Geotechnical Interpretative Report

Royal Prince Alfred Hospital – Eastern Campus

80022026

Prepared for
TSA Management c/o NSW Health Infrastructure (NSW HI)

16 February 2022

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1 INTRODUCTION

1.1 Background

Cardno, now Stantec Pty Ltd was engaged by TSA Management (TSA) ("the client") on behalf of NSW Health Infrastructure, to undertake an Interpretative geotechnical and contamination investigation report to determine the in-situ ground conditions, for the proposed redevelopment of Royal Prince Alfred Hospital (RPA) – Eastern Campus. The contents of this report detail the ground investigation, methodology, presentation of factual data obtained and interpretation of data appropriate for the design and construction.

The investigatory RPA Eastern Campus ("the Site") is approximately 4.5 Ha in area, located in Sydney's inner west suburb of Camperdown. The site resides under the Local Government Area (LGA) of City of Sydney.

The ground assessment comprised boreholes at nominated locations across the subject site in order to obtain relevant geotechnical and environmental information to aid detailed design for site redevelopment.

This report only presents the results of the geotechnical investigation works undertaken at RPA. A separate report has been prepared for environmental conditions encountered on site and is provided in Ref: 80022026, entitled "*Desktop Contamination Assessment with Limited Sampling*", by Cardno (NSW/ACT) Pty Ltd.

1.2 Purpose and Scope of works

The purpose of this report is to provide the client with geotechnical advice on the in-situ subsurface conditions encountered, along the proposed redevelopment works.

The scope of works undertaken are presented below:

i) Undertaking a desktop study of existing geotechnical information for the site and surrounding areas.
ii) Site Investigation will be carried out in accordance with AS 1726:2017 Geotechnical Investigation. The locations and depths to be undertaken following discussions with Project Civil Engineer.
iii) Preliminary work, including preparation of a Field Work Safety and Environmental Plan (FWSEP), Safe Work Method Statements (SWMS) and site-specific paperwork and inductions as required;
iv) Undertaking a Dial-Before-You-Dig search and check the site using an electronic services locator and GPR (ground penetrating radar).
v) Undertake boreholes drilling as indicated on the attached plans. This includes the following
   - Drilling of four (4) boreholes (BHs) up to a depth of 5m to 8m using track and/or ute mounted geotechnical drill rig with solid flight augers and Tungsten Carbide (TC) bit.
   - Drilling of four (4) BHs to 3m into medium strength rock. Coring of the rock was carried out using NMLC diamond drilling techniques;
vi) Undertake in-situ Standard Penetration Tests (SPT), including recovery of samples, at 1.5 m intervals in the boreholes to assess sub-surface geotechnical strength and geological material characteristics;
vii) Reinstate borehole locations, back-filling with spoil cuttings and topping up with sand, cement grout and rapid set concrete. In instances where this method is not suitable the reinstatement shall match the existing area i.e. pavers, bitumen etc.

viii) Survey of the investigation locations by using survey equipment Topcon GNSS Receiver to determine the ground co-ordinate marks and collar elevation, referencing to GDA 2020, Zone 56 and AHD (m) respectively;

ix) Installation of one (1) Groundwater (GW) monitoring well in one of the drilled borehole;

x) Laboratory testing to be carried out on representative samples by Cardno NATA accredited laboratory, which may include:

- Particle Size Distribution (AS1289.3.6.1);
- Atterberg Limits (AS1289.3.4.1 – 3.3.1 – 3.2.1);
- Moisture Contents (AS1289.2.1.1);
- California Bearing Ratio (CBR) (AS1289.6.1.1);
- Soil Aggressiveness testing (Sulphate, Chloride, Electrical Resistivity and pH testing);
- Point Load (PL) Tests; and
- Unconfined Compressive Strength (UCS).
- Acid sulphate soil (ASS) testing (covered in environmental report)

xi) Provision of a Geotechnical Report

1.3 Previous Investigation

Douglas Partners (DP) have previously carried out a geotechnical investigation, (Ref: 99709.00 R.001.Rev0 dated 26 August 2020) for the same site which included four rock cored boreholes (BH201 – BH204). This report also included previous borehole logs carried out in 1989 (Proj Ref: 12093) and 1998 (Proj Ref: 27456) by DP.

The geotechnical information provided in DP's report also has been taken into consideration in our report. The previous borehole locations are shown on Appendix A – site plan together with cross section of subsurface profiles from previous and current investigations.

DP has carried out a total of 4 BHs (BH201 – BH024) in 2020 in the eastern campus, which were drilled to a depth of approx. 14 to 16m below surface level (BSL). Two (2) Groundwater monitoring wells at BH201 and BH202 were installed. The subsurface profile consisted of Pavement/Fill overlying Residual Clay and Ashfield shale bedrock. The bedrock comprised of very low to low strength laminite over medium to very high strength laminite/siltstone.

The geotechnical investigation carried out by DP in 1989 comprised of six boreholes (BH1 to BH6) for Eastern Campus which were drilled up to 9.70m BSL. The subsurface profile comprised of Pavement/Fill overlying Residual Clay and Laminite. The Laminite varied from low to high strength.

The geotechnical investigation from 1998 comprised of 17 boreholes (BH1 to BH17) for the Eastern precinct. Those boreholes were drilled up to 11.45m BSL. The subsurface conditions comprised of Fill underlain by residual clay and shale and laminite bedrock. The laminate varied from low to high strength.

The interpretation of previous boreholes was carried out in accordance with Pells et al (2019) publication "Classification of Sandstone and Shales in the Sydney Region: A Forty Year Review". The interpreted subsurface profiles have been shown in the cross section provided in Appendix A – Site Plan. The borehole logs and test results are presented in Appendix E.

2 SITE DESCRIPTION

2.1 Site Description

The Royal Prince Alfred Hospital (RPA) campus is located in Sydney's inner west suburb of Camperdown. It is situated between Sydney University to the east and the residential area of Camperdown to the west. The campus is divided by Missenden Road, which runs north to south dividing the campus into two distinct portions, called East Campus and West Campus as show in Figure 2-1 below:

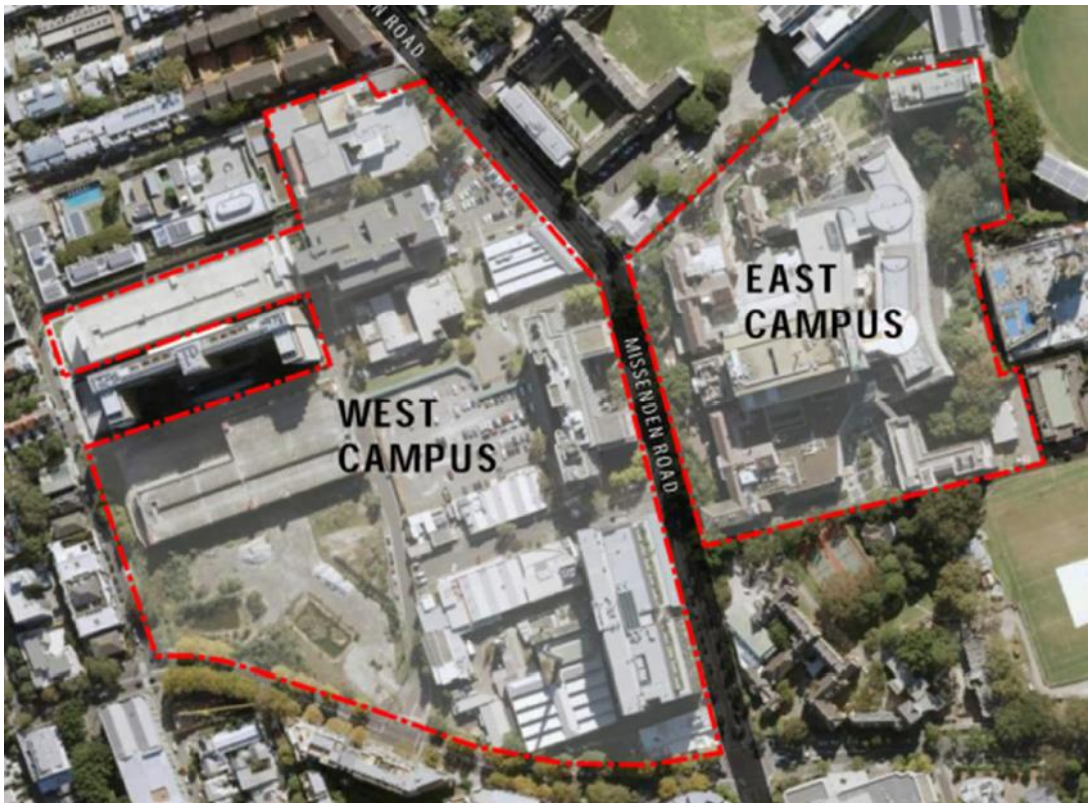

Figure 2-1 RPA Hospital Campus

The RPA Hospital campus (outlined in red in Figure 2-1 above) incorporates a diverse range of operations including research, education, student housing, acute quaternary health services, as well as healthcare in both private and public domains.

There is an internal road called John Hopkins Drive / Lambie Dew Drive, which loops around the Eastern hospital from North west to the South East direction.

The following figure shows the locations of RPA buildings with unique building numbers for the entire eastern and western campus.

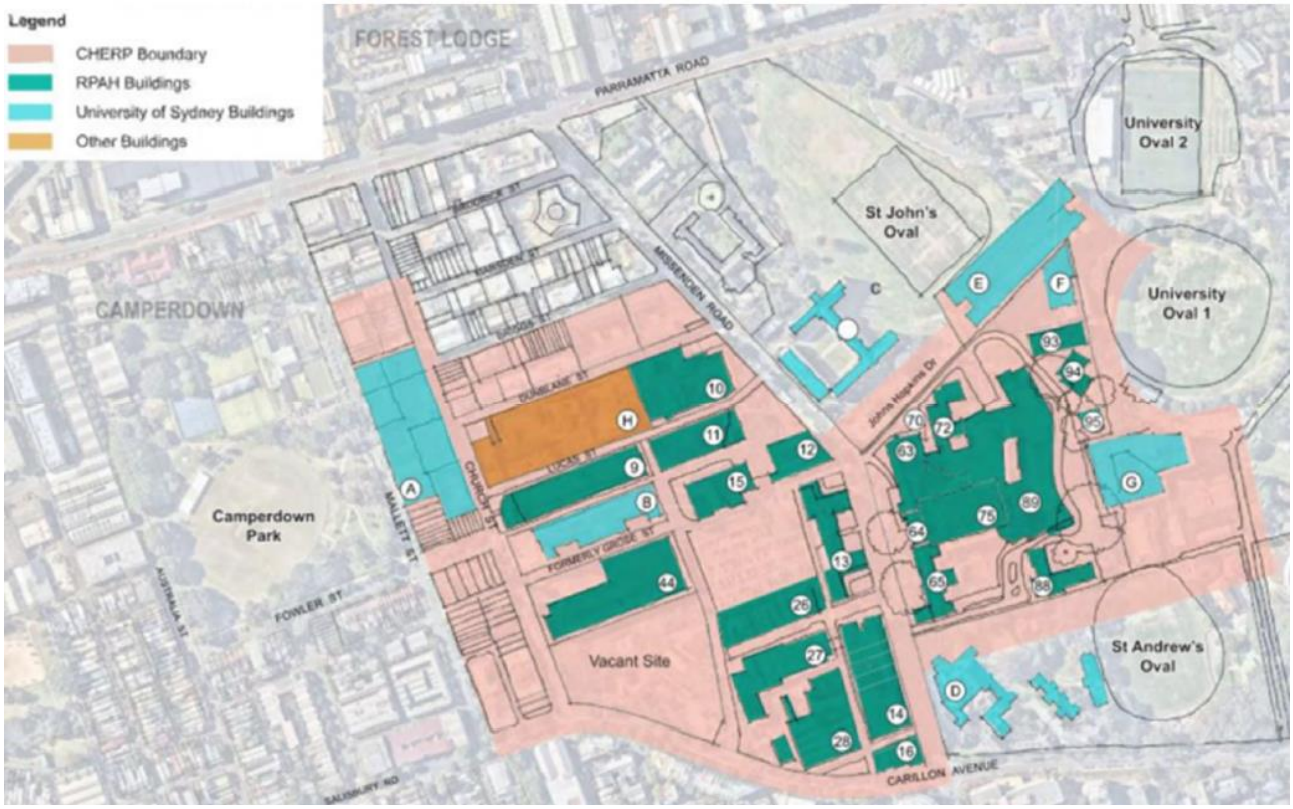

Figure 2-2 RPA Hospital Campus with building numbers

The investigatory boreholes undertaken for the hospital redevelopment are shown in Figure 2-3 below, which are also attached in **Appendix A – Site Plan**:

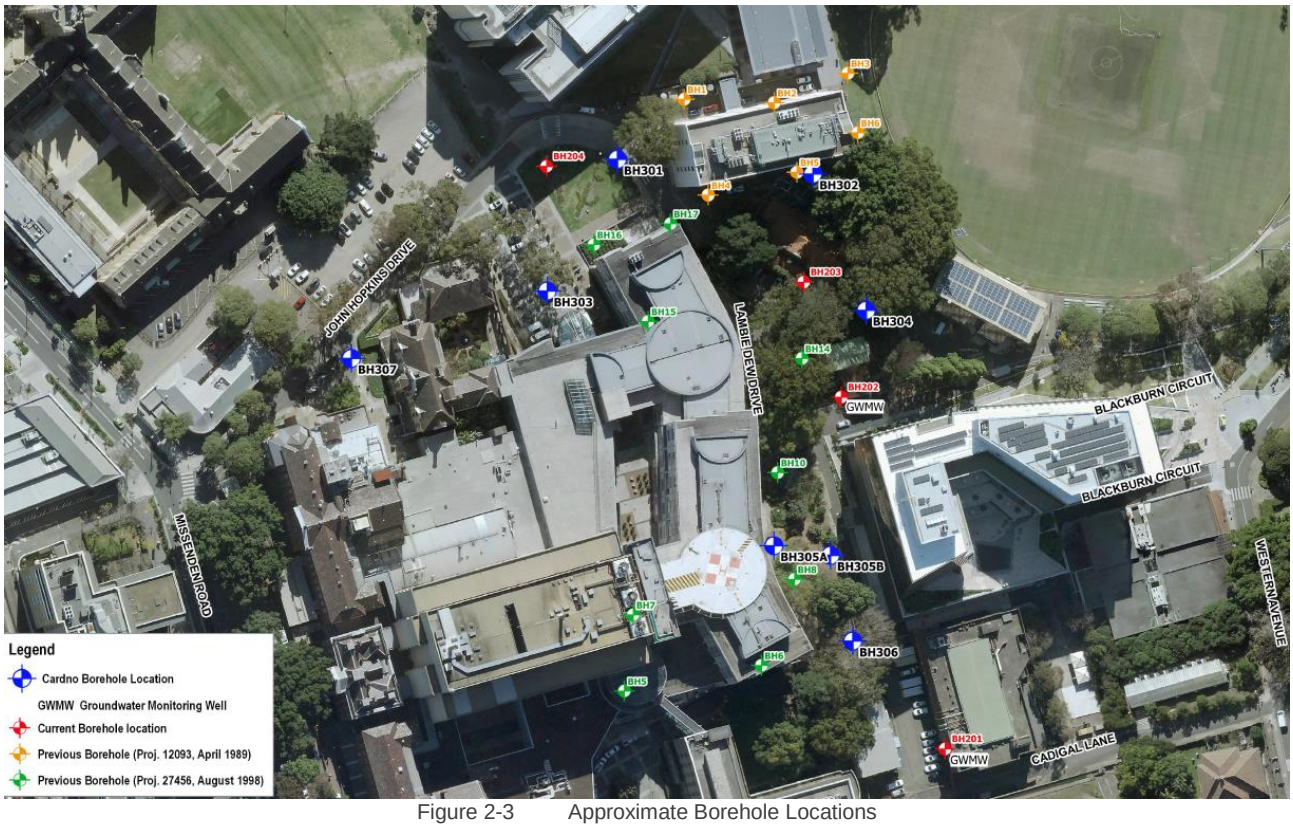

Figure 2-3 Approximate Borehole Locations

2.2 Topography and Drainage

The ground surface levels generally fall towards in an easterly direction with elevation levels varying from approx. RL 29 m AHD (westerly – BH307) to RL 19 m AHD (easterly-BH 302).

Various drainage stormwater pits were present throughout the site; however, their functionality was not assessed at the time of investigation. Majority of the site consisted of hardstand pavement areas and some landscaped / garden areas were present towards the North and East of Building 89.

Based on our site observations, there are no potential risks surrounding the building that may potentially cause landslip risks and the site is not located within high erosion potential area. There is no existing landslip prone area map available for Camperdown as well which suggests that the site is not located within the known occurrence of landslip.

2.3 Regional Geology

The Sydney 1:100 000 Geological Map, Herbert C, 1983, illustrates that the subject site ins underlain by Ashfield Shale (Rwa) of Wianamatta Group from Middle Triassic period of Mesozoic era. The map shows the site is underlain by Ashfield Shale (Rwa) which is charactered as Black to dark-grey shale and laminite.

Regional geology of the site area is presented in Figure 2-4 below:

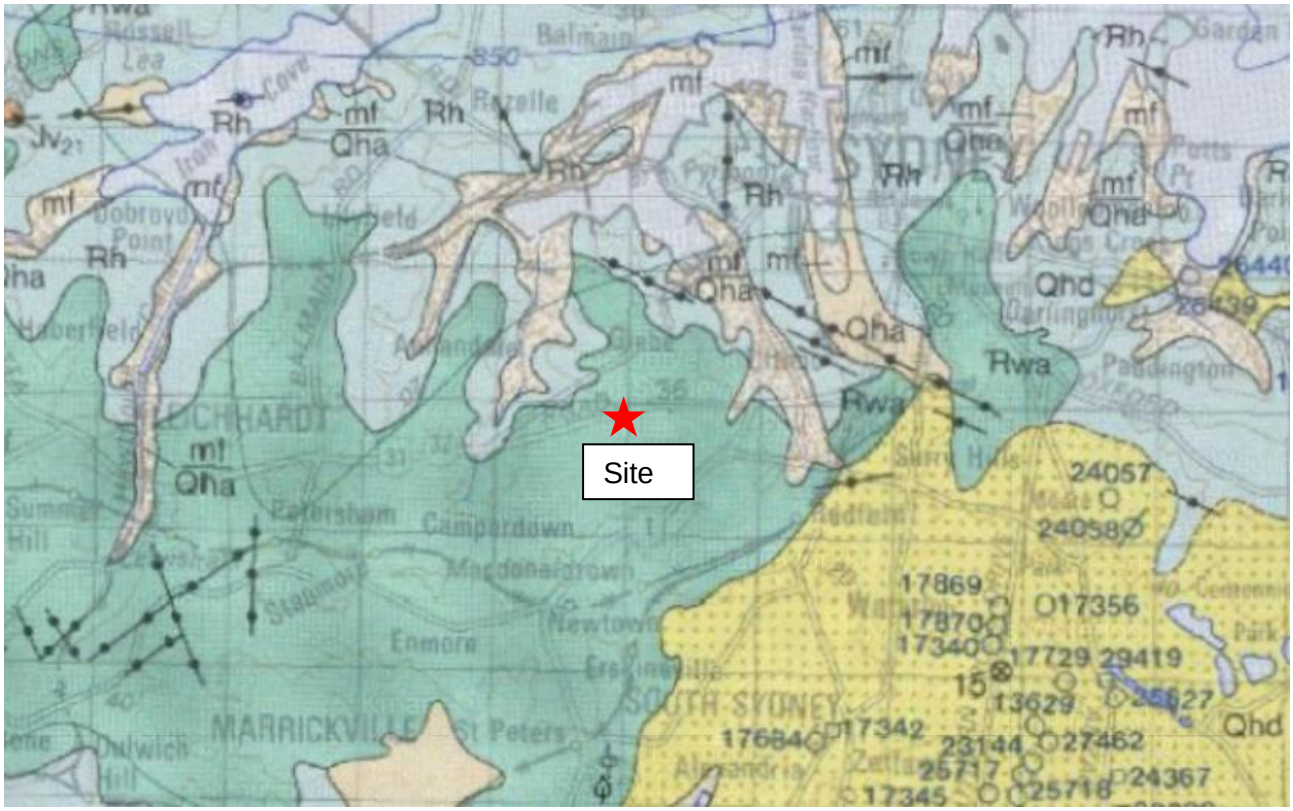

Figure 2-4 Geological Map, Herbert C., 1983, 1st Edition

3 INVESTIGATORY WORKS

3.1 Borehole Locations

The ground coordinates of boreholes are listed in Table 3-1 below. At the time of investigation, all boreholes were located by survey based on nominated borehole positions outside of overhead and underlying utility services. Upon completion of works, all boreholes were picked up with Topcon GNSS Receiver, to determine the ground coordinate marks and collar elevation, referencing to GDA2020, Zone 56 and AHD (m) respectively.

Table 3-1 Borehole Coordinates

ID	Easting (m)	Northing (m)	Elevation (m AHD)
BH301	332016.065	6248761.9	22.9
BH302	332076.300	6248757.4	19.7
BH303	331994.419	6248721.4	27.1
BH304	332092.740	6248715.4	21.9
BH305A	332064.290	6248642.9	24.2
BH305B	332081.752	6248640.0	22.6
BH306	332088.600	6248613.6	23.2
BH307	331934.052	6248700.6	29.8

3.2 Investigation Naming Convention

For fieldworks, the naming convention adopted for investigatory boreholes (BHs) was standardised in a sequential manner, since there are previously known ground investigations undertaken on the site by DP.

i) BH3xx – BH301, BH302, continuing – Represents investigatory boreholes undertaken across the subject site

ii) BH305 was subdivided into BH305A and BH305B. BH305A was shallow borehole undertaken mainly for CBR sampling whereas BH305B was carried out to identify the subsurface profile to deeper depth targeted for eastern extension to Building 89.

3.2.1 Fieldwork Activities

Fieldwork for the investigation was carried out from 29th of November to 3rd of December 2021, comprising of the following sequence of activities;

i) A review of Dial Before You Dig (DBYD) and on-site service search.
ii) Drilling of eight (8) boreholes (BHs) using a track and ute mounted drill rig. Four (4) BHs were drilled up to a depth of 8m below surface level (BSL) and four (4) BHs were drilled up to 15.21m BSL;
iii) Standard Penetration Tests (SPT) were undertaken within the soil profile at 1.50 m intervals;
iv) Collection of disturbed soil samples for laboratory testing;
v) Installation of one GW monitoring well at BH303 location;
vi) Reinstatement of boreholes

All fieldworks, including logging of the subsurface profile, collection of soil samples, was undertaken by Geotechnical Engineers from Cardno. The locations of the completed geotechnical investigations are shown on the borehole location plan, attached to this report in Error! Reference s

ource not found.**Appendix A – Site Plan.**

Subsurface conditions encountered are summarised in Section 6 and detailed in engineering borehole logs attached in **Appendix B** together with explanatory notes. Fieldwork was carried out in accordance with Australian Standard, AS1726-2017 '*Australian Standard - Geotechnical Investigations'*.

A breakdown of fieldwork activities is presented below:

3.2.1.1 Underground Service Search

A Dial Before You Dig (DBYD) underground service search was conducted by the Cardno for the site and surrounding area prior to the fieldworks. A qualified underground service locator, Astrea cleared the borehole locations from utilities, with the use of a pipe/cable locator & transmitter and ground-penetrating radar (GPR) prior to the drilling. Hand auguring was carried out for the first 1m of subsurface profile as non-destructive digging method.

3.2.1.2 Geotechnical Drilling

Investigatory drilling boreholes (BHs) were undertaken with the use of a tracked and Ute mounted rig operated by Stratacore drilling service.

Boreholes were drilled vertically (90 degrees from the horizontal). Drilling through the soil was carried out using solid flight auger with Tungsten Carbide "TC" – bit. Deep boreholes were further advanced with NMLC coring until competent rock was reached, which ever came first. Standard penetration tests (SPT) were undertaken through the soil profile at 1.50 m intervals, proceeding from 1.5m below surface level (BSL). SPT refusal was considered where 30 blows generated less than 150mm penetration.

3.2.1.3 Standard Penetration Testing (SPT)

SPT test involves raising and dropping a 63.5kg slide hammer 760mm to drive a thick-walled sample tube through the underlying layers. The number of blows it requires to penetrate the sample tube across 150mm increments is measured until the tube has penetrated 450mm into the subsurface, or the hammer is bouncing, causing refusal (Blow counts > 25).

SPT tests were undertaken, to assist with the assessment of in-situ soil strength parameters. The tests were performed at 1.0m – 1.5m increments until refusal was achieved. SPT tests are presented in engineering logs provided in **Appendix B**.

3.3 Laboratory Testing

Samples of representative strata were recovered and returned to NATA accredited laboratory. The following tests were carried out on selected samples:

i) Three (3) samples for atterberg limits and particle size distribution testing to aid for material classification;
ii) Two (2) samples for California Bearing Ratio (CBR) testing to aid for pavement design thickness;
iii) One (1) sample for shrink swell testing to aid for characteristic surface movement;
iv) Three (3) samples to aid with strength of the selected rock cores;
v) Three (3) samples to aid with chemical characterisation of the soils;
vi) Four (4) samples for Uniaxial Compressive Strength (UCS) testing to aid for rock strength; and
vii) Point load strength index tests were carried out every 1 m of recovered core where defect spacing provided enough core to carry out testing. A total of twenty (25) point load strength index tests were carried out;

The Laboratory test results for soils and rock are included in **Appendix C**. Laboratory testing was carried out in accordance with Australian Standard AS1289 'Laboratory Testing for Engineering

Purposes'.

4 PROPOSED DEVELOPMENT

The proposed development zone is situated within the Eastern campus as shown in Figures 4-1 below and the concept design plan prepared by Jacobs (Ref: IA0251300- MW- AR- DRG-0102(1)) for Eastern Campus is shown in Figure 4-2 below. The proposed development testing zone will encompass:

i) the building footprints of the new proposed development;
ii) areas between the existing buildings and new proposed development;
iii) John Hopkins Drive and Lambie Dew Drive due to potential civil works for road realignment/ enhancements and service diversions;
iv) Gloucester House Drive due to potential civil works for new in-ground services/ services connections;
v) existing Building 89 which may be subject to vertical expansion and refurbishment works to some levels;
vi) New Mortuary drop off within the access lift between levels 1 and 2 of Building 89;
vii) Relocation of the existing roller shutter door on the eastern side of the Clinical Services Building; and
viii) some departments within some levels of existing Buildings 63, 75, 94 and 95 which may be subject to refurbishment works

Figure 4-1 Proposed Development Zone – East Campus

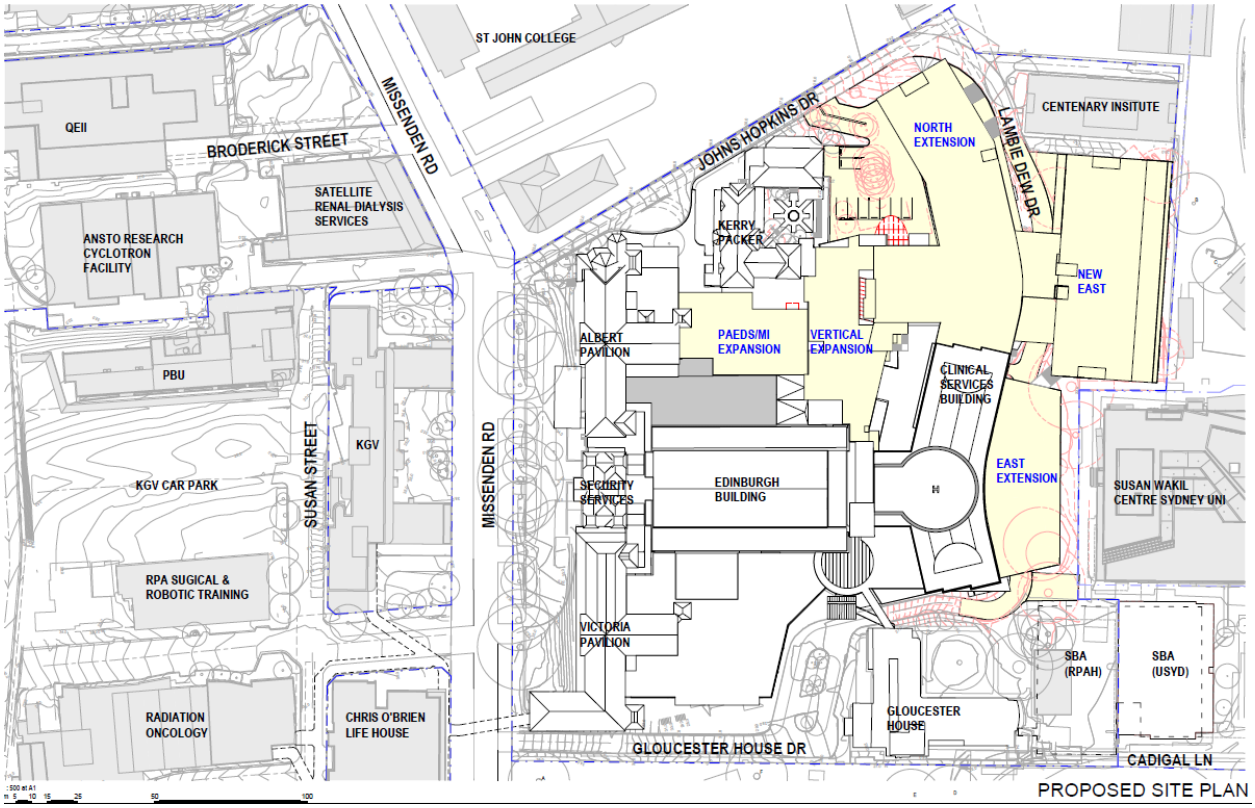

Figure 4-2 Proposed Concept Design Plan – East Campus (Prepared by Jacobs)

5 GROUND CONDITIONS ENCOUNTERED

A brief summary of the typical sub-surface conditions encountered within each investigatory locality is provided below. For full description of the sub-surface profiles encountered, reference can be made to the borehole logs presented in **Appendix B**.

5.1 Subsurface Strata

The ground conditions across the subject site were relatively uniform and resembled with the geology (Rwa – Ashfield Shale) as shown on the published map.
The subsurface profiles encountered across the site were as follows:

> Asphaltic concrete / concrete paver, between 0.00 m and 0.40 m, overlying;
> Fill consisting of Gravelly Sand, Silty/Sandy Clay, between 0.10 m and 3.30 m, overlying;
> Possible residual soil, comprising of silty CLAY, between 0.15 m to 3.30 m, overlying;
> Residual Silty CLAY, between 1.45 m to 7.00 m;
> Bedrock, comprising of Siltstone/Laminite, between 4.10 m to 15.21 m;

The subsurface profile is summarised in Table 5-1 below, and presented in engineering logs attached in Appendix B, together with explanatory notes.

Table 5-1 Subsurface Conditions Summary

BH ID	Soil Description / Depth (m) BSL						
	Asphaltic Concrete / Paver	Fill (Gravelly SAND)	Fill (Silty / Sandy Clay)	Residual Silty CLAY	Bedrock Siltstone/ Laminite	Target Depth	GW Encountered Depth m BSL
BH301	0.0-0.10	0.10-0.50	0.50-2.0	2.0-4.50	4.50-TD	7.90(R)	-
BH302	0.0-0.05	-	0.05-1.45	1.45-4.10	4.10-TD	14.36	-
BH303	0.0-0.40	0.40-0.70	0.70-3.10	3.10-4.70	4.70-TD	14.00	-
BH304	0.0-0.10	0.10-2.00	2.00-3.30	3.30-5.20	5.20-TD	15.21	-
BH305A	-	0.0-0.30	0.30-2.50	2.50-TD	-	3.00	-
BH305B	-	0.0-0.30	0.30-2.50	2.50-7.00	7.00-TD	8.00(R)	-
BH306	-	0.0-0.50	0.50-1.50	1.50-6.40	6.40-TD	14.97	4.50 6.00 (Seepage)
BH307	0.0-0.05	0.05-0.30	0.30-0.60	0.60-5.30	5.30-TD	5.50	-

Notes:
1. All depths measured in metres below ground surface level (Refer to Table 4-1) at the time of the investigation.
2. Refer to attached Soil Description, Rock Description and Glossary of Terms on Appendix B for a full list of symbols and terms.
3. Soil Classification follows United Soil Classification system (USCS).
4. TD = Termination Depth.
5. R = Auger Refusal Depth
6. BSL = Below Surface Level

5.2 Groundwater

Groundwater seepage was encountered at 4.50m and 6.00m BSL within BH306 during investigatory borehole drilling. A groundwater monitoring well was also installed at the BH03 location. There were two monitoring wells previously installed by DP at BH201 and BH202.

It should be noted that groundwater levels may fluctuate depending on the time of year and following periods of wet weather.

The following table shows a summary of the groundwater levels encountered and measured during the investigation:

Table 5-2 Groundwater Monitoring Results

Borehole ID	Date and Time	Depth m BSL	RL m AHD
BH201	12/01/22 @1045	1.69	21.51
BH202	12/01/22 @0930	5.72	20.68
BH303	12/01/22 @0800	7.81	19.29

5.3 Laboratory testing results (Geotechnical)

5.3.1 Soil Properties and classification

A summary of the material classification testing on selected samples are presented below, in Table 5-3. Geotechnical laboratory test results have been presented in **Appendix C**.

Table 5-3 Soil Classification lab results summary

Borehole	Depth (m)	MC (%)	Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)	LS (%)
BH 302	2.0-2.50	20.4	3	8	89	54	20	34	12.5
BH 303	4.0-4.50	17.4	1	10	89	53	20	33	13.0
BH 305B	4.0-4.50	23.1	8	13	79	62	21	41	17.5

Notes:
LL: Liquid Limit MC: Field Moisture Content
PL: Plastic Limit LS: Linear Shrinkage
PI: Plasticity Index NP: Non-Plastic

5.3.2 California Bearing Ratio (CBR)

Results of CBR and Standard Maximum Dry Density (SMDD) tests on selected samples from the investigatory boreholes are summarised below in Table 5-4.

Table 5-4 CBR Laboratory Results

Hole ID	Depth (m BSL)	SMDD (t/m3)	OMC (%)	CBR (%)	Swell (%)
BH 305A	2.50-3.00	1.70	19.5	3.5	2.5
BH 301	0.50-1.00	1.54	25.0	5.0	1.5

Notes:
1. CBR testing was undertaken on remoulded specimens compacted to a target 100% standard maximum dry density with a surcharge of 4.5 kg and soaked for four days. Subgrade strength is moisture and density dependent and where the existing subgrade is compacted to 100% standard compaction and moistures above OMC exist, the in situ CBR values may be less than the above tested values.
2. OMC – Optimum Moisture Content

5.3.3 Shrink Swell Test

The results of the shrink swell test are presented in Table 6-5 below.

Table 5-5 Results of Shrink Swell test

Borehole Number	Depth (m)	Shrink Swell Index %
BH307	1.00 - 1.45	2.2

5.3.4 Uniaxial Compression Strength

The results of uniaxial compression strength (UCS) testing on selected samples are summarised below in Table 6-6 below. The UCS and point load test results are attached in **Appendix C**.

Table 5-6 Uniaxial Compression Strength Results

Hole ID	**Sample Depth** (m BSL)	**Uniaxial Compressive Strength** UCS (MPa)
BH 302	10.68-10.85	52
BH 303	13.45-13.67	50
BH 304	15.00-15.11	36
BH 306	12.28-12.43	10

5.4 Laboratory testing results (Chemical)

5.4.1 Soil Aggressivity Test Results

Results of soil aggressivity tests on selected samples obtained from selected boreholes are summarised in Table 5-7 below:

Table 5-7 Environmental Soil Aggressivity Test results summary

Hole ID	Depth (m BSL)	Chloride (mg/kg)	Conductivity (µS/cm)	pH	Resistivity (ohm.cm)	Sulphate (mg/kg)	Moisture (%)	Exposure Classification [a] (AS2159-2009)
BH302	2.50	31	150	5.1	6800	37	17	Mild aggressive to steel and mild aggressive to concrete
BH303	3.40	<10	64	4.9	16000	17	6.6	
BH306	3.0	11	83	5.4	12000	<10	22	

Notes:
1. Based on AS 2159-2009 and groundwater condition mentioned above in Section 6.2.

6 GEOTECHNICAL ASSESSMENT

6.1 General

Geotechnical parameters for RPA hospital redevelopment have been developed based on available geotechnical information obtained to date for the project, published data and our experience of materials of similar nature and history on projects within Sydney region.

The design values derived are generally obtained from statistical analyses of project specific in-situ and laboratory test results. The values are considered to be representative of the properties of the material in its current condition. Where there are insufficient jn-situ or laboratory tests, empirical correlations are used.

When project specific in-situ and laboratory tests, or empirical correlations are not applicable or not available, design values are then chosen with due consideration of relevant experience from past projects and the application of engineering judgement.

6.2 Subsurface Conditions / Geology

The general ground conditions encountered on site have been discussed in Section 6 of this report. In summary the ground condition encountered are relatively similar comprising asphaltic pavement / concrete paver overlying fill, overlying residual soil and siltstone / laminite bedrock. From the borehole investigation undertaken on site, the subsurface ground profile was generally consistent with the geology maps.

6.3 Earthworks

6.3.1 Site Preparation

The following sections provide advice on preparation, formation and unsuitable materials. The relevant earthworks standards referred to as a basis for design considerations and recommendations include:

i) AS3798-2007 '*Guidelines on Earthworks for Commercial and Residential Developments*'.

ii) Safe Work Australia Excavation Work – Code of Practice

iii) Prior to bulk earthworks, the site shall be cleared of any foreign matter or unsuitable material which includes but may not be limited to the following:

- Vegetation or organic matter including root balls of any larger trees onsite;
- Topsoil or soil significantly affected by roots or root fibres;

- Any scattered waste or dumped materials;
- Uncontrolled filling which may be subject to further assessment;
- Loose or low strength (soft to firm) soils or otherwise 'unsuitable' soils; or
- Expansive soils.

BasedErosion and sediment control plan should be implemented before commencing any earthworks for the proposed development.

6.3.1.1 Structural Fill / Compaction Specification and Quality Control

Prior to the placement of any structural fill, the site should be proof rolled using a minimum 12 tonne roller in the presence of the geotechnical engineer. Should isolated soft/loose areas be encountered during this process, this material should be removed and replaced with suitable granular structural fill. Structural fill could comprise a select well graded granular material such as processed sandstone and road-base (DGB20). Additional filling may also be required for levelling purpose.

Depressions formed by the removal of vegetation should have all disturbed soil cleaned out and be backfilled with compacted select fill material.

To minimise the potential for post compaction volume change due to moisture content variations, any structural clay bearing fill, containing cohesive strata, should be placed in loose layers not greater than 300mm in thickness, and compacted to a minimum 98% of Standard Maximum Dry Density (SMDD) at a moisture content within 2% of standard optimum moisture content.

If the structural fill is located in landscaped areas, then the minimum density ratio can be reduced to 95% of SMDD.

Measures should be adopted to ensure that this clay fill material is not allowed to dry out prior to the placement of succeeding layers of fill and final covering with building slabs and road pavements.

It is recommended that the placement of all structural fill be inspected, tested and certified by Cardno to Level 1 requirements, during the earthworks operations to ensure that all fill is placed in a 'controlled manner', in accordance with AS3798-2007 'Guidelines on Earthworks for Commercial and Residential developments'.

Site observations and laboratory test results have indicated the presence of high plasticity silty clays in majority of areas which could be adversely affected by inclement weathered. Whilst these soils are typically of a stiff to very stiff consistency when dry, they can rapidly lose strength during wet periods. Trafficking over areas where high moisture content and low strength residual clays may not be possible without the use of bridging layers, structural fill and/or geogrids.

Conventional sediment and erosion control measures should also be implemented during the construction phase.

6.3.2 Material Management

The following general comments regarding appropriate material management shall be considered for design;

i) Strict moisture and compaction control, with fill materials placed as close to OMC as practical while not exceeding the OMC. Over compaction shall also be avoided;

ii) The clays would generally be suitable for general fill, and would be expected to provide a suitable subgrade for road construction; however, depending on the material utilised, a select layer and appropriate drainage would be recommended due to the swell potential;

iii) Any oversized material should be screened prior to use as fill material.

iv) The contamination report shall also be read in conjunction to this geotechnical report for the suitability of material re-use on site.

6.3.3 Excavation Conditions

When considering excavation at any of the sites, the findings and recommendations presented in the Contamination Assessment report should also be considered.

It is recommended that construction contractors assess the engineering logs, core photographs and rock cores to make their own assessment of excavation plant and production rates. Below recommendations are preliminary only and based on the geotechnical information across the site. Assessment of material excavatability can be based on the method published by Pettifer and Fookes (1994). The degree of excavatability of rock is based on its Point Load Index (Is50) and fracture spacing.

Excavatability categories range from easy to hard digging, through easy to hard ripping, to blasting.

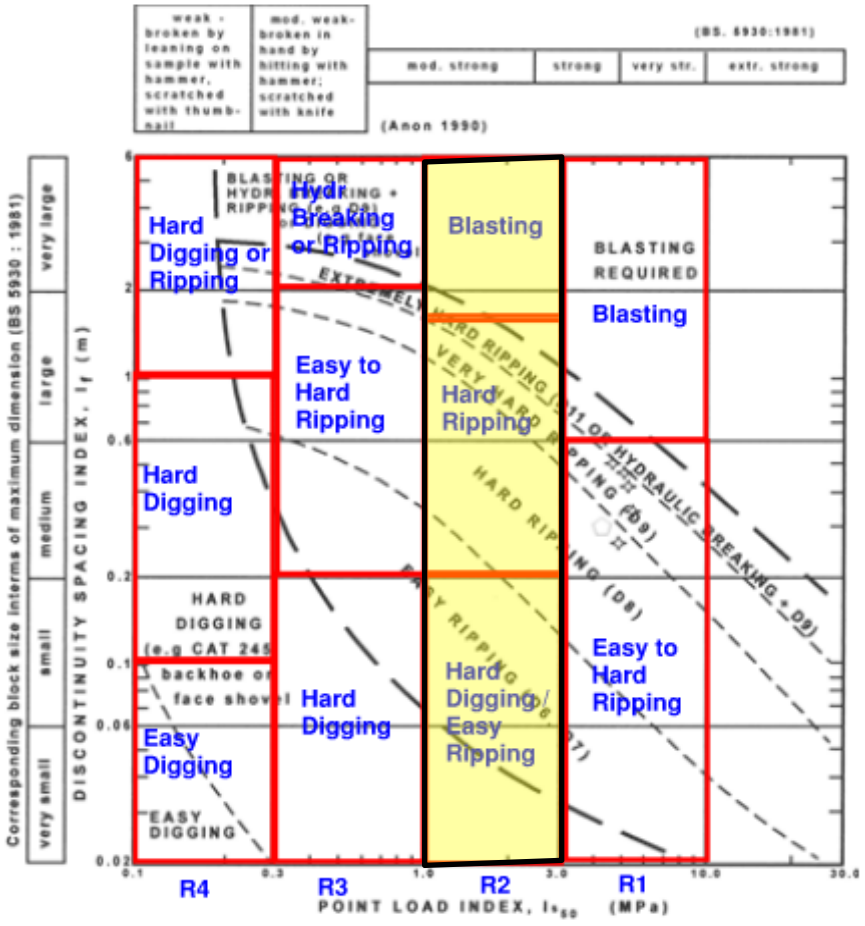

Figure 6-1 Zoning of excavatability based on Pettifer and Fookes (1994)

Examination of Figure 7-1 shows that the excavatability zones are delineated according to rock strength categories (R4-low strength, R3-medium strength, R2-high strength, R1-very high strength), and further subdivided based on the defect spacing of the rock.

Our review of the borehole logs indicates that bedrock conditions encountered were generally moderate with defect spacing in the order of 10mm – 2970mm. It is therefore expected:

i) hard digging to easy ripping conditions in Class III to Class V Siltstone / Laminite
ii) hard ripping to blasting in Class II Siltstone / Laminite

Large size hydraulic excavator or similar should be adequate for hard digging conditions and the use of hydraulic rock breakers / hammer in combination with Caterpillar D9 ripper or similar should be

adequate for hard to very hard ripping conditions.

Where high strength rock (R2 or better) is present at the site, excavation production rates are likely to decrease with the above machinery. Where larger cuts are required the use of chemicals can be used as an alternative option for rock splitting.

6.3.4 Open Cuts / Temporary and Permanent

6.3.4.1 Temporary cuts

Where open cuts are required as part of temporary works during ground support and embankment stability work. Recommendations for temporary unsupported cuts batters (if required) are presented in the following table:

Table 6-1 Cut Batter Recommendations

Geotechnical profile	Temporary Batter (Horizontal to Vertical Ratio)
Fill	2H:1V
Residual Soil	1.5H:1V
Class V / IV Siltstone / Laminite	1V:1H
Class III / II Siltstone / Laminite	Refer to Note (g)

Notes:

1. Table 6-1 applies to temporary unsupported cut batters only, for a period of no greater than 3 months once constructed
2. Temporary batters apply to cuts no greater than 1.50m in vertical height. Where deeper cuts are proposed for each stratum, further geotechnical designed support or retention systems may be required.
3. Excavations in soil have assumed no groundwater table has been encountered;
4. The ground surface at the crest of the excavation is horizontal;
5. There is no surcharge at the crest of the excavation for a distance equal to the depth of the excavation;
6. All cuts are protected from erosion.
7. Temporary sub-vertical excavations in Sandstone/Siltstone (Class III - II = medium strength or better bedrock) may be considered appropriate (where encountered), upon inspection and approval by a Geotechnical Consultant.

6.3.4.2 Permanent cuts

Permanent cuts have not been fully identified at this stage, due to the unknown locality and depth of proposed cuts. However, it is considered where the training facility is proposed, deep cuts are envisaged as part of permanent works, where the following measures would potentially be required.

