Independent Review
of
Basement Impact Assessment for planning application 2014/7674/P (UPDATED)
at

13 Ferncroft Avenue
London
NW3 7PG

for
London Borough of Camden

LBH 4324

October 2015

LBH WEMBLEY

Geotechnical & Environmental

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Foreword-Guidance Notes

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBH WEMBLEY Geotechnical & Environmental disclaims any liability to such parties.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBH WEMBLEY Geotechnical & Environmental has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in the future and any such reliance on the report in the future shall again be at the client's own and sole risk.

THIRD PARTY INFORMATION

The report may present an opinion on the disposition, configuration and composition of soils, strata and any contamination within or near the site based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. Introduction

It is proposed to construct a single storey basement beneath the footprint of the existing house, extending the depth of the existing undercroft/cellar by approximately 2m.

1.1 Brief

LBH WEMBLEY Geotechnical & Environmental have been commissioned to provide an Independent assessment of information submitted against the requirements of LDF policy DP27 (but also including CS5, CS14, CS15, CS17, CS18, DP23, DP24, DP25 and DP26 – as stated at paragraphs 1.5 and 1.6 of CPG4) and with reference to the procedures, processes and recommendations of the Arup Report and CPG4 2013.

1.2 Report Structure

This report commences with a description of the LDF policy requirements, and then considers and comments on the submission made and details any concerns in regards to:

1. The level of information provided (including the completeness of the submission and the technical sufficiency of the work carried out)
2. The proposed methodologies in the context of the site and the development proposals
3. The soundness of the evidence presented and the reasonableness of the assessments made.
4. The robustness of the conclusions drawn and the mitigation measures proposed in regard to:
    a. maintaining the structural stability of the building and any neighbouring properties
    b. avoiding adversely affecting drainage and run-off or causing other damage to the water environment and
    c. avoiding cumulative impacts on structural stability or the water environment in the local area

1.3 Information Provided

The information studied comprises the following:

1. Basement Impact Assessment by Knapp Hicks & Partners Limited, dated October 2014, Ref: 32655/R/001/RJM
2. Design Statement by Bchitecture, dated December 2014, unreferenced
3. Drawings of Existing by Bchitecture, dated September 2014, Ref: 1406 Drawings 101/- to 106/-
4. Drawings of Proposed by Bchitecture, dated September 2014, Ref: 1406 Drawings 110/A to 112/A, 113/B, 114/A, 115/A and 116/-
5. Letter from Knapp Hicks & Partners dated 2nd October 2015, Ref: 32655/U003G/RJM/rjm
6. Ground Movement Assessment by Gabriel Geo Consulting, dated July 2015, Ref: 16457/R1
7. Hydrogeological Desk Study by Gabriel Geo Consulting, dated September 2015, Ref: 16457/R2.1
8. Arboricultural and Planning Integration Report by GHA Trees, dated 11th May 2015 Ref: GHA/DS/17760:15

2. Policy DP27 – Basements and Lightwells

The CPG4 Planning Guidance on Basements and Lightwells refers primarily to Planning Policy DP27 on Basements and Lightwells.

The DP27 Policy reads as follows:

In determining proposals for basement and other underground development, the Council will require an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability, where appropriate. The Council will only permit basement and other underground development that does not cause harm to the built and natural environment and local amenity and does not result in flooding or ground instability. We will require developers to demonstrate by methodologies appropriate to the site 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;
c) avoid cumulative impacts upon structural stability or the water environment in the local area;

and we will consider whether schemes:

d) harm the amenity of neighbours;
e) lead to the loss of open space or trees of townscape or amenity value;
f) provide satisfactory landscaping, including adequate soil depth;
g) harm the appearance or setting of the property or the established character of the surrounding area; and
h) protect important archaeological remains.

The Council will not permit basement schemes which include habitable rooms and other sensitive uses in areas prone to flooding. In determining applications for lightwells, the Council will consider whether:

i) the architectural character of the building is protected;
j) the character and appearance of the surrounding area is harmed; and
k) the development results in the loss of more than 50% of the front garden or amenity area.

