Basement Impact Assessment

At

34 Udney Park Road

Teddington TW11 9BG

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Job No : 2594

Revision No : C

Written by : RJ Croot *B.Eng C.Eng M.I.Struct.E*

Date : November 2023

1.0 Introduction

1.1 Build Warranty Technical Services (BWTS) have been appointed by Mr N Jarvis, the landowner and client, to prepare a basement impact assessment in support of a planning application to the London Borough of Richmond Upon Thames Council for the construction of a pair of new semi-detached residential dwellings with part lower ground floors and basements.

1.2 The site is in Udney Park Road and is centred on a National Grid Reference (NGR) E16306 N70788 (TQ163707) with a site area of approximately 0.051 hectares (Ha). The site is located on the western side of Udney Park Road as shown in figure 1 below:

Figure 1 – Site location Plan

1.3 This report has been prepared by BWTS to consider the practicalities of the construction of the new basement at the site to ensure there will be no harmful impacts on neighbouring properties.

1.4 The report provides specific details of the excavation, temporary works and construction techniques proposed, including details of the potential impact of the subterranean development on the existing and neighbouring structures, based on the specific site characteristics and geology.

1.5 A preliminary drainage strategy is provided to deal with the surface and foul water drainage solution for the proposed development.

1.6 Mr R J Croot, the author of this report, is BEng CEng & MIStructE qualified and has over 25 years' experience of the design and construction of high-end residential properties with basements in the London and surrounding area.

2.0 Existing Conditions

2.1 The Site

There is currently a vehicular access to the site from Udney Park Road on the eastern boundary.

The site shares boundaries with several other properties to its perimeter as follows;

- 32e Udeny Park Road — Northern boundary
- 34a Udney Park Road — Western Boundary
- 36 Udney Park Road — Southern Boundary

2.2 Neighbouring Properties

There are several neighbouring properties located near the proposed lower ground floor as follows:

- *32e Udney Park Road*

  This is a three storey residential end of terrace building with a lower ground floor located 3m from the proposed basement. It appears to be of traditional masonry construction with assumed timber floors and roof construction.

- *34a Udney Park Road*

  This property is located 20m to the rear of the proposed basement and as such will not be affected by the proposed basement construction.

- *36 Udney Park Road*

  This property is located 8m to the side of the proposed basement and as such will not be affected by the proposed basement construction.

2.3 Existing Ground Conditions

A site investigation carried out by Albury SI for a similar property located at 26 Udney Park Road ref 13/9958/KJC dated October 2013 which determined the existing ground conditions as follows.

2.3.1 Geology

An examination of the 1:50,000 Geological Survey map of the area, together with the Regional Handbook of Geology, indicates that the site is underlain by Kempton Park Gravels of Recent or Pleistocene age, which in turn overlies London Clay of late Eocene age.

2.3.2 Stratigraphy

A series of boreholes and trial pits were undertaken to a maximum depth of 15.0m below ground level (BGL).

Made ground was encountered to a depth of 0.60m BGL.

Dense clayey sand with gravel becoming gravelly sand, classified as made ground, was observed beneath the made ground to a depth of 2.75m BGL.

A sandy gravel was exposed beneath the made ground and was shown to extend to 6.4m depth BGL. These soils are indicative of Kempton Park Gravel.

Beneath the Kempton Park Gravel the London Clay formation was encountered to a depth of 15.0m BGL.

2.3.3 Groundwater

Groundwater strikes were recorded at 5.70m BGL depth during the investigation. Short-term standing water levels upon completion of the borehole was 5.50mn BGL.

Subsequent return visits recorded a level of 4.25m & 4.27m BGL.

2.3.4 Soil Contamination

A sample of made ground was tested for contamination was undertaken as part of the site investigation which revealed no contaminants present.

2.4 Existing Foundations

The following assumptions have been made for the foundations of the adjacent properties:

- *32e Udney Park Road*

  Due to the presence of a lower ground floor and the prevailing ground conditions, it is likely that the existing foundations are reinforced concrete retaining structure founded within the Kempton Park Gravel member.

  The relationship of the adjacent building foundations is shown on drawing 2594-100 rev A *'Party Wall Sections'* contained within appendix C.

3.0 Proposed Works

3.1 Proposed Development

The proposed structural works are described in detail on the BWTS drawings contained within Appendix C and are summarised as follows.

A secant piled retaining wall will be provided to the perimeter of the lower ground floor and basement with internal pile supported ground beams will be provided beneath the party wall.

A full reinforced concrete basement box will be constructed forming the enclosure to the lower ground floor and basement.

Due to the proximity of the subterranean structures to the adjacent boundaries careful consideration will need to be given to the impact of the lower ground floor and basement construction on the adjoining properties and boundary structures.

3.2 Proposed Substructure

A secant piled wall utilises primary unreinforced 'soft' piles, into which secondary reinforced 'hard' piles are installed to form a solid retaining structure as shown in figure 1. The hard piles are used to transfer the applied load to the stratum at depth.

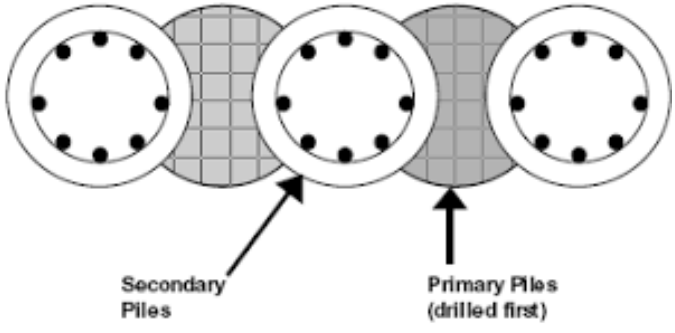


Figure 1
Typical Secant Piled Wall Construction

The secant wall to the lower ground floor will be designed as a permanent free cantilever in the temporary condition and propped upon installation of the floor slab in the long-term condition.

The secant piles to the basement box will be designed to act as propped cantilever in the temporary condition with a prop located approximately 1m from the pile cut off level. This will enable the bulk excavation of the basement to be undertaken and allow the installation of the floor slab which will act as the permeant prop in the long-term condition.

A fully suspended ground bearing reinforced concrete floor slab will be provided to the building, tied into the piled retaining wall. The floor slab will be designed to accommodate hydrostatic uplift forces. Due to the width of the building, it will be necessary to introduce a piled supported ground beam beneath the main load bearing party wall.

Due to the prevailing ground conditions, the basement will be affected by long term heave pressures associated with the relief of overburden due to the excavation of the basement. Therefore, a proprietary compressible filler board will be inserted beneath the basement slab to accommodate long term heave effects.

A 200mm thick reinforced concrete retaining wall will be provided to the internal face of the secant piled retaining walls, tied at the head by a ground beam and at the base by the floor slab. The retaining wall will be designed to resist only hydrostatic water pressure due to the permanent nature of the piled retaining wall.

As a result of the floor slab being tied to the piled retaining wall, the piles will be designed to accommodate any tension due to hydrostatic uplift forces.

The concrete for the internal wall and floor slab will have a proprietary waterproofing additive provided to form a watertight seal against the ingress of water.

The maximum deflection at the head of the piled retaining wall will be limited to 20mm during both the temporary and permanent construction works to prevent damage to any adjoining structures.

Due to the level of the water table, hydrostatic uplift pressures will be experienced beneath the floor slab. Therefore, the basement will be designed to allow for the water table to rise the full depth of the lower ground floor and basement construction.

Due to the basement level being used as residential accommodation, there is a requirement for a secondary layer of protection against water ingress which will be in the form of a proprietary cavity wall and floor drain system.

The pile design shall consider long term negative skin friction from the potential soil heave.

3.3 Proposed Superstructure

The superstructure will be formed using traditional load bearing masonry walls and precast concrete plank upper floors.

The roof shall be a traditional tiled pitched timber roof with associated steel framing as necessary.

3.4 Stability

Lateral stability of the buildings will be provided by the floors acting as plates transferring the lateral loads into the masonry walls, their foundations and in turn into the underlying soil.

3.5 Disproportionate Collapse

The building will be classified as a Class 1 building under Approved Document A of the Building Regulations. Under this classification provided the building has been designed and constructed in accordance with the rules given in Approved Document A, or other guidance referenced under Section 1, for meeting compliance with requirement A1 and A2 in normal use, no additional measures are likely to be necessary.

3.6 Flood Risk

3.6.1 According to the Environment Agency website the site is in an area that is not at risk from flooding from rivers or sea as contained within appendices E.

3.6.2 According to the Environment Agency website the site is in an area that is at low risk from flooding from surface water flow as contained within appendix F.

3.6.3 According to the Environment Agency website the site is in an area that is at risk from flooding from reservoirs when rivers are flooding flow as contained within appendix G.

3.7 Ground Water Flow

Groundwater was recorded at a depth of 4.25m bgl into which the basement will extend.

Due to the prevailing ground conditions the basement will be designed for full hydrostatic uplift forces.

4.0 Temporary Works & Sequence of Construction

4.1 Site Set Up

- Site access is available via Udney Park Road. It is assumed that all deliveries, removals and access for operatives will be made via this route.
- The site entrance will be manned by a banksman during operational hours to ensure construction deliveries do not pose potential risk to pedestrians or cyclists.
- Terminate and divert existing services as required.
- Site hoarding will be constructed along the pavement boundary to provide protection from passers-by.
- It is assumed that excavated earth can be collected by a waiting lorry or skip located within the site boundary.

4.2 Demolition of existing building

- Commence demolition of existing building.
- Demolition to be carried out 'top-down' with care taken to avoid damage to boundary structures and retained facade.
- Removal of rubble and waste materials via grab lorry and skips to contractor's preference.
- Site waste to be removed and recycled in accordance with ICE Demolition Protocol 2008.
- Remove existing over site slab, reduce levels and grub out any existing foundations.

4.3 Secant Piling

- Provide piling platform at suitable cut off level. This will necessitate the existing lower ground floor being infilled.
- Install temporary sheet piling adjacent to 64 Ridgeway on boundary line.
- Set out piles and commence installation of secant piled wall.
- Commence bulk excavation and install temporary propping in accordance with design calculations.
- Continue bulk excavation to raft slab formation level.

- Install lean mix blinding to protect exposed sub-grade.

4.4 Load Bearing Piles

- Set out load bearing piles and commence installation.
- Install underpins and ground beams beneath retained façade.

4.5 Bottom-up Construction & Superstructure

- Install below slab foul and surface water drainage including pump sets if required.
- Cast basement raft slab.
- Remove temporary bracing to secant piled retaining wall.
- Install 200mm reinforced concrete retaining wall and pile cap.
- Construct masonry cavity wall to DPC level to suit installation of ground floor.
- Install ground floor precast concrete floor planks.
- Continue load bearing masonry construction to upper floors.

5.0 Impacts of Basement on Neighbouring Structures

5.1 Stability of Neighbouring Buildings

The secant piled retaining wall will be designed to support all existing building foundations where necessary together with retained soil, hydrostatic water pressure and vehicle surcharge loadings including all construction traffic. This will ensure stability of the ground prior to excavation, during and post construction.

The stability and structural integrity of the surrounding earth and the neighbouring properties will be maintained throughout construction without any structurally detrimental effect to existing conditions.

Drawing 2594-100 rev A *'Party Wall Sections'* contained within appendix C shows the relationship of the prevailing ground conditions and proposed basement construction to the adjacent properties and the assumed founding depths.

A pre-construction survey of the existing adjoining buildings will be completed prior to the installation of the secant piled wall and agreed with the appropriate Party Wall Surveyor.

6.0 Foul Water Drainage Strategy

6.1 All foul drainage will be taken to new demarcation chambers near the eastern boundary and connect to the existing sewer connection into Udney Park Road subject to Thames Water approval.

6.2 The drainage to the buildings will discharge beneath the ground floor by gravity to the main sewer.

6.3 The gravity drainage system should not require regular maintenance providing unsuitable articles such as disposable nappies and sanitary towels are not flushed down toilets.

7.0 Surface Water Strategy

7.1 It is proposed to discharge surface water via infiltration soakaways located in the rear garden.

7.2 The soakaways shall be sized following on-site infiltration testing.

7.3 The soakaways will be designed for a 1:100 year 6 hour storm event with 40% climate change set a minimum 1.0m above existing water table.

7.4 The primary defence for water infiltration into the basement will be SIKA waterproof additive or similar approved within the concrete structure.

7.5 The secondary defence for water infiltration into the basement will be a cavity wall and floor drainage solution designed by a CSSW qualified consultant.

7.6 The lightwells will be drained via a minimum of two gullies in the event of blockage.

7.7 All basement surface water drainage shall discharge to a pump set with twin alternating duty pumps.

7.8 The proposed surface water drainage layout is shown on drawing 2594-150 'Drainage Layout' contained within appendix C.

7.9 The basement drainage solution is intended to ensure there is no ingress of water into the basement living accommodation. Any ingress of water will be captured by the cellular wall drainage system and taken down for basement slab level where upon it will be drained directly to the pump set via floor gullies.

Depending upon the final cavity drain solution adopted for the development, a perimeter channel drain may be provided directly beneath the perimeter cavity wall drain.

The cavity drain solution effectively isolates the internal wall and floor finishes from water ingress and dampness and thus improves resistance to flood damage.

7.10 The following maintenance regime should be adopted for the surface water drainage solution:

- Twice yearly clear the silt traps located prior to the soakaway of silt and debris, one clearance should be scheduled to occur after tree leaf fall in autumn.
- Plastic cellular attenuation tanks should not require any maintenance providing the silt traps are regularly cleaned of silt and debris.
- Trapped gullies should be cleaned of debris twice yearly, one clearance should be scheduled to occur after tree leaf fall in autumn.
- The surface water pumping stations serving the basement will require regular servicing every three months, or as otherwise advised by the pumping equipment supplier, and this should be covered by a service contract with a technically qualified company who will be able to deal with any emergency call out should these occur between service visits.

8.0 Conclusions

A risk-based impact assessment, backed by site investigations, has been undertaken with regard to hydro-geology and land stability.

The assessment indicates that the proposed development of the site will:

- not cause harm to the built and natural environment and local amenity, including to the ground conditions and neighbouring properties,
- not lead to ground instability, and
- not adversely impact the ground water flow, water levels and drainage.

Appendix A – Outline Specification

A.1 General

A.1.1 The following design elements should be in accordance with the Architects details:

- Water and damp proofing
- Setting-out
- Fire protection
- Floor separation and acoustic isolation
- External works
- Landscaping
- Finishes
- Internal partitions

A.2 Concrete

A.2.1 The concrete grades to be used are as follows:

- Blinding, Gen1
- Insitu RC concrete slabs, underpinning and walls, RC40

A.2.2 All formed surfaces to be class 2 type A (basic) finish in accordance with BS-8110.

A.2.3. Sika Waterproof concrete will be used for the retaining walls and basement slab.

A.3 Steelwork

A.3.1 All steelwork to be grade S355 to BS EN 10025 and in accordance with BS-5950 UNO.

A.3.2 All connections to have minimum 2no. M16 bolts, with minimum 6mm leg length continuous fillet welds, unless specifically noted.

A.3.3 All steelwork to be blast cleaned to SA2.5. Internal steelwork painted with 75 μ m of zinc phosphate primer, 75 μ m sealant. External steelwork to be galvanised to 140μ m.

A.4 Temporary Works: The contractor is responsible for the design, installation and maintenance of all necessary temporary works to ensure the strength and stability of the building throughout the construction process.

Appendix B – Codes of Practice

B.1 Codes of Practice

B.1.1 British Standards

- BS6399 Loading for Buildings
- BS5950 Structural use of Steelwork in Building
- BS8004 Foundations
- BS8110 Structural use of concrete
- BS8301 Drainage

B.1.2 Building Regulations

- Approved Document A – Structure (2010 edition)
- Approved Document H – Drainage & Waste Disposal (2010 edition)

B.1.3 Temporary Works

- Demolition Works to be carried out in line with ICE Demolition Protocol 2008.

