Peer Review comments on T&T Quantitative Landslide Risk Assessment report for Matataa

Dated May 2013

Dick Beetham 10 June 2013

Overview comments:

The report provides an excellent overview and summary, with good detail, including figures and tables, of the local geology, topography, previous landslide events and causes, and landslide risk methodology, including its application to Matata. This information is all required to assist with the understanding of the complex processes and interactions involved with landslides, including the type known as debris flows, their causes, the assessment of their risks, and possible mitigation options. The topic is complex and technically specialized. However, the report takes both the specialist and the lay reader through a logical and clearly defined development of the processes involved, including where estimates are made and where there are limitations.

My detailed comments involve the 'typos" I have seen (and I see from Craigs comments that I have missed some) and comments that may help to clarify some points.

Detailed comments:

Exec Summary p1 bottom para. A landslide inventory developed for Matata shows the escarpment is dominated by rainfall triggered instability events. Strong seismic-shaking is potentially the source of the largest landslides that could occur on the escarpment, although the triggering event may have a much longer return period that rain storms. The triggering event for large debris flows may be about the same frequent as that for strong (MM9) earthquake shaking.

Definitions;
Debris flow
A very rapid flow of water saturated, non-plastic soil, rock and vegetation debris that passes along established channels. Often deposits onto an open or unconfined fan.
Earthquake Magnitude
A measure of the energy released by an earthquake (the rupture of a fault plane). Measured in terms of Moment Magnitude. Formerly measured in the Richter or Local Magnitude.
Holocene
A geological epoch which began at the end of the Pleistocene (around 12,000 to 11,500 years ago) and continues to the present. Meaning "entirely recent", it has been identified with the current climate warm period.

Introduction, 6th Para. The Whakatane and Ohope study use the methodology of AGS 2007, regarded as international best practice for the use of susceptibility, hazard and risk assessments as a means of potentially controlling development through the requirements of the District Plan.

P 15, 6.5, 1st para. Investigations undertaken in the valley floor of the Awatarariki Stream (Tonkin & Taylor, 2006b)
indicated that the stream is underlain by up to 8m of loose to medium dense alluvium containing boulders up to 3m in diameter and mixed organic material, including tree trunks, regarded as past debris flow deposits.

P 31, 8.4, past debris flows; should reference the reports by Ian Shearer (Matataa recovery project C & D.)

P's 40 & 41, Figs 9.2 & 9.3. Can these important figs be presented at a larger scale so that they are readable. Perhaps they are inserted as A3?? Mine printed as A1.

P 44, 9.4.1, 1st para: Strong earthquakes may typically occur on a less frequent basis than heavy rainfall events, although when they do occur, strong earthquakes can be responsible for triggering a great many landslides. Strong earthquakes are also more likely to generate large to very large landslides than rainfall. It is noted that the assessed recurrence interval of the heavy rainfall at Awakaponga that was responsible for the 2005 debris flows at Matata (p 38) is approximately 500 years, which is comparable to the recurrence interval for MM9 intensity shaking at Matataa (475

years, Table 9.3). This recurrence interval is also comparable with the performance requirements of the New Zealand Building Code for seismic design of new buildings.

P 52, 10.2.1, 2nd para. The landslide inventory is critical in developing an understanding of landslide hazard, as this shows not only the location and size of previous landslides, but it also provides an insight into the areas down slope that have previously been impacted.

P 52, 10.2.1, 4th para: In areas such as Matata, where the population resides entirely within the area of debris inundation rather than initiation, debris travel distance is a critical parameter in determining the degree of hazard present at any particular location. Thus reducing debris travel distance is a viable mitigation option.

P 53, 10.2.2, bullet points: Wet deposits can also travel further, although "dry" rock avalanches above a certain large volume can have an excessive run out distance.

P 59, table 10.5: A brief note below the table saying how you have assigned the hazard ratings would be useful.

P 67, 11.3: consider starting on a new page to separate it clearly from 11.2, landslide risk assessment.

P67, 11.3, 1st para: The destructive nature of debris flows means that the shielding effect described above for landslides may not be as relevant for these larger events.

P 72, 11.3.1.3, 1st para: The 18 May 2005 event illustrated that the extent of property damage depended upon the travel distance of the larger boulders entrained by the flow.

P 74, 11.4, 4th para: It is suggested however that what is considered appropriate in other jurisdictions may be appropriate for New Zealand. It is noted that Christchurch City Council have adopted these levels of acceptable and unacceptable risk for the Port Hills zoning assessment. It is useful to compare the estimated risks with those associated with other activities (Figure 11.1).

P 78, 12.3.2, 1st sentence. The Matata Escarpments have extensive vegetative cover, except for cliff sections west of the Awatarariki Stream.

P 79, 12.4: However, WDC has previously concluded that debris flow control through engineering means is not a cost-effective option for Awatarariki Stream, although it is a viable option for Waitepuru Stream, where mitigation works have been carried out.

P 82, 12.4, last sentence: Heavy rain warning could however be the most effective means of managing the Loss of Life Risk associated with debris flows, although the Property Loss Risk would remain unchanged. For example, there was at least a days warning that exceptionally heavy rain was approaching Matataa before the 2005 debris flows occurred. This rainstorm left a swath of destruction as it passed down the coast from Tauranga, and automatic rain gauges were recording heavy antecedent rainfall and an intense, slow-moving rainstorm. Tsunami warnings of minutes to hours and evacuation drills are now increasingly common in urban coastal areas of New Zealand, and could be used as a model for intense rainfall. As well, at-risk farm areas are commonly given flood alerts for stock (and people) evacuation.

P 82, 12.5: There may be little that existing building owners can do to reduce the landslide hazard affecting their properties to any meaningful degree. This is particularly the case with respect to debris flows. The best thing that residents could do is to be vigilant when unusually heavy rainfall is forecast. This may mean that those residents located close to points where drainage exits the escarpment (in particular the Awatarariki Stream) could self evacuate for a period of a few hours. Residents who have a property close to the base of the escarpment may want to leave the rear of the property and dwelling unoccupied for the duration of the storm event.

It is possible that landslide, including debris flows, risks to life and property can be mitigated amongst other ways, by the type of building design and construction used. For example, two story houses with strong, impact resistant walls, fences and bunds, could be an effective mitigation option.

P 83, 13, 2nd para: This distinguishes the Matata Escarpment from the Whakatane and Ohope escarpments where many houses have been damaged or destroyed and lives have been lost.

P 83, last para: Options for mitigation of the risks associated with landsliding and debris flows are limited as the higher hazard zones are already occupied. Suitable planning restrictions, together with an early warning system of unusually heavy rain are probability the most suitable responses to the identified risks. Although at Waitepuru Stream, debris flow mitigation works have been designed and constructed.