Basement Impact Assessment

in connection with proposed redevelopment at

No. 5 Branch Hill
Camden
London
NW3 7LT

for

Mr & Mrs Theodoulou

LBH4523 Ver 2.0

July 2018

LBH WEMBLEY

ENGINEERING

Version	Date	Comment	Authorised
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Executive Summary

It is proposed to redevelop this property through construction of a rearwards extension at basement and ground floor level into an existing rear lightwell area, together with a small rearwards extension of this rear lightwell. The latter will require the excavation of an area of approximately 1m x 1m to form the new lightwell area.

This report provides an assessment of the potential impacts that the proposed subterranean elements of the development may have upon the surrounding area, neighbouring structures and the local environment.

The ground conditions in the area of the site comprise a potential cover of made ground underlain by the sandy clay upper layers of the Bagshot Formation, becoming progressively sandier with depth.

A construction methodology is presented, detailing the measures to be undertaken to complete the development with no adverse impact or nuisance to the neighbours during and following the construction process.

The BIA Screening and Scoping stages have identified the following potential impacts of the development.

Potential Hydrogeological Impacts:

- The site is located directly above an aquifer.

Local borehole information shows that the water table lies significantly deeper than the basement level; hence the new development will not affect any groundwater flow regime.

Potential Hydrological Impacts:

No potential hydrological impacts have been identified.

Potential Stability Impacts:

- The site is located directly above an aquifer.

The basement does not extend below the water table and no dewatering is required.

- The proposed excavation will encroach the theoretical zone of support to the adjacent car port canopy at Branch Hill Mews and the driveway access to Branch Hill Mews together with the zone of support to the retaining wall to the elevated rear garden of No. 5 Upper Terrace. The excavation will not affect neighbouring properties on Branch Hill.

The potential effects of movements associated with the development on the structures at risk have been specifically analysed using the Burland assessment system and the assessment concludes that damage to the neighbouring structures will be within Burland Damage Category 0 “Negligible”

No adverse residual or cumulative stability, hydrological or hydrogeological impacts are expected as a result of this development.

This BIA concludes that the proposed development will not cause harm to its neighbours or the wider environment.

Contents

Foreword-Guidance Notes

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBH Wembley Engineering disclaims any liability to such parties.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBH Wembley Engineering has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in the future and any such reliance on the report in the future shall again be at the client's own and sole risk.

THIRD PARTY INFORMATION

The report may present an opinion based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. Introduction

1.1 Background

A planning application (ref: 2017/6899/P) has been submitted to London Borough of Camden in December 2017 for the proposed redevelopment of No 5 Branch Hill, involving a rearwards extension of the existing building into the existing basement lightwell and the excavation of a very small new rear lightwell beyond.

This new rear lightwell will be set at the same level as the existing basement.

1.2 Brief

LBH WEMBLEY have been appointed by Mr & Mrs Theodoulou to prepare a Basement Impact Assessment (BIA) for submission to London Borough of Camden in support of the submitted planning application.

This BIA has been prepared to satisfy the specific requirements of the 2017 Camden Planning Policy and Supplementary Planning Guidance CPG on Basements and Lightwells, and the associated 2010 Camden Geological, Hydrogeological and Hydrological Study.

A screening and scoping stage BIA was prepared and submitted to Camden in March 2018. That report identified a potential stability risk to neighbouring structures. As a result, Camden have subsequently requested the assessment to proceed to Stage 4 with the submission of structural information (permanent and temporary works) including foundation and retaining wall information and an assessment of the potential impacts due to the excavation / construction.

1.3 Planning Policy

The 2017 Camden Local Plan Policy A5 reads as follows:

> *"The Council will only permit basement development where it is demonstrated to its satisfaction that the proposal would not cause harm to:*
>
> *a) neighbouring properties;*
> *b) the structural, ground, or water conditions of the area;*
> *c) the character and amenity of the area;*
> *d) the architectural character of the building; and*
> *e) the significance of heritage assets.*
>
> *In determining proposals for basements and other underground development, the Council will require an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability in the form of a Basement Impact Assessment and where appropriate, a Basement Construction Plan.*
>
> *The siting, location, scale and design of basements must have minimal impact on, and be subordinate to, the host building and property. Basement development should:*
>
> *f) not comprise of more than one storey;*
> *g) not be built under an existing basement;*
> *h) not exceed 50% of each garden within the property;*
> *i) be less than 1.5 times the footprint of the host building in area;*

j) extend into the garden no further than 50% of the depth of the host building measured from the principal rear elevation;
k) not extend into or underneath the garden further than 50% of the depth of the garden;
l) be set back from neighbouring property boundaries where it extends beyond the footprint of the host building; and
m) avoid the loss of garden space or trees of townscape or amenity value.

Exceptions to f. to k. above may be made on large comprehensively planned sites.

The Council will require applicants to demonstrate that proposals for basements:

n. do not harm neighbouring properties, including requiring the provision of a Basement Impact Assessment which shows that the scheme poses a risk of damage to neighbouring properties no higher than Burland Scale 1 'very slight';
o. avoid adversely affecting drainage and run-off or causing other damage to the water environment;
p. avoid cumulative impacts;
q. do not harm the amenity of neighbours;
r. provide satisfactory landscaping, including adequate soil depth;
s. do not harm the appearance or setting of the property or the established character of the surrounding area;
t. protect important archaeological remains; and
u. do not prejudice the ability of the garden to support trees where they are part of the character of the area.

The Council will not permit basement schemes which include habitable rooms and other sensitive uses in areas prone to flooding.

We will generally require a Construction Management Plan for basement developments.

Given the complex nature of basement development, the Council encourages developers to offer security for expenses for basement development to adjoining neighbours."

The following policies in the Local Plan are also relevant to basement development and will be taken into account when assessing basement schemes:

- "Policy A2 Open space";
- "Policy A3 Biodiversity";
- "Policy D1 Design";
- "Policy D2 Heritage"; and
- "Policy CC3 Water and flooding".

In addition to the Local Plan Policy Camden publishes Camden Planning Guidance on Basements and Lightwells. These CPG documents do not carry the same weight as the main Camden Development Plan documents (including the above Policy A5) but they are important supporting documents.

It is noted that the CPG Planning Guidance on Basements (formerly CPG4 2015) has been updated (March 2018) to reflect the Local Plan.

1.4 Documents Consulted

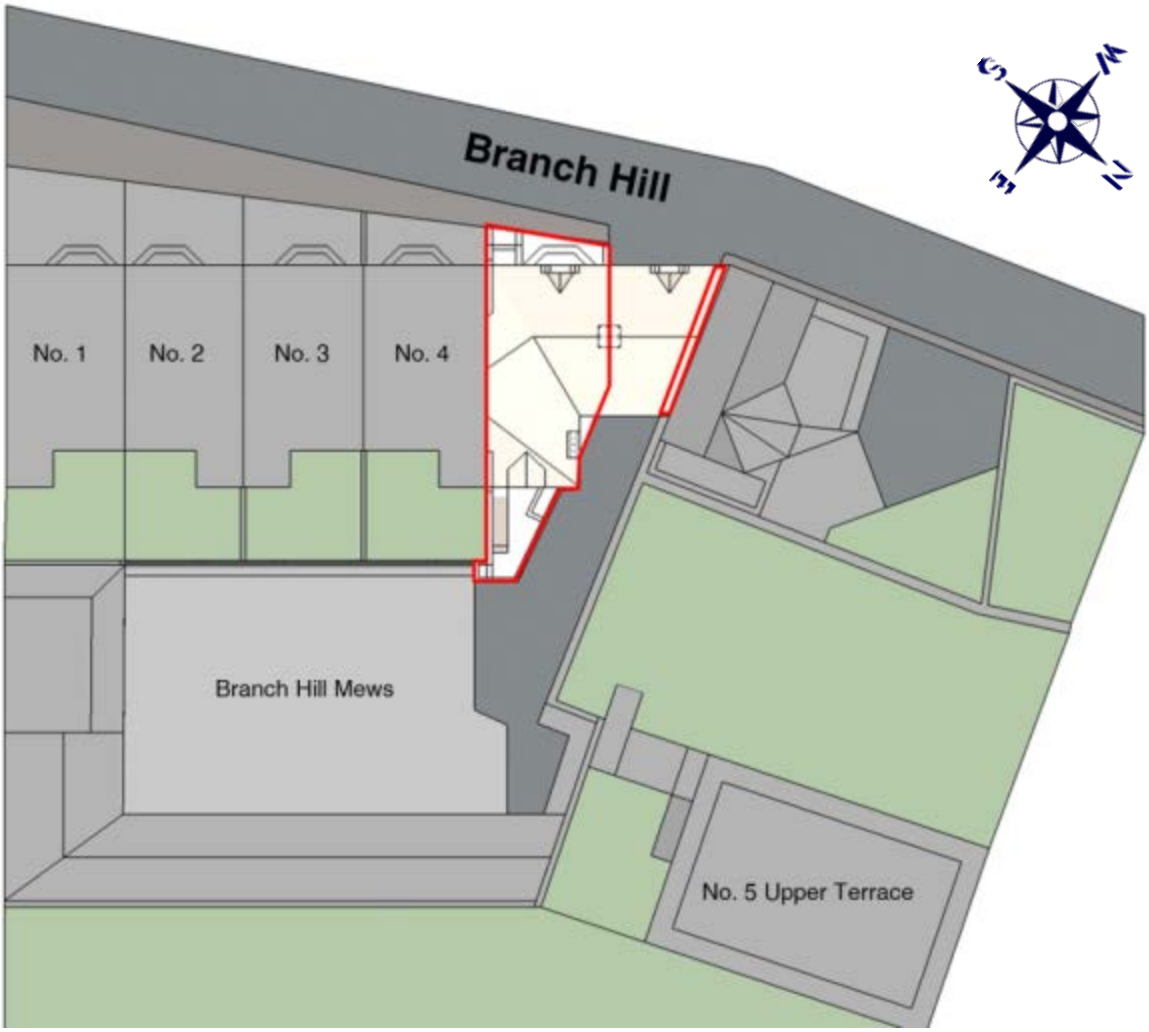
The following documents that have already been submitted to Camden have been consulted during the preparation of this document and should be referred to for further details of the scheme:

1. Existing Plans by AD Architecture and Visualisation, dated 6th December 2017, ref: E01
2. Existing Sectional Elevations by AD Architecture and Visualisation, dated 6th December 2017, ref: E02
3. Proposed Plans by AD Architecture and Visualisation, dated 6th December 2017, ref: P01
4. Proposed Sectional Elevations by AD Architecture and Visualisation, dated 6th December 2017, ref: P02
5. Proposed Roof Plan by AD Architecture and Visualisation, dated 6th December 2017, ref: P03
6. Proposed 3D Images by AD Architecture and Visualisation, dated 6th December 2017, ref: P04

2. The Site

2.1 Site Location

The site is located near the summit of Hampstead Heath, approximately 400m to then northwest of the Hampstead London Underground Station. The site may be located approximately by postcode NW3 7LT or by National Grid Reference 526090, 186125.



Detailed Location Plan

2.2 Topographical Setting

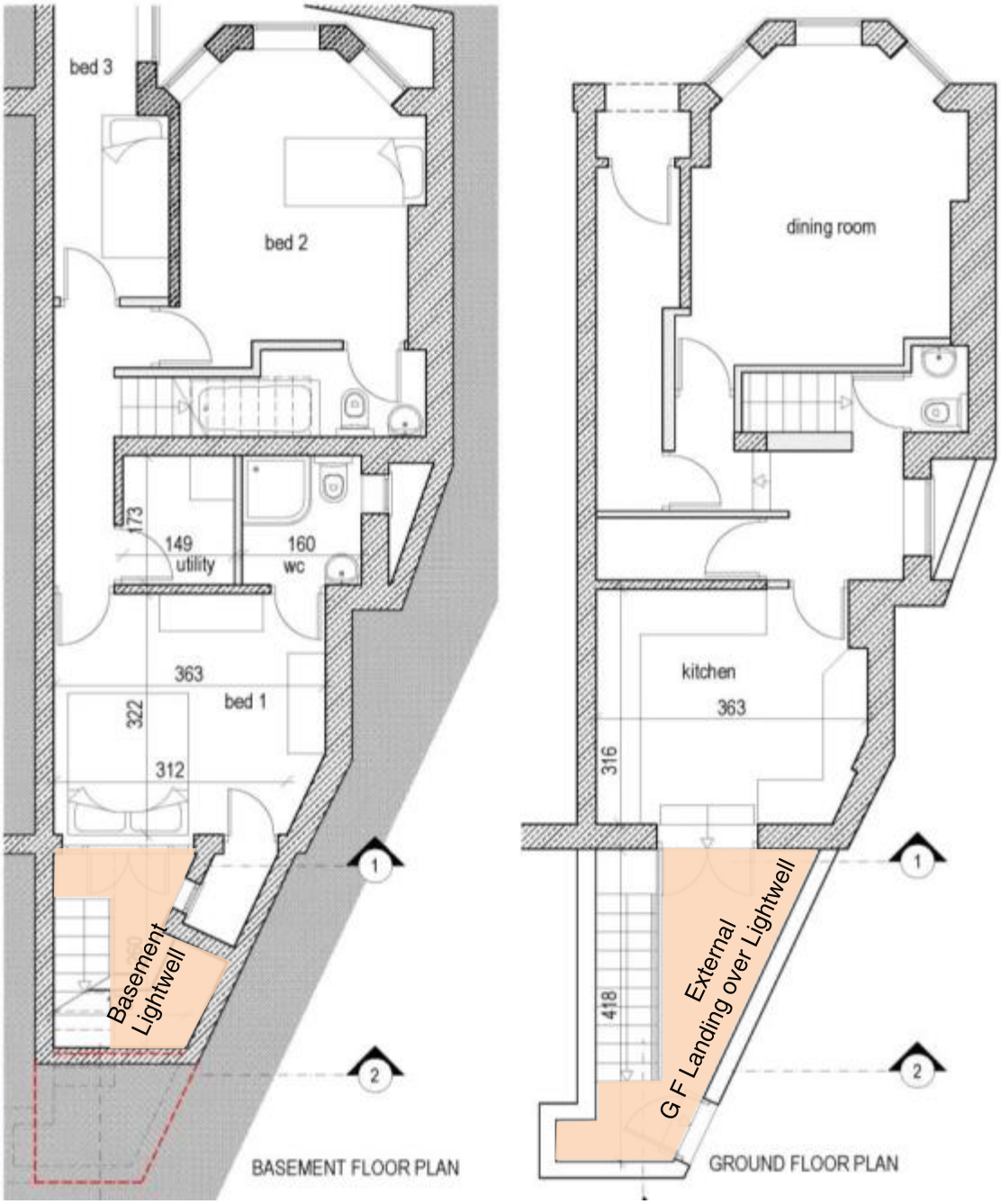
The site lies to the close to the summit of Hampstead, on the upper southwestern slopes of the hill, at a level of around +125m OD.

2.3 Geology

The British Geological Survey indicates that the site is underlain by the Bagshot Sand Formation and that this overlies the Claygate Beds at around +110m OD in this area.

2.4 Site Description

The site is occupied by a Victorian terraced property comprising three storeys plus basement. To the rear of the property there is a small basement lightwell with a staircase leading up to an external landing set at ground floor level and with gated access to the adjacent Branch Hill Mews entranceway. The property includes a first floor section that extends laterally over the access driveway to Branch Hill Mews.

