Providing Ground Solutions

Fairview Ventures Limited

Centric Close, Oval Road, Camden

Basement Impact Assessment

March, 2017

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1. INTRODUCTION

CGL has been instructed by Fairview Ventures Limited (The Client) to undertake a Basement Impact Assessment (BIA) for the proposed redevelopment of Centric Close in Camden, London. The proposed redevelopment comprises the demolition of the existing buildings and the construction of a mixed residential and commercial (Class B1), four to seven story block with a landscaped courtyard and communal amenity area. A basement will be present in the west of the site, to be used for commercial floor space and storage

CGL has previously undertaken a pre-acquisition site investigation and the findings were reported within a Geoenvironmental and Geotechnical Interpretative Report[1].

A Basement Impact Assessment (BIA) has been requested as part of the planning application for the development. Camden Guidance CPG4[2] requires BIAs to be undertaken for new basements in the borough and sets out five stages:

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[3]. It identifies key issues relating to land stability, hydrogeology and hydrology as part of the screening process (Stage 1) and also identifies potential impacts of the proposed scheme as part of the scoping process (Stage 2). The previous CGL site investigation has been reviewed as part of Stage 2 (scoping) to determine acceptability with reference to Stage 3 (site investigation), and where appropriate data from SI has used to develop a conceptual site model and geotechnical design parameters.

[1] CGL. (December 2016). *Centric Close, Oval Road, Camden. Geotechnical and geoenvironmental interpretative report*. Reference: CG/18840A.
[2] Camden Planning Guidance. (July 2015). *Basements and Lightwells*. CPG4.
[3] Ove Arup and Partners Limited. (November 2010). *London Borough of Camden. Camden geological, hydrogeological and hydrological study*. Guidance for subterranean development. Issue 01.

The CSM and geotechnical design parameters have been used, together with the proposed development plans, to allow the ground movement assessment and subsequent building damage assessment calculations to be undertaken (Stage 4).

2. SITE CONTEXT

2.1 Site location

The site is located at Centric Close in the London Borough of Camden. The National Grid Reference for the approximate centre of the site is 528521 183896. A site location plan is presented as Figure 1.

2.2 Site description

The site covers an area of approximately 0.36 Hectares and is accessed from Oval Road, which runs from north north-west to south south-east to the east of the site. The site is 'wedge' shaped and is generally flat, however, there is a slight downward gradient towards the centre of the site, possibly associated with site drainage. The existing ground level is at approximately 32.1m to 33.4m Ordnance Datum (OD).

The site is currently occupied by seven industrial units along the western boundary with associated hardstanding used for parking over the eastern part of the site. A gravel access path extends around the perimeter of the buildings and the site boundary.

A site layout plan is presented as Figure 2.

The site is bounded to the west by railway tracks, with track level at around site level. It is bounded to the north and north-east by 'The Lockhouse' (No. 35 Oval Road), the east (northern end) by No. 31 Oval Road (a commercial property), the east (southern end) by residential properties fronting Oval Road (No. 21 to 29 Oval Road) and the south by the rear garden of No. 17 Oval Road.

With reference to plans available on the Camden planning portal, The Lockhouse is a large, and relatively recent three to six storey mixed use development, with commercial (office space) and residential at ground floor, and residential only above. The Lockhouse includes a basement level, occupied by parking, shared amenity spaces and residential properties, with finished floor levels at approximately 30.3mOD. The development incorporates the former No. 33 Oval Road (located adjacent to the north-eastern corner of the site), which also includes as basement level (finished floor level at approximately 30.3mOD), herein referred to as 33/35 Oval Road.

No. 31 Oval Road is a two storey masonry building with recent, partial third floor level. A site walkover by CGL identified light wells to the front (Oval Road) and rear (site side) of the building, at a depth of approximately 1.5m below site level (around 31m to 31.2m OD).

The boundary conditions around the proposed basement is shown graphically in Figure 5a.

2.3 Proposed development

The proposed development comprises the demolition of the existing buildings at the site and construction of a four to seven storey block comprising residential units over commercial (Class B1) floor space within the footprint of the existing warehouses. To the north, a single storey wing of the building comprising commercial (Class B1) units and an electricity substation will extend outside of the existing footprint into the vehicle parking spaces. Associated soft and hard landscaping, communal amenity areas and car parking are also proposed.

A single storey basement is proposed in the northern area of the site, comprising commercial (Class B1) units and some limited storage space. The basement is, at its closest, located some 4.2m from the adjacent 35 Oval Road development (to the north of the basement), 5.6m from No. 31 Oval Road (to the east of the basement), and 9.8m from the nearest running track of the railway line (west of the basement), as shown in Figure 5a.

The structural configuration, loads and construction methodology are not currently finalised, however, it is understood that the basement floor slab will be at a level of approximately 28.4mOD. The basement will be supported by a contiguous piled wall, and for the purpose of this BIA it has been assumed that these will cantilever in the temporary condition (i.e. 'low' support stiffness) and will be propped by the basement and ground floor levels in the permanent condition. The basement and building loads will be supported on piled foundations from basement level (or ground level outside of the basement footprint).

Proposed development plans are presented as Appendix A.

2.4 Site history

The historical development of the site has been traced from Ordnance Survey maps dating between 1870 and 2014 of scales 1:1,056 to 1:10,560. The maps are presented within CGL's report[1] and a summary is presented below.

The earliest available mapping (dated 1872) indicates that the site was occupied by residential gardens attached to the properties on Oval Road, and a pianoforte factory in the north of the site. The site was bounded to the north by a potato market, to the south by more residential gardens, and to the east and west by Oval Road and the London and North Western Railway, respectively. The potato market was removed in 1895, and by 1949 had been replaced by a large warehouse. The residential gardens and pianoforte factory had also been removed and replaced by the existing row of seven warehouses and a goods yard. The residential land use to the east of Oval Road had been partially replaced by industrial uses, including an engineering works, a printing works and a garage. Electricity substations were located to the west and northeast of the site. The warehouse to the north of the site was replaced by residential apartment blocks between 2006 and 2008.

The buildings directly adjacent to the eastern side of the site on Oval Road are shown to have sustained damage during the Blitz of the Second World War (WWII)[4], ranging from "general blast damage – not structural" to "seriously damaged – doubtful if repairable". The buildings on the opposite side of Oval Road and on the opposite side of the London and North Western Railway sustained similar damage. Only minor blast damage was sustained by some of the buildings to the south. With reference to Bombsight.org[5], no bomb impacts were recorded within 300m of the site.

The site's limited and lightweight historical development on the site does not indicate potential for significant obstructions within the ground.

2.5 Topography

The site topography is generally flat, but with a slight downward gradient towards the centre of the site. Ground level at the site is an approximate average of 32.7mOD. With reference to the geological, hydrogeological and hydrological study[3] for Camden, slope angles on the site and within the immediate vicinity are noted to be less than 7° and the site is not within an area of significant landslide potential[3].

Locally, the surrounding area is relatively flat, at a similar level to site levels. Primose Hill is located some 1km to the west of the site, at an elevation of around 55mOD.

[4] Saunders, A (Ed.) (2005). *The London County Council Bomb Damage Maps 1939-1945*. London Topographical Society
[5] www.bombsight.org – *Mapping the WW2 bomb census*. [Accessed 27 February 2017]

2.6 Anticipated ground conditions

2.6.1 Published geology

The British Geological Survey (BGS) geological sheet for the area[6] indicates the site is underlain by the London Clay Formation, over the Lambeth Group, Thanet Sand and Chalk at depth.

The London Clay Formation typically comprises an overconsolidated, stiff to very stiff, fissured, dark grey, silt clay, and is anticipated to be over 40 metres thick in the vicinity of the site. The top of the London Clay may be weathered to a firm, dark orange brown with silty clay.

No superficial deposits recorded to be present within 1km of the site, although a "propensity for Head Deposits" is noted around Primrose Hill and London Zoo in Regents Park (some 650m to the south-west of the site).

2.6.2 Unpublished geology

Historical borehole records have been obtained from the BGS and relevant records and a location plan are provided in Appendix B. The borehole records, located approximately 100m north and northwest of the site support the published geology, with Made Ground directly overlying the London Clay Formation. A deeper borehole located approximately 60m southwest of the site encountered "clay" (likely to be the London Clay Formation) from ground level to 37m bgl, over "clay sand" (possibly the Lambeth Group) between 37m and 65.5m bgl, then Chalk to a confirmed depth of 98.5m bgl.

The Camden planning portal was reviewed for site investigation information, however, no such records could be identified.

2.7 Hydrogeology and hydrology

According to the Environment Agency (EA)[7], the London Clay Formation is classified as an Unproductive Strata; deposits with low permeability which have negligible significance for water supply or river base flow.

[6] British Geological Survey. (2006) North London. England and Wales Sheet 256. Bedrock and superficial deposits. 1: 50,000.
[7] http://apps.environment-agency.gov.uk/wiyby/default.aspx [Accessed 27 February 2017].

The site is not reported to be within 500m of a groundwater source protection zone (GPSZ), and there are no groundwater abstraction licenses (potable or otherwise) within 500m of the site.

The closest surface water feature is the Regent's Canal which is located approximately 80m northwest of the site at the closest point. No other surface water features are noted within 500m of the site.

The former river course of the River Fleet was located over 400m to the north-east of the site.

2.7.1 Flood risk

With reference to the Environment Agency flood risk maps[8], the site is located outside of the flood risk area for the *River Thames*, and is also outside of the flood risk area for reservoirs.

Oval Road is not noted as having flooded in either 1975 or 2002, nor being at risk of surface water flooding[3] and the site is not located in a groundwater flood risk area[9].

On this basis, a Flood Risk Assessment (FRA) is not considered to be necessary for the site.

[8] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map [Accessed 27 February 2017].
[9] Camden Borough Council. Management of flood risk in Camden. The London Borough of Camden floor risk management strategy.

3. SCREENING – STAGE 1

3.1 Introduction

A screening assessment has been undertaken based on structured guidance presented in Camden Borough Council's CPG4[2], based on the flowcharts presented in that document as a template. 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 relating to groundwater flow.

Table 1. Subterranean (Groundwater) flow.

Question	Response	Action Required
1a. Is the site located directly above an aquifer?	No The site is underlain by the London Clay Formation, although Made Ground is anticipated based on the historical development	None
1b. Will the proposed basement extend beneath the water table surface?	No The shallowest mapped stratum is the London Clay Formation, which is an unproductive stratum.	None
2. Is the site within 100m of a watercourse, well, or potential spring line?	Yes The Regent's Canal is located approximately 80m to the north of the site. However, the canal is unlikely to be hydraulic continuity with the surrounding soils.	Investigation and Assessment
Is the site within the catchment of the pond chains on Hampstead Heath?	No Hampstead Heath is located approximately 1.8km to the north of the site.	None
3. Will the proposed basement development result in a change in the proportion of hard surface?	Yes The proposed development is expected to marginally increase in permeable ground owing to the provision of small tree planters along the western and south-eastern site boundaries. However given the site is directly underlain by the relatively impermeable London Clay Formation.	None (See comment in 3.2.1 below)
4. As part of site drainage, will more surface water than at present be discharged to ground (e.g. via soakaways and/or SUDS)?	No All surface water is likely to be discharged to the sewer network through existing connections. An assessment will need to be undertaken to confirm if the existing infrastructure has sufficient capacity to take increased drainage.	None
5. 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 Whilst the basement will likely be below the water level in the Regents Canal, the canal is unlikely to be hydraulic continuity with the surrounding soils.	None

3.2.1 Non-technical summary: Groundwater

In summary, the site is underlain by the relatively impermeable London Clay Formation, which is an unproductive stratum, and there is therefore no anticipated groundwater table or general flow to be affected by basement construction. Localised perched water may be present beneath any Made Ground on site however this is unlikely to be laterally pervasive.

The site is directly underlain by the London Clay Formation, therefore infiltration rates are unlikely to be affected by minor changes in surface impermeability caused by the proposed basement.

3.3 Slope/land stability

This section answers questions relating to site topography, trees, neighbouring infrastructure and quality of underlying soils onsite with regard to the proposed basement development.

Table 2. Slope/land stability

Question	Response	Action required
1. Does the site include slopes, natural or manmade, greater than about 1 in 8?	No The site is relatively flat.	None
2. Will the proposed re-profiling of the landscaping at site change slopes at the property boundary to greater than about 1 in 8?	No	None
3. Does the development neighbour land including railway cuttings and the like with a slope greater than about 1 in 8?	No	None
4. Is the site within a wider hillside setting in which the general slope is greater than about 1 in 8?	No The topography of the surrounding region is relatively flat.	None
5. Is the London Clay Formation the shallowest stratum on site?	Yes The local properties to the proposed basements are all relatively recent and expected to be on piled foundations and/or have basements of their own that would be expected to extend below the depth of seasonal movements. The London Clay is a suitable material for foundations and its presence is in generally favourable for basement construction.	None
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.	None

Question	Response	Action required
7. Is there a history of shrink/swell subsidence in the local area and/or evidence of such at the site?	Unknown Local structures to the basement either have basements or are recent and are likely to be piled. The construction of the new basement is unlikely to affect seasonal shrink/swell movements.	None
8. Is the site within 100m of a watercourse or potential spring line?	Yes The Regent's Canal is located approximately 80m to the north of the site. However, the canal is unlikely to be hydraulic continuity with the surrounding soils.	Assessment
9. Is the site within an area of previously worked ground?	No	None
10. Is the site within an aquifer?	No The London Clay Formation is considered to be an 'Unproductive Stratum'.	None
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 While the entrance to the site is accessed from Oval Road, the site itself is recessed more than 20 metres from the road and is surrounded by residential buildings to the north and east, and by a railway to the west.	None
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No The proposed basement will not share party walls with the surrounding properties. Additionally, the surrounding properties are all expected to include basements and as such, the foundations of the proposed basement are not expected to extend to a significantly greater depth than the surrounding buildings.	None
14. Is the site over (or within the exclusion zone of) any tunnels?	No The nearest underground structure to the site is the "Middle Level Sewer", which is located 100m to the south of the centre of the site, with a greater distance from the proposed footprint of the basement.	None

3.3.1 Non-technical summary: Slope/land stability

In summary, an investigation is required to confirm ground conditions within the site and surrounding area and to also assess the potential impact of the proposed basement on the surrounding properties.

It is noted that small trees and shrubs are present on the eastern and southern boundaries of the site, and shrubs are present on the western boundary of the site. However, the distance of the trees from the proposed basement footprint and the shallow zone of influence of the shrubs suggest that the basement will not be affected by shrinkage

associated with the plants. No further assessment is considered to be necessary in this regard.

3.4 Surface flow and flooding

This section answers questions relating to the impact of the proposed development on existing drainage, permeable surfacing and flood risk.

Table 3. Surface flow and flooding

Question	Response	Action required
1. Is the area 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 It is likely that all surface water will be discharged to the sewer network through existing connections. Additionally, An attenuation tank will be included in the proposed site drainage scheme to reduce peak flows during storm events, potentially reducing the volume of rainfall drained to the sewer network at any one time.	None
3. Will the proposed development result in a change in the proportion of hard surfaced/paved external areas?	Yes The proposed development is expected to marginally increase in permeable ground owing to the provision of small tree planters along the western and south-eastern site boundaries. However given the site is directly underlain by the relatively impermeable London Clay Formation.	None (See comment in 3.4.1 below)
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	None
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	None
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?	No	None

3.4.1 Non-technical summary: Surface flow and flooding

In summary the proposed development will marginally decrease the proportion of impermeable surfaces to facilitate tree planters, however given that the site is directly underlain by the impermeable London Clay Formation it is not anticipated to impact surface water flow. In addition the site is not known to be at risk of flooding.

3.5 Conclusions

The items summarised below in Table 4 were identified as part of the Stage 1 screening process.

Table 4. Summary of Basement Impact Assessment Requirements

Item	Description
1.	*Subterranean (Groundwater) Flow* 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.
3.	*Slope (land stability)* Assessment of potential ground movements associated with construction in the London Clay Formation, including short term and long term heave movements, settlement associated with retaining wall deflections, and ground movements around the basement perimeter.
4.	Impact assessment of the impact the proposed excavation and basement installation may have on neighbouring structures and their foundations.
5.	*Surface flow and flooding* The proposed development is not expected to affect surface water flow and flooding.

4. SCOPING – STAGE 2

4.1 Introduction

This section of the report covers the scoping process (Stage 2) of the BIA, which is used to identify potential impacts of the proposed scheme and establish a conceptual site model. The scoping process also informs the scope of the site investigation. The site covers an area of approximately 3600m^2 with a basement area of approximately 660m^2, and the basement may be considered to present a limited impact to the local area.

A site investigation was carried out by CGL at the site in May 2016, consisting of four windowless sampler boreholes (WS01 to WS04) and four hand dug foundation inspection pits (FIP01 to FIP04). Standard Penetration Tests (SPT) and Hand Shear Vane (HSV) tests were carried out in all window sample holes, providing geotechnical data for the shallow strata on site. The exploratory hole records and location plan are presented in Appendix C.

This investigation is considered to be acceptable to confirm the shallow ground and groundwater conditions beneath the site for the purposes of this basement impact assessment. Additional investigation will be undertaken to allow detailed design, including deeper boreholes to provide strength information for the London Clay.

5. GROUND AND GROUNDWATER CONDITIONS – STAGE 3

5.1 Summary

The ground conditions encountered during the CGL intrusive investigation are generally consistent with those of the published geological maps. It is noted that soft to firm clay with organic matter was noted in exploratory holes WS02 and WS03 at the base of the Made Ground, overlying the London Clay Formation. Superficial deposits are not expected in the area of the site and following further review of the local geological, hydrogeology and hydrological conditions, it is considered that such deposits may be relict topsoil, associated with the overlying Made Ground. The existing ground level in the car park in the eastern half of the site is approximately 32.7mOD. The ground conditions are summarised in Table 5 below.

Table 5. Summary of ground conditions

Strata	Depth to top (mOD) [mbgl][a]	Thickness (m)
Tarmac and concrete [MADE GROUND]	33.36 to 32.43 [0]	0.1 to 0.4
Loose light brown to dark reddish brown slightly clayey slightly gravelly fine to coarse sand. Gravel of angular to rounded, fine to coarse of brick, chert, concrete and slate; or Loose light brown to dark brown slightly clayey sandy angular to subrounded fine to coarse gravel of brick, concrete and slate. Occasional cobbles of brick, concrete and slate. Sand is fine to coarse; or Soft to firm light grey to dark orange brown slightly gravelly sandy clay. Gravel is angular to subrounded fine to coarse of brick, tarmac, concrete, flint and decomposed organic matter. [MADE GROUND]	32.96 to 32.13 [0.5 to 0.3]	2.2 to 2.7
Soft to firm medium strength dark grey slightly sandy silty CLAY. Occasional to frequent black specks and rare rootlets throughout. *Encountered in WS02 and WS03 only.* [MADE GROUND – POSSIBLE RELICT TOPSOIL]	30.42 to 30.36 [2.3 to 3.0]	0.4 to 1.3
Firm to stiff medium strength mottled grey and dark brown CLAY. Occasional clusters of selenite and pockets of orange brown fine sand. [LONDON CLAY FORMATION]	29.96 to 29.12 [3.0 to 3.6]	Proven to 5.45m bgl.

a. mbgl = metres below existing ground level

The ground conditions encountered beneath the site were described fully within CGL's interpretative report[1] and are detailed below for ease of reference. Plots of SPT 'N' and undrained shear strength (c_u) values versus depth are presented as Figure 3 and Figure 4, respectively.

