CampbellReith
consulting engineers

257 Camden High Street
London, NW1 7BU

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12336-50
Revision: F1

August 2016

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Project Name	257 Camden High Street
Planning Reference	2016/0819/P

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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 257 Camden High Street, London NW1 7BU (planning reference 2016/0819/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 proposed development is the lowering of the existing reduced height lower ground floor by approximately 1m to create a full height, single storey basement along the full footprint of the property using underpinning techniques. At the rear of the property, an extension will be constructed in the existing yard area to comprise a basement and ground floor level. Sheet piling will be installed within the courtyard to allow excavation in advance of constructing the permanent reinforced concrete basement walls.

1.5. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.

1.6. In the original BIA submission, a desk study broadly in accordance with the GSD Appendix G1 was provided for the proposed development, although the appendices, including all historical mapping, Envirocheck and ground investigation information, were not available for review. In the revised submission, these documents have been provided for review.

1.7. Limited ground investigation has been undertaken due to access constraints. In advance of the main works the Contractor should undertake additional exploratory holes to identify the extent and levels of Made Ground, Alluvium and perched groundwater.

1.8. The BIA indicates the site to be at low risk of surface water flooding or impacting the wider surface water flow environment, which is generally accepted.

1.9. The original BIA discusses the hydrogeological environment. Groundwater encountered within the Alluvium is attributed to localised perched water within silty and sandy lenses and the BIA states that it is not indicative of a regional shallow water table that may be impacted by the proposed development. This can only be further assessed after additional site investigation has been completed.

1.10. The BIA indicates that there are London Underground Limited (LUL) Northern Line Tunnels and Home Office Deep Shelter Tunnels beneath and adjacent to the site. Although clear of LUL's exclusion zone, discussion with LUL and the Home Office is advisable to confirm there are no impacts on the tunnels.

1.11. A ground movement assessment (GMA) has been undertaken which includes an impact assessment in line with the Burland Scale. Damage impact in accordance with the Burland Scale is assessed as Category 1 to 2 (Very Slight to Slight) for a number of structures. Mitigation measures discussed include the use of competent and experienced contractors and the provision of stiff propping during construction, in line with best practice. The BIA should be reviewed by the structural engineer to ensure stability in line with the assumptions made in the GMA.

1.12. The BIA discusses the requirement for survey and monitoring of nearby structures during construction, in line with the recommendations of the Structural Engineer. For structures along the Party Walls, the monitoring should be agreed under the Party Wall Act.

1.13. It is accepted that there are no land stability impacts caused by slopes at or adjacent to the site.

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

1.15. It is accepted that site access constraints currently prevent the further site investigation. It is recommended that once the additional investigation works have been complete, the impact assessments are confirmed or revised accordingly, and presented within the Basement Construction Plan (BCP), which should also include the detailed construction methodology, sequencing and propping arrangements.

1.16. On the basis of satisfactory completion of a BCP, it is accepted that the BIA is adequate.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 18th April 2016 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 257 Camden High Street, London NW1 7BU, Camden Reference 2016/0819/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;

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: "Excavation at basement level to provide 76sqm additional retail (A1) floorspace".

2.6. CampbellReith accessed LBC's Planning Portal on 28 April 2016 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (ref CG/18648, Draft, Revision 1) dated February 2016 by Card Geotechnics Limited.
- Site Location Plan, Existing Plans and Elevations, Proposed Plans and Elevations, Demolition Plans dated between October 2015 and January 2016 (Revision P1) by Barr Gazetas.
- Design and Access Statement dated February 2016 (Revision A) by Barr Gazetas.
- Correspondence with interested parties provided by LBC (as per Appendix 1).

2.7. Following the audit of the original BIA submission, additional information was provided for review on 4 July 2016, which comprised:

- Basement Impact Assessment (ref CG/18648, Draft, Revision 2) dated June 2016 by Card Geotechnics Limited.

