

Appendix 4 - Geotechnical Investigation prepared by JK Geotechnics



REPORT
TO
HELM PTY LTD
ON
GEOTECHNICAL INVESTIGATION
FOR
PROPOSED RESIDENTIAL DEVELOPMENT
AT
177 RUSSELL AVENUE, DOLLS POINT, NSW

15 June 2016
Ref: 29353Srptrev1



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TABLE OF CONTENTS

1	INTRODUCTION	1
2	INVESTIGATION PROCEDURE	1
3	RESULTS OF INVESTIGATION	3
3.1	Site Description	3
3.2	Subsurface Conditions	3
3.3	Laboratory Test Results	5
4	COMMENTS AND RECOMMENDATIONS	6
4.1	Geotechnical Issues	6
4.2	Dilapidation Surveys	6
4.3	Excavation Conditions	6
4.4	Dewatering	7
4.5	Retention	7
4.6	Footings	9
4.6.1	Piles to Rock	9
4.6.2	Raft Slabs	10
4.7	Basement Slab	12
4.8	Further Work	13
5	GENERAL COMMENTS	13

STS TABLE A: POINT LOAD STRENGTH INDEX TEST REPORT

ENVIROLAB SERVICES REPORT NO: 146253

BOREHOLE LOGS 1 TO 4 INCLUSIVE

CORE PHOTOGRAPHS

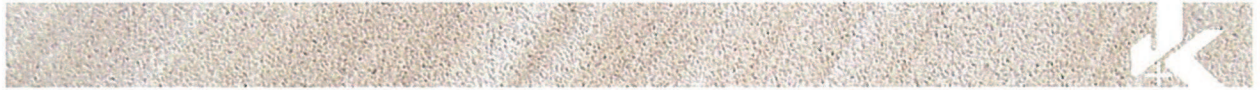
EFCP LOGS 2 AND 3

FIGURE 1: SITE LOCATION PLAN

FIGURE 2: INVESTIGATION LOCATION PLAN

FIGURE 3: CROSS SECTION AA' AND CROSS SECTION BB'

REPORT EXPLANATION NOTES



1 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed residential development at 177 Russell Avenue, Dolls Point, NSW. The investigation was commissioned by Mr Matt Campbell of Helm Pty Ltd, by returned Acceptance of Proposal dated 18 April 2016, in accordance with our fee proposal Ref: P42259S.

We understand from email correspondence and phone conversations that the redevelopment comprises:

- Demolition of the existing structures at the site.
- Construction of a multi-storey residential building.
- Excavation of a two-level basement to depths of about 6m.

At the time of investigation, detailed architectural drawings were not provided. We have not been provided with loadings and have assumed typical loadings for this type of development.

The purpose of the investigation was to obtain geotechnical information on subsurface conditions as a basis for comments and recommendations on excavation, retention and footings.

This geotechnical investigation was carried out in conjunction with an environmental assessment by our specialist division, Environmental Investigation Services (EIS). Reference should be made to the separate report by EIS, Ref: E29353KM, for the results of the environmental site assessment.

2 INVESTIGATION PROCEDURE

The fieldwork for the investigation was carried out between 3 May 2016 and 6 May 2016 during which time four boreholes, BH1 to BH4, were drilled using our track-mounted JK308 rig to depths between 25.25m (BH1) and 26.60m (BH2). These boreholes were initially auger drilled and then extended by casing advancer to depths between 22.23m and 24.30m. Coring of the bedrock by diamond coring techniques using an NMLC core barrel with water flush extended the boreholes to their termination depths.

In addition two Electric Friction Cone Penetrometer (EFCP) tests (EFCP 1 and 2) were carried out using our specialised truck mounted EFCP rig. The tests were carried out to depths of 24.8m and 22.9m respectively below the top of the existing ground surface.



EFCP testing involves continuously pushing a 35mm diameter rod with a conical tip into the soil using hydraulic rams fitted to a truck mounted rig. Measurements of the end resistance on the cone tip and the frictional resistance on a separate sleeve, immediately behind the cone, are taken. The subsurface material identification, including material strength/relative density, is assessed by interpretation of the test results based on past experience, and empirical correlations. EFCP testing does not provide sample recovery.

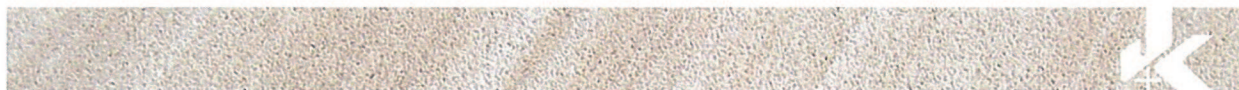
The investigation locations, as shown on Figure 2, were set out by taped measurements from existing surface features and inferred site boundaries. The approximate surface levels, as shown on the borehole and EFCP logs, were estimated by interpolation between spot levels shown on the supplied survey plan by Daw & Walton (Job No. 3063-16, dated 7/03/16). The datum of the levels is Australian Height Datum (AHD).