B.2 Design Loadings & Deflections

B.2.1 Imposed Loadings (new build areas) kN/m²

a. Residential	1.50
b. Garage	2.50
c. Roof access	0.60

B.2.2 Deflection

Imposed load deflections will be limited to:

Steelwork	Internal floors	Span / 250
	Edge support masonry	Span / 360

Appendix C

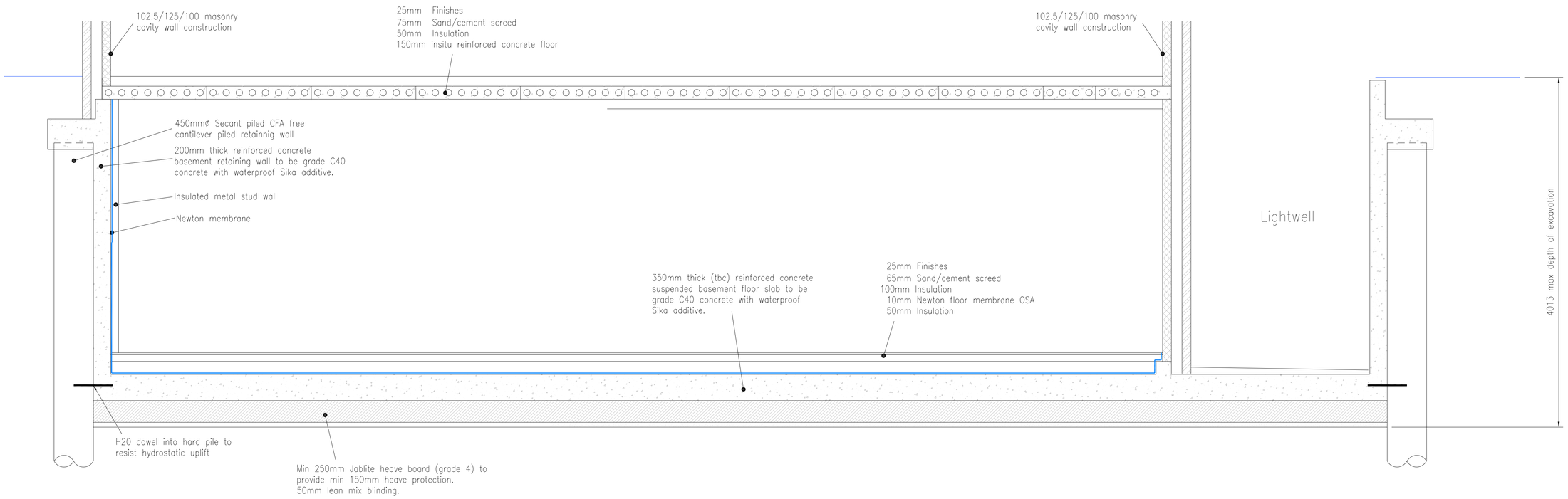
BWTS drawings

2594-100 rev B *'Party Wall Section A-A'*

2594-101 rev A *'Party Wall Section B-B'*

2594-110 rev B *'Basement & Lower Ground Floor General Arrangement Plan'*

2594-150 rev A *'Drainage Layout'*



rev.	date	description	chk.
B	14.06.23	Revised to full basement.	RC
A	09.02.23	New drawing – First Issue.	RC

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client:

Mr N Jarvis

job title:

34 Udney Park Road
Teddington

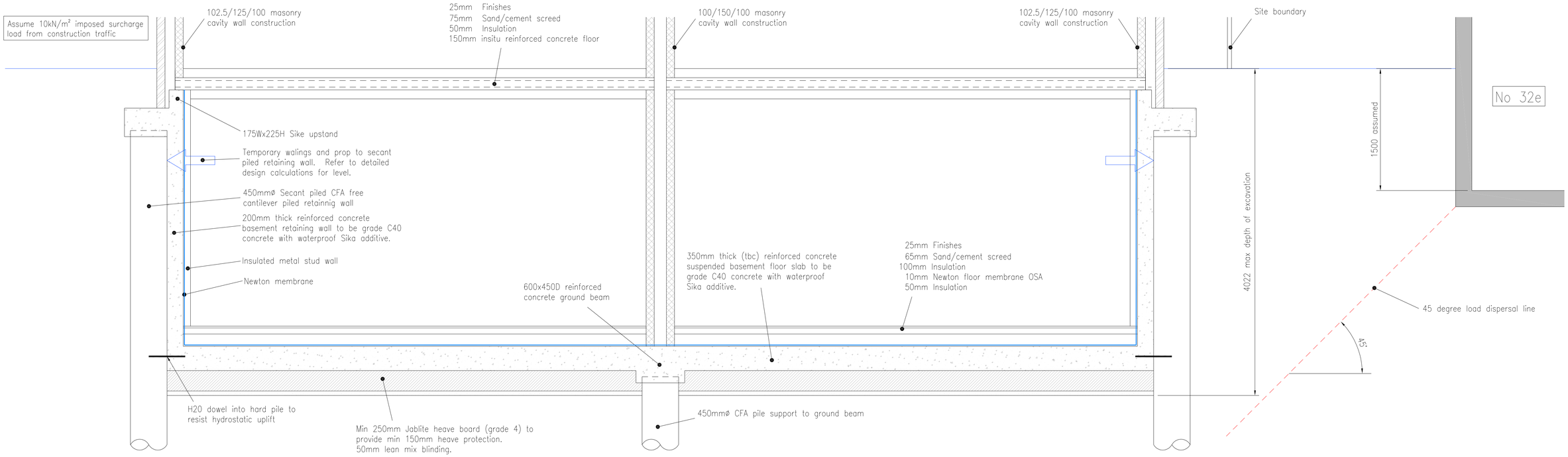
drawing title:

Party Wall Section A–A

scale and sheet size

1:25 @A1

job number:	drawing number:	revision:
2594	100	B



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drawing title:
Party Wall Section B–B

scale and sheet size
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job number:	drawing number:	revision:
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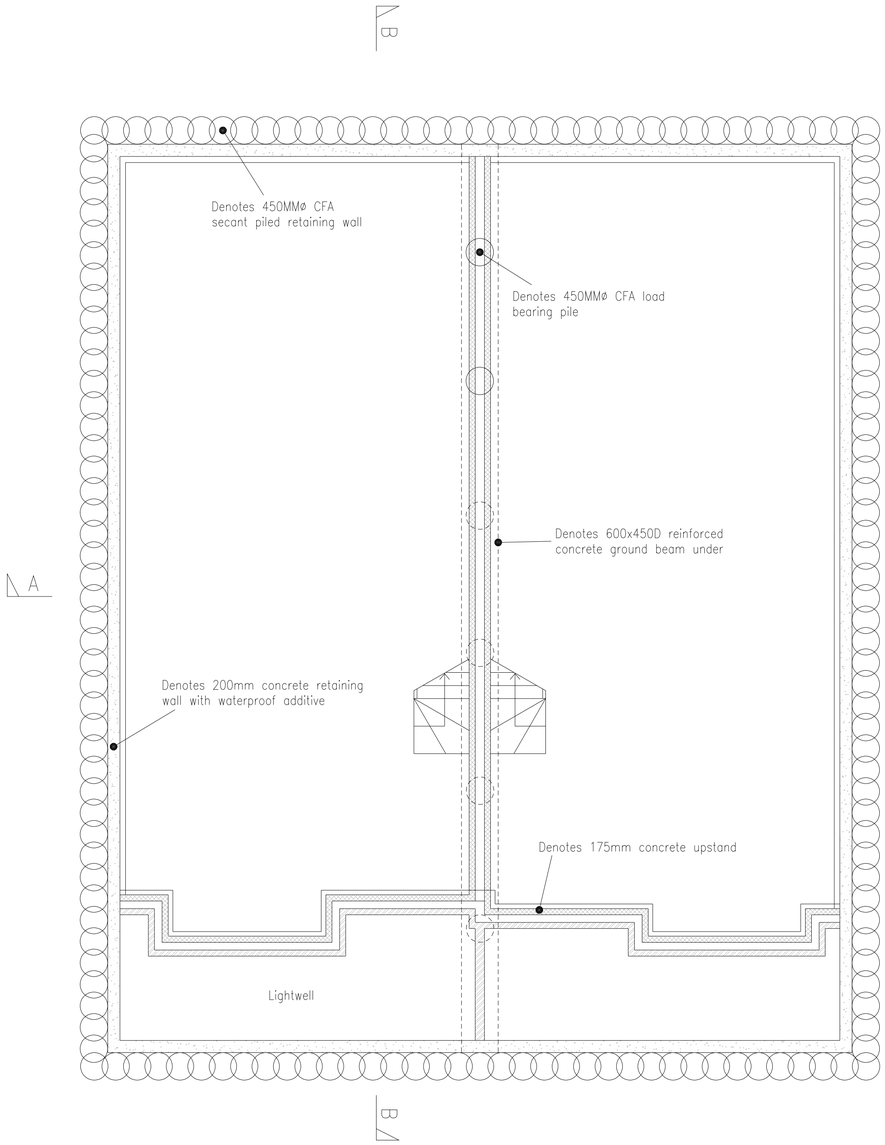
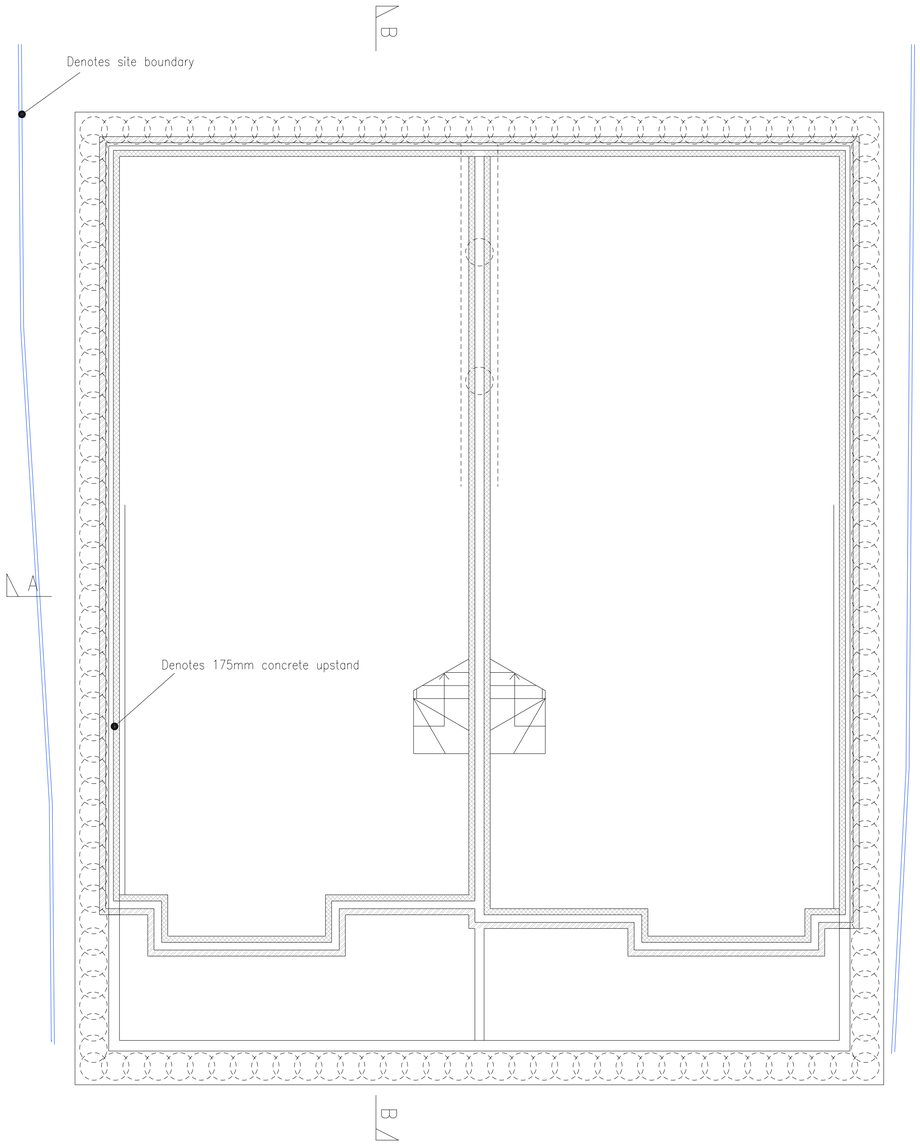
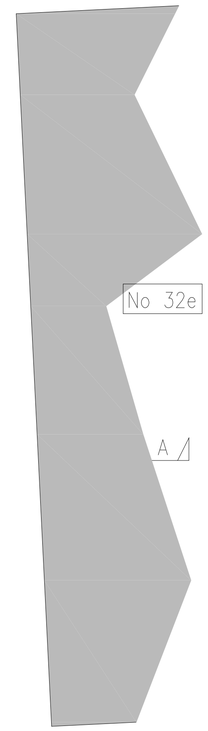


Basement Floor Plan
Section 1-1



Ground Beam Plan
Section 2-2



rev.	date	description	chk.
B	14.06.23	Revised to full basement. Drawing title revised.	RC
A	09.02.23	New drawing – First Issue.	RC

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client:
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job title:
34 Udney Park Road
Teddington

drawing title:
Basement & Ground Beam General Arrangement Plans

scale and sheet size
1:50 @A1

job number:	drawing number:	revision:
2594	110	B

32

36

Polystorm Crate Soakaways
Size to be determined from on site percolation tests designed for 1:100 year 6 hour storm with 40% climate change.

5000 min

RWP to front elevation taken out at ground floor level beneath walkway

Rising main

SVP's to be taken out beneath ground floor slab

Cavity drain & floor gulley arrangement to specialist CSSW approved contractors details

Surface water pump chamber

New demarcation chamber connecting to extg foul water pipe

Notes:
1. All drainage works are to be constructed in accordance with Sewer Sector Guidance Appendix C 'Design & Construction' V2 2020.
2. All pipes are to be selected by the Contractor and to have suitable strength for the service conditions.
3. All pipes are to be suitable for main road traffic unless stated otherwise.
4. The beddings shown are the minimum requirements. The Contractor must ensure the bedding provided is suitable for the selected pipes and loading conditions.
5. 150mm concrete bed and surround to be provided where depth of cover is less than 900mm below finished hardstanding level, or 600mm in soft landscaped areas.
6. Flexcell to be included at all joints as recommended by the manufacturer.
7. All catchpit manholes to have minimum 300 clear void beneath invert of pipe to base of manhole.
8. Pipes of different diameters entering manholes are to be installed with soffits at the same level.
9. The first manhole upstream from the connection to the existing public sewer should, when constructed, be fitted with a screen in order to prevent debris entering the sewer. The screen should be removed immediately prior to the occupation of the premises to be served by the sewer.
10. Cover levels shown are approximate, finished level to match proposed external level
11. All foul water pipes to be 100mm ø laid at 1:80 min gradient unless noted otherwise.
12. All 150mm ø foul water pipes to be laid at 1:150 min gradient unless noted otherwise.
13. All surface water pipes to be 100mm ø laid at 1:80 min gradient unless noted otherwise.
14. All pipes to be unplasticised PVC pipes, joints and fittings in accordance with BS 4660 and BS EN 1401–1.
15. Plastic chambers and rings, including demarcation chambers, shall comply with BS 7158 or BS EN 13598–1.

Drainage Key

- Surface Water Drainage
- Extg surface Water Drainage to be retained
- Foul Water Drainage
- Extg Foul Water Drainage to be retained
- Rainwater pipe with trapped gulley under
- Soil Vent Pipe
- G Trapped gulley

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client:
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job title:
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drawing title:
Drainage Layout

scale and sheet size
1:100 @A1

job number:	drawing number:	revision:
2594	150	A

Appendix D

Albury SI site investigation report ref 13/9958/KJC dated October 2013

REPORT ON A SITE INVESTIGATION

at

26 UDNEY PARK ROAD, TEDDINGTON, MIDDLESEX TW11 9BG

for

MR D HOBDAY

CONSULTING ENGINEER: TOORC CONSULTING LTD

Report No 13/9958/KJC **October 2013**

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CONTENTS

FOREWORD

The following notes should be read in conjunction with the report. Any variations on the general procedures outlined below are indicated in the text.

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General

The recommendations made and opinions expressed in the report are based on the strata conditions revealed by the fieldworks as indicated on the boring and trialpit records, together with an assessment of the data from insitu and laboratory tests. No responsibility can be accepted for conditions, which have not been revealed by the fieldworks, for example, between borehole and/or trialpit positions. While the report may offer opinions on the possible configuration of strata, both between the excavations and below the maximum depth achieved by the investigation, these comments are for guidance only and no liability can be accepted for their accuracy. For investigations, which include environmental issues, the data obtained relate to the conditions which are relevant at the time of the investigation.

Boring Techniques

Unless otherwise stated, the light cable percussion technique of soft ground boring has been used. This method generally enables the maximum information to be obtained in respect of strata conditions, but a degree of mixing of some layered soils, for example, thin bands of coarse and fine granular soils, is inevitable. Specific attention is drawn to this occurrence where evidence of such a condition is available.

The penetration resistances quoted on the boring records have been determined generally in accordance with the procedure given in BS1377:1990. The suffix '+' donates that the result has been extrapolated from less than 0.3m penetration into undisturbed soil.

