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# BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59\_BH04

CLIENT : TMR

POSITION : E: 358653, N: 8137047 (55 MGA94)

PAGE : 1 OF 4

PROJECT : SAFER ROADS SOONER PROJECT

SURFACE ELEVATION : 318.8 (AHD)

DATE DRILLED : 30/7/13 TO 30/7/13

JOB NO : CB24735.01

DIP / AZIMUTH : 90°

LOGGED BY : NC

LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)

CHECKED BY : AJ

DRILLING							MATERIAL						
PROGRESS		DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations	
DRILLING & CASING	WATER												
<div><div></div><div>AD/T</div><div></div><div></div><div>WB</div><div></div></div>		H			318.8	0.0			0.05m ASPHALT: (0.05).			FILL	
		F-H						GM	SANDY GRAVEL (GM): Grey brown, fine to medium gravel, fine to coarse grained sand, trace of clay.			0.30: Moisture Content (%) = 6.3, Liquid Limit (%) = 28, Plastic Limit (%) = 19, Plasticity Index (%) = 9, Linear Shrinkage (%) = 4, % Passing 37.5mm: 100, % Passing 2.36mm: 59, % Passing 0.425mm: 39, % Passing 0.075mm: 26, % Passing 0.002mm: 3, Max. Dry Density (t/m³) = 2.07, OMC (%) = 10	
				0.30m LB				GM	SANDY GRAVEL (GM): Orange brown, fine to medium gravel, angular, fine to coarse grained sand, with fines.				
			F		1.00m SPT 3, 4, 6 N=10	317.8	1.0			1.00m CLAYEY SILT (CI-ML): Red brown, orange brown, medium plasticity, with coarse grained sub-angular gravel, trace of fine to coarse grained sand.			RESIDUAL SOIL
					1.45m				CI-ML			F	1.00: Moisture Content (%) = 19.2, Liquid Limit (%) = 40, Plastic Limit (%) = 27, Plasticity Index (%) = 13, % Passing 2.36mm: 85, % Passing 0.425mm: 80, % Passing 0.075mm: 73, % Passing 0.002mm: 18 RESIDUAL SOIL
			H			316.8	2.0			From 2.00 m becoming pale red brown, orange brown.		St	
			H-VH		2.50m SPT 2, 8, 25/95mm N=R					2.65m			EXTREMELY WEATHERED ROCK
					2.90m					QUARTZITE: Pale brown mottled orange brown, extremely weathered, extremely low strength, appears as SANDY SILT (ML), low plasticity, fine to medium grained sand, with fine to medium grained angular gravel, comprising of medium strength quartzite.			
			F-H			315.8	3.0					H	
					4.00m SPT 30, 0 N=R	314.8	4.0			4.00m	QUARTZITE: Pale brown mottled orange brown, extremely to highly weathered, very low to low strength.	M	
		H-VH		4.37m									
		VH		5.50m					5.30m	PHYLLITE: Pale brown mottled orange brown, highly weathered, low strength.			
					313.8	5.0			5.50m	Continued as Cored Drill Hole			
					312.8	6.0							

DRILLING				SAMPLES & FIELD TESTS				DENSITY (SPT N-value)		CONSISTENCY (Su) {N-value}			
HA	Hand Auger	RR	Rock Rolling	DS	Disturbed Sample	SPT	Standard Penetration Test	VL	Very Loose	0 - 4	VS	Very Soft	< 12 kPa {0-2}
AS	Auger Screw	AT	Air Track	ES	Env Soil Sample	U	Undisturbed Tube Sample	L	Loose	4 - 10	S	Soft	12 - 25 {2-4}
AD/T	Auger Drill TC-bit	HQ	HQ Coring	EW	Env Water Sample	W	Water Sample	MD	Medium Dense	10 - 30	F	Firm	25 - 50 {4-8}
AD/V	Auger Drill V-bit	NQ	NQ Coring					D	Dense	30 - 50	St	Stiff	50 - 100 {8-15}
WB	Washbore	NMLC	NMLC Coring	HP	Hand Penetrometer			VD	Very Dense	50 - 100	VSt	Very Stiff	100 - 200 {15-30}
				HV	Hand Vane Shear			CO	Compact	>50/150mm	H	Hard	> 200 kPa {>30}
DRILLING PENETRATION				MOISTURE CONDITION									
VE	Very Easy	F	Firm	VH	Very Hard	D	Dry	M	Moist	W	Wet		
E	Easy	H	Hard	N SPT blows per 300mm									
GROUNDWATER SYMBOLS				HW SPT penetration by hammer weight									
▼ = Water level (static)				RW SPT penetration by rod weight									
▽ = Water level (during drilling)													

