

# 14H Natural Hazards

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## Introduction

Lower Hutt is an area comprising a wide variety of physical features including the coast, steep hills, low lying valleys, an escarpment and a fault. The Wellington Fault passes through Lower Hutt and there are soft soils with a high liquefaction potential. There is also the potential for extreme weather conditions, such as excessive rainfall. As a result, Lower Hutt could be exposed to severe forces of nature, causing an earthquake, landslip or flood, which present a risk to the health and economic wellbeing of the residents. Where the Lower Hutt community is vulnerable to such extreme forces of nature, the situation is known as a natural hazard.

There are four main types of natural hazards present in Lower Hutt:

- (a) **Seismic induced hazards;**
- (b) **Landslide hazards;**
- (c) **Flood hazards; and**
- (d) **Coastal hazards.**

Details of the nature and characteristics of these natural hazards are described on an area wide basis in Chapter 1.

## 14H 1 Issue, Objective and Policies

### 14H 1.1 Local Area Issue

#### 14H 1.1.1 Risk Associated With Natural Hazards

##### Issue

**There is a risk of harm to people and damage to their property from natural hazards associated with seismic action, landslides, flooding and coastal hazards. The risk to people and their property should be avoided or mitigated.**

##### Objective

To avoid or reduce the risk to people and their property from natural hazards associated with seismic action, landslides, flooding and coastal hazards.

##### Policies

- (a) That the area at risk from fault rupture causing permanent ground deformation along the Wellington Fault be managed by the Wellington Fault Special Study Area to address the effects of subdivision and development on the safety of people and their property.

- (b) That suitable engineering and emergency management measures be adopted to safeguard people and their property from liquefaction, groundshaking and tsunami hazards.
- (c) That where areas susceptible to landslide have been identified, appropriate conditions of compliance will be provided to mitigate the adverse effects of subdivision and development on the vulnerability of people and their property.
- (d) That suitable engineering, emergency management and land use control measures be adopted to reduce the vulnerability of people and their property to flood hazards.
- (e) That suitable engineering, emergency management and land use control measures be adopted to reduce vulnerability of development along the coast.

## Explanation and Reasons

### (a) Risk and Vulnerability

The close proximity of developed areas to those areas susceptible to natural hazards creates an undesirable level of risk. The risk is increased by the level of vulnerability of the people or development present in the hazard prone area. Vulnerability can be reduced by various measures, including the provision of information, avoiding at-risk areas, maintaining a low intensity of development in at-risk areas or managing development in other ways to mitigate risks, providing insurance programmes, and by constructing physical protection measures.

The aim of the objective and policies is to avoid the situation where there is injury or fatalities, damage to property, or loss of investments due to the occurrence of extreme natural events, such as an earthquake, flood or landslide. Where it is not possible to avoid this situation, measures will be taken to reduce the vulnerability of the people or development at risk. These measures are explained as follows:

### (b) Seismic Induced Hazards

#### (i) Earthquake Hazard:

The Wellington Fault runs along the western side of the Hutt Valley from Petone to the Taita Gorge. In this area it is expected that there would be permanent ground deformation following the next Wellington Fault rupture event. During such an event, accompanied by a very large earthquake, the ground on the west side of the Wellington Fault is predicted to move horizontally up to 4m relative to the east side, and there will be up to 0.5m vertical movement. This movement would be concentrated at discrete breaks at the ground surface, such as along the mapped fault traces, but will also be distributed across the immediate vicinity. Further fault rupture has a moderate to high probability of taking place within the next 100 years.

The area at risk from a fault rupture event is identified by the Wellington Fault Special Study Area. This Special Study Area extends from Petone to Silverstream. Where there is no evidence of the Wellington Fault scarp, the position of the Wellington Fault is inferred. The Wellington Fault Special Study Area is 150 metres wide to accommodate this inferred position.

Subdivision and development will be managed to ensure that no building is constructed within 20 metres of the fault line, and that no subdivision results in an allotment being created which is unusable for development purposes.

An engineering report will be required prior to any development, to ensure that any buildings proposed are not within 20 metres of the fault line. The level of investigation required will depend on the particular circumstances and this could include a range of methods necessary to determine the position of the fault. The buildings will need to be constructed to New Zealand Building

Code specifications. This will ensure that buildings are constructed in a safe manner and at a safe distance from the area susceptible to permanent ground deformation.

The conditions of compliance shall not apply to utilities or accessory buildings which are not for habitable or working purposes.

(ii) Liquefaction Hazard:

Research shows that some subsurface soils have a high probability of liquefaction occurring during strong earthquake shaking. Liquefaction is the situation where the soil becomes like liquid due to seismic action. During liquefaction, the soil loses its ability to support buildings, causing damage to the buildings. The types of soil most susceptible to liquefaction are low to medium density sands and silts, generally within 12 to 15m of the ground surface. These soils are known as flexible soils. Shallow groundwater level is also an important requirement for liquefaction to occur.

