CampbellReith
consulting engineers

19 Rona Road
London NW3 2HY

Basement Impact Assessment
Audit

For

London Borough of Camden

Project Number: 12066-75
Revision: F1

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Structural ◆ Civil ◆ Environmental ◆ Geotechnical ◆ Transportation

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by the London Borough of Camden (LBC) to carry out an audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 19 Rona Road, London NW3 2HY - Planning Reference 2015/4436/P.

1.2. Subsequent to the issue of the above initial audit, a revised and updated BIA has been issued. This current audit constitutes a revision to the initial audit, amended as necessary, to accommodate the clarifications and confirmations incorporated within the revised BIA.

1.3. The revised BIA includes screening, scoping, site investigation and impact assessment stages as required in the LBC Planning Guidance document 'Basements and Lightwells (CPG4)', dated July 2015.

1.4. The qualifications of the authors, checkers and reviewers of the BIA are broadly in accordance with the requirements of CPG4.

1.5. 19 Rona Road is cracked and in poor condition. The proposed development comprises the virtual rebuilding of the entire internal structure of the house. The existing façade of the building at the front will be refurbished and retained.

1.6. The front bay window to 19 Rona Road has been found to have been underpinned on the northern flank. The remainder of the building is understood not to have been underpinned, although this remains to be confirmed. The revised BIA confirms that 21 Rona Road has been underpinned. It is assumed from the information provided that 17 Rona Road has not been underpinned. The revised BIA has confirmed that 19 Rona Road includes a small single-storey part-basement.

1.7. Ground conditions at the site are indicated to comprise Made Ground overlying London Clay. No groundwater was encountered during a GI undertaken at the site, although a groundwater level of 4.2m bgl was recorded during monitoring. Supplementary information report that a geotechnical assessment has been carried out. A summary of the soil parameters adopted in the structural design was requested and limited information was subsequently provided although it will be insufficient for detailed design.

1.8. The site and neighbouring area do not slope at more than 7^{o} (1:8) and so slope stability issues due to ground inclination are not of concern.

1.9. The London Clay is the shallowest 'natural' stratum at the site. This material is known to be generally susceptible to shrink/swell effects. However, the new basement should be sufficiently deep to preclude any future shrink/swell movements for 19 Rona Road - although the basement

proposals will not affect the susceptibility to this of 17 Rona Road, which is understood not to have been underpinned.

1.10. It is confirmed in the BIA that the site is not at risk of water induced slope instability nor settlement as a result of dewatering. The site does not lie over or within the exclusion zone of any tunnels.

1.11. The BIA confirms that the site is not within the catchment area of the pond chains on Hampstead Heath and thus can have no influence on the surface water flow to them. It is accepted that the basement does not lie near any surface water features or spring lines and thus will not have any influence in this regard.

1.12. The BIA notes that basement construction will result in an increase in the area of impermeable hardstanding. Increased run-off is to be mitigated by rainwater harvesting.

1.13. Although there is alleged to have been flooding to cellars in Rona Road, the revised BIA confirms there to be a low risk of surface water flooding at this locality.

1.14. It is accepted that the addition of a new basement at 19 Rona Road will not cause any change in the current groundwater flow regime or contribute to any cumulative effect downstream as the existing foundations already form a barrier to flows arising from any perched water table. Any groundwater flows into the basement area during excavation would most likely be modest and controllable by sump pumping.

1.15. Whether or not further exploratory investigations are to be undertaken to confirm groundwater conditions and the potential for perched water should be confirmed. Two trial pits were excavated in January 2016 to confirm the depth of the foundations to 17 Rona Road.

1.16. The basement sidewalls/underpinnings are to comprise 350mm thick RC 'L' - shaped walls constructed contiguously with a 300mm thick RC ground-bearing slab. A void former will not be adopted beneath the ground-bearing slab. Queries with respect to the calculation method and groundwater pressures have been resolved.

1.17. An indication has been provided in the BIA of likely propping arrangements for the basement excavations and walls during construction to give confidence at planning stage that ground movements and structural damage to adjacent properties and the highway will be minimised.

1.18. Due to the close proximity of the two adjacent properties, full procedures under the Party Wall Act will be required to be implemented. The trigger levels to be adopted during movement monitoring should be confirmed as part of the Party Wall award.

1.19. The proposed basement will result in a differential in foundation depth between basement formation level and the far flank wall of 17 Rona Road which has not been underpinned. A Ground Movement Assessment predicts up to 9mm movements and states that this will result in Category 1 damage although no justification is provided. The same information states that damage up to Category 2 could be experienced. CPG4 requires that mitigation is proposed where predicted damage exceed Category 1 and measures have been suggested by the engineer. Actual mitigation measures will have to be agreed with the party wall surveyor.

