



GROUNDTECH
CONSULTING

Job title: Didsbury Point

Report type: Permanent Ground Gas Risk Assessment

Prepared for: Southway Housing

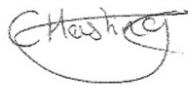
Date: September 2021

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PROJECT	DIDSBURY POINT
REPORT NAME	PERMANENT GROUND GAS RISK ASSESSMENT
REPORT REFERENCE	GRO-20064-2788
STATUS	FINAL
ISSUE DATE	20 SEPTEMBER 2021
REVISION	
CLIENT	SOUTHWAY HOUSING
CLIENT CONTACT	-

For and Behalf of Groundtech Consulting

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REVIEWED

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Introduction

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

Ground Model

Made Ground was encountered across the site generally to depths of between 0.2m and 3.5m bgl and predominantly consisted of gravelly topsoil underlain by varying gravels and sands containing brick and concrete.

Beneath the Made Ground materials, the natural ground generally consisted of firm to stiff clay. This was encountered from 1.2m to a maximum depth of 19.5m bgl.

Perched groundwater strikes were observed across the site between depths of 1.9 and 2.2m bgl.

The exploratory hole positions are shown on Groundtech Consulting Plan *GRO-20064-P02* and the 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
BH01	12.00	4.00 – 12.00	Natural Clay	Ground Gas
BH02	12.00	4.00 – 12.00	Natural Clay	Ground Gas
BH03	5.00	1.00 – 5.00	Made Ground	Ground Gas
BH04	5.00	1.00 – 5.00	Made Ground	Ground Gas
BH05	5.00	1.00 – 5.00	Made Ground	Ground Gas

The standpipes consisted of HDPE 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 between 1st March and 9th June 2021. 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 (O₂), carbon dioxide (CO₂) and methane (CH₄) as the percentage volume in air (%v/v).
- Hydrogen sulphide (H₂S) 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 and ground surface 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 presented in *Appendix 2*.

Gas Monitoring Results

During the monitoring period, no concentrations of methane (CH₄) have recorded within the standpipes. However, detectable levels of carbon dioxide (CO₂) were recorded within the standpipes, up to a maximum level of 4.7% v/v together with associated depleted oxygen (O₂) concentrations (minimum 8.8% v/v).

In addition, no positive flow rates were encountered within any of the standpipes.

Groundwater levels were recorded within the standpipes ranging from 1.76m to 2.97m bgl during the monitoring period. This was above the response zone of the standpipes for BH01 and BH02. The site was particularly boggy and flooded in areas which may account for the elevated water levels within these standpipes.

The atmospheric pressure ranged between 1004mb and 1033mb 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 **moderate sensitivity** based on the site being developed with residential apartments (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 **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, one of the monitoring visits was 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. As no levels of methane have been recorded a GSV for carbon dioxide only has been calculated.

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

For this assessment, the maximum recorded concentration of carbon dioxide of 4.7% v/v has been used together with a gas flow rate of 0.1l/hr (the limit of detection of the gas analyser as no positive gas flow rates were recorded) to calculate the GSV. This is worst case scenario.

$$\text{Carbon Dioxide GSV} = 0.047 (4.7\%) \times 0.1 = 0.0047 \text{ l/hr}$$

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

Assessment

A potential onsite source of permanent ground gas has been identified as Made Ground up to 3.5m in depth was encountered across the site.

No methane has been detected and a maximum concentration of carbon dioxide of 0.2% v/v has been recorded.

Groundwater has generally been encountered within the response zone of the boreholes.

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 apartments, 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.

Modified Wilson and Card classification

	Characteristic situation (CIRIA R149)	Comparable classification in DETR et al (1999)	Risk classification	Gas screening value (GSV) (CH ₄ or CO ₂) (l/hr) ¹ Threshold	Additional factors	Typical source of generation
	1	A	Very low risk	<0.07	Typically methane <1 % and/or carbon dioxide <5 %. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
	2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
	3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
	4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
	5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
	6	F	Very high risk	>70		Recent landfill site

Table 8.5 – Modified Wilson and Card Classification

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

Radon Gas

The site is not in a radon affected area, and no radon protection measures are required in new buildings constructed at the site.

