<u>"Lesser Wildwood"</u>
<u>15 North End</u>
<u>London, NW3</u>

Report on Engineering Feasibility of Proposed Basement Extension to 15, North End, NW3

<u>Client</u>

Mr & Mrs M Crawley
15 North End
London
NW3

1. INTRODUCTION

1.1 We were instructed by Mr & Mrs Crawley to assess the engineering feasibility of extending an existing light well at the rear of their property at 15, North End, NW3 to form a basement space for family use.

1.2 An architectural arrangement has been prepared by Andrew Kiffin (D.A.S. Ltd). The initial concept was for the basement extension to extend between the existing kitchen and the front wall of the separate studio building to the rear. This was revised to include the area under the studio within the proposed scheme – meaning that all three sides of the plot to the rear of the main residence would require underpinning to form the retaining walls of the basement. Refer to Appendix 1.

1.3 As part of this feasibility study we have:-

1.3.1 investigated the underlying geology,
1.3.2 carried out a dimensional survey within the site and also in the garden of the adjacent property,
1.3.3 met on site with a specialist groundworks contractor to discuss possible alternative construction techniques and likely costs of the groundworks,
1.3.4 carried out a utilities search to identify possible impacts on local buried services.

1.4 This Report presents the outcome of the investigations and discusses the engineering options.

2.0 GEOLOGY

2.1 The local geology of the area is characterised by the sandy clays of the Claygate Beds which form part of the upper slopes of Hampstead Heath and Highgate Hill. The higher parts of the heath are capped by the formation known as Bagshot Sands (yellow sands with layers of loamy material). Hence the Sandy Heath between North End and Spaniard's Road. The boundary between the permeable Sands and the Claygate Beds is marked by springs, for example the one giving rise to the Leg of Mutton Pond.

2.2 We have yet to arrange for any trial pits or boreholes to identify the specific depths and strengths of the soils to be excavated. Should a decision to proceed with the project be made a minimum of one 10m deep borehole will need to be carried out, ideally in the courtyard area.

2.3 The natural topography of the area is an east to west downwards slope of approx 1 : 30. The courtyard area is level and is 2metres higher than the neighbours rear garden – we would therefore expect a significant amount of made ground beneath the courtyard and studio.

2.4 The risk of water ingress into the excavation will depend on whether the soils are clay or more sandy in nature. The fact that there is no obvious damp problem in the existing light well would suggest groundwater is unlikely to be a major problem. The borehole will identify the level of the ground water table.

2.5 A clay stratum is the preferred material for underpinning works as the cut face of the excavation will normally support itself long enough to allow the concrete works to be carried out and for the concrete to gain sufficient strength to retain the soil permanently. If sandy ground is encountered temporary support can be provided by timber boarding until the concrete has been placed.

3.0 UTILITIES SEARCH

3.1 We have approached all the major utility companies requesting information on the location and nature of any buried services they may have local to the property. Their response letters are included in Appendix 4.

3.2 Water Mains (Thames Water): a 90mm distribution main lies in the road alongside the proposed works. The likely depth is 900mm (3ft) and the plan supplied suggests the line of the main is on the far side of the road. The pipe material is not given. The size and position of the main suggests it will not be affected by the proposed works, though clearly any crane operator should be made aware.

3.3 Drainage (Thames Water): a 150mm (6") combined sewer is shown in the road alongside the proposed works. The depth at Manhole 1001 is given as 800mm (2'-8"). The manhole is in the road immediately adjacent the gates to the courtyard. It is possible that the surface water gully and cover outside the gates could be affected by the piling works.

3.4 Gas mains (National Grid Gas) : A 90mm diameter low pressure main exists in North End road to the east of the property at a depth of 750mm. The proposed works will have no affect on this main. The domestic gas connection enters the property at (tbc).

3.5 Telecons : awaited

3.6 Digital Cable : awaited

3.7 Electrical : can be obtained at a later date for £58.75.

4.0 STRUCTURAL OPTIONS

4.1 For domestic scale works there are two techniques mainly used for creation of basement areas where it is not possible to create an oversize excavation in which conventional construction techniques can be used. These are:-

4.1.1 traditional underpinning – the ground underneath the existing foundations is excavated in short sections and mass or reinforced concrete is cast into the hole to form a "pin". The length of the pin is typically 1m to 2m. The pins are constructed in a "hit & miss" sequence which preserves the stability of the building above as the construction proceeds. The pins are normally connected by steel dowel bars – once the sequence of pin construction is complete the remaining soil can be excavated to create the basement.

4.1.2 Piling – two types exist : driven and bored. Driven piles are precast concrete or steel and are hammered into the ground. This type is not appropriate here because the vibrations are likely to damage the existing building and the noise would likely to cause problems with neighbours. Bored piles are created by using a piling rig to drill a hole into the ground to a calculated depth – the hole is filled with concrete and steel reinforcement. The pile depth is calculated so that once the construction of piles is complete and the soil in the basement is excavated there is sufficient pile embedded into the underlying soil to ensure the wall created is stable. Because the piles are formed using a piling rig if there is restricted headroom or difficult access piling may not be practicable.

4.2 In this case the fact that the basement walls lie on the boundary of the plot creates Party Wall Act issues, namely:

4.2.1 the public highway which is the responsibility of the local highway authority (Camden Council). They have an interest in ensuring that (for both the temporary (construction) and permanent cases the basement construction is capable of withstanding any loading from the heaviest possible vehicles (typically fire engines/refuse vehicles) etc).

4.2.2 the neighbours (Wildwood) garden wall – Mr and Mrs Salmon have said they are happy for the basement construction work to proceed but have made it clear that only the minimum impact on the existing walls between the properties is acceptable – this means that the construction technique used has, ideally, to be able to be constructed from inside the 15 North End land.

4.3 The constraints suggest two possible options for carrying out the works. (Refer to Drawing No 0601-72-001).

Option 1

4.4 The open section between the main house and the studio adjacent to the road would be formed from bored piles. The remaining section under the studio and the neighbour's garden wall would be formed by underpinning.

4.5 The basement walls adjacent to the road would require propping at the top and bottom to ensure minimal deflection under the load from passing traffic. Ideally this would be achieved by constructing the new roof slab over the basement prior to excavating the soil from between the newly constructed basement walls (this is commonly called "top-down" method). However the difference in level in the proposed slab compared to the road level outside will cause some difficulties for the Contractor with this Option.

4.6 The kitchen area and internal partition to the studio would need to be stripped out prior to the underpinning works. This would allow working space to construct the floor slab (future basement roof slab) prior to excavating the soil.

Option 2

4.7 We have identified a more radical approach to the works which we believe could save time and money compared to Option 1.

4.8 The studio is a relatively lightweight structure and because of that is not an ideal candidate for underpinning. We suggest that it could carefully be partially demolished (the front windows and doors, and the roof tiles, roof trusses and flitch beams put into store) leaving the wall between Nos. 15 and Wildwood as it is.

4.9 This would create a larger unimpeded working area and allow good access for a piling rig which could then form all of the road side and the wall of the basement in bored piles – this would be very much quicker than underpinning and most probably cheaper. The mobilisation costs of a piling rig are relatively high so the larger the number of piles to be constructed the cheaper each pile becomes to construct. This also overcomes the problem with the slab level highlighted in 4.5 above.

4.10 The party wall between Nos. 15 and Wildwood would be left free standing by the partial demolition and would need temporary bracing measures.

4.11 To avoid the need for any works in the neighbour's garden the basement wall on that side would be formed using underpinning techniques. This new section of wall would perform two purposes:-

4.11.1 to carry the vertical loading of the existing wall down to a level beneath the new basement level and

4.11.1 to strengthen and stabilise the existing walls by continuing construction of the new wall up the face of the existing wall and tying the two together with steel ties.

4.12 Once the perimeter wall works are completed the basement roof slab would be cast and the soil between excavated from under – working inwards from the existing lightwell end.

4.13 The studio would be reconstructed on the new walls/slab.

5.0 SPECIALIST ADVICE RECEIVED

5.1 We enclose at Appendix 3 a letter from a specialist groundworks contractor, Geostructural Solutions Ltd (GSS) which they prepared following a site meeting with ourselves on 17th January 2006.

5.2 The letter relates in the main to Option 1 which was the only one discussed on the day. It highlights the logistical problems presented by the small area of the site available for storage of materials and equipment, particularly if the studio building is retained.

5.3 We consider the quoted costs to be very high.

5.4 We have not yet obtained an equivalent quote for Option 2. when we do so it may be prudent to involve an alternative contractor in order to benchmark the GSS price.

6.0 ENVIRONMENTAL ISSUES

6.1 By environmental issues we mean the potential for temporary and permanent impacts on the local environment from the works.

6.2 Temporary impacts include:-

6.2.1 Noise – the majority will come from the operation of mechanical plant, particularly compressors, excavators, piling rigs and hydraulic breakers. Normally conditions will be applied to any planning consent limiting the intensity and duration of noise arising. It may be necessary to restrict noisy operations to particular periods of the day.

6.2.2 Vibration – works which involve breaking out or drilling into existing hard structures has the risk of transmitting vibration to adjacent buildings.

6.2.3 Dust – a planning condition may require the damping down of dusty activities.

6.3 The most likely permanent impact from the proposals is on vegetation. Excavation may adversely affect tree roots. Option 2 may have a greater impact on the roadside hedge than Option 1.

7.0 CONTRACT STRATEGY

7.1 It seems to us that the procurement and management of the project could be taken forward in several different ways.

7.2 There is a clear difference in the skills and experience required of the contractor carrying out the basement construction compared to those needed for the general fit-out, superstructure and finishing works.

Option 1

7.3 The Architect acts as the overall Contract Administrator and prepares a single contract specification. A standard RIBA JCT conditions of contract would be used. A main building contractor would be appointed following a competitive tender and he would be responsible for appointing and managing a specialist sub-contractor to carry out the basement groundworks. We would provide design services only for the basement and structural design of the limited superstructure elements.

Option 2

7.4 The Architect acts as the overall Contract Administrator but prepares two contract specifications – one for the basement shell and one for the fitting out and superstructure works (to include alterations to existing building). Each contract would be tendered separately and managed sequentially. The basement contract could proceed before the other has been let (or even tendered). Appropriate JCT conditions of contract would be used. We would provide design services only for the basement and structural design of the limited superstructure elements.

Option 3

7.5 We are appointed as Engineer to a separate groundworks contract which we would prepare and administer. The conditions of contract could be JCT Minor Works or, our preference, the Institution of Civil Engineers Minor Works Contract. The Architect would prepare a separate, follow-on contract for all other works. We would supervise all the works to create the basement shell – when complete our contractor would leave site and the building works contractor would take over the site and complete his works. Our appointment would include design services as above.

7.6 We consider Option 3 is a good one because the most expensive element of the work can be subject to proper price competition. The Architect (with all due respect) is not an expert on groundworks and we feel better control of the groundworkers will be achieved if we have direct responsibility for managing them.

8.0 BUDGET COSTS

8.1 We have to date obtained an indicative price from GSS Ltd for the basement works only (Option 1) of between £150k to £190k plus VAT. This seems to us to be very high and we now intend to:-

8.1.1 request GSS to review their prices &

8.1.2 request GSS to price Option 2 as an alternative approach – we hope the larger amount of piling and likely shorter contract period will lead to a significant price reduction

8.1.3 obtain alternative budget quotes from other contractors.

8.2 In order to obtain certainty in budget estimates and cost control during the works it may be beneficial to appoint a quantity surveyor to provide QS services for the project. These would be:-

8.2.1 preparation of pre-tender budget estimates during feasibility

8.2.2 preparation of a Bill of Quantities for tender purposes

8.2.3 assist Tender evaluation

8.2.4 measurement of the Works (including any extras arising and advising Client on the amount of interim and final payments due to the Contractors.

9.0 DISCUSSION

9.1 This Report is in Draft form and will be expanded as more information becomes available and the project brief is finalised.

9.2 It is expected soil conditions will be Claygate Beds (ie clay) which is the preferred material for underpinning works. Confirmation by trial pits and/or a borehole is required.

9.3 Utilities searches have so far not shown any cause for concern ie the proposed basement works are unlikely to require any major works to utilities in the adjacent road.

9.4 The formation of the basement can be achieved by a combination of traditional underpinning and/or bored piling techniques. The extent of each will depend on whether Option 1 or Option 2 is chosen.

9.5 Option 1 does not require disassembly of the Studio but has logistical problems due to the more limited access and storage and working space available to the contractor. GSS Ltd has quoted £150k to £190k + VAT for this Option.

9.6 Option 2 does require disassembly of the Studio. However this creates much greater working space for the contractor and allows most of the basement wall to be formed by piling - certainly quicker than underpinning and probably less costly even allowing for reconstruction of the Studio (yet to be confirmed).

9.7 Success will depend on proper planning and control of the construction process. We would recommend running the groundworks and building works contracts separately. We suggest that we should project manage the groundworks contract with assistance from an independent QS and the Architect.

9.8 We suggest the following timetable should be achievable:-

Further investigations / liaison with the local Authority re planning and working methods / start Party Wall procedures	8 to 10 weeks
Design to tender ie outline sizing sufficient for tender purposes	2 to 3 weeks
Tender process	4 weeks
Finalise design, including submissions to Building Control	4 weeks but can overlap with site works
Groundworks package	10 weeks
Architects package	8 weeks

10. APPENDICES

APPENDIX 1 : DRAWINGS

(A3 reduced prints of Drgs 0601-72-001 & -002)

APPENDIX 2 : PHOTOS

APPENDIX 3 : LETTER FROM GSS LTD

APPENDIX 4 : UTILITIES RESPONSES