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31st March 2020
GR1107.1J

Prestige Developments Group (NSW) Pty Ltd
C./- Morson Group
Level 2, 3 Barrack Street
Sydney NSW 2000

Re: Geotechnical Desktop Study Report
Proposed Residential Development
16-24 Hope Street, Penrith, NSW

1 INTRODUCTION

JC Geotechnics Pty Ltd (JC) was commissioned by Prestige Developments Group (NSW) Pty Ltd to carry out a Geotechnical Desktop Study (GDS) to assist with the Development Application (DA) for the proposed residential development at 16-24 Hope Street, Penrith, NSW.

The purpose of this report was to complete a desktop study of available subsurface information in the vicinity of the site, including from published information and previously completed investigations, as a basis for preliminary comments and recommendations on excavation conditions, hydrological conditions, retention, footings and additional geotechnical input required.

The following architectural drawings and geotechnical report were provided by the client:

- Demolition Plan prepared by Morson Group Pty Ltd for Project No. 18006, Drawing No. DA09, Issue A, dated on 17 March 2020;
- Basement 2 Plan to Roof Plan prepared by Morson Group Pty Ltd for Project No. 18006, Drawing No. D10 to DA18, Issue A, dated on 17 March 2020;
- North Elevation, East Elevation, West Elevation, South Elevation, Central Elevations prepared by Morson Group Pty Ltd for Project No. 18006, Drawing No. DA19 to DA23, Issue A, dated on 17 March 2020; and
- North-South Section 1, North-South Section 2, East-West Section 1 prepared by Morson Group Pty Ltd for Project No. 18006, Drawing No. DA24 to DA26, Issue A, dated on 17 March 2020.
- Geotechnical Investigation Report prepared by Morrow Geotechnics, Reference: P1153_01, dated on 20 September 2016.

From the architectural drawings provided, we understand that the proposed development comprises the demolition of the existing structures and construction of two six-story buildings over two levels of basements. Basement B2 is proposed to have a Finished Floor Level (FFL) of RL39.77m requiring

excavation to depths ranging between 7.5 and 9.5m below existing surface levels. Based on the architectural drawings of basements, the basements will have setback of 3.72m from Northern boundary, 2.0m from Southern boundary, 6.0m from Eastern boundary, and 6.0m from Western boundary. Locally deeper excavations for footings, service trenches and lift overrun pits may be required. From the footprint of the basement, it will extend to within 2m of the site boundaries. Structure loads had not been advised, typical loads have been assumed.

2 SCOPE OF WORK

A search of our project database was completed for projects completed in the vicinity of the site and a review of available Google Earth imagery was completed. Review of available geological maps was also completed.

3 BRIEF SITE DESCRIPTION

The site is located in a generally sloping topography. The site itself slops down from East to West at an angle of about 3-4°.

The site comprises of five single storey brick and weatherboard residential buildings with tiled roof. The houses appeared to be in good external condition based on aerial photographs. Other structures such as garages, swimming pool and sheds were also observed. Access to the houses is through concrete driveways from Hope Street.

The site is bounded by residential houses to the South, Hope Street to the North, multi-storey development with at least one basement level to the East and residential houses to the West.

4 INFERRED SUBSURFACE CONDITIONS

The 1:100,000 Geological Map of Penrith indicates the site is underlain by Bringelly Shale of the Wianamatta Group. Approximately 950m to the west of the site, the shale profile is overlain by deeper alluvial soils associated with Nepean River.

Previous projects completed in the vicinity of the site encountered a generalised subsurface profile comprising shallow fill over residual silty clay down to a depth of about 2 to 3m below existing surface levels.

Weathered shale/sandstone is inferred to be encountered below the clay at depths of about 2 to 3m below existing surface levels.

Groundwater if encountered will be within the bedrock profile.

We anticipate a similar subsurface profile will be encountered on the subject site. The shale/sandstone bedrock, when encountered, is expected to be initially distinctly weathered and of very low to low strength, but will increase in strength with depth, and will likely be of medium to high strength at bulk excavation level.

5 PRELIMINARY COMMENTS AND RECOMMENDATIONS

The following comments and recommendations are preliminary only and are based on the assumed subsurface conditions outlined in Section 3 above. They must be reviewed and updated as required following completion of a detailed geotechnical investigation as discussed in Section 6 below. We do not recommend that the final design be carried out based on this report.

5.1 Dilapidation Surveys

Prior to any demolition and excavation commencing, dilapidation surveys should be carried out on the adjoining buildings that fall within the influence zone of the excavation, which can be defined as a horizontal distance back from the edge of the excavation of at least twice the excavation depth. During the excavation, every care should be taken to not undermine or render unstable the footings of any adjoining structure. Care must be taken during demolition, stripping and all excavation works to not destabilise, undermine or remove support from the site boundaries and neighbouring buildings.

5.2 Excavation

Excavation for the proposed basement is expected to depth of between about 7.5 and 9.5m below existing surface levels. Such deep excavations are inferred to encounter fill and residual clays and then the shale/sandstone bedrock. Excavation of the soils may be achievable using conventional earthmoving equipment, such as hydraulic excavators. However, the bedrock may require the use of rock excavation equipment. The use of such equipment may result in transmission of vibrations through the rock mass that could affect adjoining buildings. Vibration effects (associated with general excavation but more critically rock excavation) on adjoining structures must be considered. We recommend that the initial excavation in rock be commenced away from likely critical areas, e.g. boundaries with adjoining buildings, with instrumental vibration monitoring undertaken. All excavation recommendations should be complemented by reference to Safe Work Australia's 'Excavation Work – Code of Practice', dated October 2018.

