PRICE&MYERS

REPORT

11 Netherhall Gardens
Hampstead London NW3 5RN

Basement Risk Assessment in support of a Planning Application
by
PKS Architects

The report concludes with a brief CV for the author of this report
plus a brief description of Price & Myers LLP.

This report also includes the following Appendices:
A: Drawings 18511/110,120,171,172,176
B. Sketches 18511/sk07 to 10.
C: Ground Investigation Report from SAS

Job No. 18511
September 2011
Prepared by: Philip Hudson BSc CEng MICE MIStructE

Signature:

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1.0 INTRODUCTION

The London Borough of Camden have published a Planning Guidance document relating to Subterranean Developments in the Borough. This document defines the requirement for a Basement Risk Assessment and describes a series of tests. This is discussed in section 7 of this report.

As Structural Engineers we are experienced in designing deep residential basements and at an early stage in the design process we will establish the background and particular challenges of each project. We then apply current Best Practice to develop a buildable scheme design and describe how this design can be executed on site. We refer to this as a Construction Method Statement, which is a term adopted in the Planning guidance of other London Boroughs. We consider this an excellent way of describing the risks associated with Subterranean Development projects and how these risks can be mitigated.

The following report outlines the structural methodology for the construction of the basement to be built on the footprint of 11 Netherhall Gardens. This report should be read in conjunction with the various drawings and sketches listed on the Cover sheet. A Geotechnical investigation has been completed and is included within the Appendices. The report also outlines the Hydrological issues associated with this site.

2.0 SITE & DEVELOPMENT APPRAISAL

2.1 EXISTING SITE IN CONTEXT

Netherhall Gardens lies to the east of the Finchley Road in Hampstead. It is relatively elevated compared to the Finchley Road and runs generally north-south. The road is fairly isolated from the general traffic routes. Nonetheless there will be no unusual or difficult traffic management issues.

Number 11 is occupied by a substantial 3-storey house. The house dates from the late Victorian period. The building was converted into a series of flats in the late 1940's. It is in poor condition and is beginning to deteriorate into a derelict state. The building has suffered severe subsidence problems and failed attempts have been made to solve this by underpinning.

The building has had a history of poor quality extensions and crude internal alterations. The most obvious alteration to the passer-by is the addition of a hard sand and cement render to the elevations.

Drawing 18511/110 Illustrates the outline of the building in relation to its boundaries and adjacent buildings.

2.2 PROPOSED DEVELOPMENT

It is proposed to demolish the existing building and clear the site. At the time of writing this report it is proposed to retain and conserve the front façade but for various good technical reasons we believe it will be better to demolish the façade and rebuild it as part of the main works. This issue is the subject of another report, which has been submitted to the planners for consideration.

The new property will include a new single storey basement, which will be used for car-parking and residential use.

The design of the superstructure is not part of this report but for information purposes we anticipate that the new building will have an RC frame with flat slabs construction and occasional RC beams. The presence of a railway tunnel on the site means that we cannot use any form of deep piling on the site.

The essence of the structural scheme is shown on drawings 18511/110,120, 171,172 and 176.

2.3 EXISTING GROUND CONDITIONS

An intrusive site investigation was completed Site Analytical Services (SAS) in June 2008. This included a variety of boreholes and trial pits in areas that could be accessed safely. The key observations from this work were:

- Made ground is present around the house. This is likely to be the product of natural reuse of excavated material to establish new external levels rather than material being recovered from remote locations.
- Under the made ground the work encountered London Clay which was weathered at shallow depth but quickly changes to unweathered at shallow depth. This material is increasingly stiff with depth. Apart from some minor seepage the boreholes were dry to considerable depth i.e below the depth of the proposed basement.
- The report describes the shape and depth of the existing foundations to the front façade. The testing reveals the presence of roots below foundation level and clearly establishes the cause of the damage to the front elevation i.e subsidence caused by root induced soil desiccation.
- The report didn't identify any obvious contamination on site. Our own desk-study work didn't identify any obvious reason to believe the site may be contaminated.

Although no meaningful ground water was encountered during the ground investigations experience tells us that any excavation into London Clay will eventually attract an accumulation of surface water and gradual seepage from more porous lenses within the clay i.e the hole will fill with water and generate risks associated with Floatation.

2.4 SITE HYDROLOGY

This has not been investigated by a specialist but based on our knowledge of the area, the ground conditions, and some easily completed checks the key observations are:

- The site is outside the fluvial/tidal flood zone of the River Thames and its tributaries. The site is also in a relatively elevated location in the area and as such is at very low risk of exceptional local flooding conditions. No further work on the sites Flooding risk is justified.
- The principal Chalk Aquifer is at least 75m below surface level and consequently well outside the zone of influence of the structural works for this development. The site works present no meaningful risk of contamination to the principal Aquifer under this site.

2.5 NETWORK RAIL TUNNEL

The property is immediately above a railway tunnel, which takes the main line from St. Pancras to the midlands. Network Rail refer to the tunnel as the Belsize New Tunnel. The Belsize Old tunnel runs further south of Number 11 and does not impact on this site.

Drawing 18511/110 Illustrates the outline of the building in relation to its boundaries and the railway tunnel.

At the time of writing this report we understand that the crown of the tunnel is at least 10m below the prevailing ground level across the site. One immediate result of the tunnels presence is the exclusion of any form of deep penetrative foundations on the site due to the risk of damaging Network rail's tunnel structure. Beyond this Network Rail will be concerned about the change of loading upon the tunnel structure. Our checks suggest that the new building with its basement dig results in a nett load reduction on the tunnel structure at 10m depth. The change is modest in size and we consider that this should have no impact on the tunnel structure.

3.0 PERMANENT WORKS

3.1 FOUNDATIONS IN GENERAL

The underlying strata will provide a suitable bearing stratum for the support of the proposed new house. The design of the basement will be driven by the following factors:

- The stability of the London Clay.
- The presence of minor traces of ground water and accumulation of surface water.
- Addressing the risk of Flotation and any heave.
- Maintaining the stability of adjacent buildings .
- Maintaining the stability of the public highway and any buried services under the surface of the road and footpath.
- Reducing the impact of the works on nearby trees.
- Deep piling is not available as a solution.

3.2 BASEMENT CONSTRUCTION

Drawings 18511/120 and 130 illustrate the proposals for the basement construction. The excavation wil be between 3.5 and 4m in depth. The reduced oversite will be blinded with mass concrete in preparation for a new Reinforced Concrete raft. Perimeter walls will be typically 300 mm thick. A 300mm thick Reinforced Concrete ground slab will complete the basement box.

Drawings 18511/171, 172 and 176 provide sections and isometrics illustrating the form of construction.

3.3 IMPACT ON ADJACENT STRUCTURES & SERVICES

Impact on Adjacent Structures – The works are completed close to the boundary with 9 Netherhall Gardens. A method statement for the works will be completed for Party Wall purposes. This will be incorporated within a Party Wall Agreement in the normal way. If any damage develops in the structure of the adjacent house then normal party wall procedures provide a mechanism for completing any repairs. Nonetheless we do not envisage any significant damage will develop as a result of the proposed works.

Impact on Adjacent highways and buried services etc – The works are close to a public footpaths on the front boundary. On the basis that the works are designed correctly and executed in accordance with good practice there should be no risk of damage to the Public Highway and any buried services.

Slope Stability – The works will be executed within the space defined by temporary shoring and propping. The site is generally also quite level. Consequently the risk of failure due to slope instability is very low.

Impact on buried services on the site – It is anticipated that the work will have an impact on buried services passing across the site e.g sewers, cables. In the course of the normal design development these will be considered and appropriate rerouting and replacement designs developed.

3.4 BASEMENT WATERTIGHTNESS

It is expected that the majority of the basement will need to meet a minimum level of Grade 2 water tightness in accordance with BS8007. In the context of the car park area we deem it acceptable to have floor staining but wall and ceiling staining are unacceptable.

In the residential area and plant rooms we would expect Grade 3 to be achieved I.e full water and vapour tightness with no staining permitted anywhere.

The Price & Myers LLP approach to such basements is the use of a drained cavity construction. This is a system of drainage blankets, slots and sumps used to control and discharge any leakage through the retaining structure. As a practice Price & Myers LLP have no faith in the effectiveness of any form of external tanking system unless completed in a large open & stable excavation with full working access and quality control eg. asphalt tanking with protective finishes.

For an additional level of comfort waterproofed concrete in addition to a drained cavity may be considered.

3.5 FAÇADE RETENTION

Although not related to the basement construction it is important to describe the retention of the front façade. It is proposed to erect a full height steel frame around the outline of the front elevation. These worke will be tied back into a series of braced and counterweighted steelwork towers. Sketches 18511/sk07 to 09 illustrate the basics of this solution although ultimately the Contractor will be responsible for the detailed design of the façade retention system.

4.0 TEMPORARY WORKS

4.1 RESPONSIBILITIES

The Contractual approach with regard to Temporary Works design is that the appointed Contractor has full design responsibility. They may in turn appoint their own Engineers to design the works. For

tender purposes we would expect to define the project expectations in terms of permitted movements, approvals and general design criteria. This would be supported with an outline scheme which defines the minimum expectations.

4.2 WATER CONTROL

Some water can be expected within the excavations. The Contractor will be responsible for removing this from the works. It is anticipated that sump locations will bhe defined and submersible pumps used to regulate water ingress.

4.3 TEMPORARY PROPPING

The exclusion of deep piling in whatever form means that more traditional forms of excavation and shoring will be required. It is anticipated that much of the excavation will be formed with battered slopes, particularly to the rear of the site. The sides and front of the basement will be formed in sections in the manner of an underpinning sequence. Sketch 18511/sk10 illustrates what this could entail.

5.0 CONSTRUCTION SEQUENCE / METHODOLOGY

After securing the site boundary, the first stage is retain the front façade. This can be followed by demolition of the existing building. Once obstructions have been cleared the phased construction of the basement box can can commence. Once the perimeter has been defined in the difficult side conditions the next stage is to excavate down to the base level throughout the basement. Temporary shoring is introduced in phases during the excavation work.

In general the speed of construction will be largely defined by the rate at which shoring can be introduced and excavated material removed from site.

6.0 ASSESSMENT OF KEY SAFETY ISSUES

The following issues will require further consideration in order to mitigate or eliminate inherent significant risks:

Underground Services - A detailed survey of the existing services will have to be undertaken. All existing services will need to be terminated prior to any excavation.

Bulk Deliveries - Delivery and handling of large or heavy structural elements (eg. reinforcement bars) from the main road entrance. Reinforcement can be detailed to provide smaller bars at more regular centres, which will help reduce the weight of hand-lifted elements. However licences maybe required for the delivery trucks.

7.0 CAMDEN POLICY REVIEW

As noted in the Introduction, The London Borough of Camden have policy DP27 of the Camden Local Development Framework which concerns basements and lightwell's, commonly referred to as Subterranean Developments. We are not planning specialists and it is not our role to advise on planning matters. However, the policy sets out certain tests relating to such developments, which fall within our expertise. In relation to this policy, our judgment based upon the investigations carried out, the geological record and our experience of basement developments in similar conditions in London is as follows:

(a). The development will maintain the structural stability of the proposed building and neighbouring properties including the Railway Tunnel. The engineering of basements of this kind is well understood and there are no difficult or peculiar issues that arise in this case.
(b). The development will avoid adverse effects on drainage and run-off and should not cause other damage to the water environment. We have explained the position relating to groundwater and drainage above. We do not consider that this site raises any unusual or adverse groundwater or drainage issues.
(c). There will be no cumulative impacts on structural stability or the water environment in the local area.

We note that paragraphs (d) to (h) of policy DP27 raise broader considerations, but in so far as our expertise can assist in addressing them, we do not consider that questions of engineering and ground conditions will affect any of the issues listed under those paragraphs.

Overall, based on the results of the site investigation, background information and our experience, this is a site where basement development of the type proposed should not give rise to any adverse stability, groundwater or drainage issues

The Author of this report:

Philip Hudson
BSc(Eng) CEng MIStructE MICE

Partner

Education
Caldicot Comprehensive School, Monmouthshire
UMIST, Manchester

Special Focus
Phil manages the development of Price & Myers' CAD, IT and Information Systems

After graduating from UMIST in 1981, Phil worked for Knight & Piesold Consultants. As a graduate engineer he worked on large hydro electric and thermal power station projects in Kenya, Zimbabwe, Zambia and Swaziland. His time with Knight & Piésold included a two year site secondment to the CEGB on the UK-France power link at the Sellindge Converter Station in Kent.
After a short spell with Eastwood & Partners, Phil joined Price & Myers in 1988. He has worked on a large range of projects since then. In recent years he has worked on many examples of Subterranean developments in the various London Boroughs. Recent & current examples of such work are highlighted in **bold text** within the following list:

