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SOIL SURVEYS

BOREHOLE RECORD SHEET
Location Number: BH 326

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

Location: Brisbane

Easting: 502770 Northing: 6			Dane: 4 OF 4
Logger: JI/CB Operator: PD Drilling Method .≅	Machine: MC450 Date: 13	3/02/2012	Page: 1 OF 4
Graphic Casing Method Casing Method Casing Method Depth Depth	Description	Weathering Strength Estimated Spacing	Samples and Remarks
	BITUMEN FILL Sandy GRAVEL (GP) Medium dense, fine coarse size, grey and brown, fine to coarse grained sand, moist. FILL Sandy GRAVEL (GP) Loose, fine to mediusize, grey and brown, fine to coarse grained sanwet. FILL Silty CLAY (CI) Hard, medium plasticity, liggrey and white, trace of sand. FILL Clayey GRAVEL (GC) Very dense, fine to coarse size, grey and light grey. FILL Silty CLAY (CI) Hard, medium plasticity, liggrey and white, trace of sand, trace of fine sized gravel. FILL Sandy CLAY (CH) Hard, high plasticity, prown grey and white, with pockets of clayey gravel. FILL Sandy GRAVEL (GP) Dense, fine to media size, grey, fine to coarse grained sand. 6.6m Unknown - Metal? NATURAL Sandy CLAY (CI) Hard, medium plasticity, grey/brown/white/red.	Weathering Grades RS-Residual Sell MV-Sterning weathering MV-Sternin	_
3) Monitoring well installed to 16m on or	H - Schistosity S - P-Patistra R - R-Outgri N - Clean R - S-Smooth O - Open L - S-Subplanar S - Smooth O - Open L - Cleavage L - Stepped V - Very rough S - Stain C U - Undulating	- Cusy Conde SW - Slightly weathered FR - Fresh FR - Fresh FR - Fresh FR - Fresh WW - Wery weak W - Weak W - Weak	SPT Approved:
₩ater First Noted ₩ater Steady Le	S - Snear zone T - Contact	- Carbonaceous S - Strong Distur	rbed Date:

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SOIL SURVEYS

BOREHOLE RECORD SHEET Location Number: BH 326

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

Location: Brisbane Client: AECOM

Easting: 5 Logger: JI		-	958418 RL: 31.01 m Client: AE Machine: MC450 Date: 13/0						Page: 2 OF 4
Drilling Method Casing Casing		Graphic	Description We		Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
		× × × × × × × × ×	TUFF (XW) Very weak, brown, fine to medium grained. (continued)						SPT■
	<u>- 1</u> 1.0 - - - -	× × × × × × × × × × × × × ×	TUFF, fine to medium grained, pale yellow,, porphyritic, massively bedded, with very closely spaced fractures, with some limonite staining.	DW			100	24	
	11.80 12.0 	× × × × × × × × ×	TUFF, fine to medium grained, light yellow speckled red, porphyritic, massively bedded, with very closely spaced fractures.	DW - SW			100	33	
	- 13.0 - 13.66	× × × × × × × × × × × × × × × × × × ×					98	23	10.80-16.00 m; Dl, 10° , P, R, O,
	14.0 	× × × × × × × × × × × × × × × ×	TUFF, fine to medium grained, pale light grey speckled red, porphyritic, massively bedded, with very closely spaced fractures.	SW					
	14.73 - 15.0	× × × × × × × × × × × × × × ×	TUFF, fine grained, cream and light grey, porphyritic, massively bedded, with closely spaced fractures from 15.00m, with some clay from 15.47m.				89	40	
		× × × × × × × × ×	TUFF, fine grained, cream and light grey, porphyritic, massively bedded, fragmented.	_			100	39	
		× × × × × × × × ×	SANDSTONE, fine grained, grey, granular,				87	0	
			medium bedded, fragmented to closely spaced fractures, with some coarse sand grains and trace gravel.				91	0	16.00-19.40 m; DI, 10°, P, R, O, W
	<u>18.0</u>						89	27	18.30 m; J, 89° , S, R, O, Z
Comment 1) Groundw							100	0	
Comment 1) Groundw 3) Monitorin	► 20.0 s: ater not observed. 2 g well installed to 16	a) ATV s	H - Schistorily S - Subplanar S - Smooth O - Open L - Line D - Lin	Didde	Veathering Gra RS - Residual So WS - Stremely weath W - Distinctly weath SW - Slightly weath FR - Fresh Rock Strengt VW - Very weak W - Weak MS - Medium stror	l ered ered ered	U5 SP	о [т]	Approved:
<u></u> Water Firs	st Noted Water S	teady Le	V - Vein X - Carb	n	S - Strong VS - Very strong ES - Extremely stro		Sampl		Date:

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SOIL SURVEYS

Easting: 502770

Northing: 6958418 RL: 31.01 m

BOREHOLE RECORD SHEET

Location Number: BH 326

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

Location: Brisbane Client: AECOM

Date: 13/02/2012 Page: 3 OF 4

Logg	ger: JI/0	CB Operato	r: PD	Machine:	MC450	Date: 13/0	2/2012					Page: 3 OF 4	
Drilling	Method Casing Casing	Depth	Graphic		Description		Weatherin	Strength Strength Estimated Skywyw Ms s vs ES	Defect Spacing	Rec (%)	RQD	Samples and Remarks	
		- - - 21 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	massively bedo zone). (continue SANDSTONE, granular.	ded; tending to ored) fine to coarse of	ey, cryptocrystalline, clay (transition grained, light grey, ained, light grey,	SW			100	13	20.67 m; J, 85° , S, R, O, Z	
		- - - - -	00000000000000000000000000000000000000	granular, clasts siltstone, quarta	s are fine to med z and mudstone	dium gravel size of e. Clast supported.				90	31		
		<u>22</u> .0 22.10	000000000000000000000000000000000000000	MUDSTONE, fi massively bedo CONGLOMERA granular, clasts siltstone, quarta	ded. ATE, coarse grass are fine to coa z and mudstone	ey, cryptocrystalline, ained, light grey, rse gravel size of e. Clast supported, dded with	FR			100	48	22.69 m; DI, 5° , U, R, O, Z	
				moderately wid	ely spaced frac	tures.				94	77	23.26 m; DI, 15° , U, R, O, Z	
2 Developed by Datgel		- - 24.0 - - - - - - - - 25.0 25.00	000000000000000000000000000000000000000										
EW.GPJ. < <drawingfille>> 21/05/2012 14:34 8.30.002 Developed by Datge</drawingfille>				SILTSTONE, fil laminated, mod some interlamin	derately widely s	k grey, thinly spaced fractures, grained sandstone.				98	98		
OG 111-12936 NEW.GPJ < <drawing< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></drawing<>													
SURVEYS, 00 LIBRARY 2012-05 GLB Log SOIL, SURVEY, BOREHOLE LOG 111-12938 N SUL D MUSUL D		- <u>2</u> 8.0 <u>2</u> 9.0								97	82		
COC	nments	- - - - - - 30.0			Defects -	- 1.54m : F,60°,P,R,O,C		Weathering Gra	des S	100	60 s		
_1	roundwa onitoring	ter not observed. 2 well installed to 16			Depth (m) Type Dip (deg) Plans B - Bedding C - C C - Clay seam D - D F - Foliation P - P H - Schistosity S - S	withy Roughness Aperature Infili untilinear L - Slickensides C - Closed C - Clay sconfinuous P - Polished F - Filled F - Iron (Sanar R - Rough N - Cael K - Cacilo updatrar S - Smooth O - Open L - Limo Pepped V - Very rough S - Stain G - Quarandulating	rite rtz ndary mineral entified mineral athered rock onaceous	RS - Residual SO WY - Extremely weath DW - Distinctly weath SW - Slightly weath FR - Fresh Rock Streng VW - Very weak W - Weak MS - Medium stron S - Strong VS - Very strong FS - Extremely stro	ered hered h	U5 SP sturbe	0 	Approved: Date:	

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SOIL SURVEYS Easting: 502770

