Malachy Walsh and Partners
Engineering and Environmental Consultants
London | Cork | Tralee | Limerick | The Gambia

GROUND MOVEMENT REPORT & BASEMENT IMPACT ASSESSMENT FOR

1 Ferncroft Avenue
Hampstead, London NW3 7PG
(MWP Ref: 15600)

		Date	Reason for issue
Prepared By	Fawad Mirza	July 2019	Planning
Checked By	Tim Moynihan	July 2019	Planning

1 Ferncroft Avenue
Hampstead, London NW3 7PG
Project No. 15600

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1.0 Introduction and Purpose of Report

In July 2019 Malachy Walsh and Partners were commissioned by Al-Tuhafi Architects Ltd to carry out a Geological and Geotechnical appraisal of the effects of constructing an extension (See Figure 1,2) of the existing basement at , 1 Ferncroft Avenue NW3 7PG, London NW3 7PG.

The purpose of this report is to determine the likely impact, if any, of the proposed basement construction on the adjoining properties and also its effect on the ground stability and hydrology of the surrounding area.

This report is based on a review of borehole logs for the area obtained from the British Geological Survey, and other sources of information relevant to the scheme all of which are listed in the reference section of this report. A walk over survey and a review of the proposed temporary and permanent works scheme for the construction of the basement was also carried out. From the information obtained it was possible to determine the soil types in the area and to determine the likely presence of water in the ground.

Trial excavations to determine the foundation type and depth of the adjoining properties was not carried out at this stage, however from the age and form of construction of the adjoining buildings, it is possible to make a reasonable assumption on the likely depth and width of the foundations which are likely to follow the recommendations of the "London Borough Building Regulations current at the time of construction and outlined in CIRIA Report 111. In making these assumptions we have erred on the side of caution, all assumptions will be verified during the Party Wall Process, before work commences.

Figure 1. Site-Overhead View

2.0 THE SITE

Number 1 Ferncroft Avenue is a large, detached, three-storey residential property over a basement located on the corner of Ferncroft Avenue and Platt's Lane. The property falls into the Redington and Frognal Conservation Area.

There is currently a basement under the full extent of the existing property on the site. The floor level of basement is approximately 1.7m below the general ground level which is approximately similar to the level of road on Ferncroft Avenue. There is currently a lightwell to the rear of the property which it is intended to extend.

The proposed basement extension does not immediately abut any buildings.

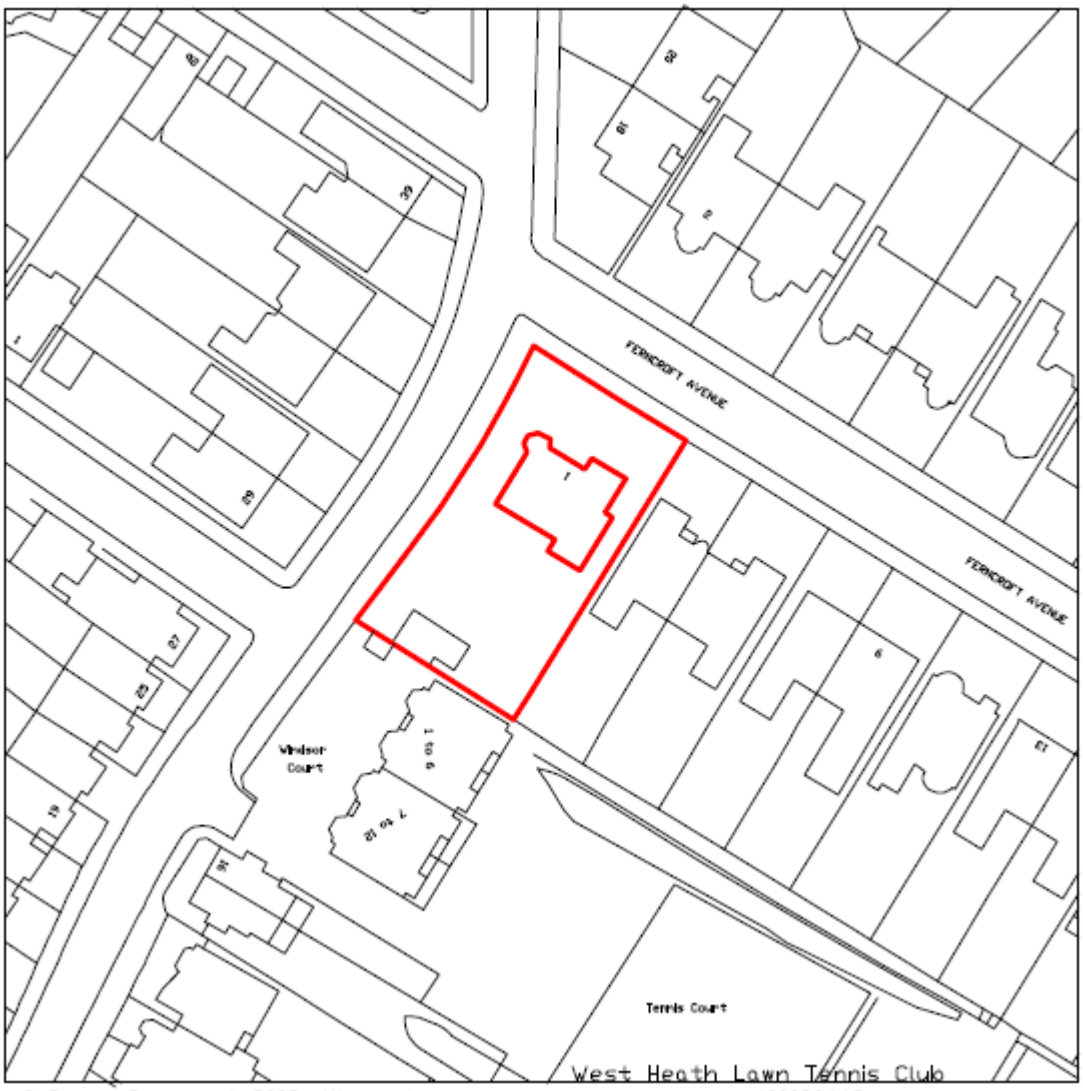

Figure 2 - Location and Site Boundary

The existing building consists of traditional brick walls and timbers floors structure with pitched roof. According to the record drawings a 300mm thick concrete ground bearing slab is at lower ground floor, see Figures 10 and 11.

The proposed three side walls of the basement abut the garden. The nearest adjoining property is more than 4.0m away to east. The foundations of the existing buildings are likely to be strip, pad or raft-foundations; these will be confirmed by investigation during the Party Wall process. The adjoining property is No. 3 Ferncroft Avenue which contains a basement the depth of which is assumed similar to the depth of the proposed basement in No. 1 Ferncroft Avenue.

The North boundary of the main site entrance is formed by Ferncroft Avenue. West boundary is formed by Platt's Lane and the strip between the house and boundary wall along Platt's Lane has a number of trees all along the wall.

The adjacent property on East boundary, No.3 Ferncroft Avenue, is a similar property which also consists of a basement. The south boundary behind the rear garden is formed with apartment block of No.1-6 Platt's Lane.

The Bomb Site map extract in Figure 3 shows that there was a high intensity explosive that fell to the South of the site on Finchley Road which is about 300m away from the site but none indicated as having fallen on the site.

However not all bombs were recorded and in particular unexploded ordnance, we therefore recommend seeking advice prior to excavations commencing on site.

Figure 3- Extract from Bomb sight map

A review of the Archive Ordnance survey maps suggest that the area wasn't developed in 1895 (See figure 4) but fully developed in 1915 (See figure 5). It is obvious that the site was built between "1895-1915" and since has been in residential use based on the historical maps ranging from 1895 to 1981 (See figure 6).

Historic maps suggest a reservoir existed yards away from the site boundary to the South which seems to have been backfilled.

