

Basement Impact Assessment (Geotechnical)



Site	Baptist Church, Braemar Avenue, Haringey, London, N22 7BY
Client	Braemar Avenue Limited
Date	December 2022
Our Ref	BIA/12942

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Executive Summary

Chelmer Global Limited (CGL) was commissioned by Braemar Avenue Ltd to undertake a Geotechnical Basement Impact Assessment at Baptist Church, Braemar Avenue, Haringey, London, N22 7BY (hereafter referred to as the 'site'). This Executive Summary is part of the complete report; and findings, opinions or conclusions in this Executive Summary are made in context with the complete report. CGL recommends that the user reads the entire report for all supporting information related to findings opinions and conclusions.

Executive Summary	
Site Details	
Client	Braemar Avenue Ltd
Site Address & Grid Reference	Baptist Church, Braemar Avenue, Haringey, London, N22 7BY Easting 530480, Northing 190780
Site Area	0.2 ha
Current Site Use	The site comprises a rectangular parcel of land situated within an area of residential use. The site is currently occupied by a mixed-storey church building which is located centrally at the site and a two-storey tin tabernacle building which is situated to the immediate south of the main church building. The existing church building dates from 1907 and is a Grade II listed structure.
Proposed Development	Based on available drawings, the proposed development will comprise demolition of the existing prayer room and the two-storey tin tabernacle building in the south and construction of a five-storey residential building with a single-storey basement to house a block of flats, a church lounge and a hall. The proposed development will also include landscaping works and a cycle parking area. The proposed basement will be a single-storey basement placed mainly under the footprint of the original tabernacle building and partly under the demolished parts of the existing church. A number of lightwells are proposed in the west, south and east. An excavation circa 4.5m deep will be required to accommodate the construction of the new basement and lightwells.
Desk Study	
Desk Study Summary	Historical mapping indicates that the site has been undeveloped land until the early 1900's when the church building and hall were constructed where they appear today. The anticipated geology is London Clay Formation. Some limited Made Ground may be present due to past developments. The potential hazard of groundwater flooding of the proposed basement is considered to be very low to negligible. According to the local Surface Water Management Plan, the site is located within the Critical Drainage Area (CDA) 'Group4_010'. It is likely that a Flood Risk Assessment will be required by the local authority. Based on available desk study data, the potential hazard of flooding from rivers or sea, surface water, reservoirs, and sewers, is considered to be low to negligible. The area of the proposed development is indicated to be outside and circa 30m to the south of the London Underground (LU) exclusion zone of Piccadilly Line. Due to the distance from the exclusion zone it is not anticipated that consultation with the LU will be required, however, it is recommended that the LU is contacted to confirm matters.

Ground Investigation Findings	
Ground Conditions	Made Ground was encountered to about 0.50mbgl over London Clay Formation at depth, thus confirming the anticipated geology indicated by publicly available data of the British Geological Survey (BGS). As expected, thicker Made Ground was confirmed locally within foundation inspection pits due to past developments.
Groundwater Conditions	Groundwater was struck in TP1 during the site investigation at a depth of 1.40m bgl. Dry conditions were recorded in the boreholes. Groundwater monitoring undertaken on three occasions in November 2022, indicated resting groundwater between 0.20m and 4.45m bgl, within Made Ground and London Clay Formation. These readings are thought to represent local perched groundwater within the Made Ground and the rare more granular fractions of the London Clay Formation at depth.
Basement Impact Assessment	
Groundwater	This report concludes that there will be no impact to the wider hydrogeological environment and that groundwater flooding risk to neighbouring properties will not increase as a consequence of the proposed development.
Land Stability	Based on the results of the ground movement assessment, the maximum damage impact to surrounding buildings within the zone of influence has been marginally assessed as Burland Category 2 ('Slight'), however considering the moderately conservative nature of the ground movement analysis, Burland Category 1 'very slight' or less is expected for all walls analysed. The building damage results are anticipated to be within the limits set by the London Borough of Haringey as per standard practice across other boroughs of London. The ground movement analysis undertaken for the adjacent Braemar Avenue and New River footpaths, and Braemar Avenue highway, indicated vertical movements of up to 7mm near the eastern and western site boundaries; the ground movements are expected to be less than 2mm at a distance of c.15m away from the western site boundary and 3mm at a distance of 10m from the eastern boundary. Such movements are not anticipated to cause any significant impact on the adjacent footpaths, culverted watercourse, road or any utilities and infrastructure contained therein.
Surface Water	It is understood that a mitigation strategy will be discussed in detail in the site-specific Flood Risk Assessment (FRA) report and the SuDS report, which were under preparation at the time of writing. These reports were outside of the scope of this BIA. It is anticipated that due to marginal changes of the soft/hard landscaping proposed, the overall impact to the site's hydrology will be negligible.
Cumulative Impact	In summary, cumulative potential impacts have been identified in respect to hydrogeology, the stability of surrounding properties, and surface water flows, and effective measures have been proposed to mitigate these impacts where required. Overall, after the application of the proposed mitigation measures, the residual impact of the proposed basement will be negligible and within acceptable limits.
Geotechnical Conclusions & Recommendations	
The purpose of this assessment was to consider the effects of the proposed basement on the local hydrogeology, land stability and hydrology and impacts to neighbouring structures / properties.	

The potential impacts were highlighted (Section 4) and reviewed in light of the site investigation findings and geotechnical interpretation (Section 5), the construction methodology and the ground movement and damage assessment (Section 6).

The site investigation has identified the London Clay Formation to be a suitable founding stratum for the proposed foundations and floor slab. Geotechnical parameters have been presented in this report for design purposes.

The structural information indicates that the sequence of works will comprise construction secant or a contiguous piled wall. Based on the ground investigation findings and assessment a contiguous piled wall will be appropriate for the construction of the basement. Reinforced concrete liner walls will be cast to the face of the piled walls and will be monolithically cast with the basement slab. The basement slab will be working as a raft foundation. High and low level stiff temporary props will be installed during basement construction to resist lateral pressures in the short term. Floor slabs will act as stiff long term supports. Loads acting upon the basement slab of between 40.3 kN/m^2 and 164.2 kN/m^2 are proposed dependent upon areas of influence of point loads from columns.

Pre- and post-construction condition surveys of adjacent properties and assets that might be affected by the works are recommended.

A structural monitoring strategy to control the works and impacts to neighbouring structures is recommended.

Th temporary works should also make allowance for local management of any groundwater encountered during the basement excavation. It is understood that these items will comprise part of the temporary works specialist contractor construction method statement and design that shall be in place and agreed with all interested parties prior to construction commencing.

1.0 Introduction

1.1 Appointment & Scope

Chelmer Global Limited (CGL) was commissioned by Braemar Avenue Ltd (the 'Client') to undertake a Geotechnical Basement Impact Assessment (BIA) at Braemar Avenue Baptist Church, London, N22 7BY (hereafter referred to as the 'site'). The site is located within the London Borough of Haringey (LBH).

This BIA report has been undertaken in accordance with our fee proposal dated 19 October 2022, which was formally approved by the Client on 10 November 2022.

The purpose of this report is to consider the effects of the proposed basement development on the land stability, hydrogeology and local hydrology, and any potential impacts to neighbouring properties, assets and the wider environment. This report satisfies the requirements of LBH's Policy DM18 included in the 'Development Management DPD' dated July 2017 and the requirements of paragraphs 9.3, 9.4, and 9.6, of the 'Draft Basement Development Guidance Note' dated June 2012, with regard to the above matters.

The BIA approach follows current guidance for basement impact assessments adopted by LBH and other London Boroughs, such as Camden, and comprises the following elements:

- Desk Study (Section 3);
- Screening and Scoping (Section 4);
- Site Investigation and Geotechnical Interpretation (Section 5);
- Ground Movement and Damage Assessment (Section 6);
- Impact Assessment (Section 7).

1.2 Authors

This report has been prepared by Harry McAllister, Senior Geotechnical Consultant and Fellow of the Geological Society (FGS) of London. Harry has over 5 years of experience in geotechnical engineering in various types of residential, industrial and infrastructure projects.

This report has been reviewed by Christos Botsialas, Technical Director of Ground Engineering. Christos is a Chartered Engineer (CEng) of the Institution of Materials Minerals and Mining, a Chartered Geologist (CGeol) of the Geological Society of London, and RoGEP Specialist of the Institution of Civil Engineers (ICE). He has over 25 years of experience in Engineering Geology, Hydrogeology and Geotechnical Engineering in various types of ground and projects, including underground excavations for railway and motorway tunnels and basement residential or commercial projects in the UK and internationally. During his career Christos was author, reviewer and auditor of several BIA reports in Camden and other boroughs across the wider area of London.

1.3 Data Sources

This BIA is based on the following available sources of information, provided by the Client unless noted otherwise:

- [1] Site Location Plan, drawing ref.no.001, spacelab, May 2022;
- [2] Topographical Survey, drawings ref.no.TS-18-163M\1 (Plan), TS-18-163M\2 & TS-18-163M\3 (Elevations), terrain Land and Architectural Surveyors, April 2018;
- [3] Existing Plans, drawings ref.no.010 (Ground Floor), ref.no.012 to 015 (Elevations A to D), spacelab, May 2022;
- [4] Demolition Plans, drawings ref.no.020 (Ground Floor), ref.no.021 to 023 (Elevations A to C), spacelab, May 2022;
- [5] Proposed Development Plans, drawings ref.no.026 (Site Plan), ref.no.031 to 036 (Lower Ground Floor to Roof Plan), ref.no.040 to 043 (Elevation A to D), ref.no.044 (Section AA), spacelab, May 2022;
- [6] Planning Application Document, spacelab, August 2022;

- [7] Structural Engineering Report and Subterranean Construction Method Statement, Rev.P2 draft issue, Elliott Wood, 16/12/2022 (Annex B);
- [8] Proposed Foundations Plan, ref.no. 2220367 EWP ZZ SK S 1000 P1, Revised Structural Scheme, Proposed Basement Plan with Loadings Sketched, Elliott Wood, 07/12/2022 & Existing Superstructure Loads, plan ref.no. 2220367 EWP ZZ XX SK S 0002 P1 (Annex B);
- [9] Envirocheck Report, ref.no.303877391_1_1, Landmark, 14/11/2022 (Annex C);
- [10] Site walkover survey details and photos, Chelmer, November 2022 (Annex C); and
- [11] Site-specific factual ground investigation report, ref.no. FACT/12942, Chelmer Global Ltd, November 2022 (Annex D).

The above sources of information are referenced to in this report with their respective number.

This BIA report was conducted with due regard to the following guidance and standards:

- BS5930:2015 (+A1:2020) Code of Practice for Ground Investigations;
- BS EN 1997 Eurocode 7;
- 'Development Management DPD', Policy DM18: Residential Basement Development and Lightwells, LBH, July 2017;
- 'Development Management DPD', Policy DM26: Critical Drainage Areas, LBH, July 2017;
- 'Draft Basement Development Guidance Note', LBH, June 2012;
- Haringey Council Strategic Flood Risk Assessment (SFRA), Draft Report v.5, JBA Consulting, February 2015; and,
- Surface Water Management Plan (SWMP), Working Draft v2.0, LBH, 24/8/2011.

1.4 Significant Assumptions

This report presents CGL's observations, findings, and conclusions as they existed on the date that this report was issued. This report is subject to modification if CGL becomes aware of additional information after the date of issue of this report that is material to its findings and conclusions.

The reliability of information provided by others to TRC cannot be guaranteed to be accurate or complete. Performance of this Geotechnical BIA is intended to reduce, but not eliminate, uncertainty of the ground conditions associated with the subject site; therefore, the findings and conclusions made in this report should not be construed to warrant or guarantee the subject site, or express or imply, including without limitation, warranties as to its marketability for a particular use. CGL found no reason to question the validity of information received unless explicitly noted elsewhere in this report.

1.5 User Reliance

This report was prepared for Braemar Avenue Ltd. Reliance on this report by any other third party is subject to requesting and fully executing a reliance letter between CGL and the third party that acknowledges the CGL Standard Terms and Conditions with the Client, to the same extent as if they were the Client thereunder.

CGL has been provided with information from third parties for information purposes only and without representation or warranty, express or implied as to its accuracy or completeness and without any liability on such third parties part to revise or update the information. Where reliance has been provided by third parties to potential purchasers this is noted in our report.

2.0 Site Setting

2.1 Location

The site comprises an approximate 0.2ha plot of land located at Baptist Church, Braemar Avenue, Haringey, London, N22 7BY, centred on National Grid Reference 530480E, 190780N, located approximately 0.65km northwest from Wood Green London underground railway station.

A site location plan is presented as Figure 1 in Annex A.

2.2 Site Layout

The site comprises a rectangular parcel of land situated within an area of residential use. The site is currently occupied by a mixed-storey church building which is located centrally at the site and a two-storey tin tabernacle building which is situated to the immediate south of the main church building.

The church building comprises a traditional construction that consists of load bearing masonry walls, stone clad walls and suspended timber floors and roofs [7]. The existing building dates from 1907 and is a Grade II listed structure. According to available information [7], there are no obvious visible signs of significant movement or settlement to either this property or the directly adjoining buildings.

The site is bounded to the north by Bounds Green Road (A109), to the west by Braemar Avenue, to the east by New River Path and Nightingale Gardens, and to the south by a two-storey residential property with its associated rear garden.

Based on available topographical survey data [2], the site has an average elevation of approximately 36.50m above Ordnance Datum (aOD) in the area of the proposed development. Topographically the Site slopes gently downwards from south to north and from west to east.

A site walkover was undertaken by a representative of Chelmer Global Ltd on 6 December 2022. A set of pictures taken on that occasion along with the full site walkover details are attached in Annex C.

