Providing Ground Solutions

Nigel and Nancy Fulton

20 Platt's Lane, Camden, London

Basement Impact Assessment

September, 2014

Card Geotechnics Limited
4 Godalming Business Centre, Woolsack Way,
Godalming, Surrey, GU7 1XW
Telephone: 01483 310 600
www.cgl-uk.com

Author	Adam Cadman, Senior Engineer *MSc BSc (Hons) FGS*		
Checked	Richard Ball, Principal Engineer *MSc BSc CEng MICE FGS*		
Approved	Ian Marychurch, Director *MSc BSc CEng MICE CGeol FGS CMgr MCMI MIoD Dip IoD*		Ian Marychurch
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1. INTRODUCTION

Nigel and Nancy Fulton are proposing to redevelop 20 Platt's Lane, comprising the construction of a single storey basement below the existing semi-detached property. Card Geotechnics Limited (CGL) has been instructed to undertake a Basement Impact Assessment (BIA) for the proposed development to assess the potential impact on surrounding structures and hydrological and hydrogeological features.

Camden Guidance CPG4[1] requires Basement Impact Assessments to be undertaken for new basements in the borough and sets out a 5 stage approach:

1. Screening
2. Scoping
3. Site investigation
4. Impact assessment
5. Review and decision making

This report is intended to address the screening, scoping and impact assessment processes set out in CPG4 and the Camden geological, hydrogeological, and hydrological study (CGHHS)[2]. It identifies key issues relating to land stability, hydrogeology and hydrology as part of the screening process.

A ground investigation comprising one borehole was undertaken by Fastrack Limited in October 2013, with a supplementary investigation comprising foundation inspection pits undertaken by CGL in July 2013. The scoping process will form a review of this existing site investigation data (and other publically available ground investigation data in the immediate area), an assessment of its suitability for use in the BIA and the establishment of a conceptual site model.

This report also provides an assessment of geotechnical impacts on adjacent structures and the surrounding area based on available site investigation data and structural details. This includes an assessment of ground movements resulting from the basement

[1] Camden Planning Guidance, CPG4, Basements and Lightwells, September 2013.
[2] Ove Arup and Partners, Camden geological, hydrogeological, and hydrological study. Guidance for subterranean development, November 2010.

excavation, including heave, settlement and lateral movements around the basement perimeter.

2. SITE CONTEXT

2.1 Site location

The site is located at 20 Platt's Lane in the London Borough of Camden and is situated to the west of West Heath. The National Grid Reference for the approximate centre of the site is 525320, 186090.

A site location plan is presented in Figure 1.

2.2 Site description

The site is broadly triangular in shape and covers an area of around 425m^2. Around half of the site is occupied by the semi-detached, two storey residential building of 20 Platt's Lane. The remainder of the site is occupied by the front garden/driveway and a single storey garage.

The site is bounded to the north and south by the residential properties of 22 and 18 Platt's Lane respectively, the west by the pavement and carriageway of Platt's Lane, the east by the rear garden of 2 Ferncroft Avenue and the south by 18 Platt's Lane.

The property shares a party wall with 18 Platt's Lane. The nearest foundations of 2 Ferncroft Road and 22 Platt's Lane are some 1.5m and 5m away respectively.

A site layout plan is presented in Figure 2.

2.3 Topography

The site is located on the western slope of Hampstead Heath. The topography of the surrounding area generally slopes up towards the north-east at an angle of approximately 5° (1:11 gradient) and slopes down towards the west at an angle of approximately 2.3° (1:25 gradient).

With reference to Figure 11 from the Arup report[2], no slope gradients greater than 1:8 are recorded on the site. Small areas of the rear gardens fronting Hollycroft Road, some 20-30m to the north-east of the site, have slopes greater than 1:8.

The site is at an elevation of around 92mOD and is relatively flat.

2.4 Proposed development

It is understood that the proposed development comprises the excavation of a single storey basement beneath the existing building to a depth of around 3.4m below ground level (bgl).

Proposed development plans are presented in Appendix A.

2.5 Site history

Ordnance Surveys maps dating back to 1850 have been reviewed to inform the BIA. The salient points are summarised below:

Mapping from the 1850s indicates that the site and surrounding area were undeveloped.

Mapping from the 1870s shows that Platt's Lane was established, with *Kidderpore Hall* located to the south of the site, and *Brick Field* to the west of Platt's Lane. The site remained part of a field.

No significant changes are noted on the site on the mapping from the 1890s. A covered *Reservoir* is noted to the south of the site, adjacent to the former *Kidderpore Hall* (labelled *Westfield College*), and the former brick field has been developed to include the *Burgess Hill Tennis Court*.

Residential development is noted on the site and surrounding area on the mapping from the 1910s. The building and road layouts are similar to the present condition.

No significant changes are noted on the site or immediate surrounding area between 1910 and present day.

2.6 Published geology

With reference to the British Geological Survey (BGS) sheet[3] for the local area, the site is shown to be underlain by the Claygate Member over the London Clay Formation. No superficial deposits are noted in the area of the site. An area of Worked Ground broadly corresponding to the *Brick Field* identified on the historical mapping is noted on the BGS geology sheet[3] and within the Arup report[2]. No further details relating to the Worked Ground could be identified.

[3] BGS. (1994). England and Wales Series Sheet 256: *North London – Solid and Drift Geology.* 1:50,000.

The Claygate Member[4] forms the top of the London Clay Formation and is a transitional unit between the silty clays of the underlying London Clay and the sand of the overlying Bagshot Formation. It consists of a repetitive sequence of low to very high plasticity, overconsolidated, fissured, firm to very stiff, silty clay, silts and medium dense to dense fine grained sands, which exhibit a general coarsening up sequence. The clays are susceptible to volume change with seasonal changes in moisture content. This may be intensified by the interbedded sand which facilitates the passage of water into and out of the clay units. Water percolating along sandy layers can adversely affect the stability of excavations and promote softening of the clays. Water strikes and running sand conditions may be encountered where significant sand layers are present.

The London Clay Formation[4] is an over-consolidated firm to very stiff, becoming hard with depth, fissured, blue to grey silty clay of low to very high plasticity. The upper and lower parts may contain silty or fine grained sand partings. It also contains within it, laminated structured, nodular claystone and rare sand partings.

The bedding in this area is sub-horizontal and, as such, the contact between these strata generally follows the topography, at an elevation of approximately 85mOD. On this basis, it is anticipated that the Claygate Member will be around 7m thick beneath the site.

2.7 Unpublished geology

2.7.1 BGS borehole records

A number of British Geological Society (BGS) borehole records existing within 500m of the site have been reviewed to place the site within a wider geological context and are summarised in Table 1.

Table 1. Summary of BGS borehole records.

BGS BH record	Distance (m)	[bearing]	Base of BH (mbgl)	Ground water depth (mbgl)	Stratum (depth encountered in mbgl)			
					MG/TS	Claygate Member	Weathered London Clay	London Clay [mOD]
TQ28NE421	185	W	20	2.0	GL	-	1.1	5.5
TQ28NE422	215	W	15	dry	GL	-	1.4	7.5
TQ28NE119 - BH1	360	S	15.4	0.4 & 6.2	GL	0.5	-	5.8 [84.9]

[4] BGS. (1997). The Engineering Geology of the London Area. Technical Report WN/97/27.

BGS BH record	Distance (m)	[bearing]	Base of BH (mbgl)	Ground water depth (mbgl)	Stratum (depth encountered in mbgl)			
					MG/TS	Claygate Member	Weathered London Clay	London Clay [mOD]
TQ28NE119 - BH2	360	S	10.7	7.5	GL	0.15	-	4.3 [83.5]
TQ28NE119 - BH3	360	S	15.2	2.1	GL	0.3	-	4.6 [83.3]
TQ28NE119 – BH4	360	S	10.7	2.0	GL	0.15	-	5.5 [84.5]

Notes:

1. - = Not recorded/encountered.
2. GL = ground level.

The Claygate Member was encountered in BGS BH record TQ28NE119 (BH1 – BH4) only, underlying a limited thickness of Made Ground or Topsoil. The Claygate Member was described as firm, locally soft to firm, becoming firm to stiff with depth, mottled grey and brown, sandy clayey silt. The underlying London Clay was encountered at depths between 4.3mbgl and 5.8mbgl and generally comprised firm becoming stiff, fissured, dark grey silty clay with gypsum throughout. Triaxial tests were undertaken within BH1, BH3 and BH4 of BGS record TQ28NE119. The results indicate undrained shear strength (Cu) values of between 36kPa and 124kPa in the Claygate Member and between 52kPa and 125kPa in the London Clay.

The Claygate Member was not recorded in records TQ28NE421 or TQ28NE422, located some 185m to 215m to the west of the site. In these locations, around 1.1m to 1.4m of Made Ground was underlain by Weathered London Clay comprising firm, becoming stiff, fissured, mottled orange brown and grey brown clay with occasional selenite. Unweathered London Clay was encountered at depths between 5.5mbgl and 7.5mbgl. Ground levels in the area of these borehole records are around 75mOD to 80mOD, corresponding to a level below the anticipated contact between the London Clay and Claygate Member, and in an area where the latter is not recorded on geological maps.

Groundwater was recorded in each exploratory hole except TQ28NE422, at depths between 2.0mbgl and 7.5mbgl. A shallow water strike was also recorded in BH1 of BGS record TQ28NE119 at around 0.4mbgl, corresponding to a depth within the Made Ground.

2.7.2 Local ground investigations

With reference to the Camden planning records[5] and CGL records, a ground investigation was undertaken at Kidderpore Avenue approximately 200m to the south of the site. The ground conditions encountered generally comprised 0.5m to 2.8m of Made Ground over Claygate Beds and London Clay. The transition from the Claygate Member to the London Clay Formation was broadly inferred on the borehole logs by a change in lithology, from mottled orange brown sandy silty clay to dark grey silty clay containing shell fragments. The base of the Claygate Member was reported at between 5.2mbgl and 8.45mbgl, or around 88mOD in the north-eastern area of the site reducing to around 82mOD in the south-west.

The Claygate Member was generally described as firm to stiff, orange brown and mottled grey, sandy silty clay with very sandy water bearing layers. The London Clay typically comprised stiff, becoming very stiff, fissured, grey, sandy, silty clay with occasional shells and shell fragments and light grey silt/sand partings towards the top of the stratum.

There was considered to be a linear increase in shear strength, and consequently stiffness with depth through both the Claygate Member and London Clay Formation. The following undrained shear strength (Cu) design line was recommended:

$$Cu = 40 + 5.7z$$

Groundwater strikes were broadly recorded as 'slow inflows' and 'seepages' between 2mbgl and 9mbgl, possibly originating from more permeable silt and sand lenses within the Claygate Member.

2.8 Hydrogeology and hydrology

The Environment Agency has produced an aquifer designation system consistent with the requirements for the Water Framework Directive. The designations have been set out for superficial and bedrock geology and are based on the importance of aquifers for potable water supply, and their role in supporting surface water bodies and wetland ecosystems.

The Claygate Member is classified as a Secondary A Aquifer and the London Clay Formation has been classified as a non-productive stratum. The site is not within a groundwater source protection zone.

[5] http://planningrecords.camden.gov.uk/

Water strikes and seepages are usually encountered within the Claygate Member. Existing and historical spring lines are present at the interface of the Claygate Member and the underlying London Clay. These springs have been the source of a number of London's 'lost' rivers, notably the *Fleet*, *Westbourne* and *Tyburn*, most of which are now diverted underground. Several sources of the River Westbourne are located to the north, east and south of the site.

With reference to Barton's 'Lost Rivers of London'[6], a tributary of the *River Westbourne* ran beneath Reddington Road, some 250m to the east of the site. The tributary flowed in a southerly direction towards the *River Westbourne*, located some 400m south-east of the site and flowing from the north-east, broadly south-west. The source of the tributary is likely to be a spring within a granular horizon of the Claygate Member.

The nearest recorded surface water feature is located some 650m to the north-east of the site and is denoted on Ordnance Survey mapping as *Leg of Mutton Pond*.

With reference to Figure 14 (Hampstead Heath Surface Water Catchments and Drainage) within the Arup report[2], the site is not located within the catchment area of the closest chain of ponds, *Golders Hill Chain*, located to the north-east of the site.

2.9 Flood risk

With reference to Environment Agency mapping, the site is not located within an area at risk from flooding from rivers, sea or reservoirs, although a small area at low risk from surface water flooding is noted on Platt's Lane. Notwithstanding this, and with reference to Figure 15 (Flood Map) of the Arup report[2], Platt's Lane was flooded in 1975 and 2002, and Ferncroft Road (located to the south of the site) was flooded in 1975.

[6] Barton N. (1962) *The Lost Rivers of London.* Historical Publications Limited.

3. SCREENING (STAGE 1)

3.1 Introduction

A screening process has been adopted in accordance with CPG4, based on the flowcharts presented in that document. Responses to the questions posed by the flowcharts are presented below, and where 'yes' or 'unknown' may be simply answered with no analysis required, these answers have been provided.

3.2 Subterranean (Groundwater) flow

This section answers questions posed by Figure 1 in CPG4:

Table 2. Responses to Figure 1, CPG4.

Question	Response	Action required
1a. Is the site located directly above an aquifer?	Yes The Claygate Member are classified as a Secondary A Aquifer.	None
1b. Will the proposed basement extend beneath the water table surface?	Unknown Unpublished geological records indicate that groundwater in the area is variable and water has been observed at depths that the basement excavation will encounter.	Confirm by investigation and assessment
2. Is the site within 100m of a watercourse, well or potential spring line?	No	None
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No The site is not within the catchment of the chain ponds on Hampstead Heath.	None
4. Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	No The basement will extend beneath the existing footprint of the property.	None
5. As part of site drainage, will more surface water than at present be discharged to ground (e.g. via soakaways and/or SUDS)?	No The shallow soils are unlikely to be a suitable medium for soakage. Surface water will be discharged to the sewer network through connections, increasing the volume of water to the sewer network compared to the existing condition.	None
6. Is the lowest point of the proposed excavation close to, or lower than, the mean water level in any local pond or spring lines?	No Although the spring lines and ponds of Hampstead Heath are noted to the north-east of the site at a higher elevation than the site, they are at a sufficient distance from the site that they are unlikely to have a significant influence on the site.	None

In summary, it is considered likely that the basement excavation may encounter groundwater within the Claygate Member.

It is considered that the basement excavation will not affect or be affected by surface water features, specifically the pond chains on Hampstead Heath.

3.3 Slope/land stability

This section answers questions posed by Figure 2 in CPG4.

Table 3. Responses to Figure 2, CPG4.