Routine Sampling

During construction of boreholes, sampling and insitu testing will be completed in general accordance with Eurocode EN 1997-2:2007 and BS5930:1999. Variations to this code of practice will only occur where the strata conditions preclude implementation or the contract specifies alternatives.

Samples which are required for environmental testing will be stored in suitable glass containers in accordance with current guidelines.

Groundwater

The groundwater observations entered on boring and trialpit records are those noted at the time of the investigation. The normal rate of progress does not usually permit the recording of any equilibrium water level for any one water strike. Moreover, groundwater levels are prone to seasonal variation and to changes in local drainage conditions. The table on each boring record shows the groundwater level at the quoted borehole and casing depths usually at the start and finish of a day's work. The word 'none' indicates that groundwater was sealed off by the borehole casing or that no water was observed in the borehole.

Trialpits

The method of construction employed to form the trialpits is entered in their records. In general, it is not possible to extend machine excavated trialpits to depths significantly below the water table, especially in predominantly granular soils. Except for manually excavated pits, and unless otherwise stated, the trialpits have not been provided with temporary side support during their construction, hence, personnel have not entered them and examined the insitu exposed strata.

Window Sampling

Window sampling comprises driving a probe into the ground. On extraction of the probe the strata encountered are logged and representative disturbed samples recovered. In general, window sampling cannot be completed in granular soils, or below the water table.

Laboratory Testing

Unless stated in the tests, all laboratory tests have been performed in accordance with the requirements detailed in BS1377 (1990): Parts 1-9, or other standards or specifications that may be appropriate.

REPORT ON A SITE INVESTIGATION

at

26 UDNEY PARK ROAD, TEDDINGTON, MIDDLESEX TW11 9BG

for

MR D HOBDAY

CONSULTING ENGINEER: TOORC CONSULTING LTD

Report No 13/9958/KJC **October 2013**

Prepared by **K J Clark BSc Hons**
Senior Geotechnical Engineer

1.0 SYNOPSIS

This investigation has demonstrated that made ground overlies soils thought to be associated with Kempton Park Gravel of Recent or Pleistocene age. At depth, London Clay of late Eocene age has been shown to be present. The groundwater observations noted at the time of the fieldworks suggest that a groundwater profile is present at approximately 4.25m depth below ground level. Hence, problems with respect to the proposed excavations are unlikely to be encountered.

It is understood that it is proposed to extend the existing basement. Strip or spread foundations located at depths of the order of 3m within the Kempton Park Gravel can be designed to apply a maximum increase in load of 150kPa.

2.0 INTRODUCTION

It is understood that it is proposed to extend the existing basement at 26 Udney Park Road, Teddington. Consequently, a site investigation has been undertaken in order to ascertain the nature and engineering properties of the soils underlying this site, and to obtain data which will assist in the formulation of a safe and economical foundation solution.

In accordance with the Client's requirements, the programme of this investigation comprised the construction of a single borehole using light cable percussion boring techniques. During this work, samples were recovered for further examination and laboratory testing. In addition, a number of insitu tests were performed. On completion of the borehole, a standpipe was installed in order to allow the monitoring of the long-term groundwater profile to be completed. This report describes the work undertaken, presents the information obtained and discusses the ground conditions with respect to foundation design and construction.

A copy of the order for these works is presented as Appendix 1. This report is for the benefit of the Client alone and cannot be assigned to a third party without the consent of Albury SI Ltd.

3.0 FIELDWORKS

The borehole was completed on 21st August 2013, at the location as shown on the site plan, drawing no 13/9958/1, which is presented as Appendix 2 to this report. The salient details of this drawing have been extracted from a layout plan supplied by the Client's representative.

The depths and descriptions of the strata encountered in the borehole are given on the borehole record, which comprises Appendix 3 to this report. This record notes the depths at which samples were taken, the results of insitu testing and the groundwater

observations noted at the time of the fieldworks. Upon completion of the borehole a standpipe was installed to allow the monitoring of the long-term groundwater profile.

4.0 GEOLOGY AND STRATA CONDITIONS

An examination of the 1:50,000 Geological Survey map of the area, together with the Regional Handbook of Geology, indicates that the site is underlain by Kempton Park Gravel of Recent or Pleistocene age, which in turn overlies London Clay of late Eocene age. This over-consolidated deposit consists of blue-grey silty clay, which can weather to a brown colouration at, or near surface.

A study of the borehole record indicates that made ground, comprising shingle over gravel grading to dark grey/brown silty sand with gravel, was noted at the investigatory location and was proved to a depth of 0.6m.

Brown clayey sand with gravel becoming gravelly sand was observed beneath the materials classified as made ground. This soil was proved to 2.75m depth. Brown sandy gravel was exposed beneath the gravelly sand and was shown to extend to 6.4m depth. These soils are indicative of the Kempton Park Gravel.

Brown silty clay, rapidly becoming blue-grey silty clay, was revealed beneath the Kempton Park Gravel and was shown to extend to the full depth of this investigation. The borehole was terminated at 15m. The brown and grey-blue soils are typical of the London Clay formation.

A groundwater strike was noted at 5.7m depth. A corresponding short-term standing water level of 5.5m was also recorded. Return visits to site were made on 28th August and 10th September 2013, when depths to water of 4.25m and 4.27m were noted.

Insitu standard penetration tests were performed within the soils associated with the Kempton Park Gravel encountered at this site. Resistances to penetration within the range 23 blows/0.3m and 43 blows/0.3m were recorded, which are indicative of a medium dense to dense condition for a purely granular soil.

5.0 LABORATORY TESTING

A programme of laboratory testing has been undertaken and the results are presented as Appendix 4 to this report. Each type of test is summarised below and the results obtained have been used to assist in the formulation of the discussion of ground conditions.

5.1 Particle Size Distribution

Samples of the granular soils encountered have been subjected to sieve analysis in order to ascertain the soils particle size distribution. This work was extended in once instance by sedimentation analysis to determine the soils clay fraction. The results of this work are presented in the form of grading curves.

5.2 Triaxial Compression

The undrained shear strength characteristics of a sample of the London Clay have been assessed by testing specimens in the triaxial compression apparatus. Under the conditions of this work, cohesions of between 140kPa to 350kPa have been recorded, which are indicative of a stiff to very insitu condition for a purely cohesive soil.

5.3 Chemical Analyses - Soluble Sulphates & pH Values

Selected samples of the soils and groundwater encountered at this site have been subjected to chemical analyses in order to determine their soluble sulphate content and pH values. Under the conditions of this work, generally low levels of soluble sulphates have been recorded in association with near neutral pH values.

5.4 Chemical Analyses - Contamination

A sample of the made ground has been analysed for the presence of contamination in accordance with the current CLEA guidelines together with currently available guidance data. A sample of the made ground has also been subject to Waste

Acceptance Criteria testing. These works have been completed in the *M*CERT*S* and UKAS accredited laboratories operated by Exova Ltd.

6.0 DISCUSSION OF GROUND CONDITIONS

It is understood that it is proposed to redevelop the site by the extension of the existing basement beneath the property under consideration. At the time of the preparation of this report, no precise information was available with regard to the structural loadings. It is likely that the basement structure will extend to depths of the order of 3m.

It cannot be recommended that major structural foundations be located within the made ground revealed by this investigation. Soils of this origin are frequently present in a weak and variable condition, such that unacceptable settlement could occur even under the action of light loading intensities. Therefore, where this condition is likely to arise it would be prudent to extend the foundation excavations through these undesirable materials where they are of less than 1m in thickness to this minimum depth in order to avoid that zone of soil which is subject to normal seasonal moisture variation or frost action. The above precautions need not necessarily be applied to light ancillary structures, which will be formed structurally discrete from the main development and in which a greater degree of settlement can be tolerated.

This is investigation has demonstrated that granular soils associated with the Kempton Park Gravel are likely to be revealed at the basement depth of 3m. It is considered that strip or spread foundations located within these soils can be designed to apply a maximum increase in load of 150kPa. At this loading intensity, a factor of safety of three against general shear failure will be operative. Moreover, settlements should remain within tolerable limits and should be sensibly complete within a normal construction period due to the free draining nature of the Kempton Park Gravel.

It is thought that a satisfactory foundation solution can be formulated on the basis of the foregoing recommendations. Should they be considered unsuitable then an alternative foundation system will be required. Consideration could be given to the use of a piled foundation design. Should the use of piles be considered, it is recommended that the advice of suitably experienced specialist piling contractors be sought in order to arrive at

a satisfactory solution to the problem. The information given in Appendices 3 and 4 of this report may be used in pile design.

Excavations of less than 1m depth should not require temporary support. However, where excavations extend below this level then adequate support should be provided in order to comply with current statutory safety regulations and to maintain the stability of the excavation faces.

The groundwater observations noted at the time of the fieldworks suggest that problems with respect to basement excavations are unlikely. Should slight seepages be encountered or surface water run off drain into foundation excavations, these it is likely that these minor amounts will dissipate through the bases of excavations.

It is evident that support will have to be given to the ground during the construction of the basement as the foundations to the adjacent properties may be present at shallow depth and in close proximity to the basement excavation. It is likely that consideration will have to be given to the use of underpinning beneath the front/rear and flank walls. The groundwater observations have noted a groundwater profile within the soils associated with the Kempton Park Gravel at 4.25m depth. Hence, it is suggested that this work can be completed in dry conditions. Underpinned foundations can be designed on the basis of the maximum increase in load of 150kPa as quoted above.

Alternatively, support can be formed by some form of insitu construction comprising either sheet piling or installation of contiguous bored piling. The final method adopted lies outside the scope of this report as it is dependent upon practical as well as economic considerations together with the construction philosophy of the contractor. However, irrespective of the system employed, it is evident that the installations will extend into the London Clay thereby controlling water inflows within the overlying Kempton Park Gravel. Hence, minimal quantities of groundwater are likely to be anticipated within the basement excavation, which can be dealt with by the use of good engineering practice. The basement should be designed and constructed as a watertight element capable of resisting hydrostatic uplift forces.

In the design of the basement retaining walls account should be taken of the earth pressures derived from the exposed soils and any surcharge loadings that will be applied to the walls. In the design of such structures it is normally necessary to employ the use of effective stress parameters such that the long term stability of the structure can be assured. The table below provides suitable design parameters which are based upon effective stress considerations and therefore reflect the long term performance at this site.

Retaining Wall Design

Soil Parameter	Effective Cohesion c' kPa	Effective angle of friction ∅'	Soil Density kg/cum
Kempton Park Gravel	0	30	1900
London Clay	5	20	1925

It is evident that the basement floor slab will be constructed on naturally occurring soils. Hence, no engineering problems are anticipated in this respect.

7.0 EFFECT OF SULPHATES

The information obtained from this investigation has been compared with the criteria proposed in BRE Special Digest 1; 2005 Edition, Concrete in Aggressive Ground. Using the information in Table C1 (natural ground) of this publication the Aggressive Chemical Environment for Concrete Classification is AC-1s, which coincides with a Design Sulphate Class DS-1. This Design Sulphate Class can be used to establish the design mix for buried concrete in accordance with Part D of the Digest.

A P P E N D I X 1

Order

ALBURY S.I. LTD

Miltons Yard, Petworth Road,
Witley, Godalming, Surrey GU8 5LH
Fax No 01428 685261

Geotechnical and environmental testing specialists

ORDER MANDATE FORM
(to be completed by Client)

Client Company Name:	Mr D Hobday		
Company Address:	26 Udney Park Road Teddington TW11 9BG		
Telephone No:	07909 538294	Email Address:	daveandbean@mac.com
Registered Address: (if different from above)			
Company Registration No:		VAT No:	
Quotation Reference: HMR/29/07/13/b			
Where did you hear of our services?			

I/we hereby confirm acceptance of quotation detailed above from Albury S.I. Limited, and instruct Albury to now programme site investigation works as detailed in their quotation.

Signed..... Dated.....

Print Name..... Position in Company.....

Site Address:	As above
Your Order No:	
Date:	

If Required:
I/we hereby confirm that I authorise my agent, detailed below, to specify works to Albury S.I. Limited required and accept agreed costs on my behalf.

Signed.....See email dated 05/08/13..... Dated...15/08/13.....

Name of Agent/Consulting Engineer/Architect/Project Manager:
Toore Consulting Ltd (Rob Croot)
Address: The Warren, Caunton Road, Bathley, Newark NG23 6DN

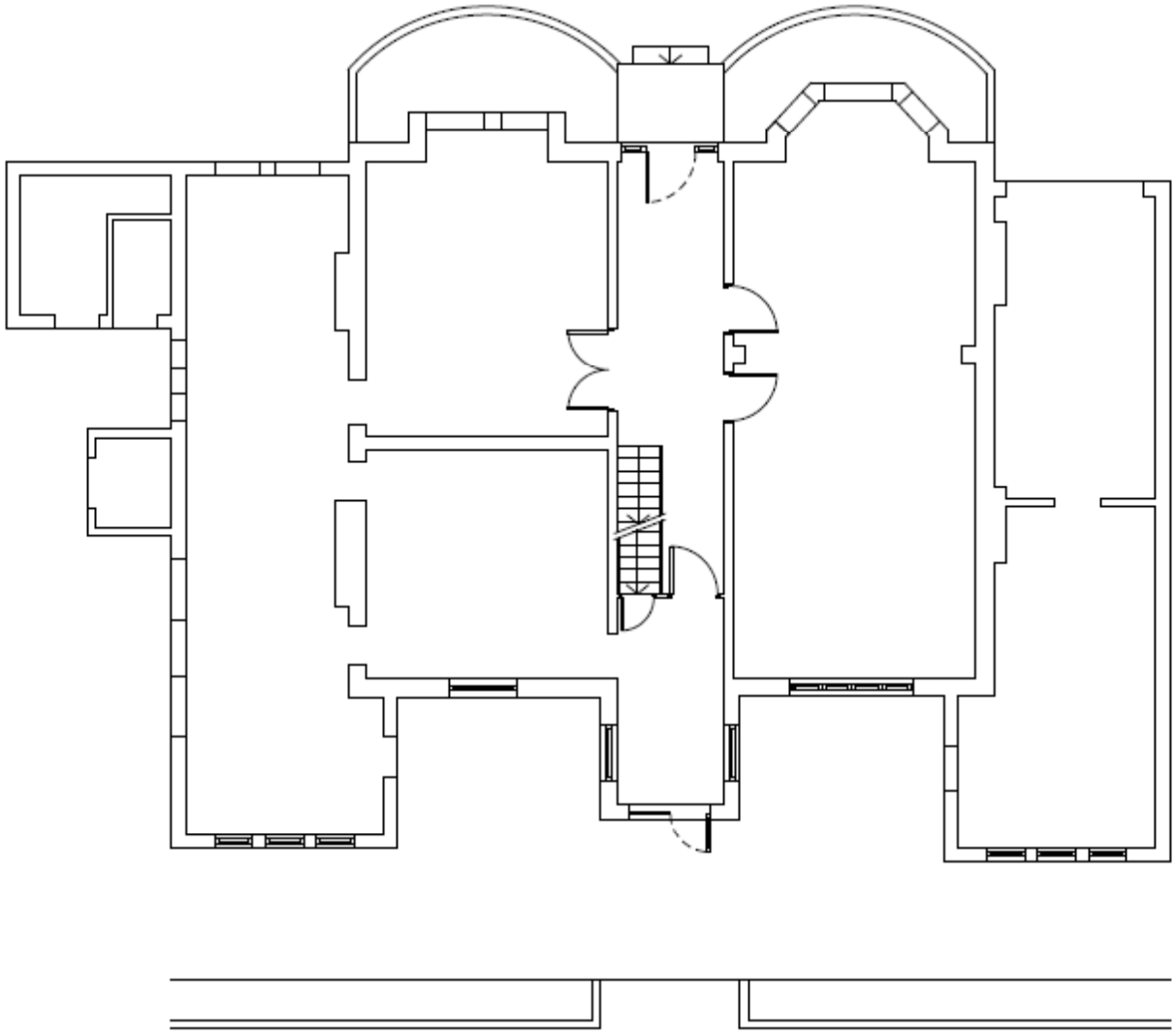
Tel No: 01636 636777 rob.croot@toore.co.uk

On receipt of this form duly completed, the required works will be placed into programme.

