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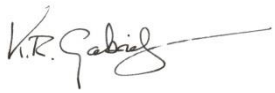
Independent Assessment of Basement Excavation Justification for Planning Application 2014/3668/P

Client:	London Borough of Camden
Site:	31 Briardale Gardens London NW3 7PN
CCS Ref:	BIA/4777 Revision 1
Dated:	April 2015

Report Status: **FINAL**		
Role	**By**	**Signature**
Lead author:	Keith Gabriel MSc DIC CGeol FGS UK Registered Ground Engineering Adviser	
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Foreword

This report has been prepared in accordance with the scope and terms agreed with the Client, and the resources available, using all reasonable professional skill and care. The report is for the exclusive use of the Client and **London Borough of Camden** and shall not be relied upon by any third party without explicit written agreement from Chelmer Site Investigation Laboratories Ltd.

This report is specific to the proposed site use or development, as appropriate, and as described in the report; Chelmer Site Investigation Laboratories Ltd accept no liability for any use of the report or its contents for any purpose other than the development or proposed site use described herein.

This assessment has involved consideration, using normal professional skill and care, of the findings of ground investigation data obtained from the Client and other sources. Ground investigations involve sampling a very small proportion of the ground of interest as a result of which it is inevitable that variations in ground conditions, including groundwater, will remain unrecorded around and between the exploratory hole locations; groundwater levels/pressures will also vary seasonally and with other man-induced influences; no liability can be accepted for any adverse consequences of such variations.

This report must be read in its entirety in order to obtain a full understanding of our recommendations and conclusions.

CONTENTS

1.0 INTRODUCTION

1.1 This second independent assessment was commissioned by the London Borough of Camden (LBC) and concerns the revised and new documents submitted in relation to planning application 2014/3668/P for enlargement of the existing basement beneath No.31 Briardale Gardens, London, NW3 7PN.

1.2 The application describes the proposed works as "*Proposed single storey rear extension and enlargement of existing basement.*". The development description provided on LBC's Planning website states: "*Excavation to provide basement level to existing dwelling, erection of single storey ground floor rear extension, alterations and additions to existing window openings, and installation of roof lights.*".

1.3 The scope for this second assessment remains as set out in LBC's letter of enquiry dated 30th July 2014, which is to provide:

1) "an audit of the submission documents for compliance with the Basement Impact Assessment";
2) "a view on the technical sufficiency of the work carried out";
3) "assessment of the completeness of the submission";

all in relation primarily to compliance with Camden's LDF Development Policy DP27 and the Basement Impact Assessment requirements as set out in LBC's guidance document CPG4 'Basements and Lightwells' (2013) and the associated 'Camden, geological, hydrogeological and hydrological study – Guidance for subterranean development'' (Camden GHHS, Arup, November 2010).

1.4 Six specific requests were included within the scope; these are addressed in the Conclusions to this report. The final two (Nos 5 and 6) also included additions to the three aspects of the scope listed above; they were:

5. comment on whether the critiques submitted by the neighbours and local Society "raise any reasonable concerns about the technical content or considerations of the submission which should be addressed by the applicant by way of further submission, *prior* to planning permission being granted".
6. "Raise any relevant and reasonable considerations in respect of the structural integrity or condition of the road and the neighbouring properties which may be unknown or unaccounted for by the submission or which would benefit from particular construction measures or methodologies in respect of the development *following* a grant of permission for the development."

1.5 The professional organisations involved with the proposed basement are:

- Martin Blake Associates Ltd — Architect
- Mann Williams — Structural Engineers
- Site Analytical Services Ltd — Site investigation contractor
- Advanced Tree Services — Arboricultural Consultant

1.6 This assessment has been prepared by Keith Gabriel, a Chartered Geologist with an MSc degree in Engineering Geology and Mike Summersgill, a Chartered Civil Engineer and Chartered Water and Environmental Manager with an MSc degree in Soil Mechanics. Both authors have over 30 years' experience in ground engineering and have previously undertaken assessments of basements in several London Boroughs.

1.7 Comments on the technical aspects of each of the main submission documents and the technical reports submitted by objectors are presented in Section 2, followed in Section 3 by a comparison against LBC's specific requirements as identified in the scope for this assessment.

1.8 Drawings of the existing property and the proposed scheme were prepared by Martin Blake Associates Ltd. The following drawings were obtained from the LBC Planning website:

- Drg 364-S-00 Location and Block Plan
- Drg 364-S-01 Survey – Basement and Ground Floor Plans
- Drg 364-S-02 Survey – First Floor and Second Floor Plans
- Drg 364-S-03 rev.A Survey – Elevations
- Drg 364-S-04 rev.A Survey – Sections A-A and B-B
- Drg 364-P-01 rev.C Proposed Lower Ground Floor and Ground Floor Plans
- Drg 364-P-02 rev.A Proposed First Floor and Second Floor Plans
- Drg 364-P-03 rev.C Proposed Elevations
- Drg 364-P-04 rev.B Proposed Sections A-A and B-B

These architectural drawings have been referred to primarily for factual information purposes. The revisions since our previous assessment are generally minor, though they include correction of the existing ground levels below the house and a simplified geometry of the reinforced concrete basement structure (which has no impact on the internal geometry).

1.9 Instructions to prepare this second Independent Assessment were received by email on 23rd February 2014.

2.0 CONSIDERATION OF DOCUMENTS SUBMITTED

2.1 Design and Access Statement

2.1.1 A revised and expanded Design and Access Statement has been prepared by Martin Blake Associates (MBA). This document has been referred to for factual details of the proposed scheme. The application now identifies separately:

- enlargement of the existing basement, for which the applicant considers that permitted development rights should apply, and
- the single storey rear extension and front lightwell to the basement.

2.1.2 The factual aspects of this Design and Access Statement are taken 'as read', since a critique of the architectural aspects of the scheme is beyond the scope of this assessment. No comment is expressed here on any opinions in the Design & Access Statement.

2.2 Basement Impact Assessment and associated Reports

2.2.1 The original Basement Impact Assessment (BIA) was prepared by Mann Williams, Consulting Civil and Structural Engineers (project No.7060, June 2014) and included a 'Structural Outline Method Statement'. This has been replaced by four completely new reports:

- New BIA by Site Analytical Services Ltd (SAS), with two supporting reports:
  - 'Phase 1 Preliminary Risk Assessment' (a desk study) by SAS,
  - 'Report on a Ground Investigation' by SAS;
- 'Proposed Basement Structural Design and Drainage' report by Mann Williams which includes an outline method statement in Section 5.0 'Temporary Works and Phasing'.

