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# Soil Surveys Engineering Pty. Limited

Specialist in Applied Geotechnics

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## BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 26/11/2011

Easting: 503356 Northing: 6960810 RL: -12.12 m

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

Page: 1 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC									
				1.0		Silty CLAY (CH) Very soft, high plasticity, dark grey.						
				2.0								
				3.0								
				4.0								
				5.0								
				5.80		Clayey SAND (SC) Loose, fine to medium grained, brown, high plasticity fines.						
				6.0								
				7.0								
				8.0								
				9.0								
				10.0								

### Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC. 3) Complete water loss at 16.70m. 4) Borehole grouted on completion.

Water First Noted Water Steady Level

### Defects - 1.54m : F,60°P,R,O,C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	With
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	F - Faulting		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Stain	Q - Quartz
	L - Cleavage		U - Undulating			S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
	T - Contact					X - Carbonaceous
	V - Vein					Z - Clean
	Z - Decomposed zone					
	DI - Drilling induced break					

### Weathering Grades

RS - Residual Soil  
XW - Extremely weathered  
DW - Distinctly weathered  
SW - Slightly weathered  
FR - Fresh  
Rock Strength  
VW - Very weak  
W - Weak  
MS - Medium strong  
S - Strong  
VS - Very strong  
ES - Extremely strong

### Samples

U50  
SPT  
Disturbed Sample

Approved:  
Date:



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Page: 2 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC									
				10.50		Clayey SAND (SC) Loose, fine to medium grained, brown, high plasticity fines. (continued)						
				11.0		TUFF, fine grained, pale white grey stained pale orange, cryptocrystalline, massively bedded, fragmented.	DW - SW					11.07 m; J, 22°, P, R, O, 11.27 m; J, 30°, P, R, O,
				11.53		CORE LOSS 0.47m (11.53-12.00)				64	21	
				12.0		TUFF, fine grained, pale white grey stained pale orange, cryptocrystalline with granules, massively bedded, fragmented.	DW - SW					12.00 m; J, 80°, P, V, O,
				12.35		CORE LOSS 0.15m (12.35-12.50)	SW					12.67 m; J, 80°, S, R, O,
				12.50		TUFF, fine grained, pale white grey stained pale orange, cryptocrystalline with granules, massively bedded, closely spaced fractures.				29	29	
				12.75		CORE LOSS 0.75m (12.75-13.50) (Clayey SAND (SC) Very dense, fine to medium grained, yellow brown and grey, high plasticity fines.)						
				13.0		Clayey SAND (SC) Very dense, fine to medium grained, yellow brown and grey, high plasticity fines.						SPT 30/150mm N=R
				13.50								
				14.0								
				15.0								
				15.12								
				15.80		CONGLOMERATE, coarse grained, pale white grey, some darker grey clasts, granular, massively bedded, closely spaced fractures gravel is fine sized.	FR					15.42 m; DI, 21°, U, V, O, 15.83 m; DI, 10°, P, R, O, 16.32 m; J, 12°, P, S, O, 16.35 m; J, 18°, P, S, O, 16.80 m; DI, 20°, P, V, O, 17.58m, Is50 = 2.04 MPa 17.67 m; DI, 10°, U, V, O, 18.14 m; DI, 10°, U, V, O, 18.48 m; DI, 15°, U, V, O,
				16.0		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	
				17.0								
				18.0								
				18.80		CONGLOMERATE, coarse grained, pale white grey, granular, thickly bedded, closely spaced fractures, gravel is medium sized.				100	100	
				19.0								18.88 m; DI, 10°, U, V, O, 19m, Is50 = 1.61 MPa 19.17 m; DI, 10°, S, V, O, 19.28 m; DI, 10°, U, V, O, L, 19.72 m; DI, 35°, P, V, O, L
				20.0						97	77	

### Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC.3) Complete water loss at 16.70m. 4) Borehole grouted on completion.

