GROUNDTECH
CONSULTING

DENBY LANE, GRANGE MOOR

PERMANENT GROUND GAS RISK ASSESSMENT

ORION HOMES

JANUARY 2025

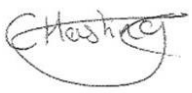
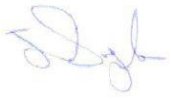
Document Control Form		
PROJECT	*DENBY LANE, GRANGE MOOR*	
REPORT NAME	*PERMANENT GROUND GAS RISK ASSESSMENT*	
REPORT REFERENCE	*GRO-24087-5293*	
STATUS	*FINAL*	
ISSUE DATE	*19 NOVEMBER 2024*	
REVISION	*1.1*	*21 JANUARY 2025*
CLIENT	*ORION HOMES*	
CLIENT CONTACT	*IAN HALLIDAY*	
For and Behalf of Groundtech Consulting		
SIGNATURE		
AUTHOR	Georgia Barnes FdSc	
SIGNATURE		
CHECKED	Connor Hastings BSc (Hons) FGS	
SIGNATURE		
REVIEWED	James Doyle BSc (Hons) CGeol FGS	

TABLE OF CONTENTS

Plans		
Plan Reference	*Revision*	*Title*
GRO-24087-P01	-	*Project Location Plan*
GRO-24087-P02B	-	*Exploratory Hole Location Plan*

1.0 INTRODUCTION

1.1 Objectives

The gas monitoring programme has been completed at Denby Lane in Grange Moor, please find enclosed the addendum ground gas assessment for the proposed residential development.

This ground gas assessment has been produced in accordance with the new and established guidance documents BS 8485:2019, BS 8576:2013 NHBC Foundation Hazardous Ground Gas (April 2023) and CIRIA Report C665 (November 2007) to discharge Land Quality pre-commencement planning conditions.

1.2 Regulator Correspondence

Kirklees Council have provided a response, referenced WK/202438517 and dated 20th December 2024, to the Ground Gas Risk Assessment undertaken by Groundtech Consulting (Ref. GRO-24087-5293, dated 19th November 2024).

A summary of the response is provided below, and the full response is provided in *Appendix 4.*

- *The regulators do not agree with the gas risk assessment due to the elevated carbon dioxide, depleted oxygen, hydrogen sulphide as well as the site being a known working site*.
- *The regulators have requested for the risk to be reconsidered to revise the gas characterisation or provide additional monitoring in worst-case pressure events to support the conclusions of the ground gas assessment. It should be noted that worst case conditions have been targeted through the monitoring and is discussed in the revised assessment.*
- *To move forward, the regulators expect the above information to be included in a robust remediation strategy.*
- *The regulators have also requested to see the results of the additional soil testing suggested in the previous Ground Investigation report.*

Groundtech acknowledge the regulator comments and have corresponded with the regulators on 21st January 2025 to discuss the recommendations. The following Ground Gas Risk Assessment has been revised having reassessed the risk and taking the comments into consideration.

2.0 SUMMARY OF PRELIMINARY RISK ASSESSMENT

2.1 Preliminary Risk Assessment Information

A Geo-Environmental Appraisal was carried out by Groundtech Consulting referenced *GRO-240078-5170,* dated 9th May 2024.

Earliest historical maps show the site being occupied by fields. Several coal pits and sandstone quarries are indicated in the surrounding area. Maps from 1893 shows the site being occupied by fields. Square colliery is shown directly to the west of the site and Red Deer Park is shown to the north. Further shafts are indicated to the north east and west of the site. A pond is also present to the east. Maps from 1907 indicate Square Colliery is no longer present to the west of the site, a shaft is shown in its place. A well is shown in the east of site. Maps from 1919 shows no change on site. To the west, filter beds are shown and the shaft is renamed as old coal shaft. Maps from 1931 show the south of the site being occupied by a sewage works with filter beds. In 1961/62, show works buildings in the centre of site. To the west of the site, the pit associated with Square Colliery is no longer shown, assumed to have been backfilled. Allotment gardens are shown to the south west. In 1989, tanks are also shown on site associated with the works on site. Residential development is shown to the south. Maps from 1999 show the site to be unoccupied and formed by fields with semi-mature and mature trees present across the centre.

It is considered likely that the pond, wells, sewage works, open cast mine and colliery identified above are a potential source of ground gas and there is a plausible pathway to migrate into confined spaces in the proposed development.

Risk of migration and accumulation of ground gas was considered to be moderate.

2.2 Ground Model

Surfacing
The surfacing of site generally comprised grass over dark brown slightly clayey slightly gravelly sandy topsoil with minor constituents of brick and rootlets to depths of between 0.2m and 0.5m bgl.

Made Ground
Made Ground was encountered beneath the eastern, central and southern areas of site within WS01 to WS02, TP04, TP06 to TP09 and RO1 to RO5 to depths of between 0.5m and 3.2.m bgl however was generally recorded at depths of less than 1.0m bgl.

Made Ground was not encountered beneath the topsoil in the north western area, parts of the western boundary and locally in the south eastern area, within WS03 to WS06, TP01 to TP03, TP05 and TP10 to TP11.

Natural Ground
One main natural stratifications were encountered during the ground investigation as outlined below:

1. *Firm becoming stiff medium to high strength grey mottled brown occasionally sandy slightly gravelly silty Clay with minor constituents of sandstone and mudstone was encountered in all exploratory holes (except TP04) from depths of between 0.25m and 1.1m bgl to depths of between 1.0m and 4.5m bgl.*

No superficial deposits are indicated to be present beneath the site and the identified natural ground is considered to be residually weathered bedrock deposits.

Bedrock

Bedrock was encountered in WS01 to WS05, TP01 to TP11 and RO1 to RO5 from depths of between 1.3m and 4.5m bgl and was encountered at greater depths in the southern area of site.

The 2nd Brown Metal Coal was encountered in TP06 and TP06 between 1.9m and 2.6m bgl in the north of the site. Coal was encountered in the probeholes between 7.0m and 8.8m bgl. Workings were identified to be present in PH09 between 9.6m and 10.5m bgl.

Groundwater

Groundwater seepages were encountered in WS01 to WS03, WS06, TP01, TP04 and TP11 in the natural sandy weathered clay and shallow residually weathered bedrock deposits.

Perched groundwater seepages were encountered in the granular Made Ground of TP06, TP07 and TP09 at 0.3m, 0.6m and 1.0m bgl, respectively.

During the monitoring period, groundwater was also encountered in PH02 at 2.3m bgl and PH03 at 4.0m bgl.

The exploratory hole positions are shown on the Exploratory Hole Location Plan *GRO-24087-P02* and the logs are in *Appendix 2.*

3.0 GROUND GAS RISK ASSESSMENT

3.1 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
RO1	*8.0*	*5.0 – 8.0*	*Mudstone*	*Ground Gas/Groundwater*
WS01	*4.0*	*1.0 – 4.0*	*Clay/Mudstone*	*Ground Gas/Groundwater*
WS02	*3.0*	*1.0 – 3.0*	*Clay/Coal/Mudstone*	*Ground Gas/Groundwater*
WS03	*3.0*	*1.0 – 3.0*	*Clay/Mudstone/Coal*	*Ground Gas/Groundwater*
WS04	*2.0*	*1.0 – 2.0*	*Mudstone*	*Ground Gas/Groundwater*
WS05	*3.0*	*1.0 – 3.0*	*Clay/Mudstone*	*Ground Gas/Groundwater*
WS06	*2.0*	*1.0 – 2.0*	*Clay*	*Ground Gas/Groundwater*

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.