Northing: 6958418 RL: 31.01 m

BOREHOLE RECORD SHEET Location Number: BH 326

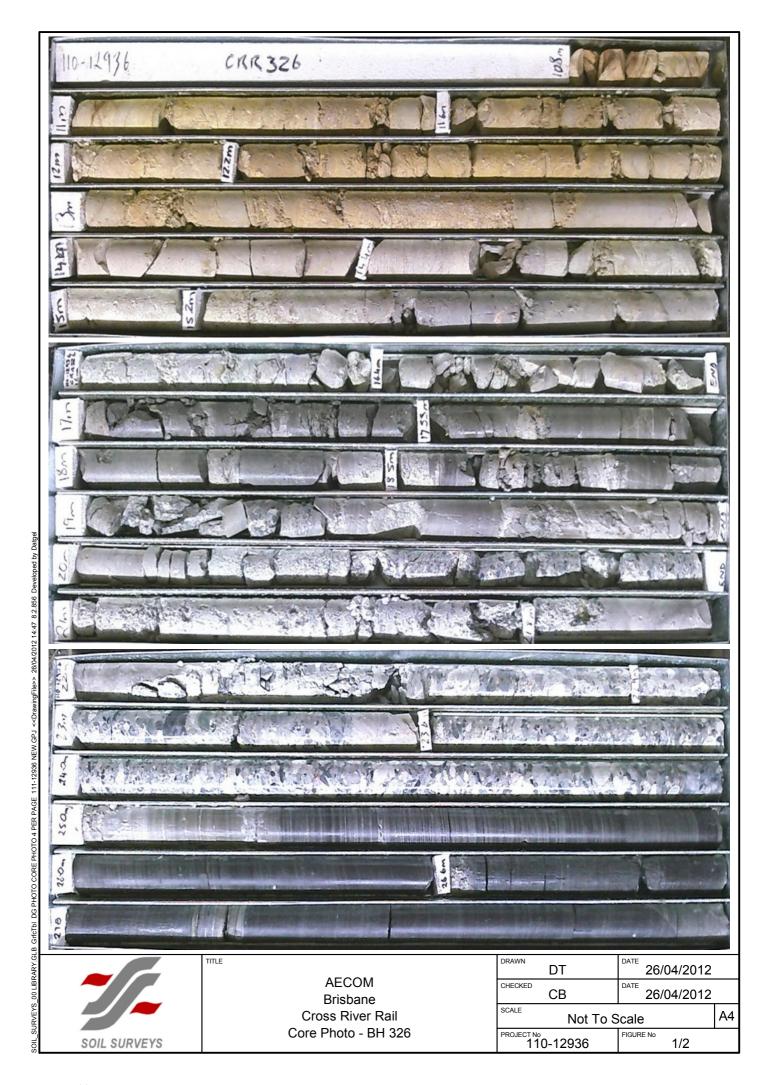
Project Number: 110-12936

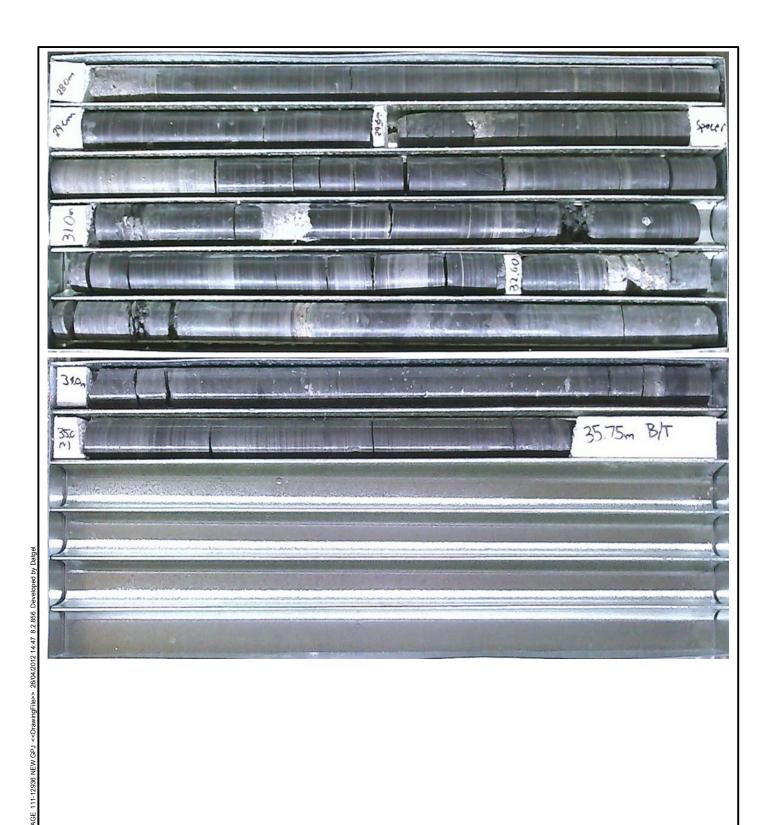
Project Name: Cross River Rail Location: Brisbane

