Executive Summary

Northland Regional Council contracted NIWA to undertake an initial study on the risk of tsunami inundation facing communities in the Northland Region. The following credible sources were identified:

- Remote source: South American origin. Return period 50-100 years. This represents the most probable tsunami risk in the next 100 years.

- Local/Region: Tonga Kermadec. Two events were modelled, Mw 8.5 and Mw 9.0. The return period of these events is much longer (500-2000 years) but these represent a worst-case scenario for a tsunami striking the Northland coast.

These scenarios were run up to the coastline to provide maximum water heights and speeds at the coast for specific districts. Additional inundation modelling was done for the specific communities of Taipa and Ahipara.

The remote South American tsunami did not cause significant inundation for Taipa and Ahipara, however high water speeds could cause erosion of dunes and scouring of estuaries. The Tonga-Kermadec subduction zone tsunamis caused considerable inundation (especially the larger of the two) and the high water levels would cause extensive erosion and scouring of these two communities. These effects are further exacerbated by the sea level rise scenarios for 50 and 100 years as projected the IPCC Fourth Assessment Report.

1. Introduction

Northland Regional Council contracted NIWA to undertake a modelling-based assessment of tsunami hazard for the Northland region. The focus of this initial study is to model maximum wave heights at the shoreline for selected districts in the Northland region for credible regional and remote sources and to undertake inundation modelling for two specified communities. Based on a tsunami source study (Goff et al. 2006) the following sources were identified as likely to cause significant tsunamis in the area of interest:

- Distant – Eastern: South America (Chile). A distant tsunami comparable to either the 1868 Peru (now Chile) earthquake (M_w9.0) event or the 1960 Chile Earthquake (M_w9.5) event (Note that although the 1960 event was larger it was directed more to the north of New Zealand where the 1868 can be considered an almost direct hit on New Zealand). This represents the most probably tsunami in the 50-100 year timeframe.

- Regional – Eastern source: Tonga Kermadec trench. Two tsunamigenic earthquakes were studied: a M_w8.5 subduction zone event located just to the north of the Rapuhia Scarp (i.e. in the central portion) and a M_w9.0 subduction zone event in the central and southern portion. These are identified as worst - case scenarios.

For each of these events NIWA modelled wave propagation up to the Northland shoreline with specific emphasis on the following districts:

- Doubtless Bay (Knuckle Point to Berghan Point)

- Ahipara (Shipwreck Bay to Headquarters Road)

- Bream Bay (One tree Point/Darch Point/Bream Head to Bream Tail)

- Whangarei (Mair Road to Home Point, to Town Basin road bridge)

- Bay of Islands (Cape Brett to Cape Wiwiki)

- Whangaruru (Home Point to Okupe Beach)

- Whangarei East Coast North (Motuara Point to Whau Point)

- Whangarei East Coast South (Whau Point to Awahoa Bay)

- Whangaroa (Point immediately west of Taupo Bay, Motuiwi Island including Stephenson and Cavalli Islands)
- Mangawhai (Sentinel Rock to Te Arai point)
- East Beach (Stanley Point to Blackney Point including Walker Island)
- Omapere (Waihopai River to Waimamaku River)
- Dargaville

Inundation modelling was also done for Taipa (in Doubtless Bay) and Ahipara. Sea level rise scenarios of 30 and 50 cm which represent the 50 and 100 year projections defined by the IPCC Fourth Assessment Report were also modelled for each scenario.