Chelmer
Consultancy Services
'Groundbreaking Services'

Independent Assessment of Basement Excavation Justification for Planning Application 2014/5939/P

Site	Flat 1, 41 Howitt Road London NW3 4LU
Client	London Borough of Camden
Date	February 2015
Our Ref	BIAREV/5079

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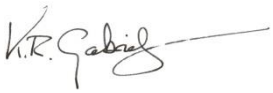
Lead author:	Keith Gabriel MSc DIC CGeol FGS UK Registered Ground Engineering Adviser	
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Foreword

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 shall not be relied upon by any third party without explicit written agreement from Chelmer Site Investigation Laboratories Ltd.

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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 independent assessment was commissioned by the London Borough of Camden (LBC) and concerns the documents submitted with planning application 2014/5939/P for enlargement of the existing basement beneath Flat 1, 41 Howitt Road, London, NW3 4LU.

1.2 The application describes the proposed works as "*Alteration and extension of a single (ground floor and basement) 2 bed flat, including rear and basement extensions*". The development description provided on LBC's Planning website states: "*Excavation of single storey basement extension including front and rear lightwells and erection of single storey ground floor rear extension*".

1.3 The scope for this assessment, as set out in LBC's letter of enquiry dated 20th January 2015, 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 "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 over-riding aim of Camden's LDF Development Policy DP27 'Basements and Lightwells', as stated in its first paragraph, is: "The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity, and does not result in flooding or instability". Detailed requirements are then presented for what developers must demonstrate and matters that the council will consider when assessing applications.

1.6 The professional organisations involved with the proposed basement are:

- Evan Ferguson Architects Architect
- David Dexter Associates Structural Engineers
- Albury SI Ltd Site Investigation contractor

1.7 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.

1.8 Comments on the technical aspects of each of the main submission documents are presented in Section 2, together with technical issues raised by the objectors, followed in Section 3 by a comparison against LBC's specific requirements as identified in the scope for this assessment. No comment is expressed here on the Design & Access Statement because a critique of the architectural aspects of the scheme is beyond the scope of this assessment. Similarly, the social and health aspects raised by some of the objectors are outside the scope of this review.

1.9 Drawings of the existing property and the proposed scheme were prepared by Evan Ferguson Architects. The following drawings were obtained from the LBC Planning website or were reproduced in the Basement Impact Assessment report:

- Drg 1308.10.A Location and Block Plan
- Drg 1308.14.A Existing Floor Plans
- Drg 1308.15.A Existing Sections AA and BB
- Drg 1308.16.A Existing Section CC and Garden Elevation
- Drg 1308.17.A Existing Street and Front Sectional Elevations
- Drg 1308.18.B Proposed Floor Plans
- Drg 1308.19.A Proposed Sections AA and BB
- Drg 1308.20.A Proposed Section CC and Garden Elevation
- Drg 1308.21.A Proposed Street and Front Sectional Elevations

These architectural drawings have been referred to primarily for factual information purposes.

1.10 Instructions to prepare this Independent Assessment were received by email on 29th January 2015 (PO no. 10391372).

2.0 CONSIDERATION OF DOCUMENTS SUBMITTED

2.1 Construction Method Statement

2.1.1 The Construction Method Statement was prepared by Evan Ferguson Architects (EFA) rather than by the appointed structural engineer, as is more usual. This document provides a commentary on the anticipated sequence of construction. Un-substantiated claims are made including "This construction method is known to be suitable for this application and will lessen any impact on this or adjoining structures".

2.1.2 No consideration has been given to how they will maintain a clean and clear access for the occupiers of Flats 2 and 3. It would be preferable for all construction operatives to use a separate entrance (through the new lightwell/bay window) rather than through the communal hallway.

2.1.3 The Conclusion states, without justification, that the damage is likely to be no more than Burland Category 2, whereas Camden Planners now typically require the damage not to exceed Category 1.

2.2 Basement Impact Assessment Report

2.2.1 The Basement Impact Assessment (BIA) was prepared by David Dexter Associates, (Project No.1343, Revision B, 23rd December 2014). The BIA also includes a site investigation report by Albury SI Ltd. The comments below broadly follow the same order as the issues appear in the report.

