



GROUNDTECH
CONSULTING

Job title: Pioneer House New-Build Project

Report type: Permanent Ground Gas Risk Assessment

Prepared for: AA Projects

Date: May 2023

Document Control Form	
PROJECT	PIONEER HOUSE NEW-BUILD PROJECT
REPORT NAME	PERMANENT GROUND GAS RISK ASSESSMENT
REPORT REFERENCE	GRO-22228-4429
STATUS	FINAL
ISSUE DATE	02 MAY 2023
REVISION	
CLIENT	AA PROJECTS
CLIENT CONTACT	CHRIS HINDLE
For and Behalf of Groundtech Consulting	
SIGNATURE	
AUTHOR	Luke Harrison BSc (Hons) FGS
SIGNATURE	
CHECKED & REVIEWED	Richard Wyatt MEng (Hons) FGS

Introduction

We are pleased to present our findings following the completion of the gas monitoring programme undertaken at the above site for the proposed commercial development.

A Geo-Environmental Appraisal was carried out by Groundtech Consulting referenced GRO-22228-3491, dated 02 December 2022.

Preliminary Risk Assessment Information

The development area comprises a tarmac surfaced school bus road and drop off area, two tarmac surfaced yards, a basketball court, a large grass surfaced field, rectangular building, and several small areas of soft landscaping.

Earliest historical maps date back to 1874 when three buildings were present onsite listed as 'Oak House' and a road is indicated to the east. The majority of the buildings were demolished in the 1950s and no further significant changes in land occurred.

The superficial deposits are indicated to be underlain by Devensian Fluvial-Glacial material which characteristically comprises sand and gravel. The solid geology is Tarporley Siltstone Formation which consists of interbedded siltstone, mudstone and sandstone.

Based on the findings of the PRA, the risk from permanent ground gases was considered to be Low.

Ground Model

Made Ground has been encountered beneath the site to a maximum depth of 1.4m bgl. The surfacing comprised tarmac and clayey topsoil with minor constituents of brick and concrete. The remainder consisted of ashy gravelly sand and firm occasionally soft to firm gravelly clay. The minor constituents included coal, brick, chert, brick, concrete, glass and occasional clinker.

The natural strata generally comprised medium dense to very dense light brown clayey gravelly Sand with minor constituents of chert and quartzite. Soft slightly gravelly Clay was present locally in WS04 from 1.2m to 1.8m bgl and stiff dark brown Clay was in WS04 from 3.0m to 3.45m bgl.

Bedrock was not encountered.

A single groundwater strike was noted in WS04 at 3.0m bgl at the base of the granular deposits.

The borehole and trial pit positions are shown on the Exploratory Hole Location Plan *GRO-22228-P04* and the exploratory logs are appended.

Gas Monitoring

During the Ground Investigation works, monitoring standpipes were installed in the following holes and a summary of the installations is provided in the table below.

Location	Depth (m bgl)	Response Zone (m bgl)	Targeted Strata	Reason
WS01	1.2	0.5 – 1.2	Made Ground & Natural Sand	Ground Gas
WS02	1.2	0.5 – 1.2	Made Ground & Natural Sand	Ground Gas
WS04	3.0	1.0 – 3.0	Made Ground, Natural Clay & Sand	Ground Gas

The standpipes consisted of polyvinyl chloride (pvc) pipe - a bentonite seal was placed around the plain pipe and a clean gravel pack was placed around the slotted pipe.

Four ground gas monitoring visits have been completed. Monitoring of the weather conditions and predicted atmospheric pressures (Met Office Surface Pressure Charts) was carried out up to 72 hours in advance of proposed monitoring visits in order that a reasonable period of data was obtained to determine atmospheric trends, and also to target the 'worst case' scenario.

Permanent gas and flow rate monitoring was carried out using a GFM436 infrared gas monitor with integral electronic flow analyser. The measurements taken are listed below:

- Oxygen (O_2), carbon dioxide (CO_2) and methane (CH_4) as the percentage volume in air (%v/v).
- Hydrogen sulphide (H_2S) and carbon monoxide (CO) as the percentage volume in air (%v/v).
- Lower Explosive Limit (% LEL) of methane.
- Atmospheric and borehole pressure, including pressure trend.
- Flow measurements (l/hr).
- Weather conditions.

