Project Name: Dr Williams Library

Conservation Engineering Report on Works Proposed to the Library Building

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Contents

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Signed on behalf of CTP	
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1.0 Brief and Introduction

1.1 CTP Consulting Engineers have been instructed to provide conservation engineering services for the adaption of Dr Williams' Library.

1.2 This report was requested by Dr John Eaton, acting for the client Dr Williams's Library Trust, at a design team meeting on 17th February 2020.

1.3 The brief for the report was to provide a considered commentary on the structure of the existing building and the interventions proposed. This report is intended to support the Listed Building Consent application and has been prepared by a Conservation Accredited Engineer.

1.4 Dr Williams' Library is a fine Grade II listed seven-storey loadbearing masonry building overlooking Gordon Square in London, WC1 (Photograph 1). It dates from 1848 and was built to designs by Thomas Donaldson. It has cellular offices and ancillary rooms arranged symmetrically north and south of a central core, in which the original two-storey lecture theatre, library and reading room are located. It is constructed in red and yellow stock bricks with stone features under a shallow-pitch roof.

1.5 The forms of construction are consistent with the period of construction. Deep-joisted timber floors span between the masonry walls; beams are generally of cast iron; the internal stairs are of stone pencheck or 'cantilever' construction, projecting from the walls; the spine corridor is also of stone.

1.6 Later interventions include the library and reading room balconies and spiral stairs at levels 4 and 5, and a cast-iron grid floor at level 7 to the centre-rear of the building, just below the top floor.

1.7 No material change of use is proposed for the building.

1.8 Photographs are included in Appendix A; sketches and reference plans are included in Appendix B.

1.9 This report is not a full structural survey. We have not inspected timberwork or other materials that are covered, inaccessible or otherwise hidden and cannot warrant that such elements are free from defect.

1.10

2.0 Structure of Existing Building

2.1 *General framing*

2.1.1 The principles of framing are identified in the Brief and Introduction above.

2.1.2 The building is substantially in its original form and therefore most of the structure must date from around 1848. Although there have been a number of additions to the structure since it was constructed, there have been few interventions involving the removal of historic fabric.

2.1.3 Those earlier interventions involving addition include the balcony to the Reading Room at level 5 (Photograph 2), the two-stage walkways and the spiral stairs to the Library also around level 5 (Photograph 3), the new grid floor at level 7 (Photograph 4), the boarding-over of the book hoist and riser at the north and south ends of the corridor and the creation of a north accessible bridge-link to the front pavement at level 2.

2.1.4 Those earlier interventions involving removal of fabric include the creation of the southern lift shaft, the laying of concrete floors in the basement: level 1 and the cutting-down of the window to create the accessible bridge link on the front facade.

2.1.5 The timber floor joists are about 250mm (10") deep, spanning north-south across the building parallel to the road, at between 350-425mm centres and built into the loadbearing masonry or onto cast iron beams. The building dates from a time when wrought was steadily replacing cast as the iron for use in structural bending members.

2.2 *Defects*

2.2.1 Whilst an exhaustive structural inspection of the building has not been carried out, there appear to be relatively few structural defects in the building.

2.2.2 Those noted include:

- Slight diagonal cracks up to about 2mm wide to the rear wall, near the south-centre corner, between levels 6 and 7 (Photograph 5).
- Significant bowing (lean) in the chimneys
- A fractured tread to one stone pencheck (cantilever) stone stair on the south flights and damage to the landings from the introduction of building services (Photograph 6)
- Timber rots, potentially including dry rot, in the rear half-landing stores where water has wept from soil downpipes.

2.2.3 There is no obvious sag in the floors, despite current stacking and storage of books around the building. There are no obvious signs of foundation movement, despite the subsoil being shrinkable clay and the proximity of tall, mature trees.

2.2.4 The two external staircases in the front light well are a concern. The stone treads are built into the main façade and water collects at the edge, soaking into the brickwork, with damp penetrating the walls (Photograph 7). It is visible as staining and a greening with algae of the masonry. This is causing damp within the archives at level 1. It is a risk to fabric and it is proposed to remove the stairs and re-detail the flights.

2.3 *Options for Adaptation*

2.3.1 Various options have been considered for adaption.

2.3.2 One of the Trust's primary functions is to act as an archive for old and rare books. Such books require delicate and careful storage and this function is seriously compromised by the lack of modern storage facilities.

2.3.3 A modern facility to support the function of the Trust demands an appropriate form of racking storage and a temperature & humidity-controlled environment. The Library currently has good, effective roller racking in the basement (Level 1), which sits on a solid, ground-bearing slab. Should space be available, other roller racking might be installed at this level without significant impact on the listed fabric, although if found to be shallow in depth, the ground-bearing floors might need to be replaced.

2.3.4 Roller racking demands very high tolerance on structural deflection and high loadings: a deflection limit of up to 1/1000 instead of normal tolerances of 1/360 or 1/250 for floors, in order to stop the rollers jamming on sagging rails. The existing timber upper floors of the building are wholly unsuitable for the installation of such racking, and to remove the floors for this purpose, given the coherent and intact nature of the existing loadbearing structure, would be an unwarranted destruction of fabric in this Listed Building.

2.5 *Material Change of Use*

2.5.1 It is understood that the building originally functioned as a residential study centre and that the north and south wings have been used for book storage and cataloguing since then (Photograph 8).

2.5.2 No material change of use is proposed, as defined by The Building Regulations 2010: Regulations 5 and 6.

2.6 Conservation Philosophy

2.6.1 It is recommended strongly that a philosophy of minimum intervention be adopted, in accordance with Historic England Conservation Principles and BS7913: Guide to the Conservation of Historic Buildings. It would in any case be expected that such principles be applied to the building by the Local Authority Conservation Officer and statutory consultees. This is balanced by the need to provide good accessibility, make measured changes to maintain its use, and correct and repair defects.

