



Proposed Residential Development

The Drove

Osbournby

Lincolnshire

Site Investigation Report

Project No. 4091

March 2015

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The **Institution**
of **Structural**
Engineers

1.0 - Introduction

- 1.1 - The proposals are to construct 16 residential units on a site on the eastern edge of the village of Osbournby. The site layout is indicated on Clive Wicks Associates drawing no. 13-2199-P-02 and includes a mix of house types ranging from two storey detached and semi-detached properties.
- 1.2 - Following instructions received in January 2016 from the Clients agent, Steve Gilman Design Ltd was instructed to prepare a basic site investigation report for the purpose of determining ground conditions to make general recommendations for the foundations required for the proposed development. This report has been prepared in general terms only and specific, (and final) founding details for each individual unit will need to be determined and agreed on site with the Building Inspector once excavations are opened up.
- 1.3 - The primary aim of this investigation was to extract soil samples for plasticity testing and to determine percolation rates for the design of the surface water drainage network.
- 1.4 - Trial holes were excavated on 28th January 2016 using a JCB 3cx excavator, the weather was dry and sunny. The sides of the trial holes remained stable during the course of the excavations, shortly after excavation the sides partially collapsed. The trial holes were backfilled after noting the soil types with the excavated material.
- 1.5 - A total of 5no. trial holes were excavated across the site and the trial hole logs and locations are contained within the Appendices. Two percolation tests was undertaken to ascertain feasibility of adopting soakaways as a means of surface water disposal from the site.

2.0 - The Site

- 2.1 - The site is relatively square shaped on plan it is approximately 85m wide x 75m deep into the site. The site is accessed off The Drove and is bounded by the road to the north, a residential development to the west and agricultural land to the eastern and southern boundaries. Beyond these boundaries is an open watercourse.
- 2.2 - A plan indicating the site location is appended to this report. The site is currently (and has historically been) been used as agricultural fields.
- 2.3 - Ground levels vary slightly across the site ranging from 20.000m AOD at the northwest boundary of the site to 18.120m AOD at the south east boundary. There are no sudden changes in level across the site.
- 2.4 - There was no vegetation noted on the site. Surrounding the site were trees and hedgerows.

3.0 - Ground Conditions

- 3.1 - From our and Lincs Laboratory's trial hole logs contained in the appendices of this report, it can be concluded that the ground conditions are consistent across the site. The subsoils encountered in the trial holes are all believed to be naturally occurring deposits. No fill material or contamination was encountered in the excavations.
- 3.2 - From the British Geological Sheet for the area, the underlying bedrock geology was Kellaways Sand member (Sandstone and Siltstone) with no superficial deposits recorded.
- 3.3 - There is a fairly consistent thickness of brown clayey silty topsoil overlying the silty clay. This topsoil will need to be removed from within the footprint of each unit.
- 3.4 - The subsoils comprise silts and clays described as being medium soft at depth.

3.5 - The silt and clay encountered are noted to range from to “soft” to “medium”. By reference to BS8004 (1) and Tomlinson (2), this would suggest that their presumed allowable bearing value would be circa 60-75kN/m².

3.6 - Groundwater seepage was encountered in three of the trial holes.

3.7 - The Atterberg test results have confirmed that the silt sample tested was non plastic and the clay sample had a plasticity index of 24%. This would suggest that the majority of the silty clays on site have low to medium shrinkability characteristics.

3.8 - Percolation tests A and B were undertaken at 1.7m below ground level within the sandy silt material and revealed no soakage after 2 hours. Test was abandoned.

4.0 - Proposed Structures and Estimated Foundation Loads

4.1 - The proposals are to construct 16 residential units as noted above.

4.2 - These units will be of traditional load bearing masonry construction with timber trussed rafter roofs overlaid with traditional tiles, timber first floors and suspended precast concrete ground floors or reinforced concrete if raft foundations are adopted.

4.3 - For the worst case house types the maximum perimeter wall and party wall load at foundation level will be in the order of 35.0 - 45.0kN/m run.

5.0 - Proposed Planting

5.1 - The Site Layout drawing indicates new planting for the site. It is recommended that only new ornamental trees and shrubs of low water demand should be planted close to the proposed buildings.

6.0 - Foundation Recommendations and Ground Floor Slabs

6.1 - The subsoils encountered on site appear to be natural tidal deposits and that all of the properties will be founded on this material.

6.2 - If these soft to medium firm silty clays are encountered at minimum founding level, then it would be reasonable to adopt an assumed allowable bearing capacity of approximately 75KN/m² to limit total settlements to acceptable levels.

6.3 - For typical house types and assuming the loads at foundation level are as noted above, then standard mass concrete strip or trench fill type foundations 600mm wide should suffice for external and internal load bearing walls. Alternatively, if ground water and unstable excavations are encountered then a reinforced concrete raft foundation may prove to be the most appropriate.

