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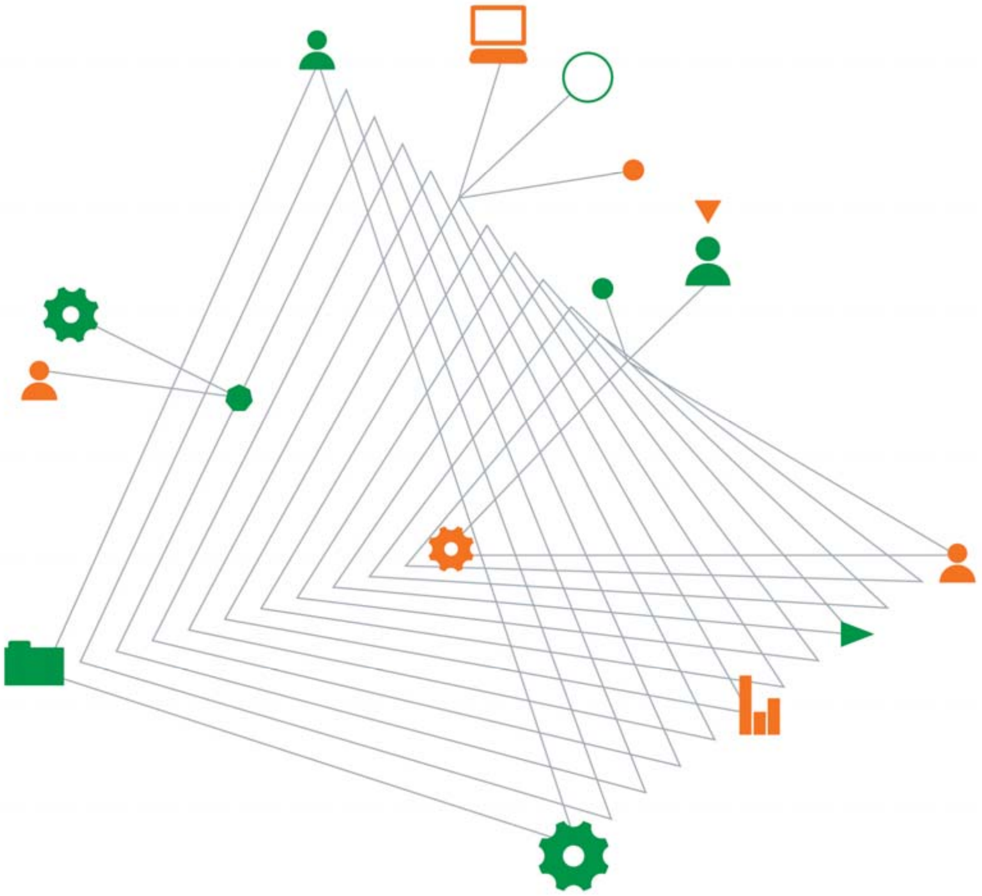
Bouygues Construction Australia Pty Ltd

Dooleys Lidcombe Catholic Club Redevelopment

Geotechnical Investigation Report - Multilevel Aboveground Car Park, Board Street, Lidcombe

11 July 2016



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Dooleys Lidcombe Catholic Club Redevelopment

Prepared for
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For and on behalf of Coffey

Robert Turner
Principal Geotechnical Engineer

Quality information

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Rev 1	First issue	4/3/2016	RH	PS	RH
Rev 2	Amendment due to car park design change	11/7/2016	CL	RT	RT

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Rev 2	1	PDF	JLL / Dooley’s Catholic Club Lidcombe	11/7/2016

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1. Introduction

This report presents the results of the additional geotechnical investigation for the proposed redevelopment at Dooleys Lidcombe Catholic Club on Church Street, Lidcombe. It is intended to be used as an addenda to our previous report GEOTLCOV25554AA-AC, dated 27 Janurary 2016. The geotechnical investigation was commissioned by George Pontifix of Bouygues Construction Australia Pty Ltd.

The purpose of the investigation was to supplement previous information to support foundation design of a multi-level car park proposed on Board Street, Lidcombe, as per our proposal GEOTLCOV25554AA-AD, dated 11 February 2016. This investigation is required as land occupied by the proposed above ground car park and associated access road was not considered by the initial investigation, ref. GEOTLCOV25554AA-AC, dated 27 January 2016. This report should be read in conjunction with the GEOTLCOV25554AA-AC. In addition, information has been used from the Douglas Partners Report (Report No 37623) for the underground car park located on Board Street, part of existing Dooleys Lidcombe Catholic Club.

We have completed additional hand augered boreholes and Dynamic Cone Penetrometer testing to assess the ground conditions at the underground car park site.

2. Site and Proposed Development

It has been proposed that in addition to the original 9,500 m^2 site, a further 4,000m^2 will be required for the development of a five storey above ground car park and access road. The car park shall be situated over existing residential properties No's 4 – 12 Board Street and No's 3 – 11 Ann Street. The access road shall be situated over existing residential property No. 17 Ann Street.

3. Method of investigation

The field investigation consisted of two hand augered boreholes, completed to depths between 0.65 m and 1.00 m. Dynamic Cone Penetrometer (DCP) tests were carried out at each borehole location, as well as two other nominated locations, completed to depths between 1.40 m and 2.29 m. Both hand augered boreholes and DCP tests were undertaken to refusal.

Figure 1 shows the approximate borehole locations, along with environmental boreholes. The results of the contamination assessment will be presented in a separate report

A Coffey geotechnical engineer was present during fieldwork to identify drilling locations, record test results and log the encountered ground conditions. The borehole logs are attached as Appendix A, together with Coffey soil and rock description and explanation sheets.

4. Subsurface conditions

4.1. Local geology

The Sydney 1:100,000 Geological Series Sheet indicates the Ashfield Shale is typically black to dark grey shale and laminite. The Ashfield Shale is the lowermost unit of the Wianamatta Group, and is underlain by the Mittagong Formation and the Hawkesbury Sandstone.

The bedrock is overlain by natural residual soils as well as any fill from previous site use.

4.2. Summary of encountered subsurface conditions

Two soil units were present on site, Fill and Residual Soil.

The fill material is orange brown to dark brown silty sandy clay and silty clay. The clay is low to high plasticity and sand is fine grained.

Residual soils were orange brown to mottled red brown clay of high plasticity and of stiff to very stiff consistency. Trace ironstone gravel was also encountered in HA10.

Table 1 summarises the DCP test results.

