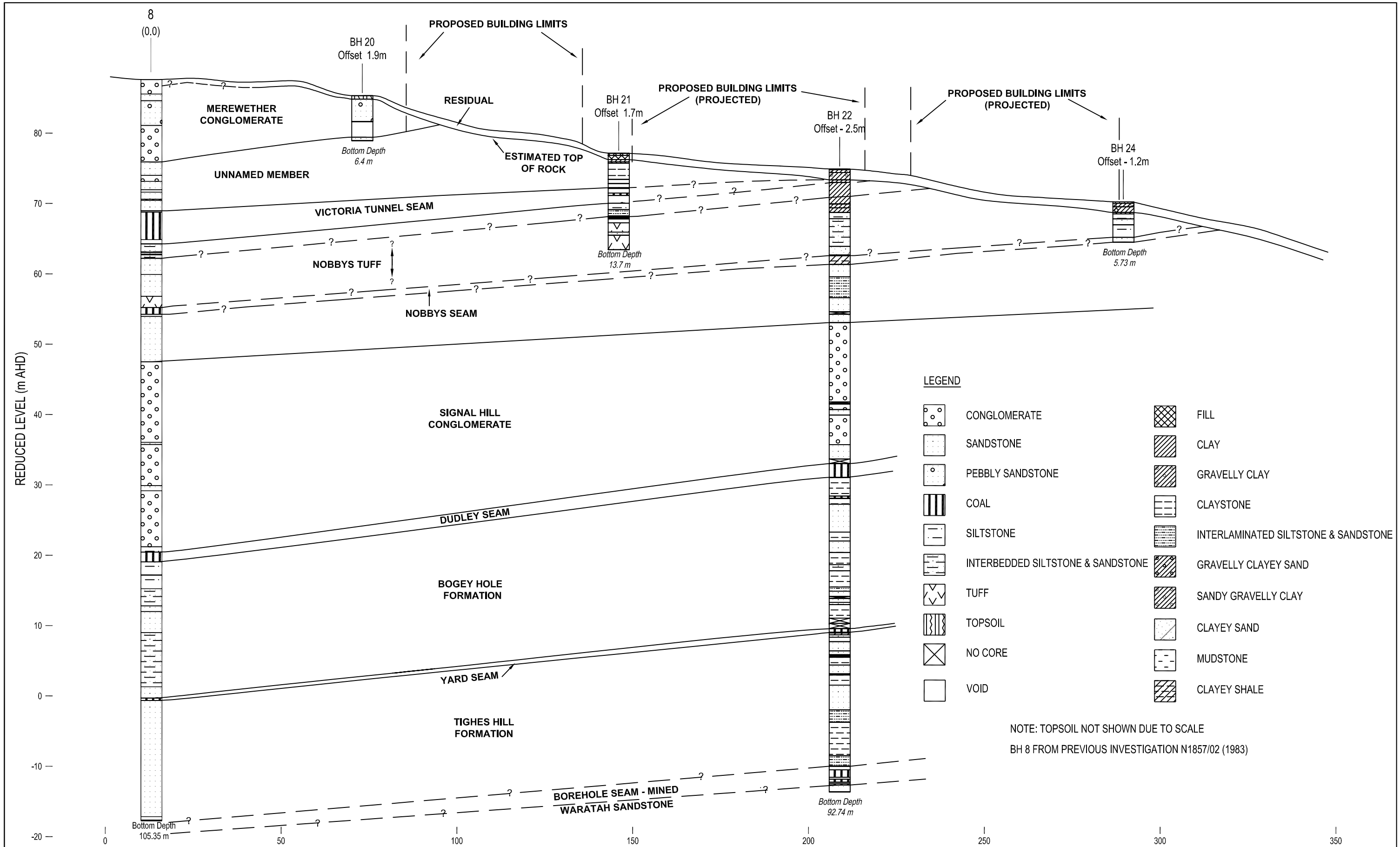

revision	description	drawn	approved	date

0 10 20 40 60
Horizontal Scale (metres)
0 5 10 20 30
Vertical Scale (metres)

drawn	ALR
approved	DLK
date	13-05-2009
scale	H - 1:1000 V - 1:500
original size	A3

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SPECIALISTS MANAGING THE EARTH

client: APP CORPORATION PTY LTD
project: PROPOSED HMRI BUILDING
JOHN HUNTER HOSPITAL, NEW LAMBTON
title: SECTION A-A
project no: GEOTWARA20576AB
drawing no: 2

drawn	NLS	coffey geotechnics SPECIALISTS MANAGING THE EARTH	client: APP CORPORATION PTY LTD	
approved	DLK		project: GEOTECHNICAL INVESTIGATION JOHN HUNTER HOSPITAL NEW LAMBTON	
date	22-05-09		title: BOREHOLE	
scale	NTS		project no: GEOTWARA20576AB	drawing no: 3
original size	A4			

Appendix A

Test Borehole Logs

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Soil Description Explanation Sheet (1 of 2)

DEFINITION:

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

CLASSIFICATION SYMBOL & SOIL NAME

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

PARTICLE SIZE DESCRIPTIVE TERMS

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

MOISTURE CONDITION

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

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

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

CONSISTENCY OF COHESIVE SOILS

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

DENSITY OF GRANULAR SOILS

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

MINOR COMPONENTS

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

SOIL STRUCTURE

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

GEOLOGICAL ORIGIN

WEATHERED IN PLACE SOILS

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

Residual soil — Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil — Deposited by wind.

Alluvial soil — Deposited by streams and rivers.

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

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

Lacustrine soil — Deposited by lakes.

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

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Soil Description Explanation Sheet (2 of 2)

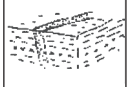
SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

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

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

COMMON DEFECTS IN SOIL

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

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

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Rock Description Explanation Sheet (1 of 2)

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

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

Rock Substance	In engineering terms roch substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or water. Other material is described using soil descriptive terms. Effectively homogenous material, may be isotropic or anisotropic.
Defect	Discontinuity or break in the continuity of a substance or substances.
Mass	Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME	Simple rock names are used rather than precise geological classification.
PARTICLE SIZE	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
FABRIC	Terms for layering of penetrative fabric (eg. bedding, cleavage etc.) are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on properties.
Distinct	Layering or fabric is easily visible. Rock breaks more easily parallel to layering of fabric.

CLASSIFICATION OF WEATHERING PRODUCTS

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

Notes on Weathering:

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

ROCK SUBSTANCE STRENGTH TERMS

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

Notes on Rock Substance Strength:

1. In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.
2. The term "extremely low" is not used as a rock substance strength term. While the term is used in AS1726-1993, the field guide therein makes it clear that materials in that strength range are soils in engineering terms.
3. The unconfined compressive strength for isotropic rocks (and anisotropic rocks which fall across the planar anisotropy) is typically 10 to 25 times the point load index (Is50). The ratio may vary for different rock types. Lower strength rocks often have lower ratios than higher strength rocks.

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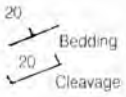
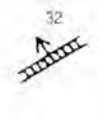
Rock Description Explanation Sheet (2 of 2)

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

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

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

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

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

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

Notes on Defects:

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

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Engineering Log - Borehole

Borehole No.	**BH 22**
Sheet	1 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model and mounting:	Hydra Power Truck	Easting:	377796.98	slope:	-90°	R.L. Surface:	74.89
hole diameter:	61.3 mm	Northing	6356832.37	bearing:		datum:	

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetrometer kPa 100 200 300 400	structure and additional observations
ADV		C						CL	**Gravelly Clayey SAND:** fine to coarse grained, brown, mottled yellow and red, low plasticity clay, fine to coarse grained, subrounded to sub angular gravel.	W <Wp	L S		Track Material
									Gravelly CLAY: low plasticity, pale brown.				
				SPT 2,4,7 N*=11	74	1		CL	**Sandy Gravelly CLAY:** low plasticity, pale grey, fine to coarse grained sand and gravel.		F		EXTREMELY WEATHERED SANDSTONE / CONGLOMERATE
				SPT 4,5,7 N*=12	73	2		CL	**CLAY:** low plasticity, dark brown, moderately carbonaceous.		St		
								CL	**CLAY:** low plasticity, white to grey, some carbonaceous bands, minor carbonaceous laminations and trace of sand.		VSt		HIGHLY WEATHERED MUDSTONE
					72	3							
				SPT 2,4,24 N*=28									
					71	4							
				SPT 3,17,25 N*=42	70	5							SPT refusal 25 blows / 70mm
								CL	**CLAY:** low plasticity, dark brown to brown, trace of sand, highly carbonaceous.				WEATHERED COAL?
								CL	**CLAY:** low plasticity, white to pale grey, trace of fine sand.				HIGHLY WEATHERED SILTSTONE
					69	6							
RR				SPT 2,25 N*=R					**SILTSTONE:** white to pale grey, trace of fine sand.	D			SPT refusal 25 blows / 20mm
					68	7			**Interbedded SILTSTONE and SANDSTONE:** pale grey to pale yellow.				
					67	8							

method

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

support

M mud N nil
C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

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

notes, samples, tests

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

classification symbols and soil description

based on unified classification system

moisture

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

consistency/density index

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

coffey geotechnics

Engineering Log - Borehole

Borehole No.	**BH 22**
Sheet	2 of 13
Project No:	**GEOTWARA20576AB**
Date started:	**6.4.2009**
Date completed:	**17.4.2009**
Logged by:	**GDT**
Checked by:	DLK

Client: ***APP CORPORATION***

Principal:

Project: ***PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL***

Borehole Location: ***SEE DRAWING***

drill model and mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm | Northing 6356832.37 | bearing: | datum:

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	pocket penetro-meter kPa 100 200 300 400	structure and additional observations
RR		C		SPT 36 N=R	66	9			**Interbedded SILTSTONE and SANDSTONE:** pale grey to pale yellow. *(continued)*	D	VSt		SPT refusal 25 blows / 20mm
				SPT 25 N=R	65	10							SPT refusal 25 blows / 90mm
					64	11			**Clayey SAND:** fine to coarse grained, white spotted black and dark grey, with low plasticity fines.		VD		WEATHERED SANDSTONE
				SPT 25 N=R	63	12							SPT refusal 25 blows / 90mm
									Carbonaceous MUDSTONE: dark brown to black.				
					62	13			**Clay SHALE:** dark grey, slightly silty, highly carbonaceous with minor coaly bands, 50mm thick.				
				SPT 25 N=R									
					61	14			**SANDSTONE:** fine to medium grained, dark grey spotted black and white with some clay seams.				SPT refusal 25 blows / 80mm MODERATELY WEATHERED
				SPT 25 N=R	60	15							SPT refusal 25 blows / 10mm, no sample
					59	16			Borehole BH 22 continued as cored hole				

method

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

*bit shown by suffix e.g. ADT

support: M mud, C casing, N nil

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

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

notes, samples, tests

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

classification symbols and soil description: based on unified classification system

moisture

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

consistency/density index

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

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **BH 22**
Sheet 3 of 13
Project No: **GEOTWARA20576AB**

Client: **APP CORPORATION**
Date started: **6.4.2009**
Principal:
Date completed: **17.4.2009**
Project: **PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by: **GDT**
Borehole Location: **SEE DRAWING**
Checked by: DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89
hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

drilling information					material substance						rock mass defects		
method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			66	9								
			65	10								
			64	11								
			63	12								
			62	13								
			61	14								
			60	15								
						Continued from non-cored borehole						
HQ			59	16		**Interlaminated SILTSTONE and SANDSTONE:** dark grey to grey, fine to medium grained sandstone, SRQD = 90%, RD = 3°.	FR		D 0.5 A 2.5	100 97		

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

core-lift
casing used
barrel withdrawn

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

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

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

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

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

roughness
VR very rough
RO rough
SO smooth
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

coating
CN clean
SN stained
VN veneer
CO coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **BH 22**
Sheet 4 of 13
Project No: **GEOTWARA20576AB**

Client: ***APP CORPORATION***
Date started: ***6.4.2009***
Principal:
Date completed: ***17.4.2009***
Project: ***PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL***
Logged by: ***GDT***
Borehole Location: ***SEE DRAWING***
Checked by: DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89
hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	Is(50) MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			58	17		**Interlaminated SILTSTONE and SANDSTONE:** dark grey to grey, fine to medium grained sandstone, SRQD = 90%, RD = 3°. *(continued)*	FR		D 0 A 1.1	97		
						Highly fractured zone yellow stained, some loss of core (20mm).	MW / SW			100		Highly jointed material ~20°, numerous joints over 100mm.
			57	18						99		JT, 8°, stepped, RO, SN, iron. JT, 0°, PL, RO, SN, iron.
						SANDSTONE: fine to coarse grained, pale brown, with some subrounded fine gravel, SRQD = 100%, RD = 3°.						PT, 11°, PL, SO, CN
			56	19					D A 1.8 2.1			
			55	20						98		
						CONGLOMERATE: fine to coarse grained, pale brown, mottled black and dark grey, subrounded clasts, matrix supported, SRQD = 100%, RD = 3°.			D A 0.9 1.8			PT, 5°, IR, RO, CN
			54	21		**SANDSTONE:** fine to coarse grained, pale brown to pale grey, some laminations and pebbly bands, SRQD = 100%, RD = 3°.						SM, 24°, PL, SO, sand and rock fragments, 35mm
			53	22		**CONGLOMERATE:** fine to coarse grained, pale brown mottled grey and white, subrounded clasts, matrix supported, trace sandstone bands, SRQD = 99%, RD= 2°.				100		
			52	23								
						Sandstone band (23.5 - 23.6)			D A 0.3 0.3			JT, 21°, PL, RO, SN, iron.
			51	24								

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

core-lift
casing used
barrel withdrawn

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

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

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

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

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

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

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

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

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	5 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			50	25		**CONGLOMERATE:** fine to coarse grained, pale brown mottled grey and white, subrounded clasts, matrix supported, trace sandstone bands, SRQD = 99%, RD= 2°. *(continued)*	SW					
						Sandstone band (24.88 - 24.94)						PT, 10°, CU, SO, SN, iron.
			49	26						100		
			48	27					D 1.3 A 1.4			SM, 15°, IR, SO, SN, iron stained, sand infill 2mm.
												SM, 0°, IR, RO, weak carbonate matrix, 20mm.
			47	28		Small cobble clasts.			D 0.3 A 0.3			hole through core, 20mm x 5mm probable solution feature
												SM, 0°, IR, RO, sand, 25mm
			46	29						100		
						Sandstone band (29.54 - 29.62)			D 1.5 A 1.9			JT, 30°, PL, RO, CN
			45	30								
						Becoming pale grey mottled grey, dark grey and white.	FR					SM, 5°, PL, RO, sand and gravel, 15mm.
			44	31					D 0.7 A 0.8	98		SM, 0°, IR, RO, gravel, 40mm.
			43	32								

method

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

core-lift

- casing used
- barrel withdrawn

graphic log/core recovery

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

water

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

weathering

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

strength

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

defect type

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

roughness

VR	very rough
RO	rough
SO	smooth
SL	slickensided

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **BH 22**
Sheet 6 of 13
Project No: **GEOTWARA20576AB**

Client: ***APP CORPORATION***
Date started: ***6.4.2009***
Principal:
Date completed: ***17.4.2009***
Project: ***PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL***
Logged by: ***GDT***
Borehole Location: ***SEE DRAWING***
Checked by: DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89
hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa: D- diametral, A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			42	33		**CONGLOMERATE:** fine to coarse grained, pale brown mottled grey and white, subrounded clasts, matrix supported, trace sandstone bands, SRQD = 99%, RD= 2°. *(continued)* Sandstone band (32.45 - 32.5)	FR			98		
						NO CORE: loss 190mm.			D 1.6 A 1.8			Gravel band, 100mm thick
						CONGLOMERATE: fine to coarse grained, sub angular, recovered as gravel.	FR / SW-FR					
			41	34		**CONGLOMERATE:** fine to coarse grained, grey with some yellow staining, sub rounded to sub angular, clasts supported, SRQD = 100%, RD = 50°.						JT, 60°, IR, RO, SN iron stained.
						SANDSTONE: fine to medium grained, pale brown to pale grey, slightly sideritic, trace of pebble band, RD = 5°, ARQD = 100%. Sidrite band.			D 0.6 A 1.8	96		
			40	35		**CONGLOMERATE:** fine to coarse grained, grey spotted dark grey, white and red, subrounded clasts, matrix supported, SRQD = 99%, RD = 5°.						SM, 10°, IR, RO, gravel, 25mm
			39	36					D 0.3 A 0.3			
			38	37						99		
			37	38		Sandstone band (38.10 - 38.23) Very little matrix between medium grained conglomerate some diametral loss of grains during drilling due to weak matrix.			D 0 A 0.1			
			36	39								
			35	40		**SANDSTONE:** fine to medium grained, grey with some silt shale laminations and sideritic bands, SRQD = 99%, RD = 3°. Siderite (39.36 - 39.59)				100		JT, 12°, PL, SO, CN JT, 12°, PL, SO, CN PT, 18°, PL, SO, CO, coal

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

core-lift
casing used; barrel withdrawn

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

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

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

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

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

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

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

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

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **BH 22**
Sheet 7 of 13
Project No: **GEOTWARA20576AB**

Client: ***APP CORPORATION***
Date started: ***6.4.2009***
Principal:
Date completed: ***17.4.2009***
Project: ***PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL***
Logged by: ***GDT***
Borehole Location: ***SEE DRAWING***
Checked by: DLV

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89
hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
HQ			34	41		**SANDSTONE:** fine to medium grained, grey with some silt shale laminations and sideritic bands, SRQD = 99%, RD = 3°. *(continued)*	SW-FR		D 0.7 A 2.1	100		PT, 12°, PL, SO, CO, coal
						SILTSTONE: dark grey with some sandy laminations and trace of carbonaceous laminations, SRQD = 100%, RD = 6°.			D 0.4 A 2.3			PT, 10°, CU, SO, CO, coal JT, 41°, PL, SO, CN
			33	42		**COAL:** dull, black, with some bright bands, slightly to extremely cleated, RD 5°, SRQD = 37%.						PT, 4°, PL, SO, CN
						DUDLEY SEAM (41.86 - 43.84)			D 0.2 A 0.1			JT, 85°, IR, SO, CN
			32	43		Mudstone band, 20mm (43.20)				98		JT, 76°, IR, SO, CN JT, 60°, PL, RO, CN
						Mudstone band, 100mm (43.50) Mudstone band, 80mm (43.62)	DW FR			100 53		Extremely cleated coal, 140mm
			31	44		**Silt SHALE:** dark grey, slight laminated, SRQD = 100%, RD = 3°.						
			30	45					D 0.1 A 0.6	100		
			29	46								
						COAL: bright, black, highly cleated, trace tuff bands, SRQD = 0%, RD = 3°. Tuff band, pale brown, 20mm, (46.54) Tuff band, pale brown, 5mm, (46.65)			D 0 A 0.8	87		JT, 78°, IR, SO, CN JT, 51°, PL, SL, CN Highly cleated coal, 330mm. PT, 0°, PL, RO, CN
			28	47		**Silty SHALE:** dark grey, some minor laminations, RD = 3°, SRQD = 96%.						SZ, 5°, PL, SL, flakes, 15mm
												JT, 70°, PL, SO, CN
			27	48								SZ, 0°, IR, RO, rock chips, 30mm

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

core-lift
casing used
barrel withdrawn

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

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

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

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

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

roughness
VR very rough
RO rough
SO smooth
SL slickensided

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

coating
CN clean
SN stained
VN veneer
CO coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	8 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
HQ			26	49		**SANDSTONE:** fine to medium grained, grey with silty shale laminations and trace sideritic bands, SRQD = 99%, RD = 5°. *(continued)* Siderite band, 60mm	FR		D 1.1 A 6.2	99		
						Siderite band, 60mm (49.26 - 49.32).						SZ, 5°, IR, RO, rock flakes, 10mm
			25	50								
			24	51					D 0.1 A 1.6			
			23	52		**Silty SHALE:** dark grey, with some fine sand, becoming laminated with depth, SRQD = 98%, RD = 0° - 3°. Siderite band (51.79 - 52.05)						JT, 42°, PL, SO, CN JT, 42°, PL, SO, CN JT, 42°, PL, SO, CN SZ, 0°, PL, RO, rock flakes, 20mm
			22	53		**SANDSTONE:** fine to coarse grained, pale grey with black carbonaceous wisps, SRQD = 100%, RD = 3°.			D 1.4 A 3.8	97		JT, 56°, PL, RO, CN
						Siderite band, 60mm (53.31).						
			21	54		Siderite band, 30mm (53.69).						
			20	55		**Silty SHALE:** pale grey to dark grey, trace of fine sand, SRQD = 90%, RD = 5°.			D 0.3 A 1.8	95		SZ, 5°, IR, RO, rock fragments, 20mm
									D 0.2 A 2.6			JT, 55°, CU, SO, CN JT, 51°, PL, SO, CN
			19	56								JT, 60°, PL, SO, CN

method

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

core-lift

- casing used
- barrel withdrawn

graphic log/core recovery

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

water

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

weathering

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

strength

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

defect type

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

roughness

VR	very rough
RO	rough
SO	smooth
SL	slickensided

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	9 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			18	57		**Interbedded SANDSTONE and SILTSTONE:** fine to medium grained, pale grey with grey, shale laminations, SRQD = 100%, RD = 3°.	FR			95		SZ, 0°, IR, RI, rock fragments, 30mm JT, 70°, IR, SO, CN JT, 62°, IR, SO, CN
			17	58		**Silty SHALE:** dark grey with trace of fine to medium grained sand, SRQD = 100%, RD = 5°.			D 0.5 A 1.3			
			16	59		Siderite band, 30mm (58.96). Sandstone band, fine to medium grained, pale grey, 50mm (59.0)				100		
			15	60		**Interlaminated SILTSTONE and SANDSTONE:** fine sandstone, pale grey to grey, SRQD = 100%, RD = 5°.			D 0.9 A 2.5			
						SANDSTONE: fine to coarse grained, pale grey with some carbonaceous wisps, SRQD = 100%, RD = 5°.						
			14	61		**Silty SHALE:** dark grey , trace of sandstone laminations, SRQD = 100%, RD = 5°.						JT, 68°, PL, SO, CN
						SANDSTONE: fine to medium grained, grey with carbobaceous wisps, SRQD = 100%, RD = 5°.			D 0.7 A 3.2	100		
			13	62		**SANDSTONE:** fine to medium grained, grey with silty shale laminations, SRQD = 100%, RD = 5°.						
						Silty SHALE: dark grey, trace of fine sand and carbonaceous laminations, SRQD = 100%, RD = 3°.						
			12	63					D 0.2 A 0.8	100		
			11	64								

method

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

core-lift

- casing used
- barrel withdrawn

graphic log/core recovery

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

water

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

weathering

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

strength

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

defect type

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

roughness

VR	very rough
RO	rough
SO	smooth
SL	slickensided

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

coating

CN	clean
SN	stained
VN	veneer
CO	coating

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	10 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
HQ			10	65		**Carbonaceous Silty SHALE:** trace of pyrite streaks, SRQD = 100%, RD = 3°. *(continued)*	FR			100		SM, 0°, PL, RO, clay, 5mm
						Carbonaceous SHALE: dark grey, SRQD = 99%, RD = 3°.						
						Tuff band, 50mm (64.96)						
			9	66		**COAL:** bright, minor, dull, moderate to high cleated, rare tuff bands, SRQD = 0%, RD = 5°. **YARD SEAM (65.31 - 65.94)** Tuff band, 10mm.				60		PT, 5°, PL, SO, CN JT, 45°, PL, SO, CN JT, 85°, PL, SO, CN Extremely cleated coal, <0mm
						NO CORE: core loss, 110m			D 0 A 0.7			
						Clay SHALE: dark grey to black, highly carbonaceous, SRQD = 100%, RD = 5°.						
						SANDSTONE: fine to medium grained, slightly sideritic, SRQD = 100%, RD = 5°.						
			8	67		**Silty SHALE:** siderite with rare coaly bands near top, SRQD = 89%, RD = 5°.						
						SANDSTONE: fine to medium grained, grey with some siltstone laminations, SRQD = 100%, RD = 5°.				95		JT, 72°, IR, SO, CN
			7	68					D 0.1 A 1.5			
						SANDSTONE: fine to coarse grained, pale grey with black wisps, SRQD = 87%, RD = 5°.						SZ, 10°, IR, RO, large sandstone fragments, 80mm
			6	69					D 3.1 A 6.7			JT, 45°, IR, RO, CN
						SIDERITE: pale grey, brown mottled grey, SRQD = 74%, RD = 10°.						PT, 10°, IR, RO, CN
						Silty SHALE: dark grey with some laminations, trace of fine sand, SRQD = 97%, RD = 5°.						
			5	70								SM, 3°, PL, SO, coal, 30mm
										97		PT, 5°, PL, SO, CN
												JT, 62°, PL, SL, VN, calcite
			4	71		**Interlaminated Silty SHALE and SANDSTONE:** fine to medium grained, grey to dark grey, SRQD = 100%, RD = 5°.			D 0 A 1.4			
												PT, 3°, CU, SO,CO, coal, <1mm
			3	72		**SANDSTONE:** fine to medium grained, pale grey, SRQD = 100%, RD = 3°.			D 2.7 A 3.6			

