

Our ref: GRA/ACV/JR/H19104/2020.03.17

Mr D Green
The Gables
Royd Lane,
Higham
Barnsley
S75 1PH

by email only

17 March 2020

Dear David,

**REPLACEMENT DWELLING AT PINE LODGE, STAINBOROUGH LANE, HOOD GREEN, BARNSELY S75 3EZ
ADDENDUM HAZARDOUS GROUND GAS RISK ASSESSMENT**

Please find below the addendum ground gas risk assessment for the above site following completion of the ground gas monitoring programme.

Introduction

Patrick Parsons (PP) were commissioned by Mr David Green to undertake the installation and monitoring of ground gas and groundwater monitoring wells at the existing Pine Lodge dwelling Stainborough Lane, Hood Green, Barnsley. This addendum report presents the findings of the now completed gas and groundwater monitoring programme undertaken as part of the original pre-demolition ground investigation works at the site, which should be read in conjunction with this report. A site location plan is presented as Drawing No. H19104-701 in Appendix A.

It is understood that the redevelopment will comprise a new detached replacement low rise dwelling. It is considered that the proposed development comprises a Type A building, in accordance with Table 3 of BS8485:2015+A1 2019 "Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings", and cited as relevant guidance with respect to ground gas protection for new development.

Limitations

This report is based on and limited to an assessment of the resultant information obtained by PP. This report is prepared for the sole use of Mr David Green and his agents only and should not be relied upon by any third parties without the written permission of PP.

Background

Recent shallow intrusive investigation at the site, prior to demolition of the existing dwelling, has confirmed either surface macadam hardstanding or topsoil underlain by made ground to depths of up to 2.2m below existing ground level (begl). The made ground was recorded to comprise either reworked firm and stiff gravelly clays, locally containing gravel of brick and ceramic, or mudstone gravel (colliery spoil) deposits. No putrescible or organic debris was recorded within the made ground. Natural residual firm and stiff gravelly

clays were recorded to underlie the made ground across the site and were proved to depths between 1.0 and 3.8m begl. Solid strata were present below the natural clays, comprising very weak mudstone, which was interbedded with siltstone, sandstone and coal seams at depth and proved to at least 30.0m begl.

The site lies within a Development High Risk Area (DHRA), as defined by the Coal Authority, and there are recorded shallow coal mine workings beneath the site. Subsequent more recent intrusive investigations at the site, prior to demolition of the existing dwelling, confirmed near surface thin coal seams (30 to 100mm thick) at depths of between 1.6 and 3.85m begl, confined to the northeastern area of the site. A deeper coal seam was identified in the majority of the exploratory boreholes across the site at 1.1m thick and present at depths of between 14.6 and 17.8m begl. In all instances, the deeper coal seam was proved as being intact with no evidence of historic mine workings. The upper shallow outcropping coal seam is considered as representing the Joan coal and the deeper seam as being the Flockton Thick coal seam.

in addition, the deeper ground investigation proved evidence suggestive of the past exploitation and disturbance of the strata immediately overlying the Flockton Thick coal seam. Anomalous strata, presenting as soft and disturbed with partial or total loss of flush returns, was encountered in several boreholes between rockhead and approximately 10 to 12m begl. No evidence of voids was noted. These findings are considered to represent former bell pit mine workings associated with the historic exploitation of the Tankersley Ironstone seam, but not the underlying Flockton Thick coal seam.

In total 3 no. mine entries (shafts) have been confirmed as present on site, 2 of these are unrecorded mine shafts. All mine entries were 2.0 to 2.5m in diameter, infilled with mudstone gravel and are considered to represent bell pits put down to exploit the underlying Tankersley Ironstone seam.

Recorded surface mining activities (opencast) are recorded adjacent to the east and southeast of the site. These are likely to be infilled with significant thicknesses of excavated materials and potentially other unknown materials.

Given the above findings and mining legacies of the site and surrounding area, potential sources of hazardous ground gas include on site deep made ground on and off site recorded shallow and deep coal and non-coal mine workings and off site adjacent former backfilled opencast mining. The primary pathway for the migration of hazardous ground gas to the surface is via pore space within soils and fracture flow within solid strata.

Fieldwork

The drilling of 5 no. mini percussive boreholes (WS01 to WS05) was undertaken in November 2019 and included the installation of 3 no. gas and groundwater monitoring wells (WS01, WS03 and WS05). Response zones were placed between 1.0 and 4.0m begl within the natural residual clays and underlying mudstone. Subsequent to the initial phase of intrusive investigation, the drilling of 6 no. rotary percussive open boreholes (R01 to R06) was undertaken to investigate possible shallow mine workings with the boreholes put down to a maximum depth of 30.0m begl in January 2020. A plan showing the location of the monitoring wells and rotary boreholes is presented as Drawing No. H19104-704A, included in Appendix A. The exploratory hole records are provided in Appendix B.

Following completion, the installed wells were monitored for hazardous ground gases and groundwater levels on 6 no. occasions over a period of 3 months, using a calibrated landfill gas analyser and electronic

dip meter in accordance with CIRIA C665 “Assessing risks posed by hazardous ground gases to buildings”, 2007.

Gas Monitoring Results

Table 1 below summarises the range of recorded ground gas parameters. The full ground gas and groundwater monitoring data is provided in Appendix C.

Table 1: Summary of Gas Monitoring Results

Location	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Flow (l/hr)	Barometric Pressure (mb)	Maximum GSV*	
						CO ₂	CH ₄
WS01	0.0	1.8 – 5.2	14.5 – 18.9	<0.1	975 – 1007	<0.07	<0.07
WS03	0.0	0.9 – 4.4	15.1 – 20.4	<0.1			
WS05	0.0	1.0 – 2.3	16.4 – 20.3	<0.1			

Carbon dioxide levels were generally below 5%, however one visit indicated levels at 5.2% v/v. Flow rates from the boreholes did not exceed the detectable limit of 0.1 l/hr. Slightly depressed oxygen concentrations were recorded. Methane, carbon monoxide and hydrogen sulphide were not detected during the monitoring programme. A total of 4 monitoring visits were undertaken at low atmospheric pressures between 975 and 993mb with 3 of these visits during periods of falling atmospheric pressure.

During the rotary drilling for possible shallow mine workings, each borehole head was monitored for gases (methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen) during its advancement, no elevated or abnormal gas levels were recorded within any of the boreholes.