Six ground gas monitoring visits have been completed between the 4th of April 2024 and the 14th of June 2024. 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 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.*

3.2 Gas Monitoring Results

During the monitoring period, methane (CH_4) has not been recorded within the standpipes.

Detectable levels of carbon dioxide (CO_2) were recorded within the standpipes, the concentrations ranged between 0.1% v/v and 6.9%v/v.

Oxygen (O_2) concentrations generally ranged between 18.8%v/v and 20.9%v/v. Depleted oxygen concentrations were identified locally to WS01 during the second monitoring visit at a level of 3.8%v/v, lower concentrations of oxygen were also identified in WS01 during the initial visit at a minimum level of 13.9%v/v. Where the depleted oxygen was recorded during the second visit, the concentration of carbon dioxide increased, there was no increase in carbon monoxide or hydrogen sulphide, indicating that other gases such as nitrogen are taking its place.

Detectable levels of hydrogen sulphide of between 10ppm and 11ppm were recorded in RO3 and WS05 during the initial visit. No other levels were detected throughout the monitoring and no levels of carbon monoxide were recorded.

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

Groundwater levels were recorded within the standpipes ranging from 0.22m bgl to 2.75m bgl during the monitoring period. During the initial visits, groundwater was generally encountered above the response zone of the standpipe due to the presence of a natural spring in the eastern section of site and poor drainage properties of the surrounding strata. The groundwater level dropped following the second monitoring visit and was generally present in the response zone.

The atmospheric pressure ranged between 972mb and 988mb during the monitoring period and was carried out during periods of rising, steady and falling barometric pressure. The monitoring was undertaken during low atmospheric pressure periods which resulted in limited falling pressure periods to be targeted, the last visit was undertaken to best target a falling atmospheric pressure trend, targeting absolute 'worst case' conditions.

3.3 Characterisation of the Gas Screening Value (GSV)

In accordance with NHBC Foundation Hazardous Ground Gas April 2023, BS 8485:2019, CIRIA Report C665, November 2007 - an adequate risk assessment can be undertaken based on the following limiting factors:

- *The proposed development has been considered as* ***high sensitivity*** *based on the site being developed with residential dwellings (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* ***moderate****, (assessment based on the environmental setting) as well as observations noted during the fieldworks.*
- *Negligible flow rates have been recorded (Table 8.5 – Modified Wilson & Card classification).*

Based upon the results recorded, in accordance with NHBC Foundation Hazardous Ground Gas April 2023, BS 8485:2019 and 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" (Qhg) have been derived for each monitoring event.

GSV (l/hr) = max borehole flow rate (l/hr) x max gas concentration (%)

For this assessment, the maximum recorded concentration of carbon dioxide of 6.9%v/v has been used together with the maximum flow rate of 0.1l/hr to calculate the GSV. As no flow rates have been detected, the limit of detection of the gas analyser of 0.1l/hr has been used to calculate the GSV.

Carbon Dioxide GSV = 0.069 (6.9%) x 0.1 = 0.0069 l/hr

Methane GSV = 0.0 l/hr

3.4 Assessment

Ground gas monitoring was carried out as multiple potential ground gas sources were identified within influencing distance of the site including former coal pit, mine shafts, colliery and sandstone quarry immediately west and north of site. A former opencast mine has been identified immediately east. Former ponds have been noted in the surrounding area and a former well is indicated in the eastern section of the site.

Methane has not been detected through all six monitoring visits. A maximum concentration of carbon dioxide of 6.9 %v/v has been recorded over the monitoring period. The carbon dioxide levels have generally been below 2.0%v/v across the site with the exception of WS01, whereby concentrations ranged between 4.1%v/v and 6.9%v/v. The source of the carbon dioxide is indicted to be deep Made Ground associated with the former sewage works and associated tanks dated 1961. It is also a possibility that the levels of carbon dioxide are caused by the possible deeper Made Ground associated with the Hunt Royd Opencast located immediately east of site. There is no evidence of the quarry to the west being a source, with no elevated gases being encountered in the western section of site.

In order to assess the ground gas regime beneath the site and the need to incorporate ground gas precautions, guidance was taken from BS 8485:2019. Based on the site being developed with a residential end use, the Wilson and Card method has been used to carry out the assessment.

When considering the results, in accordance with BS 8485:2019 (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. The hazardous gas flow rates are also less than 0.1l/hr which are indicative of CS1 conditions. It can be seen that the concentrations of carbon dioxide and methane fall beneath the assessment criteria of 1% methane and 5% carbon dioxide in the majority of the monitoring wells with the exception of WS01 where slightly concentrations of carbon dioxide were recorded above 5%.

The CL:AIRE guidance document 'Good practice for Mine Gas Emissions' has also been used to accurately classify the site. Historic mine workings have been identified in the southern section of the site at a minimum depth of 9.6m bgl, no mine workings have been identified beneath the rest of the site. No evidence of elevated hazardous gases have been identified in the monitoring wells installed in the southern section of the site, with values of methane and carbon dioxide falling below the assessment criteria in RO3 and WS06. The install in RO3 targeted the coal seam, which was worked in other areas of site further south, as well as the mudstone above. It should be noted that concentrations of hydrogen sulphide were detected in the first monitoring visit in RO3 as well as WS05, the main source of hydrogen sulphide is considered to be from wastewater and sewage sludge associated with former sewage works as well as drilling disturbance. The workings in the south should not be ruled out as a source in this instance, however the workings in the southern section of the site are to be grouted which will remove the source of mine gases in this area. The mine workings beneath the adjoining parcel to the west are also to be grouted from the same mines. The source of hazardous ground gases WS01 are indicated to be deep Made Ground associated with the nearby well/sewage works and opencast offsite, therefore there are no mine gases present. A worst-case event of falling atmospheric pressure and low atmospheric pressure of 972mb was targeted during the final visit, only

minor elevations of carbon dioxide of up to 5.2%v/v were recorded indicating that mine gases are not present and CS1 conditions prevail. Regarding the regulators comments, the depleted oxygen concentrations in WS01 have been considered. Where there were depleted oxygen, the concentration of carbon dioxide increased however there was no increase in carbon monoxide or hydrogen sulphide, indicating that other gases such as nitrogen are taking its place. This further confirms mine gases are not present.

A subfloor void and a very efficient passive ventilation system will be sufficient to mitigate the risks, of the slightly elevated carbon dioxide with no flow and the mine workings are to be grouted.

