

# Mace



One Bedford Avenue - construction method statement for foundations and sub-structure.

In relation to condition 10 of planning permission 2013/3880/P

Date: 14 October 2014

Revision A

Prepared by Mace

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## EXECUTIVE SUMMARY

There are two existing buildings on the site which are to be demolished, the basement walls will be maintained.

The works to be carried out involve the construction of a mixed use building, comprising ground floor retail, with commercial office over 7 floor levels. The existing basement will be reconfigured and extended down by approximately 1.5m and laterally beneath the existing loading bay area to the east of the site.

This report has been compiled to discuss the implications of the proposed works on the adjacent London Underground transport infrastructure and to comply with planning condition 10 of the development.

This report demonstrates that the nature and timing of our works will have no detrimental effect on the existing assets of LUL.

## 1. INTRODUCTION

Mace have been awarded the One Bedford Avenue project. With the consultant engineer, Waterman Structures Limited, we have provided this report to comply with planning condition 10 of the One Bedford Avenue scheme and to ensure that the development does not impact on the existing London Underground infrastructure.

The report contains construction method statements for all of the foundations, basement and ground floor structures and other structures below ground floor level, including temporary works piling. Waterman Structures are addressing the design statement.

It specifically contains the following:

- Details on all structures
- How the location of the existing London Underground structures are accommodated within the design
- How potential ground movement arising from the development will be addressed
- How we will mitigate the effects of noise and vibration arising from the adjoining operations.

Waterman Structures will also be supplying technical information from specialist consultants relating to:

- A condition survey of the LUL tunnel
- A ground movement assessment
- A location survey of the tunnel

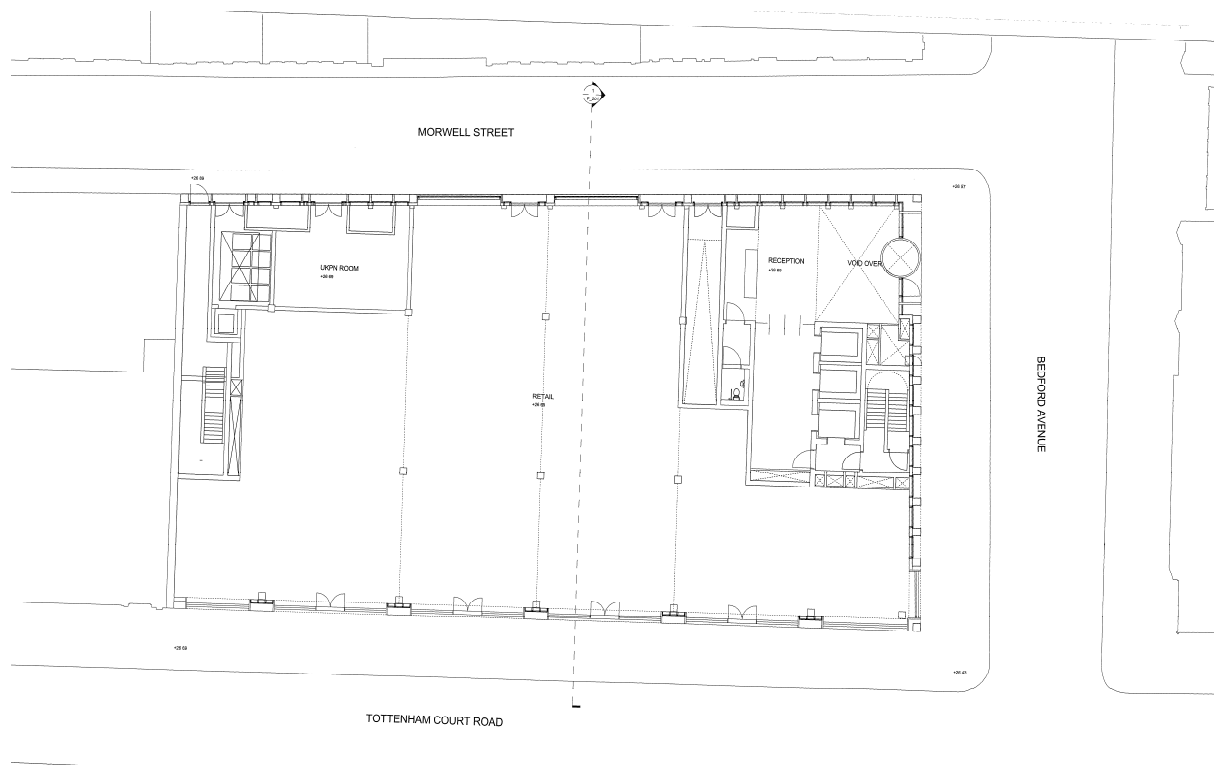
Works on site will comply at all times to Camden Council's Guide for Contractors Working in Camden and the Control of Pollution Act 1974. All work on site will meet BS 5228: Noise Control on Construction and Open Sites.