Hazardous Gas Risk Assessment

In accordance with CIRIA C665 and BS8485:2015 +A1 2019, a hazardous ground gas risk assessment requires the calculation of gas screening values (GSVs) for both methane and carbon dioxide, based on the typical maximum concentrations (TMC) and gas flow rates. The worst case of the two is then applied to establish the site-specific GSV applicable to the proposed development. In the absence of methane, carbon dioxide has been used as the worst-case assessment criteria for this site:

$$CO_{2_{max}}[\%]/100 * Flow\ rate_{max}[l/hr] = GSV[l/hr]$$

$$\frac{5.2}{100} = 0.052 * 0.1\ l/hr = 0.0052\ l/hr$$

Although the calculated GSV is below the threshold of 0.07l/hr for Characteristic Situation (CS) CS1, the presence of carbon dioxide above 5% during one visit, recorded deep made ground at the site, the presence of shallow mine workings both on and within the vicinity of the site, as well as a recorded former infilled adjacent open cast mine site, would dictate an increase in the Characteristic Situation to CS2, in accordance with BS8485:2015+A1 2019. This is a low hazard potential which will require gas protection measures accordingly.

Gas Protection Measures

In accordance with BS8485:2015 +A1 2019, the proposed residential end use equates to a Type A Building. For CS2 gas conditions, a point score of 3.5 must be achieved for adequate gas protection, which can be achieved from a range of measures as described in Section 7 of the standard.

In view of the information obtained during this risk assessment, it is considered that the provision of gas protection measures to new development, with respect to carbon dioxide and methane, will be required. The site is within an area where basic radon protection measures are necessary for new development.

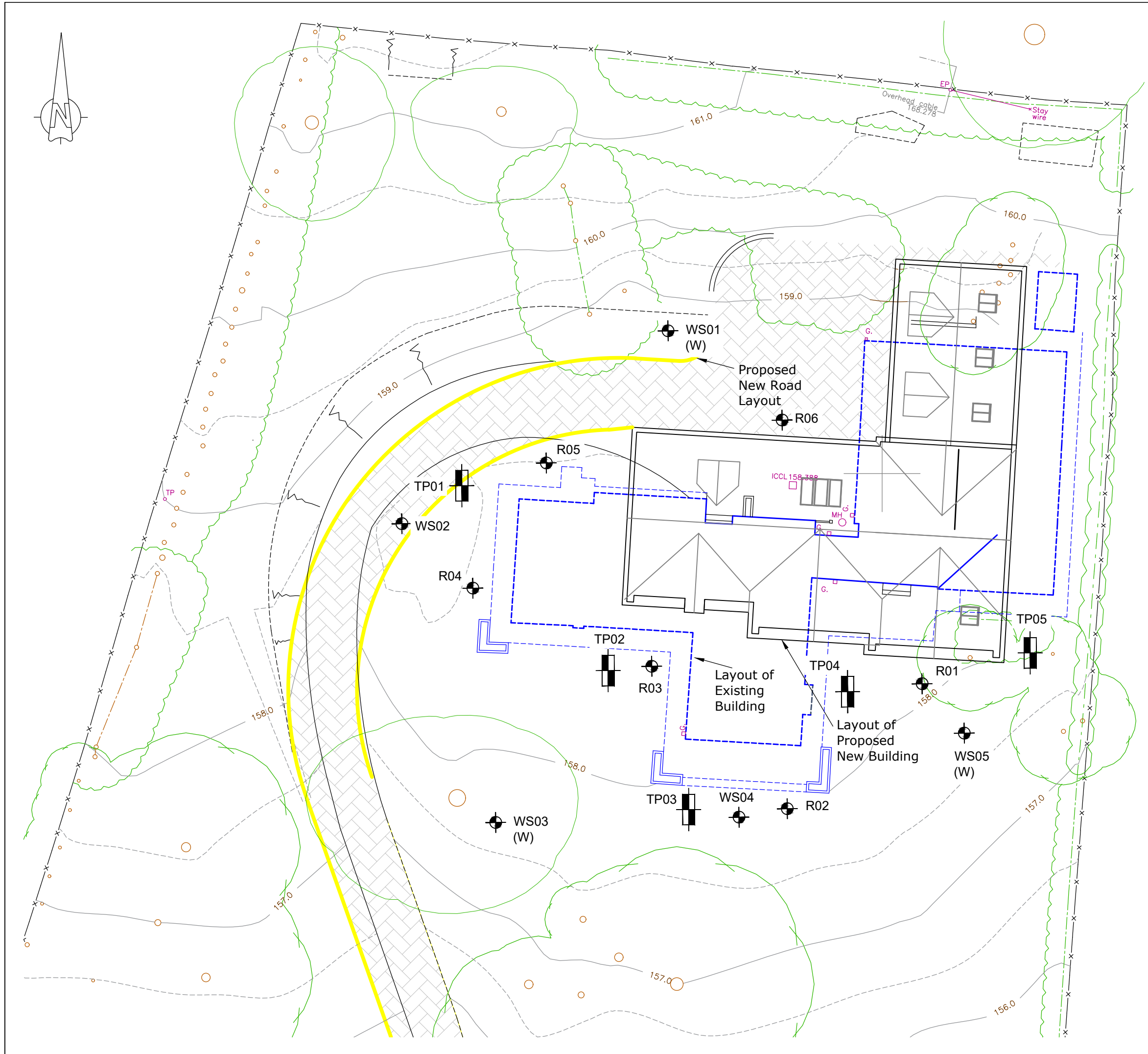
Should you have any queries regarding the above please do not hesitate to contact us.

