

contamination at the Western Entrance was shown to be very similar from that typically found in municipal sewage. There is no municipal sewage source in the vicinity of this site, but there is a possibility that the contamination originates from illegal dumping of sewage from boats. Shags were not identified as a source for the Western Entrance contamination.

In order to quantify the contributions from various sources, more intensive sampling would be required. This would include gathering more shellfish samples and also samples from known sources i.e. septic tank samples, wastewater treatment plant samples, stream samples, shag faeces etc.

access to or use of the Sounds, either by reducing accessibility to parts of the Sounds, inhibiting the use of the coast, hindering the freedom of boat movement and or interfering with fishing.

Effect of marine farms on marine mammals

One of the concerns highlighted by people making submissions on the many marine farm applications being considered by the Council in the late 1990s, was the effect they might have on marine mammals. This was particularly so because a number of the applications were for large farms (greater than 40 hectares, which in a Sounds' context was considered very large), and also for farms to be sited in the middle of bays rather than closer to shore.

The Council has therefore supported studies carried by international marine mammal experts on the movement of marine mammals in Marlborough and their interaction with marine farms. One study was conducted between 1998 and 2002 where data on dusky dolphin occurrence, distribution, abundance, and behaviour was collected during the winter period.

The research of the dusky dolphins in Admiralty Bay carried out by the Texas University under the guidance of Professor Bernd Würsig, has noted that substantial numbers of dusky dolphin from the Kaikoura population were wintering over in Admiralty Bay each year, between July and September. Of particular significance was that this change in territory also involved a change in feeding habit from night time deep sea individual feeding around Kaikoura, to more shallow water collective feeding, in Admiralty Bay. This change in feeding behaviour is considered to be of national significance.

Dolphin, Marlborough Sounds

Photo identification of individuals that make up the Admiralty Bay population, tracking and observation of the behaviours and habits of those individuals has been carried out. Locations and movements of dolphin groups were recorded at 2-minute intervals with a GPS receiver to examine the overlap of dusky dolphin use of coastal areas with existing and proposed marine farms. All cases of dolphins entering the boundaries of mussel farms and total time spent in farms were recorded. Over 8,500 dolphin dorsal fin photographs were analysed to develop a catalogue of 421 marked individuals using the Admiralty Bay area.

Mark-recapture data indicate that more than 1,000 dusky dolphins used Admiralty Bay over the course of the 5-year study, with an average of 220 individuals inhabiting the bay on any given week during the winters of 1998 to 2002. As many as 55% of individuals returned to Admiralty Bay in consecutive winters.

In 5 years, only 8 of 621 dusky dolphin groups monitored in Admiralty Bay were observed to enter the boundaries of mussel farms at any point. Dolphins entering mussel farms transited rapidly up the lanes between rows of lines and floats. Dolphins were observed inside farms for a total of 14.2 minutes versus 147.5 hours outside of farms in Admiralty Bay.

The large difference between the amounts of time the dolphins spent inside the marine farm areas compared to open water suggests they are actively avoiding established marine farms.

Monitoring biological change under a mussel farm

In January 2002 a mussel farm in Otanerau Bay, East Bay, Queen Charlotte Sound, which had been found to be located in an incorrect position, was moved to its proper authorised site. With the shifting of the mussel farm, the Council had the chance to monitor biological change in the area that had been occupied by the mussel farm. This site had been farmed from 1988 to 2002, a period of some 14 years.

A study was undertaken to establish a baseline to see if there were any physical or biological changes following the removal of the mussel farm. A secondary aim of the study was to provide information on the biological impact under particular parts of the marine farm.

Monitoring of this site occurred on an annual basis between 2002 and 2005 and every second year since. (A full report on the results of the study is due in 2009.) Data have been collected from areas under where mussel growing structures and warp structures had previously been located. In addition, four control

sites were selected within the wider bay to compare with data collected from under the retired mussel farm site. Overall preliminary results of the study report produced in 2005, showed recovery was occurring with the proportion of mussel shells on the sea bed decreasing, with the fastest rate of recovery being in the deeper areas.

At the start of the study, particular areas of the retired farm substratum were free of mussel shell debris. In areas close to the retired growing lines, the cover of mussel shell was often relatively high. With increasing depth, the mussel shell debris visible on the surface generally declined compared to inshore areas. Shell debris under retired warps was lower than under retired growing lines. No mussel shell debris was recorded from control areas. Over the duration of the study, mussel shell did not break down and was not relocated away from the retired site. Instead the mussel shell was gradually smothered by fine sediment deposited onto the benthos. The rate of smothering increases with depth with the highest smothering rates recorded in the deeper parts of the retired mussel farm.

The community composition of species under warp lines was comparable to the control areas, while the community under the growing lines was often different.

