CampbellReith
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Channing Junior School
1 Highgate High Street
London, N6 5JR

Basement Impact Assessment

For

London Borough of Camden

Project Number: 12727-40
Revision: D1

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1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for Channing Junior School, 1 Highgate Street, N6 5JR (Camden planning reference 2017/7080/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. The authors of the GEA screening and scoping report hold qualifications as required by CPG4. For completeness, the qualifications of the author/reviewer of the Heyne Tillett Steel report should be confirmed.

1.5. Together with the other current guidance documents referenced in the Heyne Tillett Steel report, the 2017 Camden Local Plan should also be referenced.

1.6. The site comprises a main school building over a basement and an associated building to the east which are both detached and remote from neighbouring properties.

1.7. It is proposed to extend the existing single storey basement by underpinning the existing building's foundations, with permanent reinforced concrete walls. A separate new build single storey basement 'pavilion' is to be constructed, utilising piled retaining walls and forming a permanent reinforced concrete box.

1.8. The proposed excavation depths are inconsistently reported between documents. However, this audit has considered the deepest excavation levels reported in order to make a conservative assessment.

1.9. Site investigation has confirmed the ground conditions comprise Made Ground over Bagshot Formation and Claygate Member. Groundwater was encountered below the proposed basement slab levels. Perched water may be encountered during construction of the Pavilion.

1.10. The BIA identifies that a springline is present within 100m of the proposed development and a historic well is present on site. It is considered prudent to undertake the additional investigation recommended by GEA to locate the existing well in the area of the proposed pavilion, prior to construction. However, there are no impacts to the wider hydrogeological environment.

1.11. Although the site topography is indicated to be sloping, it is accepted there are no impacts to slope stability.

1.12. The presence or absence of basements beneath the neighbouring properties is not confirmed. However, the proposed developments are detached and there are no neighbouring properties within the zone of influence of the works.

1.13. The proposed development will increase the site's impermeable area. The BIA proposes two drainage options, soakaway drainage or attenuation SUDS, to mitigate impacts to the hydrological environment. A definitive drainage strategy should be developed and agreed with LBC and Thames Water.

1.14. A ground movement assessment undertaken on the existing structures within the school boundaries indicates Category 0 to 1 damage (Negligible to Very Slight). There are queries on the assumptions and methodology used in the analysis. However, there are no neighbouring properties impacted by the proposed development.

1.15. Although the utilities identified in the vicinity of the site appear to be outside the zone of influence of the works, consultation with asset owners should be undertaken to confirm this and asset protection agreements entered into, if required.

1.1. An outline duration of works is included. A detailed programme may be provided by the appointed Contractor at a later date.

1.2. The proposed development is at low risk of flooding.

1.3. The BIA meets the requirements of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 26 January 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for Channing Junior School, 1 Highgate Street, N6 5JR (Camden planning reference 2017/7080/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.
- Local Plan 2017: Policy A5 Basements.

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 *"Lower ground floor extension to south elevation to provide hall with play area above and extension to the east under existing terrace with alterations to the eastern elevation at lower ground level to provide drama studio and re-provide classroom to existing school; creation of a sports changing room facility at*

subterranean level adjacent to the existing tennis courts including excavation of existing embankment and glazed single storey entrance structure above at playground level".

2.6. The Audit Instruction also confirmed Channing Junior School is not listed, nor is it a neighbour to listed buildings.

2.7. CampbellReith accessed LBC's Planning Portal on 13 February 2018 and gained access to the following relevant documents for audit purposes:

- Channing Junior School Basement Impact Assessment (and associated appendices), Heyne Tillett Steel, dated 15 December 2017.
- Channing Junior School Site Investigation and Basement Impact Assessment Report, Geotechnical and Environmental Associates (GEA) dated December 2017 (included as an appendix to the Heyne Tillett Steel report).
- Design and Access Statement for Channing Junior School, Prime Meridian Architects and Structural Engineers, dated October 2017.
- Construction Management Plan (Draft), dated November 2017
- Channing Junior School Tree Survey Report, Arbtech Consulting Limited, dated October 2017.
- Channing Junior School Arboricultural Method Statement, Arbtech Consulting Limited, dated November 2017.
- Channing Junior School, Drainage Strategy and Flood Risk Assessment Report, Heyne Tillett Steel, dated December 2017
- Prime Meridian Architects and Structural Engineers planning application drawings consisting of:

  Site Location Plan (343.36/PLA06)

  Existing Plans (343.36/PLA01, 343.36/PLA02 and 343.36/PLA03)

  Existing Elevations (343.36/PLA05)

  Proposed Plans (343.36/PLA07, 343.36/PLA08, 343.36/PLA10, 343.36/PLA11, 343.36/PLA12 and 343.36/PLA13)

