

Ground Investigation

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Geotechnical & Environmental Consultants

Phase III Ground Investigation Report

At

**Land South of Ranelagh Road, Havant,
Hampshire PO9 1NR**

For

Foreman Homes

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REPORT 14492/GIR

Phase III Ground Investigation Report

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Current regulations and good practice were used in the preparation of this report. The recommendations are based on the information provided by an appropriately qualified person at the time of preparation of the scheme design to ensure that the design is safe and sound in light of changes in regulation and practice, or additional information obtained regarding the site.



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Phase II Ground Investigation Report

At

Land South of Ranelagh Road, Havant, Hampshire PO9 1NR

For

Foreman Homes

Commission

Soils Limited was commissioned by Foreman Homes to undertake a Phase III Geotechnical Ground Investigation on land to the south of Ranelagh Road, Havant, Hampshire PO9 1NR. The scope of the investigation was outlined in Soils Limited subsequent quotation reference Q15657, dated 5th August 2014.

This document comprises the Phase III Ground Investigation Report and incorporates the results of the intrusive works for preliminary pile design.

This Phase III report must be read in conjunction with the Phase I Desk Study undertaken on the above site by Soils Limited (ref. 13284/DS, dated November 2012), the previously submitted contamination report undertaken at the site (ref. 13284/GI, dated November 2012) and the former ground investigations undertaken in 2012 (ref: 13284/GI) and 2014 (ref: 14099) and soakage test investigations (ref. 14150/SoakRes/SL, dated March 2014 and 14186/SL, dated March 2014).

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- Appendix A: Fieldwork
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Standards

The geotechnical laboratory testing was performed by K4 Soils Laboratories in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice was adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses for concrete classification were undertaken by QTS Environmental Ltd in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs as this did not form part of the client's brief.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

Section 1 Introduction

1.1 Objective of Investigation

The overall objective was understood to be to supply the client and their designers with information regarding ground conditions, to assist them in preparing a foundation scheme for development that was appropriate to the conditions present on the site.

The investigation was to be undertaken to provide parameters for the design of a piled foundation solution for a proposed housing development. The investigation was to be made by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the trial holes.

1.2 Location

The site was located at land south of Ranelagh Road, Havant, Hampshire PO9 1NR. The approximate OS Landranger grid reference for the site was SU 708 063 and ground level was approximately 4m AOD.

A site location plan is given in Figure 1 and a trial hole layout plan in Figure 2.

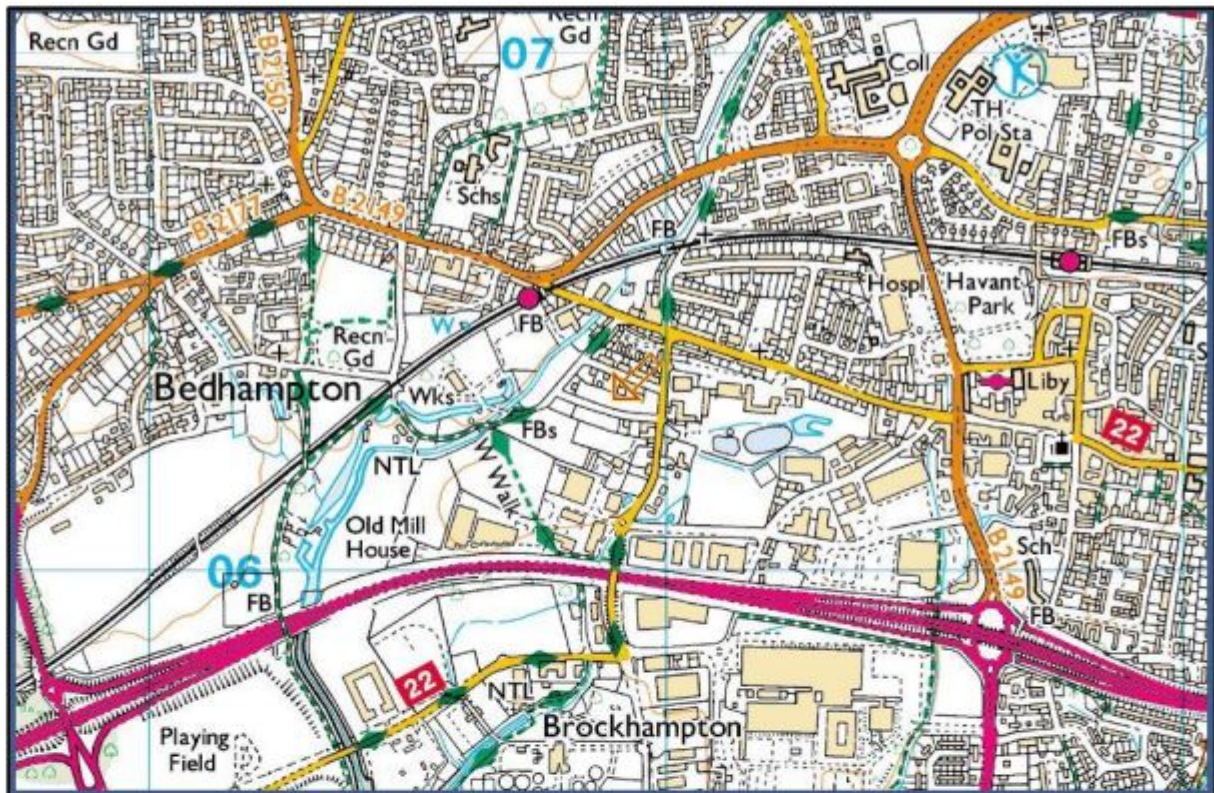


Figure 1. Site Location Plan



Figure 2. Trial Hole Location Plan

1.3 Proposed Development

The proposed development was to comprise the construction of circa 80 No. residential properties including associated soft / hard landscaping and infrastructure.

Soils Limited report ref. 14099, dated February 2014, for the above identified site suggested that a shallow foundation solution would be appropriate for parts of the site. Due to the variable nature of the Head Deposits, areas of the site were identified as requiring a piled solution.

In compiling this report reliance was placed on an annotated version of drawing number 1660 01 Rev C, dated May 2014 prepared by Architects Ltd and supplied by the client. Any change or deviation from the scheme outlined in the drawing could invalidate the foundation design recommendations presented within this report. Soils Limited must be notified about any such changes.

A copy of the drawing provided by the client is provided in Appendix C.

1.4 Limitations and Disclaimers

This Phase II Ground Investigation Report relates to the site located land south of Ranelagh

Road, Havant, Hampshire PO9 1NR and was prepared for the sole benefit of Foreman Homes (The "Client"). The report was prepared solely for the brief described in Section 1.1 of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contact of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data on any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as *"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused"*.

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best

practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets remains with Soils Limited. License is for the sole use of the client and may not be assigned, transferred or given to a third party.

Section 2 Site Works

2.1 Proposed Works

The proposed intrusive investigation was to comprise the following items:

- 4No. Cable percussion boreholes to a depth of up to 15.00m bgl;
- In-situ and undisturbed testing throughout the borehole;
- Geotechnical Testing.

2.1.1 Works Undertaken

The intrusive investigation undertaken comprised the following items:

- The drilling of 4No. Cable Percussion boreholes to a maximum depth of 22.00m bgl (BH3).
- Logging, sampling and in-situ testing of the ground conditions encountered in the borehole.
- Geotechnical testing in accordance with the standards mentioned above.

