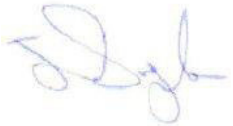


GROUNDTECH
CONSULTING

Job title:	Brunswick Mill
Report type:	Permanent Ground Gas Risk Assessment
Prepared for:	Arrowsmith Investments Limited
Date:	September 2023

Document Control Form	
PROJECT	*BRUNSWICK MILL*
REPORT NAME	*PERMANENT GROUND GAS RISK ASSESSMENT*
REPORT REFERENCE	*GRO-22462-4732*
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REVISION	
CLIENT	*ARROWSMITH INVESTMENTS LIMITED*
CLIENT CONTACT	*JASON DONES*
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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.

Preliminary Risk Assessment Information

A Geo-Environmental Appraisal was carried out by Groundtech Consulting referenced *GRO-22462-4516*, dated 05 July 2023.

Due to the historic cotton mill activity and adjacent canal, a source of ground gas has been identified on site and Made Ground is anticipated in the areas where the mill buildings were present.

Historical maps indicate the Brunswick Mill building and the adjacent India Mills buildings existing since the mid-1800s, with the latter being demolished sometime prior to 2006. The corner block area of the site contained terraced houses from the late 1800s until 1908 where they were replaced with a methodist chapel. This chapel was disused by 1953 and was partially demolished in 2018.

The mill buildings were utilised as warehouses, works, and storage, and since the mid to late 1960s were used as a clothing factory before Brunswick Mill was utilised purely as a warehouse in 1989 and the India Mills were demolished by 2006. An overground tank is located adjacent to the south-western Brunswick Mill wall.

The nearest pollution incident occurred c.53m west in 1996 relating to green oil residue within the nearby Ashton Canal. Two potential landfills are located within 250m of the site, and these include a brickfield c.20m south and a reservoir located c.160m south-east, both potentially infilled by 1893.

In addition to the onsite sources, several sources of contamination have been identified offsite, including garages, a chemical works (tar distillery), infilled ground, and surrounding industries. These could be potential sources of asbestos, ash, clinker, heavy metals, PAHs, sulphates, inorganic compounds, solvents, soaps, detergents, TPHs, and ground gases.

The risk to site end users was considered to be Moderate based on the PRA information.

Ground Model

Made Ground was encountered beneath the site to depths of between 2.3m and 4.0m bgl where fully penetrated in WS08, WS10, WS11, TP05 to TP07 and BH01 to BH03.

The surfacing generally consisted of a mixture of cobbles and concrete. The remainder comprised variably clayey gravelly sand, gravelly sandy clay, and sandy clayey gravel. The minor constituents included brick, concrete, ceramics, plastic, fabric, sandstone, wood, slate, ash, tarmac, slag, and glass.

Firm becoming stiff with depth greyish brown variably cobbly gravelly sandy silty Clay with minor constituents of shale, coal, and sandstone was encountered in BH1, BH2, BH3, HP02, TP05 to TP07, WS08, WS10 and WS11 from depths between 1.0m and 4.0m bgl to depths of up to 17.8m bgl.

Medium dense brown variably clayey Sand was present in BH2 and WS10 from depths between 3.0m and 15.2m bgl to depths between 3.5m and 15.5m bgl.

Weathered Sandstone deposits recovered as dense to very dense brown sandy silty clayey Gravel and gravelly sandy Cobbles were observed in BH1 from 13.0m to 17.0m bgl and in BH3 from 14.0m to 15.0m bgl.

More competent bedrock was encountered in the form of very weak to weak red brown fine grained Sandstone in BH1 to BH3 from depths between 15.5m and 17.8m bgl to depths between 24.0m to 26.0m bgl where the deeper boreholes were terminated.

Perched groundwater was encountered in the Made Ground of HP04, HP07, HP08, HP09, HP10, TP01 and TP04 at depths of between 1.0m and 3.0m bgl.

Groundwater was in BH3 at 20.0m bgl in the Sandstone and in WS11 at 3.45m bgl in the sandy Clay.

The exploratory hole positions are shown on the Exploratory Hole Location Plan *GRO-22462-P02* and the exploratory logs are in *Appendix 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
BH3	*3.00*	*1.00 – 3.00*	*Made Ground/Clay*	*Ground Gas*
WS02A	*2.00*	*1.00 – 2.00*	*Made Ground*	*Ground Gas*
WS05	*2.00*	*1.00 – 2.00*	*Made Ground*	*Ground Gas*
WS07A	*1.50*	*1.00 – 1.50*	*Made Ground*	*Ground Gas*
WS08	*4.00*	*1.00 – 4.00*	*Made Ground/Clay*	*Ground Gas*
BH1	*24.00*	*18.00 – 24.00*	*Sandstone*	*Ground Gas/Groundwater*
BH2	*21.00*	*18.00 – 21.00*	*Sandstone*	*Ground Gas/Groundwater*
BH3	*21.00*	*18.00 – 21.00*	*Sandstone*	*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.

Four ground gas monitoring visits have been completed between 13th June and 25th August 2023. 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.*

Gas Monitoring Results

During the monitoring period, no concentrations of methane (CH_4) have recorded within the standpipes. However, detectable levels of carbon dioxide (CO_2) were recorded within the standpipes, up to a maximum level of 9.6% v/v together with associated depleted oxygen (O_2) concentrations (minimum 0.8% v/v).

In addition, a maximum flow rate of 6.3 l/hr was recorded in BH1 on the first monitoring visit.

Groundwater levels were recorded within the standpipes ranging from depths between 1.33 to 18.82m bgl during the monitoring period and was within the response zone of the standpipes. This appears to be characteristic of the site as perched groundwater was encountered at depths of between 1.00m and 3.00m bgl in several of the exploratory holes advanced as part of the Ground Investigation.