  Existing and Proposed Sections (343.36/PLA15)

- 2 No relevant consultation responses.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	See Audit paragraph 4.1.
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?	No	Relevant maps with site location indicated not included.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	No	As above.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Relevant maps referenced but not provided (see Audit paragraph 4.11) although responses are valid.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Relevant maps referenced but not provided (see Audit paragraph 4.11) although responses are valid.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Relevant maps referenced but not provided (see Audit paragraph 4.11) although responses are generally valid.
Is a conceptual model presented?	Yes	Section 7 of the GEA BIA report and sections through the proposed extensions and new building included as an appendix.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the GEA BIA.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the GEA BIA.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Section 4 of the GEA BIA.
Is factual ground investigation data provided?	Yes	Included as an appendix to the GEA BIA.
Is monitoring data presented?	Yes	Section 5.4 of the GEA BIA.
Is the ground investigation informed by a desk study?	Yes	Section 2 of the GEA BIA.
Has a site walkover been undertaken?	Yes	Section 2 of the GEA BIA.
Is the presence/absence of adjacent or nearby basements confirmed?	No	However, the proposed development is remote from neighbours.
Is a geotechnical interpretation presented?	Yes	Section 8 of the GEA BIA.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Section 8 of the GEA BIA.
Are reports on other investigations required by screening and scoping presented?	Yes	Ground investigation and ground movement analysis reports provided as appendices to the GEA BIA. Tree survey and drainage strategy reports also provided but not referenced in the screening and scoping.

Item	Yes/No/NA	Comment
Are the baseline conditions described, based on the GSD?	Yes	Description broadly in line with the GSD, although neighbouring properties not discussed. It is acknowledged that the neighbouring properties are some distance away (see Audit paragraph 4.7).
Do the base line conditions consider adjacent or nearby basements?	N/A	See Audit paragraph 4.7.
Is an Impact Assessment provided?	Yes	Section 9 of the GEA BIA.
Are estimates of ground movement and structural impact presented?	Yes	Ground movement assessment (GMA) provided as an appendix to the GEA BIA.
Is the Impact Assessment appropriate to the matters identified by screening and scoping?	Yes	Although it is considered the hydrogeological and hydrological issues have not been sufficiently addressed (see Audit paragraphs 4.14 to 4.17).
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	GEA BIA.
Has the need for monitoring during construction been considered?	Yes	Section 6 of the GEA although specific proposals are not provided (see Audit paragraph 4.21).
Have the residual (after mitigation) impacts been clearly identified?	N/A	None identified.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	There are queries on the ground movement, however, due to the distance to the neighbouring properties these are not considered to be of significance (see Audit paragraphs 4.18 to 4.21).
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	A definitive drainage strategy should be developed and agreed with LBC and Thames Water. (see Audit paragraphs 4.14 to 4.17).

Item	Yes/No/NA	Comment
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	A definitive drainage strategy should be developed and agreed with LBC and Thames Water. (see Audit paragraphs 4.14 to 4.17).
Does the report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	Damage assessment undertaken on the existing buildings within the subject site suggests Negligible (Category 0) and Very Slight (Category 1) damage. Neighbouring properties beyond the zone of influence.
Are non-technical summaries provided?	Yes	Executive summary of GEA BIA

4.0 DISCUSSION

4.1. The BIA comprises a screening and scoping assessment undertaken by Geotechnical and Environmental Associates (GEA) with a preceding summary and structural assessment by Heyne Tillett Steel. The individuals involved in the preparation of the GEA report hold CEng MICE, CGeol and CIWEM qualifications which meet CPG4 requirements. The qualifications of the author/reviewer of the Heyne Tillett Steel report are not provided.

4.2. Section 1 of the Heyne Tillett Steel report makes reference to CPG4 and DP27. Together with the other current guidance documents, the 2017 Camden Local Plan should also be referenced.

4.3. A non-technical summary is provided within the Executive Summary to the GEA BIA.

4.4. The site comprises two detached buildings; a main school building (Fairseat House) and a building to the west referred to as the stable block within extensive landscaped grounds which includes tennis courts and a playground area. The school building comprises three above ground storeys over a single storey basement which occupies half of the building footprint. The stable block is indicated to be a two storey brick building.

4.5. The audit instruction states the site does not comprise a listed building and this is also stated on Section 2.3 of the Planning Statement. Contradictory information is however given in Section 2 of the GEA report which states with reference to Fairseat House and the stable block that '*these buildings are understood to be listed'*. A search of LBC's Planning website does not indicate listed buildings within the site.