2.2 Ground Conditions

Based on the geological map and the results of previous investigations the ground conditions were anticipated to comprise Head over White Chalk Subgroup.

Between the 29th August and 4th September 2014 four cable percussion boreholes (BH1 - BH4) were drilled at locations selected by Soils Limited and agreed with the client as shown on Figure 2. The boreholes were located to give best coverage of the site.

The borehole locations were scanned prior to drilling for the presence of underground services using a Cable Avoidance Tool (C.A.T.) and a genny prior to excavation.

The final depth of each trial hole is included in Table 2.1.

Table 2.1 Final depth of Trial Holes	
Borehole Reference	Depth (m bgl)
BH1	16.00
BH2	17.50
BH3	22.00
BH4	15.50

The soil conditions encountered were recorded and soil sampling appropriate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either

decomposing leaf litter or roots, or has been identified as part of the *in-situ* weathering profile, it has been described as Topsoil both on the logs and within this report.

The term *Made Ground* is used to describe material which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion the succession of conditions encountered in the trial holes in descending order can be summarised:

Topsoil/Made Ground (T/MG)
Head (H)
White Chalk Subgroup (WCS)

The ground conditions encountered in the trial holes are summarised in Table 2.2.

Table 2.2 Ground Conditions					
Strata	Age	Depth Encountered (m bgl)		Typical Thickness (m)	Description
		Top	Bottom		
T/MG	Recent	G.L	0.15-0.50	0.50	Dark Brown silty CLAY. Made ground generally consisted of earth and sand back fill.
H	Quaternary	0.15-0.50	3.10-3.20	2.70	Brown Clayey SAND with occasional fine to coarse sub rounded to sub angular gravel sized flint.
WCS	Cretaceous	3.10-3.20	22.00*	Not proven	Off-White structureless chalk, recovered as silt sized comminuted chalk with fine to coarse, sub angular to rounded, sand and gravel sized intact chalk and flint fragments.

Note:*Maximum depth of investigation

2.2.1 Topsoil/Made Ground

Topsoil generally consisted of bark brown silty CLAY. Made Ground was encountered beneath topsoil and concrete (in BH4) and consisted of earth and sand backfill to a maximum depth of 0.50m bgl.

2.2.2 Head

Soils of the Head generally comprised brown clayey SAND with occasional fine to coarse subrounded to subangular flint gravel. Within BH3 the Head consisted of a light brown silty sandy GRAVEL. Gravel was fine to coarse, subrounded to subangular chalk and flint fragments. The Head was present to a maximum depth of 3.20m bgl.

2.2.3 White Chalk Subgroup

The White Chalk Subgroup was encountered in all cable percussion boreholes and consisted of off-white structureless chalk recovered as silt sized comminuted chalk with fine to coarse, rounded to sub angular intact chalk and flint fragments. The chalk was encountered from 3.10 – 3.20m bgl and persisted to the full depth of the investigation (22.00m bgl in BH3).

2.3 Roots

Roots were not recorded during the investigation however it must be noted that it is difficult to assess the actual depth of root penetration in a narrow diameter borehole. Roots may be encountered on site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Mature trees were present on or surrounding the site.

Machine excavated trial pits provide a more accurate indication of the maximum depth of root penetration.

2.4 Groundwater

Groundwater seepages were encountered in BH1, BH2 and BH4. Groundwater conditions encountered during the investigation are summarised in Table 2.3.

Table 2.3 Groundwater Observations			
Location	Depth of Strike (m bgl)	Standing Depth (m bgl)	Notes
BH1	4.00	5.70	Water rising overnight to stand at 5.70m bgl during the subsequent 1.5 days drilling.
	9.50		
BH2	4.00	6.30	Water rising to 6.30m bgl by the end of construction.
	11.00		
BH3	na	na	Water added during drilling, therefore no groundwater observations can be made.
BH4	4.00	3.20	Water rising overnight to stand at 3.20m bgl.
	8.00		

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was conducted in August / September (2014), when groundwater levels should be approaching their annual minimum (lowest) elevation.

Groundwater equilibrium conditions may only be conclusively established by means of a series of measurements made in a standpipe, or piezometer installed in the ground after completion of the site works.

Section 3 Discussion of Geotechnical In-situ and Laboratory Testing

3.1 Standard Penetration Tests (SPTs)

In-situ Standard Penetration Tests (SPTs) using a split spoon sampler SPT were carried out at regular intervals during the drilling of the cable percussion borehole throughout the White Chalk Subgroup.

SPT tests involve the driving of a metal cone or split spoon sampler into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The test comprises the lowering of the SPT assembly and extension rods to the desired test depth within the exploratory hole. The drop weight is added to the string and activated, driving the SPT assembly into the ground. During the test, the number of blows for two increments of 75mm, or the penetration of the tool after 25 blows will be recorded as the "seating drive". After the seating drive, the number of blows required for each of four increments of 75mm penetration is recorded. The test will be terminated when a total penetration of 450mm has occurred or if a total of 50 blows are recorded.

These blow counts then provide a comparative assessment from which correlation have been published that permit engineering parameters to be generated.

The inferred cohesion / degree of compaction of the soils of the Head were based on the SPT "N" blow counts, derived from the in-situ tests and was based on the relationship suggested by Stroud, as indicated in the Table 3.1 and 3.2;

(ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

Coarse (granular) soils were classified based on the relationship given in Table 3.1.

Table 3.1 S.P.T. "N" Blow Count Granular Classification	
Classification	S.P.T. "N" blow count (blows/300mm)
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	Greater than 50

BS EN ISO 22476-3:2005 Geotechnical investigation and testing Field testing Part 3: Standard penetration test

Fine (cohesive) soils were classified based on the relationship given in Table 3.2.

Table 3.2 S.P.T. "N" Blow Count Cohesive Classification	
Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150

Table 3.2 S.P.T. "N" Blow Count Cohesive Classification	
Classification	Undrained Cohesive Strength C_u (kPa)
Very high	150 – 300
Extremely high	> 300

(Ref: EN ISO 14688-2:2004 Clause 5.3.)

It is difficult to assess an accurate chalk grade for the New Pit Chalk Formation in accordance with CIRIA C574 'Engineering in Chalk' as the chalk samples recovered are disturbed by the borehole drilling process.

In the absence of a standardised correlation between SPT 'N' values and chalk grade for the most recent chalk classification (CIRIA C574) a **broad indication** of the in-situ grade of the New Pit Chalk Formation can be assessed using a paper by T.R.M. Wakeling from a site in Mundford, Norfolk which compares SPT 'N' values to the old Spink & Norbury chalk classification. From the Spink & Norbury classification it is possible to infer a basic CIRIA Grade (structureless or structured). Table 3.3 provides this broad comparison.

Table 3.3 Interpretation of SPT 'N' Blow Counts in Chalk		
SPT N Value Range	Spink & Norbury Grade	Inferred CIRIA Grade
<8	VI	Structureless (Dm)
8 – 15	V	Structureless (Dc)
15 – 20	IV	Structured chalk (C5 – A1)
20 – 25	III	
25 – 35	II	
>35	I	

(Comparison of SPT N Value vs Chalk Grade based on T.R.M. Wakeling)

Table 3.4 provides an interpretation of the SPT 'N' blow counts for the soils of the Head and White Chalk Subgroup encountered in the boreholes. **Please note;** Made Ground has been excluded from the following interpretation.

