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Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12985-22
Revision: D1

November 2018

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	November 2018	Comment	CBcb12985-22-261118-16 Frognal Gardens-D1.doc	C Botsialas	E M Brown	E M Brown

Document Details

Last saved	26/11/2018 17:29
Path	CBcb12985-22-261118-16 Frognal Gardens-D1.doc
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Project Number	12985-22
Project Name	16 Frognal Gardens
Planning Reference	2018/2440/P

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 16 Frognal Gardens, London, NW3 6UX (planning reference 2018/2440/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment (BIA) for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The site has approximately rectangular shape and comprises two blocks of garages and tarmac paved area. The proposed development involves demolition of one garage block and construction of a three storey residential building including a basement, the latter extending to about 4m below the ground level at its deepest part.

1.5. It should be confirmed that the authors of the Structural Appraisal (SA) and the Ground Investigation (GI) reports possess suitable qualifications according to Section 4.7 of the CPG.

1.6. Reference to the current versions of Camden Planning Guidance Basements (CPG), CIRIA and British Standards should be made across all BIA documents.

1.7. It is recommended that the different screening and scoping sections of the SA and GI reports are made consistent to each other or are incorporated into one report, appropriately signed.

1.8. In the SA report, it is incorrectly mentioned that the site is located in London Clay.

1.9. A desktop utilities survey should be undertaken to locate underground services that could potentially affect the site or be impacted by the proposed development. According to existing information, the site may be located close to an old sewer tunnel.

1.10. It is accepted that the proposed development is not expected to affect the overall slope stability.

1.11. Contradictory information presented in the various reports about the proposed floor slab type should be amended.

1.12. 'Negligible' to 'very slight' damage is predicted by the ground movement analysis (GMA) for some of the neighbouring structures. However, the GMA should be revised to assess the

potential impact on all neighbouring structures and utilities, and include existing/proposed development loads, horizontal movements and long term movements.

1.13. Mitigation measures, should they be required, should be included in the GMA as well.

1.14. The latest version of the GI report should be referred to in the Structural BIA (BIA-S) report.

1.15. Consistency of information is required across the BIA documents with regard to proposed excavation depths.

1.16. The BIA-S report should be aligned to CPG with respect to acceptable damage levels.

1.17. A monitoring methodology informed by the GMA results, should be provided.

1.18. A brief construction method statement and a construction programme were included in the BIA.

1.19. The BIA-S retaining wall calculations should take into account the GI report's ground parameters.

1.20. Based on the above comments, it cannot currently be confirmed that the proposal adheres to the requirements of the CPG.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 29 October 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 16 Frognal Gardens, London, NW3 6UX (planning reference 2018/2440/P).

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners;
- Camden Planning Guidance Basements (March 2018);
- Camden Development Policy (DP) 27: Basements and Lightwells;
- Camden Development Policy (DP) 23: Water;
- Local Plan Policy A5 Basements.

2.4. The BIA should demonstrate that schemes:

a) Maintain the structural stability of the building and neighbouring properties;

b) Avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) Avoid cumulative impacts upon structural stability or the water environment in the local area;

and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as *"Erection of two storey 3-bed dwelling house (C3) fronting Holly Walk with PV panels following demolition of existing garage block; recladding of garage block; associated hard and soft landscape works including provision of cycle and bin store".*

2.6. The Audit Instruction also confirmed that no listed building is involved on site but there is a listed building on the opposite side of Holly Walk.

2.7. CampbellReith accessed LBC's Planning Portal on 9 November 2018 and gained access to the following relevant documents for audit purposes:

- "Structural appraisal" (SA), dated July 2018, job reference no. 180618, issued by Croft Structural Engineers;
- "Ground investigation report and basement impact assessment for the site at 16 Frognal Gardens, London NW3" (GI), dated October 2018, report reference no. GWPR2777/GIR, V1.01, issued by Ground & Water Ltd;
- "Basement Impact Assessment - Structural" (BIA-S), dated 8 October 2018, job reference no. 180618, issued by Croft Structural Engineers;
- Planning application drawings dated January 2018, job reference no. J1505, issued by MICTEC Ltd, consisting of:
  - "Existing site plan", drawing no. EX1;
  - "Existing street elevation", drawing no. EX2;
  - "Existing section A-A", drawing no. EX3;
  - "Existing section B-B", drawing no. EX4;
  - "Existing section C-C", drawing no. EX5.
- Planning application drawings dated May 2018, rev. A, issued by Peter Bernamont – Architect, consisting of:
  - "Proposed ground & lower ground plans", drawing no. FGH/6/01;
  - "Proposed upper floors plans", drawing no. FGH/6/02;
  - "Proposed east elevation & section X-X", drawing no. FGH/6/04;
  - "Proposed south elevation & section W-W", drawing no. FGH/6/05;
  - "Proposed west elevation & section Z-Z", drawing no. FGH/6/06;
  - "Proposed north elevation & section Y-Y", drawing no. FGH/6/07.
- "Design and access statement including heritage statement", dated May 2018, reference no. FGH/6/DAH, rev. A, issued by Peter Bernamont - Architect.
- Planning Comments and Responses.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	No	Refer to comment in audit paragraph 4.1.
Is data required by Cl.233 of the GSD presented?	Yes	However, reference to this audit should be made with regard to additional information required for the assessment of potential impact.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	No	Some additional information is required as per the findings of this audit. Refer to comments in Section 4.
Are suitable plan/maps included?	Yes	Suitable plans are included in the GI report. A utilities desktop survey is recommended as discussed in audit paragraph 4.6.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	Suitable plans are appended to the GI and BIA reports.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	However, additional information is required as discussed in audit paragraph 4.7.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	The hydrogeology screening is covered sufficiently.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	However, additional information is required with regard to potential flooding from sewer failure as discussed in audit paragraph 4.6.
Is a conceptual model presented?	Yes	A conceptual model is presented in Section 5 of the GI report.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	No	The land stability scoping should be revised in accordance with the comments about the screening discussed in audit paragraph 4.7.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	The hydrogeology scoping is consistent with the screening outcome and is discussed in Section 3.2.1 of the GI report.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	No	The hydrology scoping should be revised in accordance with the comments about the screening discussed in audit paragraph 4.6.
Is factual ground investigation data provided?	Yes	Refer to Sections 4 to 6 of the GI report.
Is monitoring data presented?	Yes	Refer to Section 7.2 of the GI report.
Is the ground investigation informed by a desk study?	Yes	Historical maps, BGS maps and other publicly available data are reviewed.
Has a site walkover been undertaken?	Yes	A “visual inspection of the surrounding area” is mentioned in the SA.
Is the presence/absence of adjacent or nearby basements confirmed?	No	The absence of nearby basements is assumed for the GMA.
Is a geotechnical interpretation presented?	Yes	Refer to Section 7 of the GI report.
Does the geotechnical interpretation include information on retaining wall design?	Yes	However, the derived values of Young’s Modulus and ‘Oedometric Modulus’ should be justified as discussed in audit paragraph 4.10.
Are reports on other investigations required by screening and scoping presented?	Yes	An outline construction method statement is provided in page 15 of the BIA-S.
Are the baseline conditions described, based on the GSD?	No	More information about any existing utilities and the existing and proposed loads is required as discussed in audit paragraphs 4.12 and 4.13.
Do the base line conditions consider adjacent or nearby basements?	Yes	The absence of nearby basements is assumed.

Item	Yes/No/NA	Comment
Is an Impact Assessment provided?	Yes	However, consideration of all neighbouring structures and additional information is required as discussed in audit paragraphs 4.12 and 4.13.
Are estimates of ground movement and structural impact presented?	Yes	A ground movement assessment is presented in Section 7 of the GI report. However, additional information is required as discussed in audit paragraphs 4.11, 4.12 and 4.13 of this audit.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	However, additional information is required as discussed in this audit.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Mitigation measures with regard to internal flooding and drainage are presented in the BIA-S report (p.13, 14), however, additional information is required as per paragraphs 4.12 and 4.13 of this audit.
Has the need for monitoring during construction been considered?	Yes	However, a monitoring methodology is required based on the results of the GMA as discussed in paragraph 4.19 of this audit.
Have the residual (after mitigation) impacts been clearly identified?	No	Additional information is required as discussed in paragraphs 4.12 and 4.13 of this audit.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	As above.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Refer to p.8 of the BIA report.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	Additional information is required as discussed in paragraphs 4.6, 4.12 and 4.13 of this audit.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However, additional information is required to be included in the GMA prove this outcome, as discussed in paragraphs 4.12 and 4.13 of this audit.

