Ground Investigation

soils LIMITED

Geotechnical & Environmental Consultants

Phase II Ground Investigation Report

At

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

For

Jacobs Foreman Developments Limited

Soils Limited
Newton House
Cross Road
Tadworth
Surrey KT20 5SR
☎ 01737 814221
🖷 01737 812557

REPORT 14099/GIR/Rev 2.00

Phase II Ground Investigation Report

Job Title: Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR

Client: Orchard Homes and Developments Ltd

CONTROL DOCUMENT

SOILS LIMITED DOCUMENT REFERENCE NUMBER:
14099/GIR

DOCUMENT TYPE:
Phase II Ground Investigation Report

DOCUMENT STATUS: FINAL REVISION: 2.00

DATE: December 2014

Note: This is not a valid document for use in the design of the project unless it is titled **Final** in the Document Status box.

	Name	Signature
Prepared by:	L. Howell *(ls@soilslimited.co.uk)*	[redacted]
Checked by:	N. Sidiropoulos	
	C. Morrison	
	R. B. Higginson	

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person 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.

Soils Limited
Newton House
Tadworth
Surrey KT20 5SR
Phone 01737 814221
Fax 01737 812557

Phase II Ground Investigation Report

At

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

For

Jacobs Foreman Developments Limited

Commission

Soils Limited were commissioned by the Jacobs Foreman Developments Limited to undertake a Phase II Ground Investigation on land south of Ranelagh Road, Havant, Hampshire, PO9 1NR and the scope of the investigation was outlined in Soils Limited subsequent quotation reference Q13950/issue1.02, dated October 2012, and further phases of investigation commissioned in January and November 2014.

This document comprises the updated Phase II Ground Investigation undertaken in 2012 (ref: 13284/GI) and 2014 (ref: 14099) and incorporates the results, discussion and conclusions to all of these phases of intrusive works.

This updated Phase II report must be read in conjunction with the Phase I Desk Study (ref. 13284/DS, November 2012), the previously submitted contamination report undertaken at the site (ref. 13284/GI, dated November 2012), the Soakaway Letter Report (ref. 14186/SL, dated 19th March 2014 and the Phase III Ground Investigation (ref. 14492/GIR, dated October 2014) all undertaken for the above site by Soils Limited.

©Soils Limited
December 2014

Table of Contents

Section 1 Introduction 1

1.1 Objective of Investigation 1
1.2 Location 1
1.3 Proposed Redevelopment 1
1.4 Limitations and Disclaimers 1

Section 2 Site Works 4

2.1 Proposed Works 4
2.1.1 Works Undertaken – October 2012 4
2.1.2 Works Undertaken – February 2014 4
2.1.3 Works Undertaken – November 2014 5
2.2 Ground Conditions 5
2.2.1 Topsoil 8
2.2.2 Made Ground 8
2.2.3 Head Deposits 9
2.2.4 Lewes Nodular Chalk Formation 10
2.3 Roots 11
2.4 Groundwater 11
2.5 Post-works Groundwater and Soil-Gas Monitoring 12

Section 3 Discussion of Geotechnical In-situ and Laboratory Testing 13

3.1 Dynamic Probe Tests 13
3.2 Atterberg Limit Tests 16
3.3 Grading Analysis Tests 17
3.4 Infiltration Tests 17

Section 4 Foundation Design 19

4.1 General 19
4.1.1 Topsoil or Made Ground 19
4.1.2 Head Deposits 19
4.1.3 Lewes Nodular Chalk Formation 20
4.1.4 Roots 21
4.1.5 Groundwater 21
4.2 Foundation Scheme 22
4.2.1 Guidance on Shrinkable Soils 22
4.2.2 Conclusions and Recommendations 23
4.3 Subsurface Concrete 24
4.4 Excavations 24
4.5 Surface Water Disposal 25

Section 5 Chemical Analysis of Soil Samples 26

5.1 Site Characterisation and Revised CSM 26
5.2 Soil Sampling 28
5.3 Determination of Contaminants of Concern - Soil 29
5.4 Determination of Contaminants of Concern - Groundwater 30

Section 6 Qualitative Risk Assessment 32

6.1 Assessment Criteria 32
6.2 Representative Contamination Criteria - Soil 32

©Soils Limited
December 2014

6.3 Representative Contamination Criteria - Groundwater 33
6.4 Tier 1 Quantitative Risk Assessment - Soil 34
6.5 Remedial Objective 34
6.6 Soil-Gas Risk 35
6.7 Duty of Care 35
6.8 Excavated Material 35
6.9 Re-use of Excavated Material On-site 36
6.10 Imported Material 37
6.11 Discovery Strategy 37

Figures

- Figure 1: Site Location Map
- Figure 2: Trial Hole Layout Plan
- Figure 3: Soakaway Test Location Plan

Appendices

- Appendix A: Fieldwork;
- Appendix B: Geotechnical Laboratory Analysis;
- Appendix C: Chemical Laboratory Analysis;
- Appendix D: Soil Guideline Values and General Assessment Criteria;
- Appendix E: Information Provided by the Client.

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 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.

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.

©Soils Limited
December 2014

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 redevelopment that was appropriate to the conditions present on the site.

The investigation was to be undertaken to provide parameters for the design of foundations for a proposed residential 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. Infiltration testing was also to be undertaken at a number of locations to assess the potential for the adoption of soakaway drainage for the proposed development.

In addition, soil and groundwater samples were recovered for chemical laboratory testing to enable recommendations for the safe redevelopment of the site in respect to risk to human health and the environment.

1.2 Location

The site was located south of Ranelagh Road, in Havant, Hampshire and had an approximate site area of 2.5Ha. The centre of the site had an approximate O.S. Land Ranger Grid Reference of was SU 708 063.

The general site location plan was given on Figure 1 with the approximate trial hole locations given on Figures 2.

1.3 Proposed Redevelopment

The proposed development was to include the erection of 81 dwellings consisting of 10No. two-bed flats, 12No. two-bed flats, 6No. two-bed houses and 53No. three-bed houses. The proposed redevelopment included soft and hard landscaping such as access roads and private gardens.

In compiling this report reliance was placed on drawing number SS/RR/02, Ranelagh Road Site Setup, undated, provided by Foreman Homes. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations or conclusions presented within this report. Soils Limited must be notified about any such changes.

1.4 Limitations and Disclaimers

This Phase II Ground Investigation Report relates to the site referred to as land South of Ranelagh Road, Havant, Hampshire, PO9 1NR and was prepared for the sole benefit of the Jacobs Foreman Developments Limited (The "Client") and 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

©Soils Limited
December 2014

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 or 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

©Soils Limited
December 2014

party.

©Soils Limited
December 2014

Section 2 Site Works

2.1 Proposed Works

The proposed site works to be undertaken, as detailed within the Soils Limited Proposal letter, comprised the following items:

- The drilling of windowless sampler boreholes and dynamic probes to determine parameters for foundations and obtain samples to address contamination issues;
- Installation of four dual-purpose soil gas/groundwater monitoring wells;
- The excavation of trial holes to determine parameters for foundations and contamination issues;
- Infiltration, geotechnical and contamination testing as appropriate to the ground conditions encountered in trial pits.

2.1.1 Works Undertaken – October 2012

Initial site works were undertaken on 26th October 2012 and comprised the drilling of four windowless sampler boreholes (WS1 to WS4) to a depth of 4.00m bgl. The location of trial holes was selected by Soils Limited based on the proposed development drawing supplied by Orchard Homes Limited. Trial holes were located away from known locations of underground services. 'Super Heavy' Dynamic Probes (DPSH-B) were driven adjacent to and prior to the drilling of each of the windowless sampler borehole. Dynamic Probes DP1 to DP4 were advanced to depths of between 5.80m and 6.00m bgl. Windowless sampler boreholes were restricted in depth by the presence of competent strata at depth.

Seven trial holes (referenced TP1 – TP4 and SA1 – SA3) were machine excavated to depths of between 3.00 – 3.50m bgl at locations selected by Soils Limited based on the proposed development drawing in order to recover supplementary shallow samples for geotechnical and chemical laboratory analysis.

Infiltration testing following the principles of BRE365 was undertaken within three trial pits (SA1 – SA3) at depths ranging between 2.00m bgl and 2.30m bgl.

The approximate location of trial holes is presented on Figure 2.

Prior to commencing intrusive works each trial hole was scanned using a Cable Avoidance Tool (CAT) to 'clear' for the presence of shallow underground services.

2.1.2 Works Undertaken – February 2014

The site works undertaken on 4th February 2014 comprised the drilling of six windowless sampler boreholes (WS5 to WS10) to a depth of 4.00m bgl at locations selected by Soils Limited based on the proposed development plan supplied by the client. (Orchard Homes & Developments Limited). One proposed windowless sampler borehole (WS6) was not drilled due to time constraints on the day of investigation. Trial holes were located away from known underground services. The second phase of investigation was intended to increase coverage of areas that were inaccessible during the October 2012 investigation and in particular to provide geotechnical data to allow recommendations for foundation design.

©Soils Limited
December 2014

'Super Heavy' Dynamic Probes (DP5-10) were undertaken adjacent and prior to the drilling of each of the windowless sampler borehole. Dynamic Probes DP5 to DP10 were advanced to depths of between 5.80m and 6.00m bgl. One dynamic probe (DP6) was driven with no corresponding windowless sample.

The approximate location of trial holes are presented on Figure 2.

Prior to commencing intrusive works each trial hole was scanned using a Cable Avoidance Tool (CAT) to 'clear' for the presence of shallow underground services.

2.1.3 Works Undertaken – November 2014

Following a request by the Local Authority for additional works to recover soil samples for supplementary contamination testing an additional phase of site works was undertaken on 18th November 2014 and comprised the excavation of 9No. trial pits (TP101 to TP106 and TP108 to TP110) using a mechanical backhoe excavator (JCB 3CX or similar). One proposed trial pit (TP107) was not excavated due to access restrictions on the day of investigation.

Trial pits were excavated to depths of between 2.90 and 3.00m bgl at locations selected by Soils Limited following consultation with the Local Authority. Soil samples were recovered to allow supplementary chemical laboratory analysis to be undertaken.

The approximate location of trial holes is presented on Figure 2.

Prior to commencing intrusive works each trial hole was scanned using a Cable Avoidance Tool (CAT) to 'clear' for the presence of shallow underground services.

2.2 Ground Conditions

On the 26th October 2012 4No. windowless sampler boreholes (WS1 to WS4) were drilled using a Terrier Rig, or equivalent, to depths ranging between 4.00m bgl. Dual-purpose groundwater and soil-gas monitoring wells were installed within WS1-4, upon completion to facilitate post-works groundwater monitoring.

Four super-heavy dynamic probes (DP1-4) were each driven to a depth of 6.00m bgl.

Seven trial pits (TP1-4 and SA1-3) were excavated to depths of between 2.00m bgl and 3.50m bgl using a JCB 3CX at locations selected by Soils Limited, based on the proposed development plan provided by the client, where access could be gained and deemed free of services. SA1 to SA3 were used for infiltration testing broadly in accordance with BRE 365.

Upon completion the trial pits were backfilled with excess arising and mounded over to allow for future settlement.

On the 4th February 2014 5No. windowless sampler boreholes (WS5 and WS7-10) were drilled using a Terrier Rig, or equivalent, to depths ranging between 4.00m bgl.

Five super-heavy dynamic probes (DP5-10) were each driven to a depth of 6.00m bgl.

©Soils Limited
December 2014

On the 18th November 2014 9No. trial pits (TP101 to TP106 and TP108 to TP110) were machine excavated to depths of up to 3.00m bgl.

Upon completion the trial pits were backfilled with excess arising and mounded over to allow for future settlement.

The depths of the trial holes excavated are given in Table 2.1.

Table 2.1
Final depth of Trial Holes

Trial Hole	Depth (m bgl)
October 2012	
WS1	4.00
WS2	4.00
WS3	4.00
WS4	4.00
DP1	6.00
DP2	6.00
DP3	6.00
DP4	6.00
TP1	3.30
TP2	3.30
TP3	3.00
TP4	3.50
SA1	2.00
SA2	2.00
SA3	2.30
February 2014	
WS5	4.00
WS7	4.00
WS8	4.00
WS9	4.00
WS10	4.00
DP5	6.00
DP6	5.80
DP7	6.00
DP8	6.00
DP9	6.00
DP10	6.00
November 2014	
TP101	3.00
TP102	2.90
TP103	3.00
TP104	3.00
TP105	3.00
TP106	3.00
TP108	3.00
TP109	3.00
TP110	3.00

The approximate trial hole locations are shown on Figure 2.

©Soils Limited
December 2014

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the borehole logs and quoted in this report were measured from ground level directly adjacent to the boreholes.

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. Where the soil has, in general, been found to have the same composition as the 'Topsoil' but also incorporated a minor constituent, e.g. less than an estimated 5%, of possibly non-naturally occurring material, or is of uncertain origin, the soil has been described as Topsoil/Made Ground both on the log and within this report. Where man has clearly either placed the soil, or the composition altered with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the logs and within this report.

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 boreholes in descending order can be summarised:

Topsoil/Made Ground (TS/MG)
Head Deposits (HD)
Lewes Nodular Chalk Formation (LNCF)

The ground conditions encountered in the boreholes are summarised in Table 2.2.

Table 2.2
Ground Conditions

Strata	Age	Depth Encountered (m bgl)		Typical Thickness (m)	Description
		Top	Base		
TS/MG	Recent	GL	0.20 – 1.35	0.56	**Topsoil (WS2-4, S1-3, TP1-4, TP101-104 and TP108):** Typically dark brown, silty sandy CLAY with occasional gravel. The gravel comprised flint. **Made Ground (WS1, WS5, WS7-10, TP104-106 and TP109-110):** Typically dark brown, silty CLAY with occasional brick rubble, flint cobbles and ash.
HD	Quaternary	0.20 - 0.80	2.00 - >4.00	2.00*	**Head** typically comprised orange-brown, CLAY with variable quantities of flint and chalk gravel. Locally becoming orange-brown slightly clayey SAND with abundant gravel. At the interface between the Head Deposits and the Lewes Nodular Chalk Formation, a very gravelly band of Head Deposits was noted within WS2-3, WS7-1.
LNCF	Cretaceous	2.00- 2.80	>4.00**	Not Proven	Where encountered was typically highly weathered chalk – recovered as soft grey yellow white clayey sandy gravelly CHALK with fine to medium flint and chalk gravel.

Notes:-
* Based on observed thickness (i.e. may be greater than observed in some locations where encountered to base)
** Maximum depth of trial holes

©Soils Limited
December 2014

2.2.1 Topsoil

Topsoil was encountered from ground level to depths of between 0.20 and 1.35m bgl in fifteen of the trial holes. The Topsoil typically comprised turf over dark brown, silty sandy CLAY with occasional gravel. The gravel comprised flint.

The depths of Topsoil as encountered in the boreholes are given in Table 2.3.

Table 2.3
Maximum Depth of Topsoil

Trial Hole	Depth (m bgl)
WS2	0.40
WS3	0.25
WS4	0.20
S1	0.50
S2	0.40
S3	0.50
TP1	0.35
TP2	0.65
TP3	0.40
TP4	0.25
TP101	1.35
TP102	0.80
TP103	0.40
TP104	0.20
TP108	0.70

No visual or olfactory evidence of contamination was identified within the samples recovered from the Topsoil.

2.2.2 Made Ground

Made Ground was encountered in eleven of the trial holes from ground level to depths of between 0.50 and 1.20m bgl. The Made Ground comprised dark brown, silty CLAY with occasional brick rubble, flint cobbles and ash.

The depths of Made Ground as encountered in the boreholes are given in Table 2.4.

Table 2.4
Maximum Depth of Made Ground

Trial Hole	Depth (m bgl)
WS1	0.70
WS5	0.50
WS7	0.60
WS8	0.70
WS9	0.80
WS10	0.80
TP104	0.50
TP105	1.20
TP106	0.20
TP109	0.20

©Soils Limited
December 2014

Table 2.4 Maximum Depth of Made Ground	
Trial Hole	**Depth (m bgl)**
TP110	0.30

No olfactory evidence of contamination was identified within the samples recovered from the Made Ground however visual evidence of contamination was recorded in the form of ash.

2.2.3 Head Deposits

The Head Deposits were encountered immediately below the Topsoil or Made Ground in all locations and were observed to depths of between >4.00m bgl. The Head Deposits comprised soft to firm orange-brown, CLAY with variable quantities of flint and chalk gravel.

Locally the Head Deposits became orange-brown slightly clayey SAND with abundant gravel. At the interface between the Head Deposits and the Lewes Nodular Chalk Formation, a very gravelly band was noted within WS2-3, WS7-10.

The maximum depths of the Head Deposits as encountered in the trial holes are given in Table 2.5.

Table 2.5 Maximum Depth of Head Deposits	
Trial Hole	**Depth (m bgl)**
WS1	4.00
WS2	2.80
WS3	2.00*
WS4	2.00*
WS5	2.00
WS7	2.50
WS8	2.70
WS9	3.00
WS10	2.30
S1	2.00**
S2	2.00**
S3	2.30**
TP1	3.30**
TP2	3.30**
TP3	3.00**
TP4	3.50**
TP101	3.00**
TP102	2.90**
TP103	3.00**
TP104	3.00**
TP105	3.00**
TP106	3.00**

©Soils Limited
December 2014

Table 2.5
Maximum Depth of Head Deposits

Trial Hole	Depth (m bgl)
TP108	3.00**
TP109	3.00**
TP110	3.00**

Notes:-
* Not proven
** Maximum depth of trial holes

No recovery was noted within WS3 and WS4 between 2.00-2.80m bgl and therefore the depth of Head, and start depth of the underlying Lewes Nodular Chalk Formation was unproven. Given the increased gravel content noted within WS2-3 and WS7-10, at the interface between the Head Deposits and Lewes Nodular Chalk Formation, it was inferred that the loss of recovery was Head Deposits.

No visual or olfactory evidence of contamination was identified within the samples recovered from the Head Deposits.

2.2.4 Lewes Nodular Chalk Formation

Soils of the Lewes Nodular Chalk Formation were encountered in eight trial holes immediately below the Head Deposits at depths between 2.00m bgl and 2.80m bgl.

Where encountered the soil of the Lewes Nodular Chalk Formation were typically highly weathered – recovered as soft, grey yellow white clayey sandy gravelly CHALK.

Where encountered the Lewes Nodular Chalk Formation persisted to the maximum depth of the investigation (4.00m bgl) and was inferred to the full depth of the dynamic probe holes (6.00m bgl).

The depth that the Lewes Nodular Chalk Formation was encountered in the trial holes is given in Table 2.6.

Table 2.6
Depth of Lewes Nodular Chalk Formation

Trial Hole	Depth Encountered (m bgl)	Base of Trial Hole (m bgl)
WS2	2.80	4.00*
WS3	2.80	4.00*
WS4	2.80	4.00*
WS5	2.00	4.00*
WS7	2.50	4.00*
WS8	2.70	4.00*
WS9	3.00	4.00*
WS10	2.30	4.00*

Notes:-
* Not proven

©Soils Limited
December 2014

No recovery was noted within WS3 and WS4 between 2.00-2.80m bgl and therefore the depth of Head, and the depth of the underlying Lewes Nodular Chalk Formation was unproven.

No visual or olfactory evidence of contamination was identified within the samples recovered from the Lewes Nodular Chalk Formation.

2.3 Roots

Roots were observed within the trial holes to a maximum depth of 1.30m bgl within S1. Table 2.7 shows the observed depths of roots within each trial hole.

Table 2.7
Summary of Root Observations

Trial Hole	Root Depth (m bgl)	Stratum	Description	Base of Hole (m bgl)
WS1	0.80	Head Deposits	Roots and rootlets	4.00
WS2	0.70		Roots	4.00
WS3	0.60		Roots and rootlets	4.00
WS4	0.50		Roots and rootlets	4.00
WS5	0.50		Roots and rootlets	4.00
WS7	0.50	Made Ground	Roots	4.00
WS8	None observed			
WS9	0.80	Head Deposits	Roots and rootlets	4.00
WS10	None observed			
S1	1.30	Head Deposits	Roots and rootlets	2.00
S2	0.80		Roots	2.00
S3	0.50		Roots	2.30
TP1	0.35	Head Deposits	Roots and rootlets	3.30
TP2	0.70		Roots and rootlets	3.30
TP3	0.70		Roots and rootlets	3.00
TP4	1.10		Roots and rootlets	3.50
TP101	0.20	Topsoil	Roots and rootlets	3.00
TP102	0.25		Roots and rootlets	2.90
TP103	0.20		Roots and rootlets	3.00
TP104	0.50	Made Ground	Roots and rootlets	3.00
TP105	None observed			
TP106	0.20	Made Ground	Roots and rootlets	3.00
TP108	0.25	Topsoil	Roots and rootlets	3.00
TP109	0.20	Made Ground	Roots and rootlets	3.00
TP110	None observed			

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

Trees were present on the site, typically on the site along the site and field boundaries.

2.4 Groundwater

Groundwater was encountered in three of the trial holes during the course of the October 2012 investigation at a depth of 2.30m bgl in TP3 and S3, and at a depth of 3.00m bgl in TP4. Groundwater was not encountered during drilling in the February 2014 investigation

©Soils Limited
December 2014

but was encountered in three of the trial pits excavated during the November 2014 investigation at depths of 3.00m bgl (TP103, TP108 and TP109).

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation phases during which groundwater was encountered were conducted in October 2012 and November 2014 when groundwater levels should have been rising from their annual minimum (lowest elevation). However, the summer of 2012 was one of the wettest on record resulting in uncharacteristically high groundwater levels for the time of year.

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.

Dual-purpose groundwater and soil-gas monitoring wells were installed within four of the windowless sampler boreholes to facilitate post-works monitoring.

2.5 Post-works Groundwater and Soil-Gas Monitoring

Dual-purpose groundwater and soil-gas monitoring wells were installed within WS1-4 to 4.00m bgl to facilitate post-works groundwater monitoring. Groundwater, where present, was recovered from the wells for laboratory chemical analysis.

At the time of reporting seven return monitoring visits had been completed. Table 2.8 shows the groundwater observations recorded.

Table 2.8
Post-works Groundwater Observations within Wells (m bgl)

Borehole	6.11.12	15.11.12	3.12.12	20.12.12	04.01.13	01.02.13	14.11.14
WS1	2.52	2.69	2.61	1.09	1.13	1.99	Not located
WS2	3.60	3.65	3.61	2.65	2.71	4.05	Not located
WS3	2.47	2.54	2.58	0.95	1.01	2.56	2.74
WS4	1.38	1.61	1.35	0.27	0.35	0.91	1.13

A full Soil-Gas Risk Assessment was not requested as part of the specification of works.

Groundwater monitoring was not undertaken during the February 2014 (ref: 14099) phase of investigation, as this did not form part of the brief. At the time of reporting, December 2014, two return groundwater monitoring visits were outstanding.

©Soils Limited
December 2014

Section 3 Discussion of Geotechnical In-situ and Laboratory Testing

3.1 Dynamic Probe Tests

Dynamic probing (super heavy) was undertaken at ten locations (DP1-10), to depths of 6.00m bgl, adjacent and prior to the drilling of their respective windowless sampler boreholes. DP6 was drilled without a corresponding windowless sample borehole and as a result the geology at this location was inferred from changes in blow counts.

Dynamic probing involves the driving of a metal cone 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 number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permit engineering parameters to be generated.

The dynamic probe results were converted to equivalent SPT "N" values based on dynamic energy using in-house computer software (Geostru).

The inferred undrained cohesion of the cohesive soils was based on the equivalent SPT "N" blow counts, derived from the relationship suggested by Stroud (1974). *(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.).*

Fine (cohesive) soils were classified using Table 3.1.

Table 3.1
Cohesive Soil Classification

Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
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 Lewes Nodular Chalk Formation in accordance with CIRIA C574 'Engineering in Chalk' as the chalk samples recovered are disturbed by the windowless sampling 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 Lewes Nodular 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 3.2 provides this broad comparison.

©Soils Limited
December 2014

Table 3.2 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 3.3 provides an interpretation of the equivalent SPT 'N' blow counts for the soils of the Head Deposits (HD) and Lewes Nodular Chalk Formation (LNCF) encountered in the windowless sampler boreholes and those inferred from the dynamic probe counts.

Made Ground has been excluded from this interpretation.

Table 3.3 Interpretation of Dynamic Probe Blow Counts				
Strata	**Equivalent SPT "N" Blow Counts**	**Soil Type / Strength**		**DP**
		Cohesive	**Inferred CIRIA Grade**	
Head Sandy Clay 0.70 – 5.50m bgl	0 – 9	Extremely Low to Medium (C_u = <10 – 45kPa)		DP1
Lewes Nodular Chalk[1] 5.50 – 7.00m bgl	6 – 21		Structureless (Dm) to Structured	
Head Clay 0.40 – 0.95m bgl	3 - 9	Very Low to Medium (C_u = 15 – 45kPa)		DP2
Head Sandy Clay 0.95 – 1.90m bgl	0 - 9	Extremely Low to Medium (C_u = <10 – 45kPa)		
Head Silty Clay 1.90 – 2.80m bgl	9 - 39	Medium to Very High (C_u = 45 – 195kPa)		
Lewes Nodular Chalk[1] 2.80 – 6.00m bgl	9 – 33		Structureless (Dc) becoming Structured	
Head Clay 0.25 – 2.00m bgl	0 - 18	Extremely Low to High (C_u = <10 – 90kPa)		DP3
Lewes Nodular Chalk 2.00 – 4.00m bgl	0 - 39		Structureless (Dm) becoming Structured	
Lewes Nodular Chalk 4.00 – 5.70m bgl	9 - 90		Structureless (Dc) becoming Structured	
Head Clay 0.20 – 2.00m bgl	0 - 6	Extremely Low to Low (C_u = <10 – 30kPa)		DP4

©Soils Limited
December 2014

Table 3.3
Interpretation of Dynamic Probe Blow Counts

Strata	Equivalent SPT "N" Blow Counts	Soil Type / Strength		DP
		Cohesive	Inferred CIRIA Grade	
Lewes Nodular Chalk 2.00 – 4.00m bgl	3 - 18		Structureless (Dm) to Structured	
Lewes Nodular Chalk[1] 4.00 – 6.00m bgl	18 - 39		Structured	
Head Clay 0.60 - 1.90m bgl	0 - 12	Extremely Low to Medium (C_u = <10 – 60kPa)		DP5
Lewes Nodular Chalk 1.90 – 4.00m bgl	9 - 60		Structureless (Dc) to Structured	
Lewes Nodular Chalk[1] 4.00 – 6.00m bgl	21 - 36		Structured	
Head[1] 0.40 – 1.90m bgl	9 - 21	Medium to High (C_u = 45 – 105kPa)		DP6
Lewes Nodular Chalk[1] 1.90 – 5.80m bgl	6 – 30		Structureless (Dm) becoming Structured	
Head Gravelly Clay 0.60 – 1.80m bgl	0 - 6	Extremely Low to Low (C_u = <10 – 30kPa)		DP7
Head Gravelly Clay 1.80 – 2.50m bgl	12 - 18	Medium to High (C_u = 60 – 90kPa)		
Lewes Nodular Chalk[1] 2.50 – 6.00m bgl	9 -27		Structureless (Dc) to Structured	
Head Gravelly Clay 0.70 – 2.70m bgl	0 - 9	Extremely Low to Medium (C_u = <10 – 45kPa)		DP8
Lewes Nodular Chalk 2.70 – 4.00m bgl	12 - 21		Structureless (Dc) to Structured	
Lewes Nodular Chalk[1] 4.00 – 6.00m bgl	6 - 27		Structureless (Dm) to Structured	
Head Silty Clay 0.80 – 2.10m bgl	3 - 12	Very Low to Medium (C_u = 15 – 60kPa)		DP9
Head Silty Clay 2.10 – 3.00m bgl	0 - 12	Extremely Low to Medium (C_u = <10 – 60kPa)		
Lewes Nodular Chalk 3.00 – 4.00m bgl	0 - 12		Structureless (Dm) to Structureless (Dc)	
Lewes Nodular Chalk[1] 4.00 – 6.00m bgl	21 - 36		Structured Chalk	DP9
Head Silty Clay 0.80 – 2.30m bgl	3 - 21	Very Low to High (C_u = 15 – 105kPa)		DP10

©Soils Limited
December 2014

Table 3.3 Interpretation of Dynamic Probe Blow Counts				
Strata	**Equivalent SPT "N" Blow Counts**	**Soil Type / Strength**		**DP**
		Cohesive	**Inferred CIRIA Grade**	
Lewes Nodular Chalk[1] 2.30 – 6.00m bgl	6 - 30		Structureless (Dm) to Structured	

(BS EN ISO 22476-2:2005 Geotechnical investigation and testing Field testing Part 2: Dynamic probing)

[1]Ground conditions inferred below base of corresponding Windowless Sampler Borehole.