Table 3.4 Interpretation of SPT "N" Counts			
DP	Strata	SPT "N" Blow Counts	Approximate CIRIA Chalk Grade/ Cohesive Strength / Granular Density
BH1	Head (Granular 0.90-3.10m bgl)	11 - 13	Medium Dense
	White Chalk Subgroup (Chalk 3.10-8.50m bgl)	19-21	Structured
	White Chalk Subgroup (Chalk 8.50-12.50m bgl)	13-15	Structureless D _c
	White Chalk Subgroup (Chalk 12.50-13.00m bgl)	6	Structureless D _m

Table 3.4
Interpretation of SPT "N" Counts

DP	Strata	SPT "N" Blow Counts	Approximate CIRIA Chalk Grade/ Cohesive Strength / Granular Density
	White Chalk Subgroup (Chalk 13.00-16.00m bgl)	26-29	Structured
BH2	Head (Cohesive 0.50-2.10m bgl)	8	Low to Medium ($C_u=40\text{kPa}$)
	Head (Granular 2.10-3.20m bgl)	16	Medium Dense
	White Chalk Subgroup (Chalk 3.20-7.50m bgl)	18-33	Structured
	White Chalk Subgroup (Chalk 7.50-16.50m bgl)	10-15	Structureless D_c
	White Chalk Subgroup (Chalk 16.50-17.50m bgl)	16	Structured
BH3	Head (Granular 0.15-3.20m bgl)	6-8	Loose
	White Chalk Subgroup (Chalk 3.20-9.00m bgl)	15-26	Structured
	White Chalk Subgroup (Chalk 9.00-11.50m bgl)	14-15	Structureless D_c
	White Chalk Sub Group (Chalk 11.50-22.00m bgl)	19-28	Structured
BH4	Head (Granular 0.50-3.20m bgl)	14-18	Medium Dense
	White Chalk Subgroup (Chalk 3.20-5.50m bgl)	19-20	Structured
	White Chalk Subgroup (Chalk 5.50-15.50m bgl)	3-8	Structureless D_m

The cohesive soils of the Head were classified as **low to medium strength** with a **$C_u=40\text{kPa}$** . The granular soils of the Head were classified as **loose to medium dense**, generally medium dense.

The White Chalk Subgroup was highly variable, **structureless (D_m) to structured**. Boreholes BH1-3 generally exhibited structured chalk with a band of structureless chalk between 9 and 12m bgl becoming structured to depth. BH4 however exhibited a 2m structured band overlying Structureless D_m to depth.

3.2 Dry Density and Saturated Moisture Content Tests

Saturated moisture content testing was carried out on samples from BH1, BH2 and BH3 in accordance with BS1377:1990 Part 2. The saturated moisture content and dry density tests allow the CIRIA classification of the chalk. The result of the saturated moisture content and dry density tests are presented in Table 3.5.

Table 3.5
Dry Density and Saturated Moisture Content results

Sample Depth (m bgl)	Moisture Content (%)	Saturated Moisture Content (%)	Dry Density (Mg/m ³)	Bulk Density (Mg/m ³)	CIRIA Classification
BH1 – 15.00	27	27	1.98	1.56	Medium Density
BH2 – 12.00	26	27	1.98	1.56	Medium Density
BH3 – 18.00	27	27	1.99	1.57	Medium Density
BH3 – 21.00	27	27	1.97	1.56	Medium Density

The results of the saturated moisture content testing showed that the White Chalk Subgroup could be classified as **medium dense** in accordance with CIRIA C574.

3.3 Atterberg Limit Tests

Atterberg Limits Tests were performed on two samples from the Head (BH1 at 2.00m and BH2 at 1.20m bgl) to confirm whether the cohesive soil of the Head expressed volume change potential. A précis of the results is given in Table 3.6.

Table 3.6
Atterberg Limit Test Interpretation

Stratum	Moisture Content (%)	Modified Plasticity Index (%)	Passing 425µm Sieve (%)	Soil Classification	Volume Change Potential	
					BRE	NHBC
Head	13-19	14 - 19	89-10	CI	Low	Low

(The Atterberg Limit Tests were made in accordance with B.S. 1377: Part 2:1990 Clauses 3.2, 4.4 and 5)

NB: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)
 Soil Classification based on British Soil Classification System
 NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2 Building near trees (based on Atterberg results)

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240.

The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates.

The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.

The results from the laboratory testing showed that the cohesive soils of the Head possessed **low volume change potential** in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The test results are given in Appendix B.

3.4 Californian Bearing Ratio (CBR) tests

Two samples from the granular soils of the Head were recovered and tested in the laboratory in order to derive a preliminary CBR value for the design of pavements.

A summary of the laboratory CBR results is provided in Table 3.7.

Table 3.7 CBR Results Summary			
Location	Depth (m bgl)	Moisture Content (%)	CBR (%)
BH3	0.50-0.70	8	30
BH4	0.50-0.70	13	22

The results showed that **CBR values of between 22 and 30%** were achievable in the shallow granular soils of the Head deposits at the moisture contents presented.

The test results are given in Appendix B.

Section 4 Foundation Design

4.1 General

An engineering appraisal of the soil types encountered during the site investigation and those likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the trial holes.

4.1.1 Topsoil/Made Ground

The term *Made Ground* is used to describe material which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:1986, Clause 2.2.2.3.5 Made Ground, includes the caveat that *'all made ground should be treated as suspect, because of the likelihood of extreme variability'*.

A result of the inherent variability, particularly of uncontrolled Fill and/ or Made Ground the bearing capacity and settlement characteristics can be unpredictable and must not be used as a founding stratum. Therefore, foundations should be taken through any Fill and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Topsoil generally consisted of bark brown silty CLAY. Made Ground was encountered beneath topsoil and concrete (in BH4) and consisted of earth and sand backfill to a maximum depth of 0.50m bgl.

Please note; It is possible that Topsoil and/or Made Ground exists to greater depths in other parts of the proposed development area including service trenches, infilled ground etc.

4.1.2 Head Deposits

Soils of the Head generally comprised brown clayey SAND with occasional fine to coarse subrounded to subangular flint gravel. Within BH3 the Head consisted of light brown silty sandy GRAVEL. Gravel was fine to coarse, subrounded to subangular chalk and flint fragments. The Head was present to a maximum depth of 3.20m bgl.

The SPT 'N' results classified the cohesive Head deposits as **low to medium strength** with a **$C_u=40\text{kPa}$** . The granular Head soils were classified as **loose to medium dense**, generally medium dense.

The results from the laboratory testing showed that the cohesive soils of the Head possessed **low volume change potential** in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

The results showed that **CBR values of between 22 and 30%** were achievable in the shallow granular soils of the Head deposits at the moisture

contents presented.

Based on the results of the Atterberg testing (modified PI of between 14 and 19%) the soils of the Head can generally be considered to be non-frost susceptible.

4.1.3 White Chalk Subgroup

The White Chalk Subgroup was encountered in all cable percussion boreholes and consisted of off-white structureless chalk recovered as silt sized comminuted chalk with fine to coarse, rounded to sub angular intact chalk and flint fragments. The chalk was encountered from 3.10 – 3.20m bgl and persisted to the full depth of the investigation (22.00m bgl in BH3).

