Chelmer Consultancy Services

Unit 15, East Hanningfield Industrial Estate
Old Church Road, East Hanningfield, Essex CM3 8AB
Telephone: 01245 400 930 Fax: 01245 400 933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Independent Assessment of Basement Excavation Justification for Planning Application 2012/4744/P

Client:	London Borough of Camden
Site:	12 Elsworthy Road London NW3 3DJ
CCS Ref:	BIA/3685
Dated:	April 2013

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FOREWARD

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, **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 and from 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.

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1.0 INTRODUCTION

1.1 This independent assessment concerns the documents submitted with planning application 2012/4744/P for excavation of a basement beneath No.12 Elsworthy Road, London, NW3 3DJ. The assessment has been commissioned by the London Borough of Camden (LBC) owing, at least in part, to concerns regarding the structural collapse at No.8 Elsworthy Road during excavation of the basement which had been granted planning consent in 2011 (planning reference 2011/3214/P).

1.2 The specific scope for this assessment, as set out in LBC's letter of enquiry dated 24th January 2013, is to provide:

1. "an audit of the submission documents for compliance with the Basement Impact Assessment" requirements as set out in LBC's guidance document CPG4 'Basements and Lightwells';
2. "a view on the technical sufficiency of the work carried out";
3. "assessment of the completeness of the submission…";
4. "comment on whether the reports 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".

A further six specific requests were included within the scope; these are addressed in Conclusions to this report. The assessment has taken into consideration the requirements of the London Borough of Camden (LBC) Development Policy DP27 in relation to basement construction, and the 'Camden geological, hydrogeological and hydrological study – Guidance for subterranean development' (Camden GHHS, Arup, November 2010).

1.3 The professional organisations involved with the proposed basement are:

- Nathaniel Lichfield & Partners — Planning consultants
- Edward Bennett — Architect
- Engineers Haskins Robinson Waters — Structural Engineers
- Geotechnical & Environmental Associates Ltd — Ground Engineering
- Arbtech Consulting Ltd — Arboricultural consultant

1.4 This assessment has been prepared by Keith Gabriel, a Chartered Geologist with a MSc degree in Engineering Geology and Mike Summersgill, a Chartered Civil Engineer and Chartered Water and Environmental Manager with a 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 including Barnet, Camden, Kingston and Kensington & Chelsea.

1.5 An accompanied site inspection and meeting with representatives of Nathaniel Lichfield & Partners and Engineers Haskins Robinson Waters was undertaken by Keith Gabriel on Monday 22nd April 2013. Comments on the technical aspects of each of the main submission documents are presented in Section 2, followed in Section 3 by a comparison against LBC's specific requirements as identified in scope for this assessment.

1.6 The following architectural drawings of the existing property and the proposed scheme by Edward Bennett Architect have been obtained from the LBC Planning website:

- 0120_D1001_rev00 Existing Cellar Plan
- 0120_D1002_rev00 Existing Ground Floor Plan
- 0120_D1003_rev00 Existing First Floor Plan
- 0120_D1004_rev00 Existing Second Floor Plan
- 0120_D1005_rev00 Existing Roof Plan / Site Plan
- 0120_D1101_rev00 Existing Section A-A (whole site, 1:200)
- 0120_D1102_rev00 Existing Section A-A (house close-up, 1:100)
- 0120_D1103_rev00 Existing Rear Elevation B-B
- 0120_D1104_rev00 Existing Front Elevation from Elsworthy Road

- 0120_D1200_rev00 Demolition Ground Floor Plan
- 0120_D1250_rev00 Location Plans (1:1,250 and 1:500 OS maps)

- 0120_D2001_rev00 Proposed Lower Ground Plan
- 0120_D2002_rev00 Proposed Ground Floor Plan
- 0120_D2003_rev00 Proposed First Floor Plan (No change)
- 0120_D2004_rev00 Proposed Second Floor Plan (No change)
- 0120_D2005_rev00 Proposed Roof Plan / Site Plan
- 0120_D2101_rev00 Proposed Section A-A (whole site, 1:200)
- 0120_D2103_rev00 Proposed Rear Elevation B-B
- 0120_D2104_rev00 Proposed Front Elevation from Elsworthy Road

These drawings have been referred to primarily for information purposes because they are generally beyond the scope of this assessment.

