St George Hospital Stage 3 - REF Planning Approval Pathway - Refurbishment & Additional Scope

Geotechnical Desktop Report

BESIXWatpac

Reference: SYDGE311083_AP

11 October 2024

ST GEORGE HOSPITAL STAGE 3 - REF PLANNING APPROVAL PATHWAY - REFURBISHMENT & ADDITIONAL SCOPE

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11 October 2024

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EXECUTIVE SUMMARY[1]

This Geotechnical Desktop Report, prepared by Tetra Tech Coffey for BESIXWatpac, supports the Review of Environmental Factors (REF) Planning Approval submission for the Stage 3 refurbishment and additional scope works at the St George Hospital Campus. The report provides preliminary geotechnical advice for the proposed works at three sites within the Hospital campus based on previous geotechnical investigations undertaken by Tetra Tech Coffey and other consultants over the years. The scope of works subject to the geotechnical assessment includes:

- Demolition of existing structures comprising demountable units and single-storey brick buildings.
- Construction of a new Clinical Waste extension along with landscaping and pathway development within the northern area of the campus.

Key Findings

1. **Geotechnical Conditions**:
    - The sites predominantly comprise shallow fill material underlain by natural residual clays and weathered sandstone bedrock. The fill is variable, requiring considerations for uncontrolled fill in some areas with regards to shallow footings for the new Clinical Waste structure.
    - Groundwater levels are anticipated to range from 1.5 to 6.9 m below ground level across the sites.
2. **Geotechnical Challenges**:
    - Excavation conditions are generally favourable, with fill and natural soils requiring conventional earthmoving equipment for minor excavations.
    - Footings for new structures could be founded in natural residual soils beneath the fill with specific recommendations provided for bearing pressures as outlined in Section 6.5. Alternatively, deeper footings on the underlying bedrock could be adopted.
3. **Geohazard Considerations**:
    - Minor land disturbance would be required for demolition and regrading works however in general, site topography would largely remain the same as existing.
    - No evidence suggests that the Hospital campus is within an area of known landslips.
    - No visible natural cliff lines, rock outcrops or rock shelves are evident within or surrounding the three sites.
    - No evidence of acid sulfate soils or salinity risks were found at the sites.
    - Where adopting industry standards for sediment control including topsoil cover or seeding over exposed soil area, the potential for erosion is unlikely.
    - The proposed works under this REF are not expected to intercept groundwater levels or significantly impact the groundwater table.
4. **Recommendations**:
    - Additional geotechnical investigations may be required for future developments if new or different structures are proposed, but such investigations may not be needed for the currently proposed development (depending on intended building and floor loads).
    - Dilapidation surveys are recommended to assess potential impacts to adjacent structures.

[1] This executive summary must be read in the context of the full report and the attached limitations.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1. INTRODUCTION

This report documents the geotechnical desktop assessment conducted by Tetra Tech Coffey Pty Ltd (TTC) to support the Review of Environmental Factor (REF) Planning Approval submission by BESIXWatpac (BW) for the proposed Stage 3 refurbishment and additional scope works at the St George Hospital campus. The desktop assessment report was commissioned by BW in completed in accordance with our fee proposal reference SYDGE311083_AO dated, 17 September 2024.

Based on email correspondence (Aconex) and documents provided by Marko Neskoski by BW on 13 September 2024, we understand that the overall proposed works by BW include the following items:

- Item 1 – Internal refurbishments within several areas of the existing hospital.
- Item 2 – Demolition of several existing small structures and demountable across the eastern and southern areas of the Hospital campus and make safe.
- Item 3 – Demolition of the existing Prince William Wing along with the Sleep Lab and Pelvic Floor demountable units within the northern portion of the Hospital campus.
- Item 4 – Civil landscaping across the demolished buildings in Item 3 including construction of new paved walkways and seating areas along with tree and garden bed planting.
- Item 5 – Construction of a new Clinical Waste extension annex to the existing Services Centre, comprising a single-storey waste room.
- Item 6 – Construction of several new covered walkways across the existing hospital site.
- Item 7 – Connection with existing infrastructure including water, sewer, telecommunication etc to facilitate the above works.

We understand that a portion of the above works will fall under the existing State Significant Development Application (SSDA) approved for the St George Hospital Stage 3 Re-development Works, namely for the future civil and landscaping works at the Prince William Wing area. However, several Items of work do not fall under the SSDA and will need to be approved through a separate REF Planning Approval Submission, which is the subject of this assessment.

The geotechnical items relevant to this REF Approval pathway include:

- Demolition of existing structures along the eastern Hospital campus area and make safe (Item 2).
- Removal of the existing Pelvic Floor and Sleep Lab demountable Units including civil landscaping to create new pathways and landscaped garden area (part of Item 3 and Item 4).
- Construction of a new Clinical Waste extension room adjacent to the Services Block (Item 5);

The approximate location and areas of these works are illustrated in Figure 1 and Figure 2 overleaf.

To support the REF submission by BW, a geotechnical report is required to provide preliminary geotechnical advice on the proposed works to meet the requirements of the NSW Government, Health Infrastructure REF template document.

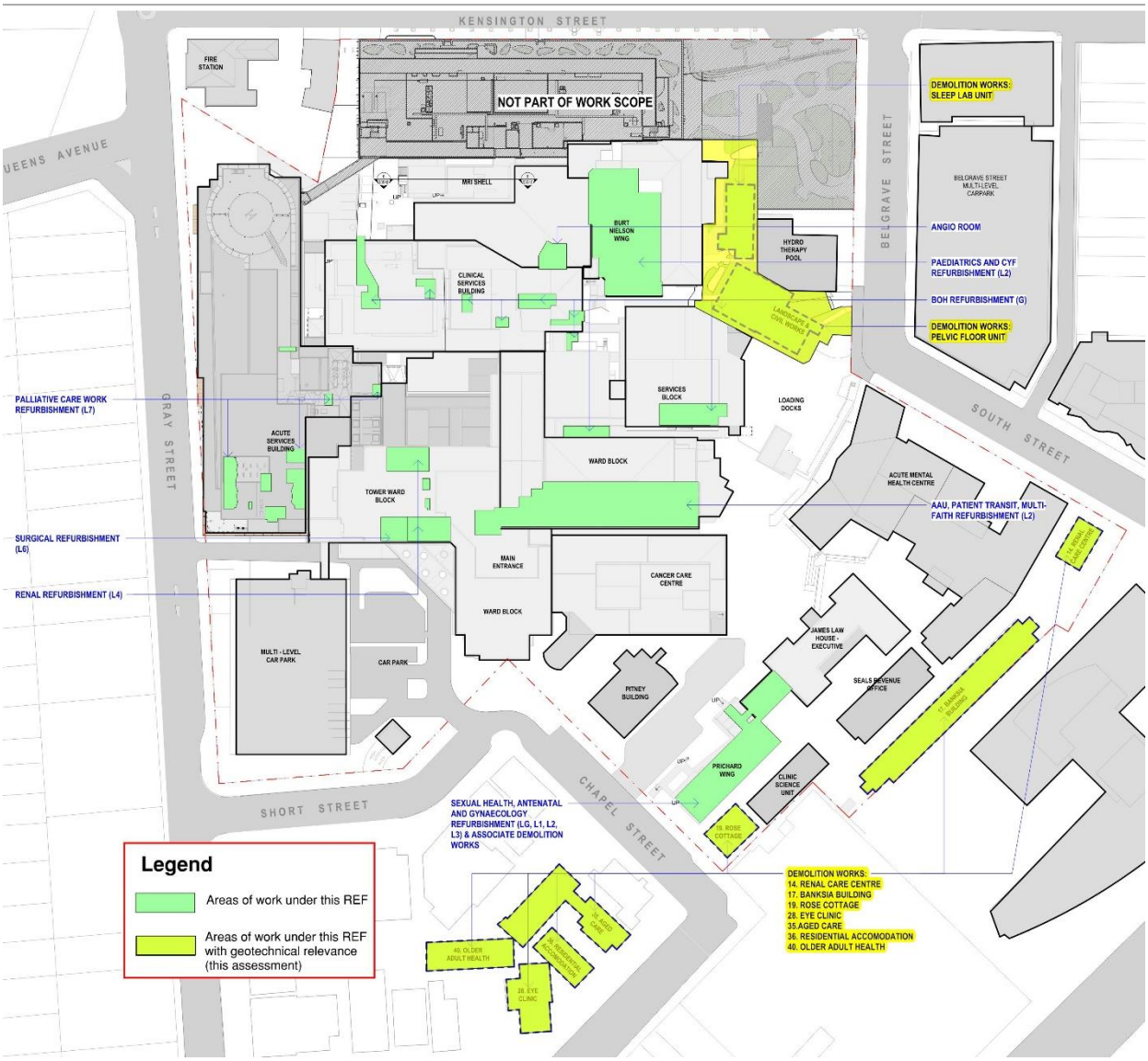


Figure 1 Overall scope of REF works with geotechnical items highlighted (Extract from Jacobs REF notification plan REFB3-AR-DG-0109)

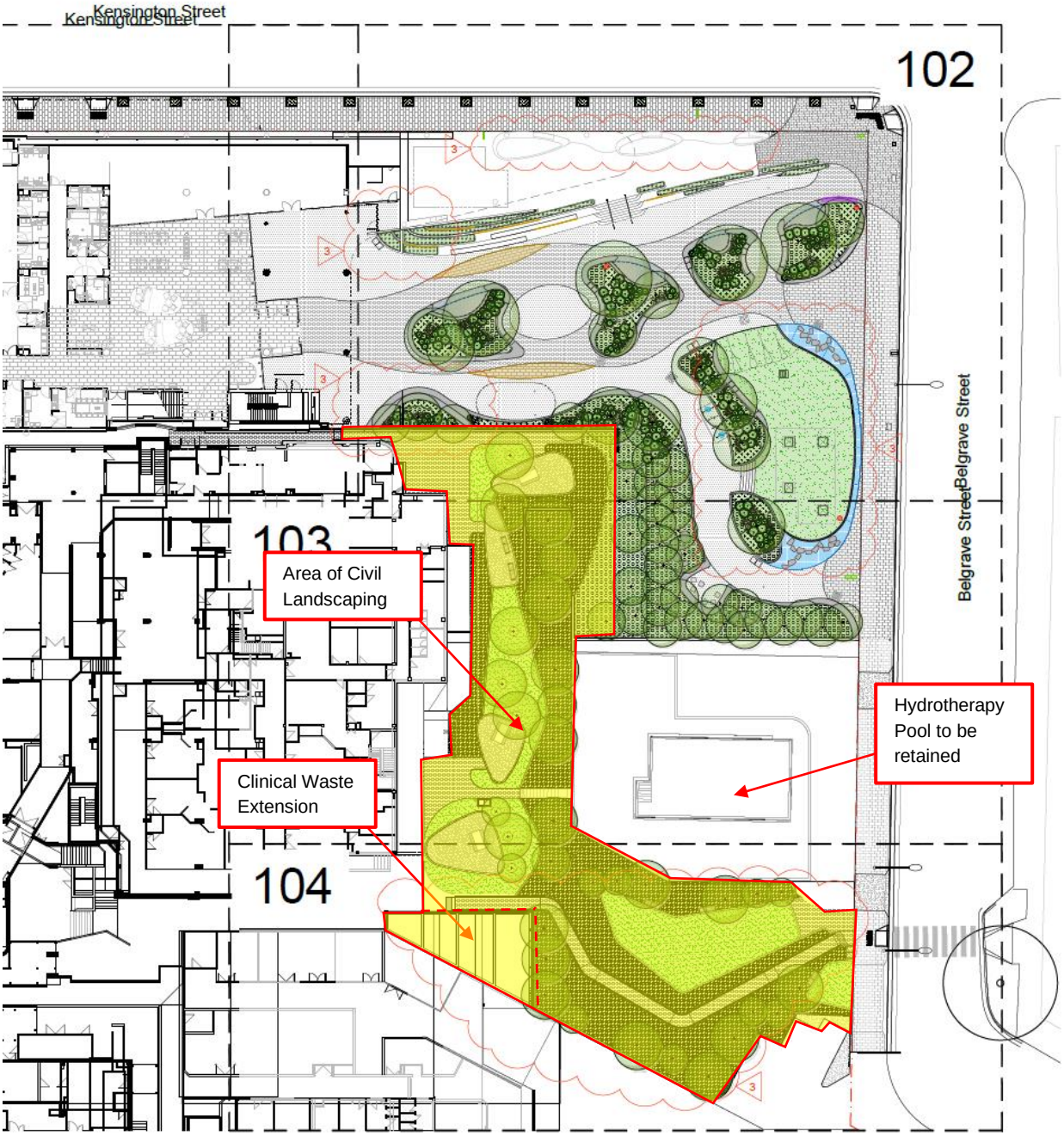


Figure 2. Proposed civil landscaping and Waste extension building in northern area (extract from Site Image Landscape Plan SGHS3-LA-DG-100)

2. SCOPE OF WORK

The objectives of the desktop study are to critically review and consolidate currently available geotechnical information for the site locality, and to develop a preliminary site geotechnical model of likely ground conditions. This initial model is then used to identify and discuss perceived potential geotechnical issues and constraints for future development to support the REF submission by BW. In particular, this study addresses the requirements outlined in the Health Infrastructure (HI) REF template document regarding:

- Section 6.4.2 on Soils & Geology, Notes 11 and 12,
- Section 6.2.6 on Hydrology, Flooding and Water Quality, Note 17.

Our geotechnical desktop study includes:

- Review of relevant published, publicly available geological, soil and groundwater information pertaining to the site locality.
- TTC archive searches for previous site investigation information in the vicinity of the site together with information provided by the client.
- A site walkover by a Geotechnical Engineer from Coffey to characterise the site conditions and surrounding topographical, geological, and hydrogeological environment.

Following completion of our desktop study, this initial geotechnical assessment report was prepared containing:

- A preliminary geotechnical/ground model for the Site.
- Identification / discussion of perceived geotechnical issues and constraints for site development.
- Initial comments on building footings and foundations, excavation conditions, retaining structures and groundwater in relation to the identified geotechnical issues and constraints.
- Discussion on the potential for Acid Sulfate soils, salinity, landslip or other factors that may affect development.
- Recommendations for intrusive geotechnical site investigations and strategies to support detailed planning and engineering design.

3. SITE & PUBLISHED INFORMATION

The proposed areas of development subject to this assessment under the REF are generally split between three broad areas of the St George Hospital Campus, namely:

- The Northern Area adjacent to Kensington and Belgrave Street along with the Prince William Hospital Wing;
- The Eastern Area comprising small standalone structures and demountable units located within the Hospital Campus between Short Street and Chapel Street, adjacent to the existing St George Private Hospital; and
- The Southern Area comprising several parcels of land along the southern portion of Chapel Street.

Figure 3 overleaf shows the locations of these Areas on a recent aerial image of the site from July 2024.

3.1.1 Northern Area

The Northern Area is irregular in shape and encompasses an area of approximately 1350m^2, bounded by the Prince William hospital wing and hydrotherapy pool to the north-east, the existing Services centre to the south, and the existing Burt Neilson hospital wing to the south-west. Further to the north-west is the current construction site for the St George Hospital Stage 3 works which at the time of this report, comprises a deep basement excavation and construction site. Within the Site currently lies the existing Pelvic Floor and Sleep Lab demountable structures along with various concrete lines walkways and awnings.

The general topography of the site slopes to the south and south-east. Survey drawings prepared by LTS Lockley surveyors (Ref No. 33459DT, dated 24 June 2015) and provided by BW indicate that elevation levels across the Site range from approximately 31m AHD in the north adjacent to the existing Prince William Wing and construction site, to 27m AHD to the south adjacent to the Services Block and Belgrave Street.

3.1.2 Eastern Area

The Eastern Area sites generally comprise three existing structures within the Hospital campus to the west of St George Private Hospital. This includes the Rose Cottage, Banksia Building and Renal Care centre with a total area of approximately 1100 m^2.The existing structures generally comprise a mix of single-storey demountable structures and weatherboard and brick structures and cottages.

No survey data has been provided for the Eastern area sites. Topographical LIDAR data from 2020 is available from the Geoscience Australia ELVIS Elevation and Depths database [1]. Based on this database, the site elevations range between 22 m to 25 m AHD, with elevations falling to the east.

3.1.3 Southern Area

The Southern Area sites generally comprise small parcels of land and structures west of the southern portion of Chapel Street. Neighbouring residential and Hospital structures include the Eye Clinic, Residential accommodation, Aged Care and Older Adult health structures. The total area of the Southern Area sites is approximately 1200m^2 and comprise a mix of single-storey demountable structures along with weatherboard and brick facing structures and cottages.

No survey data has been provided for the Eastern area sites. Topographical LIDAR data from 2020 is available from the Geoscience Australia ELVIS Elevation and Depths database [1]. Based on this database, the site elevations range between 21 m to 24 m AHD generally falling to the south and south-east.