1.20. It is accepted that, subject to detailed design and the agreement of a party wall award, the BIA has identified the potential impacts arising out of the basement proposals and describes suitable mitigation.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by the London Borough of Camden (LBC) on 28 October 2015 to carry out an audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 19 Rona Road, London NW3 2HY - Planning Reference 2015/4436/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by the LBC. The Audit reviewed the BIA for potential impacts on land stability and on local surface water and groundwater conditions arising from the proposed basement development.

2.3. Subsequent to the issue of the above initial audit, a revised and updated BIA has been issued. This audit constitutes a revision to the original CampbellReith audit, amended as necessary, to accommodate the clarifications and confirmations incorporated within the revised BIA.

2.4. A BIA is required for all planning applications with basements in the LBC in general accordance with policies and technical procedures contained within the following documents:

a) Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.

b) Camden Planning Guidance (CPG) 4: Basements and Lightwells.

c) Camden Development Policy (DP) 27: Basements and Lightwells.

d) Camden Development Policy (DP) 23: Water.

2.5. 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.

2.6. The BIA should evaluate the impacts of the proposed basement considering the issues of land stability, hydrology and hydrogeology via the process described within the GSD and should make recommendations for detailed design.

2.7. The LBC Audit Instruction described the planning proposal as '*Conversion of single household into two flats (2 x 3 beds) with associated basement with front lightwell. Rebuilt ground and*

first floor rear extension. Erection of second floor rear extension with roof terrace, front and rear dormer windows and replacement windows throughout'.

The Audit Instruction noted the following:

a) The basement proposals do not involve a listed building nor does the site neighbour any listed buildings.

b) The site is in an area subject to stability constraints but is not in an area subject to surface water flow and flooding constraints or in an area subject to subterranean (groundwater) flow constraints.

c) The application does not require determination by the Development Control Committee (DCC).

d) The scope of the submitted BIA extends beyond the screening stage.

2.8. CampbellReith originally accessed the LBC Planning Portal on 19 November 2015 and examined the following reports, drawings and correspondence relevant to the audit:

a) A 'Design and Access Statement (D&AS)' prepared by 51% Studios (Architects), dated 30 July 2015.

b) A 'Town Planning & Heritage Statement (TP&HS)' prepared by CGMS Consulting Ltd (CGMS), dated 30 July 2015.

c) A 'Basement Impact Assessment (BIA) - Surface Flow and Flooding & Subterranean (Groundwater) Flow' prepared by ESI (Environmental Specialists), dated July 2015.

d) A 'Basement Impact Assessment (BIA) - Slope/Ground Stability & Surface Flow and Flooding' prepared by Substructural Ltd (SSL) and JMS Consulting Engineers Ltd (JMS), undated, but submitted to the LBC on 27 August 2015.

e) Building structural calculations prepared by SSL/JMS, dated 30 July 2015.

f) The following planning application drawings:

Site Location Plan.

Proposed Plans & Cross-sections.

g) Comments received from the public on the planning application.

2.9. An updated audit report was issued in January (Rev D2) based on a review of the following documents issued directly to CampbellReith by LBC on 04 and 07 December 2015.

a) A 'Basement Impact Assessment (BIA) - Slope/Ground Stability & Surface Flow and Flooding' (as previously issued) prepared by SSL and JMS, undated. Also, Appendix 'A' to the above entitled 'Audit Query Tracker' and Appendix 'B' entitled 'Monitoring'.

b) A (revised) 'Basement Impact Assessment (BIA) - Surface Flow and Flooding & Subterranean (Groundwater) Flow' prepared by ESI, dated December 2015.

c) A document entitled 'Basement Design Philosophy' prepared by SSL and JMS, dated 21 December 2015.

d) Building structural calculations (as previously issued) prepared by SSL/JMS, dated 30 July 2015.

e) Basement wall structural calculations (using the computer programme Scia), dated December 2015.

f) Proposed basement plan and structural cross-section drawing N^{o} L15 - 070-03/501 Rev P2, dated July 2015.

g) A 'Construction Management Plan (CMP)' prepared by Trinity Construction Consultancy Ltd (TCC) dated November 2015.

h) Point Drilling Services single trial pit log and single borehole log (as previously issued), dated 24 June 2015.

i) Meridian Soils Ltd single plasticity test result, undated.

j) A 'Drain Doctor Plumbing & Drainage' report, dated 20 July 2015.

2.10. Further information was received on 04, 05 and 16 February in response to the updated audit report and was commented on in revision D3 of the audit report. A final set of information was provided to CampbellReith on 7 April 2016 and a copy is presented in Appendix 3.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are the BIA author(s)' credentials satisfactory?	Yes	
Is data required by Cl.233 of the GSD presented?	Yes	Supplementary information provides indicative propping arrangements for the basement excavations and walls during construction.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Supplementary information provides indicative propping arrangements for the basement excavations and walls during construction.
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	
Slope/Ground Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrology (Surface Flow & Flooding) Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrogeology (Groundwater Flow) Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	

Item	Yes/No/NA	Comment
Is a conceptual ground model presented?	Yes	
Slope/Ground Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology (Surface Flow & Flooding) Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrogeology (Groundwater Flow) Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	Foundation details to 17 Rona Road confirmed by trial pitting.
Is a geotechnical interpretation presented?	No	Preliminary comments provided 7 April 2016 (see Appendix 3).
Does the geotechnical interpretation include information on retaining wall design?	No	
Are reports on other investigations required by screening and scoping presented?	Yes	Additional reports are included in the revised BIA covering the basement design philosophy, the condition of existing drains etc.