The presence of shell debris and live mussels on the benthos at the start of the study, supported higher densities of particular species, while other species were represented by lower densities than retired warp and control areas. The eleven-arm seastar, kina, cushion seastar, and sea cucumber were more abundant from the benthos under the retired growing lines early in the study compared to control and warp areas. The abundance of these species declined over the duration of the study, presumably due to the decline in shell debris and live mussels over the three year period.

Densities of giant lampshell were consistently highest from the control and warp areas, while their densities remained relatively low from the retired growing structure area. Densities of red lampshell under the retired growing structures remained relatively low throughout the study. The low density of both species of lampshells under the growing structures suggests that mussel farming resulted in a reduction in their abundance.

Scallop densities increased at control areas over the duration of the study, while scallop densities from the retired warp and growing structure areas have not shown the same increase. The reason for this phenomenon is unknown.

Horse mussel densities at control sites were consistently above the retired structure mean densities. However, the density of horse mussels from retired warp and growing structure areas has consistently increased since monitoring began.

The results suggest that recovery of retired mussel farms situated in deep areas will occur more rapidly than shallow areas. However, recovery of the benthos and species abundance at the present site has not yet reached equilibrium.

Ecological Quality Standards for Fin Fish Farms

There are currently six salmon farming sites in the Marlborough Sounds, which produce some 75% of New Zealand's total farmed salmon. Approximately 15,000 tonnes of fish are produced each year from the current sites. This involves the introduction of up to 4,000 metric tonnes of artificial feed at each farm.

Experience has shown that the discharge of feed, together with the salmon faeces, does create some degree of environmental impact. Over recent years, the Council has been working with the industry to define this impact, and to work out the best methods of how it can be limited. An environmental quality standards system has been established. This limits the level of impact to below and up to 50 metres from the salmon farm cages. Thereafter, a transitional zone is maintained that moves from a moderate level of impact to a natural background within 150 metres from the cages. An annual monitoring programme is carried out in November of each year and the results from this determines the volume of feed that can be discharged in the subsequent year.

The system has now been in place for up to three years, and in some instances feed volumes have been reduced or capped, where monitoring shows that these environmental quality standards may potentially be breached.

Oil spill response

Cook Strait is the main transportation link between the North and South Islands, with multiple ferry crossings occurring every day between Picton and Wellington. This ferry movement, along with log ships, export vessels, cruise liner visits and numerous fishing vessels and recreational craft, mean that there is a high potential for accidents resulting in oil spills.

The Council has a statutory responsibility under the Maritime Transport Act to respond to oil spill events that occur within Marlborough. The Council has developed an Oil Spill Contingency Plan in accordance with the Maritime Transport Act and Marine

Deploying oil spill recovery equipment as part of a training exercise

Protection Rule 130C, to make sure there is a planned and coordinated response if an oil spill does occur. Field exercises are carried out twice a year to make sure that people are prepared to respond to oil spills.

Despite the large number of vessels using the Marlborough Sounds, no large spills have occurred there since the introduction of the Maritime Transport Act in 1994. The Council has responded to 70 oil spills since 2004, the majority of which have been diesel spills of a relatively small size.

Shipping activity in the Marlborough Sounds

The beginning of fast ferries operating in the Marlborough Sounds in late 1994 signalled a marked difference in the type of passenger and freight vessel operating on the inter-island run. Traditionally, single hulled vessels took up to 3 ½ hours to cross Cook Strait. The new high speed vessels (single hull and catamarans), reduced this travel time to about 2 hours.

Although the vessels provided a quicker travelling time between Picton and Wellington, there was considerable reaction from the community to their operation, as they were perceived as having an adverse impact on the Sounds' environment. This included impacts on kaimoana, erosion of beaches and sites of cultural significance, water clarity, safety and marine ecology.

Prior to the fast ferries commencing, no systematic monitoring of physical, ecological, social or cultural effects from ship wakes in the Sounds had taken place. (The records of the former Marlborough Harbour Board do provide an understanding of the effects of the wakes from conventional ships prior to 1994.) With the significant public concern about the use of fast ferries, the Council put in place a comprehensive program of investigations and monitoring to determine the extent of effects on the environment. The Council's response in gathering information has now been ongoing in some aspects for over 10 years. Some of the significant aspects of that monitoring are reported here.

Shoreline Monitoring

Initial monitoring of the impact of ferry wake on the shorelines in Queen Charlotte Sound began in 1995 soon after the fast ferries began operating. The first studies gathered information for the Planning Tribunal enforcement order proceedings. Subsequent to this, the Council engaged consultants in 1997 to set up and report on a shoreline monitoring programme in Tory Channel and Queen Charlotte Sound. Since then shoreline profiles have been surveyed every 6 months at 21 sites in inner and outer Queen Charlotte Sound and in Tory Channel. Progress reports have been provided every 6 months and three major reports, each covering a 3 year period, have been published. The reports include a photographic record of the sites on each survey occasion.