Yours sincerely



Andrea Chaverra Valencia
Geoenvironmental Engineer

**APPENDIX A
FIGURES**



GENERAL NOTES

1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF PATRICK PARSONS

1.2. DO NOT SCALE FROM THIS DRAWING.

LEGEND

	MINI PERCUSSIVE BOREHOLE (WITH MONITORING WELL)
	ROTARY OPEN BOREHOLE
	TRIAL PIT

P1	INITIAL ISSUE.	09.01.20 RDV
Rev.	Amendments	Date By
Revisions		

5 Waverley Road
Huddersfield
West Yorkshire
HD1 5NA
United Kingdom
T. +44 (0)1484 516 977
E. info@patrickparsons.co.uk
W. www.patrickparsons.co.uk

Client

MR DAVID GREEN

Project

**REPLACEMENT DWELLING AT
PINE LODGE, STAINBOROUGH
LANE, HOOD GREEN, BARNSELY**

Drawing

**PRE DEMOLITION -
EXPLORATORY HOLE LOCATION
PLAN**

Scales 1:250 @ A3		At original size A3
Drawn ACV	Checked JR	
Date MARCH 2020		

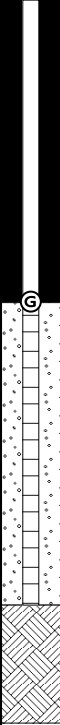
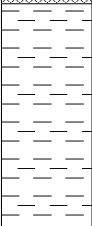
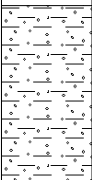
Status

PRELIMINARY

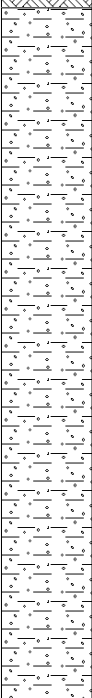
Drawing No. **H19104-704A** Rev. **P1**

**APPENDIX B
EXPLORATORY HOLE RECORDS**

				Borehole Log				Borehole No. WS01 Sheet 1 of 1	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431746E - 402769N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		158.36	
Client:		Mr David Green				Dates:		26/11/2019	
Logged By		ACV							

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	158.36		Tarmacadam.	
					0.25	158.26		MADE GROUND: Light grey, mottled yellow, clayey gravel. Gravel is angular to coarse limestone.	
								Stiff, light grey and orange mottled, slightly gravelly CLAY. Gravel is angular fine to medium mudstone.	
		1.00	SPT	N=19 (4,5/4,4,4,7)	1.00	158.11		Stiff, brown and dark grey mottled, very gravelly CLAY. Gravel is angular fine to medium of mudstone.	
		2.00	SPT	N=50 (25 for 125mm/50 for 265mm)	1.60	157.36		Very weak, thinly bedded, light brown and grey mottled MUDSTONE. Recovered as gravel.	
					2.39	156.76	End of Borehole at 2.39m		

Remarks 1) No groundwater encountered. 2) Borehole terminated at 2.39m below existing ground level (begl) due to refusal on mudstone. 3) Monitoring well installed to 2m begl.		
--	--	---

				Borehole Log				Borehole No. WS02 Sheet 1 of 1	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431732E - 402758N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		158.63	
Client:		Mr David Green				Dates:		26/11/2019	
								Logged By ACV	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30			0.30	158.63		TOPSOIL: Dark grey, organic, slightly gravelly clay. Gravel is angular fine to coarse mudstone.	1
		0.90 1.00	SPT	HVP=50 N=12 (1,6/4,2,3,3)				Firm becoming stiff, grey, orange and brown mottled, gravelly CLAY. Gravel is angular, fine to coarse mudstone and coal.	
		2.00	SPT	N=23 (5,5/6,5,6,6)				Very weak, thinly bedded, light brown and grey mottled MUDSTONE. Recovered as gravel.	2
		3.00	SPT	50 (9,13/50 for 170mm)				End of Borehole at 3.32m	3
					3.32	156.03			4
									5
Remarks 1) No groundwater encountered. 2) Borehole terminated at 3.32m below existing ground level (begl) due to refusal on mudstone. 3) Borehole backfilled with arisings to existing ground level.									

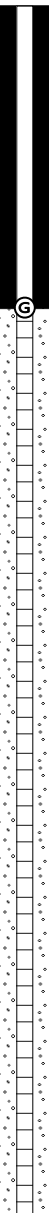
Borehole Log

Borehole No.

WS03

Sheet 1 of 2

Project Name:	Replacement Dwelling at Pine Lodge	Project No.	H19104	Co-ords:	431735E - 402737N	Hole Type	WS
Location:	Stainborough Lane, Hood Green, Barnsley			Level:	157.71	Scale	1:25
Client:	Mr David Green			Dates:	26/11/2019	Logged By	ACV

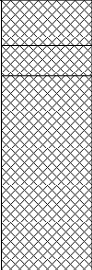
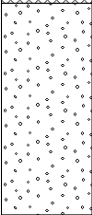
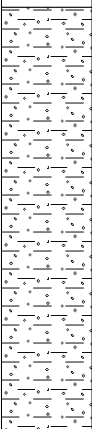
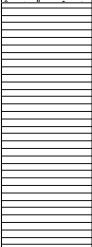
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20	157.71		TOPSOIL: Dark grey, organic, slightly gravelly clay. Gravel is angular, fine to coarse mudstone.	
					0.50	157.51		Firm, dark grey and light grey mottled, gravelly CLAY. Gravel is angular, fine to medium mudstone.	
								Firm, dark grey, very gravelly CLAY. Gravel is angular fine to coarse mudstone. Contains roots to 0.7m begl.	
		1.00	SPT	N=8 (1,2/2,2,2,2)	1.00	157.21		Very weak, thinly bedded, black mottled orange, carbonaceous MUDSTONE. Recovered as gravel. (Possibly disturbed strata)	1
		2.00	SPT	N=9 (2,3/3,2,2,2)					2
		3.00	SPT	N=5 (2,1/1,1,1,2)					3
		4.00	SPT	N=6 (1,2/1,1,2,2)					4
		5.00	SPT	N=14 (2,3/3,3,3,5)					5
Continued on Next Sheet									

Remarks

1) No groundwater encountered. 2) Borehole terminated at 5.45m below existing ground level (begl) in mudstone. 3) Monitoring well installed to 4m begl.

				Borehole Log				Borehole No. WS03 Sheet 2 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No. H19104		Co-ords: 431735E - 402737N		Hole Type WS	
Location:		Stainborough Lane, Hood Green, Barnsley				Level: 157.71		Scale 1:25	
Client:		Mr David Green				Dates: 26/11/2019		Logged By ACV	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					5.45	156.71		End of Borehole at 5.45m	
									6
									7
									8
									9
									10
Remarks 1) No groundwater encountered. 2) Borehole terminated at 5.45m below existing ground level (begl) in mudstone. 3) Monitoring well installed to 4m begl.									