Table 1: DCP Results

Depth (m)	DCP 1 (Adjacent to HA02)	DCP 2[1] (Adjacent to HA05)	DCP 3 (Adjacent to HA10)	DCP 4
0.0	2	3	7	4
0.1	3	4	8	1
0.2	4	3	8	1
0.3	3	3	9	2
0.4	1	2	7	3
0.5	4	3	6	3
0.6	6	3	5	2
0.7	6	3	5	3
0.8	3	3	2	2
0.9	4	3	7	2
1.0	4	4	4	3
1.1	4	5	4	6
1.2	8	6	7	20
1.3	6	11	7	20/100 mm
1.4	17	8/20 mm	13	-
1.5	12	-	14	-
1.6	11	-	8	-
1.7	8	-	10	-

1.8	10	-	13	-
1.9	10	-	16	-
2.0	8	-	15	-
2.1	9	-	20/50 mm	-
2.2	20/90 mm	-	-	-

Notes: 1 – DCP 2 was terminated prior to twenty blows as DCP hammer was bouncing.

4.3. Groundwater

No groundwater was encountered during our investigation.

The previous investigations encountered groundwater between 4.31 and 5.95 m below ground level.

5. Site geotechnical model

Table 2 summarises the encountered geotechnical conditions and presents a geotechnical model for use on site

Table 2: Site geotechnical model

Unit	Geological Unit	Material Description	Rock Mass Classification	Approximate Depth to top of unit (m)
1	Fill	Fill: Silty sandy clay & silty clay	NA	Ground surface
2	Residual Soil	Clay and silty clay	NA	0.3 - 0.7
3	Extremely Weathered Siltstone and Sandstone	Interbedded siltstone and sandstone, very low strength	Class V Shale	2.0 – 3.0
4a	Highly Weathered to Slightly Weathered Siltstone and Sandstone	Interbedded sandstone, siltstone: low to high strength.	Class III Shale	4.0 - 5.0
4b	Fresh Siltstone and Sandstone	Interbedded sandstone and siltstone: medium to high strength.	Class II Shale	6.0 – 8.0
5	Fresh Laminite	Sandstone and siltstone: medium to high strength, fine sandstone laminae, typically 5-10mm	Class II Shale	6.0 – 9.0

This model has been developed based on the encountered conditions from the Coffey investigation (GEOTLCOV25554AA-AC) and the previous Douglas Partners investigation (Report No 37623). For reference BH08 from the Coffey investigation and BH1B from the Douglas Partners report have been included in Appendix B as they represent the closest cored boreholes to site.

The depth of fill across the site is likely to be variable, with depths of fill deeper than those encountered in our investigation being possible depending on land use by the residential occupiers.

Approximate depths to the top of the geological units have been provided to aid in design. Rock condition and depth across the site may be variable, and consideration should be made for this in design. In addition, rock strengths may vary within these layers.

6. Foundation Recommendations

Based on discussion with Bouygues bored pier/piles are the intended footing choice.

We do not recommend the use of shallow footings or piles founded on the Unit 2 or Unit 3. Piles founded on the residual soils of Unit 2 will have limited uplift capacity, likely making them unsuitable for the car park foundation. Founding footings in the Unit 3 rock materials would be difficult, as it is typically a thin layer in this area of site making targeting this foundation material difficult.

We recommend the bored piles be installed into the higher strength rock of Units 4b and 5. Table 3 below presents serviceability and ultimate limit state geotechnical design parameters that may be used for design of bored piles into the different classes of shale.

Table 3: Geotechnical Foundation Design Parameters for Shale

Unit	Serviceability End Bearing Pressure (MPa)	Ultimate End Bearing Capacity (MPa)	Ultimate Shaft Adhesion (kPa)	Young's Modulus (MPa)
Class III Shale	1	6	350 ^{A}	200
Class II Shale	3.5	30	600 ^{A}	700

a) *For piles, shaft adhesion should only be assumed where piles have a minimum socket of at least 1 pile diameter and a clean socket of roughness category R2 or better is required. Values may have to be reduced if wall smear or polish is present.*

For the use of geotechnical design parameters for Class III or better shale, geotechnical proving of foundation conditions for individual footings will be required. Such proving would require geotechnical inspections during construction to check rock mass quality on a portion of the proposed footings.

For footings designed using a working stress approach, the serviceability end bearing pressures given above should result in settlements of less than 1% of the least footing dimension. Coffey can provide detailed analysis based on a limit state approach in accordance with AS2159, which should result in a more economic design than the working stress approach.

In accordance with AS2159-2009, the geotechnical strength reduction factor, Φg, is dependent on assignment of an Average Risk Rating (ARR) which takes into account various geotechnical uncertainties, redundancy of the foundation system, construction supervision, and the quantity and type of pile testing. The assessment of Φg therefore depends on the structural design of the foundation system as well as the design and construction methods, and testing (if any) to be employed by the designer and piling contractor.

To assist you with preliminary design we recommend Φg of 0.52 be adopted for footings on the shale. The final selection of Φg should be reviewed by Coffey at the detailed design stage.

If foundations are to resist uplift, the ultimate shaft adhesion should be reduced by applying a factor of 0.7 in addition to the geotechnical strength reduction factor. Uplift piles should also be checked for an inverted cone pullout mechanism.

The guidelines for site preparation outlined in GEOTLCOV25554AA-AC should be followed for this area of site.

Consideration should be given for the presence of groundwater during the installation of bored piers. The highest measured level of groundwater was 4.31m below ground level, which may intersect the pile installation holes. Base of piles should also be free of debris prior to concrete pouring.

7. Limitations of this report

Subsurface conditions can be complex and may vary over relatively short distances – and over time. The inferred geotechnical model and recommendations in this report are based on limited subsurface investigations at discrete locations. The engineering logs describe subsurface conditions only at the investigation locations.

Further investigations may be required to support detailed design if there are scope limitations or changes to the nature of the project. We can assist with detailed design and/or to review designs, and verify that the conditions exposed are consistent with design assumptions during construction.

The attached document entitled “Important information about your Coffey report” forms an integral part of this report and presents additional information about its uses and limitations.

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.

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.

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* 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.