2.8. A further revised BIA (Basement Impact Assessment (ref CG/18648, Draft, Revision 3) dated July 2016 by Card Geotechnics Limited) was provided for review on 5 August 2016 and a series of outline sketches from the Engineer on 15 August 2016. The sketches are presented in Appendix 3.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	The author's qualifications are in accordance with CPG4 guidelines for all sections.
Is data required by Cl.233 of the GSD presented?	Yes	A desk study broadly in line with the GSD Appendix G1 has been provided. Appendices provided for review in revised BIA.
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	In the revised submission, plans / maps have now been provided.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	In the revised submission, plans / maps have now been provided.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	In the revised submission, appropriate data sources have been provided.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Is a conceptual model presented?	Yes	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	In the revised submission, appropriate data sources have been provided.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	In the revised submission Alluvium has not been considered.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	In the revised submission a leaking building downpipe has been identified as the source of local shallow groundwater which has been confirmed as repaired.
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	In the revised submission, appropriate data sources have now been provided.
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Lower ground floors at 249 and 261 Camden High St identified. Tunnel structures below and adjacent the site identified, at depth. The revised BIA submission confirms that the adjacent office block and The Glasshouse have no basement levels.
Is a geotechnical interpretation presented?	Yes	In the revised submission, bearing capacity assessment has been presented.
Does the geotechnical interpretation include information on retaining wall design?	Yes	A structural design by Walsh Associates is referenced but not provided for review. In the revised BIA analysis for the sheet piled retailing walls is presented. Outline information for underpinning and temporary propping is also presented, although not in detail.
Are reports on other investigations required by screening and scoping presented?	Yes	In the revised submission, appropriate data sources have now been provided.
Are baseline conditions described, based on the GSD?	Yes	

Item	Yes/No/NA	Comment
Do the base line conditions consider adjacent or nearby basements?	Yes	Lower ground floors at 249 and 261 Camden High St identified. Tunnel structures below and adjacent the site identified, at depth. The revised BIA submission confirms that the adjacent office block and The Glasshouse have no basement levels.
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	The revised BIA submission presents a zone of influence for the proposed development indicating all affected structures.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	However, requires additional site investigation and assessment of Alluvium.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	However, requires additional site investigation and assessment of Alluvium.
Has the need for monitoring during construction been considered?	Yes	Movement monitoring is discussed and recommended for the adjacent structures / Party Walls. The tunnels are not recommended to be monitored.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Discussion on contractor workmanship in relation to residual damage categories is presented.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	The revised BIA presents a GMA incorporating all affected structures and assumes that foundations are all formed within firm to stiff London Clay. The BIA does not discuss the requirement to identify the extent and thickness of the Alluvium with further SI.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	The proposed basement is largely beneath current areas of hardstanding and additional run-off should not be expected.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	Not proven. The potential wider presence of Alluvium should be considered and will require further site investigation and assessment.

Item	Yes/No/NA	Comment
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.

4.2. The proposed development is the lowering of the existing reduced height lower ground floor by approximately 1m to create a full height, single storey basement along the full footprint of the property using underpinning techniques. At the rear of the property, an extension will be constructed in the existing yard area to comprise a basement and ground floor level. Sheet piling will be installed within the courtyard to allow excavation in advance of constructing the permanent reinforced concrete basement walls.

4.3. A desk study has been presented. In the revised submission a complete set of appendices have been presented for review, including historical mapping, ground investigation and Envirocheck information.

4.4. The BIA indicates that "an assessment will need to be undertaken to confirm if the existing infrastructure has sufficient capacity to take increased drainage". However, given that the change in impermeable areas across the site due to the proposed development is negligible, and that there will be "no significant changes in peak drainage outflows expected", the development should have no adverse impact on surface water flow and flooding.

4.5. The Regent's Canal and culverted River Fleet are both indicated as being within 250m of the proposed development. However, the original BIA noted that a damaged local sewer is likely to be the cause of the shallow perched groundwater encountered in the exploratory holes. In the revised BIA the water source has been identified as a leaking building downpipe which has since been repaired. Therefore the BIA states that there is no flood risk to the basement, nor is the groundwater encountered representative of a regional shallow groundwater regime.

4.6. The BIA indicates that Alluvium on site may be related to an "unmapped tributary of the River Fleet". The potential for the wider presence of Alluvium across the site cannot be ruled out by the limited ground investigation currently undertaken. Perched water within the thin layers of Made Ground and Alluvium are likely to yield relatively small volumes, if encountered. However, whilst the revised BIA suggests that local flows encountered during site investigation were the result of a leaking downpipe it has not ruled out the possibility of it actually being perched groundwater related to the Alluvium. The groundwater flooding vulnerability maps indicate that this type of flooding occurs where superficial deposits outcrop or are very near surface, and therefore assessing the potential risk and impact should be undertaken.

4.7. The original BIA did not address the Alluvium as potentially being present across the wider site footprint. In the revised BIA, the Alluvium is recognised as a Secondary (undifferentiated) Aquifer. The proposed basement structure could cut-off the groundwater flow through the

Alluvium and cause a wider hydrogeological impact. This cannot be further assessed without additional site investigation. In the revised BIA submissions, borehole record TQ/28SE/297 is presented which indicates 'River mud' to 1.83m bgl. This is not discussed in BIA but would suggest a wider presence of Alluvium in the vicinity.