Table 6-2 Permanent Options

Geotechnical Profile	Permanent Options	Additional Comments
Fill	i) Regrade batter – potentially strip and replace ii) Soil nail and shotcrete	Due to variability of material in fill stratum, the existing fill where cuts are required, the fill recommended to be removed and replaced with controlled fill.
Residual Soils	iii) Regrade batter slope iv) Soil nail and shotcrete	Not much residual soil encountered across subject site
Class II to V Siltstone / Laminite	v) Regrade batter vi) Scaling, block removal and reprofiling vii) Rock / spot bolting viii) Rock fall netting ix) Catch fence and ditches	Requires geotechnical input / site observations during top down excavation works to determine extend of stabilization options required

6.3.5 Excavation Support / Shoring

Where deep excavations are to be proposed, earth pressures for shoring support are provided in Table 6-4 material strength parameters. The options for the lateral support that may be considered are tabulated below:

Table 6-3 Recommendation for Shoring Options

Wall Type	Advantages	Disadvantages	Additional Comments
Open Cut excavation	Simple / Cheap Option	Dependent on batter slope space	i) Consideration of groundwater table required. ii) Base and slope instability and dewatering to be assessed.
Sheet pile wall	i) Provides an economic embedded wall ii) No arising's to be removed iii) Suitable as a water retaining system	iv) Potential declutching in coarse grained soil v) Difficult to impose installation where shallow rock exists	vi) Use of tie back anchors (soil strength and space considerations). Cantilever sheet piles to be evaluated. Groundwater table and tanking to be considered.
Secant Piles	i) A permanent water retaining wall ii) Installed using standard piling plant with high torque rigs	Depth is limited by the vertical tolerance, which may determine the depth of secanting	iii) Use of tie back anchors (soil strength and space iv) considerations). Cantilever option to be evaluated. v) Groundwater table and tanking to be considered.
Contiguous Piles	The cheapest form of concrete piled wall	i) Not a water retaining solution ii) Not a permanent solution in any soil due to gaps between piles unless structural face is applied.	The presence of a shallow groundwater table makes this option unlikely.

Considering the above options, pros and cons, the following recommendations are given.

i) Where excavation is not along another property, use open excavation technique.
ii) Where excavation is along another property the following two options should be considered.
   - Use a tied back sheet pile wall.
   - Use an internally braced sheet pile wall where structures sensitive to settlement / horizontal movement are located within 15m from the excavation. Elsewhere, use cantilevered sheet pile walls with provision for remedial works on the adjacent property.
   - Alternative to the above, install secant piles and use them as part of the permanent basement wall.

6.3.6 Groundwater Conditions

Due to the presence of shallow groundwater level, significant groundwater inflow is likely and is likely to vary with rainfall events as well. Some seepage into excavations is likely to occur through fissures in the residual soil, at the soil / rock interface and from joints and bedding planes in the rock. The permeability of the siltstone/sandstone rock mass is considered to be generally relatively low, although localised inflows could be high through discrete rock defects.

Further detailed investigations and groundwater modelling will be required to predict seepage rates and drawdown in the short and long term, if any basement levels are proposed.

6.3.7 Vibrations

The excavation will have to be carried out in close proximity to other hospital buildings, hence use of impact hammers may result in vibrations that could affect adjacent structures. A rock saw could be used to reduce the lateral transfer of vibrations.

For general guideline purposes, induced vibrations in structures adjacent to the excavation should not exceed a Peak Particle Velocity (PPV) of 5mm/sec for structures in good condition, or 2mm/sec for structures in poor condition or heritage structures. If vibrations in adjacent structures exceed these PPV's or if vibrations appear excessive, this office should be contacted immediately for further advice.

6.4 Aggressiveness Classification

In accordance with AS3600 (2018), exposure classification for concrete 'A2' for the subsurface materials across the investigated areas. Future concrete structures should be designed in accordance with the concrete cover specifications in AS 3600 (2018) for an exposure classification of 'A2'.

6.5 Site Classification

It has been assessed that there is more than 400mm depth of fill across the majority of the subject site, which in the absence of any construction records should be considered as '*uncontrolled*' in accordance with AS2870-2011 "*Design of Footings and Slabs for Residential Construction.* Therefore, the site is classified as Class "P".

However, if the site is prepared in accordance with Section 6.3 of this report, the site can be reclassified based on the shrink swell index (I_{ss}) results. The shrink swell test on natural clay collected from BH307 resulted in 2.2% I_{ss} and three shrink swell tests carried out by Douglas Partner gave I_{ss} in the range of 1.7 – 2.9%. With consideration of these shrink swell indices and the soil profile, the site can be reclassified as moderately reactive clay site (Class 'M1'), which may experience moderate ground movement from moisture changes with a characteristic surface movement of 20 – 40mm.

6.6 Seismic Classification

Based on the subsurface conditions encountered across the site, the site sub-soil Class C_e (shallow soil) can be assigned in accordance with AS1170 - 2007 *"Structural Design Actions, Part 4: Earthquake Actions in Australia"*. A hazard factor (Z) of 0.08 can be applied for sites in Sydney.

6.7 Geotechnical Parameters

Based on the borehole logs and the results of laboratory tests, geotechnical design parameters are inferred and presented to assist with geotechnical design.

6.7.1 Soil Classification

No geotechnical parameters have been assigned to manmade fill layers due to potential variability. Relative density/consistency of natural granular/cohesive layers, if any, shall be assessed based on SPT N values. All manmade (i.e. fill) layers are recommended to be considered loose (for granular soils), as presented below;

Table 6-4 Material Strength Parameters

Material	γ (kN/m^3)	C_u (kPa)	c' (kPa)	φ' (°)	E' (MPa)	ν'	K_a	K_p
Fill	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CLAY (Firm)	18	25	0	24	4	0.35	0.42	2.37
CLAY (Stiff)	19	50	2	26	8	0.35	0.39	2.56
CLAY (Very Stiff)	20	100	5	28	15	0.35	0.36	2.77

Material	γ (kN/m^3)	C_u (kPa)	c' (kPa)	φ' (°)	E' (MPa)	ν'	K_a	K_p
CLAY (Hard)	21	200	10	28	30	0.3	0.36	2.77
Siltstone / Laminite Class V	22	-	10	29	100	0.3	0.34	2.88
Siltstone / Laminite Class IV	23	-	25	30	300	0.3	0.33	3.00
Siltstone / Laminite Class III	23	-	100	32	600	0.2	-	-
Siltstone / Laminite Class II	24	-	300	34	1200	0.2	-	-

Notes:
γ: Unit Weight
c_u: Undrained Shear Strength
c': Drained Shear Strength
K_a: Active Earth Pressure
φ': Internal Friction Angle
E': Elastic Modulus
ν': Poisson's ratio
K_p: Passive Earth Pressure
N/A = No geotechnical parameters have been assigned to topsoil layers due to potential variability.

6.7.2 Rock Classification

The classification of sandstone and shale rock encountered on site is summarised in Table 6-5 which are extracted from current Pells et al (2019) publication "Classification of Sandstone and Shales in the Sydney Region: A Forty Year Review".

Table 6-5 Rock Mass Classification System – Shale – Pells et al (2019)

Rock Mass Classification	Unconfined Compressive Strength q_u (MPa)	Defect Spacing	Allowable Seams
I	>16	>600	<2%
II	>7	>200	<4%
III	>2	>60	<8%
IV	>1	>20	<25%
V	>1	N/A	N/A

Considering the classification system, and UCS and point load testing, the rock classification for each borehole is summarised in the Table 6-6 below.

Table 6-6 Classification of Rock at Borehole Locations

BH ID	Depth from BSL (m)	RL Depth (m AHD)	Thickness (m)	Rock Classification
BH301	4.50 – 7.90	18.496-15.096	3.4	Siltstone Class V
BH302	4.10 – 7.70	15.596-11.996	3.6	Siltstone Class V
	7.70 – 10.40	11.996-9.296	2.7	Laminite Class III
	10.40 – 14.36	9.296-5.336	3.96	Laminite Class II
BH303	4.70 – 10.00	22.398-17.098	5.3	Siltstone Class V
	10.00 – 11.50	17.098-15.598	1.5	Siltstone Class III
	11.50 – 14.00	15.598-13.098	2.5	Siltstone / Laminite Class II
BH304	5.20 – 12.26	16.673-9.613	7.06	Siltstone Class V
	12.26 – 15.21	9.673-6.663	3.01	Siltstone Class III
BH305B	7.00 – 8.00	15.568-14.568	1.0	Siltstone Class V
BH306	6.40 – 9.20	16.765-13.965	2.8	Siltstone Class V
	9.20 – 11.00	13.965-12.165	1.8	Siltstone / Laminite Class IV
	11.00 – 14.97	12.165-8.195	3.97	Laminite Class II
BH307	5.30 – 5.50	24.518-24.318	0.2	Siltstone Class V

Note:
The above classification considers rock substance strength, defect spacing and allowable seams as required by Pells et al (2019). Thereby, a portion of rock mass not meeting an upper class is placed at the next lower class where all three factors are satisfied. A strata of rock is subjected to all three factors in general and combining thin layers of different class into a thick stratum using engineering judgement. The Designer shall review the borehole logs and core photographs to assess the potential impacts of thin layers combined in thicker layers. This is particularly true for end bearing piles which shall be checked not to be adversely impacted by weak/ highly fractured bands of rock below the designed pile toe level.

6.8 Foundation Options

Both shallow and deep options of foundations could be adopted for the proposed development. Parameters for both shallow and deep footing options are provided below;

6.8.1 Shallow / Pad Footings

Due to the unknown loads and footing systems, no specified allowable bearing capacities can be determined at this time. Once specific loadings have been ascertained, Cardno can assist to optimise the footing size and depth to suit the loading on the founding material. Bearing capacity of footings in soil needs to be subjected to geotechnical checking considering footing size, depth, slope (ground surface and/or footing base) and loadings (i.e. bearing capacity is not a soil property but is dependent of footing size, depth, slope and loadings). A footing subjected to pull out forces should be further geotechnical assessment in addition to bearing capacity, overturning and sliding. Conventional shallow footings designed in accordance with engineering principles and nominally embedded 0.5m into the design founding material, may be proportioned on the following ultimate end-bearing pressures, summarised in Table 7-7 below:

Table 6-7 Shallow / Pad Footing Design Parameters

Founding Material	Area (m)	Ultimate Bearing Capacity (kPa)
CLAY - Stiff	1 x1	300
CLAY - Very Stiff	1 x1	500
CLAY - Hard	1 x1	750
Siltstone / Laminite Class V	1 x1	850

Note:
1. Ultimate bearing capacity tabulated above assuming eccentricity of 1/6 x footing width.
2. Horizontal ground is assumed
3. Consideration of Section 6.3 should be considered, prior to selection of founding level.
4. The settlement for shallow footings depends upon the loading conditions, footing size and foundation material, but it should be less than 1% of the footing width if proportioned on the basis of above parameters.
5. A minimum geotechnical strength reduction factor Øg of 0.4 can be applied for the allowable design values.

6.8.2 Deep Foundations

The proposed structures are recommended to be founded on piles that transfer the column loads to more suitable founding strata at depth below the sites. The type of pile will depend on the specific ground and groundwater conditions and relative cost. For the purposes of pile design, the parameters shown in Table 6-8 may be used. However, if bored piles are adopted, the base of the piles must be inspected during construction to ensure that material of adequate capacity supports each pile.

Table 6-8 Pile Design Parameters (Based on Pells 2019)

Class	Serviceability End bearing MPa	Ultimate Shaft adhesion[1] kPa	Typical Efield MPa
Siltstone / Laminite Class II	5	600	1200
Siltstone / Laminite Class III	3.5	350	600
Siltstone / Laminite Class IV	1	150	300
Siltstone / Laminite Class V	0.7	50	100

Note:
1. Clean Sockets for roughness category R2 or better is required.
2. Horizontal ground is assumed
3. The settlement for shallow footings depends upon the loading conditions, footing size and foundation material, but it should be less than 1% of the footing width if proportioned on the basis of above parameters

Further Discussions for Pile Footings

i) Where the design is dependent upon end bearing resistance, piles must extend at least 0.5m into the founding stratum to develop full design end bearing.
ii) The base of the piles must be inspected during construction to ensure that material of adequate capacity supports each pile.
iii) In accordance with the requirements of AS2159-2009, a geotechnical reduction factor is to be applied to the ultimate geotechnical strength to obtain the design geotechnical strength. We have determined that an average risk rating ARR=3.07 (corresponding to a moderate overall risk category) and a geotechnical reduction factor $\phi g = 0.52$ can be adopted for this project. This is based on the following assumptions:
   - Detailed level of construction control is required with professional geotechnical supervision, construction processes that are well established and relatively straightforward;
   - No performance monitoring of the supported structure during and after construction is proposed;
   - Table 6-9 below gives an option table for the proposed deep foundations that can be adopted across the subject site, discussion and comments being noted;

Table 6-9 Deep Foundation Options

Wall Type	Advantages	Disadvantages
Bored Piles	i) Quiet / No Vibration ii) Greater lengths can be installed	iii) Requires the use of liners and possible slurry. iv) Requires additional plant (cranes, etc)
CFA Piles	i) Low Noise / vibration ii) No need for casing due to sloughing/seepage iii) Faster productivity than bored piles	iv) A higher waste of concrete than traditional bored piles v) Requires additional plant (Cranes, etc)

6.9 Ground Anchors

Where required, the use of ground anchor is suggested to provide lateral restraint on the boundary soldier wall. Such ground anchors should be declined below the horizontal to allow anchorage into the stronger materials at depth. It should be noted that installation of ground anchors beyond the site boundaries will require permission to be obtained from relevant authorities and adjacent property owners. The design of temporary ground anchors for the support of pile wall systems may be carried out using the following parameters provide in Table 6-10 below:

Table 6-10 Allowable Bond Stresses for Anchor Design

Material	Allowable Bond Stress[1] (kPa)
Siltstone / Laminite Class III	300
Siltstone / Laminite Class IV	150
Siltstone / Laminite Class V	50

Note:
1. The anchors should have a minimum bond length of 3m. The anchor free length is determined to have the bond length behind the plane of failure starting from the bulk excavation level. The horizontal inclination of the plane of failure is considered to be 45 degrees.
2. All anchors should be proof tested to 1.3 times the working load under the direction of an experienced engineer.

6.10 Pavement Design Evaluation

As presented in Table 6-4, laboratory soaked CBR tests indicates a subgrade swell of between 1.5% to 2.5% considered as moderately expansive soil. Test result for the specimens indicate CBR values of 3.5 % and 5.0%. A review of SPT testing indicates that the residual subgrade material, generally consisted of stiff to hard clay.

Based on the previous results reported by DP on clayey fill and natural clay, CBR value ranged from 2 – 7%.

Taken into consideration of existing and previous CBR test results, a design CBR of 2% can be adopted for pavement design of Lambie Dew Drive.

7 CONSTRUCTION INSPECTION

It is recommended that placement of all structural fill and footing excavations be inspected, tested and certified where necessary, by a suitably qualified geotechnical engineer to ensure recommendations made in this report have been addressed. Should subsurface conditions other than those described in this report be encountered, Cardno should be consulted immediately and appropriate modifications developed and implemented if necessary.

8 CONCLUSION AND RECOMMENDATIONS

The following provides a summary of the conclusions and recommendations with regard to the geotechnical investigation that was undertaken for RPA Eastern Campus. The following conclusions can be drawn from Cardno's geotechnical investigation works undertaken, however the proceeding sections of this report should be read for a full description of the conclusions:

i) Geotechnical investigatory works were undertaken for the proposed redevelopment of RPA Hospital Eastern Campus;
ii) Investigatory works comprised of drilling eight (8) boreholes. Four (4) BHs were drilled up to a depth of 8m below surface level (BSL) and four (4) BHs were drilled up to 15.21m BSL;
iii) Standard Penetration Tests (SPT) were undertaken within the soil profile at 1.50 m intervals;
iv) Installation of one GW monitoring well at BH303 location;
v) The subsurface condition encountered across the site were relatively uniform across the site. The ground profile generally comprised of a pavement/fill overlying residual soil and siltstone/laminate bedrock.
vi) Investigatory laboratory test results can be found in section 6 of this report along with laboratory test certificated in Appendix C.
vii) Recommendations on earthworks and foundation options are discussed in Section 7.

9 REFERENCES

[1] Design Guidance Note No. 030, Rev C, Issue date: 30 May 2018, by NSW Health Infrastructure
[2] Pells et al (2019) “Classification of Sandstone and Shales in the Sydney Region: A Forty Year Review”. Issue date: August 2020, by Douglas Partners.
[3] Report on Geotechnical Investigation “Royal Prince Alfred Hospital Redevelopment”. Issue date: 2 June 2019, by Pells et al.
[4] AS 1170.4 “Structural Design Actions, Part 4: Earthquake Actions in Australia”, 2007, by Australian Standard
[5] AS 1726-2017 “Geotechnical Site Investigation”, 2017, by Australian Standard
[6] AS 2159-2009 “Piling – Design and Installation”, 2009, by Australian Standard
[7] AS 2870-2011 “Residential Slabs and Footing”, 2011, by Australian Standard
[8] AS 3798-2007 “Guidelines on Earthworks for Commercial and Residential Developments”, 2007, by Australian Standard

10 CLOSURE

We appreciate the opportunity to work collaboratively with you on this project. Our team looks forward to
bringing our high level of expertise to deliver successful outcomes in your future projects.
Your attention is drawn to the appended document titled “*Important Information about this Geotechnical Report”.* This document is intended to clarify to the reader what the realistic expectations of this report should be, and what is the correct use of the document. Misinterpretation of geotechnical information presents significant risk to projects: The document includes a discussion on general limitations of geotechnical services, which by nature, are based extensively on opinion and judgement.

The statements included in this document are not intended to be exculpatory clauses or to reduce the general responsibility accepted by Cardno, but rather to identify where Cardno and our Client’s responsibilities lie. The statements ensure that all parties that may rely on the report are aware of their respective responsibilities.

For further enquiries, please do not hesitate to contact Cardno on the information supplied.

APPENDIX A

GEOTECHNICAL INVESTIGATION PLAN

Cardno
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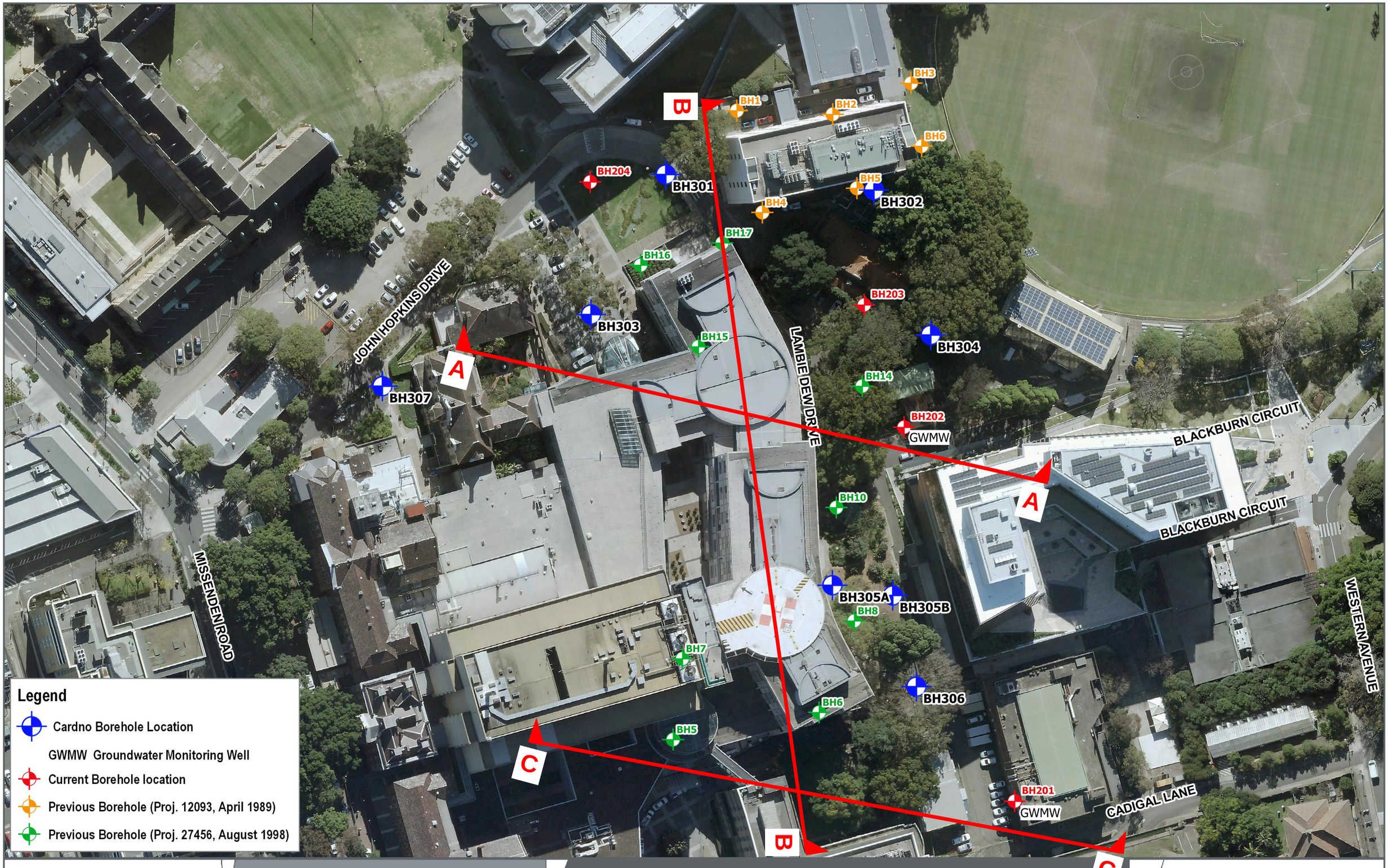
Stantec



Legend

- Cardno Borehole Location
- GWMW Groundwater Monitoring Well
- Current Borehole location
- Previous Borehole (Proj. 12093, April 1989)
- Previous Borehole (Proj. 27456, August 1998)

NSW GOVERNMENT Health Infrastructure

1:1000 Scale at A3

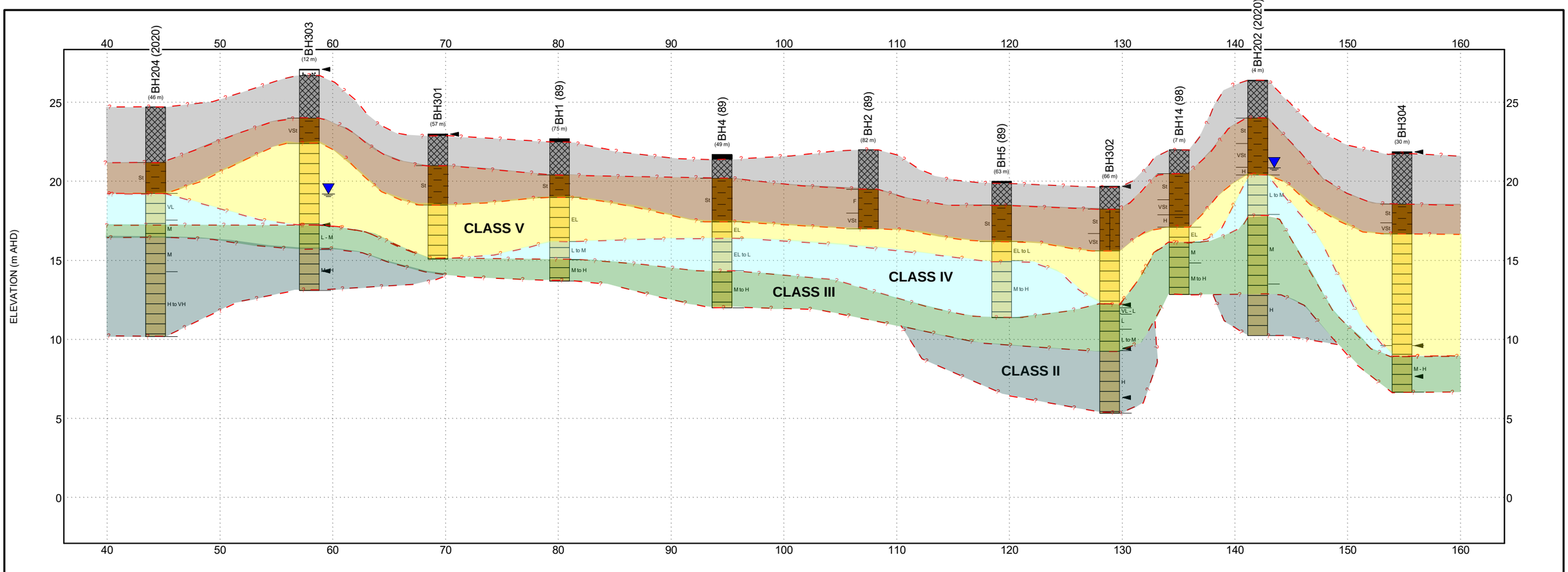
0 20 40 60 80 m

Royal Prince Alfred Hospital - East Campus

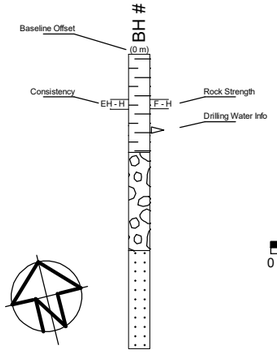
Geotechnical Investigation

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (SYD)
Date: 2022-1-10| Project: 80022026
Coordinate System: MGA Zone 56
Aerial imagery supplied by nearmap (2022)



POST LEGEND



MATERIAL GRAPHIC

- ASPHALTIC CONCRETE
- CONCRETE
- SILTSTONE / LAMINITE
- FILL
- HIGH PLASTICITY CLAY
- LOW PLASTICITY CLAY
- CI-CH - Medium to High Plasticity CLAY

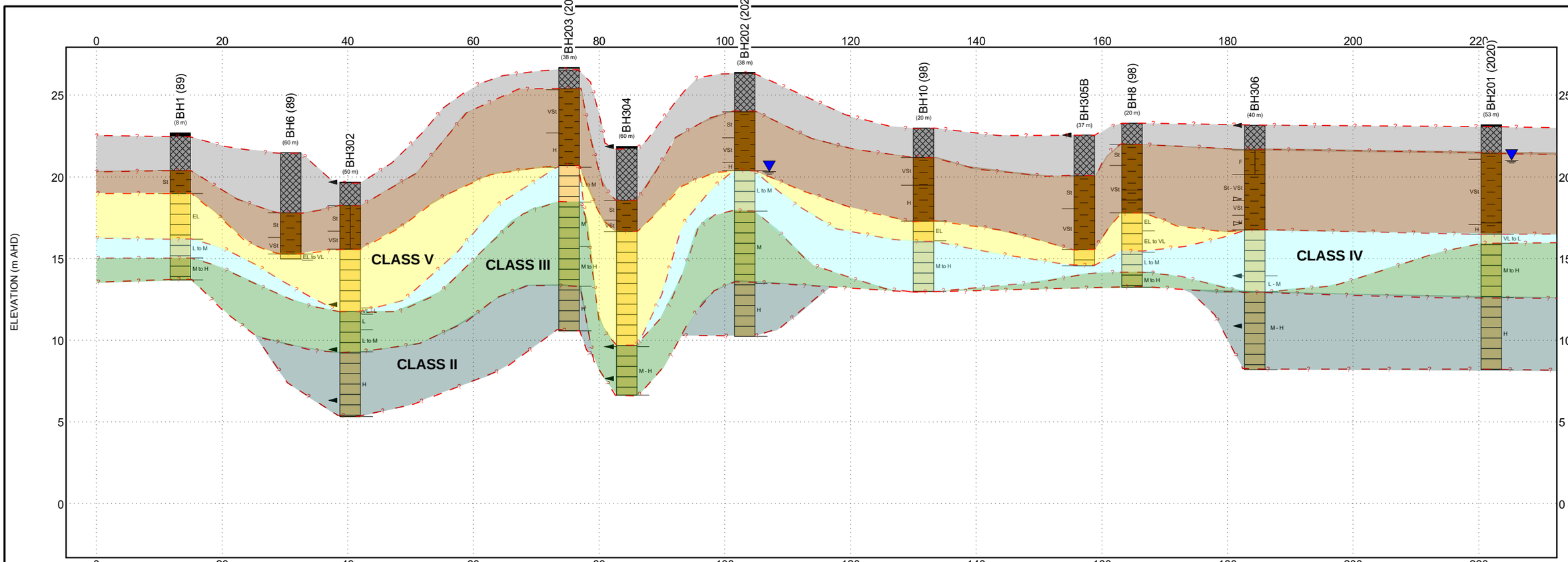
H 1:350
0 4 8 12 16 20m
V 1:250
0 2 4 6 8 10m
Coord.System: MGA94 Zone 56 Height Datum: AHD

Cardno

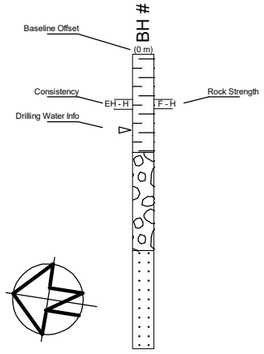
NSW GOVERNMENT Health Infrastructure

CLIENT NSW Health Infrastructure		PROJECT Royal Prince Alfred Hospital	
DRAWN AT	DATE 11/02/2022	TITLE Cross-Section A-A	
CHECKED BD	DATE 11/02/2022		
SCALE H 1:350 V 1:250	A3	PROJECT No 80022026	FIGURE No 1

GAP 8_03 LIB 26 SEPT 2012_ICD - EDITED GLB Fence FENCE A3L 80022026 DRAFT LOGS.GPJ <<DrawingFile>> 11/02/2022 08:55 10.0.000



POST LEGEND



MATERIAL GRAPHIC

- ASPHALTIC CONCRETE
- CONCRETE
- CI-CH - Medium to High Plasticity CLAY
- FILL
- MEDIUM PLASTICITY CLAY
- SILTSTONE / LAMINITE
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY

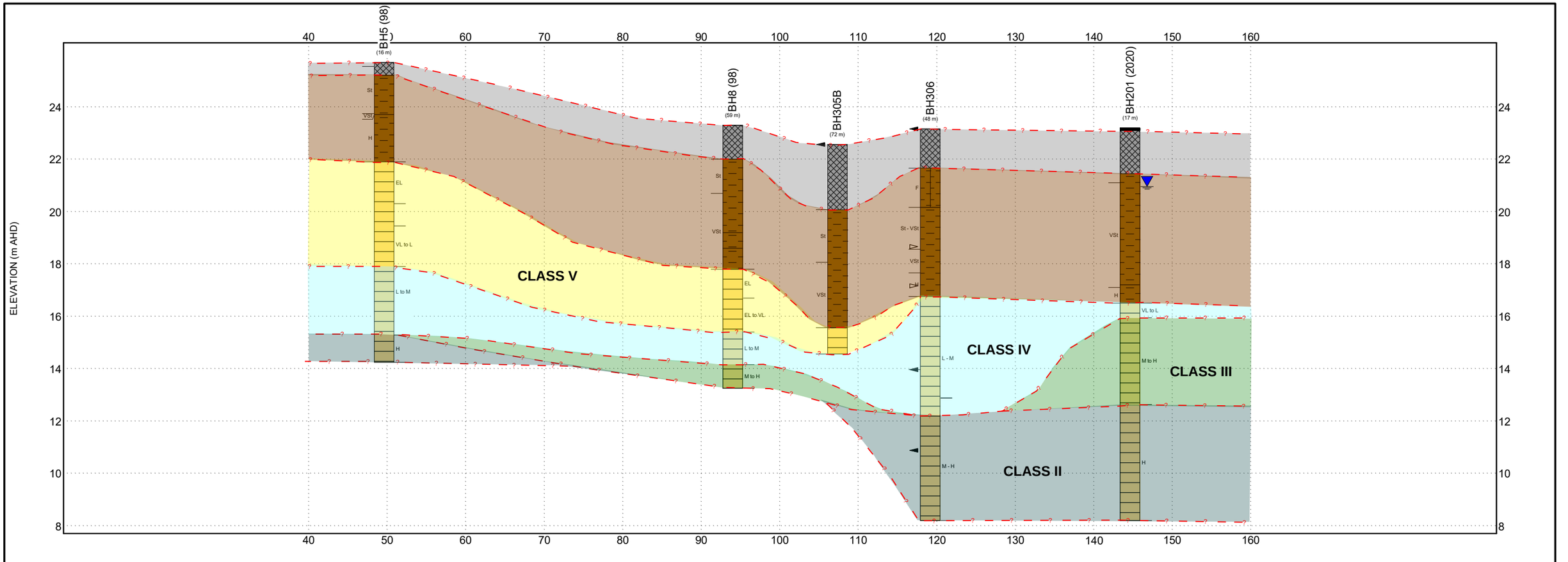
H 1:650
0 5 10 15 20 25m
V 1:250
0 2 4 6 8 10m
Coord.System: MGA94 Zone 56 Height Datum: AHD

Cardno

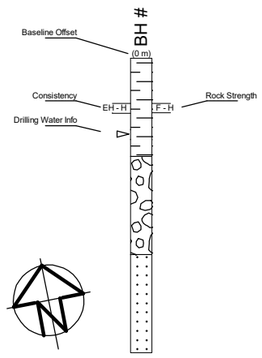
NSW GOVERNMENT Health Infrastructure

CLIENT NSW Health Infrastructure		PROJECT Royal Prince Alfred Hospital	
DRAWN AT	DATE 11/02/2022	TITLE Cross-Section B-B	
CHECKED BD	DATE 11/02/2022		
SCALE H 1:650 V 1:250	A3	PROJECT No 80022026	FIGURE No 2

GAP 8.03 LIB 26 SEPT 2012_ICD - EDITED GLB Fence FENCE A3L 80022026 DRAFT LOGS.GPJ <<DrawingFile>> 11/02/2022 09:26 10.0.000



POST LEGEND



MATERIAL GRAPHIC

- FILL
- LOW PLASTICITY CLAY
- HIGH PLASTICITY CLAY
- CI-CH - Medium to High Plasticity CLAY
- MEDIUM PLASTICITY CLAY
- ASPHALTIC CONCRETE
- SILTSTONE / LAMINITE

H 1:500
0 5 10 15 20 25m
V 1:150
0 1 2 3 4 5m
Coord.System: MGA94 Zone 56 Height Datum: AHD

Cardno

NSW GOVERNMENT Health Infrastructure

CLIENT NSW Health Infrastructure		PROJECT Royal Prince Alfred Hospital	
DRAWN AT	DATE 11/02/2022	TITLE Cross-Section C-C	
CHECKED BD	DATE 11/02/2022		
SCALE H 1:500 V 1:150	A3	PROJECT No 80022026	FIGURE No 3

GAP 8_03.LIB 26 SEPT 2012_ICD - EDITED GLB Fence FENCE A3L 80022026 DRAFT LOGS.GPJ <<DrawingFile>> 11/02/2022 09:39 10.0.000

Royal Prince Alfred Hospital – Eastern Campus

APPENDIX B

ENGINEERING LOGS

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Stantec

Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	
Test Pitting: excavation/trench	
BH	Backhoe bucket
EX	Excavator bucket
R	Ripper
H	Hydraulic Hammer
X	Existing excavation
N	Natural exposure
Manual drilling: hand operated tools	
HA	Hand Auger
Continuous sample drilling	
PT	Push tube
PS	Percussion sampling
SON	Sonic drilling
Hammer drilling	
AH	Air hammer
AT	Air track
Spiral flight auger drilling	
AS	Auger screwing
AD/V	Continuous flight auger: V-bit
AD/T	Continuous spiral flight auger: TC-Bit
HFA	Continuous hollow flight auger
Rotary non-core drilling	
WB	Washbore drilling
RR	Rock roller
Rotary core drilling	
PQ	85mm core (wire line core barrel)
HQ	63.5mm core (wire line core barrel)
NMLC	51.94mm core (conventional core barrel)
NQ	47.6mm core (wire line core barrel)
DT	Diatube (concrete coring)

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method	
Soil sampling	
B	Bulk disturbed sample
D	Disturbed sample
C	Core sample
ES	Environmental soil sample
SPT	Standard Penetration Test sample
U	Thin wall tube ‘undisturbed’ sample
Water sampling	
WS	Environmental water sample

Field testing may be conducted as a means of assessment of the in situ conditions of materials.

Field testing	
SPT	Standard Penetration Test
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows per noted increment)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
VS	Vane Shear
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Photo Ionization Detector

If encountered, refusal (R), virtual refusal (VR) or hammer bouncing (HB) of penetrometers may be noted.

The quality of the rock can be assessed by the degree of natural defects/fractures and the following.

Rock quality description	
TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater	
Not Encountered	Excavation is dry in the short term
Not Observed	Water level observation not possible
Seepage	Water seeping into hole
Inflow	Water flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions	
Stable	No obvious/gross short term instability noted
Spalling	Material falling into excavation (minor/major)
Unstable	Collapse of the majority, or one or more face of the excavation

Explanatory Notes: General Soil Description

The methods of description and classification of soils used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, a material is described as a soil if it can be remoulded by hand in its field condition or in water. The dominant component is shown in upper case, with secondary components in lower case. In general descriptions cover: soil type, plasticity or particle size/shape, colour, strength or density, moisture and inclusions.

In general, soil types are classified according to the dominant particle on the basis of the following particle sizes.

Soil Classification		Particle Size (mm)
CLAY		< 0.002
SILT		0.002 0.075
SAND	fine	0.075 to 0.21
	medium	0.21 to 0.6
	coarse	0.6 to 2.36
GRAVEL	fine	2.36 to 6.7
	medium	6.7 to 19
	coarse	19 to 63
COBBLES		63 to 200
BOULDERS		> 200

Soil types may be qualified by the presence of minor components on the basis of field examination methods and/or the soil grading.

Terminology	In coarse grained soils		In fine soils
	% fines	% coarse	% coarse
Trace	≤5	≤15	≤15
With	>5, ≤12	>15, ≤30	>15, ≤30

The strength of cohesive soils is classified by engineering assessment or field/lab testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	≤12kPa
Soft	S	12kPa to ≤25kPa
Firm	F	25kPa to ≤50kPa
Stiff	St	50kPa to ≤100kPa
Very Stiff	VSt	100kPa to ≤200kPa
Hard	H	>200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	<15%
Loose	L	15% to ≤35%
Medium Dense	MD	35% to ≤65%
Dense	D	65% to ≤85%
Very Dense	VD	>85%

The plasticity of cohesive soils is defined by the Liquid Limit (LL) as follows.

Plasticity	Silt LL	Clay LL
Low plasticity	≤ 35%	≤ 35%
Medium plasticity	N/A	> 35% ≤ 50%
High plasticity	> 50%	> 50%

The moisture condition of soil (*w*) is described by appearance and feel and may be described in relation to the Plastic Limit (PL), Liquid Limit (LL) or Optimum Moisture Content (OMC).

Moisture condition and description	
Dry	Cohesive soils: hard, friable, dry of plastic limit. Granular soils: cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure of soil layers may include: defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description	
Fill	Anthropogenic deposits or disturbed material
Topsoil	Zone of soil affected by roots and root fibres
Peat	Significantly organic soils
Colluvial	Transported down slopes by gravity/water
Aeolian	Transported and deposited by wind
Alluvial	Deposited by rivers
Estuarine	Deposited in coastal estuaries
Lacustrine	Deposited in freshwater lakes
Marine	Deposits in marine environments
Residual soil	Soil formed by in situ weathering of rock, with no structure/fabric of parent rock evident
Extremely weathered material	Formed by in situ weathering of geological formations, with the structure/fabric of parent rock intact but with soil strength properties

The origin of the soil generally cannot be deduced solely on the appearance of the material and the inference may be supplemented by further geological evidence or other field observation. Where there is doubt, the terms ‘possibly’ or ‘probably’ may be used

Explanatory Notes: General Rock Description

The methods of description and classification of rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, if a material cannot be remoulded by hand in its field condition or in water, it is described as a rock. In general, descriptions cover: rock type, grain size, structure, colour, degree of weathering, strength, minor components or inclusions, and where applicable, the defect types, shape, roughness and coating/infill.

Rock types are generally described according to the predominant grain or crystal size, and in groups for each rock type as follows.

Rock type	Groups
Sedimentary	Deposited, carbonate (porous or non), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate, or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing minerology (iron oxides or hydroxides, silica, calcium carbonate, gypsum)

Reference should be made to AS1726 for details of the rock types and methods of classification.

The classification of rock weathering is described based on definitions in AS1726 and summarised as follows.

Term and symbol		Definition
Residual Soil	RS	Soil developed on rock with the mass structure and substance of the parent rock no longer evident
Extremely weathered	XW	Weathered to such an extent that the rock has 'soil-like' properties. Mass structure and substance still evident
Distinctly weathered	DW	The strength is usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores. May be distinguished into MW (Moderately Weathered) and HW (Highly Weathered).
Slightly weathered	SW	Slightly discoloured; little or no change of strength from fresh rock
Fresh Rock	FR	The rock shows no sign of decomposition or staining

The rock material strength can be defined based on the point load index as follows.

Term and symbol		Point Load Index I_s50 (MPa)
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1.0
High	H	1.0 to 3
Very High	VH	3 to 10
Extremely High	EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength which can be significantly weaker due to the effect of defects.

A preliminary assessment of rock strength may be made using the field guide detailed in AS1726, and this is conducted in the absence of point load testing.

The defect spacing measured normal to defects of the same set or bedding, is described as follows.

Definition	Defect Spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Terms for describing rock and defects are as follows.

Defect Terms			
Joint	JT	Sheared zone	SZ
Bedding Parting	BP	Seam	SM
Foliation	FL	Vein	VN
Cleavage	CL	Drill Lift	DL
Crushed Seam	CS	Handling Break	HB
Fracture Zone	FZ	Drilling Break	DB

The shape and roughness of defects in the rock mass are described using the following terms.

Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulose	UN	Smooth	S
Irregular	IR	Slickensided	SL
Stepped	ST	Polished	POL
Discontinuous	DIS		

The coating or infill associated with defects in the rock mass are described as follows.

