Independent Review
of
Basement Impact Assessment for planning application 2014/6825/P
(THIRD UPDATE)
at

20 Platt's Lane
London
NW3 7NS

for
London Borough of Camden

LBH 4319

February 2016

LBH WEMBLEY

Geotechnical & Environmental

Project No: LBH 4319

Report Ref: **LBH 4319 Ver 4.0**

Date: 8th February 2016

Report approved by:

Digitally signed by Seamus Lefroy-Brooks
DN: cn=Seamus Lefroy-Brooks, o, ou=LBH WEMBLEY, email=seamus@LBHGEO.co.uk, c=GB
Date: 2016.02.08 17:19:30 Z

S R Lefroy-Brooks BSc MSc CEng MICE CGeol FGS CEnv MIEnvSc FRGS SiLC

Principal Engineer

LBH WEMBLEY Geotechnical & Environmental
Unit 12 Little Balmer
Buckingham Industrial Park
Buckingham
MK18 1TF

Tel: 01280 812310

email: enquiry@lbhgeo.co.uk

website: www.lbhgeo.co.uk

Contents

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 level of basement beneath the existing house to a depth of approximately 3.4m below ground level (bgl). Light wells will extend slightly further than the footprint of the building to the rear and one side of the property.

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 Card Geotechnics Limited (CGL), dated September 2014, Ref: CG/08986
2. Heritage Statement Design & Access Statement by Domus, dated 16th October 2014, Ref: 1309122
3. Engineering Method Statement by Green Structural Engineering (GSE), dated 14th May 2015, Ref: 12382 – Rev01
4. Construction Traffic Management Plan by unknown, dated February 2015, Ref: 1309122
5. Drawings of Existing by Domus, dated October 2013, Ref: 1309122 001
6. Drawings of Proposed by Domus, dated October 2013, Ref: 1309122 002A
7. Proposed Plan and Elevations OPTION B Drawing by Domus dated October 2013, Ref: 1309122 003F
8. Letter from Card Geotechnics to Domus, dated 10th April 2015, Ref:CG/08986
9. Letter from Card Geotechnics to Domus, dated 11th August 2015, Ref: CG/08986B

10. Email from Adam Cadnam (CGL) to Seamus Lefroy-Brooks dated 7th December 2015 16:18:02
11. Letter from Green Structural Engineers to Domus, dated 27th January 2016, Ref: 12382/BC

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 the following potential issues of concern:

- **The site is in an area known to be at risk from surface water flooding, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature.**

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 a 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.

- **The site is in an area known to be at risk from surface water flooding, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature.**
  The guidance advises that the developer should undertake a Flood Risk Assessment (FRA).

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 initially submitted comprised a single borehole in October 2013 taken to 5m and a review of nearby borehole records. Two foundation inspection pits were also provided from excavations carried out in July 2014.

Document 9 provides logs for two window sample boreholes extended to 5m and one hand dug trial pit undertaken in July 2015. Monitoring wells were installed in each exploratory hole.

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 comments have been made.

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

  "*Although no sand lenses or layers were identified by Fastrack, the Claygate Member does exhibit lateral and vertical variation. The potential occurrence of such soils or associated perched water beneath the site cannot be disregarded and should be accounted for in the design and construction of the basement.*"

  Document 8 states that *"Given the limited size of the proposed basement (Approx. 10m by 11.7m), we do not anticipate significant variation in ground or groundwater conditions from those reported within the BIA".*

  Additional information (Document 9) has provided borehole and trial pit logs from investigation undertaken on site along with monitoring of well installations. "*Groundwater strikes were recorded in WS1 and WS2 at depths around 4.0m bgl, with the Claygate Member. Subsequent groundwater monitoring indicated resting water levels of between 1.55m (WS1) and 1.8m (WS2) bgl…*" It is also noted that "*The supplementary ground investigation has identified more variable ground conditions than anticipated based on the available geological records and the previous ground investigation undertaken by Fastrack Limited. In particular, possible Head Deposits were recorded across the site and possible Alluvium was recorded at between 1.5m and 2.5m bgl in WS1, located in the southern area of the site."*

