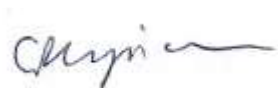




Phase 2 Intrusive Site Investigation Report

LOCATION	11 Slathwaite Drive, Manchester M11 4BA
ISSUE DATE	November 2020
FOR	Roman Wings Ltd. c/o Dumitru Gornea
CLIENT REF.	
OUR REF.	G20367

Prepared by



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Table of Contents

1. Introduction.....	3
2. Scope of Phase 2 Investigation.....	3
2.1 Scope of Works.....	3
2.2 Sampling Rationale.....	4
3. Phase 2 Investigation Findings	4
3.1 Encountered Ground Conditions.....	4
3.1.1 Windowless Sampling Boreholes (BH1 to BH5).....	4
3.1.2 Trial Pit (TP1).....	4
3.1.3 Infiltration Testing Borehole (BH4)	4
3.1.4 Moisture content and Vegetation Influence	5
4. Conclusions	5
4.1 Foundation and Floor Slab Recommendations	5
4.2 Concrete Design	6
4.3 Soakaways	6
 Appendix 1 Site Plan & Exploratory Hole Logs	
Appendix 2 Moisture Profiles & Atterberg Limit Tests	
Appendix 3 Chemtech Analytical Test Report	



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1. Introduction

In accordance with your instruction Geoinvestigate Ltd. has carried out a Phase 2 investigation at 11 Slathwaite Drive, Manchester M11 4BA.

It is understood that it is proposed to erect a new residential dwelling at the site.

The purpose of this Phase 2 investigation was to establish the true nature of the ground conditions at the site with regard to geotechnical hazards and foundation design. No Phase 1 Desk Study or contamination assessment was carried out as part of the current investigation.

2. Scope of Phase 2 Investigation

2.1 Scope of Works

Given the above the following investigation was carried out to assess the potential risks to the proposed development:

- The sinking of three (3) windowless sample boreholes (BH1 to BH3) to depths of up to 5.00m with associated soil sampling and supervision of the works by a suitably qualified geo-environmental engineer. The boreholes were sunk by windowless sampling techniques using a Dando Terrier 2002 mini drilling rig.
- The sinking of one (1) further windowless sampling borehole (BH4) to allow for infiltration testing to be carried out by way of falling head testing.
- The hand excavation of one (1) trial pit to a depth of between 1.00m to recover soils for subsequent UU UKWIR water pipe suitability contamination testing.
- Geotechnical testing on samples recovered from the site including twenty-six (26) moisture contents, one (1) Atterberg limits test, water soluble sulphate concentrations and pH testing to allow suitable foundations and concrete design advice.
- Provision of a factual and interpretative report including site plan, trial pit and borehole logs and geotechnical test results.

The borehole and trial pit positions are shown on the plan provided in Appendix 1.

The excavations were sampled and logged at site by a geo-environmental engineer and the ground conditions encountered are described on the borehole logs also provided in Appendix 1.

The moisture profiles and Atterberg limit tests are shown in Appendix 2.

The results of the water-soluble sulphate and pH are presented in the Chemtech Report (ref. 90789) and is included in Appendix 3. The results of the UU UKWIR water pipe suitability contamination testing will be provided under separate cover.

2.2 Sampling Rationale

The borehole positions were chosen to give an indication of the ground conditions and across the site.

3. Phase 2 Investigation Findings

3.1 Encountered Ground Conditions

3.1.1 Windowless Sampling Boreholes (BH1 to BH5)

The boreholes generally encountered the similar ground conditions comprising deep made ground overlying cohesive natural strata of generally weak very sandy gravelly clay and clayey gravelly sand.

The made ground was only fully penetrated in BH1 and BH2, where it was encountered to depths of between 3.80m and 4.30m, and generally comprised loose blackish brown and grey sand and brick, ash, glass, pot, concrete, coal and occasional metal gravel with cobbles. Made ground comprising loose grey and brown clayey sandy gravel of brick and concrete was encountered in BH1 at depths of between 3.10m and 3.80m.

In BH1 and BH2 the made ground was underlain by natural strata comprising soft grey very sandy clay with gravel of sandstone to the base of each borehole at depths of 5.0m.