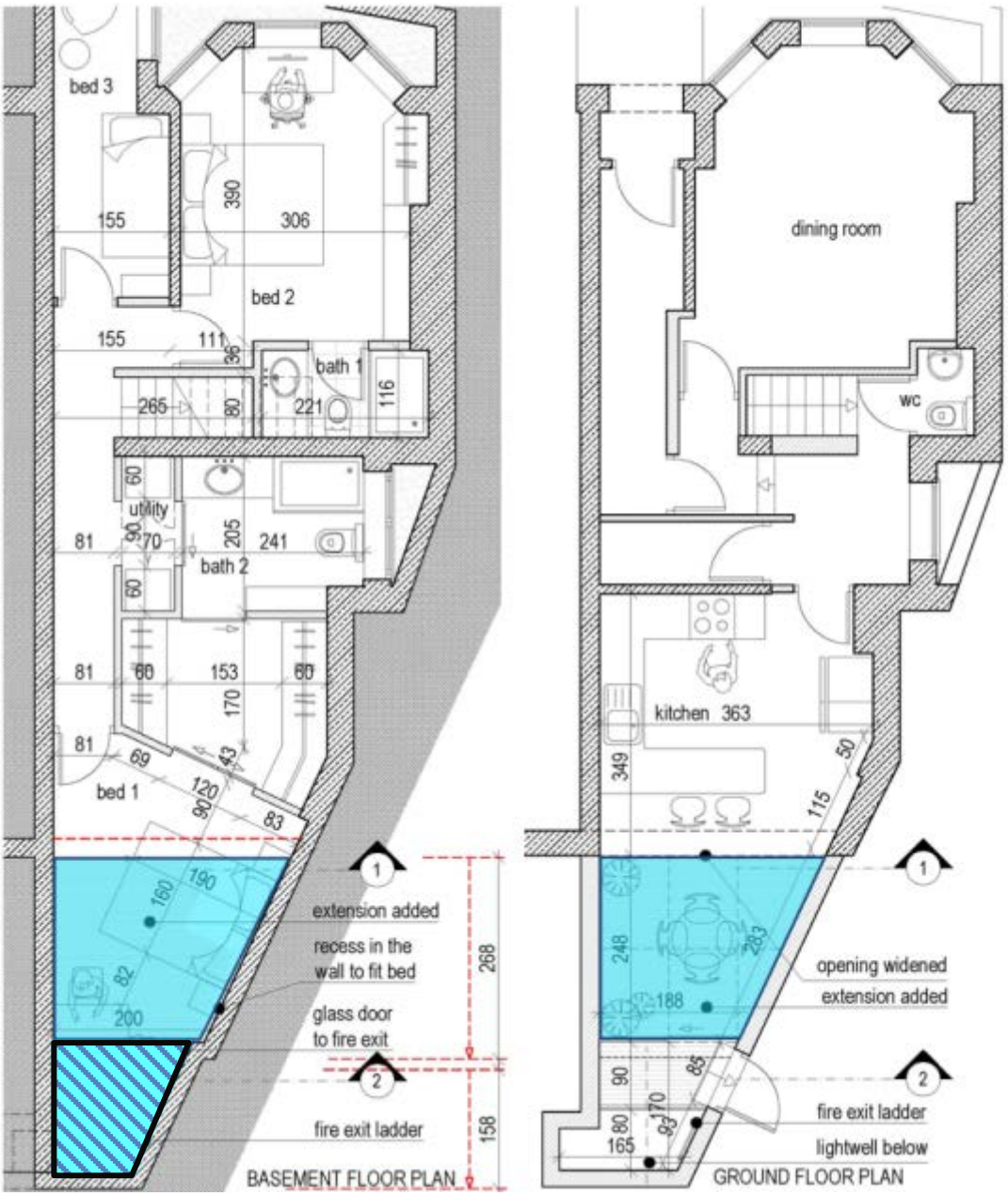


Existing Basement and Ground floor plans

Views of existing rear lightwell area

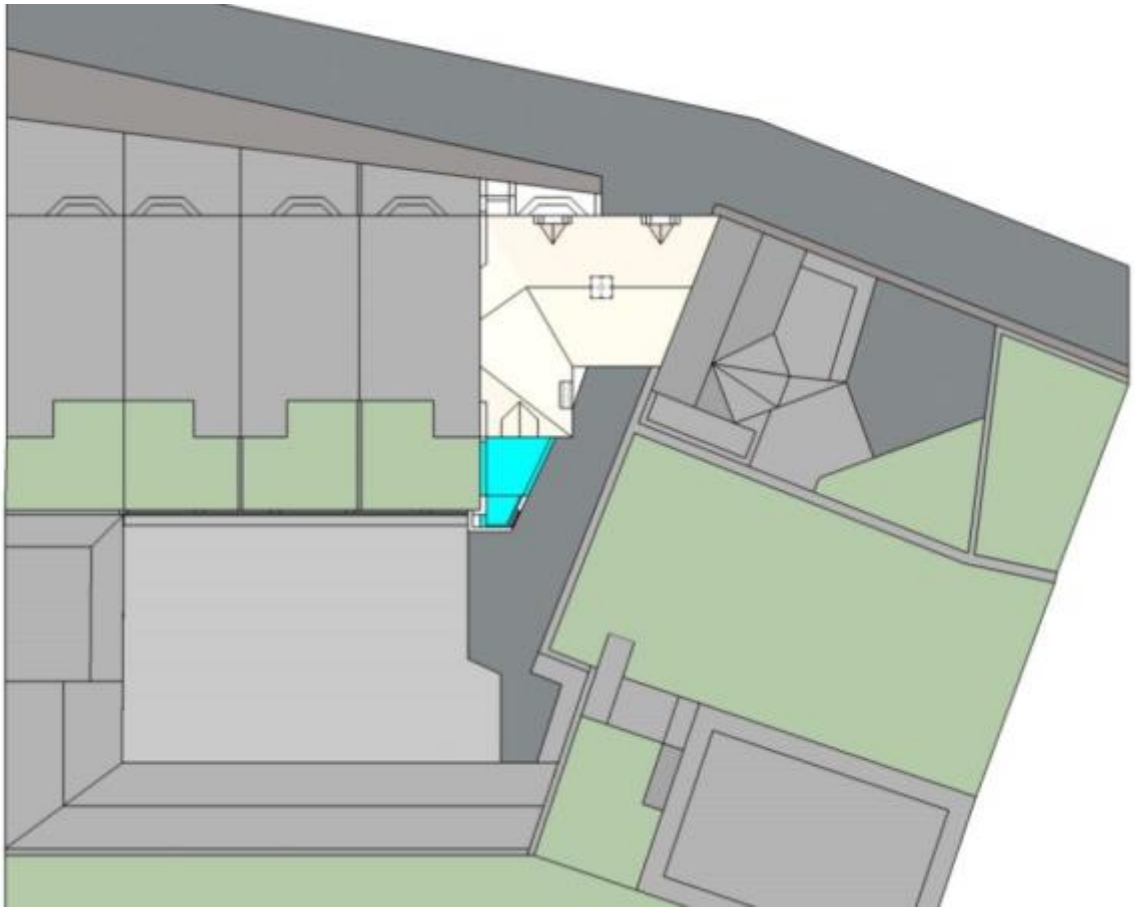
2.5 Proposed Development

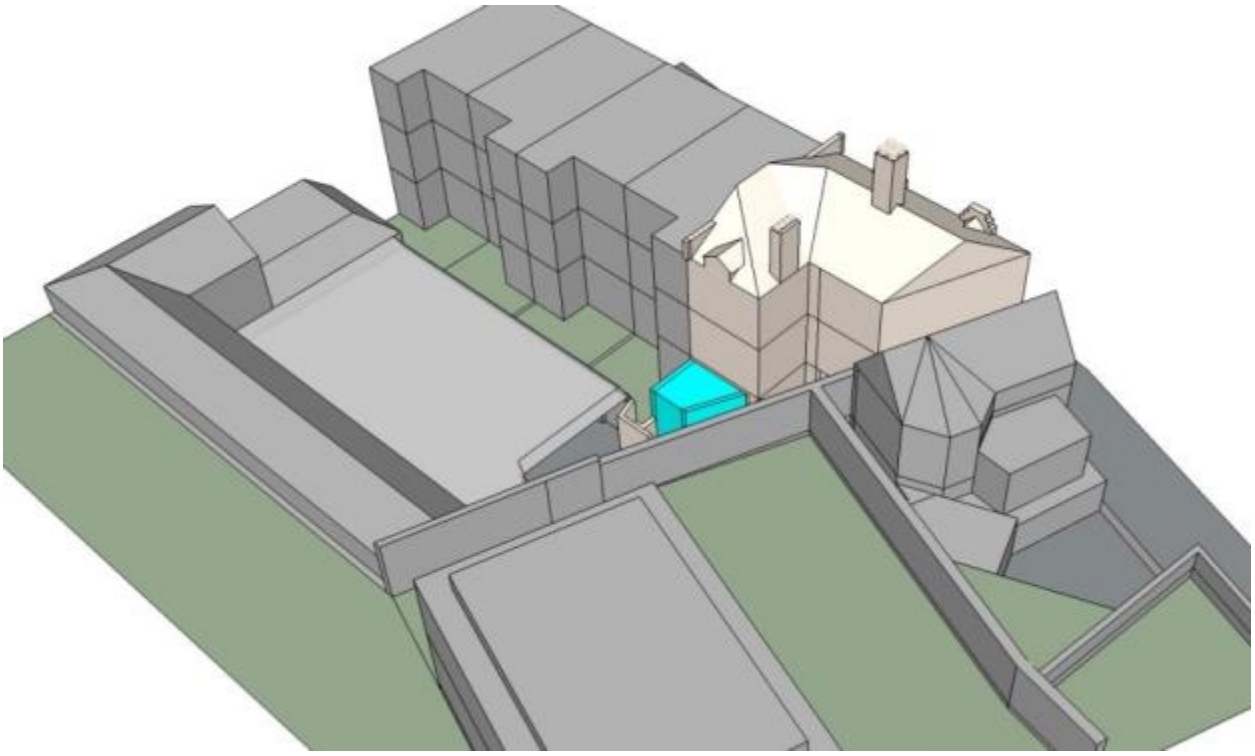
It is proposed to extend the property rearwards at basement and ground floor level to occupy most of the existing rear basement lightwell area. The latter is to be slightly extended rearwards to accommodate a lightwell for the new extension.



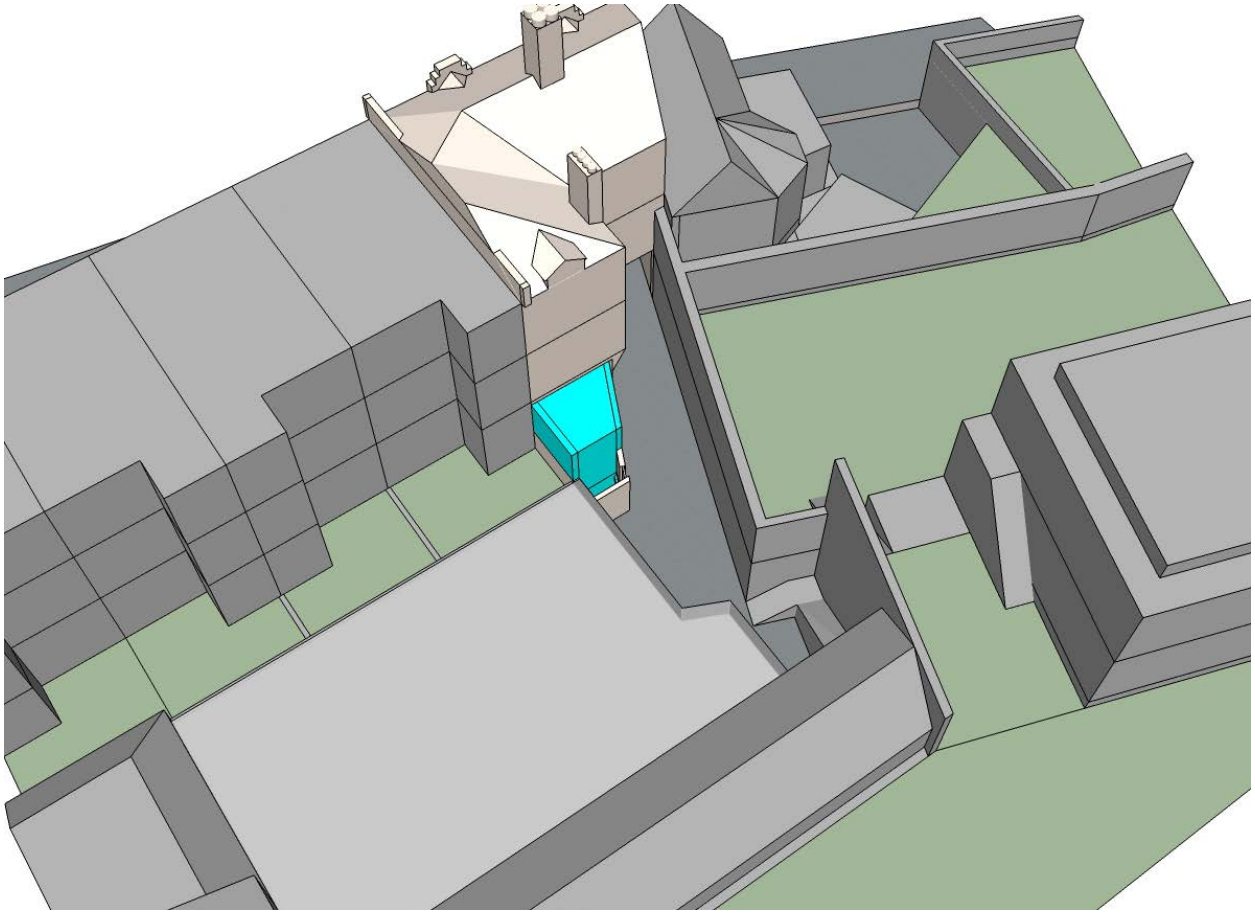
Proposed Basement and Ground floor plans

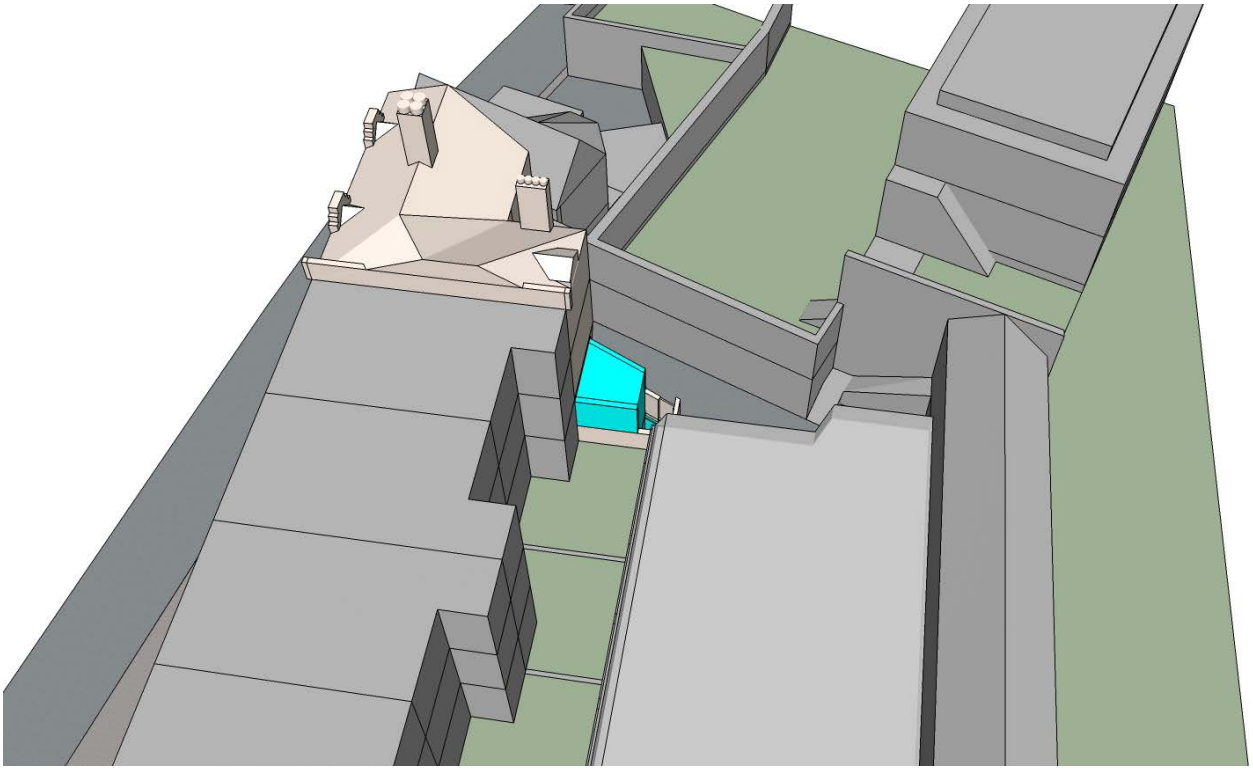
(Proposed new basement lightwell excavation shown hatched)





Proposed development (shown in blue) in relation with the neighbouring structures