The strength and relative density of the subsurface soils were assessed from Standard Penetration Test (SPT) 'N' values and the EFCP test results, augmented by hand penetrometer test results on cohesive samples recovered by the SPT split tube sampler. The strength of the cored sandstone was assessed with reference to Point Load Strength Index ($I_{s(50)}$) test results. The point load strength test results are summarised on the attached STS Table A and on the cored borehole logs.

Groundwater observations were made during and on completion of auger drilling. The use of water for core drilling limited meaningful measurements of groundwater levels once coring had commenced. Two piezometers were also installed at the locations of BH1 and BH4 to allow long-term monitoring of groundwater levels.

Our geotechnical engineer set out the borehole locations, nominated the sampling and testing locations, and prepared logs of the strata encountered. The borehole logs, which include field test results and groundwater observations, and the EFCP test results, are attached to this report together with a set of explanatory notes, which describe the investigation techniques, and their limitations, and define the logging terms and symbols used.

Selected samples were returned to Soil Test Services Pty Ltd (STS) and Envirolab Services Pty Ltd, both NATA registered laboratories, for testing to determine point load strength index test results, pH, sulphate content, chloride content and resistivity. The results of the laboratory testing are summarised in the attached STS Table A and Envirolab Report No. 146253.



3 RESULTS OF INVESTIGATION

3.1 Site Description

The site is located within a relatively flat, low-lying coastal topography near Botany Bay which is located between 250m to 300m to the south and east.

The site consists of a rectangular block which is flat or with slopes less than 1°. Located on the site are two two-storey brick unit blocks situated centrally over the site. The buildings appeared in fair condition with some cracking (generally 2mm wide) through the mortar around windows. One of the buildings had suspended timber floors supported on short brick columns; the other building had a slab on grade. Surrounding the buildings were concrete footpaths and a driveway with grassed lawn areas and garden beds. Three large trees are located on the site – one approximately 16m tall oak in the southwest corner and two 14m tall fig trees in the centre of the site.

To the west of the site is a four storey brick apartment building set back between 3m and 10.6m from the common boundary. A concrete driveway runs between this building and the site.

The northern boundary is with Russell Avenue which runs level or slopes at less than 1° along the site frontage. Russell Avenue is paved with asphaltic concrete and appeared in reasonable condition upon cursory observation with minor longitudinal cracking.

East of the site is a sandstone block-lined channel offset between 0.5m and 5m from the eastern site boundary. The channel is lined with mangrove trees on its banks. South of the site is Peter Depena Reserve – a large open grassed reserve with large trees interspersed throughout.

3.2 Subsurface Conditions

Reference to the 1:100,000 geological map of 'Sydney' indicates that the site is underlain by Holocene interdune deposits of quartz sand with moderate silt content and shell layers, with Hawkesbury Sandstone at depth.

In summary, the boreholes encountered shallow fill covering deep marine sands, with clay bands below 14m, overlying sandstone bedrock. Further comments on the subsurface conditions encountered are provided below. Reference should be made to the borehole logs for detailed descriptions of the subsurface conditions encountered.

Fill

Silty sand fill was encountered in all boreholes to depths of 0.3m and 0.5m below existing surface levels. The soils were moist, appeared poorly compacted and contained roots and root fibres.

Marine Soils

The marine soils exhibit a variability which is not unexpected for similar soils in the area. The following is a broad summary based on the borehole and EFCP test information but, as ever, for detail it is essential that reference is made to the specific logs. It must also be recognised that in the boreholes the soil descriptions and strength assessments are based largely upon the SPT test results and that there are often large gaps between tests; the soil descriptions and strengths in BH2 and BH3 where there are EFCP tests adjacent, have been partly based on the EFCP results where the borehole provided little information. In the EFCP tests it is also important to recognise that the test does not distinguish well some of the mixed soils such as sandy clay/clayey sand/clayey silt etc and where these soil types are significant to the project then it may be necessary to carry out further testing and sampling to confirm the actual conditions.

Very Loose Sand: Occurs at all locations from the near surface to depths between 3.4m and 6.0m.

Loose Sand: Present from 5.6m to 7.0m in BH1 and 4.2 to 6.1m in BH2. In BH3 the sand was interpreted as loose to medium dense from 3.4m to 6.4m. In BH4 this layer was not noted but the very loose sand extended to 6.0m.

Medium Dense Sand: This was generally interpreted as occurring between:

BH1 7.0m - 14.9m

BH2 6.1m – 11.7m

BH3 6.4m – 11.2m

BH4 6.0m – 11.7m

In addition dense sand was interpreted between the following depths:

BH1 N/A

BH2 11.7m – 16.0m

BH3 11.2m – 15.3m (with VL band 11.7m – 16.0m)

BH4 11.7m – 16.0m (with L band 13.2m – 14.7m)

Clay: A band of stiff clay was found as follows:

BH1 14.9m – 16.0m

BH3 15.3m – 16.8m