Client: AECOM Date: 13/02/2012

Page: 4 OF 4

Logger: JI/CB Operator:	PD Machine: MC450	Date: 13/02/2012		Page: 4 OF 4
Drilling Method Depth Depth Depth	Description	Weathering _{Estin}	ength Spacing	Samples and Remarks
- 31.0 - 31.0 - 32.0	SILTSTONE, fine grained, dark gr laminated, moderately widely space some interlaminations of fine grain (continued)	ey, thinly FR sed fractures, led sandstone.	100	25.00-35.75 m; B, 50° , P, S, O, Z
33.00 33.20	SANDSTONE, fine grained, grey, moderately widely spaced fracture f-m sized, white, sub-rounded graves SILTSTONE, fine grained, dark gralternating laminations of grey an moderately widely spaced fracture	ey, with d dark grey, s. some	98	70
75, 100, 100, 100, 100, 100, 100, 100, 10	interlaminations of fine grained sa BOREHOLE BH 326 TERMINATE			
1 1 1 1 1 1 1 1 1 1				
Comments: 1) Groundwater not observed. 2) A 3) Monitoring well installed to 16m Water First Noted Water Stea	V survey carried out. In completion. Depin (m) Type Dep (dep) Paradry C - Curlinger C - Consequence C - Curlinger C - Consequence C - Curlinger C - Curlin	Roughfress Aprilled Filed State Day State Div. Delay State Div. Delay St. S. F. Roughfress Aprilled Filed Filed State Day St.	ering Grades Residual Soil remely weathered tijnetly weathered	Approved:







TITLE

AECOM Brisbane Cross River Rail Core Photo - BH 326

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

CALI - ATV

Calliper Average from ATV

IMPORTANT NOTE

RHI

Rock Hardness Index



COMPOSITE LOG

BOREHOLE TELEVIEWER LOGS AND STRUCTURES

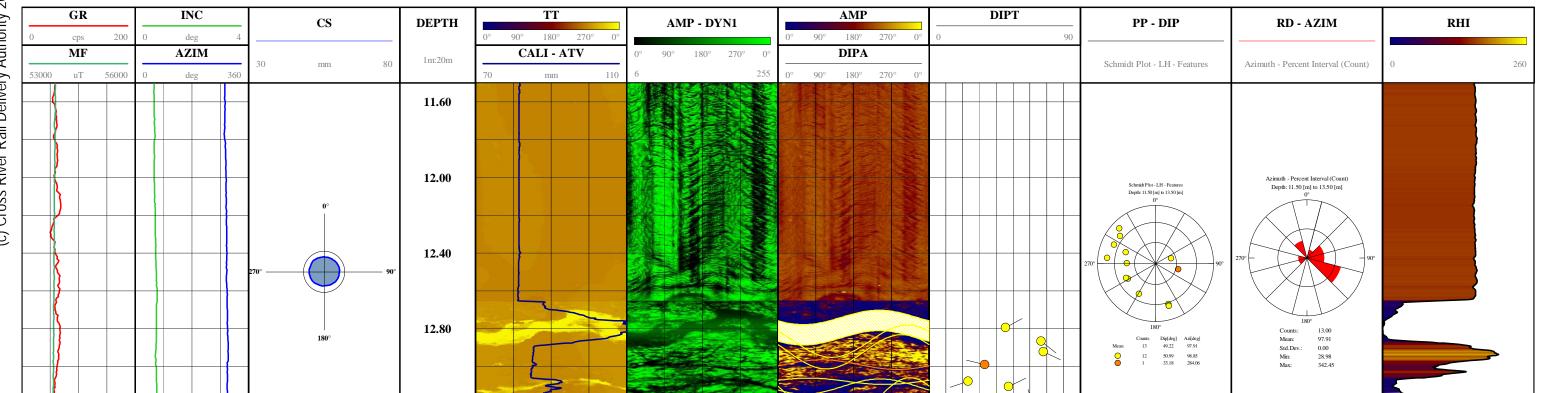


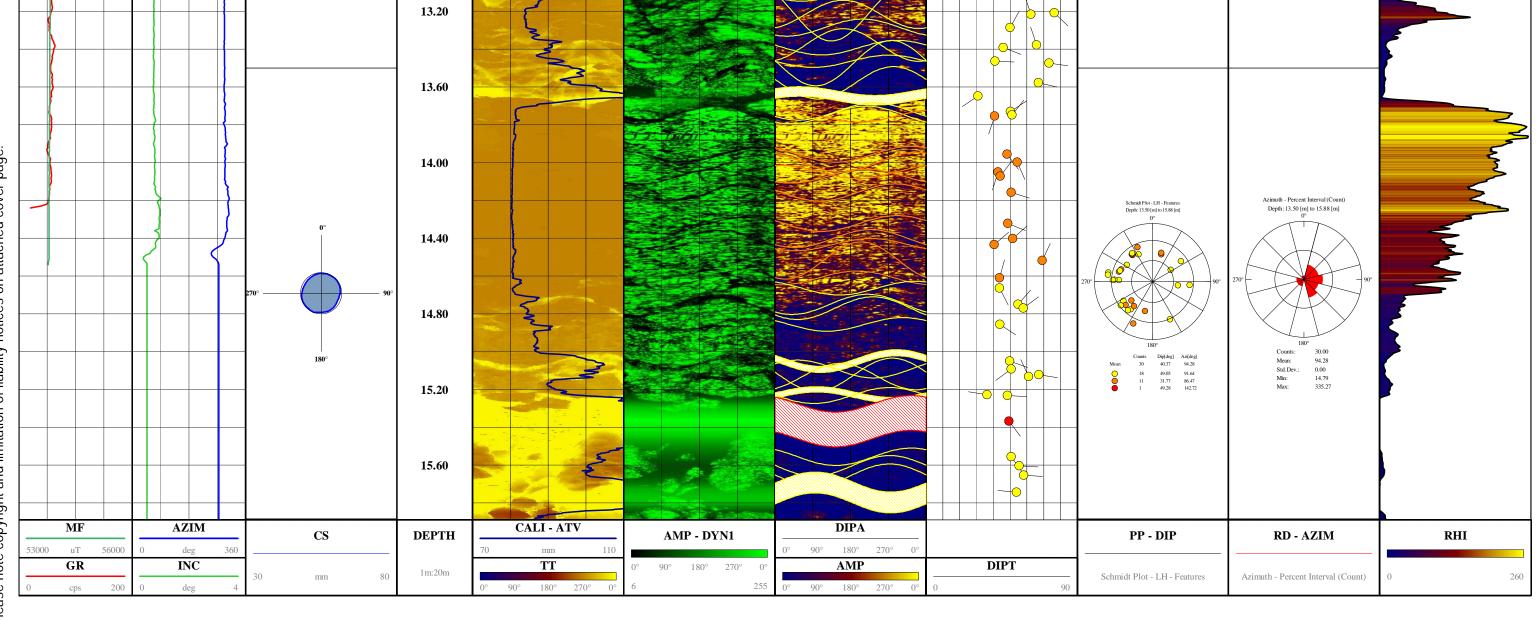
Hole Name Field Log Date Location	CRR326 Brisbane City 9th Mar,2012 QLD	Drill Depth Bit Size Casing Type Casing Dept			Grid Name N/A Collar Easting N/A Collar Northing N/A Reduced Level N/A		Logging Unit Engineer Client Represent Service Type	SV031 J.Mackay Julian Irons Televiewer
TE	LEVIEWER LOGS	STR	RUCTURAL LOGS		TADPOLES		COM	MENTS
MF GR INC AZIM TT AMP AMP - DYN1	Mag Field Gamma Tool Inclination (0 = Vertical Down) Tool Azimuth Travel Time Image Amplitude Image Amplitude Image Dynamic 1	DIPA DIPT PP - DIP RD - AZIM CS	Structures Apparent (Sinusoid Presentation) Structures True (Tadpole Presentation) Polar Projection Dip (Schmidt) Rose Diagram - Azimuth Cross Section	★★★	Open Fracture Partially Open Fracture Closed Fracture	M C	Image data is presented oriented to True North. Magnetic Declination = 10.97 deg Cross Sections are plotted at 2m intervals: White: Tool Policy Light Blue: Nominal Hole Size and Blue: Actual Hole Size	
	PROCESS	SED LOGS						

