19 BISHAM GARDENS

LONDON, N6 6DJ

BASEMENT IMPACT ASSESSMENT

ENGINEERING METHOD STATEMENT

April 2015

Project Ref: 11994

Rev 2

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
Registered in England Number 06533911

REVISION HISTORY

Rev	Purpose	Date	Issued By	Approved
Rev 0	Initial report	04/12/2013	MCM	BC
Rev 1	General amendments re slope and groundwater issues	05/03/2014	BC	
Rev 2	Additional reports incorporated	22/04/15	JC	BC

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APPENDICES

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
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INTRODUCTION

Green Structural Engineering has been involved in over 80+ successful basement designs in a number of London Boroughs on behalf of private clients, developers and contractors.

The basement projects previously undertaken successfully have been of a similar size to that proposed in this application and quite often on a much larger scale and complexity.

Green Structural engineering also undertakes the temporary works design and sequencing for a number of contractors who operate in LBC, RBKC, LBHF and Westminster.

This experience has positioned GSE at the forefront of basement design and indeed temporary works design for basement construction. This experience has led to an in-depth understanding and appreciation of the design parameters that should be considered for all basement construction projects.

GSE holds £2million in professional indemnity insurance and is a member of the ACE.

SCOPE OF REPORT

This report deals with the structural aspects of the proposed basement construction to 19 Bisham Gardens and is to be read in conjunction with the following reports by relevant specialists:

- Fastrack Geotechnical Report 8328, dated November 2013 (included in appendices)
- Fastrack Geotechnical Report 8328a, dated September 2014 (included in appendices)
- Evans Rivers and Coastal Surface Water and Flooding Screening (author: Rupert Evans MSc CEnv C.WEM MCIWEM AIEMA) (included in appendices)
- H Fraser Consulting: BIA Assessment: Groundwater, ref 30057R1, dated 23/10/2014 (Author: Hanna Fraser BA (Cantab) MSc FGS CGeol)
- Ground and Project Consultants Ltd: BIA Assessment: Land Stability, dated February 2015 (Author: Jon Smithson CGeol) (included in appendices)

The above reports cover the groundwater, surface water and slope stability required under CPG4 while this report deal with the structural aspects and the engineering implications of issues raised in the above BIA report.

This report is produced for submission to the London Borough of Camden as part of a planning application for works to 19 Bisham Gardens and should not be used for any other purposes, e.g. construction or Party Wall Awards.

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SCOPE OF WORKS

A new basement is to be created under the footprint of the existing ground floor of 19 Bisham Gardens with small lightwells to the front and rear. The new basement is to be used as living space with the lightwells providing natural light and ventilation.

The basement will project to the rear under what is currently a paved area. The front and real light wells will be covered with a metal grille/glass floor for safety and security.

The existing rear patio area is to be modified, with the large existing steps removed and replaced by small garden retaining walls. This shall allow for a larger useable outdoor area.

The basement will comprise a study, cloak/shower room, utility room, gym, a second shower room and storage space.

Investigation works on site to confirm the existing arrangement of the ground floor and the detailed design of the new permanent structure to basement and ground floor will be carried out as part of the detailed design process and are not included within this BIA report.

DESCRIPTION OF 19 BISHAM GARDENS AND ADJOINING PROPERTIES

The properties along Bisham Gardens date from the late 1800s (it is shown on the OS map of 1895 but not that from 1870) and form a terrace. They are of typical construction for the period with masonry walls supporting timber floors and roof.

The property is not heritage listed, but does lie within the Highgate Village conservation area.

It is understood that No21 has previously constructed a basement under the main house circa 2001 (Camden application number: PEX0100287) but details have not been seen. The extent and depth will need to be confirmed at the start of works on site

The property is in a sound condition structurally with no sign of movement associated with the previous basement to No21 evident during visual inspection. The adjoining properties are of similar construction and look to be in sound condition from an external non–intrusive visual examination.

The topography of the site is classified as flat (slope less than 7deg) with a fall of approximately 6 degrees towards the south-south-west.

Figure 16 of the Arup report indicates that the site has slopes greater than 7 degrees but this appears to be due to the terracing which occurred when the houses along Bisham Gardens were built, and seen in the steps down from the front garden of 19 Bisham Gardens to pavement level. This is dealt with fully in the land stability report.

A visual inspection of No 19 has been carried out and the construction of the house is traditional with timber floors supported off perimeter walls and spine wall.

A single storey rear extension was added in 2000.

The adjoining properties are of similar construction.

From the planning portal No 17 appears to have has no alterations of extensions added. Visual inspection confirmed that there no rear extensions have been constructed beyond the original closet wing.

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No21 has had significant alterations carried out with loft conversion, rear extension c1999 and basement under the main house, granted 19 June 2001. This basement is similar in depth and extent to that proposed for No19.

GEOLOGY AND HYDROLOGY CONDITIONS

Reference to the British Geological Survey (BGS) website (see the desk top study in the appendices) indictates that the site geology to consist of Bagshot strata (sands and gravels) over Claygate Beds (Sandy Clays) over London Clay. This has been confirmed by the site specific borehole.

Fastrack Site Investigations have carried out a site-specific borehole which has confirmed the ground conditions on site to be Bagshot Beds to 9.3m below ground level over Claygate Beds to 10m, where the borehole stopped. The top of the London Clay was not found.

No water was encountered in the borehole.

The new basement will bear in the Bagshot Beds, and the design will use an allowable ground bearing pressure of 150kN/m^2 to limit the potential for settlement, based on a safe bearing capacity obtained from the Mackintosh probe results.

The BIA reports listed above cover the groundwater, surface water and slope stability issues more fully but the engineering related issues are summarised below.

Subterranean (Groundwater) Flow – Refer H Fraser BIA report

Groundwater levels were measured to be approximately 10m below the existing ground levels, below the extent of the proposed basement which will therefore not have significant effect on the groundwater elevations.

The possibility of perched water tables occurring on top of clay bands within the ground may give rise to some seepage. Any water ingress which does occur due to variation in the ground strata will be relatively minor and will be controlled by forming local sumps and pumping without adversely affecting adjacent properties or the stability of excavations.

Surface water – Refer Evans Rivers & Coastal report

There are no surface water features within 250m of the site.

The street is not listed on ‘Streets at risk of surface water flooding’

There will be no significant change in hardstanding areas as the proposed basement occupies an area of existing hardstanding.

The site is located within Critical Drainage Area GROUP3-001 (Camden SWMP)

As always there is a risk of sewer flooding which is dealt with by incorporating non-return valves into the drainage connection.

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Slope and Ground Stability – Refer Ground and Project Consultants Ltd report

Overall slope stability is not an issue as the slope is approximately 6 degrees, less than the 7 degree limit for flat sites. The proposed basement will not have any significant impacts on land stability and only temporary stability during excavations need further consideration (see temporary works sections below).

STRUCTURAL DESIGN FOR PROPOSED BASEMENT

GSE have carried out an initial structural design for the new basement to confirm the feasibility and buildability of the scheme. These are attached in the appendices.

It is assumed that the proposed basement will be constructed using an underpinning approach with no adjacent pins constructed sequentially. The assumed sequence is shown on GSE drawing GA01 included in the appendices. This approach involves the following sequence of operations, local excavation for the pin, fixing reinforcement and casting the base, fixing reinforcement and casting the wall, and finally dry-packing between the top of the new wall and underside of the existing wall.

To minimize the amount of potential movement associated with the construction of the basement the retaining walls are to be designed as vertical cantilever walls, ignoring any propping action from the ground floors. This ensures that the walls are stable during the construction phase and in the final stage the walls are much stiffer due to the presence of the floor.

The design loadings for the new retaining walls will include for a surcharge of 10kN/m^2 on the adjacent surface and for water pressure to allow for the potential for burst water mains etc.

As No21 has an existing basement and therefore the impact of the new basement to No19 will be minimal the effect of potential settlement will be considered only for No17. These calculations are included in the appendices and the implications are considered in subsequent sections.

See calculation sheets in Appendix B for the retaining wall calculations prepared as part of this report.

To date only a visual inspection has been undertaken as the house is still occupied. Therefore opening up works to fully confirm the existing structural arrangement will be required at the start of works on site and the detailed design of the new basement confirmed.

The full structural design for the new basement and other alterations will be submitted for checking by Building Control or an Approved Inspector.

STRUCTURAL DRAWINGS

The following structural drawings for the proposed basement are included in the appendices:

12716	/GA01	General arrangement plan of the proposed basement indicating the proposed construction method using a ‘hit and miss’ sequence.
	/S01	Typical section details through the party wall and external wall.

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CONSTRUCTION METHOD AND TEMPORARY WORKS REQUIREMENTS

The design of the temporary works required for the construction of the new basement will be the responsibility of the contractor, but GSE have undertaken an outline temporary works design to confirm the feasibility of the proposed basement construction.

To prevent ground loss during the excavation of the underpins a sacrificial back shutter is to be used to retain the soil behind. The cohesion provided by the clay component of the soil will also act to prevent soil loss.

A typical construction sequence for the underpinning in the rear section is included in the appendices as MS01 and MS02.

The proposed basement has two distinct area, the front area under the main house and the rear area under the rear extension. The weight of the existing party walls ensures that the front section is more stable and will require propping only at low level during the final excavation stage, while the rear section will require propping at high and low levels to maintain the stability of the underpins during construction. Initially, this propping will be off the central berm but a larger and more robust propping system will be required once final stage excavation commences, using RMD or similar. The design and sequencing of this propping will be the responsibility of the contractor.

CONSTRUCTION SEQUENCE OF THE NEW BASEMENT

1. Excavation will commence from the front of the property.

   Note: It is assumed that the front of the property wall will be hoarded off, and a skip placed in the highway in front of house. The final details of this and all obtaining all permissions required are the responsibility of the contractor.

2. The existing ground in front of the bay window will be excavated, maintaining the existing manhole as required, to provide access to the new basement works area. Blind excavation faces with an oversite concrete for protection.

3. Install support to the front bat window and construct heading under existing ground floor. Batter back and reduce dig the central area.

4. A conveyor belt will be set up through the front room of the existing ground to convey the spoil from the excavation to the skip placed on the road for disposal. The conveying will be done using a method that does not impair the safety of pedestrians.

5. Underpin existing front wall working from No21 side (existing basement).

   Note: local needle and propping to wall may be required due to openings and will comprise 152UC needles and Multiprops based on temporary footings.

6. Construct front retaining wall and prop off berm behind. When sections complete cast ring beam on top to provide permanent top support.

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7. Working backwards install necessary temporary works to walls over, locally excavate and cast bases for new columns, and install permanent structure to support ground floor and structure above.

8. Commence underpinning to No17 party wall, using sacrificial cementitous back shutter to retain the soil behind, in maximum 1m long bays in underpinning sequence.

   Note: Reinforced concrete retaining walls will be formed as follows:

   - ~ Excavate locally and shore excavation as required, installing sacrificial back board to external face. Excavated face to be propped off central berm behind.
   - ~ Fix reinforcement to base and cast.
   - ~ Fix reinforcement to wall and cast.
   - ~ Dry pack between top of underpin and existing foundation
   - ~ Reprop wall off berm.

9. Continue working backwards until party wall fully underpinned.

10. Underpin rear wall to No19.

11. Commence construction of reinforced concrete retaining wall section to rear extension in maximum 1m long bays in underpinning sequence, propping off central berm.

12. As excavation progresses, any existing foundations discovered will be broken out and removed from site to make way for the new basement construction.

13. Install temporary support to existing columns in rear extension and support off temporary bases.

14. Excavate and install permanent bases and install new columns at basement level and place temporary bracing /permanent steelwork to stabilise columns.

15. Once columns are resupported commence underpinning the party walls.

    Note: Both high and low level propping will be required in rear area.

    Initially this will comprise propping off the central berm with Multiprops at high level and RMD Slimshores (or similar designed by appointed Temporary Works Engineer) at low level. The high level props can be removed once the permanent reinforced concrete ring beam is cast to tie the top of the retaining wall sections together.

    At low level the propping is to remain in place until the basement slab is cast. This will be done in strips by locally excavating the central berm and casting the new slab. This will provide the bottom support to the new retaining walls

16. Once the installation of the new underpins is complete cast the new ground floor slab. The top propping in the rear area can then be removed.

17. Commence final stage excavation of central berm, install new underslab drainage and cast new basement slab.

18. After the new basement slab has cured, a drained–cavity system will be installed to the slab and walls and finishes applied.

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PROPOSED MOVEMENT MONITORING

Condition surveys will be undertaken of the neighbouring properties before the works commence, in order to provide a factual record of any pre-existing damage, as part the Party Wall Award process and are beneficial to all parties concerned.

Movement monitoring should be undertaken throughout the period of structural works, increasing to weekly during the basement construction. Monitoring will need to commence before the start of any major works on site to allow base reading to be established before excavation of the basement starts. After the basement works are complete monitoring may revert to fortnightly

This monitoring should be undertaken with a total station instrument and targets attached at the following locations:

- Internally, on both party walls, where sighting is possible.
- Externally, at first floor and eaves level on the front walls of Nos 17-21.

The accuracy of this system of monitoring is usually quoted as +/- 2mm. Thus, if recorded movements in either direction reach 5mm, then the frequency of readings should be increased as appropriate to the severity of the movement, and consideration should be given to installing additional targets. If the recorded movements in either direction reach 7mm, then work should stop until new method statements have been prepared and approved by the structural engineer.

If any structural cracks appear in the main loadbearing walls, then those cracks should be monitored using the Demec system (or similar) on the same frequency as the target monitoring.

POTENTIAL IMPACT ON 19 BISHAM GARDENS AND ADJOINING PROPERTIES

The construction of the new basement to 19 Bisham Gardens will affect No17 with which it shares a party wall and to a lesser degree No21 (existing basement) which are within the zone of influence of the proposed excavation.

The zone of influence of the excavations will extend some distance, up to four times the excavation depth, but rapidly reducing to being insignificant and of negligible impact.

An assessment of the damage category has been carried out for the party wall with No17 and is within category 0. Likewise an assessment of the impact on existing spine all has been undertaken and this is also category 0.

The potential impact of the proposed basement will therefore be minimal provided a suitably experience constrictor is appointed and a designed temporary works methodology is developed and followed on site.

The critical stage of the works in relation to the effect on the neighbouring properties will be during construction of the basement and the major risk of movement during this stage of the works can be reduced and controlled by the appointment of a contractor with previous experience of basement construction that follows the agreed method of working incorporating all necessary temporary works.

The contractor will be required to produce traffic management, detailed method statements and provide detailed temporary works proposals for approval prior to the start of any works.

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The temporary works, in accordance with the outline temporary works intent, as described above, will maintain the stability of the new basement during the construction and prevent rotation or slipping of the retaining walls during this stage of the works.

One of the major sources of movement in basement construction is differential settlement of the new foundations when bearing onto different geological strata. The site investigations carried out reveals that the underlying ground strata comprises London Clay to depth, and any movement of the existing walls during the works will be governed by any settlement which occurs during the construction of the proposed underpinning.

The new RC retaining wall will be designed as free-standing cantilevered walled, ignoring propping from ground floor level.

From the analysis of the damage assessment due to the proposed basement being category 0 the impact of any settlement on the existing properties will be minimal and is likely to be accommodated within the elasticity of the superstructure. The extent of movement which will occur under this category is some slight distortion and hairline cracking, which can be dealt with by local redecoration.

The proximity of the proposed basement to the neighbouring properties means that Party Wall Agreements will be required and the Schedule of Conditions undertaken in this process will allow any inherent defects in the existing structures to be assessed and accommodated in the detailed design stage.

The design and construction methodology, as described above, deals with the potential risks and ensures that the excavation and construction of the proposed basement will not affect the structural integrity of the property and adjoining properties.

REDUCTION OF NOISE, DUST AND VIBRATION IMPACT ON NEIGHBOURING OCCUPIERS

The main environmental impacts are noise, vibration and dust. Contractors will always be expected to have considered noise and dust impacts related to their operations and to use Best Practicable Means (BPM) to minimise them, e.g. adjust working times, consider use of quieter methods.

The appointed contractor will be a member of the Considerate Contactors scheme.

The appointed contractor will comply with the following standards and practices.

- British Standard BS 5228 (noise and vibration control on construction and open sites).
- BS 6472:2008 (guide to evaluation of human exposure to vibration in buildings).
- Mayor's guidance on 'The control of dust and emissions during construction and demolition'.
- Principles set out within Section 61 of the Control of Pollution Act 1974.

Liaison with neighbors likely to be affected by works is an essential element of BPM and will be undertaken. The contractors will be expected to respond to complaints and resolve where practicable.

Impact on neighbors from vehicle movement will be addressed in the attached traffic management plan.

As residents are likely to be disturbed by noise, the permitted times of operation, including ancillary activities such as deliveries, will be restricted to standard hours:

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- 8am – 6.00pm (Monday to Friday);
- 8am - 1pm (Saturday);
- No working is permitted on Sundays, bank holidays or other national holidays.

The appointed contractors will employ quiet working methods and noise generating equipment where practicable. Plant and activities to be employed should be reviewed to ensure that they are the quietest available for the required purpose e.g. 'super silenced' compressors. Work and sound reducing equipment should be regularly maintained to minimise noise emissions.

