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SOIL SURVEYS

Easting: 503356

Soil Surveys Engineering Pty. Limited Specialist in Applied Geotechnics

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Northing: 6960810 RL: -12.12 m

BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 26/11/2011

Logger: D	A/DT Operator:	SO Machine:	Scout 2 Date	: 26/11/2011					Page: 1 OF 5	
Duilling Method RR NMLC Casing	Depth	Graphic	Description	Weathering		Defect Spacing	Rec (%)	RQD	Samples and Remarks	
	<u>1.0</u> <u>2.0</u> <u>3.0</u> <u>5.0</u> <u>5.0</u> <u>6.0</u> <u>7.0</u> <u>8.0</u> <u>8.0</u>	Silty CLAY (Cl grey.			Teshyw wie is visites Wei is vis visites		ample U55		Approved:	
d	t Noted Water Ste	ady Level	S - Shear zone T - Contact V - Vein Z - Decomposed Zone DI - Drilling Induced break	W - Weathered rock X - Carbonaceous Z - Clean	MS - Medium stron S - Strong VS - Very strong ES - Extremely strong	Dis	sturbe Sampl		Approved: Date:	

7.

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SOIL SURVEYS

Easting: 503356Northing: 6960810RL: -12.12 mLogger: DA/DTOperator: SOMachine:Scout 2

BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 26/11/2011

Page: 2 OF 5

Drillir	Ť	-	Depth	ı	Graphic		Description		Weathering		ength		efect		RQD	Samples and Remarks
TC	RR	Cas		10.50	J.	Clayey SAND (grained, brown	SC) Loose, fine to r , high plasticity fine:	nedium s. <i>(continued)</i>		RSVW(M	/ MS S VS E	ES 20	60 200 600	Re	œ	
	✓ × × TUFF, fine grained, ✓ × × > orange, cryptocrysta − 11.0 × × ✓ × × > fragmented.						ned, pale white gre crystalline, massivel	y stained pale – y bedded,	DW - SW							
							.47m (11.53-12.00)							64	21	11.27 m; J, 30° , P, R, O,
			<u>12</u> .0	12.00 12.35 12.50	$\langle \stackrel{\circ}{} \stackrel{\circ}{} \stackrel{\circ}{} \rangle$	TUFF, fine grai orange, cryptoc bedded, fragme	ned, pale white gree crystalline with gran ented.	y stained pale ules, massively /	DW - SW				 			12.00 m; J, 80° , P, V, O,
			 <u>13</u> .0 	12.75	\mathbf{x}	TUFF, fine grai orange, cryptoc	DRE LOSS 0.15m (12.35-12.50) IFF, fine grained, pale white grey stained pale ange, cryptocrystalline with granules, massively dded, closely spaced fractures.							29	29	12.67 m; J, 80° , S, R, O,
				13.50		(SC) Very dens	RE LOSS 0.75m (12.75-13.50) (Clayey SAND) Very dense, fine to medium grained, yellow wn and grey, high plasticity fines.) yey SAND (SC) Very dense, fine to medium									SPT
			<u>14</u> .0				brown and grey, hi									
			 <u>15</u> .0	15.12												
0.0 10.41 2102%					0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	grey, some dar	ATE, coarse graine ker grey clasts, grai led, closely spaced zed.	nular,	FR							15.42 m; DI, 21° , U, V, O,
					0000 0000 0000 0000 0000	CONGLOMERATE, coarse grained, pale white grey, granular, thickly bedded, moderately widely spaced fractures, gravel is medium sized with some fine gravel from 16.0m to 16.2m.								100	74	15.83 m; DI, 10° , P, R, O,
			 <u>1</u> 7.0		0 0 0 0 0 0 0 0											16.80 m; DI, 20° , P, V, O,
					0 0											17.58m, Is50 = 2.04 MPa
			<u>- 18</u> .0 - - -		0 0 0 0 0 0 0 0									100	100	18.14 m; Dl, 10° , U, V, O, –
			 <u>19</u> .0	18.80	0 0 0 0 0 0 0 0		ATE, coarse graine thickly bedded, clos	coarse grained, pale white								18.48 m; DI, 15° , U, V, O, 18.88 m; DI, 10° , U, V, O, 19m, Is50 = 1.61 MPa
Co 1) I rive gro					0 0		el is medium sized.							97	77	19.17 m; DI, 10° , S, V, O, 19.28 m; DI, 10° , U, V, O, L
Co	Drille	nents	m floating ba	arge - a	o o o o o o o o o o o o o o	measured from	Depth (m) Type Dip (deg) Planarity B - Bedding C - Curvilinear		X	- RS W - Ext DW - Dis	ering Gi Residual S remely wea stinctly wea	Soil athered athered	8¦	Sampl U	_	19.72 m; Dl, 35° , P, V, O, L
	outec	d on c	el. 2) Note: t) Complete v completion. t Noted			od used was NQ3 .70m. 4) Borehole vel	C - Clay seam D - Discontinuo F - Foliation P - Planar H - Schistosity S - Subplanar J - Joint Contact R - Fracture U - Undulating S - Shear zone T - Contact V - Vein Z - Decomposed Zone DI - Duiling Induced break	Is P - Polished F - Filled F - Iron Ox R - Rough N - Clean K - Calcite S - Smooth O - Open L - Limoni V - Venumum S - Stein O - Ougetz	te dary mineral htified mineral hered rock	Rocl VW MS - I	ightly weat R - Fresh K Streng - Very weat V - Weak Medium stro - Strong - Very stron vtremely stron	gth ak rong		SF isturb Samp	т] ed [Approved: Date:



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SOIL SURVEYS

Easting: 503356Northing: 6960810RL: -12.12 mLogger: DA/DTOperator: SOMachine:Scout 2

BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 26/11/2011

Page: 3 OF 5

	oggei		VDI Operato		Machine: Scout 2	Dale. 20/1						Faye. 5 OF 5	
	lling Me		Depth	Graphic	Description		Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks	
ſ				0 0	CONGLOMERATE, coarse gra grey, granular, thickly bedded, fractures, gravel is medium siz	closely spaced	FR					20.15 m; DI, 15° , U, V, O, W 20.31 m; DI, 8° , U, V, O, L	
			 21.0 	· · · · · · · · · · · · · · · · · · ·	SANDSTONE, medium grained granular, mediumly bedded, clo fractures.	d, pale grey, osely spaced				97	77	20.83 m; J, 3°, P, R, O, Z 21.23m, Is50 = 1.2 MPa	
				· · · · · · · · · · · · · · · · · · ·	CONGLOMERATE, coarse gra	ined nale white				91		21.23m, Isb0 = 1.2 MPa 21.16 m; DI, 2° , P, R, O, Z 21.43 m; DI, 8° , P, R, O, Z 21.61 m; DI, 20° , P, R, O, Z	111
			_	0 0	grey, some darker grey clasts, massively bedded, closely spa- gravel is fine sized.	granular,						22.20 m; DI, 10° , P, R, O, Z	1111
				0 0	CONGLOMERATE, coarse gra granular, thickly bedded, mode spaced fractures, gravel is med	rately widely						22.35m, Is50 = 1.88 MPa	
			<u>- 2</u> 3.0 	0 0 0 0 0 0 0 0 0 0						100	92	23.15m, ls50 = 1.66 MPa 23.16 m; DI, 5° , U, V, O, Z 23.29m, ls50 = 1.68 MPa 23.38 m; DI, 10° , P, V, O, Z 23.53 m; J, 40° , P, V, O, Z	
Datgel			<u> </u>		SANDSTONE, medium grained some darker grey beds, granul moderately widely spaced fract sized gravel conglomerate ban 23.92m.	ar, laminated, tures, medium							
NEW.GPJ < <drawingfile>> 21/05/2012 14:31 8.30.002 Developed by Datgel</drawingfile>			24.54 	· · · · · · · · · · · · · · · · · · ·	SANDSTONE, coarse grained, granular, thickly bedded, widel with some fine gravel.	, pale grey, y spaced fractures,						24.31 m; DI, 10° , P, R, O, Z	
012 14:31 8.30.0				· · · · · · · · · · · · · · · · · · ·	CONGLOMERATE, coarse gra	iined, pale grey,				100	100	25.36 m; DI, 10°, S, R, O, Z	
gFile>> 21/05/20			<u>2</u> 6.0	0 0 0 0 0 0 0 0	granular, thickly bedded, with v fractures gravel is medium size from 26.8m to 26.85m.	videly spaced				100	100	26.28 m; DI, 5° , P, R, O, Z	
V.GPJ < <drawir< td=""><td></td><td></td><td> </td><td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>, ., <u>.</u>, ., ., ., ., ., ., ., .</td><td></td></drawir<>			 	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0								, ., <u>.</u> , ., ., ., ., ., ., ., .	
111-12936 NEW			_	00000000000000000000000000000000000000									
BOREHOLE LOG			<u>28</u> .0 28.14	0 0	SANDSTONE, medium graine	d, pale grev with						28.13m, Is50 = 1.91 MPa	
SURVEY			 		some darker grey beds, granul moderately widely spaced fract sized gravel conglomerate ban 23.92m, calcite vein at 28.3m,	ar, laminated, tures, medium d from 23.75m to coal stringers at				86	100	28.52 m; J, 10° , P, S, O, C 28.85 m; J, 35° , P, R, O, X	11111
05.GLB Log SOIL			_	· · · · · · • • • • • • • • • • • • • • • •	28.8m. Some medium sized gr CONGLOMERATE, coarse gra speckled dark grey, granular, t closely to widely spaced fractu	avel. avel, pale grey, hickly bedded,						28.85 m; J, 35° , P, R, O, X 29.32 m; DI, 5° , U, S, O, Z 29.55m, Is50 = 1.16 MPa	
00 LIBRARY 2012-05.GLB Log	Comm		 			1.54m : F,60°,P,R,O,C	 v	Veathering Gra	ades Si	100 ample			
s∐ r) Drille ver be ot NMI	ed fror ed leve LC.3)	n floating barge - a el. 2) Note: the cori Complete water lo ompletion.	ll depths ng meth ss at 16	measured from bused was NQ3 70m. 4) Borehole , - Canage , - Canag	ity Roughness Aperature Infili nilinear L-Slickensides C-Closed C-Clay continuous P-Polished F-Filled F-Iron Ox nar R-Rough N-Clean K-Calolite Nedrager S-Smorth D-Open L-Limoni	ide	RS - Residual So (W - Extremely weath DW - Distinctly weath SW - Slightly weath FR - Fresh Rock Streng WW - Very weak W - Weak	bil hered hered ered th	U5 SP	0	Approved	
	Z-Wate	er First	Noted Water S	teady Le	S - Shear zone T - Contact	V - Uniden W - Weatt X - Carbor Z - Clean	hered rock	MS - Medium stro S - Strong VS - Very strong FS - Extremely stro		sturbe Sampl		Approved: Date:	



