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Royal National Throat, Nose And Ear Hospital Site London, WC1X 8DA

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13398-70
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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for the Royal National Throat, Nose And Ear Hospital Site, 330 Gray's Inn Road, London WC1 (planning reference 2020/5593/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 BIA has been carried out by WSP however the qualification of the individuals involved in its production have not been provided and are requested.

1.5. The proposed basement will be formed using an embedded retaining wall, the construction of which should be confirmed. The basement excavation will comprise two levels in the west and centre of the site and will extend to about 12m depth. In the east, the single basement will extend to about 8m depth.

1.6. Above the basements the development will include an upper and lower ground floor level, with a further 5- to 13-storey development above this.

1.7. A preliminary ground investigation has been undertaken and indicates ground conditions comprise Made Ground over London Clay, with Lambeth Group soils at depth.

1.8. It is accepted that the development will not impact the hydrogeology of the area.

1.9. Clarification is required regarding the Flood Risk at the site.

1.10. Further consideration of the Ground Movement Assessment (GMA) is required.

1.11. A detailed movement monitoring strategy is presented and should be revised in line with LBC's requirement for damage to neighbouring structures to not exceed Category 1 (Very Slight).

1.12. It cannot be confirmed that the BIA complies with the requirements of CPG: Basements until the queries raised in Section 4 and Appendix 2 are addressed.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 8 December 2020 to carry out a Category C audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for the Royal National Throat, Nose and Ear Hospital Site, 330 Gray's Inn Road, London WC1X 8DA, planning reference 2020/5593/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: 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 *"Redevelopment of the former Royal National Throat, Nose and Ear Hospital site, comprising: Retention of 330 Gray's Inn Road and a two storey extension above for use as hotel (5 above ground storeys in total), demolition of all other buildings, the erection of a part 13 part 9 storey building plus upper and lower ground floors (maximum height of 15 storeys) for use as a hotel (including a cafe and restaurant); covered courtyard; external terraces; erection of a 7 storey building plus upper and lower ground floors (maximum height of 9 storeys) for use as office (for consultation purposes only: 13,275sqm office space) together with terraces; erection of a 10 storey building plus upper and lower ground floors (maximum height of 12 storeys) for use as residential (44 units and*

748sqm affordable workspace, for consultation purposes only) on Wicklow Street and office space at lower ground and basement floors; erection of a 5 storey building plus upper and lower ground floors (maximum height of 7 storeys) for use as residential (32 units, for consultation purposes only) on Swinton Street and associated residential amenity space; together with a gymnasium; new basement; rooftop and basement plant; servicing; cycle storage and facilities; refuse storage; landscaping and other ancillary and associated works (for consultation purposes only the development includes 9,427sqm of hotel floorspace (182 rooms))".

2.6. The Audit Instruction has confirmed the site is a neighbour to a Grade II listed building at 75 Wicklow Street. A number of listed structures are also identified in the BIA to the south of the site, on the other side of Swinton Street.

2.7. CampbellReith accessed LBC's Planning Portal on 23 December 2020 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (BIA) by WSP, ref. 70057187/BIA, rev P03, dated November 2020.
- Flood Risk Assessment and Drainage Strategy (FRA) by WSP, ref. 70057187-RP-FRA-001, rev 3, dated 23 November 2020.
- Planning drawings including site masterplan drawings (all rev P01, dated 30.11.20), existing plans and sections (all rev P01, dated 30.11.20), proposed masterplan drawing (all rev P01, dated 30.11.20) and demolition drawings (rev P01, dated 30/11/20) by Allford Hall Monaghan Morris Architects.
- Design & Access Statement by Allford Hall Monaghan Morris Architects, ref. 18116, rev P00, dated 30 November 2020.
- Preliminary Arboricultural Impact Assessment and Arboricultural Method Statements by J.L.Denney Tree Consultant, dated 28/06/2019.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	No	No information provided.
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?	Yes	
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	No items carried forward.
Is factual ground investigation data provided?	Yes	One borehole has been completed and further site specific investigation is proposed.
Is monitoring data presented?	Yes	Groundwater monitoring has been undertaken on 9 occasions following completion of the borehole.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	Photographs are provided in the BIA.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	However it is indicated that further investigation will be undertaken once vacant possession of the site is available (Section 2.5 of the BIA).
Is a geotechnical interpretation presented?	Yes	Section 7.1 of the BIA.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	No additional reports are required however a Flood Risk Assessment and an Arboricultural Report have been undertaken.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	