Figure 3. Aerial image of St George Hospital site with site areas (Extract from Nearmap, dated 22 July 2024)

3.2 LOCAL GEOLOGY AND SOIL LANDSCAPE

A review of the 1:100,000 Sydney Geological Map within the Geosciences Australia Minview database system [2] indicates that the sites are situated within the Hawksbury Sandstone (Tuth) formation, typically comprising medium to coarse quartz-grained sandstone and minor shale and laminite lenses. Approximately 150m to the southeast and at a lower elevation lies the boundary with Quaternary coastal deposits comprising sands, clays and silts associated with the Scarborough Park creek channel.

The Sydney Soil Landscape Sheet within the Office of Environmental and Heritage, eSPADE database [3] indicates that the site is situated within the Lucas Heights soil landscape (9130lh) typically comprising clay and sandy clay loams situated over gently undulating crests and ridges on plateau surfaces of the Mittagong and Hawksbury Sandstone formations. Erodibility of these near surface soils is considered moderate but ranges from slight to extreme when exposed in unprotected areas. It should be noted that the current site conditions almost entirely paved or covered with topsoil material.

3.3 GROUNDWATER

The WaterNSW groundwater bore database [4]shows two boreholes located within proximity to the hospital campus. The information from these bores is summarised in Table 1 below.

Table 1. Summary of nearby groundwater bore data

Bore ID	Approximate Location and Distance from Hospital	Approximate Bore RL	Summary of ground description	Approximate GWL at time of drilling
GW108551	Eastern boundary of James Cook Boys Technology School, near intersection with Fairway Ave and Lachlan Ave. 335m east	Not recorded on log, ~8m AHD (taken from ELVIS database)	Sand to termination at 6.0m below ground	Not recorded
GW024615	Intersection of Princes Highway, Marshall Street and Rocky Point Road, 170m south-east	Not recorded on log, ~16m AHD (taken from ELVIS database)	Sand to termination at 5.48m below ground	3.6m below ground (~12.4m AHD)

It should be noted that these bores are located at a lower elevation to the proposed sites. No bore data was available upslope of the site to the west and north-west.

3.4 ACID SULFATE SOILS

A review of the eSPADE database [3] for soil mapping information indicates that the hospital campus is in an area of no known acid sulfate soils.

3.5 SALINITY MAPS

The eSPADE database [3] also provides hydrogeological mapping information for salinity potential across Western Sydney and NSW. Within the eSPADE database, there is no salinity mapping information generally along the eastern shorelines of Sydney which includes the Hospital campus, likely due to the very low salinity potential along the coastlines of Sydney.. We note that the Hawksbury Hydrogeological Landscape, which has very similar geology to the Hospital site, is indicated on the salinity maps as low salinity potential.

3.6 LANDSLIP HAZARDS

Geological hazards are typically documented at the local council level where specific hazard maps are used as development planning tools for current and future developments. These hazard maps are developed based on the specific environmental hazards that each council is likely to manage within its Local Government Area which includes flooding and landslides.

No landslide hazard mapping information is available on the Georges River Council online mapping system. A search for published papers or other anecdotal evidence of historical landslips in the site locality did not yield any obvious evidence of previous landslide activity.

3.7 SITE WALKOVER

A site walkover by a Senior Geotechnical Engineer from TTC was undertaken on 25 September 2024. During the walkover, the following was noted:

- The structures visually observed within the Northern, Eastern and Southern areas comprised single-storey structures of either lightweight demountable, or brick-façade houses. The demountable structures were generally founded on brick piers. Small permanent structures appeared to be founded on shallow slab or strip footings.
- The existing buildings appeared to be in reasonable condition particularly given the age of some structures. No significant cracking or tilting in brick facades was noticed.
- No evidence of slope instability or previous landslides was observed across the areas.
- No evidence of erosion across the site soils were identified, noting that most of the site areas were paved with either concrete walkways or asphalt roadways.
- No areas of salt deposits or sodic soils were identified during the walkover.
- No cliffs, rock outcrops or rock shelves were visible across the site or the immediate surrounds. At the time of the site walkover there were no open excavations available for inspection.
- No ponding of water or groundwater seepage from shallow retaining walls, or noticeable damp ground areas were identified.

4. PREVIOUS INVESTIGATIONS AND ASSESSMENTS

4.1 HISTORICAL INVESTIGATIONS (2015 AND PRIOR)

There is a history of geotechnical investigations and assessments undertaken at the St George Hospital due to its construction, continual upgrades and redevelopment over the years dating back to 1968. In 2015, Coffey Services Australia (now Tetra Tech Coffey) undertook additional investigations for upgrade works to the Hospital MRI and AST buildings which included a consolidation of historical investigation data by Coffey and Jeffery & Katauskas (now JK Group). Figure 4 below provides an extract of the borehole plan prepared by Coffey in 2015 which illustrates the spread of previous investigation works in relation to the areas now under this REF.

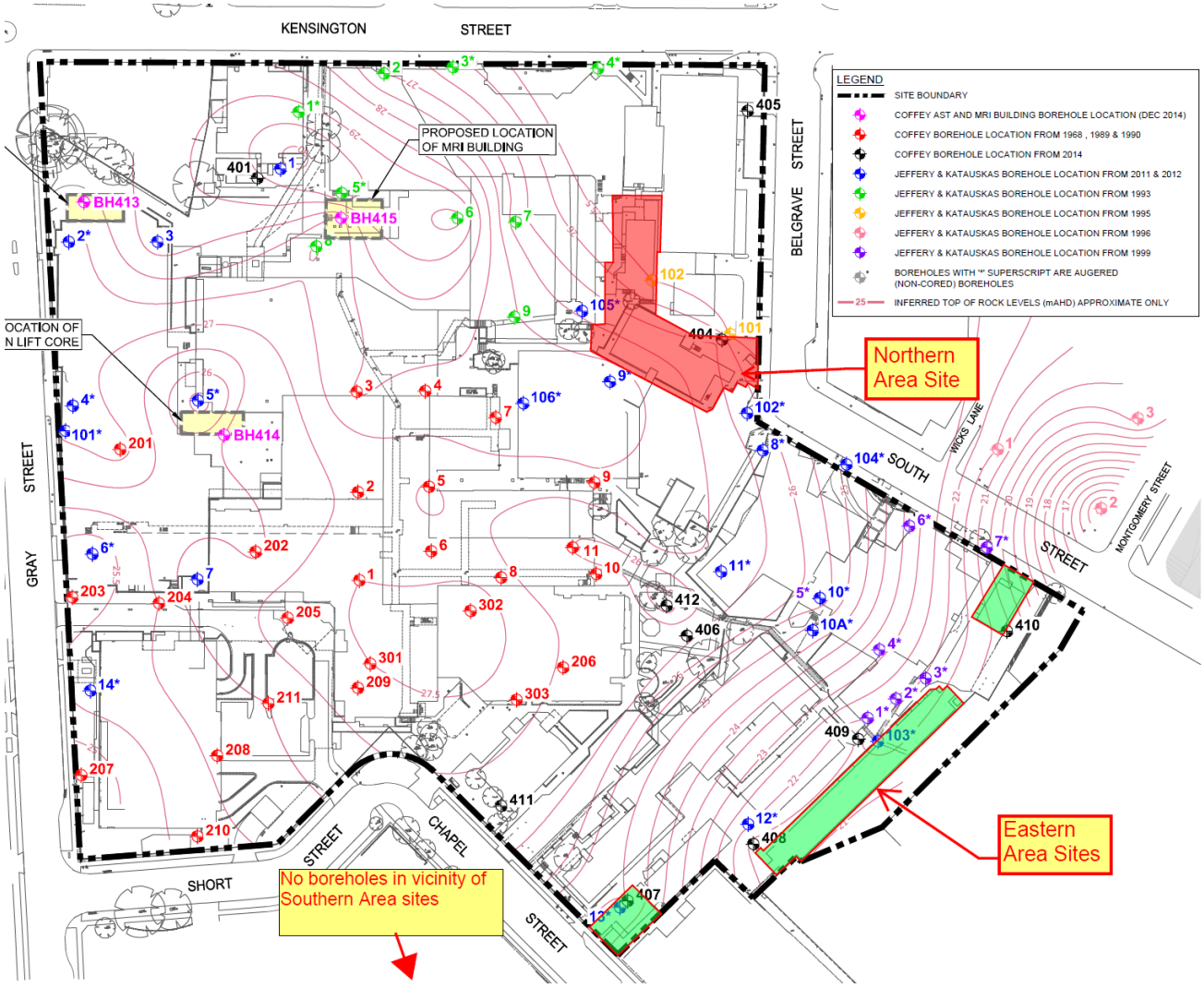


Figure 4. Extract from Coffey's 2015 report with consolidated borehole data.

Generally, boreholes within the vicinity of the REF works include:

- JK Group 1995: Boreholes 101 and 102
- JK Group 1999: Boreholes 1, 2, 3 and 7
- JK Group 2011 & 2012: Boreholes 9, 12, 13, 102, 103 and 105
- Coffey 2014: Boreholes 404, 407, 408, 409 and 410.

It should be noted that the surface levels and ground conditions encountered within these boreholes had been logged and surveyed over several decades. As such, the ground conditions reflected in these logs may differ from current site conditions due to ongoing development works at the hospital over these years.

The logs from these boreholes typically indicate shallow fill and shallow to moderately deep natural soil/residual clay profiles over a weathered bedrock formation comprising sandstone with some siltstone lenses. Rock levels varied significantly within the northern site from <1.0 m to 3.4 m below ground level (BGL), whereas rock levels within the eastern area were more consistent between 0.6 m to 2.2 m BGL. The plan from Coffey's 2015 report along with borehole logs from the above list are included in Appendix B of this report.

4.2 RECENT INVESTIGATIONS

Recently in 2021 and 2022, PSM undertook geotechnical investigations and assessments for the current Stage 3 development of the St George Hospital located within the northern portion of the Hospital campus along Kensington Street. The intent of this investigation was to provide additional data and a detailed geotechnical assessment for design and construction of the basement excavation and foundations for the new multi-storey structure. The location of the additional boreholes in proximity to the Northern area as drilled by PSM are shown below in Figure 5 and include boreholes BH01, BH02 and BH04.

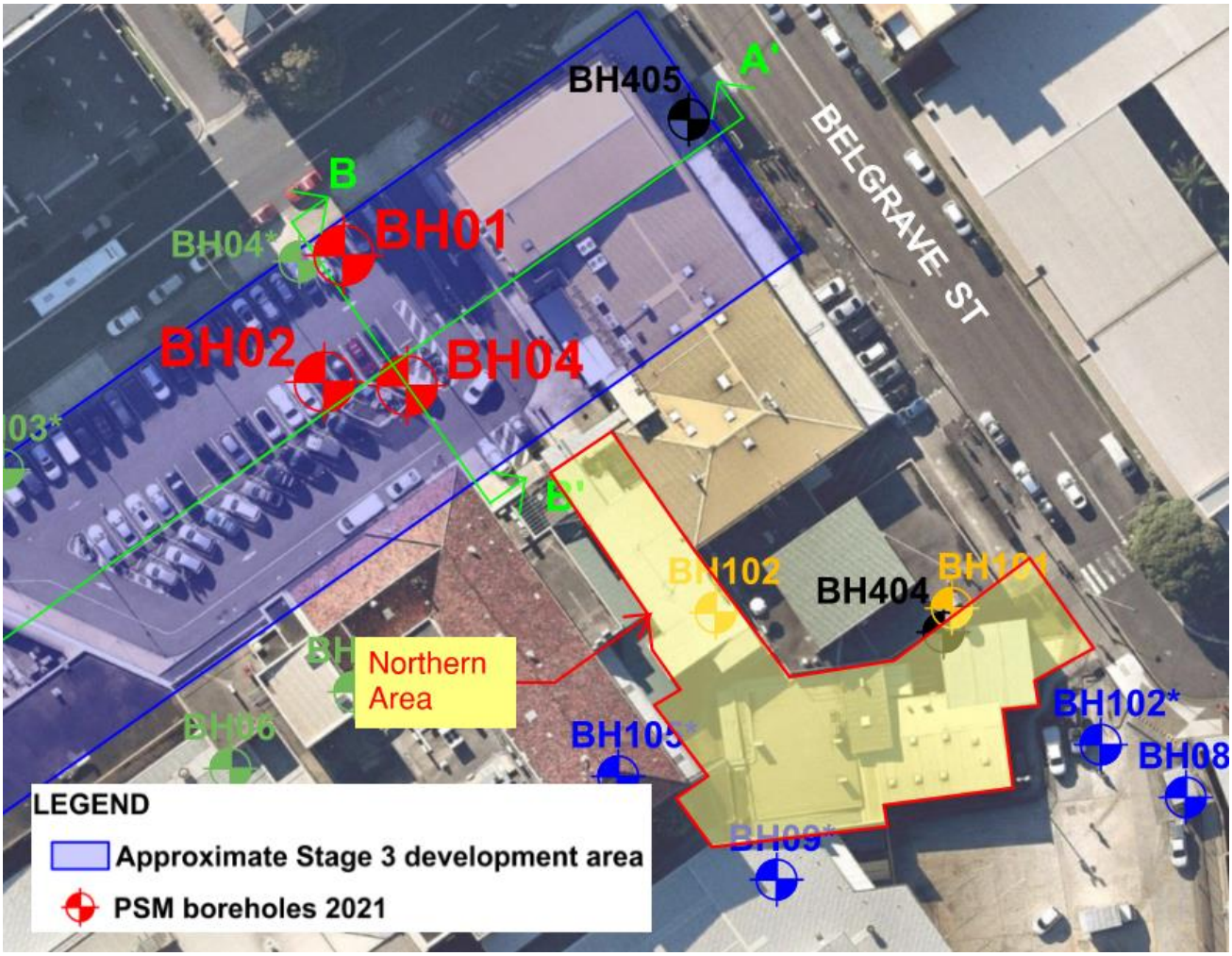


Figure 5. Additional investigation by PSM

The boreholes drilled by PSM near the northern area typically comprised shallow fill over a natural soil/residual clay profile up to 5 m below ground level and underlain by a weathered sandstone and shale bedrock profile. Figure 6 overleaf is an extract from the PSM report of a geological section through B-B' as shown in Figure 5.

A groundwater well was also installed in PSM BH01. The monitoring results at this borehole indicated that standing groundwater levels were approximately 6.5m below ground level, at around 24m AHD. These levels increased up to 25.5 m AHD during periods of heavy rainfall.

The site plan and borehole logs for PSM BH01, BH02 and BH04 along with the geological sections and groundwater monitoring data are provided in Appendix C of this report.

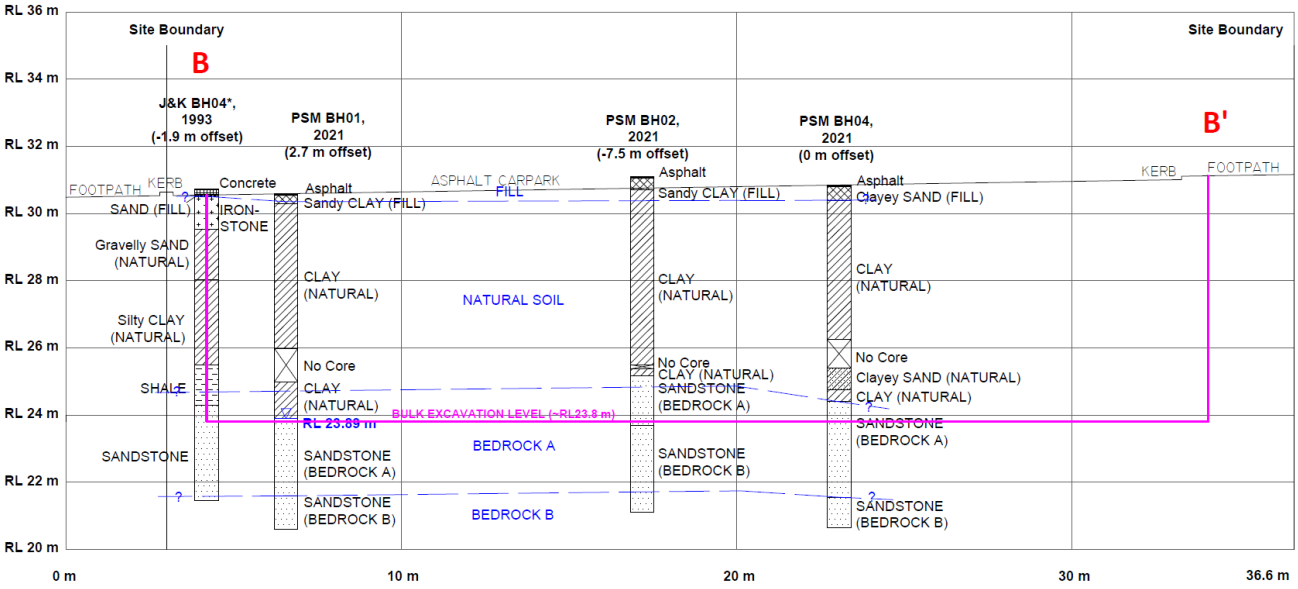


Figure 6. Geological Section B-B' from PSM 2022 report

4.3 TETRA TECH COFFEY ARCHIVAL DATA

A search of archival boreholes from TTC's internal database identified previous investigation works around the intersection of Princes Lane and Ocean Street in 2016, approximately 150 m to the south-west of the Southern site areas. The identified ground profile typically comprised shallow (up to 1.0m depth) fill over a residual clayey sand profile to a depth of 3.0 m. Below this, sandstone bedrock of moderately weathered to fresh was encountered to boreholes termination at 40 m below ground level. Groundwater levels encountered during the drilling process were approximately 2 m below ground level. Ground elevations for these boreholes was around 16 m AHD, approximately 5-8m lower than the Southern site area.

