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SPECIALISTS MANAGING THE EARTH

GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL, WAHROONGA

Taylor Thomson Whitting
Level 3, 48 Chandos Street, St Leonards, NSW, 2065

GEOTLCOV23462AA-AD
29 April 2008

Coffey Geotechnics Pty Ltd ABN 93 050 929 483
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30 April 2008

Taylor Thomson Whitting
Level 3
48 Chandos Street
ST LEONARDS NSW 2065

Attention: Barry Young

Dear Barry,

RE: Geotechnical Investigation and Report for SAN Hospital, Wahroonga

We are pleased to submit our geotechnical investigation report for SAN Hospital, in Wahroonga, Sydney.

If you have any comments or queries, please contact either Mr Sam Henwood or the undersigned on 99111000.

For and on behalf of Coffey Geotechnics Pty Ltd

Peter Waddell

Peter Waddell

Principal Geotechnical Engineer

Distribution: Original held by Coffey Geotechnics Pty Ltd
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4.2.3 Groundwater

Groundwater seepage was only observed in three boreholes surrounding the proposed Building 3 site. Within boreholes CBH1, CBH7 and CBH18 seepage was observed at depths of 3.5m, 1.0m and 5.5m respectively. Within the cored boreholes, water was used as a drilling fluid which prevented groundwater observations.

It should be noted that groundwater levels are subject to variation due to the influence of rainfall, temperature, local drainage and the seasons. There may also be the potential for development of perched groundwater tables following periods of rainfall.

4.3 Laboratory Test Results

The six CBR test were carried out in potential subgrade soils for road pavements. CBR values varied from 2% to 10%.

Testing of pH, Sulphate and Chloride was carried out on six samples from fill and resicual soil. Values for pH were found to vary from 4.7 to 8.1. The Sulphate and Chloride levels obtained from the tests were generally low with sulphate levels varying from 33 to 78 mg/kg (SO_4) and chloride levels from 2 to 290 mg/kg (Cl).

5 DISCUSSION AND RECOMMENDATIONS

Comments relevant to each separate building are provided in sections 5.1 to 5.4. Recommendations relevant to Buildings 1 to 3 are presented in sections 5.5 to 5.10. Earthquake load factors are provided for Buildings 1 to 4 in section 5.11.

5.1 Building 1

The subsurface conditions across the Building 1 site generally consist of fill, overlying a thin layer of residual soil, overlying sandstone. The existing car park was constructed by cut and fill techniques, with the eastern side of the car park cut into the natural ground and the western side filled up to 2.5m (within CBH15). The fill generally consists of Sandy Clay and Clayey Sand. In the absence of fill placement records and compaction control test results, the fill should be considered to be uncontrolled.

Preliminary sketches of the proposed car park show the base level to be at 154.6m AHD. With the depth to sandstone varying from 0.9m to 2.5m below current surface levels, it is likely that rock will be exposed or at relatively shallow depth below the proposed car park structure. With foundations spanning rock and soil there is a greater potential for differential settlements, compared to rock foundations. To avoid possible problems with differential settlement we recommend that building loads such as basement retaining walls and column loads be supported on rock. Strip, pad footings or bored piers could be adopted, depending on the bulk excavation levels and the depth to bedrock. Figure 4 shows cross sections through the site with inferred rock levels.

5.2 Building 2

The subsurface conditions across the Building 2 site generally consist of fill, overlying a thin layer of residual soil, overlying sandstone. Although the surface level of the existing car park falls at the eastern end this is where the greatest thickness of fill was observed and probably indicates the presence of a minor gully that was filled as part of the car park construction. Fill thickness varies from 0.2m at the

CONTENTS

CONTENTS

A stairway leads to the basement from within the building. Within the basement in rooms titled "South Wing Switch Room" and the "Electrical Store Room", brick strip footings supporting a concrete slab associated with the ground floor were visible. The footings were bearing on shale which was clearly visible in the cut which forms the basement as shown in photo 1 below.

Photo 1: Basement wall to the left and shale bedrock exposure to the right

4.2 Sub surface conditions

4.2.1 Published Geology

The Sydney 1:100,000 Geological Sheet indicates the site locality spans the contact between Ashfield Shale and Hawkesbury Sandstone. Ashfield Shale is described as a black to dark grey shale and laminate, while Hawkesbury Sandstone is described as medium to coarse grained quartz sandstone, very minor shale and laminate lenses.

4.2.2 Sub Surface Conditions

For a description of the subsurface conditions encountered at the borehole locations, refer to the Engineering Logs presented in Appendix A. Based on the information obtained from the boreholes, a general geotechnical model has been developed and is presented in Table 4.1. Sections showing the general geology for each building are also shown on Figures 4, 5 and 6.

1 INTRODUCTION

This report presents the results of a geotechnical investigation carried out by Coffey Geotechnics Pty Ltd (Coffey) for the proposed additions to the Sydney Adventist Hospital (SAN), Wahroonga. The work was commissioned by Barry Young of Taylor Thomson Whitting (TTW) on behalf of Coffey Projects Pty Ltd and was carried out in general accordance with our fee proposal reference GEOTLCOV23464AA-AA, dated 4 February 2008.

This report presents the results of the fieldwork, laboratory testing and a summary of the ground conditions encountered. It also provides geotechnical assessment for each of the proposed structures which form part of the proposed site development.

2 PROJECT APPRECIATION

The existing SAN Hospital is located on the western side of Fox Valley Road and is bounded by The Comenarra Parkway to the south, Fox Valley Road to the east and Coups Creek to the west and north. Existing developments within the hospital grounds include multi-storey buildings, roads, car parks, sport facilities and landscaped grassed areas. There are four proposed additions to the hospital and these are labelled Building 1, 2, 3 and 4 as shown on the Site Plan in Figure 1. Details of the proposed improvements are as follows:

- Building 1: A new five storey multi deck car park to be built in the same area as an existing car park at grade.
- Building 2: A new four storey reinforced concrete framed building to replace an existing car park at grade.
- Building 3: A new building with a possible three storey basement.
- Building 4: An existing three storey brick building with modifications to load bearing internal walls within the eastern corner. The building will appear unchanged from the outside.

The objectives of the geotechnical investigation were to provide information on the subsurface conditions, a geotechnical model, and discussions and recommendations on relevant geotechnical aspects of the project.

An environmental assessment has also been carried out on this site and is detailed in a separate report

3 INVESTIGATION METHODOLOGY

3.1 Fieldwork

3.1.1 Buildings 1, 2, 3

Fieldwork to investigate Buildings 1, 2 and 3 was carried out from 10 to 25 March 2008 and comprised the drilling of 27 boreholes (CBH1 to CBH27).

The boreholes were drilled using a truck mounted drilling rig equipped with a continuous flight auger, to depths ranging between 1m and 12.36m with the exception of CBH26 and CBH27 where a hand auger was used to depths of 0.1m and 0.2m respectively. The boreholes were augered in soils using a solid flight auger and a steel V shaped bit or tungsten carbide bit. Standard Penetration Testing was carried

out in all boreholes to assess strength and to obtain samples for logging and laboratory analysis. Upon encountering rock, diamond coring techniques were used to advance the boreholes and to obtain core for analysis

A Coffey engineering geologist monitored the fieldwork on a full-time basis and recorded an engineering log of the subsurface profile observed at each location

Water level readings have been made in the drill holes at times and under conditions stated on the borehole logs. In cored boreholes, water was used as a drilling fluid and groundwater levels could not be monitored. It must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors

Borehole locations were measured by tape relative to site boundaries. Test elevations were measured by staff and dumpy level to a datum of 162.54m AHD located within the hospital grounds.

Engineering logs of the boreholes are presented in Appendix A, together with colour core photographs and Explanation Sheets defining the terms and symbols used.

3.1.2 Building 4 Assessment

A site visit to Building 4 was carried out on 28 March 2008. The brick building is generally three stories high with a basement and is inter connected to new structures along the north western and south western walls. The assessment involved walking through the existing building and looking at the existing footings through access doors in the basement. The assessment took into consideration the following:

- Construction materials used in existing structure.
- Condition assessment of the walls and floors of the structure
- Assessment of topography surrounding the building.
- Assessment of the footings for the existing building.

3.2 Laboratory Testing

Six soaked CBR tests were carried out on bulk samples obtained from CBH7, CBH10, CBH11, CBH14, CBH15 and CBH18. Six samples from CBH1, CBH8, CBH12, CBH13, CBH15 and CBH16 were tested for pH, sulphate and chloride content

The results of the CBR, pH, Sulphate and Chloride content tests are presented in Appendix C.

Rock point load strength index tests were carried out on rock core and the results are presented on the engineering logs.

4 RESULTS OF THE INVESTIGATION

4.1 Site Descriptions

4.1.1 Building 1

The proposed Building 1 site is located along the western perimeter of the hospital where currently a level car park is situated. The land adjacent to the car park generally slopes downwards to the west, with the car park having been cut into the slope along the eastern and filled along the western boundaries respectively. The fill was estimated to be 2m high at the north western end of the car park. Batter angles of 18° and 19° were measured for the cut and fill sections respectively using a hand held clinometer.

To the west of the car park was a well maintained grassed strip of land approximately 20m wide. Further west the land falls sharply and the vegetation consists of bushes and mature trees.

4.1.2 Building 2

The proposed Building 2 site is located along the central northern perimeter of the hospital where a car park is situated. In this area, the land falls to the north at an angle of 3° to 4° with the car park terraced over 3 levels to accommodate the slope. There was minor cut and fill earthworks estimated at 1m height associated with the terracing. The eastern end of the car park is lower than the western end and has been filled where a former gully was located.

Adjacent to the north west of the car park is a grassed drainage basin. The basin is approximately 2m deep and in the base is a galvanised steel grill probably associated with a drainage system. Beyond the basin the land slopes downwards to the north towards Coups Creek where dense vegetation is present.

4.1.3 Building 3

The detail and location of proposed Building 3 was not finalised at the time this report was prepared, however we understand it is to be located adjacent and to the south of the proposed Building 1 site. In this area is a grassed drainage basin similar to that found in the Building 2 area. The basin is 2m deep and has a galvanised steel grill and manhole in the base. At the western end of the basin is a 6m wide well maintained grassed crest. Beyond this, the land falls at an angle of approximately 18° to the west and is vegetated with thick grass. At the base of the slope are mature trees and bushes. Fragments of broken brick observed on the surface at the northern end of the basin suggest that the basin walls may have been constructed using fill material.

Adjacent to the south of the basin is a car park. The south western end of the car park has been raised approximately 1.5m above the surrounding ground level. To the east of the basin are two single storey buildings. An in-ground swimming pool is located to the northeast of the basin.

4.1.4 Building 4

Building 4 is an existing three storey brick structure located in the eastern area of the hospital. The building has a basement along its south eastern side and is inter-connected to new structures along the north western and south western walls. The land surrounding the building generally slopes down to the east.

TABLE 1: SUBSURFACE PROFILE AT TEST LOCATIONS AND GEOTECHNICAL MODEL

Unit	Description	Thickness of Unit (m)[1]	R.L. Top of Layer (m AHD) [1]
Unit 1 – Fill	Bitumen and Roadbase for boreholes excavated in car parks overlying silty sand, clayey sand, sandy clay and clay, with some sandstone gravel up to cobbles size, concrete rubble, organic fragments and tree roots.	0.2 to 6.8	156.5 to 162.9
Unit 2 – Residual	Typically • Sandy Clay and Clay: stiff, low to high plasticity, orange brown, pale grey and red • Silty Sand and Sand: fine to medium grained, brownish grey	0 to 1.2	154.2 to 162.7
Unit 3 – Sandstone	Unit 3A typically: • Very low to medium strength, yellow, red, orange, grey, extremely to moderately weathered • Class V and IV sandstone[2]	0 to 3.7	151.8 to 162.2
	Unit 3B typically: • Medium to high strength, grey, yellow, orange, red and brown, moderately weathered to fresh • Class III or better sandstone[2]	-	149.7 to 161.0
Unit 4 – Shale	Found only beneath Building 4. Very low to medium strength, highly to moderately weathered, grey and orange shale. Estimate Class IV shale [2]	-	Not measured

Notes:

(1) The unit thickness and base of unit values are based on the boreholes and may not represent the extremes (maximum or minimum) values across the site.

(2) Rock classified in accordance with Pells *et al* (1998) "Foundations on Sandstone and Shale in the Sydney Region" Aust. Geomech. Jnl, Dec 1998.

western end up to 3.14m (within CBH17) at the eastern end. The fill consists of Clay, Sandy Clay, Sand, Silty Sand and Clayey Sand. In the absence of fill placement records and compaction control test results, the fill should be considered to be uncontrolled.

The level of the base of proposed Building 2 was not defined at the time this report was compiled. With the depth to sandstone varying from 0.6m to 3.6m below current surface levels, the base level of the proposed structure may lie within both soil and rock. With foundations spanning rock and soil there is a greater potential for differential settlements, compared to rock foundations. To avoid possible problems with differential settlement we recommend that building loads such as basement retaining walls and column loads be supported on rock. Strip, pad footings or bored piers could be adopted, depending on the bulk excavation levels and the depth to bedrock. Figure 6 shows cross sections through the site with inferred rock levels.

5.3 Building 3

The subsurface conditions across the Building 3 site consist of a relatively thick layer of fill overlying either a thin layer of residual soil or bearing directly on sandstone. Fill thickness varies from 2.7m (within CBH7) at the north eastern area of the proposed structure to 6.8m (within CBH18) at the south western end. The fill consists of Clay, Sandy Clay, Sand, Silty Sand and Clayey Sand. In the absence of fill placement records and compaction control test results, the fill should be considered to be uncontrolled.

Uncontrolled fill is not suitable for supporting building loads and as such, we recommend building loads be supported on rock using either piled footings or a shallow footing system. Strip, pad footings or bored piers could be adopted, depending on the bulk excavation levels and the depth to bedrock. Figure 6 shows cross sections through the site with inferred rock levels.

The proposed Building 3 may contain a three storey basement and as such will require retaining structures as part of the development. Retaining structures may take the form of a soldier piled wall with timber infill panels or shotcrete panels, although groundwater seepage could cause ground loss, requiring careful construction with infill panels being constructed in relatively short depth increments. Alternatively, contiguous piles could be used with provision for grouting between piles in the event that seepage and ground loss occurs between piles.

5.4 Building 4

Improvements to Building 4 will consist of modifications to load bearing internal walls within the eastern corner of the existing structure. Based on site observations, shale was observed beneath the existing concrete ground floor slab in the area where the improvements are proposed.

We recommend an allowable bearing pressure for the shale exposed beneath Building 4 of 1000kPa. Footings should be embedded at least 0.3m into the rock and the base cleaned of debris.

The existing basement in the eastern corner of the building was cut into the shale creating a near vertical unsupported rock cutting up to approximately 2m high in places. New footings for load bearing walls will need to be placed a distance of at least 2 footing widths from the edge of any rock cutting. If this is not feasible, our preference would be to excavate the shale to the base of the existing cut and extend the footing. Alternatively, a reduction in the allowable bearing pressure to 600kPa and an inspection by a geotechnical engineer to observe the condition of the near vertical rock face will be

required. Following the inspection, further recommendations such as the removal of any loose rock, placement of rock dowels or shotcreting of exposed face may be required.

Settlement of footings should be less than 1% of the least footing dimension.

5.5 Site Preparation and Excavation Conditions

If fill is used to support structures or pavements it will need to be excavated and re-compacted if suitable, or replaced with an imported fill. Re-compacted clayey sands, sandy clays or imported granular fills that are to support floor slabs or pavements should be placed and compacted in maximum 200mm thick layers to at least 98% Standard Density Ratio at a moisture content within ±2% of Standard Optimum Moisture Content. Fill within 0.5m of pavement subgrade level should be compacted to at least 100% Standard Density Ratio.

Soils should be readily excavated using a tracked loader. The upper weathered sandstone bedrock is likely to be able to be excavated using a tracked excavator. The less weathered sandstone at depth will require ripping or the use of an impact hammer. Contractors should be provided with the borehole logs and core photographs and be required to make their own assessment of the suitability and productivity of specific plant.

5.6 Dewatering

Groundwater seepage was observed in three boreholes within the proposed Building 3 area during the investigation at ground levels varying from 153mAHD to 156.7mAHD. No groundwater seepage was observed in the other boreholes during the investigation, however, due to water being used as a drilling medium during rock coring, groundwater maybe present in excavations. Dewatering, if required, should be able to be achieved using standard sump and pump methods.

5.7 Support Requirements

5.7.1 Cut and Fill Batters and Slope Stability Issues

Excavations within compacted fill and residual soils are likely to stand temporarily at relatively steep slopes (between 1H:1V and 1.5H:1V). Such batters will be of marginal stability and are likely to suffer instability, particularly in wet weather. We recommend that allowance be made for laying back temporary excavations at 1.5H:1V where there is limited access required to the base of the excavation or 2H:1V where workers require access. Surcharge loads should be kept well clear of the crest of cuts

A batter angle of 26 ° (approximately 2H:1V) is recommended for permanent works. Retaining walls will be required where there is insufficient room to form unsupported batters.

5.7.2 Retaining Structures

Preliminary sketches of the proposed Building 1 car park show retaining structures associated with cut and fill earthworks. Buildings 2 and 3 are also likely to require retaining structures.

Where retaining walls are cantilevered or supported by a single row of anchors, and some wall movements can be tolerated, walls can be designed assuming a triangular earth pressure distribution using an earth pressure coefficient, K, of 0.4. A bulk unit weight of 20kN/m^3 should be assumed for Unit 1 and 2 materials. For weathered rock a bulk unit weight of 22kN/m^3 is recommended. Passive

pressure coefficients, K_p, of 2.5 may be assumed for the Unit 1 Fill and Unit 2 Residual Soil. A passive pressure coefficient, K_p, of 3.7 may be assumed for Unit 3A extremely weathered sandstone bedrock.

Lateral and vertical ground movements will be dependent on the design and construction of the retention system. For example, the use of higher earth pressure coefficients, tie-back anchor loads and stiffer walls will reduce lateral deflections.

Minimum wall movements of about 1% of retained wall height are required to cause the earth pressure coefficient to reduce to the active condition. Vertical movements could be expected to be of a similar order to the lateral movements. The extent of the horizontal movement behind the excavation face is typically between 1.5 and 3 times the excavated height.

Where ground anchors restrain retaining wall movement, or where significant movements cannot be tolerated, higher earth pressure coefficients should be adopted. We recommend an earth pressure coefficient of 0.5 for propped or anchored retaining walls where movements are restrained. However, it should be understood that walls designed for this higher coefficient would still undergo some lateral movements, depending on the nature of the wall and the construction sequences. To assess the extent of lateral movements, a detailed soil structure analysis (using programmes such as WALLAP) should be undertaken.

For preliminary design of retaining walls, which are anchored or strutted at several levels, design can be based on the trapezoidal earth pressure distribution as shown in Table 2.

TABLE 2: TRAPEZOIDAL PRESSURE DISTRIBUTION

Depth (m)	Horizontal Pressure (kPa)
0	$K.p_s$
0.25 H	$K\ (0.8.\gamma.H + p_s)$
0.75 H	$K\ (0.8.\gamma.H + p_s)$
H	$K.p_t$

Where:

K = Earth pressure coefficient which depends upon material type; whether movement needs to be limited as discussed above.

p_s = Design surcharge pressure (kPa).

H = Thickness of layer being retained (m).

γ = Unit weight (kN/m^3)

Hydrostatic pressures should be added to earth pressures unless walls can be provided with effective drainage, and pressures due to adjacent footings will also need to be taken into account. The above pressures assume level ground above the retaining wall. Surcharge loads should be added to earth pressures, as appropriate.

For the preliminary design of anchors, an allowable bond stress of 800kPa may be adopted for Class III or better (Unit 3B) sandstone where anchors have a bond length of between 3m and 7m in medium strength sandstone. Anchors should be checked for an anchor pullout failure mechanism assuming a 45° failure cone in addition to bond strength.

Where structures sensitive to ground movements lie close to the site, dilapidation surveys should be carried out prior to excavation. Numerical analysis should be carried out to assess the potential ground movement and interaction with the shoring wall design to control deflection to tolerable limits. Survey monitoring should also be carried out to confirm that movements are within the predicted range.

5.7.3 Vertical Excavations In Rock

Provision for the installation of support will be required where vertical excavations are made in rock. Specific rock support requirements in un-shored sections of excavations can only be assessed during excavation. An experienced geotechnical engineer/engineering geologist should carry out regular inspections as excavation progresses (at least every 2m depth of excavation). For preliminary design purposes the support guidelines presented in table 3 are recommended:

TABLE 3: VERTICAL EXCAVATION FACE SUPPORT REQUIREMENTS

Rock Class	Support
Class V and IV Sandstone (Unit 3A)	• Shoring wall; or • Anchors or Soil Nails, mesh supported by 0.5m long dowels and shotcrete (minimum 75 mm thick) or fibre reinforced shotcrete of fractured zones below shoring walls.
Class III Sandstone or better (Unit 3B)	• Generally only isolated rock bolting to support potentially unstable wedges. • Localised pattern rock bolting, mesh supported by 0.5m long dowels and shotcrete (minimum 75 mm thick) or fibre reinforced shotcrete of fractured zones. (Within CBH16, a 0.6m thick clay seam was observed at approximately 52mAHD which will likely require shotcrete and dowel support)

Where long-term support is required below the site retention system, anchors and rock bolts must be provided with a high level of corrosion protection if they cannot be maintained (i.e. inspected and replaced, if necessary). Stainless steel bolts or multiple layers of corrosion protection such as encapsulating plain or galvanised bolts in both grout and PVC sheaths may be required.

5.8 Foundations

Foundation design parameters for sandstone are provided in Table 4.