Item	Yes/No/NA	Comment
Are baseline conditions described, based on the 'Guidance for Subterranean Development (GSD)'?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	However, consideration should be given to confirming the foundation details to 17 Rona Road by trial pitting.
Is an Impact Assessment provided?	Yes	However, this is limited by the absence of a GMA. A GMA and building damage category assessment should be carried out with particular reference to 17 Rona Road.
Are estimates of ground movement and structural impact presented?	Yes	However, no GMA has been undertaken. A GMA and building damage category assessment should be carried out, with particular reference to 17 Rona Road.
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	Predicted damage category is up to Burland Category 2. Mitigation measures proposed which will need to be agreed with party wall surveyor.
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	Although damage up to Category 2 predicted.

Item	Yes/No/NA	Comment
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Although drainage details remain to be finalised.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does the BIA 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. CampbellReith was instructed by the London Borough of Camden (LBC) to carry out an audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 19 Rona Road, London NW3 2HY - Planning Reference 2015/4436/P.

4.2. The BIA was first issued in July/August 2015 and CampbellReith's initial audit issued on 24 November 2015.

4.3. Subsequent to the issue of the above initial audit, two updated sets of information have been submitted on behalf of the applicant as outlined in Section 2.9. This current audit (Rev D2) addresses that revised information.

4.4. The revised BIA includes screening, scoping, site investigation and impact assessment stages as required in the LBC Planning Guidance document 'Basements and Lightwells (CPG4)', dated July 2015.

4.5. The qualifications of the authors, checkers and reviewers of the BIA are broadly in accordance with the requirements of CPG4.

4.6. 19 Rona Road is a Victorian three-storey mid-terraced house with roof accommodation located in a tree-lined street within the Gospel Oak area of London. The closest properties to 19 Rona Road are 17 and 21 Rona Road, to either side. The property is cracked and in poor condition. Structural problems have been observed in the front bay area and to the rear extension.

4.7. The proposed development comprises the virtual rebuilding of the entire internal structure of the house, reconstruction of the rear extension (to the full width of the property) and also the roof, and construction of a new 3.5m deep single-storey basement extending beneath the main building, the new rear extension and part of the front garden. The existing façade of the building at the front will be refurbished and retained.

4.8. The revised BIA has confirmed that the existing property includes a small single-storey part-basement on the south side of the building.

4.9. The revised BIA also confirms that 21 Rona Road was renovated several years ago and that the works undertaken included underpinning. It is assumed from the information provided that 17 Rona Road has not been underpinned.

4.10. A trial pit excavated beside the front bay window to 19 Rona Road, showed the building at this location to have been underpinned with mass concrete. The base of the underpinning was not proven but was expected to lie at least 1.8m below ground level (bgl) and to be founded on stiff clay.

4.11. The reasons for the poor condition of 19 Rona Road and for the underpinning in the window area are not known. The revised BIA states that a drainage survey had recorded drains at both roof and ground level to be blocked and defects were also noted to the existing below-ground drainage system. It was postulated that water leakage may have resulted in settlement and the observed building damage. However, damage to the building and drainage systems could be the result of subsidence due to shrink/swell effects.

4.12. It is understood that the remaining majority of the walls to 19 Rona Road have not been underpinned, although this remains to be confirmed.

4.13. A limited ground investigation (GI) was undertaken at the site in June 2015 comprising the sinking of a single groundwater monitoring borehole in the rear garden to 5.7m bgl and the excavation of the above noted trial pit to a depth of 2m bgl. Subsequent to that, two foundation inspection pits were excavated in January 2016. These revealed the party wall foundations to be around 1.75 and 0.80m below floor level. The trial pit sketches suggest the pits were excavated on both sides of the party wall.

4.14. Ground conditions were indicated from the borehole to comprise Made Ground to 2.5m or so bgl, overlying London Clay. The bearing stratum revealed by the foundation inspection pits of not described, although it is noted that the foundation depth is shallower than the London Clay encountered in the borehole. Laboratory testing was limited to the undertaking of a single plasticity test on a sample of London Clay taken at a depth of 3m bgl within the borehole. Although not quantified in the BIA, the test results show the material to be of high shrink/swell potential.

4.15. Supplemental information states that an interpretation of the geotechnical investigation was carried out and the results incorporated into the retaining wall design. A summary of the assumed parameters was requested, but not provided with the exception of preliminary comments with respect to undrained shear strength and allowable bearing pressure.