4.8. The contractor should make provision for suitable trial excavations to be undertaken in advance of the main works to investigate the presence of deeper Made Ground, Alluvium and groundwater across the site. From the single groundwater monitoring installation currently on site a conclusive hydrogeological assessment is not possible. CPG4 recommends the installation and monitoring of at least 3no groundwater wells, for example, and the Contractor will need to undertake additional exploratory holes in advance of the construction which should investigate the extent of the Alluvium and whether any local groundwater is perched within it. Further assessment should be based on those observations.

4.9. Additional groundwater monitoring should be undertaken within the Alluvium. Should this, in conjunction with the extent of the Alluvium identified by additional exploratory holes, indicate interaction and potential cut-off of a Secondary Aquifer by the proposed basement, then the impact assessment will need to be further revised.

4.10. The contractor should make suitable contingency plans to deal with any perched water encountered during construction. In the long term, the permanent structure will require suitable waterproofing to be provided in line with best practise.

4.11. Reference is made to structural design by the engineers Walsh Associates. Suitable outline discussions on construction methodology and recommendations for undertaking underpinning is provided in the BIA, along with outline sketches (refer Appendix 3). Detailed methodology, sequencing and propping arrangements should be presented in a BCP.

4.12. The BIA states that a sheet piled retaining wall will be installed around the perimeter of the courtyards to allow for the excavation to basement level before construction of the permanent reinforced concrete basement walls. The revised BIA does present details and assessment of the sheet piled retaining wall.

4.13. Results of a ground movement assessment (GMA) are provided, which has been undertaken in accordance with CIRIA 580. The GMA assesses the tunnel structures as well as the adjoining property / party walls. Mitigation in terms of limiting underpin lateral deflections is discussed with reference to relevant building damage categories. It is considered unlikely that lateral deflection could be limited to <0.5mm. However, deflection <5.5mm should be achievable and therefore a damage Category 2 'Slight' should be achievable.

4.14. The revised BIA and GMA indicate a predicted zone of influence of the proposed development including assessment of all structures potentially impacted. Damage Category 1 'Very Slight' are indicated for all structures within the zone of influence that do not share party walls with the development site. Mitigation measures have been discussed including the provision of stiff propping during construction

4.15. The BIA indicates that there are London Underground Limited (LUL) Northern Line Tunnels and Home Office Deep Shelter Tunnels beneath and adjacent to the site. The crown level of the closest LUL tunnel is approximately 5m laterally and 7m vertically from the proposed development, and outside of LUL's defined exclusion zone. The crown of the Deep Shelter Tunnels is 16.5m vertically from the proposed development. The GMA has considered stress change caused by the proposed development on the underlying tunnels. Although clear of LUL's exclusion zone, discussion with LUL and the Home Office is advisable to confirm there are no impacts on the tunnels.

5.0 CONCLUSIONS

5.1. The BIA has been prepared by Card Geotechnics Limited. The authors' qualifications are in accordance with LBC's requirements.

5.2. In the original BIA submission, a desk study broadly in accordance with the GSD Appendix G1 was provided for the proposed development, although the appendices were not available for review. In the revised submission, these documents have been provided for review.

5.3. Limited ground investigation has been undertaken due to access constraints. In advance of the main works the Contractor should undertake additional exploratory holes to identify the extent and levels of Made Ground, Alluvium and perched groundwater.

5.4. The BIA indicates the site to be at low risk of surface water flooding or impacting the wider surface water flow environment, which is generally accepted. In the revised BIA local, shallow groundwater encountered has been attributed to a leaking down pipe from the building above, which has since been repaired.

5.5. The original BIA discusses the hydrogeological environment in terms of Made Ground overlying London Clay, designated as Unproductive Strata. The presence of Alluvium across the site was not discussed in terms of potential wider hydrogeological impact. In the revised BIA, groundwater encountered within the Alluvium is attributed to localised perched water within silty and sandy lenses and the BIA states that it is not indicative of a regional shallow water table that may be impacted by the proposed development.

5.6. Whilst the presence of groundwater is likely to be low impact to the development, mitigated both during the construction and in the long term by following best practise, potentially the development may cut-off a Secondary Aquifer and impact the wider area. This can only be further assessed after additional site investigation has been completed.

5.7. Additional groundwater monitoring should be undertaken within the Alluvium. Should this, in conjunction with the extent of the Alluvium identified by additional exploratory holes, indicate interaction and potential cut-off of a Secondary Aquifer by the proposed basement, then the impact assessment will need to be further revised.

