CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD

PROJECT: GEOTECHNICAL INVESTIGATION

- TWEED VALLEY HOSPITAL

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144 BOREHOLE NUMBER: BH25

BOREHOLE DEPTH: 1.55m TO 21.3m





GEOTECHNIC

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH26

Page: 1 of 1

Job Number: GE18/144

Easting: 555422.00 Drilling Rig: Jehyco Digga

Northing: 6873815.00 **Driller:** Morrison Geotechnic

 RL:
 19.69
 Logged By:
 C. Lam

 Total Depth:
 2.10
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Г		na Info	2.1 rmation	<u> </u>		Date	Material Description	.ocati	011. 0	uugen	rtoad, i	ingsciiπ Tes	st San	nples	٦
H	<u> </u>					e	atoria: Booription						l		ᅦ
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result	
			0.1 –	ash	ШШ	CH	Silty CLAY: Stiff, high plasticity, red brown, with		М	St	1				Π
.C Bit		19.0	0.5 –	Residual Slopewash		CH	organics, moist. Silty CLAY: As above but very stiff and no organics. Silty CLAY: Very stiff to hard, medium plasticity, red brown, moist.		M	VSt-H	5 7 9 10 9	0.5 —	– U50	– PP=350-400kPa	
100mm Auger with T.C Bit			1.0	Res							8 9 11 8 7	J		-	H
mm A			1.3 –			CI	Silty CLAY: As above but grey brown. Silty CLAY: As above but with some fine to medium		М	VSt-H	9 7 6				Н
100		18.0	1.6 –		///	CI	gravel.		М	VSt-H	10				Н
			2.0 1.9 -	Bedroc k	<u> </u>	BAS	BASALT: Very low strength, extremely weathered, orange brown mottled grey.	XW		VLS					H
			2-		V A	BAS	BASALT: As above but low strength.	XW		LS				-	Ħ
		17.0	3.0				2.10m: BOREHOLE TERMINATED AT MAXIMUM TC REFUSAL							-	
		16.0	4.0											-	H H
		15.0	5.0											-	- - - -
		14.0	6.0												
Co	mm	ents:						А	uthoris	sed by					

Comments:										Authorised by:
										Date:
Water	Wea	thering	Con	sistency	Den	sity	Rock	Strength	Tests	& Results
_	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
L		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4144		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly		_			VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH27

Page: 1 of 1

Job Number: GE18/144

Easting: 555469.00 Drilling Rig: Jehyco Digga

Northing: 6873204.00 Driller: Morrison Geotechnic

 RL:
 23.08
 Logged By:
 C. Lam

 Total Depth:
 1.50
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

	Drilli	ing Info	rmation				Material Description					Tes	t Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
C Bit		23.0	0.1 –	Slopewash		CH	Silty CLAY: Stiff, high plasticity, red brown, with organics, trace of fine to medium sized gravel, moist.		M	St VSt	1 5 7			
with T.			0.4 –	Residual		CI	Silty CLAY: As above but very stiff and no organics. Silty CLAY: .Very stiff to hard, medium plasticity, red brown, moist		М	VSt-H	6 8 9 6			H
100mm Auger with T.C Bit		22.0	1.0			CI	Silty CLAY: As above but grey brown.		М	VSt-H	7 5 8 8			H
100mr			1.1 –	Bedrock	V A	BAS	BASALT: Very low strength, extremely weathered, grey brown mottled grey. BASALT: As above but low strength.	XW		VLS	9 10 9 11			H
			2.0		V	BAS	1.50m: BOREHOLE TERMINATED AT MAXIMUM TC REFUSAL	XVV		20	9			
		21.0												
			3.0											
		20.0	+ °°											†
		19.0	4.0											$\frac{1}{2}$
		18.0	5.0											<u> </u>
														H
														H
Co	mme	ents:	6.0											

Comments.										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

- Water inflow

Water outflow

Distinctly

Slightly

Fresh

SW

weathered

weathered

VSt

Moisture

Н

Very stiff

D Dry M Moist W Wet

Hard

Dense

Very dense

VD

MS

HS High

VHS

Medium

Very high

EHS Extremely

high

DC

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole

Borehole No.: BH28

Page: 1 of 1

Job Number: GE18/144

Easting: 555425.00 Drilling Rig: Jehyco Digga

Northing: 6873258.00 Driller: Morrison Geotechnic

 RL:
 17.88
 Logged By:
 C. Lam

 Total Depth:
 3.00
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

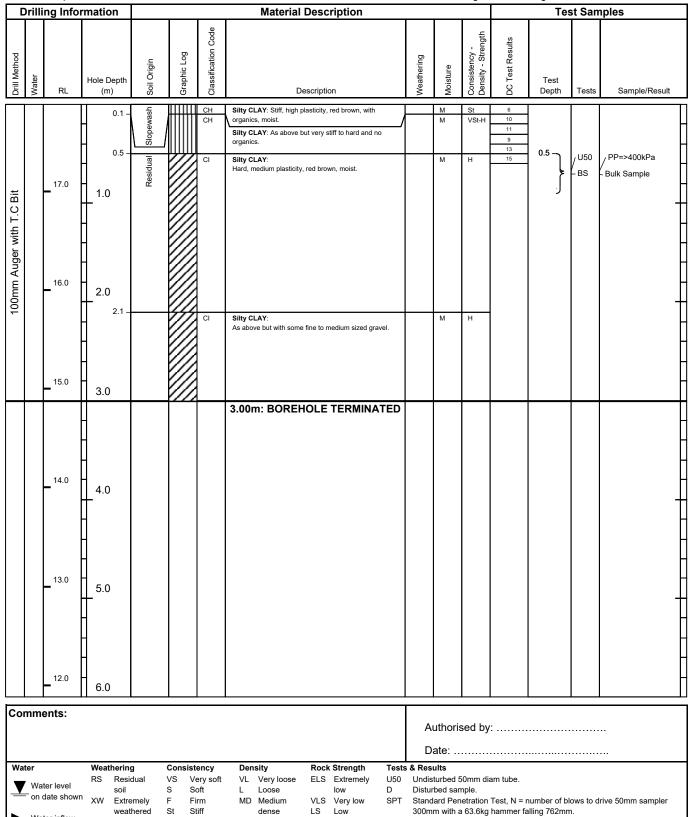
Hand penetrometer estimate of unconfined compressive strength, kPa.

Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Vane shear value kPa

taper cone fitted to rods of smaller section.



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Engineering Log - Borehole Borehole No.: BH29

Page: 1 of 6

Job Number: GE18/144

Easting: 555435.00 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873319.40 Driller: Redlands Drilling

Project: Coateab Investigation Tv.

RL: 16.18 Logged By: C. Lam

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 16.80 Date: 16/11/2018 Location: Cudgen Road, Kingscliff

Total [16.8	0		Date		Locati	on: C	udgen	Road, I	Kingscliff		
Drilling	Infor	mation		ı	ı	Material Description	1	1	ı		Tes	st San	ples
Drill Method Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
	16.0		wash		CH	Silty CLAY: Firm, high plasticity, red brown, trace of fine to medium sized gravel, moist.		М	F				
	-	0.3 -	Residual Slopewash		CI	Silty CLAY: Very stiff to hard, medium plasticity, red brown, with .some fine to medium sized gravel, moist		М	VSt-H				
Bit		0.8 – 1.0			CI	Silty CLAY: .As above but hard and no gravel	 	M	Н				H
	15.0	 1-			CI	Silty CLAY:	\top	М	Н		1	– PP	- 400kPa
with _		1.4 –				.As above but brown					}	– SPT	- 5,6,6, N=12
100mm Auger with T.C.	14.0	2.0			CI	Gravelly CLAY: Hard, medium plasticity, grey mottled dark grey and orange brown, fine to medium sized gravel, extremelyweathered basalt fragments, moist		М	Н		J		
	13.0	3.0									2.5	– SPT	- 3,9,20, N=29
Bore - Rock Roller	12.0	3.8 – 4.0			CI	Silty CLAY: Very stiff, medium plasticity, brown mottled grey and .orange brown, trace of fine sized gravel, moist		М	VSt		4-}	_ SPT	- 6,6,7, N=13
Vash	11.0	5.0											
		6.0											
Commen	ts:						Λ	uthori	and by	_			
Water		Weathering	9	Consist	ency	Density Rock Strength Tes	ts & Res						

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4144		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH29

Page: 2 of 6

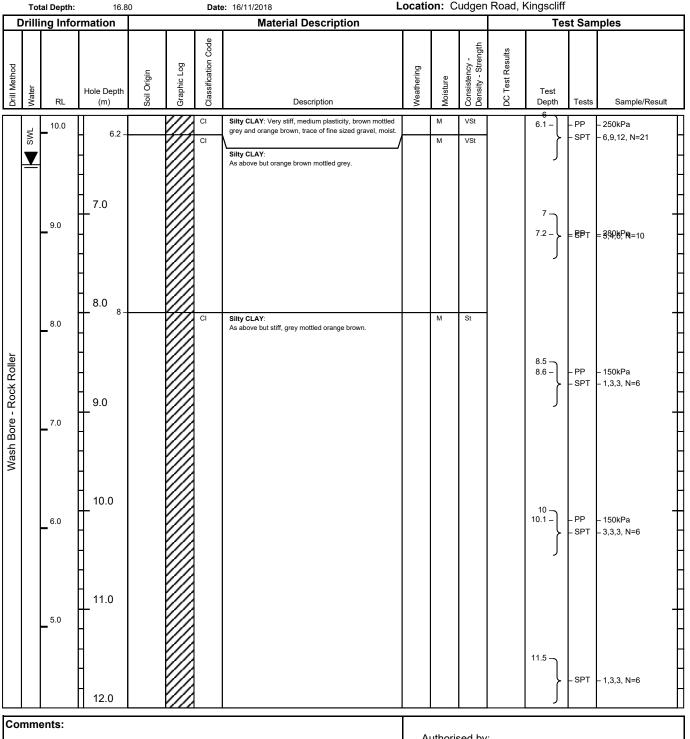
Job Number: GE18/144

Easting: 555435.00 Drilling Rig: Hydrapower Scout

Northing: 6873319.40 Driller: Redlands Drilling RL:

Logged By: C. Lam 16.18 Date: 16/11/2018 Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4144		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Easting:

555435.00

weathered

Distinctly

Slightly

Fresh

weathered

weathered

DW

SW

- Water inflow

Water outflow

Н

VSt

Moisture

Stiff

Hard

Very stiff

D Dry M Moist W Wet

dense

Dense

Very dense

VD

LS

MS

HS High

VHS

Medium

Very high

EHS Extremely

high

DC

300mm with a 63.6kg hammer falling 762mm.

taper cone fitted to rods of smaller section.

Vane shear value kPa

Hand penetrometer estimate of unconfined compressive strength, kPa.

Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH29

Page: 3 of 6

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873319.40 Driller: Redlands Drilling Project: Geotech Investigation - Tweed Valley Hospital Logged By: C. Lam RL: 16.18

	Tot	RL: al Depth:	16.1 16.8		LO		<i>t</i> : C. Lam e : 16/11/2018 L	.ocati	on: C	udgen	Road, k	Cingscliff		, ,
	Drilli	ng Info	rmation				Material Description	1				Tes	st San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		4.0			///	CI	Silty CLAY:		М	St				
		3.0	13.0				As above but stiff, grey mottled orange brown.					13 –	ODT.	-
tock Roller		2.0	14.0			CI	Sitty CLAY: As above but brown mottled dark grey, with some very low strength, extremely weathered basalt rock layering.		М	St		j	– SPT	– 5,10,18, N=28
Wash Bore - Rock Roller		1.0	15.0			CI	Silty CLAY: As above but dark grey mottled orange and brown, with some fine sized gravel.		М	St		14.5 -	– SPT	– 3,6,7, N=13
		0.0	16.0	Rock	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	BAS	BASALT: Medium strength, distinctly weathered, grey mottled orange brown	DW		MS		16 -	– SPT – PP	– 4,7,19, N=26 – 180kPa
		1.0	17.0	Rc			16.80m: COMMENCE NMLC CORING							-
Co		ents:	Weathering	1	Consiste	encv	Density Rock Strength Test		ate:					
	7 Wa	ter level date showi	RS Residusoil XW Extre	dual		ery soft oft rm	VL Very loose ELS Extremely U50 L Loose low D MD Medium VLS Very low SPT dense LS Low	Undis Distu Stand	sturbed sar rbed sar dard Per	netration	Test, N = n	umber of bl		rive 50mm sampler

GEOTECHNIC

Easting:

555435.00

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH29

Page: 4 of 6

Job Number: GE18/144

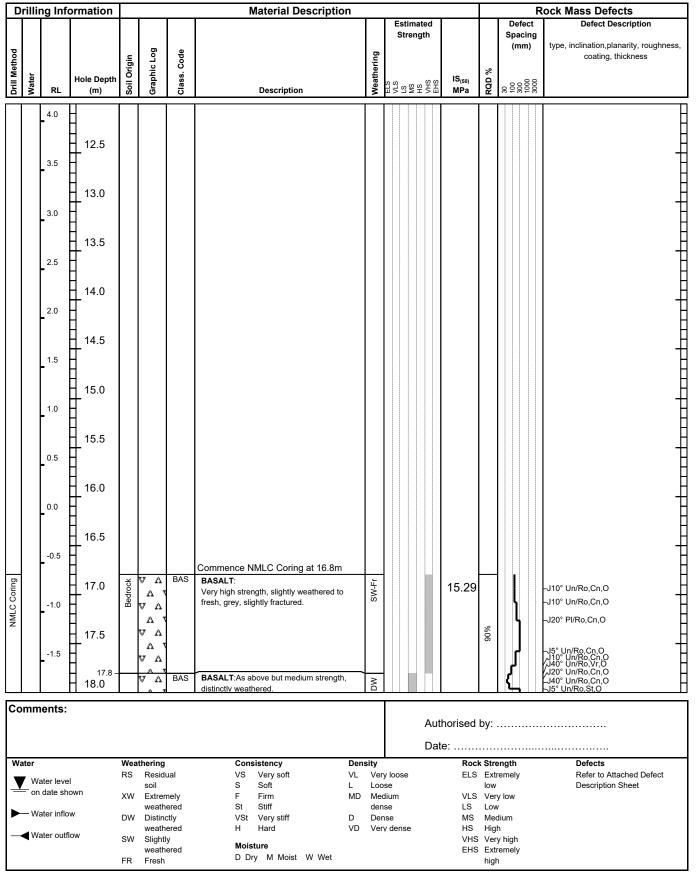
Drilling Rig: Hydrapower Scout

Client: Wood & Grieve Engineers

Northing: 6873319.40 Driller: Redlands Drilling
RL: 16.18 Logged By: C. Lam

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 25.00 Date: 16/11/2018 Location: Cudgen Road, Kingscliff



GEOTECHNIC

Easting:

Northing:

RL:

555435.00

6873319.40

16.18

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Logged By: C. Lam

Drilling Rig: Hydrapower Scout

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH29

Page: 5 of 6

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: GeotechInvestigation - Tweed Valley Hospital

	То	tal Dep		16.18 25.00			Date: 16/11/2018		Location	ı: Cudg	en F	Road, Kin	gscliff
D	rillir	ng Inf	ormation		•		Material Description						lock Mass Defects
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Estimated Strength SHA SHA SHA STA STA	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
NMLC Coring		-2.0 -2.5 -3.0	18.3 18.5		V V V V V V V V V V V V V V V V V V V	BAS	BASALT: As above but medium strength, distinctly weathered BASALT: Very high strength, slightly weathered to .fresh, grey	SW-Fr DW		0.48 7.70	%06		-J40° Un/Ro,Cn,O -J35° Un/Ro,Cn,O -J5° Pl/Ro,Cn,O -J5° Pl/Sm,Cn,O -J5° Pl/Sm,Cn,O -J5° Pl/Sm,Cn,O
		-3.5 -4.0	19.5 20.0 20.34 20.5		V A V					5.11			-J45° Un/Ro,Cn,O -J5° Pl/Ro,Cn,O -J5° Un/Ro,Cn,O -J5° Un/Ro,Cn,O -J6° Un/Ro,Cn,O -J10° Un/Ro,Cn,O -J15° Un/Ro,Cn,O
		-4.5 -5.0	21.0		V V V V V V V V V V V V V V V V V V V	BAS	BASALT: Medium strength, distinctly weathered, grey, slightly fractured.	MO		0.98	%18		-J5° Un/Ro,Cn,O -J10° Pl/Ro,Cn,O -J10° Un/Ro,Vr,O -J5° Pl/Ro,Cn,O -J10° Un/Ro,Cn,O -J10° Un/Ro,Cn,O
		-6.0 -6.5 -7.0 -7.5	22.0		V A V A V A V A V A V A V A V A V A V A					0.31	92%		–J5° PI/Ro,Cn,O –J15° Un/Ro,Cn,O –J5° Un/Ro,Vr,O –SZ 20mm, MS & clay –J5° Un/Ro,Cn,O –J10° Un/Ro,Cn,O –J10° Un/Ro,Cn,O
w:	water Wa	ents:	el Iown ow	Wea RS XW DW SW	weath	mely pered ctly pered ly pered	Consistency Derection VS Very soft VL S Soft L F Firm MD St Stiff VSt Very stiff D H Hard VD Moisture D D Dry M Moist W Wet	Loo Med den Der	Dat / loose se dium se	e: Roc ELS VLS LS MS HS VHS	k Stree Extraction Ver Low Med High	ength remely y low dium n y high remely	Defects Refer to Attached Defect Description Sheet

RL:

16.18

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Engineering Log - Cored Borehole Borehole No.: BH29

Project: Geotech Investigation - Tweed Valley Hospital

Page: 6 of 6

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Easting: 555435.00 Client: Wood & Grieve Engineers Driller: Redlands Drilling Northing: 6873319.40

Logged By: C. Lam Location: Cudgen Road, Kingscliff **Total Depth:** 25.00 Date: 16/11/2018

	otal Dep		25.00			Date: 16/11/2018		Loc	cation	: Cudg	en F	Road		
Drill	ing Inf	ormation				Material Description								Rock Mass Defects
Drill Method Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Estim Strei	ngth	IS ₍₅₀₎ MPa	RQD %	Sp (I	efect acing mm)	type, inclination,planarity, roughness, coating, thickness
		П		VΛ	BAS	BASALT:								
	-8.0 -8.5	24.5		A V A V A V A V		Medium strength, distinctly weathered, aqua grey, slightly fractured.	MO				95%			–J5° Un/Ro,Cn,O
	-9.0	H 25	t	^ *		25.00m: BOREHOLE			\Box		\Box			
	-9.5 -10.0 -10.5 -11.0 -11.5 -12.0 -13.5	27.0 27.5 28.0 28.5 29.0				TERMINATED								
Comr	ments:								Δ.,+1	norised	hv.			
											-			
<u>▼</u> ∘	Vater leve on date sh Vater inflo Vater outf	own	Wea RS XW DW	weath Slight	nely ered ctly ered	Consistency Do VS Very soft VI S Soft L F Firm M St Stiff VSt Very stiff D H Hard VI Moisture	Loo ID Med den Der	dium se	Date	Roci ELS VLS LS MS HS VHS	Extra low Very Low Med High Very	ength remel y low dium n	i y	Defects Refer to Attached Defect Description Sheet
<u>▼</u> ∘	n date sh Vater inflo	own	DW	soil Extrer weath Disting weath	mely ered ctly ered ly ered	S Soft L F Firm M St Stiff VSt Very stiff D H Hard VI	Loo ID Med den Der	se dium se nse		VLS LS MS HS VHS	low Very Low Med High	y low dium n y high	n	





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH29

BOREHOLE DEPTH: 16.8m TO 25.0m



GEOTECHNIC

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH30

Page: 1 of 1

Job Number: GE18/144

Easting: 555405.00 Drilling Rig: Jehyco Digga

Northing: 6873364.00 **Drill**

RL: 11.48
Total Depth: 3.00

Driller: Morrison Geotechnic

Logged By: C. Lam **Date:** 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		lling Info					Material Description				rtoau, i		st Sam	ples
Drill Method			Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with T.C Bit		11.0	0.1 - 0.4 - 1.0 2.0	Residual Slopewas		CH CH	Silty CLAY: Stiff, high plasticity, red brown, with organics, moist. Silty CLAY: As above but very stiff and no organics. Silty CLAY: Very stiff to hard, medium plasticity, red brown, moist.		M M	St VSt VSt-H	1 1 4 5 8 9 9 7 7 5 8 8 7 7 8 8 9 9 6 7 7 8 8 9 9 9 9 9 9 9	•		
			3.0				3.00m: BOREHOLE TERMINATED			VSI-TI				
Co	omn	6.0 nents:	6.0											

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH31

Page: 1 of 1

Job Number: GE18/144

Easting: 555411.00 Drilling Rig: Jehyco Digga

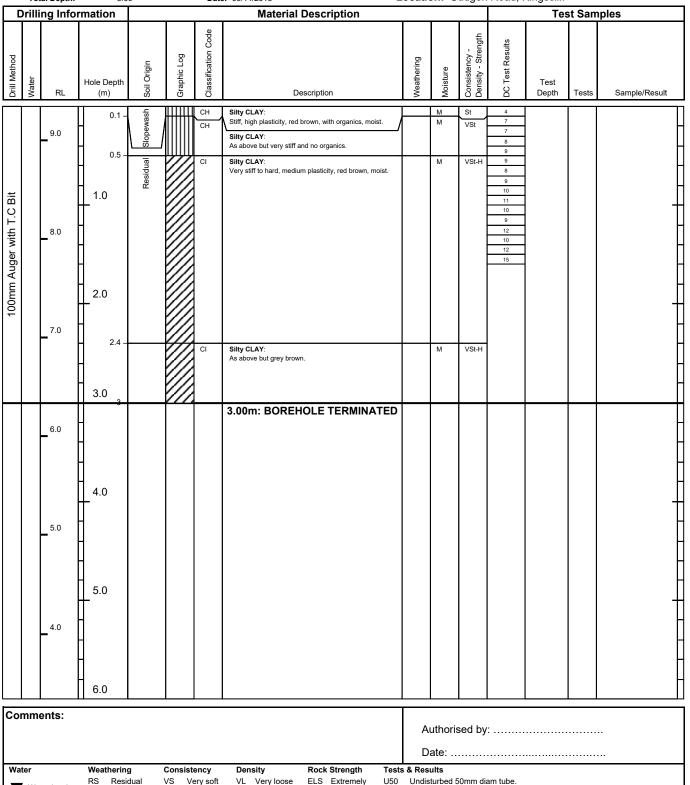
Northing: 6873417.00 Driller: Morrison Geotechnic

 RL:
 9.34
 Logged By:
 C. Lam

 Total Depth:
 3.00
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	ture			EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Water level

on date shown

- Water inflow

Water outflow

soil

DW

SW

Extremely

weathered

weathered

weathered

Distinctly

Slightly

Fresh

s

St

Н

VSt

Moisture

Soft

Firm

Stiff

Hard

Very stiff

D Dry M Moist W Wet

Loose

Medium

dense

Dense

Very dense

D

VD

low

LS

MS

HS High

VHS

Very low

Medium

Very high

EHS Extremely

high

DC

Disturbed sample.

Vane shear value kPa

Standard Penetration Test, N = number of blows to drive 50mm sampler

Hand penetrometer estimate of unconfined compressive strength, kPa.

Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

300mm with a 63.6kg hammer falling 762mm.

taper cone fitted to rods of smaller section.

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH32

Page: 1 of 1

Job Number: GE18/144

Easting: 555422.00 Drilling Rig: Jehyco Digga

Northing: 6873498.00 Driller: Morrison Geotechnic

RL: 9.19 Logged By: C. Lam

Total Depth: 3.00 Date: 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth		0		Date		_ocati	on: C	udgen	Road, k	Kingscliff		-
Drilling Info	ormation		1	ı	Material Description	ı	T	1		Tes	st Sam	ples
Drill Method Water	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with T.C Bit	0.1 - 0.4 - 1.0 1.7 - 2.0 2.5 - 3.0 3	Slope Slope Wash		CH CH	Silty CLAY: Stiff, high plasticity, red brown mottled grey, with organics, trace of fine to medium sized gravel, moist Silty CLAY: As above but very stiff and no organics Silty CLAY: .Very stiff to hard, medium plasticity, red brown, moist Silty CLAY: .As above but hard Silty CLAY: .As above but brown and very stiff		M M	St VSt VSt-H	2 4 7 9 11 10 10 10 11 10 12 10 9 11 11 10 9 9 11			
5.0	5.0				3.00m: BOREHOLE TERMINATED							
Comments:						D)ate:	-				
Water Water level	Weatherin RS Resi	dual		ency ery soft	Density Rock Strength Test VL Very loose ELS Extremely U50 L Loose low D			50mm dia	am tube.			

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH33

Page: 1 of 1

Job Number: GE18/144

Easting: 555466.00 Drilling Rig: Jehyco Digga

Northing: 6873545.00 **Driller:** Morrison Geotechnic

 RL:
 10.09
 Logged By:
 C. Lam

 Total Depth:
 3.00
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		tal Depth:	3.0	0		Date		.ocati	on: C	udgen	Road, r	Kingscliff —		 _
\vdash	Orilli T	ing Info	rmation		1	T	Material Description	1	1	T		Tes	st Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		10.0	0.1 –	Slope		CH	Silty CLAY:	_	M	St	6			
			0.3 -		4	CH	Stiff, high plasticity, red brown, with organics, moist Silty CLAY: As above but very stiff and no organics	<u> </u>	M	VSt VSt-H	9			H
				Residual		-	Silty CLAY: .Very stiff to hard, medium plasticity, red brown, moist				11 14			
				<u> </u>			.very suit to flatd, filedidiff plasticity, fed brown, filoso				13			Ц
Bit		9.0	1.0								11 9 10			#
h T.O											10			H
er wit														H
Auge			1.7 –			CI	Cile. CLAV.		<u></u>					H
100mm Auger with T.C Bit			2.0			CI	Silty CLAY: .As above but hard		М	Н				Ħ
100		8.0				CI	Silty CLAY: .As above but grey brown		М	Н				
														Ц
														H
			3.0											H
		7.0	3		///		3.00m: BOREHOLE TERMINATED							
														Ц
														H
		6.0	4.0											\mathbb{H}
														H
														H
		5.0	5.0											
		- 5.0												H
														H
														H
			6.0											H
Co	mm	ents:	l I		1			<u> </u>	<u> </u>				<u> </u>	
								А	uthoris	sed by	:			
								D	ate:					

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
—	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH34

Page: 1 of 1

Job Number: GE18/144

Easting: Drilling Rig: Jehyco Digga 555541.00

Northing: RL:

6873570.00 Driller: Morrison Geotechnic 10.79

Logged By: C. Lam Date: 00/11/2018 Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Tota	RL: al Depth:	10.7 3.0		Lo		/: C. Lam e: 09/11/2018					(ingscliff		valley i loopital
		rmation				Material Description						st Sam	ples
Drill Method Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with T.C Bit Drii	9.0 9.0	(m) 0.1 - 0.4 - 1.0 1 - 1.6 - 2.0 1.9 - 3.0	Residual Slope Soi		CH CH CI	Silty CLAY: Stiff, high plasticity, red brown, trace of fine to medium sized gravel, with organics, moist. Silty CLAY: As above but very stiff and no organics Silty CLAY: Very stiff to hard, medium plasticity, red brown, trace of fine to medium sized gravel moist Silty CLAY: As above but no gravel Silty CLAY: As above but hard Silty CLAY: As above but hard Silty CLAY: As above but red brown mottled grey 3.00m: BOREHOLE TERMINATED		M	St VSt-H VSt-H H H	4 9 5 4 4 5 4 7 7 8 9 8	Depth	Tests	Sample/Result
	6.0 5.0	5.0											-
Comme	nts:												
Water		Weathering RS Resid		Consist			ts & Res		50mm dia	am tube.			

