SECTION 12 - CONTENTS

12 Further investigations

12.1 We have endeavoured to provide a comprehensive investigation for the proposed development within budgetary constraints there are areas, which we recommend further investigations be carried out. These are as follows: -

- Subject to development proposals, further investigations in the area of the possible former air raid shelters to determine the depth and extent may be considered necessary
- Further sampling and subsequent laboratory testing in the locality of the hydrocarbon impacted soils (trial pit TP14 and TP09) with a view to establishing the likely extent of such contamination and if the contamination has affected groundwater in the area, and if so derive remedial solutions (if any)
- Further sampling and subsequent laboratory testing in the locality of borehole DTS05, with a view to establishing the likely extent of such contamination.

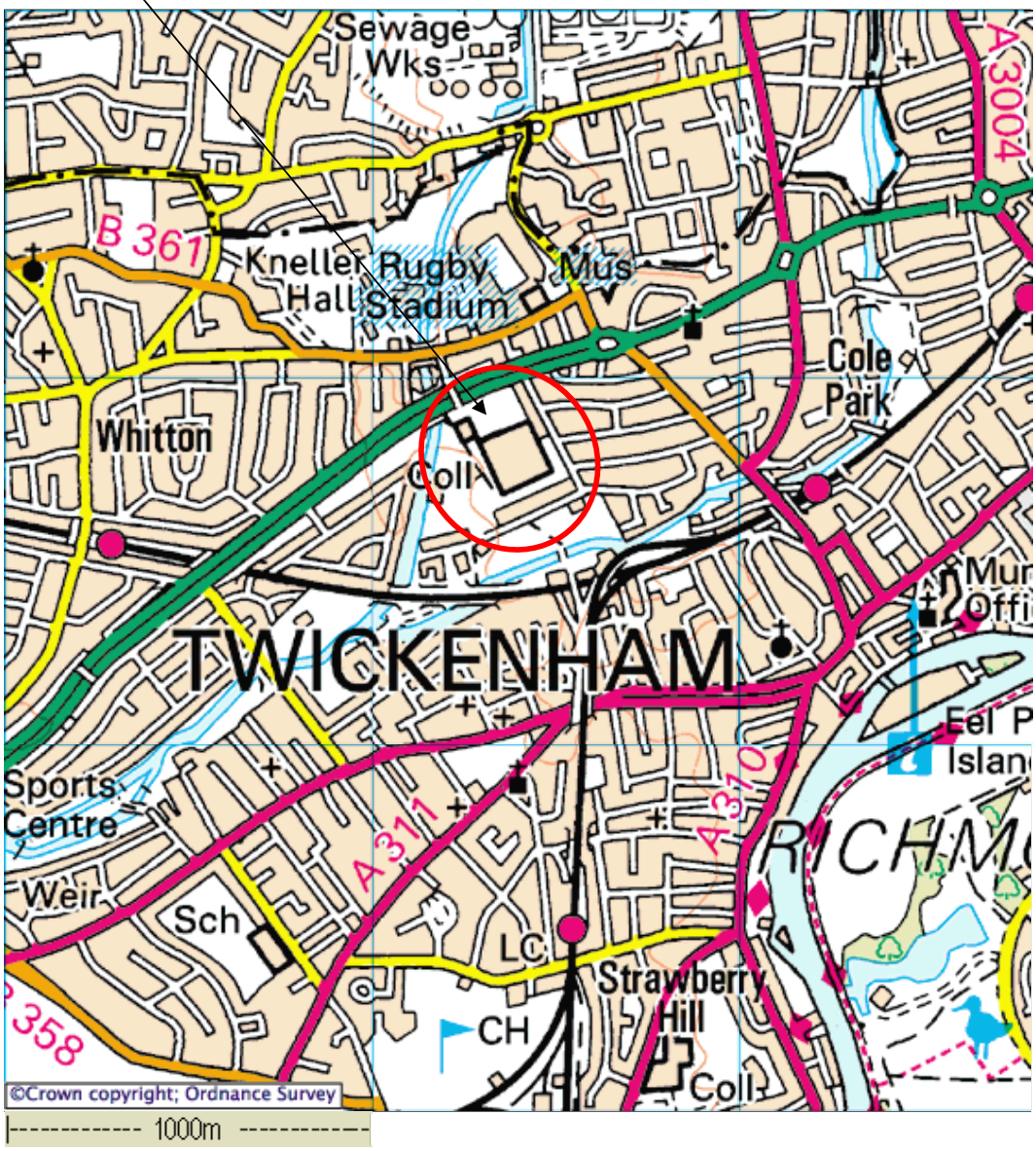
12.2 We would be pleased to carry out any of the supplementary investigations described above and provide proposals with costings on further instructions.

13 Remediation strategy and specification

13.1 At this stage, no remediation is required for the bulk of the campus, however there is the potential for some remedial works to be carried out in the areas local to trial pits TP09, and TP14, together with borehole DTS05. Recommendations for such supplementary investigations are provided in section 12. On completion of these investigations, a remedial strategy (if any) can be established.

The Site,

Grid reference 515350, 173810



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Project
Richmond-Upon-Thames College, Egerton Road, Twickenham

Title
Site Location Plan

scale	date	drawn by	checked by
As shown	16.06.08	RC	
project ref		drg no	revision
STE1297R		01	

Dwg01

Symbol	Type	Method	Depth	Objectives
DTS	Borehole	Driven Tube Sample	~4m	• Measure Made Ground thickness • Soil sampling / logging
DTS	Borehole	Driven Tube Sample	2m	• Measure Made Ground thickness • Soil sampling / logging • Infiltration test
DCP	Dynamic cone penetration testing	Dynamic cone penetration	4-5m	• Insitu density testing
BH03-06	Borehole with water standpipe	Cable and tool precussion drilling	20m	• Soil profile • Standard Penetration Testing • Soil shear strength testing • Water sampling / monitoring
BH01-02	Borehole with water standpipe	Cable and tool precussion drilling	25m	• Soil profile • Standard Penetration Testing • Soil shear strenght testing • Water sampling / monitoring
TP	Trial Pit	Hand tools	1-2m	• Expose existing foundation arrangements • Measure Made Ground thickness • Soil sampling / logging
SA	Trial Pit	Hand tools	0.5-1.5m	• Measure Made Ground thickness • Soil sampling / logging • Infiltration test

DTS10 DCP08 DTS09 BH01 SA01 DTS06 DCP07 DCP10 DTS15 TP12 DCP11 DTS14 DTS11 SA06 DCP09 DTS12 DCP04 DCP06 DTS16 TP04 BH03 TP11 SA07 DTS13 BH02 SA02 DTS08 TP03 TP10 DCP05 SA08 TP02 DTS07 DTS02 TP18 BH06 TP01 BH04 TP05 DTS03 DCP02 DTS17 SA03 DTS01 DCP01 TP07 SA10 TP14 DTS05 DCP03a DCP03b TP08 DTS21 TP09 DTS04 DCP13 TP06 DTS19 DTS20 SA05 SA04 BH05 Tennis Courts DRAKEFORD WAY DCP12 Tennis Courts SA09 DTS18

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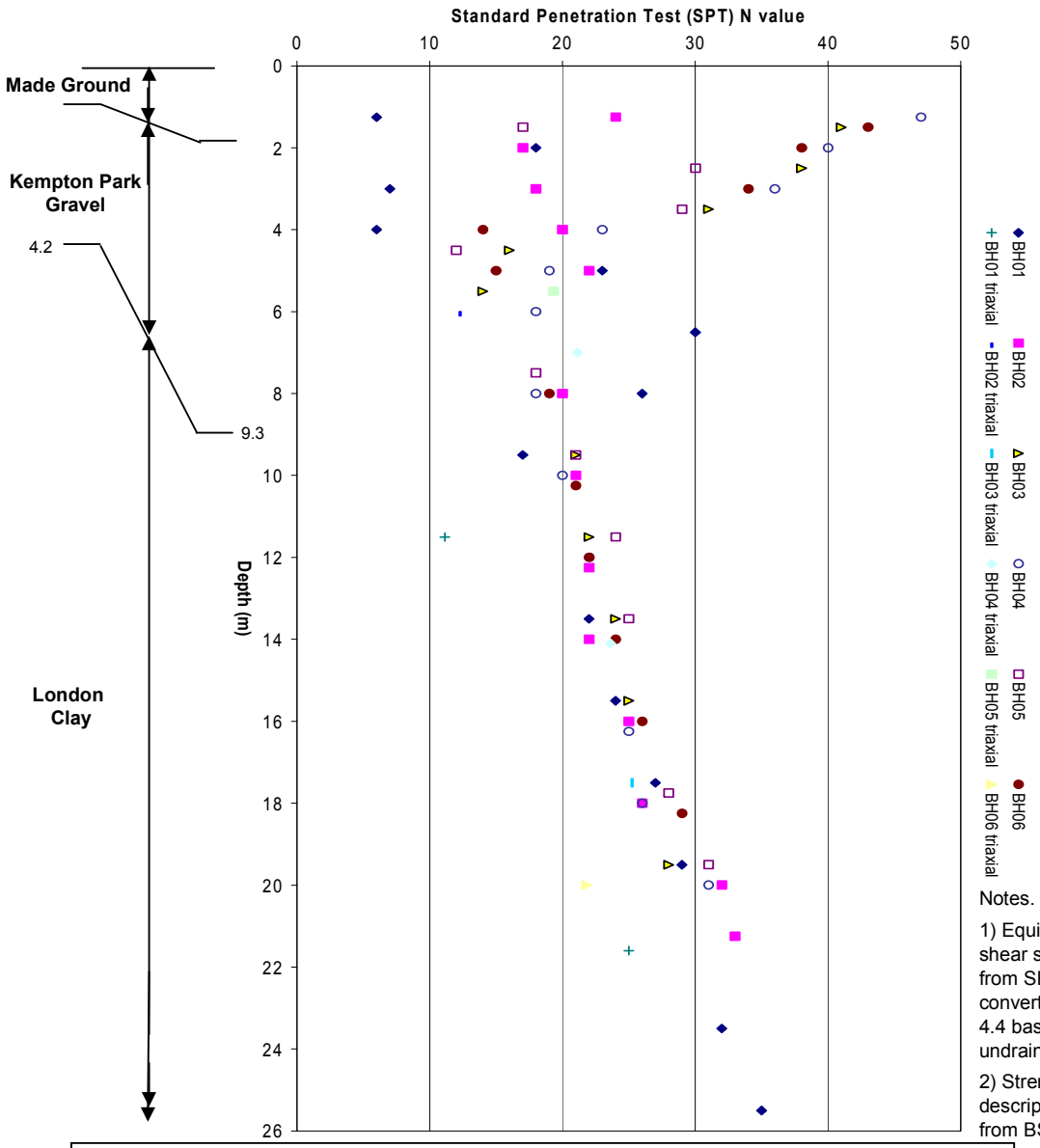

Notes.

