



# Chapter 1: Setting the Scene



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# Setting the Scene



Having information about who the people of Marlborough are and what our environment is like, is important in helping us make decisions about how we look after natural and physical resources. We need to know how Marlborough has developed over time and how people have interacted with the environment so that we can make better decisions for future generations about how Marlborough's resources should be looked after.

The Council's 1999 State of the Environment Report took readers on a journey through time so that they could gain an insight into how Marlborough's environment had developed and how human habitation had affected this development. This included a look at the geological processes that had formed Marlborough over many thousands of years but also from the time that Maori arrived in Marlborough. Some of the choices made by people living in Marlborough in those early years have contributed to the environment that we currently live in today.

For this reason we felt that including the part of the journey through time described in the 1999 report, from when Maori first arrived in Marlborough, would help in setting the scene for the remainder of the 2008 report. This journey is included below and leads to a description of the people who live in Marlborough today. From there we have described Marlborough's climate, land, water and coastal resources and current day economic activity.

## A JOURNEY THROUGH TIME

*(FROM 1999 STATE OF THE ENVIRONMENT REPORT)*

### THE ARRIVAL OF MAORI

No account here could do sufficient justice to the complexity or detail of Maori's oral history. The purpose is to give an overview of the years of occupation which predated the arrival of the Europeans.

The Marlborough district was a land rich and varied in its natural resources. Over the last millennium a succession of Maori iwi have derived a living from the diverse resources available. The range of forest and habitat meant there was a large range of waterfowl, eel, fish, shellfish and forest birds for food. There was also a plentiful supply of flax and timber.

Maori tradition links the Marlborough district with the creation of New Zealand when Kupe fished the North Island from the sea. Cloudy Bay (Te Koro o Kupe) was Kupe's scoop or bailer and Cape Jackson (Te Taonai o Kupe) was the long spear of Kupe.

The oldest known site of human habitation in Marlborough is at the Wairau Bar, where there are signs that Maori could have been here as early as 800 AD, although recent radiocarbon dating from similar sites has suggested that about 1200 AD is more likely.

Whatever the earliest date, it is clear these early people were hunting and occupying this site, and a site at Grassmere, 500-600 years ago. Their midden remains reveal a number of bird species (including the Moa) which are now extinct.

The event that had the most profound impact on the local environment, and that of the South Island, was the legendary 'Fires of Tamatea'. These fires, which burnt the forest cover from the east coast of the South Island from the Wairau Plain to Central Otago, must have been stupendous. Radiocarbon dating of charcoal samples indicates they occurred between 500 and 800 years ago. The cause of the fires is not clear, that is, whether they were accidentally or deliberately lit. What is clear is that they caused huge changes to the whole landscape. They also undoubtedly contributed to the extinction of a wide variety of species.

After the fires, the once dryland and beech forest south of the Wairau River became grassland. Only in relatively difficult hill country such as that on the Kaikoura Coast and Clarence Valleys did significant amounts of forest escape destruction.

The pattern of occupation also changed. The early peaceable people were followed by the stronger and war like Ngati Mamoe and a mix of conquest and intermarriage mingled the tribes. Ngati Mamoe were to suffer the same fate as they were forced south in the face of an invasion of other North Island tribes, Ngati Kuia, Ngati Apa and Rangitane, from around the middle of the sixteenth century. If the early period was characterised by lack of warfare, then this period was one in which the building of fighting Pa became a necessity for defence. Defensible sites around Marlborough's coast including headlands and islands in the Sounds and down the coast of Cloudy Bay and Kaikoura were developed. One of the more comprehensive sites of development are the canals, gardens and pits created by Rangitane in the Vernon/Seventeen Valley area. Apart from traditional Maori accounts, this site is one of the few visible pieces of evidence of this period.

This was the pattern of settlement throughout the classical period of history in this district. Ngati Kuia, long term residents of the region, were present when Rangitane and Ngati Apa also settled the area as early as 1650. There was some conflict with Ngai Tahu who, around this time, began their southward migration from Moioio Island in Queen Charlotte Sound. Ngati Apa, Ngati Kuia, and Rangitane retained a close relationship and occupied Pelorus Sound and the d'Urville Island area during the same period.

Issues between tribes over mana and competition for the resources Marlborough had to offer were evident in Totaranui (Queen Charlotte Sound) when Captain Cook arrived in January 1770. From this point in time, life for Maori was never to be the same again.

## EUROPEAN ARRIVAL

Britain's defeat in its war with its rebellious American colonies in 1783 ended its ability to transport large numbers of convicted felons. With convicts building up in large numbers around the English coast, the decision was taken to settle Australia. Cook's accounts of Australia and New Zealand were instrumental in seeing a penal colony established at Botany Bay in Australia in 1788. New Zealand inevitably became part of the Australian 'frontier' or sphere of influence. British ships operating out of Port Jackson (Sydney) were on the New Zealand coast in the early 1790s, as gangs of fur seal traders began to exploit the seal stocks in the Fiordland and Foveaux Strait areas. There was often bloodshed and conflict between Maori and European sealers and traders.

Soon after European arrival Maori saw the potential for muskets and other European commodities in their traditional society. Hongi Hika acquired muskets as early as 1818 and began settling traditional scores against the tribes such as Ngati Whatua in Auckland. In so doing he upset the traditional power balance amongst Maori iwi. Tribes had to acquire muskets or face the prospect of annihilation.

Ngati Toa under their astute leader Te Rauparaha realised they had little chance against Tainui and other Waikato tribes and migrated southward to Kapiti Island to re-establish themselves in a less populous area and to trade for the muskets.

Several of the local tribes including Ngati Kuia, Ngati Apa and Rangitane formed part of a coalition which attempted to throw Te Rauparaha and Ngati Toa off Kapiti Island in 1824. They only just failed and as a result Te Rauparaha had cause for attacking the local tribes. He and his allies Ngati Rarua, Ngati Mutunga, Ngati Raukawa, Te Atiawa and Ngati Tama worked their way through the Sounds and Cloudy Bay area in the years 1828-1830 taking utu (revenge) on those who had opposed them in 1824.

During this time the Kurahaupo Federation (Ngati Apa, Rangitane and Ngati Kuia) Pas at Okukari, Umukuri, Karaka Point, Te Kowhai, Huataki and Te Horiere were devastated. They had no answer to Te Rauparaha's muskets and paid a heavy price. Large numbers of their people were killed and reduced to squatter status. Others became isolated groups who carried out guerrilla warfare on the invaders in a bold attempt to keep their fires burning in the district.

*Fur seal*





*Moioio Island*

The arrival of Europeans contributed to the devastation of the local tribes with the introduction of the musket, but also prevented any further inter-tribal warfare.

Ngai Tahu also became a victim of Ngati Toa and its allies, but was in a better position to retaliate. Thus in the 1830s there were several notable taua or campaigns - many of which were fought in Marlborough. Te Rauparaha was ambushed at Waiharakeke (Lake Grassmere) and came very close to being captured. He managed to escape in a canoe to the head of Port Underwood (Ngakuta Bay) and over the saddle into Onepua Bay where a skirmish occurred. Te Rauparaha escaped to Te Awaiti and with the help of his people and the whalers there, escaped to Kapiti to raise a new taua to fend off the threat of further skirmishes. The battle began again at Oruamoia or Fighting Bay (as it was so obviously called by European whalers) with heavy casualties on both sides. Early whalers such as Worsler Heberley also took part in these campaigns as a significant number of them were married to local Maori women.

John Guard, a trader in the area, saw the potential for whaling in Marlborough in 1829 or 1830 and quickly set about acquiring the finances for a shore based whaling station. He established himself at Te Awaiti in Tory Channel and a couple of years later at Kakapo Bay in Port Underwood.

When John Guard left his trading station at Te Awaiti for Kakapo Bay in 1832 he was able to pass it over to another group of European refugees from the musket wars - William Keenan, Johnny Love, Dickie Barrett and Dan Sheridan. They had become embroiled in the musket war conflict with the Waikato Chief Te Wherowhero, and had managed to stand him off in a notable

siege at Nga Motu Pa at New Plymouth. However, many Te Atiawa who survived this skirmish migrated south to join their kinsmen in Whanganui a Tara (Wellington).

### *Whaling*

The European whalers in Marlborough exploited the natural resources of the district. In the 1830s the large number of foreign whaling ships and local shore stations made Port Underwood the second largest concentration of Europeans in New Zealand after the Bay of Islands. By the late 1830s a large number of whaling ships - American, French and British - were putting intense pressure on the local whale fishery, which caused it to all but collapse by 1840. From this time most whalers turned to trade or other pursuits to make a living from the area. The whaling industry survived in Marlborough until 1964.

### *Systematic Settlement*

In 1837 the New Zealand Association made application to the British Colonial Office for a charter to establish a colony in New Zealand. This move was vigorously opposed by the London Church Missionary Society who saw the impact on Maori as likely to be devastating. As a result of a request from the Colonial Office, the New Zealand Association formed a company (called The New Zealand Company) and, despite continued confusion and obstruction caused by the Colonial Office, the company proceeded with its plans. In May of 1839 it sent the vessel 'Tory', under the command of Captain Chaffers, to New Zealand to make preliminary purchases of land.

Unbeknown to the New Zealand Company, Captain John Blenkinsopp, a trader based in Cloudy Bay, entered into an agreement with Te Rauparaha, in 1834, to purchase wood and water for his ship while in Cloudy Bay in return for a cannon. Blenkinsopp formalised this agreement in writing, fraudulently



*Horahora Kakahu - Port Underwood*

*Kakapo Bay*



substituting the words wood and water for Ocean Bay and Wairau Plain. Te Rauparaha, who could not read, initially signed the deed. However, he had it interpreted by other Europeans. When the deed's meaning was explained to him he ripped up his copy of the deed and returned the gun to the beach at Kakapo Bay. As far as Te Rauparaha was concerned that was the end of the matter. However a copy of the deed ended up in the hands of William Wakefield in late 1839 although it is unclear how the deed came to be in his possession.

The Tory made its New Zealand landfall off Queen Charlotte Sound and proceeded to employ whalers from Tory Channel, notably Heberley and Barrett, to guide it to suitable sites for settlement. Whanganui a Tara (Wellington), Taranaki (New Plymouth) and Whakatu (Nelson or Blind Bay) were chosen as sites for these first settlements.