				Borehole Log				Borehole No. WS04 Sheet 1 of 1	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431751E - 402737N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		157.93	
Client:		Mr David Green				Dates:		26/11/2019	
								Hole Type WS	
								Scale 1:25	
								Logged By ACV	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.15	157.93		MADE GROUND: Dark grey, organic, slightly gravelly clay. Gravel is angular, fine to medium mudstone.	1	
					0.25	157.78		MADE GROUND: Light yellow gravel. Gravel is angular, coarse sandstone.		
								MADE GROUND: Firm, dark grey mottled orange and black, gravelly clay. Gravel is angular, fine to coarse mudstone and coal. (Reworked natural)		
		1.00	SPT	N=6 (3,2/1,1,2,2)	0.90	157.68		Loose, dark grey becoming light grey GRAVEL. Gravel is angular, fine to coarse mudstone.		
					1.60	157.03		Firm, orange mottled grey, slightly gravelly CLAY. Gravel is angular, fine to medium mudstone.		
		1.80								
		2.00	SPT	N=13 (2,1/3,2,4,4)	2.10	156.33		Firm becoming stiff, grey, orange and brown mottled, gravelly CLAY. Gravel is angular, fine to coarse mudstone.		
		3.00	SPT	N=28 (5,5/5,8,8,7)	3.50	155.83		Very weak, thinly bedded, light brown and grey mottled MUDSTONE. Recovered as gravel.		
			4.00					4		
					4.31	154.43	End of Borehole at 4.31m		5	

Remarks 1) No groundwater encountered. 2) Borehole terminated at 4.31m below existing ground level (begl) due to refusal on mudstone. 3) Borehole backfilled with arisings to existing ground level.		
--	--	---

Borehole Log

Borehole No.

WS05

Sheet 1 of 2

Project Name: Replacement Dwelling at Pine Lodge

Project No. H19104

Co-ords: 431765E - 402743N

Hole Type WS

Location: Stainborough Lane, Hood Green, Barnsley

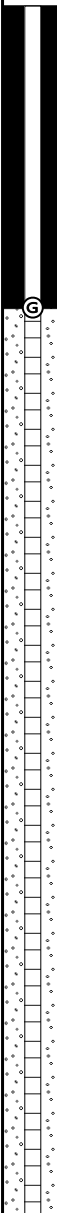
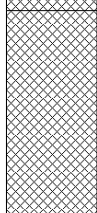
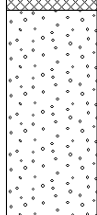
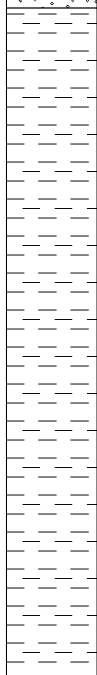
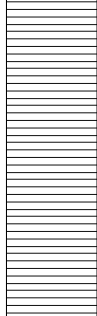
Level: 157.85

Scale 1:25

Client: Mr David Green

Dates: 26/11/2019

Logged By ACV

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20	157.85		MADE GROUND: Dark grey, organic, slightly gravelly clay. Gravel is angular, fine to medium mudstone.	
								MADE GROUND: Firm, grey, orange and black mottled, gravelly clay. Gravel is angular, fine to coarse brick, ceramic, sandstone, mudstone and coal.	
		1.00	SPT	N=12 (2,2/3,2,3,4)	0.90	157.65		Medium dense, black becoming light brown GRAVEL. Gravel is angular, fine to coarse mudstone.	1
		2.00	SPT	N=11 (1,1/2,3,3,3)	1.60	156.95		Firm becoming stiff, orange, brown and grey mottled, slightly gravelly CLAY. Gravel is angular, fine to medium mudstone.	2
		2.70		HVP=58					
		3.00	SPT	N=21 (2,3/4,5,6,6)					3
		3.85			3.85	156.25		Very weak, black, lustrous COAL.	4
		4.00	SPT	N=16 (6,5/4,4,4,4)	3.88	154.00		Very weak, thinly bedded, light brown and grey mottled MUDSTONE. Recovered as gravel.	
		5.00	SPT	N=7 (1,2/1,2,2,2)				Continued on Next Sheet	5

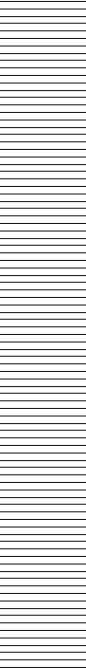
Remarks

1) No groundwater encountered. 2) Borehole terminated at 5.45m below existing ground level (begl) in mudstone. 3) Monitoring well installed to 4m begl.



				Borehole Log				Borehole No. R01 Sheet 1 of 3	
Project Name:		Replacement Dwelling at Pine Lodge		Project No. H19104		Co-ords: 431763E - 402746N		Hole Type BH	
Location:		Stainborough Lane, Hood Green, Barnsley				Level: 158.10		Scale 1:50	
Client:		Mr David Green				Dates: 14/01/2020		Logged By JR	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								MADE GROUND: Dark brown, clay and gravel.	1
					1.80	158.10		Light brown CLAY.	2
					3.50	156.30		Dark grey MUDSTONE. (Soft - Possibly Disturbed)	3
								4	
								5	
								6	
								7	
								8	
								9	
								10	
Continued on Next Sheet									
Remarks 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. Borehole sealed with cement and bentonite at rockhead and the surface on completion.									



				Borehole Log				Borehole No. R01 Sheet 3 of 3	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431763E - 402746N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		158.10	
Client:		Mr David Green				Dates:		14/01/2020	
								Logged By JR	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					25.00	138.10		Brown SANDSTONE with SILTSTONE bands.	21
					25.00	138.10		Grey, silty MUDSTONE.	25
					29.50	133.10		Grey SANDSTONE.	29
					30.00	128.60		End of Borehole at 30.00m	30
Remarks 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. Borehole sealed with cement and bentonite at rockhead and the surface on completion.									