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

core-lift
casing used; barrel withdrawn

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

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

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

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

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

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

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

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

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	11 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			2	73		**Interlaminated SANDSTONE and Silty SHALE:** fine to medium grained sandstone, pale grey to grey, rare siderite bands, SRQD = 100%, RD = 3°. *(continued)*	FR		D 0.4 A 1.5	97		JT, 62°, PL, SO, CN
			1	74		**SANDSTONE:** fine to medium grained, grey, silt shale laminations, SRQD = 100%, RD = 3°.			D 2.9 A 3.1	100		
			0	75						100		
			-1	76					D 0.5 A 2	100		
			-2	77		**Interlaminated SILTSTONE and SANDSTONE:** grey to dark grey, fine grained sand, SRQD = 100%, RD = 5°.				100		
			-3	78		Siderite band, 100mm (77.95)			D 0.1 A 1.3			JT, 45°, PL, RO, CN
			-4	79		**Silty SHALE:** dark grey, trace of fine sand, SRQD = 99%, RD = 0-10°.				100		JT, 41°, IR, RO, CN.
			-5	80								JT, 45°, PL, SO, CN
												JT, 62°, PL, SO, CN

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

core-lift
casing used; barrel withdrawn

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

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

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

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

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

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

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

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

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No.	**BH 22**
Sheet	12 of 13
Project No:	**GEOTWARA20576AB**
Client:	**APP CORPORATION**
Date started:	**6.4.2009**
Principal:	
Date completed:	**17.4.2009**
Project:	**PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by:	**GDT**
Borehole Location:	**SEE DRAWING**
Checked by:	DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89

hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

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

method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
HQ			-6	81		**Silty SHALE:** dark grey, trace of fine sand, SRQD = 99%, RD = 0-10°. *(continued)*	FR		D 0.3 A 0.7	100		JT, 60°, IR, CI
						Sideritic band, 100mm (81.2)				98		SM, PL, RO, flakey shale, 10mm
			-7	82								JT, 72°, PL, RO, CN
			-8	83					D 0.6 A 2.5	100		JT, 68°, PL, SO, CN
						Interlaminated SILTSTONE and SANDSTONE: trace of carbonaceous wisps, SRQD = 100%, RD = 5°.						JT, 88°, CU, SO, CN (82.68 - 83.90)
			-9	84								JT, 55°, CU, SO, CN
			-10	85		**COAL:** bright, black, extremely cleated, SRQD = 0%, RD = 3°. **BOREHOLE SEAM (84.85 - 87.56)**	FR		D 0.5 A 0.2	71		JT, 60°, PL, SO, SN, iron stained
						CORE LOSS:						JT, 60°, PL, SO, SN, iron stained
						COAL: bright, minor, dull, trace of claystone bands, extremely cleated to crushed, SRQD = 0%, RD = 3°. Claystone band, 10mm, (85.73)				0		SZ, 0°, IR, RO, rock fragments
			-11	86		Claystone band, red, brown, 15mm, (86.11)				0		JT, 62°, PL, SO, SN, iron stained
						CORE LOSS:	FR					
			-12	87		**COAL:** bright, minor dull, extremely cleated to crushed, SRQD = 0%, RD = 3°. Claystone band, 50mm, (86.93)				100		
						NO CORE: propable claystone based on geophysics.						
			-13	88		**COAL:** bright, minor dull, extremely cleated to crushed, SRQD = 0%, RD = 3°.						
						SANDSTONE: fine to coarse grained, pale grey, SRQD = 100%, RD = 0°.			D A			

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

core-lift
casing used; barrel withdrawn

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

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

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

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

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

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

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

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

CORED BOREHOLE ALL LOGS.GPJ COFFEY.GDT 26.5.09

Form GEO 5.5 Issue 3 Rev. 3

coffey geotechnics

Engineering Log - Cored Borehole

Borehole No. **BH 22**
Sheet 13 of 13
Project No: **GEOTWARA20576AB**

Client: **APP CORPORATION**
Date started: **6.4.2009**
Principal:
Date completed: **17.4.2009**
Project: **PROPOSED HMRI BUILDINGS, JOHN HUNTER HOSPITAL**
Logged by: **GDT**
Borehole Location: **SEE DRAWING**
Checked by: DLK

drill model & mounting: Hydra Power Truck | Easting: 377796.98 | slope: -90° | R.L. Surface: 74.89
hole diameter: 61.3 mm Drilling fluid: | Northing: 6356832.37 | bearing: | datum:

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
HQ			-14	89		**SANDSTONE:** fine to coarse grained, pale grey, SRQD = 100%, RD = 0°. *(continued)*	FR	M	2 1.9	100		
			-15	90					D A 2.2 1.6			
			-16	91						100		
			-17	92								
			-18	93		BH 22 terminated at 92.74m						
			-19	94								
			-20	95								
			-21	96								

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

core-lift
casing used
barrel withdrawn

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

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

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

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

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

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

POINT LOAD STRENGTH INDEX

Australian Standard AS4133.4.1-1993 Method 4.1:Rock Strength Tests - Determination of Point Load Strength Index

coffey geotechnics SPECIALISTS MANAGING THE EARTH

Job No. 20576AB
Sheet 1 of 1

CLIENT: APP

PROJECT: Proposed HMRI Buildings

LOCATION: John Hunter Hospital

Test Machine: Orange / Digital
Testing Locality: Newcastle Laboratory
Tested By: Gavin Tippett
Test Date: 5-May-09
Checked:

Date of Calibration:
Calibrated By:
Sampled Date:
Storage Location:

Borehole No. / Test Depth (m)		Rock Description	Moisture Condition[1] (N, D or S)	Diametral test							Axial or Irregular lump								Comments / Strength Classification
				Length L [2] (mm)	Diameter D (mm)	Load P (Gauge) (kN)	$I_s=(P/D^2)$ x 1000 (MPa)	Size Correction $F=(D/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D [2] (mm)	D_e^2	Load (Gauge) (kN)	$I_s=(P/D_e^2)$ x 1000 (MPa)	Size Correction $F=(D_e/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Axial)	
BH25	1.85	Sandstone	n	150.0	51.0	0.46	0.18	1.01	0.2	Low	51.0	38.0	2468	1.28	0.52	1.00	0.5	Medium	
BH25	6.5	Sandstone	n	36.0	51.0	0.70	0.27	1.01	0.3	Low	51.0	36.0	2338	0.34	0.15	0.99	0.1	Low	
BH24	2.4	Tuff	n	85.0	51.0	5.63	2.16	1.01	2.2	High	51.0	36.0	2338	6.60	2.82	0.99	2.8	High	
BH24	4.34	Tuff	n	91.0	51.0	9.89	3.80	1.01	3.8	V. High	51.0	34.0	2208	3.40	1.54	0.97	1.5	High	
BH24	5.35	Sandstone	n	232.0	51.0	0.38	0.15	1.01	0.1	Low	51.0	37.0	2403	0.42	0.17	0.99	0.2	Low	
BH23	8.21	Sandstone	n	28.0	51.0	10.23	3.93	1.01	4.0	V. High	51.0	28.0	1818	6.58	3.62	0.93	3.4	V. High	
BH23	10.95	Siltstone	n	47.0	51.0	0.75	0.29	1.01	0.3	Low	51.0	32.0	2078	0.47	0.23	0.96	0.2	Low	
BH23	12.05	Sandstone	n	72.0	51.0	1.43	0.55	1.01	0.6	Medium	51.0	25.0	1623	1.14	0.70	0.91	0.6	Medium	
BH20	0.93	Sandstone	n	113.0	51.0	1.35	0.52	1.01	0.5	Medium	51.0	32.0	2078	1.45	0.70	0.96	0.7	Medium	
BH20	2.37	Conglomerate	n	66.0	51.0	4.10	1.58	1.01	1.6	High	51.0	26.0	1688	3.33	1.97	0.92	1.8	High	
BH20	3.60	Sandstone	n	154.0	51.0	2.68	1.03	1.01	1.0	High	51.0	34.0	2208	2.60	1.18	0.97	1.1	High	
BH21	8.30	Sandstone	n	59.0	51.0	0.20	0.08	1.01	0.1	V. Low	51.0	34.0	2208	0.15	0.07	0.97	0.1	V. Low	
BH21	10.05	Tuff	n	80.0	51.0	1.74	0.67	1.01	0.7	Medium	51.0	29.0	1883	1.43	0.76	0.94	0.7	Medium	
BH21	11.85	Tuff	n	42.0	51.0	0.75	0.29	1.01	0.3	Low	51.0	27.0	1753	0.87	0.50	0.92	0.5	Medium	

NOTES

(1): N = Natural, D = Dry, S = Saturated
(2): L > 0.5D, 0.3 < D/W < 1.0

$I_{s(50)}$ MPa and Strength Classification

< 0.1	Very Low	1 - 3	High
0.1 - 0.3	Low	3 - 10	Very High
0.3 - 1	Medium	> 10	Extreamly High

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 6

sheet 1 of 9

office and job no: NEWCASTLE, N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK NEWCASTLE

hole commenced: 25 August 1983

hole completed: 2 September 1983

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 3 7/8" mm

slope: 90 deg.

bearing: - deg.

R.L. surface: ≃ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADT							SM	TOPSOIL - SILTY SAND, fine grained.	M			
								SANDSTONE, fine grained, white becoming yellow/brown - highly weathered.				
					2			CONGLOMERATE, fine to medium sand & some coarse, with fine to medium gravel, yellow/brown, highly weathered, becoming white/brown & moderately weathered.				
					4							
HAMMER DRILL					6			SILTSTONE & SANDSTONE, fine grained, grey.				
					8			As above, highly weathered, yellow/brown.				
								SANDSTONE, fine grained, grey & brown, with siltstone bands.				
					10							
					12			Some coarse sandstone/conglomerate with fine to medium rounded gravel.				
								CONGLOMERATE, grey/brown to brown, and SANDSTONE, fine to medium grained, brown to yellow/brown.				
					14							
					16							very easy penetration

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit; e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests: U50 — undisturbed sample 50 mm diameter; D — disturbed sample; N standard penetration test figure = result; N* SPT + sample; Nc — cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry, M moist, W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 6

sheet 2 of 9

office and job no: NEWCASTLE,N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK NEWCASTLE

hole commenced: 25 August 1983

hole completed: 2 September 1983

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 3 7/8" mm

slope: 90 deg.

bearing: – deg.

R.L. surface: ≈ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	RL depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
HAMMER / DRILL / W TC					16			CONGLOMERATE & SANDSTONE, as above.				very easy penetration
					18							
					20							
					22							
					24			SILTSTONE, grey.				
					26			SANDSTONE, fine to medium grained, grey & CONGLOMERATE grey with rare coal bands.				
					28							
					30							
					32			CLAYSTONE, see below.				

key

method

AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool

*bit shown by suffix
B blank bit
V "V" bit
T TC bit
e.g. ADT

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water 10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests
U50 undisturbed sample 50 mm diameter
D – disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W – wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 6

sheet 3 of 9

office and job no: NEWCASTLE,N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK NEWCASTLE

hole commenced: 25 August 1983

hole completed: 2 September 1983

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 3 7/8" mm

slope: 90 deg.

bearing: – deg.

R.L. surface: ≃ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W TC					32			CLAYSTONE, grey/white, trace of coal.				
					34			COAL, black.				Victoria Tunnel
					36							
					38			CLAYSTONE, grey/white.				
								SANDSTONE, fine to medium grained, grey.				
					40							
					42							
					44							Blade bit refusal at 44.21m.
HAMMER DRILL								TUFF, grey.				Very hard drilling & poor sample recovery
								? ?				
								SANDSTONE, fine grained, grey				
					46			COAL, black.				Kalby ?
								SILTSTONE & SANDSTONE, fine grained, grey, becoming SANDSTONE				
					48							

key

method
AS auger screwing*
AD auger drilling*
R roller tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V V bit
T TC bit
e.g. ADT

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 6

sheet 4 of 9

office and job no: NEWCASTLE,N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

hole commenced: 25 August 1983
hole completed: 2 September 1983

project: PROPOSED GREATER NEWCASTLE HOSPITAL
borehole location: RANKIN PARK NEWCASTLE

supervised by: AML
checked by: PJNP

drill model and mounting: Mobile Drill B40L
hole diameter: 3 7/8" mm

slope: 90 deg.
bearing: – deg.

R.L. surface: ≃ 95.4 m
datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth ∝ metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
HD					48			SANDSTONE,as above.				
W TC					50			SANDSTONE,medium grained, dark grey,becoming medium to coarse with some fine to medium rounded gravel.				
					52			SANDSTONE/CONGLOMERATE,as above,carbonaceous traces.				
								SANDSTONE,fine grained, some siltstone,grey,coal traces.				Poor cutting return
					54							jointed/ fractured? fast drill penetration
					56			CONGLOMERATE,grey/green, with bands of medium to coarse sandstone,grey.				
					58							
								TUFF?				hand drilling – poor recovery
					60			SANDSTONE,fine to medium grained grey/green. SILTSTONE BAND.				
					62			(SANDSTONE)/CONGLOMERATE, as above.				
					64			SANDSTONE,see below.				

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V "V" bit, T TC bit; e.g. ADT

support: C casing, M mud

penetration: 1 2 3 – no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes – samples and tests: U50 undisturbed sample 50 mm diameter; D disturbed sample; N standard penetration test figure = result; N* SPT = sample; Nc – cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry; M moist; W wet

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

T81-001

Coffey & Partners Pty. Ltd

engineering log borehole

COFFEY

borehole no: 6

sheet 5 of 9

office and job no: NEWCASTLE,N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

hole commenced: 25 August 1983
hole completed: 2 September 1983

project: PROPOSED GREATER NEWCASTLE HOSPITAL
borehole location: RANKIN PARK NEWCASTLE

supervised by: AML
checked by: PJNP

drill model and mounting: Mobile Drill B40L
hole diameter: 3 7/8" mm

slope: 90 deg.
bearing: – deg.

R.L. surface: ≃ 95.4 m
datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
WT					64			SANDSTONE, fine grained, grey with rare siltstone bands & coarse sand/gravelly bands becoming fine to medium.				
					66			– Carbonaceous band.				
					68							
					70			CONGLOMERATE, grey/green, with thin coal bands at approx. 70m.				
					72			SANDSTONE, as above. Becoming fine grained with increasing silt content.				
					74			Borehole 6 continued on sheet 6 - Engineering Log - Cored Borehole				
					76							
					78							
					80							

key

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

support
C casing
M mud

penetration 1 2 3
no resistance
ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc – cone penetrometer

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet

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

T81-001

engineering log — cored borehole

COFFEY

borehole no 6

sheet 6 of 9

office and job no: NEWCASTLE, N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

hole commenced: 25 August 1983
hole completed: 2 September 1983
supervised by: AML
log checked by: PJNP

project: PROPOSED GREATER NEWCASTLE HOSPITAL
borehole location: RANKIN PARK NEWCASTLE

drill model and mounting: Mobile Drill B40L slope: 90deg.
barrel type and length: TT 3.1m fluid: water/mud bearing: —deg.

R.L. surface: ≃ 95.4 m
datum:

drilling information				rock substance					rock mass defects	
method	case-lift	water		R.L. depth metres	graphic log / core loss	substance description: rock type; grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general
NQ			82.75m 083°/86°	72		For log of borehole 0 to 73.27m see Engineering log - borehole				Defects are partings 0-20°, planar, rough, some striated.
				74		SILTSTONE, grey becoming black, with coal bands, bedding 0°-20°.	Fr			
						COAL, black with siltstone bands to 100mm.				
						NO CORE, 0.16m. COAL.				
				76		SILTSTONE, light grey, laminated 0°-5°.				Joint 90°, irregular, polished, striated. 100mm? CLAY/CRUSH SEAM
						COAL				Zones of very closely spaced partings.
				78		NO CORE, 0.08m.				
						Grading to				Partings & joints 20°, planar, irregular, polished, striated, with associated crushed surfaces to 20mm.
				80		SANDSTONE, fine grained, grey, laminated to thinly bedded 0°-5° & up to 30° in parts.				
						Grading to				
				82		SANDSTONE, medium grained, grey/white, poorly defined bedding 0°-15°.				Joints 20° & 40°, planar rough. 20mm open joint, 30°, planar, rough, clean.
				84						Defects are partings/breaks? 0°-20°, planar, rough, clean.
				86		SANDSTONE, fine to medium grained, grey/white, carbonaceous traces in finer bands.				
			WL 87.2m 8/9/83 5/9/83			SILTSTONE, grey.				Water loss on partings 2°. Joints 70°, planar, smooth, clean.
				88						

key

178-097

engineering log – cored borehole

COFFEY

borehole no 6
sheet 7 of 9

office and job no NEWCASTLE N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL
borehole location: RANKIN PARK, NEWCASTLE

hole commenced 25 August 1983
hole completed 2 September 1983
supervised by AML
log checked by PJNP

drill model and mounting: Mobile Drill B40L slope 90 deg. R.L. surface ≃ 95.4 m
barrel type and length: TT 3.1 m fluid Mud bearing: deg. datum

drilling information				rock substance				rock mass defects	
method / case-int / water	Borehole Orientation	R.L. depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general

N Q	91.75 m 083°/87°	88		SILTSTONE, grey and dark grey, laminated 0 to 5°.	Fr			10mm Crush Seam 0° 20mm Broken Zone 0° Joints 60°-80° planar (irregular), smooth (rough), clean, becoming 45° to 60°.
		90		SANDSTONE, fine grained, grey, with interbanded SILTSTONE, laminated to thinly bedded 0-5°.				Joints 20°, planar, smooth to rough, clean. 70° fracture irregular
		92		becoming SILTSTONE, dark grey.				
		94		SILTSTONE, black, carbonaceous with minor coaly bands.				30mm Bedding Plane 15mm Crush Seams
		96		SILTSTONE, grey.				
				COAL				
				No core 0.12 m.				
		98		SILTSTONE/SANDSTONE, fine grained, interbanded + interlaminated, 0-5°.				Polished partings 0° 20mm Bedding Plane Crush Seam 30mm Broken Zone 0°
		100		No core 0.2 m.				1mm CLAY Seam 3° 3mm Crush Seam 0° Joints 60°-80° planar, irregular, rough, polished, striated, clean & CLAY stained.
			fe	Siderite				
		102		SANDSTONE, fine grained, grey with darker silts laminations 0-5°.	SW			LIMONITE staining on defects. Joint 45°, planar, rough, lim. stained.
		104						

Partings/Breaks ?planar, sm., clean
Defects are

key

engineering log – cored borehole

COFFEY

borehole no 6

sheet 8 of 9

office and job no. NEWCASTLE N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE

hole commenced 25 August 1983

hole completed 2 September 1983

supervised by AML

log checked by PJNP

drill model and mounting: Mobile Drill B40L slope 90 deg. R.L. surface ≈ 95.4 m

barrel type and length: TT 3.1 m fluid Water bearing: deg. datum

drilling information					rock substance				rock mass defects	
method	case-lift	water	Borehole Orientation	R.L. depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general
NQ			107.8 m 083°/87°	104		SANDSTONE, fine grained, grey with darker silt & carbonaceous laminae, 0-5°.	SW			10.5mm Broken Zones 0° with CLAY infilling. Joints 20°-60°, planar, irregular, rough, lim. stained rare CLAY + crshd. ROCK veneer, bleaching of rock on joints.
				106						
				108		As above, becoming grey-white.				Parting 3°, partial Lim. staing.
				110						
				112		SILTSTONE band.				10mm Broken Zone 0°.
				114		SILTSTONE/SANDSTONE, fine grained, grey, interlaminated 0-5°, becoming SILTSTONE.				
				116						
						COAL, black.				WATER inflow in COAL Seam, Defects are joints 45°-90°, planar, irregular, rough, clean.
				118		No core 1.39 m. Coal cored but not recovered - not mined out?				
						BOREHOLE SEAM				
				120		SANDSTONE, fine to med. grained, grey, massive.				

Defects are Partings 0-5°, planar, rough, clean + Lim. stained rare CLAY stain, some bleachg. of surfaces on some partings.

BOREHOLE

key

COFFEY

borehole no: 6

sheet 9 of 9

engineering log — cored borehole

office and job no: NEWCASTLE N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE.

hole commenced: 25 August 1983

hole completed: 2 September 1983

supervised by: AML

log checked by: PJNP

drill model and mounting: Mobile Drill B40L slope 90 deg.

barrel type and length: TT 3.1 m fluid Water bearing: deg.

R.L. surface ≃ 95.4 m

datum:

drilling information					rock substance				rock mass defects	
method	case-lift	water		R.L. depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general
N Q				120		SANDSTONE, as above.	SW			
						Borehole 6 terminated 121.2 m.				

key

Coffey & Partners Pty. Ltd.

engineering log borehole

borehole no: 7

sheet 1 of 9

office and job no: N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE

hole commenced: 5/9/83

hole completed: 7/9/83

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 100 mm

slope: 90 deg.

bearing: deg.

