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FOREWORD

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1. INTRODUCTION

It is proposed to construct a single level of basement extending beneath the entire footprint of the existing house and extending beyond the footprint sideways beside an existing rear outrigger extension that is to be demolished and replaced on a slightly larger scale. A basement lightwell is to be constructed to the front of the property.

LBHGEO have been commissioned to provide an independent assessment of information submitted against the requirements of

- Camden Local Plan 2017 Policy A5 Basements.
- Camden Planning Guidance (CPG): Basements. January 2021.
- Camden Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development (CGHHS), November 2010, prepared by Ove Arup.

The information studied comprised the following:

- Basement Impact Assessment by Key Geosolutions Limited (Key), Ref: 8271-001-R-02-3 Rev 3 dated 12th April 2023
- 2. Design Report Basement by Joe Wright Architects, dated 29th March 2023
- Structural Stability Report by Baker & Chatterton (BC Structural Design Limited) Ref J209-RP-001 dated 16th January 2023
- 4. Planning, Design & Access Statement by WEA Planning, Ref 2021_55 dated April 2023
- Arboricultural and Planning Impact Assessment Report by Wood Consulting, Ref: WCEL/PEW/AIASR/0213:23 dated 23rd February 2023



2. BIA SCOPE

The BIA does not refer to the current Camden Policy Guidance.

A check of the BIA scoping against the screening flowcharts (Section 6.2 of the CGHSS) reveals that several screening questions have been answered incorrectly as No, leading to a mis-scoping of the assessment. Corrected versions are set out below.

2.1 SUBTERRANEAN (GROUNDWATER) FLOW

Q 1a: Is the site located directly above an aquifer?

A: Yes. The site is located directly above an aquifer.

The British Geological Survey clearly shows the site to be located on the Claygate and not on the London Clay. The red circle shown on Figure 2.2-1 of the BIA has been incorrectly centred some 40m to the south and east of the site, giving the incorrect impression that the site lies at the boundary of the Claygate Member and the London Clay. The Claygate is an acknowledged aquifer that has given rise to substantial hydrogeological issues in the area.

The blue red circle shown on Figure 2.3-1 of the BIA has been incorrectly centred over 100 m to the north and east of the site, giving the incorrect impression that the site lies over unproductive strata and not over an aquifer.

The guidance advises that the basement may extend into the underlying aquifer and thus affect the groundwater flow regime.



CORRECT POSITION OF THE SITE

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Q1b: Will the proposed basement extend beneath the water table surface?

A: Yes. The proposed basement is expected to extend beneath the water table surface.

The water encountered during the actual ground investigation has been referred to as perched water. No groundwater monitoring appears to have been undertaken. The two boreholes have suggested different ground conditions to exist at the front and at the back of the site and is seems from the that the proposed basement may extend through the entire Claygate and into the London Clay. No information of ground levels at the borehole positions has been provided and the cross section presented in Figure 5.1-1 of the BIA indicates the site to be level, which is considered unlikely to be the case.

There seems little doubt that the basement excavation will encounter groundwater and that it will obstruct any flow of groundwater.

The guidance advises that the groundwater flow regime may be altered by the proposed basement. Changes in flow regime could potentially cause the groundwater level within the zone encompassed by the new flow route to increase or decrease locally.

For existing nearby structures then the degree of dampness or seepage may potentially increase as a result of changes in groundwater level

Q2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

A: Yes. The site is <70m from a watercourse, well (used/disused) or potential spring line.

The BIA has misleadingly consulted only a small scale map of watercourses (Figure 2.4-1). Reference to the larger scale Fig 2 of the CGHHS shows the site to be less than 70m from a tributary of the River Fleet and a study old maps show that that there are historic wells and pumps nearby.

The guidance advises that flow from a spring, well or watercourse may increase or decrease if the groundwater flow regime which supports that water feature is affected by a proposed basement.

If the flow is diverted, it may result in the groundwater flow finding another location to issue from with new springs forming or old springs being reactivated.

A secondary impact is on the quality of the water issuing or abstracted from the spring or water well respectively.