5. PRELIMINARY GEOTECHNICAL MODEL

5.1 STRATIGRAPHY

From the information presented in Sections 3 and 4, an indicative preliminary geotechnical model of the generalised site conditions is summarised in Table 2 below. It should be noted that no borehole information is available for the Southern site areas and as such the profiles depths presented below are more indicative than in areas with factual information.

Table 2. Preliminary Geotechnical Model

Inferred Unit	Inferred depths to top of unit (m)	General Description
PAVEMENT	All areas: at surface or not encountered.	Concrete/asphalt footpaths and walkways. Not present in all areas.
FILL	North Area: 0 – 0.05 East Area: 0 – 0.05 South Area: 0 – 1.0	General fill encountered across most boreholes comprising either reworked site-won or imported material attributed to pavement formations. Some uncontrolled fill with variable levels of compaction ranging from loose to dense and firm to very stiff. Typically comprising Sandy and Gravelly Clays of low-medium plasticity, along with Clayey Sands, Silty Sands and Gravelly Sands of fine to coarse sized grains.
NATURAL SOIL	North Area: 0.1 – 0.9 East Area: 0.2 – 1.2 South Area: 0.2 – 1.0	Predominantly CLAY soils of medium to high plasticity with varying percentages of silts, sands and gravels including ironstone. Firm to hard in consistency. Encountered within in majority of boreholes, with some locations comprising bedrock directly below shallow fill layers.
BEDROCK A	North Area: 1.0 – 6.8 East Area: 0.6 – 2.2 South Area: 0.5 – 3.0	Weathered SANDSTONE bedrock of fine to coarse grained, very low to low strength, with occasional medium strength bands near top of unit. Extremely to moderately weathered with regular clay seams and occasional SILTSTONE or interbedded siltstone/sandstone bands. Typically, Class V or IV bedrock in accordance with the Pells classification [5].
BEDROCK B	Limited information available, very few boreholes drilled deep enough to encounter. North Area: 6.2 – 9.3 East and South Area: Likely greater than 5 m	SANDSTONE of fine to coarse grained, pale grey to orange, medium to high strength with occasional low strength bands. Moderately weathered to fresh with some clay/fractured seams. Typically, Class III or better Sandstone in accordance with the Pells classification [5].

A summary of the depth to each inferred layer per borehole is provided in Table 3 below.

Table 3. Summary of depth to each layer per borehole.

Area	Borehole ID	By[1]	Year	Borehole Surface RL (m AHD)	Depth (mBGL) to top of layer					GWL[2] (mBGL)	Termination depth (mBGL)	Comments [3]
					PAVEMENT	FILL	NATURAL	BEDROCK A	BEDROCK B			
North	1	PSM	2021	30.59	0	0.05	0.3	6.8	8.6	4.8	10	Well Installed
	2	PSM	2021	31.1	0	0.05	0.4	5.9	7.4	N/E	10	
	4	PSM	2021	30.85	0	0.05	0.65	6.4	9.3	N/E	10.2	
	9	JK	2011	28.3	0	0.04	N/E	1.8 [4]	N/E	N/E	2.2	Non-core Only
	101	JK	1995	27.5	N/E	0	0.9	2.1	N/E	1.5	7.1	
	102	JK	1995	29	N/E	0	0.8	3.4	6.2	2.8	8.16	
	102	JK	2012	26.9	0	0.03	0.1	0.7	N/E	N/E	0.7	Non-core Only
	105	JK	2012	29.9	N/E	0	0.5	N/E	N/E	N/E	0.75	Non-core Only
	404	COF	2014	27.43	N/E	0	N/E	1	2.2	N/E	4.55	
East	1	JK	1999	N/E	N/E	0	0.2	1.3	N/E	N/E	3	Non-core Only
	2	JK	1999	N/E	N/E	0	0.3	1.3	N/E	1	3	Non-core Only
	3	JK	1999	N/E	0	0.05	0.5	1.4	N/E	0.6	3	Non-core Only
	7	JK	1999	N/E	N/E	0	0.2	1.2	N/E	N/E	6	Non-core Only
	12	JK	2011	24.3	0	0.04	1.2	2.2	N/E	N/E	3	Non-core Only
	13	JK	2011	25.8	0	0.04	0.4	1	N/E	N/E	3	Non-core Only
	103	JK	2012	22.8	0	N/E	0.7	1	N/E	0.5	1.6	Non-core Only
	407	COF	2014	25.8	0	0.05	N/E	0.6	N/E	N/E	3.78	
	408	COF	2014	23.5	N/E	0	0.8	1.6	3	2.1	5.31	Well Installed
	409	COF	2014	22.75	0	0.05	N/E	1.3	N/E	N/E	4.43	
	410	COF	2014	21.5	0	0.05	0.25	0.8	N/E	N/E	4.75	

Notes to table:

1. JK refers to Jeffery & Katauskas and COF refers to works by Coffey.
2. GWL refers to Ground Water Level
3. Non-core holes provide very limited information of rock conditions.
4. This depth is a reinterpretation by TTC of the conditions logged by JK.

5.2 GROUNDWATER

The desk study information suggests the following groundwater levels:

- Northern Area: 1.5 to 6.9 m below ground level (24 to 26.2 m AHD).
- Eastern Area: 0.5 to 2.1 m below ground level (21.4 to 22.3 m AHD)
- Southern Area: 0.5 to 2.0 m below ground level (19 to 23.5 m AHD.

Groundwater levels could vary based on local geological conditions and seepage paths between near-surface soils and underlying bedrock. The groundwater levels are also likely to vary significantly due to climatic conditions such as periods of dry or wet weather.

Due to the shallow bedrock profile and built environment around the hospital, excavations and footings may affect localised groundwater levels or produce perched groundwater tables.

6. COMMENTS AND RECOMMENDATIONS

6.1 PROPOSED DEVELOPMENT

We understand that the proposed works across the site areas includes:

- Demolition of existing structures followed by civil, and landscaping works along existing topographical lines within the northern area.
- New shallow foundations for the Clinical waste extension structure
- Demolition of existing structures only within the southern and eastern areas and “make safe” i.e. regrade and topsoiling of site to manage sediment controls.

We understand that no new basements will be required as part of the works and excavation will generally be limited to shallow foundations of the new Clinical Waste extension and trenching for utilities, along with minor regrading of landscaped areas and possibly light pole footings

6.2 EXCAVATION CONDITIONS

Following demolition of the existing structures, minor excavations may be required to removed shallow footings or to excavate new footings for the Clinical Waste Extension structure. Given that this extension is a single storey structure, it is anticipating that shallow footing systems would be suitable. Shallow excavation may be required to found on Natural Soil (i.e. below any existing Fill. In other areas where demolition only works are undertaken, minor excavations may be required to remove existing footings or to conduct shallow regarding works if required.

Excavation across the site areas could be reasonably undertaken using conventional earthmoving equipment such as small excavators within the shallow residual soil profile. It is not anticipated that excavation into the underlying bedrock would be required.

6.3 GROUNDWATER

Historically, groundwater levels within the northern site area were encountered between 1.5 to 6.9 m below ground level. For site works that generally comprise demolition and minor landscaping, it is not anticipated that works would intercept or alter current groundwater levels. If shallow perched groundwater seepage is encountered in shallow excavation works, the low permeability clay soils should limit inflow to volumes that could be managed using typical construction methods.

Within the eastern and Southern areas, as the works scope only includes demolition works, the works are not expected to adversely impact current groundwater conditions.

6.4 BATTER SLOPES

For unsupported shallow excavation or regarding, the batter slope gradients presented below in Table 4 are recommended for excavations up to 1.5 m in depth and above the groundwater table. Temporary batter slopes must be regularly inspected for signs of instability and groundwater seepage. Temporary batters that are required for more than three months may need to be flatter than indicated in Table 4.

Table 4: Recommended Unsupported Maximum Batter Slopes (maximum 1.5m height)

Layer	Material	Temporary Batter	Permanent Batter
PAVEMENT & FILL	Existing pavement layers, underlying shallow fill materials, disturbed or wet natural soil	1.5H:1V	2.5H:1V
NATURAL SOIL	Stiff (or better) residual clays and sand-gravel-clay mixtures.	1H:1V	2H:1V

The recommended maximum batter slopes presented above assume that no surcharge or structures are located at or near the crest of the cuts, and that no seepage occurs through the battered soil. Permanent batters in soils will require topsoiling, or provision of surface protection. It is recommended to install diversion drains above all batter crests to direct upslope runoff away from the batter face.

Batter slope stability analyses would be needed where steeper slopes or deeper excavation are planned or if groundwater is intersected, or where surcharge is expected at the crest of batters.

6.5 SHALLOW FOOTINGS

AS2870-2011 [6] provides site classification guidelines for residential slab and footing or structures of similar nature. We consider that the proposed Clinical Waste extension structure within the northern area would be of similar size to a residential structure and could be assessed in accordance with these standards depending on proposed building fabric and intended floor loads. There are no new structures proposed within the southern and eastern areas of the site.

6.5.1 Northern Area

Nearby boreholes to the Clinical waste extension structure indicate that the ground profile comprises between 0.1 m to 0.9 m of pavement and existing filling over natural soils and underlain by bedrock at depths varying between 1.0 m to 3.4 m below existing ground levels. As no records of the fill placement are available, the fill within this area would need to be considered as uncontrolled fill. Based on AS2870-2011 this area would currently be classified as Class P because of the depth and composition of the uncontrolled fill.

It is recommended that all footings be founded below fill material and within the natural residual clay soils. Where this is undertaken, pad or strip footings founded a minimum 0.3 m into stiff residual soils (or 0.6 m below outside grade, whichever is deeper) could adopt an allowable bearing pressure of 100kPa. Alternatively, footings can be deepened to found on Bedrock A or Bedrock B units where an allowable bearing pressure of 1,000 kPa may be adopted.

At this stage, we are unaware of the intended building and floor loads, which will affect recommendations on appropriate footing systems and floor slab subgrade preparation.

6.5.2 Eastern Areas

Within the Eastern area, ground conditions typically comprised fill material of generally sands and gravels to depths between 0.2 m to 1.2 m below existing ground levels and underlain by natural residual soils to bedrock which was encountered at depths between 0.6 m to 2.2 m depth. As no records of the fill placement are available, the fill within this area would need to be considered as uncontrolled fill. Based on AS2870-2011, this site would currently be classified as Class P.

No shrink-swell tests have been undertaken within the eastern area of the site, however given that the Northern and eastern site areas sit within the same geological formation, it is likely soil properties such as ground reactivity would be similar.

From the Shrink-swell tests undertaken by PSM in the north at BH202 and BH203, and where footings are founded below fill materials and into the natural site clayey soils, a Site Classification of Class S – Slightly Reactive would apply with expected ground surface movements (ys) of up to 10 mm.

It is recommended that all footings be founded below all fill material within the natural residual clay soils. Where this is undertaken, pad or strip footings founded a minimum 0.3m into stiff residual soils (or 0.6m below outside grade, whichever is deeper) could adopt an allowable bearing pressure of 100 kPa. Where shallow footings are founded on weathered bedrock, an allowable bearing pressure of 1000 kPa may be adopted.

6.5.3 Southern Area

No borehole information is available within the southern area to assess site classification in accordance with AS2870. As the works in this area generally comprise demolition works only, a site classification is not strictly required until further details of the development of the site is required.

For the purpose of this assessment and to assist with preliminary planning of possible future works on this site, it has been assumed that the ground conditions at the Southern site areas would be similar to those of the Eastern site areas, namely comprising some amount of shallow fill under natural site soils and bedrock at depths of up to 3.0 m below ground level.

Given the potential for likely surficial uncontrolled filling from historical regrading works, a preliminary site classification of Class P should be considered. Where it can be shown that future footings may extend below the fill depth into natural residual clay soils, a more favourable classification may be applicable but would need to be supported by further investigation works. Where this is undertaken, an indicative allowable ground bearing capacity of 100k Pa may be applicable for footings embedded a minimum 0.3 m into the natural clay profile, or 0.6 m below outside grade, whichever is deeper.

6.6 EARTHQUAKE SUB-SOIL CLASS

An assessment of the site sub-soil classification has been undertaken in accordance with AS1170.4-2007 [7] Structural Design Actions – Earthquakes in Australia. Based on the investigation findings, earthquake design may assume:

- A hazard factor of 0.08; and
- A site class of Class C_e – Shallow Soil Site.

6.7 RETAINING STRUCTURES

It is understood that where required, retaining structures will comprise shallow walls for minor landscaping and site regrading purposes only, not greater 1.5m high. The ground profiles likely to be retained for these structures for excavations will typically comprise existing fill and natural clay soils only. Retaining structures built for fill embankments will also comprise reconstituted soils of these same profiles.

The following design criteria should be adopted for the design of retaining structures:

- AS 4678-2002 – Earth Retaining Structures [8];
- AS 3798-2007 – Guidelines on Earthworks for Commercial and Residential Developments [9];
- An accepted industry practice for global stability factors of safety (FOS) of 1.5 for long-term conditions and 1.3 for short term construction conditions.

Table 5 below presents indicative geotechnical design parameters (shear strength and lateral earth pressure coefficients) for the design of retaining structures where there is a level ground surface behind the wall.

Table 5: Indicative Retaining Wall Design Parameters

Unit	Material	Unit Weight (kN/m^3)	Effective Friction Angle ϕ' (deg)	Effective Cohesion c' (kPa)	Undrained Cohesion Cu (kPa)	At Rest Earth Pressure Coefficient K_0
FILL	Existing pavement, and existing or new fill materials	18	30	0	-	0.5
NATURAL SOILS	stiff or better residual clays and sand-gravel-clay mixtures.	19	25	5	50	0.5

The recommended K_0 values assume that the wall is not rigid, and some wall movement occurs with consequent change in the horizontal stress acting on the wall occurs due to excavation. Retaining wall analyses will need to consider surcharges, footing loads from adjacent structures, roads and hydrostatic pressure.

The following construction recommendations are also provided to assist with the design and construction of retaining structures:

- Retaining wall backfill should comprise granular free-draining material with appropriate separation geofabric between the wall and backfill.
- Wall foundations should be founded on similar strata to limit the effects of differential settlement. Foundation material should be inspected by an experienced geotechnical engineer.
- Subsurface drainage lines should be placed behind the permanent and temporary (depending on type) retaining structures to direct seepage to appropriate points of discharge. Subsurface lines should be installed with consideration of maintenance and flush-out points.

6.8 POTENTIAL IMPANT ON ADJCENT STRUCTURES

The impact to adjacent structures would generally be due to vibration from demolition works where some jackhammering may be required to remove ground-floor slabs or other cast-in-place elements. For demountable structures, minimal impacts would occur as these structures sit on elevated brick piers which would not require slab excavation works.

Differential settlement should be considered for structures that abut to or connect to existing buildings such as the new Clinical Waste structure proposed in the northern area. Where this occurs, an assessment of the foundation of the existing structure along with the newly proposed structure will need to be undertaken to check that any differential settlements are accounted for.

It is recommended that dilapidation surveys be undertaken prior to and post works to measure any potential impacts from demolition works or differential settlements between structures.

6.9 ACID SULFATE SOILS

Acid sulfate soils (ASS) are typically encountered within alluvium or marine environments where long-term decomposition of organic matter below groundwater tables can occur. When these soils are exposed to the atmosphere, they generate sulphuric acid which can harm the environment and cause long-term durability issues with concrete and steel structures. The generation of sulfuric acid can occur either through directly exposing ASS during excavation, or by dewatering whereby groundwater levels within ASS are lowered such that these soils are exposed to air without the need for excavation.

It is noted that:

- No specific testing for Acid Sulfate Soils have been undertaken across the site from previous reports.
- From the published information discussed in Section 3.4, ASS are not known to be present at the site.
- The local geology and ground profile encountered in the site boreholes is not consistent with landforms typically associated with ASS.
- As excavations are likely to extend up to a maximum of 1.0m below existing level, groundwater drawdown effects that may generate sulfuric acid within ASS elsewhere around the site are not likely to be encountered.

Based on the above, the potential for intercepting acid sulfate soils across the Northern, Eastern and Southern areas is considered to be negligible.