Vane shear strength testing returned values of between 26kNm^{-2} and 34kNm^{-2} , indicating the natural cohesive strata were generally soft (low strength).

The in situ SPT testing (carried out with a solid cone sampler) returned results of between $N=2$ and $N=7$ in the made ground.

In the underlying natural strata an N value of $N=3$ was recorded, indicating the natural soils were generally very soft. It should be noted that an SPT N value of 50 (refusal) was recorded in the made ground in BH3 at a depth of 3.70m, this suggest that obstructions may be present within the made ground.

All boreholes (BH1 to BH3) remained open and dry on completion.

3.1.2 Trial Pit (TP1)

The trial pit generally encountered the similar ground conditions to the boreholes, comprising made ground of loose blackish brown and grey sand and gravel of sandstone, brick, ash, concrete and pot with cobbles, to the base of the excavation at 1.00m.

3.1.3 Infiltration Testing Borehole (BH4)

BH4 was sunk within the proposed garden / soft landscaped areas in the north of the site, where soakaways might potentially be installed.

This borehole encountered similar conditions to those encountered in boreholes BH1 to BH3, with made ground of loose blackish brown and grey sand and gravel of brick, concrete, ash, glass and occasional metal encountered to the base of the borehole at 1.00m depth.

It was proposed to undertake water infiltration testing in BH4 following completion of the drilling to ascertain infiltration rates in the near surface soils. However, as made ground was encountered to the base of the borehole and had been encountered to depths in excess of 3.70m in the other boreholes drilled at the site, the proposed testing was not deemed acceptable. This is because soakaways cannot be discharged into made ground due to the potential risk of mobilising any potential contaminants. Similarly, undertaking the testing in made ground increases the risk of mobilising any potential contaminants.

As surface waters cannot be discharged in to made ground, the use of soakaways for the disposal of surface waters will not be suitable at the site.

3.1.4 Moisture content and Vegetation Influence

Plasticity testing on the clay strata at the site recovered from BH1 at 4.50m depth returned a Plasticity Index (PI) of 28.4% classifying the cohesive soils as Silt of High Plasticity (CH) according to BS5930. These would equate to NHBC Medium shrinking soils.

Given the above and given the recent clearance of vegetation (including trees), consideration should be given to mitigating foundation design at the site, with regard to soil shrinkage and swelling.

4. Conclusions

4.1 Foundation and Floor Slab Recommendations

Ostensibly very weak made ground has been encountered at the site to depths of between 3.80m and at least 4.30m and is considered unsuitable as a bearing stratum. Additionally, the made ground is underlain by very soft to soft clay and this is also considered unsuitable as a bearing stratum.

Based on the above, it is considered that a piled foundation solution will be required at the site. As the potential for obstructions within the made ground has been identified it is recommended that continuous flight auger (CFA) piles are utilised for the proposed structure. However, advice with regard to a suitable type and depth of pile should be sought from a suitably qualified and experienced piling contractor. As discussed above this may require the drilling of a deeper borehole at the site, in order to identify suitably competent natural strata and obtain additional geotechnical data to inform piled foundation design. The requirement and scope for these works be determined by the piling contractor. The presence of High Plasticity / NHBC Medium shrinking natural soils below the made ground may mean that special precautions such as heave protection is required for the piles, but this would be determined by the piling contractor and would be unlikely given the depth of the cohesive material.

It should be noted that the made ground is loose and may potentially settle around the proposed structure and or services. The magnitude of potential settlement is not known without additional ground investigation, and this may impact of the serviceability of the proposed dwelling.

Given the presence of deep made ground, it is considered that a beam and block floor slab suspended from the pile ring beam will form the most suitable solution for the floor slab.

4.2 Concrete Design

The results of chemical analyses of the fill returned Water Soluble Sulphate levels of between 1454mg/l⁻¹ and 1796mg/l⁻¹ and pH levels of between 7.7 and 8.0.

On this basis and assuming mobile groundwater conditions due to the presence of granular made ground, concrete in contact with the ground may be designed to ACEC Class DS-3 AC-3 of "BRE Special Digest 1 – Concrete in aggressive ground".

4.3 Soakaways

The presence of deep made ground at the site would prohibit the use of soakaways for the disposal of surface water.

