BASEMENT IMPACT ASSESSMENT

For

Former Spiritualist Temple
Rochester Square
London
NW1

Structural Methodology Statement In Support Of Planning Application

21st December 2016
2016061/DS
Rev A – 27.06.17 – Drawings updated

Symmetrys Limited
Consulting Structural Engineers

A: 6 The Courtyard, Lynton Road, London. N8 8SL
T: 0208 340 4041
E: info@symmetrys.com
W: www.symmetrys.com

Contents

Appendices

1. INTRODUCTION

1.1 Symmetrys Limited has been engaged by Spacelab Architects to carry out a structural report relating to the proposed construction of a new four level mixed use development at the former spiritualist temple, Rochester Square, London. It is proposed to demolish an existing masonry building occupying the site and replace it with a four storey building including a single storey basement.

1.2 Our drawings and this report will be included within our client's planning application. Our documents are not intended for, and should not be relied upon by, any third party for any other purpose. Proposed and existing general arrangement drawings were passed to us from Spacelab Architecture.

1.3 This report will only detail the basement construction.

Photo 1 : Bird's eye view of rear elevation

Photo 2 : Bird's eye view of front elevation

1.3 <u>Reference documents</u>
The following documents have been used as guidance to complete this Structural Report:
1, Camden Planning guidance CPG4: Basements and Lightwells – July 2015
2, Camden's Core Strategy CS14
3, Camden Development Policy DP25
4, National Planning Policy Framework: Section 12.
5, The Lost Rivers of London, Nicholas Barton
6, LMB Geosolutions Basement Impact Assessment, Appendix D

2. EXISTING CONDITION

2.1. The existing structure is a double height single storey building of masonry construction with a timber pitched roof which used to be Rochester Square Spiritualist Temple, with a front and rear garden and a single storey extension to the rear.

Deformation of a masonry wall to the eastern boundary has taken place in the past due to the presence of a willow tree and subsequent horizontal forces applied to the footing of the wall from growth of the tree roots and heave of the soil stratum on which it is founded. The tree has since been removed from site.

2.2 Although it is proposed to demolish the existing building, it should be noted that the eastern boundary wall is bowing, and should be repaired as part of the redevelopment works.

3.0 DESIGN PROPOSALS

3.1 The proposal is to construct a new reinforced concrete basement and ground floor slab with load bearing wall construction above ground floor level, see structural drawings in Appendix A.

3.2 <u>Below the ground floor</u>

The proposed structure consists of a reinforced concrete shell below ground with a suspended reinforced concrete ground floor slab.

Due to the presence of ground water on site, it is proposed to construct the basement retaining walls using secant piles and concrete liner walls. The basement slab will be 400mm thick reinforced concrete. The superstructure is likely be load bearing masonry with timber joist floors and roof supported on the 250mm thick reinforced concrete ground floor slab. Please refer to appendix A for structural drawings and 6.0 for suggested sequence of works.

Heave forces from the ground occurs following removal of overlying ground and can cause short and long term deformation of substructure. Referring to LMB Geosolutions report, see Appendix C, there is a potential for long term heave deformation.

The basement structure will also be subject to hydrostatic pressure, and will be designed assuming a groundwater level of 1m below existing external ground level.

A heave protection system will be provided beneath the basement slab which will be designed to withstand the hydrostatic pressures and to transfer the forces to the perimeter retaining walls. These uplift forces will be resisted by the significant dead load of the existing building. Our structural calculations also demonstrate that the existing structure can be safely supported on the proposed secant piled structure within parameters provided by LMB Geosolutions for pile capacities.

3.3 Waterproofing

BS8102 sets out guidance for the waterproofing of basement structures according to their use. Two waterproofing system must be implemented in the construction of basements to be used as habitable spaces. With this in mind the use of tanked, integral and/or drained methods of waterproofing will have to be considered, with the most likely solution being waterproof concrete for the secant piles and liner walls, and a cavity wall drainage system within the structure. This will require a sump and pump drainage system. These items will be considered once a tanking specialist has been employed.

4. SCREENING AND SCOPING MATRIX

Refer to LMB Geosolutions report in appendix D for the screening and scoping matrix. Based on their findings, they undertook a ground investigation assessment and flood risk assessment to determine the impact of the proposed basement.