## 2. PROJECT DESCRIPTION

The project is located at the junction of Bedford Avenue and Tottenham Court Road, London W1T 7RE.

The project entails the demolition of the existing buildings and the construction of an 8 storey building plus single level basement for a mixed use development. The foundations are a raft slab there are no piled foundations. The scheme comprises retail use at part basement and ground floor levels and office use at part ground and first to seventh floors. Associated plant is located on the roof and in the basement.

There is an existing sub-station in the basement of the building which will be retained during the first stage of the demolition phase. It will be replaced with a temporary sub-station during the second stage demolition.



Site Plan

### 3. STRUCTURAL WORKS

The new structure will be steel framing beams and columns supporting composite metal deck concrete floor slabs, ground floor to roof inclusive. Concrete will be normal weight.

Holes will be provided through steel beams so that service and structure are integrated to provide the thinnest overall floor structure.

Set-backs at upper levels and second floor (set-back below) will be supported as transfer girders of heavier weight steelwork.

Horizontal stability of the new structure is provided by reinforced concrete walls in two cores located at either end of the building. Walls are generally located around lift shafts and stair wells.

#### 4. FOUNDATIONS

The Northern Line running tunnels are below Tottenham Court Road. To minimise the risk of vibration/noise transfer from the underground lines, a reinforced concrete raft has been chosen as the foundation solution. The basement raft slab will be lowered by approximately 1.5m below existing. Dig level will be down to approximately 2.8m to accommodate this.

The basement slab will also contain a thickened area to provide support for the tower crane which will be established on site in September 2015.

Walls will be new reinforced concrete retaining walls cast within the existing basement walls, the existing walls being used as back shutters only.

Existing pavement lights and vaults will be infilled.

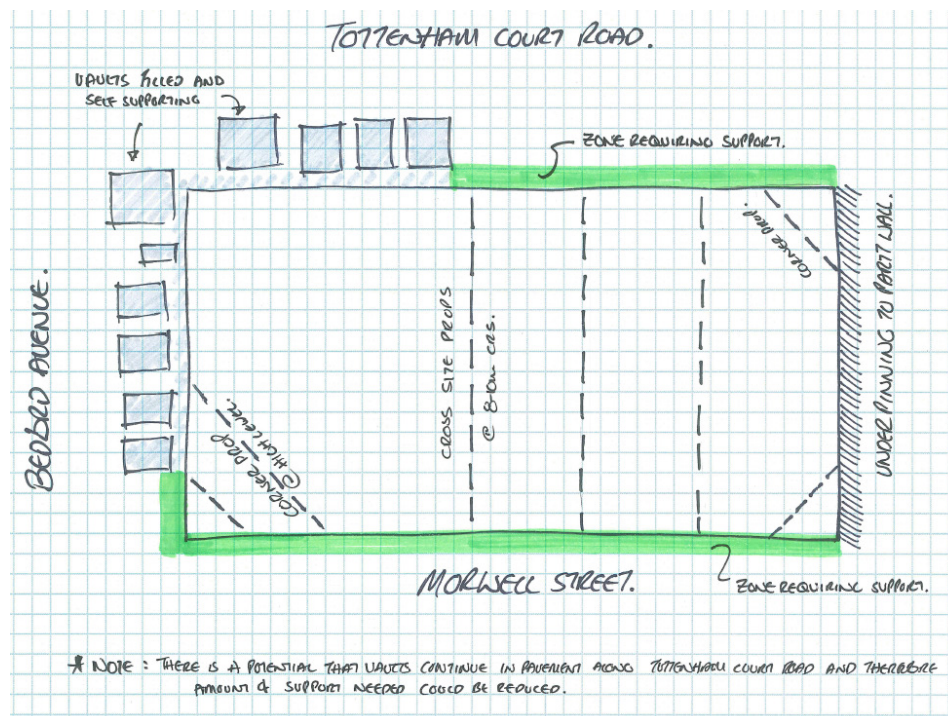
## 5. FOUNDATION SEQUENCE AND TEMPORARY WORKS METHODOLOGY

Consideration will need to be given to the existing basement structure which will be determined following the completion of intrusive structural surveys.

