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PALMDEV PTY LTD

# Construction Methodology Report

1112-1116 Barrenjoey Road, Palm Beach NSW

E25203.G15
8 August 2024

# Document Control

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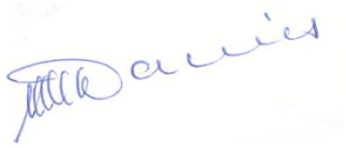
|  |  |
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# 1. Introduction

At the request of Palmdev Pty Ltd (the Client), EI Australia (EI) has prepared a Construction Methodology Report (CMR) for the proposed development at 1112-1116 Barrenjoey Road, Palm Beach NSW.

The Client provided EI with the following documents to assist in preparation of this report:

- Architectural drawings prepared by Koichi Takada Architects – Project at 1112-1118 Barrenjoey Road, Palm Beach, Drawing Nos. A0001, A0010 to A0013, A0019, A0022, A0050, A0051, A0099 to A0105, A0200 to A0203, A0300 to A0305, and A0320, latest revision I, dated 31 July 2024;
- Structural drawings prepared by M&G Consulting Engineers Pty Ltd – Job No. 5598, Drawing Nos. S010, S011, S015 and S020, Issue 1, dated 7 August 2024; and
- Site survey plan prepared by Beveridge Williams – Project No. 2101343, Drawing Ref. 2101343, Version B, dated 6 September 2021. The datum in the survey plan is in Australian Height Datum (AHD), hence all Reduced Levels (RL) mentioned in this report are henceforth in AHD.

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structures and the construction of a four-storey mixed-use building overlying a single, split-level basement. The basement is proposed to have a Finished Floor Level (FFL) of RL -1.22m to -2.4m Australian Height Datum (AHD). A Bulk Excavation Level (BEL) range between RL -1.5m and -2.7m AHD is assumed for the construction which includes allowance for a concrete basement slab. To achieve the BEL, an excavation depth varying from 4.3m (towards west of site) to 15.6m (towards east of site) Below Existing Ground Level (BEGL) is expected. Locally deeper excavations may be required for footings, service trenches, crane pads, and lift overrun pits.

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EI has previously completed the following documents for this site:

- Geotechnical Investigation (GI), referenced E25203.G03_Rev2, dated 7 December 2021;
- Additional Geotechnical Investigation (AGI) for this site, referenced E25203.G04_Rev1, dated 8 August 2024;
- Groundwater Monitoring Report No. 1, referenced E25203.G11.01, dated 28 February 2024;
- Groundwater Take Assessment (GTA), referenced E25203.G12_Rev2, dated 8 August 2024; and
- Landslide Risk Assessment (LRA), referenced E25203.G14, dated 8 August 2024.

This CMR covers the construction sequences of the bulk excavation for the proposed basement and provides recommendations for necessary hold point inspections (for geotechnical controls) so that the proposed construction can be safely controlled and does not adversely impact the neighbouring properties.

# 2. Subsurface Conditions

A brief summary of the subsurface conditions across the site, interpreted from the investigation results, is presented in **Table 2-1** below. More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs in our AGI report report referenced above.

**Table 2-1 Summary of Subsurface Conditions**

| Unit | Material[2] | Depth to Top of Unit (m BEGL)[1] | RL of Top of Unit (m AHD)[1] | Observed Thickness (m) | Comments |
|---|---|---|---|---|---|
| **1** | **Fill/ Topsoil** | Surface to 0.13 | 2.31 to 12.92 | 0.3 to 1.33 | Low plasticity sandy clay fill/topsoil and silty sand fill. Fill was assessed, based on our observations during drilling to be poorly to moderately compacted; |
| **2a** | **Marine Soil** | 0 to 0.50 | 1.24 to 2.01 | 1.0 to 2.93 | Fine to medium grained, loose sand/silty sand, becoming dense with depth. |
| **2b** | **Residual Soil** | 1.5 to 3.0 | -0.5 to 0.9 | 1.35 to 6.87 | Low to high plasticity sandy clay/ clayey sand, stiff/dense to hard with trace ironstone gravels. |
| **3** | **Very Low Strength Sandstone / Laminite** | 0.47 to 6.4 | -3.9 to 12.03 | 1.3 to 8.5 | Distinctly weathered, very low strength sandstone and laminite comprising of sandstone, claystone and siltstone, with frequent extremely weathered seams. |
| **4** | **Low to Medium Strength Laminite** | 5.2 to 11.5 | -10.3 to 7.3 | -[3] | Distinctly weathered, low to medium strength laminite comprising of siltstone and sandstone. |

