

**Independent Review
of
Basement Impact Assessment for
planning application 2015/3151/P
at**

**The Greenwood Centre
37 Greenwood Place
London
NW5 1LB**

**for
London Borough of Camden**

LBH4355

July 2015

LBH
WEMBLEY



**Geotechnical &
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LBH4355

Client: London Borough of Camden

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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 demolish the existing Greenwood Day Centre and to construct a new one to three storey community centre on a similar footprint with a single storey basement beneath most of the north western area of the building including a hydrotherapy pool. The application forms part of development proposals for a wider site that includes the Highgate Day Centre on Highgate Road.

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 Campbell Reith Consulting Engineers, dated 28th April 2015, Ref: AEDaed11167-200315BIA-F2
2. Planning, Design and Access Statement by PCKO Architects, dated May 2015, Ref: 1213
3. Preliminary Land Quality Statement by Campbell Reith Consulting Engineers, dated 30th April 2015, Ref: AEDsrm-11167-300415-LQS-F3
4. Drawings by PCKO Architects, dated March 2015 and August 2008, Refs: 1213 PL 002 B, 1213_PL_262 B, 1213_PL_265 A, 1213_PL_261 A, 1213_PL_160 B, 1213_PL_260 A, 1213_PL_164 A and 1213_PL 005 B

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 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:

- **London Clay is the shallowest strata at the site.**
- **The site is within an area of previously worked ground.**
- **The site is within 5m of a highway or pedestrian right of way.**
- **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 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 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.

- **London Clay is the shallowest strata at the site.**

The guidance advises that of the at-surface soil strata present in LB Camden, the London Clay is the most prone to seasonal shrink-swell (subsidence and heave).

- **The site is within an area of previously worked ground.**

The guidance advises that previously worked ground may be less homogenous than natural strata, and may include relatively uncontrolled backfill zones.

- **The site is within 5m of a highway or pedestrian right of way.**

The guidance advises that excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway.

- **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 information submitted (within Document 3) to date included a cable percussive borehole and a dynamic continuous sampler hole constructed on Greenwood Place to the northeast of the site and a further dynamic continuous sampler hole constructed in the southeast of the site.

The BIA recognises that further, site specific, investigation will be required as follows:

“

- *further phase of ground investigation is required for detailed design;*
- *this investigation should include the construction of additional groundwater monitoring points closer to the proposed basements and to include additional monitoring of groundwater levels;*
- *the investigation should also include additional foundation inspection pits on the southeastern elevation of Deane House and the northeastern elevation of the buildings on Murphy's Yard, so as to establish the possible need for underpinning and to provide data in any ground movement analysis to be undertaken as part of detailed design;”*

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 not proceed to a formal impact assessment stage. However, there is discussion of possible impacts provided within the scoping stage and the following statements are included:

- **The proposed basement will extend beneath the water table surface.**
“Whilst available information indicates that the basement will extend below the water level and below the level of the granular alluvium recorded in BH2, its limited size and (sic) isolated nature (compared to the development of the site as a whole) will mean that the potential for any off-site impacts on groundwater levels is limited.”

“Water ingress could affect the proposed basement, which is potentially of moderate significance. However, assuming the basement is designed to address hydrostatic pressures as required in British Standard (BS) 8102 ‘Protection of Structures against Water from the Ground’, the matter is of residual neutral significance.”
- **London Clay is the shallowest strata at the site.**
“... the preliminary ground investigation was not suggestive of desiccation to significant depths, the basement is relatively remote from trees and the underside of basement slab is comparatively deep.”
“... it is recommended that the proposed basement slab is designed to withstand the associated post construction soil heave pressure (likely to be in the region of 70kN/m²). Alternatively consideration should be given to a suspended floor slab underlain by a suitable void former.”

- **The site is within an area of previously worked ground.**

"Available ground investigation suggests up to 2.50m of Made Ground could present in the area of the basement, although the possibility of greater thicknesses cannot be discounted at this stage. The presence of such materials could present an issue for the stability and settlement of shallow foundations. A piled foundation solution is therefore proposed. In routine pile design no positive contribution towards pile capacity would be assumed in relation to the Made Ground, with the pile gaining its capacity from the underlying undisturbed strata.."

- **The site is within 5m of a highway or pedestrian right of way.**

"Statutory undertakers should be consulted, so as establish if any buried utilities are present and the owners of these assets, along with the owner of highway consulted, so as to determine any constraints to design, for example, easements, surcharge loadings on the walls, and limiting values on ground movement. This matter is considered to be of substantial significance. It is noted that a sewer and a water supply pipe, both operated by Thames Water utilities limited, are present beneath the road pavement to Greenwood Place.

The part of the basement excavation to the highway is to be supported by sheet piles. The matters outlined above will need to be modelled in the design of the relevant walls. They may result in a need for additional support to the excavation, such as propping and/or monitoring."

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

"...it recommended that foundations to these building are established through the excavation of foundation inspection pits. Subsequent to such an investigation such matters should be reappraised. If the nature of the foundations are such that they would be at risk from the basement excavation, then consideration should be given to mitigation measures such as underpinning or to ensuring that ground movements are kept to within tolerable limits by modelling, supporting the excavation/basement wall and monitoring."

"Consideration may also be needed in relation to the method of basement wall construction, for example by considering 'silent' sheet piling methods or by considering alternative forms of wall constriction (sic), such as bored pile wall, so as to limit ground movements and vibration."

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	<p>A Hydrologist or a Civil Engineer specialising in flood risk management and surface water drainage, with either:</p> <ul style="list-style-type: none"> • 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.
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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.