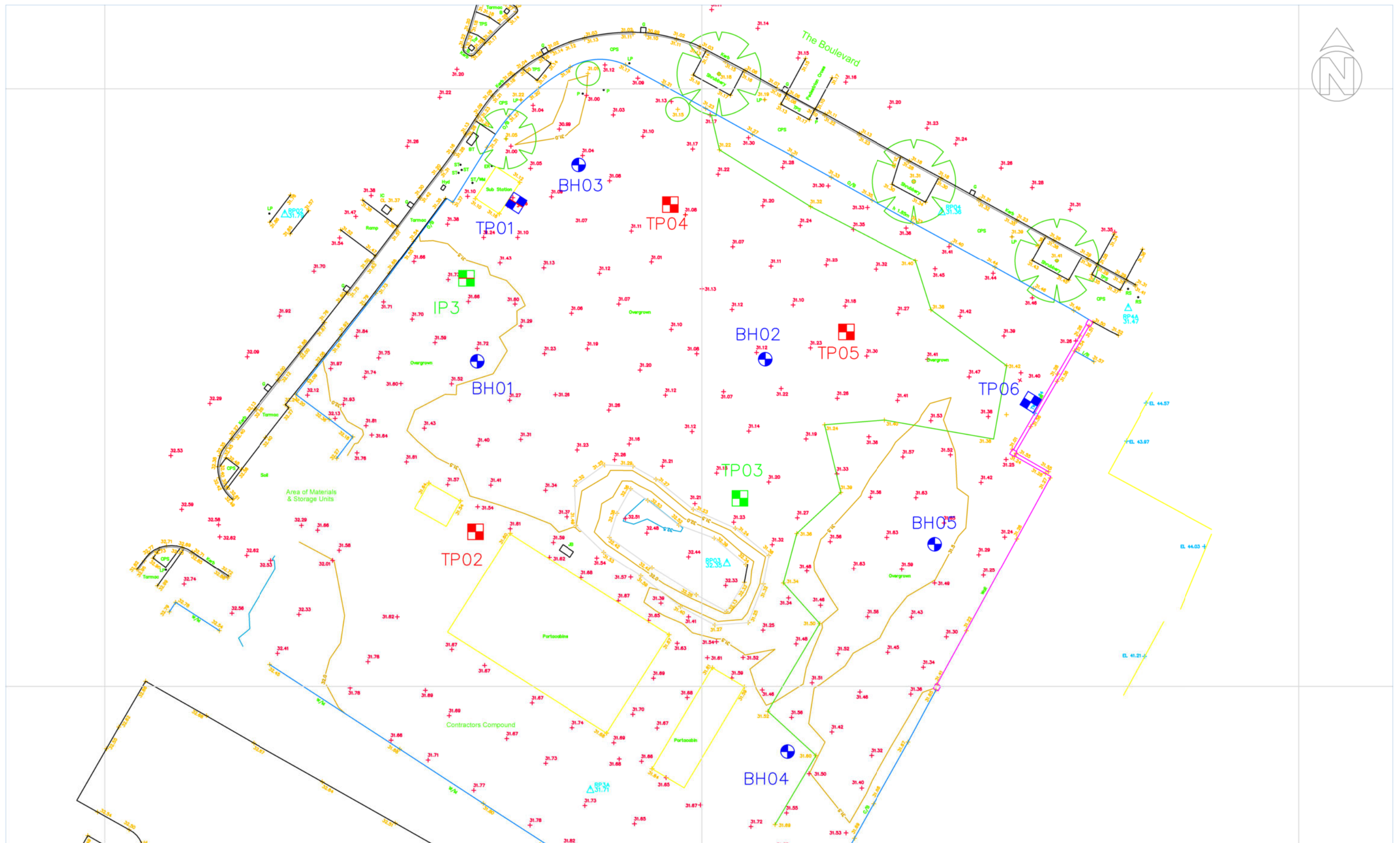
Conclusions

No gas protection measures are required within the proposed apartments at the site.