Open bored piles should be practical, although dewatering and temporary liners may be required for drilling in sand and/or if groundwater is encountered.

TABLE 4: ROCK FOUNDATION DESIGN PARAMETERS

Unit	Allowable Shaft Adhesion (kPa) [a]	Allowable Bearing Pressure (kPa) [b]
Unit 3A Class V and Class IV Sandstone	100	1000
Unit 3B Class III Sandstone or better	350	2000 – 5000 [c]

Note: (a) Assumes minimum embedment of 3 pile diameters into the relevant stratum
(b) Assumes a minimum embedment of 0.3m into the relevant bearing stratum.
(c) Value dependant on level of assessment carried out during construction (see Table 5).

For uplift capacity, the shaft adhesion should be multiplied by 0.6. In addition to shaft adhesion, the uplift capacity should be checked for a cone pullout failure mode assuming a cone angle of 70^0 considering the submerged weight of the soil or rock and adopting a factor of safety of 1 against pullout.

An experienced geotechnical engineer should observe the boring of the piles in order to assess the rock levels and to confirm the rock is suitable for the adopted design parameters. Within CBH16, located in the south eastern corner of proposed Building 3, a 0.6m thick clay seam was observed within the Unit 3B sandstone at a depth of approximately 9m below existing ground level. We recommend bored footings be carried through this seam. Where footings are designed to bear directly onto bedrock, the footing inspection and assessment requirements are provided in Table 5.

Footings designed using the parameters presented in Table 4 should result in settlements less than 1% of the footing width or diameter.

TABLE 5: FOOTING INSPECTION AND ASSESSMENT REQUIREMENTS

Rock Unit	Testing Requirements
Unit 3A	• Visual inspection of all pad footings • Observation of piling and correlation with borehole information
Unit 3B Design Bearing Pressure up to 2,000kPa	• Visual inspection of all pad footings • Observation of piling and correlation with borehole information
Unit 3B Design Bearing Pressure greater than 2,000kPa	• Visual inspection of all pad footings • Observation of piling and correlation with borehole information • Spoon testing or coring of at least 1/3 of footing locations

5.9 Pavement Design

CBR testing on potential subgrade soils for road pavements indicate values ranging from 2% to 10%. For design purposes, we recommend a CBR value of 2% be adopted subject to confirmation by a geotechnical engineer during construction

Pavement areas should be prepared by:

- Stripping all topsoil.
- Stripping all fill. Where fill is exposed at a depth of 1m below proposed subgrade level, remove to this level and proof roll in the presence of an experienced geotechnical engineer with a minimum of 6 passes of a smooth drum, 10 tonne roller. Soft or heaving areas will require further excavation and replacement.
- For other areas, proof roll at subgrade level with a minimum of 6 passes of a smooth drum, 10 tonne roller.
- Remove and replace soft or heaving areas.

5.10 Soil Aggressivity

Test results from Building 1 and 3 sites indicate that the fill and natural soils are not highly acidic and have low sulphate and chloride concentrations. Within the Building 2 site fill soils are mildly acidic, with pH values of 4.7 and 5.5, however, the tested sulphate and chloride concentrations were low. In consideration of this, we recommend a non-aggressive exposure classification in accordance with AS 2159-1995 for concrete in contact with all soils across the site.

5.11 Earthquake Loading Factor

Based on Australian Standard AS 1170.4-2007, *Structural Design Actions – Part 4: Earthquake Actions in Australia*, the site is assessed as having a sub soil class C_e – Shallow soil site.

6 LIMITATIONS

The findings within this report are the result of discrete/specific investigations methodologies used in accordance with normal practices and standards. Subsurface conditions can change over relatively short distances and the subsurface conditions revealed at the test locations may not be representative of subsurface conditions across the site. We recommend that a geotechnical engineer be engaged during construction to confirm the subsurface conditions are consistent with design assumptions.

Retaining wall design is complex and detailed soil structure interaction analysis may be required to assess shear stresses, bending moments and anchor loads in retaining walls. Coffey would be happy to assist in a detailed analysis of retaining walls for basements.

The reader's attention is drawn to the attached document entitled 'Important Information about your Coffey Report', which presents additional information on the uses and limitations of this report.

For and on behalf of Coffey Geotechnics Pty Ltd

Peter Waddell

Peter Waddell

Principal Geotechnical Engineer

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by 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 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 Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. 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 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 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 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 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 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.

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Important information about your **Coffey** Report

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 Coffey to work with other project design professionals who are affected by the report. Have 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 Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

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 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 Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters, Canberra, 1987.

BUILDING 2
- SAN CLINIC

DETAIL FIGURE 3

BUILDING 1

BUILDING 3

DETAIL FIGURE 2

BUILDING 4

FOX VALLEY ROAD

THE COMENARRA PARKWAY

LEGEND:

PROPOSED BUILDING
(LOCATIONS TO BE CONFIRMED)

EXISTING BUILDING

0 20 40 80 120

Scale (metres)

drawn	SH/LT
approved	
date	4/4/2008
scale	1:2000
original size	A3

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

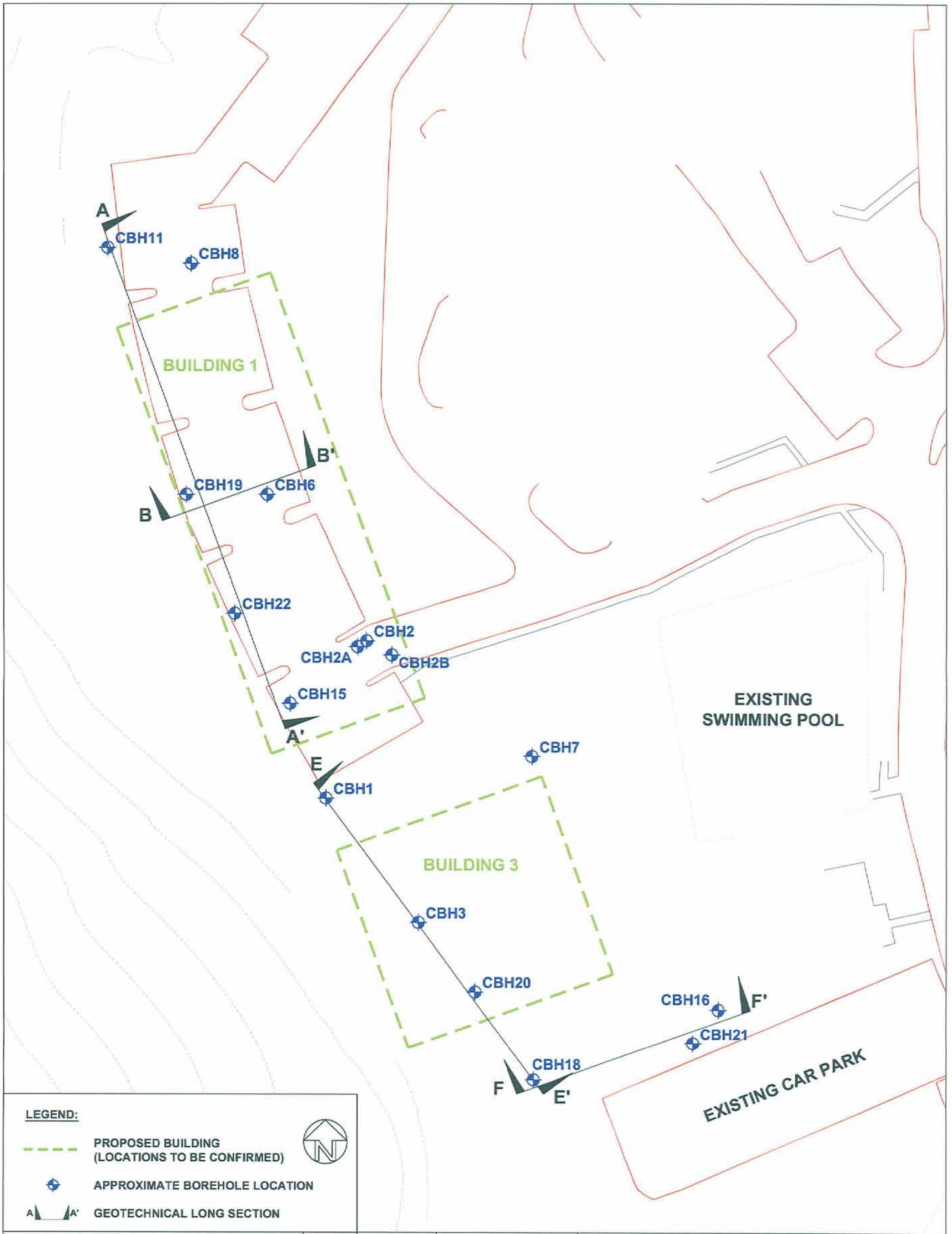
client: TAYLOR THOMSON WHITTING

project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

title: SITE PLAN

project no: GEOTLCOV23462AA

figure no: FIGURE 1



LEGEND:

PROPOSED BUILDING (LOCATIONS TO BE CONFIRMED)

APPROXIMATE BOREHOLE LOCATION

A A' GEOTECHNICAL LONG SECTION

0 5 10 20 30

Scale (metres)

drawn	SH/LT
approved	RJW
date	4/4/2008
scale	1:500
original size	A3

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SPECIALISTS MANAGING THE EARTH

client: TAYLOR THOMSON WHITTING

project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

title: DETAILED PLAN OF BUILDING 1 / 3 SHOWING BOREHOLE LOCATIONS

project no: GEOTLCOV23462AA

figure no: FIGURE 2

C'
CBH12
CBH17
EXISTING CAR PARK
CBH10
CBH23
CBH26
C
CBH9
BUILDING 2
- SAN CLINIC
CBH27
CBH14
D'
CBH25
CBH24
CBH13
CBH4
D
CBH5

LEGEND:

- PROPOSED BUILDING (LOCATIONS TO BE CONFIRMED)
- APPROXIMATE BOREHOLE LOCATION
- A / A' GEOTECHNICAL LONG SECTION

N

revision	description	drawn	approved	date

0 5 10 20 30
Scale (metres)

drawn	SH/LT
approved	
date	4/9/2023
scale	1:500
original size	A3

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SPECIALISTS MANAGING THE EARTH

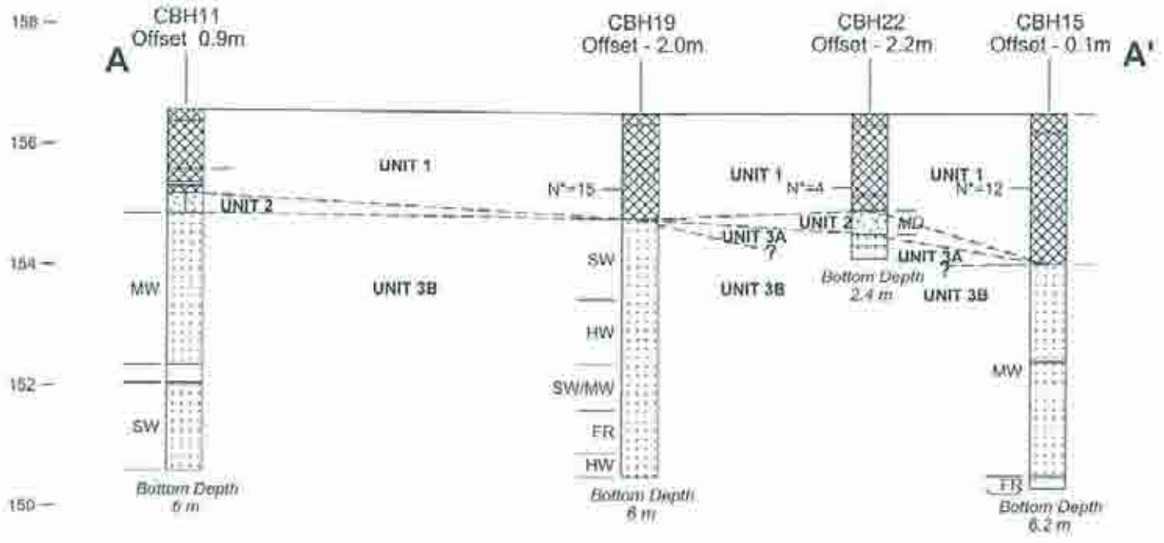
client: TAYLOR THOMSON WHITTING

project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

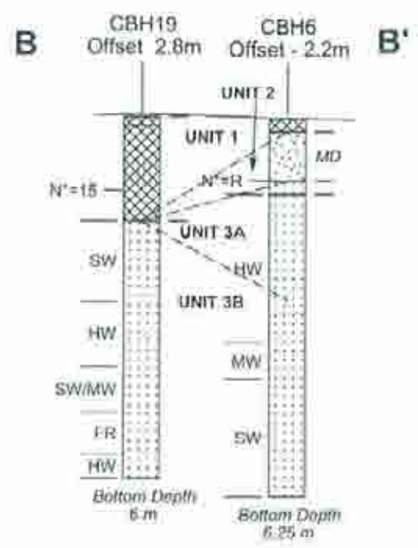
title: DETAILED PLAN OF BUILDING 2 SHOWING BOREHOLE LOCATIONS

project no: GEOTLCOV23462AA

figure no: FIGURE 3



SECTION A-A'



SECTION B-B'

LEGEND

- FILL
- SILTY SAND
- SAND
- SANDSTONE
- NO CORE

IV ROCK CLASSIFICATION (PELLS ET AL, 1998)

DX WEATHERING (SEE EXPLANATION SHEETS)

WATER LEVEL

N*=17 STANDARD PENETRATION TEST RESULT

revision	description	drawn	approved	date

0 5 10 20 30
Horizontal Scale (metres)

0 1 2 4 6
Vertical Scale (metres)

drawn	SH/LT
approved	
date	4/9/2008
scale	AS SHOWN
original size	A3

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client: TAYLOR THOMSON WHITTING

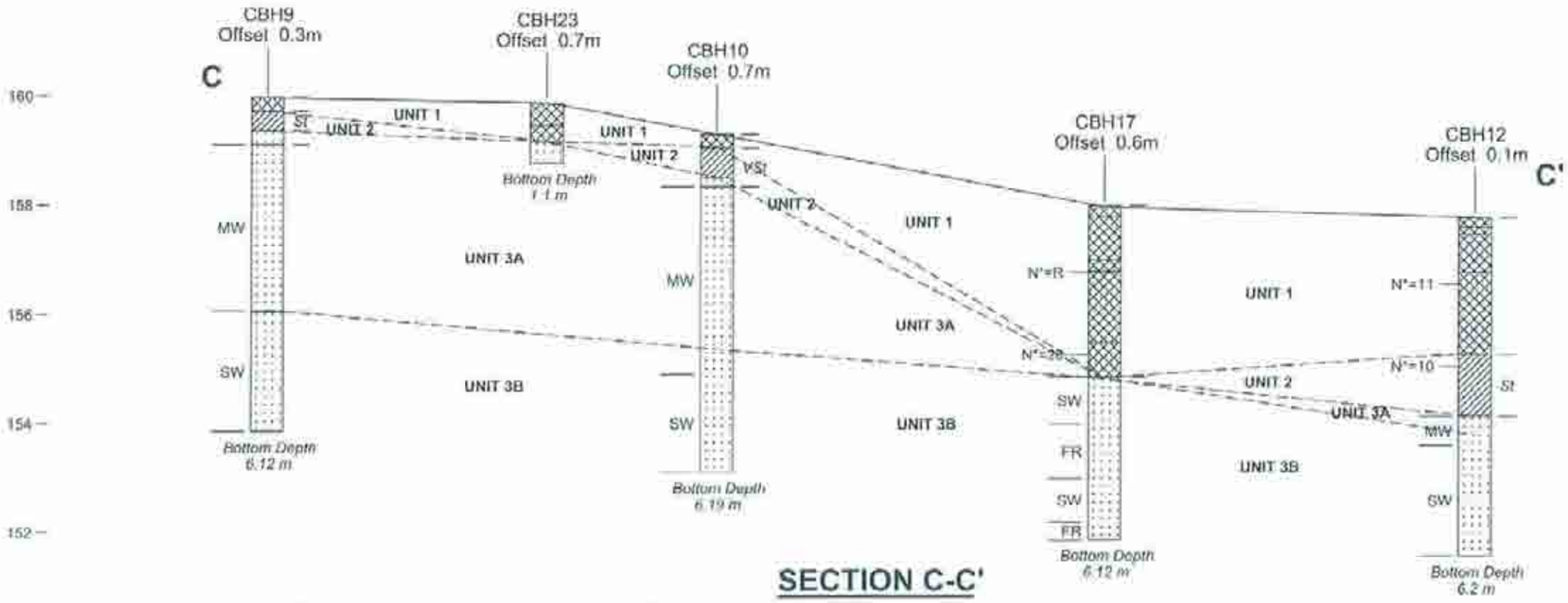
project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

title: GEOTECHNICAL LONG SECTIONS A-A' AND B-B'

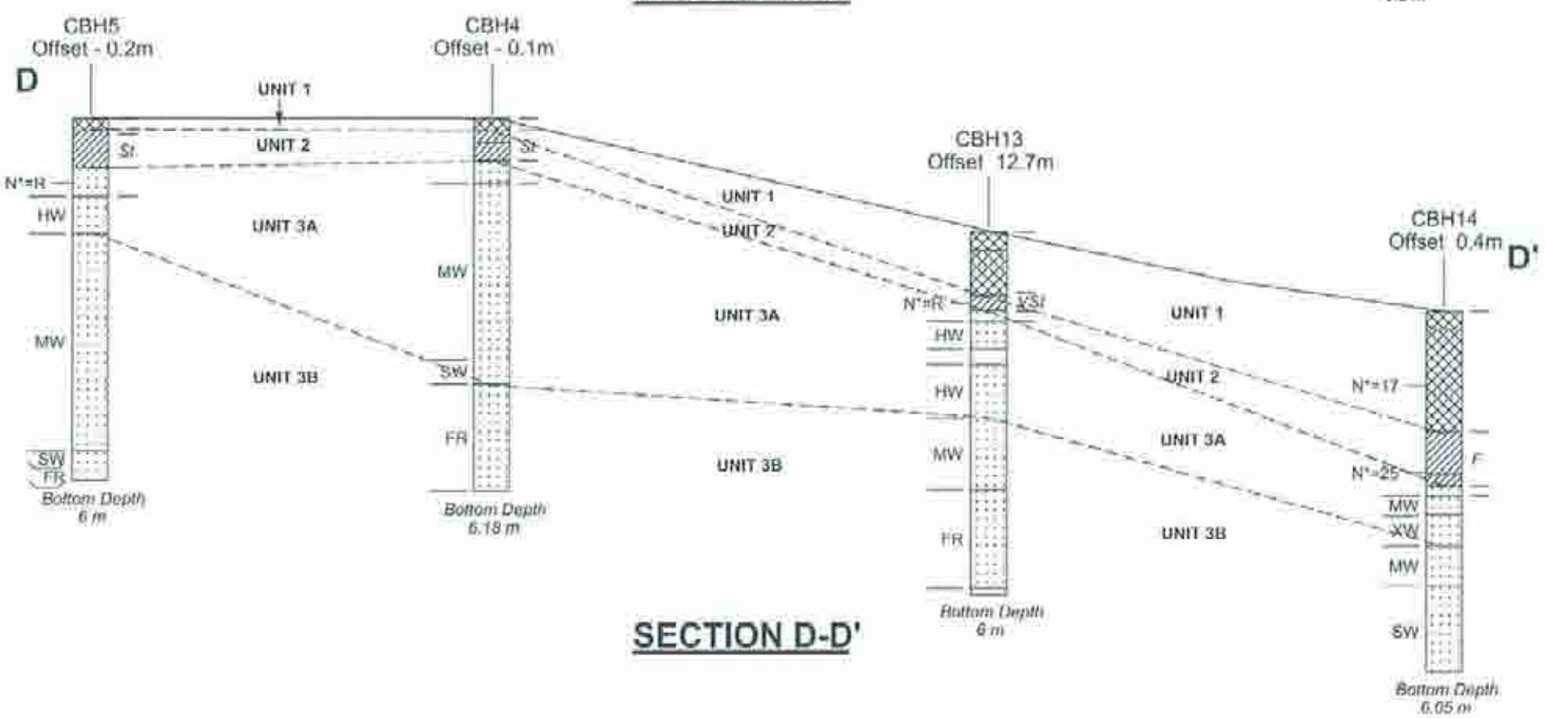
project no: GEOTLCOV23462AA

drawing no: FIGURE 4

A3LANDSCAPE - GEOTLCOV23462AA.GPJ COFFEY.GDT 8.4.08



SECTION C-C'



SECTION D-D'

LEGEND

- FILL
- SANDY CLAY
- CLAY
- SANDSTONE
- NO CORE

IV ROCK CLASSIFICATION (PELLS ET AL, 1998)

DX WEATHERING (SEE EXPLANATION SHEETS)

