

# National Report of New Zealand

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GLOSS Training Course

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*Toitu te*  
**Land whenua**  
**Information**  
New Zealand



## 1. Introduction

Land Information New Zealand (LINZ) is the government department responsible for delivering the Crown's outcomes for hydrography and bathymetry. This includes the provision of authoritative sea level information to support safety of life at sea and LINZ's geodetic and cadastral activities.

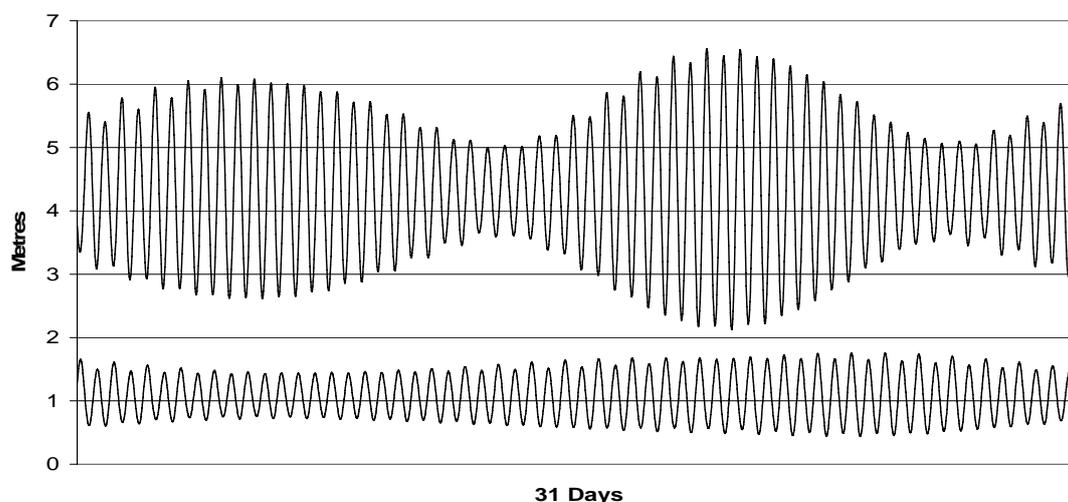
A number of other organisations run tide gauges for scientific or local environmental monitoring purposes.

## 2. Tidal Regime

All tides around New Zealand's coastline and offshore islands are semi-diurnal. Ross Dependency in Antarctica experiences a diurnal tidal regime.

New Zealand's tidal ranges are quite modest; the west coast of the North and South Islands has a spring range of 4 metres whilst the variation is 1 – 2 metres along the eastern coastline.

Another feature that distinguishes the tides on either side of the country is the variation of the fortnightly spring/neap cycle. This can be seen clearly in the following plots – the upper portion shows the tide for a month at a west coast site (Nelson), the lower plot shows Wellington, a site typical of the east coast.



**Graph 1 Spring/Neap Tidal Ranges**

Being at one of the amphidromic points in the Pacific Ocean, the tide circulates around New Zealand in an anti-clockwise direction. One of the consequences of this is that the state of the tide is significantly different on either side of Cook Strait between the two main islands.

