CampbellReith
consulting engineers

40 Frognal Lane
London NW3 6PP

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12336-47
Rev: D1

May 2016

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Appendices

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 40 Frognal Lane (planning reference 2014/5915/P). The basement is considered to fall with Category C 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 review it against an agreed audit check list.

1.4. The BIA has been prepared by personnel who have suitable qualifications and experience.

1.5. 40 Frognal Lane is a three storey detached house which has its lowest floor set a half-storey into its surrounding gardens. It is proposed to construct a basement underground swimming pool below the garden on the house's western flank. The BIA identifies the pool dimensions as 22.5 metres by 8 metres but drawn information is unclear regarding total basement size and depth. Clarification is requested.

1.6. A soils investigation has determined that the basement will be founded within laminated clays with lenses of fine sands (Claygate Member) although the deepest section of the basement swimming pool is likely to be founded in the London Clay.

1.7. Groundwater is likely to be encountered at the base of the Claygate Member although groundwater flow has been shown to be slight. The groundwater flows in a west-north-west direction and it is proposed to install a granular fill around the outside of the basement to assist this flow. Further groundwater monitoring is requested to inform the correct depth of granular fill required and allow the design of temporary and permanent groundwater control. A threshold groundwater level should be defined which takes account of seasonal variation, and appropriate mitigation described.

1.8. It is proposed to construct the basement using a contiguous bored pile retaining wall although a superior secant piled wall is being considered. This would ensure no loss of fine material through the wall during pumping operations and reduce potential ground settlement and is recommended.

1.9. It is requested that a Ground Movement Assessment is undertaken to determine potential vertical and horizontal ground movements during piling installation and excavation. Heave forces should also be evaluated to determine the effect on the proposed basement raft. A

Burland Scale damage assessment and a movement monitoring regime should then be provided for consideration.

1.10. It is accepted that the surrounding slopes to the development are stable but the basement construction is likely to undermine boundary garden walls of neighbouring properties according to the Structural Stability Report. It proposes an agreement to demolish and rebuild them but this is not mentioned in the BIA. Clarification is requested.

1.11. It is accepted that there are no hydrogeological concerns and no hydrological concerns with respect to the development proposals.

1.12. Queries and requests for clarification arising out of this initial audit are discussed in Section 4 and summarised in Appendix 2.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 13 April 2016 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 40 Frognal Lane, Camden Reference 2014/5915/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 (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

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; and,

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 the "Excavation to create basement level swimming pool under garden area in connection with residential dwelling (Class C3)."

and confirmed that the basement proposals involved a Grade II listed building.

2.6. CampbellReith accessed LBC's Planning Portal on 27 April 2016 and gained access to the following relevant documents for audit purposes:

· Basement Impact Assessment (BIA) dated September 2015 by Train & Kemp.

- Structural Stability Report (SSR) dated February 2011 by Train & Kemp.
- Architect's Proposed Floor Plans, Sections and Elevations dated 2009 by TGN Architects Ltd.
- Letter dated 5 March 2009 by Train & Kemp regarding SUDS.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Cover Sheet.
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA Section 2.
Are suitable plan/maps included?	No	Discussed in text but BIA would be improved with map extracts showing site location.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	No	No maps included.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 4.1.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 3.1.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 5.1.
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 4.2.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 3.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 5.2.
Is factual ground investigation data provided?	Yes	BIA Appendix 4.
Is monitoring data presented?	Yes	Standpipes monitored on five occasions. Further monitoring recommended.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	No	Assumed no basements are present.
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Appendix 4.
Are reports on other investigations required by screening and scoping presented?	Yes	BIA Section 6.
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	No	
Is an Impact Assessment provided?	Yes	BIA Sections 3.4, 4.4, 5.4, 6.4 and 6.5.
Are estimates of ground movement and structural impact presented?	No	

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	No	No GMA presented.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	However, further information required with respect to mitigation against groundwater ingress.
Has the need for monitoring during construction been considered?	No	
Have the residual (after mitigation) impacts been clearly identified?	Yes	BIA Sections 3.4, 4.4, 5.4, 6.4 and 6.5.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	No	
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	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	However, no supporting analysis provided.
Are non-technical summaries provided?	Yes	BIA Section 7.