LEGEND

- ENVIRONMENTAL BOREHOLE LOCATION
- GEOTECHNICAL BOREHOLE LOCATION
- ● DCP LOCATION
- BH8, PREVIOUS COFFEY INVESTIGATION (GEOTLCOV25554AA)
- BH1B, FROM DOUGLAS PARTNERS REPORT (REPORT No. 37623)

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.2
AERIAL IMAGE ©: 2015 AEROMETREX

PLOT DATE: 25/02/2016 2:03:46 PM DWG FILE: F:\GEOTECHNICS\1.PROJECTS\GEOTLCOV255\GEOTLCOV25554AA DOOLEYS LIDCOMBE CLUB & HOTEL DEVELOPMENT\CAD\GEOTLCOV25554AA-AF.DWG

revision

no.	description	drawn	approved	date
A	ORIGINAL ISSUE			

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Scale (metres) 1:1250

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date	25 / 02 / 16
scale	AS SHOWN
original size	A3

coffey

client: BOUYGUES CONSTRUCTION AUSTRALIA

project: DOOLEYS LIDCOMBE CLUB AND HOTEL DEVELOPMENT
LIDCOMBE, SYDNEY, NSW

title: BOREHOLE LOCATION PLAN

project no: GEOTLCOV25554AA-AF
figure no: FIGURE 1
rev: A

Appendix A - Borehole Logs, Soil Descriptions and Rock Descriptions

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:
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. 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.

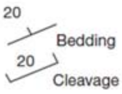
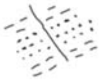
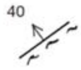
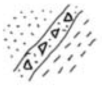
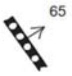
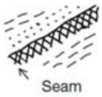
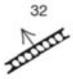
ROCK SUBSTANCE STRENGTH TERMS

Term	Abbre-viation	Point Load Index, $I_{s(50)}$ (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 bows 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:
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.
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.
The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index Is(50). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

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. but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. 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 borehole 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
Veneer	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 greater than cross section

72710 / 07-06

Soil Description Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented 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 shape.	Moderately cemented	Effort is 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.

Soil Description Explanation Sheet (2 of 2)

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

<table>
<tr><th colspan="6">FIELD IDENTIFICATION PROCEDURES USC
(Excluding particles larger than 60 mm and basing fractions on estimated mass)</th><th>USC</th><th>PRIMARY NAME</th></tr>
<tr><td rowspan="8">COARSE GRAIINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm</td><td rowspan="16">(A 0.075 mm particle is about the smallest particle visible to the naked eye)</td><td rowspan="4">GRAVELS More than half of coarse fraction is larger than 2.36 mm</td><td rowspan="2">CLEAN GRAVELS (Little or no fines)</td><td colspan="2">Wide range in grain size and substantial amounts of all intermediate particle sizes</td><td>GW</td><td>GRAVEL</td></tr>
<tr><td colspan="2">Predominantly one size or a range of sizes with more intermediate sizes missing.</td><td>GP</td><td>GRAVEL</td></tr>
<tr><td rowspan="2">GRAVELS WITH FINES Appreciable amount of fines)</td><td colspan="2">Non-plastic fines (for identification procedures see ML below)</td><td>GM</td><td>SILTY GRAVEL</td></tr>
<tr><td colspan="2">Plastic fines (for identification procedures see CL below)</td><td>GC</td><td>CLAYEY GRAVEL</td></tr>
<tr><td rowspan="4">SANDS More than half of coarse fraction is smaller than 2.36 mm</td><td rowspan="2">CLEAN SANDS (Little or no fines)</td><td colspan="2">Wide range in grain sizes and substantial amounts of all intermediate sizes</td><td>SW</td><td>SAND</td></tr>
<tr><td colspan="2">Predominantly one size or a range of sizes with some intermediate sizes missing.</td><td>SP</td><td>SAND</td></tr>
<tr><td rowspan="2">SANDS WITH FINES (Appreciable amount of fines)</td><td colspan="2">Non-plastic fines (for identification procedures see ML below).</td><td>SM</td><td>SILTY SAND</td></tr>
<tr><td colspan="2">Plastic fines (for identification procedures see CL below).</td><td>SC</td><td>CLAYEY SAND</td></tr>
<tr><td rowspan="8">FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm</td><td></td><td colspan="3">IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm</td><td></td><td></td></tr>
<tr><td rowspan="4">SILTS & CLAYS Liquid limit less than 50</td><td>DRY STRENGTH</td><td>DILATANCY</td><td>TOUGHNESS</td><td></td><td></td></tr>
<tr><td>None to Low</td><td>Quick to slow</td><td>None</td><td>ML</td><td>SILT</td></tr>
<tr><td>Medium to High</td><td>None</td><td>Medium</td><td>CL</td><td>CLAY</td></tr>
<tr><td>Low to medium</td><td>Slow to very slow</td><td>Low</td><td>CL</td><td>ORGANIC SILT</td></tr>
<tr><td rowspan="3">SILTS & CLAYS Liquid limit greater than 50</td><td>Low to medium</td><td>Slow to very slow</td><td>Low to medium</td><td>MH</td><td>SILT</td></tr>
<tr><td>High</td><td>None</td><td>High</td><td>CH</td><td>CLAY</td></tr>
<tr><td>Medium to High</td><td>None</td><td>Low to medium</td><td>OH</td><td>ORGANIC CLAY</td></tr>
<tr><td colspan="3">HIGHLY ORGANIC SOILS</td><td colspan="3">Readily identified by colour, odour, spongy feel andfrequently by fibrous texture.</td><td>PT</td><td>PEAT</td></tr>
<tr><td colspan="8">● Low plasticity – Liquid Limit w_L less than 35%. ● Medium plasticity – w_L between 35% and 50%. ● High plasticity – w_L greater than 50%.</td></tr>
</table>

COMMON DEFECTS IN SOIL

TERM	**DEFINITION**	**DIAGRAM**	**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.		SOFTENED ZONE	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.	
JOINT	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.		TUBE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
SHEARED ZONE	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		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.	
SHEARED SURFACE	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.		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.	

coffey

Engineering Log - Hand Auger

Borehole ID.	**HA05**
sheet:	1 of 1
project no.	***GEOTLCOV25554AA***
date started:	***18 Feb 2016***
date completed:	***18 Feb 2016***
logged by:	***TO***
checked by:	***DS***

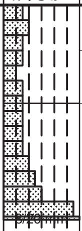
client:	***Bouygues Construction Australia***
principal:	***Dooleys Lidcombe Catholic Club***
project:	***Dooleys Lidcombe Club & Hotel Development***
location:	***24-28 John St, Lidcombe NSW 2141***