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

2.2.3 The authors of the BIA report (Rupert Clarke and Magdalini Christia) were described as "Project Engineers" without identifying their professional qualifications. Thus, it is not known whether either is a Chartered Engineer (C.Eng). There is also no evidence that the report's authors comply with any of the following requirements in CPG4 (Clause. 2.10):

- Assessment of surface flow and flooding must be undertaken by a Hydrologist or Civil Engineer specialising in flood risk management and surface water drainage, with either CEng MICE (Member of the Institution of Civil Engineers) or C.WEM (Chartered Water and Environmental Manager) qualifications.
- Assessment of subterranean (groundwater) flow must be undertaken by a Hydrogeologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London;
- Assessment of land stability must be undertaken by one of the following:
  - a Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering; or
  - a Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group; or
  - a Chartered Member of the Institute of Structural Engineers with some **proof** of expertise in engineering geology; with demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "CGeol" (Chartered Geologist) qualification.

2.2.4 The overall layout of the BIA report follows the four Stages required by CPG4. The Introduction, Section 0.0, has ten subsections which cover the existing and proposed structures and collates relevant desk study information, which is a sensible approach, yet it also includes interpretive impact assessments. The description of the existing structure is based on "received information" and generalisations, which perhaps suggests that neither author has visited the property. Of more specific concern:

1. Section 0.3 states that "The retaining wall footing will be detailed to spread the load in the same way as the original foundations to ensure that the ground is not overstressed". This is factually wrong and suggests a worrying lack of understanding of how cantilevered, 'L-shaped', reinforced concrete retaining walls transfer the applied forces (actions) into the ground.
2. Section 0.3 also claims that use of underpinning "will lessen any potential earth movement or impact on existing structures". No evidence is provided to support this generalisation, and the alternative against which the 'lessening' comparison is made is not stated.
3. The Hydrology section (0.9) considers impact on subterranean flows, which is inappropriate because Hydrogeology is dealt with in Section 0.8.
4. Figure 6 has misidentified the site's location on the 'Camden Flood Map' (placing it several streets too far to the north-west).

Screening:

2.2.5 The Stage 1 Screening requires responses to the questions identified in CPG4 and the Camden GHHS (Arup 2010); these responses are presented in Section 1.0 of the BIA report David Dexter Associates (DDA). Five questions were answered 'No' without giving any justification, albeit these 'No' answers all appeared to be appropriate.

2.2.6 Other questions for which either the response or the justification was considered to be inappropriate, and questions answered "Yes" which were not carried forward to the Scoping stage, are identified by us and explained below:

Subterranean (Groundwater) Flow Screening:

Q5: *As part of the site drainage, will there be more surface run-off discharged to the ground?* Answered *"No".*
Comment: This question should have been answered 'Yes' because Drg No.1308.18B states that "garden area includes significantly less paving and more planting + permeable surfaces"; the latter will replace the existing impermeable paving. Thus more surface water in the rear garden will be able to infiltrate which should be beneficial to plants including the protected tree in the adjoining garden. However, in relation to groundwater, as the site is underlain by clays of the London Clay this increase in infiltration will be limited and will not benefit any of the superficial aquifers. It may also be partially offset by an increase in hard surfacing at the location of the front lightwell; no details of the existing surfacing there have been provided, though a medium sized bush is visible in Photo 2 on Drg No.1308.17.A so that area may be soft landscaped.

Stability Screening:

Q5: *Is the London Clay the shallowest strata at the site?* Answered *"No".*
Comment: The claim that the site is overlain by "shallow surface deposits" disagrees with both the published geology and the findings of the ground investigation borehole. The presence of Made Ground is irrelevant in this context, so this question should have been answered 'Yes' and carried forward to Scoping.

Q6: *Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree root protection zones where trees are to be retained?* No specific "Yes/No/Unknown" answer given.

Comment: The response notes that there are four trees on site, one of which will be removed, so this issue should have been carried forward into the Scoping phase.

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

Comment: No evidence has been given, or statements made by DDA to indicate whether the presence of tunnels has been investigated, so this question should have been answered 'Unknown'. A transport/utilities search will be required to assess this.

Scoping:

2.2.7 Section 2.0 of DDA's BIA report presents the Scoping which forms Stage 2 of the BIA process. Inevitably this scoping did not consider the other screening issues which have been identified above as having inappropriate 'No' answers.

Subterranean (Groundwater) Flow Scoping:

Q5 should have been included in this Scoping. This anticipated increase in infiltration may also result in a beneficial reduction in surface water discharge to the mains sewer system (which isn't covered in the surface water screening/ scoping).

Stability Scoping:

The proposed actions in relation to ***Q12*** (labelled Q13 in the BIA) are considered to be appropriate.

The proposed actions in relation to ***Q13*** are inadequate as they do not address the fundamental issue, which is the differential depth of the foundations to No.39 once the basement has been built. The implications of future shrinking/swelling of the clays beneath No.39's foundations in response to moisture changes caused by seasonal climatic or the action of tree roots should be addressed.