END OF REPORT

The findings and contents of this (intrusive) Site Investigation Report pertain solely to the study area(s) outlined herein and are based solely on the findings of the excavations undertaken as part of the current exercise unless otherwise stated. The findings and/or recommendations of this report do not take into account any ground conditions that may be present but have hitherto not been encountered and as such further investigation and/or a reconsideration of the findings of this report should be undertaken if such conditions are subsequently encountered or an alternative development plan or land use is subsequently proposed.

This report considers various environmental and/or geological risks posed to the site and/or proposed development and offers advice accordingly as guidance only. The findings of this report will remain valid provided no change of ground or groundwater conditions, either natural or anthropogenic, take place and no warrantee is offered or implied.

No copying of this report or any part of its contents is permitted without written permission of Geoinvestigate Ltd. nor should the report be made available to any third party without similar prior arrangement.



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APPENDIX 1

Site Plan & Exploratory Hole Logs

GEOINVESTIGATE Ltd.

OUR REF: G20367	YOUR REF:	SITE PLAN (NOT TO SCALE)
DATE: November 2020	LOCATION: 11 Slathwaite Drive, Manchester, M11 4BA	

LEGEND

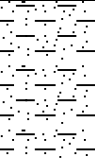
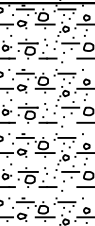
- Windowless sample borehole location
- Windowless sample borehole and proposed infiltration test location
- Trial pit location



GEOINVESTIGATE Ltd.**Your Ref.****Our Ref.**

G20367

BH No.1 Sheet No. 1 of 1**Location:** 11 Slathwaite Drive, Manchester M11 4BA**DATE:** 26/10/20

Depth (m)	Description of Strata	Thick-ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
3.10	MADE GROUND Loose blackish brown and grey sandy gravel/gravelly sand. Gravel is fine to coarse of brick, ash, glass, concrete, coal and occasional metal. Occasional cobbles noted.	3100			O	Cv kN/m ²	1/1/0/1/1/1 N=3 1.00m-1.45m		0.20
					O S				0.50
					O				0.75
					O S				1.00
					O				1.25
					O S		1/2/1/2/1/1 N=5 2.00m-2.45m		1.50
					O				1.75
					O S				2.00
					O				2.25
					O S		2/2/1/2/2/2 N=7 3.00m-3.45m		2.50
					O				2.75
					O S				3.00
3.80	MADE GROUND Soft grey and brown slightly clayey sandy gravel. Gravel is fine to coarse of brick and concrete.	700			O				3.25
					O S				3.50
					O S				3.75
4.30	Soft grey very sandy CLAY/clayey SAND.	500			O S	26	1/0/0/1/1/1 N=3 4.00m-4.45m		4.00
					O				4.25
	Soft to firm grey very sandy gravelly CLAY. Gravel is fine to coarse of sandstone.	700			O	30			4.50
					O				4.75
	Borehole terminated at 5.00m				O	34			5.00

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 5.00m

Borehole remained dry on completion

Key: Slotted Pipe Plain Pipe Bentonite Gravel Filter**O** Disturbed sample**Cv** Shear vane**W** Water sample**S** Standard Penetration Test**C** Cone Penetration Test**BH1**

GEOINVESTIGATE Ltd.**Your Ref.****Our Ref.**

G20367

BH No.2 Sheet No. 1 of 1**Location:** 11 Slathwaite Drive, Manchester M11 4BA**DATE:** 26/10/20

Depth (m)	Description of Strata	Thick-ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND Loose blackish brown and grey sandy gravel/gravelly sand. Gravel is fine to coarse of brick, ash, concrete, glass, coal, pot and sandstone. Cobbles noted. (poor sample recovery below 2.00m)					Cv kN/m ²			0.20
					O				0.50
									0.75
					O S		1/1/0/1/1/1 N=3 1.00m-1.45m		1.00
									1.25
					O				1.50
									1.75
					O S		1/1/1/1/0/1 N=3 2.00m-2.45m		2.00
									2.25
					O				2.50
									2.75
					O S		1/1/2/1/2/1 N=6 3.00m-3.45m		3.00
									3.25
					O				3.50
									3.75
					O S		1/0/1/1/1/1 N=3 4.00m-4.45m		4.00
									4.25
4.30		4300							
	Loose/soft grey very sandy gravelly CLAY/ clayey gravelly SAND. Gravel is fine to coarse of sandstone.				O	26			4.50
		700							4.75
5.00	Borehole terminated at 5.00m								5.00