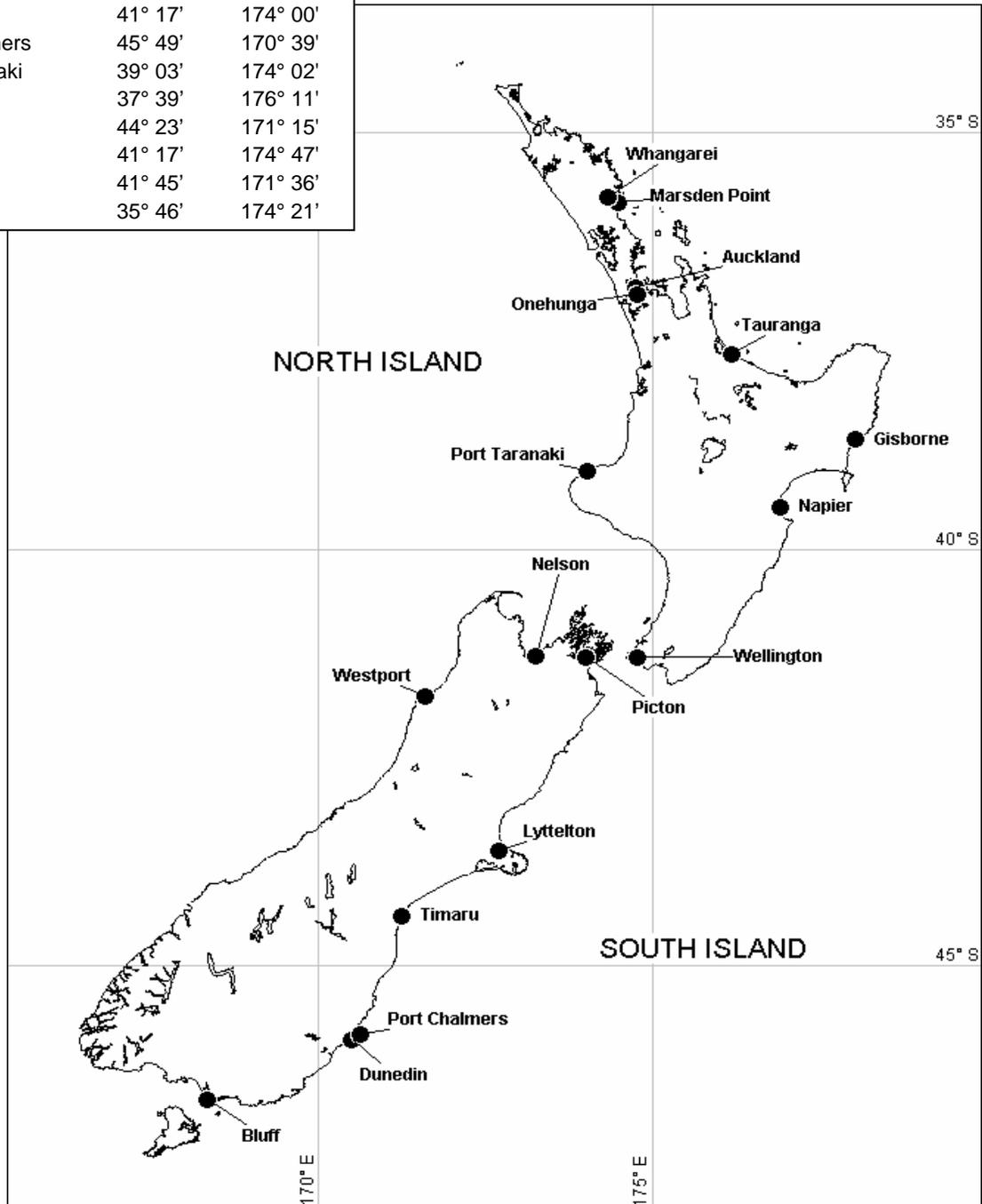
## 3. Tide Gauge Networks

### 3.1 Standard Ports

Tide predictions are published in the New Zealand Nautical Almanac (NZNA) for seventeen Standard Ports. These sites are listed in Table 1 and shown on Map 1.

Port	Latitude South	Longitude East
Auckland	36° 51'	174° 46'
Bluff	46° 36'	168° 21'
Dunedin	45° 53'	170° 30'
Gisborne	38° 40'	178° 02'
Lyttelton	43° 36'	172° 43'
Marsden Point	35° 50'	174° 29'
Napier	39° 29'	176° 55'
Nelson	41° 16'	173° 16'
Onehunga	36° 56'	174° 47'
Picton	41° 17'	174° 00'
Port Chalmers	45° 49'	170° 39'
Port Taranaki	39° 03'	174° 02'
Tauranga	37° 39'	176° 11'
Timaru	44° 23'	171° 15'
Wellington	41° 17'	174° 47'
Westport	41° 45'	171° 36'
Whangarei	35° 46'	174° 21'

**Table 1  
Standard Ports**



**Map 1  
Standard Ports**

Tide gauges at these locations are owned and operated by either the local port company or local territorial authority.