WATER LEVEL

N*=17 STANDARD PENETRATION TEST RESULT

revision	description	drawn	approved	date

0 5 10 20 30
Horizontal Scale (metres)
0 1 2 4 6
Vertical Scale (metres)

drawn	SH/LT
approved	
date	9/4/2008
scale	AS SHOWN
original size	A3

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

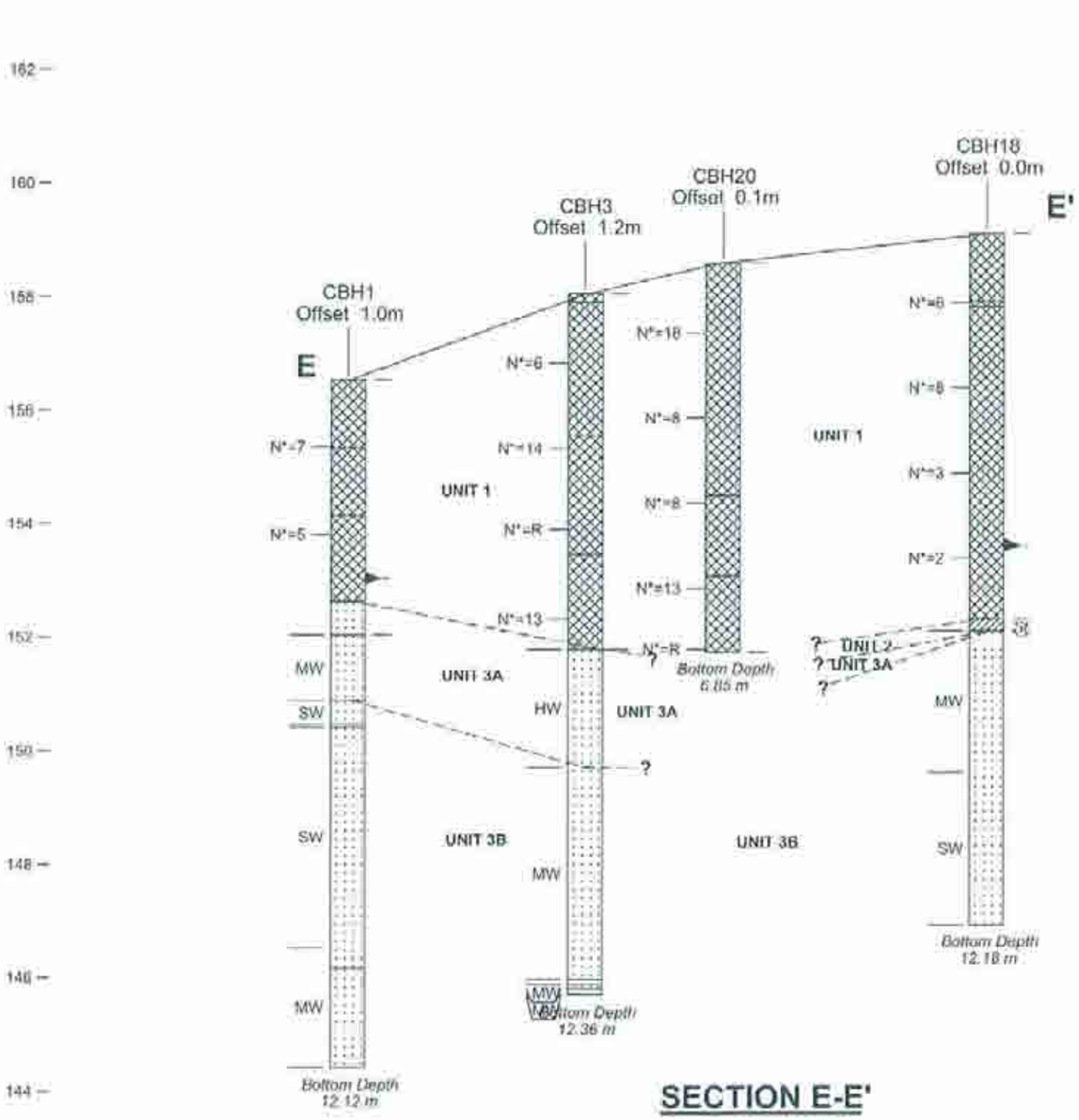
client: TAYLOR THOMSON WHITTING

project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

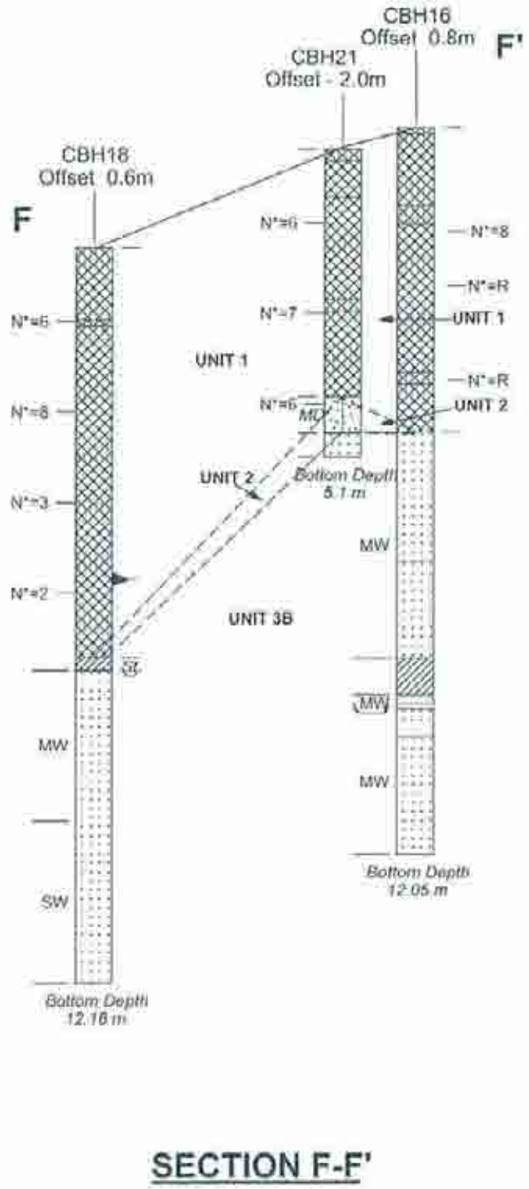
title: GEOTECHNICAL LONG SECTIONS C-C' AND D-D'

project no: GEOTLCOV23462AA

drawing no: FIGURE 5



SECTION E-E'



SECTION F-F'

LEGEND

- FILL
- CLAY
- SANDY CLAY
- SILTY SAND
- SANDSTONE
- NO CORE

IV ROCK CLASSIFICATION (PELLS ET AL, 1998)

DX WEATHERING (SEE EXPLANATION SHEETS)

WATER LEVEL

N*=17 STANDARD PENETRATION TEST RESULT

revision	description	drawn	approved	date

Horizontal Scale (metres): 0, 5, 10, 20, 30

Vertical Scale (metres): 0, 1, 2, 4, 6

drawn	SH/LT
approved	
date	4/4/2008
scale	AS SHOWN
original size	A3

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client: TAYLOR THOMSON WHITTING

project: GEOTECHNICAL INVESTIGATION AND REPORT FOR SAN HOSPITAL FOX VALLEY ROAD, WAHROONGA, NSW

title: GEOTECHNICAL LONG SECTIONS E-E' AND F-F'

project no: GEOTLCOV23462AA

drawing no. FIGURE 6

Appendix A

Engineering Borehole Logs, Core Photographs and Explanation Sheets

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Soil Description Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of unconsolidated or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 µm to 2.36 mm
	medium	200 µm to 600 µm
	fine	75 µm to 200 µm

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH s_u (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	–	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lentic/lenticular shape.	Moderately cemented	Effort required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

Extremely weathered material — **Structure and fabric** of parent rock visible

Residual soil — Structure and fabric of parent rock not visible

TRANSPORTED SOILS

Aeolian soil — Deposited by wind

Alluvial soil — Deposited by streams and rivers

Colluvial soil — Deposited on slopes (transported downslope by gravity).

Fill — Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.

Lacustrine soil — Deposited by lakes.

Marine soil — Deposited in ocean basins, bays, beaches and estuaries.

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Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 60 mm and basing fractions on estimated mass)						USC	PRIMARY NAME
COARSE GRAINED SOILS More than 50% of material is less than 63 mm is larger than 0.075 mm (A 0.075 mm particle is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.0 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.			GW	GRAVEL
			Predominantly one size or a range of sizes with more intermediate sizes missing.			GP	GRAVEL
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)			GM	SILTY GRAVEL
			Plastic fines (for identification procedures see CL below)			GC	CLAYEY GRAVEL
	SANDS More than half of coarse fraction is smaller than 2.0 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes missing			SW	SAND
			Predominantly one size or a range of sizes with some intermediate sizes missing.			SP	SAND
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).			SM	SILTY SAND
			Plastic fines (for identification procedures see CL below).			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm		IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.					
		DRY STRENGTH	**DILATANCY**	**TOUGHNESS**			
	SILTS & CLAYS Liquid limit less than 50	None to Low	Quick to slow	None		ML	SILT
		Medium to High	None	Medium		CL	CLAY
		Low to medium	Slow to very slow	Low		OL	ORGANIC SILT
	SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to very slow	Low to medium		MH	SILT
		High	None	High		CH	CLAY
		Medium to High	None	Low to medium		OH	ORGANIC CLAY
HIGHLY ORGANIC SOILS		Readily identified by colour, odour, spongy feel and frequently by fibrous texture.				Pt	PEAT

• Low plasticity – Liquid Limit W_L less than 35%. • Medium plasticity – W_L between 35% and 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length.	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	DEFINITION	DIAGRAM
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	

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Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Rock Substance In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using **soil** descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.

Defect Discontinuity or break in the continuity of a substance or substances.

Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME Simple rock names are used rather than precise geological classification.

PARTICLE SIZE Grain size terms for sandstone are:

Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm

FABRIC Terms for layering of penetrative fabric (eg. bedding, cleavage etc.) are:

Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on properties.
Distinct	Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	**RS**	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered Material	**XW**	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric still visible.
Highly Weathered Rock	**HW**	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of minerals in pores.
Moderately Weathered Rock	**MW**	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer recognisable.
Slightly Weathered Rock	**SW**	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
Fresh Rock	**FR**	Rock substance unaffected by weathering.

Notes on Weathering:

1. AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a distinction, DW may be used with the definition given in AS1726.
2. Where physical and chemical changes were caused by hot gasses and liquids associated with igneous rocks, the term "altered" may be substituted for "weathering" to give the abbreviations XA, HA, MA, SA and DA.

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, I_S50 (MPa)	Field Guide
Very Low	**VL**	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; pieces up to 30mm thick can be broken by finger pressure.
Low	**L**	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm blows of a pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	**M**	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	**H**	1 to 3	A piece of core 150mm long by 50mm can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	**VH**	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under hammer.
Extremely High	**EH**	More than 10	Specimen requires many blows with geological pick to break; rock rings under hammer.

Notes on Rock Substance Strength:

1. In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
2. The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
3. The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fail across the planar anisotropy) is typically 10 to 25 times the point load index (I_S50). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

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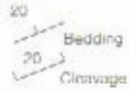
Rock Description Explanation Sheet (2 of 2)

COMMON DEFECTS IN ROCK MASSES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.			
Joint	A surface or crack across which the rock has little or no tensile strength, but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed.			
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.			
Crushed Seam (Note 3)	Seam with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.			
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.			
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in place.			

Notes on Defects:

1. Usually borenole logs show the true dip of defects and face sketches and sections the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms.

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

ROUGHNESS TERMS

Slickensided	Grooved or striated surface, usually polished
Polished	Shiny smooth surface
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper
Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper

COATING TERMS

Clean	No visible coating
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.

BLOCK SHAPE TERMS

Blocky	Approximately equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greate than cross section

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Engineering Log - Borehole

Borehole No.	CBH1
Sheet	1 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	10.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by	SH

drill model and mounting: Mobile Drill 880 | Easting: 323702.8 | slope: 90° | R.L. Surface: 156.5

hole diameter: 100 mm | Northing: 6266692.2 | bearing: | datum: AHD

drilling information

material substance

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADH				E + Bs					FILL: CLAYEY SAND: Medium grained, brown and pale brown, low plasticity clay.	D			FILL
				Bs + D									
				Bs + D + E	156	1							
				Bs					FILL: CLAY: Medium plasticity, grey	>Wp			
				SPT 2,2,5 N*=7	155	2							
					154				FILL: CLAY: Low to medium plasticity, brown, with some fine grained sand.				
				SPT 2,3,2 N*=5		3				>Wp			
ADT					153								V-bit refusal at 3.9m
				E	152	4			SANDSTONE: Fine grained, pale orange.				SANDSTONE
									Borehole CBH1 continued as cored hole				
					151	5							
						6							
					150	7							
					149	8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix

e.g. AD/T

support

N nil
M mud
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

- inflow or water level on date shown
- water inflow
- water outflow

notes, samples, tests

U_{63}	undisturbed sample 63mm diameter
U_{50}	undisturbed sample 50mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
N::	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on Unified Classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.18.08

Form GEO 5.3 Issue 3 Rev 2

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH1
Sheet	2 of 3
Project No:	GEOTLCOV23462AA
Client	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	10.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model & mounting: Mobile Drill B80 | Easting: 323702.8 | slope: 90° | R.L. Surface: 156.5

hole diameter: 100 mm Drilling fluid: | Northing: 6266692.2 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$I_{s(50)}$ MPa D diametral A axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			156	1								
			155	2								
			154	3								
		▶	153	4								
			152			Continued from non-cored borehole						
NMLC				5		SANDSTONE: Fine to medium grained, yellow and pale orange, indistinctly to distinctly bedded at 22°	MW		D 0.4 A 0.66	100		SM, Pt, RO, 2mm clay in fill, 20°. SM, PL, SO, 0°, 4mm clay infil SM, PL, SO, 6°, 4mm clay infil PT, PL, RO, 5°, VN SM, PL, SO, 0°, 2mm clay infil JT, PL, SO, 26°, CO
			151	6		SANDSTONE: Medium grained, pale grey, indistinctly to distinctly bedded at 22°. NO CORE: 0.04m	SW SW		D 0.58 A 0.04			PT, 20°, PL, RO, ROOTLETS
			150	7					D 0.68 A 0.61 D 0.58 A 0.41	100		PT, 22°, PL, RO, SANDY CLAY, 1MM PT, 22°, PL, RO, SANDY CLAY, 1MM PT, 22°, PL, RO, SANDY CLAY, 1MM JT, 50°, IR, RO, CO
			149	8								

method: GT mini tube; AS auger screwing; AD auger drilling; RR rollertricone; CB disk or blade bit; NMLC NMLC core; NQ, HQ, PQ wireline core

core-lift: casing used; barrel withdrawn

graphic log/core recovery: core recovered + graphic symbols indicate material; no core recovered

water: 10/1/98 water level on date shown; water in bore; partial drill fluid loss; complete drill fluid loss; water pressure test result (lugeons) for depth interval shown

weathering: FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type: JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity: PR planar; CU curved; UN undulating; ST stepped; IR irregular

roughness: VR very rough; RO rough; SO smooth; SL slickensided

coating: CN clean; SN stained; VN venier; CO coating

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.18.03

Form GEO 6.5 Issue 3 Rev 3

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH1
Sheet	3 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	10.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model & mounting: Mobile Drill B60 | Easting: 323702.8 | slope: -90° | R.L. Surface: 156.5

hole diameter: 100 mm Drilling fluid: | Northing: 6266802.2 | bearing: | datum AHD

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth (metres)	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	$I_{S(50)}$ MPa D-diametral A-axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
NMLC			148	9		Trace of pyrite mineralisation on defect surfaces.	SW		D 0.50 A 0.52	100		JT, 22°, PL, RO, CO JT, 15°, IR, RO, CN PT, 10°, IR, RO, CN PT, 5°, IR, RO, CN PT, 20°, UN, RO, CO
			147						D 0.98 A 0.34			
				10		9.98 - 10.37 - clay seams and fault.	MW					SM, 0°, PL, SO, LAMINATED CLAY, 70MM
			146			SANDSTONE: Medium grained, dark orange to pale grey; strong ferric alteration and effectly to distinctly bedded at 22°.			D 0.94 A 0.92	98		MAUL, 0°, PL, SI, CLAY, 2MM SM, 0°, IR, SO, CLAY, 30MM SM, 0°, PL, SO, CLAY, 100 MM JT, 70°, PL, SO, CLAY, 1MM JT, 80°, PL, RO, CLAY & IRON STAINING, 0.5MM
				11								
			145						D 0.64 A 0.46			PT, 15°, PL, SO, CLAY, 0.5MM JT, 70°, PL, RO, CO (IRON), 1MM
				12		CBH1 terminated at 12.12m						
			144									
				13								
			143									
				14								
			142									
				15								
			141									
				16								

method
- DT diatube
- AS auger screwing
- AD auger drilling
- RR roller/tricone
- CS class or blade bit
- NMLC NMLC core
- NQ, HQ, PQ wireline core

core-lift
- casing used
- barrel withdrawn

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

water
- 10/1/98 water level on date shown
- water inflow
- partial drill fluid loss
- complete drill fluid loss
- water pressure test result (Lugeons) for depth interval shown

weathering
- FR fresh
- SW slightly weathered
- MW moderately weathered
- HW highly weathered
- XW extremely weathered
- DW distinctly weathered (covers MW and HW)

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

defect type
- JT joint
- PT parting
- SM seam
- SZ sheared zone
- SS sheared surface
- CS crushed seam

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

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

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

Form GEO 5.5 Issue 3 Rev. 3

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4/3/08

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH*
scale	to scale		project no: GEOTLCOV23462AA	Photo no: CBH* 1 of *
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH2		
Sheet	1 of 1		
Project No:	GEOTLCOV23462AA		
Client:	Taylor Thomson Whitting	Date started:	10.3.2008
Principal:	Coffey Projects	Date completed:	10.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA	Logged by:	JA
Borehole Location:	Building 1	Checked by:	SH

drill model and mounting: Mobile Drill B60 | Easting: 323709.4 | slope: -90° | R.L. Surface: 156.7

hole diameter: 100 mm | Northing: 6265715.5 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT		NOT OBSERVED		E Bs C SPT >1 N =R	156	1			FILL: BITUMEN and ROADBASE FILL: CLAYEY SAND: Fine grained, brown, low to medium plasticity clay, with some sandstone gravel (15mm diameter) at 1.2m.	D			FILL TC bit refusal on concrete at 1.0m
					155	2			Borehole CBH2 terminated at 1.3m				
					154	3							
					153	4							
					152	5							
					151	6							
					150	7							
					149	8							

method
AS auger screwing* | AD auger drilling* | RR rollerbroond | W washbore | CT cable tool | HA hand auger | DT diatube | B blank bit | V V bit | T TC bit | *bit shown by suffix | ADT

support
N nil | C casing

penetration 1 2 3 4 — no resistance; ranging to refusal

water
1610/9B water level on date shown | water inflow | water outflow

notes, samples, tests
U_{ie} undisturbed sample 50mm diameter | U_{ix} undisturbed sample 63mm diameter | D disturbed sample | N standard penetration test (SPT) | N* SPT - sample recovered | Nc SPT with solid cone | V vane shear (kPa) | P pressuremeter | Bs bulk sample | E environmental sample | R refusal

classification symbols and soil description
based on unified classification system

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

consistency/density index
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

Form GEO 5.3 Issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY GDT 4.10.08

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH2A
Sheet	1 of 1
Project No	GEOTLCOV23462AA
Date started:	10.3.2008
Date completed.	10.3.2008
Logged by.	JA
Checked by:	SH

Client: Taylor Thomson Whitting

Principal: Coffey Projects

Project: 185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA

Borehole Location: Building 1

drill model and mounting: Mobile Cat 930 | Easting: 323707.66 | slope: -90° | R.L. Surface: 156.7

hole diameter: 100 mm | Northing: 6265714.9 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
AOT			NOT OBSERVED		156	1			FILL: BITUMEN and ROADBASE	D			FILL
									FILL: CLAYEY SAND: Fine grained, brown, low to medium plasticity clay, with some medium gravel.				TC bit refusal on concrete at 1.08m
					155	2			Borehole CBH2A terminated at 1.08m				
					154	3							
					153	4							
					152	5							
					151	6							
					150	7							
					149	8							

method

AS	auger screwing*
AD	auger drilling*
RR	rotary/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix	
e.g.	AOT

support

M	mud
C	casing
N	nil

penetration 1 2 3 4: no resistance; varying to refusal

water

- 10/1/08 water level on date shown
- water inflow
- water outflow

notes, samples, tests

U_{63}	undisturbed sample 50mm diameter
U_{50}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
W_p	plastic limit
W_L	liquid limit

consistency/density index

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

BOREHOLE GEOTLCOV23462AA GPJ COFFEY GDT 4.10.08

Form GEO 5A Issue 3.Rev1

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Engineering Log - Borehole

Borehole No.	CBH2B
Sheet	1 of 1
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	10.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 1
Checked by:	SH

drill model and mounting: Mobile Drill B80 | Easting: 323713.4 | slope: -90° | R.L. Surface: 156.9

hole diameter: 100 mm | Northing: 6265773 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT			▶		156	1			FILL: BITUMEN and ROADBASE	D			FILL
									FILL: CLAYEY SAND: Fine grained, brown, low to medium plasticity clay, with some medium grained gravel.				TC bit refusal on concrete at 1.6m
										W			
					155	2			Borehole CBH2B terminated at 1.6m				
					154	3							
					153	4							
					152	5							
					151	6							
					150	7							
					149	8							

method

AS	auger screwing*
AD	auger drilling*
RR	rollercone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	bankbit
V	V bit
T	TC bit

*bit shown by suffix

eg ADT

support

M	mud
C	casing
N	nil

penetration 1 2 3 4 — no resistance ranging to refusal

water

- 1(W)190 water level on date shown
- ▶ water inflow
- ◀ water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

BOREHOLE: GEOTLCOV23462AA.GPJ COFFEY.GDT 4.16.38

Form GEO 5.3 Issue 3 Rev 2

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH3
Sheet	1 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	11.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

Drill model and mounting: Mobile Drill B80 | Easting: 320710.4 | slope: -90° | R.L. Surface: 158.0

