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Middlesex Hospital Annex, 44 Cleveland Street, London W1T 4JT

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-49

Revision: F1

May 2017

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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 Middlesex Hospital Annex, 44 Cleveland Street, London W1T 4JT (planning reference 2017/0414/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 site consists of North House, South House and the Grade II listed Middlesex Hospital Annexe (the Union Work House) located in the centre of the site with two wing buildings at the rear. The basement of the Union Work House building is to be deepened and extended. It is proposed to demolish the wings at the rear and construct a mid-rise building with single storey basement. The new basement will be approximately 2m deeper than the existing basement.

1.5. The BIA, Phase I Geotechnical and Geo-Environmental Desk Study and the Structural and Civil Engineering Report have all been prepared by AECOM Limited. The credentials of the authors of the reports were not originally established, but have now been confirmed as appropriate in accordance with LBC guidelines.

In addition, the revised submission includes a Site Investigation Report, Geotechnical Interpretative Report and Ground Movement Assessment, plus revisions to the original BIA.

1.6. Information within the BIA is broadly in line with the aspects recommended of a desk study within the LBC guidance. Thames Water have provided an Asset Location Search report and information regarding BT tunnels, London Underground and Crossrail tunnels are included within the BIA. The Structural and Civil Engineering Report recommends further information is obtained from Utility companies with regards to underground infrastructure. It is accepted that this will be provided and assessed in detail in advance of the works and presented in a Basement Construction Plan (BCP).

1.7. The BIA states that the site is likely to be underlain by Made Ground over Lynch Hill Gravel. A site investigation, in accordance with the LBC guidance, was requested to confirm ground and groundwater conditions. Sufficient preliminary assessment of ground and groundwater

conditions has now been presented in the revised BIA, based on historic data and nearby recent investigations, and it is accepted that current site access prevents more detailed investigation to be undertaken at this time. Detailed site investigation will be required to confirm the assessments which should be presented in a BCP.

1.8. In response to the original BIA, a site investigation was requested to provide sufficient insitu strength / density data to confirm bearing capacity for foundation design and stiffness parameters for ground movement assessments. Groundwater conditions were requested to be considered in regards to both temporary and permanent works designs.

The revised submission provides preliminary responses and assessments. These will be further addressed in the BCP, which should include groundwater monitoring data to inform temporary works, contingency planning and control of construction, and waterproofing design.

1.9. In the revised BIA, preliminary geotechnical data has been presented in an interpretative report in accordance with the LBC guidance, including a conceptual site model. It is accepted that these will be confirmed and further assessed within the BCP.

1.10. In the revised BIA, outline retaining wall design and temporary works sequencing, propping and methodologies have been presented. It is accepted that these will be confirmed and further developed within the BCP.

1.11. In the revised BIA, a preliminary Ground Movement Assessment (GMA) has been provided which addresses both the excavation and construction methodology effects and assesses the damage impact to structures within the zone of influence. It is accepted that this is based on the designs developed to date and the ground conditions as currently identified, and that movements and damage impacts will be further assessed and confirmed within the BCP.

1.12. An outline discussion on monitoring structural movements during construction is presented. It is accepted that this will be further developed within the BCP, to be based on the updated GMA, as applicable.

1.13. An outline construction management plan has been provided. An outline construction programme has been presented in the revised BIA.

1.14. The proposed development incorporates an attenuation SUDS scheme which reduces peak discharge flow rate in accordance with relevant guidance. The scheme offers benefit to the wider hydrological environment.

1.15. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. In accordance with the BIA's own conclusions and recommendations, additional investigation and assessments are required. On the basis that a

BCP will be presented to confirm or update the preliminary assessments, and to address and mitigate any impacts resulting, the criteria of CPG4 have been met.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 25 January 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Middlesex Hospital Annex, 44 Cleveland Street, London W1T 4JT, Camden Reference 2017/0414/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within:

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

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; and,

c) avoid cumulative impacts upon structural stability or the water environment in the local area;

d) and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as: "Refurbishment of and alterations to the existing former Workhouse Building (Grade II listed) and North and South Houses (fronting onto Cleveland Street) to provide 12x residential units (Class C3); demolition of part of South House and buildings at rear of Workhouse Building and redevelopment to provide a part 4, part 5, part 8 storey building comprising 4,535sqm of commercial floor space (Class B1) and 38x

residential units (Class C3); and associated works including opening up of Bedford Passage, creation of public open space, landscaping works, and partial demolition of front boundary wall."

