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Minerva House & Telephone Exchange
WC1E 7PH

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 13693-24
Revision: F1

July 2022

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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 Minerva House & Telephone Exchange (planning reference 2021/3704/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.

1.4. The proposed redevelopment works comprise the partial demolition of the rear section of the Telephone Exchange, the construction of a three-storey extension up to the fourth floor; and deepening of the existing basement at site.

1.5. The Basement Impact Assessment has been carried out by Card Geotechnics Limited (CGL) and the individuals concerned in its production have suitable qualifications.

1.6. Screening and Scoping assessments are presented, supported by desk study information.

1.7. The site is at low risk from flooding from all the sources, and the proposed development will not result in an increase in hardstanding areas. A SuDS Strategy has been presented to ensure that the surface water run-off will be managed in accordance with LBC's guidance. It's noted that the detailed drainage design is subject to Thames Water and LBC's approval.

1.8. A site investigation has been undertaken indicating the basement will be constructed within the Lynch Hill Gravel Member. An addendum to the BIA (see Appendix 3) confirms that a sensitivity analysis of the proposed geotechnical parameters for design and assessment will be undertaken following further ground investigation. It is recommended this is presented in a Basement Construction Plan.

1.9. Two different conceptual models are presented in the BIA and in the Geotechnical and Geoenvironmental Factual & Interpretative report. The conceptual model should be confirmed in the BCP once the additional ground investigation is complete.

1.10. The BIA states that groundwater is likely to be encountered during excavation works and means of dewatering/groundwater control are suggested. There will be no impact to the wider hydrogeological environment.

1.11. A Construction Method Statement (CMS) should be presented to confirm structural and temporary works proposals. This may be presented as part of the BCP.

1.12. A ground movement assessment (GMA) has been undertaken with predicted impacts to neighbouring structures and infrastructure. The addendum to the BIA notes that the assessment will be reviewed once additional ground investigation is complete. This should be reported in the BCP.

1.13. This audit considers the GMA in regards to neighbouring buildings only and the owners of any underground infrastructure present within the zone of influence of the basement may require separate assessment to satisfy their requirements.

1.14. Queries and requests for information are discussed in Section 4 and summarised in Appendix 2. Subject to the submission of a satisfactory Basement Construction Plan it is confirmed that the BIA meets the requirements of Camden Planning Guidance: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on the 15th of November 2021 to carry out a Category C audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Minerva House & Telephone Exchange, 1-4 North Crescent and 5 North Crescent, London, WC1E 7PH, planning reference 2021/3704/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

- Camden Local Plan 2017 - Policy A5 Basements.
- Camden Planning Guidance (CPG): Basements. January 2021.
- 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 "*Refurbishment and reconfiguration of the existing buildings; including a one storey extension, plus plant, demolition works associated with internal and external alterations to provide additional office accommodation; landscaping works and other associated works".*

2.6. The Audit Instruction confirmed that both Minerva House and the adjacent Glen House are Grade II listed properties. The site is located in an area that contains numerous Grade II listed properties.

2.7. CampbellReith accessed LBC's Planning Portal on the 16th of November 2021 and gained access to the following relevant documents for audit purposes:

- Geotechnical and Geoenvironmental Factual & Interpretative Report by Card Geotechnics Limited CGL, Revision 0, ref: CGL/0.9589A, dated August 2021.
- Desk Study Report and Basement Impact Assessment by Card Geotechnics Limited CGL, Revision 2, ref: CGL/09589, dated September 2021.
- Flood Risk Assessment & SuDS Strategy Report by Heyne Tillett Steel, revision 1, dated June 2021.
- Architectural drawings including site location, plans, elevations and sections by Morris + Company Ltd, revision P01, dated July 2021.
- Demolition/Construction Management Plan by Real PM Limited, revision 2, dated 22 July 2021.
- Planning Consultation Responses.

2.8. On 25 February 2022 CampbellReith was issued with a Comment Tracker prepared by CGL, reference CGL_09589A. The tracker is presented in Appendix 3 and forms the basis of this updated audit.

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?	No	Construction methods to be used to be clearly presented in Basement Construction Plan (BCP).
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	Section 5.3 of the BIA.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 5.2 of the BIA.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Section 5.3 of the BIA.
Is a conceptual model presented?	Yes	Figure 2 of the BIA and Figure 3 of the Geotechnical and Geoenvironmental Factual & Interpretative report. However, there are some discrepancies between the two which should be clarified following proposed further ground investigation and confirmed in BCP.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 6 of the BIA.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 6 of the BIA.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 6 of the BIA.
Is factual ground investigation data provided?	Yes	See Geotechnical and Geoenvironmental Factual & Interpretative report.
Is monitoring data presented?	Yes	Section 3.2 of the Geotechnical and Geoenvironmental Factual & Interpretative report.
Is the ground investigation informed by a desk study?	Yes	Section 2 and 3 and Appendix B of the BIA.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Section 5.3 of the BIA.
Is a geotechnical interpretation presented?	Yes	Section 8.4 of the BIA. However, sensitivity analysis to be presented.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Section 8.4 of the BIA. However, sensitivity analysis to be presented.
Are reports on other investigations required by screening and scoping presented?	No	GMA, FRA and SuDS Strategy Report are presented. A CMS is required. An addendum to the BIA advises that further site investigation is planned.
Are the baseline conditions described, based on the GSD?	No	A CMS is required.

