Section 7 Hazard Mitigation

7.1. General Features

7.1.1. Earthquake Activity

The Kaipara district has experienced very little earthquake activity over the years. No significant quakes have been recorded this century. This is a reflection of the district's geological origins and associated seismic nature. Whilst it contains a number of faults they are not particularly significant from a seismic perspective.

The nature of seismic activity in New Zealand is generally described in NZ Standard 4203 1984. It divides the county into three seismic zones - A, B and C. Kaipara along with the rest of Northland lies within Zone C. This means the probability of the district experiencing an earthquake of any given intensity is considerably lower than say the Waikato district (Zone B) or Wanganui district (Zone A). At the same time it is worth noting that New Zealand lies on the circum-pacific belt of earthquake activity and in world terms is classed as being of moderate seismicity.

7.1.2. Coastal Erosion

The Kaipara district has an extensive coastline parts of which are prone to erosion and other forms of natural hazard. The main areas affected are along the east and west coasts where wave action associated with storms is the principal hazard factor. Where these storm based events are backed up to by more gradual long term erosion then significant shoreline movements can result. Stream and estuary mouths along the two coasts are particularly vulnerable to such movements. For instance the mouth of the Waihaupai Stream, situated south of Maunganui Bluff on the west coast is reported to have moved some 450 metres between 1880 and 1960. In addition to erosion from the sea, some land is also being eroded by wind and at times heavy rain. Wind based erosion of sandstone cliffs and dune areas is particularly evident along the west coast, with some associated encroachment of sand onto adjacent properties.

No detailed investigations or studies have been carried out on the natural processes at work along the coastal margins of the district. In this regard it is not possible to accurately identify those parts of the coast which are particularly affected by erosion or accretion and the extent of shoreline movement over recent years. A general study of the Northland coastline in 1976 indicated that erosion was the predominant force at work along the section of the west coast, between Baylys Beach and Black Rock. The section of coast north of Baylys Beach was considered to be relatively stable whilst south of Black Rock to the mouth of the Kaipara Harbour showed signs of long term accretion. The section of east coast between Bream Tail and the Mangawhai estuary was also considered to be affected by long term accretion.

7.1.3. Flooding

The Kaipara district contains several major river systems. Some of them pass through relatively low lying valley areas which are prone to flooding. Because of the typically high intensity rainfall which falls in the district the flooding effects can be significant causing considerable damage to property, roads and utility services.

The main areas prone to flooding are adjacent to the lower reaches of the Kaihu, Manganui and Northern Wairoa Rivers. They have been generally developed for farming purposes. However some settlements are also affected, the most notable being Dargaville. Its main commercial area is situated on the banks of the Northern Wairoa River immediately east of its junction with the Kaihu River. Industrial and residential areas in Mangawhare also border the river further to the south. Inundation of these areas has occurred in the past when flood waters from the upper catchments have been backed by high tides and high winds. The most recent flooding occurred in August 1992. The risk of flooding is greatest at times of high equinoctial tides and low barometric pressures.

Some land in Dargaville township is also prone to flooding from overflows of the Kaihu River. Floodwaters have on occasions breached stopbanks in the Beach Rd - Station Rd area and taken a more direct route to the Northern Wairoa River through adjoining properties. Flooding of this nature last occurred in June 1962.

The former Dargaville Borough and Hobson County Councils carried out various flood protection works designed to lessen the impact of flooding on Dargaville and the surrounding areas. The most significant of these were the Kaihu Valley Flood Protection Scheme and Northern Wairoa Stopbanking Programme. The Kaihu Valley Scheme was carried out in three stages between 1958 and 1971. It involved river diversion, drainage and stopbanking works as well as development of an 800 ha natural ponding area in the Rotu area. The ponding area gives some control over floodwaters in the lower valley. Ongoing river cleaning and tree removal programmes have helped maintain the level of flood protection given by the original works.

The Northern Wairoa River Stopbanking Programme was carried out in five stages in the early 1960's. It involved construction of a sea wall and stopbank system along the banks of the river from the Kaihu Bridge to the old town wharf. At the same time, parts of Day St and Beach Rd were raised to form a stopbank. The works were designed to protect the main commercial and industrial areas of the town from flooding of both the Kaihu and Northern Wairoa Rivers. In recent years the stopbank along the Northern Wairoa River has been extended to the vicinity of the new town wharf.