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
DCP id.: DCP2
drill model: Hand Auger
hole diameter : 60 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	classification symbol	material description **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
HA		Not Encountered	E E				**FILL: Silty Sandy CLAY**: low plasticity, dark brown, sand is fine grained, with trace rootlets and brick fragments.	D			**FILL** possible bonded asbestos
							FILL: Silty CLAY: medium to high plasticity, pale brown, orange brown, with trace gravel, fine to medium grained, subrounded to subangular, possible charcoal or asphalt.				
						CH	**CLAY**: high plasticity, brown, red brown.	<Wp	St		**RESIDUAL SOIL**
							Hand Auger HA05 terminated at 0.65 m Target depth				

depth (m): 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0



CDF_0_9_04BB.GLB Log COF BOREHOLE: NON CORED + DCP GEOTLCOV25554AA.GPJ <<DrawingFile>> 04/03/2016 14:17

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
W	washbore
HA	hand auger
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M mud
C casing
N nil

penetration

1 2 3 no resistance ranging to refusal

water

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

samples & field tests

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

classification symbol & soil description
based on Unified Classification System

moisture

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

consistency / relative density

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

coffey

Engineering Log - Hand Auger

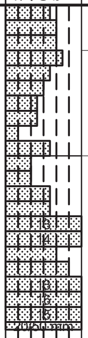
Borehole ID.	***HA10***
sheet:	1 of 1
project no.	***GEOTLCOV25554AA***
date started:	***18 Feb 2016***
date completed:	***18 Feb 2016***
logged by:	***TO***
checked by:	***DS***

client: ***Bouygues Construction Australia***
principal: ***Dooleys Lidcombe Catholic Club***
project: ***Dooleys Lidcombe Club & Hotel Development***
location: ***24-28 John St, Lidcombe NSW 2141***

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
DCP id.: DCP3
drill model: Hand Auger
hole diameter : 60 mm

drilling information | **material substance**

method & support	penetration (1 2 3)	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	**material description** **SOIL TYPE**: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	DCP (blows/ 100 mm) 2 4 6 8 10	**structure and additional observations**
HA		Not Encountered	E E					**FILL: Silty Sandy CLAY**: low plasticity, dark brown, sand is fine grained, with trace rootlets and glass fragments.	D				**FILL**
							CH	**FILL: Silty CLAY**: medium to high plasticity, dark brown, orange brown, with trace charcoal and gravel, fine to medium grained, subangular.	<Wp	St			**RESIDUAL SOIL**
					1.0			**CLAY**: high plasticity, orange brown, mottled red brown, with trace ironstone gravel.					
								Hand Auger HA10 terminated at 1.0 m Target depth					
					2.0								
					3.0								
					4.0								
					5.0								
					6.0								
					7.0								



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

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

support
M mud N nil
C casing

penetration
1 2 3
no resistance ranging to refusal

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

samples & field tests

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

classification symbol & soil description
based on Unified Classification System

moisture

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

consistency / relative density

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

Appendix B - Borehole Logs from Previous Investigation

coffey

Engineering Log - Borehole

Borehole ID.	**BH08**
sheet:	1 of 4
project no.	**GEOTLCOV25554AA**
date started:	**26 Nov 2015**
date completed:	**26 Nov 2015**
logged by:	**TO**
checked by:	**MF**

client: **Bouygues Construction Australia**

principal: **Dooleys Lidcombe Catholic Club**

project: **Dooleys Lidcombe Club & Hotel Development**

location: **24-28 John St, Lidcombe NSW 2141**

position: E: 319010; N: 6251500 (Datum Not Specified) surface elevation: 15.60 m (AHD) angle from horizontal: 90° DCP id.:

drill model: GEO205, Track mounted hole diameter : 100 mm

drilling information | **material substance**

method & support	water	samples & field tests	RL (m)	depth (m)	graphic log / classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	structure and additional observations
HA	Not Observable	E E	15	0.0–0.7		**FILL: Gravelly CLAY**: fine to medium grained, high plasticity, brown to dark brown, smell of fertiliser.	~Wp		**FILL** PID(0.2m) = 4.5ppm, no odours or staining observed PID(0.05-0.7m) = 4.7ppm
HA to 1.0; AD/T; CASING		E SPT 3, 4, 5 N*=9	14	0.7–3.0	CH	**CLAY**: high plasticity, pale grey mottled red brown. with ironstone gravel	<Wp	St to VSt VSt to H	**RESIDUAL SOIL** PID(1.0-1.1m) = 4.4ppm
AD/T; CASING		SPT 6, 12, 23 N*=35	13						
AD/T; CASING			12	3.0–3.6		**SILTSTONE**: grey and brown, extremely weathered, estimated very low strength.			**BEDROCK**
			11, 10, 9, 8	3.6		Borehole BH08 continued as cored hole			

penetration 1 2 3; hand penetrometer (kPa) 100 200 300 400; DCP (blows/ 100 mm) 2 4 6 8 10

depth (m): 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
W	washbore
HA	hand auger
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M mud N nil

C casing

penetration

1 2 3 no resistance ranging to refusal

water

10-Oct-12 water level on date shown

water inflow

water outflow

samples & field tests

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

classification symbol & soil description

based on Unified Classification System

moisture

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

consistency / relative density

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

Engineering Log - Cored Borehole

Borehole ID. **BH08**
sheet: 2 of 4
project no. **GEOTLCOV25554AA**

client: **Bouygues Construction Australia**
principal: **Dooleys Lidcombe Catholic Club**
project: **Dooleys Lidcombe Club & Hotel Development**
location: **24-28 John St, Lidcombe NSW 2141**

date started: **26 Nov 2015**
date completed: **26 Nov 2015**
logged by: **TO**
checked by: **MF**

position: E: 319010; N: 6251500 (Datum Not Specified)
surface elevation: 15.60 m (AHD)
angle from horizontal: 90°
drill model: GEO205, Track mounted
drilling fluid:
hole diameter : 100 mm