Question	Response	Action required
1. Does the site include slopes, natural or man-made, greater than approximately 1:8?	No The site is relatively level.	None
2. Will the proposed re-profiling of the landscaping at site change slopes at the property boundary to greater than approximately 1:8?	No	None
3. Does the development neighbour land including railway cuttings and the like with a slope greater than approximately 1:8?	No	None
4. Is the site within a wider hillside setting in which the general slope is greater than approximately 1:8?	No The topography of the surrounding area generally slopes up towards the north-east a gradient of 1:11 and slopes down towards the west at a gradient of 1:25 gradient. Although small areas with slopes greater than 1:8 are identified on mapping some 20-30m to the north-east of the site, these relate to the benched/sloped rear gardens of the properties fronting Hollycroft Road and are unlikely to affect or be affected by the proposed basement.	None
5. Is the London Clay the shallowest stratum on site?	No The site is underlain by the Claygate Member.	Confirm by investigation and assessment
6. Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	No It is assumed that the existing vegetation and trees will remain.	None

Question	Response	Action required
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such at the site?	Unknown The shallow soils are likely to susceptible volume change, however, no damage to buildings has been identified.	Impact assessment
8. Is the site within 100m of a watercourse or a potential spring line?	No	None
9. Is the site within an area of previously worked ground?	No Although the BGS geological sheet identifies Worked Ground in the area of the site (associated with a former brick field), no such deposits are mapped or anticipated beneath the site.	Confirm by investigation and assessment
10. Is the site within an aquifer and if so will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Yes, possibly. See Table 2, Question 1a.	Confirm by investigation and assessment
11. Is the site within 50m of the Hampstead Heath ponds?	No	None
12. Is the site within 5m of a highway or pedestrian right of way?	No Although the property fronts Platt's Lane, the proposed basement is over 5m from the highway and pavement.	None
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes The property shares a party wall with 18 Platt's Lane and it is understood that the surrounding properties do not contain basements.	Impact assessment
14. Is the site over (or within the exclusion zone of) any tunnels?	No	None

In summary, the site is located above the Claygate Member over the London Clay. It is anticipated that heave movements/long term settlement will occur during construction and over the long-term. Construction-related settlement may also occur as the proposed basement walls are installed.

A basement impact assessment will be undertaken to determine the likely magnitude of ground movements around the basement perimeter. This will include the effects of deflections of retaining walls and associated ground settlement. The results of the ground movement analysis will be used to assess potential damage categories developed in adjacent structures, particularly number 18 Platt's Lane sharing the only party wall with the property .

The topography of the surrounding area generally slopes up towards the north-east a gradient of 1:11 and slopes down towards the west at a gradient of 1:25 gradient.

Although small areas with slopes greater than 1:8 are identified on mapping some 20-30m to the north-east of the site, these relate to the benched/sloped rear gardens of the properties fronting Hollycroft Road. The proposed basement is unlikely to affect or be affected by the stability of these slopes.

The Claygate Member is the shallowest stratum beneath the site and may comprise medium to high volume change potential soils. Seasonal variation in moisture content may induce shrink/swell conditions and the effects of this will be assessed.

3.4 Surface flow and flooding

This section covers the main surface flow and flooding issues as set out in CPG4, however detailed design of the site drainage will be completed by other parties.

Table 4. Responses to Figure 3, CPG4.

Question	Response	Action required
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No	None
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off), be materially changed from the existing route?	No The basement will extend beneath the existing footprint of the property. It is understood that existing drainage outlets will be retained.	None
3. Will the proposed development result in a change in the proportion of hard surfaced/paved external areas?	No The basement will extend beneath the existing footprint of the property.	None
4. Will the proposed basement result in a change to the profile of the inflows of surface water being received by adjacent properties or downstream watercourses?	No It is understood that existing drainage outlets will be retained.	None
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No The construction of the basement will remove existing Made Ground from this area of the site. As such there will be no degradation in water quality to adjacent properties or downstream water courses.	None

Question	Response	Action required
6. Is the site in an area known to be at risk from surface flooding, or is it at risk from flooding because the proposed basement is below the static water level of a nearby surface water feature?	Yes Platt's Lane and other local roads were flooded previously.	Flood risk assessment

In summary, the basement is proposed beneath the existing building and will therefore not result in an increase of hard surfaces. It is understood that all surface water will be discharged to the sewer network through existing connections and the volumes of surface water run-off from the site are not anticipated in increase significantly.

A surface flood risk is recorded in the Camden flood risk management strategy, based on the flooding of the road in 1975 and 2002. Further details of the flood event, i.e. maximum flood height etc., could not be established and in accordance with CPG4 guidance, a flood risk assessment may be required.

Notwithstanding this, it is noted that the road and pavement slope down from the site boundary towards the west and as such a major flood event would be required to flood the site.

3.5 Summary

On the basis of this screening exercise, the basement impact assessment will address the following:

Table 5. Summary of Basement Impact Assessment requirements.

Item	Description
	Subterranean (Groundwater flow)
1.	Confirm the ground conditions and if groundwater is present within the shallow soils and, therefore, whether groundwater will be a consideration for the basement design, and if the basement will affect groundwater flows in and around proposed structures.
	Slope stability
2.	Estimate movements associated with construction in the Claygate Member and London Clay, including short and long term heave movements, settlement associated with retaining wall deflections, foundation settlement and ground movements around the basement perimeter.
3.	Impact assessment to determine effect of basement construction on adjacent residential properties and infrastructure.

Item	Description
4.	Impact assessment to determine cumulative effect of basement construction on shrink/swell characteristics of shallows soils and potential for differential movement at foundations.
5.	*Surface flow and flooding* A Flood Risk Assessment may be required. Although the basement is not considered to be at significant risk from surface water flooding based in the relative levels of Platt's Lane and the site.

The outcomes of the screening assessment are carried forward into the Basement Impact Assessment in the following report sections.

4. SCOPING (STAGE 2)

4.1 Introduction

This section of the report covers the scoping process (Stage 2) of the assessment in accordance with CPG4, which is used to identify potential impacts of the proposed scheme and establish a conceptual site model. The scoping stage also informs the scope of the site investigation.

4.2 Previous site investigation

A ground investigation was undertaken by Fastrack Limited in October 2013 and comprised a single borehole undertaken between the existing house and garage building. In-situ testing including Macintosh probes and borehole vane tests was undertaken at regular depths. It is noted that the soil descriptions are not in accordance with current best practice and do not include relative consistency of the cohesive soils. A summary of the conditions encountered during the investigation is presented in Section 5 of this report.

The intrusive investigation on the site, together with the findings from local ground investigations and published data, is considered to be sufficient to generate the ground model for the development. The assessment of land stability is based on this information and is sufficiently conservative such that a 'worst-case' assessment of ground movements can be undertaken to determine the level of risk posed to adjacent properties due to the construction of the basement.

5. GROUND AND GROUNDWATER CONDITIONS (STAGE 3)

5.1 General

A summary of the ground conditions encountered during the Fastrack ground investigation is presented in Table 6 below. The stratum references are based on CGL's interpretation of the Fastrack soil descriptions.

Table 6. Summary of ground conditions encountered in Fastrack ground investigation.

Stratum	Depth to top (mbgl)	Thickness (m)
(MADE GROUND) Comprising 11cm of hardstanding over dark brown sandy clayey brick and flint gravel.	0.0	0.4
Mid-brown gravelly CLAY. Becoming silty clay at 1.4mbgl. Becoming Grey silty CLAY at 1.4mbgl. [CLAYGATE MEMBER]	0.4	Proven to 5.0m

Made Ground was encountered at ground level, was 0.4m thick and comprised 11cm of hardstanding (paving slab set in concrete) over a dark brown, sandy, brick and flint gravel.

The Claygate Member was encountered at 0.4mbgl underlying the Made Ground and comprised brown gravelly clay. The nature of the gravel is not noted. The Claygate Member became silty clay from 1.4mbgl. No sand lenses or layers are noted on the borehole record. Average borehole shear vane results of between 95kPa and 140kPa were recorded, generally increasing with depth.

The London Clay was not encountered within the Fastrack ground investigation. However, based on published records and CGL's knowledge of the geology in this area, the base of the Claygate Beds is anticipated to be at a level of around 85mOD, or around 7mbgl.

5.2 Groundwater

No groundwater strikes were recorded during the Fastrack ground investigation. On this basis, it is anticipated that significant groundwater flows will not be encountered during the basement excavation. Given the variable nature of the Claygate Member however, the possibility of granular lenses/horizons, and hence perched water cannot be completely discounted.

5.3 Existing foundations

Two foundation inspection pits were excavated by CGL in July 2014. The foundation inspection pit (FIP) records are presented in Appendix D.

The existing perimeter walls are supported on conventional spread foundations comprising masonry walls onto between 0.2m and 0.4m thick of mass concrete founded at a depth of 0.7mbgl.

Some perched water was encountered within the disturbed soils at the base of foundation inspection pits.

5.4 Geotechnical design parameters

Geotechnical design parameters for the proposed development are summarised in Table 7 below. They are based on data obtained from the Fastrack ground investigations, local investigations and published data for the well-studied London Geology.

Table 7. Geotechnical design parameters based on local conditions and published data.

Stratum	Design depth (mbgl)	Bulk Unit Weight γ_b (kN/m^3)	Undrained Cohesion c_u (kPa) [c']	Friction Angle ϕ' (°)	Young's Modulus E_u (MPa) [E']
Claygate Member	0.4	18	40 + 5.7z	22[c]	24 + 3.4z [18 + 2.5z]
London Clay	7.0	20		24[a]	

a. BS 8002:1994 Code of practice for Earth retaining structures, British Standards institution.
b. Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2nd Edn, John Wiley, New York, 1967, p.310.
c. Burland, J.B., Standing, J.R., & Jardine, F.M. (2001). Building response to tunnelling: Case studies from construction of the Jubilee Line Extension, London. Volume 1: Projects and methods.
d. z = depth below surface of the London Clay
e. Based on 500 Cu
f. Based on 0.75Eu

Although the site specific ground investigation reported shear strength values within the Claygate Member in excess of those included in Table 7, local data suggest the consistency and strength of the clay soils, particularly the Claygate Member, may be variable. On this basis, the strength and stiffness parameters have been conservatively assumed based on local ground investigation and data from CGL boreholes.

The parameters in Table 7 are unfactored (Serviceability Limit State) and are considered to be conservative design values.

An allowable bearing capacity of 100kPa is recommended for foundations in the Claygate Member below 2.5mbgl.

5.5 Conceptual site model

A Conceptual Site Model (CSM) is presented in Figure 3, based on details of the proposed development and the outcomes of the Screening Assessment. The CSM comprises a plan and section indicating the extent of the proposed basement and the location of neighbouring properties in relation to the proposed development. The ground and groundwater conditions on the site have been assessed based on the available records, including published geological records, BGS borehole records, site specific ground investigation and local site investigation reports.

The proposed basement is approximately 2.6m deep and the new basement walls will be supported with underpin foundations. The existing building shares a party wall foundation with 18 Platt's Lane.

20 Platt's Lane does not share party walls with the remaining adjacent structures. The closest neighbouring foundations are 2 Ferncroft Road which are 1.5m from the proposed basement. The nearest foundations of 22 Platt's Lane are approximately 5m from the proposed basement. The pavement of Platt's Lane is around 11m to the north-west of the proposed basement.

On this basis, and assuming a 45° soil zone of influence from the base of the basement, the installation and possible deflections of retaining structures will have no effect on the stability of neighbouring foundations of 22 Platt's Lane or the pavement of Platt's Lane. On this basis, no further assessment of retaining wall construction/deflection induced ground movements is required for these sections.

The excavation of the basement will generate heave movements in the short-term as removal of the overburden reduces stresses at formation level. This is typically counteracted to some extent in the long-term as the application of structural loads from the proposed structure reduces net unloading and, subject to the load intensities, may induce settlement.

Two critical sections for analysis have been identified for consideration, corresponding to:

- Section A-A: South-west to north-east through proposed basement and party wall foundations and building of 18 Platt's Lane to south-west;

- Section B-B: south-east to north-west through proposed basement, adjacent property of 2 Ferncroft Road to south-east and pavement/highway of Platt's Lane;

The critical sections have been analysed to assess the potential for ground movements due to the excavation of the basement to cause damage to the neighbouring properties.

6. SUBTERRANEAN (GROUNDWATER) FLOW (STAGE 4)

6.1 Introduction

This section addresses outstanding considerations raised by the screening process regarding groundwater flow, as summarised in Section 3.2.

6.2 Impact on groundwater flow

Based on the findings of the intrusive investigation, significant groundwater strikes are not anticipated within the shallow soils, and seepages, if encountered, are likely to be minor.

Groundwater percolation/seepage within Claygate Member is likely to be in a westerly to south-westerly direction, following topography.

It is understood that the neighbouring properties do not have basements. On this basis, and given the absence of significant water bearing soils beneath the site, it is considered that the proposed basement will have not have a significant negative impact on groundwater flow or level in the vicinity of the site.

6.3 Recommendations for groundwater control

Although no sand lenses or layers were identified by Fastrack, the Claygate Member does exhibit lateral and vertical variation. The potential occurrence of such soils or associated perched water beneath the site cannot be disregarded and should be accounted for in the design and construction of the basement, i.e. the contractor should excavate with caution and make contingency measures available should water be encountered.

7. LAND STABILITY (STAGE 4)

7.1 Introduction

This section provides calculations to determine ground movements that may result from the construction of the proposed basement and assess how these may affect adjacent structures. It is understood that an underpinning construction method will be adopted throughout to form the new basement wall and provide support to the existing foundations.

Possible ground movement mechanisms are:

- Heave movements: The Claygate Member and London Clay are susceptible to short term heave and time-dependant swelling on unloading, which will occur as a result of basement excavation, generating upward ground movements.
- Long term ground movement: Net loading on the formation soils will generate ground movement, which could affect adjacent foundations.
- Underpin deflection: Underpins will act as stiff concrete retaining walls, which limits the potential for wall deflection. However, deflections that do occur may generate surface settlements that could impact adjacent properties.
- Underpin construction: Workmanship in constructing the underpins and providing temporary propping will be critical in controlling movements, particularly preventing ground loss during excavation which with good design and control should be minimal.
- Underpin settlement: Caused as structural loads are transferred to previously unloaded soils.
- Seasonal shrink/swell: The deepening of foundations below the depth of influence of tress may induce differential movements at foundations.

7.2 Seasonal shrink/swell

The proposed development will result in the deepening of the party wall foundations with 18 Platt's Lane.

The shallow soils (Claygate Member) are likely to be susceptible to seasonal changes in moisture content and associate volume change. Several large trees are noted to the south of 18 Platt's Lane.

The deepening of the foundations at the northern end of the 18 Platt's Lane relative to the southern end may result in differential movements between the foundations as the underpin foundations are taken below the depth of influence of the trees.

However, it is noted that the trees are around 15m away from the proposed underpin foundations, with the existing building likely to act as a barrier to significant root growth towards the north. On this basis, the existing party wall foundations are likely to be situated beyond the influence of tree related seasonal volume change. The deepening of these foundations are therefore not considered to materially change the existing conditions with regard to seasonal shrink/swell and no further assessment is considered necessary.

7.3 Assumed construction sequence

The basement walls below the existing party wall with 18 Platt's Lane and the remaining exterior walls of 20 Platt's Lane will be constructed using traditional underpinning techniques with pins excavated in typically 1.0m to 1.2m wide bays. It is assumed, based on the depth of the basement, that the underpins will be constructed in one lift. A toe projection will be cast at the base of each underpin section, forming an L-shaped reinforced retaining wall in the temporary condition to resist sliding, overturning and excessive bearing pressures.

The underpins will be constructed in supported trenches with a central soil mass retained to provide support for temporary props and formwork. It is recommended that temporary propping be installed at the top of the wall and the bottom of the underpin to resist sliding and rotation of the wall prior to casting the basement and ground floor concrete floor slabs. Temporary propping should remain in place until the floor slabs develop sufficient strength to sustain soil loads.

The underpins will be generally supported in the permanent condition by the ground and basement floor slabs.

7.4 Assumed loading

Details of loading assumptions used in the heave/settlement analysis are summarised in the following sections. Loading information provided by the client can be found in Appendix E.

