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consulting engineers

1 Spencer Rise, London, NW5 1AR

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12727-95

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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 1 Spencer Rise, London NW5 1AR (planning reference 2018/2442/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 to provide basement accommodation under the existing two storey terraced property with lightwells to the front and rear.

1.5. The BIA has been prepared by Ground & Water with supporting documents prepared by Vincent & Rymill. The authors' qualifications are in accordance with the requirements of CPG guidelines.

1.6. A desk study broadly in accordance with LBC guidance is presented. In the revised submissions, the structural engineer states that no utilities other than those serving the property will be impacted by the works. However, utility information has not been provided and queries remain on the geotechnical assessment and ground movement assessment (see 1.7, 1.8 and 1.12).

1.7. A site investigation has identified a varying thickness of Made Ground underlain by the London Clay Formation. The updated submissions include revised soil descriptions and provision of insitu testing. However, uncertainty remains on the insitu strength / density of the soils below formation level (see 1.11) and the geotechnical information provided. Despite correspondence with the BIA authors (presented in Appendix 3), the conclusions of the assessment are not accepted as being "sufficiently robust and accurate", as required by Section 6 of the BIA Audit Terms of Reference.

1.8. In regard to foundation design, the BIA states that *"care should be taken not to overstress any underlying soft spots"*. Given the limited amount of site investigation undertaken, and the soft clay encountered, the feasibility of achieving this with the current foundation design has not been demonstrated. It is not considered that the geotechnical assessment makes "use of cautious or moderately conservative engineering values / estimates", as required by Section 6 of the BIA Audit Terms of Reference.

1.9. The monitoring data indicates that the basement is likely to be above standing groundwater level, although shallow perched water is likely to be encountered during construction. It is stated that

there will be no impact to the hydrogeological environment, as discussed in Section 4. Stability during construction is proposed to be maintained by local sump pumping (see 1.14).

1.10. The BIA identified that the assumed course of the "lost" River Fleet runs approximately 30m west of the site. Comments from local residents indicate that this tributary has been culverted beneath York Rise.

1.11. The basement will be constructed utilising underpinned retaining walls and a ground bearing basement slab. Structural calculations and retaining wall design are provided for review along with sequencing and propping information. However, as 1.7 and 1.8, the geotechnical information provided is not accepted as sufficiently accurate to demonstrate the impacts from of the proposed design.

1.12. A Ground Movement Assessment (GMA) is presented that considers the movements relating to the proposed basement construction and the impact to the adjacent properties and rear retaining wall. The GMA is not accepted, as discussed in Section 4.

1.13. It is recognised that the neighbouring building already suffers from Category 2 (Slight) structural damage. The BIA proposes mitigation measures to reduce impacts on the neighbouring building. However, the GMA is not accepted and therefore the extent of any required mitigation cannot be confirmed.

1.14. The revised submissions include mitigation measures designed to maintain stability during construction: groundwater control via sump pumping; temporary propping; structural monitoring; transition pins to neighbouring structures. Given the uncertainties remaining in the BIA, stability impacts have not been demonstrated to have been mitigated.

1.15. The site is at very low risk of surface water flooding and fully under hard cover. It is accepted there will be no impact to the wider hydrological environment.

1.16. Queries and matters requiring further information or clarification are discussed in Section 4 and summarised in Appendix 2. The BIA does not meet the criteria of CPG: Basements.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 24 July 2018 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 1 Spencer Rise, London NW5 1AR, Camden Reference 2018/2442/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: Basements.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- The Local Plan (2017): Policy A5 (Basements).

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment; 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 Planning Portal describes the planning proposal as: *"Excavation of single storey basement underneath the residential building (Class C3) with front and rear closed lightwells"*.

LBC's Planning Portal confirmed that the site lies within the Dartmouth Park Conservation Area but is not a Listed Building.

2.6. CampbellReith accessed LBC's Planning Portal on 17 August 2018 and gained access to the following relevant documents for audit purposes:

- Ground Investigation and Basement Impact Assessment (ref GWPR2459/GIR/July 2018, V1.02), dated July 2018 by Ground and Water.
- Structural design, construction sequence and temporary works report dated March 2018 by Vincent & Rymill.
- Drawings by Edward Williams Architects: Plans for existing ground, first floor and roof plan, sections, elevations and a site location plan; Plans for proposed lower ground floor, ground floor, sections and elevations.
- Planning Design Access and Significance Appraisal dated May 2018 by Michael Burroughs Associates.
- Tree report dated April 2018 by Tretec.
- Comments and objections to the proposed development from local residents.