2.6.2 The impact of such an approach is to essentially reject options which demand significant change to the fabric, such as the imposition of heavy floor loadings which would result in otherwise unnecessary removal of floors.

2.6.3 The structural impact of the various proposed elements of work is examined more fully in section 3 below. However, the most significant impact of adoption of these principles is that modern, accessible book storage cannot be housed within the existing Grade II listed envelope except in the basement, Level 1. However, the basement in itself cannot house all the Library's valuable archive collection of rare books and manuscripts, and if the Charitable Trust is to maintain its work on the site, then it is understood that storage will need to be built on the available footprint to the rear, alongside the adjoining rear building wings and extensions.

2.6.4 Additionally, it is understood that there are non-structural concerns related to the maintenance of the document archive, in terms of fire protection and humidity and temperature control. These various matters are defined in PD 5454:2012 Guide for the storage and exhibition of archival materials.

2.6.5 Whilst links would be required between existing and new buildings, any such new buildings should not unduly alter the existing masonry walls nor adversely affect the foundations.

3.0 Structural Interventions

3.1 *New lift shaft*

3.1.1 A new lift shaft is proposed to the north of the core area, in a location mirrored to match the south lift shaft. Floor joists will need to be trimmed back and new shaft walls formed on two sides, existing masonry walls forming the other two. Simple trench-fill foundations will be used.

3.2 *Removal and replacement of floor at Level 7*

3.2.1 It is proposed to carefully remove the grid floor intervention and construct a new floor at a slightly lower level, as the current floor level is about 500mm higher than the general floor at level 7. This will permit easier access and beneficial use. The new floor will be constructed of timber joists on steel beams, bearing on padstones in the wall; the beams will be split and spliced for easy manoeuvring and erection.

3.2.2 Removal of the grid floor is a straightforward operation but will require careful planning and back-propping of the floors below, to avoid damage from impact.

3.3 *Removal and replacement of Balcony Floor over Library to front, at Level 5*

3.3.1 The balcony floor, overlooking the Library, will be carefully removed and replaced with a new, deeper structure, at a slightly higher level and extending slight further over the library floor. This will provide space for study at a level that matches the balconies to the rear, at level 5.

3.4 *Extension and Upgrading of Balconies to Library to rear, at Level 5*

3.4.1 The balconies around the reading room at level 5 will be extended out by about 550mm. The existing balustrades dismantled and reassembled with some new components, providing resistance to lateral loading and preventing falls in accordance with the modern standards in BS6399-Part 1 and the Building Regulations. These lightweight balconies are already supported on the structure bookcases and calculations will be undertaken to show how the slightly increased loads may safely be taken into this system. The twist from the balcony balusters will similarly be taken into existing balcony joists and capacity confirmed by calculation.

3.4.2 In this way the balcony balustrades will be dismantled for partial re-use but the balcony decks will not: they will be maintained and extended outwards.

3.5 *Repairs to the Chimneys*

3.5.1 Some of the existing chimneys are at risk: there is significant lean on them that must be addressed. The lean is of order of perhaps 150mm.

3.5.2 A solution to stabilise the chimneys rather than rebuild them is preferred. Investigations are proposed that will locate and permit inspection of the flues from within the roof void. This will help to confirm whether the chimneys might be strengthened by inserting large diameter hollow tubes in two or three of them and grouting these in place using a lime mortar. Such a method would be sufficient to provide confidence in performance.

3.5.3 The details of chimney stabilization will be confirmed after investigation.

3.6 *Dismantling of Existing Bridge and Construction of Two New Bridges to the front pavement, Level 2*

3.6.1 It is proposed to dismantle the existing concrete bridge, because the awkward non-original brick enclosure below it, in the light well, is due to be removed and the bridge itself rests on this structure.

3.6.2 Two new bridge links are proposed, one in the current location and the other mirroring it to the south. These will be constructed in a fine-finished concrete and bear onto the brickwork façade, as does the existing. Particular attention will be given to correct rainwater detailing, to shed water away from the façade.

3.7 *New Stairs to the front pavement light well, down to Level 1*

3.7.1 As noted above, the detail of these stairs causes rainwater penetration and damp in the building. The existing stairs will be carefully dismantled and replaced by new steel stairs.

3.8 *New Buildings to the Rear*

3.8.1 New buildings are proposed to the rear. These will be founded on piled foundations. Rainwater attenuation is to be provided to offset the loss of permeable area. In this way, there will be no long-term detrimental effect of the overall construction and presence of the new buildings on the existing, listed fabric.

3.8.2 Link structures and canopies will be provided between new and existing. These will be relatively lightweight and secured to the face of masonry using screw and bolt fixings.

3.9 *Repairs to the internal stone stairs*

3.9.1 Stonemason's repairs will be undertaken to make good the services penetrations through the stone landing slabs and pin any fractures to treads.

4.0 Conclusions and Recommendations

4.1 There appear to be relatively few structural defects in the building; the most significant is the lean of the chimneys. There is no obvious sag in the floors.

4.2 The existing upper floors of the building are, however, unsuitable for the installation of modern roller racking storage and other heavy loads. New conservation-compliant archive storage might therefore prudently be provided in the basement (Level 1) and to the rear.

4.3 No material change of use is proposed, as defined by The Building Regulations: Regulations 5 and 6; the building as proposed will contain functions that are all currently found within it.

4.4 A philosophy of minimum intervention should be adopted to enact change, balanced by the need to provide accessibility, sustain and strengthen continued use and repair defects.

4.5 Greater accessibility is provided by an additional lift and new bridges over the front façade light well; continued use is strengthened by evening-out the levels of later floor interventions; and the defects to be repaired include making-good the internal stone stairs and stabilizing the chimneys.