2.2.2 Each of these reports is considered separately below, though the ground investigation report is considered in conjunction with Stage 3 of the BIA report.

2.3 Phase 1 Preliminary Risk Assessment

2.3.1 This desk study identified the site's geology, as mapped by the British Geological Survey (BGS), and found that the historic maps showed this part of Briardale Gardens to have been built over a former brickfield. This is a significant finding which illustrates why desk studies are important. Other than those items, the scope of this report is almost entirely geoenvironmental so is concerned with potential contamination of the site and its surrounding area. No consideration was given to potential geotechnical hazards other than stating the BGS risk ratings for various ground stability hazards.

2.3.2 In Section 4.5 the report states that "There is no significant underlying groundwater at the site". This is simply wrong and potentially dangerous if, for instance, hydraulic uplift forces were to be ignored in the basement design analyses.

2.4 Ground Investigation

2.4.1 The ground investigation comprised two 10.0-15.0m deep boreholes, with groundwater monitoring using standpipes in both boreholes, and re-excavation of the previous trial pits to obtain more detailed soil descriptions.

2.4.2 The investigation recorded Made Ground to depths of 1.40m (BH2, front garden) to 3.20m (BH1, rear garden) underlain by clays interpreted by SAS as weathered London Clay. The Made Ground in the boreholes comprised soft clays with various inclusions and probably represented backfill to the former brickfield workings. As a result, the further trial excavations recommended in SAS's ground investigation report (SAS report paragraph 5.7) should be located so as to assess whether the front and rear of this house (where the cellar is absent) is founded on Made Ground; if possible, these excavations should be located either alongside the party wall or alongside the front and rear walls immediately next to the party wall line. Party Wall Act approval might be required for these trial excavations. The Made Ground in the re-logged trial pits was described using various non-standard descriptions ("soily clay", "clay and soil" and "clay and earth") which is not helpful, and leaves some uncertainty about the materials present.

2.4.3 The in-situ natural clays were described on the borehole logs as "…brown slightly silty slightly sandy CLAY…" becoming "…dark grey/blue silty, sandy CLAY…" below depths of 7.40m/7.50m, whereas the summary in the BIA (also by SAS) described them as "…silty CLAY with occasional partings of silty fine sand…". This inconsistency shows a disappointing lack of attention to detail, on a site where understanding the geology is particularly important. SAS must be asked to confirm which descriptions are correct. The general lack of groundwater entries from these strata (one entry at 11.2m in BH1; none in BH2) suggests that the borehole logs are likely to be correct, because any significant horizons of granular soils would have been expected to give rise to water entries into the boreholes. We would also note that 12+ m of sandy/slightly sandy CLAYS is more typical of the Claygate Member than of the London Clay Formation (even Unit D), although the level above Ordnance Datum is lower than usually associated with the Claygate Member, so faulting would be implicated if this interpretation is correct.

2.4.4 Groundwater was encountered to within 2.06m (BH2) to 2.63m (BH1) of the ground surface. These readings were taken at the start of the rising head permeability tests, and are slightly higher (closer to surface) than the values quoted in the report text. The report notes that "Groundwater was not encountered during the re-excavation of the trial pits" in the existing basement, yet omits to note that groundwater was recorded in two of these pits when first dug by MBA, with a standing level at 0.5m below floor level in one pit and seepages in another.

2.4.5 An allowable net bearing pressure for strip footings of "approximately 225kN/m^2 at 3.0m depth" was proposed for design purposes. Conventional bearing capacity theory indicates that settlements of up to 25mm could occur where the bearing pressures applied are equal to the allowable bearing capacity. While 25mm of settlement is not (usually) a problem for a detached structure, use of a lower bearing pressure would be more appropriate in this instance, in order to reduce the potential differential settlement relative to the adjoining No.29.

2.4.6 A coefficient of active earth pressure, K_A = 0.47 was suggested for design of the permanent basement retaining walls in the London Clay. If high stiffness ground support systems are used for both the excavations and the temporary and permanent support of the basement's retaining walls, this K_A value would be inappropriately low, leading to under-design of the retaining wall. For over-consolidated London Clay, the in-situ lateral earth pressure 'at rest', K_0, can be up to approximately 3.0 and varies with depth. Design values are likely to be somewhat lower, depending on the stress history of the site and the degree to which the ground alongside the excavation is allowed to relax.

2.4.7 Use of a fully suspended "ground slab" was recommended.

2.5 Basement Impact Assessment (BIA)

2.5.1 The new BIA was issued in December 2014, so it has been assessed against the revised (September 2013) version of CPG4.

BIA - Qualifications

2.5.2 The BIA report was prepared by a sole signatory who held only the MCIWEM qualification. This is not necessarily a Chartered status qualification, so may not comply with the qualification requirements set out in CPG4 (in paragraph 2.11). The report was apparently prepared "in conjunction with" a Chartered Geologist and Chartered Engineer. No evidence has been provided as to whether these supporting authors comply with the following requirements in CPG4:

For Mike Brice:

- the subterranean (groundwater) flow assessment should be undertaken by a Hydrogeologist with Chartered Geologist (CGeol) qualification;

For Darren Jones, no evidence has been provided to show that his expertise covers the following requirements in CPG4 for Chartered Engineers:

- "*specialising in flood risk management and surface water drainage*"; AND
- "*specialising in ground engineering*"; OR
- for Chartered MIStructE's "*with some proof of expertise in engineering geology*".

The supporting authors should be asked to identify their areas of expertise as relevant to the requirements of CPG4 and to sign off the relevant parts of the report, once revised, if they feel able to do so.

2.5.3 A ground movement assessment report by Applied Geotechnical Engineering (AGE) was appended to the BIA. The author was not identified, though was probably Mike Brice, Chartered Geologist, who was named in the BIA. The above requirements regarding authorship apply equally to this ground movement assessment.

BIA Stage 1 – Screening:

2.5.4 The Stage 1 Screening responses to the questions identified in CPG4 and the Camden GHHS (Arup 2010) were presented in Section 2.6 of SAS' BIA report. A comment (justification) was given alongside every answer, and the responses are generally more appropriate than in the previous BIA, although a few issues do remain. The questions for which either the response or the justification was considered to be inappropriate, and questions answered "Yes" or "Unknown" which were not carried forward to the Scoping stage, are identified and explained below:

Subterranean (Groundwater) Flow Screening:

2.5.5 ***Q1a:*** *Is the site located directly above an aquifer?* Answered *"No".*

Comment: The clays beneath the site were identified as London Clay, as mapped by the BGS, which SAS correctly noted is classified as an 'unproductive stratum'. However, the strata descriptions on SAS's borehole logs suggest that the strata were possibly from the Claygate Member. No.31 is mapped within the Secondary (A) Bedrock Aquifer associated with the Claygate Member (see Figure 8 in the Camden GHHS, Arup 2010) so, even if the strata were considered to be London Clay, this question should have been answered 'Yes' (as it was in Mann Williams' previous BIA), and an explanation sought for the apparent inconsistency between the aquifer classification and the mapped London Clay (viz: the location of the Claygate-London Clay boundary is uncertain and the upper part of the London Clay (Unit D) contains several silt/sand horizons similar to those in the Claygate Member).