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 5.00m

Borehole remained dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample**Cv** Shear vane**W** Water sample**S** Standard Penetration Test**C** Cone Penetration Test**BH2**

GEOINVESTIGATE Ltd.**Your Ref.****Our Ref.**

G20367

BH No.3 Sheet No. 1 of 1**Location:** 11 Slathwaite Drive, Manchester M11 4BA**DATE:** 26/10/20

Depth (m)	Description of Strata	Thick- ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	MADE GROUND Loose blackish brown and grey sandy gravel/gravelly sand. Gravel is fine to coarse of brick, ash, pot, concrete and glass. Many cobbles noted.					Cv kN/m ²			0.20
					O				0.50
									0.75
					O S		1/0/1/1/0/1 N=2 1.00m-1.45m		1.00
									1.25
					O				1.50
									1.75
					O S		1/1/1/2/1/1 N=5 2.00m-2.45m		2.00
									2.25
					O				2.50
									2.75
					O S		1/2/1/2/1/2 N=6 3.00m-3.45m		3.00
									3.25
					O				3.50
3.70		3700					N=50/10mm 3.70m-3.71m		3.70
	Borehole terminated at 3.70m due to refusal.								

Remarks:

Casing to 1.00m

Dynamic windowless sampling by Terrier Rig to 3.70m

Borehole remained dry on completion

Key:

Slotted Pipe

Plain Pipe

Bentonite

Gravel Filter

O Disturbed sample

Cv Shear vane

W Water sample

S Standard Penetration Test

C Cone Penetration Test

BH3

GEOINVESTIGATE Ltd.

Your Ref.

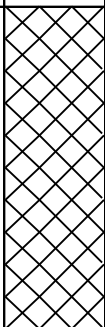
Our Ref. G20367

TP No.1

Sheet No. 1 of 1

Location: 11 Slathwaite Drive, Manchester, M11 4BA

DATE: 26/10/20

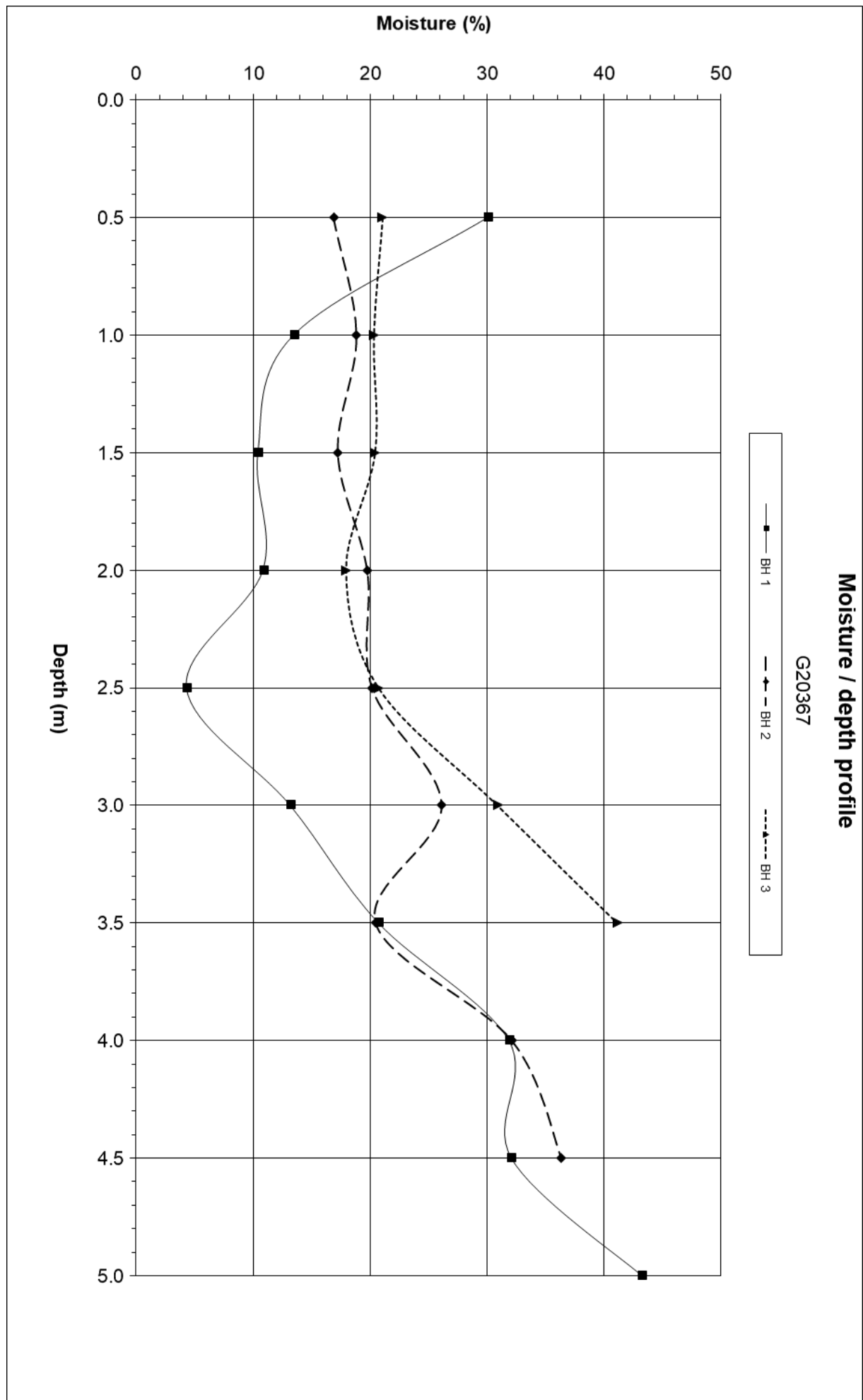
Depth (m)	Description of Strata	Thickness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
1.00	MADE GROUND Loose blackish brown and grey SAND and GRAVEL. Gravel is fine to coarse of brick, concrete, ash, glass and occasional metal.	1000						0.25 0.50 0.75 1.00