4.6 The new buildings to the rear should be constructed in a way that will not be to the long-term structural detriment of the existing fabric of the Grade II listed building.

Appendix A – Photographs

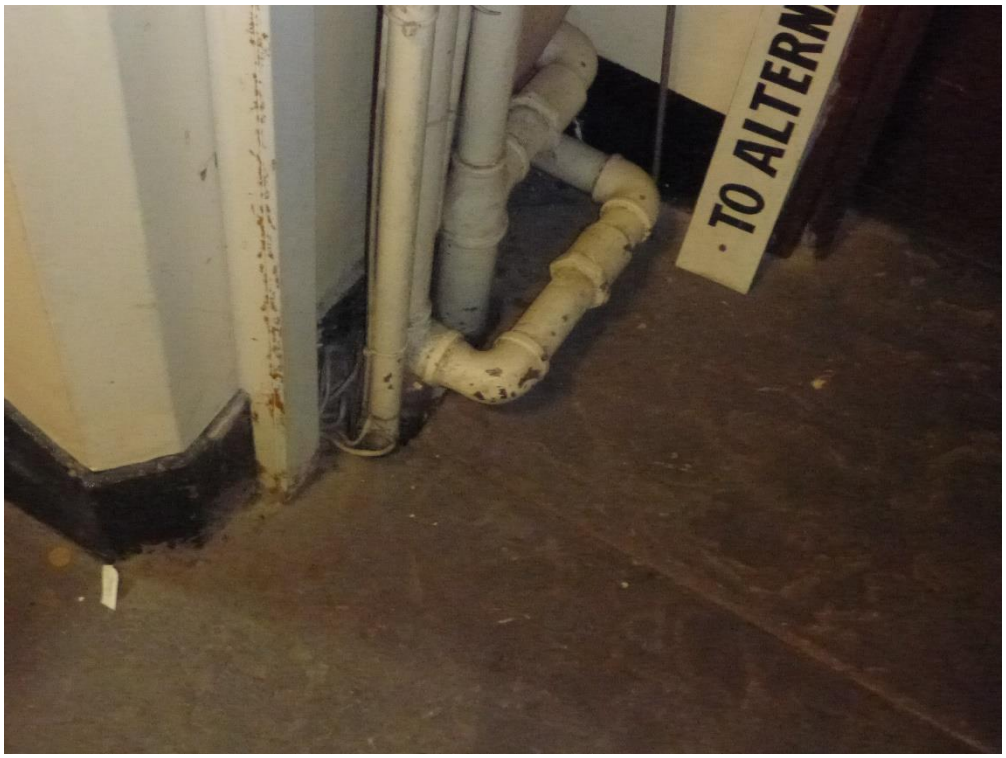
Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5

