4.0 Appendix A – Structural Sketches

List of drawings:

1003634 S SK 001B – Proposed Entrance Area. Ground Floor Plan.

1003634 S SK 002B – Proposed Entrance Area. First Floor Plan.

1003634 S SK 003B – Proposed Entrance Area. Second Floor Plan.

1003634 S SK 006A – Proposed Entrance Area. Fifth Floor Plan (Roof) Option 1.

1003634 S SK 007A – Proposed Entrance Area. Fifth Floor Plan (Roof) Option 2.

1003634 S SK 010A – Proposed Courtyard Area. Ground Floor Plan.

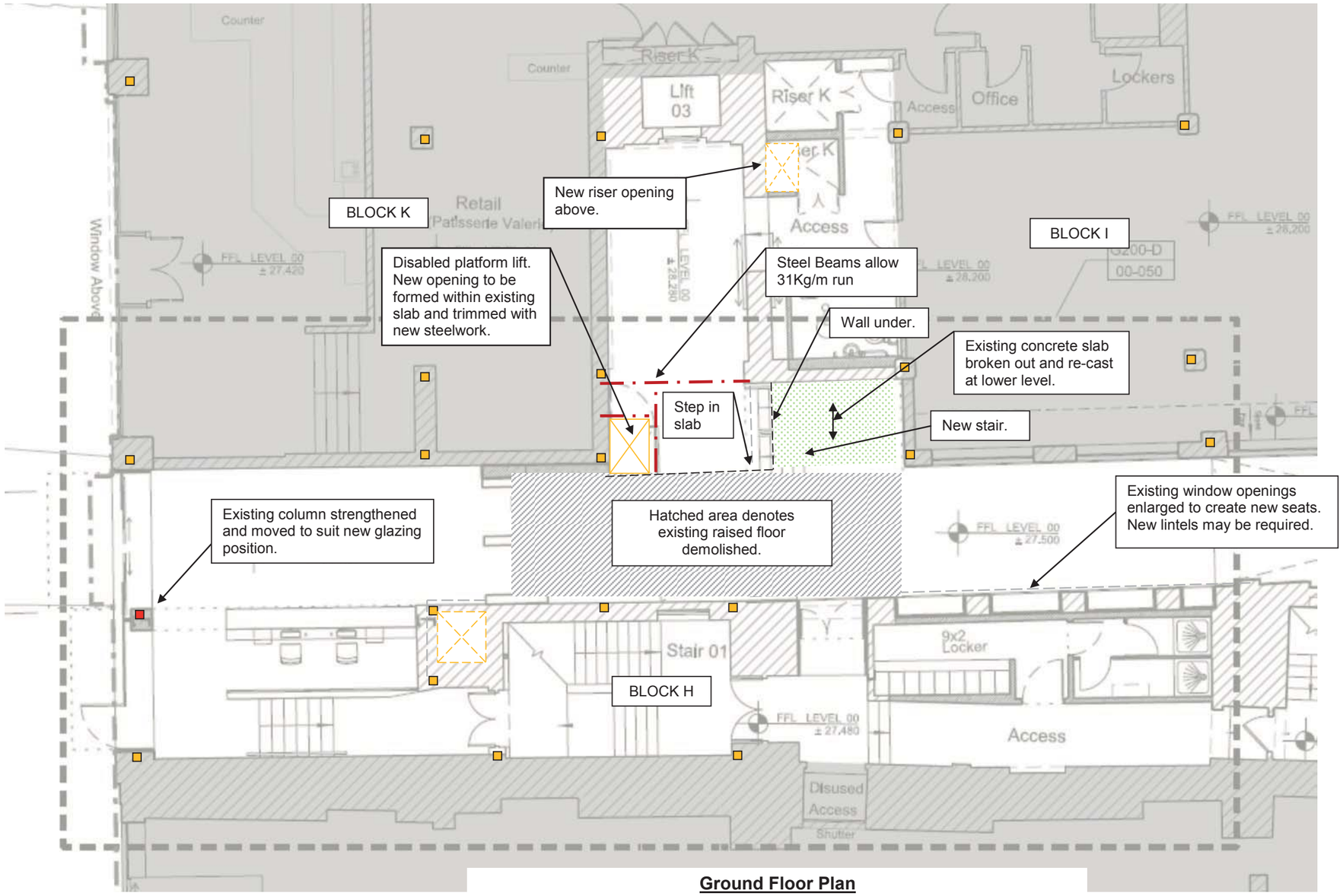
1003634 S SK 011A – Proposed Courtyard Area. First Floor Plan.

1003634 S SK 012A – Proposed Courtyard Area. Second Floor Plan.

1003634 S SK 013A – Proposed Courtyard Area. Third and Fourth Floor Plan.

1003634 S SK 014A – Proposed Courtyard Area. Roof Plan.

A3



Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam

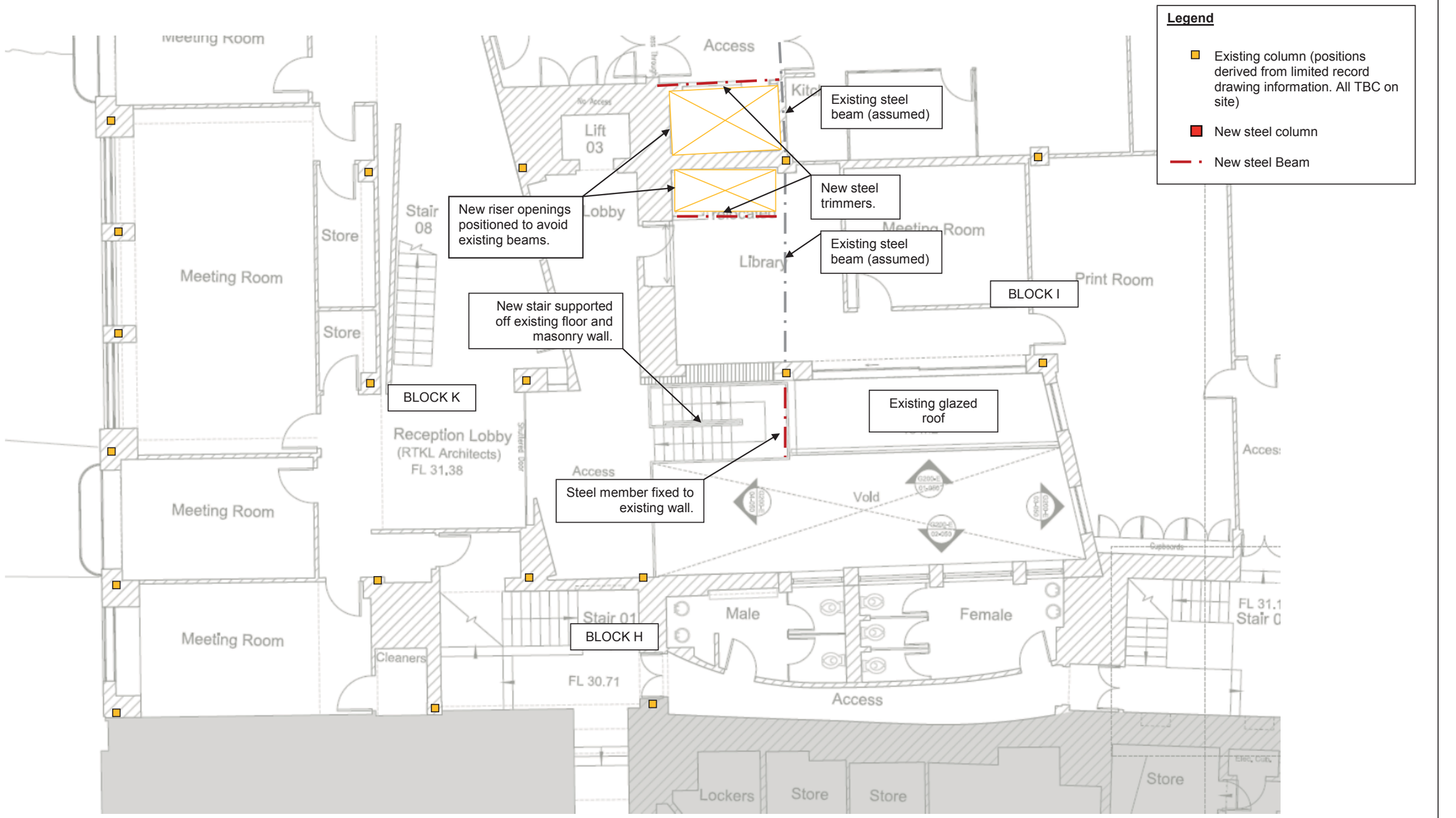
Ground Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Entrance Area
Ground Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 001 B	LA	DNC	30/09/11

A3



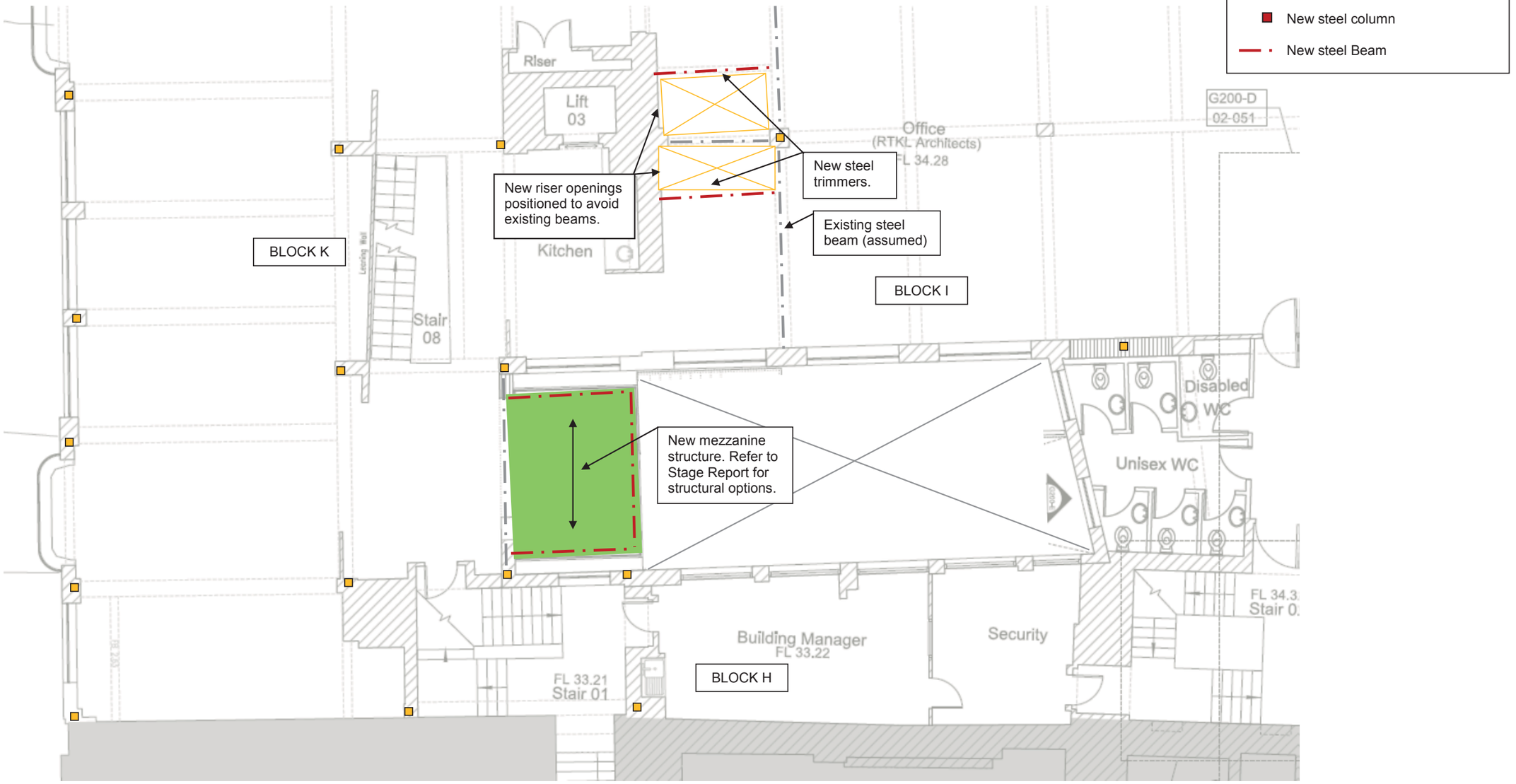
First Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Entrance Area
First Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 002 B	LA	DNC	30/09/11

A3



Second Floor Plan (Third and Fourth Plans similar)

CUNDALL
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London EC1N 8TS
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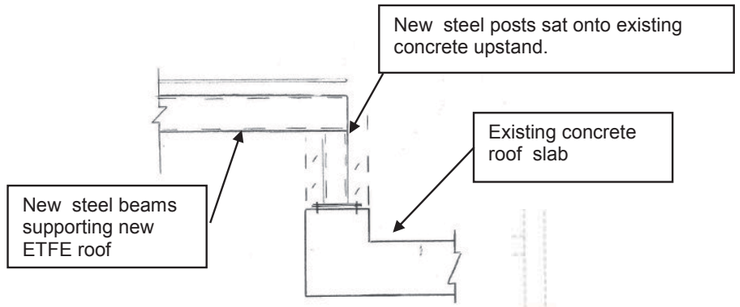
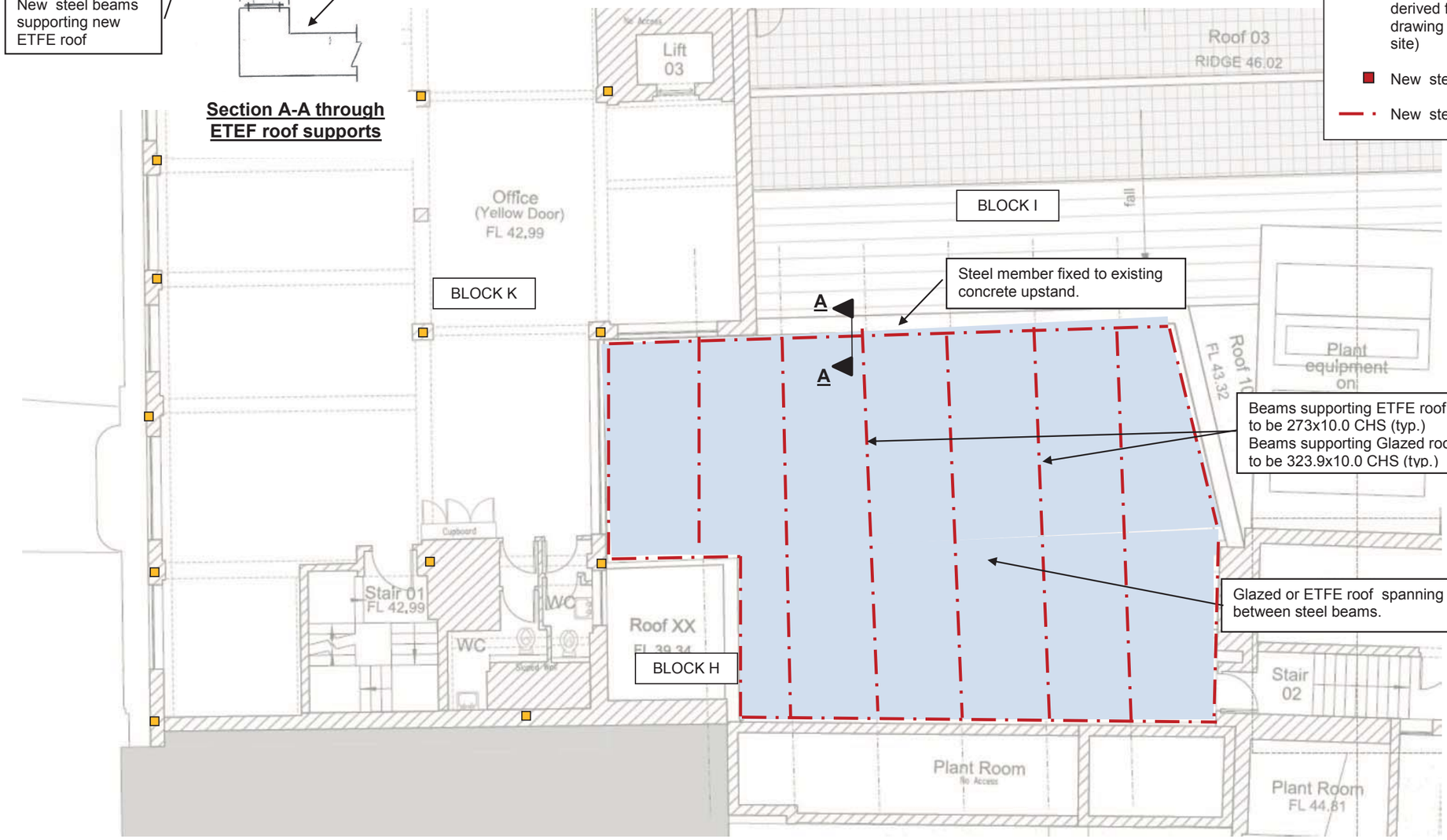
Heal's Building Redevelopment
Proposed Entrance Area
Second Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 003 B	LA	DNC	30/09/11