Outside of the Dargaville township few detailed records exist of land which is prone to flooding and the frequency or nature of past flooding events. The N.Z. Land Inventory Series Maps - Soil and Water Conservation overlay shows the general extent of land which may be affected. It identifies three categories of land:

- land flooded at least once a year
- land flooded at a five to ten year frequency
- land very seldom flooded but can suffer from surface water ponding following heavy rainfall

The overlay maps are at a scale of 1:100,000 and as such only give a broad indication of the flooding risk. Copies of the overlay maps are held at the Council's Dargaville office.

The Council does however have a reasonably good knowledge of flooding in some rural areas, particularly around the Kaihu and Northern Wairoa Rivers. Most of the land in these areas lies within specially constituted "drainage areas" administered by the Council or other associated bodies. There are some 40 drainage areas, the largest being Raupo which covers 9,000 ha and takes in the township of Ruawai.

7.1.4. Landslip and Other Types of Mass Movement

The Kaipara district contains a mosaic of land types some of which are prone to slippage, slumping and other forms of mass movement. The degree of instability is generally related to the topography of the land, associated soils, geology and vegetation cover. Some of the soils present have become deeply weathered and lost much of their structure under the prevailing warm humid climate. Where these soils are present on relatively steep slopes with little or no vegetation cover then various forms of mass movement are likely to occur. These can range from widespread soil slipping and slumping to more localised gully, hill and tunnel erosion.

The N.Z. Land Resource Inventory generally identifies the nature of erosion prone land in the district. It establishes eight land use capability classes and four subclasses, the latter of which are based around dominant erosion, wetness, soils and climate limitations. Five types of erosion are identified, the degree of which is recorded on a scale ranging from negligible (0) to extreme (5). An associated series of Soil and Water Conservation Overlay Maps categorise the land into four recommended soil conservation management regimes, these are:

- preservation management - all Class VIII land which is considered unsuitable for any form of productive use because of its extreme erosion risk
- high conservation management - all Class VII land except Class VII where considerable care needs to be taken with development of land because of its high erosion risk
- moderate conservation management - all of Classes V & VI as well as Class VII e 1 and Classes IV e 3 - IV e 10 where moderate erosion risk exists
- low conservation management - all Class II and III land as well as all Class IV except IV e 10 with a low erosion risk.

Copies of the overlay maps are held at the Council's Dargaville office.

7.2. Legislative Considerations

7.2.1. Resource Management Act

Section 31 of the Act lists one of the functions of territorial authorities as being:
"The control of any actual or potential effects of the use, development, or protection of land, including the implementation of rules for the avoidance or mitigation of natural hazards"

The term natural hazard is defined in Section 2 as meaning:

"Any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property or other aspects of the environment".

Part II of the Second Schedule also refers to the control of the use of land including the implementation of rules for the purposes of avoiding or mitigating natural hazards as a matter which may be dealt with in district plans.

Under Section 30 of the Act Regional Councils are also given responsibilities in respect of natural hazard avoidance and mitigation. These include:

(c) The control of the use of land for the purpose of-
- The avoidance or mitigation of natural hazards

(d) In respect of any coastal marine area in the region, the control (in conjunction with the Minister of Conservation) of-
(v)- Any actual or potential effects of the use, development, or protection of land, including the avoidance or mitigation of natural hazards

(g) In relation to any bed of a water body, the control of the introduction or planting of any plant in, on, or under that land, for the purpose of-
(iv)- The avoidance or mitigation of natural hazards

The respective responsibilities of territorial authorities and Regional Councils in respect of hazard avoidance and mitigation are not particularly clear. However it is apparent that territorial authorities have a responsibility to consider and if necessary introduce district plan provisions, including rules, relating to the use, development and protection of hazard prone land. The principal areas of land excluded from such a consideration are the coastal marine area, and the beds of lakes, rivers and streams. The basis upon which any rules could be promulgated is not particularly outlined in the Act. Section 106 of the Act however, does give the Council general powers to control the subdivision of land which is affected by certain natural hazards. It reads:

" Subdivision consent not to be granted in certain circumstances"

(1) A consent authority shall not grant a subdivision consent if it considers that either -

(a) Any land in respect of which a consent is sought, or any structure on that land, is or is likely to be subject to material damage by erosion, subsidence, slippage, or inundation from any source; or

(b) Any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to that land, other land, or structure, by erosion, subsidence, slippage, or inundation from any source-

unless the consent authority is satisfied that sufficient provision has been made or will be made in accordance with subsection (2).