Characteristic Situation 1

An extract of the Modified Wilson and Card table is presented below:

Characteristic Situation (Wilson and Card)	Methane		Carbon Dioxide	
	Wilson and Card		Wilson and Card	
	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)
1	<0.07	<1	<0.07	<5
2	<0.7	Borehole flow rate not greater than 70l/hr	<0.7	Borehole flow rate not greater than 70l/hr
3	<3.5		<3.5	
4	<15	Quantitative Risk Assessment Required	<15	Quantitative Risk Assessment Required
5	<70		<70	
6	>70		>70	

The proposed residential development is classified as a Building Type A in accordance with BS 8485:2019 and the site is designated as CS1 therefore, 0 points of protection are required for the proposed development.

3.5 Radon Gas

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

3.6 Conclusions

No gas protection measures are required within the proposed residential development 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.

4.0 RELEVANT INDUSTRY REFERENCES

CIRIA C665 "*Assessing Risks Posed by Hazardous Ground Gases to Buildings*" 2007

Wilson & Card "*Proposed method classifying gassing sites" Ground Engineering"* 1999.

Card & Steve Wilson in "*A pragmatic approach to ground gas risk assessment for the 21st Century*"

CIRIA/Environmental Protection UK Ground gas seminar 2011

BS 8576:2013 '*Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs*)'

BS 8485:2015+A1:2019 '*Code of practise for the design of protective measures for methane and carbon dioxide ground gases for new buildings'*

NHBC "*Hazardous Ground Gas – an essential guide for housebuilders*" April 2023

CL:AIRE 'Good Practice for Mine Gas Emissions' October 2021

APPENDIX 1 - Plans

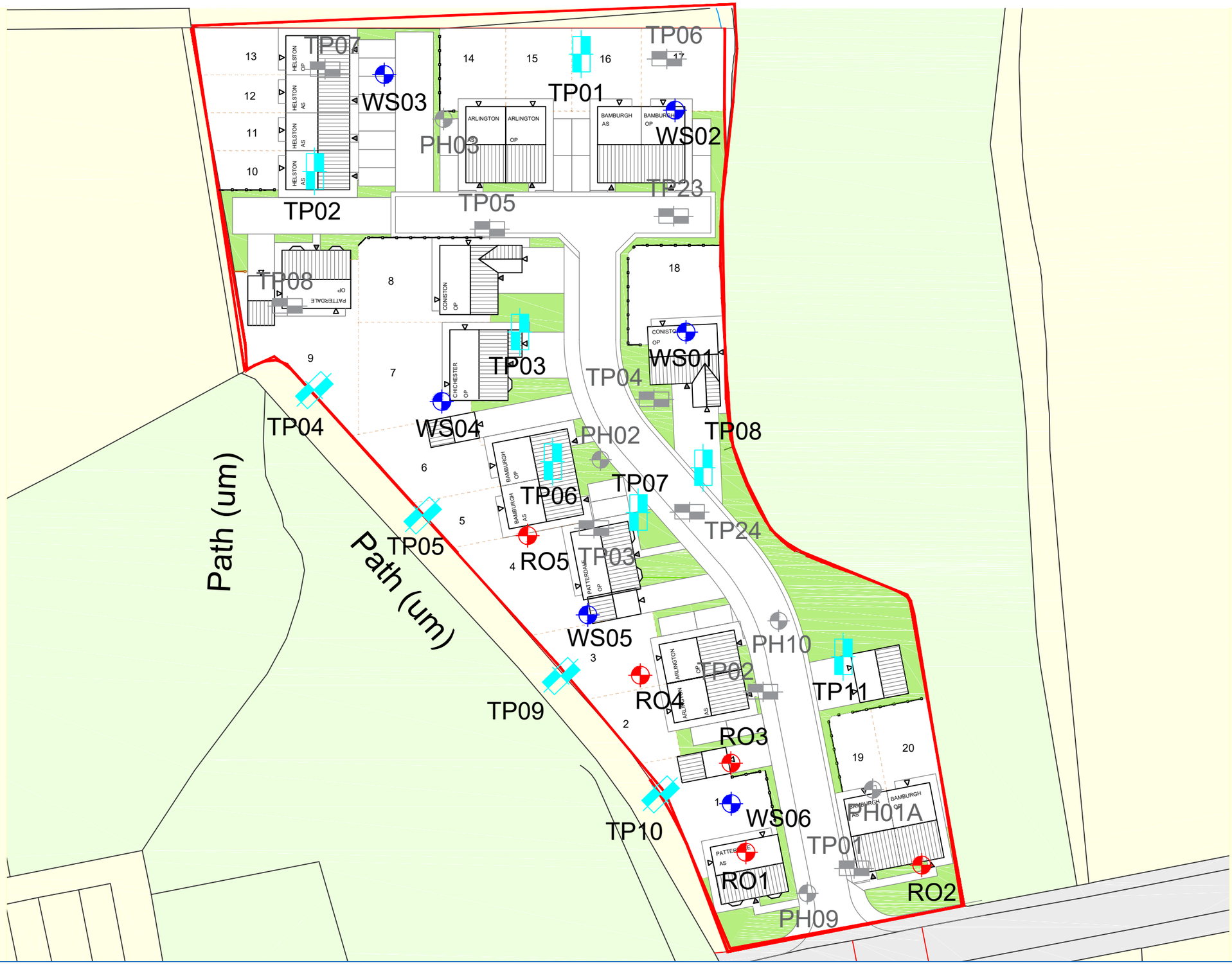
GROUNDTECH CONSULTING	CLIENT: ORION HOMES	DATE: MAY 2024
	PROJECT TITLE: DENBY LANE, GRANGE MOOR	SCALE: NTS
	PLAN TITLE: SITE LOCATION PLAN	PLAN NUMBER: GRO-24078-P01

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes

Site Location



GROUNDTECH CONSULTING	CLIENT: ORION HOMES	DATE: MARCH 2024
	PROJECT TITLE: DENBY LANE, GRANGE MOOR	SCALE: NTS
	PLAN TITLE: EXPLORATORY HOLE LOCATION PLAN - PROPOSED	PLAN NUMBER: GRO-24078-P02B

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes
- Groundtech Consulting Rotary Borehole (March 2024)
- Groundtech Consulting Trial Pit (March 2024)
- Groundtech Consulting Windowless Sample Borehole (March 2024)
- Lithos Consulting Rotary Probehole (October 2022)
- Groundtech Consulting Trial Pit (October 2022)

APPENDIX 2 - Exploratory Hole Logs

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422381.60 - 416251.82	Hole Type WS
Location: GRANGE MOOR		Level: 210.84	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	ES		0.30	210.54		MADE GROUND: Dark brown sandy clayey topsoil. Sand is fine to coarse. Frequent rootlets present.
		0.50	ES					MADE GROUND: Soft dark brown gravelly sandy clay. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse.
		1.00	D		0.90	209.94		Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
		1.00	ES					
		1.20		N=19 (3,3/4,5,5,5)				
		2.00	D		1.70	209.14		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy clay. Gravel is angular to subrounded fine to medium of mudstone. Sand is fine to medium.
		2.00		N=22 (3,4/5,5,6,6)				
	▼	3.00	D					*Becoming very gravelly and dark grey from 3.00m bgl.*
		3.00		N=41 (5,6/9,10,10,12)				
								Gravel of coal encountered from 3.60m bgl.
		4.00	D		4.00	206.84		End of borehole at 4.00 m
		4.00		N=50 (12,13/50 for 20mm)				