- **Construction of a deep basement with car park and swimming pool below the listed buildings at 13-15 Princes Gate (£30m, completion due in 2013) with Darling Associates for Viridis Assett Management.**
- **Rebuilding a mews house behind its façade and construction of a new basement in Ennismore Street (£1m, completion due in 2012) with Picardi Architects for London International.**
- **Small private residential development including a new basement at 20 Rutland Mews South (£300k, due for completion 2011) with Edward Hill Architects for a private client.**
- **Large private residential scheme involving the construction of a deep basement under an existing listed property at 22 Frognal Way (£3m, due for completion in 2012) with Alan Power Architects for a private developer.**
- **Large private residential development including double storey basement and 25m pool at 50 Hyde Park Gate (£6m, due for completion in 2013) with Chapman Workhouse for a private client.**
- **Private residential refurbishment and extensive new double basement at 7 Wilton Crescent (£10m, due for completion in 2012) for Insite Developments.**
- **Ewhurst Manor, a large private residence set within a 900 acre estate in Hampshire (£20m, due for completion in 2012) with Adam Architecture for a private client.**
- **The dining hall extension to Surrey Square School in south London (£2m, 2010) with Earle Architects for London Borough of Southwark. This is a complex 3-dimensional concrete shell partially submerged in the school grounds.**
- **Residential scheme with a substantial new basement behind a retained façade and set over a deep railway tunnel at 11 Netherall Gardens (£4m, due for completion in 2012) with PKS Architects for a Private Developer.**
- Office development at 5-7 Giltspur Street (£10m, due for completion in 2013) with Daniel Watney Architects & Surveyors for City & Guilds.
- Private Care Home for Elderly people in the grounds of grade 2 listed Perrins House, Great Malvern (£2m, due for completion in 2011) with McMorran & Gatehouse Architects for Friends of the Elderly.
- Lauriston School in Hackney (£8m, 2010) with Meadowcroft Griffin Architects for London Borough of Hackney. The construction relies heavily on the use of Cross-Laminated Timber panelling.
- Luminar Appartments - Residential scheme and large Church within a converted grade 2 listed theatre at 58 St John's Hill in Clapham (£15m, 2011) with Assael Architects for Henley Homes. The Church has a 2500 seat capacity and has been fitted out for The Deeper Christian Life Ministry (2011).
- New HQ and Distribution Centre for Italian lighting company iGuzzini in Guildford (£9m, 2008) with Lewis & Hickey and Pierre-Luigi Copat of Paris.
- The Henson Building - New residential development at 30 Oval Road in Camden (£15m, 2010) with Tate & Hindle Architects for London & Newcastle.
- Two new luxury houses at 124 West Heath Road (£2m, due for completion in 2012) with PKS Architects for a private developer.
- Refurbishment and extension of a listed public house to create a boutique hotel at The Crown & Greyhound in the heart of Dulwich Village (£5m, completion due in 2014) with EPR Architects for The Dulwich Estate.
- Large private residential development using KLH Cross-Laminated timber panelling at Caring Wood near Maidstone (£5m, due for completion in 2014) with McDonald Wright Architects for a private client.
- Large social housing development at Papermills Wharf in Walthamstow (£15m, due for completion in 2012) with Levitt Bernstein Architects for East Thames Housing.
- Social Housing development using KLH cross-laminated panelling at Kingsgate House on the Kings Road (£10m, due for completion in 2012) with Horden Cherry Lee Architects for Lancer Property Services.
- Refurbishment and extension of 1 Regent Street (£8m, completion due 2014) with JM Architects for The Crown Estate.
- New private chapel at Ripon College in Oxfordshire (£1m, due for completion in 2012) with Niall McLaughlin Architects.
- The phased refurbishment of St James Church in Piccadilly with Ptolemy Dean Architects. The church is Grade 1 Listed and designed by Sir Christopher Wren. The church suffered severe bomb damage during World War 2 and was subsequently restored in the early 1950's.
- Cranfield University Centre for Design (£1m, 2010) with Niall McLaughlin Architects. The construction uses Cross-Laminated Timber panelling.

Phil became an associate in 1994 and partner in 2001.

Price & Myers LLP – who we are:

Profile

Price & Myers was established in 1978 in London as a firm of consulting structural engineers, with the aim of working with good imaginative architects, to make excellent buildings. In our first 33 years we have completed over 20,000 jobs, and won over 350 awards; we now also have offices in Nottingham and Oxford, and currently employ about 120 people.

Our work covers an unusually wide range, both in size and type. Projects vary from minor alterations and extensions, to major new buildings and refurbishment projects, using the most recent developments in materials and construction techniques. We have advised on the repair and restoration of many historic buildings, and we have worked with some of the country's leading architects on the design of many outstanding modern buildings. Our diverse project portfolio allows us to find the right solution for every job.

We enjoy the technical, logical, engineering principles that underpin our profession; applying them creatively to help architects and clients bridge the gap between concept and reality, and meet our clients' individual needs.

All the partners are actively involved in the design of our projects, and the office is characterised by an open, informal atmosphere in which discussions of job problems and successes are encouraged. Our experience of working in multi-disciplinary teams enables us to make a positive contribution at an early stage in the design of a project, when engineering input can often help to achieve an elegant and cost effective solution.

Specialist teams

The majority of our work at Price & Myers is the design of building structures. Our aim is to create simple and elegant structural engineering, minimising the complexities that can compromise aesthetics and function, slow construction, and escalate costs. Our job is to deliver good, clear drawings and concise and readable documents.

Price & Myers Geometrics applies elements of form, structure, materials and manufacture to interpret unusual ideas and make them a reality. These projects often seem complex, but are built on tried and tested principles of geometry and engineering. We are involved from the initial modelling to the final fabrication.

Working from the conceptual stage to BREEAM certification Price & Myers Sustainability offers technical support to clients & designers to improve the environmental performance of their buildings. Combining rigorous analysis with an imaginative approach enables us to find often unique but appropriate solutions.

Price & Myers Infrastructure offer our clients underground drainage design, detailed ground modelling, road pavement design and flood risk assessments. The Infrastructure team collaborate closely with structural colleagues from initial concepts to co-ordinated detailed design. Heavy emphasis is placed on sustainability in their work.

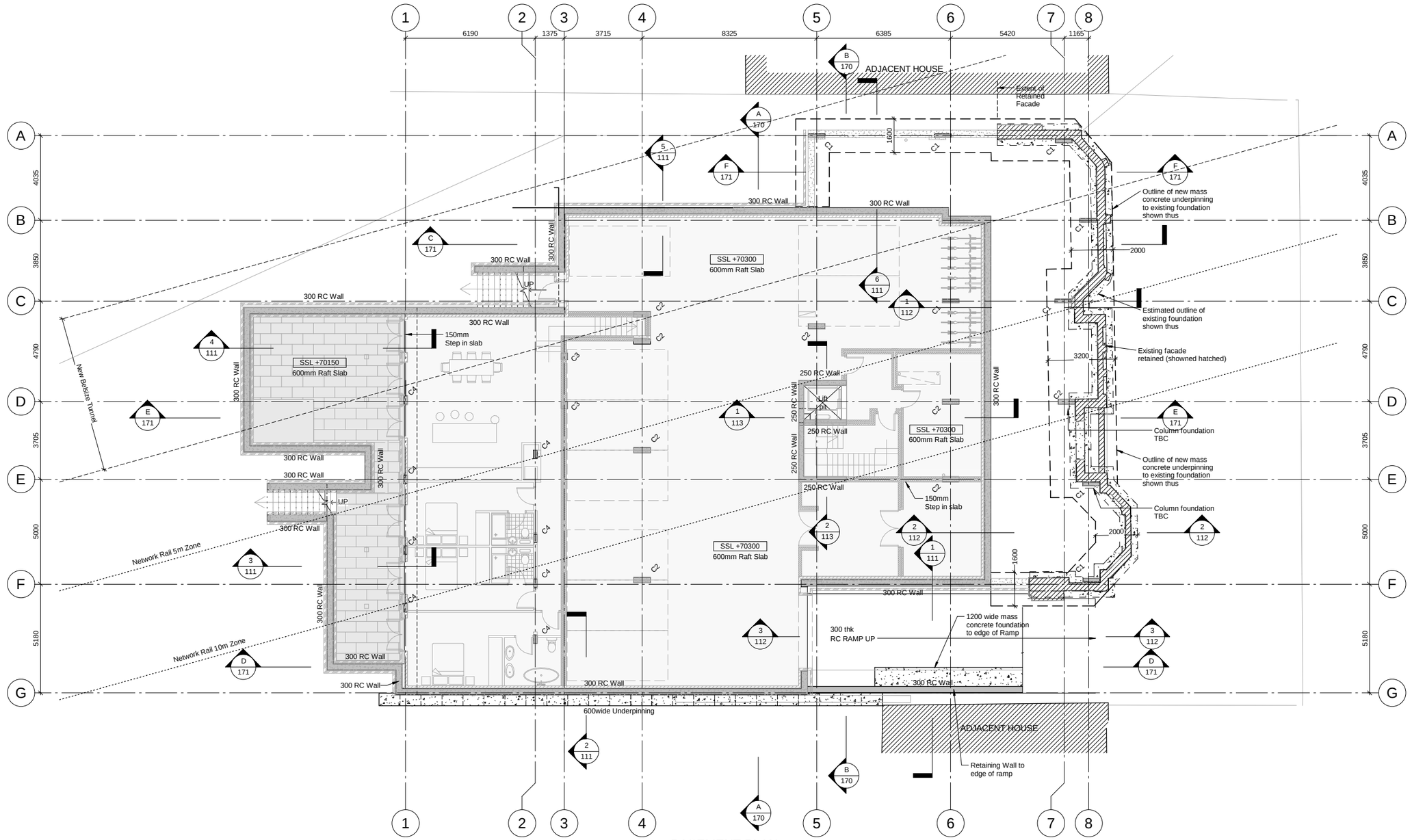
Examples of Subterranean developments

Examples of current work in the Practice which involves issues of deep basements in London with complex ground conditions and ground water.

21 Wilton Street	Complete overhaul of a listed house in Belgravia, including pool, gym, media room etc. within a new basement.
17 Phillimore Gardens	Refurbishing a listed house and constructing a new basement with swimming pool under the garden and part of the house
44 Grove End Road	Extensive refurbishment of a listed building plus construction of a basement swimming pool and car park.
7 Wilton Crescent	Rebuilding a mews house to include double storey basement with swimming pool plus renovation and rooftop extension of listed house on Wilton Crescent.
12a-14 Cheyne Row	Construction of a new basement under a central courtyard of a collection of houses.
15 Thurloe Square	Refurbishment of a listed house and construction of a basement extension
44 Markham Square	Refurbishment and extension of a house including new basement.
2 Alma Terrace	Construction of a basement under the full footprint of the house and garden. The house above remains occupied and the work is done using a tunnelling method.
15 Addison Crescent	Construction of a deep basement with swimming pool under an existing house.
40 St Petersburg Place	Alterations to house and mews house featuring new basement.
23a Earls Court Square	A basement extension under the house to include a gym and 20m lap pool
22 Frognal Way	Retaining a listed 1970's modernist house and constructing a new basement with swimming pool under the house and garden.
4 Frognal Way	Refurbishment of an existing house including an extension and new basement with swimming pool.
20 Rutland Mews South	Construction of a new basement under an existing house.
7 St James Square	Construction of a two storey basement with swimming pool under a grade 2 listed house designed by Lutyens.

APPENDIX A

LEGEND	
	New brickwork
	New 3.5N blockwork
	New 7N or 10N blockwork
	New RC concrete structure
	New mass concrete structure
	Backfill material
	Retained existing structure
	Demolished existing structure (Walls)
	Demolished existing structure (Area)
	Ground level



BASEMENT PLAN

NOTES:-

1 This Drawing is to be read in conjunction with all relevant Architect's Engineer's and specialists' drawings and specifications.

2 Do not scale from this drawings in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale this bar should be 50mm long @A1 or 25mm long @ A3

3 Health & Safety :
All specific drawing notes are to be read in conjunction with the project "Information Pack" and "Site Rules".

4 For general notes refer to Drawing No. 18511/GN01

Concrete Column Schedule (C)	
Type Mark	Size
C1	800x175mm
C2	800x250mm
C3	300x300mm
C4	400x175mm

Grand total: 64

PRELIMINARY ISSUE

Rev	Date	Drawn	Eng	Amendment
P1	09.09.11	KB	PH	Preliminary Issue - Work in progress

11 NETHERALL GARDENS
HAMPSTEAD

BASEMENT FLOOR PLAN
GA

Drawn	Jack Walshe	Eng	T Marcot
Scales	1:100 @ A1		1:200 @ A3
Drawing No.	18511 / 110	Rev.	P1

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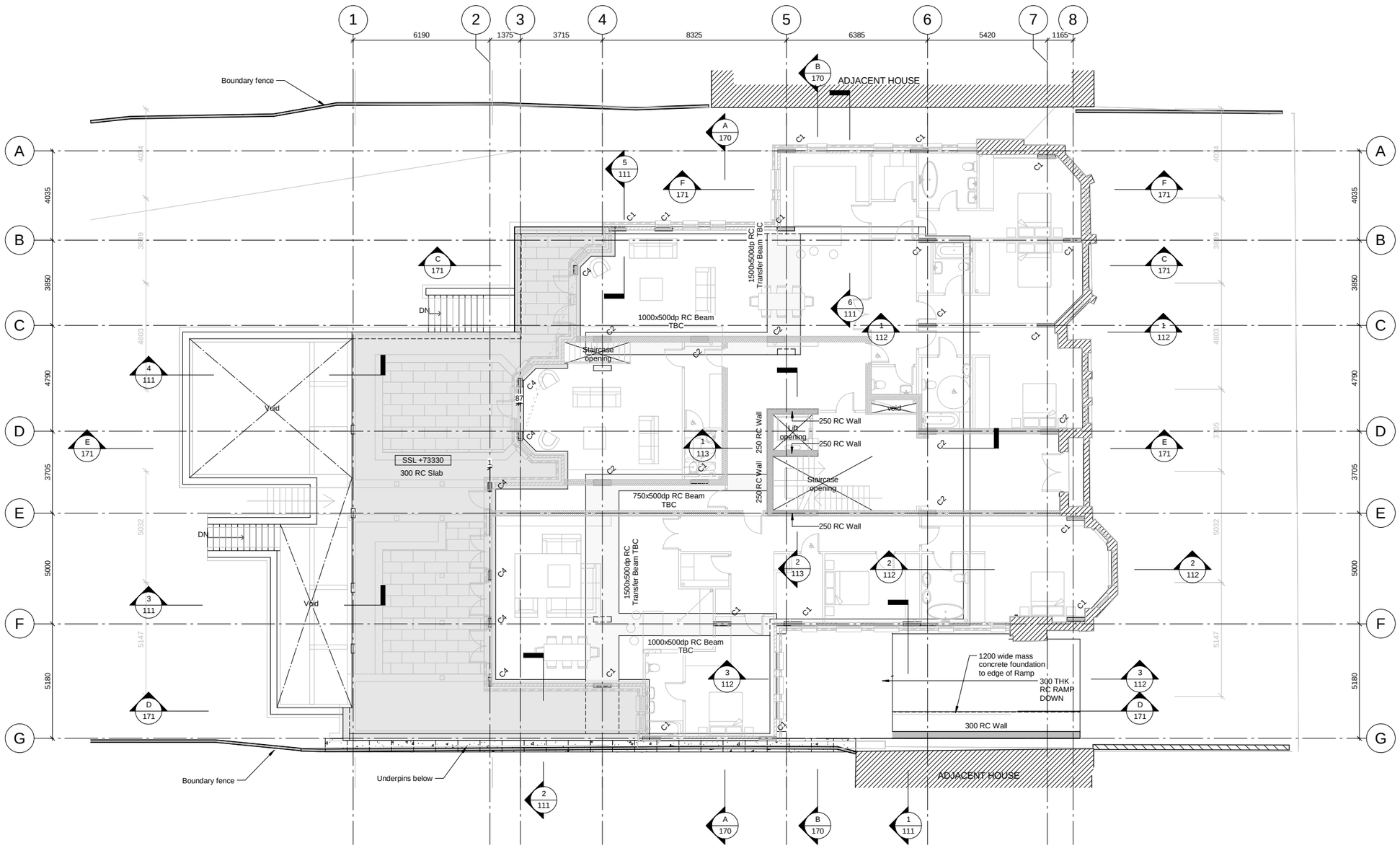
LEGEND	
	New brickwork
	New 3.5N blockwork
	New 7N or 10N blockwork
	New RC concrete structure
	New mass concrete structure
	Backfill material
	Retained existing structure
	Demolished existing structure (Walls)
	Demolished existing structure (Area)
	Ground level