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Easting: 503356

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Northing: 6960810 RL: -12.12 m

BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 26/11/2011

Logger	: DA/DT O	perator: SC	Machine: Scout 2 Date: 26/	11/2011					Page: 4 OF 5	5
		ų Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks	
	 <u>3</u> 1.0	30.05 6 6 6 0 0 0 0 0 0 0 0 0 0 0 0 30.82 0 0 0 0 0 0 0 0 0 0 0 0 0 0	speckled dark grey, granular, thickly bedded, closely spaced fractures, gravel is coarse sized.	FR					30.05 m; J, 10° , P, R, O, Z 30.19 m; DI, 22° , U, V, O, Z 30.62 m; DI, 35° , P, S, O, Z 31m, Is50 = 1.54 MPa	
	 <u>32</u> .0		o widely spaced fractures, gravel is coarse sized.				100	98	31.18 m; J, 20° , U, S, O, Z 31.27 m; Dl, 20° , U, S, O, Z	
	 <u>33</u> .0		0 0 0 0 0 0 0 0 0 0 0 0						32.20 m; DI, 30° , P, S, O, Z 32.53 m; DI, 50° , S, S, O, Z 32.88m, Is50 = 2.37 MPa	
reloped by Datgel	<u>34.0</u>	33.83 33.92 34.00 34.20	QUARTZITE, fine grained, pale grey, cryptocrystalline, laminated, closely spaced fractures. SANDSTONE, medium grained, pale grey with some darker grey beds, granular, laminated, moderately widely spaced fractures.				98	93	33.45 m; DI, 30° , P, S, O, Z 33.81 m; J, 20° , P, R, O, Z 33.93 m; J, 50° , P, R, O, Z 34.09 m; J, 20° , P, R, O, Z 34.23 m; J, 30° , P, R, O, Z 34.36m, iSO = 2.24 MPa 34.36 m; J, 10° , P, S, O, Z	
< <drawingfile>> 21/05/2012 14:31 8:30.002 Developed by Datge</drawingfile>	<u>35</u> .0	35.73	SANDSTONE, fine grained, pale grey alternating dark grey, granular, thinly laminated, closely spaced fractures, trace of Siltstone laminae. SANDSTONE, medium grained, pale grey speckled dark grey banded black in places, wide spaced fractures, granular, laminated, with trace							
149.V	<u>36.0</u> 	36.38 	CONGLOMERATE, medium gravel, pale grey speckled dark grey, granular, medium bedded, moderately widely spaced fractures, thin mudstone bands at 36.1m and 36.27m. Interlaminated SANDSTONE and SILTSTONE, fine grained, dark grey with pale grey banding,						36.14m, Is50 = 5.2 MPa 36.23m, Is50 = 1.76 MPa 36.28 m; J, 25° , P, R, O, Z	
DLE_LOG 111-12936 NEW	 <u>38</u> .0	37.95	granular, thinly laminated closely spaced fractures. Trace of mudstone and organics.				97	87	37.47m, Is50 = 0.77 MPa	
