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20 Albert Terrace Mews, Primrose Hill, London NW1 7TA

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-63

Revision: F1

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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 20 Albert Terrace Mews, Primrose Hill, London NW1 7TA, (planning reference 2017/0705/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 involves additions and alterations to include excavation of a single storey basement under the existing house and part of the front car port with rear lightwell and basement courtyard; erection of front entrance canopy and bin store; installation of 1 x front window, replacement of rear and side doors.

1.5. The BIA has been prepared by Card Geotechnics Limited (CGL) with supporting documents prepared by PR Structural Design Limited. The combined authors' qualifications are in accordance with LBC's requirements.

1.6. Revision 2 of the BIA provides sufficient Desk Study information to inform the BIA process, including the provision of historical mapping and a site walkover, to describe conditions at and local to the site. Local residents comments submitted in response to the original BIA identified potential issues, such as historic settlement of adjacent properties, the proximity of a historic well, the position of a sewer across the site and shallow groundwater. These issues have been addressed.

1.7. The site is within the Primrose Hill Local Flood Risk Zone, which is identified within the BIA revision 2, which also includes a site-specific flood risk assessment. Flood risk mitigation to the basement includes the construction of a 1.1m to 2.0m high southern boundary wall to divert surface water flows and the implementation of appropriate basement and site wide drainage.

1.8. Ground and groundwater conditions are considered based on 2 stages of investigation on site, nearby site investigations and historic bore records in the vicinity. This has yielded sufficient data for design purposes considering the proposed construction methodology and reported local subsidence and groundwater issues.

1.9. The proposed development retaining walls are to be constructed by a combination of underpinning and contiguous piled walls. Geotechnical design parameters and outline retaining wall calculations have been provided.

1.10. A conceptual site model has been provided in revision 2 of the BIA.

1.11. The ground movement and damage impact assessments have been updated in the revised submissions and the construction methodology confirmed. The updated assessment identifies maximum movements allowable to maintain damage impacts to neighbouring structures to Category 0 to Category 1 (Negligible to Very Slight). These limiting movements are considered achievable as long as temporary works are well controlled. A monitoring strategy based on the maximum allowable movements should be agreed under the Party Wall Act and implemented.

1.12. An outline drainage assessment has been presented in revision 2 of the BIA that includes consideration of attenuation SUDS to reduce off-site discharge flows in accordance with relevant best practice.

1.13. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. The additional information requested has been provided in the BIA revision 2 and the requirements of CPG4 have been met.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 28 March 2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 20 Albert Terrace Mews, Primrose Hill, London NW1, Camden Reference 2017/0705/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: "*Additions and alterations to include excavation of single storey basement under existing house and part of front car port with rear lightwell and basement courtyard; erection of front entrance canopy and bin store; installation of 1 x front window, replacement of rear and side doors*."

2.6. CampbellReith accessed LBC's Planning Portal on 18 April 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment, 20 Albert Terrace Mews, London NW1 (ref CG/18876]) dated February 2017 by Card Geotechnics Limited.
- Basement Impact Assessment Figures & Appendices, 20 Albert Terrace Mews, London NW1 (ref CG/18876]) dated February 2017 by Card Geotechnics Limited.
- Proposed and existing plans, elevations and sections numbered 15003_0100-2, 15003_0200-1, 15003_0300, 15003_2100-2, 15003_2200-2201, 15003_2300-1, 15003_1100-3, 15003_1200-1, 15003_1300-1, dated July 2016 by PR Structural Design Limited.
- Location and Block plan file name 1403-SI-001 dated January 2015, author unknown.
- Approved drawings from previous application 2015/0485/P, file name 1403-GA-100 dated January 2015.
- Planning, Design and Access Statement, 20 Albert Terrace Mews, dated February 2017, author unknown.
- Traffic Management Plan, File name 15003_SK_001-3 for 20 Albert Terrace Mews, NW1, no date, author unknown.
- Construction Management Plan, 20 Albert Terrace Mews, London, November 2016, author unknown.
- Construction Method Statement and Appendices, reference 16110, dated October 2016 by Structural engineer Paul Rogers.
- Arboriculture Report, reference 1-38-4210 dated 24 January 2017 by John Cromar's Arboricultural Company Limited.
- Comments and objections to the proposed development from local residents.