GROUND FLOOR PLAN

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11 NETHERALL GARDENS
HAMPSTEAD

GROUND FLOOR PLAN
GA

Drawn	Jack Walshe	Eng	T Marcot
Scales	1:100 @ A1		1:200 @ A3
Drawing No.		Rev.	
18511 / 120		P1	

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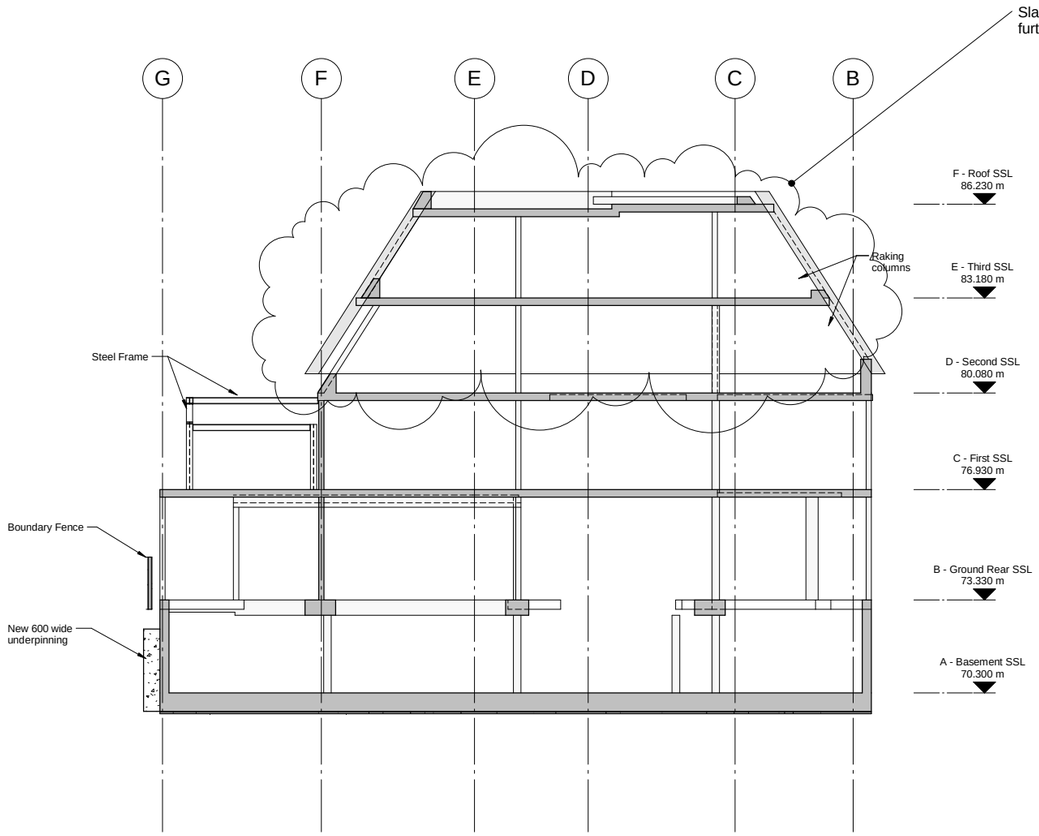
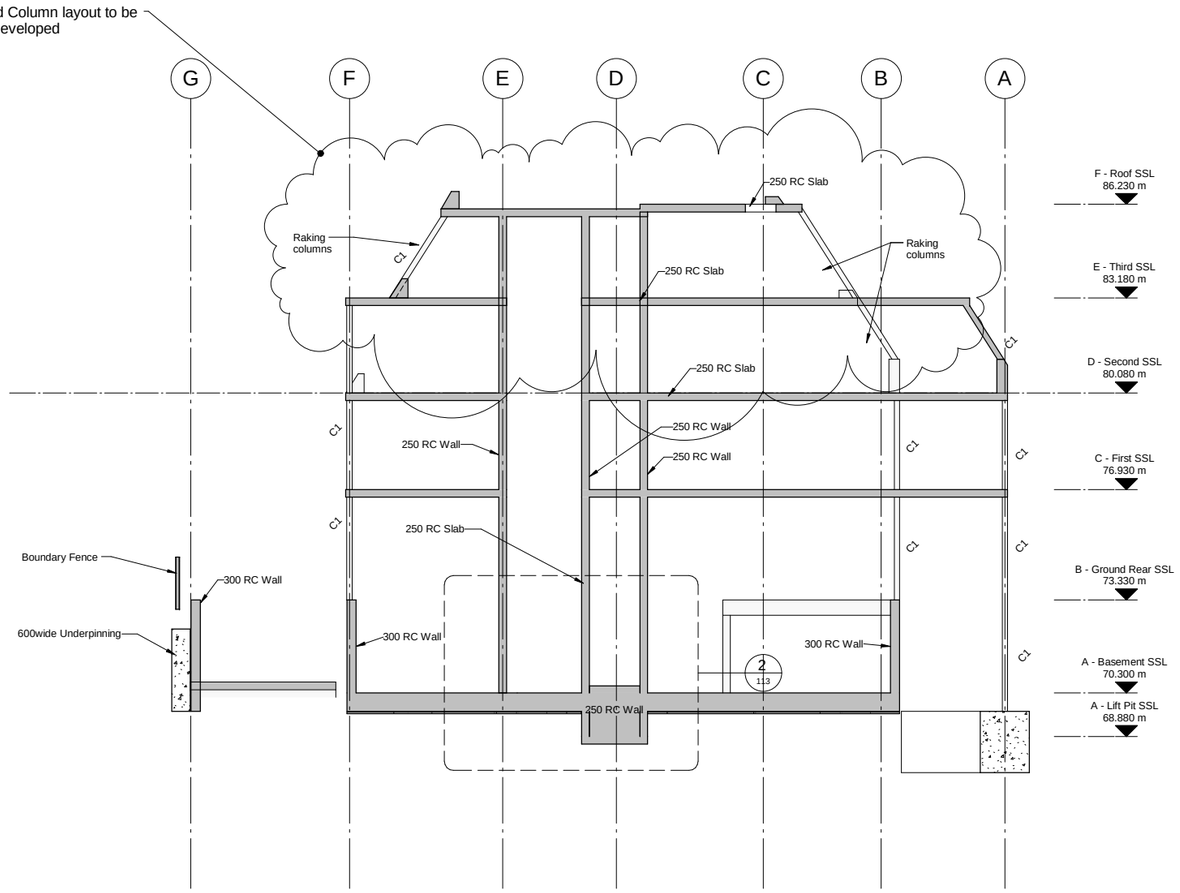


SECTION A-A



SECTION B-B

NOTES:-

PRELIMINARY ISSUE

Rev	Date	Drawn	Eng	Amendment
P1	09.09.11	KB	PH	Preliminary Issue - Work in progress

11 NETHERALL GARDENS
HAMPSTEAD

CROSS SECTIONS
SHEET 1 OF 2

Drawn Author | Eng Checker

Scales 1 : 100

Drawing No. 18511 / 170

Rev. P1

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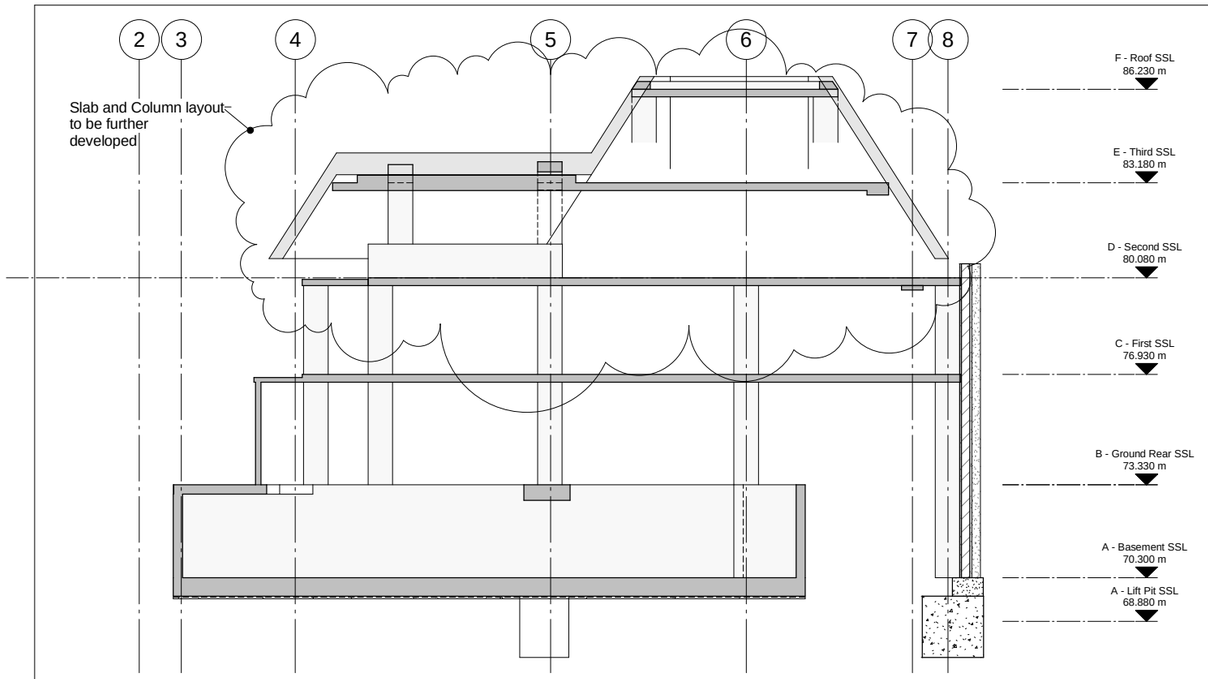

