PARSONS BRINCKERHOFF

Subject:	FIVE MILE LANE PERMEABILITY TES	TING	
Date:	3 March 2015	Ref:	3512646D-HHC
From:	Kristian James	At:	Parsons Brinckerhoff
То:	Gideon Jones	At:	Parsons Brinckerhoff

Gideon,

Introduction

This memo provides a summary of the permeability testing works completed on the Five Mile Lane project. The wider project focuses on the proposed improvement works to the A4226 in the Vale of Glamorgan. Several monitoring wells have been installed along the proposed new route to the east of the current road. Of these wells, five have been tested to establish an estimate of the permeability of the rock formation within the well response zone in two areas of interest, these are the proposed area of embankment (Figures 3B and 3C) and the proposed area for rock cutting (Figures 3E and 3F).

Methodology

The permeability testing was undertaken at the following well locations: BH102 and BH103 within the proposed area for the embankment and BH106, BH107 and BH108 in the proposed area for rock cutting. Rising head (RH) and falling head (FH) tests were conducted using a solid displacement slug of known volume, entered and removed "instantaneously" into the water column. The subsequent water level response was recorded at 0.5 second intervals using a pressure transducer suspended close to the base of the well.

Results

A table presenting the water levels, including the measurement taken from BH101, corrected for elevation are presented in Table 1 below.

Monitoring Well Location	Depth to Water (m)	Depth to Base (m)	Groundwater Elevation (mAD)	Ground Level Datum (mAD)
BH101	3.75	6.23	86.10	90.07
BH102	0.61	6.21	83.23	84.08
BH103	0.31	6.25	84.36	84.88
BH106	7.08	10.31	58.10	65.40
BH107	9.52	10.08	47.59	57.33
BH108	4.14	9.27	39.86	44.21

Table 1: Water Level Monitoring

All levels measured from top of casing.

A summary of the well response zone and associated geology are summarised in Table 2 below. Borehole logs for these specific wells are attached.



Monitoring Well Location	Screening interval (m bgl)	Geology
BH102	3.00-6.00	Limestone with layers of calcareous mudstone and siltstone
BH103	3.00-6.00	Limestone with layers of calcareous mudstone and a layer of clay
BH106	4.00-10.00	Limestone with layers of calcareous mudstone
BH107	4.00-10.00	Calcareous mudstone with layers of limestone and clay
BH108	4.00-10.00	Calcareous mudstone with layers of limestone and siltstone

Table 2: Monitoring Well Installation Details and Geology

Each test was analysed using the Bower-Rice solution for an unconfined aquifer, partially penetrating well using the AQTESOLV software. The results are summarised below in Table 3 with full detail attached. To account for the uncertainty associated with curve matching to the recovery response, a range of values (minimum and maximum) is presented for each test.

Table 3: Permeability Test Results Summary

Monitoring				
Well	FH1 (m/d)	RH1 (m/d)	FH2 (m/d)	Geomean (m/d)
BH102	0.08-0.55	0.03-0.58		0.05-0.56
BH103	0.58	0.08-0.52		0.21-0.52
BH102 0.08-0.55 0.03-0.58 0.05-0.56 BH103 0.58 0.08-0.52 0.21-0.52 BH106 0.60 0.23 0.55 0.42 BH107 0.19 0.09-1.05 0.19 BH108 0.10-0.89 0.07-1.30 0.08-1.05 0.09-1.07 Minimum (m/d) 0.03 1.30 0.03 0.03		0.42		
BH102 0.08-0.55 0.03-0.58 0.05-0.56 BH103 0.58 0.08-0.52 0.21-0.52 BH106 0.60 0.23 0.55 0.42 BH107 0.19 0.19 0.19 BH108 0.10-0.89 0.07-1.30 0.08-1.05 0.09-1.07 Minimum (m/d) 0.03 1.30 0.03 0.03		0.19		
BH103 0.58 0.08-0.52 0. BH106 0.60 0.23 0.55 BH107 0.19 BH108 0.10-0.89 0.07-1.30 0.08-1.05 0.		0.09-1.07		
Minimum (m	/d)			0.03
Maximum (n	n/d)			1.30
Geomean (m	n/d)			0.15-0.48

Geometric means of between 0.15 and 0.48 m/d were derived for all boreholes. The boreholes located within the area of rock cutting have a geometric means of 0.19 - 0.44 m/d while the boreholes located within the proposed area of embankment have a geometric means of 0.10 - 0.54 m/d.

The range of permeability results for the limestone dominated strata (BH102, BH103 and BH106) was 0.03 to 0.60 m/d, whilst mudstone dominated strata (BH107, BH108) had a range of permeability of 0.07 to 1.30 m/d.

Permeability test results provide an indication of the strata permeability within a limited zone within proximity to the well only. Permeability within underground strata can vary significantly over relatively short distances, particularly in hard rock aquifers which are often characterised by fracture flow groundwater migration which may not have necessarily been intercepted by monitoring wells.

