

195-199 Grays Inn Road, Camden
WC1X 8UL

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 195-199 Grays Inn Road, Camden WC1X 8UL (planning reference 2017/6230/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 original BIA was been prepared by Hardman Structural Engineers by a Chartered Engineer. The authors of the GEA BIA Issue 2 dated 26 March 2018 have the appropriate qualification in accordance with LBC guidance.
- 1.5. Although not identified in the Audit instruction, the planning application has identified the presence of listed structures in close proximity to the subject site, which has been addressed in the BIA Issue 2 dated 26 March 2018.
- 1.6. The BIA states that the proposed basement will be founded on piles within the London Clay formation. An adjacent party wall is to be underpinned. The original BIA is based on historic boreholes located in the vicinity of the site. Information submitted to support the BIA assumptions shows the potential for Made Ground and Superficial Deposits to extend to depths beyond that proposed for the underpinning. The BIA Issue 2 includes intrusive ground investigation information which shows water bearing granular superficial deposits overlying the London Clay formation at the site.
- 1.7. Site specific ground investigation was required to confirm the feasibility of the current methodology for forming the basement and to inform any necessary mitigation measures such as dewatering. Historic maps were also requested to be submitted. The BIA Issue 2 dated 26 March 2018 included historic maps and groundwater monitoring data, which found the groundwater level to be at 2.2m bgl. A subsequent email from Hardman Structural Engineers dated 09 May 2018 details proposals for groundwater mitigation, should this granular material be encountered in the area of proposed underpinning.
- 1.8. The BIA outlines a basement construction proposal involving piles, retaining walls and a suspended floor slab with temporary propping arrangements. Underpinning of a basement

structure at the neighbouring No. 4 Mecklenburgh Road is also proposed. The agreement of the owner should be confirmed during Party Wall negotiations or alternative measures proposed.

- 1.9. Further details of the proposed basement design in both permanent and temporary cases were requested and have been provided in BIA Issue 2, along with further detail of the underpinning construction sequence which were included with an email dated 01 May 2018.
- 1.10. In the BIA Issue 2, analysis has been undertaken of horizontal and vertical ground movements. A building damage assessment based on predicted ground movements and characterising the damage in accordance with Burland is presented in this Issue 2 version of the BIA.
- 1.11. Outline proposals are provided for a movement monitoring strategy during excavation and construction.
- 1.12. Comment was requested regarding consideration of an attenuation SUDS system, and has been provided in Issue 2 of the BIA.
- 1.13. It is accepted that the development is not in an area subject to flooding. It is also accepted that it is unlikely to impact on the wider hydrogeology of the area, and this is confirmed following the ground and groundwater investigation detailed in Issue 2 of the BIA.
- 1.14. The queries described in Section 4 and summarised in Appendix 2 of the D1 audit report are now closed out and it is confirmed that the BIA complies with the requirements of CPG4 Basements on the understanding that:
 - Additional site investigation is undertaken in the vicinity of the proposed underpinning.
 - If groundwater control methods are required to complete the underpinning, such as grouting, then a Basement Construction Plan is submitted.

2.0 INTRODUCTION

- 2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 24 January 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 195-199 Grays Inn Road, Camden WC1X 8UL, reference 2017/6230/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): 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 single storey structure. Erection of 3 storey (including a part sunken lower ground floor and a subterranean basement level) building for B1(a) office use (276m²).*"
- 2.6. The Audit Instruction noted that 195-199 Grays Inn Road is not a listed building and neither is it a neighbour to listed buildings. However, information submitted for the planning application has

shown that the building is adjacent to several Grade II listed features. This is discussed further in Issue 2 of the BIA dated 26 March 2018.