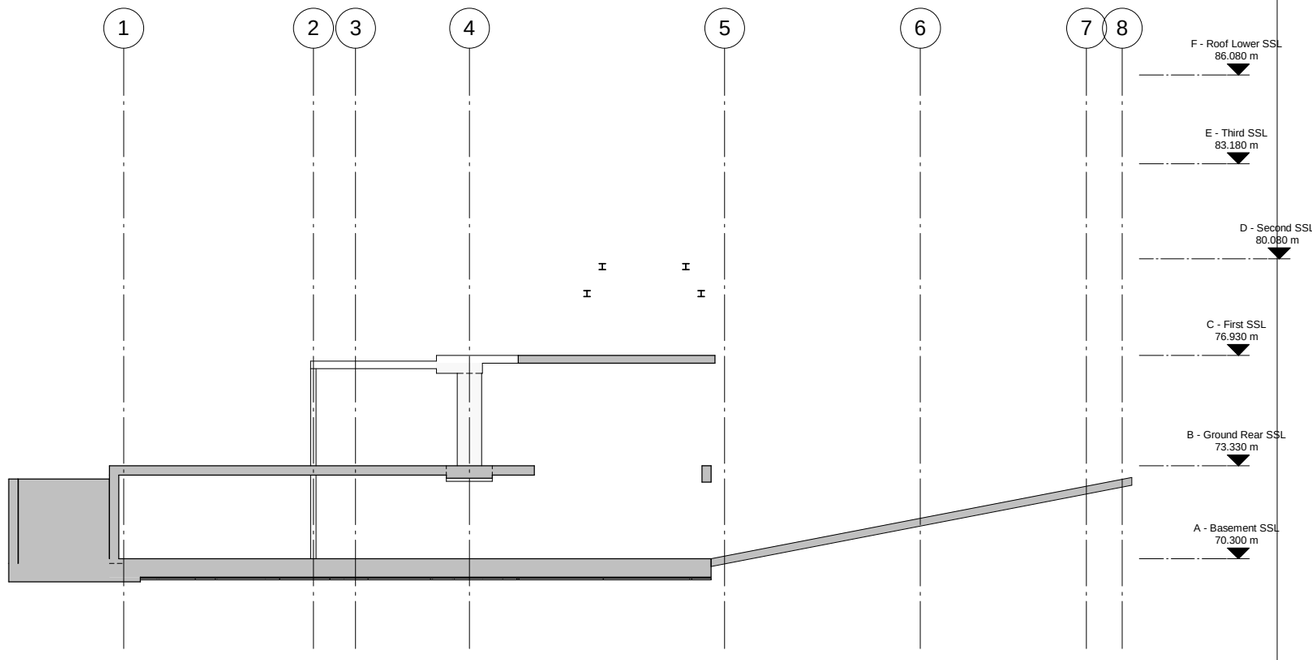

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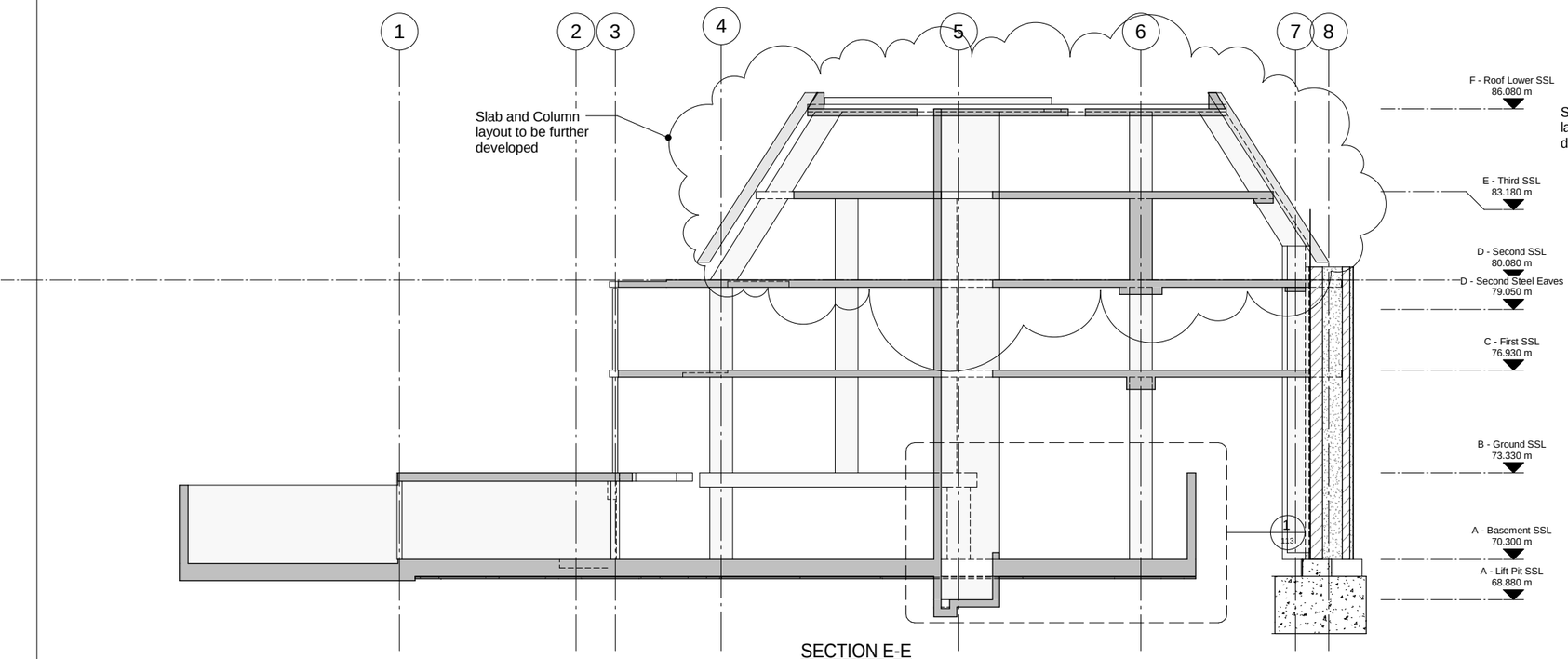
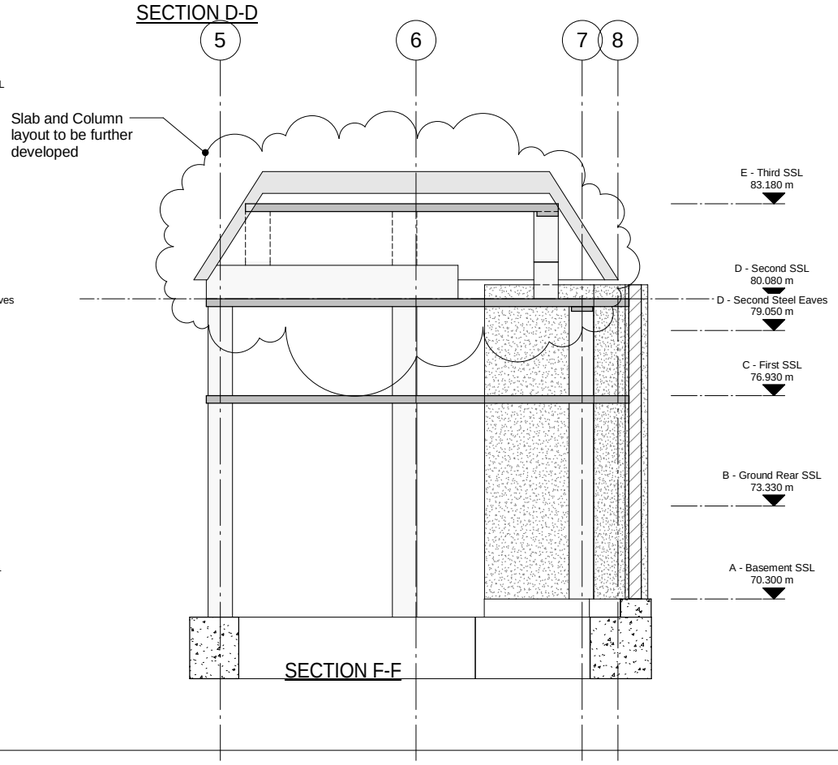


SECTION E-E

SECTION D-D



SECTION F-F

NOTES:-

PRELIMINARY ISSUE

Rev	Date	Drawn	Eng	Amendment
P1	09.09.11	KB	PH	Preliminary Issue - Work in progress

11 NETHERALL GARDENS
HAMPSTEAD

CROSS SECTIONS
SHEET 2 OF 2

Drawn Author	Eng Checker
Scales 1 : 100	
Drawing No.	Rev.
18511 / 171	P1

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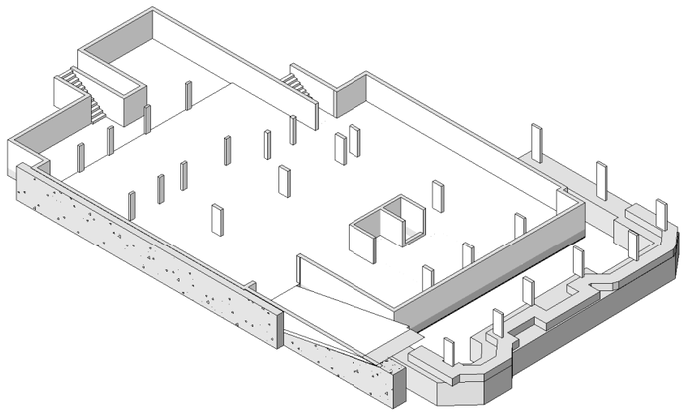
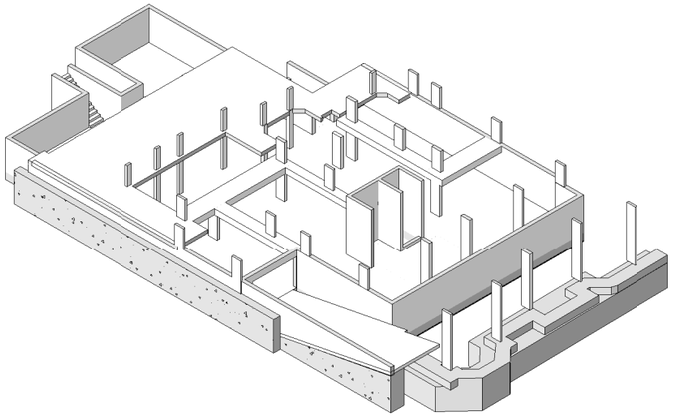
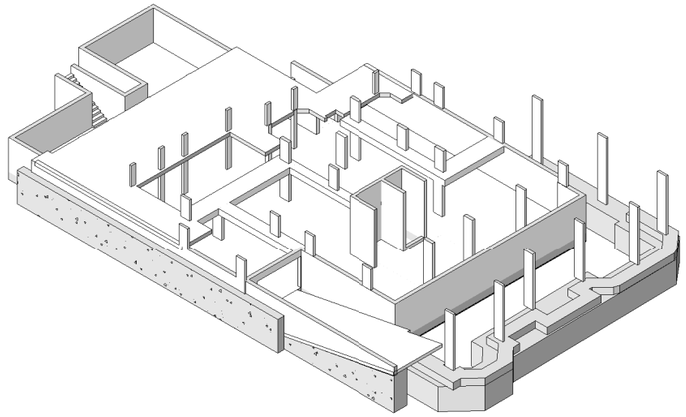


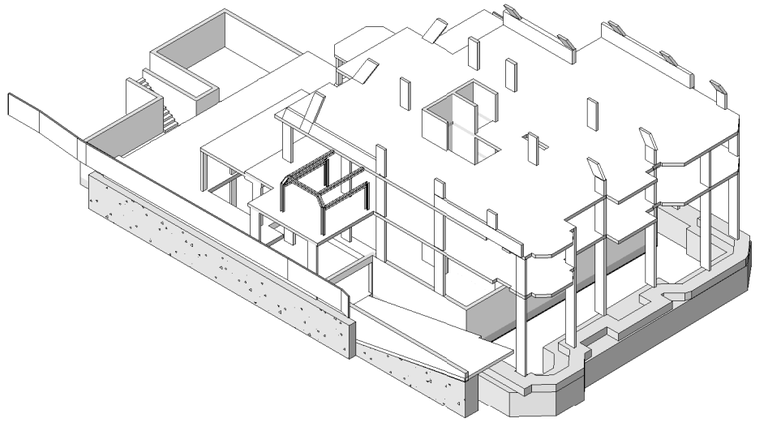
3D - 01 - Basement



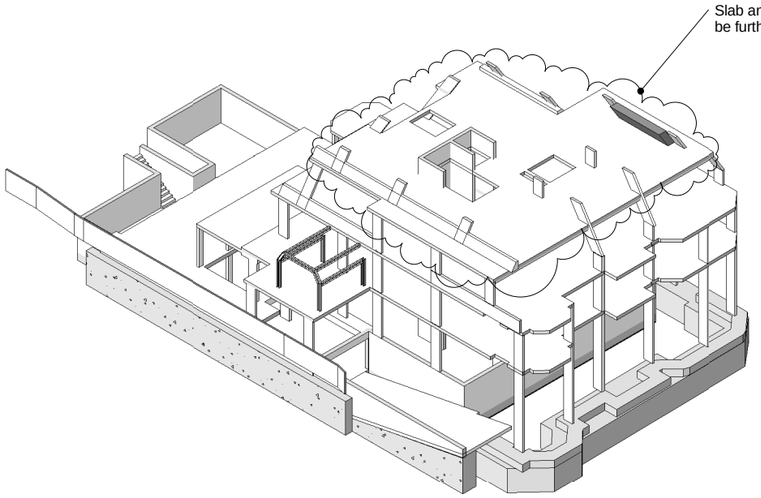
3D - 02 - Ground



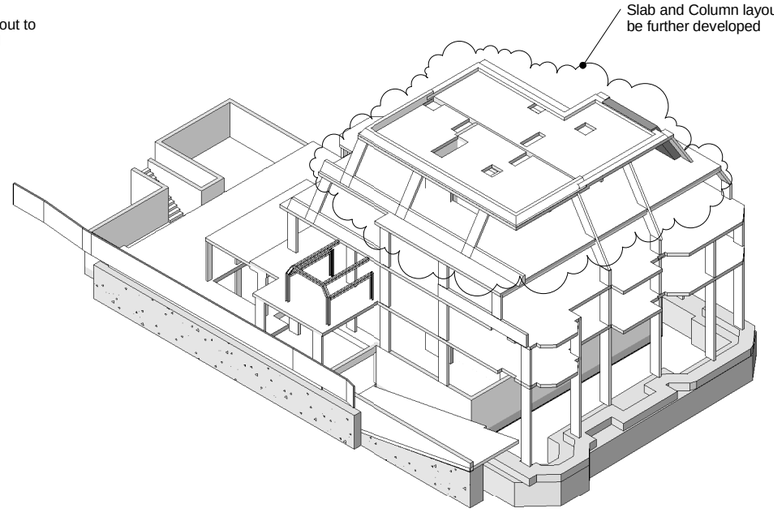
3D - 03 - First



3D - 04 - Second



3D - 05 - Third



3D - 06 - Roof

NOTES:-

PRELIMINARY ISSUE

Rev	Date	Drawn	Eng	Amendment
P1	09.09.11	KB	PH	Preliminary Issue - Work in progress

11 NETHERALL GARDENS
HAMPSTEAD

3D ISOMETRICS
AT FLOOR LEVELS

Drawn Jack Walshe	Eng T Marcot
Scales	
Drawing No. 18511 / 176	Rev. P1

PRICE&MYERS
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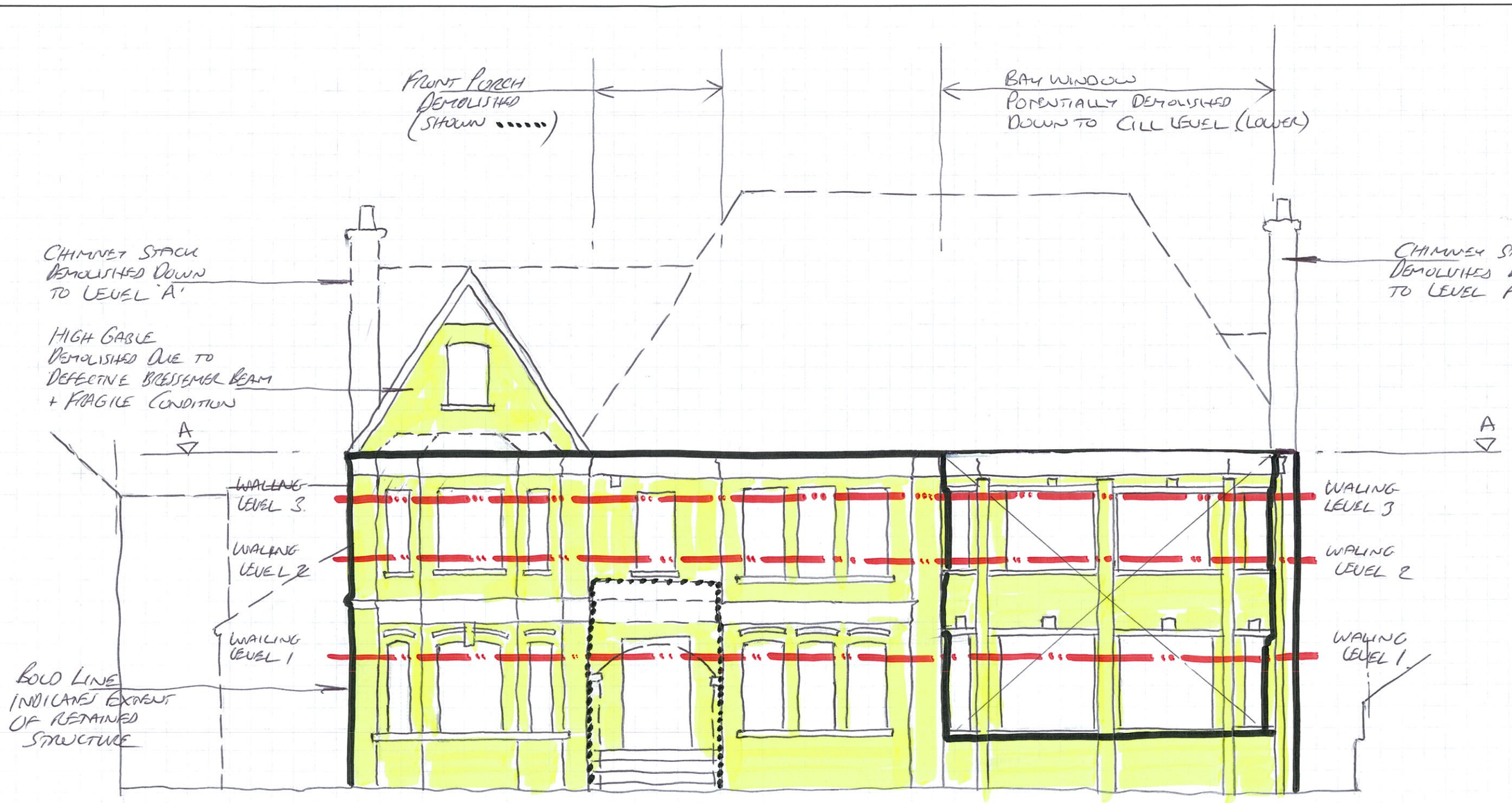
APPENDIX B