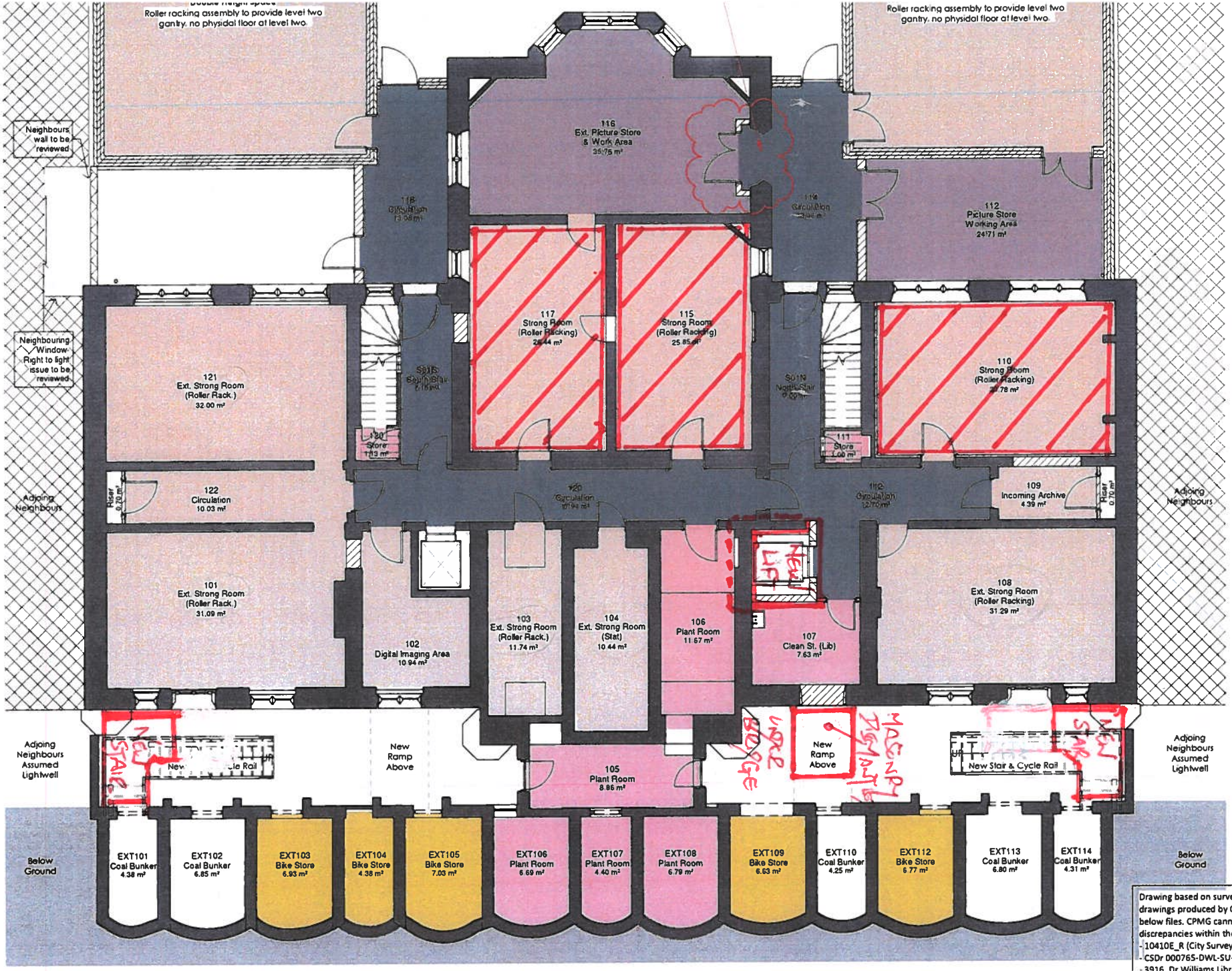


Photograph 6

Photograph 7

Photograph 8

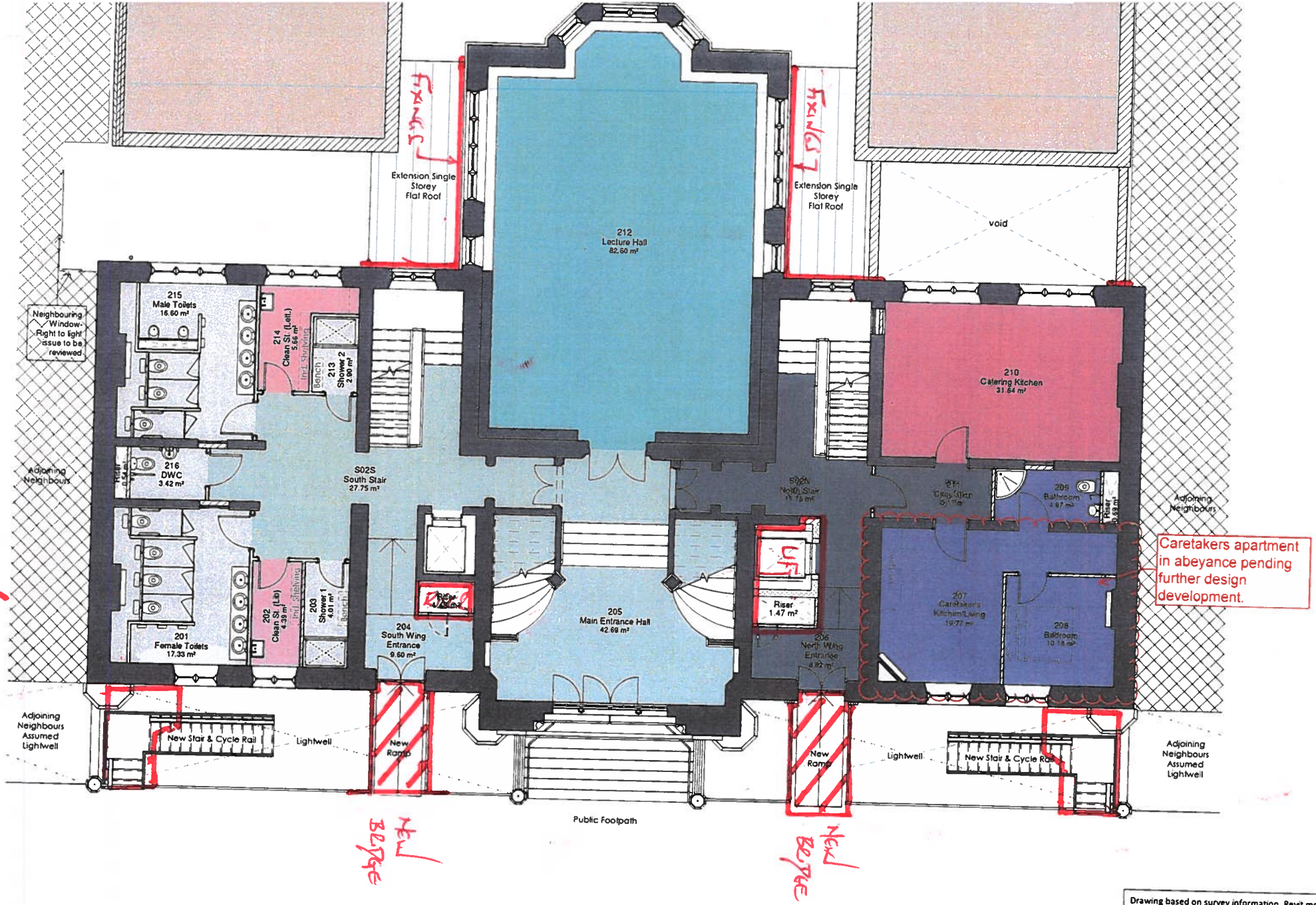
Appendix B – Plans



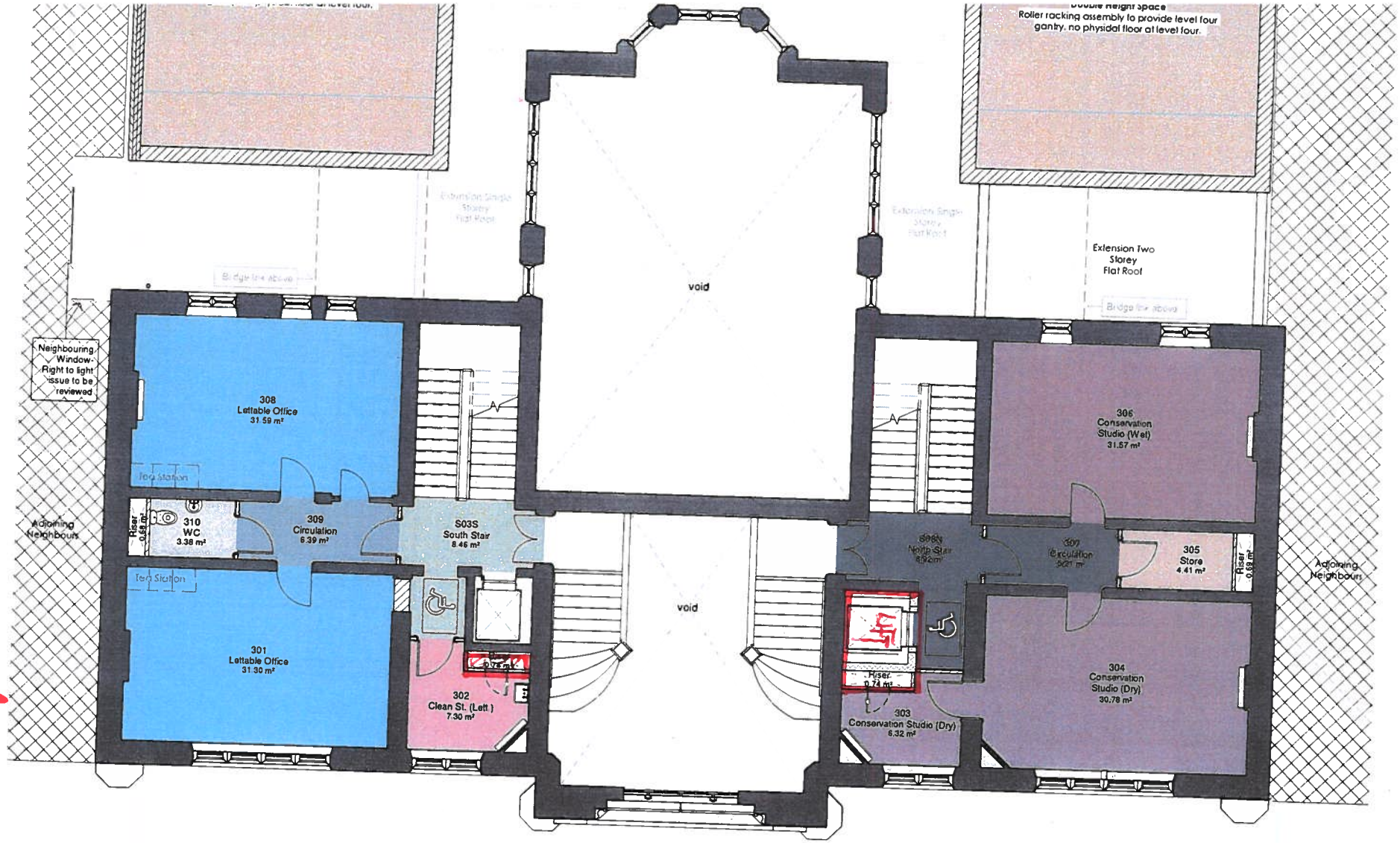
AREAS OF IMPACT SHOWN IN RED

= NEW FLOORS

LEVEL 1 (BASEMENT)



Drawing based on survey information, Revit model and CAD drawings produced by City Survey's and Survey