Infill and Coating		
Clean	CN	
Stained	SN	
Carbonaceous	X	
Minerals	MU	Unidentified mineral
	MS	Secondary mineral
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
Veneer	VNR	Thin or patchy coating
Coating	CT	Infill up to 1mm

Graphic Symbols Index

CLAY	SILT	SAND	GRAVEL
Silty CLAY	Clayey SILT	Clayey SAND	Clayey GRAVEL
Sandy CLAY	Sandy SILT	Silty SAND	Silty GRAVEL
Gravelly CLAY	Gravelly SILT	Gravelly SAND	Sandy GRAVEL
Silty Gravelly CLAY	Clayey Sandy SILT	Clayey Silty SAND	Clayey Silty GRAVEL
Silty Sandy CLAY	Clayey Gravelly SILT	Clayey Gravelly SAND	Clayey Sandy GRAVEL
Sandy Gravelly CLAY	Sandy Gravelly SILT	Silty Gravelly SAND	Silty Sandy GRAVEL

COBBLES & BOULDERS

PEAT, highly organic soil

TOPSOIL

FILL

FILL: Asphalt or Bituminous Seal

FILL: Ballast

FILL: Concrete

FILL: Roadbase

Sedimentary rock: fine, mostly clay (CLAYSTONE)

Sedimentary rock: fine, mostly silt (SILTSTONE)

Sedimentary rock: fine, silt and clay (MUDSTONE, SHALE, LAMINITE)

Sedimentary rock: medium (SANDSTONE, GREYWACKE)

Sedimentary rock: fine to coarse, angular (BRECCIA)

Sedimentary rock: coarse, rounded (CONGLOMERATE)

Sedimentary rock: Organic (COAL)

Sedimentary rock: Carbonate (LIMESTONE, DOLOMITE)

Sedimentary rock: Volcanic (TUFF, VOLCANIC BRECCIA, AGGLOMERATE)

Igneous rock: Felsic, fine (RHYOLITE)

Igneous rock: Felsic, coarse (GRANITE)

Igneous rock: Mafic, fine to medium (BASALT, DOLERITE)

Igneous rock: Mafic, coarse (GABBRO)

Metamorphic rock: Foliated, fine to medium (SLATE, PHYLLITE, SHIST)

Metamorphic rock: Foliated, coarse (GNEISS)

Metamorphic rock: Non-foliated (QUARTZITE, HORNFELS, MARBLE)

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH301

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 1

POSITION : E: 332016.07, N: 6248761.91 SURFACE ELEVATION : 22.996 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 3/12/21 DATE COMPLETED : 3/12/21 DATE LOGGED : 3/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING							MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)		GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
CC	N/A	H			22.0 / 0.0	0.10m			CONCRETE			FOOTPATH SURFACE
									Fill: Gravelly SAND fine to coarse grained, dark grey, dark orange, fine to coarse grained, sandstone, ironstone gravel, trace low plasticity clay			FILL
						0.50m						
									Fill: Silty CLAY low to medium plasticity, brown, orange-brown, trace fine to coarse grained, sub-rounded to sub-angular, ironstone gravel			
		E			1.0							
	1.50m			1.50m SPT 3, 3, 4 N=7								
				1.95m								
					21.0 / 2.0	2.00m						
									Silty CLAY high plasticity, orange-brown mottled grey, trace fine to coarse grained, sub-rounded to sub-angular, ironstone gravel			RESIDUAL SOIL
	2.50m									M (=PL)		
	B											
	3.00m			3.00m SPT 8, 7, 6 N=13	20.0 / 3.0							
		F						CH			St	
	3.50m			3.45m								
AD/T CASING			Not Encountered		19.0 / 4.0							
	4.50m			4.50m SPT 15, 20/150mm N=R 4.80m		4.50m						BEDROCK
									Siltstone brown, very low strength, extremely weathered, with sandstone band and high plasiticty clay band			
					18.0 / 5.0							
					17.0 / 6.0	6.00m						
		H							Siltstone dark grey, very low to low strength, highly weathered to moderately weathered			
					16.0 / 7.0							
						7.90m						
					15.0 / 8.0				BOREHOLE BH301 TERMINATED AT 7.90 m Refusal			

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH302

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 3

POSITION : E: 332076.30, N: 6248757.40 SURFACE ELEVATION : 19.696 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio GEO 305 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 29/11/21 DATE COMPLETED : 29/11/21 DATE LOGGED : 29/11/21 LOGGED BY : HF CHECKED BY : BD

DRILLING | MATERIAL

DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY / RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	N/A	H			19.696 / 0.0			0.05m ASPHALT			ROAD SURFACE
								Fill: Silty CLAY medium to high plasticity, dark brown, with fine grained, sub-angular to angular gravel			FILL
					19.0 / 0.35m			Fill: Silty CLAY medium to high plasticity, brown, mottled pale grey and red-brown, trace fine grained, sub-angular to angular gravel			
		E			1.0						
	1.50m			1.50m SPT 4, 5, 8 N=13				1.45m Silty CLAY medium to high plasticity, pale grey, mottled red-brown and yellow-brown, trace fine grained, sub-angular to angular gravel	w ~ PL		RESIDUAL SOIL
				1.95m	18.0 / 2.0					St	
							CI-CH				
				3.00m SPT 6, 10, 15 N=25	17.0 / 3.0			3.00m with intermittent ironstone band			
				3.45m					w < PL	VSt	
			Not Encountered	4.00m SPT 17/150mm HB N=R 4.15m	16.0 / 4.0			4.10m Siltstone grey, very low strength, extremely to highly weathered, with occassional iron staining			BEDROCK
		F			15.0 / 5.0						
					14.0 / 6.0						
					13.0 / 7.0			7.50m Continued as Cored Drill Hole			
					12.0 / 8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH302

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 2 OF 3

POSITION : E: 332076.30, N: 6248757.40 SURFACE ELEVATION : 19.696 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio GEO 308 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 29/11/21 DATE COMPLETED : 29/11/21 DATE LOGGED : 29/11/21 LOGGED BY : HF CHECKED BY : BD

CASING DIAMETER : N/A BARREL (Length) : 3.00 m BIT : NMLC Stepped BIT CONDITION : Good

DRILLING				MATERIAL			ROCK MASS		
PROGRESS: DRILLING & CASING	PROGRESS: WATER RETURN	(CORE LOSS / RUN %) DRIL. DEPTH	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	RQD (%)	DEFECT SPACING (mm) (20, 40, 100, 300, 1000)	DEFECTS (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				0.0 / 19.0							
				1.0 / 18.0							
				2.0 / 17.0							
				3.0 / 16.0							
				4.0 / 15.0							
				5.0 / 14.0							
				6.0 / 13.0							
				7.0 / 12.0							
						7.50m START CORING AT 7.50m					
NMLC	100%	0%				7.70m GRAVELLY SAND fine to coarse grained, dark grey, sub-rounded to sub-angular, ironstone, siltstone	EW / HW				7.75: BP, 0°, PR, RF, CN 7.76: BP, 0°, PR, RF, CN 7.77: BP, 0°, PR, RF, CN
				8.0							

DRILLING

AD/T	Auger Drilling with TC Bit
AD/V	Auger Drilling with V Bit
AS	Auger Screwing
DB	Washbore with Drag Bit
DT	Diatube
HMLC	HMLC Core Barrel
HQ3	HQ3 Core Barrel
NMLC	NMLC Core Barrel
NQ3	NQ3 Core Barrel
PQ3	PQ3 Core Barrel
R	Rock Roller

WEATHERING

FR	Fresh
SW	Slightly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
HW	Highly Weathered
XW	Extremely Weathered

STRENGTH

EH	Extremely High
VH	Very High
H	High
M	Medium
L	Low
VL	Very Low
EL	Extremely Low

ROUGHNESS

POL	Polished
RF	Rough
S	Smooth
SL	Slickensided
VR	Very Rough

DEFECT TYPE

BP	Bedding Plane
CL	Cleavage
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
FC	Fracture
HB	Handling Break
IS	Infilled Seam
JT	Joint
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void
FA	Fault

COATING

CN	Clean
CT	Coating (>= 1.0m)
FILLED	Filled
SN	Stained
VR	Veneer (< 1.0mm)

PLANARITY

CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

INFILL

CA	Calcite
CLAY	Clay
FE	Iron Oxide
FE	Iron Oxide Clay
CLAY	
KT	Chlorite
MS	Secondary Mineral
MU	Unidentified Mineral
QZ	Quartz
X	Carbonaceous

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH302

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 3 OF 3

POSITION : E: 332076.30, N: 6248757.40 | SURFACE ELEVATION : 19.696 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio GEO 308 | MOUNTING : Track | CONTRACTOR : Stratacore | DRILLER : Daniel

DATE STARTED : 29/11/21 | DATE COMPLETED : 29/11/21 | DATE LOGGED : 29/11/21 | LOGGED BY : HF | CHECKED BY : BD

CASING DIAMETER : N/A | BARREL (Length) : 3.00 m | BIT : NMLC Stepped | BIT CONDITION : Good

DRILLING

PROGRESS: DRILLING & CASING; WATER RETURN; (CORE LOSS RUN %); DRILL DEPTH

SAMPLES & FIELD TESTS

ELEVATION (RL) / DEPTH (m)

DRILLING & CASING	WATER RETURN	(CORE LOSS RUN %)	DRILL DEPTH	SAMPLES & FIELD TESTS	ELEVATION (RL)	DEPTH (m)
NMLC	100%	0%	10.25	Is(50) d=0.01 a=0.25 MPa	11.0	8.0
				Is(50) d=0.03 a=0.24 MPa	9.0	
				Is(50) d=0.06 a=0.67 MPa	10.0	
					10.0	
				Is(50) d=0.99 a=2.3 MPa	9.0	
	100%	0%	13.36	Is(50) d=1.42 a=1.52 MPa	11.0	
				Is(50) d=1.52 a=2.49 MPa	8.0	
				Is(50) d=1.25 a=2.12 MPa	12.0	
	100%	0%	14.36		7.0	
				Is(50) d=1.46 a=2.06 MPa	13.0	
					6.0	
					14.0	
					5.0	
					15.0	
					4.0	
					16.0	

MATERIAL

GRAPHIC LOG

DESCRIPTION
ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)

Weathering

ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral
EL (~0.03) VL (~0.1) L (~0.3) M (~1) H (~3) VH (~10) EH

LAMINITE
dark grey and grey, Sandstone (80%), dark grey - grey and Siltstone (20%), interlaminated at 0-10°, closely spaced *(continued)*

HW

10.40m

LAMINITE
dark grey and grey, Siltstone (80%), dark grey and Sandstone (20%), grey, fine grained, interlaminated at 0-5°

F

14.36m

BOREHOLE BH302 TERMINATED AT 14.36 m
Target depth

ROCK MASS

RQD (%): 81; 99; 100

DEFECT SPACING (mm): 20 40 100 300 1000

DEFECTS
(joints, partings, seams, zones, etc)
Description, orientation, infilling or coating, shape, roughness, thickness, other

- 7.97: HB
- 8.10: BP, 0-5°, PR, RF, CN
- 8.12: BP, 0-5°, PR, RF, CN
- 8.36: BP, 0-5°, PR, RF, CN
- 8.63: DB
- 8.73: BP, 0-5°, PR, RF, CN
- 8.88: HB
- 8.91: BP, 0-5°, PR, RF, Clay CT
- 9.08: DB
- 9.27: DB
- 9.37-9.38: FZ
- 9.41-9.43: HB
- 9.50: BP, 0-5°, PR, S, CN
- 9.62: DB
- 9.64: DB
- 9.76: DB
- 9.80: DB
- 9.91-9.96: FZ
- 9.97: HB
- 10.04: BP, 0-5°, PR, RF, CN
- 10.09: BP, 0-5°, PR, RF, CN
- 10.14: BP, 0-5°, PR, RF, CN
- 10.32: DB
- 10.34: DB
- 10.37: DB
- 10.40: DB
- 10.42: DB
- 11.49: DB
- 11.91: DB
- 12.04: DB
- 12.22: DB
- 12.43: DB
- 12.82: DB
- 13.11: BP, 0-5°, PR, S, CN
- 13.15: BP, 0-5°, PR, S, CN
- 13.66: DB
- 14.03: DB
- 14.30: DB

DRILLING
AD/T	Auger Drilling with TC Bit
AD/V	Auger Drilling with V Bit
AS	Auger Screwing
DB	Washbore with Drag Bit
DT	Diatube
HMLC	HMLC Core Barrel
HQ3	HQ3 Core Barrel
NMLC	NMLC Core Barrel
NQ3	NQ3 Core Barrel
PQ3	PQ3 Core Barrel
R	Rock Roller

WEATHERING
FR	Fresh
SW	Slightly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
HW	Highly Weathered
XW	Extremely Weathered

STRENGTH
EH	Extremely High
VH	Very High
H	High
M	Medium
L	Low
VL	Very Low
EL	Extremely Low

ROUGHNESS
POL	Polished
RF	Rough
S	Smooth
SL	Slickensided
VR	Very Rough

DEFECT TYPE
BP	Bedding Plane
CL	Cleavage
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
FC	Fracture
HB	Handling Break
IS	Infilled Seam
JT	Joint
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void
FA	Fault

COATING
CN	Clean
CT	Coating (>= 1.0m)
FILLED	Filled
SN	Stained
VR	Veneer (< 1.0mm)

PLANARITY
CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

INFILL
CA	Calcite
CLAY	Clay
FE	Iron Oxide
FE	Iron Oxide Clay
CLAY	
KT	Chlorite
MS	Secondary Mineral
MU	Unidentified Mineral
QZ	Quartz
X	Carbonaceous

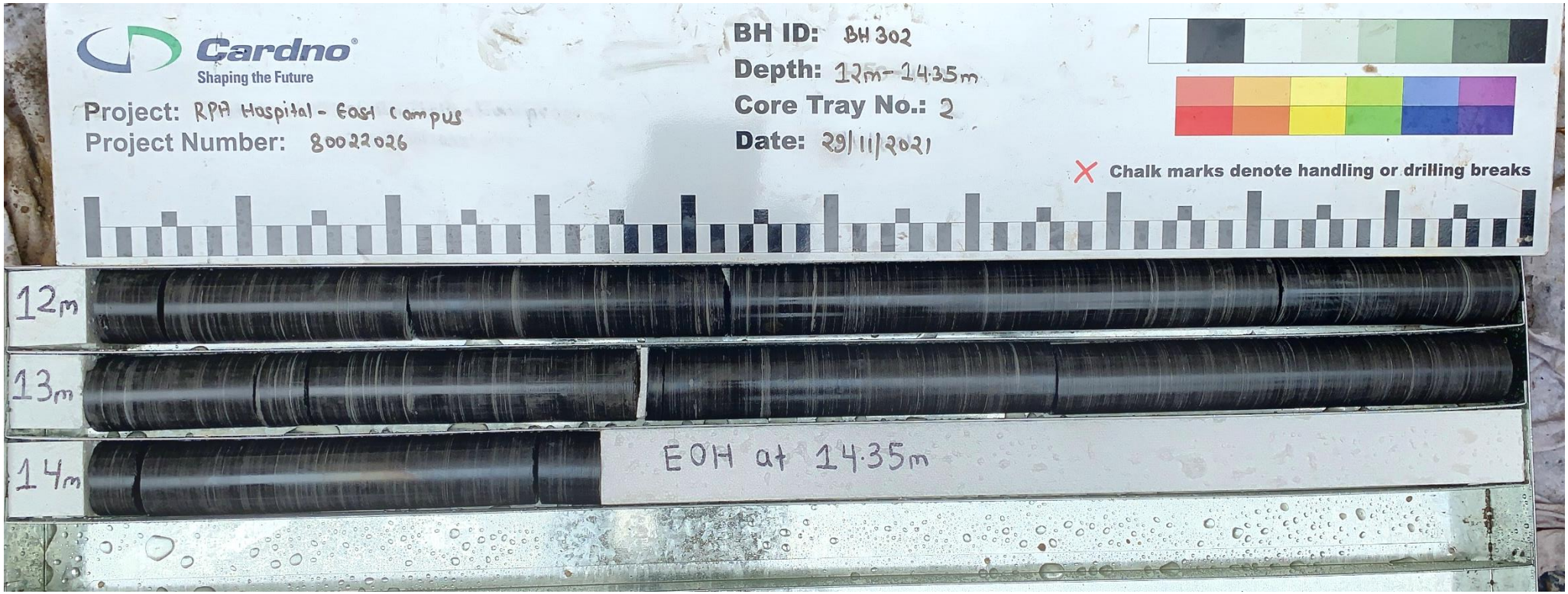
See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

Cardno	TITLE: **Borehole Core Photographs – BH302** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **29/11/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 1 OF 2** **7.50 m to 12.00 m – 4.50 m Length**
	DRILL RIG: **Comacchio GEO 305**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**

Cardno	TITLE: **Borehole Core Photographs – BH302** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **29/11/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 2 OF 2** **12.00 m to 14.35 m – 2.35 m Length**
	DRILL RIG: **Comacchio GEO 305**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH303

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 3

POSITION : E: 331994.42, N: 6248721.36 SURFACE ELEVATION : 27.098 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 3/12/21 DATE COMPLETED : 3/12/21 DATE LOGGED : 3/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A					0.0			0.05m ~~Paver~~ Concrete			ROAD SURFACE
HA		H			27.0				0.40m Fill: Gravelly SAND fine to coarse grained, dark brown, fine to coarse grained, sub-rounded, sandstone, siltstone, igneous gravel, trace low plasticity clay	D		FILL
									0.70m Fill: Sandy CLAY low to medium plasticity, brown, fine to coarse grained sand, trace sub-rounded ironstone, siltstone gravel			0.69: Hand auger refusal due to gravel
	1.00m			1.00m SPT 4, 5, 5 N=10	26.0	1.0						
				1.45m					1.30m Fill: Silty CLAY medium to high plasticity, orange-brown, trace sub-rounded to sub-angular, siltstone, sandstone, ironstone gravel			
		E				2.0				M (=PL)		
					25.0							
	3.00m			3.00m SPT 4, 8, 14 N=22		3.0			3.10m Silty CLAY high plasticity, orange-brown, mottled grey, trace sub-rounded, ironstone gravel, trace rootlets			RESIDUAL SOIL
	3.40m ES			3.45m	24.0			CH				
	4.00m					4.0			4.00m Silty CLAY high plasticity, grey, orange-brown, with sub-rounded to sub-angular ironstone gravel		VSt	
CASING	D		Not Encountered					CH		w < PL		
AD/T	**4.50m**			4.50m SPT 13, 10, 12 N=22	23.0				4.70m Siltstone dark grey, orange-brown, very low strength, extremely weathered, with clay bands and ironstone bands			BEDROCK
				4.95m		5.0						
		F			22.0							
	6.00m			6.00m SPT 8, 23, 18 N=41		6.0						
				6.45m	21.0							
						7.0						
	7.50m			7.50m SPT 13, 17, 30 N=47	20.0				7.60m Siltstone dark grey, very low strength, extremely weathered to highly weathered, with iron indurated bands			
				7.95m		8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH303

PROJECT : Royal Prince Alfred Hospital
LOCATION : John Hopkins Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 2 OF 3

POSITION : E: 331994.42, N: 6248721.36 SURFACE ELEVATION : 27.098 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 3/12/21 DATE COMPLETED : 3/12/21 DATE LOGGED : 3/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING						MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	N/A	F			19.0 / 8.0			Siltstone dark grey, very low strength, extremely weathered to highly weathered, with iron indurated bands *(continued)*			
					18.0 / 9.0			9.85m Continued as Cored Drill Hole			
					17.0 / 10.0						
					16.0 / 11.0						
					15.0 / 12.0						
					14.0 / 13.0						
					13.0 / 14.0						
					12.0 / 15.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH303

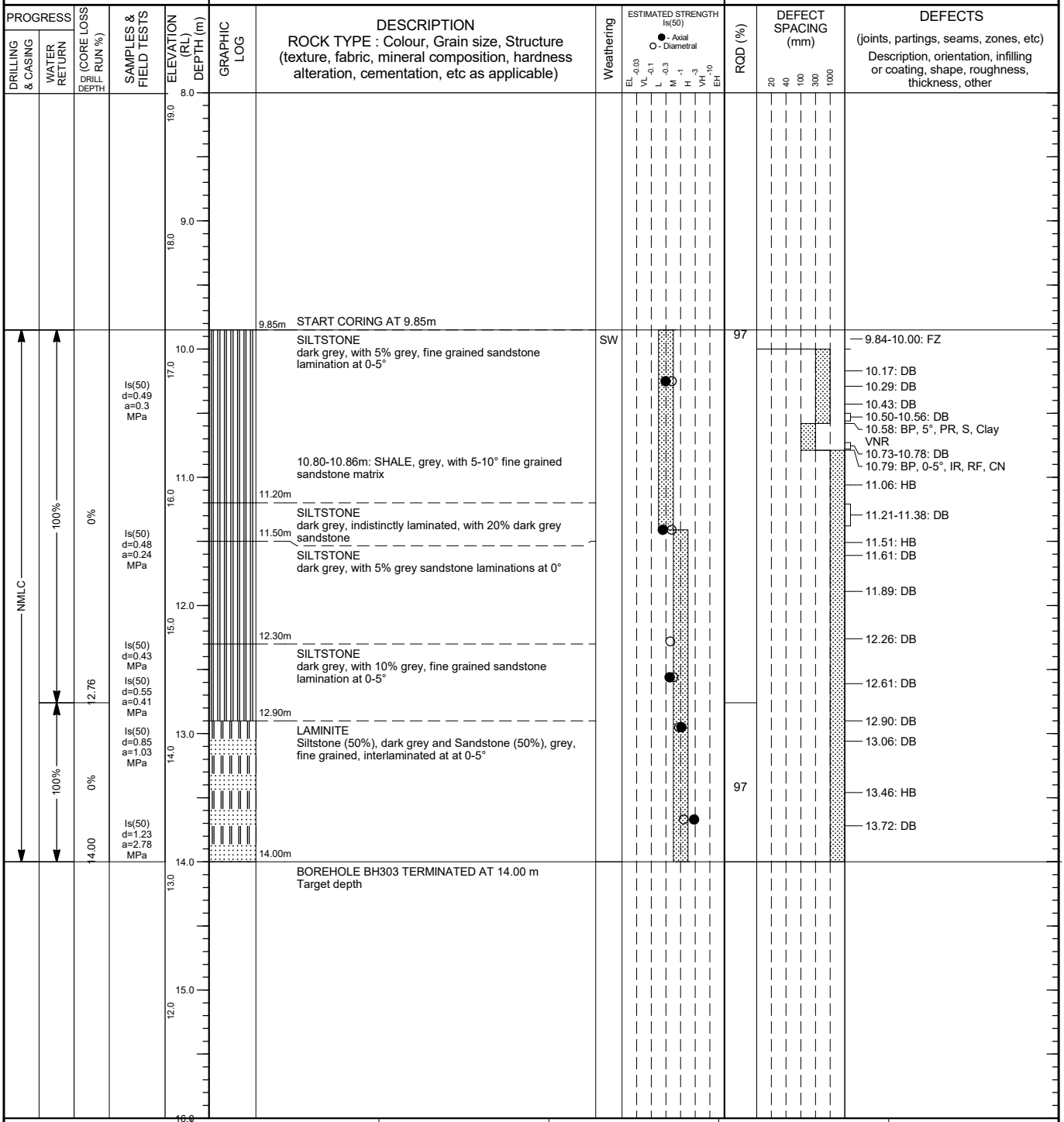
PROJECT : Royal Prince Alfred Hospital
LOCATION : John Hopkins Drive, Camperdow
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 3 OF 3

POSITION : E: 331994.42, N: 6248721.36 | SURFACE ELEVATION : 27.098 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T | MOUNTING : Ute | CONTRACTOR : Stratacore | DRILLER : Daniel

DATE STARTED : 3/12/21 | DATE COMPLETED : 3/12/21 | DATE LOGGED : 3/12/21 | LOGGED BY : RKC | CHECKED BY : BD

CASING DIAMETER : N/A | BARREL (Length) : 3.00 m | BIT : NMLC Stepped | BIT CONDITION : Good



DRILLING

AD/T	Auger Drilling with TC Bit
AD/V	Auger Drilling with V Bit
AS	Auger Screwing
DB	Washbore with Drag Bit
DT	Diatube
HMLC	HMLC Core Barrel
HQ3	HQ3 Core Barrel
NMLC	NMLC Core Barrel
NQ3	NQ3 Core Barrel
PQ3	PQ3 Core Barrel
R	Rock Roller

WEATHERING

FR	Fresh
SW	Slightly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
HW	Highly Weathered
XW	Extremely Weathered

STRENGTH

EH	Extremely High
VH	Very High
H	High
M	Medium
L	Low
VL	Very Low
EL	Extremely Low

ROUGHNESS

POL	Polished
RF	Rough
S	Smooth
SL	Slickensided
VR	Very Rough

DEFECT TYPE

BP	Bedding Plane
CL	Cleavage
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
FC	Fracture
HB	Handling Break
IS	Infilled Seam
JT	Joint
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void
FA	Fault

COATING

CN	Clean
CT	Coating (>= 1.0m)
FILLED	Filled
SN	Stained
VR	Veneer (< 1.0mm)

PLANARITY

CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

INFILL

CA	Calcite
CLAY	Clay
FE	Iron Oxide
FE	Iron Oxide Clay
CLAY	
KT	Chlorite
MS	Secondary Mineral
MU	Unidentified Mineral
QZ	Quartz
X	Carbonaceous

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

Cardno	TITLE: **Borehole Core Photographs – BH303** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **03/12/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 1 OF 1** **9.85 m to 14.00 m – 4.15 m Length**
	DRILL RIG: **D-4T Ute Rig**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH304

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 3

POSITION : E: 332092.74, N: 6248715.43 SURFACE ELEVATION : 21.873 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Geoprobe 66200DTMOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 29/11/21 DATE COMPLETED : 29/11/21 DATE LOGGED : 29/11/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING							MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	N/A	F	Not Encountered		21.0 0.0			0.10m ASPHALT			ROAD SURFACE
								Fill: Gravelly SAND fine to coarse grained, dark brown, fine to coarse grained, sub-rounded to sub-angular, ironstone gravel			FILL
								0.50m Fill: Gravelly SAND fine to coarse grained, dark brown, fine to coarse grained, sub-rounded to sub-angular, ironstone gravel, trace high plasticity clay, rootlets			
	1.50m	E		1.50m SPT 2, 5, 6 N=11 1.95m	20.0 1.0						
								2.00m Fill: Silty CLAY high plasticity, grey, orange-brown, trace rounded to sub-rounded, siltstone, ironstone gravel			
								2.50m Fill: Silty CLAY low to medium plasticity, dark grey, dark brown, trace rounded to sub-rounded, siltstone, ironstone gravel, trace fine to coarse grained sand, rootlets			
	3.00m			3.00m SPT 3, 3, 4 N=7	19.0 3.0						
								3.30m Silty CLAY high plasticity, orange-red, mottled grey, trace charcoal, siltstone gravel	M (=PL)	St	RESIDUAL SOIL
	3.45m D			3.45m							
	4.00m	F			18.0 4.0		CH				
	4.50m			4.50m SPT 4, 8, 8 N=16 4.95m	17.0 5.0		CH	4.70m Silty CLAY high plasticity, grey, mottled red, orange-brown, trace sub-rounded, ironstone gravel		VSt	
		H			16.0 6.0			5.20m Siltstone grey, very low strength, extremely weathered to highly weathered, with fine to medium grained sandstone, with ocassional clay band			BEDROCK
					15.0 7.0						
					14.0 8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH304

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 2 OF 3

POSITION : E: 332092.74, N: 6248715.43 SURFACE ELEVATION : 21.873 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Geoprobe 66200DTMOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 29/11/21 DATE COMPLETED : 29/11/21 DATE LOGGED : 29/11/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING						MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	N/A	H	Not Encountered		13.0 / 8.0 12.0 / 9.0 11.0 / 10.0 10.0 / 11.0 12.0			Siltstone grey, very low strength, extremely weathered to highly weathered, with fine to medium grained sandstone, with ocassional clay band *(continued)*			BEDROCK
								12.26m Continued as Cored Drill Hole			
					9.0 / 13.0 8.0 / 14.0 7.0 / 15.0 6.0 / 16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH304

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 3 OF 3

POSITION : E: 332092.74, N: 6248715.43 SURFACE ELEVATION : 21.873 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Geoprobe 66200DTMOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 29/11/21 DATE COMPLETED : 29/11/21 DATE LOGGED : 29/11/21 LOGGED BY : RKC CHECKED BY : BD

CASING DIAMETER : N/A BARREL (Length) : 3.00 m BIT : NMLC Stepped BIT CONDITION : Good

DRILLING					MATERIAL			ROCK MASS		
PROGRESS: DRILLING & CASING	PROGRESS: WATER RETURN	(CORE LOSS RUN %) / DRILL DEPTH	SAMPLES & FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) (● - Axial, ○ - Diametral)	RQD (%)	DEFECT SPACING (mm)	DEFECTS (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
				8.0				EL VL L M H VH EH -0.03 -0.1 -0.3 -1 -3 -10		20 40 100 300 1000	
				13.0 9.0							
				12.0 10.0							
				11.0							
				12.0 10.0		12.26m START CORING AT 12.26m					
NMLC	100%	0%	Is(50) d=0.46 a=1.39 MPa Is(50) d=0.97 a=1.57 MPa Is(50) d=0.45 a=0.8 MPa	13.0 9.0		SILTSTONE dark grey, with 5% grey, fine grained sandstone lamination at 0-5°	F		81		12.31: DB 12.37: JT, 90°, PR, S, CN 12.38-12.40: FZ 12.44-12.51: DB 12.58: JT, 85-90°, UN, S, CN 12.67-13.09: DB 13.17: BP, 0°, PR, S, CN 13.20: BP, 0°, PR, S, CN 13.24: BP, 5°, PR, S, CN 13.28: BP, 0°, PR, S, CN 13.32: BP, 0°, PR, S, CT 13.43: BP, 0°, PR, S, CN 13.50-13.64: DB 13.68: BP, 0°, PR, S, CN 13.71: JT, 50°, IR, RF, CN 13.76-13.79: DB 13.94: JT, 85°, PR, RF, CN 14.05: JT, 55°, IR, RF, CN 14.07: JT, 55°, IR, RF, CN 14.10: DB 14.15: JT, 85°, PR, RF, CN 14.21: BP, 0°, PR, S, CN 14.26: JT, 65°, IR, RF, CN 14.30: BP, 0-5°, IR, RF, CN 14.40: JT, 75°, IR, RF, CN 14.57: JT, 55°, PR, S, CN 14.60-15.21: DB
		14.21		8.0 14.0		13.70m					
	100%	0%		7.0 15.0		SILTSTONE dark grey, with 5% grey, fine grained sandstone lamination at 0-5°			80		
		15.21	Is(50) d=1.12 a=1.16 MPa	6.0 16.0		15.21m BOREHOLE BH304 TERMINATED AT 15.21 m Target depth					

DRILLING

AD/T	Auger Drilling with TC Bit
AD/V	Auger Drilling with V Bit
AS	Auger Screwing
DB	Washbore with Drag Bit
DT	Diatube
HMLC	HMLC Core Barrel
HQ3	HQ3 Core Barrel
NMLC	NMLC Core Barrel
NQ3	NQ3 Core Barrel
PQ3	PQ3 Core Barrel
R	Rock Roller

WEATHERING

FR	Fresh
SW	Slightly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
HW	Highly Weathered
XW	Extremely Weathered

STRENGTH

EH	Extremely High
VH	Very High
H	High
M	Medium
L	Low
VL	Very Low
EL	Extremely Low

ROUGHNESS

POL	Polished
RF	Rough
S	Smooth
SL	Slickensided
VR	Very Rough

DEFECT TYPE

BP	Bedding Plane
CL	Cleavage
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
FC	Fracture
HB	Handling Break
IS	Infilled Seam
JT	Joint
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void
FA	Fault

COATING

CN	Clean
CT	Coating (>= 1.0m)
FILLED	Filled
SN	Stained
VR	Veneer (< 1.0mm)

PLANARITY

CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

INFILL

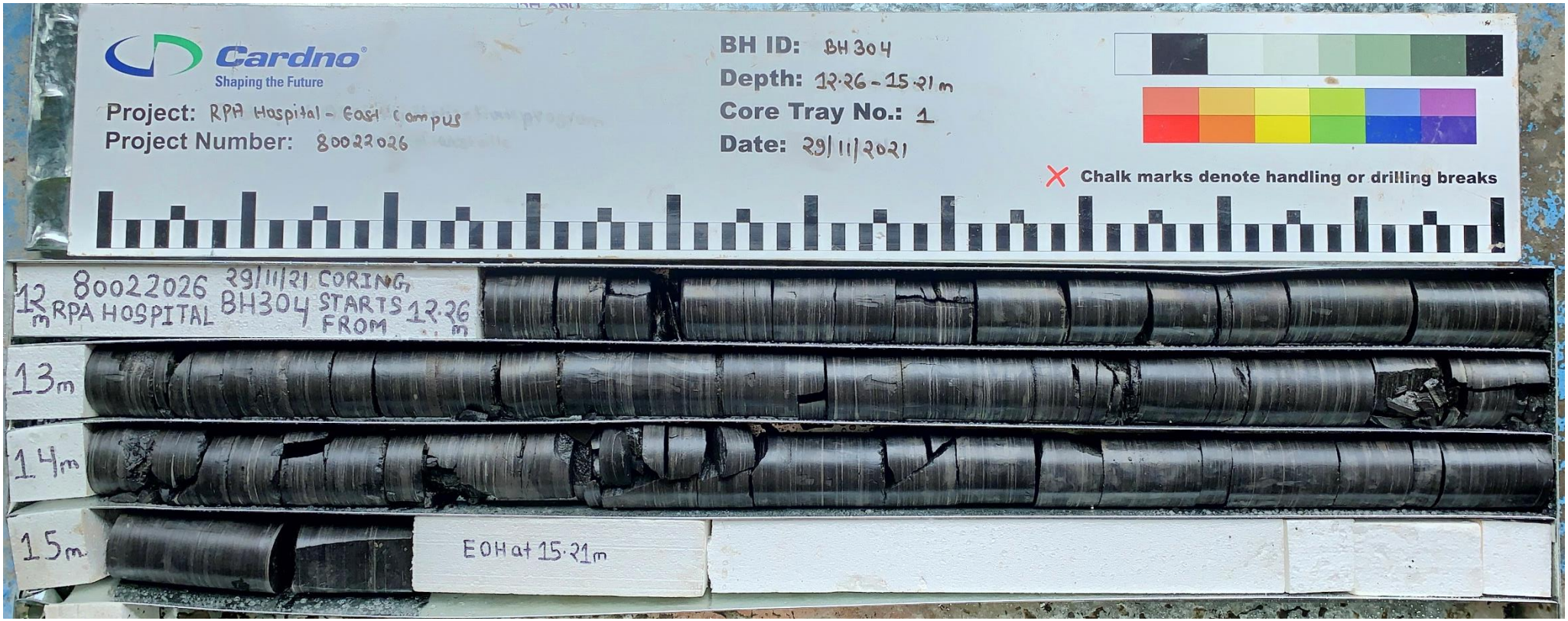
CA	Calcite
CLAY	Clay
FE	Iron Oxide
FE	Iron Oxide Clay
CLAY	
KT	Chlorite
MS	Secondary Mineral
MU	Unidentified Mineral
QZ	Quartz
X	Carbonaceous

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

Cardno	TITLE: **Borehole Core Photographs – BH304** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **29/11/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 1 OF 1 12.26 m to 15.21 m – 2.95 m Length**
	DRILL RIG: **Geoproble 6620DT**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH305A

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 1

POSITION : E: 332064.29, N: 6248642.95 SURFACE ELEVATION : 24.158 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Geoprobe 66200DTMOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 30/11/21 DATE COMPLETED : 30/11/21 DATE LOGGED : 30/11/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING							MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA	N/A				24.0	0.0			Fill: Clayey Silty SAND fine to medium grained, brown, dark grey, low plasticity clay	M		FILL
						0.30m			Fill: Silty Sandy CLAY low plasticity, dark brown, trace sub-rounded, sandstone gravel, trace rootlets			
						0.90m			Fill: Silty CLAY medium to high plasticity, dark brown, trace rootlets			
CASING		F	Not Encountered		23.0	1.0			1.50m: colour change to brown	w < PL		
						1.80m			Fill: Sandy CLAY low plasticity, brown, grey, fine to medium grained sand, trace sub-rounded, ironstone gravel			
AD/T	2.50m B				22.0	2.0						
						2.50m			Silty CLAY high plasticity, orange-brown, trace sub-rounded, ironstone gravel			RESIDUAL SOIL
	3.00m				21.0	3.0		CH			St	
									BOREHOLE BH305A TERMINATED AT 3.00 m Target depth			
					20.0	4.0						
					19.0	5.0						
					18.0	6.0						
					17.0	7.0						
						8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH305B

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 1

POSITION : E: 332081.75, N: 6248640.00 SURFACE ELEVATION : 22.568 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Geoprobe 66200DTMOUNTING : Track CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 30/11/21 DATE COMPLETED : 30/11/21 DATE LOGGED : 30/11/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING							MATERIAL						
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				22.0	0.0			Fill: Clayey Silty SAND fine to medium grained, dark brown, dark grey, low plasticity clay	M		FILL
						0.30m			Fill: Silty Sandy CLAY dark brown, trace sub-rounded, sandstone gravel, trace rootlets	w < PL		
						1.00m			Fill: Silty CLAY medium to high plasticity, dark brown			
	1.50m	E		1.50m SPT 4, 6, 8 N=14 1.95m	21.0	1.0 2.0			1.50-1.95m: trace charcoal			
						2.50m			Silty CLAY high plasticity, orange-brown, pale grey, trace sub-rounded to sub-angular, ironstone and sandstone gravel, trace rootlets, charcoal	w ~ PL		RESIDUAL SOIL
	3.00m			3.00m SPT 6, 6, 8 N=14 3.45m	20.0	3.0		CH	3.20m: colour change to orange-red, mottled grey		St	
AD/T CASING	4.00m	D	Not Encountered		19.0	4.0			3.80m: colour change to red			
	4.50m			4.50m SPT 7, 10, 15 N=25 4.95m	18.0	4.50m 5.0		CH	Silty CLAY high plasticity, pale grey, mottled red and orange-brown, with sub-rounded to sub-angular, ironstone gravel			
		F				5.30m			Silty CLAY high plasticity, pale grey, mottled orange-red, with sub-rounded to sub-angular, ironstone, siltstone gravel	w < PL	VSt	
	6.00m			6.00m SPT 8, 12, 16 N=28 6.45m	17.0 16.0	6.0		CH	6.30m: trace pale grey, fine to medium grained sand			
						7.00m			Siltstone grey, dark grey, very low strength, extremely weathered to highly weathered, with clay bands, trace fine to coarse grained sand			BEDROCK
	7.50m	H		7.50m SPT 30/150mm N=R 7.65m	15.0	7.0 8.0						
						8.00m			BOREHOLE BH305B TERMINATED AT 8.00 m Refusal			

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH306

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 3

POSITION : E: 332088.60, N: 6248613.60 SURFACE ELEVATION : 23.165 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 2/12/21 DATE COMPLETED : 2/12/21 DATE LOGGED : 2/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA	N/A	H			23.0	0.0			Fill: Gravelly SAND fine to medium grained, dark brown, fine to coarse grained, sandstone, shale gravel, trace low to medium plasticity clay			FILL
		E				0.30m			Fill: Silty SAND fine to coarse grained, brown, grey	M		
						0.50m			Fill: Silty CLAY medium to high plasticity, dark brown, trace sub-rounded, ironstone gravel, trace rootlets			
					22.0	1.0						
	1.50m			1.50m SPT 3, 3, 4 N=7		1.50m			Silty CLAY medium to high plasticity, brown, orange-brown, trace sub-rounded, ironstone gravel, trace rootlets			RESIDUAL SOIL
				1.95m								
					21.0	2.0		CI-CH			F	
	2.50m											
	D											
	3.00m			3.00m SPT 4, 5, 7 N=12		3.00m			Silty CLAY high plasticity, orange-red, mottled grey, trace sub-rounded, siltstone, ironstone gravel	M (=PL)		
				3.45m	20.0	3.0			3.59m: colour change to red		St - VSt	
								CH				
		F			19.0	4.0						
CASING	4.50m			4.50m SPT 5, 10, 19 N=29		4.60m			Silty CLAY high plasticity, pale grey, mottled orange-brown, with iron indurated bands			
				4.95m								
					18.0	5.0		CH			VSt	
						5.50m			Silty CLAY high plasticity, grey, trace sub-rounded to sub-angular, ironstone, siltstone gravel	w < PL		
	6.00m			6.00m SPT 3, 14, 27 N=41		6.00m		CH			H	
				6.45m	17.0	6.0						
						6.40m			Siltstone dark grey, very low strength, extremely weathered, with clay bands			BEDROCK
					16.0	7.0						
				7.50m SPT 11/150mm N=R 7.65m		8.0						
AD/T												

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH306

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 2 OF 3

POSITION : E: 332088.60, N: 6248613.60 SURFACE ELEVATION : 23.165 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 2/12/21 DATE COMPLETED : 2/12/21 DATE LOGGED : 2/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING						MATERIAL					
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) / DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	N/A	F			8.0 / 15.0			Siltstone dark grey, very low strength, extremely weathered, with clay bands *(continued)*			BEDROCK
					9.0			9.20m Continued as Cored Drill Hole			
					14.0 / 10.0 / 13.0						
					11.0 / 12.0						
					12.0 / 11.0						
					13.0 / 10.0						
					14.0 / 9.0						
					15.0 / 8.0						
					16.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH306

PROJECT : Royal Prince Alfred Hospital
LOCATION : Lambie Dew Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 3 OF 3

POSITION : E: 332088.60, N: 6248613.60 | SURFACE ELEVATION : 23.165 (AHD) | ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T | MOUNTING : Ute | CONTRACTOR : Stratacore | DRILLER : Daniel

DATE STARTED : 2/12/21 | DATE COMPLETED : 2/12/21 | DATE LOGGED : 2/12/21 | LOGGED BY : RKC | CHECKED BY : BD

CASING DIAMETER : N/A | BARREL (Length) : 3.00 m | BIT : NMLC Stepped | BIT CONDITION : Good

DRILLING

PROGRESS: DRILLING & CASING; WATER RETURN

(CORE LOSS RUN %) DRILL DEPTH

SAMPLES & FIELD TESTS

ELEVATION (RL) DEPTH (m)

MATERIAL

GRAPHIC LOG

DESCRIPTION
ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)

Weathering

ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral
EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH

ROCK MASS

RQD (%)

DEFECT SPACING (mm) 20 40 100 300 1000

DEFECTS (joints, partings, seams, zones, etc)
Description, orientation, infilling or coating, shape, roughness, thickness, other

Depth	Drilling & Casing	Water Return	Core Loss / Run %	Drill Depth	Samples & Field Tests	Elevation (RL)	Depth (m)	Graphic Log	Description	Weathering	Estimated Strength Is(50)	RQD (%)	Defect Spacing (mm)	Defects
8.0						15.0								
9.0														
9.20m									START CORING AT 9.20m					
9.40m	NMLC					14.0			SANDY CLAY dark grey, low to medium plasticity, fine to coarse grained sand, with siltstone gravel	EW				
9.50m									SILTSTONE dark grey, very low strength, extremely weathered, with clay bands	MW				
					Is(50) d=0.12 a=0.57 MPa	13.0	10.0		LAMINITE dark grey and grey, Siltstone (50%), fine to medium grained grey and Sandstone (50%), dark grey, interlaminated at 0-5°	EW				
					Is(50) d=0.49 a=1.04 MPa					MW				
		100%	0%							EW				
										MW				
										EW				
										MW				
11.00m						12.0	11.0			EW		56		
									LAMINITE dark grey and grey, Siltstone (80%), fine to medium grained grey and Sandstone (20%), dark grey, interlaminated at 0-5°	MW				
					Is(50) d=0.98 a=0.95 MPa					EW				
					Is(50) d=0.1 a=0.6 MPa					MW				
										EW				
				12.28						MW				
										SW				
										F				
					Is(50) d=0.45 a=1.58 MPa	11.0	12.0							
					Is(50) d=0.17 a=1.13 MPa									
		100%	0%									93		
						10.0	13.0							
						9.0	14.0							
				14.97	Is(50) d=0.98 a=1.52 MPa			14.97m						
15.0						8.0			BOREHOLE BH306 TERMINATED AT 14.97 m Target depth					
16.0														

9.34-9.50: SM, clay
9.53: BP, 5°, PR, S, clay CT
9.59: BP, 0°, PR, S, CN
9.62: JT, 85°, IR, RF, CN
9.68-9.71: FZ
9.73: BP, 0-5°, PR, S, CN
9.77: BP, 0-5°, PR, S, CN
9.82: BP, 0-5°, PR, S, CN
9.93: BP, 0°, PR, S, CN
9.97: HB
10.03: JT, 80°, IR, RF, CN
10.14: JT, 75°, IR, RF, CN
10.19: BP, 0°, PR, S, CN
10.22: BP, 0°, PR, S, CN
10.25: BP, 0°, PR, S, CN
10.28: BP, 0°, IR, RF, CN
10.34: BP, 0°, PR, S, CN
10.38: BP, 0°, PR, S, CN
10.42-10.46: FZ, clay CT
10.48: BP, 0°, PR, S, clay CT
10.52-10.55: FZ
10.57: BP, 5°, PR, S, CN
10.61-10.62: FZ
10.67-10.68: SM, clay
10.69-10.70: SM, clay
10.76: BP, 0°, PR, S, CN
10.84: JT, ST, RF, CN
10.90: BP, 0-5°, PR, RF, gravel FLD
10.93: BP, 0-5°, PR, S, silt CT
10.98: DB
11.08: DB
11.23: DB
11.35: JT, 70°, UN, RF, CN
11.50: DB
11.59: DB
11.65: DB
11.77: DB
11.84: BP, 0°, PR, S, CN
12.04: DB
12.20: DB
12.43: DB
12.46: DB
12.49: DB
12.62: BP, 0°, PR, S, CN
12.82: DB
12.88: DB
12.92: DB
12.96: DB
13.13: DB
13.35: BP, 0°, PR, S, CN
13.45-13.58: 5x BP, 0-5°, PR, S, CN
13.69: DB
14.33: DB
14.42: DB
14.75: DB

DRILLING

AD/T	Auger Drilling with TC Bit
AD/V	Auger Drilling with V Bit
AS	Auger Screwing
DB	Washbore with Drag Bit
DT	Diatube
HMLC	HMLC Core Barrel
HQ3	HQ3 Core Barrel
NMLC	NMLC Core Barrel
NQ3	NQ3 Core Barrel
PQ3	PQ3 Core Barrel
R	Rock Roller

WEATHERING

FR	Fresh
SW	Slightly Weathered
MW	Moderately Weathered
DW	Distinctly Weathered
HW	Highly Weathered
XW	Extremely Weathered

STRENGTH

EH	Extremely High
VH	Very High
H	High
M	Medium
L	Low
VL	Very Low
EL	Extremely Low

ROUGHNESS

POL	Polished
RF	Rough
S	Smooth
SL	Slickensided
VR	Very Rough

DEFECT TYPE

BP	Bedding Plane
CL	Cleavage
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
FC	Fracture
HB	Handling Break
IS	Infilled Seam
JT	Joint
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void
FA	Fault

COATING

CN	Clean
CT	Coating (>= 1.0m)
FILLED	Filled
SN	Stained
VR	Veneer (< 1.0mm)

PLANARITY

CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

INFILL

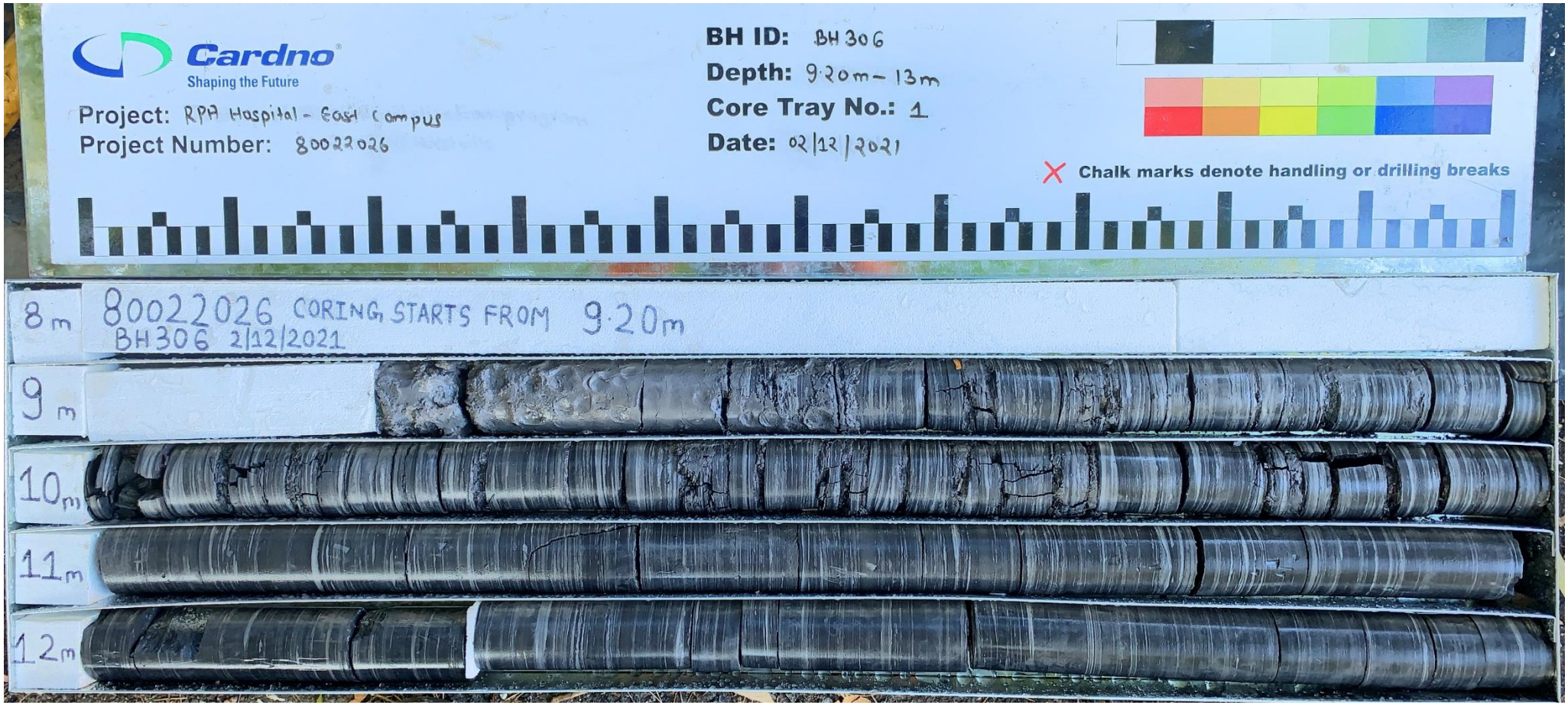
CA	Calcite
CLAY	Clay
FE	Iron Oxide
FE	Iron Oxide Clay
CLAY	
KT	Chlorite
MS	Secondary Mineral
MU	Unidentified Mineral
QZ	Quartz
X	Carbonaceous