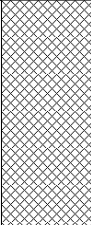
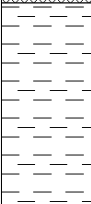
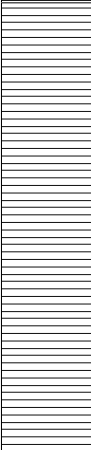
				Borehole Log				Borehole No. R02 Sheet 2 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431754E - 402738N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		157.80	
Client:		Mr David Green				Dates:		14/01/2020	
Logged By		JR							

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					12.80	147.80		Black, silty MUDSTONE. (Partial flush returns)	11
					15.00	145.00		Grey MUDSTONE.	13
					19.00	142.80		Solid STRATA. (No flush returns)	15
End of Borehole at 19.00m								19	
								20	

Remarks
1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



				Borehole Log				Borehole No. R03 Sheet 1 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No. H19104		Co-ords: 431745E - 402747N		Hole Type BH	
Location:		Stainborough Lane, Hood Green, Barnsley				Level: 158.35		Scale 1:50	
Client:		Mr David Green				Dates: 14/01/2020		Logged By JR	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.50	158.35		MADE GROUND: Dark brown clay.	1
								Grey brown CLAY.	2
					2.90	156.85		Grey, silty MUDSTONE.	3
					7.00	155.45		Black, silty MUDSTONE.	7
Continued on Next Sheet								10	

Remarks

1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



					Borehole Log			Borehole No. R03 Sheet 2 of 2		
Project Name: Replacement Dwelling at Pine Lodge			Project No. H19104		Co-ords: 431745E - 402747N		Hole Type BH			
Location: Stainborough Lane, Hood Green, Barnsley					Level: 158.35		Scale 1:50			
Client: Mr David Green					Dates: 14/01/2020		Logged By JR			
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
										
					13.80	151.35		Grey MUDSTONE.	11	
									12	
									13	
									14	
									15	
									16	
					16.70	144.55		COAL. (intact)	17	
					17.80	141.65		Grey MUDSTONE.	18	
					19.00	140.55		End of Borehole at 19.00m	19	
									20	
Remarks 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.										

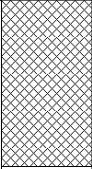
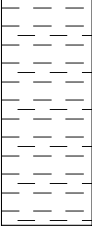
Borehole Log

Borehole No.

R04

Sheet 1 of 2

Project Name:	Replacement Dwelling at Pine Lodge	Project No.	H19104	Co-ords:	431733E - 402752N	Hole Type	BH
Location:	Stainborough Lane, Hood Green, Barnsley			Level:	158.40	Scale	1:50
Client:	Mr David Green			Dates:	15/01/2020	Logged By	JR

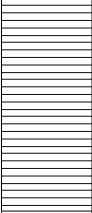
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.10	158.40		MADE GROUND: Dark brown clay.	1
								Grey brown CLAY.	2
					2.60	157.30		Grey MUDSTONE.	3
									4
									5
									6
									7
					8.00	155.80		Dark grey and black, silty MUDSTONE.	8
									9
									10
								Continued on Next Sheet	

Remarks

1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



				Borehole Log				Borehole No. R04 Sheet 2 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431733E - 402752N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		158.40	
Client:		Mr David Green				Dates:		15/01/2020	
Hole Type		BH							
Scale		1:50							
Logged By		JR							

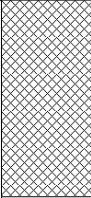
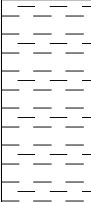
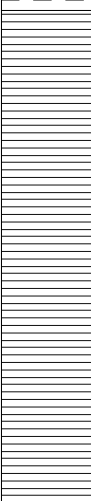
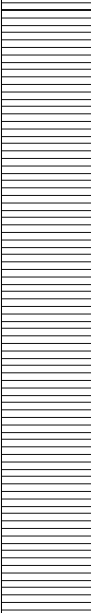
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
										
					15.50	150.40		COAL. (intact)		
					16.60	142.90		Grey, silty MUDSTONE.		
					18.00	141.80		End of Borehole at 18.00m		

Remarks

1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



				Borehole Log				Borehole No. R05 Sheet 1 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No.		H19104		Co-ords: 431738E - 402761N	
Location:		Stainborough Lane, Hood Green, Barnsley				Level:		158.45	
Client:		Mr David Green				Dates:		15/01/2020	
Hole Type		BH							
Scale		1:50							
Logged By		JR							

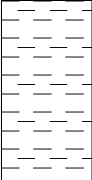
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					1.30	158.45		MADE GROUND: Dark brown clay.	1
								Brown CLAY.	2
					2.70	157.15		Grey MUDSTONE.	3
					6.00	155.75		Very soft STRATA. (No flush returns)	6
									7
									8
									9
									10

Continued on Next Sheet

Remarks
 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



					Borehole Log			Borehole No. R05 Sheet 2 of 2								
Project Name: Replacement Dwelling at Pine Lodge			Project No. H19104		Co-ords: 431738E - 402761N			Hole Type BH								
Location: Stainborough Lane, Hood Green, Barnsley					Level: 158.45			Scale 1:50								
Client: Mr David Green					Dates: 15/01/2020			Logged By JR								
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description								
		Depth (m)	Type	Results												
					10.30	152.45		Solid STRATA. (No flush returns)	11							
					12											
					13											
					14											
					15											
					16											
					17											
					18											
					19											
					20											
												17.00	148.15		End of Borehole at 17.00m	
					Remarks 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.											

				Borehole Log				Borehole No. R06 Sheet 1 of 2	
Project Name:		Replacement Dwelling at Pine Lodge		Project No. H19104		Co-ords: 431753E - 402763N		Hole Type BH	
Location:		Stainborough Lane, Hood Green, Barnsley				Level: 158.40		Scale 1:50	
Client:		Mr David Green				Dates: 15/01/2020		Logged By JR	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30	158.40		MADE GROUND: Tarmacadam and hardcore.	1
								Brown CLAY.	
								COAL smut and CLAY.	
								Grey brown CLAY.	
					1.60 1.70 2.10	158.10 156.80 156.70		Grey, silty MUDSTONE.	2
									
									3
									4
									5
									6
									7
									8
									9
									10
Continued on Next Sheet									
Remarks 1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.									

Borehole Log

Borehole No.

R06

Sheet 2 of 2

Project Name: Replacement Dwelling at Pine Lodge

Project No.
H19104

Co-ords: 431753E - 402763N

Hole Type
BH

Location: Stainborough Lane, Hood Green, Barnsley

Level: 158.40

Scale
1:50

Client: Mr David Green

Dates: 15/01/2020

Logged By
JR

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					10.50	156.30		Very soft STRATA. (No flush returns)	11
					11.60	147.90		Grey MUDSTONE. (Partial flush returns)	12
									13
									14
					14.60	146.80		COAL. (intact)	15
					15.70	143.80		Grey MUDSTONE.	16
					17.00	142.70		End of Borehole at 17.00m	17
									18
									19
									20

Remarks

1) No groundwater encountered. 2) No elevated gas concentrations recorded during advancement of the borehole. 3) Borehole sealed with cement and bentonite at rockhead and the surface on completion.