1) Equivalent undrained shear strength derived from SPT 'N' values converted by a multiple of 4.4 based on measured undrained shear strength.

2) Strength/density descriptions obtained from BS5930:1999

	Equivalent undrained Strength		44	88	132	176	220
Strength Description	Clay	Very soft	Soft	Firm	Stiff	Very Stiff
	Coarse Soils	Loose		Medium Dense		Dense

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Project
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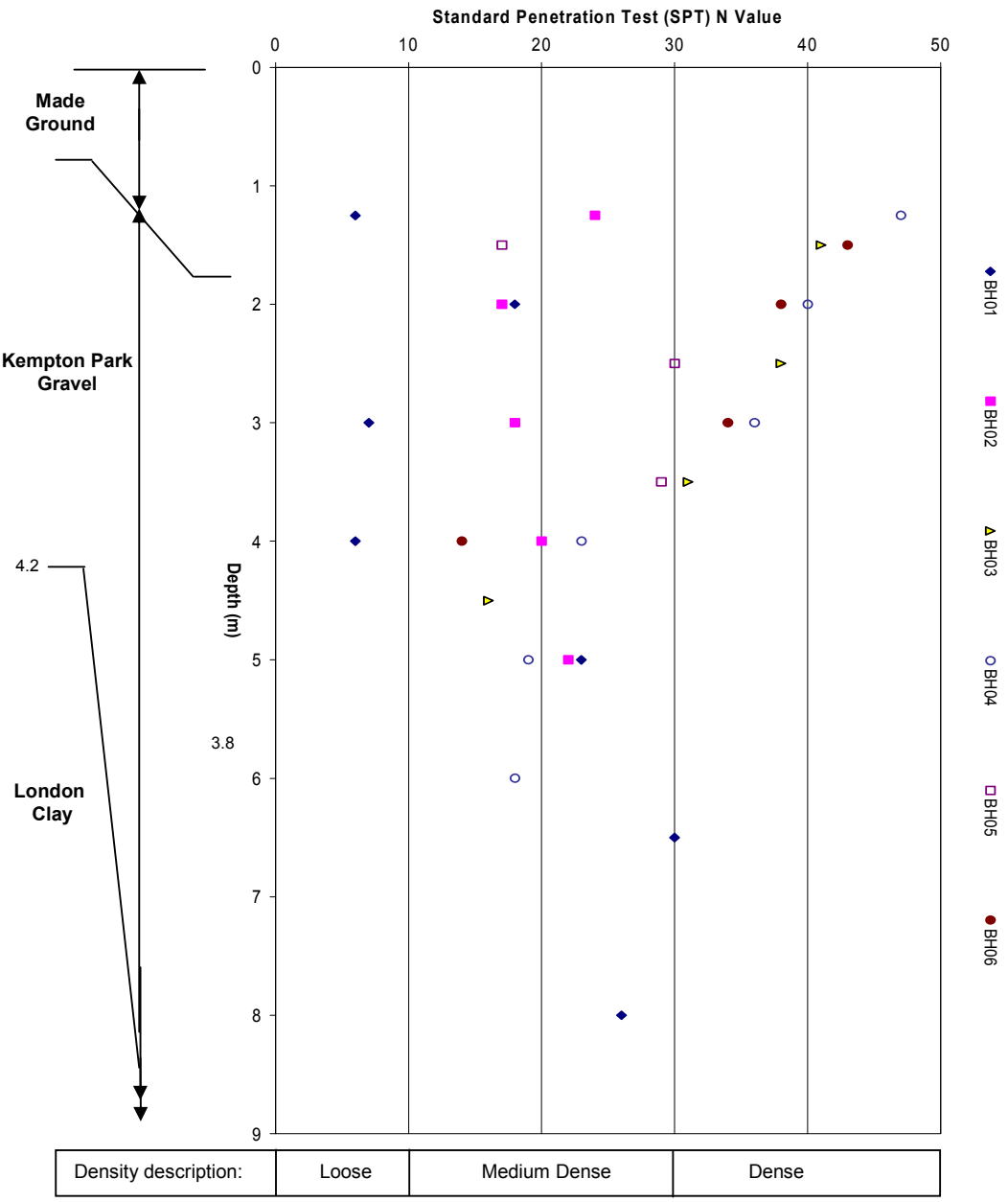
Title
Plot summarising insitu density testing from Standard Penetration Testing (SPT) and triaxial laboratory test data in boreholes BH01 to BH06.

scale	date	drawn by	checked by
As shown	27.06.08	LJD	
project ref		drg no	revision
STE1297R		03a	



Density description:	Loose	Medium Dense	Dense

Notes.

1) Density descriptions obtained from BS5930:1999

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Project
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Title
Plot summarising insitu density testing from Standard Penetration Testing (SPT) in Kempton Park Gravel.

scale	date	drawn by	checked by
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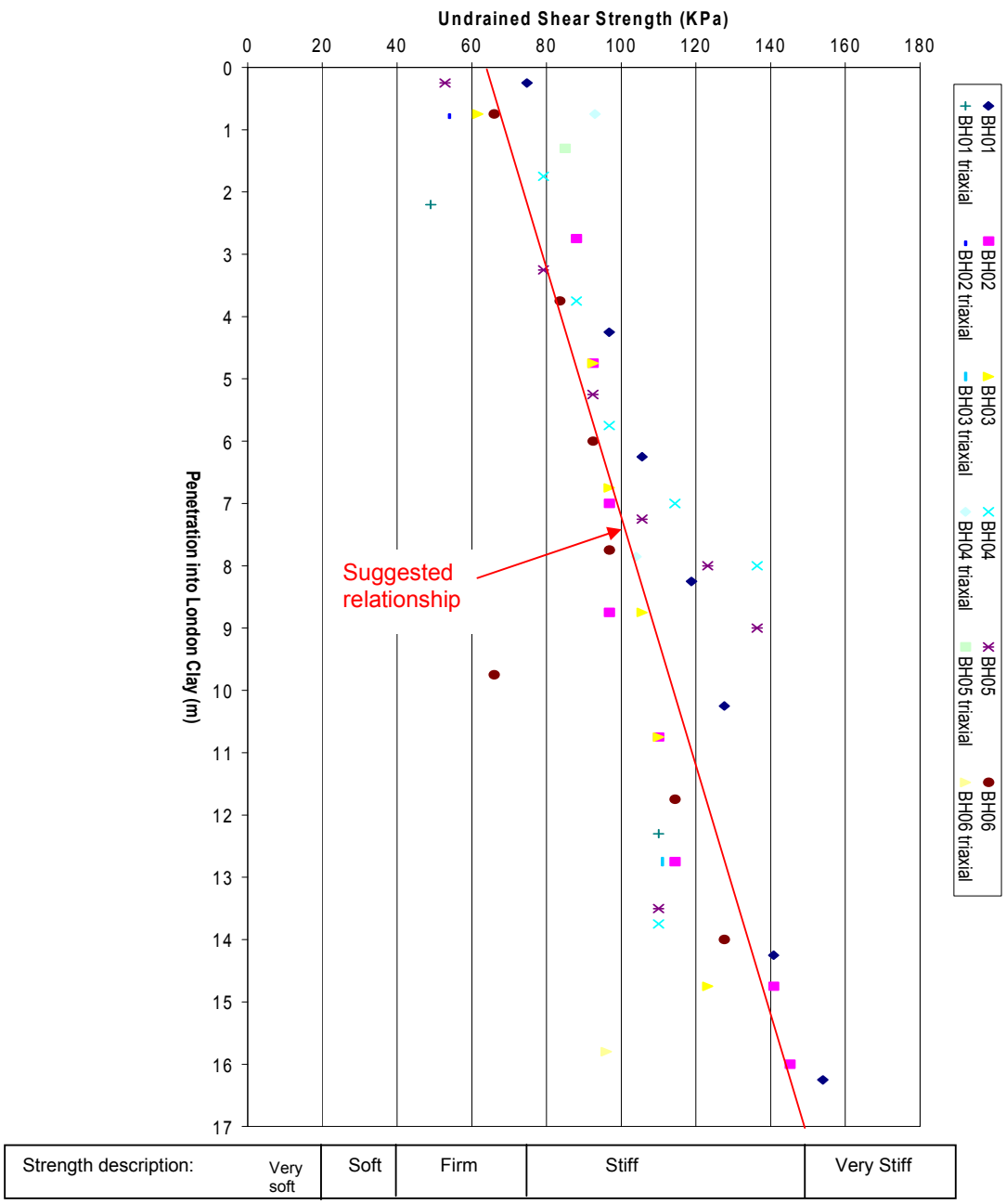
project ref		drg no	revision
STE1297R		03b	



Strength description:	Very soft	Soft	Firm	Stiff	Very Stiff

Notes.