At the time of the visit, access to the site was directly from the footpath running parallel to Braemar Avenue Road. The site comprised a flat open parcel of land housing an irregular shaped multi-level Church with an unused and dilapidated rectangular shaped tin tabernacle building to the south. Braemar Avenue footpath formed the western boundary of the site, which was lined by tree stumps in the footpath and also several telegraph poles. The southern boundary was formed by a wooded 6ft high fence, which separated the church grounds from the residential property at 1 Braemar Avenue, which is a 2-storey, brick, semi-detached house immediately south of the site. The A109 forms the northern boundary of the site. The eastern boundary of the site consisted of a wooden fence with the New River Path and Nightingale Gardens park immediately beyond.

A lower ground floor level was indicated to be present at the rear of the church during the site walkover, however no other details were available at the time of writing.

Manhole covers and access to a drainage system were evident within the southwestern corner of the site, close to the entrance of the tabernacle.

2.3 Existing Trees

According to the available topographical survey data [2], several trees are situated on site or in the proximity comprising oaks, sycamores, elders, ashes, cherries with heights ranging from 4m to 18m.

It is understood [7] that an arborist's report is yet pending to be prepared for the site. Such a report was not available to CGL at the time of writing of this BIA.

At the time of the site reconnaissance, a large Sycamore tree of particular interest was noted within the southeast corner of the site, which not only disrupted the eastern boundary fence but also appeared to be damaging the foundations associated with the existing dilapidated tabernacle structure. Several trees approximately 8-10m high were noted in the landscaped area surrounding the church. Two approximately 8m high trees, thought to be a Fruit and Elder, were also noted close to the northwest corner of the main church building, just inside the western boundary.

2.4 Surrounding Area

The site is surrounded by two and three-storey residential properties along Braemar Avenue to the west and south, Nightingale Gardens to east with the New River Path and the culverted river underneath.

The residential property with its associated rear garden located at No 1 Braemar Avenue, is an end of terrace brick construction two-storey house with attic space.

During the time of the site visit, the property at number 1 Braemar Avenue appeared to be in a good structural condition with no obvious evidence of any structural damage.

2.5 Proposed Development

Based on available architectural drawings [5], the proposed development will comprise demolition of the existing prayer room and the two-storey tin clad tabernacle building in the south and construction of a five-storey residential building with a single-storey basement to house a block of flats, a church lounge and a hall. The proposed development will also include landscaping works comprising planting of a number of trees and hard landscaping for cycle parking.

The proposed basement will be a single-storey basement placed mainly under the footprint of the original tabernacle building and partly under the demolished parts of the existing church. A number of lightwells are proposed in the west, south and east. An excavation circa 4.5m deep will be required to accommodate the construction of the new basement, and lightwells.

According to the available structural information [7], the basement is proposed to be constructed using a secant or a contiguous piled wall. Reinforced concrete liner walls will be cast to the face of the piled walls and will be monolithically cast with the basement slab. The basement slab will be working as a raft foundation. High and low level stiff temporary props will be installed during basement construction to resist lateral pressures in the short term. Floor slabs will act as long term stiff supports.

3.0 Desk Study

3.1 Site History

Information relating to the site's history has been obtained by reference to historical Ordnance Survey maps included in the Envirocheck Report [9] and aerial images from Google Earth. This information is summarised in the Table below.

Table 1: Summary of Historical Mapping

Date (Scale)	On-Site Activities	Off-Site Activities (within ~ 200m)
1868-1873 (1:10,560)	The majority of the site is shown as open undeveloped land, with a NW-SE unnamed road (current Bounds Green Road) crossing the northern-most part of the site. A row of trees is shown on the southern road boundary.	Open undeveloped land and orchards to the west, south and east. Commerce Road, Finsbury Road, and Nightingale Road already formed at the north.
1879 (1:2,500)	No significant change.	No significant change.
1894-1895 (1:1,056)	A footpath is shown along the eastern site boundary. Bounds Green Road is shown named at the north.	No significant change in the immediate west, south, and east. Nightingale Hall shown at c.100m west. Significant residential development of the areas to the north and east at distances of c.50-75m and beyond.
1896 (1:2,500)	No significant change.	Palace Gates Railway Station shown c.140m to the southwest.
1914 (1:2,500)	Church and Hall shown on-site approximately with their current layout.	Braemar Avenue terraced residential properties shown fully built to the south and west. Tramway lines shown along Bounds Green Road to the north. Nightingale Gardens shown to the immediate east.
1935 (1:2,500)	No significant change.	No significant change.
1955-57 (1:1,250)	Church and Hall shown on-site with their current layout after minor structural alterations.	Nightingale Gardens in the east shown with their current layout.
1955-1979 (1:1,250)	No significant change.	No significant change.
1989-1990 (1:1,250)	No significant change.	No significant change.
1991 (1:1,250)	No significant change.	No significant change.
1999 (1:10,000)	No significant change.	No significant change.
2022 (1:10,000)	No significant change.	No significant change.

In summary, historical mapping indicates that the site has been open undeveloped until early 1900's when the church building and hall were constructed at the position they appear today.

3.2 Geology

The following information has been reviewed:

- The British Geological Survey (BGS) geological map, sheet number 256, North London, Bedrock and Superficial Deposits, scale 1:50,000, 2006;
- The BGS website;
- The 'Geology 1:10,000 Maps Legends' included in the Envirocheck Report [9];
- The nearest BGS historic boreholes with reference no. TQ39SW651 (c.450m NW), TQ39SW355 (c.450m SE) (Annex C), drilled within similar ground conditions;

Based on the above information, the site is likely underlain by London Clay Formation. Some Made Ground is anticipated to be present due to past developments.

The site's geology is summarised in the Table below.

Table 2: Summary of Anticipated Geology

Stratum	Depth to Base (m bgl)	Depth to Base (m aOD) ¹	Thickness (m)	Typical Description
Made Ground	0.50	36.00	0.50	Heterogeneous mix of sandy, gravelly clay, or clay gravel and sand, with anthropogenic inclusions including brick and concrete fragments and obstructions.
London Clay Formation	43.10	-6.60	42.60	Brown grey to blue grey, silty to very silty clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand. Thin beds of black rounded flint gravel occurs in places.
Lambeth Group	>43.10	<-6.60	Unknown	Variable sequences of clay, some silty or sandy, with sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate.

1. Assuming a ground level of 36.50m aOD in the area of the proposed development

Made Ground was not shown on the geological maps consulted, however a variable thickness of Made Ground is anticipated on site due to past developments.

The Envirocheck report indicates 'very low' hazard to 'no hazard' for collapsible ground, compressible ground, ground dissolution, ground stability and running sand. A 'moderate' hazard is indicated for shrinking or swelling of clay, likely associated with the anticipated presence of London Clay Formation at this site. The Envirocheck report indicates that the site is not within an area affected by mining activities.

The potential hazards above are further investigated and discussed in this report by considering and evaluating the results of the site-specific ground investigation. Mitigation measures are proposed where appropriate.

3.3 Seismicity

The national foreword to BS EN 1998-1:2004+A1:2013 'Eurocode 8: Design of Structures for Earthquake Resistance – Part 1' states that there are no requirements in the UK to consider seismic loading, and the whole of the UK may be considered an area of very low seismicity in which the provisions of EN 1998 need not apply.

3.4 Hydrogeology

British Geological Survey (BGS) geological mapping and Environment Agency (EA) hydrogeological mapping indicate the following hydrogeological information for the Site:

Table 3: Summary of Hydrogeology

Geology	Geological Description	Aquifer Status	Aquifer Description
Bedrock Deposits: London Clay Formation	Clay and Silt	Unproductive Strata	Rock layers with low permeability that have negligible significance for water supply or river base flow.

The Envirocheck report and the gov.uk flood risk website (<https://www.gov.uk/check-long-term-flood-risk>) indicate that the Site is not susceptible to groundwater flooding, as expected due to the anticipated presence of the relatively impermeable London Clay Formation.

Historical BGS borehole data, indicated the presence of random groundwater at 7m depth within the London Clay Formation possibly associated with small pockets and partings of sand or claystone bands.

The potential hazard of groundwater flooding of the proposed basement is considered to be very low to negligible.

3.5 Hydrology

The hydrology of the Site is summarised in the Table below.

Table 4: Summary of Hydrology

Type	Distance (m)	Description	Reference
Surface Water Feature	8m E	New River (inland culverted river)	Envirocheck report
Flooding (Rivers or Sea)	On-Site	Very Low Risk (Zone 1)	https://www.gov.uk/check-long-term-flood-risk as of 23/11/2022
Flooding (Surface Water)	On-Site	Low Risk	https://www.gov.uk/check-long-term-flood-risk as of 23/11/2022
Flooding (Reservoirs)	On-Site	No Risk	Envirocheck report [9] and https://www.gov.uk/check-long-term-flood-risk as of 23/11/2022
Flooding (Sewers)	N22 7 postcode	Only 1 property within N22 7 postcode is indicated with issues due to sewer flooding in the past (pre 2010 data) – Low Risk	LBH SWMP

According to the local SWMP, the site is located within the Critical Drainage Area (CDA) 'Group4_010'. It is likely that a Flood Risk Assessment will be required by the local authority for the proposed development at the subject site. However, based on the available hydrological data as shown in the Table above, the

potential hazard of flooding from rivers or sea, surface water, reservoirs, and sewers, is considered to be low to negligible.

3.6 Tunnels and Infrastructure

The area of the proposed development is indicated to be outside and circa 30m to the south of the London Underground (LU) exclusion zone of Piccadilly Line based on information presented in <https://tfl.maps.arcgis.com/> (visited on 24/11/2022). Due to the distance from the LU exclusion zone it is not anticipated that consultation with LU will be required for the needs of the proposed development. However, it is recommended that the LU is contacted to confirm matters.

At the time of writing, no underground utilities plans were available for Braemar Avenue highway and nearby footpath to the west and the culverted New River to the east.

The above review does not constitute a formal review of all buried utilities and infrastructure that may be present in the vicinity of the site.

3.7 Planning Records

Haringey's planning portal was searched for any past applications relevant to a basement construction pertinent to the Site or neighbouring properties in Braemar Avenue. No such applications were found, although the search was not exhaustive and was limited to the immediate area to the site.

4.0 Screening and Scoping Assessment

4.1 General

A screening assessment has been undertaken, to assist with the identification of potential hazards related to the proposed basement development. The purpose of the screening assessment is to identify whether there are any potential issues which would require a more detailed investigation to determine potential impacts from the proposed development.

Further, a description of the potential impact for each of the elements identified during the screening assessment and recommended actions to deal with them, has been undertaken during a scoping assessment.

The robust methodology of screening and scoping assessment required by 'Camden Planning Guidance Basements (CPGB)', dated January 2021, has been adopted. The guidance has been modified appropriately to suit the subject site and the requirements of the local planning authority (LBH).

4.2 Screening Assessment

4.2.1 Subterranean / Groundwater Flow

The groundwater screening assessment is presented in the Table below.

Table 5: Subterranean (Groundwater) Screening

Question	Response	Details	Further Action Required
1a. Is the site located directly above an aquifer?	No	London Clay Formation is anticipated to be encountered on-site which classifies as Unproductive Strata.	None
1b. Will the proposed basement extend beneath the water table surface?	Unknown	Historical BGS borehole data from the surrounding area, indicated the presence of groundwater at 7m depth within the London Clay Formation possibly associated with random small pockets of sand or claystone bands. Some limited shallow groundwater may also be present if considerable Made Ground is present. It is unknown at this stage whether any groundwater will be present in the area of the proposed basement.	Carry forward to the scoping stage.
2. Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	Yes	The nearest surface water feature is 'New River' which is an inland culverted river situated about 8m to the east of the site.	Carry forward to the scoping stage.
3. Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	Yes	The proposed hardstanding is anticipated to increase compared to current status.	Carry forward to the scoping stage.

Question	Response	Details	Further Action Required
4. As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	Yes	A larger proportion of hardstanding areas as part of the proposed development means that there may be an increase of surface water that needs to be discharged to the ground.	Carry forward to the scoping stage.
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 or spring line?	No	Based on desk study data there is no local pond or spring line in the proximity.	None

4.2.2 Land Stability

The land stability screening assessment is presented in the Table below.

Table 6: Land Stability Screening

Question	Response	Details	Further Action Required
1. Does the existing site include slopes, natural or man-made greater than 7° (approximately 1 in 8)?	No	Available topographical survey data indicate near level ground in the area of the proposed development.	None
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7° (approximately 1 in 8)?	No	The proposal does not involve change of slopes at the property boundary.	None
3. Does the development neighbour land, includes railway cuttings and the like, with a slope greater than 7° (approximately 1 in 8)?	No	The development does not neighbour land with a slope greater than 7°.	None
4. Is the site within a wider hillside setting in which the general slope is greater than 7° (approximately 1 in 8)?	No	The site is not within a wider hillside setting.	None
5. Is the London Clay Formation the shallowest strata at the site?	Yes	Based on available desk study data the shallowest strata at the site is anticipated to be the London Clay Formation.	Carry forward to the scoping stage.
6. Will any trees 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?	Yes	It is anticipated that trees will be removed on the east side of the site [7].	Carry forward to the scoping stage.

