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40 GROSVENOR GARDENS, SW1W 0EB

Structural Engineer's Structural Methodology Statement for Planning

January 2021

Issue P2

Status	Revision	Issued For	Date	Author
PRELIMINARY	ISSUE P1	PLANNING	05.10.20	TH
PRELIMINARY	ISSUE P2	PLANNING	08.01.21	TP

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CONTENTS

1.0 INTRODUCTION

This report presents Michael Barclay Partnership's proposals, as Structural Engineer, for the refurbishment of the property at 40 Grosvenor Gardens, and:

- records the design criteria and performance parameters to which the new structure has been designed;
- reports on investigations and studies that have been carried-out;
- details our proposals and specification for the structural works;
- forms the Structural Methodology Statement, (SMS), required by the Borough of Westminster at planning stage.

1.1 THE BRIEF

Our proposal is based on the planning drawings prepared by Orbit Architects, the Client's brief and design discussions with the project team.

1.2 EXECUTIVE SUMMARY

This report addresses the planning requirements imposed by WCC that are set out in the borough's current and policy guidelines:

- The Desk Study can be found in Appendix A of this report;
- The Existing load paths and quantum of load essentially remains the same;
- The alterations do include minor work to the foundations;
- The Existing fabric is investigated through an opening up survey. The results of this will inform the structural design;
- The engineering design has used the restrictions imposed by the original fabric of the listed building. Some areas have been repaired or strengthened to suit the new layouts;
- Flood Risk is discussed within the Desk Study in Appendix A;
- The primary structure of the property is maintained in place throughout the works, and therefore there is no risk to the property through reduced robustness or stability.

2.0 THE SITE

2.1 LOCATION

40 Grosvenor Gardens is situated on a one-way street on the west side of Grosvenor Gardens. The property is in the Grosvenor Gardens Conservation Area and is part of the Grosvenor Estate in the London Borough of Westminster at the postcode SW1W 0EB.

The property shares a party wall with No 38 Grosvenor Gardens to the north and with No 42 Grosvenor Gardens to the south.

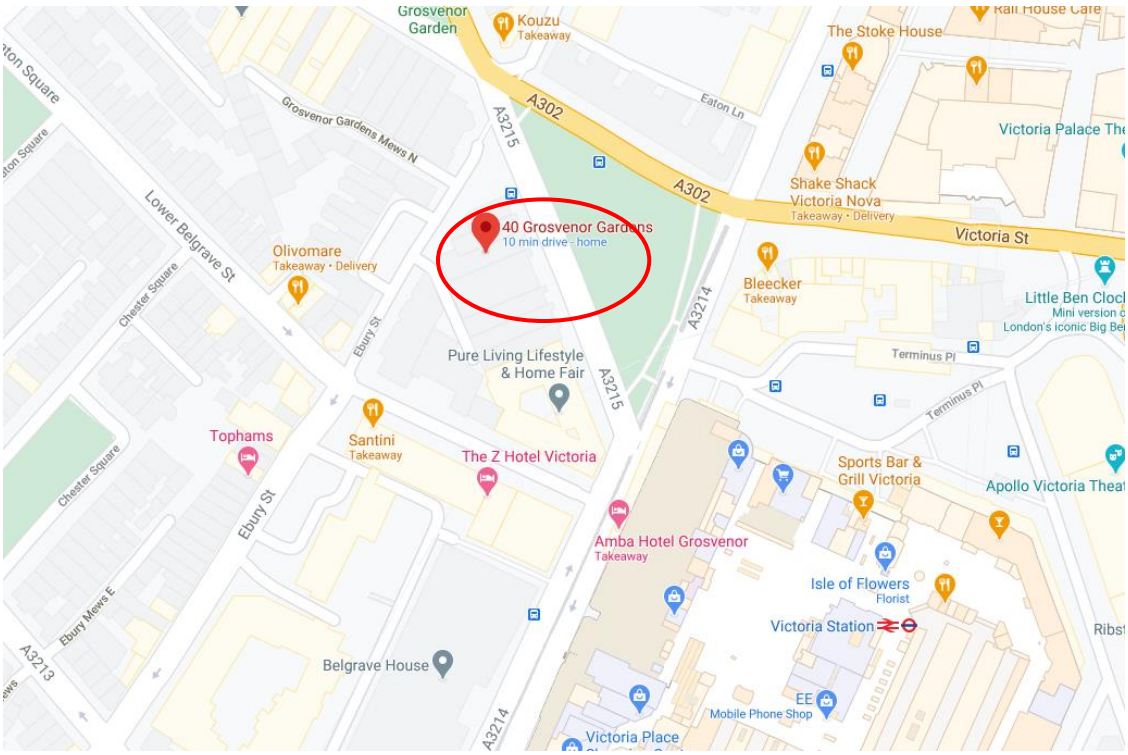

Figure 1: Maps showing the location and surrounding of the property.

2.2 DESK STUDY AND SITE HISTORY, REFER TO APPENDIX A

A separate Desk Study has been prepared by Michael Barclay Partnership and is included in the planning submission and as Appendix A to this report.

2.3 SITE GEOLOGY

The Desk Study shows that generally in this area the sites have some made ground overlying Kempton Park Gravel sitting on London clay. The London Clay then extends to a considerable depth of approximately 30 m. The water table is expected to be below the proposed excavation level.

2.4 BOUNDARIES AND ADJOINING STRUCTURES

The property shares a party wall with No 42 Grosvenor Gardens to the south and with No 38 Grosvenor Gardens to the north.

3.0 OVERVIEW OF THE PROPOSED SCHEME

3.1 Existing Structure and Recent Alterations

The existing structure of 40 Grosvenor Gardens comprises of external walls which are load bearing masonry, with suspended timber floors and internal load bearing stud walls.

There are masonry vaults on the street elevation at Basement level, and in one bay of the mews property. These vaults are separated from the main elevation of the property by a lightwell.

The property has been modified in the past, including insertion of the lift shaft. We have some historical information but will augment this with site investigation works to be carried out post planning.