In addition to DP27, the CPG4 Guidance on Basements and Lightwells also supports the following Local Development Framework policies:

Core Strategies:

- CS5 Managing the impact of growth and development
- CS14 Promoting high quality places and conserving our heritage
- CS15 Protecting and improving our parks and open spaces & encouraging biodiversity
- CS17 Making Camden a safer place
- CS18 Dealing with our waste and encouraging recycling

Development Policies:

- DP23 Water
- DP24 Securing high quality design
- DP25 Conserving Camden's heritage
- DP26 Managing the impact of development on occupiers and neighbours

This report makes some specific further reference to these policies but relies essentially upon the technical guidance provided by the Council in November 2010 to assist developers to ensure that they are meeting the requirements of DP27, which is known as the Camden Geological, Hydrogeological and Hydrological Study, Guidance for Subterranean Development (CGHHS), and was prepared by Arup.

3. Assessment of Adequacy of Information Provided

3.1 Basement Impact Assessment Stages

The methodology described for assessing the impact of a proposed basement with regard to the matters described in DP27 takes the form of a staged approach.

3.1.1 Stage 1: Screening

Screening uses checklists to identify whether there are matters of concern (with regard to hydrogeology, hydrology or ground stability) which should be investigated using a BIA (Section 6.2 and Appendix E of the CGHSS) and is the process for determining whether or not a BIA is required. There are three checklists as follows:

- subterranean (groundwater) flow
- slope stability
- surface flow and flooding

3.1.1.1 Subterranean (Groundwater) Flow

A screening checklist for the impact of the proposed basement on groundwater **is** included in the BIA (Document 1).

This identifies the following potential issues of concern:

- **The site is located directly above an aquifer.**
- **The proposed basement will extend beneath the water table surface.**

3.1.1.2 Stability

A screening checklist for the impact of the proposed basement on land stability **is** included in the BIA (Document 1).

This identifies the following potential issues of concern:

- **There is a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site.**
- **The site is within an aquifer.**
- **The proposed basement will extend beneath the water table such that dewatering may be required during construction.**
- **The proposed basement will significantly increase the differential depth of foundations relative to the neighbouring properties.**

3.1.1.3 Surface Flow and Flooding

A screening checklist for the impact of the proposed basement on surface water flow and flooding **is** included in the BIA (Document 1).

This identifies no potential issues of concern.

3.1.2 Stage 2: Scoping

Where the checklist is answered with a “yes” or “unknown” to any of the questions posed in the flowcharts, these matters are carried forward to the scoping stage of the BIA process.

The scoping produces a statement which defines further the matters of concern identified in the screening stage. This defining should be in terms of ground processes, in order that a site specific BIA can be designed and executed (Section 6.3 of the CGHSS).

Checklists have been provided in the BIA and there **is** scoping stage described in the BIA.

The issues identified from the checklists as being of concern have been assigned bold text in the previous sections and are as follows:

- **The site is located directly above an aquifer.**
  The guidance advises that the basement may extend into the underlying aquifer and thus affect the groundwater flow regime.

- **The proposed basement will extend beneath the water table surface.**
  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.
  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.

- **There is a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site.**
  The guidance advises that there are multiple potential impacts depending on the specific setting of the basement development. For example, in terraced properties, the implications of a deepened basement/foundation system on neighbouring properties should be considered.

- **The proposed basement will significantly increase the differential depth of foundations relative to the neighbouring properties.**
  The guidance advises that excavation for a basement may result in structural damage to neighbouring properties if there is a significant differential depth between adjacent foundations.

3.1.3 Stage 3: Site Investigation and Study

Site investigation and study is undertaken to establish the baseline conditions. This can be done by utilising existing information and/or by collecting new information (Section 6.4 of the CGHSS).

The site investigation submitted comprised two window sampler boreholes constructed to 4m depth and two hand-dug trial pits undertaken to expose existing foundations in October 2014. Standpipes were installed in the two borehole locations and water levels were monitored on three occasions.

3.1.4 Stage 4: Impact Assessment

Impact assessment is undertaken to determine the impact of the proposed basement on the baseline conditions, taking into account any mitigation measures proposed (Section 6.5 of the CGHSS).