The atmospheric pressure ranged between 998mb and 1011mb during the monitoring period and was carried out during periods of rising, steady and falling 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* ***moderate****, (assessment based on the environmental setting) as well as observations noted during the fieldworks.*
- *A positive gas flow rate of 6.3 l/hr has been recorded (Table 8.5 – Modified Wilson & Card classification).*

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

For this assessment, the maximum recorded concentration of carbon dioxide of 9.6% v/v has been used together with the maximum flow rate of 6.3 l/hr to calculate the GSV.

Carbon Dioxide GSV = 0.096 (9.6%) x 6.3 = 0.6048 l/hr

Methane GSV = 0.0 l/hr

Assessment

Ground gas monitoring was carried out as Made Ground up to 4.00m in depth was encountered across the site and several onsite and offsite sources of ground gas have been identified.

No methane has been detected and a maximum concentration of carbon dioxide of 9.6% v/v has been recorded.

Groundwater has been encountered within the response zone of the boreholes and is likely to be perched groundwater within the Made Ground materials which could have restricted the lateral migration of gases towards the standpipe. However, the perched groundwater seems to be characteristic of the site as this was encountered during the Ground Investigation. As the groundwater is within the response zone of the standpipes, carbon dioxide is likely to be present within the groundwater in a dissolved state in very low concentrations. A positive borehole pressure was noted in BH1 which is likely to have caused the flow of gas.

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 CS2 criteria (GSV of <0.7 l/hr) and gas protection measures are required.

Characteristic Situation 2

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

In accordance with CIRIA C665 and the site being placed in CS2, gas protection measures will be required comprising the following:

- *Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200 gauge DPM and underfloor venting.*

- *Beam and block or pre-cast concrete and 2000 gauge DPM/reinforced gas membrane and underfloor venting.*
- *All joints and penetrations sealed.*

The proposed apartments are classified as a Building Type B in accordance with BS8485:2015 and the site falls in CS2 in accordance with Table 2 of the above guidance and as such, 3.5 points of protection are required for the proposed development and gas protection measures will be required comprising a combination of the following:

Structural Barrier / Floor Slab

- *Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations – 1.5 points.*

Ventilation Protection Measures

- *Passive sub floor dispersal layer of good performance – 1.5 points.*

Gas Resistant Membrane

- *Gas resistant membrane (including carbon dioxide) meeting the criteria outlined in Table 7 of BS 8485:2015 – 2 points.*

Radon Gas

The site is indicated to be in an area where basic radon precautions are required within foundations.

Volatile Vapours

The geo-environmental testing has recorded high concentrations of PAHs across the site and also localised areas of hydrocarbons. Naphthalene has been recorded significantly above the vapour saturation limit of the Made Ground in HP03, HP11 and TP01. It is recommended that a vapour resistant membrane is included within the proposed apartment units as source removal will be difficult as the PAH contamination is widespread, and the Made Ground soils are similar in nature. Alternatively, vapour intrusion modelling can be undertaken to determine if the requirements for a vapour resistant membrane can be removed.

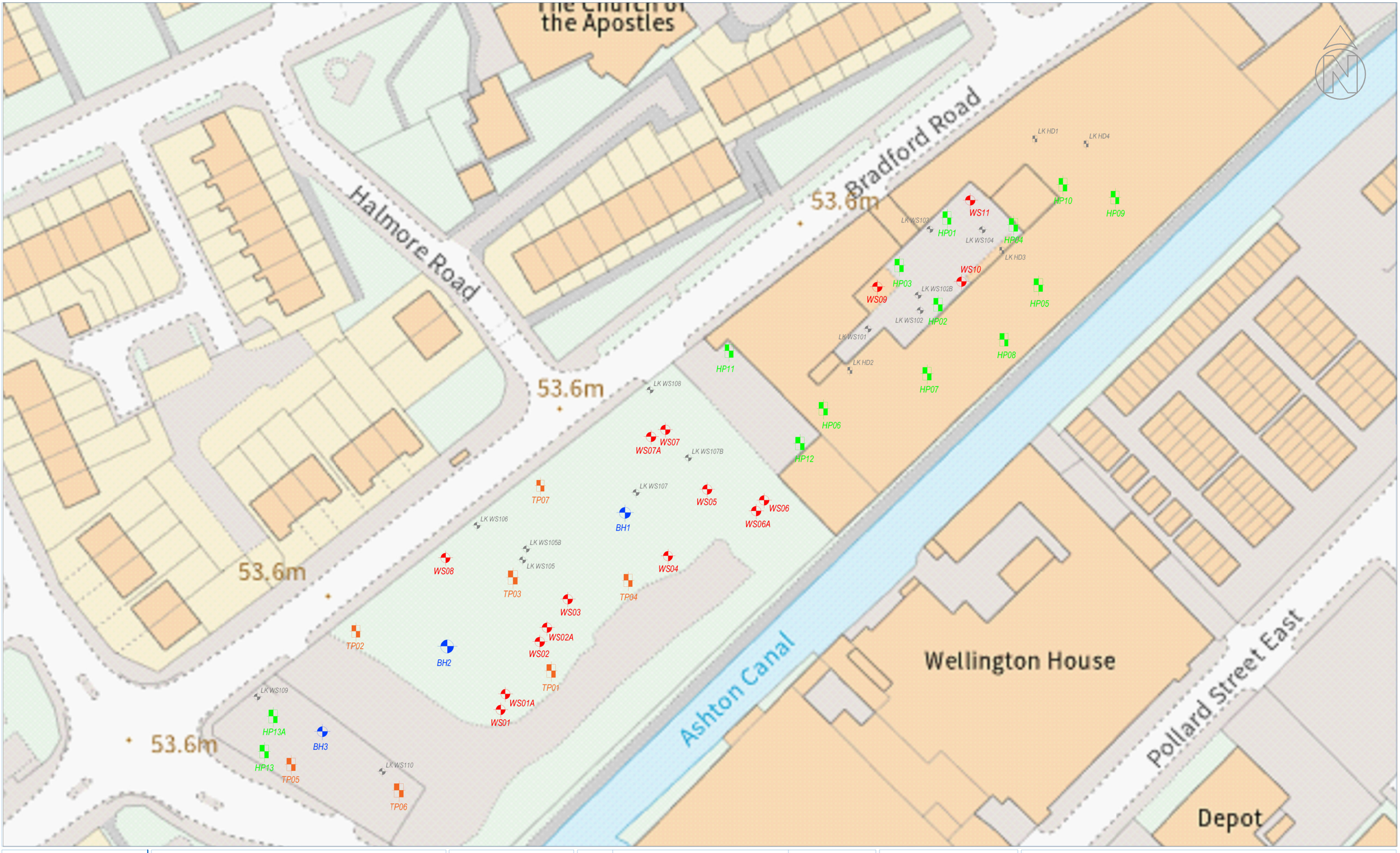
Conclusions

Gas protection measures are required within the proposed apartments at the site.

