Methodology to Estimate Mean Annual Wind Speed over Wellington Region

The following method was used to create the maps of estimated annual mean wind speeds over the Greater Wellington area.

First wind roses were constructed for the main observation sites in this region including Mt Kaukau, Kelburn, Wellington Airport, Paraparaumu Airport and Castle Point based on more than 20 years of data from the National Climate data base, plus 3 years of data from the GWRC site at Belmont. These wind roses indicate there are generally two predominant wind directions.

In the case of Belmont these are northerlies from within 15^o either side of 330^o and southerlies from within 15^o either side of 180^o. Together these explain about 90% of the total cases. Winds from the remaining 10% of cases are generally much lighter.

The mean annual wind speed was calculated at a height of 80m at the Belmont site (as requested by GWRC) from the last three years of observed hourly data for each of these directions. The Weather Prediction Model "NZLAM[1]" was then run with winds from both of these wind rose directions and the result scaled at each model grid point by the factor necessary to make the velocities match at the Belmont observation site.

This effectively estimates a mean northerly and southerly at each grid point for the Greater Wellington Region. Combining them in the appropriate 2:1 ratio, according to the wind rose, the corresponding mean annual wind speed was then estimated on a regular grid with points every 333 m.

[1] NZLAM is a modified version of the UK Met Office Unified model which is described in more detail at http://www.metoffice.gov.uk/research/nwp/numerical/unified_model/