Both peak and steady state conditions were monitored to understand the behaviour of the permanent ground gas, the steady state conditions were recorded by allowing the gas monitor to run for a minimum of 3 minutes.

Permanent gas and groundwater monitoring results are appended.

Gas Monitoring Results

During the monitoring period, no concentrations of methane (CH_4) have been recorded within the standpipes. However, detectable levels of carbon dioxide (CO_2) were recorded up to a maximum level of 4.3% v/v together with associated depleted oxygen (O_2) concentrations (minimum 13.9% v/v).

No positive gas flow rates were recorded during the gas monitoring programme.

Groundwater was encountered at depths of between 0.80m and 2.86m bgl and was generally present within the response zone of the installations. On occasions within WS02 and WS05, no groundwater was present within the standpipes.

The atmospheric pressure ranged between 982mb and 1025mb during the monitoring period and was carried out during periods of steady, falling and rising barometric pressure.

Characterisation of the Gas Screening Value (GSV)

In accordance with CIRIA Report C665, November 2007 it is felt that an adequate risk assessment can be undertaken based on the following limiting factors:

- The proposed development has been considered as **low sensitivity** based on the site being developed with a new single-storey teaching block (Table 5.5 – Typical/Idealised frequency and period of monitoring, after Wilson et al, 2005).
- The risk associated with the generation potential of a source is considered as **very low**, (assessment based on the environmental setting as well as observations noted during the fieldworks).
- No positive gas flow rates have been recorded over the monitoring period (Table 8.5 – Modified Wilson & Card classification). For this site, two of the monitoring visits were targeted to correlate with a falling atmospheric pressure trend. As a comparison, monitoring has also been undertaken during steady and rising atmospheric pressure trends.

Based upon the results recorded, in accordance with CIRIA Report C665, the risk to the site from ground gases has been assessed by converting the results to gas screening values (GSVs), calculated by multiplying the typical maximum gas concentrations with the recorded maximum positive flow rates. In addition, individual “hazardous gas flow rates” (Q_{hg}) have been derived for each monitoring point.

$$GSV \text{ (l/hr)} = \text{max borehole flow rate (l/hr)} \times \text{max gas concentration (\%)}$$

For this assessment, the maximum recorded concentrations of carbon dioxide of 4.3%v/v and methane of 0.0%v/v has been used. As no positive gas flow rates have been recorded, the limit of detection of the gas analyser of 0.1l/hr has been used to calculate the GSV.

$$\text{Carbon Dioxide GSV} = 0.043 \text{ (4.3\%)} \times 0.1 = 0.0043 \text{ l/hr}$$

$$\text{Methane GSV} = 0.0 \text{ l/hr}$$

Assessment

Made Ground was encountered across the entire site to a maximum depth of 1.4m bgl.

No methane has been detected and a maximum concentration of carbon dioxide of 4.3% v/v has been recorded. The carbon dioxide concentrations recorded are likely to be associated with the Made Ground that has been encountered beneath the site.

In order to assess the ground gas regime beneath the site and the need to incorporate ground gas precautions, guidance was taken from CIRIA C665 ‘Assessing risks posed by hazardous ground gases to buildings’. Based on the site being developed with a new teaching block, the Wilson and Card method has been used to carry out the assessment.

When considering the results, in accordance with CIRIA C665 (Section A Development and Table 8.5 – Modified Wilson and Card Classification) it can be seen that the GSV values for methane and carbon dioxide correspond with CS1 criteria (GSV of less than 0.07l/hr) and gas protection measures are not required.

Characteristic Situation 1

An extract of the table is presented below.

Characteristic Situation (Wilson and Card)	Traffic Light Classification (NHBC)	Methane				Carbon Dioxide			
		NHBC		Wilson and Card		NHBC		Wilson and Card	
		Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)
1	Green	0.16	1	<0.07	<1	0.78	5	<0.07	<5
2	Amber 1			<0.7	Borehole flow rate not greater than 70l/hr			<0.7	Borehole flow rate not greater than 70l/hr
3		Amber 2	0.63	5	<3.5		1.56	10	<3.5
4	<15				Quantitative Risk Assessment Required	<15			Quantitative Risk Assessment Required
5	Red	1.56	20	<70		3.10	30	<70	
6				>70				>70	

In accordance with CIRIA C665 and the site being placed in CS1, no special gas precautions are required on the proposed development.