PRICE&MYERS
Consulting Engineers

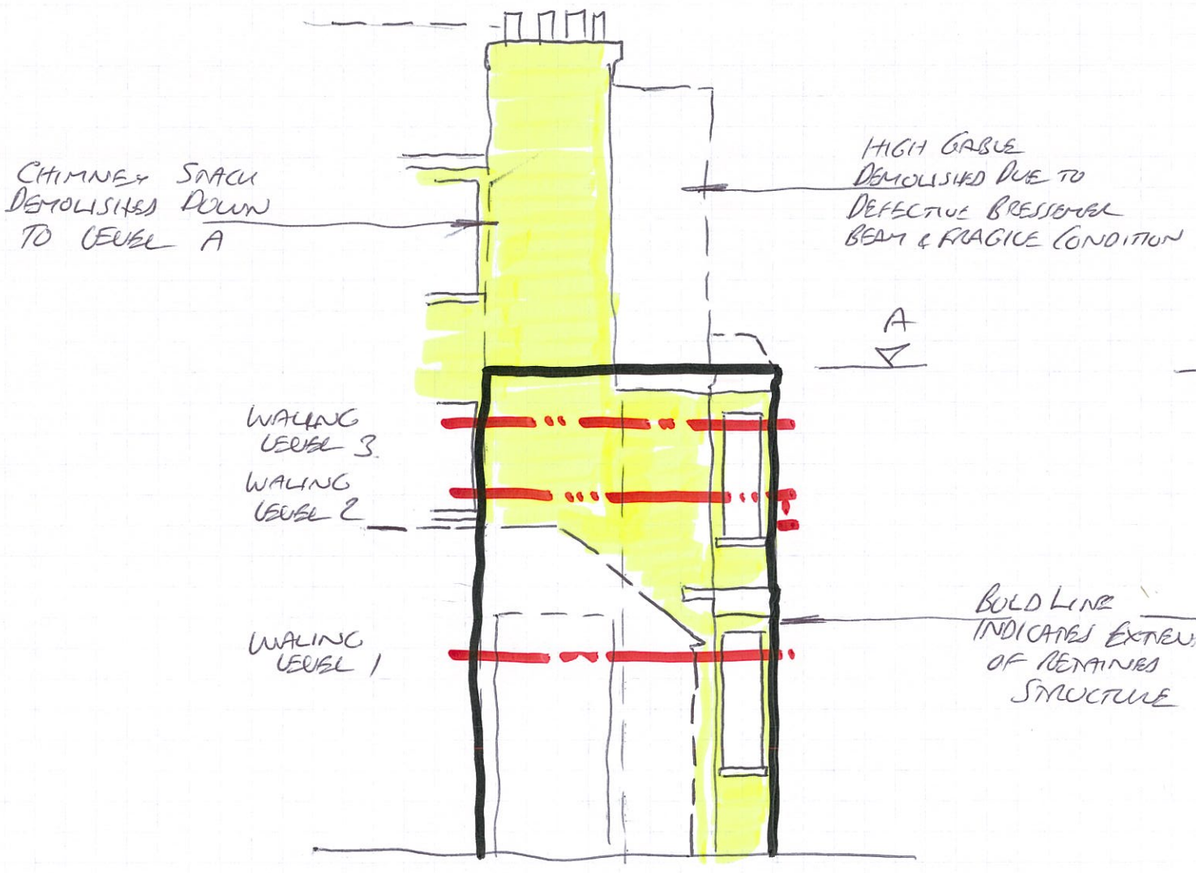
Job No 18511 Page SK 07 Rev
Date SEPT '11 Eng R.HUSSAIN Chd
Job 11 NETHERHALL GARDENS



EAST ELEVATION
(1:100)

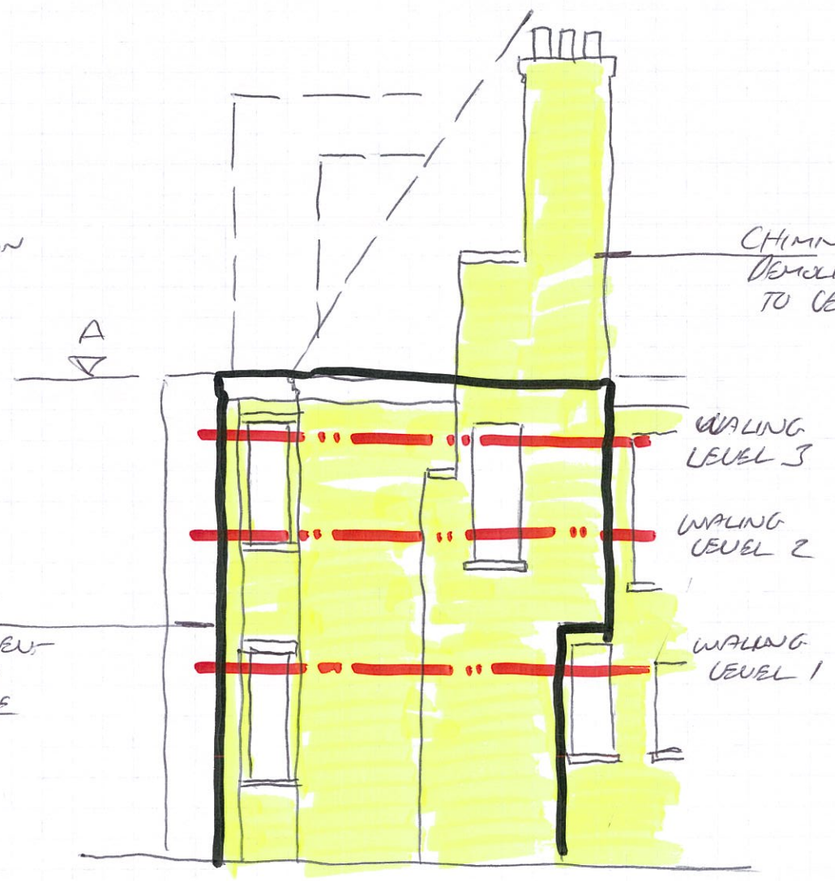
PRICE&MYERS
Consulting Engineers

Job No 18511 Page SK-08 Rev
Date SEPT'11 Eng P.HUDSON Chd
Job 11 NETHERHALL GARDENS



SOUTH ELEVATION
(1:100)

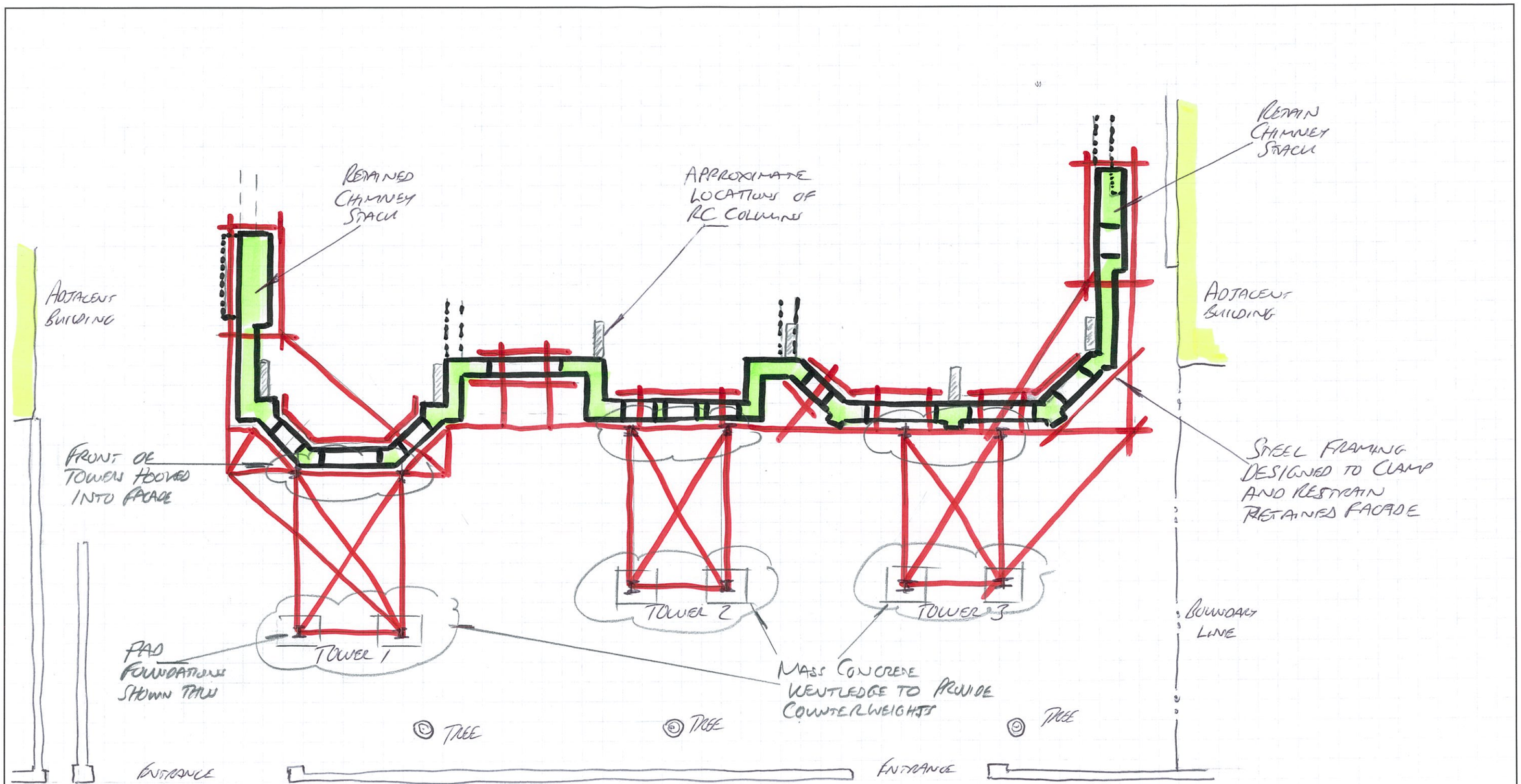
BOLD LINE INDICATES EXTENT OF RETAINED STRUCTURE



NORTH ELEVATION
(1:100)

PRICE&MYERS
Consulting Engineers

Job No 18511 Page SK09 Rev
Date SEPT'11 Eng P.HUDSON Chd
Job 11 NETHERHALL GARDENS

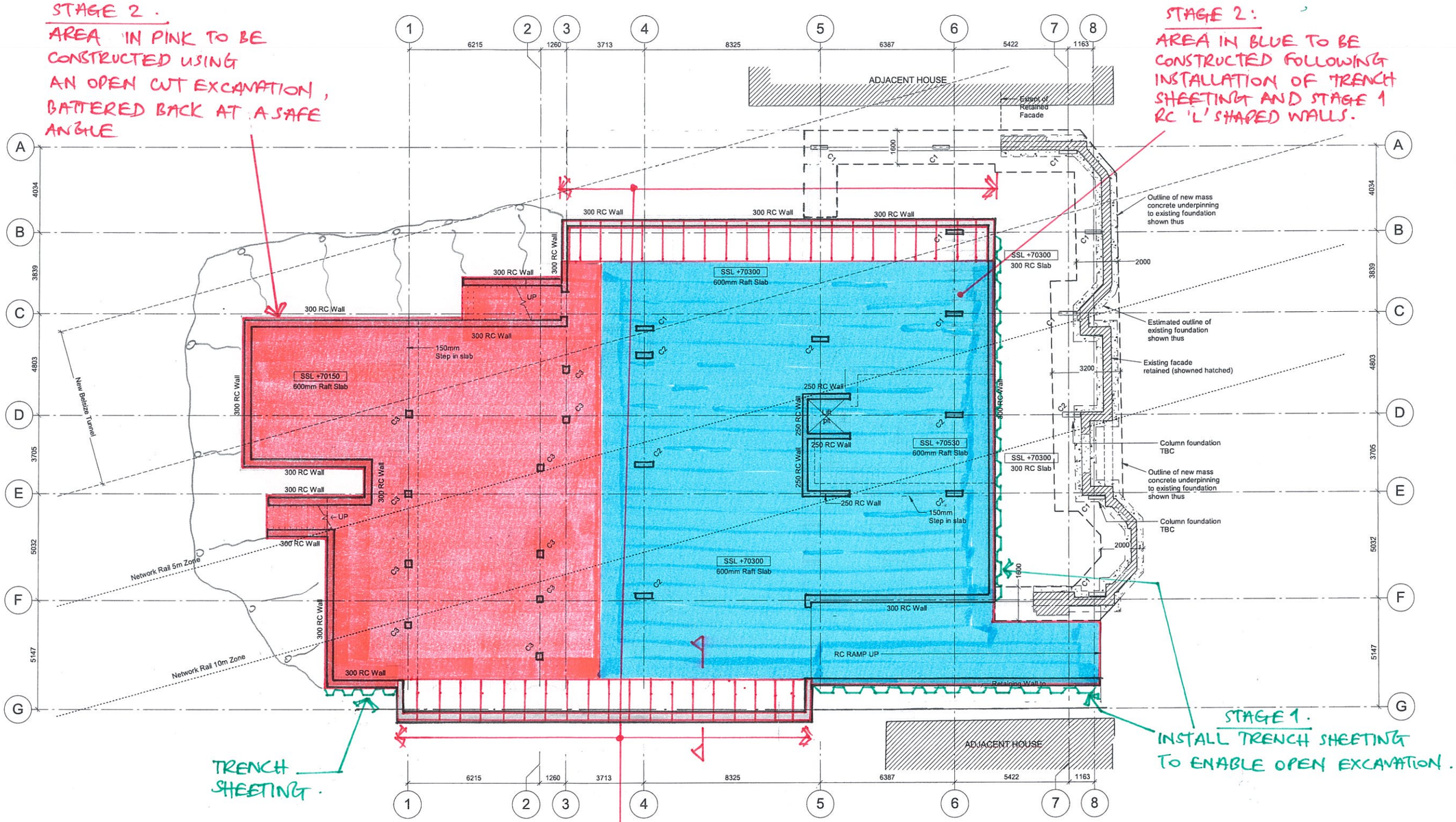


PLAN OF RETAINED FACADE
SHOWING FACADE RETENTION SYSTEM
(1:100)