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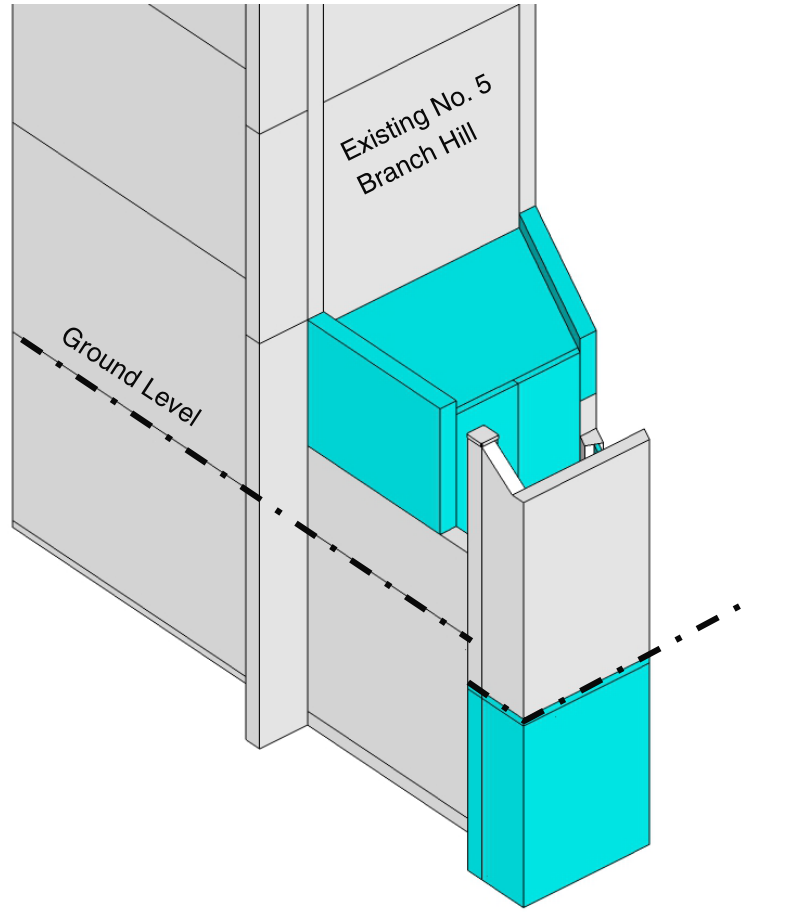
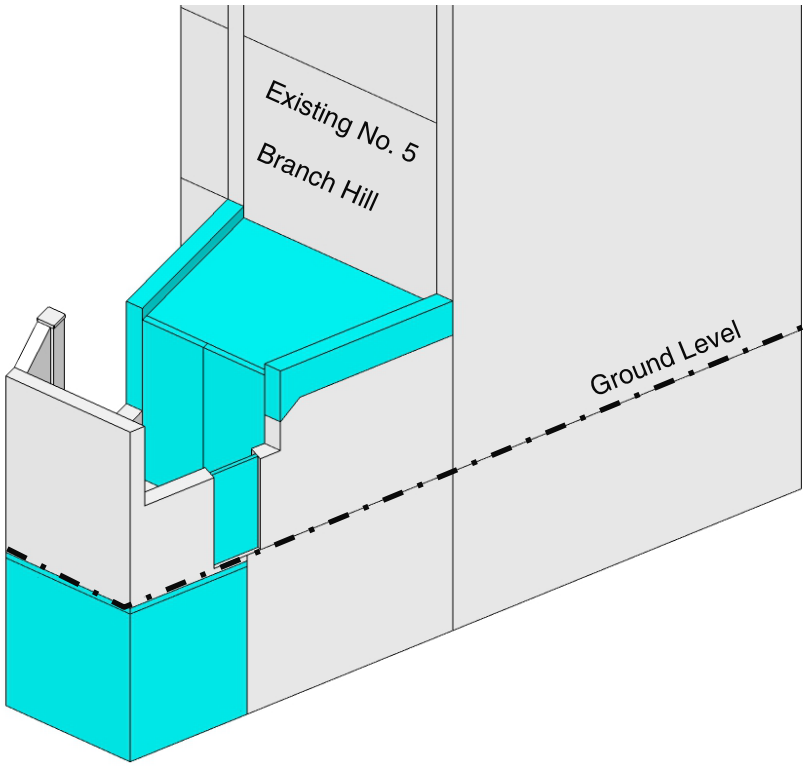




Proposed development (shown in blue)

3. Desk Study

3.1 Site History

The site has been occupied by residential development since at least the mid-19th Century, with a number of residential housing shown to be present in the area with site and neighbouring properties boundaries being different to the ones observed today.

These earlier buildings were demolished by the end of the 19th century and replaced with the existing row of terraced properties, including No. 5 Branch Hill with the bridged first floor extension over the access driveway to Branch Hill Mews.

Branch Hill Mews appear to have been redeveloped as a garage in the 1930s, with a canopy roof. The mews was provided with a new canopy to form a covered car port during partial refurbishment of the mews into office space in the 1980s.

No. 5 Branch Hill and the adjoining row of terraced properties have remained relatively unchanged since construction in the late 19th Century.

3.2 Geological Information

The British Geological Survey (BGS) records indicate that the site is underlain by the Bagshot Formation.

3.3 Hydrogeological Information

The Bagshot Formation is classed as an aquifer.

3.4 Hydrological, Drainage and Flood Risk Information

There are no surface water features near the site.

The existing building occupies most of the site, with the rest of the site being hard surfaced in the front and rear lightwell areas.

Rainfall on site is collected and discharged to a combined sewer running along the rear of the property.

Environment Agency (EA) surface water flood maps indicate the site is at a very low risk of surface water flooding.

4. Screening Assessment

The following Screening Assessment has been undertaken with reference to Appendices E and F of the CGHSS.

4.1 Screening Assessment

The Screening Assessment consists of a series of checklists that identifies any matters of concern relating to the following:

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

4.1.1 Screening Checklist for Subterranean (Groundwater) Flow

Question	Response	Justification
Is the site is located directly above an aquifer?	**Yes**	The site is underlain by the Bagshot Formation, which is classified as an aquifer.
Will the proposed basement extend beneath the water table surface?	**No**	Local boreholes confirm that the groundwater table lies well below the existing basement level. No deeper excavation is proposed, merely a small lateral extension to the existing basement lightwell.
Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	**No**	The nearest watercourse is the River Westbourne, around 180m to the west of the site.
Is the site within the catchment of the pond chains on Hampstead Heath?	**No**	The site is not within catchment of the Hampstead Heath Ponds.
Will the proposed development result in a change in the area of hard-surfaced/paved areas?	**No**	The site is currently 100% hard-surfaced and the proposed development also involves 100% coverage.
Will more surface water (e.g. rainfall and run-off) than at present will be discharged to the ground (e.g. via soakaways and/or SUDS)?	**No**	There is no drainage to the ground.
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?	**No**	There are no nearby surface water features.

4.1.2 Screening Checklist for Surface Flow and Flooding

Question	Response	Justification
Is the site within the catchment area of the pond chains on Hampstead Heath?	**No**	The site is not within catchment of the Hampstead Heath Ponds.
As part of the site drainage, will surface water flows (e.g. rainfall and run-off) be materially changed from the existing route?	**No**	The proposed development will be built in the existing basement lightwell. The new lightwell will be formed through excavating an existing hard surfaced area. The surface water flows will not be materially changed.
Will the proposed basement development result in a change in the proportion of hard-surfaced/paved areas?	**No**	The site is currently 100% hard-surfaced and the proposed development also involves 100% coverage.
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?	**No**	Surface water will be disposed of by the existing means.
Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**No**	Surface water will be disposed of by the existing means.
Is the site in an area known to be at risk from surface water flooding, 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?	**No**	Environment Agency maps indicate that the site is identified as being at a very low risk of surface water flooding.

4.1.3 Screening Checklist for Stability

Question	Response	Justification
Does the existing site include slopes, natural or manmade, greater than 7 degrees?	**No**	Figure 16 in the CGHHS indicates that there are no slopes greater than 7 degrees within the site.
Does the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees?	**No**	No re-profiling is planned at the site.
Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees?	**No**	
Is the site within a wider hillside setting in which the general slope is greater than 7 degrees?	**No**	Figure 16 in the CGHHS indicates that the regional slope in the site area is less than 7 degrees.

Is London Clay the shallowest strata at the site?	**No**	The British Geological Survey (BGS) records indicate that the site is underlain by Bagshot Formation.
Will trees be felled as part of the proposed development and/or are works proposed within tree protection zones where trees are to be retained?	**No**	There are no trees within the site.
Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	**No**	The site is underlain by the Bagshot Formation, which comprises soils that are not prone to seasonal shrink-swell.
Is the site within 100m of a watercourse of a potential spring line?	**No**	The nearest watercourse is the River Westbourne, around 180m to the west of the site.
Is the site within an area of previously worked ground?	**No**	Figure 4 of the CGHSS indicates that the site is not underlain by worked ground.
Is the site within an aquifer?	**Yes**	The site is underlain by the Bagshot Formation, which is classed as an aquifer.
Will the proposed basement extend beneath the water table such that dewatering may be required during construction?	**No**	Local boreholes confirm that the groundwater table lies well below the basement level.
Is the site within 50m of the Hampstead Heath ponds?	**No**	The site is located some 1km from the Hampstead Heath Ponds.
Is the site within 5m of a highway or pedestrian right of way?	**Yes**	The proposed basement extension is situated immediately adjacent to a street level private access roadway to Branch Hill Mews
Will the proposed basement significantly increase the differential depth of foundations relative to the neighbouring properties?	**Yes**	The proposed lateral basement extension will encroach on the ground supporting one of the columns to the car port canopy roof structure to the adjoining Branch Hill Mews.
Is the site over (or within the exclusion zone of) tunnels, e.g. railway lines?	**No**	The site is not within any exclusion zones or over any tunnels.

4.2 Non-technical summary of the screening assessment

The screening process identified the following issues to be carried forward to scoping and further assessment:

Groundwater (Subterranean) Flow:

- The site is overlying the Bagshot Formation, classified as a secondary aquifer

Stability:

- The site is overlying an aquifer
- The site is within 5m of a highway or pedestrian right of way?
- The proposed basement extension will increase differential depth of foundations relative to the neighbouring properties

.

5. Scoping Assessment

Where the checklist is answered with a “yes” or “unknown” to any of the questions posed in the flowcharts, these matters are carried forward to the scoping stage of the BIA process as follows:-

The scoping produces a statement which defines further the matters of concern identified in the screening stage.

5.1.1 Scoping for Subterranean (Groundwater) Flow

- **The site is located directly above an aquifer.**

  The guidance advises that potentially the basement may extend into the underlying aquifer and thus affect the groundwater flow regime.

Given the present configuration of the existing rear basement at this site it seems very unlikely that the planned slight rearwards lateral extension of this will intercept any groundwater table. Local borehole information shows that the water table lies significantly deeper than the basement level and hence the new development will not affect any groundwater flow regime.

5.1.2 Scoping for Surface Flow and Flooding

No potential issues have been identified by the screening.

5.1.3 Scoping for Stability

- **The site lies within an aquifer.**

  The guidance advises that dewatering can cause ground settlement. The zone of settlement will extend for the dewatering zone, and thus could extend beyond a site boundary and affect neighbouring structures. Conversely, an increase in water levels can have a detrimental effect on stability.

As stated above the basement does not extend below the water table and no dewatering is required.

- **The site is within 5m of a highway or pedestrian right of way.**
  The guidance advises that excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway.

Although privately owned rather than publically accessible, the above concerns will apply to the adjacent Branch Hill Mews entrance driveway.

- **Will the proposed basement significantly increase the differential depth of foundations relative to the neighbouring properties?**

  The guidance advises that excavation for a basement may result in structural damage to neighbouring properties if there is a significant differential depth between adjacent foundations.

Although the development proposals are small in scale there is the potential for the development to affect the stability of surrounding properties.

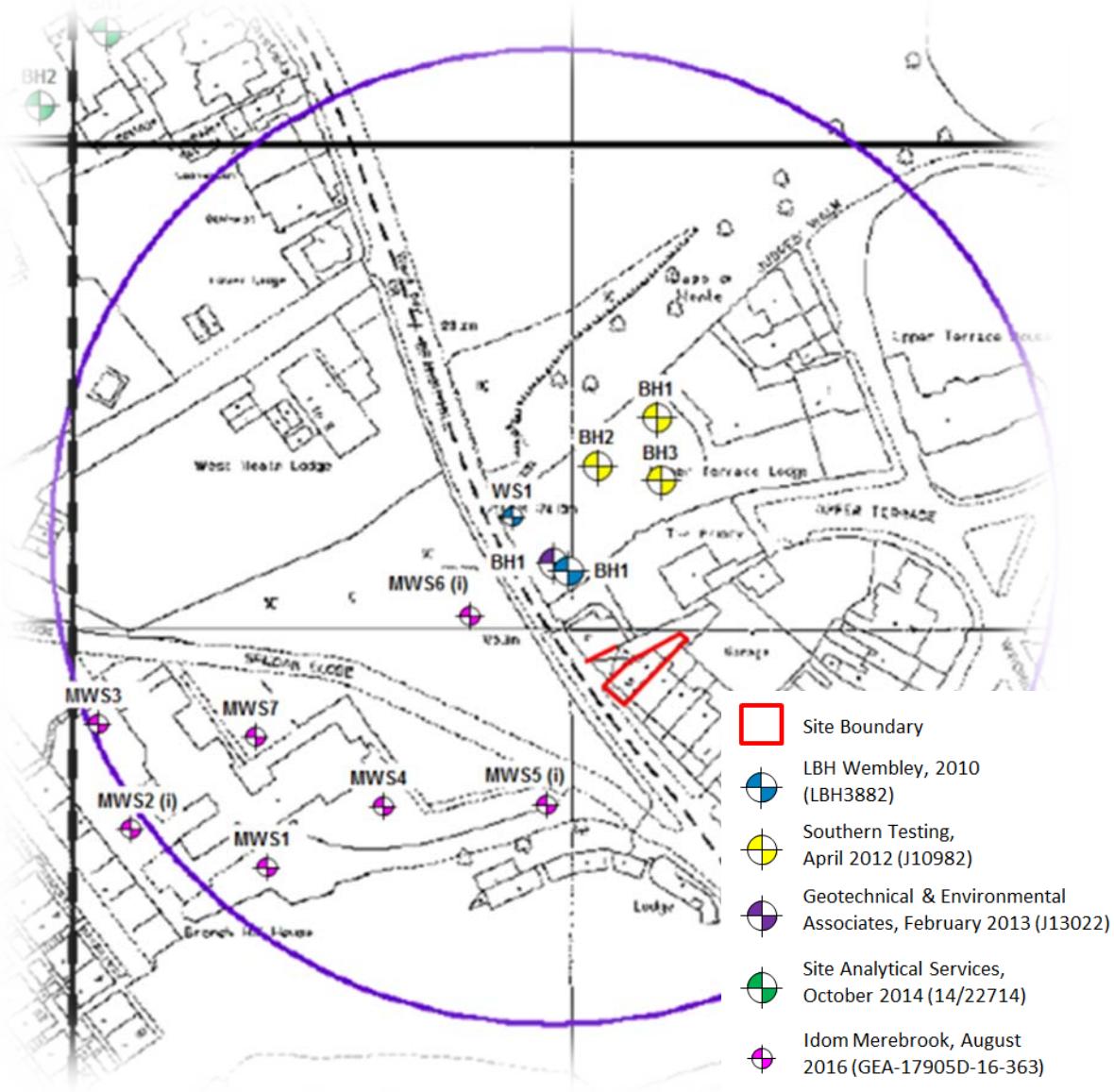
6. Site Investigation and Study

The scale of a BIA investigation need to reflect the size of the proposed development and Camden Policy requires the level of investigation information to be commensurate with the scale of the scheme.

In this case, given the very small relative scale of the planned excavation (approximately 1m x 1m), a specific site exploration would require excavation works comparable to those required for the actual construction.

Given consideration of the available information on ground conditions in the close vicinity of the site provided by past investigations detailed below, it has been considered that no site exploration is in this case necessary for a sufficiently reliable ground model to be developed.

Previous ground investigations undertaken near the site are shown on the location plan below.



6.1 Ground Model

Street level at the site lies at around +125m OD.

The information from nearby boreholes confirms that the Bagshot Beds extend down to a level of at least +112.5m OD. The Bagshot Beds comprise sand with occasional discontinuous clayey seams or lenses of sandy clay.

6.1.1 Groundwater

Past investigations undertaken close to the site show that the ground water table lies at around +115m OD, some 10m below street level.