5. SITE INVESTIGATION AND STUDY

5.1 Desktop Study

The first stage of a site investigation is to develop an understanding of the site and immediate surroundings. LMB carried a desktop study including a site walkover, see Appendix C.

5.2 Ground Conditions

The local geographical survey maps, accessible via the British Geological Society website http://mapapps.bgs.ac.uk/geologyofbritain/home.html?mode=boreholes, indicates that the underlying soil strata, much like the rest of London, is London Clay. Having reviewed the borehole cut in the vicinity of the property on Rochester Square, with the BGS reference TQ28SE4 (see figure 1), stiff clay was confirmed down to 44m.

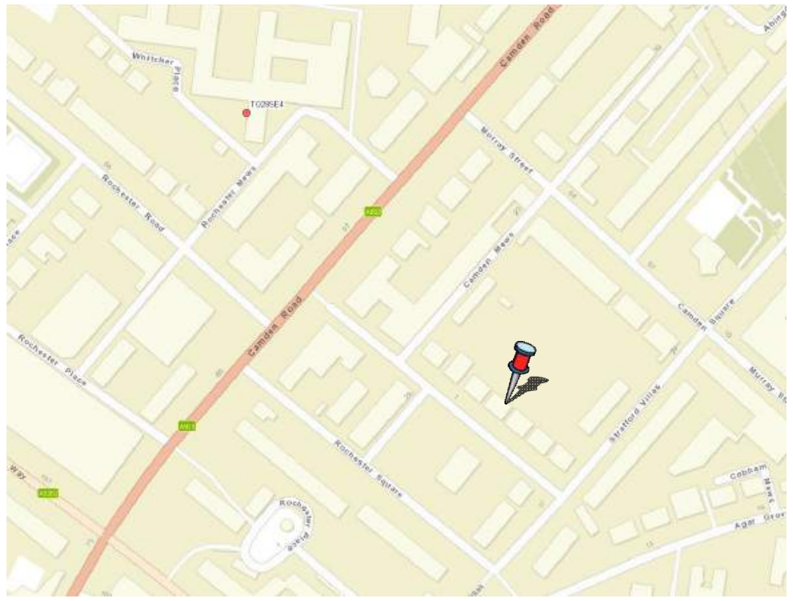


Figure 1 - Historical bore hole log map taken from the British Geological Surveys

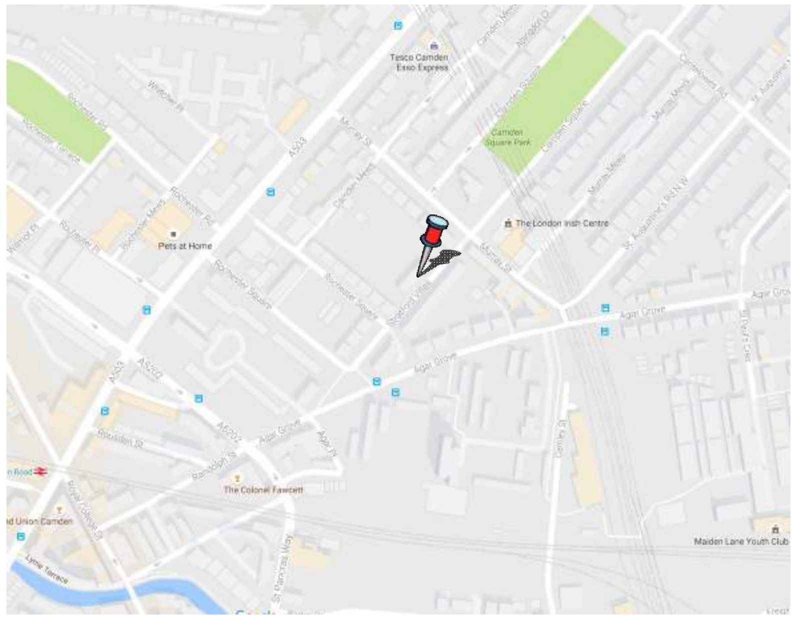


Figure 2 : Map showing local transport tunnels

5.3 Ground Investigation / Opening-Up Works Undertaken:

5.3.1 2No. 15m deep boreholes were cut to the east and west of the site to establish local soil stratum, extract soil samples for testing and install monitoring wells to allow for groundwater monitoring.