drilling information				material substance				rock mass defects
method & support	water	RL (m)	depth (m)	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		15						
			1.0					
		14						
			2.0					
		13						
			3.0					
				start coring at 3.61m				
NMLC	Not Observable	12		**INTERBEDDED SILTSTONE AND SANDSTONE**: Siltstone (60%) dark grey and Sandstone (40%), distinctly distinctly bedded at 0-10, sandstone is fine grained, pale grey, siltstone is dark grey.	MW			
			4.0			a=1.32 d=0.59	90%	
								CS, 0 - 10°, IR, 10 mm PT, 0 - 10°, IR, RO, Fe SN PT, 0 - 5°, CU, RO, CN PT, 5°, UN, RO, CN PT, 5°, IR, RO, CN
		11				a=0.79 d=0.10		
			5.0					
								JT, 80 - 90°, PL, RO, Fe SN
								CS, 0 - 5°, IR, RO, CN
		10						PT, 0°, IR, RO, Fe SN
						a=1.22 d=0.57	59%	PT, 0 - 5°, IR, RO, CN CS, 0°, IR, RO, Fe SN, 35 mm
			6.0	becoming grey and dark grey				CS, 0°, IR, RO, Fe SN, 10 mm
					SW	a=1.34 d=0.79		
		9						PT, 0°, IR, RO, Fe SN PT, 0°, IR, RO, Fe SN
								SM
			7.0					JT, 90°, IR, RO, Fe SN PT, 5°, IR, RO, Clay CO
						a=2.56 d=0.34		PT, 0°, IR, RO, Fe SN PT, 0°, IR, RO, CN
		8			FR		92%	

estimated strength & Is50: × = axial; ○ = diametral; VL L M H VH EH
defect spacing (mm): 30 100 300 1000 3000

method & support

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

water

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

graphic log / core recovery

core recovered (graphic symbols indicate material)
no core recovered

core run & RQD

barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
DW	distinctly weathered
MW	moderately weathered
SW	slightly weathered
FR	fresh

*W replaced with A for alteration

strength

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

defect type

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

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	Irregular

roughness

SL	slickensided
POL	polished
SO	smooth
RO	rough
VR	very rough

coating

CN	clean
SN	stain
VN	veneer
CO	coating

CDF_0_9_04BB.GLB Log COF BOREHOLE: CORED GEOTLCOV25554AA.GPJ <<DrawingFile>> 11/12/2015 10:48

Engineering Log - Cored Borehole

Borehole ID.	**BH08**
sheet:	3 of 4
project no.	**GEOTLCOV25554AA**
date started:	**26 Nov 2015**
date completed:	**26 Nov 2015**
logged by:	**TO**
checked by:	**MF**

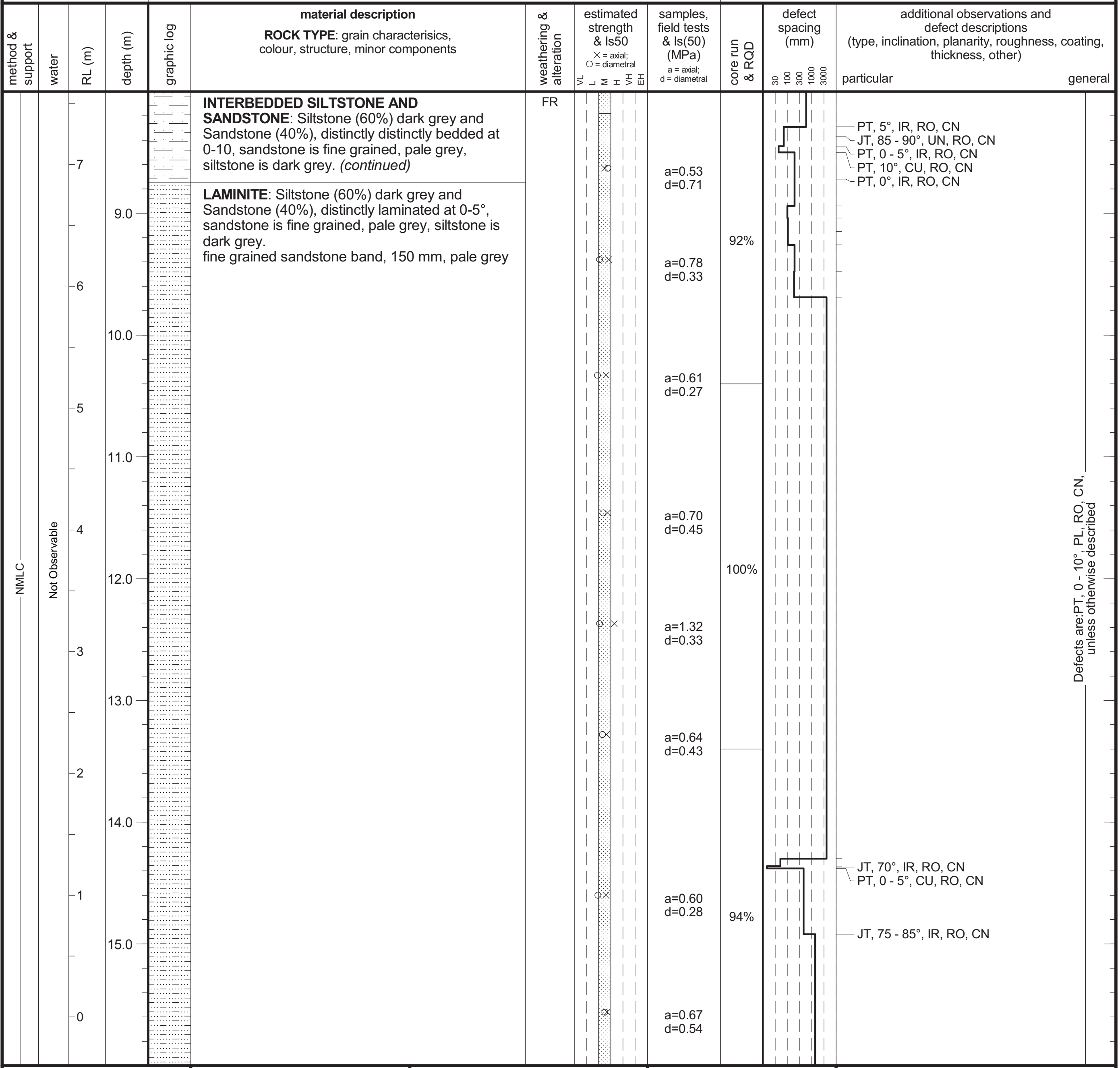
client: ***Bouygues Construction Australia***

principal: ***Dooleys Lidcombe Catholic Club***

project: ***Dooleys Lidcombe Club & Hotel Development***

location: ***24-28 John St, Lidcombe NSW 2141***

position: E: 319010; N: 6251500 (Datum Not Specified)
surface elevation: 15.60 m (AHD)
angle from horizontal: 90°
drill model: GEO205, Track mounted
drilling fluid:
hole diameter : 100 mm



material description
ROCK TYPE: grain characterisics, colour, structure, minor components