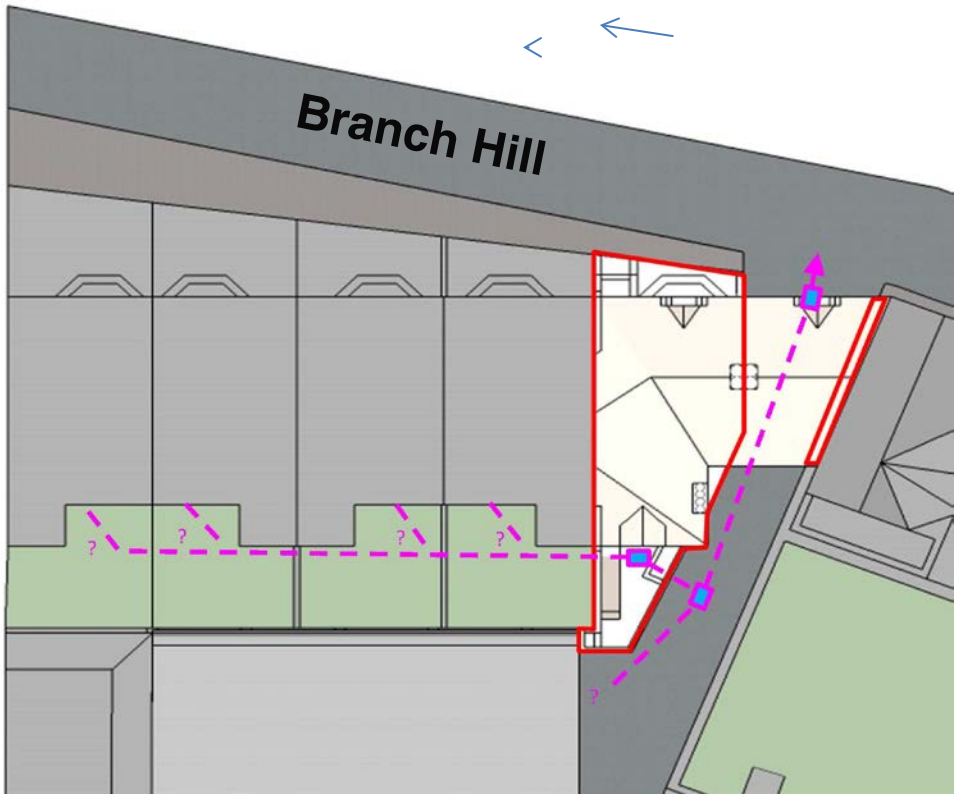
6.2 Sewer

The property, together with its neighbours at Nos. 1 to 4 is served by a combined sewer that runs behind Nos. 1-5 Branch Hill and connects, via the Branch Hill Mews access way, to the main combined sewer beneath Branch Hill. An access manhole is present within the existing rear lightwell.

Sewer manholes: **Left – Within the rear basement lightwell at the property**

Right – Within the Branch Hill Mews access

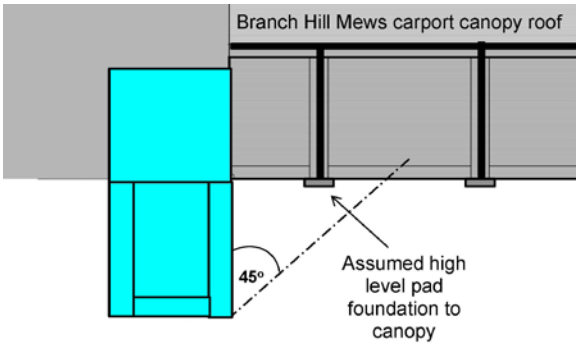
The approximate run of the drains within the site area, including locations of the manholes, is shown on below.

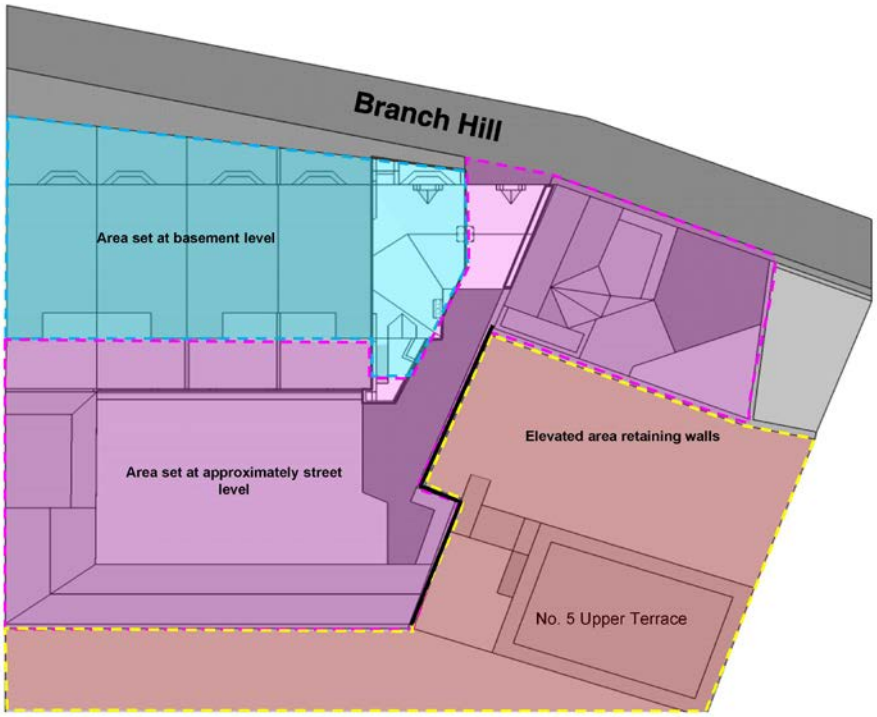


6.3 Existing Foundations

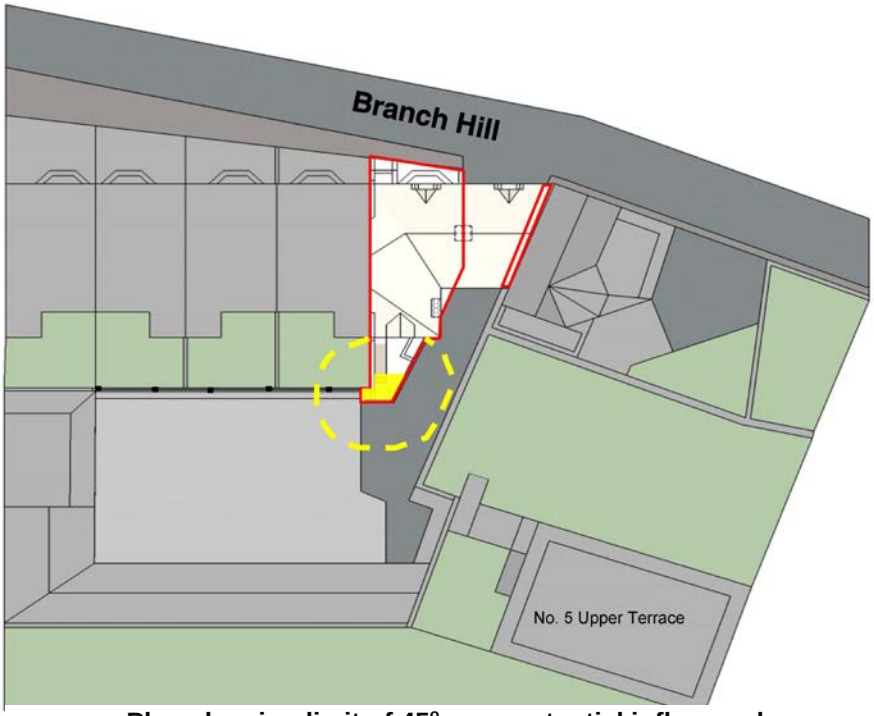
It may reasonably be assumed that the existing foundations to the lightwell and the rear of the main house comprise normal corbelled foundations, set within the Bagshot Formation just below the existing basement level.

For a worst case scenario, it is assumed that the brick encased steel columns supporting the carport canopy roof over Branch Hill Mews are founded at a high level, just below the mews ground level. Similarly, it is also assumed that the boundary wall to Branch Hill Mews is founded at the same high level.





Plan showing areas of different site surface levels



Plan showing limit of 45° zone potential influenced By the proposed area of excavation (yellow)

7. Construction Methodology

7.1 General Provisions

The proposed rear extension of the lightwell will be formed through approximately 3m depth of reinforced concrete underpinning of the three existing walls that border the proposed lightwell. The underpinning will be formed as cast-in-situ L-sections with a wall stem thickness of 350mm and base thickness of 400mm.

Due to concerns regarding potential ground movements affecting the neighbouring mews driveway and adjacent structures particular care will be exercised to maintain full lateral support to the surrounding ground in both the temporary and the permanent situation.

In order to minimise disruption to Branch Hill Mews, an in view of the small volume of soil that is to be excavated, access to the works area will be through the house of No. 5 Branch Hill rather than through the Branch Hill Mews access.

All demolition and excavated materials will be collected and placed in bags for off-site removal through the property.

7.1.1 Structural Design of Basement

The appended calculation sheets provide justification of the retaining walls design to resist the lateral pressure from the soil, surcharge and potential hydrostatic pressure.

The underpinning has been designed to apply a net allowable bearing pressure of up to 150 kN/m^2 on the dense sand of the Bagshot formation.

The underpinning will be constructed using conventional ‘hit and miss’ sequence and has been designed to act as a retaining wall to the new lightwell area, supporting the access driveway to Branch Hill Mews. The lightwell basement and ground floor will act as permanent high and low level prop to laterally support the walls.

During construction, the existing walls will be restrained using stiff lateral propping installed against walings that will be kept in place until concrete to basement walls and floors have cured to appropriate strength. A conservative K_0 condition has been used in the design of both the temporary and permanent works. Traffic surcharge loads from the Branch Hill Mews access have been included in the design.

7.2 Outline Basement Construction Methodology

The proposed construction sequence is summarised as follows:

1. Installation of temporary propping.
2. Removal of the existing rear extension, staircase and the ground floor landing in the existing lightwell
3. Excavation and underpinning of the side boundary walls to the new lightwell.
4. Excavation and underpinning of the rear wall to the new lightwell, construction of the lightwell floor
5. Construction of the proposed rear basement and ground floor building extension.
6. Removal of temporary propping.

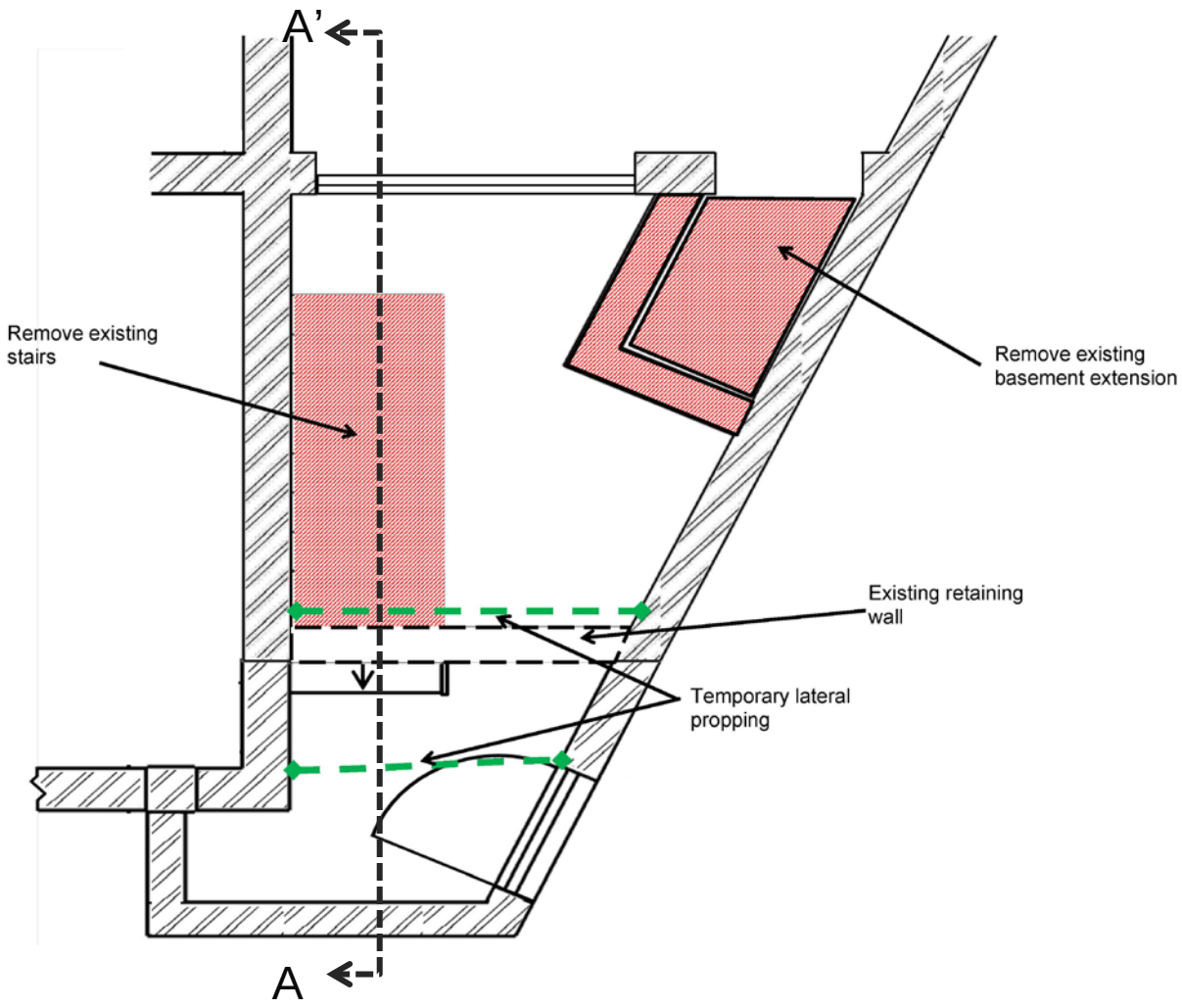
The individual stages of this sequence are explored in detail in the following sections of this statement.

7.2.1 Installation of temporary propping

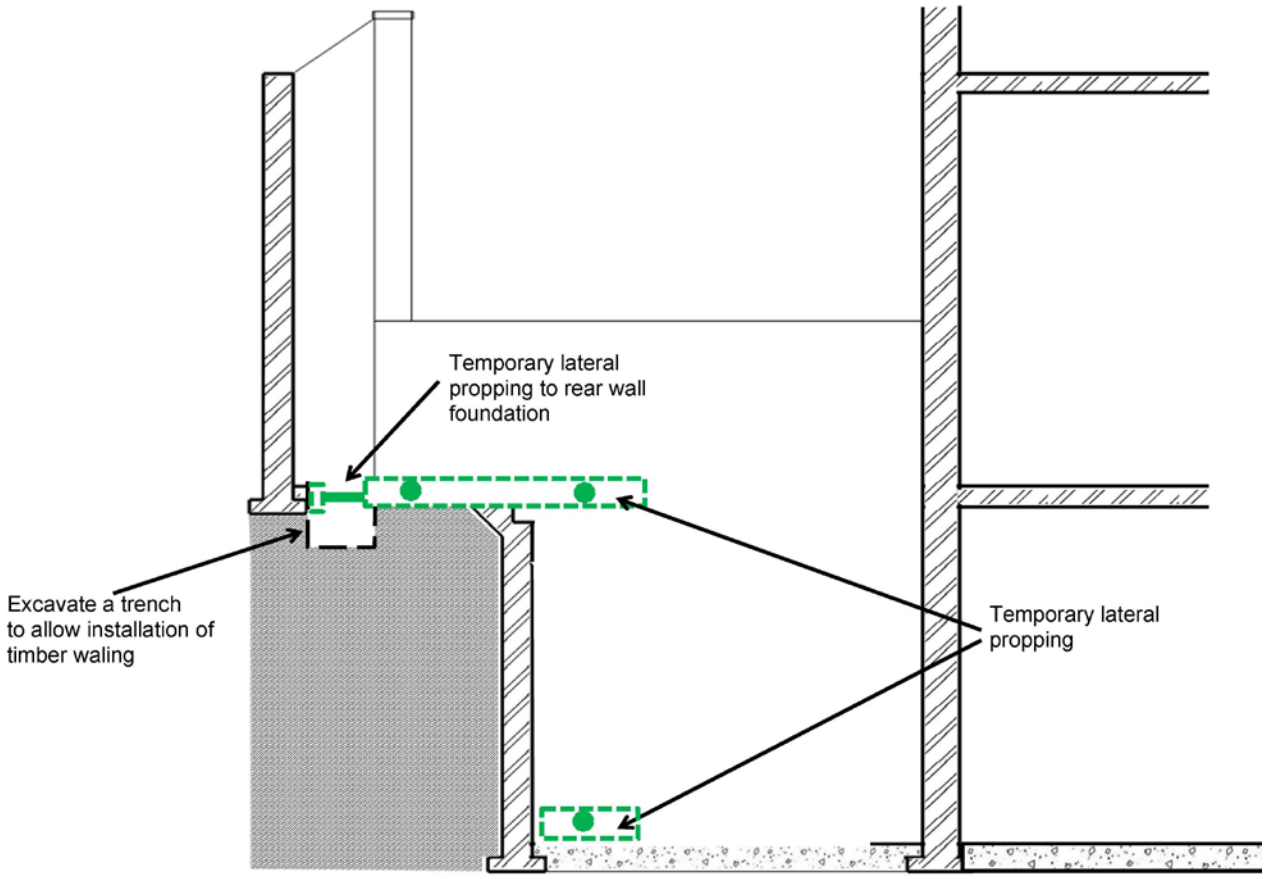
Prior to removal of any of the existing lightwell structures, horizontal propping will be introduced using adjustable “acrow” props set against 100mm x 50mm timber walings bearing between the existing lightwell side walls as shown on the drawings overleaf to ensure lateral stability of the lightwell structure and to prevent movement of the wall supporting the Branch Hill Mews access driveway.

