
APPENDIX A

NOTES RELATING TO THIS REPORT
BOREHOLE LOGS (BORES 1 TO 8, 10, 11, 15, 201, 202,
301, 303 AND 305)
GEOPHYSICAL LOGS BORES 201, 202, 301, 303 AND 305
CORE PHOTOPLATES
TABLE A1 – PERCUSSION BORE RESULTS

NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water

table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7
as 4, 6, 7
 N = 13
- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm
as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

$$q_c \text{ (MPa)} = (0.4 \text{ to } 0.6) N \text{ (blows per 300 mm)}$$

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

$$q_c = (12 \text{ to } 18) c_u$$

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable, or possible to justify on economic grounds. In any case, the boreholes represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be

the same at the time of construction as are indicated in the report.

- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section

is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS IN THE SYDNEY AREA

This classification system provides a standardized terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable.

Under this system rocks are classified by Rock Type, Degree of Weathering, Strength, Stratification Spacing, and Degree of Fracturing. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc.) where these are relevant.

ROCK TYPE DEFINITIONS

Rock Type	Definition
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments
Sandstone:	More than 50% of the rock consists of sand sized (.06 to 2mm) fragments
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated
Claystone:	More than 50% of the rock consists of clay or sericitic material and the rock is not laminated
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh	Fs	Rock substance unaffected by weathering, limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly laminated	<6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	>2 m

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics (Reference).

Strength Term	Is(50) MPa	Field Guide	Approx. qu MPa*
Extremely Low:	0.03	Easily remoulded by hand to a material with soil properties	0.7
Very Low:	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.	2.4
Low:	0.3	A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium:	1	A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
High:	3	A piece of core 150 mm long x 50 mm dia. cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very High:	10	A piece of core 150 mm long x 50 mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely High:		A piece of core 150 mm long x 50 mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	

* The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely.

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks

Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than the core diameter.
Highly Fractured:	Core lengths are generally less than 20 mm - 40 mm with occasional fragments.
Fractured:	Core lengths are mainly 30 mm - 100 mm with occasional shorter and longer sections.
Slightly Fractured:	Core lengths are generally 300 mm - 1000 mm with occasional longer sections and occasional sections of 100 mm - 300 mm.
Unbroken:	The core does not contain any fracture.

REFERENCE

International Society of Rock Mechanics, Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1 Final Draft October 1972

GRAPHIC SYMBOLS FOR SOIL & ROCK

SOIL

	BITUMINOUS CONCRETE
	CONCRETE
	TOPSOIL
	FILLING
	PEAT
	CLAY
	SILTY CLAY
	SANDY CLAY
	GRAVELLY CLAY
	SHALY CLAY
	SILT
	CLAYEY SILT
	SANDY SILT
	SAND
	CLAYEY SAND
	SILTY SAND
	GRAVEL
	SANDY GRAVEL
	CLAYEY GRAVEL
	COBBLES/BOULDERS
	TALUS

SEDIMENTARY ROCK

	BOULDER CONGLOMERATE
	CONGLOMERATE
	CONGLOMERATIC SANDSTONE
	SANDSTONE FINE GRAINED
	SANDSTONE COARSE GRAINED
	SILTSTONE
	LAMINITE
	MUDSTONE, CLAYSTONE, SHALE
	COAL
	LIMESTONE

METAMORPHIC ROCK

	SLATE, PHYLITTE, SCHIST
	GNEISS
	QUARTZITE

IGNEOUS ROCK

	GRANITE
	DOLERITE, BASALT
	TUFF
	PORPHYRY



ABBREVIATIONS USED IN DISCONTINUITIES COLUMN OF BOREHOLE LOGS

Abbreviation	Meaning
DB	Drill Break
P	Parting
J	Joint
Fr	Fracture
F	Fault
h	Horizontal
v	Vertical
sh	Subhorizontal
sv	Subvertical
he	Healed
pl	Planar
st	Stepped
un	Undulating
ro	Rough
sm	Smooth
sl	Slickensided
ti	Tight
di	Probably drilling induced
fg	Fragmented
Fe	Ironstained
cem	cemented
sty	silty
cy	clay
ca	calcite
cbs	Carbonaceous
lam	Lamination

Examples:

- At 62.04 m, P, 30°, un, st, ro, cbs lam
At 62.04 m Parting, 30°, undulating, stepped, rough, on carbonaceous siltstone lamination
- At 65.08 m, Fr, 70°, pl, ro, st, fg
At 65.08 m, fracture, planar, rough, stepped, fragmented.

ABBREVIATIONS USED FOR STRATA DESCRIPTIONS

Abbreviation	Meaning
Lithology	
CL	Coal
MS	Mudstone
St	Siltstone
SS	Sandstone
CBS	Carbonaceous
lam	Laminations
bnd	Band
sm	Seam
Strength	
EL Str	Extremely low strength
VL Str	Very low strength
L Str	Low strength
M Str	Medium strength
H Str	High strength
VH Str	Very high strength
EH Str	Extremely high strength
Weathering	
EW	Extremely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
Fr	Fractured

For thin seams to save space, instead of:

From 93.03m to 93.13m depth, medium strength carbonaceous mudstone band (30mm)

write as

92.08m? MS cbs M Str, (30mm)

where abbreviation order is

Depth, Rock type, qualifier, strength, (weathering optional), thickness.

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/-

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
22 1 21 2 20 3 19 4 18 5 17 6 16 7 15 8 14 9 13	0.15	TOPSOIL - Dark grey silt topsoil with abundant organics, humid																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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 Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/-

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		CORE LOSS -																				
	10.65	COAL - Medium strength, fresh black coal (<i>continued</i>) from 10.1m to 10.2m, light brown clay, stiff															10.1m: P,sh,pl,ro cy filled 10.2m: P,sh,pl,ro cy filled					
	11	CARBONACEOUS SILTSTONE - Medium to high strength, slightly weathered to fresh, light grey siltstone															10.31m to 10.47m, fg to highly Fr 10.47m: P,sh,un,ro, cy filled 10.55m: P,sh,un,ro, cy filled	C	92	61		
	12.0	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite															10.65m: P,sh,un,ro 10.95m: J,85°,pl,sm 10.99m: P,sh,ro,un 11.11m: J,85°,pl,sm 11.36m to 11.56m, Fg 11.65m: J,85°,pl,sm 11.75m: J,sv,pl,sm					
	12.45	CORE LOSS -															11.85m: J,75°,pl,sm 11.95m: J/Fr, 80°,pl,sm 11.98m: J/Fr, 85°,pl,sm 12.25m: J/Fr, 85°,pl, sm 12.4m: CORE LOSS: 50mm					
	13	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite															12.48m: P,30°,ro,un, cy 12.53m: P,20°, ro,un, coal 12.63m: P,10°, ro, un, coal	C	82	82		
	13.26	CORE LOSS - (Possibly coal)																				
	13.41	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite																				
	13.92	from 13.56m to 13.92m, thin coal bands at approximately 40mm spacing															13.26m: CORE LOSS: 150mm					
	14.17	CORE LOSS - (Possibly coal)															13.41m: P,sh,ro,un, cy 13.48m: P,sh,pl,sm cy 13.79m: P,sh,pl,sm, cy 13.92m: CORE LOSS: 250mm					
	14.21	COAL - Medium strength, fresh, black coal															14.21m: P,sh,pl,sm, cy 14.21m to 14.29m, highly fractured 14.95m: CORE LOSS: 690mm					
	14.95	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite																				
	15.64	CORE LOSS -																				
	16	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite															15.93m: J,40°,ro,pl		C	77	75	
	17																					
	17.79	from 17.2m to 17.27m, thin coal bands at approximately 10mm spacings from 17.5m to 17.57m, high strength, fresh, grey sandstone															17.5m: P,sh,H,pl 17.57m: P,sh,pl,ro 17.79m: P,15°,pl,ro					
	18	SANDSTONE - High strength, fresh, grey sandstone																				
	18.01	from 18.01m to 18.12m, pebbly band															18.27m: J,40°,un,ro, coal		C	100	100	
	18.22	from 18.22m to 18.32m, pebbly band																				
	18.82	from 18.64m to 18.82m, pebbly band															18.73m: P,10°,un,ro, coal 18.82m: P,15°,pl,ro 19.03m: P,sh,pl,ro 19.05m: P,sh,pl,ro, coal 19.11m: P,sh,pl,ro, cy CORE LOSS: 330mm		C	73	45	
	19.04	COAL - Medium strength, fresh, black coal																				
	19.11	SANDSTONE - High strength, moderately weathered, light															19.44m to 19.5m, fg 19.5m to 19.6m, highly		C	100	69	
	19.44																					

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	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:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding	J - Joint	Type
	21	grey-light brown sandstone CORE LOSS - (Possibly coal) from 19.5m, medium to high strength, slightly weathered to fresh LAMINITE - Extremely low to very low strength, highly to moderately weathered, grey laminite with some coal laminations (continued)													fractured 19.94m: P,sh,pl,sm 19.5m to 20.13m, Fr, sv, un, H 20.14m: J,75°,pl,ro 20.4m: J,sv,un,ro 20.8m: J,45°,pl,ro		C	100	69		
	21.72	SILTSTONE													21.25m: J, 70-80°, un,ro 21.72m: Fr,80°,pl,ro 21.84m: J,25°,un,ro 22.05m: J,sv,un,ro 22.3m: J,80°,H,un						
	22.65	CORE LOSS -													22.5m to 22.65m, highly fract, J,20°		C	92	66		
	22.9	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (80% siltstone, 20% sandstone)													22.56m: J,20°,sl,un 22.58m: J,35°,sl,pl 22.65m: CORE LOSS: 250mm 22.9m to 23.02m, fract 23.08m: J,50°,H,pl 23.4m: J,35°,pl,ro,H 23.65m: J,80°,H,un,sm 23.8m: J,85°,H,sm,pl						
	24																				
	24.69	CORE LOSS -													24.69m: CORE LOSS: 90mm		C	94	86		
	24.78	LAMINITE - Medium to high strength, fresh, grey and light grey laminite from 24.8m to 24.85m, carbonaceous siltstone band													25.05m: J,60°,H,pl 25.37m: J,45°,H,un						
	25.8	SILTSTONE - Medium to high strength, fresh, grey siltstone													25.7m: J,75°,H 25.82m: J,70°,H 26m: J,sv,H,pl,sm, (25.7m to 26.35m, open di from 25.95m)		C	100	70		
	27	from 26.95m to 27.39m, Core drilled twice causing increased fracturing															C	85	20		
	27.39	CORE LOSS -													27.35m: J,75°,pl,sm						
	27.5	SILTSTONE - High strength, fresh, grey siltstone													27.39m: CORE LOSS: 110mm 27.53m: J,75°,pl,sm						
	28																				
	28.12	LAMINITE - High strength, fresh, grey and light grey laminite															C	100	94		
	28.7	from 28.65m, bands of coal																			
	29	COAL - Medium strength, fresh black coal from 28.83m to 28.89m, bands of brown clay													28.83m: P,sh,un,ro 28.86m: P,sh,un,ro 28.89m: P,sh,un,ro 29.25m: J,80°,un,ro		C	100	100		

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	-3	COAL - Medium strength, fresh black coal <i>(continued)</i>																C	100	100	
	31 31.15	SANDSTONE - High strength, fresh, grey sandstone																			
	-9																	C	100	100	
	-10	from 32.35m to 32.38m, thin coal laminations at approximately 10mm spacings																			
	-11	from 32.7m to 32.9m, thin coal laminations at approximately 30mm spacings																			
	33.5	from 33.39m to 33.5m, thin coal laminations at approximately 2mm to 35mm spacings Bore discontinued at 33.5m, limit of investigation																			
	-12																				
	-13																				
	-14																				
	-15																				
	-16																				
	-17																				

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/-

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
22	0.2	FILLING - Generally comprising grey-brown and brown sandy clayey silt with some coal fragments, bricks, dry																								10,14,19 N = 33
		SILTY CLAY - Light grey-brown and red-brown silty clay, M<Wp																				S				
21	1.0	SILTSTONE - Extremely low to very low strength, extremely to highly weathered, light brown and red-brown siltstone																								
20	2																									
	2.4	LAMINITE - Low to medium strength, moderately to slightly weathered, light grey-brown and grey laminite (70% sandstone, 30% siltstone)																								
19	3																									
	3.3	SILTSTONE - Very low strength, highly weathered, grey-brown and orange-brown siltstone																								
18	4	from 3.75m to 3.85m, some carbonaceous mudstone bands (2mm to 10mm)																								
		from 3.85m, medium to high strength, fresh																								
		from 4.12m to 4.18m, high strength sandstone band																								
17	5	from 4.46m to 4.7m, high strength sandstone band																								
		from 4.7m to 4.76m, low strength, moderately weathered																								
	5.65	from 5.35m, very low to low strength coal bands and carbonaceous mudstone bands (2mm to 10mm)																								
16	6	CARBONACEOUS MUDSTONE - Low strength, slightly weathered, dark brown-black carbonaceous mudstone with some very low strength coal bands (1mm to 20mm)																								
	6.3	from 5.8m to 5.87m, very low strength																								
15	7	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (50% sandstone, 50% siltstone)																								
14	8																									
	8.3	SANDSTONE - High strength, fresh, light grey, medium coarse grained sandstone																								
13	9																									
	9.75	PEBBLY SANDSTONE - Medium to																								

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/-

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
12	10.07	high strength, fresh, light grey-brown medium to coarse grained pebbly sandstone														9.92m: J,80°,ro,pl					
	10.05	grey-brown medium to coarse grained pebbly sandstone														9.95m: J,85°,ro,un					
	10.3	CORE LOSS - 50mm														10m: CORE LOSS: 50mm					
		PEBBLY SANDSTONE - Medium to high strength, fresh, light grey-brown medium to coarse grained pebbly sandstone														10.07m: J,45°,ro,pl					
		LAMINITE - Medium to high strength, fractured, light grey and grey lamination (60% siltstone, 40% sandstone) with trace coal laminations														10.57m: J,50°,ro,pl		C	98	95	
	11	from 11.8m, high strength (40% sandstone, 60% siltstone)														11.22m: J,50°,ro,pl					
	12															12.4m: P,5°,ro,pl		C	100	100	
	13															13.15m: P,5°,sm,pl					
	14	from 14.3m, some pyrite in laminations														13.68m: J,20°,sl,st 13.74m: J,15°,sl,pl		C	100	100	
	15	from 15.5m, high strength (80% sandstone, 20% siltstone)														15.07m: P,10°,sm,un 15.2m: J,70°,sm,pl					
	16															15.76m: J,30°,sm,un, cy veneer 15.92m: P,10°,sm,un 16.12m: P,10°,sm,un, cy filled (8mm) 16.19m: P,10°,ro,un,Fe		C	92	78	
	17.08	CORE LOSS - 240mm														17.08m: CORE LOSS: 240mm					
	17.32	LAMINITE - High strength, fresh, light grey and grey laminite (80% sandstone, 20% siltstone)														17.35m: J,80°,ro,pl 17.4m: P,10°,ro,pl 17.58m: P,10°,h 17.65m: J,60°,ro,pl 17.75m: J,70°,ro,pl 17.85m: J,70°,ro,pl 18.07m: J,45°,ro,pl		C	100	100	
	18.15	SILTSTONE - High strength, fresh, grey siltstone																			
	19	from 19m, some carbonaceous bands (5mm to 30mm thick, 50mm to 500mm spacings)														18.85m: J,65°,h,sm,un 18.93m: P,5°,sm, cy veneer 19.03m: P,5°,sm,un cy filled (3mm) 19.07m: P,5°,sm,un cy filled (2mm) 19.11m: P,5°,sm,un cy		C	98	80	
	19.95																				

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/-

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
20.0		CORE LOSS - 50mm																				
		SILTSTONE - High strength, fresh, grey siltstone																				
21																						
		from 21.15m, medium strength																				
21.37		CORE LOSS - 50mm																				
21.42																						
21.6		SILTSTONE - Very low strength, moderately weathered, brown siltstone																				
22																						
		COAL - Low strength, fresh, dull black coal with some tuff bands at 21.7m, very low strength tuff band (12mm)																				
		at 21.8m, very low strength tuff band																				
		from 21.82m to 21.87m, very low strength tuff band																				
		at 22.11m, very low strength tuff band																				
23																						
		at 23.8m, medium to high strength tuff band																				
		from 23.9m to 23.98m, highly fractured, drilling induced																				
24																						
23.98																						
		SANDSTONE - High to very high strength, fresh, light grey fine to medium grained sandstone																				
25																						
26																						
		from 26.1m, coal laminations (1mm to 3mm thick), 40mm to 200mm spacings																				
27																						
26.95		Bore discontinued at 26.95m, limit of investigation																				
28																						
29																						

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
22		FILLING - Generally comprising brown and red-brown clay filling with trace fine to medium grained sand and fine gravel, M>Wp																									
0.75		Ironstone Layer																				A					
0.85																						A					
1		SILTY CLAY - (Very stiff to hard), light grey silty clay with orange and red silty clay inclusions																				S					6,9,10 N = 19
21																											
2	2.0	SHALE - Extremely low to very low strength, highly weathered, light grey and red-brown shale																									
20																											
2.7		CLAY - (Hard), grey and red-brown clay with some fine subangular gravel inclusions, and red-brown and grey siltstone, very low strength, highly weathered																									
3																											
3.52		from 3.07m to 3.35m, siltstone from 3.44m to 3.48m, siltstone																									
4		SILTSTONE - Very low strength, highly weathered, red-brown and grey siltstone with bands of light grey clay																				C	100	0			
4.7		SILTSTONE - Extremely low to very low strength, extremely to highly weathered, brown-grey laminated siltstone with coal laminations 1-2mm thick at 5-20mm spacing																									
5		from 5.15m, very low strength, highly weathered																									
6		from 5.61m, low strength, moderately weathered, some coal laminations																									
6.3		SILTSTONE - Medium strength, fresh, light grey siltstone with some dark grey carbonaceous siltstone laminations 1-2mm thick at 1-30mm spacings																				C	100	0			
7		from 6.98m to 7.0m, slightly weathered, ironstaining																									
7.59		SANDSTONE - Medium strength, slightly weathered, light grey-light brown fine to medium grained sandstone																									
8		from 8.25m, grading to pebbly sandstone																									
9																											
9.6		from 9.41m to 9.6m, moderately weathered, fragmented																									
		CORE LOSS - 1m																									

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear/Benson

CASING: HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/-

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
		CORE LOSS - 1m (continued)																			
12	10.6																9.35m: J,sh,5°,ro,un 9.41m to 9.6m, Fg 9.6m: CORE LOSS: 1000mm				
11																	10.62m: J,25°,ro,un,Fe 10.66m: J,10°,ro,un,Fe 10.7m: J,45°,sm,pl,Fe 10.85m: J,sh,sm,pl 10.94m: J,sh,sm,pl 11.12m: J,60°,sm,pl,Fe	C	49	25	
11	11.29																11.27m: P,ro,un				
	11.45	COAL - Medium strength, fresh, highly fractured, dull black coal with some bright black coal lenses															11.41m: Fr, sv, sm,pl 11.45m: CORE LOSS: 100mm				
	11.55																11.27m to 11.83m, Fg 11.83m: J,5°,sm,pl, cs lam				
	11.59	CORE LOSS - 0.1m															11.89m: J,30°,ro,un 12.05m: J,sh,sm,pl, cs lam				
12	11.88																12.24m: J,sh,ro,un 12.43m: J,sh,ro,pl 12.75m: J,70°,sm,pl 13.13m: J,5°,ro,pl 13.39m: J,5°,ro,pl 13.66m: J,45°,ro,pl	C	97	95	
		SILTSTONE - Low strength, highly weathered, fragmented grey and dark grey siltstone with some carbonaceous siltstone lenses															14.01m: J,sh,ro,un 14.25m: J,5°,ro,pl				
		SANDSTONE - Medium strength, fresh, light grey fine grained sandstone															14.88m: J,5°,ro,pl				
																	15.1m: P,5°,ro,pl, cs lam 15.13m: P,5°,ro,pl, cs lam 15.16m: P,20°,ro,pl, cs lam 15.23m: J,60°,ro,pl,Fe 15.31m: P,10°,ro,pl, cs lam 15.37m: P,sh,ro,pl, cs lam 15.39m: P,sh,ro,pl, cs lam				
																	15.41m: P,sh,ro,un 15.49m: J,sh,sm,pl 15.54m: J,5°,ro,pl	C	100	57	
																	15.61m: J,sh,ro,pl 15.67m: J,sh,sm,pl 15.77m: J,sm,un,pl,sh 15.88m: J,sm,un,pl,sh 15.98m: J,sm,un,pl,sh 16.02m: J,sm,un,pl,sh 16.07m: J,60°,sm,pl 16.09m: J,sm,un,sh,pl 16.26m: J,sm,un,sh,pl 16.35m: J,sh,sm,pl 16.42m: J,60°,sm,pl,Fe 16.48m: J,sh,sm,pl 16.55m: J,sh,sm,pl 16.61m: J,sh,sm,pl 16.61m to 16.94m, fractured 16.94m: P,sh,sm,pl, cs lam 16.97m: J,60°,sm,pl				
				</																	

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear/Benson

CASING: HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength						Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High	Very High		Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	20.45	SILTSTONE - Probable rubble (continued)																								
	20.67	COAL - Low strength, highly weathered black coal																								
	21	SANDSTONE - High strength, slightly weathered grey fragmented sandstone																								
	22.05	Bore discontinued at 22.05m																								
	23																									
	24																									
	25																									
	26																									
	27																									
	28																									
	29																									

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear/Benson

CASING: HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	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:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
25 1 24	0.25	SILT - Brown silt, damp																								
		CLAY - (Stiff), grey-brown clay with trace silt, M>Wp																				A,pp			130-150 kPa	
	0.7	CLAY - (Stiff), brown and grey-brown clay with some silt and trace sand, M>Wp																								
	1.05	CLAY - (Stiff to very stiff), orange-brown clay with some sand and inclusions of charcoal, trace rootlets, M<Wp																				A,pp			150-200 kPa	
	1.4	CLAY - (Hard), light grey-white clay, M<Wp																				pp			170 kPa	
2																						pp			2,6,11	
																						pp			N = 17	
23																									250-300 kPa	
																									>400 kPa	
3	2.85	CORE LOSS -																								
	3.0	CLAYSTONE - Extremely low strength, extremely weathered, red-grey claystone, clay like properties																				C	62	43		
22	3.25																									
	3.63	CORE LOSS -																								
4		CLAYSTONE - Extremely low strength, extremely weathered, red-grey claystone, clay like properties																				C	79	79		
	4.15																									
21		SILTSTONE - Very low to low strength, highly weathered, grey-brown siltstone with orange bands																								
	5.1	from 4.49m, medium strength, moderately weathered																								
20	5.22	from 5m to 5.1m, very low strength, highly weathered																								
	5.29	CORE LOSS -																								
6		SILTSTONE - Extremely low strength, extremely weathered, grey-brown siltstone																								
		SILTSTONE - Low to medium strength, moderately weathered, grey siltstone with orange bands from 6.5m, slightly weathered from 6.7m, laminations of coal substance and Fe, < 1mm thick																				C	92	71		
19																										
	7.36	COAL - Medium strength, fresh, black coal																								
18	7.5																									
	7.65	CORE LOSS -																								
8		CLAYSTONE / SILTSTONE - Medium strength, slightly weathered to fresh, grey fine siltstone / claystone with coal laminations < 1mm thickness to 8.25m																								
17																										
																						C	100	99		
9																										
16																										
																						C	100	100		

