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SOIL SURVEYS

Easting: 503232

Northing: 6960801 RL: -7.71 m

BOREHOLE RECORD SHEET

Location Number: BH 307

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

Orilling Metho		Graphic	Description	Weathering	Louinatoa	Defect Spacing	Rec (%)	RQD	Samples and Remarks
	5 - - - - - - - - - - - - - - - - - - -)	SAND (SP) Loose, fine to coarse grained, grey and brown.		REMINION NES S. IVS ES				- - - -
	- 3.0 - 3.5	0	SAND (SP) Medium dense, fine to coarse						-
	- 4.0 		grained, grey and brown.						_
	<u>- 5.</u> 0 5.0		Clayey SAND (SC) Loose, fine to medium grained, dark grey, high plasticity fines, some organics.						- - -
		0	SAND (SC) Dense, fine to coarse grained, grey and brown.						- - -
	8.0 - - - - - - - - - - - - - - - - - - -	5	Sandy GRAVEL (GP) Medium dense, fine to medium size, grey and brown, fine to coarse grained sand.						-
Commer		00000	Gravelly SAND (SP) Medium dense, fine to coarse grained, grey and brown, fine to medium size gravel. Defects - 1.54m: F,60°,P,R,O,C		/		ample	s	-
	nts: from floating barge - evel. 2) Note: the co . 3) Borehole groute	all depths ring meth d on com	remeasured from od used was NQ3 pletion. Depin (m) Type Dip (dep) Planarily Roughries Aparialue Irill Pletion. Roughries Aparialue Irill Roughries Aparialue Irill Pletion. F. Folkinskin P. Folkinskin P. Folkinskin R. Roughries Aparialue Irill Roughr	X E E E E E E E E E E E E E E E E E E E	Veathering Gra RS - Residual Sc W - Extremely weath DW - Distinctly weath SW - Slightly weath FR - Fresh Rock Streng VW - Very weak W - Weak MS - Medium stro	ered th	U5 SP	о [т]	Approved:

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SOIL SURVEYS

Easting: 503232

Northing: 6960801

RL: -7.71 m

BOREHOLE RECORD SHEET

Location Number: BH 307

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

16.50	Logger: D/	A/DT Operato		Machine: Scout 2 Date: 15/12						Page: 2 OF 5
Clavelly, SAND (SP) Medium dense, fine to medium size gravel. (continued) 11.0 11.5 Sandy GRAVEL (GP) Medium dense, fine to coarse grained said. 12.0 Sandy GRAVEL (GP) Medium dense, fine to coarse grained said. 13.0 13.0 15.5 Sandy GRAVEL (GP) Medium dense, fine to coarse grained said. 15.0 15.5 TUFF (SW) fracturated, with cobbles. 16.0 XX TUFF (SW) fracturated, with cobbles. 16.50 XX TUFF, fine grained, pale grey and stained orange brown, fine to coarse size sub-rounded to rounded, yety close fractures. 17.0 XX SANDSTONE, fine grained, fair grey, grained, grai		Depth	Graphic	Description	Weathering	Estimated	Spacing	Rec (%)	RQD	
13.0 15.0 15.5 15.5 15.0 15.5 16.0 16.50 17.8 16.50 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0 17.8 18.0				coarse grained, grey and brown, fine to medium						
16.50	30.002 Developed by Dalgel		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	coarse size, grey and brown, fine to coarse						- - - - -
17.53 X X X X X X X X X	< <drawngfile>></drawngfile>		× × × × × × × × × × × × × × × × × × ×	TUFF, fine grained, pale grey and stained orange						_ _ _
sub-rounded to rounded, grey stained orange. 17.88 2.00 sub-rounded to rounded, grey stained orange. (0.16m of core loss) SANDSTONE, fine grained, light grey, granular, laminated, very closely to closely spaced fracturing. trace of1mm sized coal beds. MUDSTONE, fine grained, dark grey, cryptocrystalline, thinly laminated, closely spaced fractures MUDSTONE, fine grained, dark grey, cryptocrystalline, thinly laminated, closely spaced fractures Defects - 1.54m : F,80°,P,R,O,C representation of the comment of	>		× × ×							_
Tomments: 19.00 Interest Int	SOKEHOLE LOG 111-	17.53 17.88 18.0 	× 00004	sub-rounded to rounded, grey stained orange. (0.16m of core loss) SANDSTONE, fine grained, light grey, granular,	SW			82	11	_
Defects - 1.54m : F,60°,P,R,O,C Townsents: 19.56m, is50 = 0.84 MPa 19.59m, is50 = 0.82 MPa 19.56m, is50 = 0.82 MPa 19.59m, is50 = 0.82 MPa 19	SOL			MUDSTONE, fine grained, dark grey, cryptocrystalline, thinly laminated, closely spaced				100	39	18.55m, Is50 = 0.42 MPa ——
1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 of the control of the coring method used was NQ3 of the corin	BKAKY ZU1Z-05.GLE	20.0		Defects 4 Edm : E 60° D D O C		Veathering Gr.	ades Si	mole	es	19.59m, Is50 = 0.82 MPa
L. Cheenage U - Undulating S. Secondary mineral W - Weak		m floating barge - al rel. 2) Note: the corir 3) Borehole grouted		s measured from od used was NQ3 pletion. Depth (m) Type Dip (dep) Planarily Roughries Aparitate Intill Roughries Aparitate Aparitate Intill Roughries Aparitate Aparitate Intill Roughries Aparitate Aparitate Intill Roughries Aparitate Aparitate Aparitate Aparitate Intill Roughries Aparitate Apa	idde e te tary mineral httlied mineral hered rock	RS - Residual So (W - Extremely weat DW - Distinctly weat SW - Slightly weath FR - Fresh Rock Streng VW - Very weak W - Weak MS - Medium stro	hered hered hered hered the	U5 SP	50 1 T 1	Approved:

RL: -7.71 m

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SOIL SURVEYS

Easting: 503232 Northing: 6960801

Logger: DA/DT Operator: DA Machine: Scout 2

BOREHOLE RECORD SHEET

Page: 3 OF 5

Location Number: BH 307

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

Date: 15/12/2011

Logger: D	A/D1 Operator: DA	Machine:	Scout 2	Date: 15/12	2/2011					Page: 3 OF 5
Drilling Method	Depth dar Oild Oild		Description		Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
		laminated, ver	fine grained, light gre y closely to closely spa e of 1mm sized coal b	aced	FR			100	39	O, Z 18.35-21.40 m; BDI, 10°, P, S, O, Z 18.35-21.40 m; BDI, 10°, P, S, O, Z 18.35-21.40 m; BDI, 10°, P, S, O, Z
		grey and spect bedded, widely	ATE, coarse grained, kled dark grey, granula y spaced fractures. Cla	ar, thickly asts are						21.3m, ls50 = 0.66 MPa 18.35-21.40 m; BDI, 10° , P, S,
		sandstone. Cla Siltstone from	sized sub-rounded gravel of siltstone and one. Clast supported. With a thin band of e from 22.70m to 22.70m.							O, Z 21.63 m; J, 60° , S, R, O, Z 21.94m, ls50 = 0.88 MPa
	23.0 23.01 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CONGLOMER grey and spect bedded. Clasts of siltstone and	RATE, coarse grained, kled dark grey, granula s are fine sized sub-ro d sandstone. Clast sup	ar, thinly unded gravel				100	82	22.69 m; B, 7°, P. S, O, Z 22.76 m; D, 1°, P. S, O, Z 22.80 m; T, 6°, P. S, O, Z 23.01 m; J, 15°, P. R, O, W 23.10 m; T, 16°, P. S, O, Z 23.20 m; Dl, 19°, S, R, O, Z
atgel	23.85 · · · · · · · · · · · · · · · · · · ·	CONGLOMER pale grey, grar to closely space to 23.51m.	ANDSTONE and RATE, medium to coars nular, medium bedded red fractures. Siltstone	, very closely from 23.48m						23.56 m; B, 8°, P, S, O, Z 23.57 m; V, 8°, U, R, O, X 23.58 m; B, 8°, P, S, O, Z 23.63 m; J, 25°, P, S, O, Z 23.67 m; T, 0°, P, R, O, Z 23.73 m; DI, 4°, S, R, O, Z 23.92 m, Is50 = 1.47 MPa 23.83 m; DI, 4°, S, R, O, Z
32 Developed by D	24.74 - 25.0	grey speckled widely spaced medium sized	AATE, coarse grained, dark grey, granular, th fractures. Clasts are f sub-rounded gravel of ast supported.	inly bedded, ine to						24.00 m; Dl. 4°, S. R. O. Z 24.15 m; Dl. 4°, S. R. O. Z 24.27 m; Dl. 4°, S. R. O. Z 24.30 m; J. 55°, D. S. O. Z 24.35 m; Dl. 4°, S. R. O. Z 24.42 m; Dl. 4°, S. R. O. Z
2012 14:31 8.30.0		grey and spect bedded, widely	ATE, coarse grained, kled dark grey, granula y spaced fractures. Cla ed sub-rounded gravel ast supported.	ar, thinly asts are fine						25.12m, Is50 = 0.96 MPa 24.67-25.74 m; DI, 5° , S, R, O, Z