Basic 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: ARROWSMITH INVESTMENT LIMITED	DATE: JUNE 2023	
	PROJECT TITLE: BRUNSWICK MILL	SCALE: NTS	
	PLAN TITLE: EXPLORATORY HOLE LOCATION PLAN	PLAN NUMBER: GRO-22462-P02	

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes

- GROUNDTECH HAND DUG PIT LOCATION
- GROUNDTECH TRIAL PIT LOCATION
- GROUNDTECH CABLE PERCUSSION AND ROTARY BOREHOLE LOCATION
- GROUNDTECH WINDOWLESS SAMPLE BOREHOLE LOCATION
- LK WINDOWLESS SAMPLE BOREHOLE LOCATION
- LK HAND DUG PIT LOCATION

EXPLORATORY HOLE LOGS

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 02/05/2023 - 04/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385811.00 N398699.70
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH1	CP+RC	53.91m AoD	JR	1:25	Sheet 1 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	ES								MADE GROUND: Brown very gravelly medium to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, ceramics, plastic and glass.
		0.50 0.50	D ES								
		1.00	ES								
		1.20 - 1.65	D				(22)				
		2.00 2.00 - 2.45	D ES				N=50 (25 for 20mm/ 50 for 10mm)				
		3.00 3.00 - 3.45	D ES					3.00	50.91		MADE GROUND: Soft brown gravelly clay. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, sandstone and shale.
		4.00 4.00 - 4.45	ES U					4.00	49.91		Firm high strength brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale.
		4.50	D								
		5.00 - 5.45	D				(15)				

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. SPT refusals encountered at 2.0m, 12.5m, 14.0m, 16.5m and 17.65m bgl. 5. Cable percussion drilling terminated at 18.0m bgl. Rotary core follow on to 24.0m bgl. 7. Monitoring standpipe installed to 24.0m bgl (18.0m plain, 6.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 02/05/2023 - 04/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385811.00 N398699.70
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH1	CP+RC	53.91m AoD	JR	1:25	Sheet 2 of 5

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Firm high strength brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale.
		6.50 - 6.95	U								
		7.00	D								*Becoming very sandy from 7.0m to 8.0m bgl.*
		8.00 - 8.45	D				(26)				*Becoming stiff at 8.0m bgl.*
		9.50 - 9.95	U								
		10.00	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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. SPT refusals encountered at 2.0m, 12.5m, 14.0m, 16.5m and 17.65m bgl. 5. Cable percussion drilling terminated at 18.0m bgl. Rotary core follow on to 24.0m bgl. 7. Monitoring standpipe installed to 24.0m bgl (18.0m plain, 6.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 02/05/2023 - 04/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385811.00 N398699.70
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH1	CP+RC	53.91m AoD	JR	1:25	Sheet 3 of 5

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		11.00 - 11.45	D				(42)				Firm high strength brown slightly gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale.
											Becoming gravelly at 12.0m bgl.
		12.50 - 12.95	D				N=50 (25 for 70mm/ 50 for 20mm)				
								13.00	40.91		Very dense brown sandy silty slightly clayey angular to subrounded fine to coarse GRAVEL of sandstone. Sand is medium to coarse.
		14.00 - 14.45	D				N=50 (25 for 20mm/ 50 for 30mm)				

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. SPT refusals encountered at 2.0m, 12.5m, 14.0m, 16.5m and 17.65m bgl. 5. Cable percussion drilling terminated at 18.0m bgl. Rotary core follow on to 24.0m bgl. 7. Monitoring standpipe installed to 24.0m bgl (18.0m plain, 6.0m slotted).

Rotary Core Log

GROUNDTECH CONSULTING

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 02/05/2023 - 04/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385811.00 N398699.70
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH1	CP+RC	53.91m AoD	JR	1:25	Sheet 4 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 15.95	D				(41)				Very dense brown sandy silty slightly clayey angular to subrounded fine to coarse GRAVEL of sandstone. Sand is medium to coarse.
		16.50 - 16.95	D				N=50 (25 for 70mm/ 50 for 50mm)				
		17.65 - 18.00	D				N=50 (25 for 30mm/ 50 for 20mm)	17.00	36.91		Weak red SANDSTONE residually weathered recovered as clayey slightly gravelly medium to coarse sand. Gravel is angular to subangular fine to coarse.
			NR					18.00	35.91		NO RECOVERY.
		18.00 - 19.50	NI 1 NI 1 NI	49	15	15		18.77	35.14		Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth planar closely spaced discontinuities. *From 18.77m to 18.86m bgl recovered as subrounded coarse cobbles.* *From 18.96m to 19.02m bgl recovered as sandy subrounded coarse cobbles. Sand is coarse.* *From 19.14m to 19.50m bgl recovered as subangular to subrounded medium to coarse gravel with occasional cobbles.*
			NR 1 NI 1 NI 1					19.50 19.58	34.41 34.33		NO RECOVERY. Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. SPT refusals encountered at 2.0m, 12.5m, 14.0m, 16.5m and 17.65m bgl. 5. Cable percussion drilling terminated at 18.0m bgl. Rotary core follow on to 24.0m bgl. 7. Monitoring standpipe installed to 24.0m bgl (18.0m plain, 6.0m slotted).