By the time the Tory had sailed for New Zealand the British government had finally accepted that formal intervention was necessary, if the interests of Maori were to be protected. The Treaty of Waitangi was the result.

Hobson (the governor of the time) had originally been instructed to apply the treaty process to "such parts of New Zealand as the natives might be willing to cede". However, at some stage he decided to go for the whole country. As a result, after the initial signing at Waitangi, copies of the treaty were sent around the country for further signatures. Local Maori signed at Rangitoto (d'Urville Island) on 24 May 1840 and Horahora Kokahu Island (in Port Underwood) on 17 June 1840.

Although that marked the formal intervention of British authority in New Zealand, it would be wrong to assume the mere assertion of that authority created the substance. Maori independence or tino rangatiranga was to continue for some time. Indeed the Wairau saw the first major assertion of tino rangatiratanga by Maori in the face of continued European encroachment.

### *Acquisition of Land and Issues of Mana*

The New Zealand Company found that it did not have the means to settle all of the land claims of land purchasers in the Nelson region. These land purchasers had bought land by ballot in England. Each lot comprised 150 rural acres, 50 suburban and 1 town acre. There was insufficient land in Tasman Bay to honour these commitments.

In November of 1842 John Sylvanus Cotterell had been sent into the Nelson hinterland to see what extra land was available



to satisfy the demands of land purchasers. In an exploratory journey, which brought him over the Tophouse Saddle and down into the Wairau, Cotterell reported to the New Zealand Company in Nelson that there was any amount of land available in the Wairau district to satisfy the claims of purchasers.

Early in 1843, in possession of a copy of the Blenkinsopp deed, and convinced that it had purchased the Wairau in its negotiations with Te Rauparaha, Te Rangihaeata and Te Hiko at Kapiti in 1839, the New Zealand Company proceeded to let tenders for the survey of the Wairau district. This was despite a warning from Te Rauparaha and Te Rangihaeata of Ngati Toa that the Company should not do so as they had not sold the Wairau. Despite that, and the fact that William Spain was due to investigate land purchases in this area, the New Zealand Company went ahead in April 1843. After the signing of the Treaty of Waitangi, Spain had been appointed by Hobson to investigate all pre-1840 purchases of land in terms of their scope and equity, and to set aside any which did not measure up.

The decision of the New Zealand Company to proceed in spite of all this was followed by the even more rash decision to arrest Te Rauparaha and Te Rangihaeata on a spurious arson charge. The result was the death of 22 Europeans and four Maori at Tua Marina on 17 June 1843 (the Wairau Incident). Symbolically the Wairau Incident occurred three years to the day after the signing of the treaty in Port Underwood. This proved to be only a temporary set back in the district's development. Following this event Sir George Grey, the Governor of the time, was put under increasing pressure to purchase the district from Maori.

New Zealand Company settlements survived but did not flourish. The problem was the lack of a viable commodity to export. By 1844 many of the entrepreneurs in the Wellington settlement had seen the potential of the grasslands of the Wairarapa for running sheep on an extensive 'Australian' model. They imported sheep from Australia and began New Zealand's first boom in its search for economic viability.

One of the original Wairarapa entrepreneurs, Frederick Weld, was soon looking elsewhere and by 1847 had leased the Flaxbourne area from Maori. At the same time Nelson men such as Cooper and Morse were squatting on 'wastelands' at the head of the Wairau Valley at Tophouse.

Not surprisingly the New Zealand Company had been lobbying for the Crown to acquire the Wairau. In 1847, under questionable circumstances, Grey purchased the Wairau, and although the lower area had been reserved for agricultural pursuits - hence the

tendency for these blocks to be in 150 acre lots - the rush was on to take up sheep runs. By about 1852 most of the available blocks of land had been taken up by men of some means in the new colony, predominantly lawyers, doctors and ex-army officers.

### *Living off the Land*

The grasslands of Marlborough and later Canterbury and Otago were ideally suited to the pastoral industry. In the 1850s the capital outlay of stock could be recouped in three to four years. It is not surprising then that runholders became something of a colonial elite.

The movement of runholders into the district inevitably led to the demand for service towns. Although Waitohi (Picton) had been laid out as a New Zealand Company town, it was Blenheim (or the Beaver as it was then known) that became the district's first major town.

The first port for the Wairau had been established at the Wairau Bar, with rival establishments on either side of the river, run by James Wynen and Francis MacDonald, respectively. Wynen took advantage of the lowering of the Plain in the 1848 earthquake by erecting a raupo whare at the confluence of the Taylor and Opawa Rivers. This was at the foot of what was to be High Street. He was quickly followed and supported by James Sinclair who established his base of operations in the area now occupied by the railway yards. Alfred Fell, who owned the two 150 acre sections comprising the Beaver had it subdivided into town lots. Blenheim grew from this.

By the end of the 1850s the local occupiers, townsmen, agriculturists and runholders, were confident enough to petition the Governor for the separation of the Wairau district from Nelson province. The main reason was an objection to revenue being raised from land in this district being spent on improvements in Nelson. The petition was successful and formal separation took place upon the gazetting of the notice on 1 November 1859 with the formation of the Marlborough Provincial Council.

### *A New Marlborough*

The new province took the name Marlborough and its principal town became Blenheim, because of the association of that name with the first Duke of Marlborough.

The 20 years following the formation of Marlborough were very active for local government and saw the creation of a number of Councils and ad hoc authorities within the Marlborough province, including the Picton and Blenheim Borough Councils and the Marlborough County Council. A number of road, river



and drainage boards were also formed at this time to manage the rivers and the ever increasing number of roads and drains that were being formed. The roads boards, the Havelock Town Board and the Sounds and Awatere Counties all later merged with the Marlborough County Council over time.

### *Exploitation of Marlborough's Resources*

The grasslands that followed the fires of Tamatea were so dense that forest regeneration had been prevented. As a consequence there was no building timber readily available in the Wairau, Awatere and Clarence Valleys when the first settlers arrived and therefore early dwellings in these areas were invariably made of earth. However, the same could not be said for the Northbank and Sounds areas where forests provided plentiful building materials. Forest clearance began in the 1860s and 70s and continued until about 1930.

Beginning with the rainforest in the Mahakipawa Valley in the 1860s, the Koromiko, Kaituna, Pelorus, Rai and Opouri Valleys were systematically milled over the succeeding decades. The ground was then burned over and sown down in pasture. From 1860 to 1930 timber was a significant contributor to the Marlborough economy, but like whales and gold in the 1860s, it was over exploited and was therefore unsustainable in the long term.

Gold was discovered in the Wakamarina Valley in the winter of 1864. On a national scale it provided little more than a 'half-way house' between the Otago gold rushes and those of the West Coast. It did however provide steady work for miners on a relatively modest scale well into the twentieth century, as did the gold fields at Mahakipawa and on the Northbank.

Flaxmilling on a large scale began throughout the district in the late 1860s and lasted through to the 1950s at the Marshlands Flaxmill. It was only the advent of synthetics which spelt the end of this industry. The same thing happened to the wool industry, which over the years from the 1860s was a significant contributor to the area's economy.

The impact of pastoral farming on the environment had been significant - particularly as fire was seen as an annual requirement for the stimulation of pasture growth. In the 1870s cropping of the virgin soils in areas like Dillons Point produced impressive harvests of grain, but was hard on the soil. The district's main produce was peas, grain, chaff, wool, timber and flax. By the late 1870s poor management, overgrazing and the spread of rabbits had reduced the natural fertility of the grasslands. Disease amongst stock became a problem and by the 1880s reduced

returns coupled with falling production brought the country into the grip of a serious recession.

### *Diversification*

The depression of the 1880s provided the drive for diversification. It led to the demand to break up the large runs, and to the investigation of refrigeration as a means of solving the problem of the 'worthless carcass'. Until this time wool was the only viable export from sheep. The successful development of the frozen meat trade gave New Zealand and Marlborough the economic buoyancy it had long been seeking. Refrigeration also made smaller farming units possible, so economic viability saw the break up of a large number of Marlborough's pastoral runs in the period 1898-1915. Some of the more notable runs affected were Blind River in 1895, Omaka Estate in 1896, Starborough in 1898, Flaxbourne Estate in 1905, Hillersden in 1913, Lynton Downs in 1914 and the Wither Run in 1915. In all something like 22 estates comprising an area of some 224,090 acres were acquired for settlement. Virtually all of Marlborough's smaller farms outside the lower Wairau and south of the Wairau River date from this period.

The years 1890 to 1972 (with the temporary setback in the 1930s depression) were the truly golden years for the New Zealand economy. New Zealand had a ready market for its produce in the United Kingdom, however the entry of Britain into the European Economic Community (EEC) marked the end of that buoyant period.

Since then New Zealand and Marlborough have sought alternative means of making a living to boost traditional economic industries. Marlborough, thanks to its unique mix of geography and climate, has fared better than most regions. Horticultural diversification into pip fruit and cherries and the planting of exotic plantation forests on marginal pastoral land have contributed to the economy.

Marlborough's sunny climate and the Wairau aquifer ground-water supply have combined to make Montana's 1972 experiment with grapes a stunning success. This can be compared with the wool boom of the 1850s and the boom generated by the refrigerated trade after 1890. The scenic attributes of the Marlborough Sounds have been, and continue to be, valued by Marlburians and tourists alike. Since the 1970s, with the development of mussel farming, the Sounds have also proven to be an asset to the local economy very akin to the depasturage licences of the 1850s.

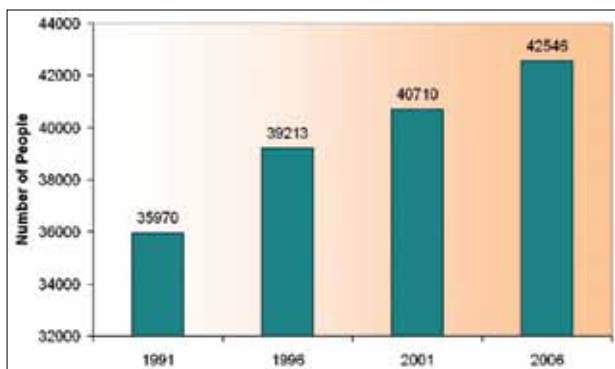


## THE PEOPLE OF MARLBOROUGH TODAY

### Population and ethnicity

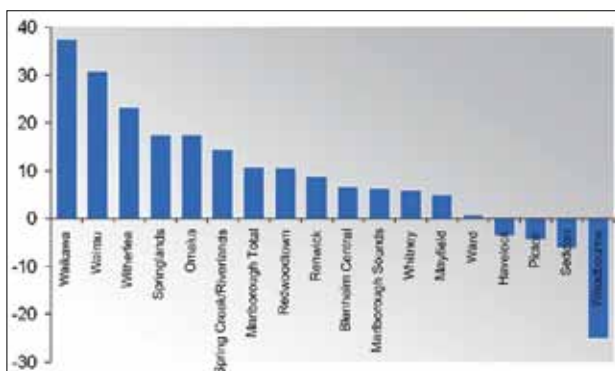
Marlborough's population recorded at the 2006 census was 42,549 - an increase of 8% since 2001. This increased population slightly exceeds the national growth rate of 7.8% and the South Island growth rate of 6.7% over the 2001 to 2006 period. Tasman/Marlborough was one of five regions in New Zealand that had population growth of more than or about 1.5% per annum since 2001 (Figure 1.1).

