

Earthquake induced topographical change in the Avon-Heathcote Estuary

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Measures*

NIWA
Christchurch

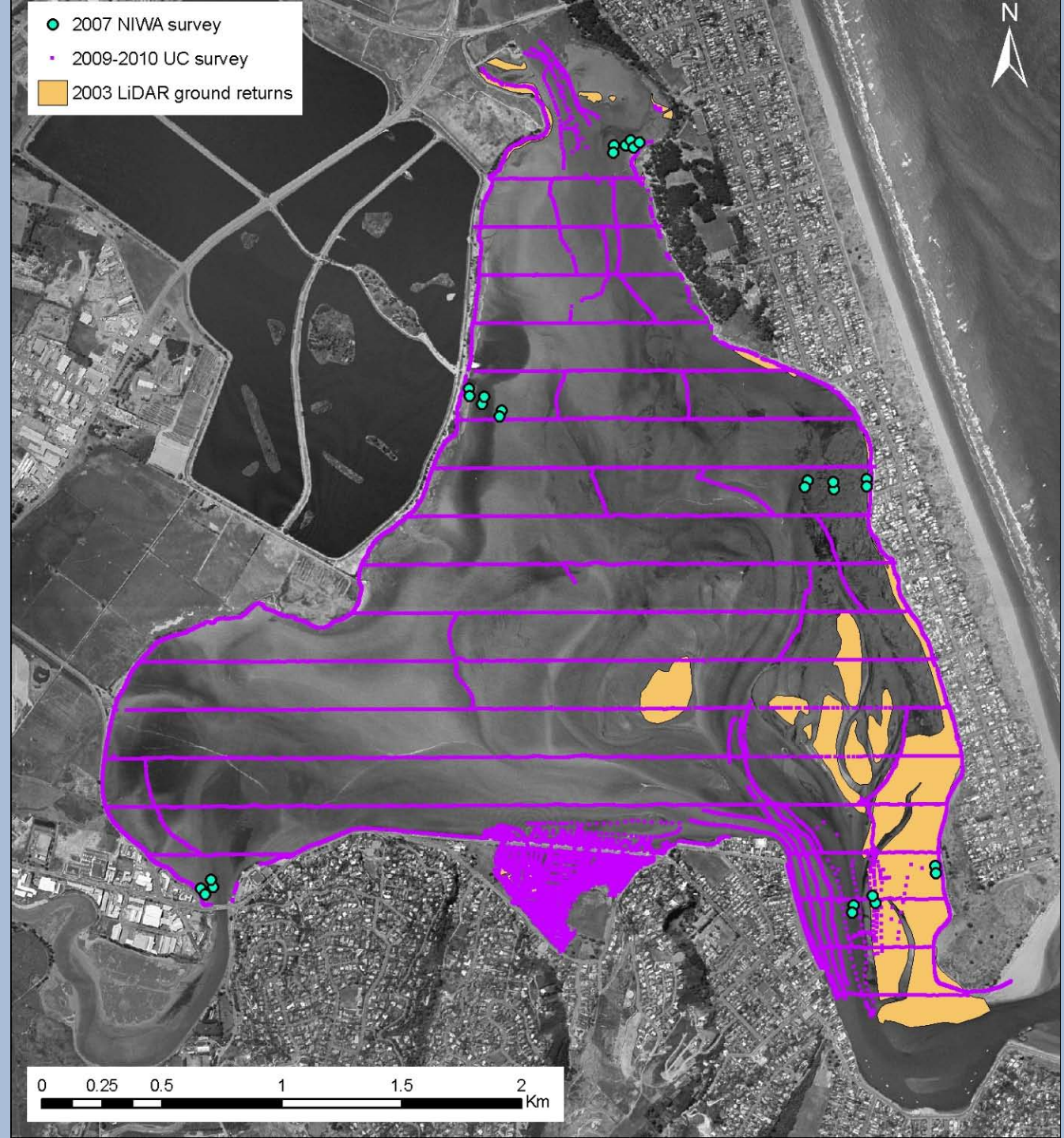
26 April 2012

Outline

- Survey data
- What we found
 - Changed inundation patterns
 - Elevation changes
 - Relation to Port Hills Fault
- Consequences for
 - Flooding
 - Hydraulic behaviour
 - Effect on inlet and adjacent coast
- Further work

