



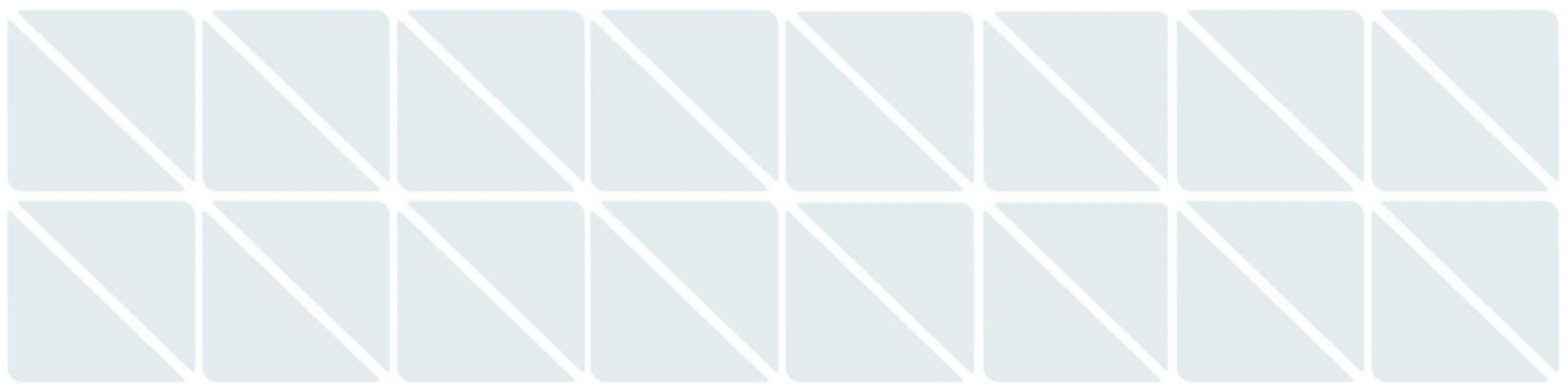
A-squared Studio

Channing School - Main Building Development

Basement Impact Assessment

February 2024

3251-A2S-XX-XX-RP-Y-0003-01





Project Name	Channing School - Main Building Development
Project Number	3251
Client	Heyne Tillett Steel Limited
Document Name	Basement Impact Assessment

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Appendices

Appendix A: Various Existing and Proposed Development Drawings

Appendix B: Site Investigation and Basement Impact Assessment Report

Appendix C: Phase I Desk Study Report

Appendix D: Building Ground Movement Assessment Report



1. Non-Technical Summary

- 1.1.1. The site is located at Channing School, The Bank, Highgate, London, N6 5HF.
- 1.1.2. The site falls within the administrative boundaries of the London Borough of Haringey and currently includes three terraced school buildings that are up to 4-storeys in height with a basement.
- 1.1.3. The scheme for the proposed redevelopment will see the addition of a new single-story glazed structure and basement in the northern-eastern portion of the existing buildings. The new structure will be linked to the existing buildings present on site. An excavation of 4m will be required to form the basement. On the fourth floor, a rooftop extension is proposed for the construction of additional classroom space.
- 1.1.4. The following assessments are presented in the current document:
- Screening.
 - Scoping.
 - Additional evidence/assessments (as required), including:
 - Architectural and structural drawings.
 - Ground movement assessment.
 - Basement impact assessment.
- 1.1.5. The ground conditions beneath the site within the zone of influence given the proposed development comprise (based on a review of BGS data and site-specific ground investigation):
- **Made Ground** to a depth of ~1.0m below ground level (bgl).
 - **Bagshot Formation** which overlies the Claygate Member, is expected to be at least 5.5m thick to a depth ~6.5mbgl.
 - **Claygate Member** which overlies the London Clay Formation, is expected to be at least 6.0m thick to a depth ~12.5mbgl.
 - **London Clay Formation** which overlies the Thanet Sand Formation, is expected to be at least 113.5m thick to a depth of ~126.00mbgl.
- 1.1.6. The hydrogeological conditions at the site, relevant to the proposed development, are predicted to comprise:
- Finite bodies of local perched groundwater within pockets of granular Made Ground.
 - The Bagshot Formation and Claygate Member are classified as Secondary A Aquifers, defined as containing permeable layers capable of supporting water supplies at a local rather than strategic scale, in some cases forming an important source of base flow to rivers. These strata are aquifers formerly classified as Minor Aquifers.
 - Data available from both the historical BGS boreholes and data included as part of the Site Investigation (SI) and Basement Impact Assessment (BIA) Report issued January 2012 (ref. J11240) for the wider Channing School site, prepared for Heyne Tillett Steel Ltd (HTS) by Geotechnical & Environmental Associated Limited (GEA), dated January 2012 (ref. J11240), included as Appendix B, indicates that the shallow groundwater table is present between 6.65mbgl to 7.19mbgl within the Bagshot Formation and Claygate Member. The groundwater is anticipated to flow downhill, towards the southeast within these materials.



- 1.1.7. The BIA has assessed land stability, and the impacts of the proposed development on the existing buildings on-site and the neighbouring off-site structures will be limited to Category 1 – Very Slight, in accordance with the Burland Scale. The impact to the adjacent public highway adjacent to the site is also considered to be low, based on movements predicted in the ground movement assessment.
- 1.1.8. The BIA has identified a hydrogeological impact. The excavation will be within the Made Ground and partially within the Bagshot Formation. The latter of which is classed as a Secondary A Aquifer. The Bagshot Formation Member in which the basement sits are largely cohesive with low permeabilities. Additionally, the new basement extension is much smaller in scale relative to the existing basement present on site. As such, the overall risk of groundwater flooding associated with the creation of the basement box extension is considered to be low.