1.7 Instructions to prepare this this Independent Assessment were received from London Borough of Camden.

2.0 CONSIDERATION OF DOCUMENTS SUBMITTED

2.1 Design and Access Statement

2.1.1 The Design and Access Statement was prepared by Edward Bennett Architect (Ref. 0120_DAS, dated August 2012). This document describes briefly the site location, the existing property and its intended use before then presenting the proposed design principles and a description of the proposed scheme including associated landscaping. Extracts from the plan and section drawings of both the existing house and the proposed scheme are presented, together with several photos of the existing house and isometric computer-generated drawings of the completed scheme.

2.1.2 It should be noted that the floor plans are presented with the east side of the house at the top whereas the sections are presented looking westwards (ie: the opposite way round).

2.1.3 The Design and Access Statement is taken 'as read' since a critique of the architectural aspects of the scheme, including both the layout and the proposed palette of finishing materials is beyond the scope of this assessment.

2.2 Arboricultural Impact Assessment and Tree Protection Scheme

2.2.1 Arbtech Consulting Ltd (Arbtech) initially undertook a tree survey. The report from that survey, dated 10/08/2012, presented a tabulated tree survey schedule and a tree plan. The report recommended:

- Tree T1 (a Robinia, category B in poor condition) should be removed or monitored;
- Trees T9 – T11 (Common Limes in the front garden, category A in good condition) should be reduced by 3m and their size maintained by pruning every 3-5 years.

2.2.2 Arbtech also prepared the Arboricultural Impact Assessment and Tree Protection Scheme to BS5837 (un-dated). This document includes a combined tree constraints/protection plan, an arboricultural implications assessment and an arboricultural method statement.

2.2.3 The arboricultural implications assessment found that the basement development would encroach on the root protection area of the Robinia in poor condition (T1) so recommended its removal, with mitigation of the loss by replacement planting. Other recommendations included removal of a category C tree (T4, Hawthorn), use of tree protection barriers around various trees, and temporary ground protection for the entire duration of the works where access will be required across the RPAs of trees, all as shown on the Tree Constraints/Protection Plan.

2.2.4 The arboricultural method statement includes guidance on size/shape of tree to be planted as mitigation for the loss of trees T1 and T4, and suggests possible species.

2.2.5 From a geotechnical perspective, the removal of tree T1 is likely to lead to heave. The common name used for most Robinia species is Locust, although the False Acacia (or Black Locust) is also a Robinia. In Chapter 4.2 of the National House Building Council's Standards, one Locust is listed as a Low water demand species but False Acacia as a Moderate water-demand species (with a maximum height of 18m). The tree survey gives the current height of T1 as 13.9m although it appeared to have undergone significant crown reduction, and so use of the mature height would be appropriate when assessing the potential zone of desiccation. The T1 Robinia stands 8.8m from the rear bay and 3m from the proposed basement, and the potential implications of its removal are considered within the review of the BIA (see paragraphs 2.4.10 and 2.4.11 below).

2.3 Structural Engineer's Design Statement for Planning

2.3.1 The Structural Engineer's Design Statement for Planning has been prepared by Engineers Haskins Robinson Waters (HRW, Ref: 1031 / August 2012). The appendices include extracted maps/diagrams from the Camden GHHS (Arup 2010) labelled with the approximate location of No.12 Elsworthy Road, the Site Investigation and BIA Report which is considered separately in Section 2.4 below, and the following structural engineering Outline Scheme Drawings:

- 1031/PL/01 revP1 Site Plan
- 1031/PL/02 revP1 Lower Ground Floor Plan
- 1031/PL/03 revP1 Ground Floor Plan
- 1031/PL/04 revP1 Section A-A
- 1031/PL/05 revP1 Section B-B
- 1031/PL/06 revP1 Typical Sections (Sheet 1)
- 1031/PL/07 revP1 Typical Sections (Sheet 2)

2.3.2 The general approach taken by HRW is considered to be appropriate while various points of detail require clarification or revision as set out below.