Water First Noted Water Steady Level

Defects - 1.54m : F,60° P,R,O,C											
Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Width	Frequency	Direction	Continuity	Stability	Notes
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay					
	F - Foliation		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide					
	H - Schistosity		P - Planar	R - Rough	N - Clean	K - Calcite					
	J - Joint		S - Subplanar	S - Smooth	O - Open	L - Limonite					
	L - Cleavage		T - Stepped	V - Very rough	S - Stain	Q - Quartz					
	R - Fracture		U - Undulating			S - Secondary mineral					
	S - Shear zone					U - Unidentified mineral					
	T - Contact					W - Weathered rock					
	V - Vein					X - Carbonaceous					
	Z - Decomposed Zone					Z - Clean					
	DI - Drilling induced break										

Weathering Grades	
RS - Residual Soil	
XW - Extremely weathered	
DW - Distinctly weathered	
SW - Slightly weathered	
FR - Fresh	
Rock Strength	
VW - Very weak	
W - Weak	
MS - Medium strong	
S - Strong	
VS - Very strong	
ES - Extremely strong	

Samples	
U50	
SPT	
Disturbed Sample	

Approved:  
Date:



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## BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 26/11/2011

Easting: 503356 Northing: 6960810 RL: -12.12 m

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

Page: 3 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC									
				20.68		CONGLOMERATE, coarse grained, pale white grey, granular, thickly bedded, closely spaced fractures, gravel is medium sized. (continued)	FR					20.15 m; DI, 15°, U, V, O, W 20.31 m; DI, 8°, U, V, O, L
				21.0		SANDSTONE, medium grained, pale grey, granular, mediumly bedded, closely spaced fractures.				97	77	20.83 m; J, 3°, P, R, O, Z 21.23 m; Is50 = 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
				21.61		CONGLOMERATE, coarse grained, pale white grey, some darker grey clasts, granular, massively bedded, closely spaced fractures, gravel is fine sized.						22.20 m; DI, 10°, P, R, O, Z 22.35 m; Is50 = 1.88 MPa
				22.0		CONGLOMERATE, coarse grained, pale grey, granular, thickly bedded, moderately widely spaced fractures, gravel is medium sized.						23.15 m; Is50 = 1.66 MPa 23.16 m; DI, 5°, U, V, O, Z 23.29 m; Is50 = 1.68 MPa 23.38 m; DI, 10°, P, V, O, Z 23.53 m; J, 40°, P, V, O, Z
				22.33		SANDSTONE, medium grained, pale grey with some darker grey beds, granular, laminated, moderately widely spaced fractures, medium sized gravel conglomerate band from 23.75m to 23.92m.				100	92	24.31 m; DI, 10°, P, R, O, Z
				23.0		SANDSTONE, coarse grained, pale grey, granular, thickly bedded, widely spaced fractures, with some fine gravel.						25.36 m; DI, 10°, S, R, O, Z
				23.65		CONGLOMERATE, coarse grained, pale grey, granular, thickly bedded, with widely spaced fractures gravel is medium sized. Siltstone band from 26.8m to 26.85m.				100	100	26.28 m; DI, 5°, P, R, O, Z
				24.0		SANDSTONE, medium grained, pale grey with some darker grey beds, granular, laminated, moderately widely spaced fractures, medium sized gravel conglomerate band from 23.75m to 23.92m, calcite vein at 28.3m, coal stringers at 28.8m. Some medium sized gravel.						28.13 m; Is50 = 1.91 MPa
				24.54		CONGLOMERATE, coarse gravel, pale grey, speckled dark grey, granular, thickly bedded, closely to widely spaced fractures.				86	100	28.52 m; J, 10°, P, S, O, C 28.85 m; J, 35°, P, R, O, X 29.32 m; DI, 5°, U, S, O, Z 29.55 m; Is50 = 1.16 MPa
				25.0								
				25.52								
				26.0								
				27.0								
				28.0								
				28.14								
				29.0								
				29.05								
				30.0								

### Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC. 3) Complete water loss at 16.70m. 4) Borehole grouted on completion.

Water First Noted Water Steady Level

### Defects - 1.54m : F, 60° P, R, O, C

Depth (m)	Type	Qty (No)	Planarity	Roughness	Aperture	With
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	U - Undulating	V - Very rough	S - Silica
	L - Cleavage					
	R - Fracture					
	S - Shear zone					
	T - Contact					
	V - Vein					
	Z - Decomposed Zone					
	DI - Drilling induced break					

### Weathering Grades

RS - Residual Soil  
XW - Extremely weathered  
DW - Distinctly weathered  
SW - Slightly weathered  
FR - Fresh  
**Rock Strength**  
VW - Very weak  
W - Weak  
MS - Medium strong  
S - Strong  
VS - Very strong  
ES - Extremely strong