The net loading at formation level below the underpins include stress relief due to the removal of overburden during excavation and the transfer of building loads to the new formation level via the underpins. The basement is some 2.6m deep, therefore stress relief due to overburden removal is likely to be of the order of 52kPa. This value assumes a typical bulk unit weight of $20kN/m^3$ for the excavated soils. The basement floor slab will not be heavily loaded, and as such the full stress relief of 52kPa will be assumed to act over this area.

Based on the provided line loads, the underpins should be constructed on concrete bases measuring a minimum of 1.0m wide beneath the party walls (assuming line loads of 101kN/m) and 0.7m wide for perimeter basement walls (assuming maximum line loads of 67kN/m).

The applied pressure beneath the underpins will be 100kPa, assuming the minimum foundation widths presented above. The line loads provided (see Appendix E) do not include the concrete self-weight of the concrete underpins. However, the differential in unit weight between the soil ($20kN/m^3$) and concrete ($24kN/m^3$) is small and will not significantly affect the analysis.

7.5 Ground movements arising from basement excavation

A heave analysis has been undertaken using OASYS Limited *VDISP* (***V****ertical* ***DISP****lacement*) analysis software. *VDISP* assumes that the ground behaves as an elastic material under loading, with movements calculated based on the applied loads and the soil stiffness (E_u and E') for each stratum input by the user. VDISP assumes perfectly flexible loaded areas and as such tends to overestimate movements in the centre of loaded areas and underestimate movements around the perimeters.

7.5.1 Short term heave due to excavation

Maximum short term heave is predicted to be approximately 7mm, occurring beneath the central region of the proposed basement.

Approximately 0.5mm of settlement is predicted beneath the party wall underpins. Negligible movement (<1mm of heave) is predicted outside of the basement footprint.

A contour plot showing the variation of heave over the short term across the basement excavation and likely impact on the adjoining property is presented within Figure 4. Full VDISP output can be provided upon request.

7.5.2 Long term heave/settlement

Long term heave movements may occur as pore pressures recover within the Claygate Member and London Clay at depth. Maximum long term heave is predicted to be approximately 11mm beneath the central region of the proposed basement.

Approximately 1mm settlement is predicted below the party wall underpins. Negligible movement (<1mm of heave) is predicted outside of the basement footprint.

A contour plot showing the variation of heave over the long term across the basement excavation and likely impact on the adjoining property is presented within Figure 5. Full VDISP output for both the short and long term ground movement assessments can be provided upon request.

7.5.3 Underpin settlement due to workmanship

The heave/settlement assessment undertaken within VDISP assumes perfect workmanship in the underpin construction and does not allow for settlement of the dry pack between existing footings and the new concrete. With good construction practice, actual settlements would be expected to not exceed 5mm for each underpin lift.

7.5.4 Ground loss due to basement wall construction

Preventing ground loss during the excavation of soil to form the underpin foundations will be critical in controlling movements at the nearest foundation of 2 Ferncroft Avenue.

With good design and construction practice, i.e. provision of sacrificial trench sheets and appropriate propping, ground loss should be minimal.

7.6 Damage Category assessment

Ground movements have been analysed based on the construction scheme as currently envisaged to provide indication as to the potential damage that may be caused to neighbouring structures and infrastructure.

The calculated ground movements have been used to assess potential 'damage categories' to the neighbouring properties. The methodology proposed by Burland and Wroth[7] and later supplemented by the work of Boscardin and Cording[8] has been used, as described in *CIRIA Special Publication 200*[9] and *CIRIA C580*.

Assumed damage categories are summarised in Table 8 below:

Table 8. Classification of damage visible to walls (reproduction of Table 2.5, CIRIA C580.

Category	**Description**
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm).
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very Severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

Of the neighbouring properties, the proposed basement only shares party wall foundations with 18 Platt's Lane. Potential damage to this property is a function of ground movements caused by stress relief due to basement excavation, underpin wall deflection and settlement of the underpin foundations due to workmanship.

Potential damage to the adjacent structures of 22 Platt's Lane and 2 Ferncroft Road are likely to be controlled by global ground movements following stress relief due to basement excavation and settlement due to ground loss/underpin wall deflections during construction. On this basis, controlling ground loss during excavation with the provision of

[7] Burland, J.B., and Wroth, C.P. (1974). *Settlement of buildings and associated damage*, State of the art review. Conf. on Settlement of Structures, Cambridge, Pentech Press, London, pp611-654

[8] Boscardin, M.D., and Cording, E.G., (1989). *Building response to excavation induced settlement*. J Geotech Eng, ASCE, 115 (1); pp 1-21.

[9] Burland, Standing J.R., and Jardine F.M. (eds) (2001), *Building response to tunnelling, case studies from construction of the Jubilee Line Extension London*, CIRIA Special Publication 200.

trench sheets at the rear of the underpin excavations in granular soils and minimising underpin wall deflections with appropriate temporary propping will be critical in controlling damage potential to adjacent structures.

For the critical party wall section (Section A-A: 18 Platt's Lane) the predicted short and long term heave and workmanship settlement have been combined to determine the deflection ratio for the property. This value has then been used to establish a limiting horizontal displacement of the underpins to ensure that the predicted damage category does not exceed Category 1 'very slight' damage.

For the critical non-party wall section (Section B-B: 2 Ferncroft Road) the predicted short and long term heave and settlement due to underpin wall deflection have been combined to determine the deflection ratio for the property. This value has then been used to establish a limiting horizontal displacement for underpin foundations to ensure horizontal displacement of the adjacent property wall do not result in a predicted damage category in excess of Category 1 'very slight' damage.

The method of deriving these values and establishing an appropriate deflection ratio for the neighbouring structures is illustrated graphically in Figure 6 and Figure 7.

Table 9. Summary of short-term movements and corresponding damage category.

Party Wall Reference	Limiting Horizontal movements (mm)	Maximum deflection (mm)	Limiting horizontal Strain Δ/L^b (%)	Deflection ratio δ_h/L^a (%)	Damage category
Section A-A: 18 Platt's Lane	5.0	6.0	0.038	0.046	1 – very slight
Section A-A: 22 Platt's Lane	Negligible movements at foundations				0 – very slight
Section B-B: 2 Ferncroft Road	3.0	1.0	0.06	0.02	1 – very slight

1. *See Figure 2.18 (a) CIRIA C580 (2003) Embedded retaining walls guidance for economic design. (L = length of adjacent structure in metres, perpendicular to basement; Δ = relative deflection).*
2. *See Box 2.5 (v) CIRIA C580 (2003) Embedded retaining walls guidance for economic design. (δh = horizontal movement in metres.*

Based on these results, limiting horizontal movements of 3mm are required for the nearest wall of the adjacent building of 2 Ferncroft Road. Given the distance between the proposed basement and this property, lateral underpin wall deflections should be limited to 5mm to ensure deflections at the adjacent foundations do not exceed the relevant limiting horizontal deflections.

Negligible movements are anticipated beneath the pavement and carriageway of Platt's Lane and the foundations of 22 Platt's Lane and on this basis the proposed basement is unlikely to cause significant damage to these structures.

The building interaction chart for the adjacent party wall structures is presented in Figure 8.

7.7 Construction monitoring

The results of the ground movement analysis suggest that with good construction control, damage to adjacent structures generated by the assumed construction methods and sequence are unlikely to exceed (within Category 1) 'very slight'.

It is recommended that a formal monitoring strategy should be implemented on site in order to observe and control ground movements during construction, and in particular movements of the adjacent property.

The system should operate broadly in accordance with the 'Observational Method' as defined in CIRIA Report 185[10]. Monitoring can be undertaken by using positional surveys compared to baseline values established before any excavation work is undertaken onsite. Survey targets can be affixed to exposed sections of footings and along the face of the adjacent buildings. Regular monitoring of these positions will determine if any horizontal translation, tilt or differential settlement of the neighbouring structure is occurring as the construction progresses. Alternatively, precise levelling can be undertaken at regular intervals around the perimeter of critical neighbouring properties to give an early and accurate indication of deviating ground movements at these critical locations. Monitoring data should be checked against predefined trigger limits and can also be further analysed to assess and manage the damage category of the adjacent buildings as construction progresses.

[10] Nicholson, D., Tse, Che-Ming., Penny, C., The Observational Method in ground engineering: principles and applications, CIRIA report R185, 1999.

8. NON-TECHNICAL SUMMARY

8.1 General

The findings of this Basement Impact Assessment are informed by site investigation data, information regarding construction methods provided by the client and assumed construction sequence and detail.

- The ground conditions beneath the site comprise Made Ground over the Claygate Member and the London Clay Formation at depth. No water strikes were recorded during intrusive investigation on the site and only slight seepages are anticipated in the Claygate Member.

- Differential movement between the southern and northern (party wall) foundations of 18 Platt's Lane due to tree induced seasonal shrink/swell is already anticipated given the distance between existing trees and the foundations. On this basis, it is considered that the deepening of the party wall foundations will not add further cumulative impact.

- From the available information, it is considered that the proposed basement construction will have a minimal effect on groundwater and negligible effect on surface water and flooding at this site.

- The existing building and proposed basement share a party wall only with 18 Platt's Lane. Damage to this building will be controlled by ground movements due to basement excavation, application of structural loads on underpin foundations and settlement of the underpins due to workmanship.

- Where the existing building does not share party walls with the neighbouring properties, damage to adjacent buildings will be controlled by ground movements (heave) caused by stress relief at basement level, potential ground loss during underpin construction and settlement due to underpin wall deflections in the temporary condition.

- Control of ground loss during underpin construction will be critical in controlling damage to neighbouring properties and trench sheeting should be placed at the rear of excavations.

- The construction of the basement will generate ground movements due to a variety of causes including; heave, underpin settlement and underpin wall deflection during and after excavation. Conservative calculations indicate that these will give rise to a damage category within 'Category 1' (very slight damage) for the adjacent properties with a limiting horizontal underpin deflection of 5mm and assuming a good standard of workmanship.

- It is recommended that an appropriate monitoring regime be adopted to manage risk and potential damage to the neighbouring structures.

- The analyses reported should be revised to account for changes to design, loading, construction method or sequence.

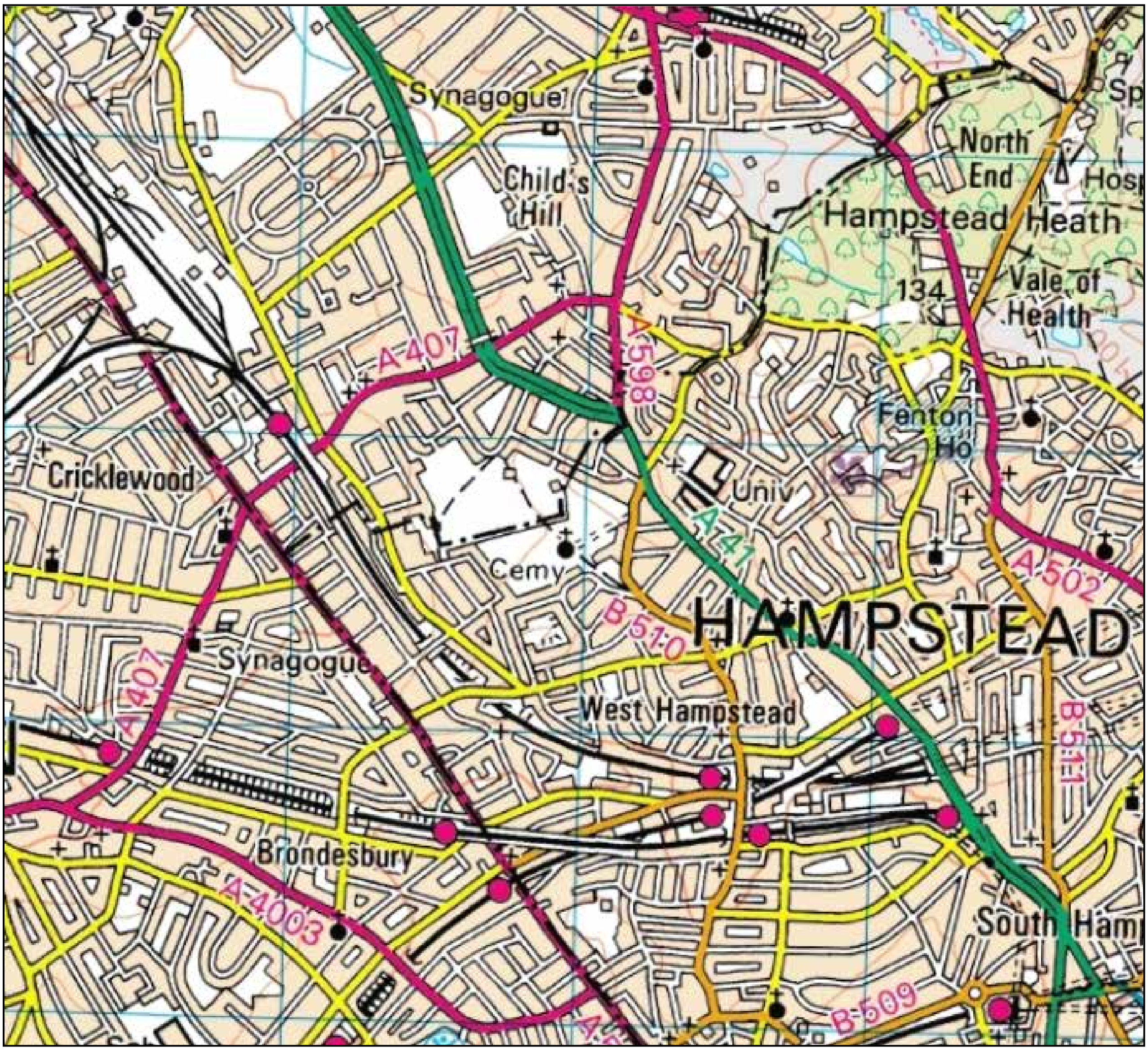
8.2 Cumulative impacts

Based on the available information, it is understood that the surrounding properties do not include basements. On this basis, it is considered that there are no significant cumulative impacts in respect of ground or slope stability due to the proposed development.

The shallow ground conditions beneath the site comprise Made Ground over the Claygate Member and London Clay. The proposed basement is likely to be founded within the Claygate Member. Limited groundwater seepage may be encountered within water bearing sand lenses in the Claygate Member, if present. On this basis, significant groundwater flow is not anticipated, and seepages will be free to percolate around the proposed basement. It is therefore considered that the proposed development would not contribute further to any cumulative effects.

The proposed development will not materially alter the proportion of hardstanding across the site. It is understood that the existing surface water run-off is currently, and will be, discharged to the drainage network through existing connections. On this basis, the development is not considered to contribute to any significant cumulative impact with regard to surface flow or flooding.