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	10.58	COAL - Medium strength, fresh, black coal																C	100	100	
	10.77																				
	11.07	CORE LOSS -																			
		SILTSTONE - Medium to high strength, fresh siltstone																C	86	86	
		at 11.75m, high strength, cobble																			
		at 12.16m to 12.21m, high strength, cobble																			

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
		igneous rock band																			
	20.49	SILTSTONE - High strength, fresh, grey siltstone (<i>continued</i>)																C	90	45	
	20.6	from 20.11m to 20.14m, grey clay band																			
	20.77	from 20.24m, extremely low to very low strength, extremely to highly weathered																C	100	81	
		CORE LOSS -																			
		CARBONACEOUS SILTSTONE - Extremely low strength, extremely weathered, dark grey carbonaceous siltstone																			
	22	from 20.63m, medium strength, moderately weathered																			
		from 20.71m, tuff, low strength, highly weathered, brown																			
		COAL - Medium strength, fresh black coal																			
	23	from 21.73m to 22.08m, white mineral inclusions																C	100	100	
	23.06	from 22.75m, dark brown carbonaceous mudstone bands																			
	24	SANDSTONE - High strength, fresh, grey sandstone																			
		from 24.11m to 24.16m, coal laminations, thickness <1mm, spacing 2mm to 30mm																			
	24.6	Bore discontinued at 24.6m, limit of investigation																			
	25																				
	26																				
	27																				
	28																				
	29																				

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
	0.2	FILLING - Generally comprising light orange-brown fine to medium clayey silt sand with some gravel and cobbles, dry																									
	0.8	FILLING - Generally comprising dark brown gravelly clay with trace sand and silt and coal, M>Wp																									
	1	CLAY - Stiff to very stiff, dark brown and orange-brown clay with some extremely low to very low strength claystone inclusions, M>Wp																				S				2,2,11 N = 13	
	2	from 2m, very stiff, light grey-brown and light yellow-brown, M<Wp																									
	2.8	WEATHERED COAL - Extremely low strength, extremely weathered, dark brown and dark orange-brown weathered coal																				S				5,4,8 N = 12	
	3																										
	3.8	CLAY - Very stiff, light grey-brown and light orange-brown clay with extremely low to medium, highly fractured tuffaceous claystone bands, M<Wp																				S				3,6,8 N = 14	
	4.3	SILTY CLAY - Very stiff, light grey and light orange-brown clay with extremely low to low strength tuffaceous claystone bands, M<Wp																									
	5	from 5.4m, grading to tuffaceous claystone																				S					5,12,11 N = 23
	6																										
	6.4	WEATHERED COAL - Extremely low to very low strength, extremely to highly weathered, dark brown-black weathered, coal																									
	7	7.05 COAL - Very low to low strength, fresh, black coal																				S					6/50mm
7.3	7.38 CORE LOSS - 250 mm																										
8	COAL - Very low to low strength, fresh, dull black coal																					C	86	79			
9	LAMINITE - Low strength, moderately to slightly weathered, brown laminite (60% sandstone, 40% siltstone) from 7.45m, medium strength, slightly weathered from 7.5m, medium to high strength, fresh from 8.34m to 8.55m, medium strength, slightly weathered																					C	100	87			
10																											
11																											

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 2 **OF** 3

[illegible]

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/-

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	20.35	SILTSTONE - High to very high strength, fresh, dark grey siltstone																C	100	100	
	21																				
	22																				
	22.23	COAL - Low strength, fresh, dull black coal with some tuff bands and some pyrite at 22.27m, tuff band 10mm from 22.35m to 22.43m, low to medium strength tuff band (45mm) at 22.54m, medium strength tuff band (10mm)																C	100	96	
	23																				
	24																				
	24.54	SANDSTONE - Very high strength, fresh, light grey fine to medium grained sandstone, abundant pyrite in discontinuities																C	100	83	
	25																				
	26																				
	26.05	Bore discontinued at 26.05m, limit of investigation																			
	27																				
	28																				
	29																				

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: 7.0m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 7.05m, then NMLC coring to 26.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 1 OF 3

[illegible]

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND	
A	Auger sample
D	Disturbed sample
B	Bulk sample
U	Tube sample (x mm dia.)
W	Water sample
C	Core drilling
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
SL	Standard penetration test
P	Point load strength ls(50) MPa
V	Shear Vane (kPa)
W	Water seep
	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/-

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		Ex Low	Very Low	Low	Medium	High	Ex High		B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments	
	10.0	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (60% siltstone, 40% sandstone)															9.22m: P,10°,sm,un					
	11	from 11.15m, high strength (80% sandstone, 20% siltstone) from 11.36m to 11.39m, extremely low strength, extremely weathered															10.29m: P,10°,sm,pl, cy filled (2mm) 10.38m: P,10°,sm,pl, cy filled (2mm)		C	100	81	
	12																11.09m: J,15°,sm,pl,Fe 11.24m: J,15°,sm,pl,Fe 11.38m: P,5°,ro,un, cy filled (30mm) 11.42m: P,5°,h,Fe 11.5m: P,5°,sm,pl, cy veneer 11.57m: P,5°,sm,pl, cy veneer 11.66m: P,5°,sm,pl, cy filled (2mm)					
	12.5	SANDSTONE - High to very high strength, fractured, light grey fine to medium grained sandstone from 12.7m to 12.89m, very high strength, fresh siderite band from 13.25m to 13.33m, very high strength siderite band from 13.45m to 13.55m, very high strength siderite band															12.73m: J,60°,ro,pl,Fe 12.74m: P,5°,ro,pl,Fe 12.84m: J,80°,ro,pl,Fe 12.85m: J,75°,ro,pl,Fe 12.86m: P,5°,ro,pl,Fe 12.89m: P,5°,ro,pl,Fe 13.44m: P,10°,ro,pl		C	100	98	
	13																					
	14																					
	15																					
	16	from 16.1m, fresh															16.13m: P,5°,ro,pl,Fe 16.44m: P,10°,ro,un,Fe		C	100	97	
	17																16.78m: J,70°,h,un,Fe 16.86m: J,30°,ro,pl,Fe 17m: J,80°,h,Fe 17.17m: J,10°,ro,pl,Fe 17.19m: J,10°,ro,pl,Fe 17.3m: J,70°,h,ro,un,Fe 17.64m: J,45°,ro,pl,Fe 17.77m: J,50°,ro,pl,Fe					
	18																18.22m: P,5°,ro,pl,Fe 18.52m: J,50°,ro,pl,Fe 18.72m: P,10°,ro,pl,Fe					
	19																		C	100	90	
	19.15	SILTSTONE - Extremely low to very low strength, extremely weathered, grey-brown and orange-brown siltstone from 19.3m, very low to low strength,															19.16m: P,5°,ro,un,Fe 19.24m: P,5°,sm,pl,Fe 19.33m: J,60°,sm,pl 19.35m: J,80°,sm,pl 19.4m: P,5°,sm,pl,Fe 19.45m: J,80°,sm,pl					

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/-

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	20.75	moderately weathered from 19.5m, medium to high strength, fresh																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														</

RIG: Scout 103

DRILLER: Sheddon

LOGGED: Reid

CASING: HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
34	0.3	TOPSOIL - Dark grey clayey silt topsoil with abundant organics to 0.1m, humid																			20,	
	0.6	CLAY - Hard, grey-brown clay with trace to some fine to coarse sized siltstone gravel, M<Wp																				
33	1	SILTSTONE - Extremely low strength, extremely weathered, light grey siltstone from 1m, (extremely low to low strength), brown																S				
	2	from 2.25m, low strength																				
	2.65	CORE LOSS - 0.55m																				
31	3																		C	0	0	
	3.3	CORE LOSS - 0.25m																				
	3.55	SILTSTONE - Extremely low to low strength, extremely weathered, grey-brown siltstone																				
30	4																		C	86	0	
	5																					
	5.9	from 5.6m to 5.65m, ironstone																				
	6.1	CORE LOSS - 0.2m																				
	7.0	SILTSTONE - Very low to low strength, highly weathered light brown siltstone																				
	7.3	CLAYEY COAL - Extremely low strength, extremely weathered black clayey coal																				
	8	CORE LOSS - 1.3m																	C	43	0	
	8.6																					
	8.7	CORE LOSS - 0.1m																				
	9	LAMINITE - High strength, fresh, grey fine to medium grained sandstone with interbedded siltstone, laminite																	C	81	58	
	9.47																					
	9.5	CORE LOSS - 0.07m																	C	100	0	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Harris **CASING:** HW to 6m
TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m
WATER OBSERVATIONS: Free groundwater obscured by drilling fluids
REMARKS: from 8.6m, 20% water loss

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/-

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
24	10.15	SANDSTONE - High strength, highly weathered, brown fine to medium grained sandstone with interbedded siltstone to 9.75m (continued)														9.5m to 9.8m, MFr, sv,h,Fe					
	10.45	CORE LOSS - 0.3m, possible extremely weathered rock														9.8m to 10.15m, MFr, sv,pl,ro,Fe					
	11	SANDSTONE - High strength, highly weathered, fine to medium grained brown sandstone														10.15m: CORE LOSS: 300mm					
	11.77	from 11.74m to 11.77m, ironstone layer														10.47m: P,sh,un,ro					
	12	SILTSTONE - Medium to high strength, slightly weathered grey siltstone														10.9m to 11.6m, MFr, sv, un, ro,Fe	C	100	0		
	12.4	CORE LOSS - 0.5m														11.74m: P,sh,un,ro					
	12.9	SILTSTONE - Medium to high strength, slightly weathered grey siltstone														11.77m: P,sh,un,ro					
	13															11.8m: J,60°,h					
	14															11.85m to 11.88m, fragmented					
	14.15	CORE LOSS - 0.3m														11.95m: J/MFr?, 45°,pl,h					
	14.45	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone														12.1m: Fr,sv,h					
	15															12.2m to 12.4m, Fg					
	15.55	CORE LOSS - 0.1m														12.4m: CORE LOSS: 500mm		C	57	0	
	15.65	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone														12.9m to 13.1m, fragmented at 0.01m intervals					
	16															13.1m to 13.35m, Frs, sv					
	17															13.35m to 13.45m, fragmented					
	17.55	CORE LOSS - 0.15m														13.6m: J/MFr,70°,h		C	70	0	
	17.7	SILTSTONE - Medium strength, slightly weathered, fragmented, grey siltstone														13.66m: J,45°,un,ro-sm, clay lined					
	18	from 17.9m, high strength, fresh														13.67m: P,sh,un					
	19															13.76m to 13.84m, friable clay					
	19.08	CORE LOSS - 0.35m														13.84m to 14.15m, fragmented					
	19.42	COAL - Medium strength, fragmented, black coal with interbedded carbonaceous mudstone layers														14.15m: CORE LOSS: 300mm		C	100	0	
																14.54m to 14.65m, fragmented					
																14.7m: MFr?,sv,un,ro					
																14.83m: P,sh,pl,sm, calcite		C	80	0	
																14.95m: MFr?,sv,un,sm					
																15.1m: MFr,45°,pl,sm					
																15.23m: P,sh,pl,sm, calcite					
																15.3m: MFr?, sv,ir,h					
																15.45m: MFr,sv, ir,ro, calcite					
																15.55m: CORE LOSS: 100mm		C	92	6	
																15.65m to 16m, fragmented					
																16m: MFr,sv,pl,sm, Fe					
																16.15m: MFr's, sv,h					
																16.2m to 16.3m, fragmented at 0.02m intervals					
																16.3m: J/MFr?, 70°,pl,sm					
																16.35m: J/MFr?, 70°,h					
																16.4m to 16.42m, friable clay seam					
																16.5m: MFr, sh to sv,h					
																16.56m to 16.6m, fragmented at 0.01m intervals		C	96	38	
																16.75m: MFr,sv,h					
																16.93m: Fr,sv,h					
																16.95m to 17.55m, MFr's, sv, h, calcite					

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Harris **CASING:** HW to 6m
TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m
WATER OBSERVATIONS: Free groundwater obscured by drilling fluids
REMARKS: from 8.6m, 20% water loss

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/-

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
14		COAL - Medium strength, fragmented, black coal with interbedded carbonaceous mudstone layers <i>(continued)</i>																				
21																						
21.71		SANDSTONE - High strength, fresh, grey sandstone																				
22																						
22.27		SILTSTONE - Medium to high strength, fresh, fragmented grey siltstone																				
22.65																						
22.75		CORE LOSS - 0.1m																				
23		Bore discontinued at 22.75m																				
24																						
25																						
26																						
27																						
28																						
29																						

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Harris

CASING: HW to 6m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS: from 8.6m, 20% water loss

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/-

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
34	0.3	TOPSOIL - Dark grey silt topsoil with abundant organics to 0.1m, humid																									20,-,-
1		CLAY - Hard, red-brown clay, M<Wp from 0.5m, with trace to some siltstone gravel																				S					
33																											
2																											
32																											
3	3.0	SILTSTONE - Extremely low strength, extremely weathered brown siltstone with interbedded clay layers																									
4	3.95	CORE LOSS - 0.35m																									
5	4.3	SILTSTONE - Extremely low strength, extremely weathered brown siltstone (soil like properties)																									PL(D) = 1.86MPa PL(A) = 0.85MPa PL(D) = 1.22MPa PL(A) = 2.13MPa PL(D) = 2.35MPa PL(A) = 3.03MPa PL(D) = 2.26MPa PL(A) = 4.21MPa
6	4.5	COAL - Extremely low strength, extremely weathered, black-brown coal (soil like properties)																									
7	5.17	SILTSTONE - Medium strength, moderately weathered, grey siltstone from 5.35m to 5.42m, extremely weathered coal from 5.5m to 5.54m, extremely weathered coal																									
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RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MM	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
24		properties) SILTSTONE - Medium strength, moderately weathered, grey siltstone (continued)														350mm		C	100	74	PL(D) = 0.32MPa PL(A) = 1.12MPa		
11		from 11m to 11.1m, very low strength, highly weathered grey siltstone														9.18m: J,65°,pl,ro,Fe 9.22m to 9.3m, P,sh,pl,sm Fe 9.3m to 9.45m, P,sh,pl,sm, cy 9.42m: J,50°,pl,ro, cy veneer 9.45m: P,10°,pl,sm, cy filled (20mm) 9.45m to 9.55m, P,sh,pl,sm 9.6m: J,55°, un,ro,Fe 9.8m: J,80°,pl,ro,Fe 9.98m: P,sh,pl,sm cy veneer		C	100	58			
23																10.07m: P,sh,un,ro, cy filled 10.14m: J,60°,un,ro 10.35m: J,75°,pl,ro, Fe 10.85m to 11.1m, frag to highly fract		C	80	15			
11.7		CORE LOSS -																				PL(D) = 7.22MPa	
11.85		SILTSTONE - Medium strength, moderately weathered, grey siltstone																					
12		from 12.03m to 12.1m, very low strength, highly weathered, fragmented, light grey siltstone																					
22		CORE LOSS - 0.55m																					PL(A) = 0.83MPa
12.81		SILTSTONE - Very low strength, highly weathered, light grey siltstone																					
13		from 13m, very low strength, highly weathered, light grey siltstone																					
21		from 13.24m to 13.27m, medium strength, moderately weathered, grey siltstone																					PL(D) = 4.25MPa PL(A) = 2.73MPa
13.53		CORE LOSS - 0.37m																					
14		SILTSTONE - Very low strength, highly weathered, light grey siltstone																					
20		VOID - 0.08m																					PL(D) = 2.17MPa PL(A) = 8.26MPa
15		SILTSTONE - Medium strength, slightly weathered, slightly fractured, light grey siltstone																					
19		COAL - Medium strength, fresh, fractured, dull black coal with some bright black coal laminations																					
16.32		from 16.37m to 16.39m, low strength, moderately weathered grey-brown siltstone																					
17		CORE LOSS - 0.17m																					
17.02		COAL - Highly fractured																					PL(D) = 1.77MPa PL(A) = 2.85MPa
17.75		from 17.61m to 17.75m, fragmented																					
18		CORE LOSS - 0.56m																					
18.31		LAMINITE - Medium strength, fresh, grey laminite																					PL(D) = 0.81MPa PL(A) = 0.61MPa
18.66		TUFFACEOUS SILTSTONE - Low strength, moderately weathered, light brown mottled light grey tuffaceous siltstone																					
18.74		COAL - Medium strength, fresh, fractured, dull black coal with some bright black coal laminations																					
19		SILTSTONE - Medium strength,																					
19.15																							
19.64																							

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/-

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
14	20.45	slightly weathered, light grey siltstone from 19.39m to 19.42m, some carbonaceous siltstone laminations from 19.61m to 19.64m, fragmented from 19.96m, fresh LAMINITE - Medium strength, slightly weathered, light grey and grey laminite (continued) Bore discontinued at 20.45m, limit of investigation																C	81	57	PL(D) = 5.29MPa PL(A) = 8.49MPa
21																					
13																					
22																					
12																					
23																					
11																					
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RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 29.8
EASTING: 370514.7
NORTHING: 6360402.3
DIP/AZIMUTH: 90°/-

BORE No: 10
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
29 1	0.1	SILT - Brown silt with some sand and organics, humid																								
	0.5	CLAY - Brown and orange clay with some gravel, M<Wp																				A				
		SANDSTONE - Extremely low strength, extremely weathered, medium grained, light brown sandstone																				A				
	1.3	CLAYSTONE / SILTSTONE - Extremely low strength, extremely weathered, orange-brown and grey claystone / siltstone																								
28 2																										
27 3	2.95	SILTSTONE - Very low to low strength, highly to moderately weathered, orange-brown and grey siltstone from 2.98m to 3.3m, grey clay bands																								
26 4	3.93	from 3.87m to 3.93m, light grey and orange-brown clay band																								
	4.05	CORE LOSS																								
	4.36	CLAYSTONE - Very low strength, highly weathered, red-brown and grey claystone																								
	5.0	from 4.25m, extremely low to very low strength, extremely to highly weathered, orange-brown and light grey claystone																								
25 5		SILTSTONE - Medium strength, moderately weathered, grey and orange-brown siltstone at 4.47m, ironstone band 7mm thick from 4.97m to 5m, clay band																								
24 6		SILTSTONE - Low to medium strength, moderately weathered, light grey siltstone interlayered with grey and brown siltstone from 5.9m to 6m, medium to high strength, slightly weathered, grey siltstone from 6.81m to 6.93m, medium to high strength, slightly weathered, grey siltstone																								
23 7		from 7.71m to 7.89m, medium to high strength, slightly weathered, grey siltstone from 8.04m, medium to high strength, slightly weathered, grey siltstone																								
22 8	8.45	CORE LOSS																								
	8.52	SILTSTONE - High strength, slightly weathered, grey-brown and grey siltstone																								
21 9																										
20																										

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 3m

TYPE OF BORING: Solid flight auger to 2.95m (TC-bit), then HQ wireline to 17.3m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 29.8
EASTING: 370514.7
NORTHING: 6360402.3
DIP/AZIMUTH: 90°/-

BORE No: 10
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS	FR	Ex Low	Very Low	Low	Medium	High	Ex High			Type	Core Rec. %	RQD %	Test Results & Comments
11	11	SILTSTONE - High strength, slightly weathered, grey-brown and grey siltstone (<i>continued</i>) from 10.13m to 10.25m, sandstone bands 2mm to 40mm thick at 5mm to 30mm spacing															C	100	85	8.45m: CORE LOSS: 70mm 8.53m: J,sv,un,ro 8.8m: P,sh,pl,H 8.86m: P,sh,pl,ro 8.89m: P,sh,pl,ro 9.42m: J,sv,pl,ro 9.57m: J,sv,un,H 9.65m: J,80°,un,sm 9.8m: J,85°,un,ro from 10.31m to 10.45m, P,sh,un,ro, clay filled 10.49m: J,70°,un,sm 10.65m: J,85°,un,sm 11m: J,65°,pl,sm 11.24m: P,5°,pl,ro 11.27m: J,75°,un,H 11.35m: P,5°,un,ro 11.58m: J,85°,H,pl 11.61m: P,5°,pl,sm 11.82m: J,65°,un,H 12.26m: J,75°,pl,ro 12.33m: J,40°,un,ro 12.39m: J,85°,un,ro 12.78m: J,80°,un,H,ro 12.8m: J,80°,un,ro 12.98m: J,20°,pl,ro cy veneer 13.1m: P,30°,un,ro cy veneer 13.19m: P,5°,un,ro 13.3m: P,sh,un,ro 13.37m: J,sv,un,H,ro 13.44m: P,5°,un,ro 13.6m: P,sh,pl,ro 13.62m: J,85°,un,ro,H 14.55m: P,5°,pl,ro 14.97m: P,sh,un,ro
12	11.35	SANDSTONE - High strength, slightly weathered, light brown-cream sandstone from 11.68m, igneous rock band 10mm thick															C	100	88	
13	12	from 12.59m to 12.63m, coal																		
14	13.1	COAL / CARBONACEOUS MUDSTONE - Medium strength, fresh, black interlayered with dark brown carbonaceous mudstone from 13.69m to 13.85m, black coal															C	100	86	
15	14	from 14.27m, black coal, medium strength, fresh																		
16	15	from 15.31m to 15.43m, brown and light brown clay band															C	100	87	
17	15.95	CORE LOSS																		
18	16.0	SILTSTONE - High strength, fresh, grey siltstone																		
19	16.25	LAMINITE - High strength, fresh, grey and light grey laminite with pyrite in some laminations															C	96	96	15.81m: P,5°,un,ro 15.86m: P,5°,un,ro, pyrite 15.95m: CORE LOSS: 50mm 16.14m: J,80°,un,sm 16.37m: J,65°,un,ro
20	17.3	Bore discontinued at 17.3m, limit of investigation																		