**FIGURE 1.1: CHANGES IN MARLBOROUGH'S USUALLY RESIDENT POPULATION 1991 TO 2006**



Within Marlborough, population growth has been greater in some areas than others - see Figure 1.2. The greatest relative growth has occurred in the Wairau Plain area, where the population has grown by 13% since 2001. At almost twice the growth rate for the South Island, this has been substantial. The growth has been concentrated from Wairau Valley township east and includes the area surrounding Blenheim. Blenheim experienced slightly less population growth than the national average, with a 7% increase since 2001, although growth within Springlands (10%) and Witherlea (14%) areas has been greater.

**FIGURE 1.2: % CHANGE IN USUALLY RESIDENT POPULATION 1996 TO 2006**

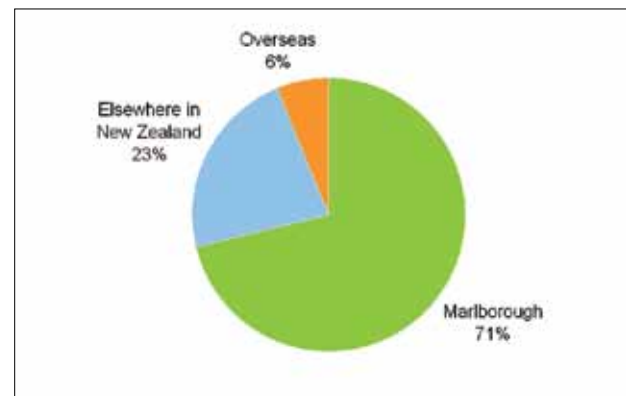


The Sounds population was stable between 1996 and 2001 but, since 2001, has grown by 4%, if the Sounds' settlements are included. The Sounds' settlements' population growth has been concentrated in Waikawa (which has had a 37% increase in 10 years) and the small settlements in the Sounds itself. Picton's population (excluding Waikawa) has declined slightly but consistently since 1996, while Havelock's population has been relatively stable since 2001.

### Population mobility

One distinctive feature of Marlborough's population is its mobility. Analysis of the 2006 census figures suggests that approximately half of Marlborough's residents had arrived since 1996 and that around 29% of residents had arrived within the period 2001 to 2006. Figure 1.3 is a 2006 census figure showing where people were living in the previous (i.e. 2001) census. That has a profound impact on Marlborough's social capital, community values and stability. Some observers suggest Marlborough has experienced one of the most dramatic socio-economic transformations of any New Zealand community in the last 30 years.

**FIGURE 1.3: WHERE PEOPLE LIVED IN 2001**



### Itinerant population

One feature of Marlborough's population that doesn't come through in the statistics is its itinerant population - associated most frequently with viticulture and horticulture. It is not possible to accurately assess the size of the itinerant population, however it is estimated that there could be at least 4,000 people in addition to the usually resident population. That is a significant portion of the population who are not fully captured by the census. This has implications for a range of things such as health services and accommodation.

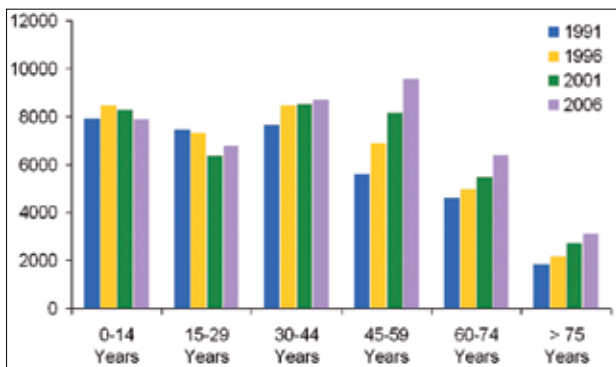
Unoccupied houses are also recorded in census figures. These are generally holiday homes like those in the Marlborough Sounds. Based on the census figures Destination Marlborough has estimated that the peak summer population of Picton, as a whole, is 10 to 20% higher than the census night.

**Ageing Population**

As for the whole country, Marlborough’s population has become increasingly characterised by greater growth in age groups over 45 years. In 2006, 16.2 percent of people in Marlborough were aged 65 years and over, compared with 12.3 percent of the total New Zealand population. In comparison Marlborough’s resident 2006 population had 18.6 percent of people aged under 15 years, compared with 21.5 percent for all of New Zealand. The median age is 41.7 years for people in Marlborough and for New Zealand as a whole, the median age is 35.9 years.

Significant growth has been experienced in the 45 to 59 year age group between the 1991 and 2006 Census - see Figure 1.4. The decline in the 15 to 29 age group is probably reflective of young people moving away initially for tertiary education and then for job opportunities.

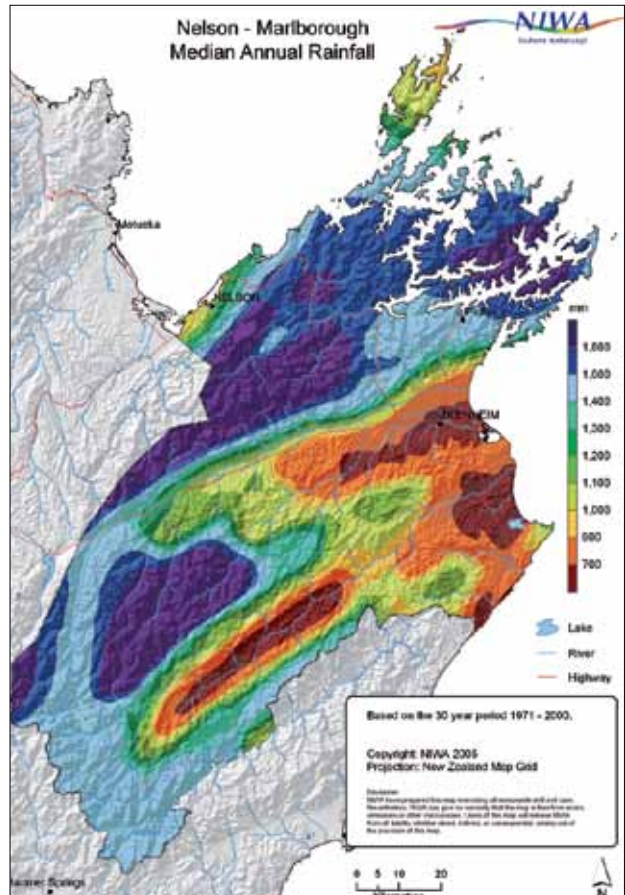
**FIGURE 1.4: AGE DISTRIBUTION FOR MARLBOROUGH 1991 TO 2006**



**Ethnic diversity and migration**

The 2006 census suggests Marlborough’s population is somewhat more culturally diverse than its neighbouring districts but greatly less diverse than the rest of New Zealand. What has been noticeable, at least anecdotally, is the rate at which population diversity has changed, particularly over the last 10 years, as migrants from diverse international backgrounds have migrated to Marlborough. Even since the 2006 census, there has been a marked visible increase in ethnic diversity, particularly in Blenheim and Seddon, as a direct consequence of recruiting to meet the labour demands of the expanding viticulture industry.

**FIGURE 1.5: NELSON-MARLBOROUGH MEDIAN ANNUAL RAINFALL**



**CLIMATE**

While Marlborough enjoys a reputation for being one of the sunniest places in New Zealand, it is also a very diverse area climatically. East coast areas, including Blenheim and the Wairau Plain enjoy long sunshine hours and a relatively low rainfall of 500 to 700 millimetres per year. However, just 50 kilometres north of Blenheim, parts of the northern Marlborough Sounds record rainfall averages of over 2,500 millimetres per year. Further inland the headwaters of the Wairau River have even higher rainfall as well as permanent snow cover in winter. The upper reaches of the Awatere Valley are very cold and dry, with around 750 millimetres of rain and over 200 ground frosts per year.

Figure 1.5 shows the median annual rainfall for Nelson-Marlborough for the years 1971 to 2000 and a summary of Blenheim climate statistics for the period 1986 to 1997 is shown in Table 1.1.



## OTHER MARLBOROUGH STATS IN BRIEF

### The People<sup>1</sup>

- 1.1% of the New Zealand census usually resident population.
- Below average population density (3.9 people per square kilometre compared with 14.9 people nationally)<sup>3</sup>.
- Median age of 41.7 years, higher than the national median age of 35.9 years.
- 10.5% identify with the Māori ethnic group, compared to 14.6% nationally.

### Housing<sup>2</sup>

- 60.2% of households own their dwellings with or without a mortgage, compared with 54.5% for New Zealand. 12.3% hold that dwelling in a family trust, the same as for all of New Zealand.
- The average household size is 2.4 people, compared with 2.7 people for all of New Zealand.
- The average weekly rent paid by households renting permanent private dwellings is \$189, compared with \$224 for New Zealand as a whole.

### Industry<sup>2</sup>

- 19.8% are employed in agriculture, forestry and fishing.
- A further 17.1% of employees are in the manufacturing industry.
- 11.6% are employed in retail trade.
- 8.1% are employed in health and community services.
- 7.9% are employed in the accommodation, cafe and restaurant industry.
- 7.7% are employed in the construction industry.

<sup>1</sup> Based on data from the 2006 Census of Population and Dwellings.

<sup>2</sup> Based on Employee Count Business Demography data as at February 2007.

<sup>3</sup> Population density is calculated using 2006 Land Areas (excludes "Inland Water" and "Oceanic").