2. Introduction

2.1. Overview

- 2.1.1. A-squared Studio Engineers Ltd (A-squared) was engaged by Heyne Tillett Steel Limited (HTS) to prepare a Basement Impact Assessment (BIA) for the proposed redevelopment of Channing School, The Bank, Highgate, London, N6 5HF. The purpose of this assessment is to consider the potential effects of the proposed works at the site on the local hydrology, geology and hydrogeology, and the potential impacts to neighbours and the wider environment.
- 2.1.2. The development site is located within the jurisdiction of the London Borough of Haringey.
- 2.1.3. The location of the proposed development is shown in Figure 2.1.



Figure 2.1 Location of the proposed development (red line reflects the site boundary used for this assessment)

- 2.1.4. The BIA has followed the approach developed by Camden Council, which is a robust approach and is considered to represent industry best practice.
- 2.1.5. The BIA comprises the following elements:
- Screening.
 - Scoping.
 - Additional evidence / assessments (as required), including:
 - Architectural and structural drawings.
 - Ground investigation.
 - Basement impact assessment.



2.2. Credentials

- 2.2.1. This technical note has been reviewed by Hamed Shariff. Hamed is a Chartered Member of the Institution of Civil Engineers (MICE) with several years of experience in geotechnical design, hydrogeological assessment, and construction of basements. Hamed is an Associate Director at A-squared Studio Engineers Ltd (A-squared) and has a Master of Engineering from University College London. He also heads the hydrogeological division of A-squared and has experience in groundwater flow modelling and impact reviews.
- 2.2.2. The BIA has been approved by Alex Nikolic. Alex is a Chartered Member of the Institution of Civil Engineers (MICE) with more than 20 years of industry experience in geotechnical design and construction of ground engineering works. Alex has attained post-graduate qualifications, including a Master of Science in Soil Mechanics (MSc DIC) from the Imperial College London and a Master of Studies (MSt Cantab) in Sustainable Development from the University of Cambridge. Alex was formerly the Director of Ground Engineering at Buro Happold Ltd.

2.3. Sources of Information

- 2.3.1. The following baseline data has been referenced to complete the BIA in relation to the proposed development:
- Current design information/data and drawings (available at the time of undertaking the assessment), provided by the project design team, included as Appendix A.
 - *Site Investigation & Basement Impact Assessment Report* for Channing School prepared for (and provided by) HTS, prepared by Geotechnical & Environmental Associated Limited (GEA), issued January 2012 (ref. J11240), included as Appendix B.
 - *Phase I Desk Study Report* for Channing School – Main Building Development prepared by A-squared, issued February 2024 (ref. 3251-A2S-XX-XX-RP-Y-0001-00), included as Appendix C.
 - *Building Ground Movement Assessment* prepared by A-squared, dated February 2023 (ref. 3251-A2S-XX-XX-RP-Y-0002-00), included as Appendix D.
 - *Envirocheck Report* for Channing School prepared by Landmark Information Group, dated January 2024 (ref. 333520734_1_1).
 - *Preliminary Unexploded Ordnance (UXO) Risk Assessment* for Channing House prepared by Brimstone, dated February 2024 (ref. PRA-24-2378).
 - Site walkover undertaken by representatives of A-squared on February 6th 2024.
- 2.3.2. Information available in the public domain:
- Google Earth (ref. earth.google.com/web/), accessed 4th October 2023.
 - Flood Maps for Planning from the Environment Agency. (ref. <https://flood-map-for-planning.service.gov.uk/>), accessed 4th October 2023).
 - The Lost Rivers of London by Nicholas Barton, 1962.
 - British Geological Survey, GeoIndex Onshore GIS database (accessed 4th October 2023); <https://mapapps2.bgs.ac.uk/geoindex/>.
 - Department for Environment, Food & Rural Affairs (DEFRA), Magic Map Application (accessed 4th October 2023); <https://magic.defra.gov.uk/MagicMap.aspx>.
 - Historic England, online Aerial Photo Explorer (accessed 4th October 2023); <https://historicengland.org.uk/images-books/archive/collections/aerial-photos/>.



- UK Health Security Agency (UKHSA) and BGS radon mapping (accessed 4th October 2023); <https://www.ukradon.org/information/ukmaps>.
- Local authority planning portal (ref. https://publicregister.haringey.gov.uk/pr/s/register-view?c_r=Arcus_BE_Public_Register).

2.4. Existing Development

- 2.4.1. The site is located within the Highgate Ward of the London Borough of Haringey (the Council).
- 2.4.2. The development site is located at Channing School, The Bank, Highgate, London, N6 5HF.
- 2.4.3. The site covers an area of approximately 0.11ha.
- 2.4.4. The approximate ground surface elevation at the site varies between 113m above Ordnance Datum (OD) within the southeastern portion of the site and 114mOD in the northwestern portion.
- 2.4.5. The site falls within the administrative boundaries of the London Borough of Haringey and currently includes three terraced school buildings up to 4-storeys in height with a single storey basement that is presented in Figure 2.2. As shown in Figure 2.3, the buildings present on site are named Channing House, Singly House and Westview House, and Haigh House.



Figure 2.2 Existing site layout (red line indicative of site boundary)



Figure 2.3 Division of the distinct parts of the Channing School Main Building

2.4.6. Slingly House and Westview House is a grade II listed building based on the Historic England allocations (Historic England, ref. 1294537).

2.5. Neighbouring Properties and Infrastructure

2.5.1. The wider Channing School asphalt-covered road and parking space is present immediately north and east of the site boundary. Brunner House, a two-storey building used for educational facilities, is located immediately northwest of the site. To the south there is The Bank, which is a one-way westbound access road trending east-west and provides access to Channing School. Cholmeley Park (single carriageway) is present west of the site.

2.5.2. There is a boundary wall along the northwestern boundary of Channing House associated with the Cholmeley Park road. This masonry wall is a maximum of approximately 4m in height from ground level.

