# BASEMENT IMPACT ASSESSMENT

# 111 FROGNAL

# LONDON

# NW3 6XR

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## 1:0 INTRODUCTION

Rose & Associates have been commissioned to prepare a Basement Impact Assessment report to accompany a Planning application for certain extension works to the rear of the subject property.

This Basement Impact Assessment is based on the criteria set down by Camden Council.

The property stands on the west side of Frognal with the building basically orientated north – south.

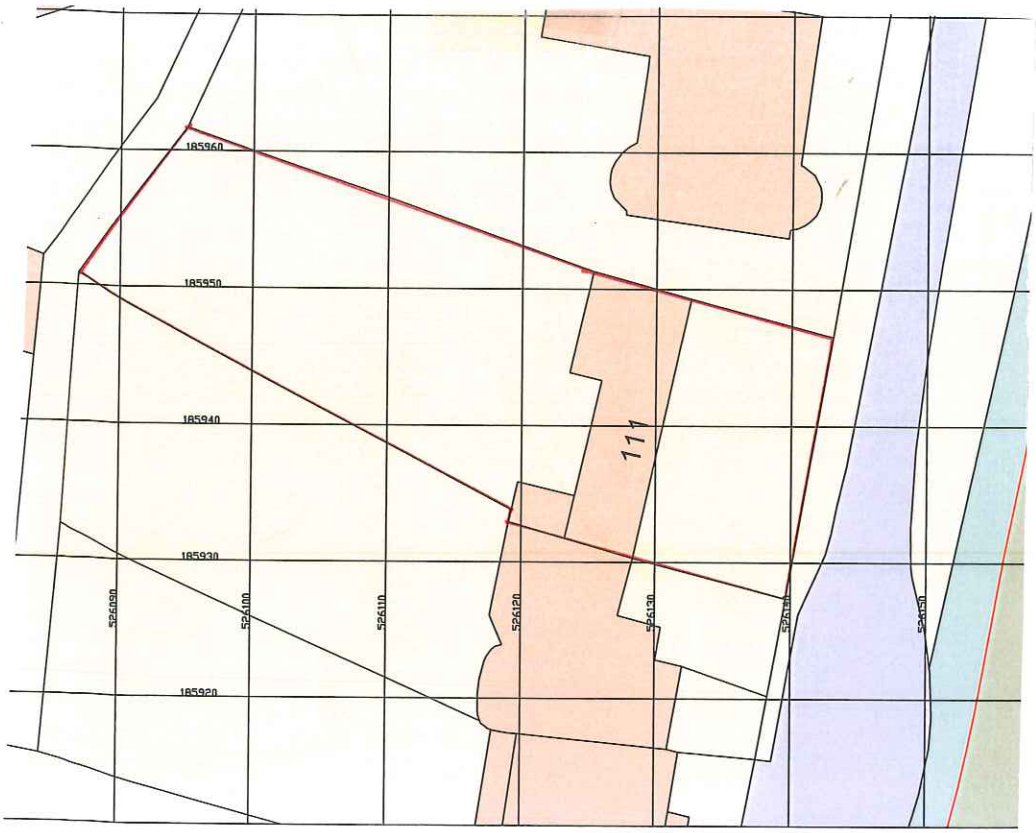
The site is set on a slope. Standing looking at the front of the property the rear right hand corner of the garden represents the highest part of the site, which runs down to the rear left hand corner of the building. The frontage has a gentler slope running in a similar manner.

Based on Google Earth the difference in ground level from the rear of the garden to the rear of the house is in the order of 5 metres, although this would need to be confirmed by a formal topographical survey.

It should be noted that the proposed extension occurs at ground and first floor level only and does not involve the construction of a basement. However, because the works entail regrading by way of lowering a small section of the garden, Camden Council's planning department have requested an initial basement Impact assessment be undertaken to supplement the planning application.

## SITE DESCRIPTION AND PROPOSED REDEVELOPMENT

As we stated above the property can be found on the east side of Frognal set between more substantial buildings. See figure 1. Which provides grid references for the site.




The site and grid references are shown in Figure 1.

The area lies on a sloping site which basically runs from the high point in the north west corner dropping down towards the south east corner. See figure 2 below.