2.7. CampbellReith accessed the LBC Planning Portal during October 2017 and gained access to the following additional documents for audit purposes:

- Basement Impact Assessment Revision 2, dated October 2017 by Card Geotechnics Limited.
- Basement Impact Assessment Revision 2 – Figures, dated October 2017 by Card Geotechnics Limited.

- Basement Impact Assessment Revision 2 – Appendices A Photosheet, date unknown, by Card Geotechnics Limited.
- Basement Impact Assessment Revision 2 – Appendices B Proposed Development Plans, dated September 2016, by PR Structural Design.
- Basement Impact Assessment Revision 2 – Appendices C Historic Maps, dated August 2017 by Groundsure Limited.
- Basement Impact Assessment Revision 2 – Appendices D Historic BGS Borehole Logs.
- Basement Impact Assessment Revision 2 – Appendices E FRA & SUDS reports, dated September 2017 by GeoSmart Information.
- Basement Impact Assessment Revision 2 – Appendices F, G and H Factual Site Investigation Data, dated June 2017, by Card Geotechnics Limited.
- Basement Impact Assessment Revision 2 – Appendices I and J Structural Calculations, dated August & September 2017 by PR Structural Design.
- 20 ATM – Campbell Reith Queries, dated 03 Oct 2017 by Card Geotechnics Limited.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
Is data required by Cl.233 of the GSD presented?	Yes	
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
Are suitable plans/maps included?	Yes	Historical mapping to evidence desk study provided in revision 2 of the BIA, including comment on: neighbouring property reports a historic well on site; historic sewer connection reported from 20 Albert Park Road beneath site.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	The nearest watercourse to the site is the Regents Canal, some 85m to the south. The site is not underlain by an aquifer. Shallow groundwater and well reported by neighbours has been considered in the BIA revision 2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	SFRA consulted identifying Local Flood Risk Zone in BIA revision 2 and FRA provided.

Item	Yes/No/NA	Comment
Is a conceptual model presented?	Yes	A conceptual site model is presented in BIA revision 2.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	Residents' comments indicate a shallow water table and existing flooding at a neighbouring property, which was investigated in revision 2 of the BIA.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	The proposed development is within the Primrose Hill Local Flood Risk Zone. EA data indicates a medium – high flood risk. A detailed Flood Risk Assessment and Drainage assessment are provided in BIA revision 2.
Is factual ground investigation data provided?	Yes	Two shallow trial pits undertaken. Supplementary GI including insitu testing, revealing the full profile to be underpinned and allowance for groundwater monitoring reported in BIA revision 2.
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	Supplementary SI was carried out on June 2017.
Has a site walkover been undertaken?	Yes	Photos and commentary included in BIA revision 2.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	A basement is indicated at 21 Albert Terrace Mews.
Is a geotechnical interpretation presented?	Yes	Design parameters based on site-specific and nearby SI presented.
Does the geotechnical interpretation include information on retaining wall design?	Yes	Underpinning and contiguous piles are proposed. Reference to CIRIA C760 for secant piling is included in revision 2 of the BIA. Retaining wall methodology is identified and outline retaining wall calculations provided.

Item	Yes/No/NA	Comment
Are reports on other investigations required by screening and scoping presented?	N/A	
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	Revision 2 BIA considers all impacts.
Are estimates of ground movement and structural impact presented?	Yes	
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	The impact assessment included in BIA revision 2 considers flood risk, groundwater issues, drainage and land stability based on the revised GMA.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	Drainage, flood risk, temporary works based on ground / groundwater conditions and updated GMA are included in BIA revision 2.
Has the need for monitoring during construction been considered?	Yes	
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Drainage assessment provided in BIA revision 2.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	In BIA revision 2.

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	A non-technical summary is provided.

4.0 DISCUSSION

4.1. The proposed development involves additions and alterations to include excavation of a single storey basement under the existing house and part of the front car port with a rear lightwell and basement courtyard, erection of front entrance canopy and bin store, installation of 1 x front window and replacement of rear and side doors. The proposed basement is single storey and will be utilised as a residential dwelling.

4.2. The BIA has been prepared by Card Geotechnics Limited (CGL) with supporting documents prepared by PR Structural Design Limited. The combined authors' qualifications are in accordance the requirements of CPG4.