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

Cardno	TITLE: **Borehole Core Photographs – BH306** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **02/12/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 1 OF 2 9.20 m to 13.00 m – 3.80 m Length**
	DRILL RIG: **D-4T Ute Rig**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**



Cardno	TITLE: **Borehole Core Photographs – BH306** **Geotechnical Investigation – RPA East Campus**			
	PROJECT NO: **80022026**	TEST DATE: **02/12/2021**	INCLINATION: **-90 degree**	CORED LENGTH: **BOX 2 OF 2 13.00 m to 14.97 m – 1.97 m Length**
	DRILL RIG: **D-4T Ute Rig**	CONTRACTOR: **Cardno & Stratacore Drilling**	LOGGED BY: **RK**	CHECKED BY: **BD**

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH307

PROJECT : Royal Prince Alfred Hospital
LOCATION : John Hopkins Drive, Camperdown
CLIENT : Health Infrastructure
FEATURE :
FILE / JOB NO : 80022026
SHEET : 1 OF 1

POSITION : E: 331934.05, N: 6248700.61 SURFACE ELEVATION : 29.818 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : D-4T MOUNTING : Ute CONTRACTOR : Stratacore DRILLER : Daniel

DATE STARTED : 2/12/21 DATE COMPLETED : 2/12/21 DATE LOGGED : 2/12/21 LOGGED BY : RKC CHECKED BY : BD

DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A	H				0.0			0.05m Asphalt			ROAD SURFACE
		E							Fill: Gravelly SAND fine to coarse grained, brown, fine to coarse grained, sub-rounded to sub-angular, ironstone gravel	M		FILL
						0.30m			Fill: Silty CLAY low to medium plasticity, dark brown, trace fine to coarse grained sand			
						0.60m			Silty CLAY high plasticity, orange-brown, trace sub-rounded, ironstone gravel	M (=PL)		RESIDUAL SOIL
	1.00m U75				29.0	1.0			1.0m: with iron indurated bands		St	
	1.45m			1.45m SPT 5, 11, 15 N=26				CH			VSt	
	2.00m			1.90m 2.00m SPT 6, 17, 21 N=38	28.0	2.0						
AD/T CASING		F	Not Encountered	2.45m					2.60m Silty CLAY high plasticity, orange-brown, with iron indurated bands	w < PL	H	
	3.00m			3.00m SPT 7, 20, 30 N=50	27.0	3.0						
				3.45m								
	4.00m			4.00m SPT 9, 19, 22 N=41	26.0	4.0						
				4.45m								
	5.00m			5.00m SPT 19, 13/30mm N=R 5.18m	25.0	5.0			5.30m			
									Siltstone 5.50m dark grey, very low strength, extremely weathered with clay bands			WEATHERED ROCK
									BOREHOLE BH307 TERMINATED AT 5.50 m Target depth			
					24.0	6.0						
					23.0	7.0						
					22.0	8.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Cardno Shaping the Future

REPORT OF BOREHOLE: BH303

SHEET: 1 OF 1

CLIENT:
PROJECT: Royal Prince Alfred Hospital
LOCATION:
JOB NO: 80022026

DRILL RIG: D-4T
CONTRACTOR: Stratacore
INCLINATION: -90°
HOLE DEPTH: 14.00 m
LOGGED: RKC DATE: 3/12/21
CHECKED: DATE:

Drilling				Sampling		Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL/ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION
HA		0					tiles concrete slab dry		Spoils
				SPT 1.00-1.45 m 4, 5, 5 N=10			Gravelly SAND fine to coarse grained, dark brown, fine to coarse grained, sub-rounded, sandstone, shale, igneous gravel, trace low plasticity clay dry		
		2					Sandy CLAY low to medium plasticity, brown, fine to coarse grained sand, trace sub-rounded ironstone, shale gravel		
							Silty CLAY medium to high plasticity, orange-brown, trace sub-rounded to sub-angular, shale, sandstone, ironstone gravel		
				SPT 3.00-3.45 m 4, 8, 14 N=22 ES 3.40 m			Silty CLAY high plasticity, orange-brown, mottled grey, trace sub-rounded, ironstone gravel, trace rootlets very stiff		
		4		C 3.85-12.76 m D 4.00-4.50 m			Silty CLAY high plasticity, grey, orange-brown, with sub-rounded to sub-angular ironstone gravel dry, very stiff		
				SPT 4.50-4.95 m 13, 10, 12 N=22			siltstone dark grey, orange-brown, very low strength, extremely weathered, with clay bands and ironstone bands		
AD/T		6		SPT 6.00-6.45 m 8, 23, 18 N=41					Bentonite
				SPT 7.50-7.95 m 13, 17, 30 N=47			siltstone dark grey, very low strength, extremely weathered to highly weathered, with iron indurated bands		Sand
		8							
NMLC	100% Water RETURN	10					SILTSTONE dark grey, with 5% grey, fine grained sandstone lamination at 0-5° slightly weathered, low to medium strength		
							SILTSTONE dark grey, indistinctly laminated, with 20% dark grey sandstone slightly weathered, low to medium strength		
		12					SILTSTONE dark grey, with 5% grey sandstone laminations at 0° slightly weathered, medium strength		
							SILTSTONE dark grey, with 10% grey, fine grained sandstone lamination at 0-5° slightly weathered, medium strength		
	100% Water RETURN			C 12.76-14.00 m			INTERLAMINATED SILTSTONE (50%) AND SANDSTONE (50%) AT 0-5° dark grey siltstone, grey fine grained sandstone slightly weathered, medium to high strength		
		14	14.00				END OF BOREHOLE @ 14.00 m TARGET DEPTH		

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

CARDNO WELL LIB_26 SEPT 2012_ICD - EDITED.GLB Log CARDNO WELL 80022026 RPAH WELLS.GPJ <<DrawingFile>> 21/12/2021 17:34 10.0.000

Royal Prince Alfred Hospital – Eastern Campus

APPENDIX

C

LABORATORY TEST RESULTS

Cardno

now

Stantec

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Unit 2, 4 Kellogg Road,
Glendenning NSW 2761

Laboratory: **Glendenning Laboratory**
Phone: 02 9854 1700
Fax: 02 4577 9055
Email: Sydney@constructionsciences.net

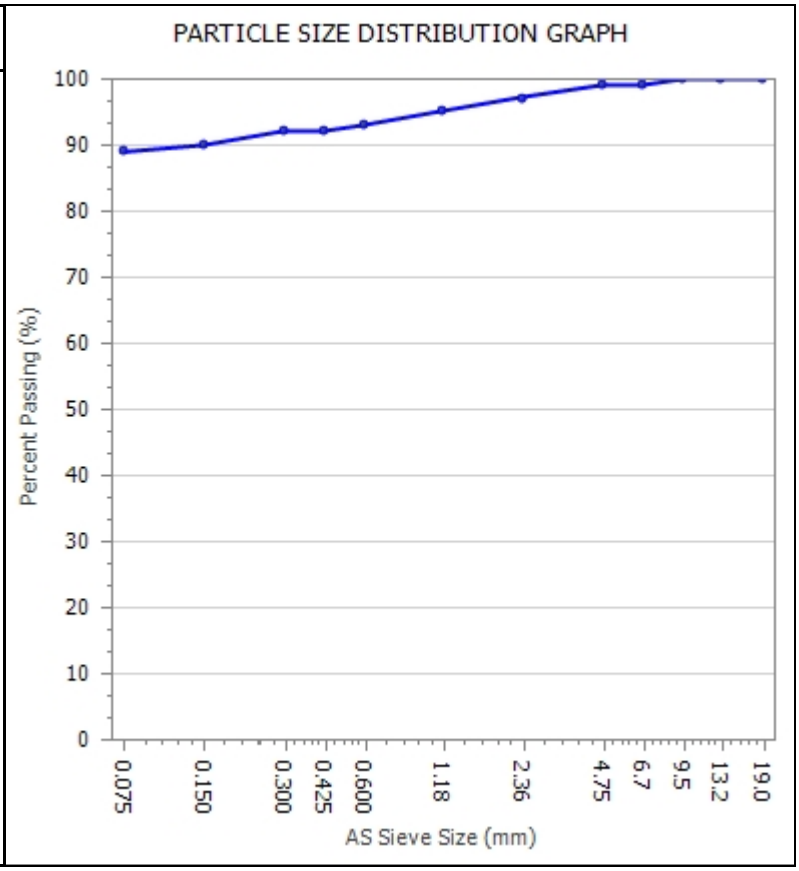
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264008-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH302
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 1 of 3

Test Procedures:	AS1289.3.6.1

Sample Number	12385/S/967183	Sample Location	
Sampling Method	Tested As Received	Borehole	BH302
Date Sampled	29/11/2021 12:00	Depth (m)	2.0-2.50
Sampled By	Client Supplied		
Date Tested	7/12/2021		
Material Source	Not Supplied	Material Type	Combined

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**99**	
4.75		**99**	
2.36		**97**	
1.18		**95**	
0.600		**93**	
0.425		**92**	
0.300		**92**	
0.150		**90**	
0.075		**89**	



Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Patrick Deasy
Form ID: W9Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Unit 2, 4 Kellogg Road,
Glendenning NSW 2761

Laboratory: **Glendenning Laboratory**
Phone: 02 9854 1700
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Email: Sydney@constructionsciences.net

PARTICLE SIZE DISTRIBUTION REPORT

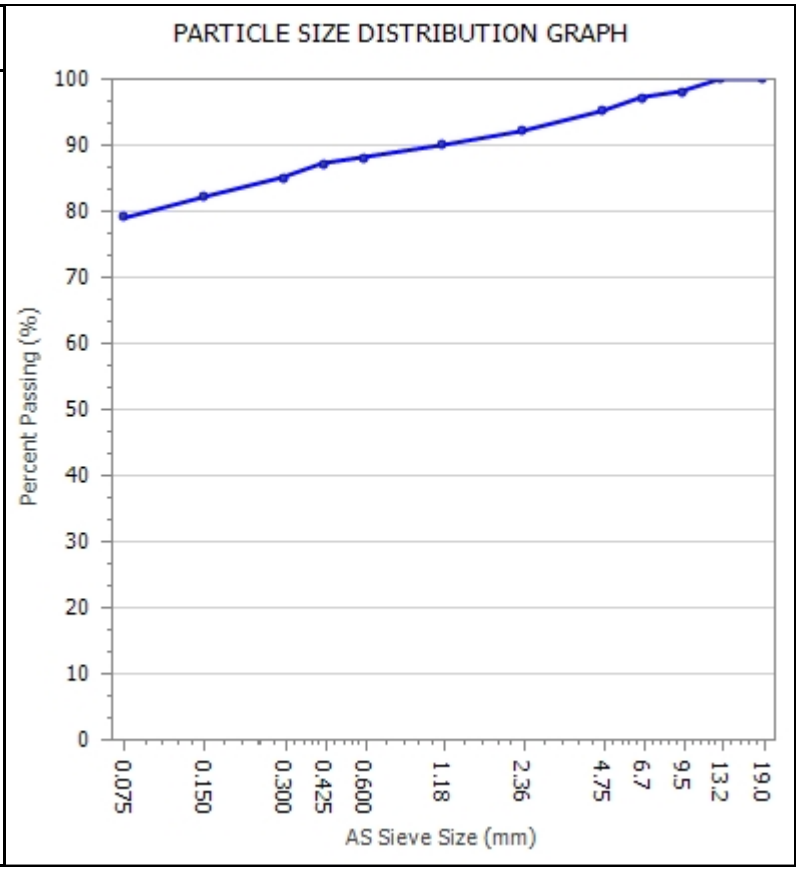
Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264008-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH305B
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 2 of 3

Test Procedures:	AS1289.3.6.1
Sample Number	12385/S/967184
Sampling Method	Tested As Received
Date Sampled	29/11/2021 12:00
Sampled By	Client Supplied
Date Tested	7/12/2021
Material Source	Not Supplied

Sample Location

Borehole		BH305B
Depth	(m)	4.0-4.50
Material Type		Combined

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
19.0		**100**	
13.2		**100**	
9.5		**98**	
6.7		**97**	
4.75		**95**	
2.36		**92**	
1.18		**90**	
0.600		**88**	
0.425		**87**	
0.300		**85**	
0.150		**82**	
0.075		**79**	



Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Patrick Deasy
Form ID: W9Rep Rev 2

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Email: Sydney@constructionsciences.net

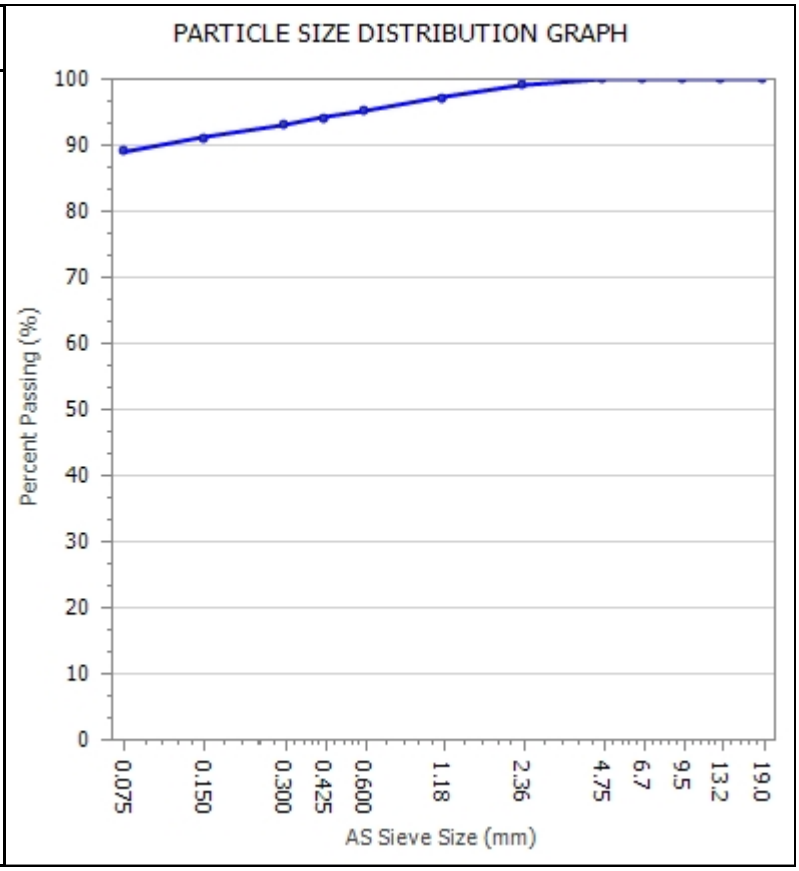
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264008-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH303
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 3 of 3

Test Procedures:	AS1289.3.6.1

Sample Number	12385/S/967185	Sample Location	
Sampling Method	Tested As Received	Borehole	BH303
Date Sampled	29/11/2021 12:00	Depth (m)	4.0-4.50
Sampled By	Client Supplied		
Date Tested	8/12/2021		
Material Source	Not Supplied	Material Type	Combined

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**100**	
4.75		**100**	
2.36		**99**	
1.18		**97**	
0.600		**95**	
0.425		**94**	
0.300		**93**	
0.150		**91**	
0.075		**89**	



Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Patrick Deasy
Form ID: W9Rep Rev 2

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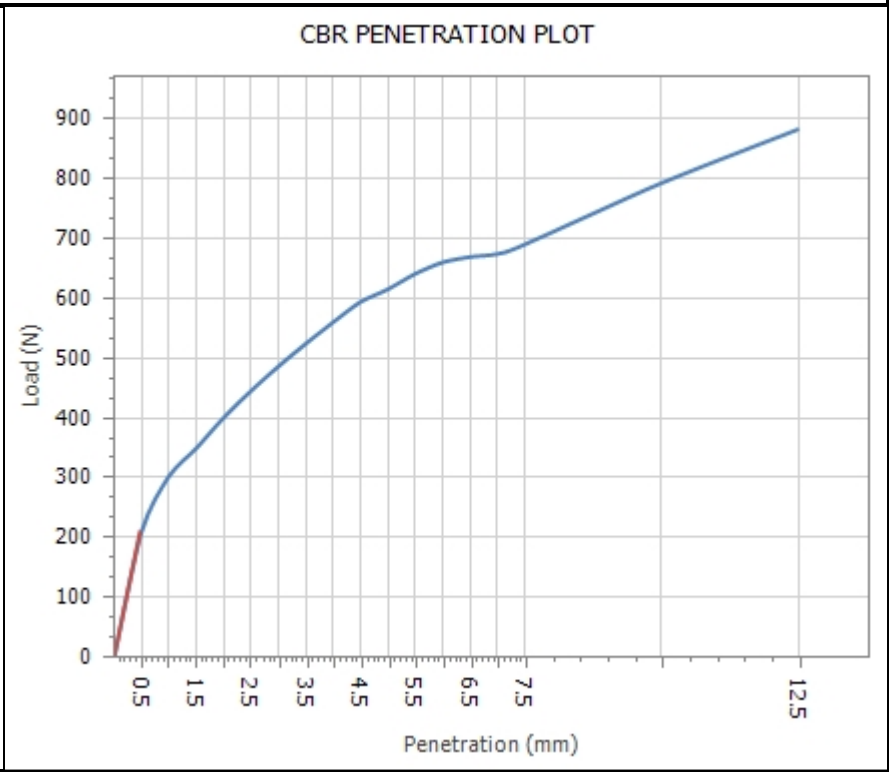
CALIFORNIA BEARING RATIO REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264009-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH305A
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 1 of 2

Test Procedures	AS1289.6.1.1, T103 (W0), AS1289.5.1.1, AS1289.2.1.1

		Sample Location		
Sample Number	12385/S/967186	Borehole		BH305A
Sampling Method	Tested As Received	Depth	(m)	2.50 - 3.0
Date Sampled	29/11/2021			
Sampled By	Client Supplied			
Date Tested	13/12/2021			
Material Source	Not Supplied	Material Limit Start		-
Material Type	Combined	Material Limit End		-
Client Reference	80022026	Compactive Effort		Standard
Material Description	Brown clay			

Maximum Dry Density (t/m³):	1.70
Optimum Moisture Content (%):	19.5
Field Moisture Content (%):	22.7
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.71
Placement Dry Density Ratio (%):	100.5
Placement Moisture Content (%):	19.2
Placement Moisture Ratio (%):	98.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.67
Total Curing Time (hrs)	3
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	25.5
Moisture (remainder) After Soak (%)	21.1
CBR Swell (%):	2.5
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	**3.5**



Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W2ASRep Rev2

Construction Sciences

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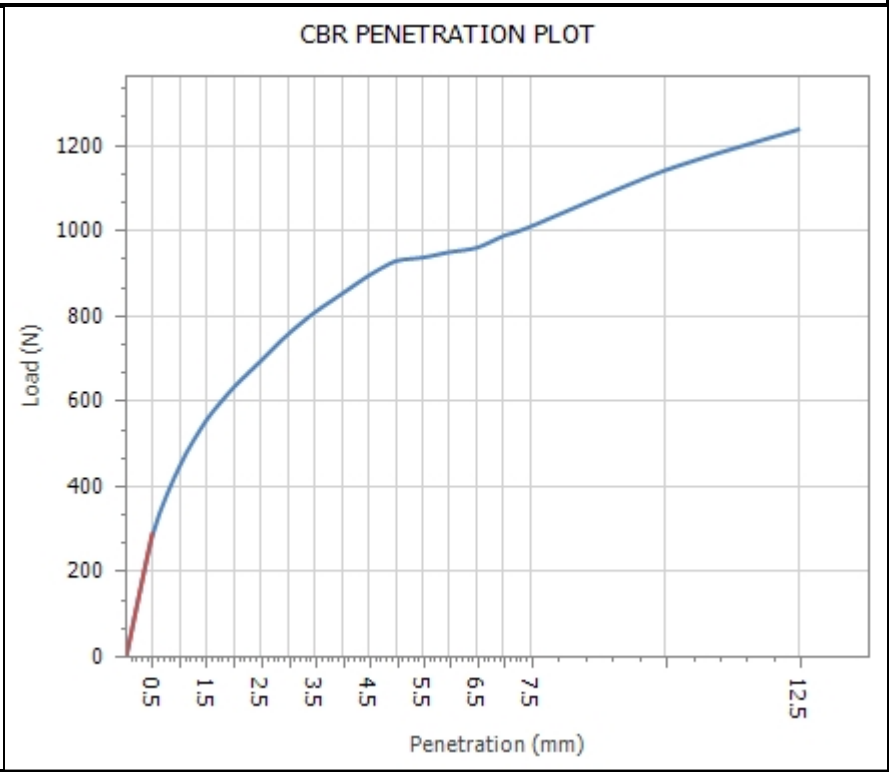
CALIFORNIA BEARING RATIO REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264009-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH301
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 2 of 2

Test Procedures	AS1289.6.1.1, T103 (W0), AS1289.5.1.1, AS1289.2.1.1

		Sample Location		
Sample Number	12385/S/967187	Borehole		BH301
Sampling Method	Tested As Received	Depth	(m)	2.5-3.5
Date Sampled	29/11/2021			
Sampled By	Client Supplied			
Date Tested	13/12/2021			
Material Source	Not Supplied	Material Limit Start		-
Material Type	Combined	Material Limit End		-
Client Reference	80022026	Compactive Effort		Standard
Material Description	Brown clay			

Maximum Dry Density (t/m³):	1.54
Optimum Moisture Content (%):	25.0
Field Moisture Content (%):	28.4
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.55
Placement Dry Density Ratio (%):	101.0
Placement Moisture Content (%):	24.8
Placement Moisture Ratio (%):	99.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.52
Total Curing Time (hrs)	3
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	27.0
Moisture (remainder) After Soak (%)	25.4
CBR Swell (%):	1.5
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	**5**



Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W2ASRep Rev2

Construction Sciences

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Email: Sydney@constructionsciences.net

ATTERBERG LIMITS REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264010-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH302
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 1 of 3

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	12385/S/967183	Sample Location	
Sampling Method	Tested As Received	Borehole	BH302
Date Sampled	29/11/2021	Depth (m)	2.0-2.50
Sampled By	Client Supplied		
Date Tested	9/12/2021		
Att. Drying Method	Oven Dried	Material Source	Not Supplied
Atterberg Preparation	Dry Sieved	Material Type	Combined
LL Device	Cassagrande	Water Type	Potable
Material Description	Silty Gravelly Clay, mottled grey brown		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**54**	
Plastic Limit (%)		**20**	
Plasticity Index (%)		**34**	
Linear Shrinkage (%)		**12.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 254.0mm / -		

Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W11bRep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

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Unit 2, 4 Kellogg Road,
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Fax: 02 4577 9055
Email: Sydney@constructionsciences.net

ATTERBERG LIMITS REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264010-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH305B
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 2 of 3

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	12385/S/967184	Sample Location	
Sampling Method	Tested As Received	Borehole	BH305B
Date Sampled	29/11/2021	Depth (m)	4.0-4.50
Sampled By	Client Supplied		
Date Tested	9/12/2021		
Att. Drying Method	Oven Dried	Material Source	Not Supplied
Atterberg Preparation	Dry Sieved	Material Type	Combined
LL Device	Cassagrande	Water Type	Potable
Material Description	Silty Clay, trace of gravel, red brown.		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**62**	
Plastic Limit (%)		**21**	
Plasticity Index (%)		**41**	
Linear Shrinkage (%)		**17.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 254.7mm / -		

Remarks	Results apply to the sample/s as received.

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W11bRep Rev 1

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

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Glendenning NSW 2761

Laboratory: **Glendenning Laboratory**
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Email: Sydney@constructionsciences.net

ATTERBERG LIMITS REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264010-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH303
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 3 of 3

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	12385/S/967185	Sample Location	
Sampling Method	Tested As Received	Borehole	BH303
Date Sampled	29/11/2021	Depth (m)	4.0-4.50
Sampled By	Client Supplied		
Date Tested	9/12/2021		
Att. Drying Method	Oven Dried	Material Source	Not Supplied
Atterberg Preparation	Dry Sieved	Material Type	Combined
LL Device	Cassagrande	Water Type	Potable
Material Description	Silty Gravelly Clay pale brown		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**53**	
Plastic Limit (%)		**20**	
Plasticity Index (%)		**33**	
Linear Shrinkage (%)		**13.0**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 251.0mm / -		

Remarks	Results apply to the sample/s as received.

NATA

Accredited for compliance with ISO/IEC 17025 – Testing

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W11bRep Rev 1

Construction Sciences

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Email: Sydney@constructionsciences.net

MOISTURE CONTENT REPORT

Client:	Cardno (NSW) Pty Ltd	Report Number:	12385/R/264013-1
Client Address:	Level 9, The Forum, 203 Pacific Highway, St Leonards	Project Number:	12385/P/1543
Project:	Royal Prince Alfred Hospital	Lot Number:	BH302
Location:	St Leonards	Internal Test Request:	12385/T/119353
Component:	Bore Hole Testing	Client Reference/s:	80022026
Area Description:	Lambie Deu Drive, Camperdown	Report Date / Page:	22/12/2021 Page 1 of 1

Test Procedures:	AS1289.2.1.1

Sample Number	12385/S/967183	12385/S/967184	12385/S/967185	
ID / Client ID	80022026	80022026	80022026	
Lot Number	BH302	BH305B	BH303	
Date / Time Sampled	29/11/2021 12:00	29/11/2021 12:00	29/11/2021 12:00	
Sampling Method	Tested As Received	Tested As Received	Tested As Received	
Sampled By	Client Supplied	Client Supplied	Client Supplied	
Tested By	Neil Pillay	Neil Pillay	Neil Pillay	
Date Tested	7/12/2021	7/12/2021	7/12/2021	
Material Source	Not Supplied	Not Supplied	Not Supplied	
Material Type	Combined	Combined	Combined	
Borehole	BH302	BH305B	BH303	
Depth	2.0-2.50	4.0-4.50	4.0-4.50	
Moisture Content (%)	**20.4**	**23.1**	**17.4**	

Sample Number				
ID / Client ID				
Lot Number				
Date / Time Sampled				
Sampling Method				
Sampled By				
Tested By				
Date Tested				
Material Source				
Material Type				
Borehole				
Depth (m)				
Moisture Content (%)				

Remarks	Results apply to the sample/s as received.

NATA

Accredited for compliance with ISO/IEC 17025 – Testing

Accreditation Number: 1986
Corporate Site Number: 12385

Approved Signatory: Connor Deasy
Form ID: W20Rep Rev 3

Construction Sciences

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ABN: 74 128 806 735

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Unit 1, 12 Callistemon Close
Warabrook NSW 2304

Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
Fax: 02 6654 0261
Email: Newcastle@constructionsciences.net

SHRINK SWELL INDEX

Client:	Construction Sciences - Professional Services	Report Number:	16822/R/32481-2
Client Address:	31 Anvil Road, Seven Hills	Project Number:	16822/P/185
Project:	Geotechical Services-Testing	Lot Number:	
Location:	Various	Internal Test Request:	16822/T/21226
Supplied To:	Construction Sciences - Professional Services	Client Reference/s:	
Area Description:		Report Date / Page:	14/01/2022 Page 1 of 1

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	NOT SUPPLIED
Sample Number	16822/S/108081	Sample Type	
Sampling Method	Tested As Received	Sample Depth	m
Date Sampled	29/11/2021		
Sampled By	Client Supplied	Material Source	-
Date Tested	10/01/2022	Material Type	-

Soil Description:	Silty CLAY		
Cracking / Crumbling:	NIL		
Estimated Inert Inclusions (%):	1.00	Swell Pre-Soak Moisture Content (%)	17.7
Shrinkage Moisture Content (%):	21.1	Swell Post-Soak Moisture Content (%)	31.5

Shrinkage Strain (%)	3.3	Shrink / Swell Index	2.2
Swell Strain (%)	1.4		

Remarks	Re-Issued Report Replaces Report No 16822/R/32481-1 (reason:)., Results apply to the sample/s as received.,

NATA

Accredited for compliance with ISO/IEC 17025 – Testing

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Blayke Desvaux
Form ID: W21Rep Rev 1

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
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Sydney: 12/1 Boden Road Seven Hills NSW 2147 | PO Box 45 Pendle Hill NSW 2145
Ph: (02) 9674 7711 **| Fax:** (02) 9674 7755 **| Email:** info@resourcelab.com.au

Test Report

Customer: Cardno
Job number: 21-0143
Project: 80022026
Report number: 1
Location: Royal Prince Alfred Hospital - East Campus

Uniaxial Compressive Strength of Rock Core

Sampling method: Tested as received
Test method(s): AS 4133.1.1.1, 4.2.2

	Results			
Laboratory sample no.	26327	26328	26329	26330
Customer sample no.	BH304 15.00-15.11m	BH302 10.68-10.85m	BH303 13.45-13.67m	BH306 12.28-12.43m
Sample depth	15.00-15.11m	10.68-10.85m	13.45-13.67m	12.28-12.43m
Date sampled	29/11/2021	29/11/2021	03/12/2021	02/12/2021
Date tested	17/12/2021	17/12/2021	17/12/2021	17/12/2021
Lithological description	LAMINITE	LAMINITE	LAMINITE	LAMINITE
Storage history, curing and environment	Sealed, moist, moisture condition as received	Sealed, moist, moisture condition as received	Sealed, moist, moisture condition as received	Sealed, moist, moisture condition as received
Type of test machine used	Matest 1500kN - Grade A	Matest 1500kN - Grade A	Matest 1500kN - Grade A	Matest 1500kN - Grade A
Description of failure	Tensile dominated	Tensile dominated	Tensile dominated	Mixed mode
Specimen average length (mm)	97.6	145.5	144.5	143.7
Specimen average diameter (mm)	51.6	51.8	51.4	51.5
Moisture content at time of test (%)	2.8	1.9	1.7	4.4
Test duration (mins)	112	18	17	12
Rate of displacement (mm/min)	<0.1	<0.1	<0.1	<0.1
Uniaxial Compressive Strength (MPa)	**36**	**52**	**50**	**10**

Notes: 26327 - Length to diameter ratio less than 2.0

Approved Signatory: C. Greely **Date:** 20/12/2021

resource laboratories
AGGREGATE, ROCK, AND SOIL TESTING
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Test Report

Customer: Cardno
Job number: 21-0143
Project: 80022026
Report number: 1
Location: Royal Prince Alfred Hospital - East Campus

Uniaxial Compressive Strength of Rock Core

Specimen prior to testing

Laboratory sample no.	26327
Customer sample no.	BH304 15.00-15.11m

Specimen after failure

Laboratory sample no.	26327
Customer sample no.	BH304 15.00-15.11m

Laboratory sample no.	26328
Customer sample no.	BH302 10.68-10.85m

Laboratory sample no.	26328
Customer sample no.	BH302 10.68-10.85m

resource laboratories
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Test Report

Customer: Cardno
Project: 80022026
Location: Royal Prince Alfred Hospital - East Campus

Job number: 21-0143
Report number: 1
Page: 3 of 3

Uniaxial Compressive Strength of Rock Core

Specimen prior to testing

Laboratory sample no. 26329
Customer sample no. BH303 13.45-13.67m

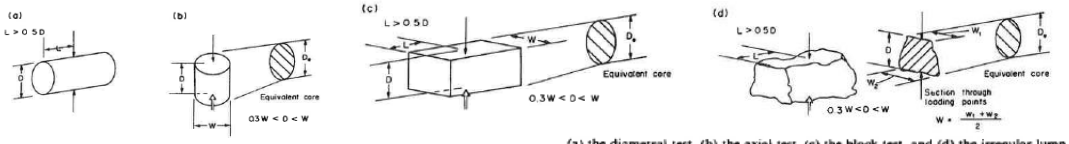
Specimen after failure

Laboratory sample no. 26329
Customer sample no. BH303 13.45-13.67m

Laboratory sample no. 26330
Customer sample no. BH306 12.28-12.43m

Laboratory sample no. 26330
Customer sample no. BH306 12.28-12.43m

POINT LOAD TEST RESULTS



(a) the diametral test, (b) the axial test, (c) the block test, and (d) the irregular lump test.

PROJECT: 80022026 RPAH

LOCATION: BH302 DATE: 1/12/2021 Coring size NMLC

SAMPLE DEPTH / INTERVAL (m)	TEST No.	ROCK TYPE #	TYPE OF TEST	L LENGTH (mm)	SHAPE OK ?	D DISTANCE (mm)	W WIDTH (mm)	P LOAD (KN)	De² (mm)	De (mm)	Is (MPa)	Size Corr. F	Is(50) (MPa)	Empirical UCS (MPa)	Rock Strength (MPa)	FAILURE TYPE *
8.03	1		Diametral	30.0	OK	52.0	n/a	0.03	2704	52	0.01	1.02	0.01	0.23	EL	C
	2		Axial		OK	30.0	52.0	0.52	1986	45	0.26	0.95	0.25	4.97	L	C
											Test Date:		1/12/2021			
9.04	1		Diametral	33.0	OK	52.0	n/a	0.08	2704	52	0.03	1.02	0.03	0.60	VL	C
	2		Axial		OK	33.0	52.0	0.53	2185	47	0.24	0.97	0.24	4.71	L	C
											Test Date:		1/12/2021			
9.57	1		Diametral	45.0	OK	52.0	n/a	0.16	2704	52	0.06	1.02	0.06	1.20	VL	C
	2		Axial		OK	45.0	52.0	1.93	2979	55	0.65	1.04	0.67	13.48	M	C
											Test Date:		1/12/2021			
10.64	1		Diametral	41.0	OK	52.0	n/a	2.62	2704	52	0.97	1.02	0.99	19.72	M	C
	2		Axial		OK	41.0	52.0	6.12	2715	52	2.25	1.02	2.30	45.93	H	C
											Test Date:		1/12/2021			
11.45	1		Diametral	37.0	OK	52.0	n/a	3.76	2704	52	1.39	1.02	1.42	28.31	H	C
	2		Axial		OK	37.0	52.0	3.73	2450	49	1.52	1.00	1.52	30.31	H	C
											Test Date:		1/12/2021			
12.25	1		Diametral	35.0	OK	52.0	n/a	4.03	2704	52	1.49	1.02	1.52	30.34	H	C
	2		Axial		OK	35.0	52.0	5.88	2317	48	2.54	0.98	2.49	49.89	H	C
											Test Date:		1/12/2021			
13.07	1		Diametral	43.0	OK	52.0	n/a	3.33	2704	52	1.23	1.02	1.25	25.07	H	C
	2		Axial		OK	43.0	52.0	5.85	2847	53	2.05	1.03	2.12	42.32	H	C
											Test Date:		1/12/2021			
14.27	1		Diametral	40.0	OK	52.0	n/a	3.89	2704	52	1.44	1.02	1.46	29.28	H	C
	2		Axial		OK	40.0	52.0	5.39	2648	51	2.04	1.01	2.06	41.24	H	C
											Test Date:		1/12/2021			

PLT MODEL No: Geotech. Systems Aust. 6500

SS=Sandstone SL=Siltstone CY=Claystone MD=Mudstone CB=Carbonaceous

CG=Conglomerate CO=Coal IG=Igneous IB=Interbedded (% 1st rock type:% 2nd rock type)

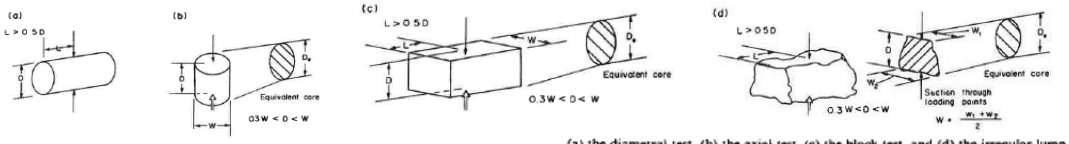
XW or EW = Extremely Weathered SW = Slightly Weathered

DW or (HW & MW) = Distinctly Weathered ** Rocks are FRESH unless otherwise stated.

* P=Partial C=Complete

MACHINE CALIBRATION FACTOR = 1.0 CONVERSION FROM Is(50) to UCS = 20

POINT LOAD TEST RESULTS



(a) the diametral test, (b) the axial test, (c) the block test, and (d) the irregular lump test.

PROJECT: 80022026 RPAH

LOCATION: BH303 **DATE:** 6/12/2021 **Coring size** NMLC

SAMPLE DEPTH / INTERVAL (m)	TEST No.	ROCK TYPE #	TYPE OF TEST	L LENGTH (mm)	SHAPE OK ?	D DISTANCE (mm)	W WIDTH (mm)	P LOAD (KN)	De² (mm)	De (mm)	Is (MPa)	Size Corr. F	Is(50) (MPa)	Empirical UCS (MPa)	Rock Strength (MPa)	FAILURE TYPE *
10.25	1		Diametral	39.0	OK	52.0	n/a	1.29	2704	52	0.48	1.02	0.49	9.71	M	C
	2		Axial		OK	39.0	52.0	0.78	2582	51	0.30	1.01	0.30	6.09	M	C
											Test Date:		6/12/2021			
11.41	1		Diametral	40.0	OK	52.0	n/a	1.27	2704	52	0.47	1.02	0.48	9.56	M	C
	2		Axial		OK	40.0	52.0	0.64	2648	51	0.24	1.01	0.24	4.90	L	C
											Test Date:		6/12/2021			
12.28	1		Diametral	25.0	NOT OK	52.0	n/a	1.13	2704	52	0.42	1.02	0.43	8.51	M	C
											Test Date:		6/12/2021			
12.56	1		Diametral	49.0	OK	52.0	n/a	1.46	2704	52	0.54	1.02	0.55	10.99	M	C
	2		Axial		OK	49.0	52.0	1.24	3244	57	0.38	1.06	0.41	8.11	M	P
											Test Date:		6/12/2021			
12.95	1		Diametral	40.0	OK	52.0	n/a	2.25	2704	52	0.83	1.02	0.85	16.94	M	C
	2		Axial		OK	40.0	52.0	2.68	2648	51	1.01	1.01	1.03	20.50	H	C
											Test Date:		6/12/2021			
13.67	1		Diametral	50.0	OK	52.0	n/a	3.28	2704	52	1.21	1.02	1.23	24.69	H	C
	2		Axial		OK	50.0	52.0	8.64	3310	58	2.61	1.07	2.78	55.60	H	C
											Test Date:		6/12/2021			

PLT MODEL No: Geotech. Systems Aust. 6500

SS=Sandstone SL=Siltstone CY=Claystone MD=Mudstone CB=Carbonaceous

CG=Conglomerate CO=Coal IG=Igneous IB=Interbedded (% 1st rock type:% 2nd rock type)

XW or EW = Extremely Weathered SW = Slightly Weathered

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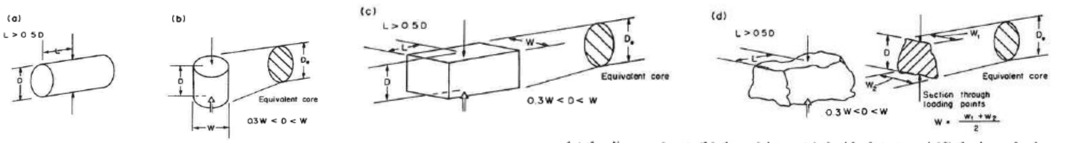
* P=Partial C=Complete

MACHINE CALIBRATION FACTOR = 1.0 CONVERSION FROM Is(50) to UCS = 20

POINT LOAD TEST RESULTS



(a) the diametral test, (b) the axial test, (c) the block test, and (d) the irregular lump test.

PROJECT: 80022026 RPAH

LOCATION: BH304 DATE: 1/12/2021 Coring size NMLC

SAMPLE DEPTH / INTERVAL (m)	TEST No.	ROCK TYPE #	TYPE OF TEST	L LENGTH (mm)	SHAPE OK ?	D DISTANCE (mm)	W WIDTH (mm)	P LOAD (KN)	De^2 (mm)	De (mm)	Is (MPa)	Size Corr. F	Is(50) (MPa)	Empirical UCS (MPa)	Rock Strength (MPa)	FAILURE TYPE *
12.63	1		Diametral	28.0	OK	52.0	n/a	1.23	2704	52	0.45	1.02	0.46	9.26	M	C
	2		Axial		OK	28.0	52.0	2.75	1854	43	1.48	0.93	1.39	27.74	H	C
											Test Date:		1/12/2021			
12.95	1		Diametral	31.0	OK	52.0	n/a	2.58	2704	52	0.95	1.02	0.97	19.42	M	C
	2		Axial		OK	31.0	52.0	3.36	2052	45	1.64	0.96	1.57	31.32	H	C
											Test Date:		1/12/2021			
13.39	1		Diametral	40.0	OK	52.0	n/a	1.19	2704	52	0.44	1.02	0.45	8.96	M	C
	2		Axial		OK	40.0	52.0	2.10	2648	51	0.79	1.01	0.80	16.07	M	P
											Test Date:		1/12/2021			
14.95	1		Diametral	36.0	OK	52.0	n/a	2.97	2704	52	1.10	1.02	1.12	22.36	H	C
	2		Axial		OK	36.0	52.0	2.79	2384	49	1.17	0.99	1.16	23.16	H	C
											Test Date:		1/12/2021			

PLT MODEL No: Geotech. Systems Aust. 6500

* P=Partial C=Complete

SS=Sandstone SL=Siltstone CY=Claystone MD=Mudstone CB=Carbonaceous

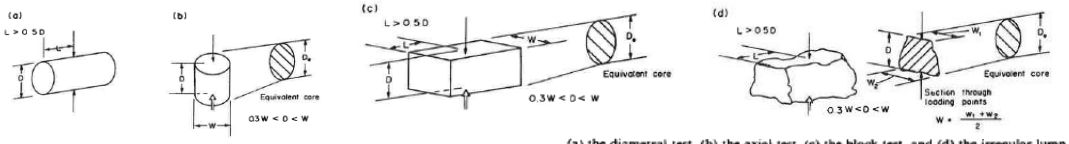
CG=Conglomerate CO=Coal IG=Igneous IB=Interbedded (% 1st rock type:% 2nd rock type)

XW or EW = Extremely Weathered SW = Slightly Weathered

DW or (HW & MW) = Distinctly Weathered ** Rocks are FRESH unless otherwise stated.

MACHINE CALIBRATION FACTOR = 1.0 CONVERSION FROM Is(50) to UCS = 20

POINT LOAD TEST RESULTS



(a) the diametral test, (b) the axial test, (c) the block test, and (d) the irregular lump test.

PROJECT: 80022026 RPAH

LOCATION: BH306 DATE: 6/12/2021 Coring size NMLC

SAMPLE DEPTH / INTERVAL (m)	TEST No.	ROCK TYPE #	TYPE OF TEST	L LENGTH (mm)	SHAPE OK ?	D DISTANCE (mm)	W WIDTH (mm)	P LOAD (KN)	De² (mm)	De (mm)	Is (MPa)	Size Corr. F	Is(50) (MPa)	Empirical UCS (MPa)	Rock Strength (MPa)	FAILURE TYPE *
9.88	1		Diametral	39.0	OK	52.0	n/a	0.31	2704	52	0.11	1.02	0.12	2.33	L	C
	2		Axial		OK	39.0	52.0	1.47	2582	51	0.57	1.01	0.57	11.47	M	C
											Test Date:		6/12/2021			
10.3	1		Diametral	34.0	OK	52.0	n/a	1.31	2704	52	0.48	1.02	0.49	9.86	M	C
	2		Axial		OK	34.0	52.0	2.39	2251	47	1.06	0.98	1.04	20.74	H	C
											Test Date:		6/12/2021			
11.41	1		Diametral	41.0	OK	52.0	n/a	2.61	2704	52	0.97	1.02	0.98	19.65	M	C
	2		Axial		OK	41.0	52.0	2.53	2715	52	0.93	1.02	0.95	18.99	M	C
											Test Date:		6/12/2021			
11.73	1		Diametral	45.0	OK	52.0	n/a	0.27	2704	52	0.10	1.02	0.10	2.03	L	C
	2		Axial		OK	45.0	52.0	1.72	2979	55	0.58	1.04	0.60	12.01	M	C
											Test Date:		6/12/2021			
12.79	1		Diametral	41.0	OK	52.0	n/a	1.19	2704	52	0.44	1.02	0.45	8.96	M	C
	2		Axial		OK	41.0	52.0	4.22	2715	52	1.55	1.02	1.58	31.67	H	C
											Test Date:		6/12/2021			
13.33	1		Diametral	37.0	OK	52.0	n/a	0.44	2704	52	0.16	1.02	0.17	3.31	L	C
	2		Axial		OK	37.0	52.0	2.79	2450	49	1.14	1.00	1.13	22.67	H	C
											Test Date:		6/12/2021			
14.78	1		Diametral	41.0	OK	52.0	n/a	2.61	2704	52	0.97	1.02	0.98	19.65	M	C
	2		Axial		OK	41.0	52.0	4.04	2715	52	1.49	1.02	1.52	30.32	H	C

PLT MODEL No: Geotech. Systems Aust. 6500

* P=Partial C=Complete

SS=Sandstone SL=Siltstone CY=Claystone MD=Mudstone CB=Carbonaceous

CG=Conglomerate CO=Coal IG=Igneous IB=Interbedded (% 1st rock type:% 2nd rock type)

XW or EW = Extremely Weathered SW = Slightly Weathered

DW or (HW & MW) = Distinctly Weathered ** Rocks are FRESH unless otherwise stated.