Frognal lies due south of West Heath with represents the highest land point in this area.

The building is predominantly set over two floors with the benefit of a small cellar at the left hand side of the building as viewed from the front road. This cellar probably originated from the fact that this part of the building stands on the lowest part of the site.

There is also a conservatory at the rear left hand side of the building set at first floor with an under croft room below. This conservatory extends beyond the rear of the house directly accessing the rear garden.

Immediately beyond the rear of the building is a relatively narrow terrace and an embankment with stairs leading up to the garden.

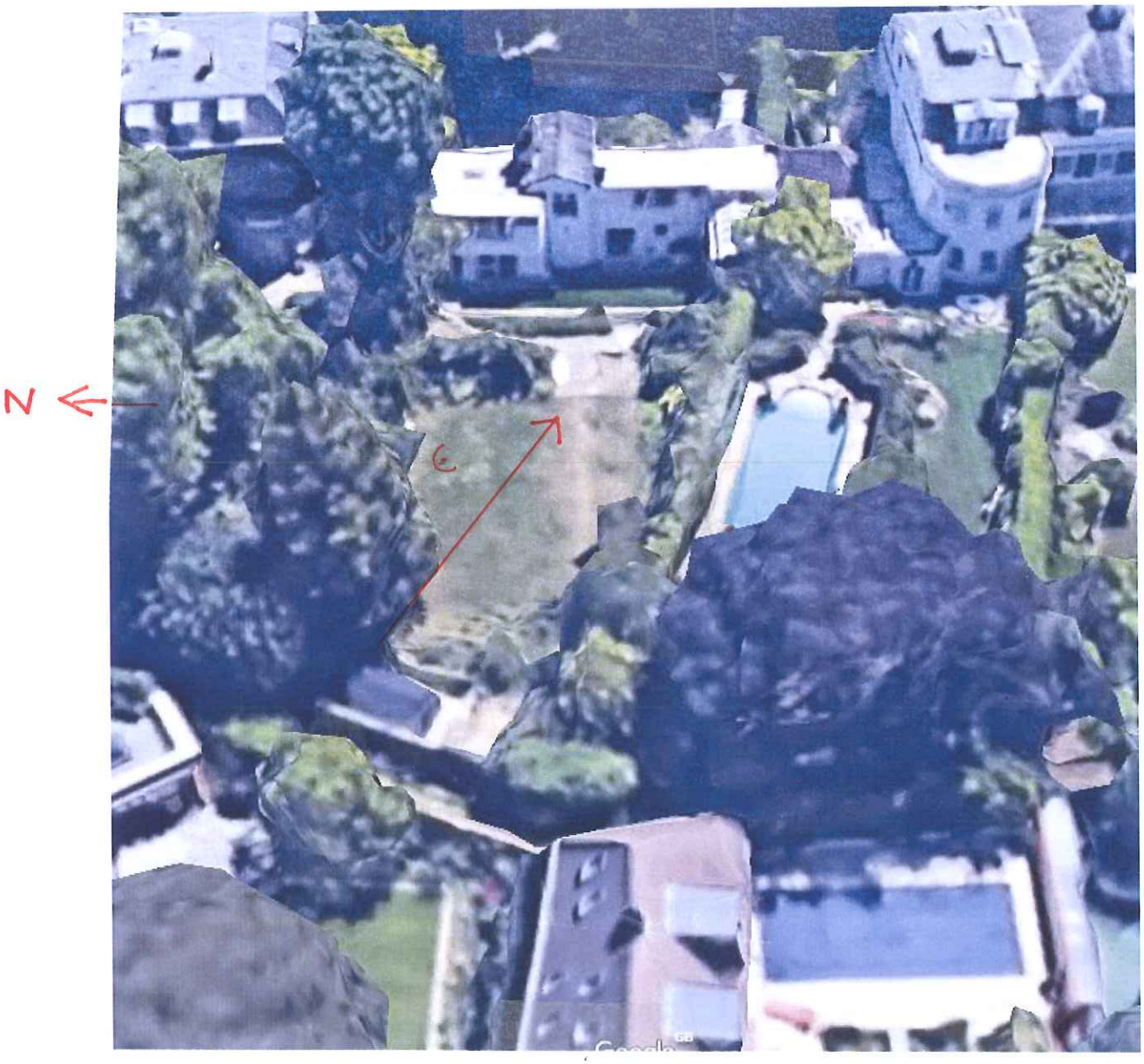



Fig: 2

Ariel view of rear of house. General fall in ground from rear right hand corner of garden down towards rear of property, indicated by red arrow.

