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Geotechnical Desktop Report

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C/- A&K Engineering Pty Ltd

Proposed Residential Development
61-65 Lucas Avenue, 36 McKay Avenue &
31 Harvey Avenue, Moorebank,
NSW 2170

Project Number: 2868
Report Number: 2868-GR-1-2
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1. INTRODUCTION AND SCOPE

1.1. Introduction

This report presents the findings of a geotechnical desktop study undertaken by Alliance Geotechnical Pty Ltd (AG) for 61-65 Lucas Avenue, 36 McKay Avenue & 31 Harvey Avenue, Moorebank, NSW (Lot 20 to 24 DP 236405). The study was commissioned by A&K Engineering Pty Ltd. AG was supplied with architectural drawings No. DA20 & DA21, Job No. 160/007, prepared by Studio Rhizome, dated 13/03/2018 and a survey plan drawing No. 160483-002, dated 13/05/2016prepared by RGM Property Surveys.
This geotechnical desktop study report was prepared to provide preliminary comments on excavation conditions, foundation strata with preliminary design parameters, and potential geotechnical constraints for the proposed development at this site. The aim of this report is to provide geotechnical information to assist with the development application (DA) process, project planning and preliminary design estimates.

1.2. Proposed Development

It is understood that the existing site buildings are to be demolished and a six- storey building with double levels of the basement are to be constructed. The lowest basement finished floor level will be at RL 19.45m. Then the maximum basement excavation depth would be 6m. The proposed basement will have an approximate offset of:

- 3.9m from the eastern side (along Lucas Avenue);
- 5.3m from the southern boundary (along McKay Avenue);
- 8m from the northern boundary (along Harvey Avenue); and,
- 0.5m and 8m from the western boundary.

1.3. Scope of Work

In order to achieve the objectives, the following scope of work was carried out:

- Review of the provided drawings and maps;
- Review of published geological information for the general area;
- Review of AG borehole records for projects undertaken in this area;
- Preliminary engineering comments and recommendations are provided in Section 4 & 5.

2. GENERAL SITE DESCRIPTION

2.1. Site Description

The site includes five (5) residential blocks, which are identified as 61-65 Lucas Avenue, 36 McKay Avenue & 31 Harvey Avenue, Moorebank, NSW (Lot 20 to 24 DP 236405). It is located within Local Government Area (LGA) City of Liverpool. The site is located approximately 1km west of Anzac Creek, approximately 1.3km north of Georges River and approximately 250m northeast of the Moorebank Shopping Centre. The site location is shown in Figure 1.

At the time of this study, each block was occupied by a single storey brick house and garage.

The site extends to Lucas Avenue on the eastern boundary, Harvey Avenue on the northern boundary and McKay Avenue on the southern boundary. It is bounded to the west by a single storey brick residence (No. 29 Harvey Avenue) and a double-storey brick house (No. 34 McKay Avenue) on which the buildings have approximately 1 m boundary offset.

The lowest site level varies from an approximate RL 23.4m on the southwest corner to an approximate RL 25.4m on the eastern side, with a general site slope of 2-degree falling towards the southwest.