A3



Section A-A through ETEF roof supports



Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam

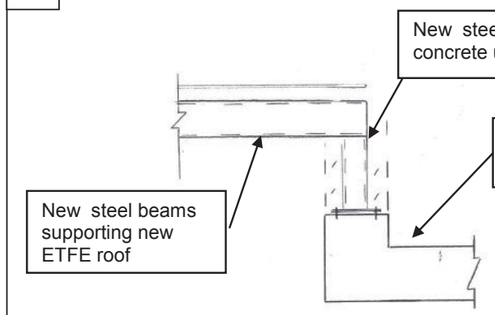
Fifth Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Entrance Area
Fifth Floor Plan (Roof) – Option 1

DWG No.:	Drawn:	Checked:	Date:
1002887 S SK 006 A	LA	DNC	30/09/11

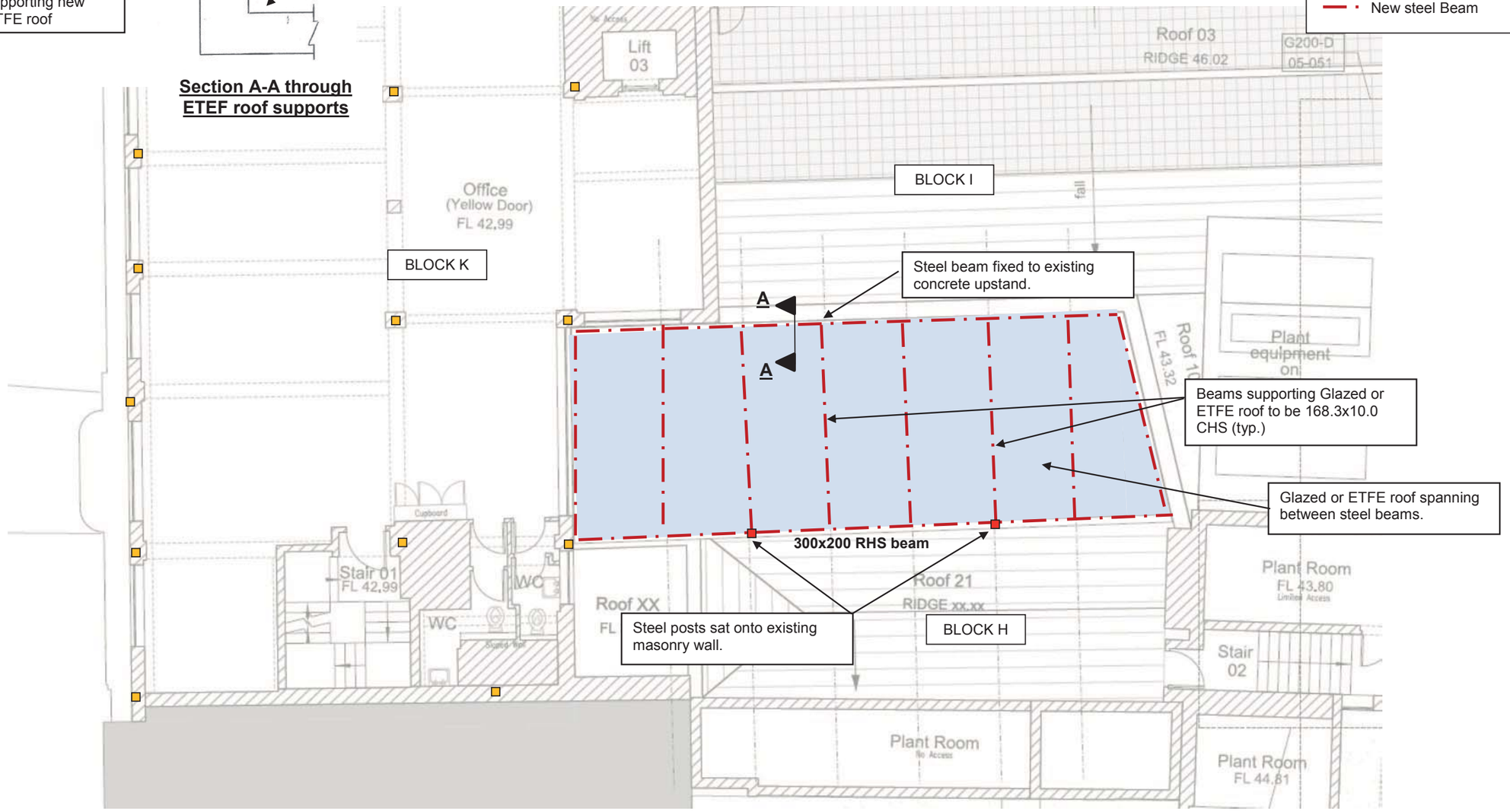
A3



Section A-A through ETEF roof supports

Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam



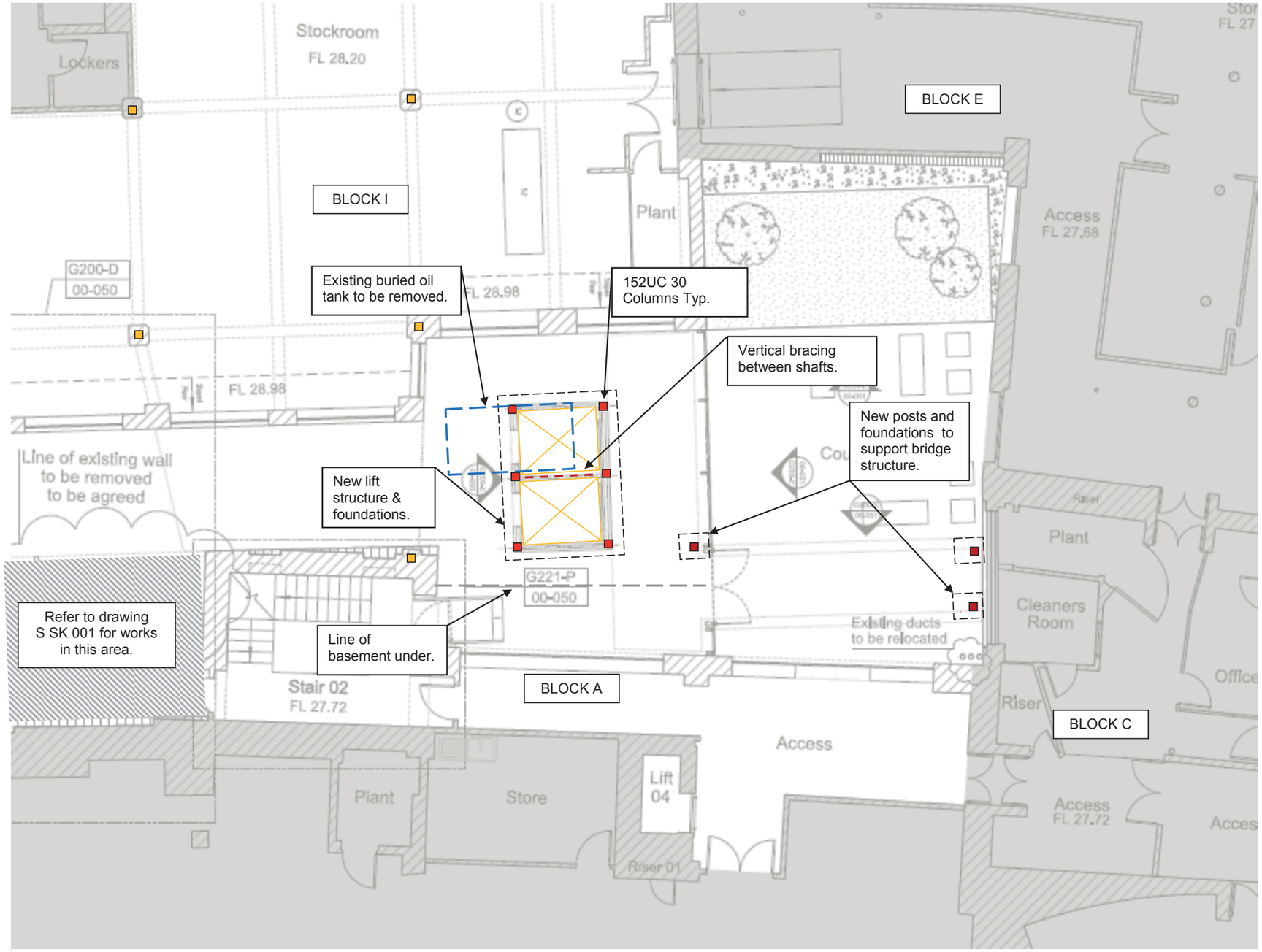
Fifth Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Entrance Area
Fifth Floor Plan (Roof) – Option 2

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 007 A	LA	DNC	30/09/11

A3



Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam

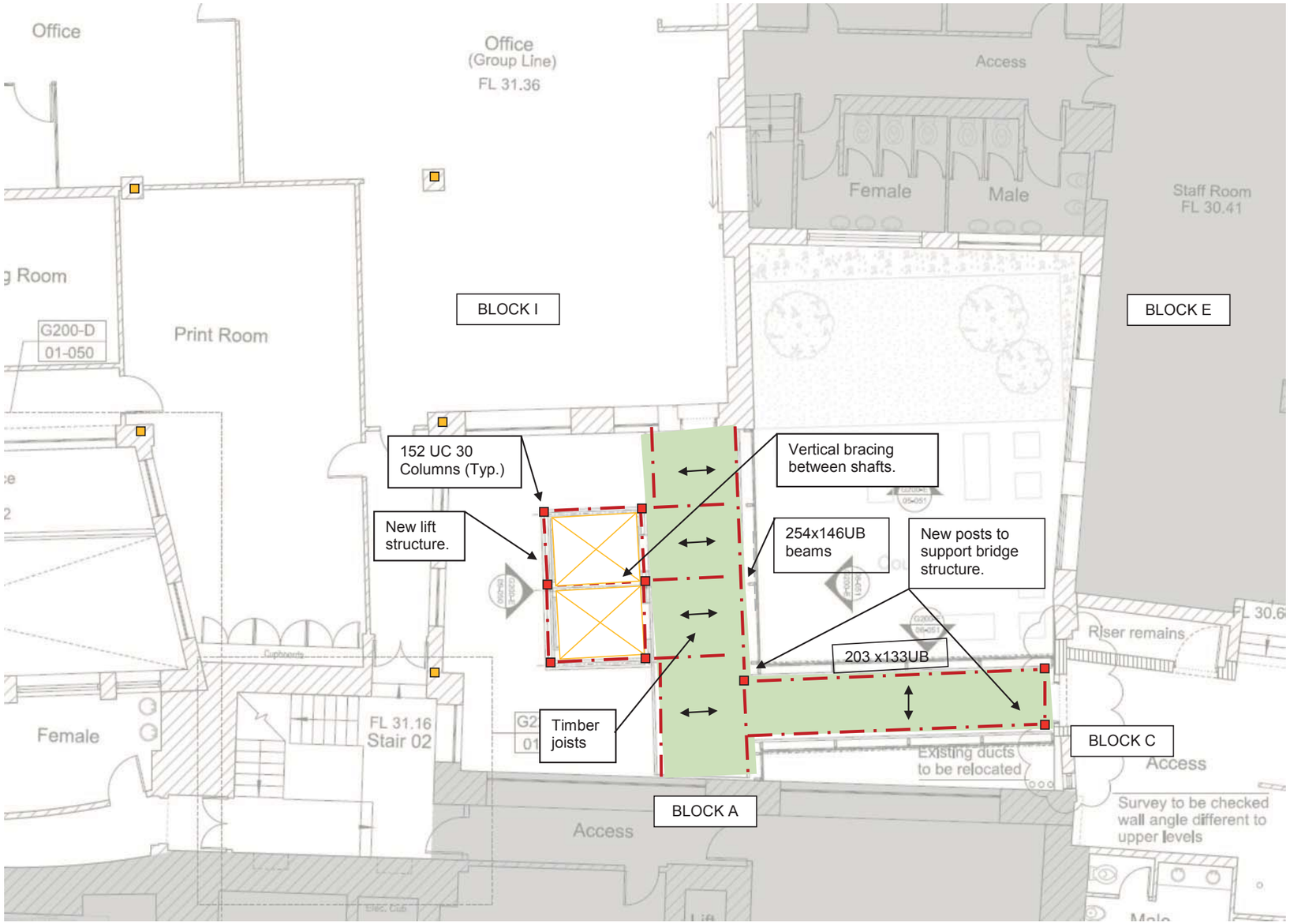
Ground Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Courtyard Area
Ground Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 010 A	LA	DNC	30/09/11

A3



Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam

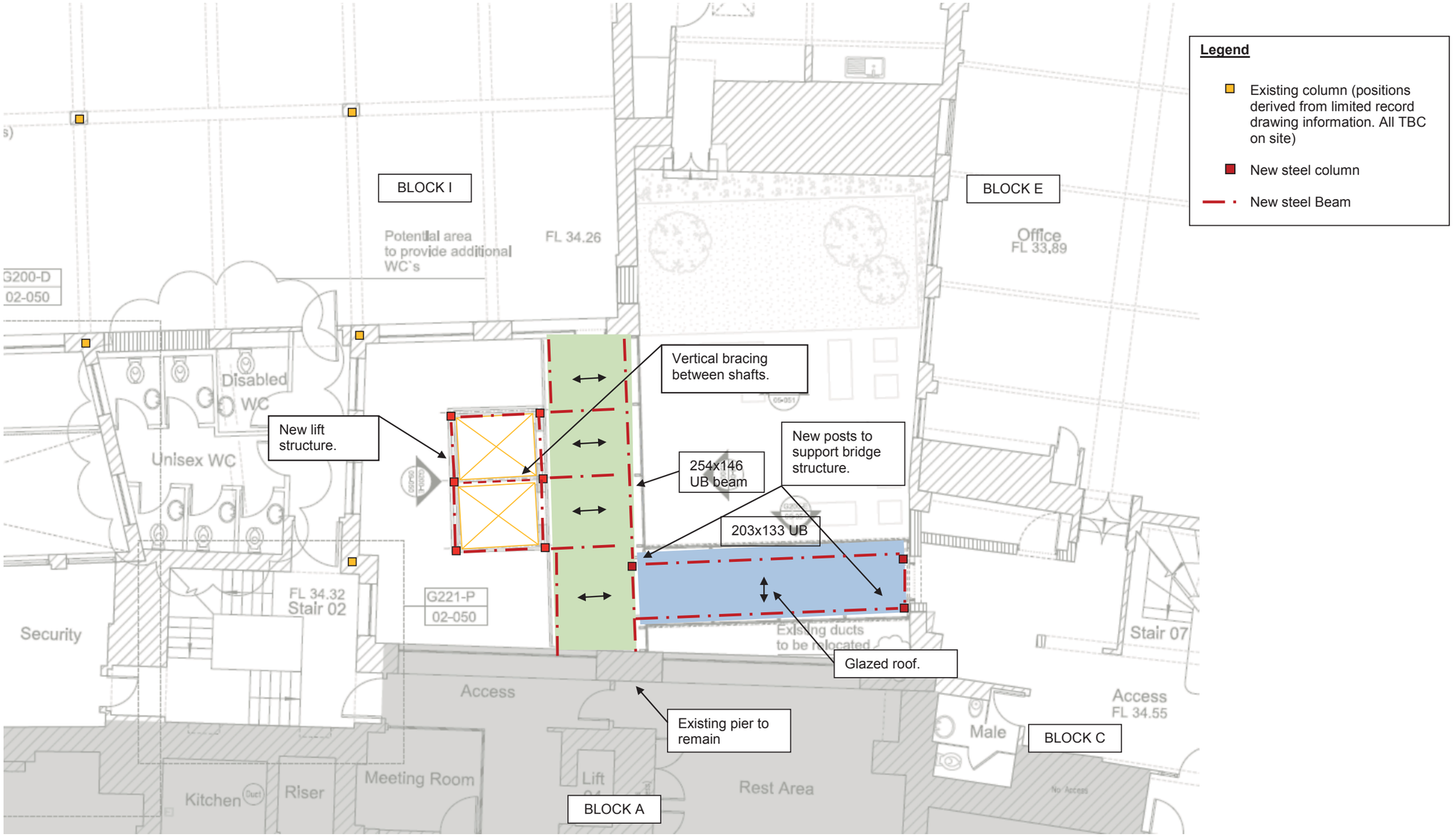
First Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Courtyard Area
First Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 011 A	LA	DNC	30/09/11