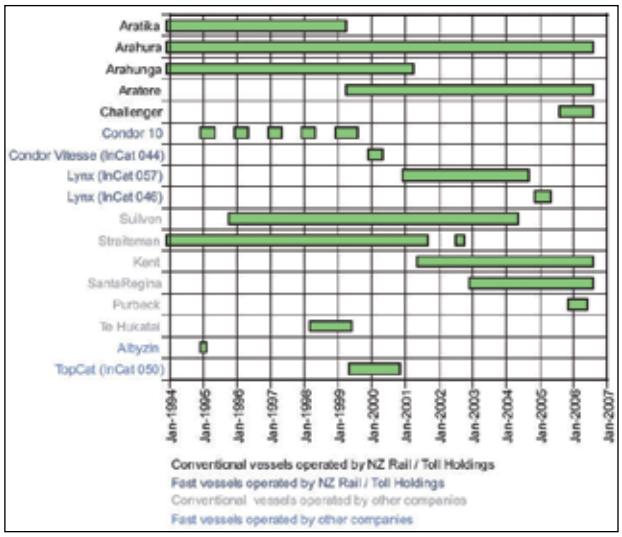
The most recent results, published in August 2006, are reported here. (Progress reports have been carried out since then and another major report will be available later in 2009.)

A second beach profile monitoring exercise was carried out in the Grove Arm. The Grove Arm was not included within the initial monitoring program, but was started in 2000 in response to concerns about erosion from long period waves, even though this area was some distance from the sailing line of the ferries. The results of this monitoring are also reported here.

Since the monitoring began, different ships have operated along the inter-island route. When the fast ferries started their operations late 1994, they did so alongside the conventional ferries. Up until 2000, various fast ferries operated over the summer months, after which there was an almost continuous service using fast vessels until April 2005. However, in December 2000 the Council bylaw slowed fast ferries to 18 knots in the Sounds, although they operated at their normal service speed outside of the Marlborough Sounds. The bylaw did not apply to conventional vessels.

Figure 10.7 shows the periods over which various ships have operated. Other ships, both large and small, also use the route.

FIGURE 10.7: VESSELS USING THE TORY CHANNEL/QUEEN CHARLOTTE SOUND ROUTE ON REGULAR INTER-ISLAND SERVICES (1994 – 2007)



Shoreline monitoring in Queen Charlotte Sound and Tory Channel

Shoreline profiles have been surveyed at the sites shown in Figure 10.8. There are five profiles located at sites in the outer Queen Charlotte Sound: Double Bay; Long Island; Clark Point; Patten's Passage; and Blumine Island. These sites are not influenced by ferry traffic, although some are on the sailing line of larger vessels using Shakespeare Bay. All five sites have remained very stable over the survey period since April 1997, with only minor changes in beach shape, beach volume and sediment composition being evident. It is interesting to note that even sites with considerable exposure to reasonably high energy, show little change.

Many of the sites on the ferry route have shown evidence of change. However, trends or seasonality consistent between sites is not apparent. It is possible to make tentative links between the changing beach shape and the operating regimes of various ships at individual sites. Sites seem to be mainly influenced by local factors, especially in terms of sediment supply.

The Bob's Bay site has demonstrated consistent erosion. This site is located on the route, but at a position where ferries are likely to be operating relatively slowly as they arrive in, or leave, Picton. There has been a consistent erosion trend across the whole profile. Why erosion occurs at this site is not understood, although the high number of boats of all types passing this point may be a factor.