Question	Response	Details	Further Action Required
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	No	There are no known relevant historical data or any indication of shrink swell subsidence effects in the local area.	None
8. Is the site within 100m of a watercourse or a potential spring line?	Yes	The nearest surface water feature is 'New River' which is an inland culverted river situated 8m to the east of the site.	Carry forward to the scoping stage.
9. Is the site within an area of previously worked ground?	No	Some limited Made Ground may be present on site due to past developments, however, extensive worked/made ground is not anticipated at this site.	None
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?	Unknown	The site is located within the Unproductive Strata of London Clay Formation. However, some limited groundwater may be present within small sandy pockets or claystone bands in the London Clay Formation or within any shallow Made Ground, if present. It is unknown at this stage whether any groundwater will be present in the area of the proposed basement.	Carry forward to the scoping stage.
11. Is the site within 5m of a highway or pedestrian right of way?	Yes	The site is within 5m of the pedestrian footpath and Braemar Avenue highway to the west, and New River Path to the east.	Carry forward to the scoping stage.
12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	The proposed basement is anticipated to increase the differential depth of foundations relative to the on-site church building to the north and the neighbouring building at no.1 Braemar Avenue to the south.	Carry forward to the scoping stage.
13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	The TFL asset map indicates that the proposed development is outside and circa 30m to the south of the London Underground (LU) exclusion zone of Piccadilly Line.	None

4.2.3 Surface Flow and Flooding Screening

The surface flow and flooding screening assessment is presented in the Table below.

Table 7: Surface Flow and Flooding Screening

Question	Response	Details	Further Action Required
1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	Surface water flows will not materially change from existing route.	None
2. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	The proposed development is anticipated to provide an increased proportion of hardstanding at the site.	Carry forward to the scoping stage.
3. 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	The profile of the inflows of surface water being received by adjacent properties is not anticipated to significantly change.	None
4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	The proposed development is not anticipated to adversely impact the quality of surface water.	None
5. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	Yes	The site is located within the Critical Drainage Area (CDA) 'Group4_010' in accordance with the local SWMP.	Carry forward to the scoping stage.

4.2.4 Summary of the Screening Assessment

The screening assessment has identified the following issues that need to be carried forward to the scoping stage for further assessment:

- The site is underlain by the Unproductive Strata of London Clay Formation; however, the proposed basement may encounter some local groundwater within shallow Made Ground, if present, and localised sandy pockets and claystone bands within the London Clay Formation at depth. Some local dewatering may be required;
- The nearest surface water feature is 'New River' which is an inland culverted river situated about 8m to the east of the site. The potential impact of the proposed development to this asset will need to be assessed;
- The proposed development is expected to increase the proportion of hardstanding at the site. Any potential impact, including any additional surface water needed to be discharged into the ground, should be assessed;

- The shallowest stratum at the site is anticipated to be the London Clay Formation. The potential impact due to the basement excavation on surrounding structures associated with the engineering behaviour of the stratum should be assessed;
- It is anticipated that trees will be removed on the east side of the site. Any potential impact with regard to tree root zones should be assessed;
- The site is within 5m of the pedestrian footpath and Braemar Avenue highway to the west, and New River Path culvert structure to the east. Any potential impact of the proposed development to these assets should be assessed;
- The proposed basement is anticipated to increase the differential depth of foundations relative to the on-site listed church building to the north and the neighbouring building at no.1 Braemar Avenue to the south. Any potential impact due to the proposed basement excavation should be assessed;
- The site is located within the Critical Drainage Area (CDA) 'Group4_010' in accordance with the local SWMP. Any potential flooding issues should be assessed in accordance with LBH policies.

The other potential hazards presented within the screening assessment have all been demonstrated to be not applicable or not significant when applied to the proposed development and are not considered further in this report.

4.3 Scoping Assessment

A description of the potential impact for each of the elements identified during the screening assessment and recommended actions to deal with them are presented in the Table below.

Table 8: Scoping Assessment

Screening Item	Potential Impact	Actions
The proposed basement may encounter some limited groundwater within shallow Made Ground and localised sandy pockets and claystone bands within the London Clay Formation at depth. Some local dewatering may be required.	The basement excavations may encounter some local groundwater. Water ingress can make working conditions difficult and in some cases may cause ground instability in excavations during construction, if not appropriately addressed.	A ground investigation (GI), including groundwater monitoring, needs to be undertaken to determine the presence of any groundwater within the geological sequence. The groundwater monitoring will inform the basement design and construction risk assessment. The results of the GI and assessment of the information collected are discussed in Sections 5 and 7 of this report.
'New River', an inland culverted river is situated about 8m to the east of the site.	The excavation of the basement may result in ground movements detrimental to this asset.	A ground movement assessment (GMA) should be undertaken to determine potential impact of the proposed basement excavation. The assumptions and results of the GMA are discussed in Section 6 of this report. Any mitigation measures if required are presented in Section 7 of this report.

Screening Item	Potential Impact	Actions
The proposed development is expected to increase the proportion of hardstanding at the site. Any relevant potential impact, including any additional surface water might be needed to be discharged into the ground, should be further assessed.	The increase of hardstanding will likely increase the surface water run-off from the site and may increase the infiltration needs into the ground.	It is understood [7] that a Flood Risk Assessment (FRA) and a SuDS report have been prepared by the applicant's Engineer which demonstrate how any increased surface water will be managed, including proposed SuDS features incorporated in the drainage strategy. An FRA and a SuDS assessment are outside of the scope of this report and therefore this matter is not considered any further.
The shallowest stratum at the site is anticipated to be the London Clay Formation. The potential impact due to the basement excavation on surrounding structures associated with the engineering behaviour of the stratum should be assessed.	The construction of a basement in the London Clay Formation may result in ground movements detrimental to nearby buildings, roads, pathways and any infrastructure contained therein.	The engineering properties and behaviour of London Clay Formation should be investigated and assessed by means of a site-specific GI. A GMA and a building damage assessment should be undertaken to determine potential impact on surrounding structures. The assumptions and results of the GI and the GMA are discussed in Sections 5, 6 and 7 of this report.
It is anticipated that trees will be removed on the east side of the site [7]. Any potential impact with regard to tree root zones should be assessed.	The basement excavation may fall within the root area of existing trees that are proposed to remain or may affect areas which include tree protection orders. The presence of tree roots within the proposed groundworks area may affect foundation design.	It is understood [7] that an arboricultural report has not been appointed yet and that any matters that may have an adverse impact on the retained trees will be assessed and dealt with at a later stage during the final design in order to co-ordinate proposed groundworks with potential root protection areas. As such, these matters are not considered further in this report. Any potential foundation design matters are discussed in Section 5 of this report.
The site is within 5m of the pedestrian footpath and Braemar Avenue highway to the west, and New River Path to the east. Any potential impact of the proposed development to these assets should be assessed.	The construction of a basement can result in ground movements detrimental to roads, pathways and any infrastructure contained therein.	Such matters will need to be considered in the design of the basement and an estimate of likely ground movements made. A GMA including a damage assessment following the guidance of CIRIA C760 report has been undertaken and is presented in Section 6 of this report. Mitigation measures, if required, are discussed in Section 7 and should be considered during the final design.

Screening Item	Potential Impact	Actions
The proposed basement is anticipated to increase the differential depth of foundations relative to the on-site listed church building to the north and the neighbouring building at no.1 Braemar Avenue to the south. Any potential impact due to the proposed basement excavation should be assessed.	There is the potential for the neighbouring foundations to be subjected to ground movements during the works resulting in damage to the structures.	A GMA including a damage assessment following the guidance of CIRIA C760 report has been undertaken and is presented in Section 6. Mitigation measures, if required, are discussed in Section 7 and should be considered during the final design.
The site is located within the Critical Drainage Area (CDA) 'Group4_010' in accordance with the local SWMP. Any potential flooding issues should be assessed in accordance with LBH policies.	Potential flooding issues due to the site being located in the CDA should be addressed for the proposed development.	It is understood [7] that a Flood Risk Assessment and a SuDS report have been prepared by the applicant's Engineer which demonstrate how the surface water will be managed, including proposed SuDS features incorporated in the drainage strategy for the proposed development. An FRA report and a SuDS assessment are outside of the scope of this report and therefore this matter is not considered any further.

A detailed assessment of the impacts and associated mitigation measures are presented in Section 7 of this report.

5.0 Site Investigation and Geotechnical Interpretation

5.1 Site Investigation and Soil Profile

In order to confirm the ground conditions beneath the site and to collect soil samples for testing for determining the engineering properties of the strata, a ground investigation was designed and undertaken by Chelmer Global Ltd on 30th of November 2022. The factual ground investigation report is attached in Annex D.

The site works comprised the following:

- 1 No. borehole (BH1) to a maximum depth of 15m bgl;
- 2 No. hand auger boreholes (BH2, BH3) to a depth of 3m bgl; and;
- 5 No. foundation inspection pits (TP1 to TP5) excavated by hand or a mini-excavator to a maximum depth of 2.40m bgl.

These were followed by three rounds of gas and groundwater monitoring visits undertaken on 19/11/2022, 23/11/2022 and 30/11/2022.

A detailed description of all the strata encountered, position and types of samples and in-situ tests undertaken along with any groundwater observations made at the time of drilling are included on the borehole and trial pit logs in the factual report in Annex D.

The ground conditions encountered generally comprised Made Ground over London Clay Formation at depth. The general distribution of each stratum is shown in the Table below.

Table 9: Ground Profile

Stratum	From	To	Thickness (m)
	m bgl	m bgl	
Made Ground	0	0.50	0.50
London Clay Formation	0.50	>15.00	>14.50

The Made Ground was found to be brown, soft, with variable composition with the primary constituent comprising either clay or silt with clinker, concrete and brick fragments. With the exception of TP3 and TP4 where live roots 4mm in diameter were observed at shallow depth, no roots were recorded elsewhere within the Made Ground. As expected, thicker Made Ground was encountered within the foundation inspection pits due to past developments. The base of the Made Ground was not encountered in TP2 to at least 2.30m depth; the significant thickness of Made Ground at this location is likely associated with the local presence of a lower ground floor feature as indicated by the available survey data and the site walkover findings. No Standard Penetration Tests (SPT) were undertaken in Made Ground due to its relatively shallow depth and small thickness. Two moisture content and two Atterberg limits tests were undertaken in the laboratory on samples retrieved from Made Ground.

The London Clay Formation was generally encountered as firm to stiff becoming very stiff with depth, orange brown to grey clay locally with partings of silt and sand. Claystone and selenite crystals were noted locally. Ten SPTs and ten hand shear vane tests were undertaken in the London Clay Formation. With the exception of TP3 and TP4 where live roots 3mm in diameter were observed at shallow depths (top 1m), no roots were recorded elsewhere within the London Clay Formation. Twenty moisture content, thirteen Atterberg limits and two pH and sulphate laboratory tests were undertaken on samples retrieved from London Clay Formation. According to the available ground investigation report [11], no undisturbed samples were retrieved from the ground and no triaxial or oedometer laboratory testing was undertaken in London Clay Formation.

Groundwater was encountered during the site investigation within TP1 at the base of the pit (1.4m bgl). Dry conditions were recorded in the remaining exploratory holes during the ground investigation.

Groundwater monitoring was undertaken on three occasions where resting groundwater levels were recorded at depths of between 0.20m and 4.45m bgl in all three installed boreholes. These readings are thought to represent local perched groundwater within the Made Ground and the rare more granular fractions of the London Clay Formation at depth.

5.2 Geotechnical Assessment

The geotechnical assessment and design parameters recommended in this Section, have been determined based on the findings of the ground investigation report (Annex D), published standards and guidance (BSI, CIRIA) as referenced, use of empirical relationships which have been widely used and accepted in the UK, and on CGL's experience on similar projects and ground conditions.

A plot of all the SPT N_{60} values versus depth obtained from the site investigation is presented as Figure 2 in Annex A.

The exploratory holes confirmed the Made Ground to comprise a heterogeneous mix of cohesive and granular materials. The Made Ground was described as soft to 'medium compact' within the exploratory hole logs. No SPTs were conducted in the stratum due to the relative shallow depth that was encountered at the Site.

Two Atterberg limits tests undertaken on samples of Made Ground resulted in liquid limit values of 73%, plastic limit values of 29% and 31%, and modified plasticity index values of 39% & 42%, indicating a medium to high volume change potential soil of very high plasticity. Two moisture content tests produced results of 36% and 39%.

Based on experience with similar ground conditions, an angle of shearing resistance, ϕ' , of 27° can be assumed for Made Ground for retaining wall design. A Young's Modulus (E_u) of 5MPa can be assumed based on a typical value for 'urban old fill', as given in Tomlinson 'Foundation Design and Construction'.

Atterberg limits tests undertaken on samples of London Clay Formation resulted in liquid limit values between 69% and 74%, plastic limit values between 28% and 32%, and modified plasticity index values between 36% and 43%, indicating a medium to high volume change potential soil of high to very high plasticity. Moisture content ranged between 28% and 35%. The results are not indicative of a moisture content deficit at proposed basement level, and therefore, no shrink/swell effects are anticipated from desiccation in this stratum in the short or long-term for the proposed foundations and basement floor slab.

Ten SPTs conducted in the boreholes within the London Clay Formation between 1m and 15m bgl, yielded uncorrected SPT N values between 6 and 26, and SPT N_{60} values between 7 and 32. Values for undrained shear strength, C_u , have been estimated using an empirical relationship between C_u and N_{60} values. A value of 4.5 as a ratio between C_u and SPT N_{60} was considered appropriate (after Stroud and Butler, 1975), based on experience and the plasticity index results. In-situ hand shear vane tests in London Clay Formation yielded C_u values between 73kPa to 140Pa. A plot of the C_u values versus depth is presented as Figure 3 in Annex A.

Considering the proposed basement reinforced raft foundation will be cast into the London Clay Formation at about 4.5m depth (c.32m aOD) and considering dry conditions or a long-term water table generally below the foundation level, an allowable bearing capacity (ABC) of 150kN/m² is recommended for the stratum. Assuming the foundation loads are limited to the bearing capacity value provided in this report the foundation settlement will be less than 50mm for the proposed basement raft. Should less settlement needed to be tolerated by the superstructure or more ground bearing capacity be required or for any other structural purpose might be needed, then the local introduction of piles below heavily loaded columns could be considered during the design stages to mitigate any issues.