MACHINE CALIBRATION FACTOR = 1.0 CONVERSION FROM Is(50) to UCS = 20

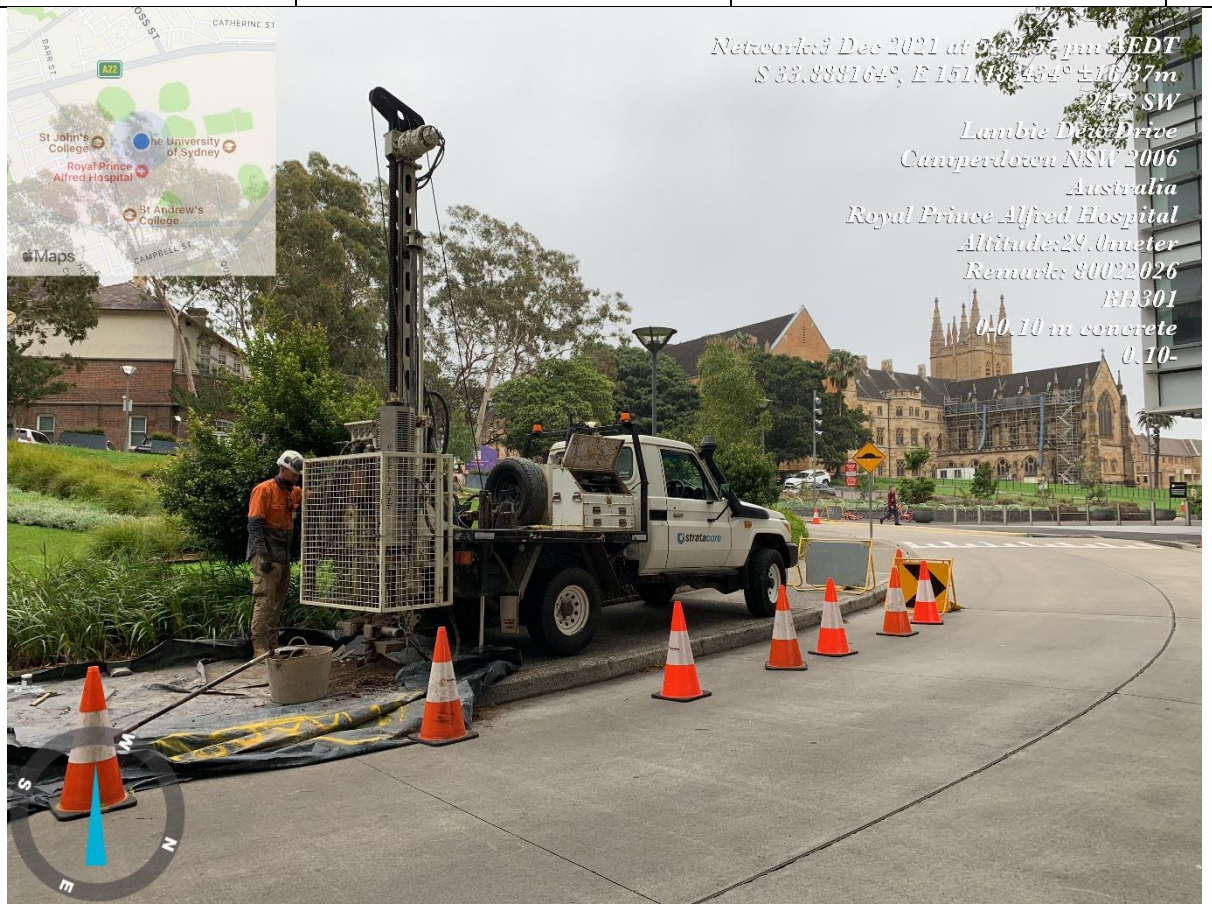
Royal Prince Alfred Hospital – Eastern Campus

APPENDIX D

SITE PHOTOGRAPHS

Cardno now Stantec

Cardno	TITLE	**Photographs – BH301** **Geotechnical Investigation – Lambie Dew Drive Footpath**		
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **1/8**



Cardno	TITLE: **Photographs – BH302** **Geotechnical Investigation – Centenary Institute and Tissue Pathology and Diagnostic Oncology**			
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **2/8**

Cardno	TITLE: **Photographs – BH303** **Geotechnical Investigation – Maternity Building**			
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **3/8**

Cardno	TITLE: **Photographs – BH304** **Geotechnical Investigation – Rear of Centenary Institute and Tissue Pathology and Diagnostic Oncology and Chapel**			
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **4/8**

Cardno	TITLE: **Photographs – BH305A** **Geotechnical Investigation – Lambie Dew Drive**			
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **5/8**

	TITLE: **Photographs – BH305B** **Geotechnical Investigation – Lambie Dew Drive**			
Cardno	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **6/8**

Cardno	TITLE: **Photographs – BH306** **Geotechnical Investigation – South end of Clinical Services Building**			
	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **7/8**

	TITLE: **Photographs – BH307** **Geotechnical Investigation – Cyclotron Building**			
Cardno	Drawn **RKC**	DATE: **09/02/2022**	Scale: **Not to Scale**	**A4**
	Checked: **BD**	DATE: **09/02/2022**	Project No: **80022026**	Photograph No: **8/8**

Royal Prince Alfred Hospital – Eastern Campus

APPENDIX E

PREVIOUS BOREHOLE LOGS AND LABORATORY TEST RESULTS

Cardno now Stantec

TEST BORE REPORT

BORE No. 1

CLIENT G. W. STACE & CO. PTY. LTD. **DATE** 7/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING **CONTRACT No.** SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWN **SURFACE LEVEL** Approx. 22.7 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
BITUMEN	0.05				
CONCRETE	0.20				
FILLING - crushed shale, sand, clay and ash with gravel and brick fragments to 25mm		S	0.50 - 0.95	3,4,4 N=8	
		S	1.70 - 2.15	8,8,4 N=12	
	2.30				
SILTY CLAY - stiff to very stiff, grey and red brown silty clay with minor ironstone gravels to 10mm		S	2.90 - 3.35	7,10,15 N=25	
	3.70				
		S	4.10 - 4.45	10,12,10/50mm	
CLAYEY SHALE - extremely weak to very weak, grey and red brown clayey shale with ironstone layers to 25mm		C	5.00 - 6.00		95
*core loss 5.00-5.05 m					
*core loss 6.00-6.20 m		C	6.00 - 9.00		94
	6.50				
LAMINITE - weak to medium strong, highly fractured to fractured, dark grey shale and pale grey fine grained sandstone with some extremely weak to very weak layers					
	7.65				
LAMINITE - medium strong to strong, fractured to slightly fractured dark grey shale and pale grey fine grained sandstone with some extremely weak fragmented layers					
*fragmented from 8.40-8.50 m	9.00				

BORE DISCONTINUED AT 9.00 METRES

RIG B20 **DRILLER** Bannister **CASING**

TYPE OF BORING Solid flight auger to 5.00 m, NMLC coring thereafter

WATER LEVEL OBSERVATIONS No free ground water observed

REMARKS $Is_{(50)}$ = 1.69MPa at 7.35 m
= 1.11MPa at 8.75 m

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

BORE No. 2

CLIENT G. W. STACE & CO. PTY. LTD. DATE 6/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING CONTRACT No. SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWN SURFACE LEVEL Approx. 22.0 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
		U	0.50 - 0.90		
FILLING - dark brown clay with some roots		S	1.70 - 2.15	1 for N=3	300mm
	2.50				
SILTY CLAY - stiff, mottled grey and red brown silty clay with minor ironstone gravel to 4mm		S	2.90 - 3.35	1,2,3 N=5	
	4.00				
SILTY CLAY - very stiff grey silty clay with ironstone gravel to 20mm		S	4.10 - 4.55	5,7,11 N=18	
	5.00				
REFUSAL AT 5.00 METRES					

RIG Jacro DRILLER Bannister CASING

TYPE OF BORING Solid flight auger

WATER LEVEL OBSERVATIONS Free ground water observed at 2.50 m

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

BORE No. 3

CLIENT G. W. STACE & CO. PTY. LTD. **DATE** 5/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING **CONTRACT No.** SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWN **SURFACE LEVEL** Approx. 22.1 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
FILLING - dark brown grey clay, gravel and ash		S	0.50 - 0.95	1,1,2 N=3	
		S	1.70 - 2.15	2,3,5 N=8	
		S	2.90 - 3.35	2,2,3 N=5	
	3.10				
FILLING - grey and brown clay with some shale fragments		S	4.10 - 4.55	2,3,5 N=8	
	5.30				
		S	5.30 - 5.75	4,6,8 n=14	
SILTY CLAY - stiff to very stiff, grey silty clay with some ironstone gravel to 20mm - grades into shaley clay		C	6.00 - 7.00		100
	6.10				
CLAYEY SHALE - extremely weak pale grey clayey shale with sandy laminations to 8mm *ironstone layer 6.90-6.95 m *core loss 7.00-7.10 m	7.10	C	7.00 - 8.00		90
LAMINITE - weak highly fractured to fractured, dark grey shale and pale grey fine grained sandstone with some extremely weak and medium strong layers *laminations at 10-15° *core loss 8.00-8.20 m		C	8.00 - 9.00		80
	9.00				
BORE DISCONTINUED AT 9.00 METRES					

RIG Jacro **DRILLER** Bannister **CASING**

TYPE OF BORING Solid flight auger to 6.00 m, NMLC coring thereafter

WATER LEVEL OBSERVATIONS No free ground water observed

REMARKS Two bores at this location, first attempt encountered a pipe at 2.2 m

$Is_{(50)}$ = 0.80MPa at 8.50 m
= 0.13MPa at 8.85 m
= 0.19MPa at 8.95 m

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

BORE No. 4

CLIENT G. W. STACE & CO. PTY. LTD. **DATE** 10/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING **CONTRACT No.** SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWNE **SURFACE LEVEL** Approx 21.7 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
					%
BITUMEN ROADBASE	S.L.				
	0.30				
FILLING - crushed sandstone to 0.7 m then clay and gravel		S	0.50 - 0.95	5,4,5 N=9	
	1.50				
SILTY CLAY - stiff to very stiff, mottled grey and red brown silty clay with minor ironstone gravel to 4mm		S	1.70 - 2.15	3,4,7 N=11	
		S	4.10 - 4.25	15 for 150mm Bouncing	
SHALE - extremely weak grey shale	4.25				
	5.30				
SHALE - very weak to weak, highly fractured to fractured, dark grey shale with high angle jointing and thinly laminated fine grained sandstone layers and some extremely weak and fragmented layers with some medium strong ferruginous layers		C	5.50 - 8.50		86
*core loss 5.50-5.90 m	7.35				
LAMINITE - medium strong to strong, fractured to slightly fractured, dark grey shale and pale grey fine grained sandstone with some extremely weak to very weak and fragmented layers		C	8.50 - 9.70		100
*extremely weak pale yellow grey clay layer from 8.35-8.45 m	9.70				

BORE DISCONTINUED AT 9.70 METRES

RIG B20 **DRILLER** Bannister **CASING**

TYPE OF BORING Solid flight auger to 5.5 m, NMLC coring thereafter

WATER LEVEL OBSERVATIONS Free ground water observed at 5 m

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

BORE No. 5

CLIENT G. W. STACE & CO. PTY. LTD. DATE 10/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING CONTRACT No. SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWN SURFACE LEVEL Approx. 20.0 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
BITUMEN & ROADBASE	0.10				
FILLING - crushed sandstone to 0.6 m then clay and gravel		S	0.50 - 0.90	5,4,4 N=8	
	1.50				
SILTY CLAY - stiff to very stiff mottled grey and red brown silty clay		S	1.70 - 2.15	2,4,5 N=9	
	2.50				
SILTY CLAY - very stiff light grey silty clay		S	2.90 - 3.35	3,6,9 N=15	
	3.80				
		S	4.10 - 4.40	12,30 N 50	Bouncing
SHALE - extremely weak to very weak grey and brown shale *core loss 4.60-5.00 m		C	4.60 - 6.60		80
	5.00				
LAMINITE - medium strong to strong, highly fractured to fractured, dark grey shale and pale grey fine grained sandstone with some extremely to very weak layers		C	6.60 - 8.60		100
	8.60				
BORE DISCONTINUED AT 8.60 METRES					

RIG B20 DRILLER Bannister CASING

TYPE OF BORING Solid flight auger from G.L. to 4.6 m then NMLC coring thereafter

WATER LEVEL OBSERVATIONS No free ground water observed

REMARKS $Is_{(50)}$ = 1.19MPa at 8.45 m
= 0.56MPa at 6.10 m

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

BORE No. 6

CLIENT G. W. STACE & CO. PTY. LTD. **DATE** 5/4/89

SITE INSTITUTE OF CANCER & CELL BIOLOGY BUILDING **CONTRACT No.** SSI/12093

LOCATION ROYAL PRINCE ALFRED HOSPITAL, CAMPERDOWN **SURFACE LEVEL** Approx. 21.5 m

Description of Strata	Depth metres	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
		S	0.50 - 0.95	2,3,2 N=5	
FILLING - stiff grey brown clay with shale fragments and gravel to 15mm and some ash		S	1.70 - 2.15	2,2,5 N=7	
		S	2.90 - 3.35	2,2,3 N=5	
	3.70				
SILTY CLAY - stiff grey brown and red brown silty clay with ironstone gravel to 12mm		S	4.10 - 4.55	3,5,7 N=12	
	5.20	S	5.30 - 5.75	4,7,11 N=18	
SILTY CLAY - very stiff to hard light grey silty clay					
CLAYEY SHALE - extremely weak to very weak grey clayey shale	6.20				
	6.50				
REFUSAL AT 6.50 METRES					

RIG Jacro **DRILLER** Bannister **CASING**

TYPE OF BORING Solid flight auger from G.L. to 6.5 m

WATER LEVEL OBSERVATIONS No free ground water observed

REMARKS Two bores at this location, first attempt encountered a pipe at 2.2 m

TYPE

A — auger sample
S — standard penetration test sample
U — mm diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

"N" VALUE

blows of a 63.5 kg hammer falling 760 mm to drive a standard 50 mm O.D. split penetrometer for the last 300 mm of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

D.J.Douglas & Partners

TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 7 JULY 98
PROJECT No.: 27456
SURFACE LEVEL: 29.1

BORE No. 1
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	CLAY – stiff, grey brown mottled orange clay	A	0.5	pp=150kPa	
1.0	SILTY CLAY – hard, grey brown silty clay	U_{50}	1.1		
2		A	2.0	pp=450kPa	
2.4	SHALY CLAY – hard, grey brown shaly clay	A	3.0	pp>450kPa	
3.5	SHALE – low strength, grey brown shale	A	3.6		
4.0	SHALE – low to medium strength, brown shale	A	4.5		
5		A	5.5		
6.4	SHALE – medium strength, brown shale	A	6.5		
7.1	TEST BORE DISCONTINUED AT 7.1 METRES – due to auger refusal				
8					
9					
10					

RIG: PENGO **DRILLER:** ROBAR **LOGGED:** KAWALSKY **CASING:** –

TYPE OF BORING: 300mm DIAMETER ROCK AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS: SLOW DRILLING FROM 6.4m

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plastic limit (%)

CHECKED:
Initials: KCSB
Date: 16/10/98

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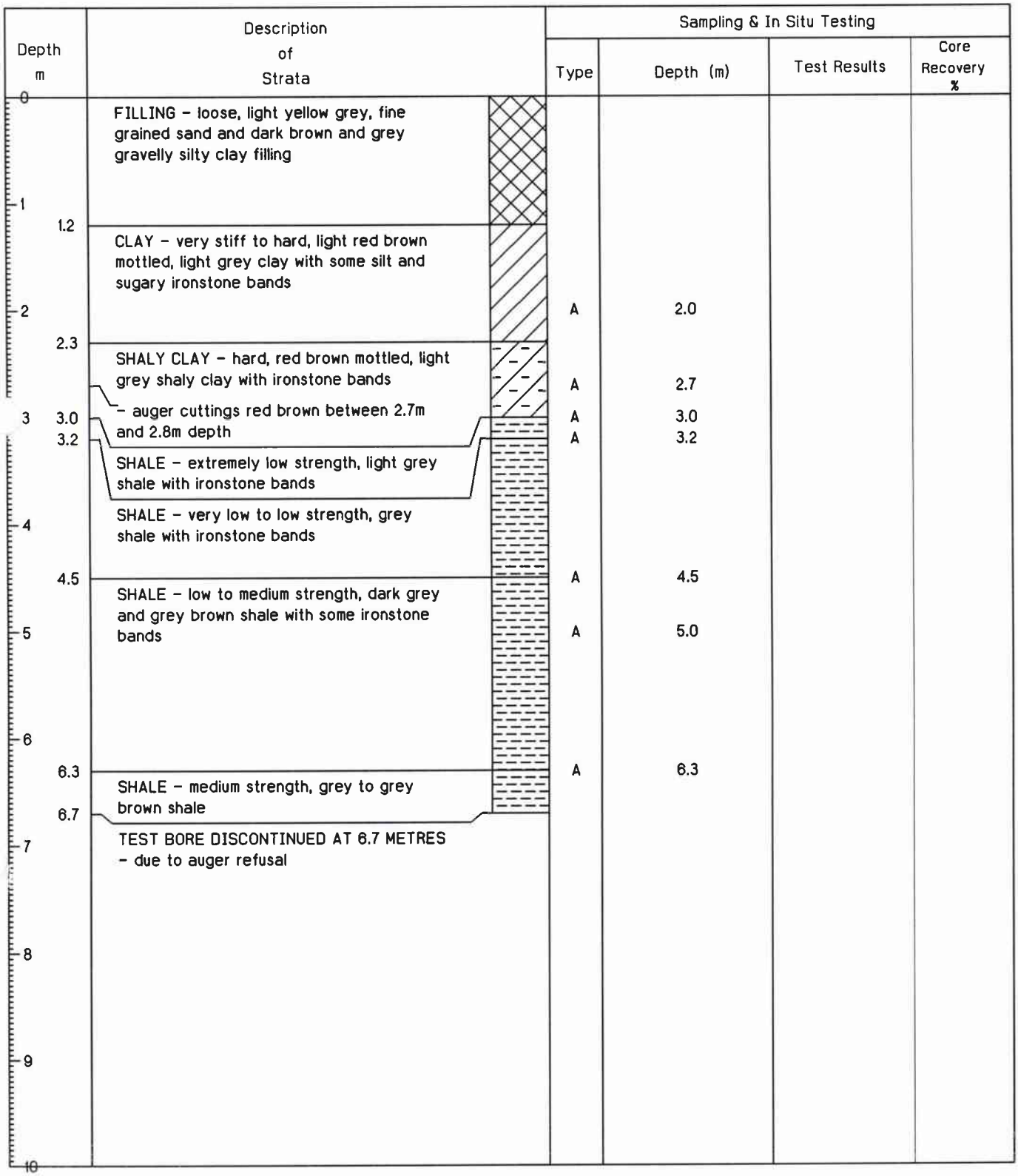
TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE **DATE:** 30 SEPTEMBER 98 **BORE No. 2**
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT **PROJECT No.:** 27456 **SHEET** 1 **OF** 1
LOCATION: MISSENDEN ROAD, CAMPERDOWN **SURFACE LEVEL:** 28.3



Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	FILLING – loose, light yellow grey, fine grained sand and dark brown and grey gravelly silty clay filling				
1.2	CLAY – very stiff to hard, light red brown mottled, light grey clay with some silt and sugary ironstone bands	A	2.0		
2.3	SHALY CLAY – hard, red brown mottled, light grey shaly clay with ironstone bands	A	2.7		
3.0	– auger cuttings red brown between 2.7m and 2.8m depth	A	3.0		
3.2	SHALE – extremely low strength, light grey shale with ironstone bands	A	3.2		
	SHALE – very low to low strength, grey shale with ironstone bands				
4.5	SHALE – low to medium strength, dark grey and grey brown shale with some ironstone bands	A	4.5		
		A	5.0		
6.3	SHALE – medium strength, grey to grey brown shale	A	6.3		
6.7	TEST BORE DISCONTINUED AT 6.7 METRES – due to auger refusal				

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL
TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER
GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED
REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: WJB
Date: 16/10/98

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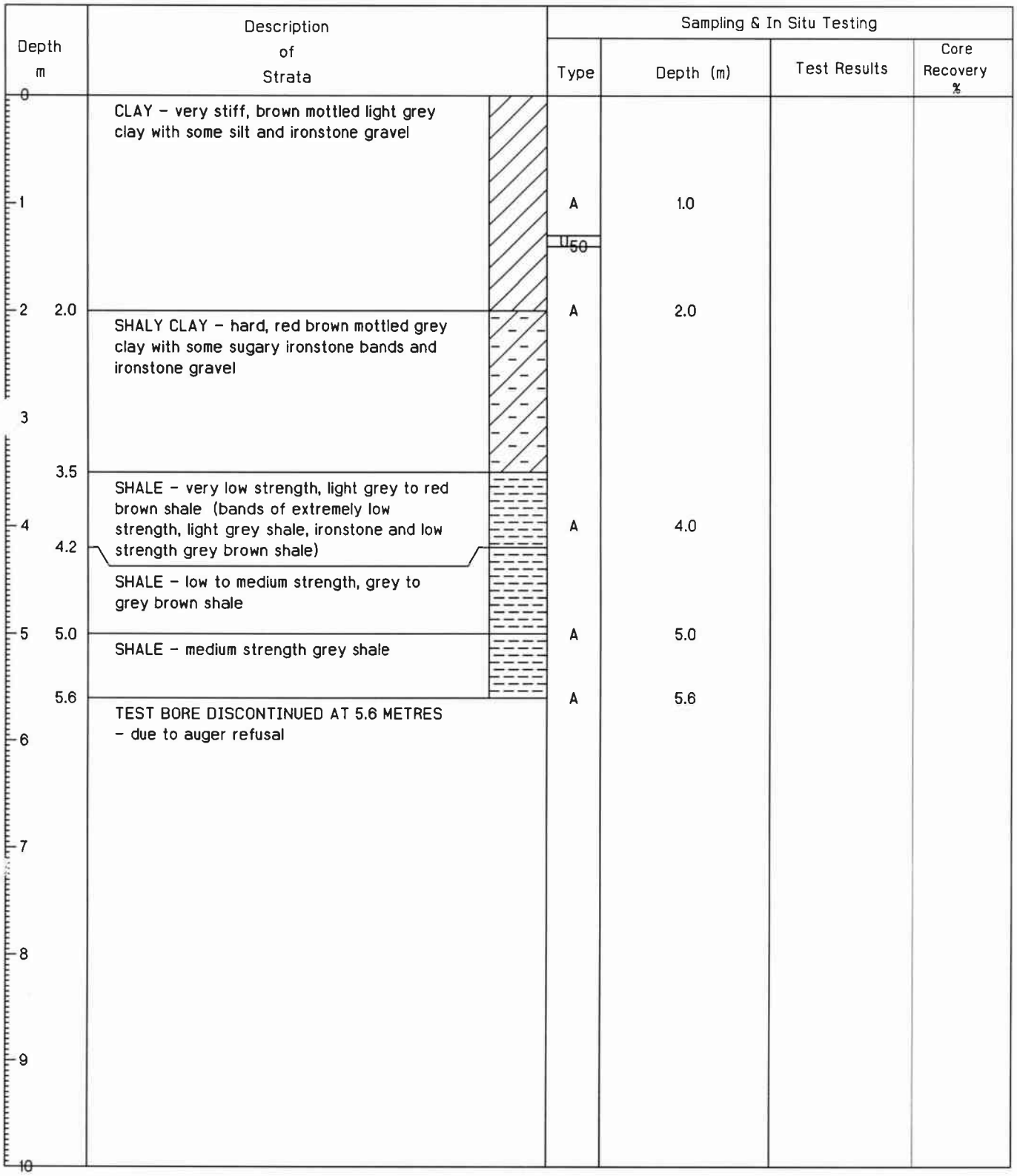
TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE **DATE:** 30 SEPTEMBER 98 **BORE No. 3**
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT **PROJECT No.:** 27456 **SHEET** 1 **OF** 1
LOCATION: MISSENDEN ROAD, CAMPERDOWN **SURFACE LEVEL:** 27.1



RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL
TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER
GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED
REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plastic limit (%)

CHECKED:
Initials: KJB
Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 30 SEPTEMBER 98
PROJECT No.: 27456
SURFACE LEVEL: 26.6

BORE No. 4
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	FILLING – dark brown to grey sandy silty clay with gravel, concrete, bricks and other fragments of building rubble				
1.8	CLAY – very stiff, light brown and red brown mottled light grey clay with some silt and sugary ironstone bands	A	2.0		
2.1	SHALE – extremely low strength, light brown mottled light grey shale with some ironstone gravel	A	3.0		
3.4	SHALE – very low strength, light grey to light brown and dark grey shale (bands of extremely low strength, light grey shale, ironstone and low strength, dark grey shale)	A	4.0		
		A	5.0		
6.0	SHALE – low to medium strength, dark grey and grey brown shale with some ironstone bands	A	6.0		
6.9	SHALE – medium strength, dark grey and brown shale	A	7.0		
7.7	TEST BORE DISCONTINUED AT 7.7 METRES – due to auger refusal	A	7.6		

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL

TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: WSB
Date: 16/10/98

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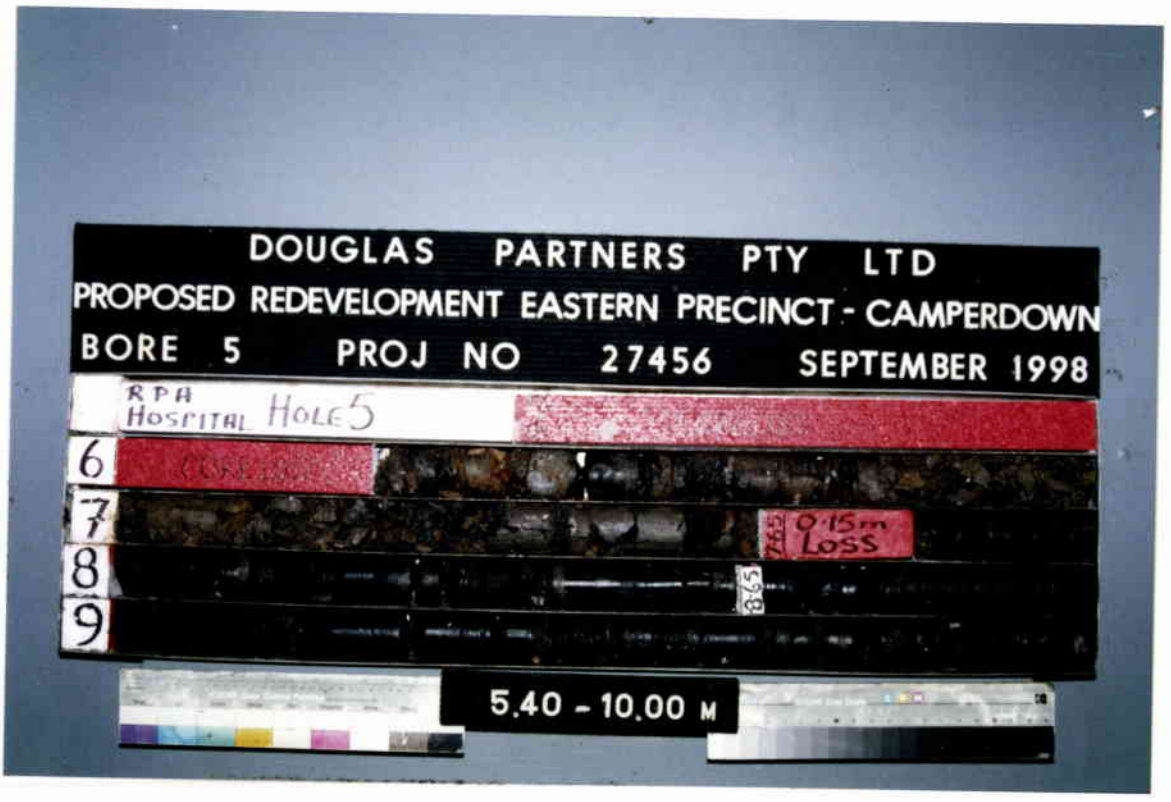
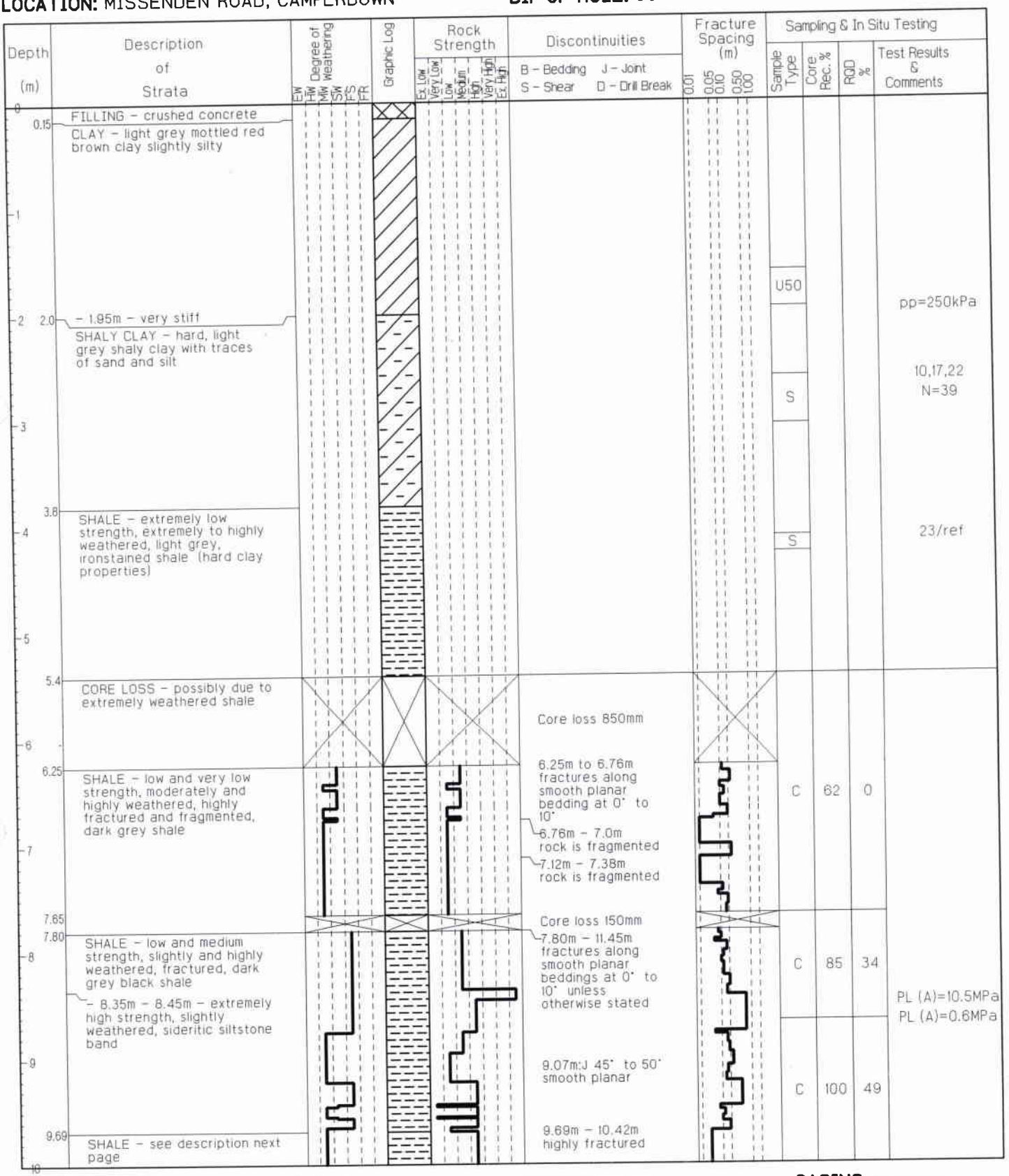

DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 5 PROJ NO 27456 SEPTEMBER 1998
RPA HOSPITAL HOLE 5
6
7
8
9
0.15m LOSS
5.40 - 10.00 M

TEST BORE REPORT

BORE No: 5
DATE: 26 AUGUST 98
SHEET 1 **OF** 2
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 25.67
DIP OF HOLE: 90°



RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 2.6m

TYPE OF BORING: ROTARY TO 5.40m, NMLC CORING TO 11.45m

WATER OBSERVATIONS: WATER LEVEL AT 4.9m AFTER ½ HOUR

REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: MKL
Date: 31.8.'98

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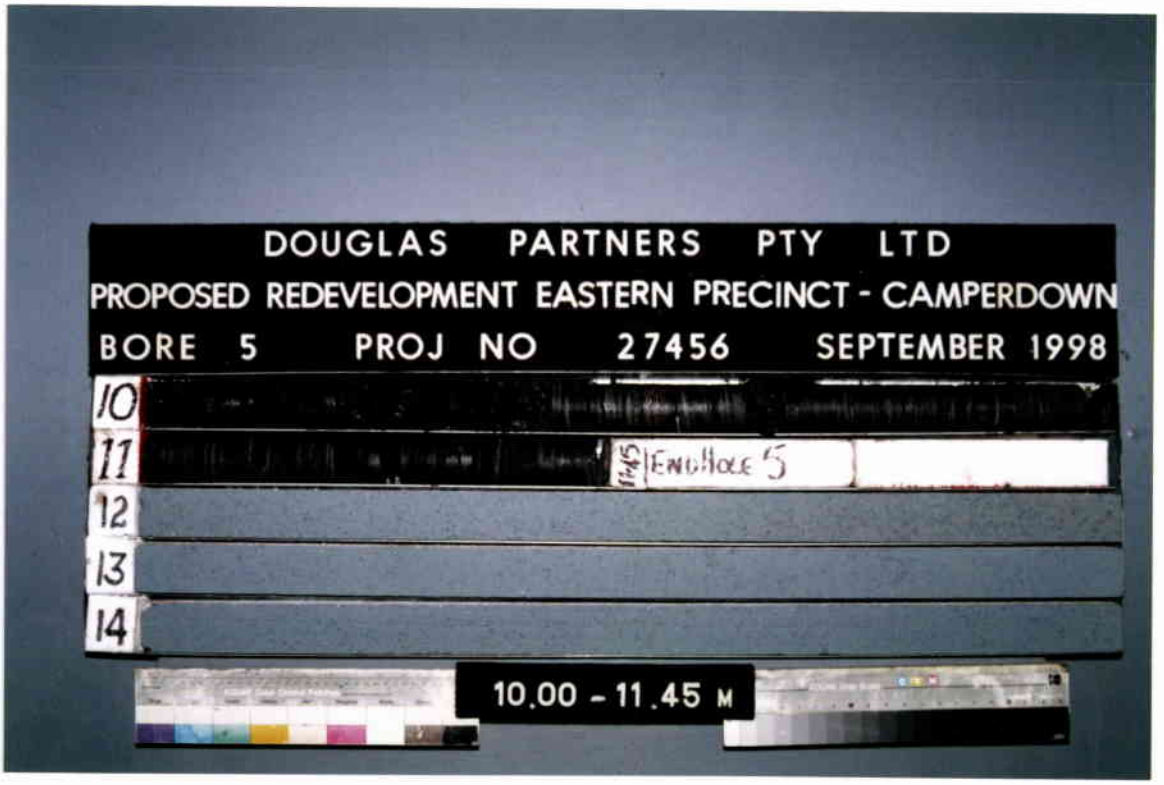
DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 5 PROJ NO 27456 SEPTEMBER 1998
10
11
11.45 End Hole 5
12
13
14
10.00 - 11.45 M

TEST BORE REPORT

BORE No: 5
DATE: 26 AUGUST 98
SHEET 2 **OF** 2
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 25.67
DIP OF HOLE: 90°

Depth (m)	Description of Strata	Degree of weathering (EW, HW, MW, SW, FS, FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Discontinuities (B – Bedding, J – Joint, S – Shear, D – Drill Break)	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Sampling & In Situ Testing: Sample Type	Core Rec. %	RQD %	Test Results & Comments
10										
10.42	SHALE – medium and low strength, highly weathered, highly fractured to fragmented, dark grey black shale									PL (A0=1.3MPa
	SHALE – high strength, slightly weathered, slightly fractured, dark grey black shale with 15 to 20% silty sandy laminae				10.62m:J 45° smooth planar		C	100	49	PL (A)=1.2MPa
11.45	TEST BORE DISCONTINUED AT 11.45 METRES									
12										
13										
14										
15										
16										
17										
18										
19										
20										

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 2.6m
TYPE OF BORING: ROTARY TO 5.40m, NMLC CORING TO 11.45m
WATER OBSERVATIONS: WATER LEVEL AT 4.9m AFTER ½ HOUR
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: UKE
Date: 31-8-98

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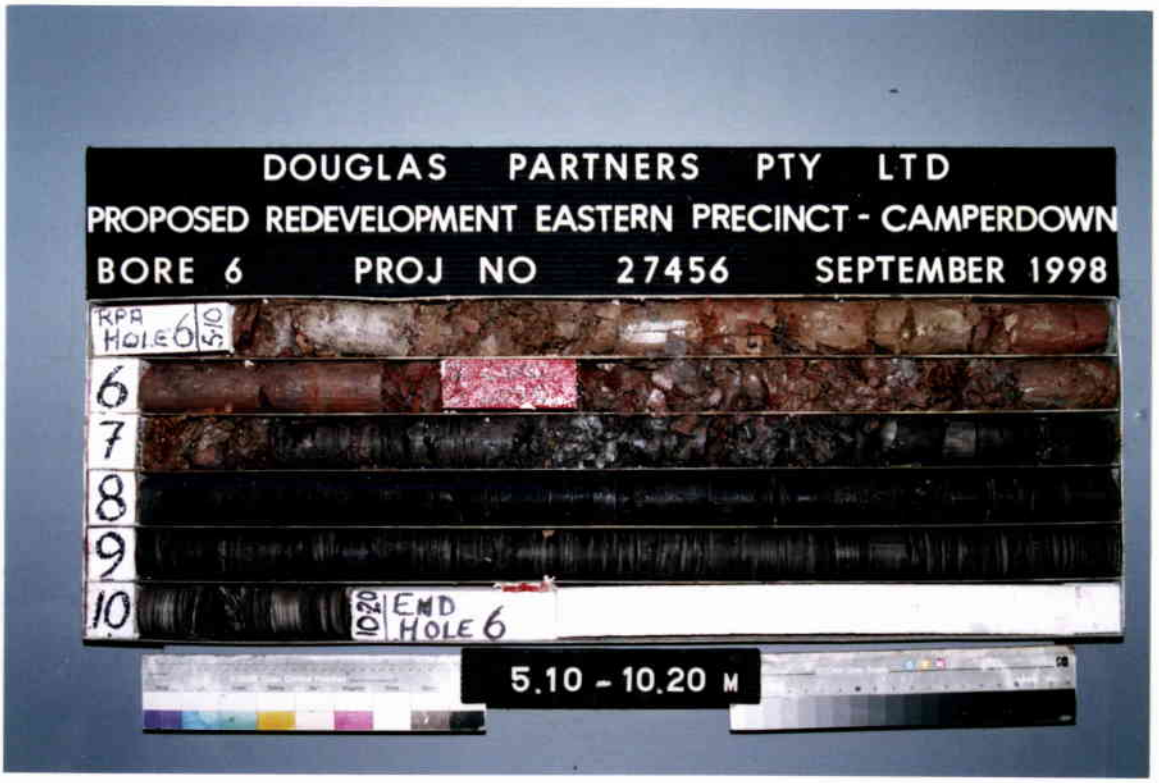
DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 6 PROJ NO 27456 SEPTEMBER 1998
RPA HOLE 6 5.10
6
7
8
9
10
10.20 END HOLE 6
5.10 - 10.20 M

TEST BORE REPORT

BORE No: 6
DATE: 25 AUGUST 98
SHEET 1 **OF** 2
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 24.32
DIP OF HOLE: 90°

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (Very Soft, Soft, Firm, Stiff, Very Stiff, Hard) / Non-Cohesive (Very Loose, Loose, Med. Dense, Dense, Very Dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sample Type	Core Rec. %	RQD %	Test Results & Comments
0	FILLING – concrete and cobble to 150mm							
0.30	SILTY CLAY – dark grey silty clay							
0.60	CLAY – firm to stiff, light grey mottled red brown clay with ironstone bands				S			2,3,5 N=8
					A			
2.6	SHALY CLAY – very stiff to hard, light grey mottled red brown shaly clay with ironstone bands				U_{50}			pp=400kPa
3.80	SHALE – extremely low to very low strength, highly weathered, light grey brown shale with ironstone bands				A			
					S			12,28/ref
5.10	SHALE – very low to low strength, highly and extremely weathered, fractured to fragmented, light brown and grey shale				C	100	0	
6.3								
6.4					C	93	3	
7.75	SHALE – medium strength, slightly weathered, slightly fractured to fractured, dark grey black shale with 15% to 20% silty sandy laminae							PL (A)=0.4MPa PL (A)=0.5MPa
					C	100	84	PL (A)=1.0MPa PL (A)=2.0MPa
10								

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 5.10m

TYPE OF BORING: SFA TO 5.10m, NMLC CORING TO 10.20m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: KJB
Date: 16/10/98

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TEST BORE REPORT

BORE No: 6
DATE: 25 AUGUST 98
SHEET 2 **OF** 2
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 24.32
DIP OF HOLE: 90°

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (Very Soft, Soft, Firm, Stiff, Very Stiff, Hard)	Soil: Non-Cohesive (Very Loose, Loose, Med. Dense, Dense, Very Dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sample Type	Core Rec. %	RQD %	Test Results & Comments
10	SHALE - see description previous page					C	100	84	PL (A)=0.7MPa
10.20	TEST BORE DISCONTINUED AT 10.20 METRES								
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 5.10m
TYPE OF BORING: SFA TO 5.10m, NMLC CORING TO 10.20m
WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: KJB
Date: 16/10/98

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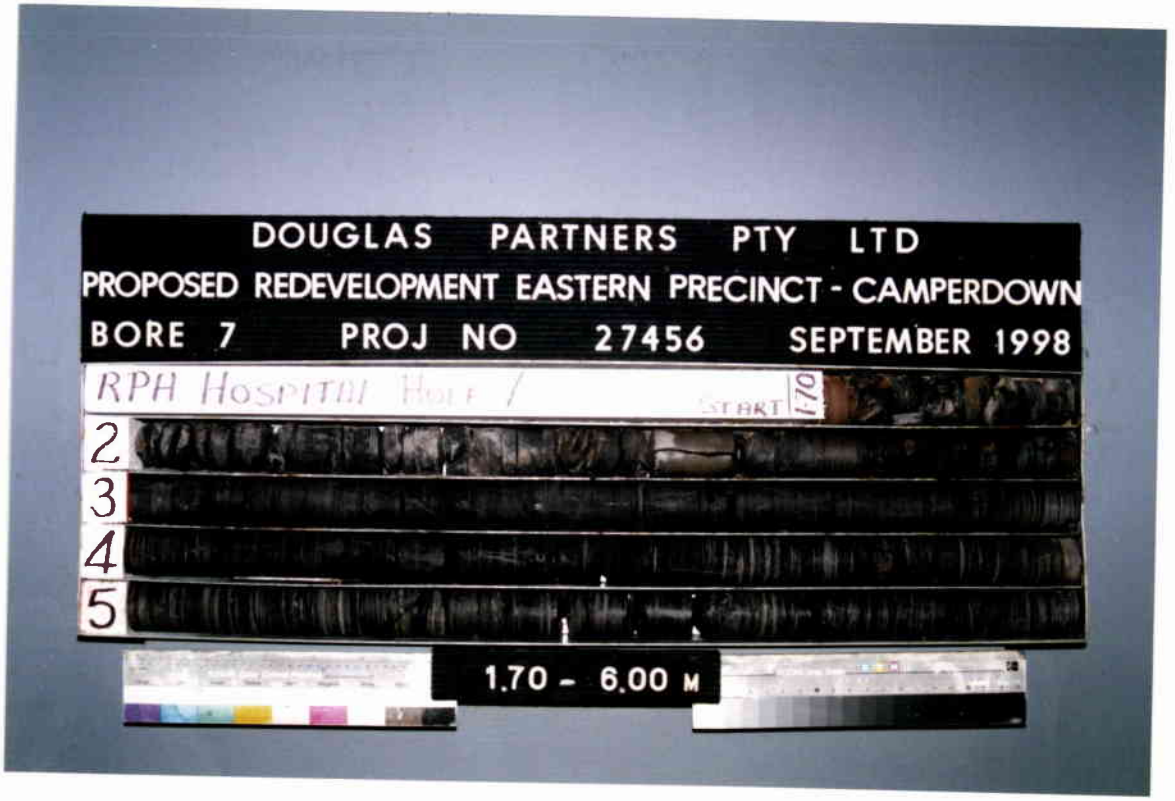
DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 7 PROJ NO 27456 SEPTEMBER 1998
RPH HOSPITAL HOLE 1
START 1.70
2
3
4
5
1.70 - 6.00 M