2.3.3 Section 2.4 of the Structural Engineer's Design Statement for Planning (SEDSfP) records "No groundwater strikes or seepages were encountered within the … trial pits…". This is incorrect as a seepage was encountered in TP2 near the top of the clay (in August 2012). Perched groundwater is typically found where Made Ground directly overlies London Clay, at least locally during the winter and spring seasons, and as the seepage in TP2 occurred in August, more widespread perched water would indeed be expected at No.12 during those other seasons.

2.3.4 The ground investigation recorded Made Ground directly beneath the foundations in trial pits TP3 and TP4, and the same may occur elsewhere. As the historic maps indicated that the site had not been developed before the present house was built this is an unexpected finding, although we have encountered similar poor construction practice on other Victorian houses built on greenfield sites.

2.3.5 The inherent variability of Made Ground means that its behaviour during the underpinning works, when additional load will be placed on both sides of each open underpinning excavation, cannot be predicted. As a result additional side support may be required where the foundations bear onto Made Ground, and/or the length of each underpin (parallel to the footing) may need to be reduced.

2.3.6 The flank wall to No.14, where not party, is shown on the ground floor plan (Drg 1031/PL/03) but not on the basement plan (Drg 1031/PL/02) nor on Section 4-4 (Drg 1031/PL/06). Figure 1 shows Section 4-4 with the foundation to No.14's flank wall added at the same depth as No.12's footing; this illustrates that is well within/above a 45 degree line drawn from the bottom corner of the proposed underpinning base. The design of the proposed underpinning must therefore allow for supporting the imposed load from No.14's flank wall and for maintaining full support to the ground beneath and alongside those footings, both during the underpinning works and permanently thereafter.

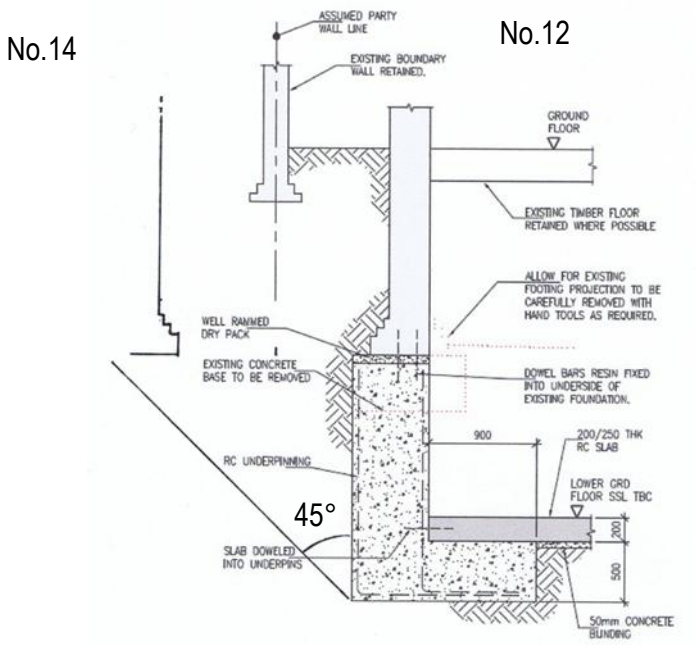


Figure 1: Section 4-4 from HRW drawing 1031/PL/06 rev.P1 showing foundation to No14's flank wall (level assumed = to No.12's) and 45 degree influence line from proposed basement excavation.

2.3.7 Section 3.3 of the SEDSfP states that the underpinning will be carried out in maximum lengths of 1.0-1.2m. The length of most of the underpins shown on drawing 1031/PL/02 are 1.0m or less, but three of the underpins exceed 1.2m. Given that some of the foundations are known to be founded on Made Ground, and that both the 12/14 boundary wall and No.14's flank wall are within the potential zone of influence of the underpinning excavations, it is considered that a maximum length of 1.0m would be more appropriate for all the underpins to No.12.