2.5.6 ***Q6:*** *Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line? Answered "Unknown".*

Comment: The answer given is correct, but this issue was not included in the list of items to be carried forward into the Scoping phase as it should have been.

Stability Screening:

2.5.7 ***Q5:*** *Is London Clay the shallowest stratum on the site? Answered "No".*

Comment: The presence of Made Ground above the natural strata is not relevant in this context, so this question should have been answered 'Yes' (as it was in Mann Williams' previous BIA) for consistency with the stated geology or 'Unknown' if the uncertainty regarding the location of the Claygate Member-London Clay boundary was appreciated.

2.5.8 ***Q14:*** *Is the site over or within the exclusion zone of any tunnels, eg railway lines? Answered "No".*

Comment: SAS contacted London Underground, Network Rail and Crossrail, so considered only railway tunnels. Thus, this question should have been answered 'Unknown'. A separate services search has been undertaken by Mann Williams (see their 'Proposed Basement Structural Design and Drainage' document) which confirmed that the only adopted services beneath the property was the sewer at the rear end of the garden. (NB: this is a combined sewer, not a foul sewer as stated by Mann Williams).

BIA Stage 2 – Scoping:

2.5.9 Unusually, the Scoping which forms Stage 2 of the BIA process has been combined in SAS's BIA report with the Impact Assessment which forms Stage 4 of the process. They are reviewed together in paragraphs 2.2.20 to 2.2.32 below.

BIA Stage 3 – Ground Investigation:

2.5.10 Section 3.0 of SAS' BIA report summarises the findings from the ground investigation, which forms Stage 3 of the BIA process, as presented in their separate 'Report on a Ground Investigation'.

"Scoping Assessments" (Stages 2 and 4):

2.5.11 Sections 4.0, 5.0 and 6.0 of the BIA provide "Scoping Assessments" for the three categories identified in CPG4; these combine both the Scoping (Stage 2) and the Impact Assessment (Stage 4). Each addresses the general issues identified in the Screening, rather than responding to the specific questions raised in the Screening. Each is considered in turn below.

Subterranean (Groundwater) Flow "Scoping Assessment":

2.5.12 ***Q6*** was not included in the list of potential issues to be carried forward to the Scoping stage, but has been adequately covered in this combined Scoping and Impact Assessment.

2.5.13 The possible recharge of the Made Ground from the Claygate Member strata (ie: from sub-surface 'springs', which possibly outcrop close up slope of No.31) was noted, and would still apply even if the site is underlain by the Claygate Member. The water levels in the trial pits when first dug, at depths of 0.50m/ 0.65m below the floor of the existing basement, were also noted.

2.5.14 The implications to No.29 of a potential small rise in the groundwater level on the upslope side of the proposed basement have not been identified. While a trial excavation was recommended in the BIA (in the penultimate paragraph of section 4.3), which is sensible, the BIA should have included a preliminary strategy for preventing a detrimental rise in groundwater to No.29's basement given that groundwater had already been identified at shallow depth below No.31's basement, and at surface in the surrounding ground.

2.5.15 There appears to be some confusion between groundwater and surface water matters, as aspects of both appear in the wrong section. The London Clay permeabilities, which are given in the surface water section, are followed by a claim that these clays "would have a mass permeability several orders of magnitude higher". The values given are mass permeabilities; the 'material permeability' could be 2 to 3 orders of magnitude lower. Despite this, SAS were correct to conclude that the use of soakaways would not be feasible.

Slope and Ground Stability "Scoping Assessment":

2.5.16 ***Q5 and Q14*** should have been included in the list of potential issues to be carried forward to the Scoping stage, although Q5 has been adequately covered in this combined Scoping and Impact Assessment. A services search has been undertaken by Mann Williams.

2.5.17 The BIA considered trees in relation only to the basement, which concludes correctly that the basement will be unaffected. The 'Structural Design & Drainage Document' by Mann Williams includes a 'NHBC check for building near trees' (pages 21-26) which shows that foundation depths of 1.0m/1.35m would be required in relation to the Magnolia (tree T1), so concludes that the requirement to found within natural soils below the Made Ground will be more onerous. These proposed actions are considered to be appropriate.

2.5.18 The BIA does not provide any guidance on mitigating differential movement between the proposed basement, founded at depth, and the adjoining property (No.29) which may be founded at shallow level. While any mitigation works are likely to be subject to agreement during the Party Wall Act processes, the potential impact and a possible strategy to minimise movement effects should have been included in the BIA.

2.5.19 The BIA does not provide any guidance on special precautions which will be necessary because at least some of No's 29 & 31 may be founded within the soft clays. If so, the clays alongside the underpin excavations could be over-stressed leading to abnormally large settlements unless appropriate additional precautions are taken; guidance on such precautions should be included in the BIA.

2.5.20 The ground movement assessment (GMA) by Applied Geotechnical Engineering (Appendix A in the BIA) was undertaken in November 2014, before the revised drawings were prepared in December 2014. They analysed depths of excavation of 0.9m and 1.95m (to 2.85m below Site Datum at the front of the house), whereas MBA's current proposals involve excavation to 3.2m below Site Datum. This difference will, however, be largely off-set by several aspects of the GMA analyses which are conservative, so their conclusions are considered to be essentially sound.

Surface Flow and Flooding "Scoping Assessment":

2.5.21 SAS note that there will be an overall increase in impermeable surface area (from the front lightwell, the rear extension and paved terrace) and state that "It is unlikely that any increase in surface water generated will cause an increase in peak runoff from the site" (in Section 6.2, page 15). No supporting justification is given for this statement, which is inappropriate without appropriate mitigation. However, an attenuation scheme has been proposed by Mann Williams (see their Drainage Design Statement and Proposed Drainage Plans, Drg No.7060/502 rev.P1). This is a type of Sustainable Drainage System (SuDS) and will provide some mitigation.

