CampbellReith
consulting engineers

38 Frognal Lane, London NW3 6PP

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13398-62
Revision: F1

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Campbell Reith Hill LLP
15 Bermondsey Square
London
SE1 3UN

T:+44 (0)20 7340 1700
E:london@campbellreith.com
W:www.campbellreith.com

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Author	K Barker, MSci CGeol FGS
Project Partner	E M Brown, BSc MSc CGeol FGS
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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 38 Frognal Lane, London NW3 6PP (planning reference 2020/4667/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 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 BIA has been prepared by individuals who possess suitable qualifications.

1.5. The BIA has confirmed that the proposed basement will be founded within Claygate Member soils. It is anticipated that the groundwater table will be encountered during basement excavation.

1.6. It is proposed to construct the basement using a contiguous pile wall. The revised construction sequence indicates high level propping will be used to support the basement during construction.

1.7. Based on the proposed mitigation measures described in the Flood Risk Assessment it is accepted that the development will not impact the hydrology of the area. It is accepted that the proposal will not impact the slope stability of the surrounding area.

1.8. Based on the revised BIA submission and mitigation measures described therein, it is accepted that the development will not impact the hydrogeology of the area.

1.9. The BIA indicates that the impact to the adjacent highway is indicated to be negligible and damage to neighbouring properties will not exceed Burland Category 1 (Very Slight).

1.10. The BIA indicates that a ground movement monitoring plan for adjacent buildings will be adopted. This should be agreed as part of any party wall agreements.

1.11. Utility data have been provided as part of the revised submission.

1.12. Based on the revised submission it can be confirmed that the BIA complies with the requirements of CPG: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 2 November 2020 to carry out a Category B audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 38 Frognal Lane, London NW3 6PP.

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

- Camden Local Plan 2017 - Policy A5 Basements.
- Camden Planning Guidance: Basements. March 2018.
- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.

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 replacement 2 storey dwelling plus basement following demolition of existing building"*.

2.6. The Audit Instruction confirmed the development does not involve a listed building. The neighbouring property at 40 Frognal Lane is identified as being a Grade II listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 12 November 2020 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) by Train and Kemp (Consulting Engineers) LLP, rev 01, dated 6 November 2020.

- Main Investigation Report (as Appendix 2 of the BIA) by Soils Limited, ref. 18577/MIR_R27, dated October 2020.
- Ground Investigation Letter Report (as Appendix 2 of the BIA) by Soils Limited, ref. 14005/FDL/RG, dated 10 January 2014.
- Ground Movement and Building Damage Assessment (as Appendix 4 of the BIA) by Train and Kemp (Consulting Engineers) LLP, ref 14604, revision 0, dated 1 October 2020.
- Flood Risk Assessment (as Appendix 6 of the BIA) by Train and Kemp (Consulting Engineers) LLP, ref. 14604, revision 2, dated 5 October 2020.
- Tree Survey and Arboricultural Method Statement by Tretec, ref. 20022, dated September 2020.
- Planning Application Drawings by Charlton Brown Architecture and Interiors, consisting of a location plan, existing and proposed plans, sections, elevations and demolition section plans, dated 2 October and 23 November 2020.
- Design & Access Statement by Charlton Brown Architects Ltd, rev 2 dated September 2020.

2.8. The following additional documents were provided to CampbellReith in response to the queries raised in Appendix 2 of the initial audit (D1) report:

- Basement Impact Assessment (BIA) by TAK Structures Ltd, ref TAK 20080, dated 03 June 2021.
- Ground Movement Assessment by TAK Structures Ltd, presented as Appendix 5 of the revised BIA, rev B, dated February 2021.
- Construction Methodology by TAK Structures, ref. 20080, rev B, dated February 2021.
- Basement construction drawings by TAK Structures, ref 20080:
    - TAK_GA-01, -03 to -08, -10 and -11, all rev P3, all dated 20 May 2021.
    - TAK_GA-02 and -09, both rev P05, both dated 20 May 2021.
- Structural calculations by TAK Structures, rev P02, dated May 2021.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
Is data required by Cl.233 of the GSD presented?	Yes	The revised submission now includes utility search data and additional drawings of the proposed basement.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	The revised BIA now includes a construction sequence.
Are suitable plan/maps included?	Yes	
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	Three recent groundwater monitoring visits are reported in the revised submission. Two visits were undertaken in 2014.
Is the ground investigation informed by a desk study?	Unknown	BIA includes a Desk Study but it is unclear whether this data was used to design the ground investigation.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	Presented in the revised BIA submission.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural Assessment and Flood Risk Assessment are provided.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	Also, estimates of heave from the basement excavation are now provided and should be considered further at detailed design stage.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	The impact to the adjacent highway is now considered.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	
Has the need for monitoring during construction been considered?	Yes	
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Based on the revised BIA.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Based on the revised BIA submission.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by Train and Kemp consulting Engineers, with input from Soils Limited. The individuals involved in the production of the BIA hold suitable qualifications.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal does not involve a listed building. The BIA identifies the neighbouring property at No. 40 Frognal Lane as being a Grade II listed building.