4.3. Reference desk study information provided within the BIA revision 2 is in accordance with the GSD Appendix G1, and includes historical map information and assessment and a description of the site and surrounding properties from a walkover survey. This second revision considers the many consultation responses reporting settlement of adjacent properties, the presence of a historical well at the adjacent property, the presence of a historical sewer connection running beneath the site and reported flooding to the neighbouring basement, and assessments updated accordingly.

4.4. The BIA identified that the Regents Canal passes some 85m to the south of the site, and no other ancient or current water courses pass within 150m of the site. Given these distances and the finding of the two-stage Ground Investigation, superficial deposits with their associated hydrogeological or stability impacts are not anticipated to be encountered during the development.

4.5. The screening stage identified that the site lies in an area of low to medium risk from surface water flooding. The Environment Agency indicates the site is at medium to high risk from surface water flooding. Additionally, the site is within the Primrose Hill Local Flood Risk Zone. A site-specific flood risk assessment is provided with BIA revision 2 which addresses potential flood risk. Flood risk mitigation to the basement includes the construction of a 1.1m to 2.0m high southern boundary wall to divert surface water flows and the implementation of appropriate basement and site wide drainage.

4.6. The BIA states that the site lies on Made Ground overlying designated unproductive strata, the London Clay. The London Clay is identified as the bearing formation for the proposed foundations. The original site investigation comprised two hand-dug trial pits which encountered Made Ground to 0.6m and 0.8m bgl over London Clay to 1.80m bgl, which was described as firm. There was no factual Ground Investigation report included with the original BIA.

4.7. Given that neighbours report extensive settlement of their properties, shallow groundwater and flooding of basements, and that the proposed basement is reliant on underpinning to form some of the structure, a site-specific site investigation was recommended, undertaken and a geotechnical assessment in line with the GSD Appendix G3 is presented in the BIA revision 2. The second stage of intrusive investigation was undertaken in June 2017 comprising two window sampler holes to 7.00m bgl and dynamic probe testing from 7.00m to 10.00m bgl. An investigation report is provided within the BIA revision 2, including the provision of engineering logs and both insitu and laboratory test data. A borehole log from a site some 30m away is also included, along with historic BGS borehole information, which together form the basis for the determined ground conditions and geotechnical parameters.

4.8. Groundwater was not detected in the trial pits which terminated at 1.80m bgl. Standpipes installed in the window sampler holes were subsequently monitored on two occasions for water and ground gas. The installations were found to be dry both on drilling and during monitoring visits on all but one occasion, when a standing water level of 5.04m bgl was recorded in WS2, which is the same depth as proposed pile toes. It is accepted that any water held in the London Clay is likely to be held in discrete units and not be laterally continuous. However, perched water may exist in the London Clay, and also within Made Ground.

4.9. Following the groundwater monitoring described in BIA revision 2, any temporary dewatering during construction will be carried out utilising isolated pumps and sumps to control groundwater seepage. The drainage assessment notes that cavity drainage will be provided in the permanent case.

4.10. The screening and scoping stage indicates that the potential for seasonal shrink swell subsidence in the London Clay at the site is unknown. However, the BIA states the proposed basement would not be affected by shrink swell movements, due to the depth of foundations, and further that no trees will be felled as part of the proposed development.

4.11. The scheme utilises underpinning and contiguous bored pile walls, with permanent reinforced concrete liner walls. The methodology for retaining wall construction at the front, on the side next to 19 Albert Terrace Mews, is confirmed in BIA revision 2. Geotechnical design parameters have been updated following the additional site investigation reported in BIA revision 2. Outline retaining wall design calculations are also presented.

4.12. Temporary works and propping arrangements are detailed in the main BIA report and the Construction Method Statement (CMS). These are generally considered appropriate, in line with the clarification of the construction methodology as described in 4.11 and confirmation of ground conditions following further site investigation. It is noted that reference to secant piling has been removed from the revised BIA, and the use of contiguous piles is confirmed.

4.13. The BIA includes a ground movement assessment (GMA) and a corresponding damage impact assessment. The assessments consider both the installation and excavation effects of piles and underpins, deflection of the walls, and movements generated by heave in both the long term and short-term condition.