Hole diameter: 100 mm | Northing: 6285676.35 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc.	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ACV				E					FILL: SILTY SAND: Topsoil, fine grained, brown.	D			FILL
				Rs E					FILL: CLAY: Low to medium plasticity clay, pale grey and orange, with some sand.	<Wp			
				Rs									
				SPT 2,1,5 N*=6	157	1							
					156	2							
				SPT 5,5,9 N*=14					FILL: SAND: Medium grained, orange, with some sandstone gravel and clay. 5mm gravel, low to medium plasticity clay, sandstone cobble.	D			
					155	3							
					154	4							
				SPT 2,3,*3 N*=R									
					153	5			FILL: SANDY CLAY: Medium plasticity, medium grained sand, with some coarse gravel	<Wp			
									Tree roots at 5.5m>5.7m				Organic odour from base of hole
				SPT 9,5,5 N*=10					Stiffer clay layer 5.7m-5.9m				
					152	6							V-bit refusal at 6.26m
									Borehole CBH3 continued as cored hole				
					151	7							
					150	8							

method
AS auger screwing*
AD auger drilling*
RR roller/rhinohe
W washbore
CT cable tool
HA hand auger
DT dribble
R Wark bit
V V bit
T TC bit
*(bit shown by suffix e.g. ADT)

support
M mud N nil
C casing
penetration 1 2 3 4 — no resistance; rasping to refusal
water
1(1)98 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
BS bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Form GEO 5 3 Issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA GPJ COFFEY GDT 4.10.08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH3
Sheet	2 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	11.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model & mounting: Mobile Drill B60 | Easting: 323716.4 | slope: -90° | R.L. Surface: 158.0

hole diameter: 100 mm | Drilling fluid: | Northing: 6265676.35 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type, grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$I_{s(50)}$ MPa D- diam. A- axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			157	1								
			156	2								
			155	3								
			154	4								
			153	5								
			152	6		Continued from non-cored borehole						
NMLC			151	7		SANDSTONE: Medium grained orange and pale grey, indistinctly to distinctly bedded.	HW		D 0.18 A 0.15	100		PT, 0°, PL, RO, SN
												PT, 15°, PL, SO, CO
									D 0.36 A 0.29	95		SM, 0°, PL, SO, sandy clay, 50mm
			150	8								SM, 5°, PL, SO, sandy clay, 3mm
												SM, 15°, PL, SO, sandy clay, 3mm

method
- DT diatube
- AS auger screwing
- AD auger drilling
- RM rotoshrikone
- CB claw or blade bit
- NMLC NMLC core
- NQ, HQ, PQ wireline core

core-lift
- casing used
- barrel withdrawn

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

water
- 10/1/98 water level on date shown
- water inflow
- permeability (field test)
- complete drill fluid loss
- water pressure test result (bar or l/s) for depth interval shown

weathering
- FR fresh
- SW slightly weathered
- MW moderately weathered
- HW highly weathered
- XW extremely weathered
- DW distinctly weathered (covers MW and HW)

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

defect type
- JT joint
- PT parting
- SM seam
- SZ sheared zone
- SS sheared surface
- CS crushed seam

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

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

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

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.13.08

Form GEO 6.5 Issue 2 Rev 3

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH3
Sheet	3 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	10.3.2008
Principal:	Coffey Projects
Date completed:	11.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model & mounting: Mobile Diti 600 | Easting: 323716.4 | slope: -90° | R.L. Surface: 158.0

hole diameter: 100 mm Drilling fluid: | Northing: 6265076.35 | bearing: | datum: AHD

drilling information					material substance					rock mass defects		
method	core loss	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$I_{s(50)}$ MPa: D diametral, A axial	RQD %	defect spacing mm	defect description: type, orientation, planarity, roughness, coating, thickness (particulars / general)
NMLC			149	9		**SANDSTONE:** Medium grained orange and pale grey, indistinctly to distinctly bedded. *(continued)*	HW		D A 0.76 0.68	95		JT, 70°, UN, CN
							MW					
			148	10					D A 0.57 0.5			PT, 20°, PL, RO, SN PT, 20°, PL, SO, CO SM, 20°, PL, SO, clay, 3mm
			147	11					D A 0.34 0.4	95		JT, 65°, PL, SO, clay, 3mm, SM, 10°, UN, SO, clayey sand, 10mm SM, 10°, UN, SO, clayey sand, 10mm SM, 10°, UN, SO, clayey sand, 10mm PT, 5°, IR, RO, CN
			146	12					D A 0.1 0.1			SM, 0°, PL, SO, clay, 40mm
						NO CORE: 0.09m Clay seam, 260mm thick, from 12.07m - 12.33m NO CORE: 0.06m	MW		D A 0.31 0.24			SM, 6°, PL, SO, clay, 260mm
						CBH3 terminated at 12.46m	MW					
			145	13								
			144	14								
			143	15								
			142	16								

method
DT diatube
AS auger screwing
AD auger drilling
RR rollerbossing
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered - graphic symbols indicate material
no core recovered

water
10/1/08 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
water pressure test results (lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

CORED BOREHOLE GEOTLCOV23462AA.GPJ, COF_KEY.GLB 4.18.08

Form GEO 5.5 Issue 3 Rev 2

drawn	MB	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2023		title	ROCK CORE PHOTOGRAPH – CBH3
scale	to scale		project no: GEOTLCOV23462AA	Photo no: CBH3 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH4
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	11.3.2008
Principal:	Coffey Projects
Date completed:	11.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model and mounting: Mobile Drill B80 | Easting: 323070.7 | slope: -90° | R.L. Surface: 162.9

hole diameter: 100 mm | Northing: 6266657.3 | bearing: | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV / ADT			NOT MONITORED	E E + Bs Bs E	162	1		CL CI	FILL: BITUMEN and ROADBASE SANDY CLAY: Low plasticity, orange, fine grained sand. CLAY: Low plasticity, orange, friable, with some fine grained sand. SANDSTONE: Fine to medium grained, pale orange.	D <Wp	St		FILL RESIDUAL SOIL SANDSTONE V-bit refusal at 0.7m
							Borehole CBH4 continued as cored hole						
					161	2							
					160	3							
					159	4							
					158	5							
					157	6							
					156	7							
					155	8							

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT Delubie
B blank bit
V V bit
T TC bit
*bit shown by suffix e.g. ADT

support
M mud N nil
C casing

penetration
1 2 3 4
no resistance ranging to refusal

water
10/7/98 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{ex} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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 geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH4
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	11.3.2008
Principal:	Coffey Projects
Date completed:	11.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Drill 880 | Easting: 323870.7 | slope: 89° | R.L. Surface: 162.8

hole diameter: 100 mm Drilling fluid: | Northing: 6265857.3 | bearing: | datum: AHD

drilling information

method	core lift	water	RL	depth (metres)
			162	1
NMLC		NOT MONITORED	161	2
			160	3
			159	4
			158	5
			157	6
			156	7
			155	8

material substance

graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL, L, M, H, VH, EH)	$Is_{(50)}$ MPa (D-diametral, A-axial)	RQD %	defect spacing mm (30, 100, 300, 1000, 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
	Continued from non cored borehole						
	SANDSTONE: Fine grained, dark orange and pale grey, distinctly bedded with irregular weathering patterns.	MW		D 0.08 A 0.5	68		SM, 0°, PL, SO, clay, 30mm SM, 0°, PL, SO, clay, 30mm PT, 0°, PL, SO, clay, 0.5mm JT, 82°, UN, RO, CO, 1mm, fine tree root PT, 5°, PL, SO, clay, 1mm SM, 0°, PL, SO, clay, 30mm SM, 25°, PL, SO, clay, 10mm
				D 0.65 A 0.5			SM, 32°, PL, SO, sandy clay, 20mm PT, 0°, PL, SO, CN, fine roots PT, 0°, PL, SO, clay, 1mm JT, 25°, PL, SO, VN PT, 0°, PL, SO, clay, 2mm PT, 15°, PL, SO, CO PT, 5°, PL, SO, CO SM, 45°, IR, SO, clay, 2mm JT, 45°, PL, SO, CO, 1mm PT, 2°, PL, RO, CN
		SW		D 0.62 A 0.71			
	SANDSTONE: Medium grained, pale grey with bands of iron stained orange, distinctly bedded.	FR		D 1.31 A 1.45	92		PT, 0°, PL, SO, CO PT, 0°, PL, RO, SN PT, 0°, PL, RO, CN
				D 0.6 A 0.77			PT, 6°, PL, SO, CO PT, 2°, PL, RO, CN
	CBH4 terminated at 6.18m						

method
DT diatube; AS auger screwing; AD auger drilling; RR rotary/coring; CB claw or blade bit; NMLC NMLC core; NQ, HQ, PQ wireline core

core lift
casing used; barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols indicate material; no core recovered

water
10/1/98 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss; water pressure test result (Lugeon) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (colours MW and HW)

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

defect type
JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness
VR very rough; RO rough; SO smooth; SL slickensided

coating
CN clean; SN stained; VN veneer; CO coating

Form GEO 5.5 (Issue 3 Rev 1)

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.18.08

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2023		title	ROCK CORE PHOTOGRAPH – CBH4
scale	Not to scale			
original size	A4		project no. GEOTLCOV23462AA	Photo no. CBH4 1 of 1

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH5
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Date started:	11.3.2008
Date completed.	12.3.2008
Logged by:	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project: *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: *Building 2*

drill model and mounting: Mobile Drill R80 | Easting: 323839.1 | slope: -90° | R.L. Surface: 162.9

hole diameter: 100 mm | Northing: 6265846.9 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type (plasticity or particle characteristics, colour, secondary and minor components)	moisture condition	consistency/ density index	pocket penetrometer kPa	structure and additional observations
ADV			NOT MONITORED	E F + Rs Rs SPT >10 N*=R	162	1		CL	FILL: BITUMEN and ROADBASE CLAY: Low plasticity, brown, with some sand fine grained sand.	D <Wp	St		FILL RESIDUAL SOIL
									SANDSTONE: Fine to medium grained, orangish brown, highly weathered.				SANDSTONE Insufficient SPT sample for PID test. Void refusal at 1.29m
									Borehole CBH5 continues as cored hole				
					161	2							
					160	3							
					159	4							
					158	5							
					157	6							
					156	7							
					155	8							

method

AS	auger screwing*
AD	auger drilling*
RR	rolle/hammer
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix	
e.g.	ADT

support

M	mud
N	nil
C	casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

- 10/7/88 water level on date shown
- water inflow
- water outflow

notes, samples, tests

U_{ae}	undisturbed sample 50mm diameter
U_{50}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on Unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.13.08

Form GEO 5.3 Issue 3 Rev 2

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH5
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	11.3.2008
Principal:	Coffey Projects
Date completed:	12.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Drill 880 | Easting: 323839.1 | slope: -00° | R.L. Surface 162.9
hole diameter: 100 mm Drilling fluid: | Northing: 6255846.0 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth (metres)	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL, L, M, H, VH, EH)	$Is_{(50)}$ MPa (D diametral, A axial)	TCR %	defect spacing mm (30, 100, 300, 1000, 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (perpendicular / general)
			162	1		Continued from non-cored borehole						
NMLC		NOT MONITORED	161	2		SANDSTONE: Fine grained, pale grey and orange, distinctly bedded	HW		D 0.01 A 0.2			
			160	3		SANDSTONE: Medium grained, orange and pale brown, bands of iron stained rock.	MW		D 0.00 A 3.02	95		SM, 0°, PL, SO, clayey sand, 28mm SM, 10°, PL, SO clayey sand 3mm SM, 5°, PL, SO, clayey sand 3mm PT, 5°, PL, SO, clay, 0.5mm PT, 21°, IR, SO, ironstone, 1mm PT, 21°, IR, SO, ironstone, 1mm PT, 21°, VR, RO, ironstone, 5mm PT, 0°, PL, RO, SN PT, 0°, PL, RO, SN PT, 0°, PL, SO, SN
			159	4					D 0.62 A 0.97			PT, 0°, SO, ironstone and clay, 5mm PT, 0°, PL, SO, ironstone, 6mm PT, 40°, IR, RO, CN
			158	5					D 0.73 A 0.93	86		PT, 2°, PL, RO, CN PT, 0°, PL, RO, ironstone, 3mm PT, 3°, PL, RO, ironstone, 4mm JT, 50°, PL, SO, clay, 0.5mm
			157	6		SANDSTONE: Medium grained, orange and pale grey, distinctly bedded.	SW / FR		D 0.63 A 0.69	100		
						CBH5 terminated at 6m						
			156	7								
			155	8								

method
DT dslube; AS auger screwing; AT auger cutting; RR rotary/coring; CB coarse blade bit; NMLC NMLC core; HQ, PQ wireline core

core-lift
casing used; barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols indicate material; no core recovered

water
10/1/95 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss

water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; EW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type
JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness
VR very rough; RO rough; SO smooth; SL slickensided

coating
CN clean; SN stained; VN veneer; CO coating

CORED BORE-CLE GEOTLCOV23462AA GPJ COFFEY GDT 4.16.08

Form GEO 3.5 Issue 3 Rev 3

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SI		project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBHE
scale	Not to scale			
original size	A4		project no: GEOTLCOV23462AA	Photo no: CBHE 1 of *

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH6
Sheet	1 of 2
Project No.	GEOTLCOV23462AA
Date started.	12.3.2008
Date completed:	12.3.2008
Logged by	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project. *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: *Building 1*

drill model and mounting:	Mobile Drill B80	Easting	323895.5	slope:	-90°	R.L. Surface:	156.4
hole diameter.	100 mm	Northing	6265737.3	bearing:		datum:	AHD

drilling information / **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
ADV			NOT MONITORED						FILL: BITUMEN and ROADBASE	D			FILL
				E, F + Bs	156			SP	SAND: Medium grained, brown, with some clay, trace of gravel.		MD		RESIDUAL SOIL
				Bs									
						1							Insufficient SPT sample for PID test. V-bit refusal at 1.02m
ADT				SPT >1 N*=R					SANDSTONE: Medium grained, pale yellow and pale grey.				SANDSTONE
					155				Borehole CBH6 continued as cored hole				
						2							
					154								
						3							
					153								
						4							
					152								
						5							
					151								
						6							
					150								
						7							
					149								
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil
C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water
10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

BOREHOLE GEOT COV23462AA.GPJ COFFEY.GDT 4.18.08

Form GEO 5.3 Issue 3 Rev.2

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH6		
Sheet	2 of 2		
Project No:	GEOTLCOV23462AA		
Client:	Taylor Thomson Whitting	Date started:	12.3.2008
Principal:	Coffey Projects	Date completed:	12.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA	Logged by:	JA
Borehole Location:	Building 1	Checked by:	SH

drill model & mounting: Mobile D8 B80 | Easting: 323695.5 | slope: -90° | R.L. Surface: 156.4
hole diameter: 100 mm Drilling fluid: | Northing: 6265737.3 | bearing: | datum: AHD

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

method	penetration	water	RL	depth metres	graphic log	core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	$I_{s(50)}$ MPa D: diametral A: axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			156	1			Continued from non-cored borehole						
NMLC		NOT MONITORED	155	2			**SANDSTONE:** Medium grained, pale yellow and pale grey distinctly bedded at 15°.	HW		D 0.26 A 0.18	95		PT, 18°, PL, SO, CO SM, 56°, PL, SO, CLAY, 2MM
			154	3						D 0.76 A 0.8			SM, 55°, PL, SO, CLAY, 2MM SM, 52°, PL, SO, CLAY, 1MM PT, 25°, PL, SO, UN PT, 15°, IR, RO, UN PT, 15°, PL, SO, CO
			153	4				MW		D 0.62 A 0.78			PT, 21°, PL, SO, CO
			152	5				SW		D 1 A 1.08	92		PT, 21°, PL, SO, CO PT, 21°, PL, SO, CO PT, 21°, PL, SO, CO PT, 21°, PL, SO, CO PT, 21°, PL, SO, CO
			151	6						D 0.75 A 0.68			
			150	7			CBH6 terminated at 6.25m						
			149	8									

method
DT diatube
AS auger screwing
AD auger drilling
RH rotary hammer
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn

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

water
1(01)08 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (litres/min) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
Pr parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coated

CORED BORE HOLE LOG GEOTLCOV23462AA.GPJ, COFFEY QLD 4.18.08
Form QEO 4.5 Issue 2 Rev 3

drawn	MB	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH6
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH6 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No	CBH7
Sheet	1 of 3
Project No:	GEOTLCOV23462AA
Date started:	12.3.2008
Date completed:	13.3.2008
Logged by:	JA
Checked by:	SH

Client: Taylor Thomson Whitting

Principal: Coffey Projects

Project: 185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA

Borehole Location: Building 3

drill model and mounting: Mobile Dyli 880 | Easting: 323734 | slope: -90° | R.L. Surface: 157.7

hole diameter: 100 mm | Northing: 6265690 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV				E(x2)					FILL: CLAYEY SAND: Topsoil, medium grained sand, organics	D			FILL
				E(x3) + Bs					FILL: SANDY CLAY: Low to medium plasticity, orange and pale grey, fine sand, with some sandstone fragments.	<Wp			
				Bs	157	1							No odour from GW
				SPT 2,9,8 N*=12					FILL: CLAYEY SAND: Medium grained, dark brown, medium plasticity clay. Sandstone cobble (weathered) 1.0-1.45m	W			Insufficient SPT sample for PID Test.
					156	2							
				SPT <10 N*=R	155	3		CL	SANDY CLAY: Low plasticity orange, fine grained sand.	>Wp	St		SPT sample disturbed. RESIDUAL SOIL. V-bit refusal at 2.96m
									Borehole CBH7 continued as cored hole				
					154	4							
					153	5							
					152	6							
					151	7							
					150	8							

methods
AS auger screwing*
AD auger drilling*
RR rotary tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. ADT

support
M mud N nil
C casing
penetration 1 2 3 4
no resistance; ranging to refusal
water
1011/08 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

BOREHOLE GEOTLCOV23462AA.SPJ COFFEY.GDT 4/5/08

Form GEO 6.3 dated 6 Nov 06

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH7
Sheet	2 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	12.3.2008
Principal:	Coffey Projects
Date completed:	13.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

rig model & mounting: Mobile Drill 880 | Easting: 323784 | slope: -90° | R.L. Surface: 167.7

hole diameter: 100 mm Drilling fluid: | Northing: 6268690 | bearing: | datum: AHD

drilling information					material substance					rock mass defects		
method	core lift	water	RL	depth (metres)	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$I_{S(50)}$ MPa (D=diametral, A=axial)	RQD %	defect spacing mm (50, 100, 300, 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
			157	1								
			156	2								
			155	3		Continued from non-cored borehole						
NMLC			154	4		**SANDSTONE:** Medium grained, pale grey with leached weathered seams and bands of ironstone.	XW		D 0.44 A 0.67			SM, 20°, PL, SO, CLAY, 250mm BM, 10°, PL, SD, CLAY, 10mm RM, 10°, PL, SD, CLAY, 3mm JT, 60°, PL, SO, CO JT, 60°, PL, SO, CLAY, 1mm
						NO CORE: 0.05m	HW		D 0.02 A D 1.21 1.34	28		SM, 0°, PL, SO, CLAY, 150mm
			153	5		**NO CORE:** 0.04m	MW					PT, 25°PL, RO, CN
				6		**SANDSTONE:** Medium grained, pale grey with occasional bands of red ironstone, sugary, bedded at 25°			D 0.31 A 0.54			PT, 5°, PL, SO, CO PT, 5°, PL, SO, CO PT, 10°, PL, SO, CO PT, 60°, UN, RO, CO
			152	7					D 0.48 A 0.31			
			151	8		Subvertical (oriented) infilled seam extends from 6.78m to 11.4m				95		PT, 20°, PL, SO, CO PT, 20°, PL, SO, CO PT, 20°, PL, SO, CO PT, 10°, PL, SO, CO SM, 10°, PL, SO, CLAY 8mm
			150						D 0.15 A 0.38			

method
DT diatube; AS auger screwing; AD auger drilling; RR roller/cone; CB claw or chisel bit; NMLC NMLC core; HQ, HC, PQ wireline core

core lift
casing used; barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols indicate material; no core recovered

water
1D/1/96 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss; water pressure test result (lugeons) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type
JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness
VR very rough; RO rough; SO smooth; SL slickensided

coating
CN clean; SN stained; VN veneer; CO coating

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 1/8/08

Form GEO 5 1998.0 3 Rev. 3

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No	CBH7
Sheet	3 of 3
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	12.3.2008
Principal:	Coffey Projects
Date completed:	13.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model & mounting: Mobile Drill 360 | Easting: 323734 | slope: -90° | R.L. Surface: 157.7

hole diameter: 100 mm | Drilling fluid: | Northing: 6266090 | bearing: | datum: AHD

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

method	core lift	water	RL	depth metres	graphic log / core recovery	material: rock type, grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$Is_{(50)}$ MPa D= diametral A= axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
NMLC			149	9		**SANDSTONE:** Medium grained, pale grey with occasional bands of red ironstone. sugary, bedded at 25°. *(continued)*	MW			95	30 100 300 1000 3000	PT, 8°, PL, RO, CN SM, 20°, PL, SO, SANDY CLAY, 5mm PT, 20°, PL, SO, CO PT, 20°, PL, SO, CO PT, 20°, PL, SO, CO PT, 20°, PL, SO, CO
			148	10								PT, 10°, PL, SO, CO PT, 10°, PL, SO, CO SM, 10°, PL, SO, CLAY, 30mm PL, 5°, PL, SO, CO
			147	11						85		PT, 10°, PL, SO, CO JT, 45°, PL, SO, CLAYEY SAND, 3mm PM, 10° PL, SO, CLAYEY SAND, 5mm PM, 10° PL, SO, CLAYEY SAND, 5mm PT, 30°, PL, SO, CO PT, 10°, PL, SO, CO
			146	12		Seam at 11.7m contains finely laminated clay and very fine sand.			D A 0.21 0.10 D A 0.82 0.7	35		SM, 25° PL, SO, CLAY (HP, DARK BROWN), 100mm SM, 10° PL, SO, CLAY LAMINATED, 170mm PT, 10°, PL, SO, CLAY, 1mm
						CBH7 terminated at 12m	FR					
			145	13								
			144	14								
			143	15								
			142	16								

method
DI diatube
AS auger screwing
AD auger drilling
RR mine/core rig
CB claw or blade bit
NMLC NMLC core
WD, HQ, PQ wireline core

core lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered - graphic symbols indicate material
no core recovered

water
10/1/08 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
2.5 water pressure test result (lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
CW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