5.8. The BIA indicates that the proposed basement construction will utilise traditional underpinning and sheet piling techniques. Only outline advice recommending standard best practices are provided and detailed methodology, construction sequencing and propping arrangements should be proposed by the Contractor, which should be reviewed by the Structural Engineer to ensure suitability in line with the assumptions made in the GMA.

5.9. The GMA has considered stress change caused by the proposed development on the underlying tunnels. The stress changes have been indicated to be negligible and as such will have no impact. Monitoring of the tunnels has not been recommended. Although the proposed development is clear of LUL's exclusion zone, discussion with LUL is advisable to confirm there are no impacts on the tunnels or that LUL do not require monitoring of the tunnels. Similar discussions with the Home Office are advisable in regards to the Deep Shelter Tunnels.

5.10. Damage impact in accordance with the Burland Scale is assessed as Category 1 to 2 (Very Slight to Slight) for all structures. Mitigation measures discussed include the use of competent and experienced contractors and the provision of stiff propping during construction, in line with best practise.

5.11. The BIA discusses the requirement for survey and monitoring of nearby structures during construction, in line with the recommendations of the Structural Engineer. For structures along the Party Walls, the monitoring should be agreed under the Party Wall Act.

5.12. It is accepted that there are no land stability impacts caused by slopes at or adjacent to the site.

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

5.14. It is accepted that site access constraints currently prevent the further site investigation required to confirm the assumptions and assessments presented in the BIA. It is recommended that once the additional investigation works have been complete, the impact assessments are confirmed or revised accordingly, and presented within the Basement Construction Plan (BCP), which should also include the detailed construction methodology, sequencing and propping arrangements.

5.15. Based on the completion of a satisfactory BCP, it is considered that the BIA is adequate. Reasonable impact assessments have been presented which should be confirmed prior to construction, after review of the BCP.