Item	Yes/No/NA	Comment
Are non-technical summaries provided?	Yes	Refer to p.3 and p.4 of the BIA report.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) reports have been prepared by two different consultancies, namely Croft Structural Engineers and Ground & Water Ltd. More specifically, Croft Structural Engineers issued a Structural Appraisal (SA) report in July 2018, that included screening and scoping sections, however, that report is unsigned and, as such, the qualifications of the individuals involved in its production cannot be checked against the requirements of Camden Planning Guidance (CPG) Basements (March 2018). Further, Ground & Water Ltd issued a ground investigation (GI) report in October 2018 that included the groundwater and land stability screening and scoping, the ground investigation and the ground movement assessment (GMA). None of the individuals concerned in the production of the GI report have suitable qualifications according to Section 4.7 of the CPG. Further, Croft Structural Engineers issued in October 2018, a Basement Impact Assessment - Structural (BIA-S) report which is signed by individuals that have suitable qualifications (CEng, MICE).

4.2. In brief, it should be confirmed that the authors of the SA and GI reports possess suitable qualifications according to Section 4.7 of the CPG.

4.3. The site has an approximately rectangular shape and comprises two blocks of garages and a tarmac paved area. The proposed development involves the demolition of one garage block and construction of a three storey residential building including a basement, the latter extending to about 4m below the ground level at its deepest part. The GI report indicates that the ground conditions consist of Made Ground up to 1m thick over Head Deposits over the Bagshot Formation at depth. Reinforced concrete cantilevered retaining walls employing a 'hit and miss' method are proposed in the BIA-S to form the basement and the foundations of the proposed building.

4.4. References to Camden CPG4, CIRIA C580 and BS8002:1994 are noted in the SA, GI and BIA-S reports, however, these documents have been superseded by CPG, CIRIA C760 and BS8002:2015 respectively, and as such, amendments are required accordingly.

4.5. The SA report includes screening and scoping sections (refer to Sections 3 and 4 of that report) for surface flow, ground water and slope stability. The GI report, issued in October 2018, also presents screening and scoping sections (refer to Sections 3.1 and 3.2 of that report) but for the ground water and slope stability only, providing different answers compared to the ones presented in the SA report. As such, the screening and scoping sections should be reviewed and made consistent between the two documents or presented in one report only, appropriately signed.

4.6. In the SA report it is incorrectly mentioned (in page 7) that the site is located "on low permeability London Clay". It is also noted in the SA report that the site could potentially be

flooded from nearby drains. According to existing information (old London sewer map dated 1930's), it appears that the site may be located close to an old sewer tunnel. A desktop utilities survey is recommended to locate underground services that could potentially affect the site or be impacted by the proposed development. The presence of any utilities at the site or in its proximity should inform the screening and scoping stages (also refer to answer in question 14 of the stability screening section of the GI report) and, where applicable, should be assessed in the ground movement analysis as discussed below in paragraph 4.13 of this audit.

4.7. The site is shown within an area potentially prone to slope instability (refer to Figure 17 of the GSD) and as such the answer to question 4 of the slope stability screening section (in page 10) of the GI report should be amended accordingly. Similarly, amendment is required in the relevant comment in paragraph 2.5 of the GI report. It is accepted though that, assuming good workmanship during construction, the proposed development is not expected to affect the overall slope stability and that this issue need not be carried over to scoping stage.

4.8. The methodology used for the calculation of the bearing capacity values and the term 'Limit Bearing Capacity' presented in page 26 of the GI report should be clarified.