A3



Second Floor Plan

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Courtyard Area
Second Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 012 A	LA	DNC	30/09/11

A3

Third and Fourth Floor Plans

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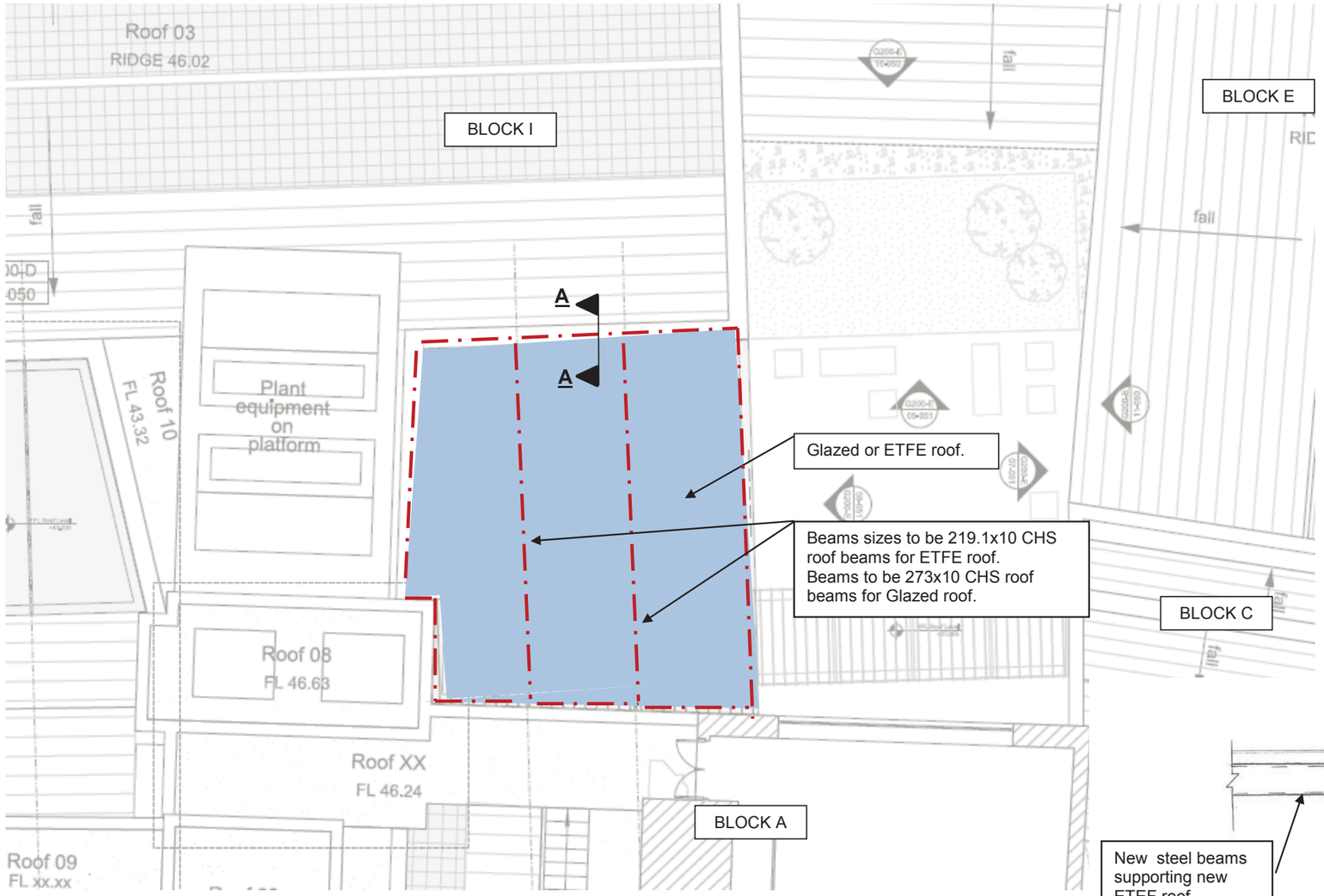
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Courtyard Area
Third and Fourth Floor Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 013 A	LA	DNC	30/09/11

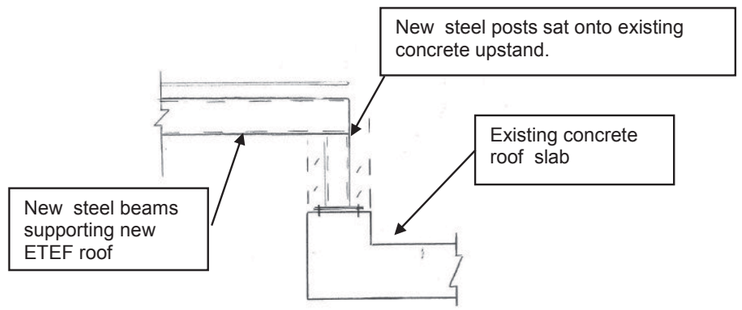
A3



Legend

- Existing column (positions derived from limited record drawing information. All TBC on site)
- New steel column
- New steel Beam

Roof Plan



Section A-A through ETEF roof supports

CUNDALL
Saffron House 6-10 Kirby Street
London EC1N 8TS
Tel 020 7438 1600 fax 020 7438 1601

Heal's Building Redevelopment
Proposed Courtyard Area
Roof Plan

DWG No.:	Drawn:	Checked:	Date:
1003634 S SK 014 A	LA	DNC	30/09/11

5.0 Appendix B – Schedule of Required Investigations

For the Retail Redevelopment Works the following investigations are anticipated to be required: -

1. Investigations of local structure for installation of service risers etc.

For the Office Redevelopment Works the following investigations are anticipated to be required: -

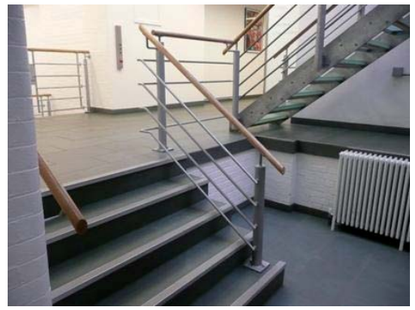
1. Break out of existing building facades at locations of proposed bridge links and atria roofs. (To determine precise arrangements of existing structure and determine proposed connection details).
2. Investigations of existing structures locally to new service risers. (To determine local structural arrangements and proposed trimming details – Stage D/E).
3. Investigation of existing slab edge detail, where we are creating new Meeting Rooms externally to existing Block K (to determine existence and size of concrete upstand).
4. Investigation of existing slab edge detail at second and fourth floor levels, where new Meeting Rooms are to be created externally to existing Block K (to determine existence and size of concrete upstand).
5. Investigations to determine existing structural arrangements locally to where a new opening is created in Block H (to determine if steel columns are present within masonry)
6. Investigations to existing structural arrangements locally to new floor infills.

6.0 Appendix C – Site Photos

Photograph 1. Tottenham Court Rd Elevation..

Photograph 2. Torrington Place Elevation..

Photograph 3. Reception Area.



Photograph 4. Existing stairs to be removed.

Photograph 5. Internal Courtyard. View on wall to be removed in Block H.

Photograph 6. Raised floor within Block H ground floor to be removed.

Photograph 7. Plant at Block H basement level.

Photograph 8. Block K rear elevation where new meeting rooms are to constructed.

Photograph 9. Block I rear elevation from internal courtyard.

Photograph 10. Rear Courtyard.

Photograph 11. Block C from rear Courtyard.

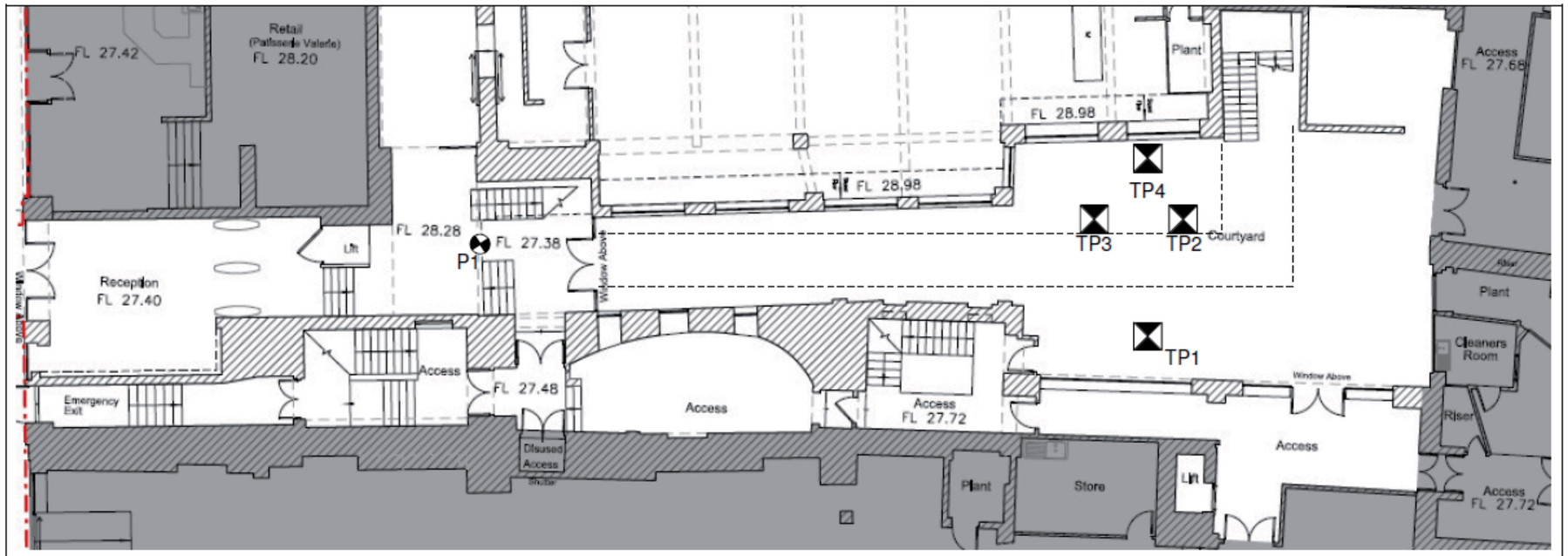
Photograph 12. Services duct within Block K basement under new disabled platform lift.

7.0 Appendix D – Record Drawing Schedule

Drawing no.	Information available			Date	Block
1469	Arch	Plan	Keyplan	1963	All
1470	Arch	Plan	Keyplan	1963	All
1471	Arch	Section		1914	B
1472	Arch	Plan	Keyplan	1928	All
1474	Eng	Section	Detail of Steel Bridge	1914	(unknown)
1475	Eng	Section	Detail of Steel Bridge (Part)	1914	(unknown)
1476	Eng	Section	Detail of Steel Bridge (Part)	1914	(unknown)
1477	Eng	Section	Detail of Steel Bridge (Part)	1914	(unknown)
1478	Eng	Section	Detail of Steel Bridge (Part)	1914	(unknown)
1479	Eng	Section	Detail of Steel Bridge (Part)	1914	(unknown)
1480	Arch	Plan	Heals Extension to 193 & 194 GF	1928	(now demolished)
1481	Arch	Plan	Heals Extension into 194 GF (Part)	1928	(now demolished)
1482	Arch	Plan	Heals Extension into 194 GF (Part)	1928	(now demolished)
1483	Eng	Plan	Original Heals building Basement	1916	B
1484	Eng	Plan	Original Heals building Ground Fl.	1916	B
1485	Eng	Plan	Original Heals building Ground Fl. (Part)	1916	B
1486	Eng	Plan	Original Heals building First Fl.	1916	B
1487	Eng	Plan	Original Heals building First Fl. (Part)	1916	B
1488	Eng	Plan	Original Heals building Second Fl.	1916	B
1489	Eng	Plan	Original Heals building Third Fl.	1916	B
1490	Eng	Plan	Original Heals building Fourth Fl.	1916	B
1491	Arch	Plan	Extension to 193 & 194 (GF)	1928	(now demolished)
1492	Arch	Plan	8-11 Francis Street (Basement to Second)	1934	K
1493	Arch	Plan	8-11 Francis Street (Part)	1934	K
1494	Arch	Plan	8-11 Francis Street (Part)	1934	K
1495	Arch	Plan	8-11 Francis Street (Part)	1934	K
1496	Arch	Plan	8-11 Francis Street (Part)	1934	K
1497	Arch	Plan	8-11 Francis Street (Third to Roof)	1934	K
1498	Arch	Plan	8-11 Francis Street (Part)	1934	K
1499	Arch	Plan	8-11 Francis Street (Part)	1934	K
1500	Arch	Plan	8-11 Francis Street (Part)	1934	K
1501	Arch	Plan	8-11 Francis Street (Part)	1934	K
1502	Arch	Plan	Keyplan		
1503	Arch	Details	Staircase between blocks H&K	1928	H&K
1504	Arch	Section	Sections	1928?	I, H & K
1505	Arch	Section	Sections	1928?	I, H & K
1506	Arch	Section	Sections	1928?	I, H & K
1507	Arch	Section	Sections	1928?	I, H & K
1508	Arch	Section	Sections	1928?	I, H & K
1509	Arch	Section	Sections	1928?	I, H & K
1510	Arch	Plan	Blocks H&K Part Plans	1934	H&K
1511	Arch	Plan	Blocks H&K Part Plans	1934	H&K
1512	Eng	Plan	Blocks H&K Part Plans	1934	H&K
1513	Eng	Plan	Blocks H&K Part Plans	1934	H&K
1514	Eng	Plan	Blocks H&K Plans	1934	H&K
1515	Eng	Section	Block M (Part section)	1959	M
1516	Eng	Section	Block M (Part section)	1959	M
1517	Eng	Section	Block M (Part section)	1959	M
1518	Eng	Section	Block M (Part section)	1959	M
1519	Eng	Section	Block M (Part section)	1959	M
1520	Eng	Section	Block M (Part section)	1959	M