3.2 Proposed Structural Alterations

3.2.1 The existing mews house at the rear of the property has a workshop at basement level and offices at the upper levels. The link between the ground floor levels and the basement is via a very tight and steep staircase. This is to be improved in the proposals with a new staircase structure, within the current covered lightwell, being installed. This will require minor structural alterations in the rear elevation of the mews at ground floor level, and a new foundation at basement level.

3.2.2 The mews house basement workshop will be made more open and converted into office accommodation, two of the internal walls that support the brick vaulted ground floor will have structural steel frames installed to facilitate this. The upper levels of the mews will also have minor alterations to improve the layout of the spaces and the staircase up to the first floor.

3.2.3 The existing covered lightwell at the rear of the property between the closet wing and the mews will be replaced. The new covering will include for the new staircase mentioned in 3.2.1. The lightwell covering will include a terrace at the rear elevation of the main property.

3.2.4 At the upper levels there are minor alterations to the layout of the internal partitions.

3.2.5 Also at the upper levels there will be a new service riser required on the back wall surface of the existing lift shaft. Structurally the lift shaft is not an original feature and its installation would have required the original floor structures to be trimmed onto the lift shaft construction. The orientation of the service riser will be in the direction of the joist span therefore utilising the space between joists and minimising the loss of original fabric.

3.2.6 At roof level the space between the two roof ridges will be linked with a new flat roof, incorporating roof lights. A new structure will be required to support the roof loads and transfer them back to the primary structural lines. This new covering will provide additional accommodation at the floor below. New timber joists and beams will be provided to support these loads.

3.2.7 An extension of the existing lift shaft to the fifth floor level is proposed.

3.3 Investigation findings

Investigation work has been carried out to further establish the existing structural arrangement at 40 Grosvenor Gardens. In respect of the property's listed status, localised opening up works have been conducted in a sensible and careful manner to ensure minimal damage to the existing fabric of the building. Whilst the structural alterations are relative minor, the proposed interventions will be sympathetic to the original fabric of the building.

3.3.1 Fifth floor

The opening up works at this level demonstrate that the existing floor joists span parallel to the main elevation of the building. The floor build-up consists of the following: carpet and lino tiles generally over 22mm thick floorboards over 220mm deep floor joists. There is approximately 30-40mm of void from the underside of the floorboards to the top of the pugging. The pugging is approximately 40-50mm and is suspended between the floor joists.

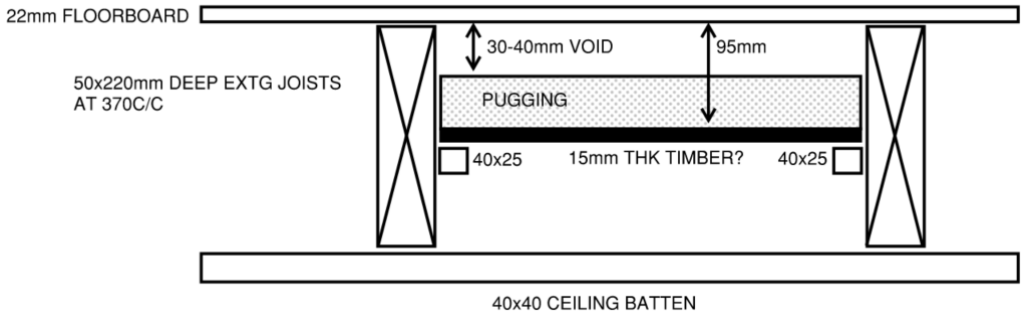

Figure 2: Typical floor build-up at fifth floor level

The central hall wall which runs parallel to the staircase is identified as a structural timber stud wall that is proposed to be retained and if necessary, can be re-used to provide support to the new roof, as it already performs that function.

A new service riser is proposed on the back wall surface of the existing lift shaft. The orientation of the riser is in the same direction as the span joists and therefore will have minimal disruption to the listed fabric. Investigations at the proposed riser location identifies a steel beam spanning beneath the lift shaft walls in the direction of the joists. The space between the first adjacent joist and the lift shaft is measured at 230mm width. The riser void can be achieved by trimming one or no joists, the cut joist will then be re-supported using a new trimmer joist.

A new fifth floor lift extension is proposed and can be constructed in a similar structural form as the levels below i.e. structural steel beams supporting shaft walls above. The new lift extension will be within the new roof structure and therefore creating minimal disruption to the existing retained roof structure.

Photo 1: Opening up at proposed riser location at fifth floor showing steel beam supporting lift shaft and span of joist

3.3.2 Fourth floor

The opening up works at this level demonstrate that the existing joist spans are parallel to the main elevation of the building. The floor build-up at this level is similar to that of the fifth floor. Furthermore, the opening up works identify that the wall separating the front two offices is of timber stud construction with the floor joists running underneath the walls. The wall does not appear to have a bottom structural chord and therefore is unlikely to perform as a truss wall at this level.

Regarding the new service riser at the lift shaft, the space between the first adjacent joist and the lift shaft is measured at 290mm width. The riser void can be achieved by trimming one or no joists, the cut joist will then be re-supported using a new trimmer joist.

3.3.3 Third floor

The opening up works at this level demonstrate that the existing joist spans are parallel to the main elevation of the building. This establishes that the spine wall does not support any floor loadings and only supports the weight of itself and the spine wall above, all of which is constructed in timber. The proposed structural interventions will be sympathetic to the original construction of the wall i.e. using timber framing as illustrated below to create the proposed opening.