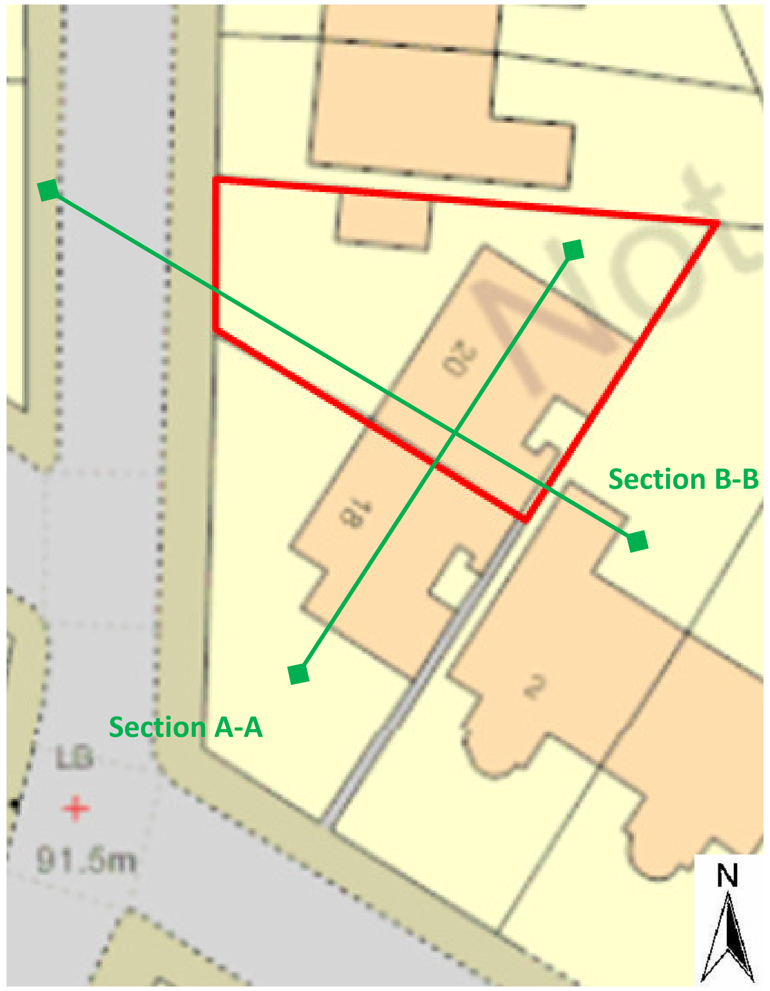
FIGURES

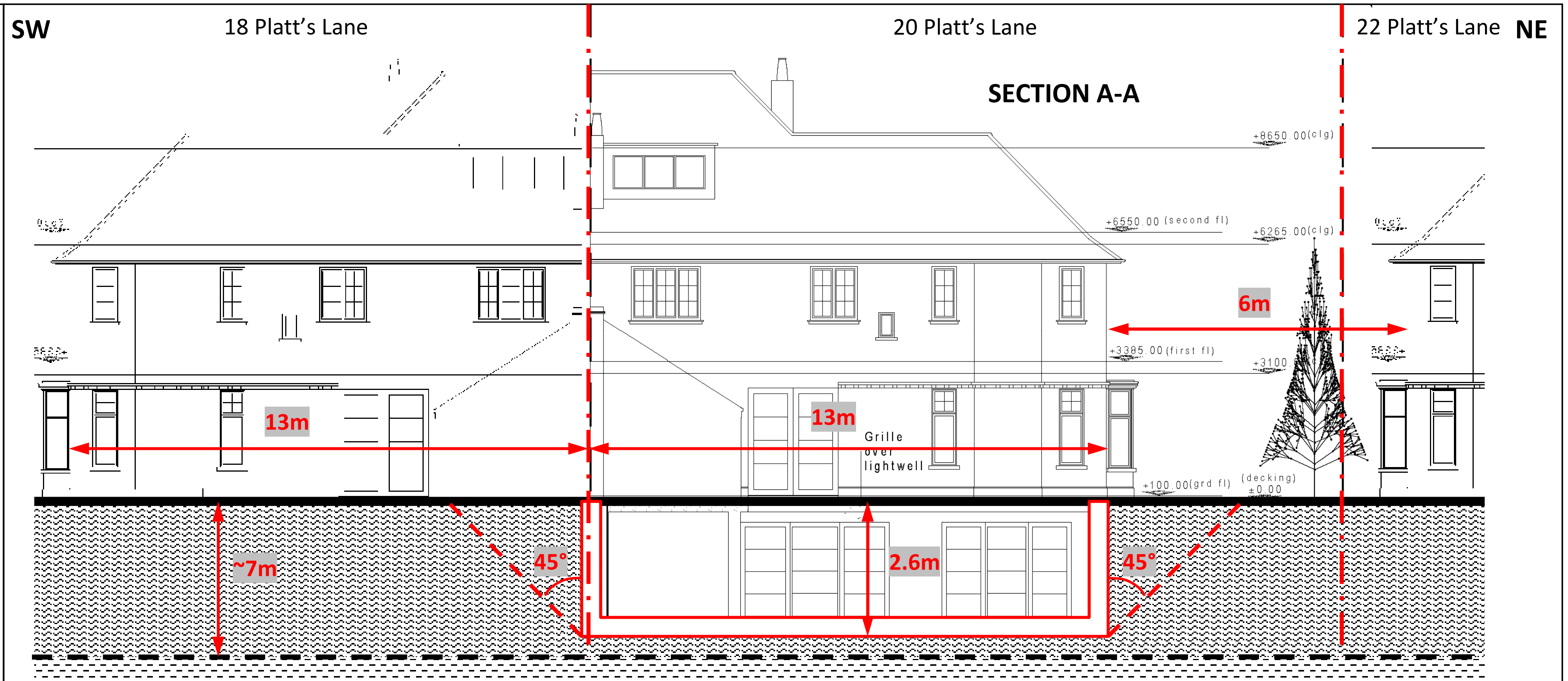


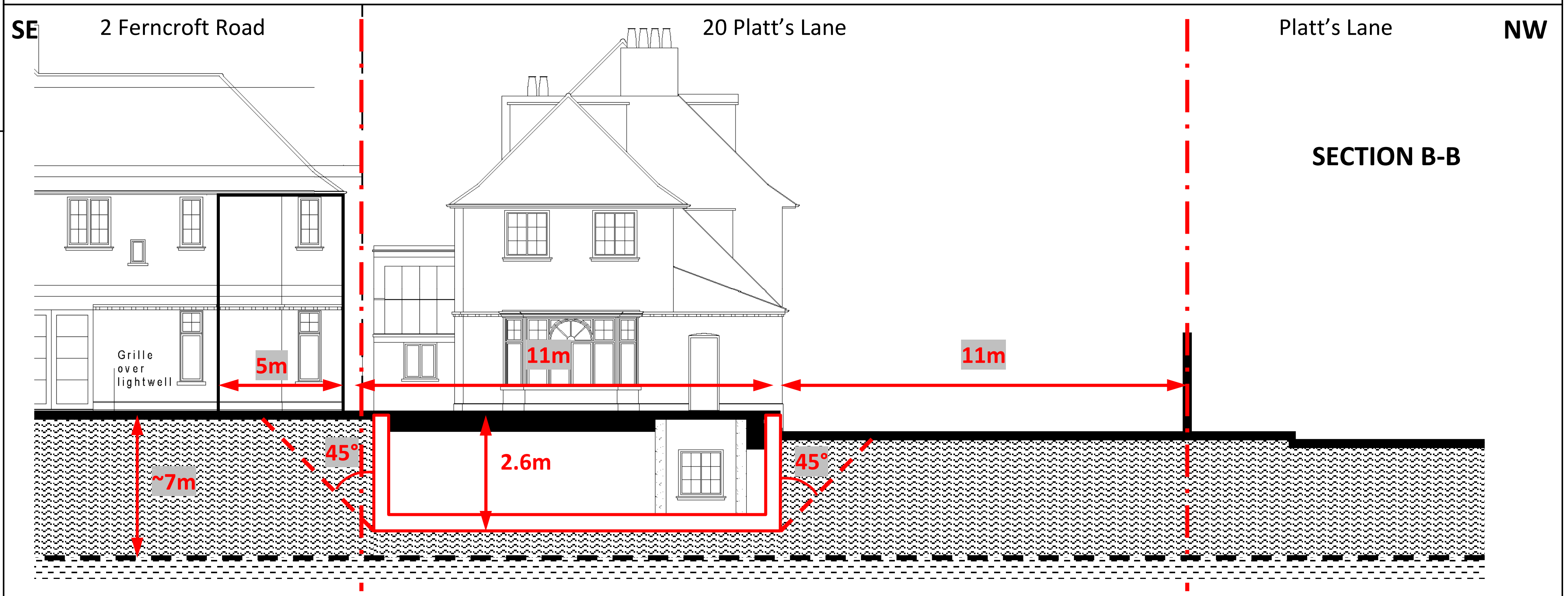
N

Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title **Site location plan**	**Figure 1**

Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
	Title	
CGL	**Existing site layout**	**Figure 2**







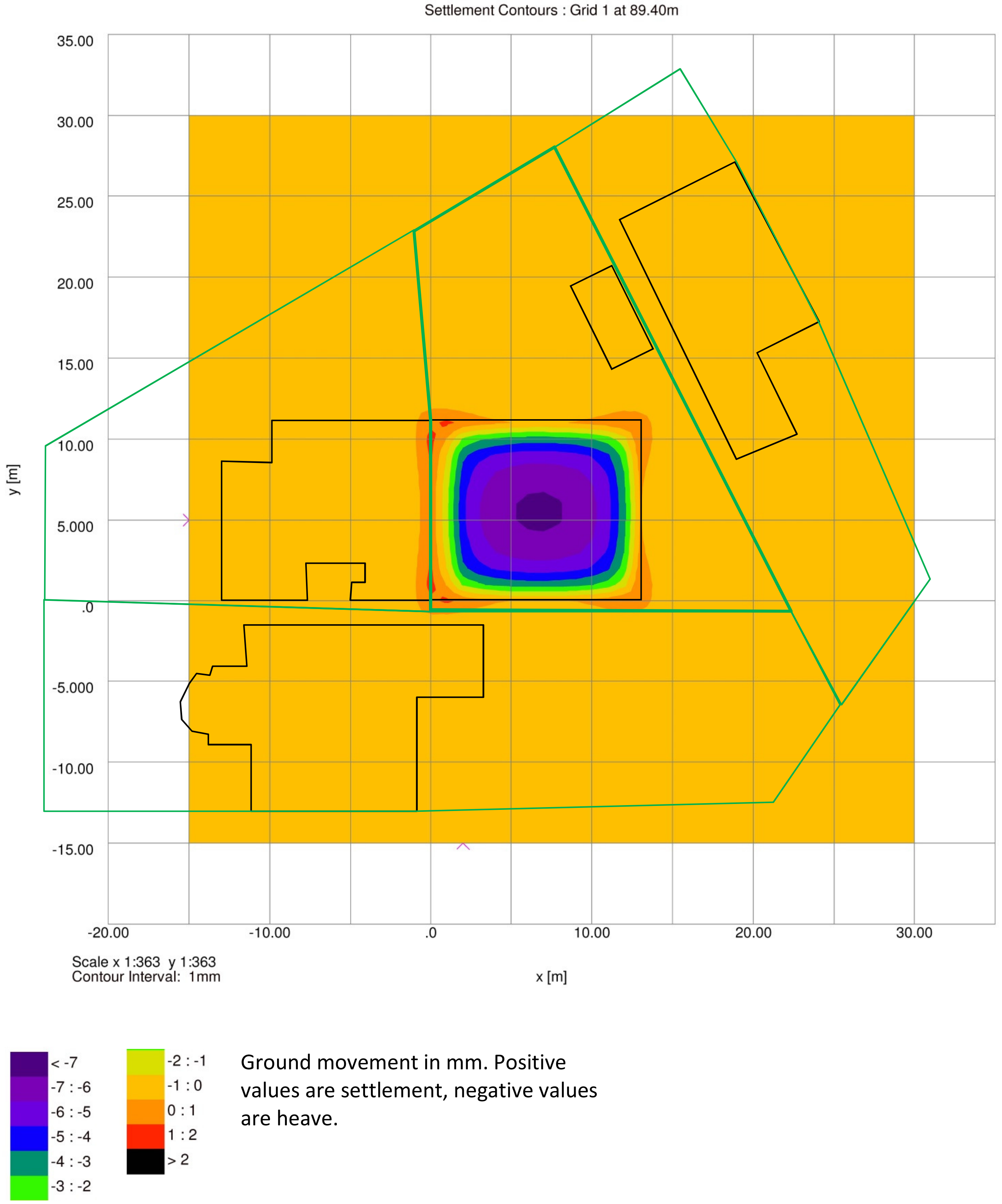
Key:

Claygate Member

London Clay Formation

NOT TO SCALE

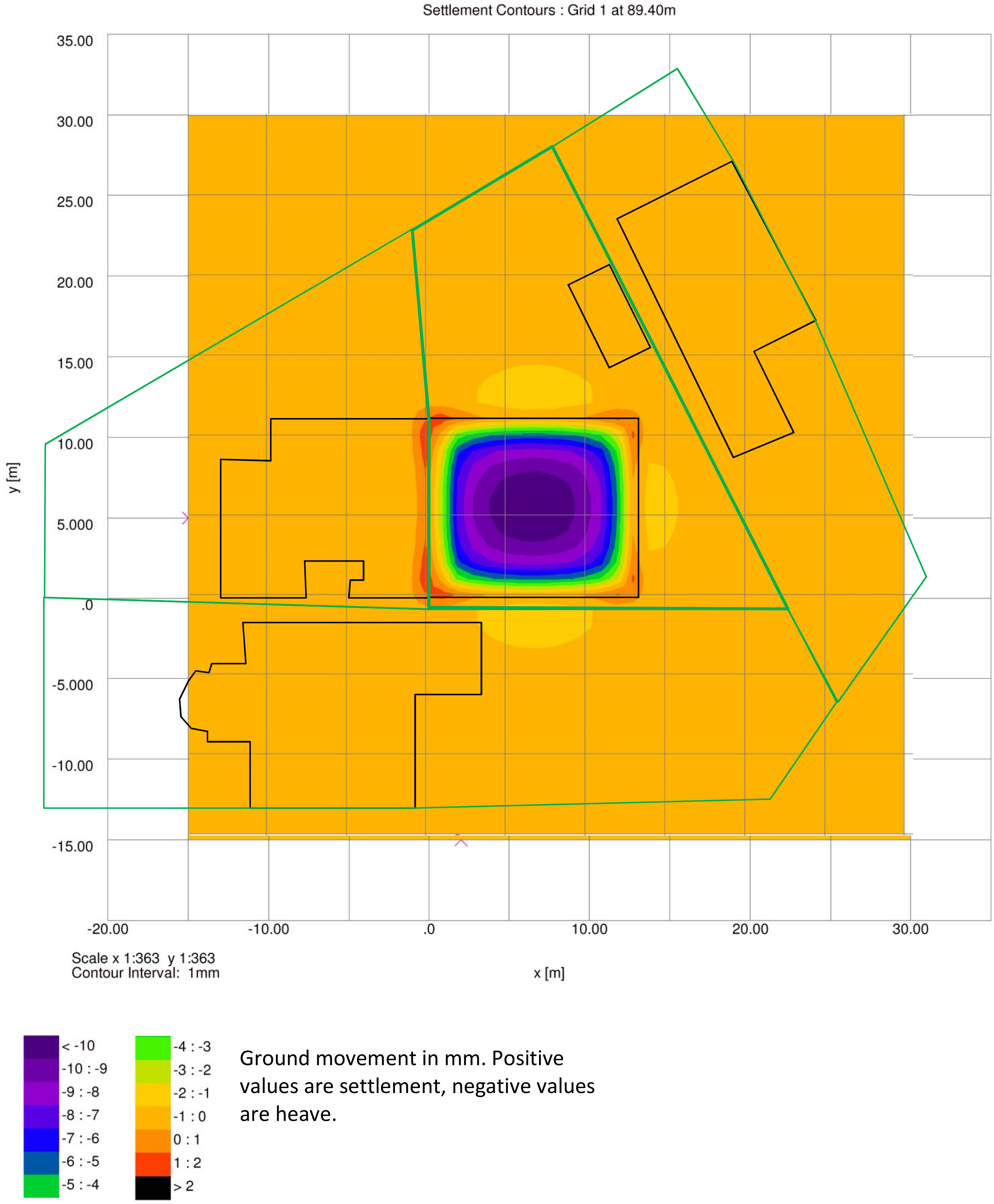
Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title **Conceptual site model**	**Figure 3**



Ground movement in mm. Positive values are settlement, negative values are heave.