**TABLE 1.1: BLENHEIM WEATHER STATION DATA 1986 TO 2007 COLLECTED AT THE MARLBOROUGH RESEARCH CENTRE WEATHER STATION ON GROVE ROAD**

Year	Total monthly sunshine hours	Average daily sunshine hours	Average monthly mean temperature (°C)	Daily Average Maximum temperature (°C)	Daily Average Minimum temperature (°C)	Total Monthly rainfall (mm)	Average daily wind speed (km/hr)	Number of days where ground temperature was < -1°C	
	1986-2007	1986-2007	1986-2007	1986-2007	1986-2007	1986-2007	1986-1995	1996-2006	1986-2007
Jan	262.0	8.4	18.0	23.3	12.4	46.6	11.1	11.9	0.0
Feb	226.3	8.0	17.8	23.1	12.3	49.9	9.7	11.4	0.0
March	229.2	7.6	16.0	21.4	10.5	41.3	9.0	11.2	0.2
April	192.7	6.4	13.3	18.8	7.7	43.	48.7	9.6	1.4
May	172.8	5.6	11.2	16.5	5.7	54.6	8.9	9.6	5.5
June	152.0	5.1	8.6	13.8	3.4	62.9	8.7	10.1	12.5
July	161.3	5.2	7.8	13.0	2.6	64.6	9.5	9.8	14.9
Aug	185.4	6.0	8.8	14.0	3.6	58.5	9.4	10.3	11.1
Sep	189.2	6.3	11.1	16.1	5.9	52.8	10.5	12.1	4.2
Oct	226.3	7.3	13.1	18.2	7.9	62.6	11.8	13.3	2.1
Nov	235.9	7.9	14.5	19.7	9.3	56.4	11.4	13.4	0.4
Dec	252.9	8.2	16.6	21.7	11.5	46.6	11.4	13.1	0.1
<b>Total</b>	<b>2485.9</b>					<b>640.0</b>			<b>52.5</b>

*From Marlborough Wine Research Centre website*

## LAND RESOURCES

Marlborough's land resource covers 10,321 square kilometres. This extremely diverse area includes high mountain ranges, river valleys, lowlands and the islands of the Marlborough Sounds. The mountain ranges and river valleys were formed some 25 million years ago by the collision of the Pacific and Indo-Australian tectonic plates. The result of this has been two quite different geographical areas: the Marlborough Sounds to the north; and the major river valleys of the Wairau and the Awatere in the south.

## MARLBOROUGH SOUNDS

The Marlborough Sounds are a unique environment consisting of a labyrinth of the enclosed and relatively sheltered waters of Port Underwood, Queen Charlotte Sound, Pelorus Sound, Tennyson Inlet, Croisilles Harbour and around d'Urville Island. The geological subsidence in the area has resulted in the drowning of river valleys and has created some 1,500 kilometres of coastline. The Marlborough Sounds' landform is rugged, sloping steeply away from the shoreline to prominent spurs and ridges on the skyline. Bays, coves, beaches, inlets, peninsulas, headlands and cliffs all mark the point where land and water meet.

The Marlborough Sounds are located between Tasman Bay in the west, the often rough and wild Cook Strait to the north-east, and the exposed open ocean conditions along its south-eastern flank. The moist climate and geology, combined with steep topography and complex coastline, creates a variety of habitats and ecological

communities. This includes broad leaved forest in gullies and black beech forest on headlands and lowland spurs, a succession of hard, red and silver beech on lower to higher slopes, and remaining podocarp species like totara, rimu, matai and kahikatea in the heads of bays and on the lower slopes.

A significant amount of original forest cover remains, and about half of the land area north of the Wairau River is in conservation estate under the management of the Department of Conservation. Regeneration of land, once cleared for pastoral farming, is also now common with vigorous native shrublands including manuka, kanuka, tauhinu and broadleaf species becoming established. An ultramafic (or volcanic based) mineral belt, which runs through parts of the Sounds, supports some distinctive vegetation and a number of rare or unusual plants.

Some of the rarest animal and insect life in the world can be found in the Marlborough Sounds (e.g. tuatara, Maud Island frog, Cook Strait giant weta). The Sounds are home to these threatened species, which have found refuge on island reserves administered by the Department of Conservation. Access restrictions are placed on these reserves to ensure that the habitat remains intact and to reduce the threat of wildlife smuggling. Species found on the predator free island reserves of Maud Island, Stephens Island and Titi Island include, tuatara, kakapo, takahe, saddleback and kiwi.

Much of the land area of the Sounds, some 60%, is in public ownership. This land is mostly protected under the Reserves Act and a large proportion of it is looked after by the Department of Conservation.



## TUATARA



*Stephens Island*

The offshore islands of the Marlborough Sounds are home to many of New Zealand's tuatara. This species, which is only found in New Zealand, is the only surviving members of a unique group called Sphenodontia that lived during the age of the dinosaurs about 200 million years ago. All of the other species in the group became extinct about 60 million years ago. The tuatara is therefore of huge international interest.

Tuatara survive on these offshore islands because they are free of rodents and other introduced mammalian predators. The total number of surviving tuatara is estimated at around 100,000 (DOC website). About half of these live on Stephens Island in Cook Strait and the rest are located on other islands in the Sounds and islands in the Hauraki Gulf, off Northland, the Coromandel Peninsula and the Bay of Plenty.



The Marlborough Sounds are also interesting because of the wide range of activities that have occurred there in the past or are undertaken there today. The Sounds have long been settled by Maori, possibly stretching back as far as 800 years. Te Atiawa, Ngati Kuia, Ngati Koata, Ngati Apa, Ngati Rarua, Ngati Toa and Rangitane all retain strong connections with this area and place great importance on their links to traditional sites, both on land and in the sea. The Sounds were a focal point for interaction between European and Maori cultures pre and post colonisation.

European explorers, whalers, and then settlers, all came to the Marlborough Sounds. In some ways, this settlement trend continues today as people are still choosing to live here.

Since the arrival of humans, the Marlborough Sounds' landscape has been extensively modified. The most obvious change was caused by the clearance of the original vegetation cover (predominantly bush) to allow for pastoral farming, followed, in some areas, by exotic forestry. Today many land farms have been left to revert to indigenous forest and bush cover.

The combination of land and water also creates a stunning coastal environment that attracts people to live or holiday in the Marlborough Sounds, creating quite unique coastal communities in the process. The desirability of living and holidaying in the Sounds is reflected in the many houses and holiday homes that dot the land adjacent to the foreshore. Some 5,000 dwellings are in existence outside of the townships of Picton, Waikawa and Havelock. The Sounds are also a recreational playground, with plenty of opportunities to tramp, cycle, swim, boat, dive and fish.

The Pelorus and Rai areas have steep to moderately steep hill country. The upper Pelorus River catchment comprises land that is mostly indigenous forest. Lower down there is a more modified environment of exotic forestry, scrub and pasture. A substantial number of Marlborough's dairy farms are based within the Pelorus and Rai catchments.

## WAIRAU AND AWATERE VALLEYS AND FURTHER SOUTH

Most of the rural areas of south Marlborough comprise moderately steep to very steep hill country and mountain land bisected by major river systems. Less than 5% of the land area could be described as low lying or flat. The dry climate and greywacke and other largely sedimentary rock types of south Marlborough are reflected in a wide diversity of habitats and in the character of the native vegetation. Because of its central location, and latitude, south Marlborough has species near the southern limits of their range (particularly lowland forest species like rangiora) and some at the northern limits of their range such as the New Zealand lilac. The extreme dryness means plants adapted to those conditions are prevalent. Interwoven into all this is the unique

*Irrigated pasture*



endemic element, including species that have evolved in the special conditions, such as the pink brooms, New Zealand lilac and Marlborough rock daisy. The widespread occurrence of dry rocky lowland habitats seems to be the key factor for most of the distinctive local species. The native fauna follows this pattern too.

The Wairau River originates at the northern end of the Southern Alps and is fed by numerous tributaries until it meets the sea east of Blenheim. The Awatere River originates in the vicinity of the Rachel Range, which acts as a watershed between the Acheron and Awatere Rivers. In their course, these rivers and their tributaries flow through glacial landscapes, indigenous and exotic forests, tussock grasslands, exotic grasslands and eventually travel through the highly modified landscapes of the Wairau Plain and lower Awatere catchment. Part of the Clarence River also flows through Marlborough.

The Wairau Plain around Blenheim is, with its flat land and alluvial soils, the most intensively developed rural area of Marlborough. The environment here is highly modified being the subject of an extensive flood management and drainage system, which benefits some 10,000 hectares of productive land. Favoured by mild climatic conditions, close to centres of population and water resources, a wide range of land uses have historically developed on the Wairau Plain. Today the main land uses include viticulture and horticulture, and to a limited extent, mixed farming, cereal production, small seed production, the production of crops for food processing, dairy farming, and intensive cropping (e.g. garlic). There are also many people living in this area on small rural lifestyle blocks.

Further south, the Awatere Valley and Ward areas have historically had a strong pastoral farming focus. However, in more recent times this area has been distinguished by contrasting land use pressures. On the one hand, these areas are vast and relatively isolated from major centres of population, with the dominant and traditional land use being pastoral farming, producing wool and meat. On the other hand, there are some areas where pastoralism is experiencing continuing pressures to change to forestry, viticulture and other horticultural activities. There have also been pressures for rural lifestyle living as people seek alternative ways to provide for their economic and social well-being.

Viticulture is the most prominent of the intensive land use changes that have occurred in Marlborough's rural areas, with a rapid expansion of vineyards. Some of the drier parts of south Marlborough have been helped in this expansion by the development of community based irrigation schemes and onsite storage of water for irrigation.



*Lake Grassmere salt works from the air*



The other aspect that characterises this area of Marlborough is the Lake Grassmere Salt Works. Lake Grassmere has been used since 1943 for the solar production of salt. The ability of the lake to produce salt arises from low rainfall, high sunshine hours and strong drying winds during the summer months, mostly from the north westerly direction. Salt is produced here for both the domestic and export market. The operations are unique in New Zealand, while some of the methods used to produce the solar salt are unique in the world.

In Marlborough's high country (the area above 1000 metres) extensive pastoralism, historically was and still is, the predominant land use activity. The relative isolation and topographical and climatic limitations of these hill country areas means that pastoralism is likely to remain the major land use activity well into the future. Much of the land is Crown owned and is in pastoral lease subject to private management.