5.2 Made Ground

Made Ground was encountered in all exploratory holes across the site from ground level and was between 2.2m and 2.7m thick (in WS01, where the window sample was terminated in Made Ground). The Made Ground generally consisted of granular deposits of gravelly sand or sandy gravel with varying proportions of clay. Occasionally the Made Ground was encountered as cohesive deposits of sandy gravelly clay with varying proportions of sand, gravel and occasional cobbles. The gravel fraction generally comprised brick, flint, concrete, tarmac and decomposed organic matter.

Nine SPTs were carried out in the Made Ground on site. Three of these SPTs were carried out in the cohesive Made Ground, recording 'N' values of 4 to 10, correlating to values of undrained shear strength (c_u) of 18kPa to 45kPA, based on established correlations[10] (where f_1 = 4.5), or a relative consistency of 'soft' to 'firm'.

Five SPTs were carried out in the granular Made Ground, recording 'N' values of 1 to 26, corresponding to a relative density of 'very loose' to 'medium dense'[11]. A ninth SPT was carried out at the base of WS01 in the Made Ground which recorded an 'N' value of 50 with a total penetration of 72mm. This value is not considered representative of the Made Ground as a whole, and is likely to have occurred due to refusal on a cobble. One Hand Shear Vane (HSV) test was carried out in the cohesive Made Ground in WS01, recording a c_u value of 23kPa.

5.2.1 Possible Relict Topsoil

Possible Relict Topsoil was encountered only in window samples WS02 and WS03, underlying the Made Ground in both cases, and was encountered as a 0.4m thick horizon at 3.0m bgl in WS03, to a depth of 3.4m bgl. In WS03 it was encountered as a 1.3m thick layer at 2.3m bgl, to a depth of 3.6m bgl. The Possible Relict Topsoil comprised a soft to firm, medium strength, dark grey, slightly sandy, silty clay with varying portions of sand

[10] Stroud, M.A. (1975). *The Standard penetration test in insensitive clays and soft rocks*, *Proceedings of the European Symposium on Penetration Testing, 2, 367-375.*
[11] British Standards Institution. (2015). *Code of practice for site investigations*. BS5930:2015.

and silt. Occasional to frequent black specks of organic matter and rare rootlets were scattered throughout the Possible Relict Topsoil.

Two SPTs were carried out in the Possible Relict Topsoil, recording 'N' values of 7 and 8, corresponding to c_u values of 31.5kPa and 36kPa, based on established correlations[10] (where f_1 = 4.5). Three HSV tests were undertaken in the Possible Relict Topsoil, recording c_u values of 49kPa to 53kPa, or strength terms of 'medium strength soil'[11], which are slightly higher than the c_u values derived from SPT 'N' values.

5.3 London Clay Formation

The London Clay Formation was encountered below the Made Ground/Possible Relict Topsoil, and was proven to a maximum depth of 5.45m bgl. The London Clay Formation generally comprised firm to stiff, mottled grey and dark brown clay with occasional selenite crystals and lenses of orange brown fine sand.

SPT 'N' values of 11 to 21 were recorded in the London Clay Formation, correlating to c_u values of 49.5kPa to 94.5kPa, based on established correlations[10] (where f_1 = 4.5) or a relative consistency of firm to stiff. HSV tests in the London Clay recorded values of 51kPa to 55kPa, corresponding strength terms of 'medium strength soil'.

5.4 Groundwater

No groundwater was noted during the site works. A summary of water levels recorded during subsequent monitoring is presented in Table 6.

Table 6. Summary of water monitoring

WS	Response zone stratum/depth	Water level					
	(m bgl)	16/05/16	01/11/16	18/11/16	30/11/16	13/12/16	04/01/17
WS1	Made Ground (1.0 to 3.0)	DRY	-	DRY	DRY	DRY	DRY
WS2	MG, PRST & LC (1.0 to 5.0)	2.82	-	2.8	-	2.82	2.84
WS3	MG, PRTS & LC (1.0 to 5.0)	5.02	2.95	2.81	2.72	2.78	2.87

Notes: MG = Made Ground; PRST = Possible Relict Topsoil; LC = London Clay.

With reference to Table 6, perched water was recorded in the Made Ground/ Possible Relict Topsoil in exploratory holes WS2 and WS3 (located in the central area of the site), resting above the London Clay. It is noted that no perched water was recorded to 3.0m bgl in WS1, located in the area of the proposed basement.

Monitoring records indicate that the perched water is considered to be laterally impersistent and is unlikely to be in hydraulic conductivity with local surface water bodies or groundwater (expected at depth in the underling Thanet Sand/Chalk aquifer).

5.5 Geotechnical design parameters

Geotechnical design parameters for the proposed development are summarised in Table 7 below, these are based on the results of laboratory and in-situ testing carried out as part of the CGL site investigation, and published data for the well-studied London Geology.

Table 7. Geotechnical design parameters

Stratum	Design Level [mOD]	Bulk Unit Weight γ_b (kN/m^3)	Undrained Cohesion c_u (kPa) [c']	Friction Angle ϕ' (°)	Young's Modulus E_u (MPa) [E']
Made Ground (cohesive)	32.5	18	30	24[a]	18[d] [13.5][e]
Made Ground (granular)	32.5	18	- [0]	36[b]	- (30)
Possible Relict Topsoil	30.4	18	30	24[a]	18[d] [13.5][e]
London Clay Formation	29.5	20	50+3.5z[c] [5][b]	24[a]	30+2.1[d] [22.5+1.6][e]

a. Peck, R.B., Hanson, W.E., and Thornburn, T.H., Foundation Engineering, 2nd Edn, John Wiley, New York, 1967, p.310.
b. Burland et. al (Eds) (2001) Building response to tunnelling, CIRIA Special Publication 200, CIRIA.
c. z = depth below upper surface of the London Clay
d. Based on 600 Cu (increase to 1000 Cu for retaining wall design based on C580) 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.
e. Based on 0.75Eu - 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.

It should be noted that the existing investigation provided in-situ test data within the London Clay to a maximum depth of 5m bgl. On this basis a conservative c_u design line of $c_u = 50 + 3.5z$ (where z = depth below the top of the London Clay Formation) has been derived for the London Clay Formation. Additional investigation will be undertaken to confirm the strength profile of the London Clay for detailed design.

5.6 Conceptual site model

A Conceptual Site Model (CSM) is presented in based on the proposed development and outcomes of the Screening Assessment. The CSM comprises a plan (Figure 5a), and the

following sections indicating the extent of the proposed basement and the location of neighbouring properties in relation to the proposed development:

- Section A-A' (Figure 5b): west to east through basement and adjacent No. 31 (measured to building wall) and No. 33/35 Oval Road;
- Section B-B' (Figure 5c): south to north through basement and adjacent 'The Lockhouse' (No. 35 Oval Road); and
- Section C-C' (Figure 5d): west to east through basement and adjacent railway tracks.

It is understood that the basement floor slab will be at a level of approximately 28.4mOD, requiring a maximum excavation depth of some 4m. The proposed basement/building will not share any party walls with the neighbouring structures.

It is noted that the proposed basement is some 5.6m from the adjacent basements of No. 35 Oval Road (at a level of 30.3mOD) and No. 31 Oval Road (at a level of 31.3mOD to 31.2mOD) (Section A-A'), 4.2m from the adjacent basement of No. 35 Oval Road (at a level of 30.3mOD) (Section B-B'), and 9.8m from the nearest running track of the railway (at a similar level to existing site ground level).

The excavation of the basement will generate heave movements in the short and long term as removal of the overburden reduces stresses at formation level. The installation of the piled retaining walls, and subsequent deflection during excavation, could also generate ground movements in the soils surrounding the basement.

As shown in the CSM figures, the foundations of the neighbouring structures are outside of the 45° zone of plastic deformation from the base of the proposed basement excavation and significant ground movements caused by retaining wall deflections are not anticipated outside of this zone. However in order to provide a conservative assessment the impact of movements on the neighbouring structures has been considered, as discussed in Section 7 of this report.

6. IMPACT ASSESSMENT – SUBTERRANEAN GROUNDWATER FLOW

6.1 Introduction

This section provides a qualitative assessment of the effect that the basement may have on the local hydrogeological regime and whether this will affect adjacent properties.

6.2 Impact on groundwater flow

Based on the observations during the site investigation and monitoring, no significant aquifers or groundwater has been encountered beneath the site. Perched water was identified within the Made Ground/Possible Relict Topsoil. However, the perched water is laterally impersistent and is not considered to 'flow' in the context of groundwater flow.

On this basis, it is considered that the proposed basement will not have a significant negative impact on groundwater flow or level in the vicinity of the site, and no further assessment is considered to be necessary.

6.3 Perched water control during construction

Based on observations of perched water at the site during the site investigation and subsequent monitoring, the basement excavation is expected to encounter localised perched water at a depth of approximately 2.8m bgl (29.9mOD). However, the perched water appears to be laterally impersistent, and the rate of infiltration into WS03 appeared to be relatively slow.

As such, it is considered likely that a limited volume of water will be encountered by the excavation and that this can be adequately accommodated with pumping from locally excavated sumps. Further investigation should be undertaken to design perched water control measures.

7. IMPACT ASSESSMENT – LAND STABILITY

7.1 Introduction

This section describes calculations undertaken to assess ground movements that may result from the construction of the proposed basement and to assess how these may affect the adjacent structures and infrastructure.

The following construction processes could give rise to ground movements; the impacts of which will be assessed in this report:

- Heave movements: The London Clay Formation is susceptible to short term heave and time dependant swelling on unloading, which will occur as a result of basement excavation, generating upward ground movements.
- Piled wall installation: Installation of piles generates a limited amount of downward movement of surrounding material. The magnitude of this movement decreases in a linear relationship with distance from the piles.
- Piled wall deflection: Following excavation of the basement, the length of the piles above the basement slab level can deflect inwards slightly due to pressure applied by the weight of external soil, which move vertically and horizontally to fill the space created by the deflected pile. The magnitude of this movement decreases with distance from the piles.

7.2 Analysis sections

Based on the CSM presented in Section 5.4, three sections have been identified for analysis and these are further discussed in the following sections.

7.2.1 Section A-A' No. 31 and No. 33/35 Oval Road

The eastern wall of the basement is located approximately 5.6m from the rear wall of No's 31 and 33/35 Oval Road.

No. 31 Oval Road is a two storey masonry building with a basement level and partial third floor levels, and is around 13m wide perpendicular to the proposed basement. The basement is at a depth of around 1.5m bgl, or a level of 31mOD to 31.2mOD. It is assumed that the building is founded on spread foundations within the London Clay.

No. 35 Oval Road forms part of the apartment complex ('The Lockhouse') to the north of the site and in this area is a three storey building, with a basement level, fronting onto Oval Road. The basement of this property is understood to be at 30.3mOD. The building has a width of approximately 13m parallel to the line of Section A. It is assumed that the building is supported on piled foundations.

The basement levels, and therefore the foundations, of No's 31 and 33/35 Oval Road are located outside of the 45° zone of influence of the proposed basement. On this basis, a semi-qualitative assessment of ground movement along this section has been carried out to assess the risk of building damage due to basement construction.

7.2.2 Section B-B' No. 35 Oval Road ('The Lockhouse')

The northern wall of the proposed basement is located approximately 4.2m from the side wall of the 9 storey, plus basement level, apartment building forming part of the wider 35 Oval Road development. A single storey basement is present beneath the footprint of the 35 Oval Road development, generally at a level of around 30.3mOD, and is around 26m wide perpendicular to the proposed basement (parallel to the line of Section B-B').

The southern wall of the apartment building is within the 45° zone of influence of the proposed basement, however, the basement foundation level of the apartment block is lower and outside of the zone. On this basis, a semi-qualitative assessment of ground movement along this section has been carried out to assess the risk of building damage due to basement construction.

7.2.3 Section C-C' Railway

The western wall of the basement is located approximately 9.8m from nearest running track of the London and Northwestern Railway. The railway is approximately 26m wide and at grade for the purposes of the ground movement assessment. The railway is located outside of the 45° zone of influence, as measured from the basement of the excavation. On this basis, a semi-qualitative assessment of ground movement along this section has been carried out to assess potential movements of the railway tracks.

7.3 Assumed construction methodology

It is understood that the proposed building will be supported on piled foundations into the London Clay, with piles formed from either ground level outside of the basement footprint or basement level within the basement footprint.

It is assumed that the basement walls will formed with contiguous, acting in cantilever in the temporary condition (during construction) and propped by the basement and ground floor slabs in the permanent condition. A pile length of 20m has been assumed for the purposes of this assessment, this is considered conservative for the purposes of calculating installation movements, and is appropriate to support column/line loads should the structure require it. The assumption of a cantilever during short term is conservative and allows for 'low support stiffness' estimations of retaining wall deflection.

In order to accommodate the expected heave beneath the basement floor slab, it is assumed that a void former will be utilised. For the purposes of modelling, Cellcore HX S grade 13/18 has been assumed, and a reduction in overburden stress relief of 16kPa has been applied to the model.

7.4 Ground movements arising from basement excavation

A ground movement assessment has been undertaken using OASYS Limited PDISP (Pressure Induced Soil Displacement) analysis software version 19.3. PDISP 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. The analysis calculates total settlement including both short term and long term movements.

As the proposed development is not expected to introduce significant loading at basement level (with building loads distributed to depth with piled foundations), PDISP calculations have been carried out with reference to unloading pressure due to removal of soil overburden only, simulating a worst-case scenario of net unloading.

The removal of overburden generates an unloading of some 80kPa and is predicted to result in an undrained heave movement of up to 20mm in the centre of the basement. Over the long term, it is assumed that heave is restricted slightly by the Cellcore (16kPa reduction in heave pressure), and long term heave is predicted to be 25mm at the centre of the basement. Undrained heave would be expected to occur immediately on excavation, with long-term drained heave occurring over subsequent months and years as pore water pressures come to equilibrium.

The net unloading conditions and results of the PDISP analysis are summarised below in Table 8, and the combined short term and long term contours are presented as Figure 6.

Table 8. Net loading conditions

	Slab formation Level [mOD]	Stress relief from overburden (kPa)	Load capacity of Cellcore HX S (kPa)	Net unloading pressure (kPa)	Maximum heave displacement (mm)
Short term	28.4	80	-	80	20
Long term	28.4	80	16	64	25

7.5 Ground movements due to installation and deflection of piles

A qualitative assessment of ground movement due to pile installation and deflection has been carried out based on CIRIA C580 guidance[12] for each of the three critical sections identified above. This assessment accounted for vertical and horizontal ground movement at ground level and at slab formation level.

Installation ground movements are based on 0.04% of the wall depth (20m long contiguous piles assumed), and distances to negligible movements are assumed as 1.5 and 2.0 times the wall depth for horizontal and vertical movements, respectively.

Piled wall deflections during excavation have been estimated based on 0.4% and 0.35% (based on low support stiffness, i.e. cantilevered in temporary condition) of the excavation depth for horizontal and vertical movements, receptively. A distance to negligible movements of 1 times the excavation depth is assumed, however, based on the extents of the plastic zone behind the retaining wall.

The results were combined and corrected to estimate ground movements at the neighbouring foundations for each section. The horizontal displacement profiles are presented as Figures 7a to 7c and vertical displacement profiles as Figures 8a to 8c. It is noted that the proportion of horizontal movement reduces at around the same distance as between the proposed basement and the adjacent buildings. This is due to the intercept of the 45° zone of plastic deformation being close to the adjacent buildings. The results are used to carry out a building damage assessment in the following section.

7.6 Building Damage Assessment

The calculated ground movements have been used to assess potential 'damage categories' that may apply to the structures adjacent to the proposed basement due to the proposed

[12] CIRIA. (2003*). Embedded retaining walls guidance for economic design*. C580.

basement construction method and assumed construction sequence. The methodology proposed by Burland and Wroth[13] and later supplemented by the work of Boscardin and Cording[14] has been used, as described in *CIRIA Special Publication 200*[15] and *CIRIA C580*. General damage categories are summarised in Table 9 below.

Table 9. 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).

The above assessment criteria are primarily relevant for assessing masonry structures founded on strip footings. Therefore, this methodology will be adopted within the damage assessment for the buildings of the apartment complex to the north and west of the site.

The predicted ground movements below 31 and 35 Oval Road due to the proposed basement development have been compiled to determine the overall ground displacement along the width of the foundations.

7.6.1 Section A-A'

7.6.1.1 31 Oval Road

The potential horizontal displacement profile for 31 Oval Road is presented as Figure 7a and indicates 6mm of movement at the nearest foundation of the building of 31 Oval

[13] 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

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

[15] 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.

Road, reducing to 2.8mm at the furthest foundation from the proposed basement. A horizontal strain of 0.025% is calculated for this section.

The vertical displacement profile for 31 Oval Road is presented as Figure 8a and indicates around 8.8mm of settlement at nearest foundation, reducing to 4mm at the furthest foundation. This corresponds to a maximum deflection of 0.7mm, a deflection ratio of 0.005% and angular distortion of 1/2250. The predicted angular distortion is within published limits[16, 17] for preventing excess cracking and damage to load bearing walls and partitions.

7.6.1.2 33/35 Oval Road

The potential horizontal displacement profile for 33/35 Oval Road is presented as Figure 7b and indicates 5.6mm of movement at the nearest foundation of 33/35 Oval Road, reducing to 2.6mm at the furthest foundation from the proposed basement. A horizontal strain of 0.023% is calculated for this section.

The vertical displacement profile for 33/35 Oval Road is presented as Figure 8b and indicates around 5.6mm of settlement at nearest foundation, reducing to 3.8mm at the furthest foundation. This corresponds to a maximum deflection of 0.7mm, a deflection ratio of 0.005% and angular distortion of 1/2250. The predicted angular distortion is within published limits[16,17] for preventing excess cracking and damage to load bearing walls and partitions.

7.6.2 Section B-B' – 35 Oval Road

The potential horizontal displacement profile for 35 Oval Road is presented as Figure 7c and indicates 6mm of movement at the nearest foundation of 35 Oval Road, reducing to 0.9mm at the furthest foundation from the proposed basement. A horizontal strain of 0.024% is calculated for this section.

The maximum vertical deflection across the width of the property is estimated to be 2mm, with a deflection ratio of 0.009%. The maximum differential movement across the property is 5mm across the 22.1m width of the property. This corresponds to an angular distortion of 1/4910. The predicted angular distortion is within published limits[16,17] for preventing

[16] Skempton, A. W. & Mac Donald, D. H. (1956). The Allowable settlement of buildings. Proceedings of the Institution of Civil Engineers, Part 3, No. 5, pp 727-784.
[17] Polshin, D. E. & Tokar, R. A. (1957). Maximum allowable non-uniform settlement of structures. Proc. 4th Int. Conf. SM&FE, Wiesbaden, No. 1, pp. 285.

excess cracking and damage to load bearing walls and partitions. The vertical displacement profile is presented as Figure 8c.