The White Chalk Subgroup was highly variable, **structureless (D_m) to structured**. Boreholes BH1-3 generally exhibited structured chalk with a band of structureless chalk between 9 and 12m bgl becoming structured to depth. BH4 however exhibited a 2m thick structured band overlying structureless D_m to depth.

The results of the saturated moisture content testing showed that the White Chalk Subgroup could be classified as **medium dense** in accordance with CIRIA C574.

4.1.4 Roots

Roots were not recorded during the investigation however it must be noted that it is difficult to assess the actual depth of root penetration in a narrow diameter borehole. Roots may be found on site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Mature trees were present on or surrounding the site.

4.1.5 Groundwater

Groundwater seepages were encountered within boreholes BH1, BH2 and BH4. Groundwater rose to a maximum height of 3.20m bgl when left overnight.

Groundwater ingress is anticipated during the construction of piled foundations.

It is anticipated that in the long-term groundwater levels may rise as a result of factors such as climate change and seasonal ground water levels.

4.2 Foundation Scheme

The proposed development was to comprise the construction of circa 80No. residential properties including associated soft / hard landscaping and infrastructure.

It is understood that the client is considering a piled foundation solution for the proposed development.

4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 and NHBC Standards Chapter 4.2 provide guidance on 'best practice' for the design and construction of foundations on shrinkable soils.

The results of Atterberg testing showed that the cohesive soils of the Head typically exhibited low volume change potential in accordance with BRE Digest 240 and NHBC standards chapter 4.2.

Low volume change potential (in accordance with NHBC Standards Chapter 4.2) must therefore be adopted for the proposed development where foundations are taken through the cohesive soils of the Head.

The BRE Digest 241 states: *"An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used"*.

The stated intention of the NHBC is to ensure that shrinkage and swelling of plastic soils does not adversely affect the structural integrity of foundations to such a degree that remedial works would be required to restore the serviceability of the building.

It must be borne in mind that adherence to the NHBC tables and design recommendations may not, in all cases, totally prevent foundation movement and cracking of brickwork might occur.

The BRE Digest 240 suggests: *"Two courses of action are open:*

- *Estimate the potential for swelling or shrinkage and try to avoid large changes in the water content, for example by not planting trees near the foundations.*
- *Accept that swelling or shrinkage will occur and take account of it. The foundations can be designed to resist resulting ground movements or the superstructure can be designed to accommodate movement without damage."*

The design of foundations suitable to withstand movements is presented in BRE Digest 241 "Low-rise buildings on shrinkable clay soils: Part 2".

4.2.2 Piled Foundations

Piled foundations should be taken through any Topsoil/Made Ground and disturbed and/or desiccated ground, below any roots and into the natural soils of the White Chalk Subgroup.

In Table 4.1 preliminary load capacities calculated for vertically loaded bored piles of various diameters and lengths taken into the soils of White Chalk Subgroup are given. The preliminary load capacities are based on the soil conditions encountered within the White Chalk Subgroup during the boreholes drilled during the intrusive investigation.

The construction of a piled foundation is a specialist job, and the advice of a reputable contractor, familiar with the type of ground and groundwater conditions encountered on this site, should be sought prior to finalising the foundation design, as the actual pile working load will depend on the particular type of pile and method of installation.

Temporary casing may be required where the upper portion of the pile passes through any Made Ground, Topsoil, granular natural soils and/or below the groundwater table, if encountered, to prevent collapse of the pile bore or necking of the green concrete.

The upper 3.00m of the shaft of the piles have been ignored in the preliminary pile design.

The values presented in Table 4.1 ***must be used for preliminary design purposes only***. The actual working load is dependent on the type of pile and the method of installation.

The pile service capacities given in Table 4.1 are applicable to single bored piles. It is possible that greater service capacities would be achievable by adopting driven piles, if considered appropriate. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Pile working loads at depth are likely to be limited by the maximum permissible stress within the concrete.

The pile working loads given in Table 4.1 incorporate a factor of safety of 1.5 on the ultimate skin and 10 on the end bearing values.

No allowance has been made in the preliminary design for negative skin friction (down drag) loads induced by settlement of soft natural soils. When assessing final pile working loads negative skin friction should be taken into consideration. This is achieved by reducing the pile capacity by the un-factored shaft resistance through soft natural soils.

Table 4.1 Preliminary Pile Design - Chalk Single Vertically Loaded Piles Factors: FofS Base = 10, Shaft = 1.5			
Depth (m bgl)	Pile Diameter (m)		
	0.30	0.40	0.60
4	0	0	0
	<u>35</u>	<u>60</u>	<u>135</u>
	35	60	135
7	170	225	335
	<u>25</u>	<u>45</u>	<u>105</u>
	195	270	440
10	425	565	845
	<u>25</u>	<u>40</u>	<u>90</u>
	450	605	935
13	770	1025	1540
	<u>25</u>	<u>40</u>	<u>95</u>
	795	1065	1635
16	1210	1610	2415
	<u>30</u>	<u>55</u>	<u>115</u>
	1240	1665	2530
19	1735	2315	3470
	<u>40</u>	<u>70</u>	<u>155</u>
	1775	2385	3625
22	2355	3140	4705
	<u>55</u>	<u>100</u>	<u>215</u>
	2410	3240	4920
Notes: 10 - pile shaft working load. <u>130</u> - pile base working load 140 - total pile capacity			

Guidance on the design of a working platform for piling rigs can be provided by Soils Limited in accordance with the BRE "Working platform for tracked plant, 2004".

4.3 Pavement Construction

Laboratory California Bearing Ratio (CBR) tests were performed on the existing natural soils of the London Clay Formation and the Head as these were considered to be the likely formation strata for the proposed access routes / roads.

The results showed that **CBR values of between 22% and 30%** were achievable in the shallow granular soils of the Head deposits at the moisture contents presented.

Any soft spots at formation level should be dug out and replaced with a suitably compacted granular fill. Prior to construction the formation level should be proof rolled.

As CBR values are highly susceptible to changes in moisture content in-situ testing must be undertaken immediately prior to the installation of pavements/roads.

Frost susceptibility must also be given consideration; the Design Manual for Road and Bridges: 1994: Volume 7: Pavement Design and Maintenance recommends that, for routine cases, all materials within 450mm of the pavement surface should be non-frost-susceptible. Given a typical PI for the near surface Head of >15% (as determined from laboratory tests undertaken on the near surface soils of the Head within the main site) it is considered that this material is non-frost-susceptible.

4.4 Excavations

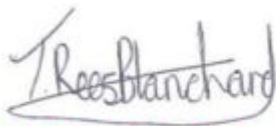
Shallow excavations (<1.0m) in the Made Ground and Head are likely to be marginally stable at best.

Long, deep excavations are likely to become unstable as are those excavated through significant thicknesses of White Chalk Subgroup or those taken below the groundwater table, if encountered.

Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose before excavations are entered by personnel.

The following figures and appendices complete this report:

Figure 1	Site Location Map
Figure 2	Trial Hole Layout Plan
Appendix A	Field Work
Appendix B	Geotechnical Laboratory Analysis
Appendix C	Information Provided by the Client



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Graduate Geotechnical and Geo-environmental Engineer



EurIng. R. B. Higginson B.Sc., PG. Dip., C.Eng., MICE., FGS.
Geotechnical Advisor

Appendix A

Field Work

Borehole Log

Borehole No.