4.14. The original GMA stated that it 'assumes perfect workmanship in the underpin construction' and on that basis settlement should not exceed 5mm. The assumption of 'perfect workmanship' was not considered reasonably conservative and further assessment was requested.

4.15. The revised GMA has identified critical sections with neighbouring properties and contour plans are presented. The combined effects of settlement and heave have been considered. Limiting horizontal movements have been stated in order to control damage impacts to neighbours to within Category 0 to Category 1 (Negligible to Very Slight). In general, the predicted movements are in line with expectations for a development of the proposed depth and scale, considering the construction methods to be utilised. These limiting movements are considered achievable as long as temporary works are well controlled, including the use of stiff temporary and permanent props, as outlined. A monitoring strategy based on the maximum allowable movements should be agreed under the Party Wall Act and implemented, with trigger levels linked to the predicted movement limits to control damage impacts to within Category 1.

4.16. An outline drainage assessment has been presented in revision 2 of the BIA that includes consideration of attenuation SUDS to reduce off-site discharge flows in accordance with relevant best practice.

4.17. A conceptual site model is presented in the BIA revision 2.

5.0 CONCLUSIONS

5.1. The proposed development involves additions and alterations to include excavation of a single storey basement under the existing house.

5.2. The combined authors' qualifications of the BIA are in accordance the requirements of CPG4.

5.3. Desk study information, including historical mapping and a site walkover to assess conditions at and local to the site, has been provided.

5.4. The site is within the Primrose Hill Local Flood Risk Zone. A site-specific flood risk assessment is provided within the BIA revision 2. Mitigation measures are proposed that includes the construction of a 1.1m to 2.0m high southern boundary wall to divert surface water flows and the implementation of appropriate basement and site wide drainage.

5.5. Further site investigation details are provided in BIA revision 2, including appropriate insitu and laboratory testing and geotechnical interpretation.

5.6. The proposed basement will be founded within the London Clay. There are no impacts to the wider hydrogeological environment.

5.7. The proposed construction methodology, including temporary and permanent works, geotechnical design parameters and outline retaining wall calculations have been provided.

5.8. In general, the predicted movements in the GMA are in line with expectations for a development of the proposed depth and scale, considering the construction methods to be utilised. A monitoring strategy based on the maximum allowable movements should be agreed under the Party Wall Act and implemented, with trigger levels linked to the predicted movement limits to control damage impacts to within Category 1.

5.9. A drainage assessment considering the implementation of attenuation SUDS, in accordance with LBC guidance, has been presented and should be implemented. There are no impacts to the wider hydrological environment.

5.10. Queries and matters requiring further information or clarification are summarised in Appendix 2. The additional information requested has been provided and the BIA meets the requirements of CPG4.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Walker	Flat 9, 39 Regents Park Road	18 March 2017	Concerned that further excavation in the local area will cause ground movement and settlement at their property. Outline concerns regarding the impact on drainage and groundwater flow to their property which is at the lowest point.	4.5, 4.13-4.16, 4.17
Goodden & Thomas	Flat 6, 47 Regents Park Road	07 March 2017	Concerned about ground vibrations and impact on the road during the construction phase.	4.13 - 4.16
McCririck	9/10 Albert Terrace Mews	13 March 2017	Concerned that existing subsidence at no.s 19, 20 & 21 is not being taken into consideration, including subsidence of the road outside these properties and opposite, no. 10 already having suffered subsidence and required underpinning. Concerned that flooding exists in the basement of no. 21 (pump utilised 24hrs a day) will be compounded by this development. Anecdotal evidence that a well was discovered at no. 19.	4.3, 4.5, 4.13-4.16
Powell	18 Albert Terrace Mews	05 March 2017	Concerned about short and long term ground movement and clay heave, sites examples of remedial structural repairs required at nearby properties as a result of basement excavation at no.s 11 and 21. Concerned about impact on surface and underground water flows to both buildings and the road.	4.5, 4.13-4.16, 4.17
Stillit	7 Albert Terrace Mews	23 March 2017	Concerned about subsidence, owners property already underpinned due to effects of subsidence. Concerned about subsidence in the road. Concerned about flooding, siting the example no. 21 being subject to heavy flooding during/following a basement construction.	4.5, 4.13-4.16, 4.17
Chappell	77 Newman Street	30 March 2017	Concerned that 20 Albert Terrace Mews is in a 'High' flood risk area from surface water and this is not being taken into account. Concerned about subsidence and the need for underpinning at nearby properties.	4.5, 4.13-4.16
Pattison	Flat 1, 20 Prince Albert Road	22 March 2017	Concerned at suggestions that his flat is underlain by a basement. Concerned that information on drainage in the vicinity may have been overlooked, suggests that a sewer from 20 Prince Albert Road passes beneath 20 Albert Terrace Mews. Concerned about long-term impacts of the development on subsidence and hydrology.	4.3, 4.5, 4.13-4.16