4.16. No groundwater was encountered during the GI, although a gradual rise in groundwater level was recorded during monitoring in June/July 2015 from 5.7m bgl (dry) to 4.2m bgl. As noted in the BIA, it is possible that groundwater levels at the site may be subject to seasonal variation and could be therefore be higher at other times of the year. Both foundation inspection pits appear to be dry.

4.17. Regarding topography and issues of slope/ground instability, the BIA confirms that the site does not slope at more than 7^{o} (1:8) and that the proposed works will not alter this situation. It is also confirmed that the site does not lie within the vicinity of slopes greater than 7^{o}.

4.18. The BIA confirms that the site is not within an area of previously worked ground, nor within 50m of Hampstead Heath Ponds.

4.19. The London Clay has been shown to be the shallowest 'natural' stratum at the site. This material is known to be generally susceptible to shrink/swell effects. It is noted that that Rona Road is tree lined and that a number of local residents have commented on building damage/subsidence issues in the local area.

4.20. The revised BIA has confirmed surveys to have recorded no evidence of cracking to either 17 Rona Road or 21 Rona Road. However, the revised BIA has also said that the trees fronting the properties have been heavily pruned/pollarded and this together with the observed cracking to 19 Rona Road and the fact that 21 Rona Road has been underpinned may be evidence of shrink/swell problems in the past. However, the founding depth of the basement of 3.5m bgl is likely to lie below any potential soil desiccation zone and should preclude any future movements from this cause for 19 Rona Road. No trees are to be felled as part of the basement proposals, therefore there are no impacts for any surrounding shallow foundations.

4.21. The BIA notes that the site is not located within 100m of a watercourse or potential spring line and is thus not at risk of slope instability due to being in proximity to such features. Additionally, the proposed basement will not be constructed within an aquifer and the risk of settlement as a result of dewatering is not therefore of concern.

4.22. The BIA confirms that the new basement will extend to within 5m of the pedestrian pavement and public highway. Construction induced damage is to be avoided by ensuring the correct sequencing and propping of the works.

4.23. The proposed basement will result in a differential in foundation depth between basement formation level and the far flank wall of 17 Rona Road which has not been underpinned.

4.24. It is confirmed in the BIA that the site does not lie over or within the exclusion zone of any tunnels.

4.25. In the context of surface water flow and flooding, the BIA confirms that the site is not within the catchment area of the pond chains on Hampstead Heath and thus can have no influence on the surface water flow to them.

4.26. The BIA notes that basement construction will result in the loss of 50% of the current garden area to impermeable surfacing and there will thus be a potential reduction in infiltration and an increase in run-off. Run-off is to be mitigated by rainwater harvesting. Any excess rainwater flow will be disposed of via existing routes i.e. into the local Thames Water sewer. On this basis, there will be no changes in the route, profile or quality of surface water flows and hence no increased impact on adjoining properties or downstream watercourses.

4.27. Although there is alleged to have been flooding to cellars in Rona Road, it is confirmed in the revised BIA that the FRA for Camden identifies there to be a low risk of surface water flooding at this locality. Additionally, the revised BIA confirms that although the site is located near a tributary of the former River Fleet, the tributary is highly likely to have been culverted many years ago. The culverting of the River Fleet and the lack of hydraulic continuity with the site due to the absence of Superficial Deposits in the area precludes the likelihood of surface water or subterranean (see below) flooding from this source.

4.28. With regard to subterranean (groundwater) flows, although groundwater levels may at certain times of the year be higher than those recorded during monitoring, the basement will be founded largely within the relatively impermeable London Clay i.e. a non-aquifer. This, together with the apparently generally high clay content of the overlying Made Ground will most likely preclude significant groundwater flows into the excavation during construction.

4.29. As the existing foundations extend through the Made Ground into the London Clay, it is accepted that the addition of a new basement at 19 Rona Road will not cause any change in the current groundwater flow regime as the existing foundations already form a barrier to flows arising from any perched water table.

4.30. As noted above, the site is not located within 100m of a watercourse or potential spring line and thus will not result in any increase, decrease, diversion or change in quality of groundwater flow due to being in proximity to any such features.

4.31. Again as noted above, the site does not lie within the catchment area of the pond chains on Hampstead Heath and thus can have no influence on the groundwater flow to them.

4.32. Any groundwater flows into the basement area during excavation would most likely be modest and controllable by sump pumping.

4.33. The revised BIA confirms that the basement will be constructed to BS 8102, the Code of Practice for the protection of sub-surface structures from groundwater inflow.

4.34. The basement sidewalls/underpinnings are to comprise 350mm thick RC 'L' - shaped walls. Three wall types are indicated in the revised BIA, depending upon location within the basement. The proposed 300mm thick RC ground-bearing slab will be cast between completed opposing underpinning wall sections so as to be structurally contiguous with them in the permanent condition to form a 'U' shaped basement box. It is now confirmed that a void former will not be adopted beneath the basement ground-bearing slab.