The proposed teaching block is classified as a Building Type C in accordance with BS8485:2015 and the site falls in CS1 in accordance with Table 2 of the above guidance. Therefore, 0 points of protection are required for the proposed development and no gas protection measures are necessary.

Radon Gas

The site lies in an area where radon protective measures are not required within new structures.

Conclusions

No gas protection measures are required within the proposed teaching block.

No radon precautions are necessary.

It is recommended that confirmation of these findings is made with the Local Authority prior to any irrevocable action being taken.

PLANS



GROUNDTECH CONSULTING 	CLIENT	AA PROJECTS	DATE	NOVEMBER 2022			Status		Notes  APPROXIMATE POSITION OF WINDOWLESS SAMPLE BOREHOLE  APPROXIMATE POSITION OF SOIL PERCOLATION TEST
	PROJECT TITLE	PIONEER HOUSE NEW-BUILD PROJECT	SCALE	NTS			Preliminary		
	PLAN TITLE	EXPLORATORY HOLE LOCATION PLAN	PLAN NUMBER	GRO-22228-P04			Draft		
							Issued		
							For Comment		
Rev.		Details		Date		Approved			



EXPLORATORY HOLE LOGS



GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10			MADE GROUND: Tarmac.	
		0.20	ES		0.35			MADE GROUND: Dark grey slightly gravelly slightly ashy sand. Gravel is angular to subangular fine to coarse of mixed lithologies including tarmac and concrete.	
		0.50	ES		0.80			MADE GROUND: Red brown sandy angular to subangular fine to coarse gravel of brick with low cobble content of brick.	
		1.00	D		1.00			Light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular to rounded fine to coarse of chert and quartzite. Rootlets present.	1
		1.20	ES	N=50 (5,6/50 for 235mm)	1.65			Becoming very dense and gravelly from 1.2m bgl.	2
								End of borehole at 1.65 m	3
									4
									5

Remarks

1. Hand dug inspection pit to 1.2m bgl. 2. No groundwater encountered. 3. Hole terminated due to SPT refusal. 4. Monitoring standpipe installed to 1.2m bgl (0.5m plain, 0.7m slotted).





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10			MADE GROUND: Tarmac.	
		0.20	ES					MADE GROUND: Dark grey slightly gravelly sand. Gravel is angular to subangular fine to coarse of mixed lithologies including tarmac and concrete.	
		0.50	ES						
					0.80			MADE GROUND: Red brown sandy angular to subangular fine to coarse gravel of brick with low cobble content of brick.	1
		1.20		N=5 (1,0/1,1,1,2)					
		1.35	D		1.30 1.40			MADE GROUND: Firm grey slightly gravelly clay. Gravel is angular to rounded medium of mixed lithologies including chert, brick and coal.	
								Light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of mixed lithologies including quartzite.	
		2.00		N=50 (6,9/50 for 235mm)	2.00			End of borehole at 2.00 m	2
									3
									4
									5

Remarks

1. Hand dug inspection pit to 1.2m bgl. 2. No groundwater encountered. 3. Hole terminated due to SPT refusal. 4. Backfilled with arisings.





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Tarmac.	
		0.20	ES		0.30			MADE GROUND: Dark grey slightly gravelly sand. Gravel is angular to subangular fine to coarse of mixed lithologies including tarmac and concrete.	
		0.50	ES					MADE GROUND: Red brown sandy angular to subangular fine to coarse gravel of brick with low cobble content of brick.	
		1.00	D		0.90			Light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is subangular to rounded fine to coarse of chert and quartzite. Rootlets present.	1
		1.00	ES						
		1.20	D					Becoming very dense and gravelly from 1.2m bgl.	
		1.20		N=50 (4,6/50 for 235mm)	1.65			End of borehole at 1.65 m	2
									3
									4
									5

Remarks

1. Hand dug inspection pit to 1.2m bgl. 2. No groundwater encountered. 3. Hole terminated due to SPT refusal. 4. Monitoring standpipe installed to 1.2m bgl (0.5m plain, 0.7m slotted).