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2.2 STABILITY

Q6: Will any trees be felled as part of the proposed development and / or any works proposed within any tree protection zones where trees are to be retained?

A: Yes. The arboricultural report acknowledges that excavations may affect the roots of three trees/tree groups T4, T5 and G1.

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The guidance advises that the soil moisture deficit associated with felled tree will gradually recover. In high plasticity clay soils (such as London Clay) this will lead to gradual swelling of the ground until it reaches a new value. This may reduce the soil strength which could affect the slope stability. Additionally the binding effect of tree roots can have a beneficial effect on stability and the loss of a tree may cause loss of stability.



Q8: The site is within 100m of a watercourse of a potential spring line.

A: Yes. The site is <70m from a watercourse, well (used/disused) or potential spring line.

See comment on previous page to Q2.

Q10: Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?

A: Yes. Dewatering may be required.

The guidance advises that dewatering can cause ground settlement. The zone of settlement will extend for the dewatering zone, and thus could extend beyond a site boundary and affect neighbouring structures. Conversely, an increase in water levels can have a detrimental effect on stability.

3. DESCRIPTION OF WORKS

The BIA states that the proposed basement will have *"a base level base level 4,055mm lower than the existing ground levels"* and proposes a combination of two stage underpinning and sheet piling / a bored pile wall.

4. INVESTIGATION OF ISSUES

Land stability:

The BIA states "Ground movements associated with the excavation works are anticipated to affect the party wall with No 30 Willoughby Road, the boundary wall between No 34 and No 32 and the property at No 34."

However, ground movements from a 4m deep excavation are likely to have an effect well beyond the party wall. (Even the diagrams presented in the BIA suggest vertical movement occurring up to 16m away and horizontal movements up to 14m away.)

Basement Heave:

It is relatively common knowledge that a 4m deep excavation into over-consolidated clay soils will cause a ground heave response but the BIA does not even begin to investigate or assess this.

Hydrogeology:

The potential groundwater impacts have not been properly investigated. No groundwater monitoring appears to have been carried out.

Trees

The potential impacts of the basement upon the growth of trees have not been investigated by the BIA. The indications are that, in addition to excavations truncating roots in the root protection zones, the basement may alter the present moisture regime in the surrounding soil through obstructing or diverting groundwater flow paths. This will affect the growth of the nearby trees and may cause potential knock-on clay shrinkage/swell ground movements to nearby foundations, particularly those of No. 30 Willoughby Road.

5. ASSESSMENT METHODOLOGY

The BIA analysis has suggested that the two-stage underpinning can be modelled as a contiguous bored pile retaining wall embedded into stiff clay and supported by high stiffness propping. This is completely inappropriate for the following reasons.

- Unlike piling, underpinning allows almost complete relaxation of horizontal stresses along a broad section, and
- Unlike piling, underpinning does not provide any degree of structural fixity at the base such as is achieved by a bored pile wall embedded some 50% deeper than the excavation base.
- Unlike piling, underpinning movements also involve inevitable sagging of the underpinned wall during installation when the wall is undermined.

To be fair, the BIA gives the impression that the BIA authors had hoped to rely upon some published basement construction or underpinning guidance. They have instead chosen to apply the CIRIA C760 guidance for embedded piled retaining wall design, but have misapplied the terms wall depth and retained

height/ excavation depth and this has compounded the miss-estimation of potential movements. The underestimation of movement is because, in addition to the errors introduced by assuming no stress relief during installation and by assuming the instantaneous presence of a high stiffness rigid box, there has been no allowance for any wall embedment. The normalised data provided in C760 relate installation movements to wall depth so that ignoring any embedment will have reduced the estimated movement. The non-normalised data in C760 in fact suggest vertical ground movements of up to 15mm within 5m of the wall installation whereas this BIA suggests about 1mm.

The BIA Appendix 3 movement assessment adds together the movement that might have been expected for a contiguous bored pile wall installed to just 3.3m depth with the movement that might have been expected for excavation to 3.3m depth in front of an embedded contiguous bored pile wall with high stiffness propping.