2.5.22 Submission and approval of the formal hydraulic design calculations for the proposed SuDS mitigation scheme should be made a condition of any consent granted in relation to this application, in order to ensure that there will be no increase in peak flow rates discharged to the combined mains drainage system beneath Briardale Gardens.

2.5.23 Section 6.3 concerns surface water 'Flood Risk' and notes that the Environment Agency's latest modelling predicts a 'High' risk of surface water flooding on Briardale Gardens, but provides no guidance on how that should be mitigated (only further advice on groundwater within the Made Ground). Additional guidance is required.

2.6 Structural Design and Drainage (including Outline Method Statement)

2.6.1 An outline method statement is provided in Section 5.0 of the 'Proposed Basement Structural Design and Drainage' report by Mann Williams. The need for a competent contractor and use of best practice design is noted, including the appointment of a temporary works coordinator, but this is not specifically extended to construction methods. This may be an oversight in drafting, but it must be clarified that best practice construction methods are equally important as the design.

2.6.2 The outline method statement is stated as being "subject to refinement when a contractor has been appointed", which is inevitable because the contractor is responsible for the temporary works. It should also be subject to review and revision following the trial excavations recommended by SAS in their Ground Investigation and BIA reports.

2.6.3 In order to ensure that the contractor(s) produce adequate method statements, a planning condition could be imposed (if consent is granted), requiring submission of the appointed contractor's method statements which have been approved by the appointed structural engineer and, if separate, by the temporary works engineer prior to the start of the works.

2.6.4 The outline method statement states that raking props will be installed to support "the external perimeter walls". The proposed raking props are shown on Drg 7060-Sk106; the number/spacing of these props appears to be completely inadequate and the king posts they will act onto are unlikely to provide sufficient reaction. The construction sequence also involves casting the parts of the central basement slab with the internal load-bearing walls extended down to the new slab before the party wall has been underpinned; this sequence appears to require excessive excavation close to the party wall footings, the level(s) of which have yet to be identified. This sequence of works should be reviewed and revised once the trial excavations have been completed.

2.6.5 The method statement also states that trench support should be provided "for working in any excavations greater than 1m depth". If the existing foundations do bear onto the Made Ground, such that Made Ground is exposed in the face to the excavations, then installation of trench support only when deeper than 1m would be inadequate and could lead to excessive settlements and structural damage.

2.7 Preliminary Retaining Wall Design

2.7.1 Appendix G of the Structural Design and Drainage report includes a revised preliminary retaining wall design calculation for one wall geometry. The analysis has not been checked as that lies outside the scope of this report. The following aspects of the input parameters still give cause for concern:

- A 10kPa surcharge behind the wall has been allowed to represent the loads from adjacent footings. This will be exceeded locally (eg: the flank wall of No.33).
- Wall friction has been allowed, though the use of stiff propping, sufficient to minimize horizontal movement, should result in little or no differential vertical movement between the ground and the retaining wall, and hence minimal or no benefit from wall friction.

2.8 Technical evidence from objectors

Mr K McHale

2.8.1 Ken McHale, Chartered Civil & Structural Engineer, provided a critique of the original application documents on behalf of the owners of the two neighbouring properties, Nos 29 & 33 Briardale Gardens (letter dated 14th July 2014).

2.8.2 McHale's letter notes the presence of an historical well "not far from the site and uphill from the basement". There are numerous wells constructed within the Claygate Member, so this is not surprising.

2.8.3 McHale also notes that "a culvert is reported to run under the back gardens of the subject and neighbouring properties". This is shown by the Thames Water plan to be a 229mm (9") diameter sewer drain rather than a culvert.

2.8.4 McHale's concern about the un-balanced forces which would act on the two sides of the basement because of the sloping ground is legitimate, though the differential pressure would be expected to be accommodated by friction on the underside of the basement slab.

Dr MH de Freitas

2.8.5 Dr de Freitas, Chartered Geologist of First Steps Ltd, has reviewed the geology and ground conditions on behalf of the owners of the two neighbouring properties, Nos 29 & 33 Briardale Gardens (report dated 10th February 2015). His report focusses on four issues, each of which is considered below.

2.8.6 Issue 4(i): Dr de Freitas has suggested that construction of the proposed basement "within yards" of a "water channel" (now known to be a 9" diameter combined sewer, laid on the line of a former ditch) where there is a liability to surface water flooding along the line of the former ditch, would risk altering the relationship of the drain with the surrounding groundwater. He referred to the map of surface water runoff in Appendix D of LBC's 'Managing flood risk in Camden' report; that map does show ponding in the area, but it is at a very low resolution so the extent is unclear. In contrast, the Environment Agency's map of risk of flooding from surface water which we referred to previously is much more detailed (albeit pixellated); an extract is presented in Figure 1, which shows a 'Low' to 'High' risk of flooding in the rear gardens of the house on Pattison Road, but only the national background 'Very Low' level of risk in the rear gardens of the houses on Briardale Gardens.

Figure 1: Extract from map of 'Risk of Flooding from Surface Water' on the Environment Agency's website

2.8.7 The rear boundary to No.31's plot is approximately 14m from No.31's rear bay window, which is also the rear wall of the proposed basement. The drain run on Thames Water's asset map is approximately 3.3m from the boundary. Thus, a 3.2m deep excavation at about 10.5m from the 9" sewer is not considered to represent any significant structural threat to the sewer or its relationship (if any) with the surrounding groundwater.

2.8.8 Other matters raised by Dr de Freitas under this item include:

- The boreholes have bridged the natural stratification, which is correct, though the well upslope and the BH1 directly across the road at the rear of 378 Finchley Road will both have had a similar effect.
- The gradient of water levels cannot be calculated because only two boreholes were drilled, and no ground levels were recorded. Three boreholes with groundwater monitoring installations are indeed the minimum requirement to determine groundwater gradients in a simple single body of groundwater. The situation at No.31 is not simple though, with strata which were recorded as clays (natural and Made Ground) with no significant permeable horizons identified and with the foundations to the house and cellar already obstructing at least some of any flow in the Made Ground. Groundwater flow at basement level, if any of potential significance, is therefore likely to be complex and at least in part channelled along service trenches and backfill around corbelled footings. As a result, modelling such a regime is impractical because it would require numerous exploratory pits or boreholes, so in practice it is better to design for the worst case scenario. SAS's proposed further trial excavations should be scoped so as to provide an adequate basis for that design.