5.4 Ground Investigation and Geology

5.4.1 The interpretative report of the site-specific investigation has been undertaken by LMB Geosolutions Ltd in appendix C. The findings and recommendations are described in their report dated December 2016

5.4.2 The ground conditions are summarised as follows:

Borehole 1

G.L to 0.8m	Made Ground
0.8m to 1.75m	Soft becoming Firm Light Brown Clay – Head Deposits
1.75m to 3.65m	Firm Brown to Light Brown gravelly Clay – Head Deposits
3.65m to 8.75m	Firm becoming stiff brown Clay – London Clay
8.75m to 15m	Stiff becoming very stiff dark grey/brown Clay – London Clay

Borehole 2

GL to 0.65m	Made Ground
0.65m to 1.5m	Soft becoming firm light brown to brown Clay – Head Deposits
1.5m to 3.75m	Firm brown to orange/brown very gravelly Clay -Head Deposits
3.75m to 9.5m	Firm becoming stiff brown with occasional orange/brown sandy partings clay – London Clay
9.5m to 15m	Stiff becoming very stiff dark grey Clay – London Clay

5.4.3 Ground Water Monitoring:

Groundwater was recorded during the monitoring and is considered to form a thin but laterally continuous aquifer unit within the Head Deposits over the area of the site.

5.4.4 The report confirms that the safe ground bearing pressure at 4 – 4.5m below ground level should be 140kN/m2.

5.5 Hydrology

Referring to the “The Lost Rivers of London” by Nicholas Barton the closest known watercourse is described to be to the south west of the site approximately 150m away which is known as the Fleet which runs from Hampstead Heath heading southwards. UNDA consulting has undertaken a Flood Risk Assessment for the site, see Appendix E.

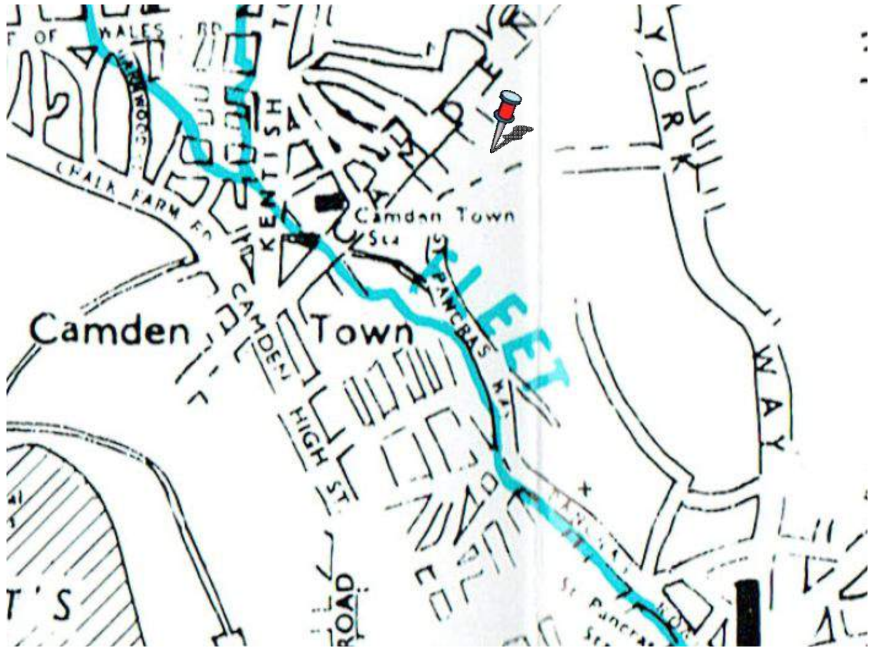


Figure 3 : Extract from the Lost River of London by Nicholas Barton

5.6 Flooding

A Strategic Flood Risk Assessment was carried out as the site is located within a critical drainage area – refer to figure 4.
It is reported in the Flood Risk Assessment that:

- The site is situated with Flood Zone 1 when using the Environment Agency Flood Map for Planning (Rivers and Sea)
- The EA Surface Water Flood Map suggests that the site lies in close proximity to an area of “High” to “Medium” risk of flooding from surface water.
- The risk of flooding posed to the site by fluvial, tidal, groundwater and sewer surcharge flooding would appear to be negligible/low.

5.7 Post completion of the Flood Risk Assessment has been completed the proposed depth of the basement structure has increased by 300mm. This will have no adverse effect on the results of the Flood Risk Assessment.