A P P E N D I X 2

Site Plan

BH 1



Site:	26 UDNEY PARK ROAD, TEDDINGTON
Drawing No:	13/9958/1
Title:	SITE PLAN
Scale:	NTS
Revision:	A
Issue Date:	1.0 – 18/4/2011

Albury S.I. Ltd
Miltons Yard
Petworth Road
Witley,
Surrey, GU8 5LH
www.alburysi.co.uk

A P P E N D I X 3

Boring Record

Albury S.I. Ltd

Petworth Road, Witley, Godalming, Surrey, GU8 5LH

Borehole No	1		
Contract	Udney Park Road, Teddington	Report No	13/9958/KJC
Client	Mr D Hobday	Ground Level	mOD
Site Address	26 Udney Park Road, Teddington, Middlesex, TW11	Boring Commenced	21/08/13
		Boring Completed	21/08/13

Type and diameter of boring: Light cable percussion (shell and auger): 150mm diameter

Water Strikes, m		Water levels recorded during boring, m							
1.	5.70	Date	21/08	21/08	28/08	10/09			
2.		Hole Depth	15.00	7.00	6.40	6.40			
3.		Casing Depth	6.60	6.40	s/p	s/p			
4.		Water Level	none	5.50	4.25	4.27			

Remarks

Excavation of starter pit to clear services

Standpipe installed to 6.4m

Samples or tests		SPT			Strata Description
Type	Depth, m	N	Depth	Legend	
			0.20		Made ground (shingle over gravel)
D	0.25				Made ground (dark grey/brown silty sand with gravel)
B	0.50		0.60		
					Dense brown clayey sand with gravel
B	1.00-1.50	32			
D	1.75				
B	2.00-2.50	43	2.00		
					Dense brown gravelly sand
D	2.75		2.75		
B	3.00-3.50	39			Medium dense to dense brown sandy gravel
D	4.00				
B	4.50-5.00	33			
D	5.50				
B	6.00-6.50	23			
			6.40		
					Brown silty clay
			6.80		
D	7.00				Stiff blue-grey silty clay
U	7.50-8.00				
D	8.50				
U	9.00-9.50				

Sampling Code: **U**- Undisturbed, **B** - Large Disturbed, **D** - Small Disturbed, **W**- Water Sample, **(U)***- Non-recovery of undisturbed sample

Albury S.I. Ltd

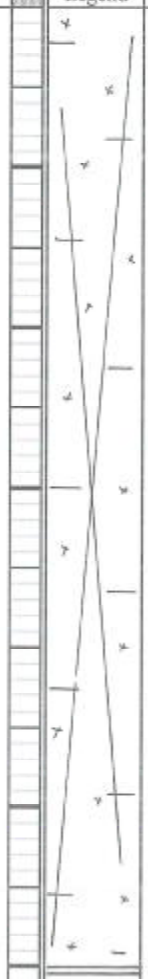
Petworth Road, Witley, Godalming, Surrey, GU8 5LH

Continuation Sheet No 1

Borehole No 1

Contract	Udney Park Road, Teddington	Report No 13/9958/KJC

Samples or tests		SPT			Strata Description
Type	Depth, m	N	Depth	Legend	
					Stiff to very stiff blue-grey silty clay
D	10.00				
U	10.50-11.00				
D	11.50				
U	12.00-12.50				
D	13.00				
U	13.50-14.00				
D	14.50				
U	15.00-15.50		15.00		



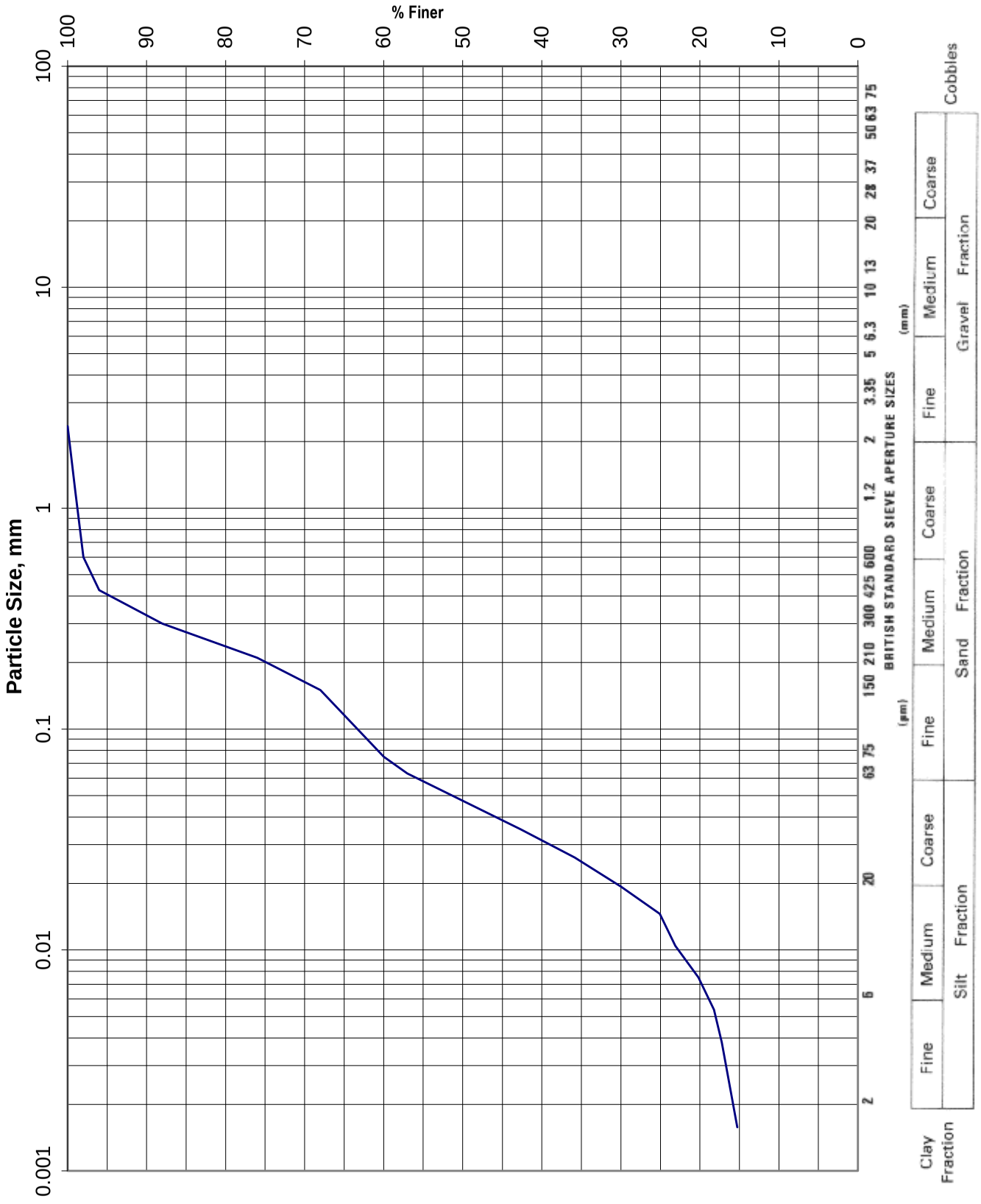
Sampling Code: **U**- Undisturbed, **B** - Large Disturbed, **D** - Small Disturbed, **W**- Water Sample, **(U)***- Non-recovery of undisturbed sample

A P P E N D I X 4

Laboratory Test Results

PARTICLE SIZE DISTRIBUTION - GRADING CURVE

Contract: Udney Park Road, Teddington	Report No. 13/9958/KJC

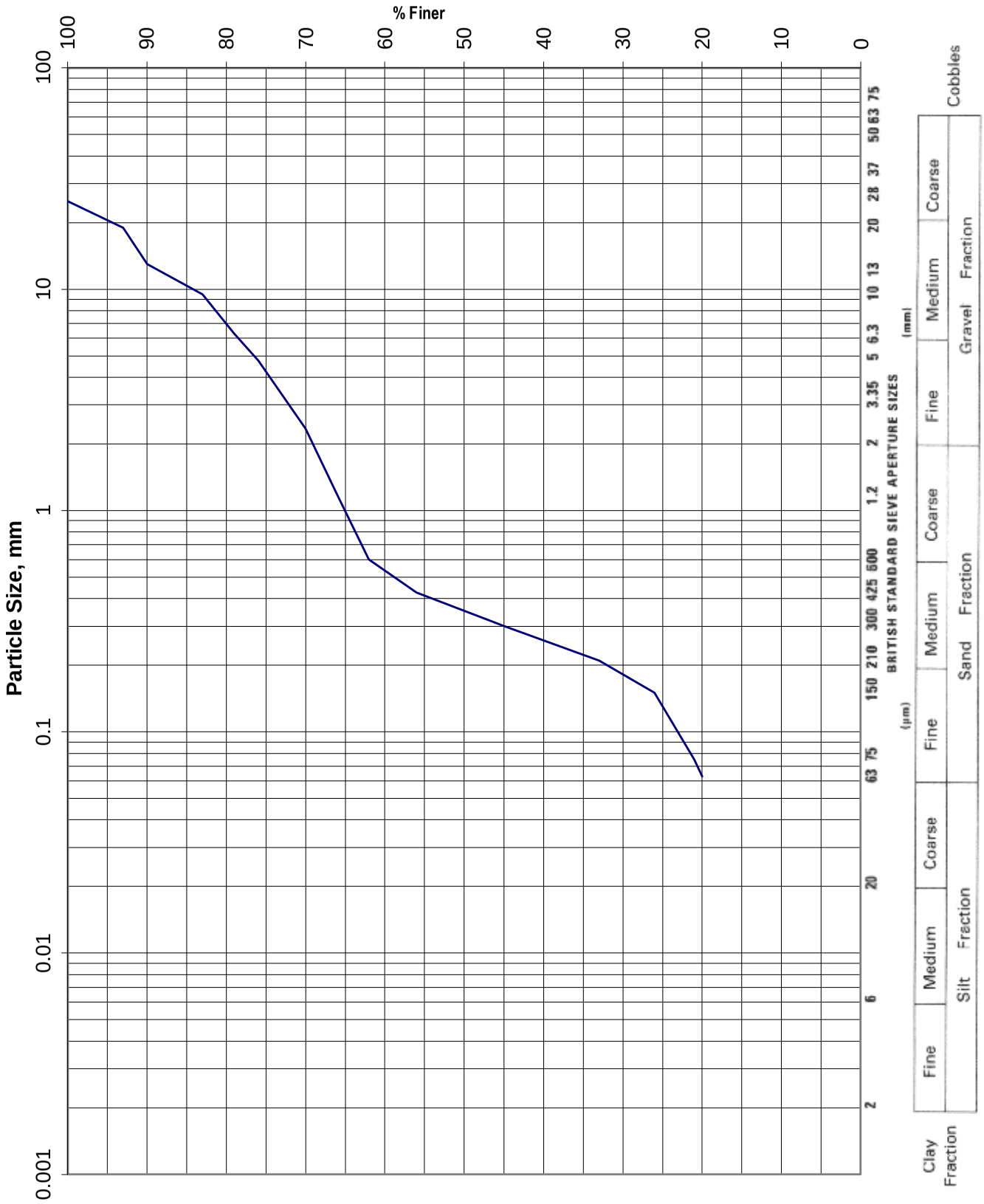


Borehole No. 1	Depth of Sample, m: 1.00-1.50

Visual Description: Brown clayey sand with occasional gravel

PARTICLE SIZE DISTRIBUTION - GRADING CURVE

Contract: Udney Park Road, Teddington	Report No. 13/9958/KJC

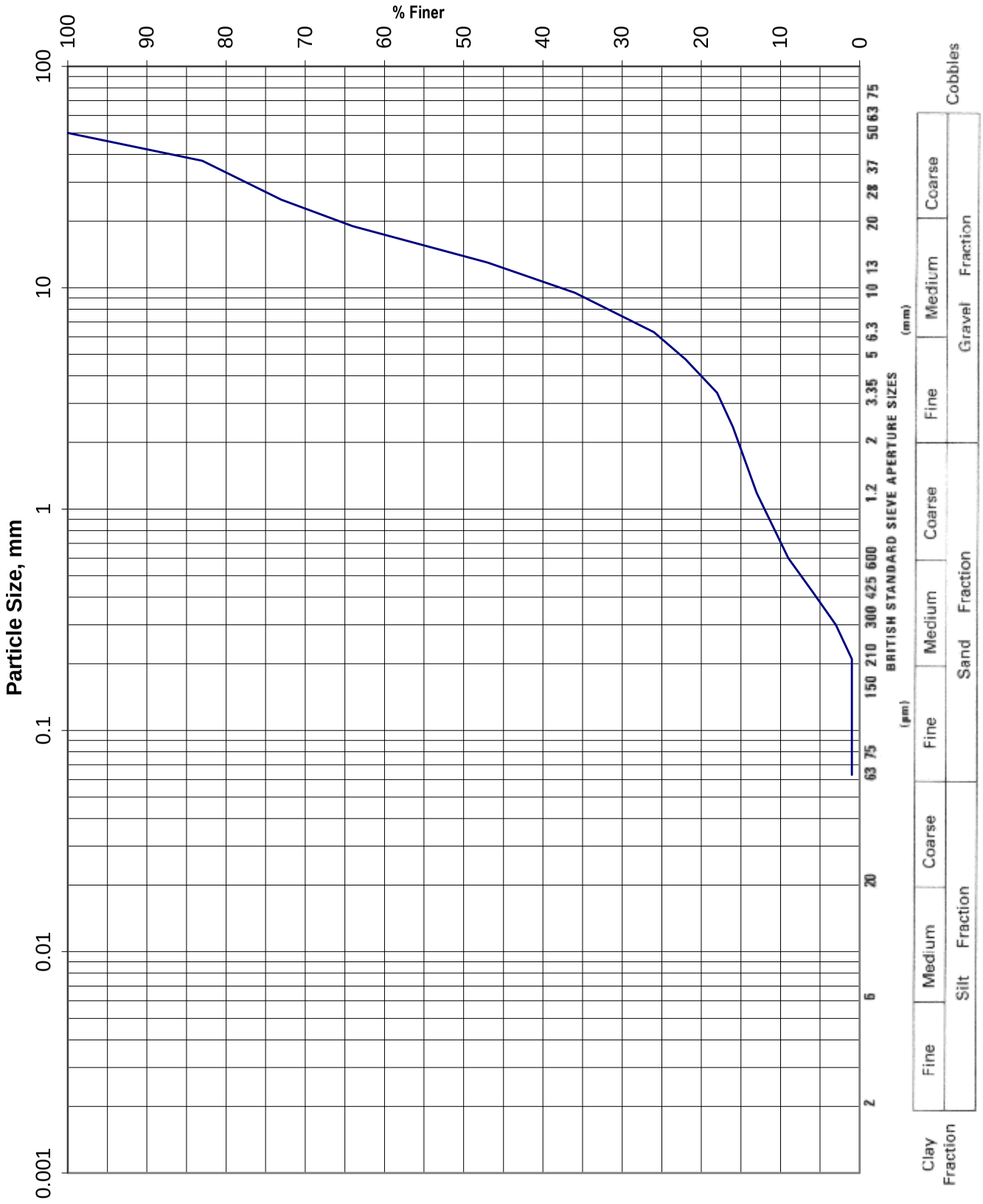


Borehole No. 1	Depth of Sample, m: 2.00-2.50

Visual Description: Brown gravlley sand

PARTICLE SIZE DISTRIBUTION - GRADING CURVE

Contract: Udney Park Road, Teddington	Report No. 13/9958/KJC



Borehole No. 1	Depth of Sample, m: 3.00-3.50

Visual Description: Brown sandy gravel

RESULTS OF TRIAXIAL COMPRESSION TESTS

Contract: Udney Park Road, Teddington
Report no: 13/9958/KJC

BH No	Depth of Sample m	Description of Sample	INDEX PROPERTIES				TRIAXIAL COMPRESSION						
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Soil Classification	Code	Lateral Pressure kPa	Compression Strength kPa	Cohesion kPa	Angle of Friction (degrees)	Bulk Density kg/m^3	Water Content (% dry wt)
1	7.50-8.00	Blue-grey silty clay					38U	150 300 450	280 320 250	140	0	1915 1950 1925	26.3 25.8 26.4
	9.00-9.50	Blue-grey silty clay					38U	150 300 450	345 320 280	160	0	1935 1935 1935	27.8 27.5 27.7
	10.50-11.00	Blue-grey silty clay					38U	150 300 450	450 520 475	240	0	1960 1950 1970	26.2 26.0 26.4
	12.00-12.50	Blue-grey silty clay					38U	150 300 450	425 350 280	175	0	1880 1915 1900	27.7 27.0 26.9
	13.50-14.00	Blue-grey silty clay					38U	150 300 450	690 750 655	350	0	1995 2005 2020	26.0 26.1 25.0
	15.00-15.50	Blue-grey silty clay					38U	300 450 600	450 350 345	190	0	1985 1985 1995	25.6 25.5 25.0

