Ground and Project CONSULTANTS LTD

63 GOLDHURST TERRACE, LONDON, NW6 3HB
ADDENDUM REPORT ON GROUND MOVEMENTS
September 2016

Client:

Dig For Victory

11 Broadfields,

East Molesey,

KT8 0BW

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1. Introduction

Ground and Project Consultants Ltd have been instructed by Dig For Victory to further assess the impact of the proposed basement construction on ground movements for 63 Goldhurst Terrace, London, NW6 3HB.

This report is an addendum to the BIA Land Stability & Ground Movement Report carried out for 'Dig For Victory' by others.

Campbell Reith's audit comments asked for clarification of ground movements.

2. Assessment of Ground Movement

An assessment of ground movements has been carried out as follows:

- Movements have been assessed for the adjoining and closest properties (Adjoining property at 61 and 65 Goldhurst Terrace) which are predicted to arise due to the excavation of the basement.
- The magnitude of ground movements has been assessed for the excavation in front of the retaining structure.
- Movement due to Wall installation has been discounted at this stage as it is understood that the property will be underpinned, and as such a wall will not be installed into the ground. Rather the 'wall' will be installed into the excavation.
- It is important to note that CIRIA report C580 is written for embedded retaining walls. Therefore movement calculations for the excavation of soil and installation of underpins does not strictly apply to C580. There is no recognised method for calculating ground movements due to underpinned basements so C580 is used as a convenient and recognised approach. However it is recognised that settlements are generally small where care and appropriate measures are taken in construction.

Outline design planning drawings supplied by DFV have been reviewed and used to inform this assessment.

The following key assumptions have been made:

- The maximum excavation depth is approximately 3.0m bgl.
- The method of basement construction will be via underpinning using a 'hit and miss' approach.
- A high wall stiffness has been assumed.
- In the permanent case the wall will always be propped at high level.
- The adjoining properties are attached to the subject property.
- For the purposes of the calculations, the width and height of 6m and 12m respectively of the subject properties have been assumed.
- A London Clay soil of stiff consistency has been assumed.

From figure 2.11 in C580 the following calculated assessments of ground movements have been developed due the excavation of soils in front of the wall. An excavation depth of 3.0m has been assumed.

No's 61 and 65 Goldhurst Terrace

Distance from wall* (m)	**0 (Near side)**	**6 (Far side)**	**Max Vertical Movement**
Horizontal Movement (mm)	5	1-2	
Vertical Movement (mm)	1	1-2	~3mm at 1.8m from the basement

This assumes that the wall is propped high and therefore a high stiffness can be assumed when reading from the graphs. It is understood that there will be adequate propping in the temporary case to justify this assumption and in the permanent case the structure will provide adequate support to the retaining walls and act as a high level prop.

There are a number of key points to note in using this assessment:

- Most ground movement will occur during wall installation, excavation of the basement and construction so the adequacy of temporary support will be critical in limiting ground movements.
- The speed of propping and support is key to limiting ground movements
- Good workmanship will contribute to minimising ground movements.
- The assessment assumes the wall is in competent clay.
- Larger movements will be expected where soft soils are encountered at, above and below formation.

Ground movement can be minimised by adopting a number of measures, including:

- Ensuring that adequate propping is in place at all times during construction
- Installation of the first (stiff) support quickly and early in the construction sequence.
- Avoidance of ground loss through the gaps between the piles.
- Avoid leaving ground unsupported.
- Minimise deterioration of the central soil mass by the use of blinding/ covering with a waterproof membrane.
- Avoid overbreak
- Control dewatering to minimise fines removal and drawdown.

It must be noted that the movements are calculated values based on the findings and methods of CIRIA C580. Larger movements may be generated if any one or any combination of the above recommendations and/or assumptions are not heeded or if ground conditions are different to a firm to stiff or stiff London Clay.

In terms of building damage assessment and with reference to Table 2.5 of C580 (after Burland et al, 1977), the 'Description of typical damage' given the *calculated* ground movements is likely to be:

- For no.s 61 and 65 Goldhurst Terrace: 'Negligible' to 'Very Slight'.

Heave

Heave of the ground will occur within the basement due to soil removal and consequent unloading of the soil. Using elastic and consolidation theories, both immediate and longer term heave movements have been calculated for within the basement. These are calculated figures and apply to the centre of the basement. The figures will be significantly lower at the edges and lower still at the corners and estimates are provided. The figures presented represent estimates and are based on a number of assumptions.

Immediate upward (elastic) movements have been calculated at around 5mm. These will be completed upon completion of soil excavation usually within about 7 days.

Longer term soil swelling will also occur. The rate of this longer term swelling will be determined largely by the availability of water and the low permeability of the London Clay. As a result this may take many years to reach full equilibrium. The basement slab will need to be sufficiently stiff to enable it to accommodate the swelling displacements/pressures developed underneath it. The amount of long term swelling has been calculated to be of the order of10mm for the centre of the excavation with the centre of basement edges and corners having calculated values of the order of 3 to 5mm.

3. Conclusions

The methodology and approach of CPG4 has been followed in developing this BIA with respect to Land stability. It is concluded that with the construction of the new basement at 63, Goldhurst Terrace should not have significant impacts on land stability provided that:

- Groundwater inflow, if encountered, is reduced to a minimum and properly controlled such that there is no significant wash out of fine material. Groundwater levels should be monitored before and during construction.
- The retaining wall should be appropriately designed.
- The construction of the basement is carried out by competent and experienced contractors and precautions are taken to maintain the stability of the excavations.
- Care should be taken to minimise the disturbance and damage to trees and their roots. Should tress be removed then an assessment of the potential for swelling of the London Clay soils should be carried out.
- Concrete should be designed in accordance with BRE Special Digest 1 accounting for the sulphate conditions anticipated.
- Monitoring of the structures is carried out before and during construction. The exact nature of this monitoring should be determined by the structural engineer.

4. References

1. BGS Geological Map Sheet 256.
2. Ordnance Survey Map, Explorer 173, London North
3. Arup: Camden Geological, Hydrogeological and Hydrological Study.
4. CIRIA Report C580: Embedded Retaining Walls
5. Drawings supplied by DFV
6. DFV Method Statements
7. Chelmer Site Investigations: Report Ref FACT /5126B: 63 Goldhurst Terrace