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Network Building & 88 Whitfield Street
London, W1T 4TP

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 13398-74
Revision: F1

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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 Network Building (95-100 Tottenham Court Road & 76-80 Whitfield Street) and 88 Whitfield Street, London, W1T 4TP (planning reference 2020/5624/P, 2020/5631/P, 2020/5638/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. For both reserved matters applications considered in this audit (RM01 office scheme, RM02 laboratory scheme) the Basement Impact Assessments (BIA) have been prepared and/or reviewed by individuals with suitable qualifications in accordance with CPG Basements.

1.5. The site is roughly rectangular in plan and is currently occupied by a six-storey building. There is an existing single-storey basement occupying the majority of the building footprint.

1.6. The proposed development will involve the demolition of the existing building and construction of a new nine (RM01) or eight (RM02) storey building with a lowered single basement level across the entire footprint of the site. The new basement excavation will be, on average, up to c.6.50m deep (RM01) or c.7.70m deep (RM02).

1.7. A secant pile wall is proposed to be cast around the perimeter of the proposed basement to facilitate construction.

1.8. An outline construction sequence for the proposed basement, including the temporary works, is presented for both schemes.

1.9. The site appears to fall within the LUL influence zone and the Crossrail 2 safeguarding zone while a number of sewer and water mains are present in proximity. An impact assessment on these assets will be required as a separate process in accordance with the respective asset owners' policies.

1.10. Screening & scoping sections have been presented supported by desk study information and a site walkover, as required by CPG Basements.

1.11. A preliminary site-specific ground investigation was undertaken. Additional ground investigation is proposed by the BIAs to further inform the design stage and confirm the BIA assumptions.

1.12. A groundwater flow assessment has been presented. It is accepted that the proposed development is not anticipated to significantly impact the hydrogeology of the area.

1.13. A ground movement assessment (GMA) and an outline monitoring strategy during construction have been presented for both schemes.

1.14. A damage assessment, outline structural calculations and a non-technical summary have been provided for both schemes.

1.15. It is accepted that there will be no impact to the surface water from the proposed development.

1.16. Given that the queries previously raised in Section 4 and Appendix 2 have been addressed by the additional information provided, it can be confirmed that the BIA meets the requirements of CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 22/12/2020 to carry out a Category B audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Network Building (95-100 Tottenham Court Road & 76-80 Whitfield Street) and 88 Whitfield Street, London, W1T 4TP (planning reference 2020/5624/P, 2020/5631/P, 2020/5638/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. The planning reference 2020/5624/P corresponds to an outline application described on LBC's website as "*Outline application for demolition of office building (95-100 TCR & 76-80 Whitfield St) and 7 flats (88 Whitfield Street) and construction of a new building to provide for a maximum of 17275 sqm (GIA) of 'commercial business and service' floorspace (use Class E) along with details of access, scale and landscaping and other works incidental to the application. Details of layout and appearance are reserved. CONSULTATION NOTE: Application is linked to redevelopment of 14-19 Tottenham Mews (ref 2020/5633/P) and Reserved Matters details for*

office building (ref 2020/5631/P) and Reserved Matters details for lab-enabled building (ref 2020/5638/P)".

The Reserved Matters Application 1 (RM01) with reference no 2020/5631/P is for an office scheme and is described on LBC's website as "*Reserved Matters details of layout and appearance for an office building comprising one basement level, ground floor and eight upper floors and associated cycle parking, servicing and all necessary enabling works, associated with planning application reference 2020/5624/P [for the demolition of office building (95-100 TCR & 76-80 Whitfield St) and 7 flats (88 Whitfield Street) and construction of a new building to provide for a maximum of 17275 sqm (GIA) of 'commercial business and service' floorspace (use Class E) along with details of access, scale and landscaping and other works incidental to the application']. CONSULTATION NOTE : Application is linked to an application for outline planning permission (ref 2020/5624/P) which is currently under assessment*".

The Reserved Matters Application 2 (RM02) with reference no 2020/5638/P is for a lab-enabled scheme. The LBC's Audit Instruction described the planning proposal as "*Reserved Matters details of layout and appearance for a building with lab-enabled use comprising one basement level, ground floor and seven upper floors, associated with planning application reference 2020/5624/P [for the demolition of office building (95-100 TCR & 76-80 Whitfield St) and 7 flats (88 Whitfield Street) and construction of a new building to provide for a maximum of 17275 sqm (GIA) of 'commercial business and service' floorspace (use Class E) along with details of access, scale and landscaping and other works incidental to the application']. CONSULTATION NOTE: Application is linked to an application for outline planning permission (ref 2020/5624/P) which is currently under assessment*".

