

IV.42.23
Date: 4th May 2023

Mr R Beaumont

Dear Sirs,

RE: The Greyhound, Botcheston, LeicestershireIntroduction

As per your instruction, Ivy House Environmental (IHE) attended the site known as the Greyhound, Botcheston, Leicestershire on the 28th March 2023 in order to undertake geotechnical investigation at the site.

At the site of the investigation, the site comprised a public house known as the Greyhound within the centre of the site, comprising a two-storey building. The eastern section of the site comprised a car park while the western section of the site comprised of a grass area with a play area. A wooden function room is present along the northern site boundary. The site slopes gently downwards to the south by approximately 0.5m.

The development proposal for the site is for the extension of the existing public house to form two residential dwellings to the west, and reconfiguration of the public house to the east, and the erection of two residential dwellings across the western section of the site.

In addition to the above, it is understood a pond is being developed within a field within close proximity to the site at land to the rear of the Oaks, Main Street, Botcheston. Excess groundworks materials from the Greyhound redevelopment are intended to be used to assist with the raised pond construction. On this basis, IHE also undertook investigation works within this area. This site comprises a relatively flat grass field with varying trees and shrubs around the site boundaries.

The scope of the investigation has been compiled to assist with designing the new structure, which includes;

- Advancing 6No. window sample boreholes to 5m or refusal;
- Geotechnical testing to assist with foundation design;
- Determine a concrete classification.
- Initial soils waste assessment

The solid geology at the site is recorded to comprise Gunthorpe Member (mudstone). No superficial deposits are anticipated to be present at the site.

Site works

In total four window sample boreholes (WS1-WS4) were advanced surrounding the public house, while two window sample boreholes (WS5 and WS6) were advanced within the footprint of the proposed pond. Boreholes WS1-WS4 were advanced to a total depth of 3.00mbgl while boreholes WS5 and WS6 were advanced to a maximum depth of 5.00mbgl.

The location of the window sample boreholes is included in Appendix A.

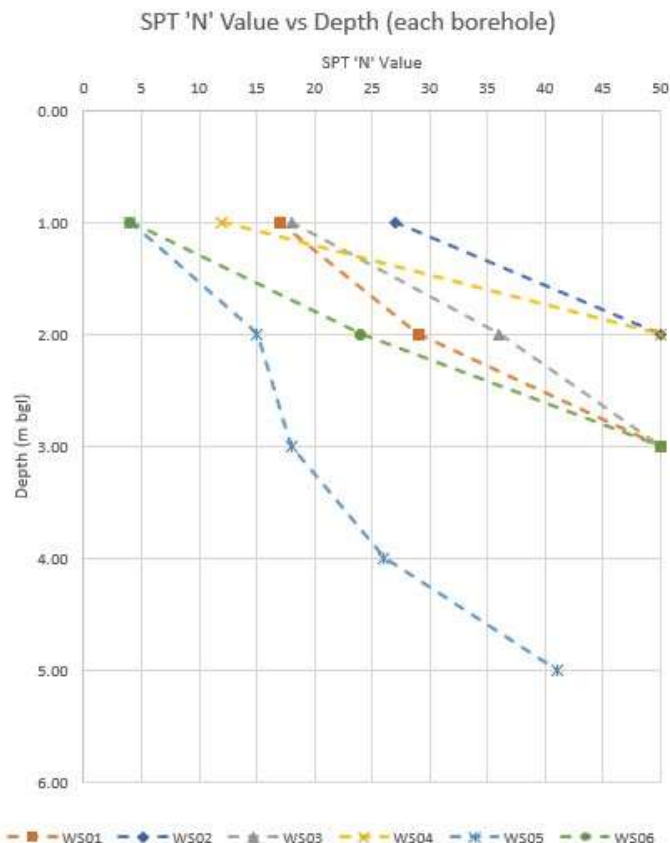
Window sample boreholes WS1 to WS4 revealed Made Ground comprising bituminous surfacing over brick gravel across the eastern section of the site to a maximum depth of 0.40mbgl while topsoil was recorded across the western section of the site to 0.40mbgl. Underlying the topsoil and made ground, firm to stiff orange brown silty Clay was recorded across the entire site, subsequently grading to very stiff Clay with mudstone lithorelics with depth.

No groundwater was encountered within boreholes WS1 to WS4 during the investigation.

Boreholes WS5 and WS6 revealed topsoil to a depth of 0.30mbgl overlying firm orange silty Clay. Within both boreholes, a layer of soft very sandy Clay with sand pockets was recorded between depths of 1.40m-1.80m in WS5 and 1.00m-1.90m in WS6, with slight groundwater ingresses in both boreholes within the sand. These materials were recorded to overlay, stiff orange brown Clay within mudstone and siltstone lithorelics, grading to very stiff and friable below 4.00mbgl.

The window sample borehole logs are included in Appendix B.

Standard Penetration Tests (SPT's) were undertaken at approximately 1.0m intervals in each borehole to assess soil strength/relative density. The chart below, shows SPT 'N' Value vs Depth for the individual boreholes.



The results generally show firm to stiff Clays at depths of 1.00mbgl within WS1 to WS4, grading to very stiff at depths of 2.00mbgl and 3.0mbgl. WS6 shows soft Clays at a depth of 1.00mbgl grading to very stiff at a depth of 3.00mbgl. WS5 shows slightly softer materials grading to very stiff at 5.00mbgl.

Laboratory Data

Samples were taken from the window sample boreholes and analysed at an accredited laboratory for geotechnical properties such as plasticity indices, moisture content, pH and water-soluble sulphate content.

A summary table of laboratory findings is detailed below:

Determinand	Gunthorpe Member
Moisture Content %	16-22
Liquid Limit %	38-44
Plastic Limit %	17-26
Plasticity Index %	18-22
% > 0.425mm %	96-100
Modified Plasticity Index* %	18-22
pH	7.6 and 8
Water Soluble Sulphate content mg/l	12 and 21

Notes: * Modified Plasticity Index Calculated in Accordance with NHBC Guidance, Chapter 4.2

The Modified Plasticity Index results indicate that the Gunthorpe Member is of low to medium volume change potential. On this basis, a minimum foundation depth of 0.90mbgl should be adopted across the site.

Based on the recorded water-soluble sulphate concentrations and pH values it is considered appropriate to adopt a basic 'brownfield' Design Sulphate Class of DS-1, together with an Aggressive Chemical Environment of Concrete (ACEC) of AC-1 across the site.