## MARLBOROUGH'S SOILS

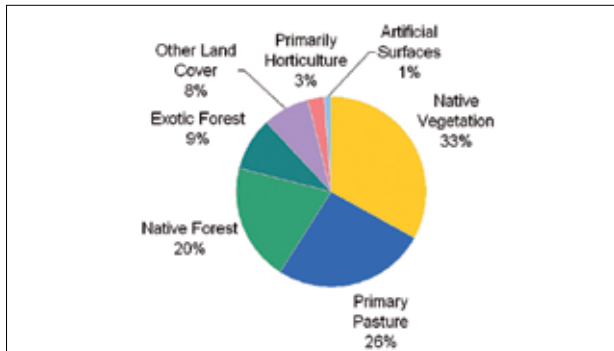
Soils are fundamental to a range of ecosystem functions and are essential to Marlborough's economic, environmental, and social wellbeing. Soils are vital for the storage of water and nutrients; they mitigate greenhouse gas emissions, filter and breakdown a range of harmful substances, and act as a buffer between the atmosphere and aquatic environments. Soils are also at the heart of Marlborough's economy, underpinning agriculture, viticulture, and forestry industries and complementing a 'clean green' tourism image. Not least, soils are the living mantle of our earth, the surface on which we live, grow our food, and build our houses.

Like the rest of New Zealand, Marlborough has a diverse range of soils. In fact there are over 87 different soil types in Marlborough representing 8 of the 15 soil orders used in New Zealand - the highest and most generalised level of soil classification. The large number of soil types within Marlborough reflects the variation of parent materials, age of soil development, the climate (i.e. mean annual rainfall and presences and absence of drought) and topography.

In very general terms, soils in northern Marlborough including the Sounds, have developed in a relatively wet climate on predominately metamorphic rocks such as schist and weakly metamorphosed greywacke-schist and lesser amounts of basic and ultramafic rocks. Soils in south Marlborough have developed in a drier climate on predominately sedimentary rocks such as greywacke, argillite, conglomerate and limestone and also on wind blown loess material. In comparison, the influence of climate has been less influential on the Wairau Plain where soils have developed on a range of parent materials ranging from alluvium and organic deposits on floodplains and dune sands, beach gravels and estuarine deposits on the coastal margins.



**FIGURE 1.6: THE PROPORTION OF DIFFERENT LAND COVER CLASSES IDENTIFIED IN MARLBOROUGH IN 2008**



## LAND COVER/USE

Like the rest of New Zealand, Marlborough has a range of different land cover patterns that reflect human pressures such as land use change and natural pressures such as geological processes.

The proportion of eight major land cover classes in Marlborough for 2008 is shown in Figure 1.6. The data has been derived mostly from the Ministry for the Environment's Land Cover Database 2. This has then been updated by the Council for several land cover classes (exotic forest, artificial surfaces [roads and infrastructure] and horticulture), using a combination of field surveys and interpretation of aerial photography.

It was found that the most dominant land-cover recorded in Marlborough is native vegetation. This includes vegetation such as manuka and kanuka, broadleaved native hardwoods and tall tussock grassland. There are also significant amounts of native forest and pasture, (which includes both improved exotic and unimproved pasture) and lesser amounts of exotic forest cover.

## FRESHWATER RESOURCES

### Rivers and lakes

Before human settlement the entire length of Marlborough's river networks, from the fast flowing mountain streams down to the swamps and wetlands of the coastal margins, were surrounded by forest and natural vegetation. However, the arrival of Europeans and their farming practices had a significant impact on the river systems of Marlborough.

Reflecting Marlborough's diverse climate, geology and topography, there are a wide range of river types. Marlborough's three largest rivers are the Pelorus, the Wairau, and the Awatere. Each has a significant catchment reaching right to the western boundary of the district. As such, a large proportion of their flow is sourced from north-west rainfall in the Richmond Ranges and

other alpine areas, that doesn't necessarily fall further to the east. Because of this, these rivers tend to have more reliable flows than smaller water bodies elsewhere in Marlborough.

The Wairau River is the largest of Marlborough's rivers being approximately 145 kilometres long with a catchment that covers 3,825 square kilometres. It flows in a north easterly direction from its source to the Pacific Ocean at Cloudy Bay. It is essentially a braided river, except in the lower reaches where it flows as a single meandering channel. The Wairau River also has tributaries that are significant in their own right. The Branch, Wye and Waihopai Rivers flow into the Wairau River on its south bank, while numerous rivers, from the Goulter River in the west to the Pukaka River in the east, flow into the Wairau River on its north bank.

One of the most significant factors about the Wairau River and its tributaries is the long history of modification to its channels. From 1861 a succession of river control works have altered the channels and flow of all rivers and streams across the Wairau Plain. These river works were carried out for the primary purpose of draining swamps and wetlands for conversion to pasture and to reduce the risk of flooding for human settlement.

The Awatere River is about 110 kilometres long and has a catchment area of 1,600 square kilometres. Its headwaters are in high snow covered mountain ranges about 2,000 metres above sea level. Over most of its length it is a steeply graded river confined in a rock channel. In its lower reaches it becomes deeply entrenched and has developed small alluvial flood plains. The Awatere River has a naturally high level of milky discolouration because of fine suspended sediments dissolved from the mudstone through which the river flows.

The Pelorus River is approximately 70 kilometres long with a total catchment area of almost 900 square kilometres. This includes the tributary catchments of the Rai and Wakamarina Rivers. The Rai River is approximately 20 kilometres long and has a catchment area of approximately 200 square kilometres. The Rai River is unusual in the fact that it has no headwaters, as it is made up of the Ronga and Opouri Rivers, which join to form the Rai River just north of the Rai Valley township. The upper Pelorus catchment is mainly indigenous forest reserve, while the Rai River and its tributaries flow through a more modified environment of pasture, scrub and exotic forest.

In the Marlborough Sounds, where rainfall is at least double that of south Marlborough, there are hundreds of short, steep creeks but very few large rivers. The largest are the Kenepuru River, Kaituna River, Waitohi Stream and the Graham River.

In the drier climate of south Marlborough, many of the smaller rivers are ephemeral in nature, only flowing for their full length after sustained periods of rainfall. For the remainder of the year the flows from the upper reaches disappear into the porous



gravels of the riverbed into the groundwater system. Ephemeral rivers are most common on the south bank of the Wairau River, in the Southern Valleys (e.g. the Taylor and Omaka Rivers), in the Awatere River catchment and further south (e.g. the Blind River).

There are numerous spring fed streams throughout Marlborough, but particularly so on the Wairau Plain where groundwater emerges onto the surface in response to the reduced gradient of the land. These spring fed streams tend to have very steady flows and good water quality.

### Biodiversity

The rivers, lakes and wetlands of Marlborough are home to 20 species of native freshwater fish. (Five exotic fish species are also present in Marlborough's rivers and streams: brown trout; rainbow trout; Chinook salmon; goldfish; and grass carp, which are confined to the Opawa Loop. Two other introduced species, tench and rudd, have also been found in the Taylor Dam.)

The streams of the Marlborough Sounds are a stronghold for native fish species with easy access to the sea for migration and bush covered catchments providing ideal habitat. The larger Marlborough Sounds streams are particularly important as they do not contain introduced salmonid species, which are known to displace the shortjaw kokopu. The giant kokopu prefer lowland streams although much of their habitat has been lost; only seven sightings of giant kokopu have been recorded on the Wairau Plain since 1973.

The ephemeral waterways of south Marlborough generally do not support a large variety of native fish species. However, they are often virtually the only remaining area of natural habitat in otherwise highly modified agricultural/horticultural environments.

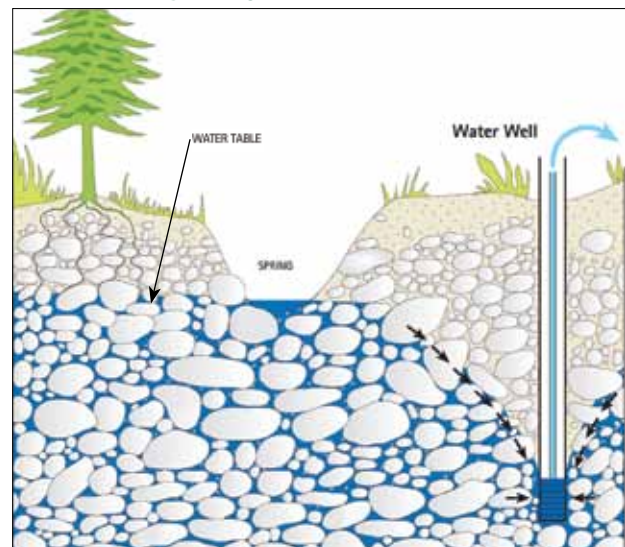
Wetlands are also an important part of freshwater ecosystems. These areas provide a food source for fish, birds and other animals. They absorb large amounts of water and nutrients from outside sources, and their micro-organisms (fungi and bacteria) efficiently decompose and recycle nutrients. They also help protect against flooding and store and cleanse water. Wetlands are also important to Maori, featuring in the history and culture of local iwi.

Less than 2% of New Zealand's land area is now covered by wetlands, yet these areas are home to 22% of native land bird species. Wetlands support an immense variety of animals, some of which are very rare. Most of New Zealand's wetland animals are not found anywhere else in the world. They include scaup, paradise shelducks, and giant kokopu. Many wetland plant species are also not found anywhere else in the world. More on the types of remaining wetlands that can be found in Marlborough is in the box 'Marlborough's wetlands'.

### Groundwater resources

Over the last 2.5 million years, sands and gravels of glacial origin have helped to shape the Wairau Valley and Plain area. The upper reaches of the Wairau River have cut through the glacial outwash gravels and deposited them downstream to form the Wairau Plain. The sands and gravels of the Wairau Plain were then modified over time by the constant reworking of the Wairau River as it meandered across the Plain. The constant reworking removed the finer sands and sediment from the gravels leaving layers of porous gravels behind. Cycles of sea level rise and fall have also helped to create layers of porous gravels (aquifers) and impermeable marine silts (aquitards) one on top of the other. Groundwater flows in the natural gaps between the rocks or gravels as shown in Figure 1.6.

FIGURE 1.6: GROUNDWATER FLOWING BETWEEN GAPS IN GRAVELS



This cross section shows groundwater (in blue) flowing around alluvial gravels. Areas where groundwater can collect in porous gravels such as shown are called aquifers. Marlborough's aquifers are commonly formed of well rounded gravels similar to what exists in the present day river bed. Where groundwater breaks the surface and begins a surface flow it is known as a spring.