The Audit Instruction did not clarify whether the subject site involved, or was a neighbour to, any listed buildings.

2.6. This audit considers the basement developments proposed under both the RM01 (office scheme) and RM02 (lab scheme) applications, as they appear to be of similar extent.

2.7. CampbellReith accessed LBC's Planning Portal on 4/1/2021 and gained access to the following relevant documents for audit purposes for the outline application:

- "Structural Engineering Report", Outline Application, 11/11/2020, Rev.P1, Elliott Wood Partnership Ltd;
- "Surface Water Drainage Statement", Outline Application, 19/11/2020, Rev.P1, Elliott Wood Partnership Ltd. It is included as Appendix B in the above Outline SER report;
- "Geotechnical and Geoenvironmental Interpretative Report" (GIR), October 2020, Rev.0, Card Geotechnics Ltd. It is included as Appendix C in the above Outline SER.

2.8. CampbellReith accessed LBC's Planning Portal on 4/1/2021 and gained access to the following relevant documents for audit purposes, for the RM01 application (office scheme):

- "Structural Engineering Report & Basement Impact Assessment" (SER), Reserved Matters Application 01, 11/11/2020, Rev.P1, Elliott Wood Partnership Ltd;
- "Preliminary Basement Impact Assessment" (Geotechnical BIA), November 2020, Rev.1, Card Geotechnics Ltd. It is included as Appendix C in the above SER report;
- Design & Access Statement, 25/11/2020, Reserved Matters 01 Office Scheme, by Piercy & Company;
- Planning Application Drawings consisting of:
    - Existing Plans, dated 25/11/2020, by Piercy & Company;
    - Demolition Plans, dated 25/11/2020, by Piercy & Company;
    - Proposed Plans, dated 25/11/2020, by Piercy & Company.

2.9. CampbellReith accessed LBC's Planning Portal on 18/1/2021 and gained access to the following relevant documents for audit purposes, for the RM02 application (lab scheme):

- "Basement Structures and Construction Report" (BSCR report), 20/11/2020, Rev.P02, AKT II Ltd;
- Design & Access Statement, Reserved Matters 02, Life Science Scheme, 25/11/2020, by Piercy & Company;
- Planning Application Drawings consisting of:
    - Proposed Plans, dated 27 & 28/10/2020, by HOK International Ltd.

2.10. CampbellReith issued on 1/2/2021 an audit report (D1) raising a number of queries on the above BIA documents. In response to these queries, the applicant submitted via LBC on 3/3/2021 & 25/3/2021 the following documents:

- "CGL_09528 – The Network Building: LBC Comment Tracker – Scheme RM01 (Office Scheme)", 24/2/2021, Card Geotechnics Ltd - (attached in Appendix 3).
- "Network Building", 25/2/2021, letter ref.no.: 4921/wc/let/df BIA, aktII (scheme RM02);
- "Preliminary Basement Impact Assessment" (Geotechnical BIA), March 2021, Rev.0, Card Geotechnics Ltd (scheme RM02).

2.11. CampbellReith issued on 13/4/2021 updated query trackers related to the above BIA documents for both schemes. In response to the updated query trackers, the applicant submitted via LBC on 29/4/2021 the following documents:

- "CGL_09528 – The Network Building: LBC Comment Tracker – Scheme RM01 (Office Scheme)", ref.: CGL Rev1_RM01, Card Geotechnics Ltd;
- "Preliminary Basement Impact Assessment" (Geotechnical BIA), RM01 Office Scheme, April 2021, Rev.2, Card Geotechnics Ltd.

- "CGL_09528B – The Network Building: LBC Comment Tracker – Scheme RM02 (Laboratory Scheme)", ref.: CGL RM02, Card Geotechnics Ltd;
- "Preliminary Basement Impact Assessment" (Geotechnical BIA), RM02 Lab Scheme, April 2021, Rev.1, Card Geotechnics Ltd.
- "Pile Installation Case Studies", April 2021, Card Geotechnics Ltd

2.12. Further, the applicant submitted on 14/5/2021, via LBC, the following updated report for RM02 application (lab scheme):

- "Basement Structures and Construction Report" (BSCR report), 14/5/2020, Rev.P03, AKT II Ltd.