Appendix 1: Residents' Consultation Comments

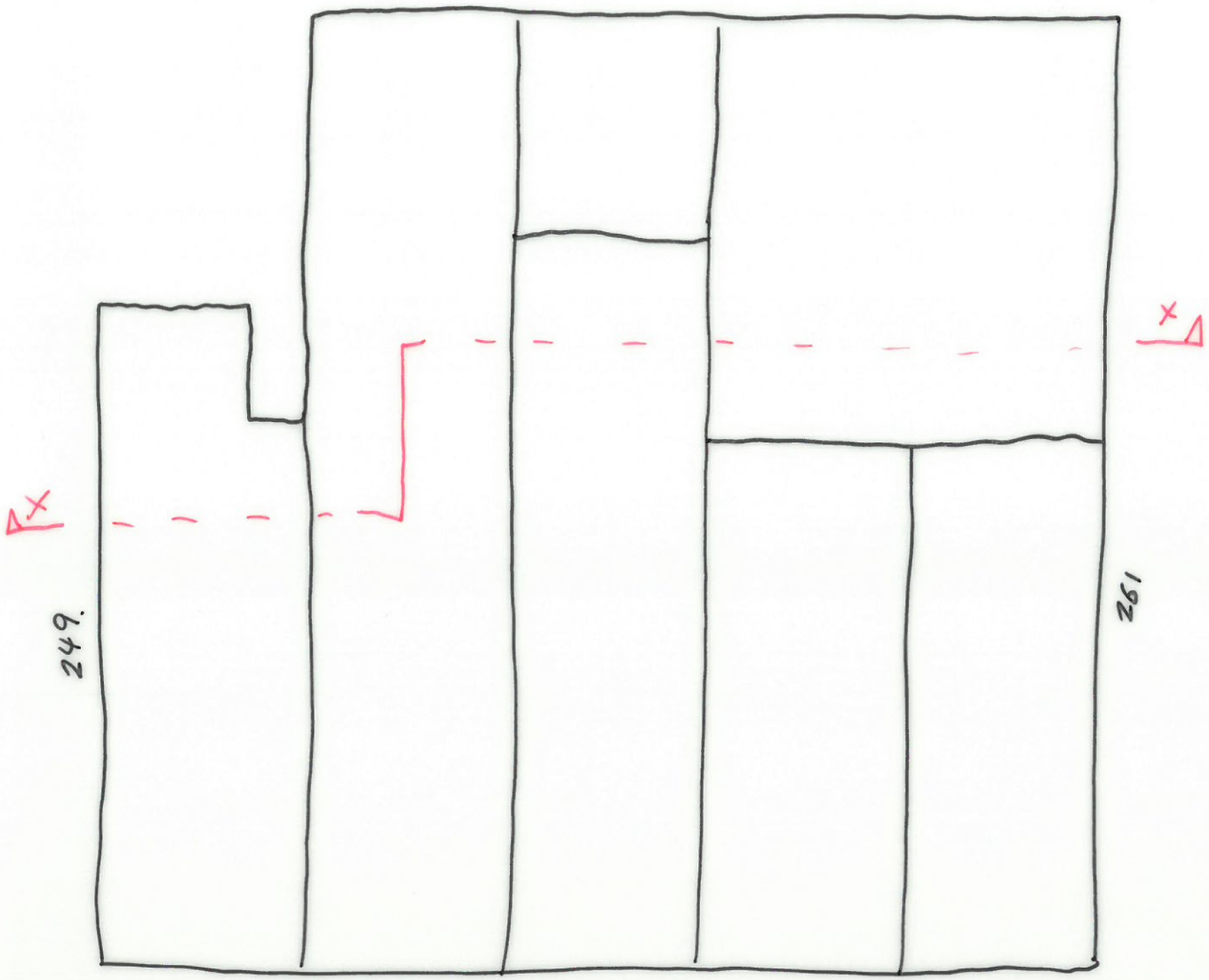
None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA	The desk study appendices should be provided for review, including all historical map, Envirocheck and ground investigation information.	Provided in revised BIA.	August 2016
2	BIA	Additional exploratory holes recommended to identify extent and thickness of Made Ground and Alluvium, and identify groundwater within the Alluvium.	Open	To be addressed prior to construction within BCP.
3	Hydrogeology	Impact of Alluvium as a Secondary Aquifer should be assessed, including impact to wider hydrogeological environment.	Open - preliminary assessment provided in revised BIA but requires additional site investigation / monitoring data to confirm assessment as 'no impact'.	To be addressed prior to construction within BCP.
4	Land Stability	Structural design / methodology by Walsh Associates should be provided for review, including bearing capacities, retaining wall information, sketches of propping arrangements and construction sequence, recommendations for the contractor.	Only outline advice recommending standard best practices are provided and detailed methodology, construction sequencing and propping arrangements should be proposed by the Contractor, which should be reviewed by the Structural Engineer to ensure suitability in line with the assumptions made in the GMA.	To be addressed prior to construction within BCP.
5	Land Stability	Ground movement assessment - a zone of influence should be identified. The presence of basements / nearby Listed structures should be identified. Impact assessments should be presented for all structures within the zone of influence.	Provided in revised BIA.	August 2016
6	Surface Flow and Flooding	An assessment of any impact due to the damaged sewer on the proposed development should be provided.	Provided in revised BIA – source of water confirmed as repaired building down pipe.	August 2016