2.6. CampbellReith accessed LBC's Planning Portal on 20 February 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment of Middlesex Hospital Annex (ref 60516144) dated 15 December 2016 by AECOM Ltd.
- Phase 1 Geotechnical and Geo-environmental Desk Study Report (ref 60516144/DS/002) by AECOM Ltd.
- Structural and Civil Engineering Report dated December 2016 by AECOM Ltd.
- Flood Risk Assessment of Middlesex Hospital Annex (ref 60516144) dated 21 December 2016 by AECOM Ltd.
- Stormwater Runoff Attenuation Strategy (ref 60516144) dated December 2016 by AECOM Ltd.
- Historic Building Structural Engineering Report (ref 60516144) dated September 2016 by AECOM Ltd.
- Existing and proposed plans, elevations and sections dated January 2017 by Llewlyn Davies.
- Construction Management Plan (ref PC/P1615 CMP) dated January 2017 by Crosby Transport Planning Ltd.
- Preliminary Ecological Assessment (ref 4624) dated December 2016 by The Ecology Consultancy.
- Design and Access statement dated January 2017 by Llewlyn Davies (design team: Temple, Aecom, Arup, Crosby Transport Planning, Urban counsel, Delva Pateman Redlar).
- Comments and objections to the proposed development from local residents.

2.7. CampbellReith were provided with the following relevant documents for audit purposes in March and April 2017:

- Initial Response to BIA Audit dated 20 March 2017 by AECOM Ltd.
- Cover Letter dated 21st April 2017 by AECOM Ltd.

- Basement Impact Assessment of Middlesex Hospital Annex (ref 60516144, Rev 2) dated 21 April 2017 by AECOM Ltd.
- Preliminary Geotechnical Interpretative Report (ref 60516144) dated 21 April 2017 by AECOM Ltd.
- Preliminary Ground Movement Assessment (ref 60516144) dated 21 April 2017 by AECOM Ltd.
- Site Investigation Report (ref 60516144) dated 21 April 2017 by AECOM 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	To be updated, if required, within the BCP.
Are suitable plans/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	BIA report section 8.3. The Screening process identifies the presence of worked ground from historical mapping.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report section 8.2 and Section 6 of the Structural and Civil Engineering Report (Proposed Surface Water Drainage). The site is underlain by Lynch Hill Gravel which is classified as a Secondary A Aquifer and the proposed extension of the basement is envisaged to extend beneath the water table surface within these deposits.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	The site is at very low risk to low risk of surface water flooding. The site is not located within a Camden Local Flood Risk Zone and did not flood during 1975 or 2002.

Item	Yes/No/NA	Comment
Is a conceptual model presented?	Yes	This may need to be updated within the BCP, depending on design development.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Further SI and confirmed assessments to be presented within the BCP.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Scoping recommends groundwater monitoring to provide information on groundwater levels in the shallow aquifer. Further SI and confirmed assessments to be presented within the BCP.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	A Flood Risk Assessment has been provided which confirms the site is not at risk of flooding. Outline SUDS proposals presented.
Is factual ground investigation data provided?	Yes	Further SI and confirmed assessments to be presented within the BCP.
Is monitoring data presented?	Yes	Further SI and confirmed assessments to be presented within the BCP.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	As part of the Phase I Geotechnical and Geo-Environmental Desk Study and the Historic Building Structural Engineering Report in 2016.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Section 2 of the Structural and Civil Engineering report confirms the following basements in the adjacent buildings: Sainsbury Welcome Centre (2 levels of basement), Astor College (single storey basement) and Middlesex House (single storey basement). Figure 2 of the BIA report provides the indicative outline for basement structures surrounding the site and estimated basement levels where these are evident from publically available information.

Item	Yes/No/NA	Comment
Is a geotechnical interpretation presented?	Yes	Further SI and confirmed assessments to be presented within the BCP.
Does the geotechnical interpretation include information on retaining wall design?	Yes	To be confirmed and presented within the BCP.
Are reports on other investigations required by screening and scoping presented?	Yes	Further SI and confirmed assessments to be presented within the BCP.
Are 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	Confirmed assessments based on final design and updated SI to be presented within the BCP.
Are estimates of ground movement and structural impact presented?	Yes	Confirmed assessments based on final design and updated SI to be presented within the BCP.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	Confirmed assessments to be presented within the BCP.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	To be presented within the BCP, as applicable.
Has the need for monitoring during construction been considered?	Yes	To be developed and presented within the BCP.
Have the residual (after mitigation) impacts been clearly identified?	No	To be presented within the BCP, as applicable.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	Confirmed assessments based on final design and updated SI to be presented within the BCP.

Item	Yes/No/NA	Comment
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Flood Risk Assessment report, SUDS proposals and Section 6 of the Structural and Civil Engineering Report
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Confirmed assessments based on final design and updated SI to be presented within the BCP.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	Confirmed assessments based on final design and updated SI to be presented within the BCP.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA, Phase I Geotechnical and Geo-Environmental Desk Study and the Structural and Civil Engineering Report have all been prepared by AECOM Limited. The credentials of the authors of the reports were not originally established, but have now been confirmed as appropriate in accordance with LBC guidelines.

