

253 - 255 Camden High
Street
London, NW1 7BU

Basement Impact Assessment
Audit

For
London Borough of Camden

Project Number: 12336-52
Revision: F2

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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 253 - 255 Camden High Street, London NW1 7BU (planning reference 2016/0821/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 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 Audit process was originally completed in August 2016, at which time it was recommended that a Basement Construction Plan (BCP) was secured by a condition of planning to address outstanding queries. CampbellReith was subsequently instructed in April 2017 to review an updated BIA. Between April and July 2017, the BIA was revised several times in response to queries raised by the audit process.
- 1.5. In August 2017 CampbellReith met with the Developer, Geotechnical Engineer and Contractor (underpinning) to discuss the temporary works arrangements proposed, including monitoring strategy, to ensure that scheme complied with LBC's policies and maintained damage to neighbouring structures, including those above, to a maximum of Category 1 (Burland Scale). Subsequent to the meeting, a final revision to the BIA and supporting documents were issued and reviewed.
- 1.6. The proposed development is the lowering of the existing reduced height lower ground floor by approximately 1m to create a full height, single storey basement at the front of the property using underpinning techniques. At the rear of the property, the existing ground floor will be lowered by up to 2m to create a double-height space (combined single level basement and ground floor). The 2017 revised submissions include proposals to reduce the basement slab and construct underpinned foundations slightly deeper (<1m) than the original proposal.
- 1.7. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.
- 1.8. In the original BIA submission, a desk study broadly in accordance with the GSD Appendix G1 was provided for the proposed development, although the appendices were not available for review. In the revised submissions, these documents have been provided for review.

- 1.9. In the original BIA submissions, limited ground investigation had been undertaken due to access constraints, and it was recommended that additional site investigation be undertaken to confirm ground and groundwater conditions. In the recent submissions, additional site investigation has been provided, which indicates Made Ground, Alluvium and London Clay to be present across the site.
- 1.10. The BIA indicates the site to be at low risk of surface water flooding or impacting the wider surface water flow environment, which is generally accepted.
- 1.11. The original BIA discussed the hydrogeological environment. Groundwater encountered within the Alluvium is attributed to localised perched water within silty and sandy lenses and the BIA states that it is not indicative of a regional shallow water table that may be impacted by the proposed development. The ground conditions indicated in the revised submissions, subsequent to the site investigation being undertaken, confirm the presence of generally cohesive Alluvium and the presence of shallow groundwater is accepted as being perched, as stated.
- 1.12. The revised 2017 BIA submissions state that the proposed basement construction will utilise underpinning and contiguous piling techniques. Structural information, calculations, sequencing and outline method statements have been provided.
- 1.13. The BIA indicates that there are London Underground Limited (LUL) Northern Line Tunnels and Home Office Deep Shelter Tunnels beneath and adjacent to the site. Although clear of LUL's exclusion zone, discussion with LUL and the Home Office is advisable to confirm there are no impacts on the tunnels.
- 1.14. A ground movement assessment (GMA) has been undertaken which includes a damage assessment in line with the Burland Scale. In the original BIA submissions, damage impacts in accordance with the Burland Scale were assessed as Category 1 to 2 (Very Slight to Slight) for a number of structures. CGL have stated maximum ground movements that the Contractor must not exceed during construction in order mitigate the damage impacts to a maximum of Category 1. On the basis of the most recent discussions and assessment revisions, it is accepted that maintaining damage to Category 1 is feasible.
- 1.15. The BIA discusses the requirement for survey and monitoring of nearby structures during construction. On the basis of the most recent discussions and assessment revisions, a suitable monitoring strategy is proposed.
- 1.16. It is accepted that there are no land stability impacts caused by slopes at or adjacent to the site.
- 1.17. Queries and matters requiring further information or clarification are summarised in Appendix 2. The BIA meets the criteria of CPG4.

2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18th April 2016 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 253 - 255 Camden High Street, London NW1 7BU, Camden Reference 2016/0821/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: "Excavation at basement level to provide 76sqm additional retail (A1) floorspace".
- 2.6. CampbellReith accessed LBC's Planning Portal on 28 April 2016 and gained access to the following relevant documents for audit purposes:
- Basement Impact Assessment (ref CG/18648, Draft, Revision 1) dated February 2016 by Card Geotechnics Limited.