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	Section 5.3 of the BIA.
Is an Impact Assessment provided?	Yes	Confirmation of assumptions and findings to be presented in a BCP.
Are estimates of ground movement and structural impact presented?	Yes	GMA provided, however assumptions and findings to be presented in a BCP.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	However however assumptions and findings to be presented in a BCP.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	However, they may need to be updated after confirmation of the impact assessment. Mitigation measures should be presented in a BCP.
Has the need for monitoring during construction been considered?	Yes	Movement Monitoring is recommended. Outline monitoring strategy presented in Section 11 of the BIA.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Negligible. However, subject to confirmation in BCP.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	However, GMA should be reviewed and confirmed in BCP and Section 4. Section 8 & 9 of the BIA.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	FRA and Section 7 of the BIA.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	However, GMA should be reviewed and confirmed in BCP.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	Section 10 of the BIA. However to be confirmed in BCP.
Are non-technical summaries provided	Yes	Section “Non Technical Summary” of the BIA.

4.0 DISCUSSION

4.1. The Basement Impact Assessment has been carried out by Card Geotechnics Limited (CGL) and the individuals concerned in its production have suitable qualifications.

4.2. The site comprises of two buildings fronting North Crescent (Minerva House and Telephone Exchange). Each building generally consists of five storeys with a single level basement; with the rear of the Telephone Exchange being three storeys.

4.3. The proposed redevelopment works comprise the partial demolition of the rear section of the Telephone Exchange and the construction of a three-storey extension up to the fourth floor; and lowering the existing basement by approximately 2.9m (to +23.20 mOD).

4.4. The LBC Instruction to proceed with the audit identified that the basement proposal involved a listed building of Grade II. The Design and Access Statement identified that Minerva House is located in the Bloomsbury Conservation Area. Although the Telephone Exchange is not listed, it is highlighted as a building of significance to the Bloomsbury Conservation Area. The site is located in an area that contains a number of Grade II listed properties.

4.5. Screening and Scoping assessments are presented and informed by desk study information. Most relevant figures/maps and other guidance documents are referenced within the BIA to support responses to the Screening questions.

4.6. A site investigation was undertaken between the 5th and the 7th July 2021 and comprised of one cable percussive borehole (BH01) from existing ground floor level (+28.80 mOD) to a depth of 25m (+3.80 mOD). The ground investigation encountered 200mm thick concrete over 2.90m of granular Made Ground. The underlying natural soils comprised 1.80m of Alluvium over 1.10m of cohesive Lynch Hill Gravel Member, 2.40m of granular Lynch Hill Gravel Member, the London Clay Formation to a depth of c. 14.50m bgl, followed by the Lambeth Group to the maximum depth of the borehole.

4.7. A groundwater strike was encountered in BH01 at 7.70m bgl, and after 20 minutes water was recorded at 7.45m bgl. Groundwater monitoring results indicate groundwater to be present within the granular Lynch Hill Gravel Member at approximately 6.65m bgl (+22.015mOD).

4.8. Two different conceptual models are presented in the BIA and in the Geotechnical and Geoenvironmental Factual & Interpretative report. An addendum to the BIA (see Appendix 3) notes that further site investigation is planned. It is recommended that the conceptual model is updated following the completion of the investigation and confirmed in a Basement Construction Plan (BCP).

4.9. The BIA states that groundwater is likely to be encountered during excavation works and means of dewatering/groundwater control are suggested. It is noted that the ground investigation and subsequent groundwater monitoring was undertaken in summer when the groundwater levels are at their lowest. It is recommended that additional groundwater monitoring is performed before construction to assess the highest water levels likely to occur during the construction of the basement and to inform the dewatering strategy, although its noted that the proposed formation level is approximately 1.00m above monitored groundwater level, and that the BIA makes an allowance of an additional 0.50m of groundwater within its assessments. The additional groundwater monitoring may be presented in the BCP.

4.10. The BIA states the surface of the London Clay slopes in a south south-westerly direction towards the river Thames and east to the lost river Fleet and that groundwater is expected to flow predominantly in that same direction over the relatively impermeable London Clay surface. It is stated that water will flow around and beneath the proposed basement due to relatively high lateral permeability within the Lynch Hill Gravel Member and that no impact on the groundwater regime and levels is anticipated.