4.3. The proposed development comprises the demolition of the existing 2-storey building on site and the construction of a new 3-storey building with a single basement level extending beyond the footprint of the proposed building. The basement will include a pool in the north. It is proposed to construct the basement using a contiguous pile wall. The basement excavation is indicated to extend to 86.2m OD, with excavation in the pool area extending to 84.4m OD. Ground level is given as 90.9m OD at the front of the property and 90.5m OD in the rear garden.

4.4. Intrusive site investigation was carried out at the site by Soils Limited in 2014 and 2020, and is presented in Appendix 2 of the BIA. It is unclear whether the scope of either of the site investigations has been informed by a Desk Study. The ground conditions are indicated to comprise Made Ground over Claygate Member soils, with London Clay below, extending to depth.

4.5. Groundwater was noted in two boreholes during each of the 2014 and 2020 site investigations. Two groundwater monitoring visits were undertaken in 2014 and recorded levels between 0.8m and 2.8m depth. The revised BIA submission presents data from three groundwater monitoring visits carried out following the 2020 investigation. Groundwater was recorded in all three of the 2020 installations, at levels between 0.99m and 2.56m depth.

4.6. Basic soil parameters are summarised in Appendix B of the Ground Investigation report provided in Appendix 2 of the BIA. Retaining wall design parameters and Young's modulus values are now provided for the undrained condition, in Section 7.1 of the revised BIA. The undrained shear strength profile adopted in the BIA is less conservative than the design line given in Appendix C of the Soils Ltd report.

4.7. The proposed basement will be constructed within the Claygate Member, which is identified as a Secondary (A) Aquifer. Two tributaries of the River Westbourne are identified to originate close to the site and the site investigation identified shallow groundwater across the site. The BIA identifies that the basement excavation will extend below groundwater level.

4.8. The screening and scoping sections within the revised BIA have been updated to present consistent information and consider the increase in impermeable surfaces due to the proposed development.

4.9. The revised BIA does not discuss the site being within a Critical Drainage Area (CDA). However, a Flood Risk Assessment (FRA) has been carried out, presented in Appendix 6 of the BIA, and does identify the site to be within CDA 3_010.

4.10. Sections 5.5.8 to 5.5.11 of the revised BIA have been updated to consider the impact of the basement development on groundwater. The BIA indicates that groundwater flow within the Claygate Member is likely to be predominantly horizontal, rather than vertical, and that groundwater flow will be limited to sandy units within the Claygate, where flow is possible. Groundwater flow is indicated to be from northeast to southwest.

4.11. The revised BIA indicates that the adjacent property at 12 Langland Gardens includes a lower ground floor level that is thought to be seated within the Claygate Member, which already restricts flow through the Claygate Member soils. The proposed basement at No. 38 Frognal Lane is upstream of the neighbouring basement. Groundwater flow will likely be locally impeded due to the detached nature of the property. The BIA indicates that any upstream rise in water level is likely to be minimal and that the neighbouring property on the upstream side is at a higher elevation than the site.

4.12. The BIA identifies the Claygate Member to be predominantly cohesive with a fine sand fraction within a silty clay matrix. The groundwater encountered during drilling and the absence of more permeable (and continuous) sandy soils suggest significant washout of soils between piles is unlikely. The BIA proposes the use of gunite (shotcrete) to fill the gaps between the piles in the temporary case should soil loss occur beyond the diameter of the pile. On this basis it is accepted that the development will not have a significant impact on the hydrogeology of the area.

4.13. The FRA indicates that attenuation geocells will be included in the development and flows off site will be restricted to 2L/second. A freeboard will be included at the entrance of the property to mitigate water ingress from Frognal Lane. Based on the mitigation measures described in the FRA it is accepted that the development will not impact the hydrology of the area.

4.14. A topographical survey of the site is provided. It shows Frognal Lane at the front of the property rising from c. 90.7m OD in the west to c. 93m OD in the east. To accommodate this slope the building platform for the site is cut into the slope on the north side to form a flat courtyard area at the front of the property. The sloping land and adjacent road are proposed by the BIA to be supported by a retaining wall which is shown to be c. 2.2m high at its highest point.

4.15. Appendix 5 of the BIA is indicated to contain Structural Engineer's Statement and Calculations. Structural calculations and drawings showing the pile layout, outline temporary works including any propping arrangements and a representative section of the two basement levels are provided as part of the revised submission.

4.16. A Ground Movement Assessment (GMA) has been carried out and is presented in Appendix 4 of the BIA. Throughout the GMA reference to CIRIA C580 is made. It should be noted that this document was withdrawn in 2017 and has been superseded by CIRIA C760, however it is acknowledged that the assessment principles remain the same and therefore the outcome of the GMA is valid.

4.17. The GMA indicates that the length of the piles forming the basement will be 10m, extending to 15m around the pool area. Appendix 2 of the GMA presents the calculations used to predict a Damage Category for the adjacent structures assessed. The approach used to assess vertical movements considers ground movement at two discrete points within the footprint of the building. Based on the data provided and the magnitude of the values calculated, it is accepted that the predicted damage category will not exceed Category 1 (Very Slight).