The contractors will make use of acoustic barriers or enclosures where there is likely to be significant disturbance to residents (subject to safety considerations).

The contractor's management team will employ the following actions to minimise the impact of noise, dust and vibration on the neighbours;

- All site operatives should be briefed and trained in the correct use of equipment and BPM measures in order to minimise noise impacts.
- Site surveys should take place to identify potential problems and facilitate work scheduling, the need for noise control measures, working hours and minimal delay and noise / dust impacts.
- Effective arrangements for the timely communication of site specific noise control measures to site teams should be in place.

To reduce air pollution the appointed contractors will be expected to employ the methods listed below.

- Ensuring that fumes and/or dust do not escape from the site to affect members of the public and the surrounding environment;
- Burning of materials on site is not permitted under any circumstances;
- Dusty activity should be undertaken away from sensitive receptors, with wind direction taken into consideration;
- The site should be regularly inspected for spillages of cement and other powders which should be removed to prevent off-site deposition;
- Dusty material and activities should be dampened down in dry weather. The use of groundwater should be investigated and water should be reused wherever possible.
- Rubber chutes should be used and drop heights minimised;
- Off-site fabrication, or cutting to size, shall be employed to avoid cutting materials on site whenever possible; and
- Careful consideration should be given to the location and temperature control of tar and asphalt burners.

POTENTIAL IMPACT ON EXISTING AND SURROUNDING UTILITIES, INFRASTRUCTURE AND MAN – MADE CAVITIES

All local services on the property's land will be maintained during construction and rerouted if necessary. The exact location of these services will not be known until the works commence. However the impact will be negligible as these services will be maintained. If it is necessary to relocate or divert any utilities, the Contractor and Design Team will be under a statutory obligation to notify the utility owner prior to any works. This will be so that they can assess the impact of the works and grant or refuse their approval.

The method of constructing the front retaining wall, along with the presence of the front garden area means that any services in the street should not be affected by these works.

There are no known tunnels in the vicinity.

POTENTIAL IMPACT ON DRAINAGE, SEWAGE, SURFACE AND GROUND WATER LEVELS AND FLOWS INCLUDING SUDS

All existing drainage and sewage connections will be maintained throughout the construction works so there will be no impact on these existing systems.

The proposed development will not alter the current state of the property, which will remain as part of a single family residence; therefore there will be no significant increased foul water discharge into the existing drainage and sewage systems.

Surface water runoff will not be greatly altered as the proposed works do not significantly alter the extent of existing hardstanding.

To prevent flooding due to back pressure in the existing drainage system suitable non-return values are to be installed to the new drainage.

The geotechnical investigations and research carried out confirm that the new formation will be into the Bagshot Beds, and as the top of the London Clay is at depth ground water is not expected to be an issue.

POTENTIAL IMPACT ON EXISTING AND PROPOSED TREES

No existing trees will be felled during the construction of the proposed works and no trees are affected by the proposed works nor are any trees protected by Tree Preservation Orders in the vicinity of the proposed works that will be damaged by the construction works.

Prepared By:

James Cogley

BEng (Structural)

Approved by:

Brian Cochrane

BEng, CEng, MIStructE

Green Structural Engineering Ltd

April 2015

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
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APPENDICES

The following appendices are included with this report:

Appendix A -	GSE Structural Drawings For Proposed Basement
Appendix B -	GSE Calculation Sheets For Design Of Basement Retaining Walls
Appendix C -	GSE Settlement Calculations And Damage Assessment Category
Appendix D -	GSE Typical Underpinning Sequence
Appendix E -	GSE Underpinning Specification
Appendix F -	Fastrack Site Investigation Report - Report 8328 – initial borehole and EnviroInsight Report - Report 8328a – Additional borehole to 10m
Appendix G -	H Fraser Consulting: BIA Assessment: Groundwater, ref 30057R1
Appendix H -	Evans Rivers And Coastal Surface Water And Flooding Screening
Appendix I -	Ground And Project Consultants Ltd: BIA Assessment: Land Stability, Dated February 2015
Appendix J -	No21 Planning Drawings For Existing Basement

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APPENDIX A

GSE STRUCTURAL DRAWINGS FOR PROPOSED BASEMENT

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
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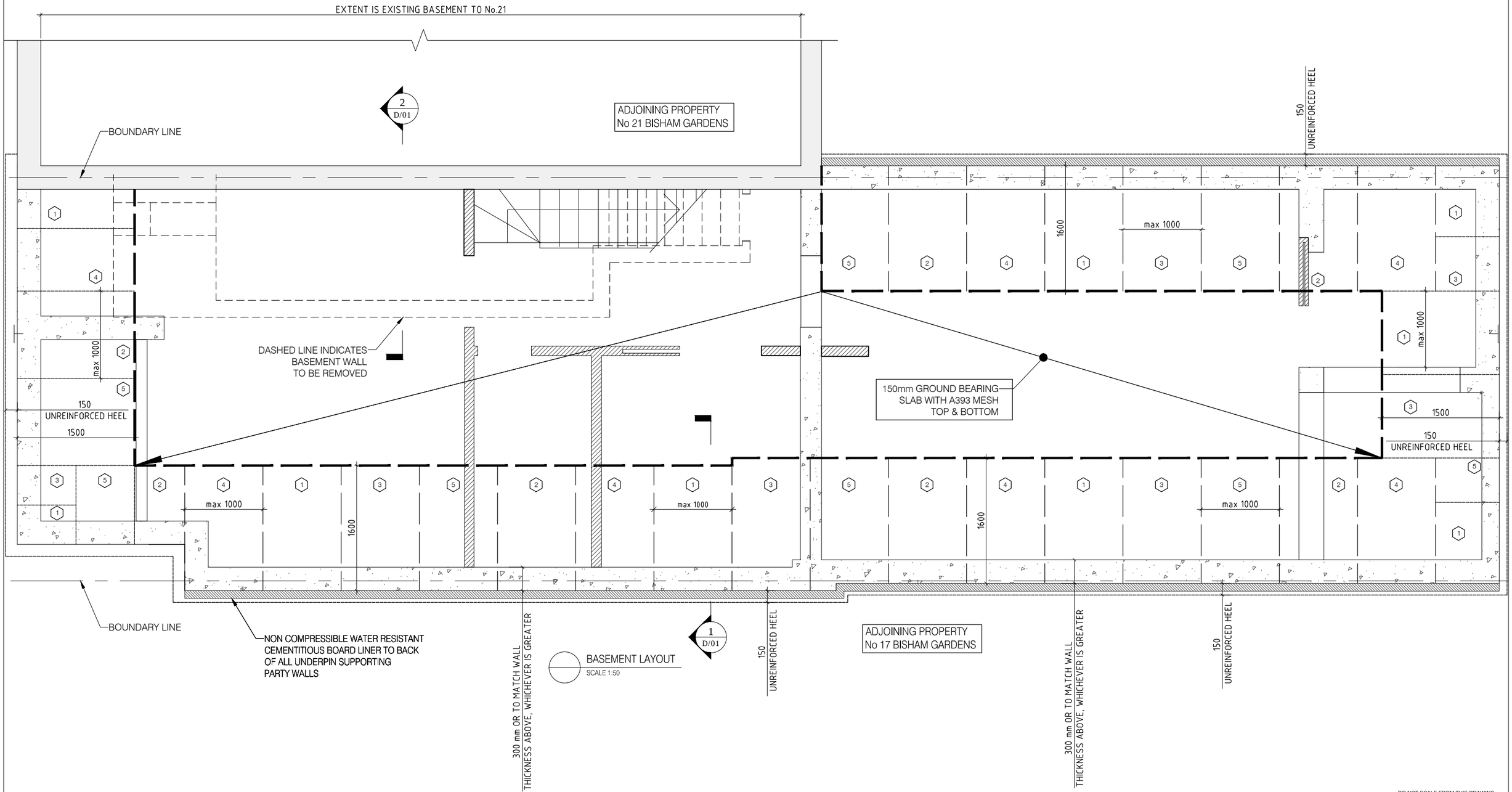
ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE

KEY

- EXISTING BRICK WALL.
- REFER TO NEW NON BEARING STUD PARTITION
- REFER TO NEW LOAD BEARING MASONRY
- REFER TO NEW LOAD BEARING CONCRETE WALL



BASEMENT LAYOUT
SCALE 1:50

DO NOT SCALE FROM THIS DRAWING
THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

11994

19 BISHAM GARDENS, LONDON, N6 6DJ

REV	DATE	DESCRIPTION
P1	04/12/13	INITIAL ISSUE

Green Structural Engineering Ltd
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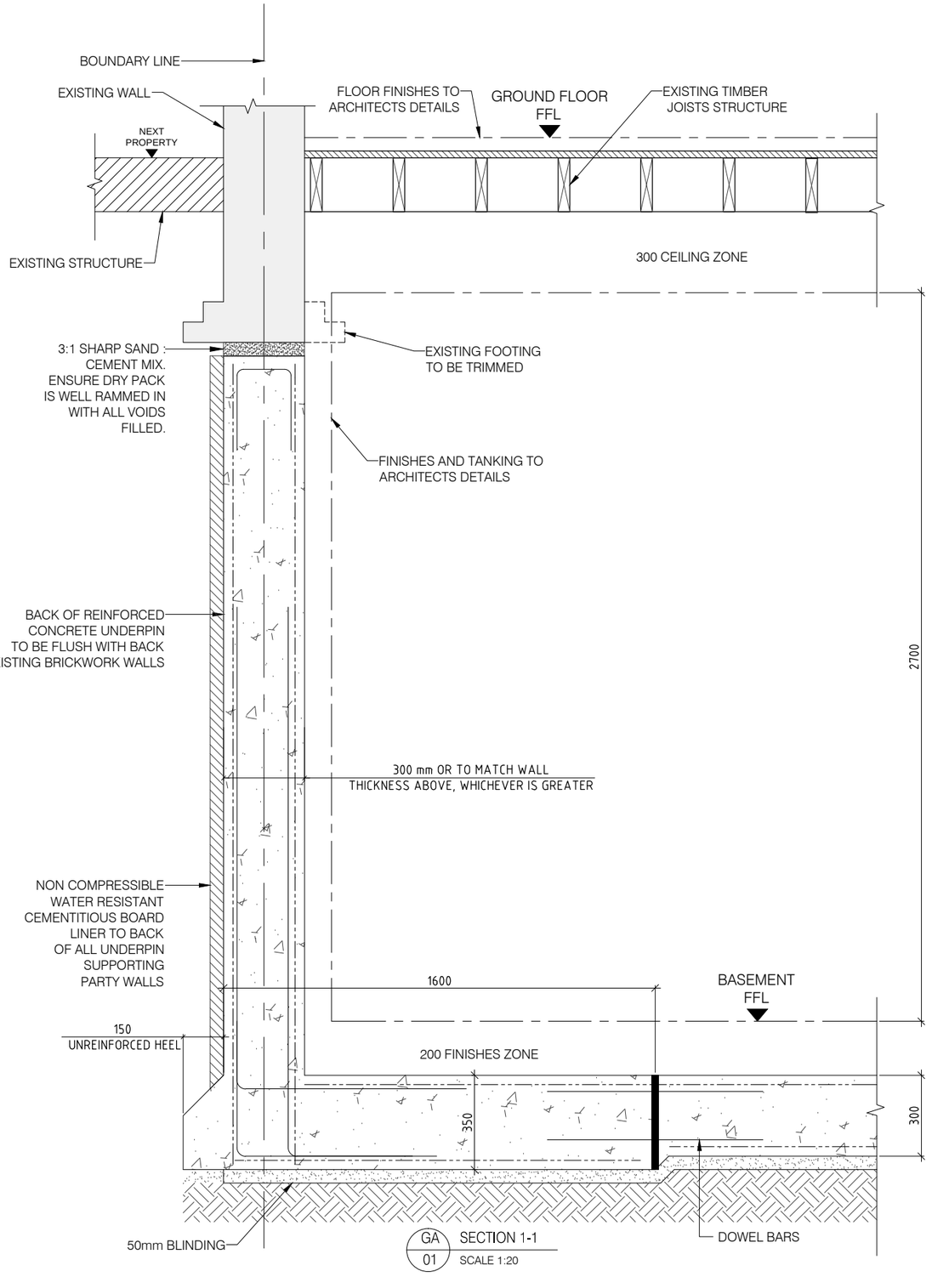
BASEMENT LAYOUT

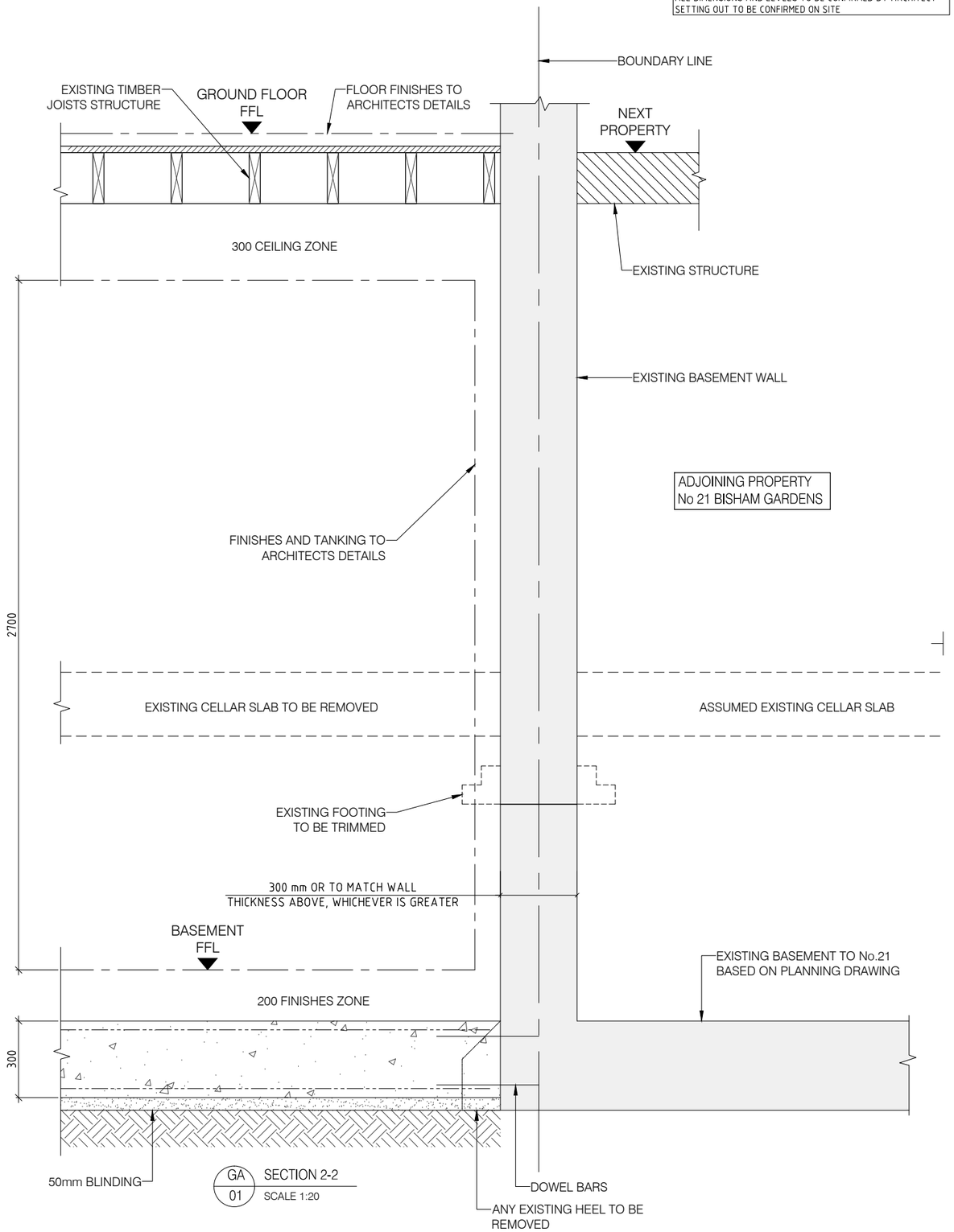
DRAWN	CHECKED	DATE	PAPER SIZE	SCALE
AD	BC	04/12/2013	A3	NTS

-

GA/01 **P1**

ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE





DO NOT SCALE FROM THIS DRAWING
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Green Structural Engineering Ltd
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STRUCTURAL DETAILS & SECTIONS -

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE		
AD	BC	04/12/2013	A3	AS SHOWN	D/01	P1

APPENDIX B

GSE CALCULATIONS FOR DESIGN OF BASEMENT RETAINING WALLS

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
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	Project		Job Ref	
GSE GREEN STRUCTURAL ENGINEERING	19 Bisham Gardens, London, N6 6DJ		11994	
	Drawing Ref	Calculations by	Checked by	Sheet No.
		MCM		C/ 01
	Part of Structure		Date	
			DEC'13	

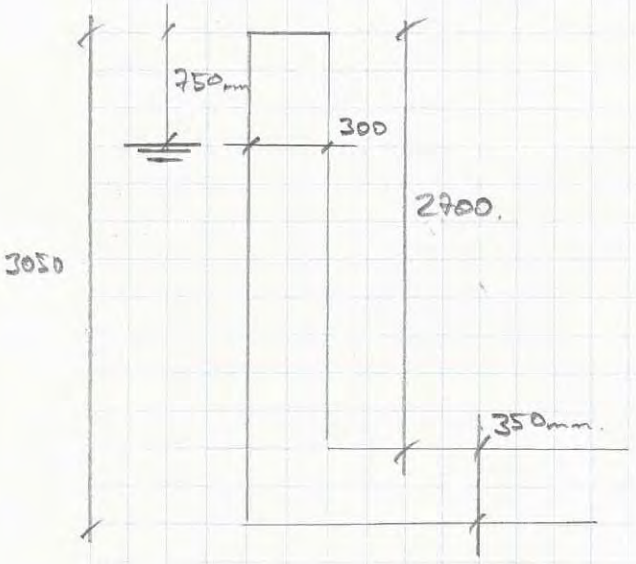
RETAINING WALL DESIGN:

LOAD TAKE DOWN:

BUILDING IS AN EXISTING 2 STORY HOUSE WITH A LOFT SPACE.
THE BUILDING HAS A HEIGHT OF 9m => 29.7 feet.