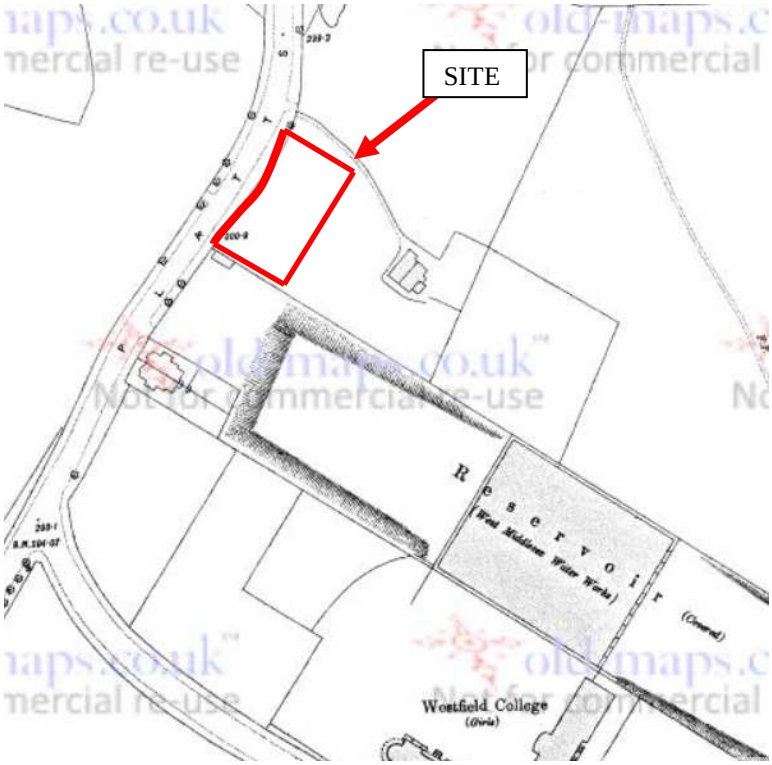

Figure 4 - Historical Map – 1895

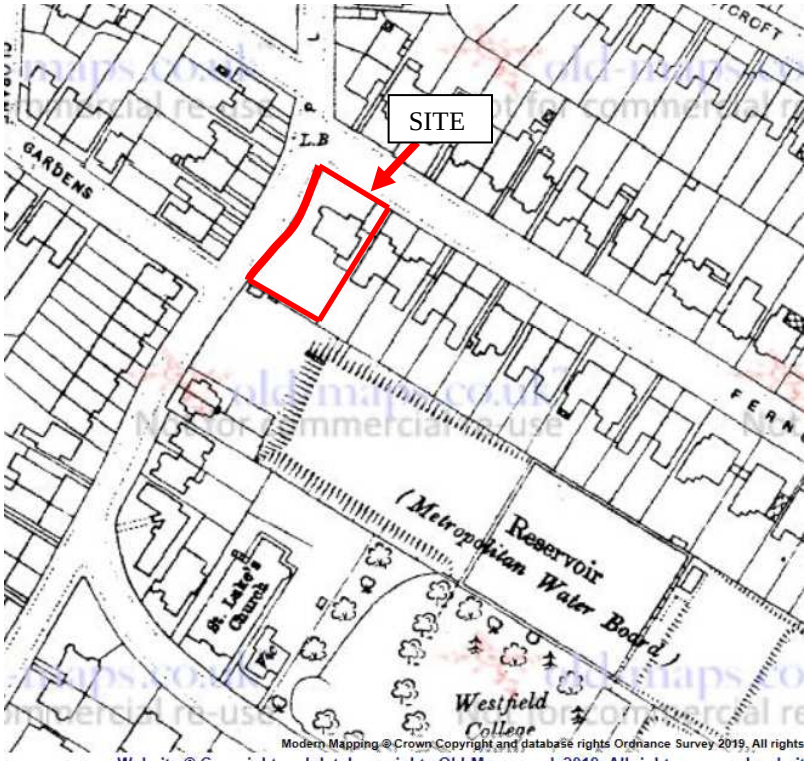

Figure 5 - Historical Map – 1915

Figure 6 - Historical Map – 1981

3.0 SITE GEOLOGY.

Based on the 1:50,000 North London Bedrock and Superficial Map (Sheet 256) produced by the British Geological Survey, it would appear that the site is underlain by the Claygate Member comprising of clay, silt, and sand. The area is shown to be free of superficial deposits. The area is a short distance to the boundaries of London Clay formation to East and Bagshot formation to West.

The general Geology of the area is indicated in the extract from the British Geological Survey Sheet 256 included in Figure 7.

The Claygate Member comprises dark grey clays with sand laminae, passing up into thin alternations of clays, silts and fine-grained sand, with beds of bioturbated silt. Ferruginous concretions and septarian nodules occur in places. Fossils from the Claygate Member at Willesden Green are recorded by Wrigley (1921).

Clays in Claygate member possess the potential for volume change on wetting and drying. The sand in Claygate member makes it relatively permeable, when compared with the underlying London Clay, allowing water to flow through them rapidly.

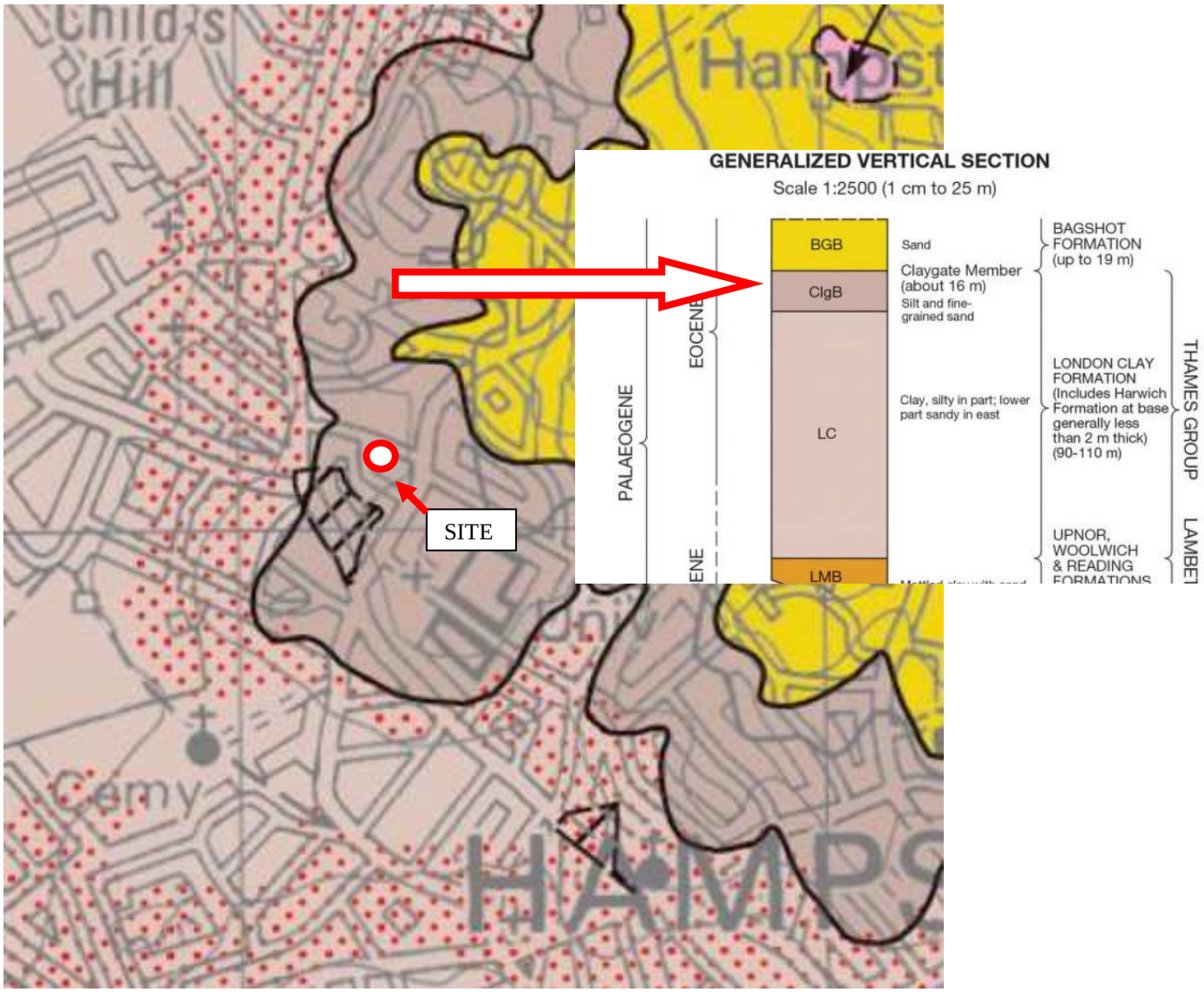

Figure 7- General Geology of the Area (extract from BGS- SOUTH LONDON Sheet 256)

4.0 INVESTIGATIONS and REPORTS

No site specific ground investigation information was available; however a borehole sunk near the site within 200-300m from the site (See Figure 8) is held in the British Geological Survey Library, an extract of which is indicated in Figure 9 below. This borehole indicates approximately 0.525m of Made ground overlying Claygate member and ground water at 2.2m bgl.