Rotary Core Log

GROUNDTECH CONSULTING

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 02/05/2023 - 04/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385811.00 N398699.70
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH1	CP+RC	53.91m AoD	JR	1:25	Sheet 5 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		19.50 - 21.00	NI 1 NI 2 ~~NI~~ 2	95	68	51		21.00	32.91		Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal rough undulating closely spaced discontinuities. *From 19.67m to 19.76m bgl recovered as subangular cobble.* *From 19.86m to 19.88m bgl recovered as subangular coarse gravel.* *From 20.05m to 20.22m bgl recovered as subangular to subrounded coarse gravel.* *From 20.30m to 20.41m bgl recovered as very clayey subangular to subrounded medium to coarse gravel.*
		21.00 - 22.50	~~NR~~ ~~NI~~ 2 NI 1 NI ~~1~~ ~~NI~~ 2 NI	97	42	31		21.05 21.09	32.86 32.82		*Yellow calcareous minerals present from 20.40m to 20.43m bgl.* *From 20.61m to 20.63m bgl recovered as subangular coarse gravel.* NO RECOVERY. Weak red brown SANDSTONE residually weathered recovered as slightly sandy angular to subangular fine to coarse gravel. Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth stepped very close to closely spaced discontinuities. *From 21.34m to 21.74m bgl recovered as gravelly angular to subrounded fine to coarse cobbles. Gravel is angular to subrounded fine to coarse.* *From 21.81m to 21.89m bgl recovered as gravelly sand. Gravel is angular to subangular fine to coarse. Sand is fine to coarse.* *From 21.92m to 21.96m bgl recovered as angular coarse gravel.* *From 22.24m to 22.50m bgl recovered as gravelly subrounded coarse cobbles. Gravel is angular to subangular fine to coarse.*
		22.50 - 24.00	2 NI 2	100	89	89		22.50	31.41		Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth undulating close to medium spaced discontinuities. *Very clayey from 22.5m to 23.86m bgl.* *From 22.90m to 23.06m bgl recovered as very clayey sandy subrounded coarse cobbles. Sand is fine to coarse.*
								24.00	29.91		End of Borehole at 24.000m

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. SPT refusals encountered at 2.0m, 12.5m, 14.0m, 16.5m and 17.65m bgl. 5. Cable percussion drilling terminated at 18.0m bgl. Rotary core follow on to 24.0m bgl. 7. Monitoring standpipe installed to 24.0m bgl (18.0m plain, 6.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 04/05/2023 - 10/05/2023
Location: MANCHESTER	Contractor:	
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2	CP+RC		JR	1:25	Sheet 1 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		0.20	ES								MADE GROUND: Brown very gravelly medium to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, concrete, ceramics, plastic, fabric and glass.
		0.50 0.50	D ES								
		1.00	ES								
		1.20 - 1.65	D				(15)				
								1.80			MADE GROUND: Concrete slab.
		2.00 2.00 - 2.45	D ES				(6)	2.00			MADE GROUND: Soft brown gravelly clay. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, sandstone and shale.
		3.00 3.00 - 3.45	D ES				(6)				
								3.50			Soft brown sandy silty CLAY. Sand is fine to coarse.
		4.00 4.00 - 4.45	D ES					4.00			Stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale and sandstone.
		5.00 - 5.45	U								

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 14.0m, 15.5m and 16.5m bgl. 5. Cable percussion drilling terminated at 16.0m bgl. Rotary core follow on to 22.0m bgl. 7. Monitoring standpipe installed to 21.0m bgl (18.0m plain, 3.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 04/05/2023 - 10/05/2023
Location: MANCHESTER	Contractor:	
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2	CP+RC		JR	1:25	Sheet 2 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		5.50	D								Stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale and sandstone. *Medium strength at 5.0m bgl.*
		6.50 - 6.95	D				(15)				
		8.00 - 8.45	U								*High strength at 8.0m bgl.*
		8.50	D								
		9.50 - 9.95	D				(20)				

6 7 8 9 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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 14.0m, 15.5m and 16.5m bgl. 5. Cable percussion drilling terminated at 16.0m bgl. Rotary core follow on to 22.0m bgl. 7. Monitoring standpipe installed to 21.0m bgl (18.0m plain, 3.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 04/05/2023 - 10/05/2023
Location: MANCHESTER	Contractor:	
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2	CP+RC		JR	1:25	Sheet 3 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale and sandstone.
		11.00 - 11.45	U								*Very high strength at 11.0m bgl.*
		11.50	D								
		12.50 - 12.95	D				(35)				
		14.00 - 14.45	D				N=50 (5,6/50 for 70mm)				
			D				(18)				

11
12
13
14
15

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 14.0m, 15.5m and 16.5m bgl. 5. Cable percussion drilling terminated at 16.0m bgl. Rotary core follow on to 22.0m bgl. 7. Monitoring standpipe installed to 21.0m bgl (18.0m plain, 3.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 04/05/2023 - 10/05/2023
Location: MANCHESTER	Contractor:	
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2	CP+RC		JR	1:25	Sheet 4 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		15.00 - 15.45						15.20			Stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including shale and sandstone. Red brown fine to medium SAND.
		15.50 - 16.00	D				N=50 (25 for 30mm/ 50 for 10mm)	15.50			Weak red SANDSTONE residually weathered recovered as sandy angular to subangular fine to coarse gravel. Sand is medium to coarse.
							N=50 (25 for 10mm/ 50 for 10mm)	16.00			NO RECOVERY
			NR								
			1					16.45			Weak red brown fine grained SANDSTONE, moderately weathered with horizontal rough planar close to medium spaced discontinuities. *From 16.54m to 16.59m bgl recovered as subrounded coarse cobbles.* *From 16.85m to 16.87m bgl recovered as angular cobbles.*
			NI								
		16.00 - 17.50	2	70	54	49					
			NI								
			3								
			NI								*From 17.35m to 17.50m bgl recovered as subangular coarse cobbles.*
								17.50			NO RECOVERY
			NR								
			NI					18.07			Weak red brown fine grained SANDSTONE, moderately weathered with horizontal striated stepped close to medium spaced discontinuities. *From 18.07m to 18.18m bgl recovered as sandy angular to subrounded fine to coarse gravel. Sand is coarse.*
		17.50 - 19.00	4	62	39	24					
			NI								*From 18.70m to 18.9m bgl recovered as firm slightly sandy silty clay. Sand is fine.*
			NI								*From 18.9m to 19.00m bgl yellow calcareous minerals present.*
			NR					19.00			NO RECOVERY.
			1					19.05			Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth planar closely spaced discontinuities. *From 19.21m to 19.30m bgl recovered as subrounded coarse cobbles.* *From 19.60m to 19.69m bgl recovered as subrounded coarse cobbles.* *From 19.61m to 19.62m bgl black organic staining on discontinuity.*
			NI								
		19.00 - 20.50	2	96	73	47					
			NI								
			2								
			NI								