Item	Yes/No/NA	Comment
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	However impact to surrounding highways is not provided and is requested.
Is the Impact Assessment appropriate to the matters identified by screening 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	Appendix I of the BIA presents outline monitoring plans.
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?	No	Further information is required as discussed in this audit.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	No	Clarification regarding the Local Flood Risk Zone at the site is required.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However the assessment should be revised in line with comments in Section 4 of this audit.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by WSP. Details of the qualifications held by the individuals involved with its production are not presented in the BIA and should be provided.

4.2. The BIA identifies a Grade II listed building to the north of the site and four Grade II listed properties along the south side of Swinton Street.

4.3. The proposed development includes the demolition of the majority of the buildings on site, including a small existing basement in the centre of the site. The building on the western side of the site, fronting on to Gray's Inn Road, will be retained to preserve the façade. The proposed development includes a single-storey basement in the east and a two-storey basement in the centre and west of the site. The basement does not extend to the western edge of the site. A lower ground floor level and an upper ground floor level are proposed over the full development area. Above this is proposed to construct four buildings comprising a further 5- to 13-storeys. The two buildings on the east side will be for residential use, the building in the centre will comprise offices and a hotel is proposed on the west side.

4.4. The deepest excavation for the two-storey basement is given as 12m, from a pile platform level of 15.60m OD to 3.60m OD. The single-storey basement will have a maximum excavation depth of 7m (to a level of 8.60m OD). It is proposed to construct the basement using a secant pile wall formed of 750mm or 900mm diameter piles. The foundation for the basement is indicated to comprise a raft with settlement control piles.

4.5. A preliminary ground investigation has been undertaken at the site, comprising one cable percussive borehole to a depth of 27.45m (-12.60m OD). Section 6 of the BIA states that the preliminary ground investigation has been used to establish preliminary ground and groundwater conditions at the site, and that additional investigation will be undertaken at a later date, post-determination. A specification for the additional investigation is provided. Subject to LBC's approval, it is proposed by this audit that the results of the additional investigation, as well as their evaluation and update of the Ground Movement Assessment (GMA), should form part of a Basement Construction Plan (BCP).

4.6. The preliminary ground investigation identified the ground conditions underlying the site to comprise Made Ground over London Clay to -4.15m OD, below which Lambeth Group soils were encountered. A characteristic groundwater level of 12.40m OD has been identified based on the results of the groundwater monitoring.

4.7. Soil parameters are presented in Section 7.1 of the BIA and are based on the findings of the preliminary site investigation data. These should be reviewed on completion of the additional investigation and evaluated as part of the BCP.

4.8. Ground elevations vary from a maximum of 19m OD on Gray's Inn Road on the western edge of the site, to 14m OD at the eastern end of Wicklow Street, which bounds to northern edge of the site. The southern edge of the site is formed by Swinton Street, which has an elevation of 19m OD in the west and 17m OD in the east. Swinton Street is supported by a retaining wall that is not attached to the existing buildings within the site. Ground level within the site, adjacent to this retaining wall, is approximately 14.50m OD. The BIA identifies that average gradient of the site does not exceed 7°.

4.9. The BIA identifies the site is in close proximity to the River Fleet, which is indicated to now be diverted into the Fleet Sewer. As such, the BIA concludes the development will not impact this water course.

4.10. It is proposed to remove one mature tree from the centre of the site as part of the proposed development. The BIA indicates that this will not impact the foundation of the new development due to the excavation required to construct the double basement in this area.