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Job No. GEOTLCOV23462AA
CBH7
DEPTH: 2.96m – 12m

drawn	MT
approved	SH
date	26 / 3 / 2008
scale	Not to scale
original size	A4

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client: Taylor Thomson Whitting

project: 185 FOX VALLEY ROAD, SAN HOSPITAL. WAHROONGA

title: ROCK CORE PHOTOGRAPH – CBH7

project no: GEOTLCOV23462AA

Photo no: CBH7 1 of 1

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Engineering Log - Borehole

Borehole No	CBH8
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	13.3.2008
Principal:	Coffey Projects
Date completed:	13.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by	JA
Borehole Location:	Building 1
Checked by:	SH

drill model and mounting: Mobile Drill 880 | Easting: 323693.6 | slope: -90° | R.L. Surface: 156.4
hole diameter: 100 mm | Northing: 6265771.4 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	R.L.	depth (metres)	graphic log	classification symbol	material: soil type; plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV			NOT MONITORED	E* / E(x3) + Bs + D / Bs / Bs + E	156				FILL: BITUMEN and ROADBASE	D			FILL
								SP	SAND: Fine to medium grained, orange and pale grey, trace of clay.		MD		RESIDUAL SOIL
													V-bit refusal at 0.87m
					155	1			Borehole CBH8 continued as cored hole				
					154	2							
					153	3							
					152	4							
					151	5							
					150	6							
					149	7							
						8							

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. AD/T

support
M mud N nil
C casing
penetration 1 2 3 4 — no resistance; ranging to refusal
water
▼ on date shown — water level
→ water inflow
→ water outflow

notes, samples, tests
U_{63} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_l liquid limit

consistency/density index
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

Form GEO 5 3 Issue 2 Rev 2
BOREHOLE: GEOTLCOV23462AA.GPJ DOFFEY.GDT 4.18.08

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Engineering Log - Cored Borehole

Borehole No.	CBH8
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Date started:	13.3.2008
Date completed:	13.3.2008
Logged by:	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project: *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: *Building 1*

drill model & mounting: Mobile Drill B80 | Easting: 323603.9 | slope: -90° | R.L. Surface: 156.4

hole diameter: 100 mm Drilling fluid: | Northing: 6265771.1 | bearing: | datum: AHD

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering & fretting	estimated strength (VL L M H VH EH)	$I_{s(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000)	defect description: type, inclination, planarity, roughness, coating, thickness — part/tube / general
			156			Continued from non-cored borehole						
NMLC		NOT MONITORED	155	1		**SANDSTONE:** Medium grained, dark red to pale yellow, indistinctly bedded.	MW		D 0.6 A 0.89			PT, 5°, IR, RO, CO PT, 5°, PL, SO, CLAY, 4MM PT, 10°, PL, SO, CLAY, 4MM
									D 0.62 A 0.52			PT, 2°, PL, RO, CO
				2								SM, 0°, PL, SO, SANDY CLAY, 80MM
			154			**SANDSTONE:** Medium grained, orange to pale yellow, indistinctly bedded.			D 0.58 A 0.61	35		
				3								PT, 10°, PL, RO, SN
			153						D 0.75 A 0.03			
				4		**SANDSTONE:** Medium grained, dark red due to staining, indistinctly bedded. Trace of fine pyrite mineralisation.						SM, 10°, PL, SO, CLAYEY SAND 3MM
			152						D 0.81 A			PT, 10°, PL, RO, SN
				5					D 0.81 A 0.88	100		PT, 15°, PL, RO, CN
			151									SO, 15°, PL, SD, CLAYEY SAND, 10MM
				6					D 0.73 A 0.67			PT, 15°, PL, RO, CO
			150			CBH8 terminated at 6.12m						
				7								
			149									
				8								

method
DT diatube
AS auger screwing
AD auger drilling
NX rotary core
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing fixed
barrel withdrawn

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

water
10/1/98 water level on date shown
water inflow
standpipe/cased bore
complete drill fluid loss
25 water pressure test result (kg/cm²) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

Form GEO 5.5 Issue 3 Rev 3

CORED BORECHOLE GEOTLCOV23462AA GPJ <<COFFEY GDT 4/5/08

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project:	185 FOX VALLEY ROAD, SAN HOSPITAL. WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH8
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH8 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Client:	*Taylor Thomson Whitting*	Borehole No.	*CBH9*
Principal:	*Coffey Projects*	Sheet	1 of 2
Project:	*185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*	Project No.	*GEOTLCOV23462AA*
Borehole Location:	*Building 2*	Date started:	*13.3.2008*
		Date completed:	*13.3.2008*
		Logged by:	*JA*
		Checked by:	*SH*

drill model and mounting: Mobile Drill D60 | Easting: 323825.6 | slope: -90° | R.L. Surface: 160.0
hole diameter: 100 mm | Northing: 6265568.9 | bearing: | datum: AHD

drilling information						material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL / depth (metres)	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro meter kPa 100 200 300 400	structure and additional observations
ASV			NOT MONITORED	E(x2)				FILL: BITUMEN and ROADBASE.	D			FILL
				E(x3) + BS			CL	SANDY CLAY: Medium plasticity, orange brown, medium grained sand becoming more sandy with depth.	<Wp	St		RESIDUAL SOIL V-bit refusal at 0.6m
ADT				Bs				SANDSTONE: Medium grained, pale grey and orange.	D			SANDSTONE
					159 1			Borehole CBH9 continued as cored hole				
					158 2							
					157 3							
					156 4							
					155 5							
					154 6							
					153 7							
					152 8							

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. ADT

support
N nil
U uncased
C cased
penetration 1 2 3 4
resistance or ranging to refusal
water
level at time shown
water flow
water cut off

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on Unified Classification System

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Form GEO 5 2 Issue 3 Rev 2
BOREHOLE GEOTLCOV23462AA GPJ COFFEY GDT 4.10.08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No	**CBH9**
Sheet	2 of 2
Project No:	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Date started:	**13.3.2008**
Principal:	**Coffey Projects**
Date completed:	**13.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Logged by	**JA**
Borehole Location:	**Building 2**
Checked by:	**SH**

drill model & mounting: Mobile Drill 880 | Easting: 323825.6 | slope: -90° | R.L. Surface: 160.0
hole diameter: 100 mm Drilling fluid: | Northing: 6265688.9 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth (metres)	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diam-ctrel A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
						Continued from non-cored borehole						
NMLC		NOT MONITORED	159	1		**SANDSTONE:** Medium grained, pale grey-orange and dark red, indistinctly to distinctly bedded at 5°, occasional bands of iron stained sandstone.	MW		D 0.33 A 0.33 D 0.48 A 0.53	36		PT, 5°, PL, SO, CO
			158	2					D 0.25 A 0.2			SM, 5°, IR, RO, CLAY/SAND, 20mm SM, 5°, IR, SO, CLAY/SAND, 20mm SM, 5°, IR, SO, CLAY/SAND, 20mm SM, 5°, IR, SO, CLAY/SAND, 60mm PT, 5°, PL, SO, CO
			157	3					D 0.18 A 0.2			JT, 74°, IR, RO, SN PT, 5°, PL, SO, CO
			156	4		NO CORE	SW		D 0.21 A 0.24			SM, 5°, PL, SO, CLAY, 180mm SM, 5°, PL, SO, CLAY, 40mm SM, 5°, PL, SO, CLAY, 25mm PT, 5°, PL, SO, CLAY, 1mm
			155	5					D 1.05 A 0.07	100		SM, 5°, PL, SO, CLAY, 10mm PT, 5°, PL, SO, CO
			154	6					D 0.62 A 0.7 D 0.66 A 1.25			PT, 5°, PL, SO, CO PT, 5°, PL, SO, CO
						CBH9 terminated at 6.12m						
			153	7								
			152	8								

method
UT diatube
AS auger screwing
AD auger drilling
RR rotary tricone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered + graphic symbols indicate material
no core recovered

water
10/1/96 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

CORED BOREHOLE GEOTLCOV23462AA GPJ COFFEY.GDT 4.18.08

Form GEO 5.5 Issue 3 Rev 3

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approvec	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBHS
scale	Not to scale		project no. GEOTLCOV23462AA	Photo no: CBHS 1 of -
origina size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	**CBH10**
Sheet	1 of 2
Project No:	**GEOTLCOV23462AA**
Client.	*Taylor Thomson Whitting*
Date started:	**14.3.2008**
Principal.	*Coffey Projects*
Date completed:	**14.3.2008**
Project:	*185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*
Logged by:	**JA**
Borehole Location:	*Building 2*
Checked by:	**SH**

drill model and mounting: Mobile Dnl 880 | easting: 323865 | slope: 90° | R.L. Surface: 159.3
hole diameter: 100 mm | Northing: 6268901.1 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RI	depth metres	graphic log	classification symbol	material: soil type; plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV			NOT MONITORED	E Bg + E + D Bs E	159	1		CL	FILL: BITUMEN and ROADBASE CI ▲Y- Medium plasticity, dark orange and brown, with some sand, medium grained sand.	D <Wp	VSt		FILL RESIDUAL SOIL
					158	2			SANDSTONE. Medium grained, orange. Borehole CBH10 continued as cored hole				SANDSTONE V-DR refusal at 0.95m
					157	3							
					156	4							
					155	5							
					154	6							
					153	7							
					152	8							

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B plank bit
V V bit
T TC bit
*bit shown by suffix e.g. ADT

support
M mud N nil
C casing
penetration 1 2 3 4
no resistance
resistance to refusal
water
10/1/90 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.19.38
Form GEO 6.3 Issue 3 Rev 2

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**CBH10**
Sheet	2 of 2
Project No:	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Date started:	**14.3.2008**
Principal:	**Coffey Projects**
Date completed:	**14.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Logged by:	**JA**
Borehole Location:	**Building 2**
Checked by:	**SH**

drill model & mounting: Mobile D/M B80 | Easting: 323855 | slope: 90° | R.L. Surface: 159.3
hole diameter: 100 mm | Drilling fluid: | Northing: 6265901.1 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering	estimated strength	$Is_{(50)}$ MPa (D = diametral, A = axial)	RQD %	defect spacing mm (30, 100, 300, 1000, 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
			159	1		Continued from non-cored Borehole						
NMLC		NOT MONITORED	158	2		**SANDSTONE:** Medium grained, orange and pale grey with some dark red iron stained bands.	MW		D 0.22 A 0.32			
			157						D 0.43 A 0.68	95		SM, 5°, IR, SO, CLAY, 10MM SM, 10°, IR, SO, CLAY, 2MM SM, 10°, PL, SO, CLAYEY, 2MM PT, 15°, PL, SO, CO SM, 10°, PL, SO, CLAY, 30MM PT, 15°, PL, RO, CN
			156	3					D 0.42 A 0.48			SM, 5°, PL, SO, CLAY, 30MM JT, 60°, PL, SO, CLAY, 3MM PT, 5°, UN, SO, CO
			155	4		Trace pyrite mineralisation from seam at 3.81m.			D 1.37 A 1.67			PT, 5°, PL, SO, VN SM, 0°, PL, SO, CLAY, 60MM SM, 0°, PL, SO, CLAY, 55MM PT, 21°, PL, RO, SN
							SW					
			154	5					D 1.24 A 1.10	95		
				6								SM, 20°, PL, SO, CLAY, 10MM SM, 20°, PL, SO, CLAY, 10MM SM, 5°, PL, SO, CLAY, 2MM PT, 21°, PL, SO, CO
			153			CBH10 terminated at 6.19m			D 0.36 A 1.11			
			152	7								
				8								

method
DT diatube; AS auger screwing; AD auger drilling; HR rotary/tricone; DB claw or blade bit; NMLC NMLC core; NQ, HQ, PQ wireline core

core-lift
casing used; barrel withdrawn
graphic log/core recovery: core recovered - graphic symbols indicate material; no core recovered

water
10/1/58 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss
water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type
JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

roughness
VR very rough; RO rough; SO smooth; SL slickensided

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

coating
CN clean; SN stained; VN veneer; CO coating

CORED BORE HOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.18.08
Form GEO 6.5 issue 2 Rev. 3

coffey geotechnics

Job No. GEOTLCOV23462AA
CBH10
DEPTH: 0.96m – 6.19m

drawn:	MT
approved	SH
date	26 / 3 / 2008
scale	Not to scale
original size	A4

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client:	Taylor Thomson Whitting
project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
title	ROCK CORE PHOTOGRAPH – CBH10
project no: GEOTLCOV23462AA	Photo no: CBH10 1 of 1

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH10
Sheet	2 of 2
Project No.	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	14.3.2008
Principal:	Coffey Projects
Date completed:	14.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Drill 880 | Easting: 323866 | slope: -90° | R.L. Surface: 159.3
hole diameter: 100 mm Drilling fluid: | Northing: 6265901.1 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	Is(50) MPa D-diametral A-axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
			159	1		Continued from non-cored borehole						
NMLC		NOT MONITORED	158	2		**SANDSTONE:** Medium grained, orange and pale grey with some dark red iron stained bands.	MW		D 0.22 A 0.32			SM, 5°, IR, SO, CLAY, 10MM SM, 10°, IR, SO, CLAY, 2MM SM, 10°, PL SO, CLAYEY, 2MM PT, 15°, PL, SO, CO
			157						D 0.43 A 0.66	95		SM, 10°, PL, SO, CLAY, 30MM PT, 15°, PL, RO, ON
			156	3					D 0.42 A 0.48			SM, 5°, PL, SO, CLAY, 30MM JT, 60°, PL, SO, CLAY, 3MM PT, 5°, UN, SO, CO
			155	4		Trace pyrite mineralisation from seam at 3.8m.	SW		D 1.37 A 1.57			PT, 5°, PL, SO, VN SM, 0°, PL, SO, CLAY, 60MM SM, 0°, PL, SO, CLAY, 55MM PT, 21°, PL, RO, SN
			154	5					D 1.24 A 1.18	95		
				6								SM, 20°, PL SO, CLAY, 10MM SM, 20°, PL, SO, CLAY, 10MM SM, 5°, PL, SO, CLAY, 2MM PT, 21°, PL, SO, CO
			153			CBH10 terminated at 6.19m			D 0.38 A 1.11			
			152	7								
				8								

CORED BOREHOLE GEOTLCOV23462AA.CPJ COFFEY.GDT 4.18.08

Form GEO 5.5 ISSUE 3 Rev 3

method
DT diatube
AS auger screwing
AD auger drilling
RR roller/Arricone
CB drawer blank bit
NMLC NMLC core
HQ, HQ, PQ wireline core

casing/HTL
casing used
barrel withdrawn
graphic log/core recovery
core recovered graphic symbols indicate material
no core recovered

water
10/1/08 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
20 water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS slickensided surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

coffey geotechnics

Engineering Log - Borehole

Borehole No	CBH11
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	14.3.2008
Principal:	Coffey Projects
Date completed:	14.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 1
Checked by:	SH

drill model and mounting: Mobile Drill B30 | Easting: 323671 | slope: -90° | R.L. Surface: 156.6

hole diameter: 100 mm | Northing: 6265773 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV			VC* MONITORED	E E(x3) + Bs Bs E + Bs	156	1			FILL: SILTY SAND: Topsoil, medium grained sand, brown, grass roots, organics. FILL: SANDY CLAY: Medium plasticity, orange and pale grey, medium grained sand.	D <Wp			FILL V-bit refusal on sandstone boulder at 1m
					155	2			Borehole CBH11 continued as cored hole				
					154	3							
					153	4							
					152	5							
					151	6							
					150	7							
					149	8							

method
AS auger screwing* | AD auger drilling* | RR rotary/core | W washbore | CT cable tool | HA hand auger | DT rotary | B blank bit | V V bit | T TC-bit | *bit shown by suffix | e.g. ADT

support
M mud | N nil | C casing

penetration 1 2 3 4 — no resistance | rapid | firm | refusal

water
10/1/93 water level on date shown | water inflow | water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter | U_{63} undisturbed sample 63mm diameter | D disturbed sample | B standard penetration test (SPT) | B* SPT - sample recovered | Bc SPT with solid cone | V vane shear (kPa) | P pressuremeter | Bs bulk sample | E environmental sample | R refusal

classification symbols and soil description based on unified classification system

moisture
D dry | M moist | W wet | Wp plastic limit | W_L liquid limit

consistency/density index
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

Form GEO 53 Issue 3 Rev 2

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SH		project:	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	26 / 3 / 2008		title	ROCK CORE PHOTOGRAPH – CBH1"
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH1" 1 of "
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH12
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	17.3.2008
Principal:	Coffey Projects
Date completed:	17.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model and mounting: Mobile Drill B60 | Easting: 323931.7 | slope: -90° | R.L. Surface: 157.8

hole diameter: 100 mm | Northing: 6256920.5 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water*	tests, samples, tests, etc	RL	depth metres	graphic log	classification symbols	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	cons./density index	shear strength kPa	structure and additional observations
ADV			NOT MONITORED	E(x2) Ds+E(x0) +D		0			**FILL: BITUMEN and ROADBASE**	D			FILL
									FILL: CLAY: Medium plasticity, brown and orange, with some fine sand and fine gravel.	<Wp			
									FILL: CLAYEY SAND: Fine to medium grained, pale reddish brown, medium plasticity clay.	D			
				Ds	157	1			**FILL: CLAY:** Medium plasticity, pale orange and pale brown, with some fine grained sand.	<Wp			
				SPT 3,5,6 N*=11					Becoming dark brown, red and pale grey, trace of rootlets, heterogeneous colouring.				
					156	2							
				SPT 2,3,7 N*=10	155	3		CL	**SANDY CLAY:** Medium plasticity, pale yellow, fine grained sand. Evenly coloured with occasional root fragments.		St		RESIDUAL SOIL Insufficient SPT sample for PID test V-bit refusal at 3.64m
					154	4			Borehole CBH12 continued as bored hole				
					153	5							
					152	6							
					151	7							
					150	8							

method

AS	auger screwing*
AD	auger drilling*
RR	mile/bicone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	bank on
V	V bit
T	TC bit
*bit shown by suffix	
HG	ADT

support

M mud N nil
C casing

penetration

1 2 3
no resistance
varying to refusal

water

10/1/08 water level on date shown
water inflow
water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm dia metal
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

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

consistency/density index

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

Form GEO 5.3 Issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.18.08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH12
Sheet	2 of 2
Project No	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	17.3.2008
Principal:	Coffey Projects
Date completed:	17.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Drill B60 | Easting: 323931.7 | slope: -90° | R.L. Surface: 157.8

hole diameter: 100 mm Drilling fluid: | Northing: 6265920.5 | bearing: | datum: AHD

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

method	core lift	water	RL	depth metres	graphic log / core recovery	material: rock type, geological characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	Is(50) MPa (D- diametral, A- axial)	RQD %	defect spacing mm (60 200 600 2000)	defect description: particular	defect description: general
		NOT MONITORED	157	1									
			156	2									
			155	3		Continued from non-cored borehole							
NMLC			154	4		SANDSTONE: Medium grained, red, pale grey and yellow, indistinctly to distinctly bedded at 10° 20°. Significant 210mm thick seam from 3.74 - 3.95m	MW / SW		D 1.19 A 1.1	96		SM, 0°, IR, SO, clayey sand/ sandy clay, 210mm	
			153	5					D 1.05 A 1.43			PT, 20°, PL, SO, CO	
			152	6					D 1.31 A 1.58			PT, 20°, PL, RO, clay, 0.5mm PT 10°, IR, RO, SN	
						CBH12 terminated at 6.2m							
			151	7									
			150	8									

method
DT diatube
AS auger screwing
AD auger drilling
RR rotary/roller bit
CB claw or blade bit
NMLC NMLC core
HQ, HQ, PQ wireline core

core/lift
casing used
barrel withdrawn

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

water
10/7/98 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

CORED BORE HOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.10.08

Form GEO 5 5 Issue 3 Rev 1

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH12
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH12 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH13
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Date started:	18.3.2008
Date completed:	18.3.2008
Logged by:	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project: *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: *Building 2*

drill model and mounting: Mobile Drill 600 | Easting: 323905.94 | slope: -90° | R.L. Surface: 161.0

hole diameter: 100 mm | Northing: 6265882.3 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth (metres)	graphic log	classification symbol	material: soil type, plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV				E Bs + C					FILL: BITUMEN and ROADBASE	D			FILL
				Bs + C + D					FILL: CLAY: Medium plasticity, brown and yellow, with some fine grained sand.	<Wp			
				SPT 7,11,>/ N*=R	160	1		CL	SANDY CLAY: Medium plasticity, yellowish brown trace of rootlets		VSt		Insufficient SPT sample for PID test RESIDUAL SOIL V-bit refusal at 1.48m
									SANDSTONE: Medium grained, yellow and orange.				SANDSTONE
			NOT WORTH CORED						Borehole CBH13 continued as cored hole				
					159	2							
					158	3							
					157	4							
					156	5							
					155	6							
					154	7							
					153	8							

method
AS auger screwing*
AD auger drilling*
RR rollercone
W washbore
CT cable tool
HA hand auger
DT diatube
B blade bit
V V bit
T TC bit
*bit shown by suffix e.g. ADT

support
N nil
C casing
penetration 1 2 3 4 — no resistance ranging to refusal
water
10/7/08 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{ex} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Form 3SE 6.3 Issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4/9/08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH13
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	18.3.2008
Principal:	Coffey Projects
Date completed:	18.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Drill 880 | Easting: 323905.94 | slope: -90° | R.L. Surface: 161.0
hole diameter: 100 mm | Drilling fluid: | Northing: 6265982.3 | bearing: | datum: AHD