7.6.3 Section C-C' – Railway

The predicted ground movements below the railway to the west of the site due to the proposed basement development have been compiled to determine the overall displacement along the width of the foundations.

Maximum horizontal displacements at the nearest railway track are estimated to be 6mm. Heave movements are estimated to be relatively low, around 2mm, with around 10mm associated with the pile installation/deflections movements.

It should be noted that the assessment undertaken is relatively conservative, and should be updated once construction methodology/sequences are better understood. Additionally, the tracks will be founded on ballast, offering an element of flexibility to the tracks, and it is therefore that all of the estimated movements will be realised on the tracks. The estimated maximum movements due to basement construction are not considered to pose a significant risk to the Network Rail assets.

7.6.4 Summary

Table 10 incorporates superimposed vertical movements derived from the heave movements due to removal of soil overburden, long term reduction of heave due to the use of Cellcore beneath the basement floor slab, and horizontal and vertical displacement due to the installation and deflection of piles. The method of deriving these values and establishing an appropriate deflection ratio for the neighbouring structures is illustrated graphically in Figures 7 and 8, and the building interaction chart is presented as Figure 9. The width of the adjacent structures has been obtained from measurements from CAD plan drawings of the site provided by the Client.

Table 10. Summary of ground movements and corresponding damage category

Section Reference	Maximum deflection (mm)	Horizontal Strain ε_h (%)	Deflection ratio Δ/L^b (%)	Damage category
Section A-A' 31 Oval Road	0.7	0.025	0.008	Category 0 – Negligible
Section A-A' 33/35 Oval Road	0.7	0.06	0.005	Category 0 – Negligible
Section B-B' 35 Oval Road	2.0	0.024	0.009	Category 0 – Negligible

a. *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)*
b. *See Box 2.5 (v) CIRIA C580 (2003) Embedded retaining walls guidance for economic design.*

It should be noted that the Building Damage Category ratings above are based on a relatively conservative assessment, particularly with regards to horizontal movements. Further assessment should be undertaken upon finalisation of the construction methodology and sequencing.

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 likely to be within Category 0 (negligible damage), for the site and neighbouring properties. To ensure movements do not start to fall outside of those predicted, it is recommended that a formal monitoring strategy is implemented on site in order to record and control ground movements during construction.

The monitoring system should operate broadly in accordance with the 'Observational Method' as defined in CIRIA Report 185[18]. Monitoring can be undertaken by using positional surveys compared to baseline values established before any excavation work is undertaken onsite. 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. 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.

As discussed previously, the horizontal and vertical displacement of ground outside the basement due to installation and deflection of the contiguous piles during construction should be limited to restrict the damage category for the adjacent critical properties to within Category 1 (very slight). This value should form the basis of the 'traffic light' trigger levels established prior to underpinning commencing onsite. 'Trigger levels' should be discussed and agreed with the party wall surveyor.

[18] 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 results of this Basement Impact Assessment are informed by ground investigation data and supplemented with published and unpublished records. The analysis is also informed by drawings and loadings provided by the architect for the project, as well as publicly available information for the surrounding properties.

- The ground conditions beneath the site comprise Made Ground over localised Possible Relict Topsoil and the London Clay Formation. Laterally impersistent perched water was encountered in the Made Ground/Possible Relict Topsoil. No groundwater was encountered and the London Clay is classified as an un-productive stratum.

- It is considered that the proposed basement will not significantly impact upon subterranean groundwater flow and surface flow and flooding.

- Based on a semi-quantitative assessment ground movements are anticipated to be of low magnitude in the locale of the adjacent structures and can be mitigated in the structural and temporary works design.

- Assuming good quality workmanship and appropriate contingencies for groundwater control, it is considered that the calculated ground movement would limit building damage categories to Category 0 'negligible' damage.

- In order to control ground movements to within the predicted range, it is recommended that a formal monitoring strategy is implemented on site in order to observe and control ground movements during construction.

- The estimated maximum movements due to basement construction are not considered to pose a significant risk to the Network Rail assets.

- It should be noted that the assessment undertaken is relatively conservative, and should be updated and refined once construction methodology/sequences are better understood.

8.2 Cumulative impacts

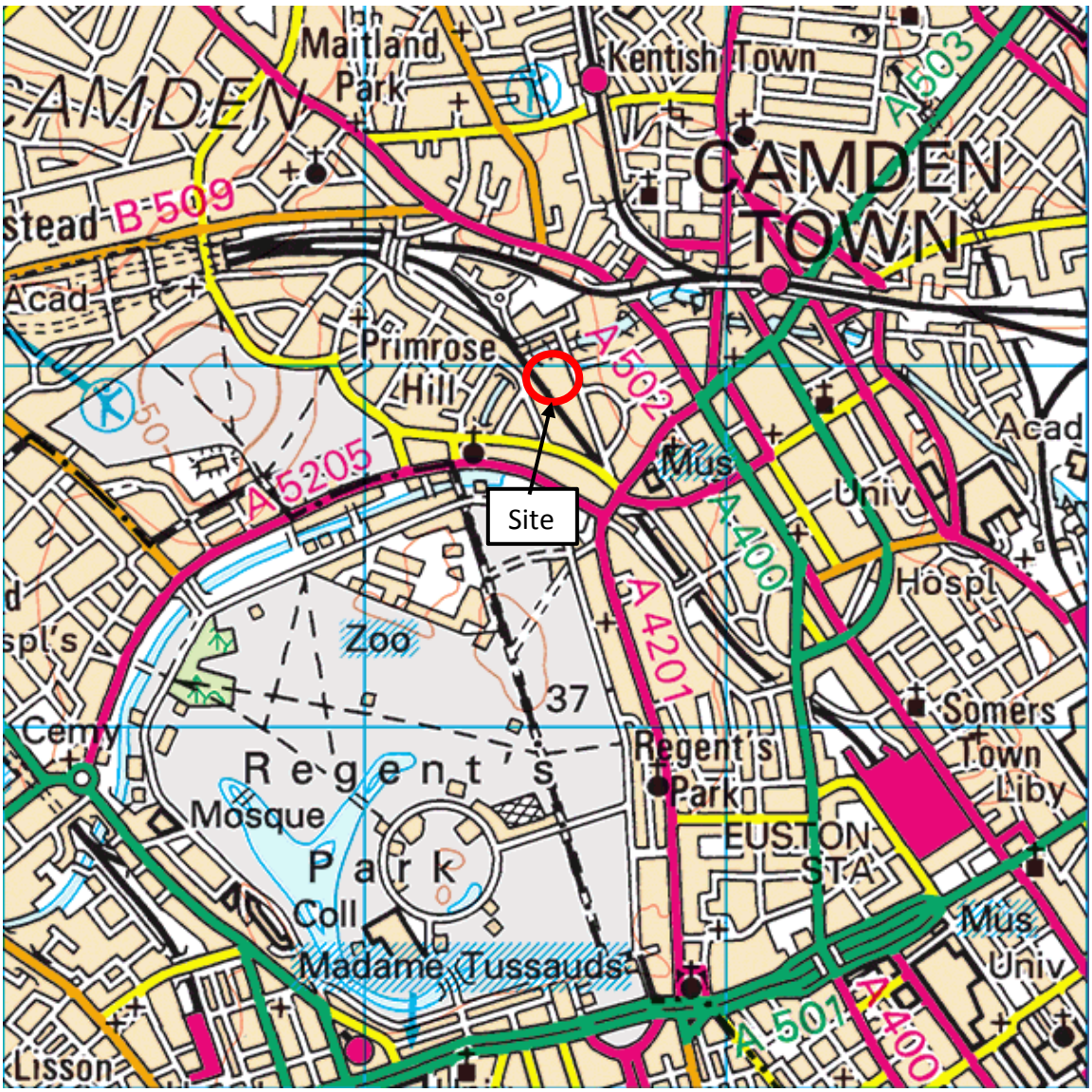
Based on the available information, it is understood that the surrounding properties adjacent to the proposed basement also include basement levels.

Given the relative positions of the existing basements and proposed basements (i.e. generally no sharing of party walls), it is considered that there are no significant cumulative impacts in respect of ground or slope stability due to the proposed development

Only perched water has been identified beneath the site (within the Made Ground/Possible Relict Topsoil), with no shallow groundwater encountered owing to the relatively impermeable London Clay (classified as a non-productive stratum). 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



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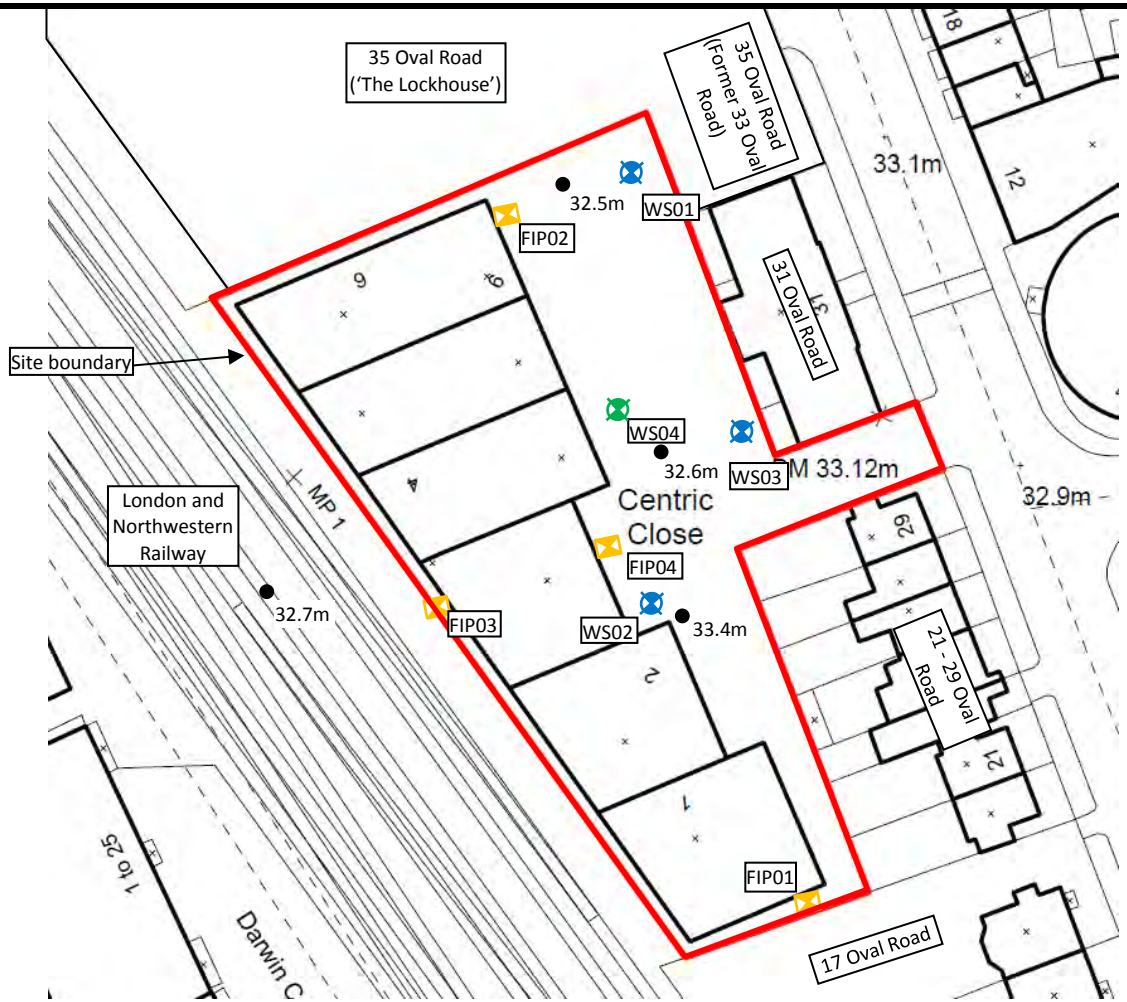
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **Site location plan**	**Figure 1**

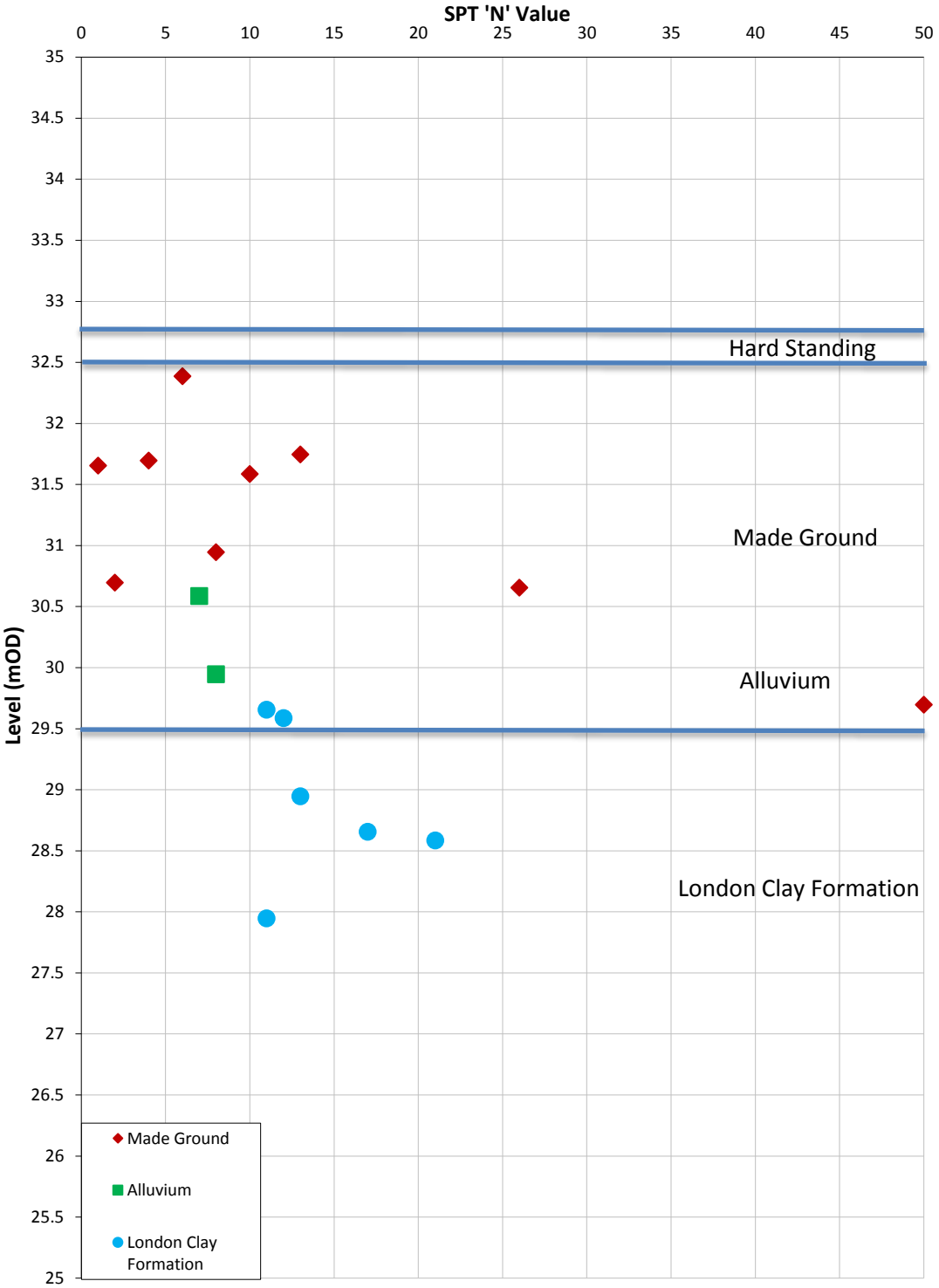


N

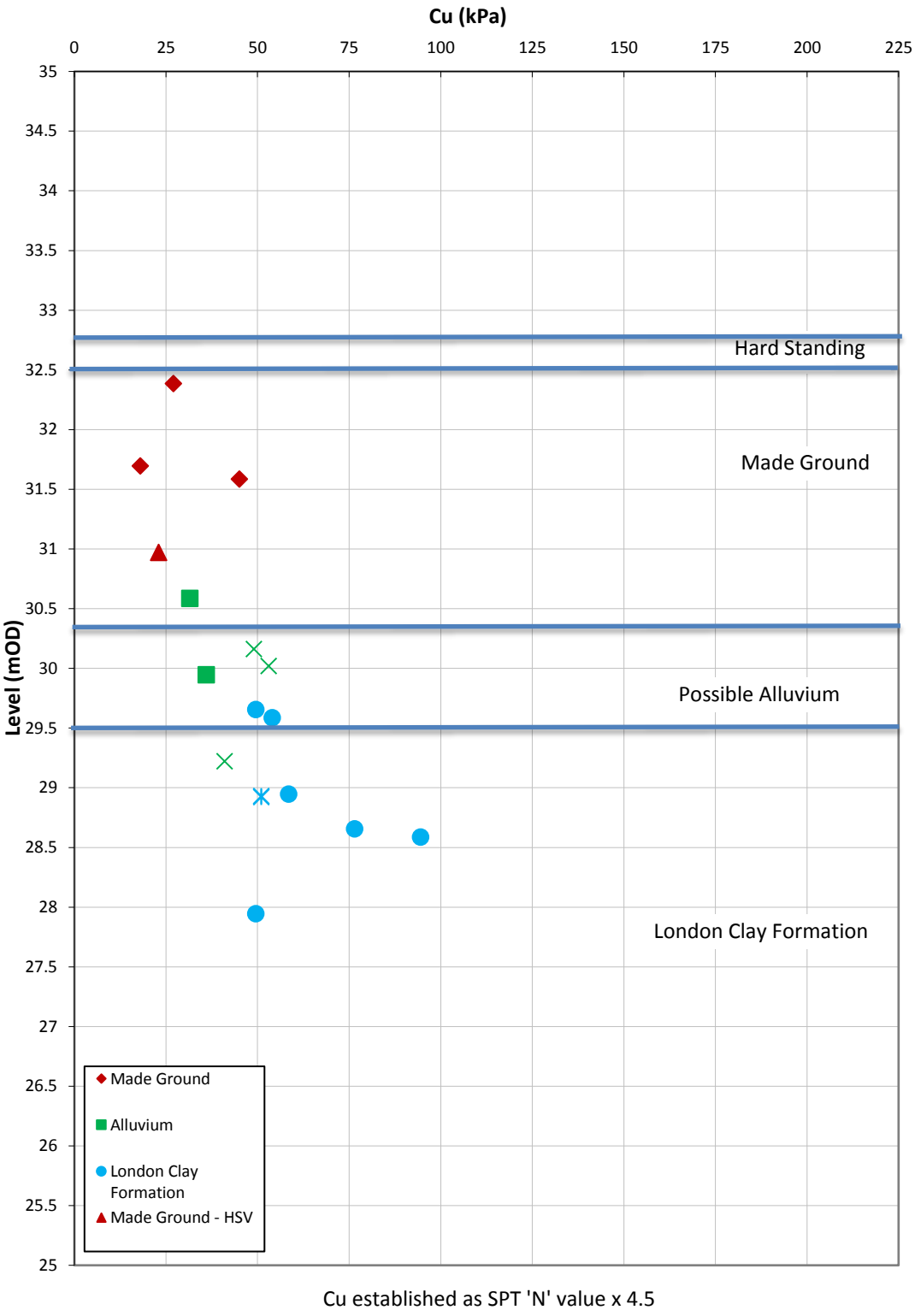
- Window sampler location with installation
- Window Sampler location without installation
- Foundation inspection pit location
- Ground level (approximate)