Attachments

Figures Borehole Logs Permeability Test Analysis









CC G	ROU		/ESTIGAT	IONS I	LTD									Bore	ehole	No.
RC		ΔR		٦R	FF			F						E	BH102	2
														She	et 1 c	of 2
Proie	ct Nar	ne: Fiv	e Mile I an	.52 7392 IE	20,Em	iali: Int	<u>@0</u> 	ccgro Proie	ect No:					Hc	le Tvr	ne
	otitai			U					C4414	Co-ords:	E 307	883 N 17	71785	C	P+RC	5
Locat	ion:	Fiv	e Mile Lan	ie, Car	diff					Level:	84.08	mAD		1	Scale : 37.5	0
Clien	t:	Va	le of Glam	organ	Counc	cil				Deteci	Start:	17/11/20	14	Lo	gged I	By
				_						Dates.	End:	20/11/20	14	F	۶F/RS	;
(m)	Water	Core Ru	un, Samples &	Testing	Core Run &	TCR SCR	In	stall		Description			Depth		Legen	d
_	Levels	No/Type	Depth (m)	Result	Sample	RQD	•5.		MADE GROUND: So	ft dark brown sli	ghtly san	dy slightly	- 0.10	83.98	XXXX	×
_		_					É		gravelly CLAY with fr	equent rootlets · edium limeston	<2mm. Gı e.	ravel is	0.10	00.00		1
_		D	0.30 - 0.50 0.30						Soft orangish brown	ocally greyish b / with frequent r	rown sligh ootlets <2	ntly sandy 2mm.				-
-		ES	0.50						Gravel is sub-angula From 0.60m; High co	fine limestone.	obbles are	9	(1.00)			-
-		D	0.70 - 1.10 0.70						sub-angular limeston	e.	\wedge	-	(1.30)			
1 -									-	/					<u> </u>	-1-1
-		СРТ	1.20	C*214					-		$\langle $					1
_		С	1.40 - 2.00	C*222		50%		F	No Recovery.		\rightarrow		- 1.40	82.68	<u></u>	-
-		CPT	1.40		- €	20% 20%		F				<u> </u>	(0.30)	82.38		L
-		CS	1.75 - 1.89						Very weak grey mottl	ed black calcare	eous mud	stone	1.75	82.33	μ	-
2 —		с	2.00 - 3.00	C**		100%			Strong grey LIMEST	ONE with subho	rizontal ve	ery closely	2.00	82.16		×2
		CPT	2.00 - 2.05		i i	50% 50%			1.89-1.90m: Firm ora	ngish brown slig	htly sand	y slightly				_
									Extremely weak oran	gish brown mott	led grey o	calcareous	(0.80)			-
									undulating rough disc	continuities.	closely s	baced				
_		CS	2.80 - 3.00		-				Strong grey LIMEST	DNE with subho ndulating rough	rizontal ve discontin	ery closely uities with	2.80	81.28	× × ×	
3 —		с	3.00 - 3.80	C**		94%			<10mm soft to firm of 2.18-2.22m: Subverti	angish brown si cal undulating ro	ilty clay in ough disc	fill. ontinuitv.	3.00	81.08		3
-		CPT CS	3.00 - 3.04 3.20 - 3.50			56% 56%	-	T.	2.32-2.35m: Non inta	ct, recovered as	subangu	llar				-
-					¢				2.35-2.53m: 2 no. ve	y closely space	d undulat	ing rough				-
-									surfaces.			ing rough	(1.32)			-
-		с	3.80 - 5.00		$\left[\begin{array}{c} \\ \\ \\ \end{array} \right]$		ſ		discontinuities (one p	ossibly drilling i	nduced).		(=)			
4 -		CPT	3.80 - 3.85	e**		100%	\langle		with subhorizontal me	n and grey calca edium spaced u	neous SII ndulating	rough				4
-						78% 70%		7	discontinuities. 2.80-3.00m: 2mm wid	le calcite vein.						
-		00			Ċ				Strong grey LIMEST	ONE with subho	rizontal ve discontin	ery closely	4.32	79.76 79.64		
-		0.5	4.44 - 4.01						<10mm soft to firm of 3 10-3 20m; Subverti	angish brown si	ilty clay in	fill.				Ŧ
-									3.57-3.60m: Soft oral	ngish brown mot	tled grey	slightly	(0.61)			1
5 —		C	5 00 - 6 00	C**	<u> </u>	100%			3.77-3.80m: Soft oral	ngish brown mol	tled grey	slightly	- 5.05	79.03		5
-		CPT	5.00 - 5.04			46%			3.87-4.09m: Subverti	cal 2mm wide c	alcite veir	nestone.	5.12	78.96		≠
-						00,0			sandy slightly gravell	igish brown mot y CLAY. Gravel	tled grey is subang	slightly Jular fine	(0.38)			+
-					Ć .				calcareous siltstone. 4.32-4.40m: 70° undu	lating rough dis	continuit	/.	- 5.50	78.58		<u> </u>
			E 92 0 00						Weak to medium stro	ng grey locally	stained or	angish	5.74	78.34		-
6 _			5.82 - 6.00						spaced planar rough	discontinuities.	Ionzontai	closely				6
REMA	RKS:						_									

15	6		I	I	1 1			igh discontinuit	00.	III.	I	′ <u></u> _ <u></u>
U GINT STD AGS 3_1.GDT 12/1/	RI E⊠CG I≦ se	EMARKS QUIPMEN IETHOD: H ASING: 15 ROUNDW ISTALLAT eal: 0.20-2	5: Hand 50mm ATEI ATEI TON: 50m	and digging too dug inspection a diameter to 1. R: Groundwate 50mm ID HDP . Concrete and	ls. Light cable pe pit 0.00-1.20m. (40m. 140mm dia r not encountered E slotted standpi raised cover 0.0	rcussion rig. Comacchie Cable percussion (150n meter to 3.00m. d prior to use of waterflu pe: 3.00-6.00m. 50mm 0-0.20m.	o MC305 multi-purpo m) 1.20-1.40m. Wa lsh. ID HDPE plain pipe:	ose track moun terflush rotary c 0.00-3.00m W	ted drilling rig. ore drilled (116mn ashed gravel respo	n) 1.40-6.00m. onse zone: 2.50	-6.00m.	Bentonite pelle
CC ROTARY LOG C4414.GF	Gr	roundwate Date	er:	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)	Hole Progress: Date 20/11/2014	Hole Depth (m) 6.00	Casing Depth (m) 3.00	Water Depth (m) 1.40		

Telephone U1452 739165, Pasc U1452 739220, Email: Info@cogurund co.uk Sheet Z on 2 Project Name: Five Mile Lane Project Name: Five Mile Lane, Cardiff Level: 84.08mAD Scale Location: Five Mile Lane, Cardiff Level: 84.08mAD Scale Client: Vale of Glamorgan Council Dates: Start: 17/11/2014 Logged By (m) Versel: Sorter Unit Serge Sama into Total Location: Five Mile Lane, Cardiff Level: 84.08mAD 1: 37.50 (m) Versel: Sorter Unit Serge Sama into Total Dates: Start: 17/11/2014 Legged By (m) Versel: Sorter Unit Serge Sama into Total Total Serger Sama into Total Serger Sama into Total Serger Sama into Total Serger Sama into (m) Versel: Sorter Unit Serger Sama into Total Serger Sama i		ARY BC		40	LE	LOG		C	C	Bore B	ehole No. 6 H102
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Location: Five Mile Lane, Cardiff Level: 84.08mAD Scale Scale End: 20/11/2014 Scale Level: Scale Star: 17/11/2014 Logged By PFRS (m) Valer Core Ran, Samples & Texting Non Type Depth (m) Result Total Scale End: 20/11/2014 Logged By PFRS (m) Valer Core Ran, Samples & Texting Non Type Depth (m) Result Total Scale End: 20/11/2014 Description						C4414	Co-ords:	E 307883 N 17	1785	C	P+RC
Client: Vale of Glamorgan Council Dates: Start: 17/11/2014 Logged By PFRS (m) Weitr Core Run, Samples & Testing, Fund, Soch Retail Description Description Description Description Description Prof. (nAS) Logged By PFRS 7 - OPP 0.00-0.01 Prof. (nAS) Core Run, Samples & Testing, Fund, Soch Run, Run, Run, Run, Run, Run, Run, Run,	Location:	Five Mile Lan	e, Cardiff				Level:	84.08mAD		1	Scale : 37.50
m Vater Levis Core Run, Samples & Testing NorType Core Built Description Core Core Description Description Description Description Description Description Description Description Description Total Description	Client:	Vale of Glame	organ Cour	icil			Dates:	Start: 17/11/20	14 14	Log	gged By PF/RS
8 1	(m) Water Levels	Core Run, Samples &	Testing Core Run &	TCR SCR	Install		Description		Depth (m)	Level (mAD)	Legend
	7	CPT 6.00 - 6.04	C*750	Depth After	er (m)	4.43-4.44m: Firm orar Medium strong grey L closely spaced undulation <10mm firm orangish	regish brown sill IMESTONE wi and the second second second second prown mottled g domly orientate gh fractures. INE with subhc gh discontinui imm wide calci uities are rand ely spaced und grey calcareou selv to closely INE with subhc gh discontinui clay infilt. t 6:00m	ty clay infill. th subhorizontal continuities with y infill. ty clay infill. rey calcareous ed extremely closely ties. omly orientated dulating rough. s MUDSTONE with spaced undulating prizontal closely ties. Casing Depth Wate (m) (6.00	78.08	