2.7. CampbellReith was provided with the following relevant documents for audit purposes in December 2018:

- Ground Investigation and Basement Impact Assessment (ref GWPR2459/GIR/November 2018, V2.01), dated November 2018 by Ground and Water.
- Structural design, construction sequence and temporary works report (issue 3) dated November 2018 by Vincent & Rymill.
- Photographs to support previous comments and objections to the proposed development from local residents.

2.8. CampbellReith was provided with the following additional documentation to review between January and April 2019:

- Ground Investigation and Basement Impact Assessment (ref GWPR2459/GIR revisions V3.01, 4.01 and 5.01), most recent dated March 2019 by Ground and Water.
- Visual Survey to 1A, 1C, 3 and 7 Spencer Rise dated 31 January 2019 by Vincent & Rymill.
- Objection Letter dated 20 December 2018 by First Steps Ltd.

2.9. CampbellReith was provided with the following responses and documents to review between July and November 2019, including correspondence between CampbelReith and the BIA authors:

- Ground Investigation and Basement Impact Assessment (ref GWPR2459/GIR revisions V5.02 and V7.01), dated July and October 2019 by Ground and Water.
- Ground & Water Response to CF (sic) Audit 3 (July 2019).

- Ground & Water Response to CF (sic) Audit 4 (October 2019).
- CampbellReith Email to LBC 6th September 2019.

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?	No	Whilst the structural report states that utilities will not be impacted, utility information is not provided; GMA is not accepted and therefore zone of influence of the works is not defined.
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	
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Report, Section 3.1.2.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Report, Section 3.1.1.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Report, Section 3.1.3.
Is a conceptual model presented?	Yes	Described in text.

Item	Yes/No/NA	Comment
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Report, Section 3.2. Consideration of reported structural damage to the retaining wall at the rear of the garden is discussed in revised submissions.
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Report, Section 3.2. Revised to discuss perched water in Made Ground and Head Deposits.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Report, Section 3.2.
Is factual ground investigation data provided?	Yes	BIA Report, Sections 4 and 5. Review soil descriptions; insitu shear strength to be confirmed.
Is monitoring data presented?	Yes	Further monitoring recommended.
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	It is reported that 1c Spencer Rise has a lower ground floor at the rear of the building to a depth of 1.2m below rear garden level and that 3 Spencer Rise does not appear to have an existing basement (BIA Report, Section 3.1.2).
Is a geotechnical interpretation presented?	Yes	BIA Report, Sections 6.1 and 7 and further discussed in submissions in July and October 2019. Although updated in the revised submissions, the information provided is considered inconsistent and insufficiently robust, reliable and moderately conservative, as discussed in Section 4.

Item	Yes/No/NA	Comment
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA Report, Section 7.4.
Are reports on other investigations required by screening and scoping presented?	Yes	An Arboricultural Assessment is provided.
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	BIA Report, Section 7.9. However, not all assessments accepted, see Section 4.
Are estimates of ground movement and structural impact presented?	Yes	BIA Report, Section 7.6. However, not accepted, see Section 4.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	No	Further consideration of ground / groundwater conditions in relation to stability; geotechnical interpretation and GMA not accepted; see Section 4.
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	No	Assessment not accepted; additional mitigation may be required.
Has the need for monitoring during construction been considered?	Yes	Appendix 4 of the Vincent & Rymill report.
Have the residual (after mitigation) impacts been clearly identified?	No	Assessment not accepted; additional mitigation may be required.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	Consideration of ground / groundwater conditions in relation to stability; geotechnical interpretation and GMA to be reviewed.

Item	Yes/No/NA	Comment
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	No	Further consideration of ground / groundwater conditions in relation to stability required; geotechnical interpretation and GMA to be reviewed.
Does report state that damage to surrounding buildings will be no worse than Burland Category 1?	Yes	However, not accepted; geotechnical interpretation and GMA to be reviewed.
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been prepared by Ground & Water with supporting documents prepared by Vincent & Rymill. The authors' qualifications are in accordance with the requirements of CPG guidelines.

4.2. The proposed scheme involves the excavation of a single storey basement below the entire footprint of a two storey, terrace residential property, with the basement formation level at 4.00m below ground level (bgl). Lightwells will be provided to the front and rear of the building.

4.3. The site investigation and BIA have been informed by a desk study broadly in accordance with the GSD Appendix G1. In the revised submissions, the structural engineer states that no utilities other than those serving the property will be impacted by the works. Utilities information is not presented and the zone of influence indicated in the ground movement assessment (GMA) is not accepted (see 4.14). Consequently, the absence of any impact to utilities should be confirmed once the GMA is updated.

4.4. The site investigation identified a varying thickness of Made Ground underlain by the London Clay Formation. Previous audits noted that: "some soil descriptions are consistent with Head Deposits, there are no descriptions of clay stiffness and no insitu testing has been undertaken. It's accepted that the London Clay is present at formation level (4.00m bgl). Review of the shallower soils should be undertaken, with consideration of potential stability or hydrogeological impacts."