With reference to Figure 3 in Annex A, the following characteristic (cautious estimate) undrained shear strength profile is considered appropriate for London Clay Formation, for design purposes:

$$C_u = 30 + 7.86z \text{ in KPa,}$$

where z is the depth below the top of London Clay Formation at 0.50m bgl and up to 15m bgl.

Undrained and drained Young's Modulus values of $E_u=500C_u$ and $E'_d=0.77E_u$ (in KPa) are recommended respectively for London Clay Formation.

On this basis, suggested soil parameters for the design of the basement are provided in the Table below.

Table 10: Retaining Wall Design Parameters

Stratum	Bulk Unit Weight (kN/m³)	Shear Strength			Young's Modulus (MN/m²)	
		Effective Angle of Friction ϕ' (°)	Effective Cohesion c' (kN/m²)	Undrained Shear Strength C_u (kN/m²) ¹		
					Undrained ¹	Drained ¹
Made Ground	18	27	0	-	5	3.85
London Clay Formation	20	24	1	30+7.86z	15+3.93z	11.55+3.02z

1. Where z is the depth at 0.50m below ground level for London Clay Formation and up to 15m depth.

A Poisson's ratio of $\nu_u=0.5$ and $\nu_d=0.2$ is proposed as a good approximation for undrained (short-term) and drained conditions (long-term) for both strata.

A contiguous concrete piled retaining wall solution incorporated into the final structure and founded in the London Clay Formation will be suitable for the construction of the proposed basement. Some perched groundwater should be anticipated within Made Ground or at the interface of Made Ground and London Clay Formation or locally within London Clay Formation, however it can be dealt with by localised pumping during construction. Stiff temporary propping at high and low levels will be required during construction due to the sensitivity of nearby structures as discussed further in the following section.

It is recommended that the retaining wall is designed with close liaison between the designer and the main contractor with respect to sequencing, propping and tolerable ground movements.

The wall designer may wish to adopt alternative parameters to those given above, especially in relation to the construction phase (temporary works), which is likely to be the governing case for design.

For retaining wall design a ground water level at 1mbgl is considered best practice in the long term. Allowance for buoyancy effect and pressure at the underside of the basement floor slab due to possible groundwater level rise and waterproofing of the basement is proposed in order to deal with potential long-term water presence during the design life of the development.

Further, the excavations required for the new basement are anticipated to be within the high plasticity London Clay Formation. For design purposes, it can be assumed that 50% of the anticipated heave due to the unloading of the stratum will occur in the short-term during construction. The remaining 50% percent will occur in the long term and will induce an estimated uplift pressure of 45kN/m² at the underside of the basement floor slab. This heave pressure will need to be taken into account during the design of the basement slab and is in addition to the groundwater pressure discussed in the previous paragraph. For the

calculation of the heave pressure a maximum excavation of 4.50m has been assumed for the new basement.

Should any foundation piles be installed, sufficient tensile reinforcement should be allowed to safeguard against tensile failure due to heave induced tension anticipated within London Clay Formation. In that case, any pile caps installed will also be subject to the uplift pressures discussed previously for the basement slab and this should be considered in the design.

Based on the ground investigation findings to date, some groundwater does rest at levels within the proposed excavation zone. The groundwater monitoring indicated the presence of perched groundwater at the site at depths of between 0.20m and 4.45m bgl. Generally dry conditions are anticipated during construction, however, it will be prudent to make allowance for some limited pumping from sumps during construction to control the confirmed local presence of groundwater within the more permeable zones of London Clay Formation and any shallow perched water within Made Ground.

With reference to BRE Digest SD1 (2005), the results indicate Design Sulphate Class DS-2 for London Clay Formation. An ACEC AC-2 Class is indicated for concrete to be installed within London Clay Formation, assuming mobile groundwater conditions, as per the site investigation findings. However, a sample recovered from London Clay Formation (BH1 at 12m bgl) is indicative of pyritic conditions and with reference to BRE Digest SD1 (2005 Ed), the calculated total potential sulphate of 1.614% warrants an increase to DS-4 and AC-4 for London Clay Formation should the stratum be exposed to surface conditions.

Overall, for the London Clay Formation a Design Sulphate Class of DS-4 and an ACEC AC-4 Class are recommended for any buried concrete within the stratum due to exposure of the stratum to surface conditions for the basement construction. For any cast in-situ piles, if required, where London Clay Formation will not be exposed to ground surface conditions a Design Sulphate Class of DS-2 and an ACEC AC-2 Class are recommended. These recommendations are in accordance with the provisions of BRE Digest SD1 (2005) (Box C8). For any buried concrete structure placed at depth greater than 12m bgl, deeper investigation data will be required to confirm appropriate buried concrete classes.

6.0 Construction Methodology and Ground Movement Assessment

6.1 Sequence of Works and Temporary and Permanent Works Proposals

This Section provides a summary of the structural proposal for the proposed basement and shall be read in conjunction with drawings and structural information attached in Annex B.

The proposed basement will be a single-storey basement placed mainly under the footprint of the original tabernacle building and partly under the demolished parts of the existing church. A number of lightwells are proposed in the west, south and east. An excavation circa 4.5m deep will be required to accommodate the construction of the new basement, and lightwells.

According to the available structural information [7], the perimeter of the basement is proposed to be constructed using a piled wall. As discussed in the previous section, a contiguous piled wall would be appropriate for this site provided some allowance for pumping of localised groundwater is made. Reinforced concrete liner walls will be cast to the face of the piled walls and will be monolithically cast with the basement slab. The basement slab will be working as a raft foundation and according to the structural proposal [7] it will be 400mm thick. High and low level stiff temporary props will be installed during basement construction to resist lateral pressures in the short term. The floor slabs will act as stiff long-term supports. Loads acting upon the basement slab of between 26.60kN/m² and 164.20kN/m² are proposed as shown in Annex B.

The details of the construction sequence for the proposed piled walls for the basement construction along with the proposed loadings are shown in the drawings attached in Annex B.

Although not detailed in the structural drawings available, steel waling beams, temporary props, and local props are recommended to support the basement excavations during construction. Temporary works should also make allowance for local management of any groundwater encountered during the excavation. It is understood that these items will comprise part of the temporary works specialist contractor construction method statement and design that shall be in place and agreed with all interested parties.

6.2 Ground Movement and Damage Assessment

6.2.1 Methodology

The structural proposal and construction phasing discussed in the previous Section has been considered in the Ground Movement Assessment (GMA) to address key construction stages.

As a first step, the ground movements from excavation and proposed construction loadings have been analysed using Oasys PDisp software. The project's structural engineers provided drawings (Annex B) detailing the proposed foundation arrangement and loadings for the proposed basement slab and columns. The provided information was used to estimate the net changes in vertical loadings due to the unloading caused by the demolition and the proposed excavations, and due to the proposed new foundations. Short (undrained) and long-term (drained) ground movements have been analysed using Mindlin method. The results are discussed in detail in section 6.2.2.

Further, the ground movements due to the construction of the contiguous piled wall, were considered together with the excavations required in front of the walls. Oasys XDisp software was used with reference to CIRIA C760 report in order to estimate the anticipated damage category both in the short and the long-term. The details of the assumptions and methodology adopted and the results of XDisp software are discussed in section 6.2.3.

6.2.2 Ground Movements Due to Net Changes in Vertical Loadings – PDisp Software

PDisp software was used to determine the likely movements anticipated as a result of the combination of unloading due to demolition, the excavation of the basement, and the application of the proposed structural loads both in the short and long-term.

The following three scenarios were considered appropriate to explore during the PDisp analysis:

- Short-term analysis due to demolition and basement excavation;
- Short-term analysis due to demolition, basement excavation and superstructure proposed loadings;
- Long-term analysis due to demolition, basement excavation and superstructure proposed loadings;

The analysis indicated peak short-term heave movements of circa 40mm occurring at about the centre of the proposed basement. Peak long-term settlement of circa 15mm is anticipated in the centre of the proposed basement.

Displacement lines were drawn from the edge of the proposed basement excavation beneath the church building to the north, the neighbouring property located at 1 Braemar Avenue to the south, across the highway (Braemar Avenue) and associated footpath to the west, and New River Path to the east.

For the church building, the maximum short-term and long-term heave movement at the wall nearest to the edge of the excavation will be about 16mm and 2mm, respectively. The short-term and long-term heave reduces to about 0mm at the far side of the church building.

For 1 Braemar Avenue, the maximum short-term heave movement at the wall nearest to the edge of the excavation will be about 11mm the maximum long-term settlement movement will be less than 3mm, respectively. The short-term and long-term movement both reduce to about 1mm at the far side of the property.

The maximum short-term heave at the nearest part of the adjacent footpath and highway (Braemar Avenue) to the excavation is anticipated to be less than 6mm, reducing to less than 1mm about 11m away from the edge of excavation. The maximum long-term heave at the nearest part of the adjacent footpath and highway to the excavation is anticipated to be less than 2mm.

The maximum short-term heave at the nearest part of the New River Path to the excavation is anticipated to be less than 6mm, reducing to less than 2mm about 8m away from the edge of excavation. The maximum long-term settlement at the nearest part of the New River Path to the excavation is anticipated to be less than 1mm.

It is noted that the long-term movements calculated by PDisp include the short-term movements.

A summary of the PDisp software output and displacement lines discussed above, are presented in Annex E.

As discussed in the following Section, ground movements resulting from the net changes in soil loading occur along with other ground movements which are associated with the construction of the walls and the excavation in front of the walls.

6.2.3 Ground Movements Due to Walls Installation and Excavation in Front of the Walls – XDisp Software

XDisp software was used to undertake the assessment of the vertical and horizontal movements caused by the installation of the proposed walls and the subsequent excavation in front of the walls.

Also, reference has been made to CIRIA C760 'Guidance on embedded retaining wall design' (London, 2017) in order to provide the basis for the estimation of the anticipated ground movements resulting from the installation of the walls and the excavation of the soils in front of the walls. CIRIA C760 provides guidance on the horizontal and vertical movements of the soil adjacent to an embedded retaining wall for both high stiffness (high propped) and low stiffness (cantilevered or low-stiffness temporary props or props

at low level) walls. In this instance, it is understood that the construction sequence, and temporary and permanent works designs, will ensure that a robust form of 'stiff propping' will be adopted throughout the works. Therefore, the contiguous piled wall proposed for the basement has been modelled in this GMA as a high stiffness wall as defined in CIRIA C760.

CIRIA C760 is based on empirical data which are assumed to include any short-term (undrained) element of ground movement that arises due to net changes in vertical stress, i.e. those caused by the excavation unloading, and new loads of the proposed foundations. Furthermore, as the empirical data of C760 were collected over a relatively short period of time following construction, it is unlikely that the data include any long-term (drained) movements. In this context, the total ground movements calculated in this GMA comprised two elements:

- Short-term movements predicted by CIRIA C760 (and XDisp). As outlined above, these comprise movements relating to the installation of the retaining walls and excavation in front of the walls, as well as any short-term movements from net changes in vertical loading.
- Long-term movements caused by the changes in vertical loading (as calculated in PDisp). As noted previously, the long-term output from PDisp includes the short-term movements. Therefore, the long-term movements included in the calculation of total ground movements are calculated as the difference between PDisp-calculated long-term movements and the PDisp-calculated short-term movements; these movements were then imported in the XDisp analysis to estimate long-term movements and anticipated damage.

On this basis, XDisp software was used to predict the anticipated damage on the nearby on-site church to the north and the neighbouring property situated at 1 Braemar Avenue due to the proposed basement.

The damage categories proposed by Burland et al., and reproduced in the Figure below, were used in this GMA:

Figure 4. Classification of Visible Damage to Walls (after Burland et al. 1977, Boscardin and Cording, 1989, and Burland, 2001)

Category of damage	Description of typical damage (ease of repair is underlined>	Approximate crack width (mm)	Limiting tensile strain, ϵ_{tm} (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	<u>Fine cracks that can easily be treated during normal decoration.</u> Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	<u>Cracks easily filled. Redecoration probably required.</u> Several slight fractures showing inside of building. Cracks are visible externally and <u>some repointing may be required externally</u> to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	<u>The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable lining. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.</u> Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	<u>Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.</u> Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Services pipes disrupted.	15 to 25, but also depends on number of cracks	>0.3
5 Very severe	<u>This requires a major repair, involving partial or complete rebuilding.</u> Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

Notes

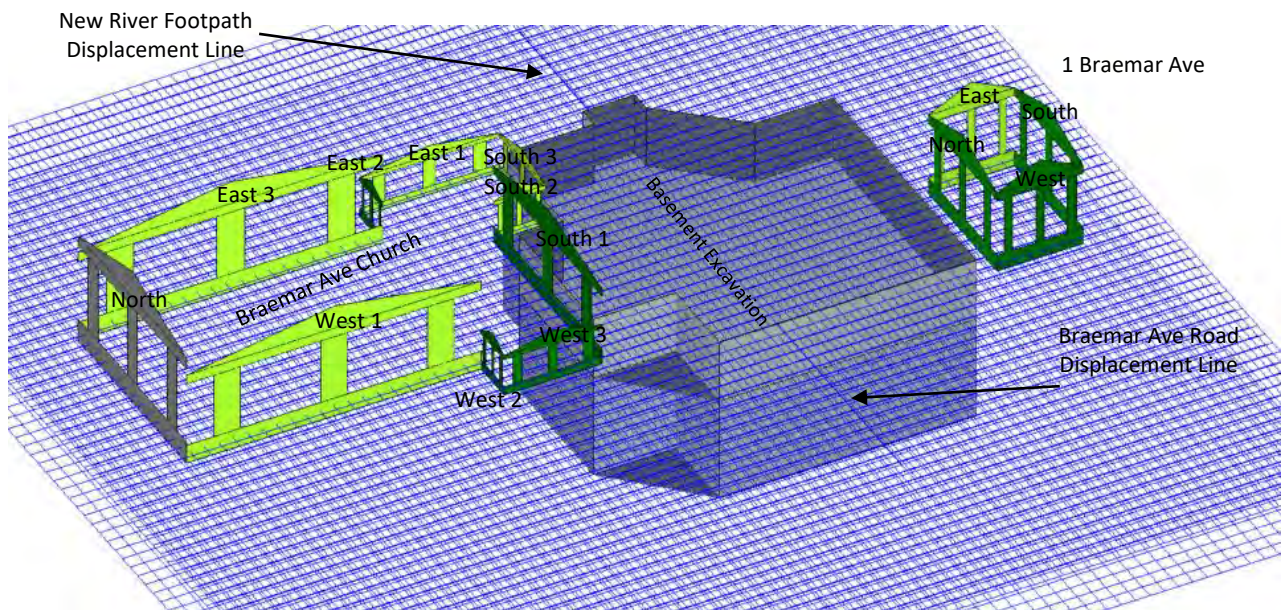
- 1 In assessing the degree of damage, account must be taken of its location in the building or structure.
- 2 Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