FROM CIRIA REPORT 111 => ALL WALLS 9" THICK.

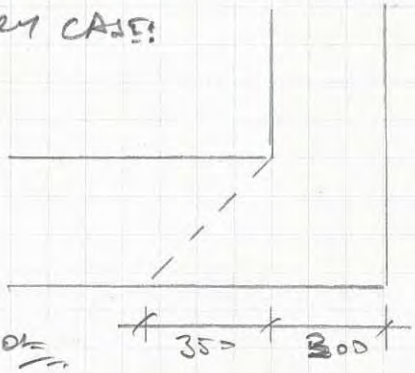
	LOADING	
	DEAD	LIVE
=> WALL LOADING => 5 × 9 = 45 kN/m.	45	–
FLOOR LOADING => DL: 0.5 × 5 × 0.5 = 1.25 kN/m × 3	3.75	–
=> LL = 1.5 × 5 × 0.5 = 3.75 kN/m × 3	–	11.25
	48.75	11.25
MULTIPLY DUE TO GROUND, FIRST & LOFT		
ADD FLOOR LOAD	3.75	11.25
FROM ADJACENT PROPERTY	52.5	22.5
TOTAL SERVICE = 75 kN/m.		



GEOTECHNICAL REPORT
=> SHEAR VANE TEST RETURNED A SAFE BEARING PRESSURE OF 140 kN/m².

=> WE SHALL USE 100 kN/m² TO BE CONSERVATIVE & ACCOUNT FOR SETTLEMENT. ESPECIALLY SINCE THE TEST WAS CONDUCTED AT A LOCATION 250m AWAY FROM SITE.

TEMPORARY CASE:



BP = $\frac{75}{0.65}$ = 115.4.

INTRODUCE A HEEL
=> $\frac{75}{0.8}$ = 93.75 < 100 ∴ OK

3.3.2 Wall slenderness and restraints

Regulations[2] for the thickness of external and internal or party walls depended on the number of storeys and the storey height. The minimum thicknesses specified in the Metropolitan Buildings Acts of 1844 for 'first class' buildings are reproduced in Figure 6. The slendernesses of the walls were cautious by modern design standards if the wall was restrained effectively at a storey height of 8 to 10 ft (2.5 to 3.0 m) in a typical house.

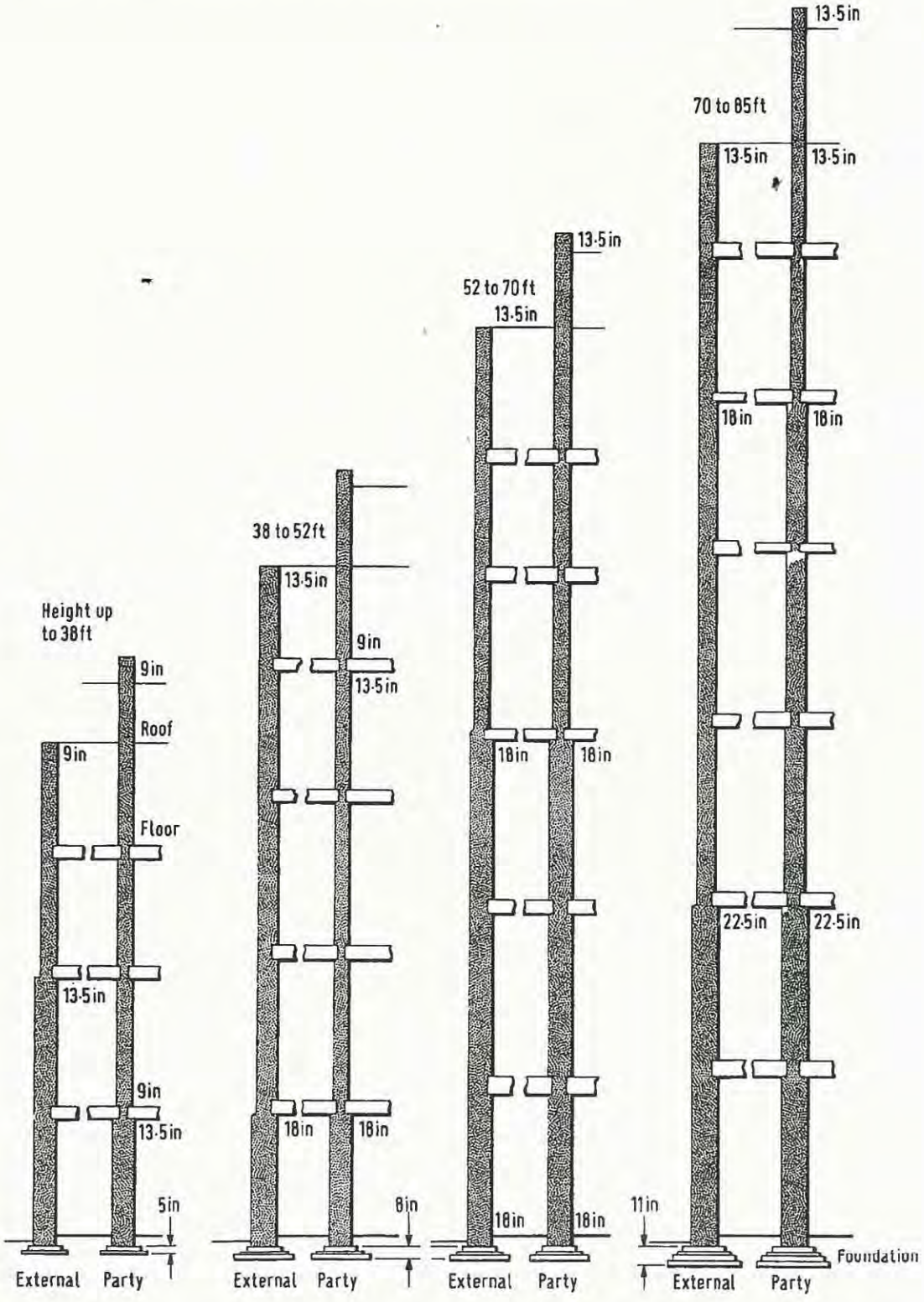


Figure 6 *Thickness of walls in accordance with the London Building Acts of 1844*

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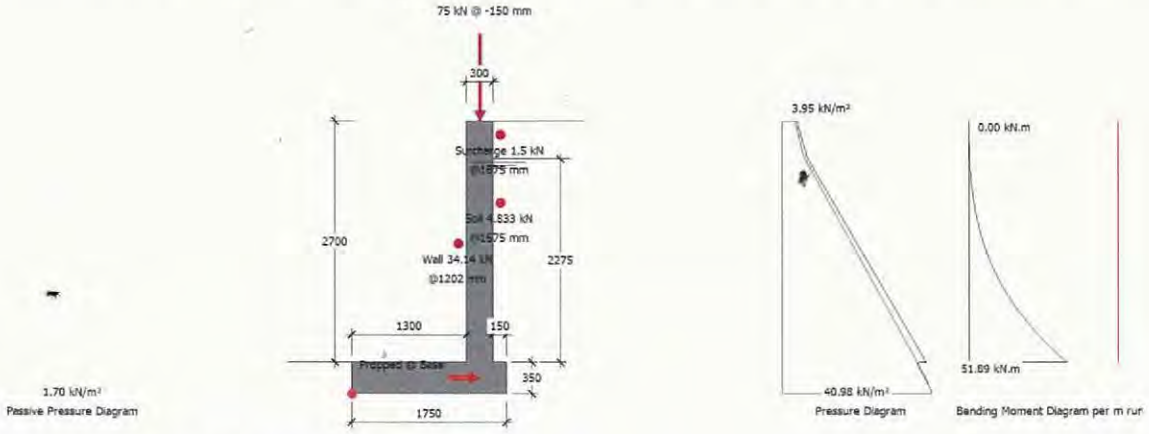
Job Ref :
Sheet : /10004 C103
Made by :
Date : 03 December 2013 / Ver. 2011.12
Checked :
Approved :

MasterKey : Retaining Wall Design to BS 8002 and BS 8110 : 1997
Basic RC Retaining Wall
Reinforced Concrete Retaining Wall with Reinforced Base



Summary of Design Data

Notes	All dimensions are in mm and all forces are per metre run
Material Densities (kN/m³)	Dry Soil 18.00, Saturated Soil 20.80, Submerged Soil 10.80 , Concrete 24.00
Concrete grade	fcu 35 N/mm², Permissible tensile stress 0.250 N/mm²
Concrete covers (mm)	Wall inner cover 40 mm, Wall outer cover 30 mm, Base cover 50 mm
Reinforcement design	fy 500 N/mm² designed to BS 8110: 1997
Surcharge and Water Table	Surcharge 10.00 kN/m², Water table level 2275 mm

† The Engineer must satisfy him/herself to the reinforcement detailing requirements of the relevant codes of practice

Additional Loads

Wall Propped at Base Level	Therefore no sliding check is required
Vertical Line Load	75 kN/m @ X -150 mm and Y 0 mm
† Dimensions	Ties, line loads and partial loads are measured from the inner top edge of the wall

Soil Properties

Soil bearing pressure	Allowable pressure @ front 100.00 kN/m², @ back 100.00 kN/m²
Back Soil Friction and Cohesion	ϕ_h = Atn(Tan(30)/1.2) = 25.69°
Base Friction and Cohesion	δ = Atn(0.75xTan(Atn(Tan(30)/1.2))) = 19.84°
Front Soil Friction and Cohesion	ϕ = Atn(Tan(30)/1.2) = 25.69°

Loading Cases

G_{Soil}- Soil Self Weight, G_{Wall}- Wall & Base Self Weight, Fv_{Heel}- Vertical Loads over Heel,
P_a- Active Earth Pressure, $P_{surcharge}$- Earth pressure from surcharge, P_p- Passive Earth Pressure

Case 1: Geotechnical Design	$1.00\ G_{Soil}+1.00\ G_{Wall}+1.00\ Fv_{Heel}+1.00\ P_a+1.00\ P_{surcharge}+1.00\ P_p$
Case 2: Structural Ultimate Design	$1.40\ G_{Soil}+1.40\ G_{Wall}+1.60\ Fv_{Heel}+1.00\ P_a+1.00\ P_{surcharge}+1.00\ P_p$

Geotechnical Design

Wall Stability - Virtual Back Pressure

Case 1 Overturning/Stabilising	66.380/160.408	0.414	OK

Wall Sliding - Virtual Back Pressure

$Fx/(Rx_{Friction}+Rx_{Passive})$	0.000/(41.668+0.039)	0.000	OK
Prop ReactionCase 2 (Serviceability)	63.8 kN @ Base		

Soil Pressure

Virtual Back (No uplift)	Max(79.720/100, 52.249/100) kN/m²	0.797	OK
Wall Back (No uplift)	Max(93.318/100, 38.651/100) kN/m²	0.933	OK

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Job Ref : C04
Sheet : /10005
Made by :
Date : 03 December 2013 / Ver. 2011.12
Checked :
Approved :

Structural Design

Prop Reaction

Maximum Prop Reaction (Ultimate)	68.1 kN @ Base

Wall Design (Inner Steel)

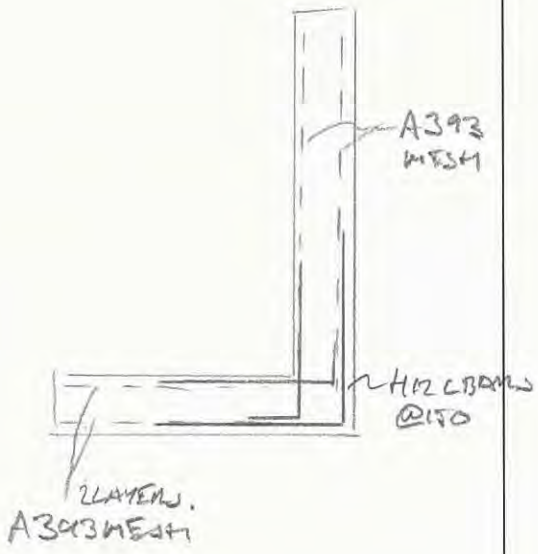
Critical Section	Critical @ 0 mm from base, Case 2		
Steel Provided (Cover)	Main H12@150 (40 mm) Dist. H10@200 (52 mm)	754 mm²	OK
Compression Steel Provided (Cover)	Main H10@200 (30 mm) Dist. H10@200 (40 mm)	393 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	254 mm, 1000 mm, 754 mm², 500 N/mm², 35.0 N/mm²	241 mm	
Mr=fn(above,As',d',x,x/d)	393 mm², 35 mm, 23 mm, 0.09	79.1 kN.m	
Moment Capacity Check (M/Mr)	M 51.9 kN.m, Mr 79.1 kN.m	0.656	OK
Shear Capacity Check	F 54.9 kN, vc 0.528 N/mm², Fvr 134.2 kN	0.41	OK

Base Top Steel Design

Steel Provided (Cover)	Main H10@150 (50 mm) Dist. H10@100 (60 mm)	524 mm²	OK
Compression Steel Provided (Cover)	Main H12@150 (50 mm) Dist. H10@150 (62 mm)	754 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	295 mm, 1000 mm, 524 mm², 500 N/mm², 35 N/mm²	280 mm	
Mr=fn(above,As',d',x,x/d)	754 mm², 56 mm, 16 mm, 0.06	63.8 kN.m	
Moment Capacity Check (M/Mr)	M 0.0 kN.m, Mr 63.8 kN.m	0.000	OK
Shear Capacity Check	F 0.0 kN, vc 0.429 N/mm², Fvr 126.5 kN	0.00	OK

Base Bottom Steel Design

Steel Provided (Cover)	Main H12@150 (50 mm) Dist. H10@150 (62 mm)	754 mm²	OK
Compression Steel Provided (Cover)	Main H10@150 (50 mm) Dist. H10@100 (60 mm)	524 mm²	
Leverarm z=fn(d,b,As,fy,Fcu)	294 mm, 1000 mm, 754 mm², 500 N/mm², 35 N/mm²	279 mm	
Mr=fn(above,As',d',x,x/d)	524 mm², 55 mm, 23 mm, 0.08	91.6 kN.m	
Moment Capacity Check (M/Mr)	M 59.9 kN.m, Mr 91.6 kN.m	0.654	OK
Shear Capacity Check	F 103.9 kN, vc 0.485 N/mm², Fvr 142.6 kN	0.73	OK



APPENDIX C

GSE SETTLEMENT CALCULATIONS AND DAMAGE ASSESSMENT CATEGORY

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
Registered in England Number 06533911

GREEN STRUCTURAL ENGINEERING	Project: Bicester Gypsy Site	Job Ref:	
	Drawing Ref:	Calculations by:	Checked by:	Sheet No:
	Part of Structure: Scour	Date:	

Burland & Burbridge gives

$$S = f_s f_f^{1.0} f_t \left[\left(q_n' - \tfrac{2}{3} p_o' \right) B^{0.7} I_c \right]$$

Safety factor 1.7 –

Proposed 3.5 –

Loading kN/m²

	Ext n	Proposed
Dead	52.5	72.7 (wt of wall)
Live	22.5	22.5

for underpin $A = 1.6 \times 1.0$

$\rightarrow q_n = 72.7 / 1.66 = 48.6$ kPa

f_s = (shape factor)

$$= \left(\frac{1.25 (L/B)}{L/B + 0.25} \right)^2 \qquad \begin{matrix} L = 1.0 \\ B = 3.5 \end{matrix} \text{ underpin}$$

$$\left(\frac{0.36}{0.0.54} \right)^2 = 0.67^2 = 0.45$$

f_I = depth of influence

Sand = 10 – deep if sand 3.5 –

$\therefore$ take = 1.0

f_t = time factor (allow 5 yrs)

$= 1 + R_3 + R \log (t/t_3)$ $t = 5$.

