

Avondale Mews residential subdivision, Stage 2: Liquefaction and lateral spreading hazard assessment

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ABSTRACT: The Avondale Mews Residential Subdivision is situated on relatively low-lying, flat land in northern Taradale, Napier in Hawke's Bay, New Zealand. The greenfield site abuts an approximately 3.5 m deep open drainage channel to the east. The liquefaction hazard and lateral spreading risk during an ultimate limit state (ULS) earthquake event of the site were assessed. To provide a traceable set of base data for assessment, thorough geological, geomorphological, and geotechnical studies including subsurface investigations and laboratory testing were conducted followed by numerical modelling and Newmark Displacement analyses.

Liquefaction analyses involving post-processing of numerical results utilising laboratory soil classification test results indicate that liquefaction will occur at the site during an ultimate limit state (ULS) earthquake event. Static and transient seepage slope stability assessments were also conducted for completeness. Utilising the resulting investigation data and published recommendations relating to liquefied soil strength parameters for use in slope stability analyses, numerical slope stability models were prepared and assessed for the ULS seismic condition. Numerical assessments utilising Jibson (2007) regression models were conducted to estimate Newmark Sliding Block Displacements for the slope. The results indicate that both the slope along the open drainage channel at the site is unstable when subjected to ULS earthquake event loads, and slumping and lateral spreading could occur. However, the liquefied subsoil materials will likely act in a dilative manner thus limiting the magnitude of lateral spreading displacements. This article presents some of the most important facts and implications of this study.