It is this embankment that will need to be partially excavated to accommodate the proposed extension. Our understanding is that it is the regrading of the embankment which could be considered as similar to excavations for a basement that has triggered Camden Council's Planners to request the Planning application be supplemented with a Basement Impact Assessment.

Simplistically the works can be split into two distinct areas.

1; Removal of the 1990's conservatory, retain and refurbish the room below and replace the conservatory with a masonry structure. Such works will not involve any excavation works.

2; On the opposite side of the building to strip away elements of the rear elevation, erected circa 1960's to enable a single and two storey extension to be built extending into the garden by regrading the embankment. Such works will allow access onto the garden from first floor level.

These details are clearly shown on Chan & Eayrs drawings.

The refurbishment and redevelopment of the property will be undertaken using traditional construction techniques.

The excavation into the existing embankment has been designed to occur near the centre of the building so there will be no risk of destabilising the ground near the boundaries, hence the neighbouring properties will not be at risk from these excavation works.

The new ground floor extension that results from the excavation works will incorporate retaining walls to hold back the sections of the embankment which are to remain, with a single window on the south elevation overlooking the existing lower level terrace.

The accompanying first floor extension is basically to be supported by the existing embankment with traditional stepped mass concrete trench fill foundation taken into undisturbed ground using traditional construction techniques. So again there is no risk to the boundary separating wall on the north boundary nor to the adjacent property.

## 4:0 GEOLOGY AND FLOOD RISK

Reference to British Geological Society data indicates that the building lies over an area of "bedrock" Bagshot formation, basically sand.

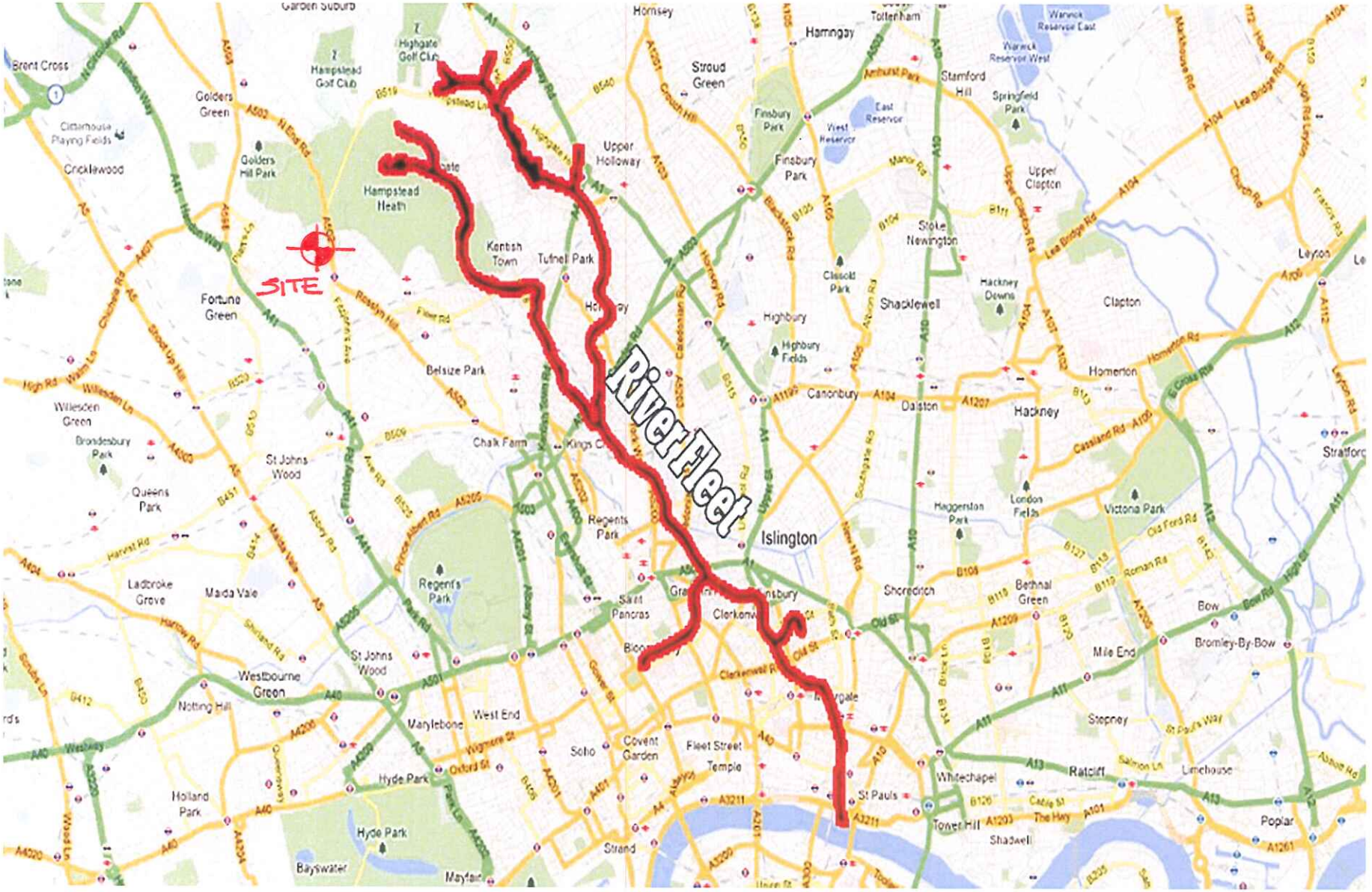
This has subsequently been confirmed by way of trial pits at the rear of the house.