2.3.8 Four 700mm deep, 1.5-1.9m wide pad footings are also required to support columns. Notes on drawing 1031/PL/02 state that these bases may be "constructed in sections if required". Unless specifically directed otherwise, most contractors would probably construct such bases in a single excavation; such wide excavations are not considered appropriate unless additional temporary support to the walls above is specifically included in the design.

2.3.9 Two alternative options for underpinning the party walls are shown on Drg 1031/PL/06 (Section 1-1). Both involve works extending beneath the neighbouring property, so will be subject to agreement under the Party Wall Act processes. Construction of the 'heel' as shown on the reinforced concrete option is rarely possible in practice, so the design analyses must not allow for any beneficial effects that 'heel' would provide; the reinforcement and/or the length of the thickened 'toe' section of the wall may therefore need to be increased.

2.3.10 Section 3-3 on Drg 1031/PL/06 shows a section across the front lightwell retaining wall including the reinforced concrete bridge which will give access to the front door. All retaining walls have to move in order to mobilise resistance to the forces/actions from the retained ground. If the RC bridge is constructed as currently shown, as a monolithic part of the retaining wall, it would therefore impose a force/action and horizontal displacement on the front wall. Consideration should be given to adapting the bridge support so as to eliminate that force/action and displacement (there are various ways this could be achieved).

2.3.11 Section 5-5 on Drg 1031/PL/07 shows a typical section through the underpinning to the rear garden wall on the 12/14 boundary; the same is assumed to be applicable to the 10/12 boundary wall. The retained ground level is shown at 2.1m below No.12's floor level. Edward Bennett's rear elevation drawings D1103 (existing) and D2103 (proposed) both show that part of the adjoining properties as blank (white). A check made during our site visit showed that No 10 has a paved terrace alongside the boundary which could be ground-bearing, while No.14 has a built extension. In both cases then, it is possible that a significantly greater height of earth may have to be retained than is currently shown on the drawings; the actual conditions will need to be checked as part of the Party Wall Act processes and, if higher ground levels are confirmed, then the design of the retaining walls will need to be strengthened accordingly.

2.3.12 The third paragraph of Section 3.4 in the SEDSfP states "It is anticipated that the weight of the new basement construction and the vertical load applied onto the new structure will approximately equal the weight of soil to be removed…". This seems unlikely, even allowing for the larger than usual crawl space under the house and the reduced depth of excavation which will result. Some heave may therefore be experienced from the underlying clay.

2.3.13 The SEDSfP concludes that HRW are satisfied that the proposed scheme "can be completed without compromising the structural stability of any adjacent properties, structures or the railway tunnel", although "detailed calculation checks and investigations are required prior to a site start". While we agree with the need for detailed design calculations and investigations, we also consider that a much more detailed preliminary method statement should be provided owing to the critical role which the temporary works will play in ensuring the safe completion of the proposed scheme, without permitting or inducing unacceptable ground movements.

2.4 Site Investigation and Basement Impact Assessment Report

2.4.1 A combined report has been prepared by Geotechnical & Environmental Associates Ltd (GEA) on the site investigation and Basement Impact Assessment (BIA); report reference J12192 dated September 2012. The comments below follow the same order as they appear in the report.

2.4.2 Section 1.3.1 provides the background to the BIA and the qualifications of its authors. There is no linkage to LBC's Development Policy DP27 and the authors have not identified the specific stages for which they were responsible as required by CPG4, and the specific technical specialisations/qualifications mentioned therein.

2.4.3 In Section 2.5 the hydrology and hydrogeological setting is summarised. No consideration has been given to the possible presence of perched groundwater in the Made Ground or in the backfill to footing trenches. There is also no mention of the likely impact of man-made features, such as service trenches and foundations, on the near-surface hydrogeology.