4.0 DISCUSSION

4.1. This BIA has been carried out by an established firm of consultants, Train & Kemp, and the authors possess suitable qualifications and experience to comply with the requirements of CPG4.

4.2. 40 Frognal Lane is an established large detached house on two storeys above a lower ground floor which is approximately a half storey below the garden on its western flank. It is proposed to install a swimming pool and ancillary leisure facilities below the garden to the west of the existing house connected by a staircase from the house. The BIA identifies the pool dimensions as 22.5 metres long by 8 metres wide although the architectural drawings appear to indicate that it is nearer 30 metres long. The basement excavation, to include steam room, shower, changing facilities and plant room as well as pool surround, is likely to be 28 metres long by 12 metres wide on the basis of the stated pool length. The BIA states that the excavation for the pool will not exceed 5 metres below the lower ground floor of the house but the architects section A-A drawing appears to indicate an excavation of up to 8 metres below lower ground floor. Dimensional drawings are requested to clarify the potential anomalies described.

4.3. A soils investigation has been undertaken in 2011, consisting of 2 no. boreholes to 18 metres in depth, followed by two window samplers installed in the forecourt of No.38 to a depth of 6 metres. This has shown that the excavation will general pass through Made Ground, 0.9 metres to 1.3 metres in thickness, the Claygate Member (laminated clays with lenses of fine sands) varying in thickness between 5.1 and 5.6 metres and the London Clay to depth. The BIA states that the deepest part of the swimming pool will be founded within the London Clay, whereas the shallower surrounding part of the basement box will be founded in the Claygate Member.

4.4. The BIA anticipates that the excavation will encounter groundwater towards the base of the Claygate Member and has identified that groundwater flow is in the west-north-west direction, although it is questioned whether the groundwater table has been accurately clarified. The BIA proposes that a coarse granular fill material is placed outside of the basement construction box to intercept existing groundwater flows and route them around the proposed structure. The BIA notes that groundwater levels may marginally rise on the up-gradient (east) side of the basement, which may affect the lower ground floor construction of the existing house. It suggests further groundwater monitoring to inform the required depth of the granular fill. Whilst the provision of the drain will mitigate any obstruction to groundwater flow, further monitoring is required to allow permanent and temporary water proofing measures to be appropriately designed.

4.5. The SSR proposes to install a contiguous bored pile retaining wall from existing external ground level, which is intended to act “as a vertical cantilever and allow the soil to be excavated without any additional propping. The piles will be 450mm diameter and installed at 600mm

centres." It is worth noting that the BIA states that a better solution to overcome groundwater entering the basement excavation during construction would be to replace the contiguous wall with a secant bored pile retaining wall. This would ensure no loss of fine material through the wall during pumping of the groundwater and a lower possibility of ground settlement through dewatering. This alternative proposal is endorsed.

4.6. The BIA states that the basement excavation will be 3 metres from the existing lower ground floor and will require localised underpinning of the existing house in the location of the linking staircase. The deeper pool section of the excavation is 6 metres from the lower ground floor of the existing house and the same distance from No.38. It is generally accepted that basement excavation has a zone of influence of four times the depth of excavation and, hence, it is requested that a Ground Movement Assessment is undertaken to show the effect of pile installation and excavation upon the existing and surrounding properties by determining potential vertical and horizontal ground movements, particularly as a free cantilever retaining wall with no temporary propping is proposed. This process will be assisted by the additional dimensioned drawings requested in Section 4.2. This will then allow an assessment of damage, in accordance with the Burland Scale, to be undertaken, which is also requested.

4.7. As the deepest portion of the excavation will extend into the London Clay, an assessment of potential heave forces is requested together with its effect on the proposed basement raft.

4.8. It is requested that a ground movement monitoring regime is proposed in accordance with the requirements of CPG4. Actual movements during construction will be able to be compared to predicted values and any propping introduced as necessary to minimise potential damage.