INTERBEDDED SILTSTONE AND SANDSTONE: Siltstone (60%) dark grey and Sandstone (40%), distinctly distinctly bedded at 0-10, sandstone is fine grained, pale grey, siltstone is dark grey. *(continued)*

LAMINITE: Siltstone (60%) dark grey and Sandstone (40%), distinctly laminated at 0-5°, sandstone is fine grained, pale grey, siltstone is dark grey.
fine grained sandstone band, 150 mm, pale grey

samples, field tests & Is(50) (MPa)
a=0.53 d=0.71
a=0.78 d=0.33
a=0.61 d=0.27
a=0.70 d=0.45
a=1.32 d=0.33
a=0.64 d=0.43
a=0.60 d=0.28
a=0.67 d=0.54

additional observations and defect descriptions – particular
PT, 5°, IR, RO, CN
JT, 85 - 90°, UN, RO, CN
PT, 0 - 5°, IR, RO, CN
PT, 10°, CU, RO, CN
PT, 0°, IR, RO, CN
JT, 70°, IR, RO, CN
PT, 0 - 5°, CU, RO, CN
JT, 75 - 85°, IR, RO, CN

general
Defects are:PT, 0 - 10°, PL, RO, CN, unless otherwise described

method & support

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

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

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

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

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
DW	distinctly weathered
MW	moderately weathered
SW	slightly weathered
FR	fresh

*W replaced with A for alteration

strength

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

defect type

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

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	Irregular

roughness

SL	slickensided
POL	polished
SO	smooth
RO	rough
VR	very rough

coating

CN	clean
SN	stain
VN	veneer
CO	coating

coffey

Engineering Log - Cored Borehole

Borehole ID.	**BH08**
sheet:	4 of 4
project no.	**GEOTLCOV25554AA**
date started:	**26 Nov 2015**
date completed:	**26 Nov 2015**
logged by:	**TO**
checked by:	**MF**

client: ***Bouygues Construction Australia***

principal: ***Dooleys Lidcombe Catholic Club***

project: ***Dooleys Lidcombe Club & Hotel Development***

location: ***24-28 John St, Lidcombe NSW 2141***

position: E: 319010; N: 6251500 (Datum Not Specified) surface elevation: 15.60 m (AHD) angle from horizontal: 90°

drill model: GEO205, Track mounted drilling fluid: hole diameter : 100 mm

drilling information				material substance						rock mass defects	
method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 × = axial; ○ = diametral VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular general
NMLC						FR		a=0.83 d=0.49	94%		
		-1			Borehole BH08 terminated at 16.50 m Target depth						
			17.0								
		-2									
			18.0								
		-3									
			19.0								
		-4									
			20.0								
		-5									
			21.0								
		-6									
			22.0								
		-7									
			23.0								
		-8									

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method & support

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

water

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

graphic log / core recovery

- core recovered (graphic symbols indicate material)
- no core recovered

core run & RQD

- barrel withdrawn

RQD = Rock Quality Designation (%)

weathering & alteration*

RS	residual soil
XW	extremely weathered
HW	highly weathered
DW	distinctly weathered
MW	moderately weathered
SW	slightly weathered
FR	fresh

*W replaced with A for alteration

strength

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

defect type

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

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	Irregular

roughness

SL	slickensided
POL	polished
SO	smooth
RO	rough
VR	very rough

coating

CN	clean
SN	stain
VN	veneer
CO	coating

PointID : BH08 Depth Range: 3.61 - 8.00 m

drawn	RH
approved	RH
date	11/12/2015
scale	N.T.S.
original size	A4

coffey

client: Bouygues Construction Australia

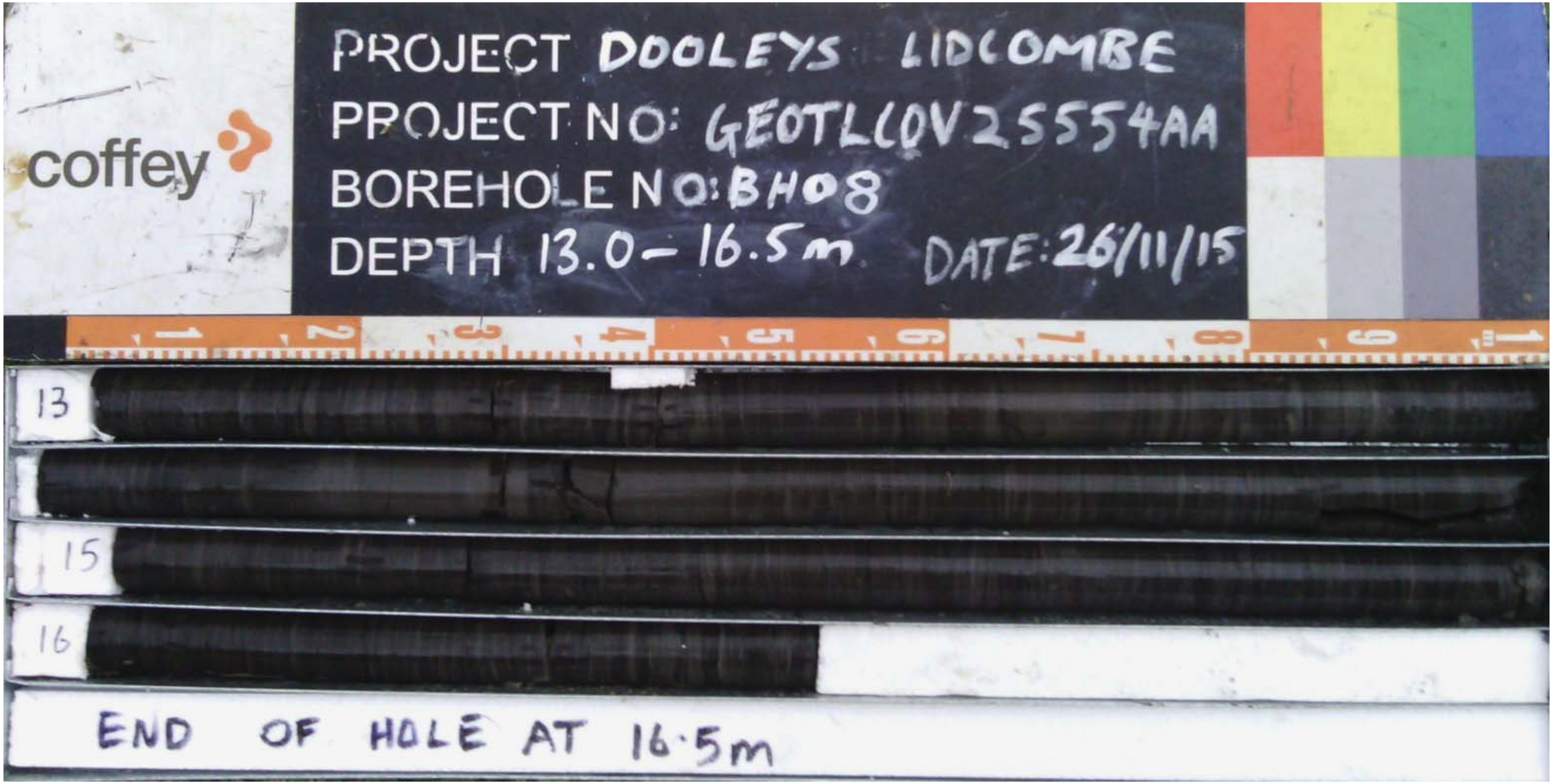
project: Dooleys Lidcombe Club & Hotel Development
24-28 John St, Lidcombe NSW 2141