Appendix 3: Supplementary Supporting Documents



PLAN VIEW

CONSTRUCTION SEQUENCE
251-259 CAMDEN HIGH STREET.
4352/SK/160520/TRL/00

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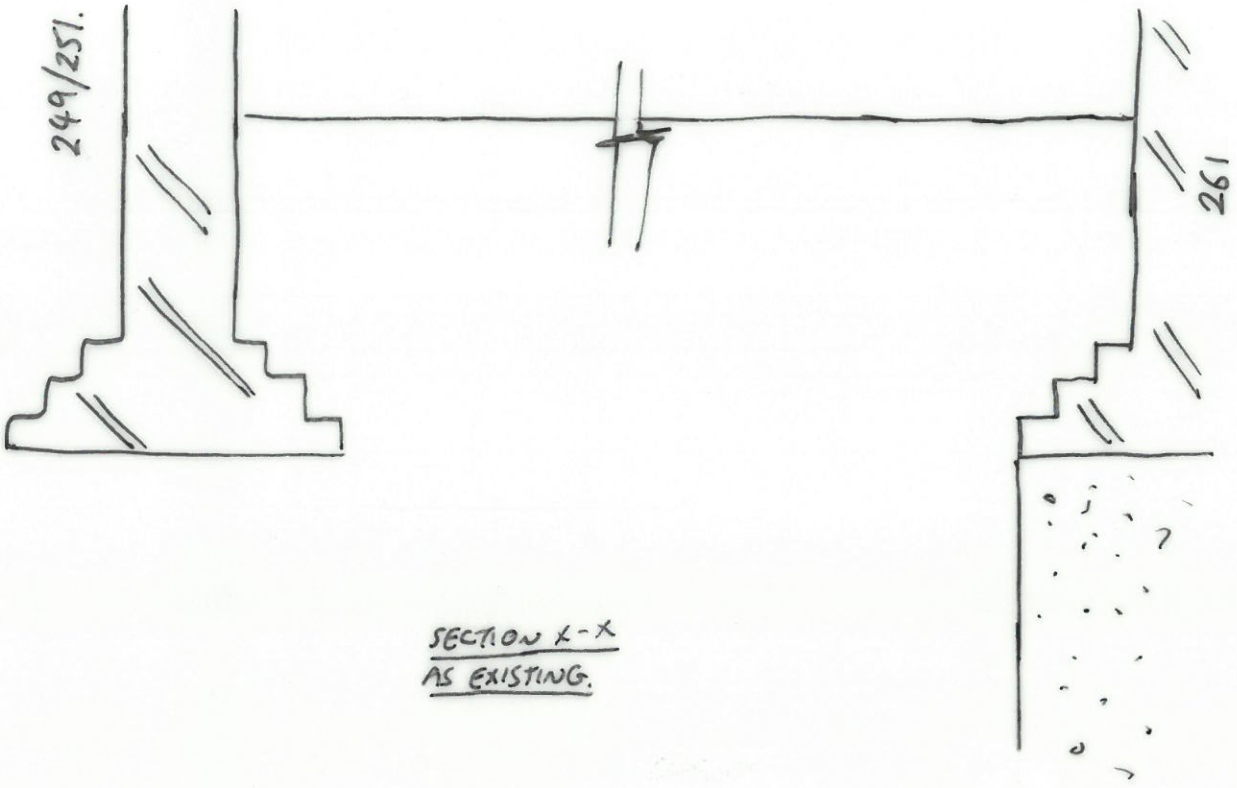

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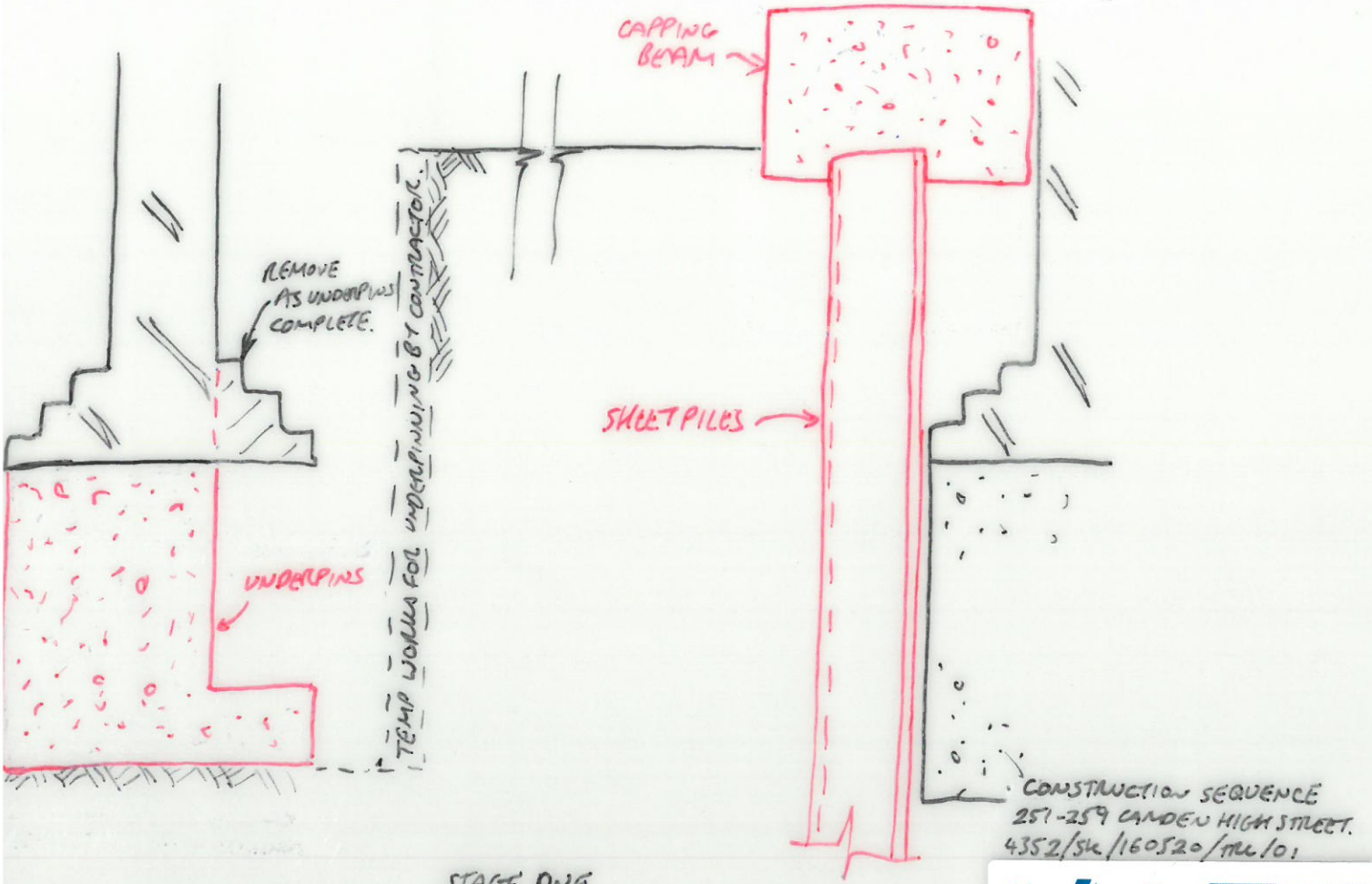