Robinson	2 Albert Terrace Mews	23 March 2017	Concerned about increased subsidence in the road.	4.13 – 4.16
Chappell	20 Prince Albert Road	22 March 2017	Structural and hydrological concerns relating to the impact of the proposal, in particular flooding and subsidence.	4.5, 4.13-4.16
Gordon	19 Prince Albert Road	12 March 2017	Concerned about the increased risk of subsidence and flooding and potential changes to the soil and water table, particularly in relation to his own property which is partially underpinned.	4.5, 4.7-4.9, 4.13-4.16
16-22 Prince Albert Road Residents Association	19 Prince Albert Road	12 March 2017	Concerned about the risk of subsidence, and states that the area has already suffered from subsidence. Concerned that the development will affect the water table and cause flooding.	4.5, 4.7-4.9, 4.13-4.16
Sacks	19 Prince Albert Road	12 March 2017	Concerned about the development causing subsidence. Outlines that the area has a history of ground movement. Concerned that the development will increase the risk of flooding.	4.5, 4.13-4.16
Woodcock	47 Regents Park Road	10 March 2017	Concerned about potential for increased flooding, states that since building works along Albert Terrace Mews started around 2003 his basement flat floods frequently, whereas it didn't flood prior to this (1974-2003).	4.5
Arditti	Flat L, 37 Regents Park Road	09 March 2017	Concerned that the construction works will cause subsidence and additional damage (cracking) to his property	4.13-4.16
Groenvold	19 Albert Terrace Mews	08 March 2017	Concerned that the flooding at no. 21 Albert Terrace Mews has not been taken into account in the hydrology and hydrogeology assessments of the BIA.	4.5, 4.7-4.9
unknown	unknown	unknown	Concerned that the determined ground conditions are based on historic borehole data and not site specific information. Concerned that the proposed development will increase the risk of subsidence and hence building damage in the vicinity. Concerned that subsidence in the road will increase. Concerned that underground infrastructure (a sewer) exists beneath the property.	4.3, 4.5 – 4.9, 4.13-4.16
Marks	1 Albert Terrace Mews	7 March 2017	Concerned that there is a flood risk in the area of no. 21, and that settlement associated with the proposed development would exacerbate the subsidence risks and cause further damage to surrounding properties,	4.3, 4.5, 4.13-4.16

			including those that are already underpinned. Also concerned about subsidence and flooding of the road.	
Hoffmann-Howard	2nd Floor Flat, 41 Regents Park Road	3 March 2017	Concerned about structural damage to neighbouring properties especially subsidence related damage to the older surrounding properties.	4.13 – 4.16

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA	Desk Study information and assessment – historical mapping and site walkover	Closed	October 2017
2	Hydrology	Flood Risk Assessment – the site is within a Local Flood Risk Zone	Closed	October 2017
3	Stability / Hydrogeology	Site specific investigation required – including insitu testing and groundwater monitoring	Closed	October 2017
4	Hydrogeology	Temporary dewatering, waterproofing, impacts to neighbouring basements	Closed	October 2017
5	Stability	Geotechnical parameters and outline retaining wall design calculations	Closed	October 2017
6	Stability	Temporary works methodologies to be confirmed and updated, if required, following additional site investigation to include further mitigation	Closed	October 2017
7	Stability	Ground movement and damage impact assessments – to be revised	Closed	October 2017
8	Hydrology	Attenuation SUDS Assessment in accordance with CPG4 3.51	Closed	October 2017
9	BIA	Conceptual Site Model	Closed	October 2017

Appendix 3: Supplementary Supporting Documents

None – Available on LBC Planning Portal

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