CLIENT : TMR

POSITION : E: 358653, N: 8137047 (55 MGA94)

PAGE : 2 OF 4

PROJECT : SAFER ROADS SOONER PROJECT

**SURFACE ELEVATION : 318.8 (AHD)**

DATE DRILLED : 30/7/13 TO 30/7/13

JOB NO : CB24735.01

DIP / AZIMUTH : 90°

LOGGED BY : NC

LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)

CHECKED BY : AJ

DRILLING				MATERIAL				DEFECTS & COMMENTS			
DRILLING	WATER DETAIL	TCR/RQD DEPTH	RL (m)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral	DEFECT SPACING (mm)	Description of joints, seams, defects, additional observations and comments	GENERAL
			318.8	0.0				EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -6 EH	20 60 200 600 2000		
				317.8	1.0						
				316.8	2.0						
				315.8	3.0						
				314.8	4.0						
				313.8	5.0						
						START CORING AT 5.50m					
						QUARTZITE: Pale grey brown, orange brown, massive.	MW				
		97% TCR  26% RQD	312.8	6.0						5.57 JT 90° PR RF 1 - 2 mm 5.58 JT 90° CH PR RF 1 - 4 mm 5.68 JT 90° IR RF 1 - 3 mm 5.70 JT 80 - 90° Fe IR RF 5.88 JT 70° IR RF 1 mm 5.95 SS 20° CH IR 20 - 30 mm	



DRILLING				SAMPLES & FIELD TESTS				DEFECT ABBREVIATIONS				ROCK STRENGTH (Is50 MPa)			
NMLC	NMLC Coring	HQ	HQ Coring	D	Disturbed Sample	ES	Env Soil Sample	CS	Crushed Seam	CN	Clean	Cu	Curved	0-0.03	Extremely Low
NQ	NQ Coring	PQ	PQ Coring	W	Water Sample	EW	Env Water Sample	CZ	Crushed Zone	CT	Coating	IR	Irregular	0.03-0.1	Very Low
				SPT	SPT Sample			DB	Drill Break	SN	Stain	PR	Planar	0.1-0.3	Low
				U	Undisturbed Tube Sample			FZ	Fractured Zone	VR	Veneer	ST	Stepped	0.3-1.0	Medium
								JT	Joint			Un	Undulated	1.0-3.0	High
								IS	Infilled Seam	POL	Polished			3.0-10	Very High
								SZ	Shear Zone	RF	Rough				
								VN	Vein	S	Smooth				
										SL	Slickensided				
GROUNDWATER SYMBOLS															



# CORED BOREHOLE ENGINEERING LOG HOLE NO : CURVE 59\_BH04

CLIENT : TMR POSITION : E: 358653, N: 8137047 (55 MGA94) PAGE : 3 OF 4  
PROJECT : SAFER ROADS SOONER PROJECT SURFACE ELEVATION : 318.8 (AHD) DATE DRILLED : 30/7/13 TO 30/7/13  
JOB NO : CB24735.01 DIP / AZIMUTH : 90° LOGGED BY : NC  
LOCATION : KENNEDY HWY (CAIRNS - MAREEBA) CHECKED BY : AJ