4.6. It is stated the site slopes from the entrance on Highgate High Street down towards Waterlow Park both in the easterly and southerly directions with an overall angle of approximately 10 degrees. The site is indicated to be split into three levels; the ground floor level at c. 117m AOD, the lower ground floor and playground levels at 114.27 to 113.59m AOD with the tennis courts at the lowest level at 110.40m AOD.

4.7. A description of the neighbouring properties together with confirmation of the presence or absence of basements beneath these is not provided. It is, however, acknowledged the proposed development is located at some distance away from the nearest properties.

4.8. Section 4 of the Heyne Tillett Steel report indicates the proposed development includes the extension of the main building eastwards and southwards at lower ground floor level by a combination of underpinning and reinforced concrete walls. A single storey pavilion (changing rooms) is to be constructed, utilising piled retaining walls and forming a permanent reinforced concrete box, adjacent to the tennis courts at subterranean level.

4.9. It is stated in Section 4 of the Heyne Tillett Steel report that the concrete underpins will be typically 2.30 to 2.60m deep with 3.40m deep reinforced concrete walls indicated for the pavilion. Section 3.3 of this report, however, indicates a 3.10 deep excavation for the pavilion. Section 1 of the GEA BIA report indicates the southern extension to be 1m below the depth of the existing playground area with excavations of 3.00 and 3.10m required for the eastern extension and the pavilion respectively. The depth of excavation/walls is therefore unclear. However, this audit has considered the deepest excavation levels reported in order to make a conservative assessment.

4.10. A structural methodology and sequence is included in the Heyne Tillett Steel report. Sketches of the lower ground floor details with temporary propping indicated together with indicative calculations are included.

4.11. Section 9 of the GEA report provides a summary of the information used to justify the responses to the screening questions. Although some of the relevant figures/maps from the Arup GSD were referenced, it would be beneficial if these are included with the site location indicated. The responses are, however, considered to be valid.

4.12. A site specific ground investigation was undertaken by GEA. This comprised three cable percussion boreholes, four open drive percussive sampler holes, five drive-in window sampler holes and nine foundation inspection pits. Standpipes were installed in six of the boreholes and falling head permeability tests were undertaken in two of these.

4.13. Section 7 of the GEA report indicates Made Ground was encountered to between 0.30 and 2.90m bgl (c.115.50 to 110.20m AOD) over Bagshot Sand to between 3.25 and 5.60m bgl (111.25 and 108.40m AOD) underlain by the Claygate Member which was proven to 17.45m BGL (96.55m AOD). Groundwater was monitored at between 3.90 and 4.80m bgl (110.50 to 109.15m AOD).

4.14. It is stated in the screening that the site is located '*roughly 100m to the northwest of the headwaters of the River Fleet which was fed by the springlines that rise in Waterlow Park*' located immediately to the south of the site. Section 7 of the GEA report states a well, understood to be covered, is present in the area of the proposed pavilion. This was not investigated and the report recommends additional investigation to confirm its exaction location prior to construction, which is considered prudent.

4.15. Section 8 of the GEA report provides recommendations for design. It is stated that groundwater was monitored at/or close to the formation level of the pavilion. Sheet piles are recommended to support the temporary excavation and control groundwater ingress, however, it is stated a secant piled wall may be adopted should noise and the impact of vibrations be considered to be

an issue for the existing buildings on site. Neighbours are considered beyond the zone of influence.

4.16. It is stated in the BIA that there will be an increase in the hard surface area and a separate drainage strategy and flood risk assessment report is provided. Section 2 of this report states the additional area is 610m^2. The existing drainage is indicated to comprise a combined foul and surface water discharging into the combined sewer beneath Highgate High Street. Section 4 of the GEA report indicates infiltration tests were undertaken in two of the standpipes and Section 5 of the drainage strategy report states further BRE365 infiltration tests are to be undertaken at a later date. The report gives two options in the conclusions for the surface water drainage; infiltration, following confirmation of the further tests, or some form of attenuation.

4.17. On the basis that one of the drainage strategies proposed is adopted, with peak off-site drainage flows restricted to the stated maximum of 5l/s, then impact to the hydrological environment should be suitably mitigated. A definitive drainage strategy should be developed and agreed with LBC and Thames Water.

4.18. A ground movement assessment undertaken by GEA is provided. Oasys Pdisp was used to estimate the vertical movements (heave and settlement) from the excavation and the underpinning modelled as vertical loads. Vertical and horizontal movements from the installation of the various walls (underpinning, reinforced concrete walls and sheet piling) and excavation together with the resulting damage category was undertaken using Oasys Xdisp. The structures considered in the damage assessment are the existing school buildings and the boundary walls.