Remarks: Hand excavated to 1.00m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

APPENDIX 2

Moisture Profiles & Atterberg Limit Tests



GEOINVESTIGATE Ltd.Atterberg Limit Test Results**Our ref.** G20367**Table 1****Your ref.****Location:** 11 Slathwaite Drive, Manchester M11 4BA

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification BS5930 [1999]
1	0.50	30.1						
	1.00	13.5						
	1.50	10.5						
	2.00	10.9						
	2.50	4.4						
	3.00	13.2						
	3.50	20.7						
	4.00	31.9						
	4.50	32.1	>95	32.1	33.6	62.0	28.4	MH
	5.00	43.2						
2	0.50	16.9						
	1.00	18.9						
	1.50	17.3						
	2.00	19.8						
	2.50	20.2						
	3.00	26.1						
	3.50	20.5						
	4.00	32.1						
	4.50	36.4						

GEOINVESTIGATE Ltd.

Atterberg Limit Test Results

Our ref. G20367

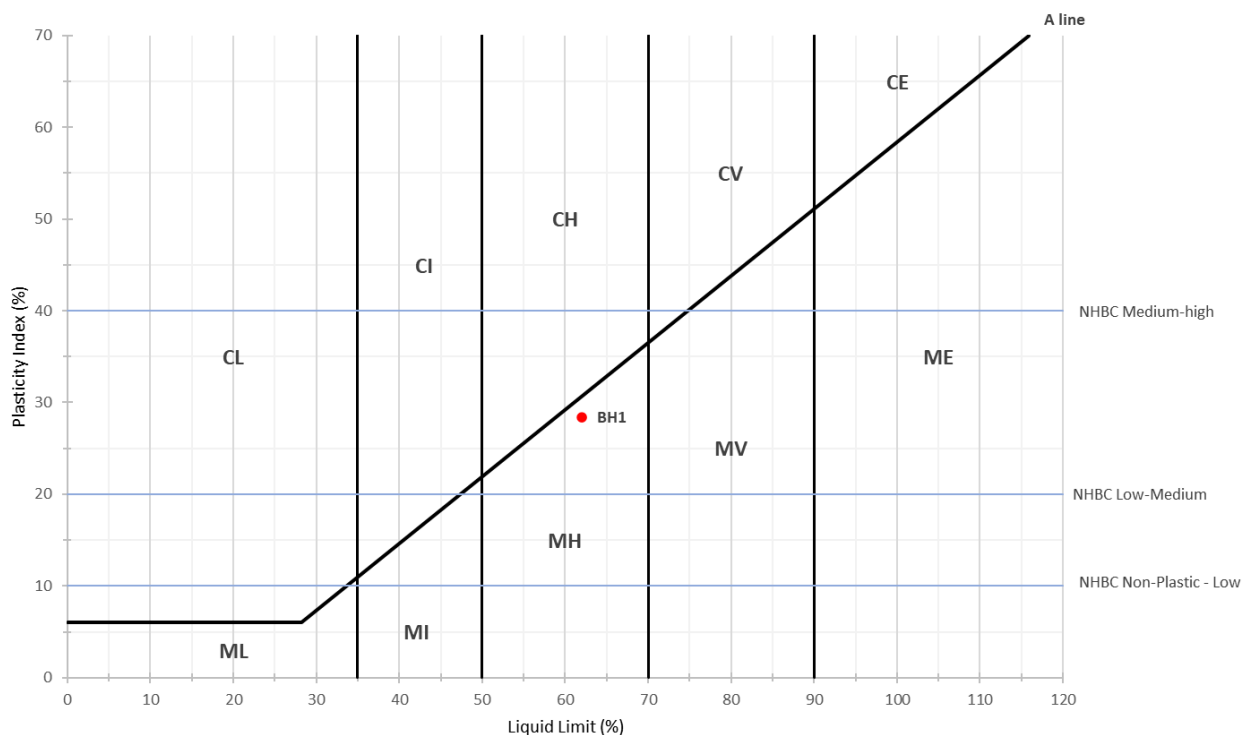
Table 1

Your ref.

Location: 11 Slathwaite Drive, Manchester M11 4BA

TP / BH No.	Sample Depth (m)	Insitu Moisture Content (%)	% Passing BS 425 Micron Sieve	Corrected Moisture Content (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Classification BS5930 [1999]
3	0.50	21.1						
	1.00	20.3						
	1.50	20.4						
	2.00	17.9						
	2.50	20.7						
	3.00	30.9						
	3.50	41.2						

G20367 - 11 Slathwaite Drive, Manchester, M11 4BA
Plasticity Chart (BS 410, BS 5930:2015, Casagrande, 1947)



APPENDIX 3

Chemtech Analytical Test Report



ANALYTICAL TEST REPORT

Contract no: 90789

Contract name: Proposed Development, 11 Slathwaite Drive, Manchester, M11 4BA

Client reference: G20367

Clients name: GEO Investigate

