

Borehole No. **CBH5**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **21.3.2007**
 Date completed: **21.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **SWAMP ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: FOX UB40 TRUCK Easting: 286506.88 slope: -90° R.L. Surface: 0.82
 hole diameter: 100 mm Drilling fluid: Northing: 6145441.04 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	IS ₍₅₀₎ MPa	D-diam- etral	A-axial	RQD %	defect spacing mm	defect description
					rock type; grain characteristics, colour, structure, minor components								type, inclination, planarity, roughness, coating, thickness
					Continued from non-cored borehole								particular
													general
NMLC			-8	9	Cobbles gravel and clay, cobbles and gravel rounded to sub rounded, brown to grey, clay pale grey and orange brown	DW			D 7.54	A 6.79			
				9.1	NO CORE: 9.1m to 9.3m								
			-9	10	Cobbles gravel and clay, cobbles and gravel rounded to sub rounded, brown to grey, clay pale grey and orange brown				D 4.25				
			-10	11					D 7.54	A 5.71			
			-11	12					D 7.54	A 5.93			
			-12	13	CBH5 terminated at 12m								
			-13	14									
			-14	15									
			-15	16									

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07 Form GEO 5.5 Issue 3 Rev. 3

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **SWAMP ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: FOX UB40 TRUCK Easting: 286506.88 slope: -90° R.L. Surface: 0.82
 hole diameter: Northing: 6145441.04 bearing: datum:

drilling information				material substance			
method	penetration	support	notes	well details	depth	material	structure and additional observations
1 2 3	1 2 3 4	C	samples, tests, etc	RL	metres	soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADT		C			0	PEAT: low to medium plasticity, black	Organic layer
					1	Silty CLAY: high plasticity, grey	ALLUVIUM
					2	Silty SAND: fine grained, pale orange, yellow and grey	
			SPT 3,3,5 N*=8		3	CLAY: high plasticity, grey	
					4	Silty Sandy CLAY: high plasticity, grey with trace fine angular gravel	
			SPT 4,5,6 N*=11		5	Silty Clayey SAND: fine grained, pale green	
					6	CLAY: low plasticity, orange, brown and grey with trace medium angular gravel	
					7	Silty Clayey SAND: fine grained, pale green and grey with some trace angular gravel	
			SPT 25,-,- N*=R		8	CLAY: low plasticity, orange	V bit and TC bit refusal. SPT bouncing @ 4.65m (25, -, -) continued with rock roller
						Clayey GRAVEL: fine to coarse grained, angular with interbedded clay bands and shale bands.	ALLUVIUM
							SPT bouncing @ 6.72m (23, 25/70mm, -)

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method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Form GEO 5.10 Issue 3 Rev.0

Borehole No. **CBH5**

Engineering Log - Piezometer

Sheet 2 of 2

Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **21.3.2007**

Principal: **RTA**

Date completed: **21.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **SWAMP ROAD, JASPERS BRUSH (REFER SITE PLAN)**

Checked by:

drill model & mounting: FOX UB40 TRUCK Easting: 286506.88 slope: -90° R.L. Surface: 0.82
 hole diameter: Northing: 6145441.04 bearing: datum:

drilling information					material substance							
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
NMLC	1 2 3					9			Cobbles gravel and clay, cobbles and gravel rounded to sub rounded, brown to grey, clay pale grey and orange brown			ALLUVIUM
						10			NO CORE: 9.1m to 9.3m			
						11			Cobbles gravel and clay, cobbles and gravel rounded to sub rounded, brown to grey, clay pale grey and orange brown			
						12			Borehole terminated at 12m			
						13						
						14						
						15						
						16						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH6**
 Sheet 1 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **15.3.2007**
 Date completed: **16.3.2007**
 Logged by: **DD**
 Checked by:

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **O'KEEFES LANE, JASPERS BRUSH (REFER SITE PLAN)**

drill model and mounting: H-POWER SCOUT TRUCK Easting: 286860.61 slope: -90° R.L. Surface: 12.33
 hole diameter: 100 mm Northing 6146530 bearing: datum:

drilling information				material substance			
method	penetration	support	notes	depth	material	moisture	consistency/density index
1 2 3		water	samples, tests, etc	metres	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	index
ADV				12	TOPSOIL: Silty CLAY: low to medium plasticity, dark grey/brown, with some fine to medium grained sand	>Wp	St
			SPT 2,4,6 N*=10	1	Silty CLAY: medium plasticity, orange/brown, with a trace of fine to medium grained sand and rootlets	<Wp	
			SPT 4,7,26 N*=33	2	Silty CLAY: low plasticity, with some fine to medium grained gravel (ironstone)	H	
RR		20-30L		3	Silty CLAY: low to medium plasticity, orange/grey mottled, with some fine to medium grained gravel, rounded to sub-rounded, ironstone and iron staining	VSt/H	
			SPT 6,11,14 N*=25	4	Silty CLAY: low to medium plasticity, pale grey/orange mottled, with some fine to coarse grained gravel, sub-rounded to sub-angular, and ironstones, trace of iron staining	Wp	S
				9	Silty CLAY: low to medium plasticity, pale grey, with a trace of fine to medium grained sand and rootlets	<Wp	VSt
				8	Borehole CBH6 continued as cored hole		
				5			
				7			
				6			
				6			
				7			
				5			
				8			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

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Engineering Log - Cored Borehole

Borehole No. **CBH6**
 Sheet 2 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **15.3.2007**
 Date completed: **16.3.2007**
 Logged by: **DD**
 Checked by:

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **O'KEEFES LANE, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 286860.61 slope: -90° R.L. Surface: 12.33
 hole diameter: 100 mm Drilling fluid: Northing: 6146530 bearing: datum:

drilling information				material substance				rock mass defects						
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral axial	A-	RQD %	defect spacing mm	defect description
						rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH				30 100 300 1000 3000		particular general
			12	1										
			11	2										
			10	3										
			9	4										
			8	5										
			7	6										
			6	7										
			5	8										
			4	9										
			3	10										
			2	11										
			1	12										
			0	13										
			12	1										
			11	2										
			10	3										
			9	4										
			8	5										
			7	6										
			6	7										
			5	8										
			4	9										
			3	10										
			2	11										
			1	12										
			0	13										

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH6**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **15.3.2007**
 Date completed: **16.3.2007**
 Logged by: **DD**
 Checked by:


Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **O'KEEFES LANE, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 286860.61 slope: -90° R.L. Surface: 12.33
 hole diameter: 100 mm Drilling fluid: Northing: 6146530 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral A- axial	RQD %	defect spacing mm	defect description	
					rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness	
												particular	general
NQ Wireline				4	NO CORE: 7.0m to 8.33m (continued)					0			
				9	Silty CLAYSTONE: pale grey/grey, indistinct, and Silty CLAY: low to medium plasticity, pale grey, with some fine to coarse grained sand, fine grained gravel	DW			D A 0.25 0.26			PT, PL, VR, CN, 15 deg PT, PL, VR, CN, 10 to 15 deg	
				10	Sandy SILTSTONE: fine to medium grained, pale grey/grey, textured surface, no distinct bedding plane	SW				48		PT, IR, VR, CN, 0 to 5 deg PT, PL, RO, CN, 5 deg JT, PL, VR/ST, CN, 20 to 30 deg JT, CU, RO, CN, 30 to 40 deg JT, PL, RO, CN, 30 to 40 deg PT, PL, VR, CN, 5 to 10 deg JT, PL, RO, CN, 30 to 40 deg PT, PL, RO, CN, 0 to 5 deg PT, PL, VR, CN, 0 to 5 deg	
				11								PT, PL, RO, CN, 5 to 10 deg JT, PL, RO, CN, 5 to 10 deg	
				12	NO CORE: 11.2m to 11.28m Sandy SILTSTONE: fine to medium grained, pale grey/grey, textured surface, no distinct bedding plane	MW			D A 0.54 0.8			PT, IR, RO JT @ 70 deg, RO PT, PL, RO PT, PL, RO PT, PL, RO 12.02m to 12.22m: PT, PL, SO, 35mm long each defect 12.22m to 12.6m: CS 380mm long	
				13									
				14	CBH6 terminated at 13.98m								
				15									
				16									

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slicksided coating CN clean SN stained VN veneer CO coating
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Borehole No. **CBH6**
 Sheet 1 of 2
 Project No: **GEOTUNAN02580-AA**
 Date started: **15.3.2007**
 Date completed: **16.3.2007**
 Logged by: **DD**
 Checked by: 