1) Undrained shear strength derived from Standard Penetration Test N values converted by a multiple of 4.4 based on measured values

2) Strength descriptions obtained from BS5930:1999

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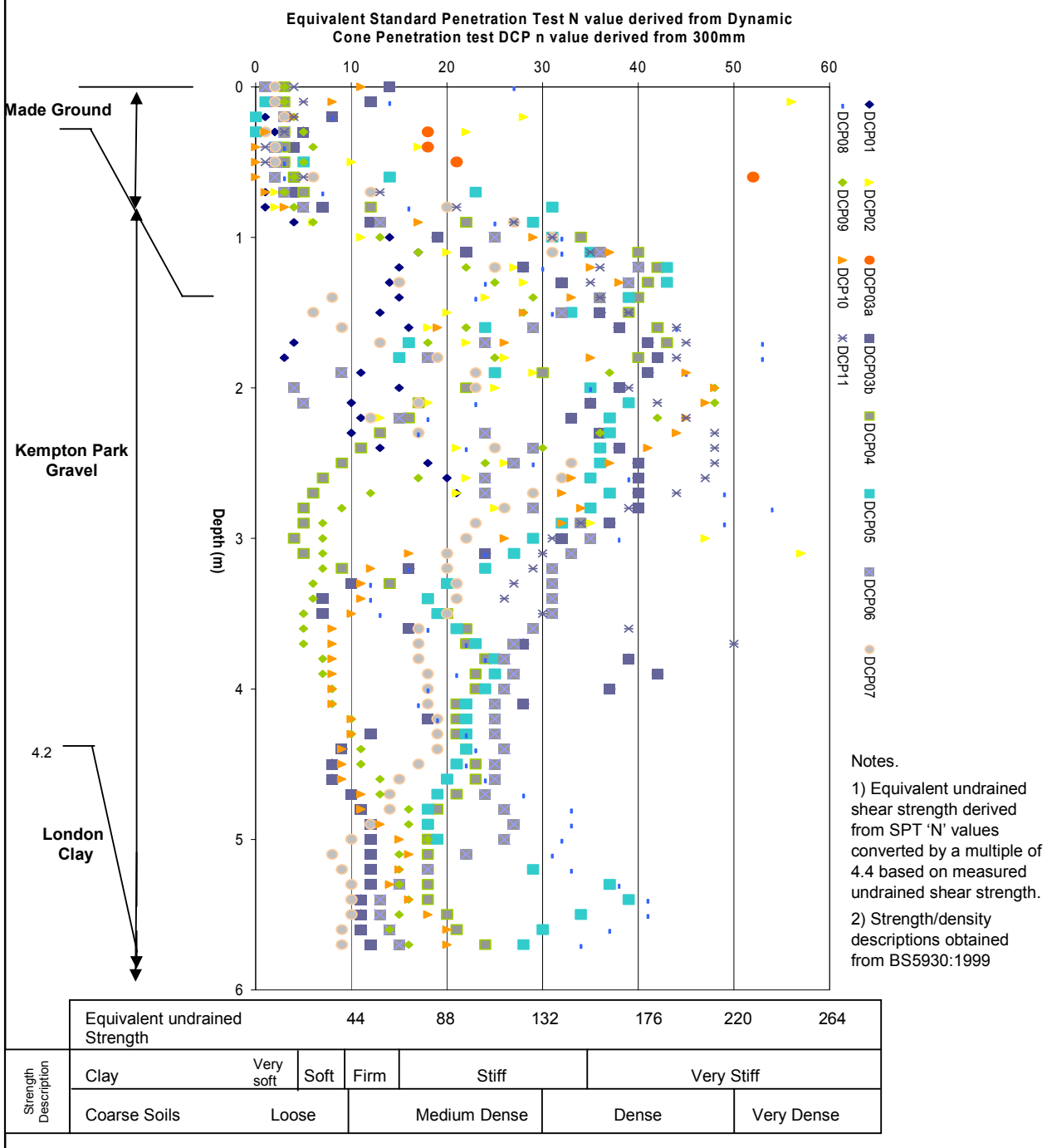
Project
Richmond-Upon-Thames College, Twickenham

Title
Plot summarising undrained shear strength derived from Standard Penetration Test (SPT) N values and triaxial laboratory test data in London Clay deposits.

scale	date	drawn by	checked by
As shown	27.06.08	LJD	
project ref		drg no	revision
STE1297R		03c	



Notes.

1) Equivalent undrained shear strength derived from SPT 'N' values converted by a multiple of 4.4 based on measured undrained shear strength.

2) Strength/density descriptions obtained from BS5930:1999

	Equivalent undrained Strength	44	88	132	176	220	264
Strength Description	Clay	Very soft	Soft	Firm	Stiff	Very Stiff	
	Coarse Soils	Loose		Medium Dense	Dense	Very Dense	

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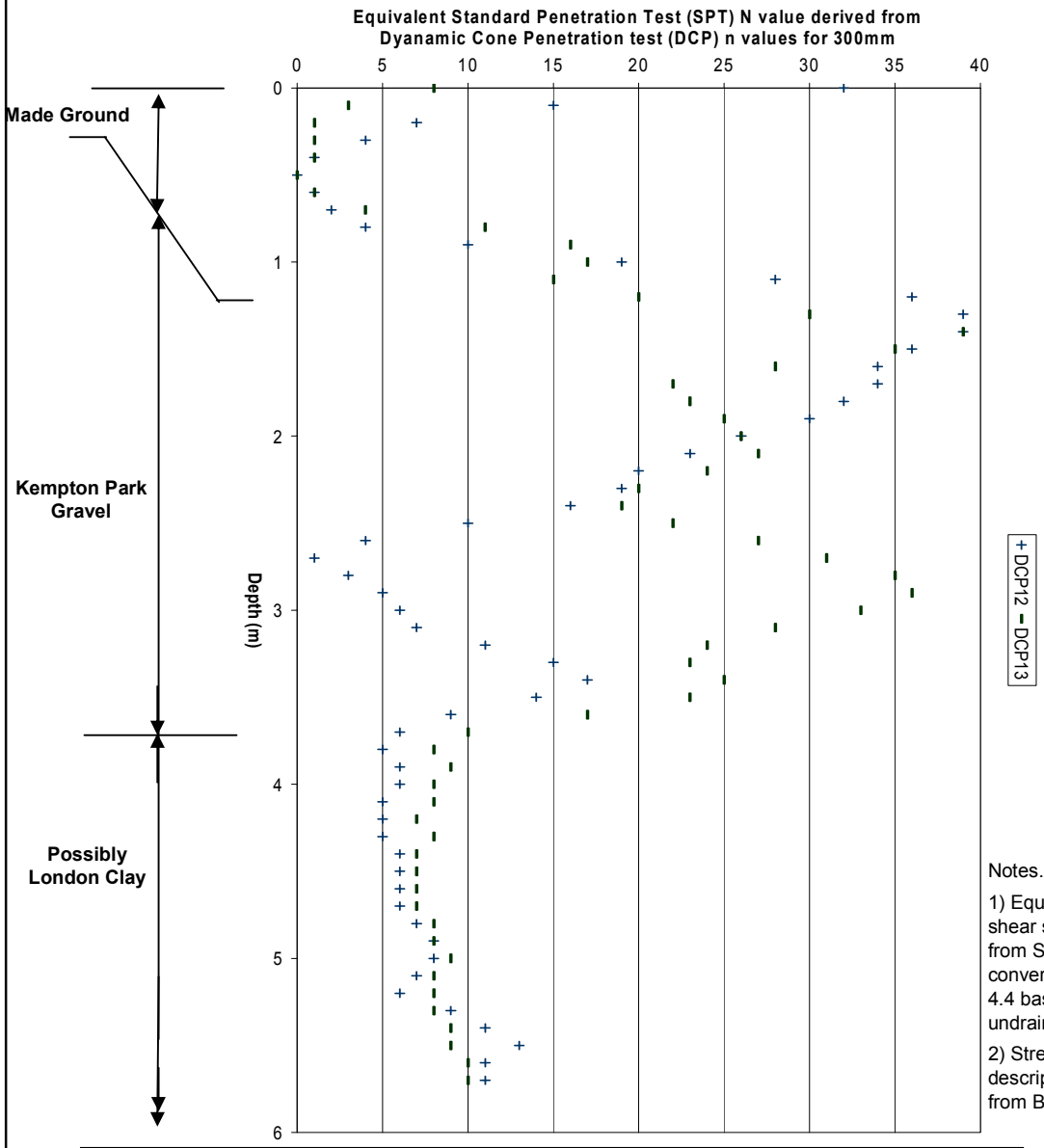
Project

Richmond-Upon-Thames College, Twickenham

Title

Plot summarising insitu density testing from Dyanmic Cone Penetration testing (DCP) across the site.

scale	date	drawn by	checked by
As shown	27.06.08	LJD	
project ref		drg no	revision
STE1297R		04a	



Notes.

1) Equivalent undrained shear strength derived from SPT 'N' values converted by a multiple of 4.4 based on measured undrained shear strength.

2) Strength/density descriptions obtained from BS5930:1999

	Equivalent undrained Strength		44	88	132	176
Strength Description	Clay	Very soft	Soft	Firm	Stiff	Very Stiff
	Coarse Soils	Loose		Medium Dense		Dense

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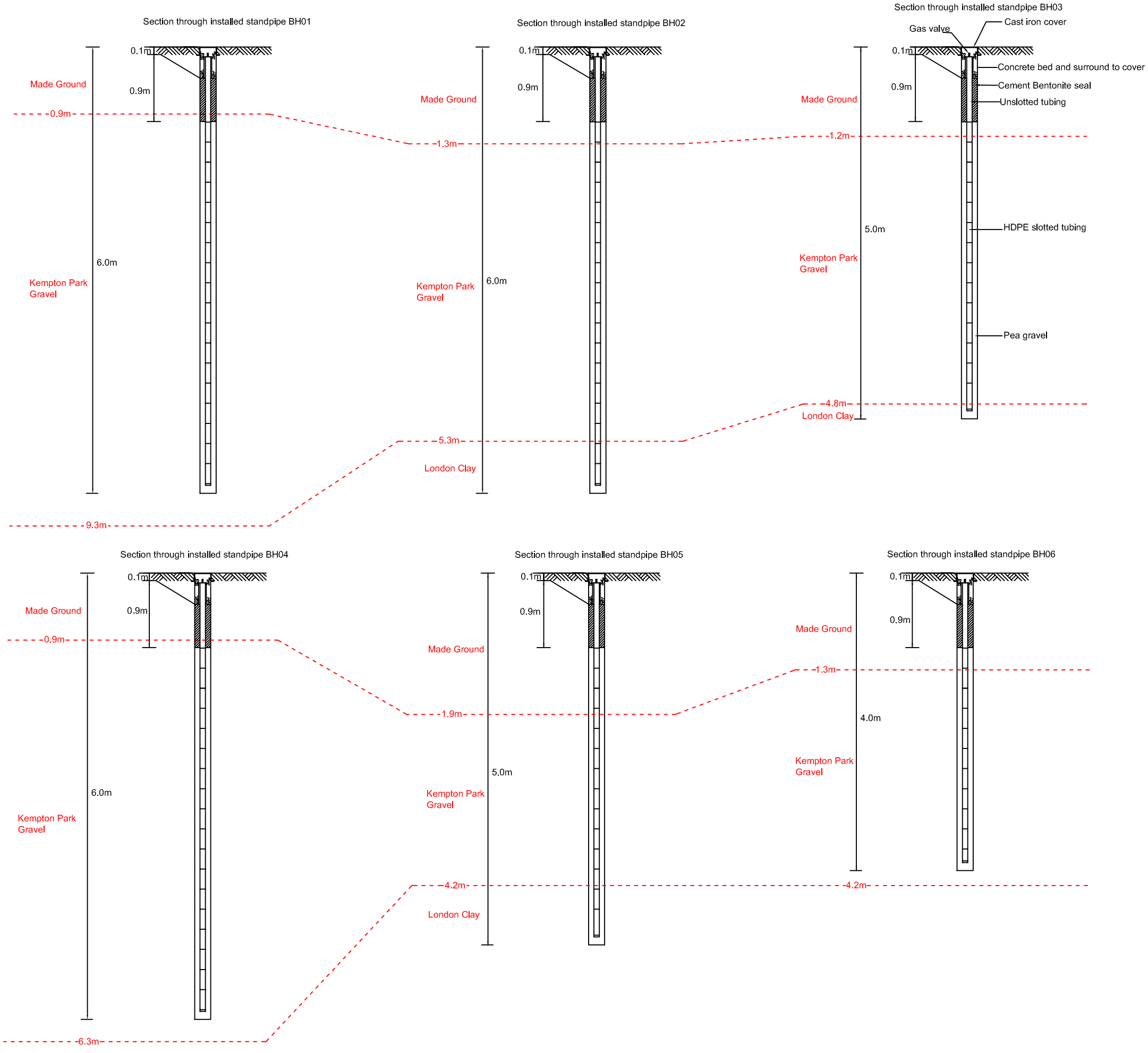
Project