Burland gives $R = 0.2$ & $R_3 = 0.3$

$= 1 + 0.3 + 0.04 = 1.34$

GREEN STRUCTURAL ENGINEERING	Project:		Job Ref:	
	Drawing Ref:	Calculations by:	Checked by:	Sheet No:
	Part of Structure:		Date:	

p_o - 0.5 kN/m² live load $\Rightarrow h = 2.5$

$\Rightarrow p_o = 2.5 \times 19 = 47.5$ kN/m²

I_c = Compressibility Index

Building (Red) fig 2.36

$N = 84 \Rightarrow I_c = 0.3$

$= 16.9$

$\Rightarrow S = 0.47 \times 1.0 \times 1.34 \left(48.6 - \frac{3}{4}(47.5)\right) 3.5^{0.7} \times 0.3$

$= 7.3$ --

Increasing of the load is existing adjacent load only

$q = 15.8 \Rightarrow S = 6.8$ --

& same p_o

Anticipated Horizontal movement

$\varepsilon_h = 1/2$ for $= 3.4$ --

GREEN STRUCTURAL ENGINEERING	Project: Broughton Blvd		Job Ref:	
	Drawing Ref:	Calculations by:	Checked by:	Sheet No:
	Part of Structure: Damage Assessment		Date:	

Party wall

Length of wall 14.7 m

Height of wall 10.2 m

$\Rightarrow L/H = 1.44$

Tube $\delta = 7.3$ mm

Allow E/a for wall = 2.6

Treating wall as deep beam

y, allow $H = 10.2$

$I = 0.35$ m (average)

$\Rightarrow I = 30.95$ m^4

$\Delta/L = 7.3/14700$

$= 4.966 \times 10^{-4}$

$= 0.000497$

$\Rightarrow$ Extreme fibre strain ε_{bmc}

$= 0.00029235$

$\Rightarrow$ extension $= 2.9$ mm

Mass design strain ε_{ym}

$= 0.00012623$

$\Rightarrow$ extension $= 1.26$ mm

GREEN STRUCTURAL ENGINEERING	Project:		Job Ref:	
	Drawing Ref:	Calculations by:	Checked by:	Sheet No:
	Part of Structure:		Date:	

Reference Burkett et al

→ Category of damage = 0 .

0 < Shear < 0.05 Limit

GREEN STRUCTURAL ENGINEERING	Project:		Job Ref:	
	Drawing Ref:	Calculations by:	Checked by:	Sheet No:
	Part of Structure:		Date:	

Cross wise

Using 7.3.- deflection from putty width and considering crown (low spine with in adjacent properties

L = 5.3_ (see AS # 19)

H = 3.3_

We get

Extreme fibre strain ε_b

= 0.00015 → ext = 1.5_

Max design soil strain ε_d

= 7.5×10^{-6}

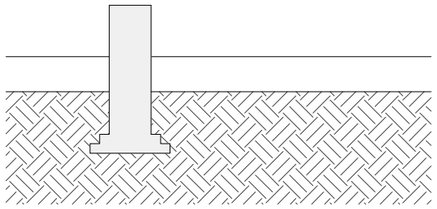
→ extension = 0.08_

→ Cat 0 Damage

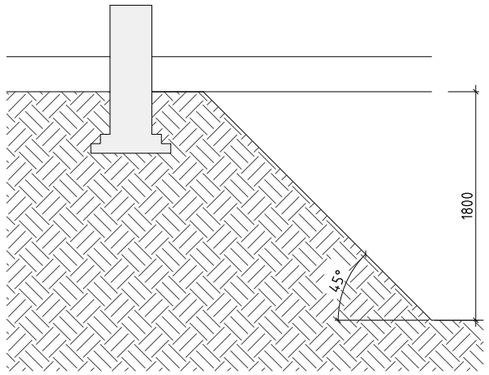
APPENDIX D
GSE TYPICAL UNDERPINNING SEQUENCE

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
Registered in England Number 06533911

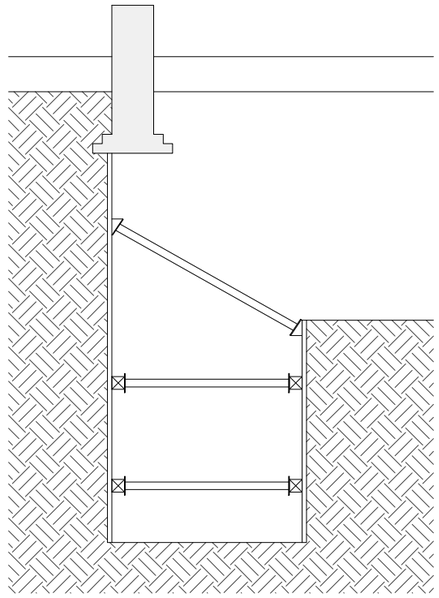
ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE



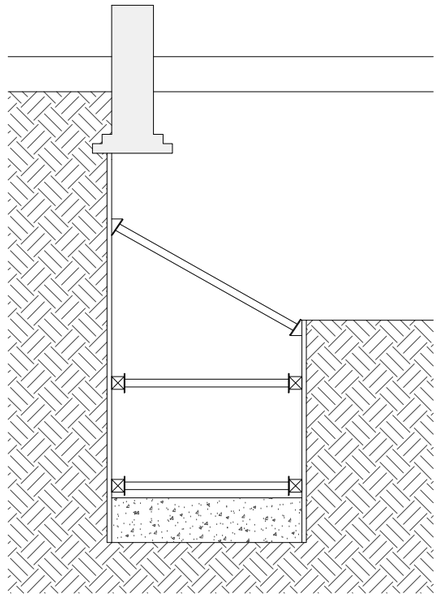
STAGE 0
EXISTING CONDITION



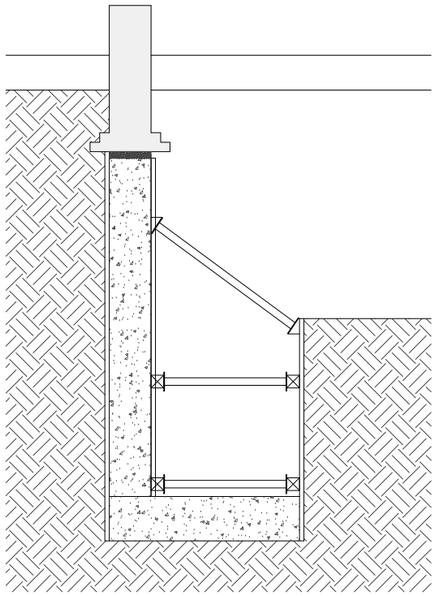
STAGE 1
GENERAL LEVEL REDUCTION



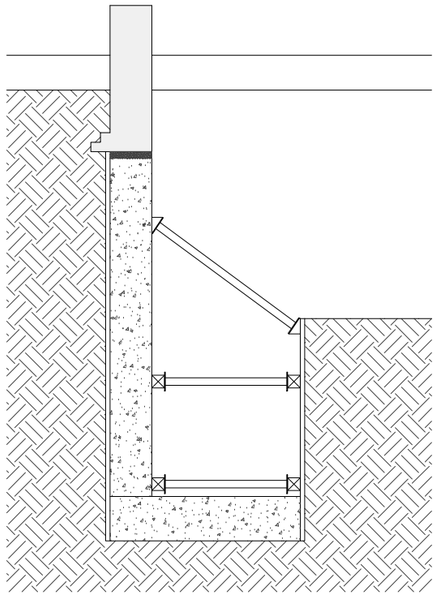
STAGE 2
EXCAVATE TO FORM UNDERPIN



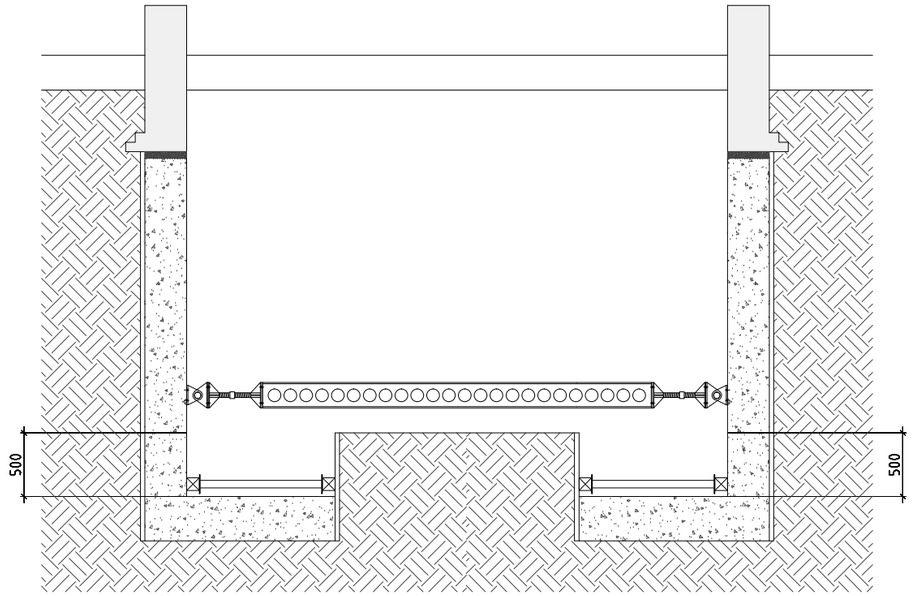
STAGE 3
CONCRETE BASE OF UNDERPIN



STAGE 4
ERECT SHUTTER
CONCRETE STEM OF UNDERPIN



STAGE 5
STRIKE SHUTTER WHEN CONCRETE HAS
GAINED SUFFICIENT STRENGTH, DRYPACK,
TRIM - OFF PROJECTING FOOTING, RE-PROP
UNTIL BASEMENT SLAB IS CAST.



STAGE 6
COMMENCE EXCAVATION OF CENTRAL BERM.
ONCE EXCAVATION IS 500mm ABOVE FORMATION LEVEL
INSTALL SUPER SLIM SOLDIER ACROSS SITE AT LOW LEVEL.
REFER TO TW06 FOR PLAN OF WALING PROPS.

DO NOT SCALE FROM THIS DRAWING
THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

11994

19 BISHAM GARDENS, LONDON, N6 6DJ

REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
P1	04/12/13	INITIAL ISSUE						

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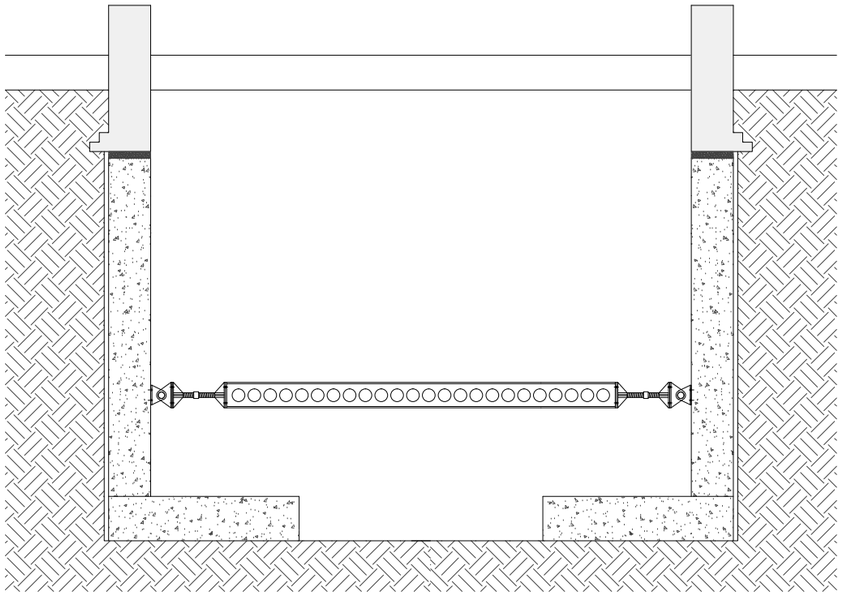
www.gseltd.co.uk

CONST. SEQ. FOR A TYPICAL UNDERPIN SECTION

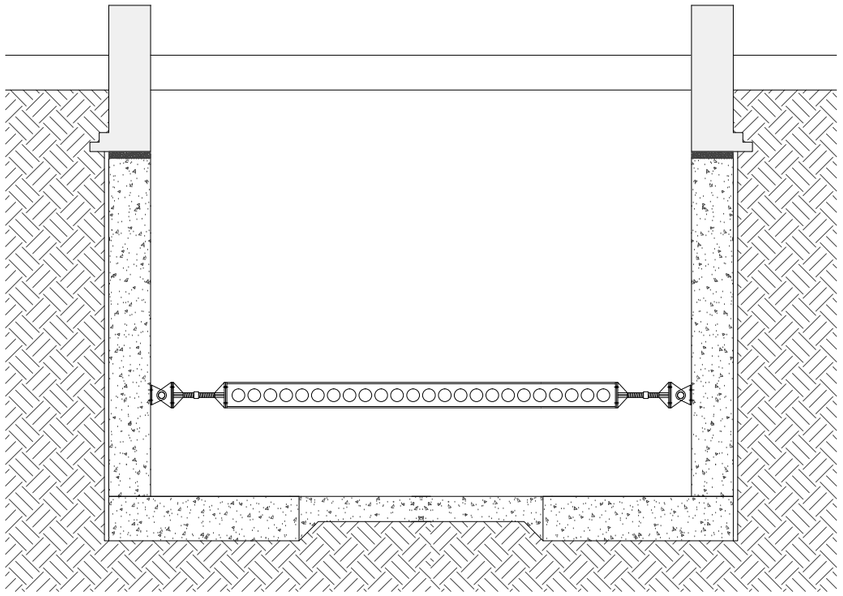
-

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE	
AD	BC	04/12/2013	A3	AS SHOWN	**MS/01** **P1**

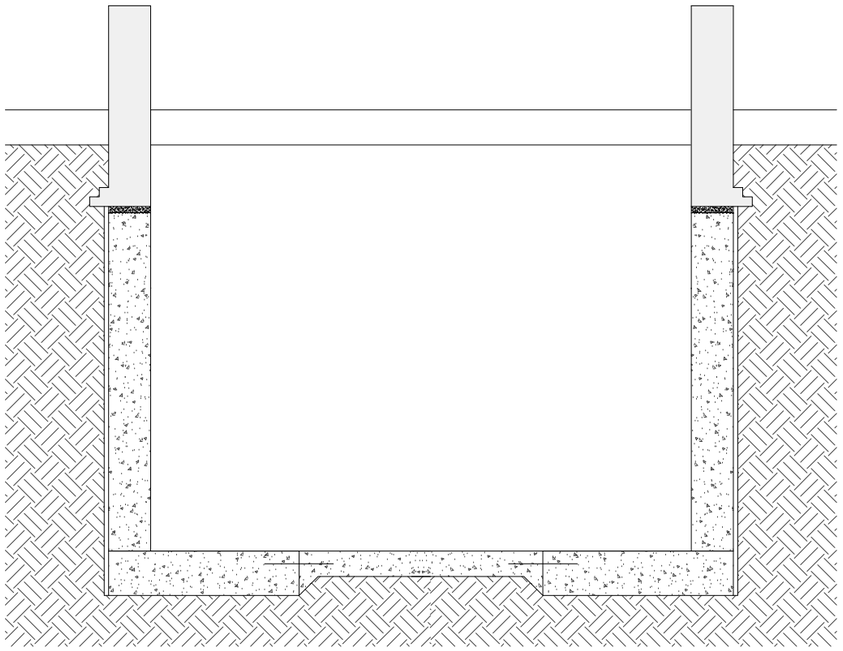
ALL DIMENSIONS IN MM UNLESS OTHERWISE NOTED
ALL DIMENSIONS AND LEVELS TO BE CONFIRMED BY ARCHITECT
SETTING OUT TO BE CONFIRMED ON SITE



STAGE 7
COMPLETE EXCAVATION TO FORMATION LEVEL



STAGE 8
CAST BASEMENT SLAB AND LET CURE



STAGE 9
ALL PROPS REMOVED

DO NOT SCALE FROM THIS DRAWING
THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING ANY WORK

11994

19 BISHAM GARDENS, LONDON, N6 6DJ

REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION	REV	DATE	DESCRIPTION
P1	04/12/13	INITIAL ISSUE						

Green Structural Engineering Ltd
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CONST. SEQ. FOR A TYPICAL UNDERPIN SECTION

-

DRAWN	CHECKED	DATE	PAPER SIZE	SCALE		
AD	BC	04/12/2013	A3	AS SHOWN	**MS/02**	**P1**

APPENDIX E

GSE UNDERPINNING SPECIFICATION

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
Registered in England Number 06533911

GREEN STRUCTURAL ENGINEERING

Specification: **Underpinning**

Project: **19 BISHAM GARDENS, N6 6DJ - BIA**

Date of issue: **April 2015**

Prepared by: **J. Cogley**

Revision: **-**

GENERAL UNDERPINNING SPECIFICATION

1. The walls to the perimeter of the new basement shall be underpinned in reinforced concrete. The underpins shall withstand the vertical loads from the walls and horizontal loads from the earth.
2. Underpinning bases shall be excavated in short sections not exceeding 1000mm in width.
3. The sequence of the underpinning shall be such that any given underpin will be completed, dry-packed and a minimum period of 48 hours lapsed before an adjacent excavation commenced to form another underpin.
4. In the event that the existing foundations to the wall are found to be unstable, sacrificial steel jacks shall be installed underneath the foundation to prop the bottom few courses of bricks. These steel jacks shall be left in place and shall be incorporated into the concrete stem.
5. In the event that the ground is unstable, lateral propping shall be provided as required to the rear of the excavation and to the sides of the excavated working trench. The front and side faces of the excavation shall be propped using trench sheeting or plywood, timber boards and acrow props as appropriate. Sacrificial back – shutters shall be used to the rear face of the excavation (i.e. underneath the wall) if required. Cementitious grout will be poured behind the back – shutters to fill up the voids behind the back – shutters.
6. Excavation for an underpin section shall be dug in a day, and the concrete to the base shall be poured by the end of the same day.
7. The concrete to the stem of the underpin shall be poured the following day. This shall be poured up to within 50 – 75mm of the underside of the existing wall foundations.
8. On the following day, the gap between the concrete and the underside of the existing foundation shall be drypacked with C35 concrete using 5 – 10mm coarse aggregate and “Combex 100” expanding admixture by Fosroc UK Ltd in accordance with their instructions.
9. Once the drypack has gained sufficient strength, any protrusions of the footings into our site shall be carefully trimmed back using hand tools to avoid causing any damage to the foundation. The protrusions shall be trimmed back to be flush in-line with the face of the wall above.
10. A minimum of 48 hours shall be allowed before adjacent sections are excavated to form a new underpin.
11. Adjacent underpins shall be connected using T12 dowel bars 600mm long, 300mm embedment each side, at 300mm vertical centres.
12. Concrete cover to reinforcement shall be 35mm for cast against shutter or the top surface of the basement slab, 50mm for cast against blinding and 75mm for cast against earth.
13. Grade of concrete shall be C35 with minimum cement content 300kg/m^3, maximum free water to cement ratio 0.60, slump 100mm.