Sheet No 1 of 1

TRIAXIAL COMPRESSION TEST CODE: **38-38mm dia specimen** **100-100mm dia specimen**
U-Undrained **CD-Consolidated Drained** **CU-Consolidated Undrained** **P-Pore water pressure measurement** **M-Multistage** **F-Functional** **R-Remoulded** **LV-Laboratory Vane Test**

Albury S. I. Ltd Miltons Yard Petworth Road Witley Surrey GU8 5LH

RESULTS OF CHEMICAL ANALYSES

Determination of Sulphate Content and pH value

Contract: Udney Park Road, Teddington **Report No:** 13/9958/KJC

BH No	Depth of sample, m	Description	Concentrations of Sulphates expressed as SO_4			pH value
			In soil		In ground-Water *g/l*	
			Total SO_4 (%)	2:1 water:soil extract *g/l*		
1	1.00-1.50	Clayey sand		0.82		5.5
	2.00-2.50	Gravelly sand		0.64		6.1
	4.50-5.00	Sandy gravel		<0.25		7.9
	6.00-6.50	Clay		<0.25		8.6
	(4.25)	Water			<0.08	6.7

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F: +44 (0)1928 515556
E: info@exova.com
W: www.exova.com

Test Certificate

Client: Albury SI Ltd
Miltons Yard, Petworth Road, Witley, Surrey, GU8 5LH
Site: Udney Park Road. Teddington
Date Tested: 02/09/13, 03/09/13, 04/09/13, 05/09/13, 06/09/13, 09/09/13
Date Reported: 9 September, 2013
Date Received: 30 August, 2013
Sample Type: Solid

Certificate No: 13/2331/R/S/C1
File No: 13/2331/R/S
Client Ref: 10317

Lab sample ref:	**B453317**
Client sample ref:	**BH1**
	0.5m
Date sampled:	**28/08/13**
Sample matrix (see notes page):	**S**

Determinand	Method	Units	ISO17025	MCERTS	LOD	
Deviation Assessment						
Deviation(s)	C. Review	N/A	N/A	N/A	N/A	N/A
MCERTS Sample Prep						
% Stones	Stones	%	N/A	N/A	0	0.0
Moisture Content @ 35°	CTP01	% w/w	N/A	N/A	0.1	8.2
Sample Description^	SGP5		N/A	N/A		4
Misc						
pH	CTP07		Y	Y		7.0
Sulphate (total)	CTP14	mg/kg	Y	Y	200	340
Sulphate (water soluble)	CTP29	g/l	Y	Y	0.01	0.02
Sulphide M	CTP16	mg/kg	N	N	2	<2
Sulphur (elemental)	SOP11	mg/kg	Y	Y	20	<20
Cyanide (total) M	CTP18c	mg/kg	Y	Y	10	<10
Phenols (screen) M	CTP20	mg/kg	Y	N	1	<1
TOC	CTP22	% w/w	N	N	0.1	3.2
Arsenic	CTP11A 2	mg/kg	Y	Y	2	17
Beryllium	CTP11A 1	mg/kg	Y	Y	1	<1
Boron (water soluble)	CTP12	mg/kg	Y	N	1	1
Cadmium	CTP11A 0.5	mg/kg	Y	Y	0.5	0.6
Chromium (III)	CTP11l	mg/kg	N	N	3	20
Chromium (VI)	CTP15a	mg/kg	Y	N	1	<1
Copper	CTP11A 3	mg/kg	Y	Y	3	35
Lead	CTP11A 1	mg/kg	Y	Y	1	317
Mercury	CTP11A 0.5	mg/kg	Y	Y	0.5	<0.5
Nickel	CTP11A 2	mg/kg	Y	Y	2	15
Selenium	CTP11A 2	mg/kg	Y	Y	2	<2
Vanadium	CTP11A 1	mg/kg	Y	Y	1	34
Zinc	CTP11A 2	mg/kg	Y	Y	2	141
Asbestos Screen*	Asb subcon		Y	N/A		NAD
PAH (USEPA16)						
Acenaphthene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Acenaphthylene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Anthracene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Benz(a)anthracene M	GCM 501	mg/kg	Y	Y	0.1	0.4
Benzo(a)pyrene M	GCM 501	mg/kg	Y	Y	0.1	0.5
Benzo(b)fluoranthene M	GCM 501	mg/kg	Y	Y	0.1	0.7
Benzo(ghi)perylene M	GCM 501	mg/kg	Y	Y	0.1	0.3
Benzo(k)fluoranthene M	GCM 501	mg/kg	Y	Y	0.1	0.2
Chrysene M	GCM 501	mg/kg	Y	Y	0.1	0.5
Dibenz(a,h)anthracene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Fluoranthene M	GCM 501	mg/kg	Y	Y	0.1	1.0
Fluorene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Indeno(1,2,3-cd)pyrene M	GCM 501	mg/kg	Y	Y	0.1	0.3
Naphthalene M	GCM 501	mg/kg	Y	Y	0.1	<0.1
Phenanthrene M	GCM 501	mg/kg	Y	Y	0.1	0.3
Pyrene M	GCM 501	mg/kg	Y	Y	0.1	0.9

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W: www.exova.com

Test Certificate

Client: Albury SI Ltd
Miltons Yard, Petworth Road, Witley, Surrey, GU8 5LH
Site: Udney Park Road. Teddington
Date Tested: 02/09/13, 03/09/13, 04/09/13, 05/09/13, 06/09/13, 09/09/13
Date Reported: 9 September, 2013
Date Received: 30 August, 2013
Sample Type: Solid

Certificate No: 13/2331/R/S/C1
File No: 13/2331/R/S
Client Ref: 10317

Lab sample ref:	**B453317**
Client sample ref:	**BH1**
	0.5m
Date sampled:	**28/08/13**
Sample matrix (see notes page):	**S**

Determinand	Method	Units	ISO17025	MCERTS	LOD	
TPH Banded						
C8-C15 M	SOP03b	mg/kg	N	N	10	<10
>C15-C20 M	SOP03b	mg/kg	N	N	10	<10
>C20-C30 M	SOP03b	mg/kg	N	N	10	12
>C30-C36 M	SOP03b	mg/kg	N	N	10	<10

Notes
1. All analyses performed on the sample dried at 35ºC, except analyses suffixed with 'M'.
2. Analyses suffixed 'M' were performed on the sample as received and corrected for '% moisture at 35ºC' where applicable.
3. All results are expressed as dry weight.
4. MCERTS accreditation applicable to Sample Matrix 'S' only.
5. Natural stones (pebbles, gravels etc.) which do not pass a 2mm sieve are excluded from dried analyses.
6. Tests marked * indicate subcontracted analyses.
7. NAD denotes 'No Asbestos Detected'.
8. The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements.
9. ^Sample Description key: 1. - Sand, 2. Loam, 3. Clay, 4. Sandy loam, 5. Sandy clay, 6. Clayey loam, 7. Other.
   suffixed with: A - Stones, B - Construction rubble, C - Visible Hydrocarbons
10. Dates of testing for all parameters are available on request.
11. Please note 'Asbestos screen' testing has been analysed at Exova (Glasgow). This laboratory holds UKAS accreditation (UKAS No. 0568) for both 'Asbestos Screen' and 'Identification' as per document 'HSG 248'.

Signed for, and on behalf of Exova (UK) Ltd.

Prepared by:

S Blemings
Account Manager

Approved by:

A Young
Operations Manager

0871

REPORT FOR WASTE ACCEPTANCE CRITERIA TESTING - BSEN 12457 - 3

Client:	Albury SI Ltd	Certificate No:	13/2332-34/R/C1
Site:	Udney Park Road. Teddington	File No:	13-2332to2334
Date Received:	30 August, 2013	Client Ref:	10317
Date Tested:	02/09/13, 03/09/13, 04/09/13, 05/09/13, 06/09/13, 09/09/13	Sample Ref:	BH1 0.5m
Date Reported:	9 September, 2013	Lab Sample ref:	B453318

Solid Waste Analysis(Dry Basis)	Accrediataion	Method	Units	Concentration in Solid(Dry weight basis)	Landfill Waste Acceptance Criteria Limit Values: Inert waste Landfill	Stable Non-reactive Hazardous waste in Non hazardous Landfill	Hazardous waste Landfill
Total Organic Carbon	N	CTP33	%w/w	**4.4**	3	5	6
Loss On Ignition	N	CTP01	%w/w	**4.2**			10
BTEX M	Y	SOP01	µg/kg	**<10**	6000		
PCB(Congeners) M	Y	SOP10	µg/kg	**<5**	1000		
Mineral Oil M	N	CTP40	mg/kg	**<10**	500		
PAH(total)	Y	SOP04	mg/kg	**4.4**	100		
pH	Y	CTP07	pH units	**7.1**		>6	
Acid Neutralisation Capacity	N	CTP41	mol/kg	**0.7**		ND	ND
Base Neutralisation Capacity	N	CTP41	mol/kg			ND	ND

Leachate Analysis	Accreditation	Method	2:1 Leachate(mg/l)	8:1 Leachate(mg/l)	Calculated amount leached at 2:1 (mg/kg)	Calculated cumulative amount leached at 10:1(mg/kg)	Landfill Waste Acceptance Criteria Values for BSEN 12457-3 for L/S 10l/kg (mg/kg dry weight): Inert waste Landfill	Stable Non-reactive Hazardous waste in Non hazardous Landfill	Hazardous Waste Landfill
pH (pH units)	N	CTP07	8.0	7.9					
Conductivity(µs/cm)	N	CTP08	217	100					
Arsenic	N	CTP30	0.027	0.011	0.054	**0.125**	0.5	2	25
Barium	N	CTP30	0.02	0.02	0.04	**0.20**	20	100	300
Cadmium	N	CTP30	<0.0005	<0.0005	<0.001	**<0.001**	0.04	1	5
Chromium	N	CTP30	0.0011	0.0013	0.002	**0.013**	0.5	10	70
Copper	N	CTP30	0.0684	0.0210	0.137	**0.253**	2	50	100
Mercury	N	CTP30	<0.0001	<0.0001	<0.0002	**<0.0002**	0.01	0.2	2
Molybdenum	N	CTP30	0.013	0.002	0.026	**0.030**	0.5	10	30
Nickel	N	CTP30	0.005	0.003	0.010	**0.032**	0.4	10	40
Lead	N	CTP30	0.002	0.006	0.004	**0.056**	0.5	10	50
Antimony	N	CTP30	0.026	0.006	0.052	**0.078**	0.06	0.7	5
Selenium	N	CTP30	<0.001	<0.001	<0.002	**<0.002**	0.1	0.5	7
Zinc	N	CTP30	0.011	0.011	0.022	**0.110**	4	50	200
Chloride	N	CTP09	<5	<5	<10	**<10**	800	15000	25000
Fluoride	N	CTP09	<1	<1	<2	**<2**	10	150	500
Sulphate	N	CTP09	20	<10	40	**18**	1000	20000	50000
Total Dissolved Solids	N	CTP04	140	75	280	**809**	4000	60000	100000
Phenols	N	CTP20	0.3	0.2	1	**2**	1		
Dissolved Organic Carbon	N	CTP33	52	39	104	**402**	500	800	1000

Notes: 1. Analyses suffixed 'S' were performed on the sample dried at 35ºC. 2. Analyses suffixed 'SM' were performed on the sample as recievd. 3. The laboratory has tested the material/items supplied by the client as sampled in accordance with the client's own requirements. 4. UKAS accrediatation does not include leachate preparation.

Signed for, and on behalf of Exova Ltd.

Prepared by:

S Blemings
Account Manager

Approved by:

A Young
Operations Manager

A P P E N D I X 5

Contamination Guidelines

Soil Generic Assessment Criteria for Human Health - Inorganics

Determinand	GAC Land-use category (mg/kg^{-1})				GAC Source
	Residential with consumption of home-grown produce	Residential without consumption of home-grown produce	Allotments	Commercial	
Arsenic*	32	ND	43	640	EA SGV, 2009
Antimony	ND	550	ND	7500	EIC/AGS/CL:AIRE, 2010
Barium	ND	1300	ND	22000	EIC/AGS/CL:AIRE, 2010
Beryllium*	51	ND	55	420	LQM/CIEH, 2009
Boron*	291	ND	45	192000	LQM/CIEH, 2009
Cadmium*	10	ND	1.8	230	EA SGV, 2009
Chromium III*	3000	ND	34600	30400	LQM/CIEH, 2009
Chromium VI*	4.3	ND	2.1	35	LQM/CIEH, 2009
Copper*	2330	ND	524	71700	LQM/CIEH, 2009
Inorganic Mercury (Hg^{2+})	170	ND	80	3600	EA SGV, 2009
Elemental Mercury (Hg^{4})	1	ND	26	26	EA SGV, 2009
Methyl Mercury (Hg^{+4})*	11	ND	8	410	EA SGV, 2009
Molybdenum	ND	670	ND	17000	EIC/AGS/CL:AIRE, 2010
Nickel*	130	ND	230	1800	EA SGV, 2009
Selenium*	350	ND	120	13000	EA SGV, 2009
Vanadium*	75	ND	18	3160	LQM/CIEH, 2009
Zinc*	3750	ND	618	665000	LQM/CIEH, 2009

*based on a sandy loam with soil organic matter of 6% and pH 7.0 (Environment Agency, 2009)
ND: Not Derived

Soil Generic Assessment Criteria for Human Health - Organics

Determinand	GAC Land-use category (mg/kg^{-1})				GAC Source
	Residential with consumption of home-grown produce	Residential without consumption of home-grown produce	Allotments	Commercial	
Benzene	0.33	ND	0.07	95	EA SGV, 2009
Phenol	420	ND	280	32000	EA SGV, 2009
Ethyl benzene	350	ND	90	2.8×10^3	EA SGV, 2009
Toluene	610	ND	120	4.4×10^3	EA SGV, 2009
o-xylene	250	ND	160	2.6×10^3	EA SGV, 2009
m-xylene	240	ND	180	3.0×10^3	EA SGV, 2009
p-xylene	230	ND	160	3.2×10^3	EA SGV, 2009

based on a sandy loam with soil organic matter of 6% and pH 7.0 (Environment Agency, 2009)
ND: Not Derived

The above GAC are presented above for reference only and should be considered with their respective technical notes.

References:

Environment Agency, 2009. Updated technical background to the CLEA model. Science Report SC050021/SR3
LQM/CIEH, 2009. Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition)
EIC/AGS/CL:AIRE, 2010. Soil Generic Assessment Criteria for Human Health Risk Assessment.

Version 6 - September 2011

WASTE TREATMENT

The Landfill (England and Wales) Regulations 2002 require that waste (including inert arisings and contaminated soil) must be treated before it is disposed of at non-hazardous and inert landfills. The proposed treatment option must be compared against a 'three-point test'.

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

There are limited exceptions to the above:

- it is inert waste for which treatment is not technically feasible
- it is waste other than inert waste and treatment would not reduce its quantity or the hazards that it poses to human heath or the environment

The waste producer should either

- treat their own waste and provide information about the treatment for subsequent holders, or
- ensure that the waste would be treated by a subsequent holder prior to landfilling

The waste producer or holder should produce a written statement detailing the type of treatment and if relevant the amount of waste sorted out for recovery or alternative treatment.

Based on the foregoing Guidance, it is evident that the current methods of simply removing "contaminated" soil from the site will have to be amended. Preferably as much soil as possible should remain on site, where possible; for example, under areas of hard cover, paths, drives etc. Soils that are to be removed from site must be treated and this may simply be sorting for example the removal of brick and concrete, which can be crushed and used elsewhere. Contaminated soils will require treatment either on site or at a specialist facility prior to disposal. It will be important therefore to ensure that the new guidelines are followed during the development of the site. This is likely to have implications on the development both in terms of cost and these should be carefully considered prior to commencement.

Appendix E

Environment Agency Map - Risk of Flooding from Rivers and Sea

BETA This is a new service – your feedback will help us to improve it.