Our preferred demolition sequence and temporary works methodology is as below.

### Outline support requirements around perimeter.

Shown below is the basic support strategy required around the perimeter of One Bedford Avenue and across the site. The existing vaults that have been observed on Bedford Avenue and Tottenham Court Road are generally self-supporting and they should be easily dealt with on site via backfilling. Opening up operations to verify the condition of these vaults will be carried out within the early stages of the demolition, to establish the level of back-filling needed and to establish whether further works within the pavement area are needed.



Further north along Tottenham Court Road it is assumed that there were vaults under the pavement which have either been filled or removed during previous re-working of the site. If they have been retained and filled then there is an opportunity along this elevation to reduce the temporary works as the pavement in this zone should be retained by the vaults.

Morwell Street is unlikely to contain vaults along the site frontage and as such this length of basement will require significant support during the reduced dig construction of the new basement.

Finally the party wall that forms the northern boundary to the site will be underpinned to allow for the deeper basement construction to One Bedford Avenue, at present the design



information presented shows that the neighbours have a basement at a similar level; therefore the new basement construction will provide a simple restraint and underpin of the wall with appropriate monitoring.

We have indicated the across site, and corner propping arrangement that we anticipate, with props at 6-8m centres, waling beams at the perimeter and some corner propping where return portions require less support.

### Donut Slab at Ground and Basement level

Shown on the right is the development of the support methodology discussed above. We would rely on a portion of the existing ground floor slab to be retained and to act as a waler support beam to the head of the basement wall.

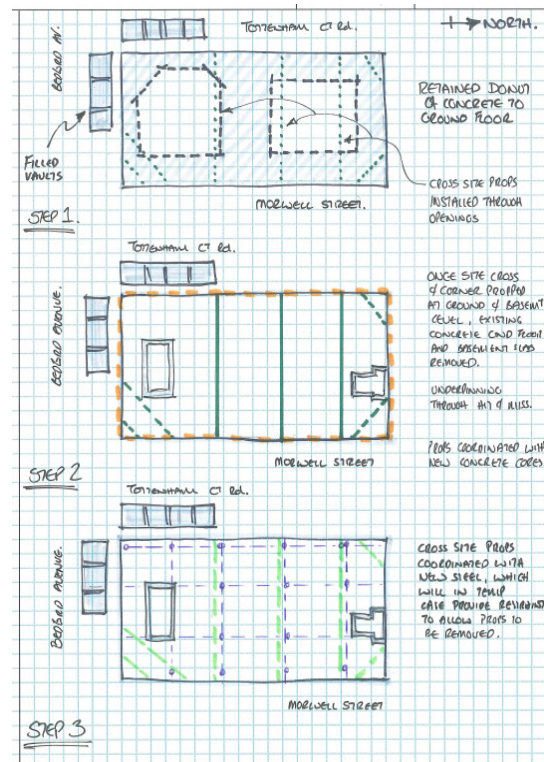
A double donut slab would be used to create openings within the ground floor slab giving access to the basement below for additional demolition. These openings would be coordinated three fold, firstly with the position of existing walls within the substructure of the building that is being demolished, so that these walls can provide temporary support to the waler at this stage.

Secondly the openings would be cut back to allow access into the basement areas, for the installation of cross-site and corner steel props. The size of the opening being maximised so as to allow the props to be lowered into the basement zone.

Thirdly, the opening and thus the props would then need to also be coordinated with the new column positions so as to avoid any clashes with the new steel. As in the final construction the new basement wall will be restrained at its head by the new ground floor slab, the props need to be placed so that the new steels can be installed and the new ground floor constructed around them, prior to their removal.