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.25			MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	1
		0.50	ES					MADE GROUND: Black slightly gravelly ashy sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, sandstone, glass, clinker, coal and chert.	
		0.70	ES		0.65			MADE GROUND: Soft to firm brown slightly gravelly clay. Gravel is angular to subangular fine to medium of coal.	
		1.20	ES	N=0 (0,0/0,0,0,0)	1.20			Soft brown slightly gravelly CLAY. Gravel is angular to subangular fine to medium of coal.	2
		1.30							
		1.50			1.80				
		2.00	D	N=13 (2,3/3,3,3,4)				Medium dense light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is angular to subrounded medium to coarse of chert and quartzite.	3
		2.50							
		3.00			3.00			Stiff dark brown CLAY.	
		3.00 - 3.45	D	N=48 (3,5/10,9,11,18)	3.45				4
								End of borehole at 3.45 m	5

Remarks

1. Hand dug inspection pit to 1.2m bgl. 2. Groundwater encountered at 3.0m bgl. 3. Hole terminated due to collapse. 4. Monitoring standpipe installation to 3.0m bgl (1.0m plain, 2.0m slotted).





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS05

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

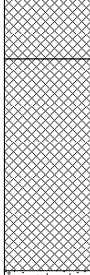
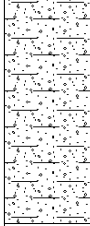
Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES	N=50 (8,11/50 for 165mm)	0.20			MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	1
		0.50	ES					MADE GROUND: Black slightly gravelly ashy sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, sandstone, glass, clinker, coal and chert.	
		1.00 1.00 - 1.45	ES D		0.90			Very dense light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is angular to subrounded medium to coarse of chert and quartzite.	
		1.20							
					1.65		----- End of borehole at 1.65 m		2
									3
									4
									5

Remarks

1. Hand dug inspection pit to 1.2m bgl. 2. No groundwater encountered. 3. Hole terminated due to SPT refusal. 4. Backfilled with arisings.





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

WS06

Sheet 1 of 1

Project Name: PIONEER HOUSE NEW-BUILD PROJECT

Project No.
GRO-22228

Co-ords: -

Hole Type
WS

Location: WYTHENSHAW

Level:

Scale
1:25

Client: AA PROJECTS

Dates: 08/10/2022 -

Logged By
LH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.20		N=50 (7,10/50 for 235mm)	0.22			MADE GROUND: Grass over dark brown slightly clayey slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	1
					0.60			MADE GROUND: Dark brown slightly gravelly sand. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, glass and quartzite.	
					0.70			MADE GROUND: Firm dark brown slightly gravelly sandy clay Gravel is angular to subrounded fine to coarse of mixed lithologies including brick and quartzite.	
								Very dense light brown slightly clayey fine to medium SAND. <i>Becoming slightly gravelly at 0.9m bgl.</i>	
					1.65			End of borehole at 1.65 m	2
									3
									4
									5

Remarks

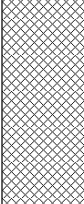
1. Hand dug inspection pit to 1.2m bgl. 2. No groundwater encountered. 3. Hole terminated due to SPT refusal. 4. Backfilled with arisings.



Trial Pit Log

Trialpit No
SuDS1
Sheet 1 of 1

Project Name:	PIONEER HOUSE NEW-BUILD PROJECT	Project No.	GRO-22228	Co-ords:	-	Level:		Date	08/10/2022
Location:	WYTHENSHAW			Dimensions (m):	2			Scale	1:25
Client:	AA PROJECTS			Depth	1.30	Logged		CJH	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			MADE GROUND: Grass over dark brown slightly clayey gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	
	0.50	ES					MADE GROUND: Orange brown gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	
	1.20	D		1.00			Light grey very clayey gravelly fine to medium SAND. Gravel is angular to subrounded fine to medium of mixed lithologies including chert and quartzite.	1
				1.30			End of pit at 1.30 m	
								2
								3
								4
								5

Remarks: 1. Pit sides unstable. 2. No groundwater encountered. 3. Soil percolation test carried out at 1.3m bgl. 4. Backfilled with arisings.

