Ross & Partners

Consulting Civil and Structural Engineers
1 Bastwick Street
Clerkenwell
London EC1V 3NU
Tel: 020 7553 6050
Fax: 020 7253 6720
Email: mail@ross-partners.co.uk

Basement Impact Assessment
for
New Subterranean Development
at
25 John's Mews
London
WC1N 2N

Document History and Status

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Author	A.Ahmadzai
Project	M O'Regan
Project	11751
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Planning	

Contents

Appendices

1.0 Non-Technical Summary

1.1 The site location is 25 John's Mews, London WC1N 2NS. The building is located on the corner of John's Mews and Northington Street within the Bloomsbury Conservation Area. The building comprises of a two-storey red brick with stone features. It is understood the building was constructed c.1903. It is an end of terraced mews house with accommodation arranged over ground, first and second floors with a pitched roof over. There is a part basement area which is thought to be part of an historic vehicular ramp that has been partly sealed. The existing walls extend to circa 3m below street level which may anecdotally suggest this part of the building may also have a full basement.

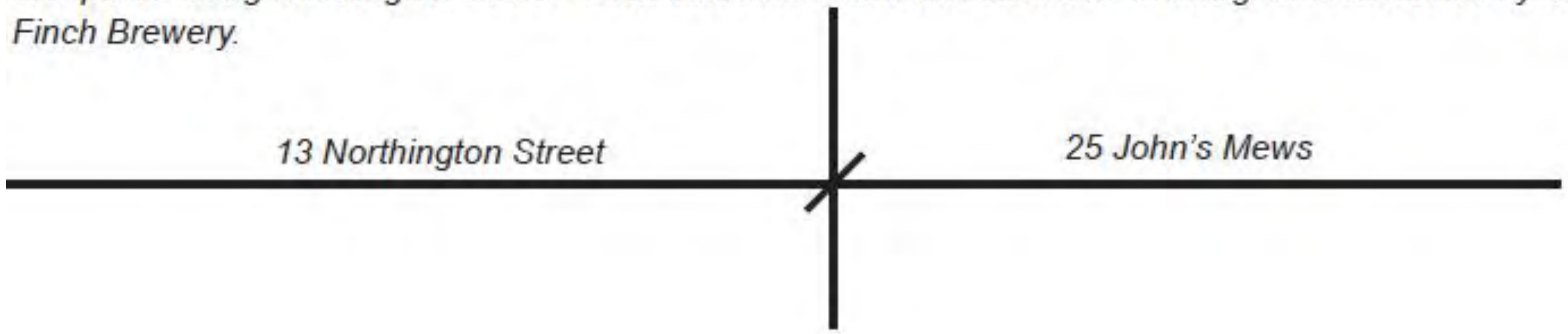
1.2 The existing property is shown in the photograph below.

Street View of 25 John's Mews

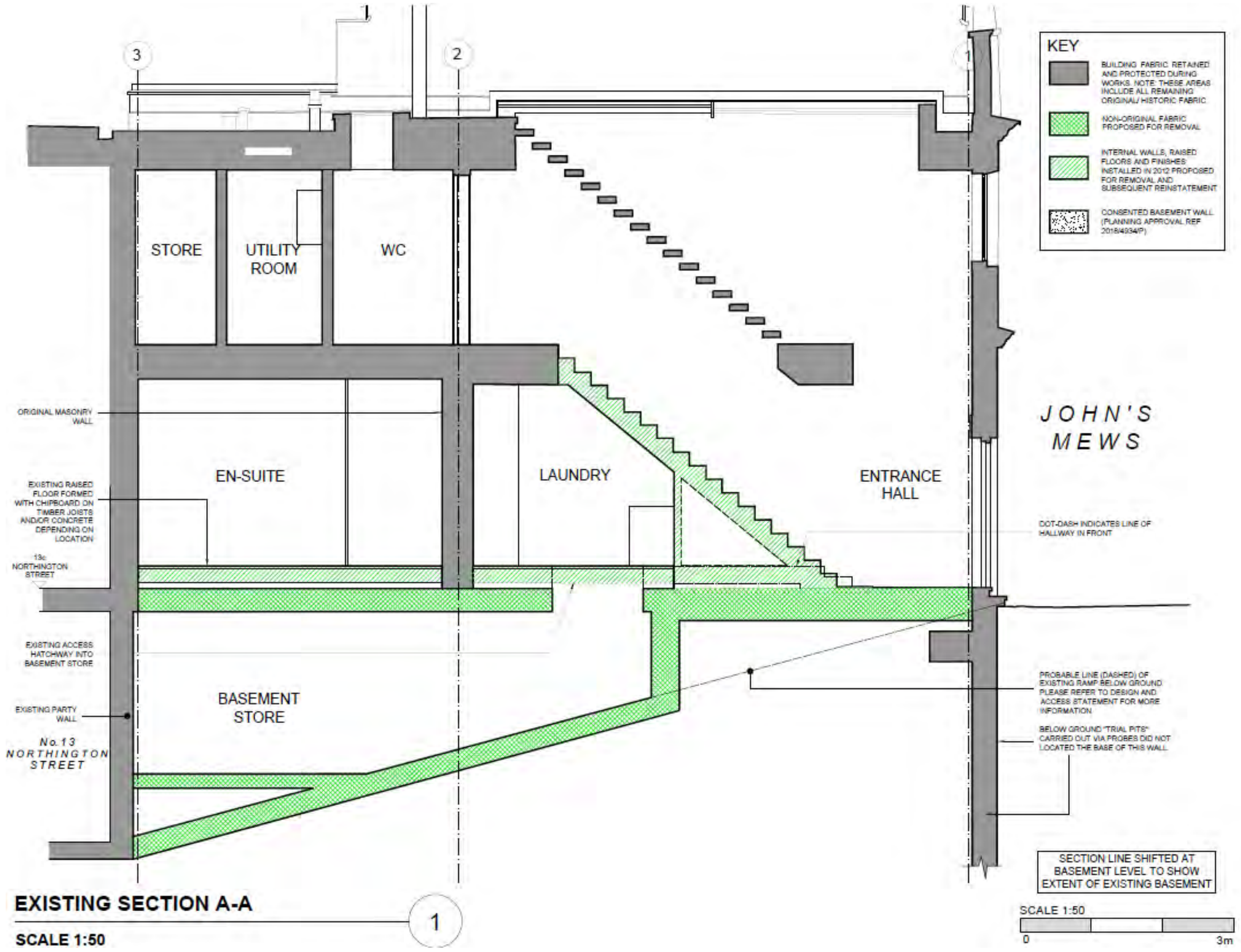
1.3 The photograph below illustrates the Northington Street Elevation. The property is divided into two sections: 25 John's Mews and 13 Northington Street. Within 25 John's Mews accommodation is arranged over ground and first floors as a single dwelling house for the client Mr Colin Fraser. The adjacent 13 Northington Street was converted into two maisonettes in 1995. Interestingly this part of the building has basement accommodation. It is believed the basement is part of the original construction.

1.4 25 John's Mews has an existing ramped area that extends to below ground level. It is considered this ramp may have historically provided access into the existing adjacent basement. At present it is used for storage.

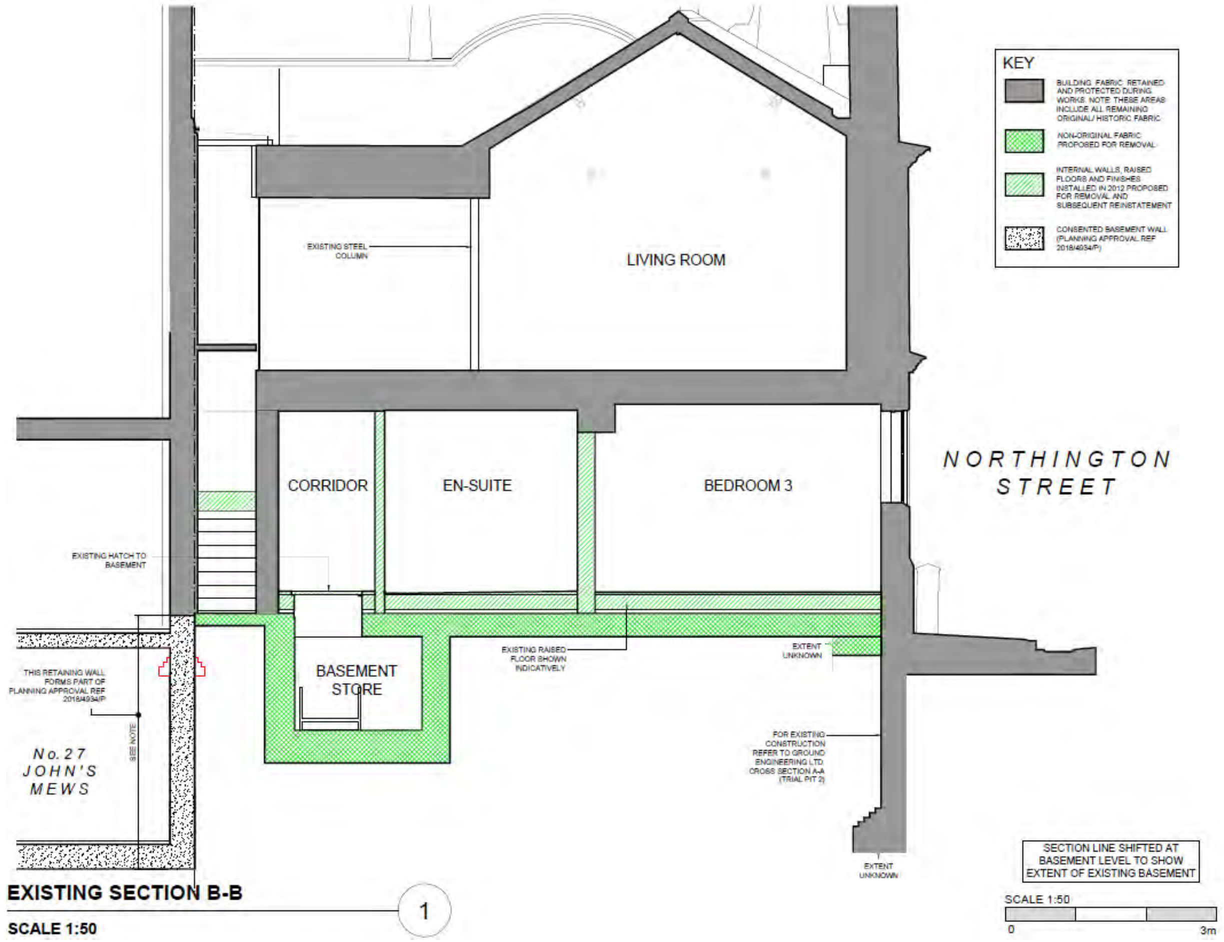
Site photo along Northington Street - Both addresses sit within the same building as constructed by the Finch Brewery.



<u>*Northington Street Elevation*</u>



Existing Section through St John's Mews



Existing Section through Northington Street

1.5 The existing building is the primary residence of the client, Mr Colin Fraser. The planning application is to extend the habitable accommodation to below ground floor level to match the existing adjacent basement of 13 Northington Street.

1.6 The remainder of the existing building will be unchanged.

1.7 The following assessments are presented:

1.7.1.1 Desk Study

1.7.1.2 Screening

1.7.1.3 Scoping

1.7.1.4 Additional evidence/assessments (as required)

- *Site investigation report by Ground Engineering Report (C 14983) dated December 2020 is included in Appendix 4*
- *An Arboricultural study is not required as there are no nearby trees*
- *Ground Movement Assessment 1474-A2S-XX-XX-RP-Y-0001-00 dated November 2020 by A-squared Studio is included in Appendix 6*
- *Impact Assessment*

1.8 The ground conditions beneath the site are:

Stratum	Depth to top (mbgl)	Thickness (m)	Average thickness (m)	Description
Topsoil	0.00	0.20m	0.20m	Existing concrete ground slab
Made Ground	0.00 to 3.75m	3.55m	3.55m	Loose to very loose brown, slightly clayey, Sand and Gravel with occasional brick cobbles, flint, ash, mortar and slate (refer to SI)
Lynch Hill Gravel	3.75m to 5.2m	1.45m	1.45m	Very dense, light, brown, slightly silty, very sandy Gravel.
Reworked London Clay	5.2m to 5.5m	0.30m	0.30m	Firm, brown and orange-brown mottled, slightly sandy, slightly gravelly clay.
London Clay	5.5m to 19.2m	13.70m	13.70m	Stiff fissured grey brown silty clay
Lambeth Group	19.2m	Depth not proven	Depth not proven	

1.9 Groundwater strikes were encountered within the Lynch Hill Gravel. Groundwater monitoring was conducted over a month. The results are summarised below.

Borehole	Unit	Lowest Water Level	Highest Water Level
TP1	Lynch Hill Gravel	4.00m bgl	4.00m bgl
BH1	Lynch Hill Gravel	5.00m bgl	3.46m bgl

1.10 The construction methods proposed are to be traditional mass concrete and reinforced (or special) underpins to the perimeter walls. These will be formed in an hit and miss sequence together with lateral propping to maintain stability of surrounding properties at all times. This is a well proven method of constructing basements beneath small terraced buildings. Temporary vertical props will provide load redundancy during the construction works. Internally there is a single masonry pier and this will be supported on a new reinforced concrete column between basement and ground. The use of Pynford Stools in the temporary condition will provide vertical support.

1.11 A structural monitoring strategy to control the works and impacts to neighbouring structures will comprise of a series of discrete survey targets fixed to the walls of adjoining properties. The three-dimensional co-ordinates of each target are to be established at least one month prior to construction. The co-ordinates are to be recorded at regular intervals during construction to check if adjoining walls have moved vertically and/or horizontally. The amount of movement will be checked against anticipated threshold levels to ensure any such movement remains within expected amounts

1.12 The BIA has assessed land stability and the impacts of the proposed development on neighbouring structures will be no greater than *Category 1* according to the *Burland Scale.*

1.13 The BIA has identified no potential slope stability impacts as the site and it's immediate and wider surrounds are relatively flat and level.

1.14 The BIA has identified there are no potential hydrological impacts.

1.15 The BIA has identified the site is above a Secondary A aquifer. The proposed development might just encounter the perched water table at formation level. Some temporary pumping might be required during construction however there are no *potential hydrogeological impacts on the wider hydrogeological environment as there will be little or no displacement of ground water as a result of the development.*

1.16 The BIA has identified the site to be *a very low flood risk for the proposed development i.e less than a 1 in 1000 annual probability of river or sea flooding.*

2.0 Introduction

The purpose of this assessment is to consider the effects of a proposed extension to the existing basement at 25 John's Mews, London WC1N 2NS on the local hydrology, geology and hydrogeology and potential impacts to neighbours and the wider environment. The site location is presented below and in Appendix 1.0.

The BIA approach follows current planning procedure for basements and lightwells adopted by LB Camden and comprises the following elements (CPG Basements):

- Desk Study;
- Screening
- Scoping
- Site Investigation and Interpretation
- Ground Movement Assessment
- Damage Impact assessment
- Impact Assessment

2.1 Authors

2.1.1 The BIA has been prepared by Ross and Partners in collaboration with Ground Engineering Ltd and A-Squared Studio.

Ross and Partners is a practice of professional Civil and Structural Engineering Consultants that was established in 1954. The company has been involved with the design of a multitude of basement developments. These include single, double and triple storey basements, including both new developments and basements beneath existing buildings.

Author:	A. Ahmadzai	BSc MSC
Reviewer/Approver:	M O 'Regan	BSc CEng MIStruct E

Ground Engineering Ltd specialises in the provision of geotechnical and geo-environmental ground investigation and associated professional services that is delivered thought their team of engineers, geologists and scientists.

Author:	J E M Davies	BSc (Hons) MSc C Geol FGS
Reviewer/Approver:	S Fleming	MSc MCSM C.Geol FGS

A-squared Studio provide specialist geotechnical engineering design, soil structure interaction analysis and numerical modelling in support of a wide range of sectors. They carried out the Ground Movement Analysis and damage assessment for the site.

Author:	M.Scordo	Dott Ing
Approver:	A Fasano	Dott Ing C Eng MICE

2.2 Sources of Information

2.2.1 The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Current/historical mapping has been reviewed from 1720 to the present day and is referenced as Figs A to X incl within Ground Engineering's Report in Appendix 5
- Geological mapping presented in the Camden Geological, Hydrogeological and Hydrological Study - Guidance for Subterranean Development (produced by Arup, 2010) Camden has been reviewed;
- Hydrogeological mapping presented in the Camden Geological, Hydrogeological and Hydrological Study - Guidance for Subterranean Development (produced by Arup, 2010) Camden has been reviewed;
- Current/historical hydrological data from Thames Water, Environment Agency;
- Flood risk mapping from the Environment Agency;
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) – Basements (March 2018);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);
- LB Camden's Audit Process Terms of Reference;

2.3 Existing and Proposed Development

2.3.1 The Application site is located at 25 John's Mews, WC1N 2NS and is within the Bloomsbury Conservations Area. The area is relatively level.

Site Location Plan

2.3.2 The house occupies the full footprint of the site.

2.3.3 The site stands at an approximate elevation of 22mOD with the surrounding area generally level and without any slopes exceeding 1.0°. The property and its immediate environs is not within a wider hillside setting.

2.3.4 The property owner is seeking permission to provide additional basement accommodation beneath the property. This will become a single basement with the basement slab set at approximately 3.5m below ground level. There is an existing part basement which is sloping and presently used as a cellar beneath part of the site. The upper floor, roof and facades will remain unchanged from the current planning application.

2.3.5 It is intended the redevelopment works will be carried out under a single construction contract.

2.3.6 Along Northington Street, the property is immediately flanked by 13 Northington Street. The photograph on page 5 shows that the two properties were constructed at the same time as a <u>single building</u> that have subsequently been divided into two sections: 25 John's Mews and 13 Northington Street. Presently, 25 John's Mews accommodation is arranged over ground and first floors as a single dwelling house for the client Mr Colin Fraser.
The adjacent 13 Northington Street was converted into two maisonettes in 1995. This part of the building has basement accommodation. It is believed the basement is part of the original construction. The desk top search indicates both buildings were historically used as (coach builders) in 1901 and (garage) during the 1960's. This suggests the building had a single use prior to its later sub-division. Given the foundations extend to circa 3.5m below ground level it is not unreasonable to presume a basement previously existed beneath 25 John's Mews.

2.3.7 Immediately to the South is 27 John's Mews. This is a small listed dwelling house with accommodation arranged over ground, first and second floors. The owners of 27 John's Mews obtained planning permission for a single storey basement extension in 2019.

2.3.8 Surrounding Basements

2.3.9 The coloured site plan adjacent illustrates the extent of existing basements immediately bordering the property. These are all single storey basements (shaded yellow). During our liaison with neighbours we also discovered a small below ground cellar space within no 25 John's Mews. We believe this dates from when the adjoining building was used as a vehicle repair workshop and constituted the means to access and repair the underside of vehicles.

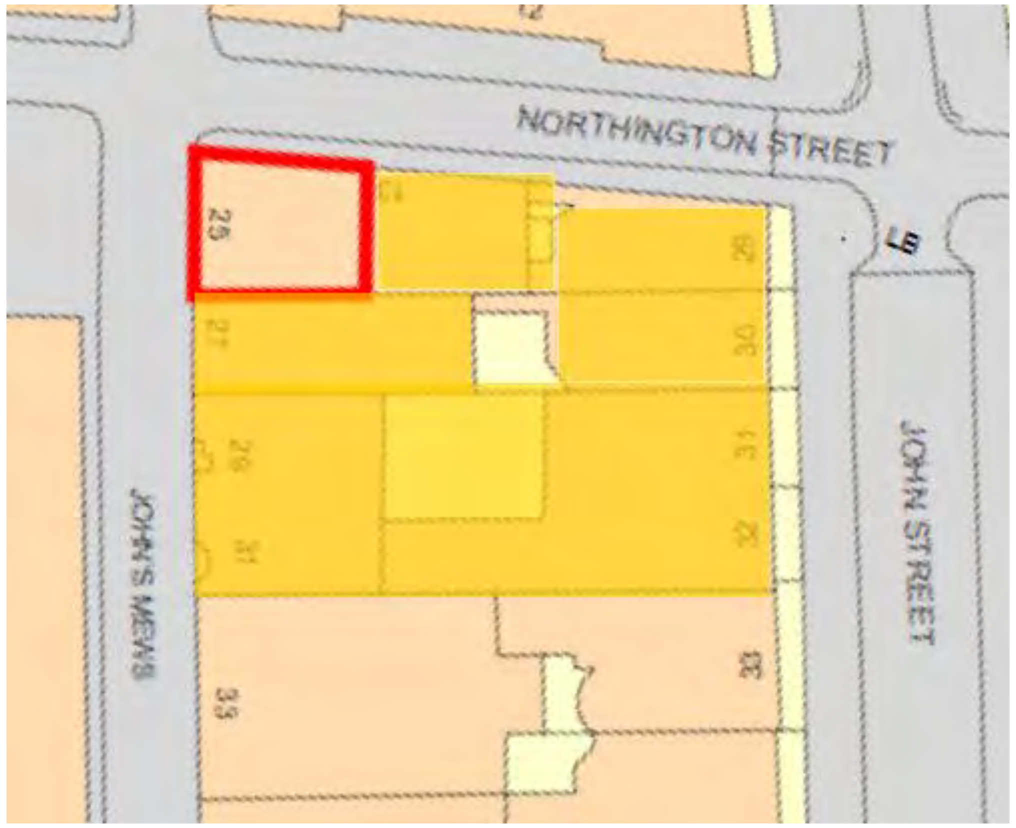
2.3.10 There is no garden at the site. Nor are there neighbouring gardens or any known trees to be protected.

2.3.11 Adjacent infrastructure includes the mews street that is John's Mews.

2.3.12 Underground infrastructure present beneath/close to the site is limited to simple gas, water, electrical and telecom at shallow depth within John's Mews. There are no underground tunnels near the site.

2.3.13 Existing and Proposed development drawings are presented in *Appendix 2.*

2.3.14 The proposed development will utilise well known construction techniques. These will include traditional hit and miss underpinning of perimeter walls, simple temporary propping and reinforced concrete substructures as shown on the sequence drawings in Appendix 2.



Surrounding basements are shown in Yellow.

3.0 Desk Study

3.1 Site History

3.1.1 With reference to historic maps the site was an open bowling green from 1720 until during most of the Eighteenth Century and was developed as a single building between 1755 and 1792. The building was used as both a stable and coach building workshop and at some time became a garage. The garage was known to have a basement in 1982 and 1995 (ref SI Report) which was subdivided and converted to residential use circa 1995.

3.1.2 There are no recorded WW2 bomb strikes at the site. The nearest recorded strike hit Cockpit Yard. It is reasonable to regard the ground beneath the property as free from any WW2 ordinance. The plan on the right shows recorded strikes in the vicinity of John's Mews.

Black	*total destruction*
Purple	*damaged beyond repair*
Dark Red	*seriously damaged; doubtful if repairable*
Light Red	*seriously damaged but repairable at cost*
Orange	*general blast damage – not structural*
Yellow	*blast damage, minor in nature*
Light blue	*clearance areas*

3.2 Geology

3.2.1 The British Geology Survey (BGS) map of the area (reference) indicates that the site is underlain by Taplow Gravels over the solid geology of the London Clay.

3.3 Hydrogeology

3.3.1 The site is designated by the EA as being underlain by a Secondary (A) aquifer, the Lynch Hill Gravel which overlies the unproductive strata of the London Clay.

3.3.2 LB Camden data indicates the site is not within a groundwater source protection zone.

3.4 Hydrology, Drainage and Flood Risk

3.4.1 There are no river networks or surface water features within 250m of the site. And the site is not at risk from these features.

3.4.2 The site is located approximately 500m from the River Fleet. There is a culverted tributary running east to west and situated approx. 120m to the north of the site.

3.4.3 The site surface area is currently 100% *impermeable with rainwater collected via roof gutters and rainwater downpipes which discharge via gravity into the public sewer.*

3.4.4 The proposed surface area will remain 100% *impermeable and maintain the same means of discharge into the public sewer.*

3.4.5 The site is classified as Flood Zone 1 with a *very low risk of surface water flooding*

3.4.6 The site *is not within a Critical Drainage Area.*

4.0 Screening

4.1 A screening process has been undertaken and the findings are described below.

Question	Response	Details
1a. Is the site located directly above an aquifer?	Yes	Site is underlain by Made Ground over River Terrace Deposits, see Site Investigation Report (Appendix 5; page 3)
1b. Will the proposed basement extend beneath the water table surface?	No	The proposed basement SSL is above the Water table.
2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	No	There is a culverted tributary of the River Fleet running some 120m to the North of the site.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No	The Hampstead ponds are approx. 5Km to the North
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	The site is presently 100% impermeable and will remain 100% impermeable.
5. As part of 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)?	No	The entire site is covered by hardstanding and is only circa 70m². The volume and peak flows will not be increased. There is no space for infiltration drainage.
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No	There are no local ponds or spring lines within 100m of the site.

4.2 Slope Stability

Question	Response	Details
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No	The site is level. See also Site Investigation (Appendix 5; page 34)
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	No reprofiling of the land is planned
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	Fig 16 of the CGHHS shows the site to be within an area of 0 to 7˚ slope.
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately1 in 8)?	No	Fig 16 of the CGHHS shows the site to be within an area of 0 to 7˚ slope.
5. Is the London Clay the shallowest strata at the site?	No	Lambeth Group present at 19.5m BGL. Refer to Site Investigation Report
6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained?	No	There is no vegetation nearby.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?`	No	No evidence of cracking damage or building movement was noted at the site.
8. Is the site within 100m of a watercourse or a potential spring line?	No	There is a culverted tributary of the River Fleet running some 120m to the North of the site. (Refer to Site Investigation; Appendix 5.0).
9. Is the site within an area of previously worked ground?	No	The site history shows the land to have historically been used as gardens
10. Is the site within an aquifer. If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	The excavation level is expected to extend some 250mm below the water table. Refer to Site Investigation report; Appendix 5.0.
11. Is the site within 50m of the Hampstead Heath Ponds?	No	The Hampstead ponds are approx. 5Km to the North
12. Is the site within 5m of a highway or pedestrian right of way?	Yes	The building faces John's Mews.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	The existing party wall foundations vary from between 1.6m and 4.0m below ground level. The new basement will unify the foundation levels.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	There are no tunnels under or near the site

4.3 Surface Water and Flooding

Question	Response	Details
1. Is the site within the catchment of the pond chains on Hampstead Heath?	No	The Hampstead ponds are approx. 5Km to the North
2. 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	The SW discharge will remain as existing.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The present site is 100% covered by the buildings and the proposed development will also cover 100%.
4. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	Little or no displacement of groundwater will take place as a result of the development. (Ref Ground Eng Report; Appendix 5.0 P35)
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Little or no displacement of groundwater will take place as a result of the development. (Ref Ground Eng Report; Appendix 5.0 P35)
6. 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.	No	The site is within Flood Risk Zone 1. There is no reported history of flooding.

4.4 Non-Technical Summary of Screening Process

The scoping stage of the BIA requires applicants to identify the potential impacts of the proposed scheme, which are shown by the screening process to require further investigation.

4.4.1 The screening process identifies the following issues to be carried forward to scoping for further assessment:

Hydrogeology

- The site is located directly above an upper secondary aquifer. The proposed development might potentially extend to approximately 250mm beneath the water table such that some local dewatering might be required during construction?

Land Stability

- The site is within 5m of a Highway or pedestrian right of way. Namely the building faces John's Mews.
- the existing party wall foundations vary from 1.6m to 4.0m below ground level. The new proposals will unify foundation depths.

These impacts are investigated further within Stage 3 Site Investigation and assessed within Stage 4 Impact Assessment.

4.4.2 The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

5.0 Scoping

The following issues have been brought forward from the Screening process for further assessment:

5.1 Hydrogeology

5.1.1 The site is directly above a Secondary (A) aquifer and the proposed development could potentially extend marginally below the water table. It is prudent therefore to consider the potential impacts such as site dewatering to facilitate construction, displacement of ground water and any consequential rise in ground water levels.

5.1.2 It is considered that the development proposals can be suitably designed to ensure no adverse impact on ground water. In order to demonstrate this, a site-specific ground investigation is presented in Section 6, with implications discussed and concluded therein and within Section 8.

5.2 Land Stability (proximity of Highway)

5.2.1 The site is immediately adjacent to John's Mews, which is a narrow roadway. Stability of the roadway must be maintained during and after construction.

5.2.2 The retaining walls will be designed for lateral loads resulting from:

- lateral loads arising from the retained earth,
- ground water (which will be taken at a conservative level of 1.0m bgl)
- a variable surcharge action of 10.0KPa and
- At rest earth pressures K_0.

Temporary lateral props will be deployed to ensure vertical and lateral stability is maintained at all times.

5.2.3 No further assessment is considered necessary. Stability will be maintained at all times.

5.3 Land Stability (differential depth of foundation)

5.3.1 The proposed development will increase differential foundation depth with neighbours. The construction activities will cause ground movements and have the potential to damage existing neighbouring properties.

5.3.2 It is considered that the development proposals can be suitably designed to maintain stability. In order to demonstrate this, a site specific ground investigation is presented in Section 4, with structural information and a ground movement assessment presented in Section 5. Conclusions of the impact assessment are provided in Section 8.

6.0 Site Investigation/Additional Assessments

6.1 Site Investigation

6.1.1 The third stage of the BIA, the Site Investigation, is undertaken to develop an understanding of the site and its immediate environs.

6.1.2 In January 2020, Ground Engineering Ltd carried out intrusive geotechnical investigations works at the site. These consisted of a trial pit excavations and a window sampling borehole. Pertinent site investigation data carried out by Ground Engineering within the adjacent 27 John's Mews is also presented with the kind permission of the property owner.

6.1.3 The results of their investigations together with an interpretative discussion of the proposed subterranean works are presented within their Report Ref No C14983, which is presented within Appendix 4.0

6.2 Site Geology

6.2.1 The ground conditions are generally as expected and summarised below:

Stratum	Depth to top (mbgl)	Thickness (m)	Average thickness (m)	Description
Existing flooring	0.00	0.35m	0.35m	Existing floorb
Made Ground	0.35 to 3.90m	3.55m	3.55m	MADE GROUND Loose, dark brown and grey, clayey, sandy gravel of brick, concrete and flint. Below 2.8m soft, brown, black and light brown mottled, slaightly sandy, slightly gravelly, silty clay. Gravel of brick, ash, limestone and flint.
Lynch Hill Gravel	3.90m to 5.8m	1.90m	1.90m	Dense, light, brown and orange brown, silty SAND AND GRAVEL.
Reworked London Clay	5.8m to below	Not Proven	Not Proven	Firm, brown and orange-brown mottled, slightly sandy, slightly gravelly clay.
London Clay	5.5m to 19.2m	13.7m	13.7m	Stiff fissured grey brown silty clay
Lambeth Group	19.2m	Depth not proven	Depth not proven	

6.2.2 Groundwater strikes were encountered within the Lynch Hill Gravel. Groundwater monitoring was conducted over a month. The results are summarised below.

Borehole	Unit	Lowest Water Level	Highest Water Level
WS1	Lynch Hill Gravel	3.9m bgl	3.9m bgl
Trial Pits	Lynch Hill Gravel	No water Strikes	No Water Strikes

7.0 Construction Methodology/ Engineering Statements

7.1 Outline Geotechnical Design Parameters

7.1.1 Reasonably conservative geotechnical parameters have been determined, based on the site investigation data presented in the site investigation report. (Appendix 4.0)

Soil Type	Bulk Density (Mg/m³) Y_B	Effective Shear Strength c' (kPa)	Angle of Shearing Resistance Φ' (Degrees)
Made Ground	1.80	0	28°
Lynch Hill Gravel	2.10	0	41°
London Clay	2.00	0-2	22°

At rest pressure coefficients have been employed, where

$K_0 = 1 - \sin(\Phi'_{r.d}) = 0.540$

7.2 Outline Temporary and Permanent Works Proposals

7.2.1 The basement construction sequence is presented within Appendix 2 on drawings 2012-RP-XX-ZZ-DR-S-101 TO 110 inclusive. The construction sequence employs traditional underpinning of perimeter walls in an hit and miss sequence coupled with temporary horizontal props and waling beams. This method maintains stability during all work stages and will be familiar to contractors specialising in basement construction works.

The basement will be formed of an insitu reinforced concrete "box" with a 350mm thick basement slab, 200mm (min) thick concrete retaining walls and 200mm thick ground floor slab.

The party walls will be underpinned in a traditional hit and miss sequence to ensure they are not undermined by the construction and are founded below the depth of the proposed excavation. The pins will be reinforced and as such are regarded as "special foundations" under the Party Wall Act. Each pin will have cast-in Kwikastrip continuity reinforcement sleeves to ensure full continuity of reinforcement between adjoining bays.

The concrete retaining walls are designed to retain the basement in the temporary and permanent condition. This includes

- lateral loads arising from the retained earth,
- ground water (which will be taken at a conservative level of 1.0m bgl)
- a variable surcharge action of 10.0KPa

The new substructure will comprise of a concrete raft foundation slab, "special" reinforced underpins which are designed to act as retaining walls and temporary propping. The construction work sequence is illustrated on Stage by Stage drawings as follows:

7.3 Ground Movement and Damage Impact Assessment

7.3.1.1 A Ground Movement Assessment (GMA) has been carried out by A-squared Studio (ref: 1474-A2S-XX-XX-RP-Y-0001-00) and is presented in Appendix 6. The assessment has been carried out using Oasys Xdisp and Pdisp software and with reference to CIRIA C760. The analysis allows for the short and long term cumulative vertical and horizontal ground movements induced by the works phases of demolition, underpinning, basement excavation and subsequent permanent works. The assessment takes into account the construction methodology and site specific ground and groundwater conditions.

7.3.2 The assessment encompasses all properties located within the *zone of influence* of the proposed scheme. The GMA assessment is based on *greenfield* movements neglecting the stiffness of any structures. The adopted assessment methodology provides a robust and conservative assessment representative of current industry best practice.

7.3.3 Two different scenarios have been considered in order to bind the potential ground movements arising from the works:

- The effects of unloading and overburden removal using Pdisp, and
- Excavation induced ground movements using empirical CIRIA curves in Xdisp.
- Both short-term (undrained) and long-term (drained) conditions have been assessed by adopting relevant soil stiffness parameters for each case.

7.3.4 The ground movements resulting from the works are movements due to unloading from excavation, underpinning as well as loading from the permanent structure. Contour plots are presented in the body of the report.

7.3.5 The following structures were assessed, having been identified as potentially within that zone of influence:

In accordance with the Burland Scale, the damage impacts are assessed as:

Property	*Potential damage Impacts*
13 Northington Street	*Category 1 Very Slight*
27 John's Mews	*Category 1 Very Slight*

7.4 Control of Construction Works

7.4.1 The construction works will be closely controlled in accordance with the relevant technical guidelines for underpinning such as the ASUC. It is recognised that basement construction works should be undertaken by suitably qualified and experienced contractors only under the supervision of a chartered engineer.

7.4.2 The temporary support works are crucial for the safety of construction works and to limit potential ground movements. Surplus props will be kept on site during the basement works to cater for any unexpected ground conditions or loose masonry.

- Props are to be checked twice daily to ensure they are securely deployed.
- Excavation will proceed in horizontal layers

7.4.3 Movement Monitoring

A structural monitoring strategy is proposed during the works.

It is known that all buildings experience some degree of movement and that this can vary with the types of foundations, ground conditions and weather conditions throughout the year.

The purpose of movement monitoring is to check adjacent properties to ensure any recorded movements are within the predicted movements determined from the Ground Movement Analyses calculated by Messrs A². The Contractor will appoint an independent surveyor to fix temporary "targets" to the external facades of adjacent buildings and check for any movement at regular intervals throughout the construction phase of the project.

Scope

Prior to commencement of any new works, a series of targets will be installed on the facades of adjoining buildings. The three-dimensional co-ordinates of each target are to be established. The co-ordinates will be recorded at regular intervals to check if a wall has moved vertically and/or horizontally. The monitoring station (s) will need to be protected throughout the construction period. Ideally two independent stations should be provided for continuity in the event of damage. If it becomes necessary for a station to be relocated, the new station should be set up and target co-ordinates established for an agreed period (min two weeks) prior to the decommissioning of the existing station.

Accuracy

The survey equipment shall achieve the following tolerances:

- Target co-ordinates +/- 2.0mm

Frequency of Monitoring and Reports:

- Ideally target monitoring should take place two to three months prior to commencement of demolition works. Target monitoring is to take place daily and to include recalibration from back-sights. All data is to be transferred to the engineer, party wall surveyor and contractor.

Monitoring Reports

- The independent monitoring surveyor will produce a summary report that includes, the following:

- Executive Summary
- Target Location diagrams/photos
- Tables showing base readings and tabulated differences (if any) in mm
- Deflection Graphs.

The reports are to be used to monitor actual building movements against those predicted from the ground movement analyses.

Action levels

Building façade movements have been calculated as part of the ground movement analyses.

Trigger Level	Action to be Taken
Green Trigger Value (movement within predicted levels)	Continue with monitoring and works as planned
Amber Trigger Value (movement approaching predicted levels)	All interested parties, including the Adjoining Owner's Surveyor should be informed. The contractor and engineer will consider the cause of the movement and submit proposals to limit movement thereafter.
Red Trigger Value (movement above predicted levels)	All interested parties including Adjoining Owner's Surveyor and Engineer will be informed immediately. Works will stop in the affected area immediately, and if required actions will be taken to make the works safe. Actions to limit movement thereafter to be proposed by the contractor for comment.

7.4.4 Noise and Vibration

In general, Best Practicable Means as defined in section 72 of the Control of Pollution Act 1974 will be employed to minimise noise and vibration. Furthermore, the guidance provided within BS 5228-1:2009 – Code of practice for noise and vibration control on construction sites –part 1 will be followed. Such measures control the noise at source by using effective acoustic screens or barriers and ensuring regular maintenance of plant. The following measures will be implemented:

- Restricted working hours to reduce impact.
- The contractor will only use the most environmentally acceptable and quietly operating plant and equipment compatible with the safe and efficient execution of the works.
- Items of plant operating on site will be shut down in intervening periods of use.
- Compressors brought onto site will be sound reduced models.
- All pneumatic tools will be fitted with silencers of mufflers.
- Where the use of impact hammers is necessary for the ground works, their attachment to larger and heavier excavators can often reduce the level of vibration.
- Care to be taken during the erection of scaffolding to avoid impacts from banging steel.
- Deliveries will be programmed to arrive during working hours only. Care will be taken when unloading vehicles and construction vehicles will be routed on major roads where possible.
- In addition, liaison with the Environmental Health Officer at LB Camden will be maintained throughout the construction period if required.

8.0 Basement Impact Assessment

8.1 25 John's Mews is a small terraced house within Bloomsbury's conservation area. The owner and occupier would like to extend the existing basement/cellar and this is the subject matter of this basement impact assessment. The four outer walls of the property will be retained; as will the roof and first floor. The rear and two side walls are Party Walls that are shared with neighbouring buildings.

The proposal is for a single-story basement extending to approximately 3.5m below existing ground level. The basement will be formed of an insitu reinforced concrete "box" with a 350mm thick basement slab, 250mm thick concrete retaining walls and 200mm thick ground floor slab.

The party walls will be underpinned in a traditional hit and miss sequence to ensure they are not undermined by the construction and are founded below the depth of the proposed excavation.

The concrete retaining walls are designed to retain the basement in the temporary and permanent condition. This includes

- lateral loads arising from the retained earth,
- ground water (which will be taken at a conservative level of 1.0m bgl)
- At rest earth pressure coefficient of $K_0 = 0.54$
- a variable surcharge action of 10.0KPa

The basement structure will comprise of an insitu reinforced concrete "box" having a 350mm raft slab and 200mm thick reinforced concrete walls.

8.1.1 The ground conditions, proven by site investigation, are:

Stratum	Depth to top (mbgl)	Thickness (m)	Average thickness (m)	Description
Existing flooring	0.00	0.35m	0.35m	Existing floorb
Made Ground	0.35 to 3.90m	3.55m	3.55m	MADE GROUND Loose, dark brown and grey, clayey, sandy gravel of brick, concrete and flint. Below 2.8m soft, brown, black and light brown mottled, slaightly sandy, slightly gravelly, silty clay. Gravel of brick, ash, limestone and flint.
Lynch Hill Gravel	3.90m to 5.8m	1.90m	1.90m	Dense, light, brown and orange brown, silty SAND AND GRAVEL.
Reworked London Clay	5.8m to below	Not Proven	Not Proven	Firm, brown and orange-brown mottled, slightly sandy, slightly gravelly clay.
London Clay	5.5m to 19.2m	13.7m	13.7m	Stiff fissured grey brown silty clay
Lambeth Group	19.2m	Depth not proven	Depth not proven	

8.1.2 The monitored groundwater level is:

Borehole	Unit	Lowest Water Level	Highest Water Level
WS1	Lynch Hill Gravel	3.9m bgl	3.9m bgl
Trial Pits	Lynch Hill Gravel	No water Strikes	No Water Strikes

8.1.3 The site is flat. And the existing foundations, which are shared with the neighbours, are founded at nearly 4.0m below ground level. The new foundation raft will be at circa 3.5m below ground level.

8.1.4 The construction methodology employs traditional methods of underpinning and temporary works props that are designed to maintain stability at all times and are familiar to contractors specialising in basement construction.

8.1.5 A ground movement assessment has been undertaken, in accordance with industry best practice, to address potential movements arising from demolition, underpinning, excavation and the permanent new structure. Short-term and long-term movements have been analysed. All surrounding properties within the zone of influence have been assessed and the results indicate Burland Damage limits not exceeding *Category 1, very slight*. This has been reviewed and considered as reasonable, acceptable, and achievable. Contractors suitably experienced with this type of construction will be employed to undertake the works together with appropriate levels of monitoring and control procedures.

8.2 Land Stability/Slope Stability

8.2.1 The site investigation has identified a suitable founding stratum of Lynch Hill Gravels.

8.2.2 The screening stage identified the two issues to be brought to the screening stage. The impact assessments are:

Scoping Issue 1
Is the site within 5m of a Highway or pedestrian right of way?
Impact Assessment
The site immediately faces John's Mews. There are utility services of electricity, water, and gas within the road. Basement construction can result in ground movements and these must not have a detrimental effect on buried utilities. The retaining walls are designed for lateral loads resulting from: Earth pressures arising from the retained soil, ground water (which will be taken at a conservative level of 1.0m bgl) a variable surcharge action of 10.0KPa and At rest earth pressures K_0. Temporary lateral props will be deployed to ensure vertical and lateral stability is maintained at all times. On such a basis the residual risk is considered to be of minor significance.
Further Information
Ground Engineering Report within Appendix 5.0

Scoping Issue 2
Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?
Impact Assessment
The perimeter walls are supported on traditional strip footings which may have been historically underpinned. They are founded between 1.6m and 4.0m below ground level. It is proposed these are underpinned to circa 3.75m below ground level. The underpinning shall be undertaken in a hit and miss sequence to maintain stability and minimise ground movements. The property at 29-31 John's Mews has an existing basement carpark and will remain largely unaffected by this. The underpinning will locally increase the stiffness of the shared party wall with 25 John's Mews; and it is noteworthy that some of the foundations of no 25 already extend to basement level. The methodology has been modelled and impacts on surrounding properties are all at Burland Category 0 and 1.0. It is also noted within Ground Engineering's Report that little, if any amount of heave is anticipated to occur at formation level, as a consequence of demolition and bulk excavation (see Ground Engineering Report in Appendix 5.0) as any heave would dissipate between the inter-grain contacts within the Lynch Hill Gravel.

8.2.3 The risk of movement and damage arising from this development due to demolition, underpinning, excavation and the new permanent structure is no greater than Burland exceeding *Category 1, very slight*.

8.2.4 The BIA has concluded that there *will not be risks or stability impacts to adjacent properties.*

8.3 Hydrogeology and Groundwater Flooding

8.3.1 The screening stage identified one issue to be brought to the screening stage. The impact assessment is as follows:

Scoping Issue
The site is within an aquifer. The proposed development is likely to extend beneath the water table such that dewatering might be required during construction?
Impact Assessment
The site investigation identified water strikes at 4m and 5m below ground level. The seepage was noted to be gradual. Localised dewatering of pins may be necessary during construction. This would be in the form of localised sump pumps within each small excavation. As this is a localised activity over a short duration, there will not be a large-scale migration of fine particles and lowering of the water table. This is a common underpinning activity and it is reasoned it will not lead to damage of adjoining properties and infrastructure.
Further Information
Ground Engineering Report in Appendix 5.0

8.3.2 The BIA has concluded there is a negligible risk of ground water flooding. The highest recorded groundwater level at the site is below the proposed basement structural floor level. Little or no displacement of groundwater will take place due to this new basement and there will be little or no rise in groundwater level. This includes the cumulative effects of surrounding nearby basements.