(2) A consent authority may grant a subdivision consent if it is satisfied that the effects described in subsection (1) will be avoided, remedied, or mitigated by one or more of the following:

(a) Rules in the district plan:

(b) Conditions of a resource consent, either generally or pursuant to section 220(1)(d):

(c) Other matters, including works.

7.2.2. Building Act

The Building Act 1991 contains specific provisions which govern the erection of buildings on hazard prone land. Under Section 36 (1) a territorial authority is required to refuse to grant a building consent involving construction of a building or major alteration to a building if:-

"(a) The land on which the building work is to take place is subject to, or is likely to be subject to, erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage; or

(b) The building work itself is likely to accelerate, worsen, or result in erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage of that land or any other property-

unless the territorial authority is satisfied that adequate provision has been or will be made to-

(c) Protect the land or building work or that other property concerned from erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage; or
(d) Restore any damage to the land or that other property concerned as a result of the building work."

However provision is made in the ensuing Section 36 (2) for a building consent to be granted relating to land which is subject to or is likely to be subject to, erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage, where the Council considers that-

"(a) The building work itself will not accelerate, worsen, or result in erosion, avulsion, alluvion, falling debris, subsidence, inundation, or slippage of that land or any other property, and
(c) The building work which is to take place is in all other respects such that the requirements of section 34 of the Act have been met."

In issuing any such consent the territorial authority is required notify the District Land Registrar of the nature of it, who is in turn required to make an entry, (generally in the form of a memorandum of encumbrance) on the certificate of title to the land. Section 36 (5) and Section 36 (6) contain alternative notification and recording procedures relating to applications by the Crown and the owners of Maori land. Under these provisions the territorial authority is required to notify the appropriate Minister and Chief Surveyor, and Registrar of the Maori Land Court respectively. The above-mentioned provisions in the Building Act replace those formerly in Sections 641A - 641D of the Local Government Act.

The Building Act also contains specific provisions relating to the use of buildings which are considered earthquake prone. Under Section 66 a territorial authority can give notice to the owner, occupier or any person having an interest in a building, requiring certain work be done on it to remove or reduce any danger of an earthquake prone nature. The term 'earthquake prone' is defined in this same section and is particularly related to buildings which are wholly or substantially made of unreinforced concrete or masonry. The provisions do not apply to buildings used for residential purposes unless they are two or more storeys high and contain three or more household units.

The N.Z. Building Code (Clause E1.3.2) requires all houses, communal residential and communal non-residential buildings be constructed so that "surface water resulting from a storm having a 2% probability of occurring annually", ie. 1 in 50 year event, does not enter them.

7.3. Management Issues

7.3.1 Buildings Likely to be Affected by Earthquake Activity

The Kaipara district is in a seismically inactive part of the country where the probability of an earthquake occurring is very low. In this regard the impact that an earthquake of any given magnitude would have on the district, and particularly urban areas like Dargaville, has not been assessed. Limited planning and precautionary measures can be taken other than through the civil defence system. The Council has a civil defence plan in place which establishes certain procedures for dealing with emergency situations arising from earthquakes and other natural disasters. The plan is regularly reviewed and administered in accordance with the provisions in the Civil Defence Act 1974.

One of the most devastating effects that an earthquake has is on buildings and other major structures. As outlined in Section 7.2.2 the maintenance and use of buildings which are earthquake prone can be controlled under the Building Act 1991. Buildings in this category are generally those which are constructed of unreinforced concrete or masonry. Council building records indicate there are few buildings of this nature in the district. The Council will continue to monitor the use of such buildings and if necessary require work to be done on them in accordance with the provisions in Section 66 of the Act. No particular planning requirements are considered necessary in the district plan.