Q5, Q6 and Q14 should also have been included in this Scoping.

2.2.8 Ground Investigation (Stage 3):

Section 3.0 of DDA's BIA report presents the site-specific ground investigation which forms Stage 3 of the BIA process, with Albury SI's complete report on the investigation included in Appendix 3. This site investigation was limited to a single shallow borehole. The 4m depth of the borehole covers the likely depth of excavation of the proposed basement, but wasn't deep enough to consider the full depth of the soils which will be stressed by the underpins (or affected by the unloading). Ideally a second borehole should have been drilled in the front garden (which should have been easier than the one they did drill in the rear garden). Also, if hand dug trial pits had been excavated to identify the depths and nature of the foundations to the accessible external walls, then some of the assumptions in the BIA would not have been necessary.

2.2.9 The recommendations in the ground investigation report are broadly sound, with the notable exception of the effective cohesion values, c' = 5kPa for both Made Ground and the London Clay; these are far too high (because a small amount of cohesion makes a big difference to the stability analyses). For the weathered London Clay at the depths of excavation for this basement, the presence of fissures in the clays means that c' is usually taken as zero.

2.2.10 A few of the recommendations are not appropriate for the geology or the proposed works (eg: wells to lower the groundwater level in London Clay, where no granular partings or horizons have been recorded, and use of a strutted cofferdam for underpinning a terraced house). However, these do not appear to have affected the proposals by DDA.

Impact Assessment (Stage 4):

2.2.11 A brief impact assessment is presented in Section 4.0 of DDA's BIA report. The importance of adequate temporary works and high quality workmanship is correctly emphasised. The assessment also includes some sweeping generalisations which are unsubstantiated and in some cases inappropriate (eg: "*underpinning the party wall will remove the risk of the movement to the adjacent property*").

2.2.12 The impact assessment does not consider either hydrology (surface water/flooding) or hydrogeology (groundwater).

2.2.13 The impact assessment does not include any "*calculations of predicted ground movements and structural impact*", as required by paragraph 2.30 of CPG4, although there is an unsubstantiated statement that the category of damage is likely to be within Burland Category 2.

2.2.14 No specific mitigation or monitoring measures are given in the BIA report.

Preliminary Retaining Wall Design:

2.2.15 Appendix 4 of the BIA report includes retaining wall design calculations for the proposed basement, prepared in part using Tedds software. From a brief inspection (NOT a full review or check) the following aspects of the calculations give cause for concern:

- The groundwater level has been taken at 1.5m below ground level; this is much too low for compliance with geotechnical design standards which require use of 'worst credible' groundwater levels.
- The uplift analysis appears to have considered only hydraulic pressure and has ignored heave from the unloaded clays.
- The founding depth has been taken as 2.9m, whereas it will be significantly deeper for some if not all of the basement when allowance is included for the thickness of the ground floor structure, and the basement slab, insulation and floor finishes.
- The earth pressure at rest (K_0) has been taken at 0.59. London Clay is over-consolidated and where undisturbed can show K_0 values up to approximately 3.0 (varying with depth). Thus, K_0 = 0.59 would only occur if the ground is allowed to relax sufficiently to release most of the locked-in horizontal stresses, which is incompatible with minimising ground movements alongside the basement and damage to the adjoining properties.
- For retaining walls which will support ground below the adjoining/adjacent properties, the lateral earth pressure should never be allowed to reduce to the active (K_a) value, because that would permit excessive ground movements and unacceptable damage in the neighbouring buildings. Thus, for the Tedds analyses, it may be necessary to set K_a equal to K_0.
- No surcharge or point load behind the wall has been allowed to represent the loads from adjacent footings (eg: the front and rear walls of No.39).
- No analysis has been undertaken of the temporary situation, when the underpins have been constructed but the centre of the basement slab has yet to be completed (ie: when there is no beneficial propping from the basement slab). However, the significance of the critical need for use of

best practice, in supporting the excavation and the underpins until the permanent support has been completed, has been identified in the BIA report.

2.2.16 The preliminary structural engineering drawings by DDA are generally appropriate, although the labels conflict as to whether the thickness of the stem of the retaining walls should match the width of the wall above or the width of the footing.

2.3 Technical evidence from objectors

2.3.1 Gail Brackett of 39B Howitt Road has noted that No.39, which is owned by LBC, has evidence of existing subsidence damage. This damage has apparently been inspected by a Council surveyor. This evidence, if verified, means that the response to stability screening Q7 is wrong and will need to be revised, and the issue should have been carried forward to Scoping.

