Geotechnical Assessment

Prepared For:

Webber Architects

Site Address:

Warringah Recreation Centre – Cnr Pittwater & Kentwell Road, North Manly

Ref No:

70251-IDF

Date:

June 2024

Accredited for compliance
With ISO/IEC 17025
NATA Accreditation No.
19226

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Contents

1.0 INTRODUCTION

Ideal Geotech has prepared this report to discuss the results of the geotechnical investigation undertaken for the proposed commercial development at Warringah Recreation Centre; corner of Pittwater and Kentwell Road, North Manly.

The proposed development indicated on the plans provided by the client comprises construction of a proposed squash club. It is understood minimal cut and fill will be undertaken to accommodate construction of the proposed works.

2.0 SITE DETAILS

Site Address	Warringah Recreation Centre – Cnr Pittwater and Kentwell Road, North Manly
Client	Webber Architects
Council Area	Northern Beaches Council

2.1 Geology

Reference to the Sydney 1:100,000 geological map (Geological Series Sheet 9130) indicates that the site is underlain by Quaternary deposits consisting of silty to peaty quartz sand, silt and clay. Ferruginous and humic cementation in places and common shell layers.

Image 1: Geological Series Map

2.2 Site Description

The subject site is roughly rectangular in shape and approximately 10,000m^2 in area and is bound by Pittwater Road to the north east, Kentwell Road to the south, Brookvale Creek to the west and by Warringah Golf Course on all remaining sides.

The site is currently occupied by tennis courts and sports facilities. The site is relatively flat with no notable slopes that will impact construction with a line of large mature trees along the western, northern and eastern boundaries.

Image 2: Site Location

3.0 GEOTECHNICAL INVESTIGATION

Fieldwork was undertaken on 13 June 2024 and included drilling two (2) boreholes using a hand auger to a maximum depth of 2.0m (BH1-BH2), drilling three (3) boreholes (BH3-BH5) using a 4wd mounted drill rig using solid flight spiral augers to a maximum depth of 6.0m, one DCP density test (DCP6) where surface was unable to be penetrated with hand equipment, and one location was unable to be tested due to concrete layer (UTP); at the locations shown on Figure 1, attached in Appendix A. The Boreholes were supplemented with Dynamic Cone Penetrometer (DCP) tests for the measurement of soil strength properties.

Borehole logs and field observations are presented in Appendix B.

3.1 Soil Profiles

A general summary of the subsurface conditions encountered across the site is presented in Table 2 below.

Table 2: Summary of Subsurface Conditions

Borehole	Depth of fill/topsoil (m)	Depth to Water table (m)	Termination depth (m)	Summary of sub-surface profiles
BH1	0.8	0.9*	2.0 (Hand Auger)	Fill- Silty Gravelly SAND / Natural- Silty Clayey SAND
BH2	1.0	1.1*	2.0 (Hand Auger)	Fill- Silty Gravelly SAND / Natural- Silty Clayey SAND
BH3	0.6	0.9*	2.0 (Hand Auger)	Topsoil- Silty SAND / Natural- Silty Clayey SAND / Silty Clayey Sand
BH4	0.4	2.6	6.0	Topsoil- Silty SAND / Natural- Silty Clayey SAND / Silty Clayey Sand
BH5	1.1	2.8	6.0	Topsoil- Silty SAND / Natural- Silty Clayey SAND / Silty Clayey Sand
BH6	NE	NE	6.0	Density test only
BH7	UTP			Unable to Penetrate

* *Water Seepage (Not standing water table)*

NE *Not Encountered*

Groundwater was observed at the time of investigation at the depths outlined in Table 2. BH1-BH3 had evidence of water seepage and BH4-BH5 showed a standing water table. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

4.0 RECOMMENDATIONS

4.1 Site Classifications

This site is classified as Class S in accordance with AS2870 – 2011:

As defined in AS 2870-2011, Table 2.1 and section 2.2.3, this site will be classified as Class S, Slightly Reactive based on laboratory testing and natural soil profile as encountered on this limited scope investigation. The site is estimated to have a Characteristic Surface Movement (ys) in the range between 0mm and 20mm.

It must be emphasized that the soil movement (heave) mentioned and recommendations referred to in this report are based solely on the soil profile observed at the time of the investigation for this report, without taking into account any abnormal moisture conditions that might be created thereafter. With abnormal moisture conditions, distresses will occur and may result in non-acceptable probabilities of serviceability and safety of the building during its design life. If these distresses are not acceptable to the builder, owner or other relevant parties then further fieldwork and revised footing recommendations must be carried out.