### Samples

U50  
SPT  
Disturbed Sample

Approved:  
Date:



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## BOREHOLE RECORD SHEET

Location Number: BH 302

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 26/11/2011

Easting: 503356 Northing: 6960810 RL: -12.12 m

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

Page: 4 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC									
				30.05		CONGLOMERATE, coarse grained, pale grey, 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
				30.82								30.62 m; DI, 35°, P, S, O, Z
				31.0		CONGLOMERATE, coarse grained, pale grey, speckled dark grey, granular, thickly bedded, with widely spaced fractures, gravel is coarse sized.				100	98	31m, Is50 = 1.54 MPa 31.18 m; J, 20°, U, S, O, Z 31.27 m; DI, 20°, U, S, O, Z
				32.0								32.20 m; DI, 30°, P, S, O, Z
				33.0								32.53 m; DI, 50°, S, S, O, Z 32.88m, Is50 = 2.37 MPa
				33.83								33.45 m; DI, 30°, P, S, O, Z
				34.0		QUARTZITE, fine grained, pale grey, cryptocrystalline, laminated, closely spaced fractures.				98	93	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, Is50 = 2.24 MPa 34.36 m; J, 10°, P, S, O, Z
				35.0		SANDSTONE, medium grained, pale grey with some darker grey beds, granular, laminated, moderately widely spaced fractures.						
				35.73		SANDSTONE, fine grained, pale grey alternating dark grey, granular, thinly laminated, closely spaced fractures, trace of Siltstone laminae.						
				36.0		SANDSTONE, medium grained, pale grey speckled dark grey banded black in places, widely spaced fractures, granular, laminated, with trace of coal stringers.						
				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.						36.14m, Is50 = 5.2 MPa 36.23m, Is50 = 1.76 MPa 36.28 m; J, 25°, P, R, O, Z
				37.0		Interlaminated SANDSTONE and SILTSTONE, fine grained, dark grey with pale grey banding, granular, thinly laminated closely spaced fractures. Trace of mudstone and organics.				97	87	37.47m, Is50 = 0.77 MPa
				38.0		Interlaminated SANDSTONE and SILTSTONE, fine grained, dark grey with pale grey banding, granular, moderately widely spaced fractures. Trace of mudstone and organics.						
				37.95								
				39.0						100	98	39.29m, Is50 = 3 MPa
				40.0								39.90 m; J, 80°, P, R, O, Z

### Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC.3) Complete water loss at 16.70m. 4) Borehole grouted on completion.

Water First Noted Water Steady Level

Defects - 1.54m : F, 60°, P, R, O, C									
Depth (m)	Type	Size (mm)	Planarity	Roughness	Aperture	Width	Frequency	Remarks	
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay			
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide			
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite			
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite			
	J - Joint		T - Stepped	V - Very rough	S - Stain	Q - Quartz			
	L - Cleavage					S - Secondary mineral			
	R - Fracture					U - Unidentified mineral			
	S - Shear zone					W - Weathered rock			
	T - Contact					X - Carbonaceous			
	V - Vein					Z - Clean			
	Z - Decomposed Zone								
	DI - Drilling Induced Break								

Weathering Grades	
RS - Residual Soil	
XW - Extremely weathered	
DW - Distinctly weathered	
SW - Slightly weathered	
FR - Fresh	
Rock Strength	
VW - Very weak	
W - Weak	
MS - Medium strong	
S - Strong	
VS - Very strong	
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Samples	
U50	
SPT	
Disturbed Sample	

Approved: \_\_\_\_\_  
Date: \_\_\_\_\_



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Location Number: BH 302

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 26/11/2011

Easting: 503356 Northing: 6960810 RL: -12.12 m

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

Page: 5 OF 5

Drilling Method					Depth	Graphic	Description	Weathering	Strength Estimated					Defect Spacing			Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC	Casing					rs	ww	ms	s	vs	es	20	60			
					40.86		Interlaminated SANDSTONE and SILTSTONE, fine grained, dark grey with pale grey banding, granular, moderately widely spaced fractures. Trace of mudstone and organics. <i>(continued)</i>	FR								100	98	40.76 m: J, 10°, P, R, O, Z	
					41.0		BOREHOLE BH 302 TERMINATED AT 40.86 m												
					42.0														
					43.0														
					44.0														
					45.0														
					46.0														
					47.0														
					48.0														
					49.0														
					50.0														

### Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC.3) Complete water loss at 16.70m. 4) Borehole grouted on completion.