"*…a shallow alluvial channel was encountered in the southern area of the site. Whilst the alluvial channel may present a possible preferential pathway for groundwater flow, the variable head permeability testing suggests similar permeability rates for the Alluvium and the surrounding Claygate Member.*"

"*It is understood that the neighbouring properties do not have basements. On this basis, it is considered that the proposed basement will have not have a significant negative impact on groundwater flow or level in the vicinity of the site as groundwater may flow around the basement, within the Claygate Member. Filter drains may be considered to the perimeter of the basements should water ingress rates within the alluvial channel, if encountered, exceed those reported within this letter.*"

Revisions (January 2016) to the Engineering Methodology, set out in Document 11, state "*The design and construction of the proposed underpinning works will be carried out in accordance with the general principles of the Observational Method in accordance with CIRIA Report 185 [The Observational Method in ground engineering – principles and applications, published 1999]*."

The methodology now proposes that the Engineer will be informed immediately if any visible seepage is observed by the site foreman, who will inspect the excavations twice daily, and that the geotechnical engineer will additionally be immediately informed if this develops into a trickle into any of the underpin excavations (defined as water ingress greater than four litres per hour per metre run).

The contingencies proposed in the latter circumstances include for the excavation to be backfilled and/or localised permeation grouting to be undertaken.

- **There is a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site.**
  "*The deepening of the foundations at the northern end of the 18 Platt's Lane relative to the southern end may result in differential movements between the foundations as the underpin foundations are taken below the depth of influence of the trees. However, it is noted that the trees are around 15m away from the proposed underpin foundations, with the existing building likely to act as a barrier to significant root growth towards the north. On this basis, the existing party wall foundations are likely to be situated beyond the influence of tree related seasonal volume change. The deepening of these foundations are (sic) therefore not considered to materially change the existing conditions with regard to seasonal shrink/swell and no further assessment is considered necessary.*"

  Document 9 states "*Possible desiccation, as defined by increased stiffness, was noted in the possible Head Deposits in WS2 to a depth of 1.0m bgl.*"

- **The proposed basement will significantly increase the differential depth of foundations relative to the neighbouring properties.**
  "The construction of the basement will generate ground movements due to a variety of causes including; heave, underpin settlement and underpin wall deflection during and after excavation. Conservative calculations indicate that these will give rise to a damage category within 'Category 1' (very slight damage) for the adjacent properties with a limiting horizontal underpin deflection of 5mm and assuming a good standard of workmanship."

  Document 9 states that "…*it is not considered necessary to alter the construction methodology, and classification of predicted damage to neighbouring structures (Category 1 – very slight damage) are not materially changed from those previously reported.*"

- **The site is in an area known to be at risk from surface water flooding, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature.**
  "*From the available information, it is considered that the proposed basement construction will have a minimal effect on groundwater and negligible effect on surface water and flooding at this site.*"
  Document 1 states:
  "… it is noted that the road and pavement slope down from the site boundary towards the west and as such a major flood event would be required to flood the site."
  "…the basement is not considered to be at significant risk from surface water flooding based in (sic) the relative levels of Platt's Lane and the site."

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).

A potential spring line lies approximately 80m to the northeast of the property.

- **The site is within 100m of a watercourse, well (used/disused) or potential spring line.**
  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.

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?

Yes.

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.

Previously only one borehole had been constructed and this was considered insufficient given the likely variability of the ground in this area. The revised Engineering Method Statement submitted (Document 3) proposed the construction of a trial pit prior to construction to agree excavation requirements with all parties. However, further exploration of the site has now been undertaken.

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?

A topographical survey does not appear to have been provided.

3.2.6 Assessment Methodology

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

Yes.

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)

It was previously stated that the appropriateness of the proposed methodology would need to be confirmed following additional ground investigation. It has now been stated that

"The basement will be constructed with hit and miss underpinning techniques. On this basis, only narrow excavations will be excavated at any one time. Groundwater is likely to be encountered during basement excavation as seepages… ingress is likely to be relatively slow…. ground loss may be controlled by sacrificial trench sheeting to the rear of the underpin excavation and pumping from sumps."