4.18. The drawing presented in Appendix 1 of the GMA identifies the extent of the deep piles around the swimming pool area. The extent identified matches the construction sequence details provided in Appendix 5 of the BIA, although it is noted that the drawing in Appendix 1 of the GMA has not been updated and still shows the swimming pool area extending beyond the line of deep piles adjacent to 12 Langford Gardens. However, this latter inconsistency does not affect the outcome of the GMA.

4.19. The revised GMA considers the neighbouring properties, and has been updated to include an assessment of the impact to the adjacent retaining wall, highway, and any utilities therein, in Section 6.5. Horizontal strains affecting the highway are indicated to be small enough that their impact is negligible. It is noted that the assessment for the highway in Appendix 2 of the GMA uses the height difference between the basement and the road level, which is higher than the land directly adjacent to the basement. As such, the results of this assessment are considered to be conservative. The GMA indicates a negligible impact to the adjacent highway and utilities. The GMA (Section 6.6.1) indicates that the northern boundary retaining wall will need temporary support during the basement excavation and this shall be considered during the detailed design.

4.20. The revised BIA now considers the heave that will occur during basement excavation. Calculations have been provided for the undrained case. As mentioned above, the soil parameters used in this assessment are less conservative than those given in the Soils Ltd report, and the assessment only considers the undrained case. Due to the use of a stiff embedded retaining wall to form the basement, ground heave within the basement is not

considered to significantly contribute to the ground movements affecting neighbouring structures.

4.21. Section 6.5 of the revised GMA discusses monitoring of the adjacent buildings, and paragraph 7.4.3 of the revised BIA indicates that a ground movement monitoring scheme will be adopted. This should form part of the party wall agreement to ensure damage to adjacent structures does not exceed the levels predicted in the GMA.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the proposed basement will be founded within Claygate Member soils. It is anticipated that the groundwater table will be encountered during basement excavation.

5.3. It is proposed to construct the basement using a contiguous pile wall. Piles will be 10m long around the majority of the basement, extending to 15m long around a proposed pool area at the front of the property. The revised construction sequence indicates high level propping will be used to support the basement during construction.

5.4. The revised BIA submission presents updated screening and scoping sections with appropriate responses for the development.

5.5. Based on the mitigation measures described in the Flood Risk Assessment it is accepted that the development will not impact the hydrology of the area. It is accepted that the proposal will not impact the slope stability of the surrounding area.

5.6. Based on the assessment contained within the revised BIA submission, and the mitigation measures described therein, it is accepted that the development will not impact the hydrogeology of the area.

5.7. The revised Ground Movement Assessment (GMA) considers the impact to neighbouring structures, as well as the adjacent highway. The impact to the adjacent highway and utilities is indicated to be negligible.

5.8. The BIA indicates that damage to neighbouring properties will not exceed Burland Category 1 (Very Slight).

5.9. The BIA indicates that a ground movement monitoring plan for adjacent buildings will be adopted. This should be agreed as part of any party wall agreements.

5.10. Based on the revised submission it can be confirmed that the BIA complies with the requirements of CPG: Basements.

Appendix 1: Residents' Consultation Comments

None pertinent to the BIA

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Interpretative soil parameters should be provided.	Closed	11/02/2021
2	Screening and Scoping	Screening and Scoping sections should be updated in line with the comments in Sections 3 and 4 of this report.	Closed	11/02/2021
3	Hydrogeology	Further consideration of the impact to the hydrogeology of the area should be undertaken on completion of the scheduled groundwater monitoring visits.	Closed	11/02/2021
4	Hydrogeology	Further details regarding the use of a pea shingle layer as a mitigation measure should be provided in line with the comments in Section 4 of this report.	Closed – further impact assessment has removed the need for mitigation	15/04/2021
5	Hydrogeology	Assessment of potential loss of fines/ground settlement due to seepages and pumping, with mitigation measures are requested.	Closed	08/06/2021
6	Stability	Calculations, structural drawings showing the pile layout, outline temporary works drawings and a representative section of the two basement levels are requested.	Closed	13/05/2021
7	Stability	The GMA should be updated in line with the comments in Section 4, and, where damage exceeds Burland Category 1, additional mitigation measures should be discussed to keep anticipated damage within acceptable levels. It is requested that a monitoring plan with trigger levels and outline contingency measures is provided to show how the risk of ground movement will be mitigated.	Closed Closed – monitoring is proposed with details to be agreed as part of the party wall award.	13/05/2021 15/03/2021
8	Stability	Consideration of the impact to the adjacent highway, and any utilities therein, is required.	Closed	08/03/2021
9	Stability	Utility data should be provided.	Closed	11/02/2021

10	Stability	Further information is required to show how the stability of the proposed retaining wall to the front of the site, will be maintained during construction.	Closed	08/03/2021

Appendix 3: Supplementary Supporting Documents

None

London

15 Bermondsey Square
London
SE1 3UN

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com