The cohesive soils of the Head were classified as **extremely low to very high,** typically showing an increase in strength with depth, with inferred cohesive strengths of between <10 to 195kPa. ***Please note;*** One dynamic probe (DP1) was classified as extremely low to low from 2.50 – 5.30m bgl displaying cohesive strengths of <10kpa.

The inferred CIRIA grade for the Lewes Nodular Chalk Formation was **structureless (Dm) becoming structured,** typically structureless (Dc) to structured chalk.

The dynamic probe test results are presented within Appendix A.

3.2 Atterberg Limit Tests

Atterberg Limits tests were performed on ten soil samples from the Head a précis of the results is given in Table 3.4.

Table 3.4 Atterberg Limit Test Interpretation							
Stratum	**Moisture Content Range (%)**	**Plasticity Index Range (%)**	**Passing 425µm Sieve (%)**	**Modified Plasticity Index (%)**	**Soil Classification**	**Volume Change Potential**	
						BRE	**NHBC**
H	17 - 27	15 - 45	20-100	8 - 29	CL to CH	Low to Medium	None to Medium

(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

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

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 of the Atterberg Limit tests showed that the cohesive soils of the Head displayed **low to medium** volume change potential in accordance with BRE Digest 240 and **none to medium** volume change potential in accordance NHBC Standards Chapter 4.2.

©Soils Limited
December 2014

The test results are given in Appendix B.

3.3 Grading Analysis Tests

2No. samples from the Head Deposits (HD) were submitted for grading analysis (particle size distribution tests). An interpretation of the results is provided in Table 3.5.

Table 3.5
Grading Analyses Interpretation

Stratum	Location/Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
			BRE	NHBC	
HD	WS10 at 2.00	Silty CLAY with gravel	Yes	No	18.8
HD	TP2 at 1.50	Very sandy GRAVEL	Yes	No	15.5

(The Particle Size Distribution Tests were undertaken in accordance with BS 1377: Part 2: 1990 clause 9)

NB Volume Change Potential refers to BRE Digest 240 (based on Grading test results).

Volume Change Potential – BRE 240 states that a soil has a volume change potential when the clay fraction exceeds 15%. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve. NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.

The two samples tested from the cohesive soils of the Head **possessed volume change potential** in accordance with BRE Digest 240 but expressed **no volume change potential** in accordance with NHBC Standards Chapter 4.2

The test results are given in Appendix B.

3.4 Infiltration Tests

Infiltration tests were undertaken in 26th October 2012, 4th March 2014 and 18th March 2014 and comprised the excavation of seventeen trial holes using an excavator to a maximum depth of 3.00m bgl with infiltration testing carried out following the principles of BRE Digest 365 Soakaway design: 1991.

The water for each test was piped into trial holes using a 4" diameter hose from a 10,000L water bowser to provide suitably rapid/volume discharge. The infiltration was measured form the side of each trial hole at ground level. The location of the trial holes was determined through discussion between the Soils Limited Engineer and the Client, targeting anticipated soakage areas.

26th October 2012 (Ref: 13284)
Infiltration tests were undertaken within trial pits SA1, SA2 and SA3, within soils described as the Head Deposits.

4th March 2014 (Ref: 14150/SoakRes/SL)
Infiltration tests were undertaken within trial pits S4, S5, S6, S8 and TP11, within soils described as the Head Deposits.

©Soils Limited
December 2014

18th March 2014 (Ref: 14186/SL)
Infiltration tests were undertaken within trial pits S101-S109 within soils described as Head Deposits.

Ground Conditions Encountered
Ground conditions were consistent with those encountered during other phases of investigation and were found to comprise a covering of Topsoil or Made Ground over typically cohesive soils (sandy silty CLAY with occasional fine gravel) of the Head Deposits. The Lewes Nodular Chalk Formation was not encountered in any of the trial pits due to the limited depths to which the plant could operate; however it was encountered during the earlier phase of investigation (14099/GIR, February 2014) at depths of between 2.00m and 2.80m bgl.

Logs of the ground conditions encountered within each trial pit are presented within Appendix A.

Infiltration Tests
Infiltration tests were undertaken within the trial pits (SA1-SA3, S1-6, TP11 and S101-109), within the Head Deposits, following the principles of BRE Digest 365 Soakaway design: 1991. BRE 365 states that for an accurate infiltration rate to be obtained a soakage pit needs to be filled three times in quick succession. Each test can only be ended once 75% of the water present has drained away. Infiltration tests were not repeated three times due to time restrictions.

Table 3.6 shows a précis of the results.

Table 3.6
Summary of Soakage Results

Test Location	Geology Targeted	Time (mins)	Water Loss (metres)	Infiltration rate (m/sec)
SA1, Soak 1	Head Deposits	350	0.10	Insufficient Infiltration Rate
SA2, Soak 1	Head Deposits	295	0.00	Insufficient Infiltration Rate
SA3, Soak 1	Head Deposits	147	0.00	Insufficient Infiltration Rate
S4, Soak 1	Head Deposits	360	0.18	1.014×10^{-5}
S5, Soak 1	Head Deposits	230	0.61	1.879×10^{-5}
S6, Soak 1	Head Deposits	265	0.39	1.2096×10^{-5}
S8, Soak 1	Head Deposits	120	0.08	Insufficient Infiltration Rate
TP11, Soak 1	Head Deposits	260	0.04	Insufficient Infiltration Rate
S101, Soak 1	Head Deposits	248	0.00	Insufficient Infiltration Rate
S102, Soak 1	Head Deposits	331	0.01	Insufficient Infiltration Rate
S103, Soak 1	Made Ground	101	0.43	2.918×10^{-5}
S103, Soak 2	Made Ground	112	0.09	1.042×10^{-5}
S104, Soak 1	Head Deposits	125	0.18	1.782×10^{-5}
S104, Soak 2	Head Deposits	143	0.30	2.813×10^{-5}
S107, Soak 1	Head Deposits	250	0.07	1.016×10^{-5}
S108, Soak 1	Head Deposits	223	0.10	5.484×10^{-5}
S109, Soak 1	Head Deposits	52	0.25	4.263×10^{-5}
S109, Soak 2	Head Deposits	115	0.25	1.476×10^{-5}

The test showed that head loss was insufficient to calculate an infiltration rate within SA1-3, S8, TP11 and SA101-102 to comply with the requirements of BRE365.

©Soils Limited
December 2014

Section 4 Foundation Design

4.1 General

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

4.1.1 Topsoil or Made Ground

The terms *Fill* and *Made Ground* are 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, the Fill and/or 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 and Fill, includes the caveat that *'all made ground should be treated as suspect, because of the likelihood of extreme variability'*.

Topsoil was encountered from ground level to depths of between 0.20 and 0.95 m bgl in ten of the trial holes. The Topsoil typically comprised turf over dark brown, silty sandy CLAY with occasional gravel. The gravel comprised flint.

Made Ground was encountered in six of the trial holes from ground level to depths of between 0.50 and 0.80m bgl. The Made Ground comprised dark brown, silty CLAY with occasional brick rubble, flint cobbles and ash.

A result of the inherent variability, particularly of uncontrolled Fill and/or Made Ground, is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Fill and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

4.1.2 Head Deposits

The Head Deposits were encountered immediately below the Topsoil or Made Ground in all locations and were observed to depths of between >4.00m bgl. The Head Deposits comprised soft to firm orange-brown, CLAY with variable quantities of flint and chalk gravel.

Locally the Head Deposits became orange-brown slightly clayey SAND with abundant gravel. At the interface between the Head Deposits and the Lewes Nodular Chalk Formation, a very gravelly band was noted within WS2-3, WS7-10.

Soils described as the Head Deposits were encountered immediately below the Topsoil or Made Ground in all locations and were observed to depths of between 2.00m bgl and >4.00m bgl. The Head Deposits comprised cohesive orange-brown, CLAY with variable quantities of flint and chalk gravel.

©Soils Limited
December 2014

At the interface between the Head Deposits and the Lewes Nodular Chalk Formation, a very gravelly band of Head Deposits was noted within WS2-3, WS7-1.

The cohesive soils of the Head were classified as **extremely low to very high,** typically showing an increase in strength with depth with inferred cohesive strengths of between <10 to 195kPa.

Please note; one dynamic probe (DP1) was classified as extremely low to low from 2.50 – 5.30m bgl displaying cohesive strengths of <10kpa. DP1 was located within the north-east corner of the site, within the footprint area of proposed residential units.

An increase in gravel content was noted within WS2-3 and WS7-10 at the interface between the Head Deposits and the Lewes Nodular Chalk Formation.
No recovery was noted within WS3 and WS4 between 2.00-2.80m bgl and therefore the depth of Head, and the underlying Lewes Nodular Chalk Formation was unproven. Given the increased gravel content noted within WS2-3 and WS7-10, at the interface between the Head Deposits and Lewes Nodular Chalk Formation, it was inferred that the loss of recovery was Head Deposits.

The results of the Atterberg Limit tests showed that the cohesive soils of the Head displayed **none to medium** volume change potential in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

Grading analysis tests proved that the cohesive soils of the Head and **possessed volume change potential** in accordance with BRE Digest 240 but expressed **no volume change potential** in accordance with NHBC Standards Chapter 4.2

The cohesive soils of the Head are normally consolidated and as such generally have moderate bearing capacities and moderate to high settlement characteristics. The Head was variable in strength and content from depths of between 0.25 and 2.00m bgl typically displaying classifications of extremely low to low however when the cohesive soils were encountered at depths greater than 2.00m bgl they were typically medium to high strength as a result the soils of the Head can be considered a suitable bearing stratum provided foundations are cast at 2.00m bgl or below.

4.1.3 Lewes Nodular Chalk Formation

Soils of the Lewes Nodular Chalk Formation were encountered in eight trial pits immediately below the Head Deposits at depths between 2.00m bgl and 2.80m bgl.

Where encountered the soil of the Lewes Nodular Chalk Formation were typically highly weathered – recovered as soft, grey yellow white clayey sandy gravelly CHALK.

Where encountered the Lewes Nodular Chalk Formation persisted to the maximum depth of the investigation (4.00m bgl) and was inferred to the full depth of the dynamic probe holes (6.00m bgl).

The inferred CIRIA grade for the Lewes Nodular Chalk Formation was **structureless (Dm) becoming structured**, typically structureless (Dc) to structured chalk.

The Lewes Nodular Chalk Formation would display high bearing capacities with moderate to low settlement characteristics and can be considered suitable bearing stratum considering the shallow depths encountered on site.

4.1.4 Roots

Roots were observed within the trial holes to a maximum depth of 1.30m bgl (S1).

Trees were present on the site, typically along the site and field boundaries.

Please note; roots may be found to greater depths at other locations on the site or around the site particularly close to existing trees and/or trees that have been removed around the site.

4.1.5 Groundwater

Groundwater was encountered in the first phase of investigation (October 2012) in three of the trial holes at a depth of 2.30m bgl in TP3 and S3, and at a depth of 3.00m bgl in TP4, however groundwater was not encountered in the second phase of investigation (February 2014). 2012 was one of the wettest summers on record and as a result it is not considered that the groundwater records form this period would be representative of typical ground conditions. Furthermore, groundwater strikes were not observed during the second phase of investigation, which was conducted during one of the wettest winters on record.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage.

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. Groundwater is not anticipated to cause a problem during construction of foundations, however, given the variability in groundwater readings a further period of groundwater monitoring must be undertaken to ensure that groundwater will not present a problem during construction of foundations.

Dual-purpose groundwater and soil-gas monitoring wells were installed within four of the windowless sampler boreholes to facilitate post-works monitoring.

Surface water ingress must be prevented from entering foundation trenches.

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

©Soils Limited
December 2014

4.2 Foundation Scheme

The proposed development was the erection of 81 dwellings consisting of 10no. two bed flats, 12no. two bed flats, 6no. two bed houses and 53no. three bed houses. The proposed redevelopment included the construction of access from Ranelagh Road, provision of landscaping, open space and associated works.

At the time of reporting, February 2014, anticipated foundation loads were not known to Soils Limited.

Considering the type of structures proposed and ground conditions encountered strip footings were considered as a suitable foundations scheme.

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 the Atterberg Limit tests showed that the cohesive soils of the Head expressed none to medium volume change potential in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

Medium volume change potential must be adopted for the proposed development where foundations bear onto or pass 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 Conclusions and Recommendations

Foundations **must not** be constructed within any Topsoil, Made Ground or low strength cohesive soils of the Head due to the likely variability and potential for large load induced settlements both total and differential.

Foundations **must not** be placed within any live root penetrated or desiccated cohesive soils. Should the foundation excavations reveal such materials, the excavations **must** be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

Roots were encountered to depths of up to 1.30m bgl. Strip foundations can be considered across the site where suitable bearing values are achievable however footings must not be placed within any live root penetrated or desiccated soils.

Allowable bearing values based on the soils of the Head or underlying Lewes Nodular Chalk Formation have been calculated, the results presented in Table 4.1. Dynamic probes (DP3, 8 and 9) were the worst case scenario and subsequently used in the foundation design.

Table 4.1
Allowable Bearing Capacities

Stratum (Soil Type)	Dynamic Probe Design	Foundation Dimensions (m)	Foundation Depth (m bgl)	Allowable Bearing Value (kN/m^2)	Estimated Total Settlement (mm)
Head	DP3	5.00 x 1.00	2.00	115	<25
Lewes Nodular Chalk			2.25	130	<25
			2.50	150	<25
Head	DP8	5.00 x 1.00	2.00	115	<25
			2.25	125	<25
			2.50	140	<25
Head	DP9	5.00 x 1.00	2.00	115	<20
			2.25	115	<20
			2.50	150	<25

These values can be considered when targeting the bearing stratum and soil type presented.

One dynamic probe (DP1) was classified as extremely low to low from 2.50 – 5.30m bgl displaying cohesive strengths of <10kpa. Considering the **'soft ground'** encountered in DP1 it is recommended that further testing, in the form of dynamic probing is undertaken in this area in order to determine the extent of this soft ground..

©Soils Limited
December 2014

Where the above allowable bearing pressures are not sufficient for the proposed development, where foundations are required to be uneconomically deep or difficult to construct then consideration should be given to a piled foundation solution – please refer to the Soils Limited Phase III Ground Investigation (ref. 14492/GIR, dated October 2014) for information on piled foundations.

Groundwater was encountered in the first phase of investigation (October 2012) in three of the trial holes at a depth of 2.30m bgl in TP3 and S3, and at a depth of 3.00m bgl in TP4, however groundwater was not encountered in the second phase of investigation (February 2014). Considering that 2012 was one of the wettest years on record and no water strikes were noted in the second phase of investigation, groundwater is not expected to cause a problem during investigation, however additional monitoring must be undertaken to confirm groundwater levels.

Reinforcement must be used to reduce the possibility of differential settlement due to the variable ground conditions encountered within the Head.

All loose material and soft spots must be removed from the base of the excavations, these excavations then being either concreted or blinded as soon after excavation as possible. Failure to do so could results in increased settlements.

Foundations must not be cast over foundations of former structures and/or other hard spots.

The adoption of a suspended ground floor is recommended due to the typically medium volume change potential associated with the cohesive soils of the Head.

4.3 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class **DS-1** of the BRE Special Digest 1 2005, *'Concrete in Aggressive Ground'.* Table C2 of the Digest indicated ACEC (Aggressive Chemical Environment for Concrete) site classifications of **AC-1**. The pH of the soil ranged between 8.1 and 8.5. For the classification given above, the mobile case was adopted for the natural soils as groundwater was encountered during the Phase II: 13284 investigation.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, *'Concrete in Aggressive Ground'* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

4.4 Excavations

Shallow excavations in the Topsoil, Made Ground and the cohesive soils of the Head are likely to be marginally stable at best.

Deep excavations taken through the Head and into the underlying Lewes Nodular Chalk Formation are likely to be unstable, particularly should groundwater be encountered.

©Soils Limited
December 2014

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.

4.5 Surface Water Disposal

Infiltration tests were undertaken in 26th October 2012, 4th March 2014 and 18th March 2014 and comprised the excavation of seventeen trial holes using an excavator to a maximum depth of 3.00m bgl with infiltration testing carried out following the principles of BRE Digest 365 Soakaway design: 1991.

During the investigation the tests comprised introducing water into the open trial hole. The drop in water level over time was then recorded to give an indication of soakage potential. The observations are detailed within Section 3.4 and Table 3.6.

The test showed that head loss was insufficient to calculate an infiltration rate within SA1-3, S8, TP11 and SA101-102 to comply with the requirements of BRE365 (i.e. zero infiltration). Where soakage was recorded infiltration rates of between 1.0 and 5.4 x 10^{-5}m/sec were recorded understood to be representative of the sandier horizons of the Head Deposits.

The results obtained from all phases of investigation have shown that variable infiltration rates are achievable across the site. Where the sandier horizons of the Head Deposits are targeted it is anticipated that sufficient infiltration would be achievable to allow the adoption of a soakaway drainage system.

Consultation with the Environment Agency must be sought regarding any use which may have an impact on groundwater resources.

©Soils Limited
December 2014

Section 5 Chemical Analysis of Soil Samples

5.1 Site Characterisation and Revised CSM

The Phase I Desk Study (report ref: 13284/DS, November 2012) identified a potential risk of contamination on-site from Made Ground from historical changes in land use, historical land use including allotments, orchards, nurseries, possible asbestos containing materials, and the farm/stable environment.

The various phases of intrusive investigation carried out to date encountered Made Ground in eleven of the trial holes from ground level to depths of between 0.50 and 1.20m bgl. The Made Ground comprised dark brown, silty CLAY with occasional brick rubble, flint cobbles and ash.

Off-site sources of potential contamination included a tannery, water works engine house, a brewery and a garage.

The Conceptual Site Model developed in report ref: 13284/DS is presented overleaf complete with any amendments applicable following the intrusive investigation:

©Soils Limited
December 2014

Table 5.1
Revised Tabulated Conceptual Site Model

Risk Rating	Source	Potential Migration Pathway	Potential Absorption Pathway	Receptor
ON SITE	Farm/Stable environment. **Moderate Risk** Allotments/orchards. **Low Risk** Made Ground from historical redevelopment. **Moderate risk** Nurseries (historical). **Low risk**	Via contact with impacted soil	Ingestion of soil Dermal contact Inhalation of dust (indoor and outdoor) Location of service supply pipes in contaminated soils Via anthropogenic pathways (services trenches)	**Human Health** Future users of the site Visitors to the site Construction workers on site Service and maintenance workers Site neighbours and wider public
				Building Materials Future Potable Water Supply Construction materials
		Consumption of home-grown produce	Ingestion Dermal contact	**Human Health** Future users of the site Visitors to the site
		~~Migration downwards via natural granular soils – Head Deposits~~ Migration via surface water		**Controlled Water** Future potable water supply
	Possible cement bound asbestos. **High Risk**	Dermal contact Inhalation of dust (indoor and outdoor)		**Human Health** Future users of the site Visitors to the site Construction workers on site Service and maintenance workers Site neighbours and wider public
OFF SITE	Tannery; Waterworks engine works to west; Brewery; Garage. **Low risk**	Groundwater Permeable soils Via anthropogenic pathways (services trenches)	Location of service supply pipes in contaminated soils direct contact of concrete to high-sulphate soils	**Human Health** Future users of the site Visitors to the site Construction workers on site Service and maintenance workers Site neighbours and wider public
				Building Materials Future Potable Water Supply Construction materials
		Via anthropogenic pathways (services trenches)		**Controlled Water** Surface waters Future Potable Water Supply

©Soils Limited
December 2014

Soil samples were taken from the logged arising recovered from the trial holes and placed in individual clean sampling containers to determine whether the soils had been impacted in order to assess the likelihood of human health being affected.

5.2 Soil Sampling

The strategy for the selection of the locations of exploratory positions was based on:

- The conceptual source, pathway and receptor model;
- Contaminative activities identified by the Conceptual Site Model;
- The sampling specification provided by the client;
- The proposed development layout plan provided by the client.

A non-targeted sampling strategy is appropriate when there is:

- No adequate information available regarding the likely locations of contamination;
- No sensitive areas where there is a need for a high degree of confidence.

A targeted sampling strategy is appropriate when there is:

- Adequate information available regarding the likely locations of contamination;
- Sensitive areas where there is a need for a high degree of confidence.

Given the size of the proposed development both a targeted and non-targeted sampling pattern was adopted, with locations selected from near surface soils (Topsoil / Made Ground or Head Deposits) typically in areas of proposed soft landscaping (based on the proposed development drawing provided) and from soils to provide coverage across the proposed development area.

The sampling depths reflected both receptor and exposure scenarios of concern for the human health receptor (this being end users, ground workers, future maintenance workers), current and future buildings in Table 5.2.

Table 5.2
Sample Depth And Potential Receptors

Sample Depth (m bgl)	Receptors
0.10 – 0.60	Site operatives, end users and maintenance workers e.g. landscape gardeners; current and future buildings; future potable water supply.

Table 5.3 provides a summary of the sampling strategy.

©Soils Limited
December 2014

Table 5.3 Summary of Sampling Strategy		
Location and Depth (m bgl)	**Description**	**Proposed use / Former use / Notes**
WS1 at 0.10	Targeted: MG	General Site Coverage / Former Nursery (Glasshouses)
WS2 at 0.30	Targeted: TS	Private gardens / General Site Coverage / Former Brick Fields
WS3 at 0.10	Targeted: TS	Private gardens / Engineering works to south
WS4 at 0.10	Targeted: TS	General Site Coverage / Former Farm Yard
WS4 at 0.40	Non-targeted: HD	General Site Coverage / Former Farm Yard
S1 at 0.40	Non-targeted: TS	General Site Coverage / Former Allotments
TP1 at 0.20	Targeted: TS	Private Gardens / Former Allotments
TP2 at 0.50	Targeted: TS	Private Gardens / Former Brick Fields
TP3 at 0.40	Non-targeted: HD	General Site Coverage / Former Brick Fields
WS5 at 0.60	Targeted: HD	Private Gardens / Amenity Space / Former Brick Fields
WS7 at 0.70	Targeted: HD	Private gardens / General Site Coverage / Former Farm Yard
WS8 at 0.40	Targeted: MG	Private gardens / General Site Coverage / Former Farm Yard
WS9 at 0.60	Targeted: MG	General Site Coverage / Former Nursery (Glasshouses)
TP101 at 0.25	Targeted: TS	General Site Coverage / Former Brick Fields
TP102 at 0.50	Targeted: TS	Private Gardens / Former Brick Fields
TP103 at 0.50	Non-targeted: HD	General Site Coverage / Former Brick Fields
TP104 at 0.25	Targeted: MG	Private gardens / Engineering works to south
TP105 at 0.25	Targeted: MG	General Site Coverage / Former Nursery (Glasshouses)
TP106 at 0.25	Non-targeted: HD	General Site Coverage / Former Nursery (Glasshouses)
TP108 at 0.25	Targeted: TS	Private gardens / Former Farm Yard
TP109 at 0.25	Targeted: HD	General Site Coverage / Former Nursery (Glasshouses)
TP110 at 0.25	Targeted: MG	General Site Coverage / Former Nursery (Glasshouses)

Notes: TS = Topsoil; MG = Made Ground; HD = Head Deposits

5.3 Determination of Contaminants of Concern - Soil

The driver for the determination of the analysis suite was the information requested by the client and information obtained from both the Phase I Desk Study and the various stages of intrusive works that formed this Phase II Ground Investigation.

The analysis suite is presented in Table 5.4.

©Soils Limited
December 2014

Table 5.4
Determination of Contaminants of Concern – Soil Samples

Determinant	Location / Depth (m bgl)												
	WS1 0.10	WS2 0.30	WS3 0.10	WS4 0.10	WS4 0.40	S1 0.40	TP1 0.20	TP2 0.50	TP3 0.40	WS5 0.60	WS7 0.40	WS8 0.40	WS9 0.60
Asbestos Screening	√	√	√	√	√	√	√	√	√	√	√	√	√
Total phenols	√	√	√	√	√	√	√	√	√	√	√	√	√
Total Cyanide	√	√	√	√	√	√	√	√	√	√	√	√	√
Organic Matter	√	√	√	√	√	√	√	√	√	√	√	√	√
pH	√	√	√	√	√	√	√	√	√	√	√	√	√
metals:	√	√	√	√	√	√	√	√	√	√	√	√	√
metalloids	√	√	√	√	√	√	√	√	√	√	√	√	√
organics	√	√	√	√	√	√	√	√	√	√	√	√	√
PAHs	√	√	√	√	√	√	√	√	√	√	√	√	√
TPH-CWG			√	√								√	√
BTEX			√	√								√	√
Pesticides							√						
Herbicides							√						

Determinant	Location / Depth (m bgl)												
	TP101 0.25	TP102 0.50	TP103 0.50	TP104 0.25	TP105 0.25	TP106 0.25	TP108 0.25	TP109 0.25	TP110 0.25				
Asbestos Screening	√	√	√	√	√	√	√	√	√				
Total phenols	√	√	√	√	√	√	√	√	√				
Total Cyanide	√	√	√	√	√	√	√	√	√				
Organic Matter	√	√	√	√	√	√	√	√	√				
pH	√	√	√	√	√	√	√	√	√				
metals:	√	√	√	√	√	√	√	√	√				
metalloids	√	√	√	√	√	√	√	√	√				
organics	√	√	√	√	√	√	√	√	√				
PAHs	√	√	√	√	√	√	√	√	√				
TPH-CWG		√		√	√	√	√		√				
BTEX + MTBE		√		√	√	√	√		√				

Notes: **metals**: Cd, Cr, Pb, Hg, Ni, Se, CN, S, Cu, Zn, Bo, V **metalloids**: As **organics**: USEPA 16 speciated PAH, TPH-CWG (speciated). **Asbestos Screening** aims at identifying fibres or fibrous material, which are indicative of the presence of asbestos. Should fibres or fibrous material be detected the sample is characterised as "Detected" and is subsequently submitted for further analysis for confirmation and speciation if required.