4.35. A statement on the design philosophy for the basement has been submitted as part of the revised BIA documentation together with preliminary structural design calculations for the permanent works. A groundwater level of 2/3 of the wall height above formation level has been

assumed in wall design. Previous queries with respect to the calculations were addressed in information presented on 7 April 2016 (ref Appendix 3).

4.36. A preliminary construction method statement is included within Section 8 of the revised BIA. The above information is expanded upon in the basement design philosophy documentation (which includes an underpinning specification) and also structural drawings.

4.37. It has been confirmed in the revised BIA that basement excavation is likely to be undertaken by a combination of mini-digger and hand excavation, as appropriate, with spoil being removed by conveyor.

4.38. The revised BIA has confirmed that any ingress of groundwater into the excavation will be pumped to the existing drainage system. However, permission and any constraints e.g. the need for settlement tanks etc. will have to be obtained from the Thames Water if this is to be the case.

4.39. Although the underpinning specification emphasises the need for correct sequencing of excavation and construction and adequate propping, this is left to the Contractor to design. Nevertheless, an indication should be provided in the BIA of likely propping arrangements for the basement excavations and walls during construction to give confidence at planning stage that ground movements and structural damage to adjacent properties and the highway will be minimised.

4.40. It is stated in Section 8.2.3 of the revised BIA that prior to construction, further 'investigation' will be required in order that heave movements may be quantified based on final loadings and levels. It has now been clarified that this refers to the GI already undertaken and does not constitute the undertaking of further GI. However, it is also stated that it would be prudent to carry out a number of additional trial excavations to as close to final basement depth as possible to confirm groundwater conditions and the potential for perched water. It has since been confirmed that this work is no longer intended although two foundation pits have been excavated as noted previously.

4.41. Due to the close proximity of the two adjacent properties, full procedures under the Party Wall Act will be required to be implemented.

4.42. A statement is made in the revised BIA to the effect that movements caused by the development are to be limited so as not to exceed 5mm at any location within the adjacent properties by installing adequate temporary propping and by the stiffness of the permanent construction. It is stated that this will keep damage to within the 'slight' Category (Category 2) as defined by Burland. Supplementary information predicts ground movements of 6-9mm and despite a statement (not justified) that this would result in Category 1 (very slight) damage, the

information notes that damage up to Burland Category 2 might be experienced. CPG 4 requires that mitigation measures are proposed where predicted damage exceeds Category 1. The engineer has suggested mitigation measures in a response provided on 7 April 2016 (see Appendix 3). Any mitigation measures will have to be agreed with the party wall surveyor.

4.43. An outline monitoring scheme is presented in Appendix B to the revised BIA comprising condition surveys of adjacent properties plus vertical and lateral movement monitoring of 19 Rona Road and the adjacent properties against defined trigger levels. Tell-tale crack width monitoring gauges are suggested for the monitoring of any existing cracks. The trigger levels to be adopted should be confirmed with the Party Wall Surveyor.

4.44. An overall contract duration for the works has been given in the CMP submitted with the revised BIA, although no breakdown of operations is provided. This is considered sufficient for planning purposes.

5.0 CONCLUSIONS

5.1. The revised BIA includes screening, scoping, site investigation and impact assessment stages as required in the LBC Planning Guidance document 'Basements and Lightwells (CPG4)', dated July 2015.

5.2. The qualifications of the authors, checkers and reviewers of the BIA are broadly in accordance with the requirements of CPG4.

5.3. 19 Rona Road is cracked and in poor condition. The proposed development comprises the virtual rebuilding of the entire internal structure of the house. The existing façade of the building at the front will be refurbished and retained.

5.4. The front bay window to 19 Rona Road has been found to have been underpinned on the northern flank. The remainder of the building is understood not to have been underpinned, although this remains to be confirmed. The revised BIA confirms that 21 Rona Road has been underpinned. It is assumed from the information provided that 17 Rona Road has not been underpinned. The revised BIA has confirmed that 19 Rona Road includes a small single-storey part-basement.

5.5. Ground conditions at the site are indicated to comprise Made Ground overlying London Clay. No groundwater was encountered during a GI undertaken at the site, although a groundwater level of 4.2m bgl was recorded during monitoring. Supplementary information report that a geotechnical assessment has been carried out. A summary of the soil parameters adopted in the structural design was requested and limited information was subsequently provided although it will be insufficient for detailed design.

5.6. The site and neighbouring area do not slope at more than 7^{o} (1:8) and so slope stability issues due to ground inclination are not of concern.

5.7. The London Clay is the shallowest 'natural' stratum at the site. This material is known to be generally susceptible to shrink/swell effects. However, the new basement should be sufficiently deep to preclude any future shrink/swell movements for 19 Rona Road - although the basement proposals will not affect the susceptibility to this of 17 Rona Road, which is understood not to have been underpinned.