7.2.2 Demolition within the existing lightwell

Following propping, the existing ground floor landing slab will be removed, followed by the existing small basement extension to the house and the staircase leading up to the ground floor landing point at the rear of the lightwell.



Plan Showing Temporary Propping



Section A-A' Showing Temporary Propping

7.2.3 Excavation and underpinning of the side walls to the new lightwell.

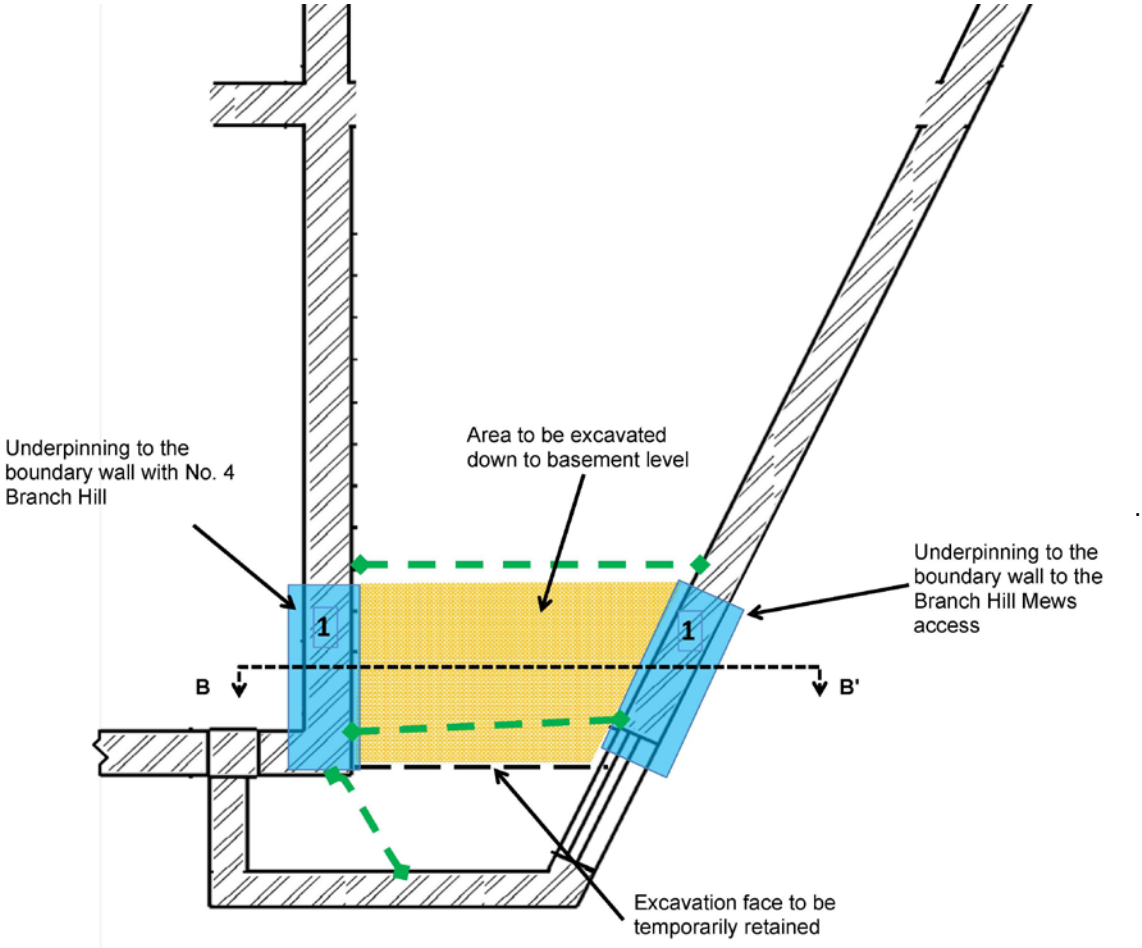
An initial trench excavation will be progressed from the rear of the ground floor landing point at the rear of the lightwell to either 500mm depth or to expose the foundations of the boundary wall to the Branch Hill Mews car port, whichever is the lesser depth. Following this a timber waling will be installed in the trench against the rear wall and propped against the garden wall shared with No. 4 as indicated above.

The rear retaining wall to the existing basement lightwell will then be removed and excavations progressed rearwards sufficiently to allow underpinning of the side walls as indicated. The face of all excavations is to be additional supported in the temporary condition by propped sacrificial 22 mm plywood sheeting that is perforated with 100mm diameter holes to allow concrete flow.

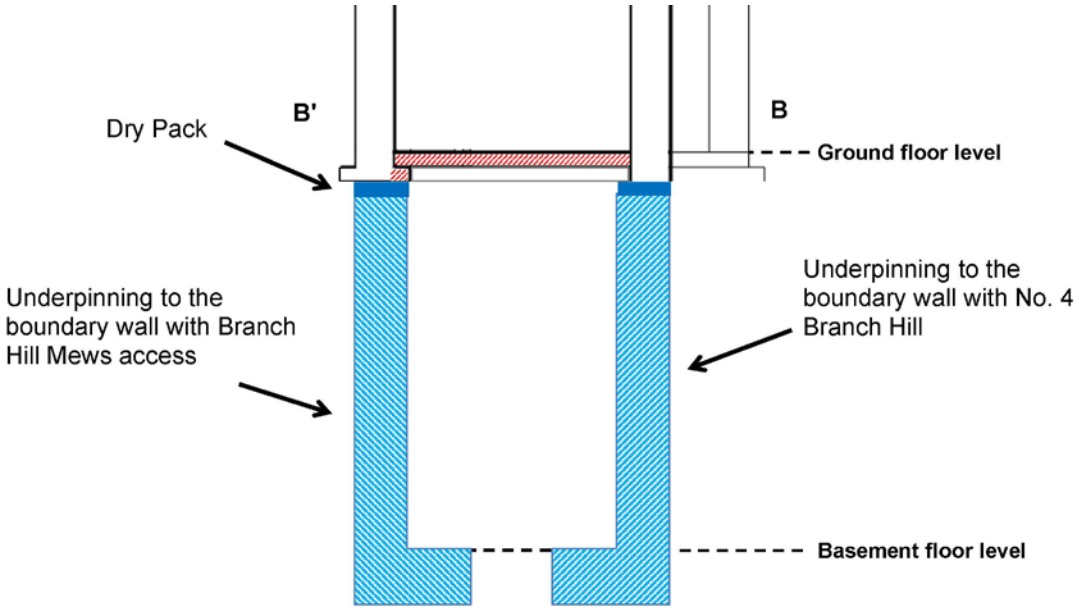
Excavation for an underpin section will be excavated in a single day. Immediately following the placement of the reinforcement, the base of each L-shaped section will be poured by the end of the same day, followed not less than 24 hours later by casting of the wall stem within plywood shuttering. A 50-75mm space will be left between the new concrete and the overlying wall foundations and this will be filled through rammed dry packing of sharp sand and cement (ratio 3:1) not less than 48 hours following casting of the stem. A minimum period of 48 hours will elapse before any adjacent excavation is commenced to form another underpin.

Once the dry pack has gained sufficient strength, any protrusions of the original footing into the site will be carefully trimmed back using hand tools to be flush with the face of the stem wall.

Adjacent underpins will be connected using B12 steel dowel bars 600mm long with 300mm embedment each side, at 200mm vertical centres.



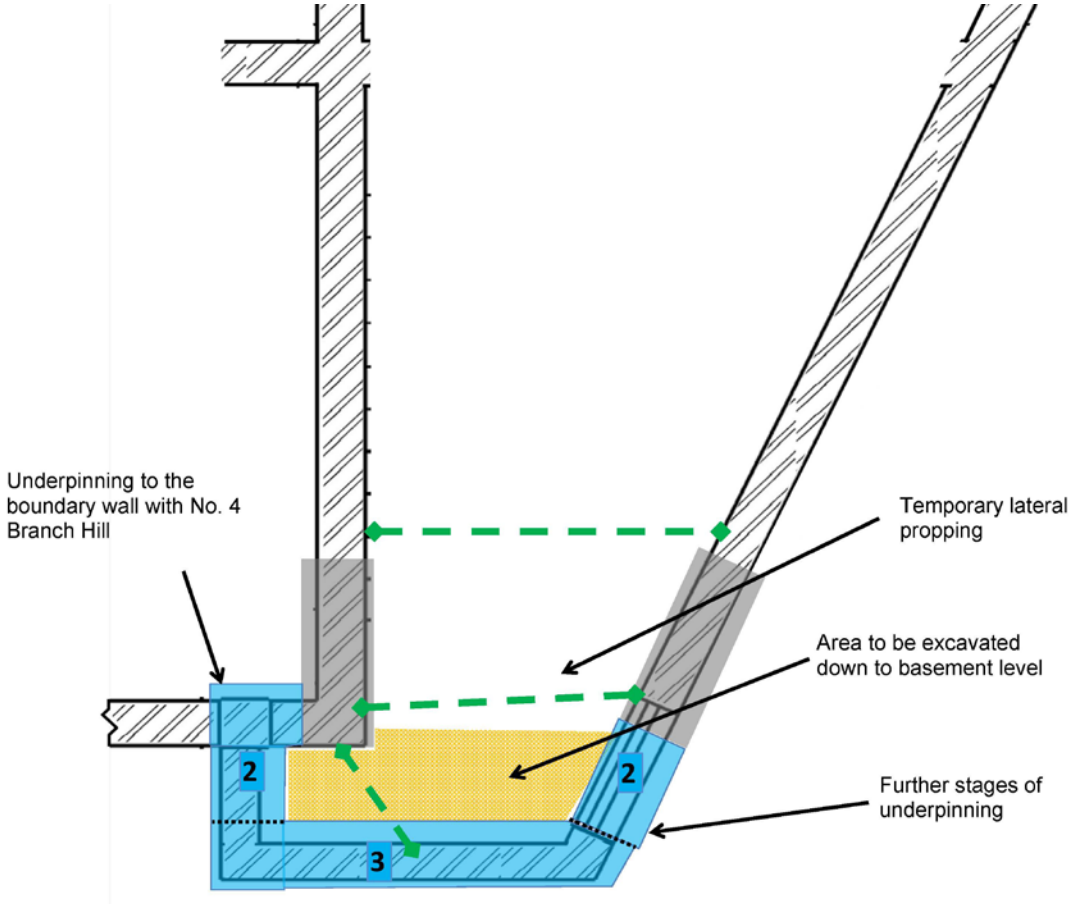
Plan showing the initial phase of underpinning



Section showing the initial phase of underpinning

7.2.4 Underpinning of the rear wall and construction of the lightwell floor slab at basement level

The rear boundary walls are expected to be set at approximately the ground floor level. The entire wall run at the rear is to be underpinned to the basement level to accommodate the proposed lightwell.



The lightwell reinforced concrete floor slab will be cast in full connection with the new retaining walls and connected to the existing lightwell floor at basement level to create a matching floor level. The floor slab will also provide low-level horizontal propping to the retaining walls formed by the underpinning.

7.2.5 Construction of the rear basement and ground floor building extension.

Following completion of the new basement lightwell, the new building extension will be constructed within the box created.

The sewer access manhole is to be preserved within the new structure using a sealed cover in order to maintain access for sewer maintenance following the development.

7.3 Structural Monitoring

A scheme of structural monitoring will be agreed as part of the Party Wall agreements that are to be reached with the neighbouring owners following the obtaining of planning permission.

8. Impact Assessment

This stage is concerned with evaluating the direct and indirect implications of the proposed development, involving a comparison between the present situation with the situation following completion of the proposed extension.

This section addresses concerns raised during the screening and scoping stage, specifically for the site of the proposed development.

8.1 Groundwater Flow

The scoping has identified no potential impacts of the development.

8.2 Surface Flow and Flooding

The scoping has identified no potential impacts of the development.

8.3 Land Stability

The screening and scoping stage has identified potential impacts of the development on the stability of its neighbouring structures due to a relative increase in differential depth between the proposed foundations and the foundations to the adjacent structures.

8.3.1 Differential depth to neighbouring structures

In order to identify the structures which could potentially be affected by the proposed development, it is necessary to consider the depth of the proposed excavations and the distance to the neighbouring structures.

As the proposed excavations are expected to extend to 3m below the existing ground level, it may be argued using the theoretical 45^{o} line of support that structures further away than approximately 3m from the edge of the proposed excavations will not be adversely affected.

Based on the above, the potentially affected structures include the foundations of the Branch Hill Mews canopy roof, and the boundary wall running along the boundary between Nos. 1-4 Branch Hill and Branch Hill Mews, as well as the retaining wall to the rear garden of No. 5 Upper Terrace.

No.4 Branch Hill is set at basement level; hence the additional small lightwell excavation to this level will not impact this building.

The impact on the identified structures at potential risk is considered in detail within the following ground movement assessment section.

8.4 Ground Movement to Neighbouring Structures

Camden Council seeks to ensure that harm will not be caused to neighbouring properties by basement development.

Camden Local Plan (June 2017) states that the BIA must demonstrate that the proposed basement scheme has a risk of damage to the neighbouring properties no higher than Burland Scale 1 ‘Very Slight’.

8.4.1 Structures Assessed for Ground Movement

8.4.1.1 Branch Hill Mews

The structures comprising the Branch Hill Mews, adjoining the site to the northeast include a set of garages, a larger office building and a canopy roof extended over the parking area, abutting on column supports running along the border wall with Nos. 1-4 Branch Hill.

These structures are expected to be founded on shallow spread foundations set at or closely below the ground floor level at No. 5 Branch Hill.

8.4.1.2 No. 5 Upper Terrace

No. 5 Upper Terrace is a recently redeveloped 3 storey detached house, set at approximately 3.5m higher level than No.5 Branch Hill.

The step change in level between Branch Hill Mews and the rear garden of No.5 Upper Terrace is accommodated by an approximately 3.3m high retaining wall between the rear garden of this property and the access driveway to Branch Hill Mews. This retaining wall runs roughly parallel to the boundary wall of No. 5 Branch Hill and is placed approximately 3m away.

8.4.2 Short term movements

Given the scale of the proposed excavation, no discernible heave movement of the underlying soils are to be expected in either the short or the long term.

Some potential movement is to be associated with underpinning of the boundary walls and potential yielding of these during the excavation.

8.4.2.1 Underpinning

Experience indicates that the scale of potential movements due to underpinning are very much dependent on workmanship.

It is suggested that given dry conditions and good workmanship, the amount of vertical movement of the party walls can be expected to be less than approximately 5mm per stage of underpinning.

Therefore, as one stage of underpinning will be utilised for the underpinning of the boundary walls 5mm of settlement may be expected to occur at the location of these walls.

The subsequent ground horizontal movements that may occur due to yielding of the underpinning wall during the basement excavation may also be estimated. As a first approximation, the magnitude of the horizontal movement is assumed to be equal to the vertical movement of the party wall.

8.4.3 Post Construction Movements

Given an absence of discernible ground heave, neglible post construction movements are anticipated.

8.4.4 Impact on neighbouring structures

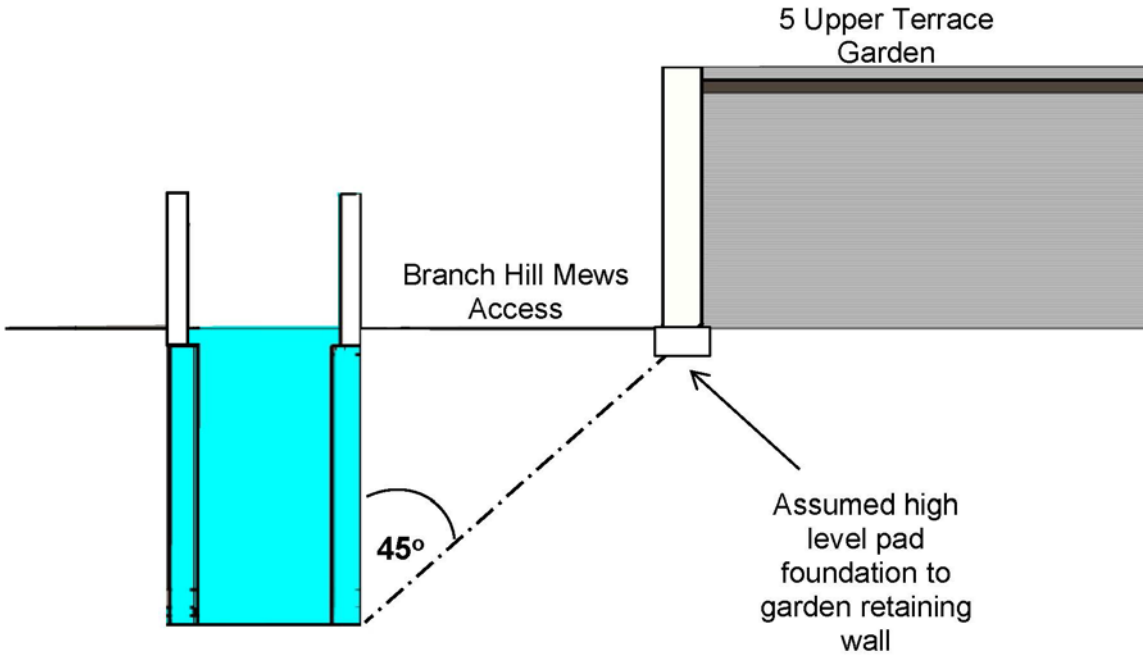
In view of the potential movement at the underpinned walls described in the previous section, the settlements affecting the underpinned boundary walls of No.5 Branch Hill could potentially reach 5mm.