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?	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	Refer to Section 3.3 of the Geotechnical BIAs.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Refer to Section 3.2 of the Geotechnical BIAs.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Refer to Section 3.4 of the Geotechnical BIAs.
Is a conceptual model presented?	Yes	Refer to Section 7 of the GIR.
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?	Yes	
Is factual ground investigation data provided?	Yes	Refer to Section 7 of the GIR.
Is monitoring data presented?	Yes	Refer to Section 7.7.1 of the GIR.
Is the ground investigation informed by a desk study?	Yes	Refer to the GIR.
Has a site walkover been undertaken?	Yes	Refer to the GIR, Section 2.2.1.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Refer to Section 2.4 of the Geotechnical BIAs.
Is a geotechnical interpretation presented?	Yes	Refer to Section 9 of the GIR.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	Ground movement assessments (GMA) were presented for both schemes.
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	Refer to Sections 8 & 9 of the Geotechnical BIAs.

Item	Yes/No/NA	Comment
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	
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	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
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	In Section 11 of the Geotechnical BIAs.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) for scheme RM01 (office scheme) consists of a Structural Engineering Report (SER) prepared by Elliott Wood Partnership Ltd and a Preliminary Basement Impact Assessment (Geotechnical BIA) issued by Card Geotechnics Ltd. The reports for scheme RM01 have been prepared by individuals with suitable qualifications in accordance with CPG Basements.

4.2. The Basement Impact Assessment (BIA) for scheme RM02 (laboratory scheme) consists of a Basement Structures and Construction Report (BSCR) issued by AKT II Ltd and a Preliminary Basement Impact Assessment (Geotechnical BIA) issued by Card Geotechnics Ltd. The reports for scheme RM02 have been prepared and/or reviewed by individuals with suitable qualifications in accordance with CPG Basements.

4.3. The site is located at 95-100 Tottenham Court Road and 76-80 Whitfield Street, termed “The Network Building”, and 88 Whitfield Street. The site is roughly rectangular in plan and is currently occupied by a six-storey office and retail building. There is an existing single-storey basement occupying the majority of the building footprint with a finished floor level (FFL) at 25.01mOD. The site is generally flat with a gentle downward slope from northwest to southeast from c.28.00mOD to 27.80mOD respectively.

4.4. The proposed development will involve the demolition of the existing building and construction of a new nine (RM01 office scheme) or eight-storey (RM02 lab scheme) building with a lowered single basement level across the entire footprint of the site.

4.5. According to available data, the plan area of the proposed basement will be approximately the same for the two schemes. The main difference is that the superstructure is proposed to comprise a lightweight CLT and steel frame for the office scheme (RM01) but with a concrete flat slab proposed for the laboratory scheme (RM02); therefore, the proposed building loads are anticipated to be different for the two schemes. Another difference between the two schemes, is the thickness of the raft foundation proposed and the required basement excavation to accommodate it as discussed in detail below.

4.6. The building for schemes RM01 and RM02, is proposed to be supported by a raft foundation 750mm and 1500mm thick, respectively. The increased thickness of the raft in RM02 scheme is related to the increased building weight. For scheme RM01, the proposed basement slab level will be at 22.36mOD and only locally deeper, at 20.76mOD to accommodate the proposed lift pits. The basement excavation formation level for RM01 is proposed to be at c.21.60mOD. Therefore, for RM01, the new basement excavation will be about 3.50m deep in areas where the existing basement is present, and up to c.6.50m deep elsewhere, and only locally up to c.8.20m, where the lift pits are proposed. For RM02, the proposed basement slab level will also

be at 22.36mOD but due to the thicker raft proposed, the new basement excavation will be about 4.30m deep in areas where the existing basement is present, and up to c.7.70m deep elsewhere. The proposed formation level for RM02 will be at c.20.80mOD.

4.7. A hard/firm cut-off secant pile wall consisting of 600mm diameter piles with a male to male spacing of 750mm c/c for RM01 and 800mm c/c for RM02 is proposed to be cast around the perimeter of the proposed basement and inside the perimeter of the existing basement wall, where the latter is present. The proposed secant pile wall will be designed to resist lateral loads only and is proposed to be propped in the temporary case for both schemes. It is proposed to be installed from a piling platform level at c.27.00mOD which is anticipated to be formed by backfilling of the existing basement footprint after the demolition works are completed. The secant piled wall will be supported by the foundation raft and the ground floor slab in the long term.