5.8. It is confirmed in the BIA that the site is not at risk of water induced slope instability nor settlement as a result of dewatering. The site does not lie over or within the exclusion zone of any tunnels.

5.9. The BIA confirms that the site is not within the catchment area of the pond chains on Hampstead Heath and thus can have no influence on the surface water flow to them. It is

accepted that the basement does not lie near any surface water features or spring lines and thus will not have any influence in this regard.

5.10. The BIA notes that basement construction will result in an increase in the area of impermeable hardstanding. Increased run-off is to be mitigated by rainwater harvesting.

5.11. Although there is alleged to have been flooding to cellars in Rona Road, the revised BIA confirms there to be a low risk of surface water flooding at this locality.

5.12. It is accepted that the addition of a new basement at 19 Rona Road will not cause any change in the current groundwater flow regime or contribute to any cumulative effect downstream as the existing foundations already form a barrier to flows arising from any perched water table. Any groundwater flows into the basement area during excavation would most likely be modest and controllable by sump pumping.

5.13. Whether or not further exploratory investigations are to be undertaken to confirm groundwater conditions and the potential for perched water should be confirmed. Two trial pits were excavated in January 2016 to confirm the depth of the foundations to 17 Rona Road.

5.14. The basement sidewalls/underpinnings are to comprise 350mm thick RC 'L' - shaped walls constructed contiguously with a 300mm thick RC ground-bearing slab. A void former will not be adopted beneath the ground-bearing slab. Queries with respect to the calculation method and groundwater pressures have been resolved.

5.15. An indication has been provided in the BIA of likely propping arrangements for the basement excavations and walls during construction to give confidence at planning stage that ground movements and structural damage to adjacent properties and the highway will be minimised.

5.16. Due to the close proximity of the two adjacent properties, full procedures under the Party Wall Act will be required to be implemented. The trigger levels to be adopted during movement monitoring should be confirmed as part of the Party Wall award.

5.17. The proposed basement will result in a differential in foundation depth between basement formation level and the far flank wall of 17 Rona Road which has not been underpinned. A Ground Movement Assessment predicts up to 9mm movements and states that this will result in Category 1 damage although no justification is provided. The same information states that damage up to Category 2 could be experienced. CPG4 requires that mitigation is proposed where predicted damage exceed Category 1 and measures have been suggested by the engineer. Actual mitigation measures will have to be agreed with the party wall surveyor.

5.18. It is accepted that, subject to detailed design and the agreement of a party wall award, the BIA has identified the potential impacts arising out of the basement proposals and describes suitable mitigation.

Appendix 1: Residents' Consultation Comments

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Surname	Address	Date	Issue raised	Response
O'Shaughnessy	21 Rona Road, London NW3 2HY.	Un-dated.	Concern that construction could lead to cracking with repair being required.	The revised BIA has confirmed that this objection was subsequently withdrawn.
Richter	12 Estelle Road.	06/10/15	Concerned that the basement will significantly alter the ground and drainage conditions and lead to structural problems within the neighbouring properties.	See Section 5.0.
McGinnity	29 Rona Road.	10/10/15	States that there is an active water body running down Rona Road. Concern that the basement will impact upon the water course and upon the structure of the adjoining properties.	Ditto.
Tapply	20 Estelle Road, NW3 2JY.	11/10/15	Concerned about risk of damage, subsidence (currently a problem locally) and possible flooding.	Ditto.
Amara	31 Rona Road, London NW3 2HY.	11/10/15	Risk of flooding and structural damage to neighbouring houses.	Ditto.
Grattidge	Ground Floor Flat, 12 Rona Road.	11/10/15	Concern that there will be structural damage to neighbours' houses.	Ditto.
Kisch	2 Rona Road NW3 2JA.	11/10/15	Concern that construction will cause ground vibration, subsidence and flooding.	Ditto.
Nelmes	8 Rona Road.	11/10/15	Concern that construction may cause subsidence.	Ditto.
Wedepohl	13 Rona Road, London NW3 2HY.	11/10/15	Concern as to risk of flooding and instability of neighbouring properties.	Ditto.

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Surname	Address	Date	Issue raised	Response
Jones	11 Rona Road NW3 2HY.	11/10/15	Recent issues with flooded cellars on Rona Road could be exacerbated by the proposed basement.	Ditto.
Dimitranovas	Top Flat, 33 Savernake Road, Corner Rona Road.	11/10/15	Area is close to the River Fleet. Examples quoted of houses being flooded when basements have been dug.	Ditto.
Panayides	3 Rona Road, London NW3 2HY.	12/10/15	Concern as to the structural effect on other properties of the basement proposal.	Ditto.
Fagg	1 Rona Road NW3 2HY.	12/10/15	States that the proposed foundation is on a downwards sloping clay formation, disruption of which threatens the structure of the two immediately adjacent properties. Notes that Rona Road is relatively steep and there are serious concerns about drainage issues.	Ditto.
Tennent	14 Rona Road.	12/10/15	Concern as to the risk of flooding and subsidence arising from basement construction.	Ditto.
Jenkins	Ground Floor Flat, 5 Rona Road.	12/10/15	Rona Road is affected by subsidence issues. Road lies between the Hampstead and Highgate branches of the River Fleet. Basements could exacerbate the problems of flood risk and disruption, leading to cracks and subsidence.	Ditto.