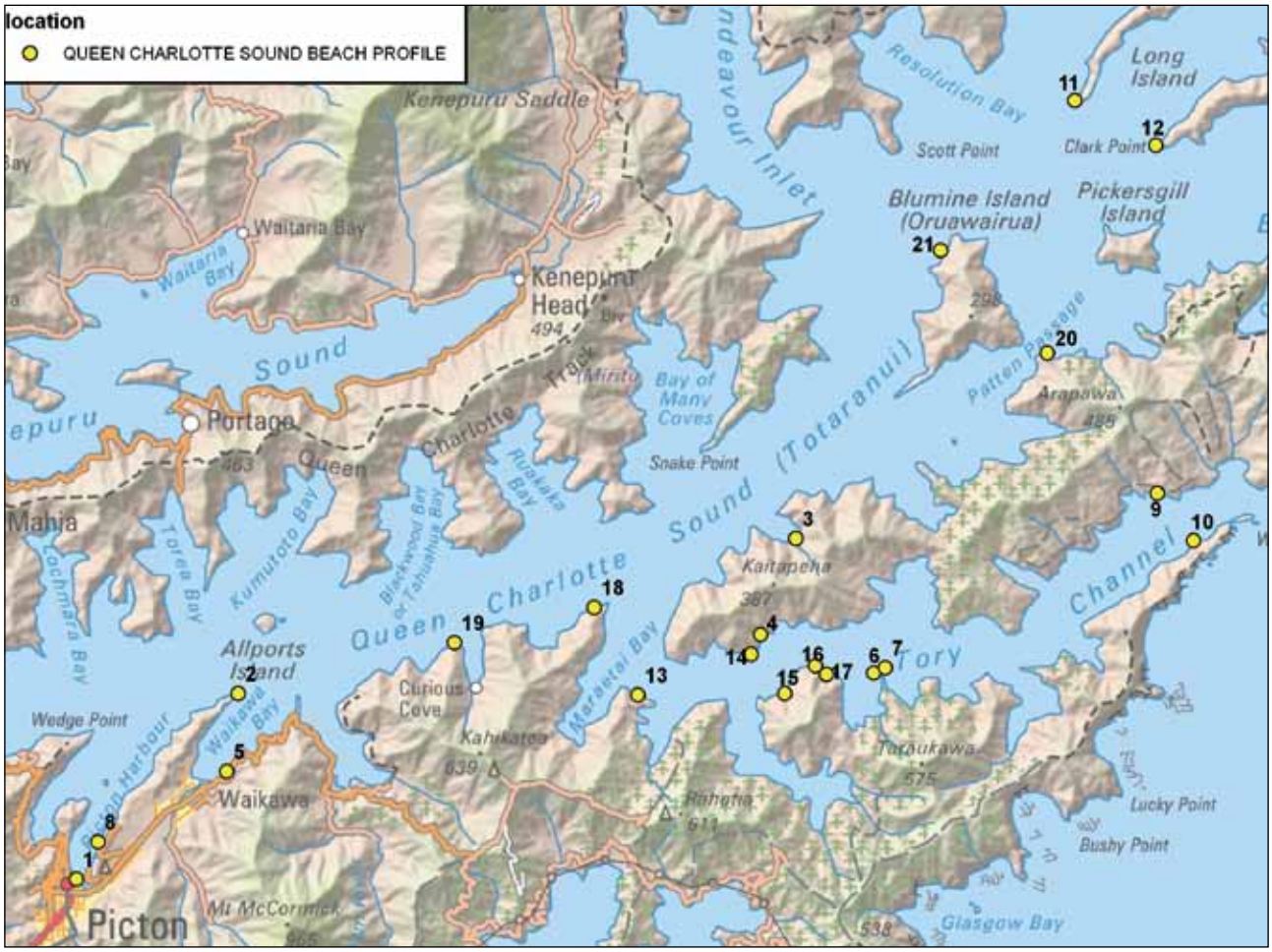
A number of profiles showed no significant change. These are Ngaionui Point, Te Awaiti, Te Weka Bay and Tipi Bay in Tory Channel, and Dieffenbach West and Curious Monkey on the eastern shore of inner Queen Charlotte Sound. The Curious Monkey site showed a change from minor accretion to minor erosion, coinciding with when fast ferries stopped operating. Ngaionui Point, a site very close to the vessel travel line, particularly on the Wellington to Picton journey, showed a change from minor accretion to minor erosion in 2002, perhaps indicating a slow return to pre fast ferry morphology.

Profile 2, The Snout at Picton Point, indicated accretion at the top of the profile and significant erosion at the bottom, and therefore a steepening of the beach profile. The deep water channel is clearly cutting into the shoreline at this point. The reason may be related to ship traffic, or may be entirely natural.

Ngaionui Bay and Slip Beach showed a trend of beach building. Ngaionui Bay has had considerable sediment removed by the residents, but it is clear that sediment accumulation is occurring. In Ngaionui Bay this appears to be the result of ferry traffic, although there is probably a sediment surplus in the bay due to a slip that occurred some years ago.

McMillan's Bay and McMillan's Side, were relatively stable, with a small amount of accretion until an event in 1999/2000, when a large amount of sediment accumulated on both profiles. The accretion trend continued until the beginning of 2001, after which time there was stability on the McMillan's Bay profile and erosion on the McMillan's Side profile. Although there is no direct evidence, it is suggested that the accretion could have occurred because of a significant earth movement event towards Arrowsmith Point, from which sediment was transported along the shore, mainly from fast ferry operations.