5.3 Hydrogeological (groundwater) Considerations

Groundwater was not encountered in the geotechnical boreholes completed at nearby site, however, considering the low permeability residual clays and bedrock encountered, the seepage rate into the excavation is inferred to be comparatively low and therefore, we do not expect the construction of the basement to be any more difficult than deep basements in similar strata in the surrounding area. In summary, our preliminary opinion is that a conventional sump and pump system is likely to be suitable. We do not consider that there is a likelihood of the construction of the basement causing significant interference to the groundwater flow due to relatively impermeable nature of the subsurface profile, nor it being untowardly affected by the groundwater provided proper drainage systems are designed and installed by a qualified hydraulic/drainage engineer. Notwithstanding, further groundwater investigation must be completed with standpipes installed in the additional boreholes for the detailed investigation stage. We expect that there will be cut in shale/ sandstone. We expect that under-floor drainage will be required for basement carpark slab, or the slab designed for uplift, though this should be reviewed following completion of further groundwater investigation in borehole standpipes and after inspection of the completed excavation. Joints and bedding planes within the completed cut faces may be subject to localised groundwater seepage flows, particularly after periods

of rainfall. Appropriate waterproofing requirements are therefore recommended for external building walls close to or in contact with the excavated areas. A perimeter subsoil drain is recommended.

5.4 Retention Systems

Where space permits, temporary batters may be used for support of the fill, residual clay and shale/sandstone of less than medium strength. The batters should be no steeper than 1 Vertical (V) to 1 Horizontal (H) with all surcharge loads set back at a distance equal to the height of the batter from the crest of the batter.

Alternatively, retention systems should be installed to below bulk excavation level or at least 1m into shale/sandstone of medium strength or better prior to the commencement of any vertical excavations. Along boundaries where it is critical to keep excavation induced movements as low as practical (e.g. along both side boundaries and rear boundary), we recommend that a more rigid support system, such as a contiguous or secant pile wall, be employed to support the depth of vertical cuts in the residual clay and shale/sandstone. Elsewhere (e.g. front street boundary), a suitable shoring system for vertical cuts may comprise semicontiguous or soldier pile walls with infill panels (e.g. reinforced shotcrete). Additional lateral support or restraint should be provided preferably by rock anchors or less preferred, by internal props. Checks need to be made that any rock anchors will not clash with adjoining basement structures, services, service pits or service tunnels. Approval from neighbouring landowners will be required prior to installation of anchors into their property. The proposed retention piles must be founded with sufficient embedment to satisfy stability and founding considerations. The piles can be used as load bearing piles for the proposed new buildings if taken down to the appropriate founding depths.

5.5 Lateral Pressures

Guidelines for the design of shoring/retention systems are provided herein. The presence of adjoining footings must be taken into consideration in the assessment of lateral pressures. For preliminary design of anchored or propped walls, we recommend the use of a trapezoidal lateral pressure distribution of minimum magnitude of 5H kPa (where H is the total excavation depth), subject to the results of site-specific boreholes. The full lateral pressure is applicable over the central 50% of the trapezoidal pressure distribution. For areas that are highly sensitive to lateral movement, consideration should be given to using a greater trapezoidal lateral pressure distribution of probable magnitude in the range of 8H-9H kPa to limit deflections. In order to provide additional lateral restraint, we recommend that the pile heads be connected with a capping beam designed to span between the pile sidewall returns. All appropriate hydrostatic pressures and surcharge loads should be incorporated in the design of the retaining walls. Anchors should have their anchor bond length within shale/ sandstone of at least medium strength.

5.6 Footings

The proposed building should be supported on footings (e.g. strip/pads or piles) founded within the shale/sandstone; these footings may be designed on a preliminary basis for likely allowable bearing pressures in the range of 700kPa to 1000kPa, subject to confirmation by site specific test boreholes. Higher bearing pressures for shale/sandstone of medium strength may be applicable if this is proven by completing and testing the shale/sandstone in diamond cored boreholes at the site.

6 ADDITIONAL WORK

Detailed geotechnical subsurface investigations must be carried out prior to final design and issue of the Construction Certificate (CC) to determine the site-specific subsurface profile and geotechnical parameters for the design of the retention systems and footings.

The geotechnical investigations should involve at least four cored boreholes drilled to at least 3m below the proposed excavations. The cored boreholes will allow less conservatism in the recommendations and allow the use of higher bearing pressures.

It is recommended that at least three (3) standpipes be installed within three of the boreholes to allow ongoing measurements of groundwater levels to assist with design of the required drainage systems and meet WaterNSW requirements. We also recommend that basic pump out tests be completed in this standpipe to estimate seepage rates.

Preferably, the geotechnical investigation should be carried out following demolition of the existing buildings to allow full access across the site area for truck mounted drilling rigs. To complete final design on the basis of this desk study and preliminary report is not recommended.

Furthermore, it will be essential during earthworks and construction that regular geotechnical inspections and testing be commissioned to check initial assumptions about excavation and foundation conditions and likely variations that may occur between borehole locations and to provide further relevant geotechnical advice. Irregular or 'milestone' inspections by a geotechnical engineer are often not adequate for excavation and foundation works. It is recommended that the client be made aware of the need to commission a geotechnical engineer for regular frequent inspections.

7 CONCLUSIONS

Overall, it is considered that construction of the proposed development is feasible, provided site specific geotechnical borehole investigations are carried out prior to final or detailed design together with review of the preliminary recommendations provided in this report. The proposed development is similar to other developments in nearby sites with similar geotechnical and geological conditions, which have been successfully constructed.

For and on behalf of
JC Geotechnics Pty Ltd

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Reviewed By

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