Richmond-Upon-Thames College, Twickenham

Title

Plot summarising insitu density testing from Dyanmic Cone Penetration testing (DCP) in tennis courts to the south of Craneford Way.

scale	date	drawn by	checked by
As shown	27.06.08	LJD	
project ref		drg no	revision
STE1297R		04b	



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Appendix A

Definition of geotechnical terms used in this report. (sheet 1 of 2)

Foundations

Strip foundations. A foundation providing a continuous longitudinal ground bearing.

Trench fill concrete foundation. A trench filled with mass concrete providing continuous longitudinal ground bearing.

Pad foundation. An isolated foundation to spread a concentrated load.

Raft foundation. A foundation continuous in two directions, usually covering an area equal to or greater than the base area of the structure.

Substructure. That part of any structure (including building, road, runway or earthwork) which is below natural or artificial ground level. In a bridge this includes piers and abutments (and wing walls), whether below ground level or not, which support the superstructure.

Piled foundations and end bearing piles. A pile driven or formed in the ground for transmitting the weight of a structure to the soil by the resistance developed at the pile point or base and the friction along its surface. If the pile supports the load mainly by the resistance developed at its point or base, it is referred to as an end-bearing pile; if mainly by friction along its surface, as a friction pile.

Bored cast in place pile. A pile formed with or without a casing by excavating or boring a hole in the ground and subsequently filling it with plain or reinforced concrete.

Driven pile. A pile driven into the ground by the blows of a hammer or a vibrator.

Precast pile. A reinforced or prestressed concrete pile cast before driving.

Driven cast in place pile. A pile installed by driving a permanent or temporary casing, and filling the hole so formed with plan or reinforced concrete.

Displacement piles. Piled formed by displacement of the soil or ground through which they are driven.

Skin friction. The frictional resistance of the surrounding soil on the surface of cofferdam or caisson walls, and pile shafts.

Downdrag or negative skin friction. A downwards frictional force applied to the shaft of a pile caused by the consolidation of compressible strata, e.g. under recently placed fill. Downdrag has the effect of adding load to the pile and reducing the factor of safety.

Appendix A

Definition of geotechnical terms used in this report. (sheet 2 of 2)

Bearing values

Ultimate bearing capacity. The value of the gross loading intensity for a particular foundation at which the resistance of the soil to displacement of the foundation is fully mobilised.

Presumed bearing value. The net loading intensity considered appropriate to the particular type of ground for preliminary design purposes. The particular value is based on calculation from shear strength tests or other field tests incorporating a factor of safety against shear failure.

Allowable bearing pressure. The maximum allowable net loading intensity at the base of the foundation, taking into account the ultimate bearing capacity, the amount and kind of settlement expected and our estimate of ability of the structure to accommodate this settlement.

Factor of safety. The ratio of the ultimate bearing capacity to the intensity of the applied bearing pressure or the ratio of the ultimate load to the applied load.

Road Pavements.

The following definitions are based on Transport and Road Research Laboratory (TRRL) Report LR1132.

Equilibrium CBR values. A prediction of the CBR value, which will be attained under the completed pavement.

Thin pavement. A thin pavement (which includes both bound and unbound pavement construction materials 1 in 300mm thick and a thick pavement is 1200mm thick (typical of motorway construction).

Appendix B
(sheet 1 of 4)

Definition of geo-environmental terms used in this report.

Conceptual model

Textual and/or schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information obtained from the investigatory process.

Contamination

Presence of a substance which is in, on or under land, and which has the potential to cause harm or to cause pollution of controlled water.

Controlled water

Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three mile limit of territorial waters.

Harm

Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of humans, including property.

Pathway

Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.

Receptor

Persons, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).

Risk

Probability of the occurrence of, and magnitude of the consequences of, an unwanted adverse effect on a receptor.

Risk Assessment

Process of establishing, to the extent possible, the existence, nature and significance of risk.

Appendix B
(sheet 2 of 4)

Definition of environmental risk / hazard terms used in this report. (sheet 1 of 2)

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice'.*

Potential hazard severity definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non sensitive ecosystems or species.

Probability of risk definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

Level of risk for potential hazard definition

Probability of risk	Potential severity			
	Severe	**Medium**	**Mild**	**Minor**
High Likelihood	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low Likelihood	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very low	Very low

Refer sheet 2 for definitions of 'very high' to 'low'

Appendix B
(sheet 3 of 4)

Definition of environmental risk / hazard terms used in this report. (sheet 2 of 2)

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice'.*

Risk classifications and likely action required:

Very high risk

High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk

Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk

It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk

It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk

It is a low possibility that harm could arise to a designated receptor. On the event of such harm being realised it is not likely to be severe.

Appendix B
(sheet 4 of 4)

Gaseous contamination - Extract copy of table 3 of BS8485:2007 Solutions scores

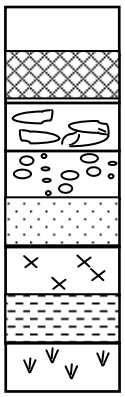
PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
a) Venting/dilution (see Annex A of BS8485)			
Passive sub-floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc) [A)]	Very good performance	2.5	*Ventilation performance in accordance with Annex A of BS8485.* *If passive ventilation is poor this is generally unacceptable and some form of active system will be required.* *There have to be robust management systems in place to ensure the continued maintenance of any ventilation system.* *Active ventilation can always be designed to meet good performance.* *Mechanically assisted systems come in two main forms: extraction and positive pressurization* *Assume car park is vented to deal with car exhaust fumes, designed to Building Regulations Document F and IStructE guidance.*
	Good performance	1	
Subfloor ventilation with active abstraction/pressurization (venting layers can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc)[A)]		2.5	
Ventilated car park (basement or undercroft)		4	
b) Barriers			
Floor Slabs			*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum.* *Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.*
Block and beam floor slab		0	
Reinforced concrete ground bearing floor slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation [B), C)]		0.5	*The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installations, and the integrity of joints.*
Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA) [B), C)]		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation.		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	*Where fitted, permanent monitoring system ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.*
Permanent monitoring and alarm system [A)]	Installed in the underfloor venting/dilution system	2	
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	*This can consist of site protection measures for off-site or on-site sources (see Annex A of BS8485)*

NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection.

[A)] It is possible to test ventilation systems by installing monitoring probes for post installation validation.
[B)] If a 200g DPM material is to function as a gas barrier it should be installed according to BRE 212)/BRE 414), being taped and sealed to all penetrations.
[C)] Polymeric Materials > 1 200g can be used to improve confidence in the barrier. Remember that their gas resistance is little more than the standard 1 200g (proportional to thickness) but their physical properties mean that they are more robust and resistant to site damage.

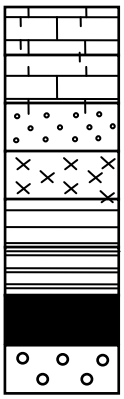
KEY TO LEGENDS (Extract from BS 5930;1999 table 11)

SOILS



Topsoil
Made ground
Boulders & Cobbles
Gravel
Sand
Silt
Clay
Peat/Organic clays

SEDIMENTARY ROCKS



Chalk
Limestone
Sandstone
Siltstone
Mudstone
Shale
Coal
Conglomerate

Composite soil types are signified by combined symbols.

KEY TO SYMBOLS USED ON TRIAL PIT RECORDS

SAMPLING

B	bulk disturbed sample	**U (38)**	undisturbed (38mm) sample
D	disturbed sample	**W**	water sample
J	jar sample	**CBR**	undisturbed sample taken in CBR mould

NOTES ASSOCIATED WITH INSITU TESTING

Hand Held Shear Vane (V) The hand held shear vane provides a quick and direct measurement of undrained shear strength and is calibrated in kN/m^2 (Pa). The apparatus reads to a maximum shear strength of 150KPa. The results are reported in columns to the right of the trial pit legend.

Pocket Penetrometer Results (P) The pocket penetrometer is calibrated in kg/cm^2 and is deemed to measure the unconfined compressive strength of the soil under test. Under most conditions the unconfined compressive strength of the soil is twice the undrained shear strength of a soil. Thus, an Unconfined compressive strength $1kg/cm^2$ = 0.009807 x 100 x 100 / 2 = 49.04, say $50KN/m^2$ (equivalent undrained shear strength).

Tests are carried out in the sides of trial pits where access can be safely achieved otherwise testing is carried out on excavated intact lumps. Neither the hand held shear vane nor the pocket penetrometer is recognised in British Standard publications.