Further, the following moderately conservative assumptions were made in the XDisp analysis for the calculation of ground movements:

- The foundations of the church building were considered to be at 0.80m bgl in accordance with the ground investigation findings;
- A lower ground floor that was indicated to exist in the southern area of the church building and near the proposed basement excavation has been ignored for the needs of this GMA.
- The foundations of the neighbouring property located at 1 Braemar Avenue were considered to be at 0.60m bgl, which is a conservative assumption.
- The piles for the basement perimeter piled wall were assumed to be 12m long;
- The base of the New River Culvert has been assumed at 1m bgl which is a conservative estimate;
- The geometry of the excavation was locally corrected/enlarged to avoid some re-entrant corners.
- CIRIA C760 report, on which XDisp's method for modelling ground movements behind walls of excavations is based, considers only movements for points lying at right angles behind single walls. It does not consider how movements should be calculated within the zone of influence of re-entrant corners, i.e. where movements would be influenced by two walls adjacent to the re-entrant corner. By default, XDisp will merely sum the effects from both walls, making no allowance for interaction or stiffening of the corners of the excavation, which is a conservative assumption for the needs of this GMA.

The XDisp geometry of the excavation and the neighbouring structures and infrastructure considered in the ground movement analysis are shown in the Figure below.

Figure 5. Ground Movement Analysis Geometry – XDisp Software



The results of the XDisp analysis and the building damage assessment for both short-term and long-term analysis are presented in the Table below.

Table 11: Ground Movement and Building Damage Assessment Results

Building	Wall Element	Anticipated Burland Category/Damage		
		Short Term Due to Demolition and Basement Excavation	Short Term with Loads from Proposed Superstructure	Long-Term
Church Building	East 1	0 - Negligible	1 – Very Slight	1 – Very Slight
	East 2	0 - Negligible	0 - Negligible	0 - Negligible
	East 3	0 - Negligible	0 - Negligible	1 – Very Slight
	South 1	2 – Slight	0 - Negligible	0 - Negligible
	South 2	1 – Very Slight	1 – Very Slight	1 – Very Slight
	South 3	2 – Slight	1 – Very Slight	1 – Very Slight
	West 1	0 - Negligible	1 – Very Slight	1 – Very Slight
	West 2	0 - Negligible	0 - Negligible	0 - Negligible
	West 3	0 - Negligible	0 - Negligible	0 - Negligible
	North	0 - Negligible	0 - Negligible	0 - Negligible
1 Braemar Avenue	East	0 - Negligible	1 – Very Slight	1 – Very Slight
	South	0 - Negligible	0 - Negligible	0 - Negligible
	West	0 - Negligible	0 - Negligible	0 - Negligible
	North	1 – Very Slight	0 - Negligible	0 - Negligible

The XDisp analysis indicated a maximum tensile strain ϵ_h (dh/L) of 0.098%, with a deflection ratio Δ/L of 0.010% for south wall 3 of the church building. This wall is anticipated to be the most affected wall of the neighbouring properties, as it is situated nearer to the proposed basement excavation. This wall and south wall 1 represent a maximum damage category of ‘Slight’ (Burland Category 2). It should be noted this movement relates to the worst credible short-term effects due to the proposed demolition, retaining wall installation, and basement excavation, and before placing the load of the proposed superstructure.

For the remaining of the walls analysed, ‘negligible’ (Burland Category 0) to ‘very slight’ (Burland Category 1) damage is anticipated due to the proposed development.

While no guidance on maximum allowable damage categories have been published for the London Borough of Haringey, the building damage results are anticipated to be within the limits as per standard practice across other boroughs of London. Should a lower than ‘Slight’ damage be required this could be controlled by a tailored construction sequence, additional support measures and robust monitoring of the site and surrounding structures, in order to further limit ground movements and anticipated damage. These matters should be dealt with and agreed prior to the construction stage, as may be required by the local authority and interested third parties.

The ground movement analysis undertaken with XDisp for the adjacent footpath and highway (Braemar Avenue) to the west, indicated anticipated settlement of less than 7mm and horizontal movements of less

than 8mm, at the western site boundary. These ground movements are expected to reduce to less than 2mm at a distance of c.15m away from the western site boundary towards the highway. Such movements are not anticipated to cause any impact on the adjacent footpath, highway, and any utilities that may be contained therein.

The ground movement analysis undertaken with XDisp for the adjacent footpath and culverted watercourse (New River Footpath) to the east, indicated anticipated settlement of less than 4mm and horizontal movements of less than 6mm, at the eastern site boundary. These ground movements are expected to reduce to less than 3mm at a distance of c.10m away from the western site boundary towards the highway. Such movements are not anticipated to cause any impact on the adjacent footpath, culverted watercourse or any utilities that may be contained therein.

The details of the XDisp software tabular input and output, along with 3D graphics and displacement lines are presented in Appendix E.

6.3 Control of Construction Works

Monitoring of ground movements and structures potentially affected from the proposed basement construction works should be carried out to ensure that movements are maintained to within acceptable agreed limits. Baseline readings should be established prior to construction commencing. Action trigger levels should be agreed in advance of construction with all interested parties. If movements reach the trigger levels then works should stop until remedial measures are implemented. Such measures could include increasing jacking forces in the temporary props to reduce horizontal movement of the retaining wall. Monitoring should be in the form of targets fixed to the retaining wall and surrounding buildings and surveyed daily using total station theodolites or other approved methods, likely agreed during a Party Wall process.

Pre- and post-construction condition surveys of adjacent properties and assets that might be affected by the works are recommended.

7.0 Basement Impact Assessment

7.1 General

The purpose of this assessment is to consider the effects of the proposed basement on the local hydrogeology, land stability and hydrology, and impacts to neighbouring structures.

The potential impacts highlighted previously (Section 4) have been reviewed in light of the site investigation findings and the geotechnical interpretation (Section 5), the construction methodology and the ground movement and building damage assessment (Section 6). Consequently, appropriate mitigation measures are recommended for each potential impact, where required, as discussed below.

7.2 Impacts and Mitigation

Potential Impact 1 – Groundwater:

The basement excavation may extend below the groundwater table. Water ingress can make working conditions more difficult and in some cases cause instability in excavations.

Mitigation:

Based on the ground investigation findings, some limited groundwater of perched nature exists within the planned basement excavation. Some allowance should be made for limited pumping during construction.

No settlement is expected to be generated as part of any localized dewatering operations during construction.

Potential Impact 2 – Land Stability:

The excavation of the basement may result in ground movements detrimental to the New River culvert situated circa 8m to the east.

Mitigation:

A ground movement and damage assessment has been undertaken and the results presented in Section 6.2 of this report. The anticipated ground movements at the nearby New River culvert are not anticipated to have an impact to these assets. However, and if required by the asset owner, the anticipated ground movements can be further reduced by additional measures during construction such as by increasing the jacking forces on temporary props.

In any case, monitoring of ground movements and structures potentially affected from the proposed basement construction works should be carried out to ensure that movements are maintained to within acceptable agreed limits.

Potential Impact 3 – Land Stability:

The construction of a basement in the London Clay Formation may result in ground movements detrimental to nearby buildings, roads, pathways and any infrastructure contained therein.

Mitigation:

A ground movement and damage assessment has been undertaken and the results presented in Section 6.2 of this report. The anticipated ground movements and building damage are anticipated to be within acceptable limits.

Monitoring of ground movements and structures potentially affected from the proposed basement construction works should be carried out during excavation to ensure that movements are maintained to within acceptable agreed limits.

Potential Impact 4 – Land Stability:

The construction of the basement can result in ground movements detrimental to roads, pathways and any infrastructure contained therein.

Mitigation:

A ground movement and damage assessment has been undertaken and the results presented in Section 6.2 of this report. The anticipated ground movements at the nearby footpath and Braemar Avenue highway and any infrastructure contained therein, are not anticipated to have a significant impact to these assets.

Monitoring of ground movements should be carried out during construction in the vicinity of footpaths and highways to ensure that movements are maintained to within acceptable agreed limits.

Potential Impact 5 – Land Stability:

There is the potential for the neighbouring foundations to be subjected to ground movements during the works resulting in damage to the structures.

Mitigation:

A ground movement and building damage assessment has been undertaken to quantify the damage expected to occur at the neighbouring property at 1 Braemar Avenue and the on-site church building with the results presented in Section 6.2 of this report. The assessment predicted that the magnitude of ground movements and resultant strains will be within acceptable limits.

Ground movement monitoring of the church building and its neighbours at No.1 Braemar Avenue during construction of the basement is recommended. Ground movement trigger levels and an action plan should be agreed in advance with all interested parties.

A qualified temporary works specialist must be engaged with a watching brief to both design and monitor the temporary works. The main contractor and any sub-contractors should be able to demonstrate competence and experience in construction of this type of development.

Potential Impact 6 – Surface Water:

Proposed increase in hardstanding areas and potential flooding issues due to the site being located in a Critical Drainage Area.

Mitigation:

It is understood that a mitigation strategy will be discussed in detail in the site-specific Flood Risk Assessment (FRA) report and the SuDS report, which were under preparation at the time of writing. These reports were outside of the scope of this BIA. However, in brief, it is understood that an outline of the SuDS proposals will include the following:

- All basement facilities (foul and surface water) are to be pumped. There are also some above ground areas which are to be directed to the pumped systems where they cannot be drained by gravity.
- With regards to SuDS, green roofs are to be included on the main residential roof and the roof over the new church access area; the inclusion of blue roof attenuation beneath the green roofs is also considered. Water butts, permeable paving and a below ground attenuation tank are anticipated to be included in the scheme.
- Foul and surface water to discharge to the respective public sewers beneath Braemar Avenue.

The reader should refer to the completed FRA and SuDS reports for more details on the above matters.

8.0 Conclusions

The purpose of this assessment was to consider the effects of the proposed basement on the local hydrogeology, land stability and hydrology and impacts to neighbouring structures / properties.

The potential impacts were highlighted (Section 4) and reviewed in light of the site investigation findings and geotechnical interpretation (Section 5), the construction methodology and the ground movement and damage assessment (Section 6).

The site investigation has identified the London Clay Formation to be a suitable founding stratum for the proposed foundations and floor slab. Geotechnical parameters have been presented in this report for design purposes.

The structural information indicates that the sequence of works will comprise construction of a contiguous piled wall followed by excavation of the basement to formation level. A reinforced basement floor slab will then be constructed which will act as a stiffened raft foundation. It is understood that the contiguous piled walls will be propped at all times in the short and the long-term by temporary props and the floor slabs, respectively.

Pre- and post-construction condition surveys of adjacent properties and assets that might be affected by the works are recommended.

Temporary works should also make allowance for local management of any groundwater encountered during the basement excavation. It is understood that these items will comprise part of the temporary works specialist contractor construction method statement and design that shall be in place and agreed with all interested parties prior to construction commencing.

A structural monitoring strategy to control the works and impacts to neighbouring structures is recommended.

This report concludes that there will be no impact to the wider hydrogeological environment and that groundwater flooding risk to neighbouring foundations will not increase as a consequence of the proposed development.

The maximum damage impact to surrounding structures within the zone of influence has been marginally assessed as Burland Category 2 ('Slight'), however considering the moderately conservative nature of the ground movement analysis, Burland Category 1 'very slight' or less is expected for all walls analysed. The building damage results are anticipated to be within the limits set by the London Borough of Haringey as per standard practice across other boroughs of London.

It is anticipated that due to marginal changes of the soft/hard landscaping proposed, the overall impact to the site's hydrology will be negligible, however, any mitigation details should be provided by the site-specific FRA and SuDS reports where the reader should refer to.

In summary, cumulative potential impacts have been identified in respect of hydrogeology, the stability of surrounding properties, and surface water flows, and effective measures have been proposed to mitigate these impacts.

Overall, after the application of the proposed mitigation measures, the residual impact of the proposed basement will be negligible and within acceptable limits.