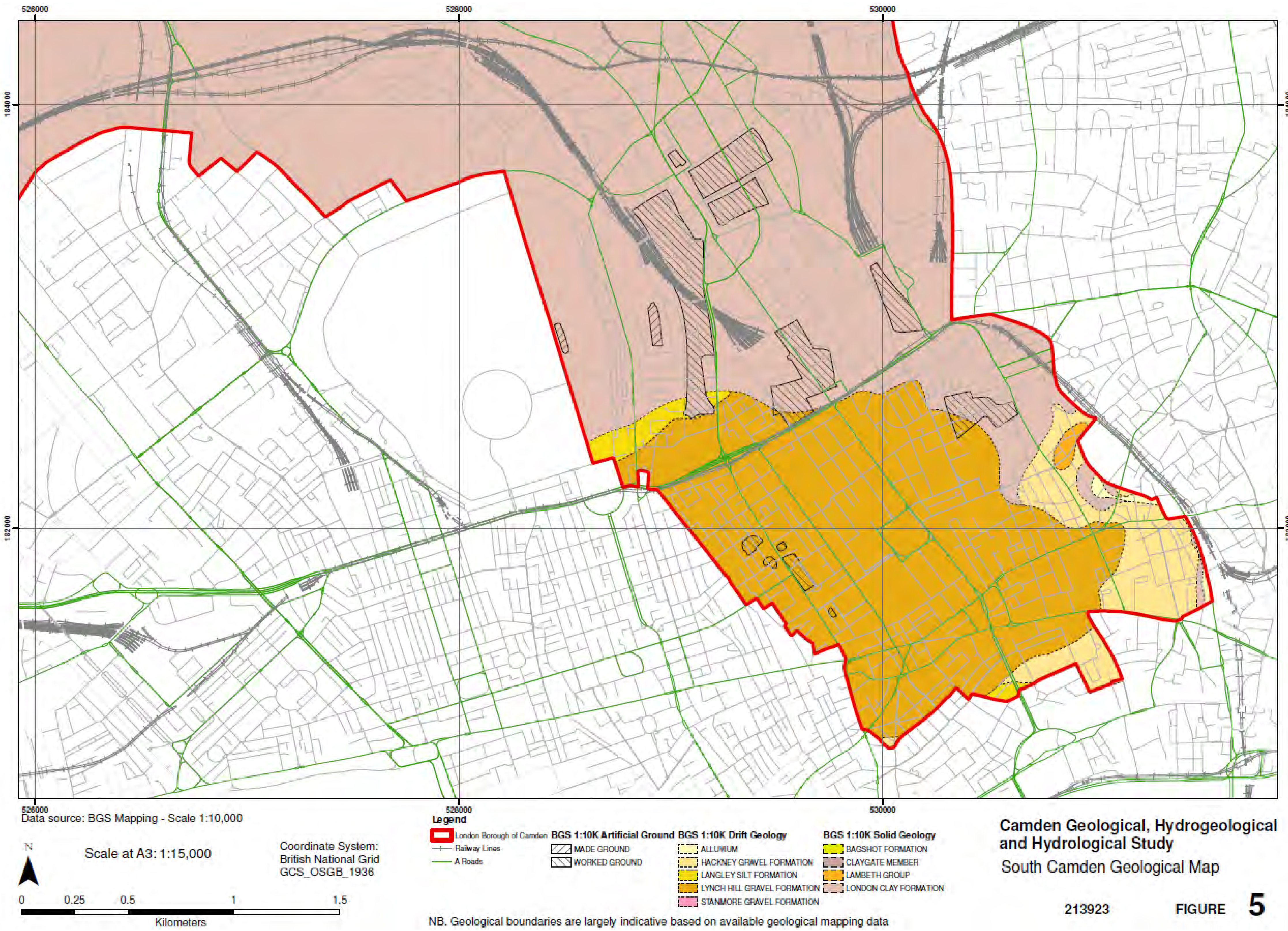
8.3.3 The BIA has concluded *there are no impacts* to the wider hydrogeological environment.

8.4 Hydrology, Surface Water Flooding and Sewer Flooding

8.4.1 The BIA has concluded there is negligible risk of *surface water/sewer flooding.*

8.4.2 The BIA has concluded there are *no impacts to the wider hydrological environment.*

Appendix 1: Desk Study References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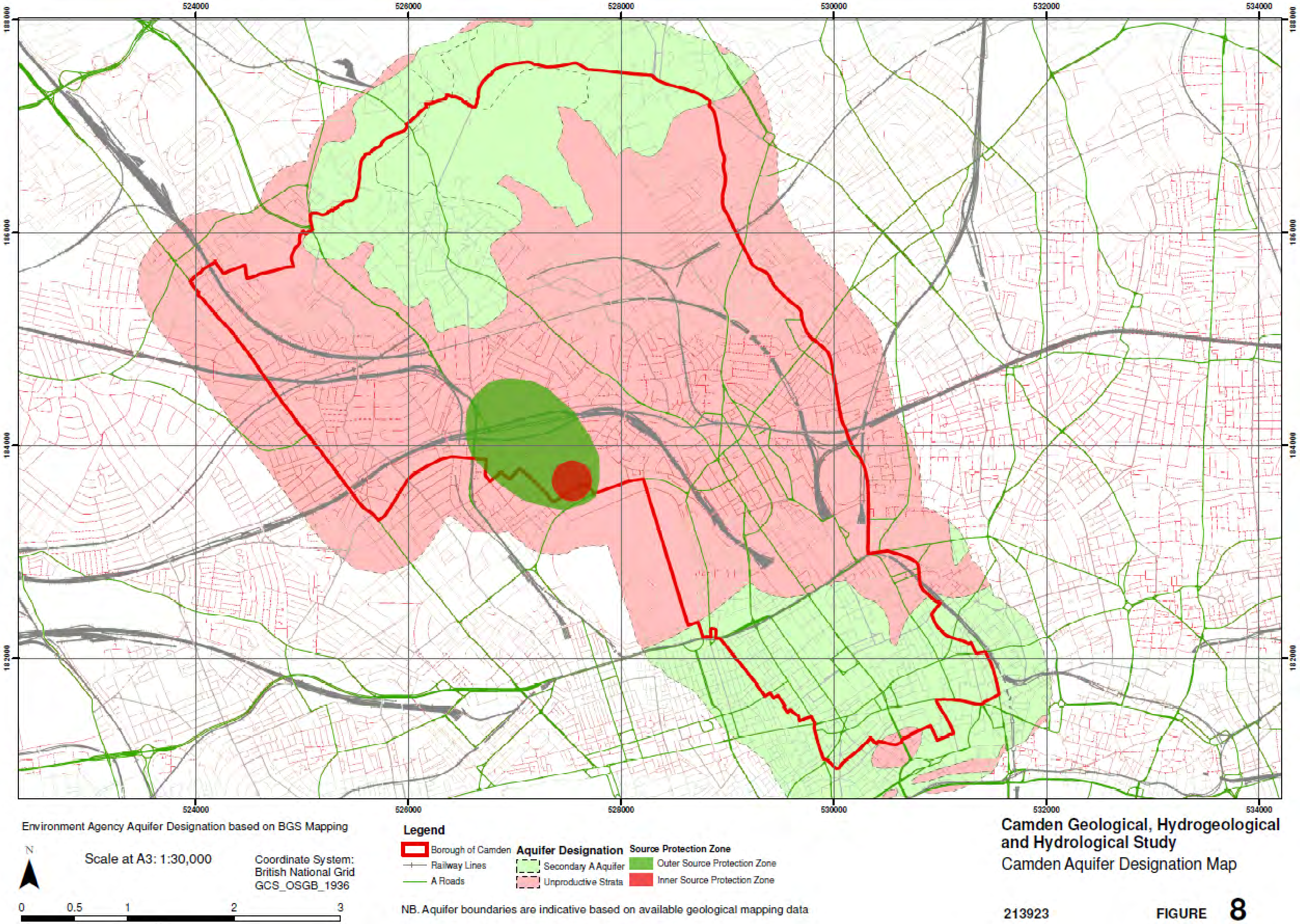
Kilometers
Legend
London Borough of Camden
Railway Lines
A Roads
BGS 1:10K Artificial Ground
MADE GROUND
WORKED GROUND
BGS 1:10K Drift Geology
ALLUVIUM
HACKNEY GRAVEL FORMATION
LANGLEY SILT FORMATION
LYNCH HILL GRAVEL FORMATION
STANMORE GRAVEL FORMATION
BGS 1:10K Solid Geology
BAGSHOT FORMATION
CLAYGATE MEMBER
LAMBETH GROUP
LONDON CLAY FORMATION
NB. Geological boundaries are largely indicative based on available geological mapping data
Camden Geological, Hydrogeological and Hydrological Study
South Camden Geological Map
213923
FIGURE 5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Environment Agency Aquifer Designation based on BGS Mapping
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Coordinate System: British National Grid GCS_OSGB_1936
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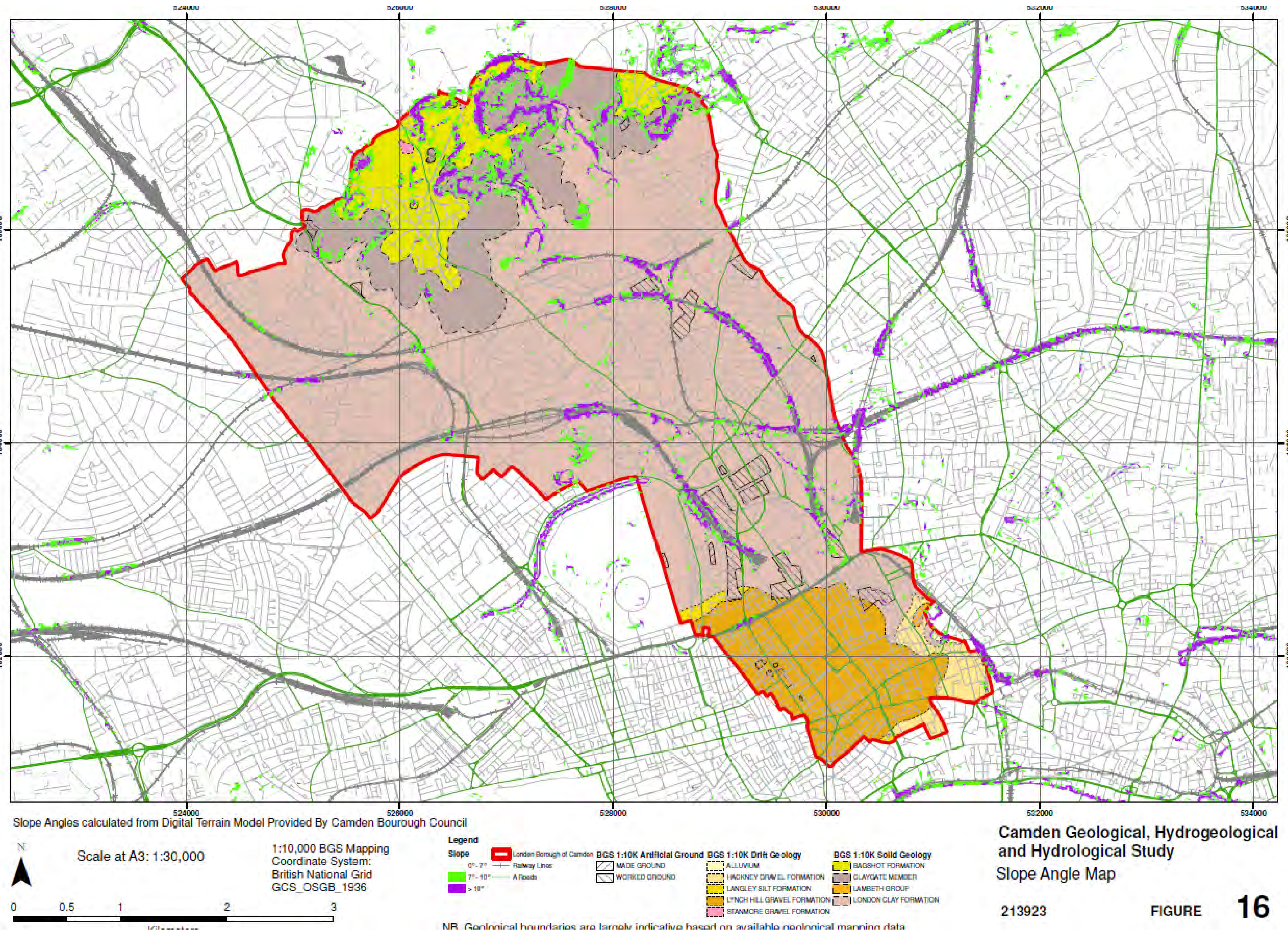
Legend
Borough of Camden
Railway Lines
A Roads
Aquifer Designation
Secondary A Aquifer
Unproductive Strata
Source Protection Zone
Outer Source Protection Zone
Inner Source Protection Zone
NB. Aquifer boundaries are indicative based on available geological mapping data
Camden Geological, Hydrogeological and Hydrological Study
Camden Aquifer Designation Map
213923
FIGURE 8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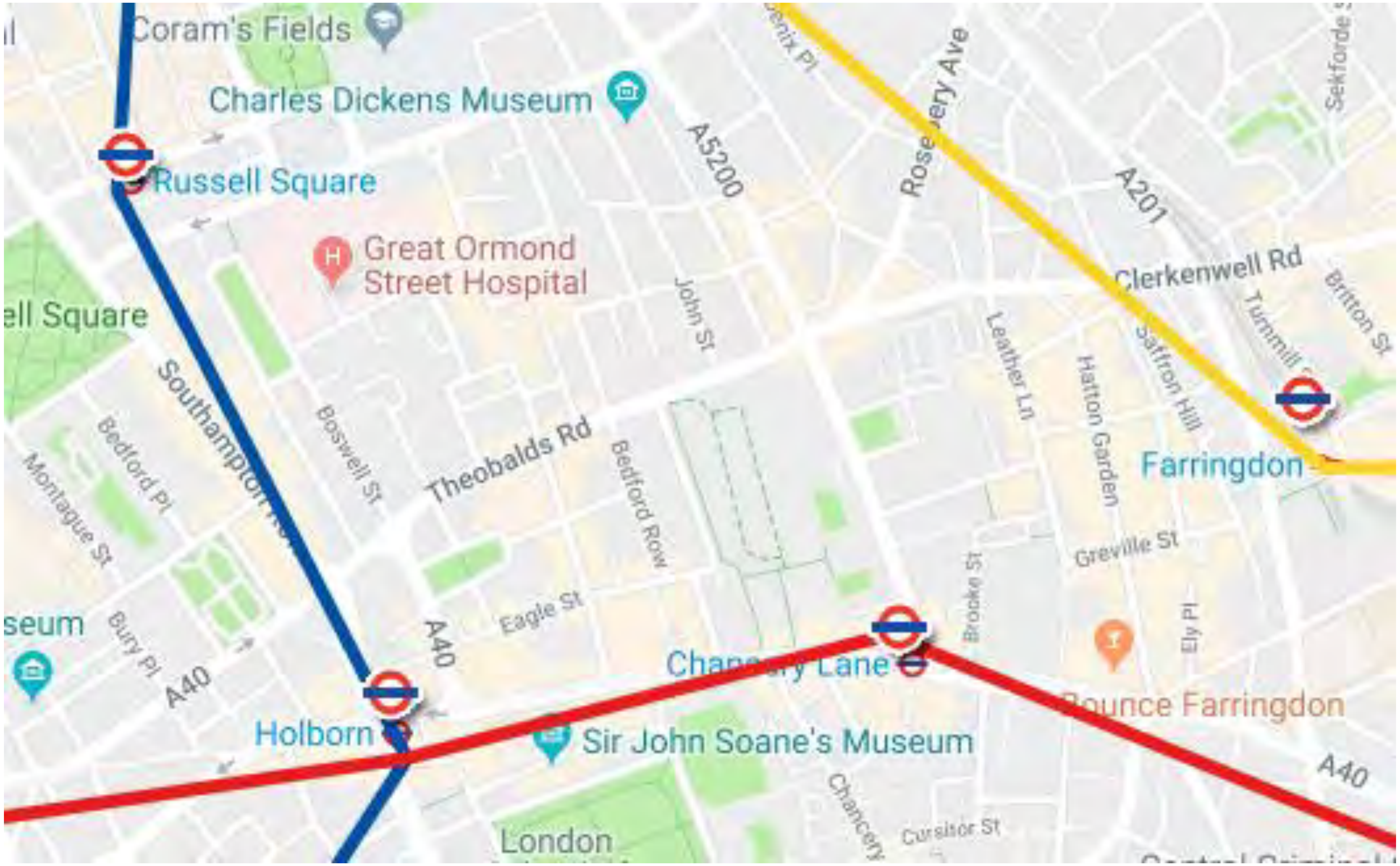
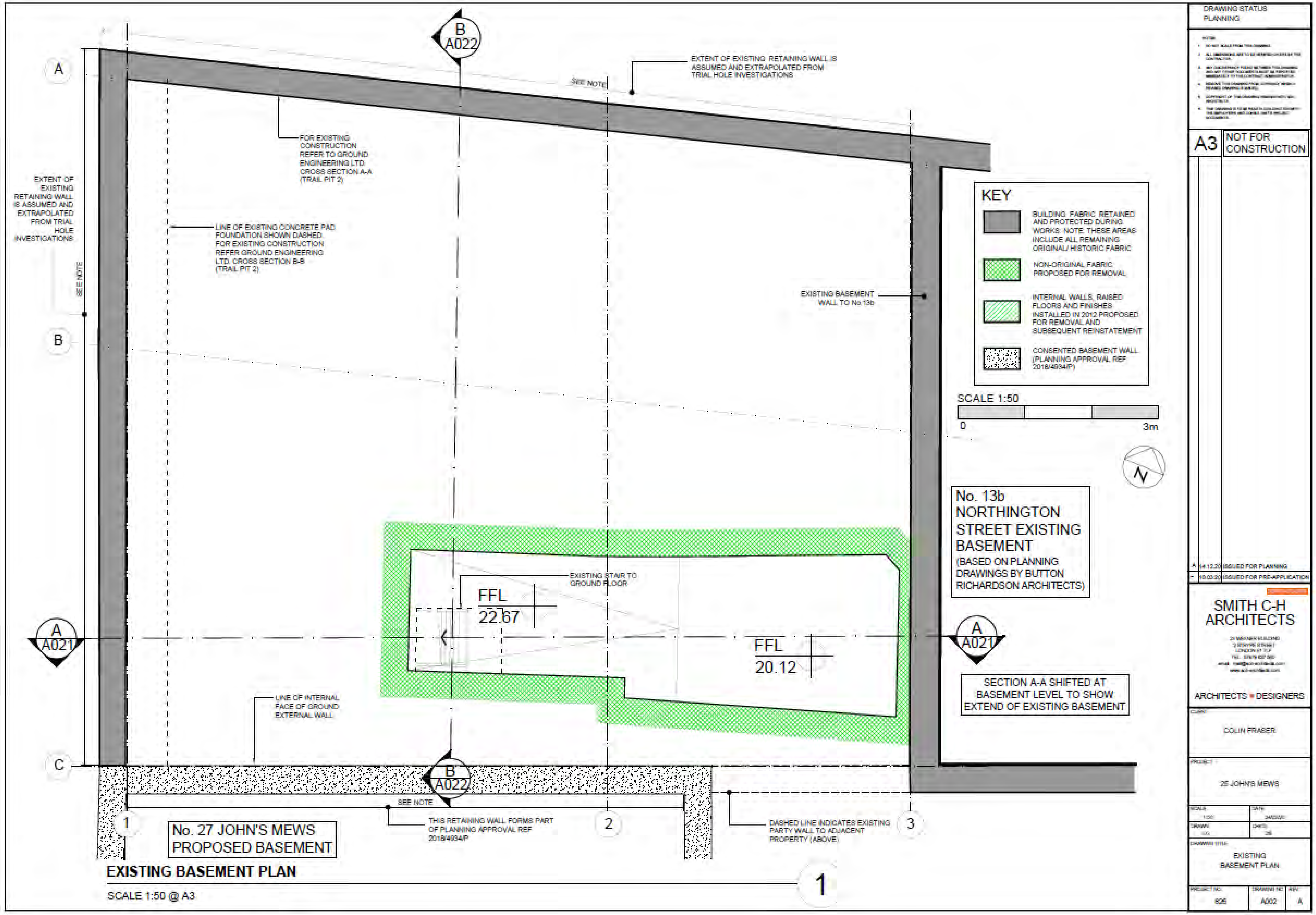
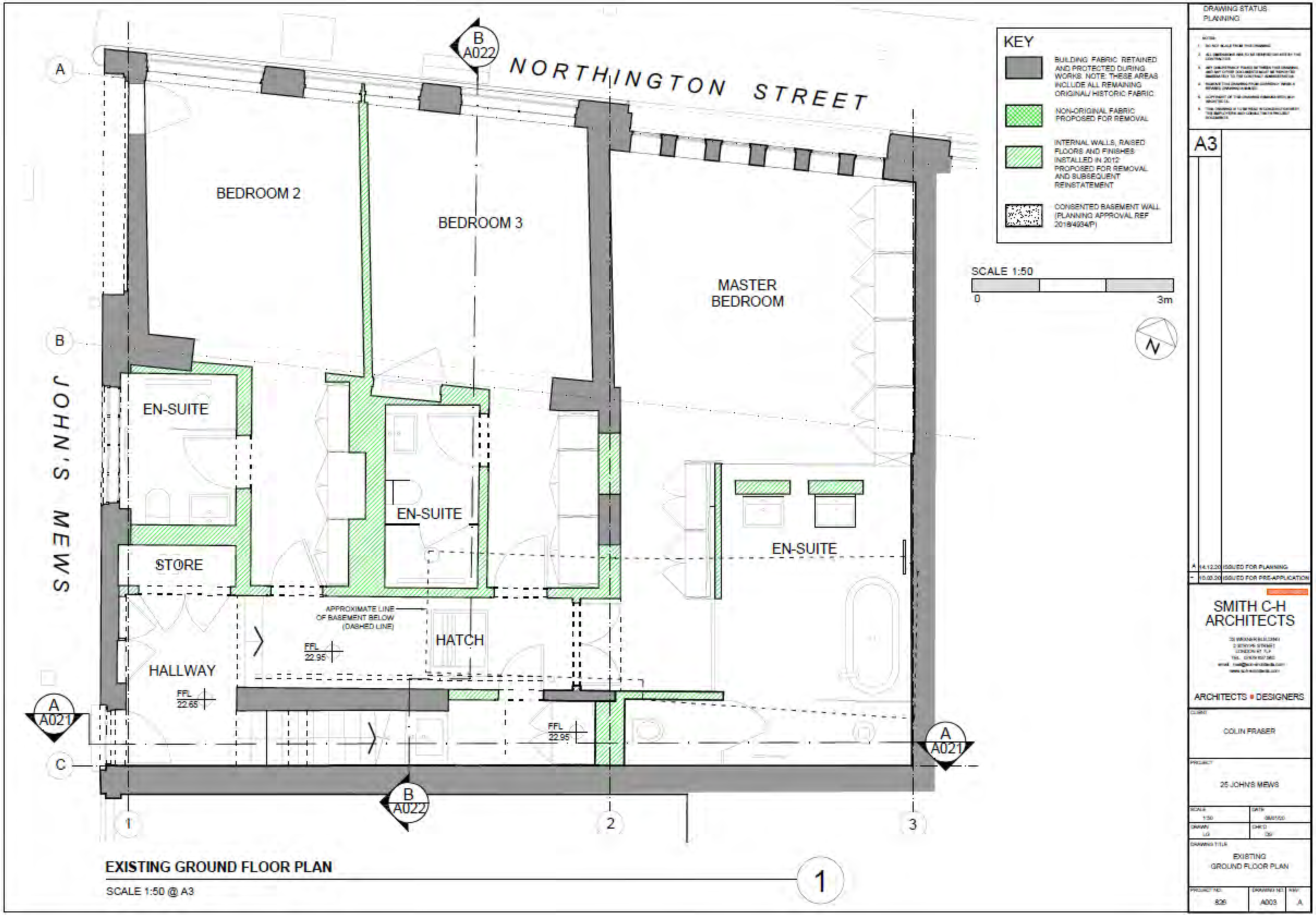
Slope Angles calculated from Digital Terrain Model Provided By Camden Bourough Council
Scale at A3: 1:30,000
1:10,000 BGS Mapping
Coordinate System:
British National Grid
GCS_OSGB_1936
0 0.5 1 2 3
Legend
Slope
0°- 7°
7°- 10°
> 10°
London Borough of Camden
Railway Lines
A Roads
BGS 1:10K Artificial Ground
MADE GROUND
WORKED GROUND
BGS 1:10K Drift Geology
ALLUVIUM
HACKNEY GRAVEL FORMATION
LANGLEY SILT FORMATION
LYNCH HILL GRAVEL FORMATION
STANMORE GRAVEL FORMATION
BGS 1:10K Solid Geology
BAGSHOT FORMATION
CLAYGATE MEMBER
LAMBETH GROUP
LONDON CLAY FORMATION
NB. Geological boundaries are largely indicative based on available geological mapping data
Camden Geological, Hydrogeological and Hydrological Study
Slope Angle Map
213923
FIGURE 16

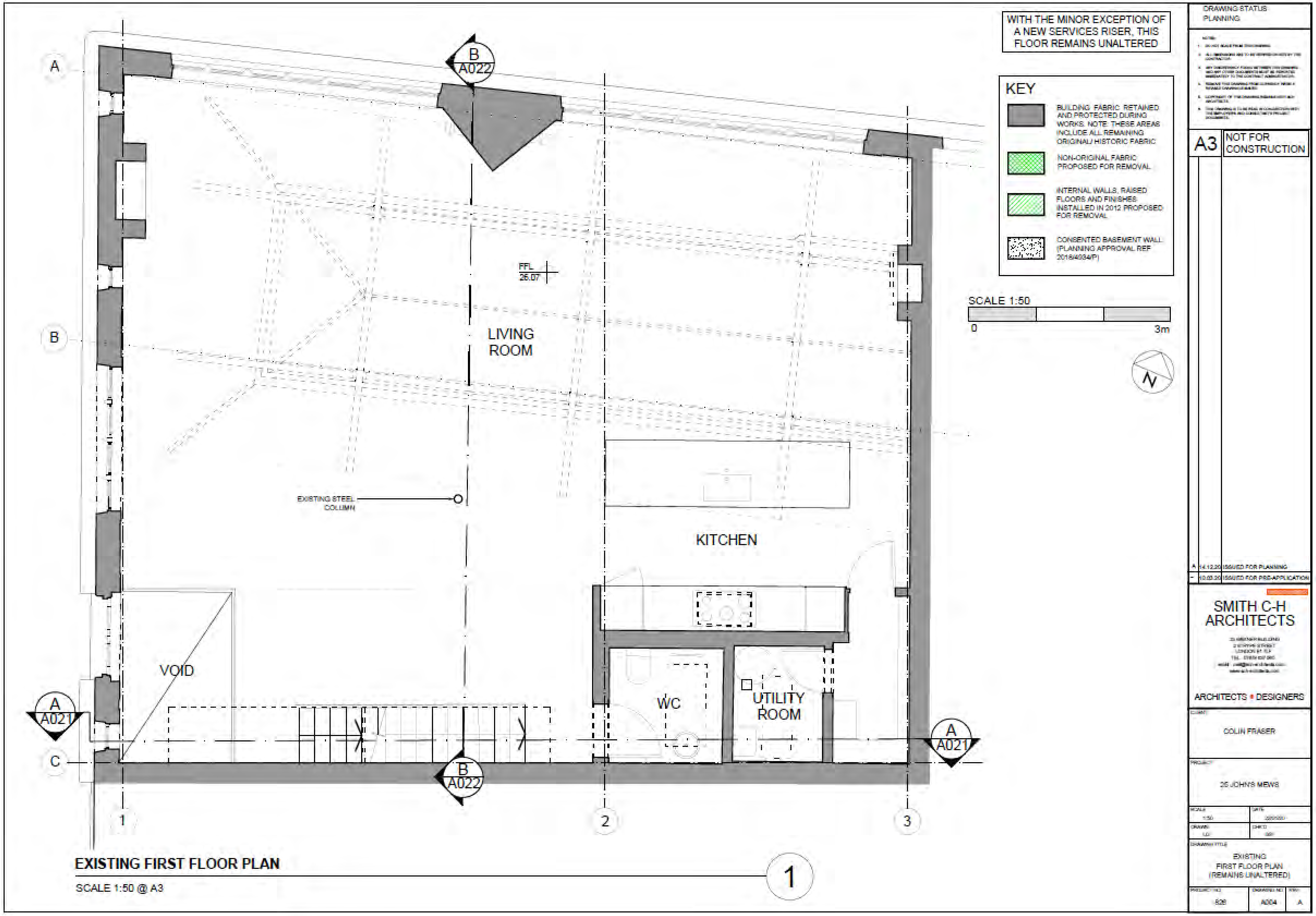


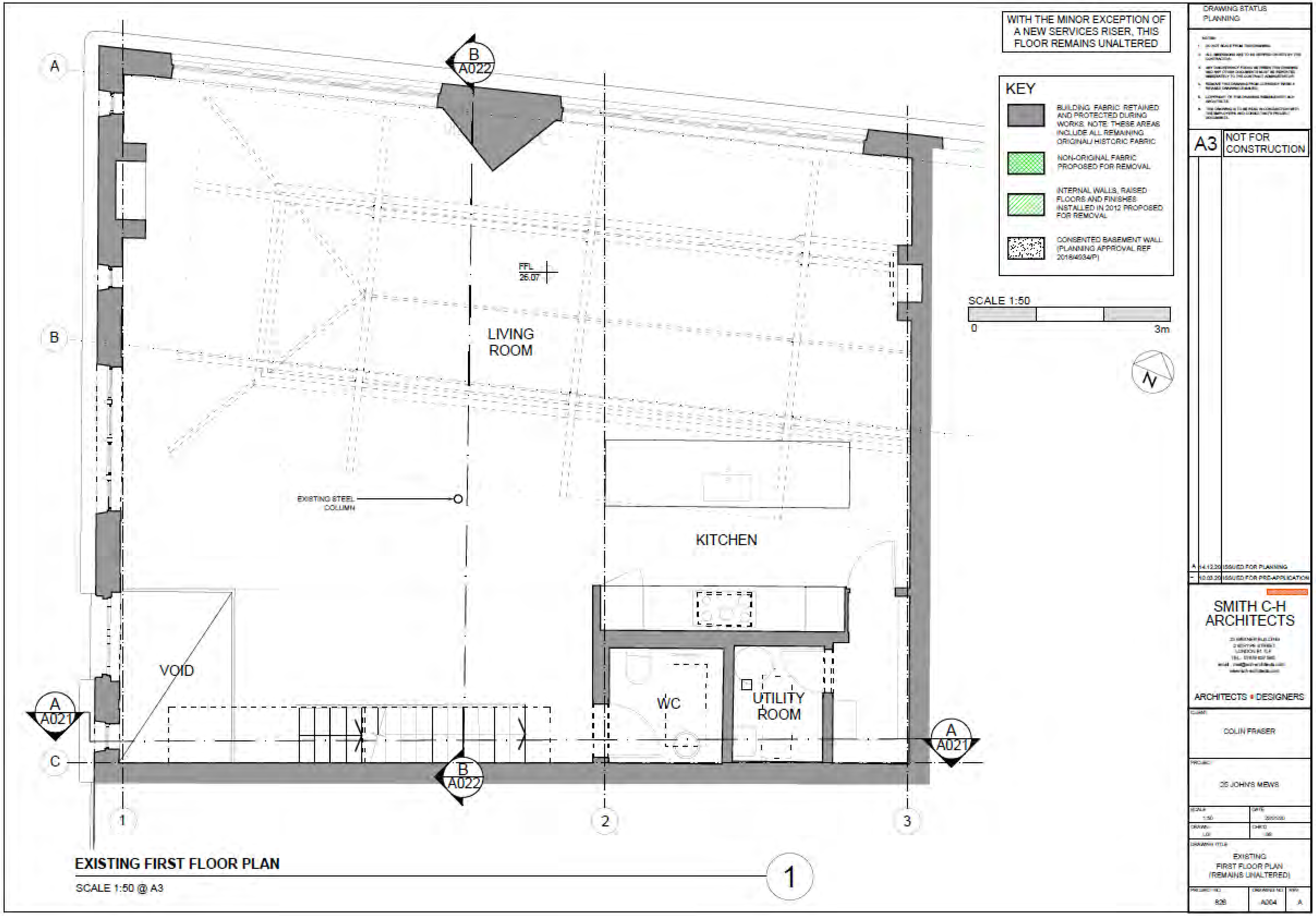
Tfl Map showing underground lines

Appendix 2: Existing and Proposed Development Drawings


EXTENT OF EXISTING RETAINING WALL IS ASSUMED AND EXTRAPOLATED FROM TRIAL HOLE INVESTIGATIONS
FOR EXISTING CONSTRUCTION REFER TO GROUND ENGINEERING LTD. CROSS SECTION A-A (TRAIL PIT 2)
EXTENT OF EXISTING RETAINING WALL IS ASSUMED AND EXTRAPOLATED FROM TRIAL HOLE INVESTIGATIONS
LINE OF EXISTING CONCRETE PAD FOUNDATION SHOWN DASHED. FOR EXISTING CONSTRUCTION REFER GROUND ENGINEERING LTD. CROSS SECTION B-B (TRAIL PIT 2)
EXISTING BASEMENT WALL TO No 13b
KEY
BUILDING FABRIC RETAINED AND PROTECTED DURING WORKS. NOTE: THESE AREAS INCLUDE ALL REMAINING ORIGINAL/ HISTORIC FABRIC
NON-ORIGINAL FABRIC PROPOSED FOR REMOVAL
INTERNAL WALLS, RAISED FLOORS AND FINISHES INSTALLED IN 2012 PROPOSED FOR REMOVAL AND SUBSEQUENT REINSTATEMENT
CONSENTED BASEMENT WALL (PLANNING APPROVAL REF 2018/4934/P)
SCALE 1:50
0
3m
No. 13b NORTHINGTON STREET EXISTING BASEMENT (BASED ON PLANNING DRAWINGS BY BUTTON RICHARDSON ARCHITECTS)
EXISTING STAIR TO GROUND FLOOR
FFL 22.67
FFL 20.12
SECTION A-A SHIFTED AT BASEMENT LEVEL TO SHOW EXTEND OF EXISTING BASEMENT
LINE OF INTERNAL FACE OF GROUND EXTERNAL WALL
THIS RETAINING WALL FORMS PART OF PLANNING APPROVAL REF 2018/4934/P
DASHED LINE INDICATES EXISTING PARTY WALL TO ADJACENT PROPERTY (ABOVE)
SEE NOTE
No. 27 JOHN'S MEWS PROPOSED BASEMENT
EXISTING BASEMENT PLAN
SCALE 1:50 @ A3
1
A
B
C
1
2
3
B A022
A A021
DRAWING STATUS PLANNING
A3 NOT FOR CONSTRUCTION
ISSUED FOR PLANNING
ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
EXISTING BASEMENT PLAN
826
A002
A


NORTHINGTON STREET
JOHN'S MEWS
BEDROOM 2
BEDROOM 3
MASTER BEDROOM
EN-SUITE
EN-SUITE
EN-SUITE
STORE
HALLWAY
HATCH
APPROXIMATE LINE OF BASEMENT BELOW (DASHED LINE)
FFL 22.95
FFL 22.65
FFL 22.95
A
B
C
1
2
3
B A022
A A021
KEY
BUILDING FABRIC RETAINED AND PROTECTED DURING WORKS. NOTE: THESE AREAS INCLUDE ALL REMAINING ORIGINAL/ HISTORIC FABRIC
NON-ORIGINAL FABRIC PROPOSED FOR REMOVAL
INTERNAL WALLS, RAISED FLOORS AND FINISHES INSTALLED IN 2012 PROPOSED FOR REMOVAL AND SUBSEQUENT REINSTATEMENT
CONSENTED BASEMENT WALL (PLANNING APPROVAL REF 2018/4934/P)
SCALE 1:50
0
3m
N
DRAWING STATUS
PLANNING
A3
A 14.12.20 ISSUED FOR PLANNING
- 15.03.20 ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS • DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
SCALE 1:50
DRAWN LG
EXISTING GROUND FLOOR PLAN
PROJECT NO. 826
DRAWING NO. A003
REV A
EXISTING GROUND FLOOR PLAN
SCALE 1:50 @ A3
1


WITH THE MINOR EXCEPTION OF A NEW SERVICES RISER, THIS FLOOR REMAINS UNALTERED
KEY
BUILDING FABRIC RETAINED AND PROTECTED DURING WORKS. NOTE: THESE AREAS INCLUDE ALL REMAINING ORIGINAL/ HISTORIC FABRIC
NON-ORIGINAL FABRIC PROPOSED FOR REMOVAL
INTERNAL WALLS, RAISED FLOORS AND FINISHES INSTALLED IN 2012 PROPOSED FOR REMOVAL
CONSENTED BASEMENT WALL (PLANNING APPROVAL REF 2016/4034/P)
SCALE 1:50
0
3m
N
A
B
C
1
2
3
B A022
A A021
FFL 26.07
LIVING ROOM
KITCHEN
VOID
WC
UTILITY ROOM
EXISTING STEEL COLUMN
EXISTING FIRST FLOOR PLAN
SCALE 1:50 @ A3
1
DRAWING STATUS
PLANNING
A3
NOT FOR CONSTRUCTION
A 14.12.20 ISSUED FOR PLANNING
- 10.03.20 ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS + DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
EXISTING FIRST FLOOR PLAN (REMAINS UNALTERED)
A004
A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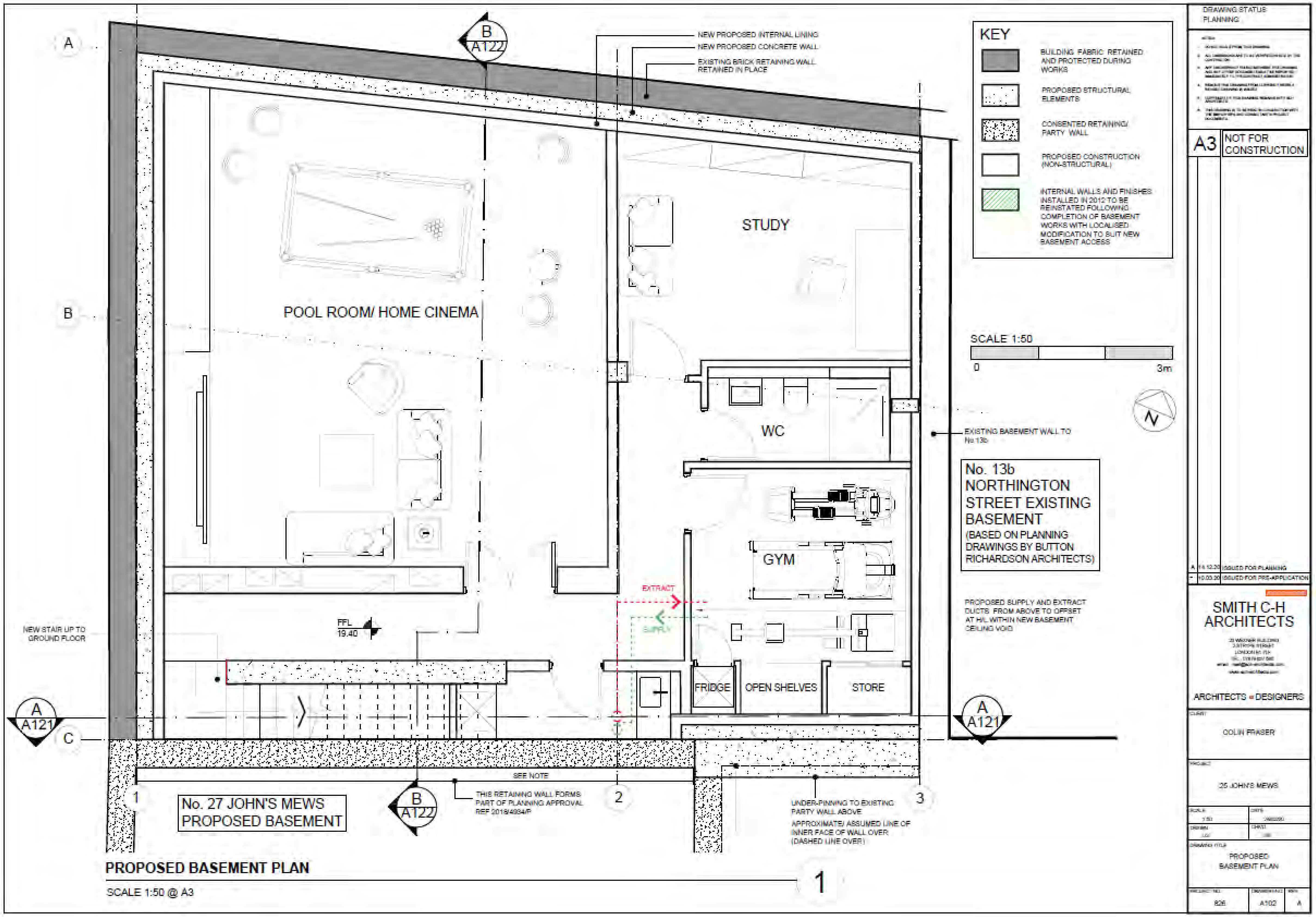
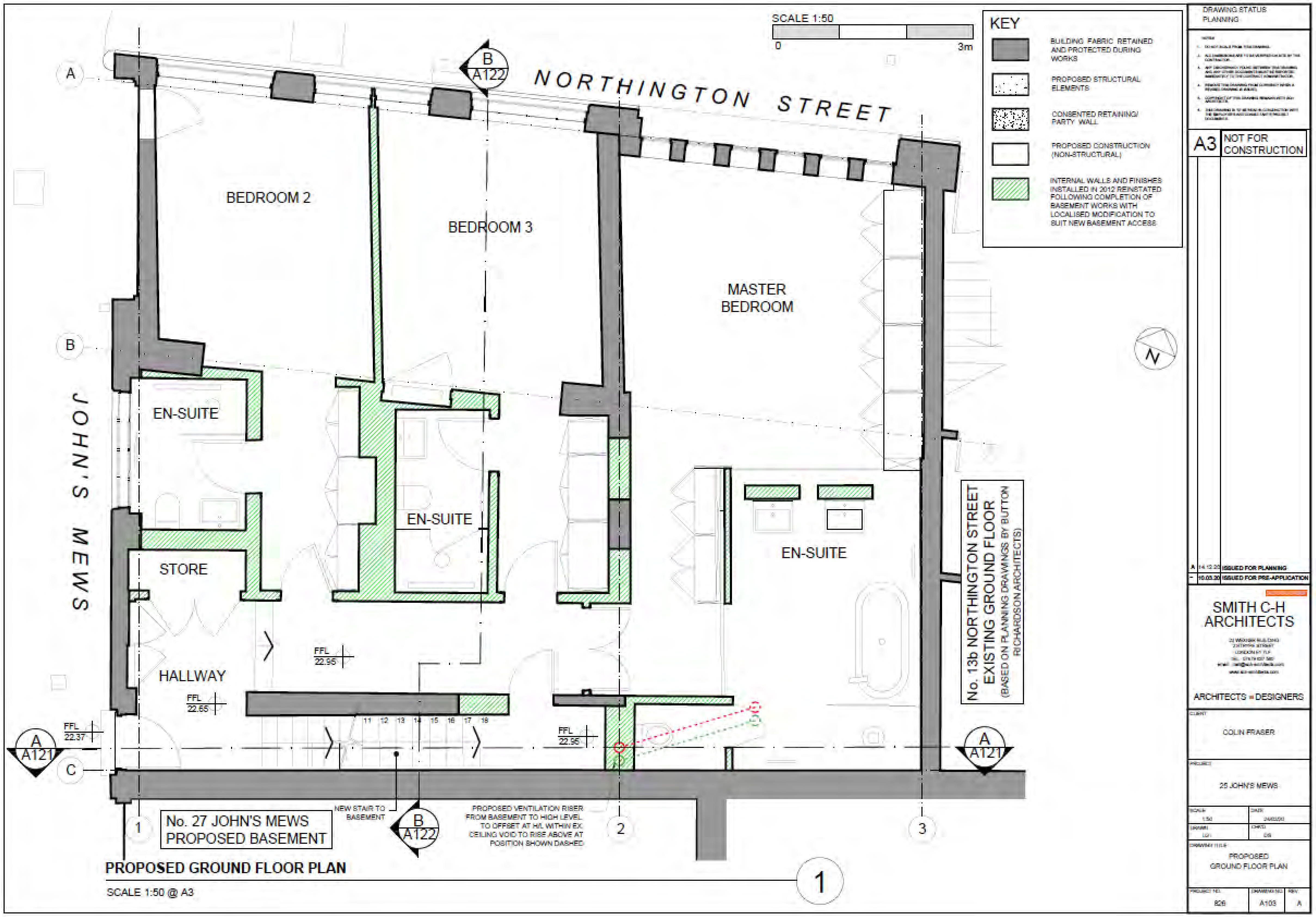
NON-ORIGINAL FABRIC PROPOSED FOR REMOVAL
INTERNAL WALLS, RAISED FLOORS AND FINISHES INSTALLED IN 2012 PROPOSED FOR REMOVAL
CONSENTED BASEMENT WALL (PLANNING APPROVAL REF 2018/4934/P)
SCALE 1:50
0
3m
N
A
B
C
1
2
3
B A022
A A021
FFL 26.07
LIVING ROOM
KITCHEN
VOID
WC
UTILITY ROOM
EXISTING STEEL COLUMN
EXISTING FIRST FLOOR PLAN
SCALE 1:50 @ A3
1
DRAWING STATUS
PLANNING
A3
NOT FOR CONSTRUCTION
A 14.12.20 ISSUED FOR PLANNING
- 10.03.20 ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
1:50
EXISTING FIRST FLOOR PLAN (REMAINS UNALTERED)
828
A004
A


