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32 Glenilla Road
London, NW3 4AN

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-46

Revision: F1

July 2017

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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 32 Glenilla Road, London NW3 4AN (planning reference 2016/6712/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 BIA has been prepared by a firm of engineering consultants, Card Geotechnics Ltd, with structural inputs from Price & Myers. The authors of the main BIA possess suitable qualifications that comply with the requirements of CPG4.

1.5. It has been confirmed that the development site does not involve a listed building, or is in close proximity to a listed building.

1.6. The proposal includes the demolition of an existing single-storey building and a garage at No. 32 Glenilla Road and the construction of two semi-detached houses, each three storeys in height with a single basement. Following the initial audit, the BIA has been updated to reflect the proposed building as shown on the architectural drawings.

1.7. An intrusive ground investigation was undertaken in August 2015. The investigation confirms that the site is underlain by up to 3.2m of Made Ground over the London Clay Formation. Groundwater was encountered within the Made Ground and the upper parts of the London Clay Formation during the site investigation and subsequent monitoring visit. It is likely that the groundwater is perched water and is not representative of a groundwater table. However, further monitoring should be undertaken to inform temporary and permanent works design.

1.8. The geotechnical design parameters adopted for the Made Ground are considered slightly optimistic, although it is accepted that the effects of the adopted values are likely to be minimal.

1.9. Following the initial audit, the conceptual site model and hydrogeological assessment has included the adjacent 34 Glenilla Road's lower ground floor.

1.10. The architectural drawings show that the proposed basement level will be 3m below the existing ground level. As the proposed thickness of the basement slab is 400mm, the formation level will be 3.4m and is within the London Clay Formation.

1.11. The basement will be formed by contiguous piled walls and a reinforced concrete basement slab. Submitted structural drawings show that the basement slab acts as a raft foundation to support the loading of the building above. The formation of the raft foundation is below the foundations of the adjacent structures. Following the initial audit, outline design calculations for the retaining walls, basement raft slab, and adequacy of the bearing stratum under superstructure loads and uplift forces from heave pressure have been considered. These have been based on cautious estimates of engineering values and assumptions.

1.12. A ground movement analysis has been carried out to assess effects on the surrounding properties. It is accepted that the damage category to neighbouring properties is within Burland Category 1 (Very Slight) assuming high quality workmanship during construction.

1.13. A formal monitoring strategy is recommended in the BIA and this is accepted. Contingency measures and trigger levels based on the outcome of the GMA should be implemented.

1.14. There are discrepancies in the Surface Flow and Flooding Screening between the BIA report by Card Geotechnics Ltd and the Flood Risk and Surface Water report by Price & Myers. However, it is accepted that off-site discharge flows will be limited to 5l/s per property by implementing an attenuation system. This should be agreed with Thames Water and LBC.

1.15. It is accepted that the new development and associated basement is at low risk of flooding.

1.16. Queries and requests for further information are discussed in Section 4 and summarised in Appendix 2. Considering the revised submissions, and consultation with CGL, the BIA is considered to meet the criteria of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 20 January 2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 32 Glenilla Road, London NW3 4AN, Camden Reference 2016/6712/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 "Erection of 2 x 3-bedroom 3-storey plus basement dwellinghouses (Use Class C3) with hard and soft landscaping following demolition of existing single storey church (Use Class D1)". The Audit Instruction also confirmed the property is not adjacent to Grade II listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 01 February 2016 and gained access to the following relevant documents for audit purposes:

- Planning Statement dated December 2015 by Tibbalds.
- Design & Access Statement dated 30 November 2016 by Adam Khan Architects.
- Geotechnical Interpretative Report and Basement Impact Assessment Revision 02 Dated November 2016 by Card Geotechnics Ltd.
- Arboricultural Report Dated 24 October 2016 by Crown Consultants.
- Architectural drawings by Adam Khan Architects include the following:
    - Existing location plan and site plan.
    - Existing roof plan and building elevations.
    - Proposed location plan and site plan.
    - Proposed floor plans, sections and building elevations.

2.7. Subsequent to the issue of the initial audit report, revised information was uploaded to LBC's Planning Portal. CampbellReith accessed the Planning Portal on 12 June 2017 and gained access to the following revised documents:

- Geotechnical Interpretative Report and Basement Impact Assessment Revision 04 Dated May 2017 by Card Geotechnics Ltd.