2.7. CampbellReith accessed LBC's Planning Portal on 05 February 2018 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) 195-199 Grays Inn Road, reference 2630, by Hardman Structural Engineers, dated 11 January 2018 (it is assumed this supersedes an earlier BIA dated November 2017);
- BIA Appendices 195-199 Grays Inn Road, by Hardman Structural Engineers, dated November 2013 and October 2017;
- Planning Application Drawings by European Urban Architecture (re-named Re Creo in 2016), dated October and November 2013, consisting of:
Location Plan AL(00)02;
Existing Plans and Sections, numbered AL(00)03-AL(00)10;
- Proposed Plans and Sections by Re Creo Architecture, date unknown, numbered AP. 06.01, AP.06.03-AP.06.05, AP.07.01-AP.07.04 and AP.08.01-AP.08.03;
- Design, Access and Heritage Statement Parts 1 and 2, by Re Creo Developments Limited, dated November 2017.

2.8. CampbellReith again accessed LBC's Planning Portal on 27 March 2018 and gained access to the following supplementary documents:

- Desk Study and Basement Impact Assessment Report (BIA) 195-199 Grays Inn Road, reference J18041 Issue 2, by Geotechnical and Environmental Associates Limited (GEA), dated 26 March 2018;
- Revised Plans and Drawings numbered AP.06.03, AP.06.04, AP.07.02 by Re Creo Architecture, undated.

2.9. In addition, correspondence via email providing clarification has been relied upon:

- Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 17 April 2018;
- Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 23 April 2018;
- Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 01 May 2018 with attachment, Suggested Sequencing Drawings reference 2630, numbered SQ01-18, dated May 2018 by Hardman Structural Engineers;
- Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 09 May 2018.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Refer to Section 4. Updated in Issue 2 of the BIA.
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	Further details of the design were requested and have been provided in Issue 2 of the BIA.
Are suitable plan/maps included?	Yes	Historic maps presented in BIA Issue 2.
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	The groundwater level at the site has been determined and described in Issue 2 of the BIA.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Local Camden SFRA maps have been consulted.
Is a conceptual model presented?	Yes	Ground conditions are adequately described in the BIA Issue 2.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Scoping identified variable ground conditions in BGS logs and detailed SI is recommended – additional SI to be completed.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	No potential impacts to carry through to scoping.
Is factual ground investigation data provided?	Yes	Original BIA states that this will be carried out at a later date due to current access constraints, Issue 2 of BIA contains GI information.
Is monitoring data presented?	Yes	Described in Issue 2 of the BIA.
Is the ground investigation informed by a desk study?	Yes	Desk study information provided. Landmark Sitecheck report from 2013 included. Historic maps included in Issue 2 of the BIA.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Basements to adjacent properties are shown on drawings.
Is a geotechnical interpretation presented?	Yes	In BIA Issue 2.
Does the geotechnical interpretation include information on retaining wall design?	Yes	In Bia Issue 2.
Are reports on other investigations required by screening and scoping presented?	Yes	In BIA Issue 2. Party wall agreements are referred to but not provided. Additional SI for underpinning required.
Are the baseline conditions described, based on the GSD?	Yes	Ground investigation carried out and described in Issue 2 of the BIA. Inconsistencies in the information described in the original BIA and the appended BGS logs addressed in BIA Issue 2. Water monitoring on site described in BIA Issue 2.

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	Nearby basements are shown on drawings, including a basement to No. 4 Mecklenburgh Street beneath part of the existing floor slab at 195-199 Gray's Inn Road.
Is an Impact Assessment provided?	Yes	A preliminary impact assessment is provided and is updated with ground investigation information in BIA Issue 2.
Are estimates of ground movement and structural impact presented?	Yes	Estimated ground movements from the excavation and underpinning/pile installation were requested. Impact on the surrounding roadways and Grade II listed buildings were requested. Both are provided in BIA Issue 2.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	In BIA Issue 2.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Mitigation measures have been revised in BIA Issue 2.
Has the need for monitoring during construction been considered?	Yes	This has been considered in the original BIA section 5.3 and requires to be further developed in due course.
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	In BIA Issue 2.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	The BIA details utilising the existing drainage system. There is no planned increase to the footprint of the existing building.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Additional SI / BCP (if required) before underpinning methodology confirmed and approved. However, sufficient information for BIA.