With the exception of one gauge, all tide measurements are now provided in digital format. The data recording rate is not standard across the network – half of the gauges record data at 1 minute intervals; the remaining ones record once every 5 or 10 minutes. LINZ obtains this data once every 3 months.

Historic analogue records from these ports have been converted to digital format. Hourly records for Auckland, Dunedin and Lyttelton are available from the beginning of the 20<sup>th</sup> century, 60 years' data is available for Wellington. Observations from most of the other standard ports date from the early 1980s.

### 3.2 Secondary Ports

Over the last half century, tide measurements have been made at some 300 locations around the coast and at off-shore islands. These observations have been made over periods that range from as short as less than a day to several years. Many of these observations have been made during the course of hydrographic surveys.

The results of the observations for nearly 200 Secondary Ports are published in the NZNA as time differences for high and low water with respect to the Standard Port that is designated as the reference station for each Secondary Port.

The Secondary Port information is being updated as new tide data becomes available from hydrographic survey activities and work carried out by other organisations.

### 3.3 Other Sea Level Recorder Sites

The National Institute of Water and Atmospheric Research Ltd (NIWA), a Crown-owned research company, coordinates a network of tide gauges at open coast sites. Gauges operated by regional and local territorial authorities, some port companies, the University of Canterbury and Australia's National Tidal Centre supplement NIWA's own installations.

The primary purpose of this network is to collect high-quality and accurate measurements of sea level and tides for scientific studies of storm surge, tides and climate change. These open coast sites have been chosen to avoid the effects that port operations and topography such as harbours and river flows might have on sea level observations.

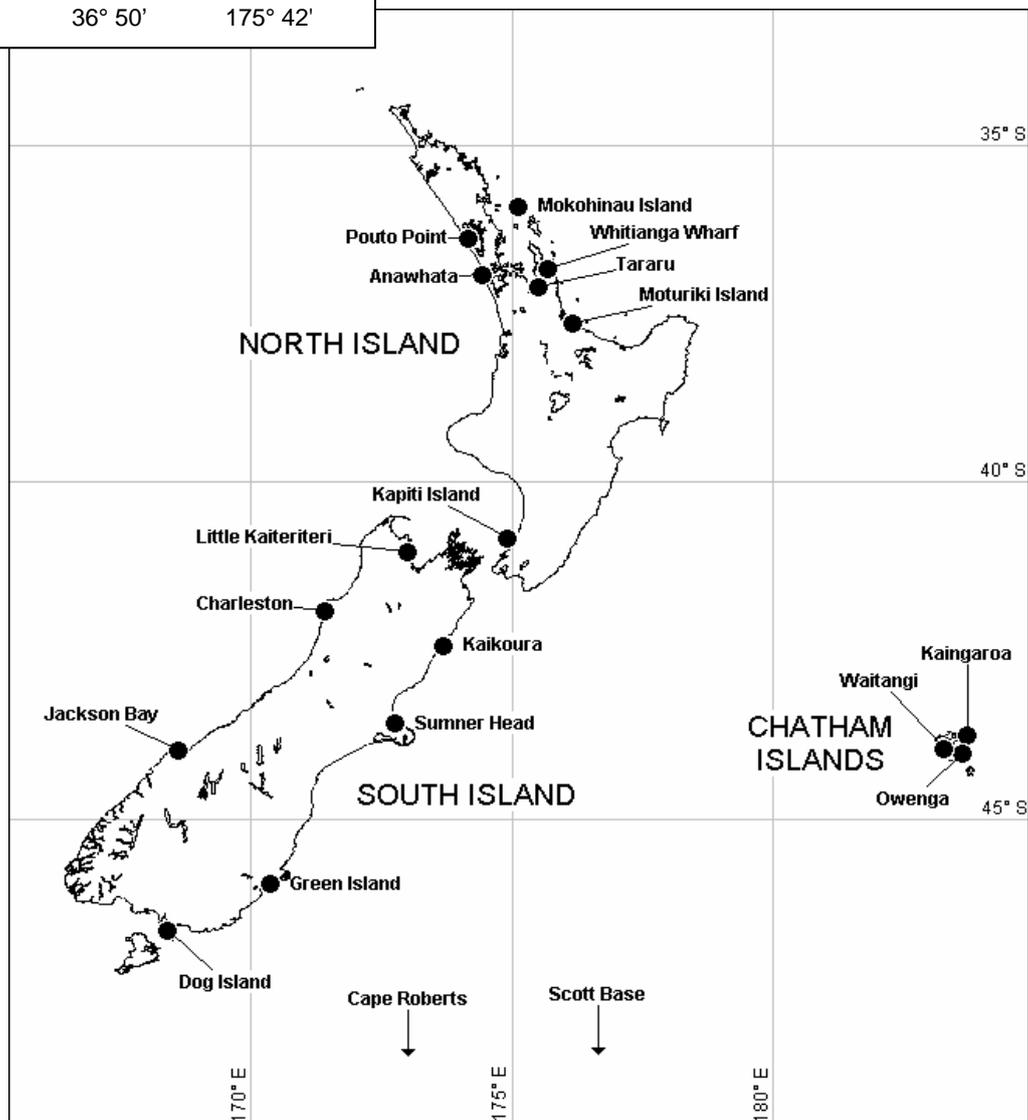
Away from the mainland of New Zealand, gauges are operated on the Chatham Islands (by NIWA and the Pacific Tsunami Warning Center) and in the Ross Dependency, Antarctica (by NIWA and LINZ).