4.9. It is accepted that there is no increase in impermeable area across the ground surface above the basement and it is also accepted that the development site is not in an area known to be at risk from surface water flooding.

4.10. The BIA has shown that the surrounding slopes to the development are stable and the basement is not within 5 metres of an adjacent highway. It is noted that the SSR discusses the fact that the new basement will be constructed close to the boundary walls of the neighbouring properties and that it is anticipated that an agreement will be made to take down the walls and rebuild them, thus eliminating the need for complex temporary works to support low level garden walls. This is not mentioned in the BIA and clarification is requested.

4.11. It is accepted that no known ponds, springlines or wells are in close vicinity to the site and the site is outside the Hampstead pond chain catchment area.

5.0 CONCLUSIONS

5.1. The BIA has been prepared by personnel who have suitable qualifications and experience.

5.2. 40 Frognal Lane is a three storey detached house which has its lowest floor set a half-storey into its surrounding gardens. It is proposed to construct a basement underground swimming pool below the garden on the house's western flank. The BIA identifies the pool dimensions as 22.5 metres by 8 metres but drawn information is unclear regarding total basement size and depth. Clarification is requested.

5.3. A soils investigation has determined that the basement will be founded within laminated clays with lenses of fine sands (Claygate Member) although the deepest section of the basement swimming pool is likely to be founded in the London Clay.

5.4. Groundwater is likely to be encountered at the base of the Claygate Member although groundwater flow has been shown to be slight. The groundwater flows in a west-north-west direction and it is proposed to install a granular fill around the outside of the basement to assist this flow. Further groundwater monitoring is requested to inform the correct depth of granular fill required and allow the design of temporary and permanent groundwater control. A threshold groundwater level should be defined which takes account of seasonal variation, and appropriate mitigation described.

5.5. It is proposed to construct the basement using a contiguous bored pile retaining wall although a superior secant piled wall is being considered. This would ensure no loss of fine material through the wall during pumping operations and reduce potential ground settlement and is recommended.

5.6. It is requested that a Ground Movement Assessment is undertaken to determine potential vertical and horizontal ground movements during piling installation and excavation. Heave forces should also be evaluated to determine the effect on the proposed basement raft. A Burland Scale damage assessment and a movement monitoring regime should then be provided for consideration.

5.7. It is accepted that the surrounding slopes to the development are stable but the basement construction is likely to undermine boundary garden walls of neighbouring properties according to the Structural Stability Report. It proposes an agreement to demolish and rebuild them but this is not mentioned in the BIA. Clarification is requested.

5.8. It is accepted that there are no hydrogeological concerns and no hydrological concerns with respect to the development proposals.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Lough	95 Redington Road	13.10.14	Effect on hydrogeology	See 4.3 and 4.4
McCarthy	19 Frognal Lane	24.10.14	Stability of neighbouring structures	See 4.3 to 4.8
diBorgoricco	42 Frognal Lane	31.10.14	Inadequate information	See 4.1 to 4.11
Hagemans	254a Finchley Road	11.11.14	Incorrect assessment of basement size and depth of water table	See 4.2 to 4.8
Coleman	18 Lindfield Gardens	-	Effect on hydrogeology	See 4.3 and 4.4

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Drawings submitted	Cross-sections do not appear to agree with stated size of pool and no excavation size provided.	Open. See 4.2	
2	Groundwater monitoring	Further monitoring required to inform depth of granular fill requirement to perimeter of basement box and allow design of permanent and temporary exclusion of groundwater.	Open. See 4.4	
3	Stability	Ground Movement Assessment required as well as Burland damage assessment.	Open. See 4.6.	
4	Stability	Heave assessment required.	Open. See 4.7.	
5	Stability	Ground movement monitoring regime required.	Open. See 4.8.	
6	Stability	Boundary garden walls to be demolished and rebuilt. Clarification requested.	Open. See 4.10.	

Appendix 3: Supplementary Supporting Documents

None

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