STRUCTURAL
SOILS LTD

MR JONATHAN UNGAR

INTERPRATIVE REPORT

on

GROUND INVESTIGATION

at

84 ST. ALDATE'S

OXFORD

JUNE 2014

REPORT NO: 729180

MANN WILLIAMS
53 Mount Stuart Square
CARDIFF
CF10 5LR

Tel: 02920 480 333
Fax: 02920 435 920
Email: cardiff@mannwilliams.co.uk
www.mannwilliams.co.uk

STRUCTURAL SOILS LIMITED
The Old School
Stillhouse Lane
Bedminster
BRISTOL
BS3 4EB

Tel: 0117 947 1000
Fax: 0117 947 1004
Email: admin@soils.co.uk
www.soils.co.uk

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STRUCTURAL SOILS LIMITED
The Old School
Stillhouse Lane
Bedminster
BRISTOL
BS3 4EB

Tel: 0117 947 1000
Fax: 0117 947 1004
Email: admin@soils.co.uk
www.soils.co.uk

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1 INTRODUCTION

This investigation was carried out on the instructions of Mann Williams on behalf of Mr Jonathan Ungar. It is proposed that a former timber framed building is reinstated on the site and that a new 4 storey residential block is built adjoining the timber framed building.

The purpose of the work was to investigate ground conditions and provide information for foundation design and to provide information for preliminary contamination assessment purposes. The work included an intrusive investigation, laboratory testing and the preparation of this report, which contains a description of the site and the works carried out, the exploratory hole logs, in-situ and laboratory testing results.

The report gives recommendations relating to geotechnical aspects such as foundation design. It presents an appraisal of geoenvironmental aspects such as soil contamination and gives recommendations on risk reduction. It should not be assumed that these would meet the requirements of the local authority, whose advice should be sought regarding planning permission.

The ground investigation has been carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930: 1999 *Code of Practice for Site Investigations* (including Amendment A2, 2010). Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations and water conditions between or below exploratory holes. It should be noted that groundwater levels, gas concentrations and gas flows usually vary due to seasonal, atmospheric and/or other effects and may at times differ to those measured during the investigation.

This report was prepared by Structural Soils Limited for the sole and exclusive use of Mr Jonathan Ungar in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded. No liability will be accepted after a period of 6 years from the date of the report.

2 SITE DESCRIPTION

2.1 Location and Topography

The site is located at the rear of 84 St. Aldate's, Oxford (see Site Location Map in Appendix A). The British National Grid Reference of the site is SP 513 058.

The site is approximately 5m by 20m in size (see Exploratory Hole Location Plan in Appendix A). The site comprises of three distinct different areas. Firstly, an existing building, which lies at the eastern end of the site, which is currently used for commercial and residential purposes. Secondly, the central area which has the same base level as the existing building, but which was previously a timber framed building, where only the exterior walls now remain. This section of the site is predominantly concrete slab with overlying tiles and lino flooring, running along the southern side of this is a brick paved area, where the Victorian-era drain runs. Thirdly, the western end of the site is a concrete slab, which lies around 0.60m above the base level of the rest of the site and which sits around 0.15m above the street level to the west of the site.

The site is bound by a property to the south, which shares a wall with the existing building on the site, there is also the original historic wall which supported the timber framed building running the length of the southern boundary of the site. The north of the site is bound by a cobbled access road which is 3m wide and runs the full length of the site. The west of the site is bound by a paved footpath which links the access road to the courtyard of Oxfordshire County Councils buildings and Magistrates Courts. The east of the site is bound by St. Aldate's (A420).

2.2 Geology

Information on the geology of the site was obtained from the following sources published by the the British Geological Survey (BGS):

- BGS survey map (sheet 236 Witney, scale 1:50,000 published 1982).
- The BGS digital geology map, which utilises the most up to date names for geological units (www.bgs.ac.uk/data).
- The BGS Lexicon of Named Rock Units, which provides typical descriptions for most geological units (www.bgs.ac.uk/lexicon).

The site is shown to be underlain by the following descending sequence of strata:

TABLE 1: SUMMARY OF SITE GEOLOGY	
Geological Unit Name	**Description**
Alluvium	Sands and gravels
River Terrace Deposits	Clay, Silt, Sand and Gravel
Oxford Clay Formation and West Walton Formation (undifferentiated)	Claystone grading to Mudstone

Note: Information obtained from BGS digital records © NERC.

The BGS National Geoscience Data Centre collection of onshore scanned boreholes, shafts and well records was consulted. These showed that there was up to 2.75m of Made Ground, overlying up to 2.00m of Alluvium which was overlying up to 2.00m of River Terrace Deposits. The boreholes showed that the Oxford Clay Formation was encountered at roughly 5.50m depth in all the surrounding boreholes.

3 FIELDWORK

3.1 Scope of Works

The following works were completed on 22 April 2014 at locations shown on the Exploratory Hole Location Plan in Appendix A:

TABLE 2: SCOPE OF INTRUSIVE WORKS AND IN-SITU TESTING		
Number	**Exploratory Hole or In-Situ Test Type**	**Hole Numbers**
2	Window Sample Holes.	WS1 & WS2
6	Hand Dug Trial Pits	TP1 – TP6

The scope of investigation and choice of investigation equipment was decided by Mann Williams. The positions were selected by Mann Williams and set out by Structural Soils LTD and adjusted where necessary to take account of buried or overhead services, or other restrictions.

The exploratory holes were logged by an engineer in accordance with the recommendations of BS5930: 1999 (Amendment A2, 2010, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1). Detailed descriptions, together with relevant comments, are given in the logs included in Appendix B.

Prior to the commencement of the trail pits and window sample holes, a scan was carried out using a cable avoidance tool (CAT) and signal generator ('genny'). Inspection pits were hand dug at the window sample locations.

3.2 Window Sampling

The window sample exploratory holes were drilled using a tracked rig with chain driven drop weight to 4.50 m & 6.00m. Steel sample tubes containing a plastic sample liner were used. The holes reduce in diameter with depth, as reported on the logs. Small and bulk disturbed soil samples were subsampled at regular intervals. Hand vane or hand penetrometer tests were carried out on intact cohesive soils, the results of which are included on the logs contained in Appendix B.

Standard Penetration Tests (SPT) were carried out at 1.00m intervals in the window sample holes using the rig's integral drop weight/hammer (see In-Situ Testing, below).

3.3 In-Situ Testing

Standard Penetration Tests (SPT) were carried out in the exploratory holes, where noted in the preceding sections, in accordance with BS EN ISO 22476-3 using a hammer which had been calibrated for efficiency. The calibration certificate is included in Appendix C. Seating drives have been recorded in increments of 75mm in accordance with recommended UK practice.

The SPT N-values are reported on the exploratory hole logs, on which the serial number of the hammer used is recorded. The full results are presented in tabular format on the Summary of Standard Penetration Tests in Appendix C, on which the normalised N_{60} values are also reported, which are the equivalent N-value for a hammer delivering 60% of the theoretical drop energy. Plots showing both N and N_{60} values versus depth are also included.

3.4 Trial Pits

The hand dug trial pits were approximately 0.30m x 0.30m in plan and ranged from 0.70m to 1.25m deep. The purpose of the pits was to expose the foundations to existing walls. The foundation details exposed are shown on the trial pit logs. Small and bulk disturbed soil samples were taken from the trial pits at regular intervals.

3.5 Chemical Contamination Sampling

Samples for contamination testing were taken from the exploratory holes where indicated on the exploratory hole logs, recorded as ES.

All samples were placed in appropriate contamination sample containers that were supplied by the laboratory. Containers for volatiles testing of soil samples were filled to capacity. All samples were then kept in cool boxes with ice packs and were transported to the laboratories under Chain of Custody documentation, as promptly as possible to maintain sample integrity.

3.6 Backfill

On completion all exploratory holes were backfilled with arisings. The trial pits were backfilled with arisings and compacted.

4 LABORATORY TESTING

Samples for potential geotechnical testing were returned to one of the Company's UKAS accredited laboratories, and those for potential contamination testing were sent to a sister company Envirolab Limited, a MCERTS and UKAS accredited chemical testing laboratory. Laboratory tests were scheduled by Structural Soils Limited in consultation with Mann Williams.

4.1 Geotechnical Laboratory Testing

Geotechnical laboratory testing was generally carried out in accordance with BS1377: 1990, *Methods of Test for Soils for Civil Engineering Purposes*, Parts 1 to 8. The number of tests completed and the test methods used are summarised below. Where non-standard procedures have been undertaken, this is recorded on the report sheet. The results are reported in tabular and/or graphical form and included as Appendix D of this report.

TABLE 3: SUMMARY OF GEOTECHNICAL LABORATORY TESTING

Number of tests	Test	Test Method	Notes
Classification Tests			
6	Moisture content.	BS1377: Part 2.	
6	Liquid and plastic (Atterberg) limits.	BS1377: Part 2.	
Chemical Tests: Soil			
2	Water soluble sulphate content and pH value.	BRE SD1*.	
3	Water soluble sulphate, total (acid soluble) sulphate and total sulphur contents and pH value.	BRE SD1*.	

Note:
* Test(s) carried out to method approved in BRE Special Digest 1.

4.2 Contamination

The contamination testing carried out is summarised in the following table. The results are included as Appendix E of this report, and include details of the test method.

TABLE 4: SUMMARY OF CONTAMINATION LABORATORY TESTING*

Numbers of tests	Description	Notes
SOIL		
6	SSL HHB Human Assessment suite	Comprises arsenic, cadmium, chromium (total), lead, mercury, selenium, copper, nickel, zinc, speciated polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPHCWG (speciated)), organic matter, soluble sulphate and pH.

Note:
* Tests carried out in accordance with MCERTS/UKAS standards where noted on the results sheets.

5 GROUND CONDITIONS

5.1 General

The exploratory holes were logged by an engineer and the ground conditions encountered are detailed on the logs contained in Appendix B. The exploratory holes encountered the following general descending sequence of strata:

TABLE 5: SUMMARY OF GROUND CONDITIONS

Strata	Exploratory holes encountered in	Depth to top of stratum m bgl	Proven Thickness (m)
Made Ground	WS1, WS2, TP1, TP2, TP3, TP4, TP5, TP6	0.00	1.35 - 1.85
Possible Made Ground	WS1	1.85	0.75
Alluvium (Soft Clay)	WS1, WS2	1.35 - 2.60	0.30 - 0.65
Alluvium (Organic Silt)	WS1, WS2	2.00 - 2.90	0.90 - 1.60
River Terrace Deposits (Sands and Gravels)	WS1, WS2	3.60 - 3.80	0.90 - 2.20

The site contained a step of 0.60m, WS1 and TP4 were undertaken on this step, so higher up that the rest of the trial pits and window samples. This is visible on the logs in the thickness variations within the made ground. The ground conditions are summarised in more detail below.

5.2 Made Ground and Possible Made Ground

Made ground was encountered in all exploratory holes to proven depths in the window samples of 1.35m to 1.85m and to depths greater than 0.70m to 1.25m in the trial pits. The made ground was variable, comprising concrete and tile over hardstand over uncompact, loose to very loose clays, sands and gravels as well as soft occasionally firm sandy gravelly silt. Anthropologic materials included concrete, brick, charcoal, roof tiles and ceramic tiles.

A layer of possible made ground was encountered in WS1 from 1.85m to 2.60m and comprised soft to very soft sandy gravelly clay.

5.3 Alluvium

Beneath the made ground and possible made ground in the window samples, Alluvium of very soft to soft sand, gravel, clay and silt were encountered to 3.60m-3.80m depth. A high organic content was locally recorded in these deposits.

5.4 River Terrace Deposits

Beneath the Alluvium in the window sample, River Terrace Deposits of medium dense to dense clay, sand and gravel were encountered to final depths of 6.00m and 4.50m.

5.5 Indications of Contamination

There were no olfactory or visual indications of contamination in any of the exploratory holes.

5.6 Existing Foundations

Existing foundations were encountered within TP2 & TP4. In TP1, TP5 & TP6, the wall extended below the achievable depth of excavation of the trial pits, with no foundations being encountered. In TP3, a large boulder was encountered, so it in unknown if this is part of the foundations or not.