2.5.3. All of the buildings to the east of the site are associated with the wider Channing School site and have associated limited (complementary strip) areas of associated soft landscaping. Other than the roads present adjacent to the boundary of the site, the immediate surrounding land uses of the site are associated with the wider Channing School site.

2.5.4. Asset owners with existing underground services that may be impacted by the proposed development include the following:

- London Borough of Haringey.
- Thames Water Ltd – Clean water and wastewater.
- BT (BT Group Plc) and Virgin Media Ltd – Telecoms.
- UK Power Networks Ltd – Electricity distribution.
- Cadent Gas Ltd and Southern Gas Networks Plc – Gas.

2.5.5. Asset protection teams for the assets listed in 2.5.4 may require engagement as the design of the proposed development continues.



2.6. Proposed Development

- 2.6.1. Relevant drawings for the proposed development are included in Appendix A.
- 2.6.2. The development is planned to continue to be used for educational use (commercial) as part of the wider Channing School site.
- 2.6.3. As shown in Figure 2.4, the scheme for the proposed redevelopment will see the addition of a new single-story glazed structure and basement in the northern-eastern portion of the existing buildings. The new structure will be linked to the existing buildings. An excavation of 4m will be required to form the basement extension.
- 2.6.4. On the fourth floor, a rooftop extension is proposed for the construction of additional classroom space. The newly proposed extension structure is anticipated to be supported by shallow foundations.
- 2.6.5. The basement will be supported in part by embedded pile walls and potentially underpins (depending on the exact extents and depth of the existing basement boundary wall). A portion of the basement will also be formed using a battered back excavation.

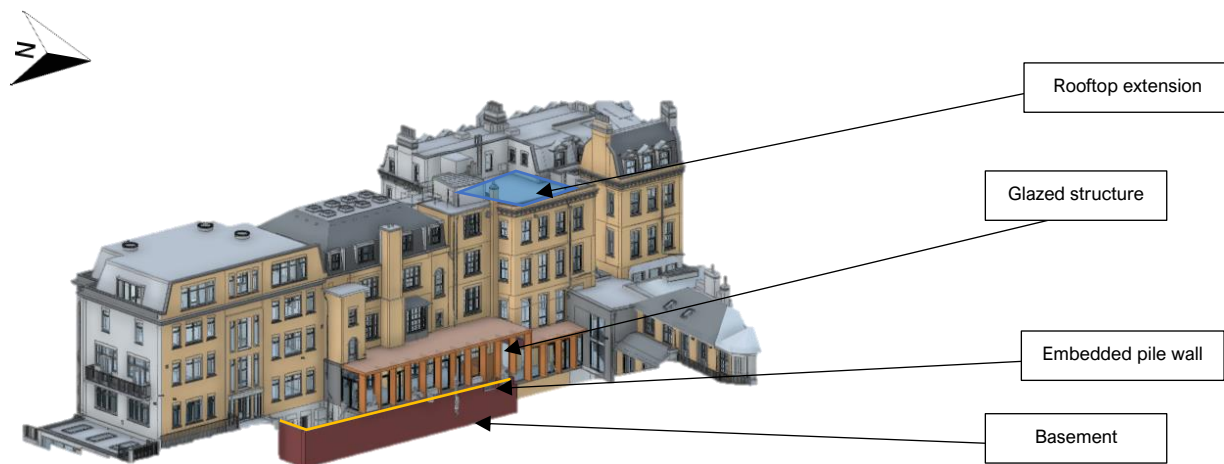


Figure 2.4 3D geometry of the proposed development

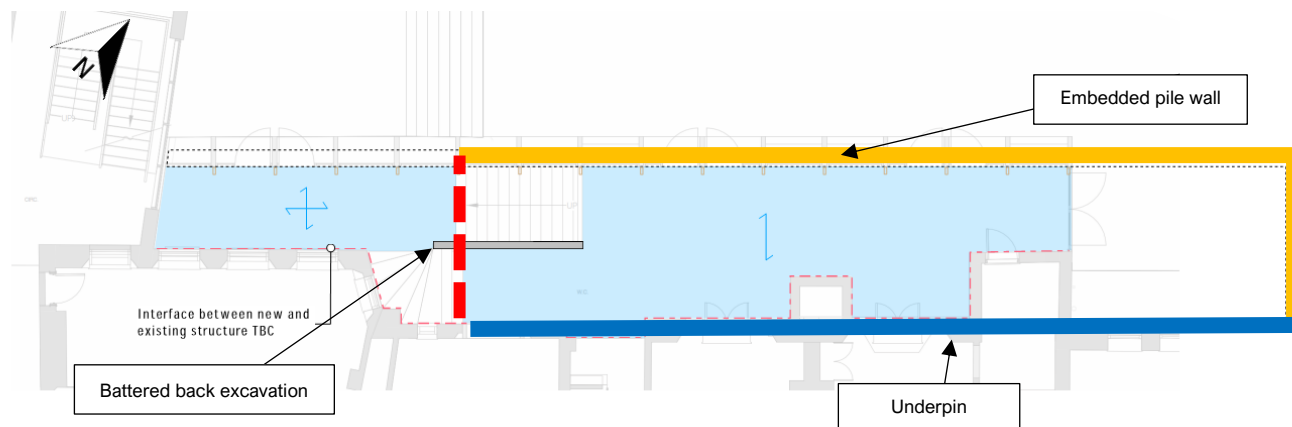


Figure 2.5 Plan of the glazed structure and the excavation support systems



3. Desk Study

- 3.1.1. A *Phase I Desk Study*, included in this report as Appendix C, has been produced by A-squared. This desk-based review has been used to inform this BIA.
- 3.1.2. The *Phase I Desk Study* includes a Preliminary Risk Assessment (PRA) which highlights the potentially complete contaminant linkages. Unacceptable risks have been identified to human health of proposed site end users, on-site buildings / structures (proposed) and controlled waters.
- 3.1.3. A ground investigation (GI) is anticipated to be undertaken to further assess the unacceptable risks identified as part of the PRA (included as part of the *Phase I Desk Study Report*) and a further understanding of the geo-environmental conditions of the site. This aspect of works will be undertaken during the next design stages.