CC GROUN	ID INV	'ESTIGATI	IONS L	TD								Bore	ehole No.
ROTA	١R	Y BC	DR	E⊦	10	LE	ELO	G				E	BH103
Telephone: 0145	52 7391	65 Fax 014	52 7392	20 Fm	ail: inf	നാതന	round co uk					She	eet 1 of 2
Project Nam	e. Eiv	e Mile I an	02 7 002 0	20 , LII		Pro	ect No:					Нс	le Type
i lojeot i talii	IC. 1 IV		C				C4414	4	Co-ords:	E 308026 N 17	1581	C	P+RC
Location:	Five	e Mile Lan	e, Caro	diff					Level:	84.88mAD		1	Scale : 37.50
Client:	Val	e of Glamo	organ (Counc	il				Dates:	Start: 17/11/20	14 14	Log	gged By PF/RS
(m) Water	Core Ru	n, Samples &	Testing	Core Run &	TCR SCR	Install		[Description		Depth	Level	Legend
Leveis N	lo/Type	Depth (m)	Result	Sample	RQD				dark brown al	ightly condy clightly	(m)	(mAD)	XXXXX
	B D ES D B CPT	0.30 - 0.60 0.30 0.40 - 0.70 0.50 0.60 0.90 - 1.20 1.20 - 1.70 1.20 - 1.65	C 12				MADE GR gravelly CL sub-angula Soft orangi slightly gra Gravel is si From 0.45r sub-angula	OUND: Soft of AY with freq in fine to med sh brown loc velly CLAY w ub-angular fii n: High cobb ir limestone.	dark brown sl uent rootlets lium limeston ally greyish b ith frequent i ne limestone le content. C	lightly sandy slightly <2mm. Gravel is e. prown slightly sandy rootlets <2mm. obbles are	(1.95)	84.73	
2 —							Orangish b	rown and gre	ey clayey CO	BBLES. Cobbles are	- 2.10	82.78	
	CPT	2.20 - 2.41	C*238				sub-angula	ir limestone.	. / .		(0.30)		
	C CS	2.40 - 3.00 2.70 - 2.82					Strong grey and closely 2.40-2.62m 2.67-2.70m Weak to m	y LIMESTON y spaced und n: Subvertical n: Firm orang edium strong	E with subho ulating rough undulating r ish brown sill	orizontal very closely a discontinuities. ough discontinuity. ty clay infill. own mottled grey	2.40 (0.43) 2.83	82.48	
3	C CPT CS C CS CS CS	3.00 - 3.30 3.00 - 3.07 3.15 - 3.26 3.30 - 3.50 3.30 - 3.45 3.50 - 4.00 3.58 - 3.80	C**				calcareous spaced und 2.86-2.96m little clay sr Strong grey and closely 3.20-3.23m 3.45-3.50m	MUDSTONE dulating roug 1: 60° undula near on surfa VLIMESTON spaced und 2: Firm orang 1: Firm orang	E with subhor h discontinui ting rough dis aces. IE with subhor ulating rough ish brown sill ish brown mo	rizontal closely ties. scontinuity with a prizontal very closely o discontinuities. ty clay infill. ottled grey slightly	- 3.05 (0.95)	81.83	
4	C CPT CS	4.00 - 5.00 4.00 - 4.26 4.27 - 4.45	C*91				sandy sligh limestone. 3.50-4.00m spaced. 3.80-3.82m infill. Grave	ntly gravelly c n: Discontinui n: Firm orang el is subangu	lay infill. Gra ities are close ish brown slig lar fine limes	vel is subangular fine ely and medium ghtly gravelly clay tone.	- 4.00 - 4.27	80.88 80.61	
5	C CPT CS	5.00 - 6.00 5.00 - 5.26 5.82 - 6.00	C*107	©			Stiff grey m gravel CLA mudstone. Strong grey spaced und randomly o occasional 4.44-4.65m discontinuit sandy clay 4.70-4.78m gravelly cla 5.00-5.15m sandy sligh	Nottled orangi Y. Gravel is Y LIMESTON dulating roug rientated 2-5 20mm diarme 1:4 no. 60° s ties with <10i infill. 1: Firm orang ay infill. Grave 1: Firm orang ty gravelly c	Isn brown slig subangular fi He with subhc h discontinui mm thick cal eter calcite in ubparallel un mm firm orar ish brown slig el is subangu ish brown mc lay. Gravel is	pntry sandy slightly ine calcareous prizontal very closely ties. Frequent cite veins and iclusions. dulating rough gish brown slightly ghtly sandy slightly lar fine limestone. ottled grey slightly s subangular fine	(1.33) - 5.60 - 5.82	79.28 79.06	
							∐ limestone.		-	-			6