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 3m

TYPE OF BORING: Solid flight auger to 2.95m (TC-bit), then HQ wireline to 17.3m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
24	0.1	SILT - Brown silt with abundant organics, leaves																								
		CLAY - (Very stiff to hard), brown clay, M<Wp																					A,pp			>400 kPa
		from 0.4m, (hard), light brown clay with ironstone bands, M<Wp																					A			
23	1																						S			15,25
																							pp			>400 kPa
22	2																									
	2.3	CLAYSTONE - Extremely low strength, extremely weathered, light grey claystone																					C	94	94	
		from 2.8m, grey-brown																								
21	3.15	CORE LOSS -																			3.15m: CORE LOSS: 50mm					
	3.2	CLAYSTONE - Very low strength, highly weathered, light grey and orange claystone																			3.46m: P,10°,ro,un		C	100	100	
		from 3.7m, very low to low strength, highly weathered																								
20	3.92	CORE LOSS -																			3.92m: CORE LOSS: 120mm		C	83	83	
	4.04	CLAYSTONE - Extremely low to very low strength, highly weathered, light grey and orange claystone																			4.25m: J,80°,un,ro					
		from 4.13m to 4.3m, low strength, highly weathered, light grey and orange siltstone																			4.4m: CORE LOSS: 150mm					
19	4.4	CORE LOSS -																								
	4.55	CLAYSTONE - Extremely low to very low strength, highly weathered, light grey and orange claystone																								
		from 4.75m, very low to low strength, highly to moderately weathered																			5.86m: J,80°,pl,H					
18	5.3	CORE LOSS -																			5.97m: J,40°,pl,H					
		CLAYSTONE - Extremely low to very low strength, highly weathered, light grey and orange-brown claystone																			6.07m: J,65°,pl,H					
		from 4.75m, very low to low strength, highly to moderately weathered																								
17	6.63	SILTSTONE - Very low to low strength, highly to moderately weathered, grey and orange-brown siltstone																			6.48m: J,un,ro					
	6.75	from 6.16m, laminated																			6.58m: J,pl,ro					
		from 6.29m to 6.34m, extremely low to very low strength, highly weathered																			6.63m: CORE LOSS: 120mm		C	93	90	
		CORE LOSS -																								
16	7.85	SILTSTONE - Very low strength, highly weathered, grey and brown siltstone																			7.85m: CORE LOSS: 130mm					
	7.98	from 6.9m to 6.96m, extremely low strength, extremely weathered																			7.98m to 8.21m, P,10°,pl,ro (50mm spacings)					
		CORE LOSS -																			8.28m: J,65°,pl,sm		C	91	56	
		SILTSTONE - Medium strength, slightly weathered, grey siltstone																			8.44m to 8.53m, highly fract					
		from 8.21m, high strength, fresh																			8.77m: J,35°,un,ro					
		from 8.31m to 8.44m, undulating laminations																			8.82m: J,50°,H,un					
		from 8.98m to 9.03m, extremely low strength, extremely weathered, light																			9.12m: J,60°,un,sm					
																					9.19m: P,sh,pl,sm, cy veneer					
																					9.21m: P,5°,un,ro		C	80	62	
																					9.25m: CORE LOSS: 250mm					

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.3m

TYPE OF BORING: Solid flight auger to 2.3m, (TC-bit), then HQ wireline to 22.7m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



Douglas Partners
Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		Ex Low	Very Low	Low	Medium	High			Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
14		grey														9.54m: J,65°,H,un					
	10.5	from 9.03m to 9.07m, low strength, moderately weathered, light grey														9.8m: P,sh,un,ro, cy					
	10.58	CORE LOSS -														10.09m: J,50°,un,ro		C	80	62	
		SILTSTONE - High strength, fresh, grey siltstone (continued)														10.2m: J,60°,un,ro					
11		from 10.05m, fresh														10.29m: J,25°,un,H					
		from 10.27m, slightly weathered														10.32m: J,15°,un,ro					
		from 10.38m, very low to low strength, highly to moderately weathered														10.33m: J,80°H,un					
		CORE LOSS														10.45m: J,85°un,ro		C	91	81	
		SILTSTONE - Low to medium strength, moderately weathered, grey siltstone														10.5m: CORE LOSS: 80mm					
12		from 10.7m, high strength, fresh														10.78m: J,80°un,ro					
		from 11.67m to 11.8m, medium strength, slightly weathered														10.94m: J,60°un,ro					
																11.03m: P,5°un,ro cy					
																11.24m: J,85°H,un		C	100	91	
																11.4m: P,5°un,ro, cy					
																11.62m: J,85°H,pl					
																11.64m: P, sh,un,ro					
																11.67m to 11.7m, P,sh,un,ro, cy					
																11.91m: J,55°H,pl					
																12.48m: J,sv, H,un					
13																12.63m: P,5°,ro,un					
																12.77m: J,80°un,ro,					
																white mineral inclusion		C	100	86	
																12.87m: J,40°un,ro					
																13.05m: J,55°un,ro					
																13.18m: J,85°un,ro					
																13.4m: J,50°pl,ro					
																13.49m: J,85°un,ro					
																13.68m: J,80°un,H					
																13.77m: J,70°pl,ro					
																13.91m: P,sh,ro,un, cy					
																13.97m: P,10°,ro,un, cy					
																14.07m: P,sh,ro,un		C	96	85	
																14.15m: P,5°,ro,un					
																14.26m: J,85°un,sm					
																14.54m: J,55°un,ro					
																14.67m to 14.82m, P,5°, un,ro, cy (50mm spacing)					
																14.71m: J,70°un,sm		C	79	40	
																14.84m: CORE LOSS: 50mm					
																15.1m: CORE LOSS: 150mm					
16		SILTSTONE - High strength, fresh, grey siltstone (laminated)														15.41m: P,10°un,ro,cy		C	100	80	
		from 16.17m to 16.4m, medium strength, slightly weathered														15.53m to 15.72m, highly fract					
		from 16.2m, band of conglomerate 15mm thick														15.53m: J,75°un,ro					
		from 16.5m, medium strength, slightly weathered														15.8m: P,5°ro,un, cy					
		from 16.69m, extremely low strength, extremely weathered														15.95m: P,un,sm, white mineral inclusions		C	100	100	
		from 16.78m, very low to low strength, highly weathered														16.02m: J,80°un,ro					
		from 16.82m, low to medium strength, moderately weathered														16.05m: P,sh,H,un					
		from 16.88m, high strength, fresh														16.17m: P,sh,pl,ro, cy filled					
		from 17.42m, light grey siltstone														16.37m: J,75°pl,ro					
																16.44m: P,5°un,H					
																16.66m: J,65°un,sm					
																17.15m: J,70°sv, un,ro					
																17.41m: J,80°					
																17.5m: P,10°un,ro					
																17.67m: P,10°un,ro, cy					
																17.84m: P,sh,pl,sm					
																18.13m: P,5°un,ro					
																18.14m: J,50°un,ro					
																18.18m: J,sh,pl,ro					
																18.46m: P,60°pl,ro,Fe					
																18.51m: J,pl,ro		C	38	20	
																18.55m: Void 0.1m					
																18.65m to 18.78m, highly fract					
																18.94m: P,45°ro,un,Fe					
																19.1m: P,sv,80°ro.un.					
19		VOID																			
		SANDSTONE - Medium to high strength, slightly weathered, pale brown sandstone																			
		VOID																			

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
			EW	HW	MW	SW	FS		FR	Ex	Low	Very Low	Low			Medium	High	Very High	Ex	High	B - Bedding	J - Joint	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
4		VOID (continued)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.3m

TYPE OF BORING: Solid flight auger to 2.3m, (TC-bit), then HQ wireline to 22.7m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	0.2	SILT - Brown grey silt topsoil with abundant organics, damp																								1,3,4 N = 7 150-190kPa
	1	CLAY - (Stiff) grey brown clay (alluvium) with red brown mottling																				A				
	2	CLAYSTONE - Extremely low strength, extremely weathered grey brown claystone																				S,pp				
	2.0	From 2.45m, increased drilling resistance																								
	3	From 2.8m, extremely low to very low strength, extremely to highly weathered, grey brown																								
	4	From 3.2m, grey brown and light grey																								
	5	From 3.4m, light grey																								
	6	From 4.0m to 4.32m, very low to low strength, highly weathered red siltstone inclusions																								
	7	From 4.23m, very low to low strength, highly weathered																								
	8	From 4.6m to 5.0m, red and orange siltstone inclusions																								4.74m: J, 15°, pl, ro 4.77m: J, 30°, pl, ro, rootlets, H 4.83m: J, 30°, H, pl 4.86m: J, 55°, H, pl 4.87m: J, 55°, H, un 4.92m: J, 40°, un, ro
	9	From 5.15m to 5.2m, red and orange siltstone inclusions																								
	10	From 5.35m to 6.15m, red and orange siltstone and light grey claystone, very low to low strength, highly weathered																								
	11	CLAYSTONE/CARBONACEOUS SILTSTONE - Very low to low strength, moderately weathered orange claystone interlayered with dark grey carbonaceous siltstone																								6.6m: P, sh, poss DI 6.61m: P, sh, poss DI 6.64m: P, sh, poss DI 6.73m: P, sh 6.74m: J, 45° 6.82m: P, sh, poss DI 6.95m: P, sh, poss DI 4.92m to 14.2m, Frs generally at 0.05m spacings 7.05m: P, sh, poss DI 7.15m: P, sh, poss DI 7.2m: P, sh, poss DI 7.3m: CORE LOSS: 100mm 7.5m: P, sh 7.8m: P, sh 8m: Fr, 45°, pl 8.15m: P, sh, poss DI 8.4m to 8.45m fg 8.55m: P, sh 8.6m: P, sh 8.68m: P, sh 9.02m: P, sh 9.07m: P, sh
	12	CARBONACEOUS SILTSTONE - Very low to low strength, moderately weathered dark grey carbonaceous siltstone with laminations of coal																								
	13	1mm to 5mm thick at 1mm to 90mm spacing																								
	14	COAL - Medium strength, fresh black coal																								C
	15	CORE LOSS - 0.1m																								
	16	COAL - Medium strength, fresh black coal																								
	17	LAMINITE - Medium to high strength, fresh grey and light grey laminite																								C
	18	CARBONACEOUS SILTSTONE - Low strength, highly weathered fragmented dark grey/grey carbonaceous siltstone with some 1-2mm thick coal laminations at																								
	19																									

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/-

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	10.12	5mm spacings														9.65m: P, sh, poss DI				
		From 9.4m to 9.48m, slightly weathered														9.85m: P, sh, poss DI				
		From 9.97m, moderately weathered with some 1-2mm coal laminations at 2-10mm spacings														9.9m: P, sh				
		LAMINITE - Medium to high strength, fresh highly fractured grey and light grey laminite (continued)														9.93m: P, sh				
		COAL - Low to medium strength, moderately weathered black coal														9.98m to 10.03m, multiple partings				
																10.47m to 10.50m, fg				
																10.9m to 10.92, fg				
																11.05m: P, sh				
																11.1m: P, sh, poss DI				
																11.33m: P, sh, poss DI	C	97	60	
																11.53m: P, sh, cy lined (20mm)				
																11.7m to 11.90m, fr, sv				
																12m: P, sh, poss DI				
																12.65m: J, 45°				
																12.85m: P, sh, poss DI				
																12.95m: P, sh, cy lined (10mm)				
																13m: P, sh				
																13.20m to 13.50m, multiple p, sh, 50-100mm spacing				
																13.65m: J, 45°, poss DI				
																13.8m: J, sh, poss DI				
																13.90m to 13.92m, fg				
																13.92m to 14.0m, J, 70°				
																14m: J, 45°				
																14.05m: P, sh				
																14.24m: P, sh, un ro				
																15.03m: P, sh, un ro				
																15.81m: P, sh, un ro	C	100	100	
																15.95m to 16.67m, P, sh, un, ro @ 20-70mm				
																16.67m to 17.05, Fg	C	81	81	
																17.05m: CORE LOSS: 250mm				
																17.30m to 18.27m, P, sh, un, ro @ 10-20mm				
																17.48m: P, sh, un ro				

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.8m

TYPE OF BORING: Solid flight auger to 2.8m, (TC-bit), then HQ wireline to 25.95m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
		LAMINITE - Medium to high strength, moderately to slightly weathered grey siltstone (continued)															un, Fg 19.99m to 20.06m, J, 60°, un, ro 20.12m: P, sh, un, ro 20.16m: P, sh, un, ro 20.17m: P, sh, un, ro 20.32m: P, sh, un, ro 20.36m: P, sh, un, ro 20.4m: P, sh, un, ro 20.48m: P, sh, un, ro 20.58m to 20.63m, Fg 20.90m to 21.70m, P, sh, un, ro @20-100mm 21.70m to 23.55m, P, sh, pl, ro	C	100	29	
	21																	C	100	29	
	22																				
	23																	C	92	0	
	23.18	SILTSTONE - Low strength, moderately weathered grey siltstone																			
	23.45	CORE LOSS - 0.15m															23.45m: CORE LOSS: 150mm				
	24	SILTSTONE - Low strength, moderately weathered grey siltstone															23.60m to 24.30m, P, sh, un, ro @ 20-50mm				
	24.3	VOID - 24.3m to 25.4m																C	100	15	
	25																				
	25.4	SILTSTONE - Very low strength, highly weathered grey siltstone, highly fragmented (possible rubble)																			
	25.64	CORE LOSS - 0.15m															25.64m: CORE LOSS: 200mm				
	26	SILTSTONE - Low strength, highly weathered grey siltstone (possible floor) Bore discontinued at 25.95m, limit of investigation																			
	27																				
	28																				
	29																				

RIG: Edson 3000

DRILLER: Simon (APS)

LOGGED: Bear

CASING: HW to 2.8m

TYPE OF BORING: Solid flight auger to 2.8m, (TC-bit), then HQ wireline to 25.95m

WATER OBSERVATIONS:

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 1 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
	0.2	CLAY - Grey brown clay with some silt with sandstone																									
	0.55	SANDSTONE - Orange brown mottled grey brown sandstone with clay inclusions																				A					
	1	SILTSTONE AND SANDSTONE - Orange brown sandstone interbedded with grey brown and orange siltstone layers																				S					9,14,9 N = 23
		From 1.5m, light grey siltstone																									
	2	From 2.2m, increased drilling resistance																				S					18/110mm refusal, bouncing
	3	From 3.0m, orange brown sandstone/siltstone																									
	4																					S					25/90mm, refusal
	5																										
	5.4	SANDSTONE - Low strength, moderately to highly weathered orange brown fine grained sandstone																									
	6																					C	100	100			
	6.51	SILTSTONE/SANDSTONE - Low to very low strength, moderately to highly weathered orange and orange grey siltstone/sandstone																									
	6.57	CORE LOSS - From 6.57m to 6.62m																									
	6.62	SILTSTONE/SANDSTONE - Low to very low strength, moderately to highly weathered orange and orange grey siltstone/sandstone																									
	7																					C	96	85			
	7.75	SILTSTONE/SANDSTONE - Low to very low strength, moderately to highly weathered orange and orange grey siltstone/sandstone																									
	8	From 6.62m to 6.68m - fragmented, higher strength material																									
	8.3	SANDSTONE - Low strength, moderately weathered grey, fine grained sandstone																				C	100	83			
	9	SILTSTONE/CLAYSTONE - Low strength, moderately to high weathered grey-dark grey siltstone/claystone																									
	9.06	CORE LOSS - From 9.06m to 9.11m																									
	9.11																					C	97	78			

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 2 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	11	SILTSTONE/CLAYSTONE - Low strength, moderately to highly weathered grey-dark grey siltstone/claystone (continued)															From 8.20m to 8.364m, DB at 10mm spacing 8.51m: P, sh, un, sm 8.59m: DB	C	97	78		
	12																From 8.61m to 8.64m, J, 45°, pl, sm From 8.76m to 8.8m, fg 8.87m: P, sh, pl, sm 8.9m: P, sh, pl, sm 9.06m: CORE LOSS: 50mm	C	100	81		
	12.6	From 12.55m, coal lenses															From 9.11m to 9.24m, J, sv, un, ro 9.18m: DB 9.2m: DB 9.24m: DB 9.26m: DB					
	12.8	CORE LOSS - From 12.6m to 12.8m															9.3m: DB 9.33m: P, clay filled 9.4m: P, sh, pl, sm 9.42m: P, sh, pl, sm 9.55m: P, sh, pl, sm 9.57m: P, sh, pl, sm	C	81	69		
	13	13.05 CLAYSTONE - Very low to low strength, moderately weathered, grey claystone with coal laminations															9.66m: P, 10°, pl, sm From 9.74m to 9.78m, J, 45°, pl, sm					
	13.35																9.86m: P, sh, pl, sm 9.95m: P, sh, un, sm 10.06m: P, sh, un, sm	C	60	0		
	13.6	CORE LOSS - From 13.05m to 13.35m															From 10.12m to 10.29m, J, 60°, fg 10.52m: DB 10.62m: DB 10.69m: DB					
	14	CLAYSTONE - Low to medium strength, moderately weathered, grey claystone From 13.57m, clay															10.8m: P, sh, pl, sm From 10.8m to 11.25m, J, sv, un, ro From 11.05m to 11.25m, fg 11.36m: DB 11.46m: DB 11.56m: DB 11.57m: DB	C	60	40		
	15	COAL - Medium strength, moderately weathered, black coal, with seams of 5mm to 330mm thick clay at approximately 160mm spacing															From 11.74m to 11.84m, J, 50°, pl, ro 11.87m: DB 11.95m: DB 11.97m: DB 12.0m to 12.07m, J, 50°, un, ro 12.16m to 12.31m, fg 12.42m: DB 12.47m: DB					
	16																12.6m: Core loss, 0.2m CORE LOSS: 200mm 13.05m: Core loss, 0.3m CORE LOSS: 300mm	C	100	87		
	17																From 13.35m to 13.7m, highly fractured to fg 13.77m: J, 80°, un, ro 14.31m: P, 1078, un, sm, cy From 14.39m to 14.45m, fg 14.5m: P, 10°, un, ro, cy filled 14.58m: P, 10°, un, sm, cy					
	17.5	CORE LOSS - From 17.5m to 17.55m															From 14.75m to 15.25m, highly fr to fg 15.25m: P, 5°, un, ro, cy filled 15.45m: J, sv, pl, ro 15.49m: P, 5°, un, ro, cy	C	93	42		
	17.55																					
	18	LAMINITE - High strength, slightly weathered, grey laminite (70% siltstone/30% sandstone)																				
	19																					
		From 19.4m, very high strength (90% sandstone/10% siltstone)																				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 3 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		LAMINITE - High strength, slightly weathered, grey laminite (70% siltstone/30% sandstone) <i>(continued)</i>																								
	21																				filled 15.6m: J, 75°, un, ro 15.66m: P, 5°, un, ro 15.72m: P, 10°, un, he 15.77m: P, 5°, un, he 15.83m: P, 5°, un, he From 15.99m to 16.02m, fg 16.1m: J, sv, un, ro (16.05m to 16.2m) 16.3 16.3m: J, sv, pl, he 16.4m: J, 80°, pl, ro From 16.95m to 17.07m, highly fr From 17.13m to 17.22m, highly fr From 17.27m to 17.5m, fg to higly fr 17.5m: Core loss, 0.05m CORE LOSS: 50mm Unless otherwise stated, discontinuities are partings, sh-10°, un, ro 17.69m: DB 17.88m: DB 18m: Sh-10°, un, ro 18.06m: Sh-10°, un, ro 18.14m: Sh-10°, un, ro 18.17m: Sh-10°, un, ro 18.33m: J, 80°, pl, sm, part he (18.17m to 18.48m) with DB on laminations 18.49m: DB 18.54m: DB 18.56m: DB 18.78m: J, 60°, un, he 18.84m: DB 18.91m: DB 18.98m: DB 19.01m: DB 19.07m: DB 19.08m: DB 19.19m: J, 70°, pl, sm (19.11m to 19.26m) 19.39m: DB 19.6m: DB 19.78m: DB 20.21m: DB 20.51m: DB 20.78m: DB 20.8m: DB 20.81m: DB 20.84m: DB 20.85m: DB 20.87m: DB 21.01m: DB 21.11m: DB 21.14m: DB 21.27m: DB 21.3m: DB From 21.33m to 21.44m, J, (MFr), 70°, stepped, sm From 21.49m to 21.64m, J (MFr?), 70°, un, sm 21.64m: DB From 21.66m to 21.78m, J, (MFr?), 70°, pl, sm 21.76m: DB 21.97m: DB 22.51m: DB 22.64m: DB	C	100	94		
	22																					C	100	100		
	23																									
	24																									
	25																					C	100	95		
	26																									
	27																						C	100	100	
	28																									
	29																					C	100	100		
																						C	98	72		

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m
TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
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		≡	Water level

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Initials:
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 4 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High			Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	30.34	Medium to high strength, Fg																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 5 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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	41																			31.29m: DB 31.6m: DB 31.69m: DB 31.74m: DB 31.77m: DB 31.8m: DB 31.87m: DB From 31.94m to 31.95m, P, sh, fg From 32.04m to 32.21m, Fr, fg From 32.28m to 32.78m, Fr, fg 33m: DB From 33.3m to 33.45m, J (MFr?), 75°, pl, sm From 33.45m to 33.46m, P, sh, un, clay filled From 33.46m to 33.56m, J (MFr?), 80°, curved slickensided From 33.50m to 33.58m, J (MFr?), 80°, irregular, slickensided 33.58m: DB 33.65m: DB From 33.75m to 34.01m, Fr, fg From 34.06m to 34.07m, Fr, fg 34.11m: P, sh, pl, fg 34.28m: DB 34.46m: DB From 37.40m to 37.49m, J, 60°, pl, sm 35.17m: DB 36.43m: DB 36.48m: DB 36.55m: DB 36.74m: DB 36.75m: DB From 36.79m to 36.82m, J, sv, un, sm, fe 36.82m: DB 36.84m: DB 36.87m: DB 36.88m: DB 36.91m: DB 36.94m: DB From 36.94m to 37.01m, J (MFr?), 80°, pl, sm, fe 36.95m: DB 36.97m: DB 36.99m: DB 37.01m: DB From 37.03m to 37.07m, Fr, fg 37.07m: DB 37.09m: DB 37.15m: DB From 37.21m to 37.4m, J, 70°, un, sm 37.24m: DB 37.28m: DB 37.33m: DB 37.36m: DB 37.37m: DB 37.41m: DB 37.44m: DB 37.48m: DB 37.57m: DB 37.59m: DB 37.67m: DB 37.74m: DB																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			</