- Fine material will be washed out of the "upper layer of ground above the clay" by flowing groundwater entering the excavations, which can only be controlled by pumping from outside the excavations, and several related concerns. The Made Ground "above the clay", was logged as a clay matrix in the boreholes, while various non-standard descriptions were used in the re-logged trial pits (see paragraph 2.2.14), which leaves some uncertainty about the materials present. These are all matters which should be addressed by the trial excavations recommended by SAS. There is a reasonable prospect that use of suitably screened sumps and/or well points with automated pumps would be able to control the groundwater flow, which the ground investigation findings suggest is likely to be quite limited, and the extent of groundwater lowering required is unlikely to exceed past natural fluctuations, so settlements caused by compression in response to changes in effective stress are unlikely to be significant.

2.8.9 Issue 4(ii): Dr de Freitas stated that the "erodible and compressible nature of the near surface deposit described as Made Ground on which these properties are founded" poses a risk of differential settlement to No's 29 & 33 because these soils are susceptible to ponding/flooding, changes in water pressure and moisture content, and erosion by water flowing to an excavation. This item repeats some of the issues raised under issue 4(i), and Dr de Freitas also suggests that the near-surface soils around Hampstead Heath which have not been worked are likely to be 'Head' or solifluction deposits, both of which were created by hillslope processes under glacial and periglacial climatic conditions. Such materials may be present, and once again must be assessed further once a better understanding of the Made Ground, natural geology and the groundwater regime has been obtained from the further trial excavations.

2.8.10 Issue 4(iii): Dr de Freitas noted that the unknown extent of the excavations associated with the former brickworks beneath No's 29 & 33, as well as No.31, means that the ground movement analysis cannot be justified. It is understood that there is no evidence in these three properties of any significant structural damage compatible with differential foundation movement, which indicates that their foundations were constructed over 100 years ago in ground with adequate bearing capacity and reasonably uniform compressibility. Provided that is correct, then it suggests that the footings passed through any soft clays and were not underlain by significant differences in the thickness of relatively compressible Made Ground. SAS's logs did not record the consistency of any of the clays in the trial pits (possibly because the pits had been left open so the clays had dried out?), so once again the nature and variability of the ground below the footings will need to be assessed further by the trial excavations.

2.8.11 Issue 4(iv): Dr de Freitas noted that the shallow mudflows/mudslides would have reduced the strength of the ground, which is relevant to the design of lateral support to the excavations. Where clays or silty clays are affected by solifluction processes the strength on the discrete failure surfaces does reduce to a 'residual' value, which is typically about half of the soil's peak strength. In London Clay, including any equally plastic clays in the Claygate Member, the critical natural slope angle at which such clays may be unstable under current climatic conditions is approximately 7°, which is why Arup mapped slope angles greater than 7° in Figure 16 of the Camden GHHS (2010). No slopes >7° are shown in the area around No's 29/31/33 Briardale Gardens, while SAS noted that the slope angle is approximately 4° (BIA, paragraph 2.4). Even where stable, such surfaces can still contribute to reducing the overall strength of the ground, so their possible presence should be assessed in the further trial excavations.

2.8.12 In paragraph 24, Dr de Freitas suggests that the shear strength of the clays at 3.2m in BH1 was 30kPa, based on the graph on page 24 of the BIA, which he links to a 'soft' consistency "as expected". Both that graph and the formula used by AGE actually give a strength of 50kPa which is indicative of a 'firm' clay (on the old system of classification); the 'soft' clays were the Made Ground above 3.2m, not the in-situ clays below 3.2m.

2.8.13 In paragraph 6, Dr de Freitas makes a further general point regarding the nature of the ground being such that the works should be designed and submitted for approval, rather than being left to Conditional clauses. Conditional clauses can and usually are used to require additional details to be submitted for approval before a specific stage in the project. A conditional clause which specifies that a certain aspect of the scheme should be submitted and approved before any works (or any excavations) commence would therefore meet Dr de Freitas's concerns.

Mr M Eldred

2.8.14 Mr Eldred, Chartered Engineer of Eldred Geotechnics Ltd, has reviewed the scheme on behalf of the owners of the two neighbouring properties, Nos 29 & 33 Briardale Gardens, in relation to Camden's Policies DP23 and DP27 and the reliability of the damage estimates in the BIA report (report dated 9th February 2015). The following paragraphs consider matters in the same order as they are raised in Mr Eldred's report.

2.8.15 It is agreed that an adequate ground model is crucial to enable a reliable assessment of the potential impact of the proposed basement (Eldred paragraph 14). A summary of the of the ground investigation's findings was presented in Section 3.0 of the BIA, without any detailed evaluation in relation to the findings of the desk study, so this does not represent an adequate ground model.

2.8.16 In paragraph 24, Mr Eldred stated that strength classes for clays are "*very soft, soft, firm, stiff, very stiff and hard*", and he asserted that the descriptions of "very stiff high strength" and "very stiff medium strength" used by SAS for the natural ground are "*meaningless and misleading*" and "*…bear no relation to any system of classification…*". These assertions show an unfortunate lack of familiarity by Mr Eldred with the current British and European standards, which changed in 2004 and 2007 as follows:

- BS EN ISO 14688 Pt2:2004 – Introduced the current classification system for the shear strength of fine soils. The classes are:

  Extremely low, very low, low, medium, high, very high and extremely high strength.

  These descriptions are only used where in-situ or laboratory test results are available. The terms very soft, soft, firm, stiff and very stiff were used to designate classes of consistency index IC (or liquidity index) though this was not widely adopted in the UK.

- BS 5930:1999, amendment No.1 (December 2007): Introduced the strength classes as above into the main British Standard for ground investigations, and linked the terms very soft, soft, firm, stiff, very stiff and hard to the consistency descriptors given in BS EN ISO 14688 Pt1:2002.

2.8.17 Mr Eldred's concern regarding the description of clay at 3.2m in BH1 as "very stiff" is reasonable (given SPT values and the undrained cohesion, Cu = 109kPa test result at 4.0-4.45m). However, SAS have used the terms "high strength" and "medium strength" correctly based on the laboratory triaxial strength test results and on the old strength classification system (as quoted by Mr Eldred) the undrained cohesion, Cu = 155kPa test result at 9.50-9.95m would have represented a 'very stiff' consistency, contrary to the claim by Mr Eldred that the clays never became very stiff within the depth excavated.

2.8.18 Mr Eldred's evaluation of the surface water and groundwater regimes (Section 3.5) is generally appropriate, although the possibility that these strata may, at least in part, be from the Claygate Member has not been considered. He is correct that the rising head permeability tests do not apply only to the shallow ground, as claimed by SAS. However, his claim that reinterpretation of the results so as to estimate the permeability of only the shallow ground would yield a permeability 10 times greater than that calculated by SAS is equally inappropriate because there was a groundwater strike at 11.2m in BH1 which was probably the main source of inflow during that test, while the level(s) at which inflow into BH2 occurred are simply not known.