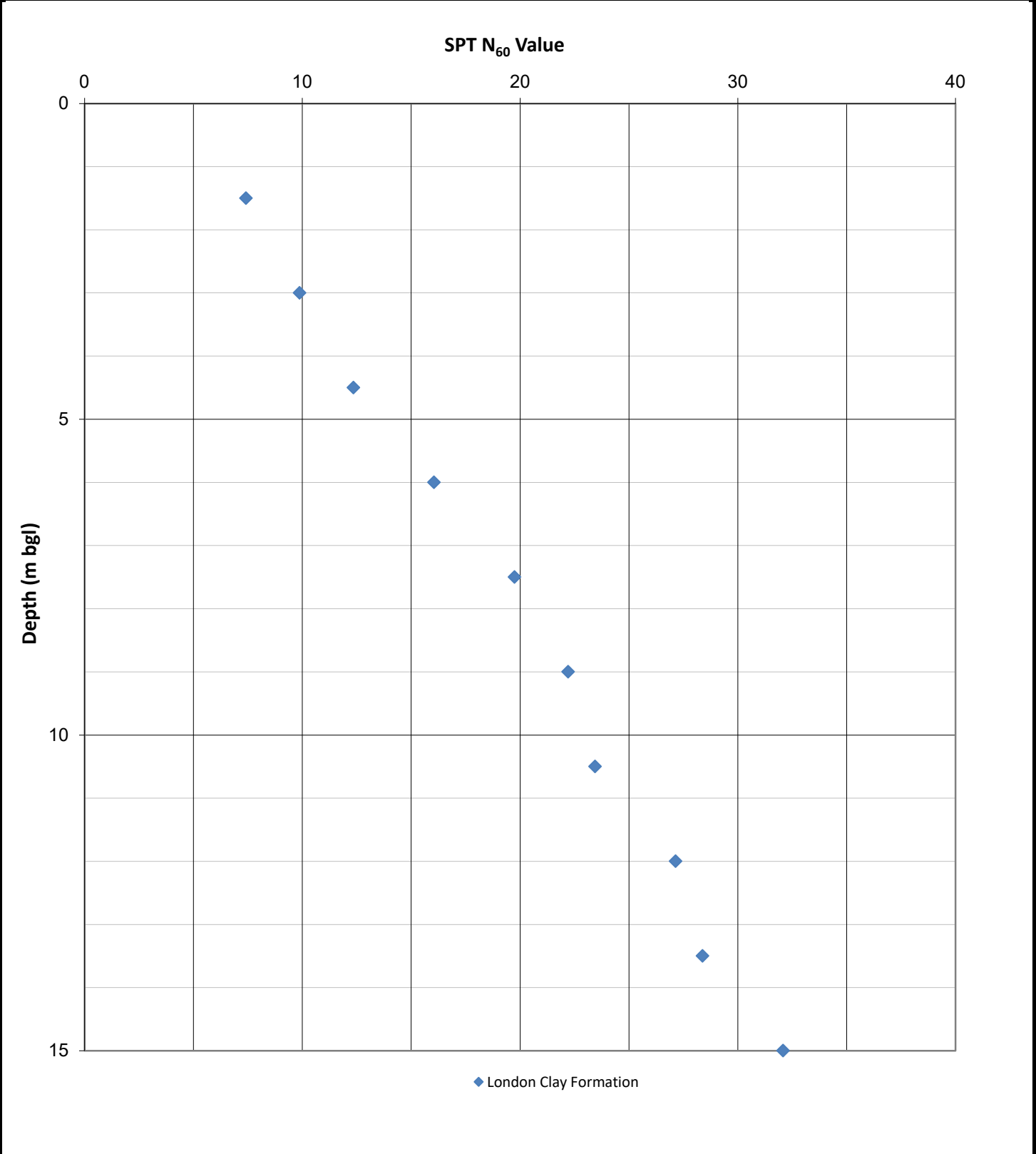
Annex A: Figures

- Figure 1: Site Location Plan
- Figure 2: SPT 'N₆₀' vs Depth Plot
- Figure 3: Cu vs Depth Plot

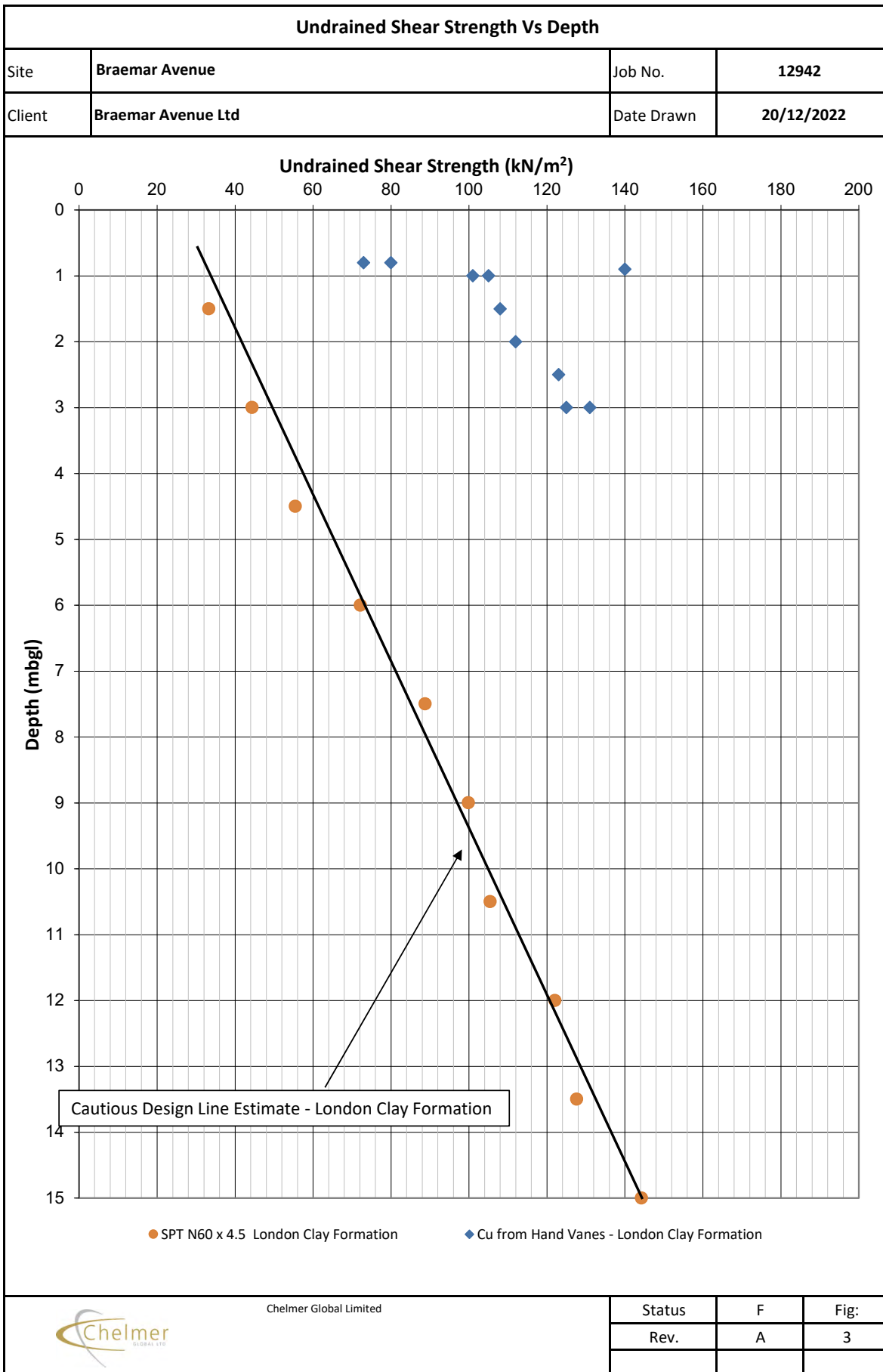


NOTES	COPYRIGHT NOTES				REVISIONS				Work.Life 20 Red Lion Street London WC1R 4PS		TITLE				
	Google imagery June 2018										SITE LOCATION PLAN				
	© OpenStreetMap contributors- data is available under the Open Database License. Cartography licensed as CC BY-SA.								TRC PROJECT NO.		SCALE				
									517419.0000.0000		750 @ A3				
					P01				PURPOSE OF ISSUE		STATUS				
				FIRST ISSUE				Braemar Avenue Ltd		SUITABLE FOR INFORMATION					
				Initials				JT		JT		23/11/21			
				REV.				REVISION NOTES/COMMENTS		PROJECT		DRAWING NO		REVISION	
				Initials						Baptist Church, Braemar Avenue		FIGURE 01		PO1	

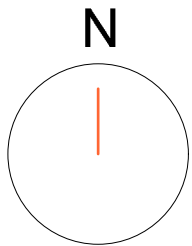
SPT N ₆₀ Value Vs Depth			
Client	Braemar Avenue Ltd	Job No.	12942
Site	Braemar Avenue	Date Drawn	20/12/2022



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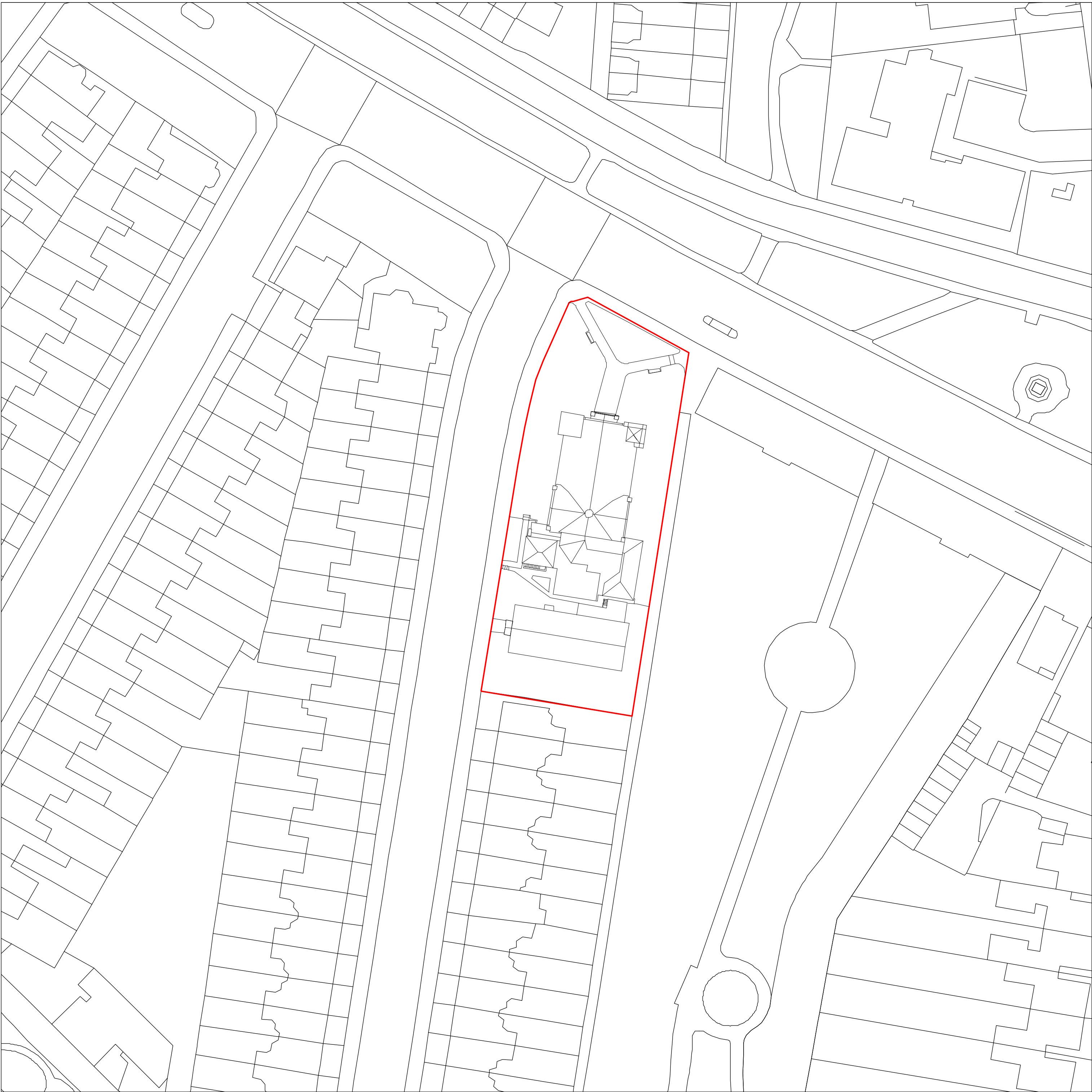
Annex B: Development Drawings & Structural Information



NOTE
This drawing is copyright. Do not scale off dimensions. All dimensions are to be checked on site by contractor. Contractor to report any dimensional discrepancies, errors or omissions prior to commencing on site.