1521	Eng	Section	Block M (Part plan)	1959	M
1522	Eng	Section	Block M (Part plan)	1959	M
1523	Eng	Section	Block M (Part plan)	1959	M
1524	Eng	Section	Block M (Part plan)	1959	M
1525	Eng	Section	Block M (Part plan)	1959	M
1526	Eng	Section	Block M (Part plan)	1959	M
1527	Eng	Section	Block M (Part plan)	1959	M
1528	Eng	Section	Block M (Part plan)	1959	M
1529	Eng	Section	Block M (Part plan)	1959	M
1530	Eng	Section	Block M (Part plan)	1959	M
1531	Eng	Section	Block M (Part plan)	1959	M
1532	Eng	Section	Block M (Part plan)	1959	M
1533	Eng	Section	Block M (Part plan)	1959	M
1534	Eng	Section	Block M (Part plan)	1959	M
1535	Eng	Section	Block M (Part plan)	1959	M
1536	Eng	Section	Block M (Part plan)	1959	M
1537	Eng	Details	Block M	1959	M
1538	Eng	Details	Block M	1959	M
1539	Eng	Plan	Block M (Part plan)	1959	M
1540	Eng	Plan	Block M (Part plan)	1959	M
1541	Eng	Plan	Block M (Part plan)	1959	M
1542	Eng	Plan	Block M (Part plan)	1959	M
1543	Eng	Plan	Block M (Part plan)	1959	M
1544	Eng	Plan	Block M (Part plan)	1959	M
1545	Eng	Plan	Block M (Part plan)	1959	M
1546	Eng	Plan	Block M (Part plan)	1959	M
1547	Eng	Plan	Block M (Part plan)	1959	M
1548	Eng	Plan	Block M (Part plan)	1959	M
1549	Eng	Plan	Block M (Part plan)	1959	M
1550	Eng	Plan	Block M (Part plan)	1959	M
1551	Eng	Plan	Block M (Part plan)	1959	M
1552	Eng	Plan	Block M (Part plan)	1959	M
1553	Eng	Plan	Block M (Part plan)	1959	M
1554	Eng	Plan	Block M (Part plan)	1959	M
1555	Eng	Plan	Block M (Part plan)	1959	M
1556	Eng	Plan	Block M (Part plan)	1959	M
1557	Eng	Plan	Block M (Part plan)	1959	M
1558	Eng	Plan	Block M (Part plan)	1959	M
1559	Eng	Plan	Block M (Part plan)	1959	M
1560	Eng	Plan	Block M (Part plan)	1959	M
1561	Eng	Plan	Block M (Part plan)	1959	M
1562	Eng	Plan	Block M (Part plan)	1959	M
1563	Eng	Plan	Block M (Part plan)	1959	M
1564	Eng	Section	Block M	1959	M
1565	Arch	Plan	Block I (part plan)	1927	demolished?
1566	Arch	Plan	Block I (part plan)	1927	demolished?
1567	Arch	Plan	Block I (part plan)	1927	demolished?
1568	Arch	Plan	Block I (part plan)	1927	demolished?
1569	Eng	Plan	Block M (Part plan)	1959	M
1570	Eng	Plan	Block M (Part plan)	1959	M
1571	Eng	Plan	Block M (Part plan) - New Goods Lift	1962	M
1572	Eng	Plan	Block M (Part plan) - New Goods Lift	1962	M
1573	Eng	Plan	Block M (Part plan) - New Goods Lift	1962	M
1574	Eng	Plan	Block M (Part plan) - New Goods Lift	1962	M
1575	Eng	Plan	Block M (Part plan) - New Goods Lift	1962	M
1576	Arch	Section	Block B		B

8.0 Appendix E – Location Plan of Trial Pits within rear Courtyard

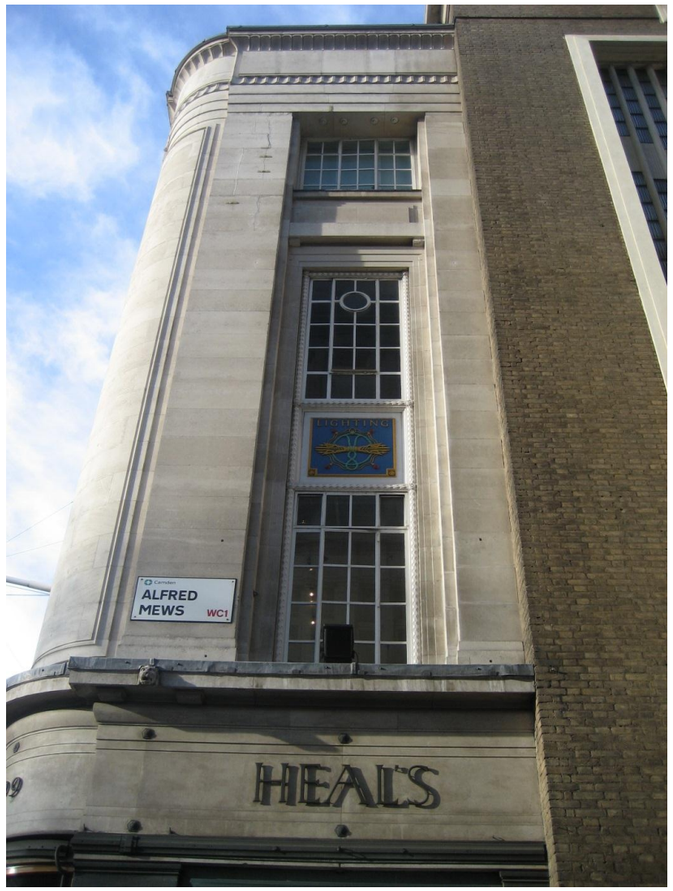


TP1 – Location of Basement wall
TP2 – Locating Buried Tank – not found
TP3 – Location of Buried Tank
TP4 – Locating Buried Tank – not found
P1 – Pilot hole to enable view of structure by endoscope

RSK	Exploratory Point Location Plan	**Client:**	Cundall, Johnston & Partners LLP	**Figure No:**	2
		Site:	Heal's Building	**Job No:**	24016
		Scale:	NTS	**Source:**	Client

9.0 **Appendix F – Cundall FRA Report**

CUNDALL



Threadneedle Property Investment Ltd & The Bedford Estates

Heal's Building Redevelopment

Level 1 Flood Risk Assessment

Job No: 1003634

Latest Revision: R0

Date: 29 September 2011

Cundall Johnston and Partners LLP Saffron House 6-10 Kirby Street London EC1N 8TS Tel +44 (0)20 7438 1600 www.cundall.com

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Document Quality Validation & History

Job Title		Heal's Building Redevelopment			Job Number
Document Title		Level 1 Flood Risk Assessment			1003634
Version / Revision	Date	Purpose of issue / description of revision / version Information			
RO	29/09/11		Prepared by	Checked by	Verified by
		Name	P. De Vere	D. Currie	G. Rollison
		Signature			
Version / Revision	Date	Purpose of issue / description of revision / version			
Choose an item.			Prepared by	Checked by	Verified by
		Name			
		Signature			
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		Signature			
Version / Revision	Date	Purpose of issue / description of revision / version			
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		Name			
		Signature			

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Level 1 Flood Risk Assessment

1.0 Reason for Report and Planning Context

1.1 Background

Cundall LLP have been commissioned by Threadneedle Property Investments Ltd and the Bedford Estates to undertake a Level 1 Flood Risk Assessment as part of the Heal's Building renovation, which will include the enclosure of two existing external courtyards. A site location plan is shown in Appendix A.

1.2 Scope of Report

The Government"s national policy on Development and Flood Risk is covered by Planning Policy Statement 25 (PPS 25). The stated aim of PPS 25 is:

"To ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk."

This Flood Risk Assessment sets out any flood risks associated with the enclosure of the two existing external courtyards as part of the building renovation process. Recommendations to counteract flood risk have been included in the report.

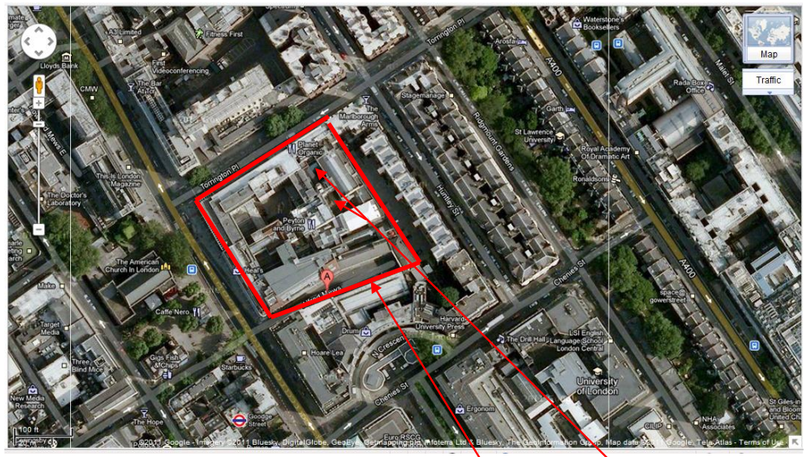
It should be noted that as the proposed development area is less than 1Ha and is located in National Flood Zone1, the Environment Agency would not normally have an interest within the planning process. PPS25 also states that a site fitting this criteria does not require a Flood Risk Assessment, however, our client has specifically requested the assessment be carried out to ensure the Environment Agency has been consulted during the planning process and to achieve a beneficial contribution to BREEAM.

This report has been prepared for the beneficial use of Threadneedle Property Investment Ltd and the Bedford Estates in connection with this development. Cundall does not accept any liability for the accuracy or otherwise of any information derived from secondary sources, however, endeavours have been made to verify the suitability and appropriateness of information obtained in this way.

2.0 Existing and Proposed Development

2.1 Existing Development

The Heal's Building is located on Tottenham Court Road, Central London adjacent to Torrington Place and Alfred Mews. The National Grid Reference for the site is E529545, N 181911. The building is a listed building and has six storeys above ground and a basement beneath it. The building also has a number of external courtyards that are located within the building footprint area with all of the site consisting of hard-standing area.



The topography of the site is generally flat with the average ground floor level being approximately 27.7m AOD. There are some loading bays adjacent to Alfred Mews which have finished floor levels at around 28.1m AOD.
The nearest watercourse is the River Thames to the south of the site approximately 1.5km away. The Regents Canal is located approximately 2km north of the site.

2.2 Proposed Development

The Heal's Building will be renovated internally and include the renovation of two external courtyards (see architects plans of the existing building in Appendix B). The two courtyards to the eastern side of the building will be enclosed at roof level to make them internal spaces. The courtyard to the south will only be partially covered with a roof level with the remainder of the courtyard being left open to the elements. It is not clear at this time whether the client intends for the remaining exposed portion of the courtyard to be repaved or left in its present state. In the southern enclosed courtyard, two lifts will be constructed that will run the full height of the building. Associated extra plant will be located on the roof of the building, adjacent to the courtyards. Proposed Architects plans of the development can be found in Appendix C.

3.0 Policy Review and Consultation

This study is based on the following:

- A background search of Planning Policy Statement 25 (PPS25)
- The North London Strategic Flood Risk Assessment (Produced by mouchel, status = Final)
- A review of aerial photos and maps
- A review of existing and proposed site plans in relation to potential flood risks.
- Discussions with the Environment Agency (See Appendix H)

3.1 Sequential Test

PPS25 requires developments to pass the Sequential Test to ensure there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development.

National Flood Zone maps acquired from the Environment Agency website have shown the site to be in flood zone 1 which means the site has a less than 1 in 1000 chance of flooding in any year. This is also confirmed with the map provided with the North London Strategic Flood Risk Assessment. Both maps can be found in Appendix D.

The basis for this test is Table D3 from PPS25, as shown below, which summarises the appropriate development type suitability against different National Flood Zones. Table D2 shown in Appendix E classifies the flood vulnerability for different types of development. This retail development falls into the 'Less Vulnerable' category.

Table D.3[22]: Flood Risk Vulnerability and Flood Zone 'Compatibility'

	Flood Risk Vulnerability classification (see Table D2)	Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	✗	✗	✗

Key:
✔ Development is appropriate
✗ Development should not be permitted

Table D3 deems the type of development to be appropriate for the flood zone the site is located in.

3.2 Exception Test

As the site is in National Flood Zone 1 and is classes as a 'Less Vulnerable' type of development, the exception test is not required according to Table D3.

4.0 Flood Risk Identification

4.1 Fluvial, Tidal and Tidelocked

The nearest watercourses shown on maps are the River Thames approximately 1.5-2km to the south and the Regents Canal approximately 2km to the north. Although not shown on the Water Features map (shown within Appendix D) in the North London Strategic Flood Risk Assessment, it is understood that the River Fleet flows below ground near the site. This is assumed to flow through a culvert system as it passes through the built up area of Central London. No reference to historic flooding from this watercourse has been highlighted in the Strategic Flood Risk Assessment.

The site lies within National Flood Zone 1 according to the maps produced by the Environment Agency. Another map provided with the North London Strategic Flood Risk Assessment also confirms this to be the case. This therefore means the site has less than 0.1% (1 in 1000) probability of fluvial flooding and is therefore regarded as low risk. The site is also not at risk of flooding from tidal sources. Discussions with the Environment Agency (EA) have also confirmed this (See Appendix H). They have also concluded that the Local Planning Authority will not need to consult to the Environment Agency due to the development area being within National Flood Zone 1 and less than 1 Hectare in area.

Assessment of Impact: Low
Assessment of Probability: Low

4.2 Artificial Drainage

A CCTV drainage survey has been undertaken of the on-site drainage system. The courtyards contain drainage, which is a combined system draining surface and foul water. A manhole is also located within the courtyard itself with gullies located at the base of any rainwater pipes.

The CCTV survey has shown the drainage system to be in good condition only requiring some descaling. It is the intention to reuse some of the existing surface water connections into the combined system to drain the new roofs over the courtyard. These connections should serve the same contributing area as they do presently and therefore should not put further loading on the system. The existing system will however need to be checked to ensure it is adequately sized to conform with modern standards.

The courtyard does have gullies which are direct paths to the local drainage system as well as a manhole with a non-watertight cover. This area could therefore be at risk of flooding should the drainage system surcharge up and out of the gully grates or manhole covers. The probability of this occurring is considered as medium.

Assessment of Impact: Medium
Assessment of Probability: Medium

4.3 Overland Flooding

The existing site has very similar floor levels of around 27.7m AOD with the site generally being level. The site is located to the north of the River Thames and the contour map provided with the Strategic Flood Risk Assessment (see Appendix F) indicates the land generally falling from a higher level in the north of Camden Borough down to lower levels of the River Thames where Tottenham Court Road is situated. The higher levels to the north of Camden Borough decrease in height further north as they start approaching the lower ground where the River Brent flows.

Given that there has been no recorded incidents of fluvial or tidal flooding around the Tottenham Court Road and that the area is relatively flat with no steep slopes adjacent to the site, the probability of the site suffering from overland flooding issues is considered low.

Assessment of Impact: Low
Assessment of Probability: Low

4.4 Infrastructure Failure

The usual services within the adopted roads external to the site are expected to exist as, would normally be present in built up city areas. There is no knowledge of any significant infrastructure that would pose a risk to flooding of the site. Water mains external to the site in the public highways are expected to serve the surrounding properties with no large diameter trunk water mains in the vicinity although this will require confirming with record drawings.

The Strategic Flood Risk Assessment also presents a map showing what infrastructure is at risk from flooding such as substations. Within the surrounding area of the site, no infrastructure items have been highlighted as being at risk from flooding.

The Strategic Flood Risk Assessment has also gathered data from any flooding incidents that are as a result of local sewers flooding. The area of Tottenham Court Road has not been highlighted as having any recorded incidents of sewer flooding (see sewer flooding map in Appendix G).

Assessment of Impact: Low
Assessment of Probability: Low

4.5 Groundwater

A ground investigation has being undertaken in the two courtyard areas which was shallow in depth down to around 750mm. The trial pits did not encounter any groundwater strikes.

A groundwater contour map is included in the Strategic Flood Risk Assessment which shows estimated depths of groundwater. The area of Tottenham Court Road is shown as having an estimated groundwater depth of around 60m. Perched groundwater could still exist at a shallower level above clay layers but the Strategic Flood Risk Assessment has not made any reference to groundwater flooding issues in this area and therefore this is viewed as being a low risk.

