Horizons Regional Council Flood Plain Mapping Project and LiDAR Overview

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EXTENDED ABSTRACT

Two major flood events hit the lower North Island in February 2004. These were the largest of the nine significant flood events over the course of that year within the Manawatu – Wanganui region. These events catalysed the Horizons Flood Plain Mapping Project in 2005 to identify flood hazard areas and to quantify flood risk. The project made use of LiDAR (Light Detection And Ranging) technology to conduct an Aerial LiDAR Survey (ALS) of the major flood plains already identified as areas with flood hazard. The ALS information was used to produce a Digital Elevation Model (DEM) of the ground surface suitable for riverine flood modeling with a nominal vertical accuracy of ±0.15m. Initially, 1200 square kilometres of the region were surveyed in 2005. A further 100 square kilometres were surveyed in 2009. ALS has become readily available in New Zealand over the last decade and is used extensively to survey all types of terrain from mountains to sea shore.

The images in the full presentation illustrate the process used to record the flood extents from the photos and other information captured to cover each flood event. Examples are included in this abstract. Figure 1 shows flood water extents from 2004 for an area to the west of Palmerston North and Figure 2 shows the similar area with flood extents from the 1976 event.

The flood plain mapping project has highlighted the need to document significant flood events by ensuring a full photographic coverage of flood extent is captured. A 'photo album' of the flood event is compiled to provide a readily accessible record for staff and public information. The photographs over time show not only flood extents but also the changes in land use and activity in the flood ways.

Figure 1. Flooding from the Mangaone Stream on the outskirts of Palmerston North in February 2004. Photo courtesy of Massey University School of Aviation.

Figure 2. Flooding from the Mangaone Stream on the outskirts of Palmerston North in 1976. Photo from Horizons archive and RNZAF.

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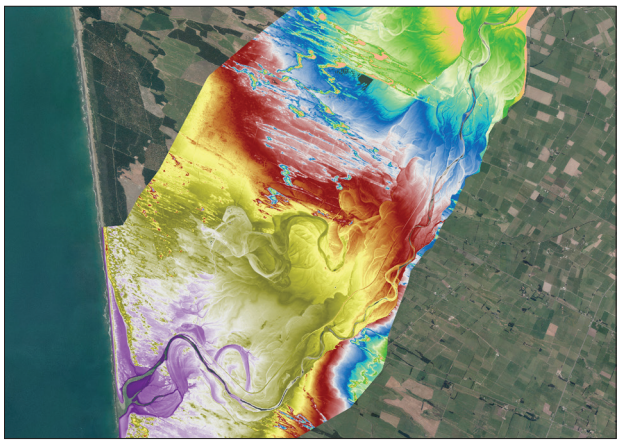
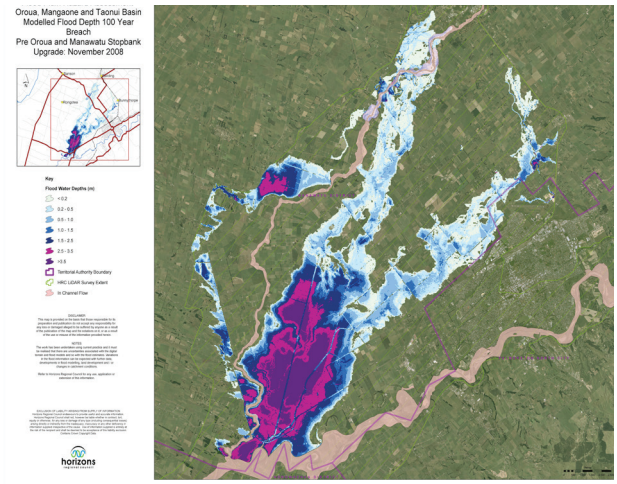


Figure 3. This elevation model is derived from a LiDAR survey of the lower Rangitikei River area. The main river channel and linear stop banking can be seen along the left hand side and lower portion of the model. Also evident are relic river channels and sand ridges driven by the prevailing WNW wind.



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Flood modeling was conducted using the DEMs (e.g. Figure 3), river gauging observations and flow records (hydrographs). Flood extents and photos were used with concurrent river gauging observations to calibrate the flood modeling runs. The calibrated flood models were run to simulate a variety of statistical flood events, nominally: 1:50, 1:100 and 1:200 year events. The resulting flood maps (Figure 4) and information from the flood models were supplied to: emergency management personnel to prepare evacuation plans, works teams to mitigate flood damage to property by building stop banks, and local authority planners to avoid dwellings being built in flood hazard areas.

Since the initial LiDAR survey in 2005 the organisation has found that the elevation models have been useful in: identifying land forms (see Figure 3), assessing land use capability (LUC), soil type mapping, contouring, waste treatment and effluent disposal, waterway identification, drainage assessment, tsunami and storm surge modeling, transport corridor planning, power/transmission line routing, erosion, river channel migration, etc.. The ground elevation information initially collected for the express purpose of providing a DEM for the flood modeling has been used multiple times for purposes that were not envisaged at the time of collection. The LiDAR survey information and subsequent elevation models commissioned and produced by Horizons Regional Council have become a well-used dataset by local authorities, research institutes and consulting engineers.

ACKNOWLEDGEMENT

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