LEGEND	
	New brickwork
	New 3.5N blockwork
	New 7N or 10N blockwork
	New RC concrete structure
	New mass concrete structure
	Backfill material
	Retained existing structure
	Demolished existing structure (Walls)
	Demolished existing structure (Area)
	Ground level

STAGE 2.
AREA IN PINK TO BE CONSTRUCTED USING AN OPEN CUT EXCAVATION, BATTERED BACK AT A SAFE ANGLE

STAGE 2:
AREA IN BLUE TO BE CONSTRUCTED FOLLOWING INSTALLATION OF TRENCH SHEETING AND STAGE 1 RC 'L' SHAPED WALLS.



TRENCH SHEETING.

STAGE 1.
INSTALL TRENCH SHEETING TO ENABLE OPEN EXCAVATION.

BASEMENT PLAN

STAGE 1.
CONSTRUCT REINFORCED CONCRETE WALL IN 1.0M WIDE (MAX) SECTIONS IN AN UNDERPINNING SEQUENCE (STAGE 1)

NOTES:-

1 This Drawing is to be read in conjunction with all relevant Architect's Engineer's and specialists' drawings and specifications.

2 Do not scale from this drawings in either paper or digital form. Use written dimensions only. To check drawing has been printed to the intended scale this bar should be 50mm long @A1 or 25mm long @ A3

3 Health & Safety :
All specific drawing notes are to be read in conjunction with the project "Information Pack" and "Site Rules".

4 For general notes refer to Drawing No. 18511/GN01

Concrete Column Schedule (C)	
Type Mark	Size
C1	800x175mm
C2	800x250mm
C3	300x300mm

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Job No 18511 Page SW10 Rev
Date 08.09.11 Eng GG Chd
Job 11 NETHERALL GARDENS

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Appendix C

Ground Investigation

Site Analytical Services Ltd.

Site Investigations, Analytical & Environmental Chemists, Laboratory Testing Services.

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Fax: 0208 594 8072
E-Mail: services@siteanalytical.co.uk

Directors: J. S. Warren, M.R.S.C., P. C. Warren, J. I. Pattinson, BSc (Hons), MSc
Consultants: G. Evans, BSc., M.Sc., P.G. Dip., FGS., MIEnvSc. A. J. Kingston, BSc C.Eng. MIMM
F. J. Gibbs, F.I.B.M.S. F.I.F.S.T., F.R.S.H. K. J. Blanchette

Your Ref:

Our Ref: **08/14401**
June 2008

11 NETHERHALL GARDENS

LONDON, NW3 5RN

REPORT ON A GROUND INVESTIGATION

Prepared for

Watts Group Plc

Acting on behalf of

Avonhead Investments Limited

Reg Office: Units 14 + 15, River Road Business Park,
33 River Road, Barking, Essex IG11 0EA
Business Reg. No. 2255616

ISO 9002

Site Analytical Services Ltd.

Ref: 08/14401
June 2008

Report on a Ground Investigation

At

11 Netherhall Gardens, London NW3 5RN

For

Watts Group PLC

1.0 INTRODUCTION

At the request of Mr James Laithwaite, Consulting Engineer to the Watts Group PLC and Avonhead Investments Limited, a ground investigation was carried out at the above site.

The information was required to aid the Consulting Engineers in their investigation as to the possible causes of cracking of the walls of the house.

A brief interpretative report was requested.

The recommendations and comments given in this report are based on the ground conditions encountered in the trial holes and the results of the tests made in the field and laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

2.0 THE SITE AND LOCAL GEOLOGY

(National Grid Reference: TQ 263 849)

2.1 General

The site of the investigation is located at 11 Netherhall Gardens in the West Hampstead area of London, NW3 5RN.

At the time of the investigation, the site was occupied by an existing large two to three-storey house with a front tarmacadam hardstanding area and an extensive rear garden. It is understood that the house has been partly underpinned in the past. A number of mature trees were present surrounding the house with some mature Horse Chestnut and Sycamore trees located within the footpath of Netherhall Gardens and also in the neighbouring property at the front and numerous mature trees within and surrounding the rear garden. Further details of the layout are indicated on the site sketch plan (Figure 1).

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area indicates the site to be underlain by Superficial Head deposits resting on London Clay, which is of a considerable thickness in this area.

3.0 SCOPE OF WORK

3.1 General

The scope of the investigation was generally specified by the Consulting Engineer and comprised:

- The excavation of three trial pits adjacent to the front, flank and rear walls of the house (Trial Pits 1, 2 and 3).
- The drilling of three continuous flight auger borehole, two to a depth of 5 metres below existing ground level (Boreholes 1 and 3) and one to a depth of 10m below ground level (Borehole 2) through the bases of Trial Pits 1, 2 and 3. In the event, Borehole 2 was made outside the trial pit due to limited space and was terminated at a depth of 9.30m below ground level on encountering a claystone nodule.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the trial pits and boreholes.
- Laboratory testing to determine the engineering properties of the soils encountered in the boreholes.
- Preparation of a report, comprising presentation of results and a brief engineering appraisal of the soils encountered with respect to any potential foundation movement.

3.2 Ground Conditions

The boreholes and trial pits were made at the positions shown on the site sketch plan (Figure 1) and revealed ground conditions consistent with those anticipated from the geological records and known history of the site. They generally comprised a surface cover of made ground up to 1.45m in thickness underlain by weathered London Clay. Records of the boreholes and trial pits are included in Appendix A.

Made ground was encountered to depths of 1.45m, 1.25m and 1.10m below ground level in Boreholes 1, 2 and 3 respectively and consisted of a surface layer of either paving slabs set on concrete or topsoil followed by made ground consisting of a mixture of medium dense clayey silty sand, stiff sandy silty clay, topsoil, fine to medium gravel, brick and concrete fragments with roots up to 20mm in diameter being noted in Trial Pit 1, roots up to 10mm in diameter in Trial Pit 2 and roots up to 50mm in diameter in Trial Pit 3.

The underlying natural material consisted of soils typical of London Clay and extended down to the full depths of investigation of up to 9.30m below ground level in the boreholes. The material generally consisted of firm becoming stiff and, in the case of Borehole 3 very stiff, and then stiff to very stiff mottled silty clay with some becoming occasional partings of silty fine sand, scattered small gypsum crystals with roots up to 2mm diameter being noted down to 2.10m depth and rootlets down to 3.30m depth in Borehole 1. In Borehole 2, roots up to 3mm in diameter were encountered down to 2.40m depth with rootlets extending down to a depth of 2.70m below ground level. In Borehole 3, roots up to 3mm in diameter were encountered down to 2.30m depth with rootlets extending down to a depth of 3.20m below ground level.

These materials are typical of weathered London Clay and extended down to the full depths of investigation of 5.00m below ground level in Boreholes 1 and 3 and to a depth of 8.60m below ground level in Borehole 2.

Borehole 2 then encountered very stiff fissured silty clay with occasional partings of silty fine sand and scattered small gypsum crystals. These materials are typical of unweathered London Clay and extended down to the full depth of investigation of 9.30m below ground level in Borehole 2 where a weak claystone nodule was encountered precluding further progress.

3.3 Groundwater

Groundwater was not encountered in Boreholes 2 and 3 and the material remained essentially dry throughout. Groundwater was encountered in Borehole 1 as a seepage at a depth of 3.20m below ground level although the base of the borehole was dry on completion of boring operations.

Isolated pockets of groundwater may be present perched within any less permeable material found at shallower depth on other parts of the site especially within the made ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (May 2008) and that changes in the groundwater level could occur due to seasonal effects and changes in drainage conditions.

3.4 Existing Foundations

Sketches of the foundations exposed in the trial pits are presented as Figures 2, 3 and 4 and indicate that the existing walls of the house are supported on sometimes out-stepped brickwork with concrete foundations between 0.80m and 1.48m in thickness placed in natural firm or stiff silty clay with roots or roots at depths of 1.43m, 2.03m and 1.90m below existing ground level in Trial Pits 1, 2 and 3 respectively.

4.0 IN-SITU AND LABORATORY TESTS

4.1 In-situ Tests

In the cohesive soils encountered below foundation level at the site, in-situ penetration vane tests were made at 0.5m depth increments down to 5m depth and at 1.00m depth increments below in order to assess the undrained shear strength of the material.

The results of the in-situ tests are shown on the borehole and trial pit records contained in Appendix A.

4.2 Classification Tests

Atterberg Limit tests were conducted on twelve samples of clay soil taken from the near surface cohesive soils present in the boreholes. The results showed the samples tested to fall into Classes CH and CV according to the British Soil Classification System.

These are fine grained silty clay soils of high to very high plasticity and as such generally have moderate bearing and settlement characteristics, have a low permeability and a generally high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values of between 39% and 47% with eleven of the samples being at or above the 40% boundary between soils assessed as high swelling and shrinkage potential and those of medium swelling and shrinkage potential and the other sample falling just below this boundary.

Natural moisture content determinations were also carried out on a further twenty eight samples of soil taken from the trial pits and boreholes.

The results of these tests are presented on Tables 1, 1a and 1b, contained in Appendix B.

4.3 Root Analyses

Roots up to 50mm diameter were encountered in the exploratory holes as detailed above in Section 3.2 with roots up to 3mm in diameter being noted within the natural soils below the made ground and rootlets extending down to a maximum depth of 3.30m below ground level. The results of the root analyses made on samples taken from the underside of the foundation in Trial Pit 1 indicated that they are associated with trees of the Acer species that includes Sycamore and Maple as well as a root from the Hedera family that includes Ivy. The results of the root analyses made on samples taken from the underside of the foundation level in Trial Pit 2 indicated that they are associated with trees of the Salicaceae and Populus species that includes Willow and Poplar. The results of the root analyses made on samples taken from the underside of the foundation and at 2.50m depth in Trial Pit 3 and Borehole 3 indicated that they are mainly associated with trees of the Aesculus species that includes Horse Chestnut. The results of the root analyses are presented in Appendix C.

5.0 ENGINEERING APPRAISAL

The results of the in-situ tests revealed shear strengths in Trial Pit / Borehole 1 of 127kPa at 1.50m to 2.00m depth increasing gradually to more than 140kPa at 3.00m depth. The results of tests made in Borehole 2 indicate similar shear strengths of 113kPa at 2.00m depth increasing to more than 140kPa at 4.00m depth. The results of tests made in Trial Pit / Borehole 3 indicate much higher shear strengths of more than 140kPa down to 3.00m depth and 137kPa at 3.50m depth increasing to more than 140kPa at 4.00m depth

It is considered that the values obtained in Boreholes 1 and 2 represent a reasonably normal shear strength profile in saturated cohesive soils, whilst the results in Borehole 3 indicate much higher shear strengths at shallow depths indicating some influence by the root systems of trees or some other moisture removal process may have taken place in Borehole 3.

Using the criteria suggested by Driscoll (1983), the following comments are made: -

The results of the Atterberg Limit tests, in conjunction with the natural moisture content tests, showed that most of the soils encountered in the boreholes had values above the 0.4LL Driscoll value and appear to be above the level indicating the onset of desiccation. However, the result in Borehole 2 at 2.50m depth indicated a moisture content deficiency of about 4% with the result at 3.50m depth indicating a slight deficiency in moisture content. The results at 1.50m depth in Borehole 3 indicate a moisture deficiency of about 2% with the results at 2.00m and 2.50m depth indicating a slight deficiency in moisture content.

The natural moisture contents were generally similar to the value of approximately 25% to 30% or more normally expected in saturated soils below the water table unless they are under the influence of the root systems of trees or some other moisture removal process. The results from Borehole 2 at 2.50m depth indicated a lower natural moisture content of 23%.

The results obtained during the present investigation indicate that any movement which has occurred in the past may well have been influenced by the root systems of the nearby Sycamore and Horse Chestnut trees combined with contributions from the form of construction of the building being supported on foundations placed at variable depths of between 1.43m and 2.03m below ground level in firm or stiff clay with roots and seasonal climatic changes in the moisture contents of the near surface clay soils.

It is likely that any shrinkage due to desiccation that has taken place occurred over the dry summer periods prior to 2006 with some swelling in the Autumn of 2006 and more especially during 2007 and early 2008 when much wetter climatic conditions have prevailed.