Water First Noted Water Steady Level

### Defects - 1.54m : F, 60° P, R, O, C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Stain	Q - Quartz
	L - Cleavage		U - Undulating			S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
	T - Contact					X - Carbonaceous
	V - Vein					Z - Clean
	Z - Decomposed zone					
	DI - Drilling induced break					

### Weathering Grades

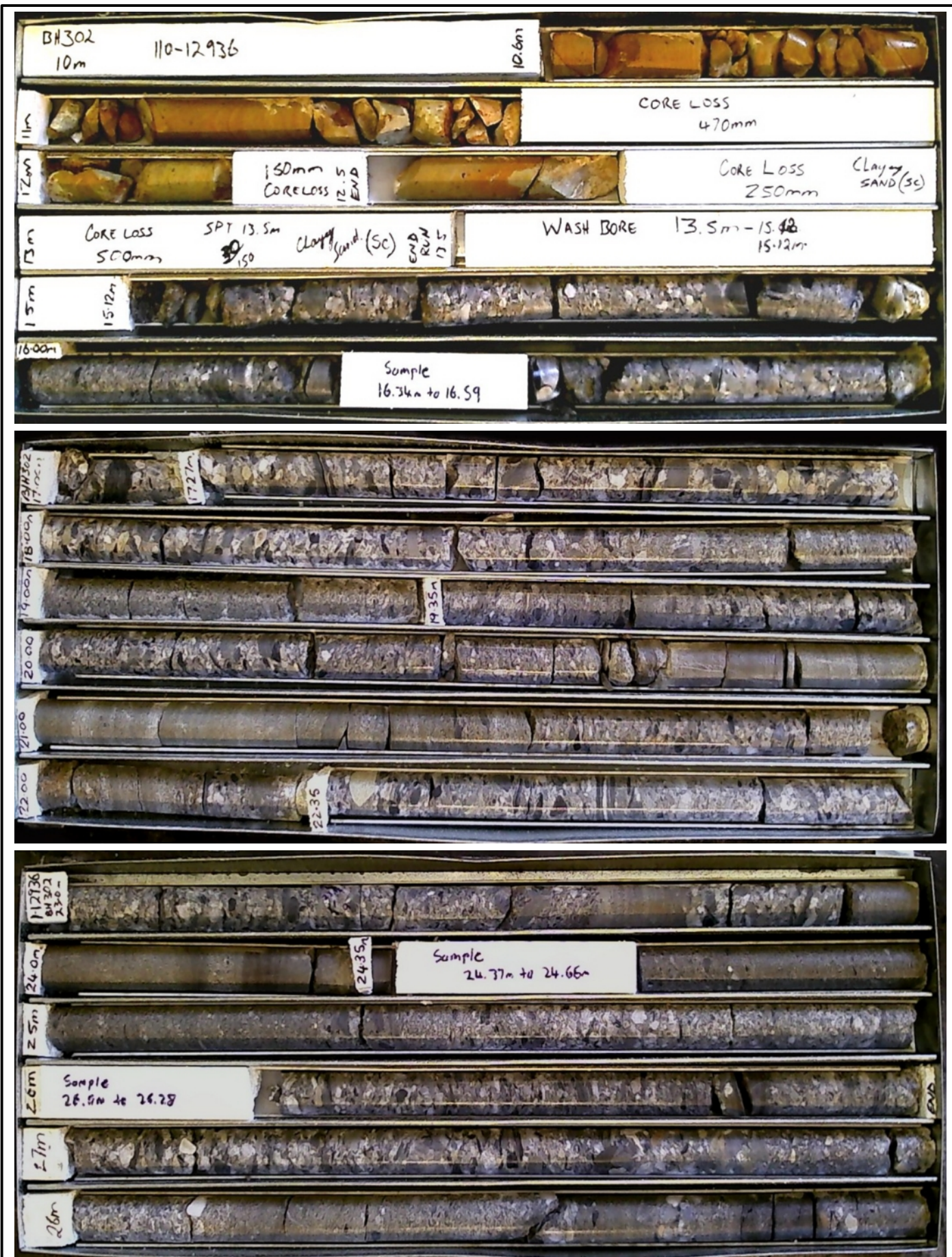
RS - Residual Soil  
XW - Extremely weathered  
DW - Distinctly weathered  
SW - Slightly weathered  
FR - Fresh  
Rock Strength  
VW - Very weak  
W - Weak  
MS - Medium strong  
S - Strong  
VS - Very strong  
ES - Extremely strong