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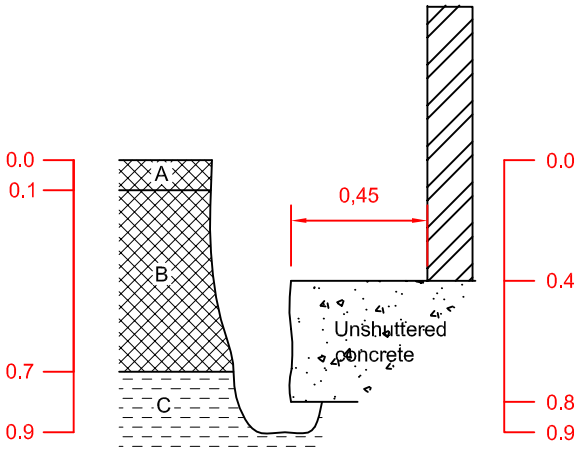
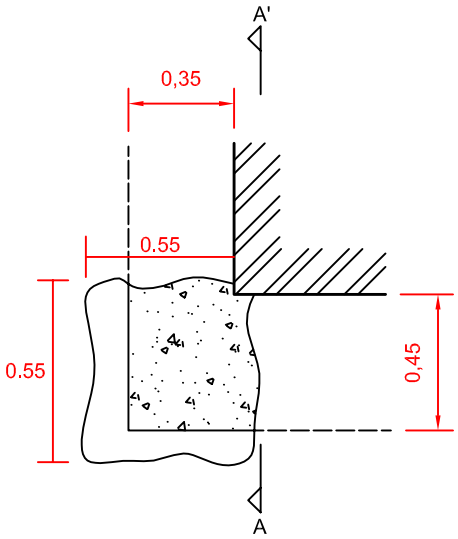
STANDARD KEY TO TRIAL PIT RECORDS

Section A - A' of trial pit TP01 facing east



Plan of trial pit TP01



Photographic record of trial pit TP01

Key

Masonry

Concrete

A 50mm thick concrete pavers onto 50mm sand
(MADE GROUND)

B Firm brown, grey and light brown gravelly sandy CLAY. Gravel consists of flint, brick, metal and concrete
(MADE GROUND)

C Firm orange and light brown gravelly sandy CLAY. Gravel consists of coarse flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres

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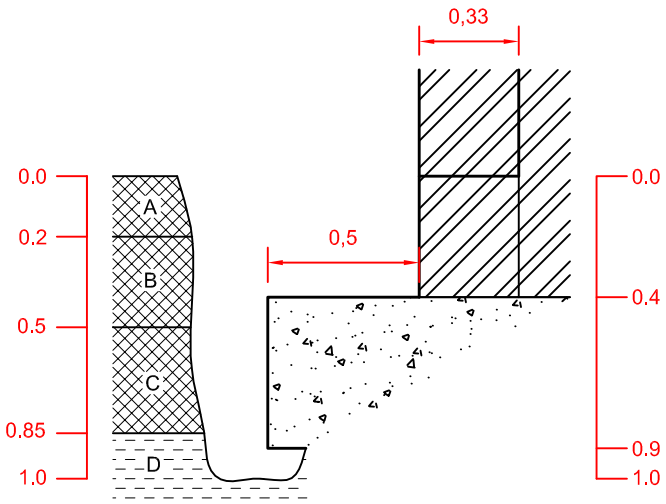
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP01

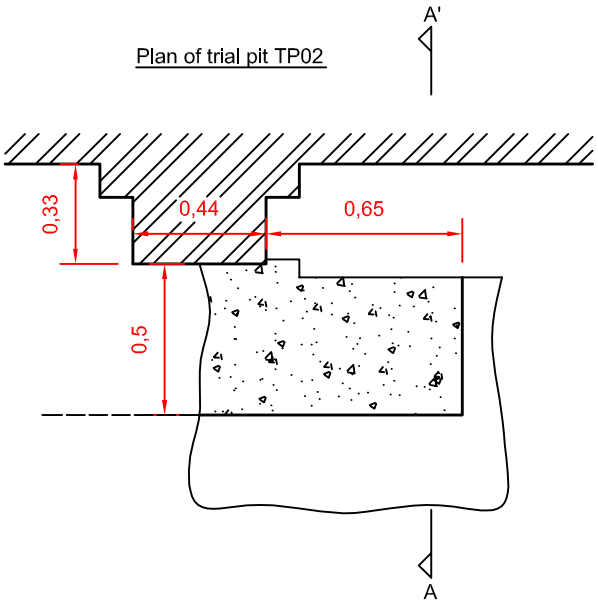
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	

project ref	drg No.	revision
STE1297R	TP01	

Section A - A' of trial pit TP02 facing south



Plan of trial pit TP02



Photographic record of trial pit TP02

Key

Masonry

Concrete

A Grass onto firm brown sandy SILT
(MADE GROUND)

B Medium dense brown and light brown clayey gravelly SAND. Gravel consists of flint, brick with some boulders of sandstone and timber
(MADE GROUND)

C Firm brown and orange brown sandy gravelly CLAY. Gravel consists of flint and brick.
(MADE GROUND)

D Firm orange and light brown gravelly sandy CLAY. Gravel consists of coarse flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres

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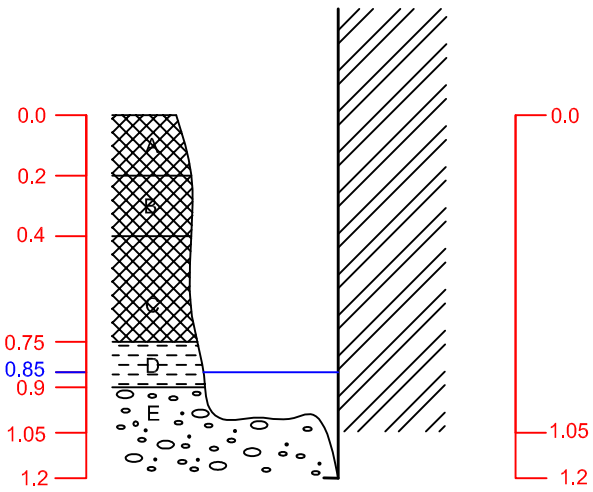
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

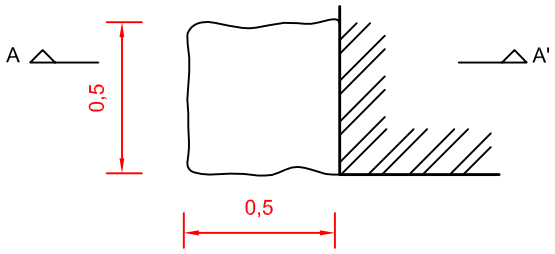
Title
Detail of foundation exposed in Trial pit TP02

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	
project ref		drg No.	revision
STE1297R		TP02	

Section A - A' of trial pit TP03 facing north



Plan of trial pit TP03



Photographic record of trial pit TP03

Key

Masonry

Concrete

A Grass onto firm brown sandy SILT
(MADE GROUND)

B Medium dense brown and light brown clayey gravelly SAND. Gravel consists of flint, brick with some boulders of sandstone and timber
(MADE GROUND)

C Firm brown and dark grey sandy gravelly CLAY. Gravel consists of sandstone, flint and brick.
(MADE GROUND)

D Stiff orange and light brown sandy CLAY.
(KEMPTON PARK GRAVELS)

E Orange sandy GRAVEL. Gravel consists of flint.
(KEMPTON PARK GRAVELS)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. Groundwater encountered at 0.85m
4. All dimensions shown in metres
5. Unable to determine base due to water
6. Steel bar used to confirm concrete projection at approximately 1.2m depth
7. Trial pit relocated tp TP04

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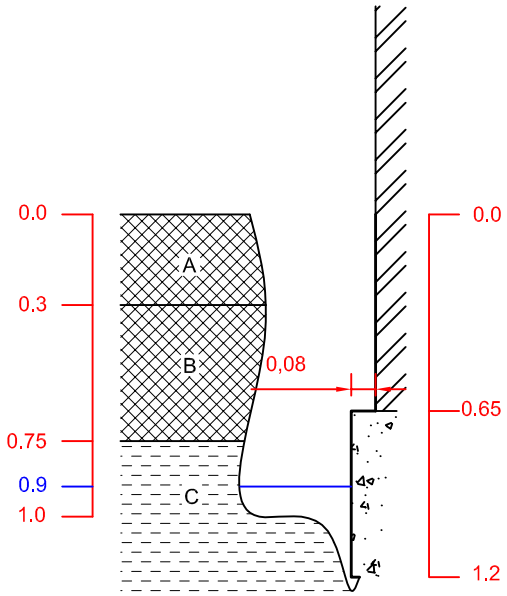
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP03

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	

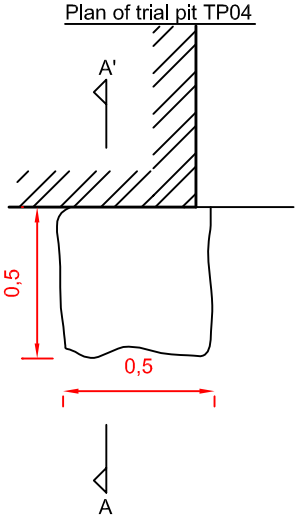
project ref	drg No.	revision
STE1297R	TP03	

Section A - A' of trial pit TP04 facing east



Photographic record of trial pit TP04

Plan of trial pit TP04



Key

Masonry

Concrete

A Grass onto firm dark brown sandy SILT
(MADE GROUND)

B Firm brown and light brown gravelly sandy CLAY. Gravel consists of flint, brick and timber
(MADE GROUND)

C Firm orange and light brown gravelly sandy CLAY. Gravel consists of coarse flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. Groundwater encountered at 0.9m.
4. Trial pit terminated due to water inflow.
5. Steel bar used to probe below and confirm foundation depth
6. All dimensions shown in metres

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Project
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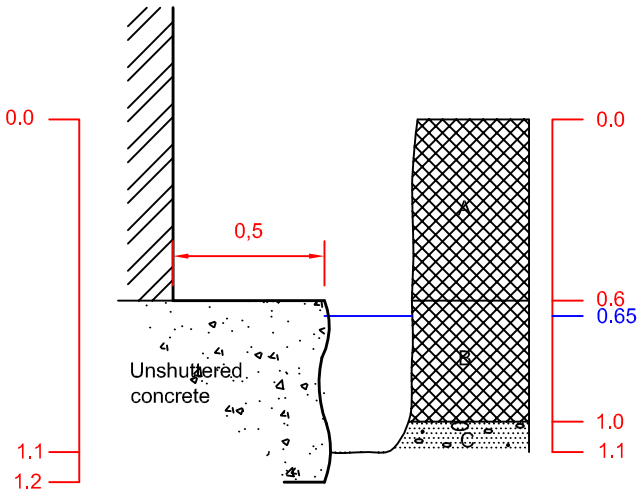
Title
Detail of foundation exposed in Trial pit TP04