< <drawingfile>> 21/05/2012 14:31 8:30 002 Developed by Datge</drawingfile>	26.26 26.51	CONGLOMER grey and spect bedded, widely medium sized	DMERATE, coarse grained, pale white speckled dark grey, granular, medium widely spaced fractures. Clasts are sized sub-rounded gravel of siltstone and le. Clast supported.					98	76	25.84m, Is50 = 0.8 MPa 26.00 m; T, 1°, S, R, O, Z 26.18 m; T, 25°, P, R, O, Z 26.21 m; Dl, 12°, P, S, O, Z 26.36m, Is50 = 0.59 MPa
NEW.GPJ	000	thinly laminate SANDSTONE, banded dark q	ine grained, pale grey d. , medium grained, pale rey, thinly bedded, clo	e grey						26.64 m; Dl, 3°, P, S, O, Z 26.81 m; Dl, 2°, S, R, O, Z 27.13 m; J, 30°, S, R, O, Z 27.24 m; J, 60°, P, S, O, Z
SURVEY BOREHOLE LOG 111-12836	- 000 - 000 - 000 - 000 - 28.0	CONGLOMER grey and speci bedded, closel	RATE, coarse grained, kled dark grey, granula y to moderately widely ts are medium sized s	ar, medium / spaced						27.24 m, Job 7, S, O, Z — 27.35m, Is50 = 0.52 MPa 27.27 m; Dl, 2°, S, R, O, Z — 27.72-27.91 m; Dl, 3°, S, R, O, Z
/EY_BOREHI		gravel of siltsto	one and sandstone. Cl	last						28.26 m; DI, 21° , U, R, O, Z
SOL		o o o o						100	91	28.55 m; DI, 20° , S, R, O, Z 28.68m, Is50 = 1.38 MPa — 28.99 m; DI, 2° , P, R, O, Z
Comment 1) Drilled fro										
₩	<u> </u>	9	Defects - 1.54m :	: F,60°,P,R,O,C	 v	Veathering Gra	I	ample	s	29.96m, Is50 = 0.75 MPa
1) Drilled from river bed level not NMLC.	om floating barge - all depth vel. 2) Note: the coring met 3) Borehole grouted on cor	ns measured from hod used was NQ3 npletion.	Depth (m) Type Dip (deg) Planarity R B. Bedding C- Carvillnear L- F. Foliation P. Planar R H. Schistosity S. Subplanar R J. Joint T. Stepped V. L. Cleavage U. Hoddleing	uughness Aperature Infill Sickensides C - Closed C - Clay - Polished F - Filled F - Iron Oxion - Smooth O - Open L - Limonii - Veryrough S - Stain U - Q - Quartz S - Second II - I Inirien	ide e ary mineral tified mineral	RS - Residual Sc (W - Extremely weat DW - Distinctly weath SW - Slightly weath FR - Fresh Rock Streng VW - Very weak W - Weak	hered hered ered th	U5	-	Approved:
_1	st Noted Water Steady L	evel	S. Shear zone T - Contact V - Vein Z - Decomposed Zone D1 - Drilling Induced break	W - Weath X - Carbon Z - Clean	nered rock saceous	MS - Medium stro S - Strong VS - Very strong FS - Extremely stro	Dis	sturbe Sampl		Approved: Date:

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SOIL SURVEYS

Easting: 503232

Northing: 6960801 RL: -7.71 m Machine: Scout 2

BOREHOLE RECORD SHEET Location Number: BH 307

Project Number: 110-12936

Project Name: Cross River Rail Location: Brisbane

Client: AECOM

	.ogge	r: D/	A/DT (Operator	: DA	Machine: Scout 2 Date: 15/	2/201					Page: 4 OF 5
	Drilling Method Depth Depth Output Depth Depth					Description	Weatherin	Strength 9 Estimated RSI/W W MS S VS ES	Defect Spacing	Rec (%)	RQD	Samples and Remarks
			= 31.0 = 32.0	l l		Interlaminated SANDSTONE and SILTSTONE, fine grained, alternating dark grey and pale grey, granular, thinly laminated, closely spaced fractures Interlaminated MUDSTONE and SILTSTONE, fine grained, dark grey, thinly laminated, closely to widely spaced fractures.	FR				100	30.22 m; B, 4°, P, S, O, Z 30.63 m; B, 10°, P, S, O, Z 30.78 m; B, 10°, P, S, O, Z 31.00 m; J, 70°, S, R, O, Z 31.34 m; B, 10°, P, S, O, Z 31.46 m; Dl, 2°, P, S, O, Z 31.56 m; J, 70°, D, S, O, Z
ZTNOS/ZUTZ 14:31 8.30.00Z Developed by Datgel			- 33.0 - 34.0 - 35.0								100	33.80 m; J, 60° , P, R, O, Z 33.85 m; Dl, 80° , D, R, O, Z
			37.0 -38.0							100	97	31.79-40.56 m; BDI, 5° , P, S, O, Z
	Comm) Drille iver be lot NMI			parge - all the corin grouted o	depth:	Defects - 1.54m : F,60°,P,R,O,C Deith (m) Type Dip (6g) Paracity Regylment Aparakas Inter- nod used was NQ3 pletion. Deith (m) Type Dip (6g) Paracity Regylment Aparakas Inter- Professor Professo	V Odde de de d	Weathering Gra RS - Resitiat So WW- Esternely weath SW - Sightly weath SW - Sightly weath Rock Strengt W - Weath	ered ered red	100 U5 SP	0	39.25m, ls50 = 1.26 MPa ———————————————————————————————————
ď	<u>Z</u> _Wate	er Firs	t Noted	– Water St	eady Le	R - Fracture	ondary mineral dentified mineral sathered rock bonaceous an	W - Weak MS - Medium stror S - Strong VS - Very strong ES - Extremely stro	Di	sturbe Sampl	d F	Approved: Date:

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SOIL SURVEYS

Northing: 6960801 Easting: 503232

RL: -7.71 m

BOREHOLE RECORD SHEET

Location Number: BH 307

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

	ngger: D		Operato	_	Machine:	Scout 2	Date: 15/1						Page: 5 OF 5	5
	NAMEC Casing		pth	Graphic		Description		Weathering	Strength Estimated	Defect Spacing	lĕ	RQD	Samples and Remarks	
		- 41.0 			fine grained, da widely spaced Interbedded SA CONGLOMER alternating pale thinly bedded, CONGLOMER grey and spech bedded, closely fractures. Class gravel of siltsto supported.	ANDSTONE and ATE, fine to coate grey and white closely spaced f ATE, coarse gradeled dark grey, g y to moderately ts are medium sone and sandsto	aminated, closely to nued) Irse grained, grey, granular, ractures. iined, pale white ranular, thickly widely spaced ized sub-rounded ne. Clast	FR			100	72	40.01 m; J, 40°, P, S, O, Z 40.40 m; J, 37°, P, S, O, Z 40.56 m; DI, 10°, P, S, O, Z 40.66 m; T, 20°, P, S, O, Z 40.75 m; DI, 5°, P, R, O, Z 40.94 m; DI, 16°, U, R, O, Z 41.02 m; J, 50°, P, R, O, Z 41.12 m; DI, 11°, S, R, O, Z 41.83 m; DI, 10°, P, S, O, Z 41.90 m; J, 75°, C, S, O, Z 42.01 m; DI, 6°, S, R, O, Z 42.01 m; DI, 6°, S, R, O, Z	
	omment: Drilled fro		barge - al	depths	thinly bedded, Interbedded sil BOREHOLE E	closely spaced f tstone from 41.5 BH 307 TERMIN.	1.54m : F,60°,P,R,O,C	,	Veathering G RS - Residual S KW - Extremely was	oil thered thered	ample	_	42.12 m; Dl, 2° , P, S, O, Z	
φ riv	er bed lev t NMLC.	om floating vel. 2) Note 3) Borehol	varge - al e: the corir e grouted	ii deptns ng metho on comp	measured from od used was NQ3 pletion.	L - Cleavage U - Un	1 - Poissed F - Filed F - Front	Oxide ite inite rtz ndary mineral ientified mineral athered rock	SW - Slightly weath FR - Fresh Rock Streng VW - Very wea W - Weak MS - Medium stro	nered yth k	U5 SP sturbe	т 📘	Approved:	
g _ \	- Water Fire	st Noted ᆚ	Water S	teady Lev	/el	R - Fracture S - Shear zone T - Contact V - Vein Z - Decomposed Zone DI - Drilling Induced break	X - Carb Z - Clea		S - Strong VS - Very stron ES - Extremely str		Samp		Date:	