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	DATE				Status		Notes CABLE PERCUSSIVE BOREHOLE LOCATION TRIAL PIT LOCATION FOUNDATION PIT LOCATION SOIL PERCOLATION TEST LOCATION
	SOUTHWAY HOUSING	APRIL 2021				Preliminary		
	PROJECT TITLE	SCALE				Draft		
	DIDSBURY POINT	NTS				Issued		
	PLAN TITLE	PLAN NUMBER				For Comment		
	EXPLORATORY HOLE PLAN	GRO-20064-P02				Approved		
		Rev.	Details		Date			



EXPLORATORY HOLE LOGS

Rotary Core Log

Project Name: DIDSBURY POINT			Client: SOUTHWAY HOUSING			Date: 01/02/2021 - 03/02/2021		
Location: MANCHESTER			Contractor:					
Project No. : GRO-20064			Crew Name:			Drilling Equipment:		
Borehole Number BH01		Hole Type CP+RC		Level		Logged By CJH		Page Number Sheet 1 of 4

Well	Water	Depth (m)	Type /FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.20	ES				0.10			MADE GROUND: Grass over brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, rubber and glass.	
		0.50	ES								
		1.00	ES							MADE GROUND: Brown grey very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, plastic and wood.	1
		1.20 - 1.65	D								
		2.00	D								
		2.00 - 2.45	ES				2.00			MADE GROUND: Brown grey slightly clayey gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick and concrete.	2
		3.00	D								
		3.00 - 3.45	ES								3
							3.50			Brown grey sandy subrounded to rounded fine to coarse GRAVEL of mixed lithologies.	
		4.00	D				4.00			Firm high strength brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies.	4
		4.00 - 4.45	ES								
		5.00 - 5.45	U								5
		5.50	D								6
		6.50 - 6.95	D								7
		8.00 - 8.45	U				8.00			Firm to stiff medium strength brown CLAY.	8
		8.50	D								9
		9.50 - 9.95	D								10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

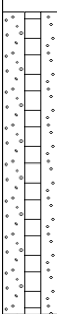
Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 3.50m bgl. 4. Sandstone bedrock encountered at 24.40m bgl. 5. Cable percussive drilling terminated at 24.40m bgl. 6. Rotary core follow on to 33.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).



Rotary Core Log

Project Name: DIDSBURY POINT				Client: SOUTHWAY HOUSING				Date: 01/02/2021 - 03/02/2021			
Location: MANCHESTER				Contractor:							
Project No. : GRO-20064				Crew Name:				Drilling Equipment:			
Borehole Number BH01		Hole Type CP+RC		Level		Logged By CJH		Scale 1:50		Page Number Sheet 2 of 4	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		10.50	D					10.50			Firm to stiff medium strength brown CLAY.	
		11.00 - 11.45	D				(16)	11.00			Firm to stiff red brown sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies.	11
											Medium dense brown clayey gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	
		12.50 - 12.95	U					12.00			Firm to stiff very high strength brown slightly sandy CLAY.	12
												13
		14.00 - 14.45	D				(33)					14
												15
		15.50 - 15.95	U									
		16.00 - 16.45	D				(31)					16
		17.00 - 17.45	D				N=50 (10,18/ 50 for 295mm)	17.00			Very dense brown very clayey gravelly SAND. Gravel is subangular to rounded fine to coarse of mixed lithologies.	17
	18.50 - 18.95	D				(50)					18	
	19.20	D					19.20			Stiff brown slightly sandy CLAY.	19	
	19.50	D					19.50			Dense brown clayey gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	20	
			D				(40)					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks 1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 3.50m bgl. 4. Sandstone bedrock encountered at 24.40m bgl. 5. Cable percussive drilling terminated at 24.40m bgl. 6. Rotary core follow on to 33.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).															
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Rotary Core Log

Project Name: DIDSBURY POINT			Client: SOUTHWAY HOUSING			Date: 01/02/2021 - 03/02/2021		
Location: MANCHESTER			Contractor:					
Project No. : GRO-20064			Crew Name:			Drilling Equipment:		
Borehole Number BH01		Hole Type CP+RC		Level		Logged By CJH		Page Number Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.00 - 20.45									Dense brown clayey gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	21
		21.50 - 21.95	D				N=50 (10,15/50 for 270mm)	22.20				22
		22.50	D								Very dense red brown slightly gravelly SAND. Gravel is angular to subrounded fine to coarse of sandstone. <i>Becoming cobbly between 22.20m bgl and 23.00m bgl.</i>	23
		23.00 - 23.45	D				N=50 (6,7/50 for 295mm)					24
		23.50	D					24.40				25
											Extremely weak red brown SANDSTONE residually weathered recovered as gravelly sand. Gravel is angular to subrounded fine to coarse of mixed lithologies.	26
												27
			NR					27.50			NO RECOVERY.	28
		27.50 - 29.00	9	51	51	16		27.91			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.	29
			NR					29.00			NO RECOVERY.	30
		29.00 - 30.50	14	85	85	0		29.48			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.	

