

Memorandum

To	Anglicare	Daniel Jukic	daniel.jukic@anglicare.org.au
From	Joshua Bendit	Date	25 Jun 2018
Subject	Review of Geotechnical Report 9-15 Northumberland Street, Liverpool	Project No.	86455.01

Introduction

As requested, we have reviewed the geotechnical report prepared by Environmental Investigations Australia (EI) [Report E23091 GA, dated 29 September 2018] in relation to the proposed development at the above site.

Our understanding of the current proposed development is as follows:

- The new structure is to be 12 storeys with 2 levels of basement carparking.
- The proposed site covers 4 lots, with the existing ground level falling by 1 m across the site.
- The existing ground level on the site varies between RL 11.1 m and RL 12.1 m AHD.
- An additional structure to act as a shelter is also proposed due to the site being below the Probable Maximum Flood line.

In summary the EI report indicated the following:

- The report comments assumed a ten storey building with a two level basement;
- The site is mapped as being underlain by Bringelly Shale but is close to the boundary with fluvial sediments comprising sand, clay and silt towards the north-western corner (see Figure 1 below);
- The investigation included the drilling of six auger boreholes to depths of 6.5-10.5 m. The boreholes were continued into the rock to depths of 11.0-14.7 m to recover core samples;
- Two groundwater monitoring wells were installed that were then pumped dry and water levels measured during the investigation period only;
- The boreholes indicated a profile typically comprising fill to depths of 0.3-0.7 m over mostly stiff to hard silty clay and sandy clay to depths of 7.1-10.1 m over shale and sandstone. The rock was logged as extremely low to low strength to depths of 8.9-10.5 m then medium to high strength;
- Groundwater seepage was observed during auger drilling at depths of between 7.8-10.4 m. However, groundwater was subsequently measured in the two monitoring wells at depths of between 5.0 m and 5.8 m (RL 5.7 m and RL 6.2 m AHD).