Learn more about flood risk

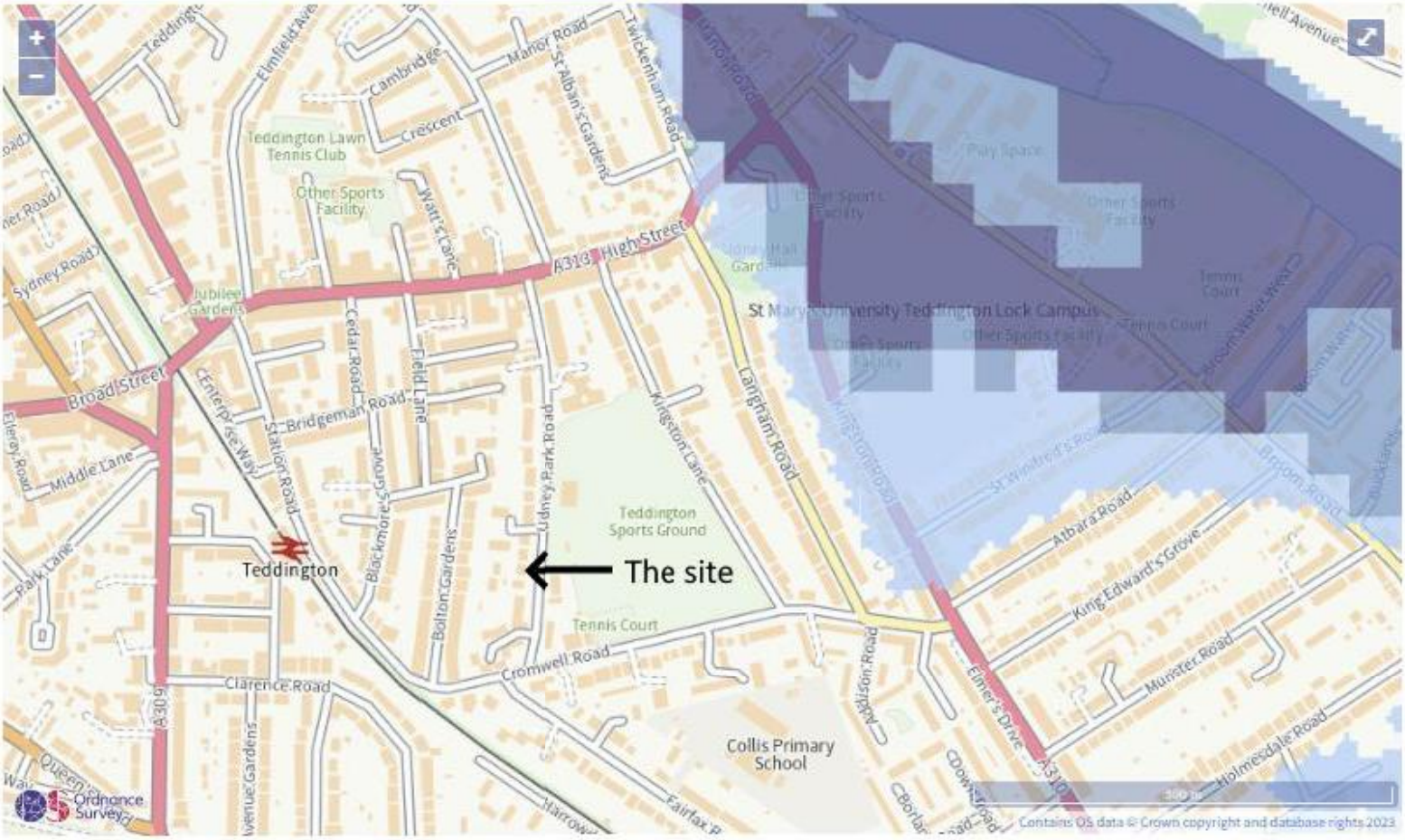
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

tw11 9bg



Extent of flooding from rivers or the sea

High Medium Low Very low

Appendix F

Environment Agency Map - Risk of flooding from Surface Water

GOV.UK **Check your long term flood risk**

BETA This is a new service – your feedback will help us to improve it.

Learn more about flood risk

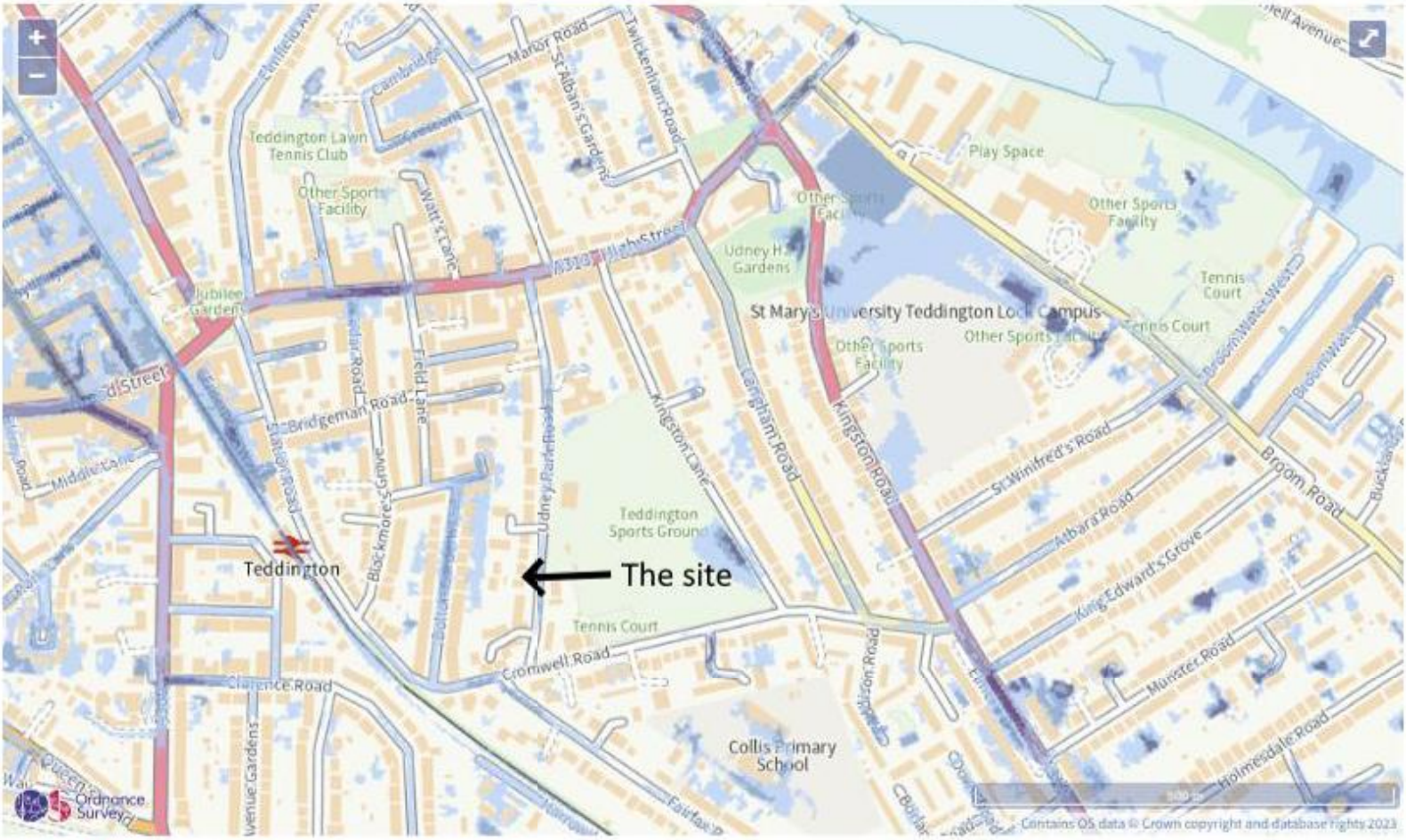
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

tw11 9bg



Extent of flooding from surface water

High Medium Low Very low

Appendix G

Environment Agency Map - Risk of flooding from Reservoirs

GOV.UK **Check your long term flood risk**

BETA This is a new service – your feedback will help us to improve it.

Learn more about flood risk

Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

tw11 9bg

Maximum extent of flooding from reservoirs:

when river levels are normal when there is also flooding from rivers

Appendix H

Burras Ltd method statement: CFA Piling - Secant wall

BURRAS Ltd
CIVIL ENGINEERING AND PILING CONTRACTORS

RISK ASSESSMENT
&
METHOD STATEMENT

For

CFA PILING – SECANT WALL

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Directors: M.Burras Vat Registration No. 109222011

Table of Contents

CFA Piling – Secant Wall				Date:	09.02.23
Job:	32 Udney Park Road, Teddington				
Client:	Mr N Jarvis				
Lengths	Soft Piles: See design		Hard Piles: See design	Centres: 700	

This site specific method statement describes the work carried out in the construction of CFA secant wall using a Piling Rig .

1. Materials & Plant

- Piling Rig – Soiltek S100
- Excavator
- Reinforcement cages
- Spacers
- Concrete pump *(image 1)*
- Concrete drum *(image 1)*

2. Task 1 – Drilling (Soft and Hard Piles)

a. Install and test pile matt
b. Mobilise Rig
c. Mark out pile locations
d. See *diagram 1* below for pile drilling sequence
e. Align auger guide over the pile location *(image 2)*
f. Drill to required depth ensuring that auger stays vertical
g. Remove spoil with mini digger to keep area clear.
h. Once depth is reach signal to pump operator to start pumping concrete
i. Retract auger as concrete is pumped
j. Once the pile is formed the pump operator will release the pressure with 5 back pumps
k. Repeat until desired number of piles are bored

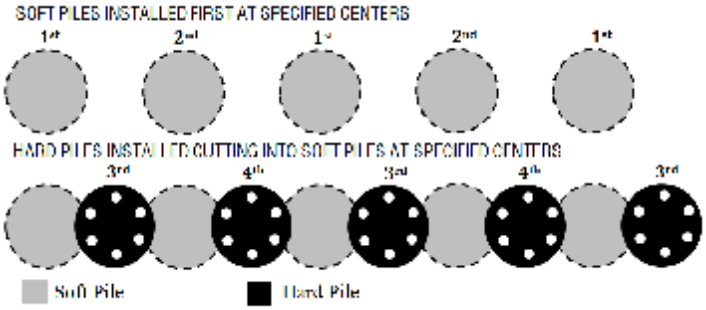

DIAGRAM 1: PILING SEQUENCE

3. Task 2 - Inserting Cage (Hard Piles only)

a. Ensure the bucket if removed from the excavator
b. Attach spacers while cages are on the ground
c. Lift and lower cages into wet concrete with the excavator *(image 3)*
d. Ensure cages are placed at the correct depth

Image 4: Shows the secant wall after excavation.

Risk Assessment

Item	Associated Hazard/Risk	Consequences	Control Measures
1.	Any visitors on behalf of Burras Ltd to be escorted to the work areas and around the project site.	Injury to third Parties.	Where necessary working area to be barrierd off and appropriate warning signs erected. Necessary PPE to be issued to all visitors.
2.	Prior to starting work	Safety Precautions.	All working operations to be planned prior to starting. Survey site and work area, check for overhead cables and obstructions etc. All operatives must attend the Principal Contractors site safety induction before commencing work on site. All operatives will be given a tool box talk on the contents of the method statement given by Burras Ltd site foreman. All Burras Ltd personnel will sign in/out of site each day. Any permits to Work will be issued by the Principal Contractor. Checks will be made before work commences to ensure that there are no underground or overhead services. A qualified banksman will be used where necessary
3.	Emergency		The emergency assembly point and emergency signal will be highlighted during the Principal Contractors safety induction briefing. All operatives will assemble at the nominated assembly point when the emergency signal is sounded.
4.	First Aid		A qualified first aider will attend all incidents and accidents; this will be the responsibility of the Principle Contractor. The names of the first aiders will be

Item	Associated Hazard/Risk	Consequences	Control Measures
			highlighted at the safety induction briefing; they will also be displayed on notices around the site. All accidents will be recorded in the Principle Contractors accident book and Burras Ltd personnel will also use the Burras accident book, there will be kept in the site office. All accidents and incidents will be reported to the Principal Contractor and Burras Foreman.
5.	Damaging existing utilities	Risk of electric Shock, burning injury, fire, Explosion, flooding, Gas inhalation, fatality.	The site will be scanned using a Cable Avoidance Tool (CAD) the operator will be trained and competent. All services will be highlighted by a spray line or chalk etc. A suitable fire extinguisher will be available on site. A permit to excavate will be issued by the Principle Contractor.
6.	Pile set our pins	Injury by tripping or falling onto pin	Pins will be clearly marked with tags and or spray line; a protective cap will be fitted over the exposed ends.
7	Fluid, hydraulic, water level checks on piling rig and concrete pump etc. checks for hydraulic or air entrapment within pipe lines.	Noise, fumes, dermatitis	Hearing, eye, respiratory, hand and foot protection must be worn. Fuel will be contained in a suitably constructed catchment bund or a double skinned bowser with drip tray.
8	Injury by being struck from delivery vehicles, piling rig or excavator.	Rig overturning-Impact, personal injury, damage to property. Struck by moving machinery	Piling rig will be set on approved platform. A qualified banksman will direct vehicular movements in accordance with the Principal Contractor. All personnel will wear Hi-Visibility clothing at all times during vehicle movements. All vehicles will have flashing warning lamps operational.

Item	Associated Hazard/Risk	Consequences	Control Measures
9	Commencement of auguring works.	Entanglement in rotating augers, cuts, bruising, severed limbs or fatality.	The driver will be responsible for the activities of the piling gang working in front of the rig at all times and in association with the banksman. The auger gate will be kept closed at all timed during drilling process. The auger cleaning mechanism will be in place and used during drilling operations. Protective gloves will be worn during the handling of the augers, protection to the body will be provided by a coverall/boiler suit.
9	Contact with human excrement/animal/human bones or other harmful substances.	Wells Disease, anthrax, tetanus, fatality. Immediately cease work and contact the Site Foreman, Contract Manager Health and Safety Adviser or Site Agent.	All personnel will cover any cuts or skin abrasions with suitable medical dressing prior to starting work. The site Foreman will ensure that PPE is worn at all times during working operations, Hygiene standards will be monitored by the Site Foreman. Area or work will be cordoned off with steel road pins and hazard warning tape.
10.	Unauthorized persons Entering work site/pilling areas.	Contact with moving machinery, struck by moving machinery, struck by piling rig, hit by falling spoil from piling rig.	All piling operatives will communicate with any persons unauthorized in the piling areas. Only authorized personnel will be permitted into the piling/ work areas.

Item	Associated Hazard/Risk	Consequences	Control Measures
11	Removal of spoil Falling spoil	Slips, trips and falls due to the spoil heap in close proximity of the bored holes. Collision with plant	The work areas will be kept clear of excess spoil. The spoil will be removed by the excavator and a dumper to a designated area, in co-ordination with the Principal Contractor. Suitable PPE will be worn at all times during working operations. All plant operatives will be competent and qualified. A banksman will be in attendance at all times during vehicular movements.
12	Handling of augers	Manual handling injuries, loose spoil, cuts to hands and arms during handling.	Augers will be stacked away from the general work and personnel routes/away from work areas. A lifting appliance will be used to lift the augers, typically the excavator with certificated chain attached, PPE will be worn at all times during auger movements, i.e. gloves foot protection, goggles/eye protection
13	Open pile/augured holes	Entrapment of feet in open bored holes resulting in falls or personal injuries.	Open holes will be covered if borehole is not to be filled immediately. Use suitable metal or timber cover plates.
14	Handling of reinforcement cages or bars.	Cuts to hands/arms during the handling of reinforcement bars. Striking personnel.	Gloves, head and foot protection will be worn and arms. Body covered during lifting cages into position. Guide ropes will be used at all times. The lifting ropes will be used planned by the Site Foreman. A qualified banksman will be used to control lifting operations. The lift areas will be inspected for overhead obstructions before lifts take place.

Item	Associated Hazard/Risk	Consequences	Control Measures
			No loads will be lifted over personnel. No loads will be lifted within 6 meters of overhead electrical cables. Adequate lighting will be available, should the light levels fall below an acceptable level.
15	Working with concrete.	Burns to skin Damage to eyes.	Gloves, eye protection and overalls will be worn at all times during concerting operations to guard against splashes.
16	Working with concrete	Burns from wet concrete, noise from pump, fumes from pump.	Gloves, eye protection and overalls will be worn at all times during concreting operations to guard against splashes. Hearing protection will be used if acoustic panels are not adequate. Exhaust will be directed away from personnel.
17	Tripping Operatives/others injured on protruding reinforcement bars.	Personal injuries.	Protective caps will be placed over vertical reinforcement bars. Spray paint will be used to highlight positions of any protruding bars.
18	COSHH	Personal injuries, burns.	All operatives will read and be instructed on the safety procedures to follow on any hazardous substances used within the work site. All operatives will wear suitable PPE as directed by the COSHH assessments. Any wet concrete or cement powder on the skin will be immediately washed off with clean fresh water. First aid will be available within the work site at all times.
19	Spoil falling on train line	Disruption to network rail	An Auger cleaner will be used at all times to ensure there is no spoil left on augers as well as some in attendance to stop operation if spoil is missed. No pile will be with 1.5m to site boundary along the railway.
20	Overturning of piling rig adjacent to Railway Piling rig overturning	Serious Delays to network rail, Injury to Operatives network rail users/	Piling platform to be installed, to insure that the rig is stable at all times. Loading of the rig has already been passed onto South Coast Constructions.