The deflections have been used in combination with the Burland damage assessment process that is based upon consideration of the theoretical deflection ratio that would be experienced by a masonry panel of a given height and length. The potential degree of damage due to the proposed excavations has been assessed for the structures identified to be potentially at risk in the previous section.

8.4.4.1 Branch Hill Mews – Car Port Boundary Wall (Section A-A')

The length of section is taken as15m and the wall height as 4m. The analysed section is directly adjacent to the underpinned sections of the boundary wall, hence the wall will experience up to 5mm of settlement and 5mm of horizontal movement, gradually reducing with increasing distance.

The maximum horizontal strain, **δh (** L) is assessed as 0.033%, producing a maximum deflection ratio ∆ / L **=** -0.006, within a limiting tensile strain of 0.04%, resulting in a Burland Category 0 "Negligible" condition.



8.4.4.2 No. 5 Upper Terrace – Rear Garden Retaining Wall (Section B-B')

The central section of this retaining wall is placed approximately 2.5m away from the proposed underpinned boundary walls, near the edge of the highlighted potential zone of influence of the excavations. The horizontal and vertical movement predicted to occur to the garden retaining wall as a result of the underpinning excavations is predicted to be less than 5mm.

Hence the predicted damage to this structure as a result of the proposed works is within the Burland Category 0 "Negligible".

9. Conclusion

No adverse residual or cumulative stability, hydrological or hydrogeological impacts are expected as a result of this development.

It is concluded that given the planned methodology the proposed development will not cause harm to either neighbouring structures or the wider environment and the development has been demonstrated to comply with the requirements of Camden Local Plan Policy A5 in terms of protection of the local structural, hydrological and hydrogeological environment.

APPENDIX

RETAINING WALL CALCS

DRAWINGS

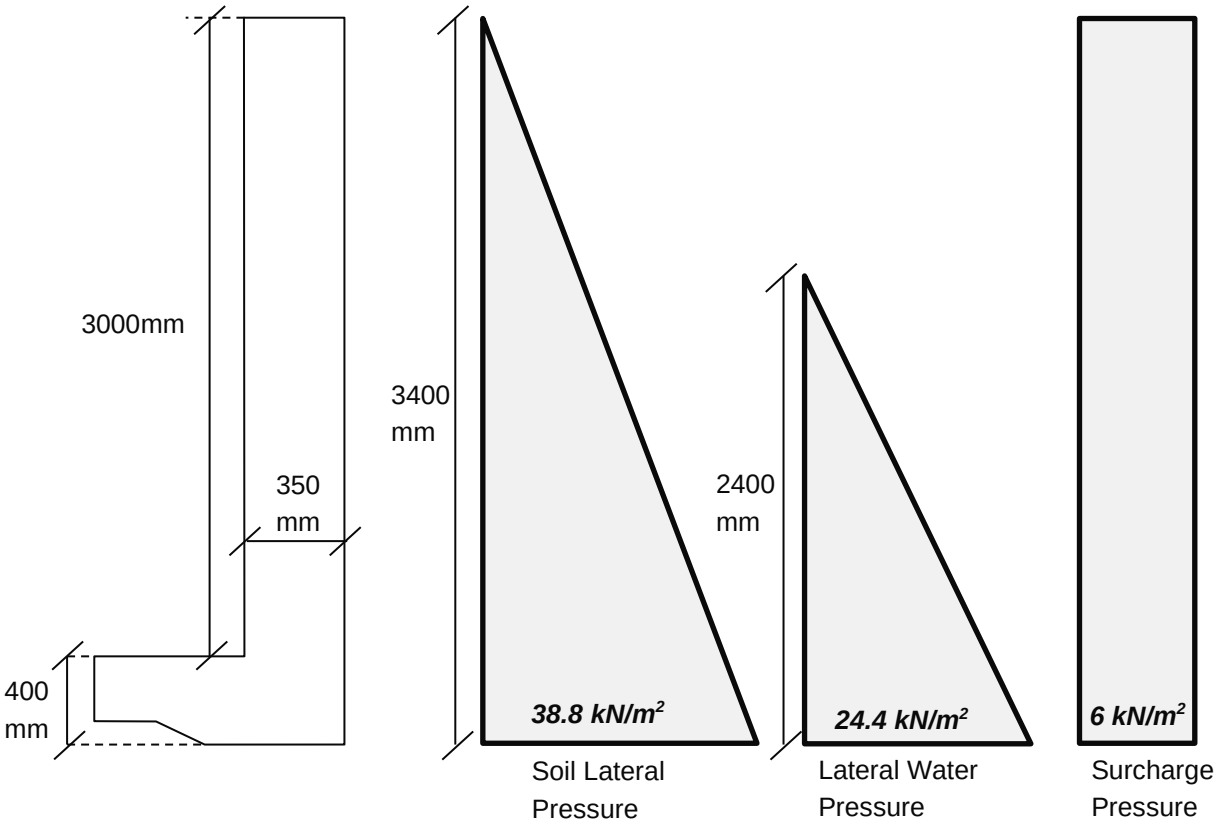
Version	Date	Comment	Prepared	Authorised
			Leszek Biel MEng (Hons) GMICE	Seamus Lefroy-Brooks BSc(hons) MSc CEng MICE CGeol FGS CEnv MIEnvSc FRGS SiLC RoGEP UK Registered Ground Engineering Adviser NQMS SQP DoWCoP QP DEFRA National Expert Panel Member
0.1	11th July	Draft Issued for internal review	LB	SRLB
1.0		Final Issue to Client	LB	SRLB

1.1 Sliding and Overturning of the Retaining Wall

The sliding and overturning stability of the retaining walls formed by the underpinning has been assessed not to be an issue for the proposed development, as a result of the provision of horizontal stability to the retaining walls by timber waling and props in the temporary situation and formation of a ‘box’ reinforced concrete structure combining the underpinning and the proposed lightwell slab following construction.

1.2 Required reinforcement for the proposed retaining walls

The retaining walls formed by the underpinning of the existing boundary walls to No. 5 Branch Hill are designed to resist the lateral pressure applied by the soil and the adjacent driveway surcharge loads. In addition, the design allows for hydrostatic pressure presence due to main burst or similar with a groundwater table at a depth of 1m below ground level.



Geotechnical parameters of the used for the retained soil the following calculations are as follows:-

Stratum	Bulk Density	Effective Cohesion	Effective Friction Angle
	(kg/m^3)	(c' - kN/m^2)	(ϕ'- degrees)
Sandy Clay (Bagshot Formation)	1900	Zero	26

$$K_0 = 1 - \sin(\varphi') = 1 - \sin(26°) \cong 0.6$$

$$max.soil\ pressure = 19 \times 0.6 \times 3.4 = 38.8kN/m^2$$

$$max.water\ pressure = 10 \times 2.4 = 24.4kN/m^2$$

$$max.surcharge\ pressure = 10 \times 0.6 = 6kN/m^2$$

1.2.1 Ultimate Limit State check

$max.Bending\ Moment\ at\ the\ base\ of\ the\ wall\ (per\ 1m\ run\ of\ the\ wall)$:

$$M = \frac{38.8 \times 3.4}{2} \times 1.13 + \frac{24.4 \times 2.4}{2} \times 0.8 + 6 \times 3.4 \times 1.7 = 132.4\ kNm \quad /m$$

$For\ Ultimate\ Limit\ State\ M_d = M \times 1.5 = 198.6\ kNm \quad /m$

$$f_{ck} = 40\frac{kN}{m^2} \qquad f_{yk} = 500\frac{kN}{m^2} \qquad b = 1000mm\ (per\ metre\ run\ of\ wall)$$

$$d = 350 - 50 = 300mm\ (assumed\ reinforcement\ cover\ of\ 50mm)$$

$$K = \frac{M_d}{f_{ck} \times b \times d^2} = \frac{198.6 \times 10^6}{40 \times 1000 \times 300^2} = 0.055$$

$K < K'as\ the\ minimum\ allowed\ \ K' = 0.168\ \ (EC2\ UK\ Annex),$

$therefore\ compression\ reinforcement\ is\ not\ required$

$$lever\ arm\ z = \frac{300}{2}\left[1 + \sqrt{1 - 3.53 \times 0.055}\right] = 285mm$$

$$Area\ of\ reinforcing\ steel\ required = \ A_S = \frac{M_d}{f_{yd} \times z} = \frac{198.6 \times 10^6}{435 \times 285} = 1602mm^2$$

Therefore, provide B20 at 125mm centres (A_S=2510mm^2), for both tensile and compressive sides of the retaining wall.

1.2.2 Deflection Check

$$Actual\ \frac{span}{effective\ depth} = \frac{3.4m}{0.3m} = 11.3$$

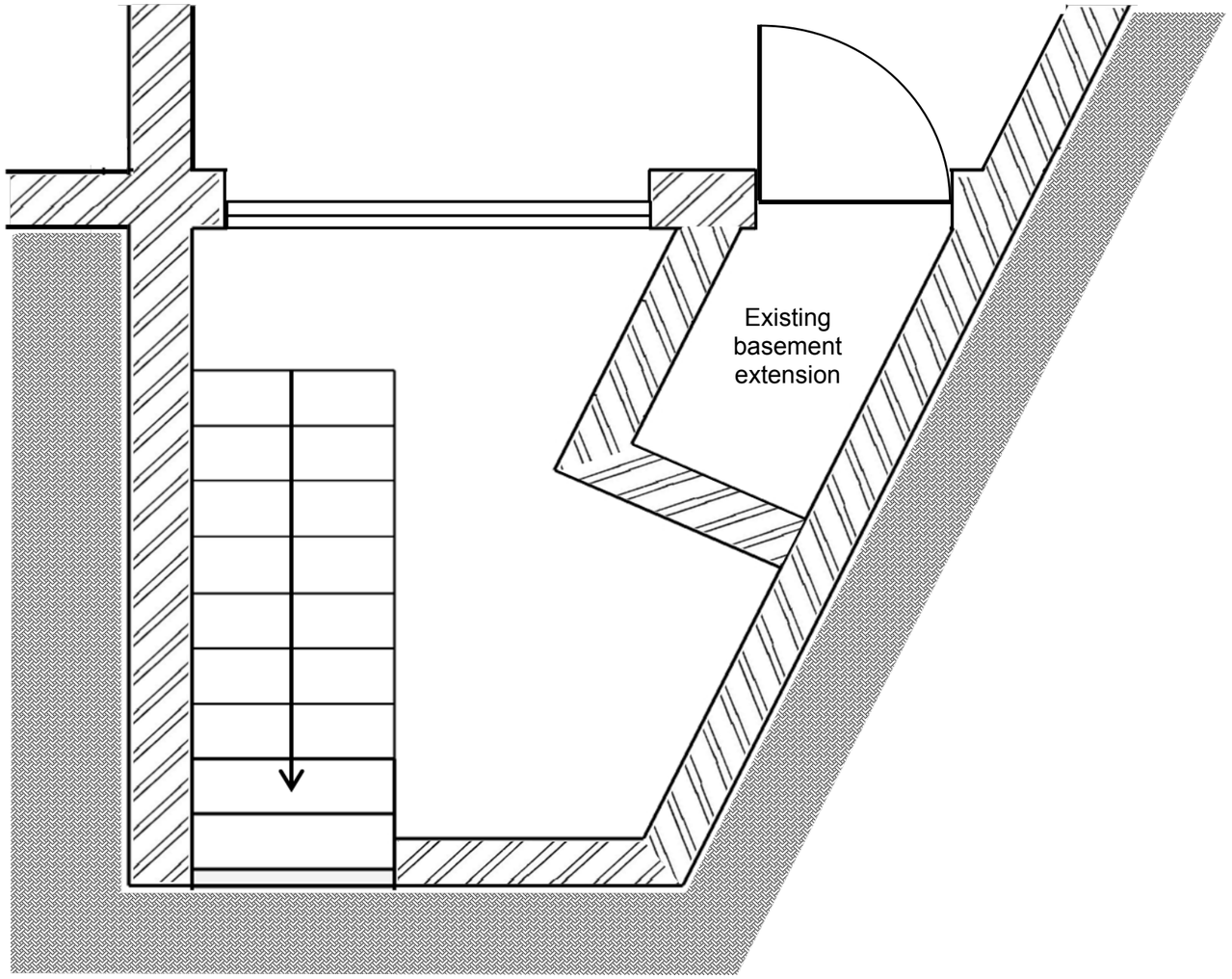
$For\ K = 0.4\ (cantilever), base\ span\ to\ effective\ depth\ ratio = 10.4$

$$F_1 = 1.0 \qquad F_2 = 1.0 \qquad F_3 = \frac{500 \times A_{S\ provided}}{f_{yk} \times A_{S\ required}} = 1.57$$

$\therefore\ allowable\ span\ to\ depth\ ratio = 10.4 \times 1.0 \times 1.0 \times 1.57 = 16.328$

$16.328 > 11.3$

Therefore, the allowable deflection is not exceeded.



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METRES

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Rev.	Description	Date

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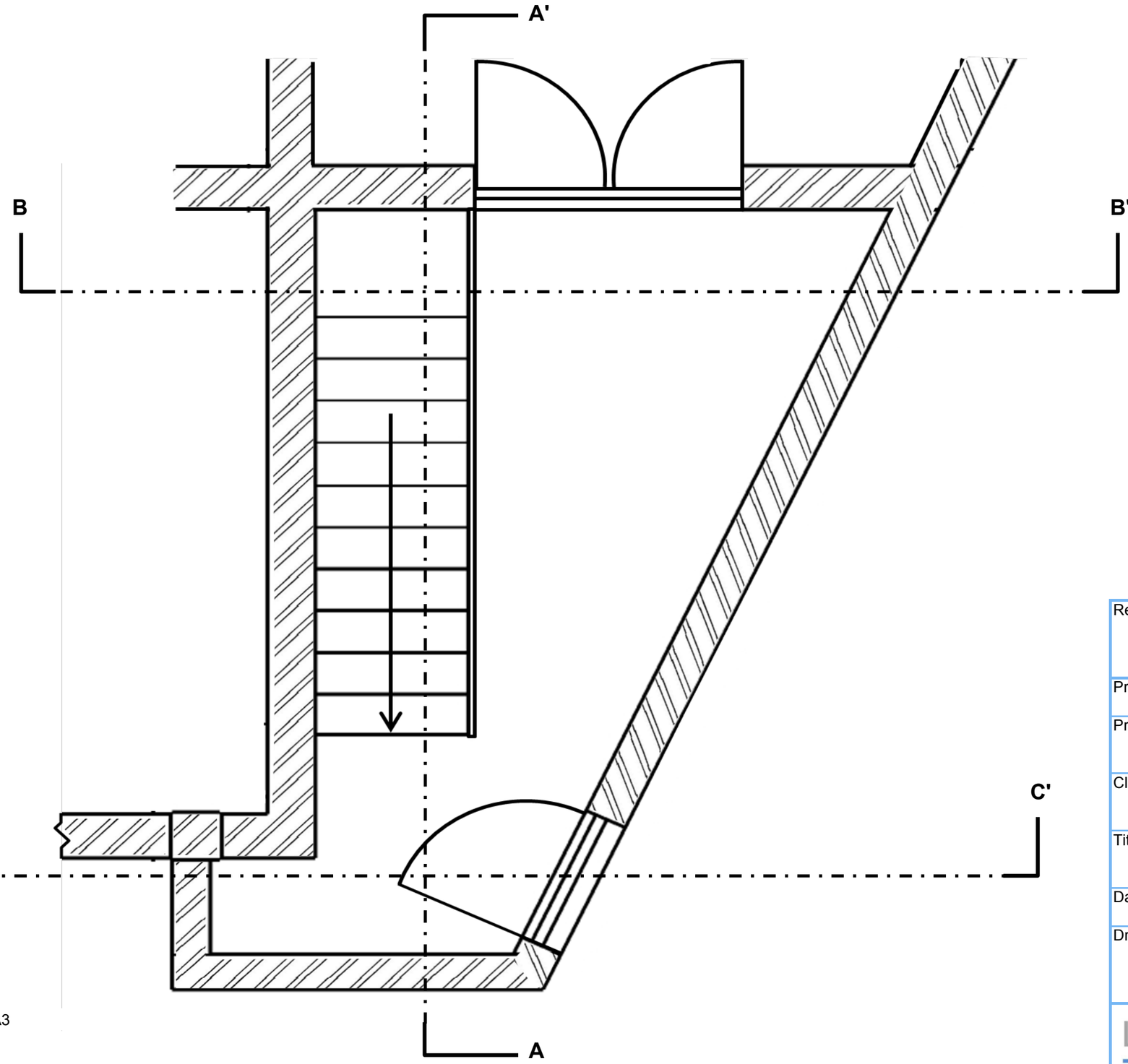
Project No.:	LBH4523
Client:	Savvas Theodoulou Esq.
Title:	Existing Basement Plan
Date:	18/07/2018
Drawing No.: LBH4523-E1	Drawing Rev.: B Drawn by: LB