Stability: Unstable



Trial Pit Log

Trialpit No
SuDS2
Sheet 1 of 1

Project Name:	PIONEER HOUSE NEW-BUILD PROJECT	Project No.	GRO-22228	Co-ords:	-	Level:		Date	08/10/2022
Location:	WYTHENSHAW			Dimensions (m):	2			Scale	1:25
Client:	AA PROJECTS			Depth	1.60			Logged	CJH

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.25			MADE GROUND: Grass over dark brown slightly clayey gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	
	0.60	ES					MADE GROUND: Orange brown gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, glass and concrete.	1
	1.50	D		1.40			Light grey very clayey gravelly fine to medium SAND. Gravel is angular to subrounded fine to medium of mixed lithologies including chert and quartzite.	
				1.60			End of pit at 1.60 m	2
								3
								4
								5

Remarks: 1. Pit sides unstable. 2. No groundwater encountered. 3. Soil percolation test carried out at 1.3m bgl. 4. Backfilled with arisings.

Stability: Unstable





GROUND GAS MONITORING RESULTS

SITE NAME:		PIONEER HOUSE NEW-BUILD PROJECT				ENGINEER:		William Sandiford Mitchell				
CLIENT:		PROSPERE LEARNING TRUST				DATE:		01/12/2022				
JOB NO:		GRO-22228										
Pressure Trend:		Rising	Weather:	Overcast			Equipment:		GFM 436			
Ambient:		O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)					
Start		20.8	0.0	0.0	0.0	0.0	0.0					
Finish		20.8	0.0	0.0	0.0	0.0	0.0					

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q _{hg} CO ₂ (l/hr)	Q _{hg} CH ₄ (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	1.3	1.2	18.9	19.0	0.0	0.0	0.0	0.0	0.0013	0.0000	1025	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	3.9	3.8	13.9	14.2	0.0	0.0	0.0	0.0	0.0039	0.0000	1025	-	N	N/A	N/A	NGW
WS04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	N/A	N/A	N/A
Notes:																						

SITE NAME:		PIONEER HOUSE NEW-BUILD PROJECT				ENGINEER:		William Sandiford Mitchell				
CLIENT:		PROSPERE LEARNING TRUST				DATE:		16/01/2023				
JOB NO:		GRO-22228										
Pressure Trend:		Falling	Weather:	Overcast			Equipment:		GFM 436			
Ambient:		O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)					
Start		20.7	0.0	0.0	0.0	0.0	0.0					
Finish		20.7	0.0	0.0	0.0	0.0	0.0					

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q _{hg} CO ₂ (l/hr)	Q _{hg} CH ₄ (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	2.4	1.4	18.3	18.6	0.0	0.0	0.0	0.0	0.0024	0.0000	983	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	4.3	3.4	15.5	16.3	0.0	0.0	0.0	0.0	0.0043	0.0000	982	-	N	N/A	N/A	NGW
WS04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	N/A	N/A	N/A

Notes:

SITE NAME:		PIONEER HOUSE NEW-BUILD PROJECT				ENGINEER:		William Sandiford Mitchell				
CLIENT:		PROSPERE LEARNING TRUST				DATE:		07/03/2023				
JOB NO:		GRO-22228										
Pressure Trend:		Falling	Weather:	Overcast			Equipment:		GFM 436			
Ambient:		O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)					
Start		20.6	0.0	0.0	0.0	0.0	0.0					
Finish		20.5	0.0	0.0	0.0	0.0	0.0					

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q _{hg} CO ₂ (l/hr)	Q _{hg} CH ₄ (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	2.1	1.1	18.5	19.0	0.0	0.0	0.0	0.0	0.0021	0.0000	1002	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	3.5	2.7	16.1	17.0	0.0	0.0	0.0	0.0	0.0035	0.0000	1002	-	N	N/A	N/A	NGW
WS04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	N/A	N/A	N/A
Notes:																						