APPENDIX C
GAS MONITORING RESULTS

Visit No: 1 of 6
Date: 13/12/2019
Operator: JR

	GAS CONCENTRATIONS												VOCs		GAS FLOWS				WELL AND GROUNDWATER DATA					Comments
Monitoring Point	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	4.2	4.0	0.0	0.0	0	0	Low	Low	15.3	15.3			0.0	0.0			DRY	2.00	158.36		1.0 - 2.0	
WS03	0.0	0.0	4.5	4.1	0.0	0.0	0	0	Low	Low	15.2	15.2			0.0	0.0			DRY	4.00	157.71		1.0 - 3.0	
WS05	0.0	0.0	1.0	1.0	0.0	0.0	0	0	Low	Low	20.3	20.3			0.0	0.0			DRY	4.00	157.85		1.0 - 3.0	
Max	0.0	0.0	4.5	4.1	0.0	0.0	0	0	0	0	20.3	20.3			<0.1	<0.1			0.00	4.00	158.4		0	
Min	0.0	0.0	1.0	1.0	0.0	0.0	0	0	0	0	15.2	15.2			<0.1	<0.1			0.00	2.00	157.7		0	

(Select correct box with X or enter data, as applicable)

	Dry
	Calm
	None
	None

	Moist
X	Light
	Slight
	Slight
975	Before
	Falling
	Before

X	Wet
	Moderate
X	Cloudy
X	Moderate

X	Steady
X	Moderate

	Snow
	Strong
	Overcast
	Heavy
975	After
	Rising
	After

975	After
-----	-------

Air Temperature

Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green

Visit No: 2 of 6
Date: 23/12/2019
Operator: ACV

Monitoring Point	GAS CONCENTRATIONS												VOCs		GAS FLOWS			WELL AND GROUNDWATER DATA					Comments	
	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)		Response Zone
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	2.6	2.6	0.0	0.0	0	0	Low	Low	20.8	17.1			0.0	0.0			DRY	2.03			1.0 - 2.0	
WS03	0.0	0.0	4.4	4.4	0.0	0.0	0	0	Low	Low	15.2	15.1			0.0	0.0			DRY	3.97			1.0 - 3.0	
WS05	0.0	0.0	1.3	1.3	0.0	0.0	0	0	Low	Low	19.6	19.6			0.0	0.0			DRY	4.00			1.0 - 3.0	
Max	0.0	0.0	4.4	4.4	0.0	0.0	0	0	0	0	20.8	19.6			<0.1	<0.1			0.00	4.00				
Min	0.0	0.0	1.3	1.3	0.0	0.0	0	0	0	0	15.2	15.1			<0.1	<0.1			0.00	2.03				

METEOROLOGICAL AND SITE INFORMATION:

State of ground:

Dry

Wind:

Calm

Cloud cover:

None

Precipitation:

None

Barometric pressure (mbar):

1002

Before

Pressure trend:

Falling

Air Temperature (Deg. C):

6

Before

(Select correct box with X or enter data, as applicable)

Moist:

X

Light:

Slight:

1002:

Before

Falling:

6:

Before

Wet:

X

Moderate:

Cloudy:

Moderate:

Steady:

Snow:

Strong:

Overcast:

Heavy:

1002:

After

Rising:

6:

After

Frozen

Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green

Visit No: 3 of 6
Date: 14/01/2020
Operator: JR

Monitoring Point	GAS CONCENTRATIONS												VOCs		GAS FLOWS			WELL AND GROUNDWATER DATA					Comments	
	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)		Response Zone
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	1.8	1.8	0.0	0.0	0	0	Low	Low	18.9	18.9			0.0	0.0			DRY	2.01			1.0 - 2.0	
WS03	0.0	0.0	4.1	4.0	0.0	0.0	0	0	Low	Low	17.2	17.2			0.0	0.0			DRY	3.97			1.0 - 3.0	
WS05	0.0	0.0	2.1	2.1	0.0	0.0	0	0	Low	Low	18.3	18.3			0.0	0.0			DRY	4.00			1.0 - 3.0	
Max	0.0	0.0	4.1	4.0	0.0	0.0	0	0	0	0	18.9	18.9			<0.1	<0.1			0.00	4.00				
Min	0.0	0.0	1.8	1.8	0.0	0.0	0	0	0	0	17.2	17.2			<0.1	<0.1			0.00	2.01				

METEOROLOGICAL AND SITE INFORMATION:

State of ground:

Dry

X

Calm

None

None

Wind:

Moist

Light

Slight

X

Slight

990

Before

X

Falling

Before

Cloud cover:

X

Wet

Moderate

x

Cloudy

Moderate

Precipitation:

Snow

Strong

Overcast

Heavy

989

After

Rising

After

Barometric pressure (mbar):

Frozen

Pressure trend:

Steady

Air Temperature (Deg. C):

Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green

Visit No: 4 of 6
Date: 29/01/2020
Operator: JR

Monitoring Point	GAS CONCENTRATIONS												VOCs		GAS FLOWS			WELL AND GROUNDWATER DATA					Comments	
	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)		Response Zone
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	2.7	2.5	0.0	0.0	0	0	Low	Low	17.8	17.8			0.0	0.0			DRY	2.00			1.0 - 2.0	
WS03	0.0	0.0	4.3	4.0	0.0	0.0	0	0	Low	Low	17.0	17.0			0.0	0.0			DRY	3.98			1.0 - 3.0	
WS05	0.0	0.0	2.2	2.0	0.0	0.0	0	0	Low	Low	18.1	18.1			0.0	0.0			DRY	4.00			1.0 - 3.0	
Max	0.0	0.0	4.3	4.0	0.0	0.0	0	0	0	0	18.1	18.1			<0.1	<0.1			0.00	4.00				
Min	0.0	0.0	2.2	2.0	0.0	0.0	0	0	0	0	17.0	17.0			<0.1	<0.1			0.00	2.00				

METEOROLOGICAL AND SITE INFORMATION:

State of ground:

Dry

Wind:

Calm

Cloud cover:

None

Precipitation:

None

Barometric pressure (mbar):