LBH WEMBLEY
ENGINEERING



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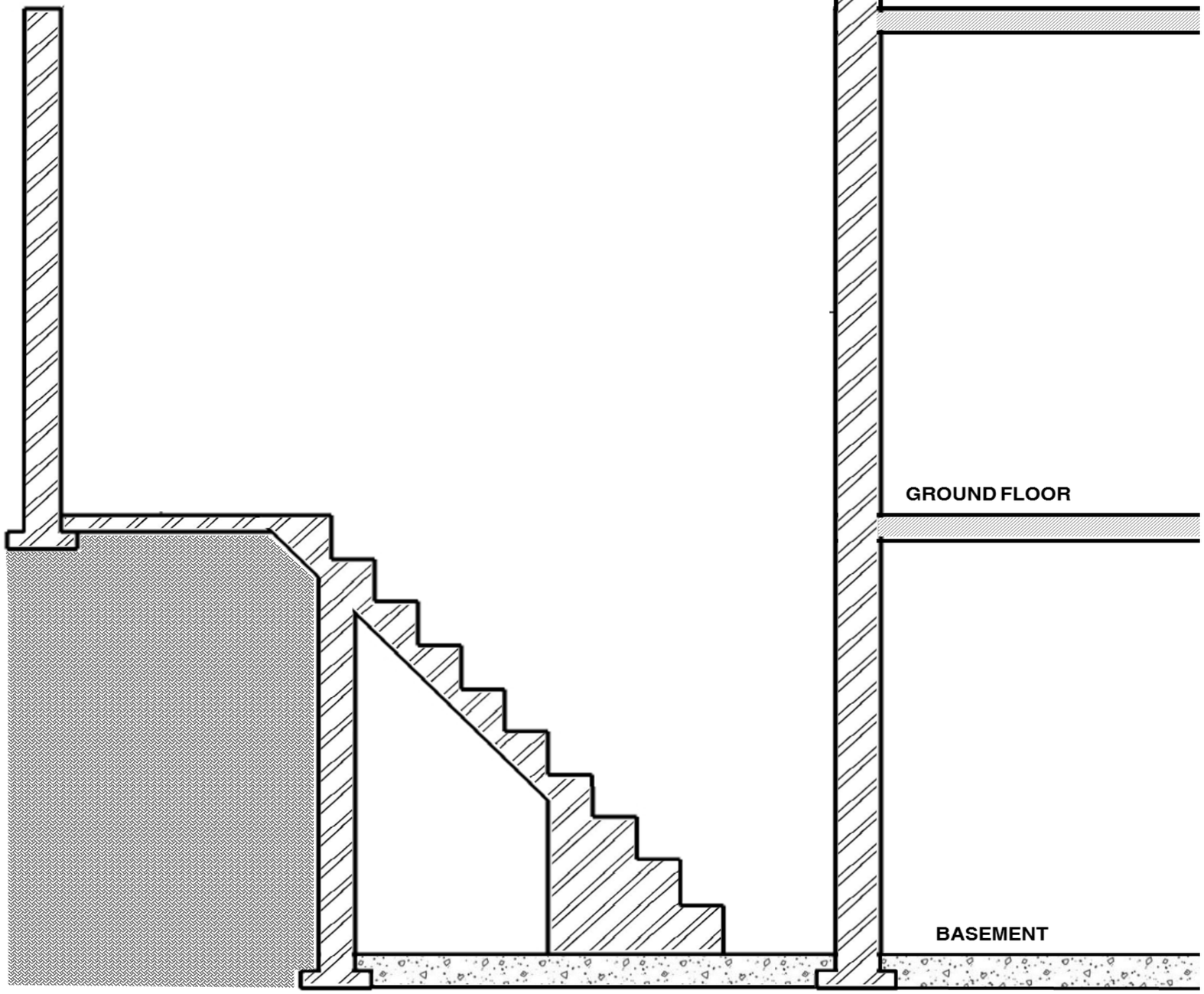
Project No.:	LBH4523
Client:	Savvas Theodoulou Esq.
Title:	Existing Ground Floor Plan
Date:	18/07/2018
Drawing No.:	LBH4523-E2
Drawing Rev.:	B
Drawn by:	LB

LBH WEMBLEY ENGINEERING

A



A'

Assumed shallow foundations

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Rev.	Description	Date

Project: 5 Branch Hill

Project No.: LBH4523

Client: Savvas Theodoulou Esq.

Title: Existing Section A-A'

Date: 18/07/2018

Drawing No.: LBH4523-E3

Drawing Rev.: B

Drawn by: LB

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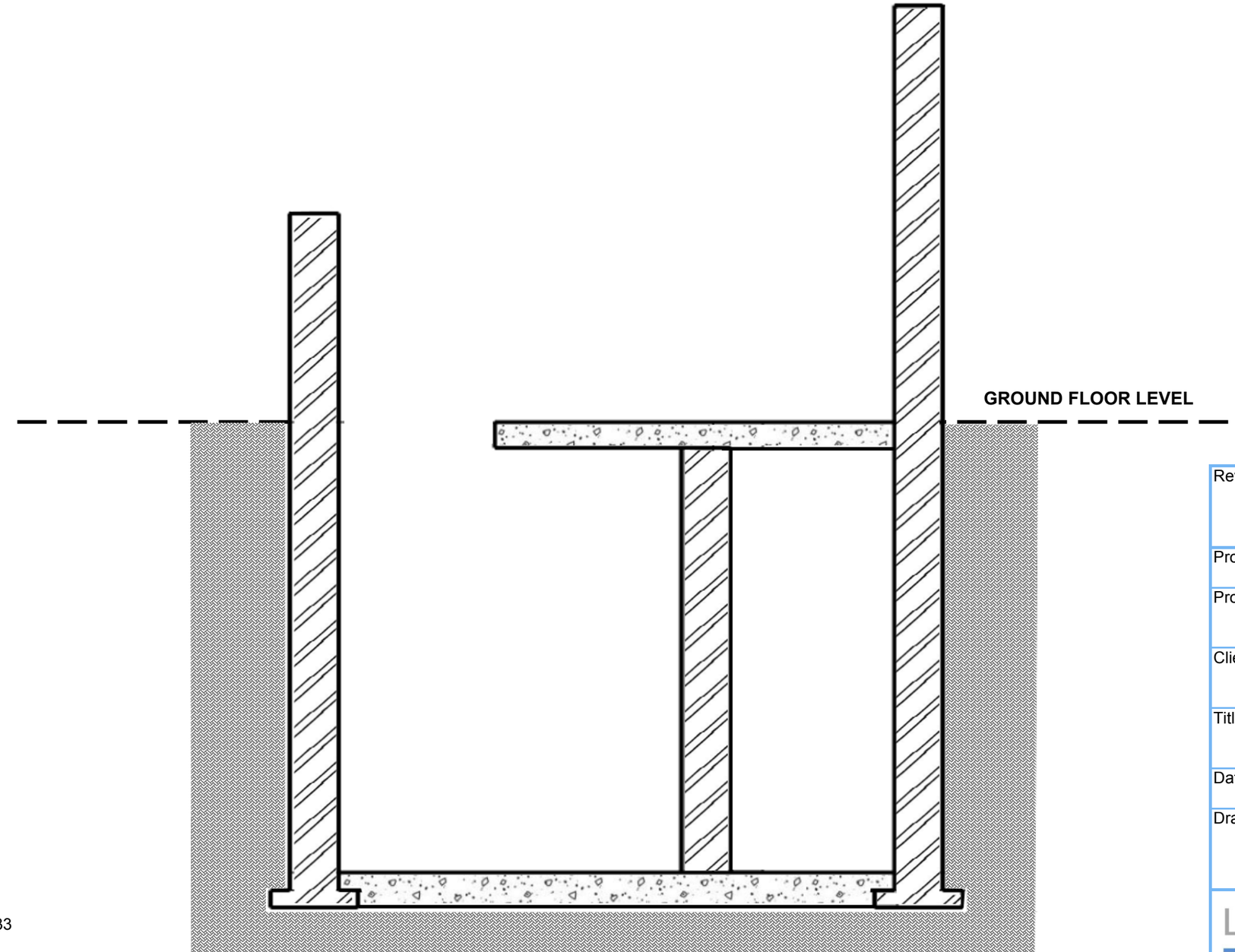
B

B'



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Project No.:	LBH4523
Client:	Savvas Theodoulou Esq.
Title:	Existing Section B-B'
Date:	18/07/2018
Drawing No.: LBH4523-E4	Drawing Rev.: B
	Drawn by: LB

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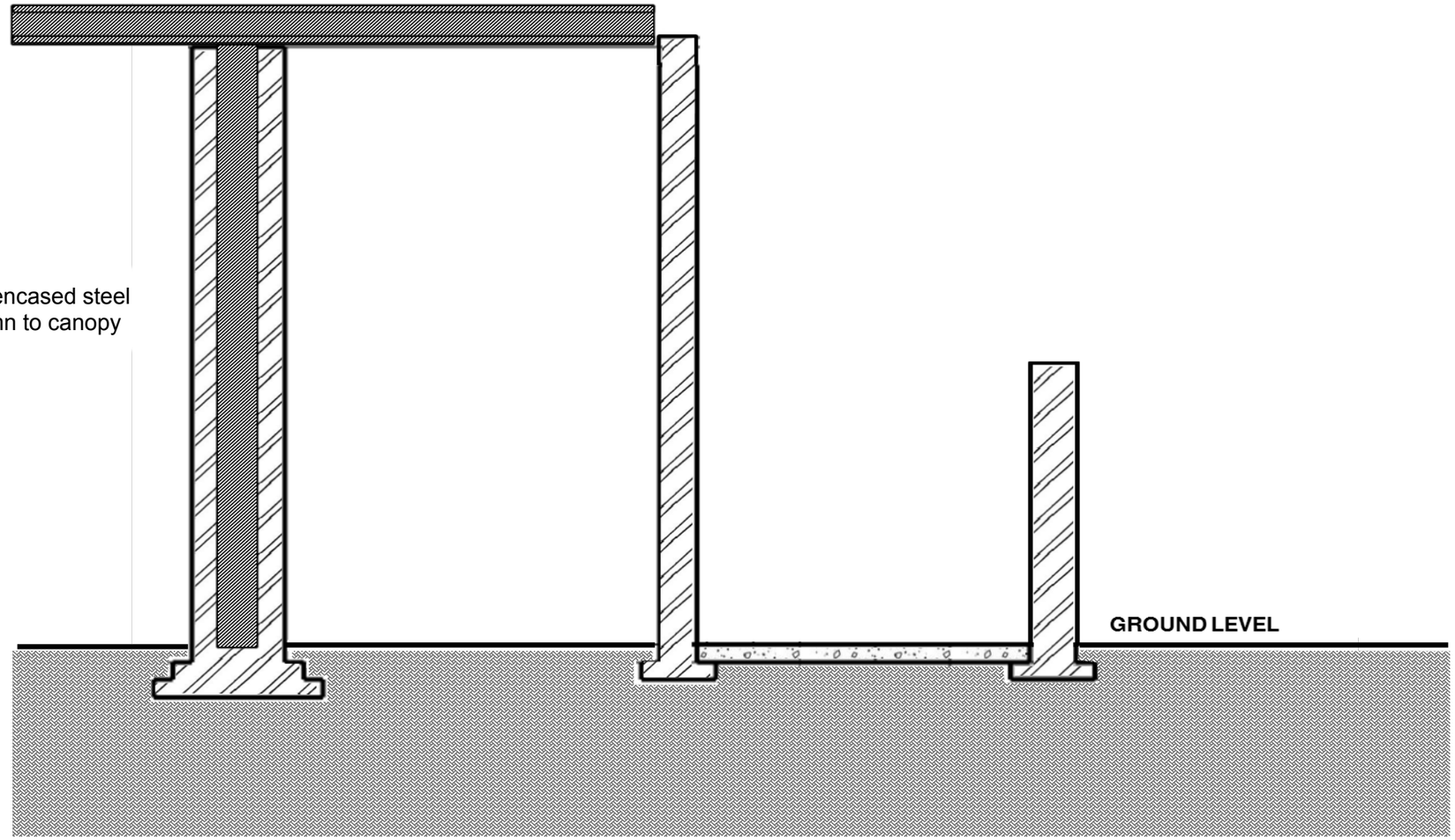
C

C'

Steel bearing beam
to canopy roof

Brick encased steel
column to canopy



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Project No.: LBH4523

Client: Savvas Theodoulou Esq.

Title: Existing Section C-C'

Date: 18/07/2018

Drawing No.: LBH4523-E5

Drawing Rev.: B

Drawn by: LB

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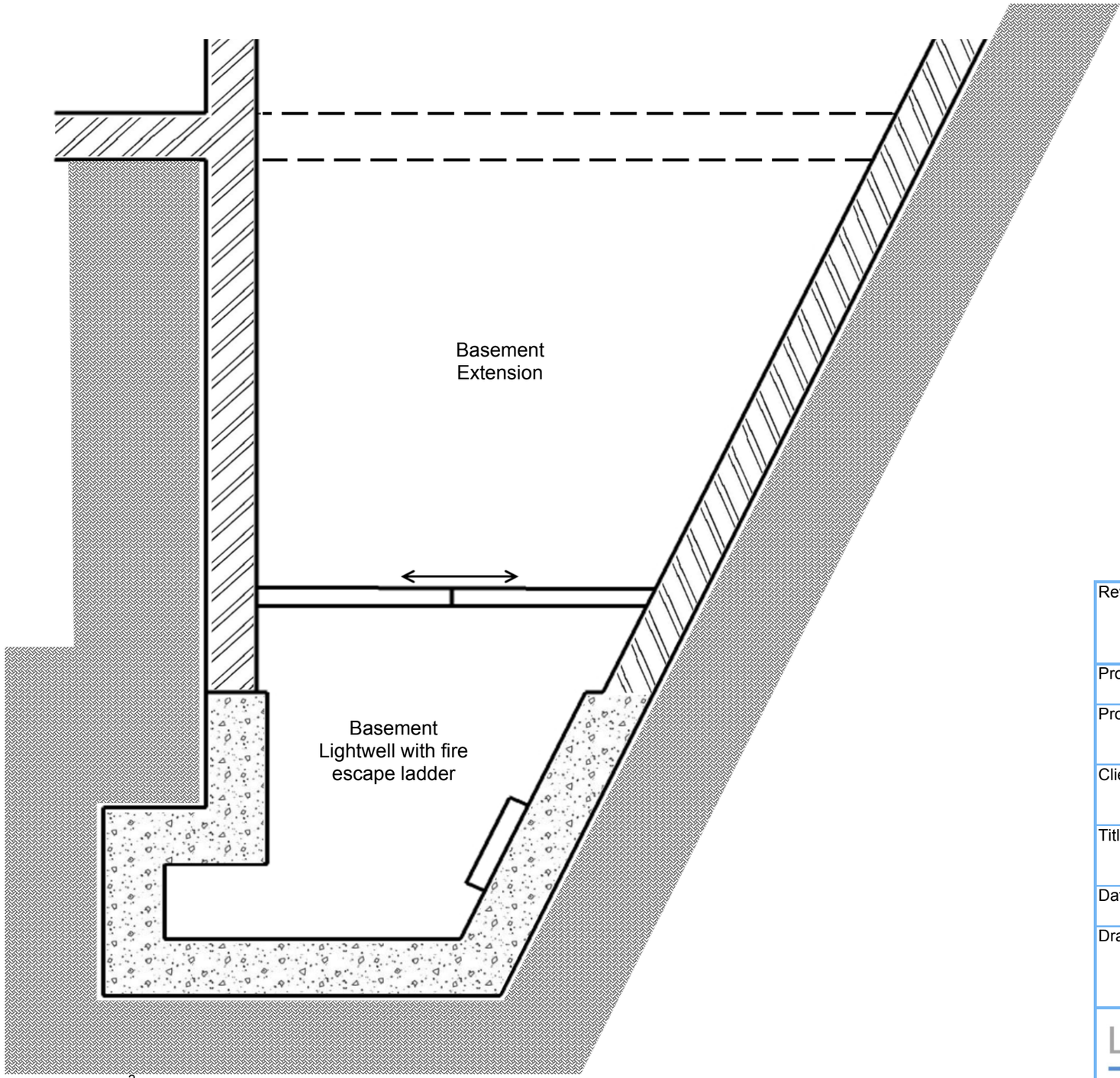