### Low level sheet piles

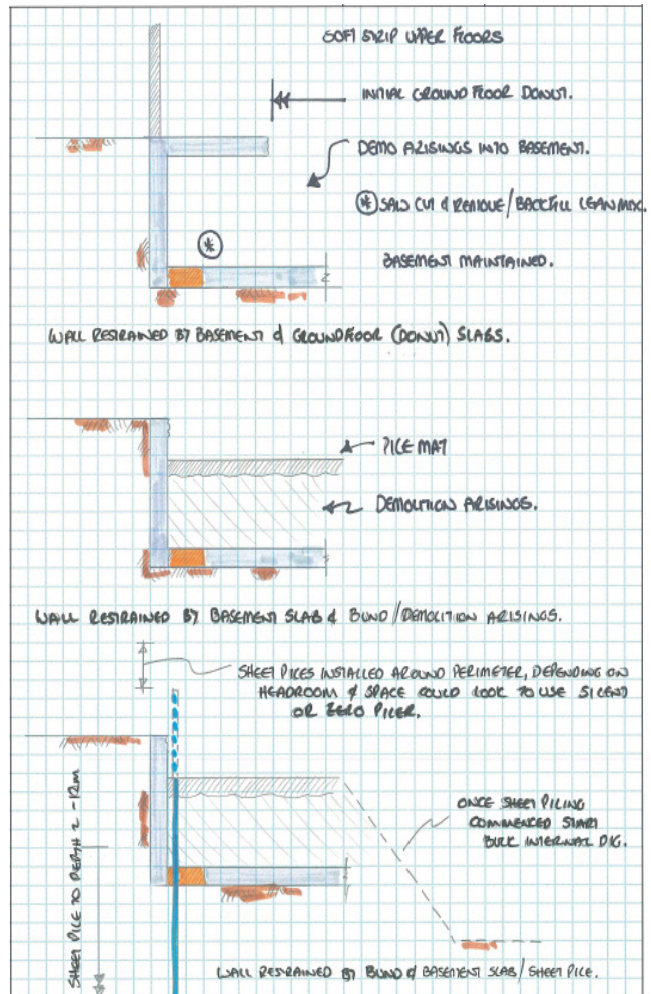
The dis-advantage with the proposed donut solution outlined above is the underpinning operations which will need to under-taken on all sides. The underpinning will be



approximately 2m lower than the proposed invert level of the basement slab. To minimise the amount of underpinning, therefore, we will introduce 11m long low level sheet piles internally. These will be embedded by approximately 5m to retain and support the existing basement wall, as well as to provide the support to the underside of the wall to allow the new basement dig. The tunnel crown is 22.7m below the raft formation level; the toes of the sheet piles being well outside of the LUL exclusion zone for tunnels. Being installed hydraulically we do not anticipate the sheet piles having any impact on the tunnel in terms of loading or vibration and sound transmissions.

Step one is the same as for the initial scheme, with a donut slab cut into the existing ground floor slab. The demolition arising's will be retained on site and used to fill the basement. At basement level a small section of the basement slab is also cut out and refilled with a lean mix concrete. This will eventually be the line of the new sheet piles which needs to be cleared as the basement is temporarily back filled with demolition arising's.

This will give support to the basement wall internally to allow the ground floor to be completely demolished and allow a pile mat to be constructed within the basement





In order to mitigate noise and vibration during the sheet piling operation, we will use a Zero or Silent Piler such as the one shown here.

The innovation of such a piling rig is that after the installation of the first piles, the remainder of the piles are installed via reaction driving. The method is very quiet, with no vibration and takes up minimal site space.