2.4.4 A Preliminary risk Assessment is included within the report (Section 2.6) as required by statute and the Building Regulations, though not specifically by LBC's policies on basements. Paragraph 2.6.1 considers potential sources of contamination but has omitted airborne contaminants (which our past experience in London has shown to be a significant source of contaminants).

2.4.5 Screening responses to the questions identified in CPG4 and the Camden GHHS (Arup 2010) are presented in Section 3.0 of GEA's report. In most instances no justification of 'No' answers has been included, as is required by CPG4, although most of the responses are considered to be appropriate. The exceptions are:

Subterranean (Groundwater) Flow Screening:

Q1b: *Will the proposed basement extend beneath the water table surface? Answered "No".*

Comment: While the basement will not extend beneath a water table within an aquifer, the possibility of perched groundwater should have been identified here.

Q4: *Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas? Answered "No".*

Comment: This is incorrect and should have been answered 'Yes'. The paved surface area will increase because the basement and lightwell will extend out to the north edge of the path alongside the verandah, thereby covering some of the ground beneath the verandah (which appeared to be un-surfaced), and Edward Bennett's drawing D2005 shows a broad area of path (as well as the lightwell's staircase) extending beyond the line of the existing path. However, as the site is underlain by London Clay, the increased impermeable area will not deprive an aquifer of recharge.

Stability Screening:

Q10b: *Will the proposed basement extend beneath the water table such that dewatering may be required during construction? Answered "No".*

Comment: Once again the possibility of perched groundwater should have been identified here, with the associated need for sump pumping to remove such entries.

Q13: *Will the proposed basement significantly increase the differential depth of the foundations relative to neighbouring properties? Answered "No, as adjacent foundations will be underpinned such that they are not detrimentally affected".*

Comment: This is incorrect. There are both adjoining and adjacent foundations for which no underpinning has apparently been planned so this question should have been answered 'Yes'.

Surface Flow and Flooding Screening:

Q2: *As part of the proposed site drainage, will surface water flows (eg volume of rainfall and peak run-off) be materially changed from the existing route? Answered "No".*

Comment: If all the surface water from the lightwell and the roof of the basement is discharged into the mains drainage system, then this would represent a significant change from the existing route. Based on the information submitted, which does contain any drainage details, the answer should have been 'Unknown'.

Q3: *Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas? Answered "No".*

Comment: As previously (Subterranean Flow, Q4) this should have been answered 'Yes' because the paved area will increase. Whether that is significant depends on where the surface water from the increased area is discharged to; mitigation could be provided by directing the surface water from the basement roof into the terraced kitchen garden and/or other parts of the garden.

2.4.6 The scoping stage identified potential impacts and the consequences arising from them for each of the "Yes" screening exercise responses. Inevitably the scoping exercise did not consider the other screening issues which have been identified above as having inappropriate 'No' answers. For instance, if the possible presence of perched groundwater had been appreciated, then groundwater monitoring readings could have been included (using the standpipes which were installed but apparently not read).

2.4.7 The failure during screening to identify the significant increase in the differential depth of the foundations relative to neighbouring properties means that the importance of minimising movements in the ground behind the underpins has not been fully appreciated within the scoping, though this aspect is generically addressed at the very beginning of Section 8, Advice and Recommendations. The possible longer term consequences of the differential foundation depths were identified within the scoping, under the seasonal shrink-swell potential impact.

2.4.8 The ground investigation scope was apparently determined by HRW and comprised two boreholes to depths of 5.0m/6.0m and four trial pits to assess the geometry of the foundations and the nature of the underlying soils. The latter were all dug from within the crawl space. This scope is considered adequate for planning purposes, for the anticipated geology and size of basement, although groundwater readings should have been taken from the standpipes - as recommended several times in GEA's report, including the final Outstanding Risks and Issues section (Section 10).

2.4.9 A ground model is presented in Section 7 of GEA's report based on the desk study and the findings of the ground investigation. This model is broadly appropriate, including the prediction that perched water should be expected, although the statement that *"groundwater does not appear to be generally present within the depth investigated…"* is misleading. Hydrostatic groundwater pressures are likely to be present within the London Clay in the depths of current interest, except where modified by the action of tree roots or the tunnel. These water pressures will need to be allowed for in the design of the basement retaining walls.