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 3.50m bgl. 4. Sandstone bedrock encountered at 24.40m bgl. 5. Cable percussive drilling terminated at 24.40m bgl. 6. Rotary core follow on to 33.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).



Rotary Core Log

Project Name: DIDSBURY POINT			Client: SOUTHWAY HOUSING			Date: 01/02/2021 - 03/02/2021		
Location: MANCHESTER			Contractor:					
Project No. : GRO-20064			Crew Name:			Drilling Equipment:		
Borehole Number BH01		Hole Type CP+RC		Level		Logged By CJH		Page Number Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
								30.50			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities. NO RECOVERY.	
			NR					30.99				
		30.50 - 32.00	15	67	67	14		32.00			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.	31
		32.00 - 33.50	NR	24	22	0		33.13			NO RECOVERY.	32
			3 3					33.50			Extremely weak red SANDSTONE extremely weathered with horizontal smooth to rough planar discontinuities. <i>Between 33.29 and 33.33m bgl recovered as sandy angular to subrounded fine to coarse gravel.</i>	33
											End of Borehole at 33.500m	34
												35
												36
												37
												38
												39
												40

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

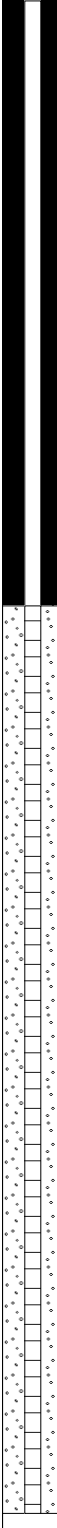
Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 3.50m bgl. 4. Sandstone bedrock encountered at 24.40m bgl. 5. Cable percussive drilling terminated at 24.40m bgl. 6. Rotary core follow on to 33.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).



Rotary Core Log

Project Name: DIDSBURY POINT			Client: SOUTHWAY HOUSING			Date: 03/02/2021 - 05/02/2021		
Location: MANCHESTER			Contractor:					
Project No. : GRO-20064			Crew Name:			Drilling Equipment:		
Borehole Number BH02		Hole Type CP+RC		Level		Logged By CJH		Page Number Sheet 1 of 3

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		0.10									MADE GROUND: Grass over brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, rubber and glass.	
		0.50	ES									
		1.00	ES					1.00			MADE GROUND: Brown grey very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete.	1
		1.20 - 1.65	D				(10)				MADE GROUND: Brown grey sandy angular to subangular fine to coarse gravel of mixed lithologies including brick and concrete.	
		2.00	D				(20)	2.00			Medium dense brown gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	2
		2.00 - 2.45	ES									
		3.00	D				(14)					
		3.00 - 3.45	ES									
		4.00 - 4.45	D				(11)	4.00			Firm brown slightly sandy silty CLAY with occasional sand and gravel bands present.	4
		4.50	D									
		5.00 - 5.45	B									
		5.00 - 5.50	U									
		5.50 - 5.95	D				(12)					
		6.00	D									
		6.50 - 6.95	D				(16)					
		8.00 - 8.95	U								Medium strength at 8.0m bgl.	8
		8.50	D									
		9.50 - 9.95	D				(18)					
												10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

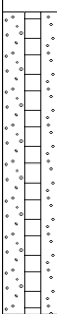
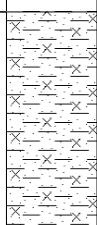
Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 1.5m bgl. 4. Sandstone bedrock encountered at 23.00m bgl. 5. Cable percussive drilling terminated at 23.50m bgl. 6. Rotary core follow on to 29.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).