Note 1 Approximate depth and level at the time of our assessment. Depths and levels may vary across the site.
Note 2 For more detailed descriptions of the subsurface conditions, reference should be made to the borehole logs of EI's AGI report**.**
Note 3 Observed up to termination depth in BH201M, BH202M and BH204M.

Long-term groundwater monitoring was completed at this site during the period from 24 October 2023 to 22 February 2024, results are shown in in **Table 2-2** below.

**Table 2-2 Summary of Long-Term Groundwater Monitoring**

| Monitoring Well ID | Highest Groundwater RL (m AHD) | Lowest Groundwater RL (m AHD) |
|---|---|---|
| BH201M | 0.78 | 0.12 |
| BH202M | 2.01 | 1.49 |
| BH203M | 1.88 | 1.52 |
| BH204M | 9.47 | 7.03 |

# 3. Excavation Support

The basement excavation will be supported by a piled wall system that has two major functions:

- Physical support for the excavation face around all four sides, and
- Sealing of the basement from ingress of groundwater to provided a permanent 'tanked' basement function.

A secant pile wall system is designed for the western side along the Barrenjoey Road property frontage, returning along both side (northern and southern) boundaries towards the rear. This type of wall provides an effective permanent seal for groundwater within the alluvial soil conditions in western half of the site.

At a point on each side (northern and southern) boundary, as the secant wall advances into the rising slope where the secant wall meets the residual soil and shallower bedrock, the wall design changes to a contiguous pile wall with shotcrete or concrete panels between the piles.

For the short-term construction period, the soldier pile form of the support wall system will be a 'drained' wall until measures are incorporated into the basement construction to provide permanent sealing of the wall.

At the rear (eastern) boundary, and along part of each side boundary returning to the west, the piles are to be installed from an elevation that requires a working platform for the piling rig. It is intended that the working platform will be constructed as an earthworks bench against the steep rear slope.

The working platform will comprise engineered select fill, placed in layers and compacted to an engineering specification.

Temporary lateral support for the excavation is provided by inclined struts at two levels, fixed to waler beams as the staged excavation is progressed down. Permanent support is transferred to the building structure as the building is progressively constructed up out of the ground.

Details are shown on the structural drawings prepared by M&G, accompanying this CMR.

Before commencement of construction, geotechnical design analysis for the excavation support system, together with important specification details to be verified, will be undertaken by a geotechnical engineer. Safety in design risks must be considered and addressed at the appropriate stage of the design for the project.

# 4. Construction Methodology

This CMR aims to set out a plan and recommendations for the construction methodology (from a geotechnical perspective) for the proposed shoring and basement structure so as to have minimal to negligible adverse effect on surrounding property and infrastructure.

An overview of the construction methodology is presented below:

## 4.1 Overview

The following outline refers to the drawings titled “Shoring & Bulk Excavation Details”, “Shoring Elevations and Sections”, “Shoring Details”, and “Shoring Staging and Sequence” prepared by M&G Consulting Engineers, Job No.5598, as at the time of writing.

