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42 Caversham Road
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Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12066-80
Revision: F1

December 2015

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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 42 Caversham Road (planning reference 2015/3052/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 well-known firms of engineering consultants using individuals who possess suitable qualifications.

1.5. The BIA has confirmed that the proposed basement will be founded within London Clay. Due to column loads, the structure will likely require piled foundations.

1.6. It is likely that perched waters contained within the Made Ground will be encountered during basement foundation excavation.

1.7. The Construction Method Statement (CMS) proposes a piled perimeter retaining wall, without temporary propping arrangements. The allowance for temporary propping is made in the CMS if monitored ground movements prove excessive.

1.8. It is recommended that further investigation of the below ground soils is carried out together with groundwater monitoring to allow detailed design of the piled foundations. Further ground investigation should be undertaken prior to construction but is not required as a part of the BIA.

1.9. The further ground investigation should be tailored to allow further consideration of any potential heave movements below the basement slab and likelihood of groundwater flow and direction affecting the local hydrogeology.

1.10. An analysis has been undertaken of horizontal and vertical ground movements. This assumes that temporary propping during basement construction will be utilised. This is in contradiction of the CMS and an additional ground movement assessment should be carried out if no temporary propping is to be utilised and once further investigations are completed.

1.11. Proposals are provided for a movement monitoring strategy during excavation and construction. Pre and post condition surveys of adjacent properties are required to be undertaken to comply with the Party Wall Act.

1.12. Confirmation that discussions with Network Rail have been undertaken should be provided to ensure that the proposed development causes no damage to Network Rail Property.

1.13. Thames Water stated that existing waters infrastructure will not be able to accommodate the needs of the proposed development. Consequently a detailed drainage strategy should be undertaken and agreed with Thames Water prior to construction works. Further site investigation should consider the use of Sustainable Urban Drainage systems (SUDs).

1.14. It is accepted that the development will not impact on the wider hydrogeology of the area. The basement will be founded within London Clay and will not have a significant impact on groundwater flows.

1.15. Queries and requests for clarification or further information are summarised in Appendix 2. It is intended that these are closed out in a Basement Construction Plan (refer to Section 5).

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 6/11/15 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 42 Caversham Road (planning reference 2015/3052/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 basement plus 5-storey, 18 x unit residential development, following demolition of 11 x residential unit building."*

The Audit Instruction also confirmed 42 Caversham Road was not a listed building, or was a neighbour to, listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 24/11/15 and 26/11/15 and gained access to the following relevant documents for audit purposes:

- Site Investigation & Basement Impact Assessment Report (BIA) (Rev 1 & Rev 2).
- Ground Movement Assessment (GMA)
- Construction Method Statement (CMS)
- Planning Application Drawings consisting of

  Location Plan

  Existing Plans

  Proposed Plans
- Design & Access Statement
- Planning Comments and Response

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	BIA section 3.1.2. However, no mention of retaining wall associated with railway line circa 10m to the east of proposed basement.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA section 3.1.1
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA section 3.1.3
Is a conceptual model presented?	Yes	BIA section 2.6
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA section 4.1. Potential impact due to basement construction on adjacent semi basements (identified in screening) not considered in scoping however considered within the Construction Method Statement and Ground Movement Assessment.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA section 4.2 and 4.3
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA section 4.3
Is factual ground investigation data provided?	Yes	BIA Appendix. Further ground investigation recommended in section BIA section 10.
Is monitoring data presented?	Yes	Only one groundwater monitoring visit undertaken. Further monitoring recommended as part of a pre-construction site investigation.
Is the ground investigation informed by a desk study?	Yes	BIA sections 2 and 3 comprise desk study.
Has a site walkover been undertaken?	Yes	Undertaken site investigation as described in BIA section 1.3.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Referred to in BIA section 2.1.
Is a geotechnical interpretation presented?	Yes	BIA section 8.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA report provides recommendations on retaining wall options. Further information on retaining wall design contained within CMS.
Are reports on other investigations required by screening and scoping presented?	Yes	BIA section 9
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Contained within GMA and CMS.
Is an Impact Assessment provided?	Yes	BIA section 9.