Within TP2, as shown on the diagram in the log, a step out to a corner foundation was encountered at 0.70m depth. This had a step out of 0.15m from the exterior wall and 0.10m from a demolished interior wall and had a thickness of 0.20m. The foundations were overlying made ground of sandy gravelly clay.

Within TP4, as shown on the diagram in the log, a stepped, stone foundation was encountered at 1.00m depth. It stepped out by 0.20m and was 0.20m thick. At the base of the foundations was what appeared to be lime mortar, as well as the foundations overlying made ground of clayey sandy gravel.

5.7 Groundwater

Groundwater strikes were encountered in WS1 and WS2 at depths of 3.00m and 1.70m representatively although the recorded depths can be influenced by the drilling technique. Due to the risk of hole collapse, the drilling of the window sample holes were immediately recommenced and therefore standing groundwater levels were not recorded.

No groundwater was encountered in TP1 to TP6 which were terminated at depths above the groundwater table.

6 GEOTECHNICAL SITE ASSESSMENT

6.1 Proposed Development

The proposed development is to reinstate the historic two storey timber framed building, in its original position, with new foundations. The current proposal is to rebuild the timber frame on a new raft foundation, in order to minimize disturbance to any underlying archaeology.

At the rear of the site, a new four storey residential structure is proposed. The higher and more concentrated loads from this structure mean that a raft may not be adequate, and the current proposal is for a raft foundations supported by mini piles.

The purpose of the investigation was to uncover any existing foundations and determine the extent and configuration of the foundations for the existing masonry walls. Secondly, to investigate the extent of contamination, if any on the site, and weather the contamination levels fall within the criteria for residential properties.

6.2 Site Preparation and Excavation

Current proposals are to use raft foundations, supported by mini piles for the new building. No significant depth of excavation is therefore expected under the current proposals, but care should still be taken not to undermine the foundations of the adjacent walls. The trial pits indicate that the walls are founded at least 0.70m, and probably at least 1.00m, below the site level.

The soils encountered at the site are considered suitable for excavation by standard mechanical plant such as a wheeled backhoe excavator. A hydraulic breaker may be required to break out any hard cover, buried foundations or other obstructions that remain following demolition.

Groundwater was encountered 1.70m depth or greater, and so is unlikely to be encountered by excavation for a raft foundation. However, it should be noted that groundwater levels may change due to seasonal or other variations, and also that surface water run-off from rainfall may also enter excavations. Advice on suitable dewatering techniques is given in CIRIA Report C515 *Groundwater Control – design and practice*.

On site works revealed that shallow unsupported excavations are likely to be stable in the short term. However, where water seepage and strikes occur within excavations their stability could be significantly reduced, resulting in collapse. Care should also be taken not to undermine the foundations of the adjacent existing walls.

All excavations should be planned and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in *Health and Safety in Construction*.

Excavations or below ground voids should be checked for the presence of harmful gases and vapours (e.g. hydrocarbons and solvents) prior to personnel entry.

6.3 Foundations

6.3.1 Historic Timber-Framed Building

The structure is to be rebuilt off a new raft. The underlying made ground is granular, 2.60m thick and very loose. Immediate settlement is to be expected, but the amount is difficult to assess, and would depend to a large extent on the load that the ground had been subjected to in the past by the building on the site. If the newly rebuilt structure is not significantly heavier than the original, then any settlement should be minimal. There is a theoretical risk of significant settlement if the area were flooded and the made ground inundated, assuming that this has not previously occurred.

In any event, some differential settlement between the raft and the surrounding structures is to be expected, and should be allowed for in the design. The raft should be designed in accordance with NHBC Standards.

6.3.2 New building

The new building is to be built off a raft supported by mini piles.

The following ultimate values for skin friction and end bearing may be used to carry out a preliminary design for bored piles. The soil profile used below is based on WS1 which was drilled in the centre of the new building footprint, supplemented by nearby BGS borehole archive data and our own data from other sites in central Oxford, where ground conditions are very similar.

TABLE 6: PRELIMINARY DESIGN VALUES FOR PILE DESIGN			
Depth (m bgl)	**Soil Description**	**Ultimate Unit Skin Friction, kN/m²**	**Ultimate Unit End Bearing, kN/m²**
0.00 to 1.35	MADE GROUND (Granular, N=0)	Ignore	Not recommended
1.35 to 2.35	Alluvial Clays/Silts (design c_u = 13kN/m²)	Ignore	Not recommended
2.35 to 3.60	Alluvial Clays/Silts (design c_u = 40kN/m²)	Ignore	Not recommended
3.60 to 5.50	River Terrace Deposits (design N = 40)	20	900[3]
5.50 to 10.00	Stiff Oxford Clay Formation (design c_u = 100kN/m²)	45[1]	900[2]
10.00-15.00	Stiff Oxford Clay Formation (design c_u = 150kN/m²)	67[1]	1350[2]

Notes:
1. Soil adhesion factor, α, of 4.5 used to derive this value.
2. Bearing capacity factor, N_c, of 9.0 used to derive this value.
3. Limiting value used to avoid overstressing the underlying stratum.

When calculating the allowable vertically compressive working load of piles for preliminary design purposes a factor of safety of 2.5 should be applied to the above ultimate values for skin friction and end bearing for soils. As the capacity of piles can vary depending on the type and method of installation, it is recommended that the advice of specialist piling contractors be sought with regard to the final design of piles. Consideration should also be given to undertaking loading tests on selected piles.

In practice the final design of any piles may be carried out by the pile designer using Eurocode methods with partial factors applied to loads and soil parameters, as opposed to using the *global* factors of safety recommended above.

6.4 Protection of Buried Concrete

This assessment of the potential for chemical attack on buried concrete is based on current guidance contained in BRE Special Digest 1 ('SD1', 2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment.* Third Edition. The site is classed as *brownfield*, as it conservatively assumed to have been subject to previous industrial development and might contain chemical residues produced by or associated with industrial production. Table C2 in BRE SD1 is therefore used to assess the site. Groundwater is assumed to be *static* above about 1.70m depth. 'Static groundwater' applies to locations where the ground is either

permanently dry, or contains water but has low permeability (i.e. little water movement is possible, permeability generally less than 10^{-7}m/s).

Soil pH values ranging from 8.07 to 10.30 were recorded. From these results a 'Characteristic Value' of 8.08 is derived, which is the mean of the lowest 2 values. The water-soluble sulphate (SO_4) results range from 46mg/l to 1300mg/l, and a 'Characteristic Value' of 795mg/l is derived, which is the mean of the highest 2 values.

It should be noted that the alluvium and Oxford Clay Formation strata may be pyritic. However, buried concrete is unlikely to be exposed to disturbed ground in which pyrite may oxidize to sulphate (e.g. the pyritic strata are too deep, or if piles are used then they will not cause disturbed ground that could oxidise) and so the concrete classification need not be based on the pyrite test results.

It is therefore concluded that for this site the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1 where concrete could be contact with groundwater, and therefore would be applicable to concrete piles, and AC-1s if there is no risk of concrete being in contact with groundwater, which would be applicable to a raft. The designer should utilise these classifications in order to produce the concrete specification.

7 GEOENVIRONMENTAL SITE ASSESSMENT

7.1 Proposed Development

The proposed development is detailed in Section 6.1 of this report.

7.1.1 Risk to Human Health

General

To determine whether contaminants are present at levels that may be deemed to pose a significant hazard to human health, measured contamination levels in soil at the site are compared against derived guideline values ('Tier 2' soil screening), either directly or following statistical analysis. Where contaminants are present above the screening values it is probable that site-specific information will be required to further examine the potential risk of harm arising from such contamination.

The background to the assessment is contained in Appendix E and the findings are summarised in the following pages.

The proposed used of the site is a mixture of residential and commercial properties, with no landscaping. The GAC for Human Health – Residential with communal soft landscaping guidelines have been used to assess the results, which are slightly conservative for this situation.

The results have been compared directly to the GACs without the use of the statistics.

Results

There were no olfactory or visual indications of contamination in any of the holes.

Contaminants assessed against the GAC's are: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, Polycyclic Aromatic Hydrocarbons (PAH) & Total Petroleum Hydrocarbons (TPH).

All of the individual results for all contaminants were all below the GAC/CLEA SGV's.

Conclusions

The investigation has shown contaminant levels in the soil to be below the assessment criteria, which indicates that no risks to human health have been identified.

7.1.2 Contamination Conclusion

No contamination has been recorded at the site resulting in no complete pollutant linkages being identified. It is therefore considered that the site is fit for the proposed end use without further assessment or remediation.

7.2 Off-site Disposal of Surplus Soil

7.2.1 General

All excavated material and excess spoil must be classified for waste disposal purposes prior to disposal at landfill. Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal all wastes must be classified as:

- 'inert', or
- 'non-hazardous', or
- 'hazardous'.

The Environment Agency's *Hazardous Waste* (*Technical Guidance WM2*) document outlines the methodology for classifying wastes.

Currently all wastes may require pre-treatment prior to disposal at landfill.

7.2.2 Initial Waste Characterisation

Envirolab have produced an assessment tool, 'Haswaste', that characterises contaminated waste soil by following the guidance within WM2. The 'total solid testing' results from this investigation have been run through this assessment tool to aid potential future off-site disposal of materials. This assessment produces an 'initial' characterisation of the waste which determines if it is hazardous or not (if it is 'not' hazardous, then it may be either inert (insoluble and inorganic) or non-hazardous. However, due to complications with the terminology of 'inert waste' it is best not to refer to it as such until after Waste Acceptance Criteria testing).

The assessment is included in Appendix D. Any samples that are classed as hazardous will have light cells with bold text, in the respective sample columns (assuming results are in black & white, otherwise yellow cells on a colour copy).

The initial waste characterisation indicates that none of the samples tested have been classified as hazardous.

It is important to note that whilst we believe our in-house assessment tool to be an accurate interpretation of the requirements of WM2, thereby producing initial classifications in accordance with it, landfill operators often have their own assessment tools and can often come to a different conclusion. As a result, some landfill operators could even refuse to take apparently suitable waste.

8 SUMMARY

8.1 The site is located within the boundaries of 84 St. Aldate's, Oxford. The British National Grid Reference of the site is SP 513 058.

8.2 It is understood that the site is to be redeveloped for residential housing consisting of a two story timber framed building and a four story stone clad building.

8.3 The site is split into three areas. The eastern section of the site currently has a three story timber framed building, with residential and commercial uses. The central section of the site previously contained a timber framed building, where only the floor slab and external walls remain. The western section of the site is raised by 0.60m and formally contained a garage, which now only contains the external wall to the south.

8.4 The British Geological Survey map (sheet 236 Witney, scale 1:50,000 published 1982) shows the site to be underlain by Alluvium deposits and River Terrace Deposits. The solid geology underlying the site is shows as the Oxford Clay Formation and West Walton Formation (undifferentiated).

8.5 An intrusive investigation comprising window sampling and hand dug trial pitting was undertaken on 22 April 2014.

8.6 Made ground and possible made ground were encountered in all exploratory holes undertaken and extended to a maximum depth of 2.60m in WS1. This was generally underlain by superficial deposits of soft cohesive material and dense gravel.

8.7 Groundwater was recorded at a minimum depth within WS2 of 1.70m below ground level.

8.8 The soils encountered at the site are considered suitable for excavation by standard mechanical plant such as a wheeled backhoe excavator. A hydraulic breaker may be required to break out any hard cover, buried foundations or other obstructions that remain following demolition.

8.9 On site works revealed that shallow unsupported excavations are likely to be stable in the short term. However, where water seepage and strikes occur within excavations their stability could be significantly reduced, resulting in collapse. Care should also be taken not to undermine the foundations of the adjacent existing walls.

8.10 The timber framed building is to be rebuilt off a new raft. The underlying ground is granular, 2.60m thick and very loose. Differential settlement between the raft and the surrounding structures is to be expected, and should be allowed for in the design. The raft should be designed in accordance with NHBC standards.

8.11 The new building is to be built off a raft supported by mini piles. The competent strata as detailed in Table 6 will offer within the stiff Oxford Clay Formation an ultimate unit end bearing capacity of >900kN/m², with an ultimate skin friction of >45kN/m².