Soil geotechnical laboratory analysis certificates are presented in Appendix C.

Foundation Assessment

It is considered that traditional strip foundation, approximately 0.60m wide, bearing on the upper horizons of the Gunthorpe Member generally comprising clays of at least firm consistency should prove to be a suitable foundation option for the proposed foundations and new buildings at the site. A net allowable bearing pressure of 120kN/m² is considered to be achievable at 0.90mbgl.

Trees and shrubs of varying type and maturity are present along the northern boundary of the site. Shallow foundations within close proximity of trees or shrubs are likely to require deepening in accordance to the recorded distances as per NHBC Standards (Building Near Trees Chapter 4.2). Where information regarding past or future tree removal/planting is available, then the guidance provided in NHBC Standards (Chapter 4.2: Building Near Trees) should be followed together with advice from a qualified structural engineer. It is recommended to undertake an arboricultural survey to assess tree types and assist with foundation design.

A ground bearing floor slab could be utilised at the site.

The above assessment should be confirmed by the appointed structural engineer.

Buried Concrete

Water soluble sulphate and pH analysis of the Gunthorpe Member has revealed results of between 12 and 21mg/l and 7.6 - 8.

Based on the above it is considered appropriate to adopt a 'brownfield' Design Sulphate Class of DS-1, together with an Aggressive Chemical Environment of Concrete (ACEC) of AC-1 across the site.

Proposed Pond

The depth and size of the proposed pond is unknown at this stage; however the window sample boreholes have revealed very soft very sand materials between 1.40-1.80mbgl within WS5 and 1.00-1.90mbgl within WS6. The remaining materials generally comprised firm orange silty clay grading too stiff with depth.

Construction of a raised bank to the pond would need to consider the settlement of the very soft materials during placement and compaction of materials and long-term performance of the pond bank.

Chemical Testing

To assess the materials for off-site disposal and hazardous or non-hazardous properties, for both the proposed residential development and the pond, two samples (WS2 at 0.20m, and WS5 at 1.00mbgl) were taken. These were sent to a UKAS accredited laboratory for analysis for Heavy Metals, PAHs and asbestos screen. The results did not reveal any elevated concentrations of heavy metals, PAHs or asbestos fibres within the two samples tested.

This concentration would be classify soils as non-hazardous (> 0.1% w/w) for disposal to landfill.

No Waste Acceptance Criteria (WAC) testing has been done at this stage.

Conclusions

Based on the findings of the ground investigation, it is considered that traditional strip foundation, bearing on the clays of at least firm consistency should prove to be a suitable foundation option for the proposed foundations and new buildings at the site. A net allowable bearing pressure of 120kN/m² is considered to be achievable at 0.90mbgl. Localised deepening may be required where foundations are located within close proximity to trees and shrubs.

A ground bearing floor slab could be utilised at the site. A Concrete Design Class of DS-1 and AC-1 is considered appropriate.

The chemical testing of the soils has revealed soils classified as non-hazardous (> 0.1% w/w) for off-site disposal purposes.

Yours Sincerely



Victoria Sutton
Engineering Manager

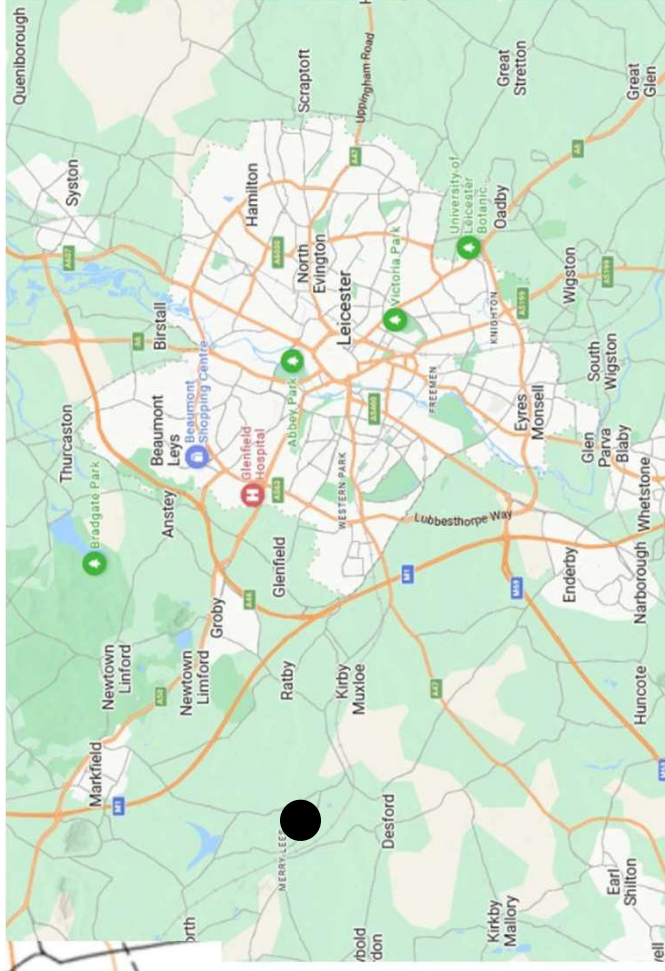
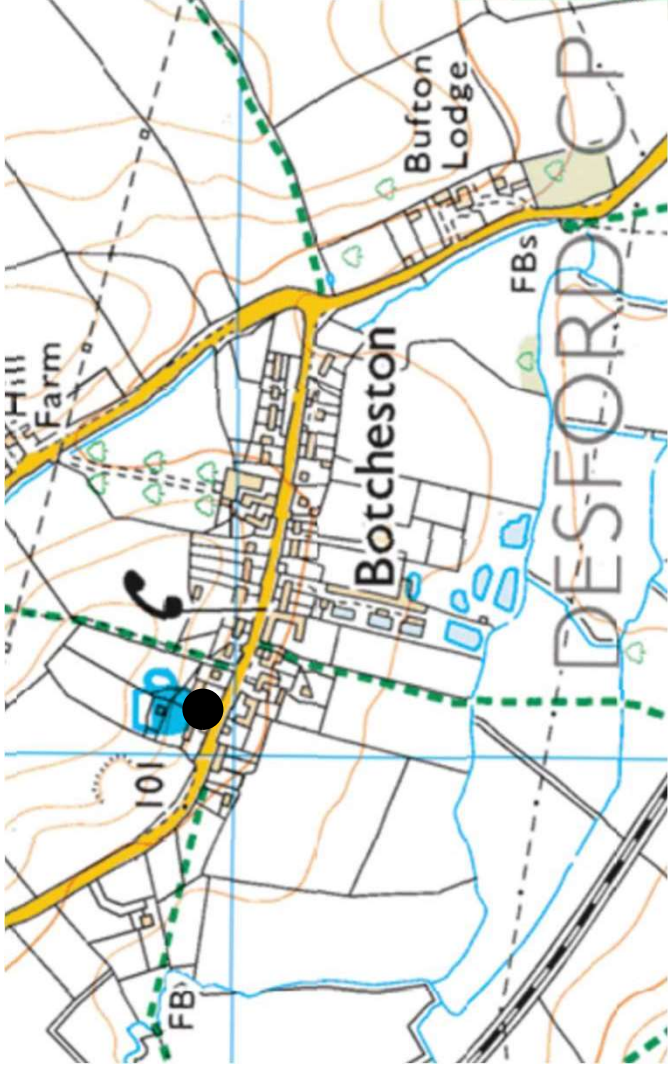