Item	Yes/No/NA	Comment
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Damage Assessment is included in the BIA Issue 2.
Are non-technical summaries provided?	Yes	A non-technical summary is included in the BIA Issue 2.

4.0 DISCUSSION

- 4.1. The original BIA was been prepared by Hardman Structural Engineers. The author is a Chartered Engineer. Evidence of expertise in ground engineering was requested. The revised BIA (Issue 2) was produced by Geotechnical and Environmental Associates Limited, the combined authors of which hold sufficient qualifications according to the requirements of CPG Basements. Despite the original author not holding the qualifications required for the assessment of impacts on groundwater flow, the conclusions that there is no significant impact on the hydrology and hydrogeology were accepted, subject to confirmation by ground investigation (now provided).
- 4.2. The LBC Instruction to proceed with the audit identified that the basement proposal did not either involved a listed building or was adjacent to listed buildings. However, the Design, Access and Heritage Statement submitted with the BIA identified that 1-8 Mecklenburgh Street, to its rear, are Grade II listed properties. The gardens of these houses are adjacent to the western (rear) site boundary. The Heritage Statement also mentions that the Eastman Dental Hospital, which is opposite the site on Grays Inn Road, is a Grade II listed building. This heritage information is mentioned in section 2.3 of the amended BIA, Issue 2 dated 26 March 2018 and considered in the Building Damage Assessment.
- 4.3. The original BIA states that an intrusive site investigation will be carried out at a later date, and preliminary ground conditions are based on historic boreholes located some 85-100m from the site. Site specific ground investigation of the below ground soils and neighbouring foundations was requested, together with groundwater monitoring to demonstrate the feasibility of the proposed construction methodology in accordance with GSD 7.2. An intrusive Ground Investigation was then carried out and detailed in Issue 2 of the BIA. It should be noted that a suitable Desk Study had already been undertaken, as per GSD 7.2.1, and the requested historic maps presented in the revised BIA (Issue 2).
- 4.4. The original BIA states that the proposed basement will be founded on piles within the London Clay formation with the basement excavated to 3.70m bgl (also shown as 3.90m bgl on some drawings). BGS borehole logs submitted from nearby sites detail Made Ground to 3.60 and 5.70m bgl, locally underlain by Superficial Deposits to depths of 4.50 and 9.90m bgl. Clarification of such inconsistencies was requested. The BIA Issue 2 confirms the proposed excavation will be to 3.5m below existing floor level, with bored pile retaining walls extending to 8.0m bgl. Engineers logs of the borehole drilled subsequent to the production of the original BIA confirm the stratigraphic sequence on site to be Made Ground to 2.0m bgl, River Terrace Gravels to 2.8m, and London Clay beneath, to 9.0m bgl which was the full depth of exploration. Water monitoring of the standpipe installed into the borehole recorded groundwater at 2.2m bgl.