APPENDIX F

FASTRACK SITE INVESTIGATION REPORT

Unit 5, Quayside, Sir William Morris Way, Fulham SW6 2UZ
Registered in England Number 06533911

Geotechnical Survey Report

FSI Ref:	8328a
Issue Date:	September 2014
Address:	19 Bisham Gardens London N6 6PJ
Engineer:	Gennaro Picardi
Company:	Picardi Architects

Director:	Martin Rush MSc FGS
Office Manager:	Louise Hiscock BSc (Hons)
Report Writer:	Perry Martin AMCIHT
Laboratory Manager:	Lara Knight

FASTRACK
Tyndales Farm, Southend Road, Woodham Mortimer,
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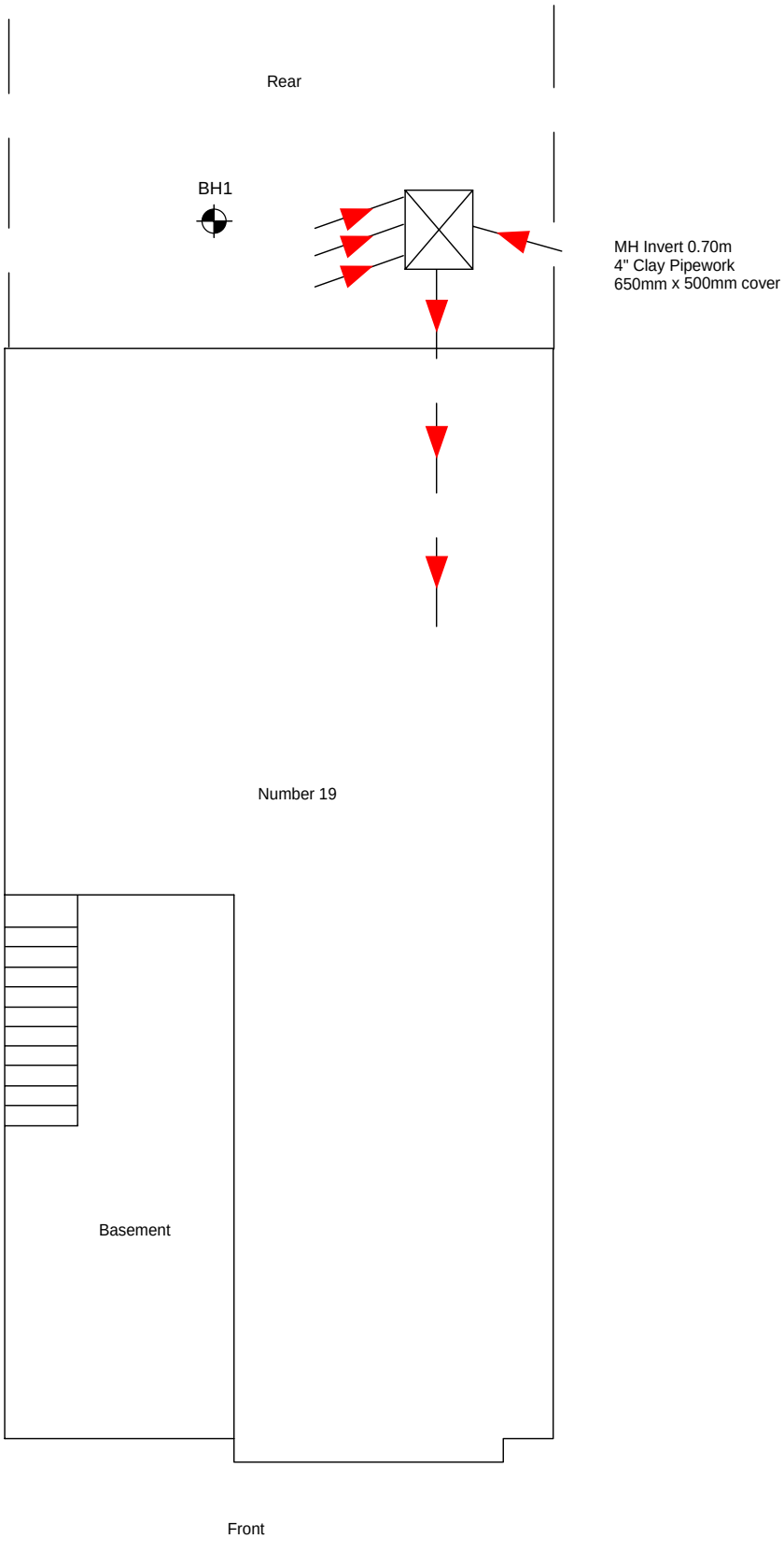
Web: www.fastrackgroup.co.uk

Appendix No: 1
FSI Ref: 8328a

SITE PLAN

Property Address: 19 Bisham Gardens, London N6 6PJ

Survey date: 22/08/2014 **Operative:** SE1



Scale:	Drawn by:	Key:
NTS	LK	Trial Pit, Borehole, Manholes, Rain Water Pipe, Soil & Vent Pipe, Surface Water Gully, Foul Water Gully, Shrub, Tree (Conifer), Tree (Deciduous)

FASTRACK
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Maldon, Essex, CM9 6TQ
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Web: www.fastrack-geotechnical.co.uk

Appendix No: 2
FSI Job No: 8328A

BOREHOLE LOG

Property Address: 19 Bisham Gardens,London, N6 6PJ
Client Claim Ref: 19 Bisham Gardens **Survey date:** 22/08/2014 **Operative:** SE1

Borehole ID: BH1 Hole Type: HA Scale: 1:55

Water Strikes	Samples Type	Samples Depth (m)	Insitu Tests Type	Insitu Tests Results	Depth (m)	Legend	Stratum Description and Observations
					0.13		30mm Paving Slab onto 100mm Concrete
							Dark brown sandy clayey MADE GROUND containing brick and gravel
	D1	1.00	MP	44/75mm			
		1.08	MP	46/75mm			
		1.15	MP	47/75mm	1.20		
		1.23	MP	47/75mm			Dense dark brown clayey sandy GRAVEL
	D2	2.00	MP	49/75mm			
		2.08	MP	51/75mm			
		2.15	MP	53/75mm			
		2.23	MP	53/75mm	2.50		
							Dense yellow clayey SAND
	D3	3.00	MP	19/75mm			
		3.08	MP	21/75mm			
		3.15	MP	22/75mm			
		3.23	MP	22/75mm			
	D4	4.00	MP	26/75mm			
		4.08	MP	27/75mm			
		4.15	MP	29/75mm			
		4.23	MP	29/75mm			
	D5	5.00	MP	34/75mm			
		5.08	MP	37/75mm			
		5.15	MP	37/75mm			
		5.23	MP	37/75mm			
	D6	6.00	MP	41/75mm			
		6.08	MP	44/75mm			
		6.15	MP	44/75mm			
		6.23	MP	44/75mm			
	D7	7.00					
	D8	8.00					
	D9	9.00					
					9.30		Orange silty sandy gravelly CLAY
	D10	10.00			10.00		End of Borehole at 10.00 m

Key: ▽ Water Strike D Disturbed Sample V Insitu vane test MP Mackintosh Probe Test

Remarks: Borehole was closed at 10.00m as requested. Borehole was noted to be dry on completion.

N.b. Unless otherwise stated small vane paddle used

AGS

FASTRACK
Tyndales Farm, Southend Road, Woodham Mortimer,
Maldon, Essex, CM9 6TQ

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Fax: 0844 3358907
Email: enquiries@fastrackgroup.co.uk
Web: www.fastrackgroup.co.uk

Appendix No: 3
FSI Ref: 8328a

LABORATORY RESULTS

Property Address: 19 Bisham Gardens, Londons, N6 6PJ

SAMPLE DETAILS

Investigation date:	**22nd August 2014**
Sample details:	**Bags as received**
Samples received:	**26th August 2014**
Schedule recieved:	**26th August 2014**
Samples tested:	**26th August-3rd September 2014**
Results reported:	**3rd September 2014**

ANALYSIS REQUESTED

Moisture Content	☑	PSD	☑
Liquid Limit	☑	Soil Suction	☐
Plastic Limit	☑	Shear Strength	☐
Plasticity Index	☑	Contamination	☐
Root ID	☐	Root/Tree DNA	☐
Other (please state)			☐

TEST DETAILS

General

Sample descriptions were written in accordance with BS 5930:1999.

Samples were prepared in accordance with BS 1377: Part 1: 1990, section 7

Samples from this contract will be retained for 1 calender month following the issue of this report unless otherwise notified

Written approval is required from Fastrack Geoetchnical Services Limited to reproduce report in full. The results shown within this report only relate to the samples tested

Moisture Content

Samples were tested in accordance with BS 1377: Part 2: 1990, section 3.2 (Oven drying method)

In accordance with Note 1 to paragraph 3.2.4 of BS 1377 Part 2 1990; these moisture contents have been corrected to give the equivalent moisture content of the fraction passing the 425µm sieve, to enable comparison with the liquid & plastic limits. (If condition of test is 'natural' the retained percentage is an estimated value, if condition is 'washed' the percentage is a measured value).

Samples are dried at 105-110^{o}C unless otherwise stated.

Atterberg Limits

Samples were tested in accordance with BS 1377: Part 2: 1990, section 4.3 (4 drop LL), 4.4 (1 drop LL), 5.3 (PL) and 5.4 (PI)
Test results on samples with a sand content, may show less accurate results. If condition of test is 'washed' results relate to the fraction passing the 425µm sieve only.

* *Driscoll's rules deem the soil to be desicated where the moisture content is less than the value calculated using driscoll's rule 1 and/or 2*

Particle Size Distribution

Samples were tested in accordance with BS 1377: Part 2: 1990 section 9.2 (Wet sieving method)

Undrained Shear Stength

Samples were prepared in accordance with BS 1377: Part 7: 1990 section 8.3 and testing in accordance with BS 1377: Part 7: 1990: section 8.4 (undrained shear strength in triaxial compression without measurement of pore pressure (UU))

Soil Suction

Samples were prepared and tested based on the BRE digest No:IP4/93 (Corrected). 'A method of determining the state of desiccation in clay soils.' (Filter paper method).

Test results on samples with a sand or silt content, may show less accurate results. Deviation to standard procedure - Polythene bags are not used from weighing filter papers.

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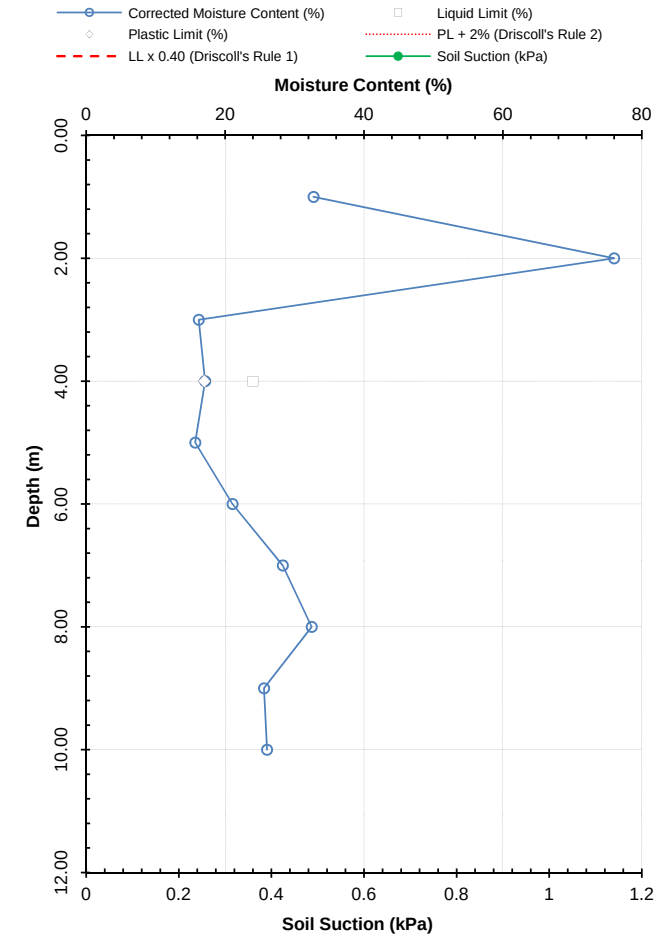
Appendix No: 3
FSI Ref: 8328a

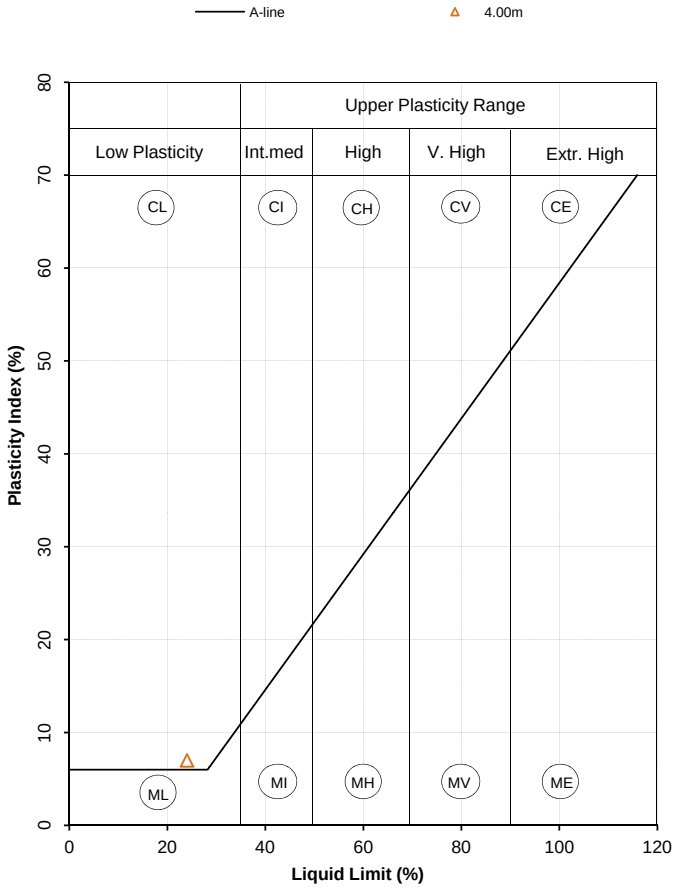
LABORATORY RESULTS

Property Address: 19 Bisham Gardens, Londons, N6 6PJ

BOREHOLE 1

Depth (m)	MC (%)	Corr. MC (%)	LL (%)	PL (%)	PI (%)	Class	% Retained (425µm)	Soil Suction (kPa)	Condition of test	Soil Description
1.00	14.4	32.73					56		Natural	Brown sandy, clayey MADEGROUND containing gravel and brick
2.00	5.7	76					92.5		Natural	Brown sandy GRAVEL
3.00	16.2	16.2					0		Natural	Brown SAND
4.00	16.5	17.12	24	17	7	CL	3.6		Natural	Brown clayey SAND containing gravel
5.00	15.7	15.7					0		Natural	Brown silty SAND
6.00	19.1	21.07					9.33		Natural	Brown SAND containing gravel
7.00	28.3	28.3					0		Natural	Brown silty SAND
8.00	32.3	32.46					0.5		Natural	Brown silty SAND
9.00	25.6	25.6					0		Natural	Brown silty SAND
10.00	21.1	26.03					18.94		Natural	Brown silty SAND containing gravel