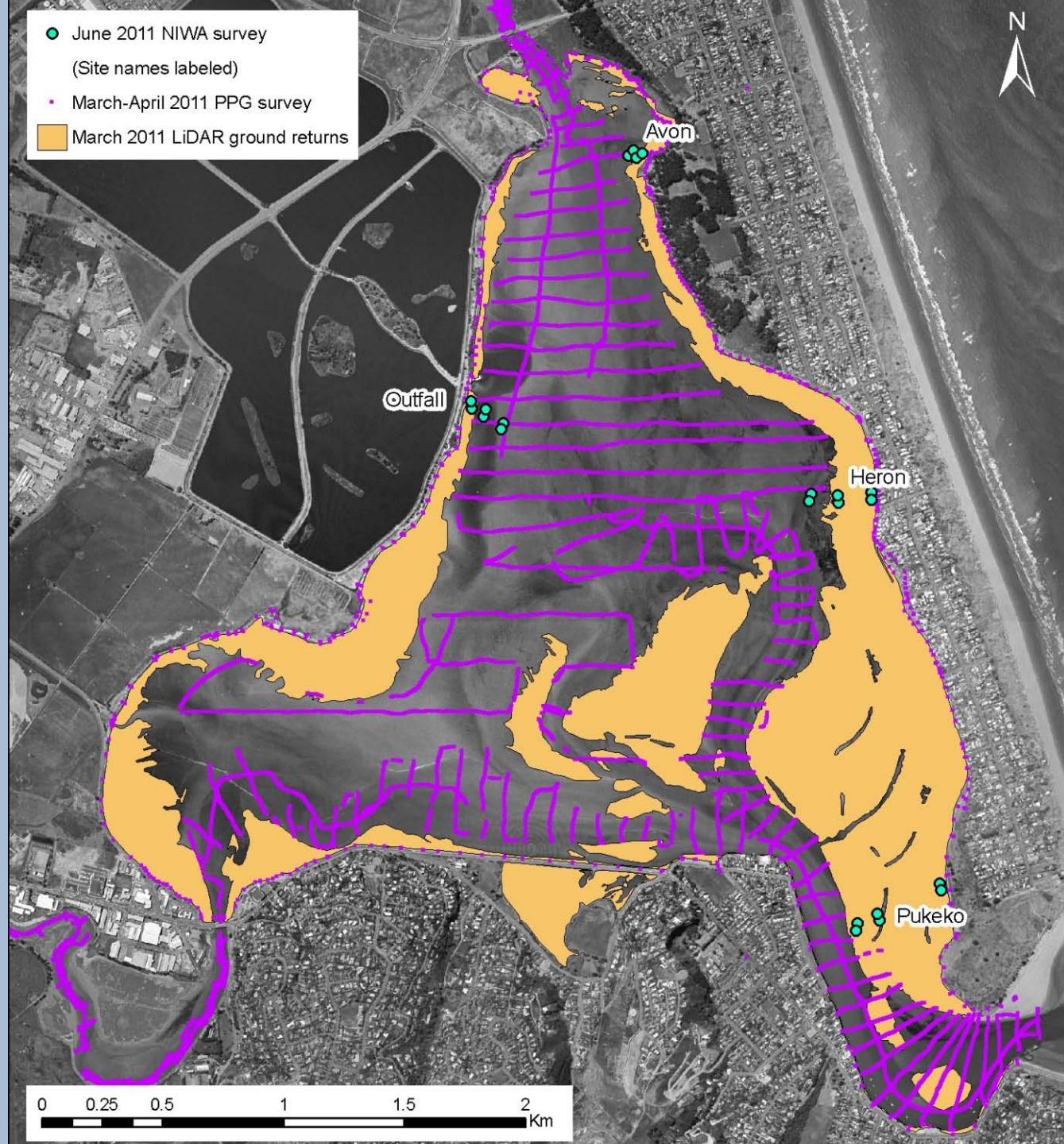


Surveys before the earthquakes