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Title:	Proposed Basement Plan
Date:	18/07/2018
Drawing No.:	LBH4523-P1
Drawing Rev.:	B
Drawn by:	LB

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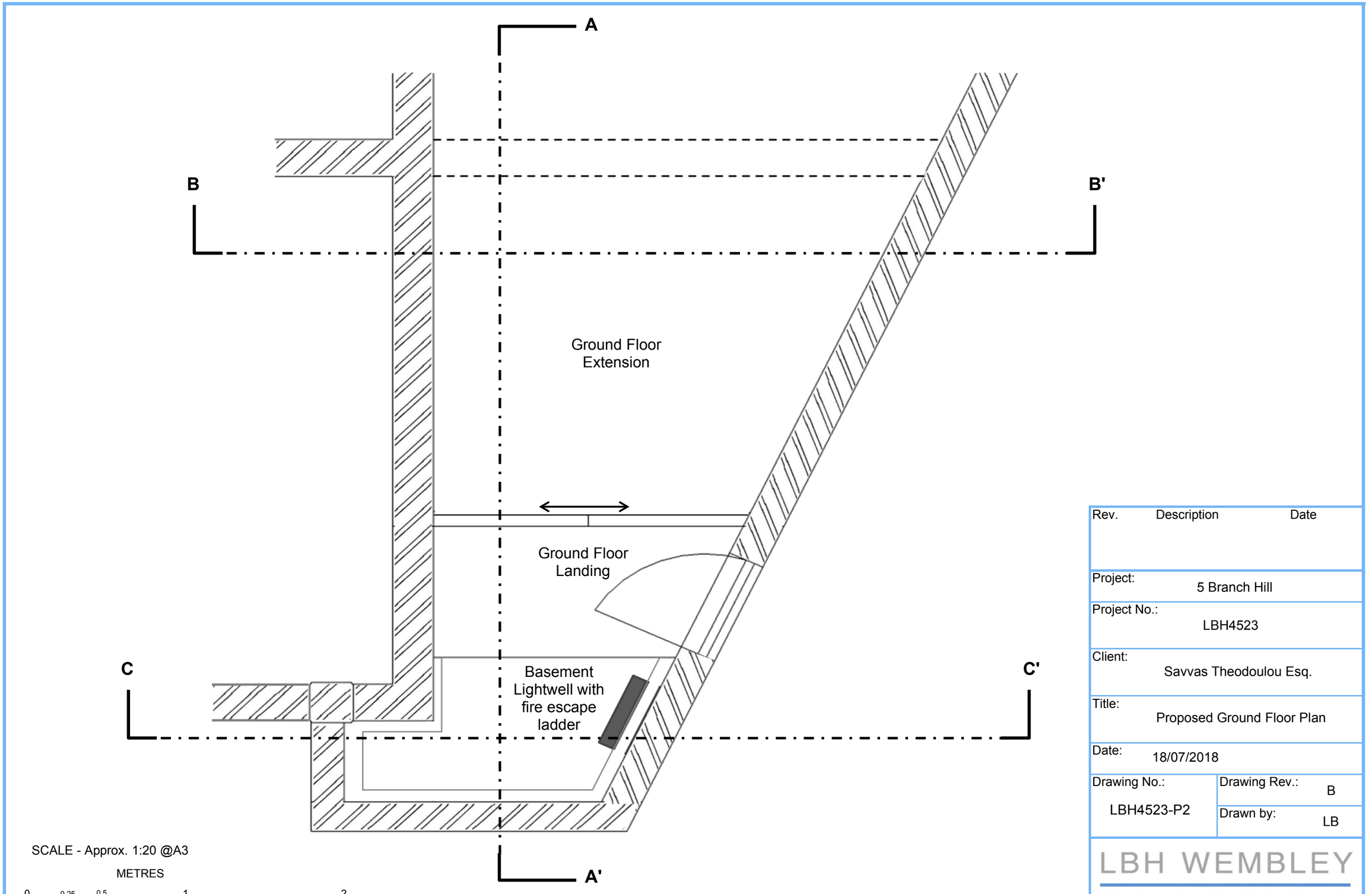

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Project No.:	LBH4523
Client:	Savvas Theodoulou Esq.
Title:	Proposed Ground Floor Plan
Date:	18/07/2018
Drawing No.:	LBH4523-P2
Drawing Rev.:	B
Drawn by:	LB

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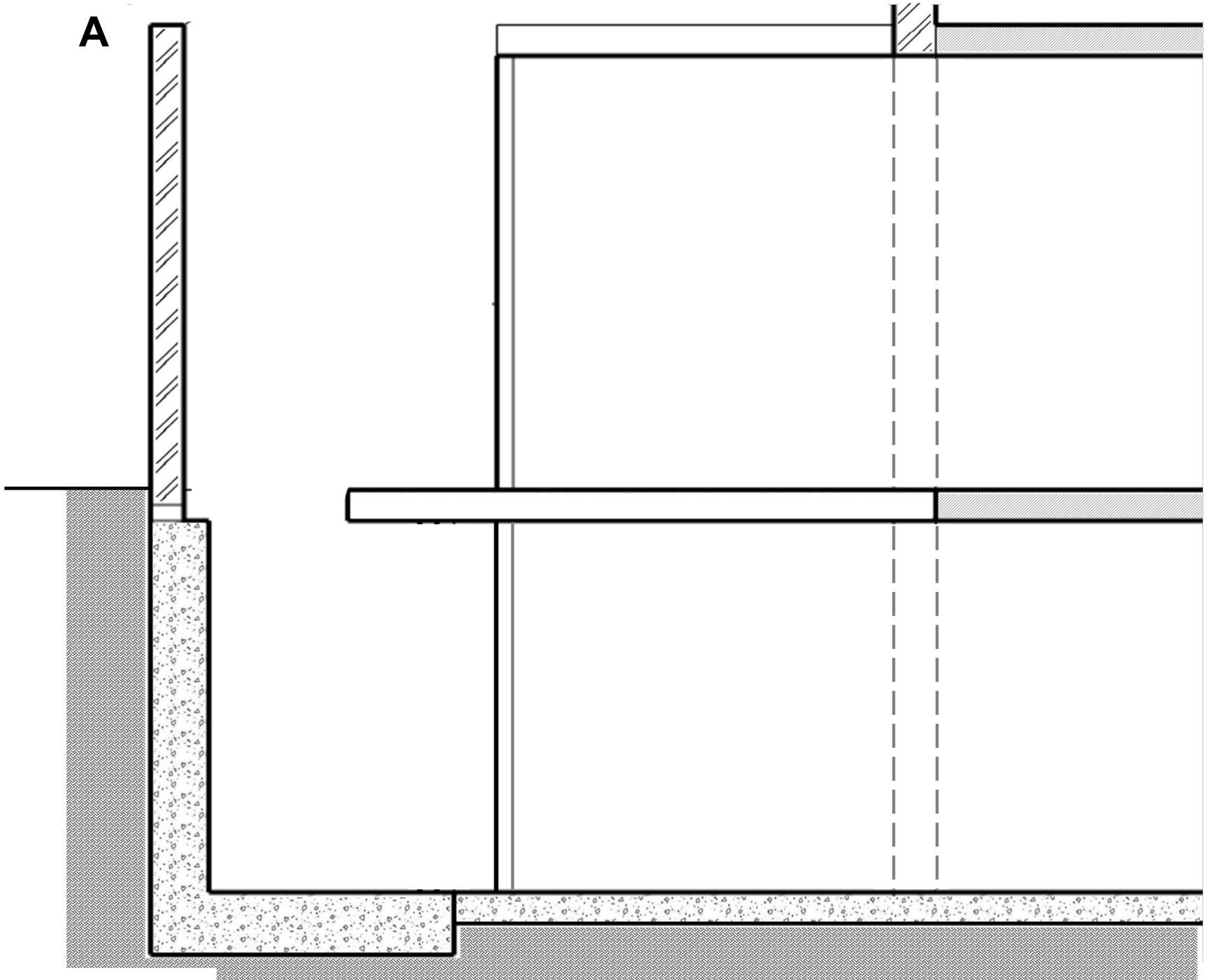
A

A'



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Project No.:	LBH4523
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Title:	Proposed Section A-A'
Date:	18/07/2018
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Drawing Rev.:	B
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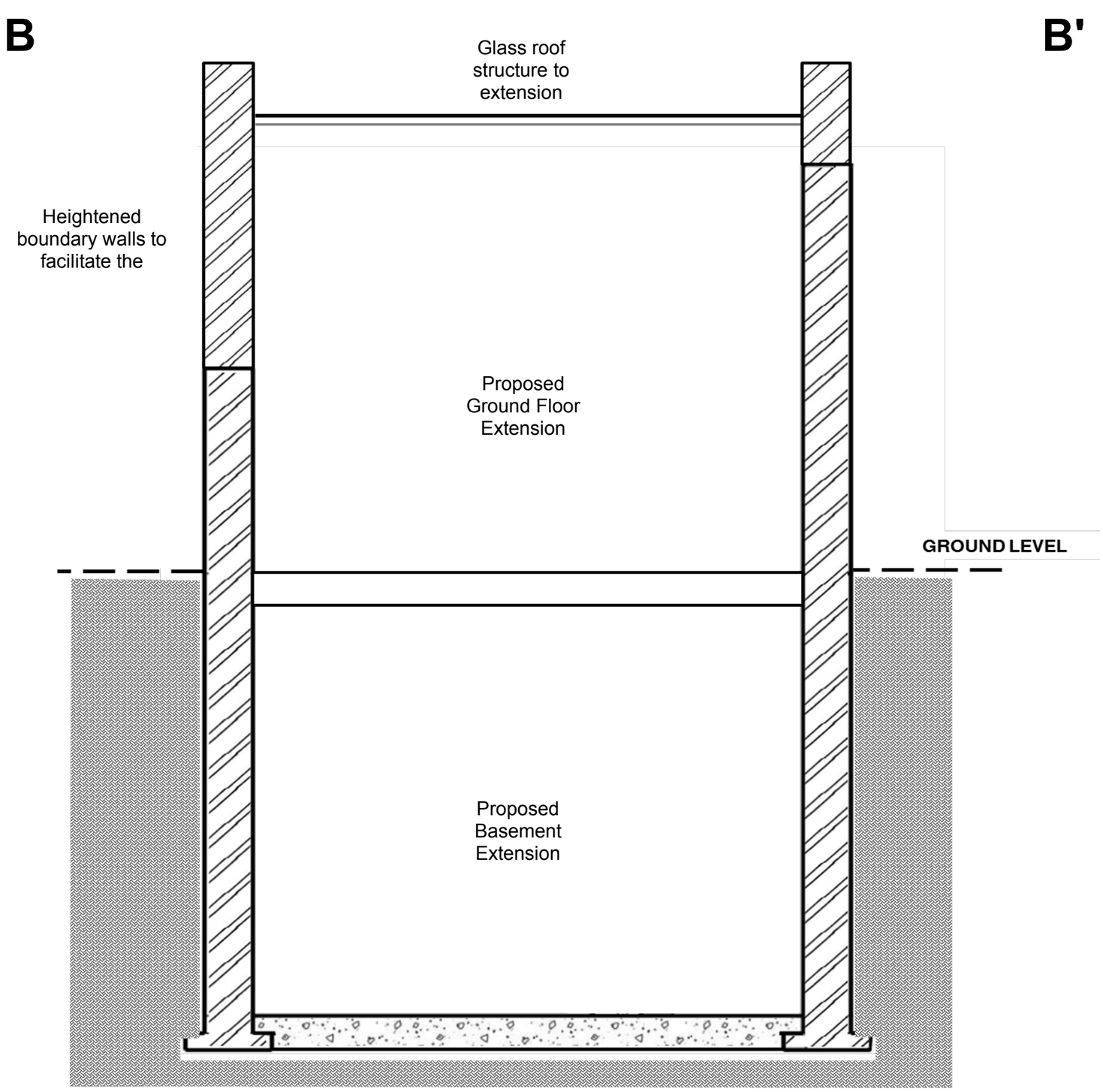

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Title:	Proposed Section B-B'
Date:	18/07/2018
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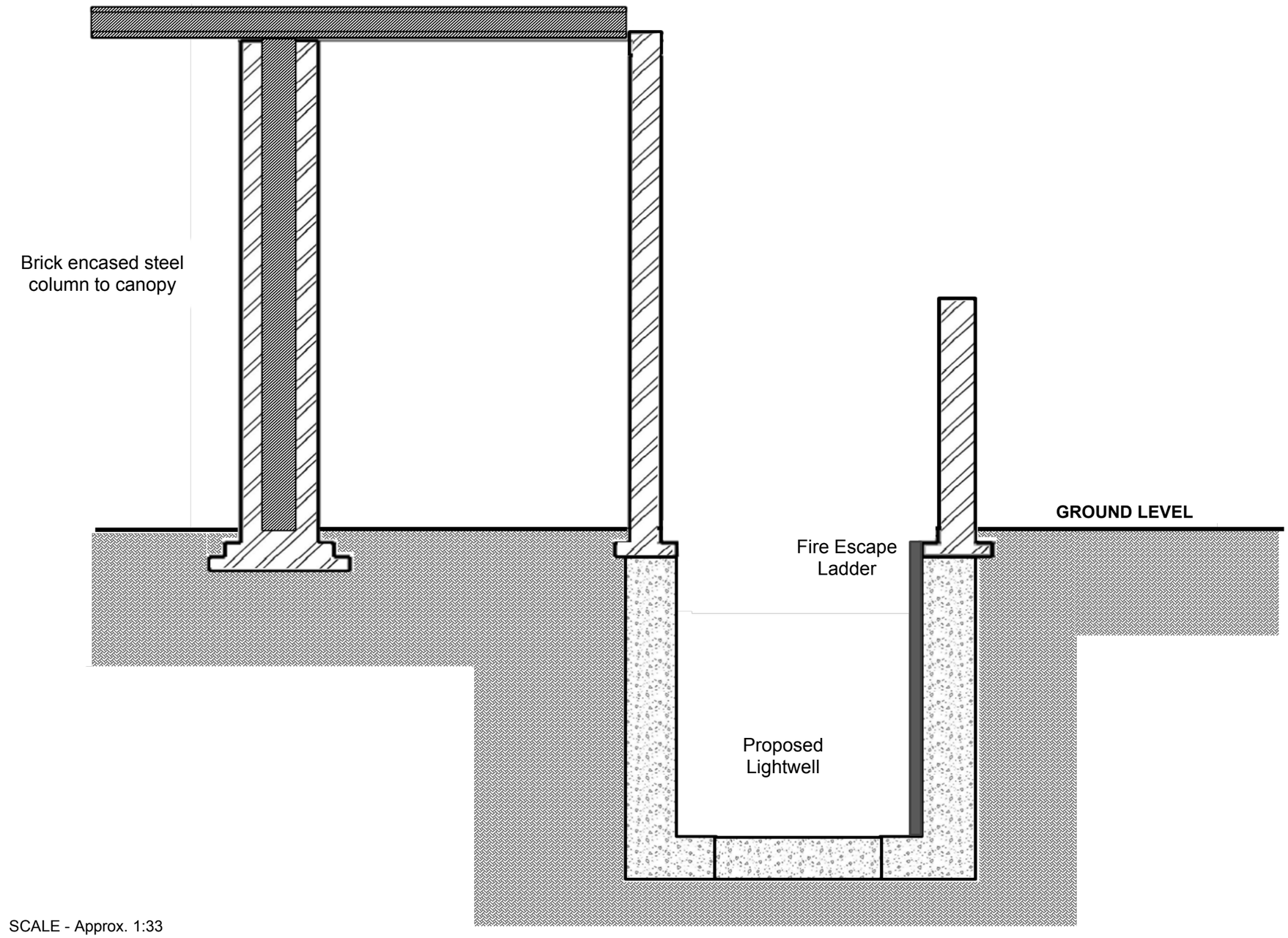
C

C'



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Project No.: LBH4523

Client: Savvas Theodoulou Esq.

Title: Proposed Section C-C'

Date: 18/07/2018

Drawing No.:	Drawing Rev.:
LBH4523-P5	B
	Drawn by: LB

LBH WEMBLEY ENGINEERING