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# BOREHOLE ENGINEERING LOG

BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 1 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING					MATERIAL							
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
					40.1	0.0	[Cross-hatched pattern]	GW	FILL (SANDY GRAVEL) (GW): Black, fine to coarse, sub-rounded to sub-angular, fine to medium grained, trace silt.			0.00: - 4.70m FILL 4.70-8.50m ALLUVIUM 8.50-14.50m RESIDUAL 14.50-TD XW ROCK
			1.00m SPT 9, 13, 9 N=22	39.1	1.0							D
			1.45m		38.6	1.5	[Cross-hatched pattern]	GW	(GW): With silt and cobbles, trace rootlets.			
			2.50m SPT 30/80mm HB N=R 2.58m	37.6	2.5							M
					37.1	3.0	[Cross-hatched pattern]	CL	FILL (GRAVELLY CLAY) (CL): Orange brown, low plasticity, medium sized, sub-angular gravel.			
			4.00m SPT 2, 2, 2 N=4	36.6	3.5							M
			4.45m		36.1	4.0	[Cross-hatched pattern]	CL	(CL): Colour change to dark brown grey and black.			
				35.6	4.5							
					35.1	5.0	[Dotted pattern]	SP	SAND (SP): Pale grey, medium grained sand.	M	L	

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

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# BOREHOLE ENGINEERING LOG

## BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 2 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING					MATERIAL							
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
AS WB					35.1	5.0		SP	SAND (SP): Pale grey, medium grained sand. (continued)	M	L	
				5.50m SPT 2, 1, 2 N=3	34.6	5.5		SC	CLAYEY SAND (SC): Grey and brown, fine to coarse grained sand, low plasticity clay, trace fine sized, sub-angular and sub-rounded gravel.			Sample - 5.50m to 5.95m Grading: Gravel = 15%; Sand = 50%; Fines = 35%  Moisture Content = 11.6%
				5.95m	34.1	6.0		SC				
				7.00m SPT 2, 4, 3 N=7	33.1	7.0		SC	(SC): Pale grey, high plasticity clay fines, with fine sized, sub-rounded (quartz) gravel, trace organics (roots).	M	L	Sample - 7.00m to 7.45m Grading: Gravel = 15%; Sand = 59%; Fines = 26%  Atterberg Limits: LL = 53.4%; PL = 24.4%; PI = 29.0%; LS = 11.2%; MC = 17.5%
				7.45m	32.6	7.5		SC				
				8.50m SPT 3, 7, 12 N=19	31.6	8.5		CI	CLAY (CI): Pale grey, medium plasticity, trace orange brown iron staining of rock fabric.	M	Vst	
				8.95m	31.1	9.0		CI				
				10.00m	30.6	9.5						
					30.1	10.0						

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



# BOREHOLE ENGINEERING LOG

BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 3 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING				MATERIAL									
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations		
			SPT 4, 6, 9 N=15	30.1	10.0		CI	CLAY (CI): Pale grey, medium plasticity, trace orange brown iron staining of rock fabric.					
			10.45m	29.6	10.5								
				29.1	11.0								
			11.50m SPT 4, 5, 9 N=14	28.6	11.5					With iron stained bands.	M	St	11.50: relict XW rock structure observed
			11.95m	28.1	12.0								
				27.6	12.5								
				27.1	13.0			CLAYEY SAND: Red brown and orange, fine to medium grained sand, with grey, coarse grained, rounded bands.					
			13.00m SPT 5, 7, 14 N=21	26.6	13.5						M	MD	
			13.45m	26.1	14.0								
				25.6	14.5								
			14.50m SPT 9, 14, 12 N=26	25.1	15.0			INTERBEDDED: SANDSTONE (pale grey, medium to coarse grained, sub-rounded), CLAYSTONE (Grey and orange-brown).	M to W	MD and VSt	14.50: SANDSTONE [Properties of SAND, medium dense] and CLAYSTONE [properties of CLAY, very stiff]		
			14.95m										

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

GROUNDWATER SYMBOLS  
 = Water level (static)  
 = Water level (during drilling)



# BOREHOLE ENGINEERING LOG

BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 4 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING					MATERIAL							
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
					25.1	15.0			INTERBEDDED: SANDSTONE (pale grey, medium to coarse grained, sub-rounded) , CLAYSTONE (Grey and orange-brown). (continued)			
					24.6	15.5					M to W	MD and VSt
				16.00m SPT 3, 8, 11 N=19	24.1	16.0			16.00m CLAYSTONE: Grey, trace black carbonaceous bands, extremely weathered, extremely low strength, with orange iron staining along joints.			16.00: [Properties of CLAY, very stiff]
				16.45m	23.6	16.5						
				17.50m SPT 6, 10, 16 N=26	22.6	17.5			17.50m Colour change to dark grey.			
				17.95m	22.1	18.0					M	VSt
				19.00m SPT 5, 13, 17 N=30	21.1	19.0			19.00m With iron staining along planar joints.			
				19.45m	20.6	19.5						
					20.1	20.0			20.00m			

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

GROUNDWATER SYMBOLS  
 = Water level (static)  
 = Water level (during drilling)



# BOREHOLE ENGINEERING LOG

BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 5 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING					MATERIAL							
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
					20.1	20.0			CLAYSTONE: Dark grey, extremely weathered, extremely low strength, with iron staining along planar joints.			
				20.50m SPT 7, 12, 14 N=26	19.6	20.5						
				20.95m	19.1	21.0						
					18.6	21.5					M	VSt
				22.00m SPT 6, 10, 14 N=24	18.1	22.0			Colour change to green grey.			
				22.45m	17.6	22.5						
				23.50m SPT 12, 18, 14 N=32	16.6	23.5			SANDSTONE: Green-grey, fine to medium grained sand in clay matrix.			23.50: [Properties of Clayey SAND]
				23.95m	16.1	24.0				M	D	
					15.6	24.5						
				25.00m	15.1	25.0						

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

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# BOREHOLE ENGINEERING LOG

BOREHOLE NO : BH-SKM-25

CLIENT : TMR POSITION : E: 10565, N: 152777 (56 South East Transit Horizontal Datum) PAGE : 6 OF 6  
 PROJECT : GUSBUS SURFACE ELEVATION : 40.1 (AHD) DATE DRILLED : 3/9/12 to 3/9/12  
 JOB NO : QB10312.540 DIP / AZIMUTH : 90° LOGGED BY : NC  
 LOCATION : Within existing stockpile CONTRACTOR : Geodrill CHECKED BY : DWL

DRILLING				MATERIAL									
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations	
			SPT 7, 10, 16 N=26		15.1	25.0			CLAYSTONE: Blue-grey, extremely weathered, extremely low strength, with orange brown iron staining.			25.00: [Properties of CLAY]	
			25.45m		14.6	25.5							
			26.50m		14.1	26.0				M	Vst		
			SPT 7, 12, 16 N=28		13.6	26.5							
			26.95m		13.1	27.0		26.95m				26.95: BH Terminated Piezometer installed to 16.00m	
					12.6	27.5							
					12.1	28.0							
					11.6	28.5							
					11.1	29.0							
					10.6	29.5							
					10.1	30.0							

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