8.12 According to Table C2 the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1 where concrete could be contact with groundwater, and therefore would be applicable to concrete piles, and AC-1s if there is no risk of concrete being in contact with groundwater, which would be applicable to a raft. The designer should utilise these classifications in order to produce the concrete specification.

8.13 The investigation has shown contamination levels in the soil to be below the assessment criteria, which indicates that no risk to human health have been identified.

8.14 The initial waste characterisation has indicated that none of the samples tested have been classed as hazardous.

STRUCTURAL SOILS LIMITED

[redacted]

H Perry BSc (Hons) FGS

[redacted]

B J Simpson MSci (Hons) FGS

9 REFERENCES

9.1 BS 5930:1999 *Code of Practice for Site Investigation*, including amendment A2 (2010)

9.2 BS 10175:2011 *Investigation of potentially contaminated sites: Code of practice*, including amendment A1 (2013)

9.3 British Geological Survey sheet 236 Witney, scale 1:50,000 published 1982

9.4 British Geological Survey online digital geological map, www.bgs.ac.uk/data

9.5 British Geological Survey Lexicon of Named Rock Units, www.bgs.ac.uk/lexicon

9.6 Environment Agency website, www.environment–agency.gov.uk

9.7 *Health and Safety in Construction*, HSG150, HSE, 1996

9.8 CIRIA Report C515 (2000) *Groundwater Control – design and practice*

9.9 BS EN ISO 14688-1:2002 *Geotechnical investigation and testing – Identification and classification of soil: Part 1: Identification and description*, including Amendment A1 (2013)

9.10 BS EN ISO 14688-2:2004 *Geotechnical investigation and testing – Identification and classification of soil: Part 2: Principles for a classification* , including Amendment A1 (2013)

9.11 BS EN ISO 22476-3:2005 (updated February 2007) *Geotechnical Investigation and Testing – Field Testing Part 3: Standard Penetration Test*, including Amendment A1 (2011)

9.12 BS 1377:1990 Methods of Test for Soils for Civil Engineering Purposes

9.13 BRE Special Digest 1 (SD1)(2005) *Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment.* Third Edition

9.14 Environment Agency Policy. Part IIA – *Detailed Quantitative Assessment of Chronic Risks to Human Health from Contaminated Soils.* Policy Number 199_04, dated 9 March 2004

9.15 *Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste*, Environment Agency, WM2 Version 1.0, June 2003

9.16 *Landfill (England & Wales) Regulations* 2002

APPENDIX A

(i) Site Location Plan

(ii) Exploratory Hole Location Plan

(iii) Proposed Development Layout Plan

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB
Tel: 0117 947 1000
Fax: 0117 947 1004
ask@soils.co.uk
www.soils.co.uk

CLIENT: Mann Williams

PROJECT: 84 St. Aldate's Oxford

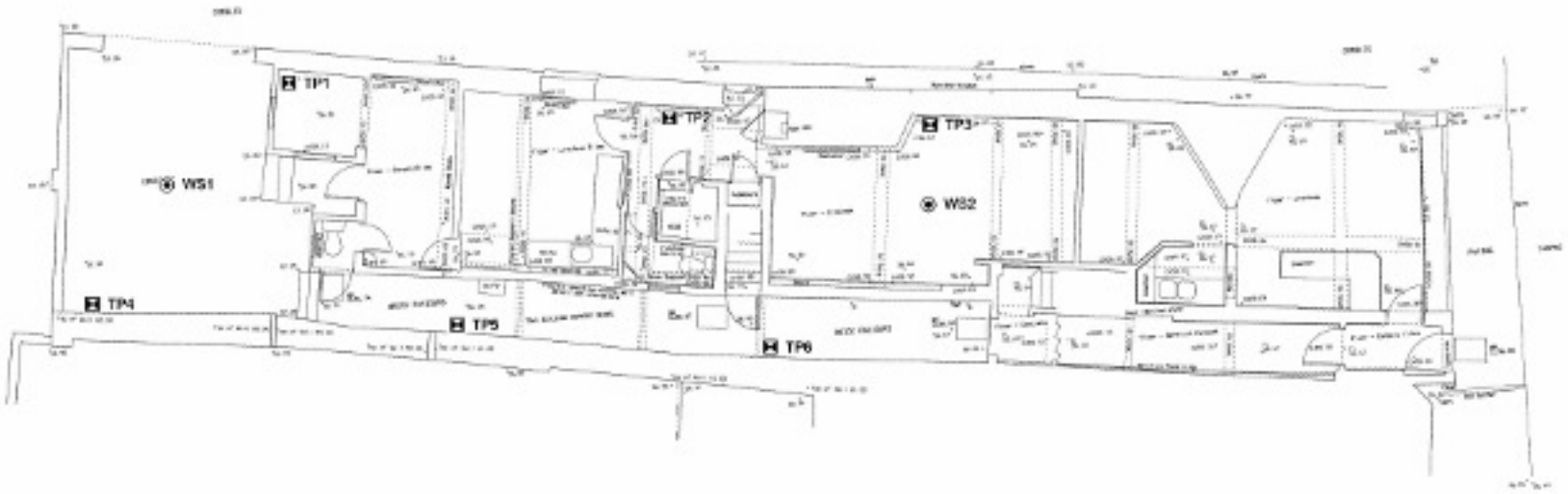
TITLE: SITE LOCATION MAP

REV.	DATE	DESCRIPTION	BY	CHD.	APR.
00	07.05.2014	-	MW	HP	-

DIMENSION	SCALE	DRAWING STATUS
m	1:25,000	-

CONTRACT No	GRID REFERENCE	SCALE BAR	ORIGIN SIZE	FIGURE No
729180	SP 513 058	0 250 500 750 1000m	A4	1

N



LEGEND

- Trial Pit Location
- Window Sample Location

REV.	DATE	DESCRIPTION	BY	CHD.	APP.
00	07.05.2014	-	HW	HP	-

DIMENSION	SCALE	ORIGIN SIZE
m	NTS	A3

STRUCTURAL SOILS

The Old School
Elmhouse Lane
Backwater
Bristol BS3 4NB

Tel: 0117 947 1000
Fax: 0117 947 1004
enq@soils.co.uk
www.soils.co.uk

CLIENT
Mann Williams

PROJECT
84 St. Aldate's Oxford

TITLE
EXPLORATORY HOLE LOCATION PLAN

JOB NO.	FIGURE
729160	2

DRAWING STATUS	REV
-	00

Not To Scale

Proposed North Elevation

N

Project	84 St Aldates, Oxford
Scale	1:100 @ A3
Drawing Title	North Elevation
Date	July 2013

MW Design

APPENDIX B

(i) Key to Exploratory Hole Logs

(ii) Trial Pit Logs

(iii) Window Sample Logs

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF ABBREVIATIONS

SAMPLING

Sample type codes

B	=	Bulk disturbed sample.
D	=	Small disturbed sample.
DSPT	=	Small disturbed sample originating from SPT test.
ES	=	Soil sample for environmental testing.

IN-SITU TESTING

SPT	=	Standard Penetration Test using split spoon sampler. ($SPT_{(NR)}$ indicates 'No Sample Recovery').
HP	=	Hand Penetrometer Test. Value given as shear strength c_u, in kPa.

ADDITIONAL NOTES

1. All soil and rock descriptions and legends in general accordance with BS EN ISO 14688-1, 14688-2, 14689-1, and BS5930:1999 including Amendment 2 (2010).
2. Material types divided by a broken line (- - -) indicates an unclear boundary.
3. The data on any sheet within the report showing the AGS icon is available in the AGS format.

STRUCTURAL SOILS

Contract Reference: **729180**

KEY TO EXPLORATORY HOLE LOGS - SUMMARY OF GRAPHIC SYMBOLS

WATER COLUMN SYMBOLS

First water strike, second water strike etc.

Standing water level following first strike, standing water level following second strike etc.

Seepage.

Standing water level recorded at documented date.

MATERIAL GRAPHIC LEGENDS


CLAY


Gravelly clayey SAND


Concrete


Clayey sandy GRAVEL


Gravelly SILT


MADE GROUND


Possible MADE GROUND


Sandy GRAVEL


Sandy gravelly SILT


Sandy clayey SILT


Sandy SILT


Clayey SILT

INSTRUMENTATION SYMBOLS


Backfill

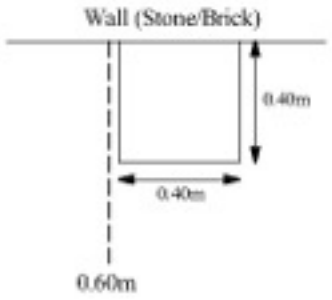
STRUCTURAL SOILS

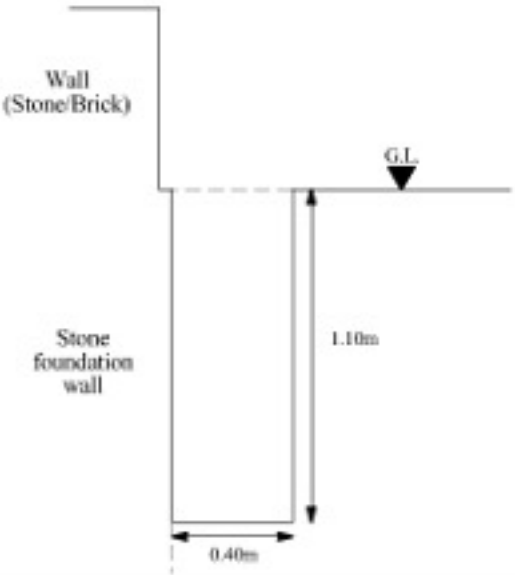
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP1**

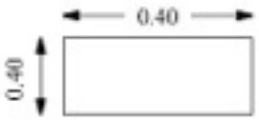
Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	**22.04.14**	**---**	**---**	**1** of **1**
	End: **22.04.14**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: CONCRETE.	0.05	
						MADE GROUND: Light orangish brown slightly sandy clayey GRAVEL. Gravel is angular medium to coarse of brick. Medium cobble content of brick.	0.30	
0.30-1.10	1	B				MADE GROUND: Greyish brown light brown reddish brown black slightly clayey sandy GRAVEL. Gravel is angular to subangular fine to coarse of brick, charcoal and sandstone.	(0.80)	
0.50	1	ES						
						Trial pit terminated at 1.10m depth due to maximum achievable depth of excavation.	1.10	





Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 1.10m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

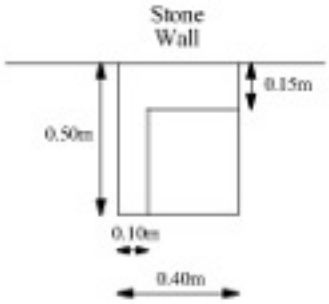
STRUCTURAL SOILS

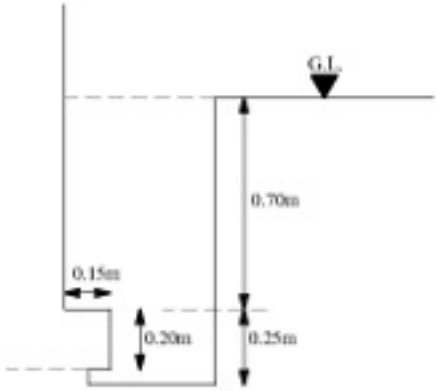
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP2**

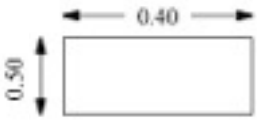
Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	End: **22.04.14**	**22.04.14**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: LINO and TILE.	0.05	
						MADE GROUND: CONCRETE.	0.10	
0.10-0.70	1	B				MADE GROUND: Soft light greyish yellowish brown slightly sandy gravelly CLAY with low cobble content. Gravel is angular fine to coarse of brick, sandstone, limestone and charcoal.	(0.60)	
							0.70	
0.70-0.95	2	D				MADE GROUND: Soft occasionally firm brown greyish brown slightly sandy gravelly CLAY. Gravel is angular fine to coarse sandstone and charcoal.	0.95	
						Trial pit terminated at 0.95m depth, when foundations had been proven.		





Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 0.90m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

STRUCTURAL SOILS

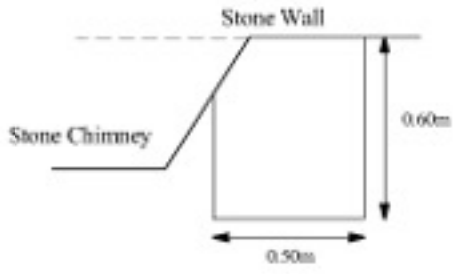
TRIAL PIT LOG

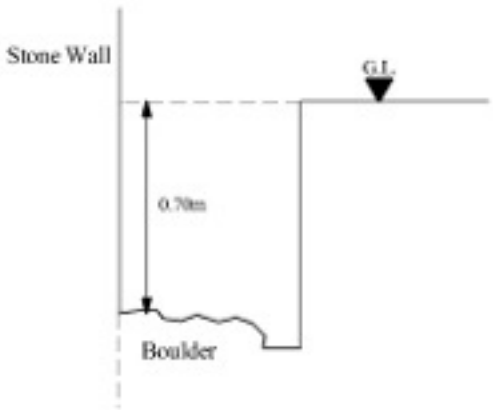
Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP3**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	**22.04.14**	**---**	**---**	**1** of **1**
	End: **22.04.14**			

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: LINO, TILE and CONCRETE.	0.10	
						MADE GROUND: Lime MORTAR.	0.30	
0.30-0.70	1	B				MADE GROUND: Soft light yellowish brown slightly sandy gravelly CLAY. Gravel is angular fine to coarse of roof tile and brick.	(0.40)	
							0.70	

Trial pit terminated at 0.70m depth on boulder.





Plan (Not to Scale)

General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 0.70m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

STRUCTURAL SOILS

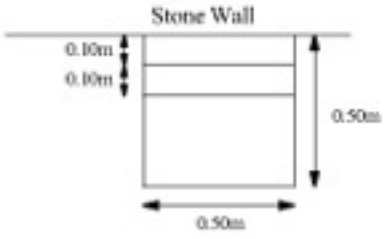
TRIAL PIT LOG

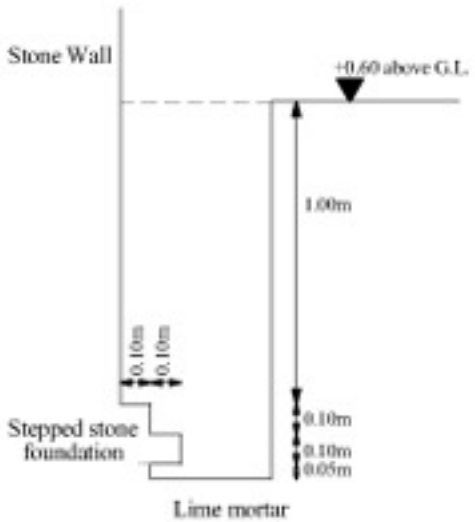
Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP4**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	**22.04.14**	---	---	**1** of **1**
	End: **22.04.14**			

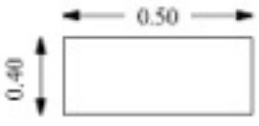
Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: CONCRETE.	0.05	
						MADE GROUND: Cream grey red brown slightly sandy GRAVEL with high cobble content. Gravel is angular fine to coarse sandstone, limestone, brick, concrete and coal.	(0.45)	
							0.50	
0.50 0.50-1.00	1 1	ES B				MADE GROUND: Soft, occasionally firm brown sandy slightly gravelly CLAY. Gravel is angular fine to medium charcoal, slag, sandstone, brick and china plate.	(0.50)	
							1.00	
1.00-1.25	2	D				MADE GROUND: Light yellowish brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse of lime mortar.	1.25	

Trial pit terminated at 1.25m depth when foundations had been proven.





Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 1.25m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

STRUCTURAL SOILS

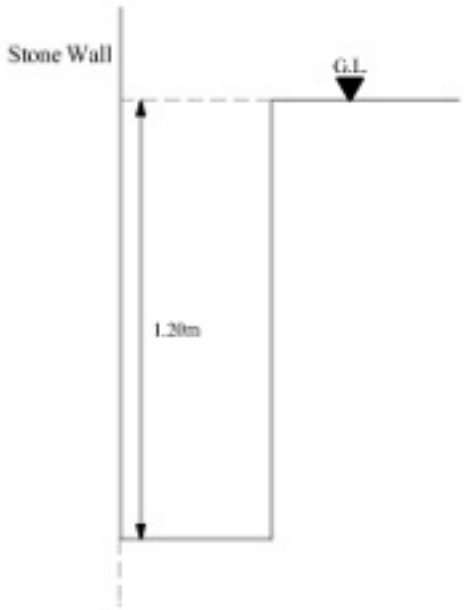
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP5**

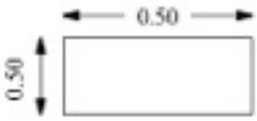
Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	**22.04.14** End: **22.04.14**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.07-1.20	1	B				MADE GROUND: BRICK.	0.07	
						MADE GROUND: Soft brown greyish brown light brownish orange slightly sandy gravelly CLAY. Gravel is angular fine to coarse of sandstone and brick.		
						. . . at 0.60m a 20mm layer of lime mortar.	(1.13)	
							1.20	

Trial pit terminated at 1.20m depth due to maximum achievable depth of excavation.



Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 1.20m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

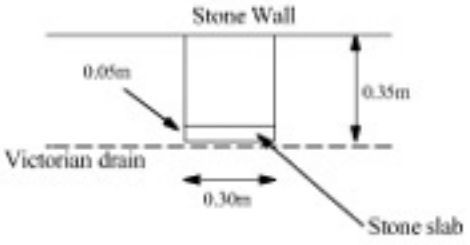
STRUCTURAL SOILS

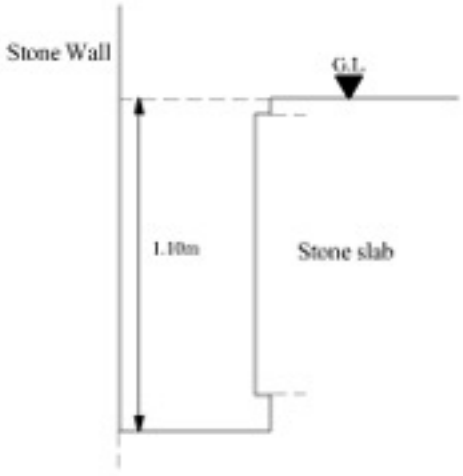
TRIAL PIT LOG

Contract:	Client:	Trial Pit:
84 St. Aldate's, Oxford	**Mann Williams**	**TP6**

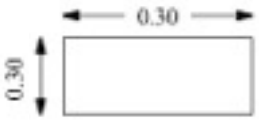
Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	**22.04.14** End: **22.04.14**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.07-1.10	1	B				MADE GROUND: BRICK.	0.07	
						MADE GROUND: Soft greyish brown gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone and brick.	(1.03)	
						Trial pit terminated at 1.10m depth due to maximum achievable depth of excavation.	1.10	





Plan (Not to Scale)



General Remarks

1. Location CAT scanned prior to excavation.
2. Hand dug inspection pit to 1.10m depth.
3. No groundwater encountered.

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**HPerry**	

STRUCTURAL SOILS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
84 St. Aldate's, Oxford	**Mann Williams**	**WS1**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	End: **22.04.14**	**---**	**---**	**1** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.00-0.30	1	B				MADE GROUND: CONCRETE	0.05	
							MADE GROUND: Uncompact light yellowish brown and cream slightly sandy GRAVEL. Gravel is angular fine to coarse of concrete.	0.30	
	0.30	1	ES					0.40	
	0.30-0.70	2	B				MADE GROUND: Uncompact light yellowish brown and cream slightly sandy GRAVEL with a medium cobble content. Gravel is angular fine to coarse of concrete and brick. Cobble of same material.	(0.30)	
								0.70	
	0.70-1.10	3	B				MADE GROUND: Uncompact brown to reddish brown and brownish black sandy GRAVEL. Gravel is angular to subangular fine to coarse of brick and charcoal.	(0.60)	
	1.00-1.45	1	SPT	N=0			MADE GROUND: Very loose light brownish yellow sandy GRAVEL. Gravel is subround to round fine to coarse of sandstone, quartz and flint.	1.30	
1.10 - 2.00 (102mm dia) 60% rec	1.30-1.85	5	D				MADE GROUND: Very loose brown to yellowish brown slightly clayey sandy GRAVEL. Gravel is angular to subround fine to coarse of sandstone, brick and charcoal.	(0.55)	
								1.85	
	1.85-2.00	6	D				POSSIBLE MADE GROUND: Soft to very soft greyish brown to yellowish brown black slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of charcoal and sandstone.	(0.75)	
	1.90		HP	c_u=25/13/25					
	2.00-2.45	2	SPT	N=3					
	2.00	2	ES						
	2.00-2.60	8	D						
	2.00		HP	c_u=25/25/25					
2.00 - 3.00 (87mm dia) 80% rec	2.50		HP	c_u=25/25/25				2.60	
	2.60-2.90	9	D				Soft greyish brown mottled orangish brown slightly sandy slightly gravelly CLAY with a medium shell fragment and organic content. Gravel is angular to subrounded fine to medium of charcoal. (ALLUVIUM)	(0.30)	
	2.90-3.00	10	D		▼			2.90	
	3.00-3.45	3	SPT	N=3			Very soft to soft dark grey slightly sandy clayey SILT with a medium shell fragment content. (ALLUVIUM)	(0.50)	
	3.00		HP	c_u=13/25/13				3.40	
3.00 - 4.00 (78mm dia) 70% rec	3.40-3.80	12	D				Very soft dark brown to black clayey SILT with medium wood/reed content. (ALLUVIUM)	(0.40)	
	3.50		HP	c_u=0/13/0				3.80	
	3.80-4.00	13	D				Medium dense dark brownish grey gravelly clayey SAND. Gravel is subangular to subrounded fine to medium of sandstone. (RIVER TERRACE DEPOSITS)	(0.80)	
	4.00-4.45	4	SPT	N=16					
	4.00-4.60	15	D						
4.00 - 5.00 (67mm dia) 100% rec								4.60	
	4.60-6.00	16	D				*Description on next sheet*		

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)
22/04/14		3.00	-	87	3.00

General Remarks

1. Location scanned with a CAT prior to and after digging the inspection pit.
2. Inspection pit dug to 1.10m.
3. Ground water strike at 3.00m.
4. Hole collapsed at 6.00m due to gravel.
5. Hole back filled with arising on completion.
6. SPT hammer AC0124-2013 (E_r = 70.62%) used.

All dimensions in metres | Scale: **1:28**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Archway Competitor**	**RD**	**HPerry**	

STRUCTURAL SOILS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
84 St. Aldate's, Oxford	**Mann Williams**	**WS1**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	End: **22.04.14**	**22.04.14**	**---**	**---**	**2** of **2**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
5.00 - 6.00 (59mm dia) 100% rec	5.00-5.45	5	SPT	N=33			Dense yellowish orangish brown slightly clayey sandy GRAVEL. Gravel is angular to subrounded fine to coarse of quartz, flint and sandstone. (RIVER TERRACE DEPOSITS) *(stratum copied from 4.60m from previous sheet)*	(1.40)	
							. . . Becoming sandier from 5.80m.	6.00	
							Window sample hole terminated at 6.00m depth after hole collapsed.		

