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Development Officer
Northern Beaches Council.

**Geotechnical assessment of additional geotechnical assessment and design
modification for proposed development
at 1102 Barrenjoey Road, Palm Beach, NSW**

It is understood that the applicant has provided Council with further geotechnical reporting and also a new/modified architectural design related to the proposed development. At the request of a neighbouring property owner (No. 1110), CGC has reviewed the supplied geotechnical reports and provides the following comments. This report should be read in conjunction with our previously supplied assessment (Dated: 12 April 2024).

As part of the new assessment we have reviewed the following supplied documents:

1. JK Geotechnics, Three dimensional (3D) numerical analysis of proposed retention system, reference: 33618rpt2 FEM, Dated: 11 July 2024.
2. JK Geotechnics, Geotechnical Monitoring and Contingency Plan, Reference: 33618Yrpt GMP, Dated: 11 July 2024.
3. Van der meer, Shoring Plan, Job No.: SY200 209, Drawing No.: S02-01, 05, 11, 15, 52, Revision: 0, Dated: 18.06.24
4. Van der meer, Structural Statement - Shoring Design, Dated: 11.07.24

It is again noted that no geotechnical investigation data has been acquired for the eastern boundary of the site, therefore the design and modelling are still based on assumptions.

The modelling report is based on an analysis of a piled and buttressed retention system as proposed by Van der Meer that is formed around the perimeter of the site, at the site boundaries, with several slight step-ins including at the north-east corner.

As part of this analysis they have modelled the following:

- The eastern wall is 450mm diameter soldier piles from about RL 11.0 to RL-6.0, so they are 17m long piles
- The eastern buttresses are 450mm diameter secant piles from about RL11.0 to RL-4.0 – so they are 15m long piles.
- The buttresses will also include a 600mm diameter secant pile wall at the north and south ends of the excavation that will also extend around the western lower half of the site.

The geotechnical modelling appears to have considered quite conservative (i.e. high risk) geological and geotechnical conditions in its assumptions/inputs. The retention design is very robust and as such, the modelling suggests deflection from the proposed excavation works are likely to be relatively low including at adjacent structures within No. 1110.

However, the modelling is based on the construction of these pile walls which will present significant construction challenges. This includes the installation of 450 and 600mm diameter secant piles of potentially between 13.0m and 17.0m length at the rear north-east and south-east corners.

The geotechnical modelling report details the need for construction of a 5.0m wide piling platform formed close to RL 11.70 for the eastern piles. It is also now proposed to form a temporary earth fill system to allow construction of a temporary piling pad adjacent to the level of the existing pile retaining wall capping beam (approx. RL 7.50) to facilitate the drilling of the secant pile walls/butress wall piles on the northern and southern boundary, prior to raising that platform to RL11.70 for the drilling of the eastern boundary piles.

This temporary platform at RL 7.50 will be up to 5.0m above the level of the adjacent Barrenjoey House floor/ground level and as such is expected to require separate retention systems to retain the fill and platform at this level to allow the operation of the piling rig adjacent to the boundary for the drilling of the piles.

The drilling of 600mm diameter secant piles along the boundary in this location, that will extend through bedrock and to about 11.50m depth, is expected to require a large piling rig (>30t). Therefore the temporary support on the north boundary will need to be significant to ensure the stability of the piling rig above Barrenjoey House. This has not been discussed or assessed within the reporting.

The previously reviewed geotechnical report lists that CFA piles were essentially recommended (see below) and this is again discussed within the modelling report and it is expected that this will be necessary to achieve secant pile walls. However, the previous geotechnical report also leaves an option for bored piles and tremie placed concrete. The use of open bored piles has increased risk of cave in and collapse of the pile creating problems especially at depth - as was encountered during works at No. 1110.

Secant piles through sands will need to be drilled using grout injected piling techniques (i.e. Continuous Flight Auger (CFA) techniques). Elsewhere, should piles be adopted as foundation piles, CFA piles are also recommended due to the high groundwater table and underlying weak bedrock which is prone to softening on contact with groundwater. If bored piles are adopted for the soldier pile wall, it is likely that these will need to be tremie poured immediately following piling, as they will extend below the groundwater table. The use of pumps or a cleaning bucket to remove all the water in the pile holes will be difficult and may not be feasible.

Whilst the more recent modelling report indicates that anchors are not proposed, we still contain the concern that upon determining construction costs related to the modelled design that alternate methods of excavation support, that utilise anchors and potentially temporarily unsupported or reduced pile support, will be preferred by the contractor/builder. Unless the proposed design is effectively 'locked into the development application' there appears insufficient mechanisms to prevent contractor variations to the support system proposed and modelled.

There are still many assumptions listed including the geotechnical conditions with no investigation completed adjacent to the eastern end of the site and very limited investigation completed across the northern half of the property, adjacent to Barrenjoey House. The assessment letter by the structural engineers regarding suitability of the deflections seen in the modelling and their impact on adjacent properties is very basic with no real explanation of how the assessment was undertaken whilst an assessment of the two required temporary piling platforms has not been undertaken.

The Monitoring Program report lists numerous monitoring requirements which appear sensible however it lists a vibration limit of 5mm/s PPV for ground vibration protection of Barrenjoey House. It is anticipated due to its age and the ground conditions identified in the adjacent site that this structure is founded via shallow footing systems in sandy soils within at least the western side.

The Australian Standard AS2187.2 and the internally referenced BS 7385-2 and USBM RI8507 all detail limits for transient/one off blast style vibrations and not the more continuous to intermittent style of vibration created by rock hammers and compaction equipment. It is considered that this condition is better assessed under the German Standard.

Based on the age of the Barrenjoey House structure and its heritage listing it would be considered a 'sensitive structure' when assessed against the vibration levels listed in the German Standard (DIN 4150: Structural Vibration - Part 3: Effects of Vibration on Structures), which suggests maximum peak particle velocities (PPV) for sensitive or heritage listed structures of 3mm/s at 4 to 50Hz and then 8mm/s for >50Hz frequencies for continuous to intermittent ground vibration sources.

Whilst frequencies from rock hammers and compaction equipment are often >50Hz there always exists potential for lower values as a result of the vibration transfer through various medium and as such it is considered that a value of **3mm/s** (PPV) should be implemented for Barrenjoey House. A 5mm/s PPV value is considered suitable for the newly constructed dwellings at No. 1110.

We trust the above comments can be considered by Council in their assessment of the proposed development, if we can be of further assistance in regard to this matter please don't hesitate to contact the undersigned.

Yours faithfully,



Troy Crozier
Principal
MIE Aust. CPEng (NER)