4.8. For scheme RM01, an outline construction sequence for the proposed basement is discussed in Section 5.1 and further presented in drawings (Appendix B of SER) including the temporary works required. Similarly, for scheme RM02, an outline construction sequence is presented in Section 5 and drawings are attached in Appendix 1 of the BSCR report.

4.9. According to the Geotechnical BIA reports, the site appears to fall within the LUL influence zone and the Crossrail 2 safeguarding zone while a number of sewer and water mains are present in proximity. These site constraints are also discussed in Section 2.3 of the BSCR, for RM02. An impact assessment on these assets will be required in accordance with the respective asset owner's policies and shall form separate submissions for whichever scheme is progressed to the next stage. Such an impact assessment check is outside the remit of this audit report.

4.10. Screening charts for the hydrogeology, land stability and hydrology of the site are included in Sections 3.2 to 3.4 of the Geotechnical BIA reports. Scoping sections are included in Section 4 of the same and are supported by desk study information and a site walkover, as required by CPG Basements.

4.11. A preliminary site-specific ground investigation (GI) was undertaken, as part of a phased site investigation approach, and a Geotechnical and Geoenvironmental Interpretative Report has been provided. The site specific GI comprised two boreholes to 10m and 30m depth and three hand-dug foundation inspection pits within the existing basement. The GI recorded Made Ground to 2.50m depth over Lynch Hill Gravel Member to 4.50m depth over London Clay to 23m depth over Lambeth Group. For both schemes, a ground model has been presented in the Geotechnical BIAs based on the results of the preliminary GI.

4.12. Additional ground investigation is proposed by the Geotechnical BIAs, in the form of four foundation inspection pits and one additional 30m borehole in the eastern part of the site along

with three wall and slab non-destructive scans, in order to determine the party wall foundation relationship with the Qube building to the north, validate the ground model and further de-risk the site. According to the Geotechnical BIAs, the additional investigation will inform the final design and a final Basement Impact Assessment.

4.13. Groundwater strikes encountered during the investigation works and subsequent monitoring readings indicate that groundwater rests at or below 23.62mOD and this elevation has been taken as the design water level.

4.14. A groundwater flow assessment is presented in Section 7 of the Geotechnical BIAs. It is anticipated that the groundwater will flow around the proposed basement due to the relatively high lateral permeability of the Lynch Hill Gravel Member. However, it is recommended that this preliminary conclusion is confirmed in the light of the monitoring data obtained from the proposed additional ground investigation and monitoring. For the purposes of this BIA audit and based on the data currently available, it is accepted that the proposed development is not anticipated to significantly impact the hydrogeology of the local area.

4.15. Separate ground movement assessments (GMA) have been presented for both schemes in the Geotechnical BIAs. The ground movements due to demolition works, installation of the proposed secant piled wall, excavation of the basement, application of the proposed structural loads, short and long term conditions have been considered in the GMAs. Proprietary software (PDisp, Wallap) was used together with a modified CIRIA C760 methodology for the assessment of ground movements due to wall installation. Relevant ground movement contour plans and graphs have been produced and are presented in the Geotechnical BIAs.

4.16. In the GMAs, horizontal and vertical ground movements due to the installation of the proposed secant piled wall have been assumed to be equal to 0.02% of wall depth, based on a case study paper by Ball et al. (2014), which are significantly lower than those suggested by CIRIA C760 (0.08% and 0.05% for horizontal and vertical movements, respectively). The case study by Ball et al., refers to a contiguous piled wall consisting of 300mm diameter piles as opposed to a secant piled wall proposed for this site (i.e. tighter pile layout is proposed for this site) consisting of 600mm diameter piles (i.e. double size piles are proposed at this site). Additional case studies and information from four projects of analogous size with the subject one were provided to support the proposed (0.02% of wall depth) ground movements due to wall installation and these were accepted.

4.17. The GMAs for both schemes confirm that the anticipated structural damage to the Qube building to the north of the site will be within Category 1 of Burland Scale. Maximum vertical and horizontal ground movements of 14mm and 12mm are predicted by the GMAs for the surrounding highways Tottenham Court Road, Howland Street, Whitfield Street, stating also that these values are not expected to significantly affect the roadways considered.

4.18. Section 10 of the GMAs propose a monitoring strategy to be applied during construction with predefined ground movement trigger levels in accordance with the Observational Method of CIRIA Report 185. However, CIRIA's Observational Method comprises a design method not a monitoring strategy. It is understood that the design at the site will be undertaken by use of calculation, not by use of the Observational Method. Also, the trigger levels adopted during construction will be informed by the ground movements predicted in the GMAs. It is anticipated that a detailed monitoring methodology will be developed with the party wall surveyors prior to the works commencing.