4.11. A flood risk assessment indicates that the site is at low risk from flooding from all the sources, and the proposed development will not result in an increase in hardstanding areas. A SuDS Strategy has been presented to ensure that the surface water run-off will be managed in accordance with LBC's guidance. It is noted that the detailed drainage design is subject to Thames Water and LBC's approval.

4.12. The proposed drawings and sections do not show the method proposed for the underpinning sequence. A Construction Method Statement (CMS) is not provided and is requested following the LBC guidance "Basement Impact Assessments: Defining the scope of Engineering input" (Guidance note 1v0). The CMS should confirm the sequencing and propping arrangements and other works measures to maintain stability through the Lynch Hill Gravel Member. Clarification regarding the structural proposal along the Minerva House boundary is required. This information may be presented in the BCP.

4.13. The geotechnical parameters to be adopted in the retaining wall calculations, foundation design and ground movement assessment (GMA) are presented. The Young's Modulus and angle of shearing resistance adopted for the Made Ground, and likewise the Young's Modulus for the cohesive Lynch Hill Gravel Member, are considered to be at the upper end of the anticipated range. The addendum to the BIA notes that the parameters will be reviewed and confirmed once additional site investigation has been carried out. They should be cautious values as required by the Terms of Reference for BIA Audits and reported in the BCP.

4.14. A GMA has been undertaken to demonstrate that ground movements and consequential damage to neighbouring properties will be within LBC's policy requirement. Ground movements

due to underpinning and consequent excavation have been modelled using FEM program PLAXIS 3D.

4.15. The GMA states that the damage to neighbouring properties will be a maximum of Burland Category 1 (Very Slight). The following clarifications are requested:

- As 4.13, a sensitivity analysis adopting more conservative geotechnical parameters for the shallow soils should be presented.
- Plaxis does not account for construction related movements. Whilst it is noted that an allowance for vertical movements due to underpinning has been added to the Plaxis calculations, no such allowance has been made for lateral movements. The category of damage results are therefore based on very low horizontal strain values due to very low lateral ground movements (of less than 1mm). This is not considered to be sufficiently conservative and a sensitivity analysis should be presented.

4.16. The addendum to the BIA notes that the assessment will be reviewed once further site investigation has been completed and that horizontal movements of 5mm or greater can be accommodated without causing damage greater than Burland Category 1 to neighbouring structures. It is recommended that this is demonstrated by means of an updated GMA, based on cautious assumptions and realistic/measurable values of movement as noted in the BIA addendum. The updated assessment should be reported in the BCP .

4.17. It is noted that various types of underground infrastructure are present nearby the site including Thames Water sewers, LU underground tunnels and air raid shelters and the site is within the Crossrail 2 safeguarding zone. This audit considers the GMA for neighbouring buildings only and the owners of the infrastructure assets may require separate assessment to satisfy their requirements, including appropriate asset protection agreements.

4.18. The BIA indicates that a movement monitoring scheme is to be adopted to ensure that the movements generated are maintained within predicted limits.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment has been carried out by Card Geotechnics Limited (CGL) and the individuals concerned in its production have suitable qualifications.

5.2. Screening and Scoping assessments are presented, supported by desk study information. An addendum has been presented in response to queries raised by CampbellReith.

5.3. A site investigation has been undertaken indicating that the basement will be constructed within the Lynch Hill Gravel Member. The proposed geotechnical parameters require confirmation following the planned additional site investigation as detailed in Section 4.

5.4. Two different conceptual models are presented in the BIA and in the Geotechnical and Geoenvironmental Factual & Interpretative report. A definitive model should be presented once the additional ground investigation has been completed.

5.5. There will be no impact to groundwater flows. Temporary dewatering is likely to be required.

5.6. A CMS should be presented to confirm structural and temporary works proposals.

5.7. The GMA should be reviewed in accordance with the comments presented in Section 4 and the addendum once the additional site investigation has been completed.

5.8. SUDs measures will be adopted to ensure that the surface water run-off will not increase as a part of the development. It is noted that the detailed drainage design is submitted and is subject to Thames Water approval.

5.9. This audit considers the GMA in regard to the neighbouring buildings only and the owners of any infrastructure present within the zone of influence of the basement may require separate assessment to satisfy their requirements.

5.10. A Basement Construction Plan is recommended which should include the results of the planned additional investigation, an updated conceptual model, cautious soil parameters, a construction method statement and updated ground movement and building damage assessment all as described in Section 4.

