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Lend Lease
30 The Bond, 30 Hickson Road
MILLERS POINT NSW 2000

ATTENTION: WARWICK McINNES
By email: warwick.mcinnes@lendlease.com

Dear Sir,

RE: 6–30 ARTARMON ROAD, WILLOUGHBY ('CHANNEL 9 SITE') GEOTECHNICAL ASPECTS OF PROPOSED DEVELOPMENT

1. INTRODUCTION

Channel 9 is proposing a residential development at 6-30 Artarmon Road, Willoughby (**the site**). The site is bound to the north by Artarmon Road, to the west by Richmond Road, to the east by other developed properties, and to the south by both undeveloped and developed properties. On average, the site slopes down towards the east and south.

PSM received details from Warwick McInnes of Lend Lease, on 12 February 2012, showing that the proposed development includes:

- Eight buildings, ranging in height from three to eighteen above-ground storeys.
- A three-level deep basement that is common across three of the buildings, but does not adjoin the site boundary.
- A two-level basement that is common across four of the other buildings, and also does not adjoin the site boundary.

The 2nd bullet point of 'Plans and Documents' Item 6, found in Appendix A to the Director-General's Requirements for the preparation of an Environmental Assessment (No. MP 10_0198), states that a Geotechnical Report is required to be *"prepared by a recognised professional which addresses the risk of Geotechnical failure on the site and identified design solutions and works to be carried out to ensure the stability of the land and structures and safety of persons"*.

This letter presents PSM's desktop assessment of geotechnical aspects of the proposed development, and addresses the Director-General's Requirement above.

2. KNOWN GEOTECHNICAL CONDITIONS

The Sydney geological map[1] indicates that the site is underlain by Hawkesbury Sandstone. This rock unit underlies much of Sydney; its geotechnical characteristics are well understood and many significant excavations and tunnels have been constructed within it. This rock is suitable to support the foundations of the proposed buildings.

Publically available images indicate that the Hawkesbury Sandstone outcrops in a small cutting on the north side of Artarmon Road, opposite the east half of the site.

We expect that the depth to rock could vary across the site, given its topography and its proximity to the partially reclaimed gully that leads to the harbour inlet some 2 km to the east.

We also expect that the overburden layer above the rock will comprise both residual soil derived from in situ weathering of the rock, and filling due to previous development.

We understand that geotechnical investigations have previously been undertaken by others; this information has not been provided to us.

3. GEOTECHNICAL RISKS

We assess that the main geotechnical risks related to stability of the land and structures and safety of persons will be associated with the proposed basement excavations, and involve failure or excessive movement of the overburden or rock face into the excavation.

Potential consequences of these events could be damage to adjacent land or structures, or safety hazards to persons within and beyond the excavation. These consequences will be most severe where the excavation is in close proximity to site boundaries or adjacent buildings. Much of the basement excavation is well within the site boundaries or adjoining undeveloped land, where consequences of such failures are somewhat less.

We expect that the following design and construction approaches could be adopted to adequately address the risks above. These approaches are well established, and commonly and successfully used, in similar projects around Sydney within the Hawkesbury Sandstone.

- Development of an excavation shoring (retaining wall) design and associated construction sequence, to support the overburden (i.e fill and residual soil) and limit movements to an acceptable level. In areas where the overburden is shallow and/or the excavation is not in close proximity to adjacent property, a battered (non-vertical) excavation without shoring may suffice.

[1] NSW Department of Mineral Resources, 1983. Sydney 1:10,000 Geological map (Geological Series Sheet 9130 Edition 1).

- An excavated rock face left unsupported for the most part, with localised support, such as rock bolts, installed in areas identified by a geotechnical engineer during excavation. This is a common approach in the Hawkesbury Sandstone, and the presence of rock conditions that permit this approach would be assessed by geotechnical investigation.
- Implementation of an appropriate geotechnical monitoring and inspection programme to address the residual risks carried through to construction, allowing any potential failures or excessive movements to be detected early and addressed.
- Completion of dilapidation (condition) surveys of adjacent land and structures prior to excavation, to provide a baseline for assessment of any actual damage or spurious claims of damage.

4. CONCLUSION

We conclude that it is most likely that there are no unusual geotechnical risks related to the proposed development, and that any risks can be addressed by established design and construction approaches.

Following the above, it is our opinion that the basement for the proposed development is feasible from a geotechnical and construction point of view, and that the information available is satisfactory for the preparation of an Environmental Assessment.

We expect that further geotechnical work during future stages of this project (e.g for a Development Application or a Construction Certificate) would be undertaken to "*identify design solutions and works to be carried out to ensure the stability of the land and structures and safety of persons",* to satisfy the Director-General's Requirement.

Please contact the undersigned should you have any queries.

For and on behalf of
PELLS SULLIVAN MEYNINK

GARRY MOSTYN
Principal

JEREMY TOH
Associate