CONSTRUCTION SEQUENCE
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4352/SK/160520/REV/01

STAGE ONE

- INSTALL SHEET PILES AND CAPPING BEAM
- INSTALL UNDERPINS MAX 1.2m WIDE IN HIT/MISS SEQUENCE

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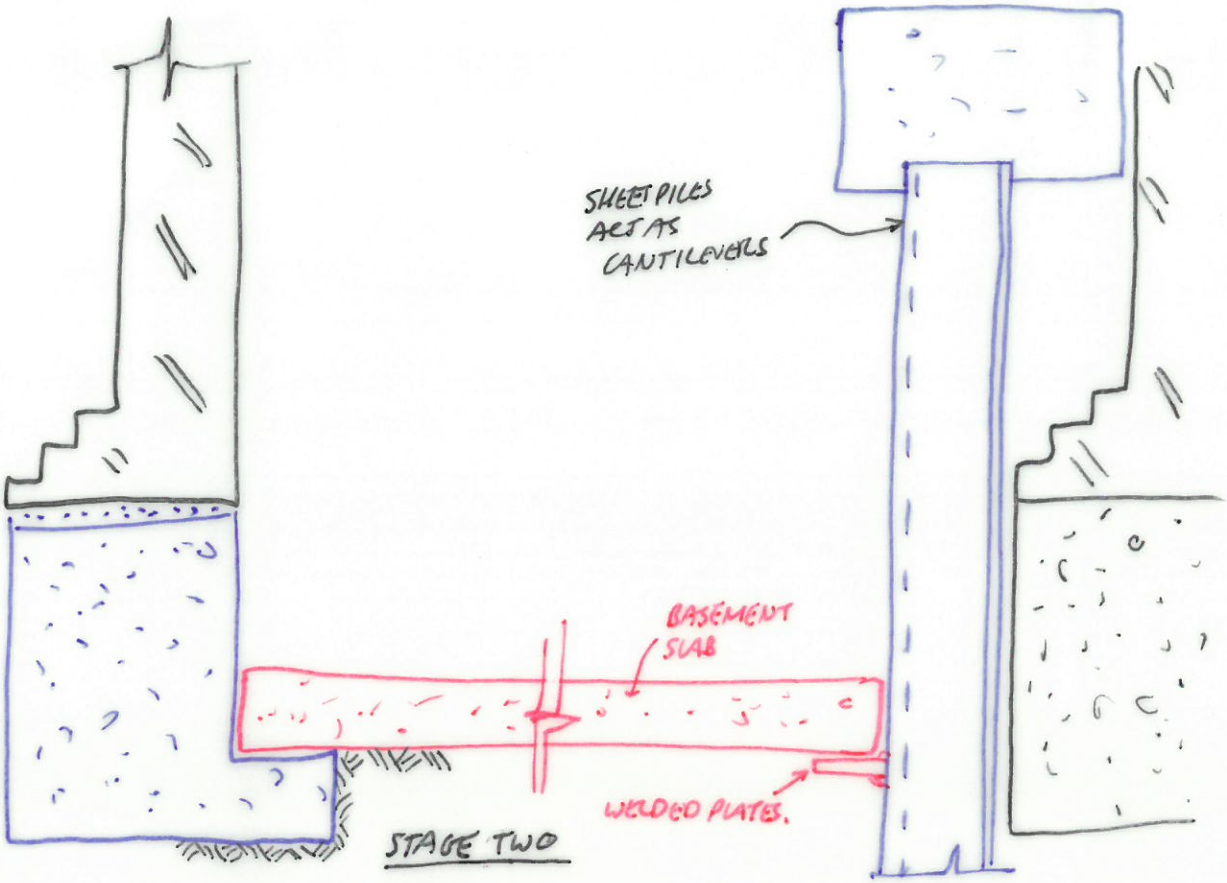