											Addionacd by
											Date:
Wate	er	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
l —		RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
	Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
	on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
			weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
	- Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
	4147		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
_	Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
			weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
		FR	Fresh	D Di	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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RL:

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH35

Page: 1 of 1

Job Number: GE18/144

Easting: 555628.00 Northing: 6873575.00

9.85

Drilling Rig: Jehyco Digga

Driller: Morrison Geotechnic

Logged By: C. Lam

Project: Geotech Investigation - Tweed Valley Hospital

Client: Wood & Grieve Engineers

	Tot	al Depth:	3.0		LO		o: 09/11/2018	Locat	ion: C	udgen	Road, I	Kingscliff		
	Drilli	ng Info	rmation		1	1	Material Description			1		Te	st San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with T.C Bit			0.1 - 0.4 - 1.0 1 - 2.0 3.0 3 - 4.0 5.0 6.0	Residual Slope wash		CH CH	Silty CLAY: Stiff, high plasticity, red brown, trace of fine to mediun sized gravel, with organics, moist Silty CLAY: As above but very stiff, trace of fine to coarse sized gravel and no organics. Silty CLAY: Very stiff to hard, medium plasticity, red brown, trace of fine to coarse sized gravel, moist. Silty CLAY: As above but no gravel. 3.00m: BOREHOLE TERMINATE!		M M	St VSt-H	5 8 7 9 7 7 9 9 9 9			
	111111	ents:						1	Authori	sed by	:			

										Additionsed by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date show	n XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH36

Page: 1 of 1

Job Number: GE18/144

Easting: 555699.00 Drilling Rig: Jehyco Digga

Northing: 6873581.00 Driller: Morrison Geotechnic

 RL:
 10.23
 Logged By:
 C. Lam

 Total Depth:
 3.00
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

_		tal Depth:		00		Date		_ocati	on: C	udgen	Road, k			
<u> </u>	Orilli	ng Info	rmation		ı		Material Description			1		Tes	st Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		10.0	0.1 -	Slope		CH	Silty CLAY: Siltf, high plasticity, red brown, with organics, moist Silty CLAY:		M	St VSt	3 3 11			
			0.4 -	Residual		CI	As above but very stiff and no organics Silty CLAY: Very stiff to hard, medium plasticity, red brown, with fine		М	VSt-H	8 6 5 9			H
S Bit			1.0	Δ.			to medium sized gravel, moist.				5 4 4 4			#
with T.0		9.0	1.1 -			CI	Silty CLAY: .As above but hard and no gravel		М	Н	5 6 5			H
100mm Auger with T.C Bit											6 5 8			H
100mr		8.0	2.0			CI	Silty CLAY:		М	Н	15			1
			2.5 -			CI	As above but orange brown. Silty CLAY:		М	Н				
			3.0				.As above but brown							
		7.0					3.00m: BOREHOLE TERMINATED							
		6.0	4.0											$\frac{1}{1}$
		_												
			5.0											
		5.0	Ī											Ţ
			6.0											
Со	mm	ents:						A	uthoris	sed by	:			

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Total Depth:

Morrison Geotechnic Pty Ltd

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Engineering Log - Borehole Borehole No.: BH37

Page: 1 of 1

Job Number: GE18/144

Easting: 555837.00 **Northing:** 6873578.00

Drilling Rig: Jehyco Digga

Driller: Morrison Geotechnic

Client: Wood & Grieve Engineers

RL: 13.60

4.50

Logged By: C. Lam

Date: 09/11/2018

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation	<u> </u>		Dutt	Material Description		• •	a a g o		Tes	st San	nples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
			0.1 -	olop ewas h		СН	Silty CLAY:		М	St	3			
		13.0	0.4 -	Residual ev		СІ	Stiff, high plasticity, red brown, with organics, moist. Sitty CLAY: As above but very stiff and no organics Sitty CLAY: Very stiff to hard, medium plasticity, red brown, moist.	_	М	VSt-H	3 3 3 5	0.2 – 0.4 –	– PP – PP	– 150kPa – 300kPa –
			1.0	ŭ.							6 6 8 8 8			- - -
Bit		12.0	1.3 -			CI	Silty CLAY: As above but hard Silty CLAY: As above but brown.		M	Н	6 6 8 8 9			
100mm Auger with T.C Bit			2.0			CI	Silty CLAY: As above but dark grey		М	Н	9 9			<u>-</u>
100mm Aug		11.0	2.5 -			CI	Sitty CLAY: As above but stiff and grey brown.		М	St		2.5 –	– PP	– 100kPa
			3.3 -			CI	Silty CLAY:		М	VSt				+
		10.0	3.5 -			CI	As above but very stiff Silty CLAY: As above but stiff.		М	St				-
		9.0	1.5				4.50m: BOREHOLE TERMINATED							-
			5.0				TOOM BONEHOLE TENNINATED							
		8.0												
			6.0											
Со	mm	ents:						_	uthoria	and by	_			

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual soil	VS S	Very soft Soft	VL L	Very loose Loose	ELS	Extremely low	U50 D	Undisturbed 50mm diam tube. Disturbed sample.
on date shown	XW	Extremely weathered	F St	Firm Stiff	MD	Medium dense	VLS LS	Very low Low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly weathered	VSt H	Very stiff Hard	D VD	Dense Very dense	MS HS	Medium High	PP S	Hand penetrometer estimate of unconfined compressive strength, kPa. Vane shear value kPa
—◀ Water outflow	SW Slightly weathered Moisture				VHS EHS	Very high Extremely	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section.		
	FR	Fresh	D Dr	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH38

Page: 1 of 1

Job Number: GE18/144

Easting: 555888.00 Drilling Rig: Jehyco Digga

Northing: 6873558.00 Driller: Morrison Geotechnic

 RL:
 19.29
 Logged By:
 C. Lam

 Total Depth:
 3.00
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation				Material Description					Tes	st Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
			0.1 –	Slope		CH	Silty CLAY: Stiff, high plasticity, red brown, with organics, moist.		M	St	10 7			
		19.0	0.3 –			CI	Silty CLAY: As above but very stiff and no organics.		M	VSt H	5 7			П
				Residual			Silty CLAY: Hard, medium plasticity, red brown, moist.				9			
				Œ							7 15			Π
Bit			1.0											$oldsymbol{oldsymbol{oldsymbol{\square}}}$
T.C		18.0				CI	Silty CLAY: As above but with some fine to medium gravel.		М	Н				
with		_ 10.0	Ц			1								Ц
iger			Ц											Ц
100mm Auger with T.C Bit			Ц											Ц
)0mr			2.0											4
=		17.0	Ц											Ц
		_	H											Н
			H											Н
			H_{aa}											Н
			3.0				3.00m: BOREHOLE TERMINATED							<u> </u>
		16.0	Н				O.OOM. BOKEHOLE TERMINATED							H
			Н											Н
			Н											H
			4.0											H
			<u> </u>											+
		1 5.0	П											Н
			П											Н
			Π											Н
			5.0											T T
		44.5												1
		- 14.0												Π
			6.0											
Co	mme	ents:												
								Α	uthori	sed by	:			

										Authorised by:
										Date:
Water	Wea	thering	Cons	istency	Den	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual soil	VS S	Very soft Soft	VL L	Very loose Loose	ELS	Extremely low	U50 D	Undisturbed 50mm diam tube. Disturbed sample.
on date shown	XW	Extremely weathered	F St	Firm Stiff	MD	Medium dense	VLS LS	Very low Low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler 300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly weathered	VSt H	Very stiff Hard	D VD	Dense Verv dense	MS HS	Medium Hiah	PP S	Hand penetrometer estimate of unconfined compressive strength, kPa. Vane shear value kPa
	SW FR	Slightly weathered Fresh	Mois D Dr	ture	-	·	VHS	Very high Extremely high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg taper cone fitted to rods of smaller section. From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH39

Page: 1 of 1

Job Number: GE18/144

Easting: 555775.00 Drilling Rig: Jehyco Digga

Northing: 6873551.00

Distinctly

Slightly

Fresh

DW

SW

- Water inflow

Water outflow

weathered

weathered

weathered

Н

VSt

Moisture

Stiff

Hard

Very stiff

D Dry M Moist W Wet

dense

Dense

Very dense

VD

EHS Extremely

high

Medium

Very high

DC

LS

MS

HS High

VHS

RL: 18.86 3.00 Driller: Morrison Geotechnic

Logged By: C. Lam

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Hand penetrometer estimate of unconfined compressive strength, kPa.

Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

300mm with a 63.6kg hammer falling 762mm.

taper cone fitted to rods of smaller section.

Vane shear value kPa

Total Depth:					e: 09/11/2018 L	.ocati	on: C	udgen	Road, k	Kingscliff		
Drilling Info	rmation		1		Material Description			ı		Tes	st Sam	ples
Drill Method Water 73	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
18.0 18.0 17.0 I 16.0 16.0 16.0 16.0 16.0 16.0 16.0 16.0	0.1 - 0.3 - 1.0 1.8 - 2.0 1.8 - 2.0 5.0 6.0	Residual wash wash		CH CH CI	Silty CLAY: Stiff, high plasticity, red brown, with some fine to medium sized gravel, with organics, moist. Silty CLAY: As above but very stiff and no organics. Silty CLAY: Hard, medium plasticity, red brown, with some fine to medium sized gravel, moist. Silty CLAY: As above but grey brown.		M M	St VSt H	6 5 4 5 5 5 5 10 6 5 5 5 5 4 4 4 5 6 7 7 15/50			
Comments:						D	ate:					
Water Water level on date shown	744 EXU	dual	S S F F	ency ery soft oft irm tiff	Density Rock Strength Test VL Very loose ELS Extremely U50 L Loose low D MD Medium VLS Very low SPT dense LS Low	Distur Stand	turbed 5 rbed sar lard Pen	etration	Test, N = n	umber of bl		ive 50mm sampler

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Engineering Log - Borehole Borehole No.: BH40

Page: 1 of 1

Job Number: GE18/144

Drilling Rig: Jehyco Digga Easting: 555783.00 Northing:

6873508.00 Driller: Morrison Geotechnic

RL: Logged By: C. Lam 23.01 Total Depth: 1.10 Date: 09/11/2018 Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation	<u> </u>			Material Description			J		Tes	st Sam	ples
Drill Method		RL 23.0	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
er with		23.0	0.1 –	Slope		CH	Silty CLAY: Stiff, high plasticity, red brown, with organics, moist. Silty CLAY: As above but very stiff to hard, with some fine to medium	_	M	St VSt-H	10 7 7			
100mm Auger with			0.4 –	sidual		CI	sized gravel, no organics and some cobbles. Sity CLAY: Hard, medium plasticity, red brown, with some fine to medium sized gravel, some cobbles, moist.		М	Н	8 15			
100m		22.0	0.8 -	Bedroc Residual	ΨΛ Λ	BAS	BASALT: Very low strength, extremely weathered, red brown and grey.	xw		VLS				Ш
			1.1		VΛ	BAS	BASALT: As above but low strength. 1.10m: BOREHOLE TERMINATED AT MAXIMUM TC REFUSAL	xw		LS				$\overline{\mathbb{H}}$
														H
		21.0	2.0											H
														H
														H
		20.0	3.0											4
														H
														H
		1 9.0	4.0											\pm
		18.0	5.0											Ħ
		10.0	+ ""											#
														H
			6.0											
Со	mm	ents:							uthoris	and by				

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
—	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH41

Page: 1 of 1

Job Number: GE18/144

Easting: 555662.00 Drilling Rig: Jehyco Digga

Northing: 6873513.00 Driller: Morrison Geotechnic

RL: 22.59 Logged By: C. Lam

Total Depth: 3.00 Date: 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		tal Depth:	3.0	0		Date		_ocati	on: C	udgen	Road, k	Kingscliff		
	rilli	ng Info	rmation		т	т	Material Description	_	1			Tes	st Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
			0.1 –			СН	Silty CLAY: Stiff, high plasticity, red brown, with some		М	St	1			
Bit		22.0	0.2 -	Residual		CH	fine to coarse sized gravels, with organics, moist. Silty CLAY: As above but very stiff and no organics. Silty CLAY: Very stiff to hard, medium plasticity, red brown, with some fine to coarse sized gravel, moist.		M	VSt-H	15 20/50			
100mm Auger with T.C Bit		_ 21.0	2.0											 - - -
10		_ 20.0	2.4 -	Bedrock	V A A	BAS	BASALT: Very low strength, extremely weathered, grey.	xw		VLS				
		19.0	4.0				3.00m: BOREHOLE TERMINATED							
		18.0	5.0											
		1 7.0	 - -											
Cor	nm	ents:	6.0											
18/-			\M\41'		Co==!=:	onc::	Donoity Dook Street T							
Wat	er		Weatherin	g	Consist	епсу	Density Rock Strength Test	s & Res	uits					

											Addionacd by
											Date:
Wate	er	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
l —		RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
	Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
	on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
			weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
	- Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
	4147		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
_	Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
			weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
		FR	Fresh	D Di	y M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH42

Page: 1 of 1

Job Number: GE18/144

Easting: 555666.00 Drilling Rig: Jehyco Digga

Northing: 6873465.00 Driller: Morrison Geotechnic

 RL:
 29.93
 Logged By:
 C. Lam

 Total Depth:
 1.40
 Date:
 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation	<u> </u>			Material Description				rtoau, i		st Sam	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with T.C Bit		29.0	0.1 - 0.3 - 0.6 - 1.0		V A V A V A	CH CH CI BAS	Silty CLAY: Stiff, high plasticity, red brown, with organics, moist. Silty CLAY: As above but very stiff and no organics. Silty CLAY: Very stiff, medium plasticity, red brown, moist. BASALT: Very low strength, extremely weathered, grey. BASALT: As above but low strength.	XW	M M	St VSt VSt VSt	5 8 4 3 4 4 4 4 5 15			
		28.0	2.0		VA	BAS	1.40m: BOREHOLE TERMINATED AT MAXIMUM TC REFUSAL	XW						
		27.0	3.0											
		_ 26.0	4.0											
		25.0	6.0											
Со	mm	ents:												

oomments.										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
10/-411	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
41147		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly		_			VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole Borehole No.: BH43

Page: 1 of 5

Job Number: GE18/144

Easting: 555522.10 Drilling Rig: Hydrapower Scout Northing:

6873345.90 Driller: Redlands Drilling RL: Logged By: L. Bexley 24.67

Project: Geotech Investigation - Tweed Valley Hospital

Client: Wood & Grieve Engineers

	To	tal Depth:					g: 05/11/2018	Locati	on: C	udgen	Road, ł	Kingscliff		
	Drill	ling Info	rmation		,		Material Description					Te	st San	nples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
th T.C Bit			0.3 -	al Slopewash		CH CH	Silty CLAY: Very stiff, high plasticity, red brown, with some fine to coarse sized gravel, with some organics, moist. Silty CLAY: As above but with some cobbles. Silty CLAY:		M M	VSt VSt		0.4 –	– PP	->600kPa -
100mm Auger with T.C Bit		_ 24.0	1.0	k Residual			Hard, medium plasticity, red brown, with some cobbles, moist					1-}	– SPT	17,10/20mm,
100				Bedrock	Λ V	BAS	BASALT: Medium strength, distinctly weathered, dark grey.	DW		MS				Ц
		23.0	2.0				1.50m: COMMENCE NMLC CORING							
		20.0	5.0											
Co	mm	nents:			•	•			•				•	<u> </u>

										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
V		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	sture			EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	w v	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555522.10

24.67

6873345.90

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

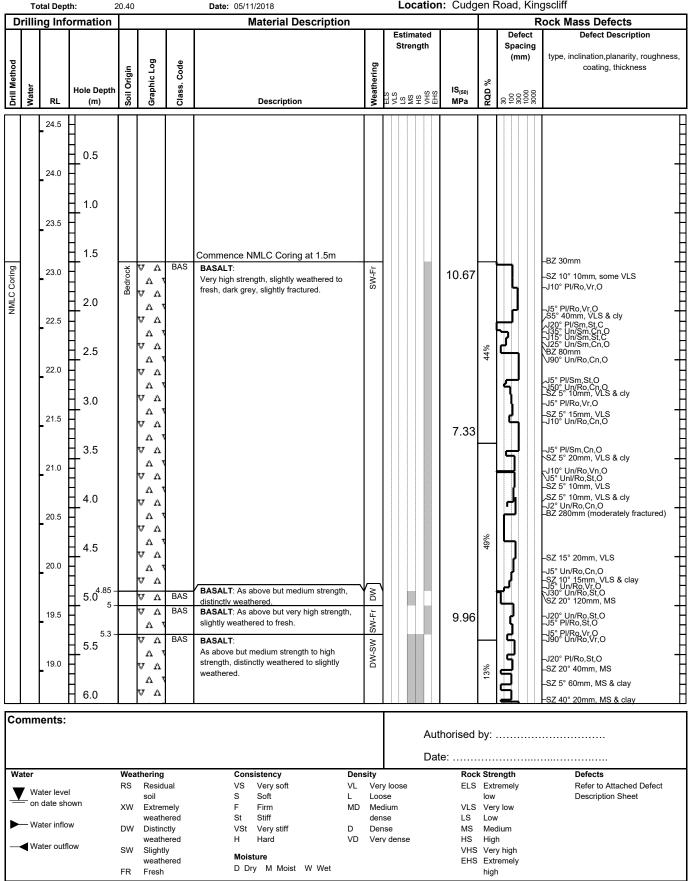
Engineering Log - Cored Borehole Borehole No.: BH43

Page: 2 of 5

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



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Engineering Log - Cored Borehole Borehole No.: BH43

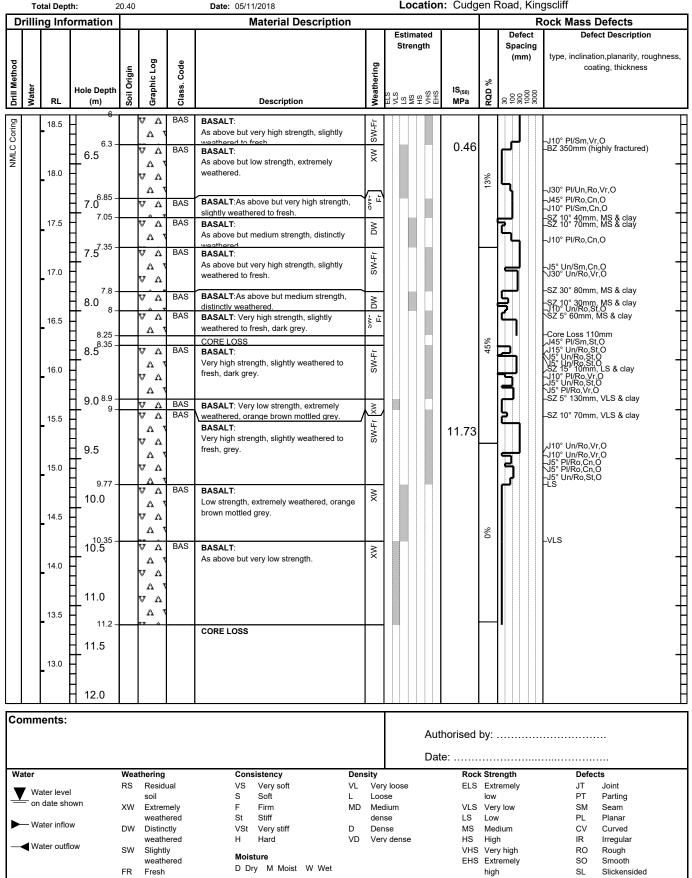
Page: 3 of 5

Job Number: GE18/144

Easting: 555522.10 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Northing: 6873345.90 Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital Logged By: L. Bexley RL: 24.67

Location: Cudgen Road, Kingscliff Date: 05/11/2018



GEOTECHNIC

Water

Water level

Water inflow

■ Water outflow

on date shown

Weathering

Residual

Extremely

Distinctly

Slightly

Fresh

weathered

weathered

weathered

soil

RS

 XW

DW

SW

FR

Consistency

Very soft

Very stiff

D Dry M Moist W Wet

Firm

Hard

VS

S Soft

St Stiff

Н

VSt

Moisture

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Engineering Log - Cored Borehole Borehole No.: BH43

Project: Geotech Investigation - Tweed Valley Hospital

Rock Strength

ELS Extremely

low

VLS Very low

Medium

LS Low

HS High

VHS Very high

EHS Extremely

high

MS

Defects

Refer to Attached Defect

Description Sheet

Page: 4 of 5

Job Number: GE18/144

Easting: 555522.10 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873345.90 Driller: Redlands Drilling

RL: 24.67 Logged By: L. Bexley Geotech Investigation - I Wee Total Depth: 20.40 Date: 05/11/2018 Location: Cudgen Road, Kingscliff

Total Dept		0.40			Date: 05/11/2018		Location	ı: Cudg	en F	load, Kingscliff	
Drilling Info	ormation				Material Description					Rock Mass	
Drill Method Water Ta	Hole Depth	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Estimated Nrs I NR	IS ₍₅₀₎ MPa	RQD %	Spacing (mm) type, inclinate	ect Description ion,planarity, roughness, ating, thickness
Dujuo 12.5 12.0 12.0 11.5 11.0 10.0 9.5 9.0 8.5 8.0 7.5 7.0	12.1 – 12.5 13.0 13.5 14.0 14.5 15.5 16.0 17.5		V A V V A V A V A V A V A V A V A V A V	BAS	CORE LOSS BASALT: Very low strength, extremely weathered, grey mottled orange brown, with some clay layering. BASALT: Very high strength, distinctly weathered to fresh, grey.	DW-Fr XW		5.80	100%	–J20° Un/Ro,S	Cn,O
Comments:											

Density

Very loose

Loose

dense

Dense

Very dense

Medium

VL

MD

VD

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Engineering Log - Cored Borehole Borehole No.: BH43

Page: 5 of 5

Job Number: GE18/144

Easting: 555522.10 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873345.90 Driller: Redlands Drilling
RL: 24.67 Dright: Redlands Drilling
Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 20.40 Date: 05/11/2018 Location: Cudgen Road, Kingscliff

Total Depth: 20.40 Date: 05/11/2018 Drilling Information Material Descript											_00	llioi	i. Cuug	gen Road, Kingscliff					
L	Dri	lling	Info	ormation				Material Description	on					1			_	Rock Mass Defects	
Della Market		Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description		Weathering	S	stima trenç		IS ₍₅₀₎ MPa	RQD %	Sp (efectoacin mm)	type, inclination,planarity, roughness, coating, thickness	
Ξ						VΛ	BAS	BASALT:			-	1 1					1 1	<u> </u>	
MIMI Corio		ľ	6.5	18.5		V V V V V V	БАЗ	Wery high strength, distinctly weathered fresh, grey.	to	DW-Fr				9.20					
		-	5.5	19.0		v v v v v v									100%				
		_ 5	5.0	20.0		A V A V										-		⇒j§° Pl/Re,Gn,⊝	
		-4	4.5	2039.4		V A V V		20.40 - DODENOLE										"J5° PI/Sm,Cn,O	
		-4	4.0	21.0				20.40m: BOREHOLE TERMINATED										 	
		-3	3.5	21.5															
		_3	3.0	<u>+</u>														<u>+</u>	
		_ 2	2.5	22.0															
		-2	2.0	22.5															
		_ 1	1.5	23.0															
		_ 1	1.0	23.5														<u> </u>	
	on	nmei	nts:	24.0														<u> </u>	
														e:					
-	<u> </u>	Wate on da Wate	er leve ate sho er inflo er outfl	own w ow	Wea RS XW DW SW	weath	nely ered ctly ered y	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Moisture D Dry M Moist W Wet	L MD D	ity Very Loos Med dens Den Very	se lium se se			Roci ELS VLS LS MS HS VHS EHS	low Ver Low Med Hig Ver	y low v dium h y hig reme	ly , h	Defects Refer to Attached Defect Description Sheet	



PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH43

BOREHOLE DEPTH: 1.5m TO 20.4m



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Engineering Log - Borehole Borehole No.: BH44

Page: 1 of 3

Job Number: GE18/144

Easting: 555502.00 **Northing:** 6873282.20

23.96

1.15

RL:

Total Depth:

Drilling Rig: Hydrapower Scout
Driller: Redlands Drilling
Logged By: C. Lam

Date: 21/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

	Drill	ing Info	rmation				Material Description						st San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with		23.0	1.0	Bedrock Residual Slopewas	V A	CI	Silty CLAY: Very stiff, high plasticity, red brown, trace of fine to medium sized gravel, moist. Silty CLAY: Very stiff, medium to high plasticity, red brown, with some fine to medium sized gravel, with some cobbles, moist. BASALT: Medium strength, distinctly weathered, grey mottled orange brown. 1.15m: COMMENCE NMLC CORING	DW	M	VSt VSt MS		1-7-	– SPT	– 20/145mm, N*=42
		_ 22.0	2.0											
		21.0	3.0											
		19.0	5.0											-
Co	omm	18.0 ents:	6.0											

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
L		weathered	St	Stiff	D	dense Dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff			MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4144		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Dry M Mois		W Wet			high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Cored Borehole Borehole No.: BH44

Page: 2 of 3

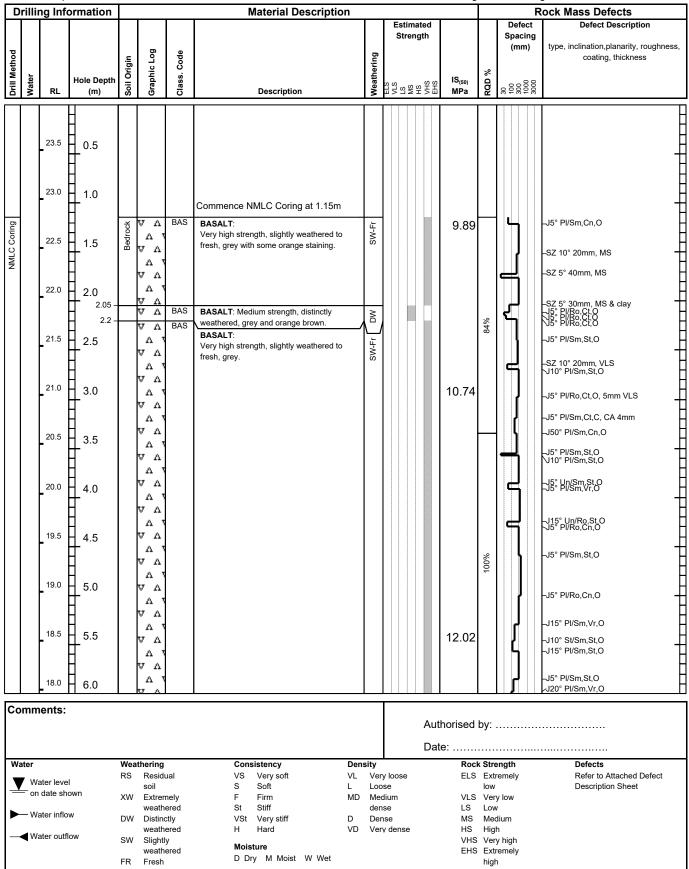
Job Number: GE18/144

Easting: 555502.00 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873282.20 Driller: Redlands Drilling

RL: 23.96 Logged By: C. Lam

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 8.30 Date: 21/11/2018 Location: Cudgen Road, Kingscliff



GEOTECHNIC

Total Depth:

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH44

Page: 3 of 3

Job Number: GE18/144

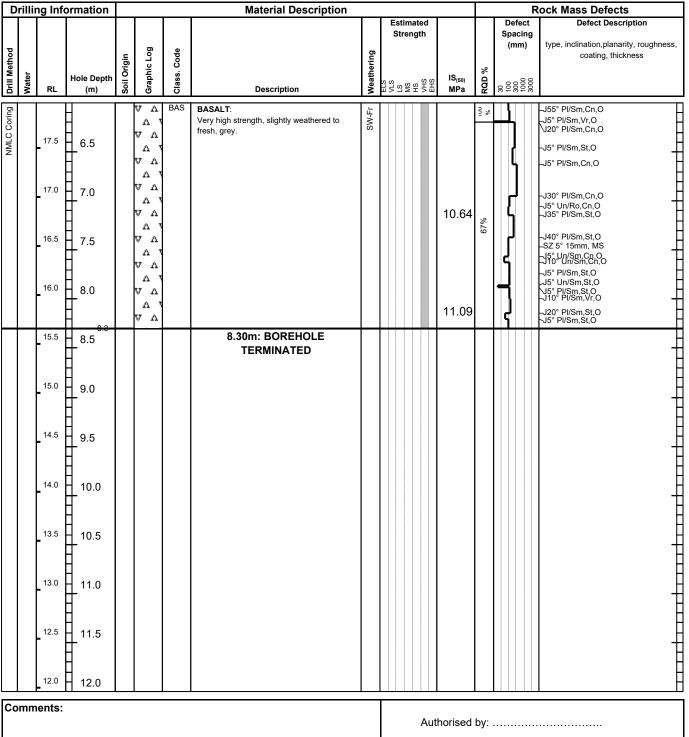
Easting: 555502.00 Drilling Rig: Hydrapower Scout

 Northing:
 6873282.20
 Driller:
 Redlands Drilling

 RL:
 23.96
 Logged By:
 C. Lam

23.96 **Logged By:** C. Lam 8.30 **Date:** 21/11/2018 Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



Comments:					
				Authorised by:	
				Date:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
Water level	RS Residual	VS Very soft	VL Very loose	ELS Extremely	Refer to Attached Defect
I V	soil	S Soft	L Loose	low	Description Sheet
on date shown	XW Extremely	F Firm	MD Medium	VLS Very low	
	weathered	St Stiff	dense	LS Low	
► Water inflow	DW Distinctly	VSt Very stiff	D Dense	MS Medium	
	weathered	H Hard	VD Very dense	HS High	
— ■ Water outflow	SW Slightly			VHS Very high	
	weathered	Moisture		EHS Extremely	
	FR Fresh	D Dry M Moist W Wel		high	





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH44

BOREHOLE DEPTH: 1.15m TO 8.3m



GEOTECHNIC

Total Depth:

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH45

Page: 1 of 5

Job Number: GE18/144

 Easting:
 555564.20
 Drilling Rig:
 Hydrapower Scout

 Northing:
 6873391.30
 Driller:
 Redlands Drilling

1.45

 ning:
 6873391.30
 Driller:
 Redlands Drilling

 RL:
 26.45
 Logged By:
 L. Bexley

Logged By: L. Bexley
Date: 09/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

	Drilling Information Material Description										Test Samples				
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result	
T.C Bit		26.0	0.25 –	Residual wash		CH	Silty CLAY: Stiff, high plasticity, red brown, with some fine to coarse sized gravel, with some organics, moist. Silty CLAY: Very stiff, medium plasticity, red brown, with some fine		M M	St VSt					
100mm Auger with T.C Bit			0.6 -	Res		CI	to medium sized gravel, moist. Silty CLAY: As above but with some cobbles.		М	VSt		1-,			
100mm		25.0	1.3 - 1.45	Bedrock	/// γ Λ	BAS	BASALT: Very low strength, extremely weathered, orange brown, mottled grey. 1.45m: COMMENCE NMLC	xw		VLS		}	– SPT	- 6,15,25, N=40	
			2.0				CORING								
		- 24.0													
			3.0												
		23.0	4.0												
		- 22.0												Ţ	
			5.0												
		21.0	 - -												
			6.0												
Со	Comments:														

oommento.										Authorised by: Date:	
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results	
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.	
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.	
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler	
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.	
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.	
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa	
Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg	
		weathered	hered Moisture		W Wet		EHS	Extremely		taper cone fitted to rods of smaller section.	
	FR	Fresh						high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes	

Easting:

Northing:

Water inflow

Water outflow

DW

SW

FR

Distinctly

Slightly

Fresh

weathered

weathered

RL:

555564.20

26.45

6873391.30

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Driller: Redlands Drilling

Logged By: L. Bexley

St

н

VSt

Moisture

Stiff

Hard

Very stiff

D Dry M Moist W Wet

Engineering Log - Cored Borehole Borehole No.: BH45

Page: 2 of 5

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Location: Cudgen Road, Kingscliff

LS

MS

HS High

Dense

Very dense

VD

Low

VHS Very high

EHS Extremely

high

Medium

Planar

Curved

Irregular

Rough

Smooth

Slickensided

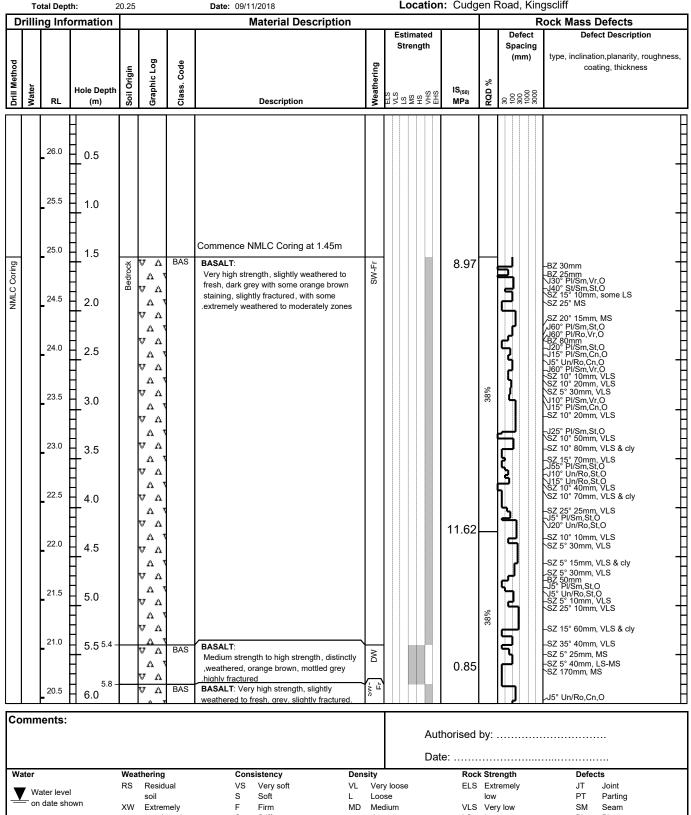
CV

IR

RO

SO

SL



GEOTECHNIC

RL:

26.45

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH45

Project: Geotech Investigation - Tweed Valley Hospital

Page: 3 of 5

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Easting: 555564.20 Client: Wood & Grieve Engineers Driller: Redlands Drilling Northing: 6873391.30

Logged By: L. Bexley Location: Cudgen Road, Kingscliff Total Depth: 20.25 Date: 09/11/2018

_		tal Dept		0.25			Date: 09/11/2018		Locati	on:	Cuage	en F	Road, Kin	
D	rillir	ng Info	ormation				Material Description		T = -	_]	-		Rock Mass Defects
Drill Method		_		rigin	Graphic Log	Class. Code		ering	Estimated Strength			%	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
Drill M	Water	RL	Hole Depth (m)	Soil Origin	Graph	Class.	Description	Weathering	ELS VLS LS MS HS VHS	EHS	IS ₍₅₀₎ MPa	RQD %	30 300 300 3000	
oring			205		V A	BAS	BASALT: Very high strength, slightly weathered to fresh, grey, slightly fractured.	W T			11.81		ן ל	SZ 15° 25mm, VLS J20° PI/Sm,Cn,O
NMLC Coring		20.0	6.25 -		ν, ν, ν,	BAS	BASALT: Low strength to medium strength, extremely weathered to distinctly weathered, orange brown mottled grey, with some extremely weathered zones, with some slightly weathered zones, highly	WQ-WX				38%	5	115° PI/Sm.Cn.O SZ 5° 90mm, VLS & cly -HFZ 450mm, LS-MS
		19.5	7.0 ^{6.85} –		V V	BAS	fractured BASALT: Very high strength, slightly weathered to fresh, orange brown mottled grey, slightly to moderately fractured, with some extremely weathered zones.	SW-Fr			10.30		2	-SZ 40° 60mm, VLS -SZ 30° 80mm, VLS -J20° St/Sm,Cn,O -J5° Pl/Sm,Ct,O, VLS -SZ 30° 30mm, VLS & cly
		18.5	8.0		V V V V V		Total of the 2016s.] =- =-	-SZ 5° 10mm, VLS -SZ 5° 10mm, VLS -SZ 20° 80mm, VLS -HFZ 10mm -SZ 15° 30mm, VLS -BZ 50mm
		18.0	8.5 8.6 -		v v v v	BAS	BASALT: Low strength to medium strength, extremely weathered to distinctly weathered, orange brown mottled grey,	XW-DW			9.31	23%	5	–SZ 10° 120mm, VLS –J40° Pl/Sm,Cn,O HFZ 180mm
		17.5	9.0 8.9 -		Λ V Λ V	BAS	highly fractured, with some extremely weathered zones BASALT: Very high strength, slightly weathered to fresh, grey.	-w-			10.84		5	-SZ 15° 90mm, VLS -SZ 5° 10mm, VLS -BZ & SZ 500mm
		17.0	9.5		Λ Λ Λ Λ Λ Λ	BAS	BASALT: Very low strength, extremely weathered, orange brown mottled grey, highly fractured.	×XW			0.15			–J25° PI/Sm.Cn.O
		16.5	9.85 – 10.0		V A	BAS	BASALT: Very high strength, slightly weathered to fresh, grey. BASALT: Very low strength, extremely weathered, orange brown mottle grey, highly fractured, sheared zones throughout.	WX WX						V10° Pl/Sm,Cn,O
		16.0	10.5		v v v v		Ü	/- in			0.15			
		15.5	11 ₁₀ 0 ₉₅ _		Λ Λ Λ Λ Λ Λ	BAS	BASALT: Very high strength, slightly weathered to fresh, grey. BASALT: Low strength, extremely weathered, orange brown mottled grey, highly fractured and sheared.	× ×				10%	1	-J5° PI/Sm,Cn,O V15° PI/Sm,Cn,O V50° PI/Sm,Cn,O
		14.5	11.65 – 11.75 – 12.0 _{95 –}		V A	BAS BAS	BASALT: Very high strength, slightly weathered to fresh, grey. BASALT: Very low strength, extremely weathered, orange brown mottled grey, with some clay lenses	XW V			0.14			–J50° Un/Ro,St,O –J15° Pl/Sm,St,O
Co	mm	ents:										•		
Water Weathering RS Residual soil Soil XW Extremely weathered Water inflow DW Distinctly weathered Water outflow SW Slightly weathered FR Fresh							Consistency Der VS Very soft VL S Soft L F Firm MD St Stiff VSt VSt Very stiff D H Hard VD Moisture D Dry M Moist W Wet	Loc Me der Der	dium se		VLS LS MS HS VHS	Ext low Ver Low Med Hig Ver	y low v dium h y high remely	Defects Refer to Attached Defect Description Sheet

GEOTECHNIC

Easting:

Northing:

RL:

555564.20

6873391.30

26.45

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH45

Page: 4 of 5

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth:	20.25	Date: 09/11/2018		Location	: Cudg	en F	Road, Kin	gscliff
Drilling Information		Material Description						Rock Mass Defects
Drill Method Hole Debti	Soil Origin Graphic Log Class. Code	Description	Weathering	Estimated Strength Nrs SH SHX SHX SHX SHX SHX SHX SHX SHX SHX S	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm) 0000 0000 0000 0000 0000 0000 0000	Defect Description type, inclination,planarity, roughness, coating, thickness
14.0 12.5 13.0 13.5 13.0 13.5 14.0 14.5 14.5 15.25 15.5 15.5 16.0 16.5 17.0 16.5 17.0 17.5 18.5 18.0	V A BAS A V V A A V V	BASALT: Very high strength, slightly weathered to fresh, grey. BASALT: Very low strength, extremely weathered, orange brown mottled grey, with some clay lenses, with some highly fractured zones BASALT: Medium strength, distinctly weathered, grey mottled orange brown, mottled grey, vesicular. BASALT: Very high strength, fresh, grey, feldspar lenses, vesicular.	Fr DW XW SW-Fr		0.13 0.24 2.44 8.47 3.24 9.61	100% 44% 10%		-BZ 150mm -BZ 150mm -J5° Un/Ro,Cn,O \documents Pi/Sm,Cn,O
Water Water level on date shown Water inflow Water outflow	Weathering RS Residual soil XW Extremely weathered DW Distinctly weathered SW Slightly weathered FR Fresh	Consistency De VS Very soft VL S Soft L F Firm ME St Stiff VSt Very stiff D H Hard VD Moisture D D M Moist W Wet	Loo Med den Den	Date / loose se dium se	Roc ELS VLS LS MS HS VHS	k Stre Ext low Ver Lov Med Hig Ver	ength remely y low v dium h y high remely	Defects Refer to Attached Defect Description Sheet

GEOTECHNIC

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH45

Page: 5 of 5

Job Number: GE18/144

Easting: 555564.20 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873391.30 Driller: Redlands Drilling
RL: 26.45 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 20.25 Date: 09/11/2018 Location: Cudgen Road, Kingscliff

_		otal Dep		0.25			Date: 09/11/2018				ocai	lion	i: Cuag	enr	Road, Kii	
Ľ	Orilli	ng Inf	ormation		1		Material Description	on <u> </u>								Rock Mass Defects
Drill Method	Water	RL	Hole Depth	Soil Origin	Graphic Log	Class. Code	Description		Weathering	St	rengti	h	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	type, inclination,planarity, roughness, coating, thickness
Ξ			(·/											_		·
NMLC Coring		8.0 7.5	18.5		V A V A V A V A V A V A V A V A V A V A	BAS	BASALT: Very high strength, fresh, grey, feldspa .lenses, vesicular		Fr				9.36	%		
		7.0	19.5		7 A 7 A 7 A 7 A									100%		–J25° Un/Ro,Cn,O –J15° St/Ro,Cn,O
		6.5	20.0		V V								6.02			<u> </u>
		6.0	20.5				20.25m: BOREHOLE TERMINATED									
		5.5	21.0													
		5.0	21.5													
		4.5	22.0													
		4.0	22.5													
		3.5	23.0													
		3.0	23.5													
		2.5	24.0													
С	omn	nents:														
1 _	— or — w	ater leve n date sh ater inflo ater outf	own	Wea RS XW DW SW	weath Disting weath Slightly weath	nely ered ctly ered	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Moisture D Dry M Moist W Wet	L MD D	Very Loos Med dens Den	ium se	e	Dall	Rock ELS VLS LS MS HS VHS	Extremely Ver Low Med High Ver	ength remely y low / dium h y high remely	Defects Refer to Attached Defect Description Sheet



PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH45

BOREHOLE DEPTH: 1.45m TO 20.25m



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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH46

Page: 1 of 4

Job Number: GE18/144

Easting: 555491.70 Drilling Rig: Hydrapower Scout

Northing: 6873374.60 Driller: Redlands Drilling

 RL:
 22.42
 Logged By: C. Lam

 Total Depth:
 2.00
 Date: 06/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

	Orilli	ng Info	rmation			r	Material Description					Tes	st San	ples]
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result	
100mm		22.0		Slopewash		СН	Sitty CLAY: Very stiff, high plasticity, red brown, with some fine to .coarse sized gravel, with some organics, moist		М	VSt]
			0.5 -	Residual		CI	Silty CLAY: Hard, medium plasticity, red brown, with some fine to coarse sized gravel, moist Silty CLAY:		M	Н					-
		24.0	1.0			Ci .	As above but with some cobbles.		IVI	"		1-	– SPT	– - 8,20,15, N=35	- - -
Wash		21.0	1.7 –	Bedrock	<u> </u>	BAS	BASALT:	DW		MS		J			
	Ш		2.0	Вес	Δ		Medium strength, distinctly weathered, dark grey.]
		20.0					2.00m: COMMENCE NMLC CORING								
			3.0											-	-
		- 19.0													
			4.0											-	<u> </u>
		18.0													1
			5.0											-	
		17.0													1
			6.0												
Co	mme	ents:							. بداد مالد،						1

Comments:										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4147		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
— ■ Water outflow	SW	Slightly		_			VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555491.70

22.42

17.40

6873374.60

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Logged By: C. Lam

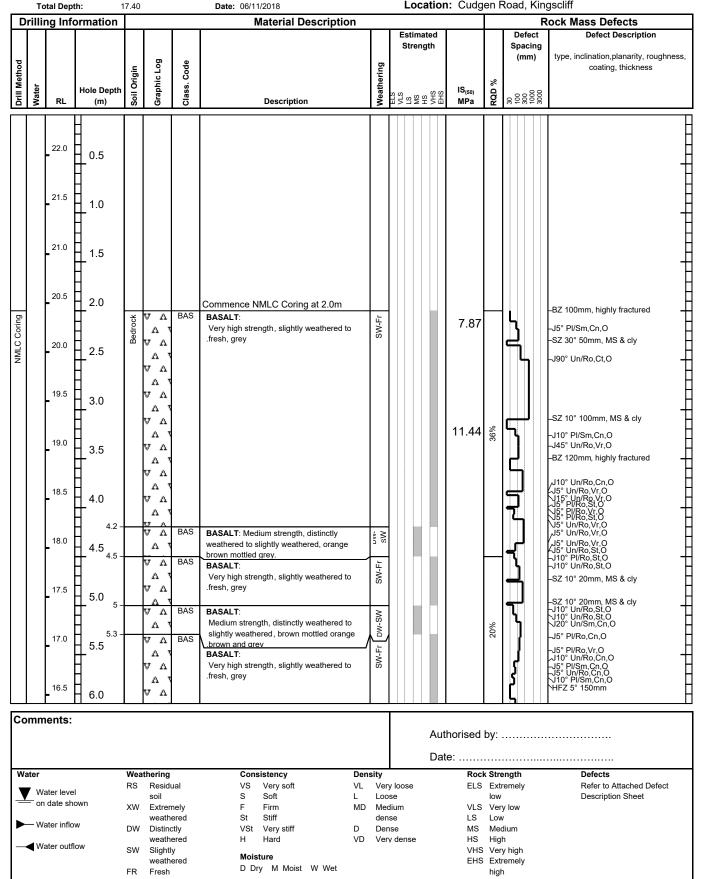
Engineering Log - Cored Borehole Borehole No.: BH46

Page: 2 of 4

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital



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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH46

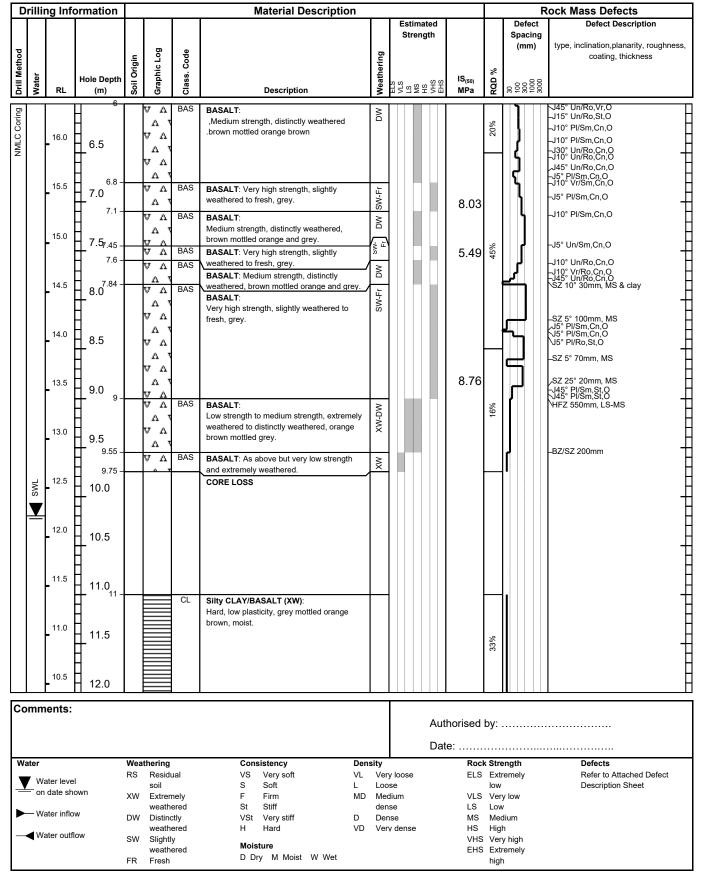
Page: 3 of 4

Job Number: GE18/144

Easting: 555491.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873374.60 Driller: Redlands Drilling

RL: 22.42 Logged By: C. Lam Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 17.40 Date: 06/11/2018 Location: Cudgen Road, Kingscliff



MORRISON GEOTECHNIC

Total Depth:

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

17.40

Λ Δ

4.5

18.0

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Date: 06/11/2018

Engineering Log - Cored Borehole Borehole No.: BH46

Page: 4 of 4

Job Number: GE18/144

Easting: 555491.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Northing: 6873374.60 Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital Logged By: C. Lam RL: 22.42 Location: Cudgen Road, Kingscliff

Drilling Information Material Description Rock Mass Defects Estimated Defect **Defect Description** Strength Spacing type, inclination, planarity, roughness, (mm) Code **Drill Method 3raphic Log** Weathering coating, thickness Origin Class. Water Hole Depth IS₍₅₀₎ MPa Rab ELS VLS MS HS VHS EHS 300 300 300 300 300 RI (m) Description BASALT: × NMLC Coring Very low strength, extremely weathered, Δ 33% dark grey mottled orange brown. 10.0 VΛ 12.5 BAS Λ BASALT: SΝ Δ Very high strength, slightly weathered, dark grey, vesicular. VΛ 9.5 13.0 Δ 7.35 ZΛ -J10° PI/Sm Cn O Λ 9.0 Λ 13.5 Λ Λ J5° St/Sm,Cn,O Λ 8.5 14.0 Λ Δ Λ -J35° Un/Ro,Cn,O Λ 8.0 14.5 Λ Δ Λ Λ 7.5 15.0 %66 Λ Δ Λ 7.0 15.5 Λ 6.43 J20° Un/Ro,Cn,O Λ 6.5 16.0 Δ Λ 6.0 16.5 Λ Λ 5.5 17.0 Δ

Comments:			А	authorised by:	
)ate:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
Water level on date shown	RS Residual soil XW Extremely	VS Very soft S Soft F Firm	VL Very loose L Loose MD Medium	ELS Extremely low VLS Very low	Refer to Attached Defect Description Sheet
Water inflow	weathered DW Distinctly	St Stiff VSt Very stiff	dense D Dense	LS Low MS Medium	
─ Water outflow	weathered SW Slightly weathered FR Fresh	H Hard Moisture D Dry M Moist W Wet	VD Very dense	HS High VHS Very high EHS Extremely high	

17.40m: BOREHOLE **TERMINATED**

11.78

J30° Un/Ro,Cn,O



CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD

PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH46

BOREHOLE DEPTH: 2.0m TO 17.4m



GEOTECHNIC

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH47

Page: 1 of 4

Job Number: GE18/144

Easting: 555446.90 Drilling Rig: Hydrapower Scout Northing: 6873412.00 Driller: Redlands Drilling

Logged By: L. Bexley RL: 14.37 Date: 19/11/2018

weathered

Distinctly

Slightly

Fresh

weathered

weathered

DW

sw

Water inflow

Water outflow

St

Н

VSt

Moisture

Stiff

Hard

Very stiff

D Dry M Moist W Wet

dense

Very dense

D Dense

VD

LS Low

MS

HS High

VHS

Medium

Very high

EHS Extremely

high

DC

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

300mm with a 63.6kg hammer falling 762mm.

taper cone fitted to rods of smaller section.

Vane shear value kPa

Hand penetrometer estimate of unconfined compressive strength, kPa.

Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

_		tal Depth:	8.2	.0		Date		_ocati	on: C	udgen	Road, k	Kingscliff	4.0	
	ווווזע	ing into	rmation		Ī	Φ	Material Description					168	st Sam	ipies
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
vith				was		СН	Silty CLAY: Very stiff, high plasticity, red brown and orange brown, with some fine to medium sized gravel,		М	VSt				
100mm Auger with		14.0	0.4 –	Slopewas			trace of organics, moist.							
m Au				Residual		CI	Silty CLAY: Very stiff to hard, medium plasticity, red brown mottled grey, with some fine to medium sized gravel, moist.		М	VSt-H				
non			1.0	ž			groy, mar come into to modulin ozea grafo, modu.							
			H 1.0									1		
		13.0	H									}	– SPT	_5,10,19, N=29: PP=>600kPa
			1.4 –			CI	Silty CLAY: As above but with some extremely weathered basalt		М	VSt-H		J		
							layers.							
			2.0											
		12.0												
		_										2.5		
												}	- SPT	7,7,6, N=13: PP=400-600kPa
5			3.0									J		
3		11.0												
Wasii bule - Ruck Rullel		-												
מום			3.7 –		///	CI	Silty CLAY:		M	Н				
192			4.0				As above but hard, pale grey mottled orange brown and no extremely weathered basalt layers.					4 -		
^		10.0										}	– SPT	_5,9,11, N=20: PP=>400kPa
		- 10.0										J		
			5.0											
			5.1 –			CI	Silty CLAY: As above but dark grey mottled orange brown and red		M	Н				
		9.0					brown.					5.5 —		
			H]	– SPT	_5,11,16, N=27:
			6.0											PP=>600kPa
or	mm	ents:												
										-				
Vat	ter		Weatherin	n	Consist	encv	Density Rock Strength Test	D s & Res						•••
		iter level	RS Resi	dual	VS V	ery soft	VL Very loose ELS Extremely U50 L Loose low D	Undis		0mm dia	am tube.			

GEOTECHNIC

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH47

Page: 2 of 4

Job Number: GE18/144

Easting: 555446.90 Drilling Rig: Hydrapower Scout

Northing: 6873412.00 Driller: Redlands Drilling RL: 14.37

Logged By: L. Bexley Date: 19/11/2018 Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		tal Depth:	8.2		20		y: L. Bexiey e: 19/11/2018	Locati	on: C	udgen	Road, ł	Kingscliff		
	Drill	ing Info	rmation				Material Description					Tes	st San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
Wash Bore - Rock Roller		7.0	7.0	Bedrock	₩ △	CI	Sitty CLAY: As above but dark grey mottled orange brown and red brown. BASALT: Medium strength, distinctly weathered, orange brown mottled grey.	DW	М	H		7	– SPT	3,3,4, N=7: PP=>400kPa
		6.0	8.2	ш	^ 1		8.20m: COMMENCE NMLC CORING							
		5.0	9.0											
		_ 4.0												
		_ 3.0	11.0											
Со	mm	ents:												

Comments:										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level on date shown		soil	S	Soft	L	Loose		low	D	Disturbed sample.
— on date snown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	ture			EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Dr	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Cored Borehole Borehole No.: BH47

Page: 3 of 4

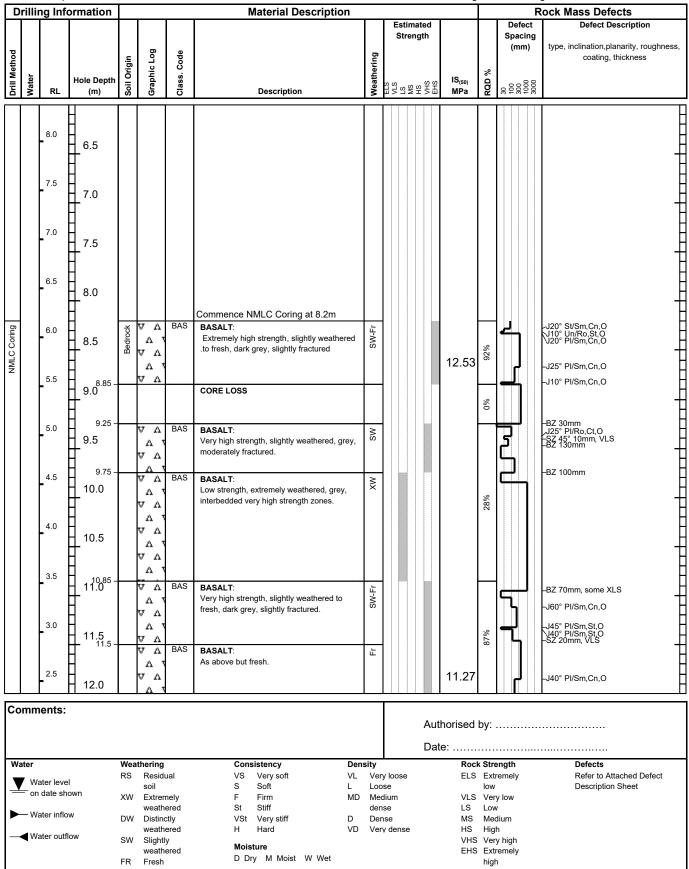
Job Number: GE18/144

Easting: 555446.90 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873412.00 Driller: Redlands Drilling

RL: 14.37 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 16.00 Date: 19/11/2018 Location: Cudgen Road, Kingscliff



GEOTECHNIC

Easting:

Northing:

RL:

555446.90

6873412.00

14.37

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH47

Page: 4 of 4

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Total Depti		4.3 <i>7</i> 6.00		LU	Date: 19/11/2018		Loc	ation	: Cudg	en F	Road, Kin	gscliff
Drilling Info	rmation				Material Description							lock Mass Defects
Drill Method Water 73	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Estima Streng STA STA STA STA STA STA STA STA STA STA	gth	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
2.0 INMN 2.0 In the second sec	15.5 15.7 – 16.0 16.5		A V A V A V A V A V A V A V A V A V A V	BAS	BASALT: As above but fresh BASALT: As above but vesicular. 16.00m: BOREHOLE TERMINATED	FF FF			6.60	91% 87%		Name
Comments:												
Water inflov	RS Residual VS Very soft VI					Loc D Med den Der	dium se		Roci ELS VLS LS MS HS VHS	Extra low Very Low Med High	ength remely y low dium n y high remely	Defects Refer to Attached Defect Description Sheet





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144 BOREHOLE NUMBER: BH47

BOREHOLE DEPTH: 8.2m TO 16.0m



GEOTECHNIC

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH48

Page: 1 of 4

Job Number: GE18/144

 Easting:
 555495.30
 Drilling Rig:
 Hydrapower Scout

 Northing:
 6873426.30
 Driller:
 Redlands Drilling

 RL:
 22.24
 Logged By:
 L. Bexley

 Total Depth:
 2.55
 Date:
 07/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation			Dut	Material Description	.oout.	<u> </u>		, touu, .	Tes	st San	nples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
Bit		22.0		oewash		CH	Silty CLAY: Very stiff, high plasticity, red brown, with some fine to coarse sized gravel, moist.		М	VSt				
k 100mm Auger with T.C		21.0	1.0	Residual Slopewash		CI	Silty CLAY: Very stiff to hard, medium plasticity, red brown, with some fine to coarse sized gravel, moist.		М	VSt-H		1-}	– SPT	4,7,9, N=16: PP=400kPa
Wash Bore - Rock			2.0	Bedrock	ν Λ ν Λ	BAS	BASALT: Very low strength, extremely weathered, orange brown, mottled dark grey.	XW		VLS				
Wash B		20.0	2.1 –		V V	BAS	BASALT: As above but medium strength and distinctly weathered.	DW		MS		2.5 –	– SPT	30/50mm, no/ recovery
		19.0 18.0 17.0	3.0				2.55m: COMMENCE NMLC CORING							
Со	mme	ents:	6.0						uthoria					

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
—	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555495.30

22.24

6873426.30

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

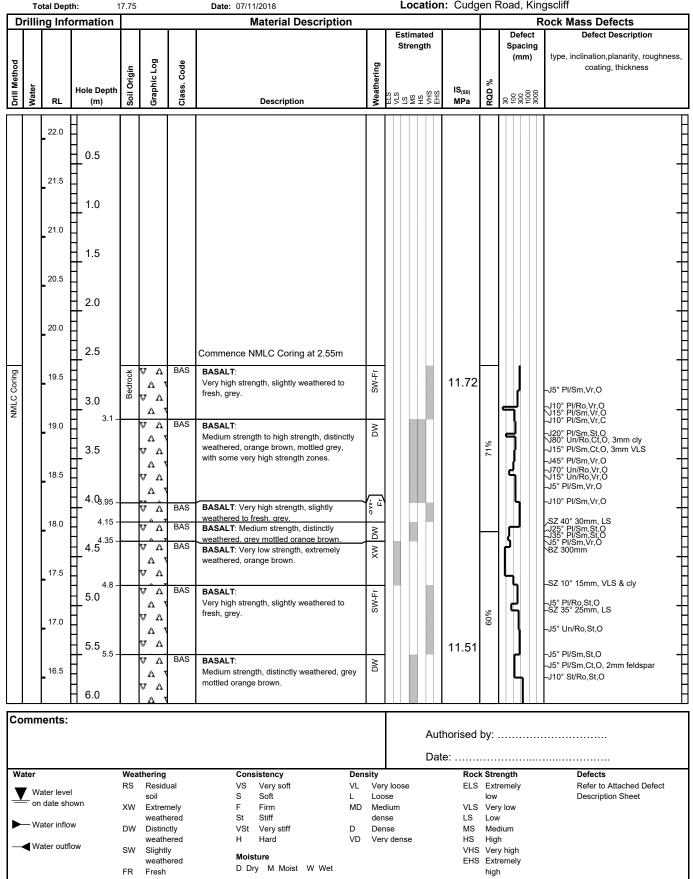
Engineering Log - Cored Borehole Borehole No.: BH48

Page: 2 of 4

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



GEOTECHNIC

Easting:

Northing:

RL:

555495.30

22.24

FR

Fresh

6873426.30

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH48

Page: 3 of 4

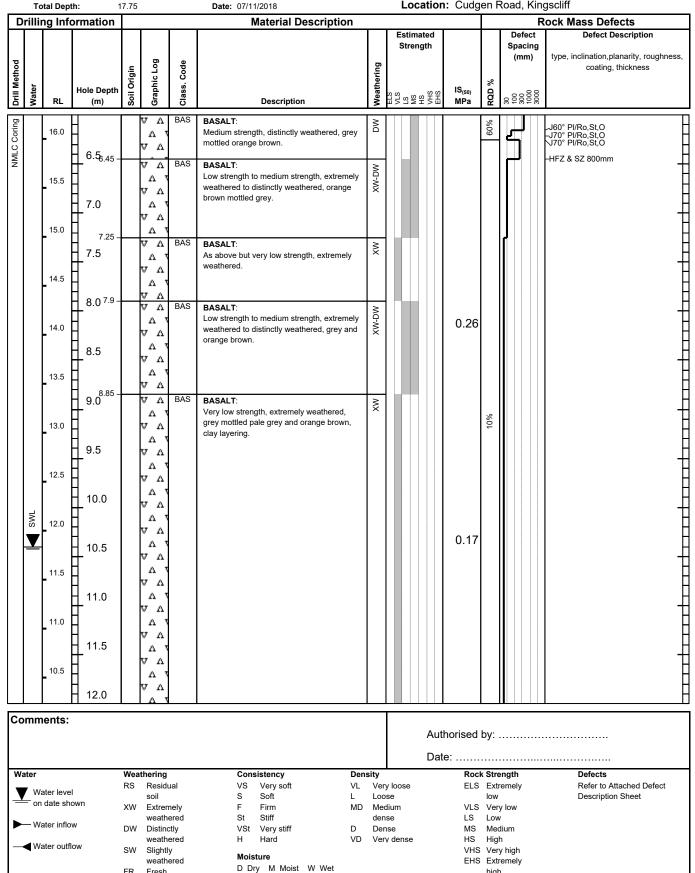
Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Location: Cudgen Road, Kingscliff

high



GEOTECHNIC

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH48

Page: 4 of 4

Job Number: GE18/144

Easting: 555495.30 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873426.30 Driller: Redlands Drilling
RL: 22.24 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 17.75 Date: 07/11/2018 Location: Cudgen Road, Kingscliff

		tal Dep		7.75			Date: 07/11/2018		Locatio	n: Cuag	jen i	Road, Kin	
D	rilli	ng Info	ormation		,		Material Description			1			ock Mass Defects
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Estimated Strength SHU SHU SNU SIN	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
NMLC Coring		10.0	12.35 -		ν ν Α ν	BAS	BASALT: Very low strength, extremely weathered, grey mottled pale grey and orange brown, clay layering. CORE LOSS	XX			10%		
N		9.5 9.0 8.5 8.0	12.75 - 13.0 13.5 14.0		A V A V A V A V A V A V A V A V A V A V	BAS	BASALT: Very high strength, fresh, dark grey, vesicular lenses of feldspar.	Fr		8.83 7.76	87%	5	J40° Un/Ro,Cn,O J40° Un/Ro,Cn,O J30° Un/Ro,Cn,O J45° Bl/Ro,Cn,O J20° Pl/Sm,Cn,O J5° Pl/Ro,Vr,O J5° Pl/Ro,Vr,O
		7.0 6.5 6.0	15.0		V V V V V V V V V V V V V V V V V V V						%86		_J50° PI/Sm,Cn,O
		5.5	17.0		V A V V V V V V V V V V V V V V V V V V		17.75m: BOREHOLE			7.05			–J10° PI/Sm,Cn,O
			18.0				TERMINATED						H
Co	mm	ents:							Au	thorised	by:		