BH 1

Sheet 1 of 2

Project Name: Land South of Ranelagh Road

 Project No.
14492

Co-ords: -

 Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

 Scale
1:50

Client: Foreman Homes

Dates: 29/08/2014 - 02/09/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.50			Grass over dark bro silty CLAY. TOPSOIL	
		0.50 - 0.70	B					Orange brown silty CLAY. (HEAD)	
		1.20		N=11 (5,6/4,3,2,2)	0.90			Brown clayey SAND with occasional fine to coarse sub rounded to sub angular flint gravel. (HEAD)	1
		1.20 - 1.65	D						
		2.00		N=13 (3,2/2,3,4,4)	3.10				2
		2.00 - 2.45	D						
		3.00		N=12 (2,2/3,3,3,3)					3
		3.00 - 3.50	B						
		4.00		N=20 (2,3/4,6,5,5)					4
		4.30 - 4.45	D						
		5.00		N=21 (3,3/6,6,5,4)					5
		5.00 - 5.45	D						
		6.00	D						6
		6.50		N=20 (2,2/3,3,7,7)					
		6.50 - 6.95	D						7
		7.50	D						
		8.00		N=19 (3,3/3,3,6,7)					8
		8.00 - 8.45	D						
		9.00	D						9
		9.50		N=13 (1,2/2,3,4,4)					
		9.50 - 9.95	D						10

Continued on next sheet

Remarks

1 Hour day work cleaning access to borehole (fly tipping). 1 Hour day work dig pit to 1.20m bgl. Seepages at 4.00 and 9.50m bgl. Water rising to 5.70m bgl.



Borehole Log

Borehole No.

BH 1

Sheet 2 of 2

Project Name: Land South of Ranelagh Road

Project No.
14492

Co-ords: -

Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

Scale
1:50

Client: Foreman Homes

Dates: 29/08/2014 - 02/09/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50	D						
		11.00		N=15 (1,2/3,3,4,5)					11
		11.00 - 11.45	D						
		12.00	D						12
		12.50		N=6 (1,3/2,1,1,2)					13
		12.50 - 12.95	D						
		13.50	D						14
		14.00		N=26 (6,5/5,6,7,8)					15
		14.00 - 14.45	D						
		15.00	D						16
		15.50		N=29 (5,6/6,7,8,8)					17
		15.50 - 15.95	D						18
					16.00			End of borehole at 16.00 m	19
									20

Remarks

1 Hour day work cleaning access to borehole (fly tipping). 1 Hour day work dig pit to 1.20m bgl. Seepages at 4.00 and 9.50m bgl. Water rising to 5.70m bgl.

Borehole Log

Borehole No.

BH 2

Sheet 1 of 2

Project Name: Land South of Ranelagh Road

 Project No.
14492

Co-ords: -

 Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

 Scale
1:50

Client: Foreman Homes

Dates: 02/09/2014 - 04/09/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.10			Grass over Dark brown clayey SILT. TOPSOIL	
		0.50 - 0.70	B		0.40			Earth backfill. Dark brown clayey SILT. MADE GROUND	
		1.20						Light orange brown silty CLAY. (HEAD)	1
		1.20 - 1.65	D	N=8 (2,2/2,2,2,2)					
		2.00 - 2.20	U		2.10				2
		2.20	D					Orangish brown clayey, gravelly, SAND. Gravel is fine to coarse, sub rounded to sub angular flint (HEAD)	
		3.00							3
		3.00 - 3.45	D	N=16 (4,5/4,4,4,4)	3.20				
		4.00						Offwhite CHALK and flints. Recovered as comminuted silt sized chalk and abundant fine to coarse, sub rounded to sub angular gravel sized intact chalk and flint fragments. (WHITE CHALK SUBGROUP)	4
		4.00 - 4.50	B	N=18 (5,6/5,5,4,4)					
		5.00							5
		5.00 - 5.45	D	N=18 (3,3/3,5,5,5)					
		6.00	D						6
		6.50							7
		6.50 - 6.95	D	N=33 (4,6/6,6,7,14)					
		7.50	D						
		8.00							8
		8.00 - 8.45	D	N=10 (1,1/1,2,3,4)					
		9.00	D						9
		9.50							
		9.50 - 10.00	B	N=12 (2,2/3,2,3,4)					10

Continued on next sheet

Remarks

2 Hours day work get rig to borehole and equipment. 1 Hour day work dig pit to 1.20m bgl. Seepage at 4.00 and 11.00m bgl. Water rising to 6.30m bgl.

Borehole Log

Borehole No.

BH 2

Sheet 2 of 2

Project Name: Land South of Ranelagh Road

Project No.
14492

Co-ords: -

Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

Scale
1:50

Client: Foreman Homes

Dates: 02/09/2014 - 04/09/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50	D						
		11.00		N=14 (3,3/2,2,4,6)					11
		11.00 - 11.45	D						
		12.00	D						12
		12.50		N=14 (2,3/3,2,4,5)					13
		12.50 - 12.95	D						
		13.50	D						14
		14.00		N=15 (1,2/4,4,5,2)					15
		14.00 - 14.45	D						
		15.00	D						16
		15.50		N=13 (1,1/1,4,5,3)					17
		15.50 - 15.95	D						
		16.50	DD						18
		17.00		N=16 (3,2/3,3,4,6)					19
		17.00 - 17.45	D						
					17.50			End of borehole at 17.50 m	20

Remarks

2 Hours day work get rig to borehole and equipment. 1 Hour day work dig pit to 1.20m bgl. Seepage at 4.00 and 11.00m bgl. Water rising to 6.30m bgl.

Borehole Log

Borehole No.

BH 3

Sheet 1 of 3

Project Name: Land South of Ranelagh Road

 Project No.
14492

Co-ords: -

 Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

 Scale
1:50

Client: Foreman Homes

Dates: 27/08/2014 - 29/08/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.15			Grass over brown silty slightly gravelly CLAY. Gravel is fine to medium, sub rounded to sub angular flint fragments. TOPSOIL	
		0.50 - 0.70	B					Light brown silty sandy GRAVEL. Gravel is fine to coarse, rounded to sub angular chalk and flint fragments. (HEAD)	1
		1.20		N=8 (3,3/2,2,2,2)					
		1.20 - 1.65	D						
		2.00		N=6 (1,2/2,2,1,1)					2
		2.00 - 2.50	B						
		3.00		3 (3,3/1,1,,1)					3
		3.00 - 3.45	D		3.20				
		3.50 - 4.00	B					Offwhite CHALK with flints. Recovered as comminuted silt sized chalk and frequent fine to coarse, sub angular to sub rounded sand and gravel sized intact chalk and flint fragments. (WHITE CHALK SUBGROUP)	4
		4.00		N=16 (2,2/2,2,4,8)					
		4.00 - 4.45	D						
		4.60 - 5.00	B		4.60			Offwhite gravelly, coarse SAND. Gravel is fine to medium, angular to sub rounded flint and intact chalk. Sand is intact chalk fragments (WHITE CHALK SUBGROUP)	5
		5.00		N=24 (2,4/7,7,5,5)					
		5.00 - 5.45	D		5.10			Offwhite CHALK with flints. Recovered as comminuted silt sized chalk and frequent fine to coarse, sub angular to sub rounded sand and gravel sized intact chalk and flint fragments. (WHITE CHALK SUBGROUP)	6
		6.00	D						7
		6.50		N=26 (2,2/6,7,8,5)					
		6.50 - 6.95	D						
		7.50	D						
		8.00		N=15 (3,2/2,3,4,6)					8
		8.00 - 8.45	D						
		9.00	D						9
		9.50		N=14 (3,3/3,3,4,4)					
		9.50 - 9.95	D						10

Continued on next sheet

Remarks

1 Hour 30 minutes day work dig pit to 1.20m bgl. Go to yard for 8", rods and 6" casing. 30 Minutes day work to get water. Water added to assist drilling.