6.10 SALINITY

Salinity affects the durability of concrete and steel elements by causing premature breakdown of concrete and corrosion of steel. This has impacts on longevity of structures in contact with these materials. Saline soils also generate salt deposits and sodic soils which in turn increase erosion and introduce difficult earthwork conditions for placement and compaction.

In previous geotechnical investigations, no salinity testing (i.e. Electrical Conductivity tests) was reported. Based on the published information, it is unlikely that the site area would be subject to saline soils given their geological formation and topographic conditions. Therefore, we consider that the potential for encountering saline soils during the works is low.

6.11 ERODABILITY

It is understood that the proposed scope of works will include demolition and creation of new landscaped areas in the Northen Area along with paved walkways and planted garden beds. Where this is undertaken and appropriate topsoils are used across non-paved areas, the potential for erosion is considered unlikely.

Across the Eastern and Southern areas, demolition of existing structures is proposed to occur. For demountable structures this may include simply lifting structures off existing brick piers, however for permanent structures they could include some minor excavations and regrading to remove existing footings. It is recommended that exposed batter slopes or cleared land that is not seeded or covered with hardstand material including asphalt or concrete are protected from runoff-driven erosion along with drainage channels being appropriately lined to reduce washout in the event of storm events. Appropriate sediment fencing should be installed around the site where exposed soil is left to limit silt runoff during and post-construction in accordance with LANDCOM [10] requirement. Exposed soil should be mulched or seeded to promote ground coverage. Where these controls are put in place, the potential for erosion in the Eastern and Southern areas is considered to be unlikely.

6.12 POTENTIAL FOR LANDSLIP

From a review of publicly available and published information, there is no historical or anecdotal evidence of past natural landslide hazards in Hospital locality.

Localised landslip can occur due to inappropriate landform design or construction, however the proposed works for the Northern Area generally comprise slight regrading and landscaping along existing topographical lines and works in the Eastern and Southern areas will comprise only the demolition of existing buildings (i.e. removal of surcharge loads from sloped areas). Due to this the potential for slope instability landslip hazards is considered to be unlikely.

7. FUTURE GEOTECNCIAL INVESTIGATIONS

Several boreholes have been undertaken within the northern area which generally provide a reasonable amount of coverage based on the proposed site works which is limited to demolition and landscaping. It is not anticipated that additional investigation within this area would be required unless specifically requested by the relevant civil or structural designers.

Given that the eastern and southern sites will comprise only demolition of the existing structures, no additional geotechnical investigation works would be required. However, if in the future structures are proposed within these sites, additional geotechnical investigations may be required and should consider the size and scale of any new structures taking into consideration aspects such as excavation, retaining structures, footings and groundwater.

8. REFERENCES

[1] Intergovernmental Committee on Surveying and Mapping (ICSM), “Foundation Spatial Data,” [Online]. Available: https://elevation.fsdf.org.au/.

[2] NSW Resources, “MinView,” Geosciences Asustralia, [Online]. Available: https://minview.geoscience.nsw.gov.au/.

[3] Office of Environment and heritage, NSW, “eSPADE V2.2,” Office of Environment and heritage, NSW, Sydney, 2016.

[4] Water NSW, “Real-time Data Groundwater Map,” [Online]. Available: https://realtimedata.waternsw.com.au/.

[5] P. J. Pells, G. Mostyn, R. Bertuzzi and P. K. Wong, “Classification of Sandstones and Shale in the Sydney Region: A Forty Year Review,” *Australian Geomechanics Journal and News of the Australian Geomechanics Society,* pp. 29-55, 2019.

[6] Australian Standard AS2870-2011, “Residential Slabs and Footings,” Standards Australia, 2011.

[7] Australian Standard AS1170.4, "Earthquake actions in Australia", Standards Australia, 2007.

[8] Australian Standard AS4678-2002, “Earth Retaining Structures,” Standards Australia, 2002.

[9] Australian Standard AS3798-2007, “Guidelines on Earthworks for Commercial and Residential Structures,” Standards Australia, 2007.

[10] Managing Urban Stormwater, Soils and Construction (Volume 1, 4th Edition), Landcom, March 2004.

APPENDIX A: LIMITATIONS

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

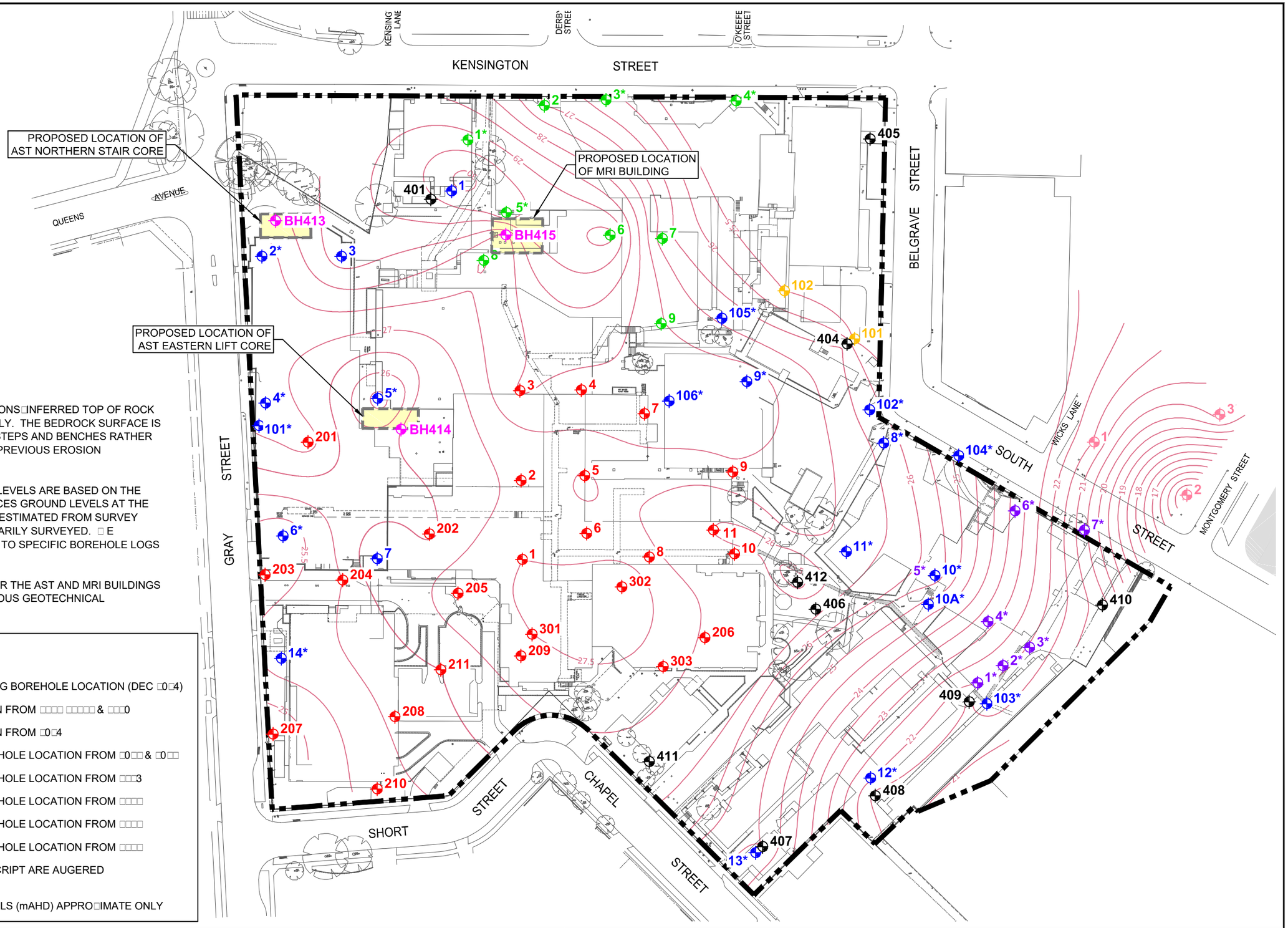
Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

APPENDIX B: HISTORICAL BOREHOLE LOGS



NOTES

1. OTHER THAN AT BOREHOLE LOCATIONS INFERRED TOP OF ROCK LEVELS SHO N ARE INDICATIVE ONLY. THE BEDROCK SURFACE IS LIKELY TO OCCUR AS A SERIES OF STEPS AND BENCHES RATHER THAN AS SMOOTH SLOPES DUE TO PREVIOUS EROSION PROCESSES.

2. INFERRED TOP OF ROCK (CLASS V) LEVELS ARE BASED ON THE BOREHOLE LOGS. IN SOME INSTANCES GROUND LEVELS AT THE BOREHOLE LOCATIONS HAVE BEEN ESTIMATED FROM SURVEY CONTOUR PLANS AND NOT NECESSARILY SURVEYED. E RECOMMEND REFERENCE BE MADE TO SPECIFIC BOREHOLE LOGS TO VERIFY ASSUMPTIONS MADE.

3. ALL BOREHOLES E CEPT THOSE FOR THE AST AND MRI BUILDINGS ERE CARRIED OUT DURING PREVIOUS GEOTECHNICAL INVESTIGATIONS.

LEGEND

- SITE BOUNDARY
- COFFEY AST AND MRI BUILDING BOREHOLE LOCATION (DEC 04)
- COFFEY BOREHOLE LOCATION FROM & 0
- COFFEY BOREHOLE LOCATION FROM 04
- JEFFERY & KATAUSKAS BOREHOLE LOCATION FROM 0 & 0
- JEFFERY & KATAUSKAS BOREHOLE LOCATION FROM 3
- JEFFERY & KATAUSKAS BOREHOLE LOCATION FROM
- JEFFERY & KATAUSKAS BOREHOLE LOCATION FROM
- JEFFERY & KATAUSKAS BOREHOLE LOCATION FROM
- BOREHOLES ITH ' SUPERSCRIPT ARE AUGERED (NON-CORED) BOREHOLES
- 25 INFERRED TOP OF ROCK LEVELS (mAHD) APPRO IMATE ONLY

revision	no.	description	dra n	approved	date
	A	ADDIT. GEOT. INVEST. & ANALYSIS FOR AST & MRI BUILDING	DG A	AJH	3 04

0 0 0 40 0

Scale (metres) 0 0 0

dra n	DG A
approved	AJH
date	3 04
scale	AS SHO N
original si e	A3

coffey

client	HEALTH INFRASTURCTURE NS		
pro ect	ADDITIONAL GEOTECHNICAL INVESTIGATION AND ANALYSIS FOR AST AND MRI BUILDING - ST GEORGE HOSPITAL GREY STREET KOGARAH NS		
title	BOREHOLE LOCATION PLAN		
pro ect no GEOTLCOV 04 AA-AL		igure no FIGURE	rev A

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Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. **101** 1/2

BOREHOLE LOG

Client:

Project: PROPOSED HYDROTHERAPY BUILDING

Location: ST. GEORGE HOSPITAL, KOGARAH. NSW.

Job No. 11292WE **Method:** SPIRAL AUGER BCD 450 **R.L. Surface:** ~27.5m

Date: 25-7-95 **Datum:** AHD

Logged/Checked by: J.E./

Groundwater Record	Samples	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0			TOPSOIL: Clayey sandy silt, dark brown, some roots.	M			
					-	FILL: Silty sand, fine to medium grained, grey with some clay.	M	-	-	APPEARS POORLY COMPACTED
	DS	N = 7 1,3,4								
	DS		1		SP	SAND: fine to medium grained, light grey mottled red brown with some clay.	M	L		-
▼ AFTER 1/2 HRS					CL	SANDY CLAY: low to medium plasticity, light grey.	MC>PL	VSt	-	-
	DS	N > 10 10/ 140mm BOUNCING	2						240	
					-	SANDSTONE: fine to medium grained, grey, moderately weathered, medium strong. REFER TO CORED BOREHOLE LOG	-	-		MODERATE 'TC' BIT RESISTANCE
			3							
			4							
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 101 2/2

CORED BOREHOLE LOG

Client:
Project: PROPOSED HYDROTHERAPY BUILDING
Location: ST. GEORGE HOSPITAL, KOGARAH. NSW.

Job No. 11292WE **Core Size:** NMLC **R.L. Surface:** ~27.5m
Date: 25-7-95 **Inclination:** 90° **Datum:** AHD
Drill Type: BCD 450 RIG **Bearing:** – **Logged/Checked by:** J.E./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION: Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_s(50)$ EW VW W MS S VS ES	DEFECT SPACING (mm) 500 300 100 50 30 10	DEFECT DETAILS: DESCRIPTION Type, inclination, thickness, planarity, roughness, coating. Specific / General
		1							NOTE: DEFECTS ARE BEDDING PARTINGS, 0-10°, PLANAR, ROUGH UNLESS OTHERWISE NOTED.
		2		START CORING AT 2.2m					
100%		3		SANDSTONE: fine to medium grained, light grey and red brown.	MW	MS	×		- JOINT, 80°, UNDULATING ROUGH, 2mm.t. ROOT INFILL - JOINT, 80°, UNDUALTING, ROUGH, 2mm.t. ROOT INFILL - BEDDING PARTING, 2°, PLANAR, ROUGH, 2mm.t., ROOT INFILL - JOINT, 60°, PLANAR, ROUGH, 1mm.t. ROOT INFILL
		4		as above, but strong.		S	×		- BEDDING PARTING, 5°, PLANAR, SMOOTH, 5mm. CLAY INFILL
100%		5							
		6					×		
		7		SANDSTONE: fine to medium grained, orange brown.	HW	VW–W	×		
				END OF BOREHOLE AT 7.1m					
		8							

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Borehole No. 102 1/2

BOREHOLE LOG

Client:

Project: PROPOSED HYDROTHERAPY BUILDING

Location: ST. GEORGE HOSPITAL, KOGARAH. NSW.

Job No. 11292WE **Method:** SPIRAL AUGER BCD 450 **R.L. Surface:** ~29.0m

Date: 25-7-95 **Datum:** AHD

Logged/Checked by: J.E./

Groundwater Record	Samples	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition	Consistency/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
			0			FILL: Silty sandy clay, dark brown with some cobles / gravel.	M			APPEARS POORLY COMPACTED
	DS	N = 9 3,3,6	1		CL-CH	CLAY: medium to high plasticity, light grey mottled red brown.	MC>PL	St-VSt	120 300 240	-
	DS									
	DS		2							
▼ AFTER 1/2 HR		N = 13 3,5,8							280 120 380	
			3		CL	SANDY CLAY: medium plasticity, light grey.				
					-	SANDSTONE: fine to medium grained, light grey mottled red brown, moderately weathered, medium strong.	-	-	-	MODERATE 'TC' BIT RESISTANCE
			4			REFER TO CORED BOREHOLE LOG				
			5							
			6							
			7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL ENGINEERS

Borehole No. 102 2/2

CORED BOREHOLE LOG

Client:
Project: PROPOSED HYDROTHERAPY BUILDING
Location: ST. GEORGE HOSPITAL, KOGARAH. NSW.