978

Before

Pressure trend:

X

Falling

Air Temperature (Deg. C):

Before

(Select correct box with X or enter data, as applicable)

X

Moist

Wet

Snow

X

Light

Moderate

Strong

Slight

X

Cloudy

Overcast

Slight

Moderate

Heavy

978

After

Rising

After

Steady

Frozen

PATRICK PARSONS

Visit No: 5 of 6
Date: 13/02/2020
Operator: JR

	GAS CONCENTRATIONS												VOCs		GAS FLOWS				WELL AND GROUNDWATER DATA					Comments
Monitoring Point	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	2.2	2.0	0.0	0.0	0	0	Low	Low	17.3	17.3			0.0	0.0			DRY	2.00			1.0 - 2.0	
WS03	0.0	0.0	4.2	4.0	0.0	0.0	0	0	Low	Low	16.4	16.4			0.0	0.0			DRY	3.98			1.0 - 3.0	
WS05	0.0	0.0	2.7	2.3	0.0	0.0	0	0	Low	Low	18.2	18.2			0.0	0.0			DRY	4.00			1.0 - 3.0	
Max	0.0	0.0	4.2	4.0	0.0	0.0	0	0	0	0	18.2	18.2			<0.1	<0.1			0.00	4.00				
Min	0.0	0.0	2.2	2.0	0.0	0.0	0	0	0	0	16.4	16.4			<0.1	<0.1			0.00	2.00				

(Select correct box with X or enter data, as applicable)

	Dry
	Calm
	None
	None

	Moist
	Light
	Slight
	Slight
993	Before
X	Falling
	Before

	Wet
	Moderate
	Cloudy
	Moderate
	Steady

	Snow
	Strong
	Overcast
	Heavy
993	After
	Rising
	After

☐ Frozen

Pressure trends:

Air Temperature

Air Temperature (Deg. C).

Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green

Visit No: 6 of 6
Date: 06/03/2020
Operator: ACV

Monitoring Point	GAS CONCENTRATIONS												VOCs		GAS FLOWS			WELL AND GROUNDWATER DATA					Comments	
	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)		Response Zone
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
WS01	0.0	0.0	5.3	5.2	0.0	0.0	0	0	Low	Low	14.8	14.5			0.0	0.0			DRY	2.03			1.0 - 2.0	
WS03	0.0	0.0	1.0	0.9	0.0	0.0	0	0	Low	Low	20.4	20.4			0.0	0.0			DRY	3.98			1.0 - 3.0	
WS05	0.0	0.0	2.3	2.3	0.0	0.0	0	0	Low	Low	16.4	16.4			0.0	0.0			DRY	3.99			1.0 - 3.0	
Max	0.0	0.0	5.3	5.2	0.0	0.0	0	0	0	0	20.4	20.4			<0.1	<0.1			0.00	3.99				
Min	0.0	0.0	1.0	0.9	0.0	0.0	0	0	0	0	14.8	14.5			<0.1	<0.1			0.00	2.03				

METEOROLOGICAL AND SITE INFORMATION:

State of ground:

Dry

Wind:

Calm

Cloud cover:

None

Precipitation:

X

None

Barometric pressure (mbar):

1007

Before

Pressure trend:

Falling

Air Temperature (Deg. C):

8

Before

(Select correct box with X or enter data, as applicable)