Comments:

Issued by:
- [x] Lara Knight (Laboratory Manager)
- [ ] Other

Signed: L Knight

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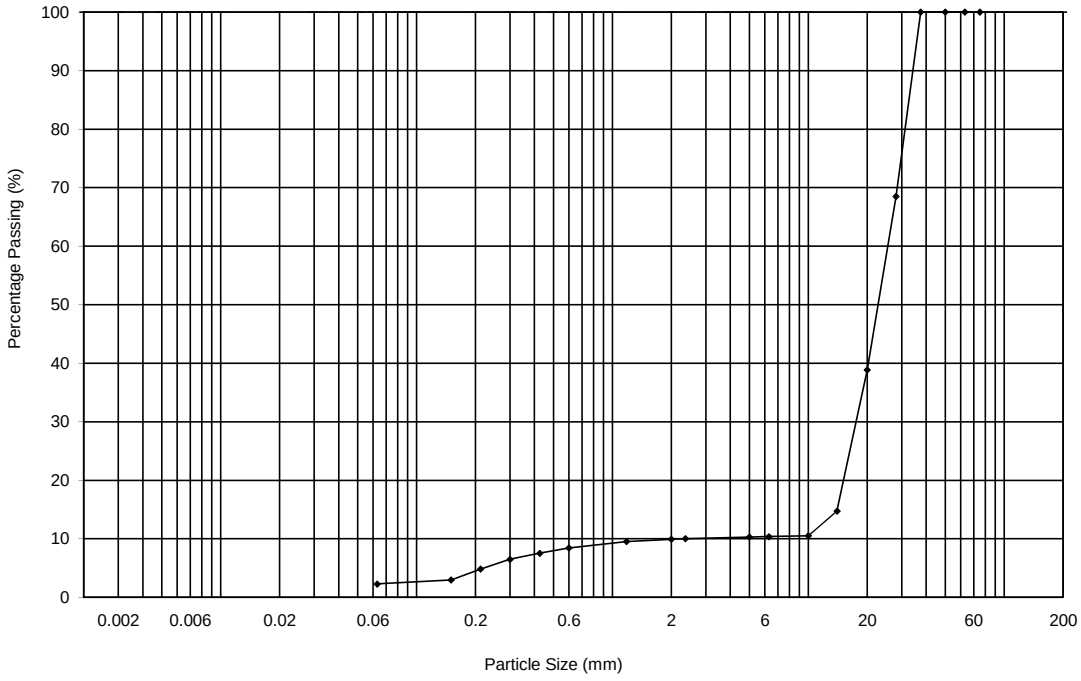
Appendix No: 3
FGS Ref: 8328a

LABORATORY RESULTS

Property Address: 19 Bisham Gardens, London, N6 6PJ

PARTICLE SIZE DISTRIBUTION: BOREHOLE 1 at 2.00m



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Issued by:
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☐ Other

Signed: L Knight

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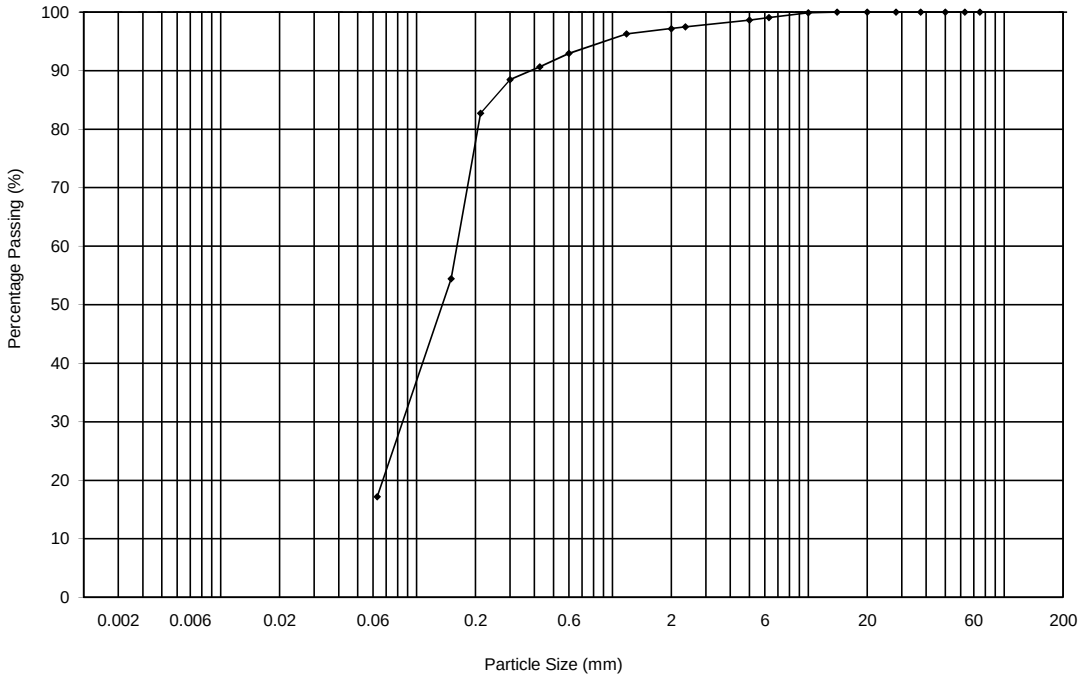
Appendix No: 3

FGS Ref: 8328a

LABORATORY RESULTS

Property Address: 19 Bisham Gardens, London, N6 6PJ

PARTICLE SIZE DISTRIBUTION: BOREHOLE 1 at 6.00m



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Issued by:

☑ Lara Knight (Laboratory Manager)

☐ Other

Signed: L Knight

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Appendix No: 3
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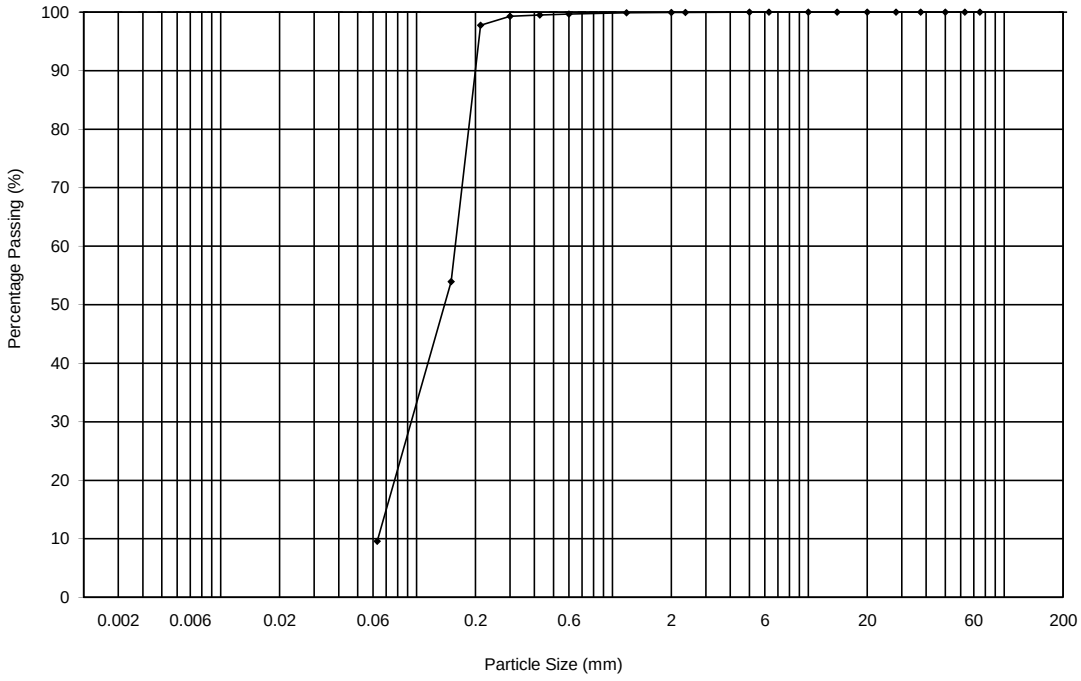
LABORATORY RESULTS

Property Address: 19 Bisham Gardens, London, N6 6PJ

PARTICLE SIZE DISTRIBUTION: BOREHOLE 1 at 8.00m



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

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☐ Other

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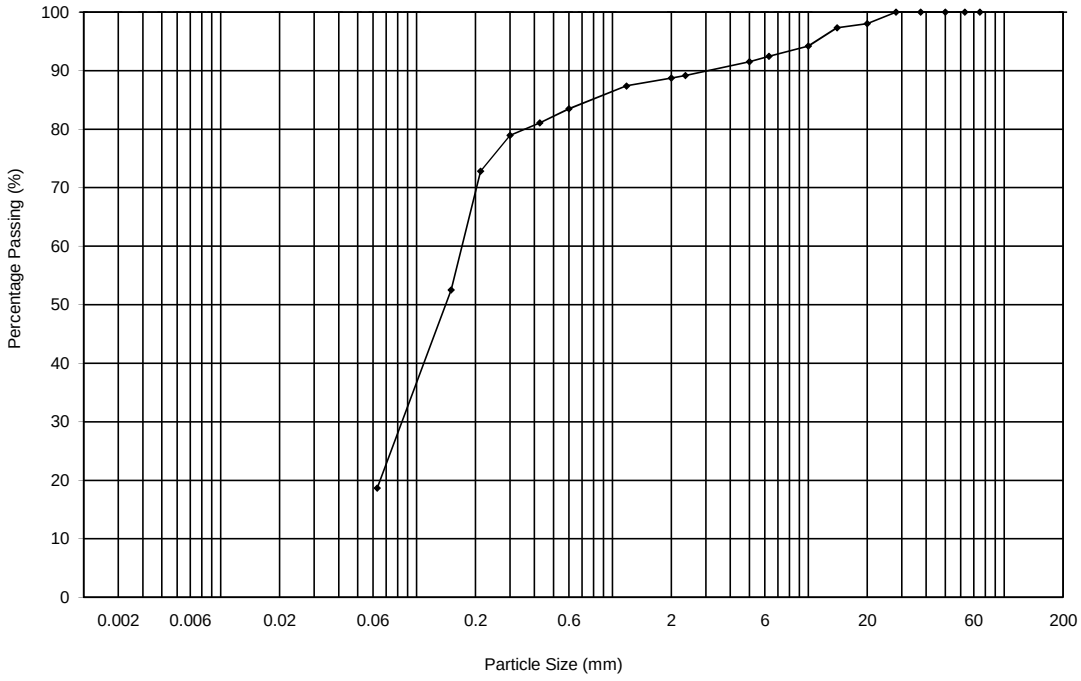
Appendix No: 3

FGS Ref: 8328a

LABORATORY RESULTS

Property Address: 19 Bisham Gardens, London, N6 6PJ

PARTICLE SIZE DISTRIBUTION: BOREHOLE 1 at 10.00m



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Issued by:

☑ Lara Knight (Laboratory Manager)

☐ Other

Signed: L Knight

Geotechnical Survey Report

FSI Ref:	8328
Issue Date:	November 2013
Site Address:	19 Bisham Gardens London N6 6PJ

Director:	Martin Rush MSc FGS
Office Manager:	Louise Hiscock BSc (Hons)
CAD Technician:	Perry Martin AMCIHT
Laboratory Manager:	Lara Knight

19 Bisham Gardens, London N6 6JP

1.0 INTRODUCTION

In accordance with instructions by Picardi Architects, we visited the site occupied by 19 Bisham Gardens on 30th October 2013. The purpose of our visit was to carry out an investigation into the ground conditions, with a view to design for a proposed basement.

The exploratory holes carried out during the fieldwork, which investigate only a small volume of the ground in relation to the size of the site, can only provide general indication of site conditions. The comments and opinions expressed within this report are based on the ground conditions revealed by the site works. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which therefore have not been taken into account in this report.

All ground water readings relate to short term observations and do not allow for variations due to seasonal or other effects.

All depths stated within this report and on the borehole logs are depths below the ground level surrounding the borehole locations.

2.0 SITE SETTING

i. Location and Description

The site is located at approximate grid reference TQ 284 873, on the north side of Bisham Gardens located towards the western end of the road. The site is a residential property with both front and rear gardens. The ground floor level of the site is raised up approximately 0.80m-1.00m above street level. There is a basement to the front left of the property which has a head room of approximately 1.60m, the site lies approximately 125m above sea level.

ii. Geology and Hydrogeology

Reference to the 1:50,000 scale geological map of the area shows the site to be underlain by the Bagshot Formation which is noted to be SAND. There are no records of artificial ground or superficial deposits on this site.

The Bagshot Formation is noted to be a Secondary (A) Aquifer – Permeable Layers. This type of aquifer are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers. There are no abstraction licence points within 500m of the site and the site does not lie within a groundwater source protection zone

The site lies within an area that shown groundwater flooding susceptibility, however the susceptibility is very low and is within a low confidence rated area. Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded. The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

iii. Natural Hazards

There is a negligible shrink swell hazard as the ground conditions are predominantly non plastic.

There landslide risk is very low; Slope instability problems are unlikely to be present

The soluble rock hazard is null/negligible as soluble rocks are not present within the site area

There is negligible risk from compressible ground, No indicators for compressible deposits identified

The collapsible rocks hazard is very low; Deposits with potential to collapse when loaded and saturated are unlikely to be present

The running sand hazard is low; there is possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site.

The site does not lie with an area affected by mining

iv. Environmental Maps

There are no records of landfill sites within 1500m or waste sites within 500m of this site.

There are 12 industrial land uses that could potentially be contaminative within 250m of the site; all of these uses are unlikely to have an impact on the ground beneath this property

The nearest fuel station is a Total garage located 321m North West of the site.

There are no sensitive sites within 1000m of the site.

v. Hydrology

There are no water courses located within 500m of the site. The nearest watercourse on the relevant 1:25,000 OS map is shown as a secondary river approximately 650-700m to the west of the site

The site does not lie within a flood zone as defined by the environment agency.

3.0 FIELDWORK

The site investigation work was carried out on 30th October 2013 and comprised of the digging of 1No. trial pits and drilling of 1No. borehole to a depth of 2.00m. The locations of the boreholes carried out are marked on the site plan within Appendix 1 and the borehole logs included as Appendix 2.

Within the boreholes, disturbed samples were taken at depths of 0.50m intervals. Insitu strength tests, in the form of mackintosh probe tests were performed within the Sub soil at 0.50m intervals. The results of all insitu strength tests are recorded on the borehole logs within Appendix 2.

4.0 TRIAL PIT FINDINGS

i. Foundation Details

The foundations of trial pit 1 are shown to be brick foundations seated into medium dense SAND and GRAVEL at a depth of 0.215m from basement floor level. The footing consisted of three brick step-outs, projecting 70mm, 75mm and 50mm with thicknesses of 70mm, 75mm and 70mm respectively.

Locations of the trial pits can be seen on the site plan in appendix 1 and the trial pit logs can be seen in appendix 2.

5.0 BOREHOLE FINDINGS

i. Overview

One borehole was carried out on site, to establish the geology and contamination levels across the site as a whole. The boreholes were drilled to a maximum depth of 2.00m. All boreholes encountered very similar profiles which matched the expected underlying geology of the Bagshot Formation. Boreholes 1 to 4 were drilled utilising a hand auger due to restricted access.

The borehole was noted to start at 0.80m above street level and recorded MADE GROUND to a depth of 0.50m and then SAND and GRAVEL to the base of the borehole (2.00m). The SAND and GRAVEL was noted to be loose at 0.50m increasing in density to medium dense between 1.00m and 2.00m depth.

ii. Root Activity

No root activity was noted within the borehole.

iii. Groundwater

The borehole was noted to be dry on completion of drilling.

It should be noted that comments on groundwater conditions are based on observations made at the time of the investigation (November 2013) and that changes in groundwater levels are likely to arise due to seasonal affects and changes in drainage conditions.

6.0 BEARING CAPACITY ASSESSMENT

For preliminary design purposes, BS8004 gives presumed bearing values which are the pressures which would normally result in an adequate factor of safety against shear failure for particular soil types, but without consideration of settlement.

These values are as follows:

Category	**Types of rocks and soils**	**Presumed bearing value**
Non-cohesive soils	Dense gravel or dense sand and gravel	>600 kN/m²
	Medium dense gravel, or medium dense sand and gravel	<200 to 600 kN/m²
	Loose gravel, or loose sand and gravel	<200 kN/m²
	Compact sand	>300 kN/m²
	Medium dense sand	100 to 300 kN/m²
	Loose sand	<100 kN/m² *depends on degree of looseness*
Cohesive soils	Very stiff bolder clays & hard clays	300 to 600 kN/m²
	Stiff clays	150 to 300 kN/m²
	Firm clay	75 to 150 kN/m²
	Soft clays and silts	< 75 kN/m²
	Very soft clay	Not applicable
Peat		Not applicable
Made ground		Not applicable

For calculation of the bearing capacities available at 2.00m, we have assumed a Mackintosh Probe result of 24 blows for 75mm travel, which was the lowest reading obtained at this depth. Based on Hansen (1968) and Tomlinson (2001), for a one metre wide foundation, which assumes groundwater will not impact upon the foundations (i.e. groundwater will not be present within the width of the foundation below the foundation) a Mackintosh Probe reading of 24 blows for 75mm travel equates to a presumed bearing capacity of 256kN/m².

ii. Ground Conditions & Construction

The boreholes drilled on this site were all found to be dry on completion of drilling. However, in the short term this would indicate that excavations on this site are unlikely to be affected by water inflows.