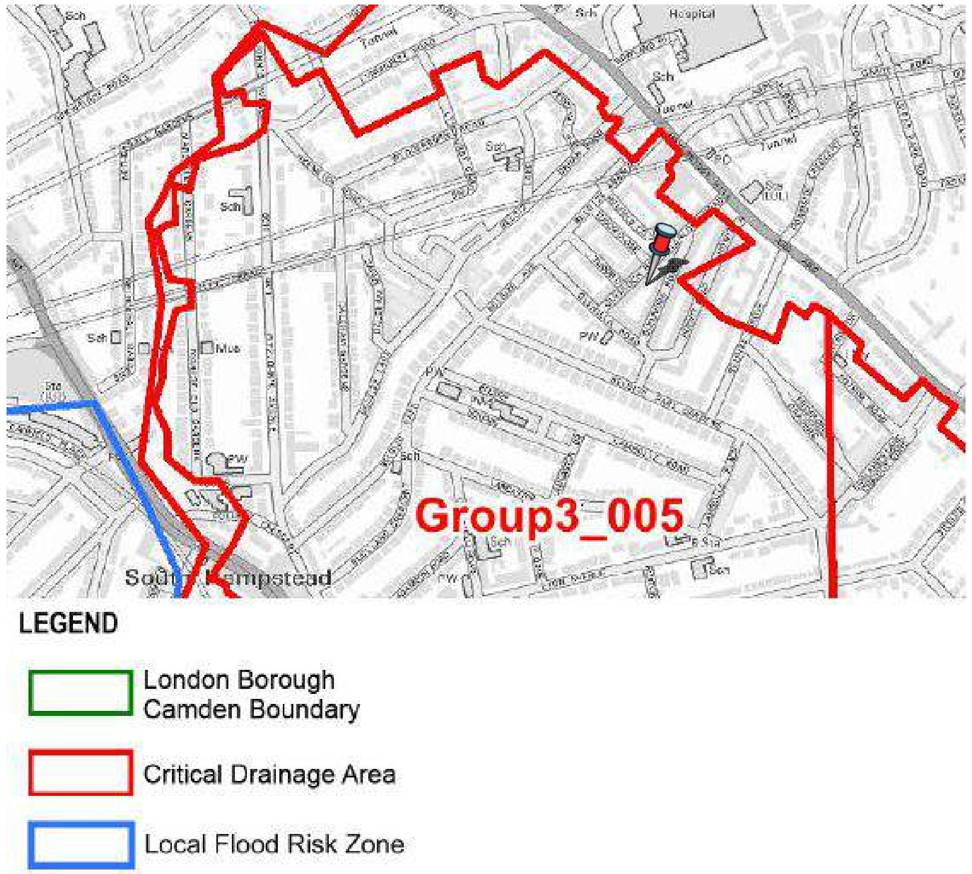


Figure 4 : Extract from Camden Strategic Flood Risk Assessment

6. PROPOSED SEQUENCE OF WORKS

6.1 The structural method statement provided, (see Appendix A), is for the design team's design development and for the client's planning application. The appointed contractor will be responsible for all temporary supports and for the stability of the structure during the works. The method of construction adopted minimises the need for temporary works. However, propping to the pile cap will be required to minimise the risk of ground movement occurring.

To ensure that the retained engineer's intent is correctly interpreted by the contactor, they will be required to submit all temporary works proposals to review a minimum of 7 working days prior to commencing excavation. The contractor should also submit a dewatering strategy to ensure a strategy is agreed should water be encountered.

6.2 Dewatering Strategy

Widely used methods for dewatering are described below. The appointed principal contractor must submit a detailed dewatering strategy to Symmetrys Ltd 14 days prior to commencing works on site.

Local Dewatering- simple sump method

All excavations shall be kept clear of water by submersible pump. Should large quantities of water be encountered, this will be pumped into the existing drainage system using a larger sump pump via a sediment settling tank. Long period of pumping will be avoided and regular inspections of the work area to ensure de-watering is carried out only when necessary,

Jetted Sumps

This method achieves the same objective as the simple sump methods of dewatering but will minimise the soil movement associates with this and other open sump methods. A borehole is formed in the subsoil by jetting a metal tube into the ground by means of pressurised water, to depth within the maximum suction lift of the extract pump. The metal tube is withdrawn to leave a void for placing a disposable well point and plastic suction pipe. The area surrounding the pipe is filled with course sand to function as a filtering media.