R.L. surface: ≃ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					0			CONGLOMERATE, fine to coarse SANDS, broken GRAVEL yellow-brown, highly weathered, with bands of fine to coarse SANDSTONE.	D			
					2							
					4			SILTSTONE/SANDSTONE, fine grained, grey.				
					6			SILTSTONE/SANDSTONE, fine grained, grey.				
					8							
					10				M/D			
					12			Cgt CONGLOMERATE SANDSTONE, fine grained to med., yellow-brown, with CONGLOMERATE bands as above, highly weathd.				
					14				M/D			
					16			Cgt yellow-brown.				

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit, e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests: U50 undisturbed sample 50 mm diameter; D disturbed sample; N standard penetration test figure = result; N* SPT + sample; Nc cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry; M moist; W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 7

sheet 2 of 9

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	5/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	7/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Mobile Drill B40L — slope: 90 deg. — R.L. surface: ≃ 95.4 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					16			SANDSTONE, fine to med.gr., yellow-brown + CONGLOMERATE as above, highly weathered to moderately weathered.	M/D			
					18			SANDSTONE, fine to med.gr., grey + grey-brown, slightly to mod. weathered.				
					20				W			
					22			SANDSTONE + CONGLOMERATE, as above, yellow-brown, highly to moderately weathered.				
					24							
					26							
					28			SILTSTONE, grey & dark grey, carbonaceous in parts, trace of COAL & CLAYSTONE, slightly weathered to fresh.				
					30			? ? ? ?				See Borehole 6 — Poor sample recovery.
					32							

key

method
AS auger screwing*
AD auger drilling*
R roller tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V 'V' bit
T TC bit
e.g. ADT

support C casing, M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan '78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 7

sheet 3 of 9

office and job no: N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE

hole commenced: 5/9/83

hole completed: 7/9/83

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 100 mm

slope: 90 deg.

bearing: deg.

R.L. surface: ≃ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					32							
					34			Trace of COAL				Poor sample recovery
								SANDSTONE, fine to medium grained, grey + yellow-brown to red, with COAL fragments, moderately weathered to highly weathered.				See Borehole 6
					36							
					38			As above, becoming dominantly grey SANDSTONE, fine grained, with traces of grey SILTSTONE.				
					40							
HAMMER DRILL					42			TUFF ?				WATER inflow 15 l/ms, from 24-42 m. Blade Bit refused at 41.7 m - poor sample recovery.
					44							
					46							See Borehole 6.
BLADE					48							

key

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

support
C casing
M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc - cone penetrometer

classification symbols and soil description based on unified classification system:

moisture
D - dry
M - moist
W - wet

consistency/density index

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

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Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 7

sheet 4 of 9

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	5/9/83
		hole completed:	7/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≈ 95.4 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					48			?				
					50							
					52							
					54							
					56							See Borehole 6
					58							Poor sample recovery with larger amounts of 'SAND' fall-in from 27-38m, i.e. highly weathered, fine to med. grained SANDSTONE.
					60			SANDSTONE, fine grained, grey, with some medium grained and some dark grey SILTSTONE + bands of CONGLOMERATE.				
					62							
					64							

key

method
AS auger screwing*
AD auger drilling*
R roller tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V "V" bit
T TC bit
e.g. AD/T

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 — undisturbed sample 50 mm diameter
D — disturbed sample
N: standard penetration test figure = result
N* SPT + sample
Nc — cone penetrometer

classification symbols and soil description
based on unified classification system

moisture
D — dry
M — moist
W — wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 7

sheet 5 of 9

office and job no: N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE

hole commenced: 5/9/83

hole completed: 7/9/83

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 100 mm

slope: 90 deg.

bearing: deg.

R.L. surface: ≃ 95.4 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type, plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					64			SANDSTONE, fine (to med.) grained, grey, with some SILTSTONE, CONGLOMERATE, and rare COALY traces.				
					66							
					68							
					70							
								CONGLOMERATE ?				See Borehole 6
					72			SANDSTONE, fine grained, grey, with some med. grain SANDSTONE and grey SILTSTONE. Increasing SILTSTONE content.				Poor recovery with much weathered SANDSTONE contamination.
					74			COAL, black				
					76			? ? ? SILTSTONE, dark grey?, and SANDSTONE, fine to med. grained, grey.				
					78							Very fast penetration
					80							

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit; e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan '78 water level on date shown; water inflow; water outflow

notes — samples and tests: U50 undisturbed sample 50 mm diameter; D disturbed sample; N standard penetration test figure = result; N* SPT + sample; Nc cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry, M moist, W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 7

sheet 6 of 9

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	5/9/83
		hole completed:	7/9/83
project	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≈ 95.4 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					80 82 84 86 88 90			SILTSTONE & SANDSTONE, fine grained, grey (to medium? grained).				
								For log of Borehole 7 below 89.85 m, see Sheet 7, Eng. Log - Cored Borehole.				

key

method

AS auger screwing*
AD auger drilling*
R roller tricone
W washbore
CT cable tool

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

support C casing, M mud

penetration 1 2 3 — no resistance ranging to refusal

water

10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N – standard penetration test figure = result
N* – SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D – dry
M – moist
W – wet

consistency/density index

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

T81-001

engineering log – cored borehole

COFFEY

borehole no 7

sheet 7 of 9

office and job no N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced	5/9/83
project	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed	7/9/83
borehole location	RANKIN PARK, NEWCASTLE	supervised by	AML
		log checked by	PJNP
drill model and mounting	Mobile Drill B40L	slope 90 deg	R.L. surface ≃ 95.4 m
barrel type and length	TT 3.1 m	fluid Water	bearing deg. datum

drilling information				rock substance				rock mass defects	
method	case-lift	water		R.L. depth metres	graphic log core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general
N Q		W.L. >90 m on 8/9/83	94 m 183°/88°	80						
				82						
				84						
				86						
				88		For log of Borehole 7, 0-89.85 m, see Eng.Log Borehole, Sheet 6.				All other defects are Partings 0-3°, planar smooth, clean, rarely polished & CLAY stnd.
				90		SILTSTONE, dark grey, laminated 0-3°, with bands of fine grained SANDSTONE, with SILTSTONE laminae.	Fr			28,15mm Bedding Plane, Crush Seams 0°, with CLAY staining.
				92						Joints 20°-60°, planar, irreg., smooth to rough, clean.
				94						15mm Broken Zone 0°. Joint 20°, irreg., rough, polished.
				96		SILTSTONE, black, carbonaceous with soden. bands				

key

engineering log – cored borehole

COFFEY

borehole no 7

sheet 8 of 9

office and job no N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced	5/9/83
		hole completed	7/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by	AML
borehole location:	RANKIN PARK, NEWCASTLE	log checked by:	PJNP
drill model and mounting:	Mobile Drill B40L slope 90 deg.	R.L. surface	≃ 95.4 m
barrel type and length:	TT 3.1 m fluid Water bearing deg.	datum:	

drilling information				rock substance				rock mass defects	
method	case-lift	water	R.L. depth metres	graphic log / core loss	substance description: rock type, grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description: thickness, type, inclination, planarity, roughness, coating. particular / general
NQ			96		SILTSTONE, dark grey	Fr		3000	Very clearly spaced Bedding Plane Parting. 10mm Softened Seam 0°.
					COAL, black, minor CLAYSTONE bands				
					SILTSTONE, as above, with sodente band.				
			98		SANDSTONE, fine grained, grey, with interlaminated and interbanded SILTSTONE. Grading to-				25mm Bedding Pl. Crush Seam 0° 20mm Bedding Pl Crush Seam 0° Joints 20°-60° planar, irreg., sm. to rough, clean. 10mm very closely spaced partings. 10mm Crush Sm. 0° Joints 20°-90°, curved, irreg., pol. & stri. +0° Cr. Seams.
			100		SILTSTONE, dark grey, with interlaminated SILTSTONE and minor sodente bands.				
					Grading to - SANDSTONE, fine grained, grey, with darker SILTSTONE laminae and bands.	SW			Defects LIMONITE stained. 10mm Cr. Seam 10°
			102						
			104						Joints 10°-45°, planar, irreg., rough, LIMONITE stained.
			106						
			108		becoming fine to med. grained, and poorly bedded to massive, with rare carbonaceous laminae + COAL streaks 0-5°.				
			110		No core 0.05 m				
			112						

Defects are Partings/Breaks ?0-30°, planar, clean, rarely polished, smooth to rough,

key

engineering log — cored borehole

COFFEY

borehole no 7

sheet 9 of 9

office and job no N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced	5/9/83
		hole completed	7/9/83
project	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by	AML
borehole location	RANKIN PARK, NEWCASTLE	log checked by	PJNP
drill model and mounting	Mobile Drill B40L	slope 90 deg.	R.L surface ≃ 95.4 m
barrel type and length	TT 3.1 m	fluid Water bearing deg.	datum

drilling information				rock substance					rock mass defects	
method	case-lift	water		R.L depth metres	graphic log core loss	substance description rock type: grain characteristics, colour, structure, minor components	weathering	strength Is (50)	defect spacing mm	defect description thickness, type, inclination, planarity, roughness, coating. particular / general
NQ				112		SANDSTONE, as above.	SW			Defects are Partings 0-5°, planar, irreg., rough, LIMONITE stnd. with some broken ROCK surfaces.
				114		SILTSTONE, grey, with interbedded and inter-laminated SANDSTONE, fine grained.				Joints 10°-45°, planar, irreg., rough, LIMONITE stained.
				116		25mm Cavity				Soft material - possible SILTSTONE fill in Mine shaft.
						No core 0.71 m.				
				118		Borehole 7 terminated at 117.19 m.				Void and debris - no water pressure, but full thrust on rods not able to force core barrel down.
				120						
				122						
				124						
				126						
				128						

key

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 1 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: | slope: deg. | R.L. surface ≃ 87.6 m

hole diameter: mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth ∝ metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer 100 200 300 400 kPa	structure and additional observations
					0			CONGLOMERATE, yellow-brown, and minor SANDSTONE, med. grained.	D			
					2			SANDSTONE, fine to med., grey-brown, and CONGLOMERT. yellow grey + red-brown.				
					4			As above, with minor CONGLOMERATE.				
					6			CONGLOMERATE, yellow-brown, with fine to med. grained SANDSTONE bands.				
					8			SANDSTONE, grey-brown to dark brown.				
					10			SANDSTONE, as above.				
					12			SANDSTONE, fine to coarse grained with CONGLOMERATE bands.				
					14			CONGLOMERATE				
								SANDSTONE, fine grained, grey.				
					16			CONGLOMERATE, grey.				

key

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

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test: figure = result
N* SPT + sample
Nc cone penetrometer

classification symbols and soil description
based on unified classification system

moisture
D dry
M moist
W wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no 8

sheet 2 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting:		slope:	90 deg.	R.L. surface:	≃ 87.6 m
hole diameter:	mm	bearing:	deg.	datum:	

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth ∝ metres	graphic log	classification symbol	material: soil type, plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
BLADE BIT					16			SANDSTONE, fine, grey, with some CONGLOMERATE.	D			
					18			COAL & SILTSTONE, carbonaceous, grey-black. SANDSTONE, fine to med., grey + minor CONGLOMERATE.				
					20			SILTSTONE, carbonaceous, grey black. COAL, black, with grey-black to brown carbonaceous SILTSTONE bands.				
					22			SILTSTONE, grey.				
					24			SILTSTONE & SANDSTONE, fine grained, grey becoming grey-white. COAL bands.				
					26			SANDSTONE, grading to CONGLOMERATE becoming SANDSTONE (fine) to med. grained + CONGLOMERATE.				
					28			SANDSTONE, fine grained, grey.				
					30							
HAMMER					32			Tuffaceous SILTSTONE, grey white.				Blade Bit refusal - no return of cuttings.

method
AS auger screwing*
AD auger drilling*
R roller tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V 'V' bit
T TC bit
e.g. AD/T

support
C casing
M mud

penetration
1 2 3
(1 = resistance ranging to refusal)

water
10 Jan '78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test figure = result
N* SPT - sample
Nc – cone penetrometer

classification symbols and soil description
based on unified classification system.

moisture
D dry
M moist
W wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 3 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
HAMMER DRILL				0209 / 89°	32			As above.				
								COAL & SILTSTONE, black, carbonaceous.				
								SILTSTONE, grey, carbonac.				
					34			SANDSTONE, fine, pale grey & SILTSTONE, grey, becoming SILTSTONE, grey.				
					36			increasing SANDSTONE, fine content, to - SANDSTONE, with some SILTSTONE.				
					38			SANDSTONE, fine to med. grained, grey-brown & grey, & CONGLOMERATE, grey-brown.				
								SANDSTONE, fine grained, & SILTSTONE.				
					40			CONGLOMERATE, grey and grey-brown.				
					42							
					44							
								SANDSTONE, fine to med. grained, grey.				
					46							Jamming in hole ?
					48							

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit; e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes – samples and tests: U50 undisturbed sample 50 mm diameter; D disturbed sample; S standard penetration test figure = result; V* SPT + sample; Nc – cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry, M moist, W wet

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

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Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 4 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L — slope: 90 deg. — R.L. surface: ≃ 87.6 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 400	structure and additional observations
HAMMER DRILL				1190/890	48			CONGLOMERATE, grey	D			
					50							
					52			SANDSTONE, fine grained, dark grey. CONGLOMERATE ?	W			Moistened overnight. No return of cuttings.
					54							
					56			SANDSTONE bands, fine to medium grained, grey.				
					58			SANDSTONE, fine to med.gr., light grey + CONGLOM. bands CONGLOMERATE				
					60				M			
					62			As above, with SANDSTONE, fine to coarse grained.				
					64							

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit, e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes: samples and tests; U50 undisturbed sample 50 mm diameter; D disturbed sample; N standard penetration test figure = result; N* SPT + sample; Nc cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry, M moist, W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 5 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 100/95 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth ∝ metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					64			CONGLOMERATE, as above.	M			
					66			SILTSTONE, dark grey, trace of fine SANDSTONE & COAL.				
								COAL, black with dark grey SILTSTONE, carbonaceous.				
95mm					68			SILTSTONE, dark grey.				
					70			— COAL band.				
					72			becoming SILTSTONE & SANDSTONE, fine grained, dark grey to grey. to SANDSTONE, fine grained, grey, with minor SILTSTONE.				
					74			SILTSTONE & SANDSTONE, as above.				
					76			SANDSTONE, fine grained, grey to grey-brown.				No return of cuttings.
					78			becoming SILTSTONE & SANDSTONE, as above.				
					80							

key

method
AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V 'V' bit
T TC bit
e.g. ADT

support C casing* M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan '78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 — undisturbed sample 50 mm diameter
D — disturbed sample
N — standard penetration test figure = result
N* — SPT + sample
Nc — cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D — dry
M — moist
W — wet

consistency/density index

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

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Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 6 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	10/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Mobile Drill B40L — slope: 90 deg. — R.L. surface: ≃ 87.6 m

hole diameter: 95 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R				120°/88°	80			SILTSTONE & SANDSTONE, fine to medium grained, grey to light grey.				
					82							
					84							
					86			SANDSTONE, fine grained, grey with some dark grey SILTSTONE + carbonaceous traces. Possible COAL bands				Poor return of cuttings.
					88							
					90							
					92							
					94							
					96							

key

method: AS auger 'screwing'*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B blank bit, V 'V' bit, T TC bit; e.g. ADT

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests: U50 undisturbed sample 50 mm diameter; D disturbed sample; N standard penetration test figure = result; N* SPT + sample; Nc cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry, M moist, W wet

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

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Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 8

sheet 7 of 7

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	8/9/83
		hole completed:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 95 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R				104m 117° 86°	96 98 100 102 104 106 108 110 112			Cavity 0.5m at 104.75 m Loose material. Borehole 8 terminated at 105.35 m. PVC Casing to 24 m.				No return. Broken ROCK? rods sticking

T81-001

key

method
AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool
*bit shown by suffix
B blank bit
V 'V' bit
T TC bit
e.g. ADT

support C casing, M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 undisturbed sample 50 mm diameter
D disturbed sample
N standard penetration test figure = result
N* SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W – wet

consistency/density index

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

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 1 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
		hole completed:	13/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
HAMMER BLADE BIT					0			SANDSTONE, fine to medium grained, yellow-brown to white-brown, with some CONGLOMERATE bands, becoming SANDSTONE & CONGLOMERATE.	D			
					2							
								SANDSTONE, fine to medium grained, white-brown, some coarse SAND with CONGLOMERATE bands.				
					4							
					6							
					8							
					10			As above, becoming grey-brown to brown.				
					12			CONGLOMERATE, grey-brown, increasing SANDSTONE with depth to				
								? ? ?				
					14			SANDSTONE, fine to medium grained, grey, with CONGLOMERATE bands.				
HAMMER								SANDSTONE, fine grained, grey-white, with SILTSTONE bands.	M D			No return.
					16							

T81-001

key

method
AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool
*bit shown by suffix
B – blank bit
V – "V" bit
T – TC bit
e.g ADT

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes — samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N standard penetration test figure = result
N* – SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D – dry
M – moist
W – wet

consistency/density index

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

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 2 of 8

office and job no: N1857/2

SINCLAIR KNIGHT & PARTNERS PTY. LTD.

project: PROPOSED GREATER NEWCASTLE HOSPITAL

borehole location: RANKIN PARK, NEWCASTLE.

hole commenced: 10/9/83

hole completed: 13/9/83

supervised by: AML

checked by: PJNP

drill model and mounting: Mobile Drill B40L

hole diameter: 100 mm

slope: 90 deg.

bearing: deg.

R.L. surface: ≃ 87.6 m

datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
HAMMER R					16			SANDSTONE, fine to medium grained, grey.				Poor return of cuttings.
					18			CONGLOMERATE, SILTSTONE, black, & SANDSTONE, fine, grey ?				
					20			COAL & SILTSTONE, black.				
					22							
					24			SILTSTONE, grey.				
					26			(See Borehole 8)				
					28							
					30							
					32							

key

method

AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool

*bit shown by suffix
B – blank bit
V – 'V' bit
T – TC bit
e.g. ADT

support

C casing
M mud

penetration 1 2 3 — no resistance ranging to refusal

water

10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N – standard penetration test figure = result
N* – SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D dry
M moist
W wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 3 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
		hole completed:	13/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					32			(See Borehole 8)				Much cave-in of weathered med. grained SAND-STONE from higher in hole.
					34							
					36			SANDSTONE, fine grained.				
					38							
					40			CONGLOMERATE & SANDSTONE, fine to coarse?, grey-brown to grey, becoming CONGLOMERATE, grey-brown. (See Borehole 8)				
					42							
					44							
					46							
					48							

key

method
AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool
*bit shown by suffix
B – blank bit
V – "V" bit
T – TC bit
e.g. ADT

support C casing, M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N – standard penetration test figure = result
N* – SPT + sample
Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture
D – dry
M – moist
W – wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 4 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
		hole completed:	13/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	supervised by:	AML
borehole location:	RANKIN PARK, NEWCASTLE	checked by:	PJNP

drill model and mounting: Mobile Drill B40L | slope: 90 deg. | R.L. surface: ≃ 87.6 m

hole diameter: 100 mm | bearing: deg. | datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
					48			(See Borehole 8)				
					50							No cuttings or air return.
					52							
					54							
					56							
					58							0.1m cavity? - broken or soft ROCK.
					60							
					62							
					64							

key

method: AS auger screwing*; AD auger drilling*; R roller/tricone; W washbore; CT cable tool; *bit shown by suffix: B – blank bit, V – "V" bit, T – TC bit; e.g. AD/T

support: C casing, M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes – samples and tests: U50 – undisturbed sample 50 mm diameter; D – disturbed sample; N – standard penetration test figure = result; N* – SPT + sample; Nc – cone penetrometer

classification symbols and soil description: based on unified classification system

moisture: D dry; M moist; W wet

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 5 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	13/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Mobile Drill B40L/ Pioneer 160L — slope: 90 deg. — R.L. surface: ≃ 87.6 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth of metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					64			(See Borehole 8)				
					66							
					68			COAL ?				
					70							
					72							
					74							
					76							
					78							
					80							

key

method

AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool

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

support C casing M mud

penetration 1 2 3 — no resistance ranging to refusal

water
10 Jan 78 water level on date shown
water inflow
water outflow

notes – samples and tests
U50 – undisturbed sample 50 mm diameter
D – disturbed sample
N – standard penetration test figure = result
N* – SPT + sample
Nc – cone penetrometer

classification symbols and soil description
based on unified classification system

moisture
D – dry
M – moist
W – wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 6 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	13/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Pioneer 160L — slope: 90 deg. — R.L. surface: ≈ 87.6 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					80			(See Borehole 8)				
					82							
					84							
					86							
					88							
					90							
					92							
					94							
					96							

key

method

- AS auger screwing*
- AD auger drilling*
- R roller/tricone
- W washbore
- CT cable tool

*bit shown by suffix: B blank bit; V "V" bit; T TC bit; e.g. ADT

support

C casing; M mud

penetration

1 2 3 — no resistance; ranging to refusal

water

10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests

- U50 — undisturbed sample 50 mm diameter
- D — disturbed sample
- N — standard penetration test figure = result
- N* — SPT = sample
- Nc — cone penetrometer

classification symbols and soil description — based on unified classification system

moisture

- D — dry
- M — moist
- W — wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 7 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	13/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Pioneer 160L — slope: 90 deg. — R.L. surface: ≃ 87.6 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					96							
					98							
					100							Possible go on joints to 2-10mm (sub-horizontal).
					102							
					104							
					106			COAL - Borehole Seam				No void
					108			Sandstone				WARATAH SANDSTONE Strong gas flow continues after drilling, also in Borehole 8, flow decreasing after ½ hour.
					110							
					112							

key

method

AS auger screwing*
AD auger drilling*
R roller/tricone
W washbore
CT cable tool

*bit shown by suffix
B - blank bit
V - "V" bit
T - TC bit
e.g. ADT

support

C casing
M mud

penetration

1 2 3 — no resistance ranging to refusal

water

10 Jan 78 water level on date shown
water inflow
water outflow

notes — samples and tests

U50 — undisturbed sample 50 mm diameter
D — disturbed sample
N — standard penetration test figure = result
N* — SPT + sample
Nc — cone penetrometer

classification symbols and soil description

based on unified classification system

moisture

D — dry
M — moist
W — wet

consistency/density index

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

T81-001

Coffey & Partners Pty. Ltd.

engineering log borehole

COFFEY

borehole no: 9

sheet 8 of 8

office and job no: N1857/2

	SINCLAIR KNIGHT & PARTNERS PTY. LTD.	hole commenced:	10/9/83
project:	PROPOSED GREATER NEWCASTLE HOSPITAL	hole completed:	13/9/83
borehole location:	RANKIN PARK, NEWCASTLE	supervised by:	AML
		checked by:	PJNP

drill model and mounting: Pioneer 160L — slope: 90 deg. — R.L. surface: ≃ 87.6 m

hole diameter: 100 mm — bearing: deg. — datum:

method	penetration 1 2 3	support	water	notes samples, tests, etc.	R.L. depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics colour, secondary and minor components	moisture condition	consistency, density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
R					112							
					114			Borehole 9 terminated at 113m.				