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **O'KEEFES LANE, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 286860.61 slope: -90° R.L. Surface: 12.33
 hole diameter: Northing: 6146530 bearing: datum:

drilling information				material substance				
method	penetration	support	notes samples, tests, etc	well details	depth metres	material	structure and additional observations	
1 2 3						soil type: plasticity or particle characteristics, colour, secondary and minor components.		
						moisture condition	consistency/density index	
ADV					12	TOPSOIL: Silty CLAY: low to medium plasticity, dark grey/brown, with some fine to medium grained sand	>Wp St	TOPSOIL
			SPT 2,4,6 N*=10		1	Silty CLAY: medium plasticity, orange/brown, with a trace of fine to medium grained sand and rootlets	<Wp	ALLUVIUM
			SPT 4,7,26 N*=33		2	Silty CLAY: medium plasticity, orange/grey mottled, with a trace of fine to medium grained gravel and fine to medium grained sand (XW siltstone and ironstone), iron staining		
RR		20-30L			3	Silty CLAY: low plasticity, with some fine to medium grained gravel (ironstone)	H VS/Fb	Auger Drilling with TC Bit used between 2.2m and 2.3m Water loss beginning at 2.3m
			SPT 6,11,14 N*=25		4	Silty CLAY: low to medium plasticity, orange/grey mottled, with some fine to coarse grained gravel, rounded to sub-rounded, ironstone and iron staining	VS/H	
					5	Silty CLAY: low to medium plasticity, pale grey/orange mottled, with some fine to coarse grained gravel, sub-rounded to sub-angular, and ironstones, trace of iron staining		SPT sample 3.0m to 3.3m
					6	Silty CLAY: low to medium plasticity, pale grey, with a trace of fine to medium grained sand and rootlets	Wp S	SPT sample 3.3m to 3.4m
					7	Silty CLAY: low to medium plasticity, pale grey, with a trace of fine grained sand	<Wp VSt	XW SILTSTONE SPT sample 3.4m
NQ Wireline		40-50L			8	CLAYSTONE: pale grey/orange mottled, indistinct bedding		
					9	interbedded SILTSTONE: pale grey/grey and Silty CLAY: medium plasticity, pale grey, with some fine to coarse grained sand		
					10	NO CORE: 4.65m to 5.38m, possible silty clay layer, note increased water pressure at 4.7m to 4.8m with the NQ siezing briefly at 5.1m		
					11	interbedded SILTSTONE: pale grey/grey, indistinct bedding, iron staining, and Silty CLAY: pale grey/orange, low to medium plasticity		
					12	NO CORE: 6.51m to 6.52m		
					13	interbedded SILTSTONE: pale grey/grey, indistinct, iron staining, and Silty CLAY: medium plasticity, pale grey, with trace fine grained sand		
					14	NO CORE: 6.87m to 6.91m		
					15	SILTSTONE: pale grey/grey, indistinct, planar / irregular fracturing		
					16	NO CORE: 7.0m to 8.33m		

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH6**
 Sheet 2 of 2
 Project No: **GEOTUNAN02580-AA**
 Date started: **15.3.2007**
 Date completed: **16.3.2007**
 Logged by: **DD**
 Checked by:

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **O'KEEFES LANE, JASPERS BRUSH (REFER SITE PLAN)**


drill model & mounting: H-POWER SCOUT TRUCK Easting: 286860.61 slope: -90° R.L. Surface: 12.33
 hole diameter: Northing: 6146530 bearing: datum:

drilling information					material substance								
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1	2	3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NQ Wireline										NO CORE: 7.0m to 8.33m (continued)			
							9			Silty CLAYSTONE: pale grey/grey, indistinct, and Silty CLAY: low to medium plasticity, pale grey, with some fine to coarse grained sand, fine grained gravel			
							10			Sandy SILTSTONE: fine to medium grained, pale grey/grey, textured surface, no distinct bedding plane			
							11						
							12			NO CORE: 11.2m to 11.28m Sandy SILTSTONE: fine to medium grained, pale grey/grey, textured surface, no distinct bedding plane			
							13						
							14			Borehole terminated at 13.98m			
							15						
							16						

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.10 Issue 3 Rev.0






method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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



Borehole No. **CBH7**
 Sheet 1 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **8.3.2007**
 Date completed: **8.3.2007**
 Logged by: **CA**
 Checked by: 

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **CROZIERS ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model and mounting: GEMCO TRAILER Easting: 286888.82 slope: -90° R.L. Surface: 30.98
 hole diameter: 100 mm Northing 6147548.74 bearing: datum:

drilling information				material substance							
method	penetration	support	notes	depth	graphic log	classification	material	moisture	consistency/density index	pocket penetrometer	structure and additional observations
1 2 3		water	samples, tests, etc	RL	metres	symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition	index	100 200 300 400 kPa	
ADV		C		30			FILL: Clayey Silty GRAVEL: fine to coarse grained, grey and brown, angular gravel	M	D		FILL
				29			Silty CLAY: high plasticity, red/brown and grey mottled	D	VS _t		RESIDUAL
			SPT 4,10,R N*=R	28			SILTSTONE: laminated orange/brown and pale grey to grey, very low strength		H		XW SILTSTONE
				27			Silty CLAY: medium to high plasticity, orange/brown and grey banded	M	H		XW/HW SILTSTONE SPT bouncing at 1.91m (4,10,13/110m) XW SILTSTONE
			SPT 24,-,- N*=R	26			SILTSTONE: laminated, orange/brown and grey, very low strength				SPT refusal at 3.15m (24/150mm, - v.-) XW/HW SILTSTONE
ADT				25			Borehole CBH7 continued as cored hole				HW/MW SILTSTONE
				24							
				23							

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to 4 refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VS _t very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Cored Borehole

Borehole No. **CBH7**
 Sheet 2 of 3
 Project No. **GEOTUNAN02580-AA**
 Date started: **8.3.2007**
 Date completed: **8.3.2007**
 Logged by: **CA**
 Checked by:

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **CROZIERS ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 286888.82 slope: -90° R.L. Surface: 30.98
 hole diameter: 100 mm Drilling fluid: Northing: 6147548.74 bearing: datum:


drilling information				material substance				rock mass defects			
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	Is(50) MPa	D-diam- etral A-axial	defect spacing mm	defect description
					rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH			30 100 300 1000 3000	particular general
			30	1							
			29	2							
			28	3							
			27	4	SILTSTONE: dark grey to brown, laminated @ 0 deg orange brown bands	DW		0.25 0.71	D A		JT @ 80 deg
NQ					NO CORE: 4.56m to 4.76						SM, 50mm XW rock (gravel appearance)
			26	5	SILTSTONE: dark grey laminated @ 0 deg with orange brown bands			0.4 1.02	D A		JT @ 70 deg
			25	6							JT @ 60 deg
			24	7	NO CORE: 7.2m to 7.5m			1.08 0.85	D A		SM @ 90 deg: closed 2mm thick
			23	8	SILTSTONE: orange brown, laminated @ 0 deg, some wavy laminae			0.4 0.69	D A		

PT, SM & JT @ 10mm to 80mm, PL RO, SN

CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.5 Issue 3 Rev. 3

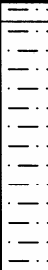
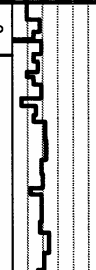
method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NO, HO, PO wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slicksided coating CN clean SN stained VN veneer CO coating
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









Borehole No. **CBH7**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **8.3.2007**
 Date completed: **8.3.2007**
 Logged by: **CA**
 Checked by: 

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **CROZIERS ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 286888.82 slope: -90° R.L. Surface: 30.98
 hole diameter: 100 mm Drilling fluid: Northing: 6147548.74 bearing: datum:

drilling information				material substance				rock mass defects				
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	Is(50) MPa D- diam- A- axial	RQD %	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness
								VL L M H VH EH		30 100 300 1000 3000		particular general
NQ			22	9		SILTSTONE: grey, laminated @ 0 deg, some wavy laminae and some fine grained sand particles	MW/SW		0.69 0.96	0		JT @ 90 deg: orange brown SN PT & JT @ 0 to 45 deg, PL, RO CN @ 30mm to 120 mm spacing
			21	10		CBH7 terminated at 9.85m			1.44 4.01			
			20	11								
			19	12								
			18	13								
			17	14								
			16	15								
			15	16								

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols  indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **8.3.2007**

Principal: **RTA**

Date completed: **8.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **CROZIERS ROAD, JASPERS BRUSH (REFER SITE PLAN)**

Checked by:

drill model & mounting: GEMCO TRAILER Easting: 286888.82 slope: -90° R.L. Surface: 30.98
hole diameter: Northing: 6147548.74 bearing: datum:

drilling information				material substance								
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1 2 3									soil type: plasticity or particle characteristics, colour, secondary and minor components.			
ADV		C				30	1		FILL: Clayey Silty GRAVEL: fine to coarse grained, grey and brown, angular gravel	M	D	FILL
						29	2		Silty CLAY: high plasticity, red/brown and grey mottled	D	Vst	RESIDUAL
			SPT 4,10,R N*=R			28	3		SILTSTONE: laminated orange/brown and pale grey to grey, very low strength			XW/HW SILTSTONE SPT bouncing at 1.91m (4,10,13/110m)
						27	4		Silty CLAY: medium to high plasticity, orange/brown and grey banded	M	H	XW SILTSTONE
			SPT 24,-,- N*=R			26	5		SILTSTONE: laminated, orange/brown and grey, very low strength			XW/HW SILTSTONE SPT refusal at 3.15m (24/150mm, -,-)
						25	6		SILTSTONE: dark grey to brown, laminated @ 0 deg orange brown bands			HW/MW SILTSTONE
						24	7		NO CORE: 4.56m to 4.76			
						23	8		SILTSTONE: dark grey laminated @ 0 deg with orange brown bands			
									NO CORE: 7.2m to 7.5m			
									SILTSTONE: orange brown, laminated @ 0 deg, some wavy laminae			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH7**
 Sheet 2 of 2
 Project No: **GEOTUNAN02580-AA**
 Date started: **8.3.2007**
 Date completed: **8.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Piezometer


Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **CROZIERS ROAD, JASPERS BRUSH (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 286888.82 slope: -90° R.L. Surface: 30.98
 hole diameter: Northing: 6147548.74 bearing: datum:

drilling information					material substance							
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NQ						9			SILTSTONE: grey, laminated @ 0 deg, some wavy laminae and some fine grained sand particles			
						10			Borehole terminated at 9.85m			
						11						
						12						
						13						
						14						
						15						
						16						

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07






method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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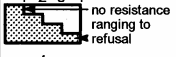
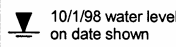
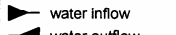
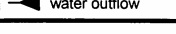
Borehole No. **CBH8**
 Sheet 1 of 1
 Project No: **GEOTUNAN02580-AA**
 Date started: **13.3.2007**
 Date completed: **13.3.2007**
 Logged by: **DD**
 Checked by: 

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **COOLANGATTA ROAD, BERRY (REFER SITE PLAN)**

drill model and mounting: H-POWER SCOUT TRUCK Easting: 289214.94 slope: -90° R.L. Surface: 2.32
 hole diameter: 100 mm Northing 6147809.01 bearing: datum:

drilling information				material substance											
method	penetration			notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer			structure and additional observations
	1	2	3									100 kPa	200 kPa	300 kPa	
ADV					2				Gravelly SAND: fine to coarse grained, brown, with fine to medium grained gravel, subrounded to subangular with some silty clay, with a trace of rootlets	<Wp	D				FILL
				SPT 2,0,2 N*=2		1			Silty CLAY: medium plasticity, dark grey, with trace of fine to medium grained sand	Wp	VS/S		X		1.0m to 1.1m: ASS Sample
						2									
					0				2.3m to 2.4m: gravel lense	>Wp	S		X		2.5m to 2.6m: Ass Sample
				SPT 4,5,6 N*=11		3			Silty CLAY: medium plasticity, pale brown, with a trace of fine to medium grained sand	<=Wp	St		X		RESIDUAL
						3			Sandy CLAY: medium to high plasticity, pale grey / orange mottled, with fine to coarse grained sand, with a trace of XW sandstone gravel fine to medium iron staining and rootlets				X		2.6m to 2.8m: SPT Sample
						4							X		2.8m to 2.9m: ASS Sample
						4			Silty CLAY: medium to high plasticity, grey / pale green	>=Wp					Cuttings turned to a clay slurry from 4.2m to 6.0m
						5							X		
				SPT 3,7,9 N*=16		5			Silty CLAY: medium high plasticity, pale grey, with a trace of fine to coarse sand and coarse gravel, subrounded to subangular, iron staining		St		X		4.6m to 4.7m: ASS Sample
						6							X		4.75m to 4.9m: SPT Sample
						6			Gravels and possibly cobbles						Drilling terminated, so not to damage augers
ADT						6									
						7			Borehole CBH8 terminated at 6.6m						
						8									

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH8**
 Sheet 1 of 1
 Project No: **GEOTUNAN02580-AA**
 Date started: **13.3.2007**
 Date completed: **13.3.2007**
 Logged by: **DD**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **COOLANGATTA ROAD, BERRY (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 289214.94 slope: -90° R.L. Surface: 2.32
 hole diameter: 100 mm Drilling fluid: Northing: 6147809.01 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	Is(50) MPa	D-diam- etral A-axial	defect spacing mm	defect description	
						rock type; grain characteristics, colour, structure, minor components						type, inclination, planarity, roughness, coating, thickness	
												particular	general
ADV			2	0		Gravelly SAND: fine to coarse grained, brown, with fine to medium grained gravel, subrounded to subangular with some silty clay, with a trace of rootlets Silty CLAY: medium plasticity, dark grey, with trace of fine to medium grained sand							
			1	0		2.3m to 2.4m: gravel lense Silty CLAY: medium plasticity, pale brown, with a trace of fine to medium grained sand Sandy CLAY: medium to high plasticity, pale grey / orange mottled, with fine to coarse grained sand, with a trace of XW sandstone gravel fine to medium iron staining and rootlets							
			3	-1		Silty CLAY: medium to high plasticity, grey / pale green							
			4	-2		Silty CLAY: medium high plasticity, pale grey, with a trace of fine to coarse sand and coarse gravel, subrounded to subangular, iron staining							
			5	-3									
			6	-4		Gravels and possibly cobbles							
ADT			7	-5		CBH8 terminated at 6.6m							
			8										

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/198 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

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Borehole No. **CBH8**
 Sheet 1 of 1
 Project No: **GEOTUNAN02580-AA**
 Date started: **13.3.2007**
 Date completed: **13.3.2007**
 Logged by: **DD**
 Checked by:

Engineering Log - Piezometer


Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **COOLANGATTA ROAD, BERRY (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 289214.94 slope: -90° R.L. Surface: 2.32
 hole diameter: Northing: 6147809.01 bearing: datum:

drilling information				material substance			
method	penetration	support	notes samples, tests, etc	well details	depth metres	material	structure and additional observations
1 2 3				RL		soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADV					2	Gravelly SAND: fine to coarse grained, brown, with fine to medium grained gravel, subrounded to subangular with some silty clay, with a trace of rootlets	FILL
			SPT 2,0,2 N*=2		1	Silty CLAY: medium plasticity, dark grey, with trace of fine to medium grained sand	1.0m to 1.1m: ASS Sample
					2		
					0		
			SPT 4,5,6 N*=11		3	2.3m to 2.4m: gravel lense Silty CLAY: medium plasticity, pale brown, with a trace of fine to medium grained sand Sandy CLAY: medium to high plasticity, pale grey / orange mottled, with fine to coarse grained sand, with a trace of XW sandstone gravel fine to medium iron staining and rootlets	2.5m to 2.6m: Ass Sample RESIDUAL 2.6m to 2.8m: SPT Sample 2.8m to 2.9m: ASS Sample
					4	Silty CLAY: medium to high plasticity, grey / pale green	Cuttings turned to a clay slurry from 4.2m to 6.0m
			SPT 3,7,9 N*=16		5	Silty CLAY: medium high plasticity, pale grey, with a trace of fine to coarse sand and coarse gravel, subrounded to subangular, iron staining	4.6m to 4.7m: ASS Sample 4.75m to 4.9m: SPT Sample
					6	Gravels and possibly cobbles	Drilling, so not to damage augers
ADT					7	Borehole terminated at 6.6m	
					8		

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VS _t very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH9**
 Sheet 1 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **12.3.2007**
 Logged by: **CA**
 Checked by: 

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **HITCHCOCKS LANE, BERRY (REFER SITE PLAN)**

drill model and mounting: GEMCO TRAILER Easting: 287601.18 slope: -90° R.L. Surface: 18.28
 hole diameter: 100 mm Northing 6149456.15 bearing: datum:

drilling information				material substance								
method	penetration	support	notes	RL	depth	graphic log	classification	material	moisture	consistency/density index	pocket penetrometer	structure and additional observations
1 2 3			samples, tests, etc		metres		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition		kPa	
ADV		C		18				GRAVEL: roadbase fill, angular CLAY: low plasticity, orange/brown	D	S/F		FILL
					1			CLAY: low to medium plasticity, orange/brown				
				17				Silty CLAY: weathered low to medium plasticity, orange/brown with fine angular gravel pieces		St		SPT bouncing @ 1.65 m. (13/150mm, -, -.)
			SPT 13,-,- N*=R		2			Silty CLAY: weathered low plasticity, light brown		VSt		V bit refusal on very stiff clay band
				16				Silty CLAY: low to medium plasticity, dark brown with approx 60% fine angular gravel pieces		St		
ADT				15				Silty CLAY: extremely weathered, low to medium plasticity, brown with approx 20% fine angular gravel pieces		St		
				14				Silty CLAY: extremely weathered, medium plasticity with approx 60% fine to medium grained gravel fraction	M	VSt		Extremely weathered rock
				13								
				12				Borehole CBH9 continued as cored hole				TC Bit Refusal
				11								
				8								

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH9**
 Sheet 2 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **12.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **HITCHCOCKS LANE, BERRY (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 287601.18 slope: -90° R.L. Surface: 18.28
 hole diameter: 100 mm Drilling fluid: Northing: 6149456.15 bearing: datum:

drilling information				material substance				rock mass defects							
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	IS ₍₅₀₎ MPa	D- diam- etral	A- axial	RQD %	defect spacing mm	defect description	
						rock type; grain characteristics, colour, structure, minor components	VL L M H VH EH	VL L M H VH EH				30 100 300 1000 3000		particular	general
			18	1											
			17	2											
			16	3											
			15	4											
			14	5											
			13	6											
NQ			12	7		SILTSTONE: grey, indistinct bedding planes with some shell fossils that become more abundant with depth.	MW/SW		B A 0.6 0.71			12		- PT, PL - JT @ 45 deg PL - JT @ 45 deg PL, SO - JT @ 45 deg PL, SO - JT @ 45 deg RO - JT @ 30 deg - INFILLED SM @ 45 deg, 2mm wide, PL	
			11	8								72			

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.5 Issue 3 Rev. 3

Engineering Log - Cored Borehole

Borehole No. **CBH9**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **12.3.2007**
 Logged by: **CA**
 Checked by:

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **HITCHCOCKS LANE, BERRY (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 287601.18 slope: -90° R.L. Surface: 18.28
 hole diameter: 100 mm Drilling fluid: Northing: 6149456.15 bearing: datum:

drilling information				material substance				rock mass defects				
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral A- axial	RQD %	defect spacing mm	defect description
					rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness
												particular
												general
NQ				10	SILTSTONE: grey, indistinct bedding planes with some shell fossils that become more abundant with depth. (continued)	MW/SW				72		— JT @ 45 deg PL, SO
				9								— JT, CU @ 0 - 50 deg ST, SO
				9								— CORE BARREL JAMMED
				10								— SZ, UN, RO
				10	CBH9 terminated at 9.93m							— JT @ 45 deg
				10								— HIGHLY WEATHERED SEAM 50mm thick
				10								— SM, IR, RO with high abundance of relict shell fish
				8								
				11								
				7								
				12								
				6								
				13								
				5								
				14								
				4								
				15								
				3								
				16								

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Borehole No. **CBH9**

Engineering Log - Piezometer

Sheet 1 of 2
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **12.3.2007**

Principal: **RTA**

Date completed: **12.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **HITCHCOCKS LANE, BERRY (REFER SITE PLAN)**

Checked by:

drill model & mounting: GEMCO TRAILER Easting: 287601.18 slope: -90° R.L. Surface: 18.28
hole diameter: Northing: 6149456.15 bearing: datum:

drilling information					material substance							
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1 2 3									soil type: plasticity or particle characteristics, colour, secondary and minor components.			
ADV		C				18			GRAVEL: roadbase fill, angular CLAY: low plasticity, orange/brown	D	S/F	FILL
						1			CLAY: low to medium plasticity, orange/brown			
						17			Silty CLAY: weathered low to medium plasticity, orange/brown with fine angular gravel pieces		St	
			SPT 13,-,- N*=R			2			Silty CLAY: weathered low plasticity, light brown		VSt	SPT bouncing @ 1.65 m. (13/150mm, -,-)
						16			Silty CLAY: low to medium plasticity, dark brown with approx 60% fine angular gravel pieces		St	V bit refusal on very stiff clay band
ADT						3			Silty CLAY: extremely weathered, low to medium plasticity, brown with approx 20% fine angular gravel pieces		St	
						15			Silty CLAY: extremely weathered, medium plasticity with approx 60% fine to medium grained gravel fraction	M	VSt	Extremely weathered rock
						14						
						13						
						12			SILTSTONE: grey, indistinct bedding planes with some shell fossils that become more abundant with depth.			TC Bit Refusal
NQ						7						
						11						
						8						

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Form GEO 5.10 Issue 3 Rev.0

Borehole No. **CBH9**
 Sheet 2 of 2
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **12.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **HITCHCOCKS LANE, BERRY (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 287601.18 slope: -90° R.L. Surface: 18.28
 hole diameter: Northing: 6149456.15 bearing: datum:

drilling information					material substance						
method	penetration	support	notes	well	depth	graphic log	classification	material	moisture	consistency/density index	structure and additional observations
1 2 3		water	samples, tests, etc	details	metres		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition		
NQ					10			SILTSTONE: grey, indistinct bedding planes with some shell fossils that become more abundant with depth. (continued)			Fossilised shells greatly weaken the lateral strength of this core sample and resulted in the core barrel frequently jamming up.
					9						
					10			Borehole terminated at 9.93m			
					8						
					11						
					7						
					12						
					6						
					13						
					5						
					14						
					4						
					15						
					3						
					16						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Engineering Log - Borehole

Client: **MAUNSELL AECOM**

Date started: **22.3.2007**

Principal: **RTA**

Date completed: **22.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

Checked by:

drill model and mounting:	FOX UB40 TRUCK	Easting:	290183.5	slope:	-90°	R.L. Surface:	26.62
hole diameter:	100 mm	Northing	6149972.19	bearing:		datum:	

drilling information				material substance							
method	penetration	support	notes samples, tests, etc	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
1 2 3				RL			soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400 kPa	
ADV		C		26			Gravel FILL: roadbase	D	L		FILL RESIDUAL
ADT				1			Clayey SAND: Fine grained, pale brown, some minor trace coarse gravel < 10%		S/F		
			SPT 25,130,R N*=R	25			Silty CLAY: low plasticity, light brown		H		V Bit Refusal
				2			Sandy CLAY: low plasticity, pale yellow, brown and orange				SPT bouncing @ 1.63m (25/130,-,-)
				24			Silty CLAY: low to medium plasticity, light brown	M			Extremely to highly weathered rock
			SPT 25,70,R N*=R	23			CLAY: low plasticity, pale yellow / light brown, weakly cemented	D			SPT bouncing @ 3.07m (25/70,-,-)
			SPT 13,70,R N*=R	22			Borehole CBH10 continued as cored hole				SPT bouncing @ 4.27m TC Bit Refusal (13/70,-,-)
				21							
				20							
				19							
				8							

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH10**
 Sheet 2 of 4
 Project No: **GEOTUNAN02580-AA**
 Date started: **22.3.2007**
 Date completed: **22.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

drill model & mounting: FOX UB40 TRUCK Easting: 290183.5 slope: -90° R.L. Surface: 26.62
 hole diameter: 100 mm Drilling fluid: Northing: 6149972.19 bearing: datum:

drilling information				material substance					rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral A- axial	RQD %	defect spacing mm	defect description	
						rock type; grain characteristics, colour, structure, minor components		VL L M H VH EH				30 100 300 1000 3000	particular	general
			26	1										
			25	2										
			24	3										
			23	4										
NMLC			22	5		CLAYSTONE: massive, pale brown with iron staining	DW				41		- JT @ 20 deg PL, RO, SN - JT @ 60 deg PL, RO, SN - JT @ 70 deg UN, RO	
			21	6		Silty SANDSTONE: fine grained, dark grey and pale blue, distinctly laminated @ 0 deg with iron staining between some joints and partings			D A 1.22 2.44				- JT @ 45 deg UN, RO - PT, RO - PT, PL, RO - PT, PL, RO	
	crushed seam		20	7					D A 1.73 2.24		23		- PT, IR, RO - JT @ 60 deg RO, SN - PT, UN, RO, SN - SM, 20mm wide extremely weathered - JT @ 5 deg ST, RO - JT @ 45 deg - JT @ 5 deg ST, RO - CS 90mm wide, extremely weathered - JT @ 15 to 30 deg adn 90mm long	
			19	8			SW		D A 0.71 2.72		36			

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Form GEO 5.5 Issue 3 Rev. 3 CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Engineering Log - Cored Borehole

Borehole No. **CBH10**
 Sheet 3 of 4
 Project No: **GEOTUNAN02580-AA**
 Date started: **22.3.2007**
 Date completed: **22.3.2007**
 Logged by: **CA**
 Checked by:

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

drill model & mounting: FOX UB40 TRUCK Easting: 290183.5 slope: -90° R.L. Surface: 26.62
 hole diameter: 100 mm Drilling fluid: Northing: 6149972.19 bearing: datum:


drilling information				material substance				rock mass defects						
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength				defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness	
								VL	L	M	H			EH
NMLC				18		Clayey SANDSTONE: fine grained, pale orange and yellow, laminated @ 0 deg	DW							
				9		Silty SANDSTONE: fine grained, dark grey and pale blue, distinctly laminated @ 0 deg with iron staining between some joints and partings	SW/FR							
				17										
				10										
				16										
				11										
				15										
				12										
				14										
				13										
				13										
				14		CLAYSTONE - dark yellow, highly weathered seam	XW							
						SANDSTONE: fine to medium grained, yellow, distinctly laminated @ 0 deg	FR							
				12		Silty SANDSTONE: fine grained, pale blue and grey, laminated @ 0 deg with medium white fragments, the sandstone fraction is coarser grained with depth								
				15										
				11										
				16										

PT, PL, RO, SN
 JT @ 0 to 80 deg. Mostly PL, RO, SN with some CU & UN

CORED BOREHOLE GU02580-AA LOGS GPJ COFFEY.GDT 4.6.07

Form GEO 5.5 Issue 3 Rev. 3

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Borehole No. **CBH10**
 Sheet 4 of 4
 Project No: **GEOTUNAN02580-AA**
 Date started: **22.3.2007**
 Date completed: **22.3.2007**
 Logged by: **CA**
 Checked by: 











Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

drilling information				material substance				rock mass defects			
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	IS ₍₅₀₎ MPa	defect spacing mm	defect description	
					rock type; grain characteristics, colour, structure, minor components					particular	general
NMLC			10	17	Silty SANDSTONE: fine grained, pale blue and grey, laminated @ 0 deg with medium white fragments, the sandstone fraction is coarser grained with depth (<i>continued</i>)	FR			100		
			9	18	CBH10 terminated at 17.05m						
			8	19							
			7	20							
			6	21							
			5	22							
			4	23							
			3	24							

CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.5 Issue 3 Rev. 3

method DT dialtube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Borehole No. **CBH10**