The proposed construction methodology has now (Jan 2016) been further amended to incorporate an observational approach, whereby both the structural engineer and the specialist geotechnical engineer will be contacted immediately should significant water ingress be encountered to advise on the implementation of contingency plan actions.

3.2.8 Monitoring

Has the need for monitoring been addressed and is the proposed monitoring sufficient and adequate? (Section 7.2.3 of the CGHSS)

Monitoring proposals have been discussed in general, but a specific scheme has not been presented.

It is noted that the building monitoring frequency of "*weekly or twice weekly*" proposed in Document 11 (Jan 2016) would be wholly inappropriate given the need to implement contingency actions within hours of any problem manifesting itself. Start and end of shift readings should be taken as a minimum frequency during the party wall underpinning.

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

Document 3 states:

"..*It is anticipated that the underpinning method with local water control will be appropriate but if significant ground water flow is present then a barrier system may be required to control the groundwater.*

The design of the groundwater control method, for example grouting, drainage pipes or well pointing, in accordance with the principles set out in Ciria Report 'C515–Groundwater control: design and practice', will be by a specialist…"

Document 9 has further confirmed the intention to adopt conventional hit and miss underpinning techniques with "*sacrificial trench sheeting to the rear of the underpin excavation and pumping from sumps.*"

The proposed construction methodology has now (Jan 2016) been further amended (Document 11) to incorporate an observational approach, whereby both the structural engineer and the specialist geotechnical engineer will be contacted immediately should significant water ingress be encountered to advise on the implementation of contingency plan actions. The contingencies proposed in the latter circumstances include for the excavation to be backfilled and/or localised permeation grouting to be undertaken.

4.2 Soundness of Evidence Presented

It is noted now that the current construction proposals are based upon further ground investigation undertaken in July 2015.

4.3 Reasonableness of Assessments

The assessment made in Document 3 that *"any water ingress…. will be relatively minor and will be controlled by forming local sumps and pumping without adversely affecting the adjacent properties" was* considered somewhat optimistic. The revised document 3 stated that *"if significant ground water flow is present then a barrier system may be required to control the groundwater."*

The additional submission Document 9 confirms the geotechnical specialists view that *"Should seepages or inflows be encountered during these works, then ground loss may be controlled by sacrificial trench sheeting to the rear of the underpin excavation and pumping from sumps."*

4.4 Robustness of Conclusions and Proposed Mitigation Measures

The mitigation measures required to undertake the proposed development will need to be confirmed following a better understanding of the actual ground conditions affecting the proposed underpinning. The proposed construction methodology has now (Jan 2016) been further amended (Document 11) to incorporate an observational approach to the design of the mitigation.

5. Conclusions

Although the original submission did reflect the processes and procedures set out in DP27 and CPG4, there appeared to have been an inadequate amount of ground investigation undertaken to provide sufficient confidence in the ground model that had been adopted.

It was considered that in order to meet the requirements of DP27 further information should be submitted as follows.

- 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.
- A Flood Risk Assessment.

An updated Engineering Method Statement was then submitted which included a proposal to construct a full depth trial pit at a position to be agreed with Camden at the start of works to confirm the groundwater conditions and the excavation requirements.

Additional ground investigation was then undertaken that confirmed the soils beneath the site to be variable and to contain groundwater (at 1.5m to 2m depth). These additional findings underlined the need to demonstrate the robustness of the proposed construction methodology and it was concluded that it would be necessary to incorporate some form of further construction method approval as a condition of planning in order to meet the requirements of DP27.

The proposed construction methodology has now (Jan 2016) been further amended (Document 11) to incorporate an observational approach, whereby both the structural engineer and the specialist geotechnical engineer will be contacted immediately should significant water ingress be encountered in any of the proposed excavations to advise on the implementation of suitable mitigation drawn from a selection of contingency options that have been described.

This adoption of an observational approach may be considered a reasonable response to the residual risk and as a consequence it is now considered that the submission is sufficient to accord 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