Seaview/Gracefield and the southern portions of Petone, Moera and Woburn have such flexible soils and shallow ground water conditions.

Details of liquefaction potential will be provided in Land Information Memoranda. Any proposed structures will be required to comply with the New Zealand Building Code.

(iii) Ground Shaking Hazard:

The Hutt Valley area would experience strong ground shaking during a large earthquake on the Wellington Fault. Larger earthquakes on distant faults could give rise to similar levels of ground shaking as would occur during a Wellington Fault rupture. Such ground shaking could cause buildings to collapse, crack and disintegrate.

All structures in the City are exposed to this hazard and, therefore, are controlled by the New Zealand Building Code. In addition to earthquakes on faults, very large magnitude earthquakes could be generated at the interface between the Australian and Pacific Plates, located 20 to 30km beneath the Wellington Region. However, data is not currently available to quantify this hazard.

(iv) Tsunami Hazard:

Coastal areas of Lower Hutt have been affected by tsunami in the past. For example, in the 1855 Wairarapa earthquake water levels rose at least 1.2m above high water level in the Wellington Harbour.

An earthquake on the West Wairarapa Fault is the most likely event to cause significant tsunami effects in Lower Hutt City. A submarine rupture on the fault near Cape Turakirae (as occurred in 1855) could cause a 1.5m rise in water level at Petone foreshore and the Eastbourne shoreline would experience a 1.3m rise in water level. In both areas, wave activity would start approximately 20 minutes after the earthquake.

It is difficult to predict the frequency and distribution of deep, large earthquakes centred offshore. The extent of land that could be affected by a tsunami has been identified by the Wellington Regional Council. This includes the Petone Beach, the Hutt River mouth, and parts of Seaview and the Eastern Bays.

The most appropriate method for reducing the impact of this hazard is an early warning system and the civil defence plans for emergency response procedures. The provision of information by the Emergency Management Office also assists community awareness and preparedness.

**(c) Landslide Hazard**

Any proposed subdivision and development in steep areas will be managed to reduce vulnerability from landslide hazards which can be triggered by earthquakes or by excessive rainfall. The steep slopes will be identified as Hill Residential Activity Areas, Landscape Protection Residential Activity Areas and Passive Recreation Activity Areas to provide the necessary conditions of compliance.

The conditions of compliance manage those aspects of proposed subdivision or development which can increase the susceptibility of a slope to landslides. This includes conditions on vegetation clearance, removal of topsoil, excavation, and earthworks. Before subdivision can occur, details are to be provided on topography, contour heights, cut and fill work, access, sewage and stormwater disposal, and an assessment of the subdivision in relation to any existing or potential natural hazards. The hazard assessment is to be carried out by an appropriately qualified and experienced person.

When development in those areas susceptible to landslide is undertaken, slope stabilisation and appropriate building setbacks will be required. The New Zealand Building Code requires such precautionary measures are taken, as well as the provision for retaining walls, and foundation strengthening.

**(d) Flood Hazard****(i) The Hutt River:**

Physical protection measures are used for the Hutt River. These include dredging at the river mouth, groynes, channel control and stopbanks. Physical protection works are planned to be upgraded during the next 40 years, under The Hutt River Floodplain Management Plan (HRFMP). This is in response to the current standard of many stopbanks and bank edge protection works that would put a large part of the Hutt Valley floodplain at risk of flooding in a major flood event.

District Plan measures are used in the Primary and Secondary River Corridors and in parts of the Hutt Valley floodplain, that are not protected from major floods by the existing stopbanks or those proposed to be upgraded under the HRFMP. This land forms a narrow margin either side of the Hutt River, including parts of Belmont and Stokes Valley. The Seaview area is also affected by flooding however this area was not investigated in detail as part of the HRFMP, as it is also affected by flooding from the Waiwhetu Stream. The Wellington Regional Council and Hutt City Council are currently investigating the Waiwhetu Stream. Seaview flooding extents will be further investigated on completion of the Waiwhetu Stream investigation.

Any activities located within the Primary or Secondary River Corridors or other unprotected areas are susceptible to flooding which includes the effects of inundation and erosion. It is accepted that development must be able to continue in those areas that have already been developed, although landowners and developers will be expected to mitigate flood hazard effects to an acceptable level. For example, it is necessary for proposed buildings or structures greater than 20m<sup>2</sup> within the 100-year flood extent to raise floor levels to above the 100-year flood event. Proposed buildings and structures will also be required to be located to avoid damage from erosion hazards or be structurally strengthened to withstand the effects of severe erosion and high flood flow velocities.

The location of the following activities in the Primary or Secondary River Corridor or in areas not protected from major flooding by the existing stopbanks will not be appropriate:

- significant buildings where people work, live or congregate; such as

schools, emergency services, hospitals, rest homes, holiday accommodation, high-density residential developments and extensive commercial development.