Borehole Log

Borehole No.

BH 3

Sheet 2 of 3

Project Name: Land South of Ranelagh Road

Project No.
14492

Co-ords: -

Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

Scale
1:50

Client: Foreman Homes

Dates: 27/08/2014 - 29/08/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50	D						
		11.00		N=15 (3,4/4,3,4,4)					11
		11.00 - 11.45	D						
		12.00	D						12
		12.50		N=24 (2,7/5,5,7,7)					13
		12.50 - 12.95	D						
		13.50	D						14
		14.00		N=24 (3,5/6,5,6,7)					15
		14.00 - 14.45	D						
		15.00	D						16
		15.50		N=19 (2,4/4,5,5,5)					17
		15.50 - 15.95	D						
		16.50	D						18
		17.00		N=21 (3,5/5,5,5,6)					19
		17.00 - 17.45	D						
		18.00	D						20
		18.50		N=26 (1,3/3,6,7,10)					
		18.50 - 18.95	D						
		19.50	D						
		20.00		N=30 (2,4/4,8,9,9)					

Continued on next sheet

Remarks

1 Hour 30 minutes day work dig pit to 1.20m bgl. Go to yard for 8", rods and 6" casing. 30 Minutes day work to get water. Water added to assist drilling.

Borehole Log

Borehole No.

BH 4

Sheet 1 of 2

Project Name: Land South of Ranelagh Road

 Project No.
14492

Co-ords: -

 Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

 Scale
1:50

Client: Foreman Homes

Dates: 26/08/2014 - 27/08/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.10			CONCRETE	
		0.50 - 0.70	B		0.50			Dark brown silty clayey SAND backfill. MADE GROUND	
		1.20						Dark orangish brown clayey SAND. (HEAD)	1
		1.20 - 1.65	D	N=14 (3,3/3,3,4,4)					
		2.00			1.80			Dark brown gravelly, clayey SAND. Gravel is fine to medium angular broken flint. (HEAD)	2
		2.00 - 2.45	D	N=18 (5,6/5,5,4,4)					
		3.00			3.20			Offwhite CHALK with flints. Recovered as comminuted silt sized chalk and occasional fine to coarse, sub angular to sub rounded sand and gravel sized intact chalk and flint fragments. (WHITE CHALK SUBGROUP)	3
		3.00 - 3.45	D	N=10 (4,4/3,2,2,3)					
		4.00 - 4.50	B						4
		4.50							
		4.50 - 4.95	D	N=19 (2,4/4,4,5,6)					
		5.00							5
		5.00 - 5.45	D	N=20 (3,5/6,7,4,3)					
		6.00	D						6
		6.50							
		6.50 - 7.00	B	N=7 (2,2/1,2,2,2)					7
		7.50	D						
		8.00							8
		8.00 - 8.45	D	N=7 (1,2/2,1,2,2)					
		9.00	D						9
		9.50							
		9.50 - 10.00	B	3 (2 for 225mm/3 for 225mm)					10

Continued on next sheet

Remarks

1 Hour 30 minutes day work dig pit to 1.20m bgl. Go to yard for more 6" casing. Seepage at 4.00 and 8.00m bgl. Water rising to 3.2m bgl overnight.

Borehole Log

Borehole No.

BH 4

Sheet 2 of 2

Project Name: Land South of Ranelagh Road

Project No.
14492

Co-ords: -

Hole Type
CP

Location: Havant, Hampshire, PO9 1NR

Level:

Scale
1:50

Client: Foreman Homes

Dates: 26/08/2014 - 27/08/2014

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50	D						
		11.00		N=4 (1,1,1,1,1)					11
		11.00 - 11.45	D						
		12.00	D						12
		12.50		N=7 (1,1/1,2,2,2)					13
		12.50 - 12.95							
		13.50	D						14
		14.00		N=7 (1,1/1,2,2,2)					15
		14.00 - 14.45	D						
		15.00		N=8 (1,1/2,2,2,2)					16
		15.00 - 15.45	D						17
					15.50			End of borehole at 15.50 m	18
									19
									20

Remarks

1 Hour 30 minutes day work dig pit to 1.20m bgl. Go to yard for more 6" casing. Seepage at 4.00 and 8.00m bgl. Water rising to 3.2m bgl overnight.

Appendix B
Geotechnical Laboratory Analysis

Contract Number: PSL14/4643

Client's Reference: 14492

Report Date: 02 October 2014

Client Name: Soils Limited
Brunel House
Chalcroft Distribution Park
Burnetts Lane
Southampton
SO30 2PA

For the attention of: Craig Morrison

Contract Title: Ranelagh Road, Havant

Date Received: 15/09/2014

Date Commenced: 15/09/2014

Date Completed: 02/10/2014

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)



D Lambe
(Senior Technician)

A Watkins
(Director)

S Royle
(Senior Technician)

M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	01/10/14		01/10/14		01/10/14
RANELAGH ROAD, HAVANT.				Contract No: PSL14/4643	
				Client Ref: 14492	

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

[illegible]