It is recommended that if any foundations affected by movement are to be underpinned, then they should be taken down below the root zone and the zone of any potential desiccation as defined by the NHBC Standards, Chapter 4.2, April 2003. Precautions should be taken to protect them from any potential lateral forces resulting from clay heave should the trees be removed or wetter climatic conditions occur. The results indicate that the existing house foundations are placed on clay soils of high swelling and shrinkage potential. Consequently, it is possible that the underlying material may well heave should any of the trees affecting the area be removed or any further moisture be taken up during periods of wet weather.

Should remedial works by underpinning not be carried out, there will be the possibility of swelling of the soils during wet periods and also increased desiccation during any subsequent dry periods. This may result in further clay swelling and shrinkage and consequent further differential foundation movement in the future.

It would be prudent to seek advice from a reputable arboriculturalist to devise a suitable tree management system for the nearby trees in order to prevent any future damage to the foundations taking place.

p.p. SITE ANALYTICAL SERVICES LIMITED

J I Pattinson BSc. (Hons), MSc.
Senior Geotechnical Engineer

J S Warren MRSC
Director

REFERENCES

Stroud M.A. and Butler F.G. (1975) Symposium on the Engineering Behaviour of Glacial Materials; the Midland Soil Mechanics and Foundation Engineering Society; pgs 124 et seq.

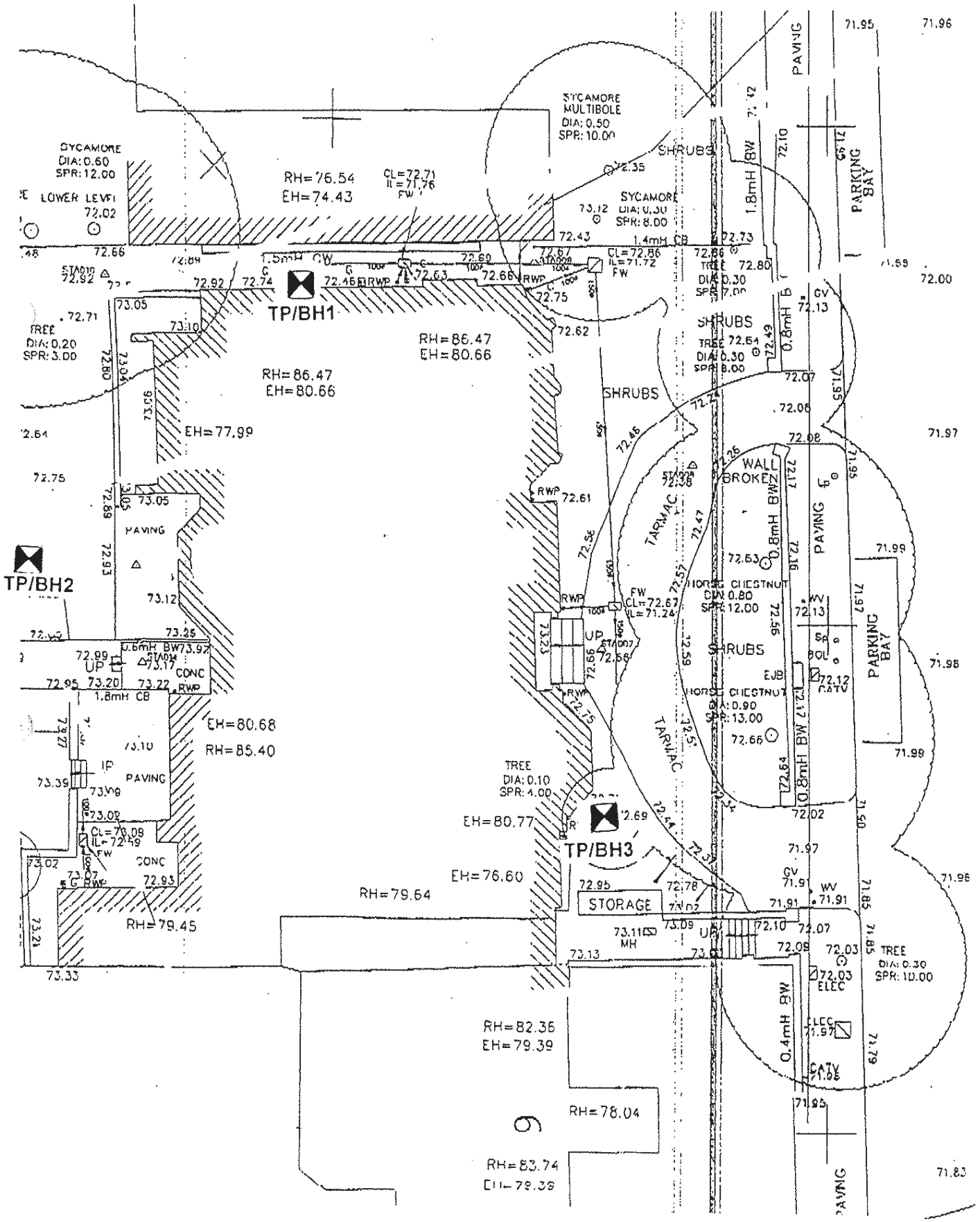
NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

NHBC Standards, Chapter 4.2, "Building near trees", April 2003.

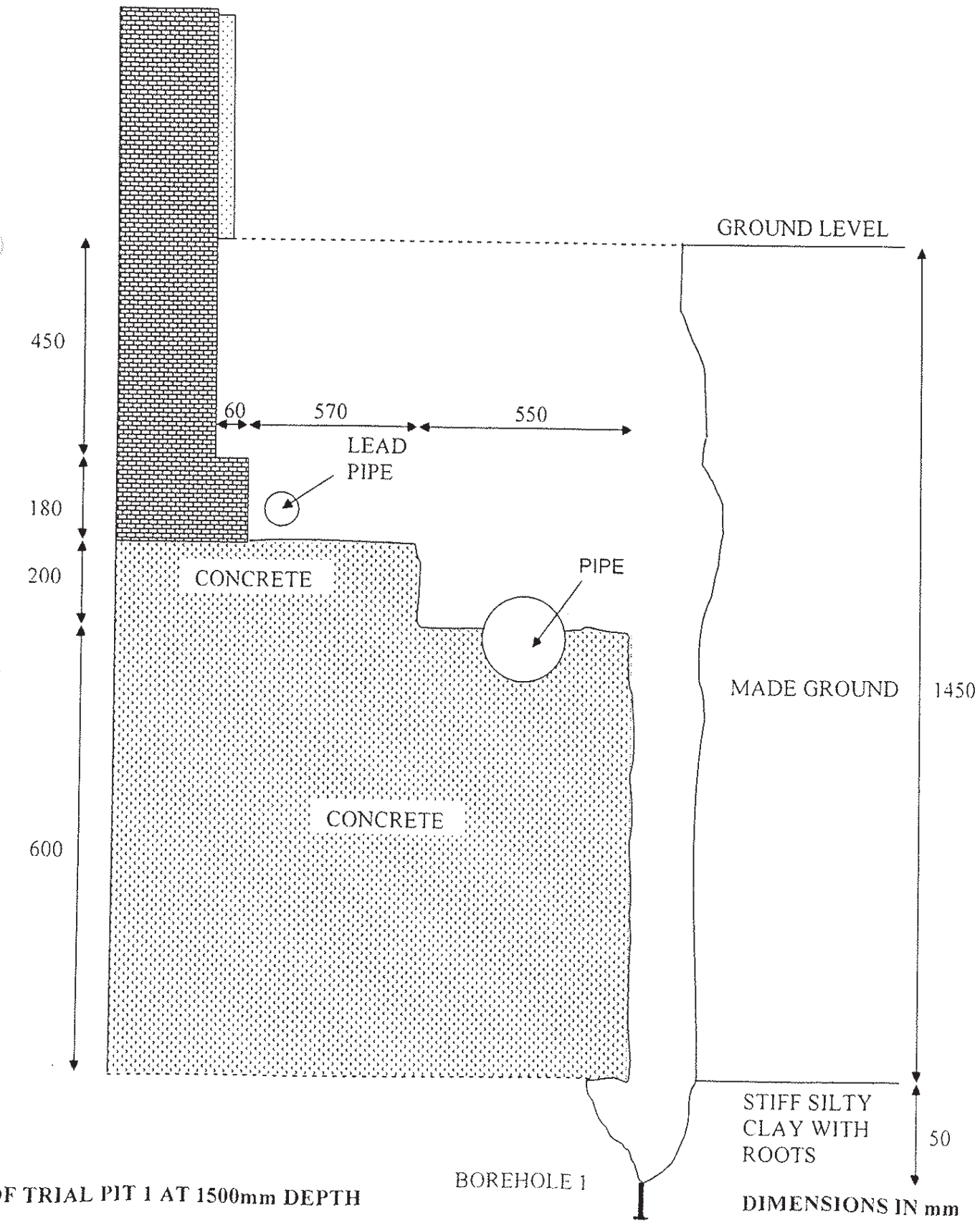
Driscoll, R (1983) "The influence of vegetation on the shrinking and swelling of clay soils in Great Britain", Geo-technique 33, 93-107

Tomlinson, M J (2001) "Foundation Design and Construction", Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

S A S	**Site Analytical Services Ltd.**	REF:	08/14401
	LOCATION: 11 Netherhall Gardens, London NW3 5RN	FIG:	1
	TITLE: Site Sketch Plan DATE: May 2008	SCALE:	NTS

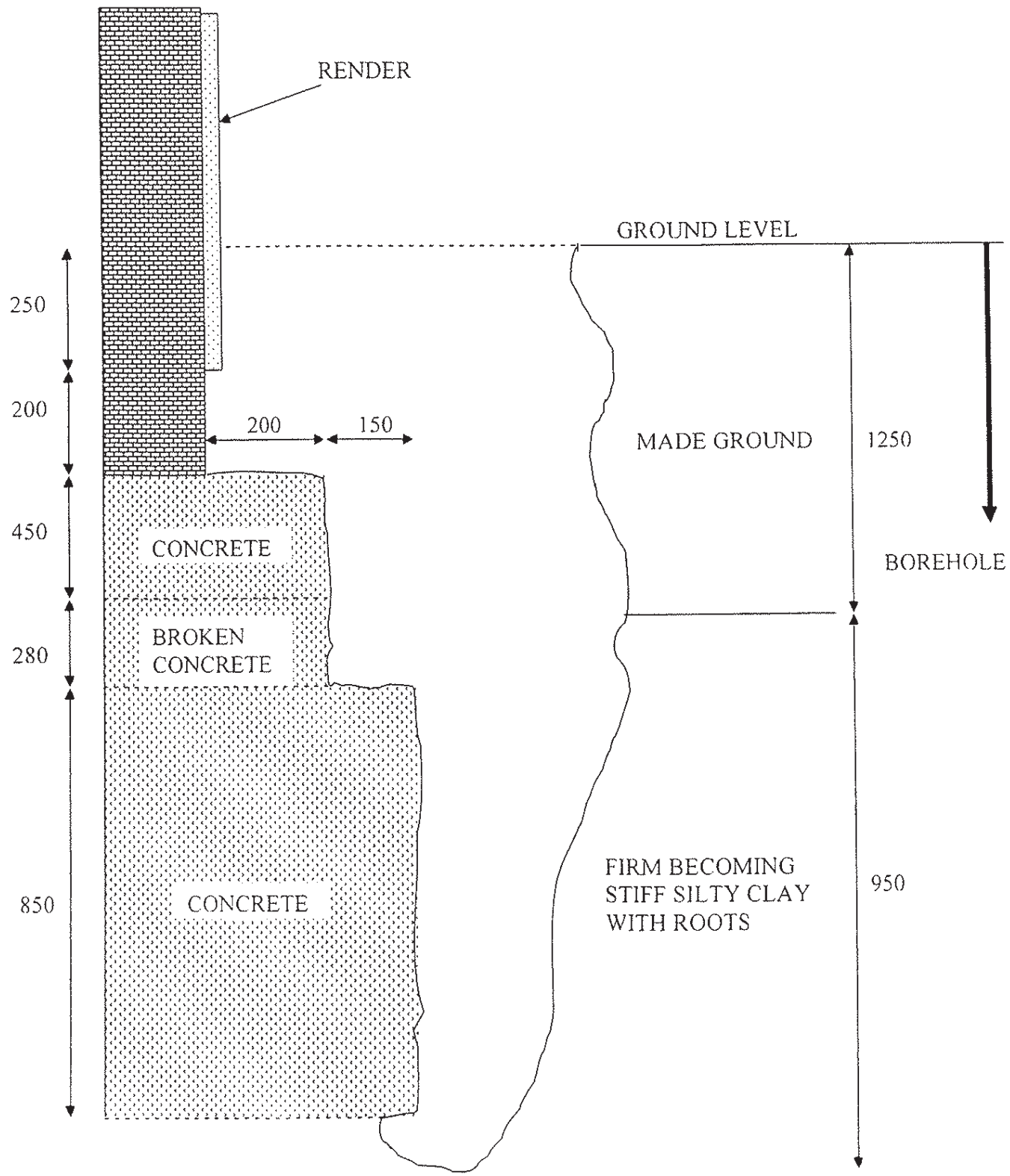


S A S	**Site Analytical Services Ltd.**	REF:	08/14401
	LOCATION: 11 Netherhall Gardens, London, NW3 5RN	FIG:	2
	TITLE: Trial Pit 1 DATE: May 2008	SCALE:	NTS