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. Groundwater encountered at 3.00m bgl. 4. Borehole terminated at 4.00m bgl due to SPT refusal. 5. Monitoring standpipe installed to 4.00m bgl (1.00m plain, 3.00m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422382.71 - 416283.53	Hole Type WS
Location: GRANGE MOOR		Level: 209.10	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Dark brown gravelly clayey fine to coarse sand. Gravel is angular to subangular fine to medium of brick. Occasional rootlets present.
		1.00 1.00	D ES		1.00	208.10		Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
		1.20		N=5 (1,1/1,1,1,2)				
		2.00 2.00	D	N=26 (2,3/3,5,8,10)				
					2.25	206.85		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
	▼	2.50	D					
					2.70	206.40		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy clay. Gravel is angular to subrounded fine to medium of mudstone. Sand is fine to medium.
		3.00 3.00	D	N=50 (11,14/50 for 10mm)	3.00	206.10		End of borehole at 3.00 m

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. Groundwater encountered at 2.50m bgl. 4. Borehole terminated at 3.00m bgl due to SPT refusal. 5. Monitoring standpipe installed to 3.00m bgl (1.00m plain, 2.00m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422342.94 - 416295.45	Hole Type WS
Location: GRANGE MOOR		Level: 209.70	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					MADE GROUND: Dark brown gravelly sandy clayey topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
		0.60	ES		0.50	209.20		
		1.00	D					Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
		1.20		N=11 (3,3/3,3,2,3)				
		2.00	D		1.60	208.10		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy clay. Gravel is angular to subrounded fine to medium of mudstone. Sand is fine to medium.
		2.00		N=12 (2,2/3,3,3,3)				
					2.80	206.90		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
		3.00	D		3.00	206.70		End of borehole at 3.00 m
		3.00		N=50 (7,7/50 for 40mm)				

1 2 3 4 5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. Groundwater encountered at 3.00m bgl. 4. Borehole terminated at 3.00m bgl due to SPT refusal. 5. Monitoring standpipe installed to 3.00m bgl (1.00m plain, 2.00m slotted).

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS04**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422349.59 - 416242.71	Hole Type WS
Location: GRANGE MOOR		Level: 212.36	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					MADE GROUND: Dark brown gravelly sandy clayey topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
		0.50	D		0.50	211.86		
		0.60	ES					Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
					1.00	211.36		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy clay. Gravel is angular to subrounded fine to medium of mudstone. Sand is fine to medium.
		1.20		N=16 (4,3/4,4,4,4)				
		1.50	D					
		2.00		N=50 (7,8/50 for 10mm)	2.00	210.36		End of borehole at 2.00 m

1
2
3
4
5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. No groundwater encountered. 4. Borehole terminated at 2.00m bgl due to SPT refusal. 5. Monitoring standpipe installed to 2.00m bgl (1.00m plain, 1.00m slotted).

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS05** Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422362.31 - 416225.90	Hole Type WS
Location: GRANGE MOOR		Level: 212.70	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					MADE GROUND: Dark brown gravelly sandy clayey topsoil with a low cobble content of brick. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
					0.60	212.10		
		0.80	ES					Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
		1.00	D					
		1.20		N=16 (2,2/3,4,4,5)				
		1.50	D					
		2.00	D		2.00	210.70		
		2.00		N=42 (7,9/9,10,11,12)				Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy friable clay. Gravel is angular to subrounded fine to medium of mudstone. Sand is fine to medium.
								Becoming very gravelly from 2.90m bgl.
		3.00	D		3.00	209.70		End of borehole at 3.00 m
		3.00		N=50 (10,12/50 for 10mm)				

1 2 3 4 5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. No groundwater encountered. 4. Borehole terminated at 3.00m bgl due to SPT refusal. 5. Monitoring standpipe installed to 3.00m bgl (1.00m plain, 2.00m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS06** Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422382.59 - 416202.18	Hole Type WS
Location: GRANGE MOOR		Level: 213.20	Scale 1:25
Client: ORION HOMES		Dates: 26/03/2024 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.55	212.65		MADE GROUND: Dark brown gravelly sandy clayey topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
	▼	0.60	ES					Firm light brown mottled grey very sandy gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone. Sand is fine to coarse.
		0.70	D					
		1.20		N=18 (1,2/3,4,5,6)				
		1.50	D					*Becoming grey from 1.50m bgl.*
		2.00		N=20 (4,4/4,4,6,6)				*Poor recovery from 2.00m to 3.00m bgl.*
		3.00		N=50 (3,8/50 for 30mm)	3.00	210.20		End of borehole at 3.00 m

1 2 3 4 5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand dug inspection pit to 1.20m bgl. 3. Groundwater encountered at 0.70m bgl. 4. Borehole terminated at 3.00m bgl due to SPT refusal. 5. Borehole collapsed to 2.00m bgl. 6. Monitoring standpipe installed to 2.00m bgl (1.00m plain, 1.00m slotted).

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP01**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422362.77 - 416295.47 Level: 209.17	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.00	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	208.87		MADE GROUND: Dark brown clayey sandy topsoil. Sand is fine to coarse. Frequent rootlets present.
	0.50	D					Firm medium strength light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
			HVP=55				
	1.50	D					
▼				2.20	206.97		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
	2.50	D					
				2.60	206.57		Extremely weak light brown MUDSTONE residually weathered recovered as firm gravelly sandy friable clay. Gravel is angular to subangular fine to medium of mudstone and coal. Sand is fine to coarse.
	3.00	D		3.00	206.17		End of pit at 3.00 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Groundwater seepage encountered at 2.20m bgl. 3. Trial pit terminated at 3.00m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422331.63 - 416277.28 Level: 211.08	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.20	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES					MADE GROUND: Dark brown clayey sandy topsoil. Sand is fine to coarse. Frequent rootlets present.
	0.50	D		0.40	210.68		Firm high strength light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
			HVP=95				
	1.50	D		1.60	209.48		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy clay. Gravel is angular to subrounded fine to medium of coal and mudstone. Sand is fine to medium.
	2.00	D		1.90	209.18		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
				2.10	208.98		Extremely weak grey brown MUDSTONE residually weathered recovered as slightly clayey very sandy angular to subrounded fine to coarse gravel of coal and mudstone. Sand is fine to coarse.
	2.50	D					
	3.00	D					
				3.20	207.88		End of pit at 3.20 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. No groundwater encountered. 3. Trial pit terminated at 3.20m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422367.79 - 416263.17 Level: 210.51	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.30	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25	210.26		MADE GROUND: Dark brown clayey sandy topsoil. Sand is fine to coarse. Frequent rootlets present.
	0.50	D					Firm medium strength light brown orange mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
	1.50	D	HVP=69				
				1.80	208.71		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff medium strength gravelly sandy clay. Gravel is angular to subrounded fine to coarse of coal and mudstone. Sand is fine to coarse.
	2.00	D	HVP=65				
				2.30	208.21		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
	2.50 2.50	B D					
				2.70	207.81		Extremely weak grey brown MUDSTONE residually weathered recovered as slightly clayey very sandy angular to subrounded fine to coarse gravel of coal and mudstone. Sand is fine to coarse.
	3.00	D					
				3.30	207.21		End of pit at 3.30 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. No groundwater encountered. 3. Trial pit terminated at 3.30m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No
TP04
Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422334.55 - 416250.81 Level: 212.66	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.10	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	ES		0.20	212.46		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
	0.40	ES		0.50	212.16		MADE GROUND: Dark grey black gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick, sandstone, and plastic.
	1.00	D					Light brown orange clayey sandy angular to subangular fine to coarse GRAVEL of mudstone and sandstone with a high cobble content of sandstone. Sand is fine to coarse.
▼				1.70	210.96		Extremely weak grey brown MUDSTONE residually weathered recovered as stiff gravelly sandy friable clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	2.00	D					
	3.00	D		3.10	209.56		End of pit at 3.10 m