This has provided a prediction of total vertical and horizontal movement reported as follows

| Structures/ Infrastructure | Distance from | Horizontal | Vertical Movement |
|----------------------------|----------------|---------------|-------------------|
| | Excavation (m) | Movement (mm) | (mm) |
| Party Wall Between 32/30 | 0 | 7.4 | 2.9 |
| Garden wall between 34/32 | 1.2 | 6.0 | 4.2 |
| Nearest part of No 34 | 2.6 | 5.4 | 4.1 |
| Public Highway | 3.0 | 4.8 | 3.5 |

Table 6.4-1: Summary of Anticipated Ground Movement

The BIA is not entirely clear as to how a Burland Building Damage assessment has proceeded from the above table. No analysis is provided and the BIA simply states:

"Providing a structural design is undertaken and a suitable construction method is employed for the basement construction then it is considered that it should be possible to minimise the amount of movement of the ground such that the degree of damage to neighbouring properties would fall into Category 0 or 1, with the degree of severity being negligible to very slight, as defined CIRIA C580 Table 2.5 (after Burland, 1995)."

6. MITIGATION

Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme? (Section 5 of the CGHSS)

The BIA has failed to recognise the potential issues and does not present the required mitigation. For example, the BIA incorrectly suggests that the works can be regarded as being of a high structural stiffness and yet the Figure 6.9-1 suggests that there will be no horizontal propping installed until over 50% of the first stage excavation has been completed and that up to 20% of the existing building is to be left unsupported at any one time. This is not a sound approach.

"It is assumed that a suitably experienced specialist basement contractor will be appointed for the works, this contractor will be responsible for the design and implementation of the temporary works necessary to build the basement and ground floor."

7. MONITORING

The BIA suggests that weekly monitoring should be sufficient and that the work should be stopped only if total movements in excess of 10mm are detected or if party wall movement greater than 3mm between targets spaced 2m apart are detected. The suggested monitoring frequency is wholly unsatisfactory in the light of buildings that have collapsed within hours of movement being detected and the limiting movement amount criteria bear no relation to the predicted movement. Is it acceptable to allow movements approaching ten times that which the BIA predicted before it is accepted that than something may possibly be awry?

It is not clear what continent remedial actions are anticipated in the event that the ground starts to go. There does not seems to be any resources provision or emergency plan in place other than for someone (it is not clear who) to review the situation.

The BIA rather hopefully states "Monitoring during construction will be undertaken to ensure that measured settlements are in accordance with the estimated values."

8. CONSTRUCTION METHODOLOGY

The BIA does not set out the proposed methodology in sufficient detail for it to be specifically assessed. The Baker & Chatterton document describes providing restraint to the party wall at a high level as the existing building is demolished but does not address the detailed requirements for low level or progressive basement excavation propping.

9. SOUNDNESS OF EVIDENCE PRESENTED

The BIA has not undertaken groundwater monitoring and has discarded the evidence of water noted in one trial pit. The geology and ground conditions appear to have been misinterpreted. The lower levels of the Claygate are often confused with the London Clay in this area.

10. REASONABLENESS OF ASSESSMENTS

The BIA has not sufficiently assessed the potential for ground movements associated with the development and has applied some wholly inappropriate analysis. The BIA does not appear to have even considered the possibility of any basement heave. The BIA has not presented any Burland Damage



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analysis. The BIA has not undertaken any hydrogeological assessment of the impacts on the local environment and neighbouring properties associated with potentially obstructing groundwater flow.

11. CONCLUSIONS

The submitted BIA is seriously flawed and does not demonstrate that the development can be safely undertaken.

The development as presented will:

- a. Risk significant cracking movement / collapse of the building and neighbouring properties
- b. Adversely impact any groundwater flows beneath the property.

It is suggested that the concerns about the BIA submission that have been raised in this document are sufficient to demand refusal of this planning application on the basis that it does not meet the requirements of the Camden Local Plan, the Camden Basements CPG or the Arup CGHHS.

If the same companies are involved in an amended submission, it is respectfully suggested that, as a minimum precaution for the protection of neighbours, a Basement Construction Plan (BCP) should be demanded with certification by a suitably qualified and experienced engineer who is independent of the design team.