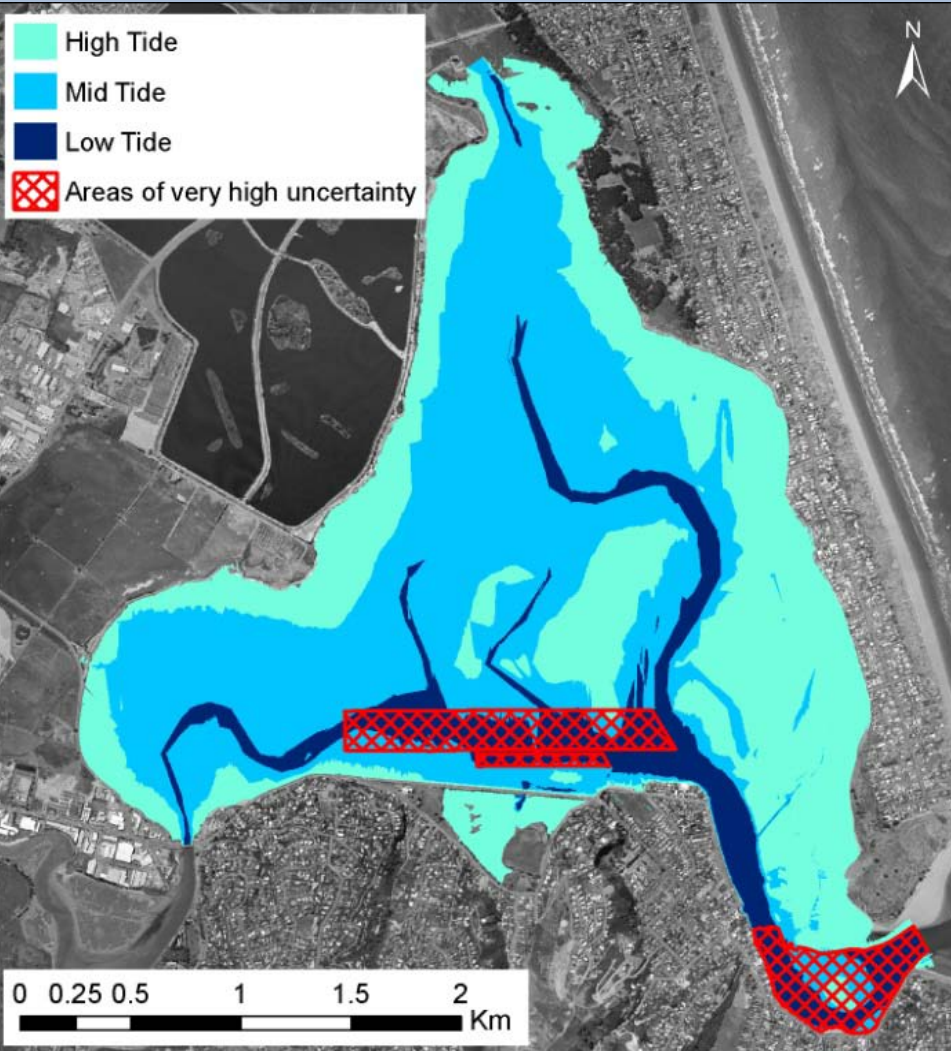


Surveys after the Earthquakes