4.11. Section 3.4 of the BIA discusses flooding, however it does not identify that the site is located within a Critical Drainage Area and that the eastern half of the site lies within the North Swinton Street Local Flood Risk Zone (LFRZ). A LFRZ is defined in the LBC Strategic Flood Risk Assessment (SFRA) as the actual spatial extent of predicted flooding in a single location. A Flood Risk Assessment (FRA) has been compiled for the site and includes a Drainage Strategy that provides details of attenuation measures to be used to limit discharge rates from the site. These measures comprise an attenuation tank within the basement and a rain water harvesting system, also located at basement level. The FRA references the LBC SFRA but it is unclear whether the classification of the eastern half of the site as a LFRZ has been considered in the FRA. Further clarification in this regard is requested.

4.12. The shallowest geology at the site is Made Ground over London Clay, with the latter designated an Unproductive Stratum with respect to groundwater. As such, it is accepted that the basement will not significantly impact the hydrogeology of the area.

4.13. Section 7.2 of the BIA presents an outline temporary and permanent works proposal for the development. The form of the existing retaining walls surrounding the site will be determined at the time of the additional site investigation work. The BIA suggests that underpinning may be used to support some of the retaining walls and adjacent party walls prior to piling. The indicative construction sequence provided in Appendix G.2 of the BIA also shows the use of underpinning.

4.14. A Ground Movement Assessment (GMA) is presented as part of the Buildings Impact Assessment in Appendix J of the BIA using specialist software and CIRIA C760 methodology, with the modifications discussed below. The GMA has been undertaken for the proposed development and considers ground movements resulting from the installation of a secant pile wall in stiff clay. The following points require further clarification or revision:

- Clarification of the construction of the embedded retaining wall should be provided. The text on page 27 of the BIA indicates a pile spacing of 1200mm, which suggests a contiguous wall, however subsequent assessment considers the wall to be of secant construction.
- The XDisp assessment for the installation of the embedded retaining wall has adopted a base level equal to the base of the excavation. This level should be the level at the toe of the deepest piles, which is indicated in the WALLAP data in Appendix H.1 to be -4.0m OD.
- The XDisp assessment of ground movements resulting from installation appears to have been undertaken separately from the assessment of ground movements due to excavation. Both elements should be combined in the same analysis to reflect construction conditions.
- Table 2 describes how ground movements would be combined to represent 5 different phases of construction. Consideration of ground movements due to wall installation seem to be missing from that Table and this should be clarified. The results are presented in Table 4 but it is not clear which construction phase is presented. Further detail is requested to show ground movement at each phase of construction, and clearly state the stage at which the worst case ground movements will occur.
- Consideration of the amount of ground movement anticipated for the adjacent highways should be provided and mitigation measures discussed, if required, against any expected damage.
- The GMA does not consider any ground movements associated with the proposed underpinning of adjacent retaining/party walls.
- The GMA and Buildings Impact Assessment need to consider the existing building between 332 UCL Ear Institute and Wicklow Street. Figure 1 in Appendix J.1 of the BIA shows this building to be within the site boundary, however Figure 2 of the main BIA text shows this area to be outside the site boundary, which is confirmed in the planning application drawings. Clarification and assessment of this building is required.

4.15. Ground movements resulting from installation of the pile wall have been reduced by 50% of that suggested by CIRIA C760, following the findings of a published case study undertaken for a similar basement development but in different ground conditions in London. Although the size and layout of the case study and this development site are considered analogous, the case

study refers to a contiguous pile wall with pile diameters of 300mm installed with a 'hit one, miss three' methodology, as opposed to a secant pile wall with pile diameters of 750mm/900mm and no reference to any specific construction methodology proposed for the subject site. Greater size piles at a tighter centre to centre arrangement (proposed use of secant vs contiguous used in the case study) are likely to result in greater ground movement due to wall installation compared to that noted in the case study. It is requested that further case studies be provided to justify the adoption of reduced ground movement curves, or that the analysis be undertaken using the full CIRIA C760 curves.

4.16. The results of the Buildings Impact Assessment currently indicates damage to neighbouring buildings will not exceed Category 1 (Very Slight), however the GMA requires further consideration in line with the points raised above.