4. Screening

4.1. Subterranean (Groundwater) Flow, Screening Flowchart

Question	Response	Details
1. Is the site located directly above an aquifer?	Yes	The site is underlain by the Bagshot Formation which is classified as a Secondary A Aquifer.
2. Will the proposed basement extend beneath the water table surface?	No	It is not anticipated that the new basement will extend below the water table surface. During the intrusive on-site GEA ground investigation groundwater was encountered within the Bagshot Formation and Claygate Member strata between 6.0mbgl to 8.0mbgl in exploratory hole positions that were within close proximity to the site. Records from subsequent groundwater monitoring visits from those same positions indicate that the shallow groundwater table is present between 6.65mbgl to 7.19mbgl within the Bagshot Formation and Claygate Member. The proposed partial basement level is not expected to extend beyond 4.0mbgl.
3. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	No	The site is not within 100m of a watercourse, well or potential spring line. There are records which suggest that a tributary of a lost river of London, the "Fleet" river is present approximately 425m south of the site.
4. Will the proposed development result in a change in the effective proportion of hard surfaced / paved areas (including impermeable basement rooftops beneath garden areas)?	No	The proposed works will take place in existing hard surfaced areas. As such, there will be no changes to impermeable regions on site.
5. As part of the site drainage, will more surface water (e.g. rainfall and runoff) than at present be discharged to the ground?	No	The proposed development will maintain the existing surface water discharge conditions within a proposed site wide drainage system. In the case of extreme events, it is envisaged that the overland flow directions will not change.
6. Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean level of any local pond?	Yes	There is the potential for the lowest point of the proposed excavation to be close to, or lower than, the mean level of the closest pond to the site which is the "Upper Pond Nature Area", which is associated with Waterlow Park (public recreational open space), and located approximately 217m southwest of the site, down the anticipated hydraulic gradient.

4.2. Stability Screening Flow Chart

Question	Response	Details
1. Does the existing site include slopes, natural or man-made, greater than 7 degrees (approximately 1 in 8)?	No	There are no existing slopes with gradients greater than 7 degrees in the regions where the proposed redevelopment is located. Any changes in levels across this region are supported by retaining walls and do not form slopes.
2. Will the proposed re-profiling or landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	There are no re-profiling / landscaping works proposed that will increase the slopes existing on site to gradients greater than 7 degrees.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	The neighbouring areas do not have a slope greater than 7 degrees.



Question	Response	Details
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8)?	Yes	The site is founded on a wider hillside setting in which the general slope is greater than 7 degrees.
5. Is the London Clay the shallowest strata at the site?	No	The GEA investigation and historical BGS borehole records show the site is underlain by the Bagshot Formation which is underlain by the Claygate Member.
6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained?	No	No trees will be impacted by the proposed works.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	No	The London Clay strata is usually classified as having a high volume-change potential and hence can lead to seasonal shrink-swell subsidence where buildings are founded in desiccated soils. However, there is no specific evidence of subsidence having been experienced on site or in the immediate surrounding area. In addition, the London Clay strata is not the shallowest natural strata on-site, so seasonal shrink-swell subsidence is not considered to be of concern for the site.
8. Is the site within 100m of a watercourse or a potential spring line?	No	The site is not within 100m of a watercourse, well or potential spring line. There are records which suggest that a tributary of a lost river of London, the "Fleet" river is present approximately 425m south of the site.
9. Is the site within an area of previously worked ground?	No	There are no records of the presence of worked ground in the development site area.
10. Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	While the site is underlain by the Bagshot Formation which is classified as a Secondary A Aquifer, it is not anticipated that the new basement will extend below the groundwater table surface. Groundwater monitoring visits undertaken during a historical investigation indicate that the shallow groundwater table is present between 6.65mbgl to 7.19mbgl within the Bagshot Formation and Claygate Member. The proposed partial basement level is not expected to extend beyond 4.0mbgl, i.e. above the anticipated groundwater table.
11. Is the site within 5m of a highway or pedestrian right of way?	Yes	The northeastern and southwestern portions of the site at the closest point are approximately 3m set back from "Cholmeley Park" and "The Bank", which are single carriageway roads.
12. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	The existing buildings on-site are supported by shallow foundations and have a single level basement. The proposed works involves the excavation of ground for a new basement extension adjacent to the existing basement. The new basement will be supported by shallow footings too. As such, it is anticipated that the depth of these proposed footings will be at a similar level as the existing buildings on site and the neighbouring buildings within the zone of influence of the works. Therefore, the differential depth of the foundations will not be significantly increased. A <i>Building Ground Movement Assessment</i> has been undertaken to confirm the impact of the works on the neighbouring buildings.



Question	Response	Details
13. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	The site is not located within or above the exclusion zone of any tunnels.

4.3. Surface Water and Flooding Screening Flowchart

Question	Response	Details
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	No	The site is not within the catchment of the ponds chains on Hampstead Heath and nor is the Upper Pond, which is located approximately 220m southwest of the site.
2. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	The proposed redevelopment does not impact the existing surface water flows / route in a material way.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The proposed redevelopment works will take place in existing hard surfaced areas, and as such no changes will be taking place as a result of the proposed works.
4. Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	Surface water flows will not be altered by the proposals. Site to discharge as per the existing setting to the neighbouring Thames Water sewer pending capacity confirmation and CCTV survey works. No impact should be applied to adjacent properties or watercourses.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Water quality from the proposals should not alter from the existing setting or impact adjacent properties or watercourses.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?	No	The long-term surface water flood risk map from the Environment Agency (EA) shows that the building and surrounding external area is at low risk of surface water flooding. The SWMP also identifies the building is at very low risk/hazard and not located within a critical drainage area (CDA).