### Samples

U50  
SPT  
Disturbed Sample

Approved:  
Date:





TITLE

AECOM  
Brisbane  
Cross River Rail  
Core Photo - BH 302

DRAWN

DT

DATE

26/04/2012

CHECKED

CB

DATE

26/04/2012

SCALE

Not To Scale

A4

PROJECT No

110-12936

FIGURE No

1/2





TITLE

AECOM  
Brisbane  
Cross River Rail  
Core Photo - BH 302

DRAWN

DT

DATE

26/04/2012

CHECKED

CB

DATE

26/04/2012

SCALE

Not To Scale

A4

PROJECT No

110-12936

FIGURE No

2/2



## IN-SITU PACKER PERMEABILITY TEST RESULT

**PROJECT:** **CRR**      **BH No.:** **302**  
**PROJECT No.:** **110-12936**      **Test No.:** **1**  
**Date:** **29/11/2011**

Packer type: Single  
Packer pressure: 2000kPa  
Gauge pressures measured in: kPa  
Tested by: CS

Vertical depth to:  
(below river bed)

Top of test section (m):	18.50
Base of test section (m):	22.50
Centre of test section(m):	20.50
Base of casing (m):	17.50
Ground water (m)	TIDAL

Depth of centre of test section (m):	20.50
Length of test section (m):	4.00

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

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	185.0	185.9	186.1	186.2	Flow (l/min)
	Water Take	0.00	0.90	0.20	0.10	0.080
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	188.5	188.8	189.5	189.8	Flow (l/min)
	Water Take	0.00	0.30	0.70	0.30	0.087
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	190.2	190.8	192.0	192.3	Flow (l/min)
	Water Take	0.00	0.60	1.20	0.30	0.140
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	192.3	192.5	192.5	192.4	Flow (l/min)
	Water Take	0.00	0.20	0.00	-0.10	0.007
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	192.2	192.2	192.2	192.2	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q) (l/min)	Gauge Press (kPa)	Gauge Press (m of water)	Friction Loss (m)*		Total Head (m)	Lugeon Value	Perm. (m/s)
				Basic	In extra rods			
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
4th	0.007	200.00	20.440	0.000	0.000	40.940	0.004	5.04E-10
5th	0.000	100.00	10.220	0.000	0.000	30.720	0.000	0.00E+00

\*Where friction loss is assumed to be negligible.

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

## IN-SITU PACKER PERMEABILITY TEST RESULT

**PROJECT:** **CRR**  
**PROJECT No.:** **110-12936**

**BH No.:** **302**  
**Test No.:** **2**  
**Date:** **29/11/2011**

Packer type: Single  
Packer pressure: 2000kPa  
Gauge pressures measured in: kPa  
Tested by: CS

Vertical depth to:  
(below river bed)

Top of test section (m):	27.00
Base of test section (m):	29.00
Centre of test section(m):	28.00
Base of casing (m):	26.00
Ground water (m)	TIDAL

Depth of centre of test section (m):	28.00
Length of test section (m):	2.00

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

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	195.6	195.6	195.6	195.6	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	198.0	198.2	198.5	198.6	Flow (l/min)
	Water Take	0.00	0.20	0.30	0.10	0.040
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	199.5	199.6	199.8	199.9	Flow (l/min)
	Water Take	0.00	0.10	0.20	0.10	0.027
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	198.5	198.5	198.5	198.5	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	196.5	196.5	196.5	196.5	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q) (l/min)	Gauge Press (kPa)	Gauge Press (m of water)	Friction Loss (m)*		Total Head (m)	Lugeon Value	Perm. (m/s)
				Basic	In extra rods			
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
4th	0.000	200.00	20.440	0.000	0.000	48.440	0.000	0.00E+00
5th	0.000	100.00	10.220	0.000	0.000	38.220	0.000	0.00E+00

\*Where friction loss is assumed to be negligible.

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