4.19. Monitoring of all structures and infrastructure is also recommended by the SER and BSCR during demolition, excavation and construction.

4.20. The site is located within Flood Zone 1 and is not located in an area identified by the London Borough of Camden as a Local Flood Risk Zone. A Surface Water Drainage Statement has been provided which included a SuDS strategy. The latter allows for blue and green roof systems along with drainage into the existing sewer, which is anticipated to provide an improvement of the run-off compared to the existing situation. It is accepted that there will be no impact to the surface water from the proposed development. Drainage into the existing sewer will require the permission of Thames Water.

4.21. Non-technical summaries have been presented for both schemes, in accordance with LBC guidance.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessments (BIA) for both schemes RM01 & RM02, have been prepared and/or reviewed by individuals with suitable qualifications in accordance with CPG Basements.

5.2. The site is roughly rectangular in plan and is currently occupied by a six-storey building. There is an existing single-storey basement occupying the majority of the building footprint.

5.3. The proposed development will involve the demolition of the existing building and construction of a new nine (scheme RM01) or eight (scheme RM02) storey building with a lowered single basement level across the entire footprint of the site. On average, the new basement excavation will be up to c.6.50m deep (RM01) or c.7.70m deep (RM02).

5.4. Different building loads, thickness of raft foundation, basement excavation depth and levels of temporary propping are proposed for the two schemes.

5.5. A secant pile wall is proposed to be cast around the perimeter of the proposed basement.

5.6. An outline construction sequence for the proposed basement, including the temporary works, is presented for both schemes.

5.7. The site appears to fall within the LUL influence zone and the Crossrail 2 safeguarding zone while a number of sewer and water mains are present in proximity. An impact assessment on these assets will be required as a separate process in accordance with their owners' policies.

5.8. Screening & scoping sections are presented, supported by desk study information and a site walkover, as required by CPG Basements.

5.9. A preliminary site-specific ground investigation (GI) was undertaken. Additional ground investigation is proposed by the Geotechnical BIAs to further inform the next stage of the design and confirm the assumptions of the BIAs.

5.10. It is accepted that the proposed development is not anticipated to significantly impact the hydrogeology of the local area.

5.11. A ground movement assessment and an outline monitoring strategy during construction have been presented for both schemes.

5.12. It is accepted that there will be no impact to the surface water from the proposed development.

5.13. Non-technical summaries have been provided for both schemes.

5.14. Given that the queries previously raised in Section 4 and Appendix 2 have been addressed by the additional information provided, it can be confirmed that the BIA meets the requirements of CPG Basements.

Appendix 1: Residents' Consultation Comments

None pertinent to the BIA

Appendix 2: Audit Query Tracker

Audit Query Tracker – Scheme RM01 (Office Scheme)

Query No	Subject	Query	Status	Date closed out
1	Stability	Additional information shall be provided to support the suggested by the GMA reduction of the anticipated ground movements due to wall installation or a sensitivity analysis be undertaken using CIRIA C760 curves.	Closed	29/4/2021
2	Stability	Construction sequence to include enabling works and temporary works required to achieve pile platform level and support external ground levels.	Closed	3/3/2021
3	Stability	A clarification is required regarding the validity of the GMA given the construction sequence starts at 27mOD while some surrounding areas are at c.28mOD.	Closed	3/3/2021
4	Stability	The basement layout considered in Figure 2 of the GMA is of a smaller extent to the current proposal. A clarification is required.	Closed	29/4/2021
5	Stability	Convergence error messages in Wallap analysis shall be clarified/amended.	Closed	29/4/2021
6	Stability	Contradictory information about the ratio L/H considered for Qube building in the GMA shall be clarified.	Closed	29/4/2021
7	Stability	The proposed Observation Method shall be clarified. The ground movement trigger values shall be informed by the GMA.	Closed	3/3/2021
8	Stability	Monitoring during the demolition and enabling works stages is requested to be added in the monitoring strategy.	Closed	3/3/2021
9	Stability	Inconsistencies encountered in the proposed basement plan and wall sections attached to the Geotechnical BIA shall be amended.	Closed	29/4/2021
10	Stability	An impact assessment on third parties assets (LUL, Thames Water etc.) will be required in accordance with the respective asset owner's policies.	Note	N/A