2.8.19 Mr Eldred's Section 3 has ignored the trial excavations recommended by SAS, which represent an acknowledgment that more information is required about the ground conditions before the scheme design can be completed.

2.8.20 Two inferences may be drawn from Mr Eldred's conclusions regarding the conceptual ground model (Section 3.6):

1. That it is feasible to construct a conceptual ground model to enable the detailed ground and groundwater conditions to be known "with reasonable certainty" beneath old houses: Every retrofit basement project we have been involved with in London has had varying depths of Made Ground around and below the property, and many have had previous below-ground alterations and the locations of private service trenches are often unknown. Thus, one can seldom be completely sure of the ground condition before the basement excavations are undertaken. In view of this, the design and the construction management has to allow for the worst conceivable scenario and should include flexibility to deal with any unexpected findings.
2. That basements cannot be built safely without investigating the ground conditions on the adjoining sites. Such investigations are seldom possible, so engineering judgement has to be used. Thousands of basements have been built successfully without any investigation on the adjoining sites, and while we acknowledge that the ground conditions at No.31 will be more challenging than some, the recommended further trial excavations, if scoped appropriately and logged by a suitably competent engineering geologist or ground engineer, should enable a reasonable conceptual ground model to be prepared.

2.8.21 Section 4 of Mr Eldred's report concerns the permanent basement structure. The uncertainties he notes regarding the structural design of the basement floor are valid and will need to be resolved.

2.8.22 In paragraph 43 he states that the internal footing projections will be cut away, but that is not what the sketches in the calculations show (pages 29 & 31 of Mann Williams' Structural Design document). No diagrams or calculations are provided to support Mr Eldred's claims in paragraphs 43 and 44 regarding the reduction in bearing capacity, but the comments in paragraph 45 show that paragraphs 43 & 44 must refer to the temporary situation when the underpins are first constructed without the internal reinforced concrete retaining walls. The sketches mentioned above show the underpins positioned centrally beneath the existing footings so, provided that adequate temporary propping is used to accommodate the horizontal forces from the retained soil, then there will be no eccentric loads contrary to the claim by Mr Eldred. He is correct however in that the excavation down to the same level as the underpins are founded will reduce the bearing capacity (by removing surcharge) though Arup have demonstrated (Camden GHHS, Appendix D) that this effect is relatively minor where foundations bear onto clay soils. For the 110-116kN/m loads given, the bearing pressures would be 183-193kPa, which exceed the 150kPa maximum allowable bearing pressure adopted by Mann Williams, and so the design of these underpins does need to be reviewed.

2.8.23 If the undrained triaxial test at 4.0m (Cu = 109kPa) was representative of the underpin formation soils at 3.2m below ground level, then the safe bearing capacity would be adequate or almost adequate for the underpins as currently designed (ie: there would be a significant margin of safety against bearing failure, although settlements would be greater than currently modelled). Conversely, if the undrained shear strength at formation level is about 63kPa as assessed from the Standard Penetration Test blowcount (following Stroud 1974, with N = 14 below 3.2m), then the safety margins would be substantially lower and the settlements would be much greater. The proposed further assessment of ground conditions at formation level in the trial excavations is therefore considered to be essential in order to determine whether the design of these underpins is adequate or whether a re-design is required. The inspection of the trial excavations must be undertaken by a competent, highly experienced engineering geologist.

2.8.24 On present evidence, the catastrophic failure of the underpins predicted by Mr Eldred is considered to be unduly alarmist.

2.8.25 It is agreed that further clarity is required from Mann Williams concerning the detail and construction method for the waterproofing system between the underpins and the internal RC retaining walls.

2.8.26 Mann Williams should also respond to the concerns raised by Mr Eldred in relation to the steel beams proposed within the ground floor structure for propping the top of the internal RC retaining walls (paragraphs 47 & 48). It should be feasible to provide additional stiffness to allay Mr Eldred's concerns.

2.8.27 Mr Eldred's concerns in relation to buoyancy (Section 4.5) ignore the proposed structural ties (dowels) between the internal RC retaining walls and the mass concrete underpins. If necessary the proposed temporary support king posts could be converted to permanent tension piles, subject to appropriate design.

2.8.28 The concern raised by Mr Eldred regarding noise and vibration from breaking out the concrete underpin/retaining structure alongside TP3b is reasonable (Section 4.6). Use of chemical breaking methods would minimise both noise and vibration, although percussive drilling would still be required.

2.8.29 Section 5 of the Eldred report concerns the construction method and temporary works. Gaining access via the front bay and a new lightwell is common practice. The amount of ground lowering required close to the party wall for construction of the new sections of basement slab below the internal walls (including the temporary pads to support the needles) is a concern. Mann Williams should clarify the precise levels of excavation for each stage of the construction sequence, though the full assessment of the adequacy of their proposals will not be possible until the trial excavations have been undertaken, and the levels of the footings at the front and rear of the party wall are known.

2.8.30 In paragraph 61, Mr Eldred suggested that small remnant bunds of earth (Made Ground) would be used to support the underpins, though we suspect that no such bunds would remain. Mann Williams' scheme proposes the use of king posts or similar for the reaction, although, as previously noted, these are unlikely to provide adequate reaction and the Phase 2 sketch (Drg No.7060-Sk106) shows a very inadequate number of props.

2.8.31 We agree with the concerns raised in Section 5.3 of Mr Eldred's report, in relation to completion of the basement floor, though alternative schemes could be envisaged which would overcome the stability issues identified.

2.8.32 Section 5.4 and most of the Section 5 Summary (5.5) in Mr Eldred's report concern groundwater control. While we agree that groundwater control will be required, the lack of groundwater entries into the boreholes at the level of the proposed excavations indicates that their extent may be less than Mr Eldred suggests. Similarly, the borehole logs suggest that there may be minimal amounts of material susceptible to internal erosion and loss of fines. Mr Eldred states that groundwater cannot be pumped from outside the excavation, though raking (ie: inclined) screened well points can be installed from within the basement to the outer edge of the works (or beyond), or screened sumps can be installed sufficiently below the level of the formation to lower the groundwater below the outer edge of the excavation. Once again, the trial excavations should assess the detailed nature of the geology and its hydrogeological characteristics in order to assess the most suitable form of groundwater control. Samples should also be taken for grading analyses in order to assist with selection of the most appropriate method and, possibly, screen aperture sizes.