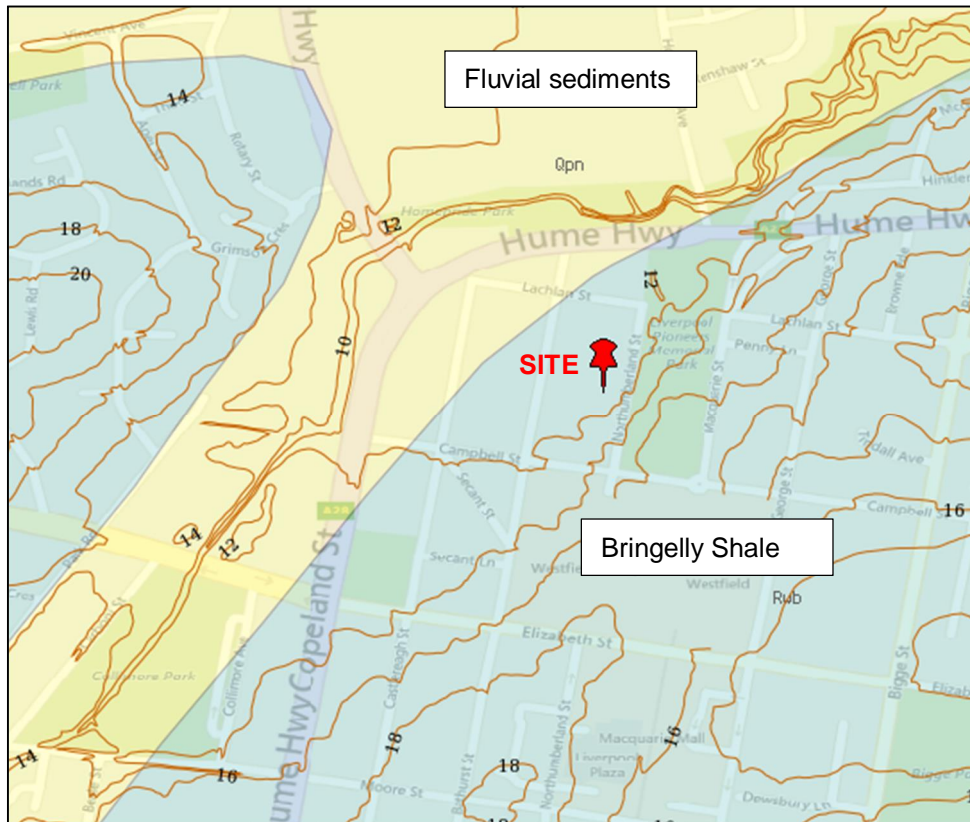


Figure 1 – extract from geological mapping

Comments

The following comments are provided in relation to our review.

1. DP has carried out investigations on nearby sites including the Westfield Shopping Centre to the south of the site. The DP investigations at Westfield generally encountered shallow residual clay to say 1-3 m depth over rock which is consistent with the geological mapping. The deeper clay profile encountered on the subject site by EI suggests that some of the clay profile may be associated with fluvial sediments, as mapped to the north and west of the site. These sediments can be more variable in strength and consistency and can also include layers of more sandy or granular soil, which if encountered, will have a higher permeability and would be associated with higher inflow rates into the basement. The EI logs and report have not identified any obvious sandy/granular layers, however there is a risk that such layers may be present between the SPT tests. Some of the SPT values in the clays were low (4-8) but the clay was still logged as stiff and very stiff. Cone penetration tests (CPTs) and possibly additional boreholes could be used to check and provide more detail on the consistency of the soil profile, if required for detailed design.
2. Based on the above comments it is considered that the measured groundwater on the site is probably associated with a regional groundwater table that is linked to Georges River system. Groundwater was measured at RL 5.7 m and RL 6.2 m AHD in 2016. Groundwater levels will

fluctuate and may temporarily rise by at least 1-2 m following prolonged rainfall. Groundwater levels may be higher than indicated in the EI report. Further groundwater measurements should be made in the existing wells (if they are operational) to assess current groundwater levels and to assess fluctuations.

3. The EI report suggested a bulk excavation level at RL4.8. If the proposed basement extends to this level then the basement will extend below the groundwater table. It will be very important to assess groundwater inflow rates to inform basement design and construction. Permeability testing should be carried out in groundwater wells (possibly using existing wells initially). Numerical modelling should probably be carried out to assess inflow rates and impacts to surrounding groundwater levels.
4. If inflow rates are assessed to be manageable in the short and long term, then a drained basement may be technically feasible. However, the use of a drained basement may be subject to approval by Council and Water NSW. It is possible that Council and Water NSW may impose a tanked basement in the DA conditions for basements extending below the groundwater. This would then involve ongoing consultation to demonstrate the suitability of a drained basement, however the final approval is ultimately up to Council.
5. Shoring could include soldier pile walls with shotcrete infill panels, however issues with spraying shotcrete onto wet clay faces below the water table should be considered.
6. An alternative design to address the above issues could be to construct a secant pile wall, or soldier pile wall without drainage behind the wall, which is designed to resist hydrostatic pressures. This would prevent horizontal flows into the basement and significantly reduce inflow rates to vertical flow through the basement floor. A secant pile wall to rock would further reduce inflow rates. These options could be used to assist with justification of a drained basement if required.
7. The EI report provides simplified parameters for shoring design. The shoring wall design could be refined and optimised using software packages such as WALLAP or similar. We can assist with such design if required.
8. The EI report has suggested piles to rock to support the building. This will probably be the lowest risk and most appropriate solution. A raft slab on very stiff to hard clay could also be considered. We would suggest CPTs to assess the soil profile and can provide further input and advice on this option if required.

We trust the above information meets your present requirements.

Yours faithfully,

Douglas Partners Pty Ltd

Reviewed by

Joshua Bendit

Geotechnical Engineer

Scott Easton

Principal