On the basis of the trial pit corroborating published geological information and based on our local knowledge having works on a number of properties in the general vicinity of this house is it our considered opinion that the expense of a formal site investigation is not necessary for this initial basement Impact Assessment.

By reference to Camden council's "geological, and hydrological study and in particular their published information on "run-off and flooding" we understand that no part of Camden currently features on the environmental Agency's flood maps and generalising the risk from sea level rise due to climate change is relatively low. Given the altitude of the site we believe there is no risk of sea level flooding.

It also shows the river Fleet emanates from headwaters on Hampstead Heath separated by Parliament Hill fields before flowing south into the river Thames. Hampstead ponds lie due east of the site with the Highgate ponds continuing eastwards. The proposed works will not affect these areas, see figure 3 below.

FIGURE 3 SHOWING ROUTE OF THE RIVER FLEET



That said it must be recognised that there is potential for an increase in winter storms and increased storm water runoff due to climate change which could lead to localised flooding.

Whilst some parts of the borough are affected by underground rivers such as the river Fleet the site lies close to the summit of the heath and would be too close to the start of ground water flows to harbour any significant ground water flow network.

We have also referred to Camden Planning Guidance CPG4. Streets at risk of surface water flooding are listed together with when known flooding has occurred. The nearest flooding occurred in Frognal Gardens 1975, 44 years ago. Frognal gardens lies some distance due south at a much lower altitude.

It is our considered opinion that the proposed works will not have an adverse effect on the existing underground drainage, nor will it affect established ground water flows. It should also be recognised that any rainwater which enters the ground will tend to pass through the sand in a vertical direction under the force of gravity and will thereafter migrate towards the river Thames when it reaches natural ground water level, typically via the river Fleet.

The extensions will increase hard surfaces and hence an increase in ground water entering the existing drainage. The new works should therefore be designed to satisfy current SuDs criteria allowing for a 1 in 100-year storm event with a 40% uplift for climate change.

## 4:2 LONDON UNDERGROUND

There are no London Underground running tunnels in the general vicinity of the site, with the northern line's deep tunnels lying to the east, running in a north – south direction.

## 5:0 SCREENING

To summarise, Camden Council's policy for basement and light wells CPG4 has been established to ensure that the new basement excavations do not: -

I Cause harm to the built and natural environment and local amenity.
II Result in flooding or
III Lead to ground instability

Further reference has also been made to London Borough of Camden's Geological, Hydrogeological and Hydrological study hereinafter referred to as CGHH, "Evidence for subterranean development" and in particular Chapter 6.