7.3.2 Shoreline Movements and the Impact of Rising Sea Levels

The shoreline of the Kaipara district is in a state of constant change being subject to wave, wind and other natural forces. Whilst past studies indicate that the coastline is relatively stable, no detailed monitoring or investigation of shoreline movements and associated hazard threats to properties have been carried out. Erosion has occurred

along some parts of the west coast although the impacts on private properties appear to be limited. Accretion has also been taking place, particularly around the Mangawhai estuary causing problems for recreational users. Dredging and foreshore protection works have been carried out under the direction of the Northland Regional Council. It has principal responsibility for management of foreshore and seabed areas below mean high water springs and is expected to develop policies and proposals relating to future works and protection measures in its Regional Coastal Plan.

The extent to which the coastline will in future be subject to shoreline movements and associated accretion or erosion is somewhat unknown. A major influencing factor will be the impact that the process known as global warming or the greenhouse effect has on sea levels. Investigations over the last decade or so have led to predictions that mean sea levels will rise at an accelerating rate throughout the next century. The atmosphere of the earth has been found to be progressively warming in part due to the build up of gases produced from various human activities. The gases include carbon dioxide (from the burning of fossil fuels), methane, nitrous oxide and chloroflurocarbons (CFCs). They have the effect of preventing heat from escaping from the earth causing a gradual rise in surface temperatures, melting of glaciers and icesheets, and thermal expansion of ocean waters.

The predicted rise in sea levels vary but conservative estimates put them at between 70-110mm by the year 2025 and 170-440mm by the year 2050. However rising sea levels are not a new phenomenon, investigations show that there has been an average rise in sea levels at NZ ports of 167mm (+ or - 23mm) over the last century. The main impacts of rising sea levels are expected to be an increase in coastal erosion and more widespread flooding of low lying areas around river mouths, estuaries and behind sandy beaches.

The Council recognises that planning precautions need to be taken to avoid the unnecessary development of land in coastal and estuarine areas which are likely to be affected by shoreline movements. It has adopted a conservative approach to the zoning of land for future residential development in such areas, and will consider any applications for land use and subdivision consent on a similar basis. If the Council has reservations about the suitability of a site for development because of its potential liability to coastal erosion or the like, it will require the applicant to commission an independent engineering report.

At this stage the Council does not have sufficient information on which it can identify in the district plan or in some other document those properties which are at risk from shoreline movements and associated sea level rise. It is to undertake with the Northland Regional Council a special coastal hazard study of selected areas, particularly those in and around existing settlements. Such investigations have in the past been carried out along parts of the Hokianga, Mangonui and Whangarei coastlines and been used as a basis for developing associated district plan provisions.

The Council has in a related regard established minimum floor level requirements for buildings in the district plan. They will apply in some to low-lying areas likely to be affected by rising sea levels. In setting these standards allowance has been made for a 300mm sea level rise by the year 2050 in line with recent predictions. Land use developments with a longer predicted life will need to be specially assessed. This matter is discussed further in the following section.

7.3.3 Flood Hazard Identification and Mitigation Measures

The NZ Land Inventory Soil and Water Conservation overlay maps show the general extent of land in the district which is prone to flooding. However, they are at a very broad scale and do not enable an accurate assessment to be made of the risks to individual properties and the associated need for mitigation measures such as stopbanking works and controls on building activities. As outlined in Section 7.1.1 the only area where some assessment of this nature has been carried out is Dargaville.

Flood levels in the township of Dargaville have been recorded over the years, the most recent of which are summarised in Table 7.1. The stopbanks along the Northern Wairoa and Kaihu Rivers in the town have been built to a height of 3.0 metres above mean sea level. This is about 0.2 metres above the highest recorded level and is estimated to be the level of a flood with a 100 year return period, assuming it coincides with a spring tide. Whilst the stopbanks give some flood protection to the town they do not make it flood free. Some parts of the rivers are unprotected whilst breachs of stopbanked sections can occur as happened along the Kaihu river in 1962. Furthermore the stopbanked sections are only designed to withstand a flood which has a probability of occurring once every 100 years. Floods of greater magnitude are a distinct possibility.