Job No. 11292WE **Core Size:** NMLC **R.L. Surface:** ~29.0m
Date: 25-7-95 **Inclination:** 90° **Datum:** AHD
Drill Type: BCD 450 RIG **Bearing:** – **Logged/Checked by:** J.E./

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION (Rock Type, grain characteristics, colour, structure, minor components.)	Weathering	Strength	POINT LOAD INDEX STRENGTH $I_s(50)$ (EW VW W MS S VS ES)	DEFECT SPACING (mm) (500 300 100 50 30 10)	DEFECT DETAILS DESCRIPTION (Type, inclination, thickness, planarity, roughness, coating.) Specific / General
		2							
		3		START CORING AT 3.5m					
				SANDSTONE: fine to medium grained, ironcemented, red brown.	HW	S	×		BEDDING PARTINGS, 5°, PLANAR, ROUGH
		4		CORE LOSS 0.1m	XW	EW			JOINT, 40-45°, PLANAR, SMOOTH, LIMONITE STAINED
				SHALE: light grey.	HW	VW–W			
				SHALE: laminated dark grey, with some sandy bands.			×		BEDDING PARTINGS, 0-5°, PLANAR, SMOOTH
		5							
100%				SANDSTONE: fine to medium grained, ironcemented, red brown.	HW	MS			
						VW	×		
		6		SANDSTONE: Laminated, fine to medium grained, light grey, with some clay bands.	MW	MS–S	×		HP = 160kPa
				CLAY BAND: Stiff, medium plasticity, light orange brown.					
				SANDSTONE: fine to medium grained, limonite stained.					
		7					×		BEDDING PARTINGS, 0-15°, PLANAR, ROUGH, LIMONITE STAINED
		8					×		
				END OF BOREHOLE AT 8.16m					
		9							

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BOREHOLE LOG

Borehole No. 1 1/1

Client:

Project: EXTENSIONS TO PSYCHIATRIC UNIT

Location: ST GEORGE HOSPITAL, KOGARAH. NSW

Job No. 14388SVA **Method:** SPIRAL AUGER INTERTECH 550 **R.L. Surface:** N/A

Date: 23-7-99 **Datum:**

Logged/Checked by: W.T./A.9

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION AND AFTER 3 HRS						0			FILL: Silty sandy gravel, fine to coarse grained, dark grey igneous gravel, with a trace of plastic, steel and concrete fragments.	M			
								SP	SILTY GRAVELLY SAND: fine to medium grained, grey, with a trace of clay fines.	M	–	–	–
						1							
								–	SANDSTONE: fine to medium grained, yellow brown.	DW	L–M	–	MODERATE 'TC' BIT RESISTANCE
									as above, but pale grey.		M		
						2							
						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 2 1/1

Client:

Project: EXTENSIONS TO PSYCHIATRIC UNIT

Location: ST GEORGE HOSPITAL, KOGARAH. NSW

Job No. 14388SVA
Date: 23–7–99
Method: SPIRAL AUGER INTERTECH 550
R.L. Surface: N/A
Datum:
Logged/Checked by: W.T./A.J

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0			FILL: Silty sandy gravel, fine to medium grained, slag and igneous gravel, dark grey.	M	–		
								SM	SILTY SAND: fine to medium grained, yellow brown, with a trace of clay fines.	M	–	–	–
▼ AFTER 2.5 HRS						1				W			
								–	SANDSTONE: fine to medium grained, yellow brown.	DW	L	–	LOW 'TC' BIT RESISTANCE
						2			as above, but pale grey.		L–M		LOW TO MODERATE RESISTANCE
									as above, but pale grey mottled red brown.				
						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							

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BOREHOLE LOG

Borehole No. 3 1/1

Client:

Project: EXTENSIONS TO PSYCHIATRIC UNIT

Location: ST GEORGE HOSPITAL, KOGARAH. NSW

Job No. 14388SVA **Method:** SPIRAL AUGER INTERTECH 550 **R.L. Surface:** N/A

Date: 23–7–99 **Datum:**

Logged/Checked by: W.T./A.9

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE–TION						0			ASPHALTIC CONCRETE: 50mm.t.				
									FILL: Silty sandy gravel, fine to medium grained, dark brown, slag gravel, with brick fragments.				
▼ AFTER 2HRS								SM	SILTY SAND: fine to medium grained, yellow brown.	M	–	–	–
						1				W			
								–	SANDSTONE: fine to medium grained, pale grey mottled yellow brown.	XW–DW	EL–VL	–	LOW 'TC' BIT RESISTANCE
						2			as above, but mottled pale grey and brown.	DW	L		LOW TO MODERATE RESISTANCE
						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							

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BOREHOLE LOG

Borehole No. 7 1/1

Client:

Project: EXTENSIONS TO PSYCHIATRIC UNIT

Location: ST GEORGE HOSPITAL, KOGARAH. NSW

Job No. 14388SVA **Method:** SPIRAL AUGER INTERTECH 550 **R.L. Surface:** N/A

Date: 23-7-99 **Datum:**

Logged/Checked by: W.T./A.G.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION & AFTER 5 MINS						0			FILL/TOPSOIL: Silty sand, fine to medium grained, dark brown, with brick fragments and rootlets.	M	–		GRASS COVER
								SP	SAND: fine to medium grained, yellow brown, with a trace of silt.	M	–	–	–
						1		SC	CLAYEY GRAVELLY SAND: fine to medium grained, yellow brown, with fine to medium grained ironstone gravel.				
								–	SANDSTONE: fine to medium grained, mottled pale grey, yellow brown and red brown.	DW	L–M	–	LOW TO MODERATE 'TC' BIT RESISTANCE
						2			as above, but pale grey mottled red brown.				
						3			SANDSTONE: fine grained, pale grey.	XW–DW	EL–VL		VERY LOW RESISTANCE
						4				DW	VL–L		LOW RESISTANCE
						5					L–M		MODERATE RESISTANCE
						6			END OF BOREHOLE AT 6.0m				
						7							

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Borehole No. 9 1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE NSW

Project: PROPOSED OXYGEN TANK HARDSTAND

Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z **Method:** SPIRAL AUGER JK250 **R.L. Surface:** ≈ 28.3m

Date: 14-10-11 **Datum:** AHD

Logged/Checked by: H.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 40mm.t	D			
									FILL: Sand, fine to coarse grained, grey brown, fine to medium grained igneous gravel.				
					SPT 10/0mm REFUSAL			-	FILL: Sand, fine to medium grained yellow brown.	SW	M-H	-	MODERATE TO HIGH 'TC' BIT RESISTANCE
						1			SANDSTONE: fine to coarse grained, light grey, with iron indurated bands.				MODERATE RESISTANCE
													MODERATE TO HIGH RESISTANCE WITH LOW BANDS
						2							HIGH RESISTANCE
						3			END OF BOREHOLE AT 2.2m				'TC' BIT REFUSAL ON SANDSTONE BEDROCK
						4							
						5							
						6							
						7							

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Borehole No. 12 1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE NSW

Project: PROPOSED ENGINEERING BUILDING

Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z **Method:** SPIRAL AUGER JK250 **R.L. Surface:** ≈ 24.3m

Date: 14-10-11 **Datum:** AHD

Logged/Checked by: H.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 40mm.t	D	-		APPEARS MODERATELY COMPACTED
					N = 10 3,4,6	1			FILL: Sand, fine to coarse grained, grey brown, with silt, fine to medium grained igneous and sandstone gravel.	M			
									FILL: Clayey sand, fine grained, with fine to coarse grained sandstone, ironstone and igneous gravel, trace of ash.				
					N = 19 4,8,11	2		CL	SANDY CLAY: medium plasticity, light grey.	MC < PL	H	-	
												> 600	
												> 600	
												> 600	
						3		-	SANDSTONE: fine to coarse grained, light grey.	SW	H	-	HIGH 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							

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Borehole No. **13** 1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE NSW

Project: PROPOSED ROSE COTTAGE EXTENSION

Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z **Method:** SPIRAL AUGER JK250 **R.L. Surface:** ≈ 25.8m

Date: 14-10-11 **Datum:** AHD

Logged/Checked by: H.W./ AZ

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 40mm.t				
								-	FILL: Gravelly sand, fine to coarse grained, grey, fine to medium grained igneous and slag gravel.	D	-	-	
					N = 16 3,3,13			CH	SANDY SILTY CLAY: high plasticity, orange brown and light grey, with ironstone gravel.	MC<PL	St	- 190 170 150	
						1		-	SANDSTONE: fine to coarse grained, light grey and yellow brown, with iron indurated bands.	DW	L	-	MODERATE 'TC' BIT RESISTANCE WITH LOW BANDS
									as above, but with clay bands.		M		LOW TO MODERATE RESISTANCE WITH VERY LOW BANDS
						2							
						3			END OF BOREHOLE AT 3.0m				
						4							
						5							
						6							
						7							

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Borehole No. 102 1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE (NSW)

Project: PROPOSED ALTERATIONS AND ADDITIONS

Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z2 **Method:** SPIRAL AUGER JK300 **R.L. Surface:** ≈ 26.9m

Date: 15-12-11 **Datum:** AHD

Logged/Checked by: H.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION						0		-	ASPHALTIC CONCRETE: 30mm.t				
								CL	FILL: Gravelly sand, fine to medium grained, grey, fine to medium grained igneous.	MC≈PL	St	150 200 200	RESIDUAL
									SANDY CLAY: low plasticity, light grey mottled orange brown, with fine to medium grained ironstone gravel.				'TC' BIT REFUSAL ON INFERRED BEDROCK
						1			END OF BOREHOLE AT 0.7m				
						2							
						3							
						4							
						5							
						6							
						7							

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BOREHOLE LOG

Borehole No. 103
1/1

Client: HEALTH INFRASTRUCTURE (NSW)
Project: PROPOSED ALTERATIONS AND ADDITIONS
Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z2
Date: 15-12-11
Method: SPIRAL AUGER
JK300
R.L. Surface: ≈ 22.8m
Datum: AHD
Logged/Checked by: H.W./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			CONCRETE: 120mm.t CONCRETE: 570mm.t				8mm DIA. REINFORCEMENT, 75mm TOP COVER
▼ ON COMPLETION	■			■				SC	CLAYEY SAND: fine to medium grained, light grey and orange brown.	M	-	-	
				□		1		-	SANDSTONE: fine to medium grained, light grey.	DW-SW	H	-	HIGH 'TC' BIT RESISTANCE
									END OF BOREHOLE AT 1.6m				'TC' BIT REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							

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Borehole No. 105 1/1

BOREHOLE LOG

Client: HEALTH INFRASTRUCTURE (NSW)

Project: PROPOSED ALTERATIONS AND ADDITIONS

Location: ST GEORGE HOSPITAL, GRAY STREET, KOGARAH, NSW

Job No. 25264Z2 **Method:** HAND AUGER **R.L. Surface:** ≈ 29.9m

Date: 15-12-11 **Datum:** AHD

Logged/Checked by: H.W./ R

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION				■	REFER TO DCP TEST RESULTS	0			FILL: Gravelly clayey sand, fine to medium grained, grey, fine to coarse grained ironstone gravel.	M			APPEARS POORLY COMPACTED
	■			■				CH	SILTY CLAY: high plasticity, orange brown, with fine to coarse grained ironstone gravel.	MC>PL	St VSt	250 150 120	
						1			END OF BOREHOLE AT 0.75m			350 310 380	HAND AUGER REFUSAL
						2							
						3							
						4							
						5							
						6							
						7							

coffey

Engineering Log - Borehole

Borehole ID.	**BH404**
sheet:	1 of 2
project no.	**GEOTLCOV25046AA**
client:	**Health Infrastructure**
date started:	**16 Apr 2014**
principal:	
date completed:	**16 Apr 2014**
project:	**St George Hospital Site Investigation**
logged by:	**SP**
location:	**St George Hospital**
checked by:	**IT**

position: Not Specified | surface elevation: 27.43 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | hole diameter : 76/100

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD/V		Not Observed		27				**FILL: Sandy CLAY**: fine grained, low plasticity, brown.	M			**FILL**
								FILL: Sandy CLAY: high plasticity, brown, fine grained sand.				
								FILL: CLAY: high plasticity, brown.				
					1.0			**SANDSTONE**: fine grained, brown, very low strength.				**ROCK**
				26	2.0			Borehole BH404 continued as cored hole				
				25	3.0							
				24	4.0							
				23	5.0							
				22	6.0							
				21	7.0							
				20								

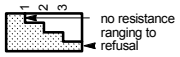
CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:03

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore

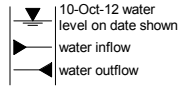
* bit shown by suffix, e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration



water



samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey

Engineering Log - Cored Borehole

Borehole ID.	**BH404**
sheet:	2 of 2
project no.	**GEOTLCOV25046AA**
client: **Health Infrastructure**	date started: **16 Apr 2014**
principal:	date completed: **16 Apr 2014**
project: **St George Hospital Site Investigation**	logged by: **SP**
location: **St George Hospital**	checked by: **IT**

position: Not Specified | surface elevation: 27.43 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | drilling fluid: | hole diameter : 76/100

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		27	1.0		start coring at 1.30m						JT, 0°, PL, RO, CO - Clay
NMLC	Not Observed	26	2.0		**SANDSTONE**: medium grained, grey, horizontally bedded (0°).	HW		a=0.50 d=0.47	23%		SM, Clay, 180 mm JT, 5°, PL, RO, CN
					NO CORE: 0.52 m						
		25	3.0		**SANDSTONE**: medium grained, brown, red/black stained, indistinctly bedded (0° to 5°), cross bedded.	HW		a=0.56 d=1.70	99%		JT, 0°, PL, RO, CN PT, 0°, PL, RO, CN, x3
		24	4.0		**SANDSTONE**: medium grained, brown, massive.			a=1.80 d=1.47			PT, 0°, PL, RO, CN, x2 JT, 5°, PL, RO, CN
		23			**SANDSTONE**: fine to medium grained, grey, indistinctly bedded (0° to 5°), cross bedded.	SW		a=1.82 d=1.66	100%		JT, 0°, PL, RO, CO - Clay
			5.0		Borehole BH404 terminated at 4.55 m						
		22	6.0								
		21	7.0								
		20									

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method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn
- RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CS crushed seam
- SM seam
- DB drilling break

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

coating
- CN clean
- SN stain
- VN veneer
- CO coating

PointID : BH404 Depth Range: 1.30 - 4.55 m

drawn	**SP**
approved	**AJH**
date	**25/06/2014**
scale	**N.T.S.**
original size	**A4**

coffey

client: Health Infrastructure

project: St George Hospital Site Investigation
St George Hospital

title: **CORE PHOTOGRAPH**
BH404

project no: GEOTLCOV25046AA | fig no: **FIGURE 1** | rev:

coffey

Engineering Log - Borehole

Borehole ID.	***BH407***
sheet:	1 of 2
project no.	***GEOTLCOV25046AA***
client:	***Health Infrastructure***
date started:	***18 May 2014***
principal:	
date completed:	***18 May 2014***
project:	***St George Hospital Site Investigation***
logged by:	***SP***
location:	***St George Hospital***
checked by:	***IT***

position: Not Specified | surface elevation: 25.80 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | hole diameter : 76/100

drilling information | **material substance**

method & support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD/T		Not Observed		25	1.0			**ROAD SURFACE: ASPHALT**				**FILL**
								SUB-BASECOURSE: Sandy CLAY: grey.				
								FILL: Sandy CLAY: low plasticity, pale brown to yellow brown.				
								SANDSTONE: fine to medium grained, pale brown, very low strength.				**RESIDUAL SOIL**
				24	2.0			Borehole BH407 continued as cored hole				
				23	3.0							
				22	4.0							
				21	5.0							
				20	6.0							
				19	7.0							
				18								

CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:03

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey

Engineering Log - Cored Borehole

Borehole ID.	***BH407***
sheet:	2 of 2
project no.	***GEOTLCOV25046AA***
client: ***Health Infrastructure***	date started: ***18 May 2014***
principal:	date completed: ***18 May 2014***
project: ***St George Hospital Site Investigation***	logged by: ***SP***
location: ***St George Hospital***	checked by: ***IT***

position: Not Specified | surface elevation: 25.80 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | drilling fluid: | hole diameter : 76/100

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		25			start coring at 0.80m						
NMLC	Not Observed	25	1.0		**SANDSTONE**: fine to medium grained, grey, orange and red stained, indistinctly bedded at 0° - 5°.	HW		a=0.62 d=0.06			SM, Clayey sand, 100 mm SM, Clay, 10 mm JT, 5°, PL, RO, CO - Clay
		24	2.0					a=0.19 d=0.14	87%		SM, Sandy clay, 60 mm
		23	3.0					a=0.29 d=0.31	89%		PT, 0°, PL, RO, CO - Clay SM, Clay, 10 mm PT, 0°, PL, RO, CO - Clay
		22			**INTERBEDDED SILTSTONE AND SANDSTONE**: fine grained, grey, distinctly bedded at 0°- 5°.			a=0.10 d=0.11			JT, 5°, PL, RO, CN PT, 0°, PL, RO, CN PT, 0°, PL, RO, CN
		22	4.0		Borehole BH407 terminated at 3.78 m						
		21	5.0								
		20	6.0								
		19	7.0								
		18									

CDF_0_9_04BB.GLB Log COF BOREHOLE: CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:07

method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn
- RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CS crushed seam
- SM seam
- DB drilling break

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

coating
- CN clean
- SN stain
- VN veneer
- CO coating

PointID : BH407 Depth Range: 0.80 - 3.78 m

drawn	**SP**
approved	**AJH**
date	**25/06/2014**
scale	**N.T.S.**
original size	**A4**

coffey

client: Health Infrastructure

project: St George Hospital Site Investigation
St George Hospital

title: **CORE PHOTOGRAPH**
BH407

project no: GEOTLCOV25046AA | fig no: **FIGURE 1** | rev:

coffey

Engineering Log - Borehole

Borehole ID.	**BH408**
sheet:	1 of 2
project no.	**GEOTLCOV25046AA**
client:	**Health Infrastructure**
date started:	**17 Apr 2014**
principal:	
date completed:	**17 Apr 2014**
project:	**St George Hospital Site Investigation**
logged by:	**SP**
location:	**St George Hospital**
checked by:	**IT**

position: Not Specified | surface elevation: 23.50 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | hole diameter : 76/100

drilling information | **material substance**

method & support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
AD/T		20/06/14		23	1.0			**ROAD SURFACE: Gravelly SAND**: fine to medium grained, dark grey, with angular fine to medium grained gravel.				**SUBBASE**
				22	2.0			**SAND**: fine grained, grey.				**RESIDUAL SOIL**
								Sandy CLAY: high plasticity, brown and yellow.				
								SANDSTONE: very low strength to soil strength (extremely weathered).				
				21	3.0			Borehole BH408 continued as cored hole				
				20	4.0							
				19	5.0							
				18	6.0							
				17	7.0							
				16								

hand penetrometer (kPa): 100 200 300 400

CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:04

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration (1 2 3) — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey

Engineering Log - Cored Borehole

Borehole ID.	**BH408**
sheet:	2 of 2
project no.	**GEOTLCOV25046AA**
client: **Health Infrastructure**	date started: **17 Apr 2014**
principal:	date completed: **17 Apr 2014**
project: **St George Hospital Site Investigation**	logged by: **SP**
location: **St George Hospital**	checked by: **IT**

position: Not Specified | surface elevation: 23.50 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | drilling fluid: | hole diameter : 76/100

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		23	1.0		start coring at 2.18m						
NMLC		22	2.0		**SANDSTONE**: fine to medium grained, grey, indistinctly bedded at 0° - 5°.	HW		a=0.11 d=0.07			PT PT SM, Clay, 10 mm SM, Clay, 30 mm
		21	3.0		**SANDSTONE**: fine to medium grained, Pale red to orange brown, indistinctly bedded at 0° - 5°.			a=1.28 d=1.04	96%		PT, 0 - 5°, PL, RO, Fe SN PT, CN
		20	4.0			SW					
		19	5.0		**SANDSTONE**: fine to medium grained, grey, distinctly bedded at 0° - 5° with some siltstone bands.			a=0.05 d=0.03 a=1.15 d=0.88	100%		PT, Clay CO
		18	6.0		Borehole BH408 terminated at 5.31 m						
		17	7.0								
		16									

CDF_0_9_04BB.GLB Log COF BOREHOLE: CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:07

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CS crushed seam
SM seam
DB drilling break

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stain
VN veneer
CO coating

PointID : BH408 Depth Range: 2.18 - 5.31 m

drawn	**SP**
approved	**AJH**
date	**25/06/2014**
scale	**N.T.S.**
original size	**A4**

coffey

client: Health Infrastructure

project: St George Hospital Site Investigation
St George Hospital

title: **CORE PHOTOGRAPH**
BH408

project no: GEOTLCOV25046AA | fig no: **FIGURE 1** | rev:

coffey

Piezometer Installation Log

Hole ID.	***BH408***
sheet:	1 of 1
project no.	***GEOTLCOV25046AA***
client: ***Health Infrastructure***	date started: ***17 Apr 2014***
principal:	date completed: ***17 Apr 2014***
project: ***St George Hospital Site Investigation***	logged by: ***SP***
location: ***St George Hospital***	checked by: ***IT***

position: Not Specified | surface elevation: 23.50 m (AHD) | angle from horizontal: 90°

equipment type: Auger, Track mounted | hole diameter : 76/100

drilling information				material substance		piezometer construction details	
method & support	water	RL (m)	depth (m)	graphic log	material name	BH408	bore construction license: drilling company: driller: driller's permit no.:
AD/T		23	0		ROAD SURFACE: Gravelly SAND		Spoil
			1		SAND	1.00 m	Bentonite
		22			Sandy CLAY		
					SANDSTONE		
	20/06/14		2				
		21					
			3				Sand
NMLC		20					
			4				
		19					
			5				
		18			Borehole BH408 terminated at 5.31 m		
			6				
		17					
			7				
		16					

method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	stick up & RL	tip depth & RL	install. date	water level
BH408	standpipe piezo.		5.31 m 18.19 m AHD		

coffey

Engineering Log - Borehole

Borehole ID.	***BH409***
sheet:	1 of 2
project no.	***GEOTLCOV25046AA***
client: ***Health Infrastructure***	date started: ***18 May 2014***
principal:	date completed: ***18 May 2014***
project: ***St George Hospital Site Investigation***	logged by: ***SP***
location: ***St George Hospital***	checked by: ***IT***

position: Not Specified | surface elevation: 22.75 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | hole diameter : 76/100

drilling information | **material substance**

method & support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
AD/T		Not Observed		22	1.0			**ROAD SURFACE: ASPHALT**	D			**FILL**
								FILL: Sandy GRAVEL: coarse grained, dark grey.				
								FILL: SAND: fine grained, pale brown.	W			
								SANDSTONE: fine to medium grained, brown, very low strength. Borehole BH409 continued as cored hole				**RESIDUAL SOIL**
				21	2.0							
				20	3.0							
				19	4.0							
				18	5.0							
				17	6.0							
				16	7.0							
				15								

CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:04

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore

* bit shown by suffix, e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration (1 2 3) — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density
- VS very soft
- S soft
- F firm
- St stiff
- VSt very stiff
- H hard
- Fb friable
- VL very loose
- L loose
- MD medium dense
- D dense
- VD very dense

coffey

Engineering Log - Cored Borehole

Borehole ID.	**BH409**
sheet:	2 of 2
project no.	**GEOTLCOV25046AA**
client: **Health Infrastructure**	date started: **18 May 2014**
principal:	date completed: **18 May 2014**
project: **St George Hospital Site Investigation**	logged by: **SP**
location: **St George Hospital**	checked by: **IT**

position: Not Specified | surface elevation: 22.75 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | drilling fluid: | hole diameter : 76/100

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		22	1.0		start coring at 1.30m						
NMLC	Not Observed	21	2.0		**SANDSTONE**: fine to medium grained, grey, red and black stained, indistinctly bedded at 0° - 5°.	MW		a=0.15 d=0.19	100%		PT, 5°, PL, RO, CO - Clay
						HW		a=0.32 d=0.38			
		20	3.0		**SANDSTONE**: medium grained, Pale grey to red-orange, distinctly bedded at 0° - 10°.	MW / HW		a=0.38 d=0.28	95%		PT SM, Clay, 20 mm PT, 0°, PL, RO, CN
		19	4.0						68%		PT, 5°, PL, RO, CN PT, 5°, PL, RO, CN
		18	5.0		Borehole BH409 terminated at 4.43 m			a=0.15 d=0.14			
		17	6.0								
		16	7.0								
		15									

CDF_0_9_04BB.GLB Log COF BOREHOLE: CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:07

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CS crushed seam
SM seam
DB drilling break

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

coating
CN clean
SN stain
VN veneer
CO coating

PointID : BH409 Depth Range: 1.30 - 4.43 m

drawn	**SP**
approved	**AJH**
date	**25/06/2014**
scale	**N.T.S.**
original size	**A4**

coffey

client: Health Infrastructure

project: St George Hospital Site Investigation
St George Hospital

title: **CORE PHOTOGRAPH**
BH409

project no: GEOTLCOV25046AA | fig no: **FIGURE 1** | rev:

coffey

Engineering Log - Borehole

Borehole ID.	***BH410***
sheet:	1 of 2
project no.	***GEOTLCOV25046AA***
client:	***Health Infrastructure***
date started:	***18 May 2014***
principal:	
date completed:	***18 May 2014***
project:	***St George Hospital Site Investigation***
logged by:	***SP***
location:	***St George Hospital***
checked by:	***IT***

position: Not Specified | surface elevation: 21.50 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | hole diameter : 76/100

drilling information | **material substance**

method & support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
AD/T		Not Observed		21				**ROAD SURFACE: ASPHALT**	W			**FILL**
								FILL: Sandy GRAVEL: coarse grained, grey.				
								FILL: SAND: fine - medium grained, dark grey.				**RESIDUAL SOIL**
								Gravelly SAND: fine and medium grained, pale brown, ironstone gravel.				
					1.0			**SANDSTONE**: fine to medium grained, grey and orange, very low strength.				
				20				Borehole BH410 continued as cored hole				
					2.0							
				19								
					3.0							
				18								
					4.0							
				17								
					5.0							
				16								
					6.0							
				15								
					7.0							
				14								

CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:04

method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey

Engineering Log - Cored Borehole

Borehole ID.	**BH410**
sheet:	2 of 2
project no.	**GEOTLCOV25046AA**
client:	**Health Infrastructure**
date started:	**18 May 2014**
principal:	
date completed:	**18 May 2014**
project:	**St George Hospital Site Investigation**
logged by:	**SP**
location:	**St George Hospital**
checked by:	**IT**

position: Not Specified | surface elevation: 21.50 m (AHD) | angle from horizontal: 90°

drill model: Auger, Track mounted | drilling fluid: | hole diameter : 76/100

drilling information				material substance						rock mass defects		
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		21	1.0		start coring at 1.45m						
NMLC	Not Observed	20	2.0		**SANDSTONE**: fine to medium grained, Pale grey to orange brown, sub-horizontally bedded (0° to 5°).	MW		a=0.04 d=0.05 a=0.14 d=0.19	65%		JT, 5°, PL, RO, CO - Clay SM, Sandy clay, 30 mm
		19			**NO CORE:** 0.34 m	XW					
			3.0		**SANDSTONE**: fine to medium grained, pale grey with red- brown iron stanined bands, distinctly bedded at 0° - 5°.	MW / HW		a=0.04	64%		SM, Sandy clay, 120 mm SM, Clay, 80 mm SM, Clay, 30 mm JT, 5°, PL, RO, Clay CO
		18	4.0			HW / SW		a=0.08 d=0.09 a=0.23 d=0.14	96%		
		17									SM, Clay, 30 mm
		16	5.0		Borehole BH410 terminated at 4.75 m						
		15	6.0								
		14	7.0								

CDF_0_9_04BB.GLB Log COF BOREHOLE: CORED GEOTLCOV25046AA_REV1.GPJ <<DrawingFile>> 15/07/2014 12:07

method & support
- AS auger screwing
- AD auger drilling
- CB claw or blade bit
- W washbore
- NMLC NMLC core (51.9 mm)
- NQ wireline core (47.6mm)
- HQ wireline core (63.5mm)
- PQ wireline core (85.0mm)
- SPT standard penetration test

water
- 10/10/12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD
- barrel withdrawn
- RQD = Rock Quality Designation (%)

weathering & alteration*
- RS residual soil
- XW extremely weathered
- HW highly weathered
- DW distinctly weathered
- MW moderately weathered
- SW slightly weathered
- FR fresh

*W replaced with A for alteration

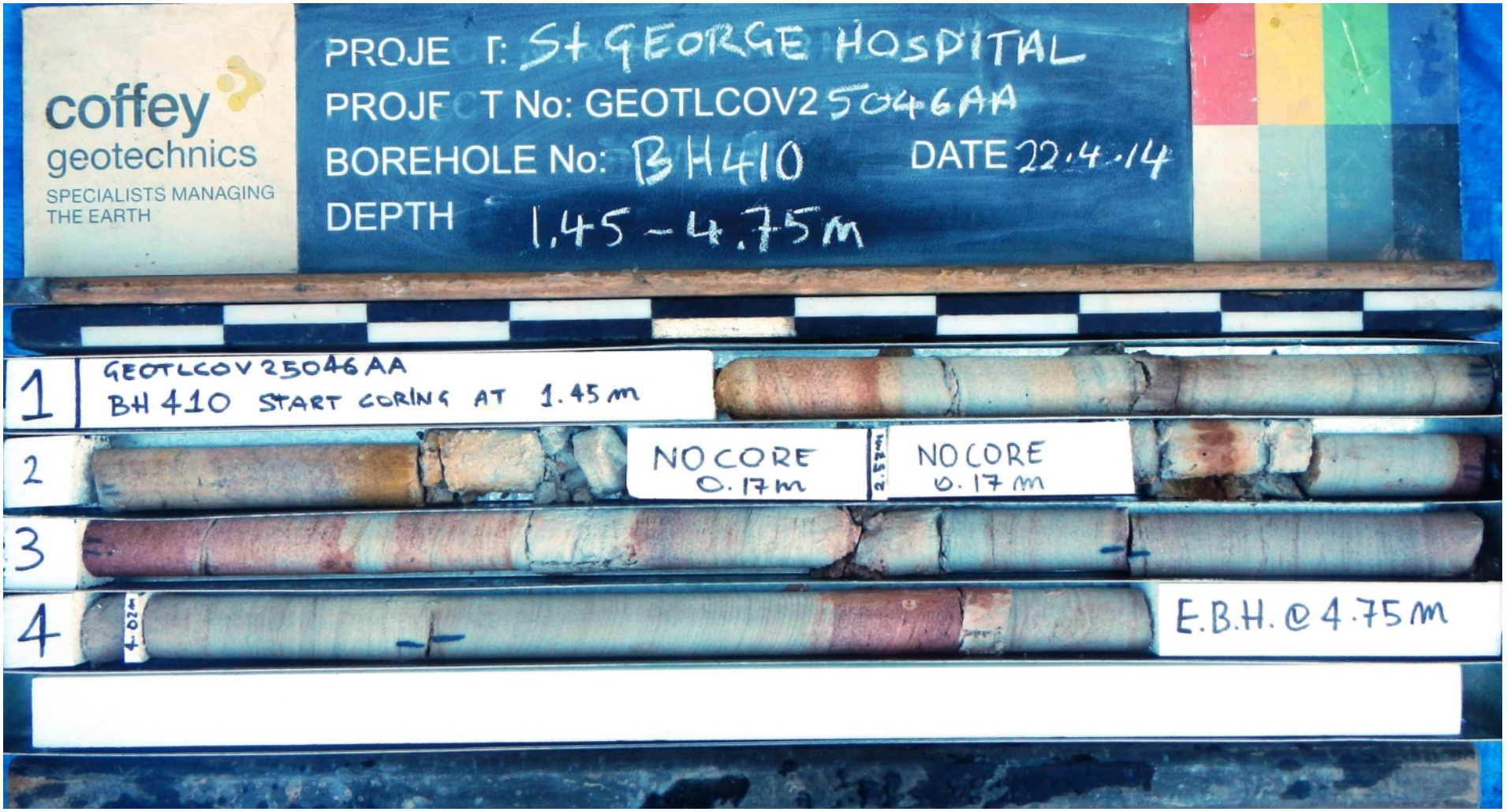
strength
- VL very low
- L low
- M medium
- H high
- VH very high
- EH extremely high

defect type
- PT parting
- JT joint
- SZ shear zone
- SS shear surface
- CS crushed seam
- SM seam
- DB drilling break

roughness
- SL slickensided
- POL polished
- SO smooth
- RO rough
- VR very rough

planarity
- PL planar
- CU curved
- UN undulating
- ST stepped
- IR Irregular

coating
- CN clean
- SN stain
- VN veneer
- CO coating



PointID : BH410 Depth Range: 1.45 - 4.75 m

drawn	SP
approved	AJH
date	25/06/2014
scale	N.T.S.
original size	A4

coffey

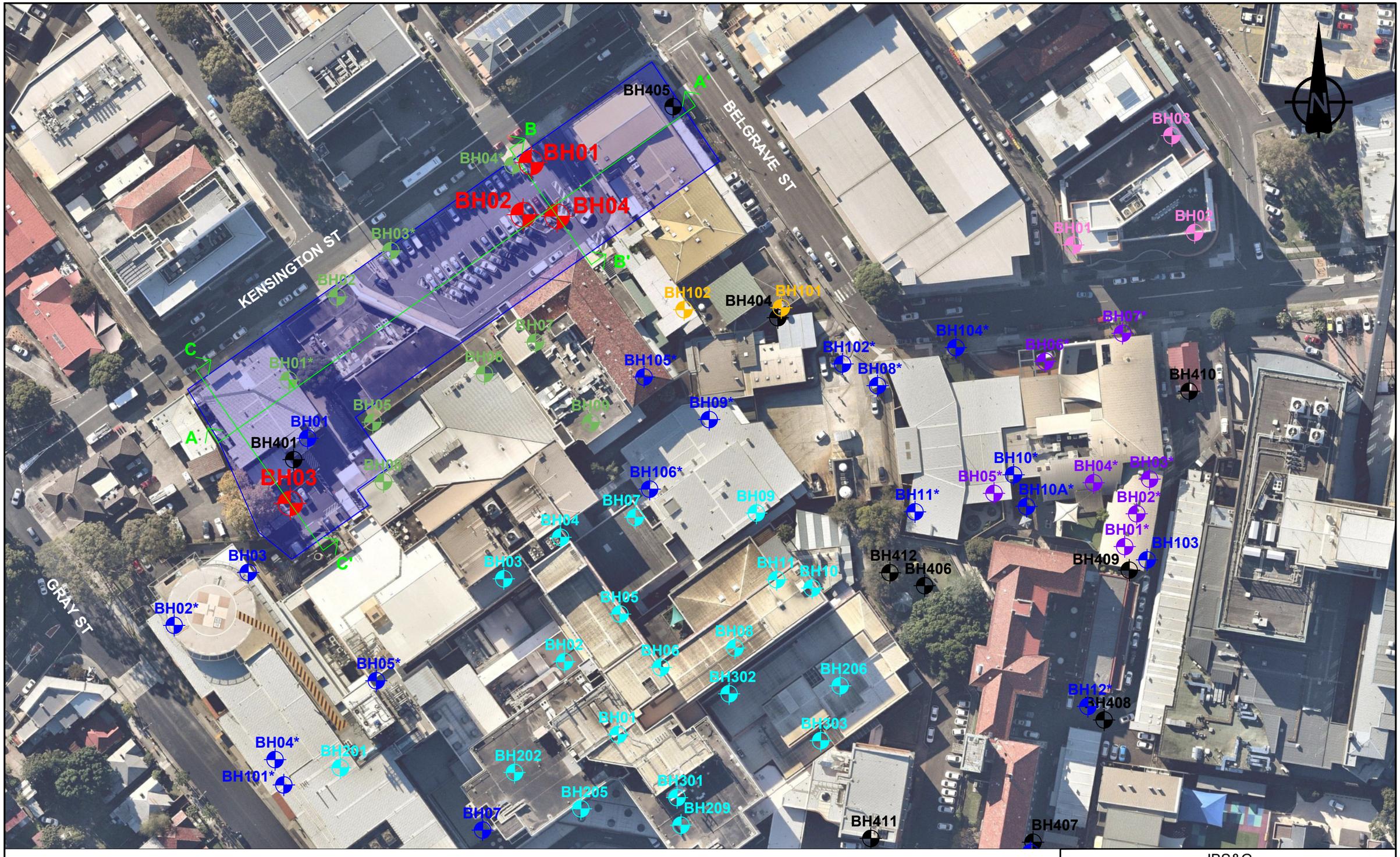
client: Health Infrastructure

project: St George Hospital Site Investigation
St George Hospital

title: **CORE PHOTOGRAPH**
BH410

project no: GEOTLCOV25046AA | fig no: **FIGURE 1** | rev:

APPENDIX C: PSM INVESTIGATION DATA



LEGEND

- Approximate Stage 3 development area
- PSM boreholes 2021
- Coffey boreholes 2014
- Jeffery & Katauskas boreholes 2011 & 2012
- Jeffery & Katauskas boreholes 1999
- Jeffery & Katauskas boreholes 1996
- Jeffery & Katauskas boreholes 1995
- Jeffery & Katauskas boreholes 1993
- Coffey boreholes 1968, 1989 & 1990

Notes:

1. Image taken from Nearmap, dated 16 May 2021.
2. PSM Piezometers were installed in BH01 and BH03.
3. * Indicates non-cored borehole.