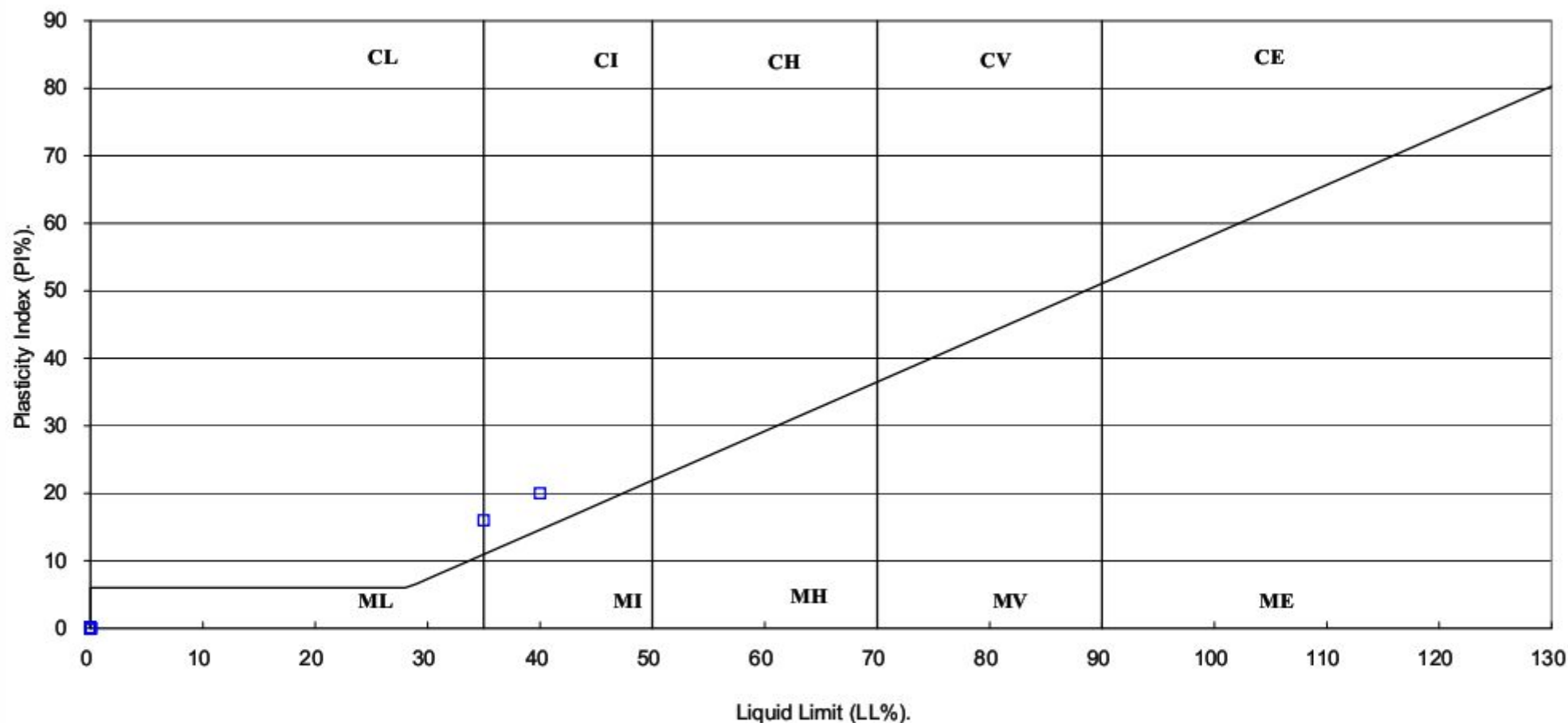
SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		01/10/14		02/10/14		02/10/14
	RANELAGH ROAD, HAVANT.				Contract No:	PSL14/4643
					Client Ref:	14492

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



PSL

Professional Soils Laboratory

Compiled by

[Signature]

Date

01/10/14

Checked by

[Signature]

Date

02/10/14

Approved by

[Signature]

Date

02/10/14

RANELAGH ROAD, HAVANT.

Contract No:

PSL14/4643

Client Ref:

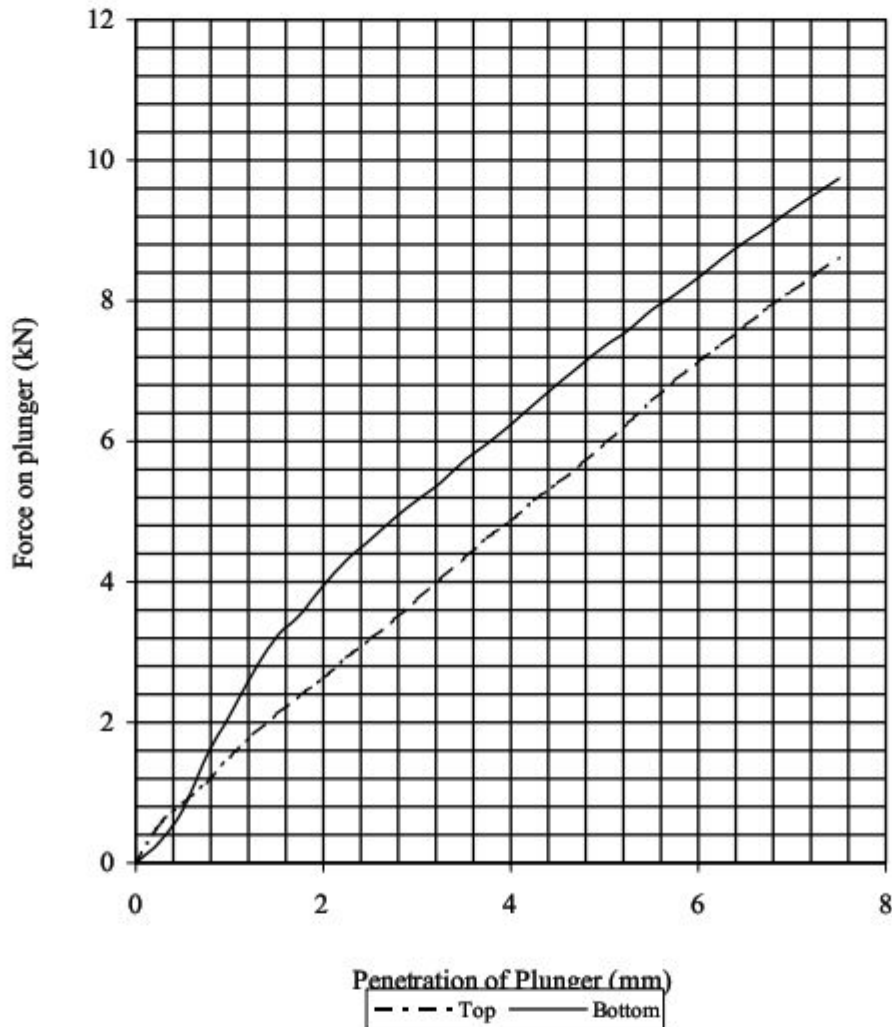
14492

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: BH3 Depth (m): 0.50-0.70

Sample Number: Sample Type: B



Initial Sample Conditions		Test Conditions		Method of compaction		2.5Kg Rammer	
Moisture Content:	8.0	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m ³ :	1.91	Soaking Time hrs	0	Sample Top	8.1	Sample Top	29.8
Dry Density Mg/m ³ :	1.77	Swelling mm:	0	Sample Bottom	7.9	Sample Bottom	36.8
Percentage retained on 20mm BS test sieve:	16	Remarks: See Summary of Soil Description.					