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Surface Water	Clarification/confirmation of flood risk in light of anecdotal evidence.	Closed. It is confirmed in the revised BIA that the site is at low risk of surface water flooding and also groundwater flooding.	11/01/16
2	Stability, hydrology and hydrogeology	A revised more detailed method statement should be submitted.	Open. Proposed construction methods are now more clearly defined. However, propping arrangements for the basement walls remain to be outlined for the temporary condition.	08/03/16
3	Stability	Confirmation of absence of shrink/swell subsidence in the local area is required.	Closed. Uncertainty still remains as to whether or not properties on Rona Road have been subject to shrink/swell subsidence/heave issues. However, basement construction at 19 Rona Road will improve the situation for this property.	11/01/16
4	Stability	Detailed information should be obtained on the current structural condition of 17 Rona Road and 21 Rona Road.	Closed. It is stated in the revised BIA that that surveys have confirmed there to be no existing cracking to either 17 Rona Road or 21 Rona Road.	11/01/16
5	Stability	Predicted building damage to be justified and potentially affected properties to be identified.	Open. Damage up to Category 2 predicted. Mitigation measures required.	08/03/16
6	Stability	The reference in the BIA to 19 Rona Road having a basement should be deleted/clarified.	Closed. It is confirmed in the revised BIA that 19 Rona Road has a single-storey part basement.	11/01/16
7	Stability	Preliminary stability (overturning, sliding and bearing capacity) calculations plus structural calculations should be provided for the basement/underpinning walls.	Open. Assessment of groundwater pressures incorrect. Calculations should utilise UK Annex to Eurocodes.	08/03/16

8	Stability	The nature and scope of proposed further investigations should be clarified.	Open. BIA states no further investigation required.	08/03/16
9	Stability	Condition surveys of the adjacent properties should be carried out prior to commencing the works and agreed with Party Wall Surveyor.	Closed. This necessity is covered in the construction method statement provided in Section 8 of the BIA. See also Appendix B to the revised BIA.	11/01/16
10	Stability	Outline movement monitoring proposals with key trigger levels for action and mitigation measures.	Closed. Now provided in Appendix B to the revised BIA. Trigger limits to be agreed with PWS.	11/01/16
11	BIA	An outline works programme sufficient for planning purposes should be provided.	Closed. An overall contract duration for the works has been given in the CMP submitted with the revised BIA. This is considered sufficient for planning purposes.	11/01/16
12	Stability	A geotechnical interpretation should be provided for the works. The interpretation should include parameters for basement wall design.	Closed. Preliminary interpretation provided. Detailed design will require further information.	20/04/16
13	Stability	Application of lateral earth pressure coefficients to ground water pressures in wall design is incorrect.	Closed. Calculations have been clarified.	20/04/16
14	Stability	The wall types on Sections A-A and B-B of structural drawing No L15-070-03/501 should be corrected to show 'Type 1' and 'Type 2' as appropriate.	Closed. Drawing L15_088_04/501 correct.	08/03/16

Appendix 3: Supplementary Supporting Documents

CIVIL & STRUCTURAL CONSULTING ENGINEERS

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19 Rona Road,
London NW1 6XU

Project No: L15/088/04

jms CIVIL & STRUCTURAL CONSULTING ENGINEERS
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www.jmsengineers.co.uk

Project No	**: L14/088/04**
Sheet	**: Structure / 2**
Made By	**: GC**
Date	**: April 2016**
Checked	**:**
Office	**: London** Tel **: 0207 347 5239**

Mitigation of category 2 (Burland) damage

Mitigation will be provided to prevent category 2 damage occurring to the neighbouring properties due to workmanship issues by utilising the following methodology:

1. Careful contractor selection will be carried out to ensure that a competent and experienced company is selected for any works that would have an impact on the neighbouring properties. To achieve this a variety of methods can be used such as contractor interviews, testimonials from previous clients, demonstration of knowledge and inspection of previous / ongoing projects to ascertain competence and quality of works.
2. During the works regular inspections and monitoring will be carried out to ensure the quality of work and adherence to the approved design and construction methodology.
3. During the works monitoring of the neighbouring properties is to be carried out and this will allow for monitoring the effects of the works and adjustments can be made to the specification and details as required to prevent damage.