X

Moist

X

Light

X

Slight

Slight

1007

Before

Falling

8

Before

Wet

Moderate

Cloudy

Moderate

Steady

Snow

Strong

Overcast

1007

After

X

Rising

8

After

Frozen

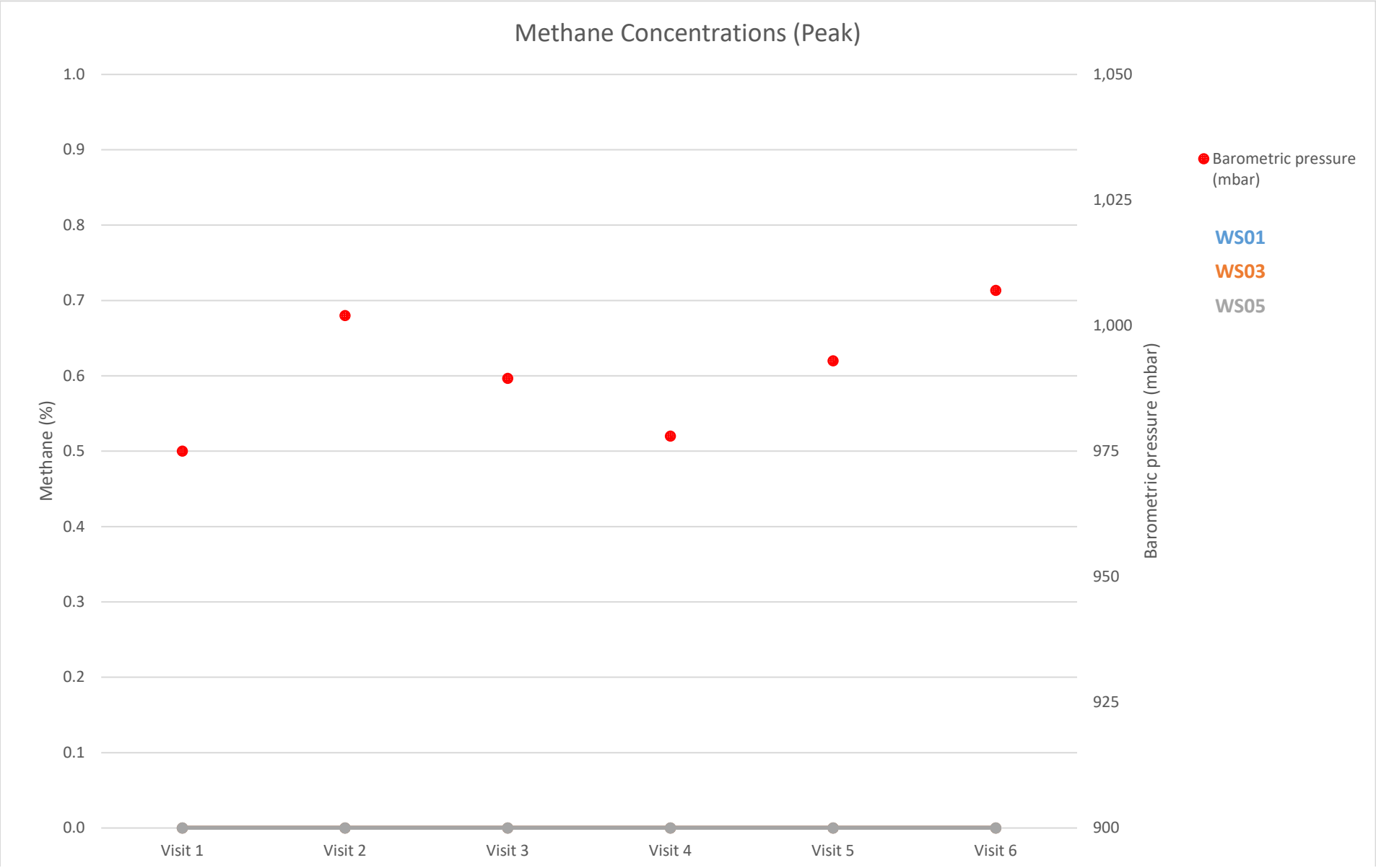
Summary Table

[illegible]

Ground Gas and Groundwater Monitoring Records



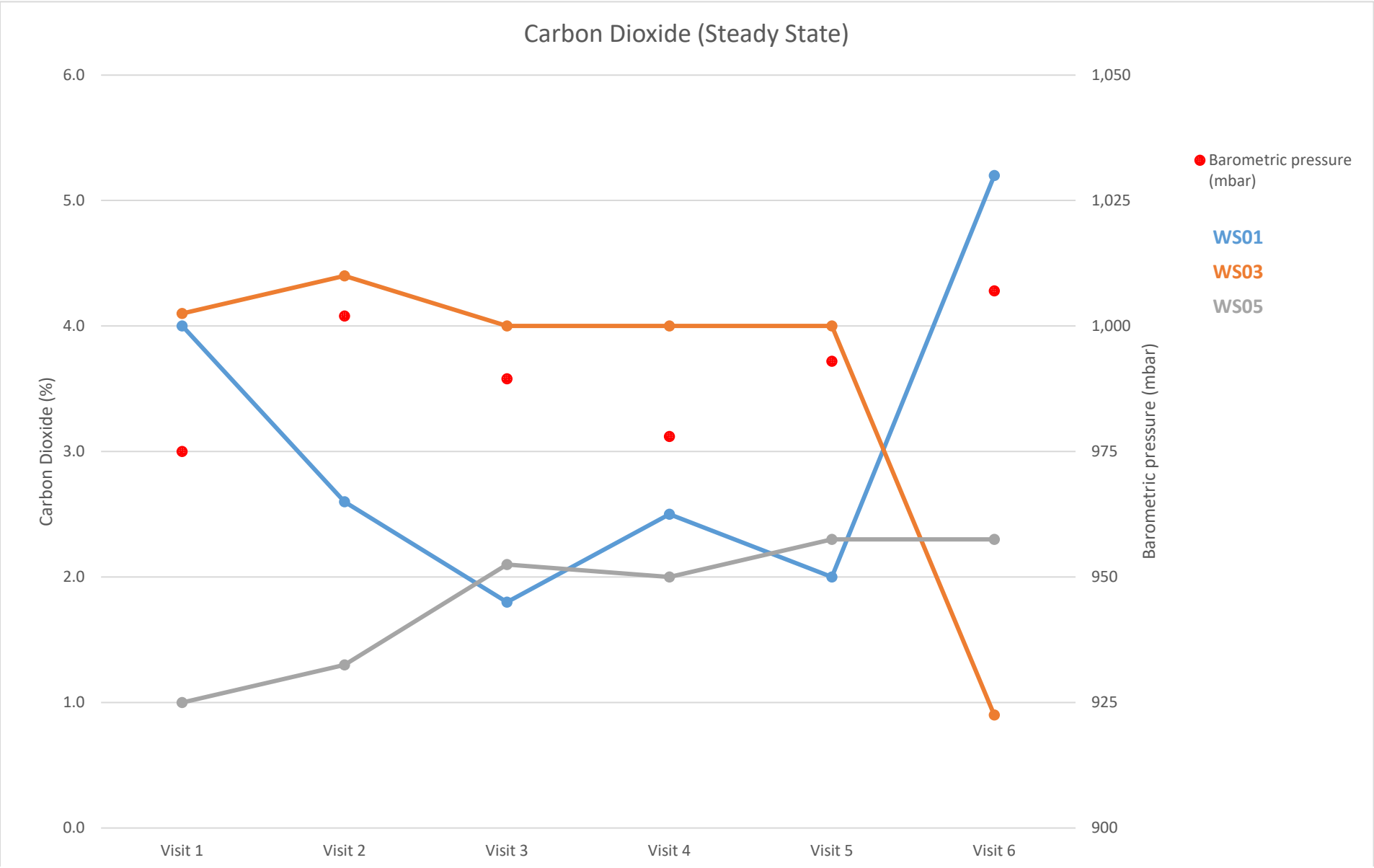
Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green



Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green



Ground Gas and Groundwater Monitoring Records



Job No: H19104
Site: Replacement Dwelling Pine Lodge Stainborough Lane, Hood Green, Barnsley
Client: Mr D Green

	MAXIMUM GAS CONCENTRATIONS										MINIMUM		MAX. VOCs		MAX. GAS FLOWS			MAX. WATER LEVELS					Comments	
Monitoring Point	Methane (%v/v)		Carbon dioxide (%v/v)		LEL (%)		Carbon monoxide (ppm)		Hydrogen sulphide (ppm)		Oxygen (%)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Diff. borehole Pressure (Pa)	Time for flow to equalise (sec)	Water level (m bgl)	Depth of well (m bgl)	Reduced level (m AOD)	Water level (m AOD)		Response Zone
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min. Peak	Min. Steady			Peak	Steady								
WS01	0.0	0.0	5.3	5.2	0.0	0.0	0	0	0	0.0	14.8	14.5			<0.1	<0.1			0.00	2.03	158.4		0.00	
WS03	0.0	0.0	4.5	4.4	0.0	0.0	0	0	0	0.0	15.2	15.1			<0.1	<0.1			0.00	4.00	157.7		0.00	
WS05	0.0	0.0	2.7	2.3	0.0	0.0	0	0	0	0.0	16.4	16.4			<0.1	<0.1			0.00	4.00	157.9		0.00	