2.8.33 Sections 6 & 7 of the Eldred report concern buildability, ground movements and structural damage. Owing to some of the issues with the scheme, Mr Eldred concluded that the scheme was not buildable and was likely to cause Category 3 or higher damage to the neighbouring properties. Until those issues which are agreed above as being valid have been resolved, including implementation of appropriate trial excavations, there is little point in giving a detailed critique of these current parts of Mr Eldred's report.

2.8.34 Sections 8 & 9 of the Eldred report deal with disposal of surface water and groundwater. The only point of concern raised by Mr Eldred is a suggested risk of "significant volumes of groundwater being disposed of to the sewer" through failure of the external tanking to the basement box. As the basement scheme currently includes both external tanking and a drained cavity system, whereas the vast majority of retrofit basements have only a drained cavity system, this is a relatively low level risk.

2.8.35 The Eldred report concludes (Section 10) with an overview of the scheme's compliance with Camden's Policy DP27, which is in practice a summary of concerns about the scheme. The main opinions given are, in essence, that the scheme is not buildable, the design is flawed and if it were to be built then it would cause unacceptable damage to Nos 29 and 33. There are indeed issues with the design, but some of Mr Eldred's analysis is not valid and other aspects of concern could be resolved with relatively simple adjustments to the scheme. The proposed trial excavations should be undertaken before the scheme is revised, because, subject to appropriate scope of those trials, they should resolve many of the uncertainties.

3.0 COMPARISON AGAINST LONDON BOROUGH OF CAMDEN'S REQUIREMENTS

3.1 Compliance with requirements for Basement Impact Assessment

3.1.1 The new Basement Impact Assessment (BIA) report by Site Analytical Services Ltd (SAS) covers Stages 1, 3 and 2/4 of the BIA as identified in LBC's CPG4 'Basements and Lightwells' and the associated Camden GHHS (Arup 2010). Two supporting reports were also prepared by SAS: a desk study and a Ground Investigation report.

3.1.2 Given that this is BIA was compiled following a previous independent assessment, we were disappointed to find that three of the four specific non-compliances previously identified were still applicable. These were:

- The authors' qualifications do not conform to the requirements of CPG4; with the sole signatory possibly not complying with any of the CPG4's requirements (see paragraphs 2.5.2 & 2.5.3 above).
- There is no linkage to LBC's Development Policy DP27.
- There are no non-technical summaries for each of the four Stages.

3.1.3 The Screening (Stage 1) was much improved, with only three questions answered "No" inappropriately, and one answered "yes" correctly but not listed for carrying forward to the Scoping, when it should have been. Two of the items were dealt with in the impact assessment or by others and the remaining two both concerned the in-situ soils below the Made Ground, specifically whether they formed part of an aquifer and whether they were part of the Claygate Member or the underlying London Clay Formation.

3.1.4 The Scoping (Stage 2) requires the potential impacts to be identified for each of the issues which have been shown by the Screening to need further investigation. This Scoping was combined by SAS with the Impact Assessment (Stage 4), so the usual sequence appears not to have been followed. If the Scoping had been undertaken separately, before Stage 3, then the need for a more detailed investigation (see below) might have been identified before or during the sitework.

3.1.5 The scope of the ground investigation (Stage 3) would have been reasonable in most circumstances, with two boreholes and four trial pits. Unfortunately, the depth of Made Ground identified, the possible presence of backfilled brick workings, and the locations selected for the trial pits, means that uncertainty remains as to the whether the parts of No.31 without a cellar are founded at shallow depth within soft clays of the Made Ground or at greater depth on similar materials as the cellar walls.

3.2 Technical sufficiency of the work carried out

3.2.1 The concerns raised in paragraph 3.1.3 above regarding the classification of the in-situ soils are both technical and procedural, so equally applicable in this section. The soil descriptions from the re-excavated trial pits repeatedly used non-standard terminology, so were not logged by someone with ground engineering expertise, and the summary description for the natural soils provided in the BIA report was quite different to the strata descriptions given on the borehole logs (see paragraph 2.4.3 for details). In addition the impact assessment did not identify the difference between the descriptions of the strata in the site-specific boreholes (which were more typical of the Claygate Member), and the 'pure' clays (ie: with no silt or sand) identified in the borehole drilled on the opposite side of the road (BH1 in the rear garden of 378 Finchley Road). The latter clays showed a typical London Clay weathering profile, so were notably different to the sandy or slightly sandy clays recorded in No.31's plot. As a result, it is still unclear whether the site is underlain by strata of the Claygate Member or the London Clay Formation (Unit D). The scope of the trial excavations recommended by SAS should include a detailed examination of the upper part of the natural strata by a suitably competent engineering geologist, in an attempt to resolve this uncertainty.

3.2.2 The recommended allowable net bearing pressure is considered to be too high and the recommended K_A value was too low (paragraphs 2.4.5, 2.4.6).

3.2.3 The BIA does not provide any guidance on mitigating differential movement between the proposed basement and the adjoining No.29, which may be founded at shallow level. A possible strategy to minimise the potential impact should have been included in the BIA (paragraph 2.5.18).

3.2.4 The BIA should also provide guidance on special precautions which would be required if parts of No.31 and the 29/31 party wall are founded within the soft clays (paragraph 2.5.19).

3.2.5 No guidance is provided in the BIA on mitigation/resistance measures in relation to the 'High' risk of surface water flooding from the Briardale Gardens carriageway (paragraph 2.5.23).

3.2.6 The outline method statement should require use of best practice construction methods as well as best practice design. Various concerns were noted about sequence of works proposed and the associated temporary works sketches, while other issues with the scheme were raised by Mr Eldred's report for the owners of No's 29 & 33 (paragraphs 2.6.2 to 2.6.5 and 2.8.14 to 2.8.35).

3.2.7 Two issues of concern were noted regarding the input parameters for the preliminary retaining wall design calculations (paragraph 2.7.1).

3.2.8 Several requirements for the scope of the proposed trial excavations have been identified throughout this report; they are summarised below for convenience:

i. The depth of the foundations at the front and rear ends of the party walls.
ii. The excavations should be taken down to the basement formation level, so will require full shoring, and are likely to require temporary groundwater control.
iii. The nature and variability of the ground below the footings should be inspected and recorded by a suitably competent and experienced engineering geologist, including identification of any solifluction or cryoturbation-induced slip/shear surfaces, and consideration of the vulnerability of the soils to washing out of fines.
iv. The approximate groundwater inflow rate should be assessed, both on first encountering groundwater and at the maximum depth achieved.

v. The shear strength of the clays at and above formation level should be measured in situ (and samples collected for laboratory strength testing if possible).
vi. Samples of any sufficiently thick granular horizons should be collected for grading analyses.