FIGURE 10.8: PROFILE LOCATIONS



1	Picton Foreshore	7	Moioio Island 1	13	Slip Beach	19	Curious Monkey
2	The Snout at Picton Point	8	Bob's Bay	14	Ngaionui Point	20	Patten's Passage
3	Double Bay	9	Te Awaiti	15	Te Weka Bay	21	Blumine Island
4	Ngaionui Bay	10	Tipi Bay	16	McMillan's Bay		
5	Blackmore's at Waikawa	11	Long Island	17	McMillan's Side		
6	Moioio Island 2	12	Clark Point	18	Dieffenbach West		

The Moioio Island sites are an unusual case, being a beach adjacent to a major landslide, and being towards the back of the island, not directly facing the track of shipping in Tory Channel. Both profiles showed that the beach is extending into the deep water channel over time (a process that takes a lot of sediment), and generally accreting. Although Profile 6 shows considerable variability, Profile 7 has been accreting throughout the survey period, but the rate increased about the time fast ferries were restricted to 18 knots in 2000. These profiles are almost certainly influenced by changes in ferry operations, being almost completely sheltered from natural wind generated waves. However, the sediment supply from the landslide (which may be affected by vessel wakes), is likely to dominate the beach behaviour.

The summary report in 2002 concluded that with the exception of Bob's Bay near Picton, the beaches on the ferry route were accreting (or were stable) as opposed to eroding, although it was equally clear that local circumstances (particularly sediment supply) played a very significant role. This conclusion was still generally supported in 2006, although on some profiles change from accretion to stability (McMillan's Bay), accretion to minor

erosion (Ngaionui Point, McMillan's Side, Curious Monkey), or in the case of Moioio Island 1, an increase in the rate of accretion, occurred at about, or soon after, the time fast ferry operation was restricted to 18 knots in December 2000. Although a definitive conclusion may never be possible, the results supported the understanding that the fast ferry wakes resulted in sediment building up at the top of the beach on most beaches along the ferry route.

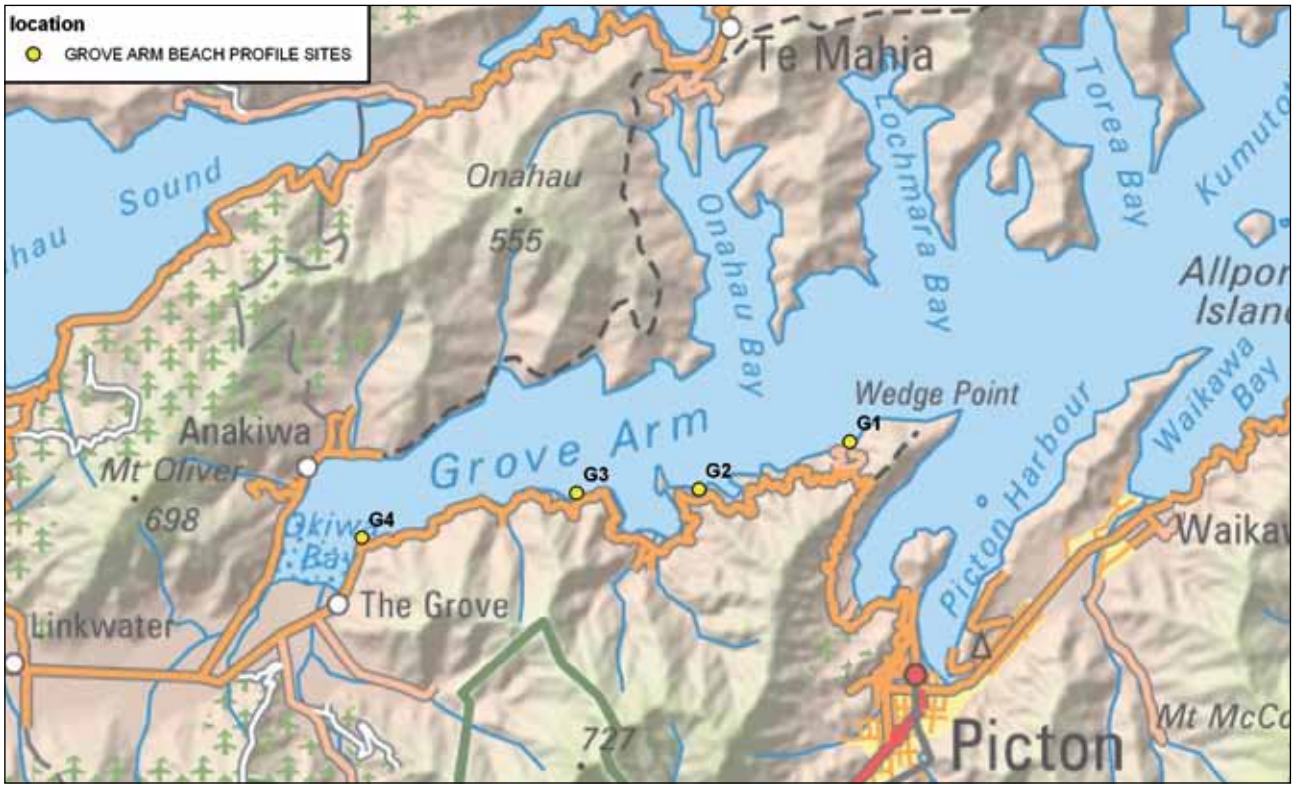
Grove Arm monitoring

When the fast ferries were operating, there were complaints about the wash from these ships damaging the shoreline in the Momorangi area. There were also concerns about erosion occurring right at the head of Grove Arm near Anakiwa, although at the time there were doubts that waves from the ferries would reach this far. Subsequent wave recordings carried out in 2001, did reveal that wake from ferries was reaching Momorangi, with heights of between 100 to 150 millimetres.

Four sites were selected for monitoring of beach cross sections over the period July 2000 to December 2008, on a twice yearly basis. The aim was to see if there were any changes arising from the bylaw, which slowed the fast ferries to about the same speed as that of conventional ferries. The sites are shown in Figure 10.9.

The most recent report on the monitoring carried out to date, states it appears there has been a change in the shoreline profile of Long Beach (G1), the closest beach to the sailing line, and

FIGURE 10.9: LOCATION OF STUDY SITES



G1 (a, b, c) - a well established beach close to the sailing line at 4 kilometres. Site "c" was established later than "a" and "b" because landowners claimed there was significant loss of sediment at the eastern end of the beach because of the fast ferries.	**G2 (a, b)** - a well established beach where it was thought any change might be shown by the apparent sediment store available even though this was 6+ kilometres from the sailing line.	**G3** - originally a small pocket beach that was stripped of sediments and located 8 kilometres from the sailing line - see box 'University investigations into the effects of ship wake' for more about this site.	**G4** - selected as a control site in that at 10 kilometres, it was thought that it would have been unaffected by wash from the ferries.

possibly continuing change albeit at a reduced rate. The degree of change at G1c suggests that there is more going on than an environmental process as a result of eroding a below low water level deposit and accumulating material in the upper intertidal area. Visual assessment suggests that the process is not balanced and that more material is being accumulated at the top of the beach than might have come from the lower beach. The report concludes that there is a process ongoing in the vicinity of G1c that is very possibly due to ship wake action.

In contrast, for each of sites G2, G3 and G4, while there has been quite a variation there was no trend evident in the results that suggested there were effects from ship wake. The head of the beach in the case of G2 had seen change, but it was considered this could not be separated from normal processes, as no trend was evident.

The information that has been gathered to date may be useful in the future for determining the effects of new ferries that are introduced onto the inter-island route. Most recently the 'Kaitaki' (or Challenger) has applied to increase speed to 19.5 knots so there may be some effect at the G1c site. A decision has been made by the Council to continue to monitor the Long Beach site (G1c) and discontinue the other sites.

Effects on the public's use of the Sounds

To find out how residential property owners and other users of the Sounds were affected by the fast ferries, the Council commissioned a social impact assessment in 2000. Input from over 450 property owners and boat operators who used the area affected by the fast ferries was gathered. What was found was that the wash from the conventional ferries had defined a limit at which people found to be safe and not threaten or constrain their use of the foreshore or the sea.

The effects of the fast ferries however, were unlike those of any ships previously seen in Queen Charlotte Sound or Tory Channel by property owners or by recreational users. In particular, the wash was considered to be more powerful and to affect the shoreline to a greater degree than that produced by the conventional ferries. The research highlighted numerous reports of damage, both to private property and to the coastal environment, and of numerous incidents threatening the safety of people both at sea and on the shore.

People reported widespread changes about how they went about their daily lives with the fast ferries travelling at speed. People also said they had experienced a reduction in the attractiveness

Long Beach (G1c)

of the Sounds as a place to live and recreate, both for themselves and for visitors. This included effects on iwi who considered that the fast ferries had affected their ability to gather kaimoana, had caused a decline in the availability of kaimoana, damaged waahi tapu sites and resulted in a loss of cultural knowledge and mana.

This information helped the Council in bringing in the Navigation Bylaw 2000 as well as in considering what changes might be needed to the Marlborough Sounds Resource Management Plan to address the wider environmental effects of shipping.

Once the bylaw had been in place for a couple of years, the Council carried out another survey to see whether people's views of how they were being affected by ferry operations had changed. The results of the follow-up survey showed that reducing the speed of the fast ferries had dealt with many concerns.