- Demolition of the remaining structures and removal of vegetation.
- Commence secant piling (Type 3) along the western frontage and on the north and south sides to the transition points with the Type 2 contiguous pilies.
- Place and compact engineered fill at the eastern portion of the site with a batter slope of 1½H:1V, to construct a working platform along the eastern site boundary, in accordance with geotechnical details (refer drawing “Shoring Staging and Sequence” - Step 1).
- Crane up and assemble the piling rig at the working platform and install Type 1 shoring piles for the eastern wall.
- Excavate down to first level of struts (S1) following the 1½H:1V batter slope (refer drawing “Shoring Staging and Sequence” – Step 2).
- Excavate slot trenches over the slope to allow for installation of the S1 struts, braced to piles installed at BEL.
- Excavate down to the second level of struts (S2) following the 1½H:1V batter slope (refer drawing “Shoring Staging and Sequence” – Step 3).
- Excavate slot trenches over the slope to allow for installation of the S2 struts, braced to piles installed at BEL.
- Excavate to BEL (refer drawing “Shoring Staging and Sequence” – Step 4).
- Internal sealing of the basement wall at the eastern side, and along the eastern portions of each side wall to the transition with the secant pile walls, will be undertaken to convert the construction to a permanently tanked basement as required for the design.
- Pour concrete for basement and ground floor slab and allow 28 days to cure.

## 4.2 Dilapidation Survey of Adjacent Properties

Prior to excavation, detailed dilapidation surveys must be carried out on all structures and infrastructures surrounding the site that falls within the zone of influence of excavation. The initial dilapidation survey will constitute a **hold point** that construction should not commence until the dilapidation surveys have been completed and submitted to neighbouring properties representative.

Once the building structure has been completed, the adjoining properties are to be inspected by a structural engineer to verify they are in a condition similar to the pre-construction report. A

post-building report is to be prepared by the structural engineer for each of the subject properties, confirming the outcome of each post-building inspection.

## 4.3 Installation of Perimeter Shoring Walls

The geotechnical consultant must be on site during the drilling of shoring piles to confirm the founding material and minimum embedment depth below BEL as per the structural drawings.

The frequency of pile inspections will be determined by the project geotechnical engineer. The inspected piles must be evenly spaced over the full lengths of the walls, with inspections commencing with the drilling of the first pile. It will be the contractor's responsibility to co-ordinate site visits by the geotechnical consultant to satisfy these requirements.

The geotechnical consultant will observe the drilling resistance and any materials recovered from the pile drilling, to compare against relevant nearby borehole logs) and will measure and record the final pile depths. The geotechnical consultant will prepare a written site report for each daily inspection. The piles are not deemed approved until the written site report is received.

The piling contractor must provide certificates of the length of the shoring wall perimeter to ensure confidence that the shoring walls have been constructed to design.

During installation, the contractor must keep a record of the shoring wall location, thickness/diameter, and toe RL as a minimum. These records must be provided to the geotechnical consultant at no greater than weekly intervals from the commencement of installation. These records will then be compared to the previous geotechnical reports completed for the site.

The contractor shall account for all ground conditions and water table levels referred to in the Geotechnical Engineer's report. Appropriate measures are to be taken to ensure proper wall placement. Before proceeding to the next stage of work, the contractor must certify that the shoring walls have been constructed in accordance with the approved structural drawings.

### 4.3.1 Contingency Plan

Where sections of the shoring wall are installed but are considered unsatisfactory, excavation works must not commence until approval is provided by both the structural and geotechnical engineers after review of the piling records/certification.

Should further analysis/assessment of the shoring wall indicate the wall to not be satisfactory, additional anchors/ props for lateral support may be required.

## 4.4 Deflection

Due to the depth of the excavation, proximity of the neighbouring properties and infrastructure assets to the excavation, it is recommended that monitoring of ground movements associated with the basement excavation should be undertaken.

This monitoring is necessary to detect any unexpected deflections early and rectify them accordingly so that the construction works do not adversely affect the neighbouring properties.

EI recommends that survey marks should be installed close to the boundary of neighbouring properties, and on the pile wall capping beams. Survey monitoring of these nominated deflection points should be carried out during excavation and construction. The Contractor's Surveyor will monitor the line and level of the above throughout the excavation process.