GROUNDTECH
CONSULTING

SITE NAME:		PIONEER HOUSE NEW-BUILD PROJECT				ENGINEER:		Jack Perkins				
CLIENT:		PROSPERE LEARNING TRUST				DATE:		28/03/2023				
JOB NO:		GRO-22228										
Pressure Trend:		Steady	Weather:	Overcast			Equipment:		GFM 436			
Ambient:		O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)					
Start		20.6	0.0	0.0	0.0	0.0	0.0					
Finish		20.5	0.0	0.0	0.0	0.0	0.0					

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q _{hg} CO ₂ (l/hr)	Q _{hg} CH ₄ (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	1.8	1.6	18.7	18.9	0.0	0.0	0.0	0.0	0.0018	0.0000	1012	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	3.4	2.8	16.0	16.7	0.0	0.0	0.0	0.0	0.0034	0.0000	1012	-	N	N/A	N/A	NGW
WS04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N	N/A	N/A	N/A
Notes:																						



LIMITATIONS

Limitations

This report (Report) forms part of the Services and if applicable Additional Services undertaken by Groundtech Consulting Ltd pursuant to a written contract (Agreement) which contains detailed provisions including express limitations of the liability of Groundtech Consulting Ltd.

This Report was prepared using reasonable skill and care as stated in the Agreement for the purpose including intended end use stated by the Client (Purpose) and the liability of Groundtech Consulting Ltd in respect of the form and content of this Report is no greater than its liability under the Agreement. All records, measurements notes, or any other data (Data) obtained by or for the benefit of the Consultant were obtained at a specific point in time and it may not be assumed by the Client or any person relying on this Report that the Data will remain unaffected by the passage of time, the seasons, weather conditions, changes in the water table or the carrying out and completion of works at the Site.

Unless otherwise agreed this Report has been prepared exclusively for the use and reliance of the Client and may not be relied upon, by any other party except as provided for in the Agreement. A third party who relies on this Report, does so at their own and sole risk and Groundtech Consulting Ltd has no liability to such parties.

Groundtech Consulting Ltd that this Report is to be used for the Purpose. The Purpose was instrumental in determining the scope and of the Services provided. If the Purpose should change, the Client may not be able to rely on the Report without the separate agreement of Groundtech Consulting Ltd.

Since the Report was written, later changes in legislation, statutory requirements and industry best practices have not been considered and this should be allowed for. Ground conditions can also change (see below) and should be investigated if there is any significant delay in acting on the findings of this Report. The period of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the Report inaccurate or unreliable. The information and conclusions in this Report should not be relied upon in the future without written confirmation from Groundtech Consulting Ltd that it is safe to do so.

The observations and conclusions outlined in this Report are based exclusively on the services that were provided as set out in the agreement between the client and Groundtech Consulting Ltd.

Groundtech Consulting Ltd is not liable for the existence of any condition, the discovery of which would require additional investigation outside the agreed scope of works or core competency. The Report is based upon Groundtech Consulting Ltd's observations of existing physical conditions at the Site gained from site reconnaissance together with interpretation of information including documentation, obtained from third parties and from the Client on the history and usage of the Site. The findings and recommendations contained in this Report are based in part upon information provided by third parties, and Groundtech Consulting Ltd have relied upon such information assuming it to be correct.

Groundtech Consulting Ltd accepts no responsibility for errors or inaccuracies in third party information presented in this Report. Groundtech Consulting Ltd was not authorised to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services or Additional Services. Groundtech Consulting Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, which may inform the scope of investigation undertaken by Groundtech Consulting Ltd and forms the contract with the client.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions may also vary due to the ground's heterogeneous properties and because investigation exploratory locations only allow examination of the ground at discrete

locations. The potential exists for ground conditions to be encountered which are different to those considered in this Report, particularly between exploratory holes. The extent of the limited area depends on the soil and groundwater conditions, together with other constraints such as the position of any existing structures and underground utilities. If so stipulated in the Agreement, geo-environmental testing was carried out for a limited number of parameters based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

Any groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The groundwater level often has not had time to reach equilibrium and a monitoring period is required. Furthermore, groundwater levels are subject to seasonal variation or changes in local drainage conditions and groundwater levels may occur at other times of the year which are higher than were recorded during this investigation.

Any site drawings provided in this Report are preliminary and used to present the general relative locations of features on, and surrounding, the Site.