Table 7.1: Dargaville Township: Recorded Flood Levels

Date	Location	Level (metres)	Flood Source
June 2nd 1962	Cnr Logan & Murdoch Sts	2.773	Kaihu
Feb 28th 1971	Victoria St	2.722	Northern Wairoa
July 20th 1978	Victoria St	2.770	Northern Wairoa
Feb 17th 1980	Totara St	2.795	Northern Wairoa
Aug 27th 1984	Totara St	2.782	Northern Wairoa
Aug 28th1992	Totara St	2.680	Northern Wairoa
Datum - Mean Sea Level			
Northern Wairoa River	Mean High Water Spring Tide - 2.17 metres Mean Low Water Spring Tide - 1.65 metres		

Source - District Council Records

Planning Map 69 shows the extent of land in the town which is below the 3.0 metre level and theoretically at risk from either a breach or failure of the stopbanks. Much of the land is at minimal risk because of its distance from the rivers and the tidal influence of the flooding events. The land at greatest risk is generally that which is adjacent to the riverbanks and/or known overflow channels. This includes most of the town's main commercial centre in Victoria St and the industrial areas along Beach Road and River Road. A recent survey of buildings in these areas found, that a considerable number had floor levels below 3.0 metres, with some as much as 300mm below known flood levels.

The Council also has records of flooding events in other parts of the district and will advise people on the appropriate floor levels of new buildings in flood sensitive areas wherever possible. In processing associated building, land use or subdivision consents it may require an applicant to provide a specialist engineering report on flood liability of a site and associated protection measures including minimum floor levels of buildings. As outlined in Section 7.2.2 the N.Z. Building Code which has been adopted by the Council requires all houses, communal residential and communal non-residential buildings be constructed to prevent floodwaters associated with a 1:50 year flood from entering them.

7.3.4 Land Drainage and River Control Works

The limited information which currently exists on the extent of land that is prone to flooding and associated risks means that a cautious approach needs to be adopted, by people purchasing properties in low lying valley areas. The Council will endeavour to advise people of such land and the reliance placed on existing river control and land drainage schemes, wherever possible. In some cases, additional improvements to drainage, including stopbanking, may not be possible because of other considerations including effects on flooding further down the catchment. Over the last fifty or so years a number of river control and drainage schemes have been carried out by the Council and its predecessor constituent authorities. The schemes have involved the construction of drainage channels, stopbanks and special ponding areas. The most notable ponding area is associated with the Kaihu River and located in the Rotu area, north of Dargaville. Its retention is critical in providing the lower parts of the Kaihu Valley including Dargaville with a reasonable degree of land protection.

The river control and land drainage works carried out over the years are administered by the Council as part of specially constituted drainage districts. There are some 40 drainage districts. The boundaries of the districts and associated drainage works are shown on maps available at the Council's offices in Dargaville.In order to maintain the integrity of the drainage schemes the Council has a bylaw which controls activities in and adjacent to them. The Land Drainage Bylaw 1993 places general restrictions on the erection of the buildings, fences, roads and shelter belts within 15.0 metres of a Council drain. The restrictions are required to retain access for drain cleaning and maintenance purposes. The bylaw requires property owners to obtain the Council's consent before connecting a private drain to a Council drain. It also requires the erection of any stopbank to be approved by the Council. Stopbanking works involving more than 2000 m3 of material also require the consent of the Northland Regional Council under the Transitional Regional Plan (See Section 2.3.1). Landowners intending to carry out drainage or stopbanking works should contact Council staff in Dargaville at the earliest possible opportunity.

7.3.5 Development of Stability Sensitive Land

Within the Kaipara district there are areas of land which because of their geological structure, soil type or slope are susceptible to slipping, slumping and other forms of mass movement. The areas concerned tend to be fairly localised and confined to particular

parts of a property or small group of properties. They have often been 'discovered' when building, roading or other major development projects have been planned or carried out on a site.

Knowledge about the existence of stability sensitive areas will tend to be patchy and incomplete in a district like Kaipara. It has a fairly complex geology, and diverse topography, some of which has been under limited development pressure. Identifying all the potentially unstable or sensitive areas would be prohibitively expensive. It cannot be justified, particularly when the likelihood of any significant building, subdivision or other development activity occurring in many of the areas is taken into account.