key

method

AS	auger screwing*
AD	auger drilling*
R	roller/tricone
W	washbore
CT	cable tool

*bit shown by suffix: B – blank bit; V – "V" bit; T – TC bit. e.g. ADT

support: C casing; M mud

penetration: 1 2 3 — no resistance ranging to refusal

water: 10 Jan 78 water level on date shown; water inflow; water outflow

notes — samples and tests

U50 – undisturbed sample 50 mm diameter

D – disturbed sample

N – standard penetration test figure = result

N* – SPT + sample

Nc – cone penetrometer

classification symbols and soil description based on unified classification system

moisture: D – dry; M – moist; W – wet

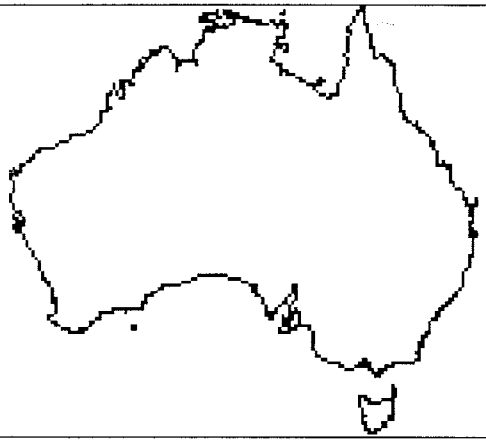
consistency/density index

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

181-001

Appendix B

Geophysical Data

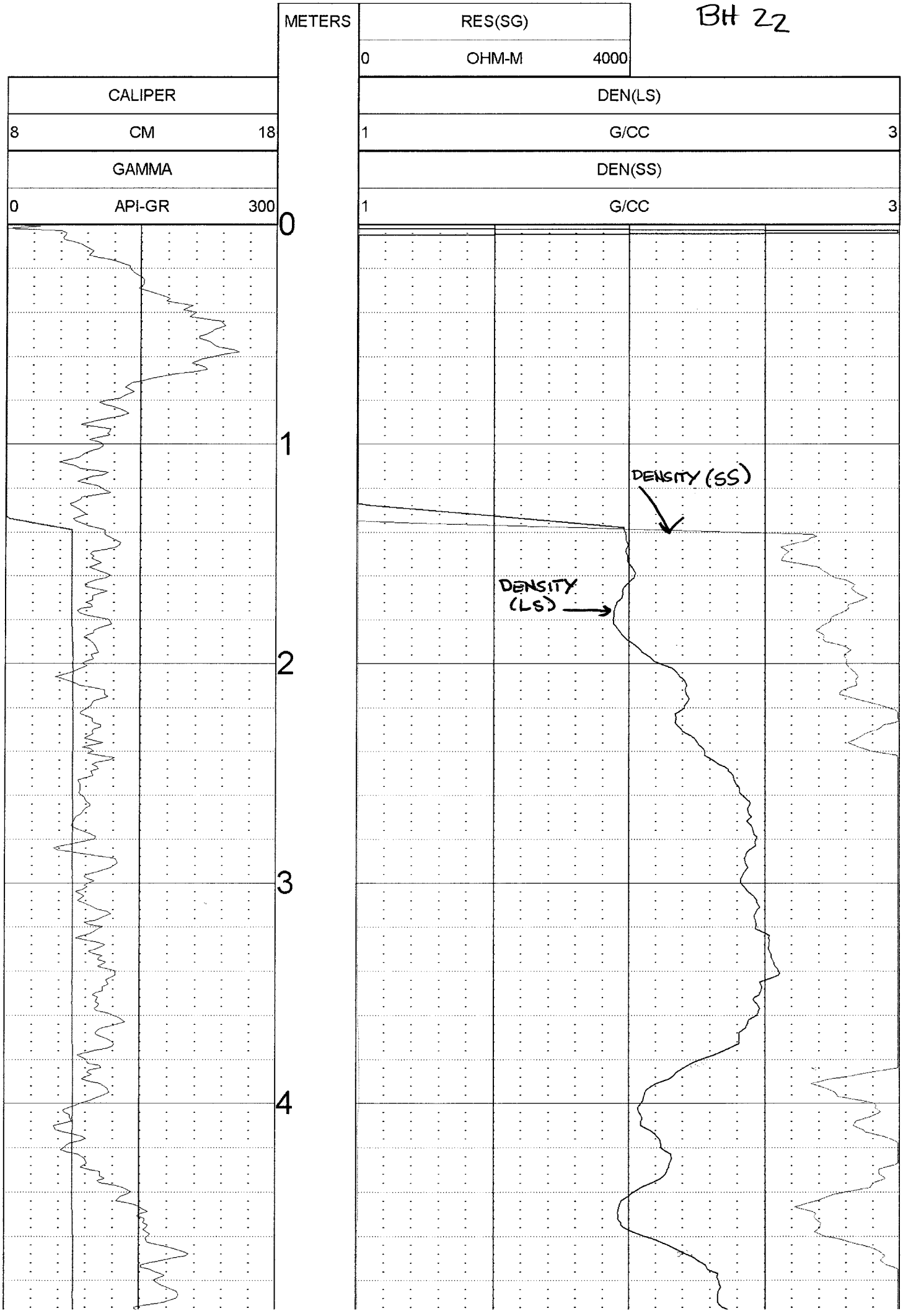


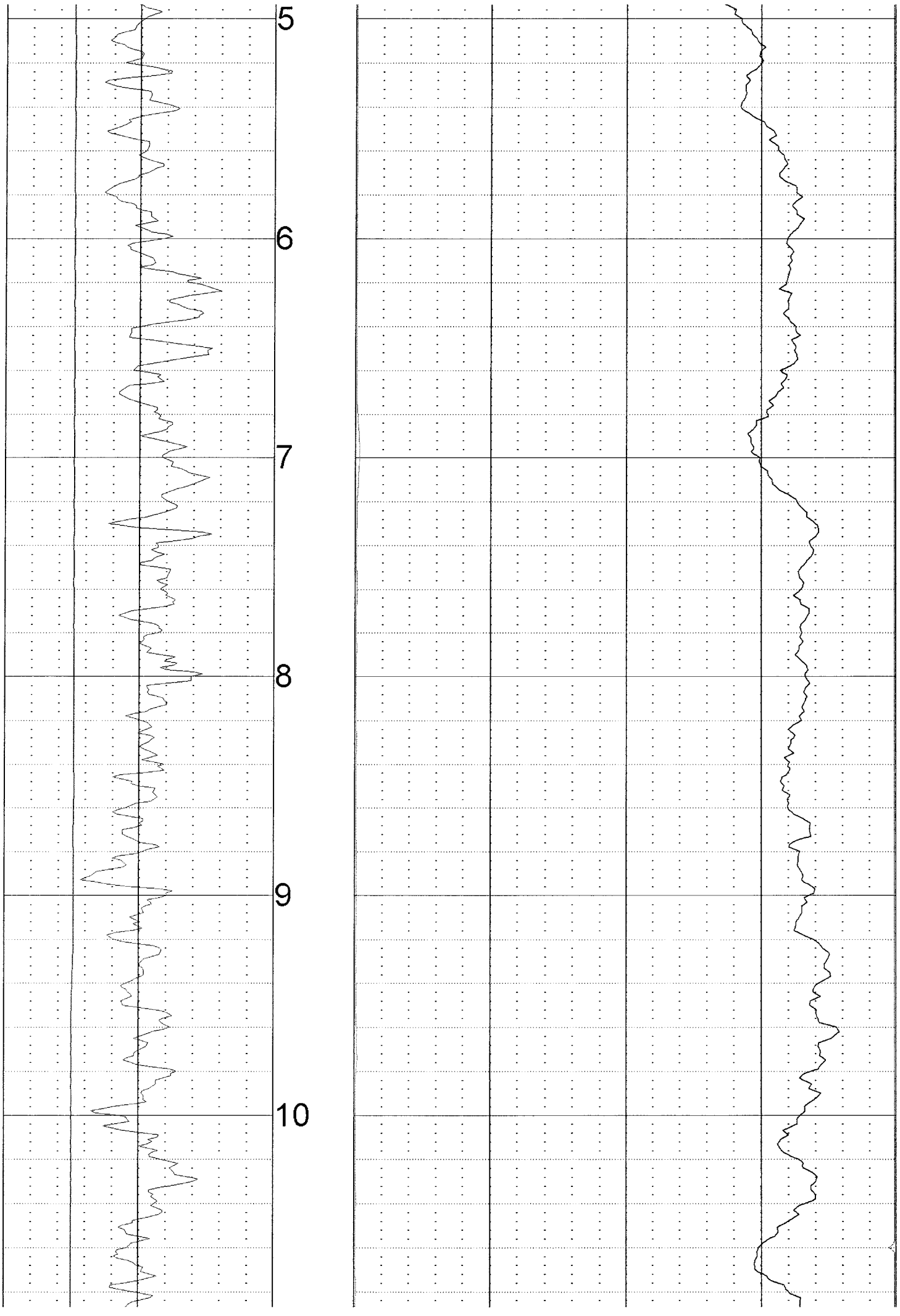
GROUNDSEARCH AUSTRALIA

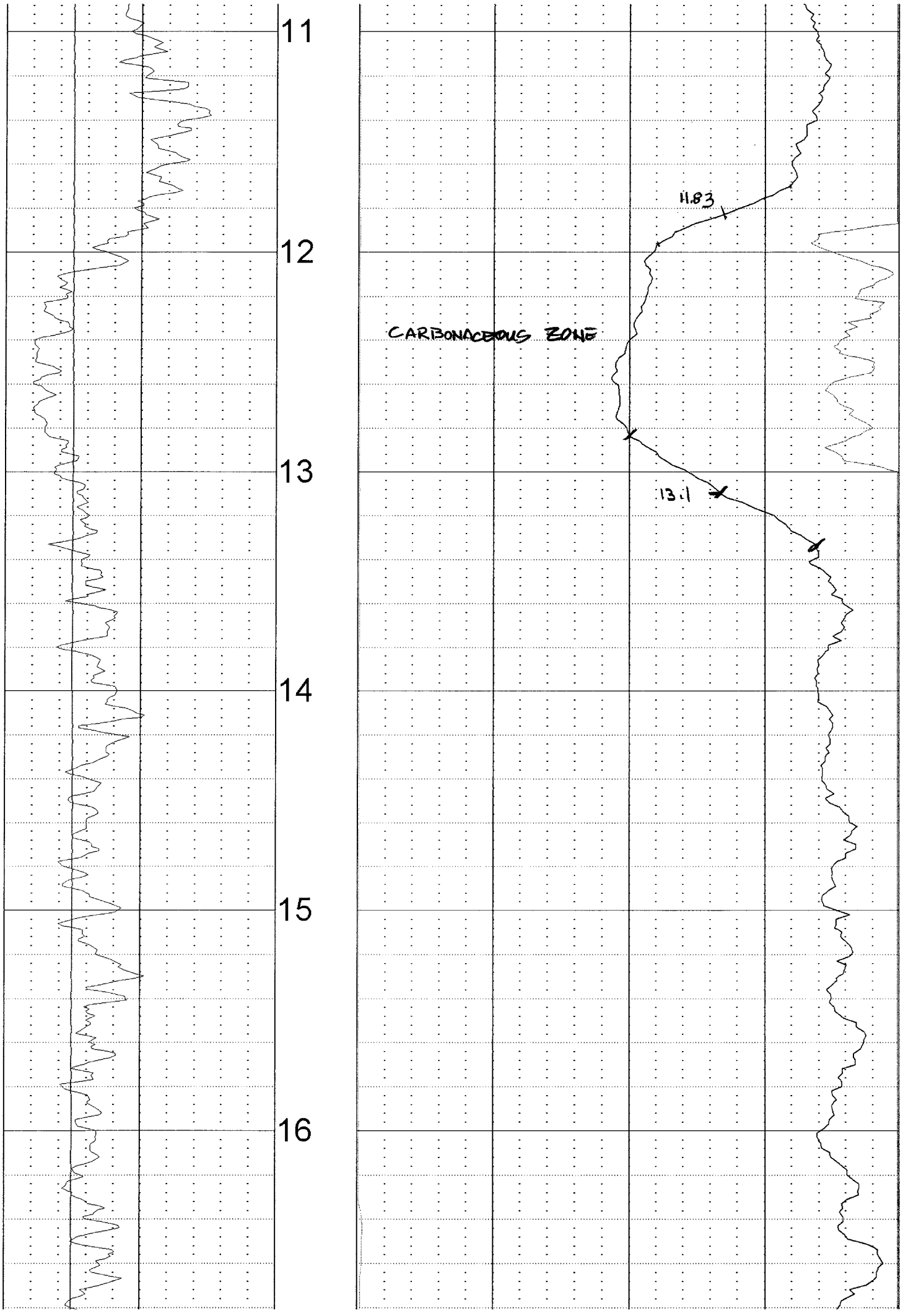
(ABN 11 057 389 152)

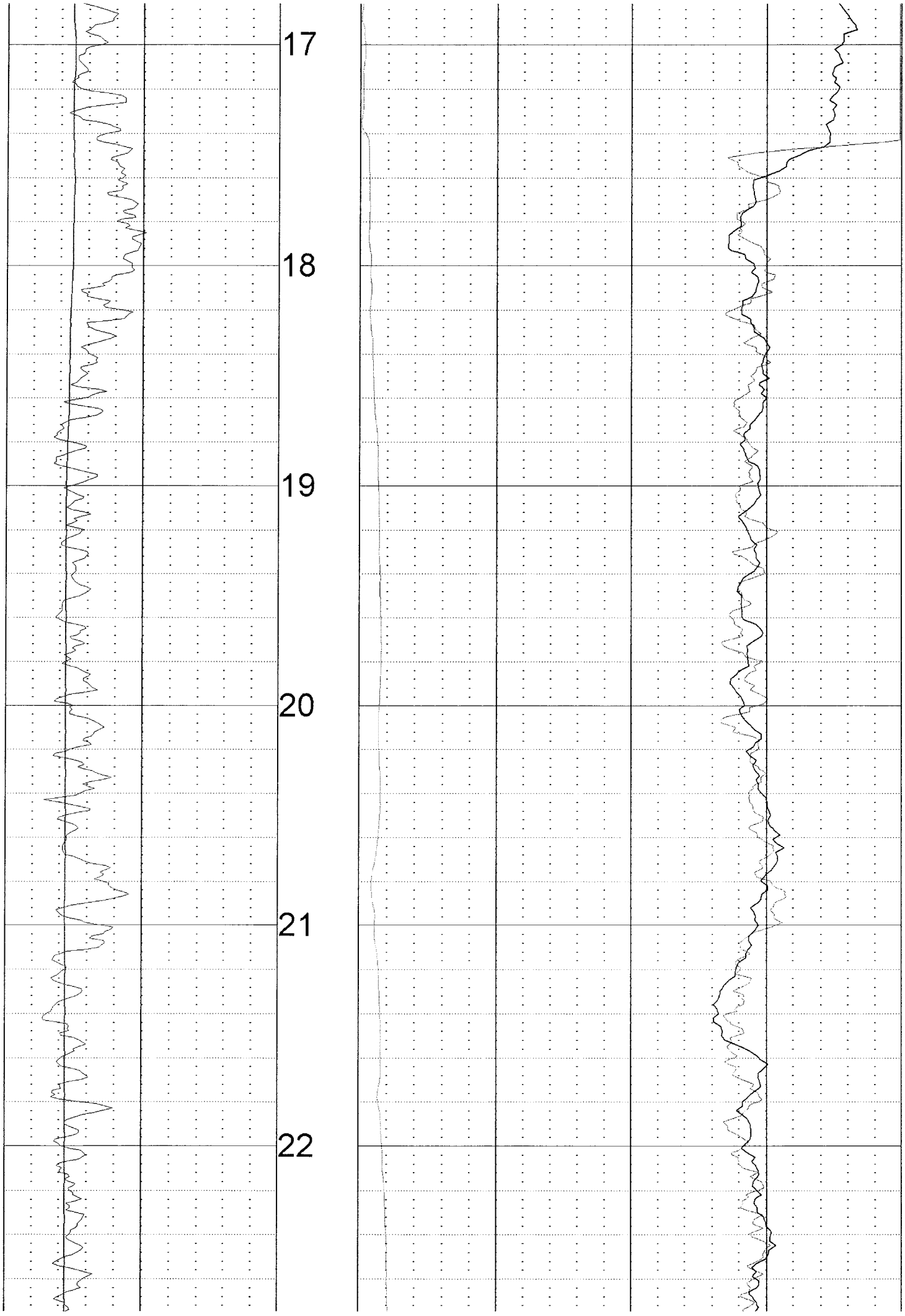
BH22 DENSITY 1:20

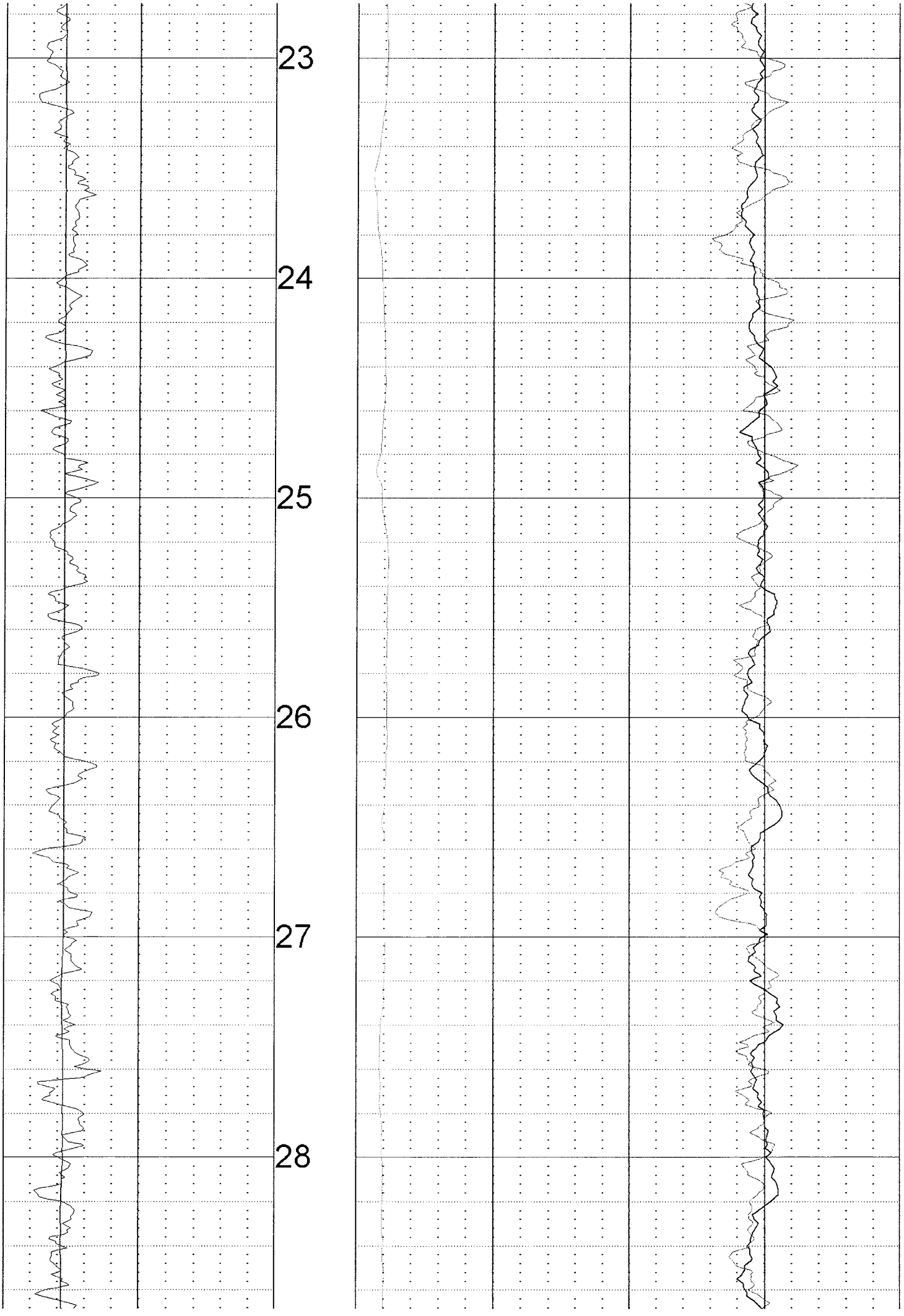
COMPANY	: COFFEY GEOSCIENCES			OTHER SERVICES:	
WELL	: BH22 DENSITY 1:20			DEN,NEU	
LOCATION/FIELD	: JOHN HUNTER HOSPITAL				
COUNTY	: AUST				
LOCATION	: NSW				
SECTION	: 0	TOWNSHIP	: 0	RANGE	: 0
DATE	: 04/17/09	PERMANENT DATUM	: GL		
DEPTH DRILLER	: 92.64			KB	:
LOG BOTTOM	: 89.11	LOG MEASURED FROM:	GL	DF	:
LOG TOP	: -1.06	DRL MEASURED FROM:	GL	GL	: 0
CASING DIAMETER	: 10.	LOGGING UNIT	: 8902		
CASING TYPE	:	FIELD OFFICE	:		
CASING THICKNESS:	.5	RECORDED BY	: I DAVIS		
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: PROCESSED
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9035AA
MATRIX DENSITY	: 2.65	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: SANDSTONE	MATRIX DELTA T	: 177		
				THRESH:	10000