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

method	core lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	Is(50) MPa (D diametral, A axial)	RQD %	defect spacing mm (200 600 2000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			160	1		Continued from non-cored borehole						
NMLC		NOT MONITORED	159	2		SANDSTONE: Medium grained, dark red to orange, ironstained rock and pale grey leached rock. Indistinctly bedded at 20°.	HW		D 0.3 A 0.17	27		SM, 0°, IR, SO, sandy clay, 10mm SM, 0°, IR, SO, clay, clay and wood/root frangments, 100mm SM, 0°, PL, SO, clay SM, 0°, IR, SO, sandy clay + wood/root frangments, 40mm
						NO CORE:						
			158	3			HW		D 0.3 A 0.44	89		SM, 20°, PL, SO, clay, 10mm SM, 20°, PL, SO, clay, 10mm SM, 20°, PL, SO, clay, 10mm PT, 20°, PL, SO, CO PT, 20°, IR, RO, CO SM, 0°, PL, SO, clay, 30mm SM, 0°, PL, SO, clay, 130mm PT, 5°, PL, RO, CO
							MW		D 0.37 A 0.62			
			157	4		SANDSTONE: Medium grained, pale grey, indistinctly to distinctly bedded. Trace of pyrite mineralisation	FR		D 0.84 A 1.36			PT, 4°, PL, RO, CO, iron stained, 4mm
			156	5						95		
									D 1.16 A 0.98			
			155	6		NO CORE: 0.09m						
						CBH13 terminated at 6m						
			154	7								
			153	8								

method
DT rockbow
AS auger screwing
AD auger drilling
RR rollerbit/cone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core lift
closing chisel
barrel withdrawn
graphic log/core recovery
core recovered + graphic symbols indicate material
no core recovered

water
10 l/s/58 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (kgal/sec) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers HW and MW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

roughness
VR very rough
RO rough
SO smooth
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

coating
CN clean
SN stained
VN veneer
CO coating

Form GEO 6-5 Issue 3 Rev 3
CORED BOREHOLE GEOTLCOV23462AA.SPJ COFFEY.SDT 4.16.38

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH13
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH13 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH14
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	18.3.2008
Principal:	Coffey Projects
Date completed:	18.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model and mounting: Mobile Drill 880 | Easting: 323945.6 | slope: -90° | R.L. Surface: 159.7

hole diameter: 100 mm | Northing 6265882.3 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV			NOT MONITORED	E					FILL: BITUMEN and ROADBASE	D			FILL
				E(x2) + Bs					FILL: CLAY: Medium plasticity, brown, yellow and pale grey, with some fine grained sand.	<Wp			
				Bs	159	1							
				SPT 5,7,10 N*=17									
					158	2							
								CL	CLAY: Medium plasticity, pale orange and brown, with some fine grained sand.		F		RESIDUAL SOIL (?)
				SPT 7,12,13 N*=25	157	3						600+ 600+	Insufficient SPT sample for PID test.
								CL	SANDY CLAY: Medium plasticity, pale grey, becoming more sandy with depth.				
									SANDSTONE: Medium grained, orange.	D			SANDSTONE: V-bit refusal @ 3.07m
									Borehole CBH14 continued as cored hole				
					156	4							
					155	5							
					154	6							
					153	7							
					152	8							

method
AS auger screwing* | AD auger drilling* | RR roller/tricone | W washbore | CT cable tool | HA hand auger | DT diatube | B blank bit | V V bit | T TC bit | *bit shown by suffix e.g. ADT

support
M mud | N nil | C casing

penetration
1 2 3 4 — no resistance ranging to refusal

water
10/1/98 water level on date shown | water inflow | water outflow

notes, samples, tests
U_x undisturbed sample 50mm diameter | U_{63} undisturbed sample 63mm diameter | D disturbed sample | N standard penetration test (SPT) | N* SPT - sample recovered | Nc SPT with solid cone | V vane shear (kPa) | P pressuremeter | Bs bulk sample | E environmental sample | R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry | M moist | W wet | Wp plastic limit | W_L liquid limit

consistency/density index
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 geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH14
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	18.3.2008
Principal:	Coffey Projects
Date completed:	18.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model & mounting: Mobile Ont D80 | Easting: 329845.6 | slope: -90° | R.L. Surface: 159.7
hole diameter: 100 mm Drilling fluid: | Northing: 6265882.3 | bearing: | datum: AHD

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

method	core lift	water	RL	depth metres	graphic log & core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	$I_{s(50)}$ MPa D diametral A axial	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness — particular	general
		NOT MONITORED	159	1		Continued from previous cored borehole							
			158	2									
			157	3									
NMLC			156	4		SANDSTONE: Medium grained, dark red ironstained, indistinctly bedded.	MW						
						SANDSTONE: Medium grained, pale grey, leached to a large clay seam.	XW						SM, 0°, PL, SO, clayey sandy clay, 540mm
						SANDSTONE: Medium grained, orange to dark red.	MW		D 0.56 A 0.68				
			155	5		SANDSTONE: Medium grained, pale grey	SW		D 0.88 A 0.78	19			PT, 20°, PL, SO, CO
			154	6					D 1 A 1.13				PT, 20°, PL, SO, CO
													PT, 20°, PL, SO, CO
			153	7		CBH14 terminated at 6.05m							
			152	8									

method
DT diatube
AS auger screwing
AD auger drilling
BH/TC bit/tungsten carbide
CB claw or blade bit
NMLC NMLC core
RD, HD, PD weathered zone

core lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered + graphic symbols indicate material
no core recovered

water
water pressure test result (lugeons) for depth interval shown
water inflow
partial drill fluid loss
complete drill fluid loss
water level on date shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW decomposed weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
AN stained
VN veneer
CO coating

Form GEO 5.5 Issue 3 Rev 3
CORED BOREHOLE SHEET LOG 23462AA GPJ COFFEY GD* 4.10.08

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SH		project:	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title:	ROCK CORE PHOTOGRAPH – CBH14
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH14 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH15
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Date started:	18.3.2008
Date completed:	18.3.2008
Logged by:	JA
Checked by:	SH

Client: Taylor Thomson Whitting

Principal: Coffey Projects

Project: 185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA

Borehole Location: Building 1

drill model and mounting: Mobile Drill 880 | Easting: 323697 | slope: -90° | R.L. Surface: 156.5

hole diameter: 100 mm | Northing: 6265706.3 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples tests etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV			NOT MONITORED	F E(x3) + Bs	156	0			FILL: BITUMEN and ROADBASE	D ~Wp			FILL
				Bs + D		1			FILL: SANDY CLAY: Low to medium plasticity, brown, yellow and pale grey, fine grained sand				
				SPT 5,5,7 N*=12	155								
ADT						2			Brick / tomcotta debris.				V-bit refusal at 2.00m TC-bit refusal at 2.49m
					154				Borehole CBH15 continued as cored hole				
						3							
					153								
						4							
					152								
						5							
					151								
						6							
					150								
						7							
					149								
						8							

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4/8/39

FORM GEO 6.3 Issue 6 Rev 2

method
- AS auger screwing*
- AD auger drilling*
- NR non-rotary
- W washbore
- CT cable tool
- HA hand auger
- DT dual tube
- B blank bit
- V V-bit
- T TC-bit
- *bit shown by suffix
- e.g. AD/T

support
- M mud
- N nil
- C casing

penetration
- 1 2 3 4
- no resistance ranging to refusal

water
- 10/1/98 water level on date shown
- water inflow
- water outflow

notes, samples, tests
- U_{ex} undisturbed sample 50mm diameter
- U_{63} undisturbed sample 63mm diameter
- D disturbed sample
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- V vane shear (kPa)
- P pressuremeter
- Bs bore sample
- E environmental sample
- R refusal

classification symbols and soil description
based on Unified classification system

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

consistency/density index
- 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 geotechnics

Borehole No	**CBH15**
Sheet	2 of 2
Project No:	**GEOTLCOV23462AA**

Engineering Log - Cored Borehole

Client:	**Taylor Thomson Whitting**	Date started:	**18.3.2008**
Principal:	**Coffey Projects**	Date completed:	**18.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**	Logged by:	**JA**
Borehole Location:	**Building 1**	Checked by:	**SH**

drill model & mounting: Mobile Drill R80 | Easting: 323697 | slope: -90° | R.L. Surface: 156.5

hole diameter: 100 mm Drilling fluid | Northing: 6265706.3 | bearing: | datum: AHD

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

method	core lift	water	RL	depth metres	graphic log / core recovery	material: rock type, grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	$I_{s(50)}$ MPa D diametral A axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, orientation, planarity, roughness, coating, thickness — particular / general
			156	1		Continued from non-cored borehole			D A			
			155	2								
NMLC		NOT MONITORED	154	3		**SANDSTONE:** Medium grained, orange, pale yellow and pale grey with leached clay seams. Indistinctly to distinctly bedded at 25°.	MW		0.28 0.32	96		SM, 0°, PL, SO, clay, 70mm PT, 25°, PL, RO, CN PT, 25°, PL, SO, clay, 3mm SM, 0°, PL, SO, clay, 50mm PT, 3°, PL, SO, CO PT, 20°, PL, SO, clay, 5mm
			153	4					D A 0.42 0.41			
			152	5		**SANDSTONE:** Medium grained, dark red and orange with pale grey leached seams. Trace of pyrite mineralisation.			D A 1.69 2.4			PT, 0°, IR, RO, CN PT, 25°, PL, RO, CN PT, 25°, PL, RO, CN PT, 25°, PL, RO, CO PT, 25°, PL, RO, CO
			151	6					D A 0.76 1.06	97		PT, 25°, PL, RO, clayey sand, 10mm PT, 25°, PL, RO, SN
						SANDSTONE: Medium grained, pale grey with minor pale orange	FR		D A 0.55 0.83			
			150	7		CBH15 terminated at 6.7m						
			149	8								

method
DT Gatube; AS auger screwing; AD auger drilling; RR roller/tricone; CB claw or blade bit; NMLC NMLC core; NQ, HQ, PQ wireline core

core lift
casing used; barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols indicate material; no core recovered

water
10/1/98 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss; 25 water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type
JT joint; FT pastng; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness
VR very rough; RO rough; SO smooth; SL slickensided

coating
CN clean; SN stained; VN veneer; CO coating

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approver	SH		project:	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	4 / 4 / 2008		title	ROCK CORE PHOTOGRAPH – CBH15
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH15 1 of 1
origina size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH16
Sheet	1 of 3
Project No:	GEOTLCOV23462AA
Date started:	19.3.2008
Date completed:	19.3.2008
Logged by:	JA
Checked by:	SH

Client: Taylor Thomson Whitting

Principal: Coffey Projects

Project: 185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA

Borehole Location: Building 3

drill model and mounting: Mobile Drill B80 | hole diameter: 100 mm | Easting: 323761.9 | Northing: 8265660.7 | slope: -90° | bearing: | R.L. Surface: 161.1 | datum: AHD

drilling information | **material substance**

method	penetration	support	water	notes, samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/density index	pocket penetrometer (kPa)	structure and additional observations
ADV			NOT MONITORED	E	161	0			**FILL: SILTY SAND:** Topsoil, medium grained sand, brown, grass roots and organics. **FILL: SAND:** Sand fine to medium grained, trace of clay, concrete rubble and organic fragments.	D			FILL
				E(x3) + Bs + D									
				Bs		1							
ADT					160								Wash refusal on fill cobbles at 1m.
				SPT 5,5,3 N*=8					**FILL: CLAYEY SAND:** Medium grained, reddish brown, with some concrete rubble.	<Wp			
					159	2			**FILL: SANDY CLAY:** Medium plasticity, brown and pale grey, with some sandstone cobbles.				
				SPT 2,4 N*=R									
					158	3							
				SPT 4,8,>5 N*=R	157	4			**FILL: CLAY:** Medium plasticity, orange and green. **FILL: CLAY:** Medium plasticity, black and pale brown, with some fine grained sand. **FILL: GRAVELLY CLAY:** Medium plasticity, greenish yellow, cobbles of ironstone.				Unknown black substance, odourless. Insufficient SPT sample for PID (4.05-4.25m)
					156	5			Borehole CBH16 continued as cored hole				
					165	6							
					154	7							
						8							

method

AS	auger screwing*
AD	auger drilling*
RR	tungsten drill
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support: V vane, N nil, C casing

penetration: 1 2 3 4 — no resistance / rapid / slow / refusal

water: 10/1/08 water level on date shown; water inflow; water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
SPT	standard penetration test (SPT)
N*	SPT - sample recovered
NC	SPT with solid core
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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

Form GEO 52 issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA.SPJ COFFEY COY 4.18.06

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**CBH16**
Sheet	2 of 3
Project No.	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Date started	**19.3.2008**
Principal:	**Coffey Projects**
Date completed	**19.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Logged by:	**JA**
Borehole Location:	**Building 3**
Checked by:	**SH**

drill model & mounting: Mobile D/R 680 | Easting: 323761.9 | slope: -90° | R.L. Surface: 161.1

hole diameter: 100 mm Drilling fluid: | Northing: 6265660.7 | bearing: | datum AHD

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

method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type, grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D=diametral A=axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
		NOT MONITORED	161	1								
			160	2								
			159	3								
			158	4								
			157	5		Continued from non-cored borehole						
NMLC			156	6		SANDSTONE: Medium grained, dark red iron stained and pale grey leached zones. Indistinctly bedded at 23°.	MW		D A 0.51 0.95	SB		PT, 85°, PL, RO, CO PT, 5°, PL, RO, VN
			155	7					D A 0.74 0.8			PT, 10°, IR, RO, CO PT, 25°, UN, RO, CO SM, 10°, UN, SO, clay, 10mm SM, 10°, IR, SO, sandy clay, 50mm
			154	8		SANDSTONE: Medium grained, pale grey and pale orange.			D A 0.3 0.44			PT, 5°, PL, RO, VN PT, 5°, PL, RO, VN SM, 0°, PL, SO, clay, 10mm SM, 0°, PL, SO, clay, 80mm

method
- OT diatube
- AS auger screwing
- AD auger drilling
- RR rotary/roadhead
- CB claw or blade bit
- NMLC NMLC core
- NQ, HQ, PQ wireline core

core-lift
- retrieved
- barrel withdrawn

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

water
- 10/23/08 water level on date shown
- water inflow
- partial drilling fluid loss
- complete drill fluid loss
- water pressure test result (lugeons) for depth interval shown

weathering
- FR fresh
- SW slightly weathered
- MW moderately weathered
- HW highly weathered
- XW extremely weathered
- DW distinctly weathered (covers MW and HW)

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

defect type
- JT joint
- PT parting
- SM seam
- SZ sheared zone
- SS sheared surface
- CS crushed seam

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

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

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

CORED BOREHOLE GEOTLCOV23462AA GPJ COFFEY GDT 4/13/09

Core GSO 6 6 Issue 2 Rev 3

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	CBH16		
Sheet	3 of 3		
Project No:	GEOTLCOV23462AA		
Client:	Taylor Thomson Whitting	Date started:	19.3.2008
Principal:	Coffey Projects	Date completed:	19.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA	Logged by:	JA
Borehole Location:	Building 3	Checked by:	SH

drill model & mounting: Mobile Drill B90 | Easting: 323761.9 | slope: -90° | R.L. Surface: 161.1
hole diameter: 100 mm | Drilling fluid: | Northing: 6265660 T | bearing: | datum: AHD

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

method	core lift	water	RL	depth (metres)	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$Is_{(50)}$ MPa (D diam, A axial)	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
NMLC		NOT MONITORED	153			**SANDSTONE:** Medium grained, pale grey and pale orange. *(continued)*	MW		D 0.24 A 0.4	98	100 200	PT, 20°, PL, RO, CO SM, 15°, PL, RO, sand with some clay, 10mm PT, 15°, PL, SO, CO PT, 15°, PL, SO, CO PT, 15°, PL, SO, CO
			152	9		**CLAY SEAM:** Low plasticity, pale grey with brown lamination s.				49		
						SANDSTONE: Medium grained, pale orange and grey.	MW		D A			
						NO CORE: 0.08m	MW		0.52 0.63			
			151	10		**SANDSTONE:** Fine grained, pale grey with brown laminations. Distinctly bedded at 0° - 5°.						SM, PL, Sandy clay 60mm PT, 5°, PL, RO, SN
						SANDSTONE: Medium grained, dark red, orange and pale yellow, mottled strong iron staining. Indistinctly to distinctly bedded at 10°-15°.						PT, 0°, ST, RO, SN
			150	11					D A 0.85 0.88	98		
												JT, 30°, PL, RO, SW
				12					D A 1.16 1.02			PT, 15°, PL, RO, SN
			149			CBH16 terminated at 12.05m						
				13								
			148									
				14								
			147									
				15								
			146									
				16								

method
DT diatube
AS auger screwing
AD auger drilling
RR roller/tricone
CB blade or blank bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core lift
casing used
barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols and rock material
no core recovered

water
10/1/98 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (Lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SI slickensided

coating
CN clean
SN stained
VN veneer
CO coating

Form GEC 5 Issue 3 Rev 3

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFEY GEC 4 18.08

drawn	MT
approved	SH
date	4 / 4 / 2008
scale	Not to scale
original size	A4

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

client:	Taylor Thomson Whitting
project	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
title	ROCK CORE PHOTOGRAPH – CBH1E
project no: GEOTLCOV23462AA	Photo no: CBH16 1 of *

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH17
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	19.3.2008
Principal:	Coffey Projects
Date completed:	19.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA/MT
Borehole Location:	Building 2
Checked by:	SH

drill model and mounting: Mobile Drill B80 | Easting: 320889.1 | slope: -90° | R.L. Surface: 158.0

hole diameter: 100 mm | Northing: 6265911.3 | bearing: | datum: AHD

drilling information

method	penetration 1 2 3	support	water	notes, samples, tests, etc.	RL	depth metres
ADV			NOT MONITORED	E E + Bs Bs E + Bs Bs		
				SPT 5,6,>15 N*=R	157	1
					156	2
				SPT 5,11,15 N*=26	155	3
					154	4
					153	5
					152	6
					151	7
					150	8

material substance

graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
		FILL: BITUMEN and ROADBASE	D			FILL
		FILL: SAND: Fine grained, pale reddish brown, free of clay and silt. Becoming dark brown with depth.				
		FILL: CLAY: Medium plasticity, red, orange and pale grey, with some fine grained sand.	<Wp			Insufficient SPT sample for PID test.
		FILL: CLAY: Medium plasticity, red and orange, with some sand and sandstone cobbles.				
		FILL: SANDY CLAY: Medium plasticity, pale brown and yellow, medium grained sand, with some sandstone gravel and cobbles				
						V-bit refusal at 3.14m
		Borehole CBH17 continued as cored hole				

method
AS auger screwing
AD auger drilling
RR rotary blade/cone
W washbore
CB cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*(bit shown by suffix)
eg: ADT

support
M mud N nil
C casing
penetration
1 2 3 4
no resistance ranging to refusal
water
10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R rock coal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Form GEO 5.3 Issue 3 Rev 7
BOREHOLE GEOTLCOV23462AA GPJ COFFEY GDT 6/1/08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No	CBH17
Sheet	2 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	19.3.2008
Principal:	Coffey Projects
Date completed:	19.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA/MT
Borehole Location:	Building 2
Checked by	SH

drill model & mounting: Mobile Drill 950 | Easting: 323899.1 | slope: -90° | R.L. Surface: 158.0

hole diameter: 100 mm Drilling fluid: | Northing: 6265911.3 | bearing: | datum: AHD

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

method	core-lift	water	Rt	depth metres	graphic log / core recovery	material: rock type; grain characteristics; colour; structure; minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
		NOT MONITORED	157	1								
			156	2								
			155	3		Continued from non-cored borehole						
NMLC			154	4		**SANDSTONE:** Medium grained, yellow, indistinctly to distinctly bedded at 12°-15°.	SW		D A 0.95 1.37	100		SM, 5°, PL, RO, CN
							FR		D A 0.19 1.08			PT, 12°, PL, SO, CO PT, 15°, PL, RO, CN PT, 15°, PL, SO, CO JT, 85°, UN, SO, clay and rootlets, 40mm
			153	5			SW		D A 0.34 1.35			SM, 30°, PL, SO, clay, 40mm PT, 10°, PL, SO, SN
			152	6		Becoming distinctly bedded at 10°-15°.	FR		D A 0.8 0.87			PT, 5°, PL, SO, VN
						CBH17 terminated at 6.12m						
			151	7								
			150	8								

method
DT dialube; AG auger screwing; AD auger drilling; RR roller/tricone; CB claw or blade bit; NMLC NMLC core; HQ, HQ, PQ wireline core

core-lift
casing used; barrel withdrawn

graphic log/core recovery
core recovered + graphic symbols indicate material; no core recovered

water
10/1/98 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss; water pressure test result (L/min/m) for depth interval shown

weathering
FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type
JT joint; BP bedding; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity
PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness
VR very rough; RO rough; SO smooth; SL slickensided

coating
CN clean; SN stained; VN veneer; CO coating

CORED BOREHOLE GEOTLCOV23462AA GPJ COFFEY 30/ 4/ 08 29

Form GEO 55 issue 3 Rev 3

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL. WAHROONGA
date	4 / 4 / 2006		title	ROCK CORE PHOTOGRAPH – CBH17
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH17 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	**CBH18**
Sheet	1 of 3
Project No:	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Date started:	**19.3.2008**
Principal:	**Coffey Projects**
Date completed:	**20.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Logged by	**MT**
Borehole Location:	**Building 3**
Checked by:	**SH**

drill model and mounting: Mobile Drill R80 | Easting: 323738.3 | slope: -90° | R.L. Surface: 159.1
hole diameter: 100 mm | Northing: 6265648.6 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth (metres)	graphic log	classification symbol	material: soil type; plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C		TOPSOIL	159				**FILL: SILTY CLAY:** Low plasticity, dark brown, with some fine grained sand, chalk gravel and igneous gravel.	<Wp			FILL
				E + Bs									
				Bs		1							
				SPT 2,3,3 N*=6	158								Insufficient SPT sample for PID test.
									FILL: SAND: Fine to medium grained, pale brown.	D			
									FILL: SILTY CLAY: High plasticity, red and dark brown with some root fibres, some fine grained sand and trace of gravel.	<Wp			
					157	2							
				SPT 3,5,3 N*=8		3							
					156								
						4							
				SPT 1,1,2 N*=3	155								
						6							
					154								
				SPT 2,1,1 N*=2		6							
					153								
				Ds		7		CH	**SANDY CLAY:** High plasticity, orange-brown, pale grey mottled red. Sand is fine to medium grained.	>Wp	St		RESIDUAL SOIL
					152				Borehole CBH18 continued as cored hole				
						8							

method
AS auger screwing*
AD auger drilling*
RR rotary tricone
W washbore
CT cable tool
HA hand auger
DT dialube
B blank bit
V V bit
T TC bit
*bit shown by suffix
eg AOT

support
M mud N nil
C casing
penetration 1 2 3 4 — no resistance ranging to refusal
water
10/1/99 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{ex} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
S standard penetration test (SPT)
N* SPT - sample recovered
N: SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on Unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