Comments:				Authorised by:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
	RS Residual	VS Very soft	VL Very loose	ELS Extremely	Refer to Attached Defect
Water level	soil	S Soft	L Loose	low	Description Sheet
on date shown	XW Extremely	F Firm	MD Medium	VLS Very low	
	weathered	St Stiff	dense	LS Low	
Water inflow	DW Distinctly	VSt Very stiff	D Dense	MS Medium	
4	weathered	H Hard	VD Very dense	HS High	
— ■ Water outflow	SW Slightly			VHS Very high	
	weathered	Moisture		EHS Extremely	
	FR Fresh	D Dry M Moist W Wet		high	





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH48

BOREHOLE DEPTH: 2.55m TO 17.75m



MORRISON GEOTECHNIC

Total Depth:

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH49

Page: 1 of 4

Job Number: GE18/144

Easting: 555477.60 Drilling Rig: Hydrapower Scout

 Northing:
 6873444.50
 Driller:
 Redlands Drilling

 RL:
 18.80
 Logged By:
 L. Bexley

1.20

Logged By: L. Bexley
Date: 19/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ai Depth: ng Infoi	rmation				Material Description			9	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Tes	st Sam	ples	7
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result	
r with				Slopewash		СН	Sitty CLAY: Stiff, high plasticity, red brown, fine to coarse sized gravel, moist.		М	St]
100mm Auger with		18.0	0.35 –	Bedrock Residual Slop		CI	Silty CLAY: Very stiff, medium to high plasticity, red brown with some grey mottling, fine to coarse sized gravel, with some cobbles, moist.		M	VSt		4		15/100mm, bouncing on	
>			1.05 –	Bedı	VΛ	BAS	BASALT: Medium strength, distinctly weathered, grey mottled orange brown.	DW		MS		¹-}-	– SPT	cobbles, no recovery	1
			2.0				1.20m: COMMENCE NMLC CORING								
Co	nme	ents:						^	uthoria	end by					1

										Authorised by:
					_			<u> </u>		Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
W 10/-411	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
_		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	ture				, ,		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet	Lilo	high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Total Depth:

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14.55

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH49

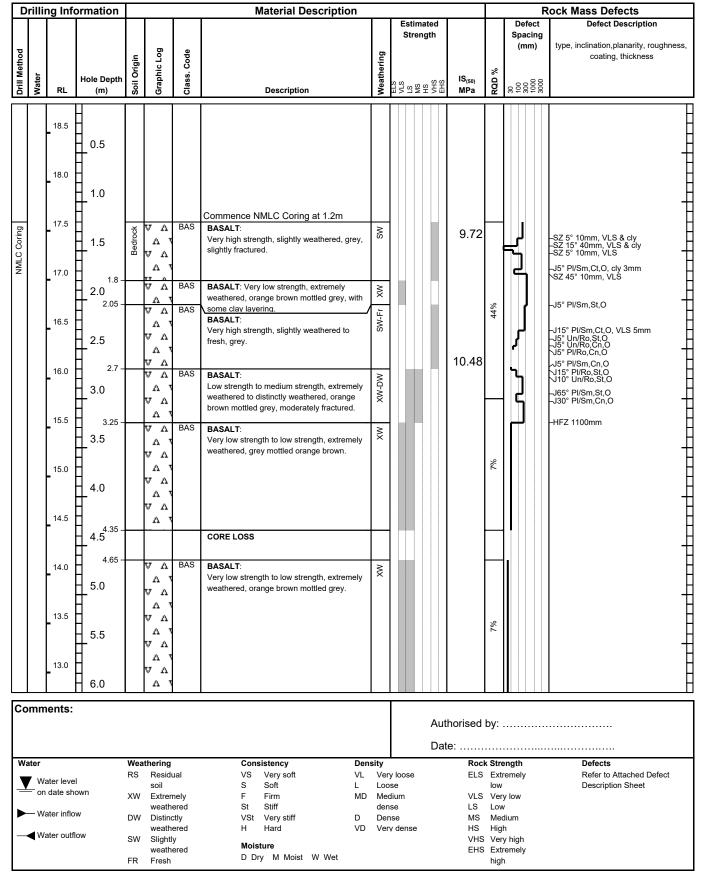
Page: 2 of 4

Job Number: GE18/144

Easting: 555477.60 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873444.50 Driller: Redlands Drilling

RL: 18.80 Logged By: L. Bexley Project: Geotech Investigation - Tweed Valley Hospital

Date: 19/11/2018 Location: Cudgen Road, Kingscliff



GEOTECHNIC

Easting:

Northing:

RL:

18.80

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Logged By: L. Bexley

Engineering Log - Cored Borehole Borehole No.: BH49

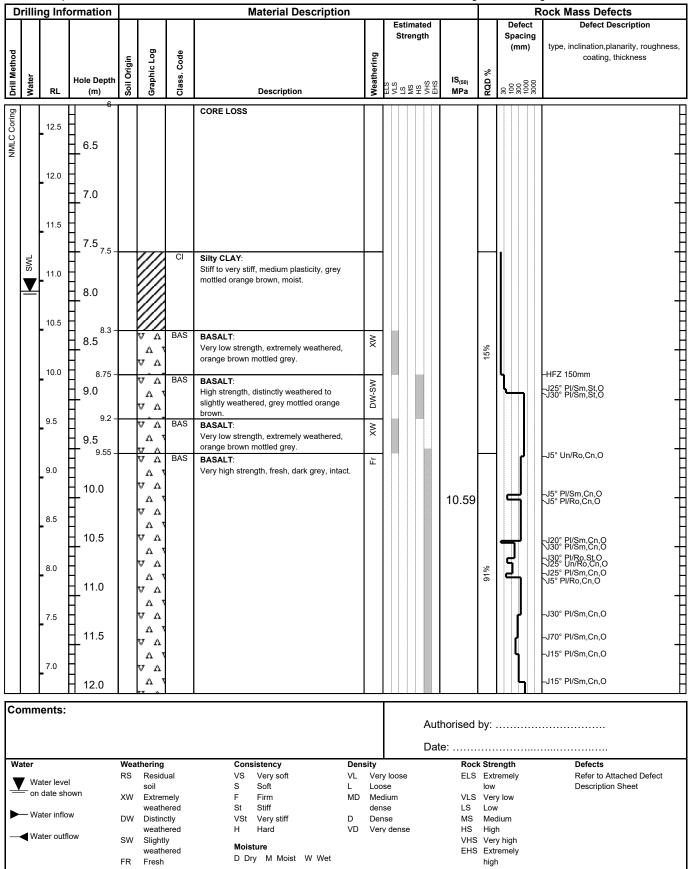
Project: Geotech Investigation - Tweed Valley Hospital

Page: 3 of 4

Job Number: GE18/144

555477.60 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
6873444.50 Driller: Redlands Drilling

Total Depth: 14.55 Date: 19/11/2018 Location: Cudgen Road, Kingscliff



MORRISON GEOTECHNIC

RL:

18.80

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH49

Project: Geotech Investigation - Tweed Valley Hospital

Page: 4 of 4

Job Number: GE18/144

Easting: 555477.60 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling Northing: 6873444.50

Logged By: L. Bexley Location: Cudgen Road, Kingscliff Total Depth: 14.55 Date: 19/11/2018

F	\rill:	na Info	rmation	4.55			Material Description					i: Cuag				Rock Mass Defects
H	71 11111 T	ig ilif	ormation		I	I	Material Description	Ι	I	Estimated	d I			De	fect	Defect Description
Drill Method	ər		Hole Depth	Soil Origin	Graphic Log	Class. Code		Weathering		Strength	l	IS ₍₅₀₎	% (Spa (m	cing im)	type, inclination,planarity, roughness, coating, thickness
Drill	Water	RL	(m)	Soil	Grap	Clas	Description	Wea	ELS	KS WS K	EHS	MPa	RQD	30 100	3000	
NMLC Coring		6.5	12.5		A V A V V A	BAS	BASALT: Very high strength, fresh, dark grey, intact.	Fr				10.35	70			
Z		6.0	13,0,5 -		Δ V Δ V Δ V	BAS	PASALT:								J	_J5° Pl/Sm,Cn,O
		5.5	13.5		Λ Λ Λ Λ	מאט	BASALT: As above but high to very high strength and vesicular.	Fr					%58	[-SZ 5° 20mm, VLS -J40° PI/Sm,Cn,O
		5.0	14.0		V V A V A V											–J15° Un/Ro,Cn,O –J20° Pl/Sm,Cn,O
		4.5	14.5		A V A V A V							3.11				J15° Un/Ro,Cn,O J15° PI/Sm,Cn,O SZ 10° 15mm, VLS V90° Un/Ro,Cn,O
		4.0	15.0				14.55m: BOREHOLE TERMINATED									
		3.5	15.5													
		3.0	16.0													
		2.5	16.5													
		2.0	17.0													
		1.0	17.5													
			18.0													
C	omm	ents:														
L									L)at	e:				
_	— on — w	ater level date sho ater inflo	own w	Wea RS XW DW SW	Residence Soil Extremed Weath Distinct Weath Slightle Weath Fresh	nely ered ctly ered y ered	Consistency Den VS Very soft VL S Soft L F Firm MD St Stiff VSt VSt Very stiff D H Hard VD Moisture D Dry M Moist W Wet	Loo Med den Der	se diur se se			VLS LS MS HS VHS	Ext low Ver Low Med Hig Ver	y low / dium h y high remely		Defects Refer to Attached Defect Description Sheet





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH49

BOREHOLE DEPTH: 1.2m TO 14.55m



GEOTECHNIC

Total Depth:

15.25

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH50

Page: 1 of 5

Job Number: GE18/144

Easting: 555537.30 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers 6873419.40 Driller: Redlands Drilling

Northing: Project: Geotech Investigation - Tweed Valley Hospital RL: 24.47 Logged By: L. Bexley

Location: Cudgen Road, Kingscliff Date: 08/11/2018

	Drilli	ng Info	rmation				Material [Description						Tes	st San	ıples	
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	De	scription		Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result	
Bit				Slope wash		CH	Silty CLAY: Stiff, high plasticity, red b	rown, with some fine to			М	St		0.15 –	– PP	– 180kPa	\prod
C B		04.0	0.25 –		////	CI	medium sized gravel, with		∤		М	VSt					П
th T		_ 24.0		Residual			Silty CLAY: Very stiff, medium plastic		fine					0.5 –	– PP	– 300kPa	П
er wi			Ī	_			to coarse sized gravel, m	IOIST.									П
√uge			1.0														П
100mm Auger with T.C			†											1		3,6,5, N=11:	Π
100r														}	– SPT	PP=>600kPa	П
		_ 23.0												J			П
																	П
			2.0														П
			†													,	Ħ
																	Н
		22.0												2.5			Н
			1												– SPT	– 4,5,5, N=10	Н
			3.0													.,=,=,	Н
			3-	Rock	VΛ	BAS	BASALT:			xw		LS					Ħ
ller			3.3 –	Rc	Λ		Low strength extremely w mottled grey.	veathered, orange brown									H
Rock Roller		21.0			V A	BAS	BASALT: As above but medium str	enath and distinctly weath	hered	DW		MS					Н
Roc			-		VΛ		, to above but modium of	ongar and doublesy frods									Н
1			3.8 – 4.0		V A	BAS	BASALT:			XW		VLS					Н
Wash Bore			+ 4.0		Λ,		As above but very low str with some clay layering.	rength, extremely weather	red,					4 –		,	$^{\rm H}$
Vash			1		ν Λ Λ ν									}	_ SPT	– 10,12,18, N=30	Н
>		20.0			VΛ									J			Н
			-		v v												Н
					Α												Н
			5.0		V A	BAS	BASALT:			DW		MS				•	H
			5.3 –		Δ		As above but medium str	ength and distinctly weath	hered.								Н
		19.0	5.5 -		VΛ	BAS	BASALT:		-1	xw		VLS					Н
			4		v v		As above but very low str weathered.	rengin and extremely						5.5			Н
			4		Λ,									}	– SPT	– 20,26,26, N=52	Н
			6.0		VΛ									J			Ш
Со	mme	ents:															\Box
										Αu	ıthoris	sed by:	:				
										Da	ate:						
	ter		Weatherin	-	Consist VS V	ency ery soft	Density VL Very loose	Rock Strength ELS Extremely	Tests U50	& Resu		0mm dia	am tuhe				٦
		ter level date showr	soil		S S	oft	L Loose	low	D	Disturt	oed san	nple.		umbo- of LI	014/0 40 -1	rivo E0mm aanala	
		ter inflow	weat	hered	St S		MD Medium dense	VLS Very low LS Low	SPT	300mn	n with a	63.6kg	hammer fa	Illing 762mm	١.	rive 50mm sampler	
				-		ery stiff ard	D Dense VD Very dense	MS Medium HS High	PP S			meter es alue kPa		inconfined c	ompress	sive strength, kPa.	
\prod	vvat	ter outflow	SW Sligh weat	tly hered	Moistur			VHS Very high EHS Extremely	DC				09kg hami Is of smalle		mm, driv	ring 20mm, 30 deg	
			FR Fres		D Dry	M Mois	t W Wet	high							for End	ineering Purposes	

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

555537.30

6873419.40

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole

Borehole No.: BH50

Page: 2 of 5

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital RL: Logged By: L. Bexley 24.47

	Tot	RL: tal Depth:	24.4 ⁻ 15.2		Log		7: L. Bexley 9: 08/11/2018					Kingscliff		valley 1100pital
			rmation	J		Date	Material Description	Locati	J 0	augun	. todu, i		st San	nles
H	, m	119 11110	mauon		T	T	material Description		Ι	T .		168	Jan	ipies
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		18.0	7.0		V A V A V A V A V A V A	BAS	BASALT: As above but very low strength and extremely weathered.	XW		VLS		⁷ ¬	ODT.	22,30/110mm,
		17.0	7.1		A V A V A V A V	BAS	BASALT: As above but low strength. BASALT: As above but very low strength.	xw		LS VLS		j	– SPT	N*=82
Wash Bore - Rock Roller		16.0	9.0		V 4 V 4 A V V 4 A V 4							8.5	– SPT	– 30/130mm, N*=69
Wash Bore		15.0	9.5 –		A V A V A V A V A V	BAS	BASALT: As above but with some clay layering.	xw		VLS		10 —	– SPT	- 18,15,19, N=34
		14.0	10.8 -	Residual	V V V V V V	CL	Silty CLAY: Stiff to very stiff, low to medium plasticity, grey mottled orange brown and dark grey, moist.	1	М	St- VSt		}	- 521	- 18,15,19, N=34
		13.0	12.0									11.5 –	– SPT	2,3,5, N=8: PP=180-300kPa
Со	mm	ents:												
								D	ate:					
Wa	ter		Weathering	9	Consiste	ency	Density Rock Strength Te	ests & Res	ults					7

										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole

Borehole No.: BH50 Page: 3 of 5

Job Number: GE18/144

Easting: 555537.30 Northing: 6873419.40

24.47

RL:

Drilling Rig: Hydrapower Scout Driller: Redlands Drilling Logged By: L. Bexley

Client: Wood & Grieve Engineers Project: Geotech Investigation - Tweed Valley Hospital

	То	tal Depth:					e: 08/11/2018	_ocati	on: C	udgen	Road, I	Kingscliff		
	Drill	ing Info	rmation			1	Material Description					Tes	st San	nples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
Wash Bore - Rock Roller	SWL	12.0	13.0			CL	Sity CLAY: As above but stiff.		М	St		13 }	– SPT	3,3,5, N=8: PP=110-200kPa
Wash		10.0	14.2 -	Bedrock	V A V A V A V A V A V A V A V A V A V A	BAS	BASALT: Very low strength, extremely weathered, grey mottled orange brown. BASALT: As above but medium strength and distinctly weathered	XW		VLS MS		14.5	– SPT	22,30/120mm, N*=75
		9.0	16.0				15.25m: COMMENCE NMLC CORING							
		8.0	17.0											
		7.0	18.0											
Со	mm	ents:												

comments.										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly		_			VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555537.30

24.47

6873419.40

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weathered

Fresh

FR

D Dry M Moist W Wet

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH50

Page: 4 of 5

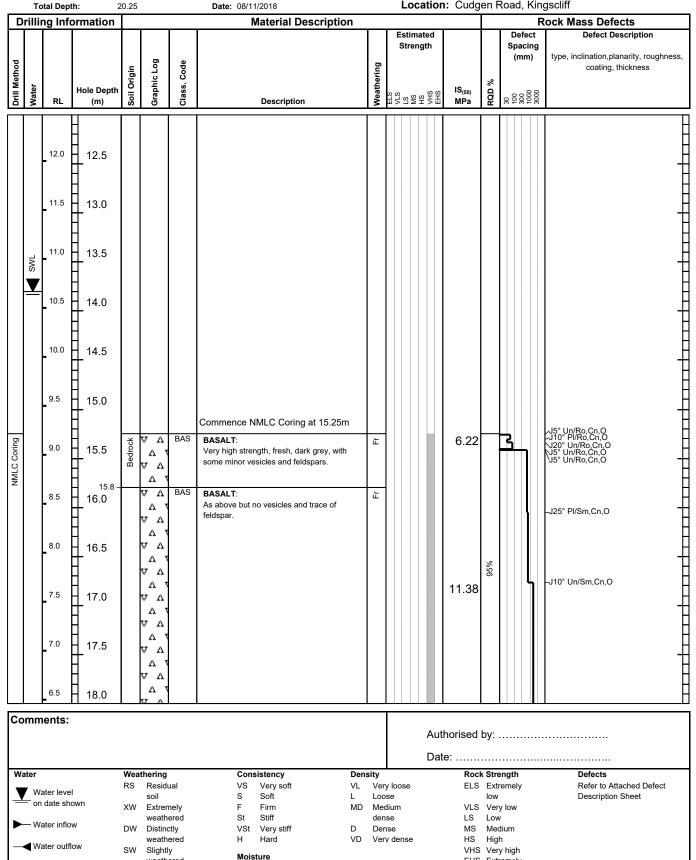
Job Number: GE18/144

Client: Wood & Grieve Engineers

EHS Extremely

high

Project: Geotech Investigation - Tweed Valley Hospital



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Engineering Log - Cored Borehole Borehole No.: BH50

Page: 5 of 5

Job Number: GE18/144

Easting: 555537.30 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873419.40 Driller: Redlands Drilling

Project: Coastal Investigation To

RL: 24.47 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 20.25 Date: 08/11/2018 Location: Cudgen Road, Kingscliff

_			Depth:		0.25			Date: 08/11/2018			LO	catio	n: Cuag	enr	Road, Kin	
L	Dri	lling	Infor	mation		,		Material Descriptio	n	-,	F	-4- •				lock Mass Defects
Duill Mathewal	DOI MANUEL STATE OF THE STATE O	Water	H. RL	ole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description		Weathering	Estim Stren SIN SIN SIN SIN	ngth	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
Ξ			- 			V A	BAS	BASALT:								
MIMIN Coring		6.	Ħ	18. ¹ 5 .4 -		Λ Λ Λ Λ Λ Λ Λ Λ	BAS	BASALT: As above but no vesicles and trace of feldspar. BASALT: As above but high strength to very high strength, slightly weathered to fresh, high vesicular, with some feldspar lenses.	-	SW-Fr Fr			13.24	%96		–J10° Un/Ro,Cn,O –J15° Un/Ro,Cn,O
		5.	Ħ	19.5		V V V V V								%98		-J10° Un/Ro,Cn,O -J60° Pl/Ro,Cn,O -J45° Pl/Ro,Cn,O -SZ 15° 30mm, VLS
		4.	.5	20.0		V V V V V V							3.92			–J5° Un/Ro,Cn,O
		4.	Ħ	20.5				20.25m: BOREHOLE TERMINATED								
		3.	Ħ	21.0												
		2.	Ħ	22.0												
		2.	.0	22.5												
		1.	.5	23.0												
		1.	.0	23.5												
L		0.	.5	24.0												
C	om	nmen	its:									_		•		
-	<u> </u>	Water on dat Water	level te showr inflow	n	Wea RS XW DW SW	thering Residu soil Extren weath Disting weath Slightl weath Fresh	nely ered ctly ered y	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Moisture D Dry M Moist W Wet	L MD	Very Loos Med dens Den	lium se	24	Rock ELS VLS LS MS HS VHS	Extremely low Ver Low Med High Ver	ength remely y low dium h y high remely	Defects Refer to Attached Defect Description Sheet





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144
BOREHOLE NUMBER: BH50
BOREHOLE DEPTH: 15.25m TO 20.25m



GEOTECHNIC

Total Depth:

RL:

26.16

10.80

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH51

Page: 1 of 5

Job Number: GE18/144

 Easting:
 555565.40
 Drilling Rig:
 Hydrapower Scout

 Northing:
 6873442.90
 Driller:
 Redlands Drilling

Driller: Redlands Drilling
Logged By: L. Bexley
Date: 13/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation				Material Description			3	,	Tes	st San	nples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		26.0		vash		СН	Silty CLAY: Stiff, high plasticity, red brown, with some fine to coarse		М	St				
C Bit			0.3 -	Slopev	<i>}}}</i>	CI	sized gravel, with some organics, moist.		М	VSt				
100mm Auger with T.C		25.0	1.0	Residual Slopewash			Sitry CLAY: Very stiff, medium to high plasticity, red brown, trace of fine to coarse sized gravel, with some cobbles, moist.					1-}	– SPT	3,7,6, N=13: PP=250-300kPa
10			H									J		H
		24.0	2.0											
			2.8 -			CI	Silty CLAY: As above but hard, with some extremely		М	н		2.5	– SPT	4,6,9, N=15: PP=250-500kPa
		23.0	3.0				weathered basalt layering.)		\mathbb{H}
Roller		-	3.5 –	Bedrock	ν Λ ν ν	BAS	BASALT: Very low strength, extremely weathered, orange brown mottled grey.	XW		VLS				H
Wash Bore - Rock Roller			4.0		V V	BAS	BASALT: As above but medium strength to high strength, distinctly weathered to slightly weathered, with some extremely weathered zones.	DW- SW		MS- HS		4		H
Vash Bo		22.0			ν Λ ν Λ	BAS	BASALT: As above but very low strength and extremely weathered.	XW		VLS		}	– SPT	11,25,30/80mm, N*=81
<i>></i>			5.0		V V	BAS	BASALT: As above but medium strength, distinctly weathered with some extremely weathered zones.	DW		MS				
		21.0			Λ V Λ V									
			5.4 –		V A	BAS	BASALT: As above but low strength and extremely weathered.	xw		LS		5.5 -}	– SPT	– 28/150mm, N*=56
			6.0		Λ .									
Co	mme	ents:						_	uthoria	sed by				

										Authorised by: Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose Medium		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD		VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	oisture				Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Dry M Moist		W Wet			high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole

Borehole No.: BH51 Page: 2 of 5

Job Number: GE18/144

Easting: 555565.40 Drilling Rig: Hydrapower Scout Northing: 6873442.90 Driller: Redlands Drilling RL: Logged By: L. Bexley 26.16

Client: Wood & Grieve Engineers Project: Geotech Investigation - Tweed Valley Hospital

	Tot	tal Depth:	10.8		,		e: 13/11/2018	_ocati	on: C	udgen	Road, Ł	Kingscliff		
	Drilli	ng Info	rmation		_		Material Description					Tes	t San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
		20.0	6.3 -		V V V V V V	BAS	BASALT: As above but low strength and extremely weathered. BASALT: As above but medium strength to high strength, distinctly weathered to slightly weathered, with some extremely weathered zones.	XW DW- SW		MS- HS				
		19.0	7.0		A V A V A V	BAS	BASALT: As above but low strength, extremely weathered, with some medium strength and distinctly zones.	xw		LS		⁷ 子	– SPT	- 30/95mm, N*=95
k Roller		18.0	7.5 – 8.0		A V A V A V A V	BAS	BASALT: As above but very low strength, extremely weathered, with some clay layering.	XW		VLS				
Wash Bore - Rock Roller			9.0		A A A A A A A A A A A A A A A A A A A							8.5	– SPT	- 14,18,26, N=44
		- 17.0	10.0		V A A V A V V A									
		1 6.0	10.0		V V V	BAS	BASALT: As above but high strength and slightly weathered.	sw		HS		10 -	– SPT	– 15,20,17, N=37
		15.0	10.8 11.0				10.80m: COMMENCE NMLC CORING							
			12.0											

Comments:										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
41111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555565.40

26.16

6873442.90

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH51

Page: 3 of 5

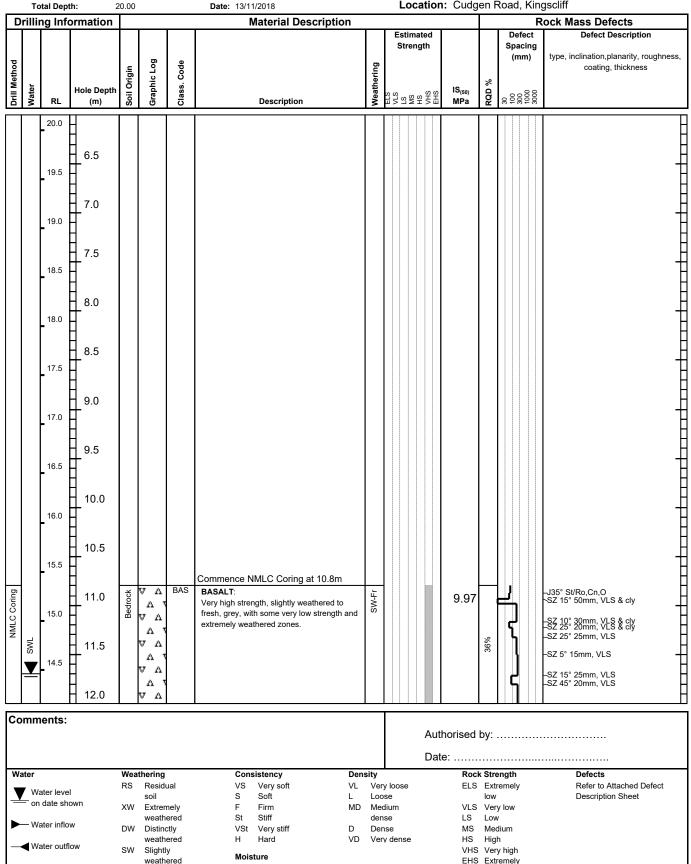
Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Location: Cudgen Road, Kingscliff

high



D Dry M Moist W Wet

FR

Fresh

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Engineering Log - Cored Borehole Borehole No.: BH51

Page: 4 of 5

Job Number: GE18/144

Easting: 555565.40 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873442.90 Driller: Redlands Drilling

RL: 26.16 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Date: 13/11/2018 Location: Cudgen Road, Kingscliff **Total Depth: Drilling Information Material Description Rock Mass Defects** Estimated Defect **Defect Description** Strength Spacing type, inclination, planarity, roughness, (mm) Code **Drill Method 3raphic Log** Weathering coating, thickness Origin Class. Water Hole Depth IS₍₅₀₎ MPa Rab ELS VLS MS HS VHS EHS 300 300 300 300 RI (m) Description SZ 5° 50mm, VLS BASALT: 14.0 × NMLC Coring Very low strength, extremely weathered, 36% Δ orange brown mottled grey, with some clay VΛ 12,545 CORE LOSS 13.5 13.0 13.0 13.5 12.5 Α BASALT: ≷ Δ Very low strength, extremely weathered grey mottled orange brown, with some clay 14.0 VΛ .lavering Λ 12.0 0.17 Λ Δ 26% 14.5 Λ 11.5 Λ Δ 15.0 Λ 11.0 15.15 BASALT: -J15° Un/Ro,St,O Λ ь Very high strength, fresh, grey, vesicular Λ -J25° PI/Sm,Cn,O 15.5 and feldspar lenses Δ 10.5 Λ 6.35 Λ Δ 16.0 Δ 10.0 Δ Λ 16.5 Δ Λ %001 9.5 Λ Λ -J20° St/PI.Cn.O 17.0 Δ 9.0 Λ Λ Λ 17.5 Λ 8.5 17.65 J45° PI/Sm,Cn,O Λ BAS BASALT: ᇤ .As above but no vesicles Λ 18.0 8.9

Comments:					
				Authorised by:	
				Date:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
Water level on date shown	RS Residual soil XW Extremely	VS Very soft S Soft F Firm	VL Very loose L Loose MD Medium	ELS Extremely low VLS Very low	Refer to Attached Defect Description Sheet
Water inflow	weathered DW Distinctly weathered	St Stiff VSt Very stiff H Hard	dense D Dense VD Very dense	LS Low MS Medium HS High	
—◀ Water outflow	SW Slightly weathered FR Fresh	Moisture D Dry M Moist W Wet		VHS Very high EHS Extremely high	

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH51

Page: 5 of 5

Job Number: GE18/144

Easting: 555565.40 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873442.90 Driller: Redlands Drilling

RL: 26.16 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 20.00 Date: 13/11/2018 Location: Cudgen Road, Kingscliff

_		otal Dept		0.00			Date: 13/11/2018				LUCA	liOi	i: Cudg	CIII	toau, i		
L	rilli	ing Info	ormation				Material Description	n				, ,			_		lock Mass Defects
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description		Weathering		Strengt	h	IS ₍₅₀₎ MPa	RQD %	Defect Spacin (mm) 000 000 000 000 000 000 000 000 000	ng)	Defect Description type, inclination,planarity, roughness, coating, thickness
=		1				BAS	BASALT:			-	1 1 1 1						· · · · · · · · · · · · · · · · · · ·
NMLC Coring		7.5	18.5		V A V A V A V A V A V A V A	BAG	As above but no vesicles.		Fr				6.73	100%			
		7.0 6.5	19.5 - 19		V V V V V V V V V V	BAS	BASALT: As above but vesicular.		Fr				3.58	10			–J20° Un/Ro,Cn,O
		6.0			v A		20.00m: BOREHOLE TERMINATED						0.00				שטט פערו,טוו,ט - -
		5.5	20.5														
		5.0	21.0														
		4.5	22.0														+
		4.0	22.5														†
		3.5	23.0														†
		3.0	23.5														
		2.5															
C	omn	nents:	24.0									Aut	horised	by:			
														-			
\	<u>~</u> oi <u>~</u> w	/ater leve n date sho /ater inflo /ater outfl	own w	Wea RS XW DW SW	Resid soil Extrer weath Distine weath Slightl weath Fresh	mely ered ctly ered ly ered	Consistency VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Moisture D Dry M Moist W Wet	L MD D	Very Loos Med dens Den	se liun se se			VLS LS MS HS VHS	Extr low Ver Low Med Hig Ver	y low v dium h y high remely		Defects Refer to Attached Defect Description Sheet





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH51

BOREHOLE DEPTH: 10.8m TO 20.0m



GEOTECHNIC

Total Depth:

Easting:

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

3.95

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH52

Page: 1 of 5

Job Number: GE18/144

555609.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers 6873441.10 Driller: Redlands Drilling

Northing: Project: Geotech Investigation - Tweed Valley Hospital Logged By: L. Bexley RL: 27.36