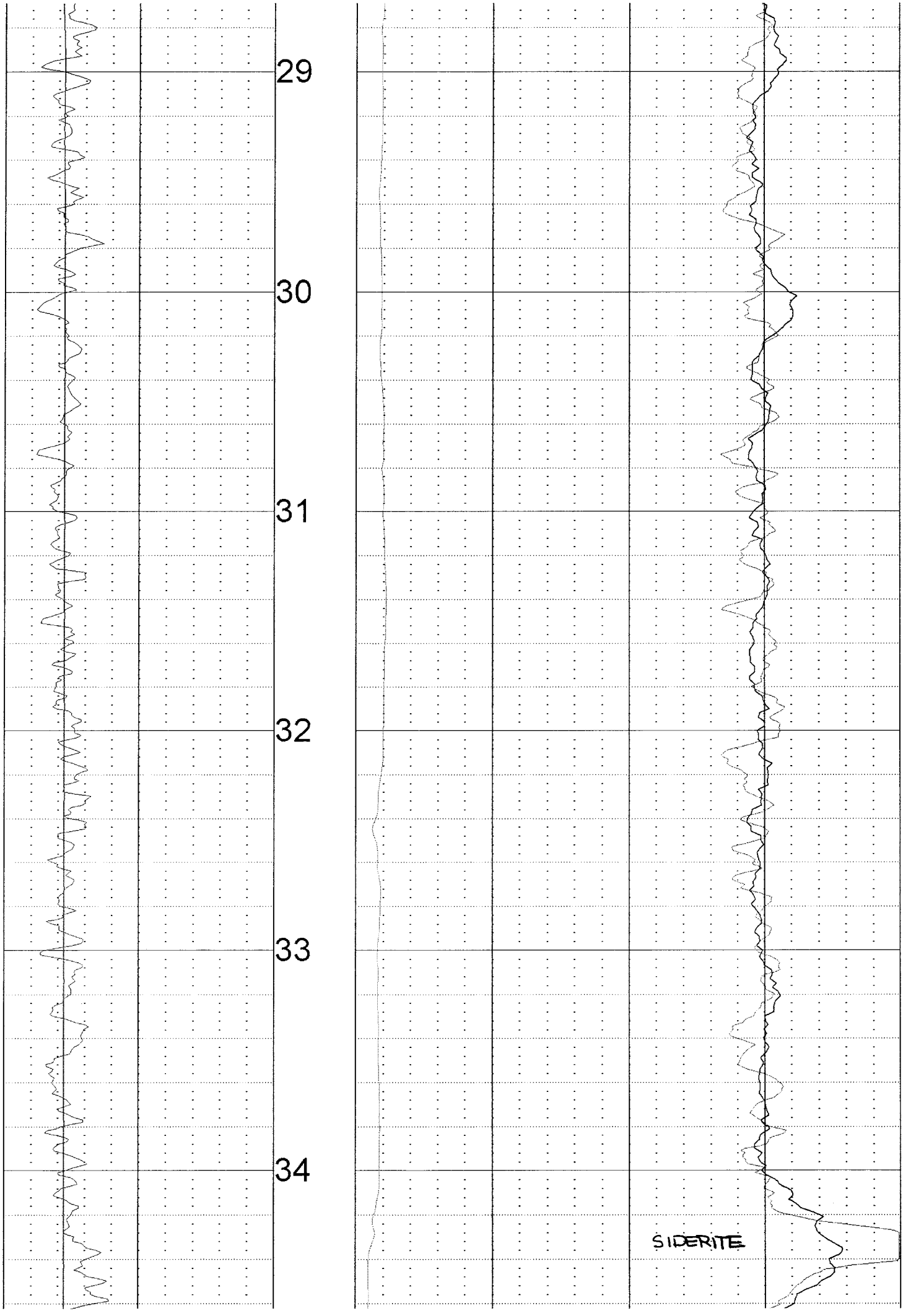

BH 22
METERS
RES(SG)
0 OHM-M 4000
CALIPER
8 CM 18
GAMMA
0 API-GR 300
DEN(LS)
1 G/CC 3
DEN(SS)
1 G/CC 3
0
1
2
3
4
DENSITY (SS)
DENSITY (LS)