SOIL SURVEYS

TITLE

AECOM Brisbane Cross River Rail Core Photo - BH 307

DT	26/04/2012
CB	26/04/2012
Not To S	Scale A4
PROJECT No 110-12936	FIGURE No 2/2

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT:CRRBH No.:307Packer type:DoublePROJECT No.:110-12936Test No.:1Packer pressure:2000kPa

33.00

Date:12/12/2011Gauge pressures measured in:kPaTested by:CS

Vertical depth to: Top of test section (m):

(below river bed) Base of test section (m):

 Base of test section (m):
 35.50

 Centre of test section(m):
 34.25

 Base of casing (m):
 32.00

 Ground water (m)
 TIDAL

Depth of centre of test section (m): 34.25
Length of test section (m): 2.50

Gauge Height above ground level (m):
Hole Diameter in test section (mm) 75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	825.6	526.1	827.0	827.6	Flow (I/min)
100	Water Take	0.00	-299.50	300.90	0.60	0.133
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	829.0	829.4	829.8	830.2	Flow (I/min)
200	Water Take	0.00	0.40	0.40	0.40	0.080
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	831.6	832.4	832.9	833.4	Flow (I/min)
400	Water Take	0.00	0.80	0.50	0.50	0.120
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	835.0	835.8	836.2	837.0	Flow (I/min)
600	Water Take	0.00	0.80	0.40	0.80	0.133
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	840.0	840.0	840.0	840.0	Flow (I/min)
300	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q)	Gauge Press	Gauge Press	Friction Loss	s (m)*	Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
1st	0.133	100.00	10.220	0.000	0.000	44.470	0.123	1.33E-08
2nd	0.080	200.00	20.440	0.000	0.000	54.690	0.060	6.51E-09
3rd	0.120	400.00	40.880	0.000	0.000	75.130	0.065	7.11E-09
4th	0.133	600.00	61.320	0.000	0.000	95.570	0.057	6.21E-09
5th	0.000	300.00	30.660	0.000	0.000	64.910	0.000	0.00E+00

^{*}Where friction loss is assumed to be negligible.

Note - flows in period 4 adjusted for leakage through pressure head

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

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT:CRRBH No.:307Packer type:DoublePROJECT No.:110-12936Test No.:2Packer pressure:2250kPa

23.00

Date: 17/12/2011 Gauge pressures measured in: kPa
Tested by: CT

Vertical depth to: Top of test section (m):

(below river bed) Base of test section (m):

Base of test section (m): 25.50

Centre of test section(m): 24.25

Base of casing (m): 22.00

Ground water (m) TIDAL

Depth of centre of test section (m): 24.25
Length of test section (m): 2.50

Gauge Height above ground level (m):
Hole Diameter in test section (mm) 75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	848.2	848.5	848.8	849.1	Flow (I/min)
100	Water Take	0.00	0.30	0.30	0.30	0.060
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	852.0	852.5	852.9	853.3	Flow (I/min)
200	Water Take	0.00	0.50	0.40	0.40	0.087
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	856.0	857.7	858.9	860.8	Flow (I/min)
400	Water Take	0.00	1.70	1.20	1.90	0.320
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	859.2	859.2	859.2	859.2	Flow (I/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					Flow (I/min)
100	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q)	Gauge Press	Gauge Press	Friction Loss	s (m)*	Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
1st	0.060	100.00	10.220	0.000	0.000	34.470	0.071	7.75E-09
2nd	0.087	200.00	20.440	0.000	0.000	44.690	0.079	8.63E-09
3rd	0.320	400.00	40.880	0.000	0.000	65.130	0.201	2.19E-08
4th	0.000	200.00	20.440	0.000	0.000	44.690	0.000	0.00E+00
5th	0.000	100.00	10.220	0.000	0.000	34.470	0.000	0.00E+00

^{*}Where friction loss is assumed to be negligible.

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

Note - zero flow in period 4 - test ended