4.5. In the revised submissions soil descriptions have been revised to include Head Deposits, and insitu testing has been undertaken in 1no borehole. Insitu testing comprises standard penetration tests (SPTs). It is noted that whilst SPTs were undertaken at 1m intervals to 4.00m bgl (formation level), the next reported SPT is at 6.00m bgl, indicating an N value of 7 (soft clay).

4.6. In the most recent responses (between July and November 2019), additional statements regarding the adopted ground profile and interpreted geotechnical parameters have been submitted. However, with reference to the LBC BIA Audit Terms of Reference (specifically Section 6, Principles for Audit), it has not been demonstrated that:

- *the conclusions have been arrived at based on all necessary and reasonable evidence and considerations, in a reliable, transparent manner … with sufficient attention paid to risk assessment and use of cautious or moderately conservative engineering values/estimates.*
- *the conclusions of the various documents/details comprising the BIA are consistent with each other.*
- *the conclusions are sufficiently robust and accurate.*

4.7. Further to 4.6, the adopted ground profile ignores data from one exploratory hole, which the author "does not consider to be reliable", and relies upon data from the other exploratory holes which do not provide consistent or complete testing data at and below the proposed formation

level. As detailed in 4.12, the assessment based on this incomplete and inconsistent ground profile is not considered to be reasonably conservative; nor has the accuracy of the data and assessment been demonstrated.

4.8. The presence of Head Deposits has been noted and identified as a secondary aquifer. Additionally, updated monitoring data indicates that the basement is likely to be above standing groundwater level, although it is reported that shallow perched water is likely to be encountered during construction. It is stated that there will be no impact to the hydrogeological environment, as the variable monitoring results appear consistent with perched water rather than "a significant saturated aquifer". The BIA states that, considering no nearby or adjacent basements, there should be no cumulative impact on groundwater flow.

4.9. Given that existing foundations likely prevent any perched water flows within Made Ground, and unobstructed routes for any limited perched water flow through the shallow Head Deposits exist to the front and rear of the property, it is accepted that impacts to the hydrogeological environment is likely to be limited.

4.10. Stability during basement construction utilising underpins could be impacted by flow of perched water into the excavation. The BIA states stability will be maintained by local sump pumping, which should be feasible if integrated into the temporary works strategy by an appropriately experienced contractor.

4.11. The BIA identified that the assumed course of the "lost" River Fleet runs approximately 100m west of the site between the site and Highgate Road. Further assessment of Figure 11 of the Camden Geological, Hydrogeological and Hydrological Study (Lost Rivers of London) indicates that the tributary of the River Fleet historically flowed approximately 30m west of the site. Comments from local residents indicate that this tributary has been culverted beneath York Rise.

4.12. The basement will be constructed utilising underpinned retaining walls and a ground bearing basement slab. Structural calculations and retaining wall design are provided for review along with sequencing and propping information. However, the information provided is not accepted as sufficient to demonstrate the impacts from the proposed design, given that:

- Whilst interpretative geotechnical information has been revised, a very large range of insitu shear strength (35 to 275kPa) has been interpreted, based on some test results but ignoring one set of data. The data utilised has not been demonstrated to be representative.
- The proposed bearing capacities are stated to "take into account the potential softer soils encountered at 6.00m bgl". The proposed bearing capacities are not considered to be reasonably conservative, considering both the SPT result at 6.00m bgl and the unknown shear strength (due to lack of test data) immediately below proposed foundation level.

- the BIA states that “care should be taken not to overstress any underlying soft spots”. Given the limited amount of site investigation undertaken, the soft clay encountered and the unknown soil strength immediately below foundation level, the feasibility of achieving this with the current foundation design has not been demonstrated.
- In the various revisions of the BIA presented, bearing capacities, geotechnical parameters and assessed settlements have varied considerably. It has not been demonstrated that the assessments are sufficiently robust and accurate.

4.13. Heave calculations have been undertaken, and the revised calculations indicate significantly smaller movements than originally calculated. It is noted that the structural design will incorporate heave protection beneath the slab. As the ground profile and geotechnical parameters are not accepted, the robustness of the heave assessment has not been demonstrated.

4.14. A Ground Movement Assessment (GMA) is presented, which has been updated in recent submissions, that considers the movements relating to the proposed basement construction and the effect on the adjacent properties along Spencer Rise. For the structures assessed, a maximum damage Category of 1 (very slight) in accordance with the Burland scale is indicated. The GMA is not accepted because the underlying ground profile and geotechnical assessment, upon which the GMA is reliant, is not considered to be robust, accurate or moderately conservative.