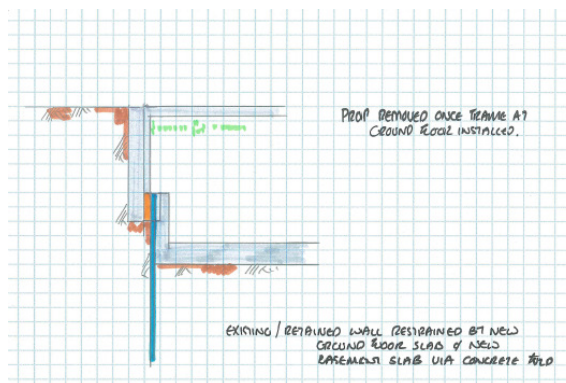
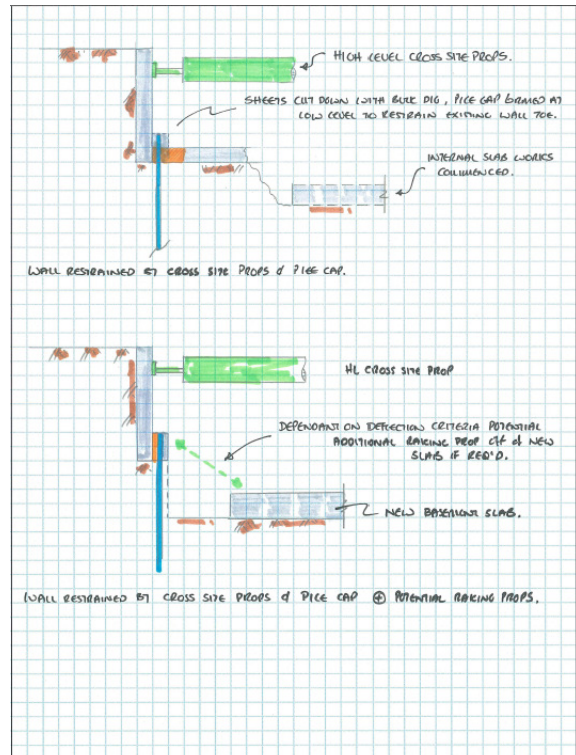
As the rig itself is not based off of the pile mat, and effectively 'walks' along the line of new piles the level of the mat can be much lower, reducing the quantity of demolition arising that need to be retained on site.





Once the sheet piles have been installed around the whole site perimeter, bulk excavation works can commence. Initially the layer of good quality pile mat material can be removed, and then using the top layer of demolition material as a support mat, the cross site props can be installed to retain the head of the sheet pile.

These provide the replacement prop force that was provided by the now demolished ground floor slab. As excavation continues the existing concrete wall is supported by the newly installed sheet piles, which we'd propose are cut down to a low level, maintaining an 800-1200mm overlap with the old wall to hold/support the toe



Internally the excavation will be progressed in advance of the edge condition to allow the internal slab to progress and to allow the cores to commence.

Works will progress to the existing retaining wall with a further wall to be introduced to support the new ground floor slab. At this point the propping will be removed.

## 6. IMPLICATIONS OF DEVELOPMENT ON LUL ASSESTS

The main LUL assets in close proximity to the site are shown on the LUL infrastructure protection drawing N104 contained in Appendix A. The Northern Line Tube tunnels lie below Tottenham Court road, about 24m below street level.

We are required by planning condition 10 to ensure that:

*the development does not impact on existing London Underground transport infrastructure.*

### 6.1 PROXIMITY OF NEW FOUNDATIONS

Please refer to drawings 1217-20-099 and 1217-20-210. Our drawings show that the new foundations proposed all fall within the existing building footprint. The horizontal distance between our new foundations and the edge of the tunnel will be determined by the topographical survey. Our new raft slab is being installed approximately 1.5m below the existing slab.

The Northern Line tunnels adjacent to the site run under Tottenham Court Road at depth with a crown level of approximately -1.9m AOD. Street level above is approximately +26.5m AOD. This gives the ground cover over the tunnels to street level of approximately 28.4m. Similarly the tunnels are approximately 24.1m below proposed basement slab level.

### 6.2 LOADING / GROUND MOVEMENTS

The development will use a raft foundation and not piles therefore the significant separation between the development and foundations will be maintained. There are no deep penetrating elements below raft level. Similarly, the proposed temporary works using sheet piling will be propped temporary retention structures for the basement construction and as such will not have deep penetrations.

The Geotechnical Consultant, via Waterman Structures is carrying out a ground movement assessment to examine the potential ground movement and the stress variations in the ground at the tunnels. The GMA report is due to be issued 7th November 2014. However, due to the significant ground cover we do not expect the building to have any significant effect on the tunnels.

### 6.3 VIBRATION AND SOUND TRANSMISSION BETWEEN THE LUL TUNNELS AND THE DEVELOPMENT

During the construction phase of the project, there are no planned works which will cause excessive vibration or noise. The installation of temporary works will use vibration less and silent methods wherever possible, eg hydraulically installed temp works sheet piling.

The raft foundation solution for the development will provide significant damping performance with regard to vibration and sound transmission between the tunnels and the development.

#### 6.4 FOUNDATION WORKS TIMINGS

The demolition of the existing basement is planned to commence from May 2015 and will be completed in July 2015. The foundation works will follow on from the demolition in July 2015 and will be fully completed in January 2016.