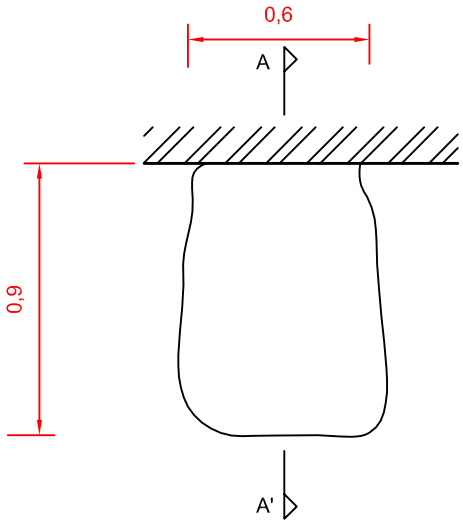
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	

project ref	drg No.	revision
STE1297R	TP04	

Section A - A' of trial pit TP05 facing west



Plan of trial pit TP05



Photographic record of trial pit TP05

Key

Masonry

Concrete

A 50mm thick concrete pavor over 50mm sand over red and brown slightly clayey sandy GRAVEL with occasional cobbles of brick. Gravel consists of brick. (MADE GROUND)

B Firm brown sandy gravelly CLAY. Gravel consists of brick and flint. (MADE GROUND)

C Loose orange brown clayey SAND and GRAVEL. Gravel consists of coarse flint. (KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. Groundwater encountered at 0.65m.
4. Trial pit terminated due to water inflow.
5. Steel bar used to estimate base of foundation.
6. All dimensions shown in metres

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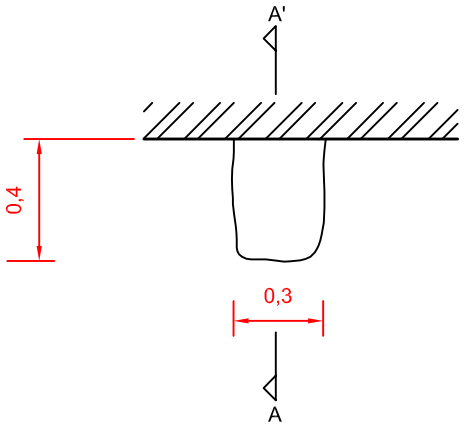
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

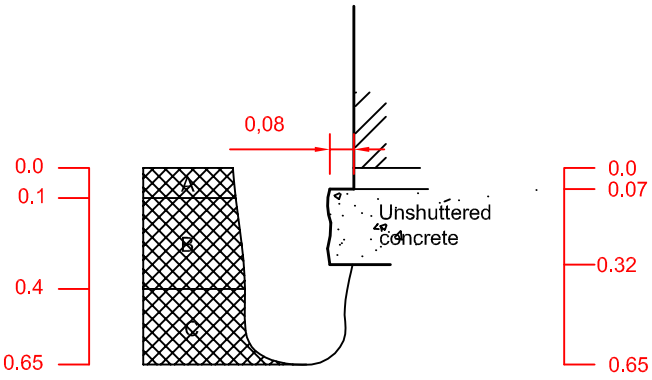
Title
Detail of foundation exposed in Trial pit TP05

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	
project ref		drg No.	revision
STE1297R		TP05	

Plan of trial pit TP06



Section A - A' of trial pit TP06 facing west



Photographic record of trial pit TP06

Key

Masonry

Concrete

A Brown clayey slightly gravelly SAND. Gravel consists of brick and flint. (MADE GROUND)

B Firm brown sandy slightly gravelly CLAY. Gravel consists of brick and flint. (MADE GROUND)

C Firm orange brown sandy slightly gravelly CLAY. Gravel consists of brick and flint. (MADE GROUND)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. No groundwater encountered
4. All dimensions shown in metres

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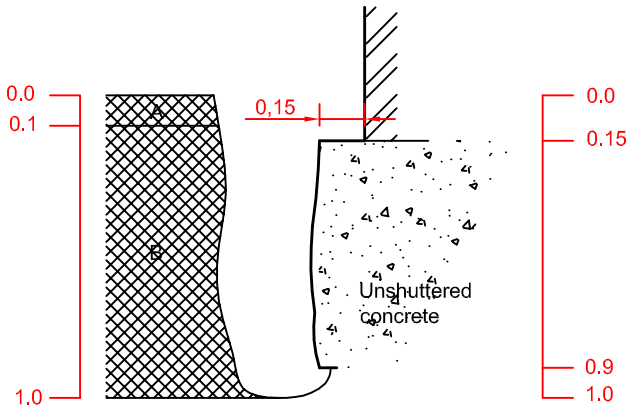
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP06

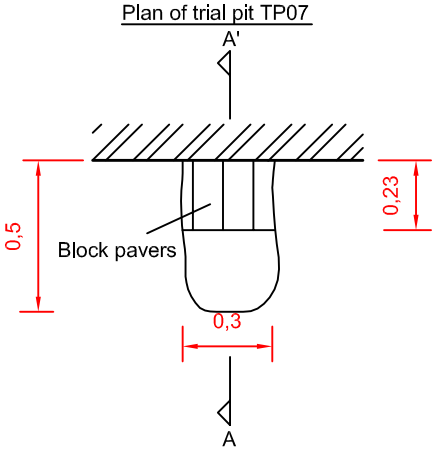
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	

project ref	drg No.	revision
STE1297R	TP06	

Section A - A' of trial pit TP07 facing west



Plan of trial pit TP07



Photographic record of trial pit TP07

Key

Masonry

Concrete

A Grass onto dark brown sandy slightly gravelly CLAY. Gravel consists of brick. (MADE GROUND)

B Firm brown orange dark grey sandy gravelly CLAY with occasional cobbles of sandstone. Gravel consists of brick, coal, ash and sandstone. (MADE GROUND)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. No groundwater encountered
4. All dimensions shown in metres

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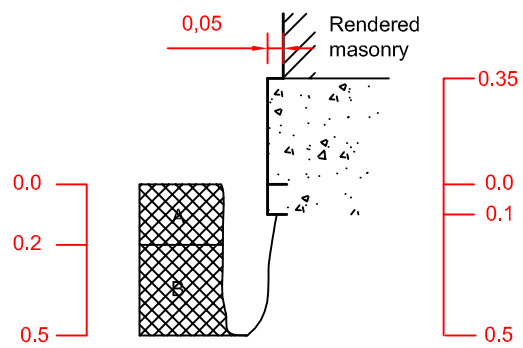
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

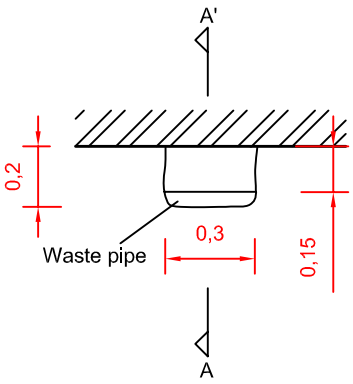
Title
Detail of foundation exposed in Trial pit TP07

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	
project ref		drg No.	revision
STE1297R		TP07	

Section A - A' of trial pit TP08 facing east



Plan of trial pit TP08



Photographic record of trial pit TP08

Key

Masonry

Concrete

A Grass onto dark brown slightly gravelly CLAY. Gravel consists of glass and brick. (MADE GROUND)

B Firm dark brown and brown slightly gravelly sandy CLAY. Gravel consists of ash, brick, coal and glass. (MADE GROUND)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. No groundwater encountered
4. All dimensions shown in metres

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Project

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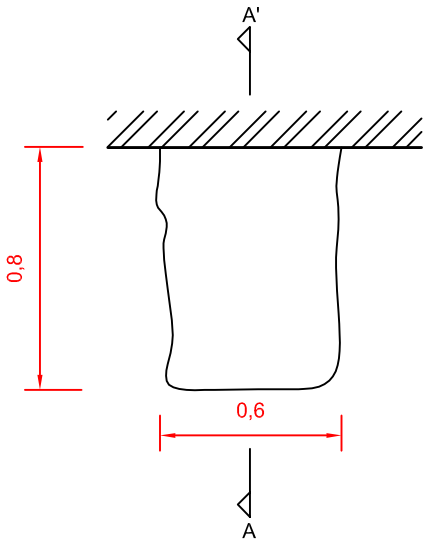
Title

Detail of foundation exposed in Trial pit TP08

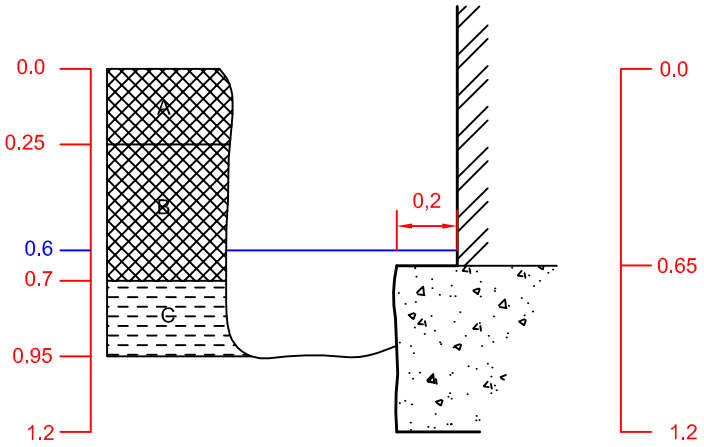
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	

project ref	drg No.	revision
STE1297R	TP08	

Plan of trial pit TP09



Section A - A of trial pit TP09 facing north



Photographic record of trial pit TP09

Key

Masonry

Concrete

A 70mm thick unreinforced concrete over 50mm thick pavor over 50mm concrete. (MADE GROUND)

B Brown and dark brown gravelly sandy CLAY. Gravel consists of brick, ash and flint. (MADE GROUND)

C Orange brown sandy gravelly CLAY. Gravel consists of coarse flint. (KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable
3. Groundwater encountered at 0.6m
4. Trial pit terminated at 0.95m due to water inflow
5. 0.1-0.2m hydrocarbon odour from one end of the pit
6. Steel bar used to estimate base of foundation
7. All dimensions shown in metres
8. Jar sample taken from 0.1-0.2m depth