(Not to scale)
Base map provided by Fairview

Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **Site layout plan and exploratory hole location plan**	**Figure 2**

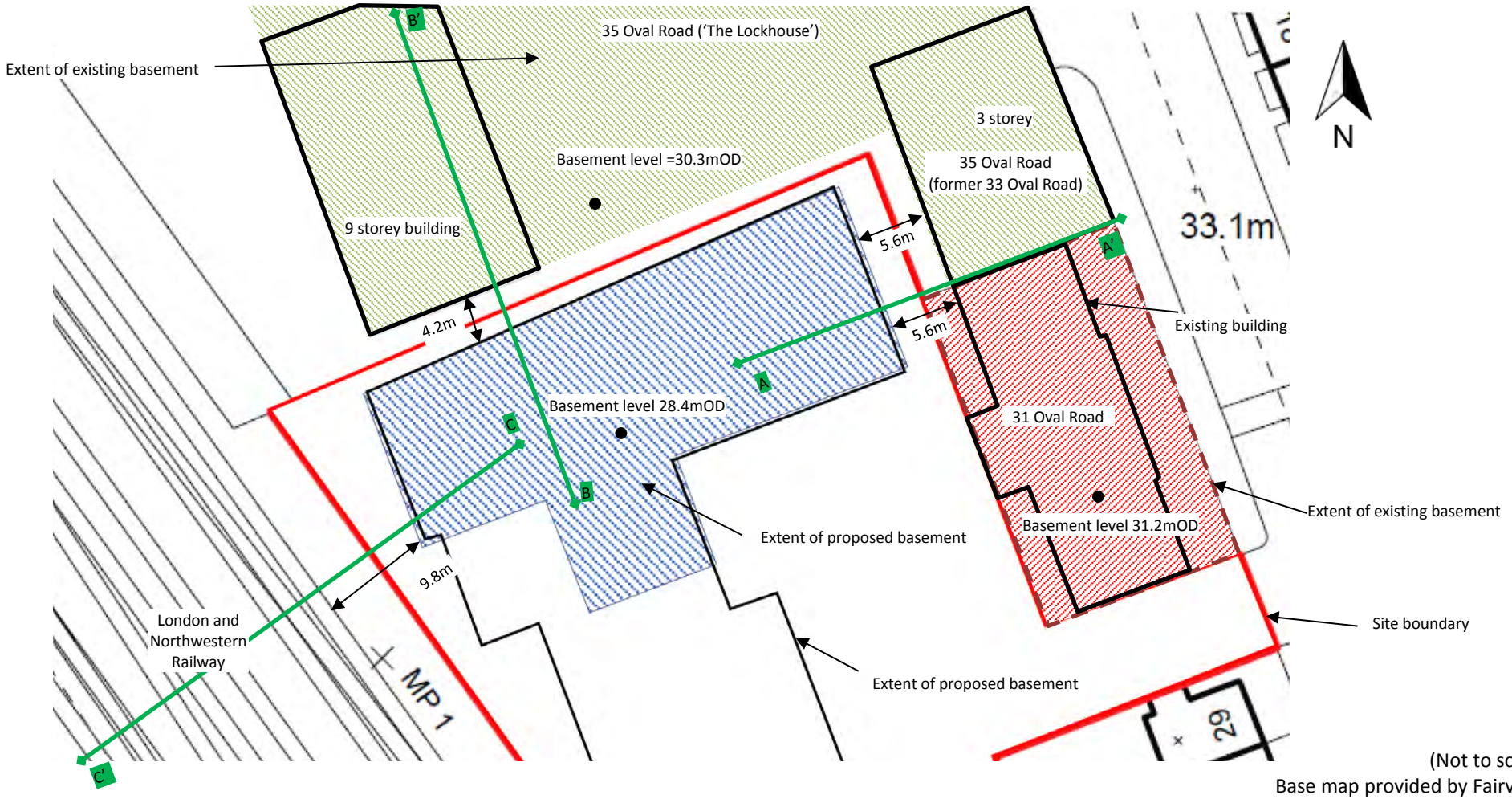


Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **SPT 'N' versus level**	**Figure 3**



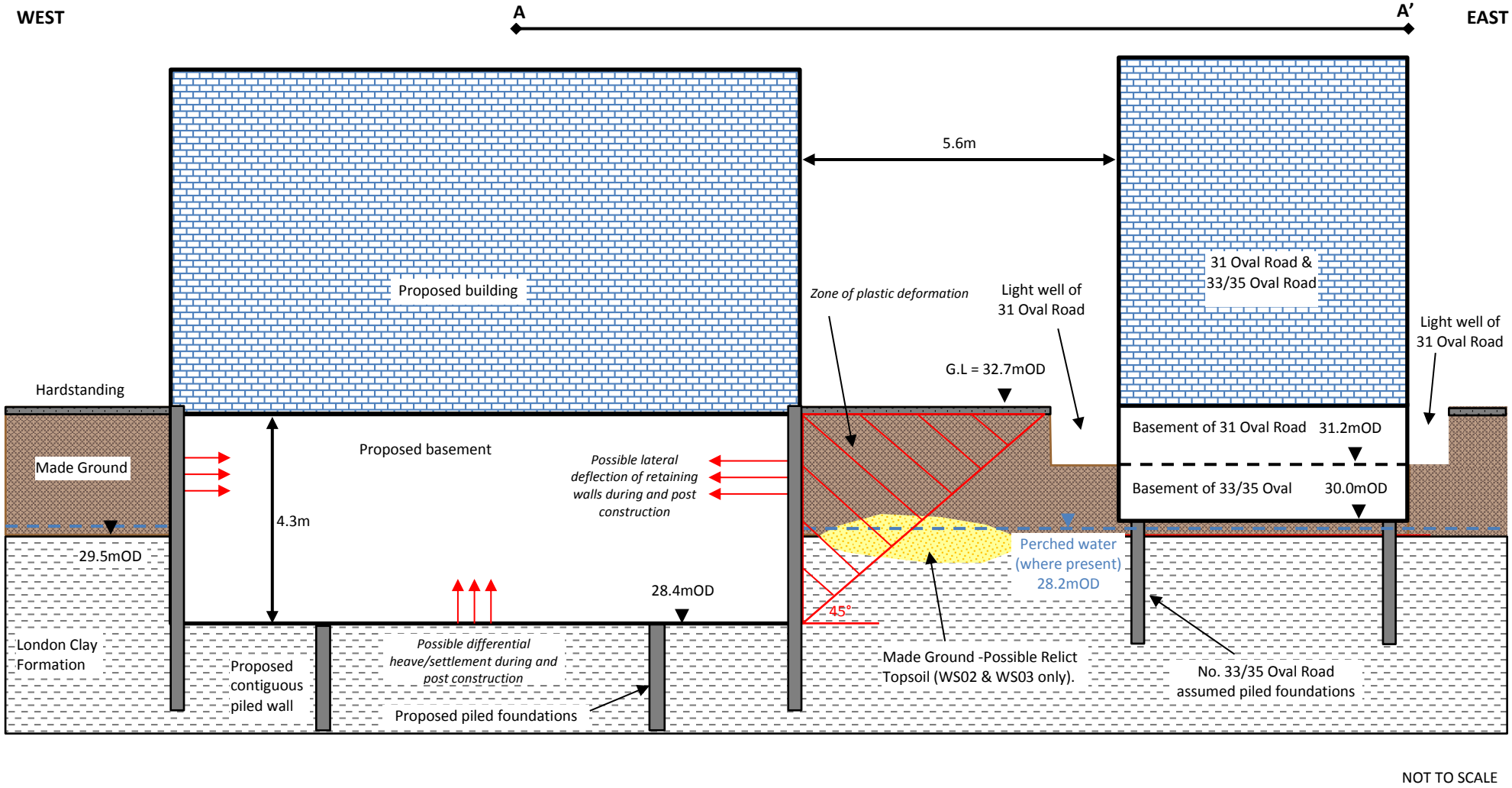
Cu established as SPT 'N' value x 4.5

Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **c_u versus level**	**Figure 4**



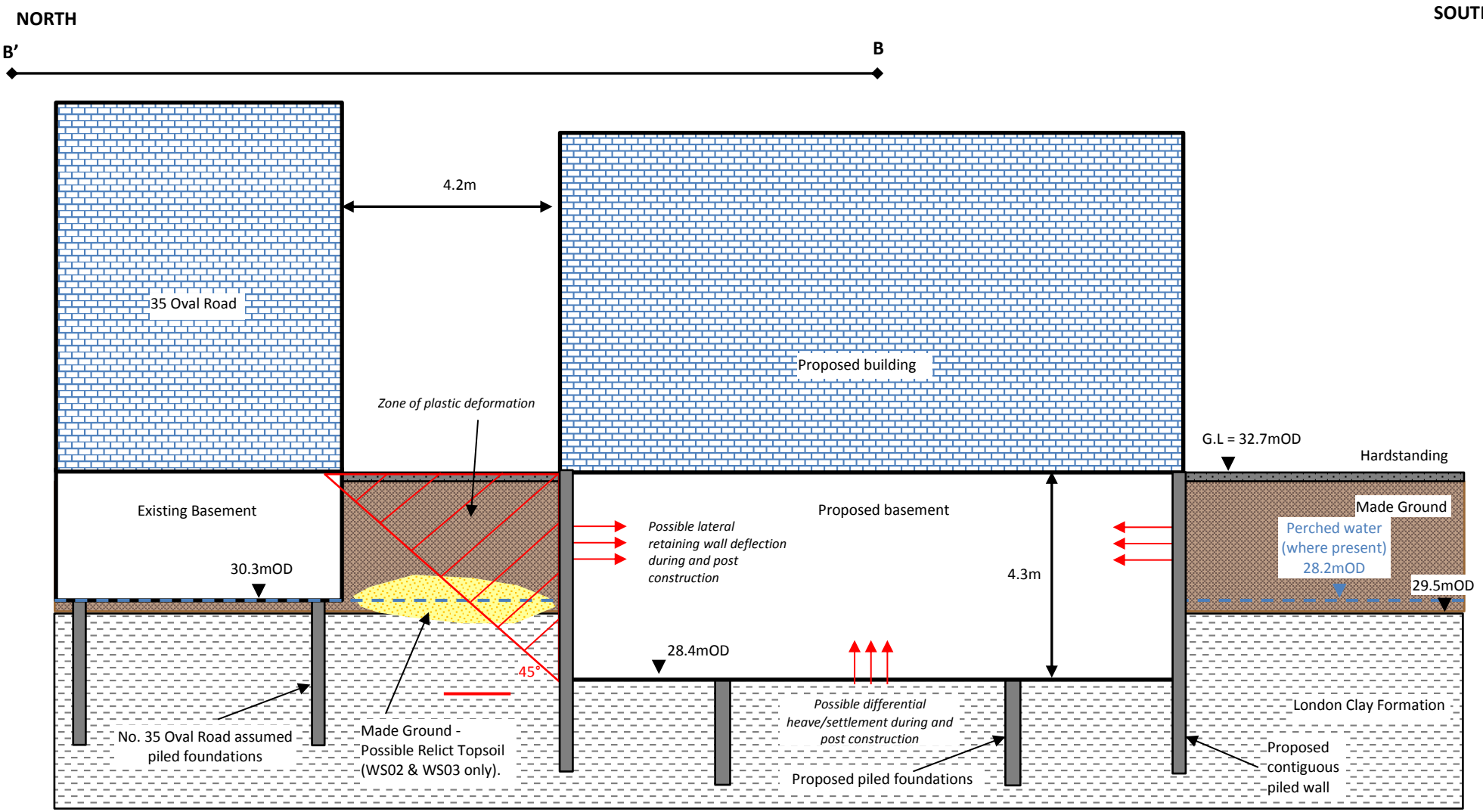
(Not to scale)
Base map provided by Fairview

Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **CSM - Plan**	**Figure 5a**

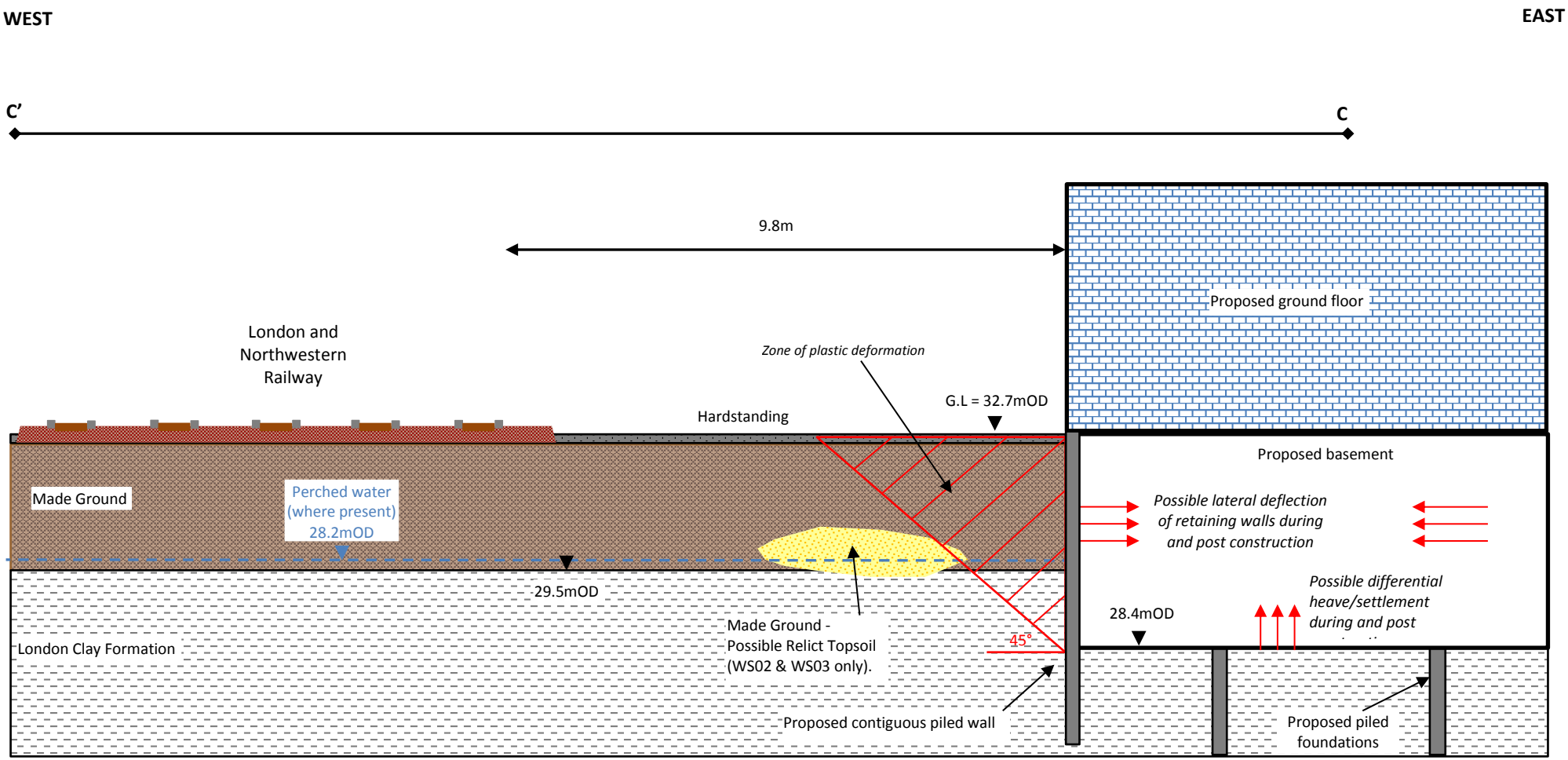


NOT TO SCALE

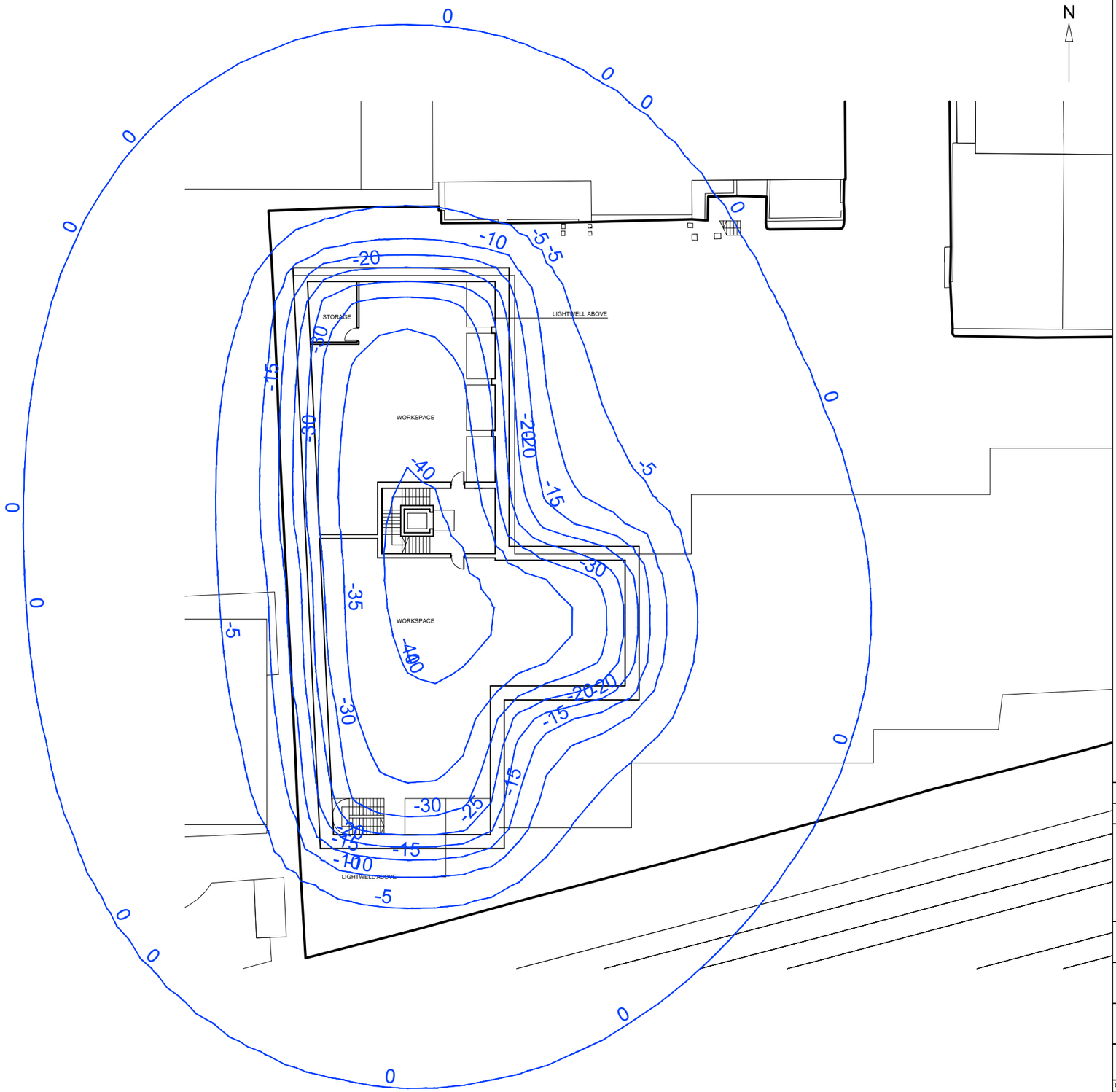
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **CSM – Section A - A'**	**Figure 5b**



Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **CSM – Section B – B'**	**Figure 5c**



Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **CSM – Section C - C'**	**Figure 5d**



Rev	Date	Comments
0	09/03/17	

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T: 01483 310600

Project
Centric Close, Oval Road, Camden

Client
Fairview Ventures Limited

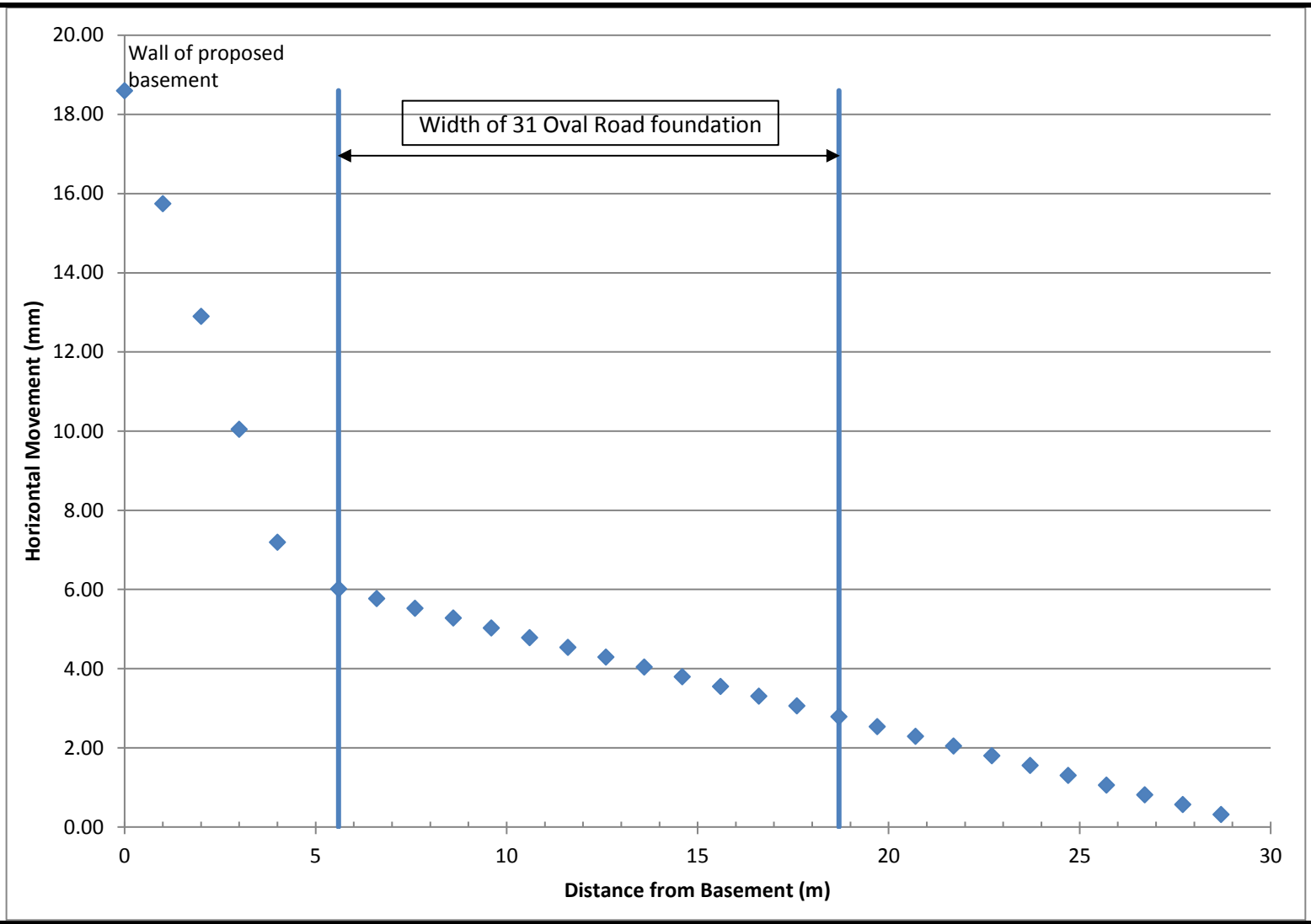
Drawing title
Combined settlement contours

Scale(s)	Job No.
NTS	**CG/18804B**

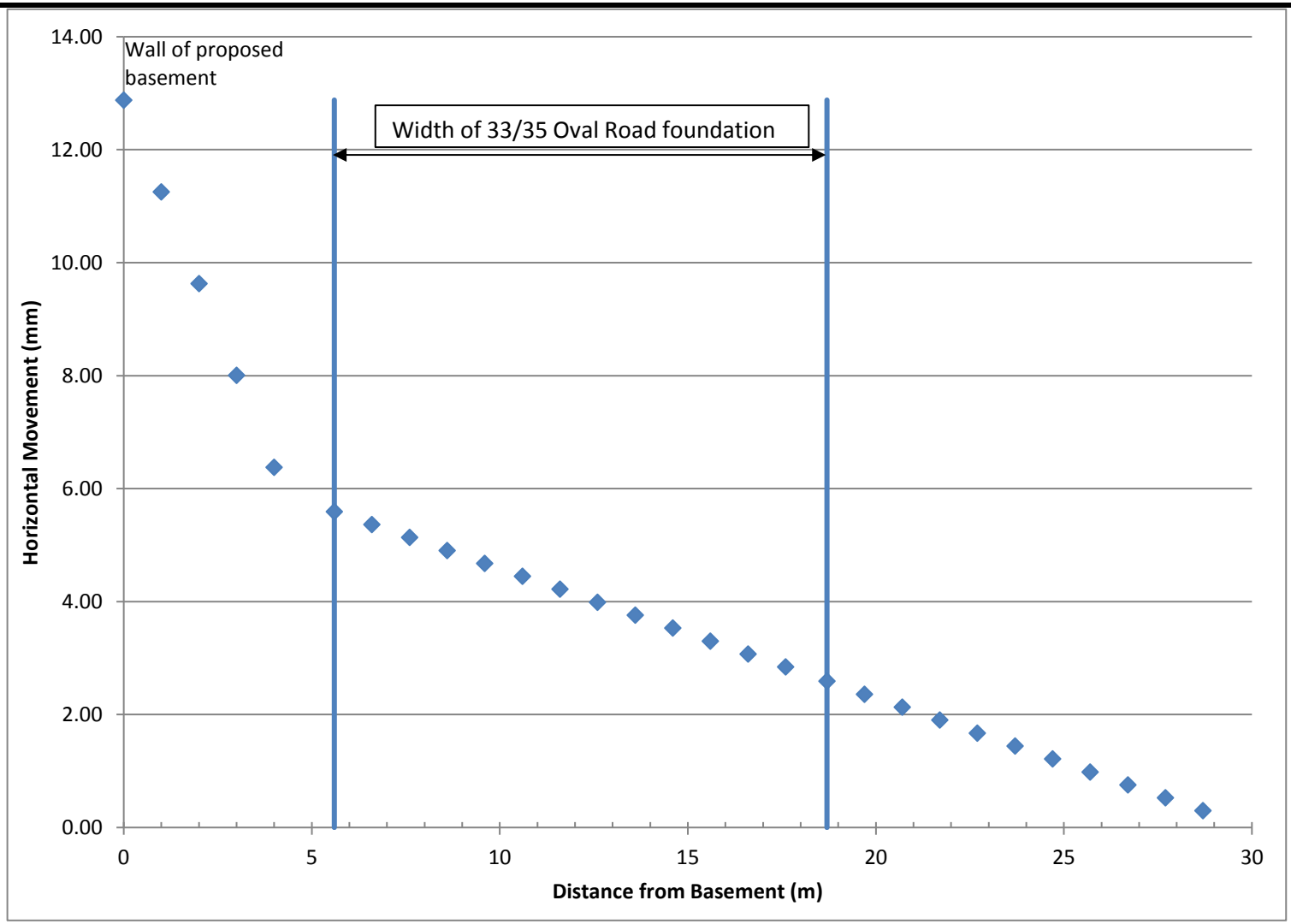
Drawn	TSB	09/03/17
Checked		
Approved		

Dwg No. **Figure 6**

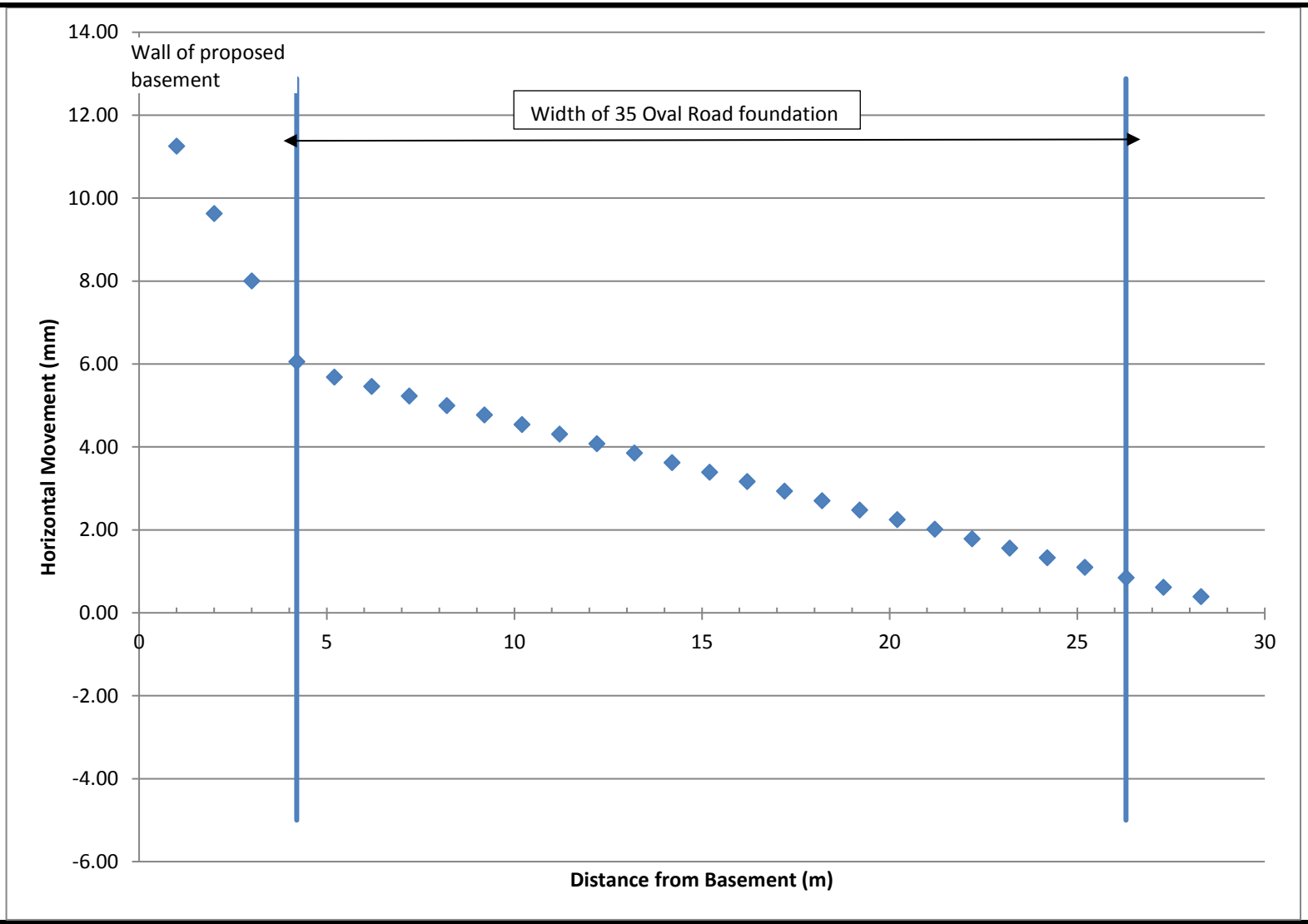
Rev. **0**



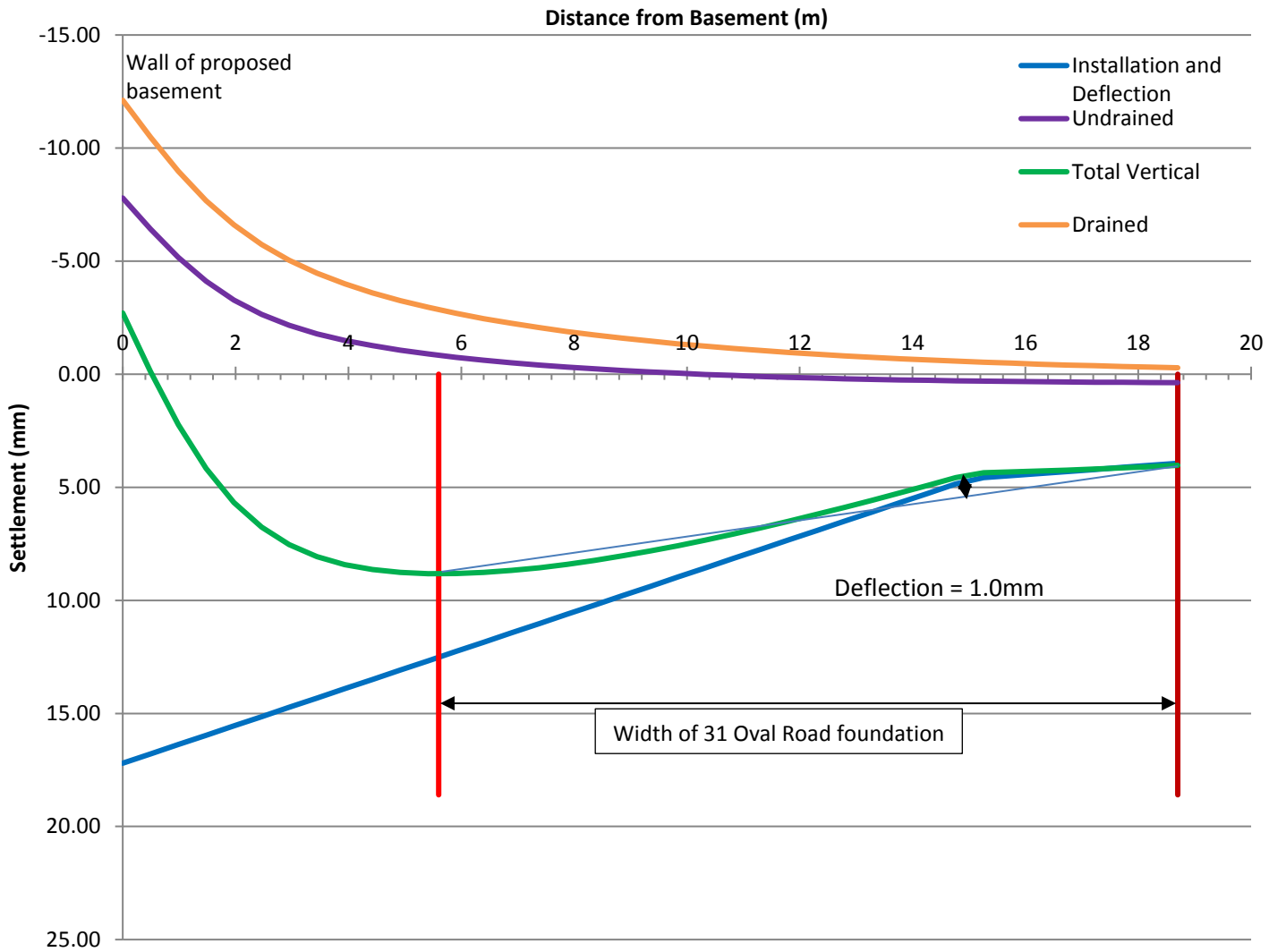
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Horizontal displacement profile – Section A – A' No. 31 Oval Road**	**Figure 7a**



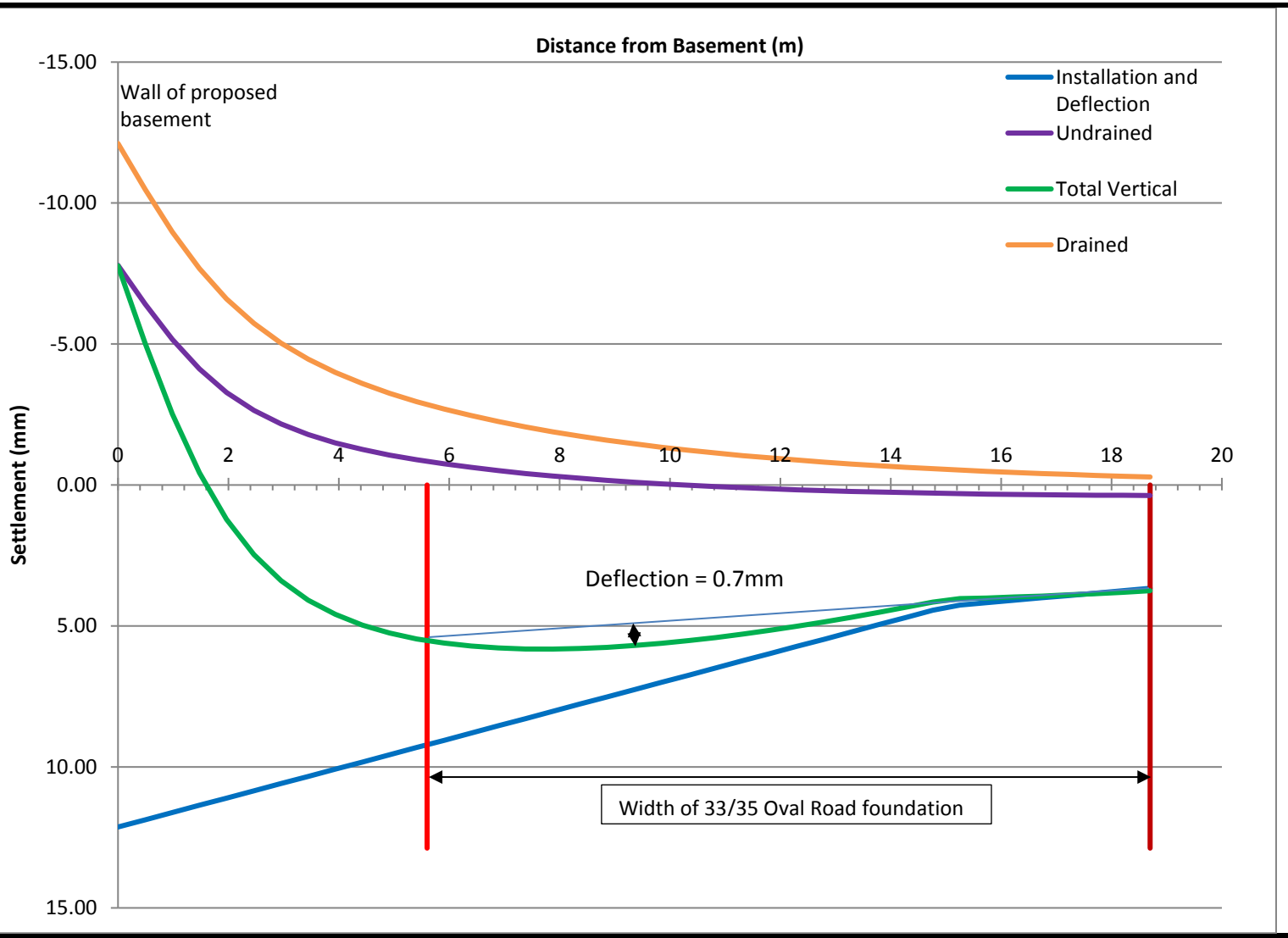
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Horizontal displacement profile – Section A – A' No. 33/35 Oval Road**	**Figure 7b**