Other dewatering

Strategies such as grouting and ground freezing are likely to be impractical for a project of this size. However, this is to the discretion of the main contractor.

7. CONSTRUCTION METHOD STATEMENTS

Please see drawings in Appendix A for construction sequence and method statements. A Construction Management Plan has also been undertaken and submitted with this planning application. It contains a draft programme of the proposed works.

8. IMPACT ASSESSMENT

8.1 Stability of Neighbouring Structures

8.1.1 Due to the robust engineering principles and construction method applied, the extent of movement is limited in accordance with British and European codes. We can confirm that the proposed structural design and method of construction of the basement has been developed with a view to ensuring structural safety, and that if constructed in accordance with this document the works will be able to be completed without any adverse impact on the structural stability of the neighbouring properties, other adjacent structures, adjoining land and gardens or the adjoining Public Highway.

8.1.2 The reinforced concrete structure will be designed to accommodate surcharges from the neighbouring property, public highway and ground pressures. The structure will have adequate stiffness to ensure that the lateral deflections do not exceed the appropriate limits recommended by British Standards Codes of Practice in order to ensure that potential ground movements be kept to acceptable limits.

8.1.3 The structures will be designed to transfer horizontal and vertical loads into the ground safely.

8.2 Ground Movement Assessment

8.2.1 Ground movement assessment report has been undertaken by LMB Geosolutions and can be found in Appendix D.

8.2.2 LMB Geosolution's report confirms that the ground movement model predicts movement to fall within category 1 generally and category 2 to the adjacent building based on the new construction being founded on piles. The categories are described in figure 5.

8.3 Figure 2, shows the position of the Northern Line relative to the proposed basement. Due to the tunnels being 520m away, which is considered a significant distance, no consultation with the London Underground Asset Protection team will be undertaken.

Category of damage	Description of typical damage (Nature of repair in italic type)
0	Hairline cracking which is normally indistinguishable from other causes such as shrinkage and thermal movement. Typical crack widths 0.1mm. *No action required*
1	Fine cracks which can *easily be treated using normal decoration*. Damage generally restricted to internal wall finishes: cracks rarely visible in external brickwork. Typical crack widths up to 1mm.
2	*Cracks easily filled. Recurrent cracks can be masked by suitable linings.* Cracks not necessarily visible externally: *some external repointing may be required to ensure weather tightness.* Doors and windows may stick slightly and *require easing and adjusting*. Typical crack widths up to 5mm.
3	Cracks which *require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.* Doors and windows sticking, service pipes may fracture. Weather-tightness often impaired. Typical crack widths are 5 to 15mm, or several of, say 3mm.
4	Extensive damage which *requires breaking-out and replacing sections of walls,* especially over doors and windows. Windows and door frames distorted, floor sloping noticeably*. Walls leaning or bulging noticeably; some loss of bearing in beams. Service pipes disrupted. Typical cracks widths are 15 to 25mm, but also depends on number of cracks.
5	Structural damage which *requires a major repair job, involving partial or complete rebuilding.* Beams loose bearing walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25mm, but depends on the number of cracks.

Important Note. Crack width is one factor in assessing category of damage and should not be used on its own as a direct measure of it. * Local deviation of slope, from the horizontal or vertical, of more than 1/100 will normally be clearly visible. Overall deviations in excess of 1/150 are undesirable.

Figure 5: Building damage categories used by the IStructE and ICE

9. PARTY WALL MATTERS

9.1 The scope of works falls within the Party Wall Act 1996. Procedures under the Act will be dealt with by the client's Party Wall Surveyor. The Party Wall Surveyor will prepare and serve necessary Notices under the provision of the Acts and agree Party Wall Awards in event of disputes. The Contractor will be required to provide the Party Wall Surveyor with the appropriate drawings, method statements and all other relevant information covering the works notifiable under the Act. The resolution of the matters under the Act and provision of Party Wall Awards will protect the interests of all owners.

9.2 <u>Monitoring</u>

It is proposed that the structural stability of the surrounding/adjacent properties is safeguarded by a system of movement monitoring.