Audit Query Tracker – Scheme RM02 (Lab Scheme)

Query No	Subject	Query	Status	Date closed out
1	BIA	The qualifications of the individuals involved in the preparation of the BSCR are requested.	Closed	14/5/2021
2	BIA	The ground model assumed in the BSCR report (scheme RM02) needs to be clarified.	Closed – GMA model adopted	25/3/2021
3	Hydrogeology	The deeper design groundwater level assumed in the BSCR compared to what the monitoring data suggest shall be clarified.	Closed – GMA groundwater adopted	25/3/2021
4	Stability	A ground movement and damage assessment has not been submitted and is requested.	Closed	25/3/2021
5	Stability	An outline monitoring strategy and outline structural calculations shall be provided.	Closed	25/3/2021
6	BIA	A non-technical summary is requested.	Closed	25/3/2021
7	Stability	An impact assessment on third parties assets (LUL, Thames Water etc.) will be required in accordance with the respective asset owner's policies.	Note	-
		Queries following submission of the "Preliminary Basement Impact Assessment, RM02 Lab Scheme", Rev.0, CGL, March 2021.		
8	Stability	Additional information (similar case studies) shall be provided to support the suggested by the GMA reduction of the anticipated ground movements due to wall installation or a sensitivity analysis be undertaken using CIRIA C760 curves.	Closed	29/4/2021
9	Stability	The excavation formation level under the raft shall accommodate the need for heave boards as specified in the structural drawings, any blinding or other structural layers etc. Inconsistencies encountered with regard to the assumed excavation formation level (20.86m OD in the GMA vs 20.50m OD in the AKTII Stage 2 report, Appendix A of the BIA) may affect the outcome of the GMA and Damage Assessment and shall be clarified.	Closed	29/4/2021
10	Stability	The Structural Report and Drawings (AKTII, Appendix A of the BIA) indicate the proposal is about an eight-storey building plus basement. This contradicts the BIA (Section 2.3). It shall be checked whether the structural loads assumed in the BIA are correct.	Closed	29/4/2021

11	Stability	In Appendix 5 of the AKTII report (Appendix A of the BIA) contradictory information to the BIA assumptions is presented with regard to description of the RM02 proposal, design groundwater level, Young's Modulus values, geological boundaries elevations, number of props, male pile toe levels (15m or -15m OD). These shall be clarified/amended.	Closed	29/4/2021
12	Stability	The need for monitoring during construction has been acknowledged by the BIA however, it is understood that the 'Observational Method' of CIRIA is not applicable in this project.	Note	-

Appendix 3: Supplementary Supporting Documents

"CGL_09528 – The Network Building: LBC Comment Tracker – Scheme RM01 (Office Scheme)", 24/2/2021, Card Geotechnics Ltd; Received via LBC on 3/3/21

CGL_09528 – The Network Building: LBC Comment Tracker – Scheme RM01 (Office Scheme)

Comment Ref	Date Received	LBC Comment Subject	LBC BIA Query	CGL Comment	Response Date	Status
1	10/02/2021	Stability	Additional information shall be provided to support the suggested by the GMA reduction of the anticipated ground movements due to wall installation or a sensitivity analysis be undertaken using CIRIA C760 curves – Audit Section 4.18. *"4.18 In the GMA, horizontal and vertical ground movements due to the installation of the proposed secant piled wall have been assumed to be equal to 0.02% of wall length, based on a case study paper by Ball et al. (2014), which are significantly lower than those suggested by CIRIA C760 (0.08% and 0.05% for horizontal and vertical movements, respectively). The case study by Ball et al., refers to a contiguous piled wall consisting of 300mm diameter piles as opposed to a secant piled wall proposed for this site (i.e. tighter pile layout is proposed for this site) consisting of 600mm diameter piles (i.e. double size piles are proposed at this site). It is requested that additional relevant case studies and information are provided to support the anticipated ground movements or a sensitivity analysis be undertaken with regard to the anticipated ground movements due to wall installation by adopting the moderately conservative approach suggested by CIRIA C760."*	By necessity a secant piled wall is constructed in a hit and miss fashion. This is so that the wet concrete in recently constructed nearby piles is not damaged during the construction process. These piles are larger diameter, but they are also relatively short, at 9m to 11m. This process is set out in the ICE Specification for piling and embedded retaining walls (SPERWall) document, which will form the basis of the piling method for this development. Movements will be monitored during pile installation such that additional control measures can be adopted if required. It is further noted that CIRIA C760 is based on limited case study data, and therefore has selected a very conservative upper bound estimate of movements. Reviewing the actual case study data reported in CIRIA – Secant Piled Wall movements and Vintners hall were caused by 'poor drilling techniques'; Blackfriars 1 was a 1.2m diameter secant piled wall next to a very heavily loaded building. The MSc thesis upon which CIRIA C760 is based, makes the comment that 8mm is *"a reasonable value which could be expected as an upper limit settlement for most wall installations".* The document also notes *"there does not appear to be a relationship between the type of wall construction and the measured surface settlements".* Where large movements behind the wall are noted, it is stated that these are due to adverse ground conditions, poor drilling techniques, and/or effects from adjacent footings. This site has 'standard' ground conditions with the London Clay present at the relatively shallow depth of 4.5m; therefore provided construction is		Open

