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Ms Tessa Craig,
Planning Officer,
London Borough Camden,
Camden Reception,
5 Pancras Square.
London N1C 4AG.

9th February 2016

Tessa.Craig@camden.gov.uk

Dear Ms Craig,

Review of the Application to develop No.10 Clorane Gardens
Camden Application No. 2015/6734/P

1. I have been commissioned by Ms. K. Marsh and Mr. P. Ross, the owners and occupiers of Nos. 12 and 8 Clorane Gardens respectively, to review the application for a basement at No.10 and report on the extent to which it satisfies the requirements of DP27 and CPG4.

2. I am a Chartered Geologist with specialisation in engineering geology and groundwater and listed as an Adviser on the UK Register of Ground Engineering Professionals retained by the Institution of Civil Engineers.

Summary

3. The Basement Impact Assessment completed by Gabriel Geo Consulting Ltd., (GCC Report 16494/R2) provides a sound basis for design of the works; those involved with compiling the Assessment are qualified to do so on matters geological, geotechnical and hydrological, and have engaged the services of a well-respected engineer (The Alan Baxter Partnership) for engineering matters beyond their field of expertise.

4. There are however matters which deserve further consideration prior to approval as they can influence not only the temporary works required to achieve the excavation of a basement but also its affect upon the surrounding groundwater environment once constructed. As such they leave the application falling short of what it should achieve to satisfy DP27 and CPG4. These matters are as follows.

4.1 The mechanical properties of ground that may have been disturbed by previous working, including the creation of the basement at No.12, have not been adequately considered for the purposes of design and construction.

4.2 The absence of a Construction Management Plan makes it ever more pressing to resolve the shortcoming in 4.1.

4.3 The cumulative effects of basements including that proposed for No.12 on groundwater beneath Nos. 8 and 10 has not been considered.

Unit 17, Hurlingham Studios, Ranelagh Gardens, London SW6 3PA. UK
Tel: 020 7736 6889 www.firststeps-geo.co.uk
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VAT Number 893667267

5. Although these matters are unlikely to prevent the works from being completed, they are matters that can affect both the short term and the long-term response of the ground to the work proposed and as such should be dealt with before approval is given.

Background to your site

6. Clorane Gardens lies on the gentle western slopes of Childs Hill which is capped by the sands and gravels of the "Bagshot Beds" (now called the Bagshot Formation by the British Geological Survey) as seen up on Hampstead Heath; these are natural areas for infiltration of rain and provide the storage for groundwater that seeps away downslope throughout most of the year. Clorane Gardens is not on the "Bagshots" but on the finer grained material beneath them, what many know as the "Claygate Beds". A little further downhill, skirting along the Finchley Road, the London Clay itself appears from beneath the "Claygates". As the "Claygates" are very much more like the London Clay than they are the "Bagshots" the Geological Survey have designated them as the Claygate Member of the London Clay Formation.

7. All this gives a general impression of layer-cake geology; "Bagshots" on top, "Claygates" beneath and London Clay at the base, and on a large scale that is so, but at the scale of basements in Clorane Gardens small departures from this general picture become significant.

8. The differences arise from the evolution of the landscape towards the end of the Ice Age when these slopes were very much wetter than now and mantled with mudslides and mudflows supplied by sediment wasting from the Bagshot and Claygate horizons. These created a shallow apron of clays, silts, sands and gravels mixed in various ways that blankets the topography and is very commonly described, sometimes quite erroneously, as "Made Ground", i.e. artificially disturbed by man. To this mix can also be found wind-blown material carried on the cold dry winds of what was then Tundra.

9. This apron has to be penetrated by basements yet it can often behave as a shallow aquifer that has direct links with the "Bagshots" up-hill. Not only that but being so shallow it is the material into which the trenches for most of the utilities are excavated, which themselves act as an aquifer network for normal shallow groundwater flow they may intersect and for any leakage from sewers and water mains that occurs within them. It is also the horizon into which most soakaways discharge.