DRILLING				MATERIAL				DEFECTS & COMMENTS			
DRILLING	WATER DETAIL	TCR/RQD	RL (m)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral	DEFECT SPACING (mm)	Description of joints, seams, defects, additional observations and comments	GENERAL
NMLC	50% RETURN (from 6.00 m)	97% TCR 26% RQD 6.50	312.8	6.0		QUARTZITE: Pale grey brown, orange brown, massive. (continued) From 6.00 m becoming orange brown, grey, indistinct to distinct bedding at 60° to 70°.	MW			6.15 JT 50° IR RF 2 mm	JT 30° - 60° Fe IR RF 1 - 3 mm
							HW			6.31 JT 10° UN RF	
										6.36 JT 10° CH PR S 10 mm	
						CORE LOSS 0.03m (6.47-6.50)	HW			6.61 JT 75° PR RF	
						QUARTZITE: Mottled pale grey brown and orange brown, indistinct bedding.	MW			6.67 SS 10° Fe IR RF 30 mm	
										6.88 JT 80° CH IR RF 2 - 3 mm	
										6.94 JT 5° IR RF 2 mm	
			311.8	7.0						7.14 JT 5° Fe IR RF 3 mm	
										7.17 SS 55° CH PR S 10 mm	
										7.25 JT 70° - 80° Fe IR RF	
										7.32 VN 10° - 25° Fe CU RF	
										7.34 VN 45° - 70° Fe CU RF	
NMLC	100% TCR 33% RQD	309.8	9.0			From 8.15 m to 8.30 m SILTY CLAY (CI).	HW			8.15 SS 0° - 10° CH IR RF 150 mm	
										8.39 JT 5° IR RF 5 mm	
										8.44 JT 5° IR RF 3 - 4 mm	
										8.46 SS 5° CH IR RF 30 mm	
										8.52 SS 10° GC IR RF 60 mm	
										8.81 JT 75° Fe PR RF 2 mm	
										8.81 JT 5° IR RF 1 mm	
										8.88 JT 0° IR RF 2 mm	
										8.90 JT 70° Fe IR RF 2 mm	
										9.10 JT 70° - 80° IR RF 1 mm	
										9.24 JT 65° Fe IR RF 2 mm	
										9.25 JT 5° IR RF 1 mm	
NMLC	10.00	308.8	10.0			From 9.30 m indistinct to distinct bedding at 10° to 40°, with pale grey bands throughout.	HW			9.36 JT 5° - 15° Fe CU RF 1 mm	
						From 9.60 m becoming orange brown, grey indistinct bedding.				9.68 JT 80° IR RF 1 mm	
										9.70 JT 80° Fe IR RF 1 mm	
										9.80 JT 80° Fe IR RF 2 - 3 mm	
										9.88 SS 10° - 30° GC IR RF 35 mm	
						CORE LOSS 0.05m (9.95-10.00)	MW			10.05 JT 10° CH PR S 1 mm	
						QUARTZITE: Grey brown, orange brown, indistinct bedding.				10.10 JT 80° - 90° PR RF 1 mm	
										10.33 JT 10° Fe PR RF 1 mm	
						From 10.43 m to 10.63 m SILTY CLAY (CI).	HW			10.35 JT 10° - 30° CU RF	
										10.43 SS 30° - 40° CH-CG IR RF 200 mm	
										10.64 JT 70° CH IR 15 mm	
										10.67 JT 10° PR RF 1 mm	
NMLC	307.8	11.0				From 10.75 m to 11.05 m SILTY CLAY (CI)/ CLAYEY GRAVEL (GC).	MW			10.70 JT 70° GC IR 10 mm	
										10.75 SS 50° SC IR 130 mm	
										10.85 SS 40° GC PR RF 200 mm	
										11.08 JT 90° Fe IR RF 1 mm	
										11.17 JT 70° - 80° PR RF 1 mm	
										11.18 JT 70° - 80° PR RF 1 mm	
										11.23 JT 70° - 80° PR RF 1 mm	
										11.33 JT 70° - 90° Fe PR RF 1 mm	
										11.37 JT 70° - 90° Fe PR RF 1 mm	
										11.42 JT 50° GC IR RF 20 mm	
										11.51 SS 50° GC IR RF 60 mm	
										11.66 JT 10° Fe IR RF 1 mm	
NMLC	306.8	12.0				From 11.85 m becoming indistinct to distinct bedding at 30° to 60°, grey blue.	SW			11.68 JT 90° PR RF 1 mm	
										11.72 JT 70° PR RF 1 mm	
										11.73 JT 70° PR RF 1 mm	