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 6 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding J - Joint		Type	Core Rec. %	RQD %	Test Results & Comments
																							S - Shear	D - Drill Break				
	50.8	LAMINITE - High to very high strength, slightly weathered blue-grey laminite (<i>continued</i>)																			From 37.77m to 37.89m, Fr, sv, irregular, sm, ca	C	100	97				
	51	COAL - Medium to high strength, moderately weathered, black coal highly fractured																			37.89m: P, sh, fg							
	52																				37.92m: P, sh, fg							
	53																				37.98m: DB							
	53.8																				38.05m: DB							
	54																				38.11m: P, sh, pl, clay filled							
	54.48																				38.17m: P, sh, pl, clay filled	C	100	66				
	55																				From 38.23m to 38.29m, J, (MFr?), 65°, pl, sm							
	55.0																				38.29m: DB							
	55.32																				38.31m: DB							
	56																				38.43m: DB							
	56.21																				38.46m: DB							
	57																				38.71m: DB							
	58																				38.89m: DB							
	59																				38.9m: DB							
	60																				38.96m: DB							
	61																				39.32m: DB							
	62																				39.43m: DB							
	63																				From 39.51m to 39.56m, J, 60°, pl, sm							
	64																				From 39.57m to 39.60m, J, 60°, pl, sm							
	65																				39.65m: DB							
	66																				39.77m: DB							
	67																				39.81m: DB							
	68																				39.87m: P, sh, un, stepped, sm, ca							
	69																				From 38.87m to 40.04m, J, 80°, un, sm-ro							
	70																				40.04m: DB							
	71																				40.15m: DB							
	72																				40.48m: DB							
	73																				From 40.63m to 40.7m, J, 70°, un, sm							
	74																				40.75m: P, sh, pl, sm, ca							
	75																				40.81m: P, sh, pl, clay filled							
	76																				40.83m: DB							
	77																				40.92m: DB							
	78																				41.26m: DB							
	79																				41.27m: DB							
	80																				41.39m: DB							
	81																				41.42m: DB							
	82																				41.44m: DB							
	83																				41.46m: DB							
	84																				41.53m: DB							
	85																				42.13m: DB							
	86																											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m
TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
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CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
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BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 7 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding	J - Joint	Type
	61	From 59.9m to 61m (90% siltstone/10% sandstone) LAMINITE - High strength, fresh, grey laminite (90% siltstone/10% sandstone) with carbonaceous laminations (continued)														43.7m: DB 43.79m: DB 43.83m: DB 43.89m: DB 43.94m: DB 43.97m: DB 44.04m: DB 44.13m: DB 44.24m: DB 44.35m: DB 44.41m: DB		C	100	96	
	62															From 44.51m to 44.70m, Fr, fg From 44.71m to 44.82m, J, 70°, pl, sm 44.97m: DB 45.09m: DB 45.3m: DB 45.35m: DB 45.43m: DB 45.61m: DB					
	63	From 63.13m to 63.42m, sandstone inclusions light grey														From 45.61m to 45.81m (MFr), irregular, ro, fr 45.79m: DB 45.86m: DB					
	64	From 63.6m, sandstone inclusion at 70°														From 45.88m to 45.94m, J (MFr), 50°, irregular, sm 45.95m: DB 46m: DB 46.05m: DB		C	100	92	
	65	From 64.05m, sandstone inclusion, sh-70°														From 46.05m to 46.27m, J (MFr), 70°, pl, sm, fr, multiple joint sets 46.1m: DB 46.15m: DB 46.24m: DB 46.4m: DB From 46.5m to 46.71m, J (MFr), sv, irregular, he 46.84m: DB From 46.84m to 46.9m, J, sv, un, ro, ca 46.9m: DB 46.93m: DB					
	66															From 46.98m to 47.11m, J (MFr), 70°, pl, sm 47m: DB 47.05m: DB 47.14m: DB 47.24m: DB 47.35m: DB 47.4m: DB 47.51m: DB		C	100	100	
	67															From 47.61m to 47.7, J (MFr), fr From 47.76m to 47.88m, J (MFr), 65°, un, ro From 47.83m to 47.99m, J (MFr), 70°, irregular, sm 48.16m: DB 48.19m: DB 48.24m: DB					
	68															From 48.26m to 48.34m, J (MFr), 70°, un, sm 48.34m: DB 48.36m: DB 48.43m: DB 48.48m: DB 48.62m: DB 48.64m: DB 48.82m: DB 48.9m: DB		C	100	100	
	69																				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m
TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	pp	Pocket penetrometer (kPa)
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CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 8 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding	J - Joint	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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	71	LAMINITE - High strength, fresh, grey laminite (90% siltstone/10% sandstone) with carbonaceous laminations (<i>continued</i>) From 70.5m, (sandstone 90%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 9 OF 9

[illegible]

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear/Benson

CASING: HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

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	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 1 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	0.75	CLAY - Very stiff to hard, light grey brown mottled orange brown clay																A			400 kPa 4,9,10 N = 19 9,11,10 N = 21	
	1	SILTSTONE/CLAYSTONE - Extremely low to very low strength, extremely to highly weathered, light grey mottled orange siltstone/claystone																pp S				
	2	From 1.8m, increased drilling resistance																S				
	3																	S				
	3.95	SILTSTONE - Very low to low strength, highly to moderately weathered, grey brown mottled orange laminated siltstone																			4.04m: J, sv, un, sm, cy, extend to 4.14m 4.6m: P, 0°-10°, un, ro 4.75m to 4.87m, J, 80°, pl, ro, fe 4.98m to 5.07m, J, 80°, un, sm, cy 5.16m: P, 0°-10°, un, ro 5.42m: P, 0°-10°, un, ro 5.65m: P, 0°-10°, un, ro 5.95m: CB 5.98m: P, 0°-10°, un, ro 6.1m: J, 45°, he 6.17m: Di 6.44m: J, 10°, he 6.5m: J, 65°, he 6.91m: Cy filled (10mm) 7.14m: DB 7.16m: DB 7.2m: DB 7.27m: Cy filled (10mm), he 7.4m: Fe 7.42m: Fe 7.47m: Fe 7.78m: DB 8.15m: DB 8.5m: CORE LOSS: 50mm 8.78m: CORE LOSS: 270mm 9.78m: J, sv, un, ro, fe	
	5	From 6.0m, interbedded sandstone																C	100	97		
	6																	C	100	90		
	7	SANDSTONE - Medium strength, moderately to slightly weathered grey-brown mottled orange sandstone																				
	8	From 7.75 to 8.45m carbonaceous laminations spacing 5mm to 140mm																	C	97		96
	8.5	From 8.47m, clay and gravel band																				
8.55	CORE LOSS - From 8.5m to 8.55m																					
8.78	SANDSTONE - Medium strength, moderately to slightly weathered, orange brown sandstone																					
9.05	CORE LOSS - From 8.78m to 9.05m																					
		From 9.55m, medium strength, moderately weathered, orange																				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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 Tube sample (x mm dia.)	PL Point load strength ls(50) MPa
W Water sample	V Shear Vane (kPa)
C Core drilling	▷ Water seep ≡ Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 2 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MM	SW	FR	Ex Low	Very Low	Low	Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
		brown SANDSTONE - Extremely low strength, extremely weathered, grey brown sandstone (clayey sand properties) (<i>continued</i>) At 10.02m to 10.18m, increased weathering along joint, extremely low to low strength, extremely to highly weathered From 10.18m, very low to medium strength, highly to moderately weathered													9.94m: J, 35°, he 10.1m: J, 60°, he, cy From 10.3m to 10.45m, highly fractured 10.75m: P, 0°-10°, un, ro 11m: Cy filled (10mm) 11.23m: P, 0°-10°, un, ro 11.28m: J, sv, un, sm, di 11.46m: J, 80°, pl, ro, fe 11.5m: Possible DB 11.77m: DB 11.83m: DB 12.15m: CORE LOSS: 650mm		C	91	87	
	11																			
	12	From 10.38m, extremely low strength, extremely weathered From 10.45m, low to medium strength, moderately weathered, interbedded sandstone with carbonaceous laminations to 10.75m																		
	12.15																			
	12.8																			
	13	From 11.1m to 11.25m, carbonaceous laminations 5mm to 60mm spacing From 11.28m to 11.4m, siltstone, grey From 11.65m to 12.1m, carbonaceous laminations spacing 1mm to 60mm													12.93m: P, 0°-10°, un, ro 13.02m: P, 0°-10°, un, ro 13.06m: P, 0°-10°, un, ro 13.2m: J, sv, un, ro, fe (13.08m to 13.3m) From 13.3m to 13.38m, P, spacing 20mm 13.5m: J, 80°, un, ro 13.74m: J, 55°, he, un, fe 13.78m: P, fe 13.84m: J, 40°, he, fe 13.86m: J, 40°, he, fe 13.96m: he 14.05m: P, 0°-10°, un, ro 14.18m: J, 70°, pl, ro, fe 20mm wide From 14.25m to 14.4m, highly fr to fg (10mm to 20mm) 14.65m: DB 14.68m: DB 14.7m: DB 14.96m: P 15.45m: J, 75°, pl, ro, fe 90mm wide (15.38m to 15.56m) 15.92m: P 16m: J, 60°, he 16.07m: P, 0°-10°, un, ro 16.15m: P, fg, 16.12m to 16.16m From 16.27m to 16.35m, fg From 16.65m to 16.75m, fg 16.75m: CORE LOSS: 450mm 17.3m: CORE LOSS: 250mm 17.55m to 17.72m, fg 17.81m to 17.89m, fg (0.01m) 17.89m to 18.0m, fg (0.03m)		C	77	61	
	13.08																			
	13.82																			
	14	CORE LOSS - From 12.15m to 12.8m SILTSTONE - Very low strength, highly weathered, grey brown siltstone From 12.93m, medium strength, moderately weathered From 13.02m to 13.06m, extremely low to very low strength, extremely to highly weathered From 13.06m to 13.08m, clay band																		
	15																			
	16	SANDSTONE - Medium strength, moderately weathered, light brown sandstone From 13.30m to 13.38m, extremely low to low strength, extremely to highly weathered From 13.38m to 13.77m, carbonaceous laminations, spacing 1mm to 30mm From 13.44m, clay band 8mm																		
	16.75																			
	17																			
	17.2																			
	17.3																			
	17.55	CLAYSTONE - Very low to low strength, moderately weathered, grey claystone From 14.05m, extremely weathered at parting At 14.96m, increased weathering at parting, extremely low strength, extremely weathered (possible core loss) At 15.14m, clay band, 5mm At 15.3m to 15.56m, highly weathered, increased weathering at joint At 15.92m, extremely low to low strength, extremely weathered, increased weathering at parting (possible core loss)																		
	17.81																			
	18																			
	19																			

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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 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:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 3 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	20.25 20.33	At 16.15m, extremely low to low strength, extremely weathered, increased weathering at parting (possible core loss)																C	92	29	
		From 16.27m to 16.35m, extremely low to very low strength, highly weathered																			
21		CORE LOSS - From 16.75m to 17.2m																C	93	0	
	21.52	CLAYSTONE - Extremely low to low strength, highly weathered, grey claystone																			
22		CORE LOSS - From 17.3m to 17.55m																			
		CARBONACEOUS SILTSTONE - Very low to medium strength, highly weathered, grey carbonaceous siltstone																			
23		COAL - Medium strength, moderately weathered, black coal with seams of 5mm to 250mm thick clay/tuff at 10mm to 270mm spacing (continued)																			
	22.95	CORE LOSS - From 20.25m to 20.33m																			
24		COAL - Medium strength, moderately weathered, black coal with bands of light brown/brown 5mm to 200 thick clay/tuff at approximately 5mm to 400mm spacing																			
	23.93	CORE LOSS - From 20.25m to 20.33m																			
25		CARBONACEOUS SILTSTONE - Medium strength, moderately weathered, grey carbonaceous siltstone																			
	25.75 25.8	From 21.58m, high strength, slightly weathered																			
26		SANDSTONE - High strength, slightly weathered, fractured, grey sandstone with carbonaceous laminations 10mm to 100mm apart																			
		LAMINITE - High strength, slightly weathered, grey/dark grey laminite																			
27		CORE LOSS - From 25.75m to 25.8m																			
		LAMINITE - High strength, slightly weathered, grey/dark grey laminite (80% siltstone/20% sandstone) with carbonaceous laminations																			
28		From 27.0m to 27.1m, sandstone																			
		From 27.3m to 28.18m, sandstone																			
29																					
		From 29.43m to 29.5m, heat affected zone																			

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 4 **OF** 9

SAMPLING & IN SITU TESTING LEGEND		CHECKED
A Auger sample	pp Pocket penetrometer (kPa)	Initials:
D Disturbed sample	PID Photo ionisation detector	
B Bulk sample	S Standard penetration test	Date:
U Tube sample (x mm dia.)	PL Point load strength ls(50) MPa	
W Water sample	V Shear Vane (kPa)	
C Core drilling	Δ Water seep ▽ Water level	

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 5 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High			Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	41	LAMINITE - High strength, slightly weathered, light grey/grey laminite (60% sandstone/40% siltstone) with carbonaceous laminations (continued)															39.35m: DB 39.69m: DB 39.94m: J, 10°, un, ro From 40.45m to 40.50m, sv fractures 40.75m: DB	C	97	83		
	42																41.15m: J, 20°, un, sm 41.42m: J, 35°, un, sl 41.45m: DB 41.64m: Possible DB 41.69m: Fr, sh - 30°, st, sm 41.75m: DB 41.88m: J, 40°, un, sm 41.94m: J, 50°, un, sm	C	96	66		
	42.52 42.62	From 42.5m to 42.52m, clay/tuff CORE LOSS - From 42.52m to 42.62m															From 41.94m to 42.42m, J, 60° - sv, un, sm, mineral deposits and highly fractured along joint					
	43	LAMINITE - High strength, slightly weathered, light grey/grey laminite (50% sandstone/50% siltstone)															42.2m: J, 10°, un, sm 42.29m: J, 15°, un, sm 42.4m: J, 30°, un, ro, mineral deposit 42.43m: DB 42.5m: P, 0°-10°, un, ro 42.52m: CORE LOSS: 100mm From 42.62m to 42.78m, parallel joints J, 70°, un, ro 42.97m: J, sv, un, ro 43.23m: P, 0°-10°, un, ro 43.68m: J, 55°, he, un 43.73m: Joint sets, 5°, st, sm 43.8m: Joint sets, 5°, st, sm 43.81m: J, 60°, sv, un, ro 43.84m: J, 70°, un, he 43.85m: Joint sets, 5°, st, sm 43.99m: Parallel joints, 75°, un, he 44.05m: Parallel joints, 75°, un, he 44.18m: Parallel joints, 75°, un, he 44.25m: F, 70°, sv, un, sm 44.66m: DB 44.82m: Possible DB 44.92m: Possible DB 45.03m: DB 45.19m: DB 45.23m: J, 5°, pl, sm 45.42m: J, 75°, un, sm, he (45.34m to 45.5m) 45.5m: J, 75°, un, he 45.7m: J, 85°, pl, sm (45.6m to 45.8m) 46.02m: DB 46.17m: DB 46.65m: J, 70°, pl, he 46.68m: P, 0°-10°, un, ro 46.71m: DB 46.78m: ??	C	100	89		
	44	From 44m, fresh																				
	45																					
	46	From 45.76m to 45.81m, grey brown heat affected zone? From 46.20m to 46.29m, dark grey band From 46.36m to 46.61m, bedding angle changes rapidly?																C	100	95		
	47	From 47.1m to 47.35m, blue grey siltstone From 47.35m to 47.5m, pale brown At 47.55m, clay, 10mm thick																				
	48	From 47.95m to 48.65m, green-grey																C	100	93		
	48.71	LAMINITE - High strength, slightly weathered, light grey/grey laminite (70% siltstone/30% sandstone) From 49m, carbonaceous lamination																				
	49	From 49.95m, grey green (various shades)																				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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 Tube sample (x mm dia.)	PL Point load strength ls(50) MPa
W Water sample	V Shear Vane (kPa)
C Core drilling	▷ Water seep ≡ Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 6 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, slightly weathered, light grey/grey laminite (70% siltstone/30% sandstone) <i>(continued)</i>																						
	51	From 51.0m to 51.15m, grey From 51.19m to 51.55m, grey																						
	52																							
	53	At 53.62m, clay band, 25mm thick																						
	54 53.98	SANDSTONE - High strength, slightly weathered, pale brown/cream sandstone with significant clay content																						
	55																							
	55.85	COAL - Medium strength, moderately weathered, black coal (Young Wallsend) with bands of tuff and carbonaceous mudstone																						
	56																							
	57																							
	58																							
	59 59.0	CARBONACEOUS SILTSTONE - High strength, fractured, dark grey carbonaceous siltstone From 59.35m, coal laminations																						

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 7 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	61.05	COAL - Medium strength, moderately weathered, black coal (Young Wallsend) with bands of 10mm to 200mm thick carbonaceous mudstone and clay at 20mm to 400mm spacing (continued)															55.81m: P, 0°-10°, un, ro	C	100	87	
		LAMINITE - High strength, fractured, grey/dark grey laminite with carbonaceous laminations (80% sandstone/20% siltstone)															55.91m: P, 5°, pl, sm, tuff/clay				
																	55.96m: P, 10°, st, ro				
																	56.12m: Fr				
	62																56.17m: P, un, ro, tuff				
																	56.17m to 56.23m, J, 80°, un, ro				
																	56.29m: DB				
																	56.35m: Fr				
																	56.4m: P, 0°-10°, un, ro				
																	56.54m: Fr, sh				
																	56.6m: Fr, sh				
																	56.65m: Fr, sh				
																	56.7m: Fr, sh				
																	56.74m: Fr, sh				
																	56.79m: Fr, sh				
		From 62.40m to 62.42m, fragmented															56.87m: J, 60°, un, ro				
																	57.1m: Fr				
																	57.2m: J, sv, he, un				
																	57.3m: Fr				
	63																57.37m: P, sh, pl, CBS MS				
		From 63.18m to 63.19m, coal lense															57.5m: Fr				
																	57.6m: J, sv, un, ro				
																	57.8m: J, 20°, pl, he				
																	57.95m: J, sv, un, he				
																	58m: J, sv, un, he				
																	58.30m to 58.48, fg along joints				
																	58.4m: J, 75°, un, ro				
																	58.55m: P, sh, pl, ro, CBS MS				
																	58.77m: P, 10°, pl, ro				
																	59.12m: P, 10°, pl, sm				
																	59.15m: P, sh, DB				
																	59.16m: J, 30°, un, sm				
																	59.18m: J, 30°, un, he				
																	59.20m to 59.26m, fractures				
																	59.26m: DB				
																	59.27m: DB				
																	59.39m: DB				
																	59.43m: DB				
																	59.53m: DB				
																	59.59m: DB				
																	59.64m: DB				
																	59.7m: P, 0°-10°, un, ro				
																	59.89m: J, 80°, pl, ro				
	67	At 66.96m, clay 15mm															60.04m: P, 0°-10°, un, ro				
		From 66.97m to 67.05, coal															60.08m: P, 0°-10°, un, ro				
																	60.35m: J, 20°, un, ro				
																	60.41m: J, 20°, un, he				
																	60.53m: J, 20°, pl, sm, cu				
																	60.62m: J, 40°, un, ro				
	68																60.73m: P, 0°-10°, un, ro				
																	60.78m: J, 80°, un, ro				
																	60.80m to 60.89m, highly fractured				
																	61.01m: J, 30°, un, ro				
																	61.18m: P, 0°-10°, un, ro				
	69																61.22m: P, 0°-10°, un, ro				
																	61.35m: J, 85°, pl, sm, possible DB				
																	62.05m: J, 40°, un, sm				
																	62.24m: Possible DB				
																	62.42m: J, 20°, pl, he				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 8 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	71	LAMINITE - High strength, fractured, grey/dark grey laminite with carbonaceous laminations (80% sandstone/20% siltstone) <i>(continued)</i>																				C	100	100	
	72																								
	73																					C	100	100	
	74																								
	75																					C	100	100	
	76																								
	76.3	VOID: Water filled (when rods lowered air pushed out)																							
	77																								
	78																								
	78.25																								
	78.35	CORE LOSS - From 78.25m to 78.35m																				C	55	49	
	78.68	COAL - Extremely low strength, extremely weathered, black coal, fragmented/silty																							
	79	From 78.4m, medium strength, moderately weathered, fragmented to highly fragmented At 78.58m, floor coal divide																							

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 9 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	80.95	SANDSTONE - Very high strength, fresh, grey sandstone with carbonaceous laminations, spacing 0.1m to 1.0m <i>(continued)</i>																			
	81	Bore discontinued at 80.95m, limit of investigation																			
	82																				
	83																				
	84																				
	85																				
	86																				
	87																				
	88																				
	89																				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	>	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 1 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		CLAY - Brown clay with some weathered coal, M> Wp																								
1	1.0	CLAYSTONE/SILTSTONE - Extremely weathered, extremely low strength, grey brown claystone/siltstone.																				D				
2		From 1.5m, increased strength and less weathering siltstone																				D				
3																						D				
4																										
5																										
6																										
7																										
8																										
9																										
		From 9.5m, brown																					D			