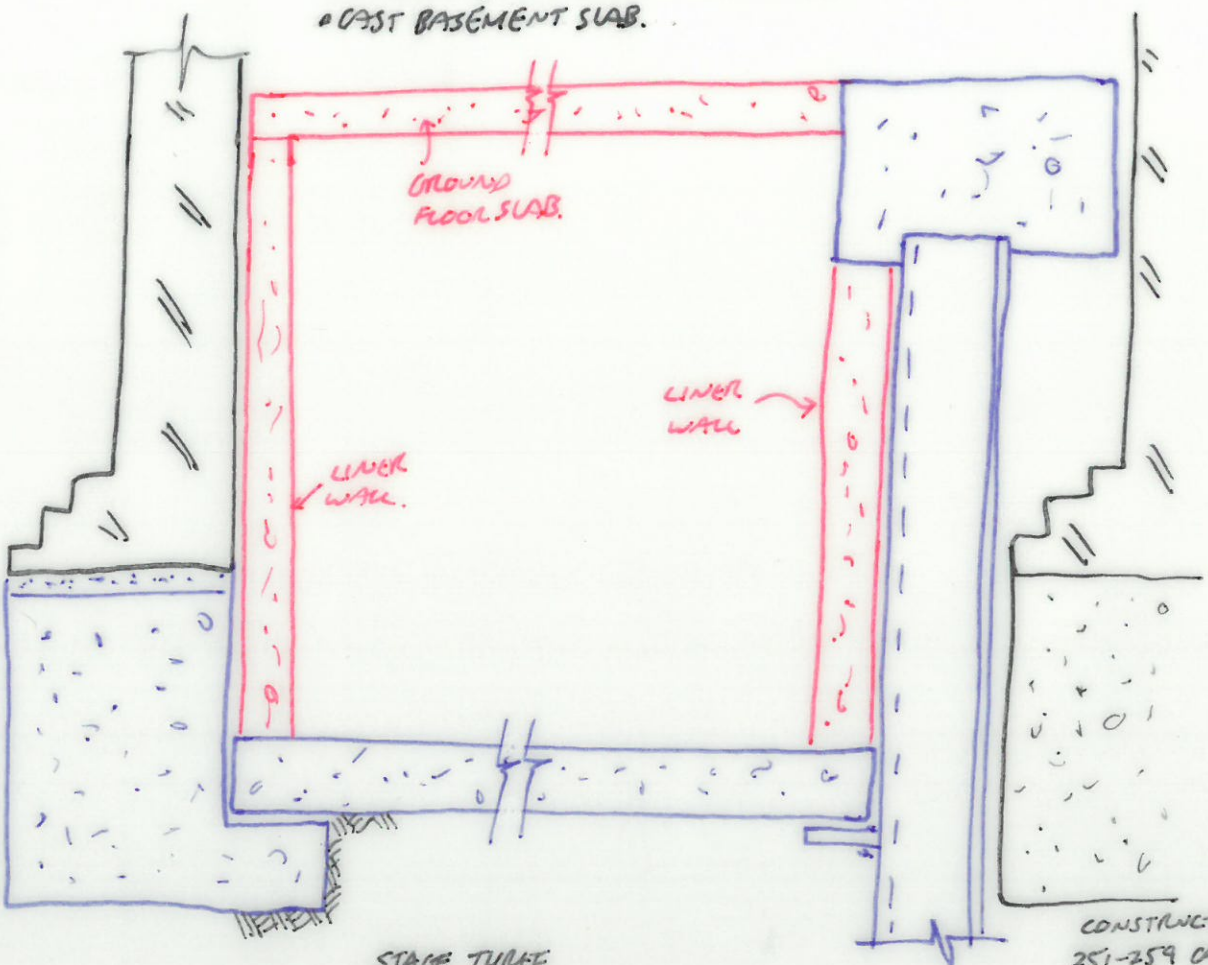


STAGE TWO

- EXCAVATE, WELD PLATES TO SHEET PILES.
- CAST BASEMENT SLAB.



STAGE THREE

- CAST LINER WALL AND VOIDS B→G
- CAST GROUND FLOOR SLAB.

CONSTRUCTION SEQUENCE PAGE 2.
251-259 CAMDEN HIGH ST.
4352/SK/160520/TRL/02

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