Hub, refer to below files. CPMG cannot be held responsible for any discrepancies within the original Revit survey or CAD drawings.
- 10410E_R (City Surveys)
- CSDr 000765-DWL-SU-DRG-0001-A01.rvt (City Surveys)
- 3916_Dr Williams Library_3D Model (Survey Hub)



LEVEL 3

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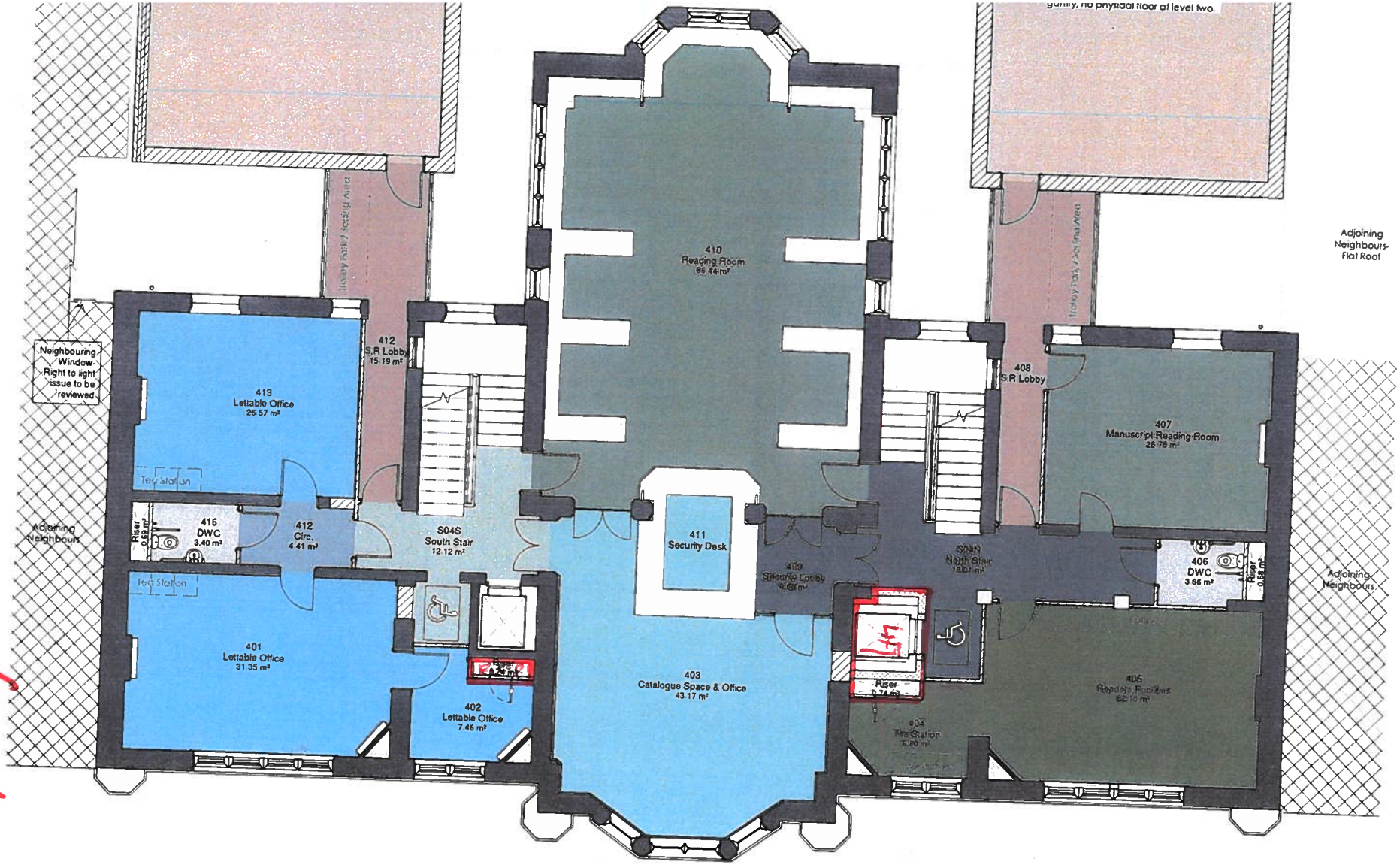

