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5 Templewood Avenue  
London, NW3 7UY

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Structural Engineering Report  
and Subterranean  
Construction Method  
Statement

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## Non-Technical Summary

If the recommended measures and sequence of works outlined in this report are properly undertaken by a suitability qualified contractor, it is very unlikely that the proposed works will pose any significant threat to the structural stability of the adjacent properties, the remaining house and surrounding grounds.

The 'Basement Impact Assessment' prepared by Chelmer, which contains a desk study and ground investigation report suggests that it is unlikely that the proposed basement will pose a risk to the hydrogeological or hydrological setting.

A suitable structural engineer will have an on-going role during the works on site to monitor that the said works are being carried out generally in accordance with the design and specification. This role will typically involve weekly site visits at the beginning of the project and fortnightly thereafter.

## 1.0 Introduction

- 1.1 Elliott Wood Partnership Ltd (EW) is a firm of consulting structural engineers approximately 120 strong operating from their offices Central and South West London, and Nottingham. Residential developments of all scales have been central to the workload of the practice with many in the Greater London area. In particular EW have been producing designs for basements to both existing and new buildings. To date, this numbers approximately 500 sites many of which have been in the Borough of Camden. Our general understanding of the development of London, its geology and unique features together with direct experience on many sites puts us in a strong position to advise clients on works to their buildings and in particular the design and construction of their basement.
- 1.2 EW were appointed by the building's owner to advise on the structural implications of the proposed construction of a new single storey basement on the site of 5 Templewood Avenue. The following report has been prepared to ensure that the property and neighbouring properties are safeguarded during the works. This report follows the guidance given in the Camden Planning Guidance on Basements and Lightwells CPG4. This assessment has been prepared in accordance with the guidance given in CPG4, DP23 and DP27. The Basement Impact Assessment is being carried out by persons holding the required qualifications relevant to each stage. Basement Impact Assessment (BIA) submitted separately by Chelmer Consultancy Services.
- 1.3 The Contractor will provide a detailed method statement including all temporary works required before the works can commence on site. The Contractor is to accept full responsibility for the stability and structural integrity of the works during the Contract and provide temporary support as necessary. They shall also prevent overloading of any completed or partially completed elements.
- 1.4 This statement focuses on the proposed subterranean works as well as the retaining of the relevant façades. It should be read in conjunction with all relevant Architects and Specialists supporting documents, some of which appear in the Appendices of this document.

## 2.0 Description of Existing Building and Desk Study Summary

- 2.1 No. 5 Templewood Avenue is a three-storey detached building with a converted attic which has been converted into multiple flats. The site is predominantly occupied by a front and rear garden whereby the house is situated approximately in the centre of the site.
- 2.2 The existing building consists of load bearing masonry walls which support timber floors throughout. The existing roof structure consists of timber joists spanning between the masonry walls. Stability of the overall structure is assumed to be provided by cellular action of the masonry walls and diaphragm action of the floors and roof. The building is not listed but is considered to contribute to the Redington and Frognal Conservation Area, in the sub area 4, the sub area of Reddington and Templewood Avenue.
- 2.3 No. 5 Templewood Avenue sits approximately 1m (at the closest point) to the south of no. 3 Templewood avenue and its associated garage building. The distance to number 7 Templewood avenue is approximately 3m.
- 2.4 Examination of the Environment Agency Flood Map indicates that the site lies within Zone 1 (low flood risk). As the site is less than 1 hectare, a Flood Risk Assessment should not be required. Also, 5 Templewood Avenue is listed as having flooded in 2002 but not in the 1975 floods (as listed by Camden Planning Guidance CPG 4). A more detailed breakdown of flooding risks can be found in the Basement Impact Assessment. It is believed that the road outside no.5 would not have flooded, as it is on a moderate slope.
- 2.5 There are a number of trees located around the periphery of the existing building. The proximity of the existing trees will need to be considered in the final design of the basement and its foundations. An arboriculturalist has been appointed to ensure that the works do not have an adverse impact on the retained trees.
- 2.6 The results of our desk study can be summarised as follows;
  - The building appears to be at least 100m from the nearest lost river of London; a tributary to the river Westbourne. This is believed to have been culverted some time ago.
  - The site is not located within a flood plain as shown on the latest Environment Agency Flood Maps (reference; [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)).
  - The site is not in the vicinity of any London Underground Ltd infrastructure.
  - Bomb Damage maps suggest that no damage was sustained in WWII. From visual inspection of the outside of the building, there does not appear to have been any bomb damage or signs of repairs to bomb damage to the building.

3.0 Ground Conditions

- 3.1 Detailed information of the site and ground conditions have been provided in the 'Desk Study and Ground Investigation Report' prepared by Chelmer Geotechnical.
- 3.2 Reference to British Geological Survey Maps suggests that the underlying ground is likely to be underlain by the Claygate Member of the London Clay Formation.
- 3.3 The ground conditions have been confirmed by a site investigation carried out by Chelmer Consultancy Services in early 2016. The site investigation comprised of 4no. trial pits to the base of foundations and 2no boreholes to 15m.
- 3.4 Three groundwater monitoring standpipes were installed to a depth of 7.0m and 8.0m to BH1 ad BH2 respectively, to assess the ground water levels across the site. They found a maximum recorded water level of 1.5m. Further details are included in the BIA.
- 3.5 The investigations imply that the underlying ground is Claygate member over London Clay. Due to the magnitude of the slope and the amount of water encountered in the clays, it is possible that there are sand lenses present, which may allow for horizontal passage of groundwater. Clays are thought to become less silty and sandy at depth, and will have a corresponding decrease in permeability.
- 3.6 The desk study carried out by Chelmer suggests that the site has not had a contaminative history, having been occupied by residential properties throughout its development history and no nearby sources of contaminants being within 500m.

4.0 Proposed Alterations

- 4.1 The proposed works involve excavation of a single storey basement underneath the house and rear garden, along with reconfiguration of some of the structure to the rear of the property and internal floor and wall arrangements.
- 4.2 The exterior walls to the front and sides will remain retained throughout the construction, though the projection to the north east of the property will be rebuilt in steel with masonry cladding, so suit construction sequencing.
- 4.3 The majority of the basement will extend 3.5m below ground level with a portion extending 6m below ground level to form the pool area, though this varies due to the slope of the existing ground.
- 4.4 Groundwater was recorded at a minimum depth of 1.5m. As the soils are predominantly clay it is proposed that contiguous piled walls are used for the external part of the basement and reinforced concrete underpins used underneath the body of the house. It is recommended that a trial shaft is excavated in the rear garden prior to commencement of the bored piles, to ensure that well pointing is an adequate method of dewatering and that the rate at which water ingresses the excavation is manageable and that there is minimal washout of fines. The piles will be temporarily propped during construction and will be required to resist lateral forces from soil and surcharge loads in the temporary and permanent case. A reinforced concrete liner wall cast with

waterproof concrete will be used to form the primary barrier to prevent water ingress. A cavity drain system will provide a secondary barrier. For design purposes, the water level will be assumed to be at ground level, in line with Eurocode guidance for Clay soils.

- 4.5 It is proposed that the basement works will follow a bottom up approach whereby the ground floor slab will only be cast once all of the substructure is in place to support it permanently. However, it would also be possible that the portion of the basement outside the footprint of the existing house could be built with a top-down sequence, to reduce the duration of the excavation. For the purposes of this report, a bottom up approach is assumed.
- 4.6 The slabs and load bearing walls within the basement will be formed with reinforced concrete. The slabs which interface with the soil will be designed to be suspended and will be designed to resist the large hydrostatic and earth pressures due to heave of the clay using tension piles, where required. The detailed design may incorporate tension piles additional to those shown on current drawings depending on the results of the long term monitoring of the ground water. Design will be finalised prior to construction.
- 4.7 The contiguous piled retaining wall will also retain the slope of the wider area. This is important due to the possible presence of sand lenses creating possible slip planes in the slope, described in the BIA by Chelmer. This should be considered by the pile designer when designing for the temporary case.
- 4.8 The basic waterproofing strategy is informed by the proposed use of the basement and the existing ground conditions. Ground water was encountered within the proposed depth of the basement and, it has still been considered in the design and waterproofing of the basement. It is proposed that the reinforced concrete basement walls and slab are constructed from waterproof concrete and will act as the primary barrier to possible water ingress. An internal drained cavity system will be installed to complete the system creating a Category 3 Basement as defined in Table 2 of BS 8102.

5.0 Proposed Below Ground Drainage

- 5.1 It is proposed that the existing connection to the public sewer is retained and re-used. This will be subject to location and condition, which will be confirmed by a CCTV survey prior to works.
- 5.2 It is proposed that all drainage from the ground floor and above is drained via gravity. The proposed basement level may be lower than the level of the existing public sewer connection as such the foul effluent generated at basement level will need to be pumped to the main private drainage system. This will prevent any flooding from the public sewer in case of backup and is a requirement in the borough of Camden.
- 5.3 The cavity drain system will include a cavity drain sump to collect any water which will then be pumped to the main private drainage system.
- 5.4 It is proposed that SuDS are incorporated within the scheme, to reduce the peak surface water run-off from the site. The architectural scheme does not allow for green roofs and the ground conditions do not allow for soakaways. A sensible solution would be the inclusion of an attenuation tank, to collect excess rainwater. It is not believed that the additional hard standing on the site will negatively impact the local water table or that of the wider area.

6.0 Party Wall Matters

- 6.1 The proposed works development falls within the scope of the Party Walls Act 1996. Procedures under the Act will be dealt with in full by the Employer's Party Wall Surveyor. The Party Wall Surveyor will prepare and serve necessary Notices under the provisions of the Act and agree Party Wall Awards in the event of disputes. The Contractor will be required to provide the Party Wall Surveyor with appropriate drawings, method statements and other relevant information covering the works that are notifiable under the Act. The resolution of matters under the Act and provisions of the Party Wall Awards will protect the interests of all owners.
- 6.2 The designs for 5 Templewood Avenue will be developed so as not to preclude or inhibit similar, or indeed any, works on the neighbouring properties. This will be verified by the Surveyors as part of the process under the Act.

7.0 Hydrogeological Statement Summary

- 7.1 Groundwater was encountered at a minimum depth of 1.5m.
- 7.2 A Basement Impact Assessment has been prepared by Chelmer to show that the proposed works are unlikely to pose a risk to the hydrogeological or hydrological setting particularly as adequate space will remain around the proposed basement structure.
- 7.3 Arup's Subterranean Development Scoping Study (para 5.1), June 2008, notes that the impact of subterranean development on groundwater flows is negligible as groundwater flows will find an alternative route if blocked by a subterranean structure.

8.0 Ground Movement Assessment

- 8.1 A ground movement assessment has been carried out by Chelmer Consultancy Services. For full information on this, refer to the BIA for the project, produced by Chelmer.
- 8.2 We have produced a summary of the anticipated loads for the proposed works and these have been inputted into the ground movement assessment. The assessment takes into account both the long and short term effects of the proposed basement and it has shown that the settlement is within acceptable limits; both settlement of the existing structure and the neighbouring structures at 3 and 5a Templewood avenue.
- 8.3 The ground movement assessment concludes that given the assumed sequence and ground conditions, the basement can be constructed without either of the neighbouring structures exceeding damage category 1 on the Burland scale.

9.0 Structural Monitoring

- 9.1 It is anticipated that the Contractor shall provide monitoring to all structures and infrastructure adjacent to the basement excavation at the time of excavation and construction. However, this is to be agreed with the party wall surveyors.
- 9.2 It is recommended that monitoring shall be completed as follows:
- 1) One month prior to any works being started to provide a base reading.
  - 2) At the start and end of every shift during the excavation and until the basement slab and lining wall has been cast.
  - 3) On a monthly basis thereafter for a 6 month period following completion of the notifiable works.
- 9.3 Cumulative movement of survey points must not exceed:
- a. *Settlement*  
Code amber trigger values: +/-4mm  
Code red trigger values: +/-8mm
  - b. *Lateral displacement*  
Code amber trigger values: +/-4mm  
Code red trigger values: +/-8mm
- 9.4 Movement approaching critical values:

*Code amber trigger value:*

All interested parties, including the Adjoining Owner's Surveyor and his Engineer should be informed and further actions immediately agreed between two of the three Surveyors and implemented by the Building Owner. Notwithstanding the Party Wall requirements, the Contractor is to appoint, and to have permanently on site, a suitably qualified Structural Engineer who will be responsible for the reviewing of the movement monitoring results at the start and end of each day and provide immediate advice, remedial works and design as necessary in the event of movement being noted. The Contractor is to ensure that he has 24 hour 7 "days a week access" to emergency support provision including but not limited to additional temporary props, needles, waling beams and concrete supply at the start of the excavation and prior to any likelihood of this trigger value being reached. If this value is reached the Contractor, and his Engineer, must without delay provide all interested parties with his plan to implement any emergency remedial and supporting works deemed necessary. The Contractor must be ready to carry out these works without delay if the movement continues and approaches the trigger value below.

*Code red trigger value:*

All interested parties including Adjoining Owner's Surveyor and Engineer will be informed immediately. Works will stop and be made safe using methods and equipment agreed at the above stage. The Contractor is to ensure that the movement has stopped as a result of the implemented remedial works designed and installed at this stage. The requirements of the Party Wall Act will also ensure that, two of the three Surveyors

and their advising Engineers shall then enter into an addendum Award, setting out whether or not the Building Owner's works can re-commence and when, and if so agree additional precautions or modifications to the proposals prior to re-commencement.

## 10.0 Conclusion

- 10.1 It is assumed that the above measures and sequence of works are taken into account in the eventual detailed design and construction of the proposed works.
- 10.2 Detailed method statements and calculations for the enabling and temporary works will need to be prepared by the Contractor for comment by all relevant parties including party wall surveyors and their engineers. EW will need to ensure that adequate supervision and monitoring is provided throughout the works particularly during the excavation and demolition stages.
- 10.3 In line with the site specific site investigation prepared by Chelmer, it is unlikely that proposed basement will pose a risk to the hydrogeological or hydrological setting.
- 10.4 To this end, EW will have an on-going role during the works on site to monitor that the works are being carried out generally in accordance with our design and specification. This role will typically involve weekly site visits at the beginning of the project and fortnightly thereafter. A written site report is provided to the design team, Contractor and Party Wall Surveyor.
- 10.5 The undertaking of such projects to existing buildings is specialist work and EW will be involved in the selection of an appropriate Contractor who will need the relevant expertise and experience for this type of project.
- 10.6 If the works noted above are properly undertaken by suitably qualified contractors, is very unlikely that these works will pose any significant threat to the structural stability of the existing house or the neighbouring properties. We consider that if the works are carried out in this manner then the likelihood of damage to the adjacent properties and will be limited to Category 2 as set out in CIRIA report 580.

## 11.0 Subterranean Construction Method Statement

### 11.1 Construction generally

All demolitions and excavations will need to be undertaken in a carefully controlled sequence. In our structural design we have assumed the Subterranean Construction Method Statement described below. The Contractor will, however, have to provide a detailed method statement including all temporary works design before the works commence on site. These proposals will be issued to EW and the design team for comments prior to commencement of the works on site.

Access onto the site will be from Templewood Avenue and must be coordinated in a sensible manner to minimise disruption to the neighbouring residents; and provide a safe working environment. The principles of access to the property during construction have been outlined in the Construction Management Plan (CMP) prepared by Montagu Evans.

### 11.2 Noise, vibration & Dust

The Contractor shall undertake the works in such a way as to minimise noise, dust and vibration when working close to adjoining buildings in order to protect the amenities of the nearby occupiers.

The breaking out of existing structure shall be carried out by saw cutting where possible to minimise vibration to the adjacent properties and associated construction noise. All demolition and excavation work will be undertaken in a carefully controlled sequence, taking into account the requirement to minimise vibration and noise. Further details are provided in the CMP and will be finalised by the contractor in their method statement, prior to construction.

Dust suppression equipment should be used during the demolition process to ensure that any airborne dust is kept to a minimum. Where practical, concrete should also be wetted down prior to and during breakout to further inhibit airborne dust.

The contractor should ensure that any concrete pours are completed within the permitted hours for noise generating works. The contractor should allow for a contingency period to ensure that concrete pours can be completed within these hours regardless of unforeseen circumstances such as batching plant delays and traffic congestion.

The fabrication and cutting of steelwork for the reinforced concrete underpins and slabs shall take place off site. If any rebar needs to be trimmed on site this should be completed using hydraulic or pneumatic tools instead of angle grinders.

The secant piled wall will be formed using continuous flight augering, subject to contractor approval. This is a non-precussive technique and therefore produces significantly less noise and vibration than the alternative; driven piles. If tension piles are required under the pool then these require breaking down to slab level once the basement works are complete. The contractor should ensure that they use non-precussive pile reduction techniques which are much quieter than traditional breakers.

In order to reduce the amount of dust generated from the site, the contractor should ensure that any cutting, grinding and sawing should be completed off site where practicable. If cutting, grinding and sawing is being carried out on site, surfaces are to be wetted down prior to and during these types of work whenever possible. Any equipment used on site should be fitted with dust suppression or a dust collection facility.

The contractor will be responsible for ensuring good practice with regards to dust and should adopt regular sweeping, cleaning and washing down of the hoardings and scaffolding to ensure that the site is kept within good order. Contact details of the contractor who will be responsible for containing dust and emissions within the site will be displayed on the site boundary so that the local residents can contact the contractor to raise any concerns regarding noise and dust.

Stockpiles of sand or other dust-generating materials or debris will be covered. Cement, fine aggregates, sand and other fine powders should be sealed after use.

### 11.3 Construction Method Statement

Refer to Appendix A for the assumed sequence of construction. This is to be developed by the main Contractor.

#### Site set-up

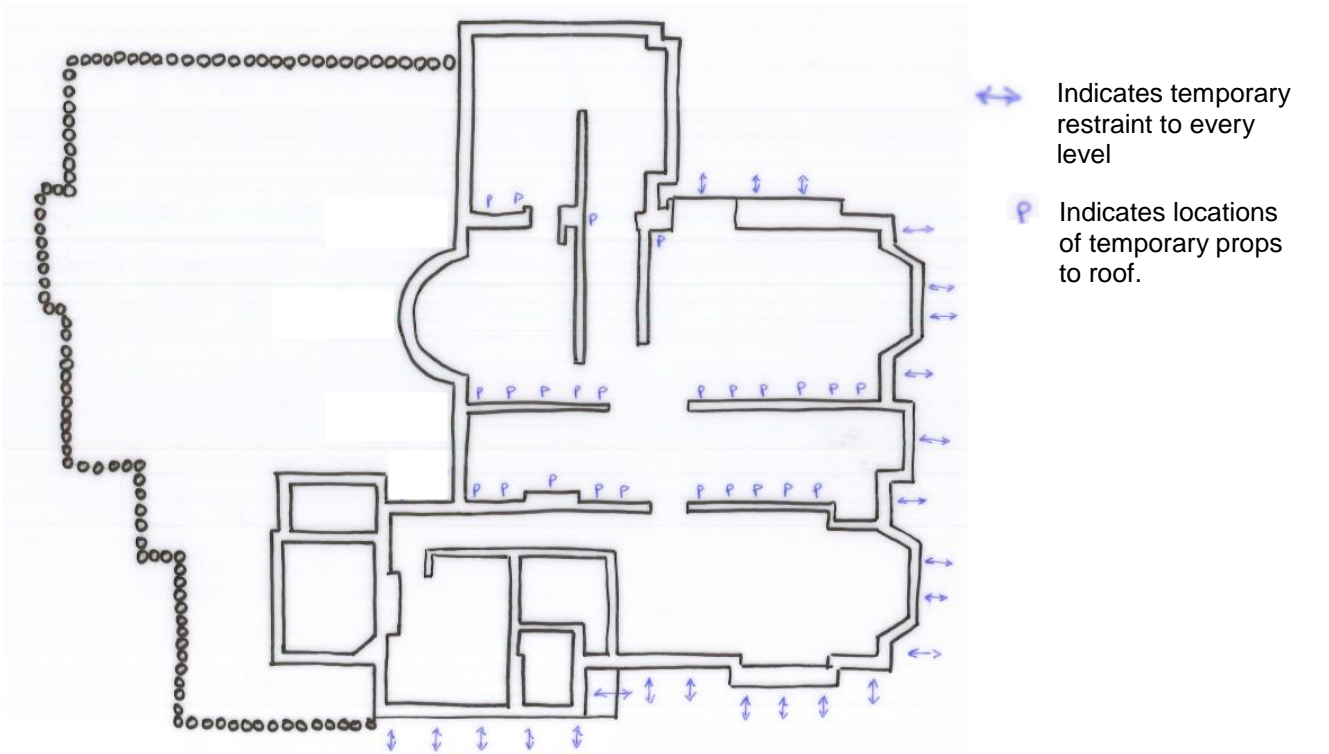
- Erect a fully enclosed painted plywood site hoarding along the boundaries, this should not impede on the neighbouring properties.
- The services within the site should be identified and isolated as necessary. All below ground obstructions which may interfere with the structure, should also be removed to allow the works to progress.
- The principles for the removal of spoil are indicated in the CMP, however, the final construction management plan and overall sequence is to be agreed with the contractor after final proposals have been agreed.
- Tree Protection methods to be agreed and installed to all retained trees where required. Refer to the Arboricultural Impact Assessment Report.
- If required, monitoring points will be installed to all neighbouring structures and infrastructure and a base reading should be taken prior to any construction works starting on the site.
- Works should be carried out with regards to the recommendations in this document and any architectural and structural specifications, as well as the construction management plan and any other specialist reports.

APPENDICES

A. Proposed Structural Layouts and Sequence of Construction

Stage 1 - Propping and pile installation

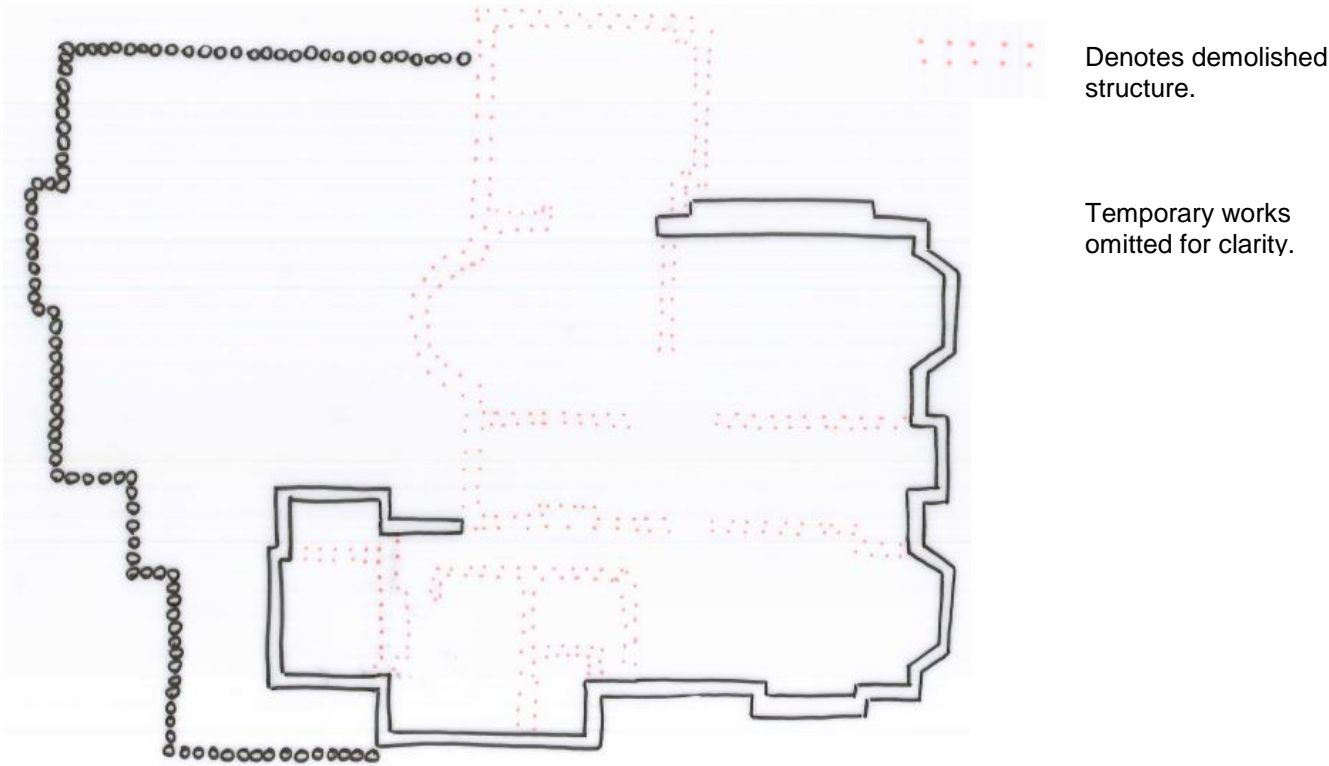
- Install temporary lateral props to the existing load bearing facades, which are to be retained (denoted by blue arrows). This will later enable the removal of floors, which currently provide lateral restraint to the walls. Lateral propping is to be placed at or just above the level of floor slabs. Design responsibility for the temporary works lies with the main contractor.
- Provide temporary support to the roof structure.
- Piles should be installed in the garden at this stage, to facilitate the excavation of the basement. It is important that a trial shaft is dug to the depth of the proposed basement to ensure that well pointing is a suitable dewatering method, and that the soil is cohesive enough to be excavated with a contiguous piled wall. Should this not be the case, a secant piled wall will be used.



Stage 1 - Ground floor

Stage 2 - Demolition

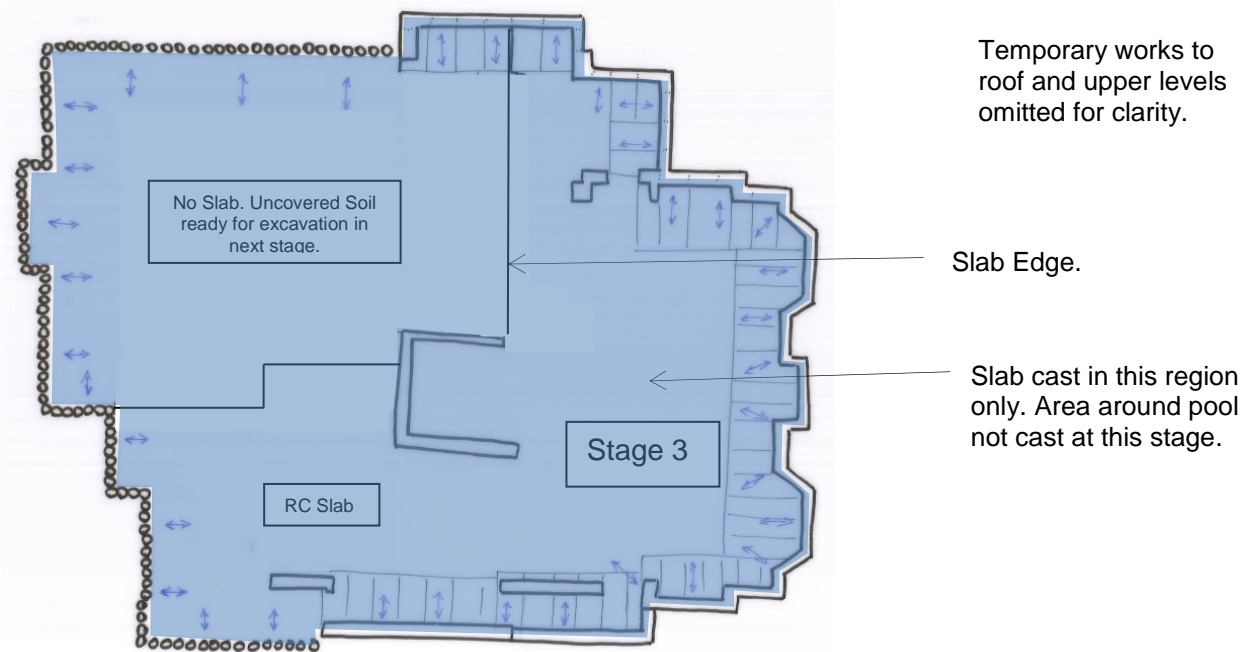
- Commence demolition of relevant elements, including North wing and majority of rear façade as well as internal walls and floors. Demolished structure shown dashed in red.
- Demolition should be conducted in a top down sequence, at all stages adhering to the requirements for noise, vibration and dust mitigation. Demolition method statement should be provided by the main contractor.
- Props shown in stage 1 are to be retained to restrain the façade until the new superstructure is in place.



Stage 2 - Ground floor

Stage 3 - Excavation/Substructure B1 Level

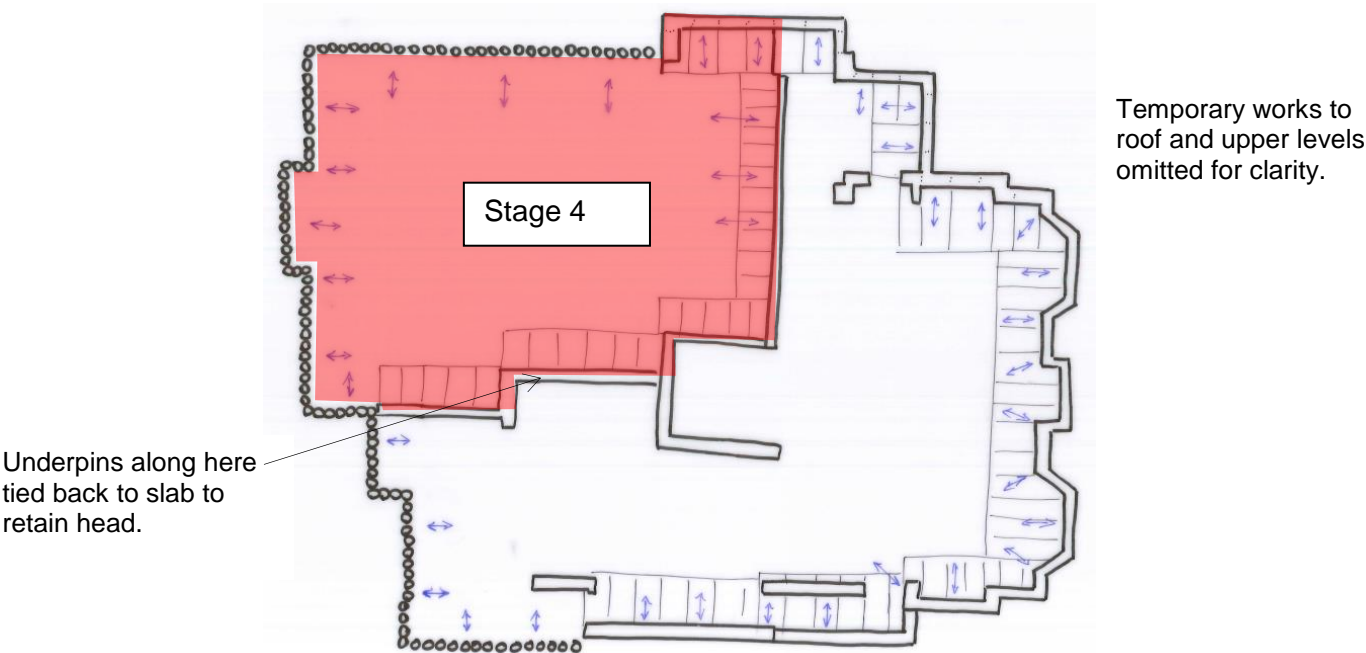
- Complete underpins which service the first level of basement, leaving a bund of earth in the middle of the basement.
- Form the capping beam to tie the piles together at Ground level.
- Provide propping to piled wall capping beam throughout duration of excavation.
- Reduce dig to the first level of basement.
- The temporary support should be designed such that individual props can be removed to be adjusted or lowered.
- Cast the slab for the first level of basement, but not the area which is to be excavated to B2 level, around the pool in stage 4.
- Dewatering with well pointing will be required. Contractor to seek approval from Thames Water for discharging water to the sewer if required.
- Propping to superstructure above to be maintained as excavation proceeds; this will require props to be adjusted to account for the depth of the new excavation.



Stage 3 - B1 level

Stage 4 – Excavation/Substructure Pool Service level

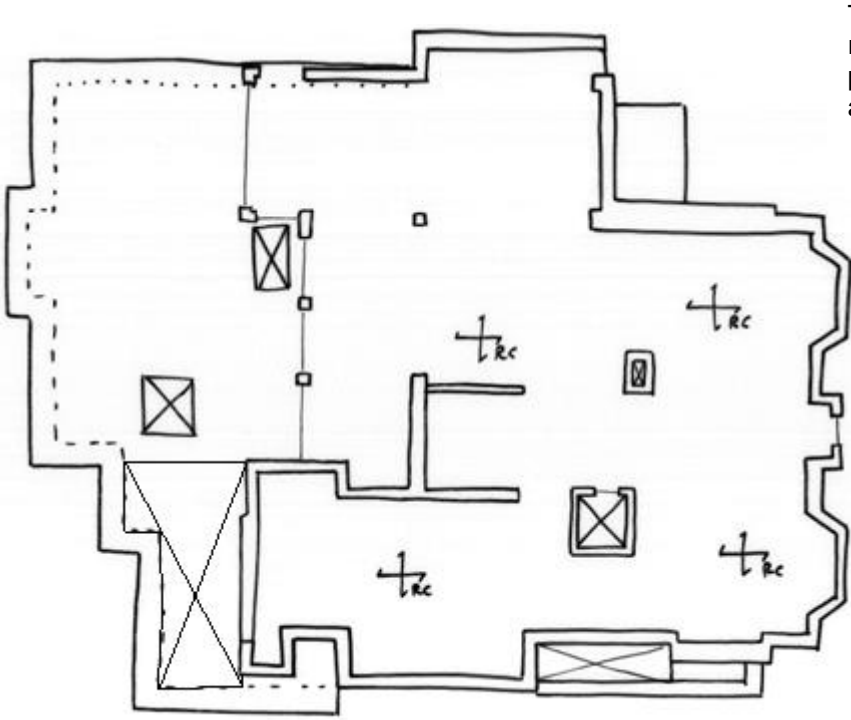
- Complete underpins which serve the second level of basement, leaving a bund of earth.
- Excavate the lower part of the basement, around the pool However, care should be taken to ensure that the upper level of the basement is not undermined. Maintain propping to piled retaining wall.
- Slab to pool service area to be constructed along with structure to for pool. Locations of access hatches to be confirmed.
- B1 level slab over the pool area to be formed at the same level as the rest of the B1 slab.



Stage 4 - B1 level

Stage 5 - Construction/superstructure

- Once substructure complete, Ground floor-level structure to be constructed. This will allow removal of props to ground floor level as the ground floor slab will prop the heads of the retaining walls below.
- Remainder of building to be built in traditional, bottom up sequence.
- Stability is gained from transferring loads through floor diaphragms into existing masonry walls and new structural cores. Note that propping should not be removed until stability is maintained by connectivity back to the cores/walls.



Temporary works removed once permanent works are complete.

Stage 4 - Ground floor

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