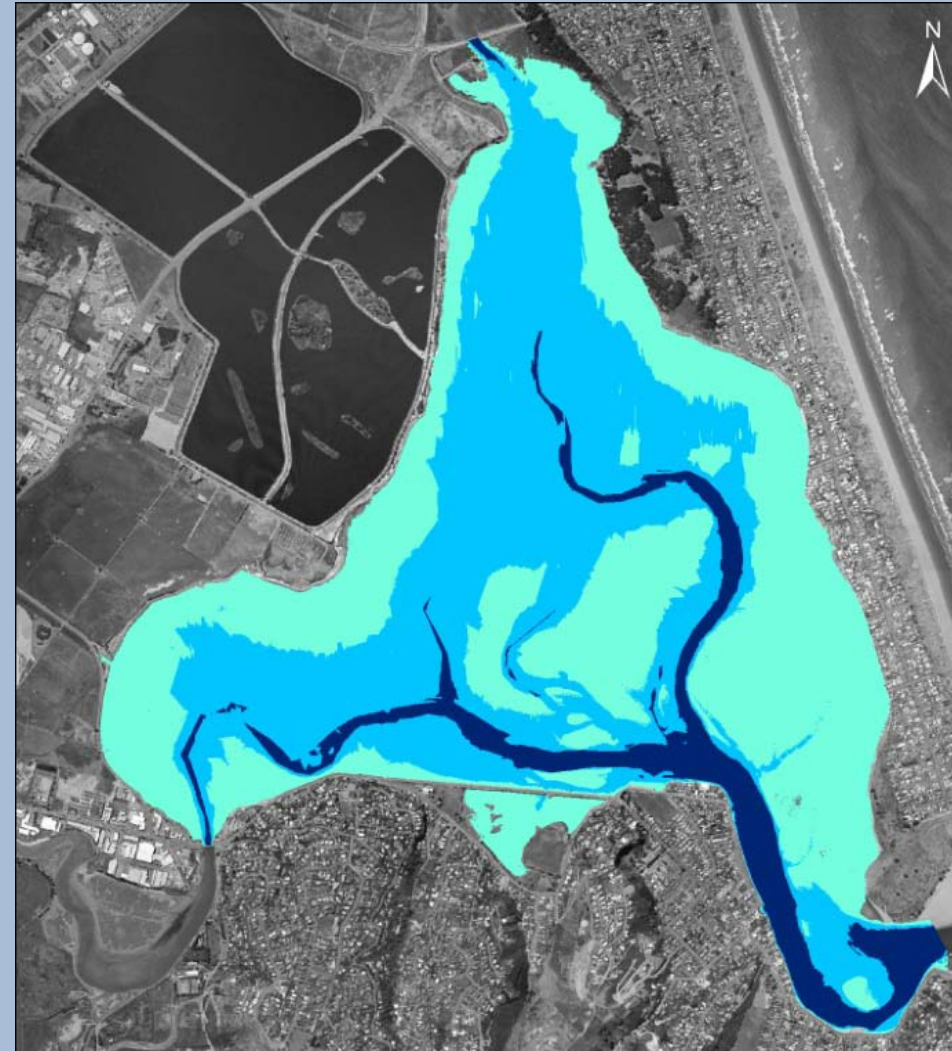
Need to fly
LiDAR at
low tide!