DRILLING				SAMPLES & FIELD TESTS				DEFECT ABBREVIATIONS				ROCK STRENGTH (Is50 MPa)			
NMLC	NMLC Coring	HQ	HQ Coring	D	Disturbed Sample	ES	Env Soil Sample	CS	Crushed Seam	CN	Clean	Cu	Curved	0-0.03	Extremely Low
NQ	NQ Coring	PQ	PQ Coring	W	Water Sample	EW	Env Water Sample	CZ	Crushed Zone	CT	Coating	IR	Irregular	0.03-0.1	Very Low
				SPT	SPT Sample			DB	Drill Break	SN	Stain	PR	Planar	0.1-0.3	Low
				U	Undisturbed Tube Sample			FZ	Fractured Zone	VR	Veneer	ST	Stepped	0.3-1.0	Medium
								JT	Joint			Un	Undulated	1.0-3.0	High
								IS	Infilled Seam	POL	Polished			3.0-10	Very High
								SZ	Shear Zone	RF	Rough				
								VN	Vein	S	Smooth				
										SL	Slickensided				
GROUNDWATER SYMBOLS															
															
															



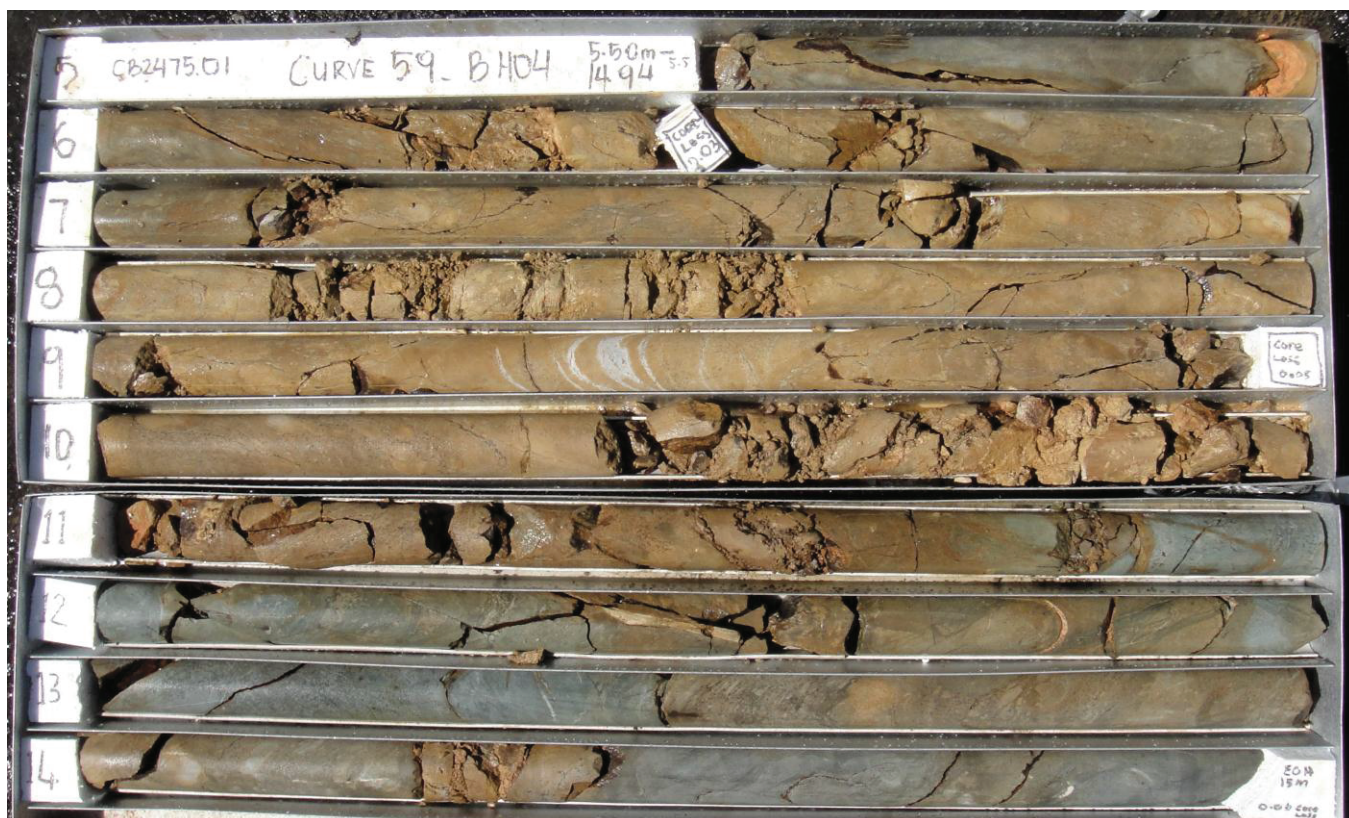
# CORED BOREHOLE ENGINEERING LOG HOLE NO : CURVE 59\_BH04