CPG4 guidance also requires any proposed development must assess the impact of the proposed works on: -

- Surface flow and flooding
- Subterranean (groundwater) flow
- Slope stability

CHHS provides 3 flow charts which are replicated below with respective answers and a narrative as to the response and proposals to mitigate any risks identified.

5:1 TABLE 1 – SURFACE WATER AND FLOOD SCREENING FLOW CHART:

| No. | Question | Y/N |
|---|---|---|
| 1 | Is the site within the catchment of the pond chains on Hampstead Heath? | N |
| 2 | As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run off) be materially changed from the existing route? | N |
| 3 | Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas? | Y |
| 4 | Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses? | N |
| 5 | Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses? | N |
| 6 | Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, 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. | N |

**Narrative**

Q1, by reference to Figure 4, site lies west of Hampstead Heath and the ponds.

Q2, part of the rear garden will become hard landscaped which will require formal drainage. The new storm water drainage is to be designed to satisfy SUDS criteria and will use either soakaways strategically placed far enough away from the subject property or the neighbours in preference to using an attenuation tank to ensure the runoff from the property does not exceed existing. As part of the SuDs design consideration can be given to utilising flats roofs as green roofs which will act as an initial source control, filtering out atmospheric pollutants and acting as a natural attenuation tank.

Q3, Technically the works are not creating a basement but to ensure there is no increase in the storm water discharge from the site a variety of options are available to ensure the design meets SuDS criteria as explained above. This includes the use of soakaways, green roofs, attenuation tanks with hydro brakes.

Q4, As stated the works are not creating a basement but it could be considered as forming a partial light well. That said the works will not affect the profile of water inflows, instantaneously or long term.

Q5. No changes envisaged.

Q6 Reference to CHHS Streets at risk of surface water flooding do not indicate Frognal having suffered from any localised flooding. The flooding in Frognal Gardens in 1975 may have been due to an inundation of the road gullies leading to the road surface becoming flooded. Worthy of note it there is no recorded flooding in the existing cellar to 111 Frognal.

# Welcome
## to Hampstead Heath




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FIGURE 4 SHOWING RELATIONSHIP OF SITE TO HAMPSTEAD HEATH

## 5:2 TABLE 2 – SUBTERRANEAN (GROUNDWATER) FLOW SCREENING FLOWCHART

| No. | Question | Y/N |
|---|---|---|
| 1a | Is the site located directly above an aquifer? | Y |
| 1b | Will the proposed basement extend beneath the water table surface? | N |
| 2 | Is the site within 100m of a watercourse, well (used/disused) or potential spring line? | N |
| 3 | Is the site within the catchment of the pond chains on Hampstead Heath? | N |
| 4 | Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas? | Y |
| 5 | As part of the site drainage, will more surface water (e.g. rainfall and run off) than at present be discharged into the ground (not just the pond chains on Hampstead) or Spring line? | N |
| 6 | Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to or lower than, the mean water level in any local pond ( not just the pond chains on Hampstead Heath) or Spring line? | N |

**Narrative**

1a. The site is situated on Bagshot Formation, which is a sand. This would be classified as an aquifer

1b. Whilst the depth of the natural water table is unknown the new works are set to coincide with the existing ground floor and not as a basement. As stated above extending the property at the rear entails excavating into an existing embankment, thus the call for this basement Impact assessment report.

2: The Hampstead Ponds lie due east from the site

3: Site lies south of Hampstead Heath.

4: Some of the open ground associated with the rear garden will be built upon. The effect of an increase in surface water run-off is to be managed by satisfying current SuDS criteria.

5. Any increase in surface water runoff from hard surfaces is matched by a corresponding decrease in the catchment area from open ground. If soakaways are used to control storm water discharge from the building's extension, then there is no net increase.

6. The fact that the existing cellar is not under water indicates that the mean water table in this area lies below the proposed excavations.

