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4 Langland Gardens
London NW3 6PY

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12066-12
Rev: F1

August 2015

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Appendices

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 4 Langland Gardens (planning reference 2015/0315/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and review it against an agreed audit check list.

1.4. The BIA has been prepared and revised by personnel who have suitable qualifications.

1.5. The proposal deepens an existing lower ground floor below the existing building footprint by 1.5 metres and has been revised to create an extension basement and rear light well within the back garden approximately 8 metres long x 3.2 metres deep. It also creates a front light well adjacent to the highway.

1.6. It is accepted that the basement will be founded in the London Clay and will not impact on the hydrogeology of the area.

1.7. It is accepted that the surrounding slopes to the development are stable.

1.8. Additional and revised information has been provided which has removed the majority of the original concerns. However, no measures are provided to overcome potential heave of the Clay subsoil and the construction of the rear retaining walls should be considered further.

1.9. Additional information has confirmed an acceptable observational assessment of potential movements due to excavation and construction that has identified that Very Slight Damage (Burland Category 1) may be caused to Nos. 2 and 6 Langland Gardens. Acceptable proposals have been offered to monitor ground movements.

1.10. Although Langland Gardens was affected by flooding in the 1975 event, the BIA anticipates that due to the gradient of the road, the property is unlikely to be affected. Additional information has indicated that adequate precautions have been identified to prevent water ingress into the front light well.

1.11. The basement proposal will increase the extent of the paved area discharging to the existing surface water drainage system but, although attenuation is identified outside the front light

wells, no details are provided to indicate how the rainwater collection system for the front and rear light wells and the roof would be connected.

1.12. The difficulty of constructing the freestanding reinforced concrete retaining walls remain unresolved and require the input of a Principal Contractor to resolve the issues through the Party Wall Approval process or preferably a Basement Construction Plan.

1.13. No proposals are identified to overcome the effect of heave on the underlying clay soils.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 10 June 2015 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 4 Langland Gardens, Camden Reference 2015/0315/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water

2.4. The BIA should demonstrate that schemes:

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

b) avoid adversely affecting drainage and run off or causing other damage to the water environment; and,

c) avoid cumulative impacts upon structural stability or the water environment in the local area.

and evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as the *"Excavation of the single storey basement and creation of a new rear lightwell beneath the footprint of the existing residential flats."*

and confirmed that the basement proposals did not involve a listed building, nor did the site neighbour any listed buildings.

2.6. CampbellReith accessed LBC's Planning Portal on 8 July 2015 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA)
- Construction Method Statement (CMS)
- Design and Access Statement
- Drawing no. 1410/100 – Site Location & Site Plan
  Drawing no. 1410/101B – Existing Basement & Ground Plans
  Drawing no. 1410/103 – Existing Side & Front Elevation
  Drawing no. 1410/104 – Existing Rear Elevation
  Drawing no. 1410/112B – Existing Long Section
  Drawing no. 1410/206E - Proposed Basement & Ground Plans
  Drawing no. 1410/208A – Proposed Roof Plan & Front Elevation
  Drawing no. 1410/209C – Proposed Side Elevation
  Drawing no. 1410/210E – Proposed Rear Elevation
  Drawing no. 1410/211F – Proposed Long Section

2.7. Following the issue of our preliminary D1 revision of our audit, supplementary information was received in response to the queries raised. The original text in the D1 revision has been kept and commentary added where relevant. The information received was as follows:

- Summary of Responses letter by Bchitecture
- Basement Impact Assessment Report (Updated July 2015) (RBIA)
- Construction Method Statement Revision B (RCMS)
- CMS Supplementary Calculations Revision A
- Revisions to Architect's drawings as 2.6 above Nos. 1410/100A, 101C, 102A, 103B, 104A, 112D, 205G (Proposed Site Plan), 206G, 207D, 208C, 209D, 210G, 211H.
- Blue Engineering drgs 2385/200 P2, 201 P2, 202 P1, 203 P1, 204 P1.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	BIA Section 1.3.
Is data required by Cl.233 of the GSD presented?	Yes	BIA and CMS.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	BIA Section 2.2.
Are suitable plan/maps included?	Yes	BIA Section 3.4.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 10.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 10.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 11.
Is a conceptual model presented?	N/A	
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 10.