- 4.5. The BIA outlines a basement construction proposal involving piles, retaining walls and a suspended floor slab with temporary propping arrangements. Underpinning of a basement structure at the neighbouring No. 4 Mecklenburgh Road is also proposed. Further details of the proposed basement design in both permanent and temporary cases was requested. The BIA Issue 2 contains confirmation of the nature of the soils in which underpinning will be carried out; verification of an adequate bearing stratum; justification for the proposal to adopt a contiguous piled wall in the temporary case and confirmation of any requirements for dewatering.
- 4.6. Drawings included with the BIA show 2.80m deep basements to the rear of the properties 4-7 Mecklenburgh Street. The basement to the neighbouring 4 Mecklenburgh Street currently extends beneath the existing floor slab of the office building at 195-199 Grays Inn Road. It is proposed to underpin the party wall in this area. In addition to the information required above, the agreement of the owner of 4 Mecklenburgh Street should be confirmed during Party Wall negotiations, or an alternative solution proposed.
- 4.7. The BIA Issue 2 and a supplementary email from Hardman Structural Engineers dated 09 May 2018 confirm that underpinning and piling will be situated in the London Clay Formation. The Structural Engineer further confirms that additional site investigation will be undertaken to confirm that no water bearing gravel will be encountered during underpinning. It is recommended that the additional site investigation is made a Condition of Planning.
- 4.8. If the additional investigation does identify water bearing gravel will be encountered during underpinning, a Basement Construction Plan (BCP) should be submitted to clarify the groundwater control methods and construction methodology to demonstrate that this can be undertaken with no impact to stability.
- 4.9. The preliminary Ground Movement Assessment (GMA) states that differential settlement of the neighbouring properties is not considered to be an issue and the original BIA also states that the movement of the basement retaining wall will be limited to 10mm. More detail of the assumptions that led to this conclusion were requested. The BIA Issue 2 includes a full GMA as Part 3.
- 4.10. Assessment has been made of horizontal and vertical ground movements associated with the installation of the underpinning and piling, and basement excavation, in the BIA Issue 2 using X-Disp and P-Disp software. Maximum anticipated vertical and horizontal movements as a result of piling and excavation are calculated to be 0 to 7mm and 0 to 12mm respectively. Predicted heave within the basement excavation is calculated as 5mm in the centre and 3mm at the margins, with an additional 1 to 2mm predicted in the long term. The results of the revised GMA are considered reasonable. Anticipated building damage associated with predicted ground movements was requested and in the BIA Issue 2 has been classified in accordance with the

Burland scale as Category 0 and 1, so within acceptable limits according to council guidance. The Basement Impact Assessment in Section 13.0 of the BIA Issue 2 confirms that the development has been designed so as to maintain the stability of the surrounding ground, including the neighbouring public highway.

- 4.11. An indicative construction sequence for the piled basement construction is presented. The same was requested for the proposed underpinning and has been provided. Consideration of the need for dewatering and mitigation following the findings of the ground investigation is given in the Hardman Structural Engineers email of 09 May 2018. As 4.8, if groundwater control methods are required, a BCP should be submitted.
- 4.12. Outline proposals are provided in section 5.3 of the original BIA for a movement monitoring strategy during excavation and construction. As stated in the D1 audit report, this will need to be further developed in due course with the derivation of trigger levels and mitigation measures to ensure the surrounding properties are safeguarded.
- 4.13. Screening and scoping section of the BIA states that there will be no increase in surface water discharge into the ground and rainwater and run-off will be transferred to surface water drains as per the existing system. Comment was requested regarding consideration of SUDS as per CPG4 section 3.51, and provided in Issue 2 of the BIA.
- 4.14. It is accepted that there are no slope stability concerns regarding the proposed development and it is not in an area prone to flooding. It is also accepted that there are unlikely to be significant impacts to groundwater flow given the presence of existing basements in the vicinity.

