CampbellReith
consulting engineers

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

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 13398-70
Revision: F1

February 2021

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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 and the individuals involved in its production, while not holding the formal qualifications required by LBC policy, have provided CVs indicating suitable significant expertise in the design and assessment of basements similar to this site. Subject to LBC's approval, the authors/reviewers qualifications may be accepted.

1.5. The proposed basement will be formed using an embedded retaining wall. 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, hydrology, or slope stability of the area.

1.9. The revised Ground Movement Assessment (GMA) indicated that damage to neighbouring structures will not exceed Burland Category 1 (Very Slight).

1.10. A detailed movement monitoring strategy is presented in line with LBC's requirement for damage to neighbouring structures to not exceed Category 1 (Very Slight). Liaison and consultation with third party asset owners will be required.

1.11. Based on the revised submission, and subject to the satisfactory completion of a Basement Construction Plan, it can be confirmed that the BIA complies with the requirements of CPG: Basements.

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.

2.8. CampbellReith issued on 12 January 2021 an audit report (D1 report) raising a number of queries. In response to these queries the following additional information were provided:

- Basement Impact Assessment (BIA) by WSP, ref. 70057187/BIA, rev P04, dated January 2021.
- Additional impact assessment for 332 UCL Ear Institute Section 1-A.
- Responses to D1 Audit Queries (presented in Appendix 3).

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	No	However CVs indicating suitable experience have been 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	
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?	Yes	Based on the revised submission.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Based on the responses to the D1 Audit.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by WSP. Whilst the qualifications of the BIA author and reviewer do not comply with the requirements of the CPG, CVs have been provided indicating their expertise in the assessment and design of basements similar to that proposed at this site. On the basis of this BIA audit it is accepted that the screening, scoping and assessment have been completed satisfactorily. Subject to LBC's approval, the authors/reviewers qualifications may be accepted.

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. It is recognised that the final form of construction, and the construction sequencing and temporary works, will be determined by the contractor. As these have a significant bearing on the impacts of the basement, a Basement Construction Plan is recommended.

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 the average gradient of the site does not exceed 7°.

4.9. The BIA states 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 (CDA) and that the eastern half of the site lies within the North Swinton Street Local Flood Risk Zone (LFRZ). 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. Consideration of the CDA and LFRZ has been provided in subsequent correspondence presented in Appendix 3. It is accepted that, due to the adjacent lower-level tracks and the attenuation measures proposed, which will reduce the site to greenfield run-off rates, the development will not impact the hydrology of the area. However, the recommendations of the Greater London Authority regarding SuDS discussed in its report dated 8/2/2021, submitted during the public consultation, should be considered during the detailed design.

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. Subsequent correspondence with WSP indicates that the need for underpinning will not be known until the full site investigation is complete, and that, if required, underpinning will be considered in the updated GMA that will form part of the BCP.

4.14. A revised Ground Movement Assessment (GMA) is presented as part of the Buildings Impact Assessment in Appendix J of the revised BIA submission. The assessment has been undertaken using specialist software and CIRIA C760 methodology, with modifications as discussed below:

4.15. The XDisp assessment for the installation of the embedded retaining wall has adopted a base level equal to the base of the excavation. The revised submission clarifies that the retaining wall will be formed by secant pile wall extending to the basement level (3.60m OD or 8.60m OD), with only the male piles extending to the full depth (-4.0m OD), essentially forming a contiguous wall below basement level.

4.16. The revised BIA now includes an assessment of the building to the east of 332 UCL Ear Institute, adjacent to Wicklow Street. The plans and figures in the BIA have been updated to show the location of this building outside the site boundary.

4.17. 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.

4.18. To support the reduction in the amount of ground movement resulting from pile installation, the revised BIA presents 3 case studies in Appendix J.1 for basements formed using secant pile walls, to comparable or greater depths than the proposed development. The settlement monitoring data provided in the case studies is of a similar or smaller magnitude to that calculated for this basement using the reductions described above. Further correspondence with WSP (presented in Appendix 3) made the following clarification "the ground response for piling installation will be a combination of both vertical and horizontal movements, it is reasonable to assume that the horizontal movements will also be reduced proportional to the vertical

movements". Based on the cased study data and subsequent communication, the approach used to calculate the ground movements arising from pile installation is accepted.

4.19. Table 2 in Appendix J.1 describes how ground movements have been assessed cumulatively to represent 5 different phases of construction. The revised submission clarifies how ground movements due to wall installation are included in the assessment.