The Contractor shall monitor the movements of the elevations of the adjacent properties around the perimeter of the proposed excavation. The monitoring shall be undertaken by a specialist survey company. The monitoring system will have at least the following characteristics:

1) The existing facades of the neighbouring properties as well as the flank wall of the neighbouring building will be monitored near ground level and at roof level, at intervals not exceeding 3m centres.

2) Monitoring points (targets) shall be firmly attached, to allow 3D position measurement, for the duration of the work, to a continuous and uninterrupted accuracy of -/+ 1mm. A suitable remote reference base/datum unaffected by the works will be adopted, one located at least 50m from the site.

3) Points/targets shall be measured for 3D positioning on, at not less than the following intervals:

- Before any works commence (base reading)
- Weekly during the period of basement excavation/construction
- Monthly during the course of the remainder of the works.
- Six months after the completion of all construction works.

4) All measurements shall be plotted graphically, to clearly indicate the fluctuation of time. The survey company shall submit the monitoring results to the Engineer (Symmetrys Ltd) and to the Adjoining Owners Party Wall Surveyors/Engineer within 24 hour of measurement, graphically and numerically.

5) The following trigger levels for movement are proposed for agreement. In the event of a trigger value being reached the Contractor will immediately stop any work that might cause further movement, assess the situation and propose alternative methods for proceeding, with definitive further movement limits for those later steps.

6) Trigger movement limits are proposed as follows:

A) Existing Buildings Horizontal/Vertical movement

Amber	+/-10mm	All parties notified.
Red	+/-15mm	Works reviewed

B) The garden walls and excavation

Amber	+/-10mm	All parties notified.
Red	+/-15mm	Works reviewed

10. DRAINAGE

10.1 The above ground drainage will be subject to invert levels, drained by gravity to the existing combined sewage system. The below ground drainage will be drained to a submersible package sewage station situated below the basement slab which will then be pumped via a rising drain to the nearest available inspection chamber on the existing gravity drainage system. This can then flow by gravity into the existing combined sewage system. To mitigate the risk of back flow suitable measures such as non-return valves will be incorporated into the drainage design.

10.2 There will be appropriate drainage installed to the landscaping on the site. There will most likely be no available space for a typical attenuation system. It is therefore envisaged at this stage that a hydro break chamber and oversized pipes will be utilised as part of the surface water drainage strategy. However, this is subject to review and detailed design stage.

11. SUSTAINABILITY

As the substructure of the proposed extension will involve significant amounts of concrete, cement replacement alternatives should be considered. Cement replacements can used to replace up to 40% of the cement in concrete mix. These replacements are typically waste products from the energy production industry such as PFA (pulverised fuel ash) and GBFS (granulated blast furnace slag) are recycled and not sent to landfill sites. Furthermore this also reduces the amount of cement that needs to be mined. Concrete should be bought from a local supplier to further reduce the carbon footprint of transport.

There is a significant amount of reinforced concrete on the project for which steel reinforcement bars will be required. By specifying reinforcement from a UK supplier it ensures that the reinforcement is made from 100% recycled steel. Any structural steelwork should be sourced from a British manufacturer to ensure that rolled sections are made from at least 60% recycled steel. Sourcing the steel from a local supplier will further reduce the transport carbon footprint.

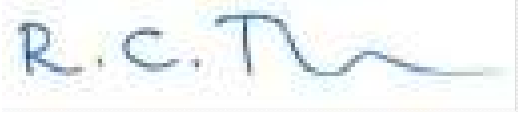
The use of timber as a structural element is to be maximised as timber production actively negates greenhouse gas production. Furthermore all timber is to be FSC certified insuring that the timber is produced from a sustainable source.

12. SUMMARY

12.1 It is essential that a thorough review of all temporary works, contractors' method statements and calculations for these works is undertaken by a suitable qualified structural engineer prior to works starting. The permanent works will also be submitted to Building Control and the necessary Party Wall Surveyors for approval prior to the works commencing on site.

12.2 The proposed works at the former spiritualist temple, Rochester Sqaure have been designed with robust structural principles and methods of construction that are widely used and known. This will ensure the integrity of neighbouring structures and roadways are not compromised during its construction.
This assumed Method Statement and Structural report has been completed by Symmetrys Limited and written by Russell Thomas CEng MIStructE who is the Associate Director of Symmetrys Limited.

David Snaith
BEng(Hons) PGCert Structs
Engineer



Russell Thomas
CEng MIStructE
Associate Director