4.17. Section 7.2 of the BIA states that a ground movement and impact assessment on the LUL asset will be undertaken at a later stage of the structural design, and that a similar exercise will be undertaken for Thames Water assets adjacent to and beneath the site. Section 9.1 of the BIA confirms that liaison with third party asset owners such as LUL and Thames Water will continue and that any specific impact assessments required by these bodies will be undertaken. The BIA presents records of initial correspondence with LUL in Appendix D.

4.18. Appendix I of the BIA presents outline monitoring plans for the development, which includes indicative monitoring points on neighbouring buildings, pavements and the adjacent LUL structures and railway tracks. Monitoring of the existing basement wall will be undertaken where this wall is to be retained to provide support in the temporary case. It is also proposed to install inclinometers within the new embedded retaining wall and survey targets on pile capping beams to monitor horizontal and vertical movements.

4.19. Trigger level values have not been provided in the monitoring plan. These should be based on the predicted values from the GMA and should be agreed as part of any party wall award. Table 16 of the BIA suggests that for some of the adjacent buildings the 'Red' trigger level threshold will comprise ground movement corresponding to 'the mid-point of 'Slight' damage'. It is a requirement of LBC that damage to neighbouring properties does not exceed Category 1 'Very Slight', therefore these thresholds are not acceptable and should be revised accordingly.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by WSP however the qualifications of the individuals involved in its production have not been provided and are requested.

5.2. The proposed basement will be formed using an embedded retaining wall and the use of contiguous or secant construction should be confirmed. The basement excavation will comprise two levels in the west and centre of the site and will extend to 12m depth. In the east the single basement will extend to 8m depth. Above the basements the development will include a lower ground floor level and an upper ground floor level, with a further 5- to 13-storey mixed-use development above this.

5.3. A preliminary ground investigation has been undertaken and indicates ground conditions comprise Made Ground over London Clay, with Lambeth Group soils below this.

5.4. It is accepted that the development will not impact the hydrogeology of the area.

5.5. Clarification is required to confirm that the designation of the east side of the site as a Local Flood Risk Zone has been taken into account in the Flood Risk Assessment.

5.6. A scope for additional site specific ground investigation has been provided. The findings of the investigation, and the evaluation of this additional data and an update of the Ground Movement Assessment (GMA), should form part of a Basement Construction Plan (BCP) for the development.

5.7. Further consideration of the Ground Movement Assessment (GMA) is required, based on the comments in Section 4 of this report.

5.8. A detailed movement monitoring strategy during demolition, excavation and construction is presented. Proposed trigger levels should be revised in line with LBC's requirement for damage to neighbouring structures to not exceed Category 1 (Very Slight).

5.9. It cannot be confirmed that the BIA complies with the requirements of CPG: Basements until the queries raised in Section 4 and Appendix 2 are addressed.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	General	The qualifications of the individuals involved with the preparation of the BIA should be provided.	Open	
2	Hydrology	Clarification is required to confirm that the designation of the east side of the site as a Local Flood Risk Zone has been taken into account in the Flood Risk Assessment.	Open	
3	Stability	Clarification of the type of embedded retaining wall to be used (secant or contiguous) is requested.	Open	
4	Stability	Please provide clarification regarding how the XDisp ground movements resulting from wall installation and ground movements due to excavation have been combined/considered. The toe elevation of the piled wall considered should be reviewed.	Open	
5	Stability	The GMA results for each identified phase of construction should be provided. Clarification is required regarding how ground movements due to wall installation have been considered.	Open	
6	Stability	Ground movements associated with underpinning should be considered as part of the GMA.	Open	
7	Stability	Consideration of the ground movements for the adjacent highways should be provided, along with mitigation measures as necessary.	Open	
8	Stability	The GMA should consider the building between 332 UCL Ear Institute and Wicklow Street.	Open	
9	Stability	Further case studies to justify the use of reduced CIRIA ground movement curves are requested, or the XDisp analysis should be undertaken using the full CIRIA C760 curves.	Open	
10	Stability	Monitoring trigger levels should be revised in line with LBC policy.	Open	

Appendix 3: Supplementary Supporting Documents

None

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