16.0 Natural Hazards

16.1 Introduction

The Marlborough Sounds landform reflects the results of global influences on its formation. The Pelorus-Rai catchment drains into Pelorus Sound. The Sounds are a partly drowned valley system resulting from successive erosional and depositional phases. It is a geologically dynamic, natural system.

Generally, the topography is very steep with some areas mountainous. There are some areas of rolling and flat land. Coastal cliffs are precipitous.

The valley ridge system tends NE - SW and this influences local climate, weathering of rocks, soil formation and vegetation.

16.2 Issue

The variability of natural hazards location, frequency, severity, and potential to reduce the safety of the community or cause damage to property, infrastructure or the environment.

The natural hazards which occur in the Marlborough Sounds area include:

- Seismic/earthquake;
- Slope instability;
- Coastal inundation, tsunami and potential sea level rise;
- Flooding;
- Fire; and
- Climatic.

The Marlborough Sounds lie within the most seismically active part of the country near the southern limit of the Pacific plate, with the Wairau (alpine) fault to the south and the Waimea-Whangamoa fault to the west.

The area is subject to frequent deep earthquakes and numerous shallow earthquakes. Earthquake events causing serious structural damage (Modified Mercalli Intensity of VIII) can be expected every 55 - 60 years. Earthquakes cause ground deformation and shaking resulting in structural damage, weakening of foundation materials, and social disruption.

Climate, topography and geology all influence the occurrence of slope instability. In the Marlborough Sounds there are numerous fault zones and rock types that are inherently unstable. Unstable rock types include:

- Patuki Melange;
- Croisilles Melange and
- Grade IIIB and IV schists.

The most significant effects of slope instability are slope failures and ground subsidence.

Coastal processes range from oceanic to enclosed waters, with low wave energy and strong tidal currents. These processes include erosion of beaches, cliff and shoreline retreat, changes to river mouths and inundation of estuarine areas.

Global warming may cause sea levels to rise significantly. Increased sea level could alter coastal processes and increase inundation of low lying coastal and estuarine areas.

Activities which affect coastal processes include:

- Extraction of sediments as aggregates;
- Dredging and dumping;
- Reclamation of tidal areas; and
- Erection of coastal protection structures.

Sustainable coastal management avoids hazards and adopts practices which are sympathetic to the functioning of coastal processes.

Floodable areas include the lowland areas adjacent to the Pelorus and Kaituna Rivers, and within the urban areas of Picton and Waikawa, adjacent to Waitohi Stream and Waikawa Stream respectively. Flooding causes damage to property and can remove land or deposit new material burying existing soils.

Fire hazard relates to fuel type, drought and proximity to settlements. Fire destroys property and severely interrupts ecosystems.

Climatic hazards include windstorms, thunderstorms, intense rainfalls, and major droughts. These events can directly damage property or trigger other forms of natural hazard.

16.3 Objectives and Policies

Objective 1	**Management of areas prone to natural hazards to avoid loss of life, and avoid, remedy or mitigate damage to property and infrastructure as a result of the occurrence of natural hazards.**
Policy 1.1	Locate new works and structures to avoid their damage from the effects of natural hazards.
Policy 1.2	Establish and maintain protection works designed to avoid, or mitigate the effects of natural hazards including adverse environmental effects, where the benefits outweigh the costs.
Policy 1.3	Define areas at risk from natural hazards, including sea level rise, within a Natural Hazards Register to assist future sustainable management of resources.
Policy 1.4	Consult iwi to identify areas of waahi tapu, and taonga needing protection from the effects of natural hazards, including sea level rise.
Policy 1.5	Provide warnings and emergency response procedures for areas at risk from or affected by natural hazards.
Policy 1.6	Assess potential protection measures for mitigating natural hazards to ensure that in themselves they do not cause adverse environment effects.

Objective 2	**Management of activities which could increase the frequency, severity or potential of natural hazards to cause loss of life or damage to property and infrastructure and other aspects of the environment.**
Policy 2.1	Locate new works and structures to avoid effects which increase the adverse effects of natural hazards.
Policy 2.2	Avoid activities, including earthworks and vegetation clearance, increasing the risk of occurrence, or potential to cause damage, of natural hazards.

The major concern relating to natural hazards is the loss of life. Other concerns relate to damage or destruction of property and infrastructure, loss of amenity values, restriction of public access, and interruption to land and water ecosystems.

In determining whether protection works will be established, Council will consider: risk to human life; value of resources including value to tangata whenua; landscape and heritage values; and costs and benefits, effectiveness and value of such works.

Sustainable management of resources requires consideration of the avoidance of the adverse effects of natural hazards. Where effects cannot be avoided then they should be remedied or mitigated to provide for community health, safety and wellbeing.

16.4 Methods of Implementation

Rules	Planning maps define known natural hazard prone areas. a) require assessment of the effects of the location and design of activities and structures on the occurrence of natural hazards in defined natural hazards prone areas; b) facilitate the maintenance of existing protection works and structures designed to avoid the effects of natural hazards; and c) require assessment of non-structural means of avoiding the effects of natural hazards or mitigating them when considering applications for protection works and structures.
Designation	Floodways will be designated to enable control of activities that may adversely affect the hydraulic efficiency of floodways.
Research	Monitor scientific findings to assess restrictions on activities relative to the occurrence of natural hazards, including sea level rise. Council will re-assess the information contained in the Natural Hazard maps within five years of the Plan becoming operative and will amend the maps if required.
Information	Maintain a Natural Hazard Register to co-ordinate all data relating to the occurrence of natural hazards.

Council Activities	Maintain emergency response procedures in association with Civil Defence. Maintain protection works and structures, including amenity improvements to existing structures.
Education	Promote community understanding of the effects of natural hazards and means to avoid, remedy or mitigate those effects.

The location of structures and activities in areas where they will be damaged by or increase the effect of natural hazards is not sustainable. Future structures and activities should recognise the likely occurrence of the processes causing natural hazards and have a reduced reliance on protection works. Rules seek to avoid the future demand for protection works and to avoid the effects of known natural hazards.

Information describing the frequency and extent of potential natural hazards is an essential precursor to the community taking appropriate measures to minimise the threat of danger or damage. Information will help the community to become more aware of the effects of their activities on the occurrence of natural hazards. The information on which the hazard areas have been defined in the Plan is contained in a report on 'Natural Processes and Environmental Hazards in the Marlborough Sounds' (Sutherland, Kirk and Bell - October 1992). This report contains reviews of the major hazard areas including diagrams and maps showing known problem areas. Council will continue to build on this knowledge and the Natural Hazards Register will provide an information base detailing the risk of natural hazard occurrence.

A co-ordinated emergency response process will ensure that the community is warned about and is prepared for any known hazard occurrence.

16.5 Anticipated Environmental Results

Implementation of the policies and methods for management relating to natural hazards will result in:

- Future use and development of the resources of the Marlborough Sounds that occurs in sympathy with the natural processes operating in the area and risk from natural hazards is minimised;
- Provision of information defining the risk to all sites from known natural hazards;
- Implementation of emergency response procedures prior to events which avoids loss of life and mitigates damage to property and infrastructure; and
- Protection of identified coastal waahi tapu and taonga.