Tonkin & Taylor

Memo

To:	Kim Smith, Kevin Strongman	T&T Ref:	28735
From:	Richard Reinen-Hamill	Date:	13 June 2013
cc:			
Subject:	Wainui Beach Coastal Hazard Assessment Review		

This memo sets out our assessment of the requirements to review the existing coastal hazard assessment that was carried out in 1995 and then reviewed in 2001 by Dr Jeremy Gibb. The reason for carrying out a review includes the incorporation of additional data and knowledge of the physical system that may affect and therefore influence the location of the specific hazard zones.

Assessment

The hazard zone mapping carried out by Dr Gibb (2001) included consideration of erosion, inundation and landslide. These are necessary items to consider.

Erosion hazard mapping

A formula was provided by Gibb with CEHZ = [(Smax +D) + (X50 +R) T + (X100 + R)] F (eqn. 2)

This formula was not rigorously applied and actual mapping was based on:

Extreme	= (Smax + D) F
High	= (Smax + D) F + (X50 + R) T
Moderate	= (Smax + D) F + (X100 + R) T
Safety Buffer	= [(Smax + D) F + (X100 + R) T] F

In addition, there are some anomalies with the specific data, including:

Long term trend, R:	The 2001 erosion hazard assessment used aerial photograph mapping from either from 1942 to 1999 (generally) but with 1942 to 1982 used between Wainui and Haumanatua Stream. It is unclear why there was a variation in the time period and with more recent aerial photographs and LIDAR this could usefully updated.
Short term (S+D):	Storm cut was developed from the GIS model in terms of m^3/m width above MSL and using the 1999 DEM as a base. It is unclear how this was done from the report and how a volume term was incorporated with a slope. It would be very useful for Council to ensure they have the working GIS model.
X + R:	The historic term offset the potential effects of sea level rise in situations where R was greater than X. This occurs at Profile 4 and 8A. This is considered unrealistic for a linear beach and should be reviewed.
F:	The stated value of F was a factor of 50% on the values. This was not the case in the mapping and it is unclear what the ultimate F value was derived from.

It may be the case that with better understanding of the GIS model that some of these uncertainties can be resolved. However, it is also apparent that there may some logic inconsistencies in the formula.

There is additional information that can be used to review and update some R and S and there is new information of Sea Level Rise that should be considered. These factors are likely to result in a changed (larger) hazard zone, particularly due to the increased allowance for sea level rise that is required to be considered.

Flood Hazard Mapping

Flood levels were based on 1995 report with an additional consideration of tsunami impacts. The derivation of flood levels appears largely based on anecdotal information, although tsunami data appears well verified. The 1995 report considered sea level rise values of 0.6 m to 1.1 m so the resulting levels may be unlikely to change significantly.

Flood levels could be reviewed based on more detailed assessment from nearshore wave data and water level data. However, it is unlikely that there will be significant variation in levels.

Landslide Hazard

Landslide hazard considered the historic rate of cliff toe retreat and the extent of slope subject to failure. It is unclear how the extent of slope was established, but this may be clarified with a review of the GIS model. However, it is unlikely that this area will vary significantly with review.

Summary

In general, the deterministic type of approach as used by Dr Gibb to evaluating areas that may be subject to coastal hazards is still appropriate today and can be considered good practice. However, we would recommend some refinement of the detail of the approach to provide a more consistent and transparent process.

In our opinion, more sophisticated probabilistic techniques are not appropriate with both due to the level of information and understanding currently available for Wainui beach as well as the uncertainty associated with the impact of future climate change and the beach responses.

Matters which need to be considered in a coastal hazard assessment are set out in the NZCPS (Policy 24). Methodologies need to address the requirements set out in Policy 24 and the general approach of Gibb largely conforms to the policy requirements. There is a case of maintain better data and information which can help increase understanding of how the beach system operates and the influence of cliff erosion on the beach system. Additional geotechnical investigations to delineate the landward beach system would also assist in better confirming the location and extent of erosion potential. Careful consideration of the information from aerial photographs and beach profiles need to be made to gain a better understanding of the overall trends, while the beach profile data set, since 1999 can be used to better examine beach cut.

The final draft of the physical science basis of the IPCC fifth assessment report (WG1 AR5) has been completed and the final issue is expected late in September 2013. We are not aware of the central government approach to the IPCC results, but based on previous responses it is likely that this information will be considered by government and there may be updates of the MfE (2008) guideline. However, the IPCC is likely to identify greater rates of sea level rise increase than used by Gibb in his 2001 update for levels to 2100 (0.5 m) or in his 1995 report (0.66 m). We would expect levels of around 1 m projected by 2100 and potentially up to 1.5 m. The lower bound level is in the same order as identified by MfE (2008) guideline. However, we note the required planning period is now realistically at least 2115.

In areas where erosion is a significant issue, adequately designed erosion protection works can provide protection from shoreline retreat for a period of time. However, they typically do not benefit the beach and area seaward of the structure and can create public and private access issues. The existing infrastructure along Wainui Beach comprises a range of construction techniques and types and generally would be considered under-designed for the environment.

We recommend analysis on the hazard to be done without consideration of infrastructure, to identify the area of land potentially affected and therefore enabling a better understanding of risk and benefit and that structures are not seen as a permanent response, but as providing time to enable other policies and strategies to be put into effect. If this is not done, then the risk due to natural hazards can increase due to increasing the value of assets affected. We note that the zones identified are areas of erosion susceptibility and not predictions of where the shoreline will be within a certain time period.

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