Item	Associated Hazard/Risk	Consequences	Control Measures
	Interference with Network Rail lines and signals	operatives	The Piling Rig must never be placed in a position where it could destabilise or turn over and fall into Network Rail property. Design Team / PC to ensure the ground on site is stabilised and adequate piling mat is designed and constructed.
21	Vibration affect the adjoining railway and signals	Serious Delays to network rail Damage to lines	CFA Piling is to be used which produces almost no Vibrations
22	Spoil Entering network rail site	Serious Delays to network rail Damage to lines	Piling rig to be kept away from site boundary at all times where possible. Hoardings to be installed along boundary by Principle contractor to prevent spoil from entering site.

Authorized By: M Burras for Burras Ltd.

Method Statement

See also, site specific method statement at the front of this document

1. General Safety Induction

A representative of the Principal Contractor will carry out a site safety induction for Burras Ltd site operatives. The safety induction will highlight the hazards and risks related to the site and work areas also items such as smoking/non-smoking areas, fire precautions and means of access and egress etc.

2. Facilities: The Principal Contractor will provide the following facilities

- Water supply equivalent to ¾ inch supply at mains pressure located adjacent to the piling areas.
- Prepare and maintain all weather hard-standing for the piling rig, delivery vehicles, access and egress areas.
- Welfare facilities.
- Access ramping for concrete holding drum and its subsequent removal, if required.
- Fencing/hoarding as necessary to protect adjacent structures and the public areas from splashing as necessary.
- Location of existing utility services and diversion/making safe as necessary.

3. Pre-Commencement Operations

3.1 All site operatives will sign in/out on a daily basis at the site office or at a designated location.

3.2 It is essential that the piling platform is firm level, where necessary steel road plates will be installed to ensure the safe working of the rig during construction of the piles and on site traversing. The principal contractor will undertake this in accordance with Burras Ltd Guidance.

3.3 It will be the responsibility of the Principal Contractor to administer a permit to lead system on the piling mat and rig operating areas.

3.4 Prior to piling works it is the responsibility of the Principal Contractor to ensure that the ground is suitable/free from obstruction and services, which will subsequently hamper or delay the pining operations.

3.5 The Principal Contractor will ensure that a Permit to Excavate is issued to Burras Ltd; this should be completed prior to ground breaking operations commencing.

3.6 Any health and safety issues raised during the safety induction will be discussed with the Principle Contractor before work commences.

3.7 All Burras Ltd operator training certificated will be copied and issued to the Principal Contractor before works commence.

3.8 All Burras Ltd personnel are competent and trained for the function sand work being carried out.

4. Sequence of Pile Construction for CFA Piling

4.1 Access and Egress to site

4.1.1 Access for both the piling rig and materials will be via site entrance during normal working hours and in accordance with the Principal Contractors instructions.

4.1.2 Materials will be unloaded and stored in the designated areas as advised by the Principal Contractor.
4.1.3 Delivery times will be undertaken in agreement with the Principal Contractor.
4.1.4 Deliveries of materials and plant will be checked against those itemised in the quality plan/start up documentation.
4.1.5 Any damaged or missing materials/plant will be logged on the delivery sheets.
4.1.6 All plant will be checked for operability before delivery vehicles leaves site.
4.1.7 Any defects, breakdowns or problems with plant will be reported to the Burras Ltd plant engineer.

4.2 The Setting up of the Self-Propelled Piling Rig

4.2.1 The piling rig will arrive on site in a mobilised position, before work can commence the rig must be assembled.
4.2.2 The machine operator will unbolt the mast extension and with the aid of an excavator or telehandler and lifting strop will swing the mast to a straight position and then bolted up.
4.2..3 The excavator will then assist in slightly lifting the mast so the stabilising bolt can be taken out.
4.2.4 The mast will then be hydraulically raised to and upright position and the necessary bolts will be positioned.
4.2.5 At this stage the augers will be attached, firstly the lead auger will be placed under the rotary table and connected to the machine, this will allow the pin to be inserted and drill into the ground.
4.2.6 The lead will be disconnected from the rotary and took out of the way the second section of auger will be lifted with the auxiliary winch, it will be slotted into the top of the lead, the banksman will then climb the ladder until he is in line with the connection of the winch line, at this point the banksmans' harness to a connection on the rig above head height, the banksman will unattach the rig and climb carefully down from the rig.
4.2.7 The rotary is then positioned over the augers and drilled into the ground, this is carried out until all augers are in place on the machine.
4.2.8 The piling rig is now ready for inspection by the rig operator, who will carry out the final safety checks.
4.2.9 All rig set up will be in accordance with the machine manufactures instructions.

4.3 Setting up of Pile Position and Rig Location

4.3.1 The pile positions will be set out by Burras Ltd in conjunction with the Principal Contractor. Using 300mm long steel pins and suitable tagging with the pile numbers as defined in the pile layout drawing.
4.3.2 The Principal Contractor will advise Burras Ltd on the pile sequence in accordance with the Permit to Excavate (where applicable.)
4.3.3 The piling rig will be tracked into position in accordance with the Principal Contractor instructions due to the nature of the work environment.
4.3.4 The auger will be centred over the pile position, at this point the mast of the rig will be checked in the vertical planes in both directions (piles will be constructed at a sufficient distance so that recently cast piles will be unaffected).

4.4 Boring the Pile

4.4.1 The piles will be constructed using a diesel/hydraulic track mounted continuous flight auger piling rig with a computerized monitoring system.

4.4.2 Piles will be constructed using the specified diameter auger using continuous length augers until the specified depth is reached.

4.4.3 Spoil generated from the pile bore will be removed from the immediate piling area to enable reasonable access to the front of the rig by the Banksman. Burras Ltd will then remove the spoil at agreed intervals. An excavator shall be in attendance to perform this function.

4.5 Forming the Pile

4.5.1 Aggregate grading from fine to 10mm will be used.

4.5.2 Piles will be formed by retracting the augers after the correct depth of hole has been reached. Ready mixed concrete will be pumped via a trailer mounted concrete pump through the stem of the auger as it is being retracted. Concrete will be stored on site in a skid mounted rotating agitator drum

4.5.3 At the achieved depth the reinforcement will be inserted into the wet concrete.

4.6 Placing Reinforcement – Wet Bore

4.6.1 The Site Foreman, Site Agent/Engineer will inspect the reinforcement cages prior to insertion in the pile bore hole.

4.6.2 The reinforcement cages will be fabricated on site by Burras Ltd, these will be lifted into position and lowered into the bore hole by the excavator. The levels will be decided as the job progresses, the protruding bars will be covered with protection caps, and the client will expose the piles at a later date and gun them to the required depth.

4.6.3 The above process will be repeated for each pile.

4.6.4 During the lifting and positioning of the reinforcement cages, guide ropes will be used. This will assist in the safe movement of the cages.

4.6.5 The main bars and helical reinforcement will be manufactured in accordance with the relevant British Standards, it will be supplied by a CARES (UK Certification Authority from Reinforcing Steels) supplier.

4.6.6 Pile cages will be fabricated on site in accordance with the requirements of the pile design.

5. Testing – by main principle contractor

5.1 Two sets of 4 in number 150mm concrete cubes will be taken each day of piling to be tested one at 7 days, one at 14 days, one at 28 days and one spare.

5.2 The delivery ticket for each load of concrete will be checked and held onsite to ensure the correct mix has been delivered.

5.3 Slump tests will be carried out by the principle contractor to determine concrete workability

6. Materials to be Stored on Site

6.1 Diesel contained within bunded area.

6.2 Rebar (pile reinforcement).

6.3 Wheel spacers.

7. General Site Safeties

7.1 Personal protective Equipment (PPE) will be provided for all personnel, as a minimum the following will be available:

Safety Head Protection.
Safety Footwear.
Hand Protection.
Eye/Face Protection.
Hi-Visibility Clothing.
Overalls.

It is the responsibility of all personnel to wear the protective equipment provided, as defined by the risk assessments, the site Foreman will enforce this policy and ensure that the correct equipment is worn when required.

8. Plant Details

8.1 Piling Rig.
8.2 Excavator.
8.3 Trailer mounted concrete pump.
8.4 Concrete holding drum.
8.5 Bunded tank holders.
8.6 Secure stores.
8.7 Assorted ancillary piling equipment.

9. Site Supervision

9.1 The site Foreman is responsible for all aspects of the site operations and will ensure that the works are undertaken in accordance with the procedures set out within this document.

Authorized By: M Burras for Burras Ltd.

Appendix J

Burras Ltd method statement: CFA Piling - Load Bearing Piles

BURRAS Ltd
CIVIL ENGINEERING AND PILING CONTRACTORS

RISK ASSESSMENT
&
METHOD STATEMENT

For

CFA PILING - LOAD BEARING

Registered Office: Walton Road, Farlington, Portsmouth, Hampshire Po6 1UJ.
Telephone: 02392 463558 Facsmile: 02392463242
Email: enquiries@burras.com
www.burras.com
Directors: M.Burras Vat Registration No. 109222011

Table of Contents

CFA Piling – Load Bearing				Date:	09.02.23
Job:	32 Udney Park Road, Teddington				
Client:	Mr N Jarvis				
Lengths	Length:	See design	Reinforcement	See design	Diameter 450mm

This site specific method statement describes the work carried out in the construction of CFA load bearing pile using a Piling Rig for 2 and 2a Woodlands Way.

1. Materials & Plant

- Piling Rig
- Excavator
- Reinforcement cages
- Spacers
- Concrete pump *(image 1)*
- Concrete drum *(image 1)*

2. Task 1 – Drilling

a. Install & test piling matt
b. Mobilise Rig
c. Mark out pile locations
d. Align auger guide over the pile location *(image 2)*
e. Drill to require depth ensuring that auger stays vertical
f. Remove spoil with mini digger to keep area clear.
g. Once depth is reach signal to pump operator to start pumping concrete
h. Retract auger as concrete is pumped
i. Once the pile is formed the pump operator will release the pressure with 5 back pumps
j. Repeat until desired number of piles are bored

3. Task 2 – Clear hole

a. Ensure the bucket if attached to the excavator
b. Remove all spoil from around the recently bored hole
c. With a graft remove reaming spoil in hole so that the cage can be inserted *(image 4)*

4. Task 3 - Inserting Cage – by hand

d. Ensure the cages can be safely lifted by one person
e. Attach spacers while cages are on the ground
f. Lift and lower cages into wet concrete *(image 3)*
g. Ensure cages are placed at the correct depth

5. Task 3 - Inserting Cage – with excavator

h. Ensure the bucket if removed from the excavator
i. Attach spacers while cages are on the ground
j. Lift and lower cages into wet concrete with the excavator
k. Ensure cages are placed at the correct depth

BURRAS Ltd
CIVIL ENGINEERING AND PILING CONTRACTORS

Registered Office: Walton Road, Farlington, Portsmouth, Hampshire Po6 1UJ.
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Email: enquiries@burras.com
Directors: M.Burras Vat Registration No. 109222011

Risk Assessment

Item	Associated Hazard/Risk	Consequences	Control Measures
1.	Any visitors on behalf of Burras Ltd to be escorted to the work areas and around the project site.	Injury to third Parties.	Where necessary working area to be barrierd off and appropriate warning signs erected. Necessary PPE to be issued to all visitors.
2.	Prior to starting work	Safety Precautions.	All working operations to be planned prior to starting. Survey site and work area, check for overhead cables and obstructions etc. All operatives must attend the Principal Contractors site safety induction before commencing work on site. All operatives will be given a tool box talk on the contents of the method statement given by Burras Ltd site foreman. All Burras Ltd personnel will sign in/out of site each day. Any permits to Work will be issued by the Principal Contractor. Checks will be made before work commences to ensure that there are no underground or overhead services. A qualified banksman will be used where necessary
3.	Emergency		The emergency assembly point and emergency signal will be highlighted during the Principal Contractors safety induction briefing. All operatives will assemble at the nominated assembly point when the emergency signal is sounded.
4.	First Aid		A qualified first aider will attend all incidents and accidents; this will be the responsibility of the Principle Contractor. The names of the first aiders will be

Item	Associated Hazard/Risk	Consequences	Control Measures
			highlighted at the safety induction briefing; they will also be displayed on notices around the site. All accidents will be recorded in the Principle Contractors accident book and Burras Ltd personnel will also use the Burras accident book, there will be kept in the site office. All accidents and incidents will be reported to the Principal Contractor and Burras Foreman.
5.	Damaging existing utilities	Risk of electric Shock, burning injury, fire, Explosion, flooding, Gas inhalation, fatality.	The site will be scanned using a Cable Avoidance Tool (CAD) the operator will be trained and competent. All services will be highlighted by a spray line or chalk etc. A suitable fire extinguisher will be available on site. A permit to excavate will be issued by the Principle Contractor.
6.	Pile set our pins	Injury by tripping or falling onto pin	Pins will be clearly marked with tags and or spray line; a protective cap will be fitted over the exposed ends.
7	Fluid, hydraulic, water level checks on piling rig and concrete pump etc. checks for hydraulic or air entrapment within pipe lines.	Noise, fumes, dermatitis	Hearing, eye, respiratory, hand and foot protection must be worn. Fuel will be contained in a suitably constructed catchment bund or a double skinned bowser with drip tray.
8	Injury by being struck from delivery vehicles, piling rig or excavator.	Rig overturning-Impact, personal injury, damage to property. Struck by moving machinery	Piling rig will be set on approved platform. A qualified banksman will direct vehicular movements in accordance with the Principal Contractor. All personnel will wear Hi-Visibility clothing at all times during vehicle movements. All vehicles will have flashing warning lamps operational.

Item	Associated Hazard/Risk	Consequences	Control Measures
9	Commencement of auguring works.	Entanglement in rotating augers, cuts, bruising, severed limbs or fatality.	The driver will be responsible for the activities of the piling gang working in front of the rig at all times and in association with the banksman. The auger gate will be kept closed at all timed during drilling process. The auger cleaning mechanism will be in place and used during drilling operations. Protective gloves will be worn during the handling of the augers, protection to the body will be provided by a coverall/boiler suit.
9	Contact with human excrement/animal/human bones or other harmful substances.	Wells Disease, anthrax, tetanus, fatality. Immediately cease work and contact the Site Foreman, Contract Manager Health and Safety Adviser or Site Agent.	All personnel will cover any cuts or skin abrasions with suitable medical dressing prior to starting work. The site Foreman will ensure that PPE is worn at all times during working operations, Hygiene standards will be monitored by the Site Foreman. Area or work will be cordoned off with steel road pins and hazard warning tape.
10.	Unauthorized persons Entering work site/pilling areas.	Contact with moving machinery, struck by moving machinery, struck by piling rig, hit by falling spoil from piling rig.	All piling operatives will communicate with any persons unauthorized in the piling areas. Only authorized personnel will be permitted into the piling/ work areas.

Item	Associated Hazard/Risk	Consequences	Control Measures
11	Removal of spoil Falling spoil	Slips, trips and falls due to the spoil heap in close proximity of the bored holes. Collision with plant	The work areas will be kept clear of excess spoil. The spoil will be removed by the excavator and a dumper to a designated area, in co-ordination with the Principal Contractor. Suitable PPE will be worn at all times during working operations. All plant operatives will be competent and qualified. A banksman will be in attendance at all times during vehicular movements.
12	Handling of augers	Manual handling injuries, loose spoil, cuts to hands and arms during handling.	Augers will be stacked away from the general work and personnel routes/away from work areas. A lifting appliance will be used to lift the augers, typically the excavator with certificated chain attached, PPE will be worn at all times during auger movements, i.e. gloves foot protection, goggles/eye protection
13	Open pile/augured holes	Entrapment of feet in open bored holes resulting in falls or personal injuries.	Open holes will be covered if borehole is not to be filled immediately. Use suitable metal or timber cover plates.
14	Handling of reinforcement cages or bars.	Cuts to hands/arms during the handling of reinforcement bars. Striking personnel.	Gloves, head and foot protection will be worn and arms. Body covered during lifting cages into position. Guide ropes will be used at all times. The lifting ropes will be used planned by the Site Foreman. A qualified banksman will be used to control lifting operations. The lift areas will be inspected for overhead obstructions before lifts take place.