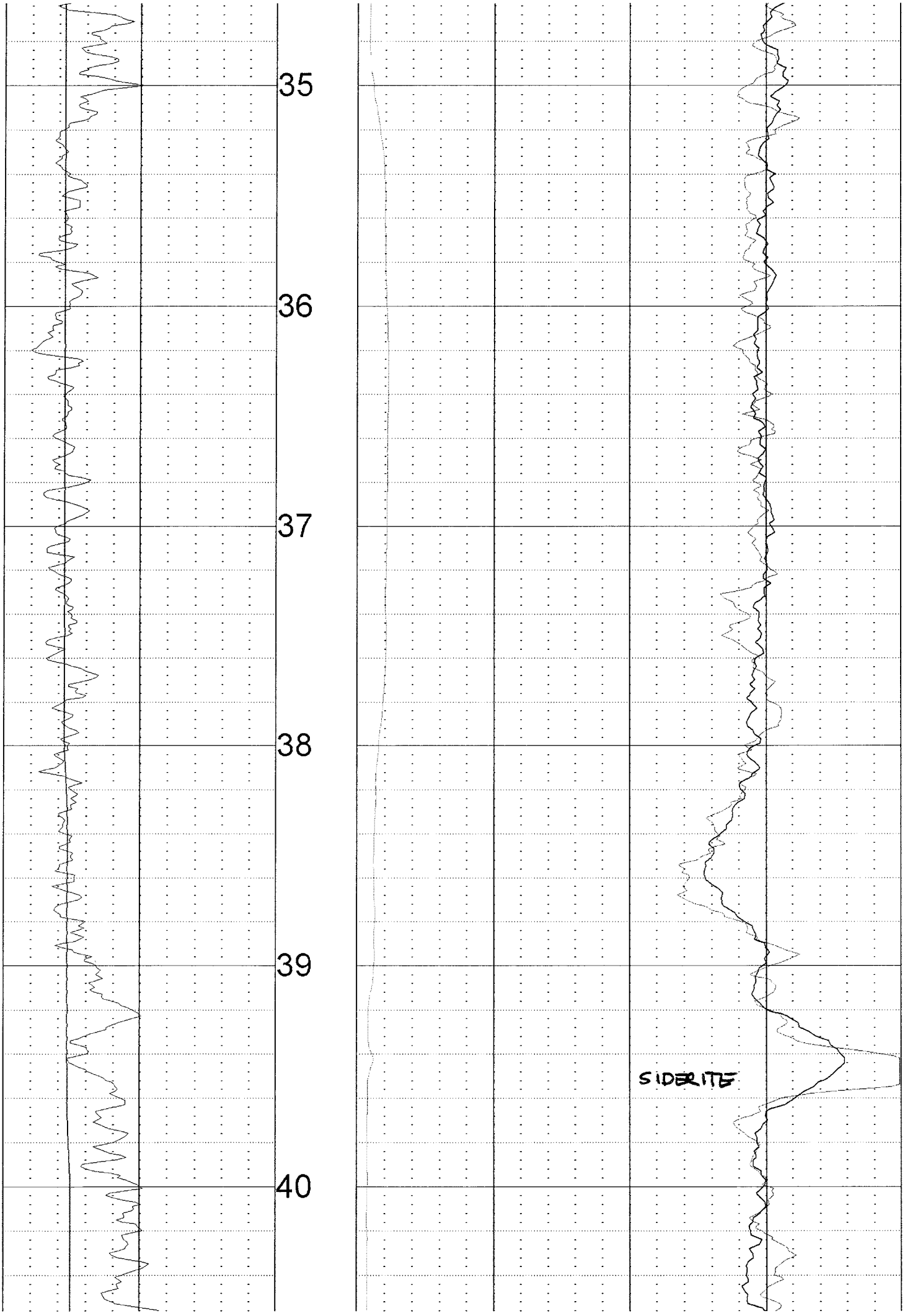

5
6
7
8
9
10

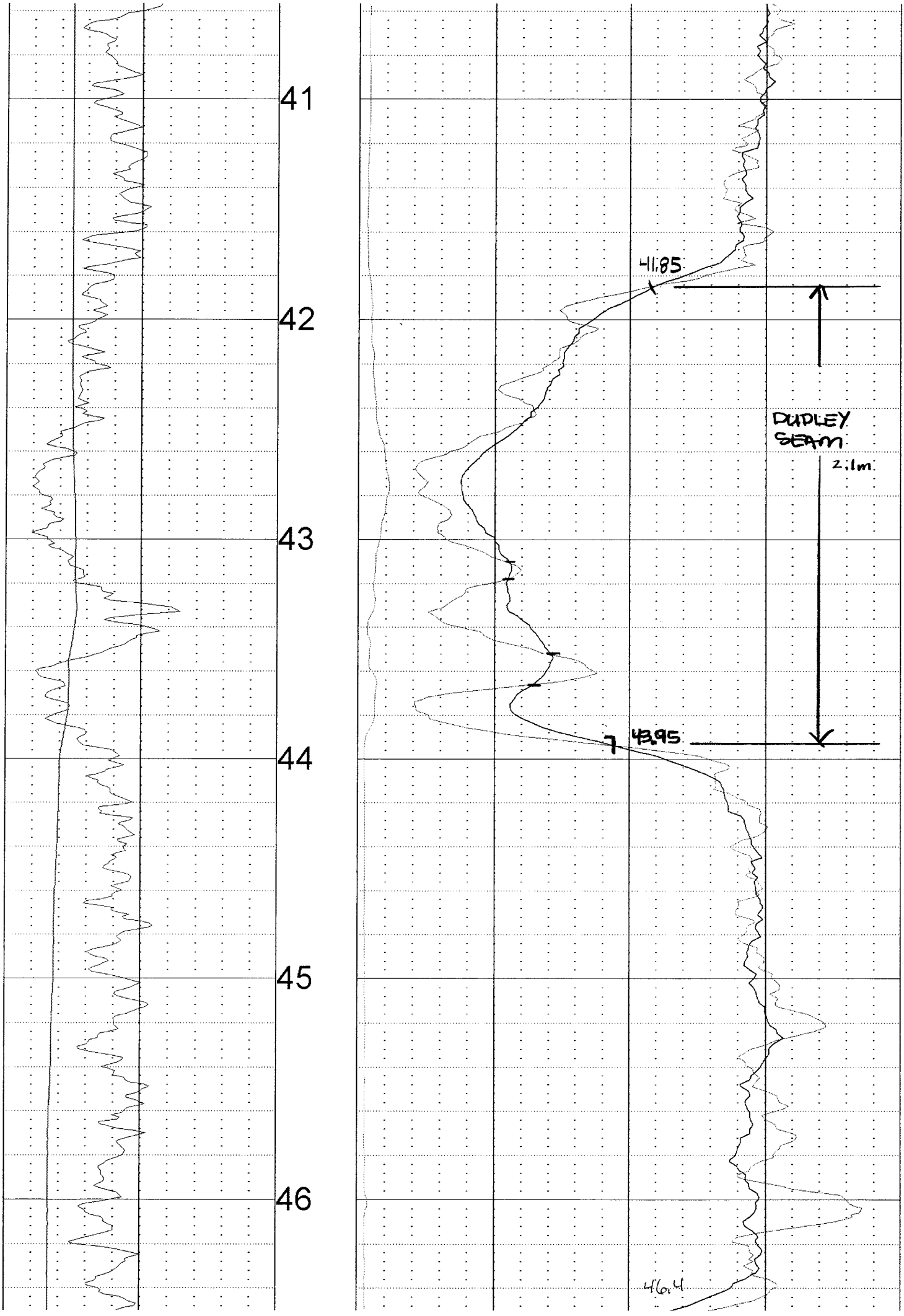

11
12
13
14
15
16
11.83
CARBONACEOUS ZONE
13.1

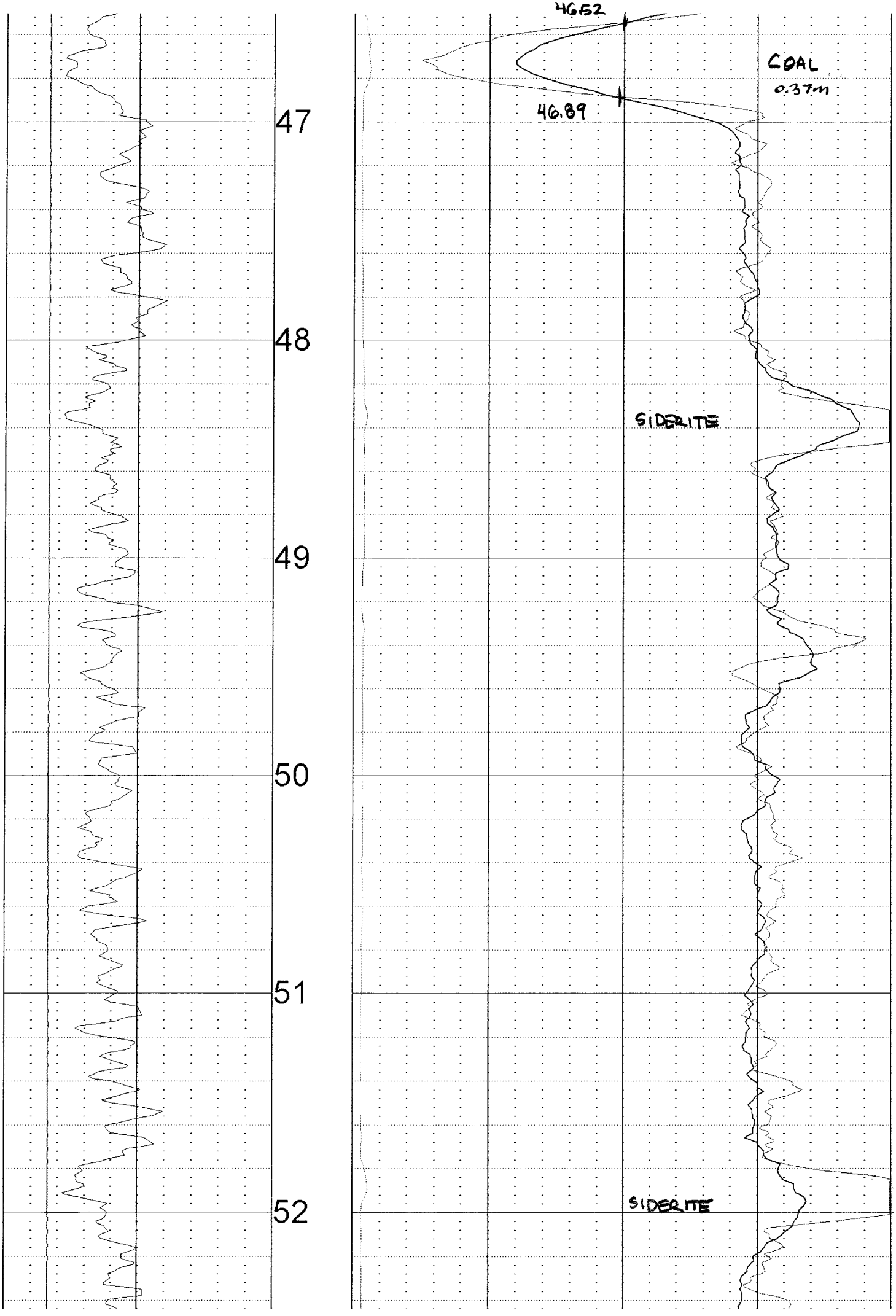

17
18
19
20
21
22

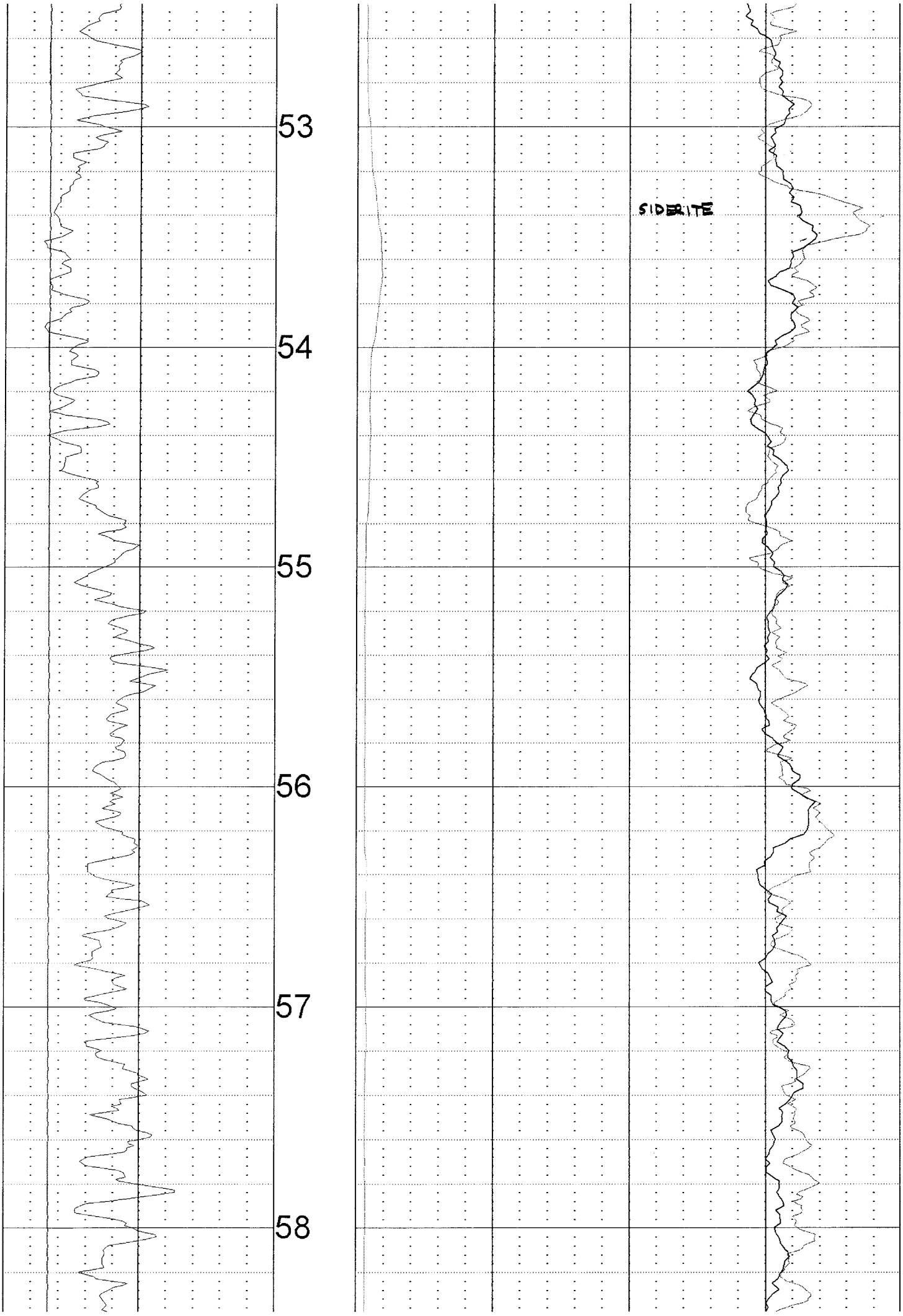

23
24
25
26
27
28

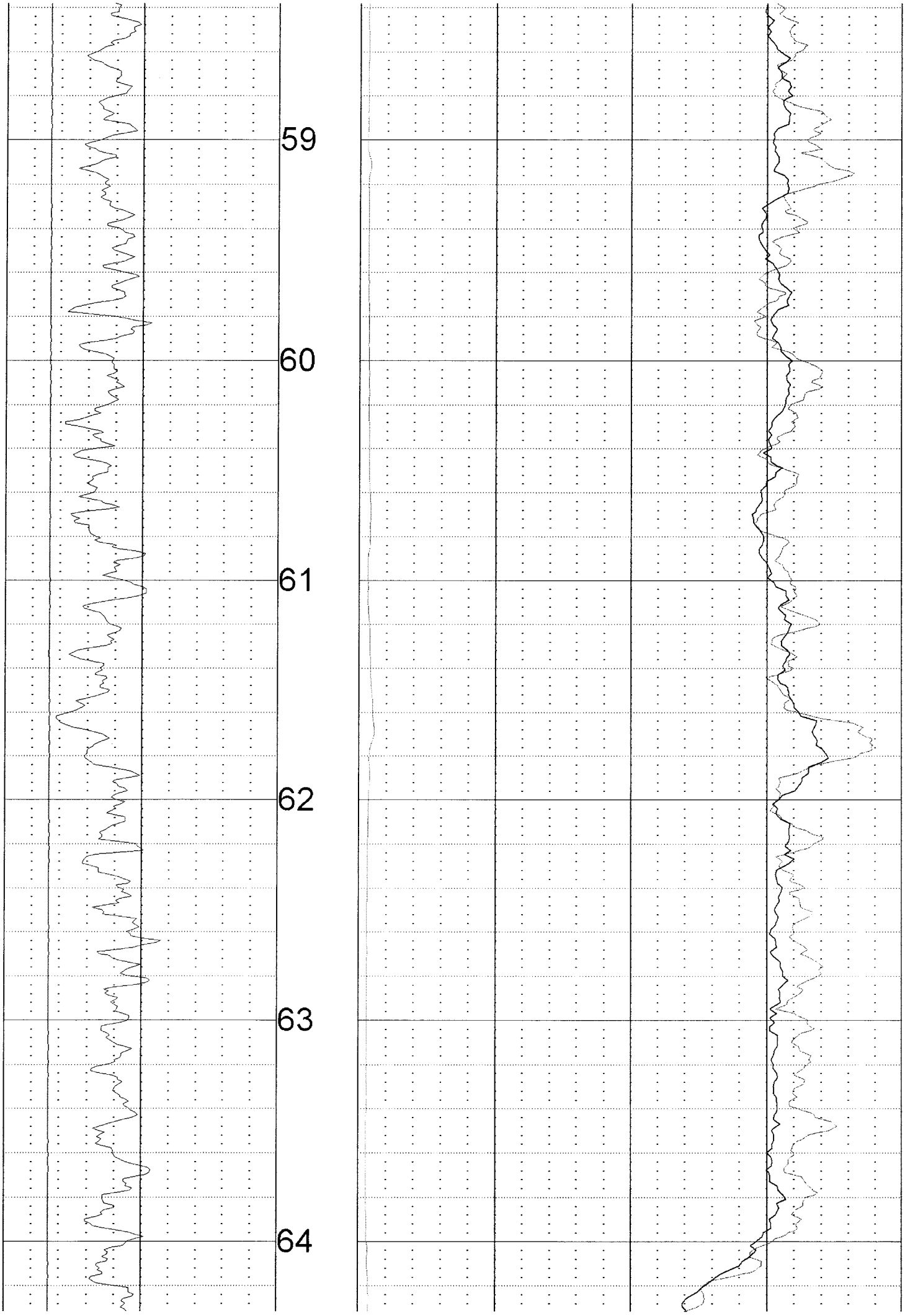

29
30
31
32
33
34
SIDERITE

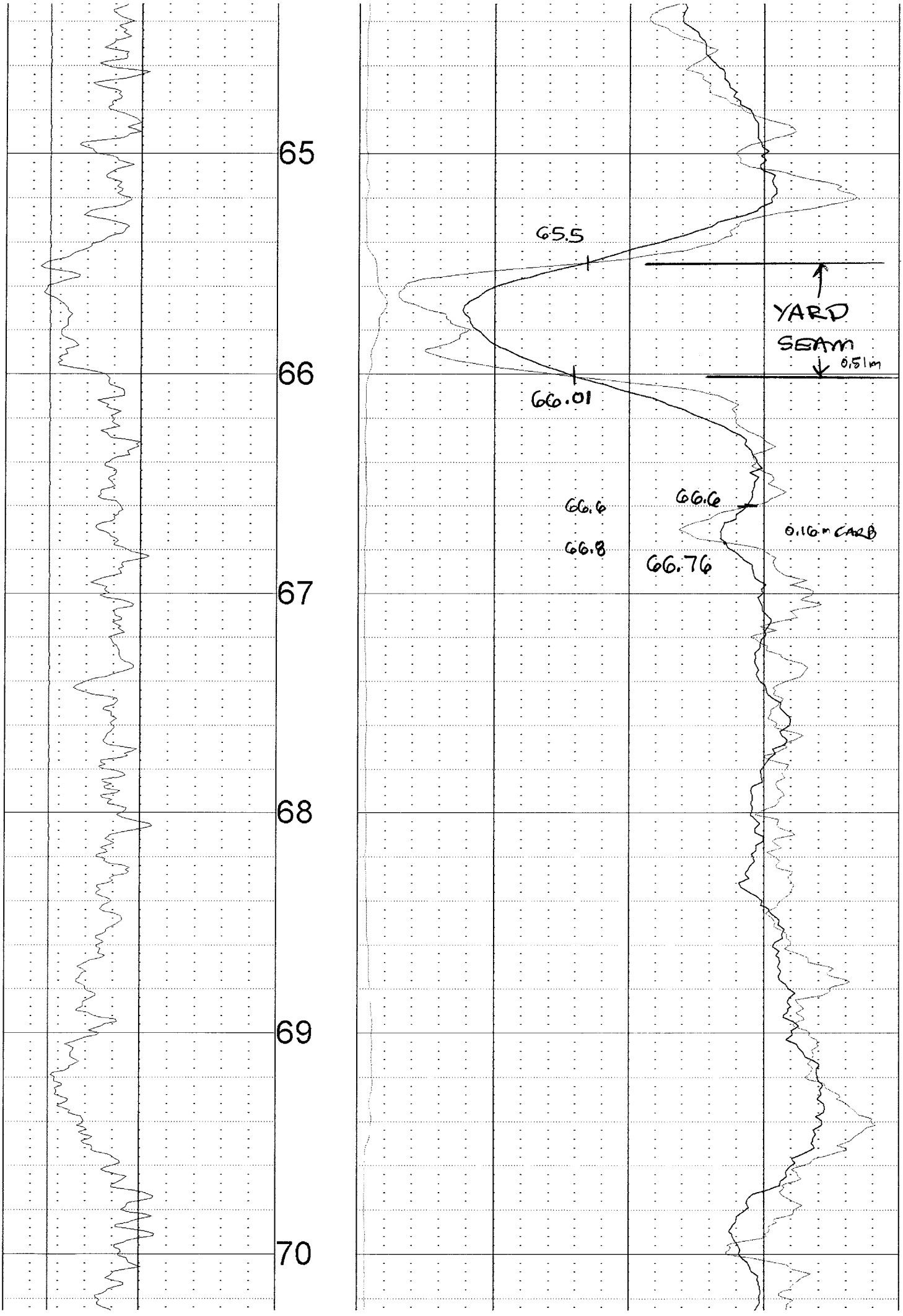

35
36
37
38
39
40
SIDERITE

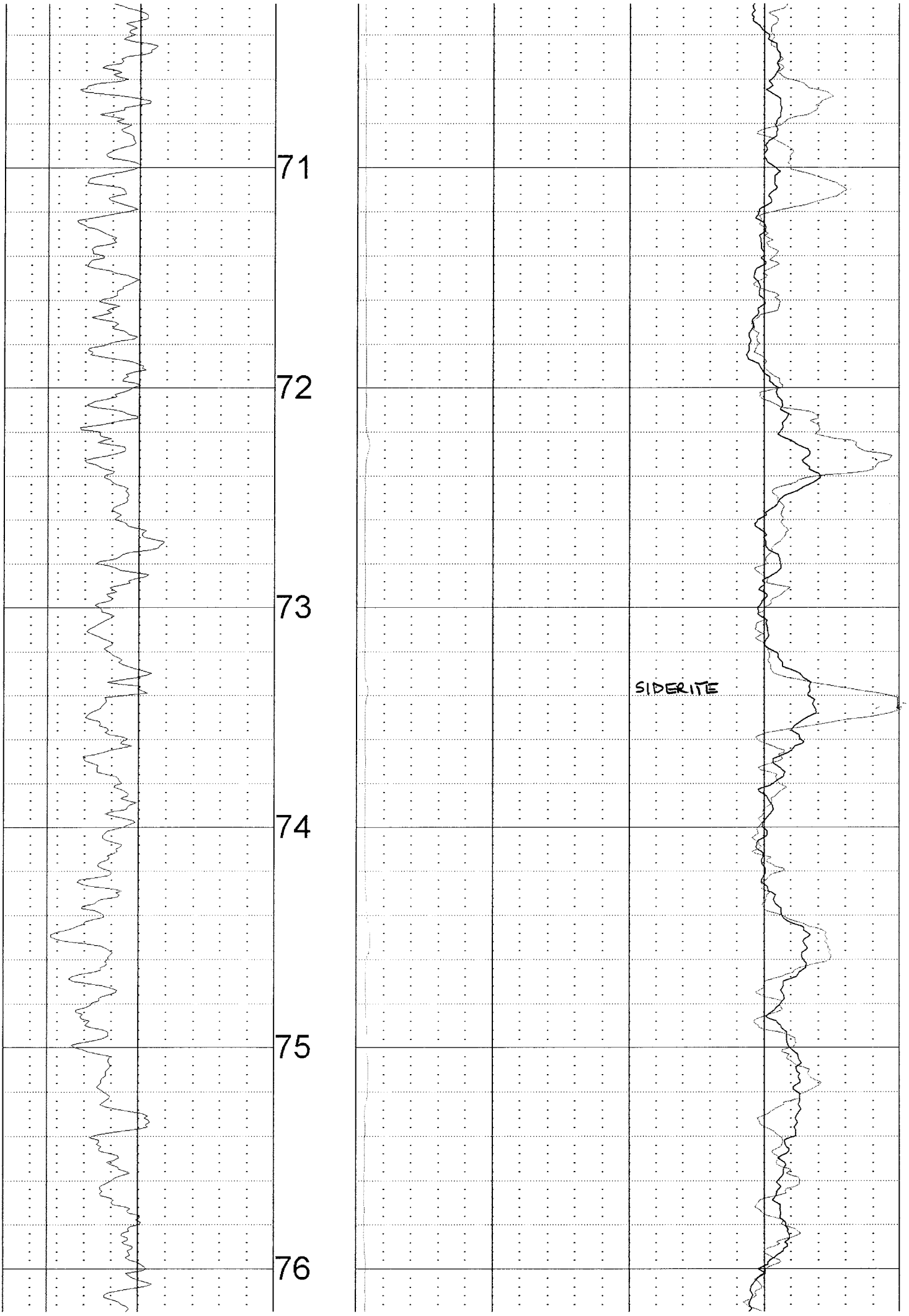

41
42
43
44
45
46
41.85
DUDLEY
SEAM
2.1m
43.95
46.4

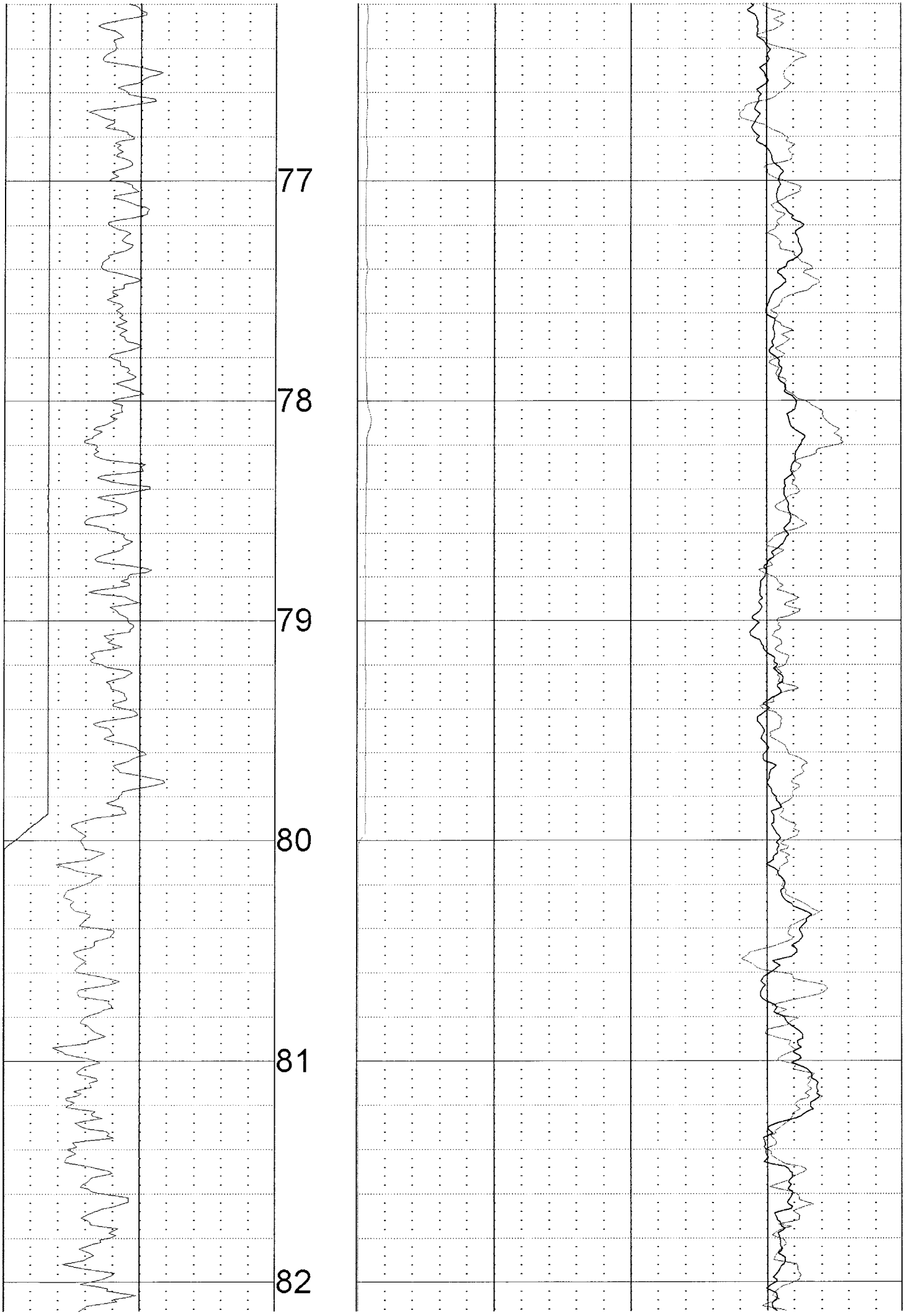

47
48
49
50
51
52
46.52
46.89
COAL
0.37m
SIDERITE
SIDERITE

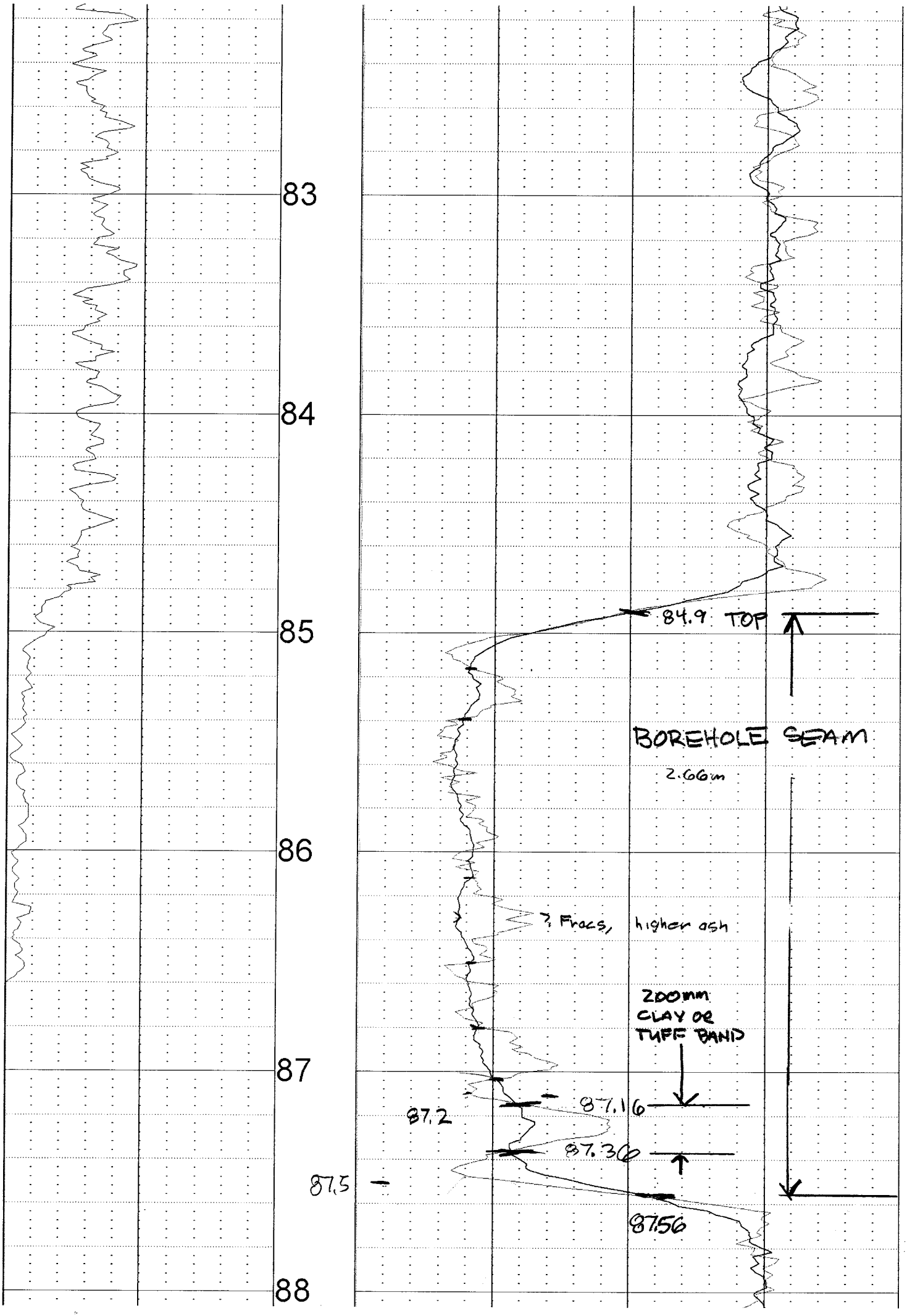

53
54
55
56
57
58
SIDERITE

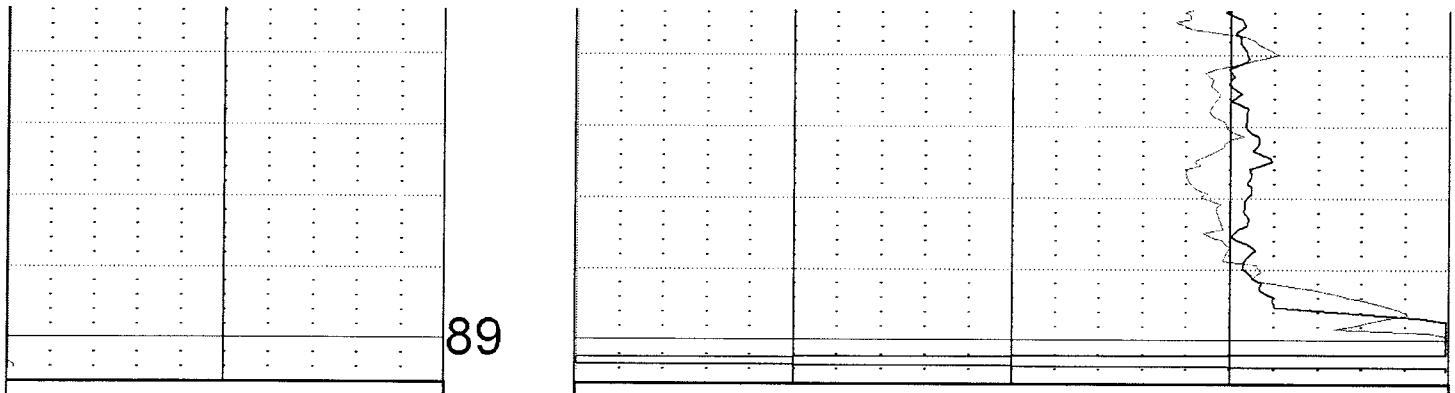

59
60
61
62
63
64


65
66
67
68
69
70
65.5
YARD
SEAM
0.51m
66.01
66.6
66.8
66.6
66.76
0.16m CARB


71
72
73
74
75
76
SIDERITE


77
78
79
80
81
82


83
84
85
86
87
88
84.9 TOP
BOREHOLE SEAM
2.66m
? Fracs, higher ash
200mm
CLAY OR
TUFF BAND
87.16
87.2
87.30
87.5
87.56



0	API-GR	300
GAMMA		
8	CM	18
CALIPER		

89

METERS

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

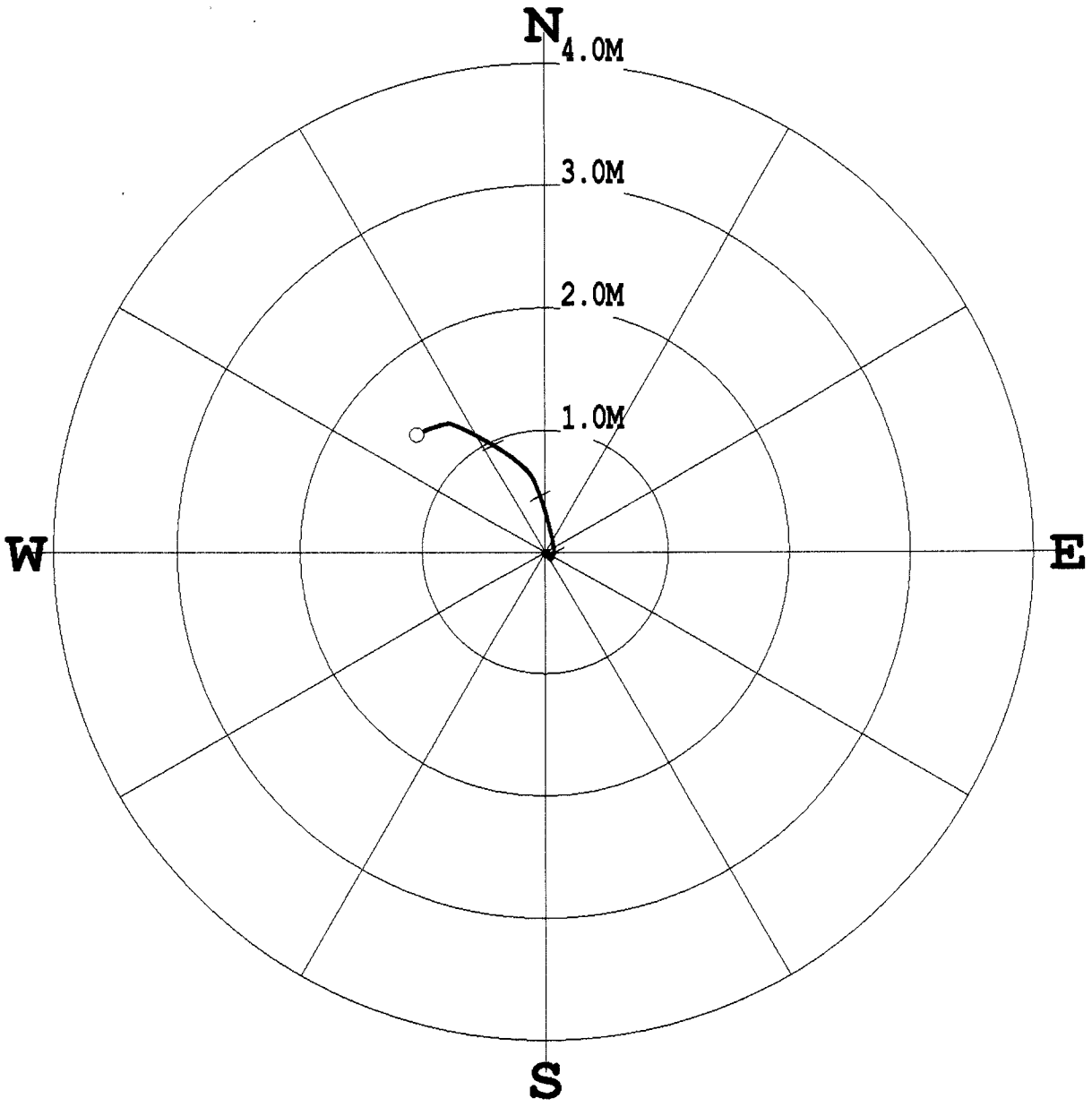
BH 22
BY DLK 28/4/09
CK

PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: COFFEY GEOSCIENCES
LOCATION: JOHN HUNTER HOSPITAL
HOLE ID: BH22 NEUTRON
DATE OF LOG: 04/17/09
PROBE: 9055A 240

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 85.26 M
AZIMUTH: 312.7
DISTANCE: 1.4 M
+ = 20 M INCR
○ = BOTTOM OF HOLE



* * * * * * * COMPU-LOG - VERTICAL DEVIATION

CLIENT : COFFEY GEOSCIENCES HOLE ID. : BH22 NEUTRON
FIELD OFFICE : DATE OF LOG : 04/17/09
DATA FROM : 0 PROBE : 9055A , 240
MAG. DECL. : 0.000 DEPTH UNITS : METERS
LOG: BH22NEUTRON_04-17-09_16-23_9055A_.01_0.06_85.28_DEVI.log

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
1.4	1.44	0.00	0.00	0.0	0.0	0.0	0.0
10.0	10.00	-0.02	0.03	0.0	122.2	0.4	151.9
20.0	20.00	-0.00	0.07	0.1	93.7	1.2	2.6
30.0	30.00	0.21	0.03	0.2	9.1	1.4	349.1
40.0	39.99	0.46	-0.04	0.5	355.0	1.6	342.0
50.0	49.99	0.70	-0.18	0.7	345.6	1.7	307.5
60.0	59.99	0.88	-0.41	1.0	334.8	1.8	302.4
70.0	69.98	1.03	-0.69	1.2	326.0	1.8	294.8
80.0	79.98	1.01	-0.93	1.4	317.4	1.3	250.6
85.3	85.24	0.96	-1.04	1.4	312.7	1.2	241.8

Appendix C

Laboratory Testing Results

POINT LOAD STRENGTH INDEX

Australian Standard AS4133.4.1-1993 Method 4.1:Rock Strength Tests - Determination of Point Load Strength Index

coffey geotechnics SPECIALISTS MANAGING THE EARTH

Job No. 20576AB
Sheet 1 of 3

CLIENT: APP

PROJECT: Proposed HMRI Buildings

LOCATION: John Hunter Hospital

Test Machine: Orange / Digital
Testing Locality: Newcastle Laboratory
Tested By: Gavin Tippett
Test Date: 5-May-09
Checked:

Date of Calibration:
Calibrated By:
Sampled Date:
Storage Location:

Borehole No. / Test Depth (m)		Rock Description	Moisture Condition[1] (N, D or S)	Diametral test							Axial or Irregular lump								Comments / Strength Classification
				Length L [2] (mm)	Diameter D (mm)	Load P (Gauge) (kN)	$I_s=(P/D^2)$ x 1000 (MPa)	Size Correction $F=(D/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D [2] (mm)	D_e^2	Load (Gauge) (kN)	$I_s=(P/D_e^2)$ x 1000 (MPa)	Size Correction $F=(D_e/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Axial)	
BH22	15.35	Sandstone	n	211.0	61.3	1.86	0.49	1.10	0.5	Medium	61.3	30.0	2341	5.88	2.51	0.99	2.5	High	
BH22	16.75	Sandstone	n	126.0	61.3	0.11	0.03	1.10	0.0	V. Low	61.3	28.0	2185	2.48	1.13	0.97	1.1	High	
BH22	18.76	ebbly Sandstor	n	267.0	61.3	6.09	1.62	1.10	1.8	High	61.3	34.0	2654	5.38	2.03	1.01	2.1	High	
BH22	20.40	Conglomerate	n	73.0	61.3	2.97	0.79	1.10	0.9	Medium	61.3	34.0	2654	4.66	1.76	1.01	1.8	High	
BH22	23.80	Conglomerate	n	192.0	61.3	1.11	0.30	1.10	0.3	Medium	61.3	51.0	3981	1.24	0.31	1.11	0.3	Medium	
BH22	26.80	Conglomerate	n	247.0	61.3	4.33	1.15	1.10	1.3	High	61.3	41.0	3200	4.29	1.34	1.06	1.4	High	
BH22	27.65	Conglomerate	n	82.0	61.3	1.03	0.27	1.10	0.3	Medium	61.3	47.0	3668	0.96	0.26	1.09	0.3	Low	
BH22	29.55	Sandstone	n	130.0	61.3	5.02	1.34	1.10	1.5	High	61.3	53.0	4137	7.13	1.72	1.12	1.9	High	
BH22	31.05	Sandstone	n	285.0	61.3	2.41	0.64	1.10	0.7	Medium	61.3	29.0	2263	1.77	0.78	0.98	0.8	Medium	
BH22	33.10	Sandstone	n	84.0	61.3	5.62	1.50	1.10	1.6	High	61.3	39.0	3044	5.27	1.73	1.05	1.8	High	
BH22	34.80	Sandstone	n	30.0	61.3	2.14	0.57	1.10	0.6	Medium	61.3	28.0	2185	4.02	1.84	0.97	1.8	High	
BH22	36.10	Conglomerate	n	128.0	61.3	0.92	0.24	1.10	0.3	Low	61.3	44.0	3434	0.80	0.23	1.07	0.3	Low	
BH22	38.45	Conglomerate	n	47.0	61.3	0.11	0.03	1.10	0.0	V. Low	61.3	47.0	3668	0.47	0.13	1.09	0.1	Low	
BH22	40.08	tstone/Sandsto	n	77.0	61.3	2.30	0.61	1.10	0.7	Medium	61.3	42.0	3278	6.41	1.96	1.06	2.1	High	
BH22	41.57	Silty Shale	n	185.0	61.3	1.50	0.40	1.10	0.4	Medium	61.3	35.0	2732	6.15	2.25	1.02	2.3	High	
BH22	42.54	Coal	n	56.0	61.3	0.78	0.21	1.10	0.2	Low	61.3	36.0	2810	0.30	0.11	1.03	0.1	Low	
BH22	44.52	Silty Shale	n	104.0	61.3	0.29	0.08	1.10	0.1	V. Low	61.3	30.0	2341	1.34	0.57	0.99	0.6	Medium	
BH22	46.46	Silty Shale	n	95.0	61.3	0.10	0.03	1.10	0.0	V. Low	61.3	27.0	2107	1.66	0.79	0.96	0.8	Medium	

NOTES

(1): N = Natural, D = Dry, S = Saturated

(2): L > 0.5D, 0.3 < D/W < 1.0

$I_{s(50)}$ MPa and Strength Classification

< 0.1	Very Low	1 - 3	High
0.1 - 0.3	Low	3 - 10	Very High
0.3 - 1	Medium	> 10	Extreamly High

POINT LOAD STRENGTH INDEX

Australian Standard AS4133.4.1-1993 Method 4.1:Rock Strength Tests - Determination of Point Load Strength Index

coffey geotechnics SPECIALISTS MANAGING THE EARTH

Job No. 20576AB
Sheet 2 of 3

CLIENT: APP

PROJECT: Proposed HMRI Buildings

LOCATION: John Hunter Hospital

Test Machine: Orange / Digital
Testing Locality: Newcastle Laboratory
Tested By: Gavin Tippett
Test Date: 5-May-09
Checked:

Date of Calibration:
Calibrated By:
Sampled Date:
Storage Location:

Borehole No. / Test Depth (m)		Rock Description	Moisture Condition[1] (N, D or S)	Diametral test							Axial or Irregular lump								Comments / Strength Classification
				Length L [2] (mm)	Diameter D (mm)	Load P (Gauge) (kN)	$I_s=(P/D^2)$ x 1000 (MPa)	Size Correction $F=(D/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D [2] (mm)	D_e^2	Load (Gauge) (kN)	$I_s=(P/D_e^2)$ x 1000 (MPa)	Size Correction $F=(D_e/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Axial)	
BH22	48.64	Sandstone	n	36.0	61.3	3.93	1.05	1.10	1.1	High	61.3	36.0	2810	17.07	6.08	1.03	6.2	V. High	
BH22	50.70	Sandstone	n	35.0	61.3	0.34	0.09	1.10	0.1	V. Low	61.3	35.0	2732	4.27	1.56	1.02	1.6	High	
BH22	52.95	Sandstone	n	31.0	61.3	4.69	1.25	1.10	1.4	High	61.3	31.0	2420	9.37	3.87	0.99	3.8	V. High	
BH22	54.90	Silty Shale	n	31.0	61.3	0.90	0.24	1.10	0.3	Low	61.3	31.0	2420	4.36	1.80	0.99	1.8	High	
BH22	55.61	Silty Shale	n	37.0	61.3	0.67	0.18	1.10	0.2	Low	61.3	37.0	2888	7.27	2.52	1.03	2.6	High	
BH22	57.45	Silty Shale	n	38.0	61.3	1.82	0.48	1.10	0.5	Medium	61.3	38.0	2966	3.67	1.24	1.04	1.3	High	
BH22	59.80	Sandstone	n	42.0	61.3	2.99	0.80	1.10	0.9	Medium	61.3	42.0	3278	7.81	2.38	1.06	2.5	High	
BH22	61.20	Sandstone	n	28.0	61.3	2.48	0.66	1.10	0.7	Medium	61.3	28.0	2185	7.12	3.26	0.97	3.2	V. High	
BH22	63.25	Silty Shale	n	29.0	61.3	0.54	0.14	1.10	0.2	Low	61.3	29.0	2263	1.84	0.81	0.98	0.8	Medium	
BH22	66.05	Silty Shale	n	25.0	61.3	0.10	0.03	1.10	0.0	V. Low	61.3	25.0	1951	1.35	0.69	0.95	0.7	Medium	
BH22	67.90	Silty Shale	n	30.0	61.3	0.30	0.08	1.10	0.1	V. Low	61.3	30.0	2341	3.57	1.52	0.99	1.5	High	
BH22	68.85	Sandstone	n	38.0	61.3	10.51	2.80	1.10	3.1	V. High	61.3	38.0	2966	19.22	6.48	1.04	6.7	V. High	
BH22	70.95	Silty Shale	n	22.0	61.3	0.10	0.03	1.10	0.0	V. Low	61.3	22.0	1717	2.58	1.50	0.92	1.4	High	
BH22	71.80	Sandstone	n	27.0	61.3	9.27	2.47	1.10	2.7	High	61.3	27.0	2107	7.99	3.79	0.96	3.6	V. High	
BH22	72.98	Sandstone	n	24.0	61.3	1.54	0.41	1.10	0.4	Medium	61.3	24.0	1873	2.97	1.59	0.94	1.5	High	
BH22	74.47	Sandstone	n	30.0	61.3	10.05	2.67	1.10	2.9	High	61.3	30.0	2341	7.27	3.10	0.99	3.1	V. High	
BH22	76.18	Sandstone	n	35.0	61.3	1.75	0.47	1.10	0.5	Medium	61.3	35.0	2732	5.35	1.96	1.02	2.0	High	
BH22	77.45	Silty Shale	n	29.0	61.3	0.31	0.08	1.10	0.1	V. Low	61.3	29.0	2263	2.98	1.32	0.98	1.3	High	

NOTES

(1): N = Natural, D = Dry, S = Saturated

(2): L > 0.5D, 0.3 < D/W < 1.0

$I_{s(50)}$ MPa and Strength Classification

< 0.1	Very Low	1 - 3	High
0.1 - 0.3	Low	3 - 10	Very High
0.3 - 1	Medium	> 10	Extreamly High

POINT LOAD STRENGTH INDEX

Australian Standard AS4133.4.1-1993 Method 4.1:Rock Strength Tests - Determination of Point Load Strength Index

coffey geotechnics SPECIALISTS MANAGING THE EARTH

Job No. 20576AB
Sheet 3 of 3

CLIENT: APP

PROJECT: Proposed HMRI Buildings

LOCATION: John Hunter Hospital

Test Machine: Orange / Digital
Testing Locality: Newcastle Laboratory
Tested By: Gavin Tippett
Test Date: 5-May-09
Checked:

Date of Calibration:
Calibrated By:
Sampled Date:
Storage Location:

Borehole No. / Test Depth (m)		Rock Description	Moisture Condition[1] (N, D or S)	Diametral test							Axial or Irregular lump								Comments / Strength Classification
				Length L [2] (mm)	Diameter D (mm)	Load P (Gauge) (kN)	$I_s=(P/D^2)$ x 1000 (MPa)	Size Correction $F=(D/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D [2] (mm)	D_e^2	Load (Gauge) (kN)	$I_s=(P/D_e^2)$ x 1000 (MPa)	Size Correction $F=(D_e/50)^{\wedge 0.45}$	$I_{s(50)}$ (MPa)	Strength Class (Axial)	
BH22	80.05	Silty Shale	n	27.0	61.3	1.01	0.27	1.10	0.3	**Low**	61.3	27.0	2107	1.48	0.70	0.96	0.7	**Medium**	
BH22	82.52	Silty Shale	n	40.0	61.3	2.20	0.59	1.10	0.6	**Medium**	61.3	40.0	3122	7.55	2.42	1.05	2.5	**High**	
BH22	84.53	Silty Shale	n	20.0	61.3	1.59	0.42	1.10	0.5	**Medium**	61.3	20.0	1561	0.35	0.22	0.90	0.2	**Low**	
BH22	87.90	Sandstone	n	40.0	61.3	6.99	1.86	1.10	2.0	**High**	61.3	40.0	3122	5.68	1.82	1.05	1.9	**High**	
BH22	89.02	Sandstone	n	31.0	61.3	7.41	1.97	1.10	2.2	**High**	61.3	31.0	2420	3.86	1.60	0.99	1.6	**High**	

NOTES

(1): N = Natural, D = Dry, S = Saturated

(2): L > 0.5D, 0.3 < D/W < 1.0

$I_{s(50)}$ MPa and Strength Classification

< 0.1	Very Low	1 - 3	High
0.1 - 0.3	Low	3 - 10	Very High
0.3 - 1	Medium	> 10	Extreamly High

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

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ABN: 92 114 364 046

uniaxial compressive strength

client:	COFFEY GEOTECHNICS - WARABROOK	job no:	INFOGLEN 00204AA
principal:		laboratory:	Glendenning
project:	GEOTWARA 20576AB - PROPOSED H.M.R.I. BUILDINGS	report date:	15 May 2009
location:	JOHN HUNTER HOSPITAL	borehole:	BH 22
	test procedure: AS 4133.1.1.1 and 4133.4.2	date received:	11 May 2009
	test apparatus: Avery with 200 kN CAS load cell S/N 080LSOO602001		page: 1 of 3

The samples were received on the 11th May, 2009. They had been wrapped in bubble wrap, sealed with tape and transported in a carton.
The samples were tested with an 'as received' moisture condition.

QESTLAB work order ID / depth / QESTLab sample ID	date tested / test duration	height / average diameter / height/dia ratio	uniaxial compressive strength MPa	wet density / moisture content	sample description / bedding/foliation	comments / failure mechanism
GLEN09W-00524 BH 22 31.375 to 31.55 m GLEN09S-01705	12 May 09 7.27 min	176 mm 60.9 mm 2.89:1	14.4	2.4 t/m³ 2.3 %	conglomerate Massive.	GT 1 Multiple axial splits around large clasts
GLEN09W-00524 BH 22 35.015 to 35.18 m GLEN09S-01710	12 May 09 9.32 min	165 mm 60.7 mm 2.72:1	16.7	2.5 t/m³ 1.9 %	conglomerate Massive.	GT 6 Single shear failure with multiple axial fractures around large clasts
GLEN09W-00524 BH 22 47.645 to 47.82 m GLEN09S-01706	13 May 09 12.22 min	174 mm 60.6 mm 2.86:1	24.1	2.5 t/m³ 2.7 %	silty shale Wavy bedding	GT 2 Multiple axial failures and disintegration
GLEN09W-00524 BH 22 77.365 to 77.52 m GLEN09S-01708	13 May 09 9.82 min	155 mm 60.7 mm 2.56:1	28.8	2.6 t/m³ 2.5 %	silty shale Wavy bedding	GT 4 Multiple axial failures and disintegration
GLEN09W-00524 BH 22 82.145 to 82.32 m GLEN09S-01709	13 May 09 9.70 min	177 mm 60.7 mm 2.92:1	12.5	2.5 t/m³ 2.7 %	silty shale Wavy bedding	GT 5 There was a split present in the sample at an angle of 15° to the axis of loading Failed along existing split

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Authorised Signature:
Alan Cocks
Associate Geotechnician

Date: 15 May 2009

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

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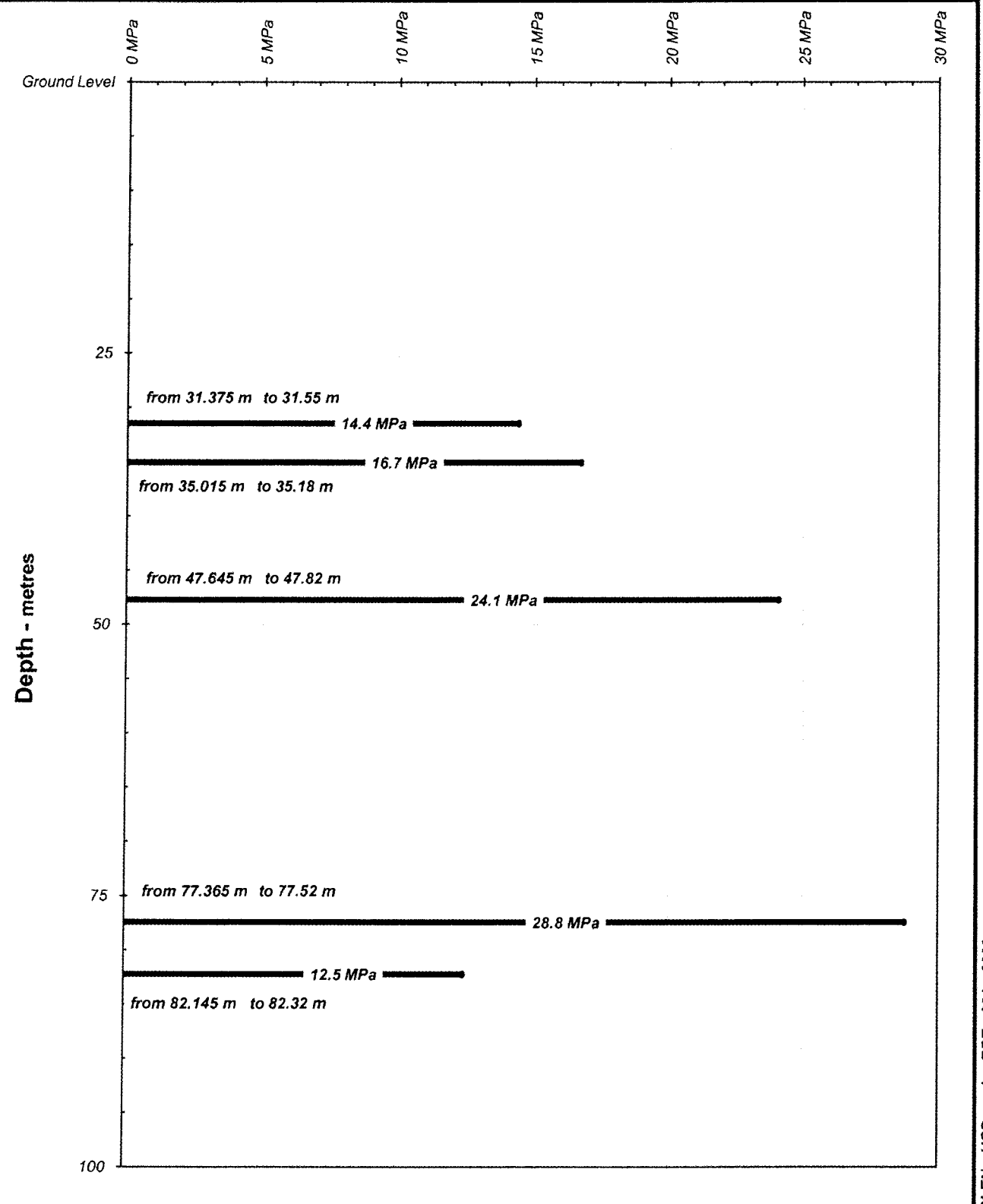
ABN: 92 114 364 046

uniaxial compressive strength - graphical summary

client:	COFFEY GEOTECHNICS - WARABROOK	job no:	INFOGLEN 00204AA
principal:		laboratory:	Glendenning
project:	GEOTWARA 20576AB - PROPOSED H.M.R.I. BUILDINGS	report date:	15 May 2009
location:	JOHN HUNTER HOSPITAL	borehole:	BH 22
test procedure:	AS 4133.1.1.1 and 4133.4.2	page:	2 of 3
test apparatus:	Avery with 200 kN CAS load cell S/N 080LSOO602001		



GLEN---UCSgraph---RPT---001---2009

coffey information
SPECIALISTS IN SCIENTIFIC TESTING SOLUTIONS

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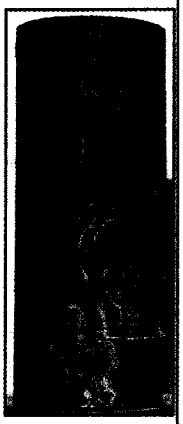
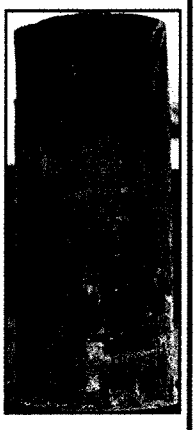
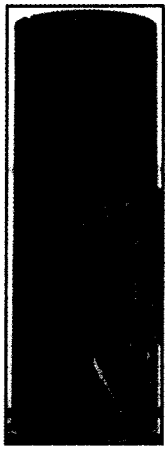
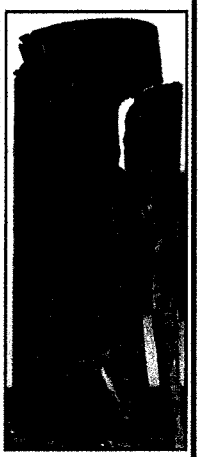
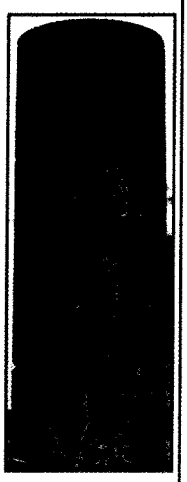
ABN: 92 114 364 046

picture summary

client:	COFFEY GEOTECHNICS - WARABROOK	job no:	INFOGLEN 00204AA
principal:		laboratory:	Glendenning
project:	GEOTWARA 20576AB - PROPOSED H.M.R.I. BUILDINGS	report date:	15 May 2009
location:	JOHN HUNTER HOSPITAL	borehole:	BH 22

QESTLab work order ID borehole and depth QESTLab sample ID comments	received sample	tested sample	QESTLab work order ID borehole and depth QESTLab sample ID comments	received sample	tested sample
GLEN09W-00524 BH 22 31.375 to 31.55 m GLEN09S-01705 uniaxial compressive strength **14.4 MPa** GT 1			GLEN09W-00524 BH 22 77.365 to 77.52 m GLEN09S-01708 uniaxial compressive strength **28.8 MPa** GT 4		
GLEN09W-00524 BH 22 35.015 to 35.18 m GLEN09S-01710 uniaxial compressive strength **16.7 MPa** GT 6			GLEN09W-00524 BH 22 82.145 to 82.32 m GLEN09S-01709 uniaxial compressive strength **12.5 MPa** GT 5 *There was a split present in the sample at an angle of 15° to the axis of loading*		
GLEN09W-00524 BH 22 47.645 to 47.82 m GLEN09S-01706 uniaxial compressive strength **24.1 MPa** GT 2			uniaxial compressive strength		

GLEN---UCSpica---RPT---001---2009

Appendix D

Calculations

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Pillar Stability Spreadsheet - Rectangular

Job No	GEOTWARA20576AB		
Sheet	1 of 3		
Client	John Hunter Hospital	Office	NEWCASTLE
Principal		Date	26/05/09
Project	HMRI Building Mine Subsidence Assessmsnt	By	DLK
Location	Newcastle, NSW	Checked	

BOREHOLE SEAM DRY

Pillar 12

	INPUT			OUTPUT	
COVER DEPTH H	77.8	m	INITIAL STRESS	1.946	MPa
MINIMUM PILLAR WIDTH w_1	2.5	m	% EXTRACTION	73.7	%
MAXIMUM PILLAR WIDTH w_2	35.0	m	Shape Factor Q	1.000	3 [R
ANGLE BETWEEN ADJACENT PILLARS f	90.0	deg.	$w = w_1 Sin(f)$	2.5	m
CENTRE-TO-CENTRE WIDTH c_1	9.0	m	$c = c_1 Sin(f)$	9.0	m
CENTRE-TO-CENTRE LENGTH c_2	37.0	m	AVERAGE PILLAR STRESS	7.406	MPa
PILLAR HEIGHT h	2.0	m	ADBUTMENT LOAD	0.000	MPa
ROCK DENSITY	2.5	t/m3	STRESS INCREASE	5.460	MPa
DISTANCE TO COMPLETE EXTRACTION	47.3		R = w/h	1.25	
EFFECTIVE PILLAR WIDTH w_{eff} (R<3)	2.5	m	PILLAR STRENGTH (R < 5)	7.666	MPa
EFFECTIVE PILLAR WIDTH w_{eff} (3 [R [6)	NA	m	PILLAR STRENGTH (R > 5)	NA	MPa Squat
EFFECTIVE PILLAR WIDTH w_{eff} (R>6)	NA	m	FOS TRIB ONLY	1.0	
			FOS TRIB PLUS ABUT	1.0	