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 10.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA Section 11.
Is factual ground investigation data provided?	Yes	BIA Appendix D.
Is monitoring data presented?	Yes	Standpipes monitored twice, see BIA Section 4.2.
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	CMS
Is a geotechnical interpretation presented?	Yes	BIA Section 4.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA & CMS
Are reports on other investigations required by screening and scoping presented?	N/A	
Are baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	BIA Sections 5 and 6.
Are estimates of ground movement and structural impact presented?	Yes	BIA Section 5.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	
Has the need for monitoring during construction been considered?	Yes	
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties maintained?	No	Clarification of construction methodology required.
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	
Are non-technical summaries provided?	Yes	BIA Section 12.

4.0 DISCUSSION

4.1. The BIA has been carried out by an established firm of consultants and the lead author possesses suitable qualifications.

4.2. The proposed single storey basement encompasses the footprint of the existing lower ground floor and lowers it by approximately 1.5 metres. A rear basement extension will then be formed with ground floor and part first floor above, for a further 5.0 metres into the existing garden, together with a rear light well and patio, in all creating an excavation and construction projection into the rear garden of approximately 11 metres x 3.2 metres deep. A small light well is also formed at the front of the property.

Revisions to Architectural drawings have subsequently reduced the length of excavation and construction to approximately 8 metres x 3.2 metres deep.

4.3. The retained walls of the existing property will be underpinned using traditional construction techniques. The CMS indicates that each pin will have a section of reinforced concrete retaining wall and base formed under the existing brickwork wall. No calculations or reinforcement details are provided and although temporary props are indicated in sketches of each stage, no details are provided. The extent of the adjacent basement to no. 2 does not appear to accord with the Architect's existing basement floor plan. No details of dowels between adjacent underpins are provided.

Blue Engineering's drawings have been revised to accord with Architectural planning drawings. The CMS Supplementary Calculations have supplied satisfactory information regarding the design of reinforced concrete retaining walls and temporary propping arrangements and details. The RCMS proposes to utilise a keyed joint for bonding successive pins of retaining wall/ underpinning concrete. Although this is structurally acceptable there is a potential for a lack of water tightness in the construction at joint positions. Continuity of horizontal reinforcement across joints is preferred.

4.4. No details are provided to show how the light well(s) at the front of the property will be excavated and constructed.

Blue Engineering's drawing No. 2385/204(P1) and the RCMS Section 3.0 provide a potential sequence of work to construct an enlarged and deepened lightwell on the left hand side of the property and a new lightwell on the right hand side, which are acceptable.

4.5. The rear light well is to be formed using reinforced concrete retaining walls with a reinforced concrete heel projecting beyond its rear face into the garden, potentially using an open cut excavation. The effect of this open excavation on the adjacent properties has not been

considered. The CMS has been produced by Blue Engineering and some of their drawings are included within the BIA. Confusingly, those within the BIA contradict the CMS as they show the walls of the rear light well constructed from reinforced masonry. One Blue Engineering drawing in the BIA, no. 2385/100 P1 states that *"underpinning has been designed so that the maximum bearing pressure is 200kN/m² based on medium dense sand and gravel ….."*, which would appear to be an error as the founding stratum is London Clay.

Blue Engineering drawings have been generally updated and the incorrect drawings contained in the original BIA have been withdrawn from the revised RBIA. The drawings, as discussed in item 4.3, provide an indicative solution to produce the deepened basement below the footprint of the existing building. However, in order to construct the extension, a retaining wall has to be constructed on the boundary line with No. 2 Langland Gardens using similar techniques. An intricate system of propping will be required with the possibility that localised damage to the adjacent property / land will occur. The rear lightwell is still to be formed utilising a toe which projects beyond the rear face of the retaining wall. The excavation to form the wall on grid line 4 will require similarly difficult construction techniques. These issues should be resolved through the introduction of a Principal Contractor making finalised construction proposals, which can be approved, either through the Party Wall Approval procedure or preferably by the requirement to produce a Basement Construction Plan prior to construction commencement.