1
2
3
4
5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Groundwater seepage encountered at 1.70m bgl. 3. Trial pit terminated at 3.10m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP05**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422362.72 - 416221.57 Level: 212.76	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.20	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.50	212.26		MADE GROUND: Dark brown clayey sandy topsoil. Sand is fine to coarse. Frequent rootlets present.
	1.00	D	HVP=79				Firm high strength light brown orange mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	1.50	D					
				1.80	210.96		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff gravelly sandy friable clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	2.00	D					
	3.00	D					
				3.20	209.56		End of pit at 3.20 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. No groundwater encountered. 3. Trial pit terminated at 3.20m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

Trial Pit Log

GROUNDTECH CONSULTING

Trialpit No **TP06** Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422372.74 - 416245.91 Level: 211.35	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.20	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
▼	0.10	ES		0.20	211.15		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
	0.50	ES					MADE GROUND: Dark grey gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick, plastic, ceramics and sandstone.
	1.00	D	HVP=45	0.75	210.60		Firm medium strength light brown orange mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	2.00	D	HVP=74	1.90	209.45		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff high strength gravelly sandy clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
				2.20	209.15		Extremely weak grey brown MUDSTONE residually weathered recovered as slightly clayey very sandy angular to subrounded fine to coarse gravel of coal and mudstone. Sand is fine to coarse.
	3.00	D		3.20	208.15		End of pit at 3.20 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Perched water seepage encountered at 0.30m bgl. 3. Trial pit terminated at 3.20m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP07** Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422379.30 - 416242.46 Level: 211.32	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.30	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.35	210.97		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
▼	0.50	ES					MADE GROUND: Light brown gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick, plastic, sandstone, ceramics and wood. *Becoming dark brown at 0.60m bgl.*
	1.50	D	HVP=64	1.00	210.32		Firm medium strength light brown orange mottled light grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	2.00	D	HVP=61	1.90	209.42		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff medium strength gravelly sandy clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	3.00	D		3.30	208.02		End of pit at 3.30 m

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Perched water seepage encountered at 0.60m bgl. 3. Trial pit terminated at 3.30m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP08** Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422382.60 - 416247.04 Level: 211.04	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.30	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES		0.25	210.79		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
	0.50	ES					MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of brick, plastic, ceramics and wood.
				1.00	210.04		Firm medium light brown orange mottled light grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	1.50	D	HVP=45				
				1.70	209.34		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff high strength gravelly sandy clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	2.00	D	HVP=77				
	3.00	D					
				3.30	207.74		End of pit at 3.30 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. No groundwater encountered. 3. Trial pit terminated at 3.30m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP09**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422362.33 - 416221.45 Level: 212.93	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.20	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30	212.63		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick. Sand is fine to coarse. Frequent rootlets present.
	0.70	ES					MADE GROUND: Dark brown gravelly fine to coarse sand with a moderate cobble content of brick. Gravel is angular to subangular fine to coarse of brick and sandstone.
▼	1.20	D	HVP=56	1.10 1.30	211.83 211.63		Firm medium strength light brown orange mottled light grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	2.00	D					Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff gravelly sandy friable clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	3.00	D		3.20	209.73		End of pit at 3.20 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Perched water seepage encountered at 1.00m bgl. 3. Trial pit terminated at 3.20m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP10**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422372.38 - 416210.40 Level: 213.08	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.20	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.50	212.58		MADE GROUND: Dark brown clayey sandy gravelly topsoil. Gravel is angular to subangular fine to medium of brick and ceramics. Sand is fine to coarse. Frequent rootlets present.
	1.00	D	HVP=46				Firm medium strength light brown orange mottled light grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
				1.55	211.53		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff gravelly sandy friable clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
	2.00	D					
	3.00	D					
				3.20	209.88		End of pit at 3.20 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. No groundwater encountered. 3. Trial pit terminated at 3.20m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

GROUNDTECH CONSULTING

Trial Pit Log

Trialpit No **TP11**

Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422400.21 - 416215.35 Level: 212.16	Date 27/03/2024
Location: GRANGE MOOR		Dimensions (m): Depth 3.10	Scale 1:25
Client: ORION HOMES			Logged JR

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	ES					MADE GROUND: Dark brown clayey sandy topsoil. Sand is fine to coarse. Frequent rootlets present.
				0.50	211.66		
	1.00	D	HVP=100				Firm high strength light brown orange mottled light grey gravelly CLAY. Gravel is angular to subangular fine to medium of mudstone and sandstone.
	1.40	D	HVP=93	1.40	210.76		
	1.50	B		1.45	210.71		Extremely weak brown mottled light grey MUDSTONE residually weathered recovered as stiff high strength gravelly sandy clay. Gravel is angular to subrounded fine to coarse of mudstone and rare coal. Sand is fine to coarse.
▼	1.50	D		1.60	210.56		Extremely weak black bituminous COAL residually weathered recovered as clayey angular to subangular fine to medium gravel.
	2.00	D					Extremely weak grey brown MUDSTONE residually weathered recovered as slightly clayey very sandy angular to subrounded fine to coarse gravel of coal and mudstone. Sand is fine to coarse.
	3.00	D					
				3.10	209.06		End of pit at 3.10 m

1 2 3 4 5

Remarks: 1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Groundwater seepage encountered at 1.70m bgl. 3. Trial pit terminated at 3.10m bgl. 4. Trial pit backfilled with arisings.

Stability: Stable

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO1**

Sheet 1 of 3

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422386.31 - 416194.86	Hole Type RO
Location: GRANGE MOOR		Level: 213.67	Scale 1:50
Client: ORION HOMES		Dates: 26/03/2024 - 26/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30	213.37		MADE GROUND: Dark brown slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rootlets.
							1.20	212.47		MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to medium of mixed lithologies including brick and ceramics.
							3.50	210.17		Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
							4.50	209.17		SAND.
										MUDSTONE.

Continued on next sheet

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. Soft drilling between 5.5m and 6.5m bgl. 5. No resistence when drilling between 14.5m and 15.5m bgl. 6. Loss of flush from 14.5m bgl to end of hole. 7. Backfilled with bentonite and arisings. 8. Logs based on drillers logs.