12/1/15 EQUIPMENT: Hand digging tools. Light cable percussion rig. Comacchio MC305 multi-purpose track mounted drilling rig. METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (150mm) 1.20-2.40m. Waterflush rotary core drilled (116mm) 1.40-6.00m. CASING: 150mm diameter to 1.40m. 140mm diameter to 3.00m. GROUNDWATER: Groundwater not encountered prior to use of waterflush. INSTALLATION: 50mm ID HDPE slotted standpipe: 3.00-6.00m. 50mm ID HDPE plain pipe: 0.00-3.00m Washed gravel response zone: 2.50-6.00m. Bentonite pellet seal: 0.20-2.50m. Concrete and raised cover 0.00-0.20m. CC ROTARY LOG C4414.GPJ GINT STD AGS 3_1.GDT Groundwater: Hole Progress: Strike Depth (m) Casing Depth (m) Hole Depth (m) Water Depth (m) Depth After Observation (m) Casing Depth (m) Date Date 6.00 3.30 1.60 19/11/2014

		ne: Fiv	e Mile Lar	ie			Proje		Co-ords:	E 308	026 N 17	1581	Ho	le Type
oca	tion:	Fiv	e Mile Lar	ie, Car	diff			64414		84 88r	mAΠ			
lien	nt:	Val	le of Glam	organ	Cound	cil				Start:	17/11/20	14	1 Loc	: 37.50 aaed B
		0 D.			Core	TCP			Dates:	End:	19/11/20	14	F	ٌF/RS
(m)	Water Levels	No/Type	Depth (m) 6 00 - 6 08	Result	Run & Sample	SCR RQD	Install	5 15-5 60m: Discontin	Description	ly and me	dium	Depth (m) 6.00	Level (mAD) 78.88	Legend
								spaced. 5.16-5.40m: Subvertic discontinuity. 5.43-5.50m: Weak thin brown and grey calcar 5.40-5.60m: Discontin wide calcite vein. Extremely weak dark of locally tending to very orientated extremely c discontinuities. Strong grey LIMESTO undulating rough disco Borehole completed a	al to 80° undul hly and thickly leous mudstone uities are close grey calcareous stiff to hard cla losely spaced in NE with subho ontinuities. t 6.00m	ating rougl aminated e. ely spaced. aMUDSTC y, with ran undulating rizontal to	h orangish . 3-10mm DNE Idomly rough 10°			
-								 						