Rotary Core Log

Project Name: DIDSBURY POINT				Client: SOUTHWAY HOUSING				Date: 03/02/2021 - 05/02/2021			
Location: MANCHESTER				Contractor:							
Project No. : GRO-20064				Crew Name:				Drilling Equipment:			
Borehole Number BH02		Hole Type CP+RC		Level		Logged By CJH		Scale 1:50		Page Number Sheet 2 of 3	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		11.00 - 11.45	U								Firm brown slightly sandy silty CLAY with occasional sand and gravel bands present.	
		11.50	D					11.50			Medium strength at 11.0m bgl.	11
		12.00	D								Firm to stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse of mixed lithologies with occasional sand and gravel bands.	12
		12.50 - 12.95	D				N=50 (8,12/5 0 for 215mm)					13
		13.50	D									
		14.00 - 14.45	B									14
		14.00 - 14.50	D				(53)					
		14.50 - 14.95	D									15
		15.00	D									
		15.50 - 15.95	D				N=50 (5,9/50 for 225mm)					16
	16.50	D										
	17.00 - 17.45	D				N=50 (8,12/5 0 for 265mm)					17	
	18.00	D									18	
	18.50 - 18.95	U						18.50			Stiff high strength brown slightly sandy CLAY.	19
	19.00	D						19.50			Stiff red brown gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse of mixed lithologies.	20
			D									

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks															
1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 1.5m bgl. 4. Sandstone bedrock encountered at 23.00m bgl. 5. Cable percussive drilling terminated at 23.50m bgl. 6. Rotary core follow on to 29.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).															

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Project Name: DIDSBURY POINT				Client: SOUTHWAY HOUSING				Date: 03/02/2021 - 05/02/2021			
Location: MANCHESTER				Contractor:							
Project No. : GRO-20064				Crew Name:				Drilling Equipment:			
Borehole Number BH02		Hole Type CP+RC		Level		Logged By CJH		Scale 1:50		Page Number Sheet 3 of 3	

Well	Water	Depth (m)	Type /FI	Coring			Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD						
		20.00 - 20.45					N=50 (7,12/50 for 280mm)				Stiff red brown gravelly sandy CLAY. Gravel is angular to subrounded fine to coarse of mixed lithologies.	21
		21.50 - 21.95	D				N=50 (9,15/50 for 265mm)					22
		23.00 - 23.45	D				N=50 (10,15/50 for 280mm)	23.00			Extremely weak red brown SANDSTONE residually weathered recovered as gravelly sand. Gravel is angular to subrounded fine to coarse of mixed lithologies.	23
		23.50 - 25.00	NR					23.50			NO RECOVERY.	
			7	67	28	0	23.99			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.	24	
		25.00	D					25.00			NO RECOVERY.	25
		25.00 - 26.50	NR								Extremely weak red SANDSTONE extremely weathered with horizontal smooth to rough planar discontinuities.	
			11	82	73	0	26.00			From 25.20m and 25.29m bgl recovered as firm grey sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone between. From 25.85 to 25.89m bgl firm grey sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	26	
		27.00	NR					26.50			NO RECOVERY.	
			D					26.99			Extremely weak red SANDSTONE residually weathered recovered as sandy angular to subangular fine to coarse gravel.	27
		26.50 - 28.00	NI	72	56	13	27.26			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.		
			12							NO RECOVERY.	28	
28.00 - 29.50	NR					28.00			Extremely weak red SANDSTONE distinctly weathered with horizontal smooth to rough planar discontinuities.	29		
	18	83	83	30	28.25			End of Borehole at 29.500m	30			

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)

Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater seepage from Made Ground at 1.5m bgl. 4. Sandstone bedrock encountered at 23.00m bgl. 5. Cable percussive drilling terminated at 23.50m bgl. 6. Rotary core follow on to 29.5m bgl. 7. Monitoring standpipe installed to 12.00m bgl (4.00m plain, 8.00m slotted).


Borehole Log

Borehole No.

BH03

Sheet 1 of 1

Project Name: DIDSBURY POINT

 Project No.
GRO-20064

Co-ords: -

 Hole Type
CP

Location: MANCHESTER

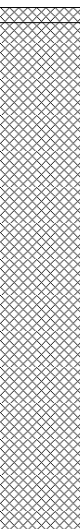
Level:

 Scale
1:50

Client: SOUTHWAY HOUSING

Dates: 04/02/2021 - 04/02/2021

 Logged By
CJH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.20	ES	N=50 (5,10/50 for 227mm)	0.10			MADE GROUND: Grass over brown sandy gravelly topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, rubber and glass. MADE GROUND: Brown grey very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete.	1					
		0.50	ES											
		0.50	ES											
		1.00	ES											
		1.20												
		2.00	ES	N=39 (3,4/5,10,10,14)	3.50			Brown clayey gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	2					
		2.00												
		3.00	B	N=23 (5,3/5,5,6,7)						4.30			Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies.	3
		3.00												
		4.00	B	N=25 (4,5/4,5,6,10)										
		4.00												
		5.00	B	N=18 (3,4/4,5,4,5)					5					
		5.00												
													6	
													7	
													8	
								9						
								10						

Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 2.00m bgl rising to 1.80m bgl after 20 minutes. 4. Monitoring standpipe installed to 5.00m bgl (4.00m plain, 1.00m slotted).





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

BH04

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -

Hole Type
CP

Location: MANCHESTER

Level:

Scale
1:50

Client: SOUTHWAY HOUSING

Dates: 04/02/2021 - 05/02/2021

Logged By
CJH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			MADE GROUND: Brown grey very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete.	
		1.00 1.20	ES	N=23 (3,4/4,6,6,7)				MADE GROUND: Brown clayey gravelly fine to coarse sand. Gravel is rounded to subrounded fine to coarse of mixed lithologies including brick.	1
		2.00 2.00	ES	N=20 (1,1/4,4,7,5)	2.00				2
		3.00 3.00	D	N=17 (1,1/3,4,4,6)					3
		4.00 4.00	D	N=16 (1,3/4,3,4,5)					4
		5.00 5.00	D	N=29 (4,5/7,6,6,10)	5.00				5
								End of borehole at 5.00 m	6
									7
									8
									9
									10

Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 2.50m bgl rising to 2.10m bgl after 20 minutes. 4. Monitoring standpipe installed to 5.00m bgl (2.00m plain, 3.00m slotted).





GROUNDTECH
CONSULTING

Borehole Log

Borehole No.

BH05

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -

Hole Type
CP

Location: MANCHESTER

Level:

Scale
1:50

Client: SOUTHWAY HOUSING

Dates: 05/02/2021 - 05/02/2021

Logged By
CJH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.20			MADE GROUND: Brown grey very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete.	
		1.00	ES					MADE GROUND: Brown clayey gravelly fine to coarse sand. Gravel is rounded to subrounded fine to coarse of mixed lithologies including brick.	1
		1.20		N=25 (3,4/4,7,9,5)					
		2.00	ES		1.80			Medium dense brown gravelly fine to coarse SAND. Gravel is rounded to subrounded fine to coarse of mixed lithologies.	2
		2.00		N=17 (2,3/5,4,5,3)					
		3.00	D						3
		3.00		N=20 (3,3/3,5,6,6)					
		4.00	D						4
		4.00		N=17 (3,4/5,4,4,4)					
		5.00	D		5.00			End of borehole at 5.00 m	5
		5.00		N=19 (3,3/4,4,5,6)					

Remarks

1. Location cleared using hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 2.50m bgl rising to 2.20m bgl after 20 minutes. 4. Monitoring standpipe installed to 5.00m bgl (1.00m plain, 4.00m slotted).









Trial Pit Log

Trialpit No

TP02

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -
Level:

Date
03/02/2021

Location: MANCHESTER

Dimensions (m):

1.5

Scale
1:25

Client: SOUTHWAY HOUSING

Depth
2.70

0.8

Logged
CJH

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	ES		0.20			MADE GROUND: Degraded tarmac gravel.	
	0.30	B					MADE GROUND: Light grey slightly sandy angular to subangular fine to coarse gravel of mixed lithologies.	
	0.50	B		0.40			MADE GROUND: Geo-membrane.	
	0.50	ES		0.42			MADE GROUND: Orange brown slightly clayey gravelly sand. Gravel is angular to subangular fine to coarse of brick, concrete, plastic and wood.	
				0.80			MADE GROUND: Brown grey gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and concrete.	1
	1.00	ES						
	1.40	B						
	1.40	D		1.50			Orange slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of mixed lithologies.	
								2
	2.00	ES						
▼	2.20	ES						
	2.50	B						
	2.50	D		2.70			End of pit at 2.70 m	3
								4
								5

Remarks: 1. Location cleared using handheld CAT scanner. 2. Plate load CBR test conducted at 0.35m bgl. 3. Trial pit excavated to 2.70m bgl. 4. Groundwater encountered at 2.20m bgl. 5. Trial pit walls unstable due to collapse from sand strata. 6. Trial pit backfilled with arisings.