The amount of damage to property, which people said had been caused by the Lynx fast ferry, fell significantly with the introduction of the bylaw. While 71% of respondents to the original survey said that some aspect(s) of their properties had sustained damage as a result of fast ferry operations, only 21% said their properties had had similar damage since the bylaw was introduced. Erosion of land/beaches and damage to vegetation were still problems for some people, which suggested while the power of fast ferry wash was significantly lower, its erosive power was still higher than what could be expected under natural conditions.

The results indicated a lower number of safety-related incidents relating to fast ferries had been experienced with the introduction of the bylaw, although the period covered by the follow-up survey was significantly shorter than the original survey (one year compared with approximately five years). People's awareness of the risk from fast ferry wash was also greater because of publicity during and since the original survey.

UNIVERSITY INVESTIGATIONS INTO THE EFFECTS OF SHIP WAKE

The Council has partially supported two university students in carrying out investigations related to the issue of ship wake in the Marlborough Sounds. These investigations helped to improve understanding of the effects of ship wake in the enclosed waters of the Sounds.

This first study (Burke) was conducted on three beaches in Tory Channel and Queen Charlotte Sound and looked at sediment transport patterns resulting from ship wake largely from the inter-island ferry service.

The second study (McDonald) investigated the impacts of ship wake on areas away from the inter-island ferry route. Grove Arm was used as the study area.

The effects from both conventional ferries and the high speed craft were investigated. The research noted that high speed craft operating at full speed (37 knots) within Queen Charlotte Sound, were theorised to have wash patterns of the highest and most energetic waves. This was supported by anecdotal evidence that showed long period waves with drawdown/surging motions at the shore. Photographs and analysis of long-term beach monitoring also suggested a strong correlation between the long period waves generated from high speed craft and subsequent erosion. The research found that there had been a rapid return of beach sediment following the introduction of speed restrictions for the high speed craft with a stable beach profile having been established.

- photos from McDonald

Hall Beach - Grove Arm

(a) 1979 - prior to operation of high speed craft.

(b) April 2000 during operation of high speed craft at super-critical speeds.

(c) January 2001 following speed restrictions imposed by the Council

Of those who responded to the original survey, 77% reported they had made a number of changes to their lifestyles to avoid being affected by the fast ferries. Results from the follow-up survey suggested that more than two thirds of these people had readjusted their behaviour in the following ways:

- Less vigilant/more relaxed about children playing on beaches.
- Could once more leave boats tied to jetties.
- Used the beach/foreshore more often than they did when the fast ferries operated at full speed.
- Generally more relaxed about using small boats.
- Went boating/fishing/diving more often.
- Went swimming more often and allowed children to go swimming more often.
- Visited others in the Sounds or received visitors more frequently (because of improved landing/berthing conditions for boats).

The one area where a significant number of people reported they did not readjust their behaviour was in scheduling their activities to avoid fast ferry sailing times.

Overall the reduced number of damage and safety-related incidents, together with comments made by some people as to the greater peacefulness of the Sounds, suggested that problems such as increased stress, reduced enjoyment of properties and time spent repairing damage were less widespread and less pronounced after the introduction of the bylaw.

Benthic studies

Biological monitoring of boulder and cobble shores has been undertaken along the inter-island ferry route since 1995. Like the shoreline monitoring, no comprehensive programme of biological monitoring along the ferry route, was in place prior to the commencement of the fast ferries. This meant the early monitoring was carried out in an environment with conventional ferries and the fast ferries operating at speed.

With the bylaw introduced in December 2000 restricting fast ferries to a maximum speed of 18 knots, the biological monitoring programme was modified. Additional sites were added and for the first time included quantitative bedrock monitoring in relation to the impacts of ferries. The investigations that occurred after the 18 knot restriction were done using a Before, After, Control, Impact (BACI) protocol. (During the period immediately after the introduction of the fast ferries, researchers were unable to apply a BACI study as no "before" data were available.)

The most recent report (August 2005) provides data on invertebrate abundance from bedrock and cobble/boulder shores. These data have been added to the existing database collected since July 1995 for cobble/boulder shores and November 2000 for bedrock shores. One of the main aims of this study was to report on any biological changes over the period since the introduction of the 18 knot speed restriction.

The report concluded that a biological recovery had been evident from a wide variety of sample sites sampled over a relatively long time scale. The recovery had occurred at intertidal and shallow subtidal cobble-small boulder shores and intertidal bedrock shores in Queen Charlotte Sound and Tory Channel. A recovery had also occurred for shallow subtidal bedrock shores in Queen Charlotte Sound. The report stated that the recovery had occurred at too many sites and for too many species to be coincidence.