The submitted BIA (Document 1) does include an Impact Assessment stage and the following statements are made:

- **The site is located directly above an aquifer.**
- **The proposed basement will extend beneath the water table surface.**
  "*…basement excvations* (sic) *and associated ground treatment will penetrate below the groundwater by approximately 1m to 1.5m, i.e. to approximately 45.5mASD to 46.0mASD. Note: this will only affect the rear half of the basement as we expect that it wil* (sic) *be possible to construct the front half of the basement by conventional hit and miss underpinning.*"

  "*The affected strata will be permeable and therefore it is considered that the groundwater will be able to flow around the ground affected by the basement where it intersects the water table*"

  "*It is considered that, subject to ongoing monitoring and the preparation and approval of a detailed methodology for the construction, the basement will have a negligible impact upon the groundwater flow regime in this area*"

  "*It is recommended that specialist advice be sought as required to confirm appropriate groundwater control measures both for the temporary and the permanent works. Knapp Hicks recommend grouting to control groundwater during construction, in particular around and underneath the rear half of the proposed basement to ensure stability throughout the works.*"

- **There is a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site.**
  "*…the soils have been classified as typically medium to high shrinkage potential and so it is possible that property on Ferncroft Avenue may have been affected by shrink-swell subsidence.*"
  "*…we would recommend that the structural designer review the tree species and heights along the site boundary and ensure that potential heave I shrinkage is taken into consideration.*"

- **The proposed basement will significantly increase the differential depth of foundations relative to the neighbouring properties.**

  "*It will be necessary to undertake some underpinning of the shared wall with No15 prior to commencement of construction of the proposed basement at No13. Underpinning of No11 should not be required but a party wall investigation is recommended to confirm the detail and depth of foundations to No11.*"

  "*…it is feasible that the proposed scheme can be constructed by a competent contractor without causing damage to adjacent properties and infrastructure. However, this is conditional on the Basement Contractor, and their structural engineers, giving full consideration in their design and construction methodology to the location of the site, and all neighbouring properties and infrastructure, in relation to their proposed method of basement construction, the form of construction of all affected or potentially affected structures and infrastructure, and all appertaining ground and groundwater conditions.*"

"*Assessment of potential movement associated with the proposed methodology should be carried out by the specialist grouting contractor. Movement assessment should also consider the effects of the construction along the change in levels between front and back of the basement.*"

"*…the proposed scheme is expected to have minimal impact upon neighbouring properties on condition that the Construction Method Statement is prepared by a competent individual and strictly adhered to during construction*"

3.2 The Audit Process

The audit process is based on reviewing the BIA against the criteria set out in Section 6 of the CGHSS and requires consideration of specific issues:

3.2.1 Qualifications / Credentials of authors

Check qualifications / credentials of author(s):

Qualifications required for assessments

Surface flow and flooding	A Hydrologist or a Civil Engineer specialising in flood risk management and surface water drainage, with either: • The "CEng" (Chartered Engineer) qualification from the Engineering Council; or a Member of the Institution of Civil Engineers ("MICE"); or • The "C.WEM" (Chartered Water and Environmental Manager) qualification from the Chartered Institution of Water and Environmental Management.
Subterranean (groundwater) flow	A Hydrogeologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London.
Land stability	A Civil Engineer with the "CEng" (Chartered Engineer) qualification from the Engineering Council and specialising in ground engineering; or A Member of the Institution of Civil Engineers ("MICE") and a Geotechnical Specialist as defined by the Site Investigation Steering Group. With demonstrable evidence that the assessments have been made by them in conjunction with an Engineering Geologist with the "CGeol" (Chartered Geologist) qualification from the Geological Society of London.

Surface flow and flooding: The report meets the requirements.

Subterranean (groundwater) flow: The report meets the requirements.

Land stability: The report meets the requirements.

3.2.2 BIA Scope

Check BIA scope against flowcharts (Section 6.2.2 of the CGHSS).

Document 1 state that "*Some mature trees are present in the gardens to the rear of the site. Root Protection Areas (as derived using BS5837:2005, Trees in relation to construction) will be confirmed in due course but the proposed scheme is not expected to impinge significantly upon them.*" Also stated "*It is not anticipated that any trees will affect or be affected by the proposed scheme but it is recommended that the mature trees located in the neighbouring gardens and along the road are assessed by a suitably qualified arboriculturalist prior to commencement of construction so that Root Protection Areas etc are confirmed and may be clearly marked out.*" It is therefore unclear as to whether the proposed development will fall within a tree protection zone and what impact this may have.

Document 8 clarifies that "*…The new lightwell to the front encroaches into an area of the RPA of T2, which equates to less that 1% of the total area; this Is deemed to be insignificant…. The proposed new basement and lightwells are situated outside of the RPA's of all of the other trees proposed for retention, therefore these trees pose no below ground constraints on the new buildings or vice versa."*

3.2.3 Description of Works

Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?