TEST BORE REPORT

BORE No: 7

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT No: 27456
DATE: 28 AUGUST 98

PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
SURFACE LEVEL: 19.96
SHEET 1 **OF** 1

LOCATION: MISSENDEN ROAD, CAMPERDOWN
DIP OF HOLE: 90°
AZIMUTH:

Depth (m)	Description of Strata	Graphic Log	Rock Strength	Discontinuities (B – Bedding J – Joint S – Shear D – Drill Break)	Fracture Spacing (m)	Sampling & In Situ Testing: Sample Type	Core Rec. %	RQD %	Test Results & Comments
0	CONCRETE								
0.25									
0.35	GRAVEL – well graded to 40mm								
	CLAYEY SHALE – weak, grey and brown clayey shale (Drillers' description)			Unless otherwise stated factures are smooth planar bedding planes dipping at 0° to 10°					
1.7	SHALE – medium strength, slightly weathered, highly fractured to fragmented, dark grey shale			1.7m to 2.09m highly fractured to fragmented		C	100	29	PL (A)=0.4MPa
				2.36m:J 50° smooth planar					
2.64	– 2.54m to 2.64m – extremely high strength sideritic siltstone band			2.54m:J 85° to 90° smooth undulating					PL (A)=0.6MPa
	SHALE – medium and high strength, slightly weathered, slightly fractured, dark grey black shale with 15 to 20% silty sandy laminae			3.08m:J 65° smooth planar					
				3.41m:J 45° smooth planar					PL (A)=1.4MPa
				3.54m to 4.84m 1–2mm clayey laminae along bedding planes		C	100	92	
									PL (A)=1.4MPa
				5.30m:J 35° smooth planar					
6.0	TEST BORE DISCONTINUED AT 6.0 METRES					C	100	100	PL (A)=1.7MPa

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 1.7m

TYPE OF BORING: DIATUBE TO 0.25m,SFA TO 1.7m,NMLC CORING TO 6.0m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS: V-bit refusal at 1.70m

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: MRe
Date: 31-8-98

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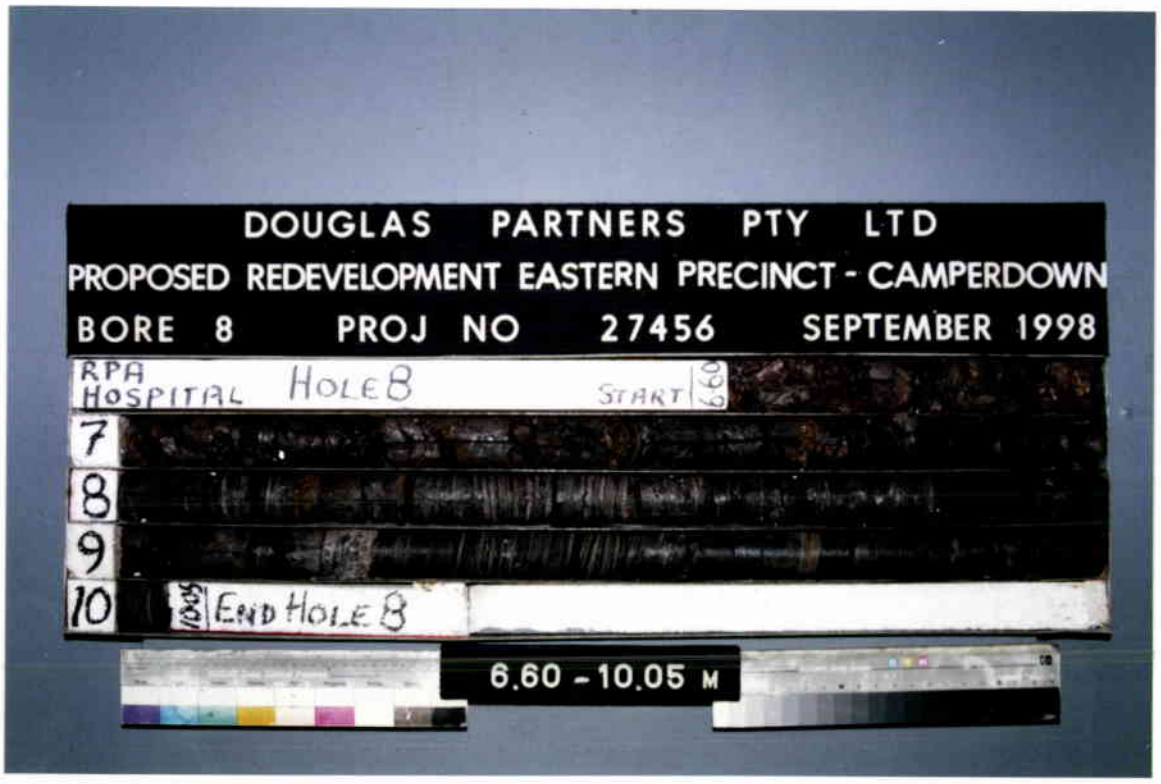
DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 8 PROJ NO 27456 SEPTEMBER 1998
RPA HOSPITAL HOLE 8 START 6.60
7
8
9
10
END HOLE 8
6.60 - 10.05 M

TEST BORE REPORT

BORE No: 8
DATE: 31 AUGUST 98
SHEET 1 **OF** 2
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 23.30
DIP OF HOLE: 90°

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (very soft, soft, firm, stiff, very stiff, hard) / Non-Cohesive (very loose, loose, med. dense, dense, very dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sample Type	Core Rec. %	RQD %	Test Results & Comments
0	FILLING – dark grey brown clay, ironstone gravel and sandstone filling							
					S			3,3,5 N=8
1.30	CLAY – light yellow brown mottled red clay with ironstone bands				A			
2								
	– 2.60m – very stiff				A,U_{50}			pp=325kPa
4.10	SILTY GRAVELLY CLAY – very stiff, light grey mottled red brown silty gravelly clay with ironstone gravel and traces of sand				S			8,10,14 N=24
4.70	SHALY CLAY – very stiff to hard, grey, shaly clay with ironstone bands				A			
5.50	SHALE – extremely low strength, extremely to highly weathered, grey shale with ironstone bands				S			17,28/ref
6.60	SHALE – extremely low and very low strength, extremely and highly weathered, dark grey, shale with low strength bands				C	100	0	
7.90	SHALE – low and medium strength, highly and slightly weathered, fractured to slightly fractured, dark grey shale with 10% to 15% silty sandy laminae and extremely weathered bands				C	100	40	
9.14	SHALE – medium and medium to high strength, slightly weathered, fractured to slightly fractured, dark grey black shale with 15% to 20% silty sandy laminae							
10								

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 6.60m

TYPE OF BORING: HAND AUGER 0.7m, SFA 6.60m, NMLC CORING 10.05m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: KJB
Date: 16/10/98

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TEST BORE REPORT

BORE No: 8

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT No: 27456
DATE: 31 AUGUST 98

PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
SURFACE LEVEL: 23.30
SHEET 2 **OF** 2

LOCATION: MISSENDEN ROAD, CAMPERDOWN
DIP OF HOLE: 90°
AZIMUTH:

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (Very Soft, Soft, Firm, Stiff, Very Stiff, Hard)	Soil: Non-Cohesive (Very Loose, Loose, Med. Dense, Dense, Very Dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sampling & In Situ Testing: Sample Type	Core Rec. %	RQD %	Test Results & Comments
10	10.05 SHALE – see description previous page TEST BORE DISCONTINUED AT 10.05 METRES								
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 6.60m

TYPE OF BORING: HAND AUGER 0.7m, SFA 6.60m, NMLC CORING 10.05m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: KJB
Date: 16/10/98

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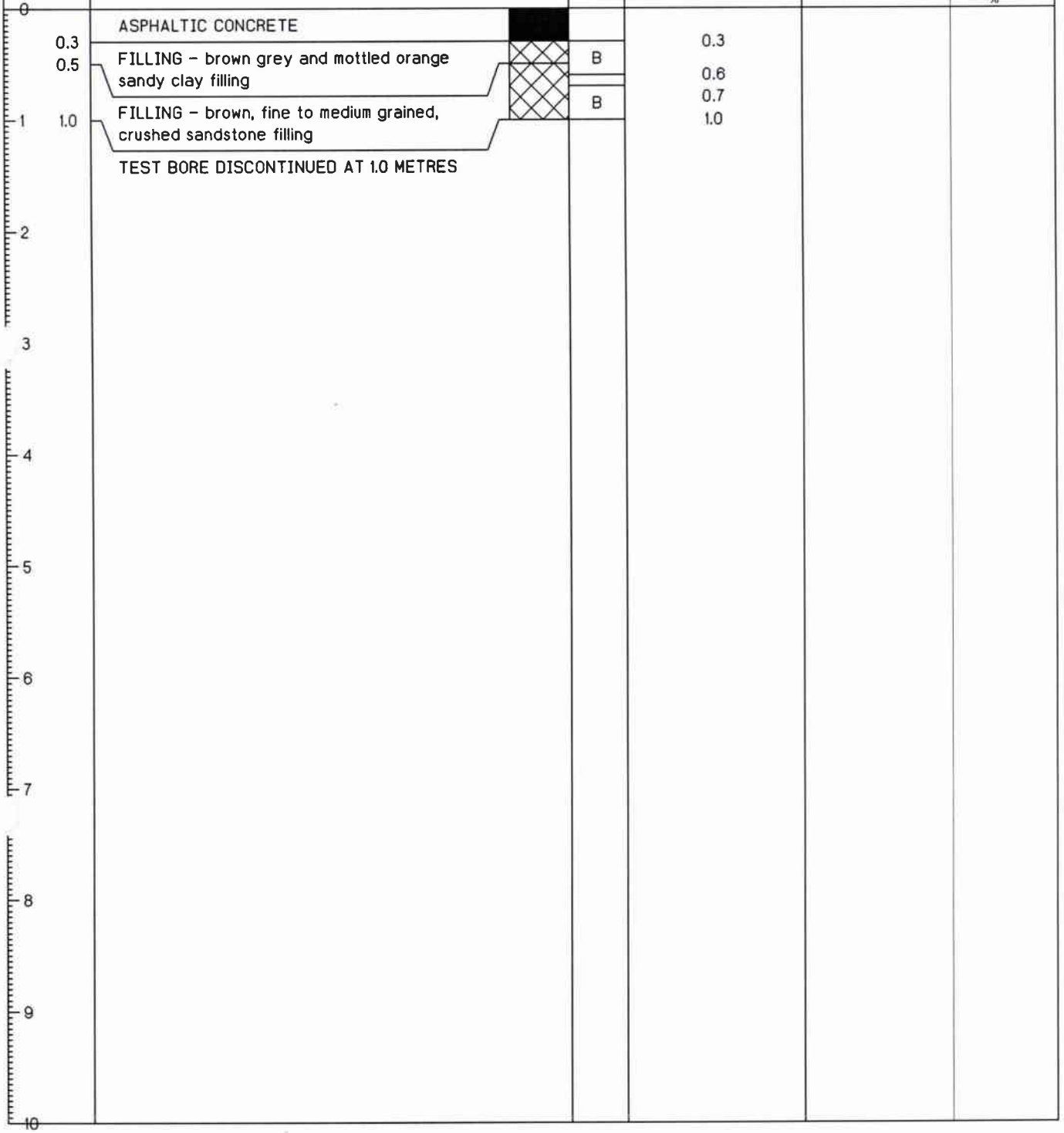
TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 7 JULY 98
PROJECT No.: 27456
SURFACE LEVEL: 23.3

BORE No. 8A
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0					
0.3	ASPHALTIC CONCRETE		0.3		
0.5	FILLING – brown grey and mottled orange sandy clay filling	B	0.6		
		B	0.7		
1.0	FILLING – brown, fine to medium grained, crushed sandstone filling		1.0		
	TEST BORE DISCONTINUED AT 1.0 METRES				



RIG: PENGO **DRILLER:** ROBAR **LOGGED:** KAWALSKY **CASING:** –

TYPE OF BORING: 300mm DIAMETER ROCK AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: WSB
Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 30 SEPTEMBER 98
PROJECT No.: 27456
SURFACE LEVEL: 24.9

BORE No. 9
SHEET 1 OF 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	FILLING – dark grey and brown sandy gravelly clay with some wood, sandstone, brick and concrete fragments				
0.6	CLAY – stiff, light brown and red brown mottled light grey clay with some silt and bands of sugary ironstone	A	0.9		
1		U_{50}	1.0		
			1.3		
1.9	SHALY CLAY – hard, light brown and red brown mottled shaly clay with a trace of ironstone	A	2.0		
2					
		A	3.2		
3.8	SHALE – very low strength, light grey, light brown and dark grey shale (bands of extremely low strength, light grey shale, ironstone and low strength grey to dark grey shale	A	4.0		
4					
5		A	5.2		
5.8	SHALE – medium strength, dark grey shale	A	6.0		
6					
6.7	TEST BORE DISCONTINUED AT 6.7 METRES – due to auger refusal	A	6.6		
7					
8					
9					
10					

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL

TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: KSB
Date: 16/10/98

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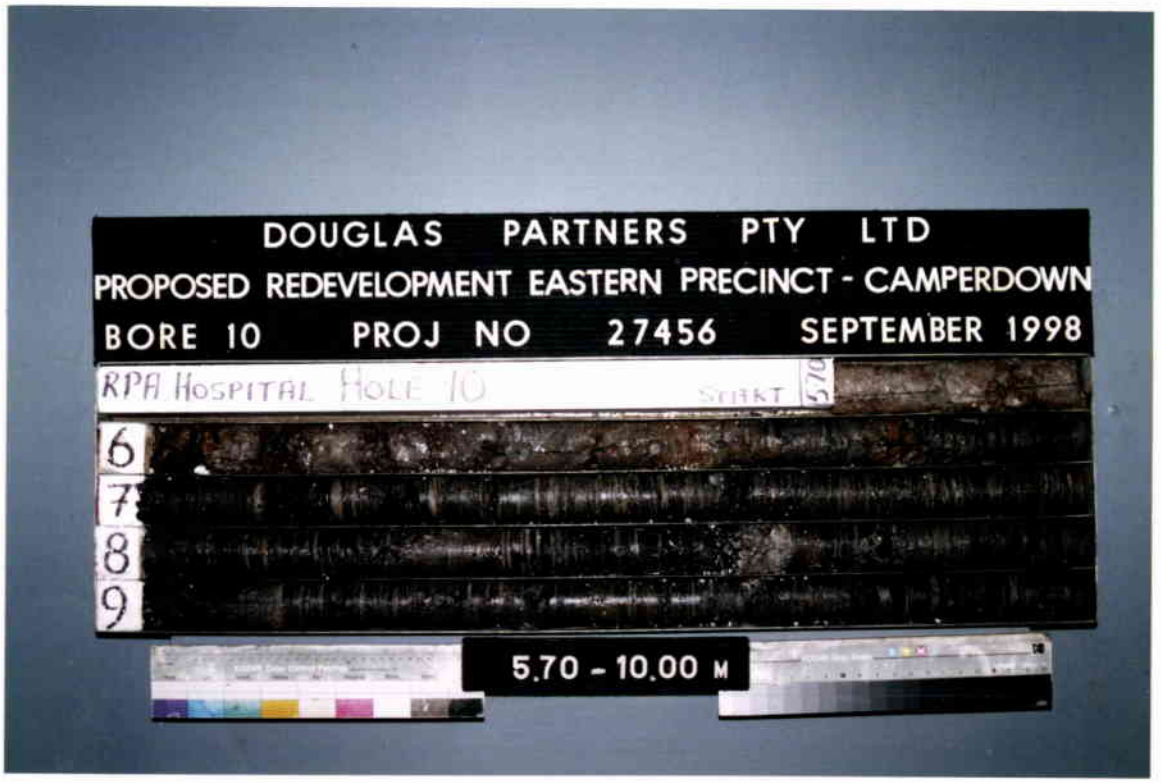
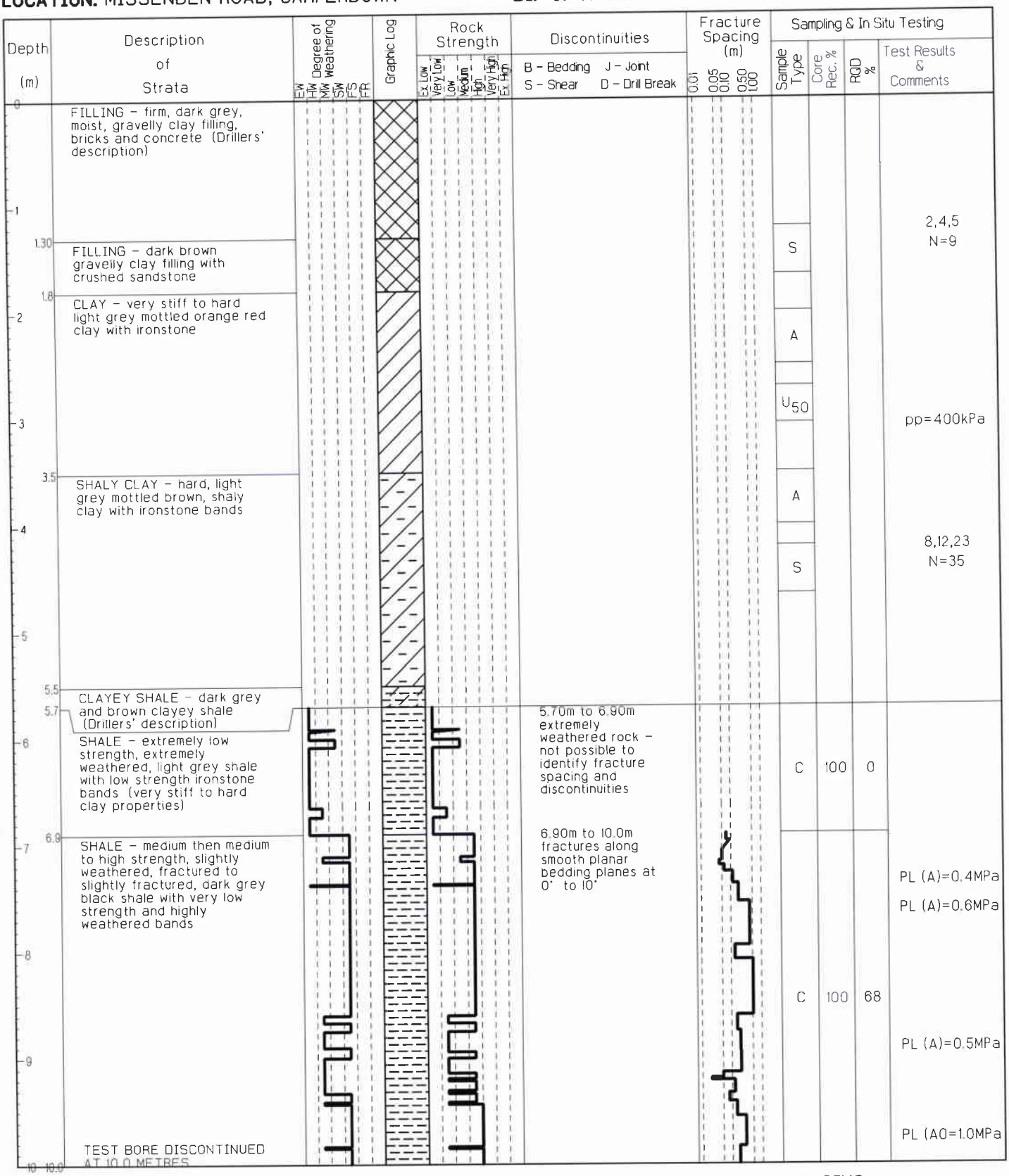

DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 10 PROJ NO 27456 SEPTEMBER 1998
RPA HOSPITAL HOLE 10
START
5.70
6
7
8
9
5.70 - 10.00 M

TEST BORE REPORT

BORE No: 10
DATE: 27-28 AUGUST 98
SHEET 1 OF 1
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 23.04
DIP OF HOLE: 90°



RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:**

TYPE OF BORING: HA - 1.0m, SFA - 4.2m, ROTARY - 5.7m, NMLC - 10.0m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS: WATER LEVEL AT 3.20m AFTER 14 HOURS

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: MK
Date: 31-8-98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 30 SEPTEMBER 98
PROJECT No.: 27456
SURFACE LEVEL: 27.6

BORE No. 11
SHEET 1 **OF** 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	FILLING – brown, grey, yellow grey and red brown sandy silty gravelly clay filling with fragments of shale, sandstone and concrete				
0.6	CLAY – stiff, light brown and red brown mottled light grey clay with some silt and ironstone	A	0.9		
1		U_{50}	1.0 1.3		
1.2	SHALY CLAY – hard light brown and red brown mottled light grey shaly clay with a trace of ironstone gravel	A	2.0		
2					
2.2	SHALE – extremely low strength, light grey shale with some ironstone nodules to 40mm				
2.7	SHALE – very low strength, light grey, brown and grey shale (bands of extremely low strength, light grey shale, ironstone and grey low strength shale)				
4					
5		A	5.0		
5.9	SHALE – low to medium strength, dark grey and grey brown shale	A	6.0		
6					
7					
8		A	8.0		
8.3	SHALE – medium strength, grey shale	A	8.6		
8.7	TEST BORE DISCONTINUED AT 8.7 METRES – due to auger refusal				
9					
10					

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL

TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER

GROUND WATER OBSERVATIONS: GROUNDWATER OBSERVED AT 7.5m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: KSB
Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE **DATE:** 30 SEPTEMBER 98 **BORE No. 12**
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT **PROJECT No.:** 27456 **SHEET 1 OF 1**
LOCATION: MISSENDEN ROAD, CAMPERDOWN **SURFACE LEVEL:** 25.7

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0	FILLING – brown sand and silty clay with some organic material				
0.5	FILLING – stiff, brown silty clay filling				
1.3	CLAY – stiff, to very stiff, light brown and red brown mottled light grey slightly silty clay with a trace of sugary ironstone bands	U_{50}	1.3		
			1.6		
2		A	2.0		
2.8	SHALY CLAY – hard, red brown and light brown mottled light grey shaly clay with some ironstone nodules	A	3.0		
3.9	SHALE – very low strength, light grey, grey and brown shale (bands of extremely low strength, light grey shale, ironstone and low strength, grey brown shale)	A	4.0		
5		A	5.0		
6.5	SHALE – low to medium strength, dark grey shale				
7	– medium strength from 7.0m	A	7.0		
		A	7.2		
7.5	TEST BORE DISCONTINUED AT 7.5 METRES – due to auger refusal				
8					
9					
10					

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL
TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER
GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED
REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: KSB
Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE **DATE:** 30 SEPTEMBER 98 **BORE No. 13**
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT **PROJECT No.:** 27456 **SHEET 1 OF 1**
LOCATION: MISSENDEN ROAD, CAMPERDOWN **SURFACE LEVEL:** 26.9

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0					
0.2	FILLING – very stiff, dark brown to dark grey sandy silty clay with some gravel and organic matter (strong odour)				
1	FILLING – stiff to very stiff, brown mottled dark grey brown clay with some silt, and a trace of sandstone gravel, mixed with dark brown organic clay	A	1.0		
1.7	SHALY CLAY – very stiff to hard, light grey shaly clay with very low strength ironstone layers	A	1.8		
2		A	2.3		
2.2	SHALE – extremely low strength, light grey shale with some ironstone and shaly clay layers	A	2.7		
2.6		A	3.0		
3	SHALE – very low strength, dark grey brown and red brown and light grey shale (bands of extremely low strength, light grey shale, ironstone and low strength grey brown shale)				
4		A	4.0		
5		A	5.0		
6					
6.1	SHALE – low to medium strength, dark grey brown shale	A	6.2		
7		A	7.0		
7.9	SHALE – medium strength, dark grey shale	A	8.0		
8	– layer of very low strength ironstone observed between 8.0m and 8.2m	A	8.5		
9		A	8.9		
9.0	TEST BORE DISCONTINUED AT 9.0 METRES – reach of rig				
10					

RIG: PACIFIC 375 **DRILLER:** DUMMETT **LOGGED:** STEWART **CASING:** NIL
TYPE OF BORING: 300mm DIAMETER SPIRAL FLIGHT AUGER
GROUND WATER OBSERVATIONS: FREE GROUNDWATER OBSERVED AT 6.2m
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: WJB
Date: 16/10/98

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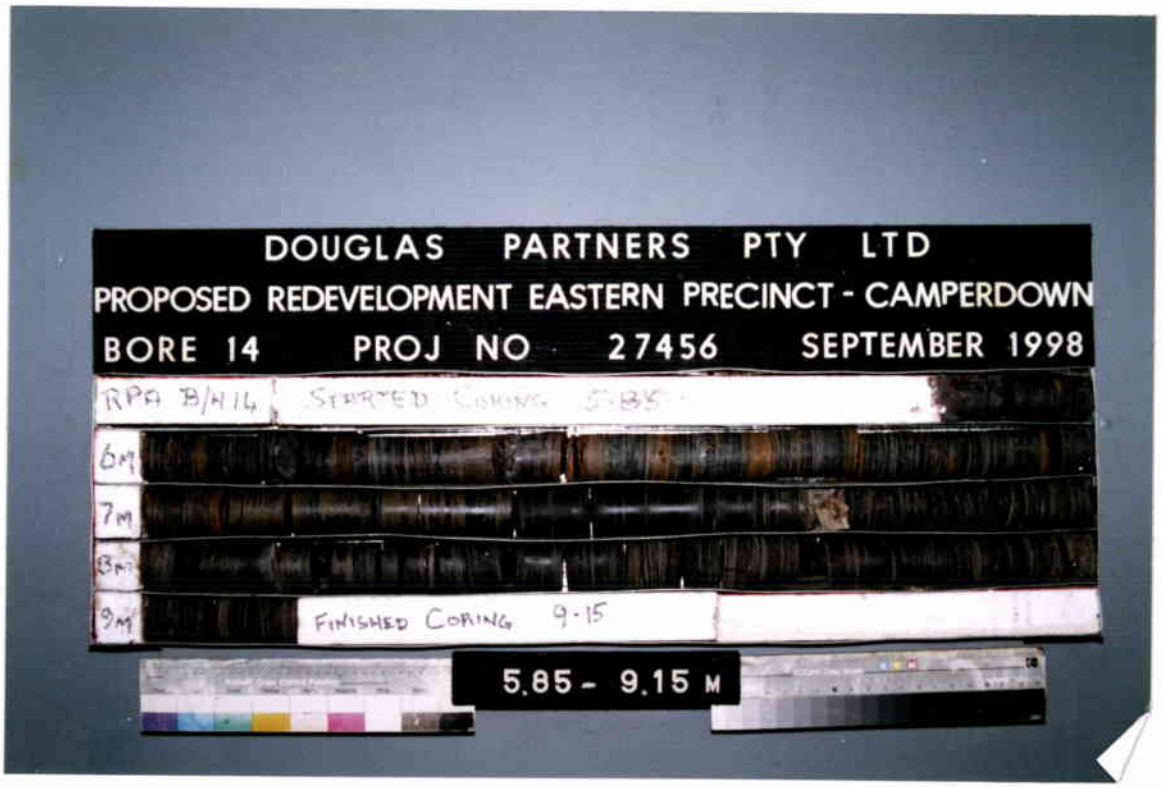
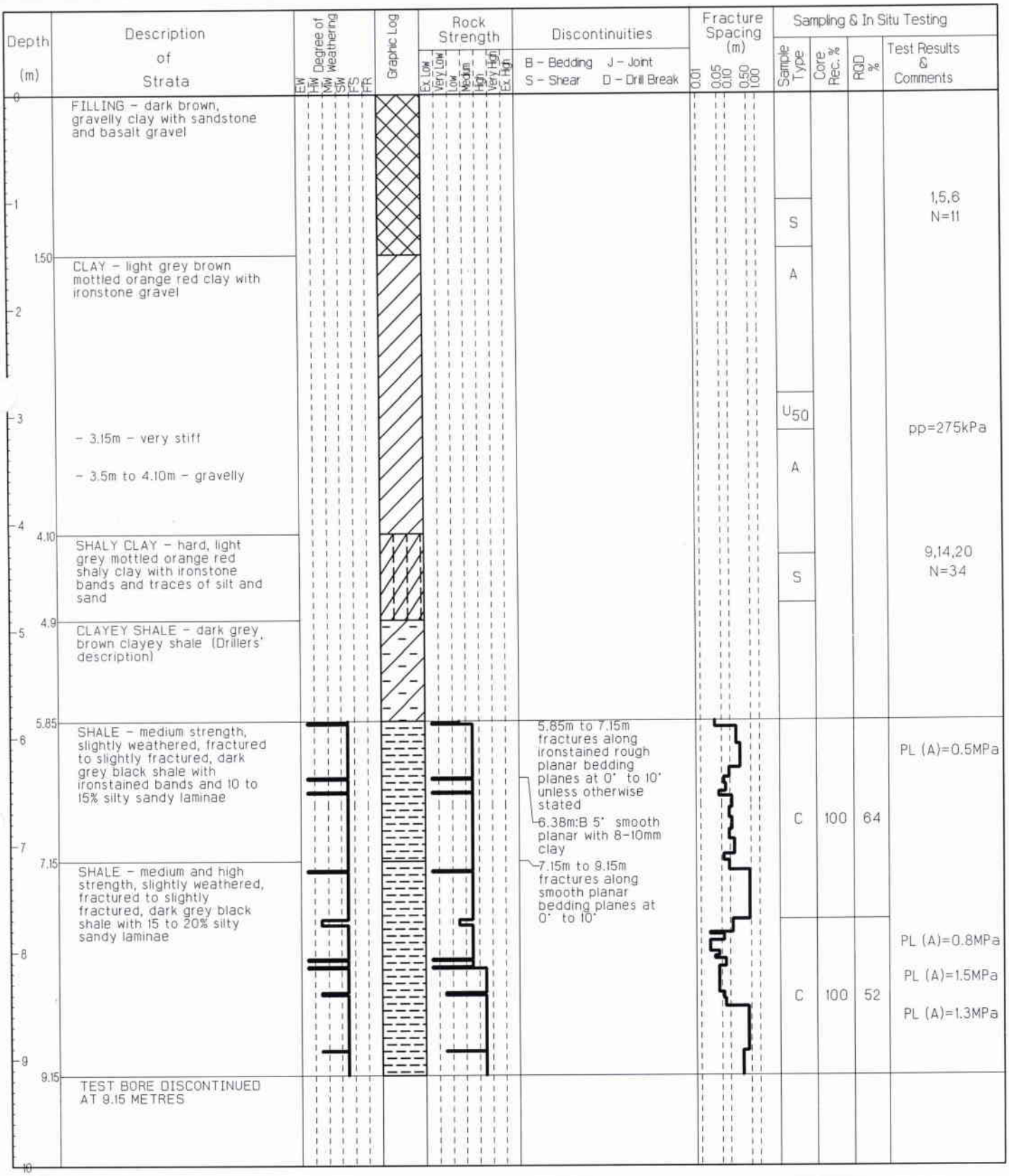

DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 14 PROJ NO 27456 SEPTEMBER 1998
RPA B/H 14
STARTED CORING 5.85
6M
7M
8M
9M
FINISHED CORING 9.15
5.85 - 9.15 M

TEST BORE REPORT

BORE No: 14
DATE: 27 AUGUST 98
SHEET 1 **OF** 1
AZIMUTH:

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: RPAH REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

PROJECT No: 27456
SURFACE LEVEL: 21.95
DIP OF HOLE: 90°



RIG: EDSON 3000 **DRILLER:** CHAPMAN **LOGGED:** PARMAR **CASING:** GL TO 5.85m

TYPE OF BORING: SFA TO 5.85m, NMLC CORING TO 9.15m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:
Initials: MKe
Date: 31·8·98

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DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 15 PROJ NO 27456 SEPTEMBER 1998
RPA Hosp Hole 15 5-10
6
7
8
9
5.10 - 10.00 M

TEST BORE REPORT

BORE No: 15

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE | **PROJECT No:** 27456 | **DATE:** 1 SEPTEMBER 98

PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT | **SURFACE LEVEL:** 24.28 | **SHEET** 1 **OF** 1

LOCATION: MISSENDEN ROAD, CAMPERDOWN | **DIP OF HOLE:** 90° | **AZIMUTH:**

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (Very Soft, Soft, Firm, Stiff, Very Stiff, Hard) / Non-Cohesive (Very Loose, Loose, Med. Dense, Dense, Very Dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sampling & In Situ Testing: Sample Type	Core Rec. %	RQD %	Test Results & Comments
0	FILLING - brick and concrete							
0.60	CLAY - yellow brown clay							
2.0	SILTY CLAY - light grey, mottled red brown silty clay with ironstone bands				A			
	- 2.60m - very stiff				S			8,10,14 N=24
					A			
3.70	SHALE - extremely low to very low strength, highly weathered, grey shale				A			
					S			30/ref
5.10	SHALE - very low to low strength, highly and extremely weathered, highly fractured to fragmented, brown and dark grey shale with medium strength ironstone bands				C	100	0	
6.55								
6.65	SHALE - medium and low to medium strength, highly and slightly weathered, fractured to slightly fractured, dark grey black shale with very low strength bands along bedding				C	96	40	PL (A)=0.4MPa PL (A)=0.5MPa PL (A)=0.3MPa
					C	100	0	PL (A)=0.4MPa
10.00	TEST BORE DISCONTINUED AT 10.00 METRES							

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:** GL TO 5.10m

TYPE OF BORING: SFA 5.1m, NMLC CORING 10.0m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:

Initials: WSB

Date: 16/10/98

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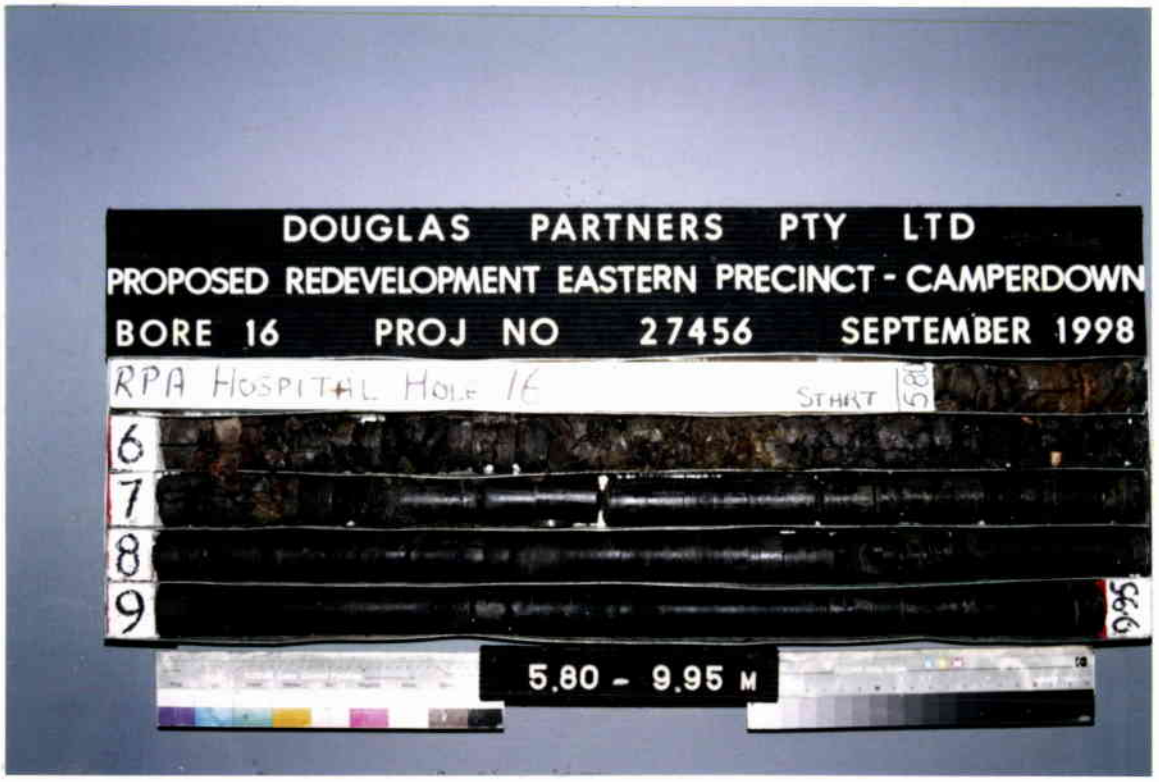
DOUGLAS PARTNERS PTY LTD
PROPOSED REDEVELOPMENT EASTERN PRECINCT - CAMPERDOWN
BORE 16 PROJ NO 27456 SEPTEMBER 1998
RPA HOSPITAL HOLE 16
START
6
7
8
9
5.80 - 9.95 M

TEST BORE REPORT

BORE No: 16

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE | **PROJECT No:** 27456 | **DATE:** 1 SEPTEMBER 98

PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT | **SURFACE LEVEL:** 24.32 | **SHEET** 1 **OF** 1

LOCATION: MISSENDEN ROAD, CAMPERDOWN | **DIP OF HOLE:** 90° | **AZIMUTH:**

Depth (m)	Description of Strata	Graphic Log	Soil: Cohesive (Very Soft, Soft, Firm, Stiff, Very Stiff, Hard) / Non-Cohesive (Very Loose, Loose, Med. Dense, Dense, Very Dense)	Rock Strength (Ex. Low, Very Low, Low, Medium, High, Very High, Ex. High)	Sample Type	Core Rec. %	RQD %	Test Results & Comments
0	FILLING – grey brown clay filling with gravel							
0.30	SILTY CLAY – dark grey silty clay							
0.60	SILTY CLAY – light grey, silty clay with traces of sand and ironstone gravel							
	– 1.55m to 3.2m – very stiff				U_{50}			pp=325kPa
					S			8,9,14 N=23
3.20	SHALY CLAY – very stiff to hard, light grey shaly clay with ironstone bands				A			
4.40	SHALE – extremely low strength, extremely weathered, dark grey shale				S			17,26/ref
5.80	SHALE – extremely low to low strength, highly and extremely weathered, highly fractured to fragmented, light brown and grey shale				C	100	0	PL (A)=6.1MPa
7.15	SIDERITIC SILTSTONE – very high strength, slightly weathered, light grey sideritic siltstone							
7.20	SHALE – medium strength, slightly weathered, fractured to slightly fractured, dark grey black shale with 10% to 15% silty sandy laminae							PL (A)=0.6MPa
					C	100	75	PL (A)=0.7MPa
9.95	TEST BORE DISCONTINUED AT 9.95 METRES							PL (A)=0.8MPa

RIG: APS 300 **DRILLER:** McNULTY **LOGGED:** PARMAR **CASING:**

TYPE OF BORING: SFA 5.8m, NMLC CORING 9.95m

WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED WHILST AUGERING

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A auger sample	PL point load strength I_S (50)MPa
B bulk sample	S standard penetration test
C core drilling	Ux x mm dia. tube
pp pocket penetrometer (kPa)	V Shear Vane (kPa)

CHECKED:

Initials: WJB

Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 7 JULY 98
PROJECT No.: 27456
SURFACE LEVEL: 27.9

BORE No. 18
SHEET 1 **OF** 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0					
0.15	CONCRETE		0.3		
0.30	GRAVEL – up to 30mm	B	0.6		
0.6	CLAY – stiff, grey brown clay		0.8		
1	SILTY CLAY – very stiff, grey brown silty clay	B	1.1		
1.2	TEST BORE DISCONTINUED AT 1.2 METRES				
2					
3					
4					
5					
6					
7					
8					
9					
10					

RIG: PENGO **DRILLER:** ROBAR **LOGGED:** KAWALSKY **CASING:** –

TYPE OF BORING: 300mm DIAMETER ROCK AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: KSB
Date: 16/10/98

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TEST BORE REPORT

CLIENT: CENTRAL SYDNEY AREA HEALTH SERVICE
PROJECT: PROPOSED REDEVELOPMENT, EASTERN PRECINCT
LOCATION: MISSENDEN ROAD, CAMPERDOWN

DATE: 7 JULY 98
PROJECT No.: 27456
SURFACE LEVEL: 33.8

BORE No. 19
SHEET 1 **OF** 1

Depth m	Description of Strata	Sampling & In Situ Testing: Type	Depth (m)	Test Results	Core Recovery %
0					
0.15	CONCRETE		0.3		
	FILLING – brown grey, sandy clay filling	B	0.6		
0.6	SHALY CLAY – stiff, grey brown shaly clay		0.8		
1		B	1.1		
1.1	TEST BORE DISCONTINUED AT 1.1 METRES				
2					
3					
4					
5					
6					
7					
8					
9					
10					

RIG: PENGO **DRILLER:** ROBAR **LOGGED:** KAWALSKY **CASING:** –

TYPE OF BORING: 300mm DIAMETER ROCK AUGER

GROUND WATER OBSERVATIONS: NO FREE GROUNDWATER OBSERVED

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A Auger sample	M Moisture content (%)
B Bulk sample	pp Pocket Penetration (kPa)
D Disturbed sample	Ux x mm dia. tube
HV Hand Vane	Wp Plasitc limit (%)

CHECKED:
Initials: KJB
Date: 16/10/98

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RESULTS OF DYNAMIC PENETROMETER TESTS

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	7-7-98
PROJECT	PROPOSED REDEVELOPMENT, EASTERN PRECINCT	PROJECT NO	27456
LOCATION	ROYAL PRINCE ALFRED HOSPITAL, MISSENDEN RD , CAMPERDOWN	PAGE NO	1 of 1

TEST LOCATIONS	1	18	19	8A						
RL OF TEST										
DEPTH m	PENETRATION RESISTANCE BLOWS/150mm									
0.00 - 0.15	4	concrete	concrete	asphalt						
0.15 - 0.30	7	2	1	-						
0.30 - 0.45	4	4	2	14						
0.45 - 0.60	4	4	4	5						
0.60 - 0.75	3	13	4	5						
0.75 - 0.90	4	11	4	10						
0.90 - 1.05	5	11	4	14						
1.05 - 1.20	10	13	4	11						
1.20 - 1.35										
1.35 - 1.50										
1.50 - 1.65										
1.65 - 1.80										
1.80 - 1.95										
1.95 - 2.10										
2.10 - 2.25										
2.25 - 2.40										
2.40 - 2.55										
2.55 - 2.70										
2.70 - 2.85										
2.85 - 3.00										

TEST METHOD AS 1289.6.3.2, CONE PENETROMETER ✓
AS 1289.6.3.3, FLAT END PENETROMETER O

TESTED BY: GAK
CHECKED BY: KJB

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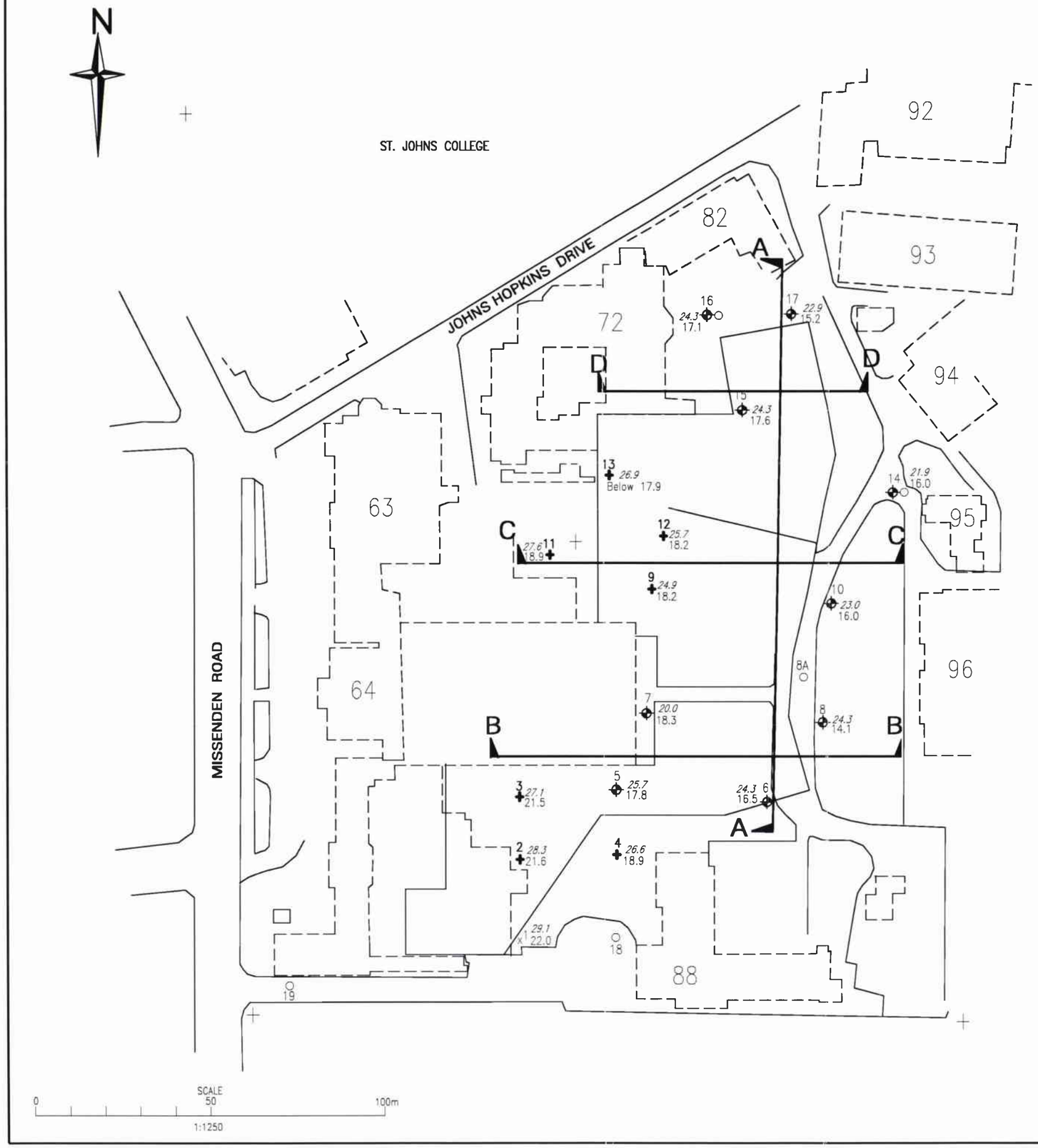

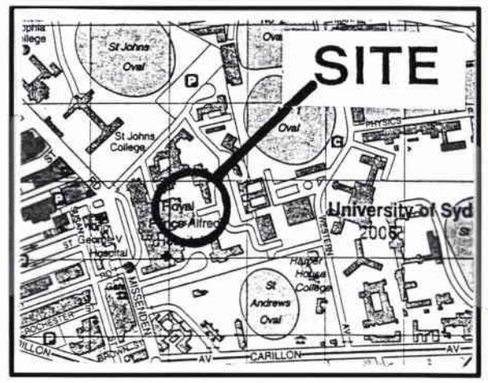

LOCALITY PLAN

LEGEND

- ○ BULK SAMPLE LOCATION – 7.7.1998
- x PENGO TEST BORE LOCATION – 7.7.1998
- ⊕ TEST BORE LOCATION – 27.8.1998
- ✚ PENGO TEST BORE LOCATION – 30.9.1998
- *24.9* GROUND SURFACE LEVEL
- 18.2 UPPER SURFACE LEVEL OF 3.5MPa ALLOWABLE END BEARING STRATUM

Rev C – Surface levels added	9.11.98
Rev B – Sections B–B,C–C & D–D added	24.9.98
Rev A – Section A–A added	24.9.98

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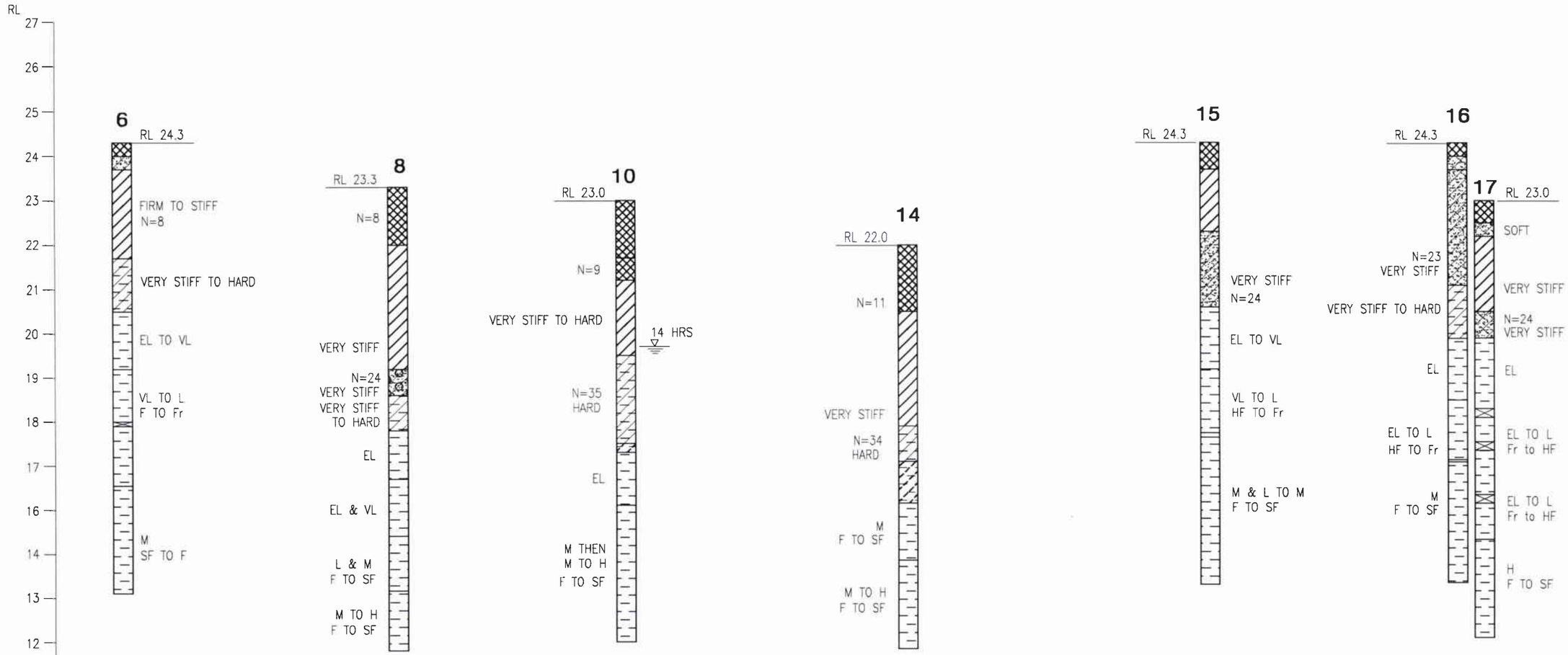
TITLE: Test Bore Locations
Proposed Redevelopment
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN

CLIENT: Central Sydney Area Health Service			
DRAWN BY: PSCH	SCALE: As shown	PROJECT No: 27456	OFFICE: SYDNEY
APPROVED BY: KJSB		DATE: 15.10.1998	DRAWING No: 1 Rev C



SECTION A-A

LEGEND

ROCK STRENGTH		FRACTURING	
EL	EXTREMELY LOW	SF	SLIGHTLY FRACTURED
VL	VERY LOW	F	FRACTURED
L	LOW	HF	HIGHLY FRACTURED
M	MEDIUM	Fr	FRAGMENTED
H	HIGH		

MATERIAL TYPE

- FILLING
- CLAY
- SILTY CLAY
- SILTY GRAVELLY CLAY
- CONCRETE
- CLAYEY SHALE
- SHALY CLAY
- SHALE
- CORE LOSS

SCALE
0 5 10 15 20 25m
1:500 (Horizontal)

NOTES

1. N=9 SPT BLOWS PER 300mm
2. 14 HRS ▽ WATER LEVEL AFTER 14 HOURS.
3. REFER DWG NO 1 (PROJECT NO 27456) FOR PLAN LOCATION OF BORE SECTION.
   ALL BORES PROJECTED ONTO THIS SECTION.