Location: Cudgen Road, Kingscliff Date: 13/11/2018

Г		ng Info	3.9				Material Description			901	Road, r		st San	nples
۲			α		1	0	material Description	T	I	I		163	Jan	ipida
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
Bit		07.0		oewash		CH	Sitty CLAY: Stiff, high plasticity, red brown, with some fine to medium sized gravel, trace of organics, moist.		М	St				
100mm Auger with T.C		- ^{27.0}	0.3 -	Residual Slopewash		CI	Silty CLAY: Very stiff, medium to high plasticity, red brown, moist.		М	VSt				-
100mm Au		26.0	1.0 0.9 -			CI	Silty CLAY: As above but with some cobbles. BASALT:	xw	М	VSt		1	– SPT	- 5,7,15, N=22
			1.8 –	Bedrock	V V		Very low strength, extremely weathered, orange brown mottled grey.							
Roller		2 5.0	2.0		V V V	BAS	BASALT: As above but low strength to medium strength, distinctly weathered.	DW		LS- MS				45/2000 Nt 450
Wash Bore - Rock Roller			3.0		Λ V Λ Λ Λ Λ	BAS	BASALT: As above but high strength, slightly weathered, grey.	SW		HS		2.5 –	- SPT	_15/30mm, N*=150, no recovery
Wash		24.0	_		V V	BAS	BASALT: As above but medium strength, distinctly weathered with some high strength layers.	DW		MS				
			3.8 - 4.0 _{3.05}		V V	BAS	BASALT: As above but high strength & slightly weathered.	sw		HS				-
		23.0	-				3.95m: COMMENCE NMLC CORING							-
			5.0											-
		22.0	- -											-
			6.0											_
Coi	omments:													
<u>▼</u>	Water level on date shown Water outflow Water outflow FR Fresh Water level on date shown RS Residual SS Soft L Loose low Very soft L Loose low Very loose ELS Extremely low Very loose Very loose							ts & Res Undi Distu Stan 300n Hand Vane Dyna tapel	sults sturbed sard dard Per mm with a d penetro shear v mic Cone	50mm di mple. netration a 63.6kg meter e alue kPa e test, 9 ted to ro	am tube. Test, N = r hammer fa stimate of u 1. 09kg hami ds of smalle	number of bl Iling 762mn Inconfined c mer, fall 508 er section.	ows to d n. ompress mm, driv	rive 50mm sampler sive strength, kPa. ving 20mm, 30 deg ineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555609.70

27.36

23.55

FR

Fresh

6873441.10

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH52

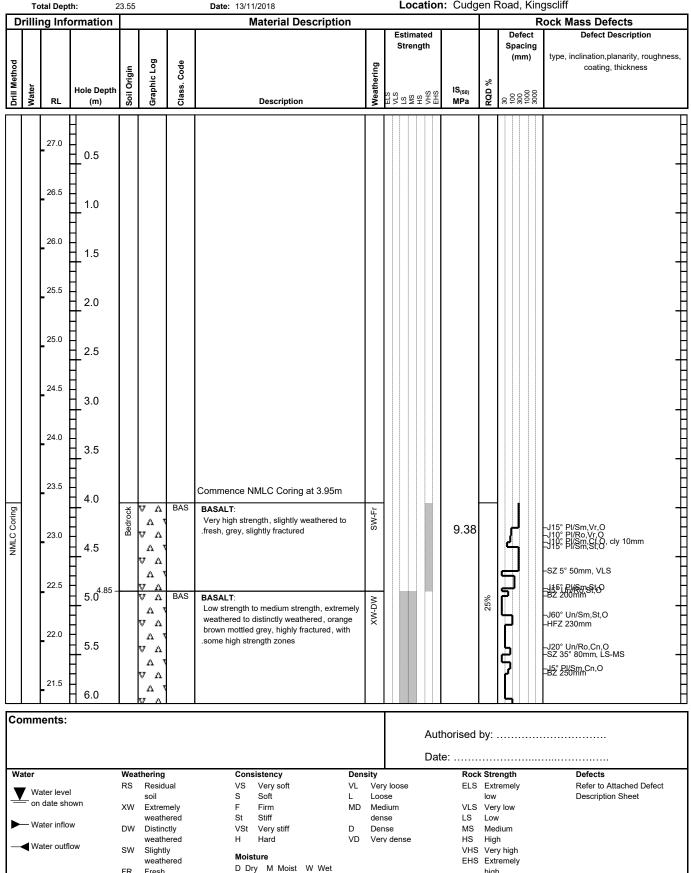
Page: 2 of 5

Job Number: GE18/144

Client: Wood & Grieve Engineers

high

Project: Geotech Investigation - Tweed Valley Hospital



GEOTECHNIC

Easting:

Northing:

RL:

555609.70

27.36

6873441.10

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Logged By: L. Bexley

Driller: Redlands Drilling

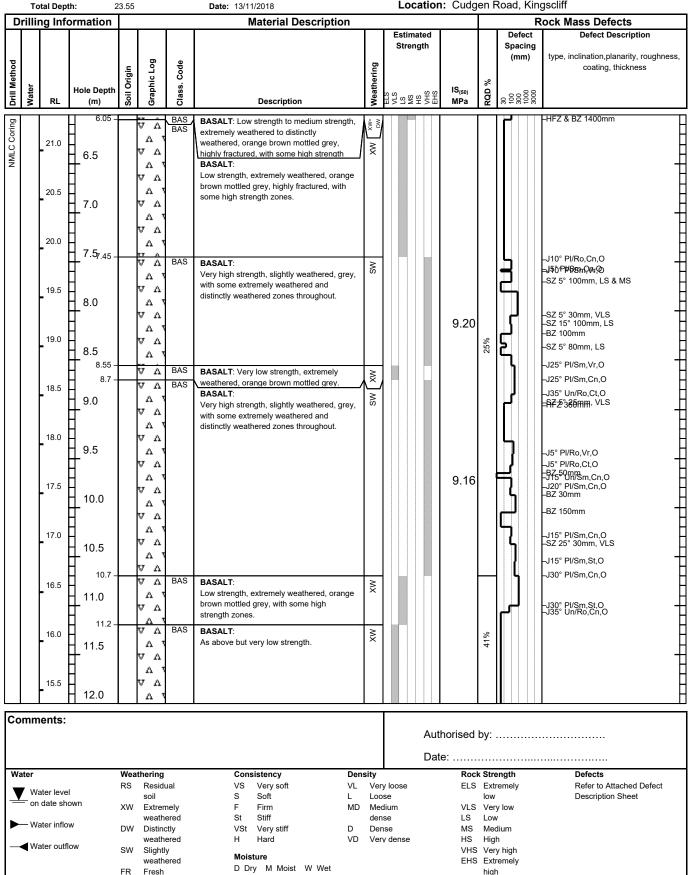
Engineering Log - Cored Borehole Borehole No.: BH52

Page: 3 of 5

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital



GEOTECHNIC

Easting:

Northing:

Total Depth:

RL:

555609.70

6873441.10

27.36

23.55

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Logged By: L. Bexley

Date: 13/11/2018

Engineering Log - Cored Borehole Borehole No.: BH52

Page: 4 of 5

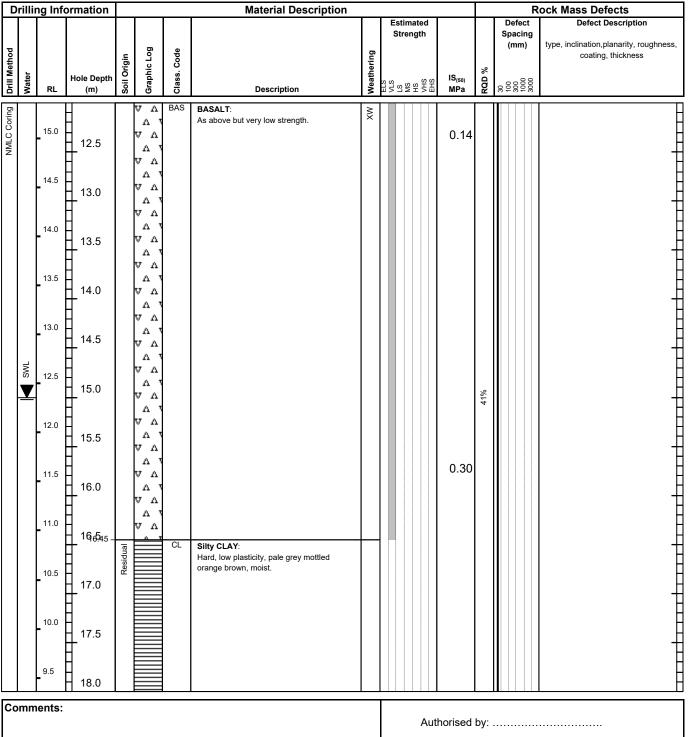
Job Number: GE18/144

Drilling Rig: Hydrapower Scout

Client: Wood & Grieve Engineers

Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital



Comments:				Authorised by: Date:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
Water level on date shown Water inflow	RS Residual soil XW Extremely weathered DW Distinctly weathered	VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard	VL Very loose L Loose MD Medium dense D Dense VD Very dense	ELS Extremely low VLS Very low LS Low MS Medium HS High	Refer to Attached Defect Description Sheet
— ⋖ Water outflow	SW Slightly weathered FR Fresh	Moisture D Dry M Moist W Wet	v 5 v or y delise	VHS Very high EHS Extremely high	

MORRISON GEOTECHNIC

Easting:

Northing:

RL:

555609.70

27.36

23.55

6873441.10

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A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Logged By: L. Bexley

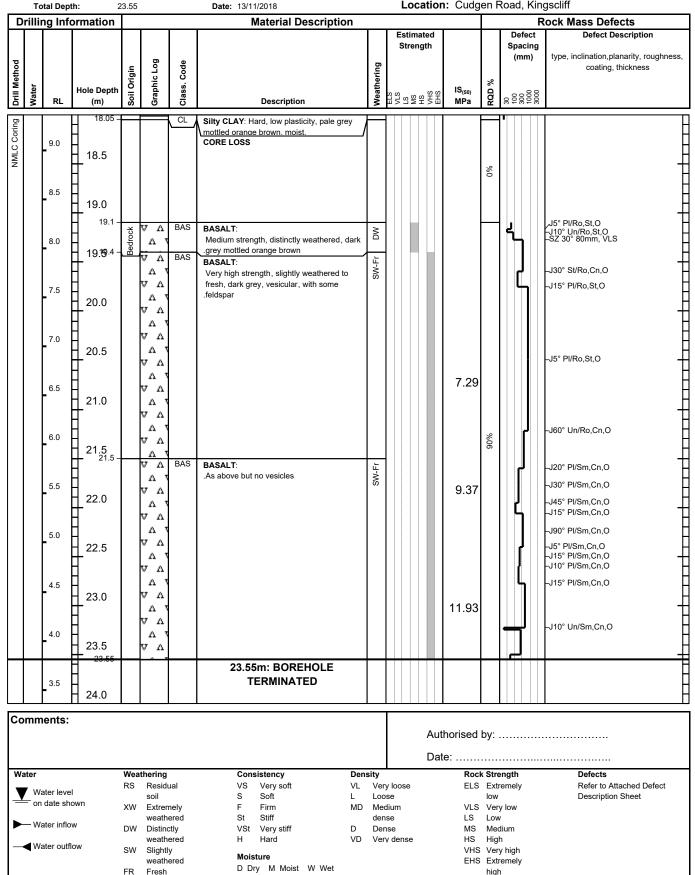
Engineering Log - Cored Borehole Borehole No.: BH52

Page: 5 of 5

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH52

BOREHOLE DEPTH: 3.95m TO 23.55m



GEOTECHNIC

RL:

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH53

Project: Geotech Investigation - Tweed Valley Hospital

Page: 1 of 6

Job Number: GE18/144

Easting: 555564.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Northing: 6873487.10 Driller: Redlands Drilling

Logged By: L. Bexley 26.00 Location: Cudgen Road, Kingscliff Total Depth: 3.90 Date: 23/11/2018

_		al Depth:	3.9	0		Date		.ocati	on: C	udgen	Road, k	Kingscliff		
Ш	Orilli	ng Info	rmation		T		Material Description					Tes	t Sam	ples
Drill Method	Water	RL 26-0	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
100mm Auger with		25.0	0.3 -	Residual Slopewas		CH CI	Sitty CLAY: Stiff, high plasticity, red brown, with some fine to coarse sized gravel, with some organics, moist. Sitty CLAY: As above but with some cobbles. Sitty CLAY: Very stiff, medium plasticity, red brown, with some fine to coarse sized gravel, with some cobbles, moist.		M M	St St VSt		¹-]		
rck Roller		24.0	2.0									}	– SPT	- 4,13,10, N=23
Wash Bore - Rock Roller		23.0	2.8 - 3.0 3.2 -	Bedrock	V A	BAS	BASALT: Low strength extremely weathered, orange brown mottled grey. BASALT:	XW DW-		LS		2.5	– SPT	
		22.0	- - - 4.0 ^{3.9}		V V V		As above but medium strength, distinctly weathered to slightly weathered, with some high strength & slightly weathered layers. 3.90m: COMMENCE NMLC CORING	SW						
		21.0	5.0				CORING							
Со	mme	ents:				1		A	uthori	sed by				

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Den	sity	Rock	Strength	Tests	& Results
	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4111		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois	ture			EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D D	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

RL:

555564.70

26.00

FR

Fresh

6873487.10

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH53

Page: 2 of 6

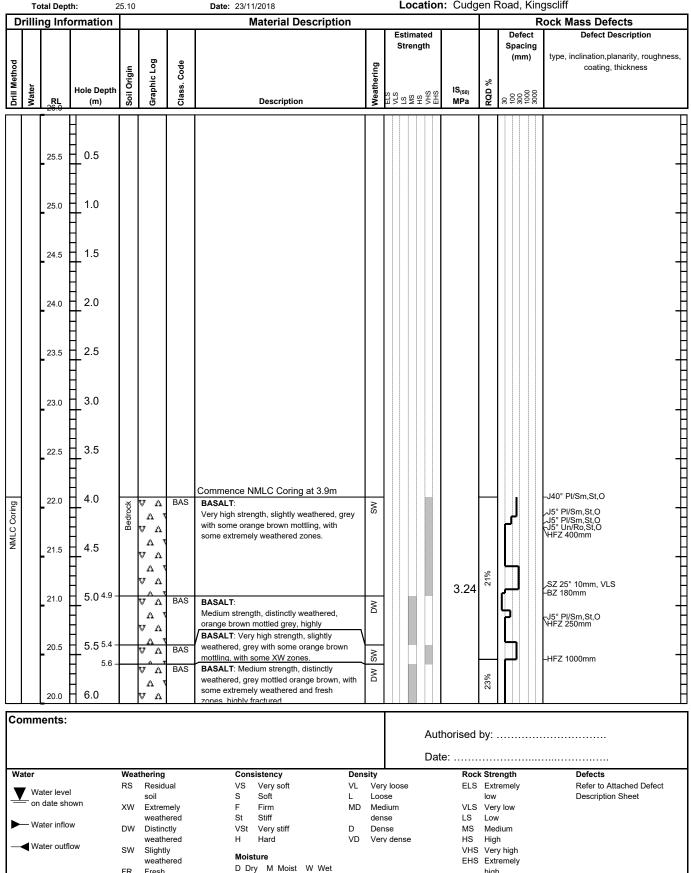
Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

Location: Cudgen Road, Kingscliff

high



GEOTECHNIC

Total Depth:

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Engineering Log - Cored Borehole Borehole No.: BH53

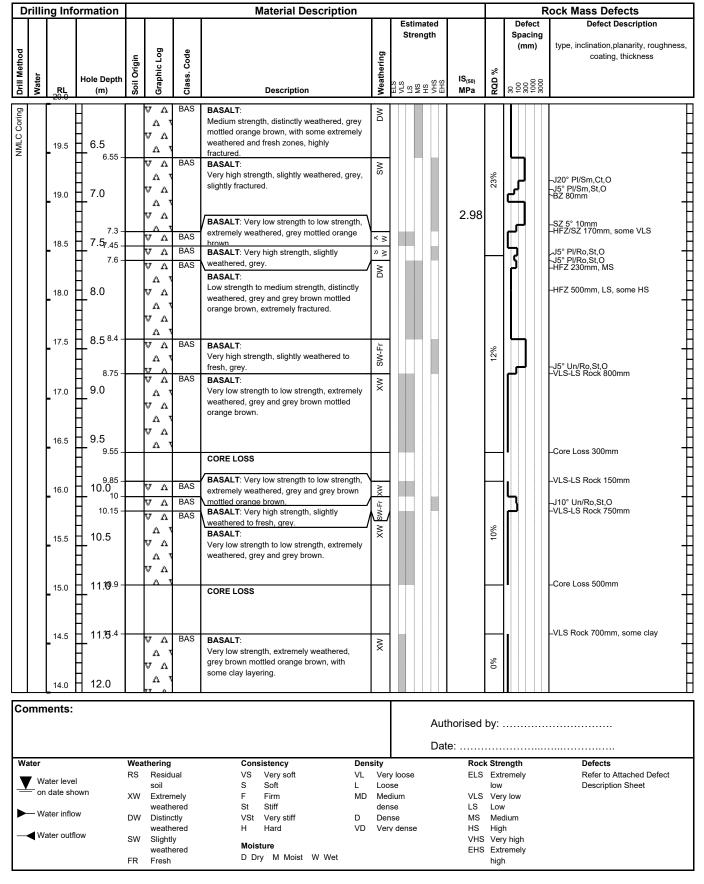
Page: 3 of 6

Job Number: GE18/144

Easting: 555564.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873487.10 Driller: Redlands Drilling

RL: 26.00 Logged By: L. Bexley Project: Geotech Investigation - Tweed Valley Hospital

Date: 23/11/2018 Location: Cudgen Road, Kingscliff



GEOTECHNIC

Easting:

Northing:

RL:

555564.70

26.00

6873487.10

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

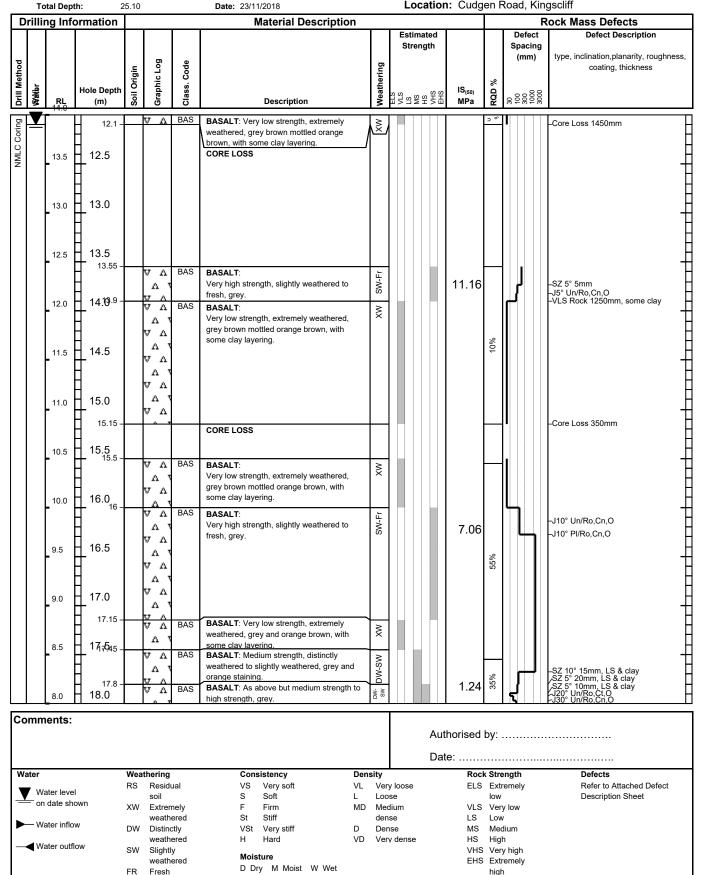
Engineering Log - Cored Borehole Borehole No.: BH53

Page: 4 of 6

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital Logged By: L. Bexley



GEOTECHNIC

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH53

Page: 5 of 6

Job Number: GE18/144

Easting: 555564.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873487.10 Driller: Redlands Drilling

Project: Out of the control of the contr

RL: 26.00 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 25.10 Date: 23/11/2018 Location: Cudgen Road, Kingscliff

		tal Dep		25.10			Date: 23/11/2018			Location	Cudg	en F	Road, Kin	gscliff		
D	rillir	ng Inf	ormation				Material Description							Rock Mass Defects Tect Defect Description		
Drill Method	Water		Hole Depth	Soil Origin	Graphic Log	Class. Code	Description	Weathering	1	Estimated Strength SHA	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm) 0001 0000 0000 0000 0000 0000 0000 0	type, inclination,planarity, roughness, coating, thickness		
	>	RL 8.0	(m)	S			Description	-	У .	> 15 T > M	IVIFA	œ	ω + ω + ω	L I5° Ha/Da Ca O		
NMLC Coring		7.5	18.5		V V V V V	BAS	BASALT: As above but medium strength to high strength, grey.	MS-MQ				35%	ئ ماريس ماريس	JS* Un/Ro, Cn, O JS* Un/Ro, Cn, O JS* Un/Ro, Cn, O –BZ 70mm, some XLS J5* Un/Ro, St, O J5* Un/Ro, St, O J5* Un/Ro, Cn, O J5* Pl/Ro, Cn, O –J10* Un/Ro, Cn, O –J40* Un/Ro, Cn, O		
		6.5	19 - 19.5 19.5 -		V A V A	BAS	BASALT: Medium strength, distinctly weathered, grey brown and orange staining.	DW			0.60			–J5° Un/Ro,Ct,O –J10° Un/Ro,Cn,O –J45° Un/Ro,Ct,O		
		6.0	19.7 -		V A V A V A	BAS	BASALT: Very low strength, extremely weathered orange brown BASALT: High strength, slightly weathered to fresh, grey.	SW-Fr XW			•		5	-BZ 60mm -J40° Un/Ro, Cn, O -J5° Un/Ro, Cn, O		
		5.5	20.5		ν, ν, ν,							74%		_J5° Un/Ro,Cn,O _J5° Un/Ro,Cn,O _BZ 140mm		
		5.0	20.85 - 21.0		V A	BAS	BASALT: As above but very high strength.	SW-Fr	_				L	J5° Un/Ro,Cn,O		
		4.5	21.5		V A V A V A V A			S			7.88	100%		-J5° Un/Sm,Cn,O		
		3.5	22.0		V V V V V V											
		3.0	23.0		V V V V V V							%86		-J45° PI/Sm,Cn,O -J10° Un/Ro,Cn,O -J40° PI/Ro,Cn,O		
		2.0	24.0		Λ Λ Λ Λ						10.84		_	–J10° Un/Ro,Cn,O		
Co	mm	ents:	•							Auth	orised	by:				
L										Date):		·····			
7	Water level RS Residual soil SW Extremely weathered Water inflow DW Distinctly			Resid soil Extrer weath	ual nely ered	Consistency Der VS Very soft VL S Soft L F Firm MD St Stiff VSt Very stiff D	L Loose MD Medium dense			L Very loose ELS Loose D Medium VLS dense LS			ELS VLS	Extr low Ver Low		Defects Refer to Attached Defect Description Sheet
	Water outflow Water outflow Water outflow Water outflow SW Slightly weathered FR Fresh				weath Slight weath	ered y ered	H Hard VD Moisture D Dry M Moist W Wet		ery de		HS VHS	Hig Ver	n y high remely			

MORRISON GEOTECHNIC

Water

Water level

on date shown

Water inflow

■ Water outflow

Weathering

Residual

Extremely

Distinctly

Slightly

Fresh

weathered

weathered

weathered

soil

RS

 XW

DW

SW

FR

Consistency

Very soft

Very stiff

D Dry M Moist W Wet

Firm

Hard

VS

S Soft

St Stiff

Н

VSt

Moisture

Morrison Geotechnic Pty Ltd

A.B.N. 051 009 878 899 PO Box 3063, Darra, QLD 4076

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH53

Page: 6 of 6

Job Number: GE18/144

Easting: 555564.70 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873487.10 Driller: Redlands Drilling
Project: Geotech Investigation - Tweed Valley Hospital

RL: 26.00 Logged By: L. Bexley

Total Depth: 25.10 Date: 23/11/2018 Location: Cudgen Road, Kingscliff

Г		na Info	ormation	5.10			Material Description					i. Cuug					Rock Mass Defects
۲	T						material Becompact		Estin						Defe	ct	Defect Description
Drill Method	Water	RL 2.0	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	Stre	ngth	ı	IS ₍₅₀₎ MPa	RQD %	S	mn (mn	ing n)	type, inclination,planarity, roughness, coating, thickness
NMLC Coring					Λ V	BAS	BASALT: As above but very high strength.	SW-Fr									
NMLC		1.5	24.5		ν ν ν ν							10.01	%86				
		1.0	25.0		ν ν ν ν												–J5° Un/Ro,Cn,O
		0.5	25.5				25.10m: BOREHOLE TERMINATED										
		0.0	26.0											8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			
		-0.5	26.5														
		-1.0	27.0														
		-1.5	27.5														
		-2.0	28.0											8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8			
		-2.5	28.5														
		-3.0	29.0														
		-3.5 -	29.5														
		-4.0	30.0														
C	omn	ents:									\11f	horised	bν.				
)at	e:			• • • •		

Density

Very loose

Loose

Medium

Dense

Very dense

VL

MD

VD

Rock Strength

ELS Extremely

low

VLS Very low

VHS Very high

EHS Extremely

high

Medium

LS Low

MS

HS High

Defects

Refer to Attached Defect

Description Sheet



PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH53

BOREHOLE DEPTH: 3.9m TO 25.1m



MORRISON GEOTECHNIC

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Borehole Borehole No.: BH54

Page: 1 of 5

Job Number: GE18/144

Easting: 555511.60 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873480.20 Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital

RL: 22.65 Logged By: L. Bexley

Total Depth: 5.30 Date: 20/11/2018 Location: Cudgen Road, Kingscliff

	Drilli	ng Info	rmation				Material Description						st San	ples
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
- with				Slope wash		СН	Silty CLAY: Very stiff, high plasticity, red brown, with some fine to coarse sized gravel, trace of organics, moist.		М	VSt				
100mm Auger with		22.0	0.3 -	Residual		CI	Silty CLAY: Very stiff, medium to high plasticity, red brown, with some fine to medium sized gravel, moist.		М	VSt				
100m	_		1.0			CI	Sitty CLAY: As above but with some cobbles.		М	VSt		1-7		H
												}	– SPT	4,6,8, N=14: PP=300kPa
		21.0												H
			2.0											+
_ e		20.0										2.5		
ock Rolle			3.0									}	– SPT	6,11,11, N=22: PP=300-400kPa
Wash Bore - Rock Roller														
Wash E		19.0												
			4.0									4-}	– SPT	12,25/90mm,N*=8
			4.25 -	ual Rock		BAS CI	BASALT: Very high strength, fresh, grey, (cobble). Sitty CLAY: Hard, medium plasticity, orange brown mottled grey, moist.	Fr	М	VHS H		J		3
		18.0	5.0	Residual			BASALT: Very low strength, extremely weathered, grey							H
			5.2 -	Bedrock	V A	BAS	mottled orange brown. BASALT: As above but medium strength to high strength, distinctly weathered.	XW		VLS MS-HS				<u> </u>
		17.0					5.30m: COMMENCE NMLC CORING							
			6.0											
Со	mm	ents:								and by				

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

GEOTECHNIC

Easting:

Northing:

Total Depth:

RL:

555511.60

6873480.20

22.65

19.00

Morrison Geotechnic Pty Ltd

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Drilling Rig: Hydrapower Scout

Date: 20/11/2018

Logged By: L. Bexley

Driller: Redlands Drilling

Engineering Log - Cored Borehole Borehole No.: BH54

Page: 2 of 5

Job Number: GE18/144

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		otal Dep ina Inf	ormation	9.00			Material Description			Location	. Ouug	<u> </u>	tou		Rock Mass Defects
		T			I					Estimated				efect	Defect Description
Drill Method	Water		Hole Depth	Soil Origin	Graphic Log	Class. Code		Weathering	S	Strength SHASHASHAS	IS ₍₅₀₎	RQD %	(mm)	type, inclination,planarity, roughness, coating, thickness
۵	Š	RL	(m)	တိ	ō	ธ	Description	Š	Ш		MPa	盗	98 9	300 3000 3000	
		22.5	0.5												
		21.0	1.5												
		20.5	2.0												
		20.0	3.0												
		19.0	3.5												
		18.5	4.0												
		18.0	4.5												
pring	-	17.5	5.5	Bedrock	V V	BAS	Commence NMLC Coring at 5.3m BASALT: Very high strength, slightly weathered to fresh, grey with some orange	SW-Fr			9.32		ل ا		J15° PI/Ro.St.0 -J55° Un/Ro.St,0 -S2 10° 40mm, VLS
NMLC Coring		17.0	5.7 - 6.0	Bed	V V	BAS	brown staining. BASALT: Medium strength, distinctly weathered, orange brown mottled grey, highly fractured.	ND NO				%0	<u>ر</u> [- S2 10° 40mm, VLS - S2 15° 20mm, VLS - SZ 15° 20mm, VLS - HFZ 400mm
Co	omn	nents:													
<u> </u>	— _{ОІ}	/ater leven date sh /ater inflo	own	RS XW DW SW	weath	mely lered ctly lered ly lered	Consistency Den VS Very soft VL S Soft L F Firm MD St Stiff VSt VSt Very stiff D H Hard VD Moisture D Dry M Moist W Wet	Ver Loc Med den Der	diu nse	loose e um	Roci ELS VLS LS MS HS VHS	k Stre Ext low Ver Low Mee Hig Ver	ength reme y low v dium h y high	l ly	Defects Refer to Attached Defect Description Sheet

GEOTECHNIC

Easting:

Northing:

555511.60

6873480.20

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH54

Page: 3 of 5

Job Number: GE18/144

Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital RL: Logged By: L. Bexley 22.65 Location: Cudgen Road, Kingscliff

Total Depth:	19.00		Date: 20/11/2018		Location	: Cudg	en F	Road, Kin	gscliff
Drilling Informa	ation		Material Description					R	lock Mass Defects
	Soil Origin	Graphic Log Class. Code	Description	Weathering	Estimated Strength SW SW SN	IS ₍₅₀₎ MPa	RQD %	Defect Spacing (mm)	Defect Description type, inclination,planarity, roughness, coating, thickness
16.5	6.05	W A BAS W A BAS W A BAS W A W A W A W A W A W A W A W A W A W A	L BASALT.	w wx		mra	80% 5% 0% W		-BZ 200mm -HFZ 100mm -J5° Un/Ro,Cn,O -SZ 5° 20mm, VLS -J5° Pl/Ro,Cn,O -J5° Un/Ro,Cn,O -BZ 100mm -J5° Pl/Ro,Cn,O -J30° Pl/Ro,Cn,O -J30° Pl/Ro,Cn,O -BZ 450mm
13.0	9.3 ————————————————————————————————————	V A BAS A V V A A V V A A V V A V A	Very low strength to low strength, extremely weathered, grey brown mottled orange. CORE LOSS	ws [w			%0 %0		-1200mm VLS-LS -Core Loss 1350mm -1760mm VLS-LS
	2.085	V A BAS	extremely weathered, grey brown.	SW			> %		
Comments:					Auth	norised	by:		
Water		othoring	Consistency		Date				Defeate