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	GMA section 6.1.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	However the need for temporary propping as assumed within GMA is not incorporated into the scheme as per CMS. A cantilevered retaining wall is proposed as alternative methodology.
Has the need for monitoring during construction been considered?	Yes	Recommendations for further groundwater monitoring provided in BIA. Recommendations made for monitoring during construction made within CMS.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Identified within GMA section 6, however if no temporary propping utilised then no detailed residual impacts given.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	GMA section 6. However if temporary propping is not installed as per CMS then a new GMA should be undertaken for appropriate construction conditions.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Drainage strategy not provided.
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	GMA section 6. 1
Are non-technical summaries provided?	Yes	BIA (rev 2) section 9.1

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by a well-known firm of engineering consultants, Geotechnical & Environmental Associates (GEA) and the individuals concerned in its production have suitable qualifications. One of the authors is a chartered structural engineer and the reviewer is a chartered geologist. The Construction Method Statement (CMS) has been carried out by a well-known firm of structural engineering consultants, Gurney Consulting Engineers.

4.2. The LBC Instruction to proceed with the audit identified that the building presently on site is not a listed building nor is adjacent to listed buildings. The Design & Access Statement identified that 42 Caversham Road is located in the Bartholomew Estate Conservation Area.

4.3. As a part of the proposed development it is intended to construct a 5 storey residential property with the addition of a single storey basement to between 3 and 4m below ground level (bgl). The existing 42 Caversham Road structure will be demolished to facilitate the proposed development.

4.4. The BIA has identified that Made Ground is present to a depth of 1.40m metres below ground level which is subsequently underlain by the London Clay Formation. It should be noted that only one exploratory hole location was fully excavated at the site due to a concrete obstruction preventing excavation to the scheduled depths within the remaining two proposed boreholes. Exploratory holes have not been attempted or excavated in the northern site section and ground conditions in that area are unknown.

4.5. The BIA assesses two alternative proposals for basement construction methodology and the CMS and GMA discuss one proposal. It is assumed that the method of construction as described within the CMS is the preferred option. This option involves the construction of a 450mm diameter contiguous piled retaining wall embedded into London Clay. The CMS suggests that the use of a contiguous piled wall can be designed as a free cantilever so that no temporary propping will be required, however briefly provides an option for temporary propping if deflections are considered excessive.

4.6. A detailed GMA has been undertaken using ground movement modelling programs Oaysis Pdisp and Oaysis Xdisp. Estimates of vertical and horizontal ground movements surrounding the basement have been undertaken on the basis of basement construction utilising contiguous piled wall, temporary propping and a minimum embedment equal to the retained height of 3m. The soil parameters presented in the ground model are appropriate to allow modelling of ground movements. The GMA has taken into account the location of surrounding structures including the rail line, No 38 and 40 Caversham Road and the outbuilding to No. 51 to 53 Islip

Street. The damage to all of the aforementioned features has been classed as either undetectable or Category 0 (according to the Burland Scale). The BIA referred to possible ground movements on Caversham Road, however this has not been discussed in detail within the GMA. It is possible to examine modelling presented within the GMA appendix, which show that horizontal and vertical movements will be in the region of 2-3mm.

4.7. The CMS and GMA describe the need for a movement monitoring plan. The monitoring plan is to include for measurements of vertical and horizontal ground movements against pre-defined trigger levels and is to include contingency measures to be implemented should the trigger levels be exceeded. An outline scope for the monitoring regime should be provided in the BIA to give confidence that the basement excavation process will, at all stages, be tightly controlled. The monitoring regime, plus pre and post-condition surveys of adjacent properties, will be required to be undertaken to comply with the Party Wall Act.

4.8. The BIA recommends that discussions with Network Rail regarding the proposed development are undertaken. Confirmation of discussions is not provided within the BIA or associated documentation.