This type of investigation (as per our commission) is not designed or capable of locating all soil conditions. Therefore, it is recommended that the builder engage the service of this company (Ideal Geotech) to confirm the soil profile and "Site Classification" at footing excavation stage if required.

4.2 Footings - Allowable Bearing Capacity

All footings should be founded below any uncontrolled fill or deleterious materials. All footings for the same structure should be founded on strata of similar density and reactivity to minimise the risk of differential movements.

All footing excavations should be inspected prior to installation of structural steel by Ideal Geotech or a suitably experienced engineer or geotechnical consultant to confirm that the founding conditions are as described in this report. All loose material should be cleared from the footing excavations before concrete is poured.

4.2.1 High Level Footings

High-level footing alternatives could be expected to comprise slabs-on-ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in the loose sand (below uncontrolled fill or other deleterious material) may be proportioned on an allowable bearing capacity of 70kPa. The founding conditions should be assessed by a geotechnical consultant or experienced engineer to confirm suitable conditions.

4.2.2 Piered Footings

Piered footings are considered as an alternative to deep edge beams or high-level footings. Piered footings, founded in the medium dense sand could be proportioned on an end bearing pressure of 130kPa.

The potential for volume change in the subsurface profile should be considered by the designer as the piered footing may move with the soil and undergo differential settlement or heaving.

4.3 Batter Slopes

We understand that excavation will be required during the construction phase. Excavations or trenches in the sand could not be expected to stand vertical in the short-term. Where personnel are to enter excavations, options for short-term excavations include benching or battering back of excavations to 1H:1V.

Unsupported permanent excavations (where not supporting existing structures) in the in-situ material batters should be sloped back at gradients not steeper than 4H:1V, subject to inspection of the strata exposed in the faces by a geotechnical professional.

Un-retained excavations should not extend below the "zone of influence" of adjacent structures. That is, a line drawn 45° down from the foundation level of adjacent structures or features (including paths, fences, stairs etc). If excavations are to extend below this line, proposed excavations are to be retained prior to excavation.

4.4 Excavation Conditions and Retaining Walls

Excavations should be readily achievable with conventional earthmoving equipment such as backhoes and excavators with bucket attachment up to the depths of the boreholes.

We would recommend that the method and size of proposed excavation equipment are advised and inspected prior to excavation.

All structural retaining walls should be engineer designed. Design of retaining walls should:

- Consider surcharge loading from slopes and structures above the wall;
- Take into account loading from any proposed compaction of fill behind the wall;
- Provide adequate surface and subsurface drainage behind retaining walls;
- Utilise materials that are not susceptible to deterioration;
- Ensure walls are founded in materials appropriate for the loading conditions.

4.5 Filling/Earthworks

In the event fill is to be placed Ideal Geotech recommends the placement of engineered fill be carried out in accordance with AS3798-2007 "Guidelines on Earthworks for commercial and residential developments".

In summary, engineered fill should comprise the following:

- Prior to filling, any soft material and vegetation should be removed down to a firm base.
- Suitable fill material shall be placed in loose horizontal layers not exceeding 250mm in thickness.
- The fill shall be compacted to a Dry Density Ratio of at least 95% Standard (AS1289: 5.1.1, 5.4.1 or 5.7.1);
- The fill should be compacted to within +/-2% of the soil's optimum moisture content
- The fill material shall not contain greater than 20%, by volume, of particles coarser than 37.5mm and no particle over 200mm in any dimension.
- Under no circumstances should any additional fill contain significant amount of organic matter or be a mixture of greatly different particle sizes.

5.0 LIMITATIONS

This type of investigation (as per our commission) is not designed or capable of locating all ground conditions, which can vary even over short distances. The advice given in this report is based on the assumption that the test results are representative of the overall ground conditions. However, it should be noted that actual conditions in some parts of the site might differ from those found. If excavations reveal ground conditions significantly different from those shown in our findings, Ideal Geotech must be consulted.