5.4 Determination of Contaminants of Concern - Groundwater

Samples of groundwater were collected from the wells installed within WS1, WS3 and WS4 during a sampling visit on the 6th November 2012.

The driver for the determination of the analysis suite was the information requested by the client and information obtained from both the Phase I Desk Study and the Phase II intrusive investigation.

The analysis suite is presented in Table 5.5.

©Soils Limited
December 2014

Table 5.5 Determination of Contaminants of Concern – Groundwater Samples (November 2012)			
Determinant	Location		
	WS1	WS3	WS4
Total phenols	√	√	√
Total Cyanide	√	√	√
Organic Matter	√	√	√
pH	√	√	√
metals:	√	√	√
metalloids	√	√	√
organics	√	√	√
PAHs	√	√	√
TPH-CWG	√	√	√
BTEX	√	√	√

Further to comments received by the Local Authority a second round of groundwater sampling and laboratory testing was undertaken. Groundwater samples were recovered from wells WS3 and WS4 on 14th November 2014 and sent to the laboratory for analysis.

The analysis suite is presented in Table 5.6.

Table 5.6 Determination of Contaminants of Concern – Groundwater Samples (November 2014)		
Determinant	Location	
	WS3	WS4
Total phenols	√	√
Total Cyanide	√	√
Organic Matter	√	√
pH	√	√
metals:	√	√
metalloids	√	√
organics	√	√
PAHs	√	√
TPH-CWG	√	√
BTEX + MTBE	√	√

The results of the groundwater analysis are discussed in Section 6.3.

©Soils Limited
December 2014

Section 6 Qualitative Risk Assessment

6.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix D.

6.2 Representative Contamination Criteria - Soil

The proposed development was to include the erection of 81 dwellings consisting of 10No. two-bed flats, 12No. two-bed flats, 6No. two-bed houses and 53No. three-bed houses. The proposed redevelopment included soft and hard landscaping such as access roads and private gardens.

In compiling this report reliance was placed on drawing number SS/RR/02, Ranelagh Road Site Setup, undated, provided by Foreman Homes. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations or conclusions presented within this report. Soils Limited must be notified about any such changes.

The results of the comparison of the representative contaminants concentration for human health receptor to the Soil Guideline Values (SGV), Atkins ATRISK^{soil} SSV Guideline Values for Lead and General Assessment Criteria (GAC) are presented in Table 6.1.

The SGV and GAC are assessed against the "Residential" land-use scenario, which was considered the most appropriate land-use scenario, given the type of the proposed redevelopment (residential houses).

The assessment for lead was undertaken based on the ATRISK^{soil} Soil Screening Value (SSV) for the "Residential with plant uptake" land-use scenario.

Table 6.1
Summary of Chemical Analysis of Soil Samples

Substance	Sample location where SGV, SSV or GAC adopted were exceeded for the '*Residential* land-use scenario
Arsenic	None
Beryllium	
w/s Boron	
Cadmium	
Chromium	
Copper	
Lead	**WS8 @ 0.40m bgl**
Mercury (inorganic)	None
Nickel	
Selenium	
Vanadium	
Zinc	
Total Cyanide	
PAHs	
TPH-CWG (speciated)	
BTEX	
Pesticides	
Herbicides	

©Soils Limited
December 2014

Table 6.1 **Summary of Chemical Analysis of Soil Samples**	
Substance	**Sample location where SGV, SSV or GAC adopted were exceeded for the '*Residential*' land-use scenario**
Asbestos Screening	Not detected

To assess the potential toxicity to the human health receptor from the concentrations of organic compounds tested for, Soil Organic Matter (SOM) tests were undertaken on the samples submitted for chemical testing, which revealed SOM values of between 0.2% and 11.5%. For each soil sample tested, the Soil Organic Matter recorded was used to derive the appropriate GAC for organic determinants.

In summary, one sample tested showed **concentrations in excess of the relevant DEFRA SGV and ATRISK^{soil} SSV for a residential land-use scenario**. In WS8 at 0.40 bgl Lead was recorded at a concentration of 385mg/kg against the residential end-use ATRISK^{soil} SSV of 276mg/kg, which was above the threshold value.

No further exceedances were recorded within the supplementary soil sampling and testing carried out as part of the November 2014 intrusive works.

Note on Asbestos; whilst asbestos was not identified in any of the samples tested it is possible that asbestos is present in other areas of the site. If encountered, care must be taken to ensure any such material is separated and disposed of in an appropriate manner to a licensed waste facility.

6.3 Representative Contamination Criteria - Groundwater

Groundwater testing was performed on samples recovered from the wells installed within WS1, WS3 and WS4 during November 2012 and from WS3 and WS4 in November 2014. The results of the groundwater testing are presented in Table 6.2.

Table 6.2 **Tabulated Results For Groundwater Samples**				
Determinant	**Units**	**EQS Source**	**EQS Level**	**Sample where EQS Level was exceeded**
Arsenic	µg/l	DWS	10	None
Cadmium	µg/l	DWS	5	None
Chromium	µg/l	DWS	50	None
Copper	µg/l	DWS	2000	None
Nickel	µg/l	SPAL	50-200	None
Lead	µg/l	SPAL	4 - 250	None
Mercury	µg/l	DWS	1	None
Selenium	µg/l	DWS	10	None
Zinc	µg/l	DWS	5000	None
Boron	µg/l	DWS	1000	None
Sulphate	mg/l	DWS	250	None
Sulphide	µg/l	SPAL	0.25	None
Total Cyanide	µg/l	DWS	50	None
Phenol [1]	µg/l	SPAL	300	None
Benzo (a) pyrene	µg/l	DWS	0.01	None
Naphthalene	µg/l	SPAL	10	None

©Soils Limited
December 2014

Polycyclic Aromatic Hydrocarbon (2)	µg/l	DWS	0.1	None
Total Petroleum Hydrocarbons	µg/l	NONE (3)	10	None
Benzene	µg/l	DWS	1	None
Toluene	µg/l	SPAL	50	None
Ethylbenzene	µg/l	WHO	300	None
Xylene	µg/l	SPAL	30	None
Notes	DWS = UK Drinking Water Standards SPAL = EA Standard for Protection of Aquatic Life (Freshwater) WHO = World Health Organisation Guidelines for Drinking Water Quality, 1984 (1) Taken as Maximum Allowable Concentration (2) Sum of fluoranthene, benzo 3.4 fluoranthene (*benzo (b) flouranthene)*, benzo 11.12 fluoranthene (*benzo (k) flouranthene)*, benzo 3.4 pyrene (*benzo (a) pyrene)* and indeno (1,2,3-cd) pyrene (3) Value given is former DWS EQS (Now withdrawn)			

In summary, **none of the determinants tested recorded concentrations above the groundwater screening values**.

6.4 Tier 1 Quantitative Risk Assessment - Soil

The intrusive ground investigation has proved from testing of soil samples collected on site that there was **a risk to the Human Health receptor**. An exceedance of lead was found in the Made Ground overlying natural strata in WS8 at 0.40m bgl.

In respect to the groundworkers and site operatives, it is understood that in order to minimise the effect of dust inhalation and dermal contact as exposure pathways, a good standard of personal hygiene must be adopted.

Full results of the contamination testing are presented in Appendix C.

6.5 Remedial Objective

Given that one of the samples tested (Soil) recorded an exceedence in respect to the relevant screening criteria for Lead there **was requirement for remediation of soil** as part of the proposed development.

WS8 contained an exceedence of **Lead** in excess of the relevant LQM CIEH GAC for a residential scenario.

It is considered likely that the existing shallow soil (Topsoil and Made Ground) will be removed from across the site as part of the 'site strip' however based solely on the results of the chemical analysis undertaken to date it is considered that the Made Ground in the areas of WS8 has been impacted by Lead contamination and would require removal and replacement with certified clean soil / Topsoil where proposed soft landscaping is required. The dig could potentially be reduced where natural strata is present at shallower depths on site. WS8 was located in an area of existing stables and it would be recommended that Made Ground within this area would be removed as part of the 'site strip', in particular in areas identified for proposed soft landscaping.

Given the development proposal and potential for layout changes it is recommended that formation level sampling and testing is carried out once the proposed soft landscaping has been set-out in the area of WS8. This will allow for

©Soils Limited
December 2014

more accurate delineation of potentially impacted Made Ground and the results would allow remediation methods to be finalised.

Given the chemical results to date, the shallow soil would be deemed suitable for reuse on site, with the exception of the soil removed from the existing stable area/WS8.

Any imported Topsoil used on this site shall be as defined in the British Standard BS3882:2007 Specification for Topsoil.

In addition any imported topsoil or other fill must be fit for purpose and must either be supplied with traceable chemical laboratory test certificates or be tested, either prior to placing or after placing, to ensure that the human receptor cannot come into contact with any compounds that could be detrimental to human health.

In respect to the groundworkers and site operatives, it is understood that in order to minimise the effect of dust inhalation and dermal contact as exposure pathways, a good standard of personal hygiene must be adopted.

6.6 Soil-Gas Risk

A Soil-Gas Risk Assessment was not requested as part of the proposed works as no soil-gas risk was identified within the Phase I Desk Study or subsequent Phase II Ground Investigation.

6.7 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust were generated as a result of construction activities. The site should be securely fenced at all times to prevent unauthorised access.

Washing facilities should be provided and eating restricted to mess huts.

6.8 Excavated Material

Excavated material must be classified with the Environment Agency for disposal at an appropriately licensed disposal facility. The requirements of Duty of Care and Health and Safety Guidance must be complied with.

Both Producers and Waste Management companies must ensure compliance with the new Waste Acceptance Criteria (WAC) prior to landfill in Hazardous, stable non-reactive cells and inert sites. These regulations govern the operation of landfill in England and Wales. Basic characterisation is the responsibility of the waste producer and compliance checking is generally the responsibility of the landfill operator. Therefore landfill operators will be unlikely to accept waste that does not meet the Waste Acceptance Criteria for their class of site.

©Soils Limited
December 2014

There is an obligation to 'treat' all soils destined for landfill, including non-hazardous waste. This treatment must now be documented and presented to the landfill operator or waste may be refused entry. Note that all liquids are banned from landfill.

For the purposes of legal compliance, 'treatment' must comprise three things (the 'three-point test'):

1. It must be a physical, thermal, chemical or biological process.
2. It must change the characteristics of the waste.
3. It must do so in order to:
    (a) reduce its volume, or
    (b) reduce its hazardous nature, or
    (c) facilitate its handling, or enhance its recovery.

WAC testing was not scheduled on any samples collected from the site during the intrusive works. Material contained in an existing bund close to the location of WS9 was examined and the material was found to comprise concrete rubble with little or no matrix. As a result it was not possible to test the material. Furthermore, as the material was concrete consideration could be given to crushing and re-using the material on-site and thus reducing costs associated with off-site disposal.

6.9 Re-use of Excavated Material On-site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

Under the EPR, material that is contaminated but otherwise suitable for re-use is also classified as waste and its re-use should be in accordance with the Environmental Permitting Regulations 2007 (EPR). Environmental Permit Exemptions (EPE) are for the re-use of non-hazardous or inert waste only; hazardous waste cannot be re-used under a permit exemption. EPE apply only to imported inert waste materials; inert material arising on site and recovered on site is not classified as waste and does not require an exemption. It is possible that materials arising on-site will be classified as inert and would not need an exemption.

Environmental Permit Exemptions are only allowed for certain activities, placing controls on the quantities that can be stored and re-used. The re-use of waste shall be within areas and levels defined in planning applications and permissions for the development. An EPE requires a site specific risk assessment for the receptor site to demonstrate that the materials are suitable for use, i.e. that they will not give rise to harm to human health or pollution of the environment.

Under the CL:AIRE voluntary code of practice (CoP) materials excavated on-site are not deemed contaminated if suitable for re-use at specified locations or generally within the site.

Material that may have been classified as hazardous waste under the EPR may be re-used. The CoP regime requires that a 'Qualified Person' as defined under the CoP reviews the development of the Materials Management Plan, including review of Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning

©Soils Limited
December 2014

and Regulatory issues, and signs a Declaration which is forwarded to the Environment Agency and which confirms compliance with the CoP.

Should it be necessary to import materials from another site where materials are excavated and which is not material from a quarry or produced under a WRAP protocol, then an EPE would be necessary for the imported material whether the work was managed under the CoP or the EPR.

6.10 Imported Material

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose for which it is intended.

6.11 Discovery Strategy

There may be areas of contamination that have not been identified during the course of the intrusive investigation. For instance, there may have been underground storage tanks (UST's) not identified during Ground Investigation for which there is no historical or contemporary evidence. Such occurrences may be discovered during the construction phases for the development of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination, this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person before proceeding, such that appropriate remedial measures and health and safety protection may be applied.

Should a new source of contamination be suspected or identified then the Local Authority and Soils Limited must be informed.

©Soils Limited
December 2014

The following figures and appendices complete this report:

Figure 1	Site Location Map
Figure 2	Trial Hole Layout Plan
Figure 3	Soakaway Test Location Plan

Appendix A	Field Work;
Appendix B	Geotechnical Laboratory Analysis;
Appendix C	Chemical Laboratory Test Results;
Appendix D	Soil Guideline Values and General Assessment Criteria;
Appendix E	Information Provided By The Client.

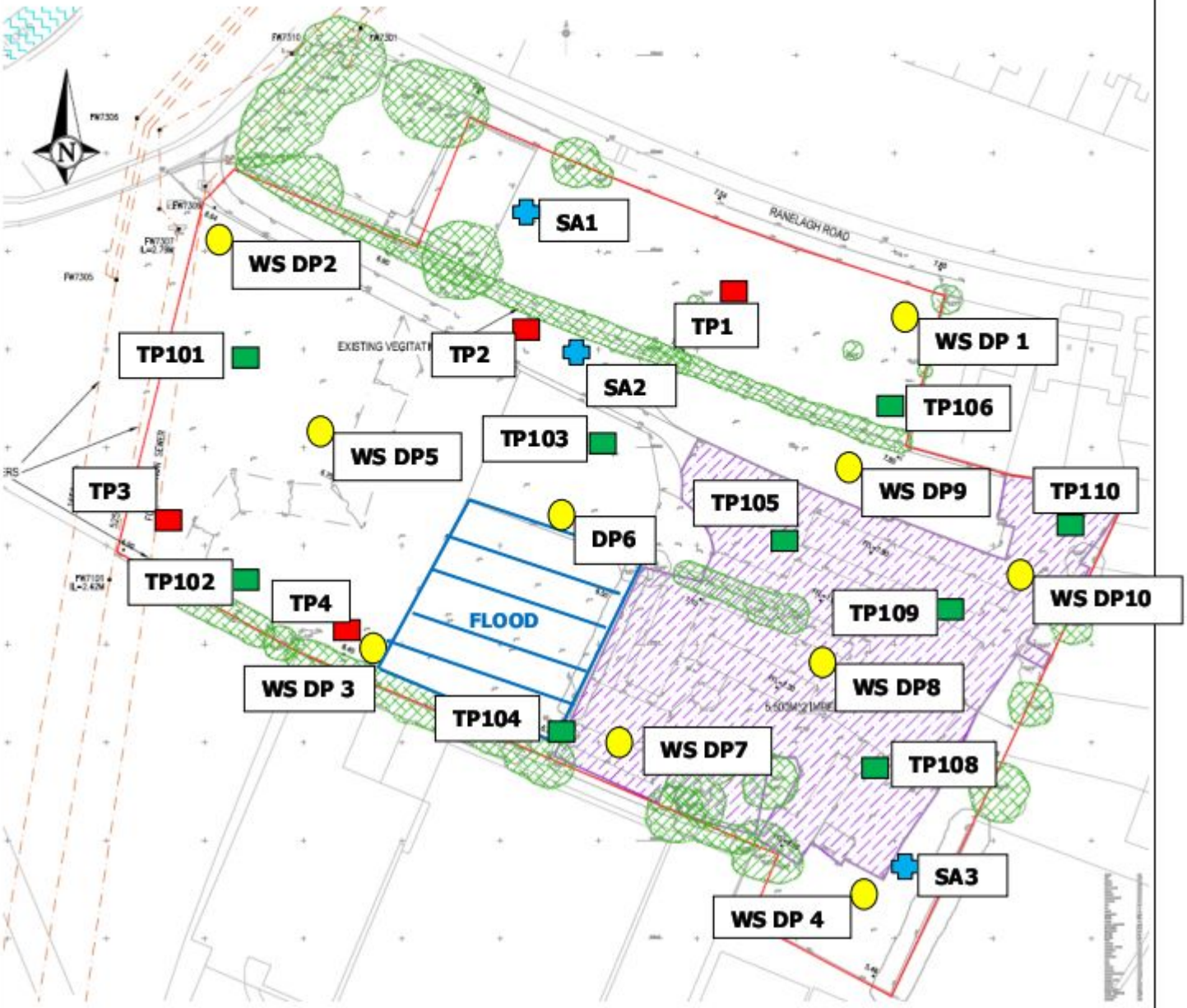
L.Howell B.SC., FGS,
(ls@soilslimited.co.uk)
Graduate Engineer

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

©Soils Limited
December 2014



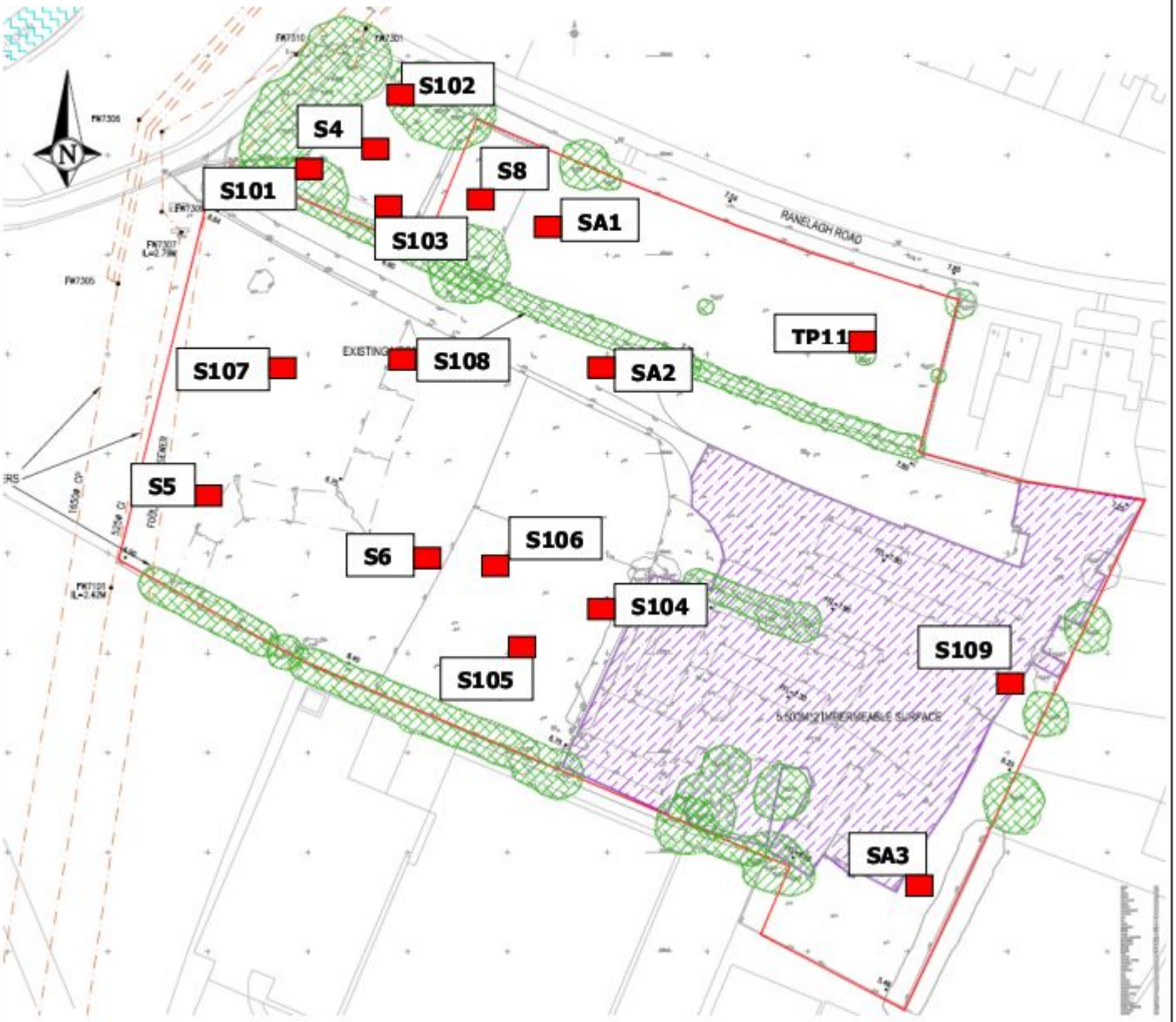
PROJECT: **Land south of Ranelagh Road, Havant, Hampshire**	DATE: **December 2014**	soils LIMITED *Geotechnical & Environmental Consultants*
CLIENT: **Jacobs Foreman Developments Limited**	SCALE: **Not to scale**	
TITLE: **Figure 1: Location Plan**	REF: **14099**	



Key:

- Windowless Sampler Boreholes/Dynamic Probing
- Trial Pits (Ref:13284/GI, November 2012)
- Soakaway test (Ref:13284/GI, November 2012)
- Trial Pits (Ref:14099/GIR/Rev2.00, November 2014)

Project: Land south of Ranelagh Road, Havant, Hampshire	soils LIMITED Geotechnical & Environmental Consultants
Client: Jacobs Foreman Developments Limited	**Date:** November 2012 (Ref:13284/GI) December 2014 (14099/GI)
Figure 2: Trial Hole Layout Plan – Inclusive of Phase II Investigations 13824 and 14099.	**Job Number:** 13248 and 14099



Key:

Soakaway tests

Project: Land south of Ranelagh Road, Havant, Hampshire	
Client: Foreman Homes	**Date:** December 2014
Figure 3: Trial Hole Layout Plan – Soakage Locations	**Job Number:** 14099

soils LIMITED
Geotechnical & Environmental Consultants

Appendix A
Field Work

Borehole Log

Borehole No. **WS 1**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 13284	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 26/10/2012 - 26/10/2012

Hole Type: WS

Scale: 1:50

Logged By: LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D & J					Dark brown silty gravelly CLAY with frequent rootlets. Gravel is flint and brick rubble. MADE GROUND
		0.40	D					
					0.70			
		0.90	D					Light brown sandy gravelly CLAY. Gravel is fine to coarse flint and chalk fragments. HEAD
		1.30	D					
		2.00	D					
		2.40	D					
		3.60	D					
					4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.80m bgl. Well installed to 4.00m bgl

Borehole Log

Borehole No. **WS 2**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 13284	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 26/10/2012 - 26/10/2012

Hole Type: WS

Scale: 1:50

Logged By: LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	D & J		0.40			Dark brown silty CLAY with numerous roots and rootlets. TOPSOIL
		0.50	D					Orange brown soft CLAY with occasional roots. HEAD
		1.00	D		0.95			Light yellow very sandy gravelly CLAY. Gravel is fine to coarse flint and chalk fragments. HEAD
		1.80	D		1.90			Soft dark brown silty gravelly CLAY. Gravel is fine to medium angular. HEAD
		2.30	D					
		3.00	D		2.80			Highly weathered structureless CHALK with abundant flint gravel. LEWES NODULAR CHALK FORMATION
		3.50	D					
					4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.70m bgl. Well installed to 4.00m bgl

Borehole Log

Borehole No. **WS 3**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 13284	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 26/10/2012 - 26/10/2012

Hole Type: WS

Scale: 1:50

Logged By: LS

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10	D & J		0.25			Dark brown silty CLAY with numerous roots and rootlets. TOPSOIL
		0.40	D					Soft orange brown CLAY with occasional roots. HEAD
		0.75	D		0.90			Dark orange brown very gravelly CLAY. Gravel is fine to coarse flint. HEAD
		1.40	D					
		2.00	D		2.00			NO RECOVERY
		2.50	D					
					2.80			Highly weathered structureless gravelly CHALK . Gravel is flints. LEWES NODULAR CHALK FORMATION
		3.40	D					
					4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.60m bgl. Well installed at 4.00m bgl

AGS

Borehole Log

Borehole No. **WS 4**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 13284	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 26/10/2012 - 26/10/2012

Hole Type: WS

Scale: 1:50

Logged By: LS

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D & J		0.20			Dark brown silty gravelly CLAY. Gravel is brick rubble, flints and rootlets. TOPSOIL
		0.40	D					Soft orange brown CLAY with occasional roots. HEAD
		1.00	D					
		1.30	D					
		1.80	D					
					2.00			NO RECOVERY
		2.90	D		2.80			Highly weathered structureless CHALK with abundant flint gravel. LEWES NODULAR CHALK FORMATION
		3.80	D					
					4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.50m bgl. Well installed at 4.00m bgl

Borehole Log

Borehole No. **WS 5**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 14099	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 05/02/2014 - 05/02/2014

Hole Type: WS

Scale: 1:50

Logged By: GB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D & J					Turf over fine to medium soft dark brown very clayey gravelly SILT with fine roots. Gravel is fine to medium sub-angular brick, ash and glass fragments. MADE GROUND.
		0.40	D & J					
		0.60	D & J		0.50			Soft to firm dark orange brown silty gravelly CLAY with fine roots. Gravel is fine to medium flint and chalk fragments. HEAD
		0.80	D					
		1.00	D					
		1.50	D					
		2.00	D		2.00			Highly weathered structureless CHALK with abundant flint and chalk gravel. LEWES NODULAR CHALK FORMATION
		2.50	D		2.50			Weak medium density white and light brown stained CHALK with fine to medium flint and angular gravel. LEWES NODULAR CHALK FORMATION
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.50m bgl