4.4. Non-Technical Summary of Screening Process

4.4.1. The screening process identifies the following issues to be carried forward to scoping for further assessment:

- The site is located directly above an aquifer.
- There is the potential for the lowest point of the proposed excavation to be close to, or lower than the mean level of the closest pond to the site (i.e. "Upper Pond Nature Area", which is associated with Waterlow Park), such that dewatering/groundwater control measures may be required during construction.
- The site is founded on a wider hillside setting in which the general slope is greater than 7 degrees.
- The northeastern and southwestern portions of the site, at the closest point, are set back 3m from Cholmeley Park and The Bank, which are a single carriageway roads.



5. Scoping

- 5.1. Subterranean Flow: The site is located directly above an aquifer and there is the potential for the lowest point of the proposed excavation to be close to, or lower than the mean level of the closest pond to the site.

Hazards

- 5.1.1. The site is underlain by the Bagshot Formation which overlies the Claygate Member. Both of these bedrock strata are classified as Secondary A Aquifers, defined as containing permeable layers capable of supporting water supplies at a local level.
- 5.1.2. The basement excavation will extend below the anticipated mean level of the closest pond to the site.
- 5.1.3. The groundwater flow regime at the site may be affected by construction of the proposed basement.
- 5.1.4. Groundwater may flow into the basement excavation during construction.

Potential Impacts

- 5.1.5. Encountering water inflow during excavation of the basement may lead to collapse events or excavation flooding.
- 5.1.6. Basement construction may result in damming of the aquifer and groundwater flow regime.
- 5.1.7. Changes in groundwater head may cause stress changes or instability within the ground. The alteration of existing flow paths may result in a permanent increase in the local water table upstream of the proposed development due to the damming effect of the basement, and a corresponding drop in groundwater levels downstream.
- 5.1.8. Ground movements associated with these stress changes in the ground may impact existing properties.
- 5.1.9. The proposed basement will also be at an increased risk of flooding and damp in the long term due to permanent submergence beneath the groundwater table.

Mitigating Factors

- 5.1.10. A review of the hydrogeological regime of the site and the surrounding areas has been undertaken. The influence of the proposed development on the hydrogeological regime has been assessed and it has been determined that the proposed development is not anticipated to comprise significant groundwater flow, and any damming effects will likely result in minor increases in groundwater head, particularly considering the presence of the existing basement. Any groundwater will likely flow around the basement box obstruction. Any effects of this obstruction on the groundwater table are mostly likely to be minor with other hydrogeological factors such as seasonality considered to be a greater influence on the existing variation of the groundwater table.
- 5.1.11. Basement extensions of similar depth and scale have been successfully constructed throughout London within similar geological conditions and urban settings.



Assessments and Further Actions

- 5.1.12. Prior to the initiation of construction works, local investigative works are proposed to be undertaken in order to ensure that the groundwater regime is in accordance with the design. Based on the findings of historical site-specific ground investigation information, the groundwater level is assumed to be 6.5mbgl.
- 5.1.13. Appropriate detailing of the basement retaining wall waterproofing should be provided by a waterproofing specialist to mitigate the risk of flooding and damp conditions within the basement.
- 5.1.14. Where a dewatering array is proposed, the design of the system will consider the volume of water that is necessary to be pumped to sufficiently reduce the groundwater level and the site-specific soil permeability of the material surrounding the excavation (Made Ground and Bagshot Formation). However; the requirement for dewatering is unlikely given the anticipated depth of the groundwater table below the depth of the proposed basement formation level.
- 5.2. **Stability:** The site is founded on a wider hillside setting in which the general slope is greater than 7 degrees. The presence of Cholmeley Park and The Bank within close proximity to the proposed works

Hazards

- 5.2.1. The site is founded on a wider hillside setting in which the general slope is greater than 7 degrees.
- 5.2.2. The impact of the proposed works on the public roads within close proximity to the site.

Potential Impacts

- 5.2.3. Collapse of the excavation and associated impact on surrounding assets and structures.
- 5.2.4. Damage to the road surface of Cholmeley Park and The Bank or buried services within the public highway easement due to excessive ground movements.

Mitigating Factors

- 5.2.5. Numerous basements of similar depth and scale with similar geological conditions and urban settings have been successfully constructed in the vicinity of the site.
- 5.2.6. The existing buildings on site have below-ground space, indicating that basements can be executed successfully in this location.
- 5.2.7. The proposed basement walls will be designed considering the sloped nature of the site as necessary.
- 5.2.8. Through use of various retaining structures, the site area has been flattened significantly, particularly in the region where further works are proposed.

Assessments and Further Actions

- 5.2.9. A ground movement impact assessment has been carried out and summarised in Section 7.2 of this report, assessing the impact of the proposed works on existing buildings on site, neighbouring properties, Cholmeley Park and The Bank.



- 5.2.10. The design of the retention system and temporary propping / support system shall be carried out by an appropriately experienced and qualified specialist / engineer / ground engineering contractor in accordance with relevant Eurocodes / British Standards, Codes of Practice, and industry standards.