ND OF TRIAL PIT 1 AT 1500mm DEPTH

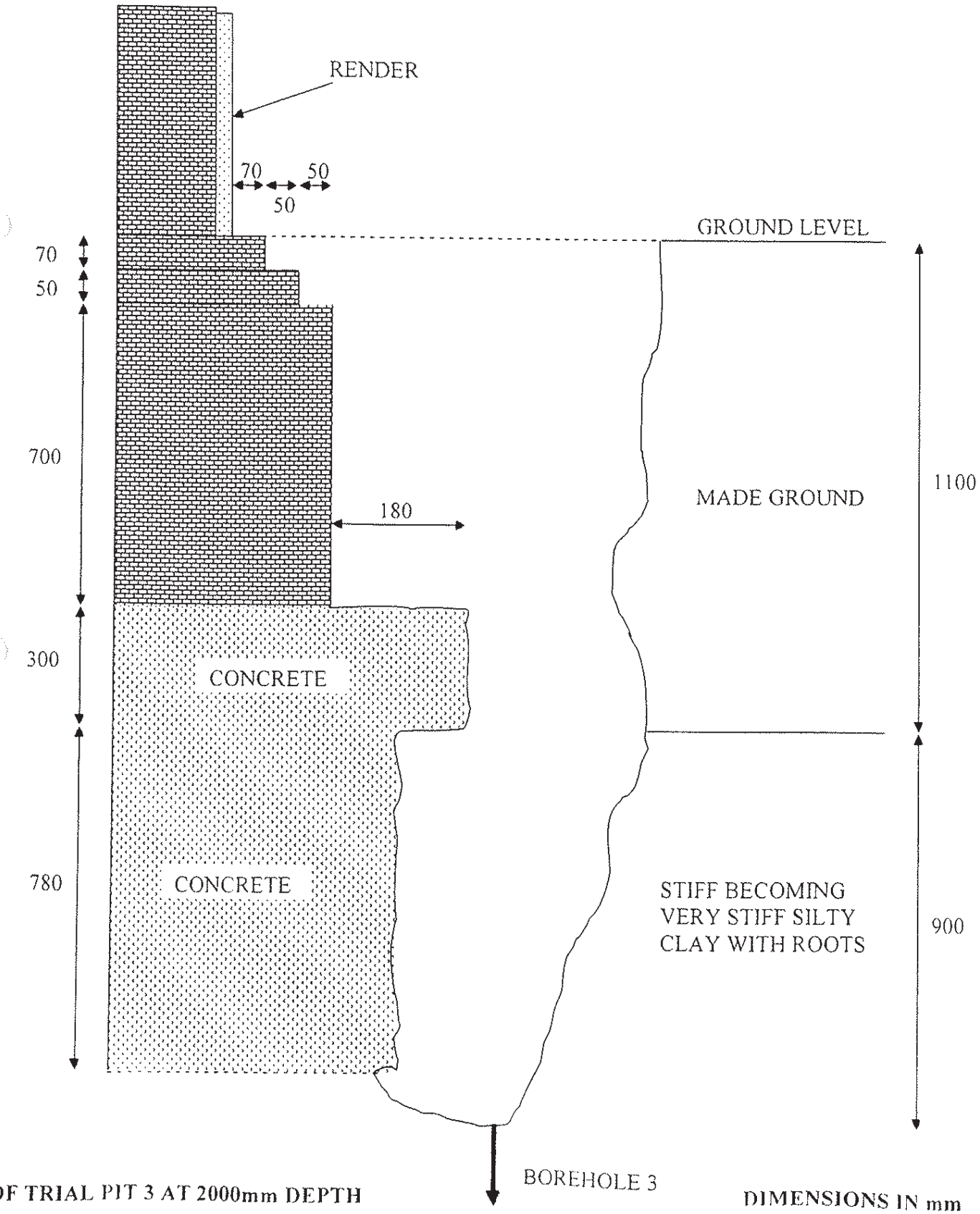
Site Analytical Services Ltd.				REF: 08/14401
LOCATION:	11 Netherhall Gardens, London, NW3 5RN			FIG: 3
TITLE:	Trial Pit 2	DATE:	May 2008	SCALE: NTS



ND OF TRIAL PIT 2 AT 2200mm DEPTH

DIMENSIONS IN mm

Site Analytical Services Ltd.				REF: 08/14401
LOCATION:	11 Netherhall Gardens, London, NW3 5RN			FIG: 4
TITLE:	Trial Pit 3	DATE:	May 2008	SCALE: NTS



D OF TRIAL PIT 3 AT 2000mm DEPTH

DIMENSIONS IN mm

Site Analytical Services Ltd.

APPENDIX 'A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site: 11 NETHERHALL GARDENS, LONDON, NW3 5RN			Borehole Number: TP/BH1
ring Method: AND EXCAVATION ONTINUOUS FLIGHT GER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD)	Client: AVONHEAD INVESTMENTS LIMITED
	Location: TQ 263 849	Dates: 09/05/2008	Engineer: WATTS GROUP PLC
			Job Number: 0814401
			Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
:5	D1					(1.00)	MADE GROUND - medium dense dry grey brown clayey silty sand, stiff sandy silty clay, fine to medium gravel, brick and concrete rubble and roots up to 20mm diameter		
50	D2								
75	D3								
)0	D4					1.00			
						(0.45)	MADE GROUND - stiff brown to orange brown sandy silty clay, brick and concrete fragments and roots up to 5mm diameter		
						1.45			
50	D5						Stiff becoming stiff to very stiff brown and mottled orange brown and veined blue grey silty CLAY with some becoming occasional partings of orange brown silty fine sand, scattered small gypsum crystals, roots up to 2mm diameter above 2.10m depth and rootlets above 3.30m depth		
50	R1								
50	V1 127								
00	D6								
00	V2 127								
50	V3 132								
.50	D7								
00	V4 140+								
00	D8					(3.55)			▽1
				SEEPAGE(1) at 3.20m.					
.50	D9								
50	V5 140+								
.00	D10								
.00	V6 140+								
50	D11								
50	V7 140+								
.00	D12								
00	V8 140+			09/05/2008:DRY		5.00			
							Complete at 5.00m		

Remarks
roundwater was not encountered during excavation and boring
or details of foundations exposed see sketch
= Disturbed Sample, R = Root Sample
= Vane Test - Result in kPa

Scale (approx)	Logged By
1:50	JIP

Figure No.
0814401.TP/BH1

Site Analytical Services Ltd.

oring Method: HAND EXCAVATION CONTINUOUS FLIGHT UGER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD):	Site: 11 NETHERHALL GARDENS, LONDON, NW3 5RN
	Location: TQ 263 849	Dates: 09/05/2008	Client: AVONHEAD INVESTMENTS LIMITED
Borehole Number: TP/BH2	Job Number: 0814401	Sheet: 1/1	Engineer: WATTS GROUP PLC

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20)	MADE GROUND - paving slabs set on concrete		
.25	D1					0.20			
).50	D2					(0.40)	MADE GROUND - medium dense dry grey brown clayey silty sand, stiff sandy silty clay, fine to medium gravel, brick and concrete rubble		
.75	D3					0.60			
.00	D4					(0.65)	MADE GROUND - stiff brown to orange brown sandy silty clay, topsoil, brick and concrete fragments and roots up to 10mm diameter		
						1.25			
.50	D5					(0.90)	Firm becoming stiff mottled brown, orange brown and blue grey silty CLAY with some partings of orange brown silty fine sand and roots up to 5mm diameter		
2.00	D6					2.15			
2.00	R1						Stiff becoming stiff to very stiff brown and mottled orange brown and veined blue grey silty CLAY with some becoming occasional partings of orange brown silty fine sand, scattered small gypsum crystals, roots up to 3mm diameter above 2.40m depth and rootlets above 2.70m depth		
:.00	V1 113								
:.5	D7								
2.50	V2 138								
:.00	D8								
:.00	V3 135								
3.50	V4 140								
:.50	D9								
4.00	V5 140+								
4.00	D10								
:.50	D11								
:.50	V6 140+								
7.00	D12								
:.00	V7 140+					(6.45)			
:.00	D13								
:.00	V8 140+								
7.00	D14								
7.00	V9 140+								
.00	D15								
.00	V10 140+								
						8.60	Very stiff dark grey brown fissured silty CLAY with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
:.00	V11 140+					(0.80)			
:.00	D16						Weak grey claystone nodule encountered at 9.40m depth		
				09/05/2008:DRY		9.40			
							Complete at 9.40m		

Remarks
' = Vane Test - Result in kPa
) = Disturbed Sample, R = Root Sample
or details of foundations exposed see sketch
iroundwater was not encountered during excavation and boring
orehole made outside trial pit and terminated at 9.40m depth on encountering a claystone obstruction

Scale (approx)	Logged By
1:50	JIP

Figure No. 0814401.TP/BH2

ite Analytical Services Ltd.

ing Method: ID EXCAVATION NTINUOUS FLIGHT GER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD):	Site: 11 NETHERHALL GARDENS, LONDON, NW3 5RN
	Location: TQ 263 849	Dates: 09/05/2008	Client: AVONHEAD INVESTMENTS LIMITED
Borehole Number: TP/BH3	Job Number: 0814401	Sheet: 1/1	Engineer: WATTS GROUP PLC

epth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.60)	MADE GROUND - medium dense dry grey brown clayey silty sand, stiff sandy silty clay, fine to medium gravel, brick and concrete rubble and roots up to 50mm diameter		
5	D1					0.60			
0	D2					(0.50)	MADE GROUND - stiff brown to orange brown sandy silty clay, brick and concrete rubble and roots up to 10mm diameter		
5	D3					1.10			
0	D4					(0.70)	Stiff mottled brown, orange brown and blue grey silty CLAY with some pockets and partings of orange brown silty fine sand and roots up to 5mm diameter		
0	D5					1.80			
)0	D6						Very stiff friable mottled brown, orange brown and blue grey silty CLAY with occasional partings of orange brown silty fine sand, scattered small gypsum crystals, roots up to 3mm diameter above 2.30m depth and rootlets		
)0	R1								
)0	V1 140+								
50	V2 140+					(1.40)			
50	D7								
50-2.60	R2								
)0	V3 140+								
)0	D8					3.20			
50	D9						Stiff becoming stiff to very stiff brown and mottled orange brown and veined blue grey silty CLAY with some becoming occasional partings of orange brown silty fine sand and scattered small gypsum crystals		
50	V4 137								
)0	D10					(1.80)			
)0	V5 140+								
50	D11								
50	V6 140+								
)0	D12								
)0	V7 140+			09/05/2008:DRY		5.00			
							Complete at 5.00m		

Remarks
Groundwater was not encountered during excavation and boring
For details of foundations exposed see sketch
) = Disturbed Sample, R = Root Sample
/ = Vane Test - Result in kPa

Scale (approx)	Logged By
1:50	JIP

Figure No. 0814401.TP/BH3

Site Analytical Services Ltd.

APPENDIX 'B'

Laboratory Test Data

Site Analytical Services Ltd.

Ref: 08/14401

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 11 Netherhall Gardens, London, NW3 5RN

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
1	0.25	17					
	0.50	24					
	0.75	16					
	1.00	29					
	1.50	33	67	23	44	98	CH
	2.00	29	61	22	39	100	CH
	2.50	26	62	21	41	100	CH
	3.00	30	70	24	46	100	CH/CV
	3.50	25					
	4.00	24					
	4.50	25					
	5.00	25					

Table 1

Ref: 08/14401

PLASTICITY INDEX &
MOISTURE CONTENT
DETERMINATIONS

LOCATION 11 Netherhall Gardens, London, NW3 5RN

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
2	0.25	35					
	0.50	35					
	0.75	31					
	1.00	27					
	1.50	29	68	24	44	98	CH
	2.00	30	66	23	43	99	CH
	2.50	23	67	21	46	100	CH
	3.00	25					
	3.50	26	66	21	45	100	CH
	4.00	25					
	4.50	25					
	5.00	26					
	6.00	26					
	7.00	27					
	8.00	27					
	9.00	27					

Table 1a

Site Analytical Services Ltd.

Ref: 08/14401

PLASTICITY INDEX &
MOISTURE CONTENT
DETERMINATIONS

LOCATION 11 Netherhall Gardens, London, NW3 5RN

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 µm %	Class
3	0.25	15					
	0.50	24					
	0.75	26					
	1.00	25					
	1.50	26	69	26	43	97	CH
	2.00	28	71	24	47	100	CV
	2.50	28	69	24	45	100	CH
	3.00	30					
	3.50	30	70	25	45	100	CH/CV
	4.00	31					
	4.50	30					
	5.00	30					

Table 1b

Appendix D

Botanical Investigation

Richardson's Botanical Identifications

Root identification
Vegetation surveys
Tree/Building investigations
Plant taxonomy

Dr Ian B K Richardson
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River Road Business Park
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Essex IG11 0EA

30/05/2008

Your ref: **08/14401**
Our ref: 68/7104

Dear Sirs

11 Netherhall Gardens, London, NW3 5RN

The roots you sent in relation to the above on 21/05/2008 have been examined.[1] The structure was referable as follows:

TP1, u/s/f:

1 root *Hedera* (**Ivy**); also the related *Fatsia* (a robust shrub with fig-like leaves). A further root, not examined in detail, appeared similar under low magnification. Recently **alive**.

1 root *Acer* (**Sycamore, Maples**). 6 further roots, not examined in detail, appeared similar under low magnification. **Dead**.

5 roots: too thin and immature for identification.

BH2, u/s/f:

1 root the family **Salicaceae** (*Salix* (**Willows**) and *Populus* (**Poplars**)). 13 further roots, not examined in detail, appeared similar under low magnification. Recently **alive**.

1 piece of BARK only.

.. continued /

[1] Identified with no information on vegetation, on or off site.

TP3, u/s/f: 1 root most like the family **Leguminosae** (a group of closely related trees: *Robinia* (**False Acacia**), *Laburnum*, *Sophora* (**Pagoda tree**), *Gleditsia* (**Honey Locust**), *Cercis* (**Judas tree/Redbud**), *Albizia* (**Silk tree**), *Acacia* (**Mimosa**), as well as such shrubs as *Wisteria*, **Gorse** and **Brooms**). 3 further roots, not examined in detail, appeared similar under low magnification. Recently **alive**.*

1 root could well be *Aesculus* (**Horse Chestnut** and related **Buckeyes**). 3 further roots, not examined in detail, appeared similar under low magnification. Recently **alive**.*

1 root: too thin and immature for identification.

TP/BH3, 2.5-2.6m: 1 root again, similar in many ways to *Aesculus* (**Horse Chestnut** and related **Buckeyes**). Tentative – this sample was very THIN. A further root, not examined in detail, appeared similar under low magnification. **Dead**.*

5 roots: too thin and immature for identification.

I trust this is of help. Please call us if you have any queries; our invoice is enclosed.

Yours faithfully

Dr Ian B K Richardson

* Based mainly on the **Iodine test** for starch. Starch is present in some cells of a living woody root, but is more or less rapidly broken down by soil micro-organisms on death of the root, sometimes before decay is evident. This result need not reflect the state of the parent tree.