NOT TO SCALE

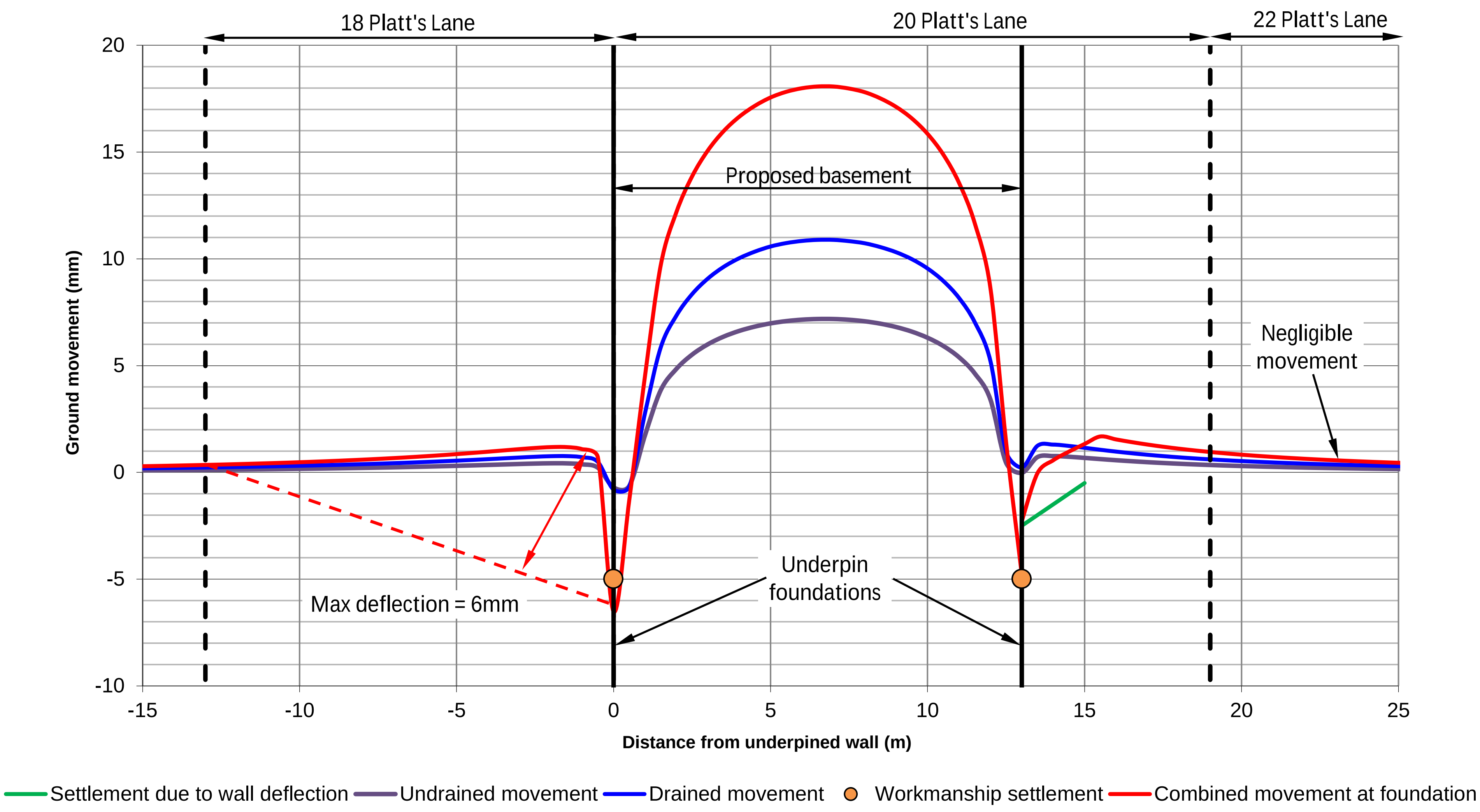
Client	Project	Job No
Mr and Mrs Fulton	20 Platt's Lane, Camden, London	CG/08986
CGL	Title: Short term (undrained) ground movement contour plot	Figure 4



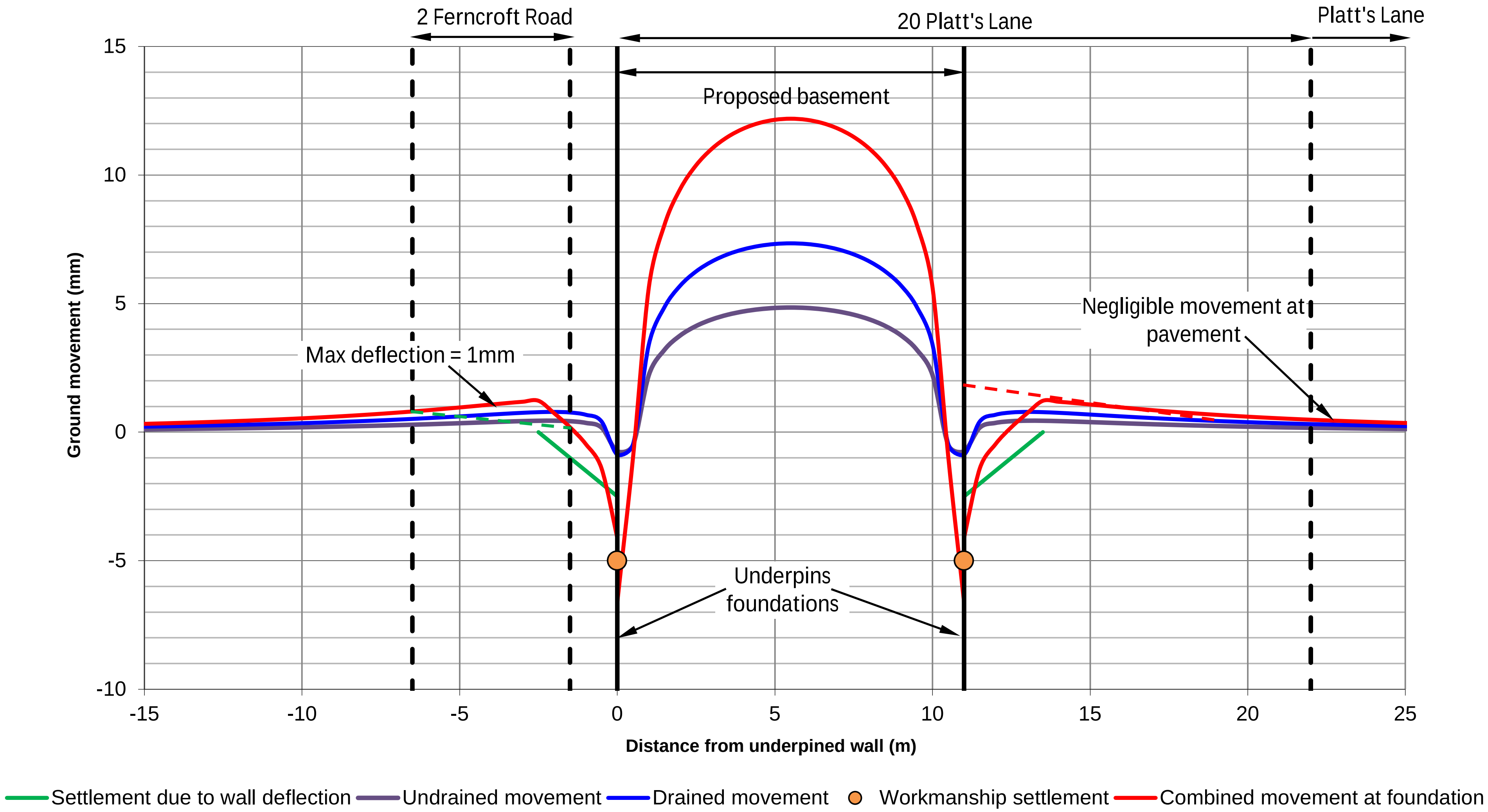
Ground movement in mm. Positive values are settlement, negative values are heave.

NOT TO SCALE

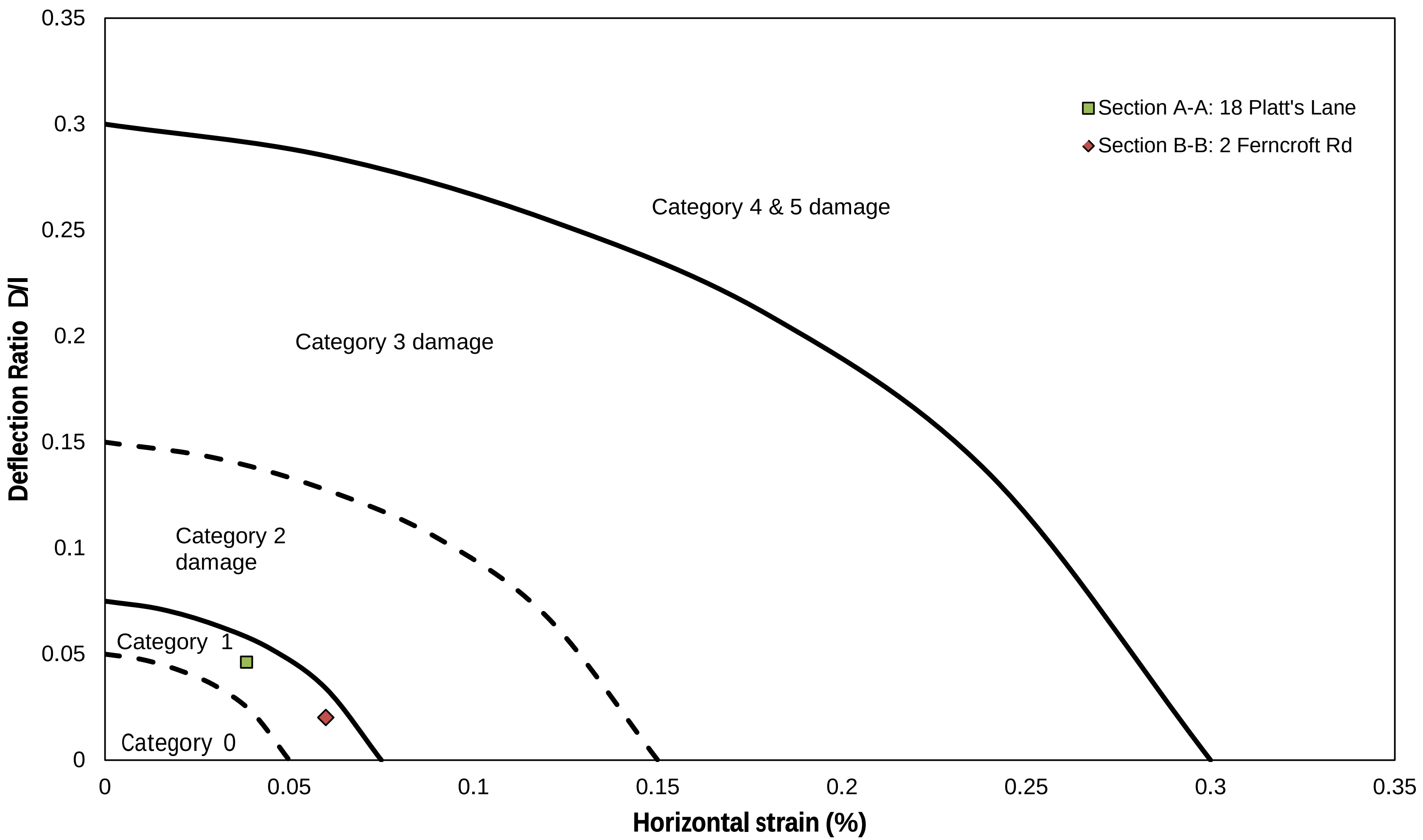
Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title **Long term (drained) ground movement contour plot**	**Figure 5**



Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title: **Combined vertical movements: Section A-A**	**Figure 6**



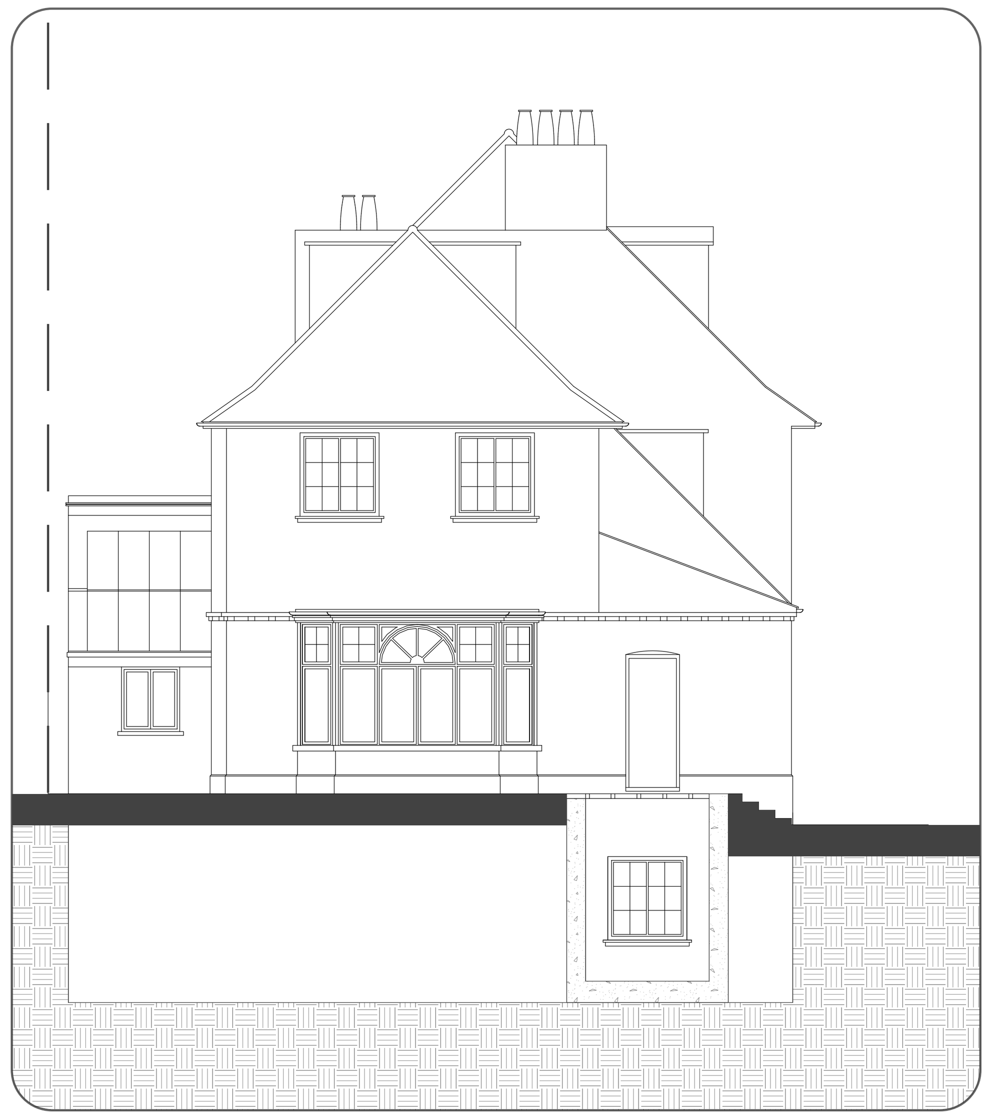
Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title **Combined vertical movements: Section B-B**	**Figure 7**