Rotary Core Log

Borehole No. **RO1**

Sheet 2 of 3

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422386.31 - 416194.86	Hole Type RO
Location: GRANGE MOOR		Level: 213.67	Scale 1:50
Client: ORION HOMES		Dates: 26/03/2024 - 26/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							14.00	199.67		VOID. *Soft ground encountered from 14.00m to 15.00m bgl.* *Loss of flush encountered between 14.00m and 21.00m bgl.*
							15.00	198.67		MUDSTONE.
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. Soft drilling between 5.5m and 6.5m bgl. 5. No resistence when drilling between 14.5m and 15.5m bgl. 6. Loss of flush from 14.5m bgl to end of hole. 7. Backfilled with bentonite and arisings. 8. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO1**

Sheet 3 of 3

Project Name:	DENBY LANE	Project No. GRO-24078	Co-ords:	422386.31 - 416194.86	Hole Type RO
Location:	GRANGE MOOR		Level:	213.67	Scale 1:50
Client:	ORION HOMES		Dates:	26/03/2024 - 26/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							21.00	192.67		End of borehole at 21.00 m

21 22 23 24 25 26 27 28 29 30

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. Soft drilling between 5.5m and 6.5m bgl. 5. No resistence when drilling between 14.5m and 15.5m bgl. 6. Loss of flush from 14.5m bgl to end of hole. 7. Backfilled with bentonite and arisings. 8. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO2**

Sheet 1 of 2

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422414.22 - 416188.02	Hole Type RO
Location: GRANGE MOOR		Level: 214.53	Scale 1:50
Client: ORION HOMES		Dates: 26/03/2024 - 26/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	214.13		MADE GROUND: Dark brown slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rootlets.
										MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to medium of mixed lithologies including brick and ceramics.
							2.40	212.13		CLAY.
							4.30	210.23		MUDSTONE.
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4.. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO2**

Sheet 2 of 2

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422414.22 - 416188.02	Hole Type RO
Location: GRANGE MOOR		Level: 214.53	Scale 1:50
Client: ORION HOMES		Dates: 26/03/2024 - 26/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							10.50	204.03		COAL.
							11.00	203.53		MUDSTONE.
							19.50	195.03		End of borehole at 19.50 m

11 12 13 14 15 16 17 18 19 20

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4.. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO3**

Sheet 1 of 2

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422382.57 - 416211.43	Hole Type RO
Location: GRANGE MOOR		Level: 212.64	Scale 1:50
Client: ORION HOMES		Dates: 27/03/2024 - 27/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	212.24		MADE GROUND: Dark brown slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rootlets.
										MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to medium of mixed lithologies including brick and ceramics.
							3.20	209.44		CLAY.
							4.00	208.64		MUDSTONE.
							8.00	204.64		COAL.
							8.70	203.94		MUDSTONE.
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

GROUNDTECH CONSULTING

Rotary Core Log

Borehole No. **RO3**

Sheet 2 of 2

Project Name:	DENBY LANE	Project No. GRO-24078	Co-ords:	422382.57 - 416211.43	Hole Type RO
Location:	GRANGE MOOR		Level:	212.64	Scale 1:50
Client:	ORION HOMES		Dates:	27/03/2024 - 27/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							16.50	196.14		End of borehole at 16.50 m

11 12 13 14 15 16 17 18 19 20

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO4**

Sheet 1 of 2

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422371.30 - 416218.06	Hole Type RO
Location: GRANGE MOOR		Level: 212.85	Scale 1:50
Client: ORION HOMES		Dates: 27/03/2024 - 27/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.40	212.45		MADE GROUND: Dark brown slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rootlets.
							1.20	211.65		MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to medium of mixed lithologies including brick.
							3.00	209.85		Firm light brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to medium of sandstone.
							8.00	204.85		MUDSTONE.
							8.50	204.35		COAL.
										MUDSTONE.

Continued on next sheet

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

Rotary Core Log

GROUNDTECH CONSULTING

Borehole No. **RO4**

Sheet 2 of 2

Project Name:	DENBY LANE	Project No. GRO-24078	Co-ords:	422371.30 - 416218.06	Hole Type RO
Location:	GRANGE MOOR		Level:	212.85	Scale 1:50
Client:	ORION HOMES		Dates:	27/03/2024 - 27/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							16.50	196.35		End of borehole at 16.50 m

Remarks

1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

GROUNDTECH CONSULTING

Rotary Core Log

Borehole No.
RO5
Sheet 1 of 1

Project Name: DENBY LANE	Project No. GRO-24078	Co-ords: 422371.71 - 416219.24	Hole Type RO
Location: GRANGE MOOR		Level: 212.84	Scale 1:50
Client: ORION HOMES		Dates: 27/03/2024 - 27/03/2024	Logged By JR

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30	212.54		MADE GROUND: Dark brown slightly gravelly sandy topsoil. Gravel is angular to subangular fine to coarse of mixed lithologies including brick and rootlets.
										MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to medium of mixed lithologies including brick.
							2.80	210.04		CLAY.
							3.70	209.14		MUDSTONE.
							7.50	205.34		COAL.
							8.20	204.64		MUDSTONE.
							10.00	202.84		End of borehole at 10.00 m

Remarks
1. Location cleared of services using CAT scanner. 2. Hand dug inspection pit to 1.2m bgl. 3. No groundwater encountered. 4. No loss of flush or dropping of rods recorded. 5. Backfilled with arisings and bentonite. 6. Logs based on drillers logs.

APPENDIX 3 - Final Gas Monitoring Results

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*Georgia Barnes*						
CLIENT:	*ORION HOMES*				***DATE:***	*04/04/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Rising*	***Weather:***	*Overcast*			***Equipment:***	*GFM 436*					
Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (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								
RO3	0.0	0.0	0.00	0.0	0.0	0.0	1.7	1.1	19.0	18.0	11.0	10.0	0.0	0.0	0.0017	0.0000	974	-	N	N/A	N/A	2.10
WS01	0.0	0.0	0.00	0.0	0.0	0.0	5.0	4.9	14.1	13.9	0.0	0.0	0.0	0.0	0.0050	0.0000	974	-	N	N/A	N/A	0.82
WS02	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.7	20.6	0.0	0.0	0.0	0.0	0.0000	0.0000	974	-	N	N/A	N/A	0.83
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.8	20.8	0.0	0.0	0.0	0.0	0.0000	0.0000	974	-	N	N/A	N/A	0.50
WS04	0.0	0.0	0.00	0.0	0.0	0.0	0.7	0.7	19.5	19.4	0.0	0.0	0.0	0.0	0.0007	0.0000	974	-	N	N/A	N/A	0.22
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.9	20.8	10.0	0.0	0.0	0.0	0.0000	0.0000	974	-	N	N/A	N/A	0.37
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.1	20.8	20.8	0.0	0.0	0.0	0.0	0.0004	0.0000	974	-	N	N/A	N/A	0.29
Notes:																						

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*Georgia Barnes*						
CLIENT:	*ORION HOMES*				***DATE:***	*16/04/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Steady*	***Weather:***	*Sunny*			***Equipment:***	*GFM 436*					