NEW PROPOSED INTERNAL LINING
NEW PROPOSED CONCRETE WALL
EXISTING BRICK RETAINING WALL RETAINED IN PLACE
KEY
BUILDING FABRIC RETAINED AND PROTECTED DURING WORKS
PROPOSED STRUCTURAL ELEMENTS
CONSENTED RETAINING/ PARTY WALL
PROPOSED CONSTRUCTION (NON-STRUCTURAL)
INTERNAL WALLS AND FINISHES INSTALLED IN 2012 TO BE REINSTATED FOLLOWING COMPLETION OF BASEMENT WORKS WITH LOCALISED MODIFICATION TO SUIT NEW BASEMENT ACCESS
STUDY
POOL ROOM/ HOME CINEMA
WC
GYM
SCALE 1:50
0
3m
EXISTING BASEMENT WALL TO No 13b
No. 13b NORTHINGTON STREET EXISTING BASEMENT
(BASED ON PLANNING DRAWINGS BY BUTTON RICHARDSON ARCHITECTS)
PROPOSED SUPPLY AND EXTRACT DUCTS FROM ABOVE TO OFFSET AT H/L WITHIN NEW BASEMENT CEILING VOID
EXTRACT
SUPPLY
NEW STAIR UP TO GROUND FLOOR
FFL 19.40
FRIDGE
OPEN SHELVES
STORE
SEE NOTE
THIS RETAINING WALL FORMS PART OF PLANNING APPROVAL REF 2018/4934/P
No. 27 JOHN'S MEWS PROPOSED BASEMENT
UNDER-PINNING TO EXISTING PARTY WALL ABOVE
APPROXIMATE/ ASSUMED LINE OF INNER FACE OF WALL OVER (DASHED LINE OVER)
A
B
C
1
2
3
A121
A122
PROPOSED BASEMENT PLAN
SCALE 1:50 @ A3
DRAWING STATUS
PLANNING
A3
NOT FOR CONSTRUCTION
ISSUED FOR PLANNING
ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS + DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
PROPOSED BASEMENT PLAN
826
A102
A


SCALE 1:50
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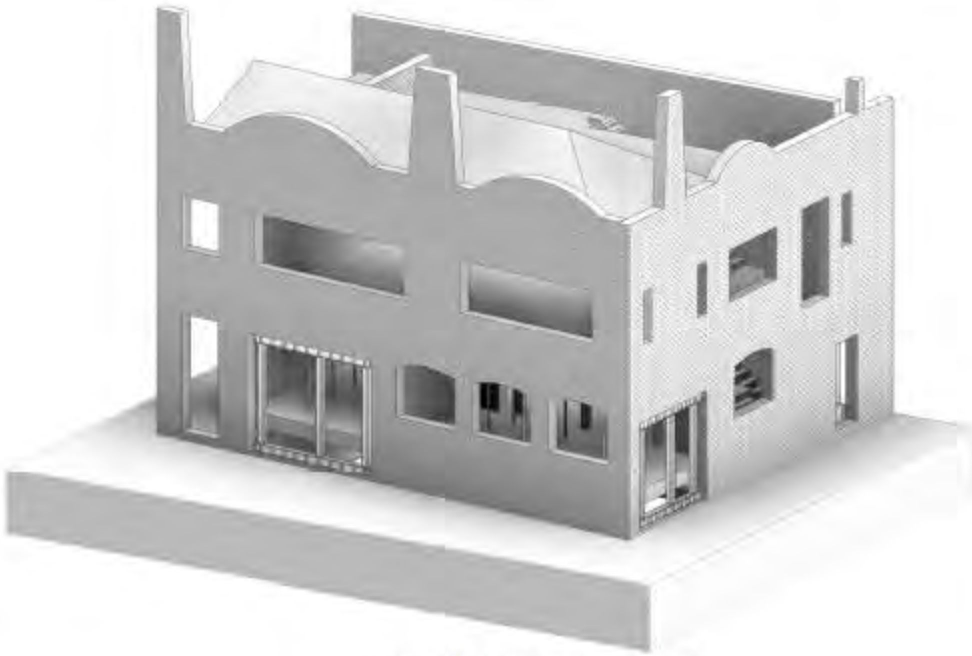
3m
KEY
BUILDING FABRIC RETAINED AND PROTECTED DURING WORKS
PROPOSED STRUCTURAL ELEMENTS
CONSENTED RETAINING/ PARTY WALL
PROPOSED CONSTRUCTION (NON-STRUCTURAL)
INTERNAL WALLS AND FINISHES INSTALLED IN 2012 REINSTATED FOLLOWING COMPLETION OF BASEMENT WORKS WITH LOCALISED MODIFICATION TO SUIT NEW BASEMENT ACCESS
NORTHINGTON STREET
JOHN'S MEWS
BEDROOM 2
BEDROOM 3
MASTER BEDROOM
EN-SUITE
EN-SUITE
EN-SUITE
STORE
HALLWAY
FFL 22.95
FFL 22.65
FFL 22.37
FFL 22.95
No. 13b NORTHINGTON STREET EXISTING GROUND FLOOR
(BASED ON PLANNING DRAWINGS BY BUTTON RICHARDSON ARCHITECTS)
No. 27 JOHN'S MEWS PROPOSED BASEMENT
NEW STAIR TO BASEMENT
PROPOSED VENTILATION RISER FROM BASEMENT TO HIGH LEVEL TO OFFSET AT H/L WITHIN EX. CEILING VOID TO RISE ABOVE AT POSITION SHOWN DASHED
PROPOSED GROUND FLOOR PLAN
SCALE 1:50 @ A3
1
DRAWING STATUS
PLANNING
A3
NOT FOR CONSTRUCTION
ISSUED FOR PLANNING
ISSUED FOR PRE-APPLICATION
SMITH C-H ARCHITECTS
ARCHITECTS + DESIGNERS
COLIN FRASER
25 JOHN'S MEWS
1:50
PROPOSED GROUND FLOOR PLAN
826
A103
A

03/12/2020 16:24:40

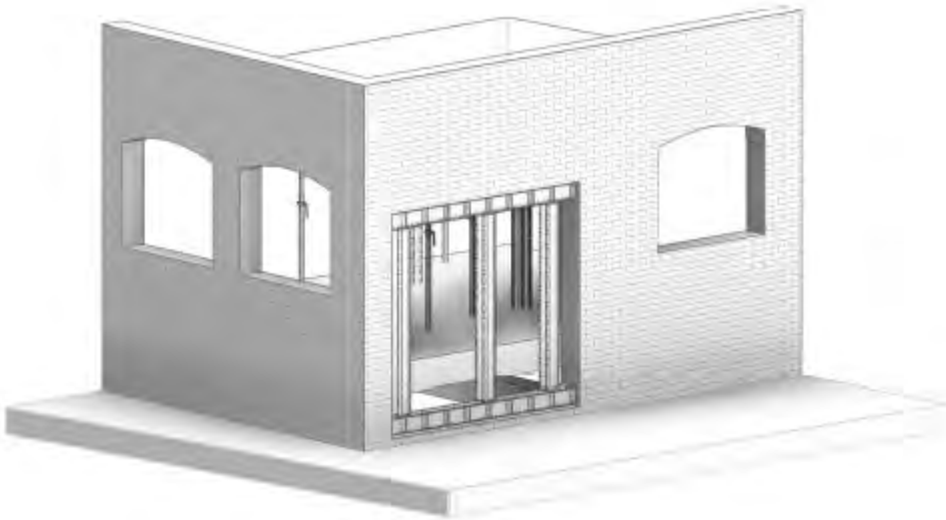
GENERAL NOTES:

1. Do not scale this drawing in either paper or digital form. Use figured dimensions only.
2. All 'Ross & Partners' drawings to be read in conjunction with all relevant Architect's drawings and any discrepancies reported to all relevant parties.
3. This drawing is to be read in conjunction with other 'Ross & Partners' drawings and 'Ross & Partners' Structural Specification documents and any discrepancies reported to all relevant parties.
4. Setting out will be in accordance with the Architect's dimensions and as discussed and agreed between Client, Contractor and the Architect and any discrepancies reported to all relevant parties.
5. For General Notes refer to drawings:
   - 2012-RP-XX-XX-FN-S-001
   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003

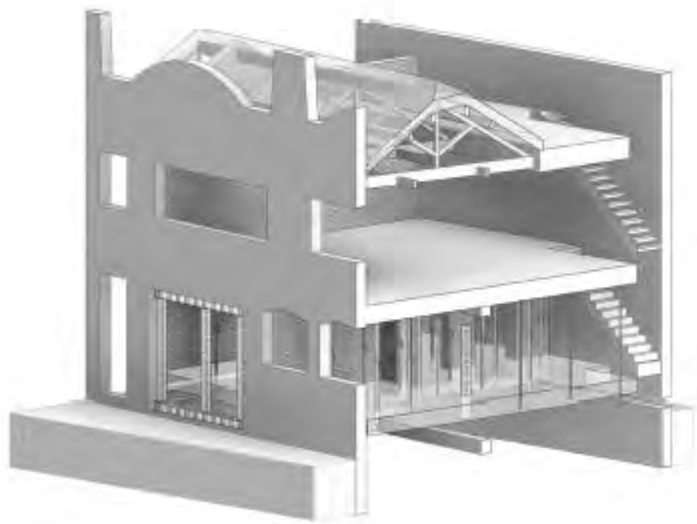


110 - 3D View - Ground Floor

111 - 3D View - First Floor



113 - 3D View - Propping Detail



112 - 3D View - Section

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CLIENT: COLIN FRASER

PROJECT MANAGER:

ARCHITECT: SMITH C-H ARCITECTS

M&E ENGINEER:

ROSS & PARTNERS
Consulting Civil & Structural Engineers
1 Baldwick Street, Clerkenwell, London, EC1V 3NU
tel. 020 155 360 50
ross-partners.co.uk

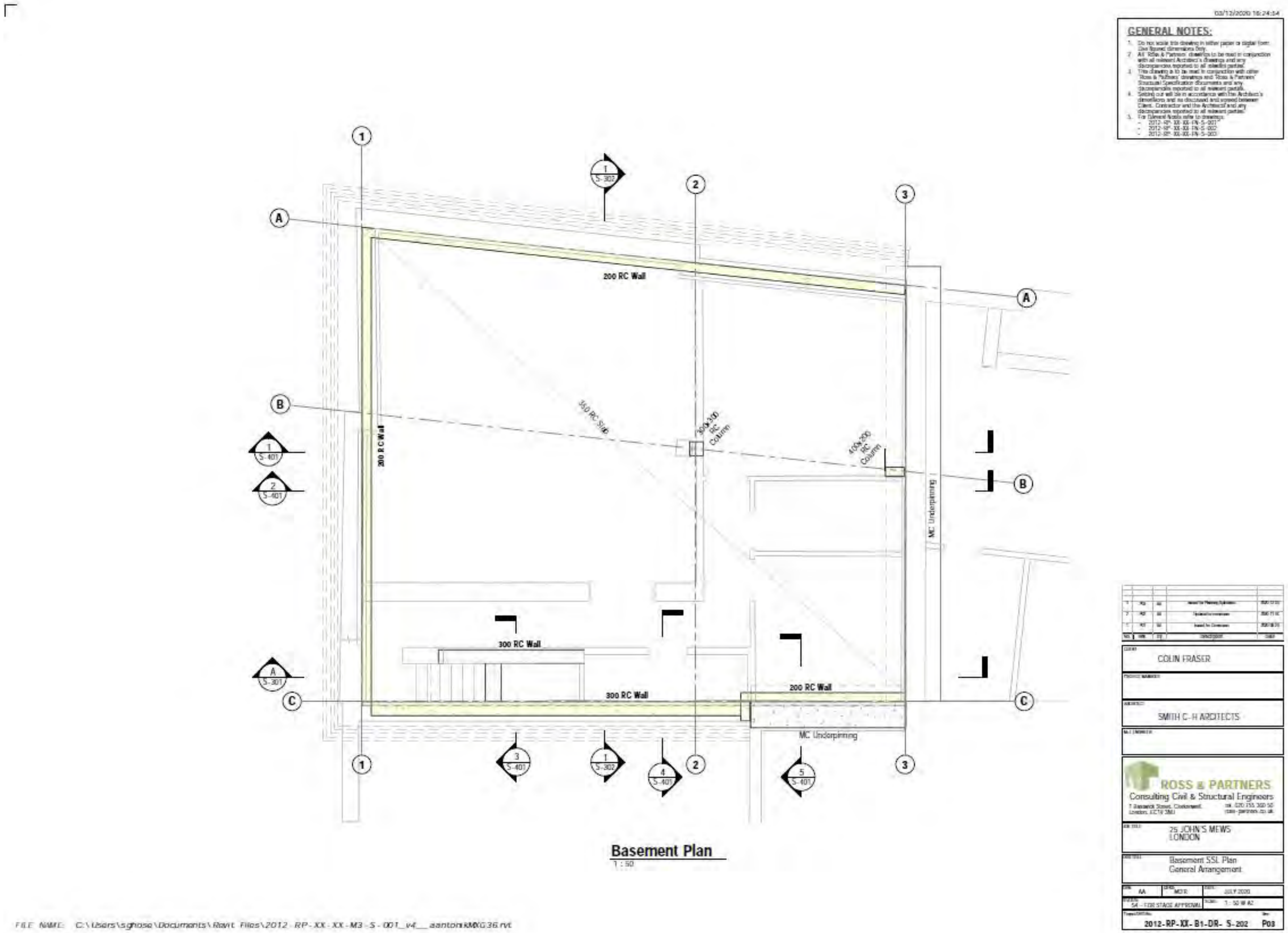
JOB TITLE: 25 JOHN'S MEWS LONDON

DWG TITLE: Existing Building Isometric Views Stage 1

DRN: AA | CHKD: MCR | DATE: September 2020

STATUS: S4 - FOR STAGE APPROVAL | SCALE: @ A2

2012-RP-XX-ZZ-DR-S-110 | Rev: P03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GENERAL NOTES:
200 RC Wall
200 RC Wall
300 RC Wall
300 RC Wall
200 RC Wall
MC Underpinning
MC Underpinning
S-301
S-302
S-401
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
Basement SSL Plan
General Arrangement
AA
MCR
JULY 2020
S4 - FOR STAGE APPROVAL
1 : 50 @ A2
2012-RP-XX-B1-DR- S-202
P03
Basement Plan
1 : 50
FILE NAME: C:\Users\sghose\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonKMXG36.rvt

03/12/2020 10:24:56

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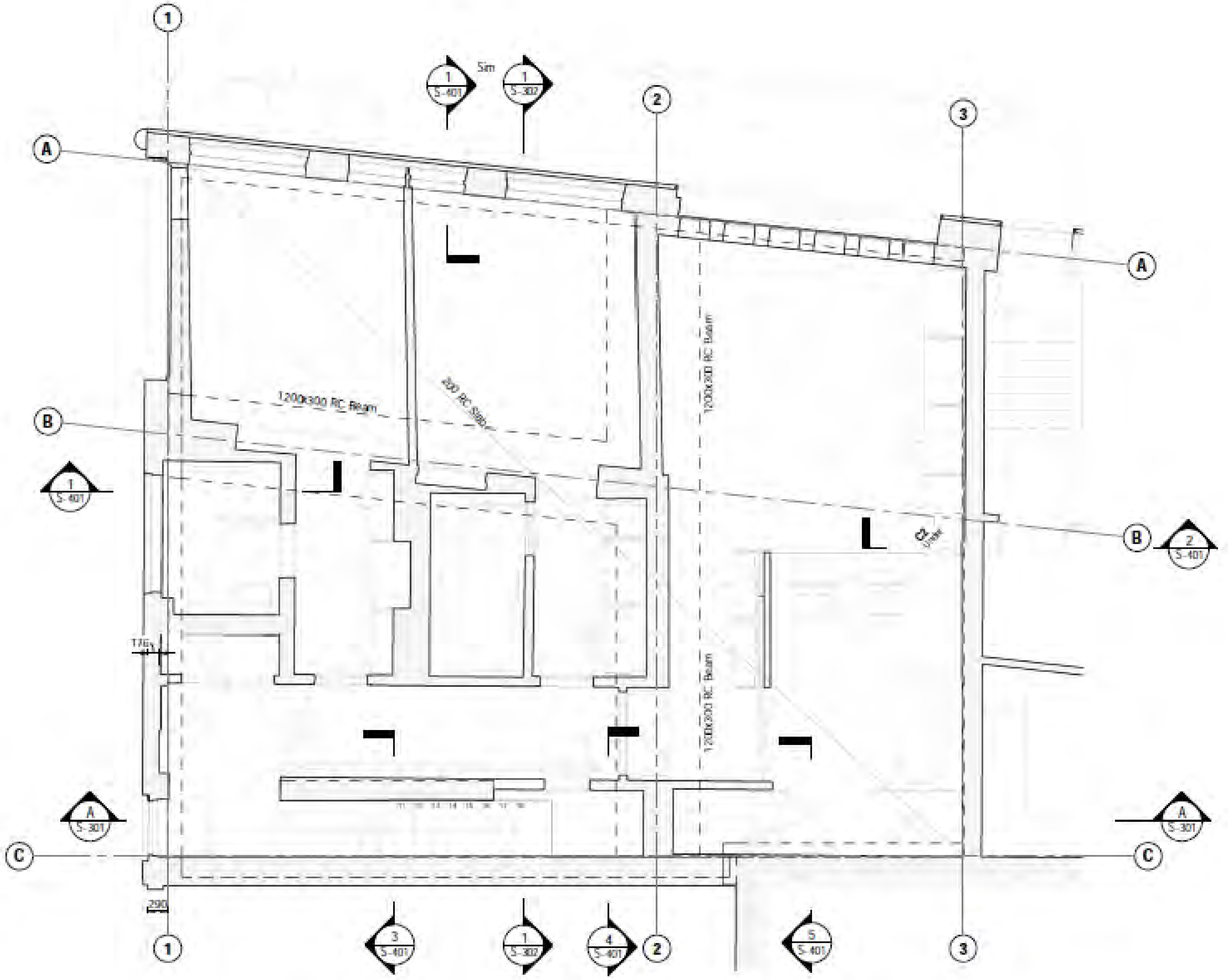
   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003



Ground Floor Plan
1 : 50

FILE NAME: C:\Users\sghoso\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonikMXG36.rvt

CLIENT: COLIN FRASER

PROJECT MANAGER:

ARCHITECT: SMITH C-H ARCITECTS

M&E ENGINEER:

ROSS & PARTNERS
Consulting Civil & Structural Engineers
7 Baldwick Street, Clerkenwell, London, EC1V 3NU
tel: 020 7SS 360 50
ross-partners.co.uk

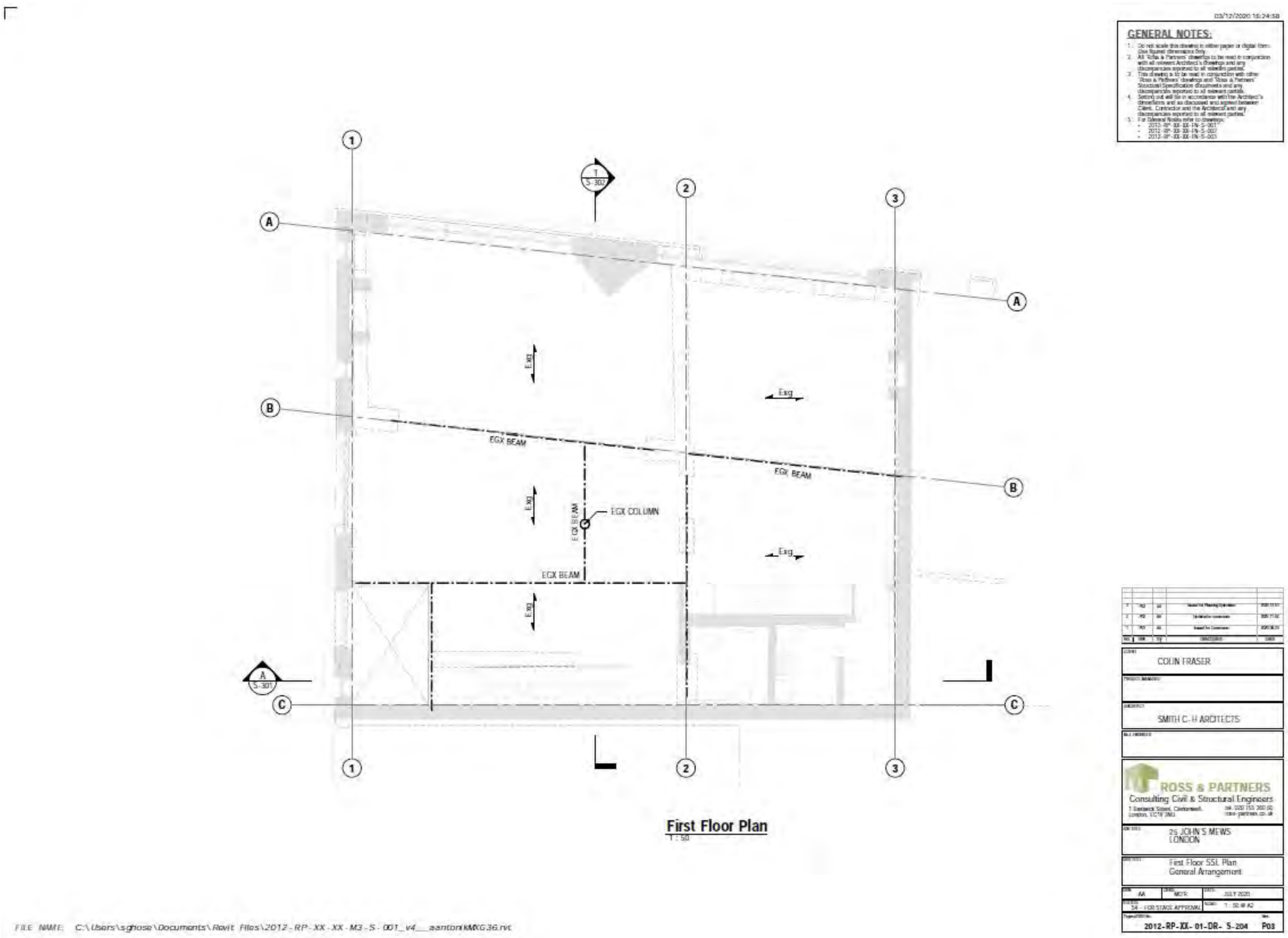
JOB TITLE: 25 JOHN'S MEWS LONDON

DWG TITLE: Ground Floor SSL Plan General Arrangement

DRN: AA | CHKD: MOTR | DATE: JULY 2020

STATUS: S4 - FOR STAGE APPROVAL | SCALE: 1 : 50 @ A2

Project/DWG No.: 2012-RP-XX-00-DR-S-203 | Rev: P03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EGX BEAM
EGX BEAM
EGX COLUMN
EGX BEAM
EGX BEAM
Exg
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
First Floor SSL Plan
General Arrangement
JULY 2020
1 : 50 @ A2
2012-RP-XX-01-DR-S-204
P03
First Floor Plan
1 : 50
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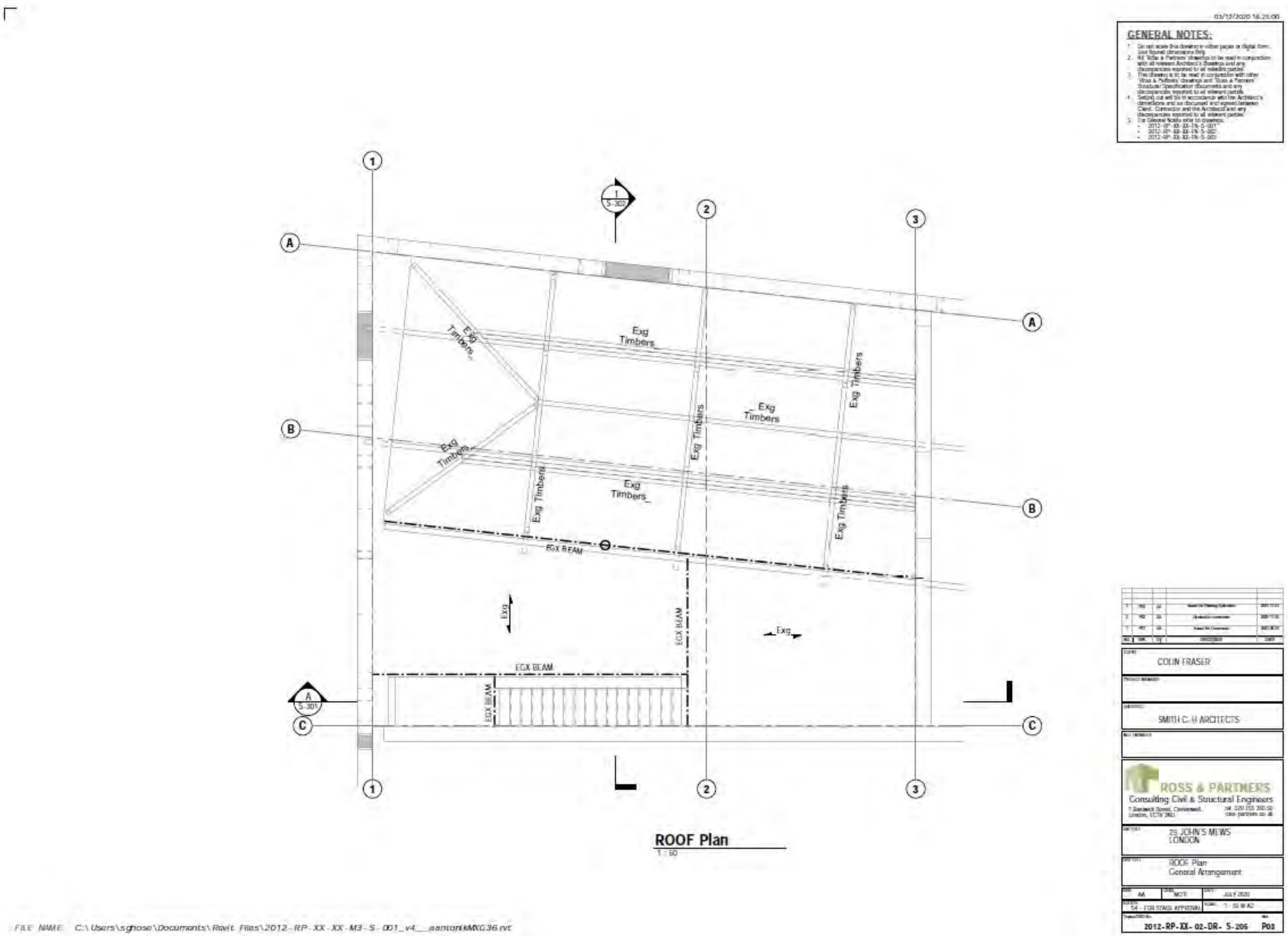
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A
B
C
1
2
3
Exg Timbers
Exg Timbers
Exg Timbers
Exg Timbers
Exg Timbers
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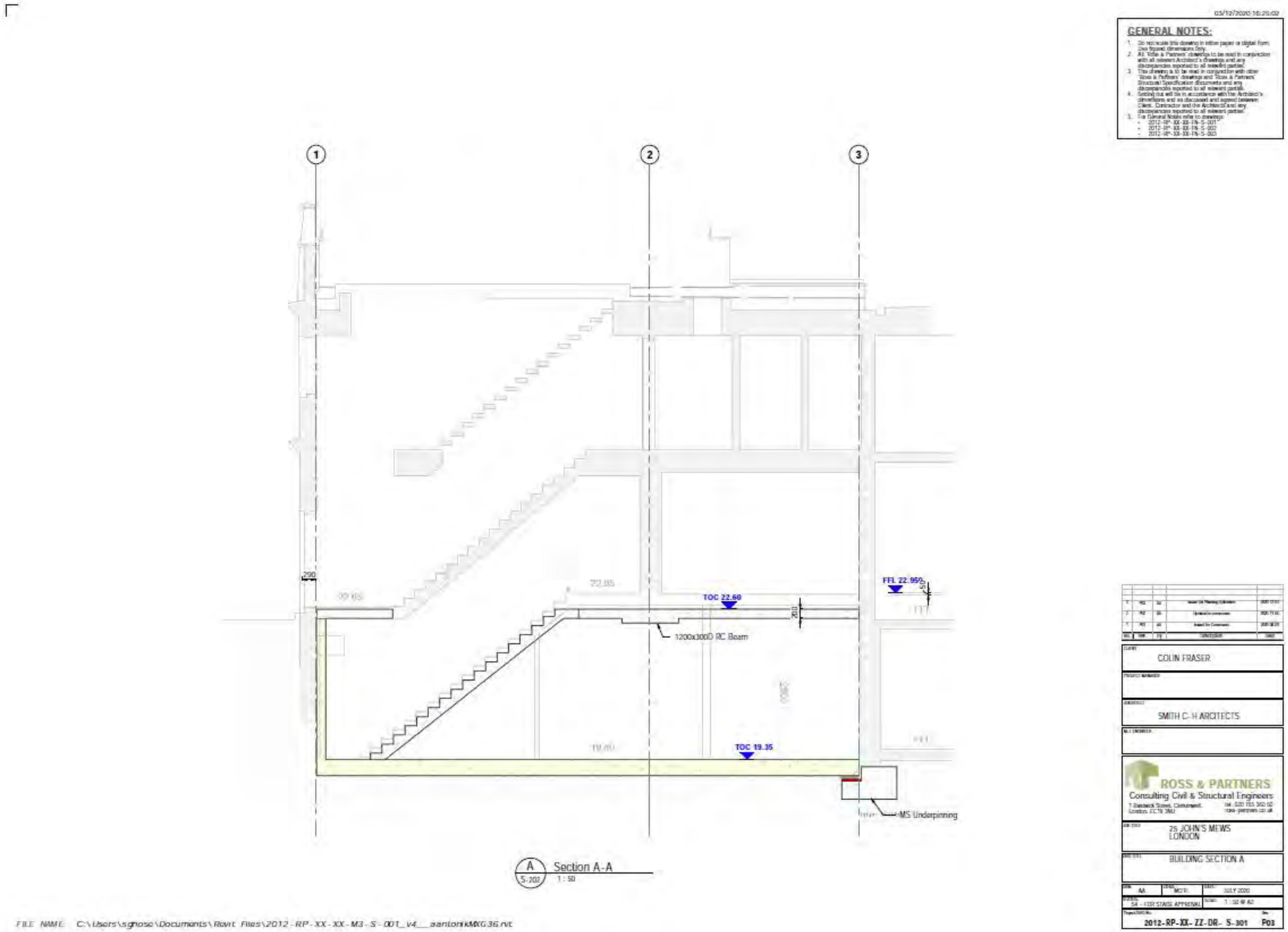
Exg Timbers
Exg Timbers
EGX BEAM
EGX BEAM
EGX BEAM
EGX BEAM
Exg
Exg
ROOF Plan
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
ROOF Plan
General Arrangement
AA
MOTR
JULY 2020
S4 - FOR STAGE APPROVAL
2012-RP-XX-02-DR-S-206
P03


GENERAL NOTES:
1
2
3
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FFL 22.950
1200x300D RC Beam
TOC 19.35
MS Underpinning
A
S-202
Section A-A
1 : 50
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COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
BUILDING SECTION A
AA
MCR
JULY 2020
S4 - FOR STAGE APPROVAL
2012-RP-XX-ZZ-DR- S-301
P03


03/12/2020 16:25:04
GENERAL NOTES:
C
TOC 22.60
TOC 19.35
19.40
3050
3250
Section B-B
1 : 50
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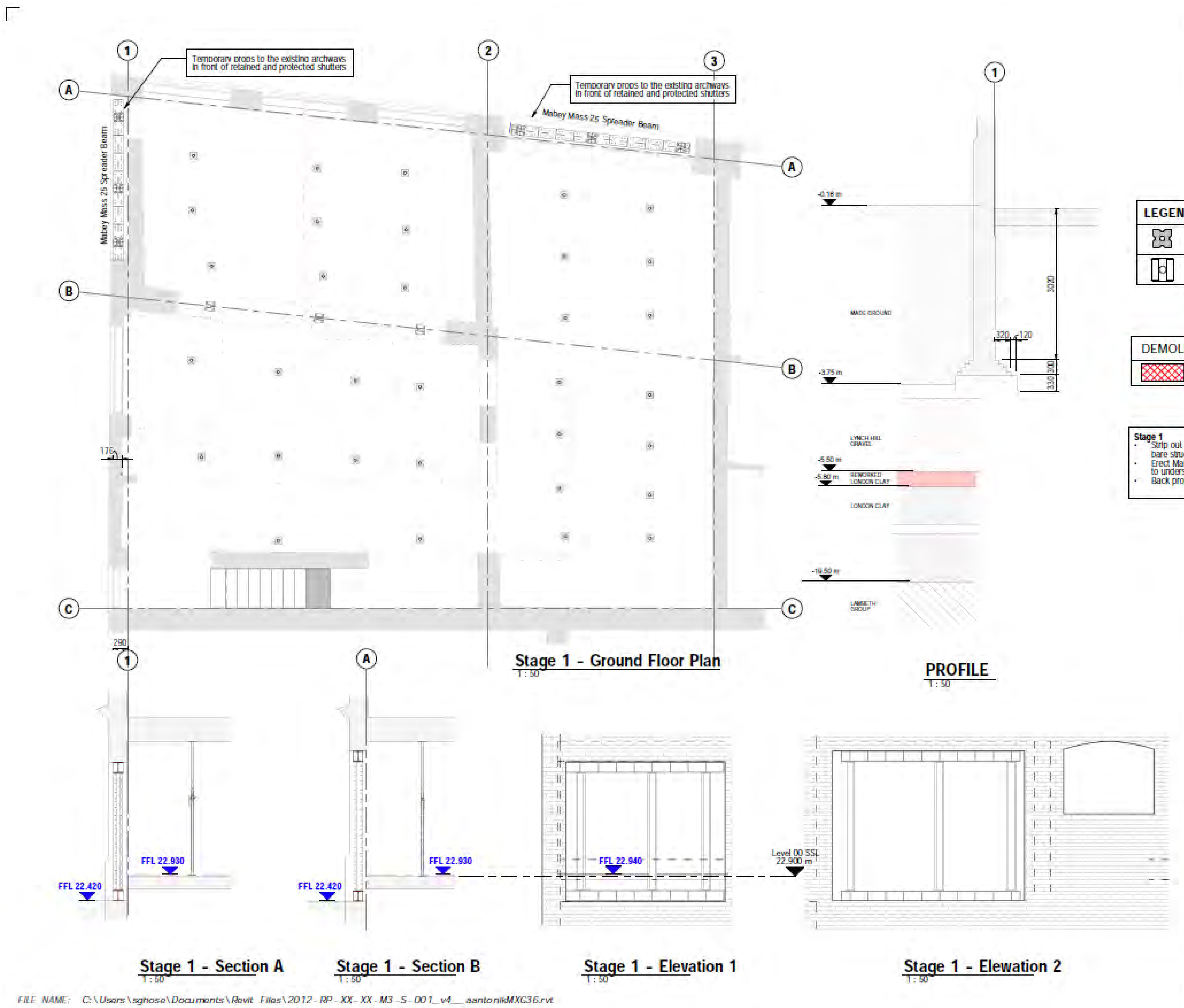
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
BUILDING SECTION B
AA
MCR
September 2020
1 : 50 @ A2
2012-RP-XX-ZZ-DR- S-302
P03

Construction Sequence Drawings - Planning Stage

Stage 1 Backpropping

- Strip out all existing ground floor fixtures and fittings back to bare structure.
- Erect Mabey Mass 25 temporary props and spreader beams to underside of first floor beams. Prop windows and arches.
- Back prop first floor slab with Titan Props



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   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003

LEGEND	
	TITAN PROPS
	MABEY MASS 25 TEMPORATY PROPS TO BEAM OVER

DEMOLISHING WORKS LEGEND	
	Elements to be demolished

Stage 1
- Strip out all existing ground floor fixtures and fittings back to bare structure.
- Erect Mabey Mass 25 temporary props and spreader beams to underside of first floor beams. Prop windows and arches.
- Back prop first floor slab with Titan Props

No.	Rev	By	Description	Date
3	P03	AA	Issued for Planning Application	[illegible]
2	P02	AA	Updated to comments	[illegible]
1	P01	AA	Issued for Comments	[illegible]

CLIENT: COLIN FRASER

PROJECT MANAGER:

ARCHITECT: SMITH C-H ARCITECTS

M+E ENGINEER:

ROSS & PARTNERS
Consulting Civil & Structural Engineers
1 Bastwick Street, Clerkenwell, London, EC1V 3NU
tel. 020 355 380 50
ross-partners.co.uk

JOB TITLE: 25 JOHN'S MEWS LONDON

DWG TITLE: Basement Construction Sequence Stage 1

DRN	CHKD	DATE
AA	MO'R	September 2020

STATUS: S4 – FOR STAGE APPROVAL | SCALE: 1 : 50 @ A2

Project/DWG No.: 2012-RP-XX-ZZ-DR-S-101 | Rev: P03

Stage 2 – Form Localised Foundation and Underpinning

Sequence 1

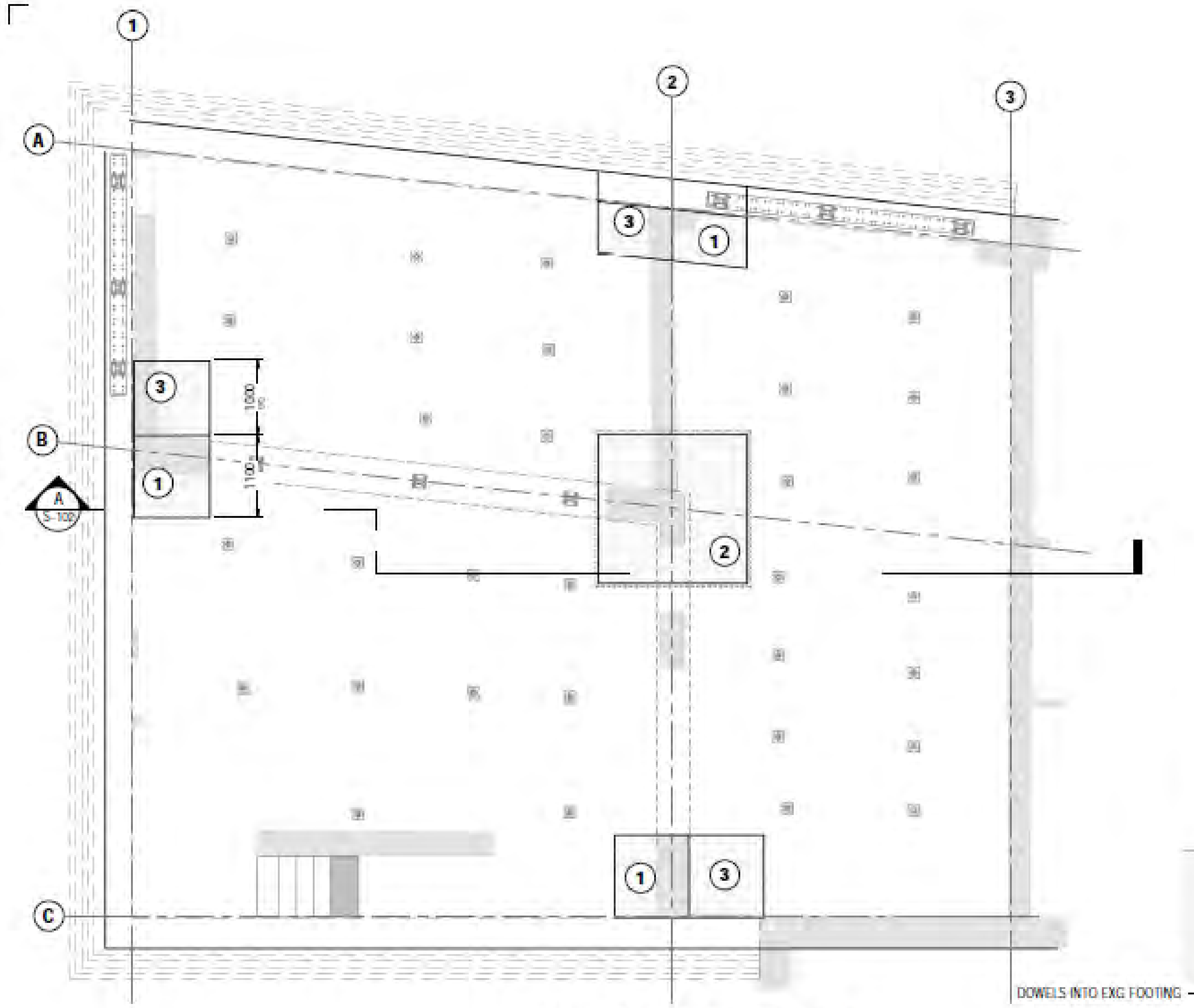
- Form individual pits not exceeding 1m in length in the sequence shown on the plan
- Shuttering is to be installed on all four sides of the pits and secured in place with trench props. The geotechnical investigation indicate the near surface soils to comprise of Made Ground deposits which will be of varying composition. So temporary propping and boarding should be installed as excavation proceeds. All temporary boarding must be adequately braced to prevent collapse.

Sequence 2

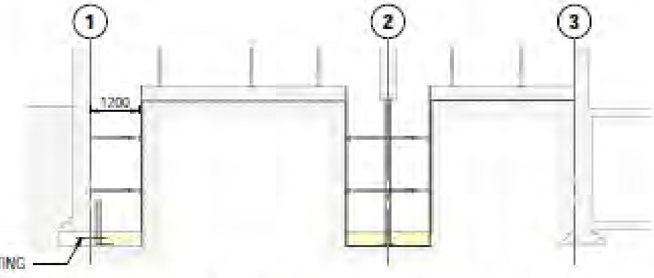
- The formation is to bear within the Lynch Hill Gravels. Arrange for the Engineer to inspect and approve the formation.
- Cast blinding, fix reinforcement – including continuity strips for adjoining bases and wall starters. Secure hydro seal waterbars to side shutters
- Cast Base

Sequence 3

- Fix wall stem reinforcing bars - including continuity strips for adjoining wall stems, shutter and cast concrete ensuring thorough compaction.
- After 24 hours dry pack between top of rc wall and underside of existing wall.



Ground Floor Plan - Stage 2
1 : 50



Section AA - Stage 2, Sequence 2
1 : 100

03/12/2020 16:24:23

LEGEND

	TITAN PROPS
	MABEY MASS 25 TEMPORATY PROPS TO BEAM OVER

DEMOLISHING WORKS LEGEND	
	Elements to be demolished

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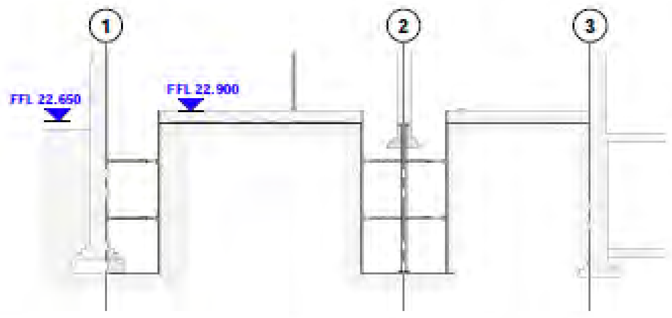
   - 2012-RP-XX-XX-PN-S-002
   - 2012-RP-XX-XX-PN-S-003

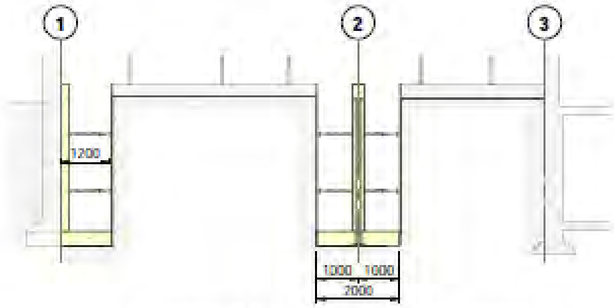
Sequence 1
- Form individual pits not exceeding 1m in length in the sequence shown on the plan
- Shuttering is to be installed on all four sides of the pits and secured in place with trench props. The geotechnical investigation indicate the near surface soils to comprise of Made Ground deposits which will be of varying composition. So temporary propping and boarding should be installed as excavation proceeds. All temporary boarding must be adequately braced to prevent collapse.

Sequence 2
- The formation is to bear within the Lynch Hill Gravels. Arrange for the Engineer to inspect and approve the formation.
- Cast blinding, fix reinforcement - including continuity strips for adjoining bases and wall starters. Secure hydro seal waterbars to side shutters
- Cast Base

Sequence 3
- Fix wall stem reinforcing bars - including continuity strips for adjoining wall stems, shutter and cast concrete ensuring thorough compaction.
- After 24 hours dry pack between top of RC wall and underside of existing wall.



Section AA - Stage 2, Sequence 1
1 : 100



Section AA - Stage 2, Sequence 3
1 : 100

FILE NAME: C:\Users\sghose\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonkMXG36.rvt

CLIENT: COLIN FRASER

ARCHITECT: SMITH C-H ARCITECTS

ROSS & PARTNERS
Consulting Civil & Structural Engineers

25 JOHN'S MEWS
LONDON

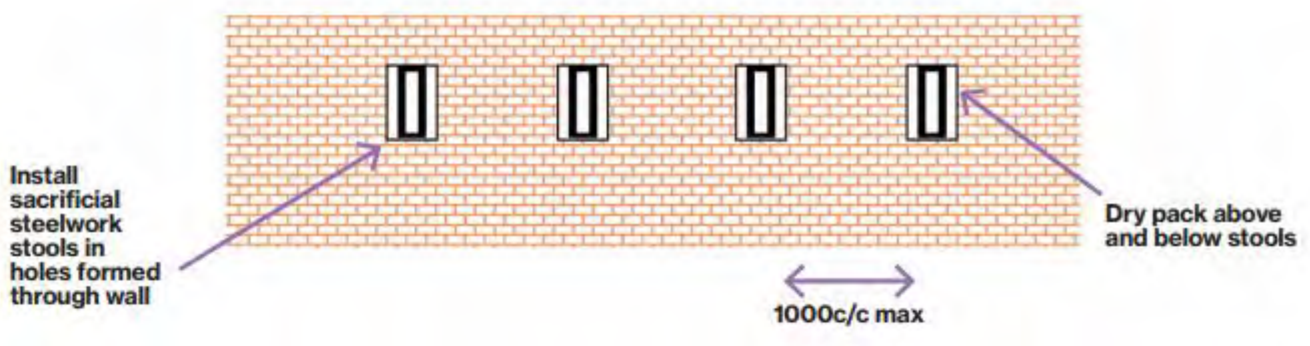
Basement Construction Sequence
Stage 2

AA | M2R | Septembre 2020
S4 - FOR STAGE APPROVAL | As indicated @ A2
2012-RP-XX-ZZ-DR-S-102 | P03

Stage 3– Form Permanent Ground Floor Beams Using Pynford Stools

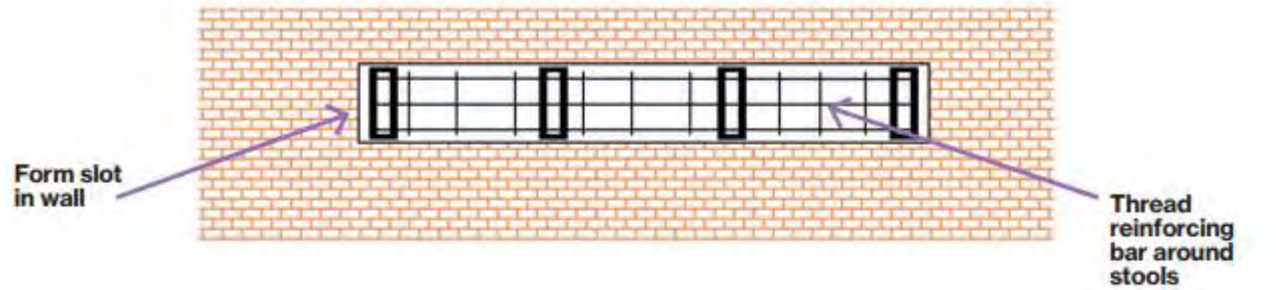
Sequence 1

- Locally break out ground bearing slab either side of the existing walls and locally reduce ground levels.
- Cast 50mm blinding layer



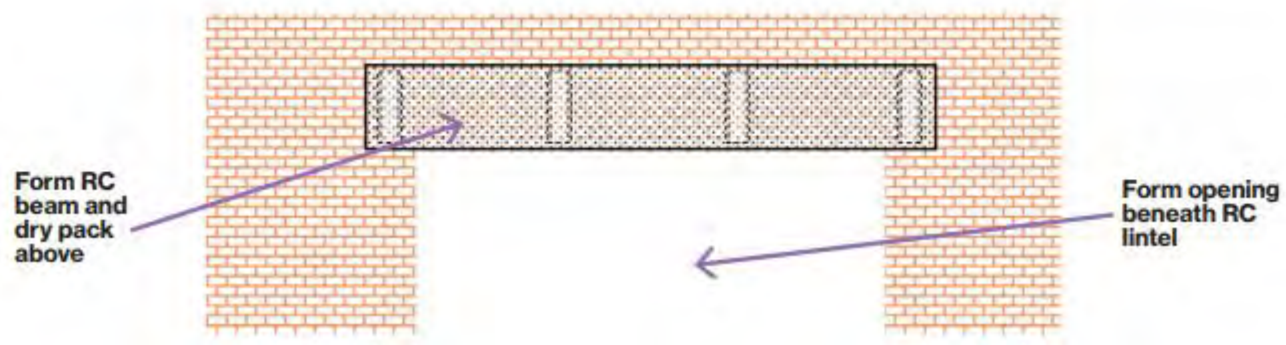
Sequence 2

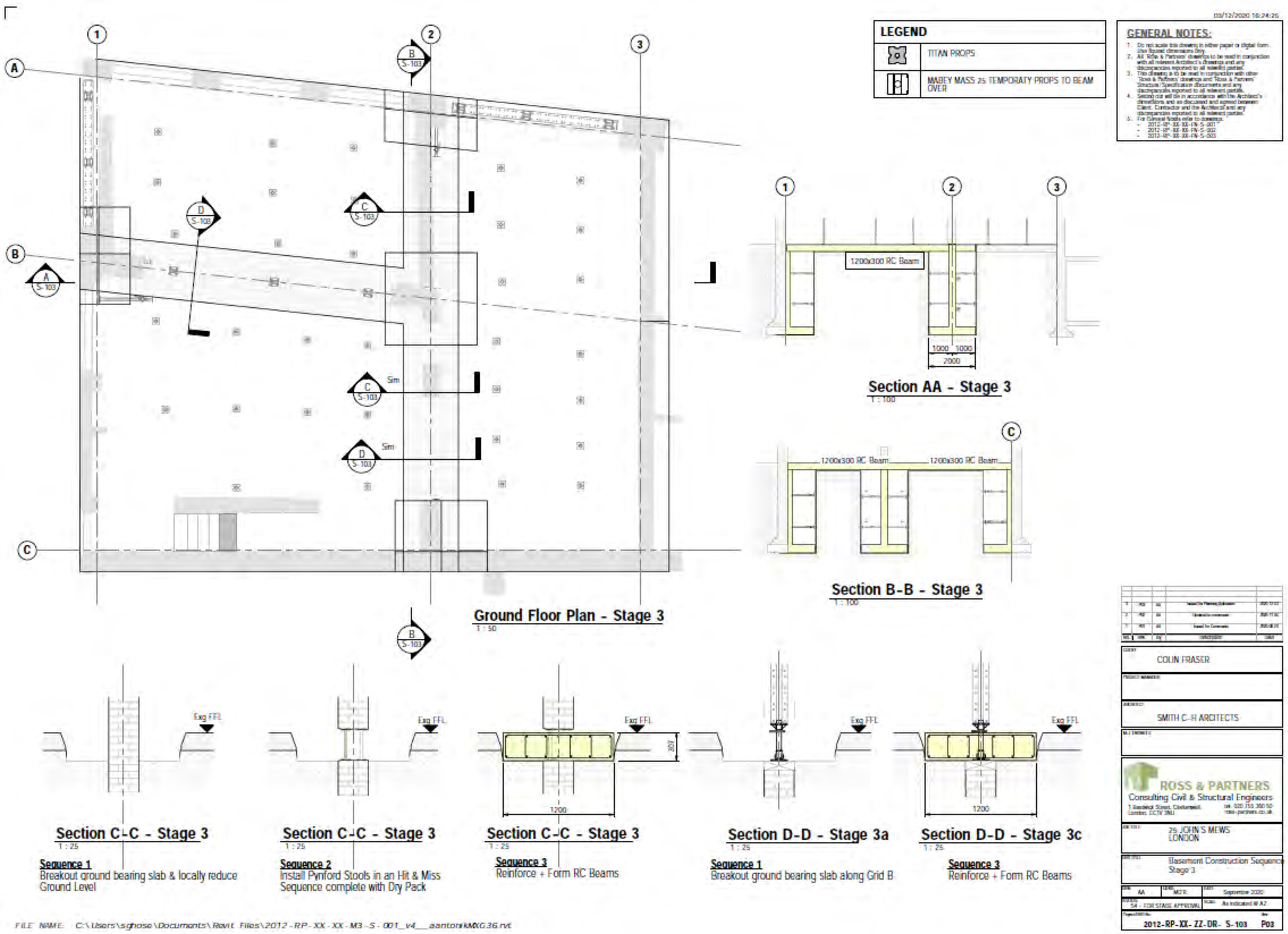
- Install Pynford stools in an hit and miss sequence and dry pack fully.
- Break out masonry between stools



Sequence 3

- Fix reinforcement, shutter and pour concrete beams
- After 48 Hours dry pack between top of beam and masonry




LEGEND
TITAN PROPS
MABEY MASS 25 TEMPORATY PROPS TO BEAM OVER
GENERAL NOTES:
Ground Floor Plan - Stage 3
1 : 50
1200x300 RC Beam
Section AA - Stage 3
1 : 100
Section B-B - Stage 3
1 : 100
Section C-C - Stage 3
1 : 25
Sequence 1
Breakout ground bearing slab & locally reduce Ground Level
Section C-C - Stage 3
1 : 25
Sequence 2
Install Pynford Stools in an Hit & Miss Sequence complete with Dry Pack
Section C-C - Stage 3
1 : 25
Sequence 3
Reinforce + Form RC Beams
Section D-D - Stage 3a
1 : 25
Sequence 1
Breakout ground bearing slab along Grid B
Section D-D - Stage 3c
1 : 25
Sequence 3
Reinforce + Form RC Beams
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
Basement Construction Sequence
Stage 3
2012-RP-XX-ZZ-DR- S-103
P03
FILE NAME: C:\Users\sghose\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonkMXG36.rvt

Stage 4

Sequence 1

- Form individual pits not exceeding 1m in length in the sequence shown on the plan
- Shuttering is to be installed on all four sides of the pits and secured in place with trench props. The geotechnical investigation indicate the near surface soils to comprise of Made Ground deposits which will be of varying composition. So temporary propping and boarding should be installed as excavation proceeds. All temporary boarding must be adequately braced to prevent collapse.

Sequence 2

- The formation is to bear within the Lynch Hill Gravels. Arrange for the Engineer to inspect and approve the formation.
- Cast blinding, fix reinforcement – including continuity strips for adjoining bases and wall starters. Secure hydro seal waterbars to side shutters
- Cast Base

Sequence 3

- Fix wall stem reinforcing bars - including continuity strips for adjoining wall stems, shutter and cast concrete ensuring thorough compaction.
- After 24 hours dry pack between top of rc wall and underside of existing wall.

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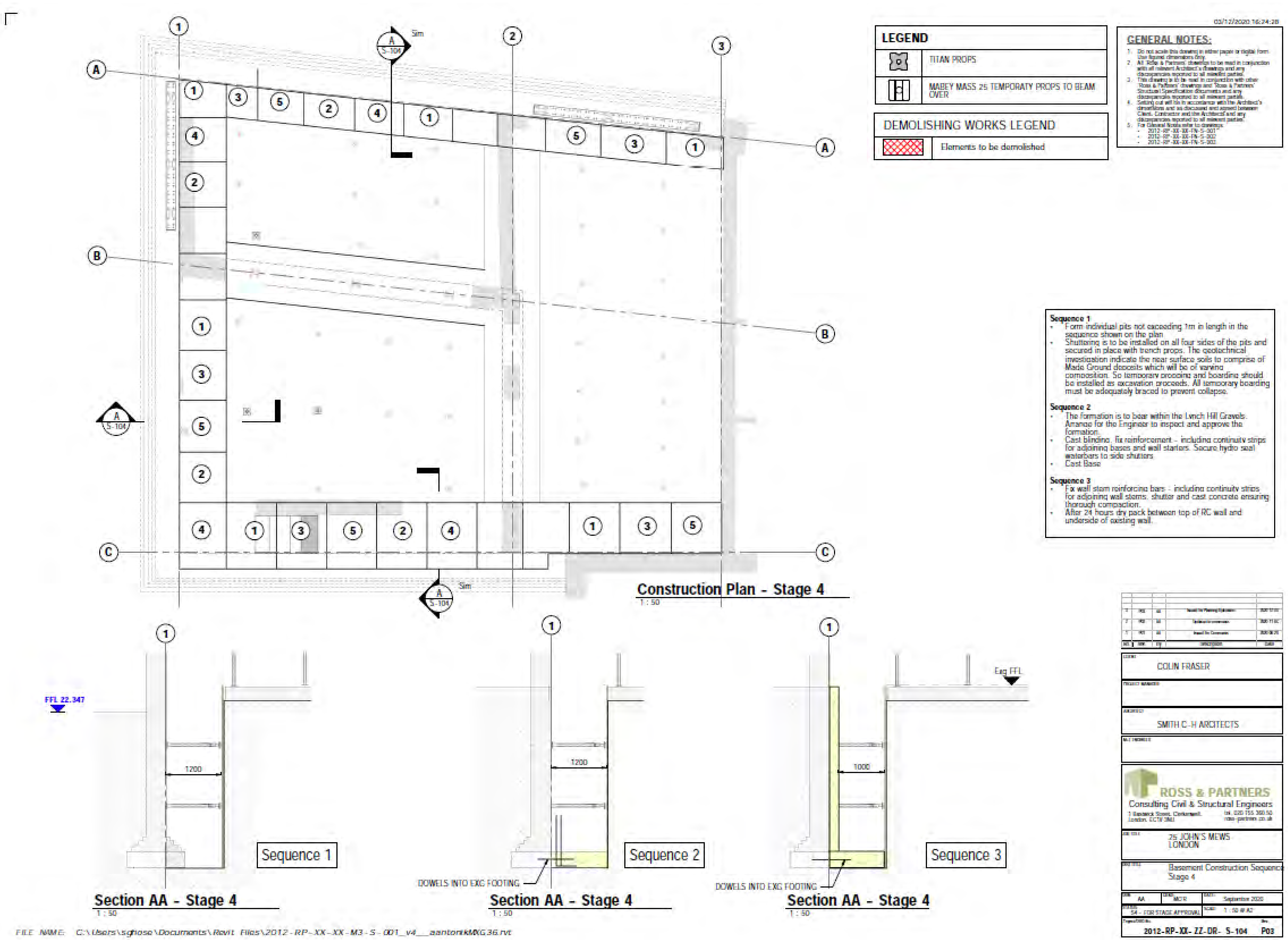
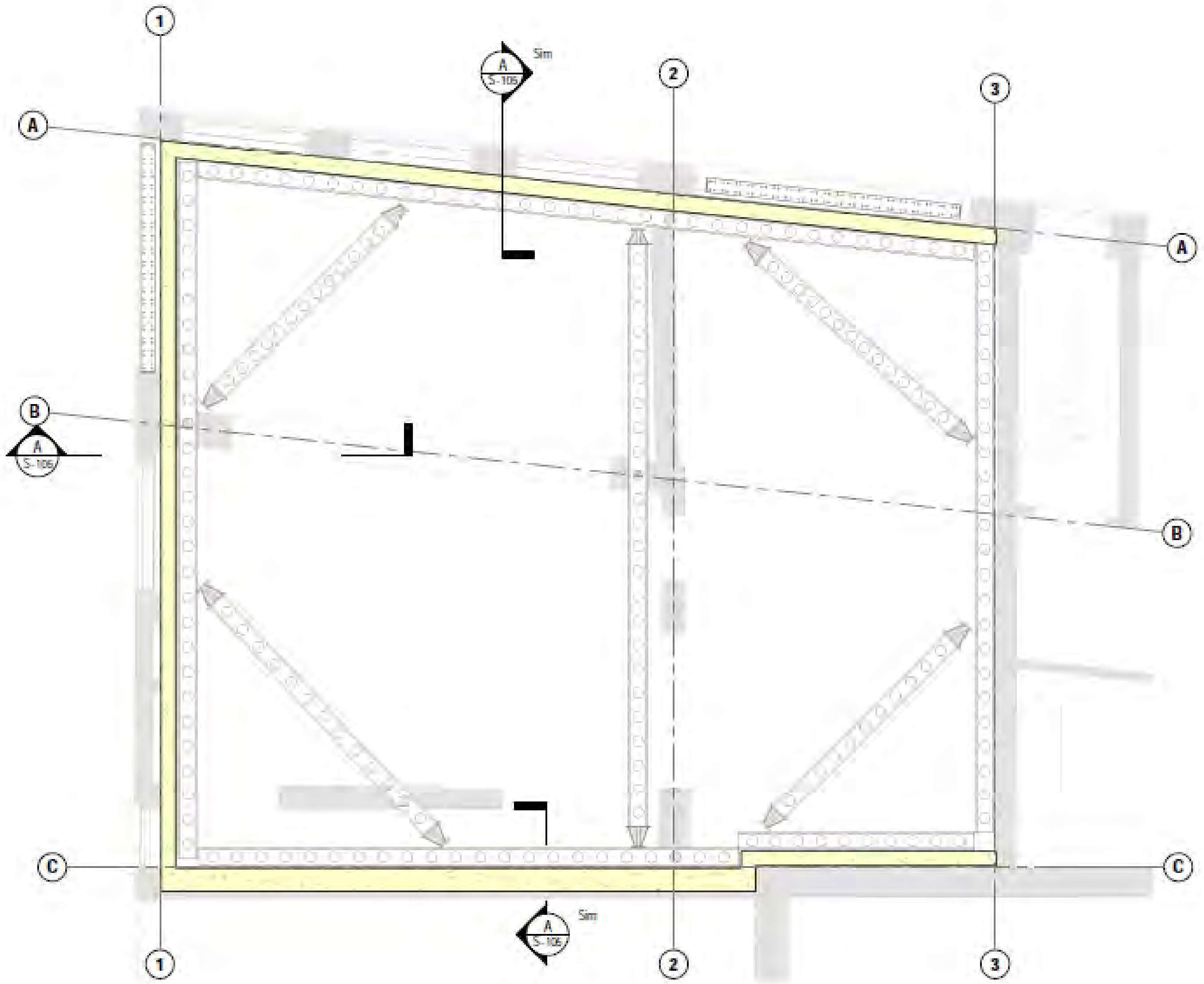
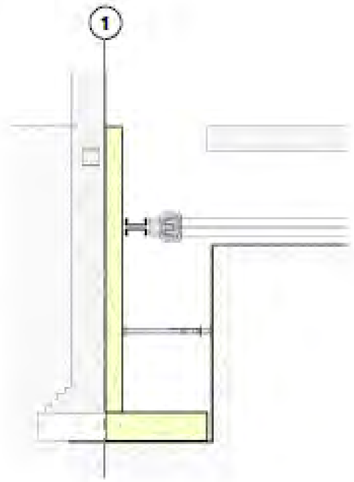


Stage 5

- Reduce ground levels in horizontal layers and install lateral bracing and props



Basement Plan - Stage 5
1 : 50



Section AA - Stage 5
1 : 50

Stage 5
- Reduce ground levels in horizontal layers and install lateral bracing and props

03/12/2020 16:24:30

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   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003

CLIENT: COLIN FRASER

PROJECT MANAGER:

ARCHITECT: SMITH C-H ARCITECTS

ROSS & PARTNERS
Consulting Civil & Structural Engineers

JOB TITLE: 25 JOHN'S MEWS LONDON

DWG TITLE: Basement Construction Sequence Stage 5

DRN: AA	CHKD: MCR	DATE: September 2020
STATUS: S4 - FOR STAGE APPROVAL		SCALE: 1 : 50 @ A2
2012-RP-XX- ZZ-DR- S-106		Rev. P03

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Stage 6

- Reduce ground levels in horizontal layers to approximately 1/3 of the total height and install second layer of props.

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GENERAL NOTES:

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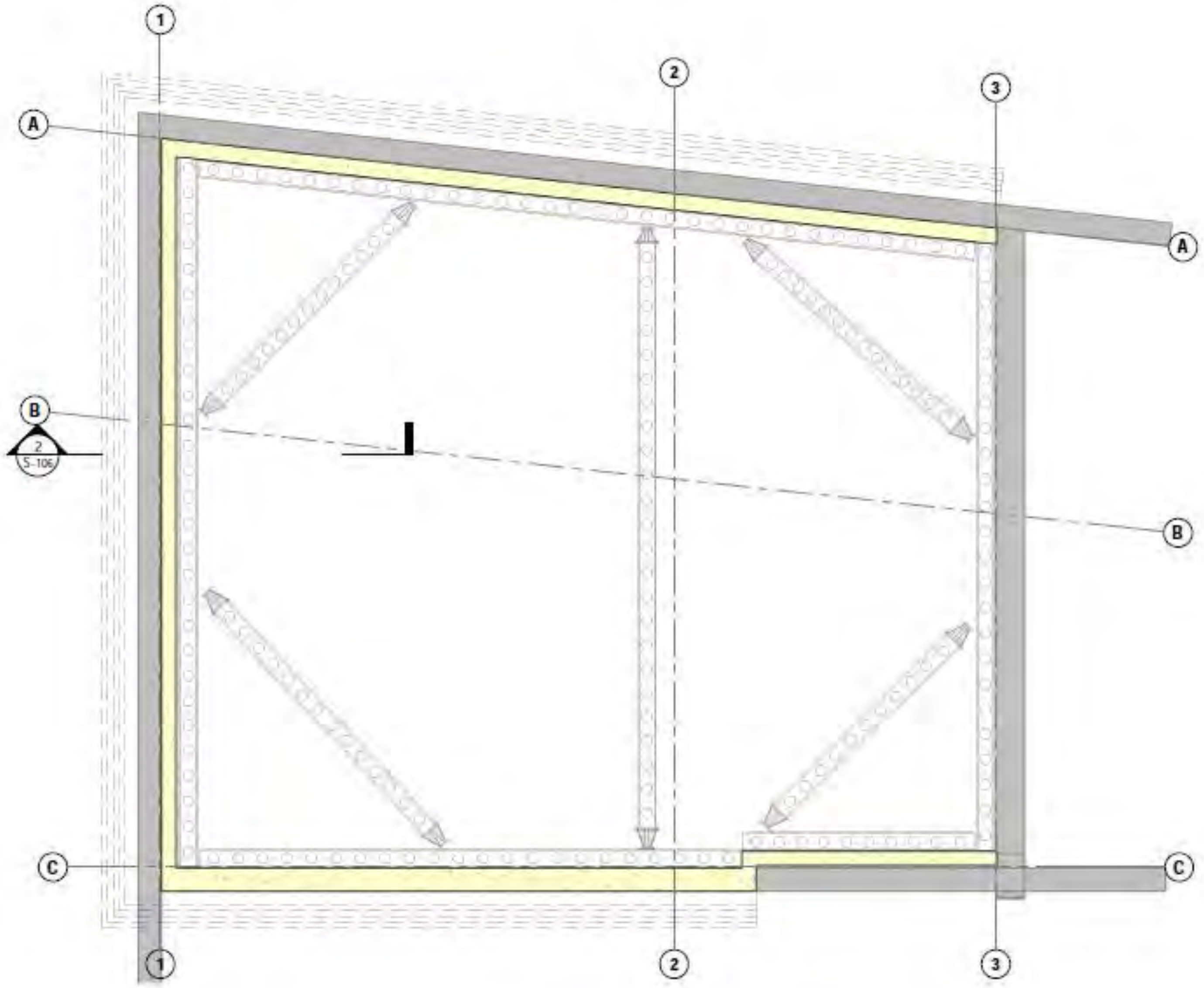
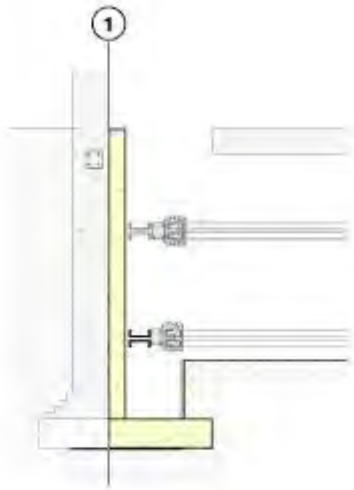
   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003



Stage 6 - Lower Level Lateral Props
1 : 50



Section AA - Stage 6
1 : 50

Stage 6
- Reduce ground levels in horizontal layers to approximately 1/3 of the total height and install second layer of props.

COLIN FRASER

SMITH C-H ARCITECTS

ROSS & PARTNERS
Consulting Civil & Structural Engineers

25 JOHN'S MEWS
LONDON

Basement Construction Sequence
Stage 6

AA | MCTR | September 2020

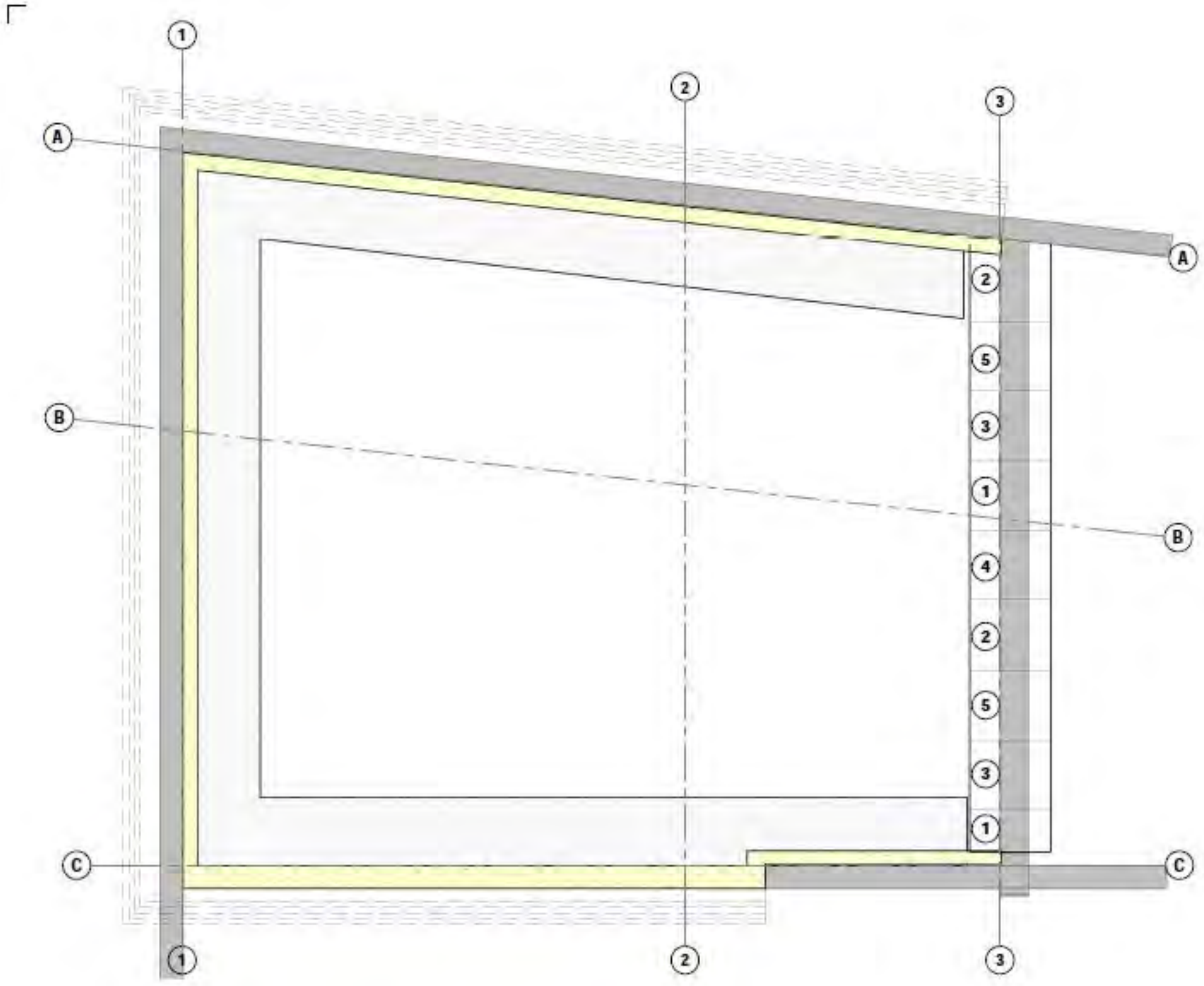
S4 - FOR STAGE APPROVAL | 1 : 50 @ A2

2012-RP-XX-ZZ-DR-S-106 P03

FILE NAME: C:\Users\sghose\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonikMXG36.rvt

Stage 7

- Commence mass concrete underpinning of party wall along grid 3 in lengths not exceeding 1m as shown on the plan.



Stage 7 - Underpinning Wall on Grid 3
1 : 50

DESIGNER'S METHOD STATEMENT & SEQUENCE OF WORK FOR MASS CONCRETE UNDERPINNING OF MASONRY WALL.

Underpinning

- Excavate the individual bay to be underpinned to the new formation level.
- The soffit of existing foundations is to be thoroughly cleaned and cut back to a sound face before concreting and dry packing.
- The existing corbelled brick foundations will be carefully cut back to the wall line on the internal face.
- Bay widths are to be limited to 1.25m max and at no point should pins be opened for more than 20% of the length of the wall.
- The condition of the masonry appears reasonably sound. In the unlikely event a localised area of defective concrete or masonry should become apparent, adequate temporary supports are to be provided. Steel prop supports shall be inserted locally if necessary after excavation beneath the foundations and shall be bedded on the approved formation and concreted into the underpinning.
- Concrete to be GEN 3 (20 N) mass concrete uno.
- Any variation from the proposed sequence of underpinning is to be agreed with the Engineer before proceeding with the work.
- Excavate and cast bays marked 1. Allow 24 – 48 hours to cure before dry packing. Allow 24-48 hours to cure before excavating the subsequent bay.
- Excavate and cast bays marked 2 and dry pack as above.
- Repeat for 3, 4, 5 until underpinning complete, or similar sequencing (Note: sequential ordering for bays in a length of wall is 1st bay, 3rd bay, 5th, 2nd, 4th and so on, such that a subsequent bay is not located adjacent to a most recently constructed bay uno).
- The width of the underpinning base at formation level is to equal the width of the existing brickwork foundations.
- The contractor is to provide any necessary temporary lateral shores to provide safe access into the excavation area at all times.

03/12/2020 16:24:36

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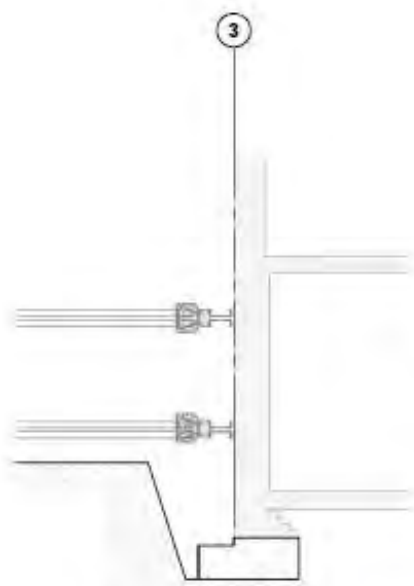
   - 2012-RP-XX-XX-FN-S-002
   - 2012-RP-XX-XX-FN-S-003



Section AA - Stage 7
1 : 50

Stage 7
- Commence mass concrete underpinning of party wall along grid 3 in lengths not exceeding 1m as shown on the plan.

CLIENT: COLIN FRASER

PROJECT MANAGER:

ARCHITECT: SMITH C-H ARCITECTS

ROSS & PARTNERS
Consulting Civil & Structural Engineers

JOB TITLE: 25 JOHN'S MEWS
LONDON

DWG TITLE: Basement Construction Sequence
Stage 7

DRN	CHKD	DATE
AA	MCR	September 2020

STATUS	SCALE
S4 - FOR STAGE APPROVAL	1 : 50 @ A2

Project/DWG No.	Rev
2012-RP-XX- ZZ-DR- S-107	P03

FILE NAME: C:\Users\sghose\Documents\Revit Files\2012-RP-XX-XX-M3-S-001_v4__aantonkMXG36.rvt

Stage 8

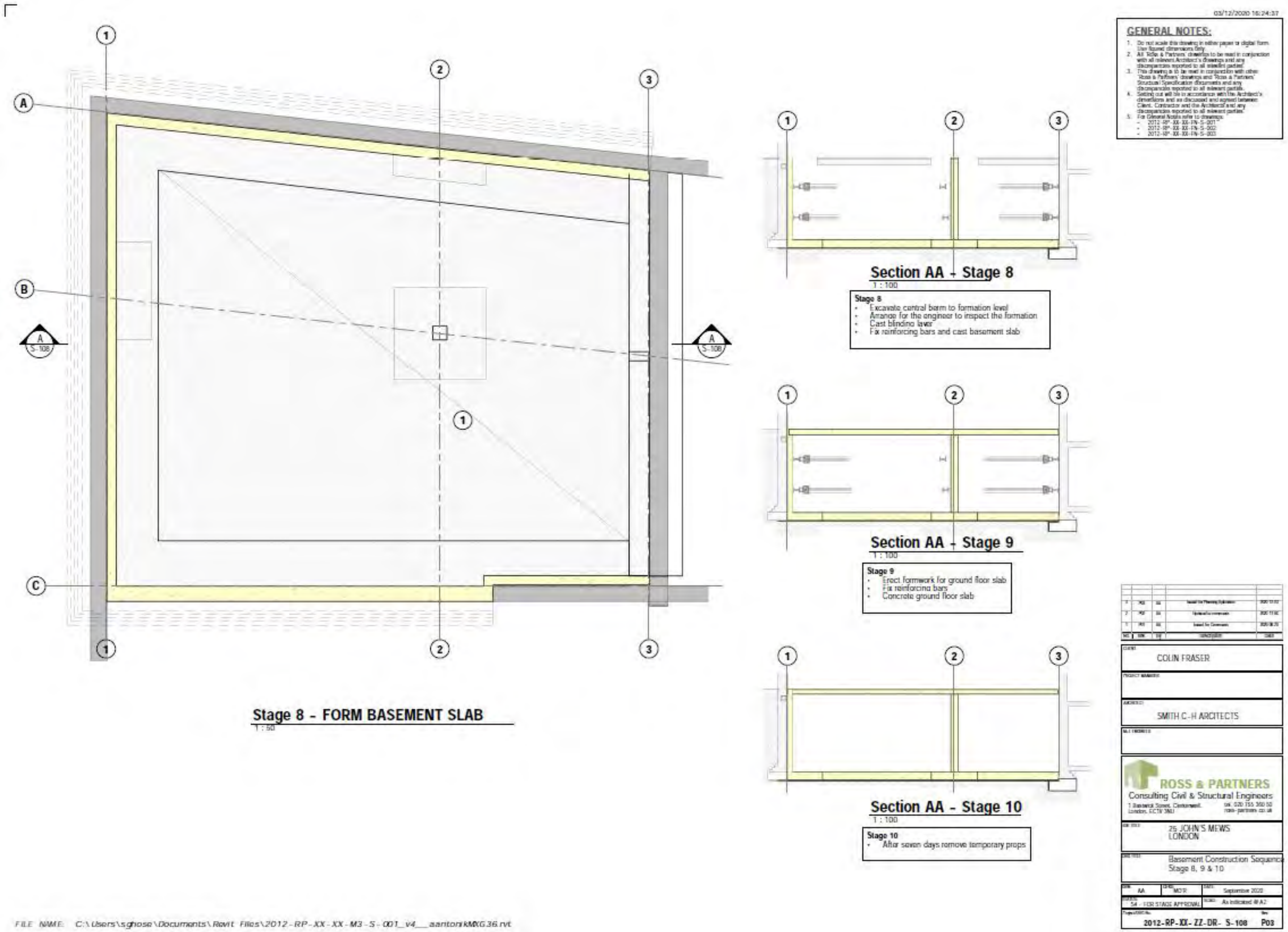
- Excavate central berm to formation level
- Arrange for the engineer to inspect the formation
- Cast blinding layer
- Fix reinforcing bars and cast basement slab

Stage 9

- Erect formwork for ground floor slab
- Fix reinforcing bars
- Concrete ground floor slab

Stage 10

- After seven days remove temporary props


GENERAL NOTES:
Stage 8 - FORM BASEMENT SLAB
1 : 50
Section AA - Stage 8
1 : 100
Stage 8
• Excavate central berm to formation level
• Arrange for the engineer to inspect the formation
• Cast blinding layer
• Fix reinforcing bars and cast basement slab
Section AA - Stage 9
1 : 100
Stage 9
• Erect formwork for ground floor slab
• Fix reinforcing bars
• Concrete ground floor slab
Section AA - Stage 10
1 : 100
Stage 10
• After seven days remove temporary props
COLIN FRASER
SMITH C-H ARCITECTS
ROSS & PARTNERS
Consulting Civil & Structural Engineers
25 JOHN'S MEWS
LONDON
Basement Construction Sequence
Stage 8, 9 & 10
AA
MO'R
September 2020
S4 - FOR STAGE APPROVAL
As indicated @ A2
2012-RP-XX-ZZ-DR- S-108
P03

Appendix 3: Structural Engineer's Statement and Calculations

Building

Superstructure

The existing above ground structure shall remain unaltered.

Substructure

The new basement accommodation shall be formed of insitu reinforced concrete "box" with a 350mm thick basement slab, 250mm thick concrete retaining walls and 250mm thick ground floor slab.

The party walls will be underpinned in a traditional hit and miss sequence to ensure they are not undermined during construction and are founded below the depth of the proposed excavation. Temporary lateral propping will be deployed during construction at all times.

The concrete retaining walls are designed will be designed for the following:

lateral loads arising from the retained earth,

ground water (which will be taken at a conservative level of 1.0m bgl)

a variable surcharge action of 10.0KPa and

Basement Waterproofing

In considering the waterproofing protection for the basement, the following grades to BS 8102:2009 could be considered to apply:

Grade 3 in the Residential and Common Space.

Performance level: no water penetration; ventilation; dehumidification or air conditioning necessary appropriate to the intended use.

It is proposed the Grade 3 Environment is best achieved using a combination of two waterproofing systems as recognised within BS8102;

Type B Water Resisting Concrete, and

Type C drained cavity system

Superstructure

The above ground structure shall be retained in its entirety and not subjected to any alteration. We will however provide lateral restraint straps to the surrounding walls to ensure the floors and roof act as horizontal diaphragm and transfer horizontal loads into the walls.

Lateral Stability

The building comprises of quite substantial masonry walls around its entire perimeter. These walls provide both vertical and lateral support. It is recognised that terraced properties dating from the late 1800's have shared party walls and that cumulative effects of thermal/lateral strains can induce issues with terrace end walls. No such impacts are likely for this development as the façade lengths are relatively short.

Design Performance Criteria and Standards

Loading

The following parameters have been adopted as design loads.

Permanent Actions (Dead Loads)

The dead load allows for the self-weight of the structure, floor screed, finishes and external cladding

Variable Actions (Imposed loads)

Imposed loads are defined as the load assumed to be produced by the intended occupancy or use, including the weight of moveable partitions and snow loads. These have been determined from NA to BS EN 1991-1-1.

The following parameters have been adopted in the design.

Location	Use	Uniformly Distributed load	Allowance for Partitions
Basement	Residential	2.50 KN/m²	
Ground	Residential	1.50 KN/m²	1.0 KN/m²
First	Residential	1.50 KN/m²	1.0 KN/m²
Roof generally	Flat Roof	0.60 KN/m²	

Wind Loads

Calculated wind loads acting on the building structure and cladding in accordance with the "Standard" method of BE EN 1991-1-4 gives:

Basic Wind Velocity = 21.8m/s

Peak velocity pressure = 1.09 KN/m²

Maximum net roof pressure (incl pressure coefficients) = 2.25 KN/m² (uplift)

Maximum net wall pressure (incl pressure coefficients) = 1.36 KN/m²

Earth Pressure and Soil Surcharge Loads

The perimeter retaining walls are designed for lateral loads resulting from:

- lateral loads arising from the retained earth,
- ground water (which will be taken at a conservative level of 1.0m bgl).
- a variable surcharge action of 10.0KPa and
- At rest pressure coefficients have been employed.
- $K_0 = 1 - \sin(\Phi'_{r.d}) = 0.540$
- Pedestrian loading should be 5.0KN/m²
- Carriageway loading should be Traffic Load LM1 in accordance with BS EN 1991-2 Table 4.2. and the recommendations of PD 6694-1:2011 "Recommendations for the design of structures subject to traffic Loading to BS EN 1997-1:2004

- However for Global design purposes a UDL of 9KN/m² will be applied as the variable surcharge load applied to the backfill behind the retaining wall.
- F = Horizontal line loads applied at ground level over a width of 1.0m due to LM1 based upon the recommendations PD 6694-1:2011 "Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004.

Balustrade Loading

Balustrades will be designed for the following performance criteria as defined in NA to BS EN 1991-1-1, Table N.A.8.

Category	Handrail Load	Infill Load
Residential Areas	0.74 KN/m	1.0 KN/m²

Fire Resistance

The fire resistance of the building structure is 60 minutes and determined in accordance with BS EN 1992-1-2.

Robustness and Disproportionate Collapse

The building is classed as a Class 2A to Building Regulations Approved Document A and Table A1 of BS EN 1991-1-7 as it is a single occupancy house exceeding four storeys.

Buildings within this category are required to have effective horizontal ties in order to reduce the sensitivity of the building to disproportionate collapse in the event of an accident. This condition is customarily met with traditional lateral floor straps.

Durability

The design life of new structural elements is taken as 50 years which falls within Category 4 in Table 2.1 of BS EN 1990: Basis of Structural Design and corresponds to a "normal" category of building.

Concrete shall be designed to provide sufficient cover to reinforcement commensurate with the conditions of exposure.

Structural Analysis and Design

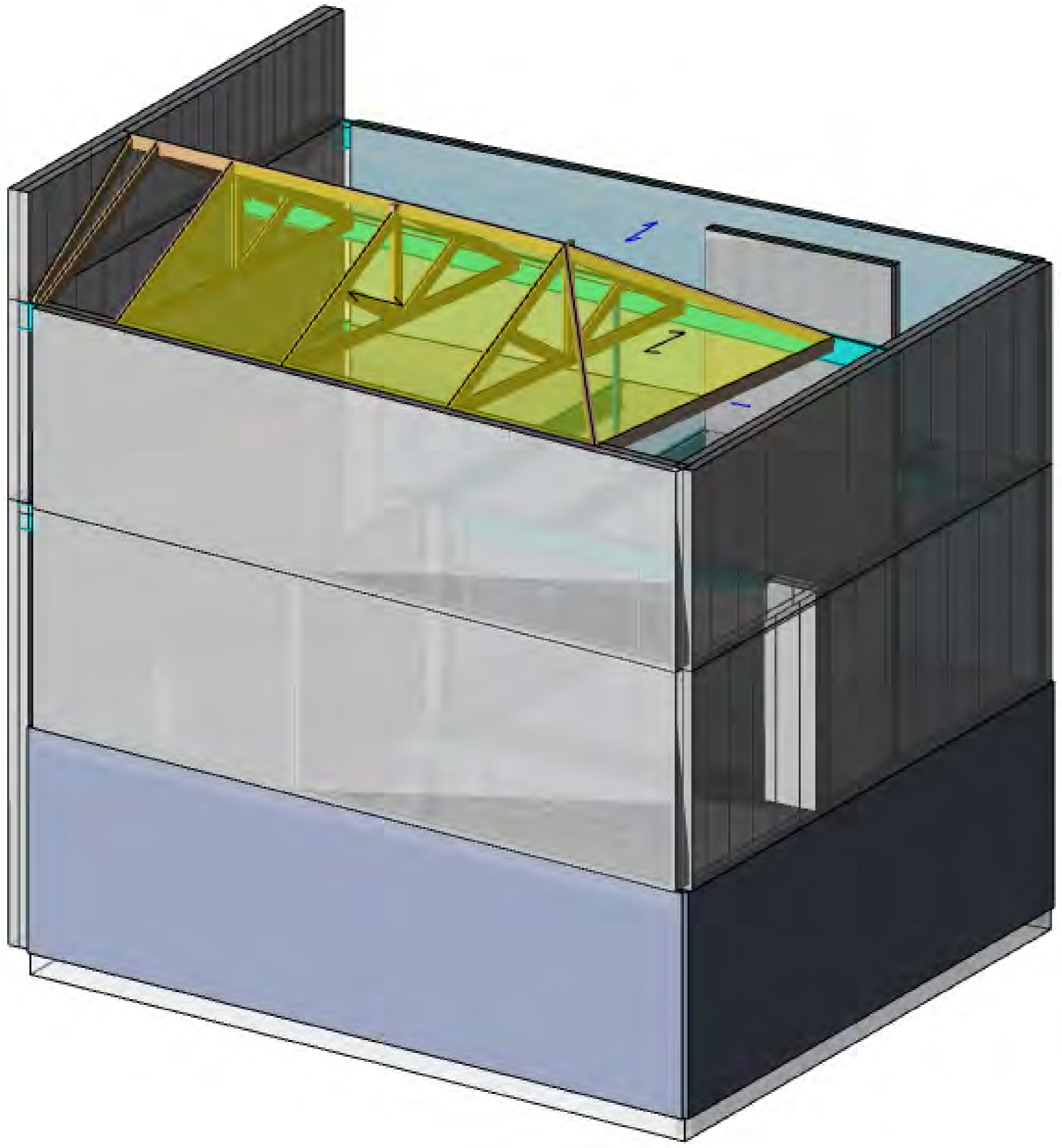
The analysis and design has been carried out Using Tekla Structural Designer. This is a comprehensive three dimensional software system that combines analysis and code compliant design for both gravity and lateral analysis in a single finite element model.

Gravity loads for the self-weight of the structural frame are calculated automatically. Wind loads are also calculated and applied automatically using the in built BREVe wind generator which calculates effective gust speeds and wind pressures for any National Grid reference. The wind forces loads are applied to wall and roof surfaces and EC1 pressure coefficients determined.

Variable actions are applied as individual pressure, point, line load as appropriate in either the x,y or z directions.

The software incorporates a powerful finite element engine that analysis model is used to assess the maximum bending, shear and axial forces together with vertical and lateral deflections.