EI also recommends that inclinometers should be installed for the shoring walls. The inclinometers are to be installed to 3m below BEL. Additionally, inclinometers will assist in

protection for the Sydney Water sewer assets along Barrenjoey Road and down the right of access driveway and No.1110 Barrenjoey Rd, along the southern boundary of the site.

Monitoring frequencies for baseline data prior to construction, and during the construction will be determined by the project geotechnical engineer.

All survey marks and inclinometers must be protected from damage caused by construction traffic, pedestrians, etc. through the use of adequate marking, monuments/covers.

All instrumentation, e.g. inclinometers and survey marks, must be kept in operational condition at all times and protected from damage caused during excavation and construction through the use of adequate marking, monuments, and barriers.

Measurements of all monitoring facilities should be taken on completion of the construction. These and all previous measurements should be submitted to adjoining property owners for record keeping.

## 4.5 Excavation

Excavation must be completed in a staged manner to allow the installation of the internal bracings for lateral restraint, in accordance with the approved engineering details. Excavation for the pre-determined stages and to the pre-determined levels must be completed as specified by the structural/geotechnical engineer. **Hold Points** are to be determined and enforced for each stage of excavation.

The geotechnical consultant must attend the site to confirm that the excavation has not exceeded the afore-mentioned depth(s). The structural engineer must attend the site to confirm that the excavations are carried out as per the design drawings. Once the geotechnical and structural engineers provide written confirmation, the excavation may continue.

### 4.5.1 Contingency Plan

Should the excavation extend below the approved level, the geotechnical/structural consultants may require the excavation be backfilled or braced to restore stability.

## 4.6 Groundwater

Two phases of groundwater are present at the site:

1 Over the front (western) half of the property, sandy alluvial soils with a measured groundwater level (GWL) overlying the bedrock are connected to the marine water body of the Pittwater, with some tidal influence likely, and

2 Seepage water within the bedrock at the rear (eastern) half of the site, along the soil/rock interface and through any defects within the bedrock (jointing, and bending planes) is a normal expectation, particularly as influenced by rainfall.

Excavations for the basement will require the groundwater to be pumped dry. The seal into bedrock provided by the secant piling should permit use of a conventional sump and pump system for the western half of the site during construction.

Due to the low permeability of the bedrock profile, any groundwater inflows into the excavation from the slope at the rear (eastern) of the site should also be able to be handled by a sump and pump system.

EI have undertaken an assessment of the potential impacts of groundwater lowering for adjoining properties. The assessment is reported in a separate statement submitted for this project. Settlements ranging between “practically nil” and 4mm were determined.

### 4.6.1 Contingency Plan

If groundwater ingress becomes unmanageable during construction, the builder must contact the geotechnical consultant for further advice.

## 4.7 Vibration

All construction activities, such as manoeuvring of tracked plant and equipment, heavy falling brick/masonry, and excavation, must be carefully controlled to avoid ground vibration damage to the neighbouring assets.

Vibration monitors should be installed at this site to allow continuous monitoring of background vibrations and vibrations during excavation.

All vibration monitors, must be kept in operational condition at all times and protected from damage caused during excavation and construction through the use of adequate marking, monuments, and barriers.

### 4.7.1 Contingency Plan

Should vibrations exceed set limits on more than 5 occasions daily, the contractor must:

- Cease excavation works and notify the stakeholders immediately; and
- If it is found that the transmitted vibrations are unacceptable, then it would be necessary to implement alternative techniques to reduce or possibly eliminate risks of damage to the adjoining properties through vibration effects transmitted via the ground.

# 5. Conclusion

Assuming that the recommendations of the CMR are followed and sound building practices and judgement are adhered to by the builder, the construction of the proposed development should not have any adverse impacts on neighbouring assets and properties.

# 6. Statement of Limitations

This report has been prepared for the exclusive use of Palmdev Pty Ltd who is the only intended beneficiary of EI's work. The scope of the assessment carried out for the purpose of this report is limited to those agreed with Palmdev Pty Ltd

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar works by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited investigation of conditions, with specific sampling and test locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during construction. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

Should you have any queries regarding this report, please do not hesitate to contact EI.