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TITLE: Bore Section A-A
Proposed Redevelopment
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN

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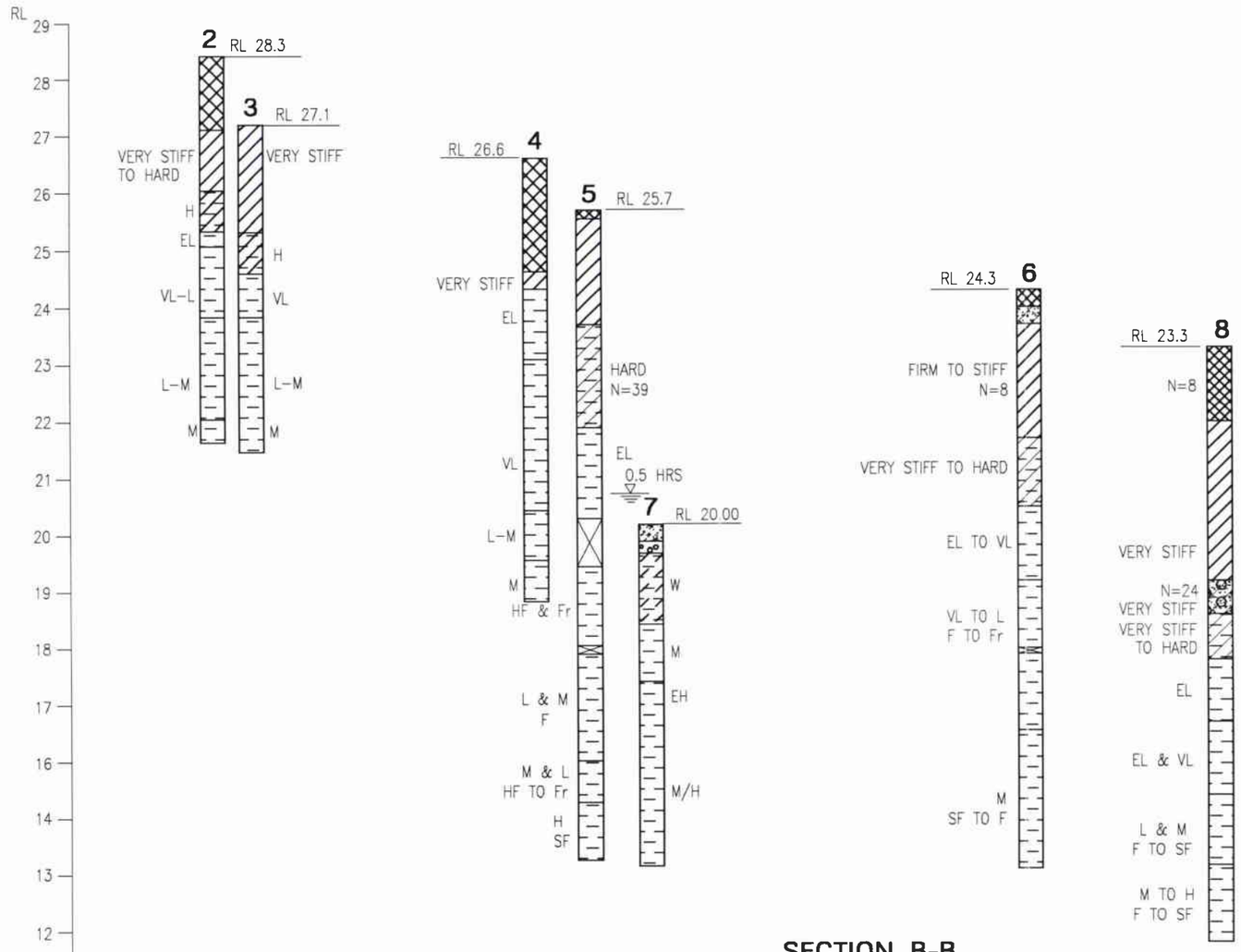
CLIENT: Central Sydney Area Health Service

DRAWN BY: PSCH	SCALE: As shown	PROJECT No: 27456	OFFICE: SYDNEY
APPROVED BY: KJB		DATE: 16.10.1998	DRAWING No: 2



SECTION B-B

LEGEND

ROCK STRENGTH		FRACTURING	
EL	EXTREMELY LOW	SF	SLIGHTLY FRACTURED
VL	VERY LOW	F	FRACTURED
L	LOW	HF	HIGHLY FRACTURED
M	MEDIUM	Fr	FRAGMENTED
H	HIGH		

MATERIAL TYPE

- FILLING
- CLAY
- SILTY CLAY
- SILTY GRAVELLY CLAY
- CONCRETE
- CLAYEY SHALE
- SHALY CLAY
- SHALE
- CORE LOSS

NOTES

1. N=9 SPT BLOWS PER 300mm
2. 14 HRS ▽ WATER LEVEL AFTER 14 HOURS.
3. REFER DWG NO 1 (PROJECT NO 27456) FOR PLAN LOCATION OF BORE SECTION. ALL BORES PROJECTED ONTO THIS SECTION.

SCALE
0 5 10 15 20 25m
1:500 (Horizontal)

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TITLE: Bore Section B-B
Proposed Redevelopment
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN

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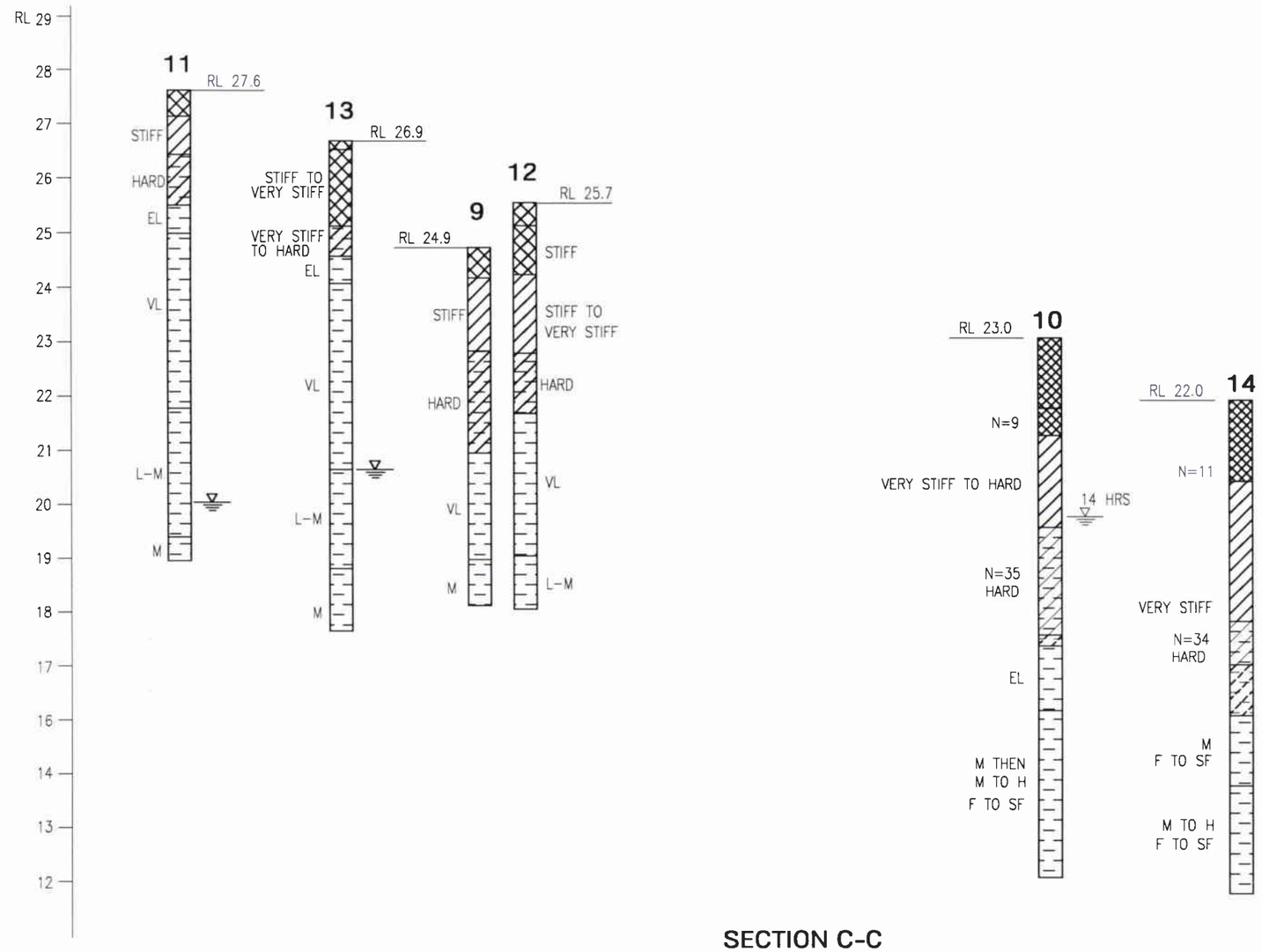
CLIENT: Central Sydney Area Health Service

DRAWN BY: PSCH	SCALE: As shown	PROJECT No: 27456	OFFICE: SYDNEY
APPROVED BY: KCJB		DATE: 16.10.1998	DRAWING No: 3



SECTION C-C

LEGEND

ROCK STRENGTH		FRACTURING	
EL	EXTREMELY LOW	SF	SLIGHTLY FRACTURED
VL	VERY LOW	F	FRACTURED
L	LOW	HF	HIGHLY FRACTURED
M	MEDIUM	Fr	FRAGMENTED
H	HIGH		

MATERIAL TYPE

- FILLING
- CLAY
- SILTY CLAY
- SILTY GRAVELLY CLAY
- CONCRETE
- CLAYEY SHALE
- SHALY CLAY
- SHALE
- CORE LOSS

SCALE
0 5 10 15 20 25m
1:500 (Horizontal)

NOTES

1. N=9 SPT BLOWS PER 300mm
2. 14 HRS ▽ WATER LEVEL AFTER 14 HOURS.
3. REFER DWG NO 1 (PROJECT NO 27456) FOR PLAN LOCATION OF BORE SECTION. ALL BORES PROJECTED ONTO THIS SECTION.

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TITLE: Bore Section C-C
Proposed Redevelopment
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN

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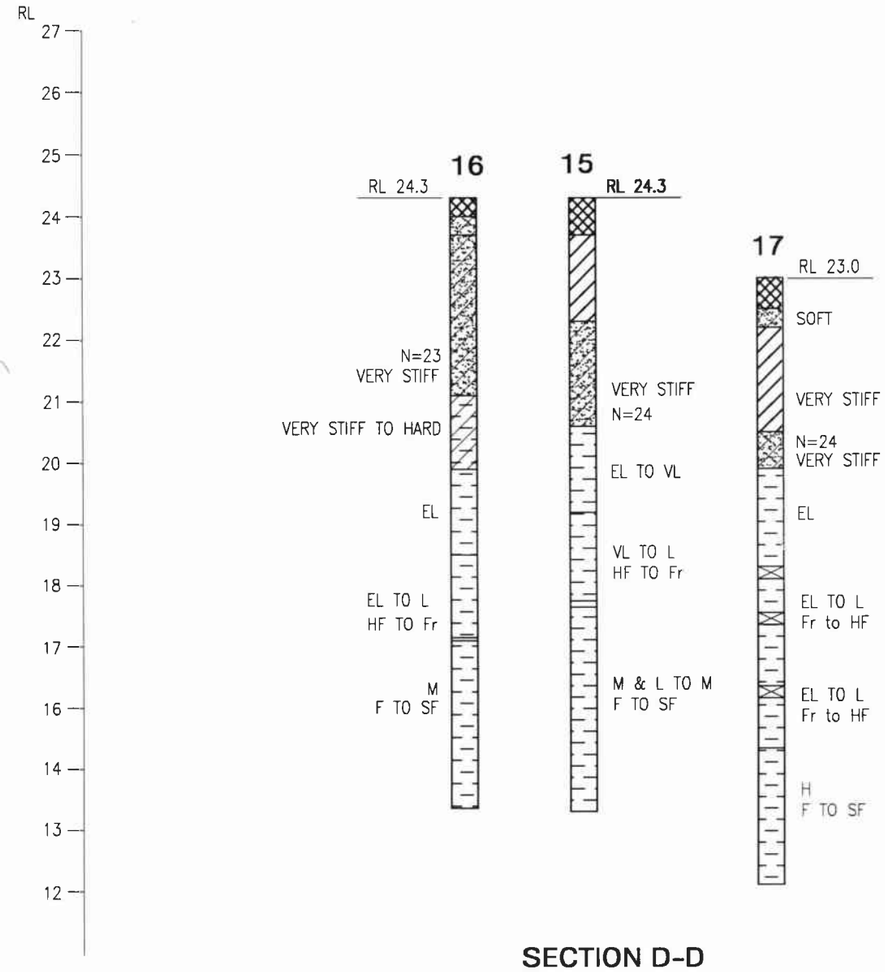
CLIENT: Central Sydney Area Health Service			
DRAWN BY: PSCH	SCALE: As shown	PROJECT No: 27456	OFFICE: SYDNEY
APPROVED BY: KSB		DATE: 16.10.1998	DRAWING No: 4



SECTION D-D

LEGEND

ROCK STRENGTH		FRACTURING	
EL	EXTREMELY LOW	SF	SLIGHTLY FRACTURED
VL	VERY LOW	F	FRACTURED
L	LOW	HF	HIGHLY FRACTURED
M	MEDIUM	Fr	FRAGMENTED
H	HIGH		

MATERIAL TYPE

- FILLING
- CLAY
- SILTY CLAY
- SILTY GRAVELLY CLAY
- CONCRETE
- CLAYEY SHALE
- SHALY CLAY
- SHALE
- CORE LOSS

NOTES

1. N=9 SPT BLOWS PER 300mm
2. 14 HRS ▽ WATER LEVEL AFTER 14 HOURS.
3. REFER DWG NO 1 (PROJECT NO 27456) FOR PLAN LOCATION OF BORE SECTION.
   ALL BORES PROJECTED ONTO THIS SECTION.

SCALE
0 5 10 15 20 25m
1:500 (Horizontal)

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TITLE: Bore Section D-D
Proposed Redevelopment
Royal Prince Alfred Hospital
Missenden Road
CAMPERDOWN

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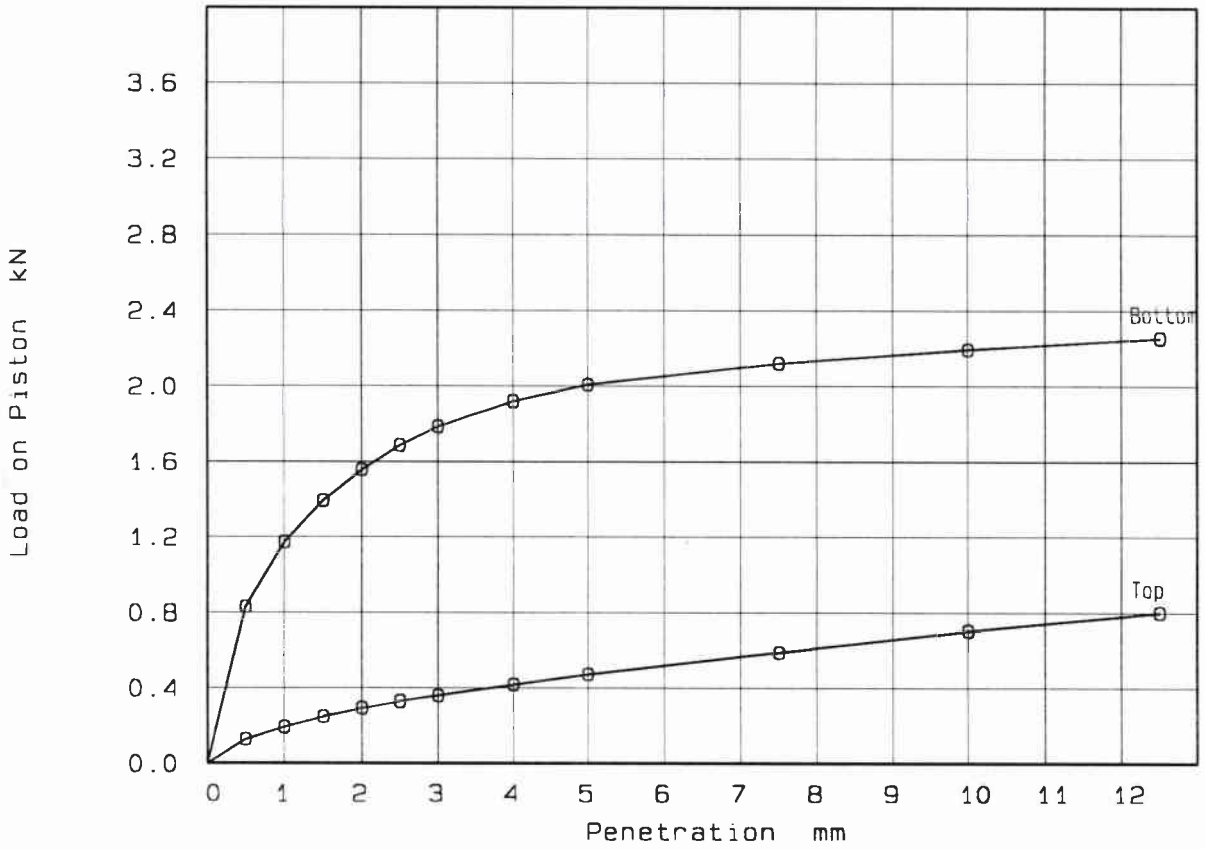
CLIENT: Central Sydney Area Health Service

DRAWN BY: PSCH	SCALE: As shown	PROJECT No: 27456	OFFICE: SYDNEY
APPROVED BY: KJB		DATE: 16.10.1998	DRAWING No: 5

RESULTS OF CALIFORNIA BEARING RATIO TEST

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	17/07/1998
PROJECT	PROPOSED DEVELOPMENT, EASTERN PRECINCT	PROJECT No.	27456
LOCATION	ROYAL PRINCE ALBERT HOSPITAL, MISSENDEN ROAD, CAMPERDOWN	TEST LOC.	8A
		DEPTH	0.3 - 0.6



DESCRIPTION FILLING - GREY BROWN AND MOTTLED ORANGE SANDY CLAY FILLING

PREPARATION Remoulded to approximate 100% Maximum Dry Density & Optimum Moisture Content, then soaked for four days.

LEVEL OF COMPACTION 100 % Standard

SURCHARGE 9 kg SWELL 2.4 %

CONDITION	MOISTURE CONTENT %	DRY DENSITY t/m^3
At Compaction	18.8	1.70
After Soaking	23.2	1.66
After Test Top 30mm	25.1	-
- Remainder	22.1	-
Field Values	21.7	-
Standard Compaction	19.4	1.70

RESULTS Type	Penetration	CBR (%)
Top	- 2.5 mm	2.5
	- 5.0 mm	2.5
Bottom	- 2.5 mm	13
	- 5.0 mm	10

TEST METHOD AS 1289.F1.1

TESTED KG
CHECKED NW

LABORATORY SYDNEY 828 REPORT No S98-190 SIGNED

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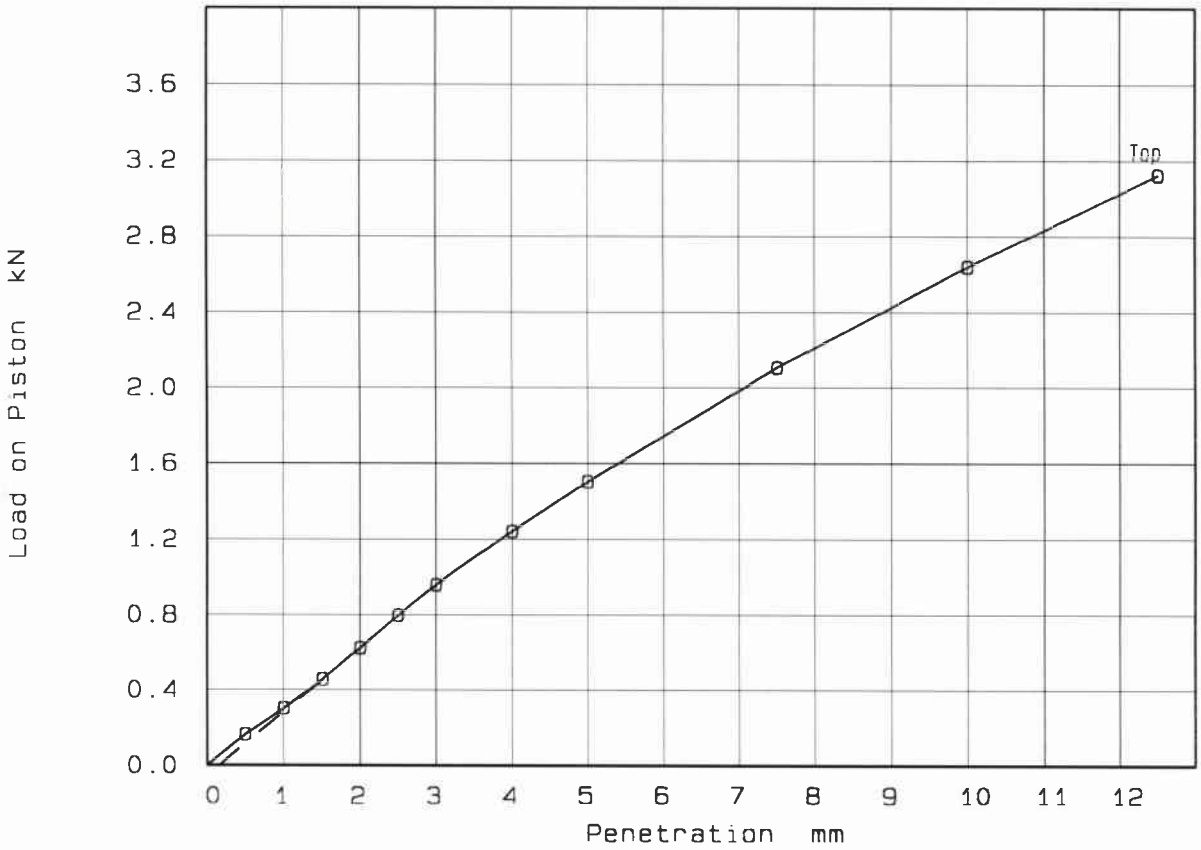
RESULTS OF CALIFORNIA BEARING RATIO TEST

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	20/10/1998
PROJECT	PROPOSED REDEVELOPMENT	PROJECT No.	27456
LOCATION	ROYAL PRINCE ALFRED HOSPITAL, MISSENDEN ROAD, CAMPERDOWN	TEST LOC.	14
		DEPTH	0.1 - 0.5



DESCRIPTION BROWN CLAYEY SANDY SILT WITH SOME SANDSTONE

PREPARATION Remoulded to approximate 100% Maximum Dry Density & Optimum Moisture Content, then soaked for four days.

LEVEL OF COMPACTION 99 % Standard

SURCHARGE 4.5 kg SWELL 0.1 %

CONDITION	MOISTURE CONTENT %	DRY DENSITY t/m^3
At Compaction	13.2	1.85
After Soaking	15.0	1.85
After Test Top 30mm	15.1	-
- Remainder	13.9	-
Field Values	9.3	-
Standard Compaction	12.8	1.87

RESULTS		
Type	Penetration	CBR (%)
Top	- 2.5 mm	6
	- 5.0 mm	8

TEST METHOD AS 1289.F1.1

TESTED CT
CHECKED KG

LABORATORY SYDNEY - 828 REPORT No S98-299 SIGNED

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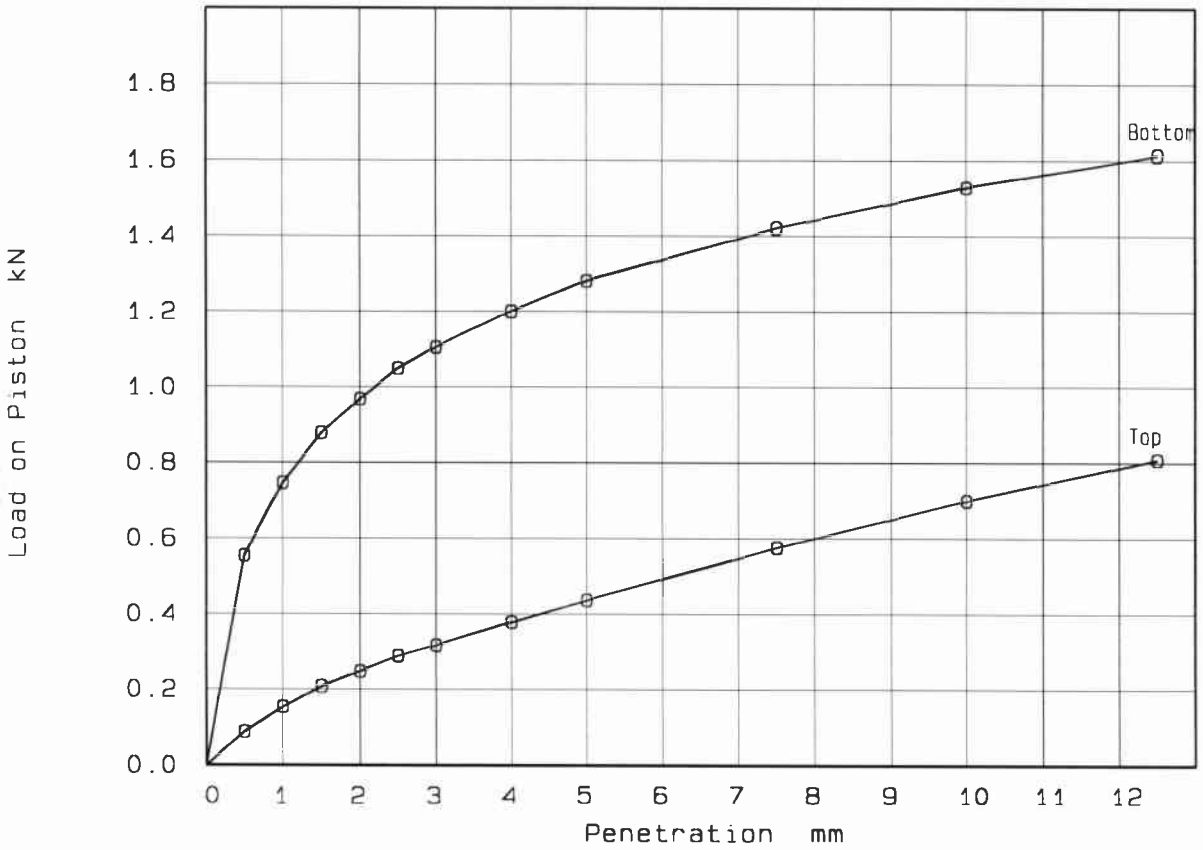
RESULTS OF CALIFORNIA BEARING RATIO TEST

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	20/10/1998
PROJECT	PROPOSED REDEVELOPMENT	PROJECT No.	27456
LOCATION	ROYAL PRINCE ALFRED HOSPITAL, MISSENDEN ROAD, CAMPERDOWN	TEST LOC.	16
		DEPTH	0.1 - 0.5



DESCRIPTION BROWN MOTTLED SILTY CLAY

PREPARATION Remoulded to approximate 100% Maximum Dry Density & Optimum Moisture Content, then soaked for four days.

LEVEL OF COMPACTION 100 % Standard

SURCHARGE 4.5 kg SWELL 3.4 %

CONDITION	MOISTURE CONTENT %	DRY DENSITY t/m^3
At Compaction	27.1	1.49
After Soaking	31.9	1.44
After Test Top 30mm	35.2	-
- Remainder	31.0	-
Field Values	29.2	-
Standard Compaction	27.2	1.49

RESULTS Type	Penetration	CBR (%)
Top	- 2.5 mm	2.0
	- 5.0 mm	2.0
Bottom	- 2.5 mm	8
	- 5.0 mm	6

TEST METHOD AS 1289.F1.1

TESTED CT
CHECKED KG

LABORATORY SYDNEY - 828 REPORT No S98-299A SIGNED

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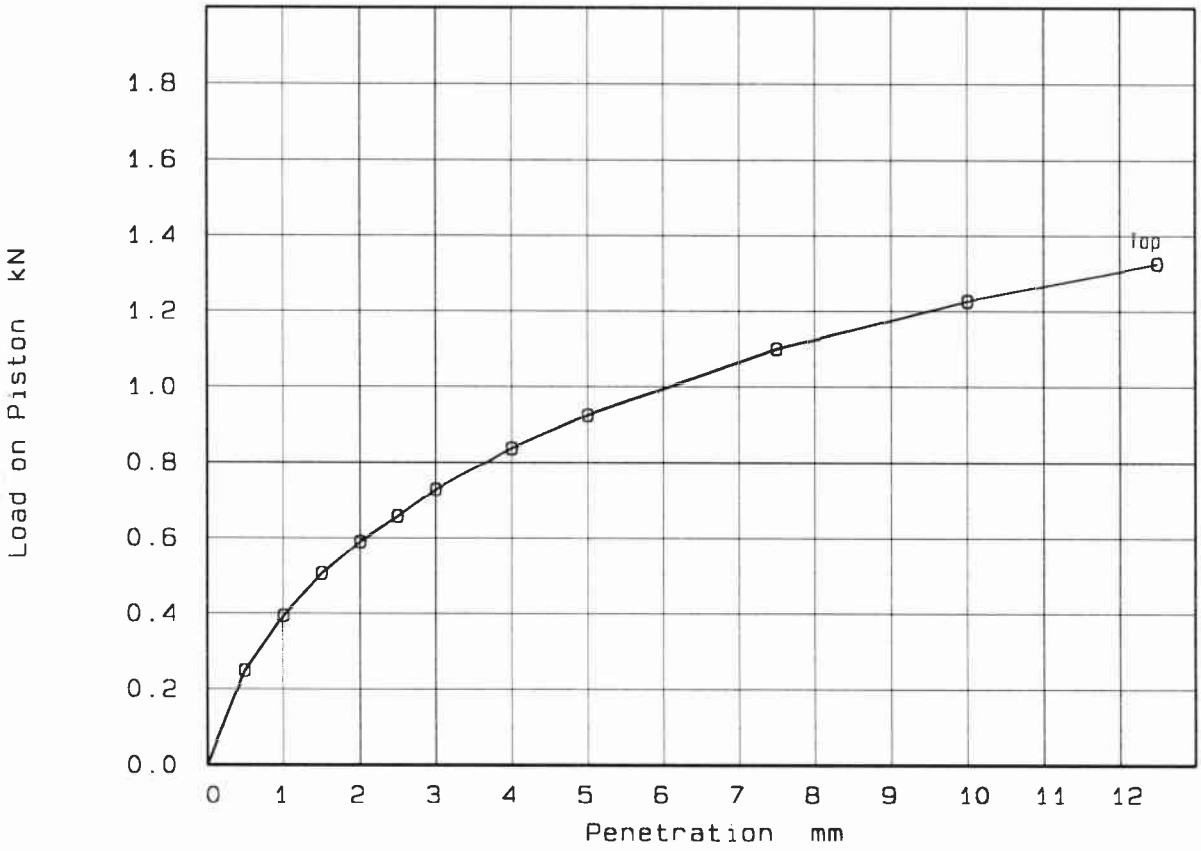
RESULTS OF CALIFORNIA BEARING RATIO TEST

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	17/07/1998
PROJECT	PROPOSED DEVELOPMENT, EASTERN PRECINCT	PROJECT No.	27456
LOCATION	ROYAL PRINCE ALBERT HOSPITAL, MISSENDEN ROAD, CAMPERDOWN	TEST LOC.	18
		DEPTH	0.3 - 0.6



DESCRIPTION CLAY - STIFF BROWN GREY CLAY

PREPARATION Remoulded to approximate 100% Maximum Dry Density & Optimum Moisture Content, then soaked for four days.

LEVEL OF COMPACTION 100 % Standard

SURCHARGE 9 kg

SWELL -0.2 %

CONDITION	MOISTURE CONTENT %	DRY DENSITY t/m^3
At Compaction	26.6	1.53
After Soaking	28.5	1.53
After Test Top 30mm	27.7	-
- Remainder	27.2	-
Field Values	30.5	-
Standard Compaction	26.7	1.53

RESULTS		
Type	Penetration	CBR (%)
Top	- 2.5 mm	5
	- 5.0 mm	4.5

TEST METHOD AS 1289.F1.1

TESTED KG
CHECKED NW

LABORATORY SYDNEY 828 REPORT No S98-190A SIGNED

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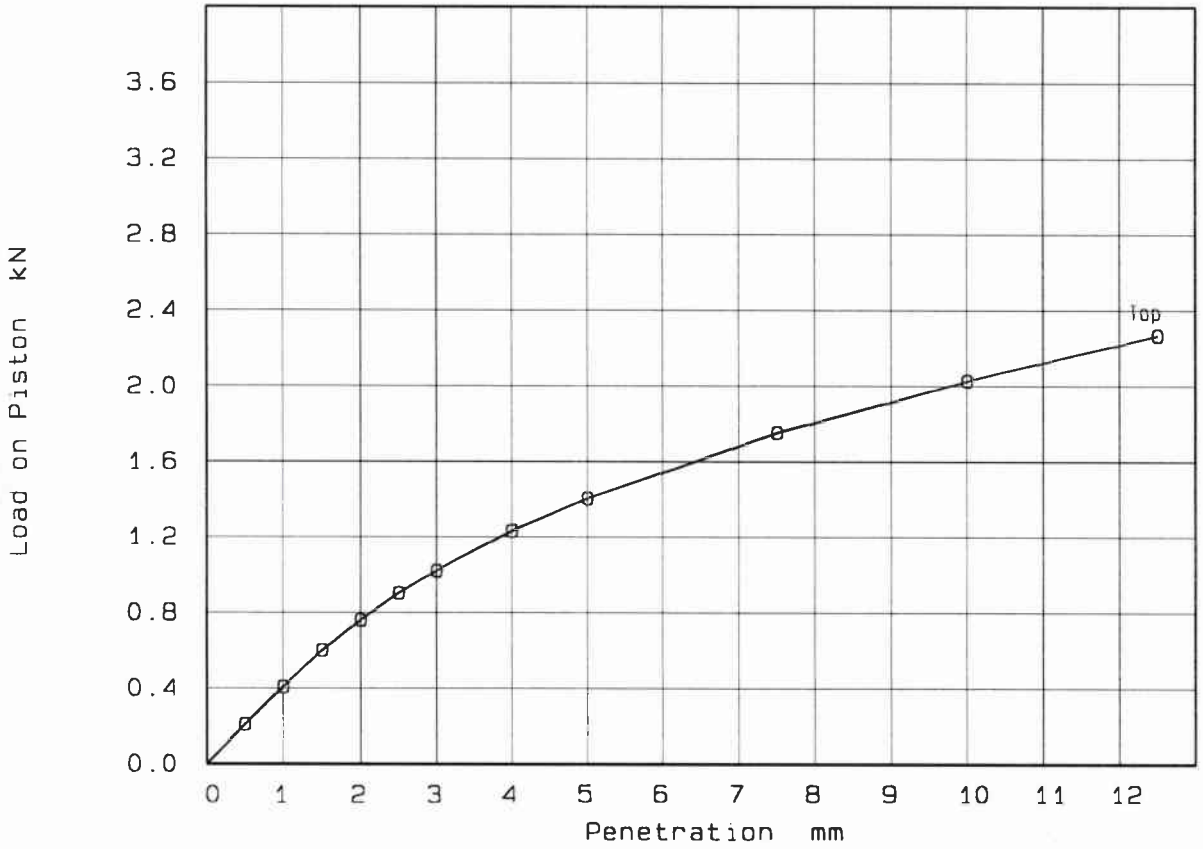
RESULTS OF CALIFORNIA BEARING RATIO TEST

CLIENT	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE	17/07/1998
PROJECT	PROPOSED DEVELOPMENT, EASTERN PRECINCT	PROJECT No.	27456
LOCATION	ROYAL PRINCE ALBERT HOSPITAL, MISSENDEN ROAD, CAMPERDOWN	TEST LOC.	19
		DEPTH	0.3 - 0.6



DESCRIPTION FILLING - BROWN GREY SANDY CLAY FILLING

PREPARATION Remoulded to approximate 100% Maximum Dry Density & Optimum Moisture Content, then soaked for four days.