4.6. The information supplied by the Architect and the CMS showing underpinning details and methodology provide an incorrect location (NW3 5BP) in their documentation.

The incorrect documentation has been revised.

4.7. It is acknowledged that the basement will be founded within the London Clay, which was encountered at between 0.65 metres and 0.9 metres below ground level in the two boreholes undertaken as part of the soils investigation. It is accepted that any minor seepages detected in the London Clay do not constitute a continuous water flow and that groundwater will not be affected by the excavation or the basement construction.

4.8. As neither borehole encountered groundwater, it is unlikely that water entering the excavation will be problematical. If perched water is encountered during excavation, care should be exercised to minimise any impact on adjacent structures.

4.9. The BIA has shown that the surrounding slopes to the development are stable. However, the plan of the existing basement does not show the existing front light well. It is unclear whether the light well is to be deepened or how this is to be achieved, particularly as it is within 5 metres of an adjacent highway.

Revised information has been supplied correctly showing the current proposals for the front lightwells, which are acceptable. The Architect has confirmed that they are set back 6.85 metres from the property boundary and should have little effect on the adjacent highway.

4.10. The BIA includes an empirical assessment of vertical settlement and horizontal movement of the excavations to construct the basement resulting in potential damage to no. 2 Langland Gardens of up to Burland Damage Category 1 – Very Slight Damage to its rear quadrant. The ground movement assessment (Section 5 of the BIA) states that the existing walls will be underpinned and the basement extension will be supported by a structural retaining wall. However, none of the information provided describes how the retaining walls will be constructed. The case studies referred to, from which ground movements have been predicted, relate to strutted excavations supported by embedded retaining walls. It is not possible to assess whether this is appropriate to the proposed construction.

Section 5 of the RBIA provides a conservative reassessment of anticipated vertical and horizontal ground movements, together with supporting calculations within Appendix F, indicating likely strains within masonry elevations of Nos. 2 and 6 Langland Gardens. It is accepted that damage is likely to be limited to Burland Category 1 – Very slight on the assumption that good levels of workmanship are adopted and the original construction is in sound condition.

4.11. Whilst horizontal ground movements are predicted, it is not clear that these have been considered in the building strain assessment. A contour plan of settlements only is presented. Additionally, whilst the adjacent properties may have basements, these are of limited extent and foundations outside the basement areas are likely to be shallow.

The revised contour plot only shows vertical settlement as horizontal movements are discussed in the revised text of Section 5 and considered in the additional Appendix F strain calculations. The damage assessment of adjacent buildings, based upon the strain calculations, assumes no basements below the adjacent properties and hence is a conservative assessment. Although Section 5 of the RBIA does not discuss the heave that will occur outside the basement excavation, and hence the effect on adjacent properties is conservative as it would offset the vertical settlement, there is no mention within the RBIA or CMS of the effect of heave on the new basement construction due to the excavation of clay subsoils and no measures are identified to overcome the issue.

4.12. No mention is made of any monitoring of ground movements which should be incorporated into the proposals in order give early warning of unexpected movements and ensure that propping arrangements, once finalised, can be adjusted as necessary to minimise potential damage.

The RCMS contains acceptable additional proposals for monitoring movements using target points with a traffic light system to confirm action to be taken if unexpected movements occur.

4.13. It is accepted that no known ponds, wells or acquifers are in close proximity to the site and that the site is outside the Hampstead pond chain catchment area. The BIA acknowledges that Langland Gardens lies adjacent to a former tributary of the River Westbourne and correctly identifies that the proposed basement will not act to prevent groundwater flow because the London Clay is not capable of providing groundwater baseflow to watercourses.

4.14. The BIA acknowledges that the proposed basement development will increase the extent of paved area discharging to the surface water drainage system and, hence, correctly proposed to install a hydrobrake limiting flows to match current rainwater run off, and attenuate any additional water on site in a below ground store facility, probably located in the rear garden. No details are provided, however, and this additional excavation could exacerbate the potential movement impact on adjacent neighbours.