2.4.10 The Basement Impact Assessment (Section 9) addresses the issues identified in the scoping of the investigation. Removal of the Robinia (T1) is considered in relation to slope stability and the founding level of the proposed basement, but the impact on the foundations to the adjoining house have not been considered. The depth of desiccation (ca. 2.0m) recorded in BH1 close to one of the Lime trees in the front garden (see cover photo) also appears to have been used inappropriately to consider the depth of desiccation associated with the Robinia in the rear garden. If the Robinia species concerned is a False Acacia, then the guidance provided in Chapter 4.2 of the NHBC Standards (Moderate water-demand broad leafed tree on High volume change potential soils) would require a minimum foundation depth of 2.1m for the nearest part of the proposed basement, and 1.5m for the existing bay window. The scheme should therefore require the underpinning excavations close

to tree T1 to be checked for deeper than normal desiccation, prior to blinding and casting of each underpin.

2.4.11 Trial pit TP2 recorded the base of the foundation to the rear wall of the house as being 1.64m below the level of the underside of the ground floor joists. Thus this foundation is probably less than 1.0m below external ground level (beneath the verandah). The foundations to No.10's bay and rear wall are probably at a similar depth/level, so the Robinia (T1) may have also caused desiccation beneath No.10's footings. Removal of the Robinia therefore has the potential to affect No.10, so further investigation will be required to assess the actual degree of desiccation.

2.4.12 The BIA is silent on the issue of the significant increase in the differential depth of the foundations relative to neighbouring properties' foundations, except in relation to seasonal shrink/swell movements where it is noted that *"The foundations of the adjacent building will also be underpinned as part of the development."* While the party wall foundations will be underpinned, no such underpinning has been called for beneath the adjoining walls or beneath the parallel flank wall to No.14 (whose footings have been shown to be within the potential zone of influence of the basement excavations, see Figure 1 earlier). Given the facts identified in paragraph 2.3.6 above, the potential impact of the works on these adjacent and adjoining foundations must be considered, including possible mitigation measures such as transitional underpins (subject to approval via the Party Wall Act processes).

3.0 COMPARISON AGAINST LONDON BOROUGH OF CAMDEN'S REQUIREMENTS

3.1 Compliance with requirements for Basement Impact Assessment

3.1.1 The Basement Impact Assessment is embedded within GEA's report on the site investigation for the proposed basement. The four stages of screening, scoping, site investigation and impact assessment have broadly been followed as required by LBC's CPG4 'Basements and Lightwells'.

3.1.2 General non-compliances include:

- The authors have not identified the specific stages (technical aspects) for which they were responsible.
- There is no linkage to LBC's Development Policy DP27.

3.1.3 Specific technical issues arising from the BIA have been described and discussed in Section 2.4 above. Inappropriate answers to six of the screening questions and their subsequent omission from the scoping exercise did not impact adversely on the scope of the ground investigation, with the exception of a lack of groundwater monitoring (see 2.4.6 and 2.4.8 above), but they have led to a lack of consideration of the impact of the proposed basement on the ground beneath the foundations of (and allied structures pertaining to) the neighbouring houses.

3.1.4 The impact assessment has considered only ground stability issues and is silent on both subterranean flow and surface water, having answered 'No' to all screening questions. The matters identified in paragraph 2.4.5 should also be included in this assessment.