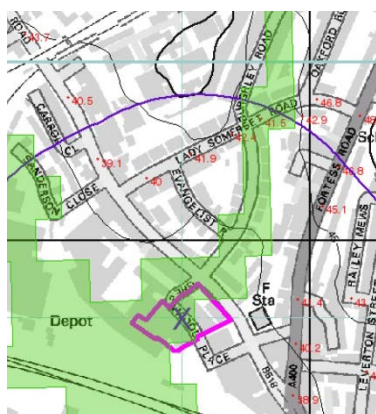
3.2.2 BIA Scope

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

The BIA scoping is considered to be inadequate in two respects where an incorrect "NO" has been returned to screening questions (Subterranean Flow Q2 and Stability Q8 and Surface Water Flow Q6).

The BIA suggests that the course of a tributary of the River Fleet crosses the site.

This inset extract of the CGHHS Fig 2 suggests that the proposed basement lies directly on the river channel. The flood map extract below also suggests the course of a natural valley in the area of the site.



Although the fleet sewer may well provide flood alleviation that diverts water out of the original stream channel, the proposed basement may effectively impound the buried channel and the construction of a groundwater diversion may be necessary in order to preserve the natural flow of groundwater along the natural stream course.

- 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.

The London Borough of Camden Strategic Flood Risk Assessment updated flood maps (July 2014) indicate that Greenwood Place is at high risk from surface water flooding.

- **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).



3.2.3 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?

The BIA states:

“The current proposals indicate that the basement walls are to be of main of load bearing sheet pile construction. A small section of the basement wall, the south-western elevation is indicated to be of reinforced concrete construction. Currently is anticipated that the associated excavation will be supported in the temporary case by a sheet pile wall which may also be required to prevent groundwater ingress into the investigation.”

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.

Not yet.

A detailed ground investigation will be required in order to detect and delimit the extent of any buried stream channel beneath the site and to identify the configuration of the foundations to the neighbouring buildings.

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?

Not yet.

Structural sections should be prepared demonstrating the relationship between the proposed basement construction and the neighbouring buildings at Deane House and Lensham House.

3.2.6 Assessment Methodology

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

Not yet.

Insufficient information has been obtained to undertake and conclude the required assessments.

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 BIA states *“In the first instance it is recommended that foundations to these building are established through the excavation of foundation inspection pits...If the nature of the foundations are such that they would be at risk from the basement excavation, then consideration should be given to mitigation measures such as underpinning or to ensuring that ground movements are kept to within tolerable limits by modelling, supporting the excavation/basement wall and monitoring.”*

While the above statement recognises the need for possible mitigation it is not possible to conclude what may be required. Furthermore, it is possible that depending upon the findings of a specific ground investigation of the proposed basement area additional measures may be required such as a groundwater by-pass.

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 is mentioned but the BIA does not provide any detail and states:

“Such matters will need to be given due consideration in design development to enable suitable schemes to be established.”

3.2.9 Residual Impacts after Mitigation

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

Not yet.

In the absence of conclusive assessments due to a lack of information, the submission has yet to be progressed to any definitive mitigation methodology and therefore a substantiated assessment of the residual impacts after mitigation cannot be concluded.

4. Assessment of Acceptability of Residual Impacts

4.1 Proposed Construction Methodology

A definitive and detailed construction methodology has not yet been developed.

4.2 Soundness of Evidence Presented

A flood risk assessment is referred to but does not appear to have been submitted.

The ground investigation information presented is unfortunately inadequate.

No information has been provided on the configuration of the foundations to the neighbouring buildings.

It is not clear whether a buried stream channel runs beneath the site.

The BIA asserts the following *“assuming groundwater flows to the southeast (i.e normal to the long axis of the basement), then based on paragraph 171 of the GSD document, the groundwater level behind the proposed basement may rise by around 60 to 120mm”*. It is not clear how these figures have been obtained.

4.3 Reasonableness of Assessments

Given the present lack of information, detailed assessments have not yet been undertaken.

4.4 Robustness of Conclusions and Proposed Mitigation Measures

Detailed mitigation measures have not yet been developed.

The BIA speculates as follows *“it is anticipated that the matters identified in the screening exercise will be of residual neutral or minor significance.”*

and states

“.. subject to appropriate design and construction, it should be possible to address the potential issues”.

5. Conclusions

The submitted BIA does reflect the processes and procedures set out in DP27 and CPG4 for the initial screening and scoping stages of a BIA. However, the potential issues that have been identified now require to be investigated so that the design of specific mitigation measures can be progressed and any residual impacts assessed.

It is unfortunately considered that the present submission therefore does 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 is suggested that the concerns about the submission that have been raised in sections 3 and 4 of this document can be addressed by way of further submission.

5.1 Further Information Required

It is considered that in order to meet the requirements of DP27 further information is required as follows:

- Ground investigation to
 - ascertain the ground conditions in the area of the proposed basement
 - detect and delimit the extent of any buried stream channel beneath the site
 - identify the configuration of the foundations to the neighbouring buildings.
- Information on neighbouring buried street services including the Fleet Sewer.
- Flood Risk Assessment

With the benefit of this further information, the BIA should then be progressed accordingly to include an assessment of any surface water, groundwater or stability impacts. A specific construction sequence and methodology needs to be developed indicating in detail how any groundwater flow is to be preserved and how the stability of neighbouring structures is to be protected in both the temporary and the permanent situation. The BIA impact assessment stage should provide a detailed assessment of the extent of the possible ground movements and any structural damage to be expected during and after the works. A detailed monitoring and contingency plan should also be presented that reflects the outcome of this further assessment.

It is envisaged that this further information and assessment might reasonably be sought by condition that it should be provided and approved prior to the commencement of any work.