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	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
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	See BIA Section 3.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	See BIA Section 3.5 and 4. Impact to pavement/highway considered in Revised BIA.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	No potential issues identified at Screening.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Discussed in drainage and flood risk assessment and mitigation proposed.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	See BIA appendix G. Further groundwater monitoring required.
Is the ground investigation informed by a desk study?	Yes	Not specifically referenced, but desk study information presented.
Has a site walkover been undertaken?	Yes	Not specifically referenced, but site and surroundings described.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Rev 4 provides updated information re 34 Glenilla Road.
Is a geotechnical interpretation presented?	Yes	Parameters for Made Ground considered slightly optimistic, although accepted that effects will be minimal.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	Drainage and flood risk.
Are baseline conditions described, based on the GSD?	Yes	The BIA does not specifically reference the GSD.
Do the base line conditions consider adjacent or nearby basements?	Yes	Updated in BIA Rev 4.
Is an Impact Assessment provided?	Yes	See BIA Section 4.
Are estimates of ground movement and structural impact presented?	Yes	

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	See BIA Section 10 to 13.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Flood risk, drainage and land stability adequate.
Has the need for monitoring during construction been considered?	Yes	This will require updating at detailed design stage to be linked with predicted ground movements.
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	
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	
Are non-technical summaries provided?	No	

4.0 DISCUSSION

4.1. The BIA has been prepared by a firm of engineering consultants, Card Geotechnics Ltd, with structural inputs from Price & Myers. The authors of the main BIA possess suitable qualifications that comply with the requirements of CPG4.

4.2. The architectural information shows that proposal includes the demolition of an existing single-storey building and a garage at No. 32 Glenilla Road and the construction of two semi-detached houses, each three storeys in height with a single basement. Following the initial audit, the BIA has been updated to reflect the proposed building as shown on the architectural drawings.

4.3. Following the initial audit, the conceptual site model and hydrogeological assessment has included the adjacent 34 Glenilla Road's lower ground floor.

4.4. An intrusive ground investigation was undertaken by Card Geotechnics Ltd in August 2015. The investigation confirms that the site is underlain by up to 3.2m Made Ground over the London Clay Formation up to the depth of investigation of 15.5m below ground level. Monitoring indicates that groundwater varied between 2.89mbgl and 4.15mblg, which is within the Made Ground and the upper parts of the London Clay Formation, during the site investigation and subsequent monitoring visit. It is likely that the groundwater is perched water and is not representative of a groundwater table. However, further monitoring should be undertaken to confirm temporary and permanent works design requirements.

4.5. The geotechnical design parameters adopted for the Made Ground are considered slightly optimistic, considering the heterogeneous nature of Made Ground and the description of 'very soft to firm'. However, it is accepted that the effects of the adopted values are likely to be minimal, considering the thickness of the Made Ground and the piled wall solution proposed.

4.6. The architectural drawings show that the proposed basement level will be 3m below the existing ground level. As the proposed thickness of the basement slab is 400mm, the formation level will be 3.4m and is within the London Clay Formation.

4.7. The BIA states that the new basement will be formed by contiguous piled walls and a reinforced concrete basement slab. The submitted structural drawings show that the basement slab acts as a raft foundation to support the loading of the building above. The formation of the raft foundation is below the foundations of the adjacent structures. The BIA Section 9.1.3 states that the basement slab could be either ground bearing or suspended. Following the initial audit, outline design calculations for the retaining walls, basement raft slab, and adequacy of the bearing stratum under superstructure loads and uplift forces from heave pressure have been considered. These have been based on cautious estimates of engineering values and assumptions.

4.8. A ground movement analysis has been carried out to assess effects on the surrounding properties. Heave, vertical settlement and horizontal displacements due to pile installation and basement excavation were determined using a combination of VDisp, WALLAP and the recommendations in CIRIA C580. The BIA states that the damage category to neighbouring properties is within Burland Category 1 (Very Slight) assuming high quality workmanship during construction. The results of the GMA are considered conservative and are accepted.

The GMA should be reviewed and updated once detailed design is conducted and construction methodologies are refined, including groundwater control methodologies, as required. It is noted that CPG4 requires that mitigation proposals be offered to reduce potential damage when in excess of Category 1. These should be considered should the proposed scheme change and result in predicted damage in excess of Category 1.