## 5:3 TABLE 3 SLOPE STABILITY SCREENING FLOWCHART

| No | Question | Y/N |
|---|---|---|
| 1 | Does the existing site include slopes; natural or man-made, greater than 7 degrees (approximately 1 in 8)? | Y |
| 2 | Will the proposed re –profiling of landscaping at site change slopes at the property boundary to more than 7 degrees? | Y |
| 3 | Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees? | N |
| 4 | Is the site within hillside setting in which the general slope is greater than 7 degrees? | N |
| 5 | Is the London clay the shallowest strata at the site | Y |
| 6 | Will any trees be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained? | N |
| 7 | Is there a history of seasonal shrink –swell subsidence in the local area, and/or evidence of such effects at site? | N |
| 8 | Is the site within 100m of a watercourse or a potential spring line? | N |
| 9 | Is the site within an area of previously worked ground? | N |
| 10 | Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction? | Y |
| 11 | Is the site within 50 meters of Hampstead Heath Ponds? | N |
| 12 | Is the site within 5m of a highway or pedestrian right of way? | y |
| 13 | Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties? | N |
| 14 | Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines? | N |

**Narrative**

Q1 The man made embankment immediately beyond the rear of the house has a slope greater than 1 in 8

Q2. The proposed extension will entail cutting into the face of the embankment and slope stability will be maintained by appropriate retaining walls. The slope within the garden is less than 7 degrees and will remain unaltered.

Q5. Local site investigation works confirm an element of fill, overlying sand. London clay will be at depth.

Q9. Reference to British Geological maps do not indicate previously worked ground.

Q10. Extension will not extend below the water table, hence no de-watering required during construction.

Q12 Although the property fronts directly onto Frognal the proposed extension lies at the rear of the property and is therefore greater than 5m away from the highway or pedestrian right of way.

Q13. As previously stated, the proposed rear extension isn't a basement and the proposed foundations will not create a significant differential depth in foundations.

Q14. No tunnels have been located passing beneath or close to the site. British Rail assets lie south of the site whilst the Northern Line Edgware branch runs to the east of the site.

## 6:0 SCOPING

## 6:1 RESULTS OF SCREENING PROCESS.

The above screening assessment has been undertaken in accordance with the three flow charts detailed in Appendix E of the Basements and Light wells Policy CPG4.

The purpose of the initial assessment was to identify factors which require further investigation to complete the Basement Impact Assessment. To aid simple identification we have set out below a summary of additional considerations and the potential impact these may have. This is basically where answers to the flow charts have primarily been answered as "Yes". Risks can be mitigated so a narrative of further investigative works or design proposals to mitigate the risks are set out below.

## 6:2 TABLE 1. SURFACE WATER AND FLOOD SCREENING

Q3. Detailed drainage design to be undertaken to SuDS requirements to ensure no increase in rainwater run-off from the site into the existing sewer.

No further investigations at this stage required.

## 6:3 TABLE 2 SUBTERRANEAN (GROUNDWATER) FLOW SCREENING FLOW CHART.

Q1. Site overlies Bagshot formation; - sands. Whilst sands are a natural aquifer there are no known water extraction from the general vicinity of the site and the extension works coupled with SuDS drainage design will not alter the hydrological regime in this area.

Q4. Some of the open ground associated with the existing rear garden will become hard landscaped. As we stated above provided the storm water run-off from the new development is managed via SuDS criteria then there is no risk to the property and those that surround it, as well as the public space beyond.

No further investigations at this stage required.

## 6:4 TABLE 3. SLOPE STABILITY SCREENING FLOW CHARTS

Q3. Changes to the existing slope associated with the man made embankment immediately beyond the rear of the house affected by the proposed works will remain stable by the construction of suitable retaining walls. These works are in essence centred around the middle of the site and will not affect the slopes near or at the two boundaries between the subject property and the neighbours.

Q5. The London clay formation is at considerable depth and will not be affected in any way by the proposed development works.

Q10. The fact that the existing cellar is not under water indicates that the mean water table in this area lies below the proposed excavations. No further investigations at this stage required.

## 7:0 STAGE 3 INVESTIGATIONS AND STUDY

Based on information provided by the British Geological Society, site plans and trial pits, the ground compromises sand. This provides a relatively stable material for excavation works provided temporary works are employed.

To mitigate the risk of damage it is commonly accepted that movement must be restricted to "slight" as defined in Ciria publication C580. Slight is defined as movements causing cracks less that 5mm in width and is based on work undertaken by Burland et.al. A copy of crack classifications is shown at the rear of this report as table 1.

The proposed rear extension requires excavation into the exiting embankment, involving the removal of a considerable amount of "soil" It is a well understood phenomena that clay subsoils will expand when clay is removed by way of excavations. This expansion is termed heave.

Non cohesive soils such as sands do not exhibit such action so the removal of sand from the embankment will mean that damage to adjacent structures will be negliable.

As the works are confined to the rear of the building there is no risk to the public footpath or highway. As for the risks to the adjoining property any perceived potential damage to the neighbouring properties to satisfy CPG4 requirements for mitigation measures where predicted damage exceeds category 0 can be dealt with under normal Party wall procedures.

## 8:0 STAGE 4

### BASEMENT IMPACT ASSESSMENT

We have undertaken a detailed analysis of the risks associated with the proposed development at the above mentioned site, We believe this desk top appraisal, using the screening and scoping procedures laid down in CPG4 have identified the direct and indirect implications of the proposed development on the environment and properties in the immediate vicinity of the proposed works.

It is clear the development will increase the area of hard landscaping so there will be an increase in storm water run-off. This can simply be dealt with by designing storm water to current SuDS criteria.

Reference to various sources and by formal trial pits show the underlying geology is sand. Stable ground in excavation works can be achieved by following good construction practices using traditional planking and strutting or other such temporary works.

The regrading works associated with excavations cut into the existing embankment can be undertaken by using battered surfaces where the works are far enough away from the boundaries and adjacent properties that such graded works will not affect them.

We have already discussed the known phenomenon of ground heave when excavating basements in a clay subsoil but as we have explained the sub soil is sand which does not exhibit heave characteristics nor do the works entail the creation of a basement.

Since the works are to be excavated at the rear of the site there is no risk to the public footpath, highway, statutory services or any of Camden Councils assets.

**As a Chartered Civil and chartered Structural engineer I have taken all of the above matters discussed above and believe the risks associated with the proposed development to be no more significant than any normal redevelopment. Hence I do not believe any further investigations than those already undertaken are necessary to satisfy Camden Councils Basement Impact Assessment criteria for Planning purposes.**

Signed.....
David Rose BSc (Hons) C.Eng. MICE; MIStructE.

Date..29th October 2009.

## TABLE 1. CLASSIFICATION OF CRACKS.

Where cracks are noted within the body of this report they relate to the standard classification given in the Building Research Establishment digest No: 251 entitled: 'Assessment of Damage in low-rise buildings.' Table 1 has been reproduced by permission of the controller of H.M. Stationery Office.

TABLE 1 CLASSIFICATION OF VISIBLE DAMAGE TO WALLS WITH PARTICULAR REFERENCE TO EASE OF REPAIR OF PLASTER AND BRICKWORK OR MASONRY.

| CATEGORY OF DAMAGE | DESCRIPTION OF TYPICAL DAMAGE | APPROXIMATE CRACK WIDTH |
|---|---|---|
| 0 | Hairline cracks of less than about 0.1mm are classed as negligible. | up to 0.1 (1) |
| 1 | Fine (also noted as very slight) cracks which can easily be treated during normal decorations. Perhaps isolated light fracturing in building. Cracks rarely visible in external brickwork. | up to 1 (1) |
| 2 | Cracks easily filled. Redecoration probably required. Recurrent cracks can be masked by suitable linings. Cracks not necessarily visible externally. Some external repointing may be required to ensure weather tightness. Doors and windows may stick slightly. | up to 5 (1) |
| 3 | The cracks require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather tightness often impaired. | 5 to 15 (1) (or a number of cracks, each up to 3) |
| 4 | Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Windows and door frames distorted, floor sloping noticeably, walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted. | 15 to 25 (1) but also depends on the number of cracks. |
| 5 | This requires a major repair job involving partial or complete rebuilding. Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. | usually greater than 25(1) but depends on number of cracks. |

Notes: 1. Crack width is one factor in assessing category of damage and should not be used on it's own as direct measure of it.
2. Local deviation of slope, from the horizontal or vertical, of more than 1/100 will normally be clearly visible. Overall deviations in excess of 1/150 are undesirable.

BRE Digests are available from:
Publications Sales Office, Building Research Establishment,
Watford, Herts WD2 7JR