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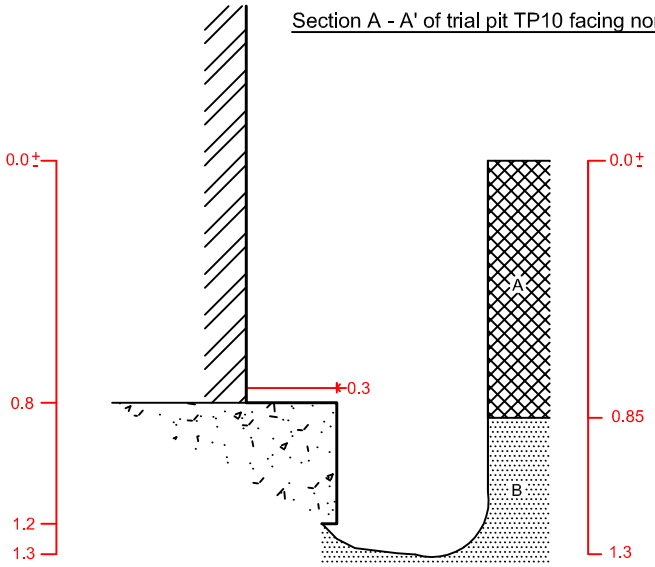
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

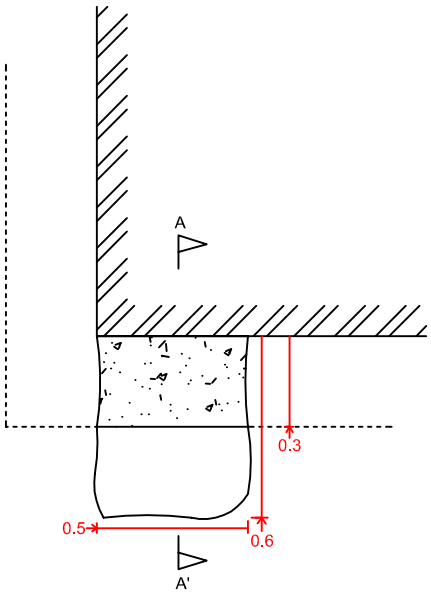
Title
Detail of foundation exposed in Trial pit TP09

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	MOW	
project ref		drg No.	revision
STE1297R		TP09	

Section A - A' of trial pit TP10 facing north



Plan of trial pit TP10



Photographic record of trial pit TP10

Key

Masonry

Concrete

A - Loose brown sandy gravelly SILT, with some roots. Gravel consists of sub-rounded flint and brick.
(MADE GROUND)

B - Loose orange brown clayey silty SAND and GRAVEL. Gravel consists of sub-rounded flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres

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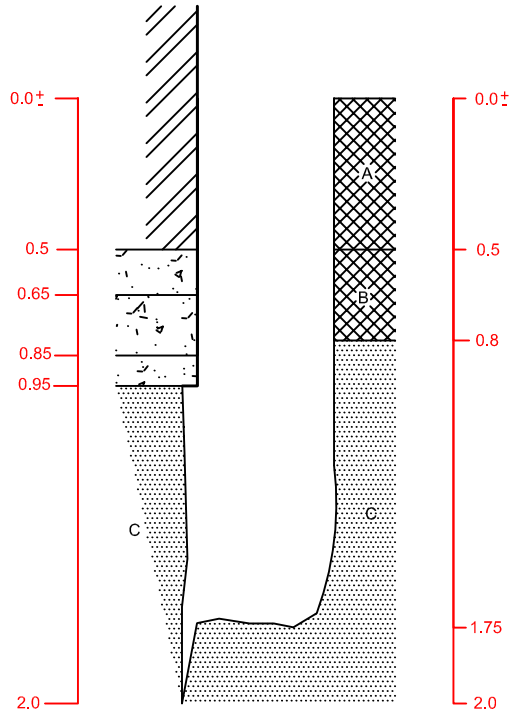
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP10

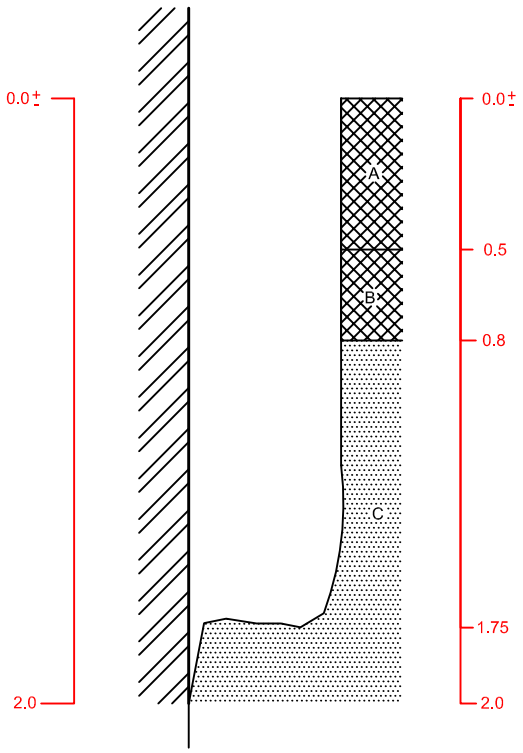
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	RC	

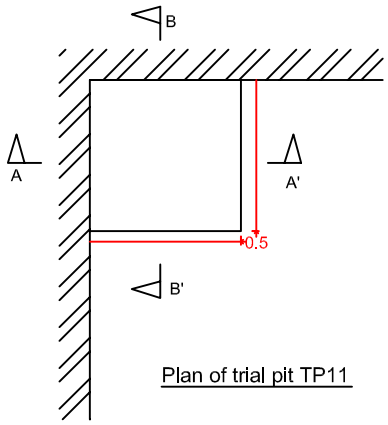
project ref	drg No.	revision
STE1297R	TP10	

Section A - A' looking south



Section B - B' looking east





Plan of trial pit TP11

Photographic record of trial pit TP11

Key

Masonry

Concrete

A - Loose brown sandy gravelly SILT, with some roots. Gravel consists of sub-rounded flint.
(MADE GROUND)

B - Loose orange brown silty SAND and GRAVEL, with occasional cobbles of brick. Gravel consists of sub-rounded flint and brick.
(MADE GROUND)

C - Loose to medium dense orange brown clayey silty SAND and GRAVEL. Gravel consists of sub-rounded flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres
4. Steel bar used to estimate presence of foundation below 1.75m

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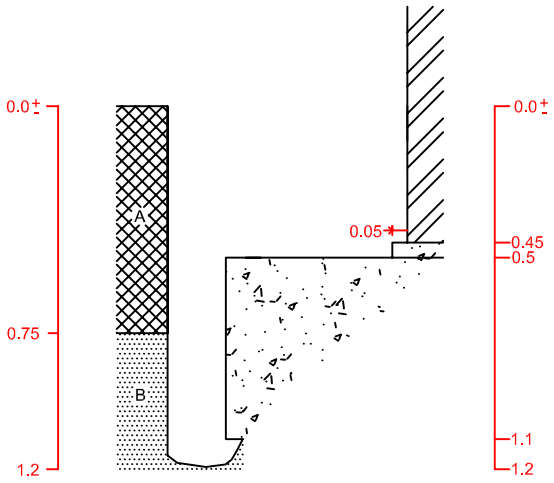
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP11

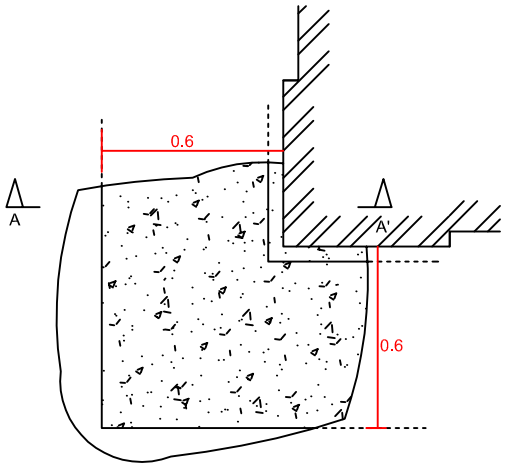
scale	date	drawn by	checked by
1:25 @ A4	28.05.08	RC	

project ref	drg No.	revision
STE1297R	TP11	

Section A - A' of trial pit TP12 facing west



Plan of trial pit TP12



Photographic record of trial pit TP12

Key

Masonry

Concrete

A - Loose brown sandy gravelly SILT, with some roots. Gravel consists of sub-rounded flint and brick.
(MADE GROUND)

B - Loose orange brown clayey silty SAND and GRAVEL. Gravel consists of sub-rounded flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres

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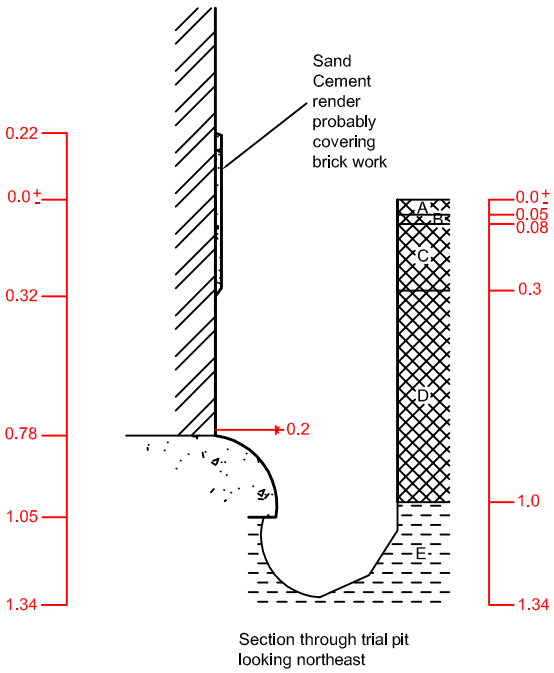
Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP12

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	RC	

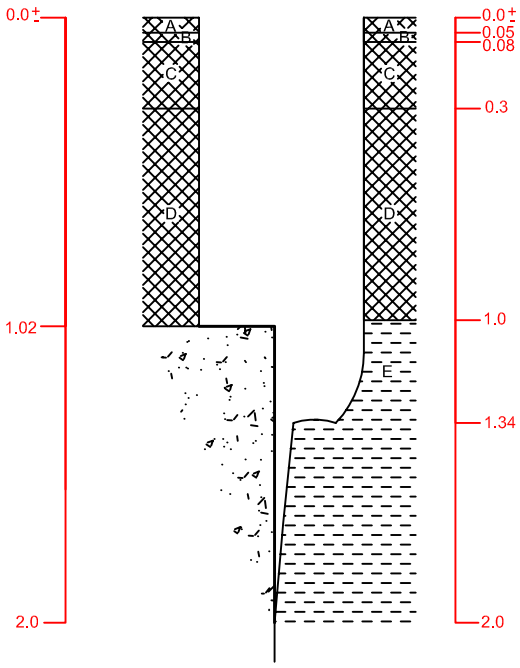
project ref	drg No.	revision
STE1297R	TP12	

Section A - A' looking north

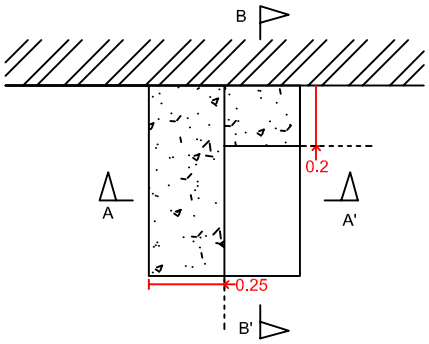


Section through trial pit
looking northeast

Section B - B' looking west



Plan of trial pit TP13



Key

Masonry

Concrete

Photographic record of trial pit TP13

A - Concrete pavour.