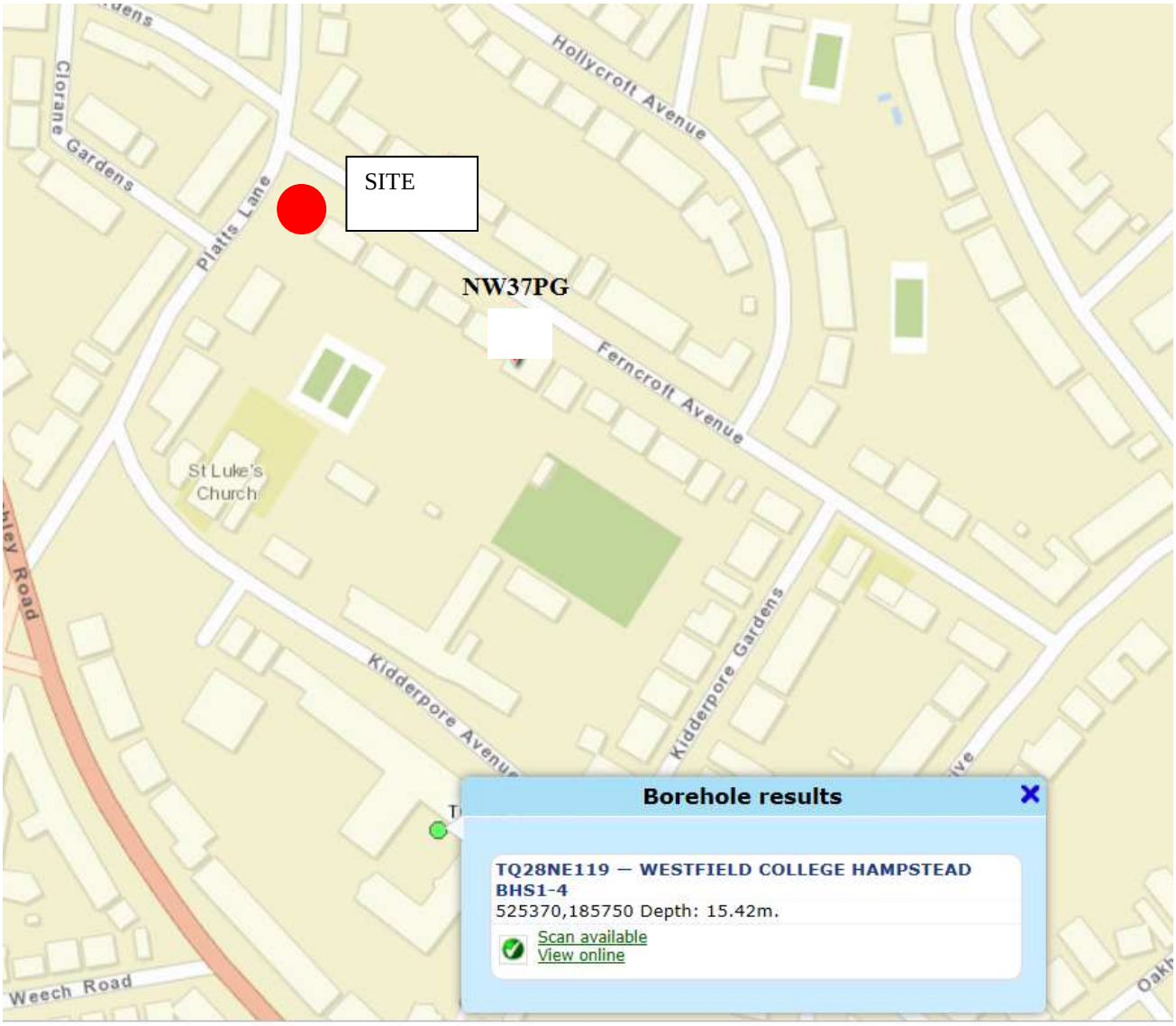

Figure 8- British Geological Survey-Borehole Location

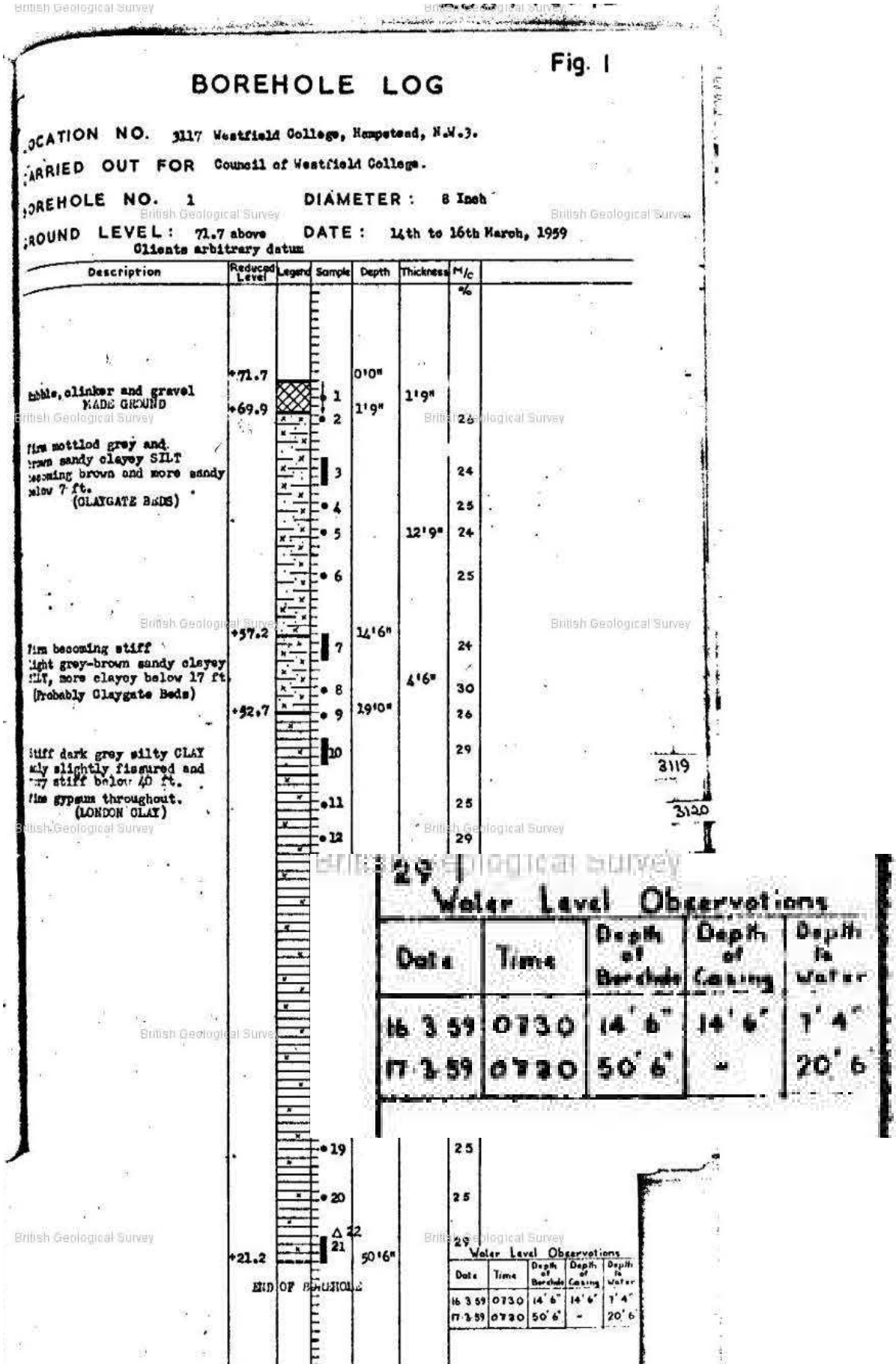

Fig. 1

BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead, N.W.3.