Figure 1.7 shows how groundwater originates either as rain falling in the hill catchments or leaking from the rivers. This water then flows through the gravels forming the Wairau Plain towards Cloudy Bay. Aquifers are either confined or unconfined: confined aquifers have a capping layer formed of impermeable materials such as clay, which forms a barrier to what is happening at the surface.

## MARLBOROUGH'S WETLANDS

A diverse range of small lakes, tarns and wetlands occur, especially at higher altitudes. These include those on the St Arnaud Range, Lake Sedgemere, Fish Lake and the Bowscale Tarn complex in the Wairau and Acheron catchments. Lake Chalice, an enclosed lake with a subterranean outlet, is particularly important for its unmodified ecosystems with a landlocked population of koaro.

Very large areas of wetlands were once found in the lowlands of Marlborough, particularly around the Blenheim area. In those days Blenheim was known as Beavertown, and travel across the boggy Wairau Plain was an arduous journey during the winter. There were also lowland freshwater swamps and wetlands grading into estuarine wetlands at the head of the Marlborough Sounds. However, the wetlands have now been almost entirely drained for development of farm land.

Marlborough has 4 main types of remaining wetlands: swamps; lakes, tarns and ponds; coastal/estuarine wetlands; and faultline associated wetlands.

**Swamps** are wetlands that have water flowing through them and have water levels that fluctuate seasonally. The water flowing through them brings silt and organic matter into the swamp making them fertile areas. Typical swamp plants include Harakeke (flax), Raupo and Purei (carex). The organic matter these plants produce encourages large populations of aquatic invertebrates including insects, water-snails, crustaceans, worms and vertebrates such as birds and fish.

**Lakes, tarns and ponds** are permanent areas of open freshwater. Lakes are natural areas of open water. Tarns are small lakes occupying glacially formed depressions. Ponds are man made wetlands, with the majority of the area in open water. Open water areas with shallow margins surrounded by swamp vegetation provide ideal habitat for waterfowl.

**Estuaries and coastal wetlands** are the most productive of all wetlands, and are especially rich in animal life. Many coastal fish, such as flounder, depend on estuaries as fish spawning grounds.

**Faultline associated wetlands** - Marlborough is notable for the earthquake faultlines that run through it, in particular the Wairau, Awatere and Clarence Faults. Associated with these faults are a series of wetlands. The movement along these faultlines turns rock into clay. Water moving slowly through the soil cannot get past the clay and is forced to the surface where it forms a wetland upstream of the faultline.

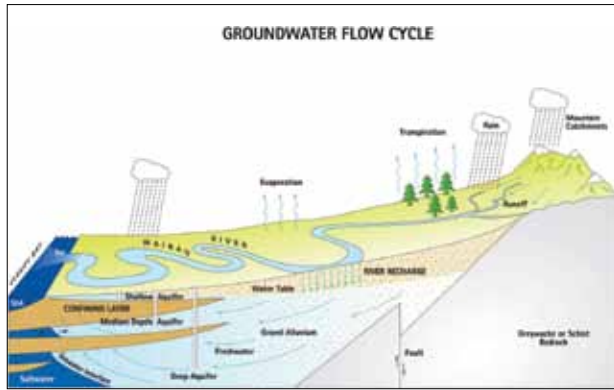
**Other wetlands types in Marlborough** - Beach ridge wetlands around Rarangi are unique within Marlborough. They are a rare landform in New Zealand, and are not common on a global scale. Bogs are wetlands that are only fed by rainfall and are therefore low in fertility and are acidic. Bogs are very rare in Marlborough with less than 1 hectare of bog remaining.

*Whangarae Inlet*





**FIGURE 1.7: SIMPLIFIED GROUNDWATER FLOW CYCLE FOR THE WAIRAU PLAIN**



The inland Wairau Aquifer beneath Rapaura or west of Renwick is an example of an unconfined aquifer. Its structure allows it to directly receive continuous recharge (water entering the aquifer) from the Wairau River in the reach north-west of Renwick. In contrast, the coastal Wairau Aquifer extending from State Highway 1 to Cloudy Bay, is confined by a thick layer of marine clays.

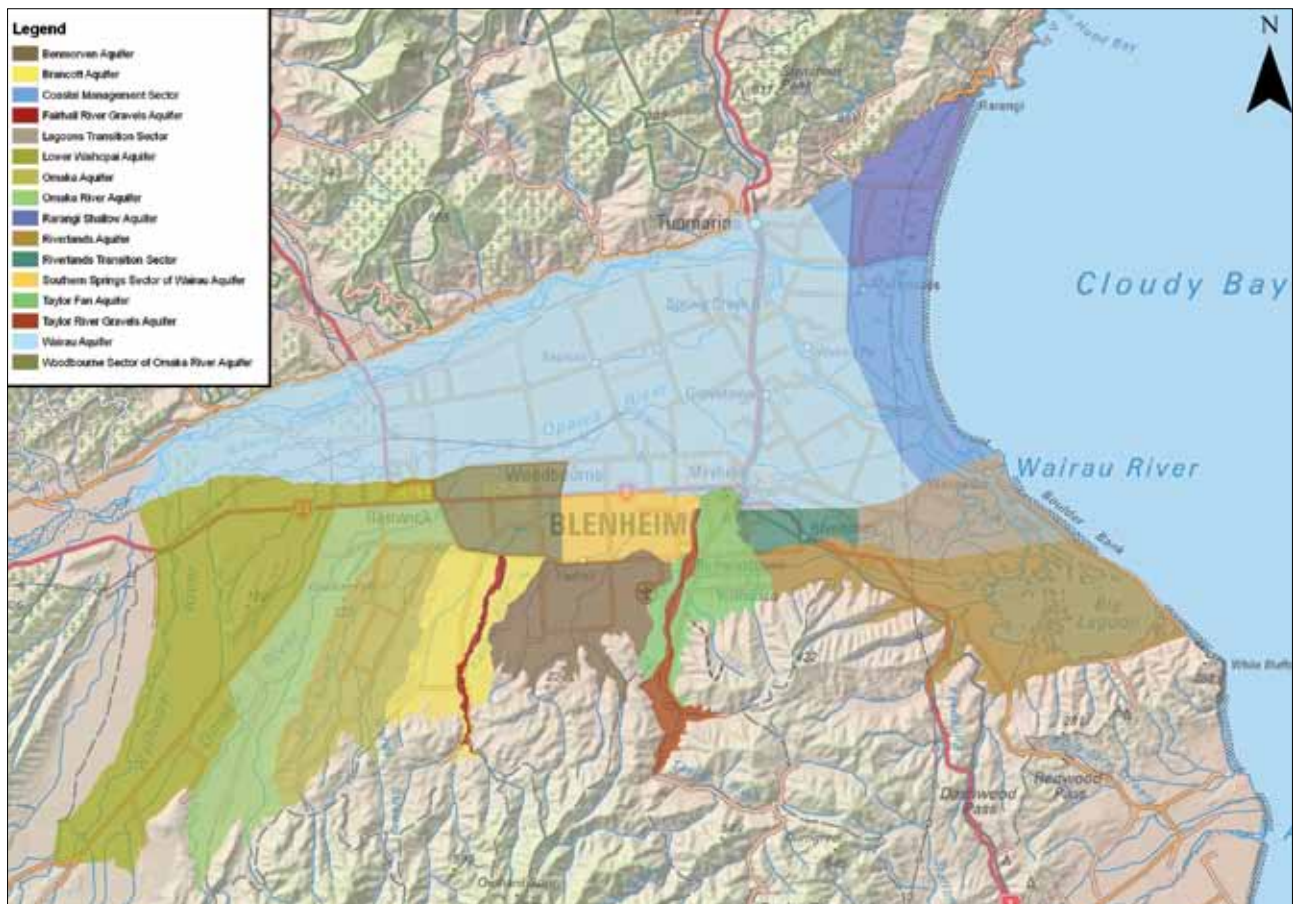
While unconfined aquifers mean there are no barriers to recharge, the downside is they are more susceptible to surface pollution. Confined aquifers often have lower yields and poorer water quality because flow is more sluggish, which leads to older and more mineralised groundwater. The Southern Valleys Aquifers located along the southern margin of the Wairau Plain are examples of aquifers that are generally confined.

**Marlborough’s aquifers**

Marlborough’s most significant aquifers are located beneath the Wairau Plain. The boundaries of these aquifers are shown in Figure 1.8.

The central and northern parts of the Wairau Plain are above Marlborough’s largest aquifer, the Wairau Aquifer. The porous gravels of this aquifer gain water from the Wairau River, at a rate up to 7,000 litres of water per second in the area just north of Renwick and Wratts Road. The full extent of the Wairau Aquifer is not known as it extends beyond the coast and under the seabed.

**FIGURE 1.8: LOCATION OF AQUIFERS BENEATH THE WAIRAU PLAIN**



In the Marshlands/Rarangi area of the Wairau Plain, a layer of marine sediments, known as the Dillons Point Formation, creates a barrier between the Wairau Aquifer and the shallower Rarangi Aquifer that is formed by beach sands and gravels adjacent to the coast.

The Southern Valleys of the Wairau Plain, around the Brancott, Benmorven, Omaka, Taylor and Riverlands areas, contain remnants of glacial outwash materials that have not been reworked by the Wairau River to remove the finer sand and sediment. The recharge of these aquifers relies on the winter flows of the small rivers and streams above them, and on local rainfall. During the summer months low rainfall means that the river and stream channels draining the Southern Valleys often dry up. Because sediment has not been removed from the gravels it means these aquifers are not as porous as those of the Wairau Aquifer, and therefore movement of water into and through the aquifers is much slower.

The Deep Wairau Aquifer is an area of porous gravels at a depth of greater than 150 metres beneath the Wairau Plain. The water of this aquifer has been dated to be between 9,100 to 40,000 years old. However, the extent of the Deep Wairau Aquifer is not known, nor is it known whether it is currently being actively recharged. Some research into the age of Marlborough's groundwater has been carried out and this is discussed in the box 'Age and source of Marlborough's groundwater'.

In other areas of Marlborough, such as the Awatere Valley, Ward and the Marlborough Sounds, groundwater is of less significance either because the geological structure of these areas has not provided large areas of porous substrate capable of holding water, or because there is no significant source of recharge water.