What we found...changed inundation pattern

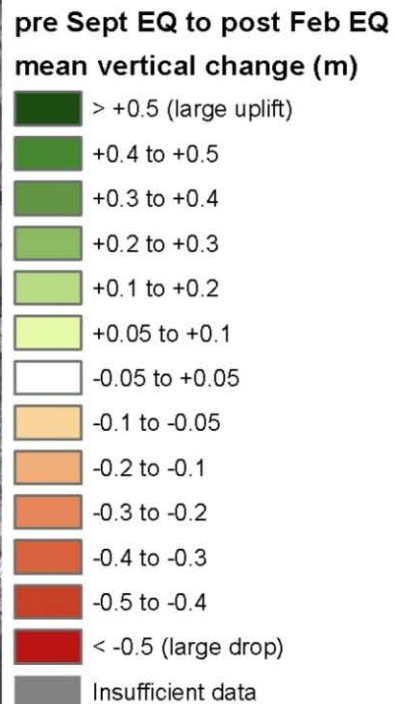


Before earthquakes



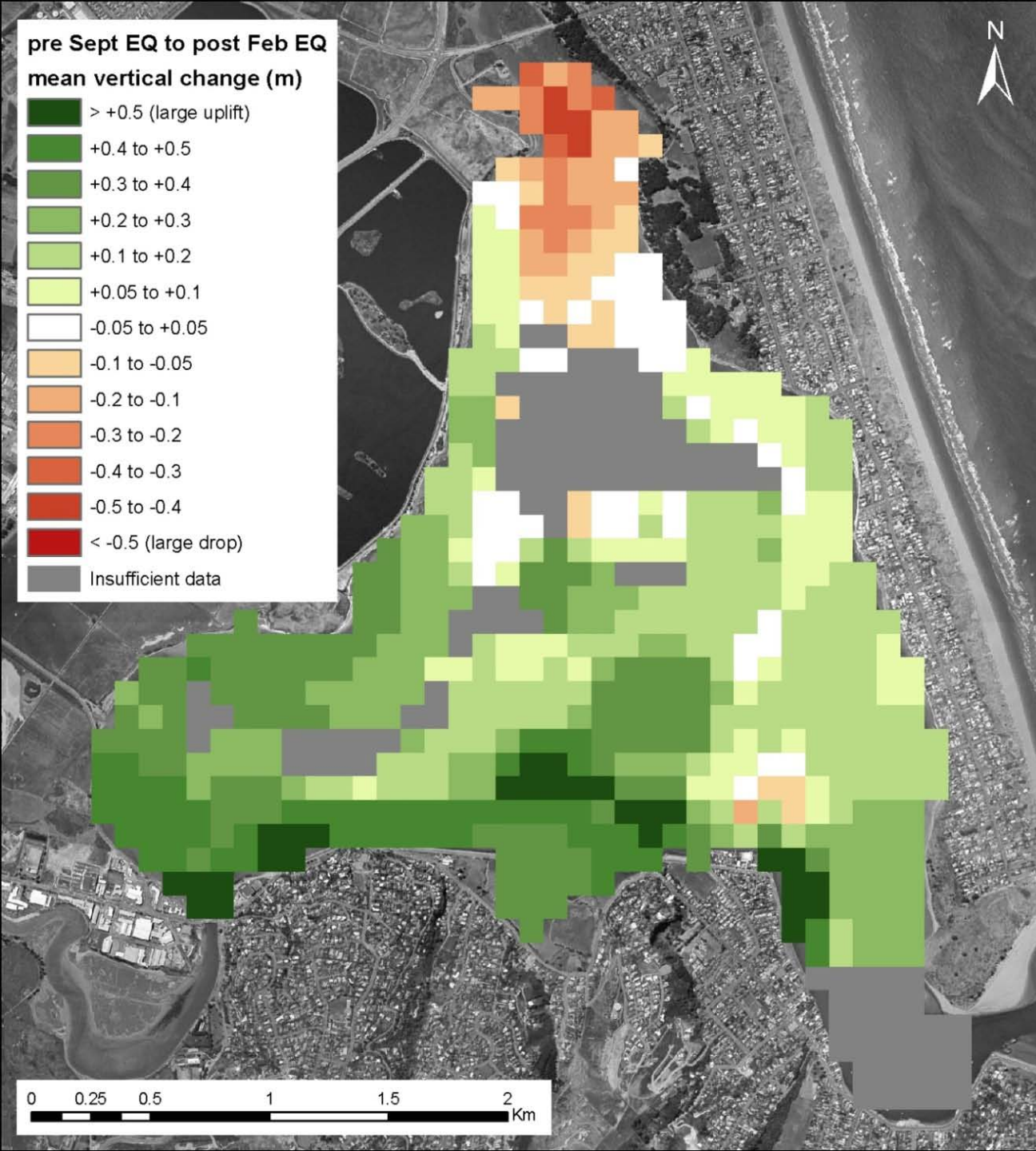
After earthquakes

An extra 50 Ha exposed at mid tide (18% increase)