Client	Project	Job No
Mr and Mrs Fulton	**20 Platt's Lane, Camden, London**	**CG/08986**
CGL	Title **Building damage category plot**	**Figure 8**

APPENDIX A

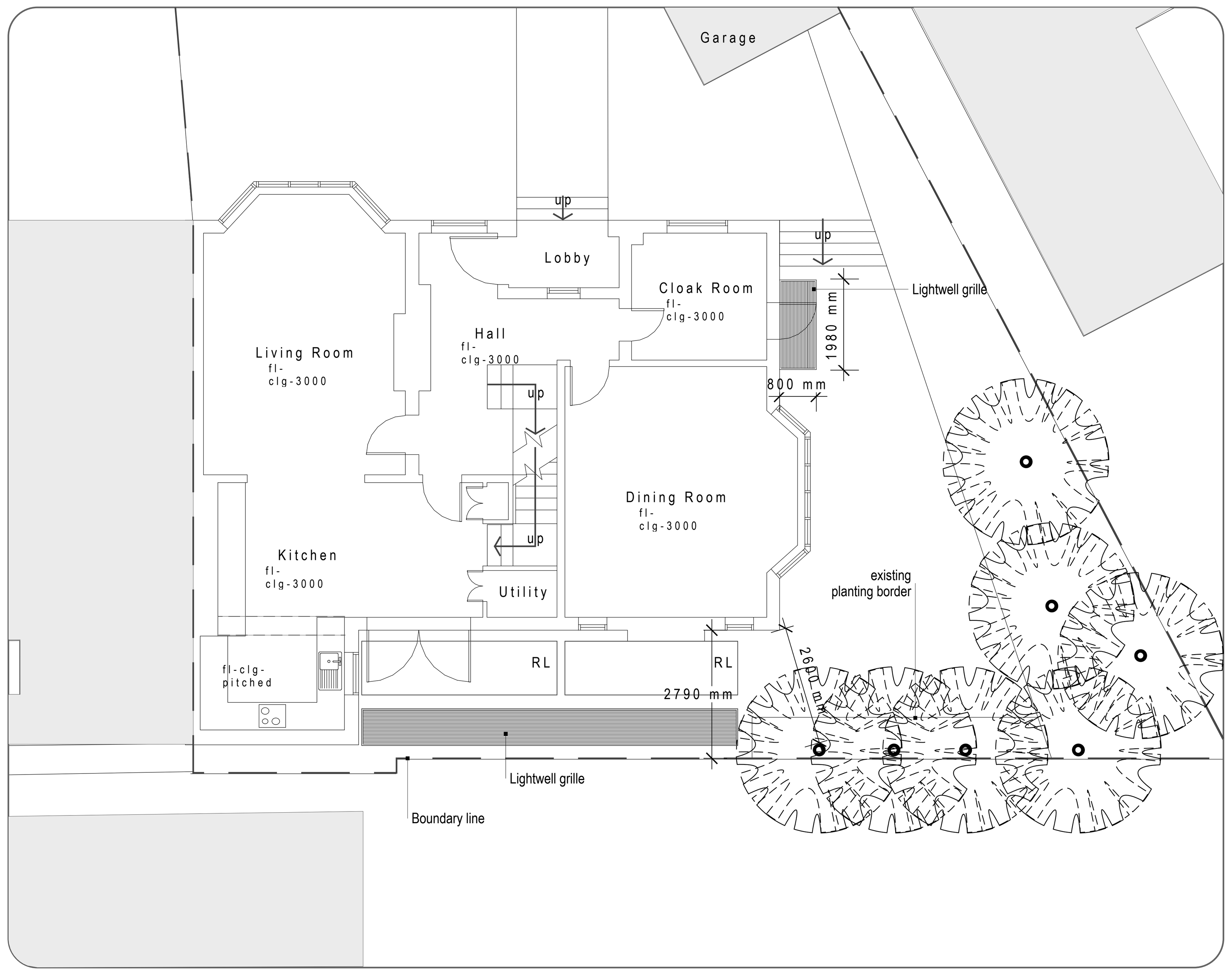
Proposed development plan



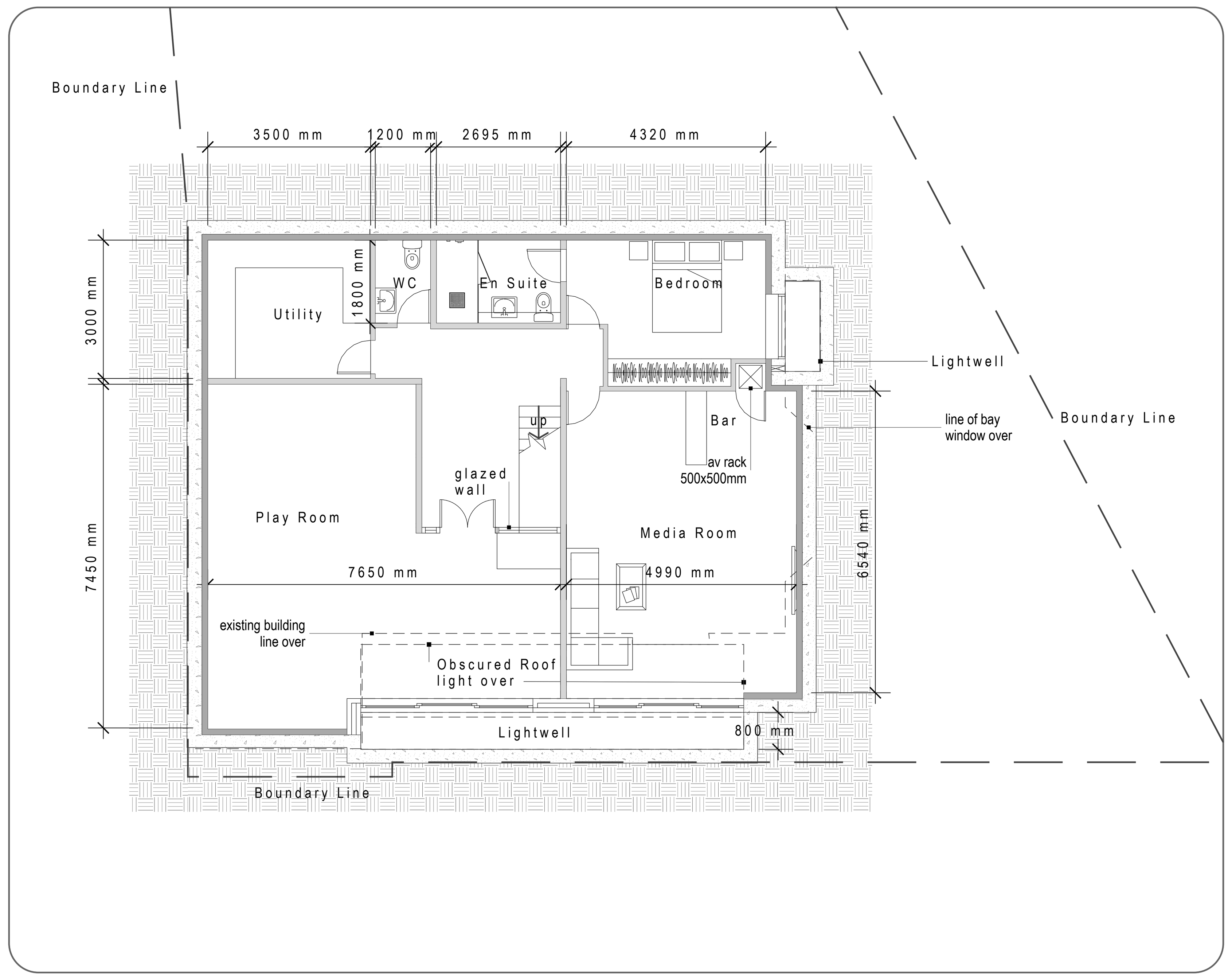
SIDE ELEVATION

REAR ELEVATION

Room	Meter Sq
Play Room	44.00
WC	2.00
Media Room	32.00
Utility	11.00
Bedroom	12.00
En suite	5.00



GROUND FLOOR PLAN



BASEMENT FLOOR PLAN

F	19/06/13	AV rack added
E	17/06/13	Internal layout updated
D	02/06/13	Internal layout updated
C	18/10/13	Roof light added amended
B	16/10/13	Bay added to basement and light well amended
A	08/10/13	Drawing schedule and room dimensions added

Domus
ARCHITECTS + PROJECT MANAGERS
domusapm.co.uk
2 Avondale Avenue, London, N12 8EJ
+44 7775 942159

CLIENT: Mr & Mrs Fulton
20 Platt's Lane
Hampstead
NW3 7NS

PROJECT: Basement

TITLE: Proposed Plan and Elevations OPTION B

SCALE: 1/100 @ A1
1/200 @ A3

DATE: October 2013
DRAWN: PAC

JOB NO: 1309122
DRAWING NO: 003
REV: F

STATUS: DRAFT PRE PLANNING

APPENDIX B

BGS historical borehole records

TQ12ENG/119

2537 8575

Fig. 1

BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead, N.W.3.

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 1 DIAMETER : 8 Inch

GROUND LEVEL : 71.7 above Clients arbitrary datum DATE : 14th to 16th March, 1959

	Description	Reduced Level	Depth	Thickness
		+71.7	0'0"	
MGRD	Rubble, clinker and gravel MADE GROUND	+69.9	1'9"	1'9"
CLGB	Firm mottled grey and brown sandy clayey SILT becoming brown and more sandy below 7 ft. (CLAYGATE BEDS)	+57.2	14'6"	12'9"
	Firm becoming stiff light grey-brown sandy clayey SILT, more clayey below 17 ft. (Probably Claygate Beds)	+52.7	19'0"	4'6"
LC	Stiff dark grey silty CLAY only slightly fissured and very stiff below 40 ft. Fine gypsum throughout. (LONDON CLAY)	+21.2	50'6"	31'6"

END OF BOREHOLE

Sample	M/C %
1	
2	26
3	24
4	25
5	24
6	25
7	24
8	30
9	26
10	29
11	25
12	29
13	27
14	26
15	25
16	25
17	24
18	25
19	25
20	25
22 (water sample)	
21	29

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
16.3.59	0730	14' 6"	14' 6"	7' 4"
17.3.59	0720	50' 6"	-	20' 6"

Scale: 1 in. = 5 ft. • Disturbed Sample ▌ Core Sample △ Water Sample

SOIL MECHANICS LTD., 65 OLD CHURCH ST., S.W.3

3119

3120

TQ/28NE/119
2537.8575

Fig. 2

BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 2 DIAMETER: 8 inches

GROUND LEVEL: 62.0 ft. above Clients arbitrary datum DATE: 19th March, 1959

	DESCRIPTION	REDUCED LEVEL	LEGEND	SAMPLE	DEPTH	THICKNESS	M/c %
Soil	TOPSOIL with turf	+62.0 +61.5		1 2	0'0" 0'6"	0'6"	
ClGB	Soft becoming firm to stiff brown and grey mottled sandy clayey SILT, more sandy below 10 ft. (CLAYGATE BEDS)	+48'0		3 4 5 6 7 8	14'0"	13'6"	25
LC	Coarse gypsum crystals Firm becoming stiff at 15 ft and very stiff at 28 ft. grey slightly fissured silty CLAY containing fine gypsum (LONDON CLAY)	+27.0		9 10 11 12 13 14 15 17△ 16	35'0"	21'0"	30 27 27

END OF BOREHOLE

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
20-3-59	0730	35'0"	—	24'6"

SCALE: 1in. = 5 ft. • Disturbed Sample ▌ Core Sample △ Water Sample

SOIL MECHANICS LTD., 65, OLD CHURCH ST., S.W.3.

3119

TQ/28NE/119
2537.8575

Fig. 3

BOREHOLE LOG

LOCATION NO. 3117 Westfield College

CARRIED OUT FOR Council of Westfield College

BOREHOLE NO. 3 DIAMETER : 8 inches

GROUND LEVEL : 62.3 ft. above clients arbitrary datum DATE : 20th and 21st March, 1959

	Description	Reduced Level	Legend	Sample	Depth	Thickness	M/c %
Soil	SOIL with turf	+62.3 +61.3		• 1 • 2	0'0" 1'0" 0.31	1'0"	
CLCB	Firm becoming stiff brown and grey mottled sandy silty CLAY. Very sandy at 5 ft. 6 in. (CLAYGATE BEDS)			• 3 ▮ 4 • 5 • 6		14'0"	28
		+47.3		▮ 7	15'0" 4.57		29
LC	Stiff grey slightly fissured silty CLAY with fine gypsum (LONDON CLAY)			• 8 • 9 • 10 ▮ 11 • 12 • 13 • 14 • 15 ▮ 16		35'0"	20 29
	Much fine gypsum 39 ft. and 1 large septarian nodule.			△ 17 • 18 • 19 • 20			
		+12.3		▮ 21	50'0" 15.24		

END OF BOREHOLE

3119

3120

3123

3124

3125

7

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
21-3-59	0730	41' 0"	70' 0"	6' 4"

Scale: 1 in. = 5 ft. • Disturbed Sample ▮ Core Sample △ Water Sample

SOIL MECHANICS LTD., 65 OLD CHURCH ST, S.W.3.

TQ/28NE/49
2537 8575

BOREHOLE LOG

Fig. 4

LOCATION NO. 3117 Westfield College, Hampstead

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 4 DIAMETER: 8 inches

GROUND LEVEL: 69.1 ft. above clients arbitrary datum DATE: 17th and 18th March, 1959

	Description	Reduced Level	Legend	Sample	Depth	Thickness	M/c %
Soil	TOPSOIL with turf.	+69.1 +68.6		1, 2	0'0" 0'6"	0'6"	
CLGB	Soft becoming firm (below 5 ft.) grey and brown mottled sandy silty CLAY (CLAYGATE BEDS) More sandy	+54.1		3, 4, 5, 6, 7, 8	15'0"	14'6"	30 28
	Firm brown and grey mottled sandy clayey SILT (Probably Claygate Beds)	+51.1		9	18'0"	3'0"	
LC.	very silty Firm to stiff grey sandy silty CLAY with shell fragments and fine gypsum. (LONDON CLAY)	+39.1		10, 11, 12, 13, 14, 15	30'0"	12'0"	26 24
	Stiff grey slightly fissured silty CLAY with fine silt laminations and shell fragments (LONDON CLAY)	+34.1		16, 17	35'0"	5'0"	26

END OF BOREHOLE

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
19-3-59	0734	35' 0"	-	6' 2"

3119
3120

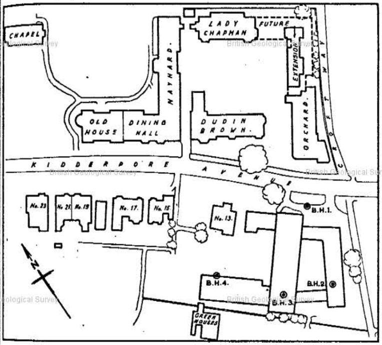
5 ft. ● Quartered Sample ▌ Core Sample △ Water Sample

SOIL MECHANICS LTD., 65, OLD CHURCH ST., S.W.3.