5.0 CONCLUSIONS

- 5.1. The original BIA was been prepared by Hardman Structural Engineers by a Chartered Engineer. Evidence of expertise ground engineering was requested in the D1 audit report, and the combined authors of the GEA BIA Issue 2 dated 26 March 2018 demonstrate this capability.
- 5.2. Although not identified in the Audit instruction, the planning application has identified the presence of listed structures in close proximity to the subject site, which has been addressed in the BIA Issue 2 dated 26 March 2018.
- 5.3. The BIA states that the proposed basement will be founded on piles within the London Clay formation. An adjacent party wall is to be underpinned. The BIA Issue 2 includes intrusive ground investigation information that confirms the presence of superficial deposits on site.
- 5.4. The BIA outlines a basement construction proposal involving piles, retaining walls and a suspended floor slab with temporary propping arrangements. Underpinning of a basement structure at the neighbouring No. 4 Mecklenburgh Road is also proposed. Additional Site Investigation to confirm underpinning methodology should be undertaken. If groundwater control is required, a BCP should be submitted.
- 5.5. Further details of the proposed basement design in both permanent and temporary cases were requested and have been provided in BIA Issue 2.
- 5.6. In the BIA Issue 2, analysis has been undertaken of horizontal and vertical ground movements. A building damage assessment based on predicted ground movements and characterising the damage in accordance with Burland is presented in this Issue 2 version of the BIA, with all potential damage to nearby sensitive structures shown to be limited to Categories 0 and 1, so within allowable limits.
- 5.7. Outline proposals are provided for a movement monitoring strategy during excavation and construction. These will require to be further developed in due course.
- 5.8. Comment was requested regarding consideration of an attenuation SUDS system, and has been provided in Issue 2 of the BIA.
- 5.9. It is accepted that the development is not in an area subject to flooding. It is also accepted that it is unlikely to impact on the wider hydrogeology of the area, and this is confirmed following the ground and groundwater investigation detailed in Issue 2 of the BIA.
- 5.10. The queries described in Section 4 and summarised in Appendix 2 of the D1 audit report are now closed out and it is confirmed the BIA complies with the requirements of CPG4 Basements on the understanding that:

- Additional site investigation is undertaken in the vicinity of the proposed underpinning.
- If groundwater control methods are required to complete the underpinning, such as grouting, then a Basement Construction Plan is submitted.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	Author's expertise in ground engineering to be confirmed.	Closed - see section 1.3.2 of BIA Issue 2	17 April 2018
2	BIA	Historic maps to be presented to confirm absence of worked ground.	Closed - included in Issue 2 of BIA	17 April 2018
3	Land Stability/Hydrogeology	Intrusive site investigation with associated sampling, monitoring and reporting required.	Closed - included in Issue 2 of BIA	17 April 2018
4	Hydrogeology	Confirmation of absence of impact on groundwater flow to be provided once ground and groundwater conditions determined.	Closed - see section 13.0 of BIA Issue 2, groundwater monitored at 2.2m bgl.	17 April 2018
5	Land Stability	Confirmation of feasibility of basement construction methodology with outline calculations required once ground and groundwater conditions determined.	Closed - see section 8.1 of BIA Issue 2	17 April 2018
6	Land Stability	Confirmation of any necessary mitigation measures required to ensure stability to be provided once ground and groundwater conditions determined.	Closed - see email dated 09 May 2018	15 May 2018
7	Land Stability	Construction sequence to be extended to include underpinning.	Closed – see email dated 01 May 2018	15 May 2018
8	Land Stability	Mitigation measures include underpinning a neighbouring property. The agreement of the owner should be confirmed.	Closed - to be carried out as part of Party Wall agreement negotiations	17 April 2018
9	Land Stability	Ground movement and building damage assessment to be provided.	Closed - see sections 10.5 and 11.0 of BIA Issue 2	17 April 2018
10	Hydrology	Drainage scheme to be clarified and potential hydrogeological impacts updated following water monitoring.	Closed - see section 3.1.1 of BIA Issue 2	17 April 2018

Appendix 3: Supplementary Supporting Documents

Desk Study and Basement Impact Assessment Report (BIA) 195-199 Grays Inn Road, reference J18041 Issue 2, by Geotechnical and Environmental Associates Limited (GEA), dated 26 March 2018

Revised Plans and Drawings numbered AP.06.03, AP.06.04, AP.07.02 by Re Creo Architecture, undated

Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 17 April 2018

Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 23 April 2018

Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 01 May 2018 with attachment, Suggested Sequencing Drawings reference 2630, numbered SQ01-18, dated May 2018 by Hardman Structural Engineers

Email from Hardman Structural Engineers to Campbell Reith Hill LLP dated 09 May 2018

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