The scope and the period of Ideal Geotech services are described in the report and are subject to restrictions and limitations. Ideal Geotech did not perform a complete assessment of all possible conditions or circumstances that may exist at the Site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Ideal Geotech in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ideal Geotech for incomplete or inaccurate data supplied by others.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

6.0 REFERENCES

- *Geological Series Sheet 9130, Map of Sydney, scale 1:100,000*
- *AS 2870-2011 Residential Slabs and footings*
- *AS3798-2007 Guidelines on earthworks for commercial and residential developments*
- *AS1289: 5.1.1, 5.4.1 or 5.7.1 Methods of testing soils for engineering purposes – Soil compaction and density tests*
- *Architectural plans/ building plans/ surveyor plans*

For and on behalf of

Ideal Geotech

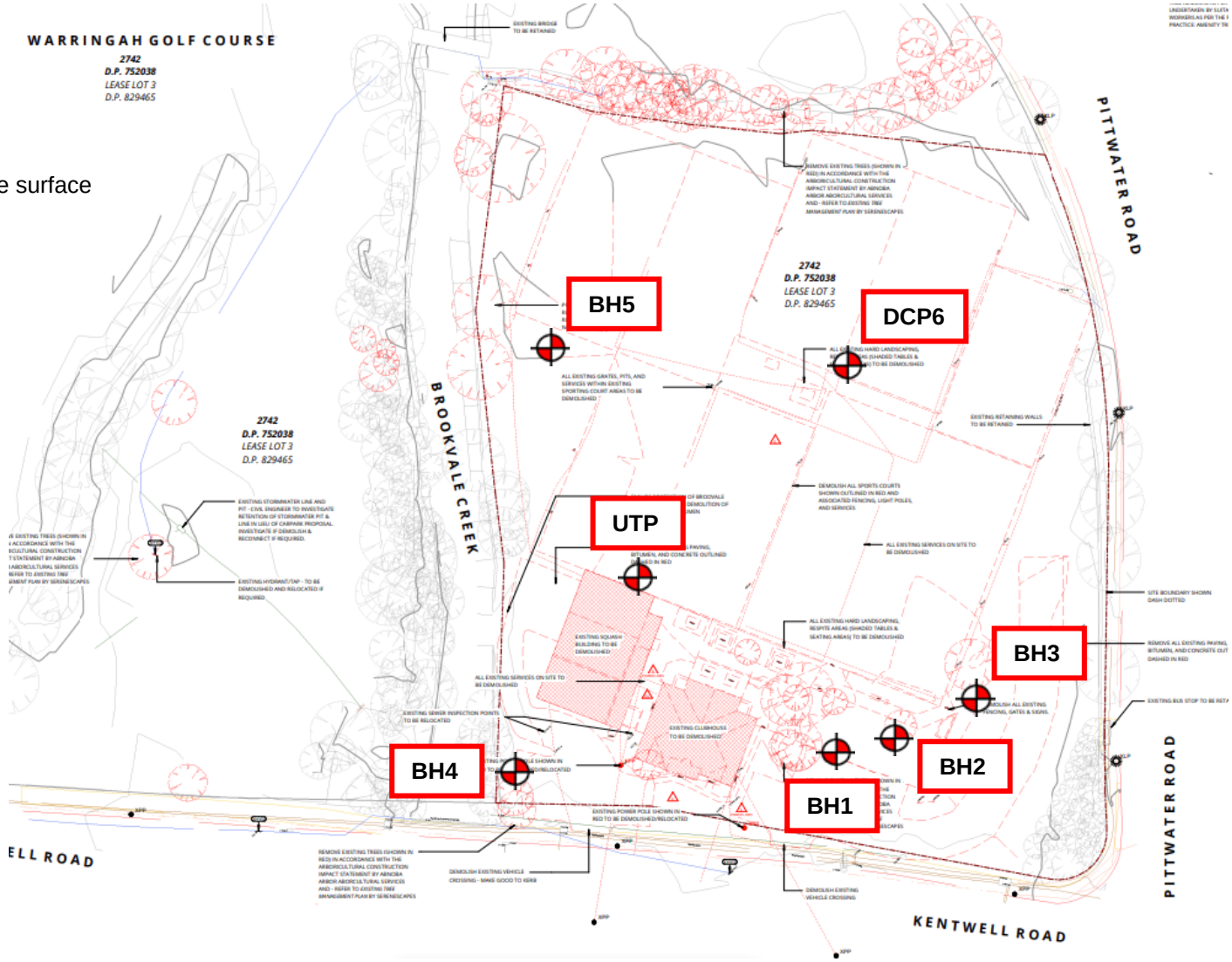
D. Dwyer

Dane Dwyer
Geotechnical Engineer

7.0 APPENDICES

7.1 Appendix A – Borehole Location Plan

UTP: Unable to penetrate surface



Title	Borehole Location Plan	**Council**	Northern Beaches Council	**Drawn By**	Ben
Project	Geotechnical Assessment	**Job Number**	70251-IDF	**Checked By**	Dane
Site Address	Warringah Golf Club – Kentwell Road, North Manly	**Figure Number**	Figure 1	**Date**	Jun-24