CC (GROU	ND IN\	/ESTIGATI	IONS I	TD								Bore	ehole No.
R		ΔR		N R	FH			F	IOG				E	BH106
Telenh	/ 01/	52 7301	65 Eax: 014	- 7302	– I 20. Em		fo@						She	eet 1 of 3
Proie	ct Nar	ne: Fiv	e Mile Lan	e	20 , LIII	ian. mi		Proje	ect No:				Hc	le Type
				•				- , -	C4414	Co-ords:	E 308145 N 1	69996	E	S+RC
Loca	tion:	Fiv	e Mile Lan	e. Car	diff									Scale
				,						Level:	65.40mAD		1	: 37.50
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										Dates.	End: 01/12/20	014		RS
(m)	Water	Core Ru	un, Samples &	Testing	Core Run &	TCR SCR	In	stall		Description		Depth	Level	Legend
. ,	Leveis	No/Type	Depth (m)	Result	Sample	RQD		•••	Verv soft grevish brow	vn slightly sand	v slightly gravelly	(m)	(MAD)	· <u>xt 1x</u> . <u>xt 1x</u> .
-									CLAY with frequent r	ootlets. Gravel i	s subangular fine to	0.20	65.20	· · · ·
-		B FS	0.30						Soft orangish brown	mottled grey slig	htly sandy gravelly	[/] (0.30)		
-		B	0.50 0.50 - 1.50		1	71%	\square	F	subangular fine to co	arse limestone.	Cobbles are	$\int_{(0,30)}^{0.50}$	64.90	
-			0.00 1.00		1	0%		F	│ limestone. │ No Recoverv			0.80	64.60	
- 1					Ċ				Firm orangish brown	mottled light gre	ey silty CLAY.			× -× -1
-					I I				0.96-1.02m: Strong g	rey Limestone.		(0.00)		
-					1				1.20-1.25m: Strong g	rey Limestone. rey Limestone.		(0.90)		× × ·
-		С	1.50 - 2.50	C*208		100%	F	-	1.35-1.50m: Stiff.	\sim	$\langle \rangle$			
-		CPT CS	1.50 - 1.61 1.70 - 1.78			45% 10%			Strong grey LIMEST	DNE. Discontinu	uities are	1.70	63.70	
-									subhorizontal closely	spaced undulation	ting rough.			
2									gravelly clay infill. Gra	avel is subangu	lar fine to medium	(0.68)		
-									1.90-1.96m: Subverti	cal undulating r	ough discontinuity.			
-		C	2 50 2 50	C*222	<u> </u>				stained discontinuity.	cal undulating r	ough orangish brown	2.38	63.02 62.94	× × × -
-		CPT	2.50 - 2.65	0 333	1	98% 48%			2.26-2.33m: Extreme calcareous mudstone	ly weak to very	weak dark grey	2.60	62.80	
-					1	15%			Extremely weak to ve	ry weak dark gr	ey calcareous	(0.47)		
3 —					Ċ				closely to closely spa	ced undulating	rough.	3.07	62.33	-3
-					I I				Discontinuities are su	rrealcareous SI Ibhorizontal ver	LTSTONE. y closely spaced	- 3.22	62.18	
-		CS	3.35 - 3.50				R	A	undulating rough. 2.50-2.60m: Non inta	ct.				
-		C CPT	3.50 - 4.50 3.50 - 3.56	C*429		100% 70%		/:	Strong grey LIMEST	ONE. Discontinu	uities are	(0.70)		
-		CS	3.60 - 3.79			31%			2.74-2.87m: Subverti	cal undulating r	ough orangish brown			
4 —					¢		(.		2.87m: Very stiff friab	le dark grey cal	careous clay.	3.92	61.48	
-			/					Į	2.98-3.07m: Subverti stained discontinuity.	cal undulating r	ough orangish brown			
-									Medium strong dark	grey calcareous	MUDSTONE.			
-		С	4.50 - 6.00	C*429		100%			spaced undulating ro	ugh.				
-		CPT	4.50 - 4.56			62% 58%			occasional fine grave	I sized mudstor	ne lithorelicts.			
5 -									Strong grey LIMEST	DNE. Discontinu Disely to closely	uities are spaced undulating	(2.10)		
-		~~~	E 40 E 24						rough. 3 22-3 29m: Subverti	cal undulating r	ough orangish brown	(2.10)		
-		US	0.10 - 5.34						stained discontinuity.					
-									clay.					
-									stained discontinuity.	cai undulating r	ougn orangish brown			
-		cs	5.85 - 6.00						3.81m: Medium stron	g dark grey calo gegrey calcare	careous mudstone.			
6		1		1	1							1		<u>'</u> 6
KEMA	KKS:													

EQUIPMENT: Hand digging tools. Comacchio MC305 multi-purpose track mounted drilling rig. METHOD: Hand dug inspection pit 0.00-0.50m. Waterflush rotary core drilled (116mm) 0.50-10.00m. CASING: 140mm diameter to 1.50m. GROUNDWATER: Groundwater not encountered prior to use of waterflush. INSTALLATION: 50mm ID HDPE slotted standpipe: 4.00-10.00m. 50mm ID HDPE plain pipe: 0.00-4.00m Washed gravel response zone: 3.50-10.00m. Bentonite pellet seal: 0.20-3.50m. Concrete and raised cover 0.00-0.20m.

5 F	Groundwater:	Strike Depth	Cooing Donth	Dooth Aftor	Hole Progress:	Hele Donth	Caping Donth	Water Depth	
5	Date	(m)	(m)	Observation (m)	Date	(m)	(m)	(m)	
2					27/11/2014	0.00		_	
					27/11/2014	0.50	Nil	Dry	
					28/11/2014	0.50	NI	Dry	
2									
3									

Rí) T		Y R()R	FF	HO	I F	IOG				Bore B	ehole No 8 H106
Telenho	one: 014	52 7391	65 Fax: 014	52 7392	20 Fm	nail: inf						She	et 2 of
Proje	ect Nar	ne: Fiv	e Mile Lan	e	20 , En		Proje	ct No: C4414	Co-ords:	E 308145 N 16	69996	Hc D	ole Type S+RC
Loca	tion:	Fiv	e Mile Lan	e, Car	diff				Level:	65.40mAD		1	Scale : 37.50
Clien	ent: Vale of Glamorgan Council								Dates:	Start: 27/11/20 End: 01/12/20	14 14	Log	gged By RS
(m)	Water Levels		un, Samples &	Testing	Core Run &	TCR SCR	Install		Description		Depth (m)	Level (mAD)	Legend
-		C C CPT	6.00 - 7.50 6.00 - 6.06	C*429		100% 67%		4.30-4.36m: Firm thinly clay.	y laminated da	rk grey calcareous	6.10	59.30	
		CS	6.23 - 6.32			33 %		4.50-4.70m: Non Intac 4.70-5.13m: Subvertic: stained discontinuity. 5.43m: Stiff thinly lami 5.65-5.85m: Subvertic: stained discontinuity. 5.81-5.88m: Medium s mudetope	t. al undulating ro nated dark gre al undulating ro trong dark gre	ough orangish brown y calcareous clay. ough orangish brown y calcareous	(0.63) - 6.73	58.67	
/ 		cs c	7.25 - 7.39 7.50 - 9.00			100%		5.85-6.00m: Subvertic: Strong grey LIMESTO subhorizontal very clos rough. (continued from Weak dark grey calcar are subhorizontal very	al undulating ro NE. Discontinu sely to closely s previous sheet cous MUDSTC closely to close	bugh discontinuity. ities are spaced undulating t) DNE. Discontinuities elv spaced	(1.65)		
8 —						28%		undulating and planar 6.20-6.23m: Soft dark Gravel is subangular fi 6.53-6.66m: Hard dark Strong grey LIMESTO subhorizontal closely s	smooth. grey slightly gr ine mudstone. grey calcareo NÉ. Discontinu spaced undulat	avelly clay infill. us clay. ities are ing rough.			