LEVEL OF COMPACTION 99 % Standard

SURCHARGE 9 kg SWELL 1.3 %

CONDITION	MOISTURE CONTENT %	DRY DENSITY t/m^3
At Compaction	24.4	1.56
After Soaking	27.8	1.54
After Test Top 30mm	28.3	-
- Remainder	25.9	-
Field Values	27.1	-
Standard Compaction	24.0	1.57

RESULTS Type	Penetration	CBR (%)
Top	- 2.5 mm	7
	- 5.0 mm	7

TEST METHOD AS 1289.F1.1

TESTED KG
CHECKED NW

LABORATORY SYDNEY 828 REPORT No S98-1908 SIGNED

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RESULTS OF INSTABILITY INDEX DETERMINATION

CLIENT:	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE:	21/10/1998
PROJECT:	PROPOSED REDEVELOPMENT	PROJECT No:	27456
LOCATION:	ROYAL PRINCE ALFRED HOS., CAMPERDOWN	LOC No:	6
		DEPTH:	2.6-2.9 m

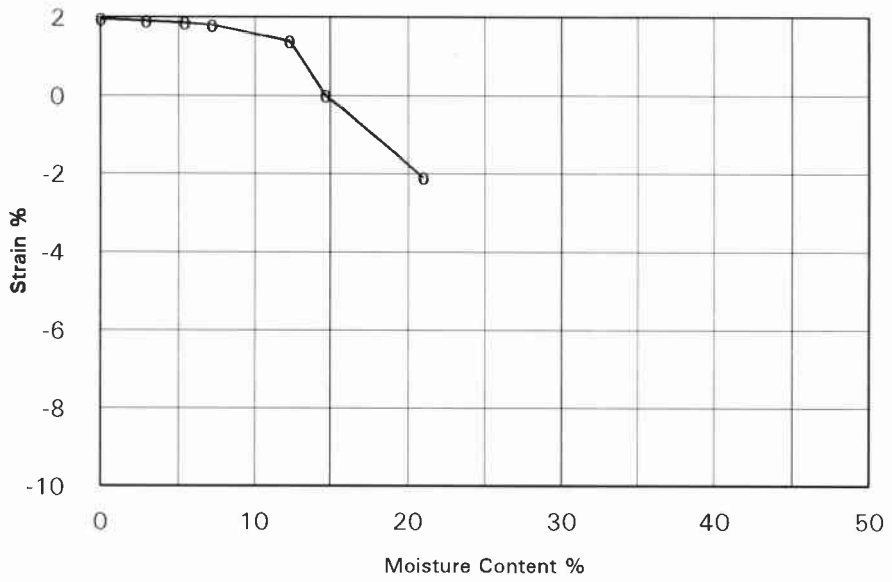
Description: CLAY - Mottled grey & red brown clay with some gravel

CORE SHRINKAGE TEST

Shrinkage - air dried	1.9 %
Shrinkage - oven dried	2.0 %
Significant inert inclusions	- %
Extent of cracking	- %
Extent of soil crumbling	- %
Moisture content of core	14.7 %

SWELL TEST

Pocket penetrometer reading at initial moisture content	>400 kPa
Pocket penetrometer reading at final moisture content	200 kPa
Initial Moisture Content	15.1 %
Final moisture content	21.0 %
Swell under 25kPa	2.1 %



SHRINK-SWELL INDEX I_{SS} 1.7 % per Δ pF

Remarks:

Test Method: AS1289 7.1.1-1998

TESTED BY: KG DATE: 16/10/98
CHECKED BY: NW DATE: 21/10/98

LABORATORY: SYDNEY - 828 REPORT NO: S98-301a

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RESULTS OF INSTABILITY INDEX DETERMINATION

CLIENT:	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE:	21/10/1998
PROJECT:	PROPOSED REDEVELOPMENT	PROJECT No:	27456
LOCATION:	ROYAL PRINCE ALFRED HOS., CAMPERDOWN	LOC No:	14
		DEPTH:	2.8-3.2 m

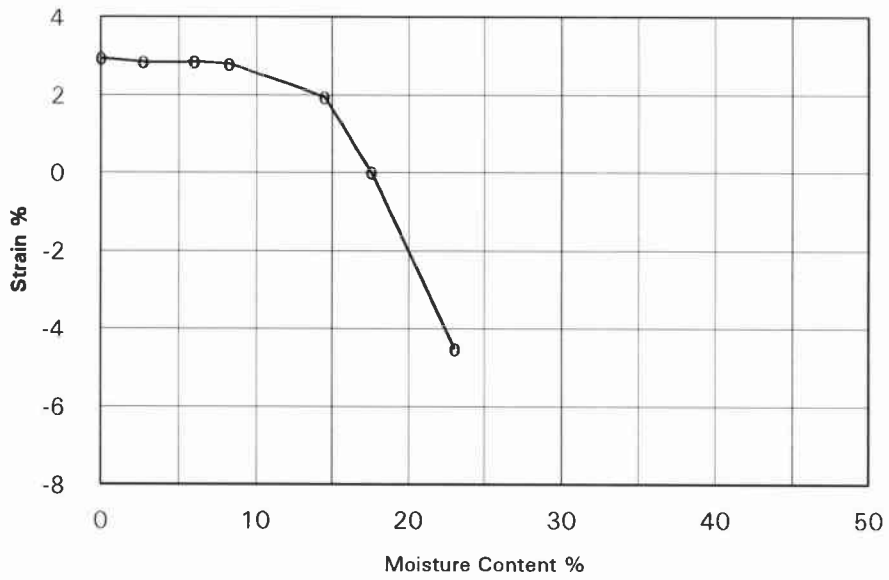
Description: CLAY - Mottled grey & red brown clay with some gravel

CORE SHRINKAGE TEST

Shrinkage - air dried	2.9 %
Shrinkage - oven dried	3.0 %
Significant inert inclusions	- %
Extent of cracking	- %
Extent of soil crumbling	- %
Moisture content of core	17.5 %

SWELL TEST

Pocket penetrometer reading at initial moisture content	>400 kPa
Pocket penetrometer reading at final moisture content	250 kPa
Initial Moisture Content	18.6 %
Final moisture content	23.0 %
Swell under 25kPa	4.5 %



SHRINK-SWELL INDEX I_{ss} 2.9% per Δ pF

Remarks:

Test Method: AS1289 7.1.1-1998

TESTED BY: KG DATE: 16/10/98
CHECKED BY: NW DATE: 21/10/98

LABORATORY: SYDNEY - 828 REPORT NO: S98-301b

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RESULTS OF INSTABILITY INDEX DETERMINATION

CLIENT:	CENTRAL SYDNEY AREA HEALTH SERVICE	DATE:	21/10/1998
PROJECT:	PROPOSED REDEVELOPMENT	PROJECT No:	27456
LOCATION:	ROYAL PRINCE ALFRED HOS., CAMPERDOWN	LOC No:	17
		DEPTH:	1.3-1.7 m

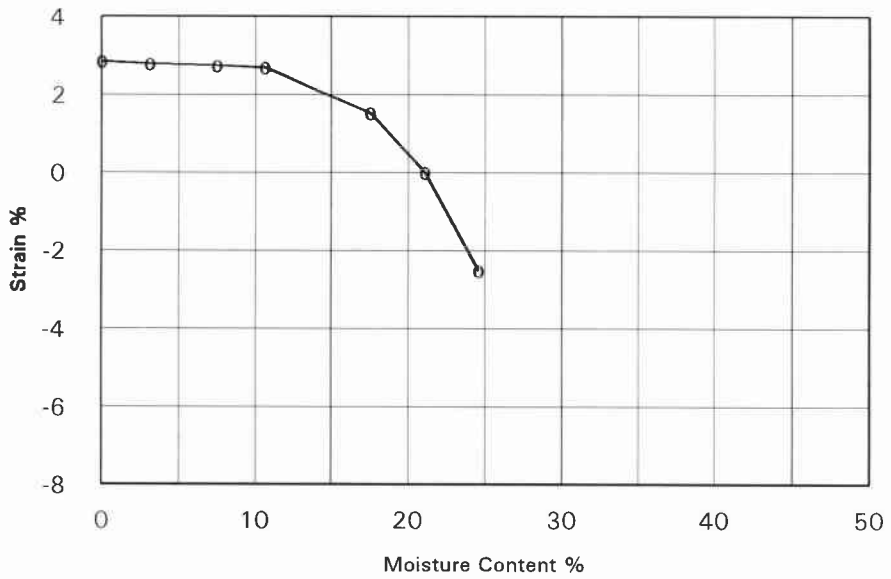
Description: CLAY - Mottled grey & red brown clay with some gravel

CORE SHRINKAGE TEST

Shrinkage - air dried	2.8 %
Shrinkage - oven dried	2.8 %
Significant inert inclusions	- %
Extent of cracking	1 %
Extent of soil crumbling	- %
Moisture content of core	21.1 %

SWELL TEST

Pocket penetrometer reading at initial moisture content	>400 kPa
Pocket penetrometer reading at final moisture content	200 kPa
Initial Moisture Content	20.8 %
Final moisture content	24.7 %
Swell under 25kPa	2.5 %



SHRINK-SWELL INDEX I_{SS} 2.3% per Δ pF

Remarks:

Test Method: AS1289 7.1.1-1998

TESTED BY: KG DATE: 16/10/98
CHECKED BY: NW DATE: 21/10/98

LABORATORY: SYDNEY - 828 REPORT NO: S98-301c

N.WEIMANN

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Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 23.2 AHD
EASTING: 332107.6
NORTHING: 6248578.5
DIP/AZIMUTH: 90°/--

BORE No: BH201
PROJECT No: 99709.00
DATE: 7/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			XW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	B - Bedding J - Joint S - Shear F - Fault				
23	0.1	ASPHALTIC CONCRETE										
		FILL/Clay: low to medium plasticity, brown and red-brown mottled grey, with fine to coarse sandstone gravel, trace silt and sand, w<PL							E/D			PID < 1 ppm
		between 0.4-0.5m: sandstone cobble										
22	1	between 0.9-1.0m: sandstone cobble							E/D			PID < 1 ppm
									E			PID < 1 ppm
	1.75	CLAY CI-CH: medium to high plasticity, red-brown mottled grey, with silt, w<PL, residual							E/D			PID < 1 ppm
21	2								E/D			PID < 1 ppm
	2.1	CLAY CI-CH: medium to high plasticity, red-brown and mottled grey, with ironstone gravel, fine to medium, angular to subangular, w<PL, very stiff, residual							S			6,9,10 N = 19
20	3											
19	4					15-07-20			S			5,8,15 N = 23
18	5											
									S			14,24,17/70 refusal
		Below 5.7m: hard, trace ironstone gravel										
17	6.0	(extremely weathered rock)						6m: CORE LOSS: 100mm	C	90	0	pp = 480
	6.1	CLAY CI-CH: medium to high plasticity, grey, trace ironstone gravel, fine to medium, angular to subangular, w<PL, hard, residual										pp = 520
	6.7	(extremely weathered rock)						6.78-6.92m: B(x4), 0-10°, pl-ir, fe, cly 10mm				
16	7	SILTSTONE: dark grey with brown, thinly laminated, with5-10% fine grained sandstone laminations, very low to low strength then medium strength with clay seams, highly weathered then moderately weathered, highly fractured, Ashfield Shale						6.92m: J50°, st, fe 6.97-6.99m: Cs, 20mm, fe 6.99-7.05m: B(0-10°), pl, fe 7.07-7.08m: Cs, 10mm 7.1-7.26m: B(x8), 0-10°, pl,fe 7.41m: B(0-10°), pl, fe 7.56m: B0°, pl, cly 9mm 8.31m: J45° and 90°, st, ti 8.37-8.50m: J(60-70°), ir, cly vn 8.66m: J60°, pl, cly vn 8.75-8.78m: Cs, 30mm				PL(A) = 0.35
	7.25								C	100	72	PL(A) = 0.78
15	8											
14	9	LAMINITE: dark grey, thinly laminated, with 30-40% fine grained sandstone laminations, medium strength then high strength with clay seams, fresh, fractured, Ashfield Shale										PL(A) = 0.95
								9.30-9.52m: B(x3), 0-10°, pl, fe, cly 5mm				
	9.71							9.55m: CORE LOSS: 160mm	C	94	52	

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.2m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.1m, Non destructive digging to 2.1m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Well installed: screened PVC 15.0m-2.5m, blank PVC 2.5m-0.1m, gravel pack 15.0m-2.0m, bentonite seal 2.0m-1.5m, backfill 1.5m-0.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 23.2 AHD
EASTING: 332107.6
NORTHING: 6248578.5
DIP/AZIMUTH: 90°/--

BORE No: BH201
PROJECT No: 99709.00
DATE: 7/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
13		LAMINITE : as previous						9.74-10.57m: B(x9), 0-10°, pl, cly up to 7mm				PL(A) = 1.8
	10.57											
12		LAMINITE: dark grey, thinly laminated, with 20-25% fine grained sandstone laminations, high strength, fresh, slightly fractured, Ashfield Shale							C	94	52	PL(A) = 2
11	11							11.39-11.63m: B(x4), 0-5°, pl, cly 3mm				
	12											PL(A) = 1.1
10								12.4m: J60°, ir				
								12.7m: J(70-80°), ir, ti				
	13											PL(A) = 1.4
								13.09m: J(45-55°), st, cln				
								13.15m: J60°, pl, ti	C	100	98	
9	14											PL(A) = 2.1
								14.17m: J45°, pl, cln				
								14.75m: J60°, ir, ti				
	15 15.0							14.93m: J45°, pl, cly vn				
8		Bore discontinued at 15.0m Target depth reached										
7	16											
6	17											
5	18											
4	19											

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.2m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.1m, Non destructive digging to 2.1m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Well installed: screened PVC 15.0m-2.5m, blank PVC 2.5m-0.1m, gravel pack 15.0m-2.0m, bentonite seal 2.0m-1.5m, backfill 1.5m-0.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 26.4 AHD
EASTING: 332074.2
NORTHING: 6248693.5
DIP/AZIMUTH: 90°/--

BORE No: BH202
PROJECT No: 99709.00
DATE: 9/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
26	0.05	ASPHALTIC CONCRETE										
	0.25	FILL/SAND: fine to coarse, dark grey-brown, with silt, trace clay and fine to medium gravel, moist, apparently well compacted							E/D			PID < 1 ppm
	1	FILL/Silty CLAY: low to medium plasticity, brown-grey, with fine to coarse igneous sandstone gravel, trace sand and rootlets, w<PL							E/D			PID < 1 ppm
25	1.2	FILL/GRAVEL and COBBLES: pale yellow-grey sandstone cobbles and coarse sandstone gravel, moist							E/D			PID < 1 ppm
	1.7	FILL/CLAY: low to medium plasticity, brown, with silt, trace fine gravel, coarse sandstone and ironstone gravel, w < PL										
	2											
24	2.4	CLAY CI-CH: medium to high plasticity, grey mottled red-brown, with ironstone gravel, fine to medium, angular to subangular, w<PL, stiff to very stiff, residual							S/E			5,7,9 N = 16 PID < 1 ppm
	3											
23												
	4								S/E			5,9,15 N = 24 PID < 1 ppm
22												
	5											
21		Below 5.5m: grey, hard (extremely weathered rock)							S/E			22,25/70 refusal PID < 1 ppm
	6					15-07-20						PL(A) = 0.19
20	6.0	LAMINITE: dark grey, thinly laminated, with 20-30% fine grained sandstone laminations, low and medium strength with clay seams, slightly weathered then fresh, fractured, Ashfield Shale						6.01-6.56m: B(x8), 0-10°, pl, fe, cly up to 5mm 6.25-6.49m: Cs(x5), 10-30mm 6.86-6.87m: Cs, 10mm,fe 6.87m: B0°, pl, fe 6.99-7.09m:J, 60-80°, ir, fe 7.09m: B0°, pl, fe 7.2m: B(x4) 0°, pl, cly 3-5mm 7.52-7.59m: Cs, 70mm, fe 7.67-7.82m: B(x4), 0°, pl, cly 5mm, fe 7.84-8.29m: Cs(x5), 10-25mm 7.90-8.20m: J(x2) 70-90°, ir, fe, cly vn 8.35-8.48m: B(x3) 0°, pl, cly 5-9mm 8.77-8.78m: Cs, 10mm 9.03-9.30m: B(x10), 0-5°, cly 5-7mm 9.09m: B0°, pl, cly 7mm 9.37-9.38m: Cs, 10mm	C	100	55	PL(A) = 0.3 PL(A) = 0.5
	7											
19												
	8											
18	8.48	LAMINITE: dark grey, thinly laminated, with 20-30%, fine grained sandstone laminations, medium strength with clay seams, fresh, slightly fractured to fractured, Ashfield Shale							C	100	63	PL(A) = 0.74
	9											
17												

RIG: Scout 1 **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.2m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.05m, Non destructive digging to 2.0m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 16.15m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Approximately 40% water loss below 13.0m
Well installed: screen 16.15m-4.0m, blank 4.0m-0.1m, gravel pack 16.15m-3.5m, bentonite seal 3.5m-3.0m, backfill from 3.0m-0.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 26.4 AHD
EASTING: 332074.2
NORTHING: 6248693.5
DIP/AZIMUTH: 90°/--

BORE No: BH202
PROJECT No: 99709.00
DATE: 9/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
16	11	LAMINITE: dark grey, thinly laminated, with 20-30%, fine grained sandstone laminations, medium strength with clay seams, fresh, slightly fractured to fractured, Ashfield Shale *(continued)*	XW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	9.89-9.94m: B(x10), 0°, pl, cly 5-9mm 9.98-9.99m: Cs, 10mm 10.75-10.76m: Cs, 10mm 10.78m: J(60-70°), ir 10.81m: J60°, pl, cly vn 10.9m: J(45° & 5°), st, cly vn 10.99-11.05m: B(x3), 0°, pl, cly 5-7mm 11.43m: J(60-70°), ir, cly vn 11.73m: B0°, pl, cly 7mm 11.74m: J45°, pl, cly vn 12.54-12.57m: J(x2), 30-60°, ir, st 12.69m: B5°, pl, cly 3mm 13.84-14.15m: J(70-80°),st, cly vn 14.20-14.47m: J60°, st, cly vn	C	100	63	PL(A) = 0.47 PL(A) = 0.78
15	12											PL(A) = 0.26
14	12.9	SILTSTONE: dark grey, thinly laminated, with 5-10% fine grained sandstone laminations, high strength, fresh, slightly fractured to unbroken, Ashfield Shale							C	100	99	PL(A) = 1.1
13	13											
12	14											PL(A) = 1.6
11	15								C	100	100	PL(A) = 2.1
10	16											
9	16.15	Bore discontinued at 16.15m Target depth reached										PL(A) = 3.1
8	17											
7	18											
	19											

RIG: Scout 1 **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.2m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.05m, Non destructive digging to 2.0m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 16.15m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Approximately 40% water loss below 13.0m
Well installed: screen 16.15m-4.0m, blank 4.0m-0.1m, gravel pack 16.15m-3.5m, bentonite seal 3.5m-3.0m, backfill from 3.0m-0.1m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 26.7 AHD
EASTING: 332070.2
NORTHING: 6248721.2
DIP/AZIMUTH: 90°/--

BORE No: BH203
PROJECT No: 99709.00
DATE: 8/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
26	0.05	ASPHALTIC CONCRETE										
	0.14	CONCRETE										
	0.5	FILL/Silty SAND: brown, fine to coarse, with fine to medium igneous gravel, moist, apparently well compacted							E/D			PID < 1 ppm
25	0.9	Between 0.18m - 0.40m: sandstone cobbles, moist							E/D			PID < 1 ppm
	1.3	FILL/CLAY: medium to high plasticity, grey mottled red-brown, with silt, trace rootlets and fine to medium ironstone gravel, w<PL							E/D			PID < 1 ppm
24	2	FILL/CLAY: low to medium plasticity, brown mottled grey, with silt, trace sand and fine to medium sandstone gravel, w<PL										
		CLAY CI-CH: medium to high plasticity, grey mottled red-brown, with ironstone gravel, fine to medium, angular to subangular, w<PL, very stiff, residual							S/E			6,11,19 N = 30 PID < 1 ppm
23	3											
22	4	Below 4.0m: hard							S/E			9,16,21 N = 37 PID < 1 ppm
21	5											
		Below 5.5m: grey, trace laminations of fine grained sandstone (extremely weathered rock)							S/E			9,14,24 N = 38 PID < 1 ppm
20	6	6.0										
		6.11 LAMINITE: dark grey, thinly laminated, with 30-40% fine grained sandstone laminations, low then low to medium strength with clay seams, slightly weathered, fractured, Ashfield Shale						6m: CORE LOSS: 100mm 6.18-6.24m: Cs, 60mm, fe 6.27-6.94m: B(x11), 0-10°, pl, cly, 0-8mm, fe 6.4-6.5m: J(80-90°), ir, fe	C	91	0	PL(A) = 0.1
19	7							6.96-6.97m: Cs,10mm 7m: B5°, pl, fe 7.03-7.05m: Cs, 30mm 7.1-7.37m: B(x8), 0-10°, pl, fe 7.24-7.57m: J(x5), 45-90°, ir, pl and st, fe 7.74m: B0°, pl, cly 5mm 7.94m: B0°, pl, fe				PL(A) = 0.24
18	8	8.19										
		8.23 LAMINITE: dark grey, thinly laminated, with 30-40% fine grained sandstone laminations, medium strength with clay seams, fresh, slightly fractured to fractured, Ashfield Shale						8.02m: CORE LOSS: 170mm 8.19-8.23m: B(0-10°), pl, fe 8.36-8.88m: B(0-5°), pl, cly 0-9mm	C	94	51	PL(A) = 0.32
17	9											PL(A) = 0.92

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.4m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.14m, Non destructive digging to 2.4m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 16.11m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Approximately 50% water loss below 8.5m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 26.7 AHD
EASTING: 332070.2
NORTHING: 6248721.2
DIP/AZIMUTH: 90°/--

BORE No: BH203
PROJECT No: 99709.00
DATE: 8/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE: dark grey, thinly laminated, with 30-40% fine grained sandstone laminations, medium strength with clay seams, fresh, slightly fractured to fractured, Ashfield Shale *(continued)*						9.90-10.10m:J(x5),45-85°, ir and pl 10.16-10.95m: J(x9), 40-80°, pl, ir, st, he 10.37-10.45m: B(x10), 10°, pl, cly 5mm				PL(A) = 0.11 PL(A) = 1.1
11	10.95	LAMINITE: dark grey, thinly laminated, with 20-30% fine grained sandstone laminations, medium then high strength, fresh, slightly fractured, Ashfield Shale										PL(A) = 0.63
									C	100	63	
12								12.13m: B0°, pl, cly 3mm 12.28-12.92m: J(x5), 20-45°, pl, cly vn, ti 12.29-12.33m: Cs, 50mm				PL(A) = 1.4
13												PL(A) = 2.2
	13.38	SILTSTONE: dark grey, thinly laminated, with 5-10% fine grained sandstone laminations, high strength, fresh, unbroken, Ashfield Shale						13.36m: J45°, pl, cln				
14												PL(A) = 3.6
									C	100	100	
15												PL(A) = 2
16												PL(A) = 1.2
	16.11	Bore discontinued at 16.11m Target depth reached										
17												
18												
19												

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** JJH/RB **CASING:** HW to 4.4m, HQ to 6.0m

TYPE OF BORING: Diacore to 0.14m, Non destructive digging to 2.4m, Solid flight auger (TC bit) to 4.0m, rotary to 6.0m. NMLC coring to 16.11m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Approximately 50% water loss below 8.5m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 24.7 AHD
EASTING: 331989.2
NORTHING: 6248757.4
DIP/AZIMUTH: 90°/--

BORE No: BH204
PROJECT No: 99709.00
DATE: 10/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Type	Core Rec. %	RQD %	Test Results & Comments
24	0.35	FILL/Silty SAND: fine to medium, dark brown, with clay and rootlets, trace gravel, moist, poorly compacted		A/E			PID < 1 ppm
		Below 0.15m: trace silt		A/E*			PID < 1 ppm
	0.8			A/E			BD1-100720
23	1	FILL/Gravelly CLAY: low plasticity, brown, igneous gravel, with sand, trace brick fragments, w>PL, variably compacted					PID < 1 ppm
		FILL/CLAY: low to medium plasticity, brown and red-brown, with ironstone and sandstone gravel, w<PL, variably compacted		A/E			PID < 1 ppm
	2	At 2.00m: possible sandstone boulder		S/E			3,7,10 N = 17
22		At 2.7m: trace ceramics					PID < 1 ppm
	3	At 3.00m: metal wire		S/E			5,5,3/20 refusal
	3.5	CLAY CI-CH: medium to high plasticity, brown to red-brown, with medium to high strength ironstone bands and ironstone gravel, fine to medium, angular to subangular, w<PL, very stiff, residual					PID < 1 ppm
21	4			S/E			10,12,17 N = 29
	4.5						PID < 1 ppm
	4.63	CLAY CI-CH: medium to high plasticity, red brown and grey, with medium to high strength ironstone bands and ironstone gravel, fine to medium, angular to subangular, w<PL, very stiff to hard, residual		C	91	0	pp = 410 pp = 420 pp = 460 pp = 380 pp = 650
20	5	(extremely weathered rock)					
	5.45	LAMINITE: brown and grey, laminated, with 20-30% fine grained sandstone laminations, very low strength with clay seams, highly weathered, fractured, Ashfield Shale					PL(A) = 0.08
19	6						
18	7			C	100	33	PL(A) = 0.05
	7.15	SILTSTONE: dark grey, thinly laminated, 5-10% fine grained sandstone laminations, medium strength, moderately weathered then fresh, fractured then slightly fractured, Ashfield Shale					
17	8						PL(A) = 0.46
	8.24	LAMINITE: dark grey, thinly laminated, with 0-10% fine grained sandstone, medium, fresh, slightly fractured, Ashfield Shale					
16	9			C	100	100	PL(A) = 0.58
15							PL(A) = 0.47

Degree of Weathering: XW, HW, MW, SW, FS, FR

Rock Strength: Ex Low, Very Low, Low, Medium, High, Very High, Ex High

Water

Fracture Spacing (m): 0.01, 0.05, 0.10, 0.50, 1.00

Discontinuities: B - Bedding, J - Joint, S - Shear, F - Fault

4.5m: CORE LOSS: 130mm

5.46-5.72: J(x4), 30-60°, pl & st, fe, cly 4mm

5.89m: Cs, 10mm, fe
5.95- 5.99m: Cs, 40mm, fe
6.02-6.06m: B(x4), 0-5°, fe
6.29m: J(x2), 45°, pl, fe, cly vn
6.42-6.47m: B(x6) 0-10°, cly vn, fe
6.59-6.73m: J(x4), 60-70°, pl & ir, fe, cly vn
7.04m: Cs, 10mm, fe
7.16-7.37m: J(x4), 60-70°, pl & ir, fe, cly vn
7.17-7.62m: B(x7), 0-10°, cly 5-8mm, fe
7.39-7.42m: Cs, 30mm, fe
7.75m: J45°, pl, cln
8.13-8.22m: J(x2) 60-70°, pl & ir

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 4.2m, HQ to 4.5m

TYPE OF BORING: Hand auger to 0.4m, Solid flight auger (TC bit) to 4.0m, rotary to 4.5m. NMLC coring to 14.51m.

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Duplicate sample: BD1-100720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 24.7 AHD
EASTING: 331989.2
NORTHING: 6248757.4
DIP/AZIMUTH: 90°/--

BORE No: BH204
PROJECT No: 99709.00
DATE: 10/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.4	LAMINITE: dark grey, thinly laminated, with up to 50% fine grained sandstone, high then very high strength, fresh, slightly fractured to unbroken, Ashfield Shale						10.21m: J 45°& 5°, st, cly vn 10.39m: B0°, pl, cly 3-5mm	C	100	100	PL(A) = 2.4
								11.93-11.97m: Cs, 40mm				PL(A) = 2.2
									C	100	100	PL(A) = 4
												PL(A) = 3.2
												PL(A) = 4.8
	14.51	Bore discontinued at 14.51m Target depth reached										

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 4.2m, HQ to 4.5m

TYPE OF BORING: Hand auger to 0.4m, Solid flight auger (TC bit) to 4.0m, rotary to 4.5m. NMLC coring to 14.51m.

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Duplicate sample: BD1-100720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 33.6 AHD
EASTING: 331807.1
NORTHING: 6248607.6
DIP/AZIMUTH: 90°/--

BORE No: BH205
PROJECT No: 99709.00
DATE: 13/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			XW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	B - Bedding J - Joint S - Shear F - Fault				
33	0.4	FILL/Sandy GRAVEL: fine to medium gravel, dark brown, igneous, fine to medium sand, angular to subangular, trace clay, moist, apparently well compacted (road base)							A/D			PID < 1 ppm
									A/E*			PID < 1 ppm BD2-130720
32	1	CLAY CI-CH: medium to high plasticity, brown mottled red-brown, trace ironstone gravel, stiff to very stiff, residual (first 300mm possibly disturbed)							A/E			PID < 1 ppm
									S/E			4,7,9 N = 16 PID < 1 ppm
	2											
31	2.5	CLAY CI-CH: medium to high plasticity, grey and red brown, with bands of medium to high strength ironstone, hard, residual							S/E			7,14,20 N = 34 PID < 1 ppm
	3.0	(extremely weathered rock)										
30		CLAY CI-CH: medium to high plasticity, grey and red brown, with bands of medium to high strength ironstone, hard, residual (extremely weathered rock)							C	100	0	pp = 580 pp = 530 pp = 560
	4								C	100	0	pp = 450 pp = 510
29						15-07-20						pp = 650
	5								C	100	0	pp = 520
28												pp = 580
	6											pp = 450
27									C	100	0	pp = 570
	7											
	7.2	SILTSTONE: brown with grey, laminated, with 5-10% fine grained sandstone laminations, very low strength with low to medium strength ironstone bands and clay seams, highly weathered, fractured, Ashfield shale						7.2-7.83m: B(x7) 0-10°, pl & ir, fe, cly up to 7mm 7.27-7.75m: Cs(x4), 10-80mm, fe 7.3-7.67m: J(x6), 45-85°, cly up to 5mm, fe	C	100	0	PL(A) = 0.2
26	8											
	8.22	SILTSTONE: brown with grey, thinly laminated, with 5-10% fine grained sandstone laminations, low to very low strength, moderately weathered, fractured, Ashfield shale						7.83-8.47m: Cs(x7), 10-80mm, fe 8.00-8.90m: J(x7), 45-90°, pl, cu & ir, fe, cly vn 8.12-8.36m: Ds(x2), 50 &120mm 8.9m: CORE LOSS: 150mm	C	100	0	PL(A) = 0.3
25	9											
	9.05							9.05-9.22m: J(x4), 60-90°, fe, cly vn 9.2-9.39m: B(x5), 0-10°, fe, cly vn	C	95	55	
24												

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 2.5m, HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC bit) to 2.5m, rotary to 3.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Well installed: screen 15.0m-4.0m, blank 4.0m-0.1m, gravel pack 15.0m-3.5m, bentonite seal 3.5m-3.0m, backfill 3.0m-0.1m. Duplicate Sample: BD2-130720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 33.6 AHD
EASTING: 331807.1
NORTHING: 6248607.6
DIP/AZIMUTH: 90°/--

BORE No: BH205
PROJECT No: 99709.00
DATE: 13/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
23	10.1	SILTSTONE: dark grey, laminated, with 5% fine grained sandstone laminations, medium strength with low to very low strength crushed seams and a sheared zone, fresh, fractured to slightly fractured, Ashfield Shale						9.54-9.66m: Ds, 120mm, fe 9.62-9.70m: Cs, 20mm, fe 9.73-9.88m: B(x3), 0-10°, pl & cu, cly vn, fe 9.91m: Cs, 10mm, fe 9.94-9.97m: J(x2) 45°, pl, fe 10.06-11.63m: J(x5) 60°, pl 11.57-11.6m: Cz, cly, 40mm 11.95m: J(x3) 60-80°, pl & ir 12.33-12.53m: Sz, cly 50mm 12.37m: J(x2), 60°, pl, cly 2mm 12.57m: CORE LOSS: 180mm 12.84-13.13m: J(x3), 35-60°, pl 13.41m: J45°, pl, cln 13.79-13.93m: J(x4), 45°, pl, cly vn 14.01-14.21m: J(x3), 45° & 90°, pl & un 14.26-14.27m: Cs, 10mm	C	95	55	PL(A) = 0.3 PL(A) = 0.5
22	11											
21	12								C	84	62	PL(A) = 0.7
20	12.75								C	100	68	PL(A) = 0.8
19	13											
18	14								C	100	100	PL(A) = 0.8
17	15 15.0	Bore discontinued at 15.0m Target depth reached										
16	16											
15	17											
14	18											
	19											

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 2.5m, HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC bit) to 2.5m, rotary to 3.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Well installed: screen 15.0m-4.0m, blank 4.0m-0.1m, gravel pack 15.0m-3.5m, bentonite seal 3.5m-3.0m, backfill 3.0m-0.1m. Duplicate Sample: BD2-130720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 33.4 AHD
EASTING: 331768.5
NORTHING: 6248588.4
DIP/AZIMUTH: 90°/--

BORE No: BH206
PROJECT No: 99709.00
DATE: 14 - 15/7/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
33	0.12	CONCRETE: 120mm thick, up to 20mm aggregate, 10mm reinforcement at 70mm depth							A/E			PID < 1 ppm
		CLAY CI-CH: medium to high plasticity, brown-dark brown, trace ironstone gravel, stiff then hard, w<PL, residual							A/E*			PID < 1 ppm BD3-140720
32	1	(possibly disturbed to 0.6m) Below 0.6m: red-brown Below 1.0m: grey mottled red-brown, stiff							S/E			3,5,9 N = 14 PID < 1 ppm
31	2											
	2.5	CLAY CI-CH: medium to high plasticity, grey and red brown, with bands of medium to high strength ironstone, hard, residual							S/E			9,19,33 N = 52 PID < 1 ppm
30	3	(extremely weathered rock)						3m: CORE LOSS: 110mm	C	91	0	
	3.11	CLAY CI-CH: medium to high plasticity, grey and red brown, with bands of medium to high strength ironstone, hard, residual (extremely weathered rock)										
29	4							4.23m: CORE LOSS: 150mm	C	80	0	
28	4.38							4.95m: CORE LOSS: 480mm	C	78	0	
27	5											
26	5.43											
	6											
	7											
	7.1	SILTSTONE: brown and pale brown, thinly laminated, with 5-10% fine grained sandstone laminations, very low then low to very low strength, highly weathered, fractured, Ashfield shale						7.15-8.38m: J(x7), 60-80°, ir, pl & vt, fe, cly vn 7.25-7.64m: Ds, 390mm 7.35-7.43m: B(x8), 0-10°, pl, cly 2mm, fe	C	100	0	
25	8											
	8.4	SILTSTONE: grey, laminated, with 5-10% fine grained sandstone laminations, very low to low strength, moderately weathered, slightly fractured to fractured, Ashfield shale						8.49-8.61: B(x3), 0-5°, pl, cly vn, fe	C	100	67	PL(A) = 0.2
24	9							8.93-9.02m: B(x4), 0-10°, pl, fe, cly vn				
	9.02	SILTSTONE: dark grey, laminated, with 5-10% fine grained sandstone laminations, medium strength, fresh, slightly fractured, Ashfield Shale						9.5m: B0°, pl, cly 6mm 9.72m: B0°, pl, cly 5mm 9.74m: J35°, pl, cly				PL(A) = 0.5

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 2.6m, HQ to 3.0m

TYPE OF BORING: Diacore to 0.12m, Solid flight auger (TC bit) to 2.5m, rotary to 3.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Duplicate sample: BD3-140720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Health Infrastructure
PROJECT: Royal Prince Alfred Hospital Redevelopment
LOCATION: Missenden Road, Camperdown

SURFACE LEVEL: 33.4 AHD
EASTING: 331768.5
NORTHING: 6248588.4
DIP/AZIMUTH: 90°/--

BORE No: BH206
PROJECT No: 99709.00
DATE: 14 - 15/7/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (XW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
23		SILTSTONE: dark grey, laminated, with 5-10% fine grained sandstone laminations, medium strength, fresh, slightly fractured, Ashfield Shale *(continued)*						2mm	C	100	67	PL(A) = 0.5
22	11 11.05							11m: CORE LOSS: 50mm 11.05-11.29m: J (70-80°), ir				
21	12								C	100	100	PL(A) = 0.5
20	13							13.1m: J45°, pl, cln				PL(A) = 0.5
19	14	Between 13.83m-15.21m: fractured						13.83m: J45°, pl, cln 14.02-14.61m: J(x5), 45-70°, pl & ir	C	100	87	PL(A) = 0.6
18	15							14.72-15.21m: J(x7), 45-60°, pl, ti				PL(A) = 0.4
17	16	Between 15.84m-15.95m: sandstone bands (x2), 20mm thick						15.81m: J60°, pl, ti	C	100	78	PL(A) = 0.6
16	17 17.0	At 16.92m: sandstone band 80mm thick Bore discontinued at 17.0m Target depth reached						16.81m: J20°, pl, cln				
15	18											
14	19											

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** RB **CASING:** HW to 2.6m, HQ to 3.0m

TYPE OF BORING: Diacore to 0.12m, Solid flight auger (TC bit) to 2.5m, rotary to 3.0m. NMLC coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Duplicate sample: BD3-140720

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

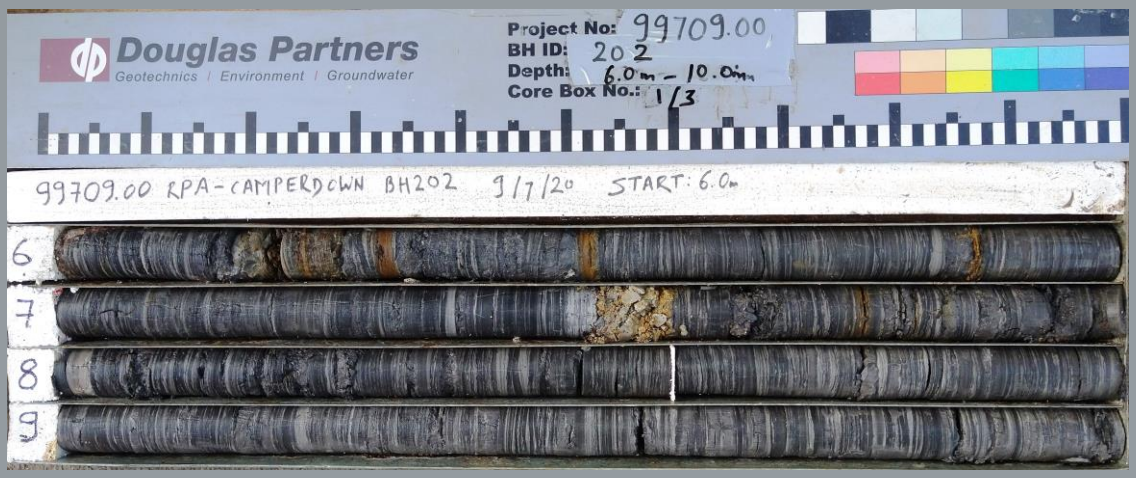
BORE: 201 PROJECT: RPA HOSPITAL JULY 2020

6.00 – 10.00m

BORE: 201 PROJECT: RPA HOSPITAL JULY 2020

10.00 – 15.00m

BORE: 202 PROJECT: RPA HOSPITAL JULY 2020



6.00 – 10.00m

BORE: 202 PROJECT: RPA HOSPITAL JULY 2020

10.00 – 15.00m

BORE: 202 PROJECT: RPA HOSPITAL JULY 2020

15.00 – 16.15m

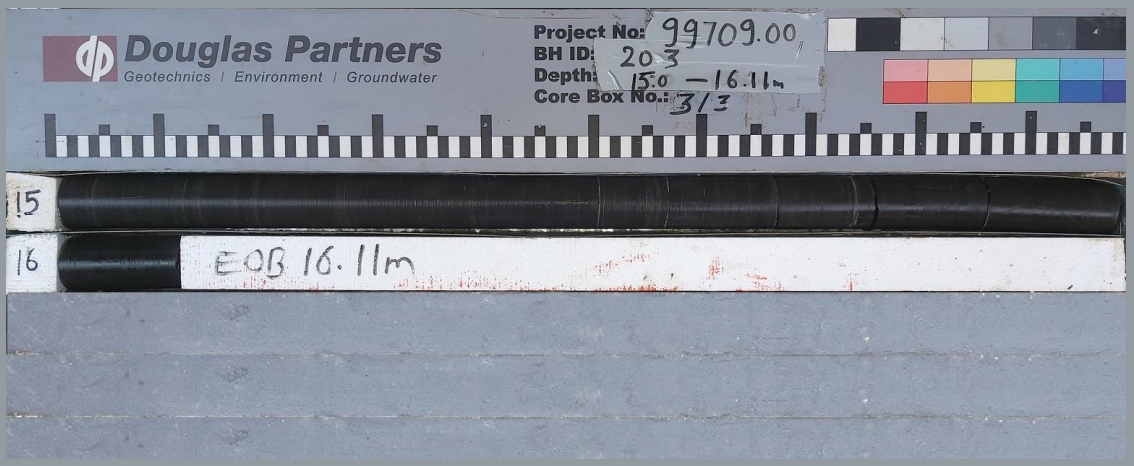
BORE: 203 PROJECT: RPA HOSPITAL JULY 2020

6.00 – 10.00m

BORE: 203 PROJECT: RPA HOSPITAL JULY 2020

10.00 – 15.00m

BORE: 203 **PROJECT: RPA HOSPITAL** **JULY 2020**



15.00 – 16.11m

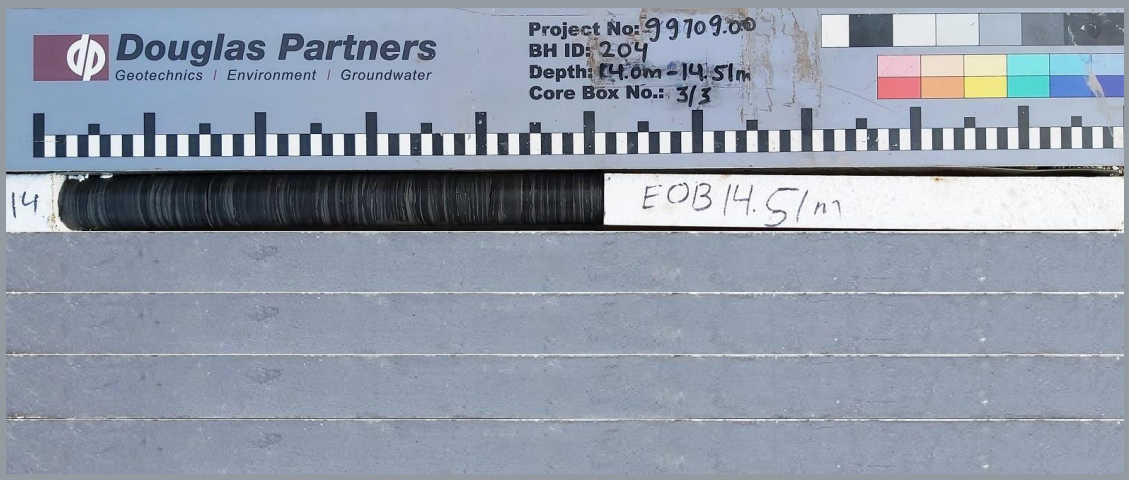
BORE: 204 PROJECT: RPA HOSPITAL JULY 2020

4.50 – 9.00m

BORE: 204 PROJECT: RPA HOSPITAL JULY 2020

9.00 – 14.00m

BORE: 204 **PROJECT: RPA HOSPITAL** **JULY 2020**



14.00 – 14.51m

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CERTIFICATE OF ANALYSIS 247251

Client Details

Client	Douglas Partners Pty Ltd
Attention	Peter Valenti
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**99709.00, RPA Hospital Redevelopment**
Number of Samples	2 Soil
Date samples received	17/07/2020
Date completed instructions received	17/07/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/07/2020
Date of Issue	24/07/2020

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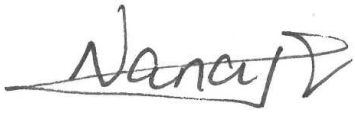
Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Misc Inorg - Soil			
Our Reference		247251-1	247251-2
Your Reference	UNITS	BH201	BH205
Depth		4.0-4.45	1.0-1.45
Date Sampled		07/07/2020	13/07/2020
Type of sample		Soil	Soil
Date prepared	-	20/07/2020	20/07/2020
Date analysed	-	20/07/2020	20/07/2020
pH 1:5 soil:water	pH Units	4.6	4.2
Electrical Conductivity 1:5 soil:water	µS/cm	63	97
Chloride, Cl 1:5 soil:water	mg/kg	<10	32
Sulphate, SO4 1:5 soil:water	mg/kg	82	43

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/07/2020	[NT]	[NT]	[NT]	[NT]	20/07/2020	[NT]
Date analysed	-			20/07/2020	[NT]	[NT]	[NT]	[NT]	20/07/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	88	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	114	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

pH/EC
Sample #1 was out of the recommended holding time for this analysis.

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

Project Name: RPA Hospital Redevelopment .....
Project No: 99709.00..... Sampler: ...Roshan B.....
Project Mgr: PAV.....Mob. Phone: 0422 000 438.....
Email: peter.valenti@douglaspartners.com.au .....
Date Required: ...Standard TAT ..... Lab Quote No. .....

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2068
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth (m)	Lab ID	Sampling Date	Sample Type S - soil W – water	Container type	Analytes									Notes
						pH	sulphate	Chloride	Electrical Conductivity						
BH201	4.0-4.45	1	7.7	S	Plastic	x	x	x	x						
BH205	1.0-1.45	2	13.7	S	Plastic	x	x	x	x						

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 247251
Date Received: 17/7/2020
Time Received: 1620
Received By:
Temp: Cool/Ambient 8.1
Cooling: Ice/Icepack
Security: Intact/Broken/None

Lab Report No. .....
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by: PAV Signed: Peter Valenti Date & Time: 17.7.20 Received By: Date & Time:

Relinquished by: JSN Signed: Date & Time: Received By: Ray Date & Time: 1620 17/7/20

Royal Prince Alfred Hospital – Eastern Campus

APPENDIX F

IMPORTANT INFORMATION

Cardno

now

Stantec

Important Information about this Geotechnical Report

Scope of Work

The purpose of this report and any associated documentation is expressly stated in the document. This document does not form a complete assessment of the site, and no implicit determinations about Cardno's scope can be taken if not specifically referenced. Whilst this report is intended to reduce geotechnical risk, no level of detail or scope of work can entirely eliminate risk.

The nature of geotechnical data typically precludes auxiliary environmental assessment without undertaking specific methods in the investigation. Therefore, unless it is explicitly stated in the scope of work, this report does not provide any contamination or environmental assessment of the site or adjacent sites, nor can it be inferred or implied from any component of the document.

The scope of work, geotechnical information, and assessments made by Cardno may be summarised in the report; however, all aspects of the document, including associated data and limitations should be reviewed in its entirety.

Standard of care

Cardno have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, data that was available or was collected, and previous experience.

Cardno's findings and assessment represent its reasonable judgment, diligence, skill, with sound professional standards, within the time and budget constraints of its commission. No warranty, expressed or implied, is made as to the professional advice included in this report.

Data sources

In preparing this document, or providing any consulting services during the commission, Cardno may have relied on information from third parties including, but not limited to; sub-consultants, published data, and the Client including its employees or representatives. This data may not be verified and Cardno assumes no responsibility for the adequacy, incompleteness, inaccuracies, or reliability of this information.

Cardno does not assume any responsibility for assessments made partly, or entirely based on information provided by third parties.

Variability in conditions and limitations of data

Subsurface conditions are complex and can be highly variable; they cannot be accurately defined by discrete investigations. Geotechnical data is based on investigation locations which are explicitly representative of the specific sample or test points. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and there are unknowns or variations in ground conditions between test locations that cannot be inferred or predicted.

The precision and reliability of interpretive assessment between discrete points is dependent on the uniformity of the subsurface strata, as well as the frequency, detail, and method of sampling or testing.

Subsurface conditions are formed by various natural and anthropogenic processes and therefore are subject to change over time. This is particularly relevant with changes to the site ownership or usage, site boundary or layout, and design or planning modifications. Aspects of the site may also not be able to be determined due to physical or project related constraints and any information provided by Cardno cannot apply following modification to the site, regulations, standards, or the development itself.

It is important to appreciate that no level of detail in investigation, or diligence in assessment, can eliminate uncertainty related to subsurface conditions and thus, geotechnical risk. Cardno cannot and does not provide unqualified warranties nor does it assume any liability for site conditions not observed or accessible during the investigations.

Verification of opinions and recommendations

Geotechnical information, by nature, represents an opinion and is based extensively on judgment of both data and interpretive assessments or observation. This report and its associated documentation are provided explicitly based on Cardno's opinion of the site at the time of inspection, and cannot be extended beyond this.

Any recommendations or design are provided as preliminary until verified on site during project implementation or construction. Inspection and verification on site shall be conducted by a suitably qualified geotechnical consultant or engineer, and where subsurface conditions or interpretations differ from those provided in this document or otherwise anticipated, Cardno must be notified and be provided with an opportunity to review the recommendations.

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