General discussion

6.4 - The above are general recommendations only and in all cases it will be appropriate to review the ground conditions and soil type encountered at foundation level once excavations for each individual unit are opened up for inspection. Advice from the Building and NHBC Inspectors should be obtained in each separate case. Construction of the foundations should be in accordance with the recommendations of NHBC standards chapter 4.4.

6.5 - If variable soil conditions are met within the excavations for individual units then it may be appropriate to consider introducing reinforcement within the footings to help span potential soft spots etc.

- 6.6 - If the softer silts and clays are encountered at founding level either the trench widths should be increased to reduce bearing pressures further (and hence to limit the risk/degree of settlement).

Effect of Proposed Vegetation (Trees and Shrubs)

- 6.7 - The development includes for numerous new trees and shrubs to be planted as indicated on the Site Plan. Again the relative position and tree type will need to be carefully considered in setting foundation depths.

Minimum Founding Level

- 6.8 - Considering the Atterberg test results it would be advised to set the minimum founding depth for the properties on this site at 0.9m below existing ground level in the silty clay.

Below Ground Services

- 6.9 - Foundation levels should be fully co-ordinated with below ground services to ensure that surcharging or undermining does not occur. Care should be taken so that the underside level of the foundations is outside the 45° line as measured from the bottom of the services trench.

Health and Safety

- 6.10 - The sides of the trial holes were un-stable during excavation. If unavoidable, operatives that are required to enter excavation trenches, consideration should be given to temporary propping to the trench sides where required.

- 6.11 - All operatives should wear appropriate personal protective equipment and should be suitably trained and experienced in this type of work.

7.0 - Conclusions

- 7.1 - The nature and consistency of the subsoils were consistent across this site range from “soft” to “medium” silty clays at anticipated formation levels.

- 7.2 - The bearing characteristics of these subsoils appear to be conducive to the use of traditional simple strip, trench fill concrete or reinforced concrete raft foundations.

- 7.3 - The plasticity of the clay subsoils has been assessed and they can be considered to be in the medium shrinkability range. The minimum foundation depth in the clay soils should be set at 0.9m below external ground level taking into account the reduction factor for climate.

- 7.4 - The effect of the proposed trees should be taken into account when setting foundation depths.

- 7.5 - It can be concluded that soakaways are not a viable option for disposal of surface water.

Report prepared by:-

Andrew Foottit

For and on Behalf of Steve Gilman Design Ltd

March 2016.

References

- 1 - BS8004:- British Standard Code of Practice for Foundations (BSI)
- 2 - Foundation Design and Construction - MJ Tomlinson
- 3 - BRE Special Digest 1 - Concrete in Aggressive Ground - (BRE)

Appendix A

Steve Gilman Design Ltd's Trial Hole Logs 28th January 2016 with Photographs



Steve Gilman Design Ltd
 South Grange
 28 High Street
 Bassingham

Project Residential Development, The Drove, Osbournby		Job no. 4091	
Calcs for Trial Pits		Start page no./Revision 1	
Calcs by AMF	Calcs date 04/04/2016	Checked by	Checked date
Approved by		Approved date	

TRIAL PIT LOG

Sheet 1 of 1

Trial pit reference TP1				
Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X X X X	(0.30) 0.30	Dark brown TOPSOIL
	-1.50	- x - x	(1.20) 1.50	Soft to firm Grey and Orange CLAY/SILT Side collapsed after 5 minutes
	-2.70	: x : x	(1.20) 2.70	Loose to medium dense Dark grey slightly silty uniform SAND becoming moist with depth
				Trial pit ends

Not shown to scale

Additional notes: Excavation became unstable after a short period of time



Steve Gilman Design Ltd
 South Grange
 28 High Street
 Bassingham

Project Residential Development, The Drove, Osbournby		Job no. 4091	
Calcs for Trial Pits		Start page no./Revision 2	
Calcs by AMF	Calcs date 04/04/2016	Checked by	Checked date
Approved by		Approved date	

TRIAL PIT LOG

Trial pit reference TP2				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X - X - - X - X - X - X -	(0.30) 0.30	Brown clayey TOPSOIL
	-0.70	- - - - - - - - -	(0.40) 0.70	Brown CLAY
	-2.50	- x - x	(1.80) 2.50	Loose to medium dense Light grey/orange sandy CLAY/SILT Water ingress at 1.5m. Sample 2 at 1.5m
				Trial pit ends

Not shown to scale
 Additional notes: Excavation became unstable after a short period of time