title: **CORE PHOTOGRAPH**
BH08

project no: GEOTLCOV25554AA	fig no: PHOTO 29	rev:	

PointID : BH08 Depth Range: 8.00 - 13.00 m

drawn	RH	coffey	client:	Bouygues Construction Australia
approved	RH		project:	Dooleys Lidcombe Club & Hotel Development 24-28 John St, Lidcombe NSW 2141
date	11/12/2015		title:	**CORE PHOTOGRAPH BH08**
scale	N.T.S.		project no: GEOTLCOV25554AA	fig no: **PHOTO 30** rev:
original size	A4			



PointID : BH08 Depth Range: 13.00 - 16.50 m

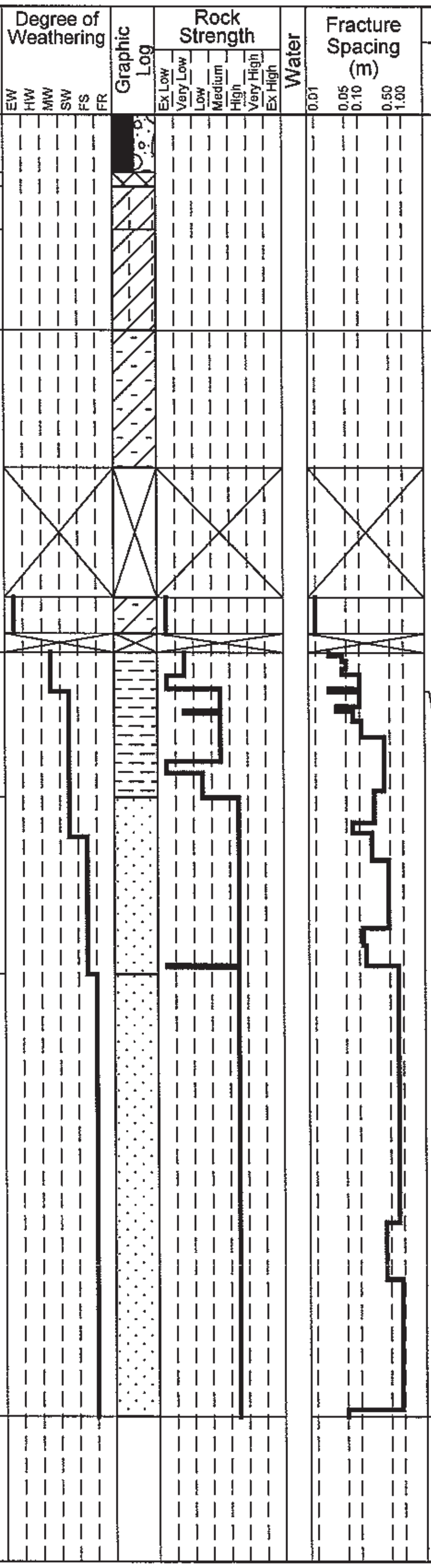
drawn	RH	coffey	client:	Bouygues Construction Australia		
approved	RH		project:	Dooleys Lidcombe Club & Hotel Development 24-28 John St, Lidcombe NSW 2141		
date	11/12/2015		title:	**CORE PHOTOGRAPH BH08**		
scale	**N.T.S.**					
original size	**A4**		project no:	GEOTLCOV25554AA	fig no: **PHOTO 31**	rev:

BOREHOLE LOG

CLIENT: Dooleys Lidcombe Catholic Club
PROJECT: Proposed Development
LOCATION: Cnr Board St & John St, Lidcombe

SURFACE LEVEL: 18.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 1B
PROJECT No: 37623
DATE: 06 Dec 04
SHEET 1 **OF** 1



Depth (m)	Description of Strata	Discontinuities B - Bedding J - Joint S - Shear D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
	ASPHALT & ROADBASE GRAVEL					
0.4 0.5	FILLING - dark grey and red brown silty clay filling, with some gravel brick fragments		A A			
0.8	SILTY CLAY - orange brown silty clay		A			
	SILTY CLAY - stiff, light grey silty clay, with some orange brown ironstone gravel - V bit refusal at 1.5m		S A			3,6,6 N = 12
1.5	SHALY CLAY - hard, grey mottled red brown shaly clay, with medium to high strength, iron cemented bands and some extremely low strength shale bands	Note: Unless otherwise stated, rock is fractured along rough planar, ironstained bedding planes & joints dipping at 0°- 10°	C	100	0	
2.45		2.45m: CORE LOSS: 900mm	C	44	0	
3.6 3.73	SHALE - very low to low then medium and low strength, moderately then slightly weathered, fractured and highly fractured, grey and brown shale	3.6m: CORE LOSS: 130mm 3.89m: B0°- 5° with 100mm clay 4m: J65° stepped	C	91	10	PL(A) = 0.1MPa PL(A) = 0.4MPa
4.73	SANDSTONE - high strength, slightly weathered then fresh stained, slightly fractured, grey and dark grey fine to medium grained sandstone with 5-10% siltstone laminations					PL(A) = 1.3MPa PL(A) = 1.6MPa
5.95	SANDSTONE - high strength, fresh stained to fresh, slightly fractured, grey and black fine grained sandstone with 25-30% siltstone laminations	5.89m: B0°- 5° with 2-3mm clay	C	100	99	PL(A) = 1.4MPa
	- some high to very high strength bands below 7.5m		C	100	97	PL(A) = 3.2MPa
9.0	Bore discontinued at 9.0m					