10. Very little is known about the hydrological response of this zone to rainfall but the few case histories known to me (on Rosslyn Hill, South Hill Park, The Old Orchard and Tanza Rd) suggest that they can transmit a rapid response to rainfall, even in the summer, and that is not surprising if they are also fed by leaking utilities; a sample of groundwater from Rosslyn Hill was contaminated.

11. From this it is evident that ground water needs to be well understood in Clorane Gardens before work that can change its long term levels and pattern of flow is undertaken.

12. Another feature of the site that has to be considered, and has been by the Basement Impact Assessment, is the possible legacy of Brick Working, i.e. the excavation of material for making bricks. This was haphazard by modern standards and excavations followed the suitable combinations of silt, sand and clay that nature had deposited in this surface apron of sediment transported downhill by gravity and mixed with windblown silt. It is not known where these excavations may have been or where the material discarded was placed. This makes the lateral correlation of near surface strata unreliable and hence the selection of representative mechanical properties for it very much a matter for judgement.

13. A further influence arising from the work of man comes from the basement beneath No.12. How this has affected the surrounding ground is probably unknown but is another reason why judgement has to be exercised when assessing ground response to excavation nearby.

Details

14. Fig. 1 is a synopsis of data obtained from the factual ground investigation; it plots a measure of strength (SPT N values) with depth and shows also the basic geology of the two boreholes from which these data come, their elevation above Ordnance datum (AOD), the elevations of the geological boundaries they intersect and that of water levels measured 3 and 4 weeks after the holes were completed.

15. No laboratory measurements were made of strength and that is not really a problem as the general trend of strength and the overall values of strength give a more reliable guide to likely conditions in such ground. However, these trends do raise questions which the technical advisors for No.10 should have answers.

16. The excavation for the basement will be in the Claygate beds which the site data now shows contains groundwater – as would be expected (see 9 above). The departure of the trend of measured strengths in BH2 from those measured in BH1 could be explained by the presence of groundwater pressures encountered by BH2 whilst penetrating the ground. The questions then are as follows.

16.1 Does this mean such groundwater driven disturbance could occur during the excavations for underpinning and if so how would groundwater be controlled so as not to encourage erosion of the surrounding ground?

16.2 If this is not driven by groundwater does it imply the ground over the short distance between BH1 and 2 changes in ways that are significant? BH2 is closer to the basement at No.12 than BH1 so perhaps some change in

conditions that affects the ground is being detected. The moisture content profile from BH2 is a subdued version of that in BH1 once below 1m (the profile in Fig 3 of the Complete Report needs to be dropped by about 1m to reflect relative ground levels) also suggesting the fabrics of the sediments encountered at BH2 may be a disturbed variant of that further away.

16.3 It is of course quite possible that the site response is a combination of both these.

17. Insufficient attention has been given to the effects the basement constructed beneath No.12 has had on the surrounding ground and to any long term adjustments of the ground the basement excavation at No.12 has promoted.

18. As GCC's report points out, the ability of this excavation to be completed with no adverse consequences to No.12 and No.8 depends critically on the workmanship at the time of construction and that will rely on the contractors being aware of the conditions they may encounter. The potential problems ahead have not been made clear.

19. One of the shortcomings of the submission is an absence of a Construction Management Plan; such a plan could take these matters into account. The 4 stages described in para 10.5.4 of the Complete Report need expanding. Unless these things are made apparent the ground will be considered as homogeneous. The borehole logs show this is not so and the problems during construction inhomogeneity can raise are not removed by taking conservative values for strength and stiffness.

20. The need for monitoring has been mentioned but the actions that follow unwarranted movements have not been defined other than the work should stop. Gravity, which will be the driver for things going wrong, will not stop whilst advisers consider what next to do. This should be sorted before seeking approval especially as there is uncertainty about the ground model.