4.15. It is noted that neighbours reported existing structural damage and structural inspection was carried out, indicating existing Category 2 (Slight) damage to the closet wing of 1C Spencer Rise. In order to mitigate this, the BIA proposes that transition pins should be provided beneath neighbouring foundations. Whilst this approach is agreed with, as the magnitude of movements presented in the GMA and potential impacts are not accepted, the extent of required mitigation cannot be confirmed. Additionally, it should be noted that the Burland damage assessment is contingent upon assessed structures being undamaged. Therefore, in advance of any works, repairs to damaged walls should be completed or impacts may be worse than predicted.

4.16. It is further noted that the structural engineer states no utilities other than those serving the property will be impacted by the proposed works. Given that the GMA is not accepted, the zone of influence is not confirmed, and utilities information has not been presented, potential impacts to utilities remain to be confirmed.

4.17. The revised GMA does consider potential impacts to the retaining wall at the rear of the property. However, given the uncertainties with the GMA, this assessment is not accepted.

4.18. Structural monitoring is proposed during the construction works. Any monitoring strategy adopted should be based on a robust GMA.

4.19. Spencer Rise is within Critical Drainage Area (Group 3-001), although this was not identified within the BIA screening or scoping process. The site is located adjacent to the York Rise flood risk zone but not within it. The site did not flood in either 2002 or 1975 although York Rise (to the west of the site) did flood in 1975 and York Rise is at 'low' risk of surface water flooding and of being at risk from reservoir flooding. The site is at very low risk of surface water flooding, although standard flood risk mitigation measures are recommended to be incorporated into the final design.

4.20. It is reported that the site area is currently 100% impermeable and there will be no change under the proposed development. There will be no impact to the wider hydrological environment. The final drainage design will need to be approved be in accordance with LBC's and Thames Water's requirements

5.0 CONCLUSIONS

5.1. The authors' qualifications are in accordance with the requirements of CPG Basements.

5.2. The structural engineer states that no utilities other than those serving the property will be impacted by the works. However, based on the current GMA and lack of utility information, this remains to be confirmed.

5.3. The updated submissions include further statements regarding the ground profile and adopted geotechnical parameters for assessment. However, uncertainty remains on the insitu strength of the soils below formation level and the geotechnical interpretation provided.

5.4. Given the limited amount of site investigation undertaken, and the soft clay encountered, the feasibility of the current foundation design has not been demonstrated.

5.5. It is stated that there will be no impact to the hydrogeological environment, as discussed in Section 4. This is accepted. Stability during construction is proposed to be maintained by local sump pumping.

5.6. A revised Ground Movement Assessment (GMA) is presented. The GMA is not accepted because the underlying ground profile and geotechnical assessment, upon which the GMA is reliant, are not accepted.

5.7. The site is at very low risk of flooding.

5.8. There will be no impact to the wider hydrological environment.

5.9. With reference to the LBC BIA Audit Terms of Reference, it has not been demonstrated that:

- *the conclusions have been arrived at based on all necessary and reasonable evidence and considerations, in a reliable, transparent manner … with sufficient attention paid to risk assessment and use of cautious or moderately conservative engineering values/estimates.*
- *the conclusions of the various documents/details comprising the BIA are consistent with each other.*
- *the conclusions are sufficiently robust and accurate.*

Therefore, the requirements of CPG Basements have not been met.

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

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Dogmetchi	Not provided	27/06/2018	There has been 'substantial subsidence to a number of houses in the street'. The application's references to flood risk seem to make no clear mention of the presence of the River Fleet in a culvert under York Rise.	Section 4
Black	Not provided	27/06/2018	Concerns about foundations and party walls of adjoining properties during excavation. A consequence of the recent work to contain flooding on the Heath could be to risk increasing the run-off of excess water into the Fleet. This passes the bottom of Spencer Rise, only 30 metres away and at approximately the same depth as the bottom of the proposed basement. I would also like to emphasise the known risk of subsidence in the street. This has already affected several properties and can only be increased by the excavation.	Section 4
Blaxland	Not provided	07/07/2018	Spencer Rise comprises late 19th century houses on a hill with historic problems of subsidence. A basement development would have the potential to contribute to structural damage to my property which is 2 doors down from the proposed site. The Fleet River runs beneath York Rise at the bottom of the street. Issues of flood risk caused by disturbance to the infra-structure as a result of the development cannot be ignored.	Section 4
Vocadlo	Not provided	10/07/2018	Concerns regarding subsidence: there is history of subsidence in Spencer Rise, and such excavations, together with the heavy-duty machinery, trucks and lorries required that will be trundling down the street, may cause or accelerate further subsidence.	Section 4 and Construction Management Plan
Owen	Not provided	12/07/2018	There has been 'substantial subsidence to a number of houses in the street'. The application's references to flood risk seem to make no clear mention of the presence of the River Fleet in a culvert under York Rise.	Section 4