5.11. Queries and requests for information are summarised in Appendix 2. Subject to the submission and approval of a suitable BCP, it is confirmed that the BIA meets the requirements of Camden Planning Guidance: Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Redacted	Flat 2 Chenies St Chambers, 9 Chenies St, London WC1E 7ET	28/10/2021	Unclear elevation of existing and proposed development.	Appendix A of the BIA.

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA	A CMS should be provided as the basis of assessments.	To be provided in Basement Construction Plan (BCP)	
2	BIA	Conceptual models to be revised to be consistent among the reports presented.	To be provided in BCP once planned additional investigation completed. See Section 4.8.	
3	Land Stability	A sensitivity analysis of geotechnical parameters should be presented.	To be provided in BCP once planned additional investigation completed. See Section 4.13.	
4	Land Stability	GMA to be reviewed and updated.	To be provided in BCP once planned additional investigation completed. See Section 4.14 - 4.16.	

Appendix 3: Supplementary Supporting Documents

CR Ref.	Date Received	LBC BIA Query	CGL Comment	Response Date	Status
4.8	06/01/22	Two different conceptual models are presented in the BIA and in the Geotechnical and Geoenvironmental Factual & Interpretative report. The information should presented consistently in both reports	The Conceptual site model in the GIR is more detailed than the BIA to reflect the site specific information gathered during the site investigation works. CGL would suggest CR refer to the GGIR CSM rather than revise the BIA.	Rev 0 21/02/22	

4.13	06/01/22	The geotechnical parameters to be adopted in the retaining wall calculations, foundation design and ground movement assessment (GMA) are presented. The Young's Modulus and angle of shearing resistance adopted for the Made Ground, and likewise the Young's Modulus for the cohesive Lynch Hill Gravel Member, are considered to be at the upper end of the anticipated range. A sensitivity analysis adopting more conservative values should be presented to demonstrate the robustness of the basement design and GMA	The values are considered characteristic in relation to the site investigation data. Generally the characteristic values used in SLS assessment are slightly less than the mean most probable values. For example the design SPT of 9 in the Made Ground remains lower than the average and is not upper bound in relation to the data.
			
			It is acknowledged that the dataset is very limited, however reference has been made to additional publicly available data and nearby site investigations when determining soil the parameters used and values remain characteristic.
			
			It should be noted that the assessment will be reviewed again following an additional phase of site investigation, yet to be completed which is to consist of:
			
			Ref. 2429 - SK0100_P1 - Updated Geotech Investigations:
			
			- 5 Nr. window samples spread over the site to get a good site coverage for confirmation on bearing strata and contamination
			- 15 Nr. foundation probe investigations (slab/pad cores followed by a follow-on dynamic probe) at targeted locations where gaps in soils testing is present
			- Additional Soils and Groundwater Testing:
			  - Geotechnical: Atterberg Limit tests, particle size distribution tests, water content tests, and sulphate tests for ACEC concrete class design.
			  - Geoenvironmental: soil suite tests, asbestos screening tests, leachate suite tests, water suite tests, WAC tests; Polychlorinated
				Rev 0 18/01/22
				
				Rev 1 31/01/22	

CR Ref.	Date Received	LBC BIA Query	CGL Comment	Response Date	Status
			Biphenyls (PCBs) and Petroleum Hydrocarbons (TPH). Additional Standpipe installation, Monitoring & Permeability Tests within 2-3 No. additional window sample positions over a further 3 No. monitoring visits		
4.15	06/01/22	As 4.13, a sensitivity analysis adopting more conservative geotechnical parameters for the shallow soils should be presented. Plaxis does not account for construction related movements. Whilst it's noted that an allowance for vertical movements due to underpinning has been added to the Plaxis calculations, no such allowance has been made for lateral movements. The category of damage results are therefore based on very low horizontal strain values due to very low lateral ground movements (of less than 1mm). This is not considered to be sufficiently conservative and a sensitivity analysis should be presented	As noted above, the currently proposed parameters are suitably conservative and lower than the most probable values. However this will be reviewed again once further site specific investigation data is received. Installation movements are not explicitly accounted for within the analysis, therefore the vertical settlement from pin induced movement has been added the calculated values. As noted in the report, lateral movements from the underpins are likely to be negligible as they from short and thick retaining walls. As a sensitivity check, consider the worst case section CS2 Minevera House (perpendicular), where a category 1 damage category was calculated. From the Building Damage Assessment plot contained within the report it can be seen that the horizontal strain could increase to approximately 0.022% and still remain damage category 1, which is equivalent a maximum differential horizontal movement of approximately 5mm across the width of the building. Likewise for the remaining sections maximum horizontal movements of 7-12mm are tolerable. These limits are readily achievable for a massive underpin, that is both restrained at the top and bottom, and propped with a permanent waler. It should also be noted that this sections are internal to the site itself and form part of the construction works and would not usually be assessed.	Rev 0 18/01/22	

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