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (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								
RO3	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.0	20.4	20.3	0.0	0.0	0.0	0.0	0.0001	0.0000	987	-	N	N/A	N/A	1.98
WS01	0.0	0.0	0.00	0.0	0.0	0.0	6.9	6.9	3.8	3.8	0.0	0.0	0.0	0.0	0.0069	0.0000	987	-	N	N/A	N/A	0.72
WS02	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.1	20.3	19.8	0.0	0.0	0.0	0.0	0.0004	0.0000	988	-	N	N/A	N/A	0.74
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.6	20.5	0.0	0.0	0.0	0.0	0.0000	0.0000	987	-	N	N/A	N/A	0.45
WS04	0.0	0.0	0.00	0.0	0.0	0.0	3.9	3.9	14.0	14.0	0.0	0.0	0.0	0.0	0.0039	0.0000	987	-	N	N/A	N/A	0.24
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.6	20.5	0.0	0.0	0.0	0.0	0.0000	0.0000	986	-	N	N/A	N/A	0.47
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.0	20.5	20.5	0.0	0.0	0.0	0.0	0.0004	0.0000	988	-	N	N/A	N/A	0.27

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*William Sandiford Mitchell*						
CLIENT:	*ORION HOMES*				***DATE:***	*17/05/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Rising*	***Weather:***	*Overcast*			***Equipment:***	*GFM 436*					

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (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								
RO3	0.0	0.0	0.00	0.0	0.0	0.0	0.2	0.2	19.8	19.6	0.0	0.0	0.0	0.0	0.0002	0.0000	986	-	N	N/A	N/A	1.61
WS01	0.0	0.0	0.00	0.0	0.0	0.0	4.7	4.1	19.3	19.5	0.0	0.0	0.0	0.0	0.0047	0.0000	986	-	N	N/A	N/A	2.49
WS02	0.0	0.0	0.00	0.0	0.0	0.0	0.9	0.7	20.1	20.0	0.0	0.0	0.0	0.0	0.0009	0.0000	985	-	N	N/A	N/A	0.93
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.1	20.3	20.2	0.0	0.0	0.0	0.0	0.0001	0.0000	986	-	N	N/A	N/A	1.49
WS04	0.0	0.0	0.00	0.0	0.0	0.0	1.5	1.4	19.7	19.9	0.0	0.0	0.0	0.0	0.0015	0.0000	986	-	N	N/A	N/A	1.52
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.0	20.5	20.6	0.0	0.0	0.0	0.0	0.0001	0.0000	985	-	N	N/A	N/A	1.26
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.3	20.4	20.1	0.0	0.0	0.0	0.0	0.0006	0.0000	986	-	N	N/A	N/A	0.79

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*William Sandiford Mitchell*						
CLIENT:	*ORION HOMES*				***DATE:***	*30/06/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Steady*	***Weather:***	*Overcast*			***Equipment:***	*GFM 436*					

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.6	0.0	0.0	0.0	0.0	0.0
Finish	20.6	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								
RO3	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.1	20.5	20.7	0.0	0.0	0.0	0.0	0.0001	0.0000	985	-	N	N/A	N/A	1.55
WS01	0.0	0.0	0.00	0.0	0.0	0.0	6.3	5.9	19.1	18.8	0.0	0.0	0.0	0.0	0.0063	0.0000	986	-	N	N/A	N/A	1.88
WS02	0.0	0.0	0.00	0.0	0.0	0.0	1.4	1.3	19.8	19.7	0.0	0.0	0.0	0.0	0.0014	0.0000	986	-	N	N/A	N/A	0.97
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.2	0.2	20.3	20.2	0.0	0.0	0.0	0.0	0.0002	0.0000	986	-	N	N/A	N/A	1.45
WS04	0.0	0.0	0.00	0.0	0.0	0.0	2.4	2.0	19.5	19.3	0.0	0.0	0.0	0.0	0.0024	0.0000	985	-	N	N/A	N/A	1.48
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.3	20.4	20.3	0.0	0.0	0.0	0.0	0.0001	0.0000	985	-	N	N/A	N/A	1.19
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.8	0.7	19.3	19.5	0.0	0.0	0.0	0.0	0.0008	0.0000	986	-	N	N/A	N/A	0.82

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*William Sandiford Mitchell*						
CLIENT:	*ORION HOMES*				***DATE:***	*14/06/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Falling*	***Weather:***	*OVERCAST*			***Equipment:***	*GFM 436*					

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.6	0.0	0.0	0.0	0.0	0.0
Finish	20.6	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								
RO3	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.4	20.3	20.5	0.0	0.0	0.0	0.0	0.0004	0.0000	972	-	N	N/A	N/A	1.48
WS01	0.0	0.0	0.00	0.0	0.0	0.0	5.2	5.1	19.4	19.5	0.0	0.0	0.0	0.0	0.0052	0.0000	975	-	N	N/A	N/A	1.94
WS02	0.0	0.0	0.00	0.0	0.0	0.0	1.2	1.0	20.2	20.1	0.0	0.0	0.0	0.0	0.0012	0.0000	972	-	N	N/A	N/A	1.03
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.3	0.2	20.3	20.2	0.0	0.0	0.0	0.0	0.0003	0.0000	972	-	N	N/A	N/A	1.29
WS04	0.0	0.0	0.00	0.0	0.0	0.0	2.5	2.3	18.9	18.8	0.0	0.0	0.0	0.0	0.0025	0.0000	972	-	N	N/A	N/A	1.44
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.5	20.4	0.0	0.0	0.0	0.0	0.0000	0.0000	972	-	N	N/A	N/A	1.31
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.4	19.8	20.1	0.0	0.0	0.0	0.0	0.0006	0.0000	973	-	N	N/A	N/A	1.05
Notes:																						

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*DENBY LANE, GRANGE MOOR*				***ENGINEER:***	*Georgia Barnes*						
CLIENT:	*ORION HOMES*				***DATE:***	*02/05/2024*						
JOB NO:	*GRO-24078*											
Pressure Trend:	*Steady*	***Weather:***	*Sunny*			***Equipment:***	*GFM 436*					

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.6	0.0	0.0	0.0	0.0	0.0
Finish	20.6	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								
RC03	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.4	20.4	0.0	0.0	0.0	0.0	0.0000	0.0000	976	-	N	N/A	N/A	1.61
WS01	0.0	0.0	0.00	0.0	0.0	0.0	5.3	5.2	20.0	19.9	0.0	0.0	0.0	0.0	0.0053	0.0000	978	-	N	N/A	N/A	2.75
WS02	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.1	20.3	19.8	0.0	0.0	0.0	0.0	0.0004	0.0000	988	-	N	N/A	N/A	1.02
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.1	20.1	0.0	0.0	0.0	0.0	0.0000	0.0000	978	-	N	N/A	N/A	1.57
WS04	0.0	0.0	0.00	0.0	0.0	0.0	1.1	1.1	20.2	20.2	0.0	0.0	0.0	0.0	0.0011	0.0000	978	-	N	N/A	N/A	1.63
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.3	20.3	0.0	0.0	0.0	0.0	0.0000	0.0000	977	-	N	N/A	N/A	1.37
WS06	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.1	20.4	20.4	0.0	0.0	0.0	0.0	0.0004	0.0000	976	-	N	N/A	N/A	0.91

Notes:

APPENDIX 4 - Regulator Response (WK/202438517)

Consultation Response from: KC Environmental Health (Pollution & Noise Control)		
2024/92444 - Land North of Denby Lane, Grange Moor, Huddersfield, WF4 4BH		
Erection of 21 dwellings and associated works with means of access from Denby Lane		
Responding Date: **20th December 2024**	**Responding Officer:** **NH**	**Responding Ref:** **WK/202438517**

Contaminated Land
Further to our comments dated 12th November 2024, we have received a Ground Gas Risk Assessment report authored by Groundtech Consulting (November 2024, GRO-24087-5293). The report includes geo-technical information, which is outside the remit of Environmental Health, this consultation response therefore only relates to the land contamination aspects of the reports.