The Council recognises the need for people to be aware of the limitations some properties have for development because of their susceptibility to mass movement. It maintains records on the areas known to be affected which will be made available to people seeking consents under the Building and Resource Management Acts. As outlined in Section 7.2 there are general provisions in these two statutes which enable the Council to control building and subdivision activities on stability sensitive land. Rules of a complementary nature have been incorporated into the land use, zoning and subdivision provisions of this plan. Where a site is known or suspected to be of an unstable nature, the Council will require any related land use or subdivision consent to be accompanied by a report from a registered engineer with geotechnical expertise. Special conditions may be imposed on any consent granted including those relating to the registration of encumbrances against the titles of any land affected.

7.4 Objectives Policies and Methods of Implementation

7.4.1 Objectives - Hazard Mitigation

Objective 1: To identify natural hazard threats and ensure that any damage to properties from them is minimised and where possible avoided.

Explanation: The district plan has an important role to play in highlighting the nature and extent of existing hazards and likely threats such as rising sea levels. Because of existing land use patterns some hazards cannot be avoided. However, measures can be taken to minimise this impact on properties, including physical protection works, and rules on land use and subdivision activities which form part of the district plan.

7.4.2 Policies and Methods of Implementation

(1) Coastal Erosion

Policy 1: To monitor shoreline movements and control land use and subdivision activities in sensitive foreshore areas.

Methods of Implementation

1 Undertake in conjunction with the Northland Regional Council a coastal hazard investigation and incorporate relevant findings into the district plan.

2 Administer rules controlling the location of buildings adjacent to mean high water springs mark.

3 Require specialist engineering reports on the subdivision and use of land likely to be affected by coastal erosion and rising sea levels.

4 Invoke where necessary provisions in the Building Act and Resource Management Act relating to the development of erosion prone land.

5 Have rules which enable the setting aside of esplanade reserves or strips along sections of coastline which are prone to erosion at the time of subdivision.

Explanation: The nature of shoreline movements along the two coasts needs to be investigated so that specific mitigation measures can be developed, particularly for areas which are subject to long term erosion. The measures may be of a regulatory or works related nature. In the meantime some general rules have been developed which enable the Council to control land use and subdivision activities in sensitive areas. Where necessary related control provisions in the Building Act and Resource Management Act will be used.

(2) Flooding

Policy 1: To identify land at risk from flooding and control land use and subdivision activities on such land.

Methods of Implementation

1 Assist the Northland Regional Council to prepare a Flood Management Plan for the Northern Wairoa River catchment and incorporate relevant findings into this plan.

2 Prepare flood management plans and associated hazard maps for other catchments as finances permit.

3 Consult with the Northland Fish and Game Council on the preparation of flood management plans and any drainage and river works which require resource consents.

4 Administer minimum floor level requirements for houses, communal residential and communal non-residential buildings in the N.Z. Building Code.

5 Require specialist engineering reports on the subdivision and use of any flood prone land as part of the building consent and resource consent processes.

6 Invoke where necessary provisions in the Building Act and Resource Management Act relating to the development of flood prone land.

Explanation: Flooding is the most significant hazard threat in the district and a variety of regulatory and works related mitigation measures are required. Such measures need to be developed on a catchment by catchment basis related to the dynamics of each river system and the associated flooding risks. Flood management plans are to be prepared for the major river systems with any necessary controls on land use and subdivision activities incorporated into the district plan.

(3) Stability Sensitive Land

Policy 1: To identify stability sensitive land and control associated land use and subdivision activities.

Methods of Implementation

1 Maintain a property based recording system for identifying land which is prone to slipping, slumping and other forms of mass movement.

2 Require specialist engineering reports on the subdivision and use of stability sensitive land as part of the building and resource consent processes.

3 Invoke where necessary the provisions in the Building Act and Resource Management Act relating to the development of stability sensitive land.

Explanation: As with flood hazard mitigation the Council has developed some general rules and procedures relating to the use of stability sensitive land. They will be used in conjunction with the associated provisions in the Building Act and Resource Management Act.