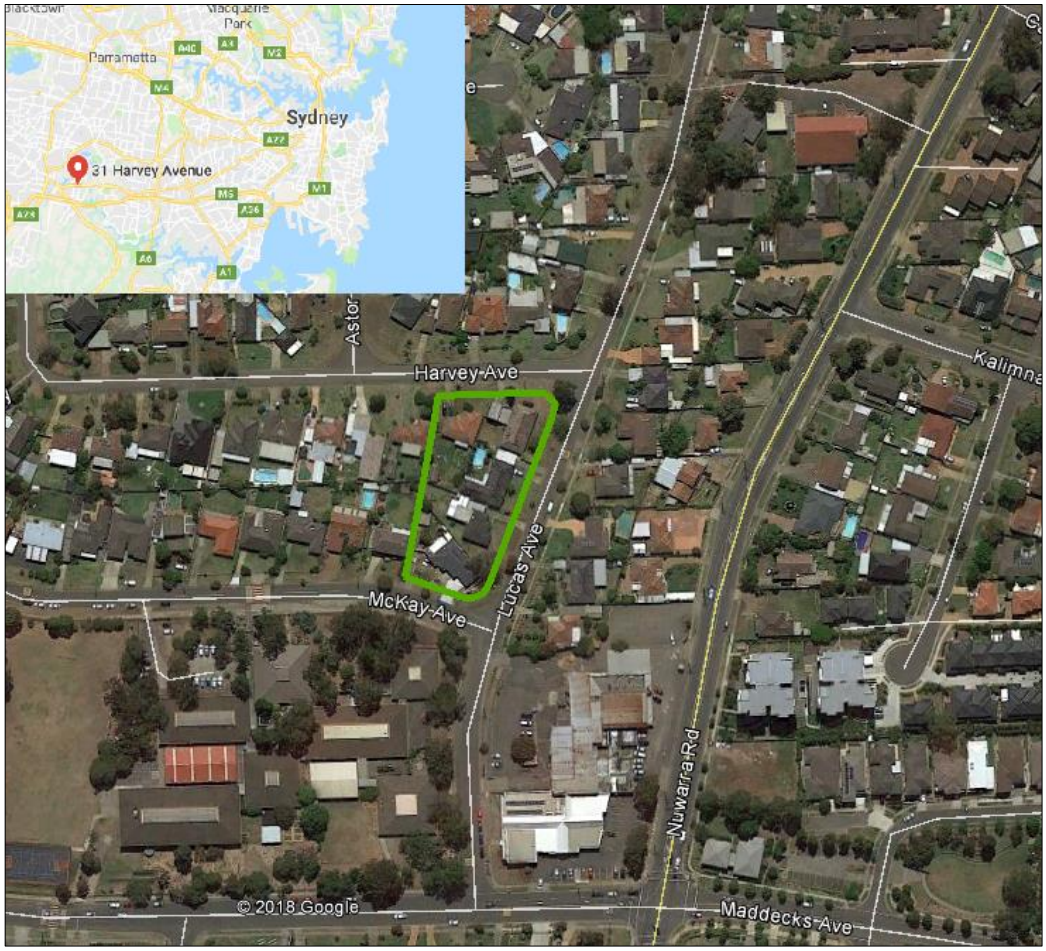

Figure 1- General Locality

2.2. Regional Geology

The 1:100,000 NSW Department of Mineral Resources Geological Map of the Sydney Region indicates the site is underlain by Ashfield Shale, described as *black to dark-grey shale and laminite*. The upper parts of the Ashfield Shale are commonly weathered to a residual soil. In addition, given the site's urban location and development history, a variable thickness of fill and topsoil are anticipated beneath the site overlying residual soils and weathered shale.

2.3. Acid Sulfate Potential

The 1:250,000 Liverpool Acid Sulphate Soil Risk Map indicates the site falls into an area classified as 'No Known Occurrence' of acid sulfate soils. Therefore, no further assessment is considered necessary for acid sulfate soil.

3. PREVIOUS SITE INVESTIGATIONS

AG's previous geotechnical investigations in nearby sites, within approximately 500m, have revealed that topsoil is underlain by residual silty/sandy clay. The very low strength shale was encountered at approximate depths between 1.5m to 3m below the ground level.

Groundwater table was not encountered in AG's previous investigations in nearby sites. It is likely that minor groundwater seepages may be encountered within the residual soils and Ashfield Shale, especially following extended periods of rain fall.

4. ENGINEERING COMMENTS

4.1. Site Classification

Generally, the site is expected to be classified as Class H1 (Highly Reactive Clay Site) in accordance with AS2870-2011 "Residential Slabs and Footings". The clayey residual soils may experience high ground movements from moisture changes with an estimated characteristic surface movement to be in the range between 40mm and 60mm for the existing subsurface conditions.
However, because the proposed building is expected to be founded on bedrock the footing design will need to be prepared in accordance with engineering principals.

4.2. Excavation Conditions and Earthworks

The excavation of the basement is expected to predominantly encounter natural residual clays overlying very low strength and highly weathered shale bedrock. Excavation of the upper soil layers and extremely weathered low strength shale profile should be feasible using conventional earthmoving equipment (i.e. excavators of 20 ton or less). Rock excavating techniques will likely be required to advance the basement excavation through bedrock. Therefore, low vibration excavation methods, such as saw cutting, ripping and grinding may be needed close to the existing structures.

4.3. Vibrations

It will be necessary to limit vibrations caused by construction activities close to the buildings and footings of adjacent structures. Vibration monitoring systems may need to be set up to include a warning alarm which sounds as vibrations approach the specified limit. Excavation methods should be adopted which limit ground vibrations at the adjoining residential developments to less than 5mm/s. It may be possible to eliminate or reduce the requirement for continuous vibration monitoring if a low-vibration excavation and work methods are developed in conjunction with specialist advice from an acoustic consultant, and/or on-site trial excavations and vibration monitoring.