Soil Investigation

The borehole logs and test results were reviewed by:

Stephen Gilchrist BSc FGS,
Senior Geotechnical EngineerGeosphere Environmental Ltd
Brightwell Barns
Ipswich Road
Brightwell
Suffolk
IP10 0BJ
01603 298076

He has commented as follows:

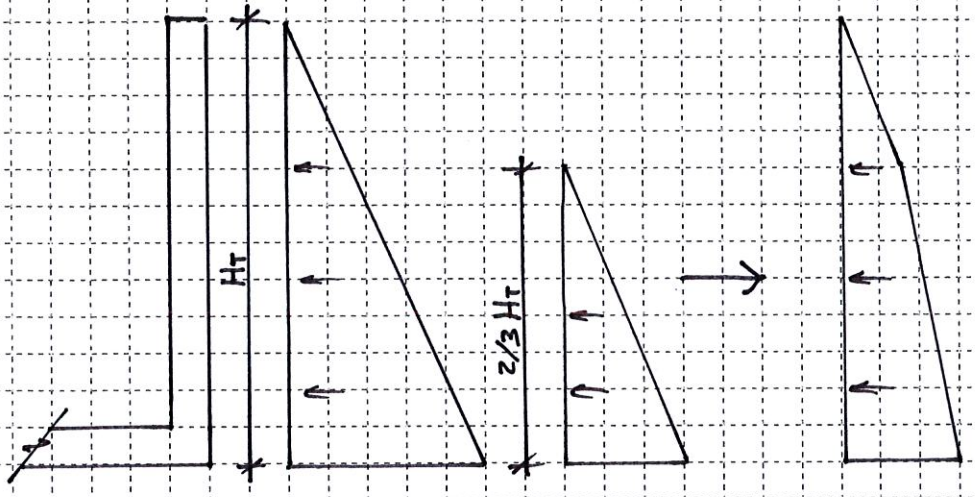
1. The logs indicate the presence of your ‘typical’ London Clay
2. Shear vanes indicate firm to stiff conditions with depth
3. shear vanes at the underside of the existing foundation indicate shear strengths of 80kN/m2, assuming the shear vane equipment is calibrated to show a direct correlation with shear strength.
4. Given the ground conditions encountered, we would expect Nett Allowable Bearing Pressures for the London Clay at 1.8m to be in the region of 140 – 160kN/m2

Factor used for K0

Clarification of K0 and figures used in calculations previously submitted for water pressure as per appended sheet.

K0 taken as 0.53 (to give the load of 8.77 kN/m^2 used in the calculations)

Derivation of K_o and calculation of load applied as waterpressure.



Soil Pressure $\sigma_{v,0} = \gamma_s H_T$

Water Pressure $u_w = \gamma_w \cdot \frac{2}{3} H_T$

Soil Pressure 'At Rest' $\sigma_{v,0} = \sigma_{v,0} - u_w$

Total Pressure P

$P = \sigma_{v,0} + u_w = K_o (\sigma_{v0} - u_w) + u_w$

$= K_o \cdot \sigma_{v0} + (1 - K_o) \cdot u_w$

$= K_o \cdot \gamma_s \cdot H_T + (1 - K_o) \cdot \gamma_w \cdot \frac{2}{3} H_T$

H_T for wall taken as 2.8m high.

$u_w = (1 - K_o) \cdot \gamma_w \cdot \frac{2}{3} H_T$

$\therefore u_w = (1 - 0.53) \times 10 \times \frac{2}{3} \times 2.8$

$= 8.77 \text{ kN/m}^2$

$\gamma_w = 10 \text{ kN/m}^3$
$H_T = 2.8\text{m}$
$K_o = 0.53$

Note water was not found in borehole and water pressure applied for 2/3 of height of wall as worst case scenario.

Re: Ref: 12066-75 - Rona Road BIA report

Liz Brown to: Graham Chapman 12/04/2016 09:55
Cc: "Massam, Brendan JC", camdenaudit, gavin.sexton, "Craig, Tessa"

Graham

Thank for your email. We shall review this additional information and come back to you next week.

Regards,
Elizabeth Brown
Partner

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Graham Chapman Elizabeth Please find attached responses to the... 07/04/2016 17:41:32

From: Graham Chapman <gchapman@jmsengineers.co.uk>
To: LizBrown@campbellreith.com, "Craig, Tessa" <tessa.craig@camden.gov.uk>, camdenaudit@campbellreith.com, gavin.sexton@camden.gov.uk, "Massam, Brendan JC" <brendan.jc.massam@jpmorgan.com>
Date: 07/04/2016 17:41
Subject: Ref: 12066-75 - Rona Road BIA repor

Elizabeth

Please find attached responses to the 3 queries with regards to the BIA on Rona Road as discussions.

I hope the enclosed is clear and answers the queries, however should you require any additional information or wish to discuss then please do not hesitate to contact me at this office.

Kind Regards

Graham Chapman

CEng MIStructE MSc BEng(hons)

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