The Rai, Kaituna and Pelorus areas have a similar geological history to that of the Wairau Plain but on a much smaller scale. Therefore the aquifers in these areas are limited to the gravels of the associated riverbeds.

## COASTAL AREAS

The coastal environment of Marlborough is made up of two quite distinct geographic areas - the Marlborough Sounds and the east Marlborough coast. The Sounds are essentially large drowned river valleys lying between mountain ranges, extending from Cape Soucis in the west to Port Underwood in the east. In complete contrast the east Marlborough coast is an open sea coast, extending from Robin Hood Bay (Port Underwood) in the

north, to Willawa Point in the south. Together these areas contain about 1,800 kilometres of coastline, or approximately 18% of New Zealand's total coastline.

The Marlborough Sounds marine environment is bordered by Tasman Bay to the west and Cook Strait to the north-east. The Sounds are exposed to open ocean conditions along its south-eastern flank and the exposed eastern and northern areas of the Outer Sounds are subjected to high wind velocities funnelling through Cook Strait. However, elsewhere the Marlborough Sounds are noted for their relatively sheltered conditions. Cobble/boulder and bedrock shores dominate the inter-tidal and shallow subtidal zones of the Marlborough Sounds. An extensive and comparatively uniform mud/silt bottom typically dominates the areas below the subtidal zones.

The marine and terrestrial environments combine visually to form an area of distinctive natural character, including an intricate coastline, numerous islands and off-shore rocks and stacks, wild and remote areas, exposed and sheltered waters in close proximity and strong tidal flows, such as those experienced through French Pass and Tory Channel.

East Marlborough's coast is markedly different from that of the Sounds, although it too is highly varied with contrasts of rocky and mudstone reefs, gravel beaches and the shallow Wairau Lagoons. The Wairau Lagoons are a large expanse of semi-enclosed shallow water. Water passes between the wetlands and the sea via a gravel and sand channel that has been extensively modified by a rock guide bank. This guide bank has been built, improved and maintained by harbour and river authorities for over 100 years. This area has a long history in terms of both Maori and European occupation. The Boulder Bank adjacent to the Wairau Lagoons was occupied by early Maori up to 800 years ago, and is considered to be one of the most important archaeological sites in New Zealand.

Further south between Cape Campbell and Wharanui, the coastline is dominated by pea-gravel and gravel beaches interrupted by rocky headlands and reefs. The unique limestone outcrops of the Chancet Rocks and the Needles are located along this section of coastline. Sandy beaches and a small wetland at the Waima (Ure) River mouth are situated south of Ward Beach.

## Marine biodiversity

Marlborough's marine biodiversity is high because of the varied coastlines and associated habitats. These habitats range from the reefs and offshore rocks stacks to the sheltered enclosed bays of



## AGE AND SOURCE OF WAIRAU PLAIN GROUNDWATER

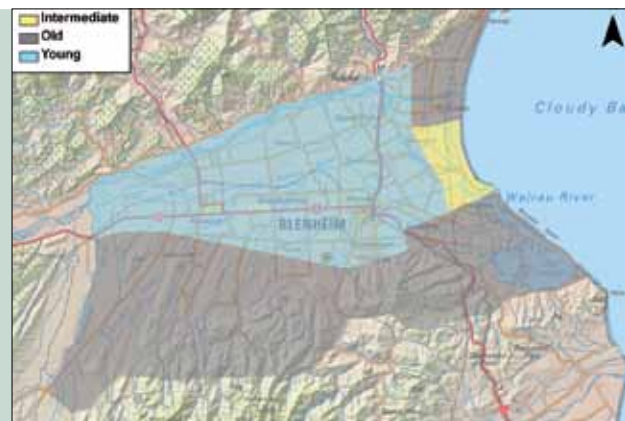
The Council has gathered a large amount of information about the Wairau Aquifer over many years and has one of the best series of records for alluvial aquifers in the country. The Council has recently had GNS Science Ltd review and report on this data to analyse the environmental isotope information collected as part of hydrological investigations in Marlborough dating back to the late 1960s. Environmental isotopes are naturally occurring tracers used to provide information on the age of groundwater and their source of recharge.

What are measured are chemical substances such as tritium or chlorofluorocarbons (CFC's) that have been released into the atmosphere by humans over the past 50 years. These substances dissolve in rain and become part of the hydrological cycle. Because they have been released in sufficient quantities into the environment, the substances can be used as tracers to provide information on how long groundwater has been underground. Naturally occurring substances such as pollen are also used to help trace the origin and age of groundwater.

The findings of the GNS report are generally consistent with what was known previously. However, the understanding about the relative split between the source of groundwater recharge i.e. rainfall as opposed to leakage from the Wairau River channel, has been refined. The report states that the proportion of rainfall recharge is around 20%, compared to earlier studies that considered rainfall to be a minor part of recharge.

The groundwater in the central area of the Wairau Plain is less than 6 years old. This water eventually reaches the central part of the coast beneath the confining layer. Older groundwater from the Wairau River (at least 60 years old) rises in the north and south parts of the coastal strip and mixes with the young water in the central zone.

Where the Omaka River Valley Aquifer and the Taylor-Burleigh and Riverlands Aquifers emerge from the Southern Valleys onto the Wairau Plain, the groundwater usually has an age of less than 10 years. This comes from equal proportions of rainfall and streamflow infiltration.



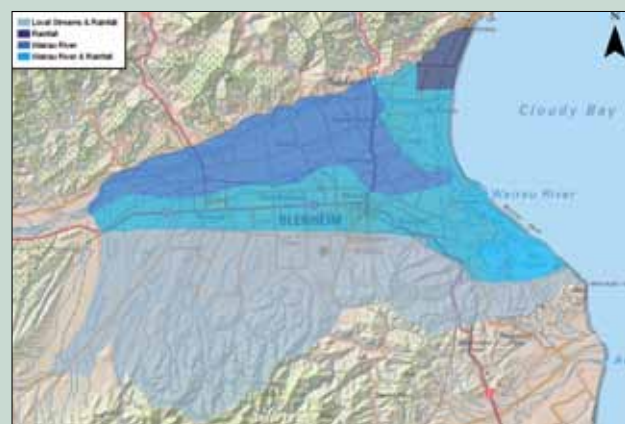
*Generalised residence age of groundwater*

For the aquifers in the valleys themselves, (i.e. Benmorven, and Brancott) the groundwater is greater than 60 years old and comes mainly from stream infiltration. The greater age in these aquifers is because sediments have not been removed from the gravels meaning the aquifers are less porous. This means that water moves more slowly through them.

Rarangi Shallow Aquifer groundwater is sourced from rainfall on the Wairau Plain or from the hills to the north of Rarangi.

The GNS work has also shown that some groundwater flows from Renwick to the coast without having a local rainfall component. The reason for this is that these waters travel by a deeper route, isolated from the surface.

*Generalised source of groundwater*





Whites Bay

the Sounds. There are also extensive and relatively uniform mud bottom areas as well as areas subjected to strong tidal currents. Some of the more well known indigenous species that live in the Sounds include the horse mussel, brachiopods, elephant fish and tubeworms.

The Wairau Lagoons are a nursery for many fish species and is of local, national and possibly international wildlife significance for bird habitat. Birds such as royal spoonbills, banded dotterals, black stilts and wrybills use the lagoons as a stopover in their migration. In the Sounds there are also numerous seabirds feeding through the mid to outer areas, including terns, shearwaters, petrels, prions, shags and gannets. King shags, which are endemic to the Marlborough Sounds, are restricted to only a few breeding sites in outer areas. Little blue penguins are common throughout the Sounds.

Cook Strait is an important migratory route for several large whale species, including sperm, humpback, minke and southern right whales. This results in a wide range of marine mammal species living in or migrating through Sounds waters. Orca (killer whales), are regular visitors and there are small resident populations of Hector's and bottlenose dolphins. Hector's dolphins are also found along the exposed Cloudy and Clifford Bay coastlines. These dolphins are a rare and endangered species and are regarded as having national significance. Dusky dolphins are relatively numerous at times. New Zealand fur seals have established small haul-out colonies at various sites through the mid to outer Sounds, with a large breeding colony present on Stephens Island.

Tidal wetlands are found at the heads of most major bays and inlets, forming an important wetland network. Most

of these wetlands are relatively small, the major exceptions being Whangarae Estuary, a very significant estuarine complex centered on the Kaituna Estuary at the head of Pelorus Sound and the Wairau Lagoons. Collectively these coastal wetlands are a crucial habitat for numerous wetland bird species.

The Long Island-Kokomohua Marine Reserve in outer Queen Charlotte Sound was the first marine reserve to be established in the South Island. Fishing and shellfish collection is prohibited in the marine reserve area to allow species found here to re-establish themselves to natural levels. The large adults that occur within these reserves are also the breeding stock for the surrounding areas.

### Use of Marlborough's coastal areas

Although extensively modified by human activity the Marlborough Sounds are particularly interesting because of the wide range of activities carried out. Many people can identify with the "working environment" of the Sounds and their use as an economic base by commercial fishers, marine farmers and tourism operators - see box 'Use of Marlborough Sounds coastal environment'.

The east Marlborough coast in comparison is much less developed than the Marlborough Sounds with fewer activities taking place. There is very limited commercial development within this area, although a few proposals for the development of marine farms have been approved but are not yet in place. The construction of a proposed interisland ferry terminal for freight and passengers to be located in Clifford Bay near Lake Grassmere has never eventuated.

Recreational usage takes place mostly in the bays at the southern end of Port Underwood, the Wairau Lagoons, Marfells Beach and Ward Beach. Recreational fishing occurs around the Wairau River Diversion mouth and the entrance to the Lagoons. Commercial fishing occurs offshore along the length of the east Marlborough coast.



## USE OF MARLBOROUGH SOUNDS COASTAL ENVIRONMENT

### Aquaculture

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

Today the black mussel buoys, which are characteristic of marine farms, are found in many parts of the Marlborough Sounds. There are currently 569 operating or consented marine farms with the majority of these located in Pelorus Sound and the outer Marlborough Sounds. There are also marine farms 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 now growing alternative shellfish and fish species (e.g. pāua, oysters, salmon, kingfish).

Aquaculture has since grown into a major industry in the Marlborough Sounds with Marlborough being a leading aquaculture area in the country. Export earnings from farmed mussels generate \$200 million per annum.