4.9. The requirement for temporary propping is a significant variation between the GMA and the CMS. Without temporary propping, horizontal and vertical ground movements adjacent to the basement will increase. The CMS warns that "*Any movement of the ground next to the adjacent structure will seriously affect the stability of adjacent buildings*". Consequently either temporary propping should be provided as per the GMA or an updated Ground Movement Assessment should be undertaken and any temporary works required from the assessment implemented.

4.10. The conclusions reached within both the BIA and, more particularly, the GMA and the CMS appear undermined by the need for further investigation to a sufficient depth to allow for the design of piled foundations along with additional monitoring of groundwater levels. The BIA states that "*Further investigation will be required, in the form of at least one deep borehole ideally to a depth of at least 15 m, to obtain information to assist with a pile design, should this be considered. Further groundwater monitoring should be carried out to establish equilibrium levels and the extent of any seasonal fluctuations. It would be prudent to carry out a number of trial excavations, to depths as close to the full basement depth to provide an indication of the likely groundwater conditions".* It should be noted that it is anticipated that there will be variations in the depth of Made Ground due to the site history. The limited ground investigation confirmed the anticipated underlying geology; however information on soil conditions to a greater depth below ground level than currently investigated will be required to allow safe and appropriate design and construction of the proposed development. The findings of this ground

investigation are not required to be presented within the BIA, but must be completed pre-construction.

4.11. The CMS states that no water table is present. This, in part, contradicts the findings of monitoring undertaken during the intrusive investigation and subsequent monitoring which encountered water in trial pits excavated and at 1.15m bgl within monitoring installations. It is however accepted that any groundwater encountered on site is likely to comprise perched water contained within Made Ground. Again this highlights the requirement for further groundwater monitoring as recommended within the BIA. Further groundwater monitoring should allow assessment of a design water level for basement construction, assessment of potential impact on subterranean flows, long term impact on basement construction, the requirement for waterproofing of the basement and the requirement for temporary dewatering.

4.12. It should be noted that the structural sketches presented within the CMS have assumed that the foundations of the adjacent property (40 Caversham Road) extend down to 1.50m below existing ground level. The depth given contradicts the depth of 'Semi Basement' given within the BIA (given as 2m). The structural drawings also state that this depth to foundation is to be confirmed. Consequently exploratory work should be undertaken in order to assess the depth to adjacent foundations if deemed required by the structural engineers or piling contractors. Alternatively shallow foundations can be conservatively assumed. Assuming the absence of adjacent basements on site is a conservative approach to assessing ground stability as shallow foundations are more likely to be affected by ground movements.

4.13. Appropriate geotechnical parameters have been included within the BIA for retaining wall design. Surcharge loading from the adjacent foundations should be provided for the permanent and temporary conditions. These geotechnical parameters should be used in conjunction with the findings of the further pre-construction intrusive investigation to allow for detailed design of the contiguous piled perimeter walls.

4.14. The BIA has shown that the development will not impact on the wider hydrogeology of the area, any other watercourses, springs or the Hampstead Heath Pond chain catchment area.

4.15. It is anticipated that the area of new development on the site will not significantly increase impact on current rainwater discharges to the below ground surface water drainage system as there is no increase in area of hardstanding. Thames Water has however identified *'an inability of the existing wastewater infrastructure to accommodate the needs of this application'.* They have requested the following 'Grampian Style' condition is imposed: '*Development shall not commence until a drainage strategy detailing any on and/or off site drainage works, has been submitted to and approved by, the local planning authority in consultation with the sewerage undertaker. No discharge of foul or surface water from the site shall be accepted into the public*

system until the drainage works referred to in the strategy have been completed'. They have also indicated '*Our preferred option would be for all surface water to be disposed of on site using SUDs as per policy 5.13 of the London plan'.*

4.16. Thames Water correspondence has also highlighted the requirement for a piling method statement. '*No impact piling shall take place until a piling method statement has been submitted to and approved in writing by the local planning authority in consultation with Thames Water'.*

4.17. It is accepted that there are no slope stability concerns regarding the proposed development and it is not in an area prone to flooding.