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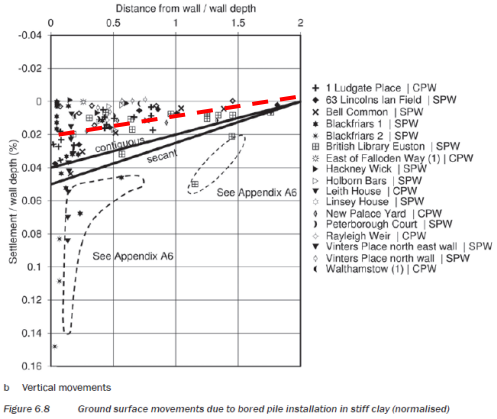
				appropriately controlled and monitored, significant displacements are not anticipated. It is further noted that CGL has another case study, pending publication – also demonstrating installation movements in line with the majority of CIRIA C760/580 case study data:  b Vertical movements *Figure 6.8 Ground surface movements due to bored pile installation in stiff clay (normalised)* It is further noted that ground movements will be fully monitored during installation works such that construction methodologies can be adapted/adjusted as necessary. On this basis the selection of a 'moderately conservative' estimate of pile installation movements as opposed to 'worst case' is considered appropriate.		
2	10/02/2021	Stability	Construction sequence to include enabling works and temporary works required to achieve pile platform level and support external ground levels – Audit Section 4.19.	CGL adopted the Piling Platform at +27.00mOD, assuming that the surrounding pavement areas at +28.00mOD would be supported by backpropping them against the basement wall. This is expected to limit the potential movements induced by the difference in level to acceptable values.		Open

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			"4.19 a) A construction sequence commencing at a level of 27mOD is proposed (level of proposed piling platform), however, in some locations the basement excavation will start at c.28mOD given the level of surrounding areas (footpaths and highways). Clarification is requested as to the impact of any enabling works required to achieve the piling platform level and confirmation that the current GMA is valid for the deeper excavation. The enabling works shall be included in the construction sequence."	However, the basement construction method is yet to be determined.		
3	10/02/2021	Stability	A clarification is required regarding the validity of the GMA given the construction sequence starts at 27mOD while some surrounding areas are at c.28mOD – Audit Section 4.19. *"4.19 a) A construction sequence commencing at a level of 27mOD is proposed (level of proposed piling platform), however, in some locations the basement excavation will start at c.28mOD given the level of surrounding areas (footpaths and highways). Clarification is requested as to the impact of any enabling works required to achieve the piling platform level and confirmation that the current GMA is valid for the deeper excavation. The enabling works shall be included in the construction sequence."*	Enabling Works have been considered as part of the PDISP analysis. Enabling Works 5.1, 5.2 and 5.3 are the only areas that lie outside the existing basement and hence, are not applied at +24.92mOD. As indicated by the Structural Engineers, a demolition unload of 52kPa has been allocated to these three areas that have no existing basement, and these demolition unloads have been applied at +27.00mOD (assumed piling platform level), for simplicity. It is true that these demolition loads could have been applied at the formation level of the strip foundations onto which this part of the structure is anticipated to be supported. Given that the FFL of the ground floor is some +28.10mOD and assuming an existing ground floor slab of 300mm and a strip footing thickness of 500mm (to be verified on the next SI phase), the resulting formation level of the strip foundation would be approximately +27.30mOD. Hence, the additional excavation required to match the proposed piling platform level from that post-demolition ground floor level would be 0.30m and this would induce an additional unload of 6kPa.		Open