4.20. The results of the Buildings Impact Assessment in the revised BIA indicate damage to neighbouring buildings will not exceed Category 1 (Very Slight).

4.21. Correspondence from WSP regarding the impact to the adjacent highways states that the XDisp analysis predicts the impact to be negligible. It is indicated that the impact to highways will be further covered as part of an AIP.

4.22. 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.

4.23. 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.

4.24. 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 the party wall process and consultation with third parties asset owners (LUL, Network Rail, Thames, and Highways Authority) as may be required.

5.0 CONCLUSIONS

5.1. The BIA has been carried out by WSP and the individuals involved in its production, while not holding the formal qualifications required by LBC policy, have provided CVs indicating suitable significant expertise in the design and assessment of basements similar to this site. Subject to LBC's approval, the authors/reviewers qualifications may be accepted.

5.2. The proposed basement will be formed using an embedded retaining wall. 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 slope stability or the hydrogeology of the area.

5.5. Based on the revised submissions it is accepted that, with the attenuation measures presented in the Flood Risk Assessment, the development will not impact the hydrology of the area.

5.6. A scope for additional site specific ground investigation has been provided. The findings of the investigation, 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. The revised Ground Movement Assessment (GMA) indicates that damage to neighbouring structures will not exceed Burland Category 1 (Very Slight).

5.8. A detailed movement monitoring strategy during demolition, excavation and construction is presented. Proposed trigger levels are in line with LBC's requirement for damage to neighbouring structures to not exceed Category 1 (Very Slight). These should be agreed as part of the party wall process and consultation with third party asset owners as may be required.

5.9. Based on the revised submission, and subject to the satisfactory completion of a BCP, it can be confirmed that the BIA complies with the requirements of CPG: Basements.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	General	The qualifications of the individuals involved with the preparation of the BIA should be provided.	Closed – Subject to LBC's approval	27/01/2021
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.	Closed	27/01/2021
3	Stability	Clarification of the type of embedded retaining wall to be used (secant or contiguous) is requested.	Closed	27/01/2021
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.	Closed	10/02/2021
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.	Closed	27/01/2021
6	Stability	Ground movements associated with underpinning should be considered as part of the GMA.	Closed	27/01/2021
7	Stability	Consideration of the ground movements for the adjacent highways should be provided, along with mitigation measures as necessary.	Closed	27/01/2021
8	Stability	The GMA should consider the building between 332 UCL Ear Institute and Wicklow Street.	Closed	10/02/2021
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.	Closed	27/01/2021
10	Stability	Monitoring trigger levels should be revised in line with LBC policy.	Closed	27/01/2021

11	BIA	Subject to LBC's approval, the additional investigation proposed by the BIA, and the subsequent update of the Ground Movement & Damage Assessment, should form part of a Basement Construction Plan (BCP).	Note	N/A
12	BIA	Consultation with third party asset owners (LUL, Network Rail, Thames Water, Highways Authority etc) potentially affected by the proposed works shall be undertaken.	Note	N/A
13	Hydrology	The recommendations of the Greater London Authority regarding SuDS, submitted during the public consultation, should be considered during the detailed design.	Note	N/A