The text within the RBIA remains unchanged and the requirement to attenuate stormwater into the surface water drainage system is supported by a revised Blue Engineering drawing 2385/201 (P2) showing a Polypipe Stormwater Modular Attenuation System which is to be wrapped in a non-permeable membrane and installed below 500mm of ground outside the extent of the front light well. No details are provide to indicate how this would be connected to the rainwater collection system and how rainwater falling into the rear light well would be connected.

4.15. The BIA identifies that Langland Gardens was subject to flooding in 1975, but not in 2002, due to the surface water drainage system not being able to cope with that rainfall event. It states that the 1 in 12 gradient of the road makes it unlikely that the flooding would have affected the subject property. Precautions should be taken to ensure that potential flood water does not enter the front light well and hence access the proposed basement.

The Architect has provided revised drawings 1410/112D and 211H to demonstrate that the lightwell curbs are set higher than the adjoining highway, which is acceptable.

5.0 CONCLUSIONS

5.1. The BIA has been prepared and revised by personnel who have suitable qualifications.

5.2. The proposal deepens an existing lower ground floor below the existing building footprint by 1.5 metres and has been revised to create an extension basement and rear light well within the back garden approximately 8 metres long x 3.2 metres deep. It also creates a front light well adjacent to the highway.

5.3. It is accepted that the basement will be founded in the London Clay and will not impact on the hydrogeology of the area.

5.4. It is accepted that the surrounding slopes to the development are stable.

5.5. Additional and revised information has been provided which has removed the majority of the original concerns. However, no measures are provided to overcome potential heave of the Clay subsoil and the construction of rear retaining walls should be considered further.

5.6. Additional information has confirmed an acceptable observational assessment of potential movements due to excavation and construction that has identified that Very Slight Damage (Burland Category 1) may be caused to Nos. 2 and 6 Langland Gardens. Acceptable proposals have been offered to monitor ground movements.

5.7. Although Langland Gardens was affected by flooding in the 1975 event, the BIA anticipates that due to the gradient of the road, the property is unlikely to be affected. Additional information has indicated that adequate precautions have been identified to prevent water ingress into the front light well.

5.8. The basement proposal will increase the extent of the paved area discharging to the existing surface water drainage system but, although attenuation is identified outside the front light wells, no details are provided to indicate how the rainwater collection system for the front and rear light wells and the roof would be connected.

5.9. The difficulty of constructing the freestanding reinforced concrete retaining walls remain unresolved and require the input of a Principal Contractor to resolve the issues through the Party Wall Approval process or preferably a Basement Construction Plan.

5.10. No proposals are identified to overcome the effect of heave on the underlying clay soils.

Appendix 1: Residents' Consultation Comments

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Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Rand Kukielski	2 Langland Gardens	05.08.15	Scope of soils investigation	Items 4.7 & 4.8
			Movement monitoring	Item 4.12
Bishop	6 Langland Gardens	06.08.15	Subsidence issues to No. 6	Item 4.10

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Revised basement methodology	Further information to address comments in 4.3 to 4.6 and 4.9.	Items 4.4, 4.4, 4.6 and 4.9 closed. Item 4.5 remains unresolved.	August 2015
2	Ground Movement monitoring	Proposals required.	Proposals acceptable – closed.	August 2015
3	Surface Water attenuation	Proposals required and impact on adjacent properties assessed.	Problems remain unresolved.	
4	Surface Water Flooding	Proposals required to prevent flood waters entering front light well.	Proposals acceptable – closed.	August 2015
5	Stability	Predictions of ground movement to be confirmed in relation to proposed construction methodology.	Proposals acceptable but heave mitigation measures requested.	
6	Stability	Once ground movement predictions are confirmed, the building damage assessment should consider horizontal movements and shallow foundations.	Proposals acceptable – closed.	August 2015

Appendix 3: Supplementary Supporting Documents

None

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