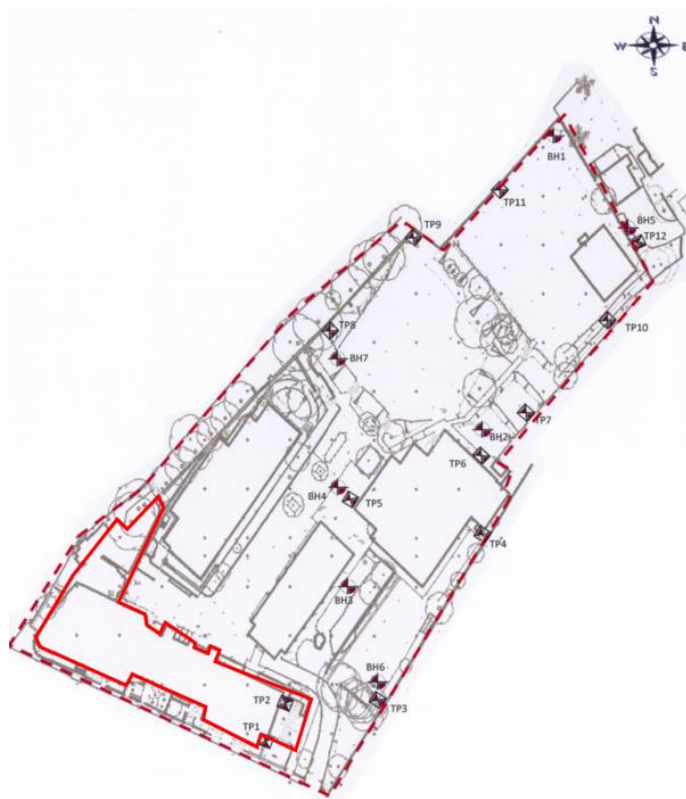
6. Site Investigation

6.1.1. A *SI & BIA Report* for the wider Channing School site has been prepared for HTS by GEA, issued January 2012 (ref. J11240). This report was issued to A-squared by HTS as an archived information source for the site.

6.1.2. The works undertaken between 10th November to 16th November 2011 comprised the following:

- 3 no. opendrive sampler (Terrier rig) boreholes (BH1 to BH3) to a maximum depth of 9.00mbgl.
- 1 no. cable percussion borehole (BH4) to a depth of 20.0mbgl.
- 3 no. window sampler boreholes (BH5 to BH7) to a maximum depth of 5.00mbgl.
- 12 no. hand excavated trial pits to unknown depths (logs were not provided as part of the SI & BIA Report).
- Standard penetration testing (SPTs) within the boreholes (carried out at regular intervals).
- Geotechnical laboratory testing in the form of index/classification testing.
- Geo-environmental laboratory testing.

6.1.3. While there are no locations within the assessed boundary for this assessment, there are three locations that are within close proximity of the boundary of this assessed area, i.e. BH3, BH4 and BH6. The locations of the ground investigation positions are shown in Figure 6.1.



Source: *SI & BIA Report for Channing School prepared for (and provided by) HTS, prepared by GEA, issued January 2012 (ref. J11240).*

Figure 6.1 GEA exploratory hole location plan

6.1.4. The parameters used to complete this Basement Impact Assessment have been obtained from the information include as part of the *GEA SI & BIA Report*, issued January 2012, (ref. J11240), and data available from the BGS and previous project experience within the surrounding area of the site. Greater emphasis has been placed on the boreholes within closer proximity to the site boundary.



6.1.5. The purpose of the site-specific investigation undertaken by GEA was designed to provide information on the ground model and geotechnical parameters and to accurately determine the hydrogeological conditions beneath the wider Channing School site.

6.1.6. The ground conditions encountered onsite are summarised in Table 6.1.

Table 6.1 Encountered stratigraphic profile

Stratum	Elevation (mOD)	Thickness (m)	Description
Made Ground	114.0	1.0	Dark brown sandy CLAY becoming sandy gravelly CLAY with depth with occasional fragments of flint, ash, brick, glass, pottery, concrete and old roots and clinker (variable anthropogenic deposits).
Bagshot Formation	113.0	5.5	Variable sequence of light brown occasionally clayey and silty fine to medium SAND and firm light brown silty sandy CLAY.
Claygate Member	107.5	6.0	Variable sequence of orange to brown and mottled grey silty very sandy and a very clayey silty SAND.
London Clay Formation	101.5	113.5	Firm becoming stiff brownish grey silty fissured CLAY with depth, with occasional selenite crystals.

6.1.7. Data available from both the historical BGS boreholes and data included as part of the GEA SI & BIA Report indicates that the shallow groundwater table is present between 4.02mbgl to 7.19mbgl within the Bagshot Formation and Claygate Member. In terms of elevation, as summarised in Table 6.2, the level of this groundwater table, is 109.98 to 107.81m above OD, where the ground surface elevation has been taken as 114m above OD (as none were specified in the GEA Report). There was a water strike encountered during the intrusive GI works at 2.0mbgl (BH5). However, this is anticipated to be perched water within the uppermost part of the Bagshot Formation, rather than representative of the water body.

Table 6.2 Groundwater monitoring from GEA SIR & BIA Report

Borehole No.	Standpipe depth (mbgl)	Depth at groundwater (mbgl)		
		29/11/2011	07/12/2011	14/12/2011
BH1	7.00	4.05	4.02	4.03
BH2	7.00	5.11	5.07	5.07
BH3 ^[1]	8.50	7.12	7.15	7.19
BH4 ^[1]	13.00	6.65	6.65	6.67

1. BH3 and BH4 are most relevant to this specific site considering their proximity relative to the other positions.

6.1.8. As described in Section 3, further intrusive exploratory works are anticipated to be undertaken to assess the unacceptable risks identified as part of the PRA. These and / or additional positions may also inform the project team of the extent and depth of the existing basement wall (including the existing foundation formation level).