CLIENT : TMR	POSITION : E: 358653, N: 8137047 (55 MGA94)	PAGE : 4 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 318.8 (AHD)	DATE DRILLED : 30/7/13 TO 30/7/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : NC
LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)	CHECKED BY : AJ	

DRILLING				MATERIAL				DEFECTS & COMMENTS			
DRILLING	WATER DETAIL	TCR/RQD DRILL DEPTH	RL (m)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral EL -0.03 VL -0.1 L -0.3 M -1 H -2 VH -3 EH -10	DEFECT SPACING (mm) 20 60 200 600 2000	Description of joints, seams, defects, additional observations and comments	GENERAL
NMLC		98% TCR 98% RQD	306.8	12.0		QUARTZITE: Grey brown, orange brown, indistinct bedding. (continued)	SW			11.77 CZ 10° - 40° GC UN RF 20 - 50 mm 11.84 JT 10° - 20° IR RF 1 mm 11.85 JT 10° - 20° IR RF 1 mm 11.90 JT 80° PR RF 1 mm 12.08 JT 70° Fe PR RF 1 mm 12.10 JT 70° Fe PR RF 1 mm 12.19 JT 80° - 90° Fe IR RF 1 mm 12.25 JT 70° Fe PR S 1 mm 12.29 JT 10° IR RF 1 mm 12.38 JT 70° Fe IR RF 1 mm 12.40 JT 10° IR RF 1 mm 12.47 JT 70° Fe PR RF 1 - 5 mm 12.49 JT 70° Fe PR RF 1 mm 12.83 JT 10° CH PR RF 2 - 6 mm	JT 30° - 60° Fe/CH IR RF 1 - 3 mm
			From 12.40 m becoming grey brown.								
			From 12.60 m becoming grey blue, brown.								
			305.8	13.0		From 12.95 m becoming grey blue.					
			From 13.47 m becoming pale grey brown.								
			304.8	14.0		From 14.50 m becoming grey blue.					
			303.8	15.0		CORE LOSS 0.06m (14.94-15.00) End of Cored Drill Hole at 15.00 m					
			302.8	16.0							
			301.8	17.0							
			300.8	18.0							

DRILLING				SAMPLES & FIELD TESTS				DEFECT ABBREVIATIONS				ROCK STRENGTH (Is50 MPa)			
NMLC	NMLC Coring	HQ	HQ Coring	D	Disturbed Sample	ES	Env Soil Sample	CS	Crushed Seam	CN	Clean	Cu	Curved	0-0.03	Extremely Low
NQ	NQ Coring	PQ	PQ Coring	W	Water Sample	EW	Env Water Sample	CZ	Crushed Zone	CT	Coating	IR	Irregular	0.03-0.1	Very Low
				SPT	SPT Sample			DB	Drill Break	SN	Stain	PR	Planar	0.1-0.3	Low
				U	Undisturbed Tube Sample			FZ	Fractured Zone	VR	Veneer	ST	Stepped	0.3-1.0	Medium
	TCR % core run recovered							JT	Joint			Un	Undulated	1.0-3.0	High
	RQD % core run > 100mm long (rock fraction only measured)							IS	Infilled Seam	POL	Polished			3.0-10	Very High
								SZ	Shear Zone	RF	Rough				
								VN	Vein	S	Smooth				
										SL	Slickensided				
GROUNDWATER SYMBOLS															
 = Water level (static)															
 = Water level (during drilling)															





		Client: Transport and Main Roads		
		Project: Safer Road Sooner		
drawn	AJ	Core Photograph – Curve 59_BH04		
date	14/08/2013	Project no. CB24735.01		
scale	NTS	Photo No: Curve 59_BH04		1 of 1