AGS

Borehole Log

Borehole No. **WS 7**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 14099	Co-ords: -	Hole Type WS
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:	Scale 1:50
Client:	Orchard Homes & Developments Ltd		Dates: 05/02/2014 - 05/02/2014	Logged By GB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D & J					Soft dark brown very clayey gravelly SILT. MADE GROUND
		0.40	D & J					
		0.60	D & J		0.60			Soft to firm dark orange brown silty gravelly CLAY. Gravel is fine to medium flints . HEAD
		0.80	D					
		1.00	D					
		1.50	D					
					1.80			Soft dark brown silty gravelly CLAY. Gravel is fine to medium angular flints. HEAD.
		2.00	D					
		2.50	D		2.50			Weak medium density white and light greyish brown stained CHALK with fine to medium flint. LEWES NODULAR CHALK FORMATION
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of borehole at 4.00 m

Remarks
Roots observed to 0.50m bgl

Borehole Log

Borehole No. **WS 8**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 14099	Co-ords: -	Hole Type WS
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:	Scale 1:50
Client:	Orchard Homes & Developments Ltd		Dates: 05/02/2014 - 05/02/2014	Logged By GB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					Soft to firm dark brown very gravelly very clayey SILT. Gravel is fine to medium flint, ash, concrete and brick fragments. MADE GROUND
		0.40	D					
		0.60	D		0.60			
		0.80	D		0.70			Moderately weak high density white CHALK with light grey brown stained pockets. MADE GROUND
		1.00	D					Soft to firm dark orange brown silty gravelly CLAY. Gravel is fine to medium flints. HEAD
		1.50	D					
		2.00	D					
		2.50	D					
					2.70			Weak medium density white and light grey yellow stained CHALK with fine to medium flint. LEWES NODULAR CHALK FORMATION
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of borehole at 4.00 m

Remarks
No roots observed

AGS

Borehole Log

Borehole No. **WS 9**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 14099	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 05/02/2014 - 05/02/2014

Hole Type: WS

Scale: 1:50

Logged By: GB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D & J					Turf over soft to dark brown slightly becoming very clayey SILT with fine to medium ash, brick, concrete, glass, chalk, angular gravel with fine roots MADE GROUND
		0.40	D & J					
		0.60	D & J					
		0.80	D		0.80			
		1.00	D					Soft becoming firm dark orange brown silty CLAY with fine to medium angular gravel and flint becoming very gravelly at 2.40m bgl. HEAD
		1.50	D					
		2.00	D		2.10			
		2.50	D					Soft dark brown silty CLAY with fine to medium angular gravel and becoming very gravelly. HEAD
		3.00	D		3.00			
		3.50	D					Soft to very soft structureless CHALK in a light brown clay matrix, occasional fine to medium flint matrix gains weak to medium density at 3.95m bgl. LEWES NODULAR CHALK FORMATION
		4.00	D		4.00			End of borehole at 4.00 m

Remarks

Roots observed to 0.80m bgl

AGS

Borehole Log

Borehole No. **WS 10**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No. 14099	Co-ords: -
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR		Level:
Client:	Orchard Homes & Developments Ltd		Dates: 05/02/2014 - 05/02/2014

Hole Type: WS

Scale: 1:50

Logged By: GB

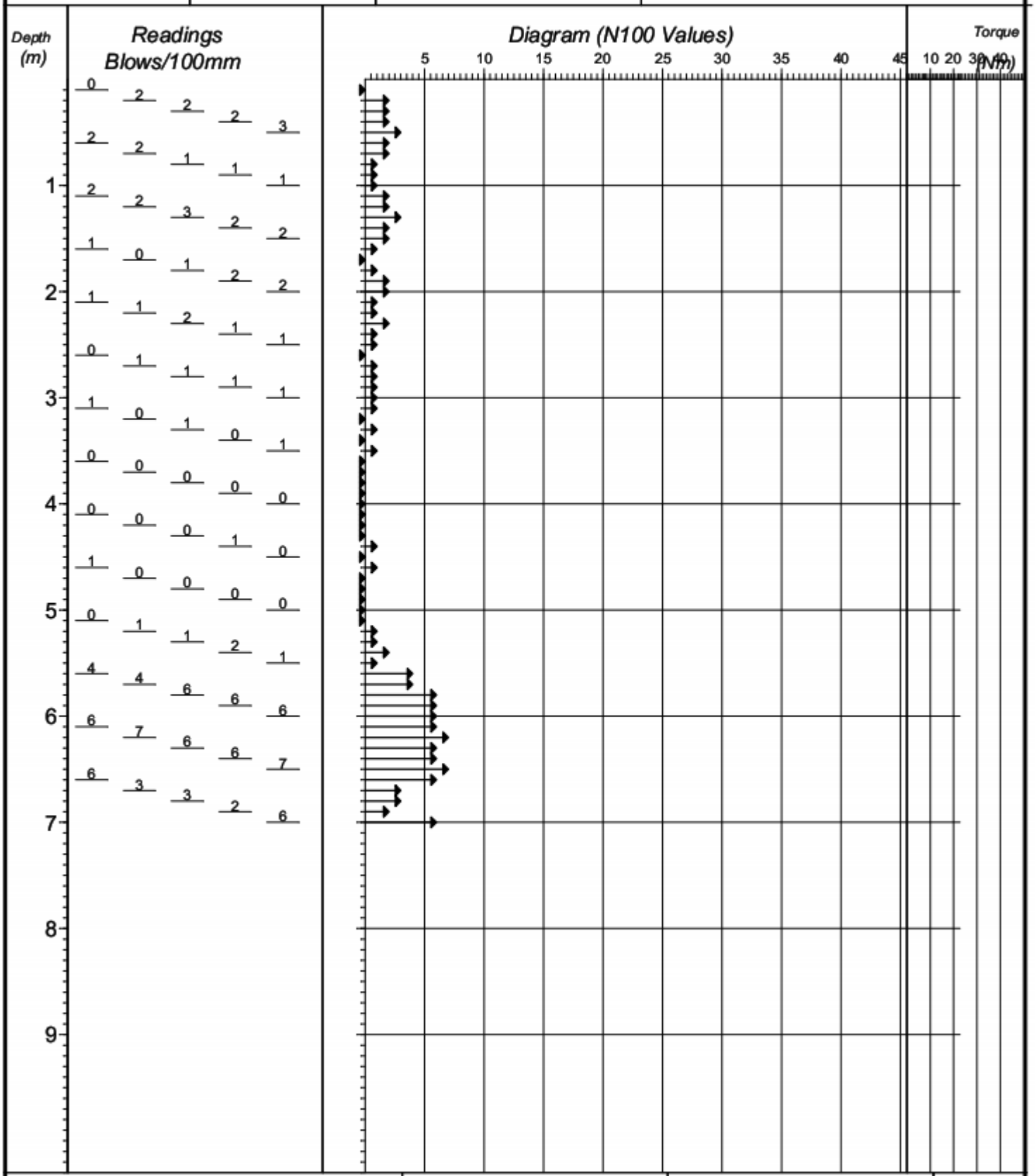
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D & J					Soft dark grey black very clayey silt with glass, brick and ash fragments and fine to medium angular gravel. MADE GROUND
		0.40	D & J					
		0.60	D & J					
		0.80	D		0.80			Soft dark orange brown silty CLAY with fine to medium angular gravel and becoming very gravelly at 1.70m bgl. HEAD
		1.00	D					
		1.50	D					
		2.00	D					
		2.50	D		2.30			Soft grey yellow white clayey sandy gravelly CHALK with fine to medium flint and gravel. LEWES NODULAR CHALK FORMATION
		3.00	D					
		3.50	D					
		4.00	D		4.00			End of borehole at 4.00 m

Remarks
No roots observed

AGS

DYNAMIC PROBING

Probe No	**DP 1**		
Client	**Orchard Homes & Developments Ltd**	Sheet 1 of 1	
Site	**Land South of Ranelagh Road**	Location No	**13284**
E -	N -	Level -	Date **26/10/2012**

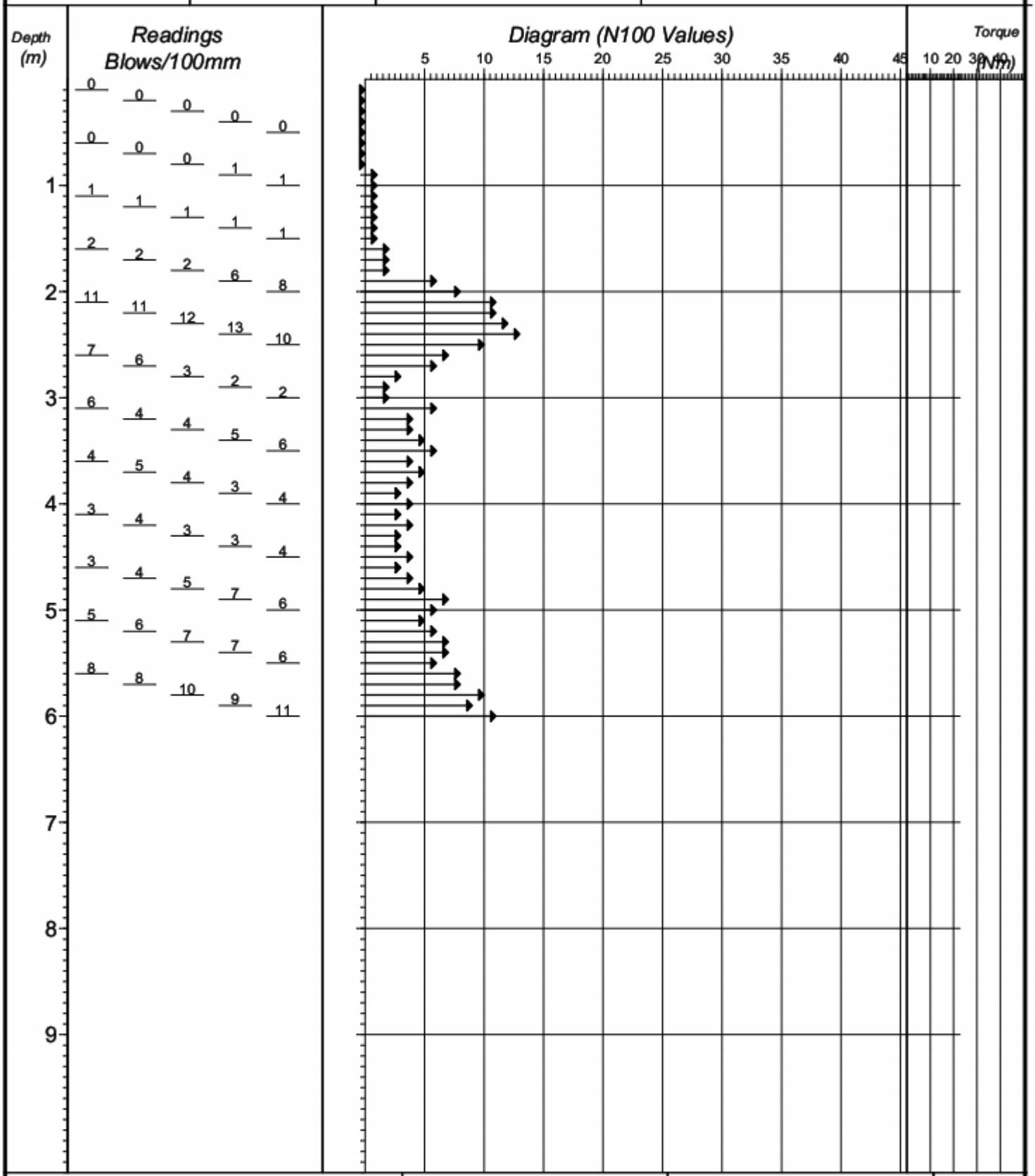


Fall Height	750	Cone Diameter	50
Hammer Wt	63.50	Final Depth	6.900
Probe Type	DPSH	Log Scale	1:50

Logger **Geolo**

DYNAMIC PROBING

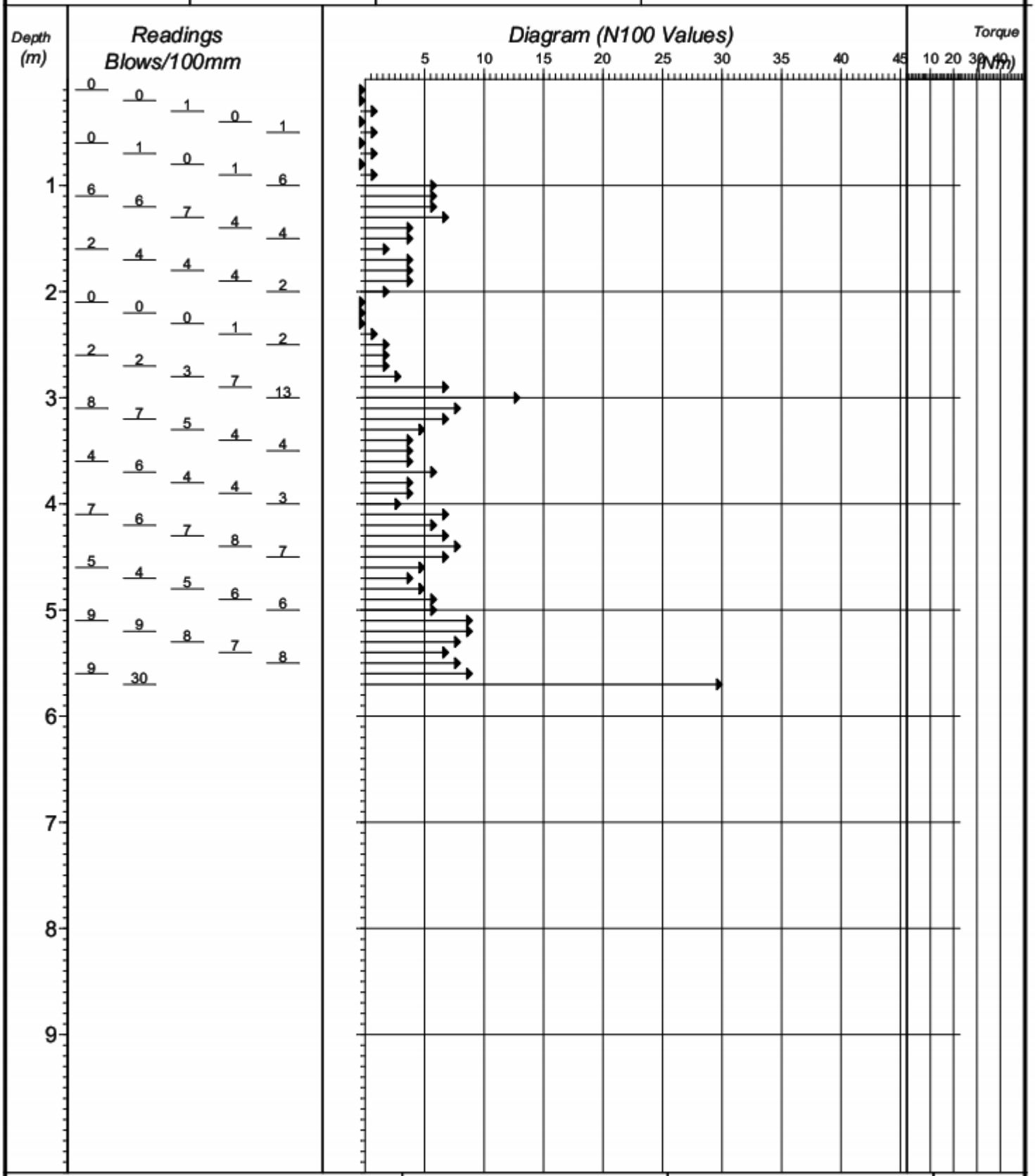
Client	**Orchard Homes & Developments Ltd**	Probe No	**DP 2**
Site	**Land South of Ranelagh Road**	Sheet 1 of 1	
E -	N -	Level -	Location No **13284**
		Date	**26/10/2012**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.900	Geolo
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

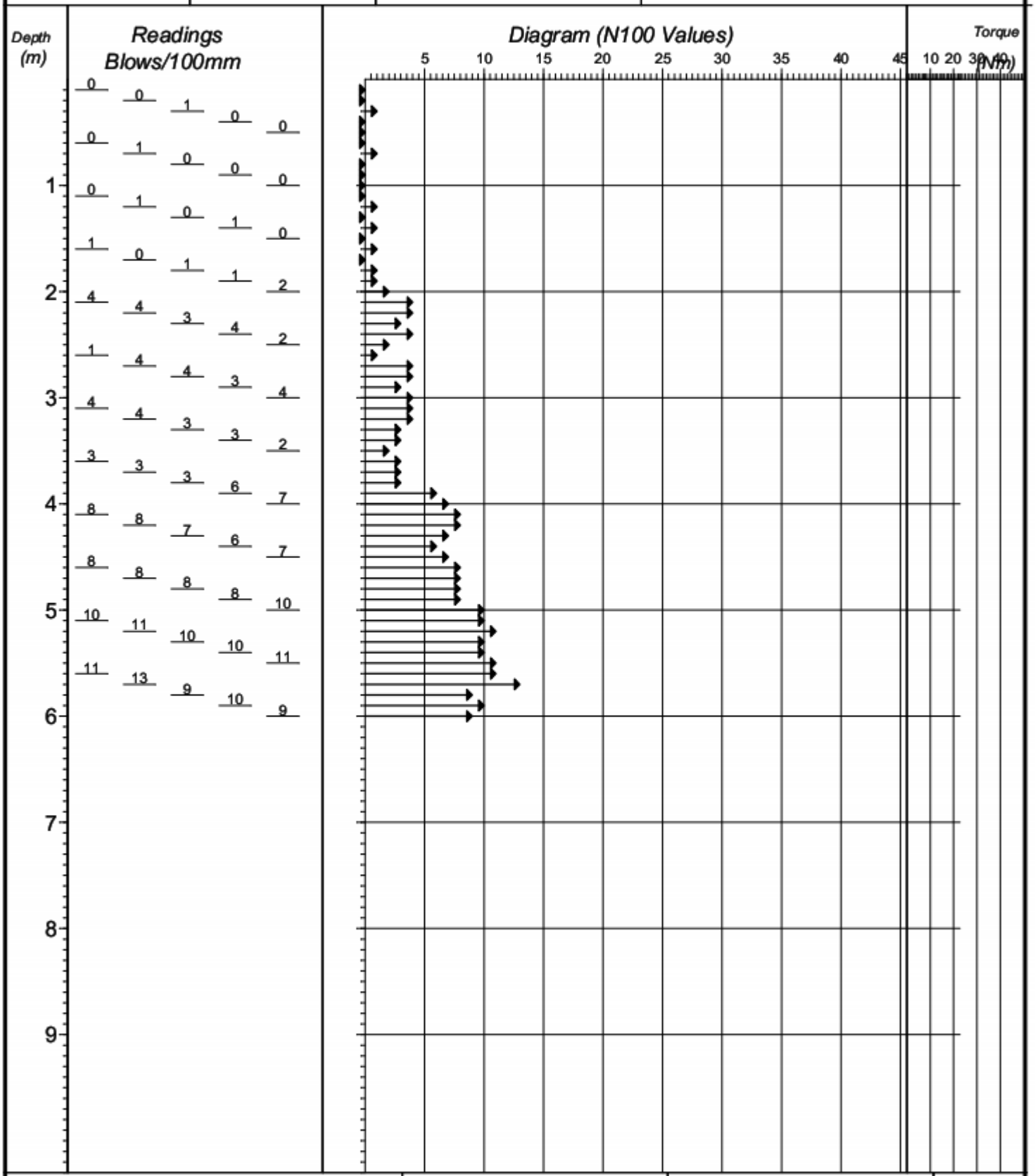
Client	**Orchard Homes & Developments Ltd**	Probe No	**DP 3**
Site	**Land South of Ranelagh Road**	Sheet 1 of 1	
E -	N -	Level -	Location No **13284**
			Date **26/10/2012**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.600	Geolo
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

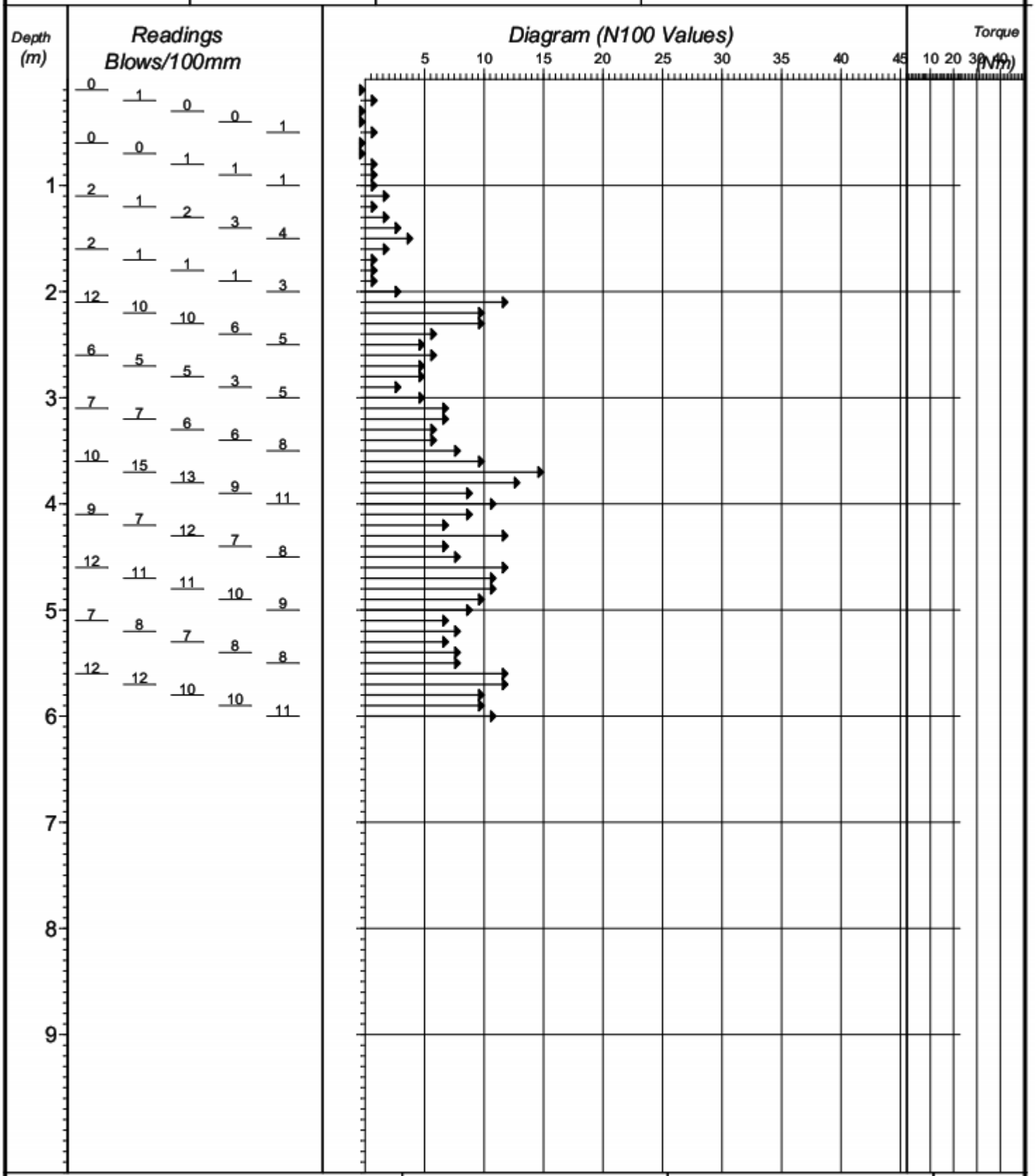
Client	**Orchard Homes & Developments Ltd**	Probe No	**DP 4**
Site	**Land South of Ranelagh Road**	Sheet 1 of 1	
E -	N -	Level -	Location No **13284**
		Date	**26/10/2012**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.900	Geolo
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

Probe No	**DP 5**
Client **Orchard Homes & Developments Ltd**	Sheet 1 of 1
Site **Ranelagh Road**	Location No **14099**
E - N - Level -	Date **05/02/2014**

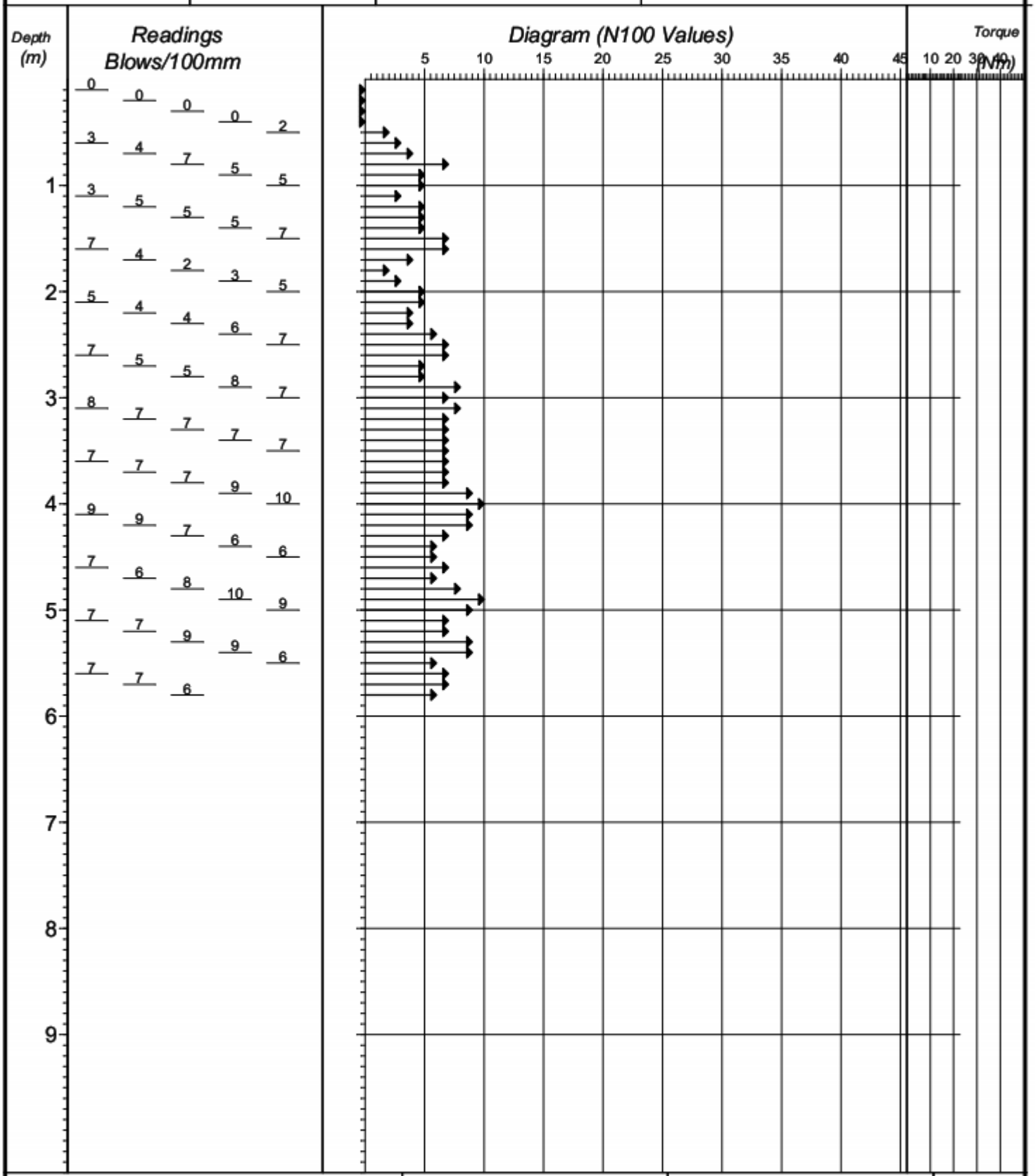


Fall Height	750	Cone Diameter	50
Hammer Wt	63.50	Final Depth	5.900
Probe Type	DPSH	Log Scale	1:50