Anderson	Not provided	13/07/2018	Spencer Rise is a row of Victorian terraced houses built on a hill, on clay with an underground river at the bottom and an underground stream running down the hill. Many houses have already had to deal with subsidence and there is a fear that both large scale excavation and the insertion of rigid structures can have an impact far beyond the immediate environs of this work.	Section 4
Tyacke	Not provided	16/07/2018 28/11/2018	Numbers 1a, 1b and 1c Spencer Rise are nineteenth-century historic in-fills, between no. 6 York Rise and no. 1 Spencer Rise. In the 1970s 6 York Rise was demolished, having been allowed to fall into decay. Following this, for some five years the site remained vacant. Despite 1a Spencer Rise being propped up by raking shores, significant movement of the party wall occurred during the interim. The present building at 6 York Rise comprises two flats and a maisonette; albeit brick-faced, it is essentially a ferro-concrete construction. In the late 1980s cracks appeared in the party wall between 1a and 1b Spencer Rise. Clay shrinkage was diagnosed as part of the problem, although the effects of unnatural rigidity introduced by the new building at 6 York Rise cannot be ruled out. In the event, it was decided not to underpin the party wall between 1a and 1b Spencer Rise, but simply to make good the damage; less severe cracking has continued to occur, particularly where the main buildings adjoin the rear extensions. Spencer Rise, as the name implies, is built on a hill slope at the bottom of which stand nos. 1, 1c, 1b and 1a (in that order). Given the relatively recent history of movement and cracking, the proposed development at 1 Spencer Rise is very worrying. Not only will the construction of a presumably concrete basement introduce further unnatural rigidity but yet more drying out of the underlying clay is bound to occur. Cracking and movement of the adjacent houses will be the likely result. There are also serious issues concerning sewerage and drainage more generally, as well as the mains water supplies. Existing ground plans are likely to be highly inaccurate. Sewers and drains run under the terrace houses concerned, from back to front and some would appear to be interconnected. Furthermore in the case of 1a Spencer Rise the mains water supply runs under the house from front to back, and this may not be untypical. We are in fact dealing here with a quite delicate infrastructure,	Section 4

			originally dating back to the nineteenth century, and one which has already been adversely affected by recent building. Photos have been provided (28/11/2018) indicating existing cracking to 1A Spencer Drive.	
Baigneres	Not provided	17/07/2018	We live on the same side as no1. Our house, like most of the houses here, has very shallow footings over clay soil - the earth is a foot below the floorboards - and has moved several times (lateral movement) over the years. The entire row of houses, pushing as it does down the hill, depends on the integrity of the soil beneath it. Several houses on this side have suffered subsidence as well as lateral movement as a result. We therefore do not see how these kind of works, entailing substantial movement of earth downhill from us, could prevent slippage further up the hill which could possibly lead to damage to our house. Evidence of movement can also be seen in the road outside. We also suspect any water running down the hill underground to join the Fleet at York Rise must run close to or below our house. Which is one reason we believe no house on this side beyond a certain point on the hill has a basement that was not part of its original build.	Section 4
Imray	Not provided	Not provided	Most if not all of the houses on Spencer Rise were cheaply constructed with only minimal foundations and therefore the street is susceptible to movement with a history of subsidence and underpinning. Movement on the north side is greater than that on the south so in the long term there must be a risk that substantial disturbance through excavation and groundworks on this bottom-of-street site will affect the stability not just of immediately adjacent houses but also of those further up the road. The River Fleet runs 30 metres away underneath York Rise. There is a possibility that instability on the north side has been exacerbated by the presence of groundwater behind or below the houses on that side. Residents report drainage and damp issues.	Section 4

Schneebeli	Not provided	19/07/2018	Concerns about the disruption to groundwater. Historically there was a large pond in York Rise at the bottom of Spencer Rise along the course of the Fleet River which now runs in a very large brick culvert under the road. There is a feed stream to the Fleet that runs behind the houses on the north side of Spencer Rise. Ms. Schneebeli is a 'near neighbour downhill from 1 Spencer Rise' and has continuous wet ground in her garden which is at the bottom of the hill and incurable damp walls in the ground floor of her house. The house directly behind the applicant's house has a 3 metre retaining wall with my garden which is not in good condition.	Section 4
Anonymous	Not provided	21/07/2018	Spencer Rise has a pronounced slope and there is already regular significant subsidence and ground movement to properties within the vicinity of the proposed development. Concerns about ground movement and subsidence to adjacent and other neighbouring properties.	Section 4
Briscoe	Not provided	28/07/2018	Concerns regarding subsidence and lack of assessment of culverted River Fleet under York Rise.	Section 4

