CampbellReith
consulting engineers

46 Avenue Road, NW8 6HS

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-83
Revision: F2

November 2018

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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 (BIA) submitted as part of the Planning Submission documentation for 46 Avenue Road, NW8 6HS (planning reference 2017/1718/P). The basement is considered to fall within 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 reviewed it against an agreed audit check list. Additional documents were provided via email and are included within Appendix 3.

1.4. In the revised submissions, the BIA has been reviewed by a Chartered Geologist. The BIA has been undertaken by engineering consultants with appropriate qualifications, in accordance with LBC guidance.

1.5. Originally, the BIA referenced more than one proposal. The updated submissions clarify the proposed development works.

1.6. The BIA has confirmed that the proposed basement will be founded within London Clay. Groundwater monitoring has indicated water may be encountered during basement construction. It is accepted that desk study references and the site investigation indicate there should be no alluvial soils on-site associated with the historic River Tyburn. There will be no impact in the wider hydrogeological environment.

1.7. Where possible foundation inspection pits should be undertaken on any party walls to determine the presence of foundations.

1.8. In the revised submissions, appropriate assessments of structural impacts are presented and mitigation measures are proposed.

1.9. The structural scheme proposed utilises underpinning, bored piled walls and sheet piled walls for the temporary and permanent works.

1.10. The damage assessment within the revised Ground Movement Assessment (GMA) predicts damage to an adjacent property to be Category 1 (Very Slight). Appropriate monitoring and mitigation measures are proposed.

1.11. The proposed tree protection measures should be reviewed by LBC's Landscape Officer.

1.12. In the revised submissions, the potential for shrink / swell impacts are assessed to be negligible.

1.13. The revised BIA considers encountering shallow groundwater to be unlikely. If required, temporary groundwater control via sump pumping will be employed during construction to ensure stability is maintained.

1.14. The BIA advises the development proposal will not increase the impermeable areas of the site at surface level from the current situation and that a change to water flow crossing the site boundaries is negligible.

1.15. Queries and requests for clarification are described in Section 4 and summarised in Appendix 2. Considering the revised submissions provided, the BIA meets the criteria of CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 15 June 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 46 Avenue Road, NW8 6HS. Initial comments were sent highlighting the deficiencies in the submitted information and the audit was commenced in December 2017 once a further suite of documents had been uploaded to the planning portal.

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): Basements.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- Local Plan 2017: 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 *"Demolition of existing building and erection of replacement dwelling house behind retained facade; excavation of basement level with front and rear lightwells; erection of replacement summerhouse"*

2.6. Planning was previously granted in January 2015 (2014/6395/P) – *"Excavation to extend existing single storey basement below footprint of dwelling house and part rear garden,*

including two front lightwells and two rear lightwells, demolition of existing outbuilding and erection of single storey ground floor outbuilding in rear garden."

2.7. The Audit Instruction also confirmed 46 Avenue Road does not involve, or neighbour, listed buildings.

2.8. CampbellReith accessed LBC's Planning Portal on 06 December 2017 and gained access to the following relevant documents for audit purposes:

- Note on Work carried out in 2011 and 2014 and used for Planning Submission in 2017 by Edge Structures dated March 2017
- Executive Summary by Edge Structures dated March 2017
- Non-Technical Summary of the BIA by RKD Consultant Ltd, March 2014
- Basement Impact Assessment Report (BIA) Rev 06 by RKD Consultant Ltd dated September 2017
- Site Investigation Report by Concept dated August 2011
- PD-21 AIA, Arboricultural Report by Tim Moya Associates dated February 2017
- Planning Application Drawings consisting of

  Edge Structures drawings:

  005 P5 Site Permeability Schematic dated September 2017

  006 P5 Site Permeability Schematic proposed section C-C dated September 2017

  011 P6 Proposed Work Sequence for Basement Construction Sheet 1 dated September 2017

  012 P6 Proposed Work Sequence for Basement Construction sheet 2 dated September 2017

  013 P7 Proposed Work Sequence for Basement Construction Sheet 3 dated September 2017

  014 P6 Proposed Work Sequence for Basement Construction Sheet 4 dated September 2017

  015 P7 Proposed Work Sequence for Basement Construction Sheet 5 dated September 2017

  016 P7 Proposed Work Sequence for Basement Construction Sheet 6 dated September 2017

  099 P5 Structural Proposals Basement dated September 2017

  100 P5 Structural Proposals Ground Floor dated September 2017

  201 P4 Structural Proposals Sections A and B dated September 2017

  203 P2 Structural Proposals Section D-D dated September 2017

  BB Partnership drawings:

  FQM 100 Rev A Site Location Plan dated April 2014

FQM 101 Rev A Existing Site Plan dated April 2013

FQM 102 Rev A Existing Plans dated April 2013

FQM 103 Rev A Existing Sections/Elevations dated April 2013

FQM 104 Rev D Proposed Ground & Basement Plan dated April 2013 with note *'Amended Basement GIA Based on Local Plan A5 Basements Policy'* dated November 2017

FQM 106-109 Rev D Proposed Sections and Elevations dated November 2017

- Planning Comments and Responses

2.9. Additional documentation was provided for download via email on the 5th April and 1st May 2018:

- 46 Avenue Road Ground Movement Assessment Report March 2018
- 46 Avenue Road subterranean risk assessment Cover Letter
- 180309 46 Avenue Road London NW8 6HS Basement Impact Assessment
- 180316 A Note on earlier work
- 180316 Planning report inc construction method rev H
- Non Tech Summary - Evidence for each BIA Stage - 46AveRd
- Planning Application Drawings consisting of

  1147_005 P5 Site Permeability Proposal Plans

  1147_006 P5 Site Permeability Proposal Section

  1147_011 P6 Construction Sequence Sheet 1

  1147_012 P6 Construction Sequence Sheet 2

  1147_013 P8 Construction Sequence Sheet 3

  1147_014 P7 Construction Sequence Sheet 4

  1147_015 P8 Construction Sequence Sheet 5

  1147_016 P8 Construction Sequence Sheet 6

  1147_099 P6 Basement

  1147_100 P6 Ground Floor

  1147_201 P5 Sections A-A & B-B

  1147_203 P3 Section D-D

2.10. A structural Method Statement by Edge Structures, dated 9th March 2017, Rev F, has also been provided. However, we note the drawings included in the appendix and the scheme described in Section 4 have been superseded by those shown in the Edge Structures' drawings above.

2.11. Following issue of the D2 Audit report, and discussion / correspondence in July, August and September 2018, the following information has been reviewed:

- Basement Impact Assessment (ref 1147) dated 16th July 2018 by Edge Structures.
- Ground Movement Assessment (ref 18.3097 Rev 01) dated 23rd July 2018 by Concept Consultants, plus additional calculations presented August 2018.
- Letter to CampbellReith from Edge Structures dated 17th September 2018.

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	Updated in revised submissions.
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	Superseded plans should be removed.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Updated in revised submissions
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	Updated in revised submissions
Hydrogeology Scoping Provided?	Yes	

Item	Yes/No/NA	Comment
Is scoping consistent with screening outcome?		
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Updated in revised submissions.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	The BIA indicates the ground investigation is informed by a desk study.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	No	Assumptions indicated
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	Updated in revised submissions
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Updated in revised submissions

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	Updated in revised submissions.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Updated in revised submissions
Has the need for monitoring during construction been considered?	Yes	Updated in revised submissions
Have the residual (after mitigation) impacts been clearly identified?	Yes	Updated in revised submissions
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Updated in revised submissions
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Updated in revised submissions
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Updated in revised submissions
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	Updated in revised submissions
Are non-technical summaries provided?	Yes	Updated in revised submissions

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) was carried out by RKD Consultant Ltd (RKD) with a more recent BIA presented by Edge Structures Ltd (ES). The BIA includes a Ground Investigation (GI) and Ground Movement Assessment (GMA) prepared by Concept Consultants. A Structural Method Statement and drawings have been prepared by ES.

4.2. The qualifications of the author of the BIA and the associated reports are in compliance with the requirements of LBC.

4.3. 46 Avenue Road is an existing four storey building with a partial basement under half the northern side of the building. A forecourt comprising hard standing with a basement car park lift is located to the front of the property adjacent to Avenue Road. A garden is located to the rear of the property with a single storey summer house. It is noted that a swimming pool was previously present in the rear garden.

4.4. The site is located in a residential area with No. 44 Avenue Road to the south east and No. 48 to the north west.

4.5. Originally, the BIA referenced more than one proposal. The updated submissions clarify the proposed development works.

4.6. The proposed development includes the retention of the front elevation to the existing property, demolition of the house behind, new accommodation being provided at basement level with 3 storeys above. Beneath the original house, a single storey basement with two new lightwells at the front will be constructed. The underside of the proposed basement floor is approximately 3.7m below ground level (bgl). To the rear of the house, a single storey basement with a services void underneath a swimming pool, changing room facilities, pool plant and access to the house is to be constructed with the proposed basement floor approximately 7.3m bgl.

4.7. It is proposed that the wall to the basement will be formed by contiguous piles except in the area of the existing basement where the existing walls will be underpinned by 1m. Reinforced concrete floors at basement and ground level will create an enclosed box. The structural details indicate the piled walls are being permanently propped at ground level by the ground floor slab.

4.8. A ground investigation undertaken by Concept Consultants in July 2017 comprised 3 No. cable percussive holes to a depth of 25m bgl. The investigation identified Made Ground up to 1.10m bgl with London Clay to the base of the boreholes. The BIA confirms that a ground water seepage was encountered in the rear garden in the Made Ground. No other water strikes were encountered. During monitoring, groundwater was monitored at 7.10m bgl in BH01 and at

4.75m bgl in BH03 after 14 days. Groundwater was monitored in BH02 at 0.55m bgl after 14 days and was attributed to perched water in the Made Ground filling the standpipe.

4.9. Where possible, foundation inspection pits should be undertaken along party walls to determine the presence of foundations.

4.10. Scoping is described in Section 4 of the Edge Structures' BIA dated March 2018. The location of a tributary of the River Tyburn is identified in Section 2.1. It is accepted that desk study references and the site investigation indicate there should be no alluvial soils on-site associated with the historic River Tyburn. There will be no impact in the wider hydrogeological environment.

4.11. We note in regards to land stability, slopes of no more than 3.6° are identified. The summary also identifies adjacent properties as having higher foundations and that the impact of the whole basement installation work needs to be considered carefully with respect to these buildings.

4.12. A revised Ground Movement Assessment (GMA) is presented by Concept Consultants. The GMA considers the proposed scheme, as described in the structural information. The letter to CampbellReith (date 17th September 2018, Appendix 3) from Edge Structures further clarifies the GMA, structural monitoring and contingency actions to be undertaken by the Engineer / Contractor to ensure stability is maintained and damage to neighbours is limited to a maximum of Category 1 (Very Slight).

4.13. The GMA provides geotechnical design parameters, which are accepted.

4.14. An arboricultural report is presented which indicates root protection zones and tree protection measures to be implemented. The report and recommendations should be reviewed by LBC's Landscape Officer and confirmed to be acceptable.

4.15. The non-technical summary identifies that London Clay is located near surface. The London Clay has the potential for shrink swell movements. In the revised submissions, the potential for shrink / swell impacts are assessed to be negligible.

4.16. The Structural Method Statement contains a description of existing conditions and a description of the proposed works and access requirements, with an adequate outline construction methodology provided. The basement is indicated as being formed in a partial top down sequence, with only a limited depth of excavation occurring to facilitate the construction of the ground level slab, prior to the excavation proceeding to full depth and the basement slab being constructed. The feasibility of the scheme is accepted, and the GMA and letter from Edge Structures (Appendix 3) confirm the stability measures to be employed.

4.17. The ground investigation identified ground water within the Made Ground and London Clay. The Structural Method Statement indicates that the basement will need to be designed to resist water pressures to CP101:1973. The lower slab will be restrained by tension piles to resist water uplift and an under slab system provided to deal with clay heave pressures.

4.18. The GMA and Ground Investigation Report describe a shallow groundwater level. Long term groundwater monitoring information is not provided. The revised BIA considers encountering shallow groundwater to be unlikely. If required, temporary groundwater control via sump pumping will be employed during construction to ensure stability is maintained

4.19. The BIA highlighted that Avenue Road is identified as a street at risk of flooding. The flood risk assessment notes the site itself is at a slightly elevated level and not considered to be at risk from flooding.

4.20. The revised BIA identifies that the proposed design includes a layer of granular fill over the basement of minimum 1,000mm. This will assist in attenuating peak runoff rates, in accordance with LBC guidance.

4.21. The BIA advises the development proposal incorporating the granular fill in the rear garden will not increase the impermeable areas of the site at surface level from the current situation and that a change to water flow crossing the site boundaries is negligible.

5.0 CONCLUSIONS

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

5.2. Originally, the BIA referenced more than one proposal. The updated submissions clarify the proposed development works.

5.3. The BIA has confirmed that the proposed basement will be founded within London Clay. The revised BIA considers encountering shallow groundwater to be unlikely. If required, temporary groundwater control via sump pumping will be employed during construction to ensure stability is maintained.

5.4. The proposed tree protection measures should be reviewed by LBC's Landscape Officer.

5.5. The damage assessment within the revised Ground Movement Assessment (GMA) predicts damage to an adjacent property to be Category 1 (Very Slight). Appropriate monitoring and mitigation measures are proposed.

5.6. The BIA advises the development proposal will not increase the impermeable areas of the site at surface level. There will be no impact to the wider hydrological environment.

5.7. There will be no impact to the wider hydrogeological environment.

5.8. Queries and requests for clarification are summarised in Appendix 2. Considering the revised submissions provided, the BIA meets the criteria of CPG Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Solti	51 Elsworthy Road	24/05/17	Risk of flooding	Addressed. See section 2.29 - 4.32
Bagherzade	49 Elsworthy Road	28/05/17	Water level rising rear garden	As above.
Bach	2 Elseworth Terrace	25/05/17	Risk of flooding	As above.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	CGeol qualification for the screening and scoping of Subterranean (groundwater) flow.	Closed	01/05/2018
2	BIA	Drawings and references to them should be updated to the current proposal.	Closed	September 2018
3	BIA	Programme of works not provided.	Closed	05/04/2018
4	BIA	A geotechnical interpretation should be provided that includes retaining wall parameters and ground bearing capacities adopted for the design.	Closed	05/04/2018
5	BIA	Screening questions should be listed and answered as per Figure 4 - 6 of Section 3 of the CPG4 July 2015 guidance.	Closed	05/04/2018
6	BIA	Scoping cannot be validated until the screening exercise has been presented.	Closed	05/04/2018
7	Stability	Differential depth of foundations – to be described and stability risks mitigated via Screening / Scoping.	Closed	September 2018
8	Stability	GMA indicates unacceptable damage impacts to neighbours.	Closed	September 2018
9	Stability	GMA should consider underpinning, vibration impacts of sheet piling, groundwater control.	Closed	September 2018

10	Stability	Shrink / swell potential impacts to neighbouring properties as a result of tree / tree root removal to be assessed via Screening / Scoping.	Closed	September 2018
11	LBC Planning Criteria	Tree protection measures	Arboricultural report and recommendations to be reviewed by LBC's Landscape Officer.	Note Only
12	Stability	Preliminary calculations for the retaining walls or sides are required. All assumptions with respect to soil parameters, groundwater and surcharges should be clearly stated.	Closed	05/04/2018
13	Stability	Temporary works proposals and associated mitigation measures being considered should be provided given the proposal. A temporary works method statement, scheme, layout and drawings should be provided.	Closed	September 2018
14	Stability	Outline monitoring strategy to be proposed to ensure damage impacts are controlled within acceptable criteria.	Closed	September 2018
15	Hydrology	Cover to basement roof slab to be reviewed in accordance with LBC guidance (i.e. minimum 1,000mm).	Closed	September 2018

Appendix 3: Supplementary Supporting Documents

Letter to CampbellReith from Edge Structures 17 September 2018

edge structures

Date: 17 September 2018 Our reference :1147

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Dear Graham ,

46 Avenue Road, NW8
Camden Planning Audit

I refer to our recent correspondence and discussions regarding the movements anticipated from the Ground Movement Assessment and the interpretation of these such that they relate appropriately to the conditions on site.

We agree that there needs to be a defined process in place in terms of a monitoring regime incorporating trigger levels for preventative action and the immediate availability of additional props to be installed should the trigger levels be reached. Our proposal is therefore as follows.

The current proposal is that after the contiguous bored piles and capping beam have been cast, the area within the piled boundary will be excavated to a level of 40.0m AOD (our drawing 1147_015 P8 refers). At this point the ground floor slab will be cast and the basement excavation will then proceed to formation level (our drawing 1147_016 P8 refers).

The anticipated maximum deflection of the wall assuming a limitless length of wall is 21mm. As you are aware, our assessment is that this degree of movement will not occur along the full length of the wall and that this will be restricted, particularly at the corners of the basement which are close to the neighbouring walls. I understand that while you agree with this assessment in principle, you make the point that it is based on engineering judgement and therefore some additional degree of control should be implemented in to the process to provide additional confidence.

The additional measures we propose are therefore as follows.

1) Prior to the commencement of excavation below the capping beam level, monitoring targets are to be fixed to the flank walls of the adjoining buildings at numbers 44 and 48 Avenue Road and also to the inner faces of the capping beam at 4m centres.
2) Before excavation proceeds, a set of 4 temporary contingency props of length to suit the full width of the excavation will be made available on site for immediate installation as required to maintain stability and impacts to neighbouring structures to a maximum of Category 1 damage (in accordance with the Burland Scale). The details of the props will be agreed in advance with the project structural engineer to ensure sufficient stiffness and suitable detail to facilitate immediate installation if required. The following trigger levels are proposed:

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a) 44/48 Avenue Road: Amber 6mm horizontal/ vertical; red 10mm horizontal/ vertical
b) Capping beam/ piles: Amber 12mm horizontal/ vertical; red 18mm horizontal/ vertical

Amber triggers require the Engineer and Contractor to review all monitoring data and undertake a visual inspection of neighbouring properties. Work shall proceed with monitoring/ inspection frequency increased. Contingency propping may be utilised, if required.

Red triggers require all works to stop and contingency propping to be implemented. In association with the Party Wall Surveyors, the Engineer and Contractor shall only re-start work once a strategy of works is agreed to limit further movement and impacts to neighbours.

3) As soon as excavation commences below capping beam level, horizontal displacement readings will be recorded on a daily basis for all target positions and the readings circulated simultaneously to the project structural engineer and to party wall surveyors for the neighbouring properties.
4) When the basement excavation reaches level 40.0m AOD and the ground floor slab is cast then additional monitoring positions will be placed on the contiguous bored piles at the lower level and further readings taken at that level until the excavation reaches full depth and the basement slab is installed. The contingency props will be detailed such that they can be installed below the level of the ground floor slab at any point during the further excavation should they be required.
5) The contingency props can be removed from site after both the basement slab and lining wall to the face of the contiguous bored pile have been completed.

I trust that this adequately covers the points discussed but please do not hesitate to contact me if you have any queries.

Yours sincerely

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Managing Director
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