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	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:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 2 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength						Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
	11.0	CLAYSTONE/SILTSTONE - Extremely weathered, extremely low strength, grey brown claystone/siltstone. <i>(continued)</i> From 10.5m to 11m, clay, brown																									
	11.0	SANDSTONE/SILTSTONE - Brown sandstone and siltstone interbedded																									
	12																										
	13																										
	14																										
	15																										
	16																										
	17																										
	18																										
	19	At 19.0m, silty clay																									
		From 19.6m to 20.6m, coal, black (yard seam)																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 3 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		SANDSTONE/SILTSTONE - Brown sandstone and siltstone interbedded (continued)																								
	21	At 21.0m, coal, black (200mm)																					D			
	21.2	LAMINITE - Grey laminite (80% sandstone)																								
	22																						D			
	23																									
	24																									
	24.5	CLAYSTONE/SILTSTONE - Grey interbedded claystone and siltstone																								
	25																						D			
	26																									
	27																									
	28																						D			
	29																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	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:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 4 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		CLAYSTONE/SILTSTONE - Grey interbedded claystone and siltstone (continued)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 5 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	41	COAL/CBS SILTSTONE - Interbedded (continued)																					D			
	42																									
	42.5	LAMINITE - Grey laminite																								
	43																						D			
	44																									
	45																									
	45.05	LAMINITE - High strength, slightly weathered, grey laminite																					C	100	0	
	46																									
	47	From 46.75m to 46.77m, clay From 46.79m to 46.81m, clay																					C	100	100	
	48																									
	48.7	SANDSTONE - High strength, slightly weathered, fragmented, grey sandstone																					C	100	10	
	49																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 6 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
		SANDSTONE - High strength, slightly weathered, fragmented, grey sandstone <i>(continued)</i>															49.09m: J, 10°, un, sm, poss MFr 49.3m: DB 49.68m to 50.11m, M Fr, 70°, sv, un, ro 50.37m: DB 50.62m: J, 30°, un, ro, poss MFr 50.64m: J, 35°, un, ro, Poss MFr	C	100	10	
51																	51.65m: DB/MFr 51.77m: DB/MFr	C	100	100	
52																					
53																	53.42m: DB 53.71m: P, 10°, un, ro, coal, di 53.97m: DB 54.2m: DB				
54																	54.61m: DB 54.71m: DB 54.83m: DB 54.91m: DB 55.06m: DB 55.37m: DB 55.59m: P, 10°, un, ro	C	100	100	
55																					
56	56.0	VOID																			
57	57.0	From 56.8m, rubble																			
	57.3	SILTSTONE/SANDSTONE - High strength, fragmented, grey siltstone/sandstone VOID															57.25m: Fr, 80°, pl, sm				
58																		C	100	100	
		From 58.65m, rubble																			
58.87	58.95	SILTSTONE - High strength, fragmented, grey siltstone																			
59		VOID																			
59.4	59.51	From 59.26, rubble																			
59.76		CLAYSTONE - Medium strength, fresh															59.65m: J, 50°, un, ro, poss Fr				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 7 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		COAL - Medium strength, moderately weathered, black coal SANDSTONE - High to very high strength, fresh, grey sandstone with some CBS laminations <i>(continued)</i>																								
	61																									
	62																									
	63																									
	63.05	Bore discontinued at 63.05m, limit of investigation																								
	64																									
	65																									
	66																									
	67																									
	68																									
	69																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m
TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.
WATER OBSERVATIONS:
REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 1 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing								
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
1		SILTY CLAY - Light brown silty clay with some sand, and dark brown weathered coal, M<Wp																										
	1.4	COAL - Dark brown weathered coal/carbonaceous mudstone																					A					
	2																						D					
	3																											
	3.5	SILTSTONE - Grey siltstone with carbonaceous laminations																										
	4	From 4.1m, medium strength, slightly weathered																										
	4.65	CLAYSTONE - Medium to high strength, slightly weathered, grey claystone																										
	5	From 5.05m to 5.17m, high strength, moderately weathered, red brown volcanic inclusion																										
	6	From 5.7m to 5.8m, heat affected rock																										
	6.0	From 5.75m, low strength																										
2		SILTSTONE - Medium strength, slightly weathered to fresh, grey siltstone																										
	6.9	From 6.6m to 6.9m, rotational shearing of rock from jamming in barrel																										
	7.05	CORE LOSS - (Possibly at 5.75m to 5.9m)																										
	7.7	CLAYSTONE - Medium strength, slightly weathered, grey claystone																										
	8	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone																										
	8.27	From 8.2m, very low to low strength, moderately weathered																										
	8.75	SANDSTONE - High strength, fresh, grey sandstone																										
	8.85	CORE LOSS - From 8.75m to 8.85m																										
	9	LAMINITE - High strength, fresh, grey laminite																										

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 2 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength				Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing								
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low			Low	Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
	10.0	LAMINITE (Continued)														highly fr, ca, Fe								
	10.52	From 10.3m to 10.45m, claystone, low strength, highly weathered														9.95m: M, fr, sv, pl, ro								
	11	CLAYSTONE - Medium strength, moderately to slightly weathered, grey claystone with bands of orange brown weathering														From 10.3m to 10.45m, fr	C	95	60					
	12	At 12.07m, coal lens														From 10.45m to 10.6m, sv, MFr								
	13	From 12.08 to 12.21, very low to low strength, highly weathered														10.7m: J, 80°, pl, ro, poss MFr								
	12.77	At 12.23m, coal lens														10.87m: J, 80°, un, ro								
	14	From 12.3m, with siltstone														10.93m: DB								
	15	SANDSTONE - Low strength, highly to moderately weathered, orange brown sandstone														10.97m: DB								
	16	At 13.1m, 100% water loss														11.25m: J, 75°, pl, sm, poss MFr								
	17	From 13.65m, medium to high strength, moderately to slightly weathered, grey and orange brown with carbonaceous laminations														11.28m: DB								
	18	At 14.27m, weak, weathered lens														11.38m: J, 75°, pl, sm, poss MFr								
	19	At 14.77m, weak, weathered lens														11.4m: DB	C	100	65					
	20	From 15.11m to 15.16m, low strength, highly to moderately weathered inclusion														11.45m: J, 75°, pl, sm, poss MFr								
	21	From 16.41, high strength														11.52m: DB								
	22															11.57m: DB								
	23															11.62m: P, sh, un, ro, Fe								
	24															11.82m: P, sh, un, ro, Fe								
	25															11.98m: P, sh, un, ro, coal								
	26															12.15m: P, sh, un, ro, he								
	27															From 12.33m to 12.56m, P, sh, 5°, un, ro, Fe								
	28															spacing 10mm to 60mm								
	29															12.45m: J, 80°, pl, he								
	30															12.67m: P, 10°, un, ro, he								
	31															12.77m: P, 15°, un, ro, he								
	32															12.93m: P, 5°, un, ro								
	33															From 12.93m to 13.65m, MFr 60°, sv, un, ro, fe								
	34															13.65m: P, 5°, un, ro								
	35															13.85m: DB								
	36															14.06m: DB								
	37															14.26m: DB								
	38															14.46m: DB								
	39															15.11m: Parallel p, 15°, pl, he								
	40															15.16m: Parallel p, 15°, pl, he								
	41															15.24m: P, 15°, un, ro, di								
	42															15.31m: DB								
	43															15.64m: DB								
	44															16.04m: DB								
	45															16.15m: J, sv, un, sm, Fe								
	46															16.41m: DB								
	47															16.81m: P, sh, pl, sm, di	C	100	100					
	48															16.99m: DB								
	49															17.15m: DB								
	50															17.3m: P, 5°, un, ro, Fe								
	51															17.76m: DB								
	52															17.78m: DB								
	53															17.81m: DB								
	54															17.83m: DB								
	55															17.91m: J, 50°, un, ro								
	56															18m: Fr, 5°, un, ro								
	57															18.16m: DB								
	58															From 18.2m to 18.27m, Fr, sh-sv, un, ro, Fe								
	59															18.35m: DB								
	60															18.43m: J, 50°, pl, sm								
	61															19.1m: J, 65°, pl, ro, Fe								
	62															19.2m: DB								
	63															19.3m: J, 35°, pl, ro								
	64															19.55m: J, 65°, pl, ro, Fe								

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m
WATER OBSERVATIONS: No free groundwater observed
REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 3 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break
	20.0	SANDSTONE (Continued)														19.68m: DB	C	100	100	
	21															20.45m: J, 65°, pl, ro, Fe				
	21.69	CORE LOSS - Possibly goaf														20.85m: DB, 15° From 20.93m to 20.98m, Fr/J at 60° and 50°, un, sm, cy				
	22															21.62m: DB 21.69m: Core Loss, 0.45m CORE LOSS: 450mm	C	85	75	
	22.14	SILTSTONE AND CLAY - Extremely low to medium strength, extremely to highly weathered From 22.2m, siltstone, high strength, fragmented														22.41m: P, 5°, un, ro				
	22.32																22.72m: P, 5°, un, sm 22.8m: P, sh, un, ro From 22.8m to 22.99m, fg			
	23	From 22.26m, very low to low strength, highly weathered														23.01m: J, 80°, pl, sm 23.45m: J, sv, st, ro				
	23.11	COAL - Medium strength, moderately weathered, black coal (yard seam)														23.65m: DB 23.71m: DB 23.72m: DB 23.8m: MFr, 80°, sv, cu, sm 23.94m: DB 24m: DB 24.05m: MFr, 80°, un, sm				
	23.58	From 22.41 to 22.48m, very low to low strength, highly weathered														24.14m: DB 24.23m: MFr, sv, un, sm 24.25m: DB 24.26m: MFr, 20°, sv, un, sm 24.27m: MFr, 20°, sv, un, sm 24.3m: MFr, 20°, sv, un, sm 24.31m: MFr, 20°, sv, un, sm 24.4m: MFr, 20°, sv, un, sm	C	100	68	
	24	From 22.52m to 22.58m, extremely low to very low strength, extremely to highly weathered From 22.75m to 22.8m, tuff														24.43m: MFr, 20°, sv, un, sm 24.48m: MFr, 20°, sv, un, sm 24.62m: MFr, 20°, sv, un, sm (some pl) 24.65m: MFr, 20°, sv, un, sm (some pl) 24.66m: J, 40°, un, ro 24.67m: MFr, 20°, sv, un, sm (some pl) 24.72m: MFr, 20°, sv, un, sm (some pl) 24.75m: MFr, 20°, sv, un, sm (some pl) 24.81m: MFr, 20°, sv, un, sm (some pl) 24.85m: MFr, 20°, sv, un, sm (some pl) 24.88m: MFr, 20°, sv, un, sm (some pl) 24.89m: J, 80°, pl, sm 24.93m: MFr, 20°, sv, un, sm (some pl) From 26.22m to 26.41m,				
	25	SILTSTONE - High strength, fragmented, grey siltstone																		
	25	COAL - Medium strength, moderately weathered coal (yard seam)																		
	26	SILTSTONE - High strength, fragmented, grey siltstone From 24.3m to 24.4m, heat affected From 24.79m to 24.88m, heat affected																		
	26.65	CORE LOSS - Possibly goaf																		
	27																			
	27.4	SILTSTONE/CLAYSTONE - Medium strength, slightly weathered, grey siltstone/claystone																		
	28	From 27.75m to 27.88, very low to medium strength, highly to moderately weathered, with clay From 28.02m to 28.05m, clay From 28.13m to 28.15m, clay From 28.15m, high strength																		
	29	From 28.17m to 28.43m, fine cracks From 28.45m to 28.6m, heat affected From 29.0m to 16m, heat affected																		

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 4 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %	Test Results & Comments
	30.0	SILTSTONE/CLAYSTONE (Continued)																						
		From 30.43m to 30.57m, fine cracking																	C	100	70			
		From 30.7m to 30.82m, chalky																						
	31	From 30.88m to 30.12m, fine cracking																						
		At 31.33m, clay (15mm)																						
		At 31.7m, clay (5mm)																	C	100	65			
	32	At 31.74m, clay (10mm)																						
		At 32.58m, clay (10mm)																						
		At 32.62m, clay (5mm)																						
	33																							
	34																		C	100	33			
	35																							
	36	From 35.65m to 35.97m, moderately weathered, medium to low strength																						
		From 36.32m to 36.4m, fine cracks																						
	37																		C	100	62			
	38																							
		At 38.65m, pale grey																	C	100	26			
	39																							
																			C	69	57			
	39.65	SANDSTONE - High strength, slightly weathered, pale grey																						

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 5 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding	J - Joint	Type
	39.97	sandstone															ca				
	40.0	COAL - Medium strength, moderately weathered, black coal															31.69m: J, 10°, un, ro, cy	C	69	57	Cave in
	40.03	COAL (Continued)															31.85m: J, 60°, sv, un, ro				
		RUBBLE/VOID															31.86m: J, 80°, un, ro				
	41																31.93m: J, 10°, un, sm, poss DB				
	41.1	COAL - Medium strength, moderately weathered, black coal															32.02m: MFr, 50°, sv, un, he (31.93m to 32.11m)	C	70	57	
																	32.2m: MFr, sv, un, he, ca (32.09m to 32.31m)				
																	32.31m: Fr, sh, 5°				
	42																32.39m: Fr, sh, 5°				
	42.19	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone															32.43m: MFr, sv, 60°, un, ro (32.31m to 32.55m)				
	42.2																32.45m: Fr, sh, 5°				
	42.35																32.55m: Fr, sh, 5°				
	42.42	RUBBLE/VOID															32.65m: DB				
	43																32.67m: DB				
	42.98	COAL - Medium strength, moderately weathered, black coal															32.69m: J, 80°, un, sm				
		SILTSTONE - High strength, slightly weathered, grey siltstone															32.7m: J, 80°, un, sm				
		CARBONACEOUS SILTSTONE - High strength, moderately weathered, dark grey carbonaceous siltstone with bands of coal (medium strength, moderately weathered, black) 5mm to 50mm spacing															32.81m: DB	C	94	87	
		From 43.25m to 43.35m, coal															32.96m: DB				
		From 43.39m to 43.61m, coal															33.05m: P, sh, un, ro, cy (5mm)				
		From 43.77m to 43.83m, coal															33.07m: MFr, sv, sm, pl (33.05m to 33.11m)				
		From 44.1m to 44.34m, coal															33.09m: P, sh, pl, sm, cy filled				
	45																33.11m: P, sh, pl, sm, cy filled				
	45.1	From 44.5m to 44.66m, extremely low to very low strength, extremely highly weathered															From 33.11m to 33.28m, MFr/J, sv, un, sm, he, ca				
		From 44.66m to 45.1m, coal															33.28m: J, 10°, un, sm, cy				
		LAMINITE - Medium strength, slightly weathered, grey laminite															From 33.36m to 33.39m, P, sh, 5°, pl, sm, di				
		From 45.14m to 45.19m, very low to low strength, highly weathered															33.43m: DB				
		From 45.19m, high strength, fresh															33.47m: DB				
		From 45.56m to 45.6m, coal laminations															From 33.47m to 33.95m, MFr, sv, un, sm (50mm spacing)	C	100	76	
		From 46.66m to 46.8m, heat affected															33.74m: DB				
		From 47.17m to 47.2m, very low strength, highly weathered, due to joints															33.9m: MFr, 10°, un, ro				
		From 47.46m, clay (10mm)															33.96m: P, 10°, un, sm, di				
																	34.05m: P, sh, un, sm, poss DB				
																	34.1m: P, 10°, pl, sm, cy veneer				
																	34.2m: MFr, sv, un, ro (34.1m to 34.35m)				
																	From 34.35m to 34.5m, MFr, sv, un, he (50mm spacing)				
	48																34.53m: J, 65°, un, ro				
																	34.55m: DB				
																	34.57m: DB				
																	34.65m: J, 60°, pl, sm				
		From 48.27m to 48.45m, coal laminations															From 34.65m to 34.75m, Fr				
																	34.89m: DB	C	100	92	
	49																From 35.0m to 35.55m, MFr/J, sv, un with secondary fracturing				
																	35.6m: J, 60°, un, sm, ca				
																	35.61m: MFr, sv, un, sm				
																	35.65m: DB				
																	35.69m: J, 60°, un, he				
																	35.81m: J, 10°, un, sm,				

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED

Initials:

Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 6 OF 8

[illegible]

TESTING LEGEND

pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
S	Standard penetration test
PL	Point load strength $I_s(50)$ MPa
V	Shear Vane (kPa)
▷	Water seep
≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 7 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	60.0	SILTSTONE/CLAYSTONE/RUBBLE - Extremely low to very low strength, extremely weathered to highly weathered, siltstone/claystone/rubble SILTSTONE/CLAYSTONE (Continued) SILTSTONE - Medium to high strength, slightly weathered, siltstone VOID COAL - Medium strength, moderately weathered, black coal SANDSTONE - High to very high strength, fresh, grey sandstone																				
	60.25																					
	60.35																					
	61																					
	61.25																					
	61.5																					
	62																					
	63																					
	64																					
	65																					
	65.85	Bore discontinued at 65.85m, limit of investigation																				
	66																					
	67																					
	68																					
	69																					

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		≡	Water level

CHECKED

Initials:

Date:



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 Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 8 **OF** 8

[illegible]

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

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	Tube sample (x mm dia.)	PL	Point load strength (s/50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep
		↗	Water level

CHECKED
Initials:
Date:



Douglas Partners
Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 1 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		SILTY CLAY - Brown silty clay with some sand, moist																								
	0.5	COAL - Highly weathered, dark brown weathered coal																								
	1																					D				
	2																									
	2.5	SILTSTONE/SANDSTONE - Grey																					D			
	3																									
	4																									
	5																					D				
	6																									
	7																									
	8																									
	9																					D				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	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:
Date:



Douglas Partners
Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 2 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
	10.0	SILTSTONE/SANDSTONE - Brown siltstone/sandstone interbedded																								
	11																						D			
	12																									
	13																						D			
	14																									
	15																									
	16																						D			
	17																									
	18																									
	19																						D			

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	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:
Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 3 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %	RQD %
		SILTSTONE/SANDSTONE - Brown siltstone/sandstone interbedded (continued)																									
	21																					D					
	22																										
	22.7	COAL - Black coal																				D					
	23																										
	23.65	SILTSTONE - Grey siltstone																									
	23.9	COAL - Black coal																									
	24																										
	24.2	SILTSTONE - Grey siltstone																									
	25																					D					
	26																										
	27	From 27m, claystone/siltstone																									
	28																										
	29																					D					

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	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:
Date:



Douglas Partners
Geotechnics • Environment • Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 4 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
																		B - Bedding S - Shear		J - Joint D - Drill Break		Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		SILTSTONE - Grey siltstone (continued)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 5 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		Possible void/goaf inferred from driling resistance <i>(continued)</i>																								
	41	LAMINITE - Grey laminite (siltstone/sandstone)																								
	42																									
	43																									
	44																									
	45																									
	46																									
	47																									
	48																									
	49																									

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	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:
Date:



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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 6 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint D - Drill Break	Type	Core Rec. %
		LAMINITE - Grey laminite (siltstone/sandstone) (continued)																								
51	51.05	LAMINITE - High strength, fresh, grey laminite (80% siltstone/20% sandstone) with lots CBS laminations																								
		From 51.4m (90% sandstone/10% siltstone), high to very high strength and few CBS laminations																								
52																										
		From 52.73m to 52.76m, heat affected band																								
53																										
		From 53.5m, lots CBS laminations																								
54																										
		From 54.05, few CBS laminations and some higher % siltstone bands																								
55																										
		From 54.86m to 55.91m, CBS laminations 1mm-2mm spacing																								
56																										
57																										
58																										
		From 58.0m, (90%-100% siltstone)																								
59																										
	59.3	COAL - Medium strength, moderately weathered, black coal																								
		From 59.3m to 59.32, very low to low strength, highly weathered																								

RIG: Scout 103

DRILLER: Total (Sheddon)

LOGGED: Bear

CASING: 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	Tube sample (x mm dia.)	PL	Point load strength ls(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	Δ	Water seep
		≡	Water level

CHECKED
Initials:
Date:



Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

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

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 7 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint D - Drill Break	Type
	61	From 59.58m to 59.6m, clay COAL - Medium strength, moderately weathered, black coal (continued)													0.01m to 0.05m 59.48m: J, sv, pl, sm 59.5m: J, 60°, pl, sm 59.68m: J, 75°, pl, sm 59.85m: J, 80°, pl, sm From 59.97m to 60.15m, highly fr-fg 60.2m: J, sv, un, sm x 2 60.5m: J, sv, un, sm (60.3m to 60.7m) 61.06m: J, sv, pl, he, poss fr	C	100	84			
	61.63	SANDSTONE - Very high to high strength, fresh, grey sandstone with CBS laminations													61.21m to 61.31m, fg 61.37m: J, sv, pl, sm 61.5m: J, 60°, un, sm						
	62															62.28m: DB 62.58m: DB 62.8m: DB	C	100		100	
	63																				
	64															63.6m: DB 63.88m: DB 64.11m: DB 64.31m: DB					
	65	At 65.33, pebbly inclusion From 65.61m to 65.69m, pebbly inclusion														64.56m: DB 64.67m: J, 10°, un, sm, pyrite 64.89m: DB	C	100	100		
	66															65.35m: DB 65.48m: DB					
	66.15	Bore discontinued at 66.15m, limit of investigation														65.84m: DB 65.89m: DB 66.01m: DB					
	67																				
	68																				
	69																				

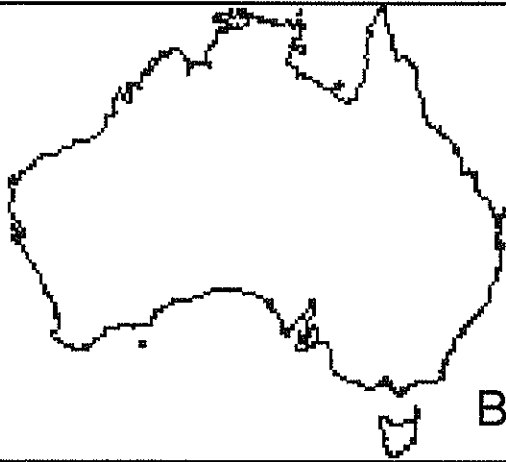
RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m
TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m
WATER OBSERVATIONS:
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

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	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:
Date:



Douglas Partners
Geotechnics • Environment • Groundwater



GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

BH 201 DENSITY 1:200

COMPANY : DOUGLAS PARTNERS
WELL : BH 201 DENSITY 1:200
LOCATION/FIELD : MINMI
COUNTY : AUST
LOCATION : NSW
SECTION : 0

OTHER SERVICES:
DEN, DE

TOWNSHIP : RANGE : 0

DATE : 04/30/08
API NO. DRILLER : 78
LOG BOTTOM : 78.00
LOG TOP : -1.93

PERMANENT DATUM : GL

KB : 0

LOG MEASURED FROM: GL

DF : 0

DRL MEASURED FROM: GL

GL :

CASING DIAMETER : 10.
CASING TYPE : STEEL
CASING THICKNESS : .5
RUN NO. :