4.2. In addition, the revised submission includes a Site Investigation Report, Geotechnical Interpretative Report and Ground Movement Assessment, plus revisions to the original BIA.

4.3. The site consists of North House, South House and the Grade II listed Middlesex Hospital Annexe (the Union Work House) located in the centre of the site with two wing buildings at the rear. The wings at the rear of the Union Work House are to be demolished with the remaining buildings being retained and refurbished into a mixed-use scheme comprising residential and commercial units. The basement of the Union Work House building is to be deepened and extended. It has been proposed to construct a two to nine storey building with a single storey basement and roof plant following the demolition of the wings at the rear of the Union Work House building. The new basement will be approximately 2m deeper than the existing basement.

4.4. The BIA includes the majority of the information required from a desk study in line with the GSD Appendix G1. An Asset Location Search report by Thames Water is provided and information regarding BT tunnels, London Underground and Crossrail tunnels are included within the BIA. The Structural and Civil Engineering Report recommends further information is obtained from Utility companies with regards to underground infrastructure. It is accepted that this will be provided and assessed in detail in advance of the works and presented in a Basement Construction Plan (BCP).

4.5. An underground service tunnel appears to be present on site, associated with the basement of the former Union Workhouse. The tunnel appears to run in a roughly north-south direction between the former Union Workhouse and South House before running in a roughly east-west direction beneath Cleveland Street. An assessment of the impacts to this structure should be assessed and presented within the BCP.

4.6. The BIA states that the site is likely to be underlain by Made Ground over Lynch Hill Gravel. A site investigation in accordance with the GSD Appendix G2 and appropriate to the scale of the proposed development should be undertaken to confirm ground and groundwater conditions.

Sufficient preliminary assessment of ground and groundwater conditions has now been presented in the revised BIA, based on historic data and nearby recent investigations, and it is accepted that current site access prevents more detailed investigation to be undertaken at this

time. Detailed site investigation will be required to confirm the assessments which should be presented in a BCP.

The thickness of any Made Ground or Worked Ground, as identified in the BIA, and the presence of any perched groundwater should be assessed in terms of stability and hydrogeological impacts. The groundwater level in the Lynch Hill Gravel (Secondary A Aquifer) should also be assessed for the same impacts.

4.7. The additional site investigation to be included within the BCP should provide sufficient insitu strength / density data to confirm bearing capacity for foundation design and stiffness parameters for ground movement assessments. Groundwater conditions should be considered in regards to both temporary and permanent works designs. Groundwater monitoring should be undertaken as required to inform temporary works contingency planning and control of construction, and waterproofing design.

4.8. In the revised BIA, preliminary geotechnical data has been presented in an interpretative report in accordance with the LBC guidance, including a conceptual site model. It is accepted that these will be confirmed and further assessed within the BCP.

4.9. The proposed development will not result in an increase in impermeable areas given that the existing site is 100% impermeable. The proposed development incorporates an attenuation SUDS scheme which aims to meet targets set in the National Planning Policy Framework (NPPF). Current peak discharge rate from the site has been calculated as 42.6l/s for a 1:1 year storm event and the scheme proposed reduces peak discharge flows by 50% from existing levels. Based on a 100 year + 20% (for climate change) return period storm event discharge flow is reduced by >80%. The attenuation scheme will comprise underground modular storage units and a hydro-brake restricting flow to 21.5l/s. The scheme offers benefit to the wider hydrological environment.

4.10. Retaining wall design was referred to in the original BIA and the Structural and Civil Engineering report but no outline structural calculations were provided. In the revised BIA, outline retaining wall design and temporary works sequencing, propping and methodologies have been presented. It is accepted that these will be confirmed and further developed within the BCP.

4.11. The potential for perched water in the Made Ground / Worked Ground and groundwater within the Lynch Hill Gravel should be considered, both in terms of permanent waterproofing grade and in the temporary case, for control of construction. A discussion on options for groundwater protection at basement level are outlined in Section 3 of the Structural and Civil Engineering report, and the assessment / design should be updated and confirmed in the BCP.

4.12. No Ground Movement Assessment (GMA) or damage impact assessment calculations were presented in the original BIA. In the revised BIA, a preliminary Ground Movement Assessment (GMA) has been provided which addresses both the excavation and construction methodology effects and assesses the damage impact to structures within the zone of influence. It is accepted that this is based on the designs developed to date and the ground conditions as currently identified, and that movements and damage impacts will be further assessed and confirmed within the BCP.