4.9. The calculation methodology of the maximum anticipated heave of 26mm and 53mm below the floor slab at 2m and 4m depth respectively, discussed in page 27 of the GI report should be clarified. Also, contradictory information is presented about the proposed floor slab where a partially suspended floor slab is mentioned in p.27 of the GI report and a ground bearing floor slab is assumed in the SA report. An amendment is required.

4.10. The derived values of Young's Modulus and 'Oedometric Modulus' and the methodology of the settlement calculation presented in pages 25 and 26 respectively of the GI report, should be clarified.

4.11. A ground movement analysis (GMA) was undertaken and presented in the GI report. The GMA assumed, in accordance with the architectural drawings, that underground excavations will be required at different levels ranging between approximately 2m and 4m below ground level. CIRIA C760 approach was adopted for assessing ground movements assuming two different foundation scenarios given the ground conditions encountered; one assessment considered that the basement will be founded in granular soils (sand) and a second, separate, assessment was undertaken for a basement foundation within cohesive soils (clay). It is noted, that whilst CIRIA approach is intended for embedded retaining walls, it is accepted that this approach can predict ground movements within the range typically anticipated for the proposed underpinning / 'hit and miss' techniques carried out with good control of workmanship. The GMA outcome was checked against any potential impact and damage to the existing buildings at 18 Holly Walk and 16 Frognal Gardens adopting Burland Scale according to CPG and CIRIA C760 methodology. 'Negligible' to 'very slight' damage is predicted in both scenarios considered assuming good

construction practice be adopted. However, the GMA should consider additional information and be revised as discussed in the following paragraphs.

4.12. The GMA should additionally consider:

- Potential horizontal movements in the sand;
- The anticipated long-term movements;
- The existing and proposed structural loads;
- Reference to the 'conservative line' (p.36 of GI report) only for the 'soft to firm clay';

4.13. The GMA should also consider the potential impact to:

- Holly Walk, both the pedestrian pavement and the highway;
- The remaining garages to the south of the site (that is the case for granular soils scenario only);
- Any utilities or underground services that might be present in the vicinity;
- The wall situated on the northern boundary with 18 Holly Walk.

4.14. Mitigation measures, should they be required, should be included in the GMA accordingly.

4.15. It is understood that an earlier version of the GI report dated September 2018 is referenced in the BIA-S report. The latest version of the GI report dated October 2018 should be referred to.

4.16. In the BIA-S report (executive summary and page 6) it is mentioned that the deepest part of the basement will extend to about 2.60m below ground level. However, based on the architectural drawings, sections 1-1 and 2-2 included in Appendix C of the BIA-S report, and the GMA analysis, the proposed excavations are anticipated to be up to about 4m deep. Consistency of information is required across the BIA documents.

4.17. In the BIA-S report (page 8) it is stated that "The design and construction methodology aims to limit damage to the existing building on the site, and to the neighbouring buildings, to Category 2 or lower as set out in Table 2.5 of CIRIA report C580". However, according to CPG, a risk of damage to existing structures no higher than Burland Scale 1 'very slight' is acceptable for basement schemes. Accordingly, that statement above is not acceptable and should be amended. Further, the proposed design and construction methodology should ensure that any potential damage to surrounding structures be limited to no higher than Burland Scale 1 'very slight'.

4.18. In the BIA-S report (page 9) it is stated that "It is not expected that any cracking will occur in nearby structures during the works. However, Croft's experience advises that there is a risk of movement to the neighbouring property". It is recommended that the risk of ground movement and the associated potential damage to neighbouring properties are assessed on the basis of the site-specific GMA results. In this context, that statement should be amended.

4.19. A generic monitoring methodology is presented in page 10 of the BIA-S report. Also, "A proposed monitoring statement" is indicated in the same page but that "monitoring statement" is not appended to the BIA-S report. It is recommended that the monitoring methodology is not generic but is based on the results of the GMA. As such, a monitoring methodology outline should be included in the BIA with movement trigger values determined in accordance with the GMA results.

4.20. An outline construction method statement is presented in page 15 of the BIA-S report along with an outline construction programme (in Appendix B) and an outline plan for the 'hit and miss' proposed basement construction (in Appendix C). Typical calculations for the proposed retaining walls are also presented in Appendix A of the BIA-S report which, although indicative at this stage, should include the ground parameters proposed by the GI report (refer to page 28 of the GI report). As such, the ground parameters used in those BIA-S calculations should be reviewed.