7. Construction Methodology / Engineer Statements

7.1. Outline Temporary and Permanent Works Proposals

- 7.1.1. The outline basement construction proposal comprises of the construction of a new 4m-deep single-level basement extension to the northern portion of the site.
- 7.1.2. Standard means and methods of excavation are expected to be suitable to excavate the basement, based upon the ground conditions proven by means of ground investigation works.
- 7.1.3. *Bottom-up* basement construction methods will be adopted.
- 7.1.4. Figure 2.5 shows that the basement will be supported in part by embedded pile walls and underpins. A portion of the basement will also be formed using a battered back excavation. At this design stage, A-squared has conservatively assumed a 6m deep embedded pile wall will be required. It is noted that the extent and depth of the existing basement boundary wall are unknown at this stage. As such considerations related to underpinning that have been included in this report are solely applicable if this retention system is used. The geometry of the existing basement and associated foundations will be determined prior to the start of construction works.
- 7.1.5. Considering the stratigraphy and the groundwater conditions present on site, the embedded piled wall will likely be contiguous and will have a length of approximately 6.0m.
- 7.1.6. It is anticipated that any potential groundwater inflow during excavation arising from finite bodies of perched ground water can be suitably managed/mitigated with localised pumping if/where required. However; given the anticipated groundwater table, i.e. below the depth of basement construction, this is unlikely.
- 7.1.7. All basement construction works will be undertaken by a reputable and experienced groundworks contractor, with appropriate safety measures implemented.
- 7.1.8. The contractor will ensure that the battered back excavation is completed with a safe angle of slope.
- 7.1.9. Underpinning works will be undertaken using the *hit and miss* construction sequence.
- 7.1.10. Design of the contiguous piled wall and temporary propping shall be carried out in accordance with the relevant Eurocodes/British Standards, non-conflicting codes of practice, and associated design best practice.

7.2. Ground Movement and Damage Impact Assessment

- 7.2.1. A GMA has been carried out in accordance with CIRIA C760 and takes into account the construction methodology and site-specific ground and groundwater conditions. The GMA is included as Appendix D.
- 7.2.2. All structures / properties within the zone of influence of the proposed redevelopment have been assessed.
- 7.2.3. The following assumptions have been made within the GMA:
- The buildings included in the GMA are assumed to be founded on ground surface.
 - The walls of the above-mentioned buildings are assumed to behave as equivalent beams.



- 7.2.4. The ground movements resulting from the works comprise deformations arising from the following mechanisms:
- Retention system installation. Underpins were included in the analyses to ensure that the most conservative scenario where this solution would be required is taken into account.
 - Excavation works.
 - Heave and settlements due to the unloading / load redistribution of the Bagshot Formation.
- 7.2.5. The following structures were assessed, having been identified as falling within the zone of influence of the proposed development:
- BW.1 to BW.2, Boundary wall
 - CC.1 to CC.3, "Channing Cottage"
 - CH.1 to CH.16, "Channing House"
 - SWH.1 to SWH.3, "Singly House and Wesview House"
 - SWH-HH.1 to SWH-HH.2, "Singly and Wesview House" and "Haigh House"
 - HH.1 to HH.6, "Haigh House"
 - FH.1 to FH.4, "Founder's Hall"
 - SSH.1 to SSH.6, "Sixth Form Centre"
 - SS-AC.1 to SS.AC.2, "Sixth Form Centre"
 - AC.1 to AC.4, "Arundel Centre"
 - BH.1 to BH.10, "Brunner House"
- 7.2.6. While the evaluated potential impact is contained within Category 1 – Very Slight, in accordance with the Burland Scale for both the base assessment and sensitivity check. Monitoring will be undertaken to review the impact of the basement construction works on the surrounding structures.
- 7.2.7. An outline impact review of the works on Cholmeley Park and The Bank has also been undertaken. The road is anticipated to experience horizontal and vertical movements of less than 2mm.
- 7.2.8. The expected ground movements resulting from the works are proposed to be limited by means of temporary propping along the span of the embedded pile wall which is planned to be installed before the excavation phase. Additionally underpinning works will be undertaken using the *hit and miss* construction sequence to avoid excessive settlements.
- 7.2.9. The following mitigation measures are proposed to reduce ground movements and impact:
- Design of the propping measures shall be carried out in accordance with the relevant Eurocodes, non-conflicting codes of practice, and associated design best practice.
 - Retention system construction works to be performed by an experienced ground works / piling contractor.
 - Frequent monitoring of neighbouring properties to be carried out during excavation, to validate ground movement predictions against reality.
 - Development of a monitoring-trigger-action plan that identifies trigger levels, responsible personnel and actions to be followed in the event of a trigger level exceedance.
 - Incorporating stiff, high-level props into the temporary works design of the excavation, so as to provide a high stiffness wall. Design details regarding minimum wall flexural stiffness, prop stiffness and arrangement, shall be defined as part of detailed design development.
 - The GMA did not consider the impact of the proposed development on existing buried utilities (e.g. Thames Water sewer assets). It is expected that these assets will be assessed (if applicable to the proposed works) following



engagement of the asset owner and direction from the asset protection team, with regards to establishing limiting performance criteria.

7.3. Control of Construction Works

- 7.3.1. Following the selection of a Principal Contractor, a Construction Method Statement should be developed, which will cover the items outlined in this section in detail.
- 7.3.2. Work method statements developed for main stages of the construction works, outlining the means and methods of safely carrying out the works.
- 7.3.3. Details of temporary propping and temporary works, required to ensure structural stability is maintained throughout excavation operations.
- 7.3.4. Construction traffic management plans.
- 7.3.5. Detailed development of structural and environmental monitoring strategy, developed to control construction works and maintain movements/impacts within the predicted limits and monitor environmental impacts, including:
 - A structural monitoring layout plan of instrumentation/survey points/critical sections.
 - Programme/frequency of monitoring.
 - Trigger values derived for each of the structures within the zone of influence of the proposed works.
 - Contingency actions and project team lines of responsibility.