Item	Associated Hazard/Risk	Consequences	Control Measures
			No loads will be lifted over personnel. No loads will be lifted within 6 meters of overhead electrical cables. Adequate lighting will be available, should the light levels fall below an acceptable level.
15	Working with concrete.	Burns to skin Damage to eyes.	Gloves, eye protection and overalls will be worn at all times during concerting operations to guard against splashes.
16	Working with concrete	Burns from wet concrete, noise from pump, fumes from pump.	Gloves, eye protection and overalls will be worn at all times during concreting operations to guard against splashes. Hearing protection will be used if acoustic panels are not adequate. Exhaust will be directed away from personnel.
17	Tripping Operatives/others injured on protruding reinforcement bars.	Personal injuries.	Protective caps will be placed over vertical reinforcement bars. Spray paint will be used to highlight positions of any protruding bars.
18	COSHH	Personal injuries, burns.	All operatives will read and be instructed on the safety procedures to follow on any hazardous substances used within the work site. All operatives will wear suitable PPE as directed by the COSHH assessments. Any wet concrete or cement powder on the skin will be immediately washed off with clean fresh water. First aid will be available within the work site at all times.

Authorized By: M Burras for Burras Ltd.

Method Statement

See also, site specific method statement at the front of this document

1. General Safety Induction

A representative of the Principal Contractor will carry out a site safety induction for Burras Ltd site operatives. The safety induction will highlight the hazards and risks related to the site and work areas also items such as smoking/non-smoking areas, fire precautions and means of access and egress etc.

2. Facilities: The Principal Contractor will provide the following facilities

- Water supply equivalent to ¾ inch supply at mains pressure located adjacent to the piling areas.
- Prepare and maintain all weather hard-standing for the piling rig, delivery vehicles, access and egress areas.
- Welfare facilities.
- Access ramping for concrete holding drum and its subsequent removal, if required.
- Fencing/hoarding as necessary to protect adjacent structures and the public areas from splashing as necessary.
- Location of existing utility services and diversion/making safe as necessary.

3. Pre-Commencement Operations

3.1 All site operatives will sign in/out on a daily basis at the site office or at a designated location.

3.2 It is essential that the piling platform is firm level, where necessary steel road plates will be installed to ensure the safe working of the rig during construction of the piles and on site traversing. The principal contractor will undertake this in accordance with Burras Ltd Guidance.

3.3 It will be the responsibility of the Principal Contractor to administer a permit to lead system on the piling mat and rig operating areas.

3.4 Prior to piling works it is the responsibility of the Principal Contractor to ensure that the ground is suitable/free from obstruction and services, which will subsequently hamper or delay the pining operations.

3.5 The Principal Contractor will ensure that a Permit to Excavate is issued to Burras Ltd; this should be completed prior to ground breaking operations commencing.

3.6 Any health and safety issues raised during the safety induction will be discussed with the Principle Contractor before work commences.

3.7 All Burras Ltd operator training certificated will be copied and issued to the Principal Contractor before works commence.

3.8 All Burras Ltd personnel are competent and trained for the function sand work being carried out.

4. Sequence of Pile Construction for CFA Piling

4.1 Access and Egress to site

4.1.1 Access for both the piling rig and materials will be via site entrance during normal working hours and in accordance with the Principal Contractors instructions.

4.1.2 Materials will be unloaded and stored in the designated areas as advised by the Principal Contractor.
4.1.3 Delivery times will be undertaken in agreement with the Principal Contractor.
4.1.4 Deliveries of materials and plant will be checked against those itemised in the quality plan/start up documentation.
4.1.5 Any damaged or missing materials/plant will be logged on the delivery sheets.
4.1.6 All plant will be checked for operability before delivery vehicles leaves site.
4.1.7 Any defects, breakdowns or problems with plant will be reported to the Burras Ltd plant engineer.

4.2 The Setting up of the Self-Propelled Piling Rig

4.2.1 The piling rig will arrive on site in a mobilised position, before work can commence the rig must be assembled.
4.2.2 The machine operator will unbolt the mast extension and with the aid of an excavator or telehandler and lifting strop will swing the mast to a straight position and then bolted up.
4.2..3 The excavator will then assist in slightly lifting the mast so the stabilising bolt can be taken out.
4.2.4 The mast will then be hydraulically raised to and upright position and the necessary bolts will be positioned.
4.2.5 At this stage the augers will be attached, firstly the lead auger will be placed under the rotary table and connected to the machine, this will allow the pin to be inserted and drill into the ground.
4.2.6 The lead will be disconnected from the rotary and took out of the way the second section of auger will be lifted with the auxiliary winch, it will be slotted into the top of the lead, the banksman will then climb the ladder until he is in line with the connection of the winch line, at this point the banksmans' harness to a connection on the rig above head height, the banksman will unattach the rig and climb carefully down from the rig.
4.2.7 The rotary is then positioned over the augers and drilled into the ground, this is carried out until all augers are in place on the machine.
4.2.8 The piling rig is now ready for inspection by the rig operator, who will carry out the final safety checks.
4.2.9 All rig set up will be in accordance with the machine manufactures instructions.

4.3 Setting up of Pile Position and Rig Location

4.3.1 The pile positions will be set out by Burras Ltd in conjunction with the Principal Contractor. Using 300mm long steel pins and suitable tagging with the pile numbers as defined in the pile layout drawing.
4.3.2 The Principal Contractor will advise Burras Ltd on the pile sequence in accordance with the Permit to Excavate (where applicable.)
4.3.3 The piling rig will be tracked into position in accordance with the Principal Contractor instructions due to the nature of the work environment.
4.3.4 The auger will be centred over the pile position, at this point the mast of the rig will be checked in the vertical planes in both directions (piles will be constructed at a sufficient distance so that recently cast piles will be unaffected).

4.4 Boring the Pile

4.4.1 The piles will be constructed using a diesel/hydraulic track mounted continuous flight auger piling rig with a computerized monitoring system.

4.4.2 Piles will be constructed using the specified diameter auger using continuous length augers until the specified depth is reached.

4.4.3 Spoil generated from the pile bore will be removed from the immediate piling area to enable reasonable access to the front of the rig by the Banksman. Burras Ltd will then remove the spoil at agreed intervals. An excavator shall be in attendance to perform this function.

4.5 Forming the Pile

4.5.1 Aggregate grading from fine to 10mm will be used.

4.5.2 Piles will be formed by retracting the augers after the correct depth of hole has been reached. Ready mixed concrete will be pumped via a trailer mounted concrete pump through the stem of the auger as it is being retracted. Concrete will be stored on site in a skid mounted rotating agitator drum

4.5.3 At the achieved depth the reinforcement will be inserted into the wet concrete.

4.6 Placing Reinforcement – Wet Bore

4.6.1 The Site Foreman, Site Agent/Engineer will inspect the reinforcement cages prior to insertion in the pile bore hole.

4.6.2 The reinforcement cages will be fabricated on site by Burras Ltd, these will be lifted into position and lowered into the bore hole by the excavator. The levels will be decided as the job progresses, the protruding bars will be covered with protection caps, and the client will expose the piles at a later date and gun them to the required depth.

4.6.3 The above process will be repeated for each pile.

4.6.4 During the lifting and positioning of the reinforcement cages, guide ropes will be used. This will assist in the safe movement of the cages.

4.6.5 The main bars and helical reinforcement will be manufactured in accordance with the relevant British Standards, it will be supplied by a CARES (UK Certification Authority from Reinforcing Steels) supplier.

4.6.6 Pile cages will be fabricated on site in accordance with the requirements of the pile design.

5. Testing – by main principle contractor

5.1 Two sets of 4 in number 150mm concrete cubes will be taken each day of piling to be tested one at 7 days, one at 14 days, one at 28 days and one spare.

5.2 The delivery ticket for each load of concrete will be checked and held onsite to ensure the correct mix has been delivered.

5.3 Slump tests will be carried out by the principle contractor to determine concrete workability

6. Materials to be Stored on Site

6.1 Diesel contained within bunded area.

6.2 Rebar (pile reinforcement).

6.3 Wheel spacers.

7. General Site Safeties

7.1 Personal protective Equipment (PPE) will be provided for all personnel, as a minimum the following will be available:

Safety Head Protection.
Safety Footwear.
Hand Protection.
Eye/Face Protection.
Hi-Visibility Clothing.
Overalls.

It is the responsibility of all personnel to wear the protective equipment provided, as defined by the risk assessments, the site Foreman will enforce this policy and ensure that the correct equipment is worn when required.

8. Plant Details

8.1 Piling Rig.
8.2 Excavator.
8.3 Trailer mounted concrete pump.
8.4 Concrete holding drum.
8.5 Bunded tank holders.
8.6 Secure stores.
8.7 Assorted ancillary piling equipment.

9. Site Supervision

9.1 The site Foreman is responsible for all aspects of the site operations and will ensure that the works are undertaken in accordance with the procedures set out within this document.

Authorized By: M Burras for Burras Ltd.

I have read and understood the above document

Name	Signature	Date

Appendix K

Burras Ltd method statement: Bulk Excavation

BURRAS Ltd
CIVIL ENGINEERING AND PILING CONTRACTORS

RISK ASSESSMENT

&

METHOD STATEMENT

Bulk Excavation

Registered Office: Walton Road, Farlington, Portsmouth, Hampshire Po6 1UJ.
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Email: enquiries@burras.com
www.burras.com
Directors: M.Burras Vat Registration No. 109222011

Bulk Excavation Method Statement

- Bulk excavation will commence upon completion of secant piled retaining wall. This will be prior to the installation of the ground beam.
- Trim Piles to level
- Once piles are trimmed to level monitoring stations will be installed
- Bracing and temporary propping is required to the secant piled retaining wall during bulk excavation. Excavate site working back towards site entrance. Site will be excavated to 1.5m below top of pile to allow for installation of waling and props.
- Excavation to continue with careful consideration to temporary props to 0.5m above reduced dig level to allow installation of load bearing piles in centre of basement.
- Excavated material will be loaded directly into muck away lorries.
- Contaminated muck will be dealt with as per method statement previously issued
- Lorries will be directed onto and off site.

Plant

The following plant will be used for bulk excavation:

- TB250 – Takeuchi 5 t mini digger
- TB016 – Takeuchi 1.5 t mini digger
- 21 t excavator Volvo EC220DNL

All plant has up to date service tickets

Groundwater

- Dewatering may be required due to existing ground water levels.

General Safety Induction

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Facilities: The Principal Contractor will provide the following facilities

- Water supply equivalent to ¾ inch supply at mains pressure.
- Welfare facilities.
- Fencing/hoarding as necessary to protect adjacent structures and the public areas from splashing as necessary.
- Location of existing utility services and diversion/making safe as necessary.

Pre-Commencement Operations

- All site operatives will sign in/out on a daily basis at the site office or at a designated location.
- Any health and safety issues raised during the safety induction will be discussed with the Principle Contractor before work commences.
- All Burras Ltd operator training certificated will be copied and issued to the Principal Contractor before works commence.
- All Burras Ltd personnel are competent and trained for the function sand work being carried out.

Access and Egress to site

- Access for materials will be via site entrance during normal working hours and in accordance with the Principal Contractors instructions.
- Materials will be unloaded and stored in the designated areas as advised by the Principal Contractor.
- Delivery times will be undertaken in agreement with the Principal Contractor.
- Deliveries of materials and plant will be checked against those itemised in the quality plan/start up documentation.
- Any damaged or missing materials/plant will be logged on the delivery sheets.
- All plant will be checked for operability before delivery vehicles leaves site.
- Any defects, breakdowns or problems with plant will be reported to the Burras Ltd plant engineer.

Risk Assessment

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2.	Prior to starting work	Safety Precautions.	All working operations to be planned prior to starting. Survey site and work area, check for overhead cables and obstructions etc. All operatives must attend the Principal Contractors site safety induction before commencing work on site. All operatives will be given a tool box talk on the contents of the method statement given by Burras Ltd site foreman. All Burras Ltd personnel will sign in/out of site each day. Any permits to Work will be issued by the Principal Contractor. Checks will be made before work commences to ensure that there are no underground or overhead services. A qualified banksman will be used where necessary Excavator will be cleaned of all contaminants before entering the water.
3.	Emergency		The emergency assembly point and emergency signal will be highlighted during the Principal Contractors safety induction briefing. All operatives will assemble at the nominated assembly point when the emergency signal is sounded.
4.	First Aid		A qualified first aider will attend all incidents and accidents; this will be the responsibility of the Principle Contractor. The names of the first aiders will be highlighted at the safety induction briefing; they will also be displayed on

Item	Associated Hazard/Risk	Consequences	Control Measures
			notices around the site. All accidents will be recorded in the Principle Contractors accident book and Burras Ltd personnel will also use the Burras accident book, there will be kept in the site office. All accidents and incidents will be reported to the Principal Contractor and Burras Foreman.
5.	Damaging existing utilities	Risk of electric Shock, burning injury, fire, Explosion, flooding, Gas inhalation, fatality.	The site will be scanned using a Cable Avoidance Tool (CAD) the operator will be trained and competent. All services will be highlighted by a spray line or chalk etc. A suitable fire extinguisher will be available on site. A permit to excavate will be issued by the Principle Contractor.
6.	Pile set our pins	Injury by tripping or falling onto pin	Pins will be clearly marked with tags and or spray line; a protective cap will be fitted over the exposed ends.
7	Fluid, hydraulic, water level checks on excavator etc. checks for hydraulic or air entrapment within pipe lines.	Noise, fumes, dermatitis	Hearing, eye, respiratory, hand and foot protection must be worn. Fuel will be contained in a suitably constructed catchment bund or a double skinned bowser with drip tray.
8	Injury by being struck from delivery vehicles or excavator.	excavator overturning- Impact, personal injury, damage to property. Struck by moving machinery	A qualified banksman will direct vehicular movements in accordance with the Principal Contractor. All personnel will wear Hi-Visibility clothing at all times during vehicle movements. All vehicles will have flashing warning lamps operational.
9	Commencement of auguring works.	Entanglement in rotating augers, cuts, bruising, severed limbs or fatality.	The driver will be responsible for the activities of the piling gang working in front of the excavator at all times and in association with the banksman. Protective gloves will be worn during the handling of the augers, protection to the body will be provided by a coverall/boiler suit.

Item	Associated Hazard/Risk	Consequences	Control Measures
10	Contact with human excrement/animal/human bones or other harmful substances.	Wells Disease, anthrax, tetanus, fatality. Immediately cease work and contact the Site Foreman, Contract Manager Health and Safety Adviser or Site Agent.	All personnel will cover any cuts or skin abrasions with suitable medical dressing prior to starting work. The site Foreman will ensure that PPE is worn at all times during working operations, Hygiene standards will be monitored by the Site Foreman. Area or work will be cordoned off with steel road pins and hazard warning tape.
11.	Unauthorized persons Entering work site/pilling areas.	Contact with moving machinery, struck by moving machinery, struck by excavator, hit by falling spoil from excavator.	All piling operatives will communicate with any persons unauthorized in the piling areas. Only authorized personnel will be permitted into the piling/ work areas.
12	Vibration Tools	Vibration white finger	Wear suitable hand protection/ anti-vibration gloves for extended use. Take regular breaks from the work. Exercise limbs during the work to ensure correct blood flow etc.
13	Noise	Tinnitus, Noise induced hearing loss	Always wear suitable and sufficient hearing protection, Where the noise assessment shows its required. Provide noise free areas, noise havens. Reduce working periods. Erect warning signs.
14	Handling of augers	Manual handling injuries, loose spoil, cuts to hands and arms during handling.	Augers will be stacked away from the general work and personnel routes/away from work areas. A lifting appliance will be used to lift the augers, typically the excavator with certificated chain attached, PPE will be worn at all times during auger movements, i.e. gloves foot protection, goggles/eye protection
15	Hose burst / pneumatic	Eye / facial / skin injury/ whiplash Contamination	Check all connections are secure before use, check condition of hoses before use. A spill kit will be present

Item	Associated Hazard/Risk	Consequences	Control Measures
16	Handling sheet piles	Manual handling injuries, crushing, cuts to hands and arms during handling.	Sheets will be stacked away from the general work and personnel routes/away from work areas. A lifting appliance will be used to lift the sheets, typically the excavator with certificated chain attached, PPE will be worn at all times during sheet movements, i.e. gloves foot protection, goggles/eye protection A certificated NED clamp will be used when lifting sheets into position.
17	COSHH	Personal injuries, burns.	All operatives will read and be instructed on the safety procedures to follow on any hazardous substances used within the work site. All operatives will wear suitable PPE as directed by the COSHH assessments. Any wet concrete or cement powder on the skin will be immediately washed off with clean fresh water. First aid will be available within the work site at all times.

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