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 1 DIAMETER : 8 Inch

GROUND LEVEL : 71.7 above Clients arbitrary datum DATE : 14th to 16th March, 1959

Description	Reduced Level	Legend	Sample	Depth	Thickness	M/c %
Rubble, clinker and gravel MADE GROUND	+71.7		1	0'0"	1'9"	
	+69.9		2	1'9"		26
Firm mottled grey and brown sandy clayey SILT becoming brown and more sandy below 7 ft. (CLAYGATE BEDS)			3			24
			4			25
			5		12'9"	24
			6			25
Firm becoming stiff light grey-brown sandy clayey silt, more clayey below 17 ft. (Probably Claygate Beds)	+57.2		7	14'6"		24
			8		4'6"	30
	+52.7		9	19'0"		26
Stiff dark grey silty CLAY locally slightly fissured and very stiff below 40 ft. Fine gypsum throughout. (LONDON CLAY)			10			29
			11			25
			12			29
			19			25
			20			25
			22 21			29
	+21.2			50'6"		

END OF BOREHOLE

3119

3120

29

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
16 3 59	0730	14' 6"	14' 6"	7' 4"
17 3 59	0730	50' 6"	-	20' 6"

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
16 3 59	0730	14' 6"	14' 6"	7' 4"
17 3 59	0730	50' 6"	-	20' 6"

Figure 9- Extract of borehole log

5.0 GROUND WATER AND HYDROLOGY.

The Environmental Agency categorises the Claygate member as a "Secondary A" aquifer, the definition of which is "Secondary A" aquifer-permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers".

Aquifers are defined as layers of permeable rock or unconsolidated material (sand, gravel, silt etc.) capable of storing and transporting large quantities of water. The understanding of the behaviour and location of aquifers is important as they can provide an indication of the potential for groundwater flooding.

The above taken together with the borehole results (see table below), suggests that the water table is high and the ground has a low to moderate permeability.

BGS Record from borehole log	**Depth below surface**
Water table	2.2m

The Clay content of Claygate member does in fact have a low permeability and although the soil contains water within the structure, this pore water does not readily exhibit itself in boreholes or trial pits unless the borehole or trial pit is left open for some time. As a result it is not uncommon to find boreholes and trial pits being dug into the Clay and recording them as dry, where as boreholes or trial pits left open for a number of days are found to contain water. The Clay is relatively impermeable and will act as a surface upon which any ground water will run down slopes to South and East or South East without altering the water levels within the soil significantly.

The sand in the Claygate Member and the Bagshot Formation make them relatively permeable, when compared with the underlying London Clay, allowing water to flow through them readily. The water within these strata is recharged at the surface from precipitation which, owing to the relatively high porosity of the deposits, is stored within the matrix of the strata and forms a local aquifer. At the junctions of the Bagshot Formation with the Claygate Member and the Claygate Member with the London Clay, springlines form at the ground surface.

The superficial deposits have a low to moderate permeability. The nearest significant open water body to the site is at Hampstead Heath around 0.5 miles to the East, the elevation of the site relative to the level of the pond suggests that the water levels at the site are not impacted by the pond levels.

There are a number of smaller ponds and lakes in the area such as those at Golders Hill and Hill garden to the East and North East and found to be around 650-700m from the site. These ponds are shallow, a review of the historic mapping suggests that these ponds have been man made rather than being historic water bodies.

According to the Environment Agency's website this property is located in Flood Zone 1(Low Flood probability) therefore a flood risk assessment would not be required for planning.

According to EA map the site is known to be at no risk of flooding from rivers or the sea, at no risk from reservoirs, and at very low risk from surface water flooding. Historic flooding maps in SFRA show no historic flooding on this site.

The risk of flooding from excessive surface water is not considered significant. The location of existing sewers should be identified prior to excavation works to determine whether there are any unusual features to be considered in the design.

6.0 BASEMENT DESIGN.

It is proposed to extend an existing basement to the proposed building; this basement will extend a part of of an existing lightwell to the rear to form a habitable room at ground floor. The total area of the basement extension is 7.3 m² which is approximately 3.5% of the existing basement area of 207 m² and 0.63% of total site area of approximately 1150 m².

The basement outline is indicated in Figure 11 below. The extent of the proposed basement is assumed to be similar to the basement of the adjoining building and of similar depth.

The basement depth including the basement floor construction will be approximately 2.0 m to 2.1m below the existing ground level depending upon the form of construction. It is anticipated that the basement will be constructed using a raft foundation with traditional retaining walls, thus reducing the extent and depth of excavation required and disruption to the adjoining building. The ground will be excavated and the ground battered back. To ensure that the load transfer from any wall into the ground does not change during the construction, the ground will be battered back at a maximum of 45 degree. A steel sheet pile can be used on the side towards the boundary with adjacent house.

Water proofing of the basement will be achieved by constructing the walls in water tight concrete with a secondary layer of impermeable membrane.

The property sits on a site which gently slopes towards the East and South. Site Investigations have not indicated the presence of significant 'perched' groundwater other than the natural seepage of water in saturated soil. The proposed basement will have a nominal impact on the existing groundwater regime. Furthermore, significant dewatering of the site is not expected to be required, however, some temporary sumps

should be allowed for during the excavation of the basement to remove any water ingress.

Heave forces caused by the removal of overburden are not expected to be significant. The basement slab should be properly reinforced and tied into the perimeter walls. The main phase of uplift or heave from the cohesive soils will come immediately following the excavation of the basement when the greatest elastic rebound of the soil will occur.

There is a potential for minor heave below the new basement. This should be catered for in the design of the reinforcement to the concrete slab or Retaining RC walls.

No trees are required to be removed to construct the new basement. An Arboriculture Report has been carried out and all works to be in accordance with the report.