With the above in mind, the site and therefore courtyards are at low risk of flooding from groundwater.

Assessment of Impact: Low
Assessment of Probability: Low

4.6 Summary of Flood Risks

A summary of the flood risks identified in section 4 is shown in Table 1.

RISK ASSESSMENT MATRIX				
	Impact →			
Probability of Event ↓		Low	Medium	High
	Low	**A, C, D, E**		
	Medium		**B**	
	High			

Key:
A: Fluvial, Tidal and Tidelocked – (Section 4.1)
B: Artificial Drainage – (Section 4.2)
C: Overland – (Section 4.3)
D: Infrastructure Failure – (Section 4.4)
E: Groundwater – (Section 4.5)

5.0 Further Measures and Residual Risks

5.1 Artificial Drainage

The courtyards being covered contain combined foul and surface water drainage systems below ground. Any exposed drainage access point into the drainage system (such as gullies or manhole covers) will be a risk to flooding the internal areas of the new covered courtyards.

To reduce the risk of flooding to the courtyard area once covered, any gullies at the base of rainwater pipes should be removed and direct connections made to the below ground drainage system from the rainwater stack. Sealed rodding eyes could be located on the rainwater stacks to ensure appropriate rodding access can still be maintained to the below ground drainage.

Any existing (or new) manhole covers that are currently external and will be located in an internal area as part of the renovation, should have new bolt down, water tight covers fitted to the chambers. This will prevent any water from surcharging out through the covers causing flooding but more importantly will prevent any gases escaping from the drainage system.

If the measures outlined above are incorporated into the existing drainage system within the courtyards to be covered over, the risk and impact are considered to be reduced from medium to low.

Final Assessment of Impact: Low
Final Assessment of Probability: Low

5.2 Other Flood Risks

Items A, C, D & E have been categorised in section 4 as having low probability and low risk to each of them and therefore no further flood risk measures will be implemented for these areas.

6.0 Conclusions

This Flood Risk Assessment analyses fluvial and tidal, artificial drainage, overland, infrastructure and groundwater flood risks for the proposed Heal's building renovation, which includes the covering of two external courtyards with a new roof. The investigation into flood hazards confirms that:

- According to Environment Agency flood maps, the site lies within National Flood Zone 1 with a less than 1 in 1000 probability of flooding from rivers or the sea.
- Any drainage in courtyards that are to be covered over are at risk of surcharging causing potential flooding. To reduce this risk, it is recommended that any manhole covers within the courtyard are replaced with bolt down water-tight covers to prevent water and gas egress into internal areas. All gullies in the courtyard and at the base of rainwater pipes should be removed and the rainwater pipes connected directly to the below ground drainage system using existing drainage connections.
- The site is not located near any slopes or high ground and is therefore not expected to suffer from any overland flooding.
- The River Fleet is understood to flow near the site but is thought to pass through a culvert below ground. This has not been identified on any watercourse plans and no flooding issues have been reported in the area as a result of the watercourse.
- No significant infrastructure is located in or near the site that would pose a flood risk to the site.
- There are no groundwater issues relating to the site.

Overall it is concluded that the Environment Agency would not have any objections to the proposed development, as part of the planning application and consultation process.

7.0 Recommendation

Based on the above conclusions, it is recommended that the renovation of the building and in particular the covering of the courtyards is suitable for this site in accordance with PPS25 Development and Flood Risk.

8.0 Appendices

Appendix A
Site Location Plan

Appendix B
Existing Building Plans

Appendix C
Proposed Building Plans

Appendix D
Environment Agency Flood Risk Map and Flood Zone Map from SFRA

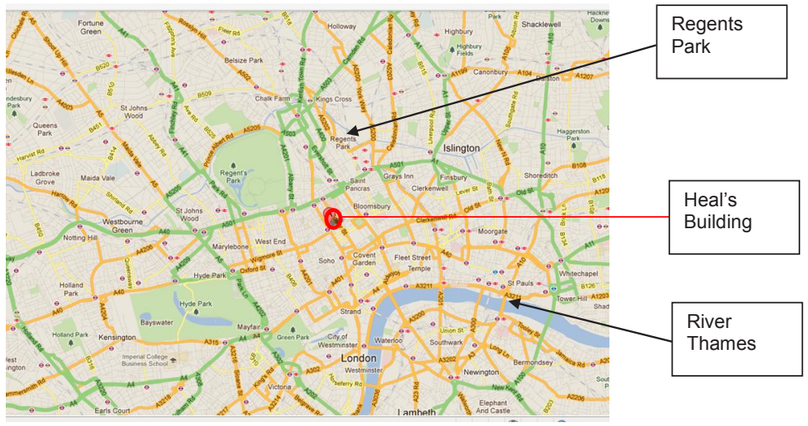
Appendix E
Flood Vulnerability Classification Table D2

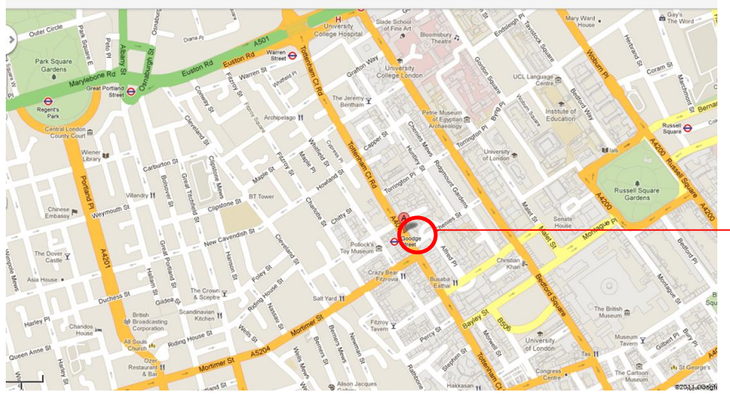
Appendix F
Contour Plan from SFRA.

Appendix G
Sewer Flooding Incident Map from SFRA.

Appendix H
Discussion with the Environment Agency.

Appendix A – Site Location Plan





Appendix B – Existing Building Plans

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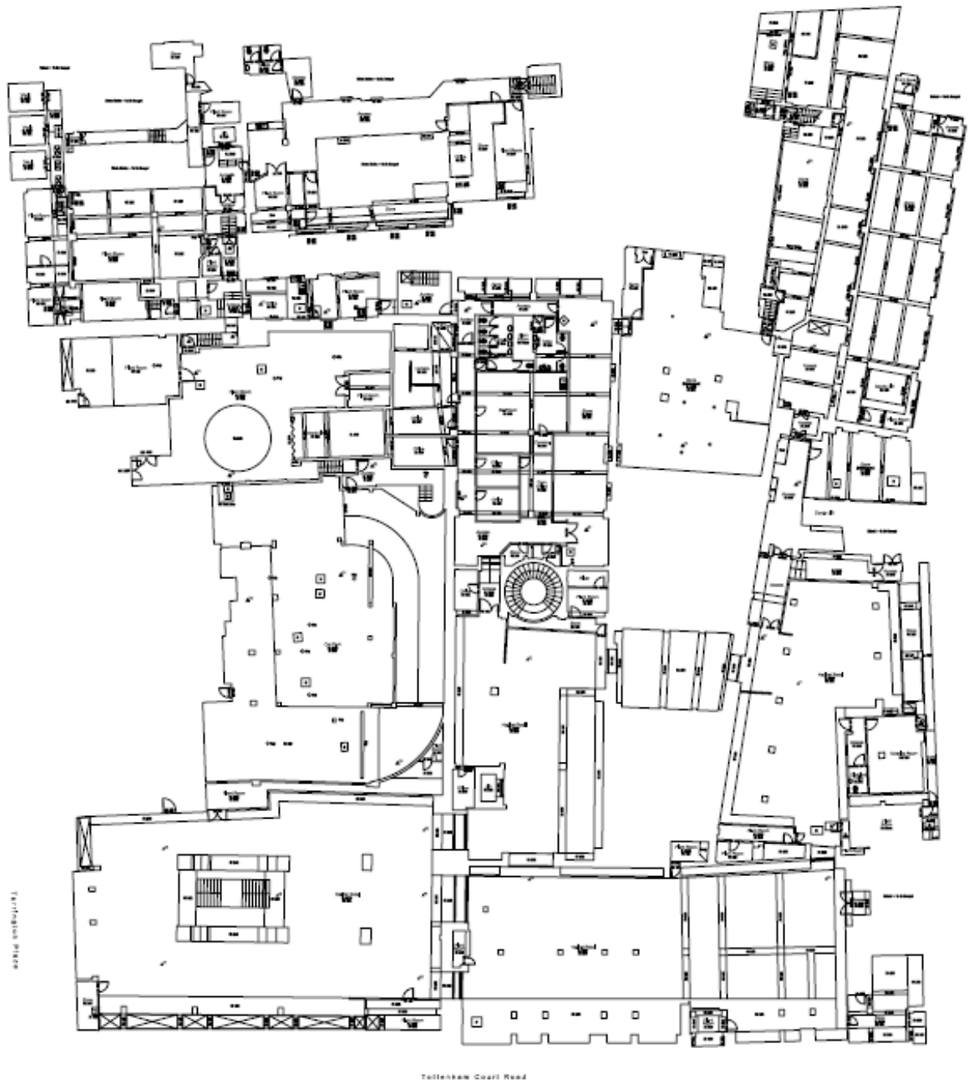


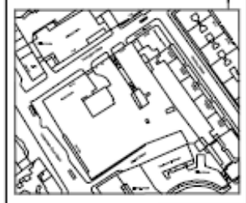
ABBREVIATIONS:

BL	•	Beam Underside Level
CL	•	Ceiling Level
FA	•	Floor to Arch Height (Highest Point)
FAC	•	Floor to Air Conditioning Unit Height
FB	•	Floor to Beam Height
FC	•	Floor to Structural Ceiling Height
FD	•	Floor to Duct Height
FL	•	Floor Level
FH	•	Floor to Head Height
FS	•	Floor to Sill Height
FSC	•	Floor to Suspended Ceiling Height
RFL	•	Raised Floor Level
SCL	•	Suspended Ceiling Level
SH	•	Sill to Head Height

KEY:

All Arrows Point Up Unless Otherwise Stated

SITE PLAN: (Not to Scale)



NOTES:
Levels related to OSL BM 27.87m

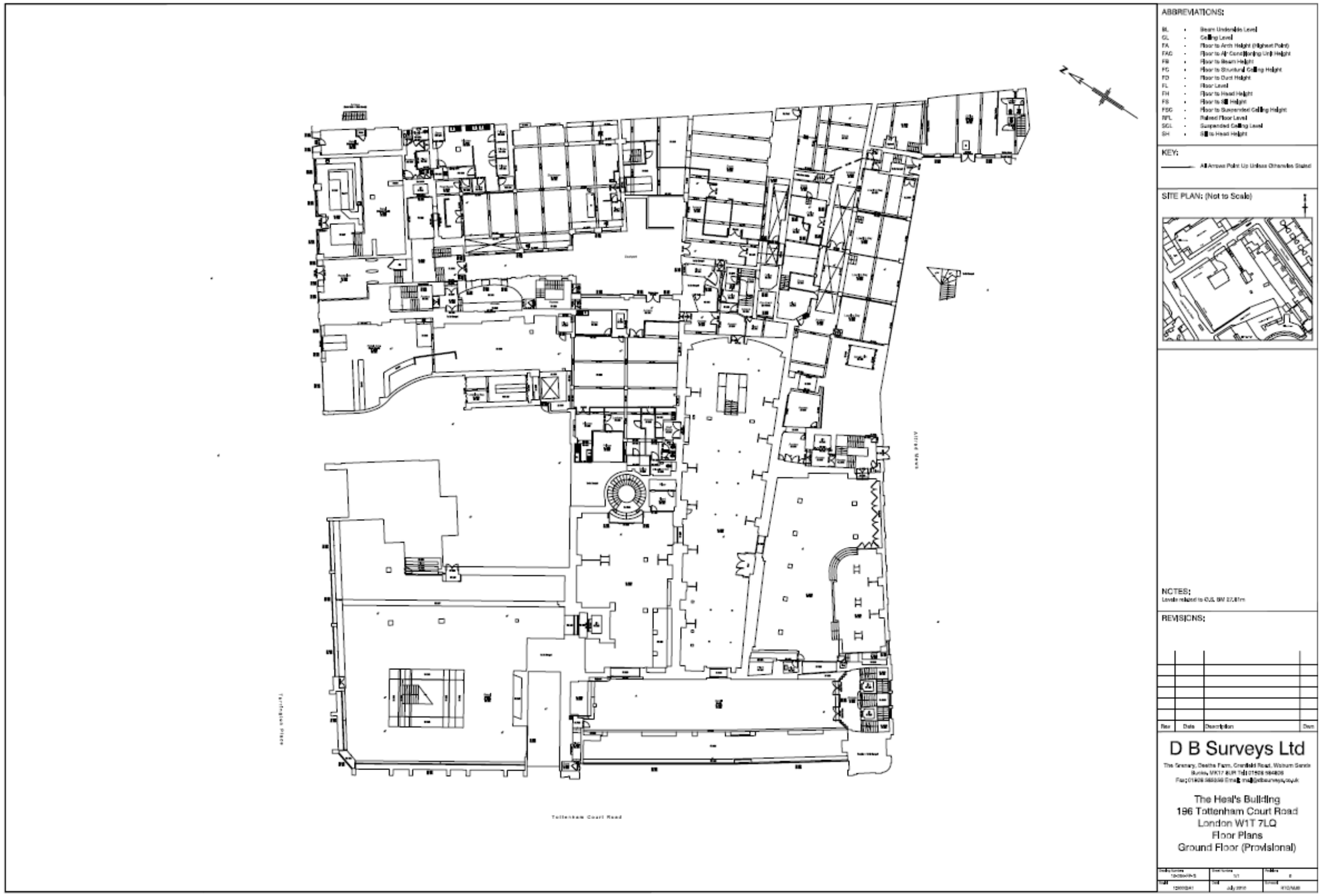
REVISIONS:

Rev	Date	Description	Dwn
2	June 2018	Original Drawing	RTD

D B Surveys Ltd

The Granary, Deeths Farm, Cranfield Road, Woburn Sands
Bunley, MK17 8UR Tel: 01908 584606
Fax: 01908 585586 Email: mail@dbsurveys.co.uk

The Heal's Building
196 Tottenham Court Road
London W1T 7LQ
Floor Plans
Basement (Provisional)



ABBREVIATIONS:

BL	-	Beam Underside Level
CL	-	Ceiling Level
FA	-	Floor to Arch Height (Highest Point)
FAC	-	Floor to Air Conditioning Unit Height
FB	-	Floor to Beam Height
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FD	-	Floor to Duct Height
FL	-	Floor Level
FH	-	Floor to Head Height
FS	-	Floor to Sill Height
FSC	-	Floor to Suspended Ceiling Height
RFL	-	Raised Floor Level
SCL	-	Suspended Ceiling Level
SH	-	Sill to Head Height

KEY:

All Arrows Point Up Unless Otherwise Stated

SITE PLAN: (Not to Scale)

NOTES:
Levels related to OS. BM 27.61m

REVISIONS:

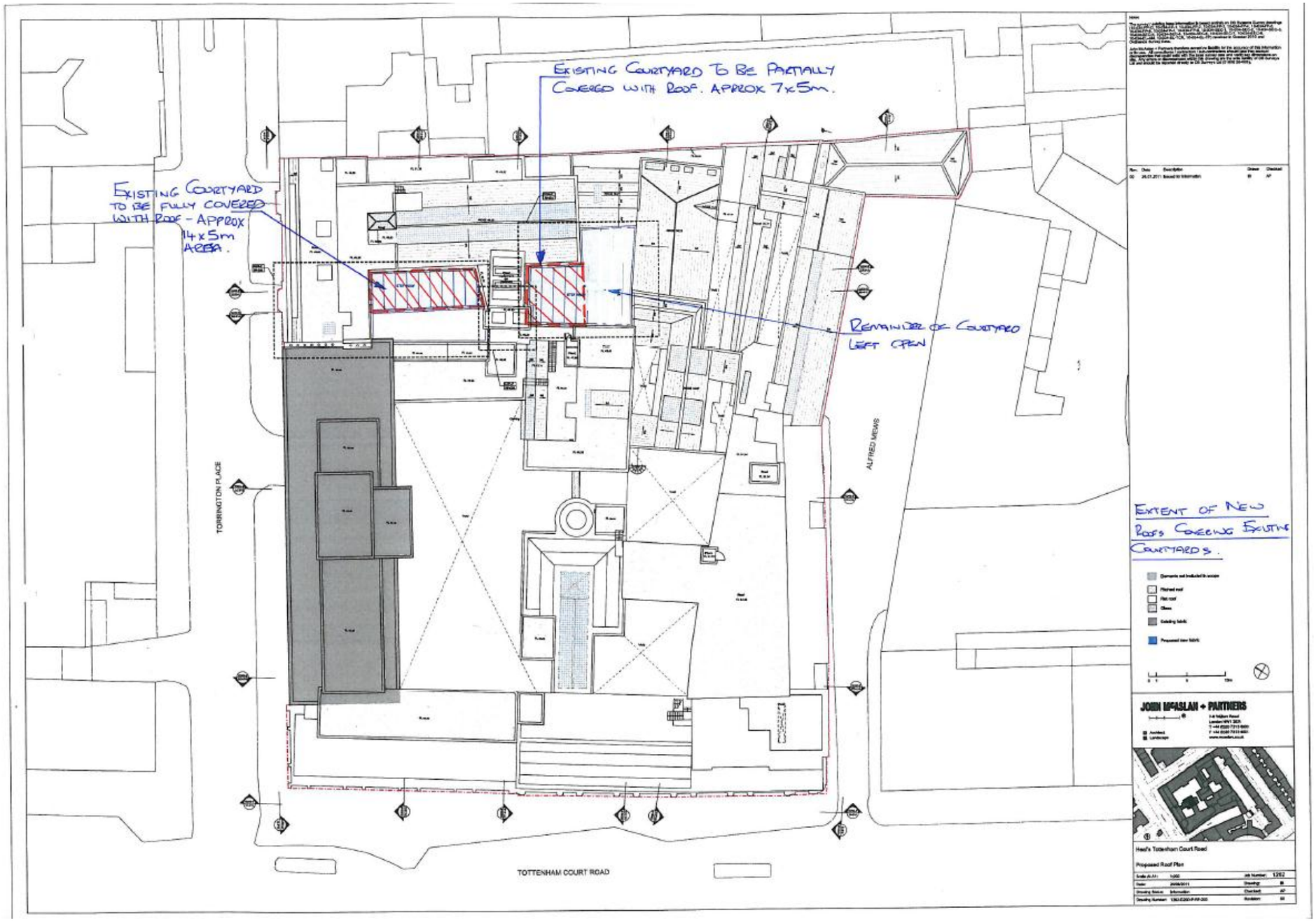
Rev	Date	Description	Dwn

D B Surveys Ltd

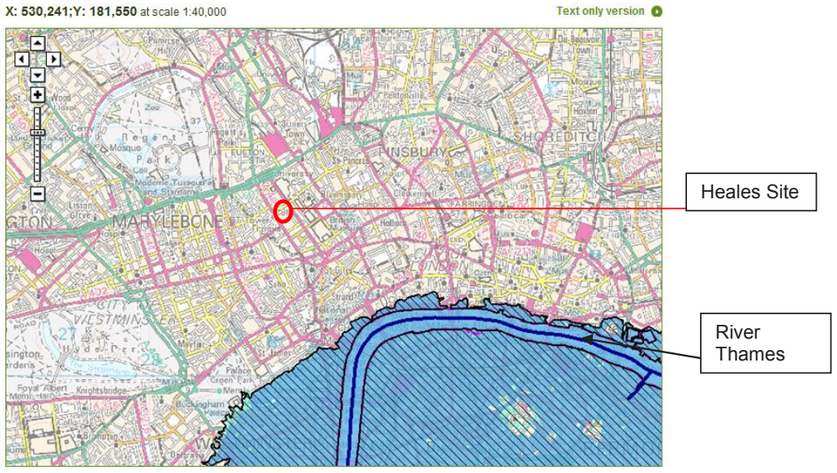
The Granary, Deaths Farm, Cranfield Road, Woburn Sands
Buckinghamshire, MK17 8UR Tel: 01908 584828
Fax: 01908 585336 Email: mail@dbsurveys.co.uk

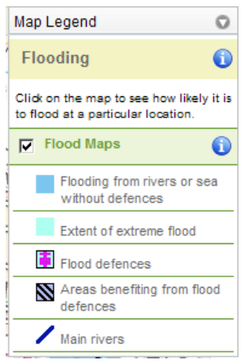
The Heal's Building
196 Tottenham Court Road
London W1T 7LQ
Floor Plans
Ground Floor (Provisional)

Appendix C – Proposed Building Plans


EXISTING COURTYARD TO BE PARTIALLY COVERED WITH ROOF. APPROX 7x5m.
EXISTING COURTYARD TO BE FULLY COVERED WITH ROOF - APPROX 14x5m AREA.
REMAINDER OF COURTYARD LEFT OPEN
TORRINGTON PLACE
ALFRED MEWS
TOTTENHAM COURT ROAD
EXTENT OF NEW ROOFS COVERING EXISTING COURTYARDS.
JOHN McASLAN + PARTNERS
Heal's Tottenham Court Road
Proposed Roof Plan

Appendix D – Environment Agency Flood Risk Map and Flood Zone Map from SFRA

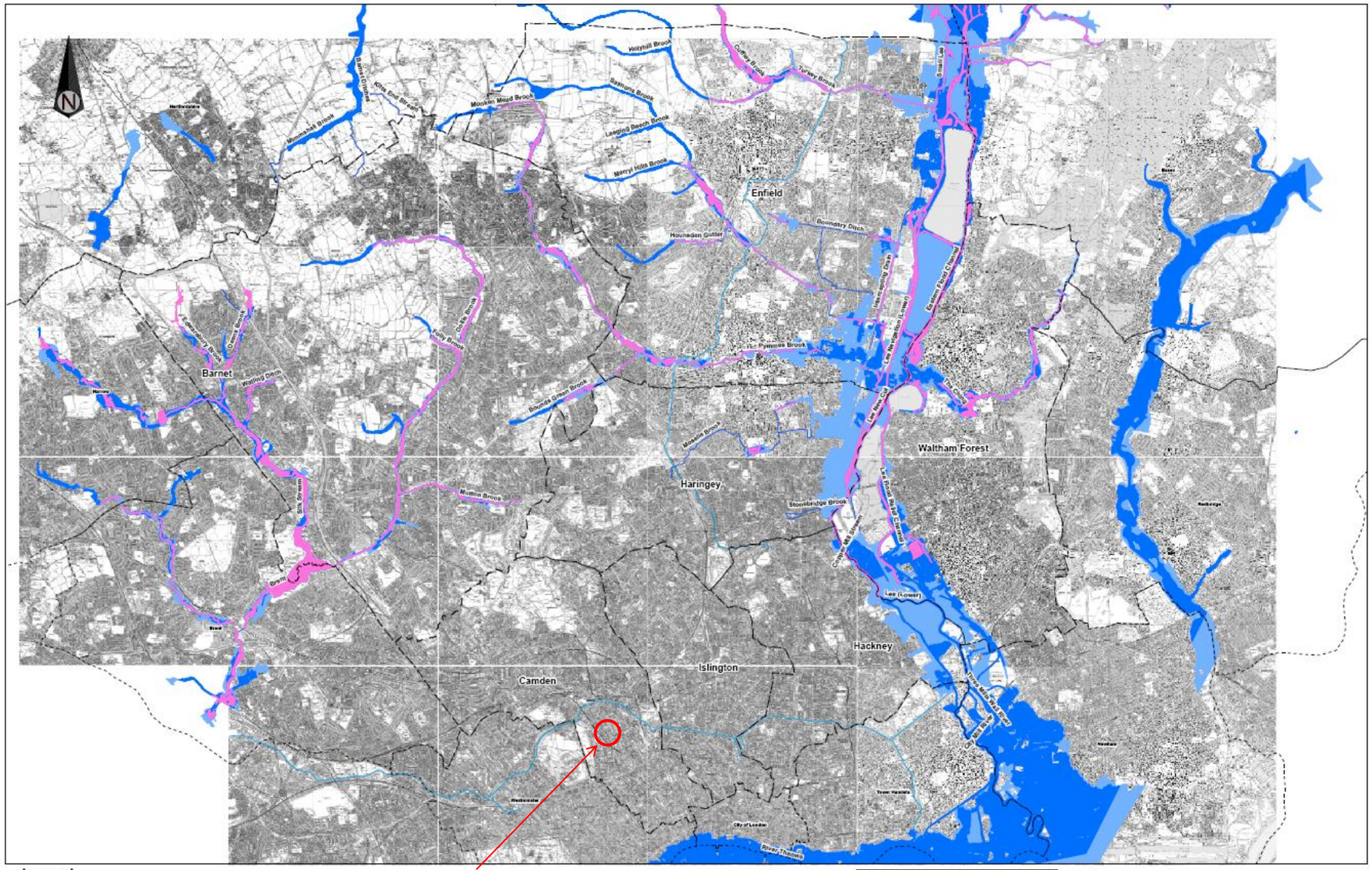




Note:- Flood Zone 1 – no shading

= Flood Zone 3

= Flood Zone 2


Enfield
Barnet
Haringey
Waltham Forest
Hackney
Islington
Camden
Approximate location of Heal's Building
Legend
Borough Boundaries
Flood Zone 1 = Non - coloured areas
Flood Zone 3b
Flood Zone 3a
Flood Zone 2
Canals
Watercourses

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Appendix E – Flood Vulnerability Classification Table D2

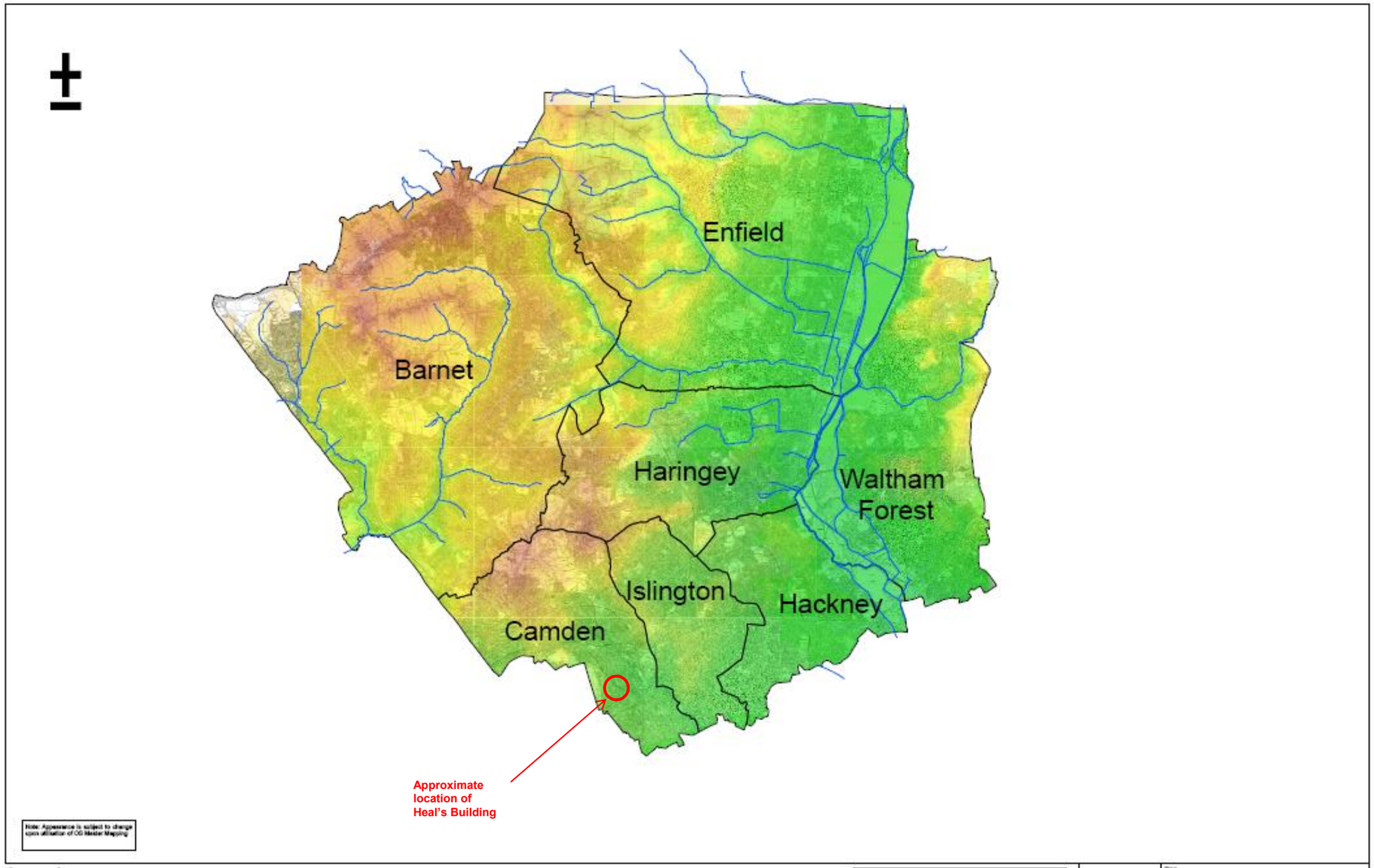
Table D.2: Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.[19]
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.[20] • Sites used for holiday or short-let caravans and camping, **subject to a specific warning and evacuation plan**.
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment plants. • Sewage treatment plants (if adequate pollution control measures are in place).