4.21. Based on the above comments, a number of queries has been raised as summarised in Appendix 2. It cannot currently be confirmed that the proposal adheres to the requirements of the CPG.

5.0 CONCLUSIONS

5.1. It should be confirmed that the authors of the Structural Appraisal (SA) and the Ground Investigation (GI) reports possess suitable qualifications according to Section 4.7 of the CPG.

5.2. Reference to the current versions of CPG, CIRIA and British Standards should be made across all BIA documents.

5.3. It is recommended that the different screening and scoping sections of the SA and GI reports are made consistent to each other or are incorporated into one report, appropriately signed.

5.4. In the SA report, it is incorrectly mentioned that the site is located in London Clay.

5.5. A desktop utilities survey should be undertaken to locate underground services that could potentially affect the site or be impacted by the proposed development. According to existing information, the site may be located close to an old sewer tunnel.

5.6. The site is within an area potentially prone to slope instability and as such, the answer to question 4 of the slope stability screening section and paragraph 2.5 of the GI report should be amended. It is accepted though, that the proposed development is not expected to affect the overall slope stability.

5.7. The methodology used for the calculation of the bearing capacity values and the term 'Limit Bearing Capacity' presented in the GI report should be clarified.

5.8. The calculation methodology of the maximum anticipated heave below the floor slab should be clarified.

5.9. Contradictory information presented in the various reports about the proposed floor slab type should be amended.

5.10. 'Negligible' to 'very slight' damage iss predicted by the ground movement analysis (GMA) for some of the neighbouring structures. However, the GMA should be revised to assess the potential impact on all neighbouring structures and utilities, and include existing/proposed development loads, horizontal movements and long-term movements.

5.11. Mitigation measures, should they be required, should be included in the GMA as well.

5.12. The latest version of the GI report should be referred to in the Structural BIA (BIA-S) report.

5.13. Consistency of information is required across the BIA documents with regard to proposed excavation depths.

5.14. The BIA-S report should be aligned to CPG with respect to acceptable damage levels.

5.15. A monitoring methodology informed by the GMA results, should be provided.

5.16. A brief construction method statement and a construction programme were included in the BIA.

5.17. The BIA-S retaining wall calculations should take into account the GI report's ground parameters.

5.18. Based on the above comments, it cannot currently be confirmed that the proposal adheres to the requirements of the CPG.

Appendix 1: Residents' Consultation Comments

None pertinent to BIA

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	Authors qualifications.	Open	
2	BIA	Superseded references of CPG, CIRIA & BS.	Open	
3	BIA	The different screening and scoping sections should be made consistent to each other or incorporated into one report.	Open	
4	BIA	It is incorrectly mentioned (in the SA) that the site is located in London Clay.	Open	
5	BIA	Contradictory information is presented about the proposed floor slab type.		
6	BIA	The latest version of the GI report should be referred to in the BIA-S report.	Open	
7	BIA	Consistency is required across the BIA documents with regard to proposed excavation depths.	Open	
8	BIA	The BIA-S report should be aligned to CPG with respect to acceptable damage levels.	Open	
9	Stability & Hydrology	A desktop utilities survey is recommended.	Open	
10	Stability	The answer to question 4 of the slope stability screening and paragraph 2.5 of the GI report should be amended.	Open	
11	Stability	The calculation methodology of bearing capacity and the 'Limit Bearing Capacity' term should be clarified.	Open	
12	Stability	The calculation methodology of heave below the floor slab should be clarified.	Open	
13	Stability	The GMA should assess potential impact on all neighbouring structures and utilities, and include existing/proposed development loads, horizontal movements and long-term movements.	Open	
14	Stability	Mitigation measures should be included in the GM as required.	Open	

15	Stability	A monitoring methodology informed by the GMA results should be provided.	Open	
16	Stability	The BIA-S retaining wall calculations should take into account the GI report's proposed ground parameters.	Open	

Appendix 3: Supplementary Supporting Documents

None

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