Figure 10- Section Through Proposed Extension

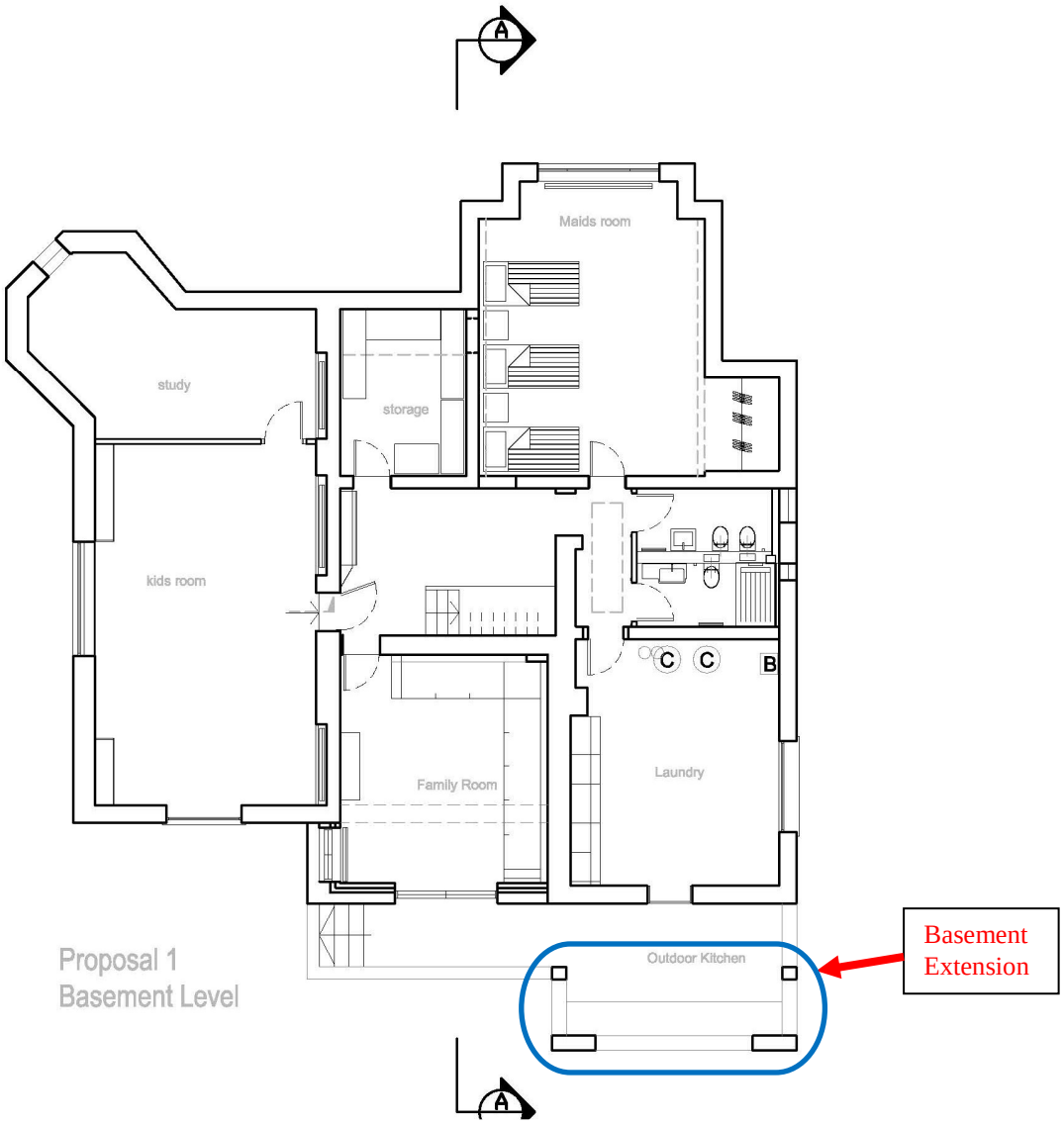

Figure 11- Proposed Basement Floor plan showing extension

7.0 GROUND MOVEMENT ANALYSIS.

It is obvious that the site previously contained a basement of similar depth and extent to the proposed basement addition. The construction of the new basement will not involve extending the depth of construction below the level of the adjoining property.

For basement excavations, batter ground option will be used, this form of construction is common practice and should not have any adverse impact on the adjoining property provided industry standard principles are followed. In all cases adjoining property is at least 4m away and basement excavation is only 2m below ground level. The details of the works should be incorporated into a Party Wall Agreement with the adjoining owners. (See figure 12).

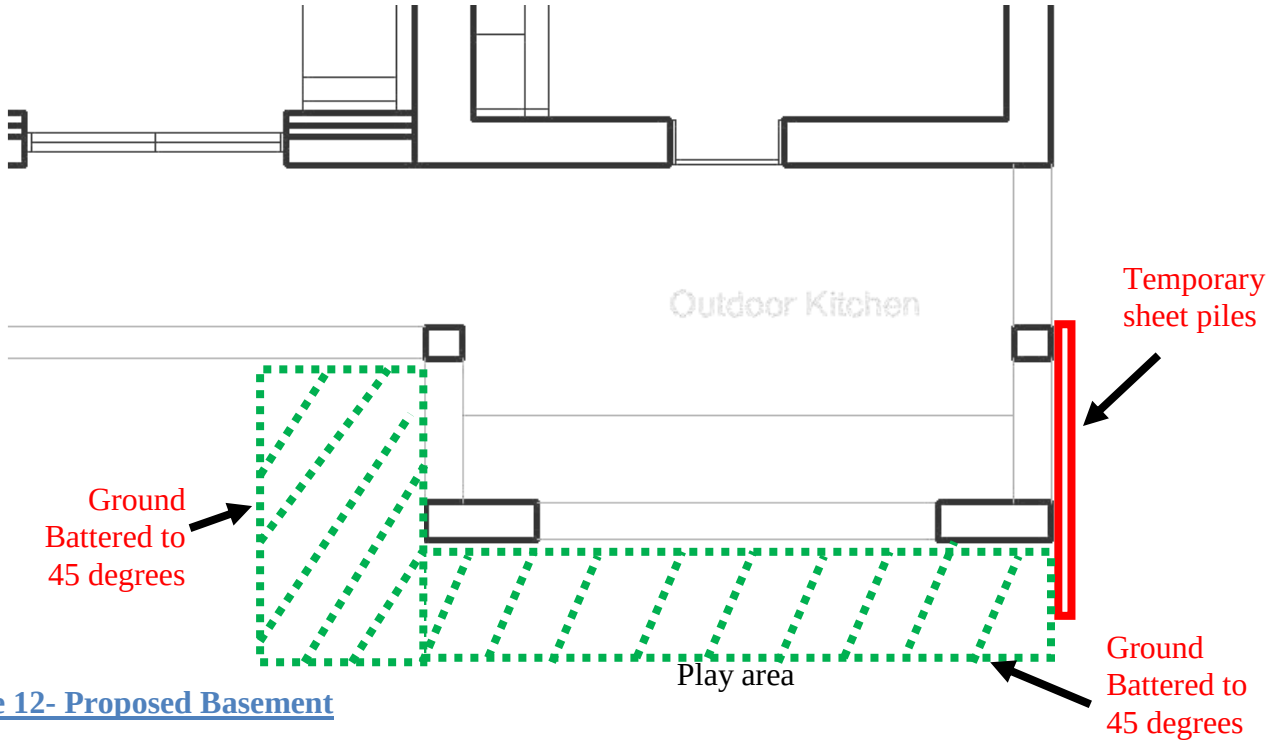

Figure 12- Proposed Basement

Along the boundary with adjacent property it will be necessary to install temporary trench sheeting to retain the soil this will be designed by a suitably qualified temporary works engineer with deflection limited to 10mm at the head of the wall to prevent damage to buried services.

We would recommend that monitoring of the adjoining structure be carried out during the works, this should involve the placing of targets on the adjoining buildings and taking measurements daily during works.

The proposed works does not include any works which would increase risk of movement to adjoining property.

8.0 CONCLUSIONS AND RECOMMENDATIONS.

This report has been prepared based on a site inspection and a review of the results of ground investigation boreholes available from the British Geological Survey; we have also consulted the British Geological Survey map for the area and other historical documents as listed in the Reference section.

The borehole logs confirm the general ground conditions suggested by the geological map for the area. The proposed development will involve the excavation of a half or single storey basement under the building.

The depth of excavation is approximately 2.0-2.10 m.

It is proposed to carry out the excavation by battering back the ground to the perimeter of the basement, and temporary sheet piles along the boundary with adjacent house, which will be designed by a specialist sub contractor and checked by the Consultant Project Engineers.

Currently there is no site specific Ground Investigation for the development, this will need to be specified by the Project Engineer and carried out by a Specialist Contractor to allow a more detailed analysis to be carried out, however as the underlying soil is Claygate member whose properties are well recorded it is unlikely that the above parameters will change as the analysis reported above has assumed conservative estimates of the soil properties.

Given the ground conditions and the use of traditional wall construction techniques to support the ground there should be no effect on the adjoining properties or the stability of the existing buildings. Prior to the works a full structural/condition survey should be carried out to determine the condition of the adjoining buildings. All works should be captured in a Party Wall agreement, this agreement should allow for the carrying out of the structural surveys, monitoring of the adjoining properties during the works and a final condition survey upon completion of the works.

Due to the elevated location of the site and the presence of the Clay in Claygate member it is unlikely that water in any significant quantities will be encountered, other than surface water during periods of rain. No significant sub surface water flows are expected which could be obstructed by the proposed basement.

The nearest known water courses are beyond the zone of influence of the site, therefore the proposed works do not pose a danger to these water bodies.

It is our opinion that provided the work is carried out by a competent contractor and in accordance with good practice and design there will be minimal disruption to adjoining properties or to the ground water or drainage of the area.