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	BIA	Utility infrastructure information to be provided, noting neighbours' comments of drainage beneath the property.	Open. The Structural Engineer states there will be no impact to utilities. Since the GMA / zone of influence is not accepted, potential impacts to utilities remain to be confirmed (see 5).	
2	Stability / Hydrogeology	Factual site investigation data to be reviewed and interpretative assessment of geological units considered.	Open	
3	Stability / Hydrogeology	Further groundwater monitoring recommended and consideration of potential for groundwater flow in regard to hydrogeological impacts and impacts to stability during underpinning, including mitigation proposals, as required.	Closed – accepted that limited impact to groundwater flow. Closed – contingency dewatering during construction to maintain stability	April 2019 December 2018
4	Stability	Insitu shear strength of soils to be established; design parameters to be reviewed.	Open	
5	Stability	GMA to be reviewed in accordance with comments in Section 4, including impacts to utilities and retaining wall to be assessed.	Open	
6	Stability	Reported structural damage by neighbours to be considered and mitigated, as required.	Open. Mitigation proposed; this can only be confirmed once GMA accepted.	
7	Stability	Structural method statement and calculations to be revised to consider slope across site.	Closed	December 2018
8	Stability	Structural monitoring proposals to be reviewed following update to GMA. Text and drawings to be consistent.	Proposals should be confirmed based on an accepted GMA.	December 2018

Appendix 3: Supplementary Supporting Documents

Ground & Water Response to CF Audit 3 (July 2019)

Ground & Water Response to CF Audit 4 (October 2019)

CampbellReith Email to LBC 6th September 2019

1 Spencer Rise
G&W response to CF Audit 3

Based on the previous audit and discussions with Graham we provided everything that was asked for and we also double checked this with Graham about its validity.

Technical queries were communicated via emails exchanged between G&W and CF between 22nd February- 25th March. We received an e-mail from Graham on the 11.02.19 with some queries. We replied on the 11.03.19. Graham replied on the 13.03.19 We check on the 25.03.19 that CF had no further outstanding issues and we confirmed on the same day that we would reply with the additional comments on this basis.

Campbell Reith's audit report (dated May 2019) states under Item 1.16 that "the queries and matters requiring further information and clarification are discussed in Section 4 and summaries in Appendix 2". We provide the following response below.

Section 4 Response

4.1- Noted, no further issues/ actions required
4.2- Agreed, no further issues/ actions required
4.3 (Utilities information missing/ GMA not accepted)
The structural report has already been revised to take into account the impact on utilities in the road. As the impact on utilities is contingent upon the acceptance of the GMA, please see the answers below regarding the GMA (4.12)
4.4 (Shallower soils review)
Yes noted, a review of shallower soils was undertaken during the additional site investigation (Specific sections with in the BIA- section 5.1 and 7.1 discuss the shallow soils, their classification and impact on the design)
4.5- Noted, no further issues/ actions required
4.6- Noted, no further issues/ actions required
4.7- Noted, no further issues/ actions required
4.8- Noted, no further issues/ actions required
4.9- Noted, no further issues/ actions required
4.10 (Soil strength)
First point: Bearing Capacity
- Proposed bearing capacity: CR incorrectly understand that the proposed bearing capacity as "up to 130kPa". This is the limit state as referred to in Eurocode 7

- The proposed bearing capacity not reasonably conservative: Our proposed bearing capacity is between 50-75kPA (as per the tables on page 28 of the attached report/33 of the pdf) which is in fact reasonably conservative.

- SPT result at 6m: As explained previously to CR the bearing capacity provided has been determined using Geostru software. The programme uses the in-situ strength data obtained from BH1 and splits the borehole up into 1m thick layers. Literature based values for undrained shear strength, elastic and consolidation moduli are then applied and bearing capacity/settlement analysis undertaken within those 1m layer. The reduction in shear strength at depth is therefore present and has been analysed. Therefore, it is considered that we have been reasonably conservative with respect to the proposed bearing capacity.

- Unknown shear strength: in 2 areas, we have shear strength data below proposed foundation level (BH1 and DP1) and in 3 areas, we have samples below the base level (BH1, WS1 and WS2). Therefore it is considered that we have been reasonably conservative with respect to the proposed bearing capacity, please see above.

Second point: Soft spots and foundation design

- Overstressing underlying soft spots: CF accepts in item 4.3 that the site investigation and BIA has been informed by a desktop study broadly in accordance with the GSD appendix G1.

- Limited site investigation: The site investigation undertaken is suitable for a project of this size. Guidance requires 3 number boreholes which is the amount undertaken in this BIA and therefore is in accordance with relevant guidance (ARUP report reference 213923, November 2010).