B - Loose light orange SAND.
(MADE GROUND)

C - Loose to medium dense dark grey and dark brown sandy GRAVEL, with many cobbles of brick. Gravel consists of clinker, ash and brick.
(MADE GROUND)

D - Stiff brown orange and dark grey sandy gravelly CLAY. Gravel consists of flint, brick and occasional metal and concrete.
(MADE GROUND)

E - Very stiff orange brown sandy gravelly CLAY. Gravel consists of flint.
(KEMPTON PARK GRAVEL)

Notes.

1. Trial pit excavated using hand tools
2. Trial pit sides remained stable and no groundwater encountered.
3. All dimensions shown in metres
4. Steel bar used to estimate presence of foundation below 1.75m

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Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Detail of foundation exposed in Trial pit TP13

scale	date	drawn by	checked by
1:25 @ A4	28.05.08	RC	

project ref	drg No.	revision
STE1297R	TP13	

DESCRIPTION	LEGEND	DEPTH (m)	SAMPLE DEPTH TYPE	INSITU SHEAR STRENGTH TEST DATA		
				DEPTH	TYPE	RESULT
Dark brown slightly gravelly SAND, with occasional roots and rootlets. Gravel consists of flint. (TOPSOIL)		0.0 0.12	0.1m J 0.3m J			
Light brown gravelly SAND, with occasional roots. Gravel consists of flint. (TOPSOIL)		0.42	0.4m J			
TRIAL PIT TERMINATED AT 0.42m Notes: 1. Trial pit sides were upright and stable. 2. No groundwater encountered. 3. Creosote odour between depths of 0.0-0.2m.						

REFER TO KEY AT BEGINNING OF THIS APPENDIX FOR EXPLANATION OF SYMBOLS

TRIAL PIT RECORD PAGE 1 OF 1

SOILTECHNICS
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GROUND LEVEL	METHOD OF EXCAVATION: **Hand tools**
LOCATION PLAN ON DRAWING No: **STE1297R-02**	DATE OF EXCAVATION: **27.05.08**
PROJECT: **Richmond-Upon-Thames College, Egerton Road, Twickenham.**	
PROJECT REF.: **STE1297R**	TRIAL PIT No: **TP14**

DESCRIPTION	LEGEND	DEPTH (m)	SAMPLE DEPTH TYPE	INSITU SHEAR STRENGTH TEST DATA		
				DEPTH	TYPE	RESULT
Grass onto dark brown slightly gravelly SAND, with occasional roots and rootlets. Gravel consists of flint and brick.		0.0				
(MADE GROUND)		0.3				
Loose light brown silty gravelly SAND, with occasional roots. Gravel consists of flint grading into brown silty SAND. (KEMPTON PARK GRAVELS)			B 0.4-0.7m			
		0.7				
TRIAL PIT TERMINATED AT 0.7m Notes: 1. Trial pit sides were upright and stable. 2. No groundwater encountered.						

REFER TO KEY AT BEGINNING OF THIS APPENDIX FOR EXPLANATION OF SYMBOLS

TRIAL PIT RECORD PAGE 1 OF 1

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GROUND LEVEL	METHOD OF EXCAVATION: **Hand tools**
LOCATION PLAN ON DRAWING No: **STE1297R-02**	DATE OF EXCAVATION: **20.06.08**
PROJECT: **Richmond-Upon-Thames College, Egerton Road, Twickenham.**	
PROJECT REF.: **STE1297R**	TRIAL PIT No: **TP15**

DESCRIPTION	LEGEND	DEPTH (m)	SAMPLE DEPTH TYPE	INSITU SHEAR STRENGTH TEST DATA		
				DEPTH	TYPE	RESULT
Grass onto dark brown slightly gravelly SAND, with occasional roots and rootlets. Gravel consists of flint and brick. (MADE GROUND)		0.0				
Light brown silty gravelly SAND, with occasional roots. Gravel consists of flint and brick (MADE GROUND)		0.3	B 0.4-0.7			
TRIAL PIT TERMINATED AT 0.7m Notes: 1. Trial pit sides were upright and stable. 2. No groundwater encountered.		0.7				

REFER TO KEY AT BEGINNING OF THIS APPENDIX FOR EXPLANATION OF SYMBOLS

TRIAL PIT RECORD PAGE 1 OF 1

SOILTECHNICS
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GROUND LEVEL	METHOD OF EXCAVATION: **Hand tools**
LOCATION PLAN ON DRAWING No: **STE1297R-02**	DATE OF EXCAVATION: **20.06.08**
PROJECT: **Richmond-Upon-Thames College, Egerton Road, Twickenham.**	
PROJECT REF.: **STE1297R**	TRIAL PIT No: **TP16**

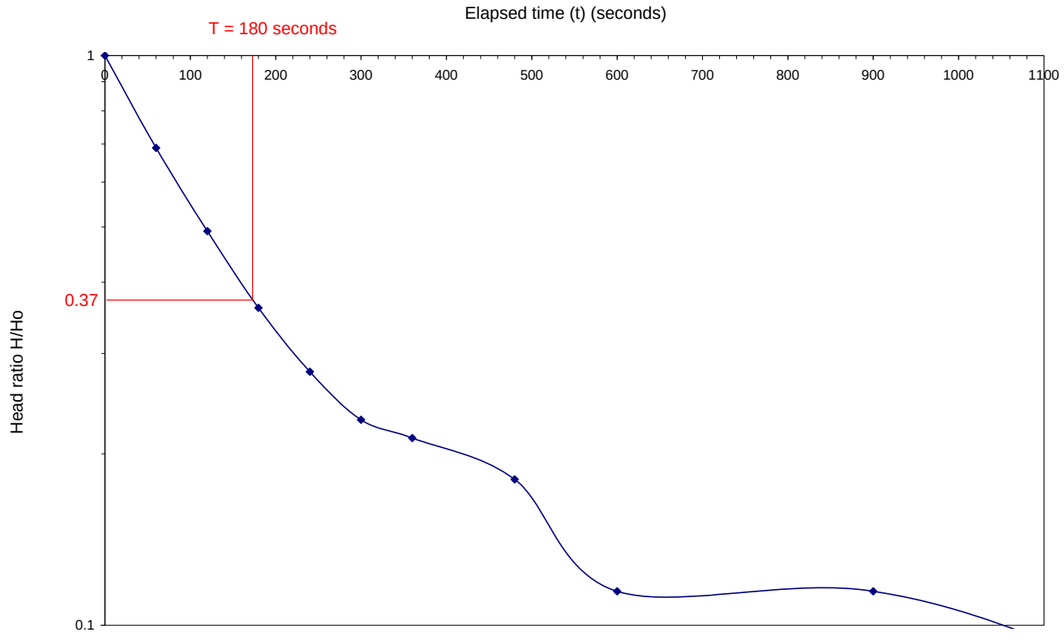
Brief soil description and strata for borehole DTS08:

DESCRIPTION	LEGEND	DEPTH (m)
Grass onto dark brown slightly clayey slightly silty slightly gravelly SAND, with some rootlets. Gravel consists of ash and flint. (MADE GROUND)		0.0
Loose becoming medium dense light brown orange very gravelly SAND. Gravel consists of flint. (KEMPTON PARK GRAVEL)		0.3
BOREHOLE TERMINATED AT 2.0m Notes: 1. Temporary slotted standpipe installed to 2.0m to maintain borehole stability. 2. Disturbed samples taken from 0.05-0.2m and 1.2-1.5m depths.		2.0

Test observations:

Time (seconds)	Water level (from GL)	Head of water above ground water level (H)
0	0.48	0.61
60	0.67	0.42
120	0.79	0.3
180	0.87	0.22
240	0.92	0.17
300	0.95	0.14
360	0.96	0.13
480	0.98	0.11
600	1.02	0.07
900	1.02	0.07
1200	1.04	0.05
1800	1.07	0.02

The basic time lag (T) is obtained from the plot of the head ratio H/Ho (log scale) against elapsed time t (seconds). The basic time lag corresponds to a value of H/Ho = 0.37 where Ho denotes the head at the start of the test and H is time measured head at the elapsed time t. The plot and identification of T is shown below.



DETERMINATION OF PERMEABILITY OF Soils between 0.48 and 1.07m in borehole DTS08

Following BS 5930: 1999, (Section 25.4) and CIRIA special publication 25 'site investigation manual'
(Variable Head Test)

Test 1

Permanent slotted casing installed between 0.5 m - 2.0 m

Borehole depth - 2.00 m

L	=	length of borehole test area	0.59	m
D	=	diameter of borehole	0.101	m
A	=	cross sectional area	0.008	m^2
G	=	Groundwater level	1.09	m

Adopting the basic time lag method

k = permeability = $\frac{A}{FT}$

Where F = intake factor (adopting fig 6D of BS5930)

$$F = \frac{2\pi L}{In\left[\frac{L}{D} + \sqrt{1+\left(\frac{L}{D}\right)^2}\right]} = \mathbf{1.5}$$

Then

$$k = \frac{0.008}{1.5 \times 180} = \mathbf{3.0 \times 10^{-5}\ ms^{-1}}$$

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Project
Richmond-Upon-Thames College, Egerton Road, Twickenham.

Title
Falling Head Test carried out in borehole DTS08 following BS 5930: 1999, (Section 25.4) and CIRIA special publication 25 'site investigation manual'

Scale	Date	drawn by	checked by
N/A	27.05.08	RC	
project ref		location	revision
STE1297R		DTS08	