- Site Location Plan, Existing Plans and Elevations, Proposed Plans and Elevations, Demolition Plans dated between October 2015 and January 2016 (Revision P1) by Barr Gazetas.
 - Design and Access Statement dated February 2016 (Revision A) by Barr Gazetas.
 - Correspondence with interested parties provided by LBC (as per Appendix 1).
- 2.7. Following the audit of the original BIA submission, additional information was provided for review on 4 July 2016, which comprised:
- Basement Impact Assessment (ref CG/18648, Draft, Revision 2) dated June 2016 by Card Geotechnics Limited.
- 2.8. A further revised BIA (Basement Impact Assessment (ref CG/18648, Draft, Revision 3) dated July 2016 by Card Geotechnics Limited) was provided for review on 5 August 2016 and a series of outline sketches from the Engineer on 15 August 2016. The sketches are presented in Appendix 3.
- 2.9. In 2017, the following revised BIA submissions have been received and reviewed:
- Basement Impact Assessment (ref CG/18648, Draft, Revision 3) dated February 2017 by Card Geotechnics Limited.
 - Basement Impact Assessment (ref CG/18648, Draft, Revision 4) dated June 2017 by Card Geotechnics Limited.
 - Basement Impact Assessment (ref CG/18648, Draft, Revision 5) dated June 2017 by Card Geotechnics Limited.
 - Basement Impact Assessment (ref CG/18648, Draft, Revision 6) dated July 2017 by Card Geotechnics Limited.
- 2.10. Following a meeting between CampbellReith and the Developer, Geotechnical Engineer and Contractor (underpinning), the following documents have been provided for review:
- Basement Impact Assessment (ref CG/18648, Draft, Revision 7) dated September 2017 by Card Geotechnics Limited.
 - Monitoring Report by MJ Rooney Construction Ltd.
 - Email from Jackson Coles re Monitoring Strategy dated 4th September 2017.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	The author's qualifications are in accordance with CPG4 guidelines for all sections.
Is data required by Cl.233 of the GSD presented?	Yes	A desk study broadly in line with the GSD Appendix G1 has been provided. Appendices provided for review in revised BIA.
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	In the revised submission, plans / maps have now been provided.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	In the revised submission, plans / maps have now been provided.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	In the revised submission, appropriate data sources have been provided.
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	In the revised submission, appropriate data sources have been provided.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	In the 2017 revised submission Alluvium has been considered.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	In the revised submission, appropriate data sources have now been provided.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Lower ground floors at 249 and 261 Camden High St identified. Tunnel structures below and adjacent the site identified, at depth. The revised BIA submission confirms that the adjacent office block and The Glasshouse have no basement levels.
Is a geotechnical interpretation presented?	Yes	In the revised submission, bearing capacity assessment has been presented.
Does the geotechnical interpretation include information on retaining wall design?	Yes	2017 Revisions
Are reports on other investigations required by screening and scoping presented?	Yes	In the revised submission, appropriate data sources have now been provided.
Are baseline conditions described, based on the GSD?	Yes	

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	Lower ground floors at 249 and 261 Camden High St identified. Tunnel structures below and adjacent the site identified, at depth. The revised BIA submission confirms that the adjacent office block and The Glasshouse have no basement levels.
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	The revised BIA submission presents a zone of influence for the proposed development indicating all affected structures.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	2017 submissions include SI and associated assessments.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	2017 submissions include SI and associated assessments.
Has the need for monitoring during construction been considered?	Yes	Movement monitoring is discussed and recommended for the adjacent structures / Party Walls. The tunnels are not recommended to be monitored.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Discussion on contractor workmanship in relation to residual damage categories is presented.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	2017 revisions include SI and updated structural information.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	The proposed basement is largely beneath current areas of hardstanding and additional run-off should not be expected.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	2017 revisions include consideration of Alluvium and perched groundwater and updated structural information

Item	Yes/No/NA	Comment
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Damage is to be limited to a maximum of Category 1 by monitoring and control of construction.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