			0.00.0.00					6.87-6.90m: Extremely mudstone. 7.06-7.10m: Extremely Discontinuities are ext rough. 7.10-7.45m: Discontinu	v weak dark gre v weak orangisl remely closely uities are very	y calcareous h brown siltstone. spaced undulating closely to closely	8.38 (0.42) 8.80	57.02 56.60	
9		C C CPT CS	8.90 - 9.00 9.00 - 10.00 9.00 - 9.07 9.22 - 9.37	C*429		97% 49% 18%		spaced. 7,14-7;24m: Subvertici, stained discontinuity. 7,45-7,50m: Very weal 7,55-7,58m: Subvertici, 7,58-7,70m; Limestone strong dark grey calca 4,70-5,43m; Limestone	al undulating ro k dark grey cal al undulating ro e thinly interber reous mudston e is locally mec	bugh orangish brown careous mudstone. bugh discontinuity. dded with medium ie. fium strong	(1.20)		
- - - - - - -		СРТ	10.00 - 10.06	C*500	- /- [Discontinuities are sub spaced planar and und 7.72-7.84m: 70° undul discontinuity. 7.84-7.97m: Very weal 8.15-8.18m: Subhorizo discontinuity.	horizontal clos dulating rough ating rough ora k dark grey calo ontal-60° undul	angish brown stained careous mudstone. ating rough	∟ 10.00	55.40	
- - - 11 _ - -								Medium strong dark gr Discontinuities are sub spaced undulating rou 8.50-8.54m: Strong gr 8.62-8.65m: Strong gr 8.68-8.80m: 2 no. suby discontinuities	rey calcareous ohorizontal very gh. ey limestone. ey limestone. vertical undulat	MUDSTONE. y closely to closely ting rough			
- - - - 12 —								Strong grey LIMESTO subhorizontal closely s 8.80-9.00m: Medium s 9.00-9.20m: Weak dar Discontinuities are ext planar and undulating 9.05-9.20m: Subvertice	NE. Discontinu spaced undulat trong. k grey calcared remely closely smooth. al-80° undulati	ities are ing rough. bus mudstone. to closely spaced			
-								discontinuity. 9.22-9.37m: Subvertice discontinuity. 9.43-9.60m: Weak to r calcareous mudstone.	al closely spac nedium strong Discontinuities	ed incipient dark grey s are subhorizontal ting rough			
- - 13 — -								9.51-9.60m: Subsettic 9.60-9.69m: 2 no. subprough discontinuities. 9.69-9.75m: Weak dar 9.75-9.95m: 3 no. subp	al undulating ro parallel subver k grey calcared vertical-70° und	bugh discontinuity. tical-70° undulating bus mudstone. dulating rough			
Groun Da	dwater: ate	Strike (n	Depth Cas n)	ing Dept (m)	h De Obse	epth Aft ervatior	ter n (m)	Hole Progress: Ho Date Ho 28/11/2014 01/12/2014 01/12/2014 01/12/2014	le Depth C (m) 9.00 9.00 10.00	Casing Depth Wate (m) (Nil 1 Nil 5 1.50 2	r Depth m) .20 .10 .20		

roje	ect Nar	ne: Five	e Mile Lan	52 7392 e	20,Em	iail: inf	Proje	und.co.uk ct No:	Co-ords	E 308	3145 N 16	9996	Ho	le Type
oca	tion:	Five	e Mile Lan	e, Car	diff			C4414	Level:	65.40	mAD			
lien	t:	Val	e of Glamo	organ	Cound	cil			Datas:	Start:	27/11/20	14	Log	ged B
	Water	Core Ru	n. Samples &	Testina	Core	TCR			Dales.	End:	01/12/20	14 Denth	Level	RS
(m) 	Levels	No/Type	Depth (m)	Result	Run & Sample	SCR RQD	Install	discontinuities.	Description			(m)	(mAD)	Legend
-								Borehole completed a	i strong dark gr it 10.00m	ey calcar	eous			
- - 4 —														
-									/	\land				
-										$\langle \rangle$				
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								_					Bore	ehole No.
RC	וו	AK	A RO	JR	ΕF	10		-E	LOG				B	BH107
Telepho	one: 014	152 7391	65 , Fax: 014	52 7392	20 , Em	nail: inf	fo@)ccgr	ound.co.uk	-1			She	eet 1 of 2
Proje	ct Nar	ne: Fiv	e Mile Lan	e				Proj	ect No: C4414	Co-ords:	E 308240 N 10	69874	Ho C	ole Type P+RC
Locat	tion:	Fiv	e Mile Lan	ie, Car	diff					Level:	57.33mAD		1	Scale : 37.50
Clien	t:	Va	le of Glam	organ	Cound	cil				Dates:	Start: 19/11/20	14	Lo	gged By RS
	Water	er Core Run, Samples & Testing Core TCR									Depth	Level		
(m)	Levels	No/Type	Depth (m)	Result	Sample	RQD	In	Istall		Description		(m)	(mAD)	Legend
-		B	0.30 - 0.60 0.50						 Soft greyish brown sli rootlets. (TOPSOIL) Very soft to soft orang sandy slightly gravelly Gravel is subangular 	ghtly sandy CLA gish brown motti / silty CLAY with fine mudstone.	AY with frequent led grey slightly n occasional rootlets.	~ 0.20	57.13	
- - 1 —		B D	0.80 - 0.90 0.80						0.80-2.20m: Gravel is coarse limestone. Hig limestone.	angular to suba h cobble conter	angular fine to nt. Cobbles are	(2.00)		
-		CPT	1.20 - 1.70 1.20 - 1.65	C 34						$\sum_{i=1}^{n}$		(2.00)		
2 —		B CPT	2.20 - 2.70 2.20 - 2.65	C 46					Firm orangish brown a CLAY with a high cob subangular fine to coa limestone.	and grey slightly ble content. Gra arse limestone.	y sandy gravelly avel is angular to Cobbles are	- 2.20 (0.60)	55.13	
3 —		C CPT	2.90 - 3.20 2.90	C*429	¢	0% 0% 0%			Dark grey LIMESTON and cobbles: Gravel is coarse limestone: Co	IE, recovered as s angular to sub bbles are limest	s very clayey gravel bangular medium to cone.	2.80 2.90	54.53 54.43	
-		С	3.20 - 3.50		¢	0% 0%						(0.60)		
-		C CS	3.50 - 4.00 3.65 - 3.75			0% 100% 20% 20%	$\sum_{i=1}^{n}$	2.	Medium strong dark g Discontinuities are su undulating rough. 3 50 3 60m: Drilling d	prey calcareous bhorizontal-20°	MUDSTONE. closely spaced	- 3.50 (0.40)	53.83	
4		C CPT CS	4.00 - 4.80 4.00 - 4.30 4.17 - 4.25	C*100		100% 20% 20%			dark grey gravelly cla fine to coarse calcare 3.65-3.75m: Subvertio Firm grey mottled ora Hard indistinctly thinly CLAY.	y. Gravel is ang ous mudstone. cal undulating ro ngish brown silt / laminated dark	ular to subangular ough discontinuity. y calcareous CLAY. grey calcareous	4.10 4.17 4.30	53.43 53.23 53.16 53.03	*4 *4 *4
5 —		C CPT	4.80 - 6.10 4.80 - 4.97	C*273		94% 69% 45%			Strong grey LIMESTC subhorizontal closely Firm indistinctly thinly CLAY with occasiona mudstone lithorelicts.	DNE. Discontinu spaced undulat laminated dark I subangular fin	ities are ing rough. grey calcareous e gravel sized	(0.32) (0.32)	52.48 52 16	
		CS	5.17 - 5.33		C				Extremely weak thinly Discontinuities are su extremely closely spa Strong grey LIMESTC subhorizontal very clo rough. 5.17-5.33m: Subvertiti 5.23 c 40m: 20% critical	aminated dark bhorizontal and ced undulating DNE. Discontinu sely and closely cal undulating re	c grey MUDSTONE. randomly orientated rough. ities are y spaced undulating ough discontinuity.	(0.55) (0.31)	51.61	