Comments:					
			Au	thorised by:	
			Da	ite:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
—	RS Residual	VS Very soft	VL Very loose	ELS Extremely	JT Joint
Water level	soil	S Soft	L Loose	low	PT Parting
on date shown	XW Extremely	F Firm	MD Medium	VLS Very low	SM Seam
	weathered	St Stiff	dense	LS Low	PL Planar
Water inflow	DW Distinctly	VSt Very stiff	D Dense	MS Medium	CV Curved
	weathered	H Hard	VD Very dense	HS High	IR Irregular
─ Water outflow	SW Slightly			VHS Very high	RO Rough
	weathered	Moisture		EHS Extremely	SO Smooth
	FR Fresh	D Dry M Moist W Wet		high	SL Slickensided

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RL:

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Fresh

FR

weathered

Moisture

D Dry M Moist W Wet

Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH54

Project: Geotech Investigation - Tweed Valley Hospital

EHS Extremely

high

Page: 4 of 5

Job Number: GE18/144

Easting: 555511.60 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Northing: 6873480.20 Driller: Redlands Drilling

Logged By: L. Bexley 22.65 Location: Cudgen Road, Kingscliff Total Depth: 19.00 Date: 20/11/2018

Description Description	Rock Mass Defects Defect Description Spacing (mm) type, inclination, planarity, roughness,
Description Description	Spacing
DOUBLE 10.5 12.12	coating, thickness
12.12 CI extremely weathered, grey brown. Silty CLAY: Very stiff, medium plasticity, yellow brown, moist CI Silty CLAY: Stiff, medium plasticity, grey, moist.	81,800
Stiff, medium plasticity, grey, moist.	_
12.8 V A BAS BASALT:	
9.5 V A weathered, grey brown.	-
9.0 A V BAS BASALT: Very high strength, slightly weathered to	J5° Un/Ro,Cn,O BZ 20mm
8.5 T V A RESIL GIEST, Grey.	J5° Un/Ro, Cn, O J8° Un/Ro, Cn, O J10° Un/Ro, Cn, O
8.0 T 14.5 V A V A V A V A V A V A V A V A V A V	J20° Un/Ro,Cn,O
7.5 H 15.0 N N N N N N N N N N N N N N N N N N N	-J5° Un/Ro,Cn,O -J5° Un/Ro,Cn,O -J10° Un/Ro,Cn,O
7.0 A V V A A A V	- 1318° Un/Re; En; 8
16.0 V A V A V A V A V A V A V A V A V A V	_
6.0 T 16.5 V A V A V A V A V A V A V A V A V A V	J5° Un/Ro,Cn,O BZ 500mm
17.0 V A V A V A A A V A A V A A V A A V A A V A A V A A V A A V A A V A A V A A A V A A A V A A V A A V A A V A A V A A V A A V A A V A A V A A V A A V A A A V A A A V A A A A A V A	-SZ 10° 30mm, LS V10° Un/Ro,Cn,O -J5° Un/Ro,Cn,O SZ 10° 40mm, LS
17.5 V A A A V A A A A A A A A A A A A A A	JS° Un/Ro, Cn, O -SZ 10° 40mm, LS J30° Pl/Ro, Cn, O -SZ 10° 30mm, MS -SZ 10° 30mm, MS -SZ 10° 20mm, MS -SZ 10° 10mm, MS -J0° Un/Ro, Ch, O
	J10° Un/Ro,Ch,O
Water Weathering Consistency Density Rock Streng	
Water level RS Residual VS Very soft VL Very loose ELS Extrem on date shown XW Extremely soil S Soft L Loose low Water inflow DW Distinctly VSt Very stiff D Dense MS Medium Water outflow SW Slightly SW Slightly SW Sylightly SW	nely Refer to Attached Defect Description Sheet ow

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Total Depth:

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Engineering Log - Cored Borehole Borehole No.: BH54

Page: 5 of 5

Job Number: GE18/144

Easting: 555511.60 Drilling Rig: Hydrapower Scout

 Northing:
 6873480.20
 Driller:
 Redlands Drilling

 RL:
 22.65
 Logged By:
 L. Bexley

19.00

Logged By: L. Bexley **Date:** 20/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

П		ng Info	ormation	0.00			Material Description							Rock Mass Defects				
										Estir Stre						Defe paci		Defect Description
po				_	go.	ф		βι								(mm	1)	type, inclination,planarity, roughness, coating, thickness
Drill Method	<u>-</u>		Hole Depth	Soil Origin	Graphic Log	Class. Code				LS MS			ıe	% (3,
Ō	Water	RL	(m)	Soil	Grap	Clas	Description	Wea	ELS VIS	S S	S E S	VHS EHS	IS ₍₅₀₎ MPa	RQD %	30	300	3000	
ring		4.5			VΛ	BAS	BASALT: Very high strength, slightly weathered to	SW-Fr										H
NMLC Coring]		V V		fresh, grey.	S								Į		–J10° Un/Ro,Cn,O
MZ		4.0	18.5		у Л У Л									10%				
		•			Λ								9.50					
			19.0 ₁₉		VΛ							Ц						
		3.5					19.00m: BOREHOLE TERMINATED											
			19.5															l H
		3.0	Ħ															l Ŧ
			20.0															l B
		2.5	20.0															1
																		l H
			20.5															4
		2.0																l H
			21.0															l A
		1.5																I
			21.5															l H
		1.0	1 21.5															
			Ħ															l H
		0.5	22.0															4
		U.5																l H
			22.5															$oldsymbol{\mathbb{F}}$
		0.0																l I
			23.0															
		-0.5	+															
		-1.0	23.5															4
		-																l E
			24.0															
С	omn	ents:																
1									1		/	Autl	horised	by:				

Comments:				Authorised by: Date:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
── Water level on date shown ── Water inflow ── Water outflow	RS Residual soil XW Extremely weathered DW Distinctly weathered SW Slightly weathered FR Fresh	VS Very soft S Soft F Firm St Stiff VSt Very stiff H Hard Moisture D Dry M Moist W Wet	VL Very loose L Loose MD Medium dense D Dense VD Very dense	ELS Extremely low VLS Very low LS Low MS Medium HS High VHS Very high EHS Extremely high	Refer to Attached Defect Description Sheet





LOCATION: CUDGEN ROAD, KINGSCLIFF

JOB NUMBER: GE18/144

BOREHOLE NUMBER: BH54

BOREHOLE DEPTH: 5.3m TO 19.0m



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Total Depth:

14.90

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D Dry M Moist W Wet

Fresh

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Engineering Log - Borehole Borehole No.: BH55

Page: 1 of 5

Job Number: GE18/144

Easting: 555541.20 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers Northing: 6873509.90 Driller: Redlands Drilling

Project: Geotech Investigation - Tweed Valley Hospital RL: Logged By: L. Bexley 23.95

Location: Cudgen Road, Kingscliff Date: 15/11/2018

		al Depth:	14.9	0		Date	o: 15/11/2018			Journe	, <u>U</u>	Test Samples				
D	rilli	ng Infor	mation				Material D	escription	1	1				Tes	nples	
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Des	cription		Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
				lsh		СН	Silty CLAY:				М	VSt				
100mm Auger with T.C Bit		23.0	0.3 -	Residual Slopewash		CI	Very stiff, high plasticity, re coarse sized gravel, with s Sitty CLAY: Very stiff to hard, medium some fine to coarse sized moist.	plasticity, red brown, w	rith		M	VSt-H		0.5 –	– PP	– 400kPa
100mm		22.0	2.0											}	– SPT	_ 4,4,6, N=10: PP=400kPa
	•	21.0	3.0			CI	Silty CLAY: As above but no cobbles.				М	VSt-H		2.5	– SPT	_4,5,8, N=13: _PP=380-450kPa
Wash Bore - Rock Roller		20.0	4.0											4-7		- -
Wash		19.0	5.0											}	– SPT	– 5,6,7, N=13 –
		18.0	6.0											5.5 -	– SPT	_3,5,6, N=11: _PP=350-450kPa
Con	mments:															
<u></u>	Water Weathering Consistency Density ✓ Water level RS Residual VS Very soft VL Very loose soil S Soft L Loose L Loose Soft L Loose Water inflow DW Distinctly F Firm MD Medium dense Water outflow DW Distinctly VSt Very stiff D Dense Water outflow SW Slightly weathered H Hard VD Very dense						VL Very loose L Loose MD Medium dense D Dense VD Very dense	Rock Strength ELS Extremely low VLS Very low LS Low MS Medium HS High VHS Very high EHS Extremely	Tests U50 D SPT PP S DC	& Resu Undist Disturd Stands 300mr Hand Vanes Dynan	ults turbed 5 bed san ard Pen m with a penetro shear va	0mm dia nple. etration 63.6kg meter es alue kPa e test, 9.	am tube. Test, N = n hammer fa stimate of u	number of bl Illing 762mm Inconfined c	ows to d 1. ompress	rive 50mm sampler sive strength, kPa. ving 20mm, 30 deg

EHS Extremely

high

taper cone fitted to rods of smaller section.

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Engineering Log - Borehole

Borehole No.: BH55

Page: 2 of 5

Job Number: GE18/144

Easting:555541.20Drilling Rig:Hydrapower ScoutNorthing:6873509.90Driller:Redlands Drilling

 RL:
 23.95
 Logged By:
 L. Bexley

 Total Depth:
 14.90
 Date:
 15/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

		ng Info	rmation	-			Material Description			J	Test Samples			
		-			ה	on Code	·			y - rength	sults			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	Description	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result
Wash Bore - Rock Roller			7.0	Rock	A V A A A A A A A A A A A A A A A A A A	BAS	Sitty CLAY: As above but no cobbles. BASALT: Very low strength, extremely weathered, orange brown mottled grey.	xw	М	VSt-H VSt-H		8.5	– SPT – SPT	- 5,9,16, N=25 - 23,26/150mm, N*=57
		14.0 13.0 12.0	10.0	Residual	V A V A V A V A V A V A V A V A V A V A	CL	BASALT: As above but low strength. Sitty CLAY: Stiff, low to medium plasticity, dark grey mottled orange brown and pale grey, moist.	xw	М	St		10 -}	– SPT – SPT	- 30/115mm, N*=78

										Authorised by:
										Date:
Water	Wea	thering	Cons	sistency	Der	sity	Rock	Strength	Tests	& Results
Water level	RS	Residual	VS	Very soft	VL	Very loose	ELS	Extremely	U50	Undisturbed 50mm diam tube.
Water level		soil	S	Soft	L	Loose		low	D	Disturbed sample.
on date shown	XW	Extremely	F	Firm	MD	Medium	VLS	Very low	SPT	Standard Penetration Test, N = number of blows to drive 50mm sampler
		weathered	St	Stiff		dense	LS	Low		300mm with a 63.6kg hammer falling 762mm.
► Water inflow	DW	Distinctly	VSt	Very stiff	D	Dense	MS	Medium	PP	Hand penetrometer estimate of unconfined compressive strength, kPa.
4		weathered	Н	Hard	VD	Very dense	HS	High	S	Vane shear value kPa
── Water outflow	SW	Slightly					VHS	Very high	DC	Dynamic Cone test, 9.09kg hammer, fall 508mm, driving 20mm, 30 deg
		weathered	Mois				EHS	Extremely		taper cone fitted to rods of smaller section.
	FR	Fresh	D Di	ry M Moist	W V	Vet		high		From AS1289-1993 Methods of Testing Soils for Engineering Purposes

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Fresh

Engineering Log - Borehole

From AS1289-1993 Methods of Testing Soils for Engineering Purposes

Borehole No.: BH55

Page: 3 of 5

Job Number: GE18/144

Easting: 555541.20 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers
Northing: 6873509.90 Driller: Redlands Drilling

Project: Coastal Investigation To

RL: 23.95 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 14.90 Date: 15/11/2018 Location: Cudgen Road, Kingscliff

-		ng Infor	14.9				: 15/11/2018 Material	Description			Test Samples						
H	/ I IIII		madON				ivialerial	Description					16:	or Sail	ihiea		
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Classification Code	D	escription	Weathering	Moisture	Consistency - Density - Strength	DC Test Results	Test Depth	Tests	Sample/Result		
				a		CL	Silty CLAY:			М	St						
ς Roller		11.0	13.0	Residual				sticity, dark grey mottled orange oist.					¹³]		2,2,4, N=6:		
Wash Bore - Rock Roller		10.0	14.0										}	- SPT	PP=120-200kPa		
	SWL	90		Bedrock	Λ V Λ Λ	BAS	BASALT: Medium strength, distinct	ctly weathered, dark grey.	DW		MS		14.5 –	– SPT	– 30/50mm, N*=180		
	_	- "	15.10 ^{1.0}				14.90m: CO	MMENCE NMLC									
		8.0	16.0				C	ORING							- - - - - - -		
		7.0	17.0														
												I					
		ents:	Marker		Can-l-1		Danaite	Dook Strong ath	D	ate:							
Wa	7 Wa −on o	ter level date shown ter inflow ter outflow	weath DW Distir weath SW Sligh	mely nered actly nered	S So F Fi St St VSt Ve	ery soft oft rm iff ery stiff ard	VL Very loose L Loose MD Medium dense D Dense VD Very dense	Rock Strength Te ELS Extremely U5 low D VLS Very low SP LS Low MS Medium PP HS High S VHS Very high DC EHS Extremely	Distu T Stand 300m Hand Vane Dyna	sturbed strbed sard Per dard Per mm with a penetro shear v mic Cor	mple. netration a 63.6kg ometer e alue kPa ne test, 9	hammer fa stimate of u	alling 762mn unconfined o	n. compress	rive 50mm sampler sive strength, kPa. ving 20mm, 30 deg		

high

GEOTECHNIC

Easting:

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Phone: (07) 3279 0900 Fax: (07) 3279 0955

Engineering Log - Cored Borehole Borehole No.: BH55

Page: 4 of 5

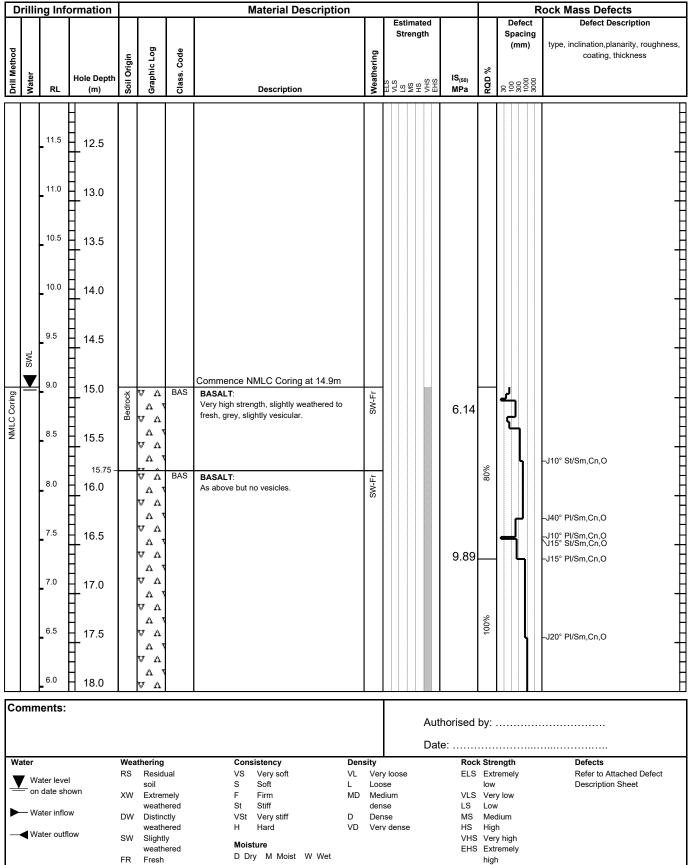
Job Number: GE18/144

555541.20 Drilling Rig: Hydrapower Scout Client: Wood & Grieve Engineers

Northing: 6873509.90 Driller: Redlands Drilling
RL: 23.95 Logged By: L. Bexley

Project: Geotech Investigation - Tweed Valley Hospital

Total Depth: 19.95 Date: 15/11/2018 Location: Cudgen Road, Kingscliff



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Engineering Log - Cored Borehole Borehole No.: BH55

Page: 5 of 5

Job Number: GE18/144

Easting: 555541.20 Drilling Rig: Hydrapower Scout

 Northing:
 6873509.90
 Driller:
 Redlands Drilling

 RL:
 23.95
 Logged By:
 L. Bexley

 RL:
 23.95
 Logged By:
 L. Bexley

 Total Depth:
 19.95
 Date:
 15/11/2018

Client: Wood & Grieve Engineers

Project: Geotech Investigation - Tweed Valley Hospital

D		ng Inf	ormation	9.95			Material Description	1							Rock Mass Defects				
f		<u> </u>							I		mate			Defe	ct	Defect Description			
Drill Method	Water	RL	Hole Depth (m)	Soil Origin	Graphic Log	Class. Code	Description	Weathering	ELS		ength SH SH	IS ₍₅₀₎ MPa	RQD %	Spac (mn	1)	type, inclination,planarity, roughness, coating, thickness			
			Ц		VΛ	BAS	BASALT:												
NMLC Coring		5.5 5.0	18.5		V V V V V		As above but no vesicles.	SW-Fr				8.97	,			–J5° Pl/Sm,Cn,O			
		4.5	19.0		V V V V V V V V V V V V V V V V V V V								100%						
		4.0	20005		7 A							8.78				l B			
		3.5 3.0 2.5 2.0 1.5	20.5 21.0 21.5 22.0 22.5 23.0				19.95m: BOREHOLE TERMINATED												
		0.0	24.0													<u> </u>			
Co	mm	nents:										e:							
W	ater				thering Resid			Density VI Ve	nı le	2000				ngth emely		Defects Refer to Attached Defect			

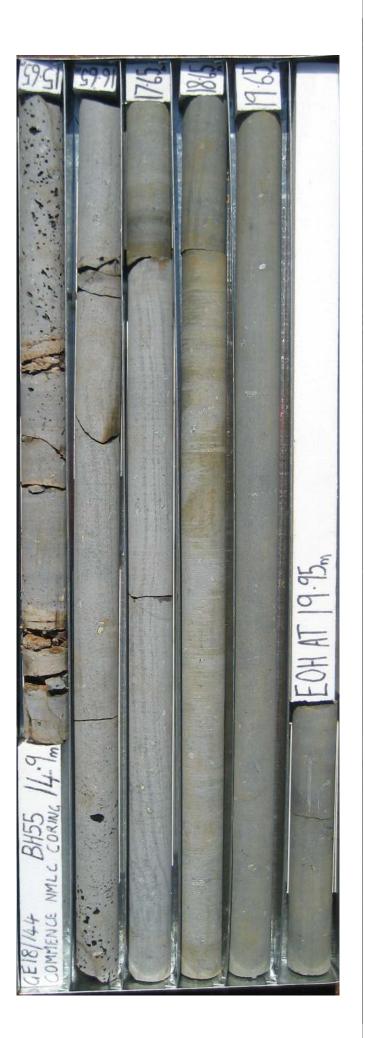
Comments.				uthorised by:ate:	
Water	Weathering	Consistency	Density	Rock Strength	Defects
Water level on date shown	RS Residual soil XW Extremely	VS Very soft S Soft F Firm	VL Very loose L Loose MD Medium	ELS Extremely low VLS Very low	Refer to Attached Defect Description Sheet
Water inflow	weathered DW Distinctly weathered	St Stiff VSt Very stiff H Hard	dense D Dense VD Verv dense	LS Low MS Medium HS High	
— ■ Water outflow	SW Slightly weathered FR Fresh	Moisture D Dry M Moist W Wet	15 15.Y dollac	VHS Very high EHS Extremely high	





PROJECT: GEOTECHNICAL INVESTIGATION - TWEED VALLEY HOSPITAL **CLIENT: WOOD AND GRIEVE ENGINEERS PTY LTD**

LOCATION: CUDGEN ROAD, KINGSCLIFF JOB NUMBER: GE18/144 BOREHOLE NUMBER: BH55 BOREHOLE DEPTH: 14.9m TO 19.95m



Discontinuity Description: Refer to AS1726-1993, Table A10.

Discontinuity Description. Neier to As									
Aniso	tropic Fabric								
BED	Bedding								
FOL	Foliation								
LIN	Mineral lineation								
Defec	t Type								
LM	Lamination Parting								
BP	Bedding Parting								
CLV	Cleavage / Foliation Parting								
J, Js	Joint, Joints								
SZ	Sheared Zone								
CZ	Crushed Zone								
BZ	Broken Zone								
HFZ	Highly Fractured Zone								
AZ	Alteration Zone								
VN	Vein								

Roughne	Roughness (e.g. Planar, Smooth is abbreviated PI / Sm) Class										
	Rough or irregular (Ro)										
Stepped	(Stp)		Smooth (Sm)		- II						
			Slickensided (SI)		II						
			Rough (Ro)		I۷	1					
Undulati	ng (Ur	ո)	Smooth (Sm)		٧						
			Slickensided (SI)		V						
			Rough (Ro)		VI	ı					
Planar (P	l)		Smooth (Sm)		VI	II					
			Slickensided (SI)		IX						
Infilling			•	Ape	erture						
Clean	Cn	No visible	coating or infill	Clo	sed	С					
Stain St Surfaces discoloured by mineral Open											
Veneer	Vr	Visible min	neral or soil infill <1mm	Fille	ed	F					
Coating	Ct	Visible mir	neral or soil infill >1mm	Tigl	nt	Т					

Other	
Cly	Clay
Fe	Iron
Co	Coal
Carb	Carbonaceous
Sinf	Soil Infill Zone
Qz	Quartz
CA	Calcite
Chl	Chlorite
Py	Pyrite
Int	Intersecting
Inc	Incipient
DI	Drilling Induced
Н	Horizontal
V	Vertical

Note: Describe 'Zones' and 'Coatings' in terms of composition and thickness (mm).

Discontinuity Spacing: On the geotechnical borehole log, a graphical representation of defect spacing Vs depth is shown. This representation takes into account all the natural rock defects occurring within a given depth interval, excluding breaks induced by the drilling / handling of core. Refer to AS1726-1993, BS5930-1999.

D	efect Spacing		Bedding Thickness (Sedimentary Rock Stratification)						
Spacing/Width (mm)	Descriptor	Symbol	Descriptor	Spacing/Width (mm)					
			Thinly Laminated	< 6					
<20	Extremely Close	EC	Thickly Laminated	6 – 20					
20 – 60	Very Close	VC	Very Thinly Bedded	20 – 60					
60 – 200	Close	С	Thinly Bedded	60 – 200					
200 – 600	Medium	М	Medium Bedded	200 – 600					
600 – 2000	Wide	W	Thickly Bedded	600 – 2000					
2000 - 6000	Very Wide	VW	Very Thickly Bedded	> 2000					
>6000	Extremely Wide	EW							

Defect Spacing in 3D								
Term Description								
Blocky	Equidimensional							
Tabular	Thickness much less than length or width							
Columnar	Height much greater than cross section							

Defect Persistence						
(areal extent)						
trace length of defect given in metres						

Symbols: The list below provides an explanation of terms and symbols used on the geotechnical borehole, test pit and penetrometer logs.

		Test Resul	lts		Test Symbols
PI	Plasticity Index	c'	Effective Cohesion	DCP	Dynamic Cone Penetrometer
LL	Liquid Limit	Cu	Undrained Cohesion	SPT	Standard Penetration Test
LI	Liquidity Index	C'R	Residual Cohesion	CPTu	Cone Penetrometer (Piezocone) Test
DD	Dry Density	φ′	Effective Angle of Internal Friction	PANDA	Variable Energy DCP
WD	Wet Density	фи	Undrained Angle of Internal Friction	PP	Pocket Penetrometer Test
LS	Linear Shrinkage	φ' _R	Residual Angle of Internal Friction	U50	Undisturbed Sample 50 mm diameter
MC	Moisture Content	Cv	Coefficient of Consolidation	U100	Undisturbed Sample 100mm diameter
ОС	Organic Content	m _v	Coefficient of Volume Compressibility	UCS	Uniaxial Compressive Strength
WPI	Weighted Plasticity Index	Caz	Coefficient of Secondary Compression	Pm	Pressuremeter
WLS	Weighted Linear Shrinkage	e	Voids Ratio	FSV	Field Shear Vane
DoS	Degree of Saturation	φ′~	Constant Volume Friction Angle	DST	Direct Shear Test
APD	Apparent Particle Density	qt/qc	Piezocone Resistance (Tip / Sleave)	PR	Penetration Rate
Su	Undrained Shear Strength	q _d	PANDA Cone Resistance	Α	Point Load Test (axial)
qu	Unconfined Compressive Strength	/ _{s(50)}	Point Load Strength Index	D	Point Load Test (diametral)
R	Total Core Recovery	RQD	Rock Quality Designation	L	Point Load Test (irregular lump)

Groundwater Symbols:

APPENDIX 'C'

LABORATORY TEST CERTIFICATES









Unit 1, 5 Brendan Drive (PO Box 2011), Nerang Q 4211 Q (07) 5596 1599 F (07) 5527 2027

ABN 51 009 878 899

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Quality of Materials Report

Client : WOOD & GRIEVE ENGINEERS Report Number:

Address:

Project Name : GEOTECHNICAL INVESTIGATION

Project Number: GE18/144

Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Report Number: **GE18-144.1/1**Report Date: **15/08/2018**

Order Number :

Test Method: AS1289.3.6.1

Page 1 of 1

Sample Number: 245179

Sampling Method : -

Sampled By: LEIGH BEXLEY
Date Sampled: 3/08/2018
Date Tested: 13/08/2018

Material Type : DISTURBED SAMPLE

Material Source : INSITU

Remarks:

SAMPLE LOCATION
BH 3

1.5 - 2.5 DISTURBED

SAMPLE

Test Number :

Lot Number:

Specification Number:

AS Sieve Size(mm)	Percent Passing	Specification Limits							
100			100 FINE SAND	SAND MEDUM SAND	COARSE SAND	FINE GRAVEL	GRAVEL MEDIUM GRAVEL	COARSE GRAVEL	COBBLES
75.0							/		
63.0			90				p p		
53.0			80						
37.5			00				0		
26.5	100		70						
19.0	96								
16.0			Percent Passing(%)						
13.2	88		g 50						
9.5	80		cent						
6.7	75		₫ 40						
4.75	71		30						
2.36	66								
1.18	63		20						
0.600	60								
0.425	58		10						
0.300	56		0 = 6	E E E	E É E	E E	E .	E E	E E E
0.150	52		. 0.150 mm	0.200 mm- 0.300 mm-	1.18 mm.	2.30 mm 4.76 mm	8 S mm	37.6 mm	76 mm 160 mm
0.075	50					AS Sieve Size(mm)			
	*	•	Test	Method	Results				

		Test Method	Results		
Liquid Limit (%):		AS1289.3.1.2	47	Shrinkage Comments :	cracking and curling
Plastic Limit (%):		AS1289.3.2.1	33	Mould Length (mm) :	250.4
Plasticity Index (%):		AS1289.3.3.1	14	Sample History	
Linear Shrinkage (%):		AS1289.3.4.1	8.5		
Soil Description :	•		•	•	



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Quality of Materials Report

Client : **WOOD & GRIEVE ENGINEERS** Report Number:

Address: Project Name :

GEOTECHNICAL INVESTIGATION

Project Number : GE18/144

TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF Location:

GE18-144.2/1 Report Date: 15/08/2018

Order Number:

Test Method: AS1289.3.6.1

Page 1 of 1

Sample Number: 245181

Sampling Method :

Sampled By: LEIGH BEXLEY Date Sampled : 3/08/2018 Date Tested: 13/08/2018 Material Type: DISTURBED Material Source: INSITU

Remarks:

SAMPLE LOCATION

BH 7 0.1 - 0.5**DISTURBED**

SAMPLE

Test Number:

Lot Number:

Specification Number:

AS Sieve Size(mm)	Percent Passing	Specification Limits													
100			100	FINE SAND		SAND MEDUM SAND	COARSE SA	NO	FNE GRAVEL		GRAVEL MEDIUM GRAVEL	COARS	E GRAVEL	COBE	LES
75.0							·								
63.0			90		_										
53.0			80												
37.5			00												
26.5			70												
19.0															
16.0			%) Bui												
13.2	100		Se 50												
9.5	99		Percent Passing(%)												
6.7	99		₫ 40												
4.75	99		30												
2.36	98														
1.18	97		20												
0.600	95														
0.425	94		10												
0.300	92		0 €	E	E	E E	E	E	E	5	É	E G	E E	E	E E
0.150	89		0.076 mm	0.150 mm	0.200 mm	0.300 mm 0.425 mm	0.600 mm 1.16 mm	2 mm	8	Ē	8.5 mm	18.0 mm	37.5 mm	76 mm	160 mm
0.075	88								AS Sieve Size	(mm)					

	Test Method	Results		
Liquid Limit (%):	AS1289.3.1.2	42	Shrinkage Comments :	cracking and curling
Plastic Limit (%):	AS1289.3.2.1	27	Mould Length (mm) :	250.1
Plasticity Index (%):	AS1289.3.3.1	15	Sample History	
Linear Shrinkage (%) :	AS1289.3.4.1	10		
Soil Description :	·	•	•	



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Specification Number:

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Quality of Materials Report

Client: WOOD & GRIEVE ENGINEERS Report Number: GE18-144.3/1

Address: Report Date: 15/08/2018

Project Name : **GEOTECHNICAL INVESTIGATION** Order Number :

Project Number : GE18/144 Test Method : AS1289.3.6.1
Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD , KINGSCLIFF Page 1 of 1

Sample Number: 245183

Sampling Method : -

Sampled By: LEIGH BEXLEY
Date Sampled: 3/08/2018
Date Tested: 13/08/2018
Material Type: BULK SAMPLE

Material Source : INSITU

Remarks:

SAMPLE LOCATION							
	BH 10						
1.0 - 1.5							
	BULK						
	SAMPLE						
Test Number :							
Lot Number :							

AS Sieve Size(mm)	Percent Passing	Specification Limits																	
100			100	FINE SAND		SAND MEDIJM SAND		COARSE SANE	0	FINE GRAVI	EL .	MEDI	RAVEL JM GRAVEL	10	COARSE GRA	VEL		COBBLES	
75.0										ļ	-	0							
63.0			90		-	_	-0-												
53.0			80																
37.5																			
26.5			70					-											
19.0																			
16.0			%) grii																
13.2	100		S S S																
9.5	99		Percent Passing(%)																
6.7	97		₫ 40																
4.75	96		30																
2.36	94																		
1.18	93		20																-
0.600	92		10																
0.425	91		10																
0.300	90		0 =		E E	E E	E	E		E	E E	Ę		E	Ę	5	E,		E 5
0.150	88		0.075 mm		0.200 mm	0.300 mm 0.425 mm	0.600 mm	1.10 mm	2 mm-	2.8	4.76 mm- 6 mm-	9.5 mm		19.0 mm	37.6 mm	8	76 99	\$	200 900
0.075	87									AS Sieve	Size(mm)								