Appendix 3: Supplementary Supporting Documents

Table of responses to D1 queries
E-mail correspondence

Royal National Throat, Nose And Ear Hospital Site BIA – Audit

Audit Query Tracker

Query No	Subject	Query	Status	WSP Comments (13/01/2021)
1	General	The qualifications of the individuals involved with the preparation of the BIA should be provided.	Open	Noted - cv's will be provided with the updated report.
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	The site is located in Flood Zone 1 and is at low risk from all sources of flooding, the local flood risk zone denoted in the SFRA does cover part of the east side of the site, however refers to the potential flood risk related to the lower track, which given its low spot is deemed to be at a high risk of potential flooding. This possible flooding does not increase the risk of flooding to the site, given the level difference between the railway track to the east of the site, and as the site is reducing the site to greenfield runoff rates the scheme itself will help reduce the impact of surface water flooding locally in the area and therefore improve the situation as the attenuation on site is designed to cater for all events up to the 1:100 year + 40% climate change.
3	Stability	Clarification of the type of embedded retaining wall to be used (secant or contiguous) is requested.	Open	The embedded retaining wall will be formed by secant piles. Updated text on p.27 shall precise this.
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	1) For the purpose of this assessment, a constant toe elevation at basement formation level has been considered since below the raft level there will be male piles only (i.e. contiguous pile wall) and small movements will be expected. Further details are given below in the response to pile installation effects. 2) The ground movements used to estimate the building damage assessment have been cumulatively combined for each calculation stage. The cumulative results are presented in the graph plots enclosed within Appendix J.2 3) The wall installation effects have been included in this assessment (refer to Methodology section in Appendix J.1, graph plots in Appendix J.2 and XDisp Input/Output sheets enclosed in Appendix J.4). The omission of this calculation stage from the bullet points in p.1 and in Table 2 of Appendix J.1 are typos and will be rectified in the next revision of the BIA.
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	1) The ground movement results obtained on Xdisp/Pdisp have been cumulatively combined for each calculation/construction stage. These are presented in terms of graph plots enclosed in Appendix J.2. Table 4 of Appendix J.1 summarizes these results for each building and refer only to the maximum movements obtained from all the calculation stages considered. This therefore presents an assessment of the worst case impact expected. 2) Wall installation movements have been included in the assessment - refer to above response in point 3).
6	Stability	Ground movements associated with underpinning should be considered as part of the GMA.	Open	At the time of preparing this assessment it not yet certain if underpinning techniques will be employed as part of this redevelopment nor where these would be undertaken. The setting of the piling mat level is at or slightly above exiting lower ground floor level is intended to negate this requirement, given that the properties adjacent to the development include basements at or close to the existing lower ground floor level. Once the development specific site investigation has been completed, the extent of underpinning, if required, will be assessed.
7	Stability	Consideration of the ground movements for the adjacent highways should be provided, along with mitigation measures as necessary.	Open	The predicted global movements from the Xdisp analysis for the adjacent highways are <20mm, with maximum tensile strains <0.05%. The impact is negligible and this will be covered in the AIP required.
8	Stability	The GMA should consider the building between 332 UCL Ear Institute and Wicklow Street.	Open	The building between 332 UCL and Wicklow St. has now been included as part of the assessment of building 332 UCL Ear Institute. The impact on this building remains within 'Negligible' Category.
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	This calculation assumption is supported by WSP experience in various sites across London. The following text will be added to the report as an appendix.
10	Stability	Monitoring trigger levels should be revised in line with LBC policy.	Open	This will be updated in the next revision of the document.

FW: 330 GIR Royal National Throat, Nose and Ear Hospital BIA audit queries
Adrego, Jose to: KatharineBarker@campbellreith.com 10/02/2021 09:40
Cc: "camdenaudit@campbellreith.com"

1 Attachment

210209_332UCL_S1-A.pdf

Good morning Katharine,

Thank you for your comments. We have addressed these within your e-mail below in red and in attachment.

Kind regards,

José Alexandre Adrêgo
Geotechnical Engineer

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From: KatharineBarker@campbellreith.com <KatharineBarker@campbellreith.com>
Sent: 09 February 2021 10:33
To: Adrego, Jose <jose.adrego@wsp.com>
Cc: camdenaudit@campbellreith.com
Subject: Royal National Throat, Nose and Ear Hospital BIA audit queries

Good morning Jose,

I am reviewing the revised BIA submission for this site and have a few questions before we can close out all of the audit queries:

-Do the case studies have any data recorded for horizontal movements to support the assumptions made for this aspect of the GMA? WSP: No horizontal movements were recorded for those case studies. Notwithstanding this, the ground response for piling installation will be a combination of both vertical and horizontal movements, it is reasonable to assume that the horizontal movements will also be reduced proportional to the vertical movements.
-Were any specific construction restrictions/limitations used in the case studies (Ball uses hit one miss three for the installation)? WSP: No specific construction restrictions were used during the secant piling works of the presented case studies – these followed standard secant pile walling procedures.
-The outline of the 332 UCL Ear Institute building has been extended to cover the building to the east, as per our audit query. Line S1 in currently in a location outside the footprint of the proposed basement. The critical section location would be adjacent to the double basement, as per the green line in the image below. Could this be included in the GMA? WSP: We have now included in our models an additional section for the 332 UCL building as you have indicated in the figure below. The building damage assessment is within the "very slight" category with a critical strain of 0.072% (graph plots and calculations are attached to our e-mail).

We're happy for this additional information/responses to be provided on its own as opposed to resubmitting a full BIA again.

Kind regards,

Kat

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Senior Geotechnical Engineer

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