Engineering Log - Piezometer

Sheet 1 of 3
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **22.3.2007**

Principal: **RTA**

Date completed: **22.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

Checked by:

drill model & mounting: FOX UB40 TRUCK Easting: 290183.5 slope: -90° R.L. Surface: 26.62
hole diameter: Northing: 6149972.19 bearing: datum:

drilling information				material substance								
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1 2 3									soil type: plasticity or particle characteristics, colour, secondary and minor components.			
ADV		C				26			Gravel FILL: roadbase	D	L	FILL RESIDUAL
ADT						1			Clayey SAND: Fine grained, pale brown, some minor trace coarse gravel < 10%	S/F		
			SPT 25,130,R N*=R			2			Silty CLAY: low plasticity, light brown	H		V Bit Refusal
						25			Sandy CLAY: low plasticity, pale yellow, brown and orange			SPT bouncing @ 1.63m (25/130,-,-)
						24			Silty CLAY: low to medium plasticity, light brown	M		Extremely to highly weathered rock
			SPT 25,70,R N*=R			3			CLAY: low plasticity, pale yellow / light brown, weakly cemented	D		SPT bouncing @ 3.07m (25/70, -, -)
						23						
			SPT 13,70,R N*=R			4			CLAYSTONE: massive, pale brown with iron staining			SPT bouncing @ 4.27m TC Bit Refusal (13/70, -, -)
NMLC						22						
						21			Silty SANDSTONE: fine grained, dark grey and pale blue, distinctly laminated @ 0 deg with iron staining between some joints and partings			
						20						
						19						
						8						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 no resistance 2 ranging to 3 refusal 4 refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.10 Issue 3 Rev.0

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **22.3.2007**


Principal: **RTA**

Date completed: **22.3.2007**

















Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

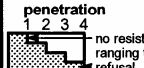



Logged by: **CA**

Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

Checked by: 

drill model & mounting: FOX UB40 TRUCK	Easting: 290183.5	slope: -90°	R.L. Surface: 26.62
hole diameter:	Northing: 6149972.19	bearing:	datum:

drilling information					material substance							
method	penetration	support	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1	2	3							soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NMLC						18			Clayey SANDSTONE: fine grained, pale orange and yellow, laminated @ 0 deg			
						9			Silty SANDSTONE: fine grained, dark grey and pale blue, distinctly laminated @ 0 deg with iron staining between some joints and partings			
						17						
						10						
						16						
						11						
						15						
						12						
						14						
						13						
						13			CLAYSTONE - dark yellow, highly weathered seam			
						14			SANDSTONE: fine to medium grained, yellow, distinctly laminated @ 0 deg			
						12			Silty SANDSTONE: fine grained, pale blue and grey, laminated @ 0 deg with medium white fragments, the sandstone fraction is coarser grained with depth			
						15						
						11						
						16						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 2 3 4 no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH10**

Engineering Log - Piezometer

Sheet 3 of 3
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **22.3.2007**


Principal: **RTA**

Date completed: **22.3.2007**


Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**


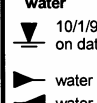
Logged by: **CA**

Borehole Location: **PRINCES HWY, BERRY (REFER SITE PLAN)**

Checked by: 

drill model & mounting: FOX UB40 TRUCK Easting: 290183.5 slope: -90° R.L. Surface: 26.62
hole diameter: Northing: 6149972.19 bearing: datum:

drilling information					material substance								
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1 2 3										soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NMLC						10	17			Silty SANDSTONE: fine grained, pale blue and grey, laminated @ 0 deg with medium white fragments, the sandstone fraction is coarser grained with depth (continued)			
						9	18			Borehole terminated at 17.05m			
						8	19						
						7	20						
						6	21						
						5	22						
						4	23						
						3	24						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 2 3 4 no resistance ranging to *refusal water  ▼ 10/1/98 water level on date shown ▲ water inflow ▲ water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH11**
 Sheet 1 of 1
 Project No: **GEOTUNAN02580-AA**
 Date started: **14.3.2007**
 Date completed: **14.3.2007**
 Logged by: **DD**
 Checked by:

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **BONG BONG ROAD, BROUGHTON (REFER SITE PLAN)**

drill model and mounting: H-POWER SCOUT TRUCK Easting: 289360.09 slope: -90° R.L. Surface: 26.86
 hole diameter: 100 mm Northing 6151157.1 bearing: datum:

drilling information				material substance											
method	penetration			notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/density index	pocket penetrometer			structure and additional observations
	1	2	3									100 kPa	200 kPa	300 kPa	
ADV				SPT 3,4,4 N*=8	26	1			TOPSOIL: Gravely Silty SAND: fine to coarse grained, brown, with fine to medium grained gravel, subangular Silty CLAY: medium plasticity, brown/green/red mottled, with a trace of fine sand, and fine to medium grained gravel from 0.15m to 0.6m	M Wp	MD F/St				FILL - TOPSOIL ALLUVIUM 0.6m to 0.7m: ASS Sample 0.7m to 0.8m: SPT Sample
				SPT 2,3,4 N*=7	25	2			Silty CLAY: low to medium plasticity, pale yellow/orange/white mottled, with a trace of fine to medium grained sand, fine grained gravel subrounded to subangular		VSt				1.6m to 1.7m: ASS Sample 1.7m to 1.8m: SPT Sample
				SPT 5,8,20 N*=28	23	4			Silty CLAY: low to medium plasticity, pale yellow/white, some fine to coarse grained sand Sandy Silty CLAY: low plasticity, white, fine to medium sand, with a trace of fine gravel subrounded to subangular 3.7m to 4.2m: Gravels, sandstone, fine to medium grained, subrounded to rounded	<Wp	VSt/H				3.1m to 3.2m: ASS Sample RESIDUAL 3.2m to 3.3m: SPT Sample XW SANDSTONE 3.36m to 3.45m: SPT Sample 4.0m to 4.2m: Grab Sample
ADT									Borehole CBH11 terminated at 4.2m						
					22	5									
					21	6									
					20	7									
					19	8									

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **14.3.2007**

Principal: **RTA**

Date completed: **14.3.2007**

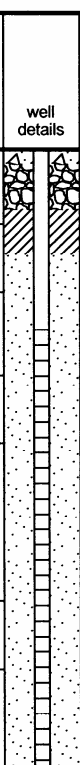
Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**





Logged by: **DD**

Borehole Location: **BONG BONG ROAD, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: H-POWER SCOUT TRUCK Easting: 289360.09 slope: -90° R.L. Surface: 26.86
 hole diameter: Northing: 6151157.1 bearing: datum:

drilling information				material substance			
method	penetration	support	notes samples, tests, etc	well details	depth metres	material	structure and additional observations
1 2 3						soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADV			SPT 3,4,4 N*=8		1	TOPSOIL: Gravelly Silty SAND: fine to coarse grained, brown, with fine to medium grained gravel, subangular Silty CLAY: medium plasticity, brown/green/red mottled, with a trace of fine sand, and fine to medium grained gravel from 0.15m to 0.6m	FILL - TOPSOIL ALLUVIUM 0.6m to 0.7m: ASS Sample 0.7m to 0.8m: SPT Sample
			SPT 2,3,4 N*=7		2	Silty CLAY: low to medium plasticity, pale yellow/orange/white mottled, with a trace of fine to medium grained sand, fine grained gravel subrounded to subangular	1.6m to 1.7m: ASS Sample 1.7m to 1.8m: SPT Sample
			SPT 5,8,20 N*=28		3	Silty CLAY: low plasticity, pale yellow/white, with some fine to medium grained gravel subrounded of ironstone and sandstone	
ADT					4	Silty CLAY: low to medium plasticity, pale yellow/white, some fine to coarse grained sand Sandy Silty CLAY: low plasticity, white, fine to medium sand, with a trace of fine gravel rubounded to subangular 3.7m to 4.2m: Gravels, sandstone, fine to medium grained, subrounded to rounded	3.1m to 3.2m: ASS Sample RESIDUAL 3.2m to 3.3m: SPT Sample XV SANDSTONE 3.36m to 3.45m: SPT Sample 4.0m to 4.2m: Grab Sample
					5	Borehole terminated at 4.2m	
					6		
					7		
					8		

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 2 3 4 no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VS _t very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH12**
 Sheet 1 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **29.3.2007**
 Date completed: **29.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TINDALLS LANE, BROUGHTON (REFER SITE PLAN)**


drill model and mounting: GEMCO TRAILER Easting: 291640.56 slope: -90° R.L. Surface: 45.52
 hole diameter: 100 mm Northing 6150962.31 bearing: datum:

drilling information				material substance								
method	penetration	support	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer kPa	structure and additional observations
1 2 3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
ADV		C		45	1			Silty SAND: fine grained, brown with some trace roots	D	L		ALLUVIUM
				44	2			Silty SAND: fine to medium grained, brown with trace rounded gravel				
			SPT 3,4,7 N*=11	44	2			Silty CLAY: medium plasticity, yellow/brown and orange	M	St		RESIDUAL
				43	3			Silty CLAY: low plasticity, pale yellow	D	VSt		
			SPT 6,9,14 N*=23	42	4							
				41	5			Silty CLAY: low plasticity, pale orange and yellow				
			SPT 7,10,14 N*=24	40	6							
				39	6			Silty Sandy CLAY: low plasticity, pale yellow and pale orange				SPT bouncing @ 6.33m (6, 13, 5/30)
			SPT 6,13,R N*=R	39	6							extremely weathered
ADT				38	7			Borehole CBH12 continued as cored hole				V Bit Refusal
				38	8							

BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 6.6.07

Form GEO 5.3 Issue 3 Rev.2


method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow 	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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









Borehole No. **CBH12**
 Sheet 2 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **29.3.2007**
 Date completed: **29.3.2007**
 Logged by: **CA**
 Checked by: 

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TINDALLS LANE, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 291640.56 slope: -90° R.L. Surface: 45.52
 hole diameter: 100 mm Drilling fluid: Northing: 6150962.31 bearing: datum:

drilling information				material substance					rock mass defects									
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength					defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness				
								VL	L	M	H	EH			IS ₍₅₀₎ MPa D-diam- etral A-axial	RQD %	30	100
			45	1														
			44	2														
			43	3														
			42	4														
			41	5														
			40	6														
			39	7														
NQ			38	8		Silty SANDSTONE: fine grained, grey to pale grey	FR						100					

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols  indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH12**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **29.3.2007**
 Date completed: **29.3.2007**
 Logged by: **CA**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TINDALLS LANE, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: GEMCO TRAILER Easting: 291640.56 slope: -90° R.L. Surface: 45.52
 hole diameter: 100 mm Drilling fluid: Northing: 6150962.31 bearing: datum:

drilling information				material substance				rock mass defects													
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength				D-axial	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness							
								VL	L	M	H				VH	EH	RQD %	30	100	300	1000
NQ				37		Silty SANDSTONE: fine grained, grey to pale grey (continued)	FR														
				9																	
				36																	
				10																	
				35																	
				11																	
				34																	
				12																	
				33																	
				13																	
				32																	
				14																	
				31																	
				15																	
				30																	
				16		CBH12 terminated at 15.74m															

- JT @ 75 deg PL, 150mm long
 - PT, PL, SO
 - JT @ 45 deg PL, SO

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **29.3.2007**

Principal: **RTA**

Date completed: **29.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **CA**

Borehole Location: **TINDALLS LANE, BROUGHTON (REFER SITE PLAN)**

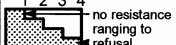
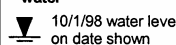
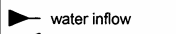
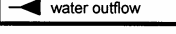
Checked by: 

drill model & mounting: GEMCO TRAILER Easting: 291640.56 slope: -90° R.L. Surface: 45.52
 hole diameter: Northing: 6150962.31 bearing: datum:

drilling information				material substance			
method	penetration	support	notes samples, tests, etc	well details	depth metres	material	structure and additional observations
1 2 3				RL		soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADV		C			45	Silty SAND: fine grained, brown with some trace roots	ALLUVIUM
					1	Silty SAND: fine to medium grained, brown with trace rounded gravel	
			SPT 3,4,7 N*=11		44	Silty CLAY: medium plasticity, yellow/brown and orange	RESIDUAL
					2		
					43	Silty CLAY: low plasticity, pale yellow	
			SPT 6,9,14 N*=23		3		
					42		
					41	Silty CLAY: low plasticity, pale orange and yellow	
			SPT 7,10,14 N*=24		4		
					40		
					39	Silty Sandy CLAY: low plasticity, pale yellow and pale orange	
			SPT 6,13,R N*=R		6		SPT bouncing @ 6.33m (6, 13, 5/30)
					7	Silty SANDSTONE: fine grained, grey to pale grey	extremely weathered V Bit Refusal TC Bit Refusal
					8		

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 6.6.07

Form GEO 5.10 Issue 3 Rev.0

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH12**

Engineering Log - Piezometer

Sheet 2 of 2
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **29.3.2007**

Principal: **RTA**

Date completed: **29.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**





Logged by: **CA**

Borehole Location: **TINDALLS LANE, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: GEMCO TRAILER Easting: 291640.56 slope: -90° R.L. Surface: 45.52
hole diameter: Northing: 6150962.31 bearing: datum:

drilling information					material substance						
method	penetration	support	notes samples, tests, etc	well details	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1 2 3				RL				soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NQ					37			Silty SANDSTONE: fine grained, grey to pale grey (continued)			
					9						
					36						
					10						
					35						
					11						
					34						
					12						
					33						
					13						
					32						
					14						
					31						
					15						
					30						
					16				Borehole terminated at 15.74m		

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 2 3 4 no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH13**

Engineering Log - Borehole

Sheet 1 of 3
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **12.3.2007**


Principal: **RTA**

Date completed: **13.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **DD**

Borehole Location: **GEMBROCK LANE, BROUGHTON (REFER SITE PLAN)**

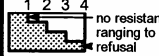
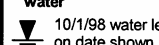


Checked by: 


drill model and mounting: H-POWER SCOUT TRUCK Easting: 292004.2 slope: -90° R.L. Surface: 15.56
hole diameter: 100 mm Northing 6150866.61 bearing: datum:

drilling information				material substance								
method	penetration	support	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
1 2 3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400	
ADV		C			15			Silty CLAY: medium plasticity, brown/orange, with a trace of fine to medium grained sand and fine to medium grained gravel, subrounded to subangular, rootlets	<=Wp	St/VSt		RESIDUAL / FILL? 0.0m to 0.05m: Grab Sample
			SPT 3,5,10 N*=15		1			Silty CLAY: low to medium plasticity, brown/orange, with a trace of fine to medium grained sand		VS/H		RESIDUAL
					14			Silty CLAY: medium to high plasticity, pale grey/red mottled, with a trace of fine grained sand and rootlets		VSt		
					13			Silty CLAY: low to medium plasticity, pale grey/orange, with a trace of fine grained sand	<=Wp	H		XW SANDSTONE
			SPT 7,14,17 N*=31		3							*2.5m to 2.85m: SPT Sample
ADT					12							V Bit Refusal
					11							Inflow at 4.7m
					10			Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand, with some fine gravel, subrounded to subangular	>Wp	S		HW SANDSTONE
					8			Silty CLAY: low to medium plasticity, grey, with a trace of fine grained sand		St/VSt		
					8			Borehole CBH13 continued as cored hole				
					9							
					7							
					8							

BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.3 Issue 3 Rev.2

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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







Borehole No. **CBH13**
 Sheet 2 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **13.3.2007**
 Logged by: **DD**
 Checked by: 

Engineering Log - Cored Borehole


Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **GEMBROCK LANE, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 292004.2 slope: -90° R.L. Surface: 15.56
 hole diameter: 100 mm Drilling fluid: Northing: 6150866.61 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	Is(50) MPa	D - diam- etral A- axial	RQD %	defect spacing mm	defect description
						rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness
													particular
													general
			15	1									
			14	2									
			13	3									
			12	4									
			11	5									
NQ			10	6		Silty SANDSTONE: fine grained, distinctly laminated @ 0 deg, grey	SW/FR		D A 2.33 1.45		62		JT, IR, RO, CN SS, PL, RO, CN JT, PL, RO, CN JT, PL, RO SS, PL, RO, CN SS, PL, RO, CN
			9	7		CLAYSTONE: pale brown and grey	SW				68		JT @ 45 deg, PL, RO CS 40mm wide PT, PL, RO, SN 7.0m to 7.2m: JT @ 45 deg, IR, RO
			8	8		Silty SANDSTONE: fine grained, laminated @ 5 deg, pale grey	SW/FR						JT @ 40 deg, PL, RO PT, RO PT, RO

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular roughness VR very rough RO rough SO smooth SL sickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07











Borehole No. **CBH13**
 Sheet 3 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **12.3.2007**
 Date completed: **13.3.2007**
 Logged by: **DD**
 Checked by: 

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **GEMBROCK LANE, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 292004.2 slope: -90° R.L. Surface: 15.56
 hole diameter: 100 mm Drilling fluid: Northing: 6150866.61 bearing: datum:

drilling information				material substance					rock mass defects				
method	core-lift	water	RL	depth metres	graphic log core recovery	material rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength	IS ₍₅₀₎ MPa D-diam- etral A-axial	RQD %	defect spacing mm	defect description type, inclination, planarity, roughness, coating, thickness	
								VL L M H VH EH		30 100 300 1000 3000		particular	general
NQ			7	9		Silty SANDSTONE: fine grained, laminated @ 5 deg, pale grey (continued)	FR		1.73 2.54	68		PT, IR, RO PT, PL PT, SO PT, SO	
				6		CBH13 terminated at 8.98m							
				10									
				5									
				11									
				4									
				12									
				3									
				13									
				2									
				14									
				1									
				15									
				0									
				16									

method DT dialube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift  casing used  barrel withdrawn graphic log/core recovery  core recovered  - graphic symbols indicate material  no core recovered	water  10/1/98 water level on date shown  water inflow  partial drill fluid loss  complete drill fluid loss  water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **12.3.2007**