21. The matters dealt with so far are all associated with the formation of the works, i.e. the underpinning and general excavations that follow. There is however the behaviour of the ground now that another basement is in place. The desk study has revealed the presence of a basements at Nos.7 and 5 across the road and there is that at No.12 and another is reported at No.14. It is also possible that some of the neighbours have cellars, shallow basements dug at the time the house was constructed. Some of these may even have been extended without anyone knowing. So a far fuller understanding of groundwater is required here than that provided.

22 The basic shallow hydrology of the site is of ground water flow off the southern extension of Childs Hill flowing approximately east north-east to west south-west towards the general area of Cricklewood, and this is reflected in the maps of flood occurrence (see Figure 6 of the Complete Report Extract from the Environment Agency's map of 'Risk of Flooding from Surface

Water'). It is also seen in the difference in piezometric levels measured in BH's 1 and 2 (see Fig 1 attached). That flow places Nos.7, 5 and 10 slightly up-stream from Nos.12 and 14; it is reported that No.7 inherited water problems with their basement.

23. A basement at No.10 has the potential for creating an underground dam that extends from the boundary of No.16 to that of No.8 on one side of the road with basements facing this dam on the other side of the road.

24. The question not addressed and one that CPG4 asks to be addressed, is what the cumulative effect of the basement at No.10 will be under these circumstances. Apparently the garden at No.12 is already sodden and the terrace there is protected with a sump pump at basement level, which when it fails permits water to rapidly rise. The garden of No.8 also experiences wetness. Further No.8 has a cellar that was deepened in 2000 to standing height so that a boiler could be housed; a small sump pump was installed and operates when water ingresses in wet weather.

25. The question is fairly simple to put; what will the effect be on surrounding ground water levels of a basement at No.10? The proposed works will probably include SUDS which will discharge rainfall and its runoff directly to the ground without the ameliorating influence of evapo-transpiration, and whilst that relieves the sewers it simply adds water to the ground as a rapid response (as per para 9 above).

26. Claims may well be made that the ground is of low permeability but groundwater has been measured in the piezometers and the two water levels recorded do not disagree with the general direction of flow suggested by topography. Further the neighbours have experienced the response of the ground to wet weather. The cause of the wetness in the gardens around and cellars should be investigated together with the speed with which groundwater there responds to rainfall, as it obviously does. It is clear that a number of sump pumps are operating in the vicinity and all these are discharging to the sewer so adding to the known problems of flooding "downstream".

Conclusions

27. There are 5 detailed issues which should be addressed before planning permission is sought because they arise from the Basement Impact Assessment and as such should be dealt with to comply with the requirements of DP27 and CPG4. They are;

27.1 Justification for;

(i) the design for the basement given the evidence that there may be around the existing basement of No.12 a zone of disturbed ground of different character from the ground in its virgin state, and probably a zone similarly disturbed adjacent to No.8, and

(ii) for the predictions for the lateral extent and vertical magnitude of the ground movements presented.

27.2 The provision of a Construction Management Plan for the ground works that takes into consideration the unknowns that the ground investigation has exposed about the character and variability of the ground.

27.3 The design for a ground water management plan that can be incorporated into the Construction Management Plan.

27.4 The incorporation of the monitoring protocol and its responses into the Construction Management Plan.

27.5 The need for the cumulative effects on groundwater of the basement at No.10 to be quantified and if necessary the design of the basement be adjusted to facilitate the continuation of groundwater flows it would have otherwise intercept.

28. To provide these data is a perfectly reasonable request to make and based on the requirements of DP 27 and CPG4. Without them permission for the application should be with held

Yours sincerely

[redacted]

THE GEOLOGICAL SOCIETY
CGeol
CHARTERED GEOLOGIST
Fellow No. 9710

MH de Freitas PhD, DIC, C.Geol, C.WEM
Director First Steps Ltd, and
Emeritus Reader in Engineering Geology
Imperial College London.
Ground Engineering Adviser,
UK Register of Ground Engineering Professionals (RoGEP) (68302453)