Logger

DYNAMIC PROBING

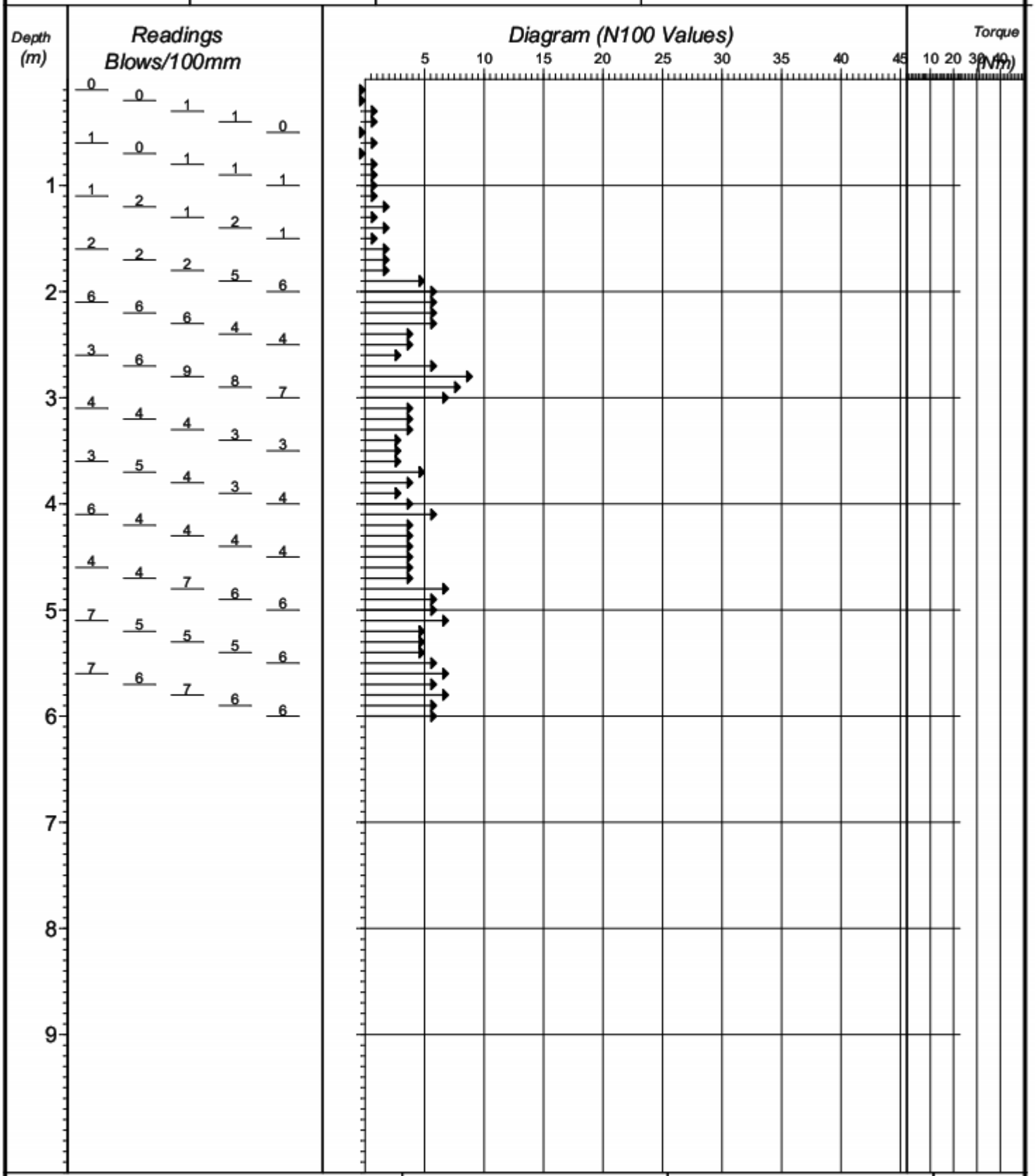
Client	**Orchard Homes & Developments Ltd**	Probe No	**DP 6**
Site	**Ranelagh Road**	Sheet 1 of 1	
E -	N -	Level -	Location No **14099**
			Date **05/02/2014**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.700	
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

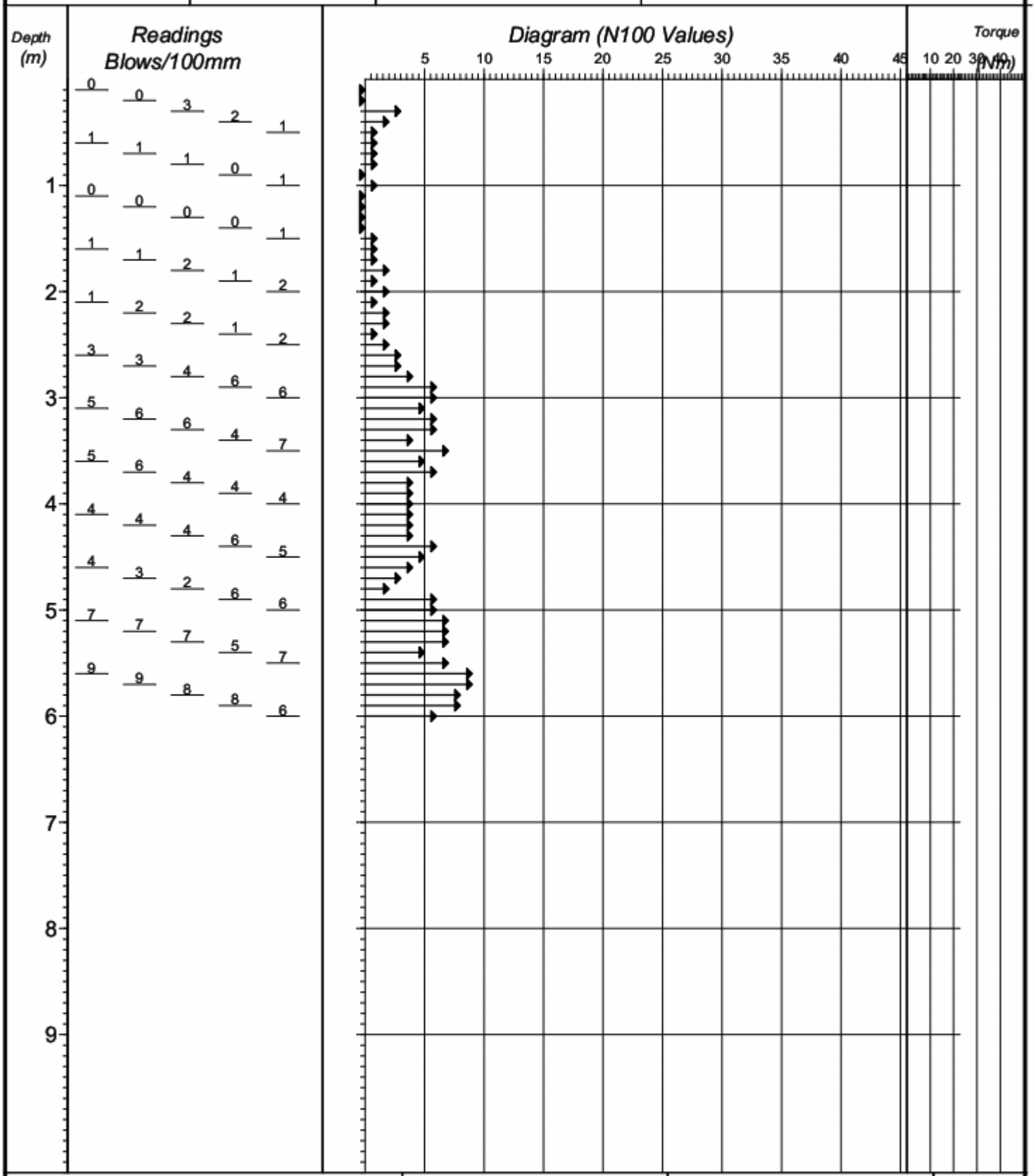
Probe No	**DP 7**		
Client	**Orchard Homes & Developments Ltd**	Sheet 1 of 1	
Site	**Ranelagh Road**	Location No	**14099**
E -	N -	Level -	Date **05/02/2014**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.900	
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

Probe No	**DP 8**
Client **Orchard Homes & Developments Ltd**	Sheet 1 of 1
Site **Ranelagh Road**	Location No **14099**
E - N - Level -	Date **05/02/2014**

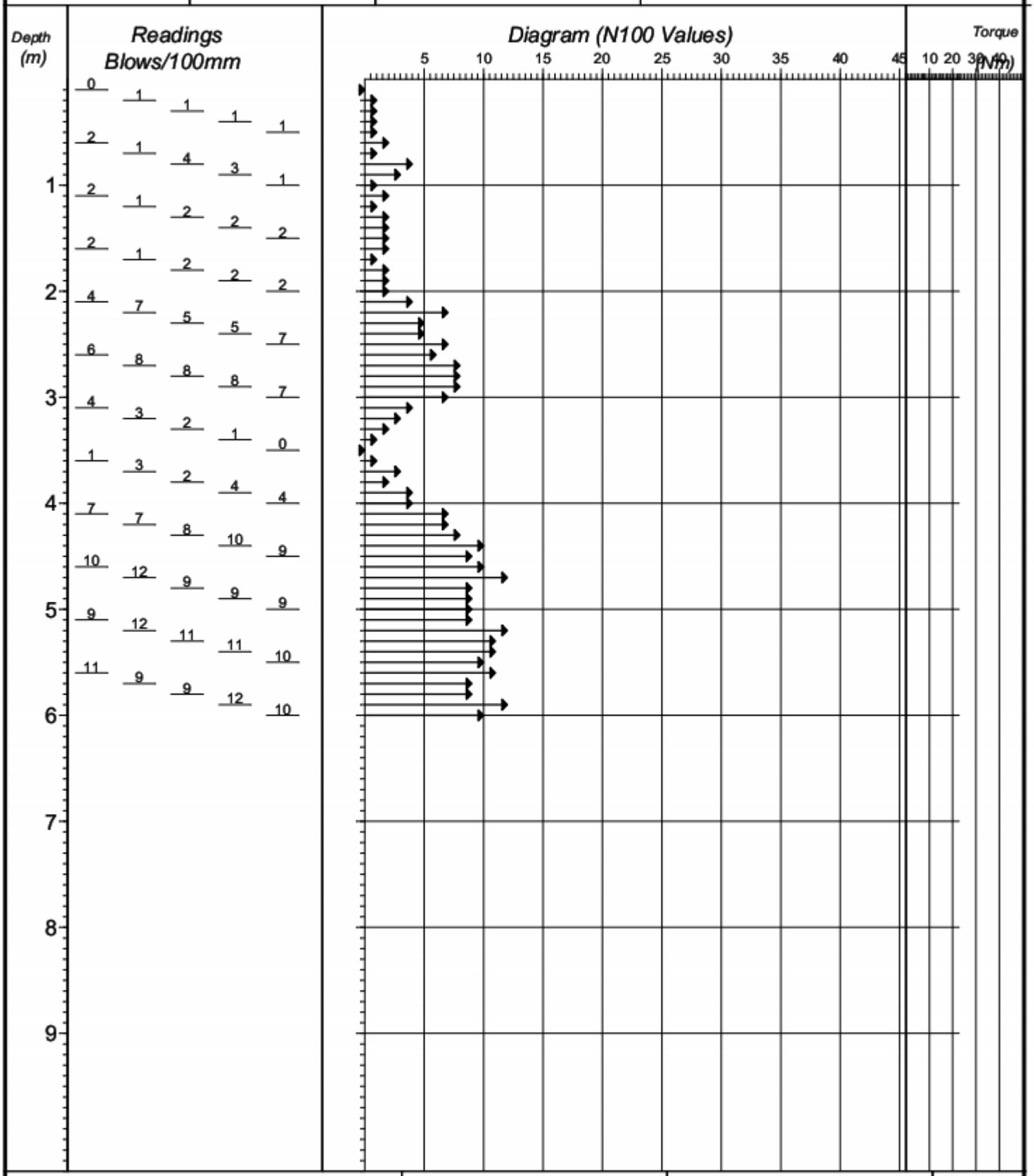


Fall Height	750	Cone Diameter	50
Hammer Wt	63.50	Final Depth	5.900
Probe Type	DPSH	Log Scale	1:50

Logger

DYNAMIC PROBING

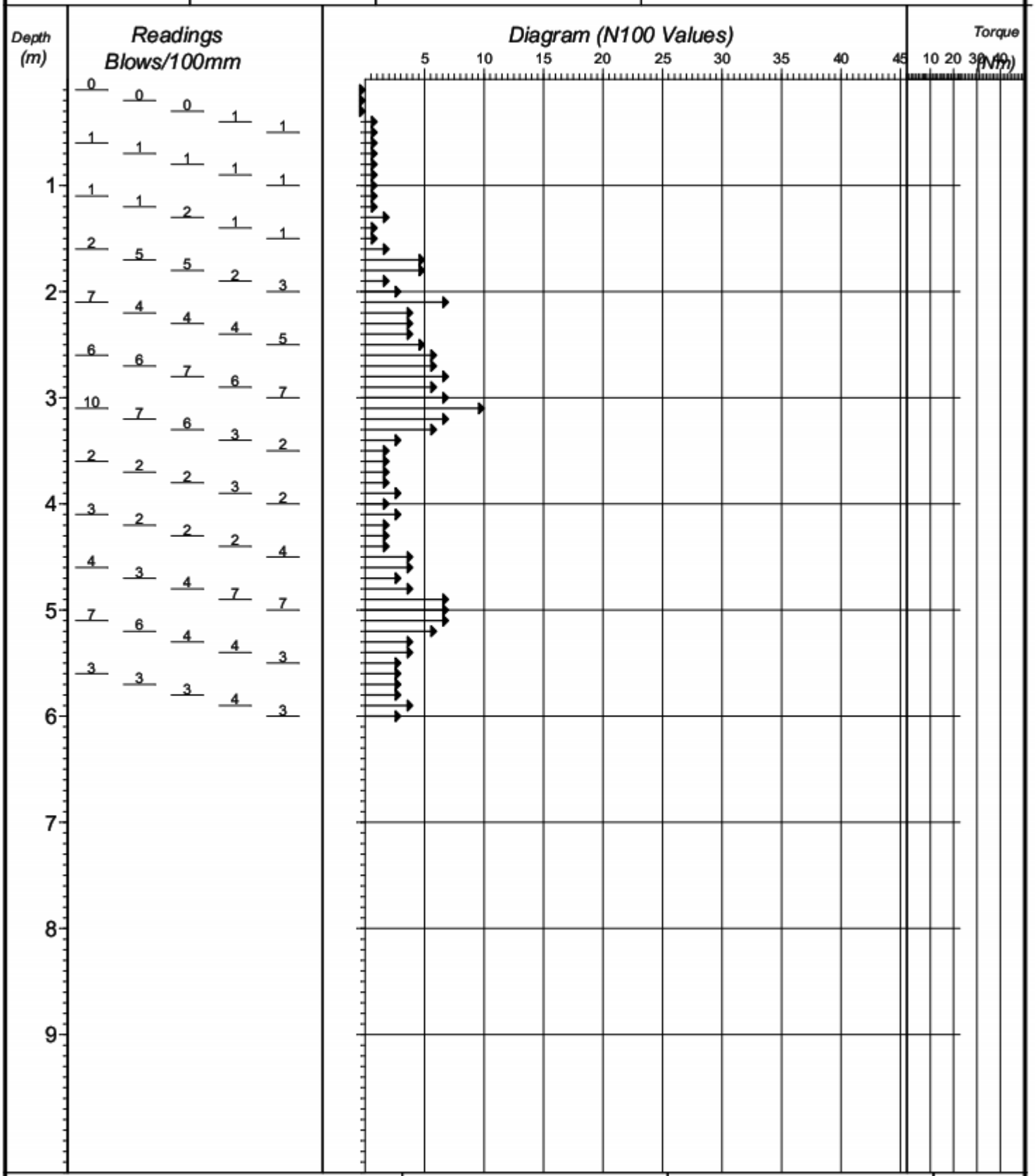
Probe No	**DP 9**
Client **Orchard Homes & Developments Ltd**	Sheet 1 of 1
Site **Ranelagh Road**	Location No **14099**
E - N - Level -	Date **05/02/2014**



Fall Height	750	Cone Diameter	50	Logger
Hammer Wt	63.50	Final Depth	5.900	
Probe Type	DPSH	Log Scale	1:50	

DYNAMIC PROBING

Probe No	**DP 10**
Client **Orchard Homes & Developments Ltd**	Sheet 1 of 1
Site **Ranelagh Road**	Location No **14099**
E - N - Level -	Date **05/02/2014**



Fall Height	**750**	*Cone Diameter*	**50**	*Logger*
Hammer Wt	**63.50**	*Final Depth*	**5.900**	
Probe Type	**DPSH**	*Log Scale*	1:50	

Trial Pit Log

Trialpit No: **TP 1**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 3.30	Date: 26/10/2012
Client:	Orchard Homes & Developments Ltd		Scale: 1:50 Logged: LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D		0.35			Dark brown silty sandy CLAY with occasional roots and rootlets. TOPSOIL
	0.50	D					Firm orange and dark orange mottled CLAY. HEAD
	1.00	D					
	1.50	D		1.47			Light yellow sandy silty clayey flint GRAVEL. HEAD
	2.00	D		2.20			Firm grey orange mottled silty sandy CLAY. HEAD
	2.50	D					
				3.10			Light yellow coarse SAND. HEAD
				3.30			End of pit at 3.30 m

Remarks: Roots observed to 0.35m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No: **TP 2**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Date	26/10/2012		
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 3.30	Scale 1:50
Client:	Orchard Homes & Developments Ltd		Logged LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	D		0.65			Dark brown clayey gravelly SILT with numerous roots and rootlets. TOPSOIL
	1.00	D		1.30			Firm orange brown mottled CLAY with occasional flint fragments. HEAD
	2.00	D		2.50			Light yellow very sandy flint GRAVEL . HEAD
	2.70	D		3.30			Firm orange CLAY. HEAD
							End of pit at 3.30 m

Remarks: Roots observed to 0.70m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No: **TP 3**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 3.00	Date: 26/10/2012
Client:	Orchard Homes & Developments Ltd		Scale: 1:50 Logged: LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.40	D		0.40			Dark brown silty sandy CLAY with occasional roots and rootlets. TOPSOIL
	1.00	D					Orange brown mottled gravelly CLAY. HEAD
	2.30	D		1.70			Light white clayey sandy flint GRAVEL. HEAD
				3.00			End of pit at 3.00 m

Remarks: Roots observed to 0.70m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No: **TP 4**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 3.50	Date: 26/10/2012
Client:	Orchard Homes & Developments Ltd		Scale: 1:50 Logged: LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.10	D		0.25			Turf over dark brown silty sandy CLAY with numerous rootlets and roots. TOPSOIL
	0.70	D					Firm orange brown silty sandy CLAY with roots and rootlets. HEAD
				1.10			Orange brown very gravelly CLAY. HEAD
	1.40	D					
	1.60	D		1.60			Creamy white sandy very gravelly CLAY. HEAD
	2.00	D					...orange white sandy clay band at 1.60m bgl
				2.40			Very soft grey CLAY. LEWES NODULAR CHALK
	2.70	D					
				3.50			End of pit at 3.50 m

Remarks: Roots observed to 1.10m bgl

Stability: Stable

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP101** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D					Soft mid brown slightly clayey SILT with rootlets. Grass topped. TOPSOIL
	0.50	D					
	0.75	D					
	1.00	D					
				1.35			Soft light to mid orangish brown slightly sandy CLAY with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	1.50	D					
				1.80			Soft light to mid orangish slightly clay SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. Occasional sand rootlets. HEAD
	2.00	D					
	2.50	D					
	3.00	D		3.00			End of pit at 3.00 m

Remarks: Roots observed at 0.2m bgl. No groundwater encountered.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP102** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 2.90	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D					Soft mid brown slightly clay SILT with occasional rootlets. Grass Topped. TOPSOIL
	0.50	D					
	0.75	D		0.80			
	1.00	D					Soft light to mid brown slightly silty CLAY with abundant sub-rounded to sub-angular, fine to coarse flint gravel. HEAD
	1.50	D		1.40			Soft light orangish brown slightly clay SAND with abundant sub-rounded to sub-angular fine to coarse flint gravel. Frequent shell fragments. HEAD
	2.00	D					
	2.50	D					
	2.90	D		2.90			End of pit at 2.90 m

Remarks: Roots observed at 0.25m bgl. No groundwater encountered.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP103**

Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D		0.40			Soft mid dark brown slightly clayey SILT with rootlets. Grass Topped. TOPSOIL
	0.50	D					Soft light to mid orangish brown slightly sandy CLAY with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	0.75	D					
	1.00	D					
	1.50	D		1.60			Soft light orangish brown slightly silty clayey SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	2.00	D					
	2.50	D					
	3.00	D		3.00			End of pit at 3.00 m

Remarks: Roots observed at 0.20m bgl. Groundwater encountered at 3.0m bgl.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP104** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D		0.20			Soft mid brown lightly clayey SILT with roots to rootlets. TOPSOIL
	0.50	B		0.50			Soft light to mid brown slightly clayey SILT with abundant brick, concrete is fine fine to coarse, sub-rounded to sub-angular. MADE GROUND
	0.75	D					Soft light to mid oranges brown slight silty to clayey SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	1.00	D					
	1.50	D					
	2.00	D					
	2.50	D		2.50			Light orangish brown sandy CLAY with abundant fine to coarse sub-rounded to sub-angular flint gravel. HEAD
	3.00	D		3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: Roots observed at 0.50m bgl. No groundwater encountered.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP105** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D					Soft mid brown silt with abundant brick to concrete and abundant fine to coarse sub-rounded to sub-angular flint gravel. MADE GROUND.
	0.50	B					
	0.75	D					
	1.00	D					
				1.20			Soft light to mid brown slightly sandy silty CLAY with occasional chalk fragments, fine to coarse sub-rounded to sub-angular. HEAD
	1.50	D					
				1.60			Soft mid brown slightly sandy SILT with abundant fine to coarse sub-rounded to sub-angular flint gravel. HEAD
	2.00	D					
				2.30			Soft light orangish brown slightly clayey slightly silty SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	2.50	D					
	3.00	D		3.00			End of pit at 3.00 m

Remarks: No roots observed. No groundwater encountered.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP106** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D		0.20			Soft mid brown slightly clay SILT with abundant brick to gravel is fine to coarse, sub-rounded to sub-angular flint. MADE GROUND.
	0.50	D					Soft orangish brown slightly sandy CLAY with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	0.75	D					
	1.00	D					
	1.50	D					
	2.00	D		1.90			Soft light to mid brown slightly clay slightly silty SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	2.50	D					
	3.00	D		2.90 3.00			Soft light orangish grey CLAY with occasional fine to coarse, sub-rounded to sub-angular flint gravel. HEAD End of pit at 3.00 m

Remarks: Roots observed at 0.20m bgl. No groundwater encountered.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP108** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D					Soft dark greenish grey slightly silty CLAY with roots and rootlets with abundant fine to coarse, sub-rounded to sub-angular flint gravel. TOPSOIL
	0.50	B					
	0.75	D		0.70			Soft light to mid brown slightly sandy SILT with abundant fine to coarse sub-rounded to sub-angular flint gravel. HEAD
	1.00	D					
	1.50	D		1.20			Soft mid to greenish grey slightly clayey SAND with abundant fine to coarse sub-rounded to sub-angular flint gravel. HEAD
	2.00	D					
	2.50	D		2.30			Soft orangish brown slightly clayey SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	3.00	D		3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: Roots observed at 0.25m bgl. Groundwater encountered at 3.0m bgl.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP109** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Soft mid brown slightly clay SILT with abundant brick to gravel and roots to rootlets. MADE GROUND.
	0.25	D		0.20			Soft mid to light orangish brown slightly clayey SAND with abundant fine to coarse sub-rounded top sub-angular flint gravel. HEAD
	0.50	D					
	0.75	D					
	1.00	D					
	1.50	D					
				1.70			Soft light orangish brown slightly clay SAND with abundant fine to coarse, sub-rounded to sub-angular flint gravel. HEAD
	2.00	D					
	2.50	D					
	3.00	D		3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: Roots observed at 0.2m bgl. Groundwater encountered at 3.0m bgl.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No **TP110** Sheet 1 of 1

Project Name: Land South of Ranelagh Road	Project No. 14639	Co-ords: - Level:	Date 18/11/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:25
Client: Foreman Homes			Logged JO

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.25	D		0.30			Soft mid brown slightly clayey SILT with abundant fine to coarse sub-rounded to sub-angular brick and flint gravel. MADE GROUND.
	0.50	D					Soft orangish brown slightly sandy CLAY with abundant fine to coarse sub-rounded to sub-angular flint gravel. Becoming more gravelly with depth. HEAD
	0.75	D					
	1.00	D					
	1.50	D					
	2.00	D					
	2.50	D		2.40			Soft light grey off white with stiff sand pockets CLAY with abundant fine to coarse sub-rounded to sub-angular flint gravel. HEAD
	3.00	D		3.00			End of pit at 3.00 m

1 2 3 4 5

Remarks: No roots observed. No groundwater encountered.