Drilling Progress and Water Observations					
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)

General Remarks

All dimensions in metres | Scale: **1:28**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Archway Competitor**	**RD**	**HPerry**	

STRUCTURAL SOILS

WINDOW SAMPLE LOG

Contract:	Client:	Window Sample:
84 St. Aldate's, Oxford	**Mann Williams**	**WS2**

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
729180	End: **22.04.14**	**---**	**---**	**1** of **1**

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.05-0.30	1	B				MADE GROUND: LINO and CERAMIC TILE.	0.05	
							MADE GROUND: CONCRETE	0.10	
	0.30	1	ES				MADE GROUND: Uncompact light yellowish brown slightly sandy GRAVEL. Gravel is angular fine to coarse of concrete.	0.30	
	0.30-0.70	2	B					(0.40)	
							MADE GROUND: Uncompact light yellowish brown to brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse of concrete, ceramic tile and brick.	0.70	
	0.70-1.00	3	B				MADE GROUND: Very loose greyish yellowish brown to brown and black clayey slightly sandy GRAVEL. Gravel is angular to subangular fine to coarse of brick, concrete and charcoal.	(0.65)	
	1.00-1.45	1	SPT	N=0				1.35	
	1.00-1.35	5	D						
1.00 - 2.00 (102mm dia) 100% rec	1.35-2.00	6	D				Very soft dark brown mottled orangish brown slightly sandy slightly gravelly SILT with medium shell fragment content. Gravel is subround to round fine to medium of sandstone. (ALLUVIUM)	(0.65)	
	1.40		HP	c_u=13/13/13					
	1.50		HP	c_u=13/13/13	▼1				
	1.60		HP	c_u=13/25/13					
	1.70		HP	c_u=13/0/13					
	1.80		HP	c_u=13/13/13					
	1.90		HP	c_u=13/13/13				2.00	
	2.00-2.45	2	SPT	N=5			Soft locally firm dark brownish grey slightly gravelly SILT. Gravel is subround fine to medium of charcoal. (ALLUVIUM)	(0.30)	
	2.00	2	ES					2.30	
	2.00-2.30	8	D						
	2.20		HP	c_u=0/0/13					
	2.30-2.35	9	D						
2.00 - 3.00 (87mm dia) 100% rec	2.35-3.00	10	D				Dark brownish grey slightly sandy GRAVEL. Gravel is subround to round fine to coarse of sandstone, flint and quartz. (ALLUVIUM)	2.35	
	2.50		HP	c_u=50/63/50					
	2.70		HP	c_u=38/50/38			Firm locally stiff dark brownish black slightly sandy clayey SILT with high wood/reed content. (ALLUVIUM)	(1.25)	
	2.90		HP	c_u=25/38/25					
	3.00-3.45	3	SPT	N=39					
	3.00-3.60	12	D						
3.00 - 4.00 (78mm dia) 60% rec	3.50		HP	c_u=50/63/50				3.60	
	3.60-3.90	13	D				Grey to greyish brown slightly clayey sandy GRAVEL. Gravel is angular to subround fine to coarse of sandstone, quartz and flint. (RIVER TERRACE DEPOSITS)	(0.30)	
	3.90-4.00	14	D					3.90	
	4.00-4.45	4	SPT	N=43			Dense orangish brown to yellowish brown slightly clayey sandy GRAVEL. Gravel is angular to subround fine to coarse of sandstone and flint. (RIVER TERRACE DEPOSITS)	(0.60)	
	4.00-4.50	16	D					4.50	
4.00 - 4.50 (67mm dia) 100% rec							Window sample terminated at 4.50m due to refusal.		

Drilling Progress and Water Observations

Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)
22/04/14		2.00	-	102	1.70

General Remarks

1. Location scanned with a CAT prior to and after digging the inspection pit.
2. Inspection pit dug to 1.00m.
3. Ground water strike at 1.70m.
4. Hole terminated at 4.50m due to refusal within the gravels.
5. Hole back filled with arising on completion.
6. SPT hammer AC0124-2013 (E_r = 70.62%) used.

All dimensions in metres | Scale: **1:28**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Tracked window sampling	**Archway Competitor**	**RD**	**HPerry**	

APPENDIX C

(i) Standard Penetration Test (SPT) Summary Sheet

(ii) SPT Hammer Calibration Records

(iii) SPT N value versus Depth Plot

(iv) SPT $N_{(60)}$ Value versus Depth Plot

STANDARD PENETRATION TEST SUMMARY TABLE

Exploratory Position ID	Depth (m)	Hole Dia (mm)	Casing Depth (m)	Water Depth (m)	Seating Drive		Test Drive			Hammer ID	Calibration Date	Energy Ratio (%)	N_{60}	Comments
					Blows	Pen (mm)	Blows	R (mm)	Result					
WS1	1.00	300			0,0	150	0,0,0,0		N=0	AC0124-2013	04/10/2013	70.62	0	
	2.00	102			0,0	150	0,0,2,1		N=3	AC0124-2013	04/10/2013	70.62	4	
	3.00	87		3.00	0,0	150	1,1,0,1		N=3	AC0124-2013	04/10/2013	70.62	4	
	4.00	78		3.00	1,2	150	1,2,6,7		N=16	AC0124-2013	04/10/2013	70.62	19	
	5.00	67		3.00	2,7	150	8,7,9,9		N=33	AC0124-2013	04/10/2013	70.62	39	
WS2	1.00	300			0,0	150	0,0,0,0		N=0	AC0124-2013	04/10/2013	70.62	0	
	2.00	102		1.70	0,0	150	0,2,2,1		N=5	AC0124-2013	04/10/2013	70.62	6	
	3.00	87		1.70	0,0	150	11,8,10,10		N=39	AC0124-2013	04/10/2013	70.62	46	
	4.00	78		1.70	1,4	150	10,11,12,10		N=43	AC0124-2013	04/10/2013	70.62	51	

Notes:
1. **Tests carried out in general accordance with BS EN ISO 22476-3:2005, including amendment A1 (2011).**
2. **Reported blows are for 75mm penetration unless indicated "+".**
3. **Where full test drive was not achieved, actual penetration (R) and extrapolated N value (N*) reported.**
4. **Tests carried out using a split spoon sampler unless noted as SPT(c) (denotes use of solid cone method) in the comments column.**
5. **Entries in the water depth column reflects the measured water depth at time of test.**

N_{60} = (Measured hammer energy ratio / 60) x N value

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By		Date	Contract Ref:
HPerry	HPERRY	06.06.14	729180

Contract: **84 St. Aldate's, Oxford**

AGS

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	COMPETETOR
Client	STRUCTURAL SOILS
Test No	EQU906
Test Depth (m)	6.90
Date of Test	04 October 2013
Valid until	04 October 2014
Hammer ID	AC0124

Mass of the hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	249J

Characteristics of the instrumented rod

Diameter	d_r =	0.052 m
Length of the instrumented rod		0.558 m
Area	A =	11.61 cm^2
Modulus	E_a =	206843 MPa

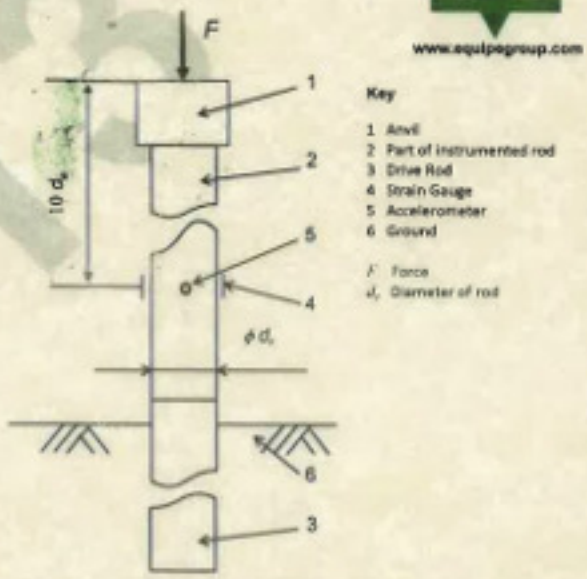
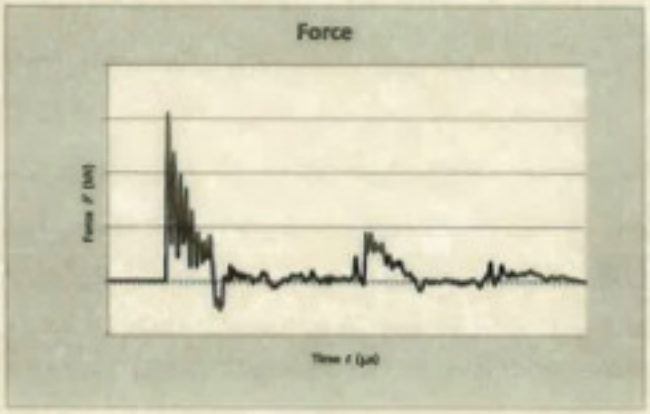
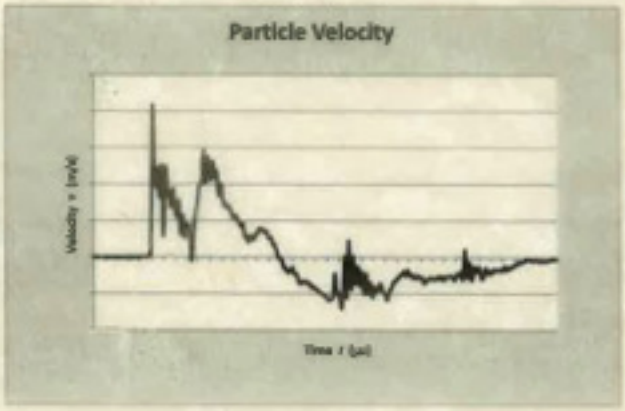
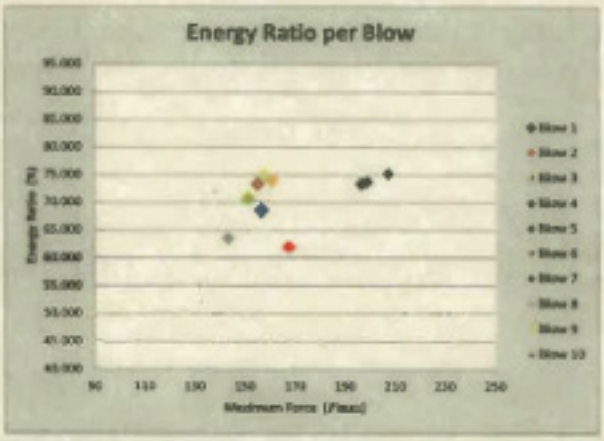


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011







Observations:
1.

E_{meas} = 0.334 kN-m

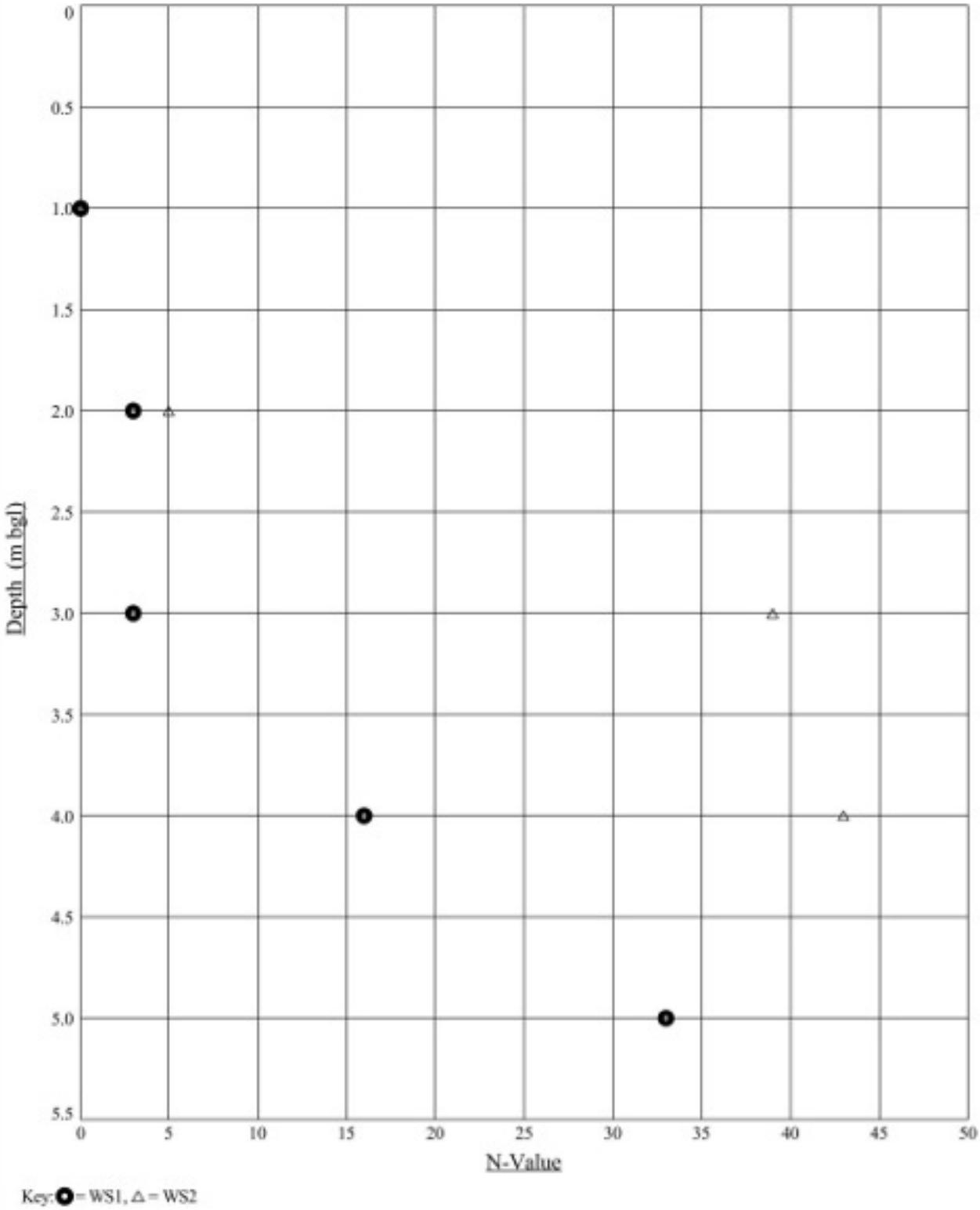
E_{theor} = 0.473 kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$ = 70.62%