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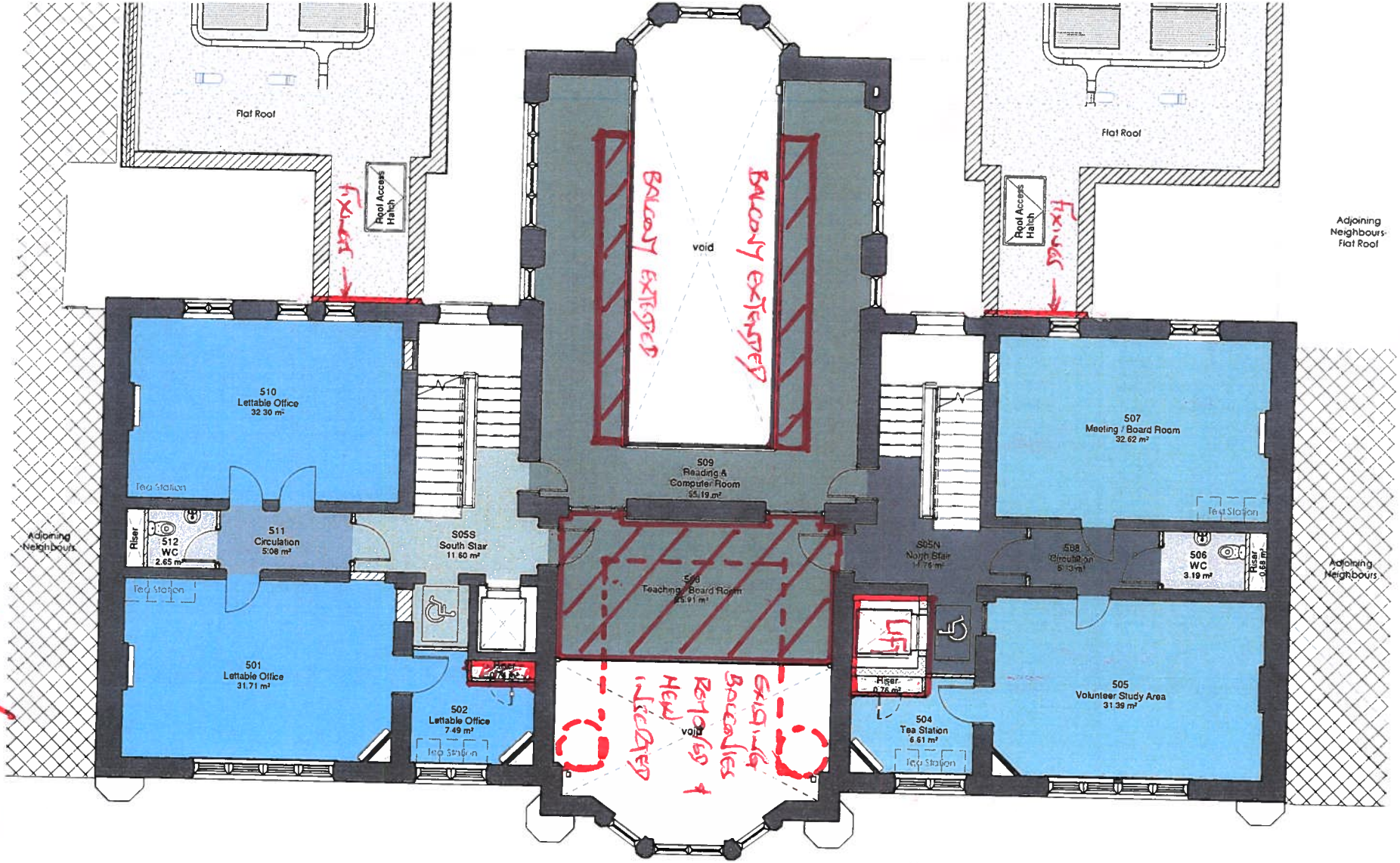