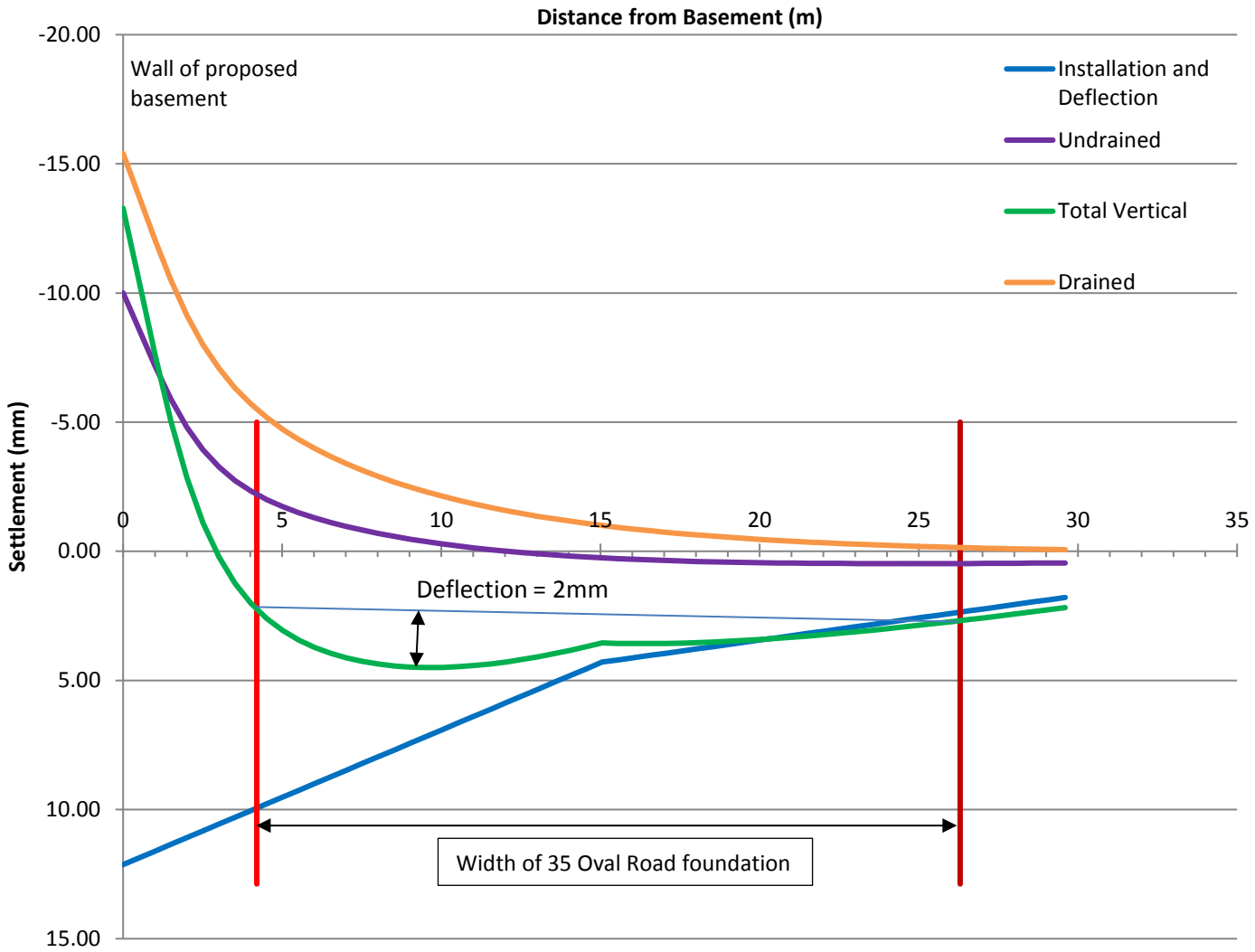
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Horizontal displacement profile – Section B – B' No. 35 Oval Road**	**Figure 7c**



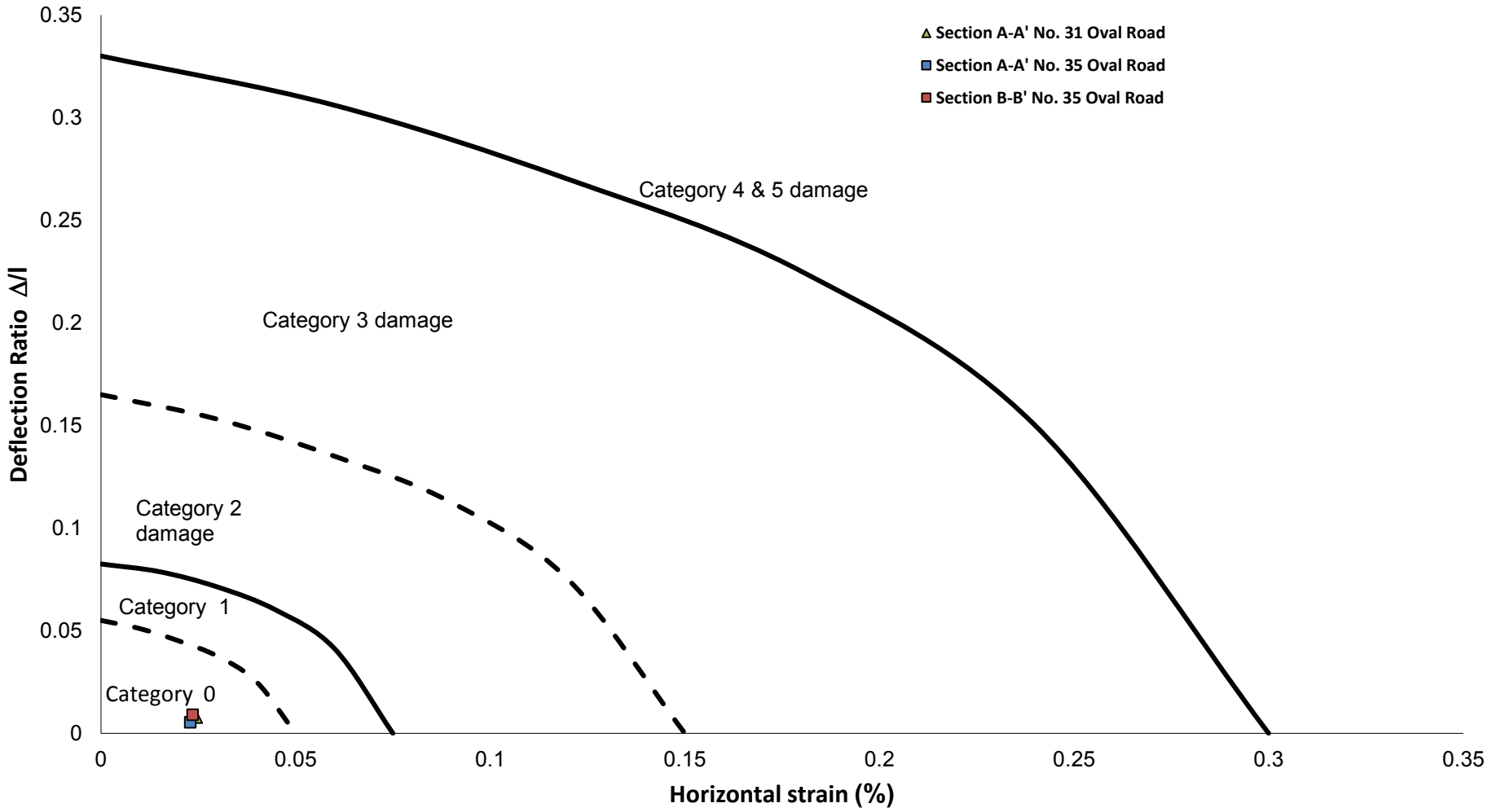
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Vertical displacement profile – Section A – A' No. 31 Oval Road**	**Figure 8a**



Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Vertical displacement profile – Section A – A' No. 33/35 Oval Road**	**Figure 8b**



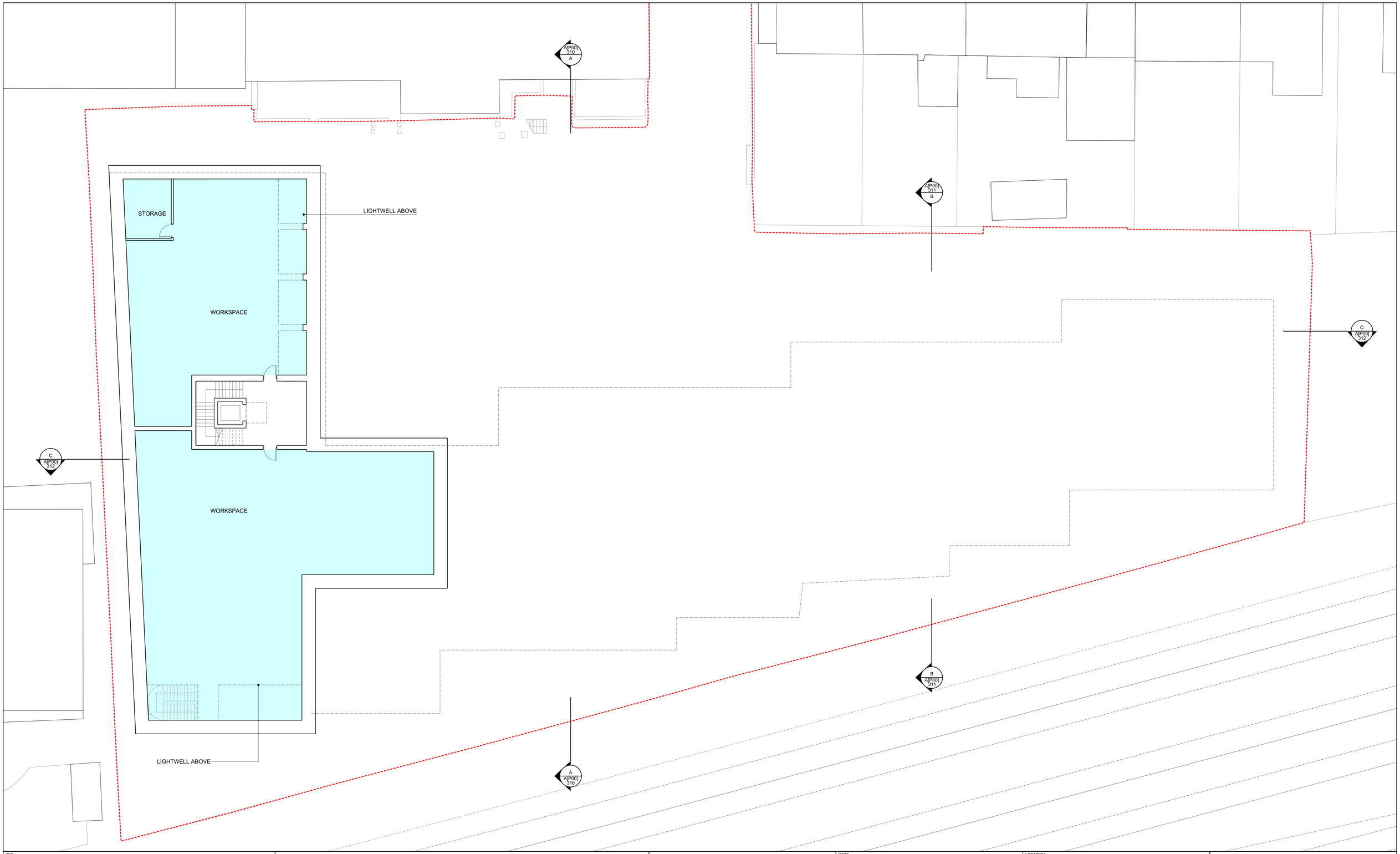
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **Vertical displacement profile – Section B – B' No. 35 Oval Road**	**Figure 8c**



Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title: **Building Interaction Chart**	**Figure 9**

APPENDIX A

Proposed development plan



KEY

- WORKSPACE
- 1B STUDIO
- 1B - 2 Persons
- 2B - 3 Persons
- 2B - 4 Persons
- 3B - 5-6 Persons

- APPLICATION SITE BOUNDARY
- SS SMOKE SHAFT
- AOV AUTOMATIC OPENING VENT
- PRIVATE AMENITY SPACE
- WHEELCHAIR ADAPTABLE UNIT

0 2 10

NOTE

When this drawing is issued in uncontrolled CAD format it will be accompanied by a PDF version and is issued to enable the recipient to prepare their own documents / models / drawings for which they are solely responsible.
The recipient should report all drawing errors, omissions and discrepancies to the architect. All dimensions should be checked on site by the contractor and such dimensions shall be the contractor's responsibility.

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- any scaling from this drawing other than by the local planning authority solely for the purposes of the planning application to which it relates

LOCATION

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ARCHITECTS Ltd
MORELANDS, 5-23 OLD STREET LONDON EC1V 9HL
TEL 020 7251 5261 FAX 020 7251 5123 WEB WWW.AHMM.CO.UK

job title
CENTRIC CLOSE

drawing title / location
PROPOSED BASEMENT PLAN

drawn by	checked	scale	status
SM	JR	1:125@A1; 1:250@A3	FOR APPROVAL

project	zone	source	classification	drawing no.	revision
16041		A	(P00)_100		P01

35 OVAL ROAD
33 OVAL ROAD
31 OVAL ROAD
29 OVAL ROAD
27 OVAL ROAD
25 OVAL ROAD
23 OVAL ROAD
21 OVAL ROAD
OVAL ROAD
RAILWAY

A[P00] 310 A
A[P00] 311 B
C A[P00] 312
A A[P00] 310
B A[P00] 311

SUB-STATION
WORKSPACE 01
374m2 total
WORKSPACE 02
551m2 total
WORKSPACE 03
107m2
WORKSPACE 04
107m2
LOBBY
FFL +32.20
34 m2
VISITOR CYCLE
2 no. sheffield stands (2 cycles resi, 2 cycles commercial)
VISITOR CYCLE
1 no. sheffield stand (2 cycles, commercial)
BIKE STORE
84 no. two tier
Josta or similar
RESI BINS
COMM. BINS
CORE A
LOBBY
PLANT ROOM
COMMERCIAL BIKE STORE
8 no. sheffield stands (16 cycles)
RESI BINS
COMM. BINS
BIKE STORE
42 no. two tier
Josta or similar
CORE B
LOBBY
1 2 3 4 5 6 7 8

B-L00-01
3B - 5P
90 m2
B-L00-02
3B - 4P
105 m2
B-L00-03
1B - 1P
45 m2
B-L00-04
1B - 2P
58 m2
B-L00-05
1B - 2P
63 m2
A-L00-28
2B - 3PWC
74 m2
A-L00-29
1B - 2P
50 m2

KEY

- WORKSPACE
- 1B STUDIO
- 1B - 2 Persons
- 2B - 3 Persons
- 2B - 4 Persons
- 3B - 5-6 Persons

- APPLICATION SITE BOUNDARY
- SS SMOKE SHAFT
- AOV AUTOMATIC OPENING VENT
- PRIVATE AMENITY SPACE
- WHEELCHAIR ADAPTABLE UNIT

0 2 10

REV	DATE	DESCRIPTION	DRN	CHK
P02	21.02.17	CAR PARKING PROVISION REDUCED CYCLE PARKING PROVISION UPDATED	JR	MW

NOTE

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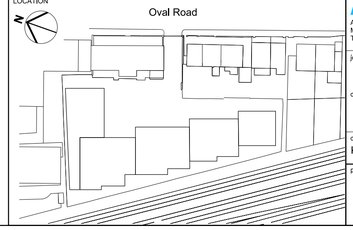
- any scalling from this drawing other than by the local planning authority solely for the purposes of the planning application to which it relates

LOCATION



ALLFORD HALL MONAGHAN MORRIS
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job title
CENTRIC CLOSE

