15 Geotechnical Considerations

The preliminary geotechnical appraisal for this project is based upon a desk study, site reconnaissance, and past investigations for the Wellington Urban Motorway Extension also provides some information. No geotechnical investigations have been specifically undertaken for this project thus far.

Ground conditions vary quite significantly in this area, with the low lying area of the Basin Reserve, and the Mount Victoria and Mount Cook foothills to either side. This is also some uncertainty as to the ground and groundwater conditions in the Cambridge Terrace, Kent Terrace, Hania Street, Ellice Street and Brougham Street areas.

Key points with regards to the geotechnical conditions in the study area are:

- Multiple streams through the project area;
- The Basin is at the bottom of a valley between two ridges;
- Accumulation of sediment (soft ground);
- High (artesian) groundwater;
- Variable geology in the area - different ages of sediment; and
- High earthquake hazard area (liquefaction, subsidence and foundation stability).

While the current options resulting from the Inquiry by Design workshop do not incorporate any below ground components, it is possible that such variations may be considered in the future. There are a number of key geotechnical issues that are applicable to the provision of a below ground trench or tunnel between Tory Street and Mount Victoria. These issues include:

- Poor soft ground and wet ground conditions;
- Artesian groundwater conditions;
- Uplift of tunnel structure;
- Difficult excavation in soft ground;
- Higher uplift pressures on tunnel structure due to liquefaction in earthquake events; and
- Obstructions from old culverted streams.

15.1 Considerations for Option Development

As part of the development of options, the following key points should be considered:

- There are likely to be problems with high embankments and settlement;
- Sufficient time should be allowed for consolidation settlement during construction as vertical drains to accelerate consolidation may not be appropriate due to the presence of artesian ground conditions;
- Deep piles will be required for elevated structures;
- Improvement of the sub-grade will be required for the pavements;
- Drainage of the pavement through the provision of sub-soil drainage will be required; and,
- Where possible, avoid high embankments on the low lying soft ground susceptible to liquefaction and with artesian groundwater conditions.

All the identified geotechnical issues can be solved; some solutions just may be more expensive.

The possible geotechnical issues can be resolved through:

- An appropriate level of geotechnical investigations;
- Early consideration of the issues during concept development and preliminary design; and
- Integrated consideration of the issues with the development of the project to achieve an appropriate urban form and resilience.

Figure 15.1: The Basin Reserve from Mount Victoria Tunnel