	Test Method	Results		
Liquid Limit (%):	AS1289.3.1.2	46	Shrinkage Comments :	cracking and curling
Plastic Limit (%):	AS1289.3.2.1	29	Mould Length (mm) :	250.1
Plasticity Index (%) :	AS1289.3.3.1	17	Sample History	
Linear Shrinkage (%) :	AS1289.3.4.1	12		
Soil Description :	:	•		

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Quality of Materials Report

Client : **WOOD & GRIEVE ENGINEERS**

Address:

Project Name : **GEOTECHNICAL INVESTIGATION**

Project Number : GE18/144

Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF Report Number:

GE18-144.4/1 15/08/2018

Report Date: Order Number:

Test Method: AS1289 3.6.1

Page 1 of 1

SAMPLE LOCATION

Sample Number: 245185

Sampling Method :

Sampled By: LEIGH BEXLEY Date Sampled : 3/08/2018 Date Tested: 13/08/2018 Material Type: **BULK SAMPLE** Material Source: INSITU

Remarks:

BH 17 0.3 - 1.0 **BULK** SAMPLE

Test Number : Lot Number:

Specification Number:

AS Sieve	Percent	Specification
Size(mm)	Passing	Limits
100		

100 75.0 63.0 53.0 37.5 26.5 19.0 16.0 13.2 100 9.5 99 6.7 99 4.75 97 2.36 87

77

65

59

52

41

36

Percent Passing(%)

AS Sieve Size(mm)

	Test Method	Results		
Liquid Limit (%):	AS1289.3.1.2	40	Shrinkage Comments :	cracking and curling
Plastic Limit (%):	AS1289.3.2.1	32	Mould Length (mm) :	250.4
Plasticity Index (%):	AS1289.3.3.1	8	Sample History	
Linear Shrinkage (%):	AS1289.3.4.1	5.5		
	-		•	

Soil Description:

1.18

0.600

0.425

0.300

0.150

0.075

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Report Number: GE18/144-1A

Issue Number:

30/11/2018 Date Issued:

Client: **WOOD & GRIEVE ENGINEERS**

LEVEL 2, 232 St PAULS TERRACE, FORTITUDE VALLEY

QLD 4006

Project Number: GE18/144

Project Name: GEOTECHNICAL INVESTIGATION

Project Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Work Request: Sample Number: G18-64A Date Sampled: 26/11/2018

Sample Location: BH 40 RL 23.00 (0.4 - 0.8)



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Morrison Geotechnic Pty Ltd

ABN: 51 009 878 899

Gold Coast Laboratory

Unit 1, 5 Brendan Drive Nerang QLD 4211

Phone: (07) 5596 1599

Email: goldcoastlab@morrisongeo.com.au

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ACCREDITATION

Approved Signatory: Ian Masman

Branch Manager

NATA Accredited Laboratory Number: 1169

Particle Distri	bution (AS128	39 3.6.1)			
Sieve	Passed %	Passin Limits	ıg	g Retained %		ed
19 mm	100			0		
13.2 mm	97			3		
9.5 mm	92			5		
6.7 mm	89			3		
4.75 mm	86			3		
2.36 mm	83			3		
1.18 mm	81			2		
0.6 mm	80			1		
0.425 mm	80			0		
0.3 mm	79			1		·
0.15 mm	77			2		·
0.075 mm	76			1		

Atterberg Limit (AS1289 3.1.2 & 3.2	Min	Max	
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	34		
Plasticity Index (%)	16		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	11.5		
Cracking Crumbling Curling	Cracking & Curling		

Report Number: GE18/144-1A Page 1 of 2

Report Number: GE18/144-1A

Issue Number:

Date Issued: 30/11/2018

Client: WOOD & GRIEVE ENGINEERS

LEVEL 2, 232 St PAULS TERRACE, FORTITUDE VALLEY

QLD 4006

Project Number: GE18/144

Project Name: GEOTECHNICAL INVESTIGATION

Project Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Work Request: 64
Sample Number: G18-64B
Date Sampled: 26/11/2018

Sample Location: BH 28 RL 17.88 (0.5 - 0.9)



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Morrison Geotechnic Pty Ltd

ABN: 51 009 878 899

Gold Coast Laboratory

Unit 1, 5 Brendan Drive Nerang QLD 4211

Phone: (07) 5596 1599

Email: goldcoastlab@morrisongeo.com.au

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Branch Manager

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Particle Distri	bution (AS12	89 3.6.1)			
Sieve	Passed %	Passing Limits	Retained %	Retain Limits	ed
19 mm	100		0		
13.2 mm	100		0		
9.5 mm	98		1		
6.7 mm	97		1		
4.75 mm	96		1		
2.36 mm	94		2		
1.18 mm	92		2		
0.6 mm	91		1		
0.425 mm	90		1		
0.3 mm	89		1		
0.15 mm	87		2		
0.075 mm	86		1		

Atterberg Limit (AS1289 3.1.2 & 3.2	Min	Max	
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	56		
Plastic Limit (%)	41		
Plasticity Index (%)	15		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	7.0		
Cracking Crumbling Curling	None		

Report Number: GE18/144-1A Page 2 of 2

Report Number: GE18/144-1B

Issue Number:

Date Issued: 03/12/2018

Client: WOOD & GRIEVE ENGINEERS

LEVEL 2, 232 St PAULS TERRACE, FORTITUDE VALLEY

QLD 4006

Project Number: GE18/144

Project Name: GEOTECHNICAL INVESTIGATION

Project Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Work Request: 64
Sample Number: G18-64A
Date Sampled: 26/11/2018

Sample Location: BH 40 RL 23.00 (0.4 - 0.8)

California Bearing Ratio (AS 1289 6.1.1	l & 2.1.1)	Min	Max
CBR taken at	2.5 mm		
CBR %	8		
Method of Compactive Effort	Standa	ard	
Method used to Determine MDD	AS 1289 5.1	.1 & 2.1	.1
Method used to Determine Plasticity	visua	al	
Maximum Dry Density (t/m ³)	1.36		
Optimum Moisture Content (%)	35.0		
Laboratory Density Ratio (%)	99.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m ³)	1.35		
Field Moisture Content (%)	36.1		
Moisture Content at Placement (%)	35.0		
Moisture Content Top 30mm (%)	43.2		
Moisture Content Rest of Sample (%)	40.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	24		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Particle Distribution (AS1289 3.6.1)									
Sieve	Passed %	Passin Limits	g	Retained %	Retain Limits	ed			
19 mm	100			0					
13.2 mm	97			3					
9.5 mm	92			5					
6.7 mm	89			3					
4.75 mm	86			3					
2.36 mm	83			3					
1.18 mm	81			2					
0.6 mm	80			1					
0.425 mm	80			0					
0.3 mm	79			1					
0.15 mm	77			2					
0.075 mm	76			1					

Atterberg Limit (AS1289 3.1.2 & 3.2	Min	Max	
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	34		
Plasticity Index (%)	16		



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ABN: 51 009 878 899

Gold Coast Laboratory

Unit 1, 5 Brendan Drive Nerang QLD 4211 Phone: (07) 5596 1599

Email: goldcoastlab@morrisongeo.com.au

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Approved Signatory: Ian Masman

Branch Manager

NATA Accredited Laboratory Number: 1169

	1	Cali				-			-		1	1	
2 -		1				+ -							•
11		1			*								
Applied Eddd (KN)													
	1					1		1		1	1		
	*	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	-		1	1	1		1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	
0	1	2	3	4	5	6	7	8	9	10	11	12	

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	11.5		
Cracking Crumbling Curling	Cracking & Curling		
3 3 3	3	3	

Report Number: GE18/144-1B Page 1 of 2

Report Number: GE18/144-1B

Issue Number:

Date Issued: 03/12/2018

Client: WOOD & GRIEVE ENGINEERS

LEVEL 2, 232 St PAULS TERRACE, FORTITUDE VALLEY

QLD 4006

Project Number: GE18/144

Project Name: GEOTECHNICAL INVESTIGATION

Project Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Work Request: 64
Sample Number: G18-64B
Date Sampled: 26/11/2018

Sample Location: BH 28 RL 17.88 (0.5 - 0.9)

California Bearing Ratio (AS 1289 6.1.1	& 2.1.1)	Min	Max
CBR taken at	5 mm		
CBR %	2.5	100	100
Method of Compactive Effort	Standa	ard	
Method used to Determine MDD	AS 1289 5.1	.1 & 2.1	.1
Method used to Determine Plasticity	Visual T	actile	
Maximum Dry Density (t/m ³)	1.27		
Optimum Moisture Content (%)	40.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	99.5		
Dry Density after Soaking (t/m ³)	1.27		
Field Moisture Content (%)	32.8		
Moisture Content at Placement (%)	39.7		
Moisture Content Top 30mm (%)	40.4		
Moisture Content Rest of Sample (%)	38.9		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	24		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Particle Distribution (AS1289 3.6.1)							
Sieve	Passed %	Passing Limits		Retained %	Retain Limits	ed	
19 mm	100			0			
13.2 mm	100			0			
9.5 mm	98			1			
6.7 mm	97			1			
4.75 mm	96			1			
2.36 mm	94			2			
1.18 mm	92			2			
0.6 mm	91			1			
0.425 mm	90			1			
0.3 mm	89			1			
0.15 mm	87			2			
0.075 mm	86			1			

Atterberg Limit (AS1289 3.1.2 & 3.2	Min	Max	
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	56		
Plastic Limit (%)	41		
Plasticity Index (%)	15		



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ABN: 51 009 878 899

Gold Coast Laboratory

Unit 1, 5 Brendan Drive Nerang QLD 4211

Phone: (07) 5596 1599

Email: goldcoastlab@morrisongeo.com.au

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Approved Signatory: Ian Masman Branch Manager

NATA Accredited Laboratory Number: 1169

1		all	1011	iia i	Беа	ring	, No	1110	-	-	-	-	
0.9 -					-1								-
0.8		-											•
0.7 -													
0.6 -													
0.5					-	/							-
0.4 -					1								-
0.3 -		•											
0.2 -		×											
0.1 -													
	-					I	1						
0	1	2	3	4	5 Pene	6 etrati	7 ion (8 mm)	9	10	11	12	

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	7.0		
Cracking Crumbling Curling	None		

Results $2.5 \div 5$

Report Number: GE18/144-1B Page 2 of 2



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ABN 51 009 878 899

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15/08/2018

Shrink Swell Index Report

Client: WOOD & GRIEVE ENGINEERS Report Number: GE18-144.5/1

Address: Report Date:
Project Name: GEOTECHNICAL INVESTIGATION Order Number:

Accredited for compliance with ISO/IEC 17025 - Testing.

Project Number: GE18/144 Test Method: AS1289.7.1.1

TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF Page 1 of 1

Sample Number :	245178	245180	245184	245186
Test Number :				
Sampling Method :	-	-	-	-
Sampled By :	LEIGH BEXLEY	LEIGH BEXLEY	LEIGH BEXLEY	LEIGH BEXLEY
Date Sampled :	3/08/2018	3/08/2018	3/08/2018	3/08/2018
Date Tested :	7/08/2018	7/08/2018	7/08/2018	7/08/2018
Material Type :	UNDISTURBED SAMPLE	UNDISTURBED SAMPLE	UNDISTURBED SAMPLE	UNDISTURBED SAMPLE
Material Source :	INSITU	INSITU	INSITU	INSITU
Sample Location :	BH 2	BH 4	BH 12	BH 18
	0.15 - 0.24	0.1 - 0.29	0.5 - 0.76	0.5 - 0.7
	U50	U50	U50	U50
Inert Material Estimate (%):	0	0	0	0
PP before (kPa) :				
PP after (kPa) :				
Shrinkage Moisture Content (%):	28.6	28	33.6	37
Shrinkage (%):	2.3	2.5	2.2	6.3
Swell Moisture Content Before (%):	29.3	27.2	34.9	32.4
Swell Moisture Content After (%):	31.4	30.6	37.1	37.7
Swell (%):	0	0	0	0
Unit Weight (t/m³) :	1.69	1.62	1.83	1.76
Shrink Swell Index Iss (%):	1.3	1.4	1.2	3.5
Visual Classification :	Silty Clay - Brown			
Cracking:	Y	Y	Y	Y
Crumbling:	Y	Υ	Y	Y
Remarks :				

WORLD RECOGNISED ACCREDITATION

Location:

APPROVED SIGNATORY

IAN MASMAN - MANAGER NATA Accreditation Number 1169

Material Test Report

Report Number: GE18/144-1

Issue Number: 2 - This version supersedes all previous issues

Date Issued: 30/11/2018

Client: WOOD & GRIEVE ENGINEERS

LEVEL 2, 232 St PAULS TERRACE, FORTITUDE VALLEY

QLD 4006

Project Number: GE18/144

Project Name: GEOTECHNICAL INVESTIGATION

Project Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Work Request: 64

MORRISON GEOTECHNIC

Brisbane | Gold Coast | Maroochydore

Morrison Geotechnic Pty Ltd

ABN: 51 009 878 899

Gold Coast Laboratory

Unit 1, 5 Brendan Drive Nerang QLD 4211

Phone: (07) 5596 1599

Email: goldcoastlab@morrisongeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

NATA / Man

WORLD RECOGNISED
ACCREDITATION

Approved Signatory: Ian Masman

Branch Manager

NATA Accredited Laboratory Number: 1169

Shrink Swell Index AS 1289 7.1.1 & 2.1.1		
Sample Number	G18-64C	G18-64D
Sampling Method	AS1289 1.3.1	AS1289 1.3.1
Date Sampled	26/11/2018	26/11/2018
Date Tested	26/11/2018	26/11/2018
Material Source	Insitu	Insitu
Sample Location	BH 26 RL 19.69 (0.5 - 0.8)	BH 28 RL 17.88 (0.5 - 0.85)
Inert Material Estimate (%)	0	0
Pocket Penetrometer before (kPa)	**	**
Pocket Penetrometer after (kPa)	**	**
Shrinkage Moisture Content (%)	32.2	32.7
Shrinkage (%)	2.6	3.6
Swell Moisture Content Before (%)	28.6	29.9
Swell Moisture Content After (%)	30.9	31.2
Swell (%)	0.0	0.0
Shrink Swell Index Iss (%)	1.4	2.0
Visual Description	Sandy Gravelly Clay, red/brown	Sandy Gravelly Clay, red/brown
Cracking	Moderately Cracked	Moderately Cracked
Crumbling	No	No
Remarks	**	**

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.

NATA Accreditation does not cover the performance of pocket penetrometer readings.

Report Number: GE18/144-1 Page 1 of 1



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Unit 1, 5 Brendan Drive (PO Box 2011), Nerang Q 4211, P (07) 5596 1599 F (07) 5527 2027 ABN 51 009 878 899

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California Bearing Ratio Report (1 Point)

WOOD & GRIEVE ENGINEERS Client : Report Number: GE18-144.6/1

Address:

GE18/144

Project Number:

Project Name: **GEOTECHNICAL INVESTIGATION**

Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Report Date: 15/08/2018

Order Number: Test Method: AS1289.6.1.1

Page 1 of 1

Sample Number : 245182 Date Sampled: 3/08/2018

Date Tested: 10/08/2018 Sampled By: LEIGH BEXLEY

Sampling Method:

Material Source: INSITU

Material Type: **BULK SAMPLE**

Remarks :

Moisture Method :	AS 1289.2.1.1
Maximum Dry Density (t/m³) :	1.579
Optimum Moisture Content (%):	25.5
Compactive Effort :	Standard
Nominated Percentage of MDD :	100
Nominated Percentage of OMC :	100
Achieved Percentage of MDD:	99
Achieved Percentage of OMC :	100.0
Dry Density Before Soak (t/m³) :	1.571
Dry Density After Soak (t/m³) :	1.568
Moisture Content Before Soak (%):	25.6
Moisture Content After Soak (%) :	29.0
Density Ratio After Soak (%):	99
Field Moisture Content (%):	28.0
Top Moisture Content - After Penetration (%):	29.9
Total Moisture Content - After Penetration (%):	27.0
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%):	0.0
CBR Surcharge (kg) :	4.5
Oversize (%) :	

SAMPLE LOCATION BH 8 0.1 - 1.1 BULK SAMPLE Lot Number:

Test Number:

Site Selection: Soil Description:

CBR 2.5mm (%): 12 CBR 5.0mm (%): **10**

CBR Value (%): 12



Oversize Material Replaced (%):

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APPROVED SIGNATORY

IAN MASMAN - MANAGER NATA Accreditation Number:

1169 Document Code RFO39-12



Brisbane | Gold Coast | Maroochydore

Unit 1, 5 Brendan Drive (PO Box 2011), Nerang Q 4211, P (07) 5596 1599 F (07) 5527 2027 ABN 51 009 878 899

Report Date:

Test Method:

BH 10

1.0 - 1.5 BULK

SAMPLE

Lot Number:

Test Number:

Order Number:

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15/08/2018

AS1289.6.1.1

California Bearing Ratio Report (1 Point)

Client : **WOOD & GRIEVE ENGINEERS** Report Number: GE18-144.7/1

Address:

Project Number:

GE18/144

Project Name: **GEOTECHNICAL INVESTIGATION**

Location:

Page 1 of 1 TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Sample Number : 245183 SAMPLE LOCATION

Date Sampled: 3/08/2018 Date Tested : 10/08/2018 Sampled By: LEIGH BEXLEY

Sampling Method:

Material Source : INSITU

Material Type: **BULK SAMPLE**

Remarks:

Moisture Method :	AS 1289.2.1.1	_
Maximum Dry Density (t/m³) :	1.358	
Optimum Moisture Content (%) :	36.7	
Compactive Effort :	Standard	
Nominated Percentage of MDD :	100	
Nominated Percentage of OMC :	100	
Achieved Percentage of MDD :	100	
Achieved Percentage of OMC :	100.0	_
Dry Density Before Soak (t/m³) :	1.358	-
Dry Density After Soak (t/m³) :	1.359	- 2
Moisture Content Before Soak (%) :	36.7	
Moisture Content After Soak (%) :	38.0	_
Density Ratio After Soak (%):	100	
Field Moisture Content (%):	38.2	_
Top Moisture Content - After Penetration (%):	38.5	_
Total Moisture Content - After Penetration (%):	36.6	_
Soak Condition :	Soaked	
Soak Period (days) :	4	_
Swell (%):	0.0	_
CBR Surcharge (kg) :	4.5	
Oversize (%):		

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Site Selection :	
Soil Description :	

CBR Value (%): 6



Oversize Material Replaced (%):

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APPROVED SIGNATORY

IAN MASMAN - MANAGER NATA Accreditation Number: 1169

Document Code RFO39-12



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0.3 - 1.0

BULK

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California Bearing Ratio Report (1 Point)

WOOD & GRIEVE ENGINEERS Client : Report Number: GE18-144.8/1

Address:

GE18/144

Project Number:

Project Name: **GEOTECHNICAL INVESTIGATION**

Location: TWEED VALLEY HOSPITAL, CUDGEN ROAD, KINGSCLIFF

Report Date: 15/08/2018

Order Number:

Test Method: AS1289.6.1.1

Page 1 of 1

Sample Number :	245185	SAMPLE LOCATION
Date Sampled :	3/08/2018	BH 17

Date Sampled: 3/08/2018 10/08/2018 Date Tested: Sampled By: LEIGH BEXLEY

Sampling Method:

Material Source : INSITU

Material Type: **BULK SAMPLE**

Remarks :

Moisture Method :	AS 1289.2.1.1
Maximum Dry Density (t/m³) :	1.401
Optimum Moisture Content (%) :	34.8
Compactive Effort :	Standard
Nominated Percentage of MDD :	100
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	99
Achieved Percentage of OMC :	100.0
Dry Density Before Soak (t/m³) :	1.393
Dry Density After Soak (t/m³) :	1.395
Moisture Content Before Soak (%) :	34.7
Moisture Content After Soak (%) :	34.0
Density Ratio After Soak (%):	100
Field Moisture Content (%) :	33.5
Top Moisture Content - After Penetration (%):	37.5
Total Moisture Content - After Penetration (%):	32.7
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%):	0.0
CBR Surcharge (kg) :	4.5
Oversize (%):	

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Soak Period (days) :	4	85 1 15 2 25 3 35 4 45 5 55 6 65 7 75 10 125 Feetralion (mi)
Swell (%):	0.0	
CBR Surcharge (kg) :	4.5	CBR 2.5mm (%): 4.0
Oversize (%):		CBR 5.0mm (%) : 4.5
Oversize Material Replaced (%):		CBR Value (%): 4.5

Site Selection: Soil Description:



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APPROVED SIGNATORY

IAN MASMAN - MANAGER NATA Accreditation Number:

1169 Document Code RFO39-12



		POINT	LOAD	TES	T R	EPOR ⁻	Γ		
Client:		Wood & Grieve	Engineers			Report No:	GE18/1	44.1	
Client Address:	Lev	vel 2, 232 St Pauls Terrace, F	ortitude Valle	Report Date:	08.07	18			
Job No:		GE18/14	14			Sample Date:	03.08	18	
Project:	Geote	echnical Investigation - Prop	osed Tweed V	alley Hospi	tal	Order No:			
Location:		Lot 102 on DP870722, Cud	gen Road, Kin	gscliff		Test Method:	AS4133	4.1	
								Page 1 of 1	
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term	
634	08.07.2018	Borehole BH1	2.00	Core	7.95	7.84	Diametral	VH	
635	08.07.2018	Borehole BH1	3.40	Core	0.98	0.98	Diametral	M - H	
636	08.07.2018	Borehole BH1	5.30	Core	6.17	6.01	Diametral	[#] VH	
637	08.07.2018	Borehole BH1	6.20	Core	11.30	10.78	Diametral	EH	
638	08.07.2018	Borehole BH1	7.20	Core	9.75	9.40	Diametral	VH	
639	08.07.2018	Borehole BH1	10.00	Core	0.63	0.63	Diametral	М	
640	08.07.2018	Borehole BH1	14.60	Core	8.18	8.03	Diametral	VH	
641	08.07.2018	Borehole BH1	16.30	Core	10.10	10.00	Diametral	VH - EH	
642	08.07.2018	Borehole BH1	17.20	Core	8.96	8.63	Diametral	VH	

Remarks:

Samples are Basalt which are slightly weathered to fresh (SW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





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[#] Denotes sample failed along defect plane



lient:		Wood & Griev	ve Engineers			Report No:	GE18/1	44.2	
lient Address:	Leve	I 2, 232 St Pauls Terrace	e, Fortitude Valle	Report Date:	08.08	.18			
ob No:		GE18	3/144			Sample Date:	01.08	.08	
roject:	Geotecl	hnical Investigation - Pr	oposed Tweed V	alley Hospi	tal	Order No:			
ocation:	ı	Lot 102 on DP870722, C	udgen Road, Kin	gscliff		Test Method:	AS4133	4.1	
								Page 1 of 1	
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term	
643	07.08.2018	Borehole BH2	3.73	Core	9.31	9.14	Diametral	VH	
644	07.08.2018	Borehole BH2	4.80	Core	10.43	10.24	Diametral	VH - EH	
645	07.08.2018	Borehole BH2	5.55	Core	12.99	12.51	Diametral	EH	
646	07.08.2018	Borehole BH2	6.55	Core	11.88	11.55	Diametral	EH	
647	07.08.2018	Borehole BH2	8.30	Core	7.59	7.45	Diametral	VH	
648	07.08.2018	Borehole BH2	9.25	Core	11.15	10.85	Diametral	EH	
•									

Remarks:

Samples are Basalt which are slightly weathered to fresh (SW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





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[#] Denotes sample failed along defect plane



Client:		Wood & Griev	e Engineers			Report No:	GE18/1	44.3		
Client Address:	Leve	I 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	08.08	18		
Job No:		GE18	/144			Sample Date:	31.07	.08		
Project:	Geotecl	hnical Investigation - Pro	oposed Tweed V	alley Hospi	tal	Order No:				
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS4133	3 4.1		
								Page 1 of 1		
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term		
649	07.08.2018	Borehole BH4	1.20	Core	8.22	8.22	Diametral	VH		
650	07.08.2018	Borehole BH4	3.40	Core	8.53	8.14	Diametral	VH		
651	07.08.2018	Borehole BH4	4.95	Core	10.30	10.11	Diametral	VH - EH		
652	07.08.2018	Borehole BH4	6.45	Core	12.13	11.80	Diametral	EH		
653	07.08.2018	Borehole BH4	6.95	Core	11.97	11.97	Diametral	EH		
654	07.08.2018	Borehole BH4	7.90	Core	11.71	11.71	Diametral	EH		
655	07.08.2018	Borehole BH4	8.50	Core	14.17	14.04	Diametral	EH		
656	07.08.2018	Borehole BH4	9.80	Core	10.39	10.21	Diametral	VH - EH		

Remarks:

Samples are Basalt which are slightly weathered to fresh (SW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





Accredited for compliance with ISO/IEC 17025.

[#] Denotes sample failed along defect plane



		POINT	LOAD	TES	T RI	EPOR	Γ	
Client:		Wood & Griev	e Engineers			Report No:	GE18/1	44.4
Client Address:	Lev	vel 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	08.08	.18
Job No:		GE18	/144			Sample Date:	30.07	.08
Project:	Geote	echnical Investigation - Pro	oposed Tweed V	alley Hospi	tal	Order No:		
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS413	3 4.1
								Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
657	06.08.2018	Borehole BH5	1.35	Core	8.26	8.11	Diametral	VH
658	06.08.2018	Borehole BH5	3.35	Core	12.73	12.49	Diametral	EH
659	06.08.2018	Borehole BH5	4.95	Core	5.30	5.30	Axial	VH
660	06.08.2018	Borehole BH5	6.40	Core	9.64	9.46	Diametral	VH

Remarks:

Samples are Basalt which are slightly weathered to fresh (SW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





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[#] Denotes sample failed along defect plane



lient:		Wood & Grie	ve Engineers			Report No:	GE18/1	44.5	
lient Address:	Leve	2, 232 St Pauls Terrace	e, Fortitude Valle	y QLD 4006		Report Date:	08.08	.18	
ob No:		GE18	3/144			Sample Date:	30.07	.08	
roject:	Geotechnical Investigation - Proposed Tweed Valley Hospital Orc								
ocation:	Lot 102 on DP870722, Cudgen Road, Kingscliff						AS4133 4.1		
								Page 1 of 1	
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term	
661	06.08.2018	Borehole BH6	8.40	Core	7.34	7.21	Diametral	VH	
662	06.08.2018	Borehole BH6	9.37	Core	11.23	10.92	Diametral	EH	
663	06.08.2018	Borehole BH6	12.70	Core	0.29	0.29	Diametral	#L-M	
664	06.08.2018	Borehole BH6	14.00	Core	0.27	0.27	Diametral	#L-M	
665	06.08.2018	Borehole BH6	14.45	Core	0.39	0.39	Diametral	#M	

Remarks:

Samples are Basalt which are distrinctly weathered to fresh (DW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





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[#] Denotes sample failed along defect plane



			LOAD			Report No:		
lient:		Wood & Griev	e Engineers			· ·	GE18/1	44.6
lient Address:	Leve	2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	80.80	.18
ob No:		GE18	/144			Sample Date:	30.07	.08
roject:	Geotecl	nnical Investigation - Pro	oposed Tweed V	alley Hospi	tal	Order No:		
ocation:	ı	Lot 102 on DP870722, Co	udgen Road, Kin	gscliff		Test Method:	AS4133	4.1
								Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
666	06.08.2018	Borehole BH7	2.20	Core	6.51	6.51	Diametral	VH
667	06.08.2018	Borehole BH7	3.75	Core	2.56	2.56	Diametral	Н
668	06.08.2018	Borehole BH7	6.25	Core	6.48	6.36	Diametral	VH
669	06.08.2018	Borehole BH7	8.95	Core	9.85	9.58	Diametral	VH
670	06.08.2018	Borehole BH7	10.30	Core	10.93	10.83	Diametral	EH
671	06.08.2018	Borehole BH7	13.15	Core	0.15	0.16	Diametral	#L
672	06.08.2018	Borehole BH7	17.65	Core	8.21	8.29	Diametral	VH
673	06.08.2018	Borehole BH7	18.50	Core	10.81	10.91	Diametral	EH
674	06.08.2018	Borehole BH7	18.85	Core	4.95	4.90	Diametral	VH

Remarks:

Samples are Basalt which are distinctly weathered to fresh (DW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





Accredited for compliance with ISO/IEC 17025.

[#] Denotes sample failed along defect plane



		POINT	LOAD	TES	ST R	EPOR ¹	Γ	
Client:		Wood & Grieve	e Engineers			Report No:	GE18/1	44.7
Client Address:	Lev	vel 2, 232 St Pauls Terrace,	Fortitude Valle	y QLD 4006		Report Date:	08.08	18
Job No:		GE18/	144			Sample Date:	03.08	18
Project:	Geote	chnical Investigation - Pro	posed Tweed V	alley Hospi	ital	Order No:		
Location:		Lot 102 on DP870722, Cu	dgen Road, Kin	gscliff		Test Method:	AS4133	3 4.1
								Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
675	06.08.2018	Borehole BH25	1.60	Core	8.82	8.66	Diametral	VH
676	06.08.2018	Borehole BH25	2.90	Core	9.74	9.38	Diametral	VH
677	06.08.2018	Borehole BH25	3.70	Core	10.17	9.80	Diametral	VH
678	06.08.2018	Borehole BH25	11.80	Core	16.36	15.60	Diametral	EH
679	06.08.2018	Borehole BH25	14.35	Core	0.17	0.17	Diametral	L
680	06.08.2018	Borehole BH25	17.80	Core	7.95	7.81	Diametral	VH
681	06.08.2018	Borehole BH25	18.65	Core	1.38	1.37	Diametral	Н
682	06.08.2018	Borehole BH25	19.70	Core	7.95	7.87	Diametral	VH
683	06.08.2018	Borehole BH25	21.20	Core	6.58	6.42	Diametral	VH

Remarks:

Samples are Basalt which are slighlty weathered to fresh (SW-Fr).

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High





Accredited for compliance with ISO/IEC 17025.

