

210 Shaftesbury Avenue,
London WC2H 8DP

Basement Impact Assessment
Audit

For
London Borough of Camden

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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 a variation to a previously approved development at 210 Shaftesbury Avenue, London WC2H 8DP (planning reference 2020/1318/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 groundwater conditions arising from the variation to the basement development, in accordance with LBC's policies and technical procedures.
- 1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.
- 1.4. The BIA has been prepared by individuals who possess suitable qualifications.
- 1.5. The building is located within the Bloomsbury Conservation Area and is Grade II listed.
- 1.6. The proposed basement development involves the extension of an existing basement below the adjacent highways of Bloomsbury Street and High Holborn. The maximum excavation depth is approximately 4.55m, to a level of 19.60m OD.
- 1.7. Site investigation identifies the site to be underlain by Lynch Hill Gravel, over London Clay.
- 1.8. The Lynch Hill Gravel is a secondary A Aquifer. Groundwater was not encountered during any of the site investigations carried out at the site. Based on the density of basements in the area and guidance presented in the Arup GHHS report, it is accepted that the proposed development will not impact the wider hydrogeological environment.
- 1.9. The revised BIA submission provides the input data for the PDisp and XDisp analyses, and includes an assessment of ground movements associated with the underpinning in the northwest of the basement extension area. A maximum of Burland Category 1 (Very Slight) is predicted for the neighbouring properties, with negligible movements to the highways.
- 1.10. A structural monitoring strategy should be agreed under Party Wall and Asset Protection Agreements (as required), including trigger levels and contingency measures, to ensure construction is controlled and impacts are maintained within the predicted limits.
- 1.11. Liaison with TFL and utility asset owners should be undertaken in advance of the works.
- 1.12. Based on the revised submission, the BIA meets the requirements of CPG Basements.

2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18 May 2020 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for a variation to a previously approved development at 210 Shaftesbury Avenue, London WC2H 8DP.
- 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 groundwater conditions arising from the revised basement development proposals. The impact to surface water was not assessed as the proposed variation will not affect this aspect at the site.
- 2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within
- Camden Local Plan 2017 - Policy A5 Basements.
 - Camden Planning Guidance: Basements. March 2018
 - Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- 2.4. The BIA should demonstrate that schemes:
- a) maintain the structural stability of the building and neighbouring properties;
 - b) avoid adversely affecting drainage and run off or causing other damage to the water environment;
 - c) avoid cumulative impacts upon structural stability or the water environment in the local area;
- and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.
- 2.5. LBC's Audit Instruction described the planning proposal as *"Variation of condition 5 (Basement Impact Assessment), 11 (Pavement rooflights) and 12 (Approval in Principle Report) of planning permission ref. 2018/0575/P granted on 15/11/2018 for 'Various alterations to theatre building (Class D2) including basement extensions, creation of new entrance fronting Princes Circus, replacement of external lighting to facade and plant at roof level, installation of pavement lights and delivery hatch as well as minor alterations to facade and doors.'*"

- 2.6. LBC's planning portal confirms that the site lies within the Bloomsbury Conservation Area and the building is Grade II listed.
- 2.7. CampbellReith accessed LBC's Planning Portal on 19 May 2020 and gained access to the following relevant documents for audit purposes:
- Updated Basement Impact Assessment by RSK Environment Ltd, ref. 52167-01(00), dated 6th February 2020
 - Site Investigation Report by Strata Geotechnics, ref. G184804, issue no. 002, dated 5 December 2019.
 - Site Investigation Report by Southern Testing, ref. J13424, dated 29 January 2018.
 - Factual Site Investigation Report by Southern Testing, ref. J11265, dated 25 January 2013.
 - Proposed Basement construction plans and sections (ref 2714) by Michael Jackson Consulting.
- 2.8. The following additional document was provided to CampbellReith in July 2020 in response to the initial audit report and the queries summarised in Appendix 2:
- Updated Basement Impact Assessment by RSK Environment Ltd, ref. 52167-01(01), dated 15th July 2020

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?	N/A	Not assessed in this audit.
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	N/A	Not assessed in this audit.
Is factual ground investigation data provided?	Yes	Site investigations from 2013, 2018 and 2019.
Is monitoring data presented?	No	No groundwater recorded during the site investigations and no subsequent monitoring undertaken.
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?	Yes	
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	The same soil parameters have been used to assess the revised basement scheme.
Are reports on other investigations required by screening and scoping presented?	N/A	
Are the baseline conditions described, based on the GSD?	Yes	The same soil parameters have been used to assess the revised basement scheme.
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	

Item	Yes/No/NA	Comment
Are estimates of ground movement and structural impact presented?	Yes	
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	
Has the need for monitoring during construction been considered?	Yes	
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
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 1?	Yes	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

- 4.1. The Basement Impact Assessment (BIA) has been carried out by RSK Environment Limited, with supporting information from Michael Jackson Consulting Engineers, and the individuals involved in its production have suitable qualifications.
- 4.2. The LBC Instruction to proceed with the audit identified that the basement proposal involves a listed building. The property is the Shaftesbury Theatre and comprises 3 above ground levels and a single basement level underlying the entire footprint of the building. The existing basement slopes from an elevation of 20.80m OD in the west to 18.20m OD in the east, and accommodates theatre seating and the stage area.
- 4.3. Planning permission for the basement redevelopment was originally granted in 2018. A BIA for the scheme was audited by CampbellReith. Changes to the original scheme, increasing the depth of excavation, have subsequently been made, requiring the submission and audit of a new BIA.
- 4.4. The proposed basement consists of a single storey extension to the existing basement. The basement extension will be constructed below the adjacent highways of Bloomsbury Road to the west and High Holborn to the south. The maximum excavation depth is indicated to be 4.55m, with the maximum excavation level indicated to be 19.60m OD.
- 4.5. The basement box will be constructed using sheet piles and propping to support the ground during excavation and the construction of the basement. The basement will be formed by reinforced concrete retaining walls cast inside the sheet pile walls and a reinforced concrete ground bearing slab. In the northwest part of the extension, existing vaults under the highway will be demolished to accommodate the extension, and the foundations of the existing building will be underpinned. The underpins will be 750mm deep and formed of mass concrete.
- 4.6. The BIA indicates the geology underlying the site to comprise Lynch Hill Gravel overlying the London Clay, with Lambeth Group soils present at depth. Since planning permission for the previous scheme was granted, further site investigation was carried out in 2019 by Strata Geotechnics, and comprised 3 no. cable percussive boreholes to a maximum depth of 30m. The boreholes confirm Lynch Hill Gravel to a depth of between 4.50 and 5.00m below ground level, with London Clay below this. No elevation levels were provided on the boreholes. The ground model presented in BIA assumes a 4m thickness of Lynch Hill Gravel, with a corresponding level at the base of 20.00m OD. The basement will therefore be constructed at the interface between the Lynch Hill Gravels and the London Clay Formation. It is noted that the level of the existing basement crosses this interface.
- 4.7. The BIA references the Camden Geological, Hydrogeological and Hydrological Study produced by ARUP, and states that, given the density of existing basement developments bounding the site and

within the local area, and the absence of evidence to suggest that these existing basement have resulted in an increase in flooding events, the proposed development will have little or no impact on the existing subterranean water flows. It is noted that part of the existing basement at the site already extends deeper than the proposed extension level, and that none of the site investigations carried out at the site encountered groundwater within the Lynch Hill Gravel. In light of the above it is accepted that the development will not adversely impact the wider hydrogeological environment.

- 4.8. A Ground Movement Assessment (GMA) is presented in section 8 of the BIA. It considers the movements relating to the proposed basement construction and the effect on nearby sensitive structures and highways. An assessment of vertical ground movements resulting from construction of the basement has been undertaken using PDisp software. The input and output data from the PDisp analysis are presented in Appendix D of the revised BIA.
- 4.9. The results of the PDisp analysis have been imported into XDisp software and used to predict the damage category associated with the development. The XDisp assessment adopts a secant pile wall construction for the assessment, which is considered to be a broadly acceptable assumption. For the structures assessed, a maximum of Category 1 (Very Slight) damage is predicted in accordance with the Burland Scale. Appendix E of the BIA presents the output results from the XDisp analysis. The revised submission now provides the input data for the XDisp analysis.
- 4.10. The revised BIA submission includes assessment of the movements associated with the underpinning that will be carried out in the northwest part of the extension, and its effect on the Grade II listed host building. The predicted damage category for the underpinning does not exceed Burland Category 1 (Very Slight).
- 4.11. A Crossrail tunnel is located 8.00m south of the site (running along High Holborn) at an approximate depth of 14.00m below ground level and is considered in the GMA. LBC has confirmed that Crossrail have been consulted and did not raise an objection to the work.
- 4.12. Drawing reference 2714-1020-T titled 'Notes' states that the use of driven piles is not permitted. Appendix C of the revised BIA now includes detailed of the sheet pile installation methodology, which indicates a silent piler methodology will be used to minimise noise and vibration.
- 4.13. The BIA refers to an outline monitoring strategy. This should be agreed under Party Wall and Asset Protection Agreements (as required), including trigger levels and contingency measures, to ensure construction is controlled and impacts are maintained within the predicted limits.
- 4.14. Final consultations with TFL and utility asset owners should be undertaken in advance of the works and Asset Protection Agreements entered into, as required.

5.0 CONCLUSIONS

- 5.1. The Basement Impact Assessment (BIA) was carried out by RSK Environment Ltd by individuals whose qualifications are in accordance with CPG Basements.
- 5.2. The building is located within the Bloomsbury Conservation Area and is Grade II listed.
- 5.3. The site investigation identified Lynch Hill Gravel underlain by the London Clay Formation. Appropriate interpretative geotechnical information is presented.
- 5.4. Groundwater was not encountered during any of the site investigations carried out at the site. Based on the density of basements in the area and guidance presented in the Arup GHHS report, it is accepted that the proposed development will not impact the wider hydrogeological environment.
- 5.5. The proposed basement development involves the extension of an existing basement below the adjacent highways of Bloomsbury Street and High Holborn. The maximum excavation level is given as 19.60m OD. The proposed basement will require the installation of a sheet pile wall around the perimeter of the site to allow excavation. The revised BIA submission includes details of the method of installation for the sheet piles.
- 5.6. The revised BIA submission provides the input data for the PDisp and XDisp analyses, and includes an assessment of ground movements associated with the underpinning in the northwest of the basement extension area.
- 5.7. The Ground Movement Assessment (GMA) predicts a maximum of Category 1 (Very Slight) damage to the neighbouring properties with negligible movements to the highways.
- 5.8. A structural monitoring strategy should be agreed under Party Wall and Asset Protection Agreements (as required), including trigger levels and contingency measures, to ensure construction is controlled and impacts are maintained within the predicted limits. Liaison with TFL and utility asset owners should be undertaken in advance of the works.
- 5.9. Based on the revised submission, the BIA meets the requirements of CPG Basements.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Clarification of the installation methodology for the sheet pile wall is required.	Closed	15 July 2020
2	Stability	Full input data for PDisp and XDisp assessments should be provided.	Closed	28 July 2020
3	Stability	Ground movements resulting from underpinning should be considered and the impact to the listed building should be undertaken.	Closed	15 July 2020
4	Stability	It should be confirmed that approval of the scheme by Crossrail is not required.	Closed	24 July 2020

Appendix 3: Supplementary Supporting Documents

None

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