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— Indicates site boundary



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PROJECT
Braemar Avenue, Wood Green

DRAWING TITLE
Site Location Plan

STATUS
Planning Application

DATE	SCALE
May 2022	1:500@A1;1:1000@A3

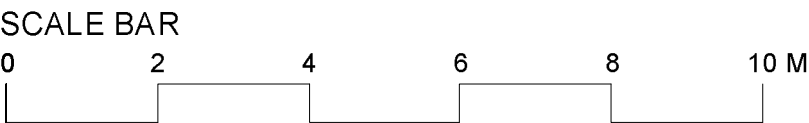
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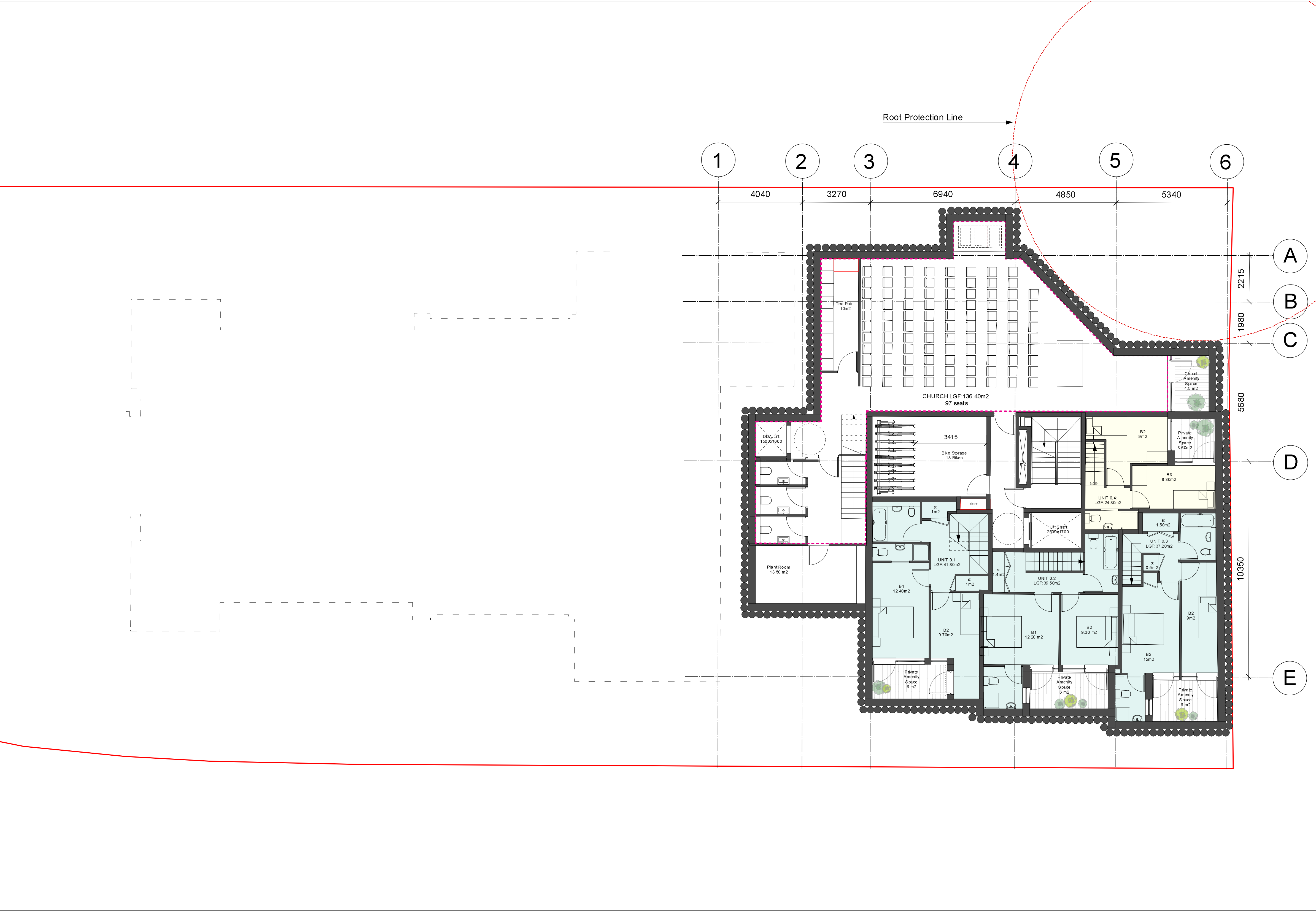
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- - - - - Indicates new space to be provided to the church



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PROJECT

Braemar Avenue, Wood Green

DRAWING TITLE

Proposed Plans - Lower Ground Floor Plan

STATUS

Planning Application

DATE

May 2022

SCALE

1:100@A1;1:200@A3

JOB NO.

1802

TYPE

GA

DRAWING NO.

031

REVISION

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Braemar Avenue Baptist Church, Wood Green

Structural engineering report and subterranean construction
method statement

engineering a better society

		Remarks:	Revised with updated sketches				
Revision:	P1	Prepared by:	Tugay Uzunoglu	Checked by:	Jennifer Camilletti CEng MIStructE	Approved by:	Sanja Buncic CEng MIStructE
Date:	16/12/2022						
Revision:	P2	Prepared by:	Tugay Uzunoglu	Checked by:	Jennifer Camilletti CEng MIStructE	Approved by:	Sanja Buncic CEng MIStructE
Date:	16/12/2022						

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Our practice

Elliott Wood work with likeminded people to engineer a better society

Our portfolio is extraordinarily diverse, and we particularly enjoy those projects which provide the opportunity to engineer for the common good – from making dramatic improvements to the life of a town or city, through to nurturing a new generation of exceptional engineers in our own in-house academy.

Despite more than twenty years in practice, we continue to be curious and find ways to pass on the benefit of our collective experience. We foster enquiring minds and share ideas because we know that this knowledge can make a real difference to our clients.

Engineering is often about the unseen: much of what we do is hidden when a building is complete. But engineering is not a necessary evil – it's much cleverer than that. Our role is to demystify the invisible workings of a structure, to reveal unexpected opportunities and to make the existing engineering work harder.

We value both technical and creative thinking, and are activists for a new kind of engineering profession in which our craft is pivotal to the design process. We are no ordinary engineers.

We are no ordinary engineers

Elliott Wood people are activists for a new kind of engineering profession, in which our craft is re-evaluated by clients and collaborators as being pivotal to the design process. We are ambitious for ourselves, our practice and our discipline, and recognise that this paradigm shift will require a combination of both technical and creative thinking.

We help others to see the unseen

Engineering is often about the unseen: much of what we do is hidden, so part of our role as engineers is to explain and demystify this, uncovering the invisible workings of any structure. In so doing, it is also possible to reveal the hidden opportunities in a project, making the engineering work harder for our clients, materialising previously unidentified assets to make a positive impact.

Engineering is anything but routine

We aim to extend our existing reputation for reliability by demonstrating that engineering is not a necessary evil. Getting the nuts and bolts to work is a given, but our engineering is cleverer than that. Clients can't afford not to have our input, and should involve us as early as possible in the design process. By asking the right questions (of ourselves and others), we can shift conventional thinking about the engineer's place in a design team, and surprise and stimulate our clients with ideas they wouldn't necessarily have thought of.

We're still learning, after nearly twenty-five years

With decades of experience, we have considerable expertise over a huge range of building types. We remain relevant, however, because we continue to be curious. We learn something from every single project and invest time in sharing new ideas and thinking across the practice. We foster enquiring minds because we know that our collective, continually-developing knowledge can make a real difference to our clients

Reveal / Materialise / Impact

Engineers make a difference.

We like to be involved at the start of our clients' creative and commissioning journey, because we are concerned that not enough people are realising the full potential of their buildings. They are only working with what they can see.

Our process challenges usual perceptions of the engineer's role, because we help clients to see the unseen and achieve results beyond the aspirations of the brief – and which have a positive legacy for their wider communities.

Reveal

We ask questions. With innovative thinking, we reveal the unexpected opportunities in an already ambitious brief.

Materialise

We give ideas life. Using expertise and imagination, we materialise new assets for our clients.

Impact

We make a difference. Our work not only benefits our clients, it has a positive impact on society as a whole.

One

Non-technical summary

1.1

Elliott Wood has worked on a number of projects in the area and is aware of both the underlying soil and groundwater; the basement has been designed with this in mind. The site-specific site investigation and flood risk assessment conclude that the basement will have no adverse effect on the local hydrogeology.

1.2

If the works noted above are properly undertaken by suitably qualified contractors, these works will pose no significant threat to the structural stability of the building or the adjoining properties. A damage risk assessment will be completed by a competent geotechnical engineer in accordance with CIRIA C580 and is pending site specific soil investigations. However, based on the predicted ground movements, the properties surrounding the site are not expected to suffer any damage greater than CIRIA C580 Damage Category 1 or 2.

A demolition and construction traffic management plan will be completed by a contractor. This will give advice on the likely programme, vehicular access and site set-up.

1.3

The construction of a new basement on the site will not have any adverse effect on the property, neighbouring properties, groundwater, surface water or slope stability.

1.4

This report is for the sole use of the [clients] for whom the report is undertaken and cannot be relied

upon by third parties for any use whatsoever without the express authority of Elliott Wood.

Two

Introduction

2.1

Elliott Wood is a firm of consulting structural engineers approximately 150 strong operating from their head office in Southwest London. Residential developments of all scales have been central to the workload of the practice with many in the Greater London area. In particular, Elliott Wood has been producing designs for basements to both existing and new buildings. To date, this numbers approximately 500 sites, our general understanding of the development of London, its geology and unique features together with direct experience on many sites puts us in a strong position to advise clients on works to their buildings and in particular the design and construction of their basement.

2.2

Elliott Wood was appointed by SpaceLab to advise on the structural implications of creating a single storey basement under the footprint of the demolished outbuildings. The following report has been prepared to help ensure that the neighbouring properties are safeguarded during the works. The report provides information in accordance with the requirements of the London Borough of Haringey basement construction guidance.

The documents referred to are the 'Policy DM18: Residential Basement Development and Light Wells' and 'Haringey Council Planning Regeneration & Economy – Draft Basement Development Guidance Note'. However, we also understand that Haringey council have also adopted the London Borough of Camden Basement Impact Assessment guidance as best practice and as such, the relevant document from Camden Council are also referred to inform design of the basement structure.

It includes information on the site, the proposed alterations and their impact on the site, the building and adjoining buildings and provides information on how the works will be constructed.

Elliott Wood has extensive experience of projects of this type and has previously produced planning reports for other properties in the area. We also have a comprehensive understanding of the underlying ground conditions in the area gained from the numerous basement projects we have completed in throughout Greater London.

This statement focuses on the proposed subterranean works as opposed to the superstructure works and should be read in conjunction with all relevant Architects and Specialists supporting documents.

2.3

The site-specific site investigation will be completed in due course; however British Geological Survey maps were consulted to gain an understanding of the local site conditions. The BGS borehole records indicate that the nearest boreholes to site are located approximately 500mm away. These have been reviewed to gain approximate soil information.

2.4

A preliminary desk study has been completed to establish the general ground conditions and history of the building (See Section 3.4 for the summary of the desk study).

Three

Description of existing building and site conditions

3.1 Site location

The site is located in Wood Green, London. It is bounded by the A109 Bounds Green Road to the north, Braemar Avenue to the west and New River Path/Nightingale Gardens to the east. A residential property bounds the site to the south. Refer to Figure 1 for the site location.

The site approximately centred at OS grid reference 530479 E, 190772 N.

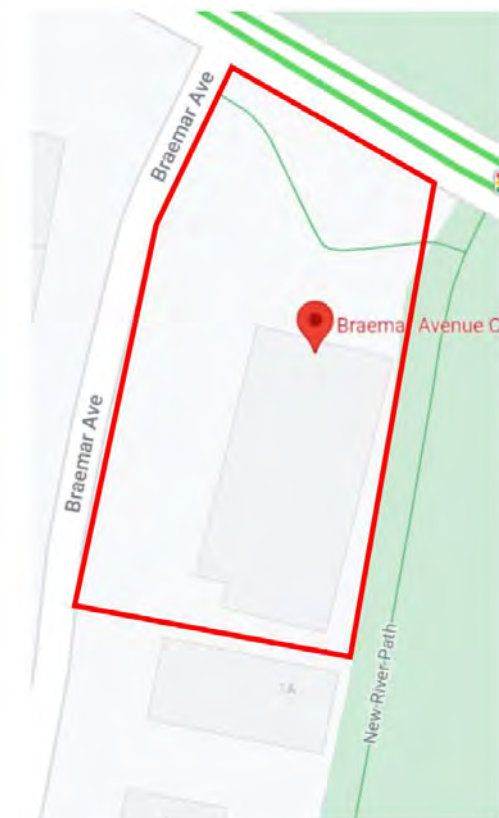


Figure 1: Map view of site location



Figure 2: Aerial photo of site

3.2 Site access

The site can be accessed by vehicles from Braemar Avenue and A109 at the entrance of the property.

3.3 Site History

The site has been occupied by the church since the 1900s. The properties in the area are on a gently sloping site. The site layout shortly after construction is indicated on Figure 3.

Previous to the construction of the church building the site was unoccupied and undeveloped. The green field and minor footpath is indicated on Figure 5.



Figure 3: Historic map shortly after construction of church (1912)

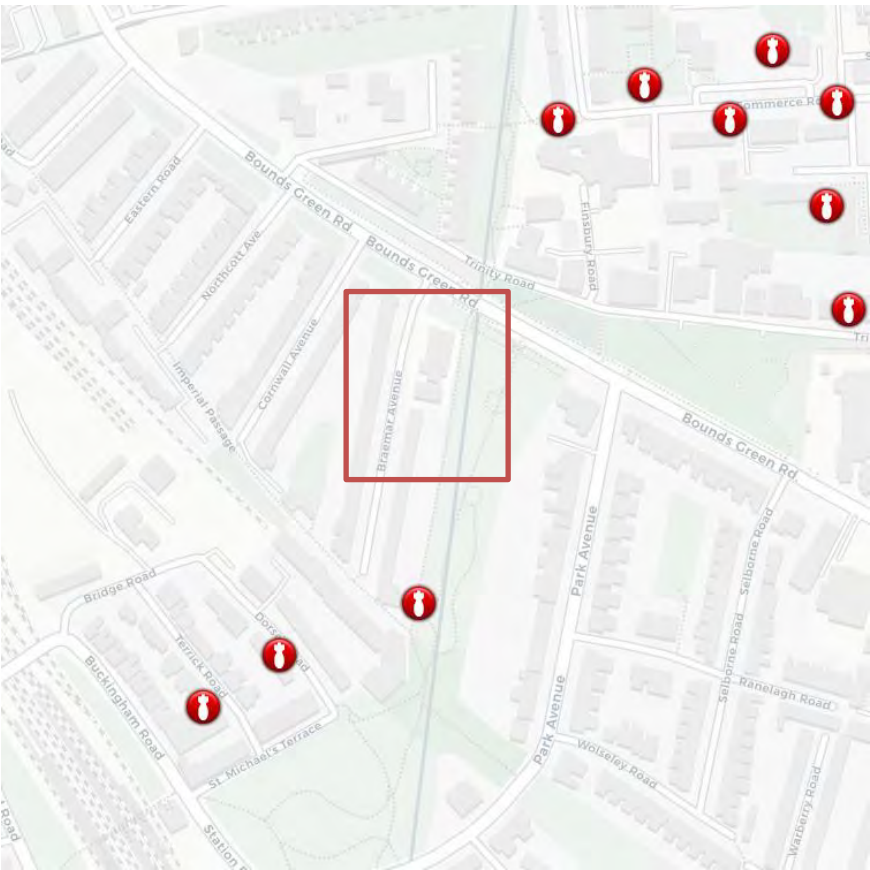


Figure 4: WWII Bomb Damage Map (1945)