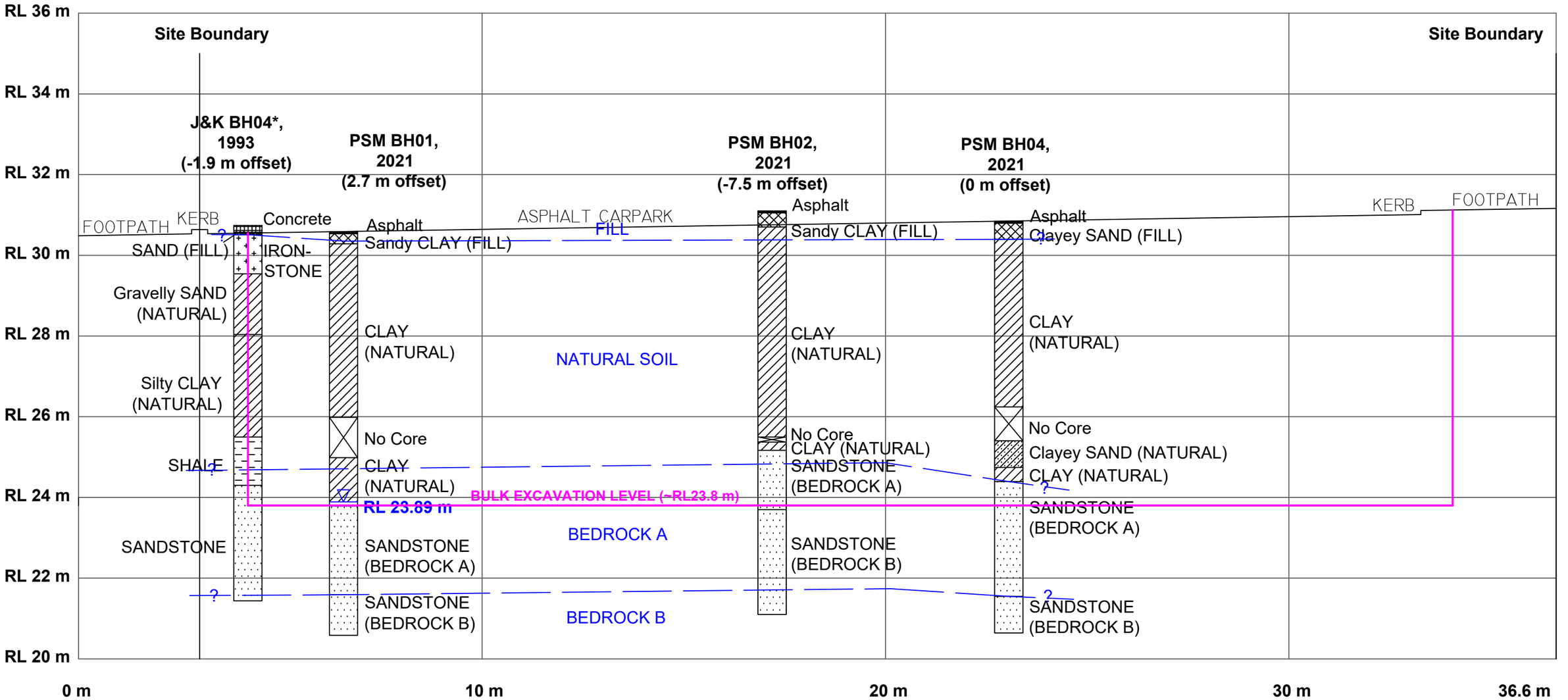
0 m — 50 m

Scale
1:1000 at A3

JBS&G
St. George Hospital
Kogarah

St. George Hospital - Stage 3 Redevelopment
BOREHOLE LOCALITY PLAN

PSM4370-003L | Figure 1



Notes:

1. **J&K 1993 borehole RL's are based on inferred top of rock levels from Figure 1 of Coffey report, "Element 2 - Site Investigation/Risk Assessment Report".**
2. **Ground Profile is approximate and inferred from borehole RL's and LTS Lockley's 2014 Survey Plan.**
3. **Graphic Log of soil/rock units are as per PSM Geotechnical Logging Explanation Sheet.**

0 m — 5m

Scale
1:100 at A3

JBS&G
St. George Hospital
Kogarah

St. George Hospital - Stage 3 Redevelopment
Section B-B'

PSM4370-003L | Figure 3

Borehole ID

BH01

Engineering Log - Non Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	31/05/2021
Project Name:	St George Hospital	Completed:	31/05/2021
Hole Location:	Refer to Figure 1	Logged By:	GF/IZ
Hole Position:	327562.9 m E 6240056.4 m N GDA2020	Checked By:	AS

Drill Model and Mounting:	JK 308 Track mounted	Inclination:	-90°	RL Surface:	30.59 m		
Hole Diameter:	100 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		D 0.20 m B 0.30-0.50 m					CL	Asphalt; Thickness 50 mm				0.00: ASHPHALT 0.05: FILL
										Sandy CLAY with gravel: low plasticity, pale grey and pale pink; sand fine to medium grained; gravel medium to coarse grained, angular to sub-angular.	D			
									CI	CLAY trace gravel trace sand: medium plasticity, orange and red; gravel medium to coarse grained up to 5 mm; sand fine grained.				0.30: NATURAL SOIL
				SPT 0.50 m 6,13,17 N=30		29.6	1							
AD/V		N				28.6	2					VSt to H		
						27.6	3			occasionaly rock fabric observed.	D to M			
										Becoming grey at 3.7 m.				
						26.6	4					H		
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

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

Soil and rock descriptions in accordance with AS 1726:2017

Borehole ID

BH01

Engineering Log - Cored Borehole

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Hole Location:	Refer to Figure 1	Logged By:	GF/IZ
Hole Position:	327562.9 m E 6240056.4 m N GDA2020	Checked By:	AS

Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 30.59 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					29.6	1						
					28.6	2						
					27.6	3						
					26.6	4						
			4.60m					Continued from non-cored borehole sheet				
NMLC			C-1					NO CORE: 1000 mm.				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

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

Engineering Log - Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	31/05/2021
Project Name:	St George Hospital	Completed:	31/05/2021
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Hole Position:	327562.9 m E 6240056.4 m N GDA2020	Checked By:	AS

Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 30.59 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	▽				24.6	6		NO CORE: 1000 mm.*(continued)*				
								Clay trace sand: medium plasticity, pale pink and grey; sand fine grained.				PP = 450 kPa, 600 kPa, 510 kPa PP = 430 kPa, 600 kPa, 320 kPa
			7.00m C-2 Is(50) d=0.45 a=0.37 MPa		23.6	7		SANDSTONE: medium to coarse grained, brown and dark orange, very thinly bedded, distinct cross-bedding up to 20°. Becoming pale grey, fine to medium grained sand.				BP, 0°, CN, PR, RF DB x 3 SS, 0°, CL & Rock Fragment, PR, RF, 30 mm, soft BP, 0°, CL, PR, RF, 1 mm
			7.90m C-1 Is(50) d=0.17 a=0.26 MPa		22.6	8						BP, 10°, CN, PR, RF SM, 0°, Fe & CL, PR, RF, 2 mm SM, 0°, Fe & CL, PR, RF, 2 mm SM, 0°, CL, PR, RF, 8 mm
		80	8.50m C-2 Is(50) d=0.17 a=0.19 MPa	100								BP, 2°, FE, PR, RF, 1 mm
			9.25m C-1 Is(50) d=0.33 a=0.29 MPa		21.6	9						JT, 20°, Fe & CL, PR, RF, 1 mm JT, 30°, Fe & CL, PR, RF, 10 mm SM, 0°, CL & Rock Fragment, PR, RF, 10 mm BP, 0°, FE, PR, RF, 1 mm JT, 20°, FE, PR, RF, 1 mm SM, 0°, CL, PR, RF, 50 mm, PP = 110 - 230 kPa JT, 70°, CL, PR, RF, 100 mm BP x 2, 0°, CL, PR, RF, 2 mm
			10.00m					Hole Terminated at 10.00 m				

Method
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AD/V - Auger drilling V bit
WB - Washbore
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PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

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

Engineering Log - Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	31/05/2021
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Hole Location:	Refer to Figure 1	Logged By:	GF/IZ
Hole Position:	327562.9 m E 6240056.4 m N GDA2020	Checked By:	AS

Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 30.59 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
												SM, 0°, CL & Sand, PR, RF, 20 mm BP, 0°, CN, PR, RF
					19.6	11						
					18.6	12						
					17.6	13						
					16.6	14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
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Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
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SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
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Shape
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CU - Curved
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See Explanatory Notes for details of abbreviations and basis of descriptions.

JBS&G

St. George Hospital

Kogarah, NSW

STAGE 3 GEOTECHNICAL INVESTIGATION

CORE PHOTOGRAPHY - BH01

PSM4370-003L	**Appendix B**

Engineering Consultants
Rock - Soil - Water

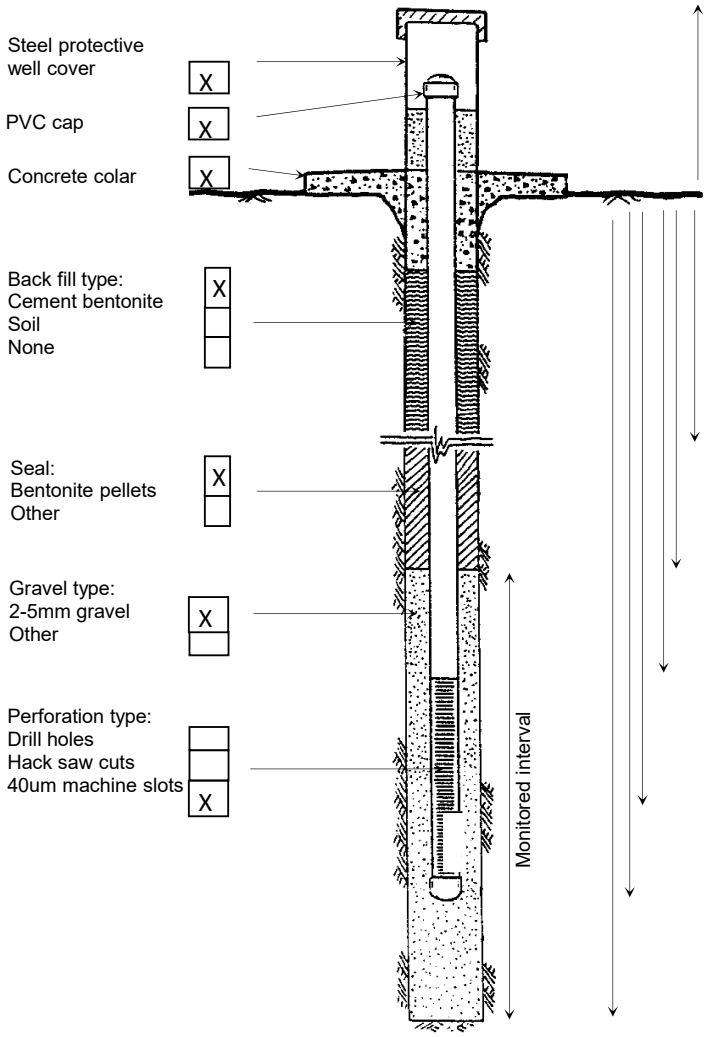
JOB No.: PSM4370

PROJECT: St. George Hospital

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH01
PIEZOMETER: PZ01
COLLAR EASTING: 327563 mE
COLLAR NORTHING: 6240056 mN
COLLAR RL(m): 30.59
DATUM: AHD

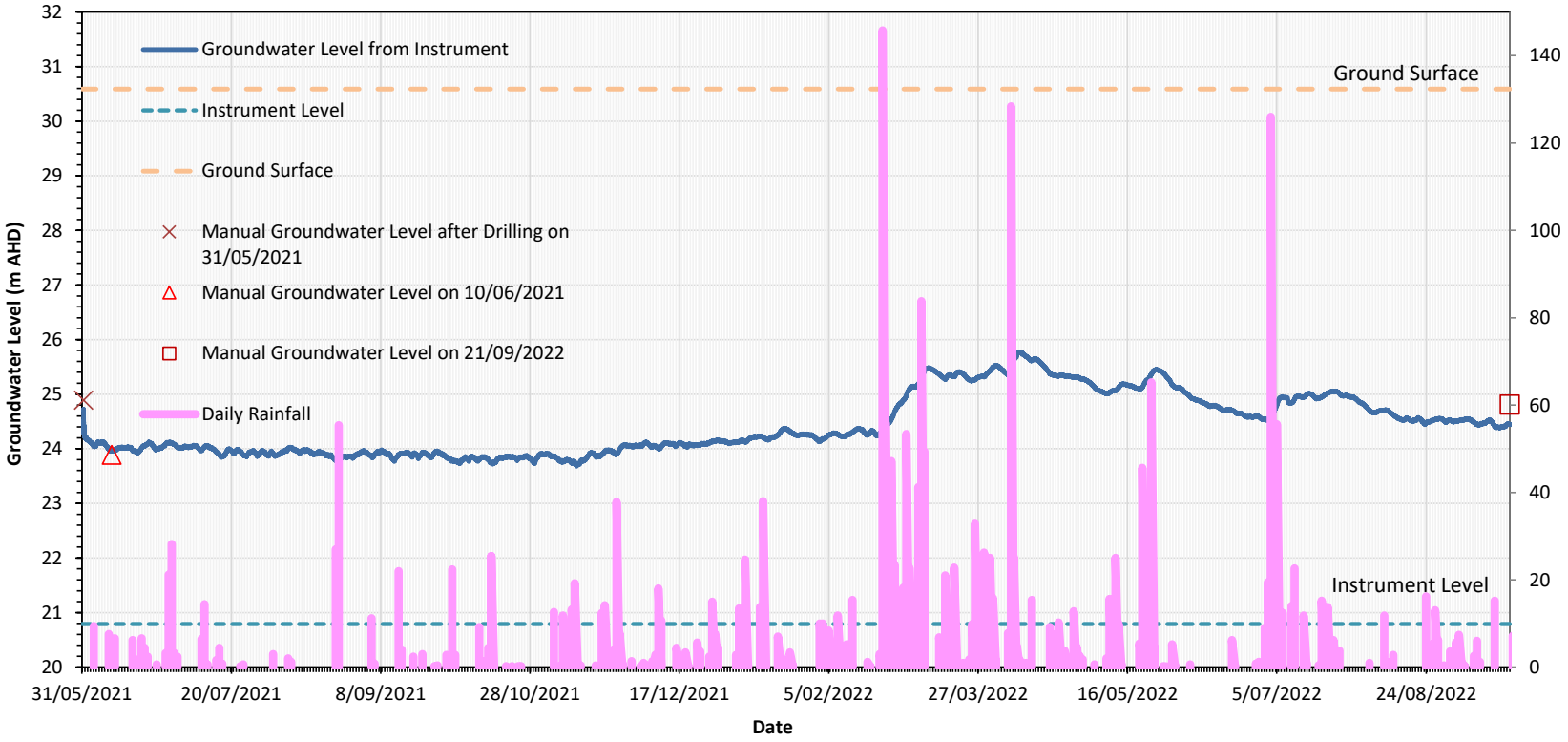
DRILLING CONTRACTOR: JK Drilling
RIG: JK308 Track Mounted
DEPTH OF HOLE (m): 10.0
BOREHOLE INCLINATION: -90°
PIEZO INSTALLATION DATE: 31/05/2021
SUPERVISED BY: GF/IZ