3.2 Technical sufficiency of the work carried out

3.2.1 The structural engineering drawings for the scheme and the Structural Engineer's Design Statement for Planning (SEDSfP) prepared by Engineers Haskins Robinson Waters (HRW) have been reviewed in Section 2.3. Their general approach is considered appropriate, while clarification or revision is required in relation to:

- Perched groundwater above, and groundwater pressures within, the London Clay Formation (2.3.2);
- Side support to underpinning excavations where Made Ground was present beneath the existing foundations (2.3.4, 2.3.5);
- Adequacy of the underpinning to support loads from the flank wall of No.14, where not a party wall, and of the stability of the underpinning excavations and the retaining walls prior to completion of the structural works (2.3.6);
- The maximum length of underpinning excavations (2.3.7, 2.3.8);
- The appropriate geometry of the (toe/heel of the) basement's reinforced concrete retaining walls (2.3.9);
- Possible forces/actions and displacements imposed on the front wall of the house by the bridge across the lightwell (2.3.10);

- Adequacy of the underpinning beneath the boundary walls in the rear garden because the ground level to be retained may be much higher than is shown on both Edward Bennett's and HRW's drawings (2.3.11);

3.2.2 The fieldwork for the site investigation is generally considered to be appropriate for the scheme and the site's geology, although the following extra information should be obtained:

- water levels in the standpipes should be read, unless groundwater monitoring has already been commissioned following the 2012 report (2.4.8);
- the extent of any clay desiccation beneath/adjacent the rear wall of Nos 10 & 12 (2.4.10), due to the identified Robinia tree.

3.2.3 The BIA has also been reviewed in Section 2.4 above.

- Six of the screening questions were incorrectly answered 'No' (2.4.5).
- The significant increase in the differential depth of the foundations relative to neighbouring properties was not identified (2.4.7);
- GEA's ground model is considered broadly appropriate, including the prediction that perched water should be expected, although the statement that *"groundwater does not appear to be generally present within the depth investigated…"* is misleading (2.4.9).
- The BIA has not identified the possibility that the Robinia (T1) to be removed may also have caused desiccation beneath No.10's footings (2.4.10 & 2.4.11);
- The BIA is silent on the issue of the significant increase in the differential depth of the foundations relative to neighbouring properties' foundations. Given the potential impact of the varying founding levels, mitigation must be considered, including possible measures such as transitional underpins (subject to approval via the Party Wall Act processes) (2.4.12).

3.2.4 Clause 2.29 of CPG4 specifically calls for "calculations of predicted ground movements and structural impact to be provided", for which the table of Burland categories is provided. Burland categories can be calculated using published data and specialised software programs for embedded bored piled walls; however for underpinning works there are no such published data, because the ground movements generated will depend primarily on the adequacy of the temporary support provided in the excavations for the underpins, the timing of its installation, and the stiffness of the permanent support. As a result it is not possible to calculate Burland categories for underpinning schemes. As an alternative approach LBC could consider imposing a maximum limit (not to be exceeded) on structural damage which would be considered acceptable; in compliance with clause 2.30 of CPG4, the limit should be set at the Burland category of 'slight'.

3.2.5 Following the failure at No.8 Elsworthy Road, it was discovered that the cast iron drainage pipe which runs at depth alongside the flank wall was defective and appeared to have caused wash-out of the ground around/above the pipe. It would therefore be prudent to undertake a CCTV survey of the drains serving No.12, including a careful assessment of the depth of the drains relative to the foundation levels, and for any defects to be repaired before the underpinning works commence.

3.3 Completeness of the Submission

3.3.1 The submitted documents cover, in varying levels of detail, the matters required by CPG4, DP27 and the Camden GHHS except 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 A further ground investigation has been proposed to assess whether the Robinia tree (T1) has caused desiccation beneath the rear walls of Nos 10 & 12; that investigation might be more complete if it is undertaken during the Party Wall Act processes. Ground investigation in the neighbouring properties might also be required to identify the ground levels to be retained by the retaining walls along the rear garden boundaries. Accordingly, it is recommended that the supplementary ground investigation, together with a quantitative assessment of possible heave caused by both the removal of T1 and the unloading of the London Clay (as also proposed in GEA's report), should be presented as an addendum to the BIA, and should be made the subject of a planning condition to be imposed on any consent granted.