[19] DETR Circular 04/00 – para. 18: *Planning controls for hazardous substances.* www.communities.gov.uk/index.asp?id=1144377

[20] See *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* for definition. www.communities.gov.uk/index.asp?id=1500757

Appendix F – Contour Plan from SFRA


Enfield
Barnet
Haringey
Waltham Forest
Islington
Hackney
Camden
Approximate location of Heal's Building
Note: Appearance is subject to change upon utilisation of OS Master Mapping
Legend
Non Main Rivers
Height in Metres
High : 150
Low : 0
All designs, comments and recommendations are done so on behalf of Mouchel Parkman and no individual responsibility is taken or implied in anyway by entering and acting on this information you, the client or any third party are accepting that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).
This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.
Data Origin
Lidar data from the EA and Hectmap DTM data provided by the LB Infrastructure.
mouchel
Client: North London Waste Plan
Project: North London Strategic Flood Risk Assessment
Purpose: Information
Drawing Title: Map 7: Study Area Lidar Topography Map
Issue: MV
Draft
Issue
Scale (at A1 size): 1:50,000
Issuing Office: Sutton Coldfield
Telephone: 0121 355 8848
Drawing Number: 722596/007
Rev: B

Appendix G – Sewer Flooding Incident Map from SFRA

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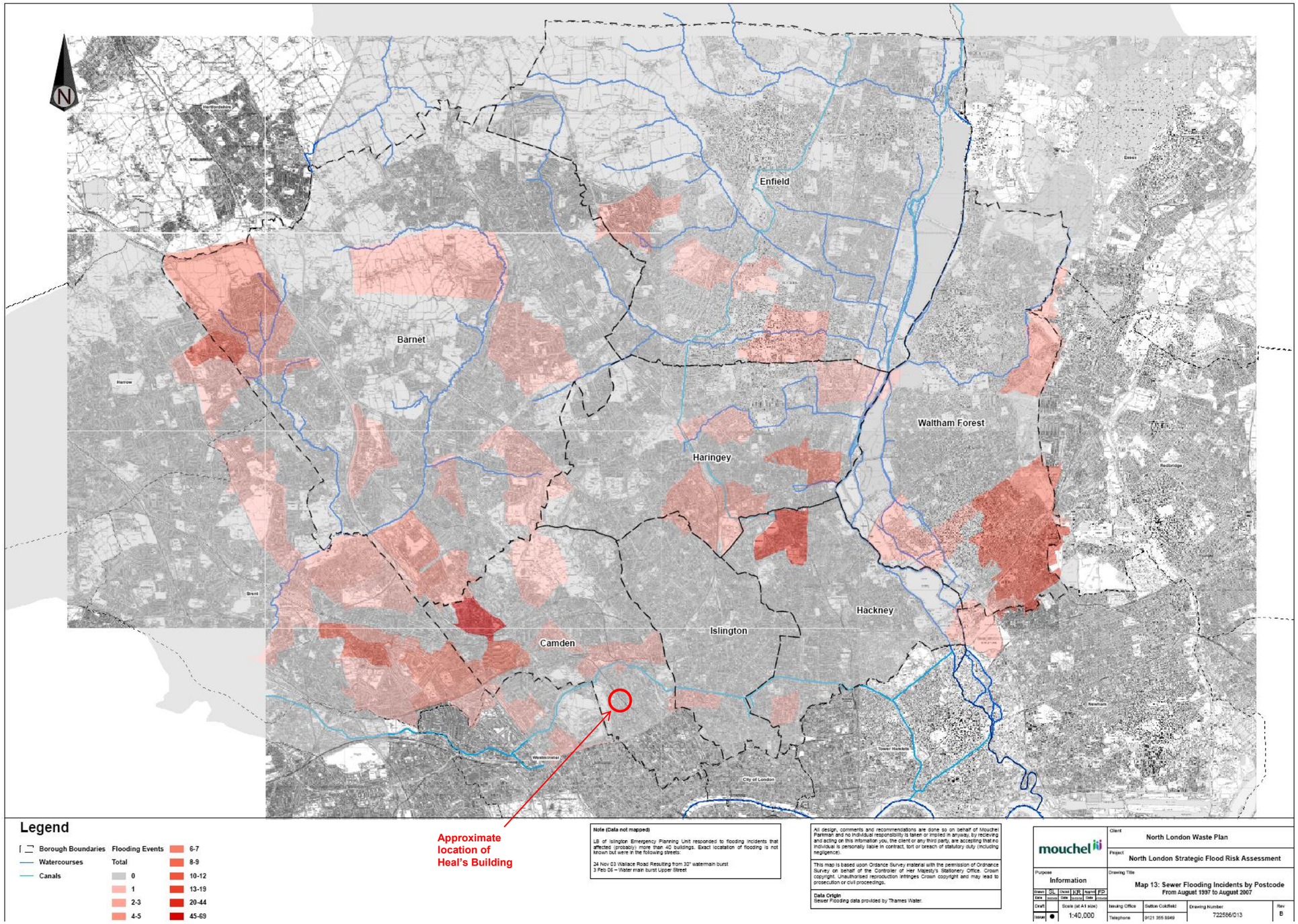
Hertfordshire
Enfield
Barnet
Harrow
Waltham Forest
Haringey
Redbridge
Brent
Hackney
Islington
Camden
Newham
Westminster
Tower Hamlets
City of London
Legend
Borough Boundaries
Watercourses
Canals
Flooding Events
Total
0
1
2-3
4-5
6-7
8-9
10-12
13-19
20-44
45-69
Approximate location of Heal's Building
Note (Data not mapped)
LB of Islington Emergency Planning Unit responded to flooding incidents that affected (probably) more than 40 buildings. Exact location of flooding is not known but were in the following streets:
24 Nov 03 Wallace Road Resulting from 30" watermain burst
3 Feb 06 – Water main burst Upper Street
As design, comments and recommendations are done so on behalf of Mouchel Parkman and no individual responsibility is taken or implied in anyway, by receiving and acting on this information you, the client or any third party, are accepting that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).
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Data Origin
Sewer Flooding data provided by Thames Water.
mouchel
Client
North London Waste Plan
Project
North London Strategic Flood Risk Assessment
Purpose
Information
Drawing Title
Map 13: Sewer Flooding Incidents by Postcode From August 1997 to August 2007
Scale (at A1 size)
1:40,000
Issuing Office
Sutton Coldfield
Drawing Number
722586/013
Rev
B
Telephone
0121 355 8949

Appendix H – Discussion with Environment Agency

CUNDALL

From: planning, North London [mailto:northlondonplanning@environment-agency.gov.uk]
Sent: 22 September 2011 14:42
To: Devere, Paul
Subject: RE: F.A.O Matt Arthur - Flood Risk Assessment, Heal's Building, Tottenham Court Road

Dear Paul

Site Address: Heal's Building, Tottenham Court Road

Thank you for your email below. We have assessed this proposal and have identified surface water run-off as the only potential flood risk issue at this site.

The Local Planning Authority (LPA) will be using our Flood Risk Standing Advice (FRSA) to determine if we need to be consulted directly on an application regarding flood risk. This site is in Flood Zone 1 and is under a hectare. Therefore cell F5 of the consultation matrix applies and the LPA do not need to consult us.

The main flood risk issue at this site is the management of surface water run-off and ensuring that drainage from the development does not increase flood risk either on-site or elsewhere.

We recommend the surface water management good practice advice in cell F5 is used to ensure sustainable surface water management is achieved as part of the development.

If the LPA have identified drainage problems at this site through there Strategic Flood Risk Assessment or Surface Water Management Plan, they may want to request a formal Flood Risk Assessment from yourselves in line with Flood Risk Assessment Guidance Note 1.

If you have any further questions about the above development or about our FRSA, please contact me.

Yours sincerely

Joe Martyn

Planning Liaison Officer
Environment Agency

1

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020 7091 4042

From: Devere, Paul [mailto:p.devere@cundall.com]
Sent: 12 September 2011 11:06
To: planning, North London
Cc: Currie, David
Subject: F.A.O Matt Arthur - Flood Risk Assessment, Heal's Building, Tottenham Court Road
Importance: High

F.A.O Matt Arthur

Dear Sirs,

We have been appointed to undertake a Level 1 Flood Risk Assessment for the renovation of the above building off Tottenham Court Road, Central London.

The renovation works external to the building comprises of covering in one small external courtyard with a roof (approx. 14 x 5m in area) and partially covering another adjacent courtyard with a roof (approx. 7 x 5m). I have attached a copy of the flood zone maps showing where the site is located and you will see the site is situated in National Flood Zone 1. As the development of the courtyards is less than 1 Hectare and is flood zone 1, we understand that the Environment Agency would not normally be consulted. However, our client wishes for us to undertake a flood risk assessment to ensure the EA is consulted and the planning process goes smoothly.

Given the above, we propose to include the following information in the Flood Risk Assessment:

- Statement of what site the flood zone lies in and the proposed courtyard areas.
- Acknowledgement of no formal requirement for a flood risk assessment but the clients request for a Level 1 FRA.
- Existing and proposed plans
- Discussion of the Sequential & Exception Test
- Discussion of risk from tidal or fluvial flooding
- Discussions on how roof will be drained – using existing drainage connections where possible
- Discussion of any overland flooding issues

As the site is not within a flood zone, we would presume that there will be no requirement to formulate an evacuation plan? Please could you confirm this.

Please could you review the above and the attached items and confirm that our proposed content for the report would meet your requirements for a Level 1 Flood Risk Assessment. We would appreciate a prompt response on the matter.

If you have any queries, please contact me on the number below.

Regards

Paul

C | ENERGY STATEMENT

Heal’s Redevelopment, Tottenham Court Road

Energy Statement

Job No: 1003634

Date: 9th December 2011

Cundall Johnston and Partners LLP Saffron House 6-10 Kirby Street London EC1N 8TS tel 020 7438 1600 www.cundall.com

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	1.2	Summary of targets	4
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	2.1	National Policy	5
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Prepared by	Checked by	Verified by	Stage/Status	Revision ref	Date
WS	AF		For Planning	01	10/08/2011
WS	AF	AF	For Planning	02	04/10/2011
WS			For Planning	03	01/11/2011
WS	AF	AF	For Planning	04	08/12/2011
WS	AF	AF	For Planning	05	09/12/2011

File ref: \\Cjp.Co.Uk\Projects\1003634 Heal's Refurbishment\24-Environmentally_Sustainable_Design\05_Reports\Drafts\6z_01b_HEAL'S_Energy_Statement.Doc

Executive Summary

This Energy Statement has been prepared by Cundall and is included as part of the planning application submission. This report sets out the proposed energy strategy for the development reflecting the Mayor's Energy Hierarchy of 'Be Lean, Be Clean and Be Green'.

This Energy Strategy Proposes to reduce the carbon dioxide emissions from the development by 15.5%, when compared to the baseline conditions. This will be achieved by the following:

- The introduction of low carbon technology and energy efficient equipment which will be incorporated to reduce energy consumption by 6%.
- Renewable energy will be generated using air source heat pumps and 20m² of solar collectors. In total, the contribution of the renewable energy sources will reduce the building CO_2 emissions by approximately 9%.

Some of the proposed sustainable measures are:

- 100% low-energy lighting together with daylight dimming and occupancy sensors
- Energy-efficient external lighting & designed to minimise light pollution
- Solar thermal hot water.
- Heat exchangers to air handling plant

1.0 Introduction

Sustainable development requires a long-term, integrated approach to develop and achieve healthy communities by jointly addressing economic, environmental, and social issues, whilst avoiding the over consumption of key natural resources.

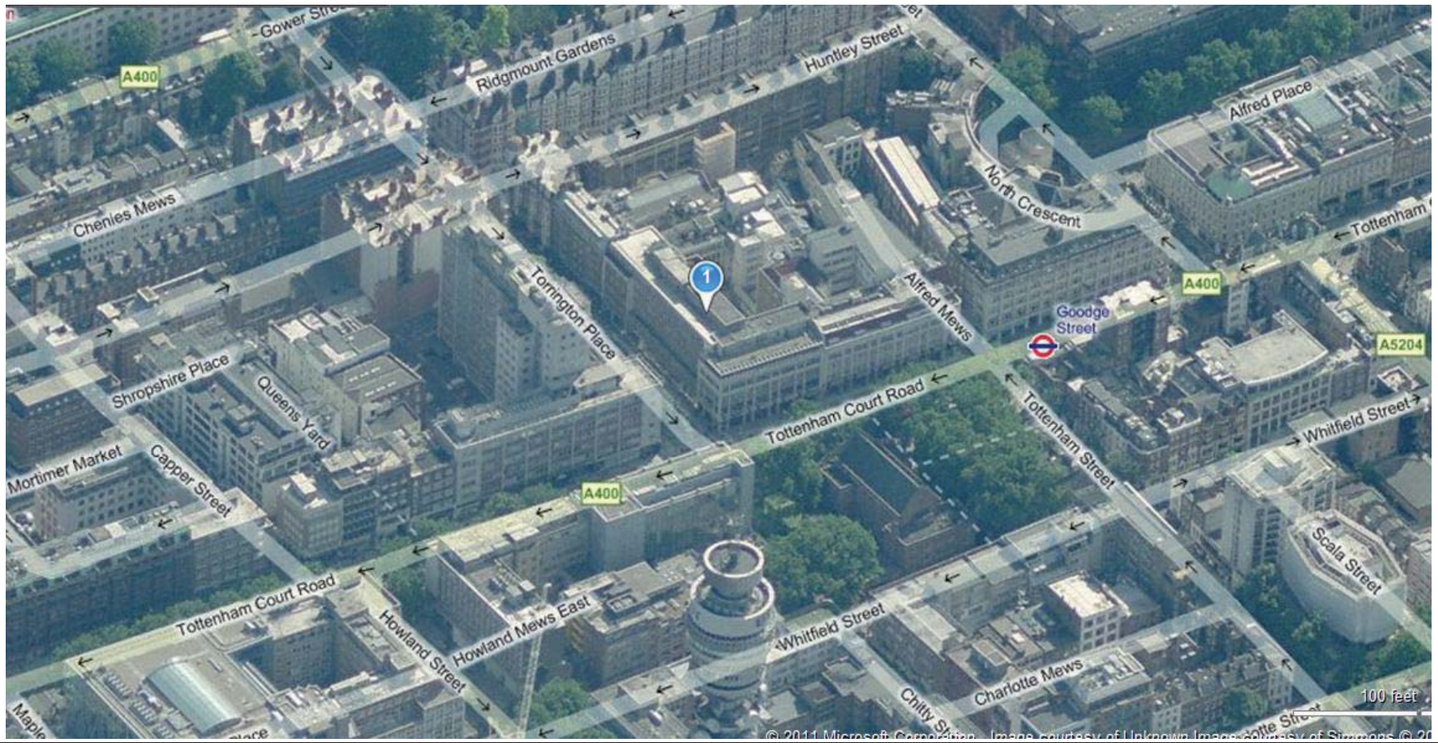
Cundall have prepared this sustainability review in order to assess a number of environmental issues related to the proposed refurbishment of the commercial areas of the Heal's development at Tottenham Court Road

The proposals incorporate a number of sustainable measures and energy efficient systems into the design, so as to limit the demand for energy in operation, the associated carbon emissions, as well as to minimize the development's overall environmental impact.

1.1 Description of the development

The existing Heal's development is located in Tottenham Court Road, central London. It is a listed building and as such there is a limitation on what changes can be made to the building's appearance. The majority of the basement to 1st floor form the retail space. The upper floors are used as offices. The proposal is to refurbish the office part of the development with the replacement of building services to achieve high quality space with low energy systems. It is planned to retain the facades whose insulation levels will be improved in so far as the listing will permit. It is currently proposed to upgrade the windows.

The proposed building services will comply with the Non-Domestic Building Services Compliance Guide, CLG 2010. Balanced mechanical ventilation systems with heat recovery will be provided to all spaces excluding toilets. Heating and cooling demand will be satisfied by efficient air source VRV (variable refrigerant volume) systems, with one per tenancy to increase the flexibility of heating and cooling. Toilets will be provided with local extract ventilation and heating demand will be satisfied by electrical heaters. High efficiency linear fluorescent luminaries with daylight dimming and PIR control where applicable will further reduce the building energy consumption:

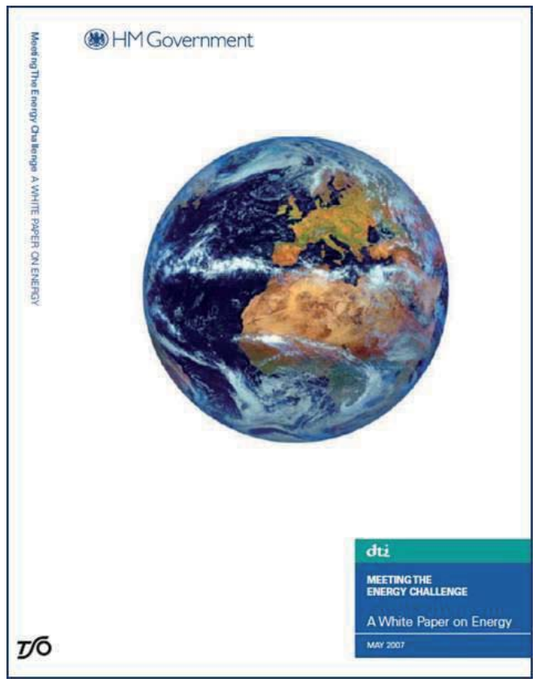


1.2 Summary of targets

The development will be designed with the aim of meeting the following energy related policies / targets:

- At least 10% of the project cost should be spent on environmental improvements
- Energy saving measures should be maximised through the use of the low energy and renewables technologies
- 20% reduction in the overall CO_2 emissions beyond the baseline using renewable energy sources will be targeted, in line with the London Plan.