Stability:



Trial Pit Log

Trialpit No

TP03

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -
Level:

Date
04/02/2021

Location: MANCHESTER

Dimensions (m):

1.3

Depth
2.10

0.7

Scale
1:25

Logged
CJH

Client: SOUTHWAY HOUSING

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
▼	0.10	B		0.20			MADE GROUND: Brown gravelly sandy slightly clayey topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including plastic, brick, concrete and wood.	1	
	0.20	ES							
	0.30	B							
	0.50	ES			MADE GROUND: Orange brown slightly clayey gravelly sand. Gravel is angular to subangular fine to coarse of brick, concrete, plastic and wood.				
	1.00 1.00 1.00	B D ES					MADE GROUND: Grey brown slightly clayey gravelly sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick.		
									1.10
				1.40					
	1.50	B				Grey brown slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of mixed lithologies.			
							2.00 2.10 2.10 2.10	ES B D ES	
				2.10					
	End of pit at 2.10 m								
								2	
								3	
								4	
								5	

Remarks: 1. Location cleared using handheld CAT scanner. 2. Plate load CBR test conducted at 0.35m bgl. 3. Trial pit excavated to 2.10m bgl. 4. Groundwater encountered at 1.90m bgl. 5. Trial pit walls unstable due to collapse from sand strata. 6. Soil percolation test conducted between 1.50m bgl and 2.10m bgl within natural sand strata. 7. Trial pit backfilled with arisings.

Stability:



Trial Pit Log

Trialpit No

TP04

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -
Level:

Date
04/02/2021

Location: MANCHESTER

Dimensions (m):
Depth 2.10

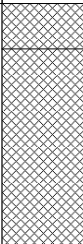
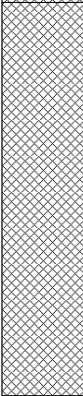
1.4

0.8

Scale
1:25

Logged
CJH

Client: SOUTHWAY HOUSING

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
	Depth	Type	Results							
	0.10	B		0.15			MADE GROUND: Brown gravelly sandy slightly clayey topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including plastic, brick, concrete and wood. MADE GROUND: Orange brown sandy cobbly angular to subangular fine to coarse gravel of brick, concrete, plastic and wood.	1		
	0.20	B								
	0.20	ES								
	0.50	B								
	0.50	ES								
	1.00	B								
	1.00	ES								
	2.00	B		2.10			MADE GROUND: Brown cobbly gravelly fine to coarse sand. Gravel is angular to subangular of brick, concrete, wood, glass and metal. Large pieces of concrete and adjoined brick foundation associated with former slab of hospital building between 0.8m bgl and 1.5m bgl.	2		
	2.00	ES								
	End of pit at 2.10 m									
							3			
							4			
							5			

Remarks: 1. Location cleared using handheld CAT scanner. 2. Plate load CBR test conducted at 0.35m bgl. 3. Trial pit excavated to 2.10m bgl. 4. Groundwater encountered at 2.00m bgl. 5. Trial pit terminated due to presence of metal and plastic pipe associated with former hospital building. 6. Trial pit backfilled with arisings.

Stability:



Trial Pit Log

Trialpit No

TP05

Sheet 1 of 1

Project Name: DIDSBURY POINT

Project No.
GRO-20064

Co-ords: -
Level:

Date
04/02/2021

Location: MANCHESTER

Dimensions (m):

1.6

Scale
1:25

Client: SOUTHWAY HOUSING

Depth
2.20

0.6

Logged
CJH

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	B					MADE GROUND: Brown gravelly sandy slightly clayey topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including plastic, brick, concrete and wood.	
	0.20	ES		0.20				
	0.50	B					MADE GROUND: Grey brown slightly clayey gravelly sand with abundant concrete cobbles and boulders. Gravel is angular to subangular fine to coarse of mixed lithologies including brick.	
	0.50	ES		0.70				
	0.90	B					MADE GROUND: Grey gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and concrete.	
	1.00	ES		1.20				1
	1.50	B					Grey slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of mixed lithologies.	
	1.50	D		1.70				
	2.00	ES					Orange slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine to coarse of mixed lithologies.	2
	2.20	B		2.20				
	2.20	D					End of pit at 2.20 m	
								3
								4
								5

Remarks: 1. Location cleared using handheld CAT scanner. 2. Plate load CBR test conducted at 0.35m bgl. 3. Trial pit excavated to 2.20m bgl. 4. Groundwater encountered at 2.10m bgl. 5. Trial pit walls unstable due to collapse from sand strata. 6. Trial pit backfilled with arisings.