4.9. Following the initial audit, the revised damage impact assessment has included an assessment of Glenilla Road's pavement / highway, which is within the zone of influence of the development. Although the estimated maximum movements due to basement construction are not considered to pose a risk to Glenilla Road, this requires correspondence with the Highways Authority to ensure that they are satisfied.

4.10. A formal monitoring strategy is recommended in the BIA and this is agreed. The formal monitoring strategy, linked to the predicted ground movements, should be presented at detailed design stage, including trigger values and contingency planning recommendations.

4.11. It is noted that there are discrepancies in the Surface Flow and Flooding Screening between the BIA report by Card Geotechnics Ltd and the Flood Risk and Surface Water report by Price & Myers. However, it is accepted that off-site discharge flows will be limited to 5l/s per property by implementing an attenuation system. This should be agreed with Thames Water and LBC.

4.12. It is accepted that the site is at low risk of surface water flooding, due to the raised nature of the site in relation to the adjacent road level. Threshold elevations should be confirmed as being suitably raised within the final design. Standard flood risk mitigation measures against sewer surcharging should be implemented.

5.0 CONCLUSIONS

5.1. The authors of the main BIA possess suitable qualifications that comply with the requirements of CPG4.

5.2. A site investigation confirms that the site is underlain by Made Ground over the London Clay Formation. Groundwater was encountered. Further monitoring should be undertaken to confirm temporary and permanent works design requirements.

5.3. The geotechnical design parameters adopted for the Made Ground are considered slightly optimistic, although it is accepted that the effects of the adopted values are likely to be minimal.

5.4. The basement formation level will be within the London Clay, formed by contiguous piled walls and a reinforced concrete basement slab. Following the initial audit, outline design calculations for the retaining walls, basement raft slab, and adequacy of the bearing stratum under superstructure loads and uplift forces from heave pressure have been provided. These have been based on cautious estimates of engineering values and assumptions.

5.5. A ground movement analysis has been carried out to assess effects on the surrounding properties. It is accepted that the damage category to neighbouring properties is within Burland Category 1 (Very Slight) assuming high quality workmanship during construction.

5.6. A formal monitoring strategy is recommended in the BIA and this is accepted. Contingency measures and trigger levels based on the outcome of the GMA should be implemented.

5.7. It is accepted that off-site discharge flows will be limited to 5l/s per property by implementing an attenuation system. This should be agreed with Thames Water and LBC.

5.8. It is accepted that the new development is at low risk of flooding, based on raised levels in relation to the adjacent road, which should be confirmed at detailed design stage.

5.9. A summary of queries and information requests is presented in Appendix 2. Based on the revised submissions, the BIA meets the criteria of CPG4.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Arculas	Flat 2, 20 Belsize Park Gardens, NW3 4LH	20/01/2017	Effects of basement excavation on the stability of the adjoining properties.	See 4.3, 4.5 – 4.10
Williams	32 Belsize Park Gardens	20/12/2016	Effects of basement excavation on the stability of the adjoining properties.	See 4.3, 4.5 – 4.10

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA Content	Inconsistencies in the proposed scheme presented, to be clarified.	Closed	04/05/2017
2	Stability / Hydrogeology	Inconsistencies within BIA regarding the presence of nearby basements.	Closed – BIA Rev 4 describes adjacent basement at 34 Glenilla Road. Figures 7 and 8 have been updated to show the sections more clearly.	20/06/2017
3	Hydrogeology	Groundwater levels	Closed, however as 4.4, further monitoring should be undertaken to confirm temporary and permanent works design requirements.	N/A – ongoing
4	Stability	Made Ground parameters	Closed – Although considered slightly optimistic, the parameters are accepted.	20/06/2017
5	Stability	Outline calculations for basement raft slab, retaining walls, and adequacy of the bearing stratum.	Closed	04/05/2017
6	Stability	GMA / damage impact assessment to be revised, calculations to be presented, BIA text to be updated.	Closed – Revised GMA, based on the proposed methodology and sequence, accepted.	20/06/2017
7	Stability	A more detailed monitoring strategy should be provided.	Closed – Preliminary recommendations for monitoring presented. Detailed monitoring strategy to be presented at detailed design stage.	20/06/2017

Appendix 3: Supplementary Supporting Documents

Available on Camden Planning Portal:

BIA Revision 4 by CGL dated May 2017

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