Clients address: Units 3a & 4 Terry Dicken Industrial Estate
Ellerbeck Way, Stokesley
North Yorkshire
TS9 7AE

Samples received: 04 November 2020

Analysis started: 04 November 2020

Analysis completed: 06 November 2020

Report issued: 06 November 2020

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing

Approved by:

John Campbell
Director

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB
Tel 01207 528578 Email customerservices@chemtech-env.co.uk
Vat Reg No. 772 5703 18 Registered in England number 4284013

Page 1 of 5 Pages

CE709 Test Report Issue 14 June 2019

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.
Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
90789-1	BH1	2.50	Loam with Gravel	-	-	13.2
90789-2	BH3	1.50	Loam with Gravel	-	-	18.2

Chemtech Environmental Limited

SOILS

Lab number			90789-1	90789-2
Sample id			BH1	BH3
Depth (m)			2.50	1.50
Date sampled			26/10/2020	26/10/2020
Test	Method	Units		
pH	CE004 ^M	units	7.7	8.0
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	1454	1796

90789
Proposed Development, 11 Slathwaite Drive, Manchester, M11 4BA
G20367

CE709 Test Report Issue 14 June 2019

Page 3 of 5 Pages

Chemtech Environmental Limited**METHOD DETAILS**

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄

Chemtech Environmental Limited

DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
90789-1	BH1	2.50	N	
90789-2	BH3	1.50	N	

90789

Proposed Development, 11 Slathwaite Drive, Manchester, M11 4BA

G20367

CE709 Test Report Issue 14 June 2019

Page 5 of 5 Pages