LOGGING UNIT : 104
FIELD OFFICE : RUTHERFORD
RECORDED BY : M LEA

BIT SIZE : 9.6
MAGNETIC DECL. : 0
MATRIX DENSITY : 2.8
NEUTRON MATRIX : LIMESTONE
CASING OD : 10.5

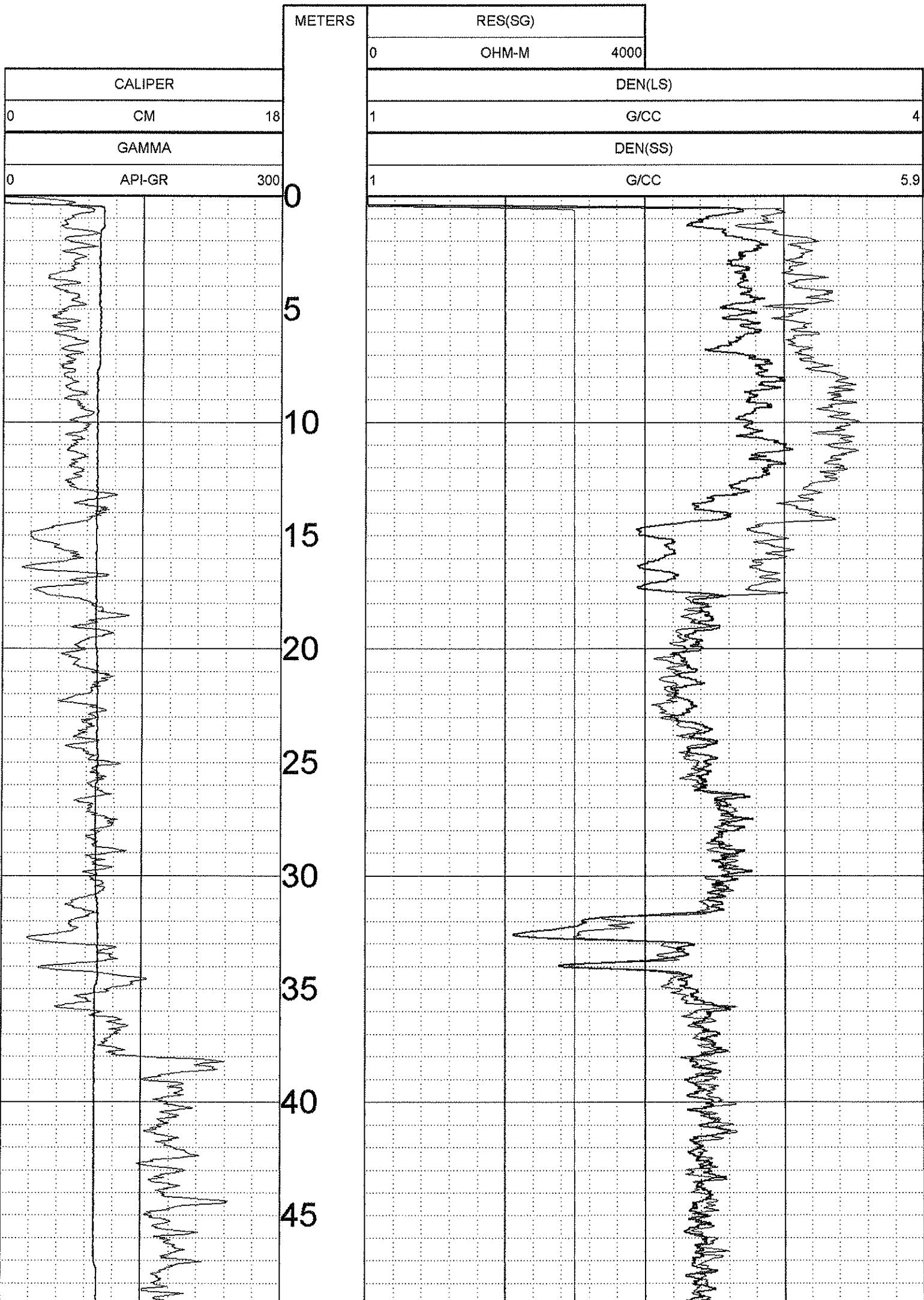
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RM : 0
RM TEMPERATURE : 0
MATRIX DELTA T : 144

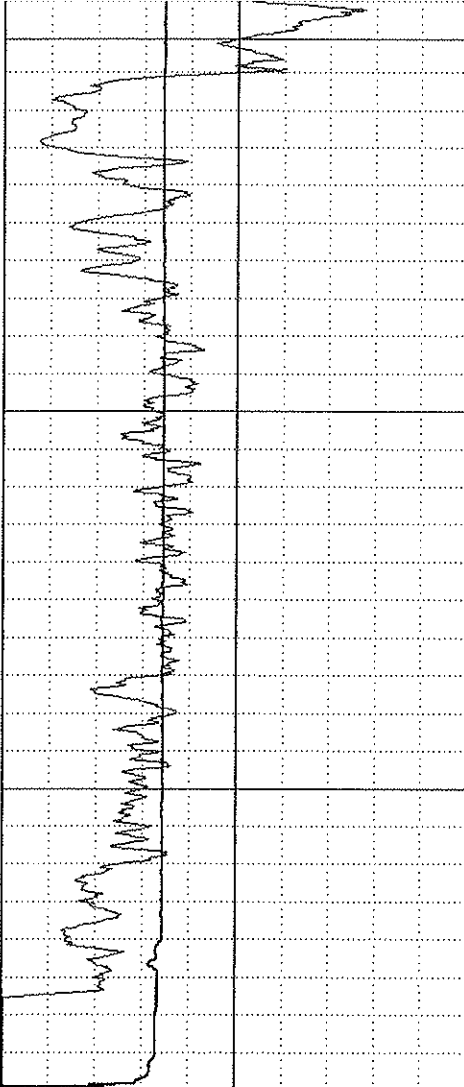
FILE : ORIGINAL
TYPE : 9035AA

THRESH: 3000

JOB NUM 39663 D

WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

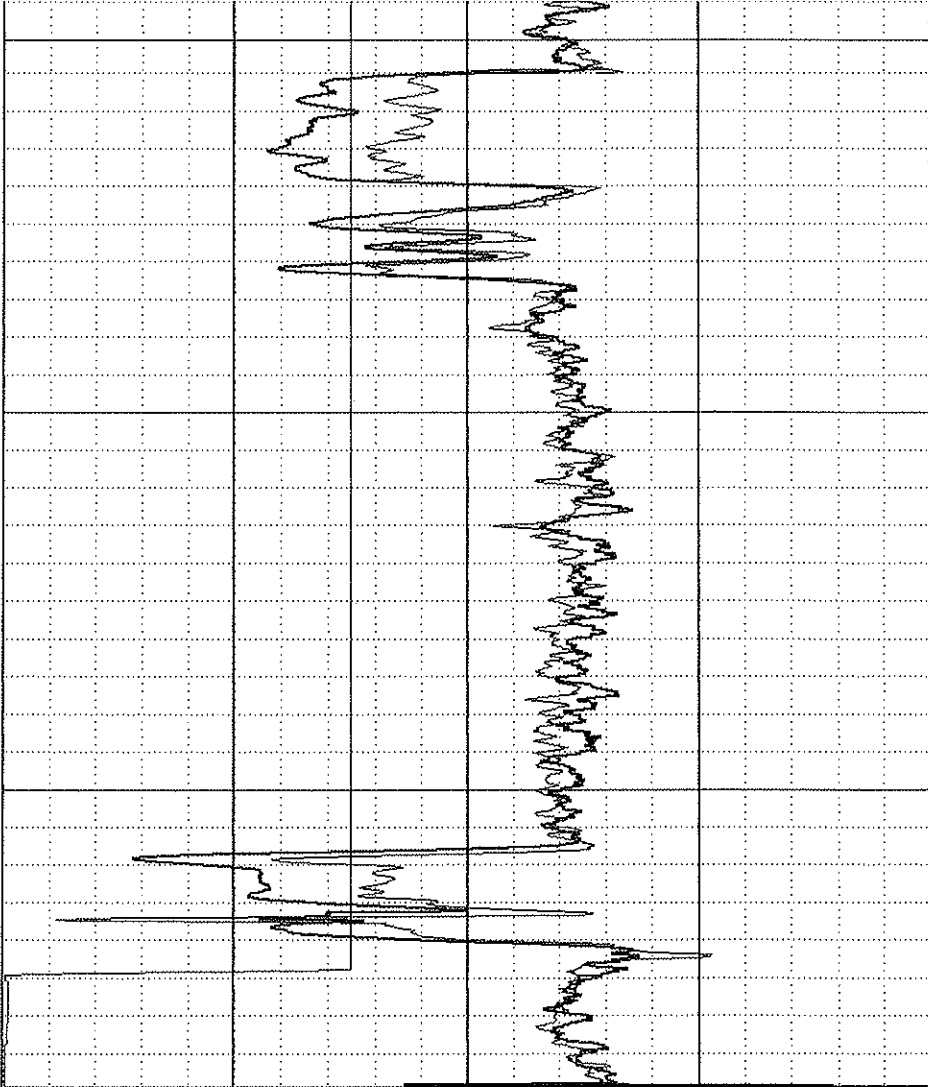




0	API-GR	300
GAMMA		
0	CM	18
CALIPER		

50
55
60
65
70
75

METERS



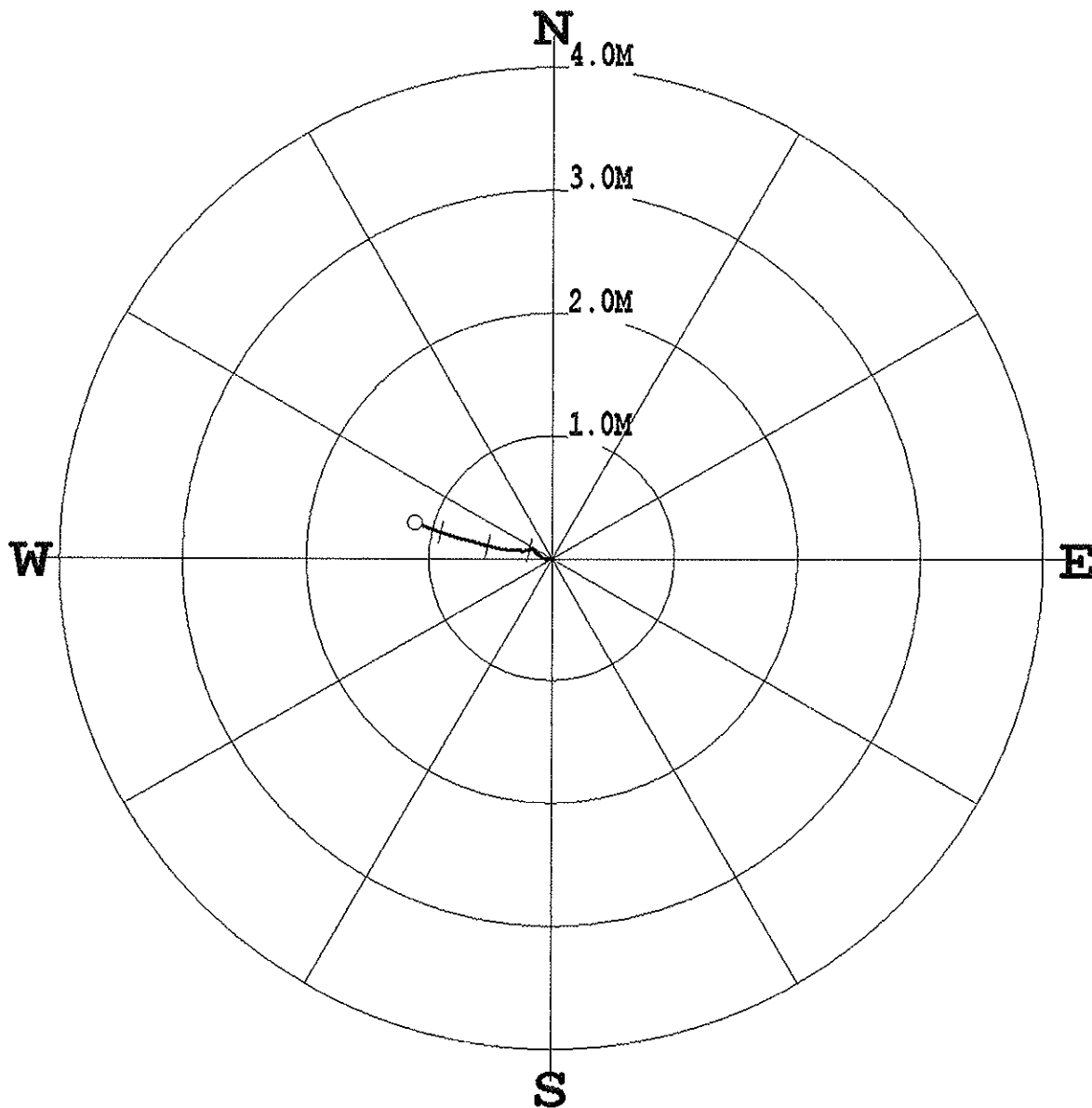
1	G/CC	5.9
DEN(SS)		
1	G/CC	4
DEN(LS)		
0	OHM-M	4000
RES(SG)		

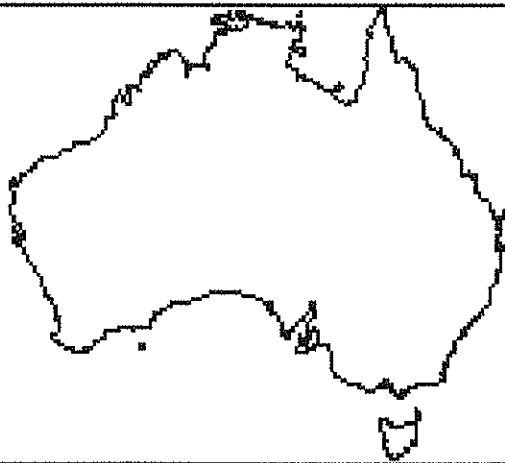
PLAN VIEW COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 201 DEVIATION
DATE OF LOG: 04/30/08
PROBE: 9702A 4359

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 70.63 M
AZIMUTH: 284.8
DISTANCE: 1.1 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

202 DENSITY 1:200

COMPANY : DOUGLAS PARTNERS
WELL : 202 DENSITY 1:200
LOCATION/FIELD : MINMI
COUNTY : AUST
LOCATION : NSW
SECTION : 0

OTHER SERVICES:
DEN, DE

TOWNSHIP : RANGE : 0

DATE : 04/22/08
API NO. DRILLER : 30.95
LOG BOTTOM : 80.57
LOG TOP : -1.83

PERMANENT DATUM : GL
LOG MEASURED FROM: GL
DRL MEASURED FROM: GL

KB : 0
DF : 0
GL :

CASING DIAMETER : 10.
CASING TYPE : STEEL
CASING THICKNESS: .5
RUN NO. :

LOGGING UNIT : 104
FIELD OFFICE : RUTHERFORD
RECORDED BY : M LEA

BIT SIZE : 9.6
MAGNETIC DECL. : 0
MATRIX DENSITY : 2.8
NEUTRON MATRIX : LIMESTONE
CASING OD : 10.5

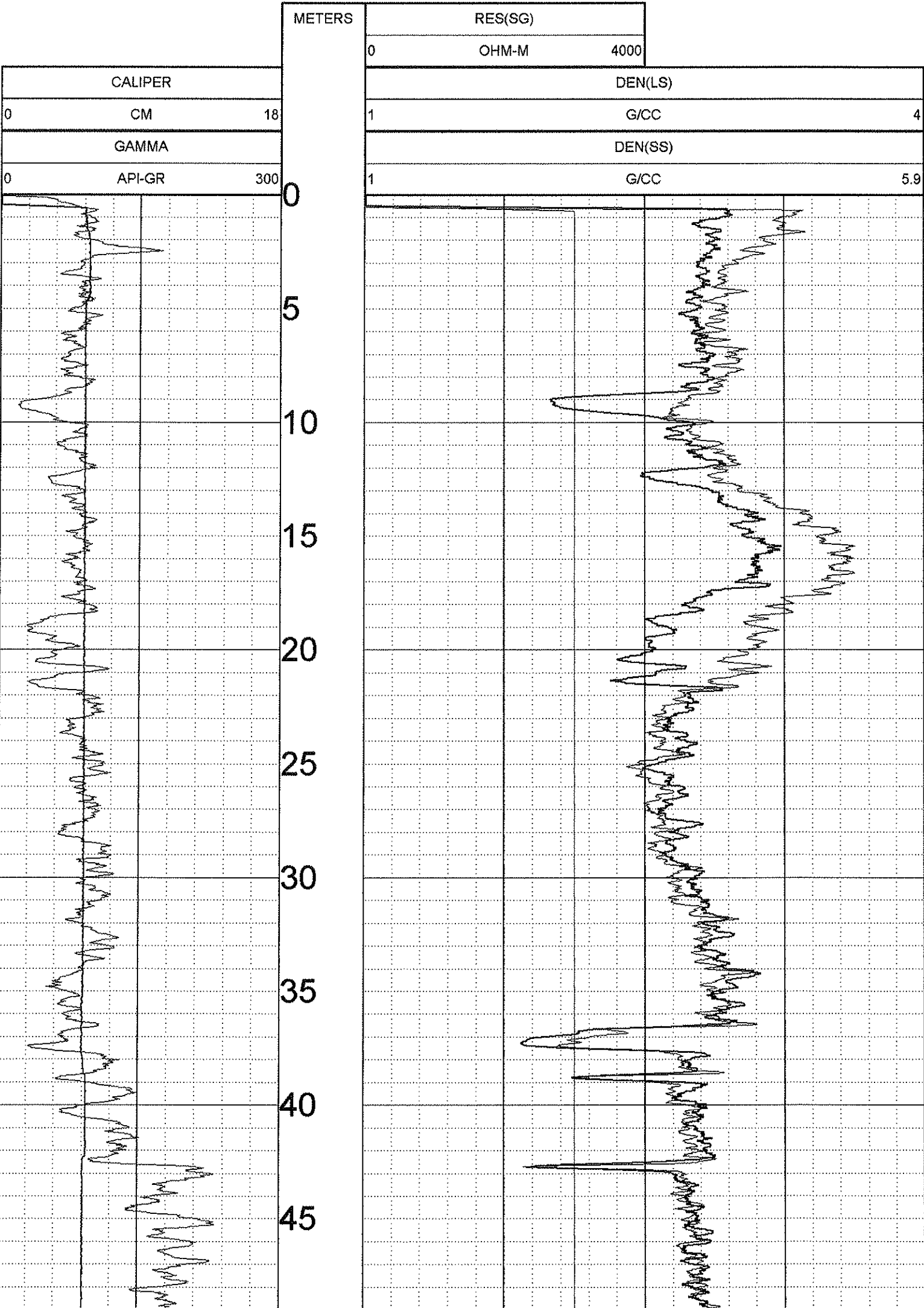
BOREHOLE FLUID : 0
RM : 0
RM TEMPERATURE : 0
MATRIX DELTA T : 144

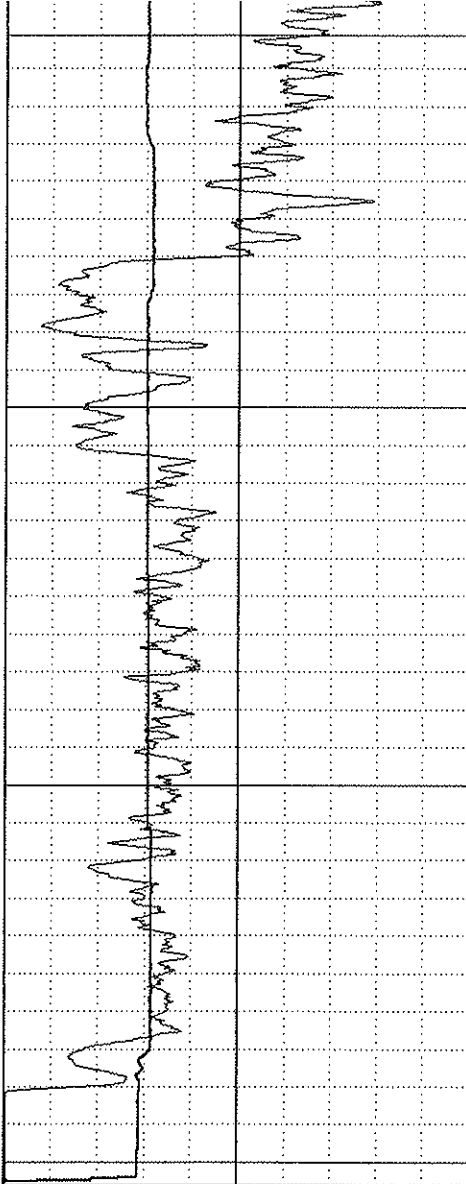
FILE : PROCESSED
TYPE : 9035AA

THRESH: 3000

JOB 39663D
LOGGED IN STEEL

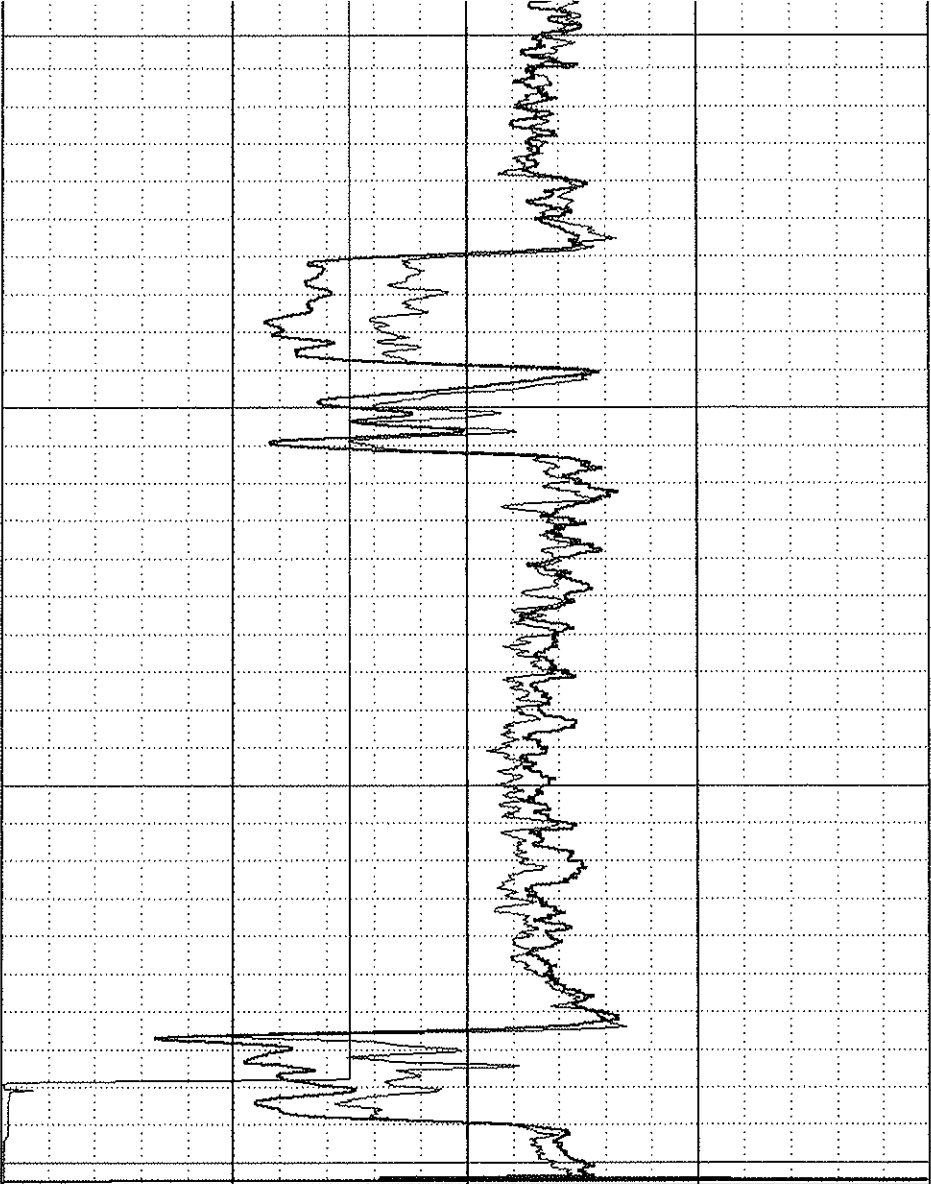
WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS





0	API-GR	300
GAMMA		
0	CM	18
CALIPER		

50
55
60
65
70
75
80
METERS



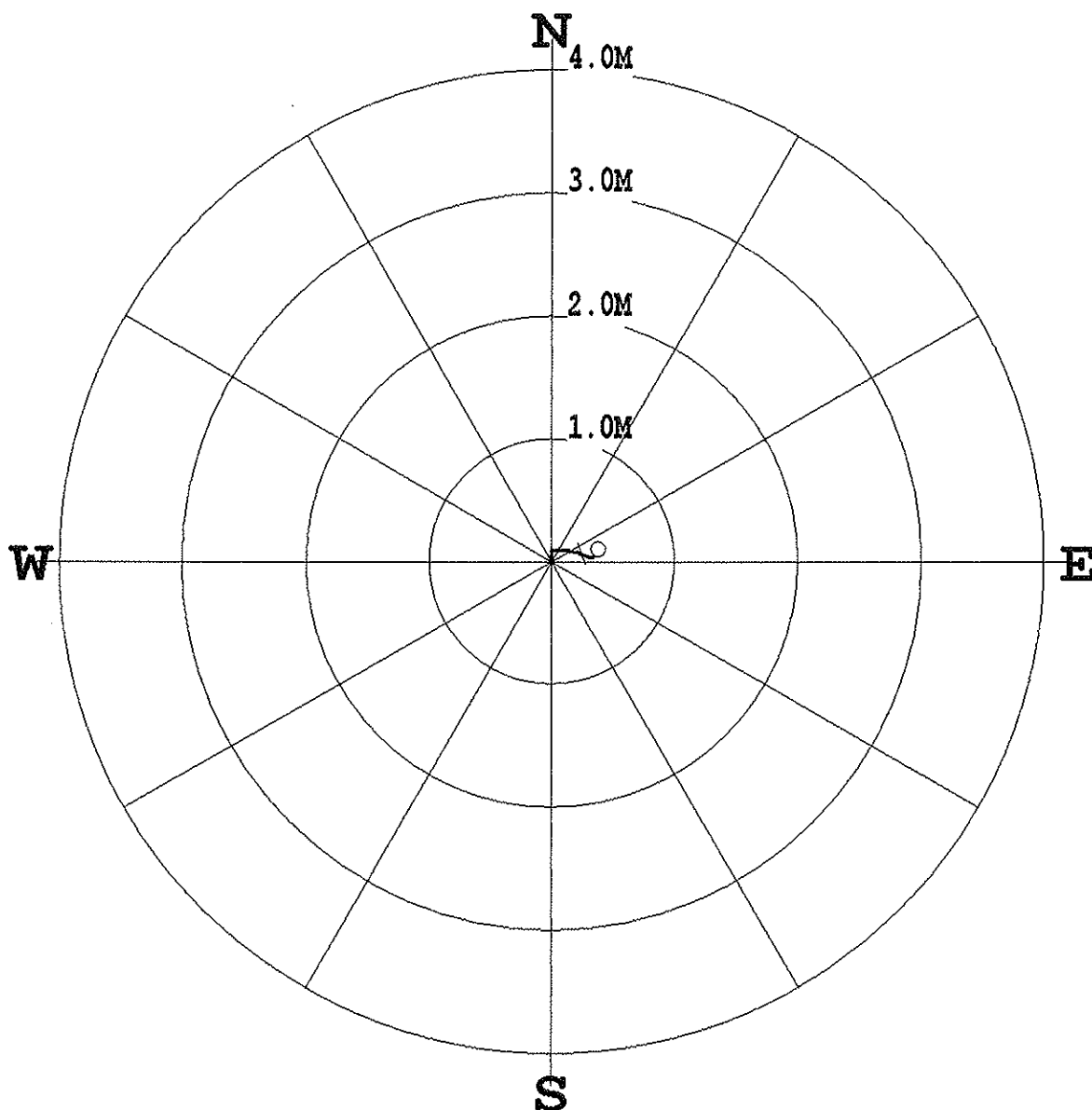
1	G/CC	5.9
DEN(SS)		
1	G/CC	4
DEN(LS)		
0	OHM-M	4000
RES(SG)		

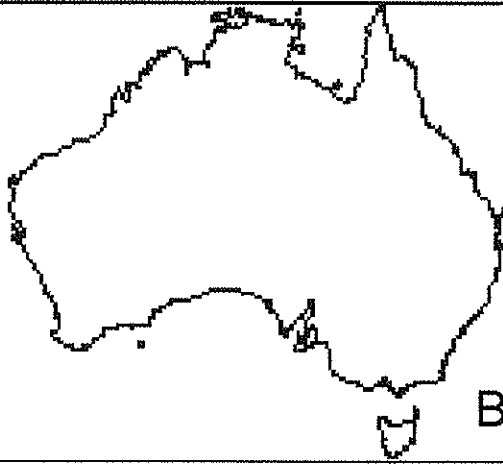
PLAN VIEW COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: 202 DEVIATION
DATE OF LOG: 04/22/08
PROBE: 9702A 4359

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 76.12 M
AZIMUTH: 74.8
DISTANCE: 0.4 M
+ = 50 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

BH 301 DENSITY 1:200

COMPANY : DOUGLAS PARTNERS
WELL : BH 301 DENSITY 1:200
LOCATION/FIELD : MINMI
COUNTY : AUST
LOCATION : NSW
SECTION : 0

OTHER SERVICES:
DEN, DE

TOWNSHIP : RANGE : 0

DATE : 05/20/08
API NO. DRILLER : 33.3
LOG BOTTOM : 62.34
LOG TOP : -1.03

PERMANENT DATUM : GL
LOG MEASURED FROM: GL
DRL MEASURED FROM: GL

KB : 0
DF : 0
GL :

CASING DIAMETER : 10.
CASING TYPE : STEEL
CASING THICKNESS : .5
RUN NO. :

LOGGING UNIT : 194
FIELD OFFICE : RUTHERFORD
RECORDED BY : I DAVIS

BIT SIZE : 9.6
MAGNETIC DECL. : 0
MATRIX DENSITY : 2.8
NEUTRON MATRIX : LIMESTONE
CASING OD : 10.5

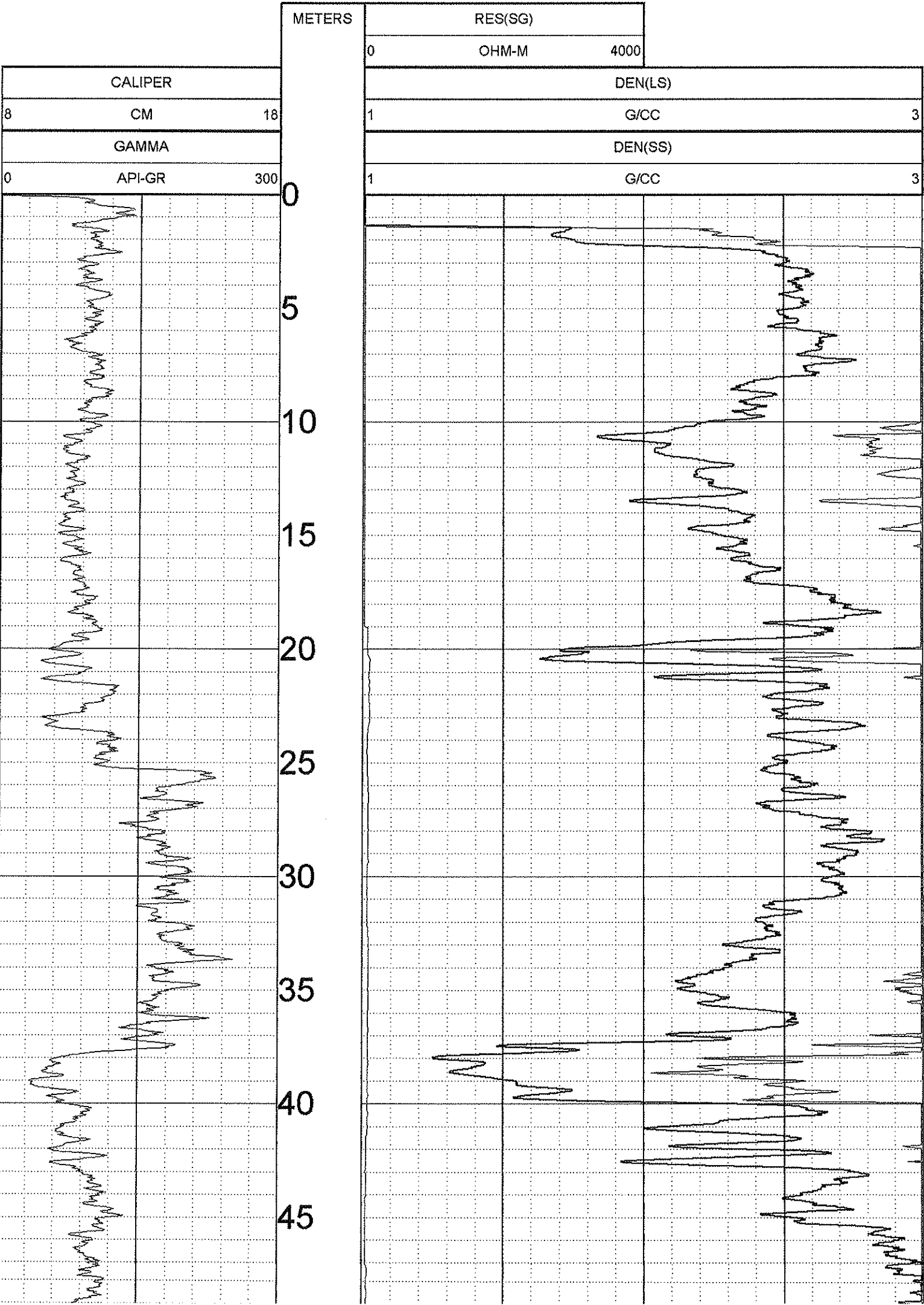
BOREHOLE FLUID : 0
RM : 0
RM TEMPERATURE : 0
MATRIX DELTA T : 144

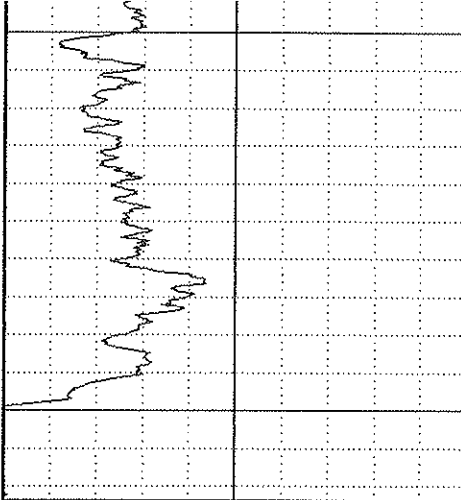
FILE : PROCESSED
TYPE : 9035AA

THRESH: 3000

LOGGED THROUGH STEEL
JOB NO.39663D

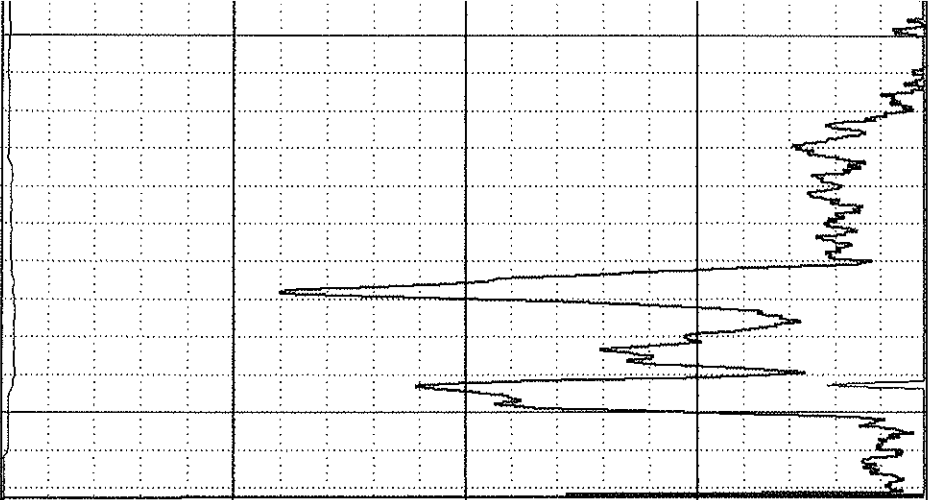
WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS





0	API-GR	300
	GAMMA	
8	CM	18
	CALIPER	

50
55
60
METERS



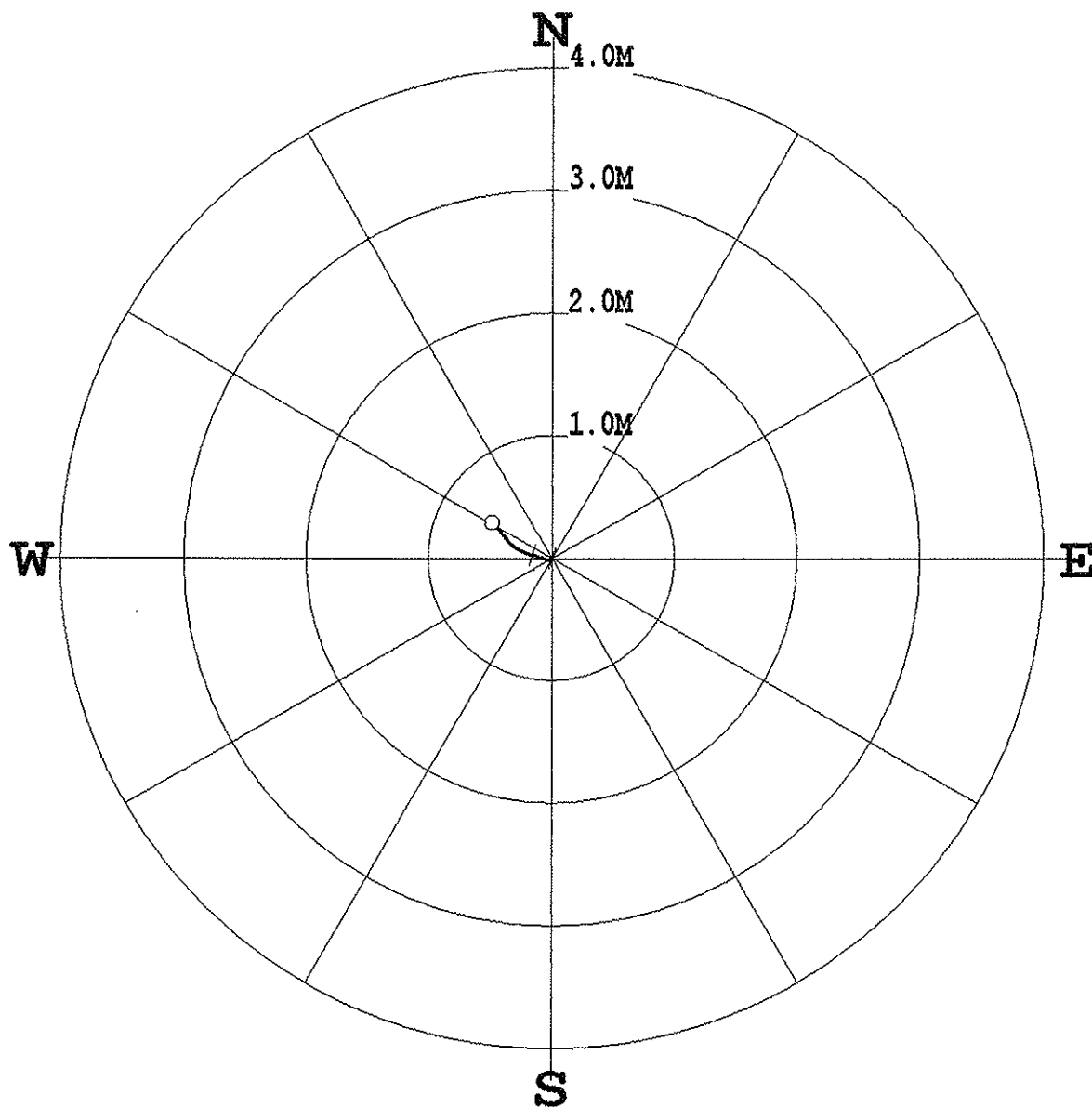
1	G/CC	3
	DEN(SS)	
1	G/CC	3
	DEN(LS)	
0	OHM-M	4000
	RES(SG)	

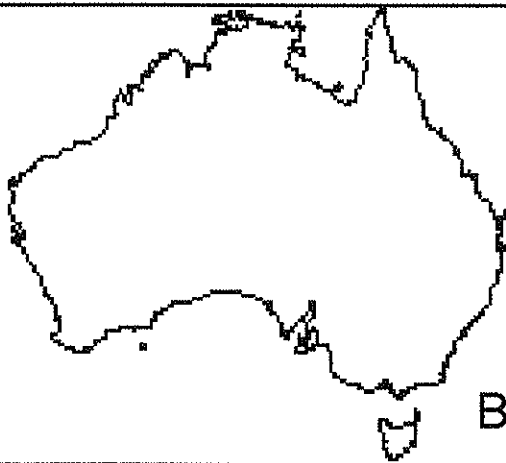
PLAN VIEW COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 301 DEVIATION
DATE OF LOG: 05/20/08
PROBE: 9055A 244

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 36.19 M
AZIMUTH: 300.9
DISTANCE: 0.6 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

BH 303 DENSITY 1:200

COMPANY : DOUGLAS PARTNERS
WELL : BH 303 DENSITY 1:200
LOCATION/FIELD : MINMI
COUNTY : AUST
LOCATION : NSW
SECTION : 0

OTHER SERVICES:
DEN

TOWNSHIP : RANGE : 0

DATE : 05/20/08
API NO. DRILLER : 35.85
LOG BOTTOM : 63.88
LOG TOP : -1.13

PERMANENT DATUM : GL

KB : 0

LOG MEASURED FROM: GL

DF : 0

DRL MEASURED FROM: GL

GL :

CASING DIAMETER : 10.
CASING TYPE : STEEL
CASING THICKNESS : .5
RUN NO. :

LOGGING UNIT : 104
FIELD OFFICE : RUTHERFORD
RECORDED BY : I DAVIS

BIT SIZE : 9.6
MAGNETIC DECL. : 0
MATRIX DENSITY : 2.8
NEUTRON MATRIX : LIMESTONE
CASING OD : 10.5

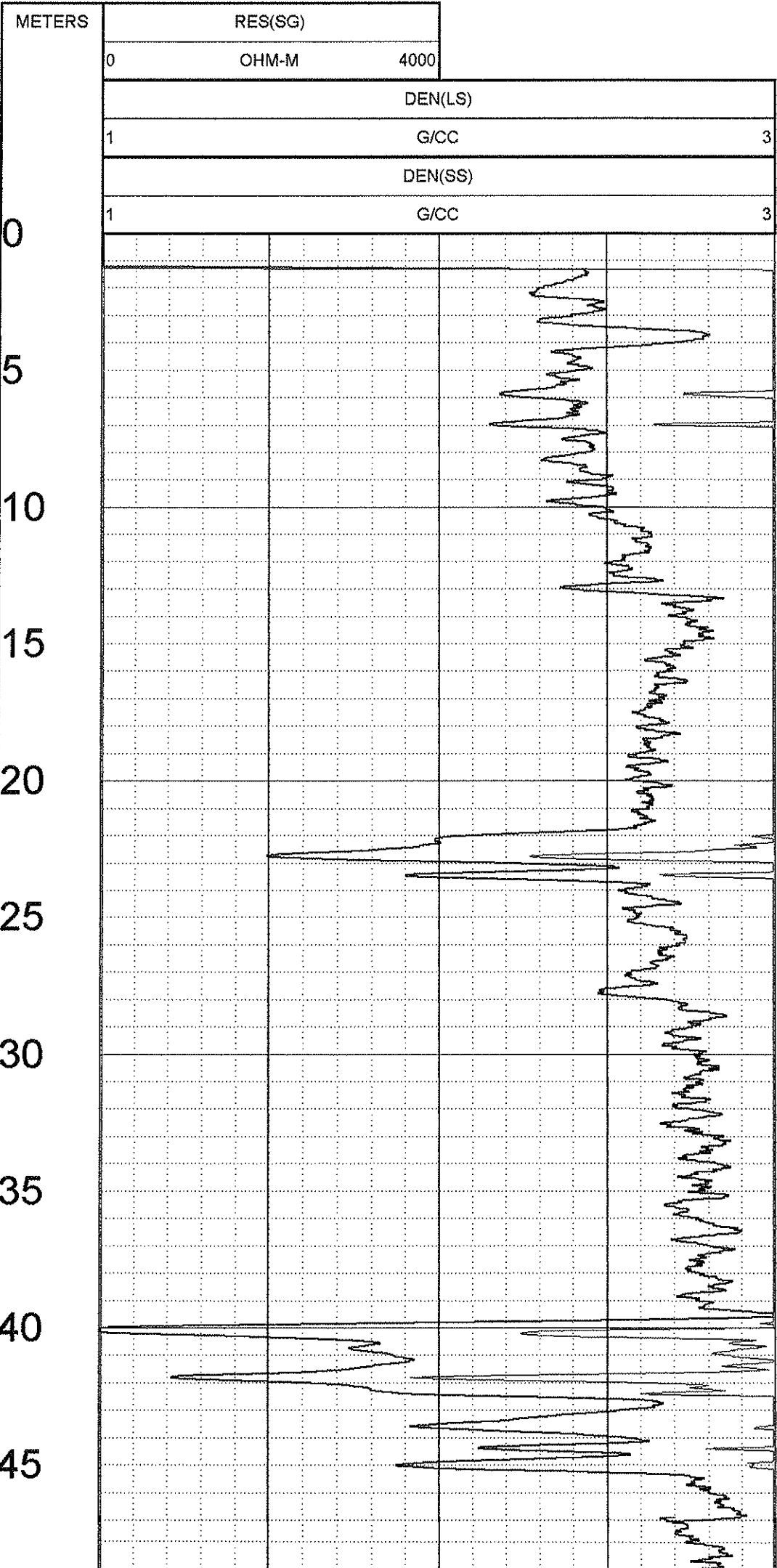
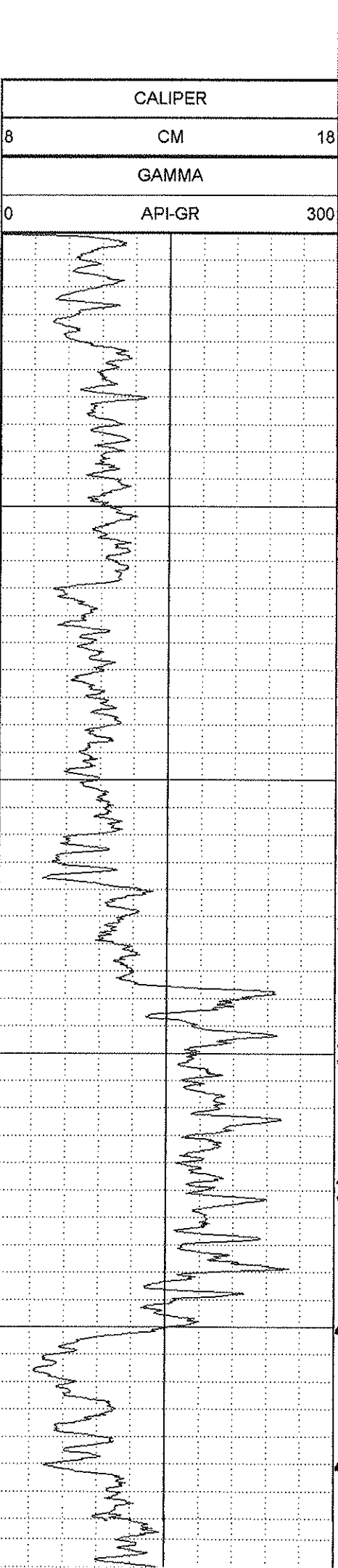
BOREHOLE FLUID : 0
RM : 0
RM TEMPERATURE : 0
MATRIX DELTA T : 144