Prepared By.

Eur Ing Fawad Mirza BscEng CEng MICE
For Malachy Walsh and Partners.

REFERENCES.

British Geological Survey England and Wales Sheet 256 North London Edition.
British Geological Survey Borehole Logs –
London borough of Camden-SFRA
London borough of Camden-Camden Geological, Hydrogeological and Hydrological study by Arup

Appendix A: Architectural Drawings

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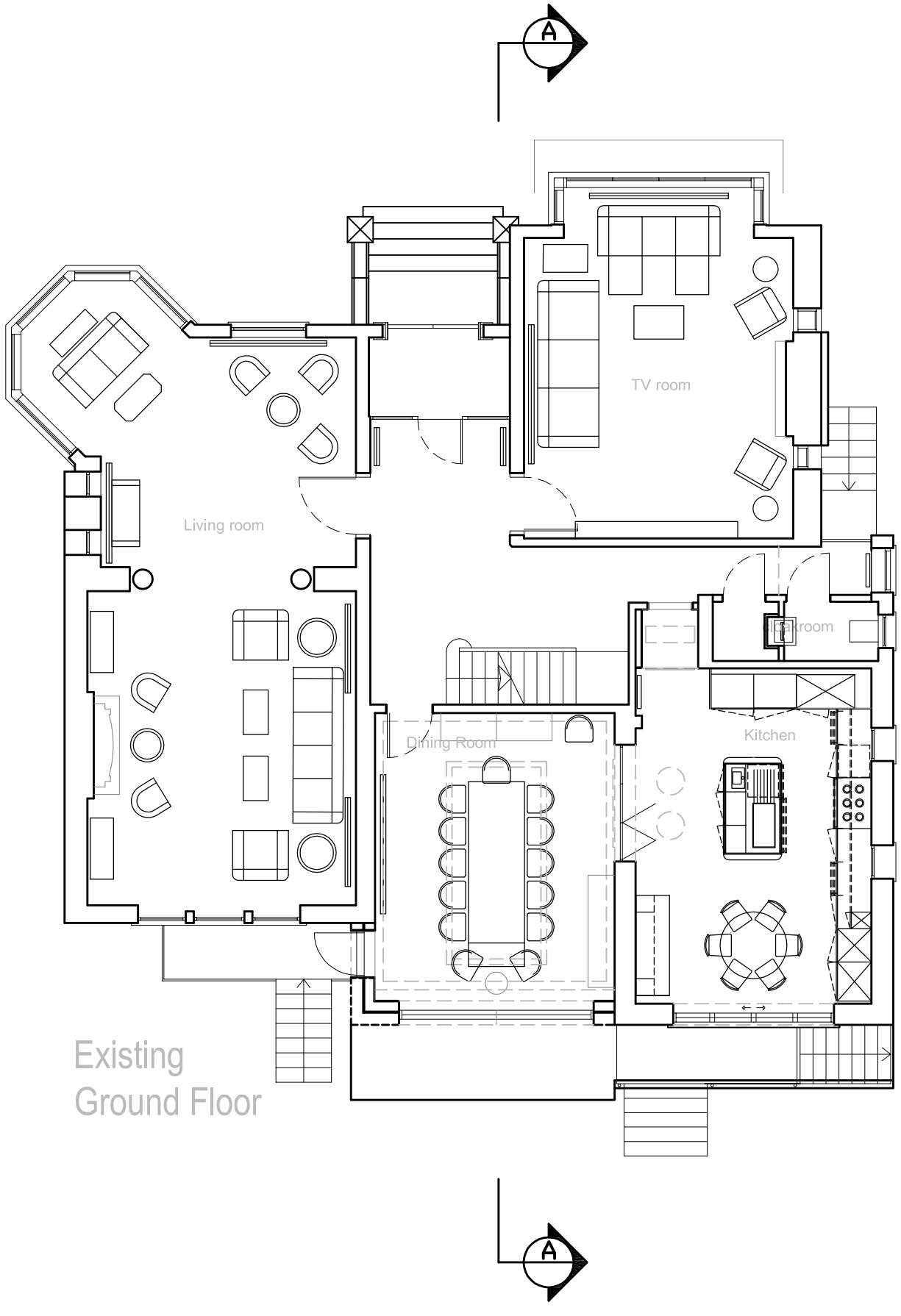
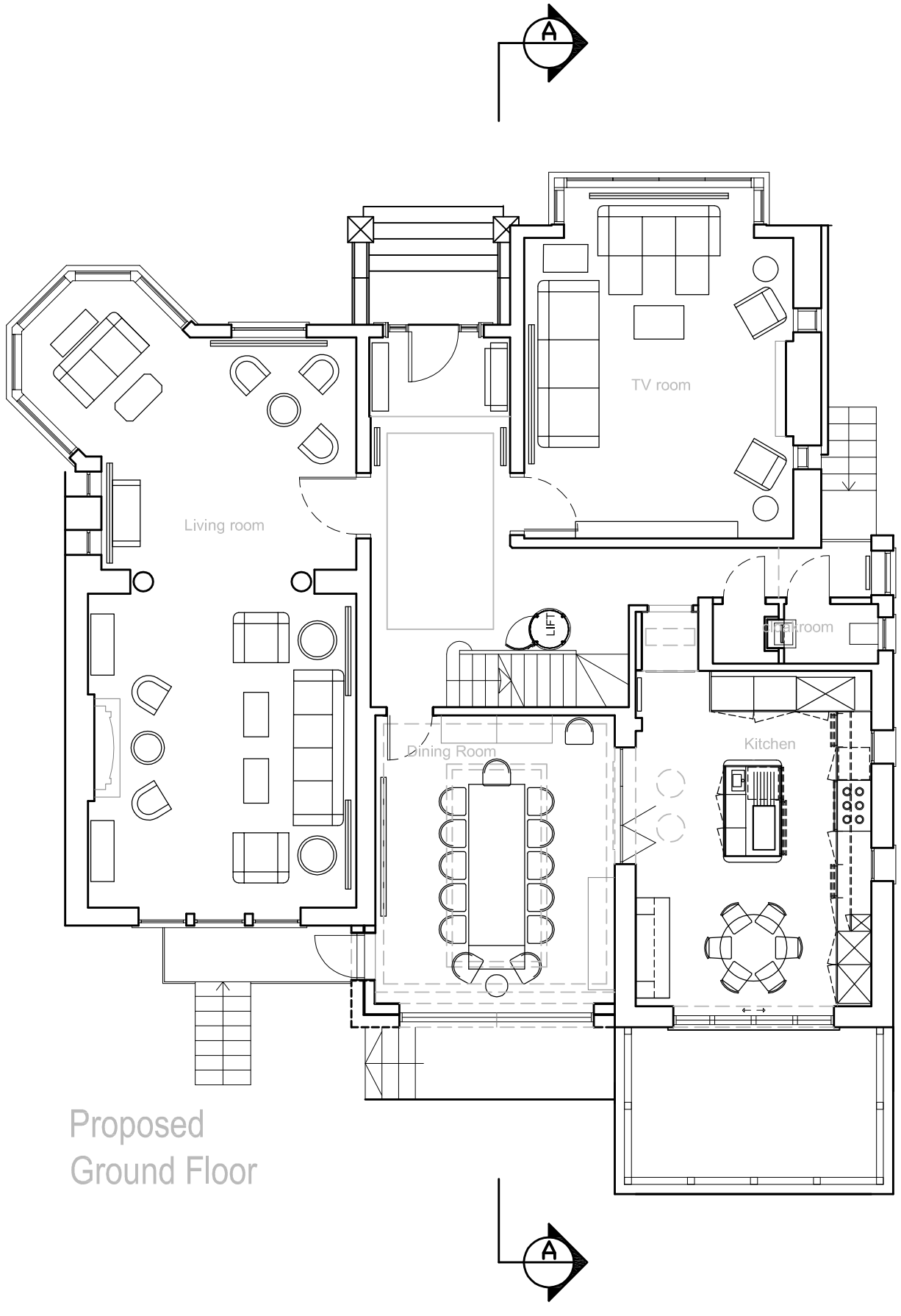
ARCHITECTS LTD