These open coast sites are shown on Map 2 and listed in Table 2.

Location	Latitude South	Longitude East
Anawhata	36° 55'	174° 27'
Cape Roberts, Antarctica	77° 02'	163° 12'
Charleston	41° 54'	171° 26'
Dog Island	46° 39'	168° 25'
Green Island	45° 57'	170° 23'
Jackson Bay	43° 58'	168° 37'
Kaikoura	42° 25'	173° 42'
Kaingaroa, Chatham Island	43° 44'	183° 44'
Kapiti Island	40° 50'	174° 56'
Little Kaiteriteri	41° 02'	173° 01'
Mokohinau Island	35° 54'	175° 07'
Moturiki Island	37° 38'	176° 11'
Pouto Point	36° 22'	174° 11'
Owenga, Chatham Island	44° 01'	183° 38'
Scott Base, Antarctica	77° 51'	166° 45'
Sumner Head	43° 34'	172° 47'
Tararu	37° 06'	175° 31'
Waitangi, Chatham Island	43° 57'	183° 17'
Whitianga Wharf	36° 50'	175° 42'

**Table 2**  
**Open Coast Stations**

**Map 2**  
**Open Coast Stations**

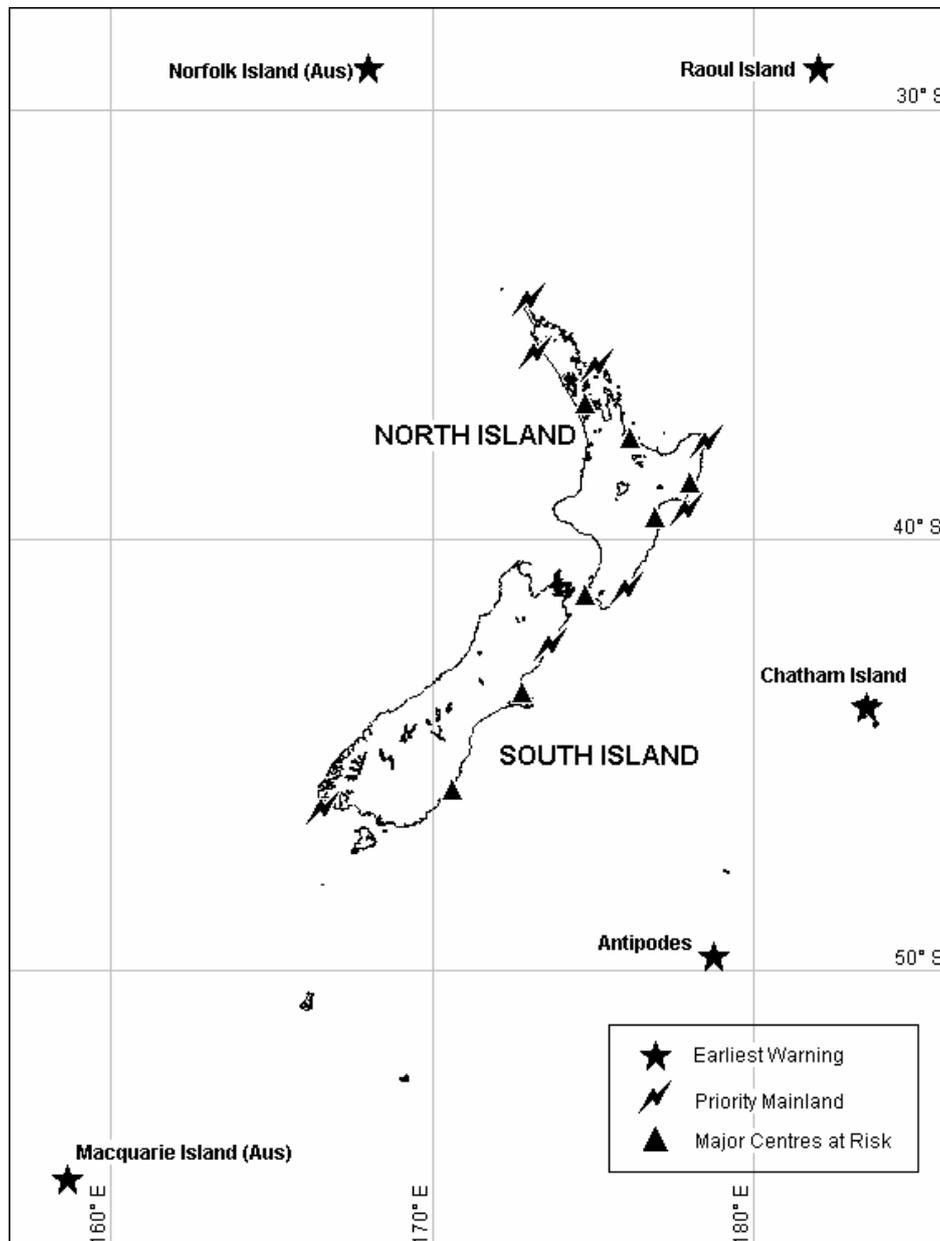


### 3.4 Future Sea Level Recorder Network

Following the Indian Ocean tsunami of 26 December 2004, the New Zealand Government directed LINZ to initiate a project to improve the system of sea level gauges in New Zealand to allow better detection and confirmation of tsunamis.

An assessment has been made of the sources of tsunamis that potentially pose a threat to New Zealand. A number of offshore islands and areas around the coastline have been identified as sites that would provide early confirmation, or otherwise, that a tsunami had been generated.

Map 3 shows the distribution of the proposed tsunami detection and warning network.



**Map 3**  
**Tsunami Network**

#### **4. GPS Connections**

GPS observations have been made out at bench marks at many of the Standard Ports. This work was carried out as part of a project to establish a vertical datum for New Zealand.

Continuous GPS observations are made at four Standard Ports (Auckland, Wellington, Lyttelton and Dunedin). GNS Science, a Crown-owned research company, operates these receivers.

#### **5. Data Availability**

Data for the Standard Ports (Table 1, Map 1) are available from the author, although permission must be obtained from the original supplier of the data before it can be released.

Enquiries about data from the network of open coast tide gauges (Table 2, Map 2) can be directed, in the first instance, to [sealevel@niwa.co.nz](mailto:sealevel@niwa.co.nz).

Data from the proposed tsunami network (Map 3) will be made freely available. The author will be able to provide details as to how the data from this network can be obtained once the necessary infrastructure has been established.

Tidal data from some of New Zealand's tide gauges are held in several international archives such as those managed by the University of Hawaii Sea Level Center and the Permanent Service for Mean Sea Level. However, this data is neither comprehensive nor complete; ownership of the data and the lack of coordination at a national level being the reasons for this less than desirable situation.