The report continues the ground gas assessment for the site and reports of six ground gas monitoring visits have been completed between the 4th of April 2024 and the 14th of June 2024. No methane was detectable levels of carbon dioxide (CO_2) were recorded within the standpipes, the concentrations ranged between 0.1% v/v and 6.9% v/v. Oxygen (O_2) concentrations ranged between 3.8% v/v and 20.9% v/v. The site has been considered as Characteristic Situation 1. Groundtech add that the existing workings are to be grouted which will remove the source of potential mine gas on site.

We acknowledge the information received. However, we do not agree with the conclusions of the ground gas risk assessment. Due to the elevated carbon dioxide, depleted oxygen, the presence of hydrogen sulphide and known mineworking on site, we request that the applicant reconsider the risk assessment to revise the gas characterisation or, in the first instance provide additional monitoring in worst-case pressure events to support the conclusions of the ground gas assessment. Any revised assessment must consider all good practice guidance. To move forward, we expect this information to be included in a robust remediation strategy. We also expect to see the results of the additional soil testing suggested in the previous report.

Recommended Conditions
CLC3 Submission of Remediation Strategy - Condition
Where site remediation is recommended in the Phase II Intrusive Site Investigation Report approved pursuant to condition (CLC2) further groundworks shall not commence until a Remediation Strategy by a suitably competent person has been submitted to and approved in writing by the Local Planning Authority. The Remediation Strategy shall include a timetable for the implementation and completion of the approved remediation measures.
Reason: To ensure the safe occupation of the site in accordance with Policy LP53 of the Kirklees Local Plan and paragraph nos. 189 and 190 of the National Planning Policy Framework

CLC4 Implementation of the Remediation Strategy - Condition
Remediation of the site shall be carried out and completed in accordance with the

Remediation Strategy approved pursuant to condition (CLC3). In the event that remediation is unable to proceed in accordance with the approved Remediation Strategy or contamination not previously considered in either the Preliminary Risk Assessment or the Phase II Intrusive Site Investigation Report is identified or encountered on site, all groundworks in the affected area (except for site investigation works) shall cease immediately and the Local Planning Authority shall be notified in writing within 2 working days. Works shall not recommence until proposed revisions to the Remediation Strategy have been submitted to and approved in writing by the Local Planning Authority. Remediation of the site shall thereafter be carried out in accordance with the approved revised Remediation Strategy.
Reason: To ensure the safe occupation of the site in accordance with Policy LP53 of the Kirklees Local Plan and paragraph nos. 189 and 190 of the National Planning Policy Framework

CLC5 Submission of Verification Report - Condition
Following completion of any measures identified in the approved Remediation Strategy or any approved revised Remediation Strategy a Verification Report by a suitably competent person shall be submitted to the Local Planning Authority. No part of the site shall be brought into use until such time as the remediation measures have been completed for (that part of) the site in accordance with the approved Remediation Strategy or the approved revised Remediation Strategy and a Verification Report in respect of those remediation measures has been approved in writing by the Local Planning Authority.
Reason: To ensure the safe occupation of the site in accordance with Policy LP53 of the Kirklees Local Plan and paragraph nos. 189 and 190 of the National Planning Policy Framework

CLC7 Contaminated land - Footnote
All contamination reports shall be prepared by a suitably competent person, as defined in Annex 2 of the National Planning Policy Framework. Reports must be prepared in accordance with the following guidance:

- *Land Contamination Risk Management (LCRM)*
- BS 10175:2011+ A2:2017 *Investigation of Potentially Contaminated Sites. Code of Practice*
- *Development on Land Affected by Contamination - Technical Guidance for Developers, Landowners & Consultants - (v11.2) June 2020* by the Yorkshire and Lincolnshire Pollution Advisory Group.

The conditions relate to Planning Control only. Approval under the Building Regulations may also be required, and the applicant should contact their Building Control Provider for further information. Any other necessary consent must be obtained from the appropriate authority. If the applicant commences work without discharging conditions, they will be at risk of enforcement action and invalidating the permission if the planning condition is a pre commencement condition.

CEMPC Construction Environmental Management Plan - Condition
Prior to development commencing, a Construction Environmental Management Plan (CEMP) shall be submitted to and agreed in writing with the Local Planning Authority. The plan shall describe in detail the actions that will be taken to minimise adverse impacts on occupiers of nearby properties by effectively controlling:

- Noise & vibration arising from all construction related activities. This should also include suitable restrictions on the hours of working on the site including times of deliveries.
- Dust arising from all construction related activities, which should include measures to monitor and record the emissions of dust during construction
- Artificial lighting used in connection with all construction related activities and security of the construction site.

A communications plan detailing the responsible person, their contact details and how this will be communicated to residents and the Local Authority must be included.
The agreed plan shall be adhered to throughout the construction of the development.
Reason: To safeguard the amenities of the occupiers of nearby properties in accordance with part 15 of the NPPF and LP52 of the Local Plan.

CEMPF Construction Environmental Management Plan - Footnote
No construction related noise shall be audible beyond the site boundary outside the hours of:

- 07.30 to 18.30 hours Mondays to Fridays
- 08.00 to 13.00 hours Saturdays

With no construction related noise audible beyond the site boundary on Sundays or Bank/Public Holidays.

For further information regarding dust control, guidance can be found in the Institute of Air Quality Management (IAQM) document *"Guidance on the assessment of dust from demolition and construction"* Version 2.2 2024.

Kirklees Council has powers under Section 60 of the Control of Pollution Act 1974 to control noise from construction sites and may serve a notice imposing requirements on the way in which construction works are to be carried out. It has additional powers under Sections 80 of the Environmental Protection Act 1990 to prevent statutory nuisance including noise, dust, smoke and artificial light and must serve an abatement notice when it is satisfied that a statutory nuisance exists or is likely to occur or recur. Failure to comply with a notice served using the above-mentioned legislation would be an offence for which the maximum fine on summary conviction is unlimited.

EVF1 Electric Vehicle Charging Points – Advisory Footnote
- Approval under the Building Regulations may also be required, and the applicant should contact their Building Control Provider for further information in relation to Approved Document S.
- The electrical supply of the final installation should allow the charging equipment to operate at full rated capacity and the installation must comply with all applicable electrical requirements in force at the time of installation.
- To futureproof the development, we would encourage the applicant to provide these in accordance with the current *Air Quality & Emissions Technical Planning Guidance* from the West Yorkshire Low Emissions Strategy (WYLES) Group

APPENDIX 5 - 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.