TQ/28NE/119

1" : 256

Fig. 6.



SCALE :- 1 : 1000

BOREHOLE	DEPTH FT.	GROUND LEVEL FT.	LONDON CLAY FT.	WATER LEVEL FT.	TRIAXIAL TEST RESULTS: SAMPLE DEPTH FT.	SHEAR STRENGTH OR COHESION (C) lb/sq ft.	ANGLE OF SHEARING RESISTANCE (ϕ)°
1	50·5	71·7	52·7	51·3	5 15	(1) 2230 (2) 2580	0
					21 41	(3) 2090 (4) 2598	0
2	35·0	62·0	48·0	37·5	-	-	-
3	50·0	62·3	47·3	55·6	7 16	(1) 790 (2) 1080	0
					26	(3) 1800	0
4	35·0	69·1	51·1	62·9	18 30	(1) 1730 2230	0

NOTE: ALL LEVELS REFERRED TO CLIENT'S DATUM WHICH IS 226·64 ft. ABOVE O.D.

LOC. 3117. WESTFIELD COLLEGE,
HAMPSTEAD N.W.3.
PLAN SHOWING BOREHOLES POSITIONS ON SITE OF NEW SCIENCE BUILDING.

SOIL MECHANICS LTD.
65, OLD CHURCH STREET,
LONDON, S.W.3

3119

GROUND ENGINEERING

Geo-Environmental Specialists
01733 566566

Site: 378 FINCHLEY ROAD, LONDON NW3

BOREHOLE BH1

Date: 06/06/06

Hole Size: 150mm dia to 20.00m

Ground Level: 83.34m. O.D.

Depth m	Type	Blows	(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
0.20-0.70	B1				MADE GROUND - CONCRETE		0.20	83.14
1.00-1.50	B2				MADE GROUND - Firm, friable, dark brown/brown/grey mottled slightly gravelly, sandy CLAY with occasional brick, concrete, coal and ash fragments		1.10	82.24
1.15-1.45	S	N12	0.90		Stiff brown/orange brown/light grey mottled CLAY with occasional selenite crystals. Becoming fissured below 2.50m			
1.75	D1							
2.00-2.40	U1	38	1.20 ▼s					
2.03	W1							
2.45	D2				(WEATHERED LONDON CLAY)			
2.75	D3							
3.00-3.40	U2	48	1.20					
3.45	D4						3.60	79.74
3.75	D5				Very stiff, closely fissured to stiff, brown/orange brown CLAY with occasional selenite crystals			
4.00-4.40	U3	55	1.20	BENEATH INSTALLATION				
4.45	D6				(WEATHERED LONDON CLAY)			
4.75	D7							
5.00-5.40	U4	55	1.20					
5.45	D8						5.50	77.84
6.00	D9				Stiff, becoming very stiff below 7.00m, closely fissured, dark grey CLAY with occasional silt and fine sand seams			
6.50-6.90	U5	60	1.20		(LONDON CLAY)			
6.95	D10							
7.50	D11							
8.00-8.40	U6	62	1.20					
8.45	D12							
9.00	D13							
9.50-9.90	U7	70	1.20					
9.95	D14						10.00	73.34

REMARKS
1. Breaking out concrete from 0.00m to 0.20m for 0.50 hours
2. Excavating a pit from 0.20m to 1.00m for 1 hour
3. Borehole cased to 1.20m depth
4. Fibrous live roots observed to 1.75m depth
5. Standpipe installed to 4.00m depth

Project No 10575

Scale 1:50 | Page 1/2

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- W - Water Sample
- S/C - SPT Spoon/Cone
- ▽ Water Strike
- ▼ Water Rise
- N - SPT Blows for 0.3m
- • - Blows for quoted penetration
- V - Vane Shear Test Cohesion ( ) kPa
- ▼c Level on completion
- c▼w Level casing withdrawn
- ▼s Standpipe Level

Groundwater Strikes

No	Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Hole	Casing	Water
06/06/06	20.00	1.20	dry
06/06/06	20.00	0.00	dry
20/07/06	4.00	0.00	2.03

GROUND ENGINEERiNG Geo-Environmental Specialists 01733 566566	Site: 378 FINCHLEY ROAD, LONDON NW3	BOREHOLE BH1
Date: 06/06/06	Hole Size: 150mm dia to 20.00m	Ground Level: 83.34m. O.D.

Depth m	Type	Blows	(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
				BENEATH INSTALLATION	Very stiff, closely fissured to stiff, dark brown/dark grey CLAY with occasional light brown silt and fine sand seams up to 6mm thick. Rare bivalve shell fragments at 15.00m		10.00	73.34
10.50	D15							
11.00-11.40	U8	78	1.20					
11.45	D16							
12.00	D17							
12.50-12.90	U9	85	1.20					
12.95	D18							
13.50	D19							
14.00-14.40	U10	90	1.20					
14.45	D20							
15.00	D21				(LONDON CLAY)			
15.50-15.90	U11	90	1.20					
15.95	D22							
16.50	D23							
17.00-17.40	U12	95	1.20					
17.45	D24							
18.00	D25							
18.50-18.90	U13	100	1.20					
18.95	D26							
19.55-19.95	U14	100	1.20					
20.00	D27						20.00	63.34

REMARKS

Borehole completed at 20.00m depth

Project No	
10575	
Scale	Page
1:50	2/2

KEY
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- ▽ Water Strike
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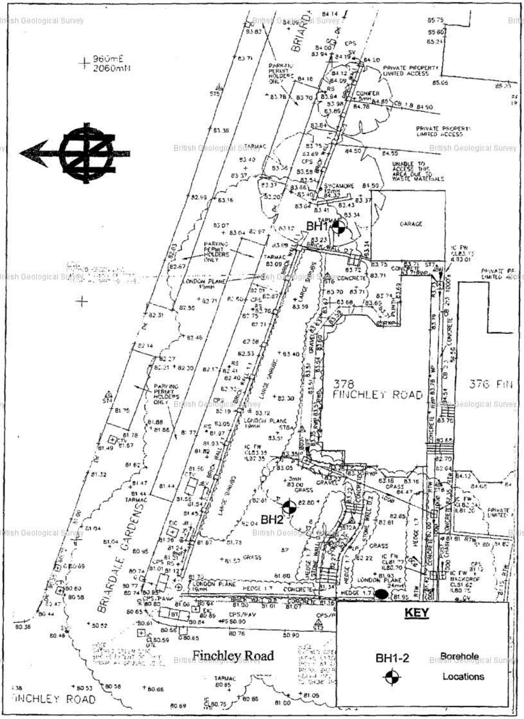
- • - Blows for quoted penetration
- V - Vane Shear Test Cohesion ( ) kPa
- ▼c Level on completion
- c▼w Level casing withdrawn
- ▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water

Borehole Location Plan



NOT TO SCALE

Project : 378 Finchley Road, NW3 **Client : Mr Manoj Shah**	**GROUND ENGINEERING** Peterborough Tel : 01733 566566	**Project No.** **C10575**

GROUND ENGINEERiNG
Geo-Environmental Specialists
01733 566566

Site: 378 FINCHLEY ROAD, LONDON NW3

BOREHOLE **BH2**

Date: 05/06/06

Hole Size: 150mm dia to 15.00m

Ground Level: 82.80m. O.D.

Depth m	Type	Blows	(Date) Casing	Description of Strata	Legend	Depth m	O.D. Level m
0.00-0.50	B1			MADE GROUND - Firm, friable, dark brown/black/grey mottled sandy, gravelly CLAY with occasional brick, ash, concrete and coal fragments			
0.50-1.00	B2						
1.00-1.50	B3						
1.15-1.45	S	N15	0.90			1.40	81.40
1.75	D1			Firm, becoming stiff and fissured below 3.50m, brown/orange brown/grey mottled CLAY. Occasional selenite below 3.00m			
2.00-2.30	U1	35	1.50				
2.35	D2			(WEATHERED LONDON CLAY)			
2.75	D3						
3.00-3.40	U2	38	1.50				
3.45	D4						
3.75	D5						
4.00-4.40	U3	42	1.50			4.00	78.80
4.45	D6			Stiff, fissured brown/orange brown CLAY with occasional selenite crystals and orange brown stained fissures			
4.75	D7						
5.00-5.40	U4	46	1.50	(WEATHERED LONDON CLAY)			
5.45	D8						
6.00	D9						
6.50-6.90	U5	50	1.50				
6.95	D10						
7.50	D11					7.50	75.30
8.00-8.40	U6	50	1.50	Stiff, closley fissured to firm, dark grey CLAY with occasional light brown fine sand and silt partings			
8.45	D12			(LONDON CLAY)			
9.00	D13						
9.50-9.90	U7	60	1.50				
9.95	D14					10.00	72.80

REMARKS
1. Excavating a pit from 0.00m to 1.00m for 1 hour
2. Borehole cased to 1.50m depth
3. Fibrous live roots observed to 3.45m depth

Project No 10575

Scale 1:50 Page 1/2

KEY
D - Disturbed Sample
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U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N - SPT Blows for 0.3m
• - Blows for quoted penetration
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Hole	Casing	Water
05/06/06	15.00	1.50	dry
05/06/06	15.00	0.00	dry

GROUND ENGINEERING
Geo-Environmental Specialists
01733 566566

Site: 378 FINCHLEY ROAD, LONDON NW3

BOREHOLE BH2

Date: 05/06/06

Hole Size: 150mm dia to 15.00m

Ground Level: 82.80m. O.D.

Depth m	Type	Blows	(Date) Casing	Description of Strata	Legend	Depth m	O.D. Level m
				Very stiff, fissured to stiff, dark grey/dark brown CLAY with occasional brown fine sand and silt partings up to 5mm thick. Occasional bivalve shell fragments at 13.00m. Locally slightly sandy		10.00	72.80
10.50	D15						
11.00-11.40	U8	66	1.50				
11.45	D16						
12.00	D17			(LONDON CLAY)			
12.50-12.90	U9	75	1.50				
12.95	D18						
13.50-13.90	U10	80	1.50				
13.95	D19						
14.50-14.90	U11	82	1.50				
15.00	D20					15.00	67.80
				Borehole completed at 15.00m depth			

REMARKS

Project No 10575

Scale 1:50

Page 2/2

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N - SPT Blows for 0.3m
• - Blows for quoted penetration
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
	Depth m						Depth m		
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water

APPENDIX C

Fastrack – Geotechnical survey report

Geotechnical Survey Report

FSI Ref:	8263
Issue Date:	October 2013
Risk Address:	20 Platts Lane London NW3
Engineer:	Geoff Green
Company:	Green Structural Engineers

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

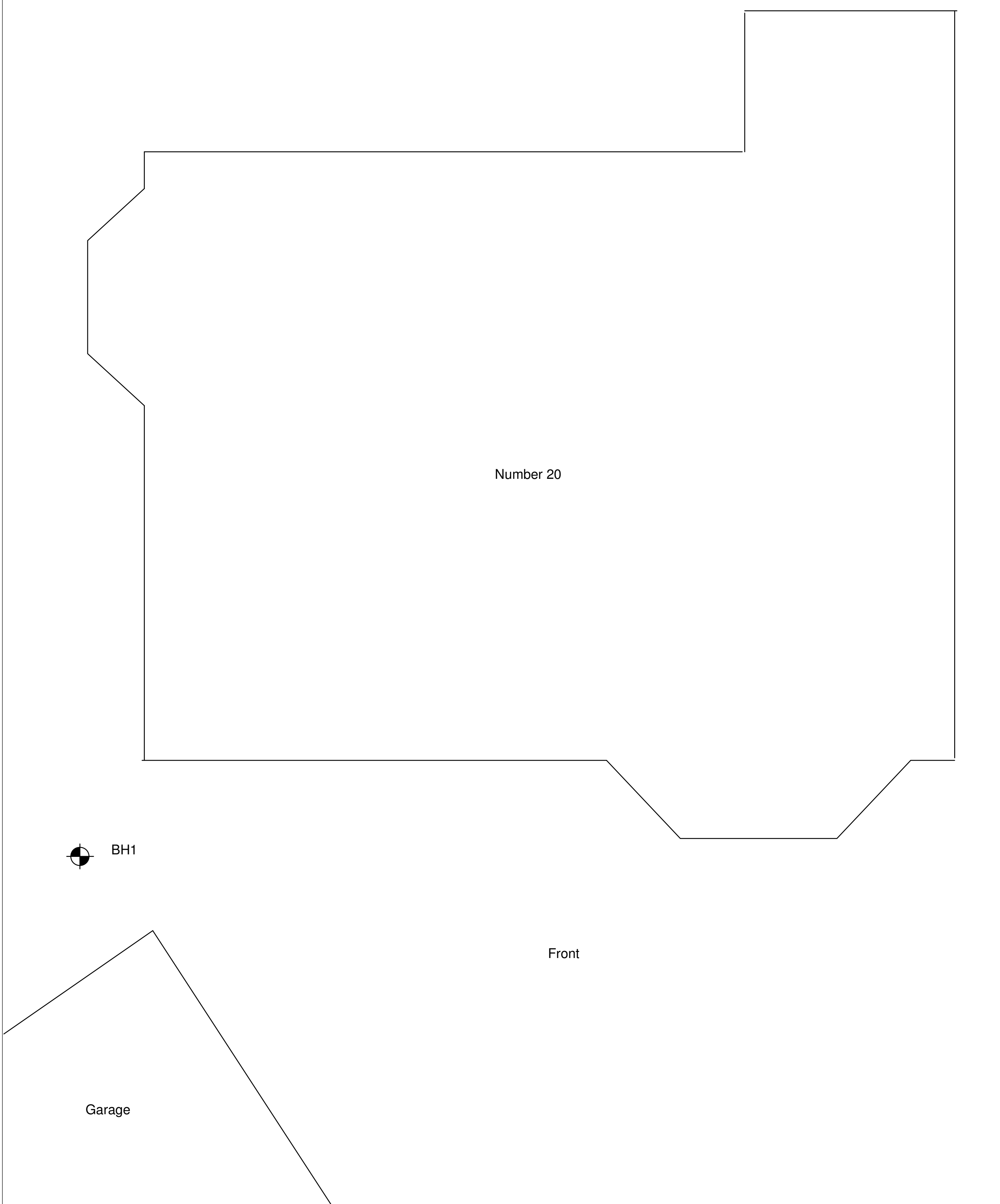
FASTRACK
Tyndales Farm, Southend Road, Woodham Mortimer, Maldon, Essex, CM9 6TQ
Telephone: 0844 3358908
Fax: 0844 3358907
Email:enquiries@fastrackgroup.co.uk
Web: www.fastrackgroup.co.uk

Appendix No: 1
FSI Ref: 8263

SITE PLAN

Property Address: 20 Platts Lane, London NW3

Survey date: 04/10/2013 **Operative:** SE1



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

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

Tel: 0844 3358908
Fax: 0844 3358907
Email: enquiries@fastrack-geotechnical.co.uk
Web: www.fastrack-geotechnical.co.uk

Appendix No: 2
FSI Job No: 8263

BOREHOLE LOG

Property Address:
Client Claim Ref: 20 Platts Lane, London, NW3 7NS **Survey date:** 04/10/2013 **Operative:**