6 REMA EQUIF METH CASIN GROL	ARKS: PMENT: OD: Hai IG: 150r INDWAT	Hand dig nd dug in: nm diame FER: See	ging tools. Lig spection pit 0.0 eter to 2.80m. page at 0.60m	ht cable p 00-0.90m 140mm d . No rise	bercussi Cable j iameter recorde	on rig. percus to 4.50 d.	Cor sion)m.	maccl	nio MC305 multi-purpose mm) 1.20-2.90m. Waterfl	track mounted out of the track mounted of the track	drilling rig. drilled (116mm) 2.90-	10.00m.		<u> </u>

INSTALLATION: 50mm ID HDPE slotted standpipe: 4.00-10.00m. 50mm ID HDPE plain pipe: 0.00-4.00m Washed gravel response zone: 3.50-10.00m. Bentonite pellet seal: 0.20-3.50m. Concrete and raised cover 0.00-0.20m.

Groundwater:				Hole Progress	:		
Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)	Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
19/11/14	0.60	Nil	0.60	19/11/2014	2.90	2.80	2.60
				21/11/2014	2.90	Nil	2.60
				21/11/2014	4.00	2.90	1.20
				24/11/2014	4.00	2.90	2.60

ROTARY BOREHOLE LOG													Borehole No. BH107	
Telepho	one: 014	52 7391	65 , Fax: 014	52 7392	20 , Em	nail: info	@ccgro	und.co.uk	1			She	et 2 of 2	
Proje	ct Nan	ne: Fiv	e Mile Lan	e			Proje	ct No: C4414	Co-ords: E 308	240 N 16	9874	Ho C	le Type ;P+RC	
Locat	tion:	Fiv	^r e Mile Lan	ie, Car	diff				Level: 57.33	mAD		1	Scale 1 : 37.50	
Clien	t:	Va	le of Glam	organ	Cound	cil			Dates: Start: End:	19/11/20	14 14	Lo	ged By RS	
(m)	Water	Core R	un, Samples &	Testing	Core Run &	TCR SCR	Install		Description		Depth		Legend	
	Levels	No/Type CS CPT CS CPT CS CPT CS CPT CS CPT CS CPT CS CPT	Depth (m) 6.03 - 6.10 6.10 - 7.10 6.10 - 6.21 6.84 - 6.95 7.10 - 7.50 7.10 - 7.22 7.38 - 7.50 7.50 - 8.50 8.41 - 8.50 8.50 - 8.90 8.50 - 8.90 8.50 - 8.90 9.92 - 10.00 10.00 - 10.18	Result C*600 C*426 C*600		RQD 100% 68% 19% 100% 63% 63% 63% 63% 51% 10% 86% 55% 0% 91% 86% 51%		undulating rough disco extremely weak orangi 5.48-5.62m: Weak dar 5.62-5.71m: Subvertica Extremely weak thinly MUDSTONE. Disconti closely spaced undulai <i>previous sheet</i>) Strong grey LIMESTOI subhorizontal closely s Extremely weak dark g Discontinuities are sub undulating rough. Strong grey LIMESTOI subhorizontal very clos rough. 6.40-6.57m: Subvertica stained discontinuity, 6.64-6.69m: Medium s 6.75-7.04m: Weak dar 7.10-7.18m: Extremely mudstone. Discontinuit extremely closely spac 7.18-7.26m: Subvertica 7.26-7.38m: Extremely mudstone. Discontinuit closely to very closely Weak dark grey calcar are subhorizontal extre undulating rough. Strong grey LIMESTOI subhorizontal very closely Weak dark grey calcar are subhorizontal extre undulating rough. Strong grey LIMESTOI subhorizontal very closely Weak dark grey calcar are subhorizontal very closely Weak dark grey calcar are subhorizontal extre undulating rough. 8.14-8.22m: Subvertica stained discontinuity. Weak dark grey calcar are subhorizontal very closer rough. 8.0-8.90m: Medium s 9.60-9.77m: Subvertica stained discontinuity. 9.50-9.60m: Medium s 9.60-9.77m: Subvertica stained discontinuity. 9.90-9.92m: Soft orang Borehole completed at	Intinuity, forming bounda sh brown mudstone. k grey calcareous mudsi al undulating rough disco laminated dark grey calca nuities are subhorizontal ting rough. <i>(continued fro</i> NE. Discontinuities are paced undulating rough rey calcareous MUDST whorizontal very closely size NE. Discontinuities are selv to closely spaced undulating rough oran trong grey calcareous mudsi weak dark grey calcare tes are randomly orienta ted undulating rough disco weak dark grey calcare tes are randomly oriental ed undulating rough disco weak dark grey calcare bely to very closely spaced undulating rough disco weak dark grey calcare tes are subhorizontal ex spaced undulating rough eous MUDSTONE. Disco mely to very closely spaced undulating rough orientated extrem gh. al undulating rough oran eous MUDSTONE. Disco closely to closely spaced undulating rough orientated extrem gh. al undulating rough oran eous MUDSTONE. Disco closely to closely spaced exp limestone. jish brown clay infill. trong. al undulating rough oran al undulating rough oran	ary with tone. ontinuity. areous l extremely om ONE. spaced adulating gish brown udstone. tone. ous ated ontinuity. ous ated ontinuities aced indulating nudstone. ely closely gish brown continuities d adulating nudstone. ely closely gish brown continuities d	(m) 6.03 6.10 - 6.35 (1.15) - 7.50 (0.45) - 7.95 8.22 (1.78) - 10.00	(mAD) 51.30 51.23 50.98 49.83 49.38 49.11 47.33		
	dwator:							Holo Prograss:						
Da	uwater: ate	Strike (r	Depth Cas n)	ing Dept (m)	h De Obse	epth Aft ervation	er (m)	Date Hoi 24/11/2014 25/11/2014 25/11/2014 25/11/2014	le Depth Casing De (m) (m) 8.90 4.50 8.90 4.50 10.00 4.50	pth Water (r 7. 7. 8.	Depth m) 00 90 10			

CC GROU	ND IN\	/ESTIGAT	IONS I	LTD								Bore	ehole No.
ROT	AR	Y BC	DR	E۲	HC)L	E	LOG				E	3H108
Telephone: 014		65 , Fax: 014	52 7392		nail: inf	fo@d	ccgro	ound.co.uk				She	et 1 of 2
Project Nar	ne: Fiv	e Mile Lan	e			F	Proje	ect No: C4414	Co-ords:	E 308330 N 16	69776	Ho C	le Type P+RC
Location: Five Mile Lane, Cardiff									Level:	1	Scale : 37.50		
Client:	Vale of Glamorgan Council								Lo	Logged By RS			
(m) Water	Core Ru	un, Samples &	Testing	Core Run &	TCR SCR	In	stall		Description		Depth	Level (mAD)	Legend
-	No/Type	Depth (m)	Result	Sample	RQD	• 5 .	•••	Soft greyish brown sli	ghtly sandy CL	AY with frequent		(IIIAD)	<u> </u>
	B D	0.30 - 0.70 0.40						rootlets. (TOPSOIL) Soft orangish brown r occasional rootlets.	nottled grey silt	ty CLAY with	- 0.20 (0.40)	44.01	
-	ES B	0.50 0.80 - 1.20						Firm orangish brown a gravelly CLAY with a	and grey slightl low cobble con	y sandy slightly tent. Gravel is	0.60	43.61	
	D	0.80						are limestone.		innesione. Cobbles			
	B SPT	1.20 - 1.70 1.20 - 1.65	S 18					-					
									\sum		(2.20)		
2	P	2 20 2 70	C 20										