Stability: Stable

AGS

Trial Pit Log

Trialpit No: **TP S1**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 2.00	Date: 26/10/2012
Client:	Orchard Homes & Developments Ltd		Scale: 1:50 Logged: LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.40	D		0.50			Dark brown silty sandy clay with occasional roots and rootlets. TOPSOIL
	1.00	D					Dark orange mottled slightly gravelly CLAY with occasional rootlets. Gravel is flints. HEAD
	1.70	D		1.65			Light yellow sandy silty clayey GRAVEL with numerous flint cobbles. HEAD
				2.00			End of pit at 2.00 m

Remarks: Roots observed to 1.30m bgl

Stability: Stable

Trial Pit Log

Trialpit No: **TP S2**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 2.00	Date: 26/10/2012 Scale: 1:50 Logged: LS
Client:	Orchard Homes & Developments Ltd		

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.40			Dark brown silty sandy clay with occasional roots and rootlets. TOPSOIL
	0.50	D					Orange CLAY with frequent flint cobbles. HEAD
	1.00	D					
	1.60	D					
				1.80			Cream and white silty sandy flint GRAVEL. HEAD
	2.00	D		2.00			End of pit at 2.00 m

Remarks: Roots observed to 0.80m bgl

Stability: Stable

AGS

Trial Pit Log

Trialpit No: **TP S3**

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Project No.: 13284	Co-ords: - Level:
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 2.30	Date: 26/10/2012
Client:	Orchard Homes & Developments Ltd		Scale: 1:50 Logged: LS

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.50	D		0.50			Light brown silty slightly gravelly SAND. Gravel is flints. TOPSOIL
	1.00	D					Firm orange grey mottled slightly gravelly CLAY. Gravel is flints. HEAD
	1.70	D		1.60			Firm orange brown very gravelly CLAY. HEAD
	2.10	D		2.00			Grey orange mottled slightly gravelly CLAY. HEAD
				2.30			End of pit at 2.30 m

Remarks: Roots observed to 0.50m bgl.

Stability: Stable

AGS

soils LIMITED Geotechnical & Environmental Consultants
Brunel House, Unit 14,
Chalcroft Dist. Park,
Burnetts Lane,
Soutampton,
SO30 2PA

Trial Pit Log

Trialpit No **S4**
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road,	Project No. 14150	Co-ords: - Level:
Location:	Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 1.70	Date 04/03/2014
Client:	Orchard Homes & Developments Ltd		Scale 1:50 Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D		0.30			Turf over dark brown sandy slightly gravelly slightly clayey SILT. Sand is fine to coarse, gravel is fine to coarse sub-angular to sub-rounded flints. TOPSOIL
	0.50	D					Soft dark brown slightly sandy silty slightly gravelly CLAY. Sand is fine to coarse, gravel is fine to medium sub-angular to sub-rounded flints. HEAD
	0.90	D		1.30			
	1.50	D		1.70			Light grey brown sandy silty gravelly CLAY. Sand is fine to coarse, gravel is fine to medium, sub-angular to sub-rounded flint and chalk. HEAD
							End of pit at 1.70 m

1 2 3 4 5 6 7 8 9 10

Remarks: Maximum Root Depth: 0.60m bgl.

Stability:

AGS

soils LIMITED Geotechnical & Environmental Consultants
Brunel House, Unit 14,
Chalcroft Dist. Park,
Burnetts Lane,
Soutampton,
SO30 2PA

Trial Pit Log

Trialpit No **S5**
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road,	Project No. 14150	Co-ords: - Level:
Location:	Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 2.00	Date 04/03/2014
Client:	Orchard Homes & Developments Ltd		Scale 1:50 Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20	D		0.30			Turf over dark brown sandy slightly gravelly slightly clayey SILT. Sand is fine to coarse, gravel is fine to coarse sub-angular to sub-rounded flints. TOPSOIL
	0.50	D					Brown orange sandy silty fine to coarse sub-angular to sub-rounded flint GRAVEL. HEAD
	0.90	D					
	1.50	D		1.60			Light grey brown sandy silty gravelly CLAY. Sand is fine to coarse, gravel is fine to medium, sub-angular to sub-rounded flint and chalk. HEAD
	1.90	D		2.00			End of pit at 2.00 m

Remarks: Maximum Root Depth: 1.10m bgl

Stability:

AGS

soils LIMITED Geotechnical & Environmental Consultants
Brunel House, Unit 14,
Chalcroft Dist. Park,
Burnetts Lane,
Soutampton,
SO30 2PA

Trial Pit Log

Trialpit No **S6**
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road,	Project No. 14150	Co-ords: - Level:
Location:	Havant, Hampshire, PO9 1NR	Dimensions (m): Depth 1.80	Date 04/03/2014
Client:	Orchard Homes & Developments Ltd		Scale 1:50 Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20			0.40			Turf over dark brown sandy gravelly SILT. Sand is fine to coarse gravel is fine to coarse sub-angular to sub rounded flint, brick and concrete. MADE GROUND
	0.50	D					
	0.90	D		0.80			Soft light orange brown sandy gravelly CLAY. Sand is fine to coarse, gravel is fine to coarse sub-angular to sub-rounded brick, flint and concrete. MADE GROUND
				1.40			Brown orange sandy silty fine to coarse sub-angular to sub-rounded flint GRAVEL. HEAD
	1.60	D		1.80			Light grey brown sandy silty gravelly CLAY. Sand is fine to coarse, gravel is fine to medium, sub-angular to sub-rounded flint and chalk. HEAD
							End of pit at 1.80 m

Remarks: Maximum Root Depth 1.00m bgl.

Stability:

AGS

soils LIMITED Geotechnical & Environmental Consultants Brunel House, Unit 14, Chalcroft Dist. Park, Burnetts Lane, Soutampton, SO30 2PA	**Trial Pit Log**	Trialpit No **S8** Sheet 1 of 1

Project Name: Land South of Ranelagh Road,	Project No. 14150	Co-ords: - Level:	Date 04/03/2014
Location: Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 3.00	Scale 1:50
Client: Orchard Homes & Developments Ltd			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	D		0.30			Turf over dark brown sandy slightly gravelly slightly clayey SILT. Sand is fine to coarse, gravel is fine to coarse sub-angular to sub-rounded flints. TOPSOIL
	0.50	D					Soft dark brown slightly sandy silty slightly gravelly CLAY. Sand is fine to coarse, gravel is fine to medium sub-angular to sub-rounded flints. HEAD
	0.90	D					
	1.40			1.30			Light grey brown sandy silty gravelly CLAY. Sand is fine to coarse, gravel is fine to medium, sub-angular to sub-rounded flint and chalk. HEAD
				3.00			End of pit at 3.00 m

Remarks: Maximum Root Depth: 1.40m bgl.
Groundwater Strike at 3.00m bgl.

Stability:

AGS

soils LIMITED Geotechnical & Environmental Consultants
Brunel House, Unit 14,
Chalcroft Dist. Park,
Burnetts Lane,
Soutampton,
SO30 2PA

Trial Pit Log

Trialpit No
TP11
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road,	Project No. 14150	Co-ords: - Level:	Date 04/03/2014
Location:	Havant, Hampshire, PO9 1NR		Dimensions (m): Depth 1.90	Scale 1:50
Client:	Orchard Homes & Developments Ltd			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	D		0.40			Turf over dark brown sandy slightly gravelly slightly clayey SILT. Sand is fine to coarse, gravel is fine to coarse sub-angular to sub-rounded flints. TOPSOIL
	0.50	D					Soft dark brown slightly sandy silty slightly gravelly CLAY. Sand is fine to coarse, gravel is fine to medium sub-angular to sub-rounded flints. HEAD
	0.90	D		1.20			Light grey brown sandy silty gravelly CLAY. Sand is fine to coarse, gravel is fine to medium, sub-angular to sub-rounded flint and chalk. HEAD
	1.40	D		1.60			Brown orange sandy silty fine to coarse sub-angular to sub-rounded flint GRAVEL. HEAD
				1.90			End of pit at 1.90 m

Remarks: No Roots Observed.
Groundwater Strike at 1.90m bgl.

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 101
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 2.50	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.50			Turf over dark sandy gravelly slightly clayey SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of brick, concrete, flint and frequent rootlets. MADE GROUND
				1.50			Soft dark brown very gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse cobble sub-angular to sub-rounded made up of concrete, brick, wood, metal and rootlets. MADE GROUND
				2.00			Soft light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint, brick and concrete. MADE GOUND
				2.50			Light orange yellow sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint.
							End of pit at 2.50 m

Remarks: Roots observed to 1.50m bgl

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 102
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 2.30	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Turf over dark sandy gravelly slightly clayey SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of brick, concrete, flint and frequent rootlets. MADE GROUND
							Soft dark brown gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint and occasional rootlets.
				1.80			Light orange yellow sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint.
				2.30			End of pit at 2.30 m

Remarks: Roots observed to 1.20m bgl

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 103
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 0.60	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			Turf over dark sandy gravelly slightly clayey SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of brick, concrete, flint and frequent rootlets. MADE GROUND
				0.60			Soft dark brown gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint and occasional rootlets.
							End of pit at 0.60 m

Remarks: Roots observed to 0.60m bgl

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 104
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 0.60	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Wood chipping, rubber pellets (riding school) over dark brown grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of brick and flint. MADE GROUND
				0.60			Soft to firm light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of flint.
							End of pit at 0.60 m

Remarks: No roots observed

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 105
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 1.60	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			Wood chipping, rubber pellets (riding school) over dark brown grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of brick and flint. MADE GROUND
				0.70			Soft to firm light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of flint.
							Light orange yellow sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint.
				1.60			End of pit at 1.60 m

Remarks: Roots observed to 0.50m bgl. Pit opened at 11:00 no water. Closed at 14:10 water level 1.28m bgl

Stability:

AGS

soils LIMITED Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No: S 106

Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 0.55	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			Wood chipping, rubber pellets (riding school) over dark brown grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-angular to sub-rounded made up of brick and flint. MADE GROUND
				0.55			Soft to firm light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of flint.
							End of pit at 0.55 m

Remarks: No roots observed. Pit opened at 11:00 depth of pit 0.55m bgl water level 0.52m bgl. Closed at 16:00 water level 0.52m bgl

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 107
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 2.00	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			Turf over dark brown sandy slightly gravelly SILT. TOPSOIL Soft to firm light orange brown sandy very slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium flint.
				1.00			Light orange yellow sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of flint.
				2.00			End of pit at 2.00 m

Remarks: No roots observed

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 108
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 0.50	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			Turf over dark brown slightly gravelly SILT. Gravel is fine to medium made up of flint.
				0.50			Soft to firm light orange brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-angular to sub-rounded made up of flint.
							End of pit at 0.50 m

1 2 3 4 5 6 7 8 9 10

Remarks: No roots observed

Stability:

AGS

soils LIMITED
Geotechnical & Environmental Consultants

Trial Pit Log

Trialpit No
S 109
Sheet 1 of 1

Project Name:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage	Project No. 14186	Co-ords: - Level:	Date 18/03/2014
Location:	Land South of Ranelagh Road, Havant, Hampshire, PO9 1NR : Soakage		Dimensions (m): Depth 0.40	Scale 1:50
Client:	Foreman Homes			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			Turf over dark sandy gravelly slightly clayey SILT. Sand is fine to coarse. Gravel is fine to coarse sub-angular to sub-rounded made up of brick, concrete, flint and frequent rootlets. MADE GROUND
				0.40			Soft to firm light orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sub-rounded to sub-angular made up of flint.
							End of pit at 0.40 m

1 2 3 4 5 6 7 8 9 10

Remarks: Roots observed to 0.40m bgl

Stability:

AGS

Appendix B
Geotechnical Laboratory Analysis

Project Name:	Ranelegh Road, Havant			**Samples Received:**	01/11/2012
				Project Started:	01/11/2012
Client:	Soils Ltd			**Testing Started:**	13/11/2012
Project No:	13284	**Our job/report no:**	13602	**Date Reported:**	14/11/2012

K4 SOILS

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
TP3	D	1.00	Brown and orangey brown slightly sandy gravelly CLAY (gravel is fmc and angular to sub-angular)	17	51	22	29	30	
WS1	D	0.90	Pale brown and occasional dark brown slightly sandy gravelly CLAY with gravel size chalk fragments and occasional brick fragments and rootlets (gravel is fmc and angular to sub-angular)	17	34	19	15	50	
WS2	D	1.80	Brown and orangey brown slightly sandy slightly gravelly CLAY (gravel is fm and angular to sub-angular)	20	38	18	20	90	
WS3	D	1.40	Brown gravelly CLAY (gravel is fmc and angular to sub-angular)	27	78	33	45	20	
WS4	D	1.80	Brown, orangey-brown and pale gray mottled slightly sandy slightly gravelly CLAY (gravel is fmc and angular to sub-angular)	26	45	20	25	78	

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.

BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.

BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved

Initials: K.P

Date: 14/11/2012

Project Name:	Ranelagh Road, Havant			**Samples Received:**	10/02/2014
				Project Started:	11/02/2014
Client:	Soils Ltd			**Testing Started:**	17/02/2014
Project No:	14099	**Our job/report no:**	16110	**Date Reported:**	18/02/2014

K4 SOILS

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
WS5	D	1.00	Orange brown and occasional brown slightly sandy silty CLAY	25	45	22	23	99	
WS7	D	1.50	Orange brown sandy silty CLAY with scattered bleck flecks	20	43	20	23	100	
WS8	D	1.50	Orange brown and occasional pale grey slightly sandy silty CLAY with rare fine gravel	23	50	21	29	99	
WS9	D	1.50	Orange brown slightly mottled pale grey slightly sandy silty CLAY with rare fine gravel	21	42	21	21	99	
WS10	D	1.50	Grey and orange brown mottled sandy silty CLAY with scattered black flecks and rare fine gravel	21	41	20	21	100	

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.
BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

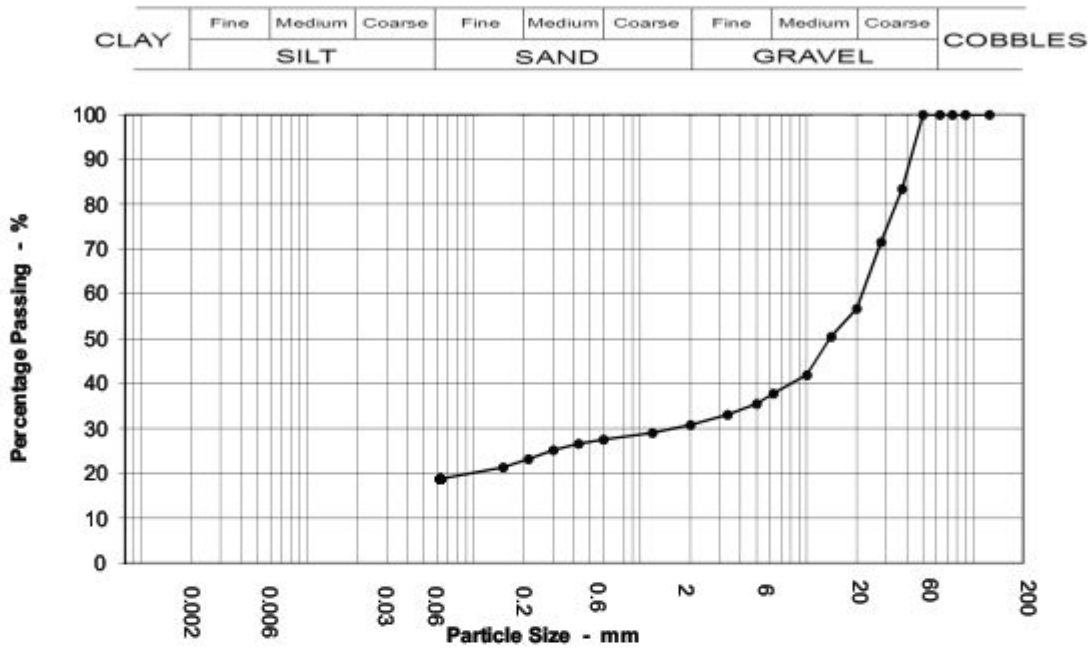
Checked and Approved
Initials: K.P
Date: 18/02/2014

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

All samples connected with this report ,incl any on 'hold' will be stored and disposed off according to Company policy.A copy of this policy is available on request.

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	16110
		Project No:	14099
Location	Ranelagh Road, Havant	Borehole / Trial Pit No:	WS10
		Depth	2.00 m
Visual Soil Description	Brown sandy clayey GRAVEL with occasional calcareous deposits (gravel is fmc and sub-angular to angular)	Sample Type/No	D -



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	83		
28	72		
20	57		
14	50		
10	42		
6.3	38		
5	36		
3.35	33		
2	31		
1.18	29		
0.6	28		
0.425	27		
0.3	25		
0.212	23		
0.15	21		
0.063	19		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.2
Sedimentation	N/A
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	69.2
Sand	12.0
Silt & Clay	18.8

Grading Analysis	
D100	125.0
D60	21.8
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

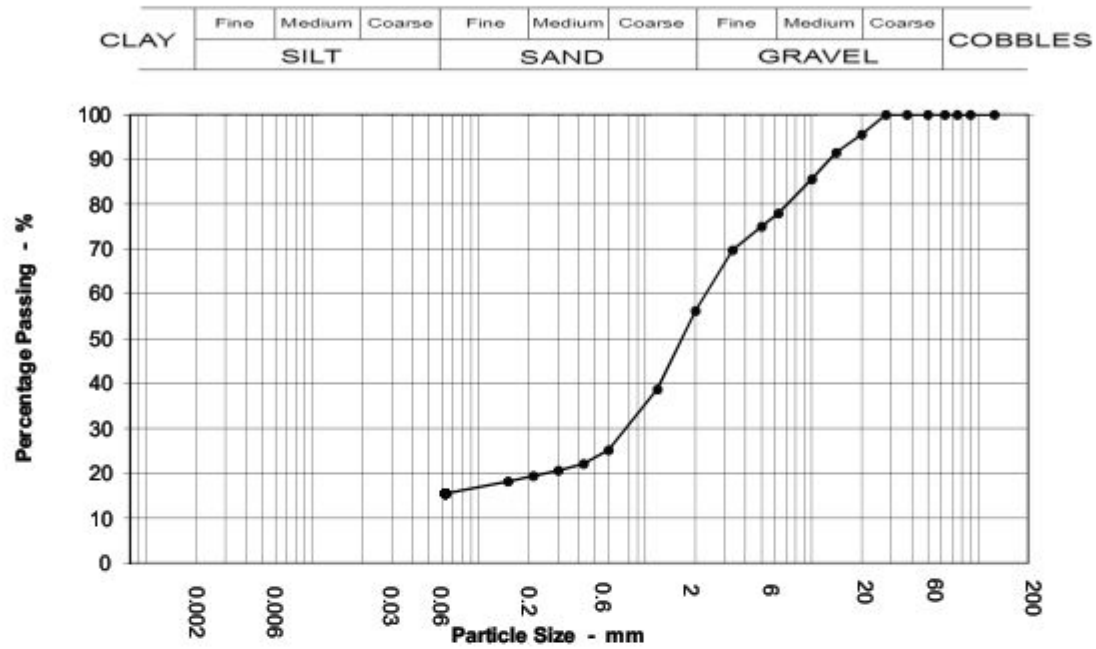
Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 18/02/2014

UKAS TESTING

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request. Sheet 3.8 MSF-11/R9

K4 SOILS	PARTICLE SIZE DISTRIBUTION BS 1377 : Part 2 : 1990 : Clause 9	Our Report No:	13602
		Project No:	13284
Location	Ranelegh Road, Havant	Borehole / Trial Pit No:	TP2
		Depth	1.50 m
Visual Soil Description	Brown slightly clayey sandy GRAVEL with occasional fmc chalk fragments (gravel is fmc and sub-angular to sub-rounded)	Sample Type/No	B -



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	96		
14	92		
10	86		
6.3	78		
5	75		
3.35	70		
2	56		
1.18	39		
0.6	25		
0.425	22		
0.3	21		
0.212	19		
0.15	18		
0.063	15		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving Sedimentation	Clause N/A
Suitable Amount Of Sample Received	Yes

Sample Proportions	
Cobbles	0.0
Gravel	43.8
Sand	40.8
Silt & Clay	15.5

Grading Analysis	
D100	125.0
D60	2.4
D10	
Uniformity Coefficient	N/A

K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU.
E-mail: k4soils@aol.com

Approved Signatories:
K.Phaure(Tech.Mgr) J.Phaure(Lab.Mgr)

Test results relate only to the sample numbers shown above

Checked and Approved
Initials: kp
Date: 14/11/2012

UKAS TESTING

All samples connected with this report, incl any on 'hold' will be disposed off according to company policy. A copy of this policy is available on request. Sheet 3.8 MSF-11/R9

Craig Morrison
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 851105
russelljarvis@qtsenvironmental.com

4480

QTS Environmental Report No: 12-11608

Site Reference:	Ranelagh Road, Havant
Project / Job Ref:	13284
Order No:	None Supplied
Sample Receipt Date:	01/11/2012
Sample Scheduled Date:	01/11/2012
Report Issue Number:	1
Reporting Date:	07/11/2012

Authorised by: [redacted]

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by: [redacted]

Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate						
QTS Environmental Report No: 12-11608	**Date Sampled**	30/10/12	30/10/12	30/10/12		
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	**TP / BH No**	WS1	WS2	WS4		
Project / Job Ref: 13284	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	**Depth (m)**	1.30	1.00	2.90		
Reporting Date: 07/11/2012	**QTSE Sample No**	54854	54855	54856		

Determinand	Unit	MDL	Accreditation					
pH	pH Units	N / a	MCERTS	8.1	8.1	8.2		
Total Sulphate as SO_4	mg/kg	< 200	NONE	445	< 200	513		
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	NONE	0.05	0.02	0.01		
Total Sulphur	mg/kg	< 200	NONE	< 200	< 200	< 200		
Ammonium as NH_4	mg/kg	< 0.5	NONE	< 0.5	< 0.5	< 0.5		
W/S Chloride (2:1)	mg/kg	< 10	NONE	< 10	< 10	< 10		
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 4	NONE	4	12	< 4		
W/S Magnesium	mg/kg	< 10	NONE	< 10	10	< 10		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Stone content is classified as material greater than 10mm in diameter
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 12-11608	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 13284	
Order No: None Supplied	
Reporting Date: 07/11/2012	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
54854	WS1	None Supplied	1.30	12.2	Grey gravelly clay with chalk and stones
54855	WS2	None Supplied	1.00	18	Brown clay with vegetation
54856	WS4	None Supplied	2.90	13.9	Light brown clay with chalk and stones

Insufficient sample I/S
Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 12-11608
Soils Ltd
Site Reference: Ranelagh Road, Havant
Project / Job Ref: 13284
Order No: None Supplied
Reporting Date: 07/11/2012

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	AR	Asbestos Screening	Visual screening of samples for fibrous material	E024
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E021
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by turbidimeter	E020
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E023
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	D	Phosphorus	Determination of phosphorus by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	AR	Sulphide	Determination of sulphide by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia, potassium iodide/iodate followed by ICP-OES	E002
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E009
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E009
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E010
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E009
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	EPH (with florisil cleanup)	Determination of acetone/hexane extractable hydrocarbons with florisil cleanup step by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001

Key

D Dried
AR As Received

Lucy Howell
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russelljarvis@qtsenvironmental.com

QTS Environmental Report No: 14-19432

Site Reference:	Ranelagh Road, Havant
Project / Job Ref:	14099
Order No:	None Supplied
Sample Receipt Date:	13/02/2014
Sample Scheduled Date:	13/02/2014
Report Issue Number:	1
Reporting Date:	19/02/2014

Authorised by: [redacted]
Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by: [redacted]
Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
QTS Environmental Report No: 14-19432	**Date Sampled**	12/02/14	12/02/14	12/02/14	12/02/14	
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road, Havant	**TP / BH No**	WS9	WS10	WS5	WS7	
Project / Job Ref: 14099	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	**Depth (m)**	2.00	2.50	2.00	2.00	
Reporting Date: 19/02/2014	**QTSE Sample No**	93691	93692	93693	93694	

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	8.3	8.5	8.3	8.1	
Total Sulphate as SO_4	mg/kg	< 200	NONE	354	472	641	< 200	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	NONE	0.02	0.01	< 0.01	0.01	
Total Sulphur	mg/kg	< 200	NONE	< 200	< 200	221	< 200	
Ammonium as NH_4	mg/kg	< 0.5	NONE	4.6	1.9	6.4	5.5	
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	16	8	5	14	
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	MCERTS	28	< 3	3	6	
W/S Magnesium	mg/kg	< 10	NONE	< 10	< 10	< 10	14	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30 °C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-19432	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 14099	
Order No: None Supplied	
Reporting Date: 19/02/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
93691	WS9	None Supplied	2.00	15.3	Brown loamy clay with concrete and stones
93692	WS10	None Supplied	2.50	12.7	Light brown gravelly clay
93693	WS5	None Supplied	2.00	12.7	Beige clayey gravel with chalk
93694	WS7	None Supplied	2.00	11.9	Brown gravelly clay with stones

Insufficient sample I/S
Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 14-19432
Soils Ltd
Site Reference: Ranelagh Road, Havant
Project / Job Ref: 14099
Order No: None Supplied
Reporting Date: 19/02/2014

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

Moisture content is part of procedure E003 & is not an accredited test

D Dried
AR As Received

Appendix C
Chemical Laboratory Test Results;

Craig Morrison
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 851105
russelljarvis@qtsenvironmental.com

QTS Environmental Report No: 12-11610

Site Reference:	Ranelagh Road, Havant
Project / Job Ref:	13284
Order No:	None Supplied
Sample Receipt Date:	01/11/2012
Sample Scheduled Date:	01/11/2012
Report Issue Number:	1
Reporting Date:	08/11/2012

Authorised by: [redacted]
Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by: [redacted]
Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12	30/10/12	30/10/12	30/10/12
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS2	WS3	WS4	WS4
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.10	0.30	0.10	0.10	0.40
Reporting Date: 08/11/2012	QTSE Sample No	54862	54863	54864	54865	54866

Determinand	Unit	MDL	Accreditation					
Fibrous Material Screen	P/A	N/a	NONE	Negative	Negative	Negative	Negative	Negative
pH	pH Units	N/a	MCERTS	7.8	7.3	6.0	7.0	7.1
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	NONE	0.10	0.03	0.03	0.01	< 0.01
Sulphide	mg/kg	< 5	NONE	12	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	NONE	4.5	4.7	6.7	1.2	11.5
Total Organic Carbon (TOC)	%	< 0.1	NONE	2.6	2.7	3.9	0.7	6.7
Arsenic (As)	mg/kg	< 2	MCERTS	10	14	7	10	7
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	< 0.5	< 0.5	0.6	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	1.8	1.1	1.3	1.8
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium (Cr)	mg/kg	< 2	MCERTS	16	21	27	28	32
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	43	36	37	47	15
Lead (Pb)	mg/kg	< 3	MCERTS	84	290	96	195	18
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	13	18	20	21	21
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	31	36	51	48	47
Zinc (Zn)	mg/kg	< 3	MCERTS	83	194	139	274	56
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Stone content is classified as material greater than 10mm in diameter
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate						
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12	26/10/12	26/10/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	S1	TP2	TP3		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.40	0.50	0.40		
Reporting Date: 08/11/2012	QTSE Sample No	54867	54869	54870		