4.19. Section 5.2 of the GEA ground movement assessment (GMA) report states horizontal movements due to underpinning are considered to be negligible and therefore assumed to be zero in the analysis. For the eastern extension, a ground movement curve assuming 5mm horizontal movement immediately behind the wall and reducing with distance as per the CIRIA 760 trend for excavation of a stiff wall has been used. Vertical movements are stated to be derived from the Pdisp analysis. For the pavilion, curves for the installation of a secant piled wall in stiff clay have been adopted although it is stated in the same paragraph in the GMA that the walls will be formed using a sheet piled wall. The southern extension does not appear to have been considered in the Xdisp analysis.

4.20. Section 5.2.2 states that due to lack of data sets for the installation of reinforced concrete walls in granular soils, predicted movements in clay have been used to estimate the anticipated movements in the granular soils underlying the site. The report further states this is considered to be conservative. Category 0 (Negligible) and 1 (Very Slight) damage is predicted for the main school building with Category 0 indicated for the remaining structures considered within the site.

4.21. Whilst the assumptions and approach to the ground movement analysis are questioned, given the distance to the neighbouring structures these are all considered to be beyond the zone of influence of the proposed development.

4.22. Section 6.2 of the GMA recommends movement monitoring of the two existing buildings and the boundary walls to the north and west. Although outline proposals with trigger levels are not provided, this is again not considered to be significant due to the distance to the neighbouring properties. To protect on site assets, adoption of a monitoring strategy is considered prudent.

4.23. Correspondence with various asset owners which indicate the presence of utilities beneath Highgate High Street is included in the BIA appendices. A Thames Water asset location search was undertaken together with a CCTV survey of the existing site drainage. Although the utilities identified in the vicinity of the site appear to be outside the zone of influence of the works, consultation with asset owners should be undertaken to confirm this and asset protection agreements entered into, if required.

4.24. The GEA report states it is possible that trees may be felled as part of the proposals. A separate tree survey and arboricultural method statement are included. The method statement indicates the removal of a number of trees. It is accepted, as stated in Section 9 of the BIA, that due to the granular nature of the underlying soils, heave as a result of tree removal is unlikely to be an issue.

4.25. Section 2.3 of the GEA report states a preliminary unexploded ordnance (UXO) risk assessment was undertaken by others which indicated a bombing incident at the site. It further states Channing School was badly damaged during World War II in reference to 'the school grounds to the north of the site'. It is assumed this reference relates to the senior school across the road. The BIA concludes that no further action is required with respect to UXO.

4.26. An outline duration of works is included in the construction management plan.

4.27. It is accepted that slope stability concerns regarding the proposed development are not considered to be of significance and the site is not in an area prone to flooding.

5.0 CONCLUSIONS

5.1. The authors of the screening and scoping report hold qualifications as per the requirements of CPG4. For completeness, the qualifications of the author/reviewer of the Heyne Tillett Steel report should be confirmed.

5.2. Together with the other current guidance documents referenced in the BIA, the 2017 Camden Local Plan should also be referenced.

5.3. It is proposed to extend the existing single storey basement to the main building and build a single storey basement 'pavilion'. The proposed excavation depths are inconsistently reported between documents. However, this audit has considered the deepest excavation levels reported in order to make a conservative assessment.

5.4. Although the site topography is indicated to be sloping, it is accepted there will be no impact on slope stability.

5.5. Site investigation has confirmed the ground conditions comprise Made Ground over Bagshot Formation and Claygate Member. Groundwater was encountered below the proposed basement slab levels. The proposed development will not impact the wider hydrogeological environment.

5.6. The proposed development will increase the site's impermeable area. The BIA proposes two drainage options, soakaway drainage or attenuation SUDS, to mitigate impacts to the hydrological environment. A definitive drainage strategy should be developed and agreed with LBC and Thames Water.

5.7. There are no neighbouring properties within the zone of influence of the proposed works.

5.8. Although the utilities identified in the vicinity of the site appear to be outside the zone of influence of the works, consultation with asset owners should be undertaken to confirm this and asset protection agreements entered into, if required.

5.9. The proposed development is at low risk of flooding.

5.10. The BIA meets the requirements of CPG4.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Lewis	Flat 1 110 Highgate Hill London N6 5HE	February 2018	Effects of excavation, increase in hardstanding and Waterlow Park not considered. Presence of a springline along southern boundary and waterlogged ground. Presence of '*substantial neighbouring basement structure'* (World War II bunkers). No mention of felling trees	Section 4
Rose, Highgate CAAC	Heathwinds Merton Lane N6 6NA	February 2018	Effect of excavations on the groundwater regime and damage to Waterlow Park Increase in hardstanding will have '*an effect on water runoff in the park*'.	Section 4

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Appendix 2: Audit Query Tracker

None

Appendix 3: Supplementary Supporting Documents

None

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