

## Multi-Hazard Baseline Modelling for Eastern Suburbs<sup>1</sup>: “what are the odds of...?”

This specialist work carried out by Engineering consultancy GHD Christchurch, in association with Netherlands-based HKV for Christchurch City Council and was circulated in June 2021.

### What was the work about?

This work is focused on what tide levels can be expected in the future, for consenting and asset maintenance purposes. The knotty problem it addresses is the probability of a super spring tide, with uncommonly high rainfall coincident with a freak storm. This is extremely pertinent to what scenarios will underlie the co-creation of Trigger points as part of adaptation to climate change conversations between communities and local government.

### How did they do it and what did they find?

They have discovered statistical relationships between sea-level and rainfall. This is not as trivial as it sounds, and the work has analysed these relationships in novel and conservative ways.

They have defined uncommonly high rainfall as only those events where it rains for 24+ hours. Using this definition they have expressed rainfall in terms of the average return interval (ARI) for these or larger events. Their analysis ignores events (for example those that only last 3 hours, irrespective of how much rain falls). They then have taken current tide data, *i.e.* when high and low tides occur at current sea-level and expressed this as ARIs for a given high tide level.

Using this data they have then generated probability surfaces for when both highest tides and these large rainfall events occur together. Because we do not have the length of data record one might more usually want for these studies (*e.g.* 100-200 years), they have modelled the outliers of what that distribution might look like with a *Poisson* distribution (or similar). This is statistically appropriate.

In the short term there are predicted to be slightly more of these coincident extreme events on the 10/50 year ARIs. However, beyond that there look to be less of them.

### Implications?

- In some areas, the super high tide with freak rain tide level is a bit higher (maybe 8cm), whereas in others a bit less)
- In those areas it is likely to result in a slightly higher (2 to 8 cms) minimum floor height if you are building a house.

This information is part of a matrix of good quality information required to support the setting of Trigger points in the adaptation conversations when they begin. Good Trigger points are based on measurements, and this work does not affect this.

<sup>1</sup> GHD | Report for Christchurch City Council - LDRP097 Multi-Hazard Baseline Modelling, (Joint Risks of Pluvial and Tidal Flooding) 125/31791/00. Available: <https://www.ccc.govt.nz/tidal-data>