The material encountered on this site was found to be of a generally granular nature, which would indicate that sides of excavations are unlikely to be self-supporting, certainly in the long term. Temporary support should be considered for all excavations where collapse is to be avoided, with heavy duty closed shoring in excavations below 1.20m where construction workers access is required.

7.0 CERTIFICATION

Although the boreholes were positioned to give a spread across the site, it is impossible to give total coverage across a site, especially one which contains buildings, hardstandings and obstructions. Therefore areas exist on the site where investigations were not carried out. Such areas are generally only exposed during the construction stage. Should any areas of potential contamination be identified during construction, further testing may be required.

Responsibility cannot be accepted for variation in ground conditions between and around exploratory points not revealed by the data or at the time of the investigation. The report may suggest an opinion on the nature of the strata or conditions between exploratory points and below the maximum depth of investigation. However, this is for guidance only and no liability can be accepted for its accuracy.

The conclusions and recommendations given within this report are based upon the stated development plans for the site. If the site is to be developed for a more or less sensitive use then a different interpretation may be appropriate. This report relies upon the co-operation of other organisations and the free availability of information and total access. No responsibility can therefore, be accepted for conditions arising from information, which was not available to the investigation team as a result of information being withheld or access prevented.

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I hope that this is satisfactory for you requirements. If you have any queries please do not hesitate from contacting me.

Yours faithfully

Martin Rush
For and on behalf of
FASTRACK SITE INVESTIGATIONS LTD

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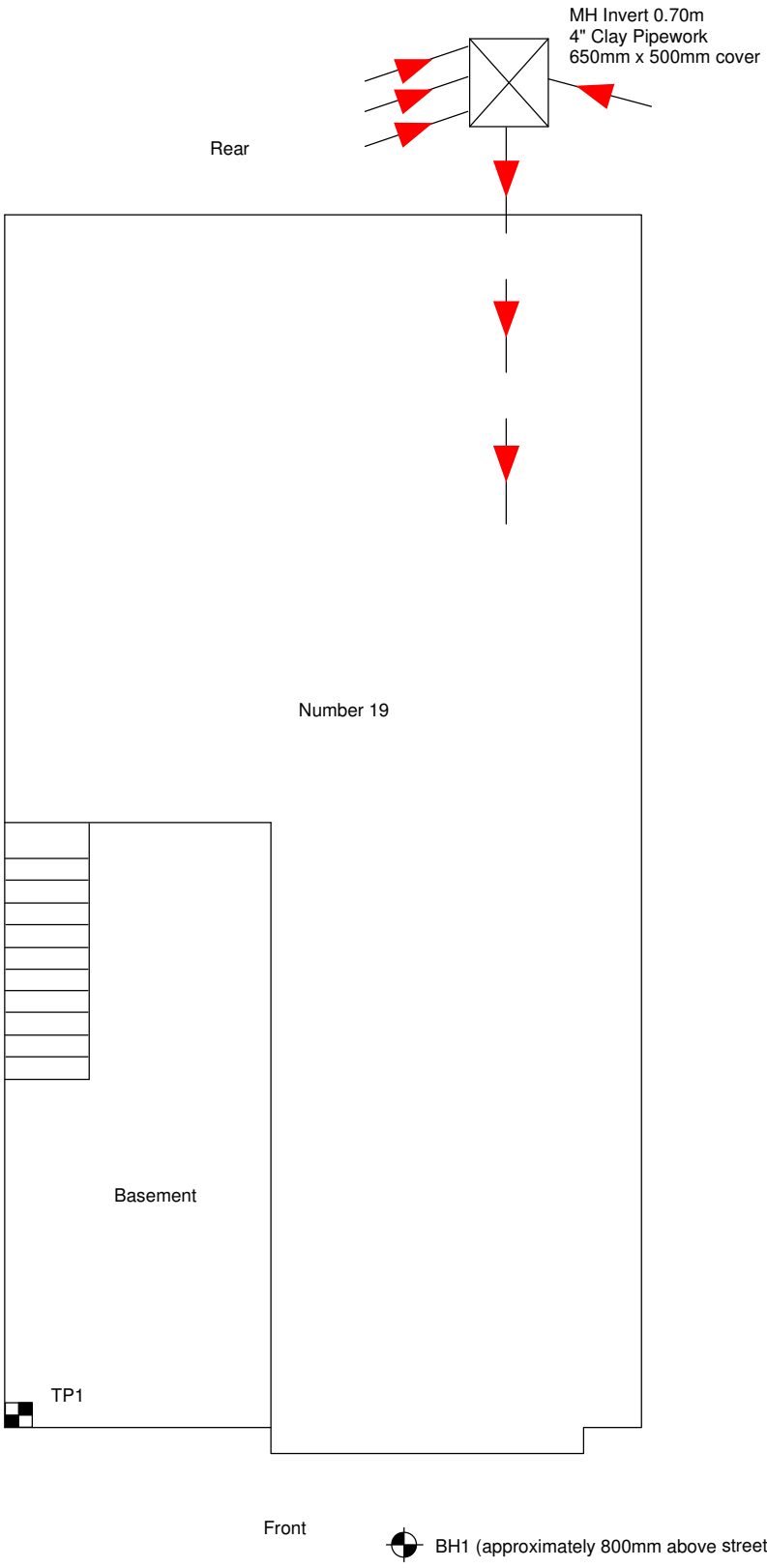
Appendix No: 1
FSI Ref: 8328

SITE PLAN

Property Address: 19 Bisham Gardens, London N6 6PJ

Survey date: 30/10/2013 **Operative:** SE1



Scale:	Drawn by:	Key:
NTS	LH	Trial Pit, Borehole, Manholes, Rain Water Pipe, Soil & Vent Pipe, Surface Water Gully, Foul Water Gully, Shrub, Tree (Conifer), Tree (Deciduous)

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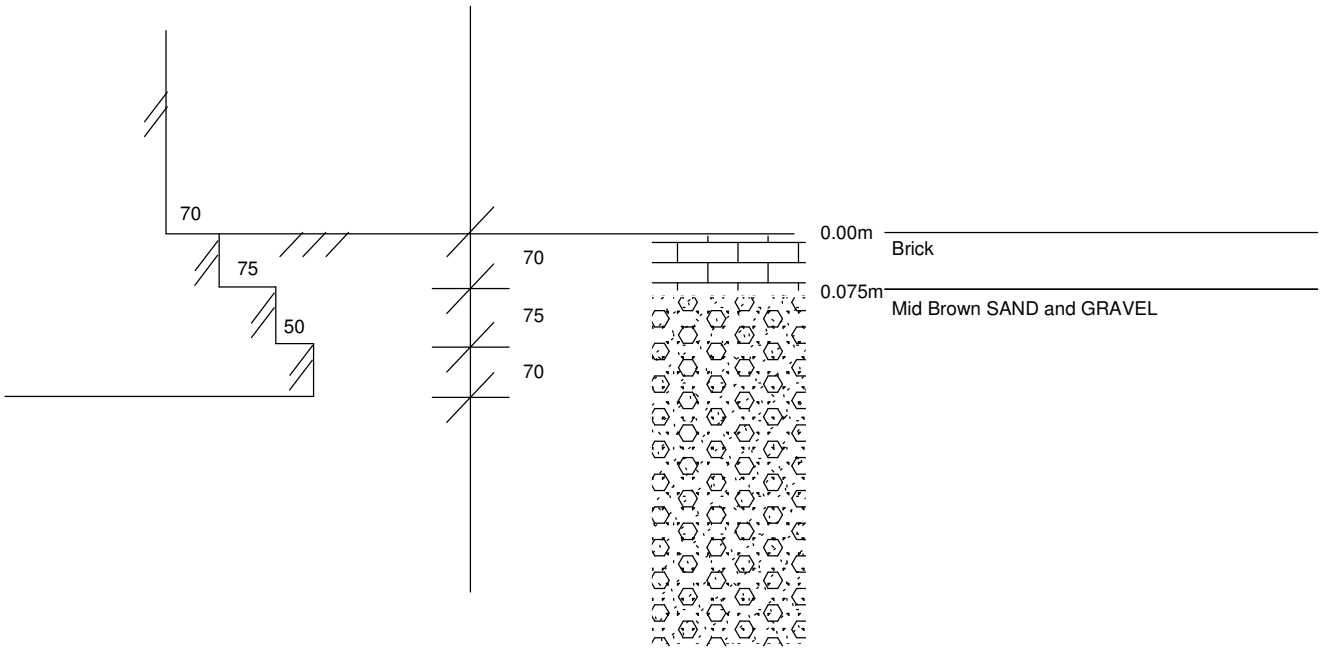
Appendix No: 2
FSI Ref: 8328

TRIAL PIT 1

Property Address: 19 Bisham Gardens, London N6 6PJ

Survey date:30/10/2013 **Operative:** SE1

Party wall and front elevation have matching foundation profiles



Foundation Level = 0.215m

Founding strata: Mid brown SAND and GRAVEL

Trial Pit Location:

Drawn by: MR

Scale: 1:10

D= small disturbed sample, B= large bulk sample, U= undisturbed sample,
MP= mackintosh proble blow counts, V= shear vane reading (kPa)

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Appendix No: 2
FSI Job No: 8328

BOREHOLE LOG

Property Address:
Client Claim Ref: 19 Bisham Gardens London N6 **Survey date:** 30/10/2013 **Operative:**

Borehole ID: BH1 Hole Type: HA Scale: 1:10

Water Strikes	Samples Type	Samples Depth (m)	Insitu Tests Type	Insitu Tests Results	Depth (m)	Legend	Stratum Description and Observations
							Pea Shingle
					0.10		Dark brown, sandy clayey MADE GROUND containing brick pieces and gravel
	D1	0.50	MP	9/75mm	0.50		Mid brown SAND and GRAVEL
		0.58	MP	9/75mm			
		0.65	MP	10/75mm			
		0.73	MP	10/75mm			
	D2	1.00	MP	17/75mm			
		1.08	MP	19/75mm			
		1.15	MP	19/75mm			
		1.23	MP	21/75mm			
	D3	1.50	MP	24/75mm			
		1.58	MP	24/75mm			
		1.65	MP	25/75mm			
		1.73	MP	27/75mm			
					2.00		End of Borehole at 2.00 m

Key: ▽ Water Strike D Disturbed Sample V Insitu vane test MP Mackintosh Probe Test

Remarks: Borehole closed at 2.00m, unable to progress with hand auger
Borehole noted to be dry on completion
N.b. Unless otherwise stated small vane paddle used

AGS

GroundSure EnviroInsight

Address:	**19,BISHAM GARDENS,HIGHGATE,LONDON, N6 6DJ**
Date:	**19 Nov 2013**
Reference:	**CMAPS-CM-274708-14894-191113**
Client:	**CENTREMAPS**

NW N NE

W E

SW S SE

Aerial Photograph Capture date: 20-Apr-2013

Grid Reference: 528460,187308

Site Size: 0.01ha

Contents Page

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
1.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
1.1.1 Records of historic IPC Authorisations	0	0	0	0
1.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
1.1.3 Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0
1.1.4 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0
1.1.5 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
1.1.6 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
1.1.7 Records of Part A(2) and Part B Activities and Enforcements	0	0	2	2
1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
1.1.9 Records of Licensed Discharge Consents	0	0	1	0
1.1.10 Records of Planning Hazardous Substance Consents and Enforcements	0	0	0	0
1.2 Records of COMAH and NIHHS sites	0	0	0	0
1.3 Environment Agency Recorded Pollution Incidents				
1.3.1 National Incidents Recording System, List 2	0	0	0	0
1.3.2 National Incidents Recording System, List 1	0	0	0	0
1.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 2: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-5000
2.1 Landfill Sites						
2.1.1 Environment Agency Registered Landfill Sites	0	0	0	0	0	Not searched
2.1.2 Environment Agency Historic Landfill Sites	0	0	0	0	0	0
2.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
2.1.4 GroundSure Local Authority Landfill Sites Data	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						
2.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
2.2.2 Environment Agency Licensed Waste Sites	0	0	0	0	0	0

Section 3: Current Land Use

	On-site	0-50m	51-250	251-500
3.1 Current Industrial Sites Data	0	3	8	Not searched
3.2 Records of Petrol and Fuel Sites	0	0	0	1
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0

Section 4: Geology

4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None
4.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 5: Hydrogeology and Hydrology

	0-500m
5.1 Are there any records of Productive Strata in the Superficial Geology within 500m of the study site?	No
5.2 Are there any records of Productive Strata in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
5.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
5.7 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
5.8 Detailed River Network entries within 500m of the site	0	0	0	0	Not searched	Not searched
5.9 Surface water features within 250m of the study site	No	No	No	Not searched	Not searched	Not searched

Section 6: Flooding

6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	No
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	No
6.3 Are there any Flood Defences within 250m of the study site?	No
6.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
6.5 Are there any areas used for Flood Storage within 250m of the study site?	No
6.6 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Very Low
6.7 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Low

Section 7: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	2
7.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
7.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
7.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
7.5 Records of Ramsar sites	0	0	0	0	0	0
7.6 Records of Ancient Woodlands	0	0	0	0	1	3
7.7 Records of Local Nature Reserves (LNR)	0	0	0	0	1	3
7.8 Records of World Heritage Sites	0	0	0	0	0	0
7.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
7.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
7.11 Records of National Parks	0	0	0	0	0	0
7.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
7.13 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0

Section 8: Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Low

Section 9: Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Negligible
9.3 Are there any brine affected areas within 75m of the study site?	No

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure underground oil and gas pipelines.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence.

9. Mining

Provides information on areas of coal and shallow mining.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (08444 159000) for further information and guidance.

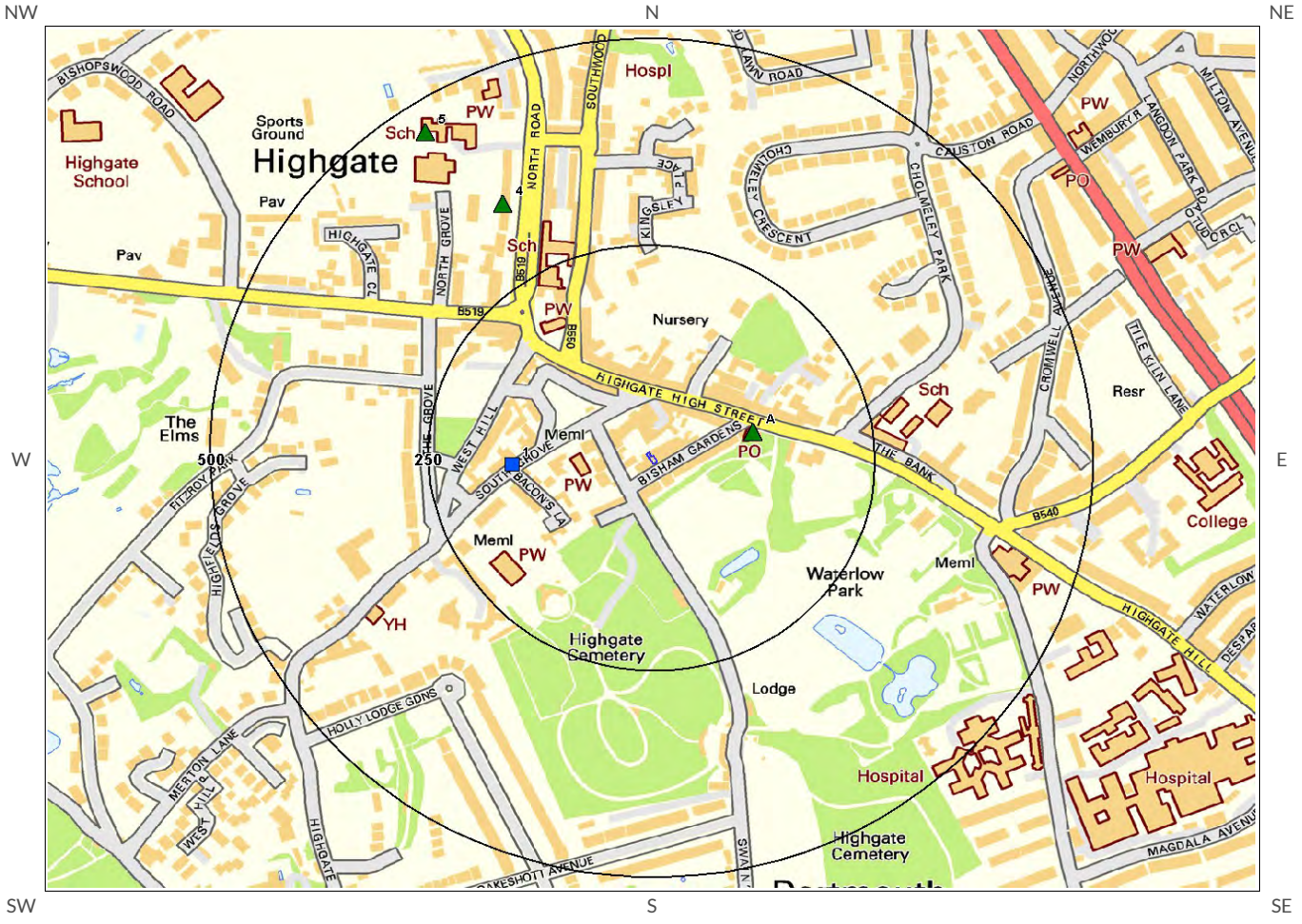
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1 Environmental Permits, Incidents and Registers Map



Environmental Permits, Incidents and Registers Legend

Mapping sourced from Ordnance Survey

- Site Outline
- Search Buffers (m) — 250 / 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

Report Reference: CMAPS-CM-274708-14894-191113
Client Reference: 14894

1 Environmental Permits, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

1.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

1.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

1.1.3 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

1.1.4 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

1.1.5 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

1.1.6 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

1.1.7 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

4

The following Part A(2) and Part B Activities are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
2A	115.0	E	528576 187337	Address: First Choice, 5 Highgate High Street, N6 5JR Process: Dry Cleaner Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
3A	115.0	E	528576 187337	Address: First Choice, 5 Highgate High Street, London, N6 5JR Process: Dry Cleaner Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
4	342.0	NW	528289 187613	Address: John Nichol Service Station, 31-33 North Rd, Highgate, N6 4BE Process: Petrol Station Status: Current Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified
5	463.0	NW	528200 187700	Address: North Rd Serv Stn, North Rd, N6 4BE Process: Petrol Vapour Recovery Process Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of Enforcement: No Enforcement Notified Comment: No Enforcement Notified

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1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

1.1.9 Records of Licensed Discharge Consents within 500m of the study site:

1

The following Licensed Discharge Consents records are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
1	155.0	W	528300 187300	Address: Highgate, Highgate Effluent Type: Trade Discharges - Unspecified Permit Number: TEMP.0148 Permit Version: 1	Receiving Water: River Thames Status: Revoked - Unspecified Issue date: 15/9/1989 Effective Date: 15/9/1989 Revocation Date: 5/10/2000

1.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site: 0

Database searched and no data found.