David Johnson
Technical Director

Encl.
Appendix A – Figures
Appendix B – Window sample logs
Appendix C – Geotechnical Laboratory Analysis Results

APPENDIX A





KEY:

● Approximate Site Location

DO NOT SCALE

TITLE:

Site Location Plan

PROJECT:

The Greyhound, Botcheston

PROJECT No:

IV.42.23

DATE:

03/2023

SCALE:

NTS

DRAWN:

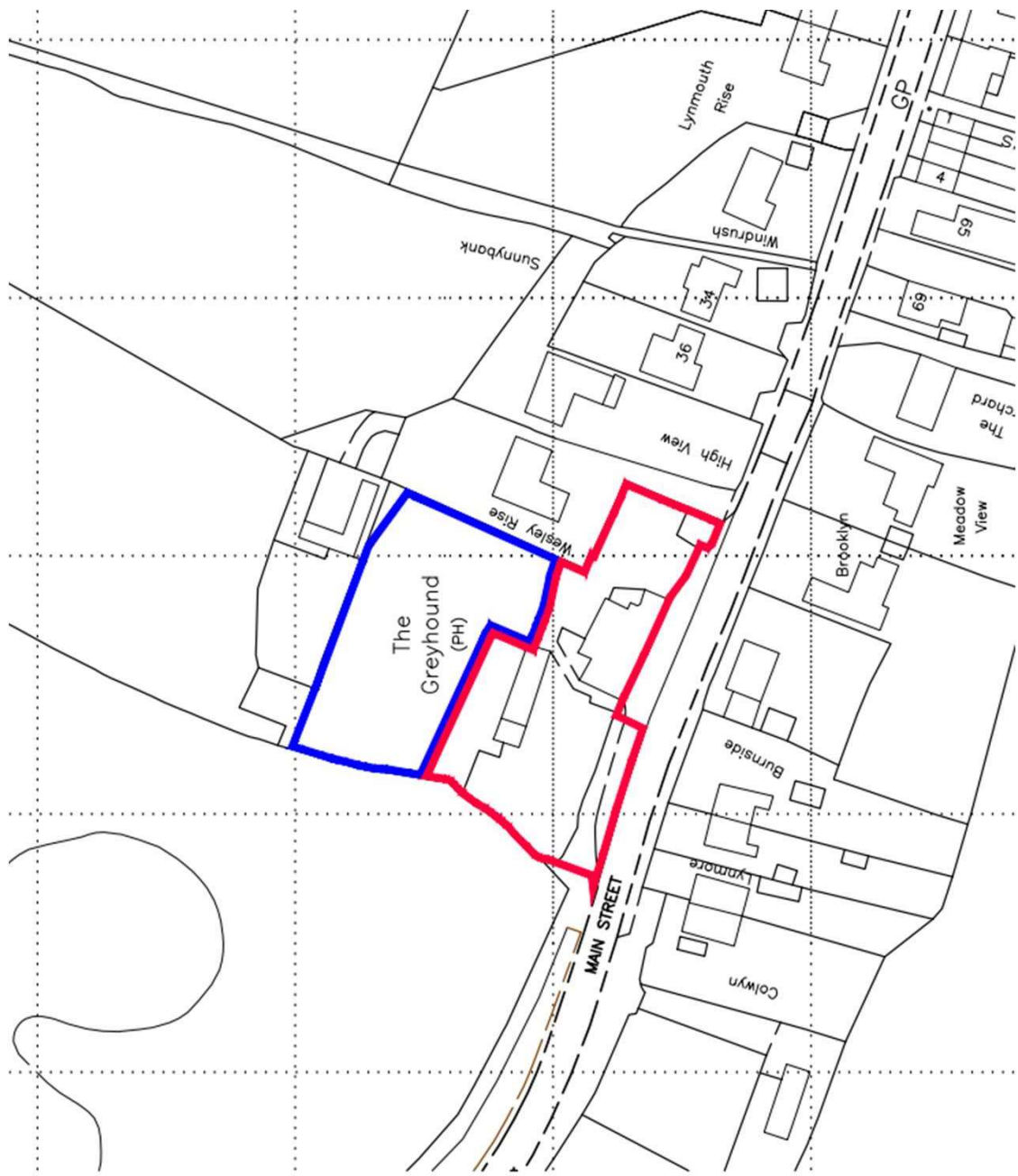
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DWG No:

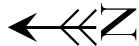
Figure 1



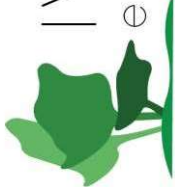
Scotland Farm, Ockbrook, Derby, DE72 3RX
rps@ivyhousesenv.co.uk • www.ivyhousesenv.co.uk • 01332 661 987



KEY:  Site Boundary		TITLE: Site Layout	
		PROJECT: The Greyhound, Botcheston	
 Scotland Farm, Ockbrook, Derby, DE72 3RX rps@ivyhouseenv.co.uk • www.ivyhouseenv.co.uk • 01332 661 987		PROJECT No: IV.42.23	DATE: 03/2023
		SCALE: NTS	DRAWN: VS
DO NOT SCALE		DWG No: Figure 2	



KEY:



IVY HOUSE

environmental

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TITLE:

Development Proposal

PROJECT:

The Greyhound, Botcheston

PROJECT No:

IV.42.23

DATE:

03/2023

SCALE:

NTS

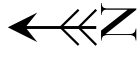
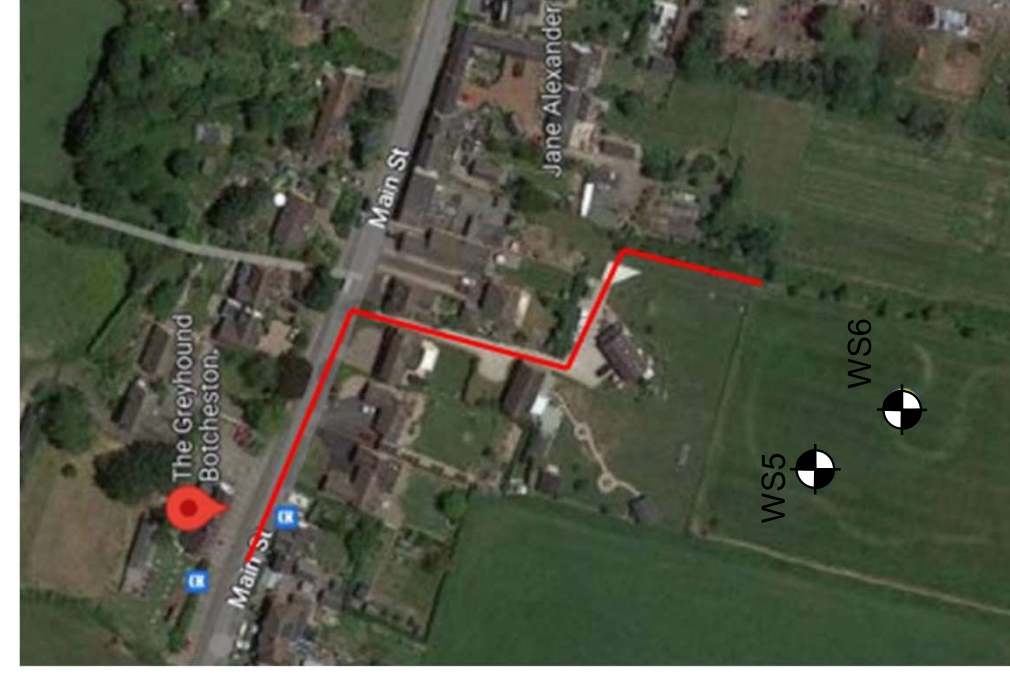
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DWG No:

Figure 3

DO NOT SCALE



KEY:



Window Sample Boreholes

DO NOT SCALE

TITLE:

orehole Location Plan

PROJECT:

The Greyhound, Botcheston

PROJECT No:

IV.42.23

DATE:

03/2023

SCALE:

NTS

DRAWN:

VS

DWG No:

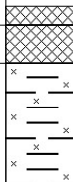
Figure 4

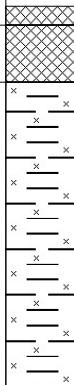


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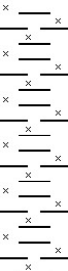
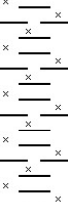
APPENDIX B



		Chartered Environmental Surveyors & Environmental Consultants Scotland Farm, Ockbrook, Derby DE72 3RX Telephone. 01332 661987				Site The Greyhound, Botcheston		Number WS1	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Mr R Beaumont		Job Number IV.42.23	
		Location		Dates 28/03/2023- 28/04/2023		Project Contractor Regional Drilling Ltd		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20	E1				(0.10)	MADE GROUND: Bituminous surfacing.			
					(0.20)				
					(0.30)				
1.00-1.45 1.00	SPT N=17 E2		1,2/3,4,5,5		(0.70)	MADE GROUND: Orange grey slightly sandy fine to coarse angular to subangular brick gravel. Stiff orange brown silty CLAY.			
2.00-2.45	SPT N=29		5,4/6,7,8,8		1.00	Very stiff red brown mottled grey friable silty CLAY with siltstone lithorelics.			
3.00-3.45	SPT N=50		7,10/15,18,17		(2.00)				
					3.00	Complete at 3.00m			
Remarks No groundwater encountered during drilling. Borehole terminated at 3.00mbgl due to hard strata. Borehole backfilled with arisings on completion.							Scale (approx) 1:40	Logged By VS	Figure No. IV.42.23.WS1

		Chartered Environmental Surveyors & Environmental Consultants Scotland Farm, Ockbrook, Derby DE72 3RX Telephone. 01332 661987				Site The Greyhound, Botcheston		Number WS2	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Mr R Beaumont		Job Number IV.42.23	
		Location		Dates 28/03/2023-28/04/2023		Project Contractor Regional Drilling Ltd		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20	E1				(0.10) (0.30) 0.40	MADE GROUND: Bituminous surfacing. MADE GROUND: Grey brown sandy gravel. Gravel is fine to medium, angular to subangular brick and roadstone. Stiff orange brown grey silty CLAY.			
0.90 1.00-1.45	E2 SPT N=27		2,4/5,6,6,10		(1.60)	... becoming very stiff and friable with mudstone lithorelics below 1.00mbgl.			
2.00-2.43	SPT 50/275		7,10/9,12,17,12		2.00	Complete at 2.00m			
Remarks No groundwater encountered during drilling. Borehole terminated at 2.00mbgl due to hard strata. Borehole backfilled with arisings on completion.							Scale (approx)	Logged By	
							1:40	VS	
							Figure No. IV.42.23.WS2		

Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD)	Client Mr R Beaumont	Job Number IV.42.23
	Location	Dates 28/03/2023- 28/04/2023	Project Contractor Regional Drilling Ltd	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20	E1				(0.40) 0.40	TOPSOIL. Firm orange brown silty CLAY.		
1.00-1.45 1.00	SPT N=18 E2		2,2/4,4,5,5		(2.60)	... becoming stiff and friable below 1.00mbgl.		
2.00-2.45	SPT N=36		8,7/8,10,8,10			... becoming very stiff and very friable with occasional mudstone lithorelics below 2.00mbgl.		
3.00-3.40	SPT 50/245		8,10/12,13,17,8		3.00	Complete at 3.00m		

Remarks

No groundwater encountered during drilling.
Borehole terminated at 3.00mbgl due to hard strata.
Borehole backfilled with arisings on completion.