25 **John's Mews**



Earth Pressure Loads

Retained soil properties

Soil type; Medium dense well graded sand

Moist density; γ_{mr} = 21 kN/m^3

Saturated density; γ_{sr} = 22 kN/m^3

Characteristic effective shear resistance angle; $\phi'_{r.k}$ = 28 deg

Characteristic wall friction angle; $\delta_{r.k}$ = 0 deg

Base soil properties

Soil type; Medium dense well graded sand

Soil density; γ_b = 21 kN/m^3

Characteristic cohesion; $c'_{b.k}$ = 0 kN/m^2

Characteristic effective shear resistance angle; $\phi'_{b.k}$ = 41 deg

Characteristic wall friction angle; $\delta_{b.k}$ = 15 deg

Characteristic base friction angle; $\delta_{bb.k}$ = 30 deg

Loading details

Variable surcharge load; $Surcharge_Q$ = 10 kN/m^2

Using Coulomb theory

At rest pressure coefficient; $K_0 = 1 - \sin(\phi'_{r.d}) = 0.531$

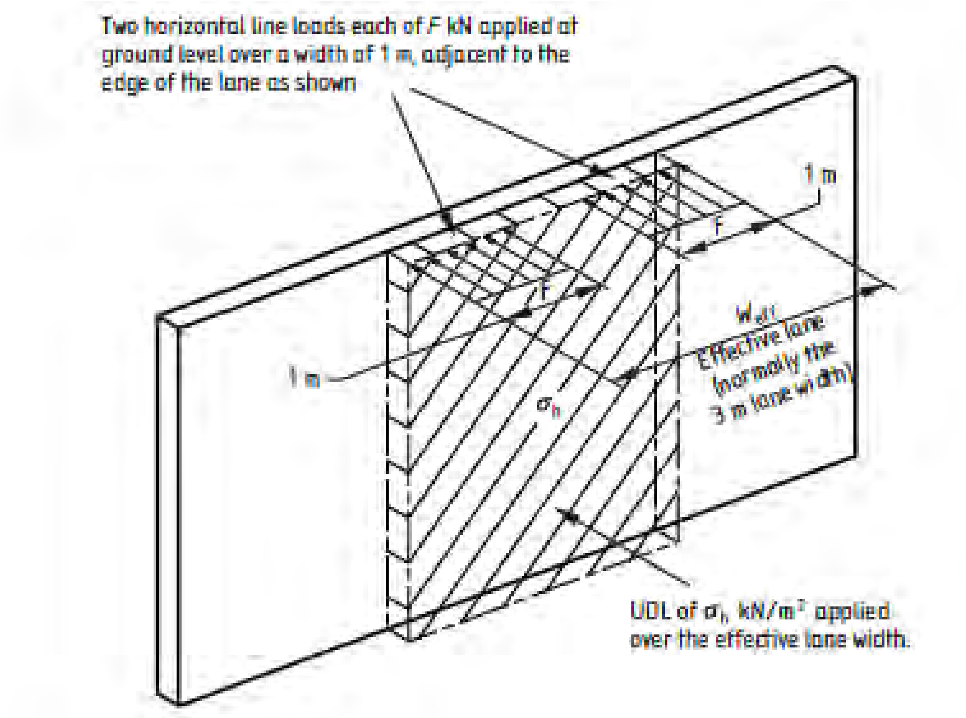
Highway Surcharge Loads

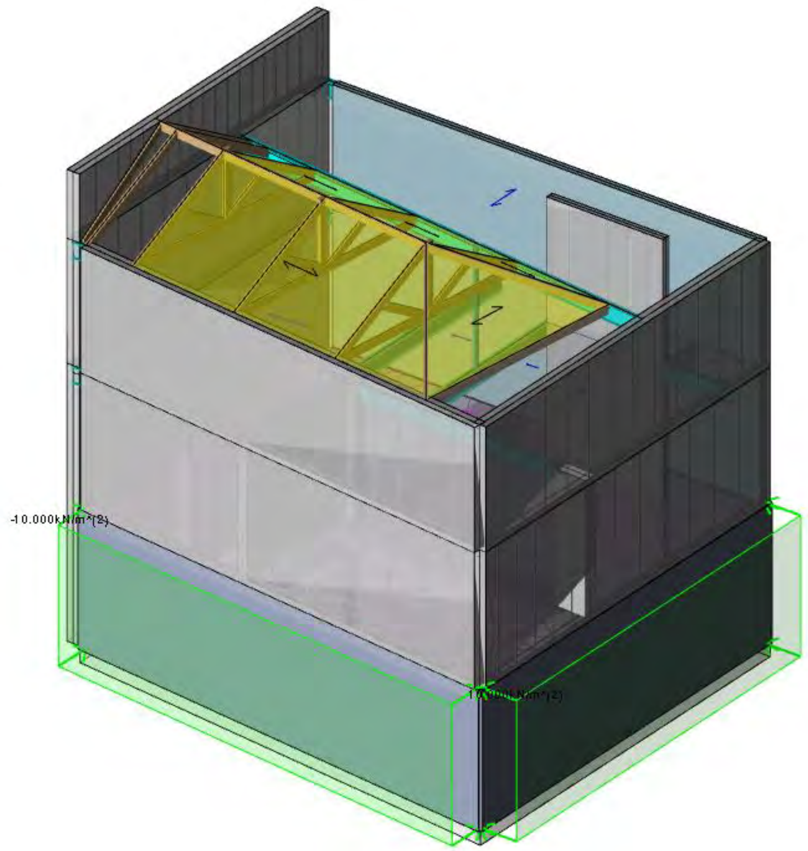
Pedestrian loading should be 5.0KN/m^2

Carriageway loading should be Traffic Load LM1 in accordance with BS EN 1991-2 Table 4.2. and the recommendations of PD 6694-1:2011 "Recommendations for the design of structures subject to traffic Loading to BS EN 1997-1:2004

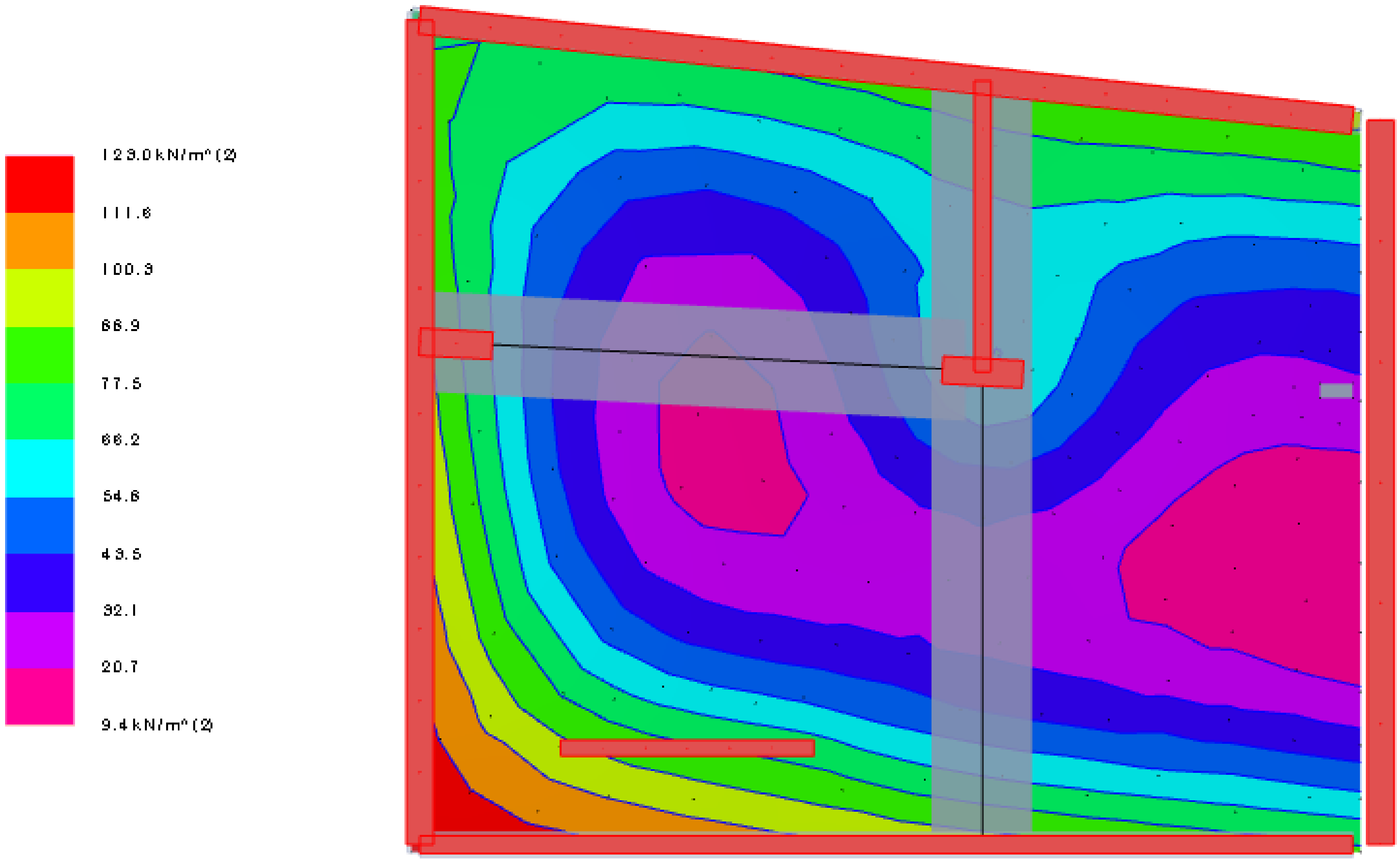
However for Global design purposes a UDL of 9KN/m^2 will be applied as the variable surcharge load applied to the backfill behind the retaining wall.

F = Horizontal line loads applied at ground level over a width of 1.0m due to LM1 based upon the recommendations PD 6694-1:2011 "Recommendations for the design of structures subject to traffic loading to BS EN 1997-1:2004.





Results for Raft Foundation



SLS Bearing Pressure for Full Permanent, Variable, Earth Retaining and Surcharge Pressures

Concrete

Slab/Mat Design

Slab/Mat Design per Plane

St. Base (Base)

Slab/Mat Panels

Mat: MF 2, Panel: Sl 23

Static

Reinforcement Design Summary

Reinforcement Layer	*Reinforcement Provided*	*Area Provided [mm²/m]*	*Area Required [mm²/m]*	*Utilization*
Bottom-X	H20-150.0-B2	2094	1680	0.802
Bottom-Y	H20-175.0-B1	1795	1393	0.776
Top-X	H10-150.0-T2	524	492	0.939
Top-Y	H10-150.0-T1	524	517	0.988

Bearing Pressure Summary

Bearing pressure checks	*Max. value [kN/m²]*	*Limit [kN/m²]*	*Status*	*Utilization*
Pressure	179.6	200.0	✓ Pass	0.898

Static

Panel Details

Concrete Class	C32/40	
Overall Depth	350.0	mm
Top Cover	30.0	mm
Bottom Cover	30.0	mm
Max Cracked	0.3	mm

Reinforcement Design Details

Bottom-X

Summary

Utilization ratio	$A_{s,reqd}$ / $A_{s,prov}$ = 0.802
Analysis method	Grillage chase-down
Critical combination	1 Combination

✓ Pass

Moment Capacity Check

$A_{s,prov\ X\ Bottom}$	2094	mm²/
$M_{dX\ Bottom}$	-197.112	kNm/m
$A_{s,req\ X\ Bottom}$	1680	mm²/
Required tension steel area for bending in	$A_{st,reqd} = M_{Ed} / (f_{yd} \times z) = 1680$	
Utilization ratio	$A_{s,reqd} / A_{s,prov} = 0.802$	

Limiting Reinforcement Parameters Checks

Check Minimum Diameter	Pass		
Bar Diameter φ	20.0	mm	
Min Diameter φ_{min}	10.0	mm	
Check Maximum Diameter	Pass		
Bar Diameter φ	20.0	mm	
Max Diameter φ_{max}	25.0	mm	
Check Minimum Bar Distance	Pass		EN 1992-1-1:2004 Section 8.2(2)
Clear Distance s_{cl}	130.0	mm	
Min Clear Distance $s_{cl,min}$	100.0	mm	
Check Maximum Spacing Tension	Pass		EN 1992-1-1:2004 Section 9.3.1.1(3)
Bar Spacing S	150.0	mm	
Max Spacing S_{max}	450.0	mm	
Check Maximum Spacing Tension Bars (h > 200)	Pass		EN 1992-1-1:2004 Table 7.3N
Bar Spacing S	150.0	mm	
Max Spacing $S_{cr,max}$	216.6	mm	
σ_S	226.7	N/m	
Check Minimum Area of Reinforcement	Pass		EN 1992-1-1:2004 Section 9.2.1.1(1) and 7.3.2(2)
A_S	2094	mm²/	
$A_{S,min,reqd}$	482	mm²/	
σ_S	280.0	N/m	
A_{ct}	17167	mm²/	
d	290.0	mm	
Check Maximum Area of	Pass		EN 1992-1-1:2004 Section 9.2.1.1(3)
A_S	2094	mm²/	
$A_{S,max}$	14000	mm²/	

Bottom-Y

Summary

Utilization ratio	$A_{s,reqd} / A_{s,prov} = 0.776$
Analysis method	Grillage chase-down
Critical combination	1 Combination

✓ Pass

Moment Capacity Check

$A_{s,prov\ Y\ Bottom}$	1795	mm^2/m
$M_{dY\ Bottom}$	-177.604	kNm/m
$A_{s,req\ Y\ Bottom}$	1393	mm^2/m
Required tension steel area for	$A_{st,reqd} = M_{Ed}\ /\ (f_{yd} \times z) = 1393$	
Utilization ratio	$A_{s,reqd}\ /\ A_{s,prov} = 0.776$	

Limiting Reinforcement Parameters Checks

Check Minimum Diameter	Pass		
Bar Diameter φ	20.0	mm	
Min Diameter φ_{min}	10.0	mm	
Check Maximum Diameter	Pass		
Bar Diameter φ	20.0	mm	
Max Diameter φ_{max}	25.0	mm	
Check Minimum Bar Distance	Pass		EN 1992-1-1:2004 Section 8.2(2)
Clear Distance s_{cl}	155.0	mm	
Min Clear Distance $s_{cl,min}$	100.0	mm	
Check Maximum Spacing Tension	Pass		EN 1992-1-1:2004 Section 9.3.1.1(3)
Bar Spacing S	175.0	mm	
Max Spacing S_{max}	450.0	mm	
Check Maximum Spacing Tension Bars (h > 200)	Pass		EN 1992-1-1:2004 Table 7.3N
Bar Spacing S	175.0	mm	
Max Spacing $S_{cr,max}$	225.9	mm	
σ_S	219.3	N/m	
Check Minimum Area of Reinforcement	Pass		EN 1992-1-1:2004 Section 9.2.1.1(1) and 7.3.2(2)
A_S	1795	$mm^2/$	
$A_{S,min,reqd}$	519	$mm^2/$	
σ_S	260.0	N/m	
A_{ct}	17164	$mm^2/$	
d	310.0	mm	
Check Maximum Area of	Pass		EN 1992-1-1:2004 Section 9.2.1.1(3)
A_S	1795	$mm^2/$	
$A_{S,max}$	14000	$mm^2/$	

Top-X

Summary

Utilization ratio	$A_{s,reqd}\ /\ A_{s,prov} = 0.939$
Analysis method	First-order linear
Critical combination	1 Combination

✓ Pass

Moment Capacity Check

$A_{s,prov\ X\ Top}$	524	mm²/
$M_{dX\ Top}$	61.948	kNm/
$A_{s,req\ X\ Top}$	492	mm²/
Required tension steel area for bending	$A_{st,reqd} = M_{Ed} / (f_{yd} \times z) = 492$	
Utilization ratio	$A_{s,reqd} / A_{s,prov} = 0.939$	

Limiting Reinforcement Parameters Checks

Check Minimum Diameter	Pass		
Bar Diameter φ	10.0	mm	
Min Diameter φ_{min}	10.0	mm	
Check Maximum Diameter	Pass		
Bar Diameter φ	10.0	mm	
Max Diameter φ_{max}	25.0	mm	
Check Minimum Bar Distance	Pass		EN 1992-1-1:2004 Section 8.2(2)
Clear Distance s_{cl}	140.0	mm	
Min Clear Distance $s_{cl,min}$	100.0	mm	
Check Maximum Spacing Tension Bars	Pass		EN 1992-1-1:2004 Section 9.3.1.1(3)
Bar Spacing S	150.0	mm	
Max Spacing S_{max}	450.0	mm	
Check Maximum Spacing Tension Bars (h > 200)	Pass		EN 1992-1-1:2004 Table 7.3N
Bar Spacing S	150.0	mm	
Max Spacing $S_{cr,max}$	168.2	mm	
σ_S	265.4	N/mm	
Check Minimum Area of Reinforcement	Pass		EN 1992-1-1:2004 Section 9.2.1.1(1) and 7.3.2(2)
A_S	524	mm²/	
$A_{S,min,reqd}$	489	mm²/	
σ_S	280.0	N/mm	
A_{ct}	17404	mm²/	
d	305.0	mm	
Check Maximum Area of	Pass		EN 1992-1-1:2004 Section 9.2.1.1(3)
A_S	524	mm²/	
$A_{S,max}$	14000	mm²/	

Top-Y

Summary

Utilization ratio	$A_{s,reqd}$ / $A_{s,prov}$ =
Analysis method	Grillage chase-
Critical	1 Combination

✓ Pass

Moment Capacity Check

$A_{s,prov\ Y\ Top}$	524	mm²/
$M_{dY\ Top}$	67.296	kNm/
$A_{s,req\ Y\ Top}$	517	mm²/
Required tension steel area for bending	$A_{st,reqd}$ = M_{Ed} / (f_{yd} × z) = 517	
Utilization ratio	$A_{s,reqd}$ / $A_{s,prov}$ = 0.988	

Limiting Reinforcement Parameters Checks

Check Minimum Diameter	Pass		
Bar Diameter φ	10.0	mm	
Min Diameter $φ_{min}$	10.0	mm	
Check Maximum Diameter	Pass		
Bar Diameter φ	10.0	mm	
Max Diameter $φ_{max}$	25.0	mm	
Check Minimum Bar Distance	Pass		EN 1992-1-1:2004 Section 8.2(2)
Clear Distance s_{cl}	140.0	mm	
Min Clear Distance $s_{cl,min}$	100.0	mm	
Check Maximum Spacing Tension Bars	Pass		EN 1992-1-1:2004 Section 9.3.1.1(3)
Bar Spacing S	150.0	mm	
Max Spacing S_{max}	450.0	mm	
Check Maximum Spacing Tension Bars (h > 200)	Pass		EN 1992-1-1:2004 Table 7.3N
Bar Spacing S	150.0	mm	
Max Spacing $S_{cr,max}$	151.0	mm	
$σ_S$	279.2	N/mm	
Check Minimum Area of Reinforcement	Pass		EN 1992-1-1:2004 Section 9.2.1.1(1) and 7.3.2(2)
A_S	524	mm²/	
$A_{S,min,reqd}$	495	mm²/	
$σ_S$	280.0	N/mm	
A_{ct}	17396	mm²/	
d	315.0	mm	
Check Maximum Area of	Pass		EN 1992-1-1:2004 Section 9.2.1.1(3)
A_S	524	mm²/	
$A_{S,max}$	14000	mm²/	

Bearing Capacity

First-order linear

Max base pressure, q_{max}	179.6	kN/m²
Critical combination	1	
Combination type	STR	
Allowable bearing	200.0	kN/m²
Bearing capacity	0.898	
Pressure status	✓ Pass	

Grillage chase-down

Max base pressure, q_{max}	172.4	kN/m²
Critical combination	1	
Combination type	STR	
Allowable bearing	200.0	kN/m²
Bearing capacity	0.862	
Pressure status	✓ Pass	

FE chase-down

Max base pressure, q_{max}	172.4	kN/m²
Critical combination	1	
Combination type	STR	
Allowable bearing	200.0	kN/m²
Bearing capacity	0.862	
Pressure status	✓ Pass	

Tension Check

First-order linear

Min base pressure, q_{min}	12.3	kN/m²
Critical combination	1 Combination	
Combination type	STR	
Tension status	✓ Pass	

Grillage chase-down

Min base pressure, q_{min}	12.3	kN/m²
Critical combination	1 Combination	
Combination type	STR	
Tension status	✓ Pass	

FE chase-down

Min base pressure, q_{min}	12.3	kN/m²
Critical combination	1 Combination	
Combination type	STR	
Tension status	✓ Pass	

Punching Checks

Base-C1-PC1

Static

Summary

	Section	Perimeter	u_0 / u_1 / u_2 [mm]	v_{Ed} [N/mm²]	v_{Rd} [N/mm²]	Ratio	Status	A_{sw} / s_r [mm²/m]	u_{out} [mm]	Studs Provided
Column	400.0×400.0	Loaded	1600.0	2.590	5.581	0.464	✓ Pass			
		Control	5369.9	0.624	0.829	0.752	✓ Pass	1924	5595.1	12 × H10-290-2-525

Base-C2-PC2

Static

Summary

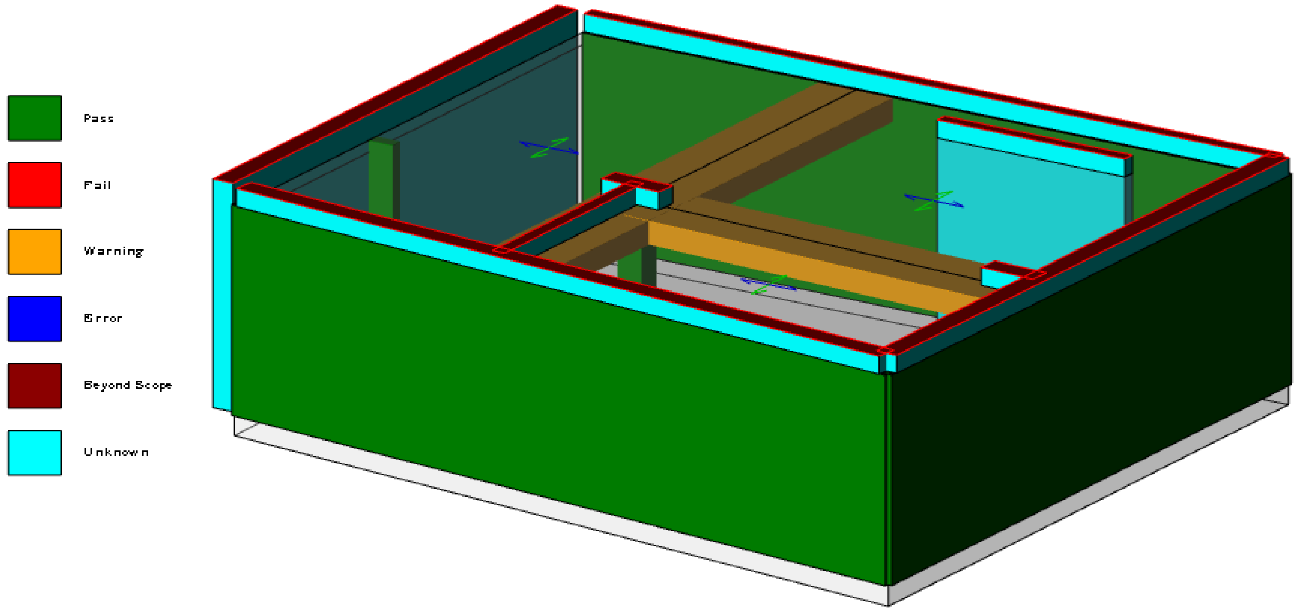
	Section	Perimeter	u_0 / u_1 / u_2 [mm]	v_{Ed} [N/mm²]	v_{Rd} [N/mm²]	Ratio	Status	A_{sw} / s_r [mm²/m]	u_{out} [mm]
Column	400.0×200.0	Loaded	1200.0	0.529	5.581	0.095	✓ Pass		
		Control	3085.0	0.162	0.598	0.271	✓ Pass		

Slab/Mat Design Summary

Static & RSA

Level	Slab	Reference	Type	Thickness [mm]	Grade	Utilization	Status
St. Base (Base) : 0.000m	MF 2	Sl 23	Foundation mat	350.0	C32/40	0.985	✓ Pass

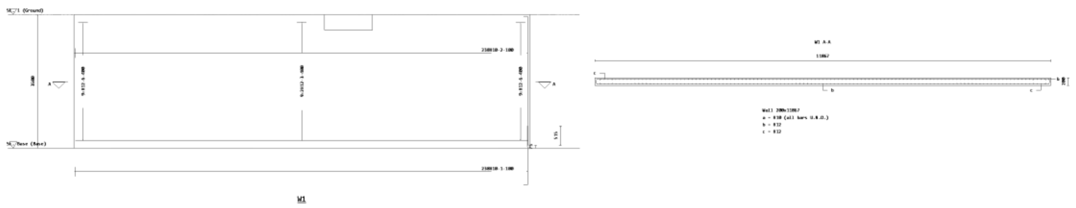
Retaining Walls



Wall Design

Walls

W1



Static

Vertical Bars Summary

Panel	*Length*	*Thickness*	*Vertical Bars*	*Analysis*	*Combination*	*Critical position*	*Ratio*	*Status*
1	11.867 m	200.0 mm	238H10 - 100	3D Building Analysis	1	Bottom	0.944	✓ Pass

Shear Summary

Panel	Horizontal Bars	Top support link legs	Span link legs	Bottom support link	Analysis	Combination	Ratio	Status
1	H12-400	-	-	-	3D Building Analysis	1	0.625	✓ Pass

Head code: United Kingdom (Eurocode), design code: BS EN 1992-1-1 + UK NA (2004)

Static

Panel 1 - Critical

Vertical Bars - Critical

3D Building Analysis - Critical

1 Combination - Critical

Bottom - Critical

Axial force	N_{Ed} = 1559.5 kN
Moment about major axis	M_{major} = -1465.4 kNm
Moment about minor axis	M_{minor} = -668.1 kNm
Major moment resistance	$M_{major,res} = M_{major,res,conc} + M_{major,res,steel}$ = -1553.1 kNm
Minor moment resistance	$M_{minor,res} = M_{minor,res,conc} + M_{minor,res,steel}$ = -708.1 kNm
Moment resistance ratio	$M_{major}^2 + M_{minor}^2 \ / \ M_{major,res}^2 + M_{minor,res}^2$ = 0.944

✓ Pass

Shear - Critical

3D Building Analysis - Critical

1 Combination - Critical

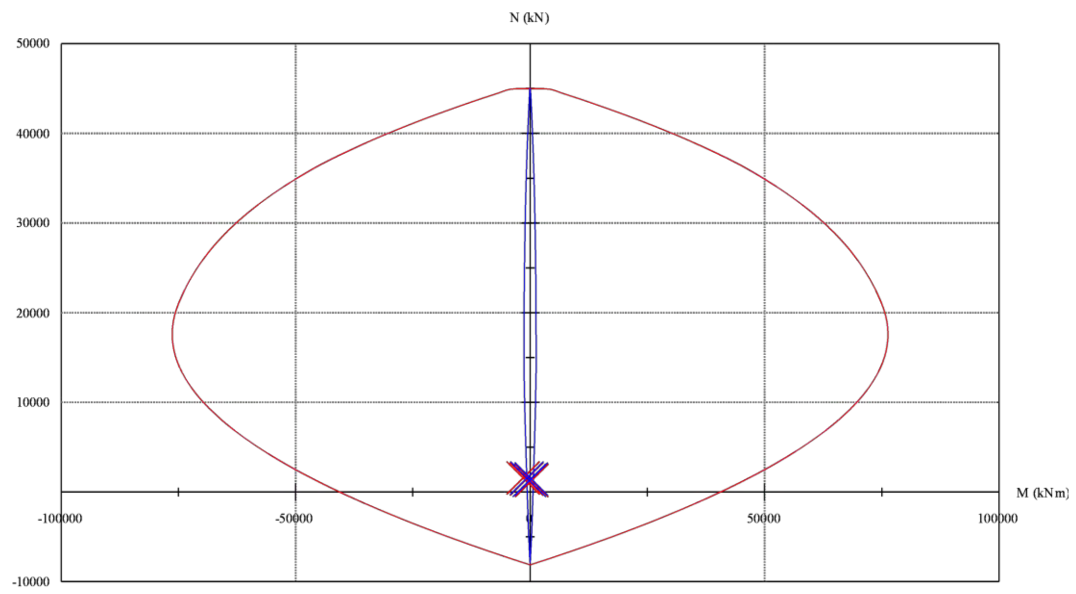
Minor Load Direction - Critical

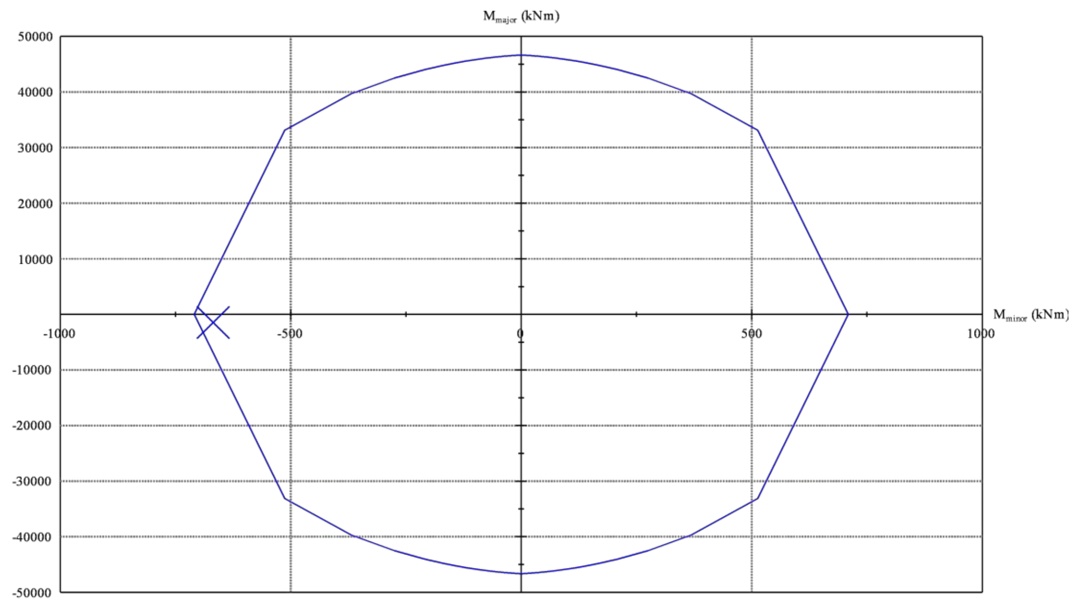
Unreinforced shear resistance sufficient

✓ Pass

Interaction Diagrams

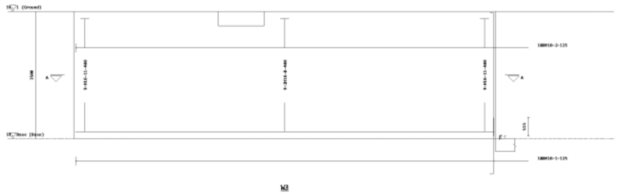
Static

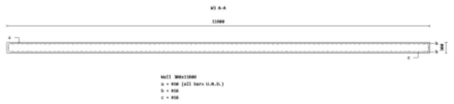




M-M Interaction Diagram at N_{Ed} = 1559.5 kN

W3





Static

Vertical Bars Summary

Panel	Length	Thickness	Vertical Bars	Analysis	Combination	Critical position	Ratio	Status
1	11.600 m	300.0 mm	186H10 - 125	FE Chase Down	1	Bottom	0.273	✓ Pass

Shear Summary

Panel	Horizontal Bars	Top support link legs	Span link legs	Bottom support link legs	Analysis	Combination	Ratio	Status
1	H16-400	-	-	-	3D Building Analysis	1	0.076	✓ Pass

Head code: United Kingdom (Eurocode), design code: BS EN 1992-1-1 + UK NA (2004)

Static

Panel 1 - Critical

Vertical Bars - Critical

FE Chase Down - Critical

1 Combination - Critical

Bottom - Critical

Axial force $N_{Ed} = 1306.6$ kN

Moment about major $M_{major} = 615.3$ kNm

Moment about minor $M_{minor} = -265.2$ kNm

Major moment $M_{major,res} = M_{major,res,conc} + M_{major,res,steel} = 2256.6$

Minor moment resistance $M_{minor,res} = M_{minor,res,conc} + M_{minor,res,steel} = -972.8$

Moment resistance ratio $M_{major}^2 + M_{minor}^2 \ / \ M_{major,res}^2 + M_{minor,res}^2 = 0.273$

✓ Pass

Shear - Critical

3D Building Analysis - Critical

1 Combination - Critical

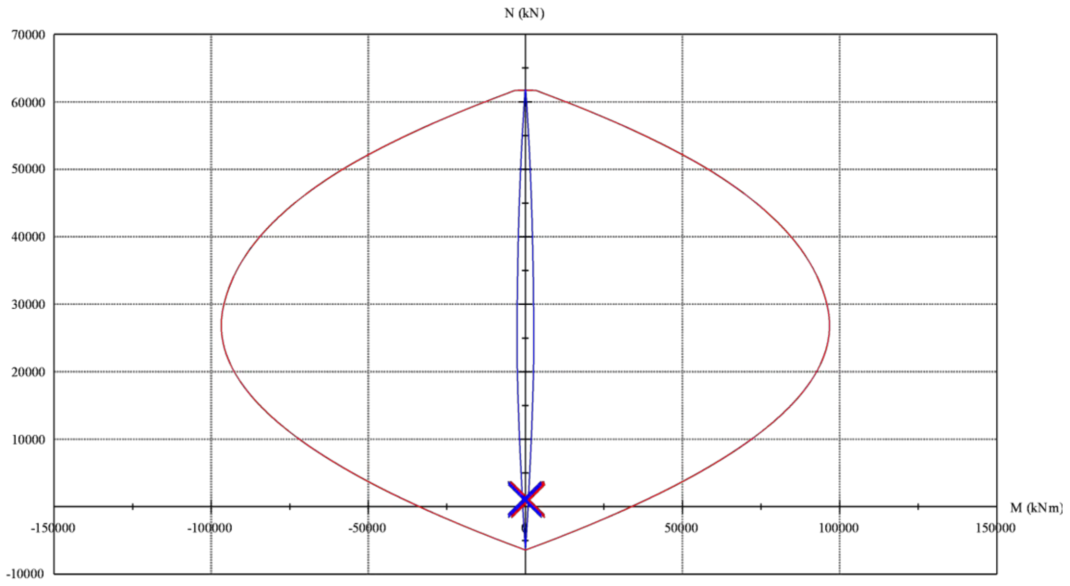
Major Load Direction - Critical

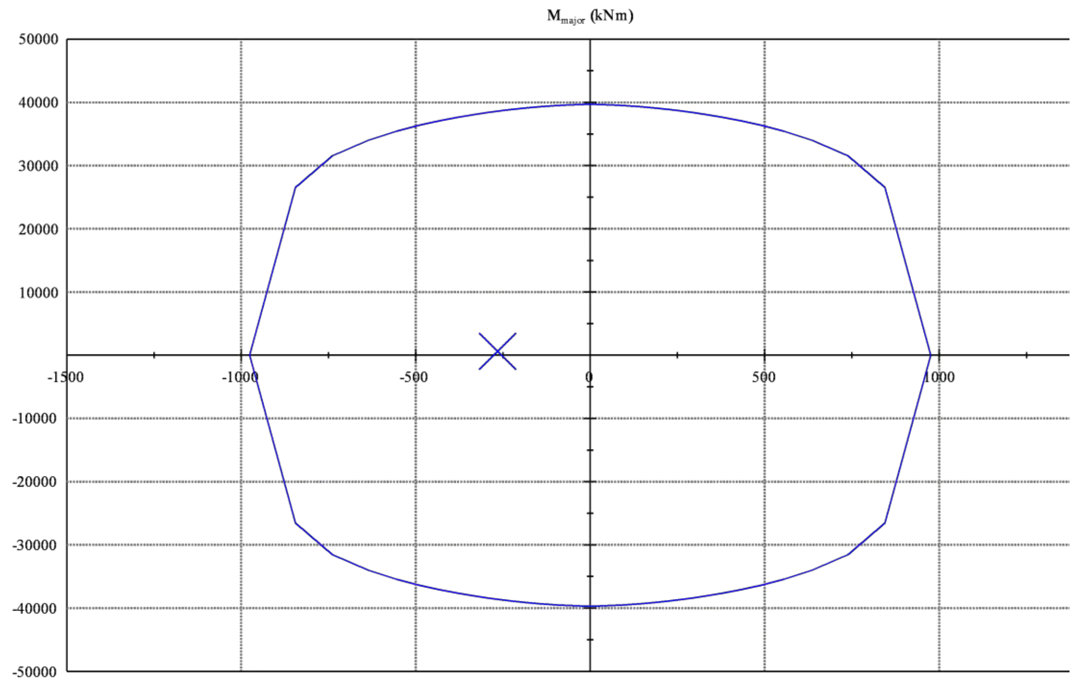
Unreinforced shear resistance sufficient

✓ Pass

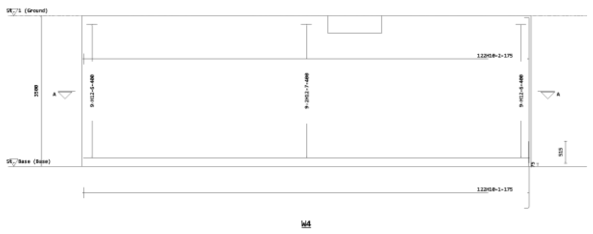
Interaction Diagrams

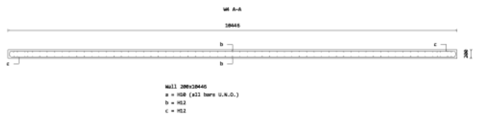
Static




M_{major} (kNm)
50000
40000
30000
20000
10000
-10000
-20000
-30000
-40000
-50000
-1500
-1000
-500
0
500
1000

W4





Static

Vertical Bars Summary

Panel	Length	Thickness	Vertical Bars	Analysis	Combination	Critical position	Ratio	Status
1	10.446 m	200.0 mm	122H10 - 173	3D Building Analysis	1	Bottom	0.971	✓ Pass

Shear Summary

Panel	Horizontal Bars	Top support link legs	Span link legs	Bottom support link legs	Analysis	Combination	Ratio	Status
1	H12-400	-	-	-	3D Building Analysis	1	0.647	✓ Pass

Head code: United Kingdom (Eurocode), design code: BS EN 1992-1-1 + UK NA (2004)

Static

Panel 1 - Critical

Vertical Bars - Critical

3D Building Analysis - Critical

1 Combination - Critical

Bottom - Critical

Axial force	N_{Ed} = 1430.0 kN
Moment about major axis	M_{major} = 727.8 kNm
Moment about minor axis	M_{minor} = -438.6 kNm
Major moment resistance	$M_{major,res} = M_{major,res,conc} + M_{major,res,steel}$ = 749.8 kNm
Minor moment resistance	$M_{minor,res} = M_{minor,res,conc} + M_{minor,res,steel}$ = -451.9 kNm
Moment resistance ratio	$M_{major}^2 + M_{minor}^2 \,/\, M_{major,res}^2 + M_{minor,res}^2$ = 0.971

✓ Pass

Shear - Critical

3D Building Analysis - Critical

1 Combination - Critical

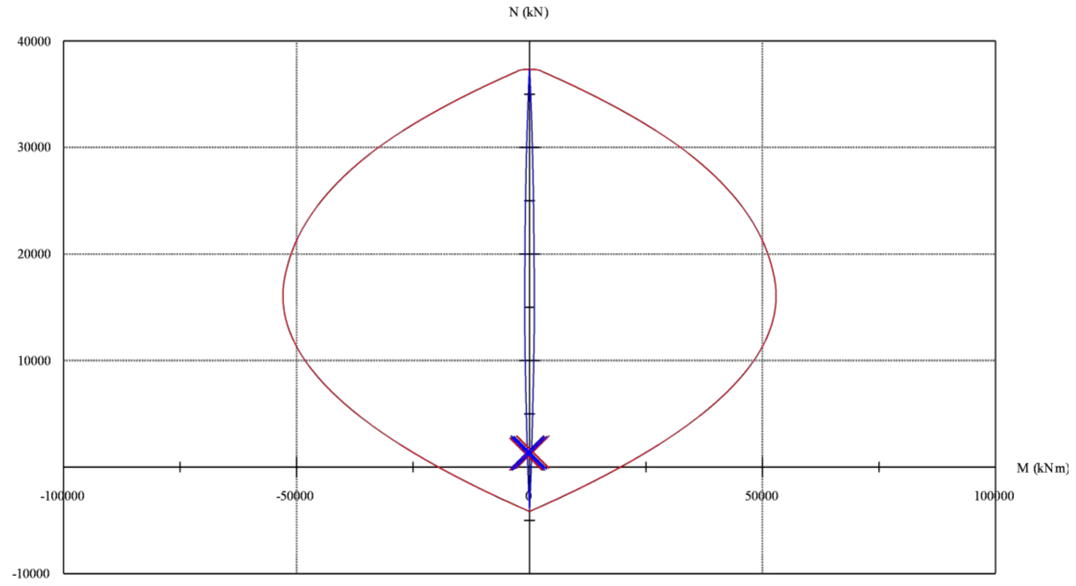
Major Load Direction - Critical

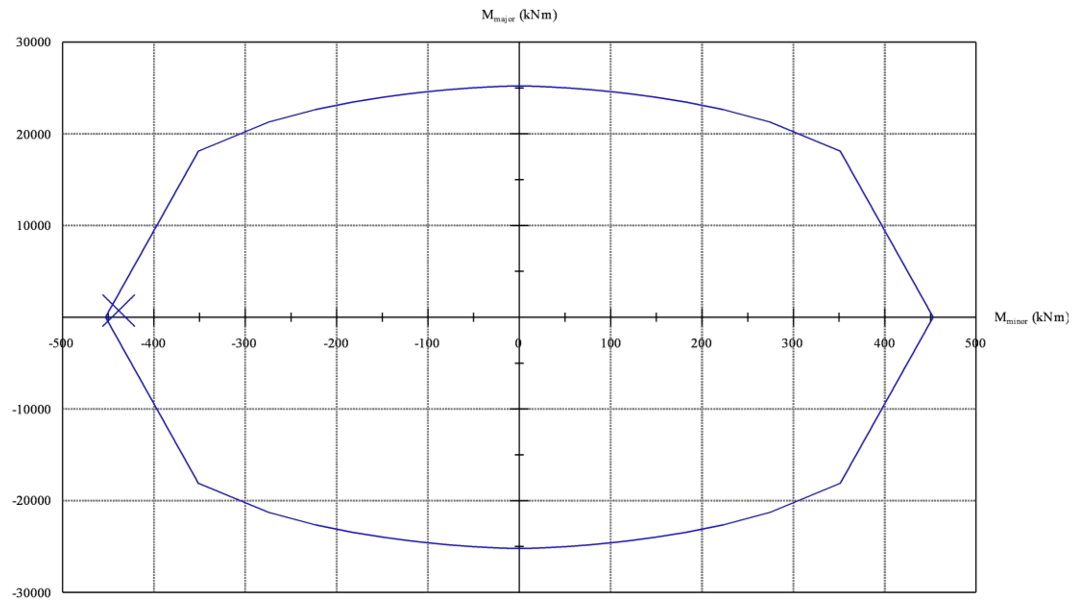
Unreinforced shear resistance sufficient

✓ Pass

Interaction Diagrams

Static





M-M Interaction Diagram at N_{Ed} = 1430.0 kN

Wall Design Summary

Static

Member Reference	*Panel*	*Grade*	*Thickness [mm]*	*Utilization*	*Status*
W1	1	C32/40	200.0	0.944	✓ Pass
W3	1	C32/40	300.0	0.273	✓ Pass
W4	1	C32/40	200.0	0.971	✓ Pass

Design Standards and Codes

The structural design is to comply with the Building Regulations. This is achieved by complying with the current issue of the Eurocodes as "approved documents" and the UK National Annexe. This includes:

Basis of Design

BS EN 1990: Basis of structural design

Loading

BS EN 1991-1-1: General Actions. Densities, self-weight, imposed loads for buildings
BS EN 1991-1-3: General Actions. Snow actions or BS6399
BS EN 1991-1-4: General Actions. Wind actions or BS6399
BS EN 1991-1-5: General Actions. Thermal actions.
BS EN 1991-1-6: General Actions. Actions during Execution.
BS EN 1991-1-7: General Actions. Accidental actions.

Steel Design

BS 5950, or
BS EN 1993-1-1: General rules and rules for buildings
BS EN 1993-1-2: General rules. Structural fire design
BS EN 1993-1-5: Plated structural elements
BS EN 1993-1-8: Design of joints

Geotechnical Design

BS EN 1997-1 General Rules

Timber Design

BS 5268: Structural Use of Timber

Concrete Design

BS EN 1992-1-1: General rules and rules for buildings

Materials

The following grades of new materials will be taken in the design of this project:-

Superstructure Concrete	C32/40 N/mm^2
Reinforcement	500 N/mm^2
Structural Steel	S355

Appendix 4: Site Investigation Data

GROUND ENGiNEERiNG
LIMITED
Newark Road
Peterborough
PE1 5UA
Tel: 01733 566566
admin@groundengineering.co.uk

SITE INVESTIGATION REPORT

25 JOHN'S MEWS

LONDON WC1

Report Reference No. C14983

On behalf of:-

Mr Colin Fraser
25 John's Mews
London
WC1N 2NS

December 2020

CONTENTS

APPENDICES

MR COLIN FRASER

ROSS & PARTNERS

CONSULTING ENGINEERS

REPORT ON A SITE INVESTIGATION

AT

25 JOHN'S MEWS

LONDON WC1

Report Reference No. C14983 **December 2020**

INTRODUCTION

Mr Colin Fraser, the client, intends to remodel the existing dwelling, No.25 John's Mews, London WC1. The proposed residential redevelopment will include the construction of a 3.50m deep basement beneath the footprint of the existing mews house.

Ground Engineering Limited was instructed by the client to carry out a site investigation comprising a desk study and ground investigation under the direction of Consulting Engineers, Ross & Partners. The ground investigation was to determine the nature and geotechnical properties of the underlying soils in relation to foundation/basement design and construction, and provide technical information to support the planning application for the proposed basement, as required by Camden Planning Guidance: Basements (2018). In addition, a contamination assessment was to be included within the scope of this investigation.

The client's neighbour, Mr Brendan O'Toole, at No.27 John's Mews, intends to complete a similar redevelopment. This adjoining site was the subject of Ground Engineering

Limited report reference C14337, January 2018. It is understood that Mr O'Toole has graciously allowed Ground Engineering Limited to reference the exploratory hole records from the 2018 investigation, during the compilation of this report.

LOCATION, TOPOGRAPHY, GEOLOGY AND HYDROGEOLOGY OF THE SITE

Location/Description

No.25 John's Mews is situated on the eastern side of the road, immediately to the south-east of its junction with Northington Street, and 150m west of Gray's Inn Road, within the Bloomsbury district of the London Borough of Camden, London WC1. The dwelling is centred at National Grid Reference TQ 30810 82010.

The 13m long and 11m wide approximately rectangular site extends eastwards from its frontage on John's Mews roadway. At the time of the investigation the two-storey with partial basement, brick building occupied the whole of the plot.

The plot was bounded to the east by No.13 Northington Street, and to the south by No.27 John's Mews.

The site and immediate surrounding area was devoid of vegetation.

Topography

The site stands at an approximate elevation of 22mOD on locally gently northward and eastward falling ground, some 1.25km north of the eastward flowing River Thames. Ground floor level within the dwelling was some 0.30m above ground/street level. The floor level of the small, partial basement lies some 2.25m below ground/street level.

Geology

The 1936 geological map for the area at 1:10,560 scale is based on the 1920 Ordnance Survey London Sheet V SW and shows the site to be covered by Taplow Gravel and underlain by the solid geology of the London Clay. This map also shows the culverted course of the River Fleet, flowing southwards, some 625m east of the site.

The 2006 geological map for the area at 1:50,000 scale, Sheet 256, also shows the site to be covered by the renamed superficial Lynch Hill Gravel Member and underlain by the solid geology of the London Clay Formation.

Well records on the 1936 geological map indicate that the surface cover of made ground and superficial deposits are together about 5m thick beneath this part of London.

The previous ground investigation adjacent the site at No.27 included a single deep borehole, which confirmed the presence of 3.75m of made ground, underlain by sand and gravel, and then the initially reworked London Clay at 5.20m below ground level. The latter was found to 19.20m depth where it was underlain by mottled clays of the Lambeth Group, to at least 20.00m below ground level where it was completed. Groundwater was recorded at about 3.50m below ground level. A copy of the deep borehole record and hole location plan is presented at the rear of this report in Appendix 1.

Hydrogeology

The site is designated by the Environment Agency (EA) as being underlain by a Secondary (A) Aquifer, the Lynch Hill Gravel, which overlies the Unproductive stratum of the London Clay. Based on the local topography and geology of the site area, the direction of near surface groundwater and surface water flow would be expected to be from west to east, towards the culverted River Fleet.

Well records on the 1936 geological map indicate that the practically impervious Unproductive stratum of the London Clay Formation is 12m to 15m thick beneath this part of London and that the underlying Principal Aquifer of the White Chalk Subgroup lies about 40m below ground level, about -18mOD.

HISTORY OF THE SITE

Historical maps and photographs dating between 1720 and the present day have been reviewed as part of this desk study together with internet research. Selected map sheets and photographs are reproduced in Appendix 2 with relevant descriptions given below.

Stow's 'Survey of the Cities of London & Westminster' was published circa 1720 (Figure A), and shows the future site of No.25 John's Mews to lie within a bowling green immediately to the north-east of the Cock Pit Inn, on the northern side of The Kings Way (later Theobald's Road). It is unclear if a circular feature associated with the Inn is a small pond or a cock pit arena. The land to the west was developed with a terrace of townhouses and their associated rear gardens along both sides of Great James Street; the land to the north was open through to a ditch and was crossed by a track (later Northington Street) running between Great James Street and Gray's Inn Road; and the land to the immediate east and south, between the site and Gray's Inn Road/The Kings Way, was covered by gardens. The course of the River Fleet was indicated in the north-eastern corner of this map extract.

John Roque's 'Exact Survey of the City's of London, Westminster and Borough of Southwark' was published in 1747 (Figure B) and shows the site within gardens as before, at the northern edge of London. The Foundling Hospital, partially under construction, was depicted about 450m to the north-west within Lambs Conduit Fields, which locally contained small ponds and earthworks generally associated with small scale gravel workings. The course of the River Fleet is also depicted to the north and south of Mount Pleasant, to the north-east, on this survey.

The 1755 revision of Stow's 'Survey of the Cities of London & Westminster' (Figure C) still has the site within a bowling green and formal gardens set out to the immediate east of the plot. Buildings now partially lined the northern side of The Kings Way, to the south, otherwise little had changed.

The 1792, First Edition of Richard Horwood's 'Plan of London' (Figure D) shows the site to have been developed and apparently occupied by a mews building at the western end of the rear garden to one of the townhouses, at the northern end of the terrace on the western side of John Street. The unnamed mews buildings are not individually delineated on this survey, as seems typical for similar developments within the district, for example to the east along both sides of King's Mews. The former track to the immediate north of the site was named Little James Street (now Northington Street), and The Kings Way was marked as Kings Road (now Theobald's Road). The Cock Pit Inn had been removed, but Cock Pit Yard remained to the west. The ditch to the north of Little James Street was no longer visible but its former route was marked as a parochial boundary.

The 1813, Third Edition of Richard Horwood's 'Plan of London' (Figure E) shows the site at the northern end of the now named John's Mews; John Street to the east had been extended north of its junction with Little James Street; and a number of buildings were depicted lining both sides of Cock Pit Yard, to the west. Further residential development had taken place across parts of the former fields to the north, including the completion of the Foundling Hospital, and the construction of the Middlesex House of Correction (built 1788-94) on the eastern flank of the River Fleet. The latter remained above ground north of Mount Pleasant, to the south of which it was apparently culverted.

The 1827, First Edition of Greenwood's 'Map of London' (Figure F) shows the site and immediate surrounding area largely as before, and the further development of the former fields to the north. The 1830, Second Edition of this map (not reproduced) has the site unchanged.

Stanford's 'Library Map of London and its Suburbs' was published in 1862 (Figure G) and shows the site and surrounding area in little detail, though largely covered by development.

The 1874-75, O.S. Town Plans, at 1:1056 scale (Figure H) show the site in detail for the first time and wholly occupied by the western half of a building facing west on to John's Mews and north on to Little James Street. The site was bounded to the west and north by the adjacent roadways; to the south by similar but generally slightly smaller mews buildings, some with adjoining rearward extensions to the dwellings on John Street; and to the south-east by an adjoining rear garden.

The 1877-78 O.S. 1st Edition maps, London Sheets XXVI & XXXV at 1:2500 scale (Figure I) show the site and surrounding area as before, although some of the former rear gardens to the south-east were now indicated as being covered by glass roofed structures.

The 1896, O.S. 2nd Edition London Sheets L & LXII at 1:2500 scale (Figure J) show the site and surroundings largely unchanged, although the glass roofed structures to the south-east had been removed and several larger buildings now extended through from John's Mews to link with the townhouses lining John Street to the east. The buildings on the eastern side of Cock Pit Yard, formerly accessed from Little Cock Pit Yard, now appeared to have been replaced by a single large rectangular building.

The 1901, Goad's Insurance Map (Figure K) for the immediate site area indicates that the western half of the brick building within the site comprises a stable at ground level with a dwelling (*D.*) on the floor above, whilst the eastern half of the rectangular site to the east (now No.13 Northington Street) was a single-storey building occupied by a coach builder. Similar two-storey buildings were depicted to the immediate south of the site, although those further to the south were extended eastwards and had central glass skylights. The extended buildings to the south included stores and a clothing factory, the latter of which was of three-storeys and had a basement, whilst most of the dwellings along the western side of John Street were offices. The Cockpit Yard buildings to the west of John's Mews were detailed as including an upholstery and trimming factory; a steam works; and a sausage and shrimp paste factory.

The 1916, 3rd Edition O.S. maps (London Sheets V.6 & V.10) at 1:2500 scale (Figure L) have the site and surrounding area unchanged.

The 1938, Provisional Edition O.S. maps London V. SW & NW at 1:10,560 scale (Figure M) show the site unaltered. The Foundling Hospital to the north-west had latterly been partially removed, whilst the Middlesex House of Correction to the north-east had been removed in the late 1880s and replaced by The Post Office's Mount Pleasant Sorting Office.

The London Bomb Damage Maps (1939-1945) for the area (Figure N), show the site was unscathed by World War Two bombing. The nearby clothing factory to the south on John's Mews had been seriously damaged, whilst buildings on John Street to the east and Theobald Road to the south had suffered general blast damage (shaded orange), were damaged beyond repair (shaded purple) or had been totally destroyed (shaded black). Little James Street was renamed Northington Street on these maps.

The 1948, 1:10,560 scale O.S. map, Sheet TQ 38 SW (Figure O), shows the site as before, and extensive vacant areas where buildings had been destroyed by bombing and subsequently cleared.

The 1951, 1:1250 scale maps TQ 3081 NE and TQ 3082 SE (Figure P) show the site and buildings to the immediate south and east as before. The land between the southern end of John's Mews and Theobald's Road is indicated to be covered by ruins, whilst the former mews on the western side of John's Mews appear to have been removed and incorporated with the adjoining buildings of Cockpit Yard, where they are denoted as a council depot. Further occasional vacant plots and ruins are detailed within the district, including plots on John Street and King's Mews to the north and east, respectively.

The 1960, Goad's Insurance Map (Figure Q) has the site outline as it was detailed in 1901 but the brick building was now shown as a single unit, with a garage on the ground floor and a second storey of dwellings. The adjacent mews building to the south remained but that to its immediate south had been removed and was being replaced by a five-storey building with a full basement (car park) and a single-storey rearward extension. This building was mainly used as offices and had a dwelling on the highest level. The south-western corner of this basement was noted to contain an oil fuel tank and oil fire heaters. The neighbouring building further to the south had also been redeveloped and was marked as having up to four-storeys and a full basement occupied by a photo developing and printing business. The three-storey Holborn Borough Council buildings on the western side of John's Mews now contained an engineer's store; a cardboard box factory; an urban social centre; a salt store; offices; a paint shop and carpenters; a musical instrument factory and a small garage with oil fuel tanks in its basement. The plot immediately to the south-west of the junction of Northington Street and John's Mews had been cleared of its former end of terrace house (No.15 Northington Street) and the unsupported end of the adjacent No.17 shored up.

The 1965, 1:2500 scale maps TQ 3081 and TQ 3082 (Figure R) show the site as before and marked as a commercial (vehicle repair) garage, and various areas in the district to have been cleared or still occupied by ruins.

The 1974, 1:1250 scale maps TQ 3081 NE and TQ 3082 SE (Figure S) and the 1982 edition of TQ 3082 SE (Figure T) show the site unchanged but no longer marked as a garage. By theses dates, the cleared land to the north-west of the junction of John's Mews and Northington Street had been partly redeveloped with a primary school, whilst the land at the southern end of John's Mews had been redeveloped with a library and residential blocks. The eastern part of the council depot along the western side of John's Mews was marked as an assembly hall on the 1974 survey. Further residential development had taken place around the primary school site to the north-west by the time of the 1982 revision.

London Borough of Camden planning records of 1982 indicate that the basement and ground floors of No.13 Northington Street, which included some or all of the site, were authorised for general industrial use, whilst the first floor was for residential use.

The 1990-91, 1:1250 scale maps TQ 3081 NE and TQ 3082 SE (Figure U) show the site and immediate area largely as before. Several buildings to the south (Nos.29 & 31 John's Mews and Nos.31 & 32 John Street) appear to have been reconfigured since the 1982 survey.

The 1995, 1:1250 scale map revisions (TQ 3081 NE and TQ 3082 SE) have the site and surrounding area unchanged (Figure V).

Planning records of 1995 record that the adjacent No.27 John's Mews was permitted to add a roof extension for use as a single dwelling. In the same year, the owners of the site were granted permission for a change of use and the conversion of the basement and ground floor into two self-contained maisonettes, presumably No.13 Northington Street and No.25 John's Mews.

The 2002 Raster Map at 1:10,000 scale (Figure W), shows the site and surrounding area as it was in the 1990s. Similarly, the 2010 and 2014 (not reproduced) National Grid maps at 1:10,000 scale have the site in little detail and apparently as before.

The 1999 to 2019 aerial photographs presented on pages 6 to 10 of Appendix 3 show the site apparently as it was in the 1990s.

The 2017 National Grid Map extract (Figure X) shows the site unchanged and as it was at the time of this investigation. The adjacent former rear garden to No.30 John Street was now shown to be almost entirely covered by a building.

Summary

In summary, the site was within an area of bowling greens/gardens during most of the Eighteenth Century, and was developed with a single mews building and presumed workshop (coach builder) between 1755 and 1792. The stable and coach building workshop was later (from 1960) denoted as a garage, although it was likely to have become such several decades before. The garage was known to have a basement in 1982 and 1995 although this was not indicated on the 1960 Goad's Insurance map. The former garage was sub-divided and converted to residential use at the end of the Twentieth Century (circa 1995).

The immediate surrounding area has been, and is, mixed residential/commercial with a number of offices, small scale factories, stores, and latterly a council depot. The adjacent building to the south was a mews dwelling with stables at ground level and a dwelling above, whilst a basement car park was/is present beneath offices to the south.

ENVIRONMENTAL DATABASE INFORMATION

Appendix 3 contains information from Environmental Databases for a radius of up to 2km from the site. The information covers various datasets and contributors include the Environment Agency, Local Authorities, British Geological Survey, Ordnance Survey and the Coal Authority. The results obtained are presented together with a detailed search on selected areas of enquiry, and have been described below for a radius of 250m from the site.

Historical Land Use

Details on historical industrial sites in the surrounding area are presented in the Environmental Searches Report in Appendix 3. In summary, there are no potentially contaminative uses identified on the site, and eleven (11) identified within 250m. These are for a workhouse, police stations, an unspecified yard, unspecified ground workings, and a hospital, 132m to 225m distant. There is one (1) record pertaining to a historical tank 187m east of the site in 1878. There are six (6) records relating to two historical energy features (electricity sub-stations) within 250m of the plot, 144m and 176m to the east, and 200m north-east.

There are no records of historical petrol and fuel sites within 250m of the site.

There is one (1) record of a historical garage and motor vehicle repair workshop on the site in 1960, and four (4) within 250m of the plot. The latter refer to garage workshops, 117m and 214m north-east and 229m north of the site.

There is a single (1) record of historical military land within 250m of the site. This refers to the Phoenix Factory, some 237m to the north-east of the site, where the National Fuse Rectification Factory repaired and rectified American fuses during World War I.

Six (6) waste exemptions are recorded at sites, 10m to the south-east of the site for the sorting of mixed waste, the manual treatment of waste, the treatment of waste aerosol cans, and the preparatory treatment (baling, sorting, shredding) of waste materials; 40m to the south for storing waste at Cockpit Yard; and other sites to the north-east, west, north-west and east for the sorting of waste.

<u>Current Industrial Lane Use</u>

There are no (0) recorded potentially contaminative uses listed for the site address and thirty-five (35) within 250m of the site. The latter are for the offices of several publishers, 26m to the north; two consulting engineers, 30m to the south; milliners, 40m to the south; a council depot 51m to the south-west; the offices and shops of various companies on neighbouring streets; and two (2) electricity sub-stations located 200m to the east and north-east of the site. There are no (0) recorded fuel filling stations recorded within 250m of the site.

There are no (0) records for high voltage underground electricity transmission cables within 250m of the site. There are no (0) recorded underground high pressure gas transmission pipelines within 250m of the site. There are no (0) recorded entries or notices on the Contaminated Land Register listed on, or within 250m of the site.

There are no (0) recorded sites regulated by the Health and Safety Executive under the Control of Major Accident Hazards (COMAH) regulations 1999, on, or within 250m of the site. There are no (0) regulated explosive sites within 250m of the site. There are no (0) sites regulated by the HSE under the Notification of Installations Handling Hazardous Substances (NIHHS) regulations noted on or within 250m of the site.

There are no (0) recorded sites authorised by the Environment Agency under Part I of the Environmental Protection Act 1990, to carry out processes subject to Integrated Pollution Control (IPC) on, or within 250m of the site.

There are no (0) records of licenced industrial Part A(1) activities under the Environmental Permitting (England and Wales) Regulations 2016 within 250m of the site, but there are six (6) Part A(2)/B installation permits for the release of substances to the environment. These all refer to local dry cleaners.

There are no (0) records held by the Environment Agency under the Radioactive Substances Act 1993, within 250m of the site.

There are no (0) licensed discharges to controlled waters recorded on or within 250m of the site; pollutant releases to surface waters (Red List) or discharges of special category effluents to the public sewer.

There is one (1) Environment Agency List 1 site and no (0) List 2 Dangerous Substance Inventory Sites listed within 250m of the site. The former refers to the use of mercury and cadmium at a plating works some 171m east of the site.

There are no (0) pollution incidents recorded by the EA within 250m of the site.

Geology & Hydrogeology – Pathways & Receptors

The site, including a 50m buffer, is recorded as being covered by superficial deposits of undifferentiated River Terrace Deposits and underlain by the solid geology of the London Clay Formation (Thames Group).

The site is designated by the EA as being covered by the Secondary (A) Aquifer of the Lynch Hill Gravel and underlain by the solid geology London Clay.

There are no (0) recorded water abstraction licences listed on, or within 2000m of the site. The site does not lie within a Source Protection Zone.

There is no (0) Environment Agency information relating to river quality within 250m of the site. There are no (0) river networks or surface water features within 250m of the site. The site does not lie within Zone 2 or Zone 3 flood plains. The site has a very low risk of flooding from rivers and the sea. There are no records of historical flooding for the site since 1946. The site is not within a zone benefiting from flood defences. The site is also not within 250m of areas used for flood storage. The site is in an area that has a 1 in a 100 year risk of surface water flooding and a moderate risk of groundwater flooding when the water table rises above the ground surface or within underground structures such as basements.

Environmentally Sensitive Receptors

There are no (0) environmentally sensitive areas within 250m of the site.

Natural & Mining Hazards

According to the British Geological Survey there is: a ‘Very Low’ hazard potential for Landslides, Running Sand and Collapsible Rocks; and a ‘Negligible’ hazard potential for Shrinking or Swelling Clay, Soluble Rocks and Compressible Ground.

The site is not within 75m of any areas affected by coal mining. The site is not within 75m of any areas affected by non-coal mining. The site is not within 75m of any areas affected by brine extraction.

The site lies within an area where less than 1% of properties are above the action level for radon. The site lies within an area where no radon protection measures are necessary for new dwellings or extensions in accordance with Building Research Establishment report BR211 (1999).

PRELIMINARY RISK ASSESSMENT

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source – pathway – target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets. ***Contaminants or potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed below in Table 1.

Table 1: Identified Potential Contaminant Sources

Contaminant Source	***Comments***
Drainage/Buildings	Effluent from leaking drains would provide a contaminant source. The existing building may have asbestos containing material within it.
Soil Beneath Site	Contamination may be present within any made ground materials beneath the site, notably associated with the former on-site vehicle repair garage.
Soil Gas	Potential soil gas generated from made ground or natural organic soils.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites, including the basement car park to the south.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

Human Receptor-Mechanism	***Typical Exposure Pathway***
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -plants grown on contaminated soil Ingesting dust or soil on fruit or vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

Receptor-Water Environment	***Typical Exposure Pathway***
Groundwater The site is covered by the Secondary (A) Aquifer of the Lynch Hill Gravel and underlain by the practically impervious London Clay.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water/Watercourses There are no watercourses or surface water features recorded within 250m of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life

Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model relative to the construction phase and completed development is presented below in Table 4.

Table 4: Preliminary Conceptual Model Relative to Construction/Future Use of Site

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage/ Buildings	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Likely	Low likelihood	Low likelihood	Low likelihood
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Unlikely	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or groundwater	Low likelihood	Low likelihood	Unlikely	Low likelihood
Flora	Vegetation on site growing on contaminated soil.	Low likelihood	Low likelihood	Unlikely	Low likelihood
Building Materials	Contact with contaminated soil	Low likelihood	Low likelihood	Unlikely	Low likelihood

Key to Table 4

Estimated Potential for Linkage with Contaminant Source	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.
N/A	Not Applicable

SITE WORK

A single borehole and two foundation inspection pits were undertaken under the supervision of a Geo-environmental Engineer at the positions depicted on the site plan at the rear of this report, as requested by the Engineer. Services information was obtained and referenced in relation to the exploratory hole positions prior to boring/excavation.

The investigation was undertaken following the protocols detailed in British Standards (BS) 'Code of Practice for Site Investigations' (BS5930:2015+A1:2020) and 'Methods of test for soils for engineering purposes' (BS1377:1990).

Borehole

Following site preparation, including the removal of floor coverings and the temporary displacement of the underfloor heating system, a single borehole (WS 1) was undertaken by a restricted access, low headroom dynamic sampling rig on 29th January 2020. The final borehole position was chosen following a scan using a cable avoidance tool (CAT). The timber floor was removed using an electrically powered saw, and a starter pit was hand dug to 1.20m depth in order to confirm the absence of buried services.

The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrels were initially of 87mm internal diameter and were reduced in diameter with successive barrels with increasing depth. Upon extraction, a continuous profile of the soil was obtained within the plastic liners (U samples). Borehole WS 1 was completed at 6.05m below floor level, following the collapse of the unsupported hole below 4.50m depth after the sampler had been removed.

Standard penetration tests were undertaken in the borehole at regular intervals in order to give an indication of the in-situ relative density/shear strength of the material. The test was made by driving a 50mm diameter solid cone (C) or open shoe and split spoon sampler (S) of similar diameter into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The results have been tabulated to the rear of the borehole record.

Representative disturbed samples of soil were taken from the boring tools at regular intervals throughout the depth of the borehole and placed in polycarbonate pots and amber glass jars (D samples).

On completion the hole was infilled with arisings and the floor, floor coverings and underfloor heating reinstated.

The borehole record gives the descriptions and depths of the various strata encountered, results of the in-situ tests, details of all samples taken and the groundwater conditions observed during boring and on completion.

Trial Pits

Two foundation inspection pits (TPs 1 and 2) were undertaken between 29th and 31st January 2020 using hand tools, a small electric breaker, and an electrically powered masonry drill. Trial pit TP 1 was extended from 3.45m depth using 70mm diameter hand auger tools. The exposed strata and foundations were logged and the soils sampled by the supervising Geo-environmental Engineer.

The pits were abandoned at depths of 0.81m below existing basement floor level (TP 1) and 4.00m below ground floor level (TP2). In the former case, a sloping concrete slab encountered beneath the existing basement floor was proved to be 0.40m thick, using a masonry drill, and the excavation was abandoned. In the latter excavation, it was not possible to advance the hole beyond 4.00m depth using the small diameter hand auger, and the hole was abandoned.

Disturbed samples of soil were taken at regular intervals throughout the pits and placed in polycarbonate pots and glass jars (D samples).

The trial pit records give descriptions and depths of the various strata encountered, the details of all samples and the groundwater conditions observed during excavation. Sketch sections, plans and photographs of the exposed footings and drill holes are presented on the pages following the record for each excavation.

The spoil was returned to the pits and placed in layers, which were recompacted, and the surface layers and floor coverings/underfloor heating reinstated.

LABORATORY TESTING

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil sample descriptions are in accordance with BS5930:2015+A1:2020.

The chemical testing schedule was devised by Ground Engineering Limited for a broad suite of potential contaminants, outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'.

The geotechnical tests were conducted to BS1377:1990 and other industry standards, and the results are presented following the exploratory hole records, whilst the results of the chemical tests are presented in Appendix 4.

Geotechnical Testing

The index properties of a selected soil sample were determined as a guide to soil classification and behaviour. The liquid limit was determined by the cone penetrometer method.

The particle size distribution of selected samples were obtained by sieve analysis. The results of these tests are given as particle size distribution curves at the end of this report.

Selected samples of soil were analysed to determine the concentration of soluble sulphates. The pH values were also determined using an electrometric method.

Chemical Testing

Six soil samples recovered from the exploratory holes were tested for total concentrations of arsenic, cadmium, chromium, lead, mercury, selenium, nickel and benzo[a]pyrene, together with speciated polyaromatic hydrocarbons (PAH), boron, copper and zinc, phenols, total and free cyanide, hexavalent chromium, sulphate, sulphide and pH. The organic content of these samples was also determined. Three soil samples were screened for total petroleum hydrocarbons (TPH) and three samples were also screened for asbestos containing material (ACM).

A sample of made ground, from TP 2 at 2.70m depth, was scheduled for a Waste Acceptance Criteria (WAC) CEN Leachate Suite at 10l/kg.

GROUND CONDITIONS

The ground conditions encountered were generally as expected from the known history of the site, geological records and the borehole undertaken about 2m from the site within No.27 John's Mews in 2018. At No.25 a similar and significant thickness (about 4.00m) of made ground covered 1.90m of Lynch Hill Gravel. This superficial deposit was underlain by the solid geology of the London Clay at 5.80m below ground floor level, which stands some 0.30m above ground level (so 5.50m below ground level), and was found to at least 6.05m depth.

The neighbouring 20.00m deep BH 1 penetrated a similar thickness of made ground (3.75m), 1.45m of Lynch Hill Gravel, and met the London Clay at 5.20m below ground level. The London Clay was underlain by strata of the Lambeth Group at 19.20m below ground level, which was found to at least 20.00m depth. Water levels were recorded in the 7.00m deep BH 1 standpipe during December 2017 some 3.46m and 3.60m below ground level.

Made Ground

The suspended timber ground floor in the north-western corner of the site (WS 1 & TP 2) had a sub-floor void to 0.35m depth, beneath which were alternating layers of screed, concrete and sand to 0.85m below floor level.

Below this floor and former garage floor construction the borehole and trail pit encountered a loose, dark brown and grey, clayey, sandy gravel with a gravel fraction of brick, concrete and flint. This coarse grained fill was found to 2.80m and 2.90m depth in WS 1 and TP 2, respectively, and was followed by a soft or firm brown, dark brown, black and light brown mottled, slightly gravelly, slightly sandy to sandy, silty clay. This clay fill had a gravel fraction of brick, ash, limestone, concrete and flint, and was proved to 3.90m depth in WS 1. In TP 2, the clay fill was underlain at 3.50m depth by a further layer of coarse grained fill. This 'loose' dark brown ad brown, very clayey, very sandy gravel was found to at least 4.00m depth where this extended trial pit was abandoned when no further recovery was possible using hand auger tools.

It is considered likely that this depth of abandonment coincides with the base of the made ground/Lynch Hill Gravel interface.

Trial pit TP 1, within the 2.25m deep (below ground/street level) small existing basement in the south-eastern part of the site, penetrated the tiled 0.20m thick concrete floor slab. This was laid upon a well compacted, light grey brown, sandy gravel with occasional concrete cobbles, which had a gravel fraction of flint and concrete. This was proved to depths between 0.72m and 0.81m below basement floor level, where it was underlain by a sloping concrete slab. This appears to be the eastward and downward continuation of the sloping basement floor within the western half of the basement. A series of three holes were drilled within this pit through this sloping slab in order to determine its thickness and assess if this excavation could be continued. Two of these probe holes proved the slab to be 0.40m thick, whilst the third was abandoned once an obstruction (?steel) was met within the slab. This pit was consequently abandoned without attempting to remove the 0.40m thick slab.

Lynch Hill Gravel

In borehole WS 1, the superficial Lynch Hill Gravel was met beneath the made ground at 3.90m below ground floor level (3.60m below ground/street level), and was proved to 5.80m depth. This stratum was a dense, light brown and orange brown, silty sand and gravel, with a gravel fraction of angular to rounded flint and quartzite. The Lynch Hill Gravel was proved to 5.80m depth (5.50m below ground/street level) in WS 1, a recorded thickness of 1.90m, which was consistent with nearby well and borehole records, and the 1.45m depth recorded in the neighbouring borehole BH 1.

London Clay

The solid geology of the London Clay was reached at 5.80m depth (5.50m below ground/street level) and was initially reworked to a firm, brown and orange brown mottled, slightly gravelly, silty clay with a gravel fraction of angular to rounded flint and quartzite. This reworked horizon was found to 6.05m below ground floor level where the window sample borehole was completed.

In the neighbouring BH 1, this reworked layer was 0.30m thick and was followed by a firm, closely fissured, grey brown clay with occasional silt partings. The London Clay became stiff, fissured and silty below 8.00m, and from 10.00m depth contained rare gravel size pyrite nodules. These 'Basement Beds' of the London Clay became slightly sandy below 17.00m depth, and were proved to 19.20m below ground level, a recorded thickness of 14.00m.

Lambeth Group

In BH 1, the underlying solid geology of the Lambeth Group was met at 19.20m and began with a 0.30m thick layer of very stiff, grey, shelly clay. Below 19.50m depth the borehole entered a very stiff, red brown and light blue grey mottled clay, and these typical 'mottled beds' of the Lambeth Group were found to at least 20.00m below ground level where the neighbouring borehole was completed.

Groundwater

The 4.00m deep trial pit TP 2 was dry throughout excavation and on completion, as was the 0.72m to 0.81m deep pit (TP 1) through the existing basement floor. Water was recorded standing at 4.20m below ground floor level (3.90m below ground/street level) on completion of borehole WS 1, but may still have been rising when the hole was backfilled.

The addition of water to enable boring of the Lynch Hill Gravel from 3.75m to 5.00m depth in the neighbouring BH 1 will have masked any initial water ingress, but water was recorded by the driller as being met at 5.00m and rose to 4.80m in the fifteen minutes before drilling resumed. This water was largely sealed out of the borehole once the casing entered the underlying London Clay, and the 20.00m deep borehole BH 1 was 'damp' on completion. The water levels recorded in the 7.00m deep standpipe during December 2017 recorded water levels between 3.46m and 3.60m below ground level.

Observations

The unsupported hole sides of WS 1 collapsed within the water-bearing Lynch Hill Gravel below 4.50m depth following the removal of the sampler. The sides of trial pits TP 1 and TP 2 were recorded as stable during excavation.

Evidence of Contamination

The made ground contained fragments of brick, concrete and ash. There was no olfactory or visual evidence of hydrocarbon contamination. No visual evidence of asbestos containing material was detected within the exploratory holes.

Existing Foundations

The foundations to the rear/eastern elevation of No.25 uncovered by trial pit TP 1, 0.20m behind a modern dry wall, comprised brickwork that extended down to the interface with the 0.40m thick sloping concrete slab. The southern elevation of No.25 at this location was supported by a concrete wall, the base of which was also masked by the 0.40m thick sloping concrete slab at 0.81m below the existing basement floor level, some 3.06m below ground/street level.

Trial pit TP 2, excavated within the north-western corner of the plot, found the northern elevation to be supported by a corbelled brick footing on a 0.33m thick concrete strip footing based at 3.41m below ground floor level, about 3.10m below ground/street level. The maximum projection of this strip footing was 0.40m. The foundation for the western elevation was obscured by the presence of a concrete 'beam' (associated with the overlying historical garage ground floor opening) that projected 0.60m into the site. The brickwork wall beneath this 'beam' was found to at least 1.55m below ground floor level, where this part of this excavation was completed.

COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

The investigation found a significant thickness of made ground beneath the existing building, and practically identical ground conditions to that found beneath the neighbouring No.27 John's Mews. Foundations for the 3.50m deep basement will need to penetrate this made ground to reach the top of the underlying dense Lynch Hill Gravel, which was met at 3.60m to 3.75m below ground/street level, some 1.45m to 1.90m above the interface with the underlying firm becoming stiff solid geology London Clay. Indeed, there may be a net reduction in pressure at the reduced basement floor level, although resultant base heave would not be expected.

Water was recorded within the Lynch Hill Gravel at 4.20m depth during this investigation, but standpipe water levels in the neighbouring BH 1 were previously recorded at about 3.50m below the ground level, at about or just above the proposed basement floor level. This water level is considered to reflect the depth of 'perched' groundwater within the superficial Lynch Hill Gravel.

Foundation Depths

The exploratory holes encountered natural ground at 3.75m to 4.00m depth within and adjacent this site.

The top of the high volume change potential London Clay was recorded at 5.50m below ground/street level and so will be well below the depth affected by tree root-induced desiccation.

Foundations will need to be taken down through the made ground and into the top of the dense Lynch Hill Gravel, which was met at 3.60m below ground/street level within this small site. Depending on the basement excavation depth, this may therefore require the construction of foundations just below the 3.50m deep proposed basement floor level.

Bearing Pressure

The construction of a 3.50m deep basement on this site will remove most of the made ground. The foundations will need to be extended so that they reach the underlying dense sand and gravel at 3.60m depth. With only 1.45m to 1.90m of sand and gravel remaining between the base of the made ground and the top of the London Clay, the superior bearing properties of the dense Lynch Hill Gravel can only partly be utilised, during the design of strip or pad foundations for the proposed basement walls.

The results of the in-situ standard penetration tests indicate that an allowable bearing pressure of 300kN/m^2 could have been applied on foundations cast just below basement level on the Lynch Hill Gravel if this stratum were of a greater thickness than the 1.45m to 1.90m proved from this investigation and that on the neighbouring plot. Due to the presence of the underlying firm London Clay from 5.50m below ground/street level, a reduced maximum safe bearing pressure of 200kN/m^2 on the top of the Lynch Hill Gravel would be appropriate in order not to overstress the London Clay, which initially has a maximum safe bearing capacity of 115kN/m^2, with a factor of safety of 3.0 (as previously determined in BH 1).

A bearing pressure of 200kN/m^2 should be sufficient to support the likely foundation pressures for the new structure and for adjacent buildings underpinned to the same depth as the proposed basement.

Basement

The construction of a 3.50m deep basement will remove most of the made ground. Foundations for the basement walls just below the new basement floor level would be within the dense Lynch Hill Gravel and could be designed using the previously detailed bearing parameters.

Alternatively, a basement raft foundation could be considered for this structure, although this would need to be designed using the bearing properties of the underlying London Clay. A net safe bearing capacity of 100kN/m^2, which incorporates a factor of safety of 3.0, could be used for the design of a 10.00m wide raft foundation at 3.50m below existing ground level.

It is estimated that theoretical base heave at the centre of a 12.00m long and 10.00m wide, 3.50m deep unconfined basement excavation would be in the order of 15mm, based on the proposed basement dimensions and the results of the previously obtained BH 1 oedometer tests in the London Clay. However, with between 1.45m and 1.90m of Lynch Hill Gravel remaining below the proposed underside of the 3.50m deep basement floor slab, little, if any, base heave would be expected following the removal of about 65kN/m^2 of overburden pressure within the basement, as any heave would dissipate between inter-grain contacts within the Lynch Hill Gravel.

A likely basement raft loading is unknown but if it were the 65kN/m^2 of removed overburden pressure no net heave/settlement would be expected. Raft loadings greater than 65kN/m^2 could result in net settlement, whilst conversely loads lower than 65kN/m^2 could result in net heave, although as detailed above this is considered unlikely. Net differential heave/settlement will need to be taken into account in the design of the basement floor. The advice of specialists should be sought in this regard.

<u>Excavations/Groundwater</u>

The excavation of the basement to approximately 3.50m below existing ground level will require the construction of close support to its sides, the control of groundwater, and the need to avoid undermining adjacent structures.

The use of mass concrete basement walls, constructed in alternate panels around the perimeter of the basement could provide support, a limited cut-off to ‘perched’ water and reduce the scale of any dewatering required within the basement excavation.

An alternative would be to use sheet, contiguous or secant piled walls around the perimeter of the basement, although this may well be problematical on this relatively small restricted access site. Piling to a sufficient depth to mobilise adequate passive pressure below the basement level should be feasible on this site.

The excavation of a 3.50m deep basement could then be undertaken within the mass concrete or piled walls, although it should be noted that mass concrete, contiguous and sheet pile lined excavations may not be watertight.

In order to construct the basement beneath this site it will be necessary to provide permanent support to the adjacent structures, which are based on deepened strip and underpinned foundations. This support can either be provided by underpinning these structures to the same depth as the proposed basement prior to basement construction or by constructing piled walls to the excavation that are adequately propped during construction by temporary support and permanently by the basement and ground floors, to prevent movement at the top of the retaining walls.

Such lateral movement would otherwise be accompanied by settlement of the ground behind the basement walls. CIRIA report C760 'Guidance on Embedded Retaining Wall Design' (2017) indicates very small scale horizontal and vertical movements resulting from the construction of a secant piled wall embedded in sand/gravel and stiff clay, as does the use of high support stiffness (high propped walls and top down construction) to the basement excavation. Provided that such a very stiff bracing system is used to prevent deflection of the proposed basement walls, and that the neighbouring structures are of robust construction, the anticipated level of structural damage, if any, would fall within Category 1 'very slight' as described in Table 6.4 of the aforementioned CIRIA document.

The advice of specialist groundworks contractors with experience of constructing such basements should be sought, particularly in respect of other potential methods of providing support to the sides of the basement excavation.

The basement excavation should be inspected on completion to ensure that the condition of the soil complies with that assumed in design. Should pockets of inferior material be present, they should be removed and replaced with well graded hardcore or lean mix concrete.

The excavated surface should be protected from deterioration and a blinding layer of concrete used where foundations are not completed without delay.

Water was recorded in the neighbouring borehole standpipe at about 3.50m depth within the base of the made ground. This is at or just above the proposed basement excavation level. Potential flotation due to this groundwater level will not therefore be a problem on this site.

As the groundwater level approximately coincides with the floor of the proposed basement, it will be necessary to waterproof the basement in order to prevent the ingress of groundwater into the completed structure. In addition, downward percolating surface water will need to be prevented from entering the basement.

Safety precautions should not be neglected especially where personnel are to enter excavations when close side support will be required in order to maintain excavation stability. All excavations should be undertaken in accordance with CIRIA Report 97 '*Trenching Practice*'.

Care should also be taken to ensure that the proposed retaining walls of the basement are not surcharged with plant and equipment or the stockpiling of materials and excavated soils outside of the basement excavation.

Piled Foundations

In the event that piled foundations are preferred due to practical or economic considerations related to the construction of the basement and underpinning foundations on this site, the ground conditions are considered suitable for bored or CFA, but not driven piles as the vibrations during installation of driven piles could damage the existing dwelling and adjacent structures. The advice of specialist piling contractors should be sought as to their preferred method of pile installation in these conditions on this restricted access site and their attention drawn to the dense nature of the Lynch Hill Gravel, and the possible presence of concretionary limestone nodules within the London Clay beneath the site.

Preliminary working loads for a single bored pile may be estimated for design and cost purposes using pile bearing coefficients, which are based on the following assumptions, and include values based on the findings of the 2018 investigation at the neighbouring No.27.

1) The ultimate load on a pile would be the sum of the side friction/adhesion acting on the pile shaft together with the end bearing load.

2) The pile bearing properties within the depth of the proposed basement have been ignored.

3) The shaft friction of a pile within sand and gravel would be a function of the SPT 'N' values and the overburden pressure. The groundwater level was previously recorded at about 3.50m depth. End bearing within the 1.90m thick layer of dense Lynch Hill Gravel should not be considered.

4) In the London Clay and Lambeth Group the shaft adhesion and end bearing would be a function of the lower bound average of the apparent cohesion values determined by triaxial compression strength tests.

5) A factor of safety (FOS) of 2.5 should be used to assess pile working loads, although if test loading of selected piles is practical the factor of safety may be reduced to 2.0.

Item	**Ultimate Pile Bearing Value kN/m^2**
Shaft adhesion/friction in ground to about 4m	Ignored
Average shaft adhesion in Lynch Hill Gravel	20
Average shaft adhesion in firm London Clay to 8m	25
Average shaft adhesion in stiff London Clay, 8m to 14m	45
Average shaft adhesion in stiff London Clay below 14m	60
End bearing in London Clay at 10m	810
End bearing in London Clay at 15m	1080

Using these coefficients, it is estimated that a single, 300mm diameter bored pile installed to 10m below ground level would have an anticipated working load of 95kN, with a factor of safety of 2.5, whilst a 15m long pile of the same diameter would have an anticipated working load of 190kN, with the same factor of safety. Different pile lengths, or diameters, from those detailed above would give different available working loads, which could be tailored to suit the working loads required.

The design of piled foundations on this site will also need to take into account potential tensile stresses in the piles during basement construction where the net change in load is to be reduced.

A piling specialist should undertake the final design of piles.

Retaining Walls

The walls of the proposed basement will act as retaining walls and will need to be designed accordingly. For a permanent retaining wall analysis effective stress parameters would be appropriate, however, in the absence of effective stress testing on samples from this site, published parameters, previous experience and in-situ test results could be used as a conservative approach.

The design of retaining walls around the basement area may be based on the following stress parameters:

Soil Type	Bulk Density (Mg/m^3) γ_B	Effective Shear Strength (kPa) c'	Angle of Shearing Resistance (degrees) ϕ'
Made Ground	1.80	0	28
Lynch Hill Gravel	2.10	0	38
London Clay	2.00	0-2	22

Buried Concrete

Sulphate analysis of the soil samples tested during this investigation gave results in Design Sulphate Class DS-1 of the BRE Special Digest 1, Table C2 (2005) presented in Appendix 5, but those in the underlying London Clay during the neighbouring investigation yielded DS-1 and DS-2 results. The pH results were between 7.5 and 11.6 and so alkaline.

Using the sulphate and pH results an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-2 would be considered appropriate for buried pile concrete beneath this site as detailed in the above cited BRE document.

Slope Stability

The ground within which the level plot is located slopes down gently to the north/north-east and falls from 23mOD at the southern end of John's Mews to about 22mOD at its junction with Northington Street, 80m distant. This is a slope angle of less than 1 degree and hence this slope is not marked on Figure 16 of the London Borough of Camden 'Guidance for subterranean development' (2010), which indicates slopes of greater than 7 degrees.

There is no evidence of historical slope instability, nor would it be expected based on the topography of the immediate surrounding area.

On this site it is considered unlikely that the proposed basement development will induce slope instability.

Other Issues

The basement development beneath this site would only be considered likely to affect the drainage system of the site itself. However, drainage and sewerage records for the surrounding buildings will need to be referenced, if available, or perhaps surveyed to confirm that the site does not share a communal drainage system that runs beneath the site.

The flow of surface water within the surrounding area, from west to east, should not be changed by the proposed basement on this small site.

As previously described, 'perched' groundwater was recorded within the basal part of the made ground beneath the neighbouring site at 3.50m below ground level. The proposed 3.50m basement excavation depth therefore does not extend below the 'perched' groundwater level, although foundation excavations for the basement walls may well need to extend slightly below this level to reach the underlying Lynch Hill Gravel. Little or no displacement of groundwater will therefore take place by its exclusion from beneath the area of the proposed basement and footings, so little or no rise would be expected in the level at which groundwater currently stands adjacent to the site.

The orientation of the small proposed basement, when considered together with the proposed adjacent basement to the immediate south of the site, would be across the likely direction of near surface groundwater flow from west to east on this gently sloping ground. As the proposed 3.50m deep basement does not extend below the recorded 'perched' groundwater level, the drainage path will not be increased.

COMMENTS ON THE CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on samples of made ground have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.071 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 5 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 5: Comparison of Chemical Test Results for Made Ground with Soil Screening Values (SSVs)

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Soil Screening Criteria SSV (1.0% SOM)			
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial	Assessment Method	Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial mg/kg
Organic matter	6	0.5%	5.4%	-	-	-	-	-	-	-
Arsenic	6	10	13	0	0	0	S4UL	37	40	640
Cadmium	6	<0.2	0.4	0	0	0	S4UL	11	85	190
Trivalent Chromium	6	15	28	0	0	0	S4UL	910	910	8600
Hexavalent Chromium	6	<4.0	<4.0	0	0	0	S4UL	6	6	33
Lead	6	45	790	4	3	0	C4SL	200	310	2330
Mercury	6	<0.3	2.6	0	0	0	S4UL	11	15	320
Selenium	6	<1.0	<1.0	0	0	0	S4UL	250	430	12,000
Nickel	6	14	22	0	0	0	S4UL	130	180	980
Phenols	6	<1.0	<1.0	0	0	0	S4UL	120	440	440
Benzo[a]pyrene	6	<0.05	0.80	1	0	0	S4UL	0.79	1.2	15
Copper	6	21	230	0	0	0	S4UL	2400	7100	68,000
Zinc	6	42	210	0	0	0	S4UL	3700	40,000	730,000

Notes
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.
LQM/CIEH S4ULs ‘Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reserved’.
ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

Discussion of Results and Statistics

The results of the laboratory analysis indicate the made ground contains elevated concentrations of lead, which exceeded residential soil screening criteria, and a single marginal elevated value of benzo[a]pyrene for a residential with home grown produce end use. The highest recorded concentrations of lead did not exceed its screening value for a commercial/industrial end use. None of the other contaminants tested for exceeded their respective screening values for a residential or commercial/industrial land uses.

The results indicate that the made ground beneath the site would be unsuitable for retention exposed at the surface in a residential setting due to the presence of elevated concentrations of lead and benzo[a]pyrene within the made ground.

Visual evidence of ACM was not recorded during this investigation, during sample preparation in the laboratory, and during screening in the laboratory by a qualified chemist.

Visual and olfactory evidence of hydrocarbon impacted soils was not detected within the soils beneath this site during the investigation. The three TPH results and the TPH result within the WAC test ranged were all <10mg/kg. This confirms that the soils tested beneath this site have not been impacted by hydrocarbons, which is noteworthy beneath this former garage workshop site.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model, updated following the intrusive works, monitoring and testing, and targeted to provide coverage across the site, relative to the construction phase and completed development, is presented below in Table 6.

Table 6: Updated Conceptual Model Relative to Construction and Future Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage/ Buildings	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health – ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Moderate	Moderate	Very Low	Very Low
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	Very Low	Very Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	N/A	Very Low	Very Low	Very Low
Flora	Vegetation on site growing on contaminated soil.	N/A	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	N/A	Very Low	Very Low	Very Low

Key to Table 6

RISK	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

The proposed residential redevelopment will include the remodelling of the mews dwelling and the construction of a basement under its whole footprint. Anticipated exposure scenarios relating to the site and future redevelopment works including remedial options as applicable are discussed as follows.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that may appear to be contaminated.

Contaminated Soil

The exploratory holes found about 4.00m of made ground beneath the site. The made ground contained elevated concentrations of lead and locally benzo[a]pyrene, which exceeded soil screening values for residential end uses. None of the other contaminants tested for exceeded their respective screening values for a residential or commercial/industrial land use.

Existing Drainage/Buildings

Redundant foul or surface water drain runs, should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed off-site. The integrity of existing drainage should be checked, and where they are to be retained, any damaged sections should be replaced prior to development. The latter measures should remove any future risk to human health and to the water environment.

The existing building may have asbestos containing materials within it. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during the remodelling/construction phase.

Human Health - Construction Workers

The presence of lead and benzo[a]pyrene contamination within the made ground soils beneath the site indicates that there is a moderate risk that a pathway could develop affecting groundworkers during the construction phase of development.

However, no special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Dust suppression measures such as 'damping down', could also be adopted to prevent the spread of soil contaminants.

Human Health - Users of Completed Development

The risk of the encountered ground contamination affecting the site users when present beneath buildings and permanent areas of hardstanding would be considered to be very low. This is because it would be highly unlikely that the general site users would normally be able to penetrate the basement walls and floors, which would be necessary for them to uncover any contaminated soils beneath the site, and after taking into account that the made ground beneath the site will be largely removed during basement excavation.

Effects on Services

Consideration should be given to upgrading service materials, particularly for water supply pipes, where they will be in contact with made ground containing elevated concentrations of lead and benzo[a]pyrene, or ensure that the made ground is not used as a backfill around such water supply pipes. Further guidance on the selection of materials for use as water supply pipes should be sought from the local water supplier.

Soil Gas

According to database information, there are no active landfills within influencing distance of the site and although up to 3.90m of made ground was encountered these soils were not found to include a significant amount of organic or putrescible material.

No special precautions are consequently considered necessary to protect the proposed redevelopment from the ingress of soil gases.

The site lies within an area where radon protection measures are not required for new dwellings in accordance with BR211.

Water Environment

Groundwater was previously found to lie within the base of the made ground at about 3.50m below ground/street level in the immediate vicinity of the site. The site and immediate surrounding area are devoid of water courses, surface water features and source protection zones.

It is consequently considered unlikely that the proposed redevelopment, including the installation of foundations, would impact the quality of the water environment.

Off-Site Disposal of Soil Arisings

The results of chemical analysis are provided in Appendix 4 and can be used for the basic characterisation of the soil destined for landfill. The Environment Agency publication

Hazardous Waste, Technical Guidance WM3 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous waste or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code, which is determined by the waste type. The results of Waste Acceptance Criteria (WAC) leachate testing should be used to check whether if categorised as non-hazardous waste it could be disposed of at an inert waste landfill; or if categorised as hazardous waste whether it could qualify as stable non-reactive hazardous waste for disposal in non-hazardous landfill.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer and compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer as the approach relies on the information from basic characterisation.

It is expected that clean arisings from excavations into the natural soils across this site would also fall into the inert category under the European Waste Catalogue description 'Soil and Stones', EWC code 17 05 04 with restrictions excluding topsoil and peat.

CONTAMINATION ASSESSMENT CONCLUSIONS

The proposed residential redevelopment will include the remodelling of the dwelling and the construction of a basement under the whole footprint of the mews house. The existing site is detailed on the site plan at the rear of this report. The proposed site layout will need to be provided by the Engineer in due course to satisfy planning conditions. As the basement will occupy the entire footprint of the site there will be no gardens or landscaping included within the proposed redevelopment.

Remediation Statement

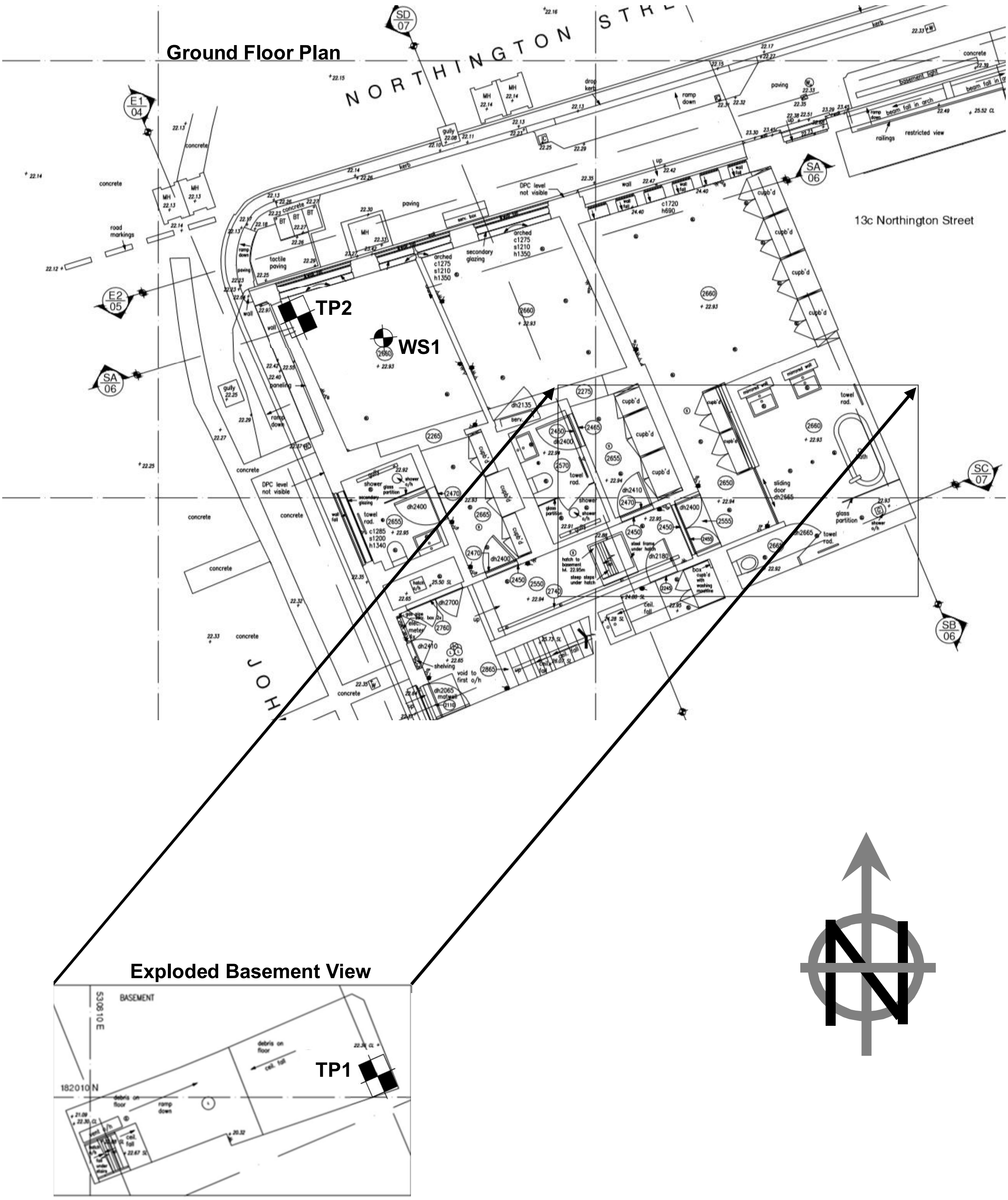
Remediation of the soils beneath the site, in respect of the redevelopment, is not considered necessary, as the proposed basement floors and walls will prevent contact between any contaminated ground and the site end users.

GROUND ENGINEERING LIMITED

S. J. FLEMING
M.Sc., M.C.S.M.,
C.Geol., F.G.S.,
Director

J. E. M. DAVIES
B.Sc.(Hons.), M.Sc.,
C.Geol., F.G.S.,
Senior Geotechnical Engineer

Exploratory Hole Location Plan



Not to Scale

Project : 25 John's Mews, London WC1 **Client : Mr Colin Fraser**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14983**

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www.groundengineering.co.uk

Site: 25 JOHN'S MEWS, LONDON WC1

WINDOW SAMPLE WS1

Date: 29/01/20

Hole Size: 87mm dia to 2.00m
67mm dia to 4.00m
57mm dia to 6.05m

Ground Level:

Samples Depth m	Type	Result	(Date) Water	Description of Strata	Depth m	O.D. Level m
				MADE GROUND - Suspended timber floor.	0.35	
				MADE GROUND - SCREED.	0.40	
				MADE GROUND - CONCRETE.	0.55	
				MADE GROUND - SAND.	0.65	
				MADE GROUND - CONCRETE.	0.85	
1.00 1.00-2.00 1.15-1.45 2.00 2.00-3.00 2.15-2.45	D1 U1 S D2 U2 S	 N4 N4		MADE GROUND - Loose, dark brown and grey, clayey, sandy GRAVEL. Gravel of brick, concrete and flint.	2.80	
3.00 3.00-4.00 3.15-3.45	D3 U3 S	 N4		MADE GROUND - Soft, brown, black and light brown mottled, slightly sandy, slightly gravelly, silty CLAY. Gravel of brick, ash, limestone and flint.	3.90	
4.00-5.00 4.15-4.45 5.00-5.60 5.15-5.45 5.60 5.75-6.05	U4 C U5 C D4 S	 N42 N36 N13	▼c	Dense, light brown and orange brown, silty SAND AND GRAVEL. Gravel of angular to rounded flint and quartzite. (LYNCH HILL GRAVEL)	5.80	
				Firm, brown and orange brown mottled, slightly gravelly, silty CLAY. Gravel of angular to rounded flint and quartzite. (REWORKED LONDON CLAY)	6.05	
				Hole completed at 6.05m depth		

REMARKS
1. Starter pit excavated from 0.00m to 1.20m depth
2. Hole collapsed below 4.50m depth following removal of sampler

Project No 14983
Scale 1:50
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KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
▽ Water Strike
▼c Depth to Water on completion
J - Jar Sample
M - Mackintosh Probe
V - Vane Shear Test Cohesion ( ) kPa
P( ) - Hand Penetrometer Cohesion ( ) kPa
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Hole (Depth m)	Casing	Water
29/01/20	6.05		4.20

Borehole Number	Depth (m)	Casing Depth (m)	Depth to Water (m)	Type of Test *	Seating Drive Blows/ Penetration (mm)	Test Drive: 300mm Blows for each successive 75 mm Penetration				N Value	Extra-polated Value
WS1	1.00 - 1.45			S	3/150	1	1	1	1	4	
	2.00 - 2.45			S	1/150	1	1	1	1	4	
	3.00 - 3.45			S	1/150	1	1	1	1	4	
	4.00 - 4.45			C	13/150	8	10	12	12	42	
	5.00 - 5.45			C	22/150	12	11	8	5	36	
	5.60 - 6.05			S	3/150	2	3	4	4	13	

* C denotes test using a solid cone
S denotes test using a split barrel sampler

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Results of Standard/Cone Penetration Tests

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25 JOHN'S MEWS, LONDON WC1

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Site: 25 JOHN'S MEWS, LONDON WC1

TRIAL PIT TP1

Date: 29/01/20

Pit Size: 0.60m L x 0.58m W x 1.20m D.

Ground Level:

Samples and in-situ Tests: Depth m	Type	Result	(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
				MADE GROUND - TILES.		0.01	
				MADE GROUND - CONCRETE.		0.21	
0.30	D1			MADE GROUND - Well compacted, light grey brown, sandy GRAVEL with occasional concrete cobbles. Gravel of flint and concrete.		0.81	
0.60	D2						
				MADE GROUND - CONCRETE slab, proved by masonry drilling.		1.20	
				Pit abandoned at 1.20m depth			

KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ∇ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Pit dry
2. Pit sides stable
3. Pit abandoned at 0.81m depth on concrete slab
4. Masonary drill used to prove concrete slab at base of pit was 0.40m thick
5. PIT UNDERTAKEN AT BASEMENT LEVEL

Project No 14983

Scale 1:25

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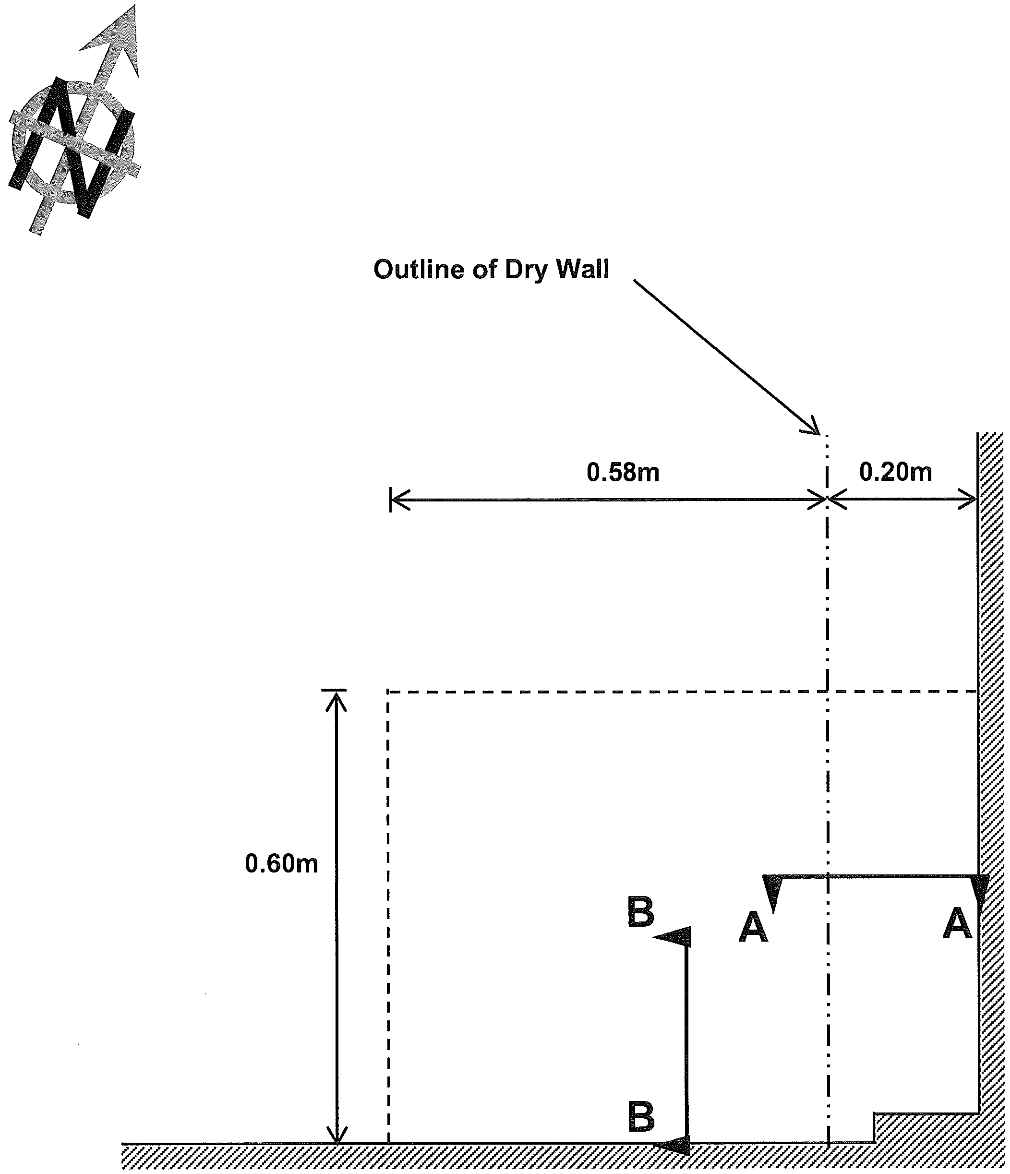
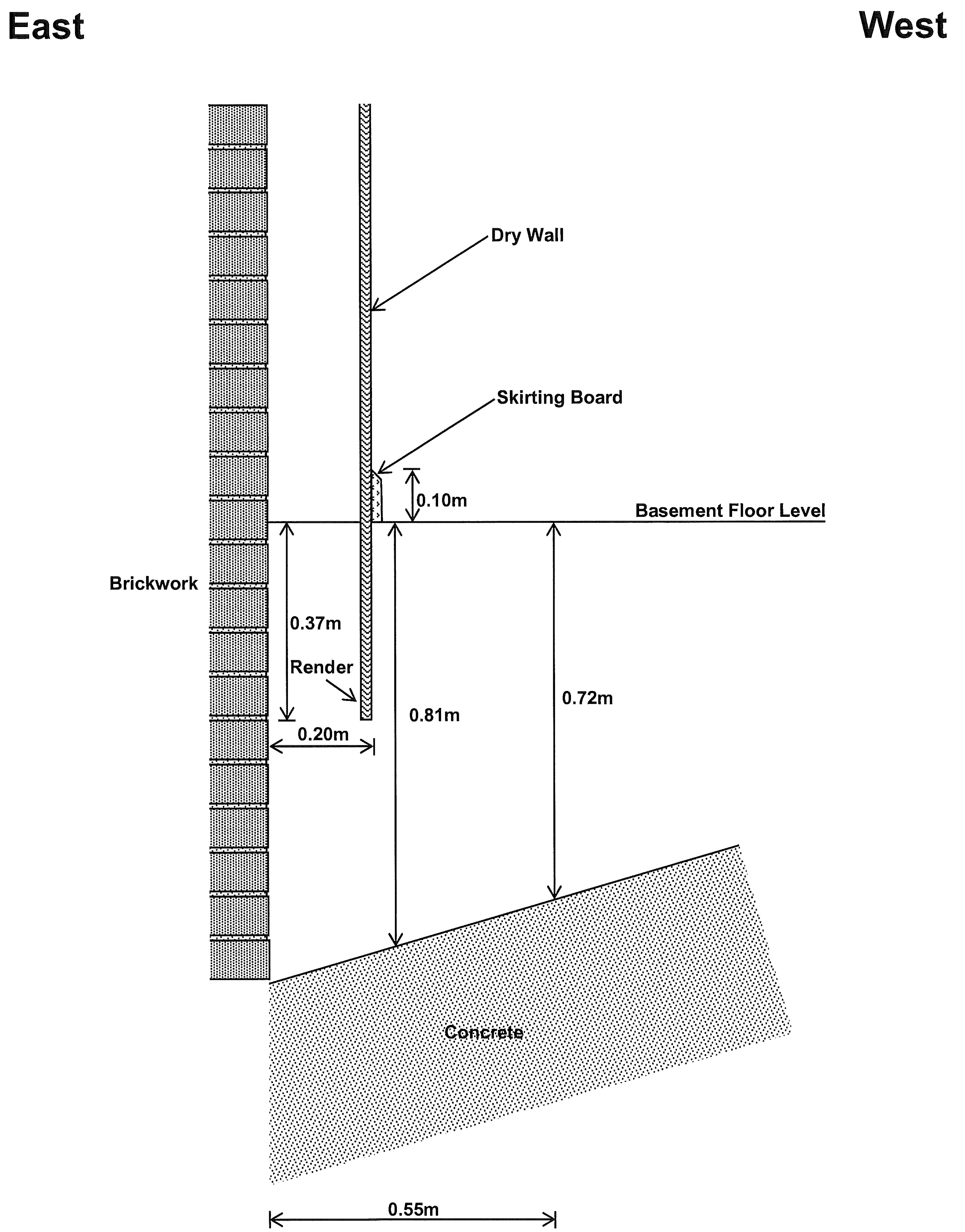
Trial Pit TP1
Plan



Not to Scale

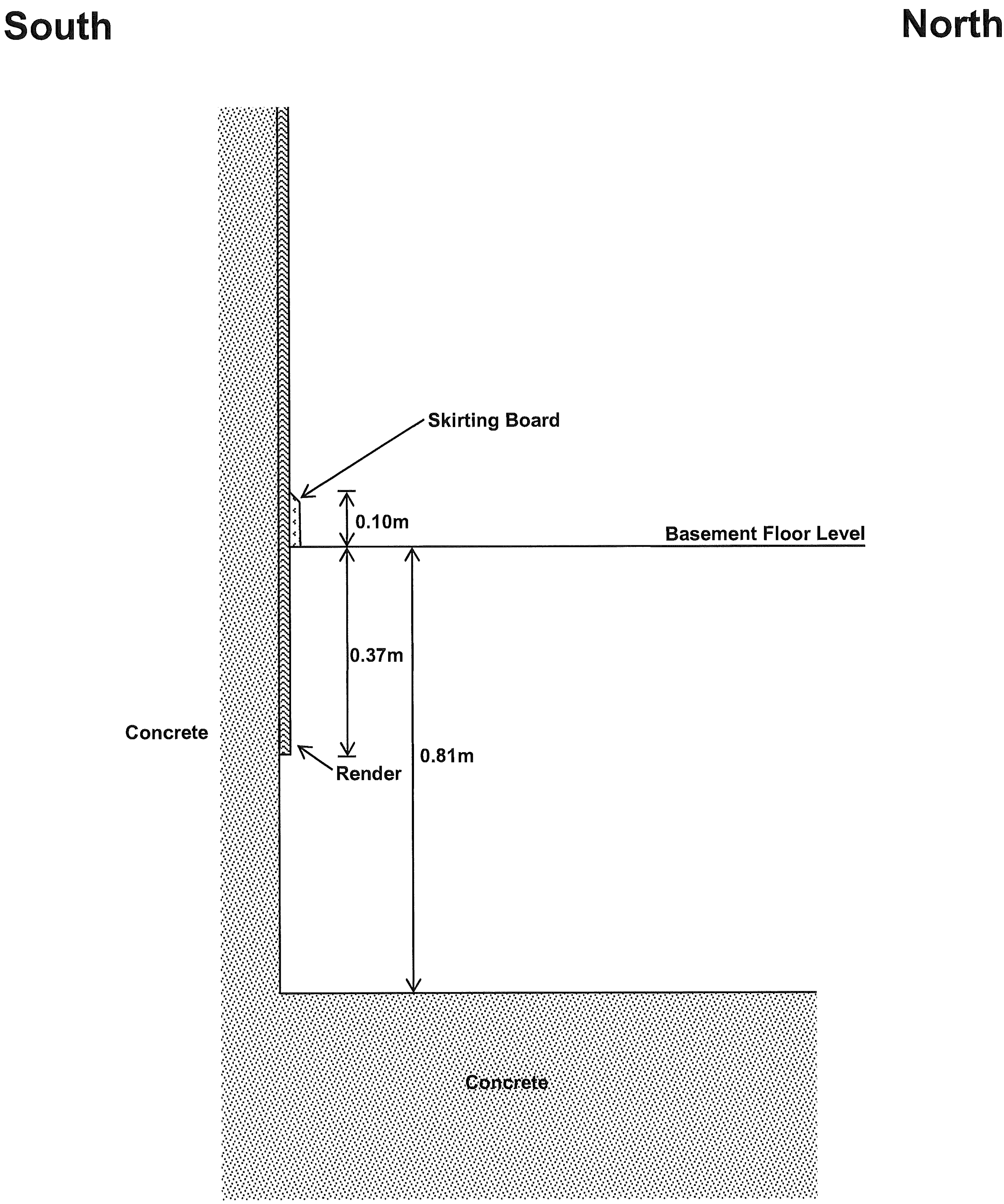
Project : 25 John's Mews, London WC1 **Client : Mr Colin Fraser**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14983**

Trial Pit TP1
Cross Section A-A



Project : 25 John's Mews, London WC1 **Client : Mr Colin Fraser**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14983**

Trial Pit TP1
Cross Section B-B



Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

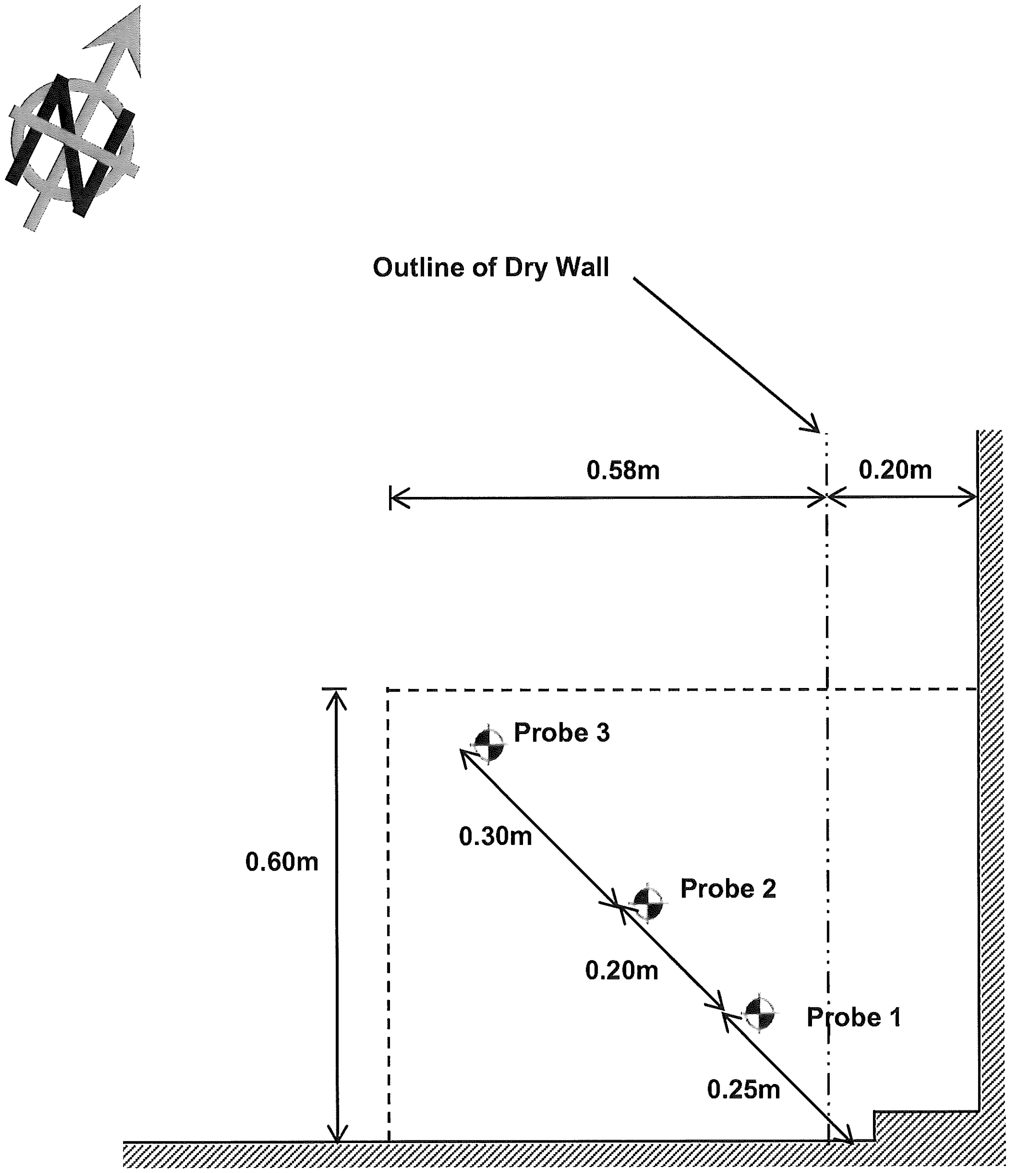
Trial Pit TP1
Photographs

Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

Trial Pit TP1
Photographs

Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

TP1 Drilled Probe Location Plan



Probe 1:- Concrete slab proved to be 0.40m thick

Probe 2:- Concrete slab proved to be 0.40m thick

Probe 3:- Masonry drill hit obstruction within concrete slab at 0.35m depth - abandoned

Not to Scale

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Trial Pit TP1
Photographs

Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

GROUND ENGiNEERiNG LIMITED

Tel: 01733-566566
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Site: 25 JOHN'S MEWS, LONDON WC1

TRIAL PIT TP2

Date: 31/01/20

Pit Size: 1.10m L x 1.10m W x 3.45m D.
Hole Size: 70mm dia to 4.00m

Ground Level:

Samples and in-situ Tests: Depth m	Type	Result	(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
				MADE GROUND - Suspended timber floor.		0.35	
				MADE GROUND - SCREED.		0.40	
				MADE GROUND - CONCRETE.		0.55	
0.60	D1			MADE GROUND - SAND.		0.65	
				MADE GROUND - CONCRETE.		0.85	
0.90	D2			MADE GROUND - 'Loose', dark brown and light grey, clayey, sandy GRAVEL. Gravel of brick, concrete and flint.			
1.20	D3						
1.50	D4						
1.80	D5						
2.10	D6						
2.40	D7						
2.70	D8					2.90	
3.00	D9			MADE GROUND - Firm, dark brown, slightly gravelly, sandy, silty CLAY. Gravel of flint and brick.			
3.30	D10					3.50	
3.60	D11			MADE GROUND - 'Loose', dark brown and brown, very clayey, very sandy GRAVEL. Gravel of flint, brick, tile and quartzite.			
4.00	D12					4.00	
				Pit abandoned at 4.00m depth			

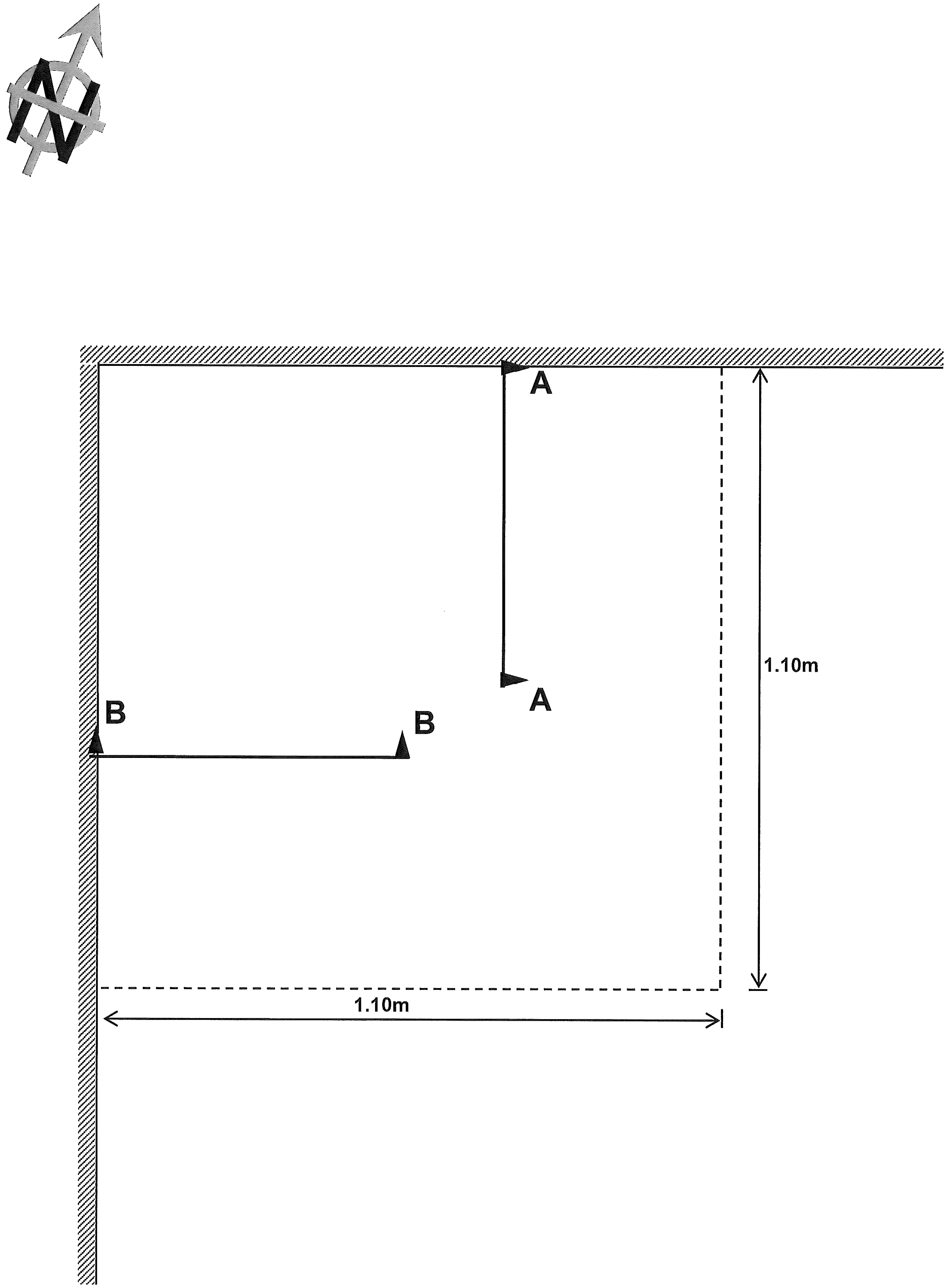
KEY
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ∇ Water Strike
- ▼ Water Rise
- ▼c Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

REMARKS
1. Pit dry
2. Pit sides stable
3. Unable to advance hole below 4.00m depth using hand tools, pit abandoned

Project No 14983

Scale 1:25

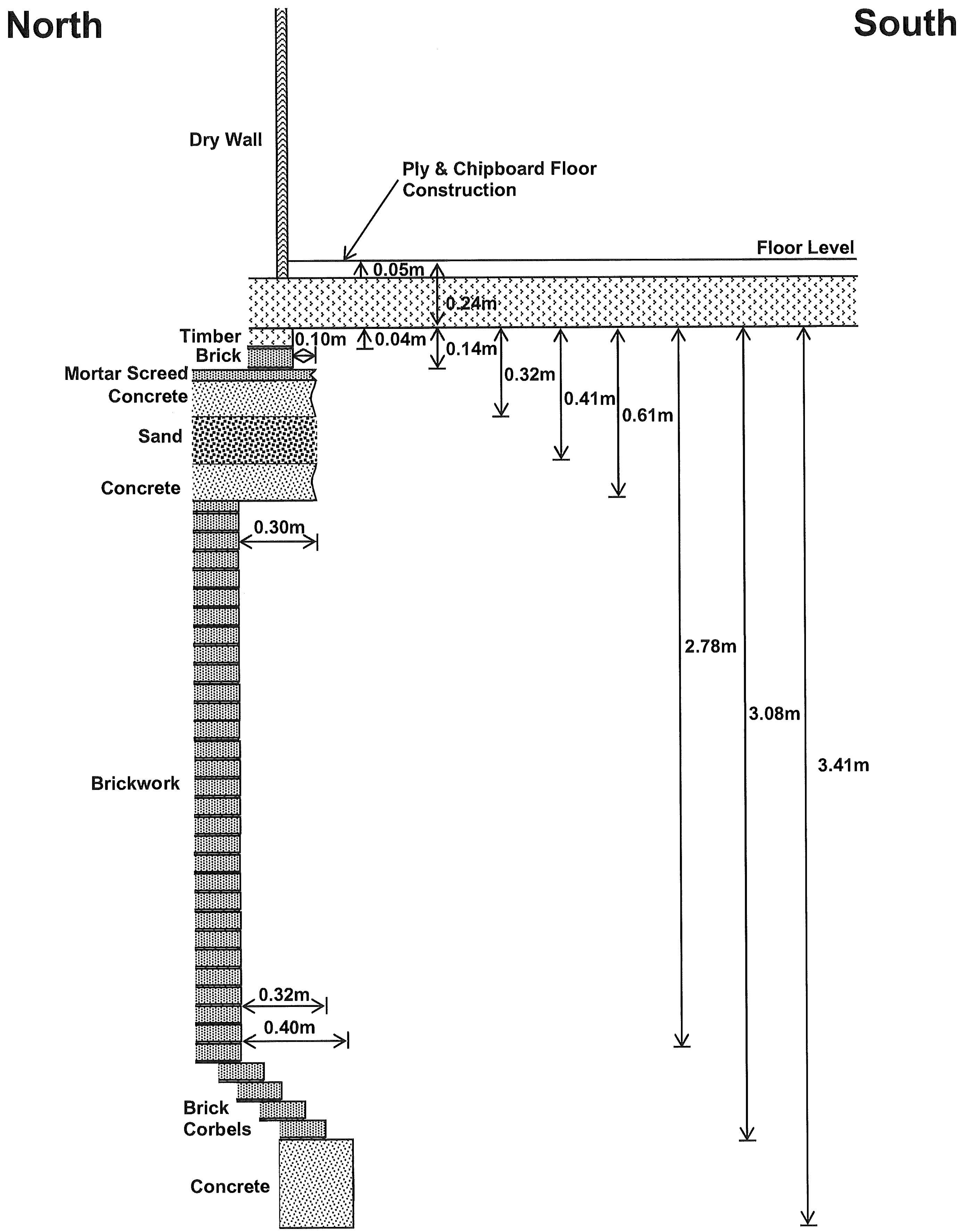
Trial Pit TP2
Plan



Not to Scale

Project : 25 John's Mews, London WC1 **Client : Mr Colin Fraser**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14983**

Trial Pit TP2
Cross Section A-A



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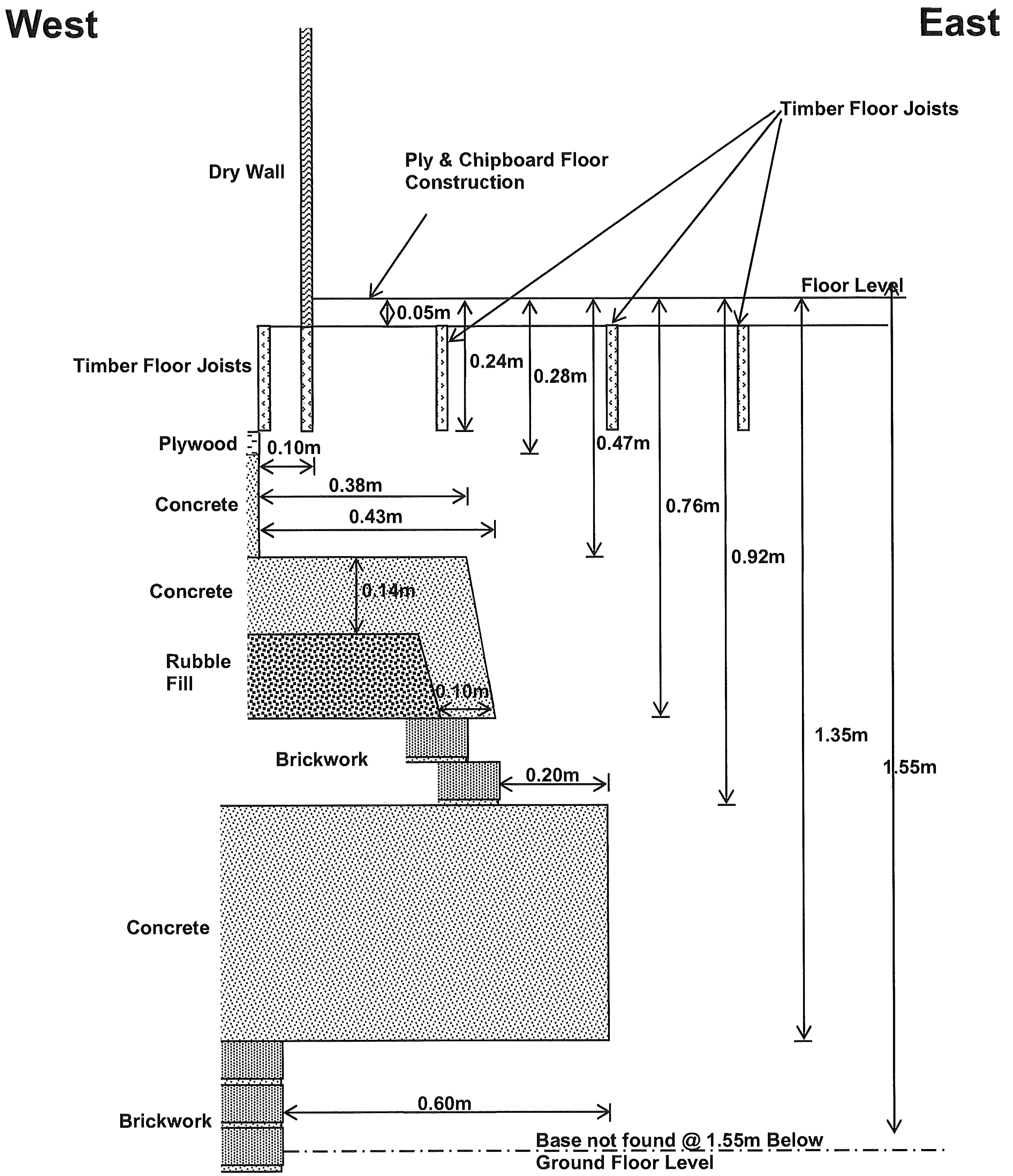
Trial Pit TP2
Cross Section B-B



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Trial Pit TP2
Photographs

Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

Trial Pit TP2
Photographs

Project : 25 John's Mews, London WC1 **Client : Mr Colin Fraser**	**GROUND ENGINEERING LIMITED** **Peterborough Tel : 01733 566566**	**Project No.** **C14983**

Trial Pit TP2
Photographs

Project : 25 John's Mews, London WC1 Client : Mr Colin Fraser	GROUND ENGINEERING LIMITED Peterborough Tel : 01733 566566	Project No. C14983

LABORATORY TEST RESULTS

CONTRACT 25 JOHN'S MEWS, LONDON WC1

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil Total % Dry Wt.	Soil Aqueous Extract mg/l	Water mg/l	pH	
WS1	D1	1.00													107		8.0	
	D2	2.00													66		8.0	
	D3	3.00	43	23	20													SOIL CLASSIFICATION = CI 23% retained on 425µm sieve

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

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LABORATORY TEST RESULTS

CONTRACT 25 JOHN'S MEWS, LONDON WC1

Trial-pit	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO_4)				Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m^3	Dry Mg/m^3	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil Total % Dry Wt.	Soil Aqueous Extract mg/l	Water mg/l	pH	
TP2	D2	0.90													25		8.2	
	D4	1.50													58		8.0	
	D7	2.40													33		8.0	
	D10	3.30	39	22	17										33		7.5	SOIL CLASSIFICATION = CI 25% retained on 425μm sieve

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

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Tel: 01733-566566
www.groundengineering.co.uk

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GROUND ENGINEERING

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

TEST CERTIFICATE

Determination of Particle Size Distribution

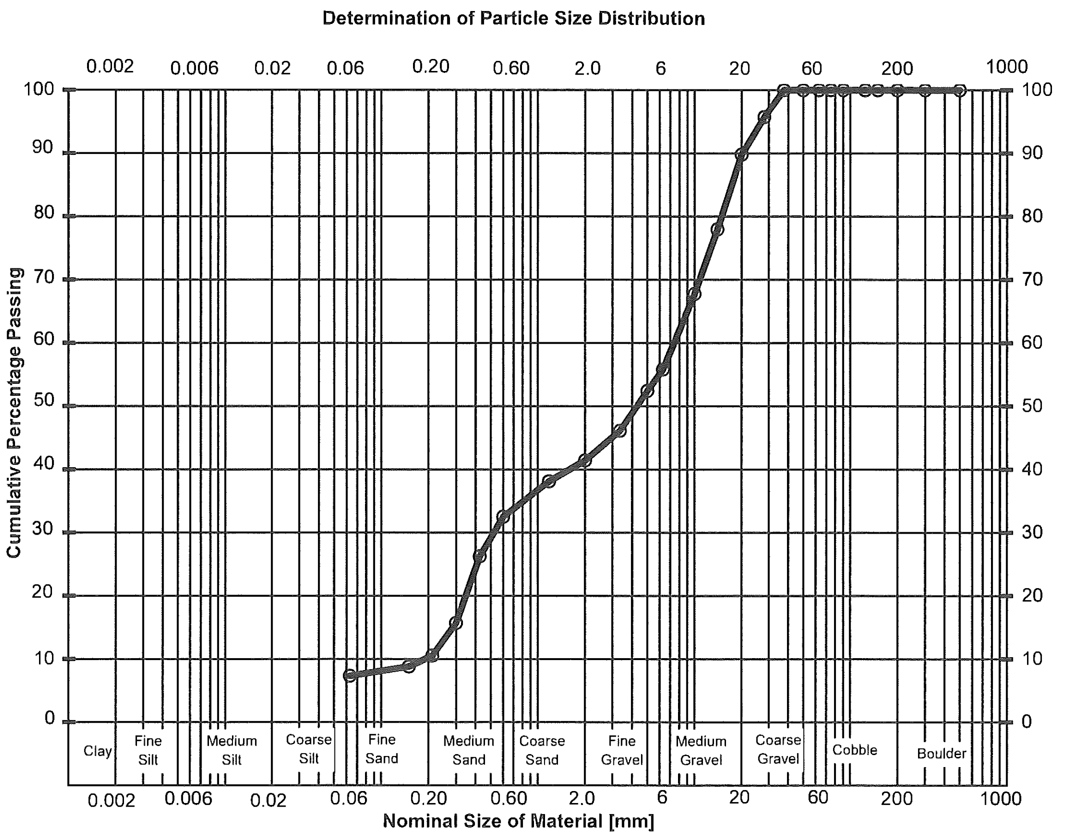
Tested in Accordance with BS 1377-2: 1990: Clause 9.2
Sieved Grading

Client:	Ground Engineering Ltd	Certificate Number:	PL6981-1/4/710-2
Client Address:	Newark Road	Client Reference:	C14983
	Peterborough	Lab Job Number:	PL6981-1
	PE1 5UA	Date Sampled:	Unknown
		Date Received:	07.02.2020
Contact:	Steve Fleming	Date Tested:	20.02.2020
		Certificate of Sampling:	N/A
Site Name:	25 Johns Mews	Sampling Certificate No.:	N/A
Site Address:	London WC1	Sampled By:	Client

TEST RESULTS **Laboratory Reference:** PL6981-1/4 **Pre-treatment for organic material:** N/A
Client Reference: U4

Sample Description: Brown orange-brown slightly clayey silty SAND and GRAVEL. Gravel consists of sub-angular to rounded flint and quartzite.