Stability:





GROUND GAS MONITORING RESULTS

GROUNDTECH
CONSULTING

Pressure Trend:	Rising	Weather:	Sunny			Equipment:	GFM 436	
Ambient:	O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)		
Start	20.5	0.0	0.0	0.0	0.0	0.0		
Finish	20.6	0.0	0.0	0.0	0.0	0.0		

Notes: BH02 monitoring pipe fallen.

GROUNDTECH
CONSULTING

Pressure Trend:	Steady	Weather:	Clear			Equipment:	GFM 436
Ambient:	O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)	
Start	20.5	0.0	0.0	0.0	0.0	0.0	
Finish	20.5	0.0	0.0	0.0	0.0	0.0	

Notes: BH02 monitoring pipe fallen.

GROUNDTECH
CONSULTING

Pressure Trend:	Falling	Weather:	Rain			Equipment:	GFM 436
Ambient:	O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)	
Start	20.2	0.0	0.0	0.0	0.0	0.0	
Finish	20.2	0.0	0.0	0.0	0.0	0.0	

Notes: BH02 has fallen out of reach.

GROUNDTECH
CONSULTING

SITE NAME:	DIDSBURY POINT	ENGINEER:	Jack Perkins
CLIENT:	CIVIC ENGINEERS	DATE:	09/06/2021
JOB NO:	GRO-20064		

Pressure Trend:	Steady	Weather:	Clear			Equipment:	GFM 436
Ambient:	O ₂ (%v/v)	CH ₄ (%v/v)	CO ₂ (%v/v)	LEL	H ₂ S (ppm)	CO (ppm)	
Start	21.2	0.0	0.0	0.0	0.0	0.0	
Finish	21.2	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)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady						
BH01	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.0	19.4	20.5	0.0	0.0	0.0	0.0	0.0001	0.0000	1014	-	N	2.29
BH02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH03	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	21.1	21.2	0.0	0.0	0.0	0.0	0.0000	0.0000	1014	-	N	2.06
BH04	0.0	0.0	0.00	0.0	0.0	0.0	4.7	3.7	9.9	12.7	0.0	0.0	0.0	0.0	0.0047	0.0000	1014	-	N	2.68
BH05	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.2	20.1	21.0	0.0	0.0	0.0	0.0	0.0006	0.0000	1014	-	N	2.48
Notes:																				

LIMITATIONS

Limitations

This contract was completed by Groundtech Consulting on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with due skill and care, taking into consideration the project brief provided, project objectives, agreed scope of works, prevailing site conditions and budget allocation.

Other than that defined in the paragraph above, Groundtech Consulting provides no other accountability or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted industry practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Groundtech Consulting. A third party who relies on this report, does so at their own and sole risk and no liability to such parties is provided by Groundtech Consulting.

It is the understanding of Groundtech Consulting that this report is to be used for the intended purpose as set out in the introduction. The purpose was instrumental in determining the scope and level of the services provided. Should the purpose of the report or the proposed end use of the site change, this report will no longer be directly applicable, and its validity readdressed. No reliance upon the report in the revised situation should be assumed by the client without the permission of Groundtech Consulting.

The report was written in 2021, 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 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 the written confirmation from Groundtech Consulting 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.

Groundtech Consulting are 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 services provided are based upon Groundtech Consulting 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 assume the information to be correct.

No responsibility can be accepted for errors for third party information presented in this report. Groundtech Consulting were 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. Groundtech Consulting are not liable for any inaccurate information, misrepresentation of data or conclusions, which may inform the scope of investigation undertaken by Groundtech Consulting 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 can also be variable due to its heterogeneous properties and as 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. Geo-Environmental testing was carried out for a limited number of parameters [as stipulated in the contract] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The 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 higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawings provided in this report are not meant to be an accurate base plan, but are preliminary and used to present the general relative locations of features on, and surrounding, the site.