Borehole ID: BH1 Hole Type: FA Scale: 1:30

Water Strikes	Samples Type	Samples Depth (m)	Insitu Tests Type	Insitu Tests Results	Depth (m)	Legend	Stratum Description and Observations
					0.03		Paving Slab
					0.11		CONCRETE (Dry Mix)
					0.40		Dark brown, sandy clayey MADE GROUND containing brick and flint gravel
	D1	1.00 1.08 1.15 1.23	MP MP MP MP	23/75mm 27/75mm 27/75mm 26/75mm	1.40		Mid brown, gravelly CLAY
	D2	2.00	V V	96.00 94.00			Mid brown silty CLAY
	D3	3.00	V V	114.00 118.00			
	D4	4.00	V	140.00			Noted to become grey in colour at 4.40m
	D5	5.00	V	140.00	5.00		End of Borehole at 5.00 m

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

Remarks: Borehole closed at 5.00m
Borehole noted to be dry on completion
N.b. Unless stated otherwise small vane paddle used

AGS

FASTRACK

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

Telephone: 0844 3358908
Fax: 0844 3358907
Email:enquiries@fastrackgroup.co.uk
Web: www.fastrackgroup.co.uk

Appendix No: 1

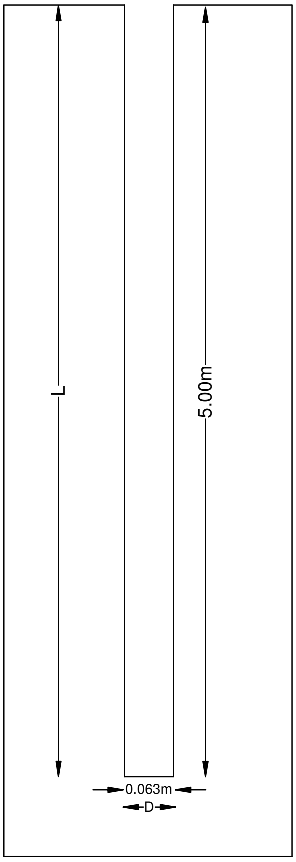
FSI Ref: 8263

Variable Head Test

Property Address: 20 Platts Lane, London, NW3 7NS

Survey date: 04/10/2013 **Operative:** SE1

Borehole Information



Permeability (k) = A/FT = 0.0031 / (0.17325 x N/A) = unable to calculate

A = Cross sectional area of BH = 0.0031 m^2

F = Intake Factor = 0.17325

T = Basic Time Factor when H/H^0 = 0.37 = Unable to calculate

H^0 = Head at start of test

H = Head at any time t

F = 2.75 x D

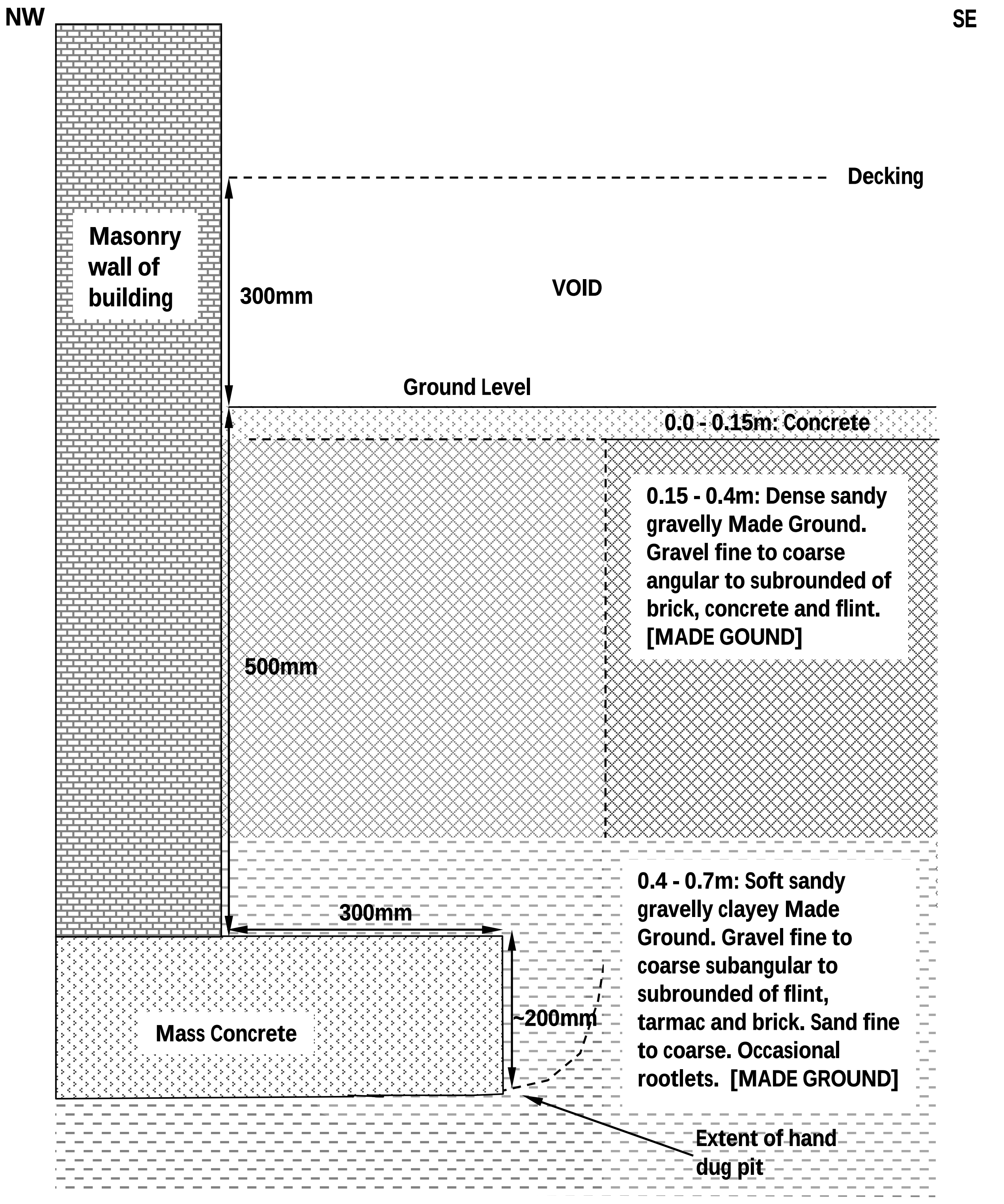
NO DROP IN WATER LEVEL AFTER 30 MINUTES

Falling Head Permeability Tests were carried out within borehole 1 at depths of 5.00m below existing ground level.
The permeability tests undertaken at this site were falling head tests undertaken in accordance with
B.S. 5930:1999 Part 25.4.3 Variable Head Test.

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)

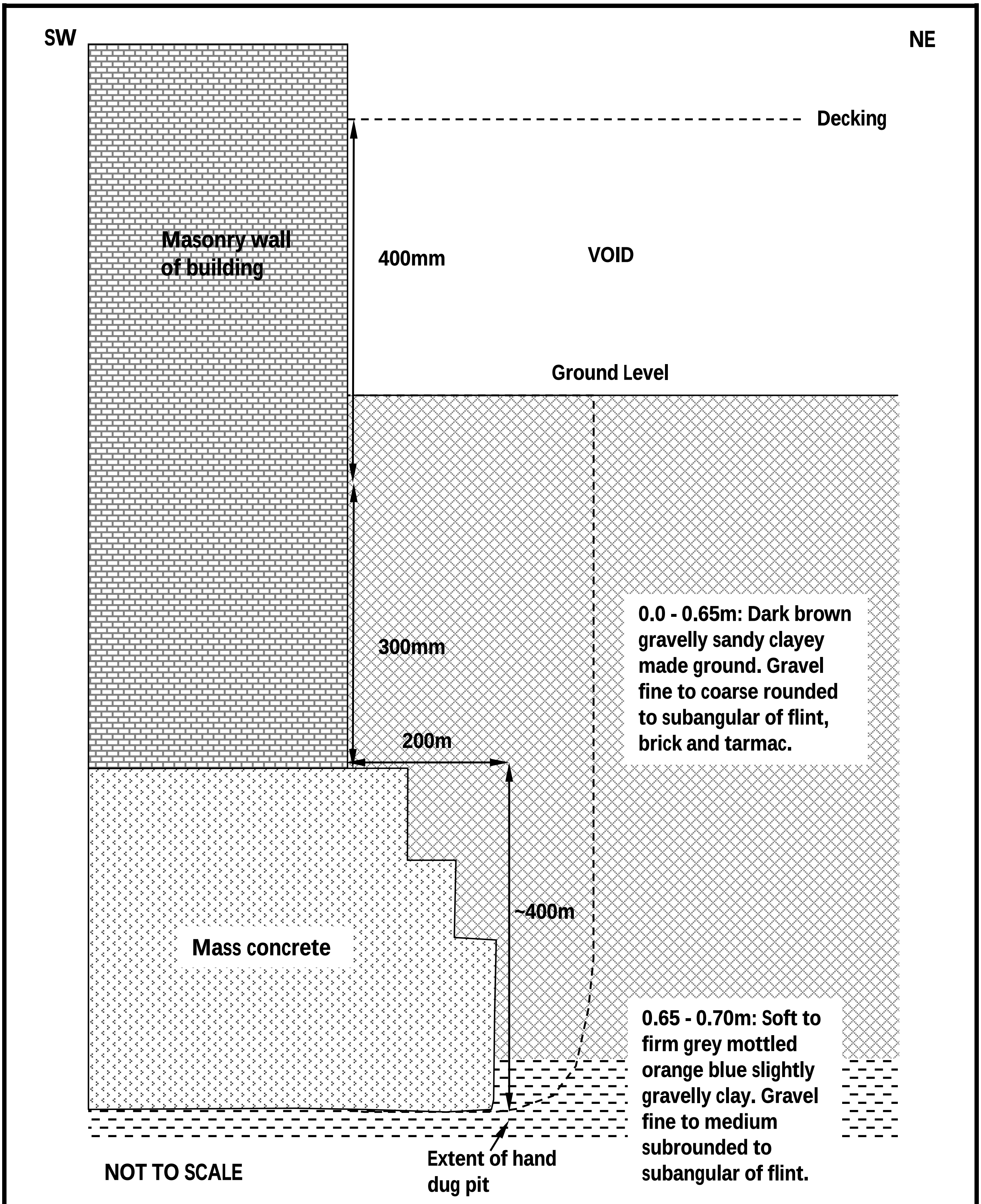
APPENDIX D

Foundation inspection pit records



NOT TO SCALE

Client	Project	Job No
Mr and Mrs Fulton	20 Platt's Lane, Camden, London	CG/08986
CGL	Title: Foundation Inspection Pit 01	



Client	Project	Job No
Mr and Mrs Fulton	20 Platt's Lane, Camden, London	CG/08986
CGL	Title: Foundation Inspection Pit 02	

APPENDIX E

Loading information

WALL A = 46.1 kN/m - G_k

17.75 kN/m - Q_k

TOTAL = 64 kN/m

WALL B = 47.8 kN/m - G_k

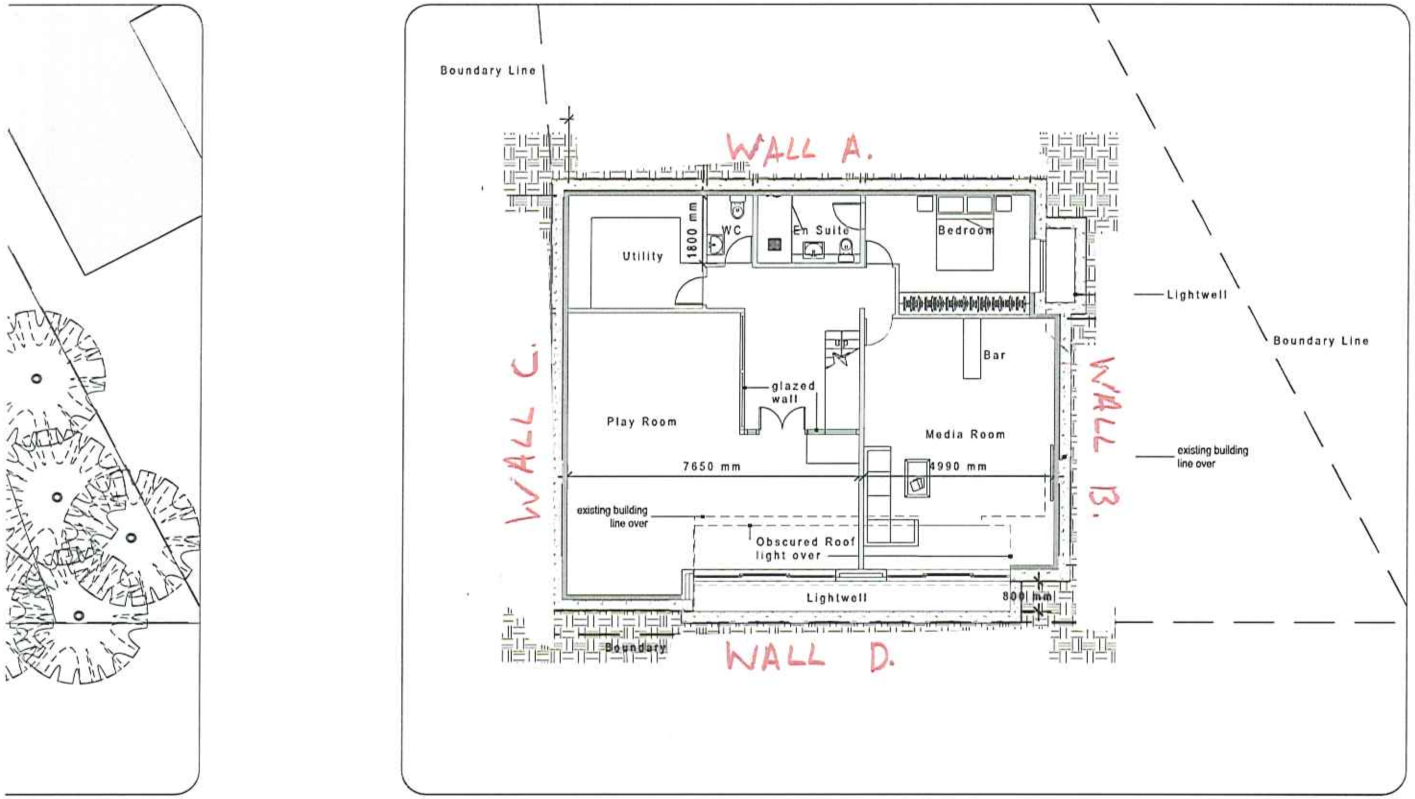
18.75 kN/m - Q_k

TOTAL = 67 kN/m

WALL C = 61 kN/m - G_k

40 kN/m - Q_k.

TOTAL = 101 kN/m



BASEMENT FLOOR PLAN

WALL D = 46.1 kN/m - G_k

17.75 kN/m - Q_k

TOTAL = 64 kN/m

SURCHARGE = 10 kN/m^2

GREEN STRUCTURAL ENGINEERING

Project No: 12382

Date: August 2014

Project: 20 Platts Lane

Title: Load take downs - SK01

By: E. Alexander

Domus

ARCHITECTS + PROJECT MANAGERS

domusapm.co.uk

2 Avondale Avenue, London, N12 8EJ

+44 7775 942159

CLIENT: Mr & Mrs Fulton
20 Platt's Lane
Hampstead
NW3 7NS

PROJECT: Basement

TITLE: Proposed Plan and Elevations OPTION B

SCALE: 1/100 @ A1
1/200 @ A3

DATE: DRAWN: