Concept Consultancy
Chartered Civil & Structural Consulting Engineers

Basement Impact Report

3 Belsize Crescent, London, NW3 5QY

Job No.: 2604
Client: David Templer
Date: December 2015

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Non-Technical Summary

The proposals are to lower the existing basement floor under an existing end terrace house at No. 3 Belsize Crescent by approx. 1m.

A thorough desk study of the site has been carried out which indicates that the site is underlain by the London Clay formation.

A Site Investigation confirms that the site is underlain my some made ground with London Clay below. The water table is below the level of the proposed basement.

The site is not located in within the flood zone for rivers and seas and reservoirs. The site is located within the area for low risk of surface water flooding.

The existing structure is constructed of load bearing masonry walls with timber joisted floors supported on shallow strip foundations. The site investigation has confirmed that the foundations are stepped brick within the London Clay.

The proposed works a new single storey basement and to extend the ground floor at the rear of the property. The works also include some alterations to the ground floor to remove loadbearing walls at ground and first floor.

The existing perimeter walls shall be underpinned and a new basement floor constructed approx. 1m below its current level.

The temporary works will be required to limit any movements in the neighboring buildings.

This report demonstrates how all the issues with lowering the basement level have been addressed and where any constraints has impacted on the proposed works to the basement.

1.0 INTRODUCTION

Concept Consultancy has been commissioned by David Templer to carry out a basement Impact Assessment for the site at 3 Belsize Crescent, London, NW3. The intention is to make some structural modifications to an existing basement in the form of lowering the existing basement floor slab level by approximately 1.0m. There are internal renovation works to be carried out to the basement and superstructure but this report is concerned only with the lowering of the basement slab.

2.0 Site Location

The site is located at the southern end of Belsize Crescent, London NW3 adjacent to Burdett Mews. The site is roughly rectangular and measures approximately 11m x 7m. The site presently contains a four-storey end terrace (3 storey's over Basement) residential building.

The building has been constructed entirely within the London Clay formation.

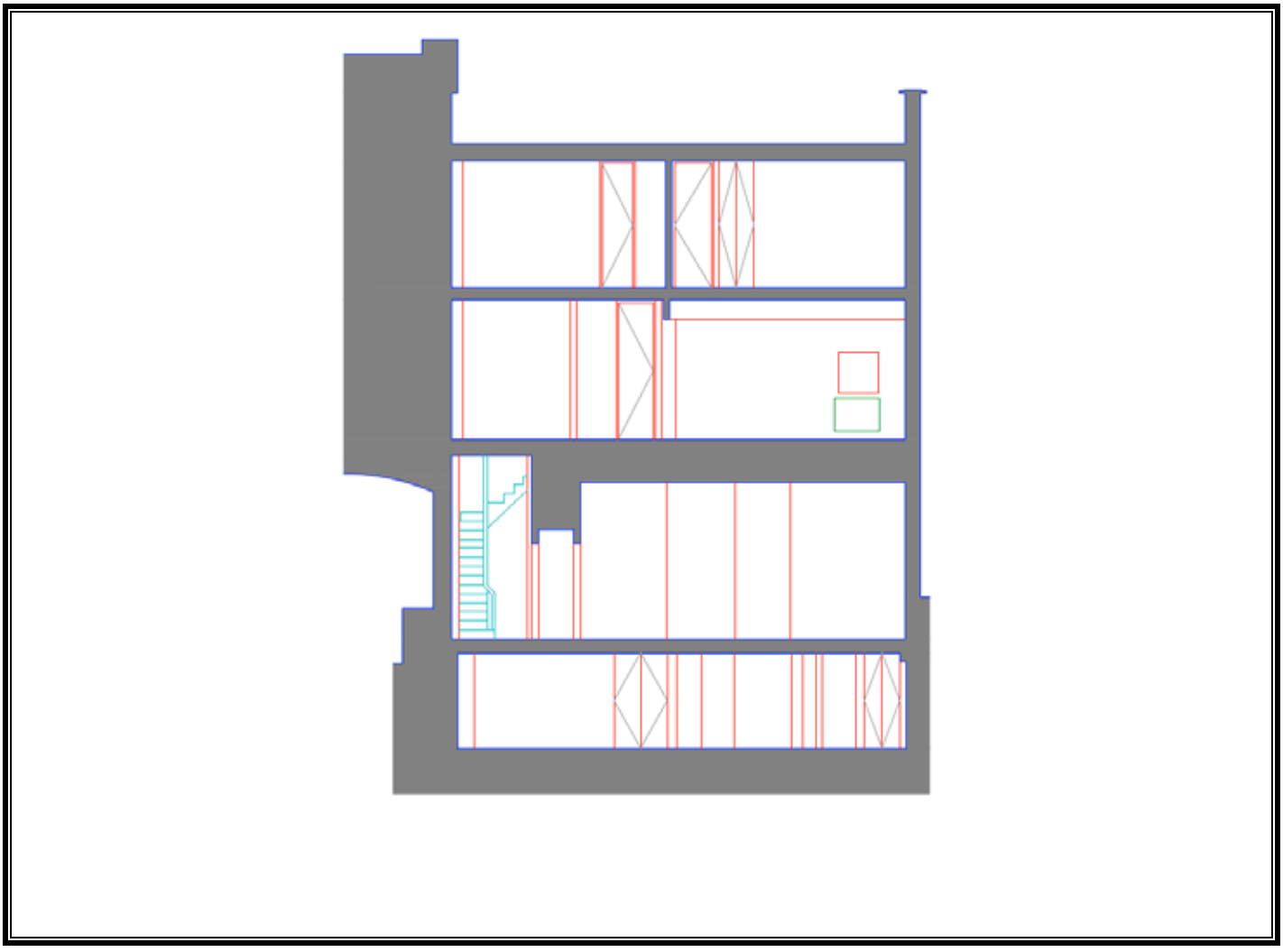


Fig 1: Original Long Section Through Property

The site is essentially a level site from front to back, however, the ground level of Belsize Crescent, to the front of the site has a fall across the front of approximately 0.6m. but this will have no influence over the proposed works. The rear boundary of the property is formed by a masonry/concrete retaining wall up to first floor level. The properties to the rear are a set of terraced domestic dwellings/mews.

2.1 Basement Works

The existing building is supported off the existing basement walls and slab within the London Clay stratum with the foundation formation level being approximately 2.7m below existing ground level. It is intended to increase the height of the headroom of the basement by lowering the basement floor level by approximately 1.0m (see Fig2).

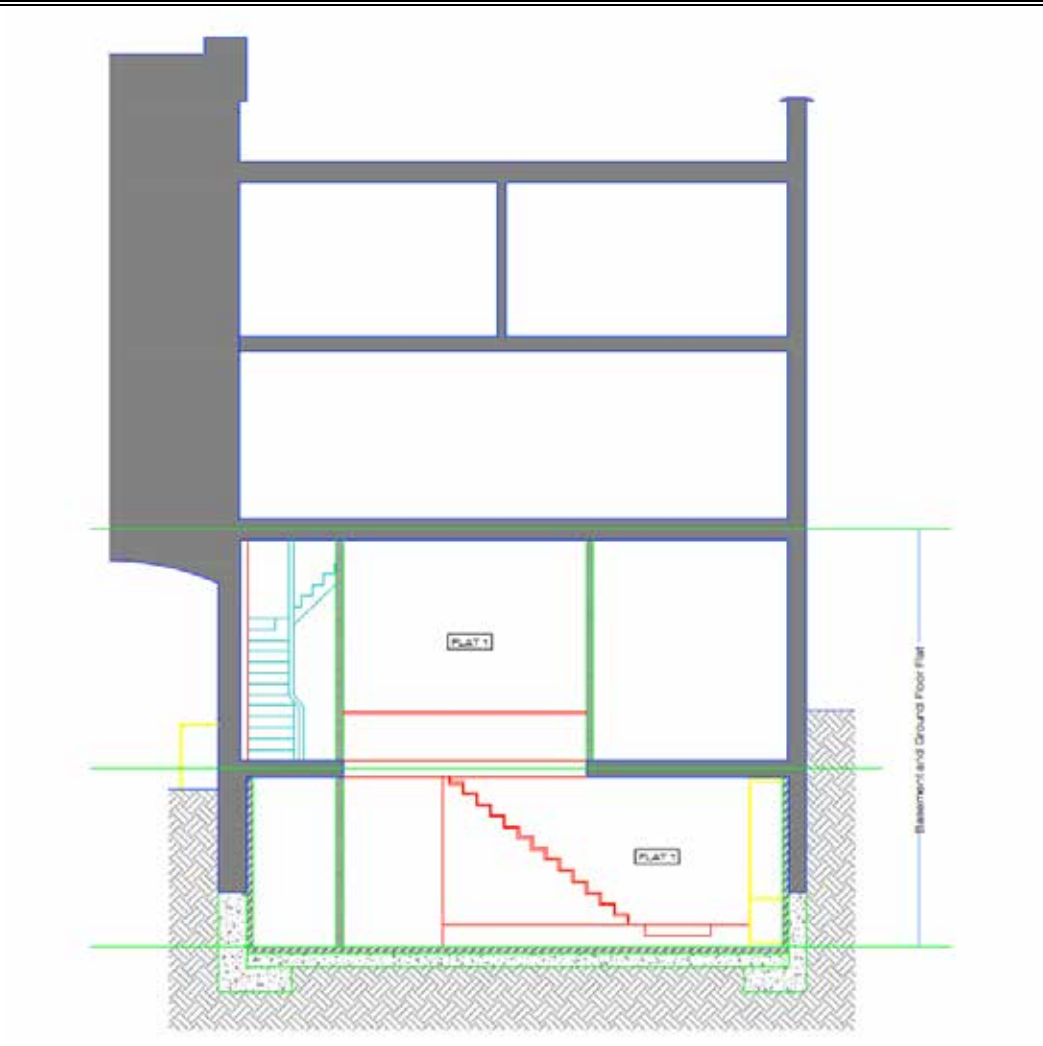


Fig 2: Proposed Long Section Through Property

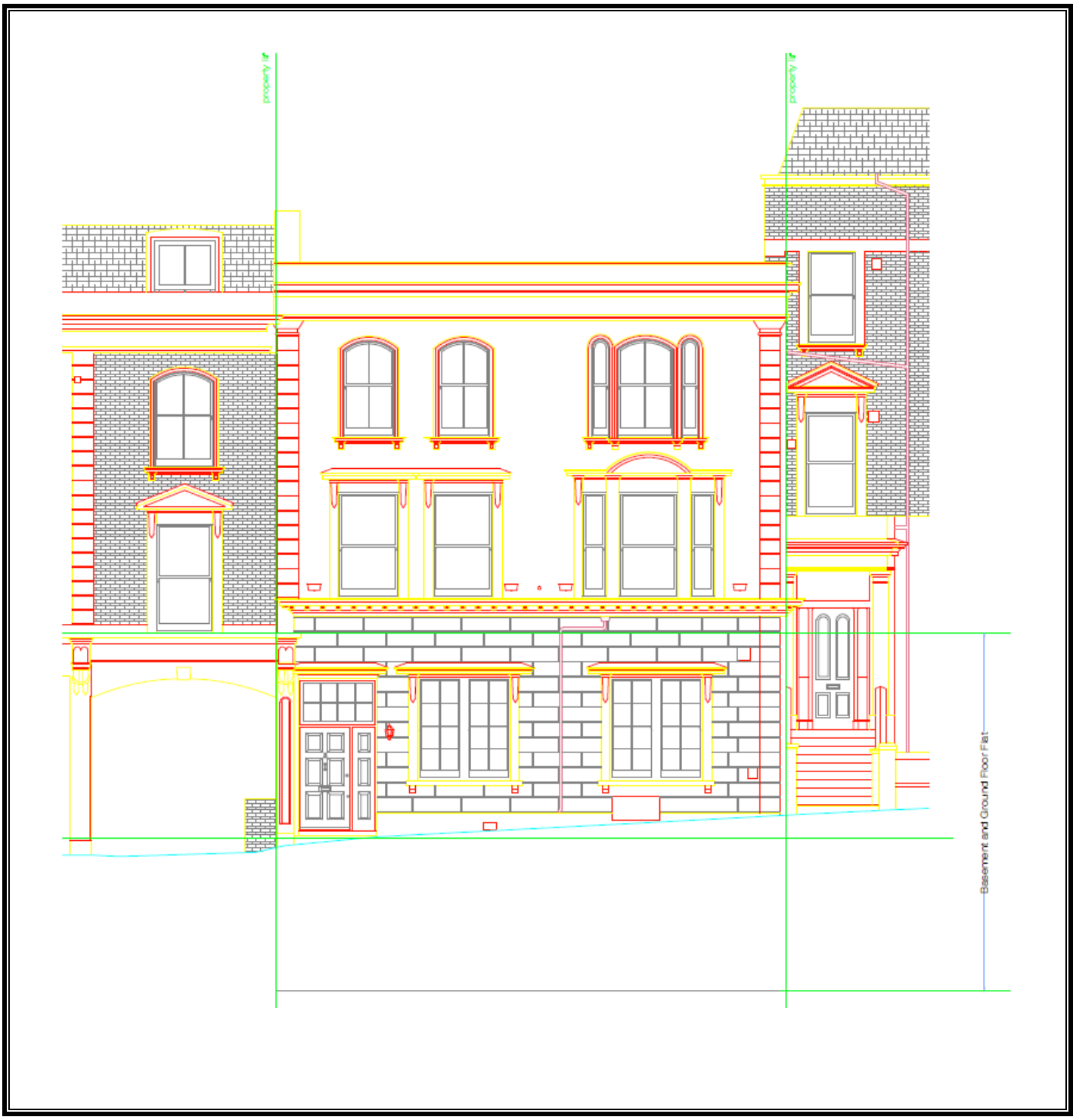


Fig 3: Front Elevation

3.0 Ground Conditions

3.1 Soil Conditions

A desktop study indicates London Clay close to the surface. This underlying London Clay formation is in line with the Geological Survey Map for the area which indicates same.

Ground investigation was carried out by Land Science as part of this project. A detailed report by Land Science is available, in summary a single window sampler borehole and 2 No. trial pits were dug. These confirmed the underlying ground comprises of:

- 0.65m to 0.75m of Made Ground Overlaying
- 0.75m to 2m plus London Clay

One borehole and two trial pits were constructed at 3 Belsize Crescent in January 2016. These were logged from basement floor level. These encountered made ground to 0.65 to 0.75 m depth, then London Clay. The existing foundation level was 0.65 m to 0.75 m below ground level (i.e. the same as the depth of made ground).

Trial pit TP1 and borehole WS1 were constructed in the north east corner of the basement. WS1 went through the base of TP1; the borehole reached 2 m depth and was dry to its base. Trial pit TP2 encountered a seepage of water, which stood at 0.73 m depth. This elevation is at the very base of the gravelly made ground, and the trial pit was 0.80 m deep in total.

The existing foundations were found to be at a depth of 0.65m and 0.75m below existing basement level (in trial holes TP 1 and TP2 respectively).

Whilst no laboratory testing was carried out on soil samples we would expect the stiffness of the London Clay to be in the order of E=30MPa

3.2 Adjacent Structures

The property is a terrace house. The adjacent houses are of similar construction. The adjacent building (and all other buildings within the immediate area) are Category 6 structures in accordance with table B.1 of BS ISO 4866:2010 which would be described as having a medium resistance to vibration and therefore would require little or no protection against vibration for the type of works proposed. It is noted that:

- The basement construction will not be lower than the prevailing groundwater level in this area so will not interfere with the natural flow of the groundwater.
- The building will be formed off of stiff London Clay, which has a significant bearing capacity, and the foundations will be designed to reflect the recommended permissible pressures and ensure they will not be compressed by more than 15mm
- Removal of the existing construction will, ultimately generate little or no relief and consequent heave in the London Clay that underlies the band of Made Ground.
- The boundary walls on four sides can be retained safely and easily following industry-standard practices and, by following a pre-determined sequence will allow the basement wall to be constructed without detriment to the existing, surrounding construction.
- Excavations for the pins that will form the new basement walls can be undertaken using small excavators, which will be low-impact technique and unlikely to generate excessive vibration.

Adopting a controlled and sequenced work process will limit any damage to surrounding buildings to between Category 1 and 2 on The Burland Scale, Hairline or Very Slight cracks, easily repaired with filling & decoration. Predicted displacements are covered in section 3.2.2

The existing foundations of the adjacent property are expected to be stepped brick on a concrete strip footing also. The adjacent properties do not presently have basements.

3.2.1 Vibration Monitoring

It is proposed to carry out vibration monitoring on the existing building structure immediately to the works. A detailed methodology will be agreed at construction stage

but shall include the following based on adopted on previous similar projects is presented below.

Trigger Action Plan for vibration

The vibration monitors to be of a type that sounds an alarm should the trigger levels be exceeded.

Trigger values for vibration should be:

Amber - 5mm/s PPPV

Red – 10mm/s PPV

The actions at the trigger levels are:

Amber

In the event of an Amber alarm Contractor to review and adjust construction practices as necessary to ensure that the Red trigger level is not exceeded.

Red

In the event of a Red alarm Contractor to cease work immediately, investigate the cause of the breach and adjust work practices accordingly. The breach to be recorded and reported on with details of what caused the breach, any remedial action that was required at the time and what measures were implemented to ensure a non-reoccurrence. Party Wall Surveyor to be informed of breach within 24 hours and to receive copy of report within 48 hours from the time of the breach.

Frequency of monitoring

During the demolition, excavation and underpinning phase, monitoring to be on a continuous basis.

Trigger Action Plan for Differential Settlement, Lateral and Out-of-Plane Movement

Trigger values for differential settlement, lateral and out of plane movement should be:

Green - lesser of 1:1250 or 11mm

Amber - lesser of 1:1000 or 14mm

Red – lesser of 1:800 or 17mm

The adjoining owner's surveyor and the adjoining owner's engineer are to be notified of amber and red triggers within 24 hours of their occurrence.
The building owner will instruct the contractor to comply with the Trigger Action Plan for Asset Protection Monitoring.

The actions at the trigger levels are:
Green
Contractor to review and confirm pattern of ground movement is consistent with location of excavation; modify construction practices as necessary to ensure that the amber trigger level is not exceeded.

Amber
As per green but undertake formal review with engineers in attendance. Consider rate of change to determine appropriate time for review and consider suspending construction activities.

Red
Cease construction activities. Investigate and determine cause of breech and devise alternative means of carrying out activity.
We recommend that monitoring is carried out for the duration of the works.

3.2.2 Predicted Displacement

The vertical and horizontal displacement of the adjacent ground due to the underpinning of the existing walls (in stiff clay) is assumed to be based on the equivalent published date for a bored pile wall or a planar diaphragm wall. Using data from CIRIA C80 Embedded Retaining Walls – Guidance for Economic Design – 2003 it is assume that the following displacement will occur:

Vertical Movement will be a max of 0.05% of the underpinning depth at the face of the underpinning tapering linearly to 0 at a distance of 2 x underpinning depth. This is based on worst case of figures 2.8b and 2.9b (CIRIA C580).

Horizontal Movement will be a maximum of 0.05% of the underpinning depth at the face of the underpinning tapering to 0 at a distance of 1.5 x the underpinning depth. This is based on worst case of figures 2.8a and 2.9a (CIRIA C580).

Based on an underpinning depth of 1.5m it is therefore predicted that the following displacements will occur:

Vertical – 0.75mm at the face of the wall
Horizontal – 0.75mm at the face of the wall

Assuming that any crack which would develop in the wall directly above the underpinning would be no greater than a combination of both the maximum vertical and horizontal displacement above the maximum predicted crack width would be 1mm. Based on The Burland scale this would at worst put any damage at category 1 – Very slight.

The existing ground behind the underpinning may also move vertically and horizontally. Based on Table 2.4 and figures 2.11a & b (CIRIA C580) the ground at the face of the wall the maximum vertical and horizontal ground movement is expected to be 1.5mm and 1mm respectively at 4m and 3.5m respectively (see predicted deflection contour plots in Appendix C. This is based on a High support stiffness from the temporary propping. Based on The Burland scale this would at worst put any damage at category 2 – Slight.

3.3 Groundwater Conditions

During the ground investigation ground water was found to be at a depth of 0.73m below existing basement level (in Trial Hole No. 2) and at 1.8m below basement level during the window sampling. As the existing ground is clay the ground water is most likely perched on the clay layer.

3.4 Surface Water Features

No culvert, rivers and or other water bodies are known within the immediate vicinity of the site.

4.0 Stage 1 - Screening

The London Borough of Camden guidance suggests that any development proposal that includes a subterranean basement should be screened to determine whether or not a full BIA is required.

The following screening is based on a series of questions as set out in the Camden Planning Guidance - Basement & Light Wells (CPG 4).

4.1 Ground Water Flow:

Question 1a: Is the site located directly above an aquifer?

No. The geological map and the nearest off-site boreholes indicate that a layer of permeable superficial deposits is not present beneath the site. Local boreholes and the site borehole show clayey made ground, over London Clay. None of these can be considered an aquifer. Beneath made ground a considerable thickness of London Clay isolates the deeper aquifer units of the London Basin aquifer from the surface.

Question 1b: Will the proposed basement extend beneath the water table surface?

No. Only one out of several local boreholes identified a groundwater seepage at 12.1m below ground level. A 0.8 m trial pit (TP2) at 3 Belsize Crescent did encounter a seepage of water at the base of gravelly made ground, but a 2 m deep borehole at the site did not encounter any water.

It is typical of some boreholes in the London Clay to exhibit seepages of water from horizons above low permeability bands; others remain dry to depth. These are not instances of intercepting water tables, just pockets of water moving through the upper horizons. This is likely to be the case with the water encountered in the single local borehole, TQ28SE2336, about 500 m from the site.

The water detected in TP2 was inside the existing foundations of the property, and it seems probable that the water is not groundwater, but leakage from the property or an adjacent property. Despite there being shallower foundations in TP1 and WS1 there was no water detected: if there was a local perched water table in the made ground it should have been expected to have flowed in below the foundation here.

Hence it is considered that, in the event of water being encountered by the excavation, inflows will be low, but it may need a little dewatering. Waterproofing of the basement may be required for property protection purposes. However when the basement is constructed these flows are not expected to be sufficient to lead to any change in the groundwater flow patterns beneath or around the site.

Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

No. There are no surface water bodies within 100 m of the site. The site lies about 200m east of a former tributary of the former River Tyburn. There are no known water wells within 100 m of the site.

Geological conditions indicate that there is no potential for development of a spring line near the property, as the 1:50 000 geology map indicates that it is located on London Clay outcrop (Claygate Beds crop out about 130 m to the north west, and 8 m higher in elevation), and there are no superficial deposits nearby.

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

No. The development will be beneath the current footprint of the property, so surface water flows will be unchanged.

Question 4: As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?

No. Discharge to the ground is not proposed.

Question 5: 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)?

No. The nearest surface water body is the Hampstead No. 1 Pond, about 970 m to the north east of the site. Whilst the elevation of the pond is about the same as that of 3 Belsize Crescent there is a ridge feature between them that rises to about 80 m AOD.

The above assessment has identified that there are no potential issues that need to be assessed

4.2 Slope Stability:

Question 1: Does the existing site include slopes, natural or manmade, greater than 7 degrees? (Approximately 1 in 8)

No. The existing ground level falls across the site at approximately 1 in 16

Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degrees? (Approximately 1 in 8)

No.

Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7degs? (Approximately 1 in 8)

No.

Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7degrees? (Approximately 1 in 8)

No.

Question 5: Is the London Clay the shallowest strata at the site?

Yes. The existing basement is within the existing London Clay layer.

Question 6: Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?

No. There are no trees on the site.

Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?

No. We have no evidence indicating any possible shrink-swell subsidence in the local area.

Question 8: Is the site within 100m of a watercourse or a potential spring line?

No. There is no known watercourse, spring or well within 100 m of the site.

Question 9: Is the site within an area of previously worked ground?

Yes. This is an existing basement, to be extended downwards further into the London Clay

Question 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?

No. The site is not within and aquifer.

Question 11: Is the site within 50m of the Hampstead Heath Ponds?

No. No the site is approx. 920m from the nearest pond in Hampstead Heath.

Question 12: Is the site within 5m of a highway or pedestrian right of way?

Yes. The front wall of the basement is on the same line of the edge of the footpath on Belsize Crescent

Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to the neighboring properties

Yes. The depth to the new foundations will be increased by approximately 1.0m to that of the surrounding buildings, underpinning will be carried out as required.

Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?

No. There are no railway networks in close proximity of the property.

The above assessment has identified the following issues to be assessed:

Question 12 The existing property fronts directly on to Belsize Crescent the existing basement is fully within the site. This existing arrangement will remain unchanged. The new works will have no impact on the right of way on the public road or foot path.

Question 13 By lowering the existing basement slab by approximately 1.0m will mean that the new foundations will be lowered by the same amount relative to the surrounding

buildings. Any potential impact on the foundations of the surrounding buildings will be address at design stage and underpinning will be carried out where necessary.

4.3 Surface Flow & Flooding:

Question 1: Is the site within the catchment area of the pond chains on Hampstead Heath?

No. The site is not located within the catchment area as shown on Figure 14 of the Camden Geological, Hydrogeological and Hydrological Study. The site is approximately 1km from Hampstead Heath.

Question 2: As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak run off) be materially changed from the existing route?

No. The current proposal is to re-use the existing connections to the Thames Water combined public sewer located in Belsize Crescent.

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?

No. The proposed development will not increase the impermeable area post-development. The site is at present 100% hard standing and will remain so post development

Question 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.

No. The proposed development is deemed not to affect the profile of inflows to adjacent properties.

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream water courses?

No. The proposed basement will not result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses.

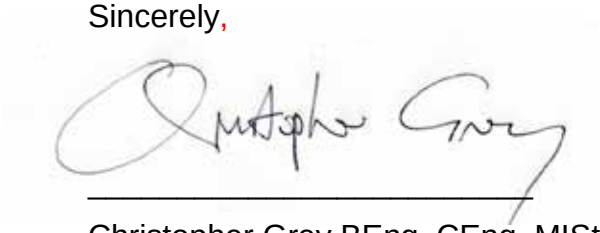
Question 6: Is the site in an area known to be at risk from surface water flooding such as South Hampstead, West Hampstead, Gospel Oak and Kings Cross, or is it at risk from flooding, for example because the basement is below the static water level of a nearby surface water feature?

Yes. Perched water table discovered in ground investigation, see Chapter 3 for details. **Developer is required undertake a Flood Risk Assessment in accordance with the NPPF**.

The above assessment has identified that there are potential issues, which has triggered the requirement for a Flood Risk Assessment. A detailed Flood Risk Assessment was undertaken by Water Environment Ltd in October 2016 in accordance with the NPPF. This assessment concludes that, with recommended mitigation measures, the proposed development is not at significant risk of flooding from any source.

Nothing further occurs.

Sincerely,



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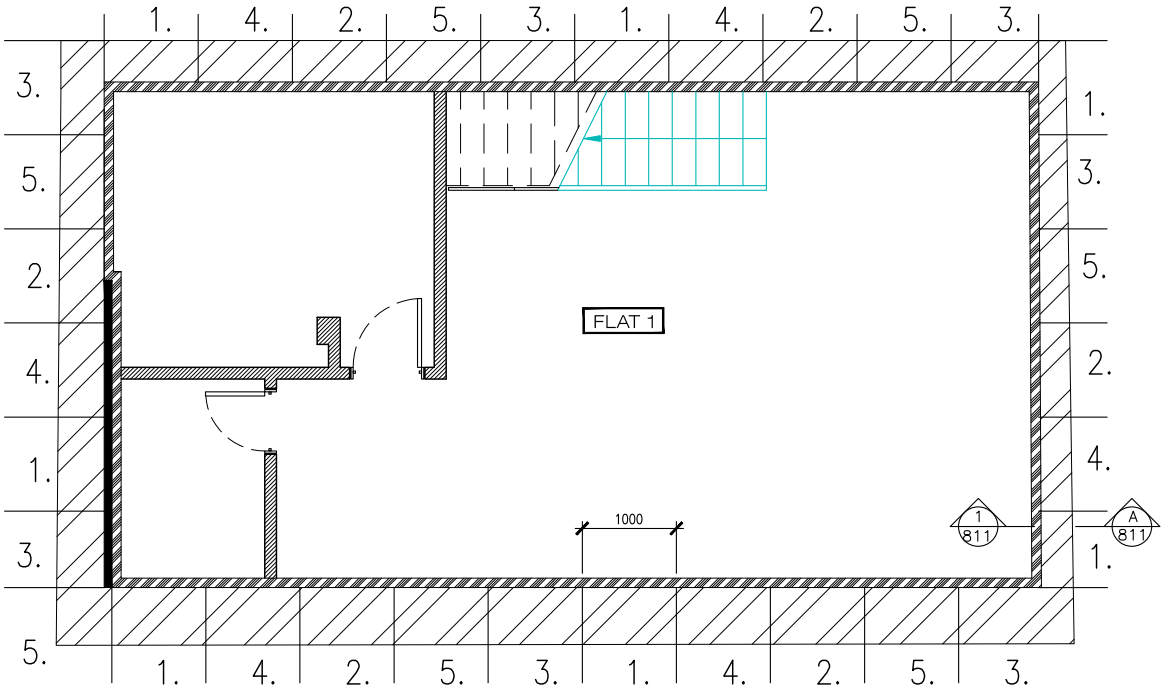
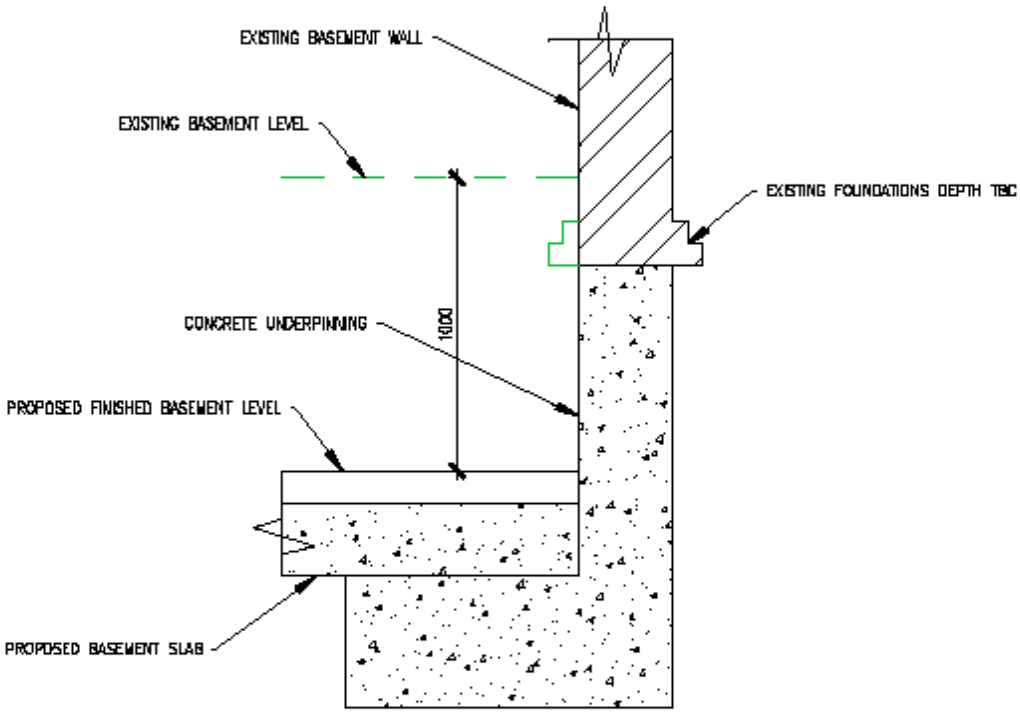
APPENDIX A – Proposed Underpinning Sequence



PROPOSED BASEMENT UNDERPINNING SEQUENCE PLAN



DETAIL 1

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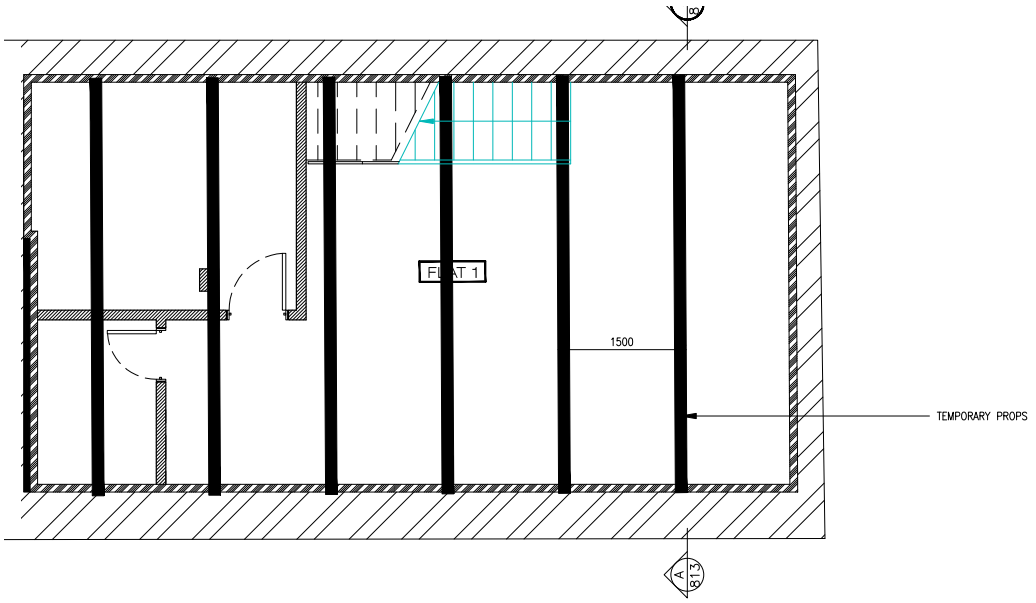
Underpinning Sequence of works:

1. Underpinning to be carried out in the sequence shown, in bays 1000mm width max.
2. Bays with the same number to be excavated simultaneously with concreting carried out immediately after exposure to avoid deterioration.
3. Excavate out by hand all bays No. 1 to the depth & width specified. Ensure that ground is level, clean and rammed if necessary. Should any ground water be encountered this may be pumped out.
4. Dowel bars to be inserted into surrounding ground on both sides as required to provide a key for the adjoining base section.
5. Pour concrete to 75mm of underside of existing wall.
6. The day after concreting fill the 75mm gap with dry pack mortar and backfill excavation.
7. Excavation of bays No. 2 of underpinning shall not be commenced until at least 48 hours after previous bay has been dry packed.
8. Continue remaining bays as per above until all underpinning is complete.
9. Once complete excavation to lower existing basement level.
10. Installation of new concrete basement floor.

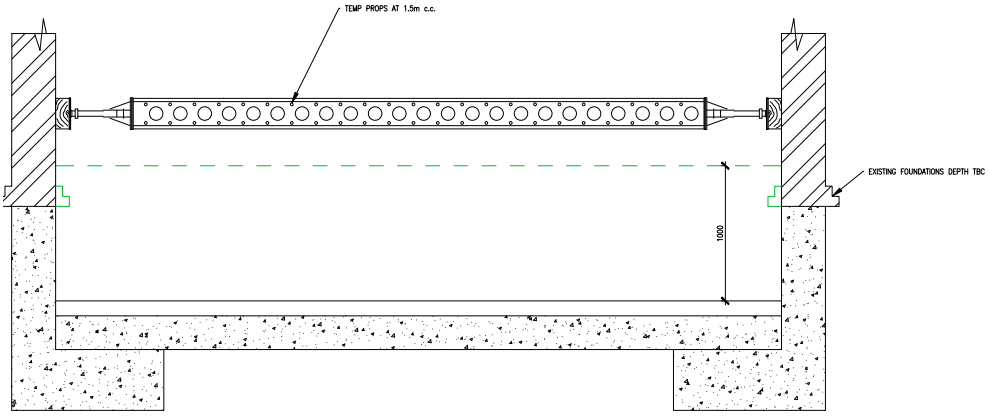
The anticipated construction program is as follows. This will need to be verified when a contractor for the underpinning works has been appointed.

1. Week 1, contractor set up.
2. Week 2 – Underpinning sequence No.'s1 1 & 2.
3. Week 3 – Underpinning sequence No.'s 3 & 4.
4. Week 4 – Underpinning sequence No. 5.
5. Week 5 – Clean up.
6. Week 6 – 7 Excavation and construction of new basement floor.
7. Week 8 – Completion of basement structural works.

APPENDIX B – Proposed Temp Propping

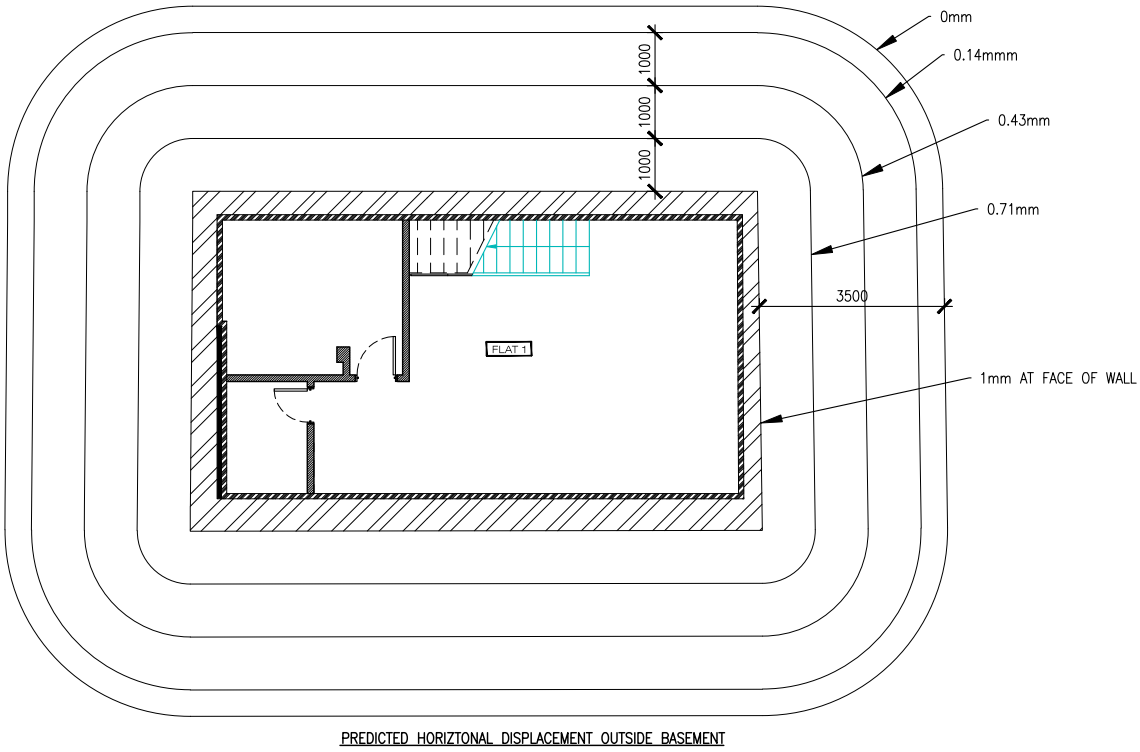


PROPOSED BASEMENT WALL TMEMP PROPPING PLAN

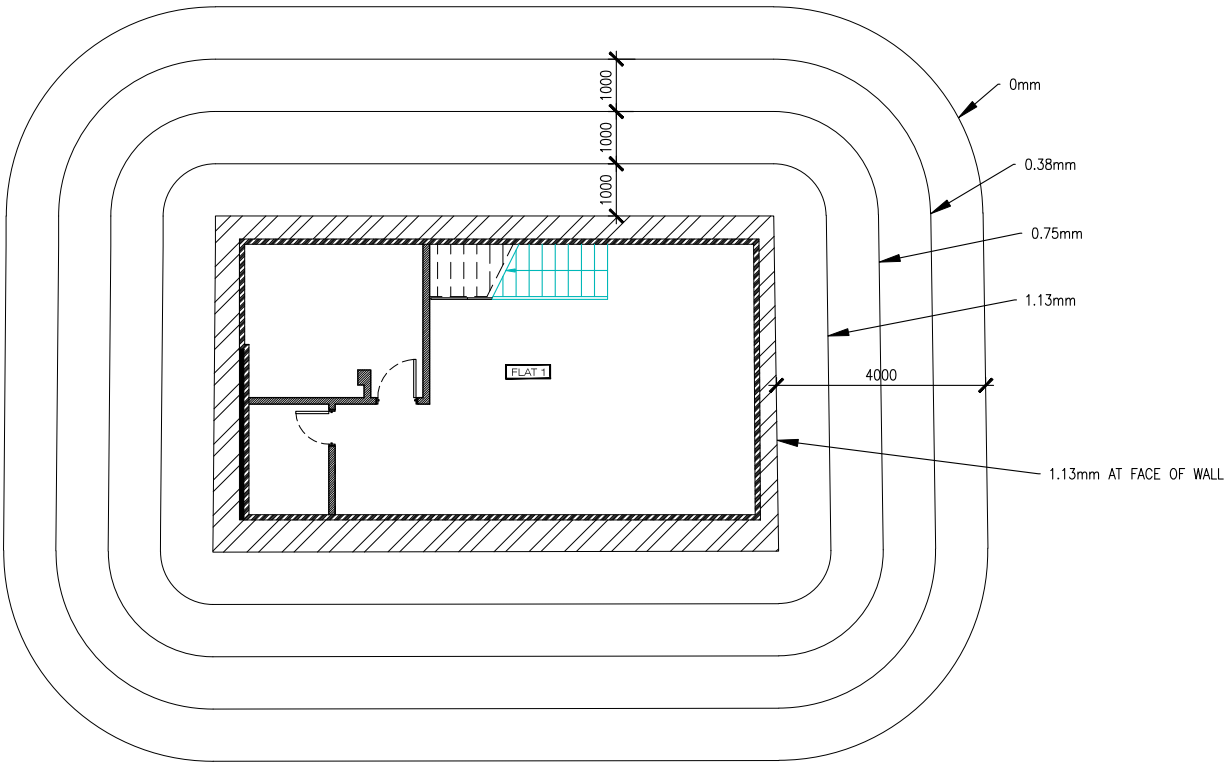


SECTION A–A

APPENDIX C – Predicted Horiz & Vert Movement of Ground Outside Basement



PREDICTED HORIZTONAL DISPLACEMENT OUTSIDE BASEMENT



PREDICTED VERTICAL DISPLACEMENT OUTSIDE BASEMENT

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