Photo 2: Opening up flooring at third floor level

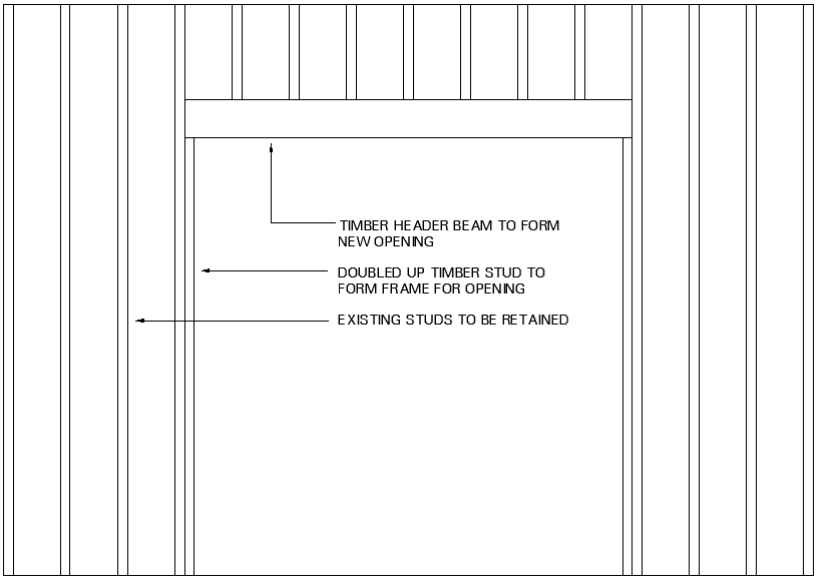

Figure 3: Typical proposed opening formed in timber construction

The third floor build-up consists of the following: carpet over lino tiles generally, approximately 15-18mm of over boarding, 22mm original floorboards, 40mm deep void between underside of board and pugging and 40-50mm of pugging suspended between joists. The existing joist width varies on this floor and are generally in a good condition. Overboarding is generally observed throughout the building with the exception of the fifth floor, fourth floor and mews house.

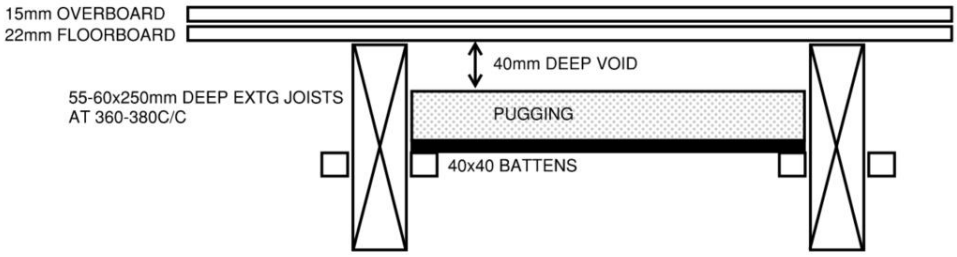

Figure 4: Typical floor build-up at third floor level

Further opening up works identify that the wall separating the front two offices is timber stud construction with the floor joists running underneath the walls. The wall does not appear to have a bottom structural chord and therefore is unlikely to perform as a truss wall at this level.

Regarding the new service riser at the lift shaft, the space between the first adjacent joist and the lift shaft is measured at 290mm width. The riser void can be achieved by trimming one or no joists, the cut joist will then be re-supported using a new trimmer joist.

3.3.4 Second floor

The existing joists span parallel to the main building elevation i.e. from party wall to party wall and is consistent with the structural philosophy of the floors described above. This demonstrates that the spine wall does not bear any floor loading and the proposed opening can be formed with minimal detriment to the originally intended

load-path, refer to Figure 3. Once again, the interventions will be sympathetic to the original construction i.e. using timber construction to match that of the existing.

The wall separating the front two offices which runs parallel to the Party Wall may be load-bearing. The investigative work has identified the presence of an original timber beam measured at 200x290mm deep which runs under this wall. The opening up also establishes the absence of a kingpost and diagonal bracing members and therefore this wall is unlikely to perform as truss wall at this level. Refer to Photos 4 and 5.

Photo 4: Primary timber beam below wall

Photo 5: Removal of finishes to expose structure in wall

In terms of the new service riser, the space between the first adjacent joist and the lift shaft is measured at 340mm width. The riser void can be achieved by trimming one or no joists, the cut joist will then be re-supported using a new trimmer joist.

3.3.5 First floor

The proposals at this level are to remove the internal partitions separating the existing front offices. As can be seen from the photos below, these walls are clearly non-structural given that they divide what appears to be an original single front room, refer to photos 6 and 7.

Photo 6: Internal partition separating front offices at first floor level

Photo 7: Internal partition separating front offices at first floor level

The joist spans and floor build-up are generally consistent with the floors above. Again, this means that the spine wall is non-structural. The proposed opening can be constructed with minimal detriment to the originally intended load-path. The interventions will be sympathetic to the original construction i.e. using timber construction to match that of the existing.

Regarding the new service riser at the lift shaft, the space between the first adjacent joist and the lift shaft is measured at 50mm width. The riser void can be achieved by trimming two or less joists, the cut joist will then be re-supported using a new trimmer joist.

3.3.6 Mews

Local opening up of the mews at first floor identifies existing timber joists to span back to front. The joist depths are generally 250mm deep with traditional herringbone strutting to provide lateral restraint, refer to Photo 8. On investigation the roof is formed of a series of trusses which span from the back wall to the front wall, see Photo 9. It can be assumed that the two central walls are only providing support to the stair and stair void. In the proposals, the stair void will be infilled using matching timber joists and the loads will be taken back to the main load-bearing lines i.e. front and back walls. The removal of the staircase walls will generally not affect the roof structure.

Photo 8: Local opening up at first floor level in Mews

Photo 9: Photograph of truss roof in loft spanning back to front

A large timber beam is identified over the top of the ground floor rear opening. The first floor level joists are supported onto this beam, see Photo 10. This existing beam is proposed to be retained and if required repairs or strengthening will be carried out on the element insitu.

Photo 10: Opening up of junction between first floor joists and rear timber beam lintel

No overboarding was found in the mews and investigations were limited due to potential hazardous materials within floor zone.

4.0 DESIGN AND PERFORMANCE PARAMETERS

4.1 OCCUPANCY LOADS

The new structure elements have been designed in accordance with current British Standards, Codes of Practice and Building Regulations. The general design imposed loads for the buildings are as follows:

Category	Use	Uniformly distributed load* (kN/m^2)	Concentrated load* (kN)
B	Offices for General Use	2.5	2.7

* defined by BS6399: PT 1

4.2 ENVIRONMENTAL LOADS

The building new basement structure has been designed to support loads from the wind in combination with the occupancy loads scheduled above.

The wind net lateral load onto the structure was determined as 0.60kN/m^2 based on a worst case south-westerly wind direction.