RIG: Bobcat **DRILLER:** T Mawhood **LOGGED:** MMK **CASING:** to 1.50m
TYPE OF BORING: Spiral flight auger to 1.50m; NMLC-Coring to 9.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⊻ Water level

CHECKED
Initials: PLF
Date: 20/2/04

Douglas Partners
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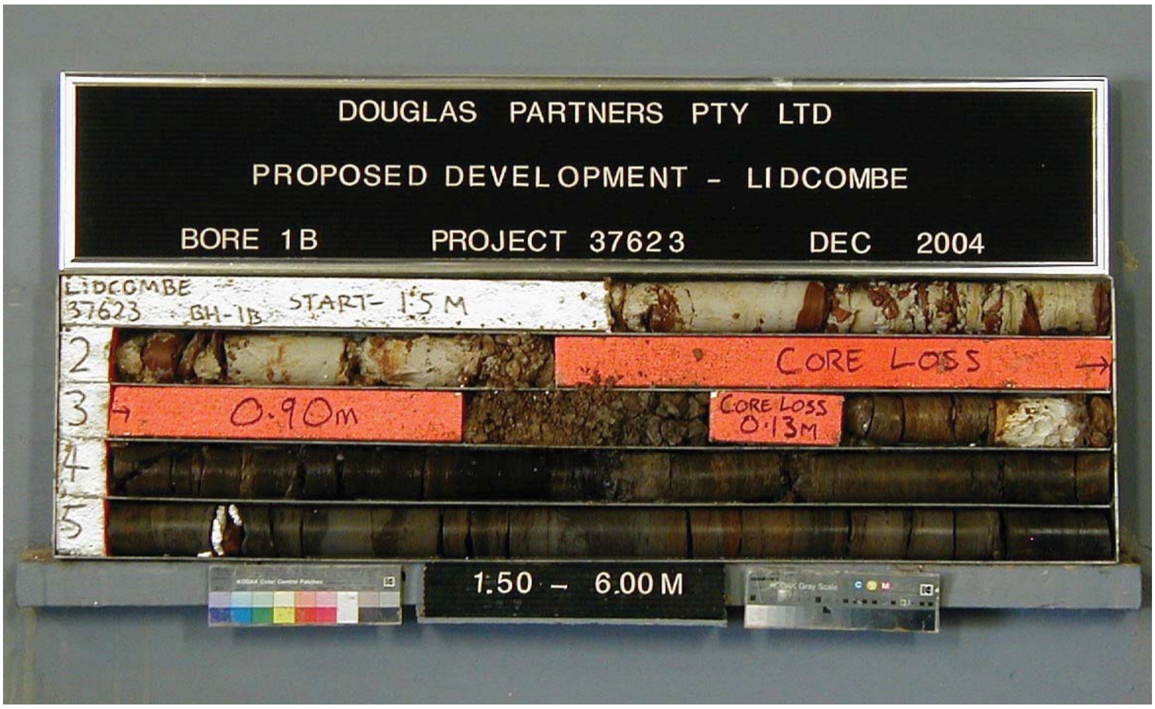
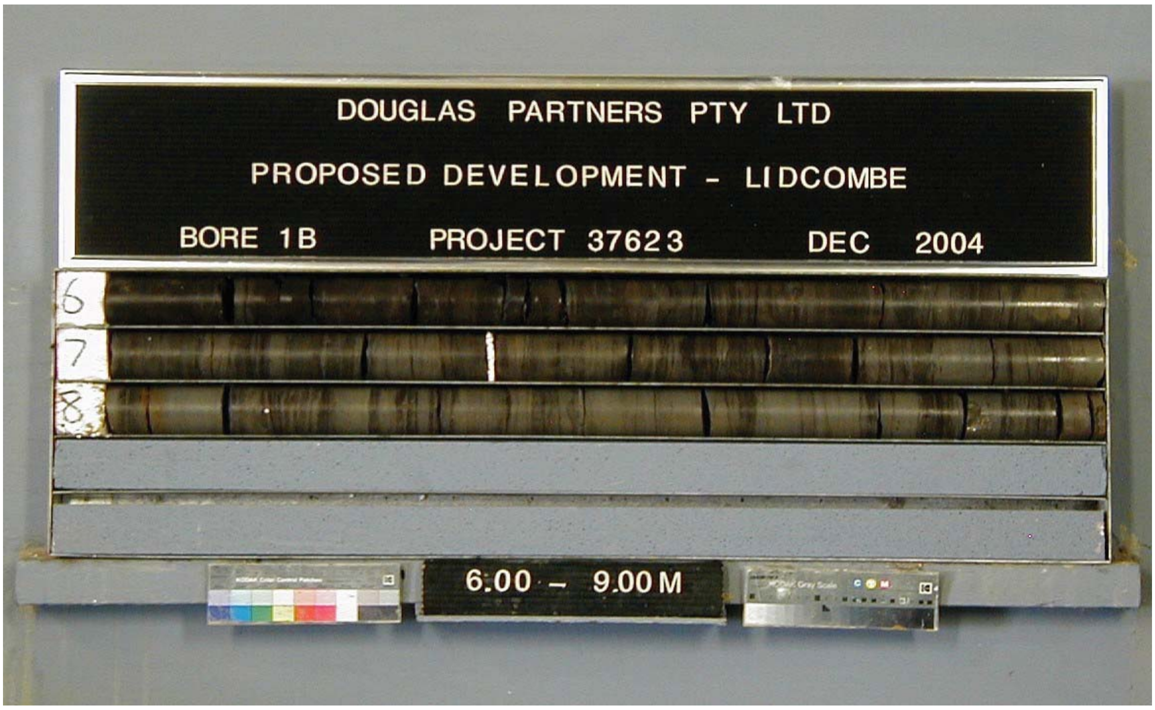

DOUGLAS PARTNERS PTY LTD
PROPOSED DEVELOPMENT - LIDCOMBE
BORE 1B
PROJECT 37623
DEC 2004
LIDCOMBE
37623
BH-1B
START- 1.5 M
2
CORE LOSS
3
0.90m
CORE LOSS 0.13M
4
5
1.50 - 6.00 M


DOUGLAS PARTNERS PTY LTD
PROPOSED DEVELOPMENT - LIDCOMBE
BORE 1B
PROJECT 37623
DEC 2004
6
7
8
6.00 - 9.00 M