Although some control sites showed increases, many did not. Comparison between control and impact sites supported the existence of a recovery because the impact recovery was often very large. In some cases, the scale of the increase raised impact densities above those recorded for the control sites. This did not occur at any time prior to the 18 knot restriction. In contrast, the subtidal bedrock shores in Tory Channel naturally supported low densities of invertebrates and no change due to the 18 knot restriction was recorded.

In terms of the BACI approach used, the recovery is representative of a biological improvement from the "before" state. The level of "impact" at the intertidal cobble-small boulder shores, for example, represented an impact at the high end of the scale. The "before" wave environment was characterised as a combination of conventional ferries and fast ferries operating with no speed or wave restrictions from 1995 to December 2000. The current or "after" period was characterised by a wave environment with fast ferries restricted to 18 knots combined with the present conventional ferries. This "after" state allowed a recovery to levels above the "before" biological equilibrium. The "before" environment resulted in the dramatic differences between many impact and control sites. The report concluded that any change to the existing shipping regime resulting in increased wave energy reaching the shore, will probably at best slow the recovery or at worst reverse the recovery.

Monitoring of the benthic environment continues.

Changes to the Marlborough Sounds Resource Management Plan

Changes to the Marlborough Sounds Resource Management Plan were first proposed in late 2002 to allow the Council to manage the full range of effects of shipping activity in Queen Charlotte Sound. The changes were the subject of an extensive process including a Council hearing and a subsequent Environment Court hearing. The decision of the Court (finally issued in 2008) has supported the Council's approach to managing the effects of ship generated waves, albeit with some change to that initially proposed by the Council. (More on the range of methods that are to be used to deal with the effects of shipping operating through the Sounds is included in the box 'Managing shipping activity through the Marlborough Sounds Resource Management Plan'.)

One of the most important aspects of the changes to the Marlborough Sounds Plan was the use of a rule to limit the amount of energy able to be produced from a ship's wake. The amount of energy within waves generated from ships is what is responsible for creating the adverse environmental effects that have been experienced. One of the significant points to come out of the Court's decision concerns these levels of energy. The Court said the appropriate levels of energy to be generated within the national transportation route, are to be based on the

environmental effects that were being experienced with the conventional ships, operating prior to the introduction of the MV Aratere in 1999. This effectively fixes a baseline for managing shipping along the national transportation route.

Gathering information on Marlborough's significant natural marine areas

The Council and the Department of Conservation are currently working on a report that will give an overview of the significant marine habitats and species in Marlborough. The report is due to be released in 2009. Identifying specific habitats in the marine environment is a very difficult task as you cannot easily see them underwater. In order to get a picture of the different marine habitats the Council has developed a database of sites where scientific studies have occurred. Currently there are over 1900 individual sites recorded in the database. Many of these are reports that have been produced as part of marine farm applications. The data from this database along with the knowledge gained from consultants and Department of Conservation experts will be used as the basis of the significant marine areas report.

Boulder Spit point, Greville Harbour

MANAGING SHIPPING ACTIVITY THROUGH THE MARLBOROUGH SOUNDS RESOURCE MANAGEMENT PLAN

Area Identification

Tory Channel and part of Queen Charlotte Sound have been identified as a National Transportation Route. Queen Charlotte Sound (excluding the National Transportation Route) has also been defined as part of an established shipping route.

Rules

Rules apply to the National Transportation Route and elsewhere in Queen Charlotte Sound. (The rules refer to ships that are capable of reaching certain speeds in relation to weight displacement in the water [e.g. fast ferries] and also ships that exceed 500 gross registered tonnes.) Ships that are 'fast', or 'large' such as conventional ferries, are permitted, subject to speed limits, and in some cases meeting a wave height criterion.

Monitoring

The Council will monitor the activity of ships in Queen Charlotte Sound and Tory Channel to ensure that ship operators comply with individual consent conditions and do not exceed permitted speed levels. Monitoring of things like shoreline stability and the benthic environment will also occur as part of the Council's overall state of the environment monitoring in Marlborough.

Advisory Group

An advisory group will be set up from community groups, shipping operators, iwi and the Council. The role of the group will be to:

- Review monitoring information from shipping operators, the Council and any other expert reports lodged with the Council on the effects of shipping.
- Help the Council to determine the best way to manage shipping in the Sounds.
- Facilitate voluntary action to avoid, remedy or mitigate unforeseen effects of shipping activity.
- Seek input from an appropriately qualified person (or persons) to provide advice.
- Provide a manawhenua iwi view on managing the effects of shipping activity.

Te Atiawa Partnership

The Council will work in partnership with Te Atiawa on emerging issues, environmental enhancement and protection programmes and monitoring. This is in recognition of their long association with the Tory Channel and Queen Charlotte Sound area.

Tory Channel entrance