62 UPPER MONTAGU ST. LONDON, W1H 1SW
TEL.: +44 (0)207 7248877
FAX.: +44 (0)207 7248980
AYAD@AL-TUHAFI.COM



Existing
Ground Floor



Proposed
Ground Floor

1:100
0 1 2 3 4 5 6 7 8 9 10 [mm]

REV	DATE	DESCRIPTION

Client:

Project:

One Ferncroft Avenue
London NW3 7PG

Drawing Title:

Existing & Proposed
Ground Floor

Date: 10/04/2019

Scale: 1:100 @ A3 Drawn By: ZT

Drawing Number: AA003 - 41 - 04 Revision:

A3 420mm x 297mm

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62 UPPER MONTAGU ST. LONDON, W1H 1SW
TEL.: +44 (0)207 7248877
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NOTES:

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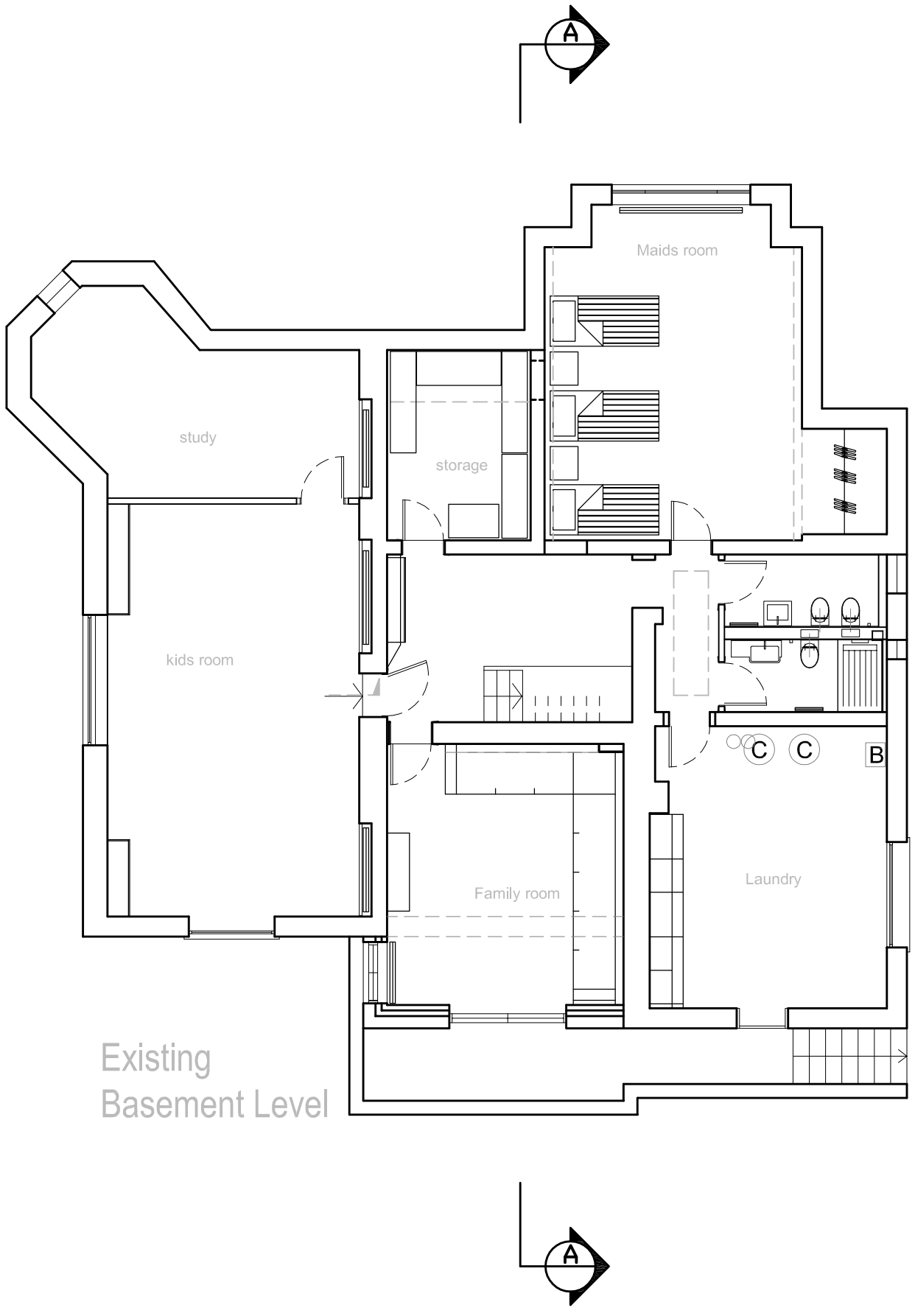
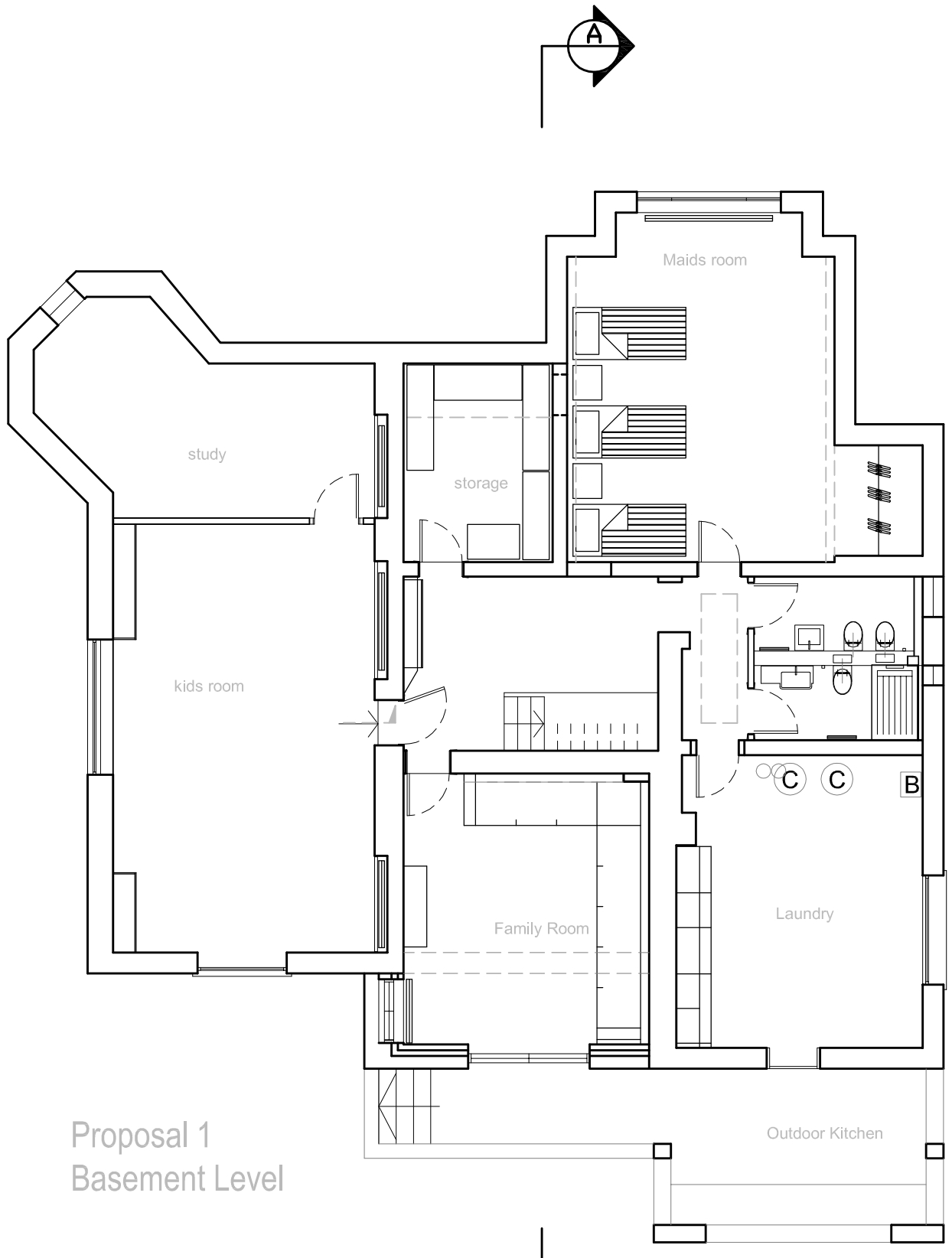
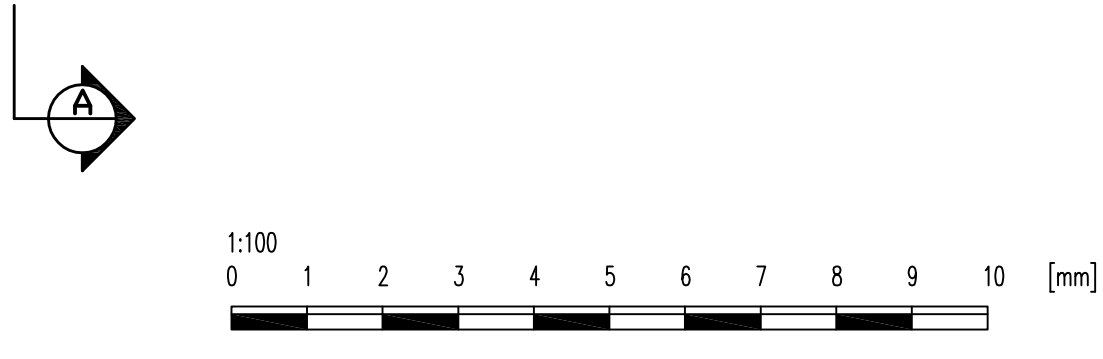
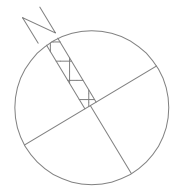