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 14.0m, 15.5m and 16.5m bgl. 5. Cable percussion drilling terminated at 16.0m bgl. Rotary core follow on to 22.0m bgl. 7. Monitoring standpipe installed to 21.0m bgl (18.0m plain, 3.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 04/05/2023 - 10/05/2023
Location: MANCHESTER	Contractor:	
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH2	CP+RC		JR	1:25	Sheet 5 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
			4								Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth planar closely spaced discontinuities.
			NR					20.50			*From 19.84m to 20.04m bgl recovered as sandy angular to subangular fine to coarse gravel of sandstone. Sand is fine to coarse.*
			2					20.55			*From 20.03m to 20.04m bgl yellow calcareous minerals present.*
			NI								NO RECOVERY.
			2								Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth planar close to medium spaced discontinuities.
		20.50 - 22.00	NI	96	80	75					*From 20.81m to 20.94m bgl recovered as subrounded coarse gravel.*
			3								*From 21.21m to 21.27m bgl recovered as subangular coarse cobbles.*
											From 21.75m to 21.76m bgl yellow calcareous minerals present.
			NI					22.00			*From 21.96m to 22.0m bgl recovered as subrounded coarse cobbles.*
											End of Borehole at 22.000m

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 14.0m, 15.5m and 16.5m bgl. 5. Cable percussion drilling terminated at 16.0m bgl. Rotary core follow on to 22.0m bgl. 7. Monitoring standpipe installed to 21.0m bgl (18.0m plain, 3.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 1 of 6

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	D								MADE GROUND: Dark brown very gravelly medium to coarse sand. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, sandstone, concrete and plastic.
		0.50	ES								
		1.00	ES								
		1.20 - 1.65	D				(16)				
		2.00	D				(10)				
		2.00 - 2.45	ES								
								2.30	52.14		Firm grey mottled brown sandy CLAY. Sand is fine to coarse.
		3.00	ES								
		3.00 - 3.45	U								
		3.50	D								
		4.00 - 4.45	D				(21)				
		5.00 - 5.45	U								

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 2 of 6

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		5.50	D								Firm grey mottled brown sandy CLAY. Sand is fine to coarse.
		6.50 - 6.95	D				(22)				
		8.00 - 8.45	U								
		8.50	D								
		9.50 - 9.95	D				(22)				

6
7
8
9
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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 3 of 6

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Firm grey mottled brown sandy CLAY. Sand is fine to coarse.
		11.00 - 11.45	U								*Very high strength at 11.0m bgl.*
		11.50	D								
		12.50 - 12.95	D				(32)				
		14.00 - 14.45	D				(40)	14.00	40.44		Brown sandy gravelly COBBLES of sandstone. Gravel is angular to rounded fine to coarse of sandstone. Sand is medium to coarse.
								15.00	39.44		

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 4 of 6

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		15.50 - 15.95	D				(42)				Stiff brown CLAY with a high cobble content of sandstone.
								16.50	37.94		Stiff grey silty CLAY.
		17.00 - 17.45	D				(37)				
								17.80	36.64		Weak red SANDSTONE residually weathered recovered as red brown clayey gravelly sand. Gravel is angular to subangular fine to coarse. Sand is medium to coarse.
		18.00 - 18.45	D				(27)				
		19.00	D				N=50 (25 for 10mm/ 50 for 20mm)				
		19.50	D				N=50 (25 for 20mm/ 50 for 10mm)				
								20.00	34.44		

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 5 of 6

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		20.00 - 21.50	NR	33	14	0					NO RECOVERY.
			4					21.00	33.44		Very weak red brown fine grained SANDSTONE, extremely weathered with subhorizontal rough undulating closely spaced discontinuities. *From 21.21m to 21.28m bgl grey colour within discontinuities.*
			NI					21.50	32.94		*From 21.21m to 21.50m recovered as angular to subangular coarse gravel.*
		21.50 - 23.00	NR	53	10	10					NO RECOVERY.
			NI					22.20	32.24		
			1					22.30	32.14		Extremely weak red brown SANDSTONE, residually weathered recovered as stiff gravelly clay. Gravel is angular coarse. *From 22.20m to 22.30m recovered as stiff gravelly clay. Gravel is angular coarse of sandstone.*
			NI								Very weak red brown fine grained SANDSTONE, extremely weathered with subhorizontal rough undulating close to medium spaced discontinuities.
			NR					23.00	31.44		*From 22.55m to 23.00m bgl recovered as angular coarse gravel.*
			2					23.02	31.42		*From 22.20m to 23.00m bgl occasional angular to subangular coarse gravel of chert.*
		23.36 - 23.56	NI C								NO RECOVERY.
		23.00 - 24.50	6	99	88	83					Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal stepped striated closely spaced discontinuities. *From 23.30m to 23.36m bgl recovered as angular coarse cobbles.*
			NI								*From 24.33m to 24.50m recovered as angular to subangular coarse gravel.*
			NI					24.50	29.94		Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth undulating closely spaced discontinuities.
			2								*From 24.50m to 24.60m bgl recovered as angular to subangular coarse gravel.*
			NI								