SURVEYS ON DIRVARY 2012-05 GLB LOG SOIL, SURVEY BOREHOLE LOG 111-12836 NEW Dirverson Dirverson Commence Dirverson Commence and Commence Burgerson	 <u>3</u> 9.0		Interlaminated SANDSTONE and SILTSTONE, fine grained, dark grey with pale grey banding, granular, moderately widely spaced fractures. Trace of mudstone and organics.							
KAKY 2012-09.GLB L00							100	98	39.29m, Is50 = 3 MPa 39.90 m: J. 80°, P. R. O. Z	
Comme 1) Drillec river bec not NML grouted		arge - all dep the coring me water loss at	(6.70m. 4) Borehole H - estationally J - Jarit L - Ceavage R - Practure - Steppart U - Undustry - Steppart - Steppart	:	Veathering Gra RS - Residual Sc XW - Extremely weat DW - Distinctly weath FR - Fresh Rock Streng W - Very weak W - Very weak MS - Medium stro S- Streng	bil hered hered ered th	U5 U5 SP	о	Approved:	
Water	r First Noted	- Water Steady	V - Vein X - U	ean	S - Strong VS - Very strong FS - Extremely stro		Sampl		Date:	



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Northing: 6960810 RL: -12.12 m

BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 26/11/2011

Logger: DA/	DT Operator: S	SO Machine:	Scout 2	Date: 26/1						Page: 5 OF 5
Dulling Method MB NMLC Casing Casing	Depth	Glaphic	Description		Weathering	Strength Estimated	Defect Spacing 20 60 200 600	Rec (%)	RQD	Samples and Remarks
	—	Interlaminated fine grained, da granular, mode	SANDSTONE and SI ark grey with pale grey erately widely spaced to tone and organics. (cc	/ banding, fractures.	FR			100	98	40.76 m : 1 10° P. P. O. 7
	40.86 41.0 41.0 42.0 42.0 43.0 43.0 44.0 44.0 45.0 45.0 45.0 45.0 45.0 46.0 45.0 46.0 49.0 49.0 50.0 1	BOREHOLE E	3H 302 TERMINATED	AT 40.86 m				mple	99	40 76 m; J, 10°, P, R, O, Z
(¹	floating barge - all de 2) Note: the coring n complete water loss a npletion. loted - — Water Stead		Depti (m) Type Dig (deg) Painumy	vighness Aperature Infill Slickensides C - Closed C - Clay Polished F - Filled F - Iron Ov Rough N - Clean K - Calcite Smooth O - Open L - Limoni - Very rough S - Stain Q - Quart S - Stain L - Univer	xide E a lite Jary mineral hered rock naceous	RS - Residual Si W - Extremely weat W - Distinctly weat SW - Slightly weath FR - Fresh Rock Streng W - Very weak MS - Medium strc S - Strong VS - Very stron, FS - Extremely str	th f ⁽	U5 SP turbe Sampl	т]	Approved: Date:





IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: PROJECT No.:	CRR 110-12936	BH No.: Test No.: Date:	302 1 29/11/2011		Packer type: Packer pressure: Gauge pressures Tested by:		Single 2000kPa kPa CS	
Vertical depth to:	Top of test section	(m):	18.50]	Depth of centre of	of test section (m):	20.50	
(below river bed)	Base of test section	n (m):	22.50		Length of test se	ction (m):	4.00	
	Centre of test sect	ion(m):	20.50			. ,		1
	Base of casing (m)):	17.50		Gauge Height ab	ove ground level	(m):	1
	Ground water (m)		TIDAL		Hole Diameter in	-		
				•				1
	1st period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	185.0	185.9	186.1	186.2	Flow (l/min)	
	100	Water Take	0.00	0.90	0.20	0.10	0.080	
	2nd period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	188.5	188.8	189.5	189.8	Flow (I/min)	
	200	Water Take	0.00	0.30	0.70	0.30	0.087	
	3rd period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	190.2	190.8	192.0	192.3	Flow (I/min)	
	300	Water Take	0.00	0.60	1.20	0.30	0.140	
	4th period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	192.3	192.5	192.5	192.4	Flow (I/min)	
	200	Water Take	0.00	0.20	0.00	-0.10	0.007	
	5th period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	192.2	192.2	192.2	192.2	Flow (l/min)	
	100	Water Take	0.00	0.00	0.00	0.00	0.000	
								-
Period	Flow (q)	Gauge Press	Gauge Press	Friction Los		Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
1st	0.080	100.00	10.220	0.000	0.000	30.720	0.067	8.05E-09
2nd	0.087	200.00	20.440	0.000	0.000	40.940	0.054	6.55E-09
3rd	0.140	300.00	30.660	0.000	0.000	51.160	0.070	8.46E-09

5th 0.000 100.00 *Where friction loss is assumed to be negligible.

4th

N.B. Pressure Conversion: 1 bar = 100 kPa = 14.503 psi

0.007

200.00

20.440

10.220

0.000

0.000

0.000

0.000

5.04E-10

0.00E+00

40.940

30.720

0.004

0.000

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: PROJECT No.:	CRR 110-12936	BH No.: Test No.: Date:	302 2 29/11/2011		Packer type: Packer pressure: Gauge pressures Tested by:		Single 2000kPa kPa CS	
Vertical depth to:	Top of test section	(m):	27.00]	Depth of centre c	of test section (m):	28.00]
(below river bed)	Base of test section	n (m):	29.00		Length of test se	. ,	2.00	
	Centre of test sect	ion(m):	28.00					•
	Base of casing (m)	:	26.00		Gauge Height ab	ove ground level	(m):	
	Ground water (m)		TIDAL		Hole Diameter in	test section (mm)	75	
				-				
	1st period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	195.6	195.6	195.6	195.6	Flow (l/min)	
	100	Water Take	0.00	0.00	0.00	0.00	0.000	
	2nd period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	198.0	198.2	198.5	198.6	Flow (l/min)	
	200	Water Take	0.00	0.20	0.30	0.10	0.040	
	3rd period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	199.5	199.6	199.8	199.9	Flow (l/min)	
	300	Water Take	0.00	0.10	0.20	0.10	0.027	
	4th period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	198.5	198.5	198.5	198.5	Flow (l/min)	
	200	Water Take	0.00	0.00	0.00	0.00	0.000	
	5th period	Time (mins)	0	5	10	15	Average	
	Gauge Pressure	Flow reading	196.5	196.5	196.5	196.5	Flow (l/min)	
	100	Water Take	0.00	0.00	0.00	0.00	0.000	
	-							
Period	Flow (q)	Gauge Press	Gauge Press	Friction Los		Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
1st	0.000	100.00	10.220	0.000	0.000	38.220	0.000	0.00E+00
2nd	0.040	200.00	20.440	0.000	0.000	48.440	0.042	4.35E-09
3rd	0.027	300.00	30.660	0.000	0.000	58.660	0.023	2.39E-09

5th 0.000 100.00 *Where friction loss is assumed to be negligible.

4th

N.B. Pressure Conversion: 1 bar = 100 kPa = 14.503 psi

0.000

200.00

20.440

10.220

0.000

0.000

0.000

0.000

48.440

38.220

0.000

0.000

0.00E+00

0.00E+00