Existing
Basement Level



Proposal 1
Basement Level





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One Ferncroft Avenue
London NW3 7PG

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Basement Level

Date: 10/04/2019

Scale: 1:100 @ A3

Drawn By: ZT

Drawing Number: AA003 - 41 - 06

Revision:

A3 420mm x 297mm

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Existing South East Rear Elevation

Proposed South East Rear Elevation

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REV	DATE	DESCRIPTION

Client:

Project:

One Ferncroft Avenue
London NW3 7PG

Drawing Title:

Existing & Proposed
South-East
Rear Elevation

Date: 10/04/2019

Scale: 1:100 @ A3

Drawn By: ZT

Drawing Number: AA003 - 41 - 07

Revision:

A3 420mm x 297mm

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Existing North East Side Elevation

Proposed North East Side Elevation

1:100
0 1 2 3 4 5 6 7 8 9 10 [mm]

REV	DATE	DESCRIPTION

Client:

Project:

One Ferncroft Avenue
London NW3 7PG

Drawing Title:

Existing & Proposed
North-East
Side Elevation

Date: 10/04/2019

Scale: 1:100 @ A3

Drawn By: ZT

Drawing Number: AA003 - 41 - 08

Revision:

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Existing South West Side Elevation

Proposed South West Side Elevation

1:100
0 1 2 3 4 5 6 7 8 9 10 [mm]

REV	DATE	DESCRIPTION

Client:

Project:

One Ferncroft Avenue
London NW3 7PG

Drawing Title:

Existing & Proposed
South-West
Rear Elevation

Date: 10/04/2019

Scale: 1:100 @ A3

Drawn By: ZT

Drawing Number: AA003 - 41 - 09

Revision:

A3 420mm x 297mm

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Existing Section A–A

Proposed Section A–A

1:100
0 1 2 3 4 5 6 7 8 9 10 [mm]

REV	DATE	DESCRIPTION

Client:

Project:

One Ferncroft Avenue
London NW3 7PG

Drawing Title:

Existing & Proposed
Section A-A

Date: 10/04/2019

Scale: 1:100 @ A3

Drawn By: ZT

Drawing Number: AA003 - 41 - 10

Revision:

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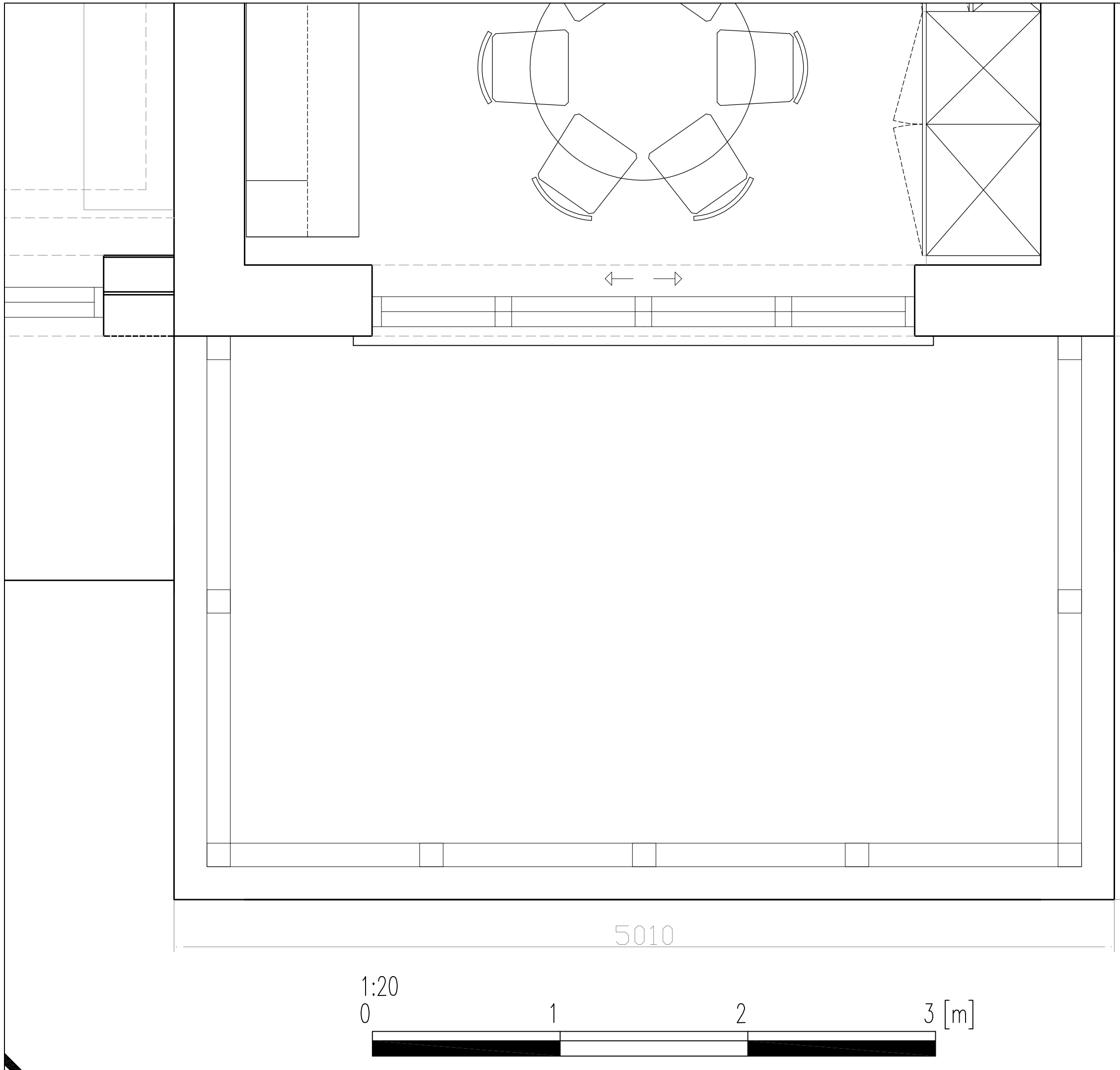

1:20

0 1 2 3 [m]

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-

REV	DATE	DESCRIPTION

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Project:

One Ferncroft Avenue

Drawing Title:

Proposed Conservatory Dimensions

Date: 10/04/2019

Scale: 1:20 @ A3

Drawn By: ZT

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Revision:

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