3.3.3 The method statement provided by HRW in the SEDSfP is very basic (and the drawings referred to therein have not been seen). Adequate control of ground movements will depend primarily on the timely use of the appropriate temporary and permanent support, as noted in paragraph 3.2.4 above. It is standard practice in the UK construction industry for the detailed method statements to which most works are undertaken to be compiled by the contractor; these detailed method statements are therefore unlikely to be available until after planning consent has been granted and a contractor has been appointed. Thus it is recommended once again that a condition should be imposed on any planning consent granted which requires the applicant to submit a detailed method statement.

3.3.4 Clause 2.28 of CPG4 notes that the interpretive site investigation report which forms part of the BIA "must contain details of the retaining wall design for the basement excavation". This is contrary to how the site investigation industry works, contrary to the requirements of the Eurocode EC7 standard for geotechnical design, and is potentially open to challenge as being a matter which is rightly dealt with under another regulatory regime (the Building Regulations). Consideration could be given however to the inclusion of a planning condition on any consent granted, requiring

submission of the detailed retaining wall design to the Planning Authority for approval.

3.3.5 All three 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 Revised copies of HRW's drawings should be requested covering the issues summarised in paragraph 3.2.1 (where they relate to drawings).

3.4.2 An addendum to GEA's report should be requested to cover the six screening questions which were answered inappropriately, the impact assessment on those aspects, and all the other matters identified in paragraphs 3.2.2 and 3.2.3.

3.4.3 Based on our understanding of the issues at No.8 Elsworthy Road, a CCTV survey and water testing of the drains serving No.12 is suggested. This could be conditioned or could be requested prior to grant of planning.

3.4.4 Copies of the correspondence with Network Rail regarding the tunnel beneath the rear garden should be requested, in order to validate their reported exclusion zone requirements and to confirm the specific location/depth of their tunnel, as described by GEA in their Report.

4.0 CONCLUSIONS

4.1 These conclusions consider only the six specific requests in the enquiry letter from London Borough of Camden (dated 24th January 2013). 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.*
   Once the additional information has been received which is requested above and required by the proposed planning conditions, then the BIA will be compliant with the relevant requirements of CPG4.

2. *The methodologies have been appropriate to the scale of the proposals and the nature of the site.*
   We confirm that, subject to comments elsewhere in this report, the methodologies have been appropriate to the scale of the proposals and the nature of the site.

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.*
   Once the additional information has been received which is requested above and required by the proposed planning conditions, then we anticipate that the conclusions will comply with this requirement.

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*

   Same answer as for 3 above.

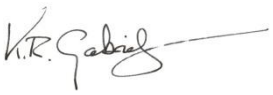
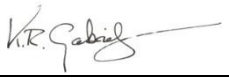
5. *Raise any reasonable concerns about the technical content or considerations of the submission which should be addressed by the applicant by way of further submission, prior to planning permission being granted. In this case it would need to be apparent that the submission is so deficient in some 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 Section3.4 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 or the adjoining properties, although please note that we have not made any internal or close external inspection of the adjoining properties. Provided that best practice is followed in both the design and the construction of the proposed basement, we would see no reason to suggest that the scheme would not proceed to a safe conclusion.

Chelmer Consultancy Services
Unit 15, East Hanningfield Industrial Estate, Old Church Road
East Hanningfield, Essex CM3 8AB
Telephone: 01245 400 930 **Fax:** 01245 400 933
Email: info@siteinvestigations.co.uk **Website**: www.siteinvestigations.co.uk

Report Status: **FINAL**		
Role	**By**	**Signature**
Lead author:	Keith Gabriel MSc DIC CGeol FGS UK Registered Ground Engineering Adviser	
Slope/ground stability aspects approved by:	Mike Summersgill MSc CEng MICE C.WEM FCIWEM	
Subterranean (Groundwater) flow aspects approved by:	Keith Gabriel MSc DIC CGeol FGS	
Surface flow and flooding aspects approved by:	Mike Summersgill MSc CEng MICE C.WEM FCIWEM	

References

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

BS EN 1997-1 (2004) Eurocode 7: Geotechnical Design – Part 1: General rules. British Standards Institution.

London Borough of Camden (April 2011) Camden Planning Guidance CPG4– Basements and lightwells.

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

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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.
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