Steve Gilman Design Ltd
 South Grange
 28 High Street
 Bassingham

Project Residential Development, The Drove, Osbournby		Job no. 4091	
Calcs for Trial Pits		Start page no./Revision 3	
Calcs by AMF	Calcs date 04/04/2016	Checked by	Checked date
Approved by		Approved date	

TRIAL PIT LOG

Trial pit reference TP3				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.40	X - X - - X - X - X - X - - X - X -	(0.40) 0.40	Brown clayey TOPSOIL
	-0.60	- x - x - x - x - x	(0.20) 0.60	Brown sandy CLAY/SILT
	-2.20	x : x :	(1.60) 2.20	Loose to medium dense Orange/light grey sandy SILT Slow water ingress at 1.5m
				Trial pit ends
Not shown to scale				
Additional notes:				



Steve Gilman Design Ltd
 South Grange
 28 High Street
 Bassingham

Project Residential Development, The Drove, Osbournby		Job no. 4091	
Calcs for Trial Pits		Start page no./Revision 4	
Calcs by AMF	Calcs date 04/04/2016	Checked by	Checked date
Approved by		Approved date	

TRIAL PIT LOG

Trial pit reference TP4				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.30	X X X X X X	(0.30) 0.30	Brown TOPSOIL
	-0.70	- - - - - - - - -	(0.40) 0.70	Soft to firm brown CLAY
	-2.40	- x -	(1.70) 2.40	Loose to medium dense Orange/light grey sandy CLAY/SILT Pockets of moist soft sand. Water evident in bottom of excavation after 15 minutes.
				Trial pit ends
Not shown to scale				
Additional notes:				



Steve Gilman Design Ltd
 South Grange
 28 High Street
 Bassingham

Project Residential Development, The Drove, Osbournby		Job no. 4091	
Calcs for Trial Pits		Start page no./Revision 5	
Calcs by AMF	Calcs date 04/04/2016	Checked by	Checked date
Approved by		Approved date	

TRIAL PIT LOG

Trial pit reference TP5 Sheet 1 of 1

Water	Reduced Level (m)	Legend	Depth (m)	Description
	0.00			
	-0.40	X X X X X X X X	(0.40) 0.40	Brown TOPSOIL
	-1.20	x : x : x : x : x : x : x : x : x : x : x : x : x : x : x : x : x : x : x : x :	(0.80) 1.20	Loose to medium dense Orange/brown sandy SILT
	-2.10	- x -	(0.90) 2.10	Soft to firm grey silty CLAY Water ingress at 1.5m. Sample 2 taken at 1.8m
				Trial pit ends

Not shown to scale

Additional notes:



The Site



Trial Hole 1



Trial Hole 1 spoil heap



Trial Hole 2



Trial Hole 2 spoil heap



Trial Hole 3



Trial Hole 3 spoil heap



Trial Hole 4



Trial Hole 4 spoil heap



Trial Hole 5



Trial Hole 5 spoil heap



Percolation Test 1



Percolation Test 2

Appendix B

Lincs Laboratory Soil Analysis Report Dated 03rd February 2016

Lincs Laboratory

St Georges Lane, Riseholme, Lincoln, LN2 2LQ

Tel: (01522) 530355 Fax: (01522) 510573

www.lincolnshire.gov.uk/lincslab



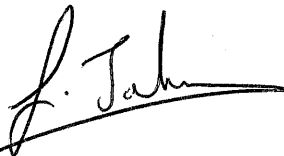
0699

TO: Mr Andrew Footit
Steve Gilman Design Ltd
28 High Street
Bassingham
LINCOLN
LN5 9EY

REPORT NO: 67992
JOB NO: 39126
DATE: 3 February 2016

PROJECT TITLE: THE DROVE, OSBOURNBY
WORK UNDERTAKEN: ANALYSIS OF SOIL SAMPLES

Authorising Signature:



(G Johnson; Supervisor – Laboratory Testing)

Notes:

1. This report is factual and only relates to the items tested.
2. Advice on the interpretation of these results is available from Lincs Laboratory Consultancy Staff. Opinions and interpretations are outside the scope of our UKAS/ISO 17025 accreditation.
3. Any samples or their residues will normally be kept for four weeks after the publication of this report.
4. Tests marked 'UKAS accredited' in this report are listed in our UKAS accreditation schedule bearing No. 0699.
5. This report shall not be reproduced except in full, without written approval of Lincs Laboratory.

