Cyclic Testing on Undisturbed Samples of Pumice-Rich Soils from the Waikato Basin

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Introduction & Objectives

Pumice-rich soils originating from the Taupo volcanic zone are found across large areas of the North Island of New Zealand. These soils are lightweight, vesicular, crushable and highly variable. The crushability of the pumice particles can significantly alter the penetration mechanisms of conventional field tests in comparison with relatively hard-grained materials. Pumice-rich soils do not feature in databases used to develop correlations between engineering & in-situ parameters. The resistance to liquefaction triggering in these soils and subsequent post-liquefaction behaviour is poorly understood in these soils. This project aims to:

- Investigate the cyclic resistance of natural (undisturbed) pumice-rich soils, taking account of different depositional environments.
- Compare the liquefaction resistances of the natural soil samples against existing frameworks for liquefaction assessment.

Undisturbed Sampling

2 sites in Hamilton were targeted in 2017
Tramway Rd: Hinuera formation
Grantham St: Taupo Alluvium
At both sites, CPT and dMT profiles were obtained at the time of sampling
Gel-push “triple tube” and Dames & Moore sampling was used to target pumice rich layers at the sites

Samples were frozen prior to transportation to Auckland and Christchurch

Pumiceous deposits in the Hamilton area

Significant differences expected proximal and distal to the Waikato river

Lowe 2010

Triaxial Specimens from Tramway Road and Grantham Street

Cyclic resistance curves for Grantham Street

Empty Markers: Post-Cyclic measurements
Filled Markers: Consolidation measurements
End of cyclic loading

Summary

- Undisturbed soil sampling was attempted at two locations in Hamilton, covering pumiceous deposits in the Hinuera and Taupo Pumice Alluvium sequences.
- Cyclic triaxial testing has been completed on specimens from the Taupo Pumice Alluvium. Curves of cyclic resistance lie above those estimated from the Boulanger & Idriss (2015) simplified procedure.
- Post-liquefaction volumetric strains were in-line with quartzitic sands of similar relative density.
- Additional sites will be targeted in the future (2018-2020) to provide data from different K values.

Acknowledgements

We would like to acknowledge funding of this work through QuakeCoRE Flagship 2, as well as the Natural Hazards Research Platform. The authors would like to acknowledge McMillan Drilling Ltd for performing the undisturbed soil sampling in this project, Ground Investigation Ltd for performing CPT and dMT tests, as well as Hamilton City Council for site access and AECOM for providing borehole information.

References