Scale (approx)

1:40

Logged By

VS

Figure No.

IV.42.23.WS3

		Chartered Environmental Surveyors & Environmental Consultants Scotland Farm, Ockbrook, Derby DE72 3RX Telephone. 01332 661987				Site The Greyhound, Botcheston		Number WS4
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Mr R Beaumont		Job Number IV.42.23
		Location		Dates 28/03/2023- 28/04/2023		Project Contractor Regional Drilling Ltd		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20	E1				(0.40) 0.40	TOPSOIL.		
1.00-1.45 1.00	SPT N=12 E2		2,2/2,2,4,4		(1.60)	Firm orange brown silty CLAY. ... becoming stiff and friable with mudstone lithorelics below 1.00mbgl.	         	
2.00-2.45	SPT N=50		4,4/7,14,13,16		2.00	Complete at 2.00m		
Remarks No groundwater encountered during drilling. Borehole terminated at 2.00mbgl due to hard strata. Borehole backfilled with arisings on completion.							Scale (approx) 1:40	Logged By VS
							Figure No. IV.42.23.WS4	

Excavation Method Drive-in Windowless Sampler	Dimensions	Ground Level (mOD)	Client Mr R Beaumont	Job Number IV.42.23
	Location	Dates 28/03/2023– 28/04/2023	Project Contractor Regional Drilling Ltd	Sheet 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20	E1				(0.30) 0.30	TOPSOIL.		
						Firm orange silty CLAY.		
1.00-1.45 1.00	SPT N=4 E2		1,1/1,1,1,1		(1.10)			
					1.40	Soft orange silty very sandy CLAY.		
					(0.40)			
2.00-2.45	SPT N=15		1,2/3,4,4,4		1.80	Firm orange silty CLAY.		
					(0.70)			
					2.50	Stiff orange brown friable silty CLAY with occasional mudstone and siltstone lithorelics.		
3.00-3.45	SPT N=18		4,5/4,4,5,5					
					(2.50)			
4.00-4.45	SPT N=25		5,5/5,6,7,7					
								
5.00-5.45	SPT N=41		6,6/10,10,10,11		5.00	Complete at 5.00m		

Remarks
Borehole backfilled with arisings on completion.
Borehole terminated at 5.00mbgl.
A slight groundwater ingress recorded at 1.50mbgl.

Scale (approx)
1:40

Logged By
VS

Figure No.
IV.42.23.WS5

		Chartered Environmental Surveyors & Environmental Consultants Scotland Farm, Ockbrook, Derby DE72 3RX Telephone. 01332 661987				Site The Greyhound, Botcheston		Number WS6	
Excavation Method Drive-in Windowless Sampler		Dimensions		Ground Level (mOD)		Client Mr R Beaumont		Job Number IV.42.23	
		Location		Dates 28/03/2023- 28/04/2023		Project Contractor Regional Drilling Ltd		Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	
0.20	E1				(0.30) 0.30	TOPSOIL.			
						Firm orange silty CLAY.			
					(0.70)				
1.00-1.45 1.00	SPT N=4 E2		1,1/1,1,1,1		1.00	Very soft orange silty very sandy CLAY.			
					(0.90)				
					1.90	... fine to medium, subrounded to rounded quartzite gravel band between 1.80m and 1.90mbgl.			
2.00-2.45	SPT N=24		2,3/4,6,7,7			Stiff orange silty CLAY.			
					(1.10)				
						... becoming very stiff and very friable below 2.50mbgl.			
3.00-3.45	SPT N=50		8,10/12,12,12,14		3.00	Complete at 3.00m			
Remarks Slight groundwater ingress recorded at 1.20mbgl. Borehole terminated at 3.00mbgl due to hard strata. Borehole backfilled with arisings on completion.							Scale (approx) 1:40	Logged By VS	Figure No. IV.42.23.WS6

APPENDIX C



Client: Ivy House Environmental Ltd

Client Address: Scotland Farm, Ockbrook,
Derby, DE72 3RX

Contact: Victoria Sutton

Site Address: The Greyhound, Botcheston

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: IV 42 23

Job Number: 23-25809-1

Date Sampled: 28/03/2023

Date Received: 30/03/2023

Date Tested: 07/04/2023

Sampled By: Not Given

Test Results:

Laboratory Reference: 2634442

Hole No.: WS1

Sample Reference: E2

Sample Description: Reddish brown sandy slightly silty CLAY

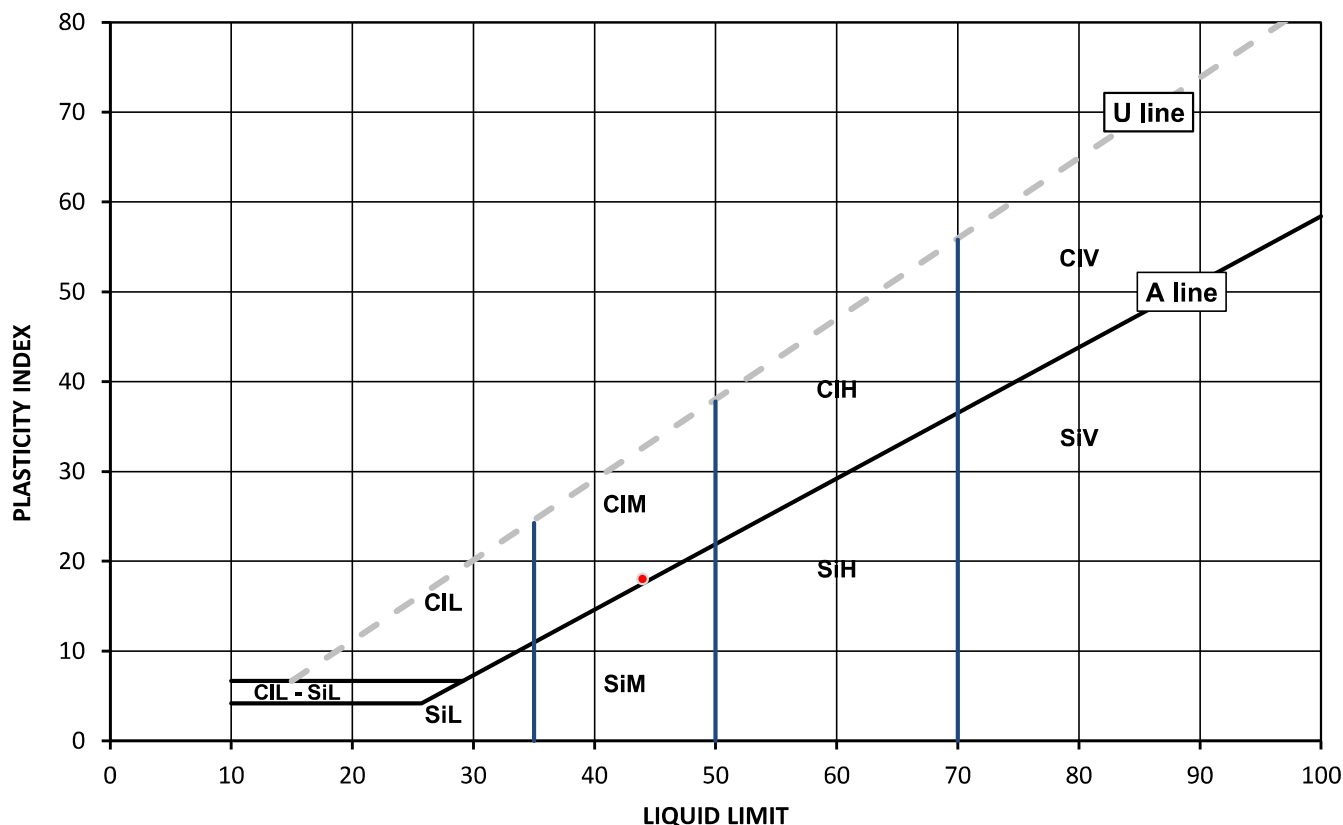
Depth Top [m]: 1.00

Depth Base [m]: Not Given

Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	44	26	18	100



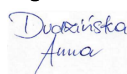
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
CI Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Client: Ivy House Environmental Ltd
Client Address: Scotland Farm, Ockbrook,
Derby, DE72 3RX

Contact: Victoria Sutton
Site Address: The Greyhound, Botcheston

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: IV 42 23
Job Number: 23-25809-1
Date Sampled: 28/03/2023
Date Received: 30/03/2023
Date Tested: 07/04/2023
Sampled By: Not Given

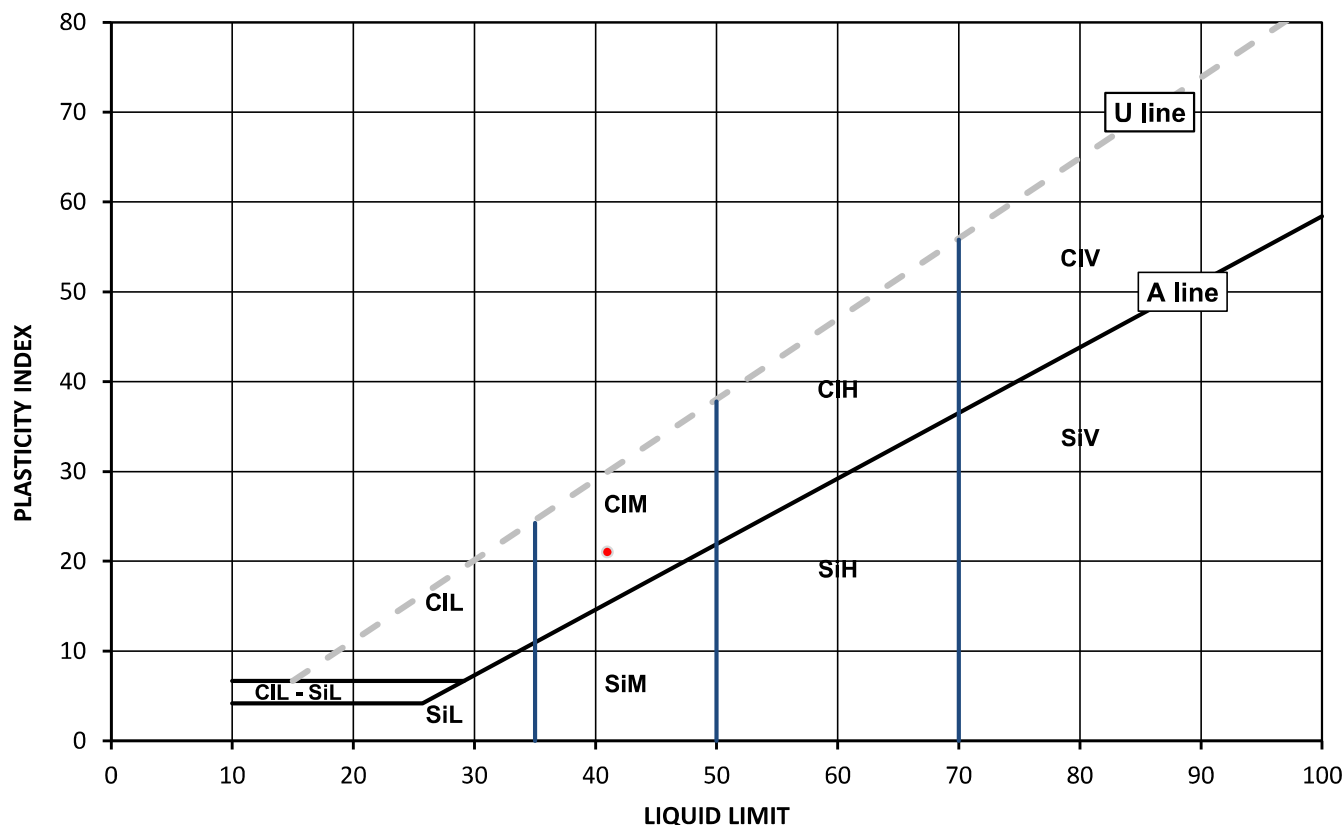
Test Results:

Laboratory Reference: 2634443
Hole No.: WS3
Sample Reference: E2
Sample Description: Reddish brown sandy CLAY

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	41	20	21	100



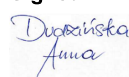
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
CI Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Ivy House Environmental Ltd

Client Address: Scotland Farm, Ockbrook,
Derby, DE72 3RX

Contact: Victoria Sutton

Site Address: The Greyhound, Botcheston

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: IV 42 23

Job Number: 23-25809-1

Date Sampled: 28/03/2023

Date Received: 30/03/2023

Date Tested: 07/04/2023

Sampled By: Not Given

Test Results:

Laboratory Reference: 2634444

Hole No.: WS6

Sample Reference: E2

Sample Description: Reddish brown slightly gravelly sandy CLAY

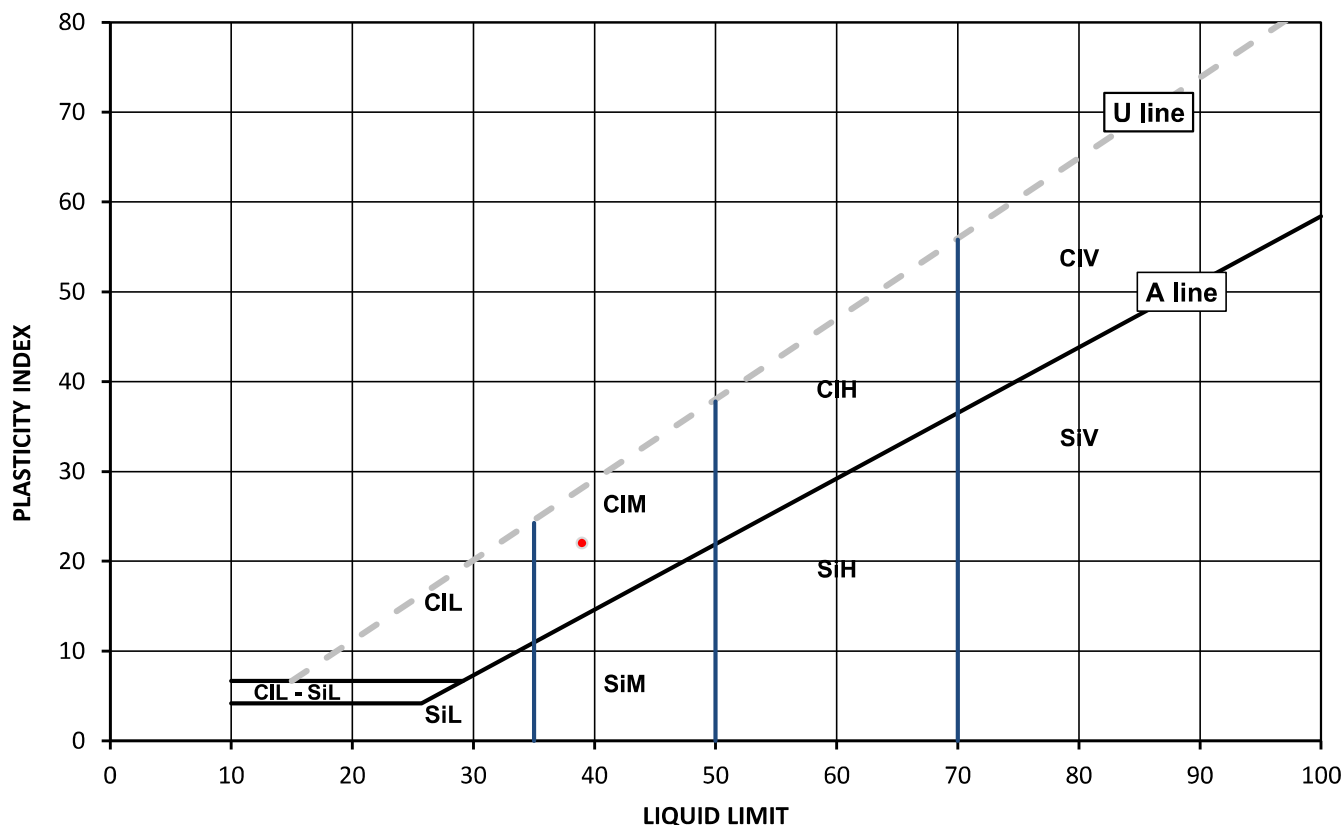
Depth Top [m]: 1.00

Depth Base [m]: Not Given

Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
21	39	17	22	96



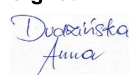
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
CI Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Ivy House Environmental Ltd
Client Address: Scotland Farm, Ockbrook,
Derby, DE72 3RX

Contact: Victoria Sutton
Site Address: The Greyhound, Botcheston

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: IV 42 23
Job Number: 23-25809-1
Date Sampled: 28/03/2023
Date Received: 30/03/2023
Date Tested: 07/04/2023
Sampled By: Not Given

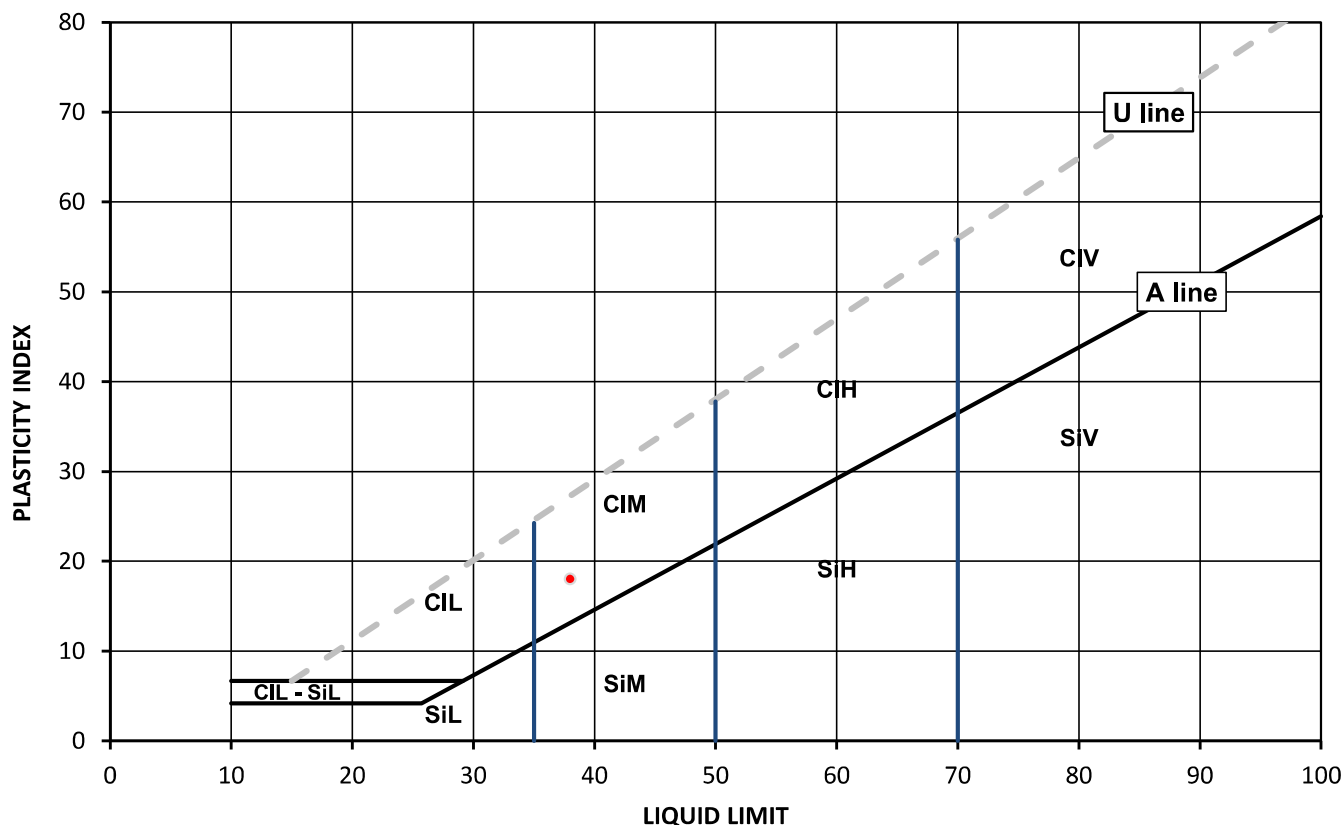
Test Results:

Laboratory Reference: 2634445
Hole No.: WS2
Sample Reference: E2
Sample Description: Reddish brown sandy CLAY

Depth Top [m]: 0.90
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
16	38	20	18	100



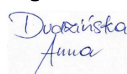
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
CI Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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4041

Client:

Iw House Environmental Ltd

Client Address:

Scotland Farm, Ockbrook,
Derby, DE72 3RX

Contact:

Victoria Sutton

Site Address: The Grevhound, Botcheston

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Water Content by BS 1377-2:1990: Clause 3.2
Atterberg by BS 1377-2:1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

Client Reference: IV 42 23

Job Number: 23-25809-1

Date Sampled: 28/03/2023

Date Received: 30/03/2023

Date Tested: 07/04/2023

Sampled By: Not Given

Test results

[illegible]

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Signed: *Dariańska Anna*

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2



Environmental Science

4041
Client: Ivy House Environmental Ltd
Client Address: Scotland Farm, Ockbrook,
Derby, DE72 3RX
Contact: Victoria Sutton
Site Address: The Greyhound, Botcheston
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: IV 42 23
Job Number: 23-25809-1
Date Sampled: 28/03/2023
Date Received: 30/03/2023
Date Tested: 07/04/2023
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing		
		Reference	Depth Top m	Depth Base m	Type						
2634442	WS1	E2	1.00	Not Given	D	Reddish brown sandy slightly silty CLAY		22	Sample was quartered, oven dried at 107.1 °C		
2634443	WS3	E2	1.00	Not Given	D	Reddish brown sandy CLAY		22	Sample was quartered, oven dried at 107.1 °C		
2634444	WS6	E2	1.00	Not Given	D	Reddish brown slightly gravelly sandy CLAY		21	Sample was quartered, oven dried at 107.1 °C		
2634445	WS2	E2	0.90	Not Given	D	Reddish brown sandy CLAY		16	Sample was quartered, oven dried at 107.1 °C		

Comments:

Signed: Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

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Victoria Sutton

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e: reception@i2analytical.com

e: vs@ivyhousenv.co.uk

Analytical Report Number : 23-25811

Project / Site name:	The Greyhound, Botcheston	Samples received on:	30/03/2023
Your job number:	IV 42 23	Samples instructed on/ Analysis started on:	30/03/2023
Your order number:		Analysis completed by:	13/04/2023
Report Issue Number:	1	Report issued on:	14/04/2023
Samples Analysed:	2 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-25811

Project / Site name: The Greyhound, Botcheston

Lab Sample Number				2634448	2634449
Sample Reference				WS1	WS4
Sample Number				E2	E2
Depth (m)				0.20	1.00
Date Sampled				28/03/2023	28/03/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	14
Total mass of sample received	kg	0.001	NONE	0.3	0.3

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8	7.6
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.021	0.012

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



Analytical Report Number : 23-25811

Project / Site name: The Greyhound, Botcheston

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2634448	WS1	E2	0.2	Brown clay.
2634449	WS4	E2	1	Brown clay.

Analytical Report Number : 23-25811
Project / Site name: The Greyhound, Botcheston

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Victoria Sutton

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t: 01923 225404**f:** 01923 237404**e:** reception@i2analytical.com**e:** vs@ivyhousenv.co.uk

Analytical Report Number : 23-25989

Project / Site name:	The Greyhound, Botcheston	Samples received on:	30/03/2023
Your job number:	IV.42.23	Samples instructed on/ Analysis started on:	30/03/2023
Your order number:		Analysis completed by:	11/04/2023
Report Issue Number:	1	Report issued on:	12/04/2023
Samples Analysed:	2 soil samples		

Signed:*Izabela Wójcik*

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-25989
Project / Site name: The Greyhound, Botcheston

Lab Sample Number				2635459	2635460
Sample Reference				WS2	WS5
Sample Number				None Supplied	None Supplied
Depth (m)				0.20	1.00
Date Sampled				28/03/2023	28/03/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9.8	17
Total mass of sample received	kg	0.001	NONE	1.2	1.2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	IZJ	IZJ

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.6	7.2
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1100	80
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.019	< 0.0013
Organic Matter (automated)	%	0.1	MCERTS	6.8	0.6

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.12	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.11	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.12	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	19	15
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	47	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	68	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	44	44
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	51	44
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	44	68

Petroleum Hydrocarbons

TPH C10 - C40 _{EH,CL,1D,TOTAL}	mg/kg	10	MCERTS	< 10	< 10
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U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-25989

Project / Site name: The Greyhound, Botcheston

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2635459	WS2	None Supplied	0.2	Brown gravelly loam with concrete and brick.
2635460	WS5	None Supplied	1	Brown clay.

Analytical Report Number : 23-25989

Project / Site name: The Greyhound, Botcheston

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics

Analytical Report Number : 23-25989

Project / Site name: The Greyhound, Botcheston

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
AR	Aromatics				
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
-	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				