BOREHOLE SECTLOGS\23462AA.GPJ COFFEY.GDT 4.18.08
Form GEO 5 3 Issue 2 Rev 2

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No:	CBH18		
Sheet:	2 of 3		
Project No:	GEOTLCOV23462AA		
Client:	Taylor Thomson Whitting	Date started:	19.3.2008
Principal:	Coffey Projects	Date completed:	20.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA	Logged by:	MT
Borehole Location:	Building 3	Checked by:	SH

drill model & mounting: Mobile Drill B60 | Easting: 329738.3 | dip/az: -90° | R.L. Surface: 159.1
hole diameter: 100 mm | Drilling fluid: | Northing: 6255648.5 | bearing: | datum: AHD

drilling information					material substance					rock mass defects		
method	core lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength	$Is_{(50)}$ MPa (D- diametral A- axial)	RQD %	defect spacing mm (20 60 200 600 2000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
			160									
			158	1								
			157	2								
			156	3								
			155	4								
			154	5								
		▶	153	6								
				7		Continued from non-cored borehole						
NMLC			152			SANDSTONE: Fine to medium grained, orange-brown and pale grey, indistinctly bedded at 0°-20°.	MW		D A 1.17 1.13	98		
				8								

method
DT diatube
AS auger screwing
AD auger drilling
RR rollerbicone
CB crow or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered
- graphic symbols indicate material
no core recovered

water
10/1/98 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
water pressure test result (lugeons) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

Form GEO 5.5 Issue 3 Rev 2

CORED BOREHOLE GEOTLCOV23462AA.GPJ COFFLY.GDT 4.8.08

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **CBH18**

Sheet 3 of 3

Project No: **GEOTLCOV23462AA**

Client: **Taylor Thomson Whitting**

Date started: **19.3.2008**

Principal: **Coffey Projects**

Date completed: **20.3.2008**

Project: **185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**

Logged by: **MT**

Borehole Location: **Building 3**

Checked by: **SH**

drill model & mounting: Mobile Drill 880 | Easting: 323738.3 | slope: -90° | R.L. Surface: 159.1

hole diameter: 100 mm Drilling fluid: | Northing: 6256648.5 | bearing: | datum AHD

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength	$I_{s(50)}$ MPa (D diametral, A axial)	RQD %	defect spacing mm	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
NMLC			151	9		**SANDSTONE:** Fine to medium grained, orange-brown and pale grey, indistinctly bedded at 0°-20° *(continued)*	MW		D 1.1 A 1.35	65	30 100 300 1000 3000	PT, 15°, PL, SO, CN PT, 0°, PL, SO, SN SM, 0°, PL, SO, clay, 5mm
			150	10		Becoming distinctly bedded at 0°-20°.	SW		D 0.73 A 0.82			
			149	11					D 0.98 A 1.22			PT, 10°, UN, RO, SN
			148	12					D 1.11 A 1.09	97		SM, 0°, PL, SO, clay, 5mm PT, 0°, UN, RO, CN
			147						D 1.07 A 1.03			
						CBH18 terminated at 12.18m						
			146	13								
			145	14								
			144	15								
				16								

method
DT diatube
AS auger screwing
AD auger drilling
RR roller/tricone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn
graphic log/core recovery
core recovered - graphic symbols indicate material
no core recovered

water
10/1/08 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
water pressure test result (key zone) for depth interval shown

weathering
FR fresh
SW slightly weathered
MW moderately weathered
HW highly weathered
XW extremely weathered
DW distinctly weathered (covers MW and HW)

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

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

Form GEO 5.5 (Issue 3 Rev 3)

CORE BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.16.38

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Job No. GEOTLCOV23462AA
CBH18
DEPTH: 7m – 12.18m

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client:	Taylor Thomson Whitting
approved	SH		project:	185 FOX VALLEY ROAD, SAN HOSPITAL WAHROONGA
date	26 / 3 / 2008		title	ROCK CORE PHOTOGRAPH – CBH1E
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH1E 1 of 1
original size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH19
Sheet	1 of 2
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	20.3.2008
Principal:	Coffey Projects
Date completed:	20.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	MT
Borehole Location:	Building 1
Checked by:	SH

drill model and mounting: Mobile Drill B60 | Easting: 323582.6 | slope: -90° | R.L. Surface: 156.5
hole diameter: 100 mm | Northing: 6265736.9 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth (metres)	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C	NOT MONITORED	E + BS	156	1			FILL: BITUMEN and ROADBASE	D			FILL
				BS					FILL: CLAYEY SAND: Fine to medium grained, red and orange-brown with some sandstone gravel	M			
				SPT 5,7,8 N*=15	155								V-bit refusal at 1.73m.
						2			Borehole CBH19 continued as cored hole				
					154	3							
					153	4							
					152	5							
					151	6							
					150	7							
					149	8							

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. ADT

support
M mud N nil
C casing
penetration 1 2 3 4: no resistance; ranging to refusal
water
10/1/98 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bk bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
W_p plastic limit
W_L liquid limit

consistency/density index
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 geotechnics

Engineering Log - Cored Borehole

Borehole No.	**CBH19**
Sheet	2 of 2
Project No.	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Principal:	**Coffey Projects**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Borehole Location:	**Building 1**
Date started:	**20.3.2008**
Date completed:	**20.3.2008**
Logged by:	**MT**
Checked by:	**SH**

drill model & mounting: Mobile Drill B60 | Easting: 323882.5 | slope: -90° | R.L. Surface: 156.6
hole diameter: 100 mm Drilling fluid: | Northing: 6285736.9 | bearing: | datum: AHD

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa: D diametral, A axial	RQD %	defect spacing mm (200 600 2000 6000)	defect description: particular	defect description: general
			156	1		Continued from non-cored borehole							
RMLC		NOT MONITORED	155	2		SANDSTONE: Fine to medium grained, orange-brown and pale grey. Indistinctly to distinctly bedded at 0°-15°.	SW		D 0.43 A 0.37	100		SM, 10°, PL, 5mm SM, 0°, PL, 75mm	
			154	3		Becoming red and orange-brown	HW		D 0.12 A 0.1			SM, 0°, PL, 5mm SM, 0°, PL, 20mm	
			153	4		Becoming pale grey stained orange-brown and red.	SW/MW		D 0.53 A 0.46				
			152	5		Becoming pale grey.	FR		D 0.5 A 0.48	100		PT, 10°, PL, SO, VN JT, 65°, PL, SO, clay, 10mm JT, 65°, PL, RO, CN	
			151	6		Becoming red and orange-brown stained pale grey.	HW		D 0.22 A 0.77				
						CBH19 terminated at 6m							
			150	7									
			149	8									

method: DT dustube; AS auger screwing; AD auger drilling; RR roller/tricone; CT claw or blade bit; NMLC NMLC core; HQ, HQ, PQ wireline core

core-lift: casing used; barrel withdrawn

graphic log/core recovery: core recovered, graphic symbols indicate material; no core recovered

water: 1/01/08 water level on date shown; water inflow; partial drill fluid loss; complete drill fluid loss; water pressure test result (lugeons) for depth interval shown

weathering: FR fresh; SW slightly weathered; MW moderately weathered; HW highly weathered; XW extremely weathered; DW distinctly weathered (covers MW and HW)

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

defect type: JT joint; PT parting; SM seam; SZ sheared zone; SS sheared surface; CS crushed seam

planarity: PL planar; CU curved; UN undulating; ST stepped; IR irregular

roughness: VR very rough; RO rough; SO smooth; SL slickensided

coating: CN clean; SN stained; VN veneer; CO coating

CORED BOREHOLE GEOTLCOV23462AA GPJ, COFFEY 60 * 8.10.08

Form GEO 5 sheet 3 Rev 3

drawn	MT	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client	Taylor Thomson Whitting
approvec	SH		project	185 FOX VALLEY ROAD, SAN HOSPITAL. WAHROONGA
date	26 / 3 / 2008		title	ROCK CORE PHOTOGRAPH – CBH15
scale	Not to scale		project no: GEOTLCOV23462AA	Photo no: CBH15 1 of 1
origina size	A4			

coffey geotechnics

Engineering Log - Borehole

Borehole No.	**CBH20**
Sheet	1 of 1
Project No.	**GEOTLCOV23462AA**
Client:	**Taylor Thomson Whitting**
Date started:	**20.3.2008**
Principal:	**Coffey Projects**
Date completed:	**20.3.2008**
Project:	**185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA**
Logged by:	**MT**
Borehole Location:	**Building 3**
Checked by:	**SH**

Drill model and mounting: Mobile Drill B60 | Easting: 323423.4 | slope: 90° | R.L. Surface: 158.6
Hole diameter: 100 mm | Northing: 6265666.3 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT		N	NOT OBSERVED	B E SPT 3,9,9 N*=18 SPT 3,4,4 N*=8 SPT 2,3,5 N*=8 SPT 7,6,7 N*=13 SPT 14/110mm N*=R	158 157 156 155 154 153 152 151	1 2 3 4 5 6 7 8			FILL: SILTY CLAY: Low plasticity, dark brown.	<Wp			FILL
									Becoming high plasticity, orange-brown and red, trace of sandstone gravel, ignious gravel and some ironstone gravel				
									FILL: SANDY CLAY: High plasticity, pale grey, orange-brown and red, with some sandstone gravel and ironstone gravel.	≈Wp			
									FILL: SILTY CLAY: High plasticity, dark brown				insufficient SPT sample for PID test
									Borehole CBH20 terminated at 6.65m				Insufficient SPT sample for PID test

method
AS auger screwing*
AD auger drilling*
RR roller/tricone
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V-bit
T TC bit
*bit shown by suffix
e.g. AD/T

support
N nil
C casing
penetration 1 2 3 4 — no resistance; ranging to refusal
water
▼ inflow water level on date shown
water inflow
water outflow

notes, samples, tests
U_x undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
ES bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on Unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

Form GEO_5.3 Issue 3 Rev 2

coffey geotechnics

Engineering Log - Borehole

Borehole No.	CBH21
Sheet	1 of 1
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	25.3.2008
Principal:	Coffey Projects
Date completed:	25.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 3
Checked by:	SH

drill model and mounting: Mobile DH 680 | Easting: 323757.8 | slope: -90° | R.L. Surface: 160.7
hole diameter: 100 mm | Northing: 6265655.53 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	Rl	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT		N	NOT MONITORED	C C E	160	1			<ASP> FILL: SILTY SAND: Fine grained, dark brown, Topsoil and grass FILL: SAND: Fine grained brown, with some silt, clay and gravel	D			FILL
				SPT 2,3,3 N*=6	159	2			FILL: SANDY CLAY: Medium plasticity, red, pale grey, orange and brown, medium grained sand, with some gravel and cobbles	<WP			Insufficient SPT sample for PID test
				SPT 4,3,4 N*=7	158	3			FILL: SANDY CLAY: Medium plasticity, brown, medium grained sand. FILL: CLAY: Medium plasticity orange and red, with some, sand and cobbles.				
				SPT 2,2,4 N*=6	157	4		SM	SILTY SAND: Fine grained, brownish grey.	D	MD		Insufficient SPT sample for PID test RESIDUAL SOIL
ADT				E	156	5			SANDSTONE: Fine grained, orange and pale grey.				V-bit refusal at 4.7m SANDSTONE
					155	6			Borehole CBH21 terminated at 5.1m				
					154	7							
					153	8							

method
AS auger screwing*
AD auger drilling*
RR rock roller/bit
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V-bit
T TC-bit
*(not shown by suffix)
e.g. ADT

support
N nil
M mud
C casing

penetration 1 2 3 — no resistance; rapidly to refusal

water
1/1/98 water level on date shown
water strike
water inflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{xx} undisturbed sample xxmm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
Wp plastic limit
W_L liquid limit

consistency/density index
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

BOREHOLE GEOTLCOV23462AA GPJ COFFEY.GDT 4/8/08

Form GEO 5.3 Issue 1 Rev 2

coffey geotechnics

Engineering Log - Borehole

Borehole No	CBH22
Sheet	1 of 1
Project No:	GEOTLCOV23462AA
Date started:	25.3.2008
Date completed:	25.3.2008
Logged by:	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project: *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: *Building 1*

drill model and mounting:	Mobile Drill 8811	Eastng:	323689.5	slope:	-90°	R.L. Surface:	156.5
hole diameter:	100 mm	Northing	6255710.2	bearing:		datum:	AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc.	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADT			NOT OBSERVED	E SPT 2,2,2 N*=4 E F	156 155 154	1 2		SP	FILL: BITUMEN and ROADBASE FILL: CLAYEY SAND: Medium grained, orange, pale grey and red, medium plasticity clay, with some sandstone cobbles. FILL: SILTY SAND: Fine grained, dark brown, trace of rootlets, sandstone cobbles (50mm) SAND: Medium grained, orange, with some clay. SANDSTONE: Medium grained, yellow and pale grey SANDSTONE: Medium grained, yellow and red. Borehole CBH22 terminated at 2.4m	D M M/D			FILL Insufficient SPT samples for PID test. TOPSOIL ? RESIDUAL SOIL SANDSTONE

method
AS auger screwing*
AD auger drilling*
RR rotary mud
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V bit
T TC bit
*bit shown by suffix
e.g. ADT

support
M mud N nil
C casing
penetration 1 2 3 4
no resistance ranging to refusal
water
10/150 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
N_C SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
W_p plastic limit
W_L liquid limit

consistency/density index
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

Form GEO 5 5 issue 3 Rev 2

BOREHOLE GEOTLCOV23462AA.SPJ COFFEY GDT 4/6/08

coffey geotechnics

Engineering Log - Borehole

Borehole No	CBH23
Sheet	1 of 1
Project No:	GEOTLCOV23462AA
Date started:	25.3.2008
Date completed:	25.3.2008
Logged by:	JA
Checked by:	SH

Client: *Taylor Thomson Whitting*

Principal: *Coffey Projects*

Project: *185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA*

Borehole Location: ***Building 2***

drill model and mounting: Mobile Drill 880 | Easting: 323850 | slope: -90° | R.L. Surface: 159.0

hole diameter: 100 mm | Northing: 6265805.6 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
AD/T			NOT OBSERVED	0.1m					FILL: BITUMEN and ROADBASE	D			FILL
									FILL: CLAYEY SAND: Fine grained, orange-brown, medium plasticity clay, with some gravel.				
					159	1			SANDSTONE: Fine to medium grained, orange and pale grey.				SANDSTONE
									Borehole CBH23 terminated at 1.1m				
					158	2							
					157	3							
					156	4							
					155	5							
					154	6							
					153	7							
					152	8							

method
AS auger screwing*
AD auger drilling*
RR roller/blade
W washbore
CT cable tool
HA hand auger
DI diatube
B Wash bit
V V bit
T TC bit
*bit shown by suffix
e.g. AD/T

support
N nil
M mud
C casing
penetration 1 2 3
or resistance ranging to refusal
water
1 on date shown
water inflow
water outflow

notes, samples, tests
U_{63} undisturbed sample 63mm diameter
U_{50} undisturbed sample 50mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet
W_p plastic limit
W_L liquid limit

consistency/density index

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

BOREHOLE GEOTLCOV23462AA.GPJ COFFEY.GDT 4.10.05

Form GEO 5.1 Issue 3 Rev.2

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Engineering Log - Borehole

Borehole No.	CBH24
Sheet	1 of 1
Project No:	GEOTLCOV23462AA
Client:	Taylor Thomson Whitting
Date started:	25.3.2008
Principal:	Coffey Projects
Date completed:	25.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA
Logged by:	JA
Borehole Location:	Building 2
Checked by:	SH

drill model and mounting: Mobile Drill 880 | Easting: 323832.3 | slope: -90° | R.L. Surface: 161.2

hole diameter: 100 mm | Northing: 6265870.7 | bearing: | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa	structure and additional observations
ADT			NOT OBSERVED	0.1m E	161	1			FILL: BITUMEN and ROADBASE	D			FILL
									FILL: SAND: Fine to medium grained, grey/ish brown, with some silt, gravel and cobbles				
									SANDSTONE: Medium grained, orange and pale grey				SANDSTONE
					160	2			Borehole CBH24 terminated at 1m				
					159	3							
					158	4							
					157	5							
					156	6							
					155	7							
					154	8							

method

AS	auger screwing*
AD	auger drilling*
RR	rotary tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support: M mud, N nil, C casing

penetration: 1 2 3 4 — no resistance / rapid / slow / refusal

water: 10/7/90 water level on date shown; water inflow; water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
G	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Ds	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

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 geotechnics

Engineering Log - Borehole

Borehole No.	CBH25		
Sheet	1 of 1		
Project No:	GEOTLCOV23462AA		
Client:	Taylor Thomson Whitting	Date started:	25.3.2008
Principal:	Coffey Projects	Date completed:	25.3.2008
Project:	185 FOX VALLEY ROAD, SAN HOSPITAL, WAHROONGA	Logged by:	JA
Borehole Location:	Building 2	Checked by:	SH

drill model and mounting: Mobile D8T/B80 | Easting 323857.9 | slope: 00° | RL Surface 161.4
hole diameter: 100 mm | Northing 6255874.4 | bearing: | datum AHD

drilling information							material substance					
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	structure and additional observations
ADT			NOT OBSERVED	D 0.0-0.1m D 0.1-0.2m D 0.9-1.0m	161	1			FILL: BITUMEN and ROADBASE	D		FILL
									FILL: GRAVELLY SAND: Medium grained, greyish brown, medium to coarse sandstone gravel			
									SANDSTONE: Medium grained, pale yellow.			SANDSTONE
									Borehole CBH25 terminated at 1m			
					160	2						
					159	3						
					158	4						
					157	5						
					156	6						
					155	7						
					154	8						

methods
AS auger screwing*
AD auger drilling*
RR rock roller/bit
W washbore
CT cable tool
HA hand auger
DT diatube
B blank bit
V V-bit
T TC-bit
*bit shown by suffix
e.g. ADT

support
M mud N nil
C casing
penetration 1 2 3 4 — no resistance; varying to refusal
water
▼ 10/1/90 water level on date shown
water inflow
water outflow

notes, samples, tests
U_{50} undisturbed sample 50mm diameter
U_{63} undisturbed sample 63mm diameter
D disturbed sample
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
V vane shear (kPa)
P pressuremeter
Bs bulk sample
E environmental sample
R refusal

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet
W_p plastic limit
W_L liquid limit

consistency/density index
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

Appendix B

Laboratory Test Reports

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Lane Cove West,Sydney Laboratory

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV085-01180
Issue No: 1
This report replaces all previous issues of report no 'CBR LCOV085-01180'.

Client: Coffey Geotechnics Pty Ltd
8/12 Mars Road
Lane Cove NSW 2066
Principal:
Job No: LABTLCOV00268AA
Project: GEOTLCOV23462AA
Lot No: **TRN:**

Approved Signatory: Marshall Webster
(Laboratory Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 22/04/2008

Sample Details

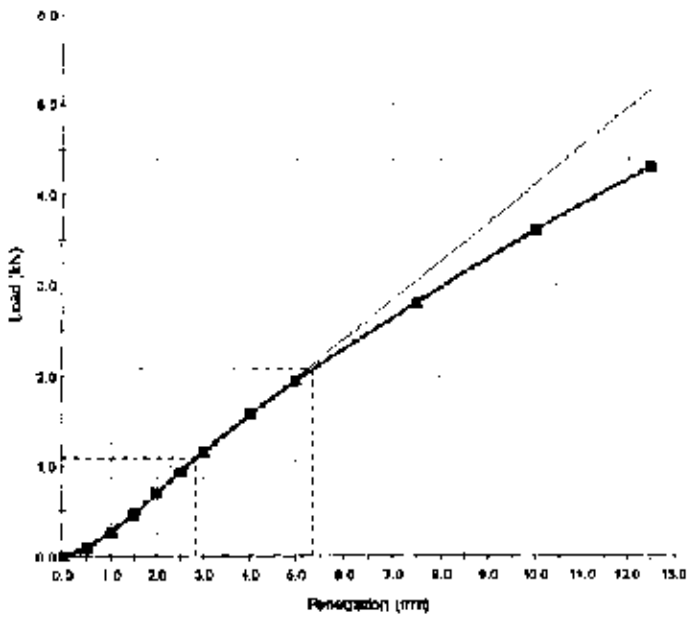
Product:
Source:
Location: SAN Hospital, Wahroonga
Client Ref: CBH 15

Date Sampled: 7/04/2008
Sampling Method:
Sample ID: LCOV085-01180

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m³)	1.970
Optimum Moisture Content (%)	11.2
CBR 2.5mm (%)	8.0
CBR 5.0mm (%)	**10.0**
Preparation	Soaked
Initial Moisture Content (%)	11.8
Achieved Dry Density (t/m³)	1.956
Achieved Moisture Content (%)	11.8
Swell (%)	0.0
Moisture After Penetration (%)	11.8
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	13.1
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	105
Laboratory Density Ratio After Compaction (%)	99
Oversize Material Excluded	YES
Percent Oversize Excluded	7.9

Chart



CBR (%): 10.0

Rate of Penetration

Comments

Depth of sample = 0.25 - 1.0m

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Lane Cove West,Sydney Laboratory

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV08S-01181
Issue No: 1
This report replaces all previous issues of report no: CBR:LCOV08S-01181.