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 (BIA) report is structured appropriately so that it covers Stages 1 to 4 of the requirements in LBC's CPG4 'Basements and Lightwells' and the associated Camden GHHS (Arup 2010). Summaries were provided for the Screening and Impact Assessment (Stages 1 and 4); these complied with CPG4's requirement for 'non-technical summaries' even though they were not called non-technical.

3.1.2 The ground investigation scope was limited to a single 4m deep borehole despite space being available for a more thorough (and deeper) investigation. Trial pits excavated alongside the front and rear walls to assess the depth and nature of the footings would have enabled an assessment of whether perched groundwater (if any) could flow through the Made Ground beneath the house, and would have allowed the BIA to be more specific on various issues.

3.1.3 A detailed commentary on matters arising from the BIA report is presented in Section 2.2. The main non-compliances include:

- The authors' qualifications are not given, though they are described as "engineers", so it is unlikely that they conform to all the requirements of CPG4, and especially the need for qualified hydrogeological expertise.
- There is no linkage to LBC's Development Policy DP27.
- Some aspects of the Screening were answered "No" inappropriately so were not carried forward to the Scoping when they should have been.
- There were no non-technical summaries for Stages 2 and 3.
- The impact assessment did not consider either groundwater or surface water matters. The omission of some items from the Scoping also meant that they were not considered in the impact assessment.
- There were no ground movement calculations, contrary to paragraph 2.30 of CPG4, so the damage category assessment remained unjustified.

3.1.4 Thus, the BIA report must be revised in order to comply with CPG4 and DP27, and adequately assess all the impacts which the proposed basement will have on the neighbouring properties and on groundwater levels/flows beneath these properties, which are two of the most important requirements of CPG4 and DP27.

3.2 Technical sufficiency of the work carried out

3.2.1 While many aspects of the Basement Impact Assessment are sufficient, concerns remain about several important issues, as raised in Sections 2.2 and 3.1 above.

3.2.2 It would appear that the authors of the BIA may not have inspected No.41 nor, externally at least, the neighbouring properties.

3.2.3 The ground investigation should have included trial pits and, preferably, a deeper borehole.

3.2.4 The Construction Method Statement states that there are no trees in No.41's rear garden, whereas the BIA report states that there are four trees, one of which will be removed (no arboricultural report has been seen, but one is referred to in the BIA). No consideration has been given to the potential for future differential movement between the basement and the adjoining No.39 which will remain in part on shallow footings. This is especially important given that one of the occupiers has noted that No.39 is already suffering from what sounds like typical subsidence damage (eg: seasonal cyclical movements and distortion of door frames).

3.2.5 Several other technical issues of concern are identified in paragraphs 2.2.12 to 2.2.16 above. All these matters should be addressed in a revised BIA report.

3.3 Completeness of the Submission

3.3.1 The submitted BIA report falls short of the matters required by CPG4, DP27 and the Camden GHHS in several 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. These method statements should include full details of the methods to be used to minimise ground movements, and for 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.
- 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 and the ground exposed 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 Submission of a revised and expanded version of the BIA should be required prior to this application for planning permission being determined. This revised document should address all the issues identified in Sections 2.2, 3.1 and 3.2 above.

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4.0 CONCLUSIONS

4.1 These conclusions consider only the six specific requests in the enquiry letter from London Borough of Camden (dated 30th January 2015). 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 BIA is currently deficient in several respects. A revised and expanded BIA is therefore 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.*
   The suspected lack of any involvement by a hydrologist, a hydrogeologist and an engineering geologist (the authors' qualifications are not given in the BIA), contrary to the requirements in CPG4, has resulted in a minimal ground investigation and the use of inappropriate input data into the design calculations. The deficiencies in the BIA must be resolved, by preparation of a revised and expanded version, before the appropriateness of the methodologies can be confirmed.

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.*
   As mentioned above, the scope of the ground investigation was minimal which has resulted in various assumptions having to be made. Some of the engineering parameters used in the design are distinctly **not** conservative.
   As noted above, in the absence of any information about the qualifications of the authors of the BIA, it is suspected that they do not cover all the competencies required for compliance with the requirements of CPG4.
   The ground stability risks associated with heave below the basement and differential movement between No's 41 and 39 have not been adequately addressed.

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 (c) above. In addition, no mitigation measures have been included, so they should be added.

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 BIA states that there is no evidence of structural damage in the neighbouring properties which might be a cause for concern, though an occupier of No.39B has reported that the house is suffering from subsidence damage. The revised BIA should include a review of the evidence for that and recommendations on what actions should be taken. If planning consent is granted, the detailed condition of the adjoining properties 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.

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

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.
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f) The content of this report represents the professional opinion of experienced environmental consultants.
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