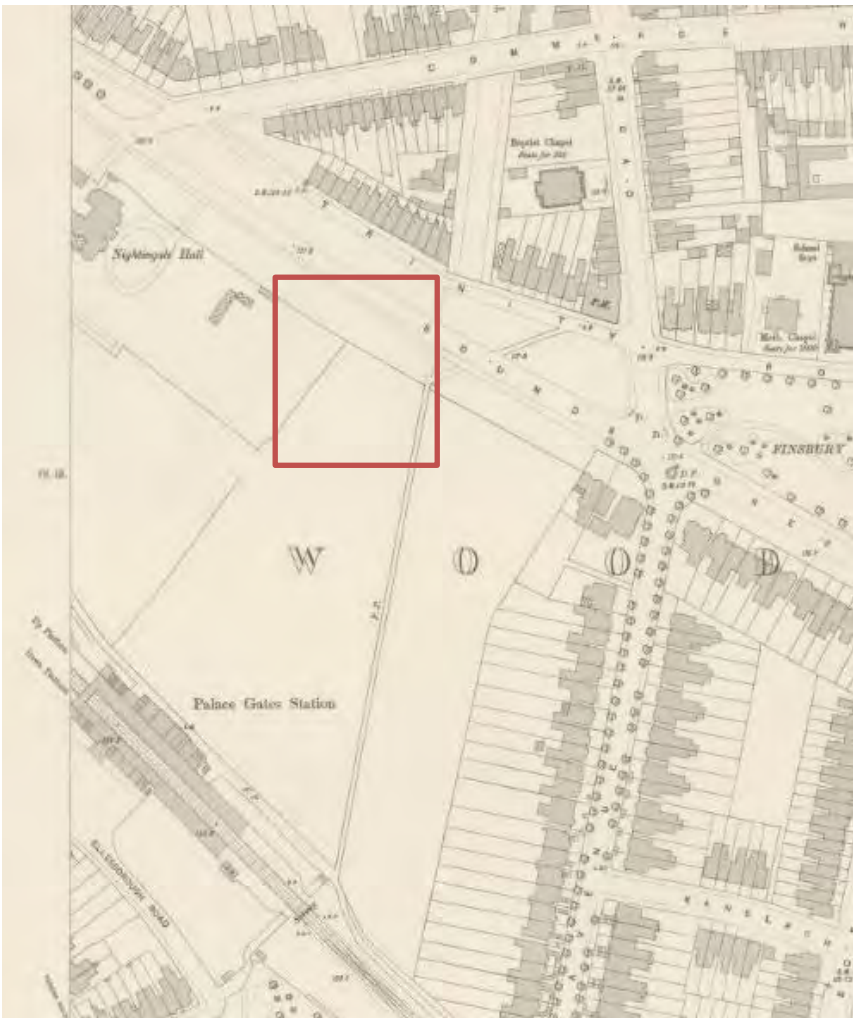


Figure 5: OS Map (1894) with the site indicated in red.

3.4 Existing Building

The existing building appears to be of traditional construction consisting of loadbearing masonry walls, timber suspended floors and roofs. The existing foundations are assumed to be of modest depth either built as stepped brick foundations or trench concrete footings. The front wall of the building is in reasonable condition and is proposed to remain.

The existing church building contains an elaborate roof arrangement. However, no structural works to these areas are proposed by the architect. It is assumed that the existing roof structure is of traditional carpentry comprising a combination of valley and hip rafters supporting pitched timber rafters and purlins where necessary.

The exact layout existing structure is currently unknown. The relevant areas will be inspected to understand the existing arrangements and where necessary further opening up works and measured surveys will be requested.

The existing building at Braemar Avenue is a mixed storey church building and a two-storey high Tabernacle church building on the eastern side of Braemar Avenue.

The existing Braemar Avenue Baptist Chapel building dates from 1907 and is Grade II listed.

3.5 Stability

The overall stability is assumed to be provided by external load bearing masonry walls and diaphragm action of the timber floors at each level.

3.6 Desk Study

A site-specific investigation will be completed in due course. For the purpose of Pre-planning application, we have undertaken a desk top study of the existing online data.

Geological records of the site and our understanding of ground conditions in the area indicate that the ground conditions are likely to consist of London Clay formation with no superficial deposits. A nearby BGS borehole TQ39SW265 indicates the following ground conditions: Made ground to a depth of 5m, London Clay to a depth of 27.5m and Thanet Sand to a depth of 52m depth. The borehole also indicates rest water level is at 12.0m below ground level.

London Clay is well documented as being a firm to very stiff, over consolidated clay which is typically of high or very high plasticity and high-volume change potential. As a result, it is susceptible to considerable volume changes in response to variations in its natural moisture content. In response to normal climatic variations these volumetric changes can occur seasonally to a depth of up to 1.5m. However, in the presence of tree they can occur to much greater depths. This interaction will be reviewed in detail upon receipt of an arboricultural report as detailed in Section 3.7 below.

The clay swells when unloaded by excavations such as those required for the construction of basements.

No likely sources of gaseous contamination have been identified at the site, however this will be confirmed upon the completion of the site specific geo-environmental site investigation report.

3.7 Arboriculture Report

An arboriculture specialist has not been appointed yet. This will be required to ensure that the works do not have an adverse impact on the retained trees.

Once appointed and an arboricultural report is produced, Elliott Wood will carry out a review to understand the implication on the foundation designs. The proposed groundworks would also be co-ordinated with the potential root protection areas.

The site is heavily planted, particularly around the existing building footprint. Majority of trees will be retained, but trees are to be removed on the east side of the site. It is important to gain an understanding of the depth and extent of roots and susceptibility of the soil/rock matrix to shrinkage and swelling to ascertain the potential impact of trees on proposed structures.

Damage to tree roots during investigative works to be limited as much as possible.

3.8 Flood Risk Assessment

In accordance with the Environment Agency's flood risk map for planning, the site is shown to lie entirely within Flood Zone 1. The site lies in a Critical Drainage Area.

The Flood Risk Assessment concludes that the site is at low risk of flooding from tidal and fluvial sources and artificial waterbodies. Risk of flooding from surface water and overland flows is low with the inclusion of a new surface water drainage system.

Site investigations in the form of groundwater monitoring should be undertaken to confirm groundwater levels across the site, and subsequently the level of mitigation required to protect against potential groundwater flooding.

The risk of flooding from public sewers can be mitigated by introducing a non-return valve to the new pumped drainage systems. Emergency storage will need to be provided for the pumped drainage systems.

A CCTV survey is to be undertaken to confirm the levels, routes and condition of the existing private drainage on the site, including any existing connections to the public sewer network.

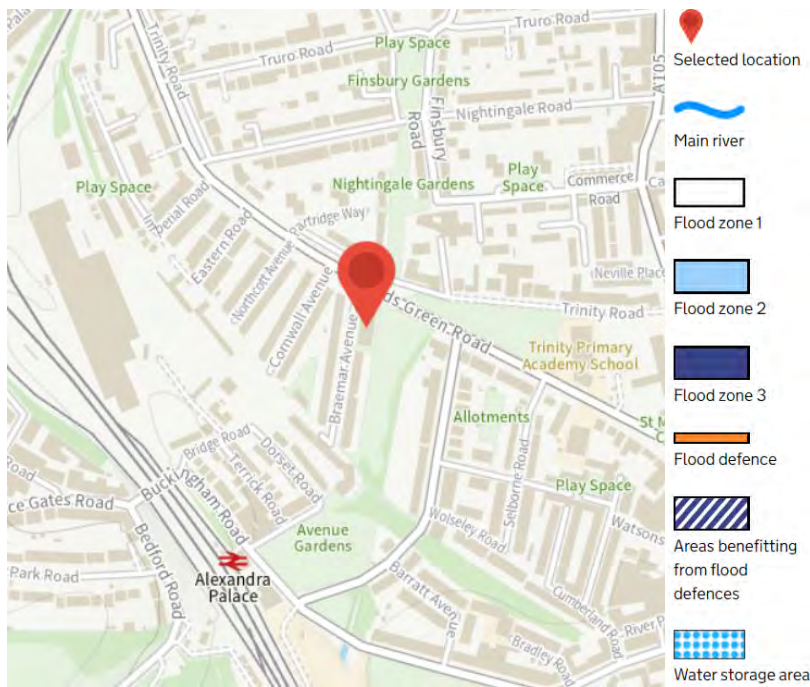


Figure 9: Environmental Agency Flood Risk Map

3.9 Network Rail assets

The LU asset map suggests that the site is sufficiently far from any rail infrastructure, with the closest line being a Network Rail mainline, approximately 350m away from the rear boundary to the south-west. Therefore, no consultation with Network Rail is considered to be necessary.



Figure 10: Rail assets map

Four Observations

4.1

Generally, the front façade of the building appears to be in good condition for its age and type. There are no obvious visible signs of significant movement or settlement to either this property or the directly adjoining buildings. A detailed visual site inspection of the property will be carried out in the early stages of the project to understand fully the current conditions of the existing buildings



Figure 11: Front Elevation

Five

Proposed alterations

5.1

The proposed development is a new residential block of flats to replace parts of the church and existing outbuildings.

The proposed works consist of the demolition of the existing prayer room in Braemar Avenue Baptist Church and the 2-storey tin clad tabernacle church building and construction of a 3-storey residential building with single-storey basement to house block of flats, church lounge and hall. The proposed works also includes revised landscaping.

All excavated soil is intended to be kept on site, and landscaping works will be carried to reprofile the site accordingly. Hard landscaping for cycle parking area is also proposed. Landscaping proposals also include planting a number of trees around the development.

Proposed foundations depend on the results of site investigations. The foundations are currently assumed to be a reinforced concrete raft foundation with the basement retaining walls formed using either secant or contiguous piled walls. A number of the proposed superstructure columns are to be supported by the piled walls, so would act as foundations in some locations.

All foundation requirements are to be confirmed and agreed with the geotechnical engineer upon receipt of the site investigation results.

5.2

Basement accommodation has been designed in line with London Borough of Haringey council policies. The basement will be placed under the footprint of the original tabernacle building and will extend slightly under the demolished parts of the existing church.

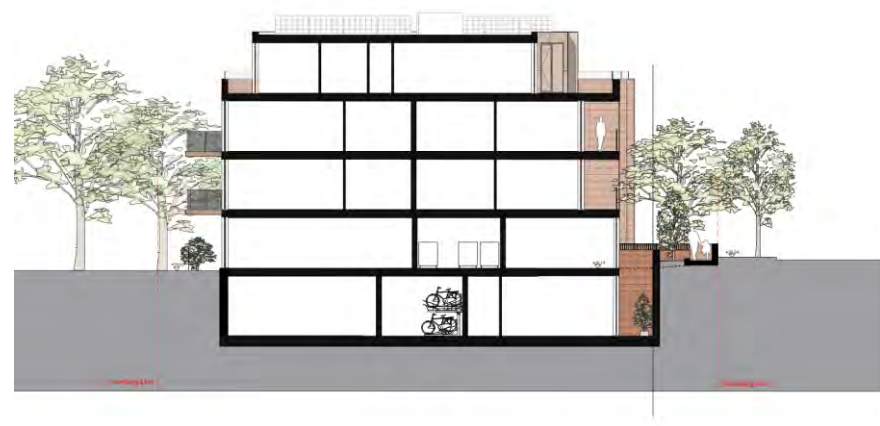


Figure 13: Proposed longitudinal section showing the extent of basement

5.3

The basement walls will be constructed using secant or continuously piled wall reinforced concrete walls. The walls will be finishes with an RC liner wall internal and will be monolithically cast with the basement slab. The basement slab is currently assumed to be working as a raft foundation. This is to be confirmed by the geotechnical engineer upon receipt of the site investigation results. The raft foundations may require to be piled or the raft may be replaced with discrete piles joined by RC pile caps.

The RC walls will resist lateral loads from any soil, hydrostatic and surcharge pressures. High level horizontal props will be installed to resist the lateral pressures in the temporary state.

To resist any uplift due to heave piles can be placed under the new RC basement slab, which is to be confirmed upon receipt of the geotechnical site investigation results.

The roof to the basement, which will form the ground floor slab to the new development will also be in reinforced concrete. In the permanent state, the RC ground slab will provide propping action to the RC retaining walls.

5.4

It is assumed the new superstructure will be constructed as RC frame with flat slabs. The internal partitions are to be of lightweight and non-load bearing construction. The vertical loads from the superstructure will be transferred by the ground floor slab and capping beams to the piled walls.

Six

Proposed below ground drainage

6.1

The proposed surface water drainage strategy is to be attenuated in blue roofs / a below ground attenuation tank. Green roof overlays will be incorporated on the main residential roof and the roof over the new church access area, to improve the quality of the rainwater discharged from site. The sustainable drainage solutions on site will reduce the discharge rate to 50% of the existing 1 in 1 year brownfield rate. The new drainage system has been designed for the 1 in 100-year storm event plus an allowance for 40% climate change.

The proposed foul drainage strategy requires all foul facilities at lower ground floor level to be pumped, with appropriate 24-hour storage provided. All foul drainage serving the ground floor level and above is to drain by gravity.

Please refer to flood risk assessment and SUDS report No 2220367-EWP-ZZ-XX-RP-C-0001 and 0002 for details of below ground drainage. These reports demonstrate that the proposed development has a low probability of flooding. It is considered that the information provided within these reports satisfy the requirements of the National Planning Policy Framework, London Plan and local policy.