Document 5 now states

"*The proposed method of construction is underpinning with underpinning blocks to be constructed in a 'hit-and-miss' sequence which is indicated and described in the drawings.*

Further detailed structural design will follow upon grant of Planning Permission and will address any specific requirements identified by Planning."

3.2.4 Investigation of Issues

Have the appropriate issues been investigated? This includes assessment of impacts with respect to DP27 including land stability, hydrology, hydrogeology.

Document 5 now includes a ground movement assessment by Gabriel Geo Consulting (Document 6) and this states "*Damage category assessments were undertaken for the adjoining No.l5. These gave damage classifications up to the boundary between Burland Categories 1 & 2, 'very slight' to 'slight' (6.4 to 6.8)…*

…. For the adjacent No.ll, which Is 1.56m lower than No.13, no damage category assessment was warranted for the front wall because the basement will be founded at about the same level as No.ll's footings (6.15)."

Document 5 now includes a hydrogeological assessment by Gabriel Geo Consulting (Document 7) and this includes a discussion of potential groundwater control issues.

3.2.5 Mapping Detail

Is the scale of any included maps appropriate? That is, does the map show the whole of the relevant area of study and does it show sufficient detail?

Yes.

3.2.6 Assessment Methodology

Have the issues been investigated using appropriate assessment methodology? (Section 7.2 of the CGHSS).

Yes. A specific ground movement and damage assessment has now been undertaken and is included in Document 6.

3.2.7 Mitigation

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

The submission includes proposals for the selection of appropriate mitigation methods.

3.2.8 Monitoring

Has the need for monitoring been addressed and is the proposed monitoring sufficient and adequate?

Document 5 now includes a more detailed discussion of monitoring requirements and indicates that a detailed structural monitoring schedule will be prepared in due course.

3.2.9 Residual Impacts after Mitigation

Have the residual (after mitigation) impacts been clearly identified?

Yes.

4. Assessment of Acceptability of Residual Impacts

4.1 Proposed Construction Methodology

The submission now includes a preliminary scheme for construction and includes a provision for a geotechnical specialist to further assess and select appropriate groundwater control and dewatering measures.

4.2 Soundness of Evidence Presented

The evidence presented appears sound.

4.3 Reasonableness of Assessments

Specific ground movement and damage assessments have now been undertaken and the conclusions appear reasonable.

4.4 Robustness of Conclusions and Proposed Mitigation Measures

The conclusions and proposed mitigation measures appear reasonable.

5. Conclusions

The originally submitted BIA did reflect the processes and procedures set out in DP27 and CPG4, and included recommendations for construction. However, in the absence of commitment to a specific methodology and sequence, it was considered that the submission did not demonstrate sufficient detail. and certainty to ensure accordance with DP27, in respect of:

a. Maintaining the structural stability of the building and any neighbouring properties
b. Avoiding adverse impact on drainage and run-off or causing other damage to the water environment and
c. Avoiding cumulative impacts on structural stability or the water environment

It was suggested that the concerns about the submission could be addressed by way of submission of further information as follows.

- Condition Surveys of 11 and 15 Ferncroft Avenue
- Trial pits to confirm details of the foundations to 11 and 15 Ferncroft Avenue.
- A scheme of groundwater investigation and monitoring, including trial excavations to the proposed formation level, to inform the selection of appropriate groundwater control measures.
- A detailed monitoring and contingency plan.
- The appointment of a suitably qualified engineer to take responsibility for the design of the temporary works.

An additional submission has now been made that includes hydrogeological and ground movement assessment reports and proposes the use of initial trial underpinning excavations to inform the selection of appropriate groundwater control measures.

It is stated that the excavation and construction of the initial sections of walls will be observed by a geotechnical specialist to assess the stability, soil and groundwater conditions to assess and review the width of the wall sections, with particular attention paid to the wall sections which penetrate the water table.

The additional submission proposes the use of a Basement Construction Plan secured by a Section 106 Agreement that will incorporate the designs of a temporary works designer appointed by the contractor.

It is considered that the use of a Basement Construction Plan secured by a Section 106 Agreement would be an acceptable means of ensuring the submission of the following additional information and sufficient detail and certainty to ensure accordance with DP27:

- Condition Surveys of 11 and 15 Ferncroft Avenue
- Confirmation of the details of the foundations to 11 and 15 Ferncroft Avenue.
- Trial excavations to the proposed formation level and the selection of appropriate groundwater control measures.
- A detailed monitoring and contingency plan.
- The appointment of a suitably qualified engineer to take responsibility for the design of the temporary works.