Equipe SPT Analyzer Operators: KS

Prepared by:	Checked by:	Date
		07/10/2013

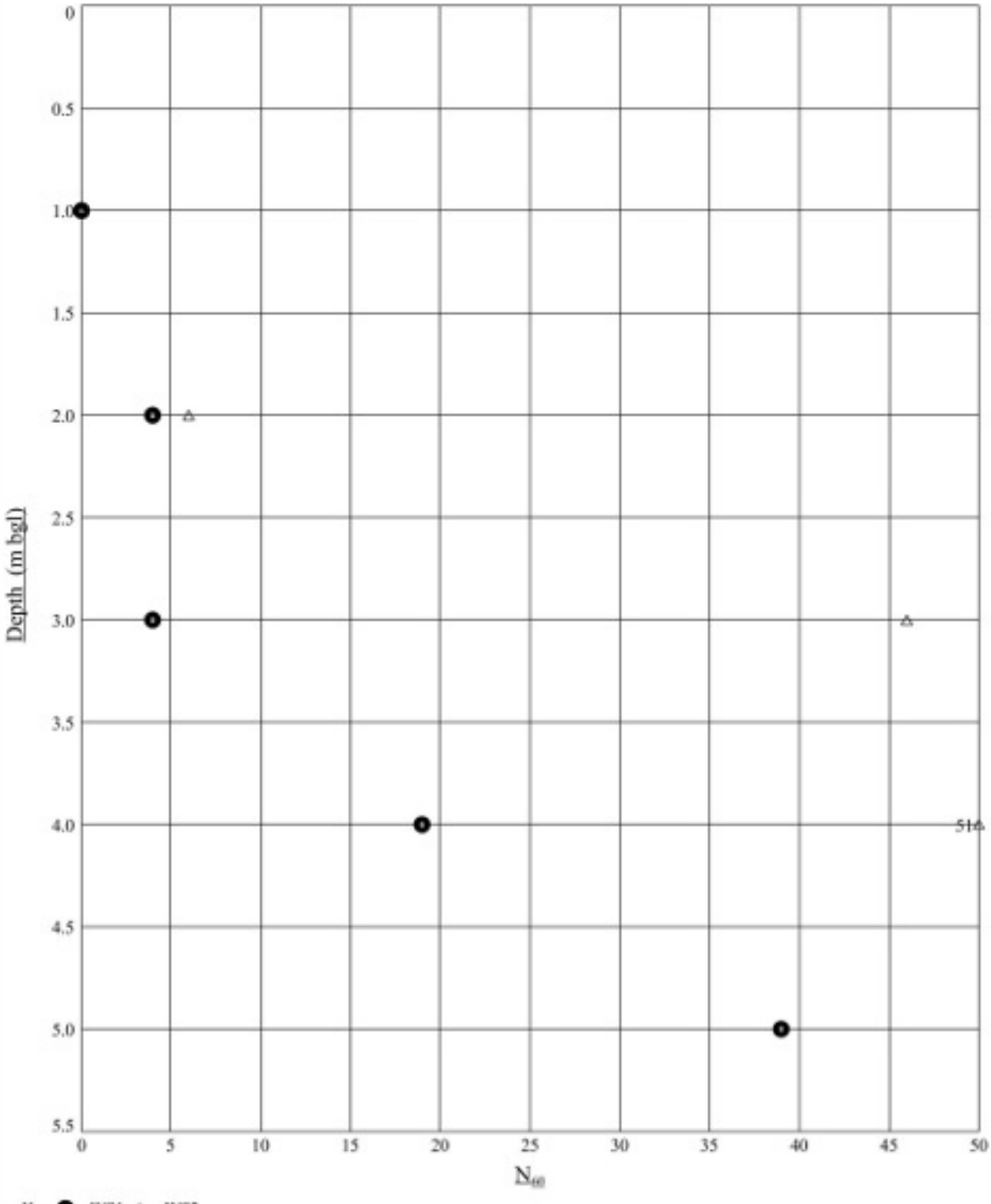
STANDARD PENETRATION TEST (SPT N-Value) vs DEPTH



STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Contract	Date	Compiled By
84 St. Aldates	**04.06.14**	HP
Client: **Mann Williams**	Contract Ref: **729180**	

STANDARD PENETRATION TEST (SPT N_{60}) vs DEPTH



STRUCTURAL SOILS The Old School Stillhouse Lane Bedminster Bristol BS3 4EB	Contract **84 St. Aldates**	Date **04.06.14**	Compiled By HP
	Client **Mann Williams**	Contract Ref: **729180**	AGS

APPENDIX D

(i) Geotechnical Laboratory Test Verification Sheet

(ii) Geotechnical Laboratory Test Results

TESTING VERIFICATION CERTIFICATE

1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with Structural Soils Ltd Laboratory Quality Assurance Manual, Issue 6, January 2010 all results sheets and summaries of results issued by the laboratory are checked by an approved signatory. This check will also involve checking of at least 10% of calculations for each test type to ensure that data has been correctly entered into the computer and calculated. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Assurance Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **15/05/2014 14:04:29**.

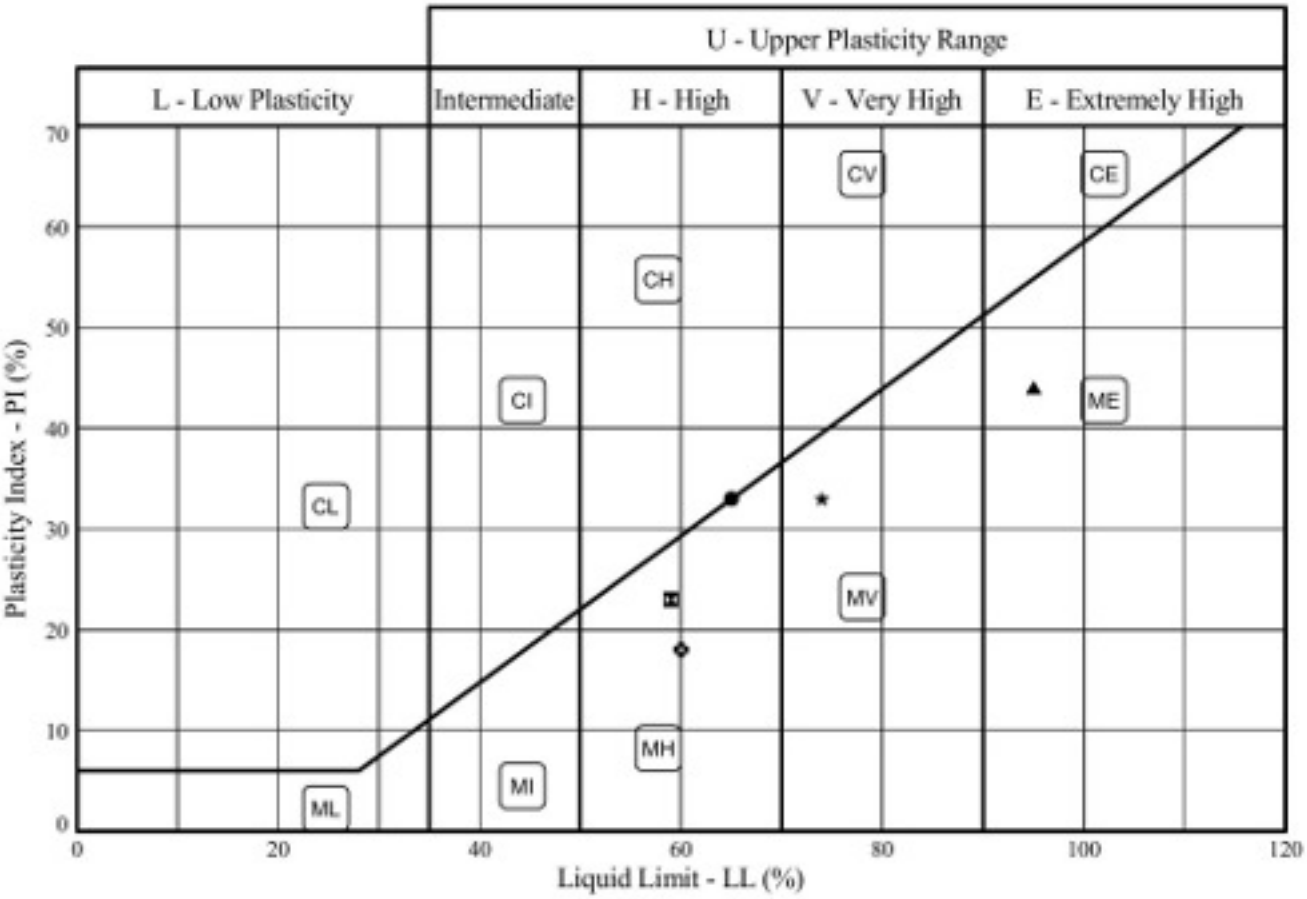
Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Justin Barrett (Laboratory Manager)

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Contract: **84 St. Aldates**	Job No: **729180**

PLASTICITY CHART - PI Vs LL

In accordance with clause 42.3 of BS5930:1999
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC	LL	PL	PI	<425um	
	Exploratory Position ID	Sample	Depth (m)			%	%	%	%	%	
●	WS1	9D	2.60	3.2/4.4/5.3/5.4	4.2.4	38	65	32	33	80	
■	WS1	11DSPT	3.00	3.2/4.4/5.3/5.4	4.2.4	48	59	36	23	63	*
▲	WS1	12D	3.40	3.2/4.4/5.3/5.4	4.2.4	66	95	51	44	77	
★	WS2	6D	1.35	3.2/4.4/5.3/5.4	4.2.4	45	74	41	33	66	
	WS2	10D	2.35	3.2/4.4/5.3/5.4	4.2.3	113	197	104	93	83	
◇	WS2	12D	3.00	3.2/4.4/5.3/5.4	4.2.4	77	60	42	18	73	

Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non standard test, NP = Non plastic.

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
A.D.Frost	ALAN FROST	12/05/14

Contract	Contract Ref:
84 St. Aldates	729180

AGS

SUMMARY OF CHEMICAL ANALYSES

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Acid Soluble Sulphate (% SO_4)	Aqueous Extract Sulphate (mg/l SO_4)	pH	Total Sulphur (%)	Description
WS1	9	D	2.60	0.08	96	8.12	0.03	Greyish brown mottled orangish brown slightly sandy slightly gravelly clayey SILT
WS1	12	D	3.40	0.13	123	8.09	0.29	Dark brown mottled dark grey slightly gravelly SILT with some organic matter
WS1	16	D	4.60		74	8.38		Brown slightly clayey gravelly SAND
WS2	10	D	2.35	0.23	289	8.23	0.80	Dark brown/black slightly sandy slightly gravelly SILT with some organic matter
WS2	16	D	4.00		46	8.73		Brown clayey very sandy GRAVEL

NOTES:- All chemical tests were undertaken by Envirolab.