Ţ Ţ Ţ	SPT	2.20 - 2.65	0.30					2.20-2.80m: High Cob		obbles are imestone.			
	B	2.80 - 3.20	S*53					Extremely weak to ve	ry weak grey ca	alcareous	2.80	41.41	
3	В	3.20 - 3.70					E	to subangular fine to	coarse gravel.	andy clayey angular	(0.90)		
-						5							
	SPT C	3.70 3.80 - 5.00	S*273		100% 32%			Strong grey LIMESTO subhorizontal closely	ONE. Discontinu spaced undula	uities are ting rough.	- 3.70 - 3.88	40.51 40.33	
4					0%			SILTSTONE. Discont randomly orientated e rough with a little clay	inuities are sub extremely close smear on disc	bhorizontal and ly spaced undulating ontinuity surfaces.	(0.78)		
-	cs	4.66 - 4.75						4.38-4.52m: Subvertio 4.44-4.49m: Strong g Strong grey LIMESTO	cal undulating s rey limestone. DNE. Discontini	smooth discontinuity.	4.66	39.55	
5 —	с	5.00 - 6.20	C*273		92%			subhorizontal extreme smooth. 4.66-4.88m: Subvertie	ely closely spac	ced undulating ough discontinuity.	4.88	39.33	-5
	CPT	5.00 - 5.14			22% 0%			4.76-4.79m: Discontir Gravel is subangular Extremely weak grey	nuity infilled with fine to medium calcareous MU	h soft clayey gravel. limestone. DSTONE.	5.25	38.96	
	CS	5.44 - 5.49		- - -				Discontinuities are rai spaced undulating rou 5.00-5.25m: Drilling d gravelly clay. Gravel i	ndomly orientat ugh. isturbed, recov s angular to su	ted extremely closely ered as soft slightly bangular fine to	(0.95)		
6								medium mudstone.		-			

REIVIARNO:

EQUIPMENT: Hand digging tools. Light cable percussion rig. Comacchio MC305 multi-purpose track mounted drilling rig. METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (150mm) 1.20-3.70m. Waterflush rotary core drilled (116mm) 3.70-10.00m. CASING: 150mm diameter to 3.00m. 140mm diameter to m. GROUNDWATER: Encountered at 3.00m. Rising to 2.45m following twenty minute monitoring period. INSTALLATION: 50mm ID HDPE slotted standpipe: 4.00-10.00m. 50mm ID HDPE plain pipe: 0.00-4.00m Washed gravel response zone: 3.50-10.00m. Bentonite pellet seal: 0.20-3.50m. Concrete and raised cover 0.00-0.20m.

18/11/14 3.00 2.80 2.45 18/11/2014 3.20 3.00 2.60 19/11/2014 3.20 3.00 2.40 19/11/2014 3.70 3.00 2.40 19/11/2014 3.70 3.00 2.40 19/11/2014 3.70 3.00 2.40	Groundwater: Date	Strike Depth (m)	Casing Depth (m)	Depth After Observation (m)	Hole Progress: Date	Hole Depth (m)	Casing Depth (m)	Water Depth (m)
19/11/2014 3.70 3.00 2.40 25/11/2014 2.80 Nil 0.70	18/11/14	3.00	2.80	2.45	18/11/2014 19/11/2014	3.20 3.20	3.00 3.00	2.60 2.40
Z0/11/2014 0.00 NII 0.70					19/11/2014 25/11/2014	3.70 3.80	3.00 Nil	2.40 0.70

12/1/15 CC ROTARY LOG C4414.GPJ GINT STD AGS 3_1.GDT

CC GROU		/ESTIGAT		TD							Bore	ehole No.
ROT	٩R	Y B(DR	EF	Ю	LE	LOG				E	BH108
Telephone: 014	52 7391	65 , Fax: 014	52 7392	20 , Em	ail: info	©ccgro	und.co.uk		-		Sne	
Project ivar			е				C4414	Co-ords:	E 308330 N	169776	C	P+RC
Location:	Fiv	e Mile Lan	e, Car	diff				Level:	44.21mAD		1	Scale : 37.50
Client:	Va	le of Glam	organ (Counc	il			Dates:	Start: 18/11/2 End: 26/11/2	2014 2014	Lo	gged By RS
(m) Water	Core Ru	un, Samples &	Testing	Core Run &	TCR SCR	Install		Description		Depth	Level	Legend
Levels	No/Type	Depth (m)	Result	Sample C	RQD		Very weak to weak dar Discontinuities are sub	k grey calcared	ous MUDSTONE. emely closely to	(m)	(mAD)	
7	C CPT	6.20 - 7.50 6.20 - 6.41	C*150		77% 32% 18%		closely spaced undulal With orangish brown si (continued from previou 5.32-5.38m: Strong da 5.64-5.68m: 30° undula 5.80-5.88m: Extremely gravel. 6.00-6.04m: Extremely gravel.	ting rough. Loca taining on disco us sheet) rk grey mudsto ating rough disc weak, locally to weak, locally to	ally planar smooth. ontinuity surfaces. ne. continuity. ending to clayey ending to clayey	6.20	38.01	-7
8	CS C CPT	7.39 - 7.50 7.50 - 8.50 7.50 - 7.70	C*158		100% 42% 15%		6.05-6.20m: 45° undula 6.11-6.20m: Extremely gravel. Very weak to weak dar Discontinuities are sub spaced undulating roug 6.20-6.65m: Drilling dia medium to coarse grav 6.75-6.83m. Strong gre 6.83-7.10m. Discontinu	ating rough disc weak, locally to k grey calcared horizontal very gh. sturbed, recove rel. ay limestone. jities are subho	continuity. ending to clayey bus MUDSTONE. closely to closely ered as subangular prizontal extremely	(3.80)		
9 —	CS C CPT CS	8.35 - 8.50 8.50 - 9.40 8.50 - 8.65 8.69 - 8.77	C*300		83% 37% 11%		to very closely spaced 6.95-7.05m: Soft grave fine mudstone. 7.02-7.09m: 2 no. inter rough discontinuities. 7.13-7.30m: Subvertica discontinuity. 7.25-7.50m: Medium s 7.38-7.39m: Discontinu	undulating roug elly clay infill. Given the secting 45° and al-80° undulating trong.	gh. ravel is subangular d 55° undulating ng rough soft gravelly clay.			9
	C CS	9.40 - 10.00 9.88 - 9.97			100% 50% 0%		7.77,7.99m; Non intact fine to coarse gravel. 8.06-8,13m 2 no. para undulating smooth disc 8.13-8,23m; Non intact fine to coarse gravel.	ne mudstone. t, recovered as illel 60° very clo continuities. t, recovered as	clayey subangular osely spaced clayey subangular			
	CPT	10.00 - 10.13	C*333				8.30-8.38m: Non intact fine to coarse gravel. 8.38-8.50m: Medium s 8.50-8.60m: Drilling dis medium to coarse grav 8.83-8.87m: Strong gre 8.98-9.02m: Discontinu Gravel is subangular fi 9.70-9.73m: Discontinu Consult is subangular fi	t, recovered as sturbed, recove /el. 2y limestone. 1ity infilled with ne mudstone. 1ity infilled with	clayey subangular ored as subangular soft gravelly clay. soft gravelly clay.		34.21	
							9.78-9.88m: Subvertica Borehole completed at	al undulating ro	ugh discontinuity.			11 - - - - - - - - - - - -
12												- 12 - - - - - -
13 – Groundwater:							Hole Progress:					- - - - - - - - - - - - - - - - - - -
Date	Strike (n	Depth Cas ı)	ing Deptł (m)	n De Obse	epth Afte ervation	er ∫(m)	Date Hol 25/11/2014 26/11/2014 26/11/2014	le Depth C. (m) 7.50 7.50 10.00	asing Depth Wa (m) 3.80 3.80 4.50	ater Depth (m) 2.40 2.60 2.60		

