## 7. CONCLUSIONS

We are required by planning condition 10 prior to commencement of the project to supply the following information:

*The development hereby permitted shall not be commenced until detailed*

*design and method statements for all of the foundations, basement and ground floor structures, or for any other structures below ground level, including piling (temporary and permanent), have been submitted to and approved in writing by the local planning authority in consultation with London Underground which shall:*

*o provide details on all structures*

*o accommodate the location of the existing London Underground structures and tunnels*

*o accommodate ground movement arising from the construction thereof*

*o and mitigate the effects of noise and vibration arising from the adjoining operations within the structures and tunnels.*

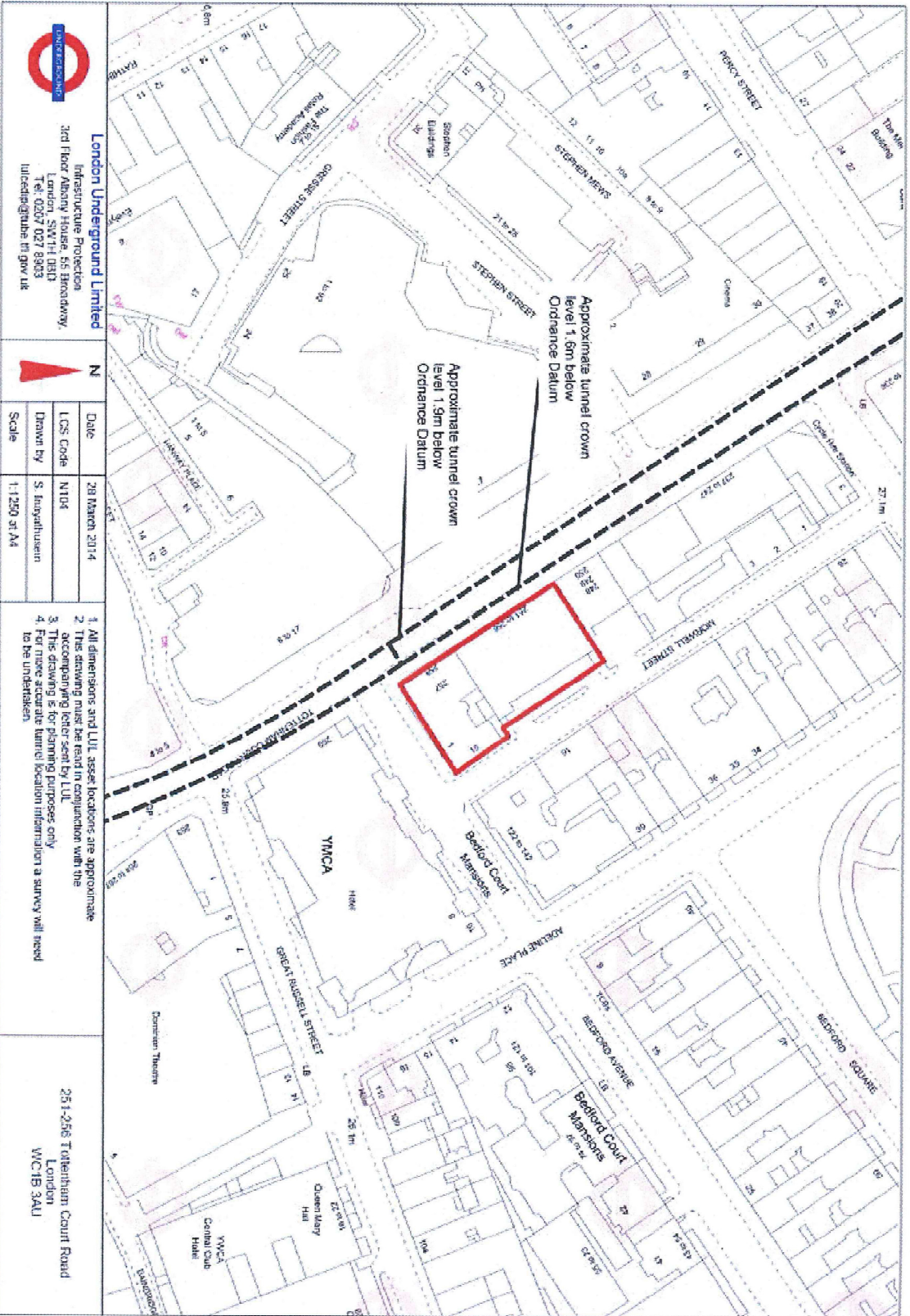
*The development shall thereafter be carried out in all respects in accordance with the approved design and method statements, and shall be completed in their entirety before any part of the building hereby permitted is occupied.*

*Reason: To ensure that the development does not impact on existing London Underground transport infrastructure, in accordance policy CS5 of the London Borough of Camden Local Development Framework Core Strategy.*

The information contained within this report addresses the items listed above and determines that the proposed works will not cause detrimental effects on the existing LUL assets located to the west of the site. The proposed foundation works within the basement of One Bedford Avenue are sufficiently far away from the LUL assets to ensure that the development does not impact on them.

## APPENDIX A - DRAWINGS





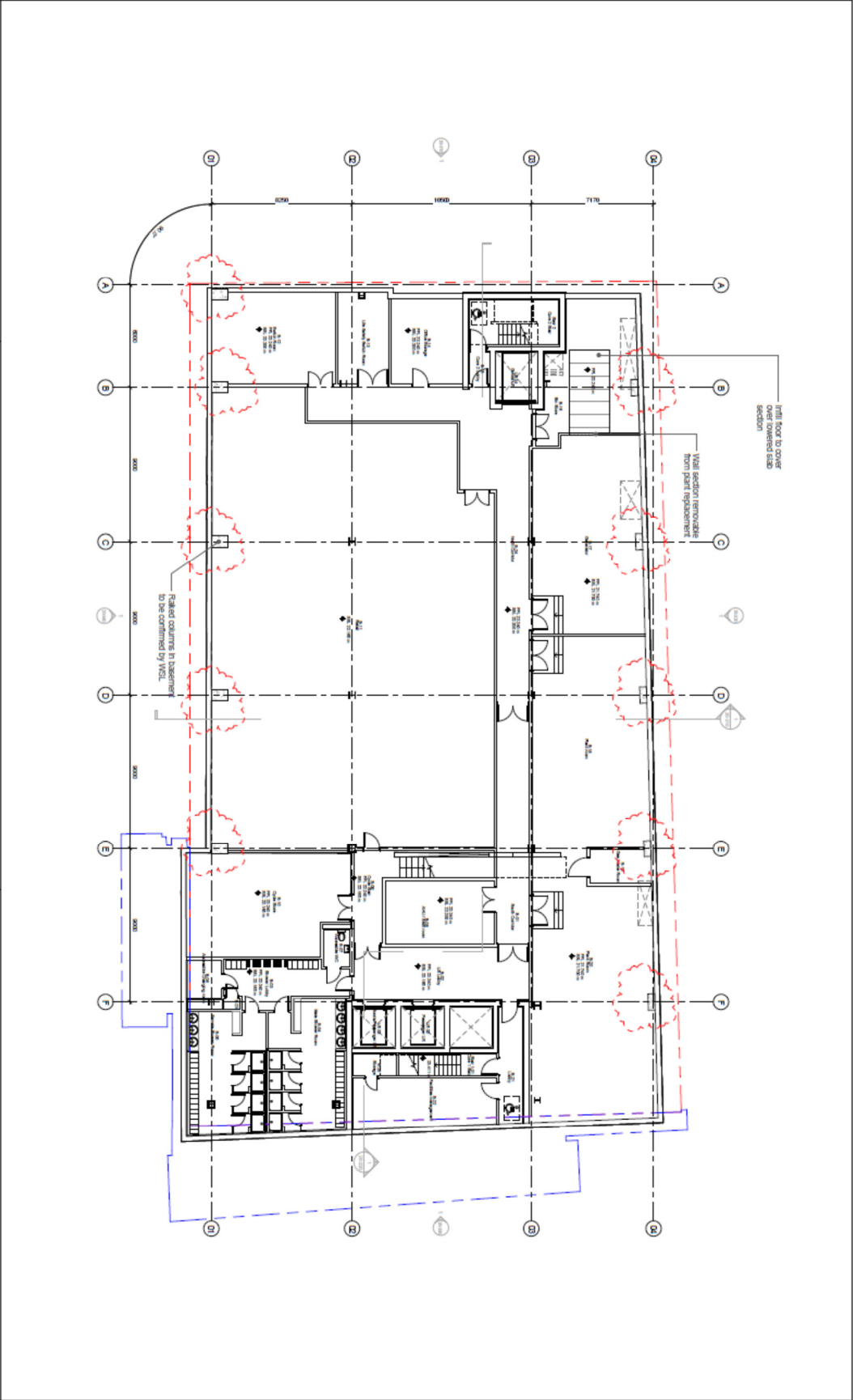
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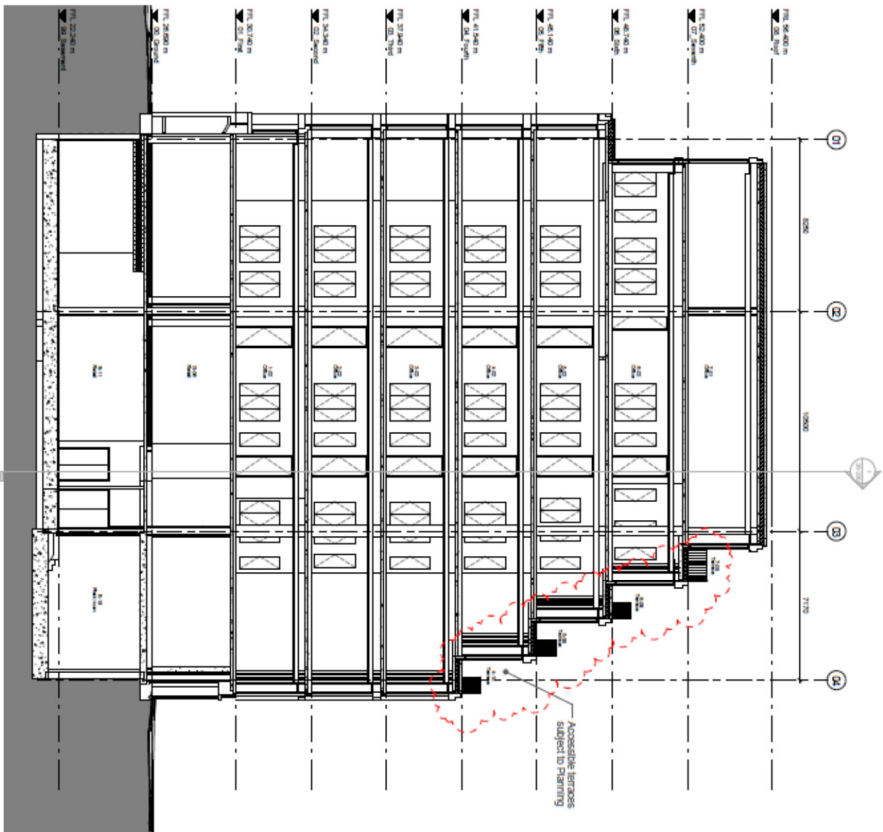
N	Date	28 March 2014
	LCS Code	N104
Scale	Drawn by	S. Ingvathusen
	Scale	1:1250 at A4

1. All dimensions and LUL asset locations are approximate
2. This drawing must be read in conjunction with the accompanying letter sent by LUL
3. This drawing is for planning purposes only
4. For more accurate tunnel location information a survey will need to be undertaken

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<b>Project:</b> <b>One Bedford Avenue</b> Energy Project, Denver, CO Electrical Plans		
<b>Client:</b> 12175 S. 25th Suite 400 80231	<b>Architect:</b> Bennetts Associates 12175 S. 25th Suite 400 80231	<b>Scale:</b> 1" = 12'-0"





Project No. 1277 Bennett's Associates Architects One Bedford Avenue General Project: Industrial Ltd. General Arrangement Section A-A Scale: 1:200 Date: 14/01/11	Project No. 1277 Bennett's Associates Architects One Bedford Avenue General Project: Industrial Ltd. General Arrangement Section A-A Scale: 1:200 Date: 14/01/11	Project No. 1277 Bennett's Associates Architects One Bedford Avenue General Project: Industrial Ltd. General Arrangement Section A-A Scale: 1:200 Date: 14/01/11	Project No. 1277 Bennett's Associates Architects One Bedford Avenue General Project: Industrial Ltd. General Arrangement Section A-A Scale: 1:200 Date: 14/01/11
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