NORTH POINT

7.2 Appendix B – Borehole Logs

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5.1 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kenneth Road, NORTH MANLY, NSW, 2100

Borehole: BH1
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
No water observed	2 1 2 1 1 2 2 3		0.5	FILL		SM	Silty Gravelly SAND Brown	Slightly Moist	Loose
	4 4		1.0	NATURAL		SM	Silty Clayey SAND Grey Black	Very Moist	Medium Dense
	4 3 3 3 3 4 2 2 2		1.5 2.0						
	2 2 3 4 4 4 4 3 3 3		2.5 3.0				End Bore (Hand Auger) 2m		
	3 4 5 5 5 5 4 4 4		3.5 4.0						
	5 4 4 5 6 6 5 5 6 5		4.5 5.0						
	7 8 9 7 8 8 7 7 7		5.5						

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

SAND – Density Index vs Approx. Penetrometer results

DENSITY		Density Index	DCP Blow Count (blows/100mm)
VL	Very Loose	< 15 %	< 1
L	Loose	15 – 35 %	1 – 3
MD	Medium Dense	35 – 65 %	3 – 9
D	Dense	65 – 85 %	9 – 15
VD	Very Dense	> 85 %	> 15

SILTS & CLAY – Cu vs Approx. Penetrometer results

CONSISTENCY		Undrained Shear Strength (kPa)	DCP Blow Count (blows/100mm)
VS	Very Soft	0 – 12	< 1
S	Soft	12 – 25	1 – 2
F	Firm	25 – 50	2 – 3
St	Stiff	50 – 100	3 – 5
VSt	Very Stiff	100 – 200	5 – 8
H	Hard	> 200	> 8

MOISTURE

D	Dry
M	Moist
W	Wet
W_P	Plastic Limit
W_L	Liquid Limit
m	Moisture

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5.2 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kenneth Road, NORTH MANLY, NSW, 2100

Borehole: BH2
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
No water observed	1 2 3 3 6 5 15 7 4 4		0.5 1.0	FILL		SM	Silty Gravelly SAND Brown	Slightly Moist	Loose
	4 4 3 2 2 2 2 3 3 3		1.5 2.0	NATURAL		SM	Silty Clayey SAND Grey Black	Very Moist	Medium Dense
	3 4 4 3 3 3 3 3 3 3		2.5 3.0				End Bore (Hand Auger) 2m		
	4 4 4 4 4 5 5 4 4 5		3.5 4.0						
	5 5 5 6 6 5 5 5 5 5		4.5 5.0						
	5 6 6 6 6 5 5 6 6		5.5						

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

SAND – Density Index vs Approx. Penetrometer results

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SILTS & CLAY – Cu vs Approx. Penetrometer results

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VS	Very Soft	0 – 12	< 1
S	Soft	12 – 25	1 – 2
F	Firm	25 – 50	2 – 3
St	Stiff	50 – 100	3 – 5
VSt	Very Stiff	100 – 200	5 – 8
H	Hard	> 200	> 8

MOISTURE

D	Dry
M	Moist
W	Wet
W_P	Plastic Limit
W_L	Liquid Limit
m	Moisture

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5.3 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kimbriki Road, NORTH MANLY, NSW, 2100

Borehole: BH3
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
No water observed	3 1 1 1 1 2		0.5	TOPSOIL		SM	Silty SAND Black Grey	Slightly Moist	Loose
	1 2 1 1		1.0	NATURAL		SM	Silty Clayey SAND Black Grey	Very Moist	Loose
	1 1 1 1 2 2 2 2 1 1		1.5 2.0						
	1 2 2 2 3 4 3 2 3 2		2.5 3.0						
	2 2 2 2 3 3 3 3 3 2		3.5 4.0						
	2 2 2 2 2		4.5						
	2 3 6 6 2		5.0	NATURAL		SM	Silty Clayey SAND Black Grey	Very Moist	Medium Dense
	3 2 4 5 5 7 8 8 8		5.5				End Bore 6m		