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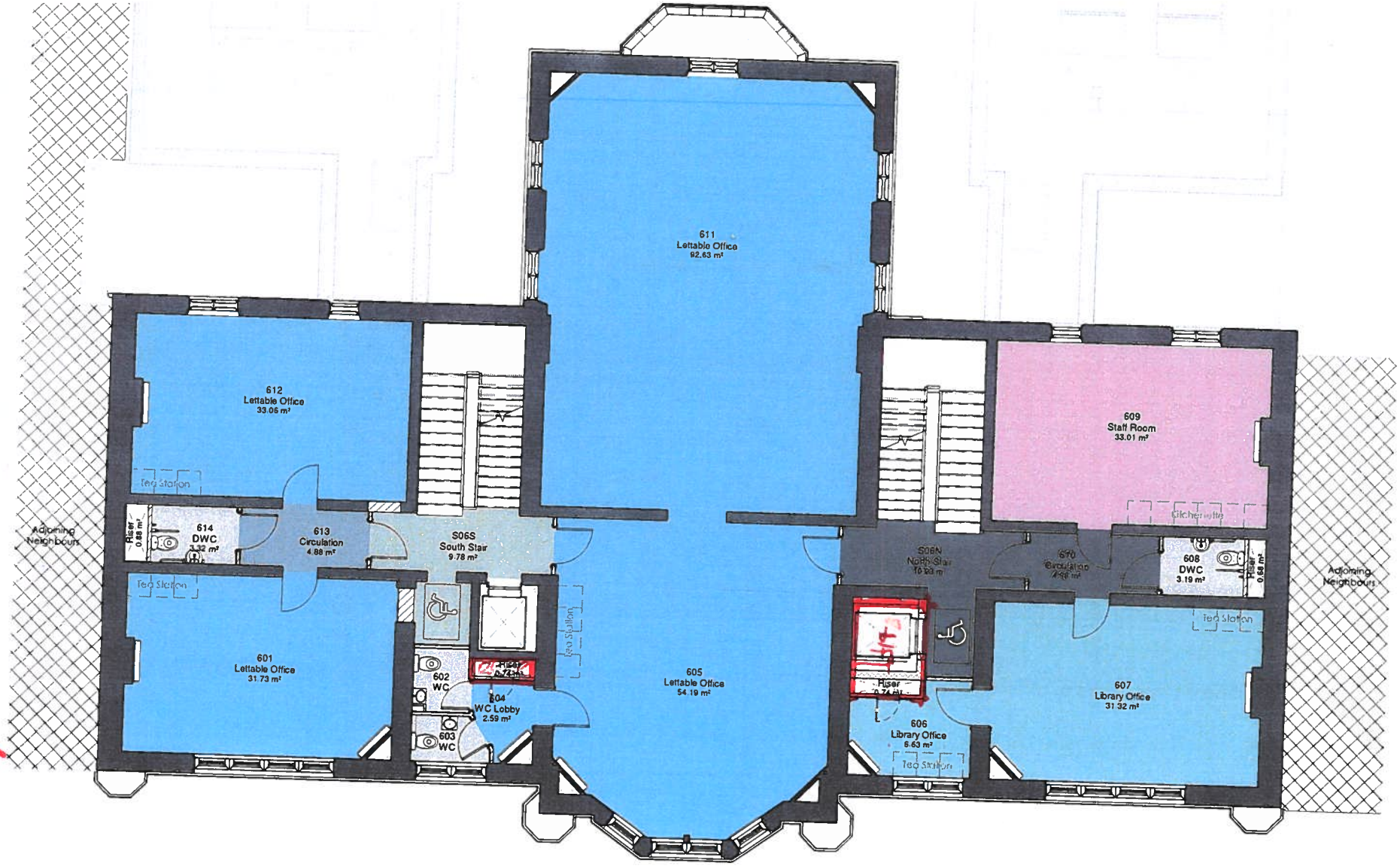

LEVEL 6

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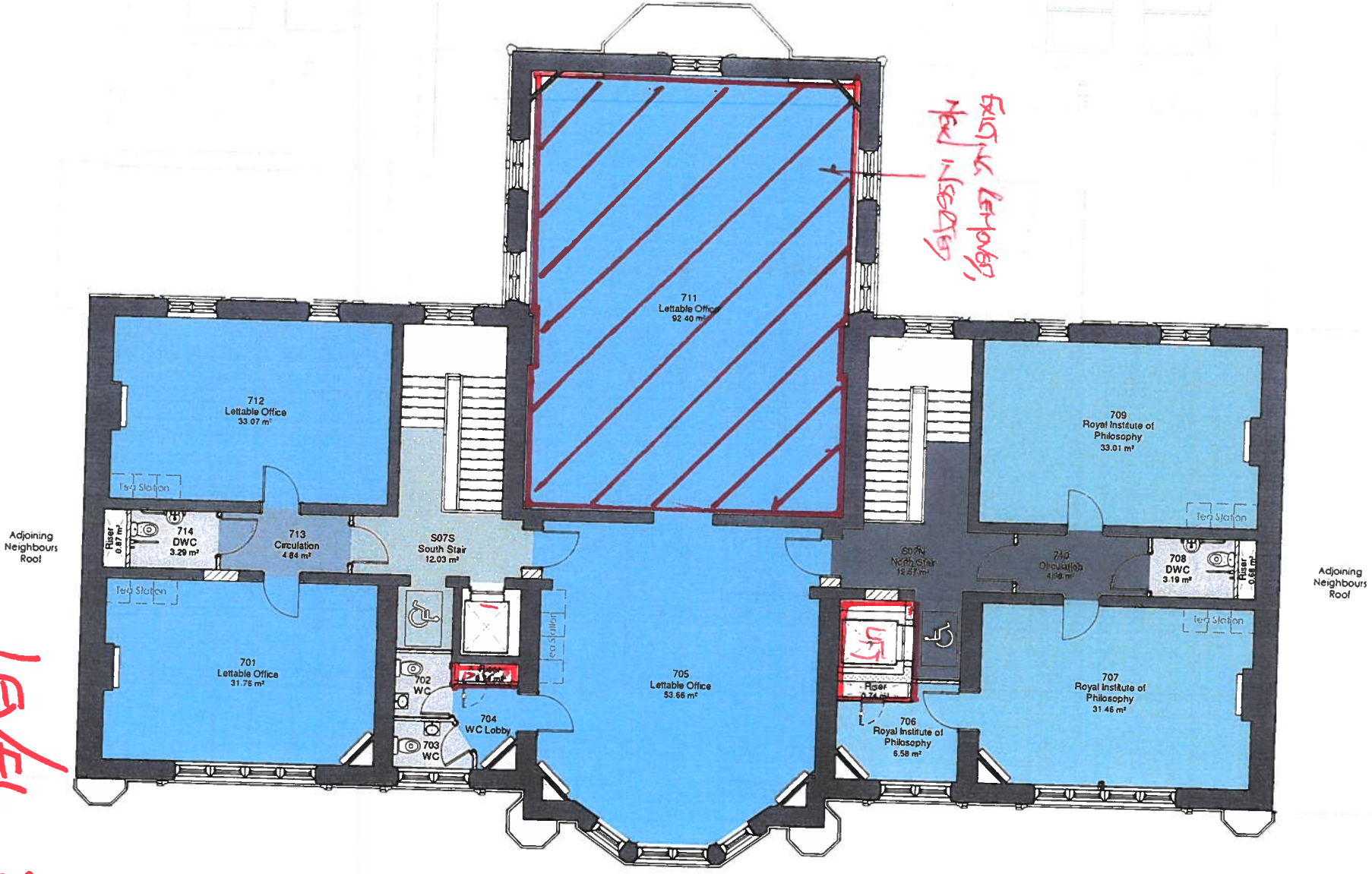

Existing Lettable Area

LEVEL 7

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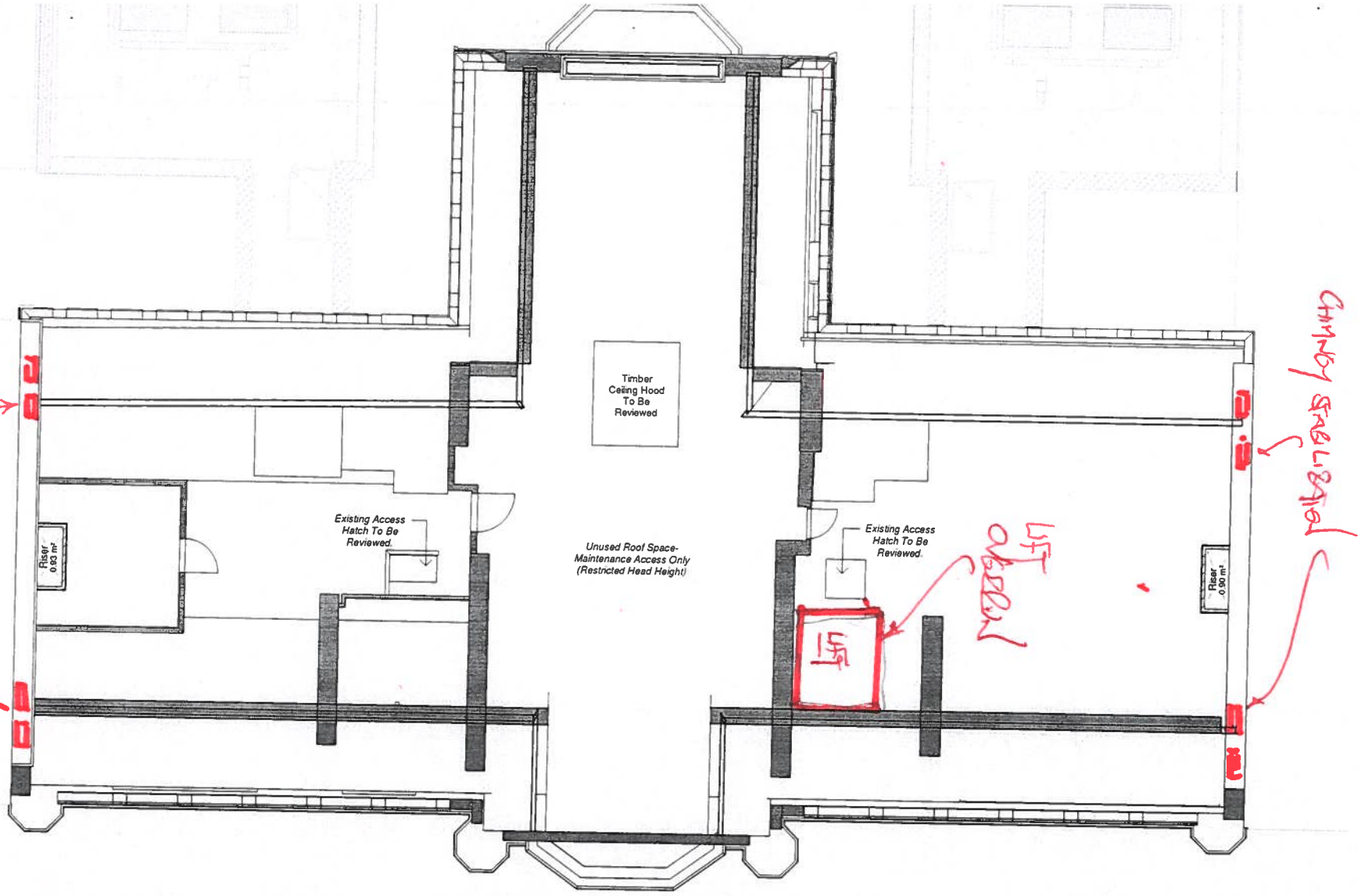

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