In this report, a preliminary review has been undertaken of how these targets might be achieved.
The strategy will be developed in more detail as the design progresses and further details can be submitted with the full planning application at a later stage.



2.0 Policy Context

This section summarises the recent national and regional policy context and introduces the energy requirements of the Code for Sustainable Homes, which will play a significant role in the setting of targets for the development.

2.1 National Policy

The UK Government published its Energy Review in 2002 which included the following recommendations: 20% of energy demand to be met by renewables by 2020; 20% improvement in energy efficiency of buildings and transport by 2010; and 60% reduction in carbon dioxide (CO_2) emissions by 2050.

The Department of Trade and Industry released an Energy White Paper in 2003 (revised in May 2007) which led to the Office of Deputy Prime Minister (ODPM) (now the Department for Communities and Local Government (DCLG)) publishing an updated strategy entitled Sustainable Communities: building for the future. It introduced reforms to the planning system and incentives to improve the performance of buildings, driving a planning culture change. This strategy translated into the 2004 Planning Policy Statement 22 (PPS22): Renewable Energy, which sets out the Government's policies for renewable energy, which planning authorities referred to when preparing local development documents and when taking planning decisions. Planning Policy Statement 1 (PPS1): Delivering Sustainable Development, published in 2005, sets out the latest Government policy on the delivery of sustainable developments through the planning system.

There are five key principles outlined in paragraph 1 of PPS22:

- Planning must promote and encourage rather than restrict renewable energy projects
- Wider environmental and economic benefits of projects, regardless of their scale, are material considerations to be given weight in determining planning applications
- Planning authorities should not make technical and commercial assumptions about project feasibility
- Small scale projects are important; and
- Community involvement in projects should be fostered.

Following these documents, the Government has launched a range of measures/policies aimed at combating global warming and climate change including:

- The Energy Challenge – Energy Review, DTI, 2006
- The Stern Review: The Economics of Climate Change 2006
- The draft Climate Change Bill, March 2007
- Climate Change and Sustainable Energy Act, 2006
- Sustainable and Secure Buildings Act, 2007
- Building A Greener Future – Towards Zero Carbon Development, DCLG, 2006

The cumulative effect of all these measures is the strengthening of the planning and building control process that contributes to the Government's long-term commitment to reduce carbon emissions by 60% by 2050, with an interim target of 26-32% by 2020.

2.2 Regional & Local Policy

The Mayor's London Plan (2011) sets out policy and guidance in the London context and identifies a number of main objectives related to improving London as a workplace and living place.

Overview of the GLA Energy Strategy

The plan encourages planning officers to require renewable energy and energy efficiency in new developments. In brief the London Plan states:

Policy 5.2A states that Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

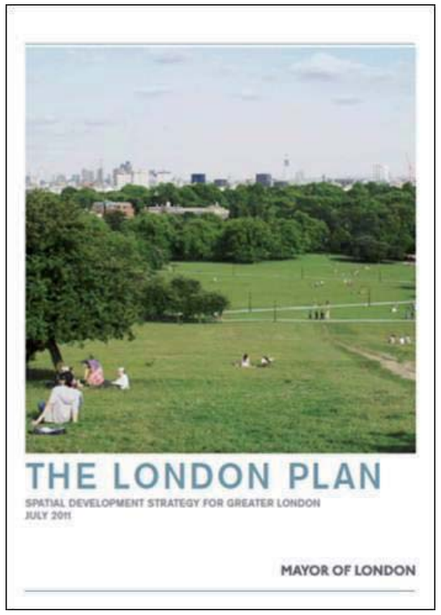
1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

Policy 5.2B states that The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings.

Policy 5.2C states Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

Policy 5.2D states that as a minimum, energy assessments should include the following details:

a) calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations at each stage of the energy hierarchy



b) proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
c) proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)
d) proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

Policy 5.5 states that London Boroughs should require developers to prioritise connection to existing or planned decentralised energy networks where feasible.

Policy 5.7 states that The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation, Energy Strategy and in supplementary planning guidance will be achieved in London.

Clause 5.42 states that there is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20% through the use of on-site renewable energy. Development proposals should seek to utilise renewable energy technologies such as: biomass heating; cooling and electricity; renewable energy from waste; photovoltaics; solar water heating; wind and heat pumps. The Mayor encourages the use of a full range of renewable energy technologies, which should be incorporated wherever site conditions make them feasible and where they contribute to the highest overall and most cost effective carbon dioxide emissions savings for a development proposal.

2.3 Camden Town Planning Requirements

Camden Town Planning requirements related to the energy strategy of the developments are addressed in the following documents

- Camden Planning Guidance CPG3
- Core Strategy CS13 - Tackling climate change through promoting higher environmental standards
- Policy DP22 – Promoting sustainable design and construction

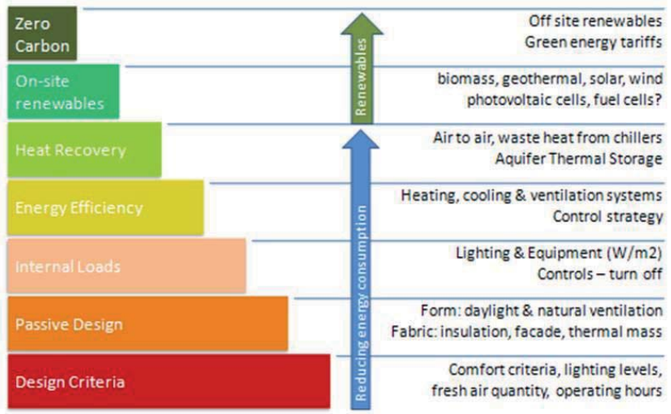
Camden Planning Guidance CPG3 requires that at least 10% of the project cost should be spent on environmental improvements

Core Strategy CS13 imposes the following requirements on the developments:

- minimising carbon emissions from the redevelopment, construction and occupation of buildings by implementing, in order, all of the elements of the following energy hierarchy:
    - ensuring developments use less energy,
    - making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;
    - generating renewable energy on-site (20%); and
- ensuring buildings and spaces are designed to cope with, and minimise the effects of, climate change.

Policy DP22 oblige the development to incorporate sustainable design and construction measures. Schemes must in between demonstrate how sustainable development principles have been incorporated into the design and proposed implementation, see table below.

Design	Fabric/Services
• the layout of uses • floorplates size/depth • floor to ceiling heights • location, size and depth of windows • limiting excessive solar gain • reducing the need for artificial lighting • shading methods, both on or around the building • optimising natural ventilation • design for and inclusion of renewable energy technology • impact on existing renewable and low carbon technologies in the area • sustainable urban drainage, including provision of a green or brown roof • adequate storage space for recyclable material, composting where possible • bicycle storage • measures to adapt to climate change (see below) • impact on microclimate	• level of insulation • choice of materials, including - responsible sourcing, re-use and recycled content • air tightness • efficient heating, cooling and lighting systems • effective building management system • the source of energy used • metering • counteracting the heat expelled from plant equipment • enhancement of/provision for biodiversity • efficient water use • re-use of water • educational elements, for example visible meters • on-going management and review



Cundall's "Steps to low carbon"

3.0 Estimated Energy Consumption

The designs of the development will be advanced with the aim of reducing their annual energy consumption, whilst providing energy in the most environmentally friendly way to reduce the annual CO_2 footprints.

The outline strategy has been developed using the methodology recommended by the London Plan and Camden Town CPG3, i.e. achieving reductions in CO_2 emissions in accordance with the following hierarchy:

1. reducing energy needs through improved design and construction
2. delivering energy through the use of decentralised and low carbon energy
3. further reducing CO_2 emissions through the use of on-site renewables.

Further to the above methodology, we have applied Cundall "Steps to low carbon" methodology (see figure opposite), which includes:

- The incorporation of energy efficiency measures through the design of services and improved fabric performance
- Calculation of the predicted design energy consumption rates and associated annual CO_2 emissions in comparison with a 'baseline' building (using Part L Regulations compliance standards)
- Assessment of the viability of incorporating low and zero carbon energy sources

Element	Minimum Part-L2A compliance	Proposed design
HVAC System	VRV Heating/Cooling + Central Balanced Ventilation System with Heat Recovery	
Seasonal CoP heating	2.2	3.1
Seasonal SEER cooling	2.5	4.5
AHU Fan SFP	2.2 W/l/s	2.1 W/l/s
Heat Recovery Efficiency	70%	75%
Office Lighting Loads	55 Lm/W	55Lm/W
Lighting Controls	PIR (Auto On/Off)	PIR (Auto On/Off) + Daylight Dimming

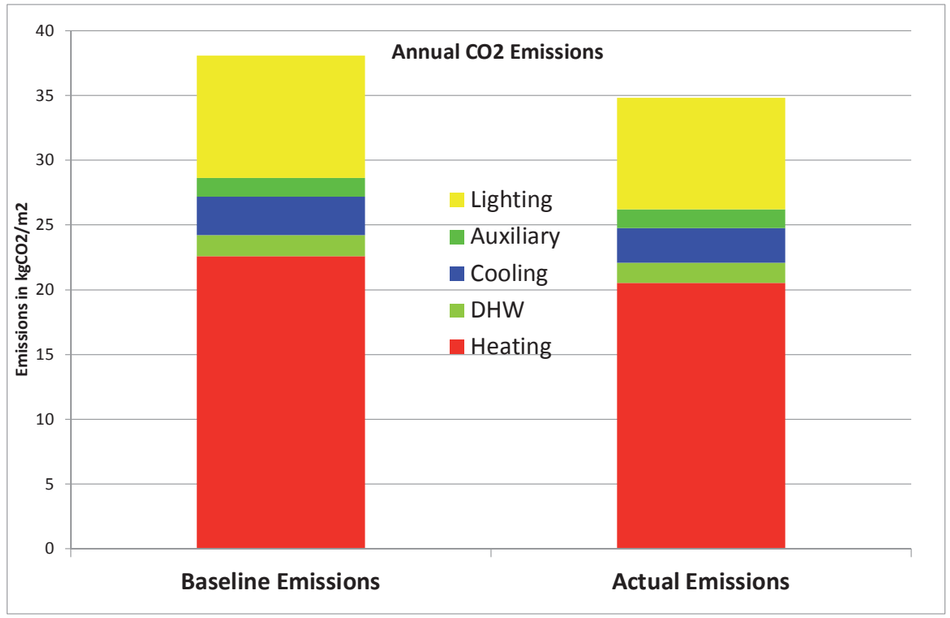
A number of energy-efficiency improvements over the Building Regulations compliant 'baseline' building have been incorporated as summarised below.

- Efficiencies need to comply with the minimum requirements of Non-Domestic Building Services Compliance Guide 2010 which relates to heating/cooling/ventilation/lighting/renewable energy systems. The exemplary properties include:
  - Electric heat pump space heating boiler seasonal efficiency SCoP of 3.1
  - Cooling system seasonal efficiency SSEER of 4.5,
  - Supply and extract AHU with heat recovery SFP of 2.1W/l/s
  - Heat recovery system sensible efficiency of 75%
  - Centralised extract systems specific fan SFP of 0.6W/l/s
  - All fans & pumps will be fitted with variable speed equipment
  - Lighting efficacy – 55 lumen/circuit watt
  - Digitally dimmable lighting in perimeter office areas
  - Full BEMS system with the ability to draw attention to 'out of range' values
  - Power factor correction to achieve a whole-building power factor of at least 0.95
- Energy meters should be applied to allow the occupiers to assess min 90% of their energy consumption. Metering should be provided in accordance with CIBSE TM39 and TM46 and it should enable automatic meter reading and data collection.
- Commissioning of all the building services should be carried out in accordance with CIBSE Commissioning Code M and ductwork leakage tasting, in accordance with HVCA DW/143.

Furthermore, it is proposed to upgrade existing windows in order to limit heat/solar gain and reduce heat loss.

In total, the energy saving measures will exceed 10% of the refurbishment budget in line with the CPG3 planning document.

	Heating	Cooling	Auxiliary	Lighting	DHW	Equippment	Total
	Baseline CO_2 Emissions						
$kgCO_2/m^2$	22.6	1.6	2.9	9.5	1.4	16.1	54.2
tCO_2	152.8	11.1	19.9	64.0	9.7	109.1	366.6
	Actual CO_2 Emissions						
$kgCO_2/m^2$	20.5	1.6	2.7	8.6	1.4	16.1	50.9
tCO_2	138.9	10.6	18.1	58.1	9.7	109.1	344.6



The estimated annual carbon dioxide emissions associated with space heating, domestic hot water, cooling and electricity as a whole are summarised in the adjacent table and chart, with the majority of emissions being attributed to the lighting and heating.

The proposed improvement in lighting and air distribution systems efficiencies beyond the already demanding minimum Part-L2010 standards will allow to reduce the CO2 emissions for the proposed building by approximately 6% when compared to the baseline conditions.

Furthermore, the planning policy (CS13) locks for the proposed developments to offset 20% of the building CO2 emissions with the use of renewable energy sources. Using the estimated annual emissions rate for the development a "Renewables" Target is set on the level of 69 tCO2 per annum.

	Potentially feasible (yes/no)	Comments
Heat Network / CHP	NO	Very small base loads of the building (office development) will not be able to sustain viable operation of the CHP units, or become feasible option for connection to heat network.
Air Source Heat Pump	YES	High efficiency VRV system allows for flexible arrangement of heating and cooling per each tenant with minimum space required per floor.
Water Source Heat Pump	NO	Water cooled WRF system per tenant connected to the central condensing water circuit with gas boiler and dry air cooler. For this building, the application of water source heat pump requires extensive condensing water distribution network to 6+ risers, which is not considered feasible
Photovoltaics	Possible	Very limited potential to apply PV panels as: - limited space potentially available (Most of the available roof space allocated for plant) - east/west sloping roof and the risk of overshadowing from the neightbouring buildings, which reduces the efficiency of the panels
Solar Thermal	YES	Solar collectors need to be carefully sited as: - there is limted space available (Most of the available roof space allocated for plant) - long pipework runs may be required between solar collectors and storage heaters
Biomass Boiler	NO	Considered not feasible, as city centre location and refurbishement development rises the issues of: - NOx emissions (Clean Air Act) - Suitable space for Biomass storage - Regular access for biomass supplies into the city centre side streets
Biodiesel Boiler	NO	City centre location and refurbishement development rises the issues of: - Suitable space for a boiler and oil tank - Access for biodiesel supplies into the city centre side streets
HAWT	NO	City centre location and limited footprint of the development rise the following issues: - Low and upredictable efficiency of the wind turbines - Limited number of the turbines (1 - 2) could be fitted - Strong visual but also noise and structural issues
HAWT	NO	
Heat Pumps - GSHP	NO	No space available for the boreholes (Refurbishement development in the city centre)
Heat Pumps - ATES	NO	No space available and too small heating/cooling demand to apply aquifer thermal energy storage

4.0 Low or Zero Carbon Technologies

The sections that follow discuss a number of LZC technologies in relation to their suitability for the proposed site. A preliminary assessment has been undertaken of the feasibility of each technology with regards to its potential for supplying a proportion of the energy demand for the development, thus offsetting CO_2 emissions, whilst also considering the technical, planning and financial issues.

The Mayor's London Plan and the London Renewables Toolkit consider the following renewable and low carbon technologies as being acceptable for supplying a proportion of a site's energy demand. These are considered to potentially be the most likely options for developments in London:

1. Combined Heat & Power (CHP)
2. Wind Turbines
3. Solar Thermal
4. Photovoltaics
5. Biomass Heating
6. Ground Source Heat Pumps – Closed Loop
7. Aquifer thermal energy storage (ATES)
8. Air/Water Source Heat Pumps

Only a few of the options above can potentially be applicable to the Heal's redevelopment, mainly due to the city centre location and site constraints . The table opposite summarises the issues with the renewable energy sources to justify the limited number of renewable technologies analysed in this report.