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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

Rotary Core Log

Project Name: BRUNSWICK MILL	Client: ARROWSMITH INVESTMENT LIMITED	Date: 10/05/2023 - 12/05/2023
Location: MANCHESTER	Contractor:	Co-ords: E385741.30 N398644.50
Project No. : GRO-22462	Crew Name:	Drilling Equipment:

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
BH3	CP+RC	54.44m AoD	JR	1:25	Sheet 6 of 6

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		24.50 - 26.00	1 NI 1 NI 4 NI 1	100	80	71		26.00	28.44		Weak red brown fine grained SANDSTONE, moderately weathered with subhorizontal smooth undulating closely spaced discontinuities. *From 24.50m to 24.61m bgl yellow calcareous minerals present.* *From 24.86m to 25.02m bgl recovered as subrounded coarse cobbles.* *From 25.09m to 25.13m bgl recovered as subrounded coarse gravel.* *From 25.28m to 25.36m bgl recovered as subrounded coarse cobbles.* *From 25.89m to 25.91m bgl recovered as subangular coarse gravel.* End of Borehole at 26.000m

26
27
28
29
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 with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 20.0m bgl. 4. SPT refusals encountered at 19.0m and 19.5m bgl. 5. Cable percussion drilling terminated at 20.0m bgl. Rotary core follow on to 26.0m bgl. 7. Dual monitoring standpipes installed to 21.0m bgl and 3.0m bgl (18.0m plain, 3.0m slotted, and 1.0m plain, 2.0m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS01A** Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: 385776.70 - 398658.80	Hole Type WS
Location: MANCHESTER		Level: 53.55	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 04/05/2023 -	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: Brown gravelly medium to coarse sand with a moderate cobble content of brick and sandstone. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, fabric, sandstone and wood. Faint ashy organic odour.
								Becoming black at 0.7m bgl.
		1.00	ES					
		1.20		N=50 (3,5/50 for 60mm)				
					1.65	51.90		End of borehole at 1.65 m

1 2 3 4 5

Remarks
1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385782.15 - 398665.48	Hole Type WS
Location:	MANCHESTER		Level:	53.64	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.05	ES		0.10	53.54		MADE GROUND: Brown gravelly medium to coarse sand with moderate cobble content of sandstone. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, fabric, sandstone and wood. End of borehole at 0.10 m

1
2
3
4
5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 0.1m bgl. 3. No groundwater encountered. 4. Borehole terminated due to sandstone boulder obstruction. 5. Backfilled with arisings.

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS02A** Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385781.17 - 398666.27	Hole Type WS
Location:	MANCHESTER		Level:	53.70	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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: Brown black gravelly medium to coarse sand with moderate cobble content of sandstone. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, sandstone and wood. Faint ashy organic odour.
		1.00	D					
		1.20		N=12 (1,4/3,3,3,3)				
		1.50	ES					
		2.00		N=50 (9,11/50 for 30mm)	2.00	51.70		End of borehole at 2.00 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Monitoring standpipe installed to 2.0m bgl (1.0m plain, 1.0m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385789.18 - 398678.50	Hole Type WS
Location:	MANCHESTER		Level:	53.75	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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: Brown black gravelly medium to coarse sand with moderate cobble content of brick and sandstone. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, sandstone and wood.
		1.00	D					
		1.20		N=13 (3,3/4,3,3,3)				
		1.50	ES					
		2.00		N=28 (25 for 60mm/4,4,8,12)	2.00	51.75		End of borehole at 2.00 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385803.87 - 398685.93	Hole Type WS
Location:	MANCHESTER		Level:	53.61	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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: Brown black gravelly fine to coarse sand with moderate cobble content of brick and sandstone. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, roof slates, sandstone and wood. Faint ashy organic odour.
		1.00	D					*Becoming very sandy at 1.0m bgl.*
		1.20		N=11 (3,3/3,3,3,2)				
		1.50	ES					
		2.00		N=50 (6,9/50 for 50mm)	2.00	51.61		End of borehole at 2.00 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Backfilled with arisings.

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS05**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385819.00 - 398704.58	Hole Type WS
Location:	MANCHESTER		Level:	53.72	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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: Brown gravelly fine to coarse sand with moderate cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, roof slates, sandstone and wood.
		1.20		N=8 (2,0/2,2,2,2)				
		1.50	ES					
		2.00		N=50 (25 for 50mm/50 for 10mm)	2.00	51.72		End of borehole at 2.00 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Monitoring standpipe installed to 2.0m bgl (1.0m plain, 1.0m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS06**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385830.31 - 398706.55	Hole Type WS
Location:	MANCHESTER		Level:	53.38	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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		0.60	52.78		MADE GROUND: Brown gravelly fine to coarse sand with moderate cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, glass, paper, plastic, rubber, sandstone and wood. Faint ashy organic odour.
								End of borehole at 0.60 m

1
2
3
4
5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 0.6m bgl. 3. No groundwater encountered. 4. Borehole terminated due to brick obstruction. 5. Backfilled with arisings.

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS06A** Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: 385828.15 - 398704.56	Hole Type WS
Location: MANCHESTER		Level: 53.47	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 04/05/2023 -	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		0.60	52.87		MADE GROUND: Brown gravelly fine to coarse sand with moderate cobble content of brick and a faint hydrocarbon odour. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, plastic, sandstone and wood.
								End of borehole at 0.60 m

1 2 3 4 5

Remarks
1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 0.6m bgl. 3. No groundwater encountered. 4. Borehole terminated due to concrete obstruction. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS07**

Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: 385814.06 - 398711.63	Hole Type WS
Location: MANCHESTER		Level: 53.61	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 04/05/2023 -	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: Brown gravelly fine to coarse sand with moderate cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, plastic, sandstone and wood.
					0.80	52.81		End of borehole at 0.80 m

1
2
3
4
5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 0.8m bgl. 3. No groundwater encountered. 4. Borehole terminated due to concrete obstruction. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS07A**

Sheet 1 of 1

Project Name:	BRUNSWICK MILL	Project No. GRO-22462	Co-ords:	385813.25 - 398711.65	Hole Type WS
Location:	MANCHESTER		Level:	53.74	Scale 1:25
Client:	ARROWSMITH INVESTMENT LIMITED		Dates:	04/05/2023 -	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: Brown gravelly fine to coarse sand with moderate cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, fabric, plastic, sandstone and wood.
		1.00	ES					
		1.20		N=3 (1,1/0,1,1,1)				
		1.50		N=50 (25 for 0mm/50 for 0mm)				
					1.95	51.79		End of borehole at 1.95 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated due to SPT refusal. 5. Monitoring standpipe installed to 1.5m bgl (1.0m plain, 0.5m slotted).