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				Given the order of magnitude of the excavation unloads (more than 100kPa) and construction loads (90kPa) used in the model, this additional unload of 6kPa is understood to have negligible effect on the outputs of the GMA and as such, the current GMA results provided are considered to be valid.		
4	10/02/2021	Stability	The basement layout considered in Figure 2 of the GMA is of a smaller extent to the current proposal. A clarification is required - Audit Section 4.19. *"4.19 b) The basement layout considered in Figure 2 of the GMA is of a smaller extent towards the northern-central area of the site when compared to the latest architectural drawings dated 25/11/2020. However, the basement excavation considered in Figure 6 of the GMA seems to match that proposed by the Architect and the structural proposal. Confirmation is required that the correct extent of the basement excavation has been considered in the GMA and in accordance with the latest proposal."*	Figure 5 to Figure 7 show the proposed loading areas assumed in the different stages considered in the analysis. Figure 6, specifically, presents the excavation areas considered in PDISP and therefore, shows the external layout of the basement considered. Hence, the resulting ground movements predicted as part of the GMA and used in the Building Damage Assessment plots are as per the structural drawings provided. Figure 2 has been updated to match the proposed basement area as indicated in Figure 6.		Open
5	10/02/2021	Stability	Convergence error messages in Wallap analysis shall be clarified/amended - Audit Section 4.19. *"4.19 d) Convergence errors are noted in the output of Wallap analysis for critical section 3 and these should be reviewed and corrected as required."*	Convergence error amended with no impact on predicted displacements.		Open
6	10/02/2021	Stability	Contradictory information about the ratio L/H considered for Qube building in the GMA shall be clarified - Audit Section 4.19. *"4.19 e) Figure 19 of the GMA indicates L/H=2.08 while the main text states L/H=1.78 for the Qube building. A clarification/amendment is required."*	Based on the dimensions assumed in the PBIA, L/H should be 1.78, as specified in the text. Figure 19 updated accordingly.		Open
7	10/02/2021	Stability	The proposed Observation Method shall be clarified. The ground movement trigger values shall be informed by the GMA - Audit Section 4.21.	It is recognised that monitoring is essential to confirm movements during enabling works, excavation and construction, however the details of		Open

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			"4.21 Section 10 of the GMA proposes a monitoring strategy to be applied during construction with predefined ground movement trigger levels in accordance with the Observational Method of CIRIA Report 185. However, CIRIA's Observational Method is relevant mainly to the design method, not the monitoring strategy. It is understood that the design at the site will be undertaken by use of calculation, not by use of the Observational Method. Also, the trigger levels adopted during construction shall be informed by the ground movements predicted in the GMA. Clarifications and amendments are requested."	the methodology will be developed with the party wall surveyors prior to the works commencing. It is not appropriate at this stage to incorporate a detailed methodology for monitoring, which for practical reasons may ultimately conflict with that proposed and agreed between the PW surveyors.		
8	10/02/2021	Stability	Monitoring during the demolition and enabling works stages is requested to be added in the monitoring strategy – Audit Section 4.22. *"4.22 Monitoring of all structures and infrastructure is also recommended by the SER (scheme RM01) during excavation and construction. It is requested that monitoring is also undertaken during the demolition and enabling works stages to confirm the conclusions of the GMA."*	Monitoring can be undertaken by installing survey targets along the top of the secant piled wall and ideally on the façade of the neighbouring properties/structures. Baseline values should be established prior to commencement of works as outlined below: • Monitoring targets installed on the facade of the neighbouring structures and baseline reading established prior to demolition and/or enabling works and piles installation. • Monitoring targets installed along the capping beam once constructed and baseline readings established prior to the main basement excavation/construction works commencing. However, as indicated above, the more specific details of the methodology and trigger values will be developed with the party wall surveyors prior to the works commencing.		Open

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9	10/02/2021	Stability	An impact assessment on third parties assets (LUL, Thames Water etc.) will be required in accordance with the respective asset owner's policies – Audit Section 4.9. *"4.9. According to the Geotechnical BIA report (RM01), the site appears to fall within the LUL influence zone and the Crossrail 2 safeguarding zone while a number of sewer and water mains are present in proximity. These site constraints are also discussed in Section 2.3 of the BSCR, for RM02. An impact assessment on these assets will be required in accordance with the respective asset owner's policies and shall form separate submissions for whichever scheme is progressed to the next stage. Such an impact assessment check is outside the remit of this audit report."*	Noted.		N/A

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