Distribution:

- 1 - Client
- 1 - Lab File

Lincs Laboratory

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0699

REPORT: 67992
JOB NO: 39126
DATE: 3 February 2016

PROJECT TITLE: THE DROVE, OSBOURNBY
WORK UNDERTAKEN: ATTERBERG LIMITS TEST RESULTS

Lab Sample No:	Ref (No)	Sample (type)	Depth (m)	NMC (%)	LL (%)	PL (%)	PI (%)	Ret 425um (%)
S120-16	1	d	Not Supplied	Not Tested	-	Non Plastic	-	0
S121-16	2	d	Not Supplied	Not Tested	38	14	24	0

Notes:

- i) Sampler : Client
- ii) Sampling Procedure : Not Supplied
- iii) Date Received : 29/01/16
- iv) Date Tested : 01/02/16-03/02/16
- v) Test Procedures : (MC) BS 1377:Part 2:1990 Cl 3.2 (UKAS Accredited)
(PL) BS 1377:Part 2:1990 Cl 5.3 (UKAS Accredited)
(LL) BS 1377:Part 2:1990 Cl 4.4 (UKAS Accredited)
(PI) BS 1377:Part 2:1990 Cl 5.4 (UKAS Accredited)
- vi) The samples were prepared in accordance with BS 1377:Part 1:1990 (UKAS Accredited)
- vii) d = Disturbed
- viii) The samples were tested in their natural state.

Lincs Laboratory

Tel: (01522) 530355

Fax: (01522) 510573

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St Georges Lane
Riseholme
Lincoln LN2 2LQ

REPORT: 67992
JOB NO: 39126
DATE: 3 February 2015

PROJECT TITLE: THE DROVE, OSBOURNBY
WORK UNDERTAKEN: VISUAL DESCRIPTION TEST RESULTS

Lab Sample No.	Ref (No)	Sample (type)	Depth (m)	Visual Description
S120-16	1	d	Not Supplied	Multi-coloured grey, yellowish brown, light yellowish brown SILT with rare pseudo-fibrous and fibrous plant root material
S121-16	1	d	Not Supplied	Multi-coloured grey, dark yellowish brown, reddish yellow, bluish grey, dark brown slightly silty CLAY with rare fibrous plant material and pseudo-fibrous roots

Notes:

- i) Sampler : Client
- ii) Sampling Procedure : Not Supplied
- iii) Date Received : 29/01/16
- iv) Date Tested : 03/02/16
- v) Test Procedure : BS 5930:1999 (Not UKAS Accredited)
- vi) The samples were prepared in accordance with BS 1377:Part 1:1990 (UKAS Accredited)
- vii) d = Disturbed

Appendix D

Clive Wicks Associates drawing no. 13-2199-P-02a - Proposed Site Layout



The trees shall be protected during construction work to BS 5837:2005 or a 1.0 m high HEAS fencing on concrete bases erected around the trees shall be retained until all construction work has been completed. Within the protected area no alteration to the ground level shall occur. No additional excavation or ground level changes shall be permitted within the protected area. No materials shall be stored, no waste tipped, or any other activity which could damage the trees or their roots shall be carried out within the protected area.

In addition the following should be addressed or avoided:

- Construction vehicles should be sited away from trees to avoid contact with trees, soil, cables, or other site items, and concrete can be damaged by contact with vehicles. Such contact can result in serious damage to trees and might make their safe retention impossible. Consequently, any transit or movement of plant or loose materials should be avoided at all times. In some circumstances it may be possible to maintain adequate clearance by erecting access facilitation material which will contaminate the soil, e.g. concrete kerbs, diesel oil and vehicle washings. Should not be discouraged.
- Trees should not be lit in a position where their flames can extend to within 5m of foliage, branches or trunks. This will depend on wind direction, temperature, canopy or other methods should not be attached to any part of the tree's foliage.



- Signs to be hung on each section of tree protection fencing stating 'tree protection area - do not enter - do not move this fence'
- Tree protection barriers to be in accordance with BS 5837:2012, namely 'Type 3' fencing with concrete bases (i.e. a robust, braced framework)
- All tree protection barriers to be erected prior to commencement of any site clearance, ground works and/or removal of trees
- Please note all existing services to be retained, thereby not affecting existing landscaping.
- All trees to be retained unless otherwise stated. Any trees to be removed shall be replaced with suitable species.
- All works areas noted beyond tree protection zones and have suitable separation to prevent damage to retained trees
- No tree felling or tree surgery works required other than removal in its entirety of the two trees shown.

Rev	Detail	Date
A	As per amended Plans 1, 2, 3, 4 & 8-10-15	
B	13 retained & foundations adjusted	
C	Screen walls added to F05 & F13/14	

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Proposed Residential Development at The Drove Osbourne Skelton

Project: Proposed SITE PLAN

Drawn: 1:200 @ A1

Scale: 1:200 @ A1

Date: Sept 15

Rev: A

Proj No: 13-2199-P-02

Architects - designers - planning consultants: Clive Urlicks Associates Ltd., Old School House, 36 Bampton Road - Skelton, Lincolnshire - NG34 7EE - Tel: 01537 414141 Fax: 01537 414159