### Commercial fishing

Historically, the coastal waters of the Marlborough Sounds supported significant commercial and recreational fisheries. Although the number of commercial fishers has decreased over the years, fishers with quota for various species of fish and shellfish still operate mainly from Picton and Havelock. In contrast, the number of recreational fishers continues to grow as do fishing charter businesses. The main species targeted by recreational fishers are blue cod, groper, snapper, crayfish, scallops and pāua. Fishing and diving are now significant recreational pursuits for Marlborough residents and for visitors to the Marlborough Sounds.

### Transport

The Marlborough Sounds have long been an important transportation corridor - from the time Maori first paddled their waka to the present day. Today the waterways of the Sounds form an integral part of the national transportation

network with the inter-island ferries providing an important link between the North and South Islands. The port of Picton is currently the terminus for inter-island passenger and freight traffic and for large numbers of commercial water transport and tourist vessels serving the Sounds and outer islands. The port is also the base for a significant fleet of commercial fishing vessels and fishing activities as well as being Marlborough's export/import port.

Havelock's port is the base for a significant fishing and marine farming industry and for large numbers of commercial water transport and tourist vessels serving the Sounds and outer islands.

There are large marinas at Picton, Waikawa and Havelock with extensive back-up facilities. These marinas are important bases providing landing, storage, and loading facilities for residents of the Sounds, as well as providing an important access point to the Sounds for many boat owners who are not residents.

### Recreation and tourism

The coastal environment is important to Marlborough's community, not least its popularity as a recreational and tourist area. With wild and exposed coastlines, quiet sheltered bays, a vast network of waterways and its dramatic hilly coastal landscape, the Marlborough Sounds are inevitably the focal point of coastal tourism activity in Marlborough. The beauty and importance of the Sounds are recognised world-wide.

The Sounds are the most popular marine recreational area in Marlborough. Boating, sailing, water-skiing, jetskiing, sea kayaking, diving, swimming and fishing are just some of the in-water activities pursued in the Sounds.

The Sounds are also home to a large number of residences - some are permanent while a large number are used for holiday purposes only. Many of these residences have no roads and jetties or wharves provide their only means of access. There are nearly 600 jetties dotted around the Sounds with over 250 boatsheds to house small recreational boats and boating equipment. Swing moorings are also a common feature of many of the bays with some 3,000 being registered with the Council.



## ECONOMIC ACTIVITY IN MARLBOROUGH

Marlborough's prosperity has always been dependent on the value of production from its rural and marine areas. These core primary industries are viticulture, agriculture, marine farming, horticulture and forestry. The economy has diversity and is not reliant on one single sector, however many of the industrial, construction, retail and administrative businesses are reliant on the fortunes of the core resource-based industries. Most businesses are small-to-medium sized. A July 2006 survey carried out by the Council found that 40% of surveyed businesses employ less than 5 staff, 23% employ between 5 to 10 staff, 29% employ between 11 to 100 staff and 8% employ more than 100 staff.

Based upon GDP (Gross Domestic Product) indicators, there are six main sector groups that might be said to drive the Marlborough economy. As might be expected, four of these are primary industries. The six groups are viticulture, commercial forestry, farming, aquaculture, tourism/hospitality and aviation industries.

### Analysis of main sector groups

The Marlborough Regional Development Trust has undertaken an analysis of these six sector groups comparing data between the 2001 and 2006 census years. A cluster approach has been undertaken for this analysis, whereby all of the elements of an activity that go to make up an industry sector are aggregated to give a fully integrated picture of that sector. For example, the forestry cluster includes tree nurseries, silviculture, harvesting, processing and timber manufacturing undertaken in Marlborough.

The benchmark period used to compare the relative performance of the industry sectors is calendar years 2001 to 2006. The base data for regional performance was derived by Business and Economic Research Limited (BERL) from the regional economic database.

The definition of regional GDP is the income generated within Marlborough from wages and salaries, from the purchase of goods and services produced within the district, retained profits and the rental/hire charges for the district's infrastructure and superstructure, such as commercial and industrial property and the transport network.

The summary identifies the level of employment within the cluster in Full Time Equivalents, where typically two people working part time (up to 30 hours a week) are taken as one Full

Time Equivalent. The GDP estimate for each of the industry clusters is recorded in 2006 dollar revenues accruing to the regional economy.

The change in the relative performance by the key economic drivers has been dramatic in this benchmark period. This analysis has generally found that the Marlborough economy is estimated to have generated \$1.7 billion in GDP in 2006, up by 26% since 2001. The primary sector generates in the range of 40% of this income.

The analysis is shown in Table 3. During the 5 year period 2001 to 2006, there have been dramatic changes in the primary sector mix with diversification/conversions from former horticulture and pastoral land use to the planting of grapes. This has generated significant increases in employment and GDP generated downstream in other sectors of the economy, e.g. service industries.

The winegrowing, forestry, tourism, and aviation sectors all stand out in terms of increased employment and contribution to Marlborough's economy. There are a high proportion of part-time workers in the winegrowing/horticulture, aquaculture processing, and tourism sectors. There are also a considerable number of contractor firms operating in the primary sector.

Estimates of the number of business units operating in the base year 2001 and in 2006 are also included. A period of dynamic economic growth stimulates the establishment of startup companies and enterprises. In the case of the winegrowing industry, an increasing degree of processing was undertaken during the benchmark period as the size of the vintage increased nearly fourfold.

### Projected growth

The 'Blenheim Business Land Study' carried out in 2006 provided some comment on projected growth in individual sectors for the period 2005 to 2006 as follows:

- The forestry industry forecasts increased yield from forests maturing between now and 2025. This is expected to generate a large increase in employment in the forest harvesting industry. Forestry harvest is expected to increase significantly once economic factors improve with a potential "spike" in harvest production in 2022 levelling out to sustained increased harvest levels. Most of the existing plantations are in the north of the district. Large areas of the South Island north of Kaikoura have been identified as having potential for plantation redwood forests. There is potential for the establishment of additional forestry, for additional timber processing and bio-fuel production.



TABLE 3: INDUSTRY CLUSTER COMPARISONS 2006 YEAR

	2006	2001	% Change (2001-06)
<b>Horticulture/Winegrowing Cluster</b>			
Employment	4,330	3,030	43
GDP (\$m)	342	264	30
Business Units	980	715	37
<b>Aquaculture/Seafood Cluster</b>			
Employment	1,060	1,015	4
GDP (\$m)	116	110	15
Business Units	220	230	-4
<b>Pastoral Cluster</b>			
Employment	1,040	1,370	-24
GDP (\$m)	73	120	-40
Business Units	730	610	20*
<b>Forestry Cluster</b>			
Employment	590	480	22
GDP (\$m)	112	76	47
Business Units	380	325	18
<b>Tourism Cluster</b>			
Employment	1,135	1,015	12
GDP (\$m)	83	75	11
Business Units	275	220	25
<b>Aviation Cluster (Including RNZAF)</b>			
Employment	1,185	1,000	18
GDP (\$m)	118	96	23
Business Units	23	17	35

- A slight decline in employment in traditional agricultural production is projected over the next 20 years but this is offset by substantial growth in viticulture and agriculture services related to viticulture. Marlborough currently grows over 50% of New Zealand's grapes on approximately 22,000 hectares. Projections made in 2006 about the area of grapes to be planted by 2010 have already been exceeded. Relatively strong growth is projected for horticulture, however it should be noted that the absolute size of the sector is expected to remain small relative to other sectors.
- Employment in aquaculture is projected to remain relatively static over the forecast period. Current marine farming production is estimated to be 65,000 to 70,000 tonnes per annum. The industry suggests this could increase by between 10,000 to 100,000 tonnes per annum with areas approved for farming but not yet developed. Currently a significant portion of the harvest is transported out of Marlborough for processing. Increasing harvest tonnage in future would consolidate the potential for establishing processing industries and retaining the value added within the district.
- Significant growth is forecast for industry, construction and office employment. These are expected to be linked to fortunes in the key resource-based industries. Strong growth is also forecast for retail and the hospitality industry.
- Growth in the retail, education, healthcare, telecommunications, financial and construction sectors is driven by (and relies on) growth in the population employed in the other industry sectors.
- Domestic and international tourism contributes strongly to Marlborough's economy. In 2005, tourist visitors made 1.33 million visits to Marlborough tourist operators. Of these visits, 21.9% were made by international overnight travellers, 41.6% were made by domestic overnight travellers, 5% were made by international day travellers and 31.5% were made by

domestic day travellers. International and domestic travellers spent a total of 2.15 million visitor nights in Marlborough in 2005. International travellers accounted for 34.2% of these stays.

International and domestic travellers spent over \$176 million with Marlborough tourist operator facilities in 2005. International overnight travellers accounted for 45% of this spend, domestic overnight travellers accounted for 40.6% of the spend, and international and domestic day travellers accounted for the remaining 14.4%<sup>23</sup>. Increased visitor numbers in the order of 15-35% have been forecast to 2012. This growth will have significant implications for Marlborough's settlements and infrastructure.

### The value of natural resources to the Marlborough economy

In its "Environment New Zealand 2007" report, the Ministry for the Environment stated that New Zealand's economic wealth and

well-being are heavily dependent on the natural environment. The part played by Marlborough's natural resources in the health of the Marlborough economy supports that statement. With Marlborough's economic wealth centred on primary production, just a quick glance shows the extent of this reliance. Healthy soil and adequate water underpin agriculture, viticulture and forestry. Coastal water supports the aquaculture industry and the visual expression of natural resources, clean air and water and sustainably managed land/seascape, attracts and supports tourism.

The management of fresh water resources is a typical example of how we rely totally on the natural world. Water is a finite resource and climate change predictions for the east coast of the South Island, including Marlborough, suggest increased risk of drought. This will increase reliance on water and is a particular issue for industries that need a high level of security of supply.

*Marlborough Rock Daisy*





Water availability (coupled with water quality) is probably the number one determinant of or constraint on future growth. Reliability of supply is necessary to maintain business confidence and will require a carefully managed regime of water allocation, monitoring and management. Freshwater quality is an issue for many of Marlborough's smaller settlements. Marine water quality is also an important issue for aquaculture and for public health reasons in some Sounds' coastal settlements.

The way in which natural and physical resources that underpin Marlborough's economy are managed, will be extremely important in the coming years. As a community we need to recognise that there is only so much land, water or coastal space available and that we may reach limits in being able to allocate some of these resources for economic growth. Why this is important is because our personal health and wellbeing also relies on having access to good quality land, water and air resources.