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS08** Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: 385763.49 - 398679.02	Hole Type WS
Location: MANCHESTER		Level: 53.97	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 04/05/2023 -	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: Brown gravelly fine to coarse sand with moderate cobble content of brick. Gravel is angular to subrounded fine to coarse of mixed lithologies including brick, concrete, ceramics, sandstone and wood.
		1.20		N=4 (1,1/1,1,1,1)				
		1.50	ES					*Becoming very sandy at 1.4m bgl.*
		2.00		N=8 (1,0/2,2,2,2)				
					2.20	51.77		Stiff brown mottled grey gravelly CLAY. Gravel is angular to subangular fine to coarse of mixed lithologies including coal, shale and sandstone.
		2.50	ES					
		3.00 3.00	D	N=28 (4,4/5,7,8,8)				
		4.00 4.00	D	N=17 (4,4/4,4,4,5)	4.00	49.97		End of borehole at 4.00 m

1 2 3 4 5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated at 4.0m bgl. 5. Monitoring standpipe installed to 4.0m bgl (1.0m plain, 3.0m slotted).

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS09**

Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 05/05/2023 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			MADE GROUND: Paving cobbles.
		0.50	ES					MADE GROUND: Dark brown slightly clayey ashy gravelly medium to coarse sand with a low cobble content of brick. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, ash, tarmac and slag. Faint ashy organic odour odour.
					0.90			End of borehole at 0.90 m

1
2
3
4
5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 0.9m bgl. 3. No groundwater encountered. 4. Borehole terminated due to drain encountered at 0.9m bgl. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS10**

Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 05/05/2023 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			MADE GROUND: Paving cobbles.
		0.50	ES					MADE GROUND: Dark grey black slightly clayey ashy gravelly medium to coarse sand with a low cobble content of brick. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, tarmac and slag. Mild ashy organic odour.
		1.20 1.20	ES	N=2 (1,0/0,1,0,1)				*Becoming very clayey from 1.2m to 1.5m bgl.*
					1.50			Firm brown mottled grey slightly sandy CLAY. Sand is medium to coarse.
		1.70	ES					
		2.00 2.00	D	N=15 (2,3/3,4,4,4)				
		3.00 3.00	D	N=13 (4,4/4,3,3,3)	3.00			Medium dense brown clayey fine to medium SAND.
					3.50			Firm brown mottled grey slightly sandy CLAY. Sand is medium to coarse.
		4.00 4.00	D	N=32 (6,6/8,8,8,8)	4.00			End of borehole at 4.00 m

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. No groundwater encountered. 4. Borehole terminated at 4.0m bgl. 5. Backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS11** Sheet 1 of 1

Project Name: BRUNSWICK MILL	Project No. GRO-22462	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: ARROWSMITH INVESTMENT LIMITED		Dates: 05/05/2023 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.15			MADE GROUND: Paving cobbles.
		0.50	ES					MADE GROUND: Dark grey black slightly clayey ashy gravelly medium to coarse sand with low cobble content of brick. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, tarmac and slag. Faint ashy organic odour.
		1.20		N=8 (2,2/2,2,2,2)	1.25			
		1.50	ES					MADE GROUND: Firm dark grey slightly ashy gravelly clay. Gravel is angular to subangular fine to coarse of mixed lithologies including brick, and sandstone. Moderate hydrocarbon odour.
		2.00		N=20 (4,4/4,5,5,6)				
		2.50	ES		2.45			Firm brown mottled grey slightly sandy CLAY. Sand is medium to coarse.
								Band of fine to coarse sand at 2.7m to 2.9m bgl.
		3.00 3.00	D	N=20 (3,4/5,5,5,5)				
	▼							
		4.00 4.00	D	N=33 (7,8/7,8,9,9)	4.00			End of borehole at 4.00 m

1 2 3 4 5

Remarks

1. Location cleared with hand held CAT scanner. 2. Hand dug pit to 1.2m bgl. 3. Groundwater encountered at 3.45m bgl. 4. Borehole terminated at 4.0m bgl. 5. Backfilled with arisings.

GROUND GAS MONITORING RESULTS

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*BRUNSWICK MILL*					***ENGINEER:***	*William Sandiford Mitchell*					
CLIENT:	*CIVIC ENGINEERS*					***DATE:***	*13/06/2023*					
JOB NO:	*GRO-22462*											
Pressure Trend:	*Steady*	***Weather:***	*Clear*			***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								
BH01	6.3	6.3	0.55	0.0	0.0	0.0	5.2	0.5	0.8	19.7	0.0	0.0	0.0	0.0	0.3276	0.0000	1007	-	N	N/A	N/A	17.26
BH02	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.4	20.0	20.8	0.0	0.0	0.0	0.0	0.0006	0.0000	1007	-	N	N/A	N/A	17.27
BH03S	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	1006	-	N	N/A	N/A	NGW
BH03D	0.0	0.0	0.00	0.0	0.0	0.0	3.4	3.4	13.1	13.1	0.0	0.0	0.0	0.0	0.0034	0.0000	1006	-	N	N/A	N/A	18.71
WS02A	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	13.6	13.6	0.0	0.0	0.0	0.0	0.0000	0.0000	1007	-	N	N/A	N/A	NGW
WS05	0.0	0.0	0.00	0.0	0.0	0.0	9.1	0.3	10.9	21.3	0.0	0.0	0.0	0.0	0.0091	0.0000	1008	-	N	N/A	N/A	NGW
WS07A	0.0	0.0	0.00	0.0	0.0	1.5	1.5	1.4	20.1	19.5	0.0	0.0	0.0	0.0	0.0015	0.0000	1007	-	N	N/A	N/A	NGW
WS08	0.0	0.0	0.00	0.0	0.0	2.9	2.9	2.9	12.5	12.5	0.0	0.0	0.0	0.0	0.0029	0.0000	1007	-	N	N/A	N/A	NGW
Notes:																						