Principal: **RTA**

Date completed: **13.3.2007**

Project: **GRRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **DD**





Borehole Location: **GEMBROCK LANE, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: H-POWER SCOUT TRUCK Easting: 292004.2 slope: -90° R.L. Surface: 15.56
hole diameter: Northing: 6150866.61 bearing: datum:

drilling information				material substance			
method	penetration	support	notes	well details	depth	material	structure and additional observations
1 2 3			samples, tests, etc	RL	metres	soil type: plasticity or particle characteristics, colour, secondary and minor components.	
ADV		C	SPT 3,5,10 N*=15	15	1	Silty CLAY: medium plasticity, brown/orange, with a trace of fine to medium grained sand and fine to medium grained gravel, subrounded to subangular, rootlets Silty CLAY: low to medium plasticity, brown/orange, with a trace of fine to medium grained sand	RESIDUAL / FILL? 0.0m to 0.05m: Grab Sample RESIDUAL
				14	2	Silty CLAY: medium to high plasticity, pale grey/red mottled, with a trace of fine grained sand and rootlets	VSt
			SPT 7,14,17 N*=31	13	3	Silty CLAY: low to medium plasticity, pale grey/orange, with a trace of fine grained sand	XW SANDSTONE 2.5m to 2.85m: SPT Sample
				12	4		V Bit Refusal
ADT				11	5	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand, with some fine gravel, subrounded to subangular Silty CLAY: low to medium plasticity, grey, with a trace of fine grained sand	Inflow at 4.7m HW SANDSTONE
NQ				10	6	Silty SANDSTONE: fine grained, distinctly laminated @ 0 deg, grey	TC Bit Refusal
				9	7	CLAYSTONE: pale brown and grey Silty SANDSTONE: fine grained, laminated @ 5 deg, pale grey	
				8	8		

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 no resistance ranging to refusal 2 3 4 water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Form GEO 5.10 Issue 3 Rev.0

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **12.3.2007**


Principal: **RTA**

Date completed: **13.3.2007**

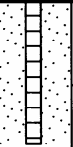
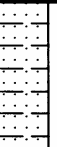
Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**





Logged by: **DD**

Borehole Location: **GEMBROCK LANE, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: H-POWER SCOUT TRUCK Easting: 292004.2 slope: -90° R.L. Surface: 15.56
hole diameter: Northing: 6150866.61 bearing: datum:

drilling information					material substance						
method	penetration	support	notes	well	depth	graphic	classification	material	moisture	consistency/density index	structure and additional observations
1 2 3			samples, tests, etc	details	metres	log	symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition		
NQ					7 9			Silty SANDSTONE: fine grained, laminated @ 5 deg, pale grey (continued)			
					6 10 5 11 4 12 3 13 2 14 1 15 0 16			Borehole terminated at 8.98m			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Borehole

Client: **MAUNSELL AECOM**

Date started: **19.3.2007**

Principal: **RTA**

Date completed: **19.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**


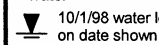
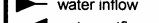

Logged by: **SD**

Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model and mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
hole diameter: 100 mm Northing 6152209.5 bearing: datum:

drilling information				material substance							
method	penetration	support	notes samples, tests, etc	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	pocket penetrometer	structure and additional observations
1 2 3				RL			soil type: plasticity or particle characteristics, colour, secondary and minor components.			100 200 300 400 kPa	
ADV		C					Silty CLAY: medium to high plasticity, brown, with orange mottling, trace organic material, fine to coarse grained gravel, angular	<Wp	F		COLLUVIUM
			SPT 3,2,3 N*=5	85	1					X	
			SPT 3,8,11 N*=19	84	2		CLAY: high plasticity, pale brown, with trace of silt		SI/VSt	X	
			SPT 6,8,8 N*=16	83	3		CLAY: high plasticity, pale brown/orange/white mottled, with trace fine to coarse grained gravel, subangular to angular hw sandstone gravel				
				82	4		CLAY: high plasticity, pale brown, trace silt and fine to coarse grained gravel subrounded to rounded				
			SPT 6,10,14 N*=24	81	5		CLAY: high plasticity, orange/red/green/pale brown, mottled, trace fine to coarse grained gravel of xw sandstone			X	SANDSTONE (XW)
				80	6		CLAY: high plasticity, pale brown, with trace silt	=<Wp	St		
				79	7		CLAY: high plasticity, pale brown, with trace silt, with fine to coarse grained gravel, subrounded, subangular	=>Wp			
				78	8						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 6.6.07

Borehole No. **CBH14**
 Sheet 2 of 5
 Project No: **GEOTUNAN02580-AA**
 Date started: **19.3.2007**
 Date completed: **19.3.2007**
 Logged by: **SD**
 Checked by:

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

drill model and mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
 hole diameter: 100 mm Northing 6152209.5 bearing: datum:

drilling information					material substance											
method	penetration			notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/density index	pocket penetrometer				structure and additional observations
	1	2	3									100	200	300	400	
ADV				SPT 4,6,9 N*=15	77	9			CLAY: high plasticity, pale brown, with trace silt, with fine to coarse grained gravel, subrounded, subangular (continued)	=>Wp	St					
ADT									SANDSTONE: (XW) Borehole CBH14 continued as cored hole							
					76	10										
					75	11										
					74	12										
					73	13										
					72	14										
					71	15										
					70	16										

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud C casing penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VS _t very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Borehole No. **CBH14**
 Sheet 3 of 5
 Project No: **GEOTUNAN02580-AA**
 Date started: **19.3.2007**
 Date completed: **19.3.2007**
 Logged by: **SD**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
 hole diameter: 100 mm Drilling fluid: Northing: 6152209.5 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	graphic log core recovery	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral A- axial	RQD %	defect spacing mm	defect description
						rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness
													particular
													general
			77	9		Continued from non-cored borehole							
NQ Wireline				76	10	SILTSTONE: fine grained, grey, massive	FR						Closed JT @ 45 deg
				75	11	9.8m to 10.0m: Band of conglomerate material 100mm thick, gravel cemented in 2 to 5mm diameter, rounded 10.2m to 10.35m: Band of conglomerate 150mm thick, gravel, subrounded, 5mm diameter 10.55m to 10.85m: Band of cemented conglomerate, rounded gravel 5 to 20mm diameter, white/red/grey							Closed JT @ 30 deg, 5mm spacing JT @ 5 deg, open, RO, CN, PL
				74	12	SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size							JT @ 0 deg, open, RO, CN, IR JT @ 0 deg, open, PL, SO, CN
				73	13	11.9m to 12.1m: Band of cemented gravel conglomerate, rounded 10 to 30mm							SM @ 90 deg, CU, SN, filled with white, pink substance 100mm long
				72	14	13.35m to 13.43m: Band of cemented gravel conglomerate, round, 5 to 25mm Band of cemented gravel conglomerate 30mm thick, round, 5 to 25mm							SM @ 85 deg, CU, SN, filled with white/pink 100mm long JT @ 0 deg, closed, PL
				71	15	NO CORE: 14.5m to 14.6m SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size							JT @ 0 deg, PL, closed
				70	16	15.65m to 15.7m: Gravel conglomerate, gravel 2 to 3mm in diameter							JT @ 0 deg, PL, CL, RO SM @ 45 deg, closed, CU, SN, filled

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slicksided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.5 Issue 3 Rev. 3

Borehole No. **CBH14**
 Sheet 4 of 5
 Project No: **GEOTUNAN02580-AA**
 Date started: **19.3.2007**
 Date completed: **19.3.2007**
 Logged by: **SD**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
 hole diameter: 100 mm Drilling fluid: Northing: 6152209.5 bearing: datum:

drilling information				material substance				rock mass defects				
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	IS ₍₅₀₎ MPa	D- diam- A- axial	RQD %	defect spacing mm	defect description
					rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness
												particular
												general
NQ Wireline			69	17	SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size (continued) 16.00m to 16.17m: Gravel conglomerate cemented in gravel size 2 to 5mm rounded	FR		2.33 3.86		90		with white JT @ 0 deg, PL < closed
			68	18	10mm band of gravel concrete conglomerate 50mm band of conglomerate 2 to 5mm rounded gravel				D A 5.01 5.35			JT @ 0 deg, closed, PL, RO, @ 2 to 5mm intervals
			67	19	Silty SANDSTONE: fine grained, massive, grey / pale grey, with white specs 1mm diameter					90		Gravel, red, one rock 30mm, rounded
			66	20								
			65	21					D A 3.52 4.55			
			64	22					D A 5.31 6.7	100		JT @ 5 deg, PL, RO, CN, open
			63	23								JT @ 45 deg, PL, closed
			62	24						100		

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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Borehole No. **CBH14**
 Sheet 5 of 5
 Project No: **GEOTUNAN02580-AA**
 Date started: **19.3.2007**
 Date completed: **19.3.2007**
 Logged by: **SD**
 Checked by:

Engineering Log - Cored Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
 hole diameter: 100 mm Drilling fluid: Northing: 6152209.5 bearing: datum:

drilling information				material substance				rock mass defects					
method	core-lift	water	RL	depth metres	material	weathering alteration	estimated strength	Is(50) MPa	D- diam- etral A- axial	RQD %	defect spacing mm	defect description	
					rock type; grain characteristics, colour, structure, minor components							type, inclination, planarity, roughness, coating, thickness	
												particular	general
NQ Wireline			61	25	Silty SANDSTONE: fine grained, massive, grey / pale grey, with white specs 1mm diameter (continued)	FR				100		Fossilised shell	
			60	26								JT @ 45 deg, open, RO, PL, CN	
			59	27	10mm band of concreted gravel conglomerate rounded 2 to 5mm diameter							JT @ 0 deg, closed, PL	
			58	28	26.95m to 27.00m: Gravel conglomerate rounded 5mm diameter							JT @ 0 deg, open, PL, RO, CN	
			57	29								JT @ 0 deg, open, PL, RO, CN	
			56	30								JT @ 0 deg, open, PL, RO, CN	
			55	31	CBH14 terminated at 30.7m							JT @ 0 deg, closed, PL, filled with black	
			54	32								JT @ 0 deg, closed, PL, filled with black @ 10mm spacing	
												JT @ 1 deg, PL, open, RO, CN	

method DT diatube AS auger screwing AD auger drilling RR roller/tricone CB claw or blade bit NMLC NMLC core NQ, HQ, PQ wireline core	core-lift casing used barrel withdrawn graphic log/core recovery core recovered - graphic symbols indicate material no core recovered	water 10/1/98 water level on date shown water inflow partial drill fluid loss complete drill fluid loss water pressure test result (lugeons) for depth interval shown	weathering FR fresh SW slightly weathered MW moderately weathered HW highly weathered XW extremely weathered DW distinctly weathered (covers MW and HW) strength VL very low L low M medium H high VH very high EH extremely high	defect type JT joint PT parting SM seam SZ sheared zone SS sheared surface CS crushed seam planarity PL planar CU curved UN undulating ST stepped IR irregular	roughness VR very rough RO rough SO smooth SL slickensided coating CN clean SN stained VN veneer CO coating
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CORED BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Borehole No. **CBH14**

Engineering Log - Piezometer

Sheet 1 of 4
Project No: **GEOTUNAN02580-AA**

Client: **MAUNSELL AECOM**

Date started: **19.3.2007**

Principal: **RTA**

Date completed: **19.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**





Logged by: **SD**

Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
hole diameter: Northing: 6152209.5 bearing: datum:

drilling information				material substance			
method	penetration	support	notes samples, tests, etc	well details	depth metres	material	structure and additional observations
1 2 3				RL		soil type: plasticity or particle characteristics, colour, secondary and minor components.	
						moisture condition	consistency/density index
ADV		C					RESIDUAL / TOPSOIL
			SPT 3,2,3 N*=5		1	Silty CLAY: medium to high plasticity, brown, with orange mottling, trace organic material, fine to coarse grained gravel, angular	<Wp F
				85			
			SPT 3,8,11 N*=19		2	CLAY: high plasticity, pale brown, with trace of silt	St/VSt RESIDUAL
				84			
			SPT 6,8,8 N*=16		3	CLAY: high plasticity, pale brown/orange/white mottled, with trace fine to coarse grained gravel, subangular to angular hw sandstone gravel	RESIDUAL
				83			
					4	CLAY: high plasticity, pale brown, trace silt and fine to coarse grained gravel subrounded to rounded	RESIDUAL
				82			
					5	CLAY: high plasticity, orange/red/green/pale brown, mottled, trace fine to coarse grained gravel of xw sandstone	SANDSTONE (xw)
			SPT 6,10,14 N*=24		6		
				81			
					7	CLAY: high plasticity, pale brown, with trace silt, with fine to coarse grained gravel, subrounded, subangular	=>Wp St
				80			
					8		
				79			
				78			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  1 no resistance 2 ranging to 3 refusal 4 refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **19.3.2007**

Principal: **RTA**

Date completed: **19.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **SD**

Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

Checked by:

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
hole diameter: Northing: 6152209.5 bearing: datum:

drilling information					material substance						
method	penetration	support	notes	well	depth	graphic log	classification	material	moisture	consistency/density index	structure and additional observations
1 2 3		water	samples, tests, etc	details	metres		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition		
ADV		C	SPT 4,6,9 N*=15		9			CLAY: high plasticity, pale brown, with trace silt, with fine to coarse grained gravel, subrounded, subangular (continued)	=>Wp	St	
					77			SANDSTONE: (XW)			
					76			SILTSTONE: fine grained, grey, massive			
					10			9.8m to 10.0m: Band of conglomerate material 100mm thick, gravel cemented in 2 to 5mm diameter, rounded			
					11			10.2m to 10.35m: Band of conglomerate 150mm thick, gravel, subrounded, 5mm diameter			
					75			10.55m to 10.85m: Band of cemented conglomerate, rounded gravel 5 to 20mm diameter, white/red/grey			
					74			SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size			
					12			11.9m to 12.1m: Band of cemented gravel conglomerate, rounded 10 to 30mm			
					73						
					13			13.35m to 13.43m: Band of cemented gravel conglomerate, round, 5 to 25mm			
					72			Band of cemented gravel conglomerate 30mm thick, round, 5 to 25mm			
					14						
					71			NO CORE: 14.5m to 14.6m			
					15			SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size			
					70						
					16			15.65m to 15.7m: Gravel conglomerate, gravel 2 to 3mm in diameter			

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

Form GEO 5.10 Issue 3 Rev.0

Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **19.3.2007**

Principal: **RTA**

Date completed: **19.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **SD**





Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**

Checked by: 

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
hole diameter: Northing: 6152209.5 bearing: datum:

drilling information					material substance								
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1	2	3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NQ Wireline						69	17			SILTSTONE: fine grained, grey, massive, with white specs 2 to 3mm in size (<i>continued</i>) 16.00m to 16.17m: Gravel conglomerate cemented in gravel size 2 to 5mm rounded			
										10mm band of gravel concrete conglomerate			
						68	18			50mm band of conglomerate 2 to 5mm rounded gravel			
										Silty SANDSTONE: fine grained, massive, grey / pale grey, with white specs 1mm diameter			
						67	19						
						66	20						
						65	21						
						64	22						
						63	23						
						62	24						

PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Piezometer

Client: **MAUNSELL AECOM**

Date started: **19.3.2007**

Principal: **RTA**

Date completed: **19.3.2007**

Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**

Logged by: **SD**

Borehole Location: **TOMLINS ROAD, BROUGHTON (REFER SITE PLAN)**


Checked by: **Y**

drill model & mounting: H-POWER SCOUT TRUCK Easting: 293890.82 slope: -90° R.L. Surface: 85.99
hole diameter: Northing: 6152209.5 bearing: datum:

drilling information					material substance								
method	penetration	support	water	notes samples, tests, etc	well details	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index	structure and additional observations
1	2	3								soil type: plasticity or particle characteristics, colour, secondary and minor components.			
NQ Wireline							25			Silty SANDSTONE: fine grained, massive, grey / pale grey, with white specs 1mm diameter (<i>continued</i>)			
						61							
						60	26			10mm band of concreted gravel conglomerate rounded 2 to 5mm diameter			
						59	27			26.95m to 27.00m: Gravel conglomerate rounded 5mm diameter			
						58	28						
						57	29						
						56	30						
						55	31			Borehole terminated at 30.7m			
						54	32						

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool DT diatube B blank bit V V bit T TC bit TBX Tubex *bit shown by suffix e.g. ADT	support C casing N nil penetration 1 2 3 4 no resistance ranging to refusal water 10/1/98 water level on date shown water inflow water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone P pressure meter Bs bulk sample R refusal E environmental sample PID PID measurement WS water sample PZ piezometer ALT air lift test	classification symbols and soil description based on unified classification system moisture D dry M moist W wet W _p plastic limit W _L liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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PIEZOMETER GU02580-AA LOGS.GPJ COFFEY.GDT 4.6.07





Borehole No. **CBH15**
 Sheet 1 of 3
 Project No: **GEOTUNAN02580-AA**
 Date started: **23.3.2007**
 Date completed: **23.3.2007**
 Logged by: **CA**
 Checked by: 

Engineering Log - Borehole

Client: **MAUNSELL AECOM**
 Principal: **RTA**
 Project: **GERRINGONG TO BOMADERRY, PRINCES HWY UPGRADE**
 Borehole Location: **AUSTRAL PARK LANE, TOOLIJOOA (REFER SITE PLAN)**

drill model and mounting: FOX UB40 TRUCK Easting: 293530.18 slope: -90° R.L. Surface: 36.06
 hole diameter: 100 mm Northing 6151294.7 bearing: datum:

drilling information				material substance											
method	penetration	support	notes	RL	depth	graphic log	classification	material	moisture	consistency/density index	pocket penetrometer			structure and additional observations	
	1 2 3		samples, tests, etc		metres		symbol	soil type: plasticity or particle characteristics, colour, secondary and minor components.	condition		100	200	300	400	
ADT		C						Organic CLAY: low plasticity, dark brown & orange with trace gravel Concrete BOULDERS: angular fill / rubble	M	S					FILL
				35	1			Gravelly CLAY - low to medium plasticity, orange brown, angular	M	F					RESIDUAL
								SANDSTONE - medium grained, pale yellow, brown and orange with minor shale and silty clay seams							SANDSTONE (XW)
				34	2			Borehole CBH15 continued as cored hole							
				33	3										
				32	4										
				31	5										
				30	6										
				29	7										
					8										

method AS auger screwing* AD auger drilling* RR roller/tricone W washbore CT cable tool HA hand auger DT diatube B blank bit V V bit T TC bit *bit shown by suffix e.g. ADT	support M mud N nil C casing penetration 1 2 3 4  no resistance ranging to refusal water  10/1/98 water level on date shown  water inflow  water outflow	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone V vane shear (kPa) P pressuremeter Bs bulk sample E environmental sample R refusal	classification symbols and soil description based on unified classification system moisture D dry M moist W wet Wp plastic limit W _l liquid limit	consistency/density index VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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BOREHOLE GU02580-AA LOGS.GPJ COFFEY.GDT 6.6.07