Determinand	Unit	MDL	Accreditation					
Fibrous Material Screen	P/A	N/a	NONE	Negative	Negative	Negative		
pH	pH Units	N/a	MCERTS	7.2	7.8	7.1		
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2		
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	NONE	0.02	0.02	0.02		
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5		
Organic Matter	%	< 0.1	NONE	8.9	5.7	5.9		
Total Organic Carbon (TOC)	%	< 0.1	NONE	5.2	3.3	3.4		
Arsenic (As)	mg/kg	< 2	MCERTS	10	11	8		
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	< 0.5		
W/S Boron	mg/kg	< 1	NONE	2.1	2	1.4		
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5		
Chromium (Cr)	mg/kg	< 2	MCERTS	24	23	24		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	44	57	35		
Lead (Pb)	mg/kg	< 3	MCERTS	198	223	129		
Mercury (Hg)	mg/kg	< 1	NONE	1.1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	19	22	18		
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		
Vanadium (V)	mg/kg	< 2	NONE	35	45	47		
Zinc (Zn)	mg/kg	< 3	MCERTS	226	166	104		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Stone content is classified as material greater than 10mm in diameter
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12	30/10/12	30/10/12	30/10/12
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS2	WS3	WS4	WS4
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.10	0.30	0.10	0.10	0.40
Reporting Date: 08/11/2012	QTSE Sample No	54862	54863	54864	54865	54866

Determinand	Unit	MDL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	0.16	0.21	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	0.20	1.04	0.17	< 0.1	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	0.15	0.95	0.15	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.40	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	0.64	0.12	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.67	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.32	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.44	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.30	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	0.24	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	5.2	< 1.6	< 1.6	< 1.6

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Speciated PAHs						
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12	26/10/12	26/10/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	S1	TP2	TP3		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.40	0.50	0.40		
Reporting Date: 08/11/2012	QTSE Sample No	54867	54869	54870		

Determinand	Unit	MDL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	0.31	0.30	0.38		
Pyrene	mg/kg	< 0.1	MCERTS	0.27	0.27	0.35		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.14	0.16		
Chrysene	mg/kg	< 0.1	MCERTS	0.19	0.22	0.28		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.22	0.21	0.28		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.12		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	0.15	0.17		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	1.9		

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

Soil Analysis Certificate - TPH CWG Banded						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Ranelagh Road, Havant	TP / BH No	WS3	WS4			
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.10	0.10			
Reporting Date: 08/11/2012	QTSE Sample No	54864	54865			

Determinand	Unit	MDL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aliphatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1			
Aliphatic >C21 - C34	mg/kg	< 6	NONE	< 6	< 6			
Aliphatic (C5 - C34)	mg/kg	< 12	NONE	< 12	< 12			
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01			
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05			
Aromatic >C8 - C10	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C10 - C12	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C12 - C16	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C16 - C21	mg/kg	< 1	NONE	< 1	< 1			
Aromatic >C21 - C35	mg/kg	< 6	NONE	< 6	< 6			
Aromatic (C5 - C35)	mg/kg	< 12	NONE	< 12	< 12			
Total >C5 - C35	mg/kg	< 24	NONE	< 24	< 24			

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - BTEX / MTBE						
QTS Environmental Report No: 12-11610	Date Sampled	30/10/12	30/10/12			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Ranelagh Road, Havant	TP / BH No	WS3	WS4			
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	0.10	0.10			
Reporting Date: 08/11/2012	QTSE Sample No	54864	54865			

Determinand	Unit	MDL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2			
Toluene	ug/kg	< 5	MCERTS	< 5	< 5			
Ethylbenzene	ug/kg	< 10	MCERTS	< 10	< 10			
p & m-xylene	ug/kg	< 10	MCERTS	< 10	< 10			
o-xylene	ug/kg	< 10	MCERTS	< 10	< 10			

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

UKAS TESTING
4480

Soil Analysis Certificate - Organochlorine Pesticides						
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12				
Soils Ltd	Time Sampled	None Supplied				
Site Reference: Ranelagh Road, Havant	TP / BH No	TP1				
Project / Job Ref: 13284	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	0.20				
Reporting Date: 08/11/2012	QTSE Sample No	54868				

Determinand	Unit	MDL	Accreditation					
Aldrin [S]	mg/kg	< 0.02	ISO17025	< 0.02				
alpha-HCH [S]	mg/kg	< 0.02	ISO17025	< 0.02				
beta-HCH [S]	mg/kg	< 0.02	ISO17025	< 0.02				
cis-chlordane [S]	mg/kg	< 0.02	ISO17025	< 0.02				
delta-HCH [S]	mg/kg	< 0.02	NONE	< 0.02				
Dieldrin [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Endosulfan A [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Endosulfan B [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Endrin [S]	mg/kg	< 0.02	ISO17025	< 0.02				
gamma-HCH (Lindane) [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Heptachlor [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Heptachlor epoxide [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Hexachlorobenzene (HCB) [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Isodrin [S]	mg/kg	< 0.02	ISO17025	< 0.02				
Methoxychlor [S]	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDD [S]	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDE [S]	mg/kg	< 0.02	NONE	< 0.02				
o,p' - DDT [S]	mg/kg	< 0.02	NONE	< 0.02				
p,p' - DDD [S]	mg/kg	< 0.02	ISO17025	< 0.02				
p,p' - DDE [S]	mg/kg	< 0.02	ISO17025	< 0.02				
p,p' - DDT [S]	mg/kg	< 0.02	ISO17025	< 0.02				
trans-chlordane [S]	mg/kg	< 0.02	NONE	< 0.02				
Trifluralin [S]	mg/kg	< 0.02	NONE	< 0.02				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30 °C
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

Soil Analysis Certificate - Phenyl Urea Herbicides							
QTS Environmental Report No: 12-11610	Date Sampled	26/10/12					
Soils Ltd	Time Sampled	None Supplied					
Site Reference: Ranelagh Road, Havant	TP / BH No	TP1					
Project / Job Ref: 13284	Additional Refs	None Supplied					
Order No: None Supplied	Depth (m)	0.20					
Reporting Date: 08/11/2012	QTSE Sample No	54868					

Determinand	Unit	MDL	Accreditation					
Chloroxuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Chlortoluron [S]	mg/kg	< 0.1	NONE	< 0.1				
Diflubenzuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Dimefuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Diuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Isoproturon [S]	mg/kg	< 0.1	NONE	< 0.1				
Linuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Methabenzthiazuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Metoxuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Monolinuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Monuron [S]	mg/kg	< 0.1	NONE	< 0.1				
Pencycuron [S]	mg/kg	< 0.1	NONE	< 0.1				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30 °C
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 12-11610	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 13284	
Order No: None Supplied	
Reporting Date: 08/11/2012	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
54862	WS1	None Supplied	0.10	17.1	Brown clayey loam with stones and chalk
54863	WS2	None Supplied	0.30	26.4	Brown loamy clay with vegetation and stones
54864	WS3	None Supplied	0.10	21.7	Light brown clayey sand with chalk
54865	WS4	None Supplied	0.10	23.4	Brown clayey loam with vegetation and rubble
54866	WS4	None Supplied	0.40	18.7	Light brown clay with vegetation
54867	S1	None Supplied	0.40	27.5	Brown loamy clay with vegetation
54868	TP1	None Supplied	0.20	27.4	Brown loamy clay with vegetation
54869	TP2	None Supplied	0.50	23.4	Brown loamy clay with vegetation
54870	TP3	None Supplied	0.40	21.8	Brown clayey loam with vegetation

Insufficient sample I/S
Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 12-11610
Soils Ltd
Site Reference: Ranelagh Road, Havant
Project / Job Ref: 13284
Order No: None Supplied
Reporting Date: 08/11/2012

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	AR	Asbestos Screening	Visual screening of samples for fibrous material	E024
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E021
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by turbidimeter	E020
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E023
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	D	Phosphorus	Determination of phosphorus by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	AR	Sulphide	Determination of sulphide by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia, potassium iodide/iodate followed by ICP-OES	E002
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E011
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E009
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E009
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E010
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E009
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	EPH (with florisil cleanup)	Determination of acetone/hexane extractable hydrocarbons with florisil cleanup step by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001

Key

D Dried
AR As Received

Lucy Howell
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russelljarvis@qtsenvironmental.com

QTS Environmental Report No: 14-19431

Site Reference:	Ranelagh Road, Havant
Project / Job Ref:	14099
Order No:	None Supplied
Sample Receipt Date:	13/02/2014
Sample Scheduled Date:	13/02/2014
Report Issue Number:	1
Reporting Date:	19/02/2014

Authorised by: [redacted]

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised b [redacted]

Kevin Old
Director
On behalf of

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
QTS Environmental Report No: 14-19431	**Date Sampled**	12/02/14	12/02/14	12/02/14	12/02/14	
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road, Havant	**TP / BH No**	WS5	WS7	WS8	WS9	
Project / Job Ref: 14099	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	**Depth (m)**	0.60	0.40	0.40	0.60	
Reporting Date: 19/02/2014	**QTSE Sample No**	93687	93688	93689	93690	

Determinand	Unit	RL	Accreditation					
Asbestos Screen [S]	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	8.1	8.1	8.1	9.6	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	NONE	0.02	0.07	0.10	< 0.01	
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	
Organic Matter	%	< 0.1	NONE	< 0.1	1	2.9	< 0.1	
Total Organic Carbon (TOC)	%	< 0.1	NONE	< 0.1	0.6	1.7	< 0.1	
Arsenic (As)	mg/kg	< 2	MCERTS	4	9	12	5	
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	< 0.5	< 0.5	
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	2.7	< 1	
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	
Chromium (Cr)	mg/kg	< 2	MCERTS	28	16	18	8	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	13	31	30	15	
Lead (Pb)	mg/kg	< 3	MCERTS	13	27	385	58	
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	3.9	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	20	25	15	6	
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	
Vanadium (V)	mg/kg	< 2	NONE	43	34	35	16	
Zinc (Zn)	mg/kg	< 3	MCERTS	48	73	75	31	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30 °C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs							
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14	12/02/14	12/02/14	12/02/14		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	WS5	WS7	WS8	WS9		
Project / Job Ref: 14099	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.60	0.40	0.40	0.60		
Reporting Date: 19/02/2014	QTSE Sample No	93687	93688	93689	93690		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.28	< 0.1	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.23	< 0.1	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.14	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.17	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded							
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14					
Soils Ltd	Time Sampled	None Supplied					
Site Reference: Ranelagh Road, Havant	TP / BH No	WS8					
Project / Job Ref: 14099	Additional Refs	None Supplied					
Order No: None Supplied	Depth (m)	0.40					
Reporting Date: 19/02/2014	QTSE Sample No	93689					

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01				
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aliphatic >C8 - C10	mg/kg	< 1	NONE	< 1				
Aliphatic >C10 - C12	mg/kg	< 1	NONE	< 1				
Aliphatic >C12 - C16	mg/kg	< 1	NONE	< 1				
Aliphatic >C16 - C21	mg/kg	< 1	NONE	< 1				
Aliphatic >C21 - C34	mg/kg	< 6	NONE	< 6				
Aliphatic (C5 - C34)	mg/kg	< 12	NONE	< 12				
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01				
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aromatic >C8 - C10	mg/kg	< 1	NONE	< 1				
Aromatic >C10 - C12	mg/kg	< 1	NONE	< 1				
Aromatic >C12 - C16	mg/kg	< 1	NONE	< 1				
Aromatic >C16 - C21	mg/kg	< 1	NONE	< 1				
Aromatic >C21 - C35	mg/kg	< 6	NONE	< 6				
Aromatic (C5 - C35)	mg/kg	< 12	NONE	< 12				
Total >C5 - C35	mg/kg	< 24	NONE	< 24				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 14-19431	Date Sampled	12/02/14					
Soils Ltd	Time Sampled	None Supplied					
Site Reference: Ranelagh Road, Havant	TP / BH No	WS8					
Project / Job Ref: 14099	Additional Refs	None Supplied					
Order No: None Supplied	Depth (m)	0.40					
Reporting Date: 19/02/2014	QTSE Sample No	93689					

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 10	MCERTS	< 10				
p & m-xylene	ug/kg	< 10	MCERTS	< 10				
o-xylene	ug/kg	< 10	MCERTS	< 10				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-19431	
Soils Ltd	
Site Reference: Ranelagh Road, Havant	
Project / Job Ref: 14099	
Order No: None Supplied	
Reporting Date: 19/02/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
93687	WS5	None Supplied	0.60	18.1	Light brown clay
93688	WS7	None Supplied	0.40	11.6	Brown clayey gravel with stones
93689	WS8	None Supplied	0.40	19.8	Brown clayey loam with rubble
93690	WS9	None Supplied	0.60	18.2	Brown clayey loam with chalk

Insufficient sample I/S
Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 14-19431
Soils Ltd
Site Reference: Ranelagh Road, Havant
Project / Job Ref: 14099
Order No: None Supplied
Reporting Date: 19/02/2014

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

Moisture content is part of procedure E003 & is not an accredited test

D Dried
AR As Received

Craig Morrison
Soils Ltd
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 14-26749

Site Reference:	Ranelagh Road
Project / Job Ref:	14639
Order No:	None Supplied
Sample Receipt Date:	21/11/2014
Sample Scheduled Date:	21/11/2014
Report Issue Number:	1
Reporting Date:	26/11/2014

Authorised by:

[redacted]

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by:

[redacted]

Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate							
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP101	TP102	TP103	TP104	TP105	
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	0.25	0.50	0.50	0.25	0.25	
Reporting Date: 26/11/2014	QTSE Sample No	126538	126539	126540	126541	126542	

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	6.9	7.0	7.5	7.5	7.8
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.03	0.04	0.03	0.02	0.02
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter	%	< 0.1	NONE	1.4	0.4	0.2	4.1	1
Total Organic Carbon (TOC)	%	< 0.1	NONE	0.8	0.2	< 0.1	2.4	0.6
Arsenic (As)	mg/kg	< 2	MCERTS	5	5	4	4	7
Beryllium (Be)	mg/kg	< 0.5	NONE	< 0.5	0.6	0.5	< 0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium (Cr)	mg/kg	< 2	MCERTS	24	23	22	21	23
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	29	14	9	11	27
Lead (Pb)	mg/kg	< 3	MCERTS	40	22	10	48	194
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	17	21	23	10	16
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 2	NONE	38	32	31	33	37
Zinc (Zn)	mg/kg	< 3	MCERTS	64	50	45	109	73
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Piotr Lipski

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis (S)

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate							
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road	TP / BH No	TP106	TP108	TP109	TP110		
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.25	0.25	0.25	0.25		
Reporting Date: 26/11/2014	QTSE Sample No	126543	126544	126545	126546		

Determinand	Unit	RL	Accreditation					
Asbestos Screen	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	
pH	pH Units	N/a	MCERTS	7.0	7.2	7.5	7.2	
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
W/S Sulphate as SO4 (2:1)	g/l	< 0.01	MCERTS	0.01	0.01	0.03	0.04	
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	
Organic Matter	%	< 0.1	NONE	6.5	1.4	2.1	3.6	
Total Organic Carbon (TOC)	%	< 0.1	NONE	3.8	0.8	1.2	2.1	
Arsenic (As)	mg/kg	< 2	MCERTS	10	6	7	9	
Beryllium (Be)	mg/kg	< 0.5	NONE	0.7	< 0.5	0.5	0.6	
W/S Boron	mg/kg	< 1	NONE	1.5	1.5	< 1	2.1	
Cadmium (Cd)	mg/kg	< 0.5	MCERTS	0.8	< 0.5	< 0.5	< 0.5	
Chromium (Cr)	mg/kg	< 2	MCERTS	27	23	19	20	
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	
Copper (Cu)	mg/kg	< 4	MCERTS	40	13	26	35	
Lead (Pb)	mg/kg	< 3	MCERTS	104	27	97	118	
Mercury (Hg)	mg/kg	< 1	NONE	1.4	< 1	< 1	< 1	
Nickel (Ni)	mg/kg	< 3	MCERTS	19	15	17	17	
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	
Vanadium (V)	mg/kg	< 2	NONE	40	37	39	41	
Zinc (Zn)	mg/kg	< 3	MCERTS	206	65	58	104	
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

The samples have been examined to identify the presence of asbestiform minerals by polarising light microscopy and dispersion staining technique to In-House Procedures QTSE600 Determination of Asbestos in Bulk Materials; Asbestos in Soils/Sediments (fibre screening and identification)

This report refers to samples as received, and QTS Environmental Ltd, takes no responsibility for the accuracy or competence of sampling by others.

The material description shall be regarded as tentative and is not included in our scope of UKAS Accreditation.

Opinions and interpretations expressed herein are outside the scope of UKAS Accreditation.

Asbestos Analyst: Piotr Lipski

RL: Reporting Limit

Pinch Test: Where pinch test is positive it is reported "Loose Fibres - PT" with type(s).

Subcontracted analysis (S)

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs								
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP101	TP102	TP103	TP104	TP105	
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied	Depth (m)	0.25	0.50	0.50	0.25	0.25	
Reporting Date: 26/11/2014	QTSE Sample No	126538	126539	126540	126541	126542	

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.27	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.92	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.84	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.42	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.48	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.60	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.20	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.42	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.27	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.27	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	4.7	< 1.6

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs								
QTS Environmental Report No: 14-26749		Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	
Soils Ltd		Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Ranelagh Road		TP / BH No	TP106	TP108	TP109	TP110	
Project / Job Ref: 14639		Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: None Supplied		Depth (m)	0.25	0.25	0.25	0.25	
Reporting Date: 26/11/2014		QTSE Sample No	126543	126544	126545	126546	
Determinand	**Unit**	**RL**	**Accreditation**				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.24	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.13	0.42	
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.13	0.34	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.16	
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.22	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.28	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.17	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	1.8	

Analytical results are expressed on a dry weight basis where samples are dried at less than 30^{O}C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - TPH CWG Banded								
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP102	TP104	TP105	TP106	TP108
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.25	0.25	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126539	126541	126542	126543	126544

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	< 21
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	3	< 3	4	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	21	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21	25	< 21
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42	< 42	< 42

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - TPH CWG Banded							
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14					
Soils Ltd	Time Sampled	None Supplied					
Site Reference: Ranelagh Road	TP / BH No	TP110					
Project / Job Ref: 14639	Additional Refs	None Supplied					
Order No: None Supplied	Depth (m)	0.25					
Reporting Date: 26/11/2014	QTSE Sample No	126546					

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01				
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10				
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21				
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01				
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2				
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2				
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2				
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3				
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10				
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21				
Total >C5 - C35	mg/kg	< 42	NONE	< 42				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14	18/11/14	18/11/14	18/11/14	18/11/14
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Ranelagh Road	TP / BH No	TP102	TP104	TP105	TP106	TP108
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.25	0.25	0.25	0.25
Reporting Date: 26/11/2014	QTSE Sample No	126539	126541	126542	126543	126544

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
p & m-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
o-xylene	ug/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 14-26749	Date Sampled	18/11/14					
Soils Ltd	Time Sampled	None Supplied					
Site Reference: Ranelagh Road	TP / BH No	TP110					
Project / Job Ref: 14639	Additional Refs	None Supplied					
Order No: None Supplied	Depth (m)	0.25					
Reporting Date: 26/11/2014	QTSE Sample No	126546					

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 10	MCERTS	< 10				
p & m-xylene	ug/kg	< 10	MCERTS	< 10				
o-xylene	ug/kg	< 10	MCERTS	< 10				
MTBE	ug/kg	< 5	MCERTS	< 5				

Analytical results are expressed on a dry weight basis where samples are dried at less than 30°C

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 4480

Soil Analysis Certificate - Sample Descriptions	
QTS Environmental Report No: 14-26749	
Soils Ltd	
Site Reference: Ranelagh Road	
Project / Job Ref: 14639	
Order No: None Supplied	
Reporting Date: 26/11/2014	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
126538	TP101	None Supplied	0.25	17.2	Brown loamy clay with vegetation
126539	TP102	None Supplied	0.50	12	Brown gravelly clay with stones
126540	TP103	None Supplied	0.50	13.6	Brown gravelly clay with stones
126541	TP104	None Supplied	0.25	16.9	Brown loamy clay with brick
126542	TP105	None Supplied	0.25	18.7	Brown loamy clay with brick
126543	TP106	None Supplied	0.25	31.6	Brown loamy clay with vegetation
126544	TP108	None Supplied	0.25	19	Brown clayey loam
126545	TP109	None Supplied	0.25	21.4	Brown gravelly clay with rubble
126546	TP110	None Supplied	0.25	19.7	Brown sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 14-26749
Soils Ltd
Site Reference: Ranelagh Road
Project / Job Ref: 14639
Order No: None Supplied
Reporting Date: 26/11/2014

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	TPH LQM	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E001

D Dried
AR As Received

4480

Craig Morrison
Soils Ltd
Brunel House, Unit 14
Chalcroft Distribution Park
Burnetts Lane
Southampton
Hampshire
SO30 2PA

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 851105
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 12-11722

Site Reference:	Ranelagh Road, Havant
Project / Job Ref:	13284
Order No:	None Supplied
Sample Receipt Date:	09/11/2012
Sample Scheduled Date:	09/11/2012
Report Issue Number:	1
Reporting Date:	15/11/2012

Authorised by:

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by:

Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

4480

Water Analysis Certificate						
QTS Environmental Report No: 12-11722	Date Sampled	06/11/12	06/11/12	06/11/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS3	WS4		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 15/11/2012	QTSE Sample No	55432	55433	55434		

Determinand	Unit	MDL	Accreditation					
pH	pH units	N / a	ISO17025	7.2	7.4	7.3		
Total Cyanide	ug/l	< 5	NONE	< 5	< 5	< 5		
Sulphate as SO_4	mg/l	< 1	NONE	73	54	46		
Sulphide	mg/l	< 0.1	NONE	< 0.1	< 0.1	< 0.1		
Total Organic Carbon (TOC)	mg/l	< 0.1	NONE	32.2	4.9	5.5		
Arsenic (dissolved)	ug/l	< 10	NONE	< 10	< 10	< 10		
Beryllium (dissolved)	ug/l	< 1	NONE	< 1	< 1	< 1		
Boron (dissolved)	ug/l	< 50	NONE	63	< 50	< 50		
Cadmium (dissolved)	ug/l	< 0.5	NONE	< 0.5	< 0.5	< 0.5		
Chromium (dissolved)	ug/l	< 5	NONE	< 5	< 5	< 5		
Chromium (hexavalent)	ug/l	< 5	NONE	< 5	< 5	< 5		
Copper (dissolved)	ug/l	< 10	NONE	< 10	< 10	< 10		
Lead (dissolved)	ug/l	< 5	NONE	< 5	< 5	< 5		
Mercury (dissolved)	ug/l	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Nickel (dissolved)	ug/l	< 7	NONE	< 7	< 7	< 7		
Selenium (dissolved)	ug/l	< 5	NONE	< 5	< 5	< 5		
Vanadium (dissolved)	ug/l	< 5	NONE	< 5	< 5	< 5		
Zinc (dissolved)	ug/l	< 5	NONE	< 5	< 5	< 5		
Total Phenols	ug/l	< 0.5	NONE	< 0.5	< 0.5	< 0.5		

Subcontracted analysis [S]

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

Water Analysis Certificate - Speciated PAH							
QTS Environmental Report No: 12-1	**Date Sampled**	06/11/12	06/11/12	06/11/12		
Soils Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	**TP / BH No**	WS1	WS3	WS4		
Project / Job Ref: 13284	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	**Depth (m)**	None Supplied	None Supplied	None Supplied		
Reporting Date: 15/11/2012	**QTSE Sample No**	55432	55433	55434		

Determinand	Unit	MDL	Accreditation					
Naphthalene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Acenaphthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Fluorene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Phenanthrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Chrysene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(ghi)perylene	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Total EPA-16 PAHs	ug/l	< 0.01	NONE	< 0.01	< 0.01	< 0.01		

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

Water Analysis Certificate - TPH CWG Banded							
QTS Environmental Report No: 12-11722	Date Sampled	06/11/12	06/11/12	06/11/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS3	WS4		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 15/11/2012	QTSE Sample No	55432	55433	55434		

Determinand	Unit	MDL	Accreditation					
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10	< 10	< 10		
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70	< 70		
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10	< 10		
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70	< 70	< 70		
Total >C5 - C35	ug/l	< 140	NONE	< 140	< 140	< 140		

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 851105

UKAS TESTING
4480

Water Analysis Certificate - BTEX / MTBE							
QTS Environmental Report No: 12-11722	Date Sampled	06/11/12	06/11/12	06/11/12		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Ranelagh Road, Havant	TP / BH No	WS1	WS3	WS4		
Project / Job Ref: 13284	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	None Supplied	None Supplied	None Supplied		
Reporting Date: 15/11/2012	QTSE Sample No	55432	55433	55434		

Determinand	Unit	MDL	Accreditation					
Benzene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
Toluene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5	< 5		
p & m-xylene	ug/l	< 10	ISO17025	< 10	< 10	< 10		
o-xylene	ug/l	< 5	ISO17025	< 5	< 5	< 5		

4480

Craig Morrison
Soils Ltd
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

QTS Environmental Report No: 14-26666

Site Reference:	Ranelagh Road
Project / Job Ref:	14639
Order No:	None Supplied
Sample Receipt Date:	17/11/2014
Sample Scheduled Date:	18/11/2014
Report Issue Number:	1
Reporting Date:	24/11/2014

Authorised by: [redacted]

Russell Jarvis
Director
On behalf of QTS Environmental Ltd

Authorised by [redacted]

Kevin Old
Director
On behalf of QTS Environmental Ltd

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING
4480

Water Analysis Certificate								
QTS Environmental Report No: 14-26666	**Date Sampled**	14/11/14	14/11/14			
Soils Ltd	**Time Sampled**	None Supplied	None Supplied			
Site Reference: Ranelagh Road	**TP / BH No**	WS3	WS4			
Project / Job Ref: 14639	**Additional Refs**	None Supplied	None Supplied			
Order No: None Supplied	**Depth (m)**	None Supplied	None Supplied			
Reporting Date: 24/11/2014	**QTSE Sample No**	126286	126287			