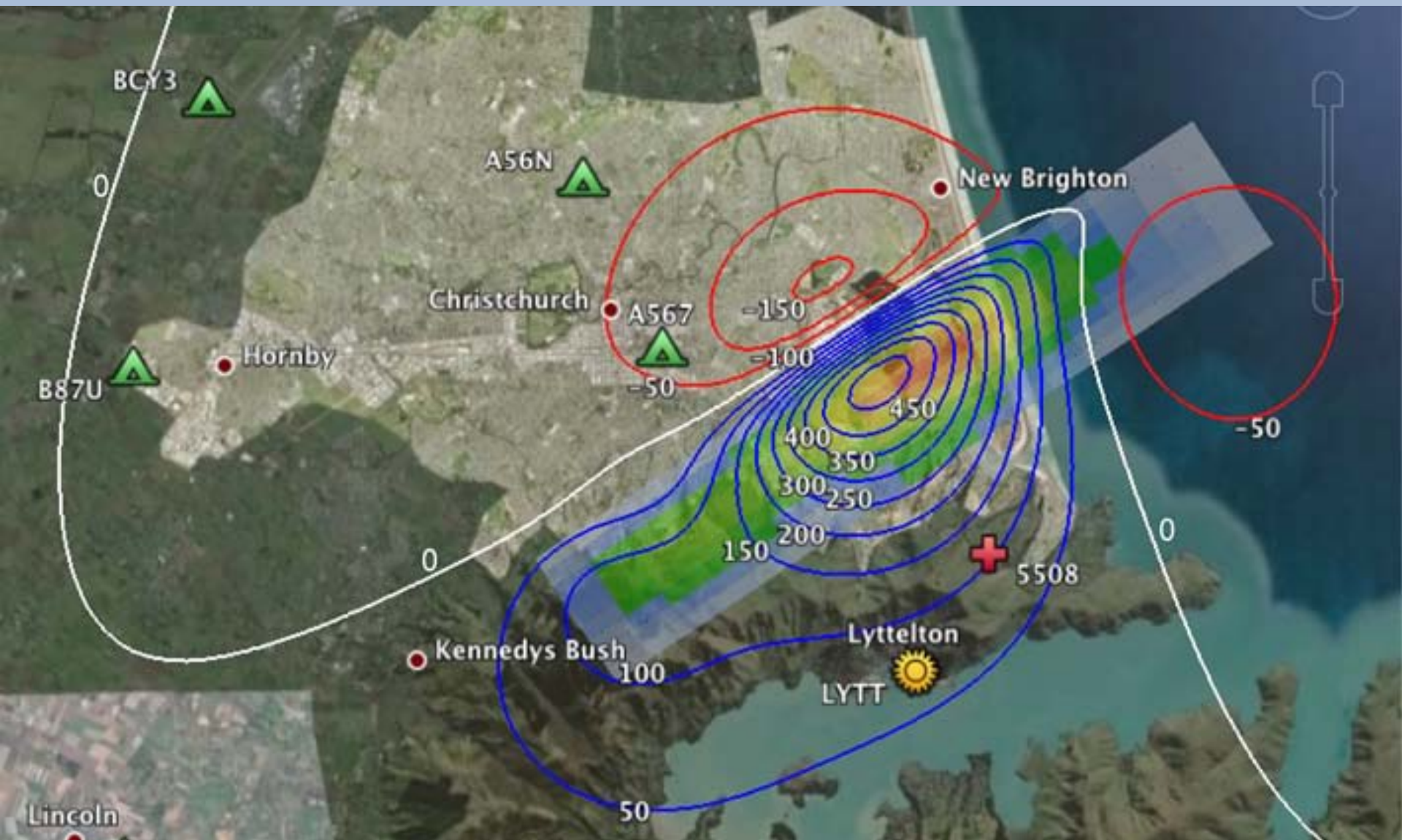


Elevation changes

- Tilted down to north
- Uplift by up to 0.5 m in south
- Subsided by up to 0.5 m at north end
- Net bed-level rise of 0.14 m has reduced tidal prism by 14% (from ~ 9 million m³)



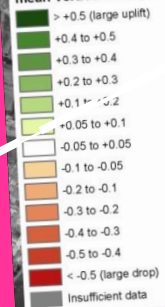
Geological context: Port Hills Fault



Source: GNS

New Brighton

pre Sept EQ to post Feb EQ
mean vertical change (m)