4.13. The presence or absence of other nearby basements, underground structures listed buildings and foundation depths of structures within the zone of influence should be confirmed within the BCP. In line with CPG4, where Category 1 or a higher damage category is identified, the BIA should provide mitigation measures to address ground movement.

4.14. An outline discussion for monitoring structural movements during construction is presented. It is accepted that this will be further developed within the BCP, to be based on the updated GMA, as applicable, and provide outline details of methodology, trigger values and contingency actions to maintain stability within acceptable limits.

4.15. An outline construction management plan has been provided. An outline construction programme has been presented in the revised BIA.

4.16. It is accepted that the site is at low risk of flooding and a Flood Risk Assessment has been provided.

4.17. The assessments provided within the revised BIA are generally appropriate, considering the complexity of the proposals and the requirement to further confirm ground and groundwater conditions. In advance of construction, the BCP should confirm or update these assessments, including the impact assessment, and propose suitable mitigation as and where required in line with LBC guidance.

4.18. Non-technical summaries have been provided within revised BIA submitted.

4.19. Queries and matters requiring further information or clarification are summarised in Appendix 2.

5.0 CONCLUSIONS

5.1. The qualifications of the authors meet the LBC requirements.

5.2. The revised BIA submission contains appropriate information and assessments. However, due to the complexity of the scheme and current site constraints, assessments in full are not yet complete and should therefore be presented in a Basement Construction Plan (BCP).

5.3. The BCP should update all assessments as required due to any changes in design or updated assessment of the baseline conditions. Specifically the BCP should provide:

- Identification and assessment of underground utility infrastructure within the zone of influence.
- Detailed site investigation.
- Updated assessment of geotechnical parameters based on the additional site investigation undertaken.
- Updated construction methodology, retaining wall calculations and temporary works information, based upon design developments and updated geotechnical assessments.
- An updated ground movement and damage impact assessment, including outline structural monitoring strategy.
- Updated impact assessments, including proposed mitigation measures and residual risks identified, as applicable.

5.4. It is accepted that the site is at a low risk of surface water flooding. The proposed attenuation SUDS scheme offers benefit to the wider hydrological environment.

5.5. Queries and matters requiring further information or clarification are summarised in Appendix 2. In accordance with the BIA's own conclusions and recommendations, additional investigation and assessments are required. On the basis that a BCP will be presented to confirm or update the preliminary assessments, and to address and mitigate any impacts resulting, the criteria of CPG4 have been met.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	Author's qualifications	The author's qualifications for the BIA have not been established in accordance with CPG4 guidelines.	Closed	May 2017
2	Stability	Utility infrastructure to be confirmed	Sufficient preliminary information has been considered. Further identification and assessment to be presented in a BCP, as applicable	N/A - BCP
3	Site investigation	No site investigation or interpretative geotechnical information, no groundwater monitoring, in line with GSD G2 / G3	Sufficient preliminary information has been provided, considering current site access. Further assessment to be presented in a BCP.	N/A - BCP
4	Stability	Retaining wall designs, permanent and temporary works proposals, groundwater control	Sufficient preliminary assessment has been provided. Further assessment to be presented in a BCP as design is developed.	N/A - BCP
5	Stability	Ground Movement Assessment and Damage Assessment	Sufficient preliminary assessment has been provided. Further assessment to be presented in a BCP as design is developed.	N/A - BCP
6	Stability	Structural monitoring proposals	Outline discussion has been provided. Further proposals to be presented in a BCP as design is developed.	N/A - BCP
7	BIA Format	Impact assessments should be updated and presented for issues carried through scoping and clarified by site investigation, GMA etc.	Further assessment to be presented in a BCP as design is developed.	N/A - BCP
8	BIA Format	Impact mitigation measures (stability, hydrogeology)	Further assessment to be presented in a BCP as design is developed, if applicable.	N/A - BCP
9	BIA Format	Construction programme	Closed	May 2017
10	BIA Format	Non-technical summaries	Closed	May 2017

Appendix 3: Supplementary Supporting Documents

- Initial Response to BIA Audit dated 20 March 2017 by AECOM Ltd.
- Cover Letter dated 21st April 2017 by AECOM Ltd.
- Basement Impact Assessment of Middlesex Hospital Annex (ref 60516144, Rev 2) dated 21 April 2017 by AECOM Ltd.
- Preliminary Geotechnical Interpretative Report (ref 60516144) dated 21 April 2017 by AECOM Ltd.
- Preliminary Ground Movement Assessment (ref 60516144) dated 21 April 2017 by AECOM Ltd.
- Site Investigation Report (ref 60516144) dated 21 April 2017 by AECOM Ltd.

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