4.4. Dilapidation survey

It is recommended that a dilapidation survey be undertaken on existing neighbouring structures.

4.5. Temporary Batter Slopes and Retaining Structures

Either temporary batter slopes or reattaining structures will be required for excavations carried out on this site, however, a battered slope may be considered in the preliminary stage of the excavations. "Excavation Work Code of Practice" states that benching is required for unsupported excavations deeper than 1.5m. Vertical excavations must not be undertaken without engineering support structures in place or advice from a geotechnical engineer.

The deeper basement excavations for the proposed structure will require the installation of engineered retaining structures prior to commencing excavation on site to protect neighbouring structures from damages due to ground movements and/or vibrations. An appropriate, engineer designed, shoring system within the upper residual soils and the underlying extremely weathered shale and low to medium strength shale bedrock is recommended. The retaining structures can incorporate temporary shoring walls into the permanent basement excavation support and the design should be as per AS4678 Earth Retaining Structure Standard.

Support systems consisting of semi-contiguous piles or soldier piles for perimeter walls are considered technically feasible at this stage. It is expected that an unrestrained temporary or permanent shoring system will experience some lateral movement during construction as the active earth pressure is mobilised onto the wall. If the calculated lateral movements are not acceptable then a temporary anchorage system will be required to avoid movement induced damage on adjoining properties (i.e. where movements may affect adjacent structure footings).

Temporary anchor installation beyond the property boundaries will be subject to approval by the owners of the adjacent buildings, roads, and underground assets.

Potential surcharge loadings from neighbouring structures should be taken into account in the design of retaining structures along the site boundaries as the footings of these structures may be founded within the zone of influence of the proposed excavations. The zone of influence for this site can be defined as the area above a hypothetical plane projected from the toe of the excavation upwards in the direction of the retained ground surface at 45^{o} from the horizontal.

4.6. Footings

It is anticipated that the site will be underlain by topsoil and silty clay residual soils underlain by shale bedrock. It is anticipated that bedrock would be encountered at depths in excess of 1.5 to 3 metres. This will need to be confirmed by a detailed intrusive geotechnical investigation prior to finalising the structural design for the development. Due to the size of the proposed building and the anticipated foundation loads, it is anticipated that footing founded on the rock will be necessary. The quality of encountered shale is expected to be variable and it is anticipated that the allowable bearing pressure of the bedrock shale could range from 500kPa to 1000kPa depending on the rock quality encountered at founding depths.

On this basis, an intrusive geotechnical investigation would be required to ascertain the depth to rock at the site and its engineering properties for footing design.

4.7. Groundwater Control

AG's observations during the investigation at this area indicate that groundwater table will not be encountered to the depth of excavation. However, groundwater seepage could be expected to occur towards the interface between the residual soil and shale bedrock. Groundwater seepage also tends to fluctuate with seasonal weather patterns and may increase following extended rainfall periods. As such, the construction should be planned to manage seepage and surface runoff that could occur into excavations during site earthworks by installing drains and sump pits with a suitable pumping system for dewatering purposes.

5. RECOMMENDATIONS

The above-expected ground conditions are provided for preliminary assessment and broad scale costing proposes and will need to be verified by detailed intrusive geotechnical investigations before finalising the structural design for the development. Therefore, it is recommended that:

1. The geotechnical investigation to include the drilling of two (2) boreholes to a minimum depth of 10 m (with rock coring) and drilling at least two (2) boreholes to the depth of bedrock (TC bit refusal) to confirm subsurface profile across the site.
2. A detailed geotechnical report be prepared after the intrusive drilling investigation to provide the engineering design parameters and comments on the construction approach.

6. LIMITATIONS

This desktop report is based on AG's previous experience in this area and published geological information. Geotechnical investigation (e.g. boreholes and in-situ testing) have not been conducted at this site to date. The information provided in this report is preliminary and should be confirmed by a geotechnical intrusive investigation prior to finalising the structural design for the development, or comment of any construction works.
If you require further advice, or need to discuss this report, please contact the undersigned.

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References

- AS2870-2011 - Residential Slabs and Footings
- AS4678 – Earth Retaining Structures
- The 1:100,000 NSW Department of Mineral Resources Geological Map of Sydney Region
- 1:250,000 Liverpool Acid Sulphate soil map
- "Excavation Work Code of Practice", NSW Government WorkCover, July 2015