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*BRUNSWICK MILL*	***ENGINEER:***	*William Sandiford Mitchell*
CLIENT:	*CIVIC ENGINEERS*	***DATE:***	*19/06/2023*
JOB NO:	*GRO-22462*		

Pressure Trend:	*Rising*	***Weather:***	*Overcast*
Equipment:	*GFM 436*		

	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Ambient:						
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								
BH01	0.0	0.0	0.00	0.0	0.0	0.0	6.0	4.2	6.7	1.5	0.0	0.0	0.0	0.0	0.0060	0.0000	1000	-	N	N/A	N/A	NGW
BH02	0.0	0.0	0.00	0.0	0.0	0.0	0.3	0.2	20.8	20.2	0.0	0.0	0.0	0.0	0.0003	0.0000	1000	-	N	N/A	N/A	4.01
BH03S	0.0	0.0	0.00	0.0	0.0	0.0	0.3	0.3	20.3	20.2	0.0	0.0	0.0	0.0	0.0003	0.0000	1000	-	N	N/A	N/A	1.92
BH03D	0.0	0.0	0.00	0.0	0.0	0.0	0.4	0.0	20.6	19.9	0.0	0.0	0.0	0.0	0.0004	0.0000	1000	-	N	N/A	N/A	18.82
WS02A	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	13.6	13.4	0.0	0.0	0.0	0.0	0.0000	0.0000	1000	-	N	N/A	N/A	1.72
WS05	0.0	0.0	0.00	0.0	0.0	0.0	9.2	9.2	11.4	11.4	0.0	0.0	0.0	0.0	0.0092	0.0000	1000	-	N	N/A	N/A	NGW
WS07A	0.0	0.0	0.00	0.0	0.0	0.0	1.9	1.8	19.6	19.4	0.0	0.0	0.0	0.0	0.0019	0.0000	1001	-	N	N/A	N/A	NGW
WS08	0.0	0.0	0.00	0.0	0.0	0.0	2.9	2.9	12.5	12.4	0.0	0.0	0.0	0.0	0.0029	0.0000	1000	-	N	N/A	N/A	1.33

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*BRUNSWICK MILL*	***ENGINEER:***	*Ethan Hitchcow*
CLIENT:	*CIVIC ENGINEERS*	***DATE:***	*04/08/2023*
JOB NO:	*GRO-22462*		

Pressure Trend:	*Falling*	***Weather:***	*Overcast*	***Equipment:***	*GFM 436*

	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Ambient:						
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								
BH01	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	21.4	21.2	0.0	0.0	0.0	0.0	0.0000	0.0000	1011	-	N	N/A	N/A	NGW
BH02	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.1	20.0	20.9	0.0	0.0	0.0	0.0	0.0006	0.0000	1011	-	N	N/A	N/A	4.01
BH03S	0.0	0.0	0.00	0.0	0.0	0.0	0.8	0.8	20.2	20.3	0.0	0.0	0.0	0.0	0.0008	0.0000	1011	-	N	N/A	N/A	1.92
BH03D	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.1	21.2	21.1	0.0	0.0	0.0	0.0	0.0001	0.0000	1011	-	N	N/A	N/A	18.82
WS02A	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	2.5	4.7	0.0	0.0	0.0	0.0	0.0000	0.0000	1010	-	N	N/A	N/A	1.72
WS05	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	21.3	21.2	0.0	0.0	0.0	0.0	0.0000	0.0000	1011	-	N	N/A	N/A	NGW
WS07A	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	20.9	21.2	0.0	0.0	0.0	0.0	0.0000	0.0000	1010	-	N	N/A	N/A	NGW
WS08	0.0	0.0	0.00	0.0	0.0	0.0	5.2	4.3	3.6	1.6	0.0	0.0	0.0	0.0	0.0052	0.0000	1011	-	N	N/A	N/A	1.33

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*BRUNSWICK MILL*		***ENGINEER:***	*Ethan Hitchcow*	
CLIENT:	*CIVIC ENGINEERS*		***DATE:***	*25/08/2023*	
JOB NO:	*GRO-22462*				
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	20.5	0.0	0.0	0.0	0.0	0.0
Finish	20.5	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
BH01	0.0	0.0	0.00	0.0	0.0	0.0	1.5	0.8	13.0	16.8	0.0	0.0	0.0	0.0	0.0015	0.0000	1000	-	N	N/A	N/A	17.24
BH02	0.0	0.0	0.00	0.0	0.0	0.0	1.1	0.6	18.7	19.6	0.0	0.0	0.0	0.0	0.0011	0.0000	998	-	N	N/A	N/A	14.53
BH03S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WS02A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WS05	0.0	0.0	0.00	0.0	0.0	0.0	9.6	9.4	2.6	2.5	0.0	0.0	0.0	0.0	0.0096	0.0000	998	-	N	N/A	N/A	NGW
WS07A	0.0	0.0	0.00	0.0	0.0	0.0	6.6	4.6	15.4	13.4	0.0	0.0	0.0	0.0	0.0066	0.0000	1000	-	N	N/A	N/A	NGW
WS08	0.0	0.0	0.00	0.0	0.0	0.0	0.7	0.0	19.8	20.4	0.0	0.0	0.0	0.0	0.0007	0.0000	999	-	N	N/A	N/A	1.43

Notes: Could not locate WS02. Could not gain access to the enclosed space BH03S/D are located.

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.

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 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.