0 0.25 0.5 1 1.5 2 Km

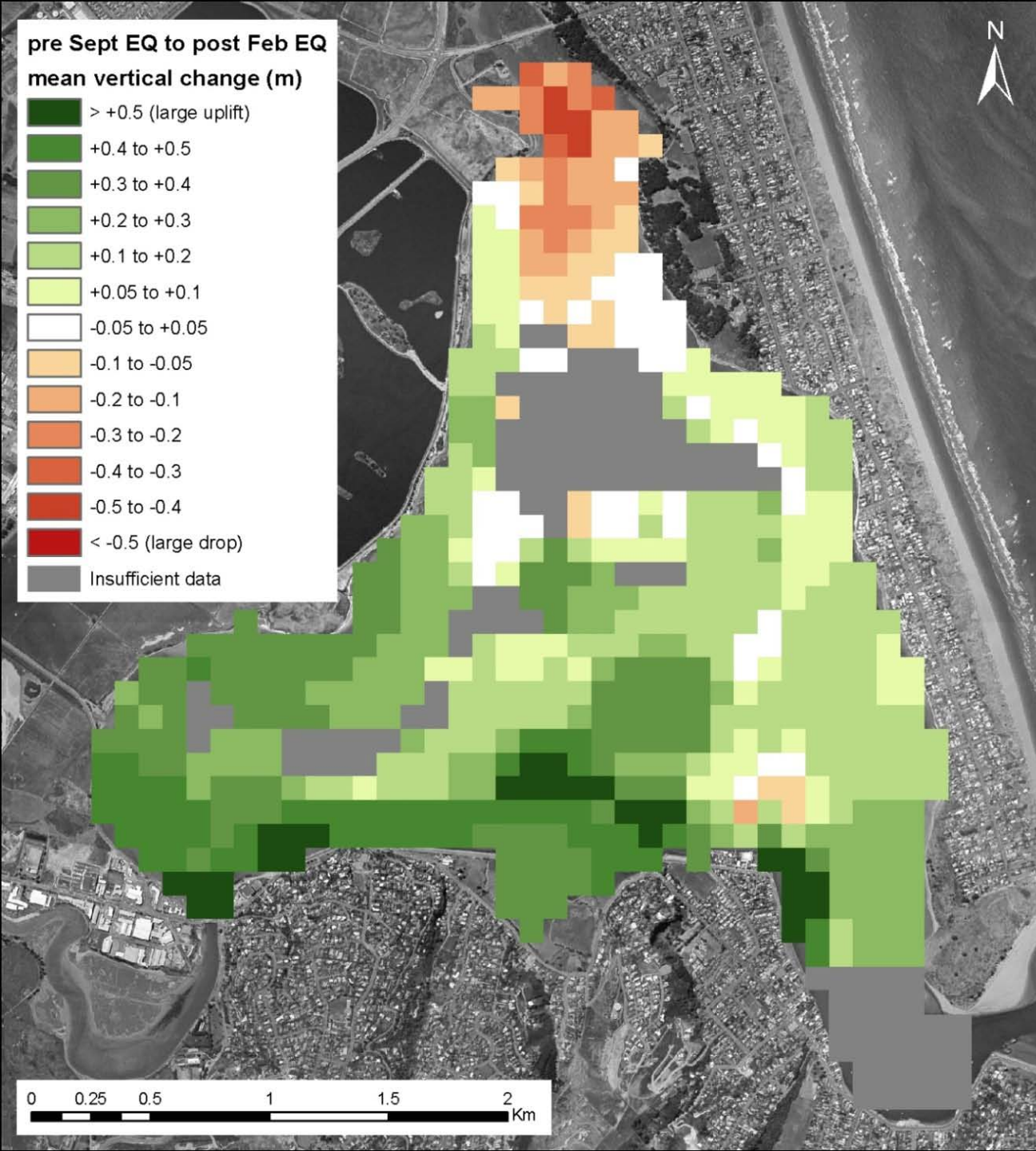
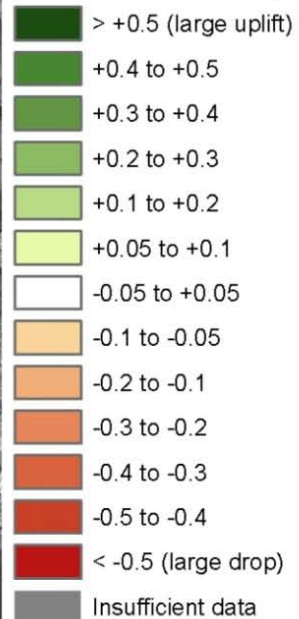
N



5508

pre Sept EQ to post Feb EQ

mean vertical change (m)



Expected Consequences

- Flooding in Avon reach
- Changed hydraulic behaviour of estuary - have a pond at N end and a big bar between it and inlet (need to model)
- Changes at inlet due to reduced tidal prism

Likely changes at inlet (due to reduced tidal prism)

- Throat (220 m) narrows by ~ 14% (~30 m)
(*Hume & Herdendorf equation*)
- Ebb-tidal delta sand volume reduced by ~ 18%
(*Hicks & Hume equation*)
- Excess sand (~ 0.5 million m^3) released to beaches?



Further work

- Update elevation model with more recent data
- Planning to set-up a 2d hydrodynamic model to
 - identify changes in circulation & hydraulic behaviour, including tide
- Would like to set-up a morphological model to predict
 - topographic evolution & time scale
 - sediment redistribution