Material Specification: Not Required **Depth Top:** 4.00m
Location: WS1 **Depth Base:** 5.00m
Source: **Supplier:**



Sieve Analysis

Sieve mm	%Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	96
20	90
14	78
10	68
6.3	56
5.0	52
3.35	46
2.00	41
1.18	38
0.600	33
0.425	26
0.300	16
0.212	11
0.150	9
0.063	7
0.020	
0.006	
0.002	

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 04.03.2020 Page 1 of 1
Form Number: GELab/C/709-2 Version 52

Registered in England & Wales
Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA

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GROUND ENGINEERING

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

TEST CERTIFICATE

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Tested in Accordance with BS 1377-2: 1990: Clause 9.2
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	PE1 5UA	Date Sampled:	Unknown
		Date Received:	07.02.2020
Contact:	Steve Fleming	Date Tested:	20.02.2020
		Certificate of Sampling:	N/A
Site Name:	25 Johns Mews	Sampling Certificate No.:	N/A
Site Address:	London WC1	Sampled By:	Client

TEST RESULTS **Laboratory Reference:** PL6981-1/5 **Pre-treatment for organic material:** N/A

Client Reference: U5

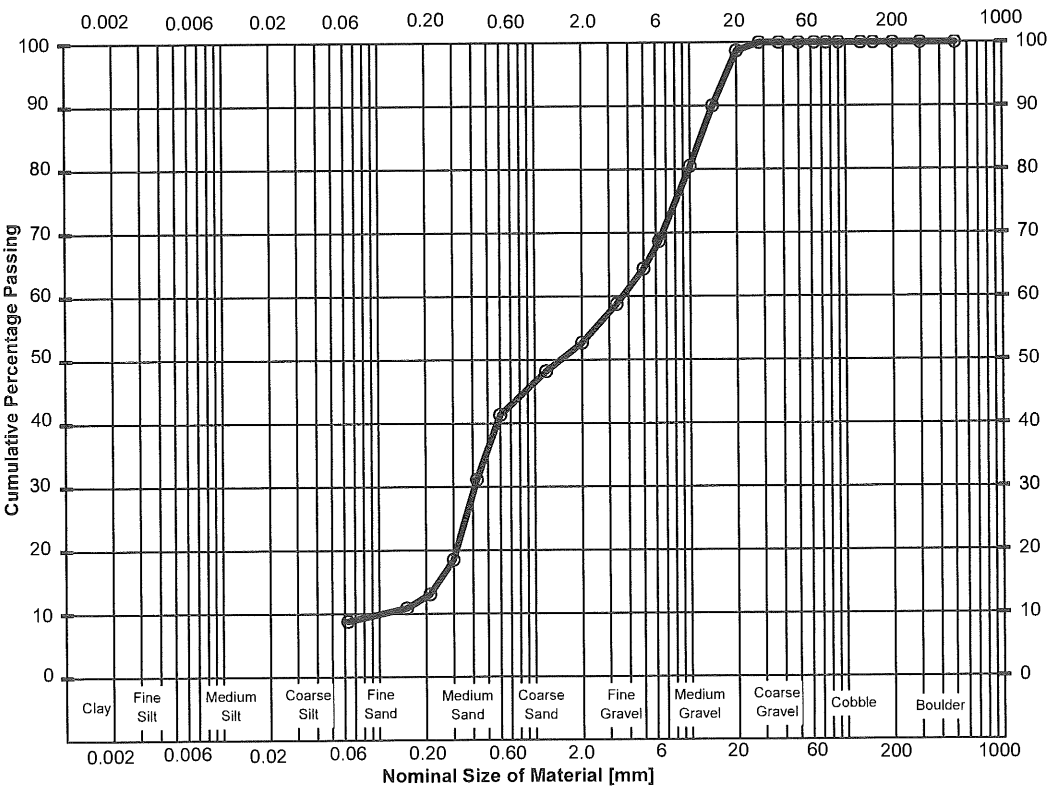
Sample Description: Brown orange-brown silty SAND and GRAVEL. Gravel consists of fine to medium angular to rounded flint and quartzite.

Material Specification: Not Required **Depth Top:** 5.00m

Location: WS1 **Depth Base:** 5.60m

Source: **Supplier:**

Determination of Particle Size Distribution



Sieve Analysis

Sieve mm	%Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	99
14	90
10	81
6.3	69
5.0	64
3.35	59
2.00	53
1.18	48
0.600	41
0.425	31
0.300	19
0.212	13
0.150	11
0.063	9
0.020	
0.006	
0.002	

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 04.03.2020 Page 1 of 1
Form Number: GELab/C/709-2 Version 52

Registered in England & Wales
Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA

UKAS TESTING 8180

GROUND ENGiNEERiNG

TEST CERTIFICATE

Determination of Particle Size Distribution

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Tested in Accordance with BS 1377-2: 1990: Clause 9.2
Sieved Grading

Client:	Ground Engineering Ltd	Certificate Number:	PL6981-1/12/710-2
Client Address:	Newark Road	Client Reference:	C14983
	Peterborough	Lab Job Number:	PL6981-1
	PE1 5UA	Date Sampled:	Unknown
		Date Received:	07.02.2020
Contact:	Steve Fleming	Date Tested:	20.02.2020
		Certificate of Sampling:	N/A
Site Name:	25 Johns Mews	Sampling Certificate No.:	N/A
Site Address:	London WC1	Sampled By:	Client

TEST RESULTS **Laboratory Reference:** PL6981-1/12 **Pre-treatment for organic material:** N/A

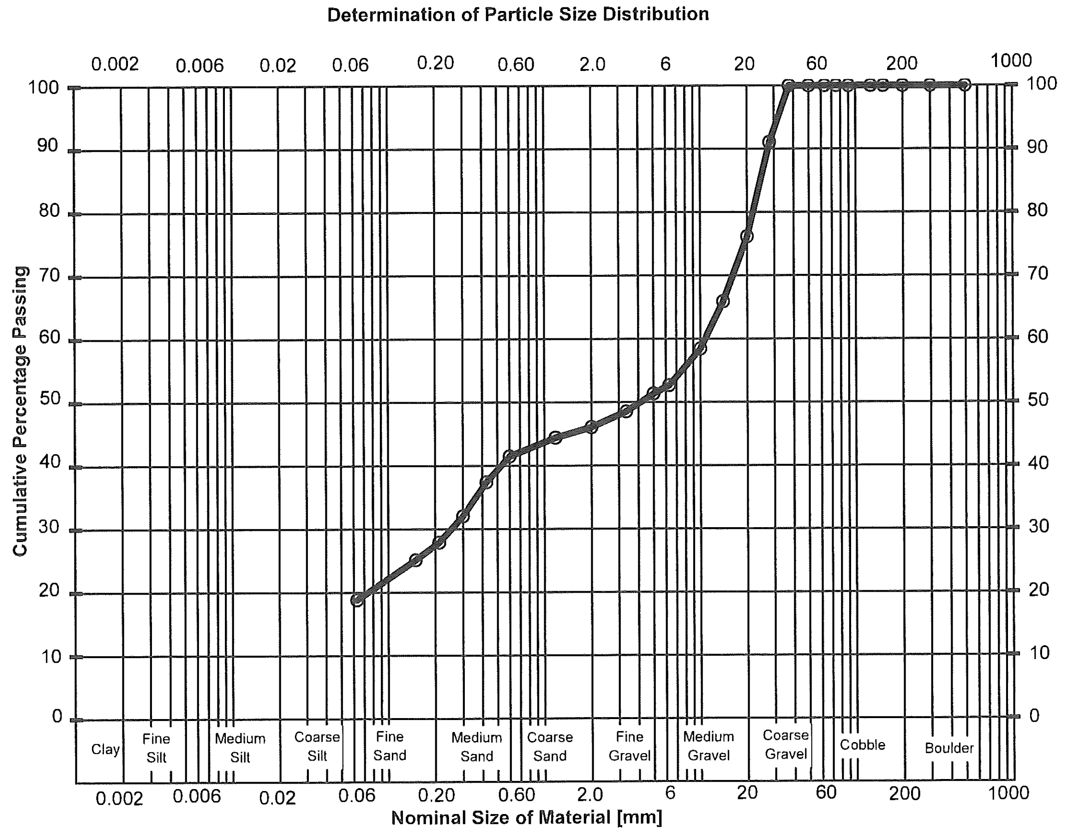
Client Reference: D11

Sample Description: Dark brown clayey silty SAND and GRAVEL. Gravel consists of sub-angular to rounded flint quartzite brick and tile.

Material Specification: Not Required **Depth:** 3.60m

Location: TP2

Source: **Supplier:**



Sieve Analysis

Sieve mm	%Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	91
20	76
14	66
10	58
6.3	53
5.0	51
3.35	49
2.00	46
1.18	44
0.600	42
0.425	37
0.300	32
0.212	28
0.150	25
0.063	19
0.020	
0.006	
0.002	

Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 04.03.2020 Page 1 of 1
Form Number: GELab/C/709-2 Version 52

Registered in England & Wales
Registration Number: 6929574
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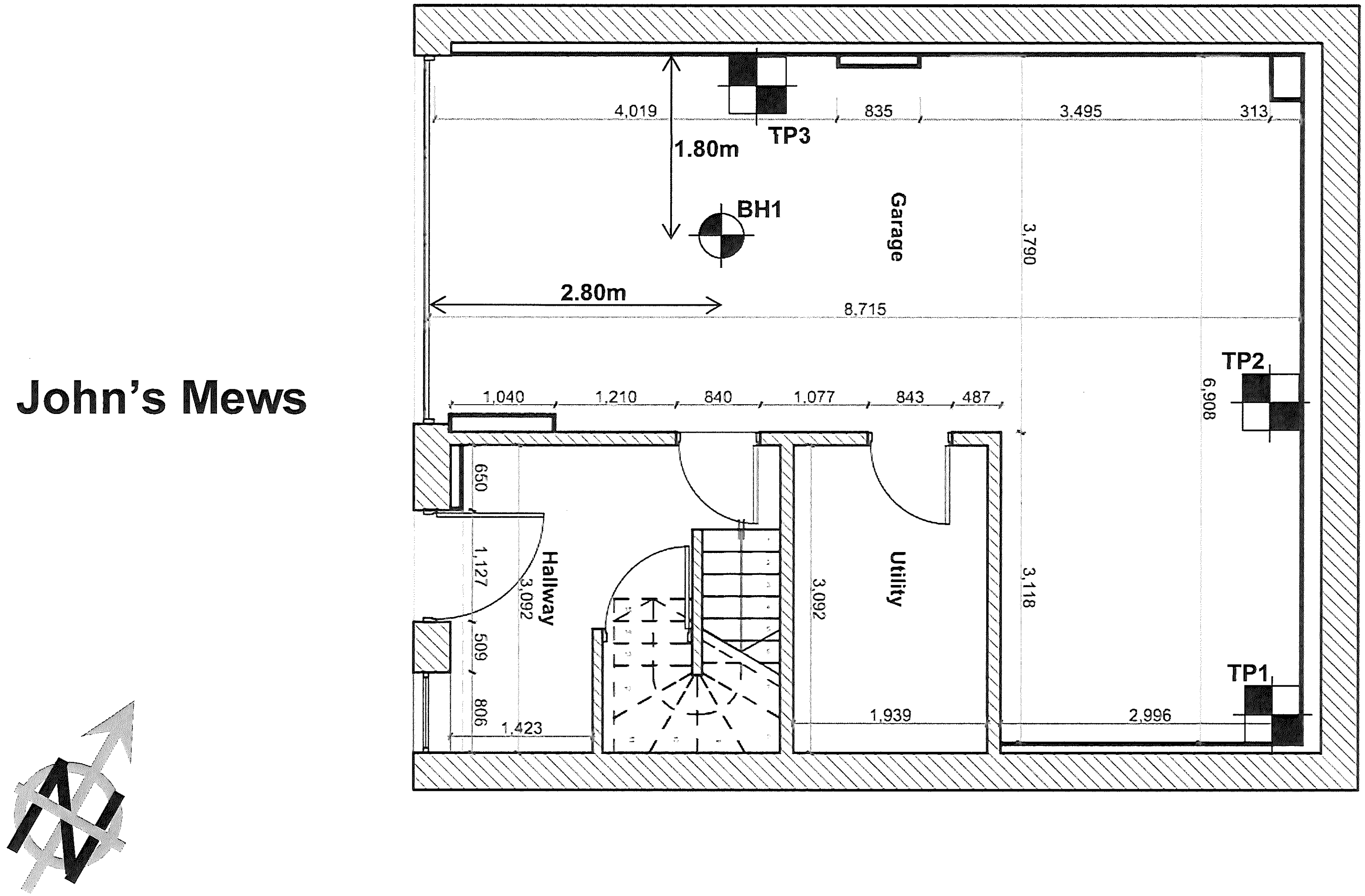
Newark Rd, Peterborough PE1 5UA

APPENDIX 1

EXPLORATORY HOLE RECORD & HOLE LOCATION PLAN FOR NEIGHBOURING SITE (No.27 JOHN'S MEWS) – C14337, January 2018

Site Plan
(Taken from Engineer's Drawing)



Not to Scale

Project : 27 John's Mews, London WC1

Client : Brendan O'Toole

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Project No.
C14337

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Site: 27 JOHN'S MEWS, LONDON WC1

BOREHOLE BH1

Date: 23/11/17 to 24/11/17

Hole Size: 150mm dia to 20.00m

Ground Level:

Samples and in-situ Tests

Depth m	Type	Blows	(Date) Casing
0.20-0.30	B1		
0.30-0.45	B2		
0.85-1.20	B3		
1.20-1.70	B4		
1.35-1.65	C	N4	
2.00-2.50	B5		
2.15-2.45	C	N2	2.00
2.50-3.00	B6		
3.10-3.50	B7		
3.25-3.55	C	N6	3.10
3.50-3.75	B8		
3.75-4.00	B9		
4.00-4.50	B10		
4.15-4.41	C	50*	4.00
4.80-5.30	B11		
4.95-5.25	C	N56	4.80
5.30-5.80	B12		
5.30	W1		
5.80-6.00	U1	38	5.70
6.00	D1		
6.70-7.15	U2	40	5.70
7.15	D2		
7.50-7.95	U3	40	6.00
7.95	D3		
8.00	W2		
8.00	D4		
9.00-9.45	U4	50	6.00
9.40	D5		
10.00	D6		

Inst.: BENEATH INSTALLATION (below 7.00m)

Description of Strata

Description of Strata	Depth m	O.D. Level m
MADE GROUND - CONCRETE floor slab.	0.20	
MADE GROUND - Brown, slightly clayey SAND AND GRAVEL with occasional brick cobbles. Gravel of brick, concrete, slate and ash.	0.45	
MADE GROUND - Red brown, sandy GRAVEL AND COBBLES of brick.	0.85	
MADE GROUND - Brown, slightly clayey SAND AND GRAVEL with occasional brick cobbles. Gravel of brick, concrete, slate and ash.	1.20	
MADE GROUND - Soft, brown and dark grey brown mottled, slightly gravelly, sandy, silty CLAY with occasional brick cobbles. Gravel of brick, concrete, mortar, ash and flint.	2.00	
MADE GROUND - Very loose, brown, slightly clayey SAND AND GRAVEL with occasional brick cobbles. Gravel of brick, concrete, ash, mortar and slate.	2.50	
MADE GROUND - Soft, brown and dark grey mottled, slightly gravelly, sandy, silty CLAY with occasional brick cobbles. Gravel of brick, concrete, flint, ash, mortar and slate. Becoming dark brown below 3.50m depth.	3.75	
Very dense, light brown, slightly silty, very sandy GRAVEL. Gravel of angular to rounded flint and occasional quartzite. (LYNCH HILL GRAVEL)	5.20	
Firm, brown and orange brown mottled, slightly sandy, slightly gravelly CLAY. Gravel of angular to rounded flint. (REWORKED LONDON CLAY)	5.50	
Firm, closely fissured, grey brown CLAY with occasional silt partings. (LONDON CLAY)	8.00	
Stiff, fissured, grey brown, silty CLAY with occasional silt partings. (LONDON CLAY)	10.00	

REMARKS
1. Floor slab cored using diamond drilling equipment
2. Excavating a pit from 0.20m to 1.20m for 1 hour
3. Water added from 3.75m to 5.00m
4. Borehole cased to 6.00m depth
5. Gas monitoring standpipe installed to 7.00m depth

Project No 14337

Scale 1:50

Page 1/2

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
▽ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed
1	5.00	4.80	slow	5.00	5.60

Groundwater Observations

Date	Hole (Depth m)	Casing (Depth m)	Water (Depth m)
23/11/17	8.00	5.70	dry
24/11/17	8.00	5.70	6.50
24/11/17	20.00	6.00	damp
04/12/17	7.00		3.60
11/12/17	7.00		3.46

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Site: 27 JOHN'S MEWS, LONDON WC1

BOREHOLE BH1

Date: 23/11/17 to 24/11/17

Hole Size: 150mm dia to 20.00m

Ground Level:

Depth m	Type	Blows	(Date) Casing	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
				BENEATH INSTALLATION	Stiff, closely fissured, grey brown, silty CLAY with occasional silt partings and rare gravel size pyrite nodules.		10.00	
10.50-10.95	U5	60	6.00					
10.95	D7							
11.50	D8							
12.00-12.45	U6	50	6.00					
12.45	D9							
13.00	D10							
13.50-13.95	U7	60	6.00					
13.95	D11							
14.50	D12				(LONDON CLAY)			
15.00-15.45	U8	65	6.00					
15.45	D13							
16.00	D14							
16.50-16.95	U9	70	6.00					
16.95	D15				Becoming slightly sandy below 17.00m depth.			
17.50	D16							
18.00-18.45	U10	70	6.00					
18.45	D17							
19.20	D18						19.20	
19.50-19.95	U11	80	6.00		Very stiff, grey, shelly CLAY. (LAMBETH GROUP)		19.50	
20.00	D19				Very stiff, red brown and light blue grey mottled CLAY. (LAMBETH GROUP)		20.00	

REMARKS

Borehole completed at 20.00m depth

Project No 14337

Scale 1:50

Page 2/2

KEY
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
S/C - SPT Spoon/Cone
∇ Water Strike
▼ Water Rise
N/* - SPT Blows for 0.3m or given penetration
ES - Environmental Sample
V - Vane Shear Test Cohesion ( ) kPa
▼c Level on completion
c▼w Level casing withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Struck	Rose to	Rate	Cased	Sealed

Groundwater Observations

Date	Hole	Casing	Water
19/12/17	7.00		3.56

Borehole Number	Depth (m)	Casing Depth (m)	Depth to Water (m)	Type of Test *	Seating Drive Blows/ Penetration (mm)	Test Drive: 300mm Blows for each successive 75 mm Penetration				N Value	Extra-polated Value
BH1	1.20 - 1.65			C	2/150	1	1	1	1	4	
	2.00 - 2.45	2.00		C	1/150	1	0	1	0	2	
	3.10 - 3.55	3.10		C	1/150	1	1	1	3	6	
	4.00 - 4.41	4.00	3.90	C	12/150	11	15	17	7/30		59
	4.80 - 5.25	4.80	4.80	C	22/150	15	22	10	9	56	

* C denotes test using a solid cone
  S denotes test using a split barrel sampler

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Results of Standard/Cone Penetration Tests

14337

27 JOHN'S MEWS, LONDON WC1

APPENDIX 2

HISTORICAL MAPS

Site History

Figure A

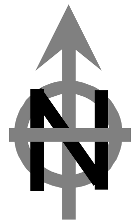
Reproduced from the **1720** Stow's 'Survey of the Cities of London & Westminster'
Not to scale

Project : 25 John's Mews, London WC1 **Client : Colin Fraser**	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C14983**

Site History

Figure B

Reproduced from the **1747** John Rocque's **Plan of the Cities of London and Westminster and Borough of Southwark**
Not to scale



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Client : Colin Fraser

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Project No. C14983

Site History

Figure C

Reproduced from the **1755** Stow's 'Survey of the Cities of London & Westminster'
Not to scale

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Site History

Figure D

Reproduced from the **1792** 1st Edition **Richard Horwood's Plan of London**
Not to scale

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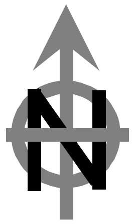
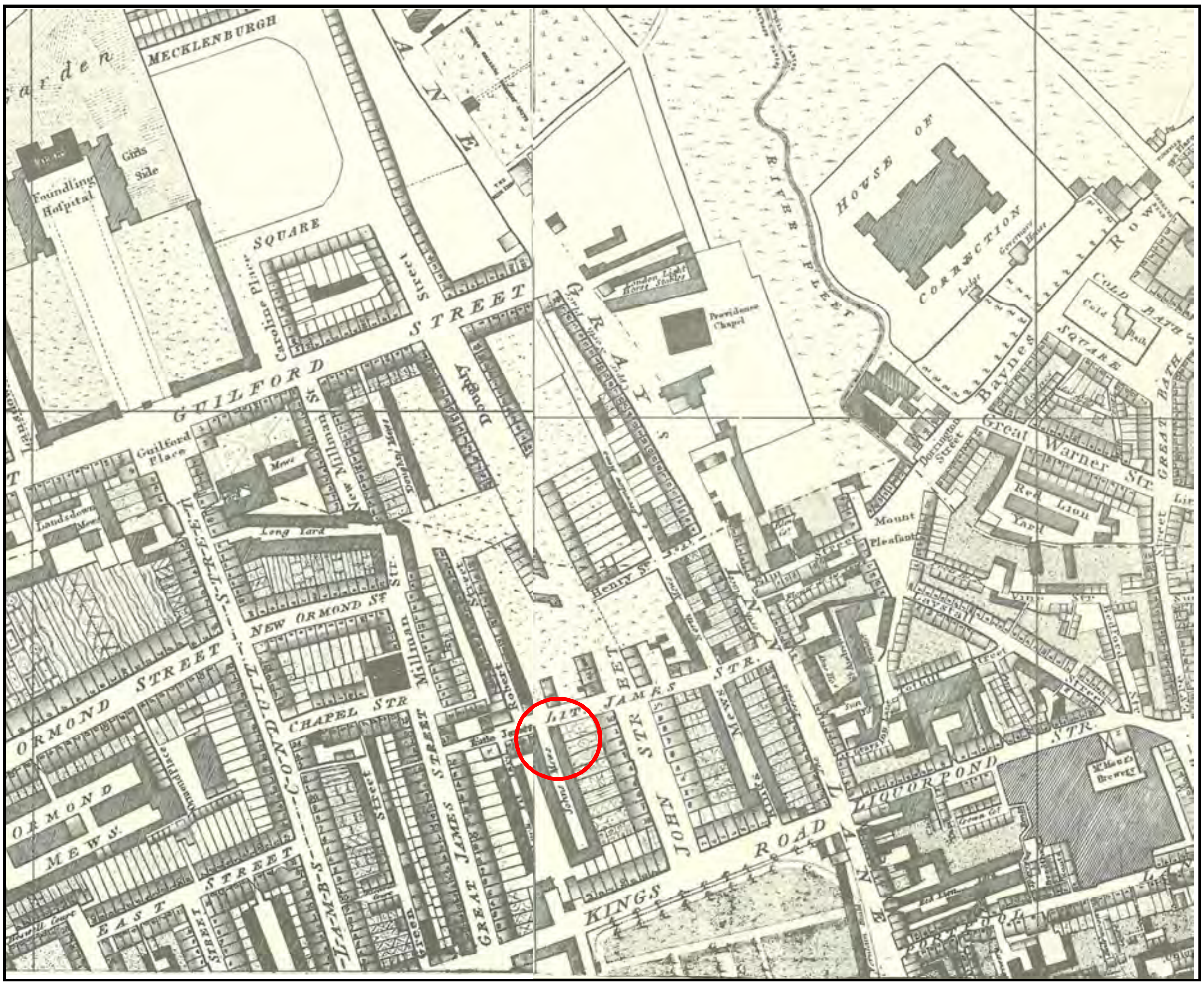
Site History

Figure E

Reproduced from the **1813** 3rd Edition **Richard Horwood's Plan of London**
Not to scale

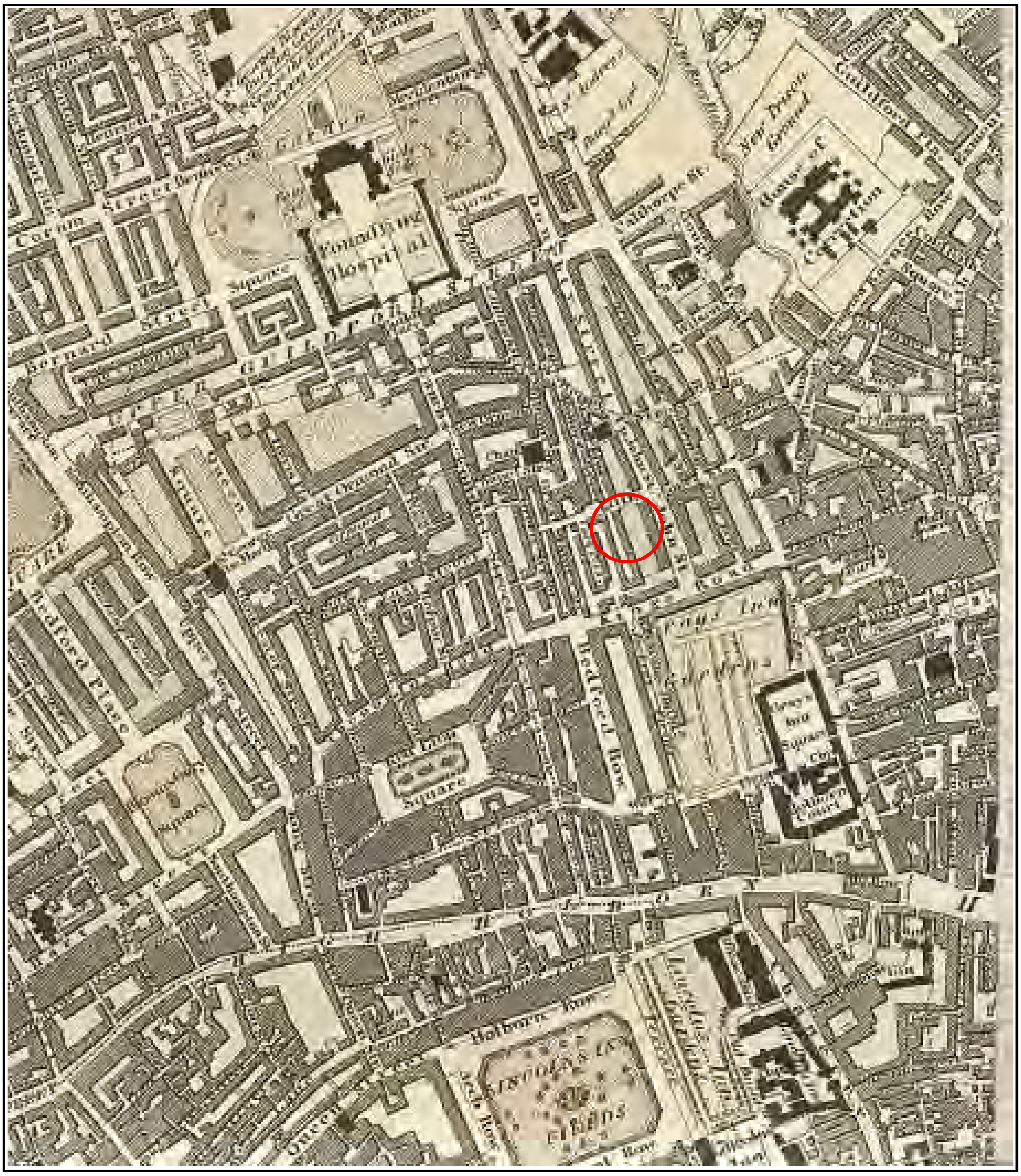




Site History

Figure F

Reproduced from the **1827** edition Greenwood's **Map of London**
Not to scale.



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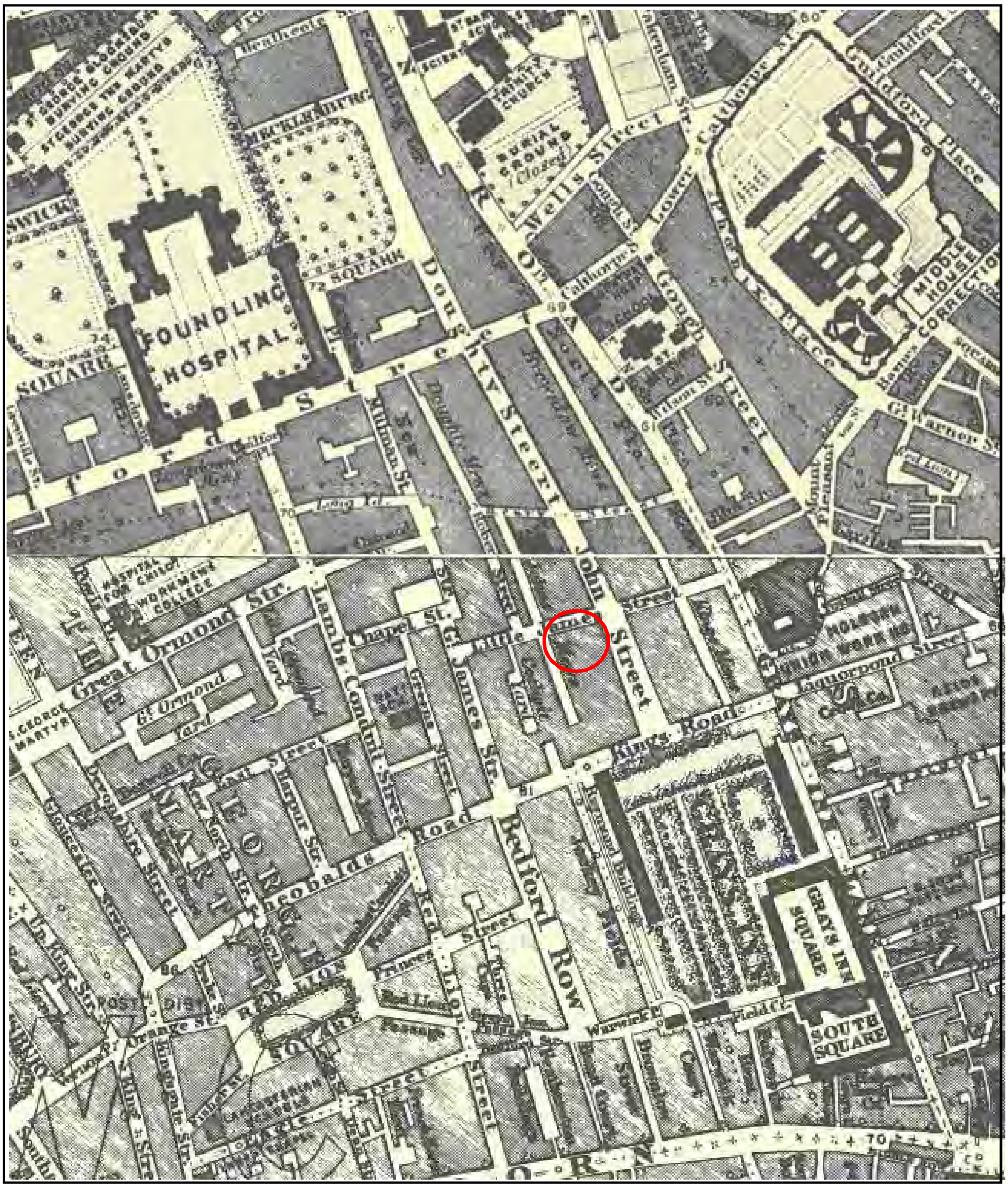
Site History

Figure G

Reproduced from the **1862** edition Stanford's **Library Map of London and its Suburbs, Not to scale.**



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Project No.

C14983

Site History

Figure H

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Project No.
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Site History

Figure I

Reproduced from the **1877-78** edition Ordnance Survey sheets **London XXVI & XXXV** at **1:2500** scale with the permission of the

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Project No.
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Site History

Figure J

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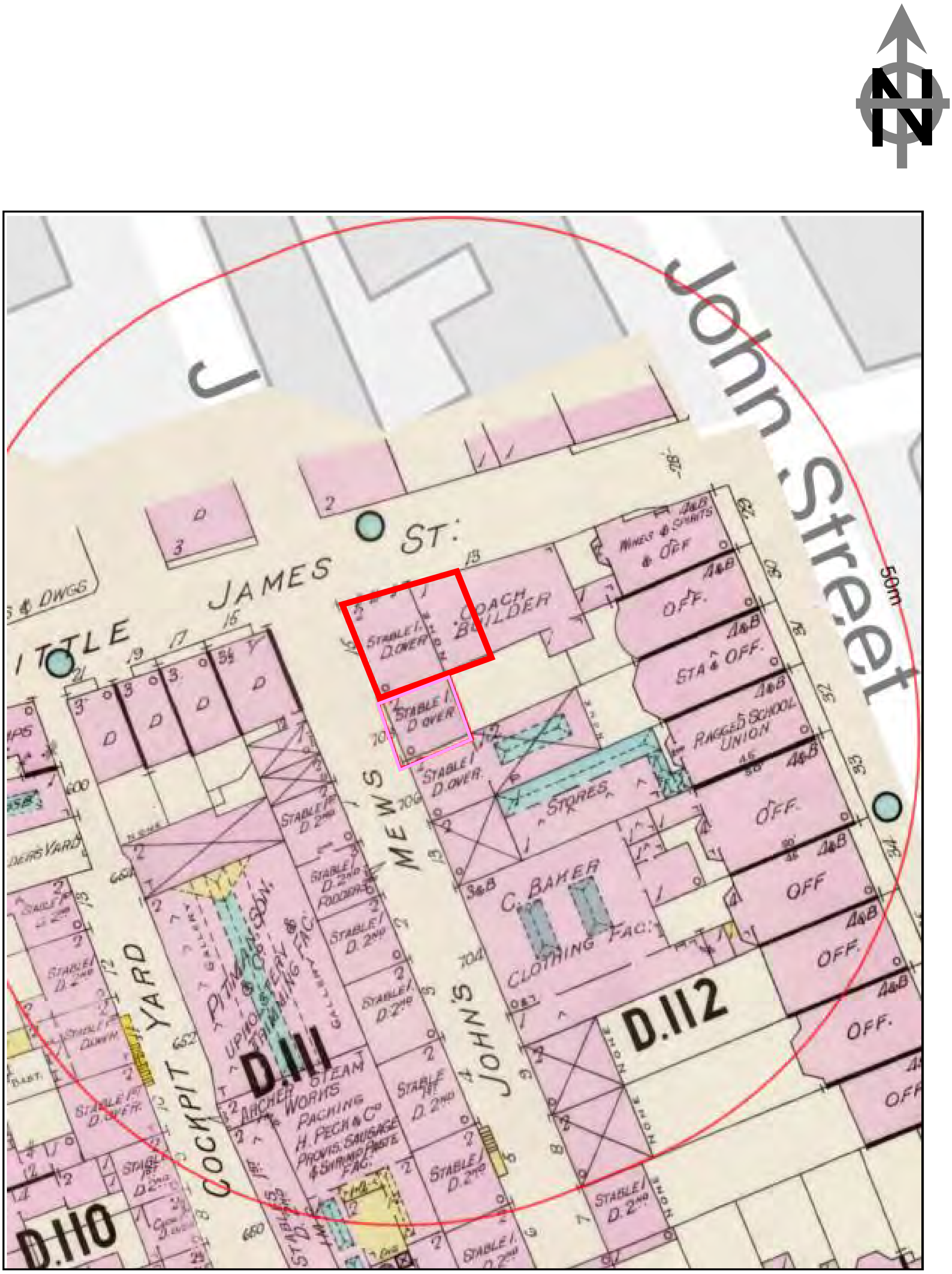
Site History

Figure K

Reproduced from the **1901 Goad's Insurance Map**
Not to scale



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Project No.
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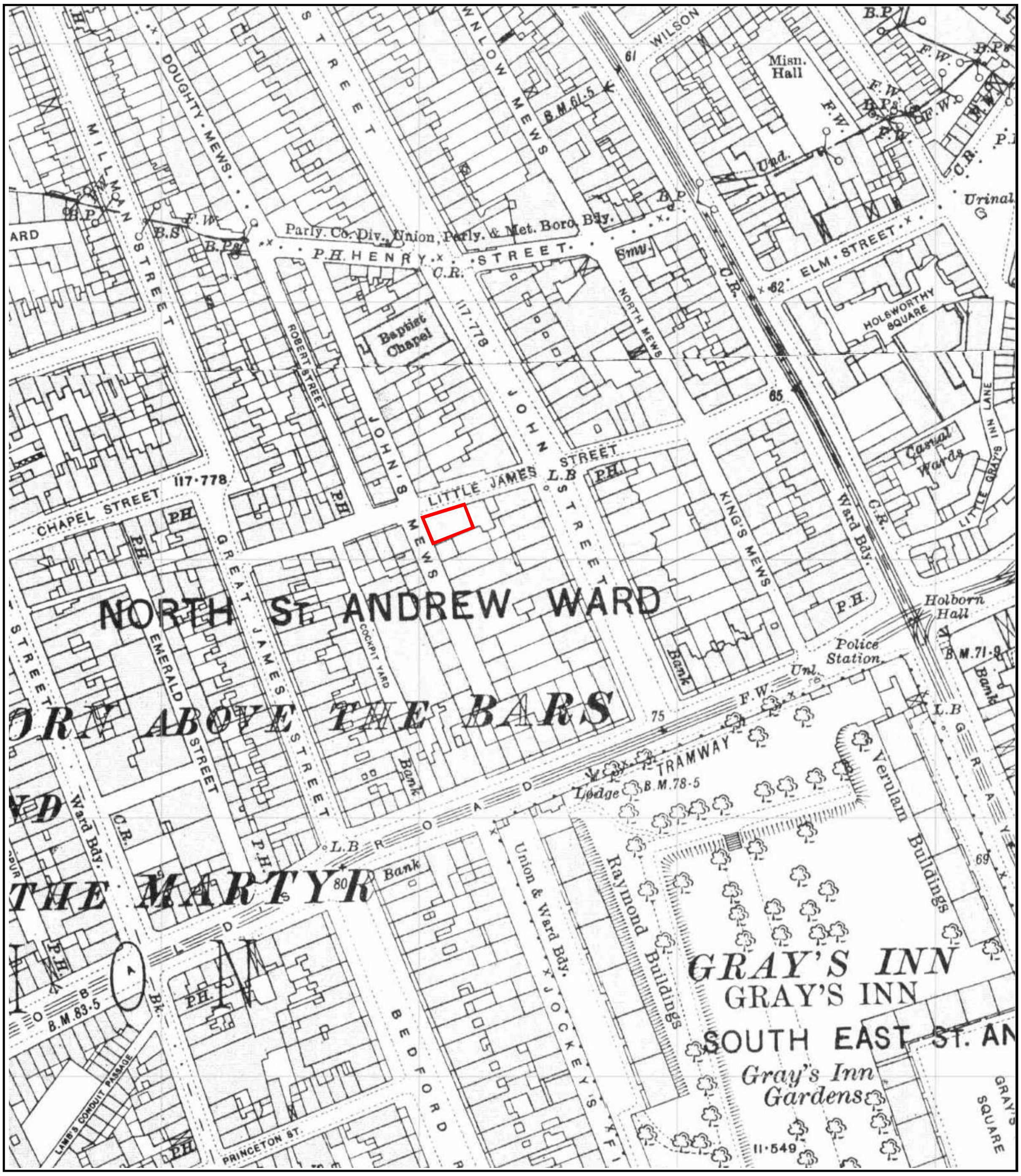
Site History

Figure L

Reproduced from the **1916** edition Ordnance Survey sheets **London V.6 & V.10** at **1:2500** scale with the permission of the Controller of Her Majesty's Stationery Office, © Crown Copyright. All rights reserved. Licence number AL100005523



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Client : Colin Fraser

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Peterborough Tel : 01733 566566

Project No.
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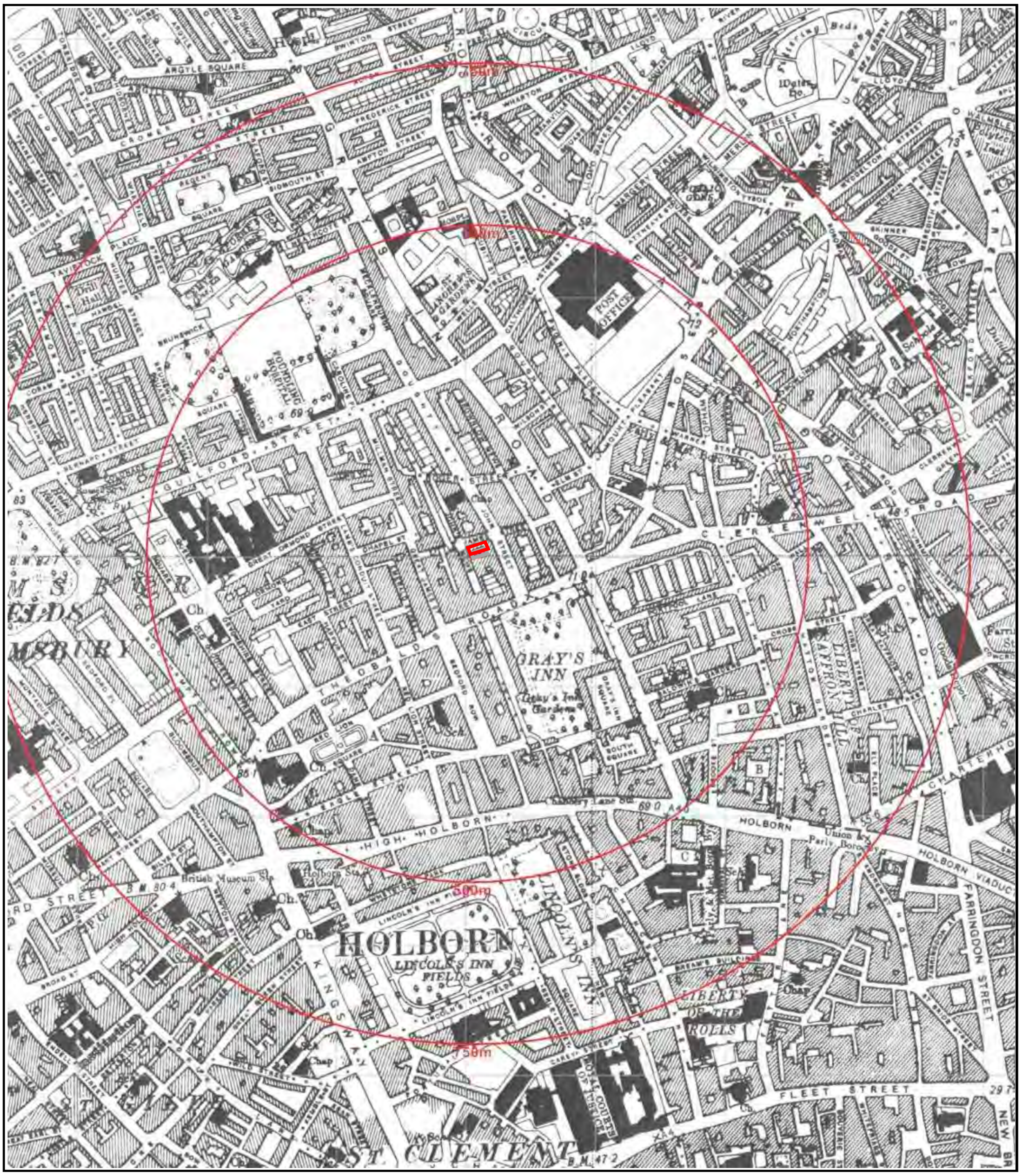
Site History

Figure M



Project : 25 John's Mews, London WC1

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Project No. C14983