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

SAND – Density Index vs Approx. Penetrometer results

DENSITY		Density Index	DCP Blow Count (blows/100mm)
VL	Very Loose	< 15 %	< 1
L	Loose	15 – 35 %	1 – 3
MD	Medium Dense	35 – 65 %	3 – 9
D	Dense	65 – 85 %	9 – 15
VD	Very Dense	> 85 %	> 15

SILTS & CLAY – Cu vs Approx. Penetrometer results

CONSISTENCY		Undrained Shear Strength (kPa)	DCP Blow Count (blows/100mm)
VS	Very Soft	0 – 12	< 1
S	Soft	12 – 25	1 – 2
F	Firm	25 – 50	2 – 3
St	Stiff	50 – 100	3 – 5
VSt	Very Stiff	100 – 200	5 – 8
H	Hard	> 200	> 8

MOISTURE

D	Dry
M	Moist
W	Wet
W_P	Plastic Limit
W_L	Liquid Limit
m	Moisture

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5.4 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kenneth Road, NORTH MANLY, NSW, 2100

Borehole: BH4
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
	4 4 2 1			TOPSOIL		SM	Silty SAND Black Grey	Slightly Moist	Loose
	3 1 2 2 2 1		0.5 1.0	NATURAL		SM	Silty Clayey SAND Black Grey	Very Moist	Loose
	2 1 1 1 1 1 2 3 2 2		1.5 2.0						
▼	2 2 1 1 3 2 3 4 5 5		2.5 3.0						
	5 5 4 6 5 5 5 5 3 3		3.5 4.0						
	4 6 6 5 7 7 8 6 7 8		4.5 5.0						
	7								
	9 9 9 9 7 8 9 8		5.5	NATURAL		SM	Silty Clayey SAND Black Grey End Bore 6m	Very Moist	Medium Dense

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

SAND – Density Index vs Approx. Penetrometer results

DENSITY		Density Index	DCP Blow Count (blows/100mm)
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VS	Very Soft	0 – 12	< 1
S	Soft	12 – 25	1 – 2
F	Firm	25 – 50	2 – 3
St	Stiff	50 – 100	3 – 5
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MOISTURE	
D	Dry
M	Moist
W	Wet
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5.5 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kenneth Road, NORTH MANLY, NSW, 2100

Borehole: BH5
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
	2 1 1 1 2 1 2 3 2 1		0.5 1.0	TOPSOIL		SM	Silty SAND Black Grey	Slightly Moist	Loose
	1 1 2 2 2 1 1 1 3 1		1.5 2.0	NATURAL		SM	Silty Clayey SAND Black Grey	Very Moist	Loose
▼	3 2 2 2 2 2 2 3 4 4		2.5 3.0						
	3 4 4 5 5 6 5 5 4 4		3.5 4.0						
	4 4 4 5 7 8 7 8 7 7		4.5 5.0						
	7 7 7								
	7 7 7 9 9 9		5.5	NATURAL		SM	Silty Clayey SAND Black Grey End Bore 6m	Very Moist	Medium Dense

▼ Water Table **UTP** - Unable to penetrate **DCP** - 9kg Dynamic Cone Penetrometer **PP** - Pocket Penetrometer

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	DENSITY	Density Index	DCP Blow Count (blows/100mm)
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5.6 FIELD LOG

Date: 13/06/2024
Customer Job: Signed Quote
Ideal Job: 2897-70251
Site Address: Warringah Golf Club Cnr Pittwater and Kenneth Road, NORTH MANLY, NSW, 2100

Borehole: BH6
Surface RL:
Easting:
Northing:

Water	DCP Blows/100mm (10, 20, 30, 40)	Samples	Depth	Material Origin	FILL Depth	Classification Code	Material Description	Moisture	Density / Consistency
No water observed	3 3 3 3 3 2 1 1 1		0.5						
	1 1 1 1 1 1 1 1 1 2		1.0 1.5 2.0						
	2 2 3 4 2 2 2 2 2 2		2.5 3.0						
	2 2 3 3 2 2 2 2 2 5 7		3.5 4.0						
	8 6 6 6 6 6 6 8 8 7		4.5 5.0						
	7 7 7 6 7 7 7 8 8		5.5						

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