- 4.1. In August 2017 CampbellReith met with the Developer, Geotechnical Engineer and Contractor (underpinning) to discuss the temporary works arrangements proposed, including monitoring strategy, to ensure that scheme complied with LBC's policies and maintained damage to neighbouring structures, including those above, to a maximum of Category 1 (Burland Scale). Subsequent to the meeting, a final revision to the BIA and supporting documents were issued and reviewed.
- 4.2. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.
- 4.3. The proposed development is the lowering of the existing reduced height lower ground floor by approximately 1m to create a full height, single storey basement at the front of the property using underpinning techniques. At the rear of the property, the existing ground floor will be lowered by up to 2m to create a double-height space (combined single level basement and ground floor). The 2017 revised submissions include proposals to reduce the basement slab and construct underpinned foundations slightly deeper (<1m) than the original proposal.
- 4.4. A desk study has been presented. In the revised submission a complete set of appendices have been presented for review, including historical mapping, ground investigation and Envirocheck information.
- 4.5. The BIA indicates that "an assessment will need to be undertaken to confirm if the existing infrastructure has sufficient capacity to take increased drainage". However, given that the change in impermeable areas across the site due to the proposed development is negligible, and that there will be "no significant changes in peak drainage outflows expected", the development should have no adverse impact on surface water flow and flooding.
- 4.6. The Regent's Canal and culverted River Fleet are both indicated as being within 250m of the proposed development. However, the original BIA noted that a damaged local sewer is likely to be the cause of the shallow perched groundwater encountered in the exploratory holes. In the revised BIA the water source has been identified as a leaking building downpipe which has since been repaired. Therefore the BIA states that there is no flood risk to the basement, nor is the groundwater encountered representative of a regional shallow groundwater regime.
- 4.7. The original BIA indicates that Alluvium on site may be related to an "unmapped tributary of the River Fleet". The potential for the wider presence of Alluvium across the site could not be ruled out by the limited ground investigation undertaken at the time. Perched water within the thin layers of Made Ground and Alluvium are likely to yield relatively small volumes, if encountered. Whilst the revised 2016 BIA suggested that local flows encountered during site investigation

were the result of a leaking downpipe, it did not rule out the possibility of it actually being perched groundwater related to the Alluvium. The groundwater flooding vulnerability maps indicate that this type of flooding occurs where superficial deposits outcrop or are very near surface, and therefore assessing the potential risk and impact was recommended within the previous BIA Audit.

- 4.8. The original BIA did not address the Alluvium as potentially being present across the wider site footprint. In the revised 2016 BIA, the Alluvium was recognised as a Secondary (undifferentiated) Aquifer. The proposed basement structure could cut-off the groundwater flow through the Alluvium and cause a wider hydrogeological impact. This could not be further assessed without additional site investigation. In the revised 2016 BIA submissions, borehole record TQ/28SE/297 is presented which indicates 'River mud' to 1.83m bgl. This is not discussed in the BIA but would suggest a wider presence of Alluvium in the vicinity.
- 4.9. In the 2017 revisions submitted, further site investigation has been undertaken, confirming deeper and more widespread Alluvium than originally anticipated. However, the Alluvium is generally cohesive in nature and the BIA states that groundwater is considered to be locally perched rather than part of a wider groundwater body. It is accepted that there will not be an impact on the wider hydrogeological environment.
- 4.10. The contractor should consider the presence of deeper Made Ground, Alluvium and groundwater across the site within their temporary works strategy to ensure stability is maintained. The contractor should make suitable contingency plans to deal with any perched water encountered during construction. In the long term, the permanent structure will require suitable waterproofing to be provided in line with best practice.
- 4.11. Reference is made to structural design by the engineers Walsh Associates. Suitable outline discussions on construction methodology and recommendations for undertaking underpinning is provided in the 2016 BIA submissions, along with outline sketches (refer to Appendix 3). The 2017 revisions provide further structural information, including proposed temporary and permanent works, and outline method statements from the underpinning contractor, MJ Rooney, and temporary works engineer, Michael Barclay Partnership.
- 4.12. The 2016 BIA submissions state that a sheet piled retaining wall will be installed around the perimeter of the courtyards to allow for the excavation to basement level before construction of the permanent reinforced concrete basement walls. The revised 2016 BIA does present details and assessment of the sheet piled retaining wall. However, the 2017 revisions refer to a contiguous pile wall, originally at 450mm diameter and subsequently at 350mm diameter. It is proposed to maintain stability and minimise deflections by use of a capping beam and temporary propping, calculations for which are presented.