The following interpretations are opinions based upon inferences from borehole logs,

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IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: CRR Packer type: BH No.: 326 Double PROJECT No.: Packer pressure: 2000kPa 110-12936 Test No.: 1

> Date: 16/02/2012 Gauge pressures measured in: kPa СВ Tested by:

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

31.00 32.50 Base of test section (m): Centre of test section(m): 31.75 Base of casing (m): 30.00 Ground water (m) NR

Depth of centre of test section (m) 31.75 Length of test section (m): 1.50

Gauge Height above ground level 0.00 Hole Diameter in test section (mm 75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1668.0	1668.0	1668.0	1668.0	Flow (I/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	1670.2	1670.3	1670.5	1670.5	Flow (I/min)
200	Water Take	0.00	0.10	0.20	0.00	0.020
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1670.5	1670.6	1670.6	1670.7	1733.800
400	Water Take	0.00	0.10	0.00	0.10	0.013
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1670.2	1670.2	1670.2	1670.2	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)
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q)	Gauge Press	Gauge Press	Friction Loss (m)*		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	41.970	0.000	0.00E+00
2nd	0.020	200.00	20.440	0.000	0.000	52.190	0.026	2.50E-09
3rd	0.013	400.00	40.880	0.000	0.000	72.630	0.013	1.20E-09
4th	0.000	200.00	20.440	0.000	0.000	52.190	0.000	0.00E+00
5th	0.000	0.00	0.000	0.000	0.000	31.750	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 period 4 - test ended

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT:CRRBH No.:326Packer type:DoublePROJECT No.:110-12936Test No.:2Packer pressure:2000kPa

Date: 16/02/2012 Gauge pressures measured in: kPa
Tested by: CB

Vertical depth to: Top of test section (m): 19.00

Base of test section (m): 20.50

Centre of test section(m): 19.75

Base of casing (m): 18.00

Ground water (m) NR

Depth of centre of test section (m) 19.75
Length of test section (m): 1.50

Gauge Height above ground level 0.00
Hole Diameter in test section (mm 75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1679.0	1683.0	1686.5	1688.6	Flow (I/min)
100	Water Take	0.00	4.00	3.50	2.10	0.640
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1690.2	1694.7	1697.5	1700.7	Flow (I/min)
150	Water Take	0.00	4.50	2.80	3.20	0.700
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1701.6	1703.7	1709.0	1715.7	1733.800
250	Water Take	0.00	2.10	5.30	6.70	0.940
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1718.0	1737.1	1753.1	1756.7	Flow (I/min)
400	Water Take	0.00	19.10	16.00	3.60	2.580
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1756.7	1757.5	1758.3	1758.7	Flow (I/min)
200	Water Take	0.00	0.80	0.80	0.40	0.133

Period	Flow (q)	Gauge Press	Gauge Press	Friction Loss (m)*		Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
1st	0.640	100.00	10.220	0.000	0.000	29.970	1.454	1.39E-07
2nd	0.700	150.00	15.330	0.000	0.000	35.080	1.359	1.30E-07
3rd	0.940	250.00	25.550	0.000	0.000	45.300	1.413	1.35E-07
4th	2.580	400.00	40.880	0.000	0.000	60.630	2.898	2.77E-07
5th	0.133	200.00	20.440	0.000	0.000	40.190	0.226	2.16E-08

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

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