Checked by	Date	Approved By	Date
	01/10/14		01/10/14

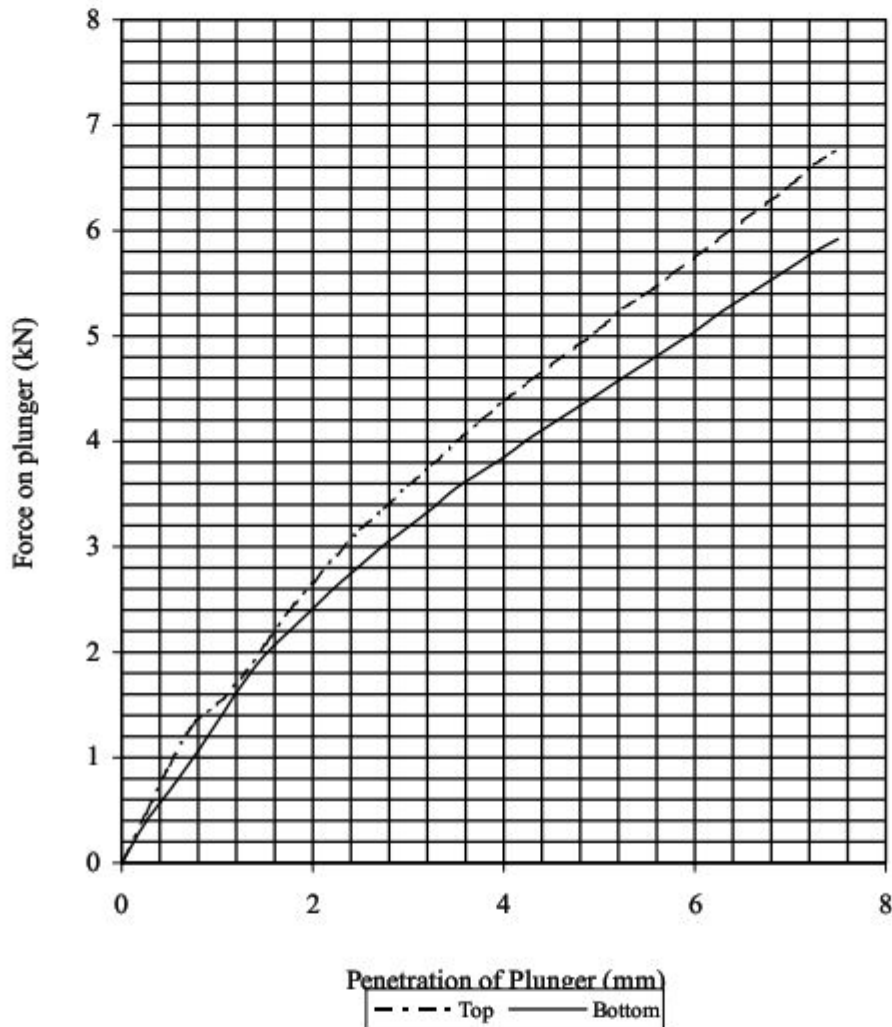
PSL Professional Soils Laboratory	RANELAGH ROAD, HAVANT.	Contract No. PSL14/4643
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California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: BH4 Depth (m): 0.50-0.70

Sample Number: Sample Type: B



Initial Sample Conditions		Test Conditions		Method of compaction 2.5Kg Rammer			
Moisture Content:	13	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m ³ :	1.88	Soaking Time hrs	0	Sample Top	13	Sample Top	25.3
Dry Density Mg/m ³ :	1.66	Swelling mm:	0	Sample Bottom	13	Sample Bottom	22.3
Percentage retained on 20mm BS test sieve:	0	Remarks: See Summary of Soil Description.					

Checked by	Date	Approved By	Date
	01/10/14		01/10/14

PSL Professional Soils Laboratory	RANELAGH ROAD, HAVANT.	Contract No. PSL14/4643
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Certificate of Analysis

Certificate Number 14-16626

02-Oct-14

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 14-16626

Client Reference PSL14/4643

Contract Title Ranelagh Road Havant

Description One Soil sample.

Date Received 26-Sep-14

Date Started 26-Sep-14

Date Completed 02-Oct-14

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read 'Rob Brown'.

Rob Brown
Business Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 14-16626

Client Ref PSL14/4643

Contract Title Ranelagh Road Havant

Lab No	705195
Sample ID	BH2
Depth	12.00
Other ID	
Sample Type	SOIL
Sampling Date	n/s
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10
Inorganics				
pH	DETSC 2008#			8.7
Chloride Aqueous Extract	DETSC 2055	1	mg/l	8.0
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	3.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	< 10

Information in Support of the Analytical Results

Our Ref 14-16626
Client Ref PSL14/4643
Contract Ranelagh Road Havant

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
705195	BH2 12.00 SOIL			PT 500ml	Sample date not supplied	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/- 2°C.

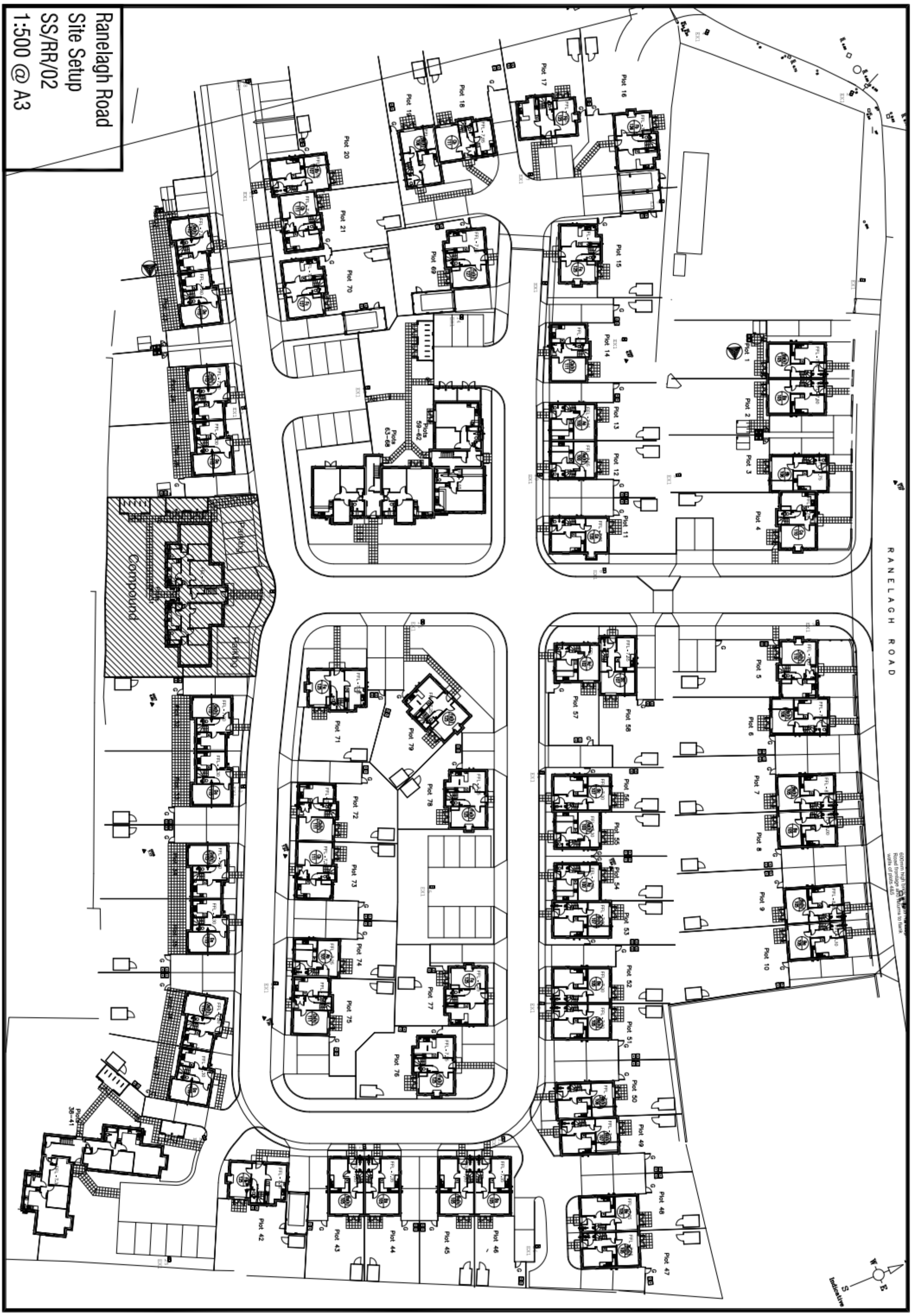
Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :- Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix C
Information Provided by the Client

RANELAGH ROAD

600mm high brick wall
Road (to be built) returns to Bank
width of plots 485



Ranelagh Road

Site Setup

SS/RR/02

1:500 @ A3