- Soft clay encountered:
- Unknown soil strength immediately below foundation level
- Suitability of current foundation design

Third point: Settlement calculations

- Bearing in mind the depths of excavation (4m), the bearing pressure can be calculated as 4m x 15-20kPa = 60- 80kPa. Therefore the settlement calculations are perfectly realistic as one is simply imposing the same load in the design as has been removed by the excavation. In this situation, it is perfectly reasonable that settlement is calculated as less than 1mm. (page 28 of report/33 of PDF attached).

4.11 (Heave calculations)

- The heave of 5-8mm quoted by CR in item 4.10 is derived from page 31 of the BIA/page 36 of the PDF which shows the predicted vertical displacement although we are not sure how the precise number ranges of 5-8mm is arrived at by CR.

Although heave under the slab is expected following overburden removal, analysis of the underpin is probably better undertaken through review of the load analysis in on page 28 of report/33 of PDF attached.

Please note that this will be a hit and miss underpin approach. Therefore, there will be no long term heave under the underpins as they will be formed quickly at alternative locations, with the stages of construction being either existing or with underpin formed and load transferred. We would agree that a long term heave approach would be relevant to more of a concrete box approach, where it is dug as a whole, left, with retaining form and slab cast. But this is not the case with this site.

4.12 (GMA not accepted)

The GMA is based on sound engineering principles and up to date methodologies and we have undertaken it in line with previously accepted methodologies. We respond to the CR's specific reasons listed under section 4.12 as to why the GMA is not accepted below:

First point: inconsistent/incorrect calculations and deflections

- Yes there is a typo identified within the calculations. This has now been corrected and the overall results remain the same. Please find the attached revised GMA which addresses this issue. In view of this, the strains are not underestimated.

Second point: Settlement of underpinned foundations

- The stated settlement is realistic as per our response in 4.11 above

Third point: Heave at party walls

- The stated heave at party walls is accounted for as per our response in 4.11 above

4.13 – Noted, no further issues/ action required as the council cannot expect the applicant to repair the neighbour's damaged walls.
4.14- See response to 4.12 above
4.15- see response to 4.12 above
4.16- Noted, no further issues/ action required
4.17- Noted, no further issues/ action required
4.18- Noted, no further issues/ action required

Appendix 2 Response

Query no 1- See responses to 4.3 above
Query no 2- See responses to 4.10 above
Query no 3- closed, no further issues/ actions required
Query no 4- See responses to 4.10 above
Query no 5- See responses to 4.12 above
Query no 6- See responses to 4.12 above
Query no 7- closed, no further issues/ actions required
Query no 8- See responses to 4.12 above

In summary, the BIA provided is in line with the requirements set out by the Camden CPG guidance, the core of which is the following;

Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance: Basements.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- The Local Plan (2017): Policy A5 (Basements).

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;

The BIA and structural methodology provided demonstrates the scheme is develop-able without adverse impacts to the above.

1 Spencer Rise
G&W response to CF Audit 4

In response to the specific request for information from CR as conveyed by Camden Council's email (email from Nora Constantinescu, 26/09/2019);

1. What profile of shear strength has been adopted between base of 4m SPT and 6m SPT? Please provide inputs / outputs from software used as the basis of the assessment.
   - The SPT and corresponding Cu for the geostru software, which was used in deriving the bearing capacity can be found in the report

   See answers on page 36 of updated BIA

   - Pdisp was used for assessing the heave/settlement ground response for the basement area and beyond, for different phases of construction. The geotechnical parameters for Pdisp are explained and presented in the relevant table in the report. Relevant inputs and outputs are provided.

   See answers on page 31-38 of updated BIA

2. Whilst it is stated that the investigation has sampled the soil profile at 3 locations (in accordance with the guidance), unfortunately the assessment presented so far is still based on a single borehole with questionable results. It is the CR view that the site investigation (SI) data is not "sufficiently robust and accurate" and consideration should be given to whether this can be improved by analysis or DP1 or by further investigation conclusively demonstrating a ground profile that can be relied upon.
   Shear strength data has only been interpreted for BH1. No assessment is presented for DP1. What is the shear strength profile at DP1?

   DP1 was not considered to be reliable; therefore, the assessment was carried out using BH1 in combination with a geotechnical assessment of WS1 and WS2, with a conservative view and the aid of published literature, again with a conservative view.

   See answers on page 18, 23 of updated BIA

3. Please provide the PDisp inputs / outputs / contour plots. Are the movements reported in the table on page 31 cumulative ie does stage 4 indicate total movements from all stages?