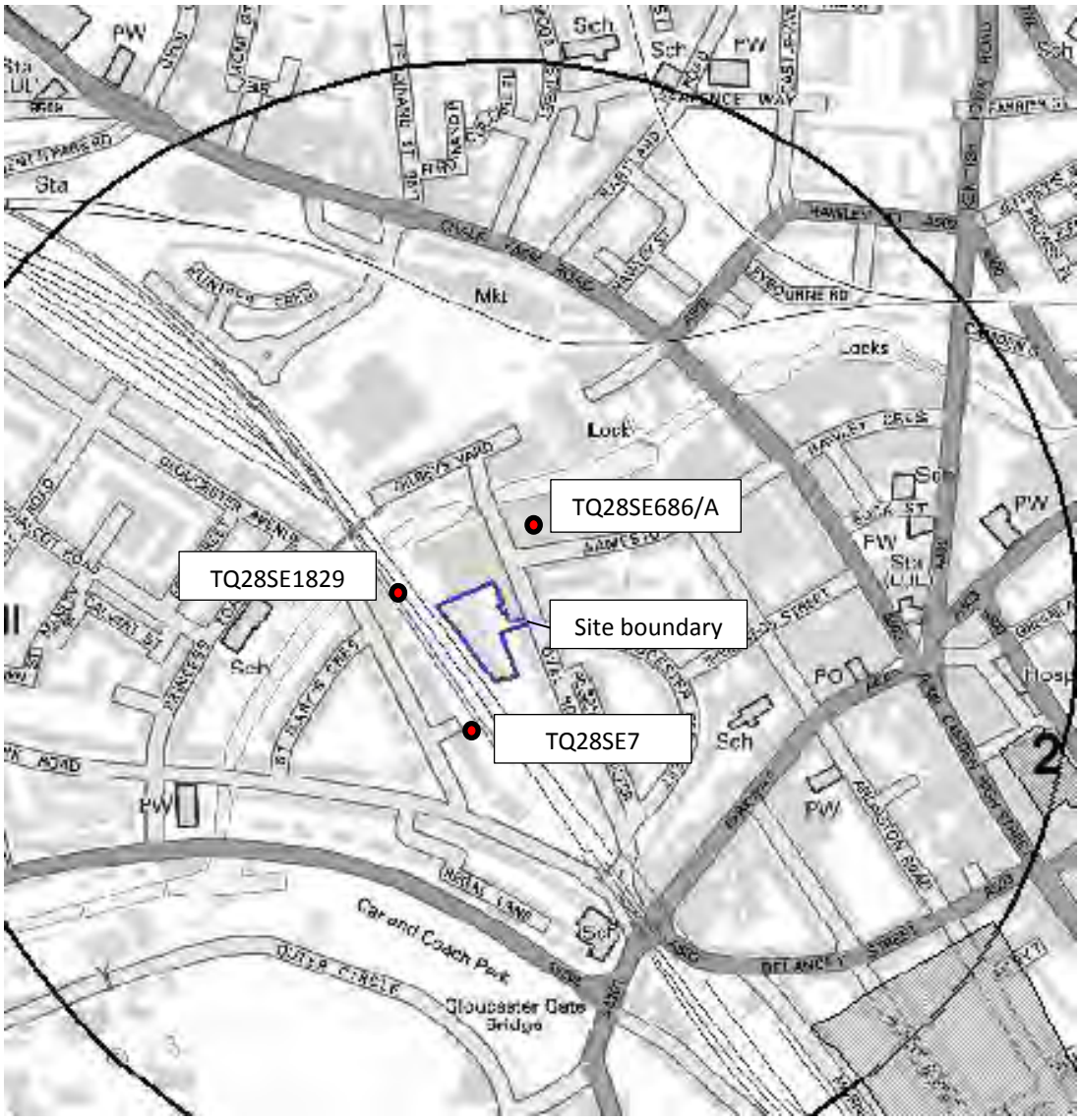
drawing title / location
PROPOSED L00 PLAN

drawn by	checked	scale	status
KP	JR	1:125@A1; 1:250@A3	FOR APPROVAL

project	zone	source	classification	drawing no.	revision
16041		A	(P00)_101		P02

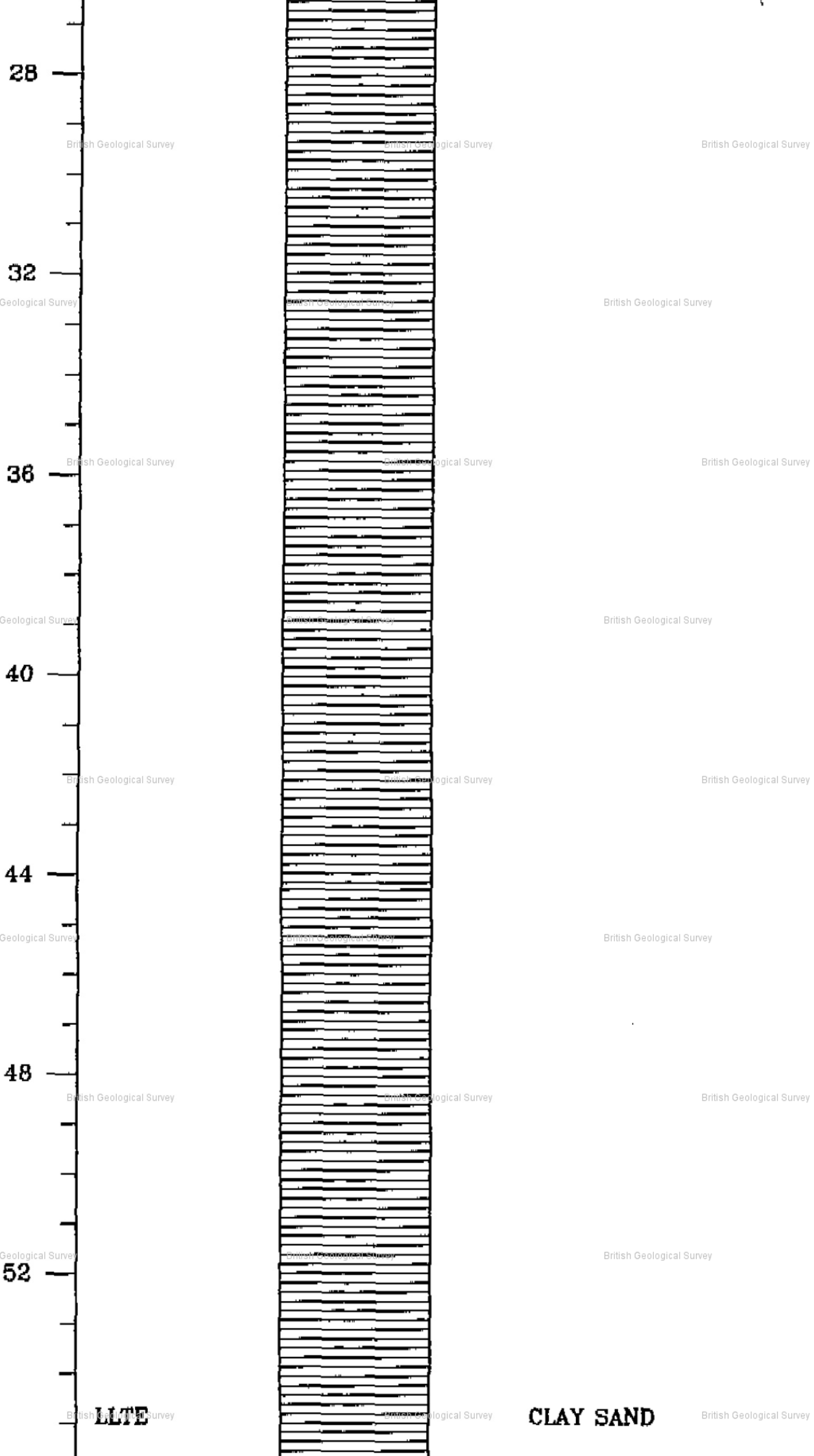
APPENDIX B

BGS borehole logs



(Not to scale)

Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804B**
CGL	Title **BGS borehole locations**	**Appendix B**


28
32
36
40
44
48
52
LLTE
CLAY SAND

15

TQ 28 SE / 686 A
c 2855. 8400

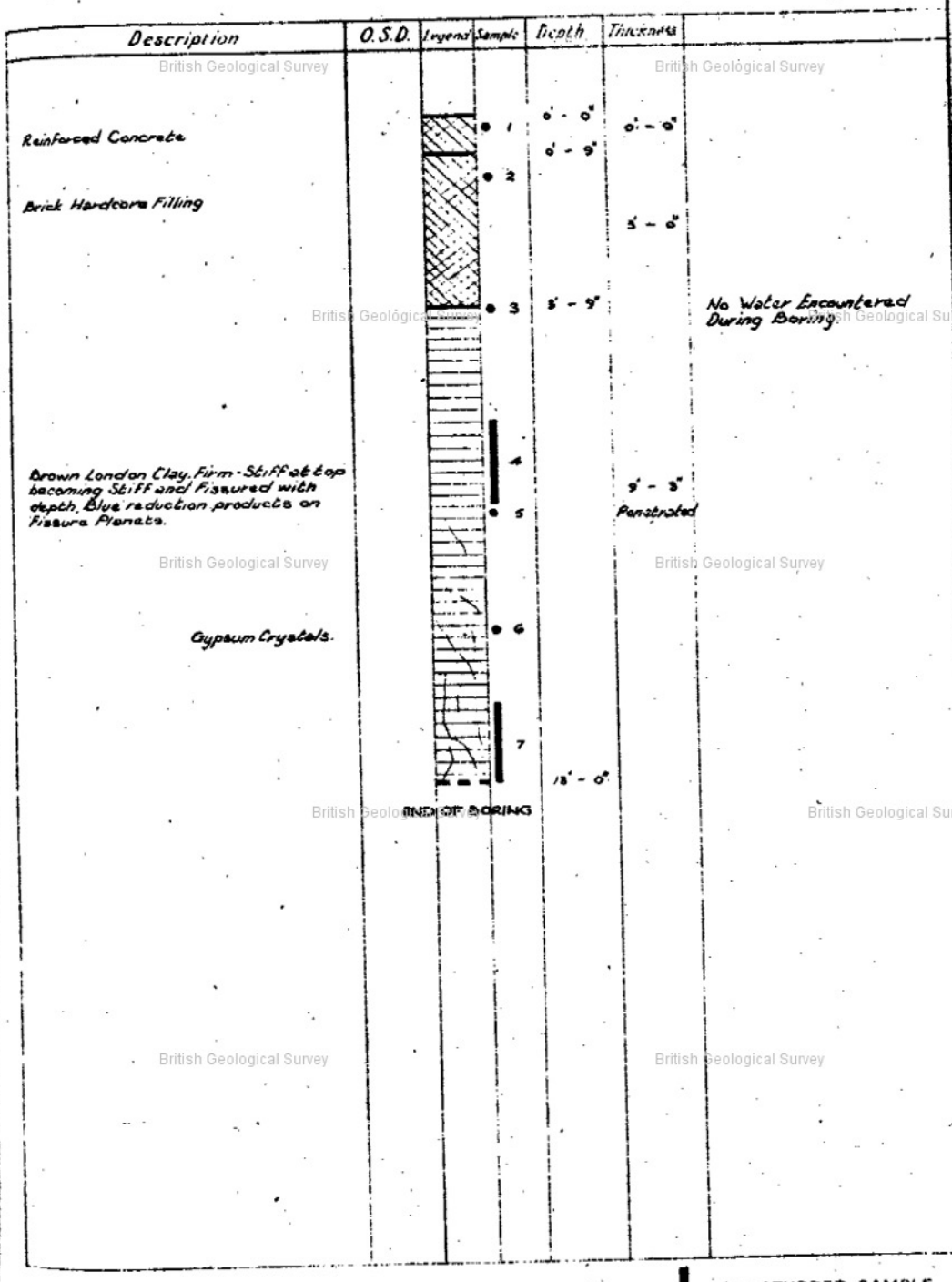
BOREHOLE LOG

LOCATION No 448 GILBEY'S WAREHOUSE, CAMDEN TOWN.

CARRIED OUT FOR MESSRS F.S SNOW & PARTNERS.

BOREHOLE No 1 DIAMETER: 6"

GROUND LEVEL: 1'-8" ABOVE BOREHOLE 2 DATUM DATE: 22-5-48



449

450

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Site	Trial Pit Number
CTRL GI DATA - Entire NDATA19 data set	TP3739

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		27.53	UR/LCE	Issue 1
	Location	**Dates**	**Engineer**	**Sheet**
	529844 E 183933 N	20/10/1995	RLE	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Loose; brown fine to coarse SAND and angular to subrounded; fine to coarse BRICK; CONCRETE and ROADSTONE GRAVEL.;(MADE GROUND) (STRATUM I);At 0.25m to 0.30m; layer of concrete cobbles.		
0.20	V2			27.23	0.30			
0.20	K1							
0.50	K3				(0.70)			
0.50	V4							
0.50	B5							
0.50	D6							
1.00	K9					Dense; black fine to coarse SAND and angular to rounded; fine to coarse ASH; BRICK; CONCRETE ROADSTONE and CLINKER GRAVEL. Rare fire bricks.;(MADE GROUND) (STRATUM II);		
1.00	V10			26.53	1.00			
1.00	B11							
1.00	D12				(0.70)	Firm; brown mottled grey CLAY with rare subangular to rounded; fine flint gravel.;(MADE GROUND) (STRATUM III);At 1.40m; concrete block.		
1.00	V8							
1.00	K7			25.83	1.70			
1.50	B13					Firm; brown mottled CLAY with some partings of light brown silt.;(LONDON CLAY - GRADE IV) (STRATUM IV)		▼1
1.50	D14		SLIGHT SEE(1) at 1.90m, rose to 1.90m in 20 mins.					
1.70	W21							
2.00	K15				(1.11)			
2.00	V16							
2.00	B17							
2.00	D18							
2.50	D20							
2.50	B19			24.72	2.81			
						Complete at 2.81m		

Plan

Remarks

1) Groundwater was encountered at 1.90m as a slight seepage; which rose to 1.70m in 30 minutes.;2) The sides of the trial pit were slightly unstable from 0.15m to 0.50m.;3) In situ tests for gas composition and water quality were carried out during trial pit excavation.;4) On completion; the trial pit was backfilled with arisings.

Scale (approx)	Logged By	Figure No.
1:50	JPH	

APPENDIX C

Exploratory hole records

WINDOW SAMPLE LOG

Project				HOLE No
Centric Close, Oval Road, Camden				**WS01**
Job No	Date	Ground Level (m)	Co-Ordinates (m)	
CG/18804A	10-05-16	32.47	E 528,528.4 N 183,895.9	
Client				Sheet
Fairview Ventures Limited				1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument /Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thick-ness)	DESCRIPTION	
				32.30		0.17	[TARMAC]	
				32.17		0.30	Loose light brown gravelly medium to coarse sand. Gravel is subangular to subrounded, fine to coarse of concrete and flint. [MADE GROUND]	
0.40	ES1			31.87		(0.30) 0.60	Loose dark brown slightly clayey gravelly fine to coarse sand. Gravel is angular to subrounded, fine to coarse of brick, concrete and tarmac. Occasional cobbles of brick. [MADE GROUND]	
0.80	PID	0.7						
1.00		N4					Soft light brown slightly gravelly sandy clay. Sand is fine to coarse. Gravel is subangular to rounded, fine to medium of brick, concrete and flint. [MADE GROUND]	
						(1.40)		
1.50	HSV	23						
1.50	PID	0.6						
1.60	D1			30.47		2.00		
2.00		N2					Loose dark brown fine sand. [MADE GROUND]	
				29.97		(0.50) 2.50		
				29.82		2.65	Soft dark orange brown slightly gravelly sandy clay. Sand is fine to coarse. Gravel is angular to subangular, fine to medium of brick and tarmac. [MADE GROUND]	
2.70	ES3							
2.80	PID	0.0				(0.42)		
3.00		N50/ 72 mm		29.40		3.07	Loose light grey sandy subangular to subrounded, fine to coarse gravel of concrete and brick. [MADE GROUND]	
							(Window sample terminated at 3.07m)	

Boring Progress and Water Observations

Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth

General Remarks

1. Borehole installed with 0.0 to 0.2mbgl cement surround, plain pipe and flush cover, 0.2 to 1.0mbgl plain pipe with bentonite surround, 1.0 to 3.0mbgl slotted pipe with gravel surround.
2. ES = environmental sample, D = disturbed sample, PID = photoionisation detection value (ppm), HSV = hand shear vane result (average of three readings), N = standard penetration test 'N' value.
3. No groundwater encountered.
4. Borehole terminated due to encountering an obstruction at 3.0mbgl.

Method/ Plant Used	Field Crew	Logged By	Checked By
Tracked window sample rig	Topdrill	FJC	SMK

WINDOW SAMPLE LOG

Project				HOLE No
Centric Close, Oval Road, Camden				**WS02**
Job No	Date	Ground Level (m)	Co-Ordinates (m)	
CG/18804A	10-05-16	33.36	E 528,523.7 N 183,883.1	
Client				Sheet
Fairview Ventures Limited				1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument /Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thick-ness)	DESCRIPTION	
				33.24		0.12	[TARMAC]	
				32.96		(0.28) 0.40	Concrete. 5mm Rebar noted at 0.07m and 0.15m, 15mm rebar noted at 0.2m. [CONCRETE]	
				32.86		0.50		
0.50	PID	0.4					Loose red brown gravelly slightly clayey sand. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of chert and brick. [MADE GROUND]	
0.60	ES4							
							Soft dark brown slightly gravelly slightly sandy clay. Sand is medium to coarse. Gravel is angular to subangular, fine to coarse of brick. Rare subangular to subrounded cobbles of brick. [MADE GROUND]	
1.20		N6						
1.50	PID	0.2				(2.20)		
1.60	D3							
1.80	D2							
2.00		N10						
2.30	ES6							
			1 1	30.66		2.70		
				30.36		(0.30) 3.00	Loose dark brown slightly silty slightly sandy subangular to subrounded, fine to coarse gravel of concrete. Sand is fine to coarse. [MADE GROUND]	
3.00		N7					2.70 - 2.75 Horizon of slightly silty fine to coarse sand.	
3.20	HSV	49				(0.40)	2.80 - 3.00 Very wet.	
3.30	D4			29.96		3.40	Soft to firm medium strength dark grey slightly silty CLAY. Rare rootlets throughout and occasional specks of decomposed organic matter. [MADE GROUND - RELICT TOPSOIL]	
							Firm to stiff mottled grey and brown CLAY. [LONDON CLAY FORMATION]	
4.00		N12						
4.20	D5					(2.05)		
							4.60 - 3.00 Becoming grey with occasional brown mottling.	
4.70	D6						4.70 - 3.00 10mm horizon of orange brown fine sand.	
5.00		N21						
				27.91		5.45		
							(Window sample terminated at 5.45m)	

Boring Progress and Water Observations

Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth
	2.8				2.8

General Remarks

1. Borehole installed with 0.0 to 0.2mbgl cement surround, plain pipe and flush cover, 0.2 to 1.0mbgl plain pipe with bentonite surround, 1.0 to 5.0mbgl slotted pipe with gravel surround.
2. ES = environmental sample, D = disturbed sample, PID = photoionisation detection value (ppm), HSV = hand shear vane result (average of three readings), N = standard penetration test 'N' value.
3. Groundwater encountered between 2.8 to 3.0mbgl.

Method/ Plant Used	Field Crew	Logged By	Checked By
Tracked window sample rig	Topdrill	FJC	SMK

WINDOW SAMPLE LOG

Project				HOLE No
Centric Close, Oval Road, Camden				WS03
Job No	Date	Ground Level (m)	Co-Ordinates (m)	
CG/18804A	10-05-16	32.72	E 528,533.4 N 183,904.7	
Client				Sheet
Fairview Ventures Limited				1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument /Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thick-ness)	DESCRIPTION	
				32.62		0.10	[TARMAC]	
				32.47		0.25	Loose light brown slightly gravelly fine to coarse sand. Gravel is angular to subrounded, fine to coarse of concrete, brick and rare tarmac. [MADE GROUND]	
0.40	ES7					(0.45)		
0.50	PID	1.8		32.02		0.70	Loose dark reddish brown gravelly fine to coarse sand. Gravel is angular to subrounded, fine to coarse of brick. Occasional subrounded cobbles of brick. [MADE GROUND]	
						(0.50)	Light brown gravelly fine to coarse sand. Gravel is angular to subangular, fine to coarse of brick, concrete, slate and rare flint. Rare subrounded cobbles of sandstone. [MADE GROUND]	
1.10	PID	0.9		31.52		1.20		
1.20		N13					Loose light brown angular to subangular, fine to coarse gravel and cobbles of brick and rare concrete and slate. [MADE GROUND]	
						(1.10)		
2.00		N8						
				30.42		2.30		
							Soft to firm medium strength dark grey slightly sandy silty CLAY. Frequent black specks and rare rootlets throughout. [MADE GROUND - RELICT TOPSOIL]	
2.70	D7							
2.70	HSV	53				(1.30)		
3.00		N8						
3.30	D8							
3.50	HSV	41		29.12		3.60		
3.70	D9						Firm to stiff medium strength mottled grey brown CLAY. Rare dark brown 5mm specks and rootlets. [LONDON CLAY FORMATION]	
3.80	HSV	51						
4.00		N13					4.00 - 3.00 Becoming grey with occasional brown mottling.	
4.30	D10						4.20 - 5.00 Occasional clusters of fine to coarse selenite.	
						(1.85)		
4.70	D11							
5.00		N11						
				27.27		5.45		
							(Window sample terminated at 5.45m)	

Boring Progress and Water Observations

Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth

General Remarks

1. Borehole installed with 0.0 to 0.2mbgl cement surround, plain pipe and flush cover, 0.2 to 1.0mbgl plain pipe with bentonite surround, 1.0 to 5.0mbgl slotted pipe with gravel surround.
2. ES = environmental sample, D = disturbed sample, PID = photoionisation detection value (ppm), HSV = hand shear vane result (average of three readings), N = standard penetration test 'N' value.
3. No groundwater encountered.