- 4.13. In the original 2016 BIA, results of a ground movement assessment (GMA) were provided, which was undertaken in accordance with CIRIA 580. The GMA assessed the tunnel structures as well as the adjoining property / party walls. Mitigation in terms of limiting underpin lateral deflections was discussed with reference to relevant building damage categories. CampbellReith considered it unlikely that lateral deflection could be limited to the proposed $<0.5\text{mm}$. However, deflection $<5.5\text{mm}$ was considered achievable which CGL estimated would result in Category 2 'Slight' damage.
- 4.14. The GMA and damage impact assessment were revised several times in the 2017 submissions, in response to design changes and additional mitigation proposals to maintain predicted damage impacts to within Category 1 (Very Slight). The assessments were discussed in detail with CGL and MJ Rooney. The revised proposals, presented in September 2017, to limit ground movements and consequential damage to Category 1 are accepted as being feasible, subject to high standards of workmanship and close control of the works, including review and appropriate reaction to structural monitoring.
- 4.15. The BIA indicates that there are London Underground Limited (LUL) Northern Line Tunnels and Home Office Deep Shelter Tunnels beneath and adjacent to the site. The crown level of the closest LUL tunnel is approximately 5m laterally and 7m vertically from the proposed development, and outside of LUL's defined exclusion zone. The crown of the Deep Shelter Tunnels is 16.5m vertically from the proposed development. The GMA has considered stress change caused by the proposed development on the underlying tunnels. Although clear of LUL's exclusion zone, discussion with LUL and the Home Office is advisable to confirm there are no impacts on the tunnels.

5.0 CONCLUSIONS

- 5.1. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.
- 5.2. In the original BIA submission, a desk study broadly in accordance with the GSD Appendix G1 was provided for the proposed development, although the appendices were not available for review. In the revised submissions, these documents have been provided for review.
- 5.3. In the original BIA submissions, limited ground investigation had been undertaken due to access constraints. In the 2017 submissions, additional site investigation has been provided, which indicates Made Ground, Alluvium and London Clay to be present across the site.
- 5.4. The BIA indicates the site to be at low risk of surface water flooding or impacting the wider surface water flow environment, which is generally accepted.
- 5.5. The ground conditions indicated in the revised submissions, subsequent to the site investigation being undertaken, confirm the presence of generally cohesive Alluvium and the presence of shallow groundwater is accepted as being perched.
- 5.6. The revised 2017 BIA submissions state that the proposed basement construction will utilise underpinning and contiguous piling techniques. Structural information, calculations, sequencing and outline method statements have been provided.
- 5.7. The GMA has considered stress change caused by the proposed development on the underlying tunnels. The stress changes have been indicated to be negligible and as such will have no impact. Monitoring of the tunnels has not been recommended. Although the proposed development is clear of LUL's exclusion zone, discussion with LUL is advisable to confirm there are no impacts on the tunnels or that LUL do not require monitoring of the tunnels. Similar discussions with the Home Office are advisable in regards to the Deep Shelter Tunnels.
- 5.8. CGL have indicated maximum ground movements that the Contractor must not exceed during construction in order mitigate the damage impacts to a maximum of Category 1. These are accepted as being feasible, subject to high standards of workmanship and close control of the works, including review and appropriate reaction to structural monitoring.
- 5.9. It is accepted that there are no land stability impacts caused by slopes at or adjacent to the site.
- 5.10. Queries and matters requiring further information or clarification are summarised in Appendix 2. The BIA meets the criteria of CPG4.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA	The desk study appendices should be provided for review, including all historical map, Envirocheck and ground investigation information.	Closed	August 2016
2	BIA	Additional exploratory holes recommended to identify extent and thickness of Made Ground and Alluvium, and identify groundwater within the Alluvium.	Closed	May 2017
3	Hydrogeology	Impact of Alluvium as a Secondary Aquifer should be assessed, including impact to wider hydrogeological environment.	Closed	May 2017
4	Land Stability	Structural design / methodology by Walsh Associates should be provided for review, including bearing capacities, retaining wall information, sketches of propping arrangements and construction sequence, recommendations for the contractor.	Closed	May 2017
5	Land Stability	Ground movement assessment - a zone of influence should be identified. The presence of basements / nearby Listed structures should be identified. Impact assessments should be presented for all structures within the zone of influence.	Closed	September 2017
6	Surface Flow and Flooding	An assessment of any impact due to the damaged sewer on the proposed development should be provided.	Closed	August 2016

Appendix 3: Supplementary Supporting Documents

Basement Impact Assessment (ref CG/18648, Draft, Revision 7) dated September 2017 by
Card Geotechnics Limited

Monitoring Report by MJ Rooney Construction Ltd

Email from Jackson Coles re Monitoring Strategy dated 4th September 2017

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