   - The geotechnical parameters for Pdisp are explained and presented in the relevant table in the report. Contour plots are provided.
   See answers on page 37, 43, Appendix I (Pdisp Inputs and Outputs including Contour Plots) Appendix J (Ground Movement Assessment Calculations / Xdisp (including Contour Plots) of updated BIA

   - The construction sequence is represented by stages 1 - 3. Stage 4 is the same as Stage 3 (all loads together) with long-term geotechnical parameters / long term response. All stages, progressively include additional loads (minus for excavations, plus for loading), as the construction continues and no load is removed from the previous stage. The response in Stages 3 and 4 are the short and long term cumulative movements / response from cumulative loads, including excavation and construction of the basement.
   See answers on page 33 of updated BIA

4. As the underpins are not embedded it is generally accepted that the heave generated by the bulk dig impacts the underpins and beyond. Therefore we will be considering this as part of the GMA, once the PDisp analysis has been reviewed.

5. The GMA not been comprehensively reviewed again as until the ground profile and issues above are clarified uncertainty remains.

   A new ground movement assessment was undertaken, based on a revised PDisp model, as well as XDisp software which assessed the damage to the surrounding properties.
   See answers on page 31-38 of updated BIA

In response to the additional comments from CF within the attached document (CR Comments 06/09/2019):

"LBC terms of reference for the audit process states that:

The audit should provide conclusions on the following principles:

The methodologies and assumptions are clearly stated and are appropriate to the scale of the proposals and the nature of the site.

The conclusions have been arrived at based on all necessary and reasonable evidence and considerations, in a reliable, transparent manner, by suitably qualified professionals, with sufficient attention paid to risk assessment and use of cautious or moderately conservative engineering values/estimates.

The conclusions are sufficiently robust and accurate and are accompanied by sufficiently detailed amelioration/mitigation measures to ensure that the grant of planning permission would accord with policy"

See answers on page 32 of updated BIA
This calculation process is closely related to the general proposals within BS 8004:2015 Code of Practice for Foundations. The bearing capacities calculated were cross-referenced with proposals included within BS 8004:2015 Code of Practice for Foundations and based on a 5m long by 1m wide foundation and a maximum settlement of 25mm, based on insitu testing results and inspection of samples recovered.
The bearing capacities were found to be in line with the anticipated results from BS 8004:2015 Code of Practice for Foundations and based on a 5m long by 1m wide foundation and a maximum settlement of 25mm, based on in-situ testing results and inspection of samples recovered

12727-95: 1 Spencer Rise - BIA Audit - Comments

Graham Kite to: Nora-Andreea Constantinescu 06/09/2019 16:39
Cc: Camden Audit

Hi Nora

Unfortunately, having reviewed the comments and submission from the applicants team, we still have comments. I have marked up some notes on the attached which may assist any further responses from the applicant's team.

To be clear, the basis of our audit comes from the Audit terms of reference and the various applicable policy documents. There seems to be a suggestion from the applicant's team that we are not being fair or consistent with our audit of their assessments, which we refute. I would draw their attention to the terms of reference, especially Section 6 (Principles for Audit), notably d and e, as quoted below for reference:

6d. The conclusions have been arrived at based on all necessary and reasonable evidence and considerations, in a reliable, transparent manner, by suitably qualified professionals, with sufficient attention paid to risk assessment and use of cautious or moderately conservative engineering values/estimates.

6e. The conclusions of the various documents/details comprising the BIA are consistent with each other. The conclusions are sufficiently robust and accurate and are accompanied by sufficiently detailed amelioration/mitigation measures to ensure that the grant of planning permission would accord with policy.

Currently the BIA submissions do not meet these criteria. Whilst it is stated that the investigation has sampled the soil profile at 3 locations (in accordance with guidance) unfortunately the assessment presented so far is still based on a single borehole with questionable results. It is our view that the SI data is not "sufficiently robust and accurate" and consideration should be given to whether this can be improved by analysis of DP1 or by further investigation conclusively demonstrating a ground profile that can be relied upon.

We have the following specific requests for information:

1. What profile of shear strength has been adopted between base of 4m SPT and 6m SPT? Please provide inputs / outputs from the software used as the basis of the assessment.

2. Shear strength data has only been interpreted for BH1. No assessment is presented for DP1. What is the shear strength profile at DP1?

3. Please provide the PDisp inputs / ouputs / contour plots. Are the movements reported in the table on page 31 cumulative ie doe stage 4 indicate total movements from all stages?

4. As the underpins are not embedded it is generally accepted that the heave generated by the bulk dig impacts the underpins and beyond. Therefore we will be considering this as part of the GMA, once the PDisp analysis has been reviewed.

5. The GMA has not been comprehensively reviewed again as until the ground profile and issues above are clarified uncertainty remains.

Regards

Graham Kite

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190906_CR Comments_1SR_GW response to CF audit 3 FW Comments.pdf

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