FILE : PROCESSED
TYPE : 9035AA

THRESH: 3000

LOGGED THROUGH STEEL
JOB NO. 39663D

WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

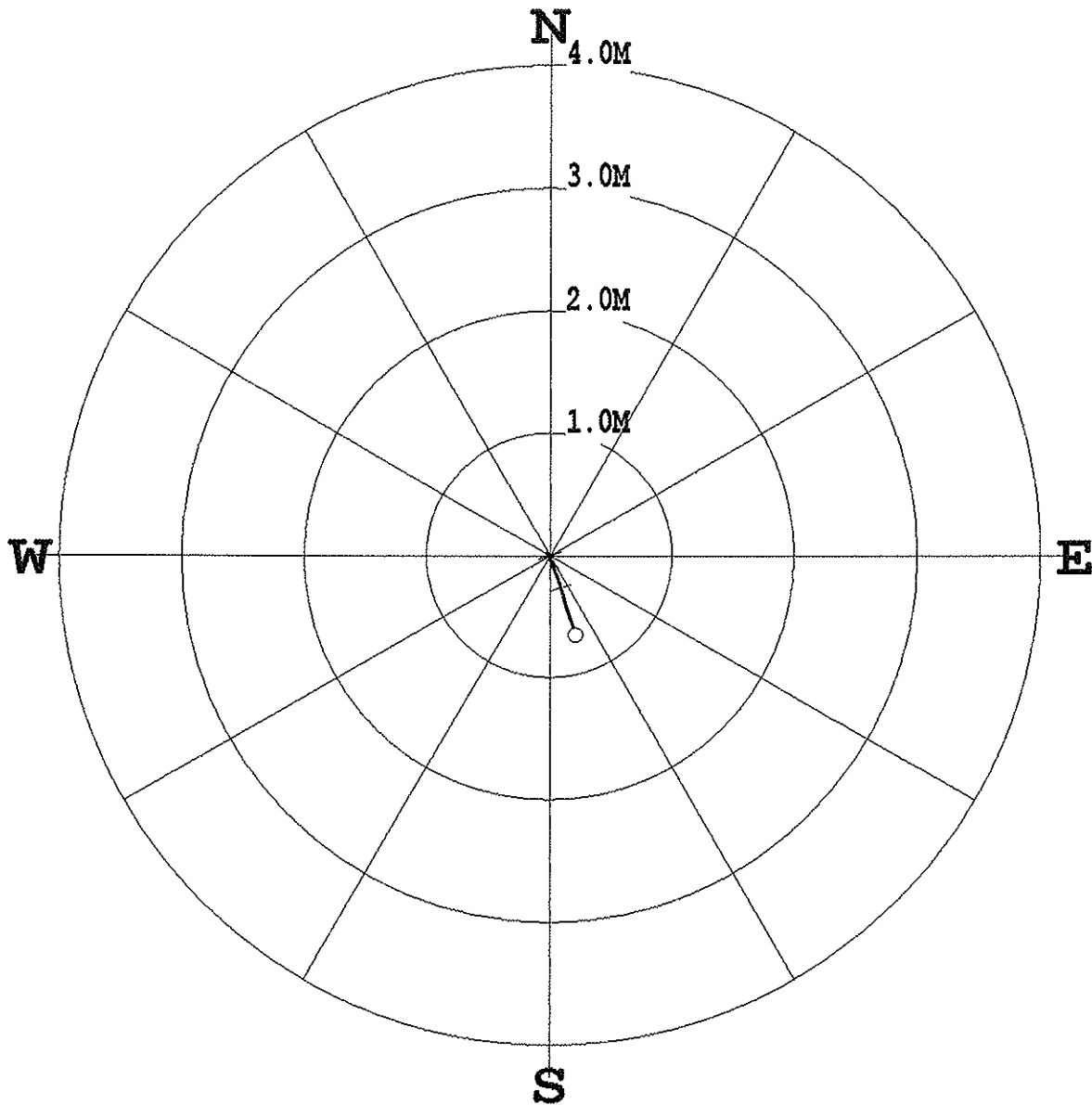


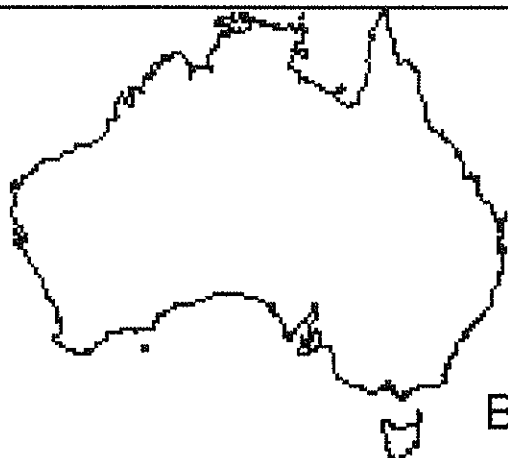
PLAN VIEW COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 303 DEVIATION
DATE OF LOG: 05/20/08
PROBE: 9055A 244

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 39.76 M
AZIMUTH: 162.0
DISTANCE: 0.7 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

BH305 DENSITY 1:200

COMPANY : DOUGLAS PARTNERS
WELL : BH305 DENSITY 1:200
LOCATION/FIELD : MINMI
COUNTY :
LOCATION : NSW
SECTION :

OTHER SERVICES:
DEN,DEV

TOWNSHIP : RANGE :

DATE : 05/27/08
API NO. DRILLER : 66.15
LOG BOTTOM : 64.94
LOG TOP : -1.58

PERMANENT DATUM :

KB :
DF :
GL :

LOG MEASURED FROM:
DRL MEASURED FROM:

CASING DIAMETER : 10.
CASING TYPE : STEEL
CASING THICKNESS: 0
RUN NO. : 1

LOGGING UNIT : 107
FIELD OFFICE : RUTHERFORD
RECORDED BY : I DAVIS

BIT SIZE : 9.6
MAGNETIC DECL. : 0
MATRIX DENSITY : 2.65
NEUTRON MATRIX : SANDSTONE
CASING OD : 11.5

BOREHOLE FLUID : 0
RM : 0
RM TEMPERATURE : 0
MATRIX DELTA T : 177

FILE : PROCESSED
TYPE : 9239B1

THRESH: 2500

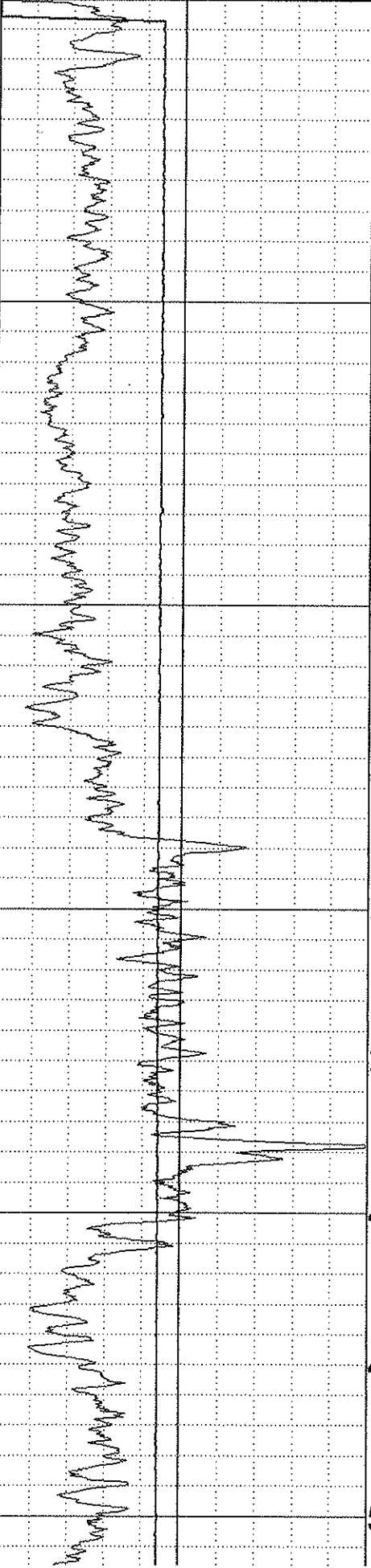
DEN LOGGED THROUGH RODS

WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS

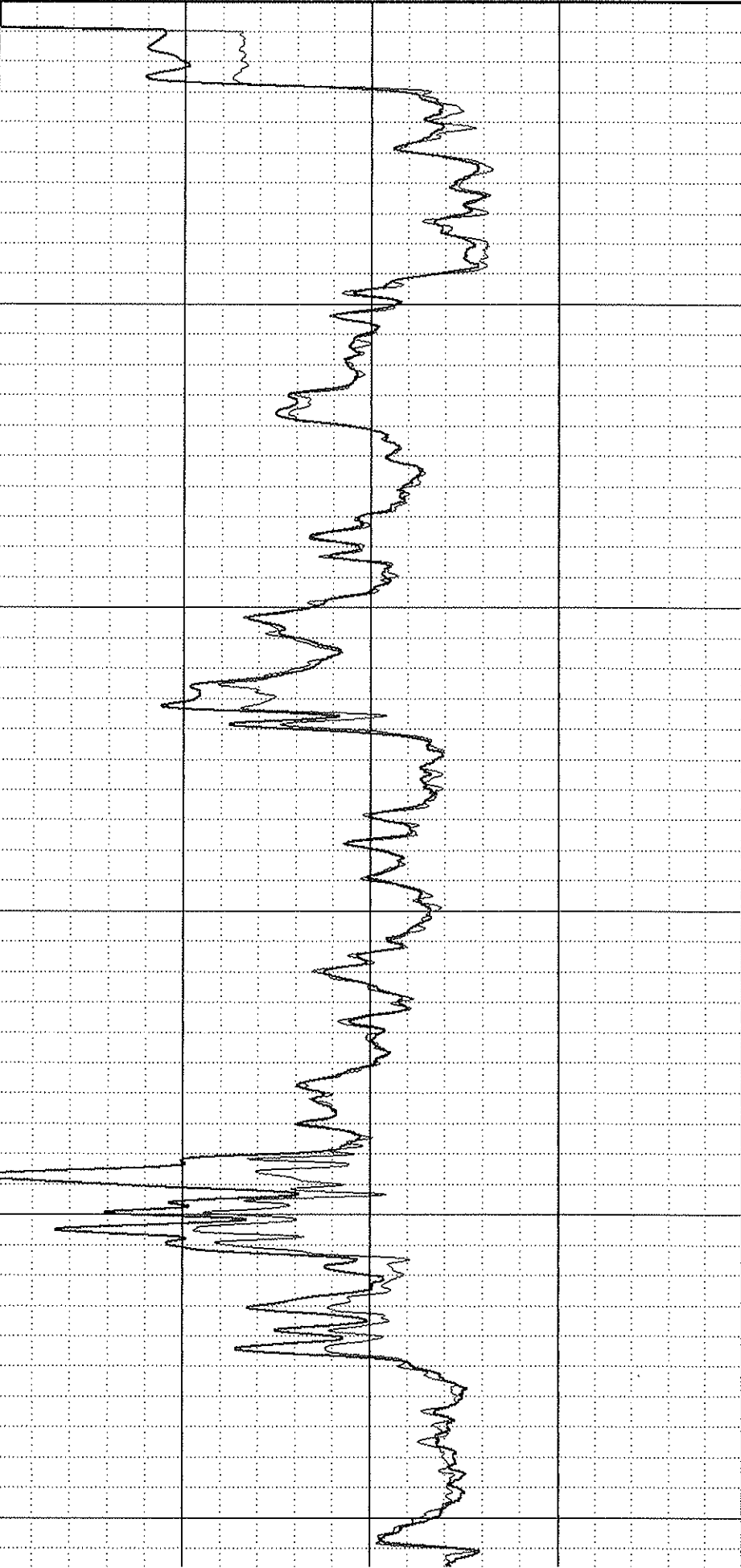
CALIPERL		
0	CM	18
GAMMA		
0	API-GR	300

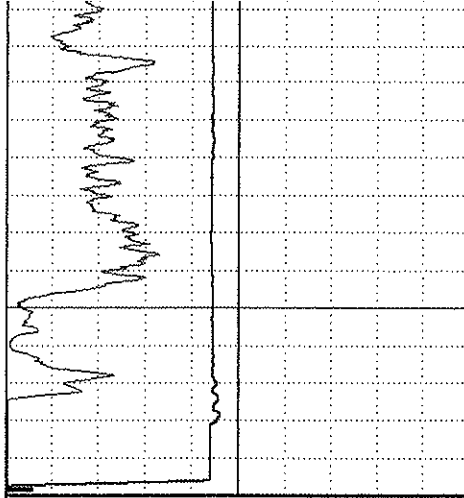
METERS

DEN(LS)		
1	G/CC	4
DEN(SS)		
1	G/CC	4.9



0
5
10
15
20
25
30
35
40
45
50





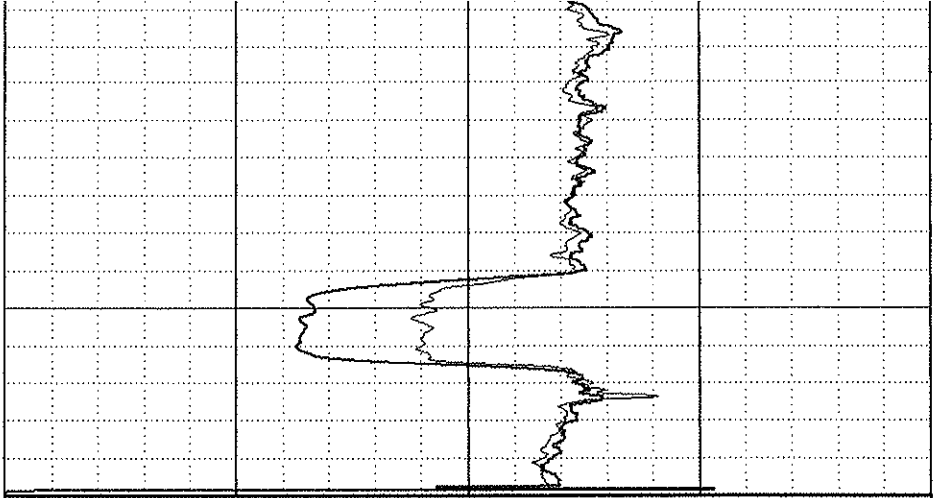
0	API-GR	300
	GAMMA	
0	CM	18
	CALIPERL	

55

60

65

METERS



1	G/CC	4.9
	DEN(SS)	
1	G/CC	4
	DEN(LS)	

METERS

PLAN VIEW COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH305 DEVIATION
DATE OF LOG: 05/27/08
PROBE: 9057A 4455

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 36.97 M
AZIMUTH: 153.1
DISTANCE: 0.5 M
+ = 20 M INCR
○ = BOTTOM OF HOLE

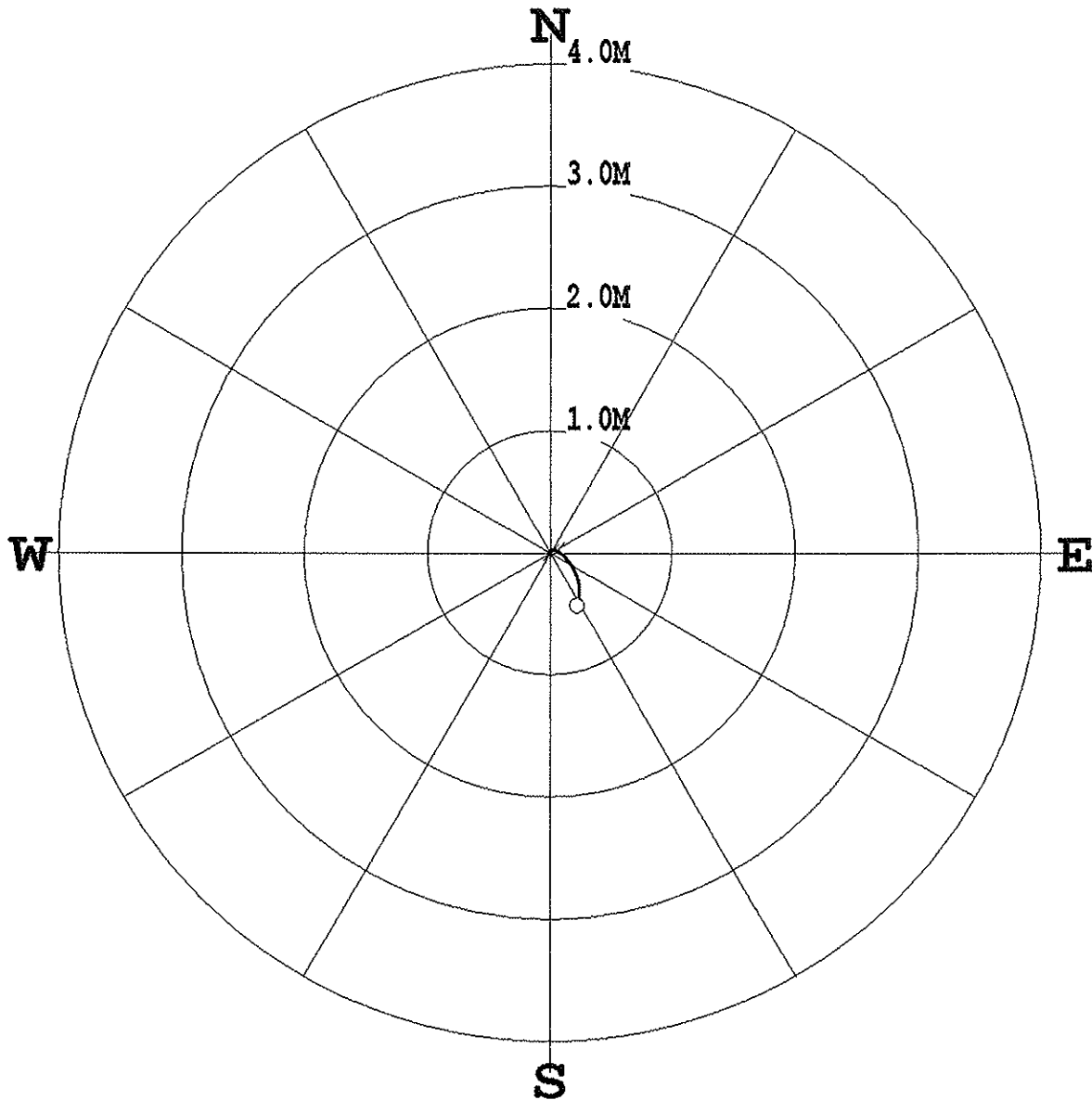




PHOTO 1: 5.25 m to 12.63 m



PHOTO 2: 12.63 m to 20.36 m



PHOTO 3: 12.36 m to 27.50 m



PHOTO 4: 27.50 m to 33.50 m



PHOTO 1: 2.70 m to 6.65 m



PHOTO 2: 6.65 m to 10.65 m

Core Photos for Borehole 2

PROJECT
39663D

Douglas Partners
Geotechnics - Environment - Groundwater



PHOTO 3: 10.65 m to 14.45 m



PHOTO 4: 14.45 m to 18.20 m



PHOTO 5: 18.20 m to 22.05m



PHOTO 6: 22.05 m to 25.90 m



PHOTO 7: 25.90 m to 26.95 m



PHOTO 1: 2.70 m to 5.30 m



PHOTO 2: 5.30 m to 9.0 m

Core Photos for Borehole 3

PROJECT
39663D

Douglas Partners
 Geotechnics - Environment - Groundwater



PHOTO 3: 9.0 m to 12.90 m



PHOTO 4: 12.90 m to 16.70 m



PHOTO 5: 16.70 m to 22.05 m



PHOTO 1: 2.85 m to 6.16 m



PHOTO 2: 6.16 m to 10.0 m



PHOTO 3: 10.0 m to 14.0 m



PHOTO 4: 14.0 m to 17.8 m



PHOTO 5: 17.8 m to 21.4 m



PHOTO 6: 21.4 m to 24.6 m



PHOTO 1: 7.05 m to 10.90m



PHOTO 2: 10.90 m to 14.80 m

Core Photos for Borehole 5

PROJECT
39663D





PHOTO 3: 14.80 m to 18.70 m



PHOTO 4: 18.70 m to 22.60 m



PHOTO 5: 22.60 m to 26.05 m



PHOTO 1: 6.20 m to 10.08 m



PHOTO 2: 10.08 m to 13.90 m



PHOTO 3: 13.90 m to 17.72 m



PHOTO 4: 17.72 m to 21.37 m

Core Photos for Borehole 6

PROJECT
39663D

Douglas Partners
Geotechnics - Environment - Groundwater



PHOTO 5: 21.37 m to 24.00 m



PHOTO 1: 2.65 m to 10.45 m



PHOTO 2: 10.45 m to 17.9 m