These types of activities may expose people and assets to an unacceptable risk, or impose unacceptable costs on the community. Other activities such as earthworks, and accessory buildings and structures will also be required to avoid, remedy or mitigate the adverse flood hazard effects adequately. Adverse effects include, but are not limited to, erosion of the site or any part of a building, inundation and effects on other land and structures off-site. These effects may be cumulative or one-off in nature.

The Primary and Secondary River Corridors and those parts of the Hutt River Floodplain affected by flooding and erosion in a 100-year flood event are identified in the Map Volume of the District Plan. The height of floor levels for buildings and structures within the 100-year flood extent shall be above the 100-year flood level. This height is determined by the location of the proposed building in relation to a modelled flood level. The Wellington Regional Council has information on the Hutt River Floodplain, which will assist in determining an appropriate height for floor levels of buildings.

In addition to the District Plan measures, information on flood prone sites are given in Land Information Memoranda, and all Building Consents require a minimum floor level for all new development to be above the 50-year flood level.

While engineering works for flood defence can reduce the risk of flooding, they can never eliminate it completely. In the event of the stopbanks being over-topped or breached, the implementation of emergency management procedures may be necessary. Therefore, it is important that Hutt City residents are aware of the flood hazard, and prepare themselves for flooding should it occur.

(ii) The Wainuiomata River:

The Wainuiomata River also has the potential for flooding. Subdivision and development in this area will be controlled to maintain a low intensity usage and ensure that any buildings have an appropriate floor level above the level of flooding. The Regional Council has information to assist in determining appropriate floor levels, which will be above the 2% design flood level (one in fifty year flood).

(iii) Waiwhetu Stream:

The Waiwhetu Stream can cause flooding of the adjacent floodplain. The risk of flooding from the Stream is increased by weed growth and stormwater inflow. Given the built up nature of much of the floodplain, information on flood prone sites will be given in Land Information Memoranda and a building consent may require floor levels of buildings to be raised. The Regional Council has information on the Waiwhetu Stream floodplain which will assist in determining an appropriate height for floor levels.

(iv) Local Ponding:

Flooding in other areas of Lower Hutt can result from local ponding due to excessive rainfall or blocked storm water channels and streams. The areas susceptible to local ponding include sites near the streams in Stokes Valley; sites along Opahu Creek, sites along Waiwhetu Stream and its tributaries; and sites in the vicinity of Hathaway Avenue.

Information on sites which are susceptible to local ponding will be given in Land Information Memoranda and a Building Consent may require floor levels of buildings to be raised. The Plan helps to reduce the chance of debris blocking streams and stormwater drains by controlling subdivision and development

in areas susceptible to landslip.

Proposed subdivision or development in those areas near streams in Wainuiomata and the Western Hills should undertake the necessary investigations to identify land susceptible to local flooding or ponding.

**(e) Coastal Hazards**

Subdivision and development in the coastal environment will be managed by the District Plan above Mean High Water Springs. The Regional Council will control development below Mean High Water Springs. These controls assist in reducing the vulnerability of development to coastal hazards.

Coastal hazards can result in erosion of areas adjoining the coast, inundation of land due to sea level rise, and effects on property and development from storms, cyclones and tsunamis. Where existing development is experiencing erosion problems, protection measures may be adopted such as relocation, seawalls, groynes, and beach nourishment.

Areas most susceptible to coastal hazards are identified as a Significant Natural Resource in Chapter 14E of the Proposed District Plan. Provisions in this Chapter ensure that any activity or site development within this area requires a resource consent.

Engineering measures have been provided to mitigate coastal erosion in Eastbourne. Seawall protection has been provided in Muritai and also for the residential properties on the seaward side of Eastern Bays Marine Drive in Days Bay. Engineering protection measures have also been used to reinforce Eastern Bays Marine Drive against the wave action of the sea.

The Emergency Management Office provides information regarding tsunami hazard, sea level rise and storm wave threats, which helps community awareness and preparedness.

## 14H 2 Rules

### 14H 2.1 Restricted Discretionary Activities

- (a) All structures and buildings on any site where the whole site or a portion of the site falls within the Wellington Fault Special Study Area, excluding the following:
- Proposed accessory buildings which are not required for habitable or working purposes, or
  - Utilities including associated uninhabited buildings,
- which are Permitted Activities.

#### 14H 2.1.1 Matters in which Council has Restricted its Discretion and Standards and Terms

- (i) Safe Separation Distance of Structures and Buildings from the Wellington Fault:
- For all structures and buildings, an engineering report will be required to confirm that the Wellington Fault is not within 20.0m of any proposed structure or building, or that the necessary engineering precautions have been taken.

### 14H 2.1.2 Other Matters

All Restricted Discretionary Activities must comply with other relevant Permitted Activity Conditions.

## 14H 3 Anticipated Environmental Results

- (a) Increased public awareness of natural hazards.
- (b) Reduced level of vulnerability experienced by people and their property in hazard prone areas, through the safe location and construction of all structures and buildings.