**ROBERT TAYLOR – GEOTECHNICAL**

I am Robert Taylor and a Principal Geotechnical Engineer at CMW Geosciences here in Tauranga. I have 19 years experience, 11 of which have been spent in the Waikato and Bay of Plenty region. I am a Chartered Professional Engineer with Engineering New Zealand and a Tauranga City Council and Western Bay of Plenty District Council Category 1 Geo-Professional.

I am familiar with this site, having been involved with several development feasibility assessments over the past 8 years.

This site is not all that geotechnically challenging and is not dissimilar to other developments occurring within the region such as the Teihana Residential Subdivision up the road, the Takitimu North Link project currently under construction and the Tauriko Business Estate and Lakes developments.

The site is situated on the edge of a broad gully with the gully escarpment rising above the site in the southwest and the base of the gully extending in the northeast towards the Wairoa River.

The geology of the site consists of approximately 1m to 2m of existing fill comprising of clayey silt. This existing fill overlies soft alluvial deposits comprising interbedded clay, silt and sand. The depth of these alluvial deposits increase in thickness towards the northeast to approximately 15m to 20m deep at the northern boundary. Below this, the older Matua Subgroup soils occur as stiff silts and dense sands.

The presence of standing water within the drains across the site and along Te Puna Station Road and the groundwater level measurements collected during the 2021 and 2022 site investigations suggest that groundwater typically occurs within 200mm of the natural ground surface in the lower areas of the site and increases in depth in the southwest across the gully escarpment.

The 3 main geotechnical hazards identified for this site include settlements, liquefaction and slope stability.

* Starting with settlement, excessive settlement (or consolidation) of the underlying soft alluvial soils is predicted in a response to the placement of fill to raise the site above flood levels as well as future building loads. To mitigate this, a preload ground improvement has been recommended, which involves placing a temporary fill embankment above the design ground level during earthworks. The preload will typically remain in place for 6-12months, following which the site can then be cut to design level in readiness for building or installation of civil services. This approach has been successfully completed at the Teihana subdivision development up the road, the Tauriko Business Estate and is currently underway for the Takitimu North Link Project.
* Liquefaction settlement and lateral spreading has been predicted to occur during an Ultimate Limit State earthquake event. For this large 1in500year earthquake, the building code states that damage may be expected to occur however buildings must not collapse thereby preserving the loss of life. Across the proposed future lots where buildings will occur, liquefaction settlements in the vicinity of 65mm is predicted. This magnitude of settlement can readily be accommodated within the structural design of foundations so that buildings don’t collapse. Also this magnitude of settlement is within the design criteria of a TC2 foundation solution, so is equivalent to the Papamoa and Mount Maunganui areas where standard ‘off the shelf’ TC2 foundation solutions exist.
* Due to the generally flat the site, slope instability of the existing landform is considered low, however slope stability of the design ground levels still needed to be considered for the:
	+ Proposed borrow area in the southwest of the site
	+ The road embankment associated with Te Puna Station Road widening; and
	+ Proposed pond and stormwater drain batters.

For the burrow site, stability analyses provided in the WSP Geotech Report suggests grading of the cut batter to 1:1.75 (ie 30 degrees) will meet required slope stability factors of safety. I recommend further lowering the gradient to 1:2 (ie 26 degrees) based on my experience modelling these terrace escarpments in the Te Puna area and accounting for elevated porewater pressures that can development following periods of extreme rainfall.

With regards to stability of the Te Puna Station Road widening, a construction methodology for this has been provided in the Geotech Report and involves the placement of several layers of geogrid reinforcement within the widened embankment and placement of a temporary preload to mitigate excessive settlement and slope instability. These road widening works will greatly improve the performance of the current Te Puna Station Road within this area.

The pond batters haven’t been specifically designed which is usually undertaken following resource consent approval. However, pond batters are usually gently graded at approximately 1:3 and at these gradual gradients are generally shown to be geotechnically stable, similar to the ponds currently being built for the Rangiuru Business Park and Tauriko Business Estate which are constructed in similar gully environments. If steeper pond batters are required to reduce the area of the pond, the stability of the batters can be improved with engineering design and may include geogrid reinforcement, similar to the road widening works, the use of rockfill shear keys or perimeter retaining walls.

With these mitigation measures briefly discussed, the identified geohazards for the site can be adequately managed.

Thank you and I am happy to take any questions.