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	ISO17025	6.7	6.5			
Total Cyanide	ug/l	< 5	NONE	< 5	< 5			
Sulphate as SO_4	mg/l	< 1	ISO17025	19	26			
Sulphide	mg/l	< 0.1	NONE	< 0.1	< 0.1			
Total Organic Carbon (TOC)	mg/l	< 0.1	NONE	59.2	61.2			
Arsenic (dissolved)	ug/l	< 10	NONE	< 10	< 10			
Beryllium (dissolved)	ug/l	< 1	NONE	< 1	< 1			
Boron (dissolved)	ug/l	< 50	NONE	52	85			
Cadmium (dissolved)	ug/l	< 0.5	NONE	< 0.5	< 0.5			
Chromium (dissolved)	ug/l	< 5	NONE	< 5	< 5			
Chromium (hexavalent)	ug/l	< 5	NONE	< 5	< 5			
Copper (dissolved)	ug/l	< 10	NONE	< 10	< 10			
Lead (dissolved)	ug/l	< 5	NONE	< 5	< 5			
Mercury (dissolved)	ug/l	< 0.05	NONE	< 0.05	< 0.05			
Nickel (dissolved)	ug/l	< 7	NONE	< 7	< 7			
Selenium (dissolved)	ug/l	< 5	NONE	< 5	< 5			
Vanadium (dissolved)	ug/l	< 5	NONE	< 5	< 5			
Zinc (dissolved)	ug/l	< 5	NONE	7	9			
Total Phenols	ug/l	< 0.5	NONE	< 0.5	< 0.5			

Subcontracted analysis (S)
Insufficient sample I/S
Unsuitable Sample U/S

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Speciated PAH							
QTS Environmental Report No: 14-2	**Date Sampled**	14/11/14	14/11/14			
Soils Ltd	**Time Sampled**	None Supplied	None Supplied			
Site Reference: Ranelagh Road	**TP / BH No**	WS3	WS4			
Project / Job Ref: 14639	**Additional Refs**	None Supplied	None Supplied			
Order No: None Supplied	**Depth (m)**	None Supplied	None Supplied			
Reporting Date: 24/11/2014	**QTSE Sample No**	126286	126287			

Determinand	Unit	RL	Accreditation					
Naphthalene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Acenaphthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Fluorene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Phenanthrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Chrysene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Benzo(ghi)perylene	ug/l	< 0.01	NONE	< 0.01	< 0.01			
Total EPA-16 PAHs	ug/l	< 0.01	NONE	< 0.01	< 0.01			

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - TPH CWG Banded								
QTS Environmental Report No: 14-26666		Date Sampled	14/11/14	14/11/14				
Soils Ltd		Time Sampled	None Supplied	None Supplied				
Site Reference: Ranelagh Road		TP / BH No	WS3	WS4				
Project / Job Ref: 14639		Additional Refs	None Supplied	None Supplied				
Order No: None Supplied		Depth (m)	None Supplied	None Supplied				
Reporting Date: 24/11/2014		QTSE Sample No	126286	126287				
Determinand	**Unit**	**RL**	**Accreditation**					
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10			
Aliphatic >C21 - C34	ug/l	< 10	NONE	< 10	< 10			
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70			
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10			
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10			
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70	< 70			
Total >C5 - C35	ug/l	< 140	NONE	< 140	< 140			

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING
4480

Water Analysis Certificate - BTEX / MTBE								
QTS Environmental Report No: 14-26666		Date Sampled	14/11/14	14/11/14				
Soils Ltd		Time Sampled	None Supplied	None Supplied				
Site Reference: Ranelagh Road		TP / BH No	WS3	WS4				
Project / Job Ref: 14639		Additional Refs	None Supplied	None Supplied				
Order No: None Supplied		Depth (m)	None Supplied	None Supplied				
Reporting Date: 24/11/2014		QTSE Sample No	126286	126287				
Determinand	**Unit**	**RL**	**Accreditation**					
Benzene	ug/l	< 1	ISO17025	< 1	< 1			
Toluene	ug/l	< 5	ISO17025	< 5	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5	< 5			
MTBE	ug/l	< 10	ISO17025	< 10	< 10			

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING
4480

Water Analysis Certificate - Volatile Organic Compounds (VOC)							
QTS Environmental Report No: 14-26666	Date Sampled	14/11/14	14/11/14			
Soils Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Ranelagh Road	TP / BH No	WS3	WS4			
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied			
Order No: None Supplied	Depth (m)	None Supplied	None Supplied			
Reporting Date: 24/11/2014	QTSE Sample No	126286	126287			

Determinand	Unit	RL	Accreditation					
Dichlorodifluoromethane	ug/l	< 5	ISO17025	< 5	< 5			
Vinyl Chloride	ug/l	< 5	ISO17025	< 5	< 5			
Chloromethane	ug/l	< 5	ISO17025	< 5	< 5			
Chloroethane	ug/l	< 5	ISO17025	< 5	< 5			
Bromomethane	ug/l	< 5	ISO17025	< 5	< 5			
Trichlorofluoromethane	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
MTBE	ug/l	< 10	ISO17025	< 10	< 10			
trans-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloroethane	ug/l	< 5	ISO17025	< 5	< 5			
cis-1,2-Dichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
2,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Chloroform	ug/l	< 5	ISO17025	< 5	< 5			
Bromochloromethane	ug/l	< 10	ISO17025	< 10	< 10			
1,1,1-Trichloroethane	ug/l	< 5	ISO17025	< 5	< 5			
1,1-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
Carbon Tetrachloride	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dichloroethane	ug/l	< 10	ISO17025	< 10	< 10			
Benzene	ug/l	< 1	ISO17025	< 1	< 1			
1,2-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Trichloroethene	ug/l	< 5	ISO17025	< 5	< 5			
Bromodichloromethane	ug/l	< 5	ISO17025	< 5	< 5			
Dibromomethane	ug/l	< 5	ISO17025	< 5	< 5			
TAME	ug/l	< 5	ISO17025	< 5	< 5			
cis-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
Toluene	ug/l	< 5	ISO17025	< 5	< 5			
trans-1,3-Dichloropropene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,2-Trichloroethane	ug/l	< 10	ISO17025	< 10	< 10			
1,3-Dichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
Tetrachloroethene	ug/l	< 5	ISO17025	< 5	< 5			
Dibromochloromethane	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dibromoethane	ug/l	< 5	ISO17025	< 5	< 5			
Chlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,1,2-Tetrachloroethane	ug/l	< 5	ISO17025	< 5	< 5			
Ethyl Benzene	ug/l	< 5	ISO17025	< 5	< 5			
m,p-Xylene	ug/l	< 10	ISO17025	< 10	< 10			
o-Xylene	ug/l	< 5	ISO17025	< 5	< 5			
Styrene	ug/l	< 5	ISO17025	< 5	< 5			
Bromoform	ug/l	< 10	ISO17025	< 10	< 10			
Isopropylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,1,2,2-Tetrachloroethane	ug/l	< 10	ISO17025	< 10	< 10			
1,2,3-Trichloropropane	ug/l	< 5	ISO17025	< 5	< 5			
n-Propylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
Bromobenzene	ug/l	< 5	ISO17025	< 5	< 5			
2-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5			
1,3,5-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
4-Chlorotoluene	ug/l	< 5	ISO17025	< 5	< 5			
tert-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,2,4-Trimethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
sec-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
p-Isopropyltoluene	ug/l	< 5	ISO17025	< 5	< 5			
1,3-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,4-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
n-Butylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dichlorobenzene	ug/l	< 5	ISO17025	< 5	< 5			
1,2-Dibromo-3-chloropropane	ug/l	< 10	ISO17025	< 10	< 10			
Hexachlorobutadiene	ug/l	< 5	ISO17025	< 5	< 5			

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Semi Volatile Organic Compounds (SVOC)								
QTS Environmental Report No: 14-26666	Date Sampled	14/11/14	14/11/14					
Soils Ltd	Time Sampled	None Supplied	None Supplied					
Site Reference: Ranelagh Road	TP / BH No	WS3	WS4					
Project / Job Ref: 14639	Additional Refs	None Supplied	None Supplied					
Order No: None Supplied	Depth (m)	None Supplied	None Supplied					
Reporting Date: 24/11/2014	QTSE Sample No	126286	126287					

Determinand	Unit	RL	Accreditation					
Phenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,2,4-Trichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Nitrobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
0-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-chloroethoxy)methane	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-chloroethyl)ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Chlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,3-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,4-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
1,2-Dichlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dimethylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Isophorone	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachloroethane	ug/l	< 0.1	NONE	< 0.1	< 0.1			
p-Cresol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4,6-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4,5-Trichlorophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chloro-3-methylphenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Methylnaphthalene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorocyclopentadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorobutadiene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,6-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dimethyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2-Chloronaphthalene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chloroanaline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Nitrophenol	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Chlorophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
3-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Nitroaniline	ug/l	< 0.1	NONE	< 0.1	< 0.1			
4-Bromophenyl phenyl ether	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Hexachlorobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
2,4-Dinitrotoluene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Diethyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dibenzofuran	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Azobenzene	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Dibutyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Carbazole	ug/l	< 0.1	NONE	< 0.1	< 0.1			
bis(2-ethylhexyl)phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Benzyl butyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			
Di-n-octyl phthalate	ug/l	< 0.1	NONE	< 0.1	< 0.1			

QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

UKAS TESTING
4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
QTS Environmental Report No: 14-26666
Soils Ltd
Site Reference: Ranelagh Road
Project / Job Ref: 14639
Order No: None Supplied
Reporting Date: 24/11/2014

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by co	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detect	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 – C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	EPH TEXAS	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID	E104
Water	F	TPH LQM	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6 - C10)	Determination of hydrocarbons C6-C10 by headspace GC-MS	E101

Key

F Filtered
UF Unfiltered

Appendix D
Soil Guideline Values and General Assessment Criteria;

Appendix D
Soil Guideline Values and General Assessment Criteria

D1 Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

D1.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

1) EA Science Report SC050021/SR2: *Human health toxicological assessment of contaminants in soil.*
2) EA Science Report SC050021/SR3: *Updated technical background to the CLEA model.*
3) EA CLEA Bulletin (2009).
4) CLEA software version 1.04 (2009)
5) Toxicological reports and SGV technical notes.

The CLEA guidance and tools:

- *do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.*
- *do not cover risks to the environment, such as groundwater, ecosystems or buildings.*
- *do not provide a definitive test for telling when human health risks are significant.*
- *are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.*

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

D1.2 Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models as follows:

1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home grown vegetables will not occur.

2) Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

3) Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

D1.3 Soil Guideline Values

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination.

SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues.

SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less that the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

D1.4 Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health will be used. For derivation of these Generic Assessment Criteria reference must be made to:
Nathanial, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition).* **Land Quality Press**. 2009.

In the case of Lead, the AtRisk Soil SSV have been used.

D1.5 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaking to develop site specific values for relevant soil contaminants.

⇒ Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
⇒ Developing more accurate parameters using site data.

D1.6 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published.
Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

⇒ GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
⇒ SGV reports may give values that differ from the GAC's used in this report.
⇒ These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.

D1.7 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- ICRCL 70/90: *Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*

D1.8 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CLAIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CLAIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots

⇒ A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.

⇒ Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

D2 Soil Guideline Values and General Acceptance Criteria

Soil Guideline Values and General Acceptance Criteria used in the preparation of this report is tabulated in the following pages:

DEFRA CLEA 1.04 Soil Guideline Values (as at July 2012)

(Sandy Loam, pH 7, SOM 6%)

Contaminant	Residential (mg/kg DW)	Allotments (mg/kg DW)	Commercial (mg/kg DW)
Inorganic			
Arsenic	32	43	640
Cadmium	10	1.8	230
Mercury			
- Elemental	1.0	26	26
- Inorganic	170	80	3600
- Methyl	11	8	410
Nickel	130	230	1800
Selenium	350	120	13000
Organic May not be protective if SOM <6%			
Phenol	420	280	3200 (38,000*)
Benzene	0.33	0.07	95
Toluene	610	120	4400
Ethylbenzene	350	90	2800
Xylenes			
- o-xylene	250	160	2600
-m-xylene	240	180	3500
-p-xylene	230	160	3200
Dioxins			
Sum of PCDDs, PCDFs and dioxin-like PCB's.	8	8	240

* Based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health affects following long term exposure provided for illustration only)

Atkins AtRisk SSV Guideline Values For Lead (mg/kg)

Contaminant	Residential With Plant Uptake	Residential Without Plant Uptake	Commercial & Industrial	Open spaces
Lead 1% SOM sand soil	276	383	6490	1590
Lead 6% SOM sandy loam soil	342	383	6490	1590

LQM CIEH General Assessment Criteria (2nd edition) (mg/kg)

Contaminant	Residential	Allotment	Commercial
Metals			
Beryllium	51	55	420
Boron	291	45	192000
Chromium (III)	3000	34600	30400
Chromium (VI)	4.3	2.1	35
Copper	2330	524	71700
Vanadium	140	150	4250
Zinc	3750	618	665000

LQM CIEH General Assessment Criteria

General Assessment Criteria For Polycyclic Aromatic Hydrocarbons (PAH's) (mg/kg)

Determinants		Residential	Allotments	Commercial
Acenapthene	1.0% SOM	210	34	85,000 (57) [sol]
	2.5% SOM	480	85	98,000 (141) [sol]
	6.0% SOM	100	200	100,000
Acenapthylene	1.0% SOM	170	28	84,000 (86) [sol]
	2.5% SOM	400	69	97,000 (212) [sol]
	6.0% SOM	850	160	100,000
Anthracene	1.0% SOM	2,300	380	530,000
	2.5% SOM	4,900	950	540,000
	6.0% SOM	9,200	2200	540,000
Benzo(a)anthracene	1.0% SOM	3.1	2.5	90
	2.5% SOM	4.7	5.5	95
	6.0% SOM	5.9	10	97
Benzo(a)pyrene	1.0% SOM	0.83	0.6	14
	2.5% SOM	0.94	1.2	14
	6.0% SOM	1.0	2.1	14
Benzo(b)flouranthene	1.0% SOM	5.6	3.5	100
	2.5% SOM	6.5	7.4	100
	6.0% SOM	7.0	13	100
Benzo(ghi)perylene	1.0% SOM	44	70	650
	2.5% SOM	46	120	660
	6.0% SOM	47	160	660
Benzo(k)flouranthene	1.0% SOM	8.5	6.8	140
	2.5% SOM	9.6	14	140
	6.0% SOM	10	23	140
Chrysene	1.0% SOM	6.0	2.6	140
	2.5% SOM	8.0	5.8	140
	6.0% SOM	9.3	12	140
Dibenzo(ah)anthracene	1.0% SOM	0.76	0.76	13
	2.5% SOM	0.86	1.5	13
	6.0% SOM	0.90	2.3	13
Flouranthene	1.0% SOM	260	52	23,000
	2.5% SOM	460	130	23,000
	6.0% SOM	670	290	23,000
Flourene	1.0% SOM	160	27	64,000 (31) [sol]
	2.5% SOM	380	67	69,000
	6.0% SOM	780	160	71,000
Indeno(123-cd)pyrene	1.0% SOM	3.2	1.8	60
	2.5% SOM	3.9	3.8	61
	6.0% SOM	4.2	7.1	62
Napthalene	1.0% SOM	1.5	4.1	200 (76) [sol]
	2.5% SOM	3.7	9.9	480 (183) [sol]
	6.0% SOM	8.7	23	1100 (432) [sol]
Phenanthrene	1.0% SOM	92	16	22,000
	2.5% SOM	200	38	22,000
	6.0% SOM	380	90	23,000
Pyrene	1.0% SOM	560	110	54,000
	2.5% SOM	1,000	270	54,000
	6.0% SOM	1,600	620	54,000

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

General Assessment Criteria For TPH (mg/kg)

Determinants		Residential	Allotments	Commercial
Aliphatic				
EC 5-6	1.0% SOM	30	740	3,400 (304) [sol]
	2.5% SOM	55	1,700	6,200 (558) [sol]
	6.0% SOM	110	3,900	13,000 (1150) [sol]
EC >6-8	1.0% SOM	73	2,300	8,300 (144) [sol]
	2.5% SOM	160	5,600	18,000 (322) [sol]
	6.0% SOM	370	13,000	42,000 (736) [sol]
EC >8-10	1.0% SOM	19	320	2,100 (78) [sol]
	2.5% SOM	46	770	5,100 (118) [vap]
	6.0% SOM	110	1,700	12,000 (451) [vap]
EC >10-12	1.0% SOM	93 (48) [vap]	2,200	10,000 (48) [sol]
	2.5% SOM	230 (118) [vap]	4,400	24,000 (118) [vap]
	6.0% SOM	540 (283) [vap]	7,300	49,000 (283) [vap]
EC >12-16	1.0% SOM	740 (24) [sol]	11,000	61,000 (24) [sol]
	2.5% SOM	1,700 (59) [sol]	13,000	83,000 (59) [sol]
	6.0% SOM	3,000 (142) [sol]	13,000	91,000 (142) [sol]
EC >16-35	1.0% SOM	45,000 (8.48) [sol]	260,000	1,600,000
	2.5% SOM	64,000 (21) [sol]	270,000	1,800,000
	6.0% SOM	76,000	270,000	1,800,000
EC >35-44	1.0% SOM	45,000 (8.48) [sol]	260,000	1,600,000
	2.5% SOM	64,000 (21) [sol]	270,000	1,800,000
	6.0% SOM	76,000	270,000	1,800,000
Aromatic				
EC 5-7	1.0% SOM	65	13	28,000 (1220) [sol]
	2.5% SOM	130	27	49,000 (2260) [sol]
	6.0% SOM	280	57	90,000 (4710) [sol]
EC >7-8	1.0% SOM	120	22	59,000 (869) [vap]
	2.5% SOM	270	51	110,000 (1920) [sol]
	6.0% SOM	611	120	190,000 (4360) [vap]
EC >8-10	1.0% SOM	27	8.6	3,700 (613) [vap]
	2.5% SOM	65	21	8,600 (1500) [vap]
	6.0% SOM	151	51	18,000 (3580) [vap]
EC >10-12	1.0% SOM	69	13	17,000 (364) [sol]
	2.5% SOM	160	31	29,000 (899) [sol]
	6.0% SOM	346	74	34,500 (2150) [sol]
EC >12-16	1.0% SOM	140	23	36,000 (169) [sol]
	2.5% SOM	480	57	37,000
	6.0% SOM	770	130	37,800
EC >16-21	1.0% SOM	250	46	28,000
	2.5% SOM	480	110	28,000
	6.0% SOM	770	260	28,000
EC >21-35	1.0% SOM	890	370	28,000
	2.5% SOM	1,100	820	28,000
	6.0% SOM	1,230	1,600	28,000
EC >35-44	1.0% SOM	890	370	28,000
	2.5% SOM	1,100	820	28,000
	6.0% SOM	1,230	1,600	28,000
Aromatic & Aliphatic				
EC >44 - 70	1.0% SOM	1200	1200	28,000
	2.5% SOM	1300	2100	28,000
	5.0% SOM	1300	3000	28,000

Note: a) *SOM = Soil Organic Matter Content (%)* *b)LQM CIEH GAC not set for Allotment land-use*

ICRCL 70/90 *Restoration of metalliferous mining areas* (mg/kg)

Phytotoxicity (Harmful to Plants) Threshold Trigger Values	
Copper	250
Zinc	1000

Notes: Many cultivars and specifically grasses have a high tolerance and there will be no ill-effect at the threshold trigger values given for neutral or near neutral pH. Site observation of plant vitality may give additional guidance.

LQM CIEH General Assessment Criteria

Volatile and Semi-Volatile Organic Compounds (mg/kg)

Contaminant	Residential	Allotment	Commercial
Chloroalkanes & alkenes			
1,2 Dichloroethane			
1.0% SOM	0.0054	0.0046	0.71
2.5% SOM	0.0080	0.0083	1.00
6.0% SOM	0.014	0.016	1.80
1,1,2,2 Tetrachloroethane			
1.0% SOM	1.4	0.41	290
2.5% SOM	2.9	0.89	580
6.0% SOM	6.3	2.0	1200
1,1,1,2 Tetrachloroethane			
1.0% SOM	0.90	0.79	120
2.5% SOM	2.1	1.9	260
6.0% SOM	4.8	4.4	590
Tetrachloroethene			
1.0% SOM	0.94	1.6	130
2.5% SOM	2.1	3.7	290
6.0% SOM	4.8	8.7	660
1,1,1 Trichloroethane			
1.0% SOM	6.2	48	700
2.5% SOM	13	110	1400
6.0% SOM	28	240	3100
Tetrachloromethene			
1.0% SOM	0.018	0.16	3.0
2.5% SOM	0.039	0.37	6.6
6.0% SOM	0.089	0.85	15
Trichloroethene			
1.0% SOM	0.11	0.43	12
2.5% SOM	0.22	0.95	25
6.0% SOM	0.49	2.2	55
Trichloromethane			
1.0% SOM	0.75	0.36	110
2.5% SOM	1.3	0.70	190
6.0% SOM	2.7	1.5	370
Vinyl Chloride			
1.0% SOM	0.00047	0.00055	0.063
2.5% SOM	0.00064	0.0010	0.081
6.0% SOM	0.00099	0.0018	0.12

Contaminant	Residential	Allotment	Commercial
Explosives			
2,4,6 Trinitrotoluene			
1.0% SOM	1.6	0.24	1000
2.5% SOM	3.7	0.58	1000
6.0% SOM	8.0	1.4	1100
RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)			
1.0% SOM	3.5	0.52	6400
2.5% SOM	7.4	1.1	6400
6.0% SOM	16	2.5	6400
HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)			
1.0% SOM	5.7	0.86	110,000
2.5% SOM	13	1.9	110,000
6.0% SOM	26	3.9	110,000
Atrazine			
1.0% SOM	0.24	0.037	870
2.5% SOM	0.56	0.085	880
6.0% SOM	1.3	0.20	880
Pesticides			
Aldrin			
1.0% SOM	1.7	1.3	54
2.5% SOM	2.0	2.6	54
6.0% SOM	2.1	4.0	54
Dieldrin			
1.0% SOM	0.69	0.13	90
2.5% SOM	1.4	0.32	91
6.0% SOM	2.2	0.73	92
Dichlorvos			
1.0% SOM	0.29	0.044	942
2.5% SOM	0.6	0.091	972
6.0% SOM	1.3	0.2	983
Alpha - Endosulfan			
1.0% SOM	2.9	0.47	2310 (0.003)^{vap}
2.5% SOM	7.0	1.2	2990 (0.007) ^{vap}
6.0% SOM	16	2.7	3390
Beta - Endosulfan			
1.0% SOM	2.8	0.44	2580 (0.00007)^{vap}
2.5% SOM	6.6	1.1	3160 (0.0002) ^{vap}
6.0% SOM	15	2.6	3480
Alpha -Hexachlorocyclohexanes			
1.0% SOM	19	3.0	14000
2.5% SOM	46	7.4	14600
6.0% SOM	100	18	14900
Beta -Hexachlorocyclohexanes			
1.0% SOM	1.7	0.26	1120
2.5% SOM	3.9	0.64	1130
6.0% SOM	8.5	1.5	1130
Gamma -Hexachlorocyclohexanes			
1.0% SOM	0.58	0.089	532
2.5% SOM	1.4	0.22	546
6.0% SOM	3.0	0.52	552

Chlorobenzenes			
Chlorobenzene			
1.0% SOM	0.33	5.9	59
2.5% SOM	0.73	14	32
6.0% SOM	59	130	310
1,2-Dichlorobenzene			
1.0% SOM	16	94	2100 (571) [sol]
2.5% SOM	39	230	5100 (1370) [sol]
6.0% SOM	91	540	12000 (3240) [sol]
1,3-Dichlorobenzene			
1.0% SOM	0.29	0.25	32
2.5% SOM	0.70	0.61	77
6.0% SOM	1.7	1.5	180
1,4-Dichlorobenzene			
1.0% SOM	30	15	4500 (224) [vap]
2.5% SOM	72	37	10000 (540) [vap]
6.0% SOM	167	88	22000 (1280) [vap]
1,2,3,-Trichlorobenzene			
1.0% SOM	1.0	4.7	110
2.5% SOM	2.6	12	270
6.0% SOM	6.1	28	620
1,2,4,-Trichlorobenzene			
1.0% SOM	1.8	31	230
2.5% SOM	4.5	75	560
6.0% SOM	11	180	1300
1,3,5,-Trichlorobenzene			
1.0% SOM	0.23	4.7	24
2.5% SOM	0.57	12	57.8
6.0% SOM	1.3	28	140
1,2,3,4,-Tetrachlorobenzene			
1.0% SOM	12	4.4	1800 (122) [vap]
2.5% SOM	4.5	75	3200 (304) [vap]
6.0% SOM	11	180	4500 (728) [vap]
1,2,3,5,- Tetrachlobenzene			
1.0% SOM	0.49	0.38	52 (39.4) [vap]
2.5% SOM	1.2	0.94	120 (98.1) [vap]
6.0% SOM	2.8	2.2	250 (235) [vap]
1,2,4, 5,- Tetrachlobenzene			
1.0% SOM	0.30	0.064	44 (19.7) [sol]
2.5% SOM	0.68	0.16	73 (49.1) [sol]
6.0% SOM	1.4	0.37	97
Pentachlrobenzene			
1.0% SOM	5.2	1.2	650 (43.0) [sol]
2.5% SOM	10	3.1	770 (107) [sol]
6.0% SOM	17	7.1	830
Hexachlorobenzene			
1.0% SOM	0.59 (0.20) [vap]	0.18	48 (0.20) [vap]
2.5% SOM	1.0 (0.50) [vap]	0.42	53
6.0% SOM	1.4	0.92	55
Phenols & Chlorophenols			
Chlorophenols (4 Congeners)			
1.0% SOM	0.87	0.13	3500
2.5% SOM	2.0	0.30	4000
6.0% SOM	4.4	0.70	4200
Pentachlorophenols			
1.0% SOM	0.55	0.084	1200
2.5% SOM	1.3	0.21	0.49
6.0% SOM	1200	1300	1400

Others			
Carbon Disulphide			
1.0% SOM	0.10	4.8	12
2.5% SOM	0.20	10	23
6.0% SOM	0.44	23	50
Hexachloro-1,3-Butadiene			
1.0% SOM	0.21	0.25	32
2.5% SOM	0.51	0.61	69
6.0% SOM	1.2	1.4	120

[vap] – GAC presented exceeds the vapour saturation limit, which is presented in brackets.
[sol] – GAC presented exceeds the soil saturation limit, which is presented in brackets.

Appendix E
Information Provided By The Client

RANELAGH ROAD

600mm high brick wall to Ranelagh Road frontage and returns to flank walls of plots 4&5

Plot 1
Plot 2
Plot 3
Plot 4
Plot 5
Plot 6
Plot 7
Plot 8
Plot 9
Plot 10
Plot 11
Plot 12
Plot 13
Plot 14
Plot 15
Plot 16
Plot 17
Plot 18
Plot 19
Plot 20
Plot 21
Plot 69
Plot 70
Plots 59–62
Plots 63–68
Plot 71
Plot 72
Plot 73
Plot 74
Plot 75
Plot 76
Plot 77
Plot 78
Plot 79
Plot 47
Plot 48
Plot 49
Plot 50
Plot 51
Plot 52
Plot 53
Plot 54
Plot 55
Plot 56
Plot 57
Plot 58
Plot 42
Plot 43
Plot 44
Plot 45
Plot 46
Plots 38–41
Parking
Parking
Compound

Ranelagh Road
Site Setup
SS/RR/02
1:500 @ A3