Client: Coffey Geotechnics Pty Ltd
8/12 Mars Road
Lane Cove NSW 2066

Principal:
Job No: LABTLCOV00266AA
Project: GEOTLCOV23462AA
Lot No: **TRN:**

Approved Signatory: Marshall Webster
(Laboratory Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 22/04/2008

Sample Details

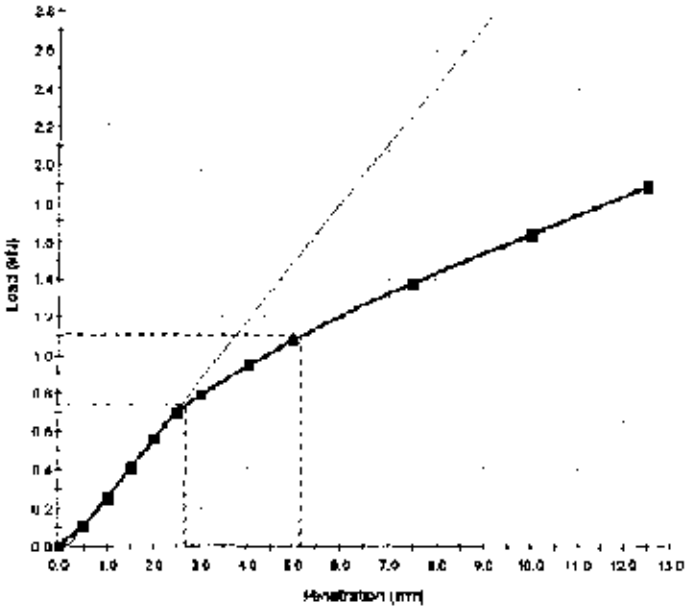
Product:
Source:
Location: SAN Hospital, Wahroonga
Client Ref: CBH 11

Date Sampled: /04/2008
Sampling Method:
Sample ID: LCOV08S-01181

Test Results

Description	Result
Test Method	AS 1289 6 1.1
Maximum Dry Density (t/m³)	1.890
Optimum Moisture Content (%)	12.8
CBR 2.5mm (%)	**6.0**
CBR 5.0mm (%)	**6.0**
Preparation	Soaked
Initial Moisture Content (%)	12.9
Achieved Dry Density (t/m³)	1.882
Achieved Moisture Content (%)	12.9
Swell (%)	3.5
Moisture After Penetration (%)	13.8
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	16.0
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	101
Laboratory Density Ratio After Compaction (%)	100
Oversize Material Excluded	YES
Percent Oversize Excluded	0.0

Chart



CBR (%): 6.0

Rate of Penetration

Comments

Depth of sample = 0.25 - 1.0m

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Lane Cove West,Sydney Laboratory

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV08S-01182

Issue No: 1

This report replaces all previous issues of report no 'CBR:LCOV08S-01182'.

Client: Coffey Geotechnics Pty Ltd
8/12 Mars Road
Lane Cove NSW 2066

Principal:

Job No: LABTLCOV00268AA

Project: GEOTLCOV23462AA

Lot No: TRN:

Approved Signatory: Marshall Webster
(Laboratory Manager)
NATA Accredited Laboratory Number: 431
Dated Issue: 22/04/2008

Sample Details

Product:

Source:

Location: SAN Hospital, Wahroonga

Client Ref: CBH 14

Date Sampled: 7/04/2008

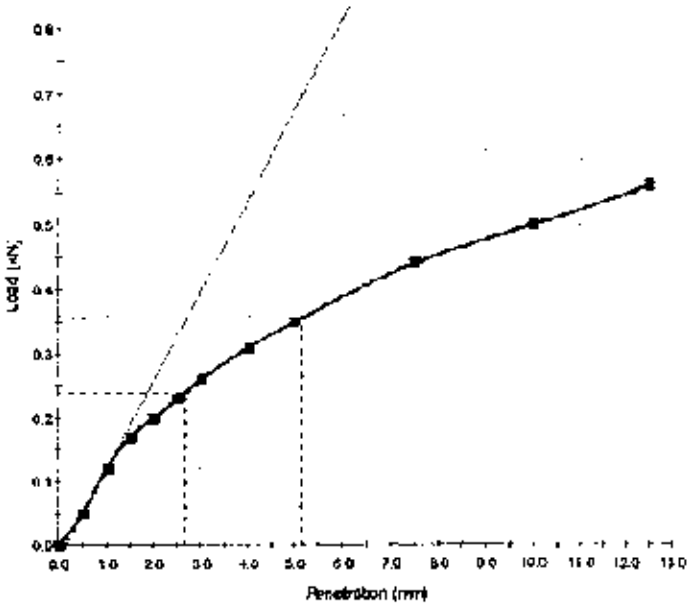
Sampling Method:

Sample ID: LCOV08S-01182

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m³)	1.690
Optimum Moisture Content (%)	20.0
CBR 2.5mm (%)	**2.0**
CBR 5.0mm (%)	**2.0**
Preparation	Soaked
Initial Moisture Content (%)	22.3
Achieved Dry Density (t/m³)	1.656
Achieved Moisture Content (%)	22.3
Swell (%)	0.0
Moisture After Penetration (%)	22.3
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	23.2
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	112
Laboratory Density Ratio After Compaction (%)	98
Oversize Material Excluded	YES
Percent Oversize Excluded	

Chart



CBR (%): 2.0

Rate of Penetration

Comments

Depth of sample = 0.25 - 1.0m

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Lane Cove West,Sydney Laboratory

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV08S-01183
Issue No: 1
This report replaces all previous issues of report no 'CBR:LCOV08S-01183'.

Client: Coffey Geotechnics Pty Ltd
8/12 Mars Road
Lane Cove NSW 2066

Principal:
Job No: LABTLCOV00268AA
Project: GEOTLCOV23462AA
Lot No: **TRN:**

Approved Signatory: Marshall Webster
(Laboratory Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 22/04/2008

Sample Details

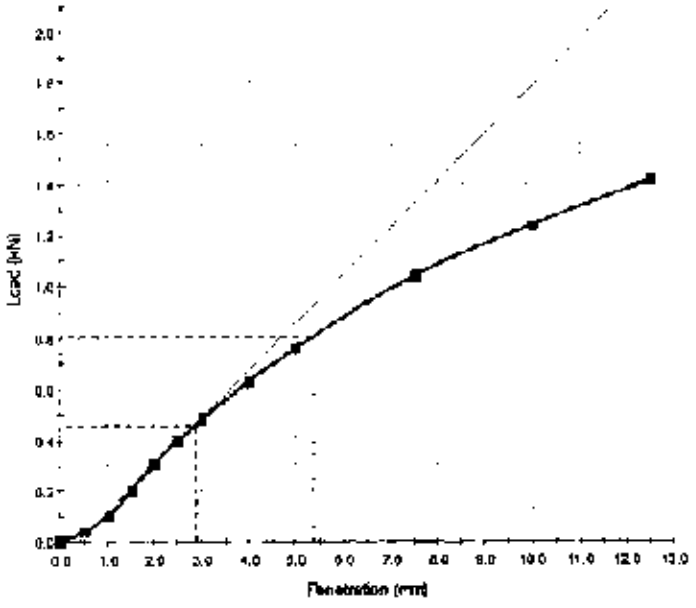
Product:
Source:
Location: SAN Hospital, Wahroonga
Client Ref: CBH 10

Date Sampled: 7/04/2008
Sampling Method:
Sample ID: LCOV08S-01183

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m³)	1.900
Optimum Moisture Content (%)	11.4
CBR 2.5mm (%)	3.5
CBR 5.0mm (%)	**4.0**
Preparation	Soaked
Initial Moisture Content (%)	15.2
Achieved Dry Density (t/m³)	1.846
Achieved Moisture Content (%)	15.2
Swell (%)	0.0
Moisture After Penetration (%)	15.7
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	16.2
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	133
Laboratory Density Ratio After Compaction (%)	97
Oversize Material Excluded	YES
Percent Oversize Excluded	3.6

Chart



CBR (%): 4.0

Rate of Penetration

Comments

Depth of sample = 0.3 - 0.6m

Lane Cove West,Sydney Laboratory

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV08S-01184

Issue No: 1

This report replaces all previous issues of report no 'CBR:LCOV08S-01184'.

Client:	Coffey Geotechnics Pty Ltd 8/12 Mars Road Lane Cove NSW 2066
Principal:	
Job No:	LABTLCOV00268AA
Project:	GEOTLCOV23462AA
Lot No:	TRN:

Approved Signatory: Marshall Webster (Laboratory Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 22/04/2008

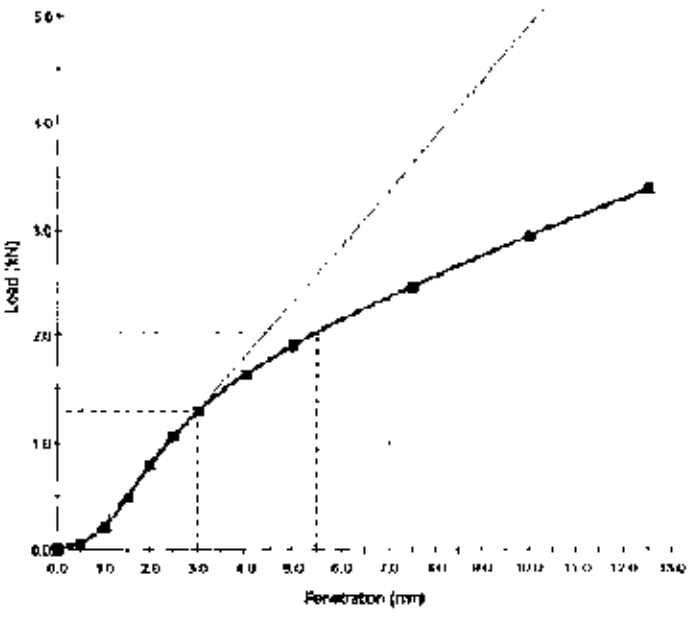
Sample Details

Product:		**Date Sampled:**	7/04/2008
Source:		**Sampling Method:**	
Location:	SAN Hospital, Wahroonga	**Sample ID:**	LCOV08S-01184
Client Ref:	CBH 7		

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m³)	1.930
Optimum Moisture Content (%)	11.9
CBR 2.5mm (%)	**10.0**
CBR 5.0mm (%)	**10.0**
Preparation	Soaked
Initial Moisture Content (%)	11.5
Achieved Dry Density (t/m³)	1.935
Achieved Moisture Content (%)	11.5
Swell (%)	0.0
Moisture After Penetration (%)	11.9
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	14.1
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	97
Laboratory Density Ratio After Compaction (%)	100
Oversize Material Excluded	YES
Percent Oversize Excluded	0.0

Chart



CBR (%): 10.0

Rate of Penetration

Comments

Depth of sample = 0.25 - 1.0m

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Lane Cove West,Sydney Laboratory

Coffey Geotechnics Pty Ltd
ABN 93 056 929 483
8/12 Mars Road
Lane Cove West NSW 2066

Telephone: +61 2 9911 1000
Facsimile: +61 2 9911 1002

California Bearing Ratio

Report No: CBR:LCOV08S-01185
Issue No: 1
This report replaces all previous issues of report no 'CBR:LCOV08S-01185'.

Client: Coffey Geotechnics Pty Ltd
8/12 Mars Road
Lane Cove NSW 2066
Principal:
Job No: LABTLCOV00268AA
Project: GEOTLCOV23162AA
Lot No: **TRN:**

Approved Signatory: Marshall Webster
(Laboratory Manager)
NATA Accredited Laboratory Number: 431
Date of Issue: 22/04/2008

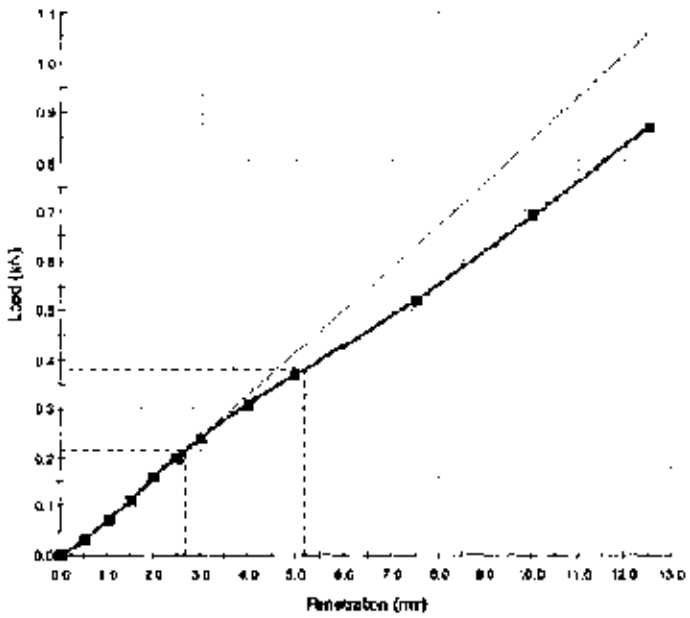
Sample Details

Product:
Source:
Location: SAN Hospital, Wahroonga
Client Ref: CBH 18
Date Sampled: 7/04/2008
Sampling Method:
Sample ID: LCOV08S-01185

Test Results

Description	Result
Test Method	AS 1289.6.1.1
Maximum Dry Density (t/m³)	1.810
Optimum Moisture Content (%)	15.8
CBR 2.5mm (%)	1.5
CBR 5.0mm (%)	**2.0**
Preparation	Soaked
Initial Moisture Content (%)	16.7
Achieved Dry Density (t/m³)	1.794
Achieved Moisture Content (%)	16.7
Swell (%)	0.0
Moisture After Penetration (%)	16.7
Period of Soaking (days)	4
Moisture Content of Top 30mm (%)	19.6
Moisture of Penetrated End (%)	
Compaction Type	
Surcharge Mass (kg)	4.50
Laboratory Moisture Ratio After Compaction (%)	106
Laboratory Density Ratio After Compaction (%)	99
Oversize Material Excluded	YES
Percent Oversize Excluded	0.0

Chart



CBR (%): 2.0

Rate of Penetration

Comments

Depth of sample = 0.2 - 1.0m

2 April 2008 **TEST REPORT**

Coffey Environments Pty Ltd
8/12 Mars Road
LANE COVE WEST
NSW 2066

Your Reference: GL23462AA
Report Number: 59760

Attention: Richard Moyle

Dear Richard
The following samples were received from you on the date indicated.

Samples: Qty.	7 Soils
Date of Receipt of Samples:	26/03/08
Date of Receipt of Instructions:	26/03/08
Date Preliminary Report Emailed:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

The results and associated quality control are contained in the following pages of this report.
Unless otherwise stated, solid samples are expressed on a dry weight basis (moisture has been supplied for your information only), air and liquid samples as received.

Should you have any queries regarding this report please contact the undersigned.

Yours faithfully
SGS ENVIRONMENTAL SERVICES

Ly Kim Ha
Senior Organic Chemist

Edward Ibrahim
Laboratory Services Manager

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services Unit 16, 33 Maddox Street, Alexandria Australia | t (02) 9594 0400 f (02) 9594 0499 | www.au.sgs.com

Inorganics						
Our Reference:	UNITS	59760-1	59760-2	59760-3	59760-4	59760-6
Your Reference	----------	CBH16	CBH13	CBH15	CBH12	CBH8
Sample Type	----------	Soil	Soil	Soil	Soil	Soil
Depth		0.3-0.5	0.7-1.0	0.25-1.0	0.2-0.3	0.3-0.4
Date Sampled		19/03/2008	18/03/2008	18/03/2008	17/03/2008	19/03/2008
Date Extracted (pH)		27/03/2008	27/03/2008	27/03/2008	27/03/2008	27/03/2008
Date Analysed (pH)		27/03/2008	27/03/2008	27/03/2008	27/03/2008	27/03/2008
pH 1:5 soil:water 1:5 soil:water	pH Units	7.7	4.7	8.1	5.5	7.6

Inorganics		
Our Reference:	UNITS	59760-7
Your Reference	----------	CBH1
Sample Type	----------	Soil
Depth		0.1-0.6
Date Sampled		10/03/2008
Date Extracted (pH)		27/03/2008
Date Analysed (pH)		27/03/2008
pH 1:5 soil:water 1:5 soil:water	pH Units	8.0

Anions in soil						
Our Reference:	UNITS	59760 1	59760-2	59760-3	59760-4	59760-5
Your Reference	----------	CBH16	CBH13	CBH15	CBH12	CBH8
Sample Type	----------	Soil	Soil	Soil	Soil	Soil
Depth		0 3-0.5	0.7-1.0	0.25-1.0	0.2-0.3	0.3-0.4
Date Sampled		19/03/2008	18/03/2008	18/03/2008	17/03/2008	19/03/2008
Date Extracted		31.03.08	31/03/2008	31/03/2008	31/03/2008	31/03/2008
Date Analysed		02.04.08	31/03/2008	31/03/2008	31/03/2008	31/03/2008
Chloride, Cl 1:5 soil:water	mg/kg	6.2	290	6.7	17	2.0
Sulphate, SO4 1:5 soil:water	mg/kg	33	46	33	78	39

Anions in soil		
Our Reference:	UNITS	59760-7
Your Reference	----------	CBH1
Sample Type	----------	Soil
Depth		0.1-0.6
Date Sampled		18/03/2008
Date Extracted		31/03/2008
Date Analysed		31/03/2008
Chloride, Cl 1:5 soil:water	mg/kg	6.4
Sulphate, SO4 1:5 soil:water	mg/kg	38

Moisture						
Our Reference:	UNITS	59760-1	59760-2	59760-3	59760-4	59760-6
Your Reference	----------	CBH16	CBH13	CBH15	CBH12	CBH8
Sample Type	----------	Soil	Soil	Soil	Soil	Soil
Depth		0.3-0.5	0.7-1.0	0.25-1.0	0.2-0.3	0.3-0.4
Date Sampled		19/03/2008	18/03/2008	18/03/2008	17/03/2008	13/03/2008
Date Analysed (moisture)		27/03/2008	27/03/2008	27/03/2008	27/03/2008	27/03/2008
Moisture	%	10	10	10	11	7

Moisture		
Our Reference:	UNITS	59760-7
Your Reference	----------	CBH1
Sample Type	----------	Soil
Depth		0.1-0.5
Date Sampled		10/03/2008
Date Analysed (moisture)		27/03/2008
Moisture	%	17

Method ID	Methodology Summary
AN101	pH - Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
SEI-035	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 20th ED, 4110-B.
AN002	Preparation of soils, sediments and sludges undergo analysis by either air drying, compositing, subsampling and 1:5 soil water extraction where required. Moisture content is determined by drying the sample at 105 - 5°C.

QUALITY CONTROL Inorganics	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD
Date Extracted (pH)				[NT]	59760-1	27/03/2008 || 27/03/2008
Date Analysed (pH)				[NT]	59760-1	27/03/2008 || 27/03/2008
pH 1:5 soil:water 1:5 soil:water	pH Units	0	AN101	[NT]	59760-1	7.7 || 7.7 | RPD: 0

QUALITY CONTROL Anions in soil	UNITS	LOR	METHOD	Blank	Duplicate Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Matrix Spike % Recovery Duplicate + %RPD
Date Extracted				31/03/08	59760-1	31.03.08 || 31.03.08	LCS	31/03/08%
Date Analysed				31/03/08	59760-1	02.04.08 || 02.04.08	LCS	31/03/08%
Chloride, Cl 1:5 soil:water	mg/kg	0.5	SEI-038	<0.5	59760-1	6.2 || 6.0 || RPD: 3	LCS	103%
Sulphate, SO4 1:5 soil:water	mg/kg	2	SEI-038	<2	59760-1	33 || 28 | RPD: 16	LCS	101%

QUALITY CONTROL Hold sample NO test required	UNITS	LOR	METHOD	Blank
Sample on HOLD				[NT]

QUALITY CONTROL Moisture	UNITS	LOR	METHOD	Blank
Date Analysed (moisture)				[NT]
Moisture	%	1	AN002	[NT]

Result Codes

[INS]	:	Insufficient Sample for this test	[RPD]	:	Relative Percentage Difference
[NR]	:	Not Requested	`	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Report Comments

Date Organics extraction commenced: N/A

NATA Corporate Accreditation No. 2562, Site No 4354

Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).

Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.

Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.

Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.

Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.

Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.

Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

Unless otherwise specified in the test method, the following general acceptance criteria apply:

Method Blanks:	<LOR
Duplicates:	<5 x LOR: No RPD criteria applied.
	>5 x LOR: 0-30% RPD is accepted.
LCS's:	Determined by Control Charts.
	Where control charts have not been developed, the Matrix Spikes criteria apply.
Matrix Spikes:	70-130% recovery is accepted for metals / inorganics.
	60-140% is accepted for organics
Surrogates:	60-130% recovery is accepted for BTEX.
	70-130% recovery is accepted for other organics.