Height of stickup	0 m
Diameter of PVC	60 mm
Depth to top of seal	2.0 m
Depth to top of gravel pack	5.0 m
Depth to top of screen	4.85 m
Depth to base of screen	9.85 m
Depth to base of piezo	9.9 m
Depth to base of gravel	9.9 m

COMMENTS:

Groundwater Level in Borehole BH01



Notes:

1. Instrument elevation (m RL): 20.79
2. Ground surface elevation (mRL): 30.59
3. Water level was measured manually on 31/05/2021, 10/06/2021 and 21/09/2022
4. Data logger instrument installed on 31/05/2021
5. Rainfall data from BOM, station 66037, downloaded 10/10/2022

JBS&G
St. George Hospital
Kogarah, NSW
GROUNDWATER MONITORING
BH01

PSM4370-003L | **Figure 13**

Borehole ID

BH02

Engineering Log - Non Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	31/05/2021
Project Name:	St George Hospital	Completed:	31/05/2021
Hole Location:	Refer to Figure 1	Logged By:	IZ/GF
Hole Position:	327561.0 m E 6240042.0 m N GDA2020	Checked By:	AS

Drill Model and Mounting:	JK 308 Track mounted	Inclination:	-90°	RL Surface:	31.10 m		
Hole Diameter:	100 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								*Soil Description*					*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		B 0.20-0.50 m SPT 0.20 m Refusal at 0.2 m D 0.30 m SPT 0.50 m 10, 10, 14 N=24					CI	Asphalt; Thickness 50 mm Sandy CLAY with gravel: low to medium plasticity, grey and pale brown; sand fine to medium grained; gravel angular to sub-angular up to 5 mm.				0.00: ASHPLALT 0.05: FILL 0.40: NATURAL SOIL
AD/V		N				30.1	1		CI-CH	CLAY trace sand: medium to high plasticity, orange and grey; sand fine grained.	D to M	St to VSt		
						29.1	2							
						28.1	3			Becoming grey at 3.5 m.				
						27.1	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

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Soil and rock descriptions in accordance with AS 1726:2017

Engineering Log - Non Cored Borehole

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Hole Position:	327561.0 m E 6240042.0 m N GDA2020	Checked By:	AS

Drill Model and Mounting:	JK 308 Track mounted	Inclination:	-90°	RL Surface:	31.10 m		
Hole Diameter:	100 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N							CI-CH	CLAY trace sand: medium to high plasticity, orange and grey; sand fine grained. *(continued)* Becoming grey and pale red.	D to M	St to VSt		
										Auger V-bit refusal.				
										Continued on cored borehole sheet				
						25.1	6							
						24.1	7							
						23.1	8							
						22.1	9							

Method
AD/T - Auger drilling TC bit
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Penetration
No resistance through to refusal

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Soil and rock descriptions in accordance with AS 1726:2017

Engineering Log - Cored Borehole

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Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 31.10 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ●- Axial ○- Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
								Continued from non-cored borehole sheet				
NMLC		58	5.60m C-1	96	25.1	6		NO CORE: 130 mm.				
								CLAY trace sand: medium to high plasticity, pale pink and grey; sand fine grained.				PP = 60 kPa, 70 kPa PP = 150 kPa, 110 kPa, 180 kPa
								SANDSTONE: medium to coarse grained, brown, orange grey with some white, very thinly bedded, cross-bedding up to 10°.				SM, 0°, CL & Sand, PR, RF, 30 mm
			6.50m C-1 Is(50) d=1.54 a=2.62 MPa					Becoming coarse grained sand.				SM, 0°, CL & Sand, PR, RF, 80 mm, soft SM, 0°, CL & Sand, PR, RF, 25 mm, soft BP x 2, 0°, CL & Sand, PR, RF, 2 mm SM, 0°, CL & Sand, PR, RF, 25 mm, soft
					24.1	7		Becoming pale grey and laminated with Siltstone at 6.8m.				FZ, 0°, S, PR, RF, 80 mm BP, 0°, CL & Sand, PR, RF, 2 mm
			7.25m C-1 Is(50) d=0.26 a=0.13 MPa					Siltstone laminations at 7.35 m, 100 mm thick.				SS, 10°, CL & RF, PR, RF, 30 mm BP, 0°, S, PR, RF SM, 10°, CL & Fe, PR, RF, 10 mm JT, 15°, CN, CU, RF SM, 10°, CL & Sand, PR, RF, 10 mm BP, 0°, CN, CU, RF, 1 mm BP, 5°, CN, PR, RF BP, 0°, S, PR, RF, 1 mm SM, 0°, CL, PR, RF, 10 mm JT, 10°, CN, PR, RF
					23.1	8						SM, 8°, CL & Sand, PR, RF, 40 mm, soft DB
			8.30m C-1 Is(50) d=0.38 a=0.57 MPa									BP, 0°, CN, PR, RF
		94	C-2 8.50m	100								
			9.10m C-1 Is(50) d=0.65 a=0.73 MPa		22.1	9		Siltstone laminations at 9.2 m, 30 mm thick.				
								Clay band of extremely weathered Sandstone at 9.32 m, 110 mm thick.				SM, 0°, CL & Sand, PR, RF, 110 mm
			9.90m C-1 Is(50) d=0.1 a=0.06 MPa					Clay band of extremely weathered Sandstone at 9.75 m, 80 mm.				SM, 0°, CL & Sand, PR, RF, 20 mm SM, 0°, CL & Sand, PR, RF, 30 mm

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Water
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Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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Strength
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Infilling/Coating
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Barrel Type and Length: — Bearing: — Datum: AHD — Operator: JK Drilling

Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering (XW HW MW SW FR)	Strength Is(50) ● - Axial ○ - Diametral (VL L M H VH EH)	Defect Spacing (mm) (<20 60 200 600 1000)	Defect Descriptions / Comments: Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
								Clay band of extremely weathered Sandstone at 9.93 m, 100 mm thick.				SM, 0°, CL & Sand, PR, RF, 20 mm SM, 10°, CL & Sand, PR, RF, 100 mm, soft
								Hole Terminated at 10.00 m				
					20.1	11						
					19.1	12						
					18.1	13						
					17.1	14						

Method
AD/T - Auger drilling TC bit
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WB - Washbore
HQ3- Wireline core (63.5 mm)
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PT - Push tube

Water
▷ Inflow
◁ Partial Loss
◀ Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

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

JBS&G

St. George Hospital

Kogarah, NSW

STAGE 3 GEOTECHNICAL INVESTIGATION

CORE PHOTOGRAPHY - BH02

PSM4370-003L	**Appendix B**

Borehole ID

BH04

Engineering Log - Non Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	02/06/2021
Project Name:	St George Hospital	Completed:	02/06/2021
Hole Location:	Refer to Figure 1	Logged By:	IZ/GF
Hole Position:	327577.0 m E 6240043.0 m N GDA2020	Checked By:	AS

Drill Model and Mounting:	JK 308 Track mounted	Inclination:	-90°	RL Surface:	30.85 m		
Hole Diameter:	100 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								*Soil Description*					*Observations*
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Colour, structure, plasticity, additional	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		B 0.30-0.75 m D 0.30 m SPT 0.30 m 10, 6, 8 N=14 SPT 1.00 m 2, 1, 1 N=2 SPT 2.00 m 8, 3, 3 N=6 SPT 3.00 m 1, 6, 9 N=15		29.9 28.9 27.9 26.9	1 2 3 4		SC CI-CH	Asphalt; Thickness 50 mm Clayey SAND with gravel: fine to coarse grained, well graded, sub-angular to angular, grey and pale brown; clay low plasticity; gravel medium grained up to 10 mm angular to sub-angular. CLAY trace sand trace gravel: medium to high plasticity, pale pink and grey; sand fine grained; gravel fine grained up to 5 mm angular to sub-angular. Occasional gravel up to 10 mm at 20 mm. Concrete fragment observed from SPT at 2.33 m. Becoming red and grey at 3.2 m. Continued on cored borehole sheet	D to M	St S F to St St to VSt		0.00: ASHPHALT 0.05: FILL 0.45: NATURAL SOIL

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance through to refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

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

Soil and rock descriptions in accordance with AS 1726:2017

Engineering Log - Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	02/06/2021
Project Name:	St George Hospital	Completed:	02/06/2021
Hole Location:	Refer to Figure 1	Logged By:	IZ/GF
Hole Position:	327577.0 m E 6240043.0 m N GDA2020	Checked By:	AS

Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 30.85 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							***Rock Substance***				***Rock Mass Defects***	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					29.9	1						
					28.9	2						
					27.9	3						
					26.9	4		Continued from non-cored borehole sheet				
NMLC								NO CORE: 840 mm.				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
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FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
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Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
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BSH - Bedding Shear
DB - Drilling Break

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SN - Stain
VN - Veneer
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RF - Rock fragments
G - Gravel
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Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
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See Explanatory Notes for details of abbreviations and basis of descriptions.

Engineering Log - Cored Borehole

Project No.: PSM4370

Client:	JBS&G	Commenced:	02/06/2021
Project Name:	St George Hospital	Completed:	02/06/2021
Hole Location:	Refer to Figure 1	Logged By:	IZ/GF
Hole Position:	327577.0 m E 6240043.0 m N GDA2020	Checked By:	AS

Drill Model and Mounting: JK 308 Track mounted | Inclination: -90° | RL Surface: 30.85 m
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	SAMPLES & FIELD TESTS	TCR (%)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK TYPE: Colour, grain size, structure (texture, fabric, mineral composition, hardness, alteration, cementation, etc as applicable), inclusions and minor components	Weathering XW HW MW SW FR	Strength Is(50) ●- Axial ○- Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC					24.9	6		NO CORE: 840 mm.*(continued)*				
								Clayey SAND: fine to coarse grained, brown and grey; clay low to medium plasticity.				PP = 110 kPa, 150 kPa, 160 kPa PP = 230 kPa, 250 kPa, 250 kPa PP = 80 kPa, 90 kPa, 100 kPa
								CLAY: medium to high plasticity, pale grey to medium grey, very stiff to hard.				PP = 390 kPa, 400 kPa, 400 kPa PP = 360 kPa, 460 kPa, 490 kPa PP = 450 kPa, 470 kPa, 550 kPa PP = 500 kPa, 520 kPa, 480 kPa
			6.50m C-1					SANDSTONE: coarse grained, brown orange and grey, distinctly very thinly cross-bedded, inclined up to 15°. Clay band at 6.53 m, 130 mm thick.				SS, 25°, CL, ST, RF, 100 mm PP = 120 kPa, 190 kPa, 200 kPa BP x 2, 0°, CN, PR, RF BP, 0°, CN, PR, RF BP, 0°, CN, PR, RF
			6.80m C-1 Is(50) d=0.39 a=0.4 MPa		23.9	7						
			7.50m C-1 Is(50) d=0.04 a=0.14 MPa									BP x 3, 0°, CN, PR, RF BP, 0°, CN, PR, RF
		84		100	22.9	8		Becoming fine to medium grained, pale grey and orange, cross-bedding inclined up to 10°.				BP, 0°, CL & Sand, PR, RF, 10 mm
			8.50m C-1 Is(50) d=0.03 a=0.05 MPa									BP, 0°, CL, PR, RF, 2 mm
			8.80m C-1 Is(50) d=0.1 a=0.1 MPa		21.9	9						BP, 0°, CL, PR, RF, 1 mm BP, 5°, CL, PR, RF, 2 mm BP, 3°, CL, PR, RF, 2 mm
			9.50m C-1 Is(50) d=0.6 a=0.9 MPa									SM, 30°, CL & Sand, PR, RF, 60 mm SM, 30°, CL & Sand, PR, RF, 30 mm SM, 40°, CL & Sand, PR, RF, 20 mm SM, 0°, CL & Sand, PR, RF, 10 mm BP, 0°, CN, PR, RF BP, 0°, CN, PR, RF BP, 0°, CL, PR, RF, 1 mm DB
		89	10.00m	100								

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Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
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PSM

Engineering Log - Cored Borehole

Project No.: PSM4370

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Project Name:	St George Hospital	Completed:	02/06/2021
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			10.10m C-1 Is(50) d=0.6 a=0.7 MPa						MW–SW	● M		60–200	BP, 20°, CN, PR, RF SM, 0°, CL, PR, RF, 5 mm
								Hole Terminated at 10.20 m					
					19.9	11							
					18.9	12							
					17.9	13							
					16.9	14							

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- PQ3- Wireline core (85.0 mm)
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Water
- ▷ Inflow
- ◁ Partial Loss
- ◀ Complete Loss

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- POL - Polished
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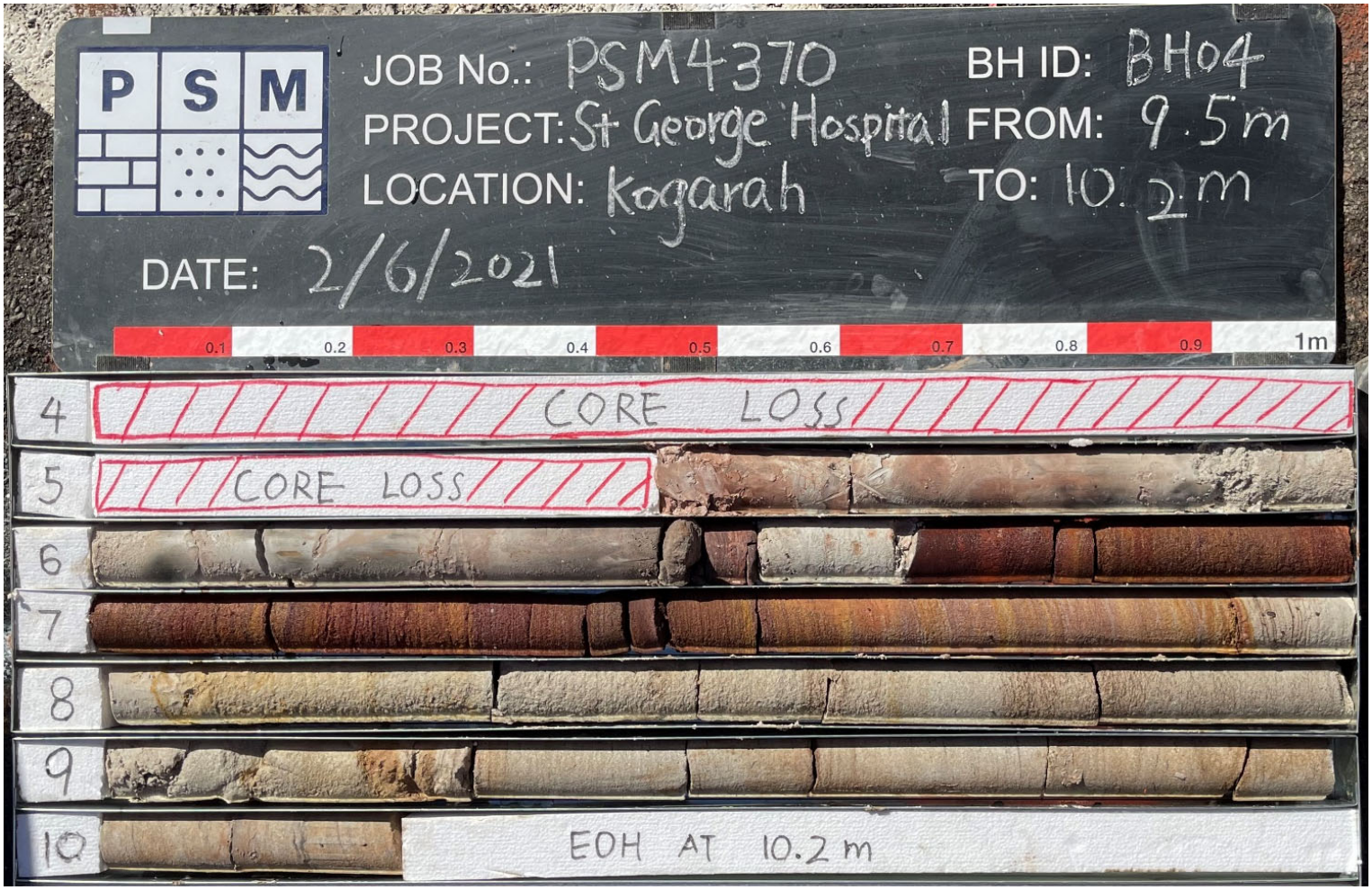
See Explanatory Notes for details of abbreviations and basis of descriptions.



JBS&G

St. George Hospital

Kogarah, NSW

STAGE 3 GEOTECHNICAL INVESTIGATION

CORE PHOTOGRAPHY - BH04

PSM4370-003L	**Appendix B**