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

1.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site: 0

Database searched and no data found.

1.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site: 0

Database searched and no data found.

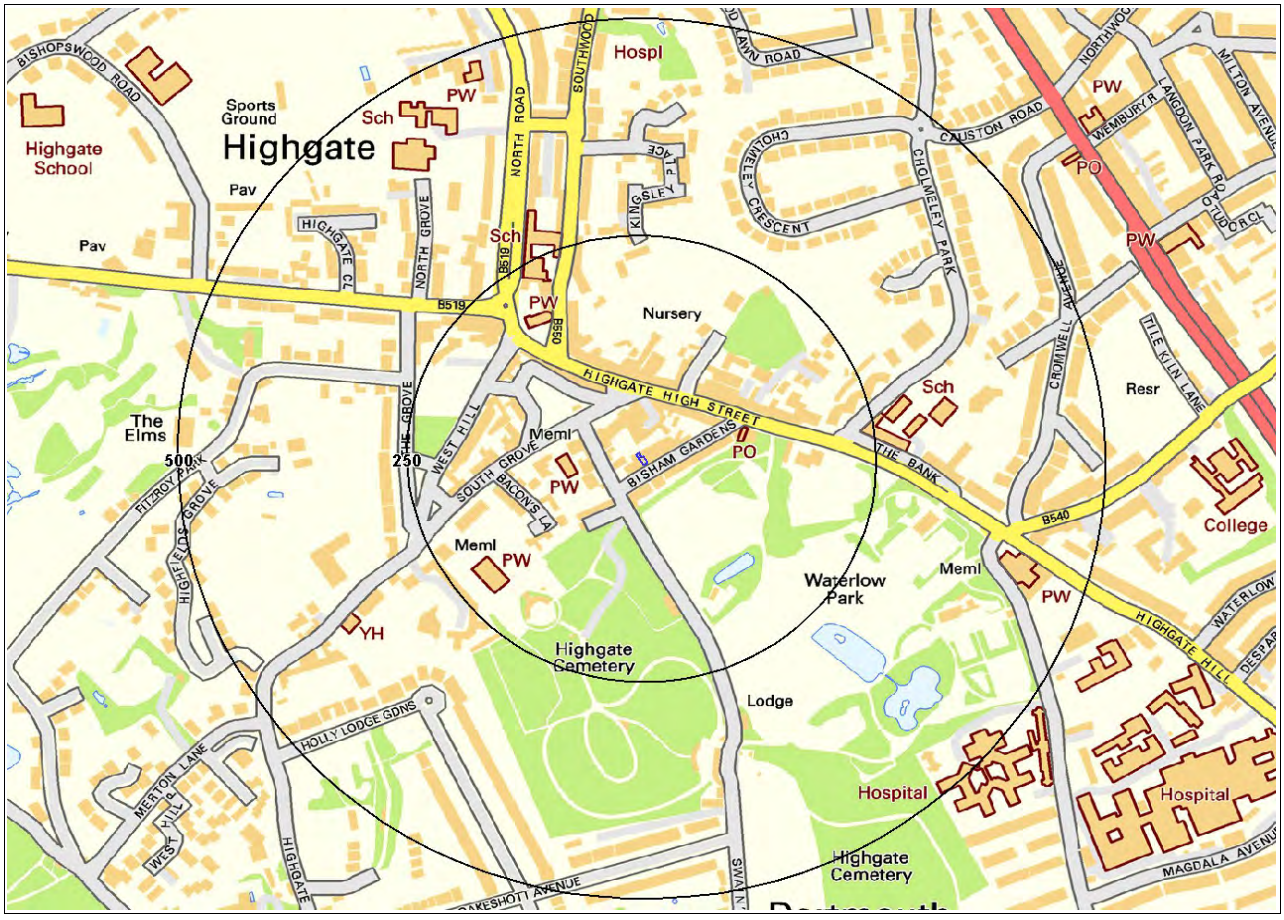
1.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

2 Landfill and Other Waste Sites Map

NW N NE



W E

SW S SE

Landfill and Other Waste Sites Legend

Mapping sourced from Ordnance Survey

- Site Outline
- Search Buffers (m) — 250 / 500
- E.A. Active Landfill
- E.A. Historic Landfill
- Local Authority Landfill
- Historic and Planned Waste Sites
- E.A. Licensed Waste Site
- BGS / DoE Survey Landfill

2 Landfill and Other Waste Sites

2.1 Landfill Sites

2.1.1 Records from Environment Agency landfill data within 1000m of the study site:

0

Database searched and no data found.

2.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

0

Database searched and no data found.

2.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

2.1.4 Records of Local Authority landfill sites within 1500m of the study site:

0

Database searched and no data found.

2.2 Other Waste Sites

2.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

2.2.2 Records of Environment Agency licensed waste sites within 1500m of the study site:

0

Database searched and no data found.

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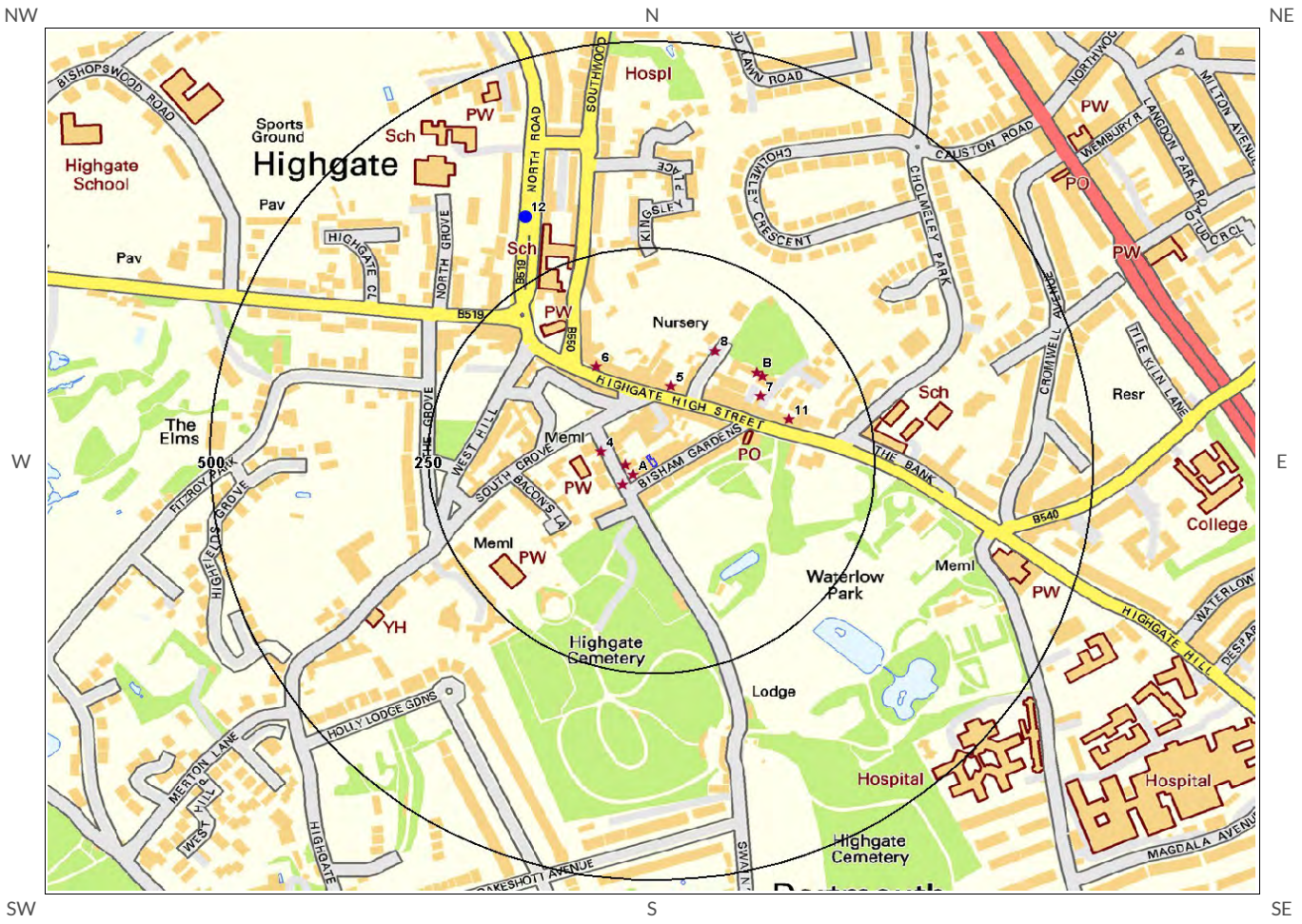
3 Current Land Use Map



Current Land Use Legend

Mapping sourced from Ordnance Survey

Site Outline

Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Underground High Pressure Oil & Fuel Pipelines

3 Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 11

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1A	26.0	SW	Television Mast	528438 187291	N6	Telecommunications Features	Infrastructure and Facilities
2A	26.0	SW	Television Reception Station	528430 187303	N6	Telecommunications Features	Infrastructure and Facilities
3A	41.0	SW	Electricity Sub Station	528427 187279	N6	Electrical Features	Infrastructure and Facilities
4	52.0	W	Depot	528402 187319	N6	Container and Storage	Transport, Storage and Delivery
5	87.0	N	Village Curtains	528482 187398	52, Highgate High Street, London, N6 5HX	Curtains and Blinds	Consumer Products
6	123.0	NW	Walter Castellazzo Designs	528396 187422	84, Highgate High Street, London, N6 5HX	Carpets, Flooring, Rugs and Soft Furnishings	Consumer Products
7	144.0	NE	R D H Supplies	528584 187386	16, Highgate High Street, London, N6 5JG	Packaging	Industrial Products
8	147.0	NE	Electricity Sub Station	528533 187441	N6	Electrical Features	Infrastructure and Facilities
9B	158.0	NE	Highgate Motors	528580 187414	9, Broadbent Close, London, N6 5JW	Vehicle Repair, Testing and Servicing	Repair and Servicing
10B	159.0	NE	Radiant Architectural Lighting Ltd	528586 187410	10, Broadbent Close, London, N6 5JW	Lampshades and Lighting	Consumer Products
11	161.0	E	Petroleum Development Consultants	528617 187358	Stanhope House 4-8, Highgate High Street, London, N6 5JL	Special Purpose Machinery and Equipment	Industrial Products

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 1

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
12	321.0	NW	528315 187603	Total	John Nichol Cars, 31-33, North Road, North Road, Highgate, London, Greater London, N6 4BE	No	Open

3.3 Underground High Pressure Oil and Gas Pipelines

Records of high pressure underground pipelines within 500m of the study site: 0

Database searched and no data found.

4 Geology

4.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.2 Superficial Ground and Drift Geology

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
BGS-SAND	BAGSHOT FORMATION	SAND

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

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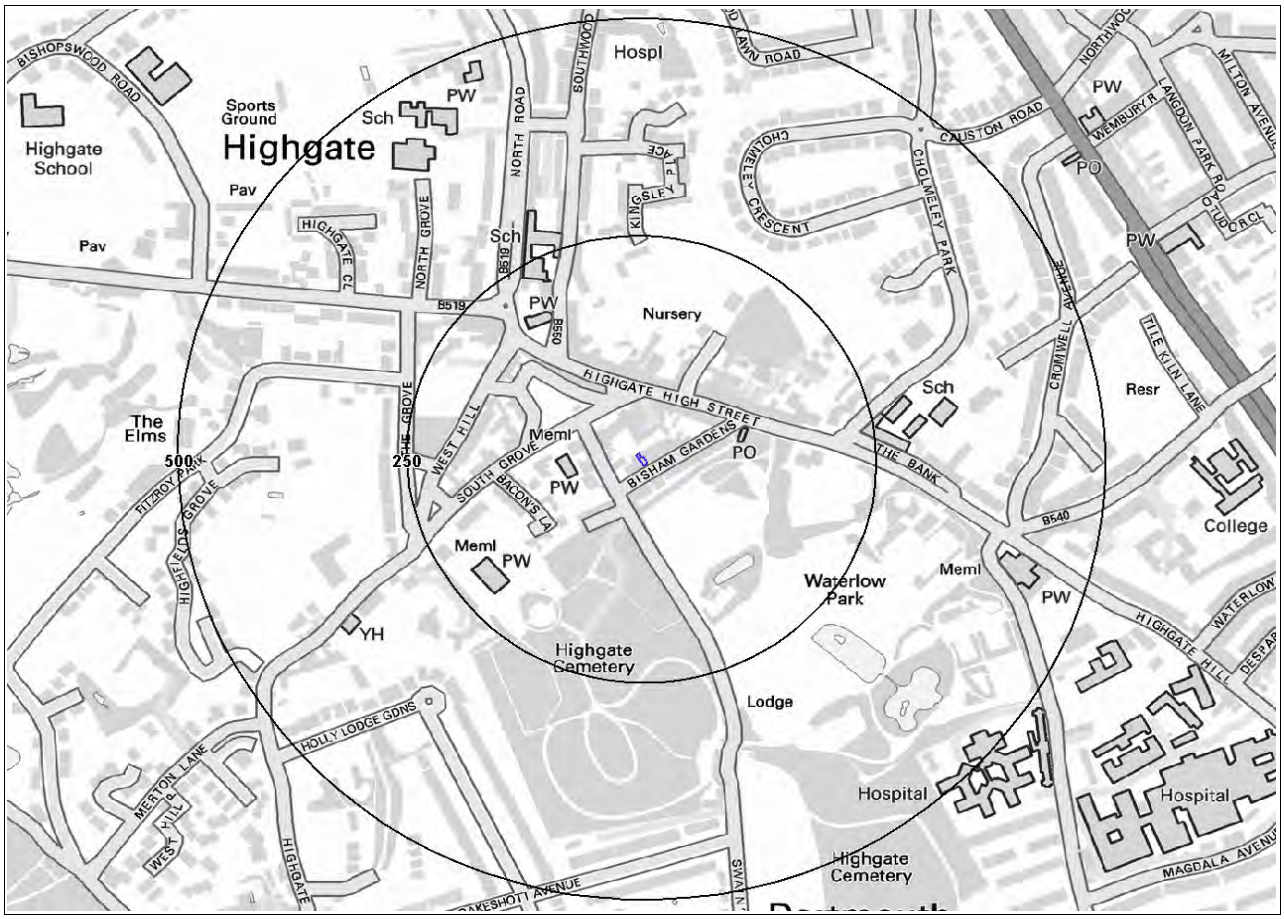
5 Hydrogeology and Hydrology

5a Aquifer Within Superficial Geology

NW N NE



W E

SW S SE

Map Legend

Mapping sourced from Ordnance Survey

Site Outline

Search Buffers (m) 250 500

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)