Approved Signatories: J.BARRETT A.FROST M.STOKES S.HANDCOCK S.PHILP

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date	Contract Ref:
A.D.Frost	ALAN FROST	12.05.14	729180
Contract:	84 St. Aldates		

SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	% <425um	Description of Sample
WS1	9	D	2.60	38	65	32	33	80	Greyish brown mottled orangish brown slightly sandy slightly gravelly clayey SILT
WS1	11	DSPT	3.00	48	59	36	23	63	Dark grey slightly gravelly sandy SILT
WS1	12	D	3.40	66	95	51	44	77	Dark brown mottled dark grey slightly gravelly SILT with some organic matter
WS2	6	D	1.35	45	74	41	33	66	Dark brown mottled dark grey slightly sandy slightly gravelly SILT
WS2	10	D	2.35	113	197	104	93	83	Dark brown/black slightly sandy slightly gravelly SILT with some organic matter
WS2	12	D	3.00	77	60	42	18	73	Dark grey slightly sandy slightly gravelly SILT with some organic matter

STRUCTURAL SOILS LTD

Contract:

84 St. Aldates

Contract Ref:

729180

AGS

APPENDIX E

(i) Contamination Laboratory Test Results

(ii) Initial Waste Characterisation (Haswaste)

(iii) Laboratory UKAS Accreditation Certificate

(iv) RSK Group Generic Assessment Criteria (GAC)

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number:	14/02063
Issue Number:	1
Date:	08 May, 2014

Client:

Structural Soils Bristol
The Old School House
Stillhouse Lane
Bedminster
Bristol
UK
BS3 4EB

Project Manager:	Helen Perry
Project Name:	84 St. Aldate's
Project Ref:	729180
Order No:	N/A
Date Samples Received:	24/04/14
Date Instructions Received:	24/04/14
Date Analysis Completed:	08/05/14

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Liz Oliver
Client Service Manager

Envirolab Job Number: 14/02063

Client Project Name: 84 St. Aldate's

Client Project Ref: 729180

Lab Sample ID	14/02063/1	14/02063/2	14/02063/3	14/02063/4	14/02063/5	14/02063/6			Units	Method ref
Client Sample No	1	1	1	2	1	2				
Client Sample ID	TP1	TP4	WS1	WS1	WS2	WS2				
Depth to Top	0.50	0.50	0.30	2.00	0.30	2.00				
Depth To Bottom										
Date Sampled	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
MCERTS Sample Matrix Code	5AB	4ABE	4A	6A	4A	6A				
% Stones >10mm$_A^{\#}$	11.4	7.1	13.4	8.4	12.9	<0.1			% w/w	A-T-038
pH$_D^{MW}$	10.30	8.07	8.42	8.17	8.33	8.09			pH	A-T-037a
Sulphate (water soil 2:1)$_D^{MW}$	0.26	1.30	0.10	0.05	0.16	0.05			g/l	A-T-038a
Organic matter$_D^{MW}$	1.3	8.6	3.1	3.1	1.3	5.0			% w/w	A-T-030 DM
Arsenic$_D^{MW}$	26	14	27	12	15	20			mg/kg	A-T-025
Cadmium$_D^{MW}$	0.8	0.6	1.0	0.8	0.8	1.0			mg/kg	A-T-025
Copper$_D^{MW}$	61	27	20	24	24	18			mg/kg	A-T-025
Chromium$_D^{MW}$	13	9	17	20	12	22			mg/kg	A-T-025
Lead$_D^{MW}$	128	261	201	146	139	101			mg/kg	A-T-025
Mercury$_D$	1.17	0.98	0.92	0.38	0.65	0.39			mg/kg	A-T-025
Nickel$_D^{MW}$	13	11	17	16	13	16			mg/kg	A-T-025
Selenium$_D^{MW}$	<1	<1	<1	<1	<1	<1			mg/kg	A-T-025
Zinc$_D^{MW}$	73	85	104	80	48	74			mg/kg	A-T-025

Envirolab Job Number: 14/02063

Client Project Name: 84 St. Aldate's

Client Project Ref: 729180

Lab Sample ID	14/02063/1	14/02063/2	14/02063/3	14/02063/4	14/02063/5	14/02063/6			Units	Method ref
Client Sample No	1	1	1	2	1	2				
Client Sample ID	TP1	TP4	WS1	WS1	WS2	WS2				
Depth to Top	0.50	0.50	0.30	2.00	0.30	2.00				
Depth To Bottom										
Date Sampled	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
MCERTS Sample Matrix Code	5AB	4ABE	4A	6A	4A	6A				
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Ali >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Ali >C16-C21$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Ali >C21-C35$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s+23s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Aro >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Aro >C16-C21$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Aro >C21-C35$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s
Total Aromatics$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s+23s
TPH (Ali & Aro)$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			mg/kg	A-T-022s+23s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-022s

Envirolab Job Number: 14/02063

Client Project Name: 84 St. Aldate's

Client Project Ref: 729180

Lab Sample ID	14/02063/1	14/02063/2	14/02063/3	14/02063/4	14/02063/5	14/02063/6			Units	Method ref
Client Sample No	1	1	1	2	1	2				
Client Sample ID	TP1	TP4	WS1	WS1	WS2	WS2				
Depth to Top	0.50	0.50	0.30	2.00	0.30	2.00				
Depth To Bottom										
Date Sampled	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14	22-Apr-14				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES				
MCERTS Sample Matrix Code	5AB	4ABE	4A	6A	4A	6A				
PAH 16										
Acenaphthene$_A^{MW}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	A-T-0118
Acenaphthylene$_A^{MW}$	<0.01	0.01	0.02	<0.01	<0.01	<0.01			mg/kg	A-T-0118
Anthracene$_A^{MW}$	<0.02	0.03	0.06	<0.02	<0.02	<0.02			mg/kg	A-T-0118
Benzo(a)anthracene$_A^{MW}$	<0.04	0.14	0.20	<0.04	<0.04	<0.04			mg/kg	A-T-0118
Benzo(a)pyrene$_A^{MW}$	0.05	0.18	0.16	<0.04	<0.04	<0.04			mg/kg	A-T-0118
Benzo(b)fluoranthene$_A^{MW}$	0.06	0.22	0.19	<0.05	<0.05	<0.05			mg/kg	A-T-0118
Benzo(ghi)perylene$_A^{MW}$	<0.05	0.12	0.08	<0.05	<0.05	<0.05			mg/kg	A-T-0118
Benzo(k)fluoranthene$_A^{MW}$	<0.07	0.10	0.08	<0.07	<0.07	<0.07			mg/kg	A-T-0118
Chrysene$_A^{MW}$	<0.06	0.17	0.18	<0.06	<0.06	<0.06			mg/kg	A-T-0118
Dibenzo(ah)anthracene$_A^{MW}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04			mg/kg	A-T-0118
Fluoranthene$_A^{MW}$	<0.08	0.29	0.38	<0.08	<0.08	<0.08			mg/kg	A-T-0118
Fluorene$_A^{MW}$	<0.01	<0.01	0.03	<0.01	<0.01	<0.01			mg/kg	A-T-0118
Indeno(123-cd)pyrene$_A^{MW}$	0.04	0.11	0.08	<0.03	<0.03	<0.03			mg/kg	A-T-0118
Naphthalene$_A^{MW}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03			mg/kg	A-T-0118
Phenanthrene$_A^{MW}$	<0.03	0.11	0.24	<0.03	<0.03	<0.03			mg/kg	A-T-0118
Pyrene$_A^{MW}$	<0.07	0.23	0.29	<0.07	<0.07	<0.07			mg/kg	A-T-0118
PAH (total 16)$_A^{MW}$	0.17	1.72	2.01	<0.08	<0.08	<0.08			mg/kg	A-T-0118

REPORT NOTES

Notes - Soil chemical analysis
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General
This report shall not be reproduced, except in full, without written approval from Envirolab.
Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.
All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.
All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts.
Superscript "M" indicates method accredited to MCERTS.
For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations. If results are in italic font they are associated with such quality control failures and may be unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

TPH analysis of water by method A-T-007
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Asbestos in soil
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if present as discrete fibres/fragments. Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified a being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed.
Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER.
Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our MCERTS accreditation.

Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

As cmpds (AsS), Cd (CdO), CrVI cmpds ($FeCrO_4$), Cu (Cu_2O), Inorg Hg cmpds (HgO), Pb cmpds (Pb_3O_4), Ni ($NiCO_3$), Se cmpds (SeS) and Zn as ZnO. Also Be ($BeCO_3$), Be cmpds ($BeSO_4$), Co (CoO), Mn (MnO_2) and Mo (MoO_3).

HASWASTE v5.2b Environlab's Contaminated Land Soil Hazardous Waste Assessment Tool.

Environlab, Sandpits Business Park, Mottram Road, Hyde, Cheshire SK14 3AR.

Site Code and Name								
TP/WS/BH	TP1	TP4	BS1	WS1	BS2	WS2		
Depth (m)	8.50	0.60	8.00	2.00	8.00	2.00		
Environlab reference	14/02063/1	14/02853/2	14/02063/3	14/02853/4	14/02063/5	14/02853/6		
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
% Moisture								
pH (soil)	10.30	8.07	8.42	8.17	8.35	8.08		
pH (leachate)								
Arsenic	20	14	21	12	15	28		
Cadmium	0.8	0.5	1.0	0.9	0.8	1.0		
Copper	61	27	30	24	26	18		
CrVI or Chromium	13	9	17	28	12	22		
Lead	129	261	261	146	138	181		
Mercury	1.17	0.58	8.92	0.38	8.65	0.38		
Nickel	13	11	17	16	13	16		
Selenium	1	1	1	1	1	1		
Zinc	73	68	184	68	46	74		
Barium								
Beryllium								
Cobalt								
Manganese								
Molybdenum								
TPH								
Petrol								
Diesel								
Lube Oil								
White Spirit / Kerosene								
Creosote								
Unknown TPH with ID								
Unknown TPH/OWG								
Inseparable TPH Mixtures								
Any								
Any but No Petrol								
White Spirit / Kerosene and Diesel								
Total USEPA 16 PAHs	8.2	1.7	2.8	8.1	8.1	8.1		
Acenaphthene	8.01	0.01	8.01	0.01	8.01	0.01		
Acenaphthylene	8.01	0.01	8.02	0.01	8.01	0.01		
Anthracene	8.02	0.03	8.00	0.02	8.02	0.02		
Benzo(a)anthracene	8.04	0.14	8.20	0.04	8.04	0.04		
Benzo(a)pyrene	8.05	0.18	8.16	0.04	8.04	0.04		
Benzo(b)fluoranthene	8.05	0.22	8.19	0.05	8.05	0.05		
Benzo(ghi)perylene	8.05	0.12	8.00	0.05	8.05	0.05		
Benzo(k)fluoranthene	8.01	0.18	8.09	0.07	8.07	0.07		
Chrysene	8.05	0.17	8.18	0.05	8.05	0.05		
Dibenzo(ah)anthracene	8.04	0.04	8.04	0.04	8.04	0.04		
Fluoranthene	8.09	0.29	8.30	0.08	8.09	0.08		
Fluorene	8.01	0.01	8.03	0.01	8.01	0.01		
Indeno(123cd)pyrene	8.04	0.11	8.08	0.03	8.03	0.03		
Naphthalene	8.03	0.03	8.03	0.03	8.03	0.03		
Phenanthrene	8.03	0.11	8.24	0.03	8.03	0.03		
Pyrene	8.07	0.23	8.29	0.07	8.07	0.07		
Benzene	8.01	0.01	8.01	0.01	8.01	0.01		
Toluene	8.01	0.01	8.01	0.01	8.01	0.01		
Ethylbenzene	8.01	0.01	8.01	0.01	8.01	0.01		
Xylenes	8.01	0.01	8.01	0.01	8.01	0.01		
Trimethylbenzenes	8.010	8.010	8.010	8.010	8.010	8.010		
Chlorobenzene								
1,2-Dichlorobenzene								
1,3-Dichlorobenzene								
1,4-Dichlorobenzene								
1,2,4-Trichlorobenzene								
2-Chlorotoluene								
4-Chlorotoluene								
Trichloroethene (TCE)								
Total Sulphide								
Free Cyanide								
Thiocyanate								
Elemental/Free Sulphur								
PCBs Total (eg EC7/WHO12)								
Phenols Total by HPLC								
Phenol								
Cresols								
Xylenols								
1-Naphthol								
Resourcinol								
2,3,5,6-Tetrachlorophenol								
2,4,5-Trichlorophenol								
2,4,6-Trichlorophenol								
2,4-Dichlorophenol								
4-Chloro-3-methylphenol								
Pentachlorophenol								
Bis(2-ethylhexyl)phthalate								
Butylbenzylphthalate								
Di-n-butylphthalate								

Consider other individual contaminants on a case by case basis.