Pillar 13

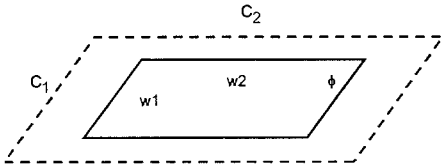
	INPUT			OUTPUT	
COVER DEPTH H	79.6	m	INITIAL STRESS	1.990	MPa
MINIMUM PILLAR WIDTH w_1	8.5	m	% EXTRACTION	49.8	%
MAXIMUM PILLAR WIDTH w_2	37.0	m	Shape Factor Q	1.2	3 [R
ANGLE BETWEEN ADJACENT PILLARS f	90.0	deg.	$w = w_1 Sin(f)$	8.5	m
CENTRE-TO-CENTRE WIDTH c_1	15.8	m	$c = c_1 Sin(f)$	15.8	m
CENTRE-TO-CENTRE LENGTH c_2	39.8	m	AVERAGE PILLAR STRESS	3.961	MPa
PILLAR HEIGHT h	2.0	m	ADBUTMENT LOAD	0.066	MPa
ROCK DENSITY	2.5	t/m3	STRESS INCREASE	2.037	MPa
DISTANCE TO COMPLETE EXTRACTION	34.6		R = w/h	4.3	
EFFECTIVE PILLAR WIDTH w_{eff} (R<3)	NA	m	PILLAR STRENGTH (R < 5)	15.868	MPa
EFFECTIVE PILLAR WIDTH w_{eff} (3 [R [6)	10.41	m	PILLAR STRENGTH (R > 5)	NA	MPa Squat
EFFECTIVE PILLAR WIDTH w_{eff} (R>6)	NA	m	FOS TRIB ONLY	4.0	
			FOS TRIB PLUS ABUT	3.9	

Pillar 14

	INPUT			OUTPUT	
COVER DEPTH H	81.1	m	INITIAL STRESS	2.027	MPa
MINIMUM PILLAR WIDTH w_1	6.0	m	% EXTRACTION	61.0	%
MAXIMUM PILLAR WIDTH w_2	37.0	m	Shape Factor Q	1.0	3 [R
ANGLE BETWEEN ADJACENT PILLARS f	90.0	deg.	$w = w_1 Sin(f)$	6.0	m
CENTRE-TO-CENTRE WIDTH c_1	14.5	m	$c = c_1 Sin(f)$	14.5	m
CENTRE-TO-CENTRE LENGTH c_2	39.3	m	AVERAGE PILLAR STRESS	5.197	MPa
PILLAR HEIGHT h	2.0	m	ADBUTMENT LOAD	1.099	MPa
ROCK DENSITY	2.5	t/m3	STRESS INCREASE	4.269	MPa
DISTANCE TO COMPLETE EXTRACTION	19.4		R = w/h	3.00	
EFFECTIVE PILLAR WIDTH w_{eff} (R<3)	NA	m	PILLAR STRENGTH (R < 5)	11.981	MPa
EFFECTIVE PILLAR WIDTH w_{eff} (3 [R [6)	6.00	m	PILLAR STRENGTH (R > 5)	NA	MPa Squat
EFFECTIVE PILLAR WIDTH w_{eff} (R>6)	NA	m	FOS TRIB ONLY	2.3	
			FOS TRIB PLUS ABUT	1.9	

NOTES:

1. Pillar Strength Formulas are UNSW Power Law Formulas for Rectangular and Irregular Pillars (J.M. Galvin, B.K. Hebblewhite, M.D.G. Salamon, B.B Lin) ACARP Research Report No. C5024 UNSW Dec 1998
2. Effective Pillar Width for Rectangular Pillars $W_e = 2(WL)/(W+L)$ (Wagner,1974) for Strength Calculation(refer text)



coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Pillar Stability Spreadsheet - Rectangular

Job No	*GEOTWARA20576AB*		
Sheet	2 of 3		
Client	*John Hunter Hospital*	Office	*NEWCASTLE*
Principal		Date	*26/05/09*
Project	*HMRI Building Mine Subsidence Assessmsnt*	By	DLK
Location	*Newcastle, NSW*	Checked	

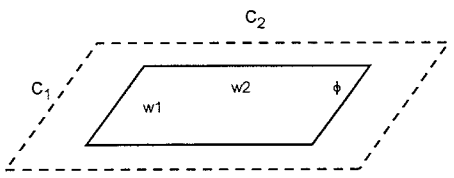
BOREHOLE SEAM DRY

Pillar 15

	INPUT			OUTPUT	
COVER DEPTH H	81.8	m	**INITIAL STRESS**	2.046	MPa
MINIMUM PILLAR WIDTH w_1	4.7	m	% EXTRACTION	65.1	%
MAXIMUM PILLAR WIDTH w_2	38.0	m	Shape Factor Q	1.000	3 [R
ANGLE BETWEEN ADJACENT PILLARS f	90.0	deg.	$w = w_1 Sin(f)$	4.7	m
CENTRE-TO-CENTRE WIDTH c_1	12.7	m	$c = c_1 Sin(f)$	12.7	m
CENTRE-TO-CENTRE LENGTH c_2	40.3	m	**AVERAGE PILLAR STRESS**	5.856	MPa
PILLAR HEIGHT h	2.0	m	ADBUTMENT LOAD	4.760	MPa
ROCK DENSITY	2.5	t/m3	STRESS INCREASE	8.570	MPa
DISTANCE TO COMPLETE EXTRACTION	5.8		**R = w/h**	2.35	
EFFECTIVE PILLAR WIDTH w_{eff} (R<3)	4.7	m	**PILLAR STRENGTH (R < 5)**	10.578	MPa
EFFECTIVE PILLAR WIDTH w_{eff} (3 [R [6)	NA	m	**PILLAR STRENGTH (R > 5)**	NA	MPa Squat
EFFECTIVE PILLAR WIDTH w_{eff} (R>6)	NA	m	**FOS** TRIB ONLY	1.8	
			FOS TRIB PLUS ABUT	1.0	

NOTES:

1. Pillar Strength Formulas are UNSW Power Law Formulas for Rectangular and Irregular Pillars (J.M. Galvin, B.K. Hebblewhite, M.D.G. Salamon, B.B Lin) ACARP Research Report No. C5024 UNSW Dec 1998
2. Effective Pillar Width for Rectangular Pillars $W_e=2(WL)/(W+L)$ (Wagner,1974) for Strength Calculation(refer text)



	drawn	approved	date

Pillar Location Sketch

0 20 40 80 120

Scale (metres)

3/3

drawn	
approved	
date	
scale	1:2000
original size	A3

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Computations

project no:

sheet 1 of 7

client:

office:

principal:

date: 25/5/09

project: Hunter Hospital

by: DLK

location:

checked:

Estimate Remaining subsidence

Since it is estimated 0.5m of crush occurred in BH6 & 0.29m of crush is estimated in BH22, it is estimated that 0.2m of crush remains in BH22.

If 0.2m of additional crushing occurs, the estimated surface subsidence is 0.55 (0.2m) = 0.11m = 110mm

Note: calculations based on uniform ground surface that is approx level.

$$\frac{W}{H} = \frac{70m}{80m} = 0.875$$

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Computations project no: sheet 2 of 7

client: office:

principal: date: 25/5/09

project: Hunter Hospital by: DLK

location: checked: GB

Estmate max tensile strain

$$E_{max} = 1000(K1)\, S_{max}/H$$

From Holla, Fig 10 $K_1 = 0.55$

$$+E_{max} = 1000\,(0.55)\left(\frac{0.11m}{80m}\right)$$

$$= 0.76\ mm/m$$

Estimate max compressive strain

From Holla, Fig 11 $K_2 = 0.9$

$$-E_{max} = 1000\,(K_2)\frac{S_{max}}{H}$$

$$= 1000\,(0.9)\left(\frac{0.11m}{80m}\right)$$

$$= 1.24\ \frac{mm}{m}$$

Est Max tilt

From Holla, Fig 13, $K_3 = 2.7$

$$G_{max} = 1000\,(K_3)\left(\frac{S_{max}}{H}\right)$$

$$= 1000\,(2.7)\left(\frac{0.11m}{80m}\right)$$

$$= 3.7\ \frac{mm}{m}$$

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Computations project no: sheet 3 of 7

client:	office:
principal:	date: 25/5/09
project: Hunter Hospital	by: DLK
location:	checked: SC

Estimate curvature

From Holla, Fig 14

For Tensile Strain, $+\varepsilon_{max} = 0.76 \frac{mm}{m}$

$C_{+\varepsilon_{max}} = 12.6\ km$

For Compressive strain, $-\varepsilon_{max} = 1.24 \frac{mm}{m}$

$C_{-\varepsilon_{max}} = 7.55\ km$

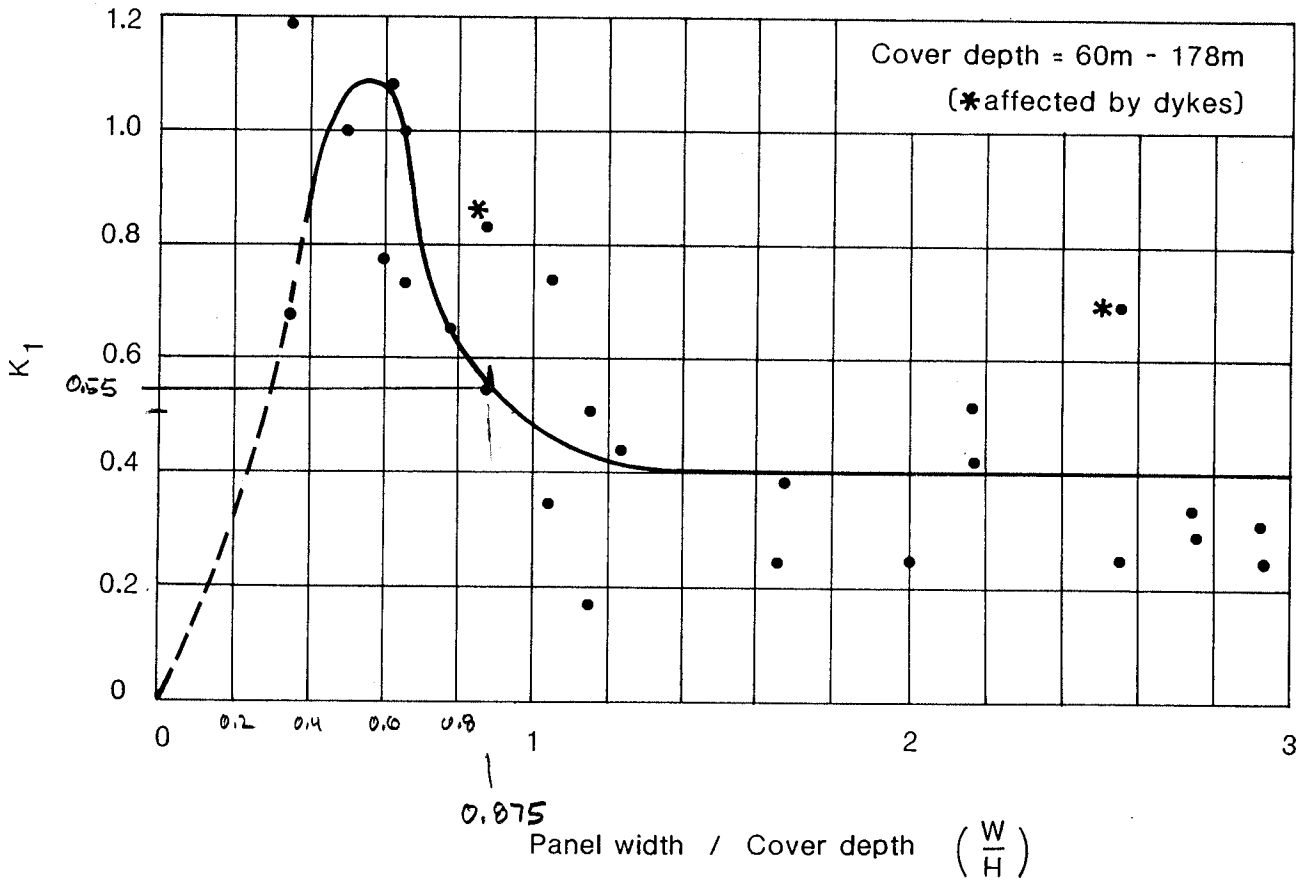

FIGURE 10 – Relationship of maximum tensile strain factor K_1 to W/H ratio

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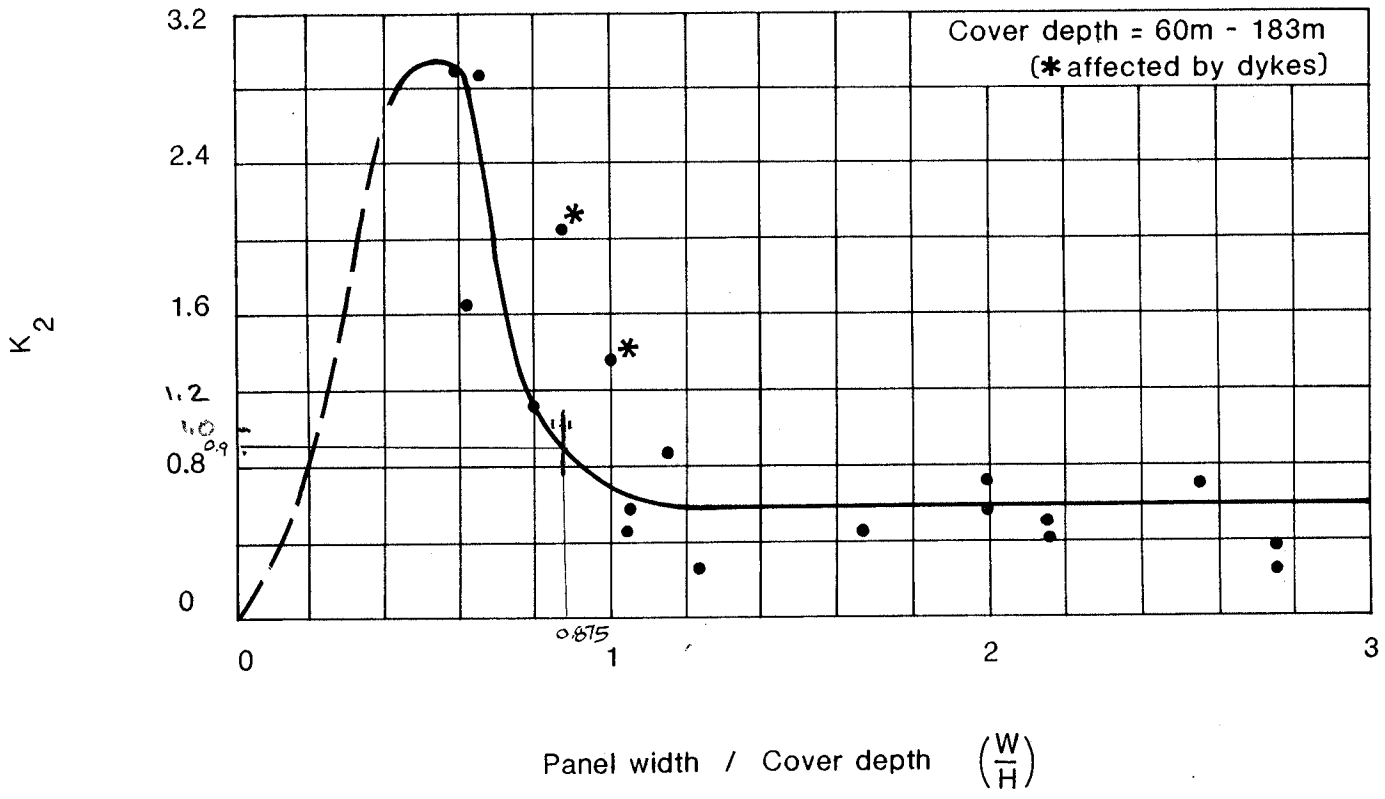

FIGURE 11 – Relationship of maximum compressive strain factor K_2 to W/H ratio

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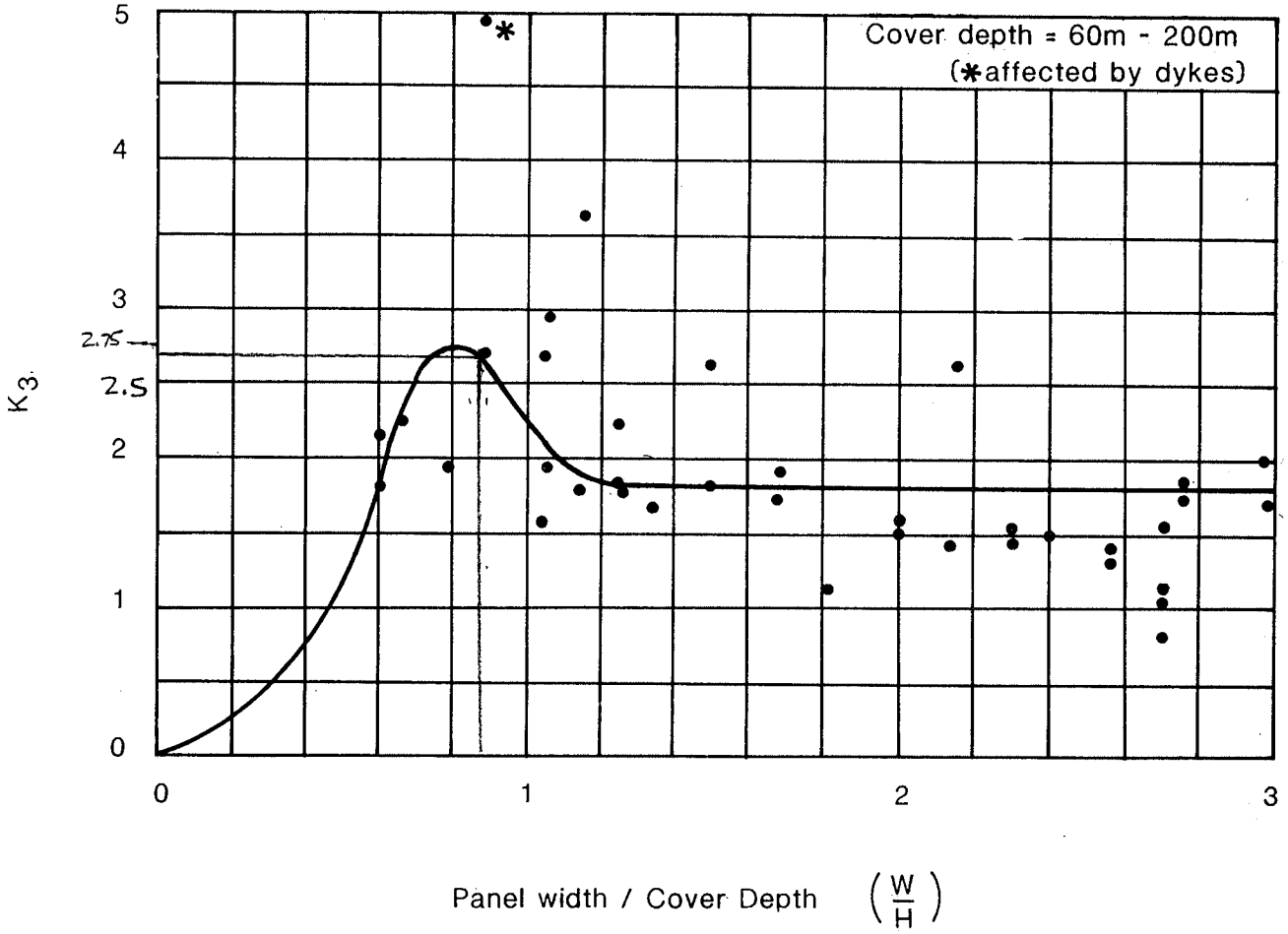

FIGURE 13 – Relationship of maximum tilt factor K_3 to W/H ratio

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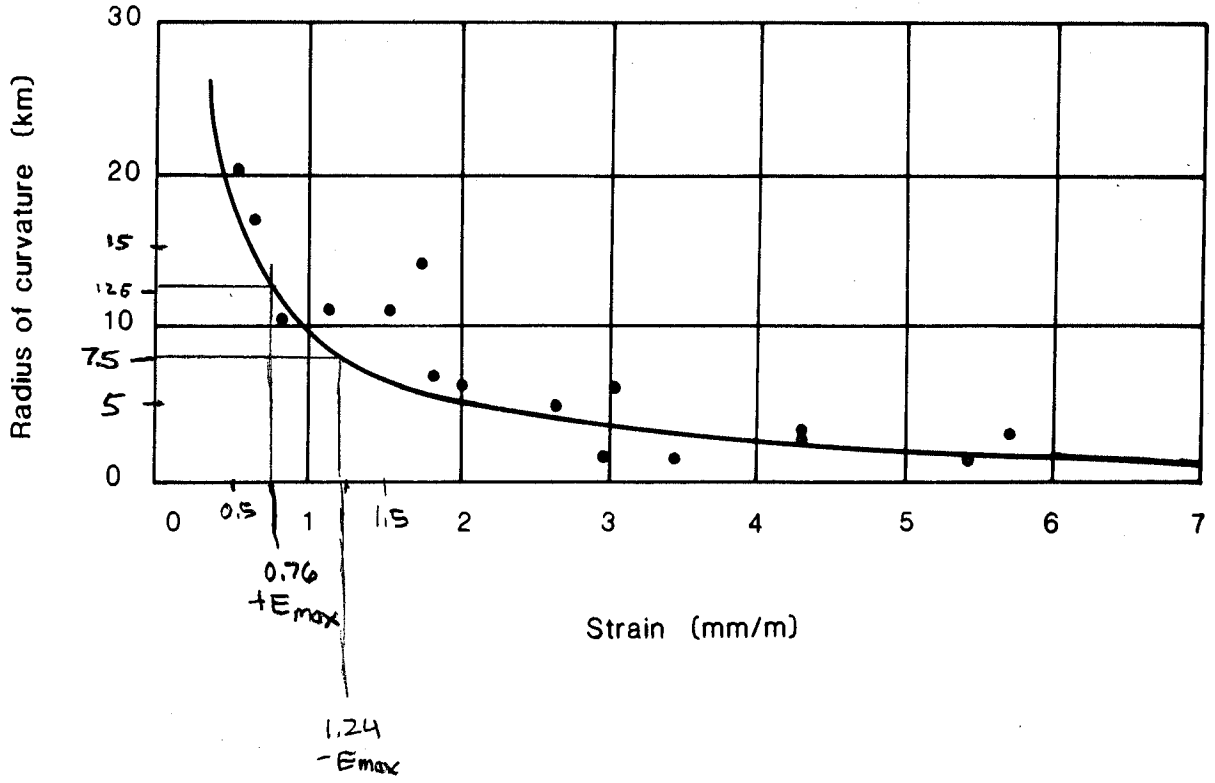

FIGURE 14 - Relationship of radius of curvature to strain