5.0 CONCLUSIONS

5.1. The BIA and supporting documents have been prepared by individuals who possess suitable qualifications.

5.2. The BIA has confirmed that the proposed basement slab will be founded within the London Clay. A contiguous piled wall is proposed to construct the basement. However proposals for propping in the temporary and permanent cases require clarification as discussed below.

5.3. It is likely that moderate amounts of perched waters will be encountered during basement foundation excavation. However there has been very little ground investigation to date to confirm the ground and groundwater conditions.

5.4. It is recommended that further investigation of the below ground soils and is carried out, together with groundwater monitoring to allow further understanding of below ground conditions. Exploratory holes should be constructed to a sufficient depth to allow for pile design and SUDs. Further ground investigation should be undertaken prior to construction but is not required as a part of the BIA.

5.5. The further soils investigation should be tailored to allow further consideration of any potential heave movements below the basement slab and groundwater levels for the design of permanent and temporary works.

5.6. Proposals are provided for a ground movement monitoring strategy during excavation and construction. Pre and post-condition surveys of adjacent properties will be required to be undertaken to comply with the Party Wall Act.

5.7. An analysis has been undertaken of horizontal and vertical ground movements. Significantly this assumes the provision of propping which is not shown as required within the CMS. Temporary propping should be installed as per the model used within the GMA to assess the magnitude of ground movements. Alternatively an additional GMA can be undertaken to estimate ground movements which will occur without the use of temporary propping. This should be carried out once a final on methodology has been taken and the above mentioned further investigations have been completed. The GMA should comment on ground movements impacting Caversham Road.

5.8. Confirmation that discussions with Network Rail have been undertaken should be provided to ensure that the proposed development causes no damage to Network Rail Property.

5.9. Thames Water has indicated that the existing water infrastructure will not be able to accommodate the needs of the application. Consequently a drainage strategy should be

undertaken and agreed with Thames Water prior to construction works. It is anticipated that ground conditions underlying the site are not amenable to soakaway drainage.

5.10. Appropriate preliminary geotechnical parameters and assumptions for the design of the contiguous piled perimeter walls have been provided in the BIA. Calculations should demonstrate that the perimeter walls are stable under all reasonable assumptions of ground and groundwater pressures and surcharge loading from the adjacent foundations.

5.11. No significant slopes in excess of 7 degrees are present surrounding the site, and it is accepted minor surrounding slopes to the development site are stable.

5.12. It is accepted that the development will not impact on the wider hydrogeology of the area and is not directly in an area subject to flooding.

5.13. It is recommended that the queries and discrepancies identified are closed out in a Basement Construction Plan. This should cover the following:

- Discrepancies between CMS and GMA regarding construction methodology to be resolved and documents updated accordingly
- Predicted damage categories to be confirmed for actual construction sequence, basement configuration and nature and condition of surrounding structures and infrastructure
- Detailed design of retaining walls (permanent and temporary works) with soil and groundwater assumptions clearly stated. This will require further ground investigation
- Evidence of consultation with Network Rail to seek their approval
- Evidence of consultation with Thames Water to seek their approval
- Evidence of consultation regarding condition surveys and monitoring with surrounding building and asset owners.

Appendix 1: Resident Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Williams	38c Caversham Road	07/09/15	Excavation of basement impacting rail line.	Ground movement assessment details impact on rail line. Confirmation of consultation with Network Rail has been requested as per paragraph 5.8.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	GMA and CMS to be consistent.	To be closed out in BCP	N/A
2	Stability	Design assumptions for retaining wall and basement slab to be provided.	To be closed out in BCP	N/A
3	Stability	Confirmation of correspondence with Network Rail Required.	To be closed out in BCP	N/A
4	Stability	Further ground investigation and groundwater monitoring details to be provided prior to construction.	Open	N/A
5	Stability	Monitoring and condition surveys to be agreed and completed as required by the party wall act and in conjunction with requirements following consultations with Network Rail.	Open	N/A

Appendix 3: Supplementary Supporting Documents

None

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