4.3 SURCHARGE LOADS

The traffic surcharge for the design of the proposed retaining walls along the pavement was defined by the Transportation and Highway department of Westminster City Council two loads to be considered separately:

- A nominal live load of 10kN/m2 onto the carriageway, to the side of the retaining structure
- A wheel load of 100kN, over a 300x300mm2, applied onto the street 600mm from the face of the retaining wall or onto the pavement.

4.4 PERMISSIBLE DEFLECTIONS

The design of new constructional steel and reinforced concrete elements will limit deflection and displacement in accordance to the following criteria:

Steel Elements			
	Limit – under full load	Limit - under full load for stone finishes	Limit - under full load where supporting walls
Simple Beams	Span / 360	Span/750	Span/500
Cantilever Beams	Span / 360	Span/750	Span/500

The above criteria must be read in conjunction with any performance specifications produced by MBP for individual works packages.

4.5 PROTECTION OF ADJACENT PROPERTIES

The structural works to be carried out within the property of 40 Grosvenor Gardens are minor in nature and when executed by a competent contractor will not have a detrimental impact on the adjacent properties.

4.6 FIRE RATING

The structure is designed and detailed to achieve the minimum period of fire resistance required by Approved Document B, Table A2. This will be controlled and set out by the approved inspector, i.e. 60 minutes for load-bearing, structural elements (beams columns and upper floor plates).

4.7 DURABILITY

The design life of the new elements in the property is taken as a minimum period of 60 years. This falls into category 4 in Table 1 of BS 7543/1992: Durability of Buildings and Building Elements, Products and

Components, and corresponds to a 'normal' category of building, which includes new housing and high-quality refurbishment of public buildings.

4.8 DISPROPORTIONATE COLLAPSE

The Listed Building will not be extended or altered in such a way as to change the existing condition.
It is a traditionally constructed property with timber elements bearing onto loadbearing masonry and timber walls.

4.9 SITE CONSTRAINTS

Grosvenor Gardens is a one-way road with double red line restrictions on both sides of the road.

A detailed strategy will be developed in conjunction with the Contractor to provide an efficient management of the construction traffic and use of the space available on site for storage of materials.

4.10 DESIGN CODE AND STANDARDS

The following documents are used:

- BS648 - Schedule of Weights of Building Materials
- BS6399: Pt 1 - Code of Practice for Dead and Imposed Loads
- BS6399: Pt 2 - Code of Practice for Wind Loads
- BS6399: Pt 3 - Code of Practice for Imposed Roof Loads
- BS5268: Pt 2 - Code of Practice for Structural use of Timber
- BS5628: Pt 1 - Code of Practice for Structural use of Masonry
- BS5950: Pt 1 - Design of Steel Structures
- BS8002: Pt 1 - Code of practice for Earth Retaining Structures
- BS8004: Pt 1 - Code of Practice for Foundations
- BS8110: Pt 1 - Structural Use of Concrete
- The Building Regulations 1991 - Approved Documents A, B, C, E, H, K & N

5.0 CONSTRUCTION HAZARDS

The proposed construction has standard materials and components and is of common form within the construction industry. Nevertheless, MBP will produce a separate document that will be developed as the detailed design proceeds

6.0 SPECIFICATION

The proposed construction materials, components, workmanship etc. will be specified using the National Building Specification documents and a separate performance specification. Those sections that MBP will schedule for planning stage are:

Excavating and Filling	D20
In situ concrete construction generally	E05
In situ concrete mixes, casting and curing	E10
Formwork for in situ concrete	E20
Reinforcement for in-situ concrete	E30
Worked finishes to in situ concrete	E41
Structural Steel Framing	G10

Carpentry/Timber Framing/First Fixing	G20
Intumescent coatings for fire protection of steelwork	M61
Holes/chases/covers/supports for services	P31

It is Michael Barclay Partnership's practice to specify materials and construction-practices that do not cause undue harm to the environment. For example, timber used in temporary and permanent works must be obtained from a certified sustainable source, and be identified as such. The paint specification will avoid red lead, zinc chromate or coal-tar content and have a low solvent (VOC) content and offer manufacturers with an Environmental Policy in operation. The Contractor will be encouraged to use Portland cement replacement materials for the reinforced concrete elements.

As the property is on The Grosvenor Estate, the design and execution of the proposed works, so far as applicable, will be carried out in accordance with The Grosvenor Specification.

7.0 RECYCLING

The manufacture of concrete can involve many recycled materials through the use of cement substitutes and recycled aggregates. In the UK almost all reinforcement bars used in construction is made from recycled steel. While structural steel uses iron ore, which is extracted by a very energy-intensive process, the formation of reinforcement steel uses much less heat, to only melt and reform the source metal, which requires less than half the energy of that for manufacturing structural steel.
Concrete arising from demolished structures is 100% recyclable, although the extraction process means only 70-90% is currently recovered. Reinforcement is separated to be recycled 100% (often into more reinforcement) and the concrete crushed to become, amongst other things, sub-base and compacted fill beneath foundations, roads, railways and runways as well as aggregate in new concrete.

MBP specified the use of recycled aggregates where possible; moreover this building, when it comes to the end of its life, can therefore be expected to be highly recycled, i.e. the concrete, blockwork, steelwork and timber should all be extracted and re-used in some form.

8.0 DESIGN PORTION SUPPLEMENT

The following elements of the structure and cladding will, where required, be designed by the fabricator/supplier/manufacturer and will therefore require a Design Portion Supplement:

- Any precast concrete elements.
- Fixings for lift shaft guide rails
- Staircase installations

9.0 APPENDED DOCUMENTS

The following documents are appended to this report:

A Michael Barclay Partnership Desk Study Report

Report Prepared by:

Thean Phuah MEng
For Michael Barclay Partnership LLP
Date: 08.01.21

Report Checked by:

(Principal) Tony Hayes BSc (Hons) CEng MIStructE
For Michael Barclay Partnership LLP
Date: 08.01.21

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Structural Engineer's Desk Study for Planning

October 2020

Issue P1

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1. PREAMBLE

This report has been prepared by Michael Barclay Partnership LLP (MBP) on the instructions of West End Investments (Cowell Group) Ltd, and for the sole use and benefit of, the Client.

MBP shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. If the Client wishes to pass copies of the report to other parties for information, the whole of the report should be copied. No professional liability or warranty is extended to other parties by MBP as a result of permitting the report to be copied or by any other cause without the express written agreement of MBP.

2. TERMS OF REFERENCE

MBP has been appointed by the owner of the property to undertake a desk study and assess the feasibility of undertaking minor internal structural alterations including removal of partitions, modifications to the mews house, and the infill between the roof slopes to provide additional floor space at the top floor of the property.

3. INTRODUCTION

MBP has been appointed to provide a design for alterations and strengthening of the structure at 40 Grosvenor Gardens. The current proposal is set out on the architects planning drawings and does not change the load paths and primary structures of the listed property. No 40 Grosvenor Gardens is a single building arranged as offices, within a terrace of similar buildings.

The aim of this desk study is to identify issues that might impact the structural design and construction of the proposed works. This is a routine process that we go through when embarking on a project of this nature.

4. SITE LOCATION

40 Grosvenor Gardens is situated on a one-way street on the west side of Grosvenor Gardens. The property is in the Grosvenor Gardens Conservation Area and is part of the Grosvenor Estate in the London Borough of Westminster at the postcode SW1W 0EB.
The property shares a party wall with No 38 Grosvenor Gardens to the north and with No 42 Grosvenor Gardens to the south.

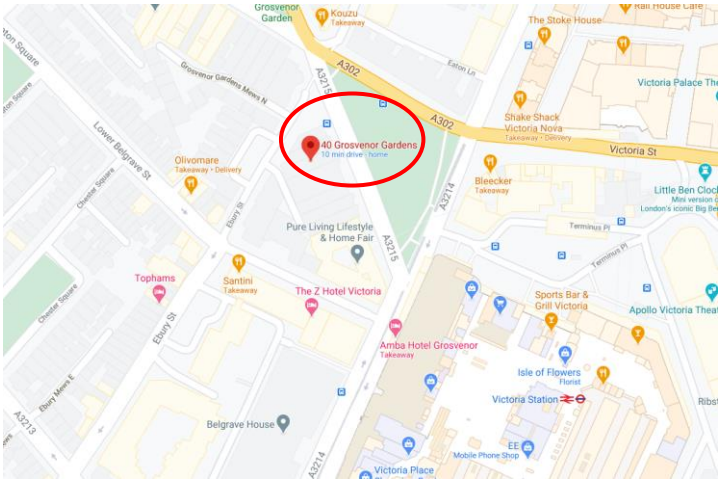

Figure 1: Maps showing the location and surrounding of the property.

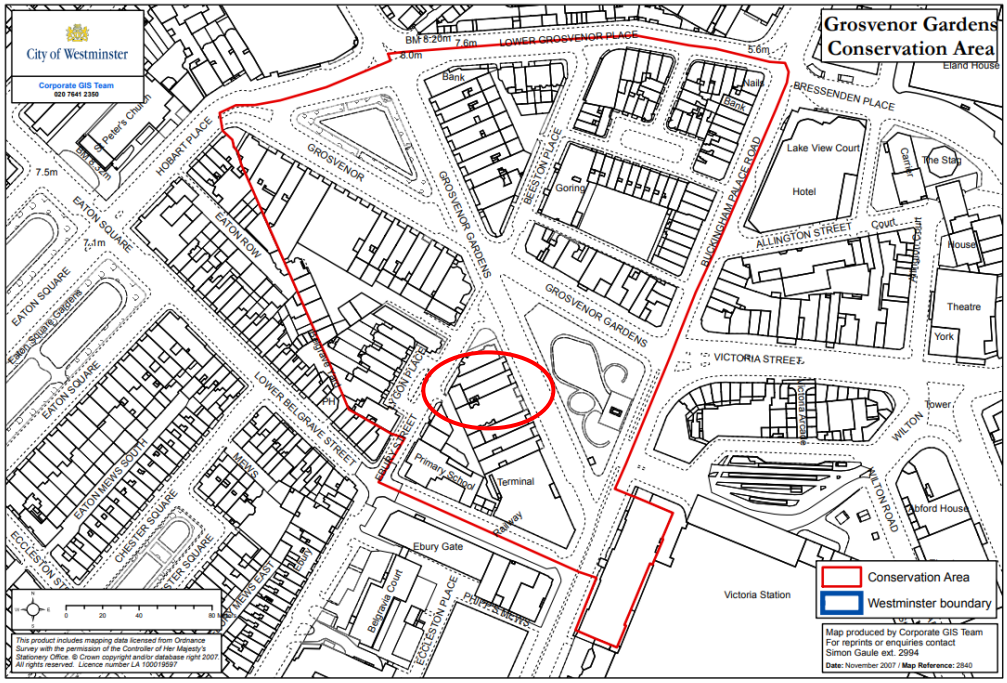

Figure 2: Maps showing the property within the WCC Grosvenor Gardens Conservation Area.

5. SITE HISTORY

5.1 CROSS NEW PLAN OF LONDON, 1850

The map below, Figure 3, is an extract from Cross's New Plan of London of 1850, shows Grosvenor Gardens not yet in existence, although there is development in the area. The street layout is different to todays.

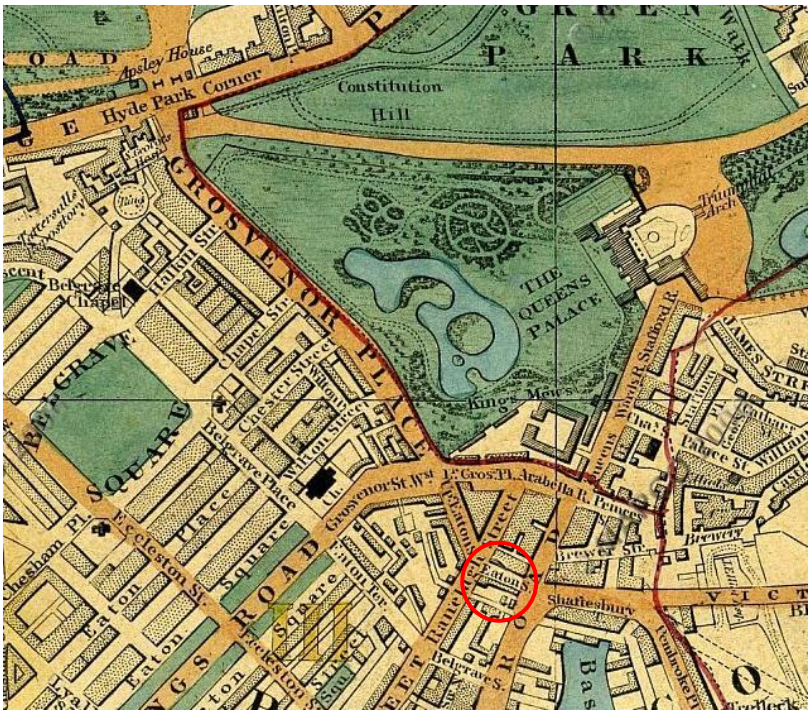

Figure 3: ***Cross New Plan of London, Map Of London c1850***

5.3 STAMFORDS MAP OF LONDON, 1872

A block plan shows the area of 40 Grosvenor Gardens, then Lower Grosvenor, as being developed and of a streetscape similar to todays, shown in Figure 4, on the *Stamfords Map of London 1872.*

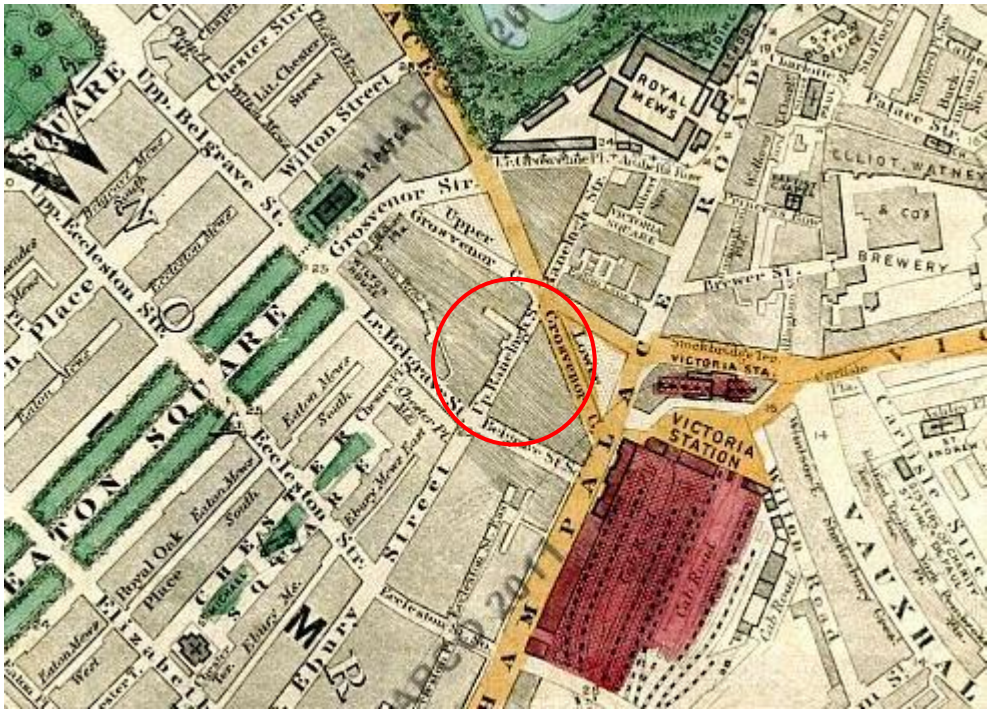

Figure 4: ***Ordnance Survey Map Of London 1875***

5.4 THE BOOTH POVERTY MAP, 1898

The *Booth Poverty Map of 1898,* Figure 5, shows indeed general area as being Upper-Middle and Upper Classes, No 40 being identified as Upper-Middle and Upper Class, Wealthy.

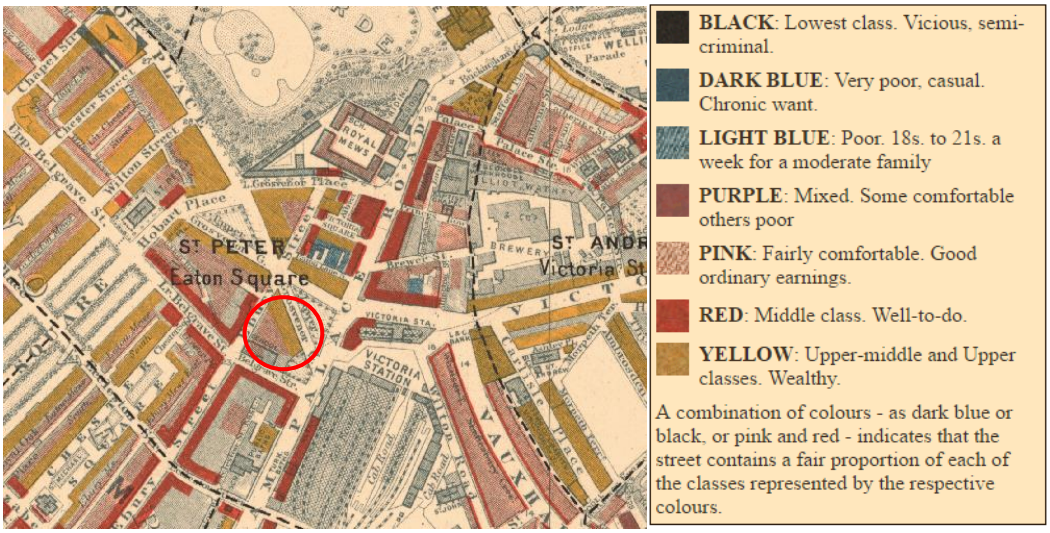

Figure 5: ***Booth Poverty Map*****, 1898**

5.5 WWII BOMB CENSUS MAP

The information provided on this map suggests that no industrial contamination is expected to be found on site. The map below, Figure 6, extract from the *WWII Census Map* (http://www.bombsight.org/), shows one major bombing in the locality of No 40, albeit at a distance from our property. The map suggests that significant structural bomb damage at No 40 is unlikely.

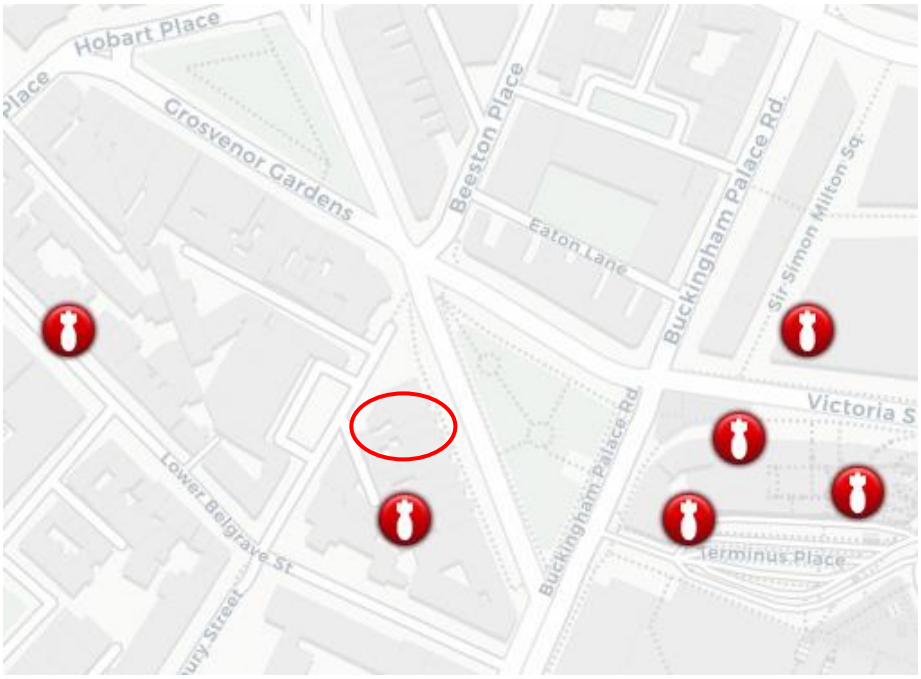

Figure 6: WWII bomb census map, http://www.bombsight.org/

6. UNDERGROUND FEATURES

6.1 LONDON'S UNDERGROUND RIVERS

There are many rivers running under London that feed into the Thames. The closest one, Tyburn, is sufficiently far away from the site (approximately 750 m to have no impact on the proposed development, Figure 7 gives an extract from Lost Rivers of London.

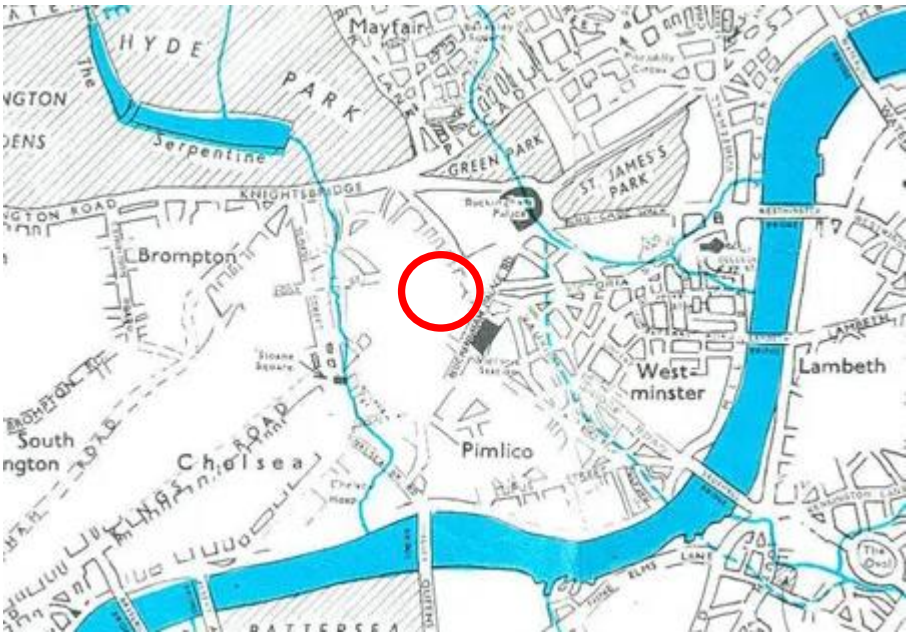

Figure 7: Extract from *The Lost Rivers of London; Nicholas Barton; Historical Publications Ltd, 1982*

6.2 LONDON UNDERGROUND TUNNELS

The map below, Figure 8, shows the site being far enough from any London Underground tunnels. No impact from the underground lines is therefore expected on both the proposed works and vibration issues to the property at 40 Grosvenor Gardens.