[#] Denotes sample failed along defect plane



Client:		Wood & Griev	e Engineers			Report No:	GE18/1	44.8
Client Address:	Leve	el 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	28.11	.18
Job No:		GE18	/144			Sample Date:	BH29: 16.11.18 /	BH43: 5.11.18
Project:	Geoted	chnical Investigation - Pro	posed Tweed V	alley Hospi	tal	Order No:		
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS413	3 4.1
						•		Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
724	23.11.18	Borehole BH29	16.90	Core	15.57	15.29	Diametral	EH
725	23.11.19	Borehole BH29	18.10	Core	0.49	0.48	Diametral	М
726	23.11.20	Borehole BH29	18.95	Core	7.85	7.70	Diametral	VH
727	23.11.21	Borehole BH29	19.41	Core	5.20	5.11	Diametral	VH
728	23.11.22	Borehole BH29	20.60	Core	1.00	0.98	Diametral	М
729	23.11.23	Borehole BH29	21.20	Core	0.40	0.39	Diametral	М
730	23.11.24	Borehole BH29	22.98	Core	0.31	0.31	Diametral	М
731	23.11.25	Borehole BH43	1.55	Core	10.87	10.67	Diametral	EH
732	23.11.26	Borehole BH43	3.31	Core	7.47	7.33	Diametral	VH
733	23.11.27	Borehole BH43	5.12	Core	10.15	9.96	Diametral	VH
734	23.11.18	Borehole BH43	6.34	Core	0.47	0.46	Diametral	М
735	23.11.19	Borehole BH43	9.30	Core	11.94	11.73	Diametral	EH
736	23.11.20	Borehole BH43	15.20	Core	5.91	5.80	Diametral	VH
737	23.11.21	Borehole BH43	16.41	Core	8.77	8.61	Diametral	VH
738	23.11.22	Borehole BH43	18.74	Core	9.38	9.20	Diametral	VH



All samples are basalt rock.



Accredited for compliance with ISO/IEC 17025.

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High



Client:		Wood & Griev	e Engineers			Report No:	GE18/1	44.9
Client Address:	Lev	rel 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	28.11	.18
Job No:		GE18	/144			Sample Date:	BH43: 5.11.18 / BH44: 21	.11.18 / BH45: 9.11.18
Project:	Geote	chnical Investigation - Pro	pposed Tweed V	alley Hospi	tal	Order No:		
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS4133	3 4.1
								Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
739	23.11.23	Borehole BH44	1.20	Core	10.07	9.89	Diametral	VH
740	23.11.24	Borehole BH44	2.95	Core	10.94	10.74	Diametral	EH
741	23.11.25	Borehole BH44	5.38	Core	12.24	12.02	Diametral	EH
742	23.11.26	Borehole BH44	7.12	Core	10.84	10.64	Diametral	EH
743	23.11.27	Borehole BH44	8.25	Core	11.29	11.09	Diametral	EH
744	23.11.18	Borehole BH45	1.50	Core	9.13	8.97	Diametral	VH
745	23.11.19	Borehole BH45	4.23	Core	11.84	11.62	Diametral	EH
746	23.11.20	Borehole BH45	5.76	Core	0.87	0.85	Diametral	М
747	23.11.21	Borehole BH45	6.00	Core	12.03	11.81	Diametral	EH
748	23.11.22	Borehole BH45	7.06	Core	10.49	10.30	Diametral	EH
749	23.11.23	Borehole BH45	8.20	Core	9.48	9.31	Diametral	VH
750	23.11.24	Borehole BH45	9.00	Core	11.04	10.84	Diametral	EH
751	23.11.25	Borehole BH45	9.35	Core	0.16	0.15	Diametral	L
752	23.11.26	Borehole BH45	10.50	Core	0.15	0.15	Diametral	L
753	23.11.27	Borehole BH45	11.52	Core	0.14	0.14	Diametral	L



All samples are basalt rock.



Accredited for compliance with ISO/IEC 17025.

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Client:		Wood & Grieve	e Engineers			Report No:	GE18/14	14.11		
Client Address:	Leve	el 2, 232 St Pauls Terrace,	Fortitude Valle	y QLD 4006		Report Date:	28.11	.18		
Job No:		GE18/	144			Sample Date:	BH45: 9.11.18 / I	3H46: 6.11.18		
Project:	Geotec	chnical Investigation - Pro	posed Tweed V	alley Hospi	tal	Order No:				
Location:		Lot 102 on DP870722, Cu	ıdgen Road, Kin	gscliff		Test Method:	AS4133	3 4.1		
							Page 1 of			
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term		
754	23.11.18	Borehole BH45	12.96	Core	0.13	0.13	Diametral	L		
755	23.11.19	Borehole BH45	14.84	Core	0.24	0.24	Diametral	L		
756	23.11.20	Borehole BH45	15.54	Core	2.48	2.44	Diametral	Н		
757	23.11.21	Borehole BH45	16.40	Core	8.63	8.47	Diametral	VH		
758	23.11.22	Borehole BH45	16.80	Core	3.30	3.24	Diametral	VH		
759	23.11.23	Borehole BH45	17.60	Core	9.79	9.61	Diametral	VH		
760	23.11.24	Borehole BH45	18.40	Core	9.53	9.36	Diametral	VH		
761	23.11.25	Borehole BH45	20.10	Core	6.13	6.02	Diametral	VH		
762	23.11.26	Borehole BH46	2.05	Core	8.02	7.87	Diametral	VH		
763	23.11.27	Borehole BH46	3.35	Core	11.65	11.44	Diametral	EH		
764	23.11.18	Borehole BH46	7.06	Core	8.18	8.03	Diametral	VH		
765	23.11.19	Borehole BH46	7.45	Core	5.59	5.49	Diametral	VH		
766	23.11.20	Borehole BH46	8.85	Core	8.92	8.76	Diametral	VH		
767	23.11.21	Borehole BH46	13.16	Core	7.49	7.35	Diametral	VH		
768	23.11.22	Borehole BH46	15.73	Core	6.55	6.43	Diametral	VH		
769	23.11.23	Borehole BH46	17.35	Core	12.00	11.78	Diametral	EH		





Accredited for compliance with ISO/IEC 17025.

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Approved Signatory	Form Number
Sien A	
MODIFIE	
Liam McDowall - Laboratory Manager	
(Brisbane)	
NATA Accreditation Number	ER0033
1162 / 1169	



Client:		Wood & Griev	e Engineers			Report No:	GE18/14	14.12
Client Address:	Leve	el 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	28.11	18
Job No:		GE18/	/144			Sample Date:	BH47: 19.11.18 / BH48: 7.	11.18 / BH49: 19.11.18
Project:	Geoted	chnical Investigation - Pro	posed Tweed V	alley Hospi	tal	Order No:		
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS4133 4.1	
						•		Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Tern
770	23.11.24	Borehole BH47	8.62	Core	12.76	12.53	Diametral	EH
771	23.11.25	Borehole BH47	11.80	Core	11.48	11.27	Diametral	EH
772	23.11.26	Borehole BH47	13.90	Core	12.07	11.85	Diametral	EH
773	23.11.27	Borehole BH47	15.90	Core	6.73	6.60	Diametral	VH
774	23.11.18	Borehole BH48	2.65	Core	11.94	11.72	Diametral	EH
775	23.11.19	Borehole BH48	5.45	Core	11.72	11.51	Diametral	EH
776	23.11.20	Borehole BH48	8.27	Core	0.26	0.26	Diametral	L
777	23.11.21	Borehole BH48	10.30	Core	0.17	0.17	Diametral	L
778	23.11.22	Borehole BH48	13.35	Core	8.99	8.83	Diametral	VH
779	23.11.23	Borehole BH48	14.10	Core	7.90	7.76	Diametral	VH
780	23.11.24	Borehole BH48	17.70	Core	7.18	7.05	Diametral	VH
781	23.11.25	Borehole BH49	1.25	Core	9.90	9.72	Diametral	VH
782	23.11.26	Borehole BH49	2.64	Core	10.68	10.48	Diametral	EH
783	23.11.27	Borehole BH49	10.00	Core	10.78	10.59	Diametral	EH
784	23.11.18	Borehole BH49	12.30	Core	10.54	10.35	Diametral	EH
785	23.11.19	Borehole BH49	14.25	Core	3.17	3.11	Diametral	VH





Accredited for compliance with ISO/IEC 17025.

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Approved Signatory

Sieu A

Liam McDowall - Laboratory Manager
(Brisbane)

NATA Accreditation Number

1162 / 1169

Form Number

Form Number

Form Number

Form Number

Form Number



Client:		Wood & Griev	e Engineers			Report No:	GE18/14	14.14		
Client Address:	Leve	el 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	28.11	18		
Job No:		GE18	/144			Sample Date:	BH50: 8.11.18 / BH51 13.1	11.18 / BH52: 23.11.18		
Project:	Geoted	chnical Investigation - Pro	posed Tweed V	alley Hospi	tal	Order No:				
Location:		Lot 102 on DP870722, Cu	udgen Road, Kin	gscliff		Test Method:	AS4133 4.1			
								Page 1 of 1		
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Tern		
786	23.11.20	Borehole BH50	15.27	Core	6.34	6.22	Diametral	VH		
787	23.11.21	Borehole BH50	16.82	Core	11.59	11.38	Diametral	EH		
788	23.11.22	Borehole BH50	18.08	Core	13.48	13.24	Diametral	EH		
789	23.11.23	Borehole BH50	20.15	Core	3.99	3.92	Diametral	VH		
790	23.11.24	Borehole BH51	10.82	Core	10.16	9.97	Diametral	VH		
791	23.11.25	Borehole BH51	14.10	Core	0.17	0.17	Diametral	L		
792	23.11.26	Borehole BH51	15.70	Core	6.47	6.35	Diametral	VH		
793	23.11.27	Borehole BH51	17.85	Core	9.07	8.91	Diametral	VH		
794	23.11.18	Borehole BH51	19.00	Core	6.86	6.73	Diametral	VH		
795	23.11.19	Borehole BH51	19.90	Core	3.65	3.58	Diametral	VH		
796	23.11.20	Borehole BH52	4.27	Core	9.56	9.38	Diametral	VH		
797	23.11.21	Borehole BH52	8.10	Core	9.38	9.20	Diametral	VH		
798	23.11.22	Borehole BH52	9.68	Core	9.33	9.16	Diametral	VH		
799	23.11.23	Borehole BH52	12.31	Core	0.14	0.14	Diametral	L		
800	23.11.24	Borehole BH52	15.70	Core	0.30	0.30	Diametral	L-M		
801	23.11.25	Borehole BH52	20.70	Core	7.42	7.29	Diametral	VH		





Accredited for compliance with ISO/IEC 17025.

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	_	POINT	LOAD	IES	I RI			
Client:		Wood & Griev	e Engineers			Report No:	GE18/14	44.15
Client Address:	Le	evel 2, 232 St Pauls Terrace	, Fortitude Valle	y QLD 4006		Report Date:	28.11	.18
Job No:		GE18/	144			Sample Date:	BH52: 13.11.18 / BH53: 21	.11.18 / BH54: 20/11/18
Project:	Geot	echnical Investigation - Pro	posed Tweed V	alley Hospi	tal	Order No:		
Location:	Lot 102 on DP870722, Cudgen Road, Kingscliff Test Method						AS4133	3 4.1
								Page 1 of 1
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Term
802	23.11.26	Borehole BH52	21.80	Core	9.55	9.37	Diametral	VH
803	23.11.27	Borehole BH52	23.00	Core	12.15	11.93	Diametral	EH
804	23.11.18	Borehole BH53	4.83	Core	3.30	3.24	Diametral	VH
805	23.11.19	Borehole BH53	7.22	Core	3.04	2.98	Diametral	Н
806	23.11.20	Borehole BH53	13.70	Core	11.37	11.16	Diametral	EH
807	23.11.21	Borehole BH53	16.20	Core	7.13	7.06	Diametral	VH
808	23.11.22	Borehole BH53	17.83	Core	1.27	1.24	Diametral	Н
809	23.11.23	Borehole BH53	19.10	Core	0.61	0.60	Diametral	М
810	23.11.24	Borehole BH53	21.32	Core	8.03	7.88	Diametral	VH
811	23.11.25	Borehole BH53	23.50	Core	11.04	10.84	Diametral	EH
812	23.11.26	Borehole BH53	24.54	Core	10.20	10.01	Diametral	EH
813	23.11.27	Borehole BH54	5.35	Core	9.50	9.32	Diametral	VH
814	23.11.18	Borehole BH54	13.90	Core	6.89	6.77	Diametral	VH
815	23.11.19	Borehole BH54	16.05	Core	8.26	8.11	Diametral	VH
816	23.11.20	Borehole BH54	17.90	Core	3.97	3.90	Diametral	VH
817	23.11.21	Borehole BH54	18.75	Core	9.68	9.50	Diametral	VH





Accredited for compliance with ISO/IEC 17025.

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Client:		Wood & Grieve I	Engineers			Report No:	GE18/14	14.17
Client Address:	Le	vel 2, 232 St Pauls Terrace, F	ortitude Valle	y QLD 4006		Report Date:	28.11.	.18
lob No:		GE18/14	4			Sample Date:	BH55: 15	.11.18
Project:	Geote	echnical Investigation - Prope	osed Tweed \	/alley Hospi	tal	Order No:		
ocation:		Lot 102 on DP870722, Cud	gen Road, Kir	ngscliff		Test Method:	AS4133	3 4.1
						Page 1 of		
Sample Number	Date of Test	Location	Depth (m)	Sample Type	Is (MPa)	Is (50) (MPa)	Loading Direction	Descriptive Terr
818	23.11.22	Borehole BH55	15.23	Core	6.25	6.14	Diametral	VH
819	23.11.23	Borehole BH55	16.60	Core	10.07	9.89	Diametral	VH
820	23.11.24	Borehole BH55	18.44	Core	9.13	8.97	Diametral	VH
821	23.11.25	Borehole BH55	19.90	Core	8.94	8.78	Diametral	EH



Remarks:

All sample are basalt rock.



Accredited for compliance with ISO/IEC 17025.

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Brisbane 346A Bilsen Road, Geebung QLD 4034 Ph: +61 7 3265 5656 Perth 2 Kimmer Place, Queens Park WA 6107 Ph: +61 8 9258 8323

		ITV 51/ 54			_			
	PERMEABILITY BY FALLING HEAD TEST REPORT Test Method AS 1289 6.7.2, 5.1.1, KH2 (Based on K H Head (1988) Manual of Laboratory Testing, 10.7)							
Client	Morrison Geotechnic Pty Lt	:d		Report No.	1811028	1-FHPT		
				Workorder No	.0005126	;		
Address	PO Box 2011 Nerang QL	D 4211		Test Date	14/11/18	-21/11/18		
				Report Date	21/11/20	18		
Project	GE18/216 - Tweed Valley Hospital - Lot 102 Cudgen Rd, Kingscliff							
Client ID	BH7			Depth (m)	0.20-0.80	0		
Description	Description Silty CLAY-red			Sample Type Remoulded Soil Specimen				
		RESULTS	S OF TESTING					
Compaction Me	thod	AS1289.5.1.1 - S	tandard Compaction					
Maximum Dry D	Density (t/m³)	1.31	Hydraulic Gradient			9.4		
Optimum Moisture Content (%)		31.5	Surcharge (kPa)		3.0			
Placement Mois	sture Content (%)	31.4	Head Pressure Applied (kPa)			10.79		
Moisture Ratio (%)	99.5	Water Type			Deaerated		
Placement Wet	Density (t/m³)	1.69	Percentage Material Retained/Sieve Size (mm)			0 % /9.5 mm		

PERMEABILITY

Density Ratio (%)

 $k_{(20)} =$

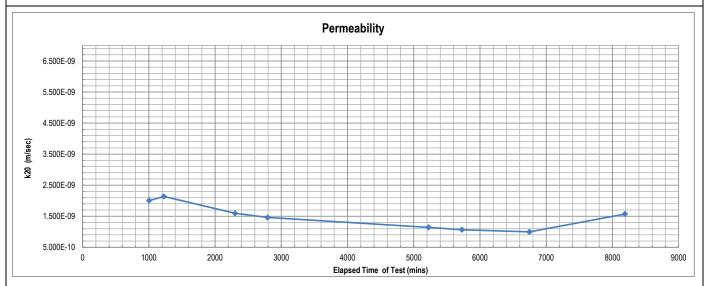
98.2

1.6 x 10 ⁻⁰⁹

Sample Height and Diameter (mm)

(m/sec)

116.63 / 101.14 mm



Remarks: The above specimen was remoulded at 98% Standard Dry Density and at Optimum Moisture Content as advised by the client

 Page: 1 of 1

REP06301

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

C. Park

Authorised Signatory

NATA
ACCREDITED FOR
TECHNICAL

Tested at Trilab Brisbane Laboratory.

Laboratory No. 9926



Brisbane 346A Bilsen Road, Geebung QLD 4034 Ph: +61 7 3265 5656

Perth 2 Kimmer Place, Queens Park WA 6107 Ph: +61 8 9258 8323

	PERMEABII	LITY BY FAL	LING HEAD T	EST REPOR	Т	
	Test Method AS 1289 6.7.2	2, 5.1.1 , KH2 (Based o	n K H Head (1988) Manu	al of Laboratory Testi	ng,10.7)	
Client	Morrison Geotechnic Pty Lt	d		Report No.	1811028	2-FHPT
				Workorder No	.0005126	
Address	PO Box 2011 Nerang QLD 4211			Test Date	14/11/20	18
				Report Date	20/11/20	18
Project	GE18/216 - Tweed Valley H	Hospital - Lot 102	Cudgen Rd, Kingsc	liff		
Client ID	BH10			Depth (m)	0.20-0.80	
Description SILTY CLAY-red brown				Sample Type	Remoulded Soil Specimen	
		RESULT	S OF TESTING			
Compaction Me	thod	AS1289.5.1.1 - S	tandard Compaction			
Maximum Dry D	Density (t/m³)	1.41	Hydraulic Gradient			9.4
Optimum Moistu	ure Content (%)	31.5	Surcharge (kPa)			3.0
Placement Mois	Placement Moisture Content (%) 31.2 Head Pressure Applied (kPa)					10.79

Water Type

PERMEABILITY

Moisture Ratio (%)

Density Ratio (%)

Placement Wet Density (t/m3)

 $k_{(20)} =$

99.2

1.82

98.2

9.6 x 10

Sample Height and Diameter (mm)

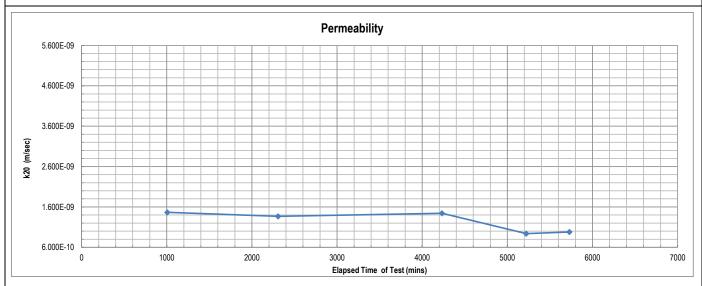
Percentage Material Retained/Sieve Size (mm)

(m/sec)

De-ionized

0 % /9.5 mm

116.41 / 100.58 mm



Remarks: The above specimen was remoulded to a target of 98% of Standard Dry Density and at 100% of Optimum Moisture Content.

Sample/s supplied by client The compaction data was supplied by the client. Page: 1 of 1

REP06301

Accredited for compliance with ISO/IEC 17025 - Testing. The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/National Standards.

Authorised Signatory

Tested at Trilab Brisbane Laboratory.

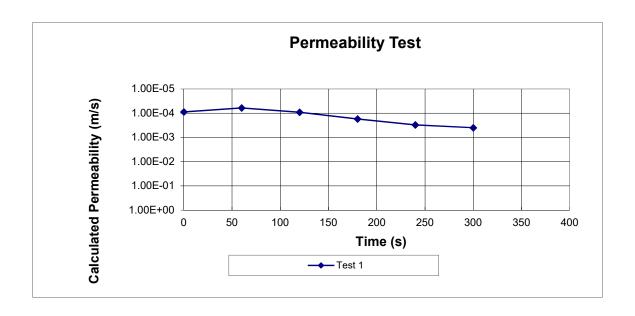
Laboratory No. 9926

Project	Tweed Valley Hospital			
Project Number	Test 1		Date	3/08/2018
Test Location	BH22		Tester	BE
Depth of Hole		500 mm		
Diameter of Hole	<u></u>	100 mm		
Length of Test Section	on	400 mm		

Date	Time		Depth of water from	Δt	Δd	Permeability
		of test (t) (s)	Reference level (d) (mm)			(P) (m/s)
3/8/18	12:00:00	0	340	0	0	, , ,
	12:01:00	60	270	60	70	8.87E-05
	12:02:00	120	230	60	40	6.07E-05
	12:03:00	180	180	60	50	9.09E-05
	12:04:00	240	110	60	70	1.74E-04
	12:05:00	300	40	60	70	3.05E-04
	12:06:00	360	0	60	40	3.98E-04

Time	for	25mm	drop	

Permeability (m/s)	1.9E-04		
mm/hr	670.3		

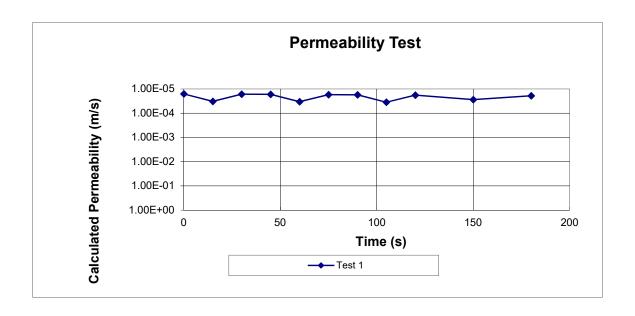


Project	Tweed Valley Hospital			
Project Number	Test 2		Date	24/10/2018
Test Location	BH22		Tester	CL
Depth of Hole		500 mm		
Diameter of Hole		100 mm		
Length of Test Section	<u></u>	400 mm		

Date	Time	Time since start	Depth of water from	Δt	Δd	Permeability
_ 3.0		of test (t) (s)	Reference level (d) (mm)			(P) (m/s)
24/10/18	11:45:00	0	500	0	0	(1) (11#5)
	11:45:15		495		5	1.59E-05
	11:45:30		485		10	3.24E-05
	11:45:45		480	15	5	1.64E-05
	11:46:00		475	15	5	1.66E-05
	11:46:15	75	465	15	10	3.37E-05
	11:46:30	90	460	15	5	1.71E-05
	11:46:45	105	455		5	1.73E-05
	11:47:00		445			3.51E-05
	11:47:30	150	435			1.79E-05
	11:48:00	180	420	30		2.76E-05
	11:48:30	210	410	30	10	1.89E-05
	11:49:00	240	395			2.92E-05
	11:49:30	270	385			2.01E-05
	11:50:00	300	375			2.06E-05
	11:50:30	330	365		10	2.11E-05
	11:51:00	360	350	30	15	3.27E-05
	11:51:30	390	340	30	10	2.25E-05
	11:52:10	420	330	40	10	2.31E-05

Time	for	25mm	drop	
			P	

Permeability (m/s)	2.3E-05
mm/hr	83.5

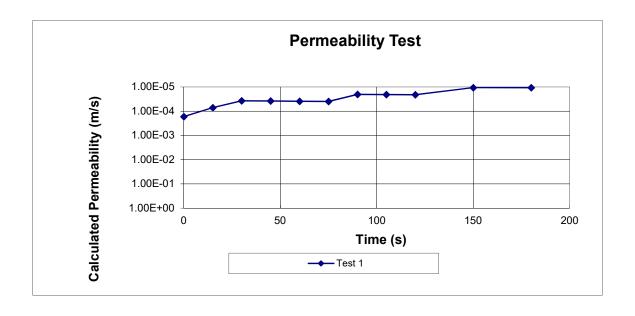


Project	Tweed Valley Hospital			
Project Number	Test 3		Date	24/10/2018
Test Location	BH22		Tester	CL
Depth of Hole		500 mm		
Diameter of Hole	·	100 mm		
Length of Test Section	<u></u>	400 mm		

Date	Time	Time since start	Depth of water from	Δt	∆d	Permeability
		of test (t) (s)	Reference level (d) (mm)			(P) (m/s)
24/10/18	11:45:00	0	500	0	0	, , , ,
	11:45:15	15	450	15	50	1.67E-04
	11:45:30	30	430	15	20	7.17E-05
	11:45:45	45	420	15	10	3.70E-05
	11:46:00	60	410	15	10	3.79E-05
	11:46:15	75	400	15	10	3.88E-05
	11:46:30	90	390	15	10	3.97E-05
	11:46:45	105	385	15	5	2.02E-05
	11:47:00	120	380	15	5	2.05E-05
	11:47:30	150	370	30	10	2.08E-05
	11:48:00	180	365	30		1.06E-05
	11:48:30	210	360			1.08E-05
	11:49:00	240	350	30	10	2.19E-05
	11:49:30	270	335		15	3.40E-05
	11:50:00	300	320		15	3.55E-05
	11:50:30	330	310	30	10	2.45E-05
	11:51:00	360	300	30	10	2.53E-05
	11:51:30	390	290	30	10	2.60E-05
	11:52:10	420	270	40	20	5.47E-05

 Permeability (m/s)
 4.1E-05

 mm/hr
 149.0

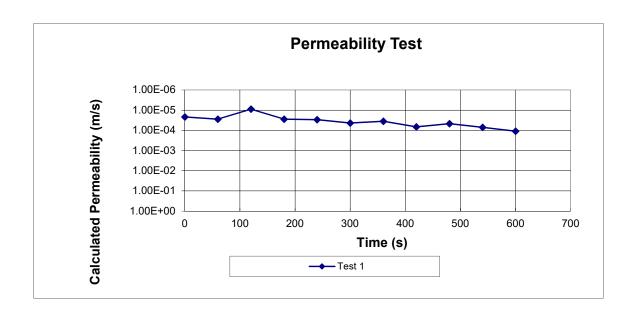


Project	Tweed Valley Hospital			
Project Number	Test 1		Date	3/08/2018
Test Location	BH23		Tester	BE
Depth of Hole		500 mm		
Diameter of Hole	<u></u>	100 mm		
Langth of Tast Saction	\n	400 mm		

Date	Time	Time since start	Depth of water from	Δt	Δd	Permeability
_ 3.0		of test (t) (s)	Reference level (d) (mm)	-		(P) (m/s)
3/8/18	11:45:00	0	510	0	0	(1) (111/0)
3,3,10	11:46:00	60	483		27	2.16E-05
	11:47:00	120	450	60	33	
	11:48:00	180	440	60	10	
	11:49:00	240	410		30	2.78E-05
	11:50:00	300			30	2.98E-05
	11:51:00	360	340	60	40	4.33E-05
	11:52:00	420	310	60	30	3.57E-05
	11:53:00	480	260	60	50	6.74E-05
	11:54:00	540	230	60	30	4.63E-05
	11:55:00	600	190	60	40	7.11E-05
	11:56:00	660	140	60	50	1.10E-04
	11:57:00	720	80	60	60	1.88E-04

Time	for	25mm	drop	

Permeability (m/s)	5.7E-05
mm/hr	203.5



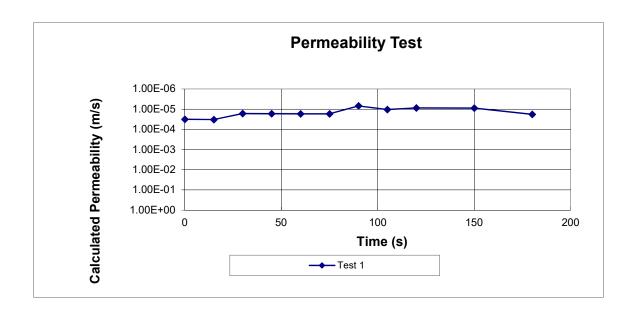
Project	Tweed Valley Hospital			
Project Number	Test 2		Date	24/10/2018
Test Location	BH23		Tester	CL
Depth of Hole		500 mm		
Diameter of Hole		100 mm		
Length of Test Section	on	400 mm		

Date	Time	Time since start	Depth of water from	Δt	∆d	Permeability
		of test (t) (s)	Reference level (d) (mm)			(P) (m/s)
24/10/18	11:45:00	0	500	0	0	, , ,
	11:45:15	15	490	15	10	3.21E-05
	11:45:30	30	480	15	10	3.27E-05
	11:45:45	45	475	15	5	1.66E-05
	11:46:00	60	470	15	5	1.68E-05
	11:46:15	75	465	15	5	1.69E-0
	11:46:30	90	460	15	5	1.71E-0
	11:46:45	105	458	15	2	6.89E-06
	11:47:00	120	455	15	3	1.04E-0
	11:47:30	150	450	30	5	8.73E-06
	11:48:00	180	445	30	5	8.82E-06
	11:48:30	210	435	30	10	1.79E-0
	11:49:00	240	425	30	10	1.83E-0
	11:49:30	270	420	30	5	9.31E-0
	11:50:00	300	410	30	10	1.89E-0
	11:50:30	330	405	30	5	9.63E-0
	11:51:00	360	395	30	10	1.96E-0
	11:51:30	390	390	30	5	9.98E-0
	11:52:10	420	380	40	10	2.03E-0

	drop	25mm	for	Time
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 Permeability (m/s)
 1.7E-05

 mm/hr
 60.9

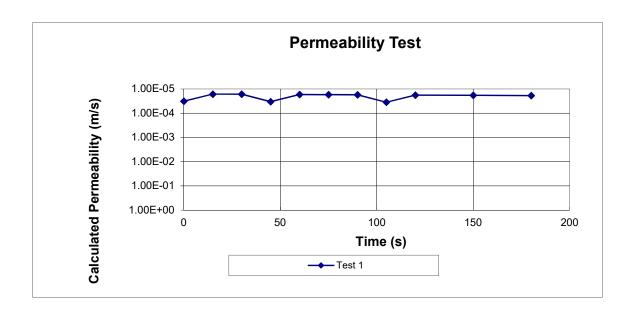


Project	Tweed Valley Hospital			
Project Number	Test 3		Date	24/10/2018
Test Location	BH23		Tester	CL
Depth of Hole		500 mm		
Diameter of Hole		100 mm		
Length of Test Section	n	400 mm		

Date	Time	Time since start	Depth of water from	Δt	∆d	Permeability
		of test (t) (s)	Reference level (d) (mm)			(P) (m/s)
24/10/18	0:45:00	0	500	0	0	, , ,
	0:45:15	15	490	15	10	3.21E-05
	0:45:30	30	485	15	5	1.63E-05
	0:45:45	45	480	15	5	1.64E-05
	0:46:00	60	470	15	10	3.33E-05
	0:46:15	75	465	15	5	1.69E-05
	0:46:30	90	460	15	5	1.71E-05
	0:46:45	105	455	15	5	1.73E-05
	0:47:00	120	445	15	10	3.51E-05
	0:47:30	150	435	30	10	1.79E-05
	0:48:00	180	425	30	10	1.83E-05
	0:48:30	210	415	30	10	1.87E-05
	0:49:00	240	405	30	10	1.92E-05
	0:49:30	270	395	30	10	1.96E-05
	0:50:00	300	385		10	2.01E-05
	0:50:30	330	375	30	10	2.06E-05
	0:51:00	360	360	30	15	3.19E-05
	0:51:30	390	350	30	10	2.19E-05
	0:52:10	420	340	40	10	2.25E-05

Time for 25mm drop	
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Permeability (m/s)	2.2E-05
mm/hr	77.6



APPENDIX 'D'

CROSS SECTIONS OF BOREHOLES – SECTIONS A, B, C AND D)