Table 3.2 of Annex VI of the CLP Regulation including 3rd ATP where applicable (sometimes called ATP3).

As cmpds (AsS), Cd (CdO), CrVI cmpds ($FeCrO_4$), Cu (Cu_2O), Inorg Hg cmpds (HgO), Pb cmpds ($Pb(SO_4)$), Ni ($NiCO_3$), Se cmpds (SeS) and Zn as ZnO. Also Ba ($BaCO_3$), Be cmpds ($BeSO_4$), Ca (CaO), Mn (MnO_2) and Mo (MoO_3).

HASWASTE v5.2b. Envirolab's Contaminated Land Soil Hazardous Waste Assessment Tool.

Envirolab, Sandpits Business Park, Moltram Road, Hyde, Cheshire SK14 3AR.

Site Code and Name									
TP/WS/BH		TP1	TP4	WS1	WS1	WS2	WS2		
Depth (m)		0.50	0.50	0.30	2.00	0.30	2.00		
Envirolab reference		14/020631	14/020632	14/020633	14/020634	14/020635	14/020636		
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Asbestos in Soil		%	%	%	%	%	%	%	%
Asbestos detected in Soil (enter Y or N)		N	N	N	N	N	N		
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)									
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)		N	N	N	N	N	N		
Hazard Codes	Thresholds								
Irritant H4	≥18%	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008
Irritant H4	≥20%	0.0026	0.0022	0.0034	0.0022	0.0026	0.0022	0.0000	0.0000
Harmful H5	≥25%	0.0225	0.0215	0.0295	0.0286	0.0195	0.0154	0.0000	0.0000
Toxic H6	≥0.1%	0.00021	0.00017	0.00021	0.00013	0.00016	0.00015	0.00080	0.00008
Toxic H6	≥2%	0.00540	0.00302	0.00529	0.00467	0.00430	0.00549	0.00080	0.00008
Carcinogenic H7	≥0.1%	0.00430	0.00298	0.00563	0.00662	0.00287	0.00728	0.00080	0.00008
Carcinogenic H7	≥1%	0.00082	0.00017	0.00020	0.00001	0.00081	0.00001	0.00080	0.00008
Carcinogenic H7 Unknown TPH with ID	≥1,000mg/kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic H7 biop marker test (Unknown TPH with ID only)	≥0.01%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Carcinogenic H7 % Asbestos in Soil (Fibres)	≥0.1%	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008
Corrosive H8 (Irritant H4)	≥5%H4=18%; H8=18%	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008
pH Corrosive H8 (Irritant H4) pH (soil or leachate)	H8 ≥11.5	10.38	8.07	8.42	8.17	8.33	8.08	8.80	0.00
pH Corrosive H8 (Irritant H4) pH (soil or leachate)	H8 ≤2	10.38	8.07	8.42	8.17	8.33	8.08	8.80	0.00
Toxic for Reproduction H10	≥0.5%	0.01280	0.02615	0.02010	0.01468	0.01380	0.01318	0.00080	0.00008
Toxic for Reproduction H10	≥5%	0.01280	0.02615	0.02010	0.01468	0.01380	0.01318	0.00080	0.00008
Mutagenic H11	≥0.1%	0.00082	0.00017	0.00020	0.00001	0.00081	0.00001	0.00080	0.00008
Mutagenic H11 Unknown TPH with ID	≥1,000mg/kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mutagenic H11 biop marker test (Unknown TPH with ID only)	≥0.01%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Mutagenic H11	≥1%	0.00263	0.00020	0.00043	0.00020	0.00263	0.00020	0.00080	0.00008
Produces Toxic Gases H12 Sulphide	≥1,400mg/kg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases H12 Free Cyanide	≥1,200mg/kg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Produces Toxic Gases H12 Thiocyanate	≥2,000mg/kg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H13 Sensitising	≥1%	0.00430	0.00298	0.00563	0.00662	0.00287	0.00728	0.00080	0.00008
Ecotoxic H14	≥1.0	0.15467	0.19768	0.19085	0.15468	0.12417	0.13891	0.00080	0.00008
Ecotoxic H14 individual substance specific threshold	≥0.0025%	0.000017	0.000172	0.000251	0.000008	0.000008	0.000008	0.000008	0.000000
Ecotoxic H14 individual substance specific thresholds	≥0.025%	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008	0.00080	0.00008

Consider other individual contaminants on a case by case basis.

Table 3.2 of Annex VI of the CLP Regulation including 3rd ATP where applicable (sometimes called ATP3).

United Kingdom Accreditation Service

ACCREDITATION CERTIFICATE

UKAS
UNITED KINGDOM ACCREDITATION SERVICE

TESTING LABORATORY
No. 1247

Envirolab

is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005
General Requirements for the competence of testing and calibration laboratories.

This accreditation demonstrates technical competence for a defined scope as detailed in and at the locations specified in the schedule to this certificate, and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The schedule to this certificate is an essential accreditation document and from time to time may be revised and reissued by the United Kingdom Accreditation Service. The most recent issue of the schedule of accreditation, which bears the same accreditation number as this certificate, is available from the UKAS website www.ukas.com.

This accreditation is subject to continuing conformity
with United Kingdom Accreditation Service requirements. The absence of a schedule on the UKAS website indicates that the accreditation is no longer in force.

[redacted]

Accreditation Manager, United Kingdom Accreditation Service

Initial Accreditation date
2 December 1992

This certificate issued on
12 November 2012

UKAS is appointed as the sole national accreditation body for the UK by The Accreditation Regulations 2009 (SI No 3155/2009) and operates under a Memorandum of Understanding (MoU) with the Department for Business, Innovation and Skills (BIS).

Table 6
Human health generic assessment criteria for residential with communal soft landscaping

Compound	GrAC for groundwater (mg/l)	SAC for soil SOM 1% (mg/kg)	SAC for soil SOM 2.5% (mg/kg)	SAC for soil SOM 6% (mg/kg)
Metals				
Arsenic	-	35	35	35
Cadmium	-	85	85	85
Chromium (III) - oxide	-	3,000	3,000	3,000
Chromium (VI) - hexavalent	-	4.3	4.3	4.3
Copper	-	6,200	6,200	6,200
Lead	-	300	300	300
Elemental Mercury (Hg^0)	0.0094	0.17	0.42	1.0
Inorganic Mercury (Hg^{2+})	-	240	240	240
Methyl Mercury (Hg^{1+})	20	5.4	11	14
Nickel	-	130	130	130
Selenium	-	600	600	600
Zinc	-	41,000	41,000	41,000
Cyanide	-	110	110	110
Volatile organic compounds				
Benzene	7	0.27	0.49	1.0
Toluene	1,800	510	1,209	2,700
Ethylbenzene	280	170	361	840
Xylene - m	84	55	130	300
Xylene - o	100	60	139	320
Xylene - p	87	53	125	290
Total xylene	84	55	130	300
Methyl tertiary butyl ether [MTBE]	2,200	160	169.55	270
Trichloroethene	1.8	0.11	0.2	0.51
Tetrachloroethene	3.6	1.0	2.3	5.3
1,1,1-Trichloroethane	26	5.5	12.8	28
1,1,1,2-Tetrachloroethane	14	1.1	2.5	5.8
1,1,2,2-Tetrachloroethane	14	2.7	5.58	12
Carbon tetrachloride	0.065	0.02	0.040	0.09
1,2-Dichloroethane	0.30	0.006	0.0083	0.02
Vinyl chloride	0.012	0.0025	0.0037	0.001
1,2,4-Trimethylbenzene	0.075	0.4	0.89	2.3
1,3,5-Trimethylbenzene	0.047	0.5	1.10	2.6
Semi-volatile organic compounds				
Acenaphthene	9.2	2,050 (52)	3,750 (141)	3,500 (340)
Acenaphthylene	4.2	2,050 (58)	3,050 (212)	3,500 (510)
Anthracene	0.021	20,000 (1.2)	22,000	23,000
Benzo[a]anthracene	0.004	3.7	5.2	5.2
Benzo[b]fluoranthene	0.003	7.0	7.3	7.4
Benzo[g,h,i]perylene	0.0009	47	47	48
Benzo[k]fluoranthene	0.0009	10	10	10
Chrysene	0.002	9.6	9.7	10
Dibenzo[a,h]anthracene	0.00006	0.87	0.91	0.93
Fluoranthene	0.03	970	990	1,000
Fluorene	1.9	1,950 (181)	2,507 (77)	2,500 (180)
Indeno(1,2,3-cd)pyrene	0.0008	4.2	4.4	4.4
Phenanthrene	0.13	840 (26)	930	970
Pyrene	0.13	2,300	2,400	2,400
Benzo[a]pyrene	0.004	1.0	1.0	1.0
Naphthalene	15	1.5	3.9	9.2
Phenol	-	310	420	520
Total petroleum hydrocarbons				
Aliphatic hydrocarbons EC_5–EC_6	10	30	65	110
Aliphatic hydrocarbons >EC_6–EC_8	2.6	73	160	370
Aliphatic hydrocarbons >EC_8–EC_{10}	0.23	19	45	110
Aliphatic hydrocarbons >EC_{10}–EC_{12}	0.03	93 (46)	230 (118)	540 (280)
Aliphatic hydrocarbons >EC_{12}–EC_{16}	0.0047	745 (24)	1,700 (59)	3,240 (140)
Aliphatic hydrocarbons >EC_{16}–EC_{35}	-	45,000	64,200 (21)	77,000
Aliphatic hydrocarbons >EC_{35}–EC_{44}	-	45,000	64,200 (21)	77,000
Aromatic hydrocarbons >EC_5–EC_8 [aliphatic]	7.4	260	627	1,400
Aromatic hydrocarbons >EC_8–EC_{10}	7.4	33	81	190
Aromatic hydrocarbons >EC_{10}–EC_{12}	2.6	160	417	970
Aromatic hydrocarbons >EC_{12}–EC_{16}	0.6	1,300 (170)	1,600 (419)	1,700
Aromatic hydrocarbons >EC_{16}–EC_{21}	-	1,300	1,300	1,300
Aromatic hydrocarbons >EC_{21}–EC_{35}	-	1,300	1,300	1,300
Aromatic hydrocarbons >EC_{35}–EC_{44}	-	1,300	1,300	1,300

Notes:
'-' Generic assessment criteria not calculated owing to low volatility of substance and therefore no pathway or an absence of toxicological data.

EC - equivalent carbon. GrAC - groundwater assessment criteria. SAC - soil assessment criteria.

The SAC for organic compounds are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58:
1% SOM is (1.54% TOC - R. Howell Soil Science: Methods and Applications, Longman, 1994

SAC for TPH fractions, polycyclic aromatic hydrocarbons, MTBE, BTEX and trimethylbenzene compounds were produced using an attenuation factor for the indoor air inhalation pathway of 10 to reduce conservatism associated with the vapour inhalation pathway, section 10.1.1, SR3.

The SAC has been set as the model calculated SAC with the saturation limit shown in brackets.
For consistency where the GrAC exceeds the solubility limit, GrGV has been set at the solubility limit. These are highly conservative as concentrations of the chemical are very unlikely to be at sufficient concentration to result in an exceedance of the health criteria value at the point of exposure (i.e. indoor air) provided free phase product is absent.