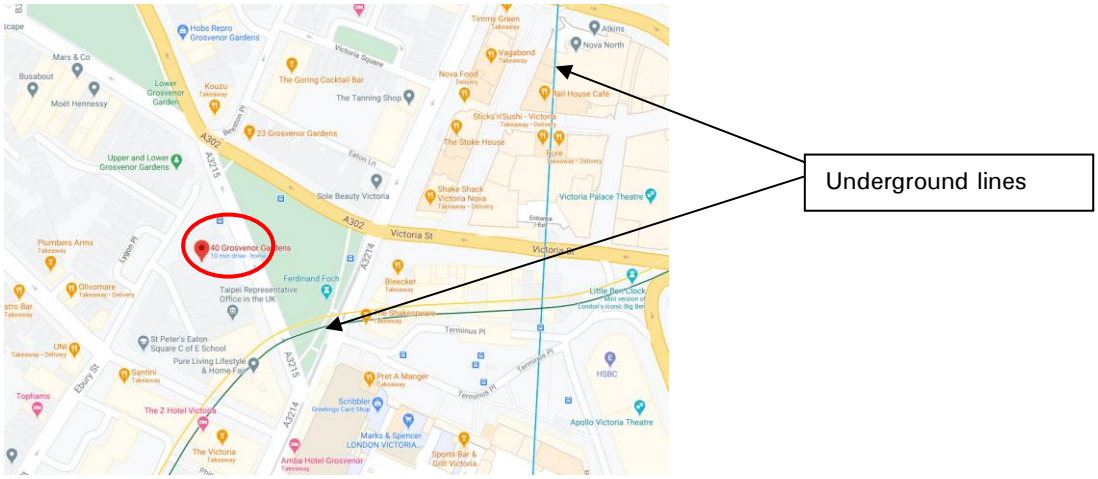

Figure 8: London Underground Lines

7. EXISTING GROUND CONDITIONS

7.1 BRITISH GEOLOGICAL SURVEY

British Geological survey map indicates underlying strata in the area to be Kempton Gravel Formation. The lower boundary of the strata rests with sharp base on bedrock geology, i.e. London Clay. Typical thickness is 8m, can extend locally to 10m. Figure 9 is an extract of the local geology map.

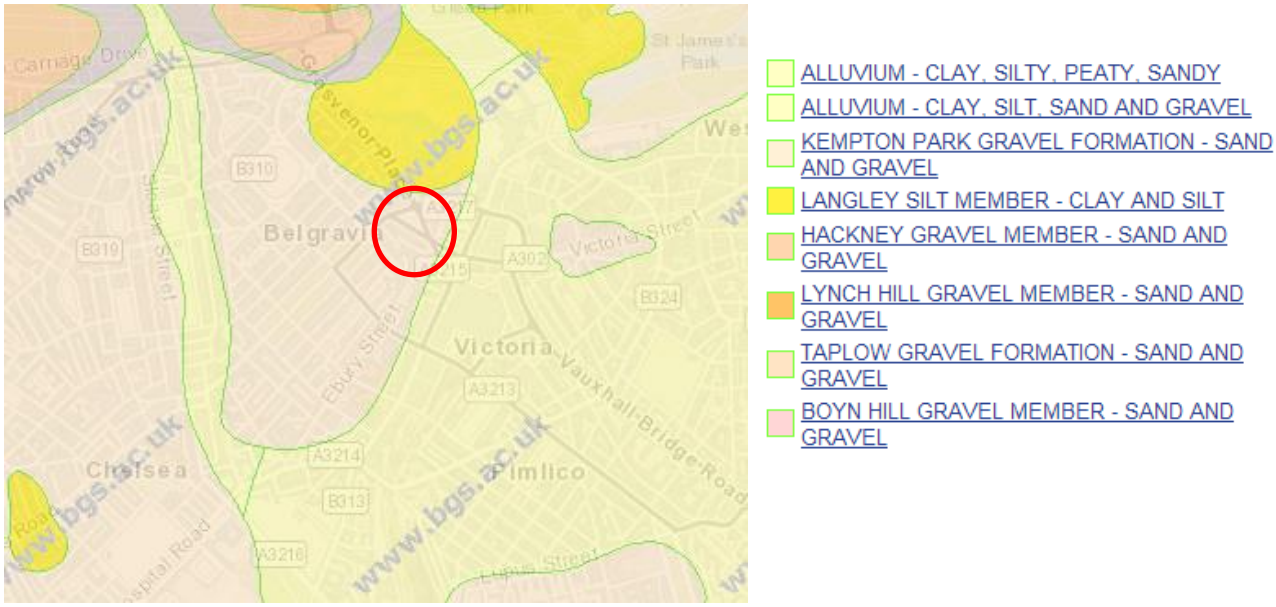

Figure 9: Extract from Geology of Britain viewer

7.2 SITE INVESTIGATIONS DATA

The British Geological Survey has records of several boreholes in the area, although some are restricted. MBP also have records available for sites in Chester Square, Belgrave Square, Eaton Square and Eaton Place.

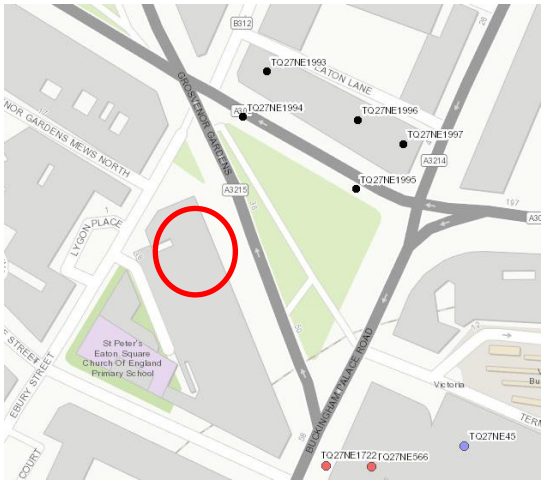

Figure 10: Boreholes location- Extract from BGS website

8. FLOOD RISK

The *Westminster City Councils Residential Basement Report* prepared by Alan Baxter & Associates LLP Consulting Engineer for and on behalf of the Westminster City Council provides initial guidance for the identification of areas subject to flood risk from overtopping and breach inundation (Figure 11) and local surface water (Figure 12), together with an indication of the areas with a significant risk of drains surcharge during heavy rainfall periods (Figure 13).

Figure 11: Overtopping and breach inundation

Figure 12: Local surface water inundation

Figure 13: Critical drainage areas

40 Grosvenor Gardens is in an area associated to very low risk of overtopping or breach inundation and local surface water inundation; however, the property is in a critical drainage area.
There are no planned groundworks or adaptations to the drainage installations that would impact this situation.

9. PROPOSED WORKS

Based on the visual inspections, studies and MBP experience we anticipate that:

- The proposed works will not significantly alter the existing foundations that will be laid within Kempton Park Gravel stratum.
- The water table is below the lowest level of the property.
- London Underground tunnel and underground rivers are far enough from the site to have no impact on any works.

The proposals are for minor alterations to the existing basement structure and minor alterations to the superstructure of the property and therefore there will be no the impact on the subsoil or watercourses.

Report Prepared by:

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Date: 08.10.20