Method/ Plant Used	Field Crew	Logged By	Checked By
Tracked window sample rig	Topdrill	FJC	SMK

WINDOW SAMPLE LOG

Project				HOLE No
Centric Close, Oval Road, Camden				**WS04**
Job No	Date	Ground Level (m)	Co-Ordinates (m)	
CG/18804A	10-05-16	32.43	E 528,517.9 N 183,908.5	
Client				Sheet
Fairview Ventures Limited				1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument /Backfill
Depth (m)	Type No	Test Result (N/kPa/ppm)		Reduced Level	Legend	Depth (m) (Thick-ness)	DESCRIPTION	
				32.13		(0.30) 0.30	Concrete. 8mm rebar noted at 0.08m. [CONCRETE]	
				31.73		(0.40) 0.70	Loose light brown clayey gravelly fine to coarse sand. Gravel is subangular to rounded, fine to coarse of chert. [MADE GROUND]	
0.80	PID	1.0					Loose dark brown slightly clayey sandy subangular to subrounded, fine to coarse gravel of chert, brick, concrete and slate. Rare subrounded cobbles of brick and concrete. [MADE GROUND]	
1.00		N1		30.93		(0.80) 1.50		
1.50	PID	0.6					No Recovery due to concrete cobble in sampler barrel.	
				30.43		(0.50) 2.00		
2.00		N26		30.28		2.15	Loose light grey slightly gravelly fine to coarse sand. Gravel is angular to subrounded, fine to medium of concrete. [MADE GROUND]	
2.30	ES9						Firm dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse of brick, concrete and decomposed organic matter. [MADE GROUND]	
				29.43		(0.85) 3.00		
3.00		N11					Firm to stiff mottled dark brown and grey CLAY. Rare decomposed and fresh rootlets. [LONDON CLAY]	
3.40	D12							
3.50	HSV	51				(1.00)		
3.90	D13			28.43		4.00		
4.00		N17					*(Window sample terminated at 4.45m)*	

Boring Progress and Water Observations

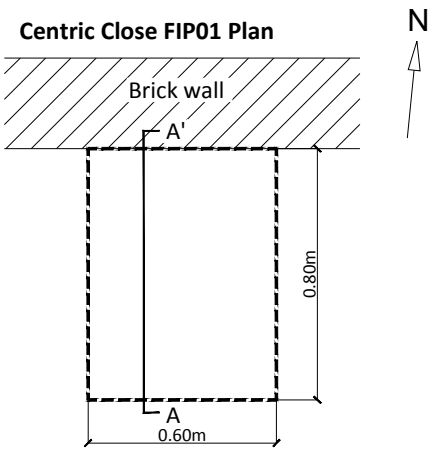
Date	Strike depth	Casing depth	Comment	Time measured	Standing Depth

General Remarks

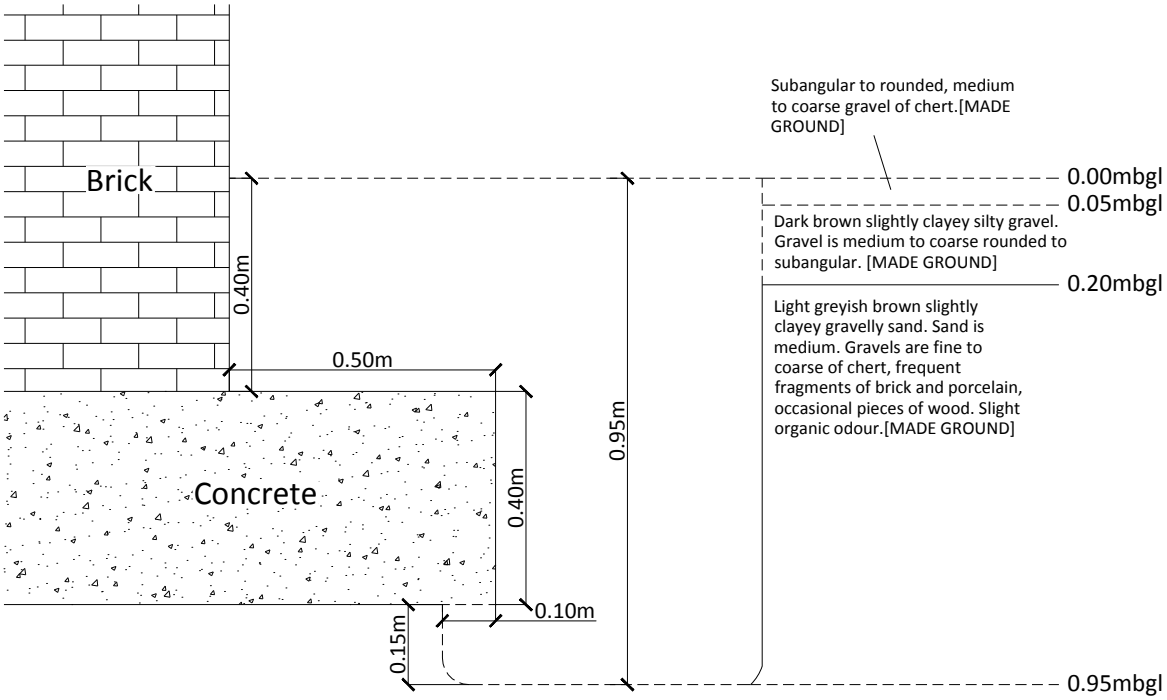
1. Borehole backfilled with arisings upon completion and concrete hardstanding reinstated.
2. ES = environmental sample, D = disturbed sample, PID = photoionisation detection value (ppm), HSV = hand shear vane result (average of three readings), N = standard penetration test 'N' value.
3. No groundwater encountered.

Method/ Plant Used	Field Crew	Logged By	Checked By
Tracked window sample rig	Topdrill	FJC	SMK

Centric Close FIP01 Plan

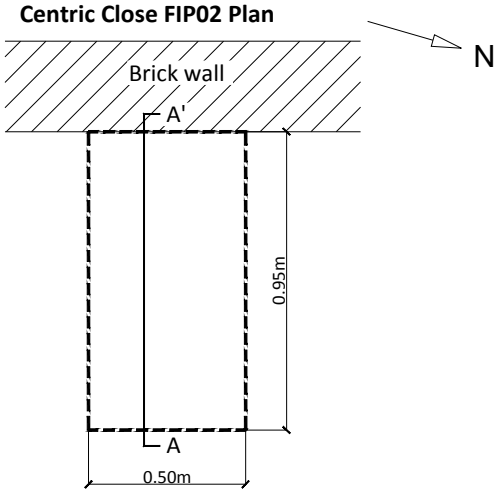


Centric Close
FIP01
Section A-A'

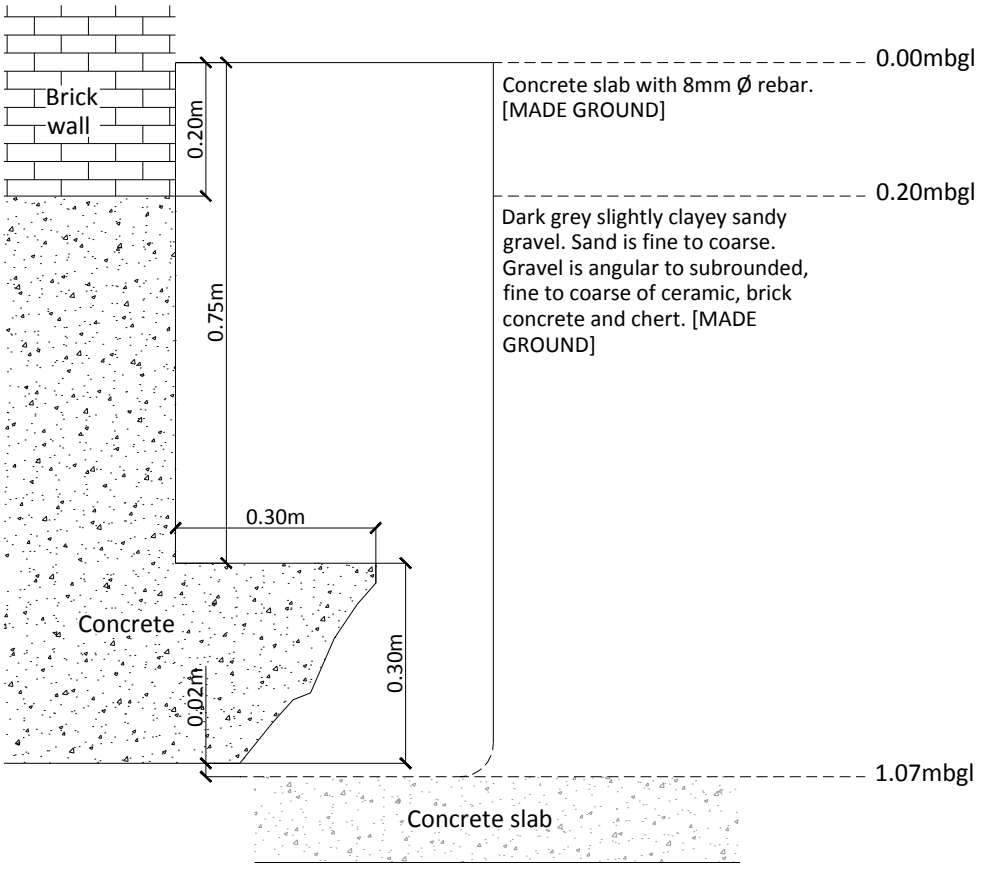


Client **Fairview Ventures Limited**	Project **Centric Close, Oval Road, Camden**	Job No **CG/18804**
CGL	Title **Foundation Inspection Pit FIP01 Plan & Section**	Drawn by: TSB Checked by: SMK Approved by: DWM **Appendix E**

Centric Close FIP02 Plan



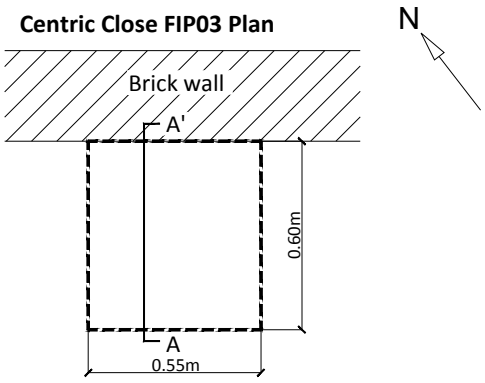
Centric Close
FIP02
Section A-A'



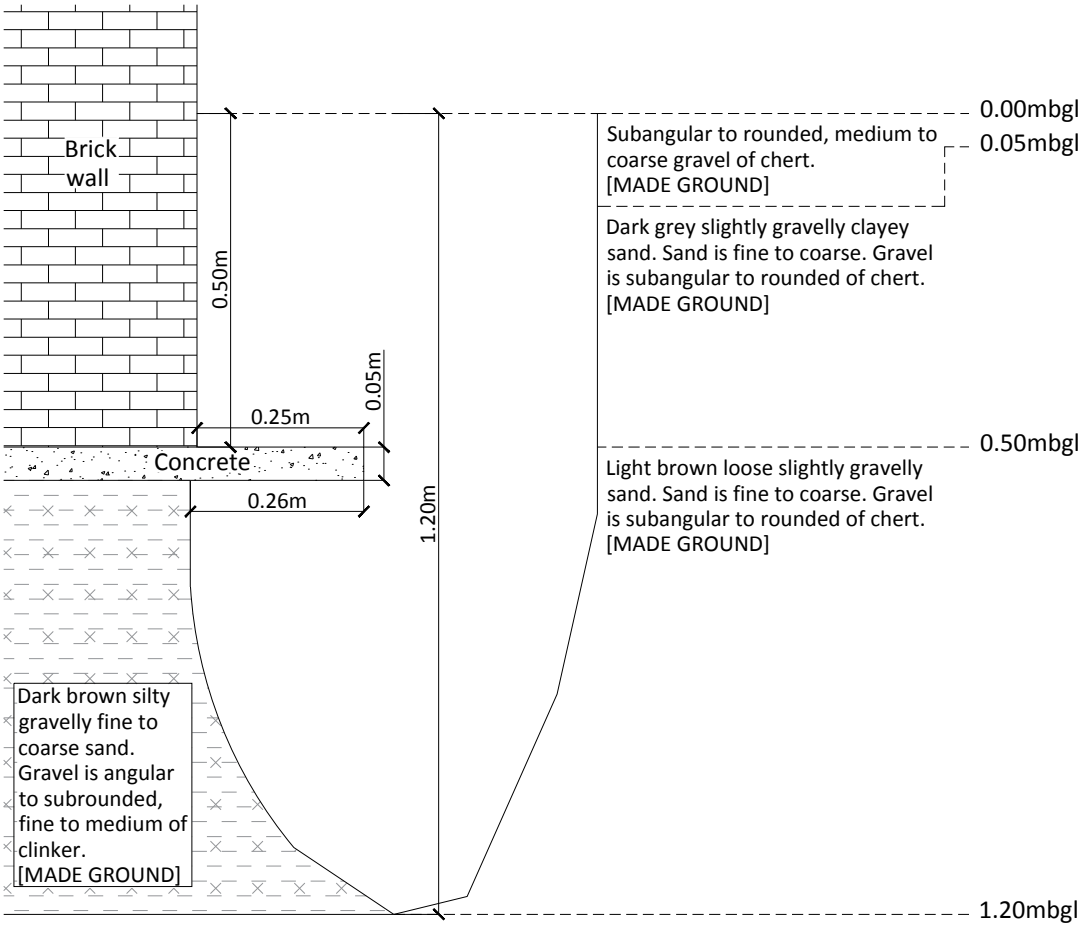
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804**

	Title		
CGL	**Foundation Inspection Pit FIP02 Plan & Section**	Drawn by	TSB
		Checked by	SMK
		Approved by	DWM
		Appendix E	

Centric Close FIP03 Plan



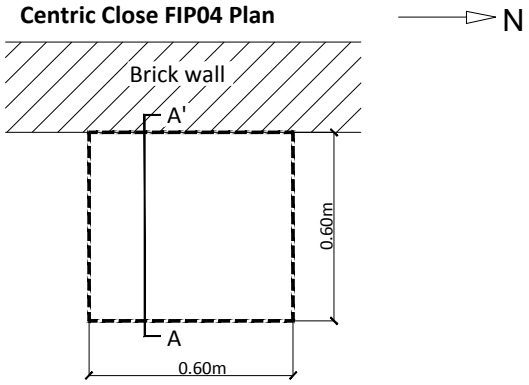
Centric Close FIP03 Section A-A'



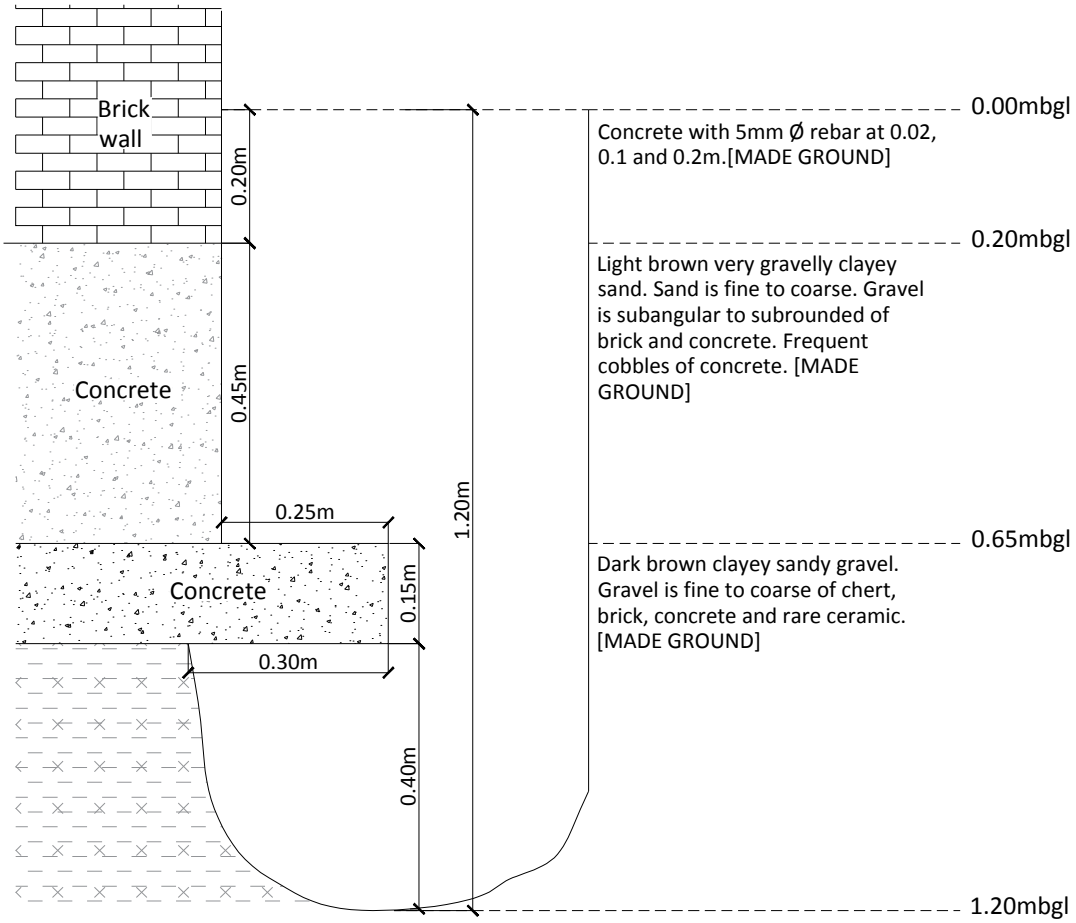
Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804**

	Title		
CGL	**Foundation Inspection Pit FIP03 Plan & Section**	Drawn by	TSB
		Checked by	SMK
		Approved by	DWM
		Appendix E	

Centric Close FIP04 Plan



Centric Close FIP04 Section A-A'



Client	Project	Job No
Fairview Ventures Limited	**Centric Close, Oval Road, Camden**	**CG/18804**

Title		
Foundation Inspection Pit FIP04 Plan & Section	Drawn by	TSB
	Checked by	SMK
	Approved by	DWM
	Appendix E	