3.3 Completeness of the Submission

3.3.1 The submitted BIA report still falls short of the matters required by CPG4, DP27 and the Camden GHHS in certain respects, as has already been identified. Recommendations for further submissions which should be obtained and reviewed prior to planning permission being granted are given in Section 3.4 below, so those aspects are not considered further in this section.

3.3.2 The following matters could sensibly be made the subject of planning conditions to be imposed on any consent granted:

- Submission prior to the start of the works of the appointed contractor's method statements which must have been approved by the appointed structural engineer and, if separate, the temporary works engineer (paragraph 2.6.3). These method statements should include full details of the methods to be used to minimise ground movements, and minimising noise and vibration during the works. Use of non-percussive techniques ought to be mandatory for all demolition and breaking-out, although use of hammer drills will be unavoidable.
- Submission prior to the start of the works of the formal hydraulic design calculations for the proposed Sustainable Drainage System (SuDS) which will be required to mitigate the increase in hard surface area at the front and at the rear (paragraph 2.5.22).
- A requirement that the appointed contractor must operate these works under the Considerate Constructors Scheme.
- A requirement for an appropriately competent ground engineer, who complies with the relevant professional qualification requirements within CPG4 and/or is a member of the UK Register of Ground Engineering Professionals at Specialist or Adviser grade, to be retained by the applicant for the duration of the groundworks. The ground engineer's brief should be to review all scheme drawings, specifications, method statements and other relevant documents and to inspect the works at appropriate stages, so that he/she is able to advise the applicant and his appointed structural engineer regarding the adequacy of all ground engineering aspects of the permanent and temporary works.

3.3.3 The planning conditions proposed above should require the applicant to submit the document(s) concerned to the Planning Authority for their review and approval in writing, prior to the start of basement construction works on site.

3.4 Requirement for further Submissions

3.4.1 Once the findings from the trial excavations (see 3.2.8 above) are available a revised scheme should be prepared addressing all the issues raised herein and should be submitted prior to this application for planning permission being determined.

3.4.2 The revised scheme should include a revised version of the current BIA which should address the issues identified in Sections 2.2, 3.1 and 3.2 above.

4.0 CONCLUSIONS

4.1 These conclusions consider only the six specific requests in the enquiry letter from London Borough of Camden (dated 30th July 2014). Each is considered in turn below. The whole report should be read to obtain a full understanding of the matters considered.

1. *The submission contains a Basement Impact Assessment, which has been prepared in accordance with the processes and procedures set out in CPG4.*
   The new BIA follows the processes and procedures in CPG4 except in respect of its authorship (see point 3 below) and the unifying of Stages 2 and 4 of the assessment. A further (though much more limited) revision of the BIA will be required, as described in paragraph 3.4.1 above.

2. *The methodologies have been appropriate to the scale of the proposals and the nature of the site.*
   If the Scoping had been undertaken in advance of the ground investigation then the need for further trial pits might have been identified, and the extent of the remaining uncertainties reduced.

3. *The conclusions have been arrived at based on all necessary and reasonable evidence and considerations, in a reliable, transparent manner, by suitably qualified professionals, with sufficient attention paid to risk assessment and use of conservative engineering values/estimates.*
   Further ground investigation is required, in the form of the trial excavations and groundwater flow investigations recommended by SAS. Such trials are often more appropriate post-planning but in this case it is considered that they should be undertaken pre-planning, because the findings should be used to inform the required revisions to the design of the scheme.
   The sole signatory of the BIA may not comply with any of the professional qualifications required by CPG4, and no evidence has been provided regarding the relevant specialisms of the supporting authors (who have not signed the BIA).
   The scheme is deficient in various respects and must be revised pre-planning.

4. *The conclusions are sufficiently robust and accurate and are accompanied by sufficiently detailed amelioration/mitigation measures to ensure that the grant of planning permission would accord with DP27, in respect of*
   a. *maintaining the structural stability of the building and any neighbouring properties*
   b. *avoiding adversely affecting drainage and run-off or causing other damage to the water environment and*
   c. *avoiding cumulative impacts on structural stability or the water environment in the local area*

   The evidence and conclusions are currently not sufficiently robust, as described under items 1-3 above, to ensure accordance with DP27 in respect of (a) and (b) above.

5. *Raise any reasonable concerns about the technical content or considerations of the submission which should be addressed by the applicant by way of further submission, prior to planning permission being granted. In this case it would need to be apparent that the submission is so deficient in some respect that the three conclusions (points 4a-c above) cannot be guaranteed without the provision of further information at this stage. Please clearly denote the precise information (if any) that would be required to satisfy 4a-c*

See Sections 3.2 & 3.4 above.

6. *Raise any relevant and reasonable considerations in respect of the structural integrity or condition of the road and the neighbouring properties which may be unknown or unaccounted for by the submission, or which would benefit from particular construction measures or methodologies in respect of the development following a grant of permission for the development. Please clearly denote what such conditions should entail.*

We are not aware of any abnormal conditions affecting the road, though no site inspection was included in this review.

The technical report prepared for the owners of the neighbouring properties has confirmed that the existing foundations have performed satisfactorily (ie: it is understood that there is no significant evidence of structural damage attributed to differential foundation movement). If planning consent is granted, those properties' detailed condition should be established by condition surveys under the Party Wall Act processes.

Use of best practice methods of underpinning and temporary support will be essential to control adequately the ground movements and hence minimise structural damage in the neighbouring properties, although control of temporary works through the planning system is known to be difficult.

Items which could be made the subject of planning conditions, rather than being required prior to planning, are listed in paragraph 3.3.2.

References

Arup (November 2010) Camden geological, hydrogeological and hydrological study – Guidance for subterranean development. Issue 01. London.

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Cripps JC & Taylor RK (1981) The engineering properties of mudrocks. Q.J.Eng.Geol. London, Vol.14, pp325-346.

London Borough of Camden (2013) Camden Planning Guidance CPG4– Basements and lightwells.

NHBC (2013) NHBC Standards, Chapter 4.2, Building Near Trees.

a) This report has been prepared for the purpose of providing advice to the client pursuant to its appointment of Chelmer Site Investigation Laboratories Limited (CSI) to act as a consultant.
b) Save for the client no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions herein set out.
c) All work carried out in preparing this report has used, and is based upon, our professional knowledge and understanding of the current relevant English and European Community standards, approved codes of practice, technology and legislation.
d) Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, CSI has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, we will have no obligation to advise the client of any such changes, or of their repercussions.
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CSI does not provide specialist legal advice and the advice of lawyers may be required.
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