8. Basement Impact Assessment

8.1.1. The Conceptual Site Model (CSM) is described below:

- The ground conditions of the site comprise Made Ground overlying the Bagshot Formation over Claygate Member over London Clay Formation.
- The approximate ground surface elevation at the site varies between 113m above Ordnance Datum (OD) within the southeastern portion of the site and 114mOD in the northwestern portion.
- The shallow groundwater table is present between 6.65mbgl to 7.19mbgl within the Bagshot Formation and Claygate Member. The groundwater is anticipated to flow downhill, towards the southeast within these materials.
- The site falls currently includes three terraced masonry school buildings that are up to 4-storeys in height with a basement. The buildings present on site are named Channing House, Singly House and Westview House, and Haigh House.
- The proposed development may result in impact to the neighbouring buildings. Any potential impact will be mitigated by appropriate construction means and methods (such as temporary propping/shoring and controlled excavation operations).

8.2. Land Stability / Slope Stability

- 8.2.1. It is assumed that all new substructure elements will be founded in the Bagshot Formation, which is considered to be a suitable founding stratum.
- 8.2.2. The risk of movement and impact to this development due to volumetric changes of the Claygate Member of the London Clay Formation will be considered as part of the scheme design of the development. Heave mitigation measures (if appropriate) will be adopted, and the relevant soil structure interaction mechanisms will be reviewed.
- 8.2.3. A GMA has concluded that ground movements caused by excavation and construction of the proposed development will be limited. The upper bound impact category for surrounding structures within the zone of influence of the proposed development for neighbouring off-site buildings has been assessed as Category 1 – Very Slight in accordance with the Burland Scale.
- 8.2.4. The BIA has concluded that risks to the adjacent properties, public highway and infrastructure (including ultimate and serviceability limit state considerations) are limited and will be mitigated in a reasonable fashion as part of design development.

8.3. Hydrology and Groundwater Flooding

- 8.3.1. The BIA has concluded that there is no risk of groundwater flooding.
- 8.3.2. The BIA has identified a hydrogeological impact. The excavation will be within the Made Ground and partially within the Bagshot Formation. The latter of which is classed as a Secondary A Aquifer. The Bagshot Formation Member in which the basement sits are largely cohesive with low permeabilities. Additionally, the new basement extension is much smaller in scale relative to the existing basement present on site. As such, the overall risk of groundwater flooding associated with the creation of the basement box extension is considered to be low.



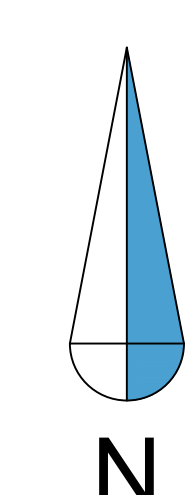
- 8.3.3. Prior to the initiation of construction works, local investigative works are proposed to be undertaken in order to ensure that the groundwater regime is in accordance with the design. Based on the findings of the site-specific ground investigation information, the groundwater level is assumed to be 6.5mbgl.

8.4. Hydrology, Surface Water Flooding and Sewer Flooding

- 8.5. The BIA has concluded that there is a very low risk of surface water flooding.
- 8.6. The BIA has concluded that there are no impacts to the wider hydrological environment.



Appendix A: Various Existing and Proposed Development Drawings



Notes: The survey has been orientated to the O.S. National Grid (OSGB36) via GPS and the O.S. Active Network. True OSGB36 coordinates have been established at: Station: ST CTRL A E: 187389.9775 N: 528782.248 EL: 112.034 Further OSGB36 points have been established to create a true O.S. bearing for orienting. All levels are related to O.S. Datum.
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ON FENCES/WALLS/DIVISIONS					
M/W	Barbed Wire Fence	E/P	Electric Fence	P/W	Post and Wire Fence
C/W	Chain Link Fence	P/W	Panel / Board Fence	S/W	Requiring Wire
C/B	Cold Boarded Fence	F/TR	Trellis Fence	S/F	Safety Fence
C/W	Chain Wall	C/R	Cinder Block	S/W	Stainless Steel
C	Chain Link Fence	F	Iron Rail Fence	S/W	Stone Wall
C	Concrete Wall	C	Cinder Block	W/M	Wash Fence
C/W	Concrete Wall	P/L	Palisade Fence		
P/W	Post and Wire	P/W	Post and Rail Fence		
ON BUILDINGS					
ASR	Asbestos	GL	Glazed Roof Light	SOF	Soft Foam
ASR	Asbestos	P	Partitions	S/P	Self Protection
C	Ceiling Tiling	PAR	Paralining	SVP	Sevent Five Feet
C	Ceiling Tiling	R	Ridge	S/W	Sevent Five Feet
C	Cil	R/L	Ridge Level	USB	Underneath Of Beam
DR	Door Head	RWC	Rain Water Channel	W	Water Header
DR	Door Head	R/P	Ridge Pipe	W	Water Pipe
E	Exhaust Fan	S	Spring Of Arch	WST	Water Storage Tank
E	Exhaust Fan	SCH	Shed Roof Ceiling		
P/L	Flat Roof Level				

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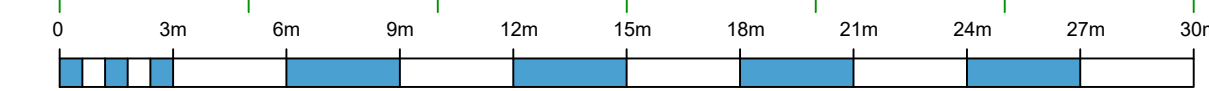


Client NVB Architects	Date 10/10/2022
	Scale A1 @ 1:200

Grid Orientation NORTH GPS	Site Level Datum OS GPS
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All dimensions are to be checked on site where applicable. This drawing must not be scaled, and only written dimensions should be respected.

Tree species and sizes on this drawing are not guaranteed, and if critical should be verified by an arboriculturist. Tree spreads are average about the bole, and heights are approximate at the time of the survey.



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Ground bearing RC slab

400thk piled wall

200thk RC wall

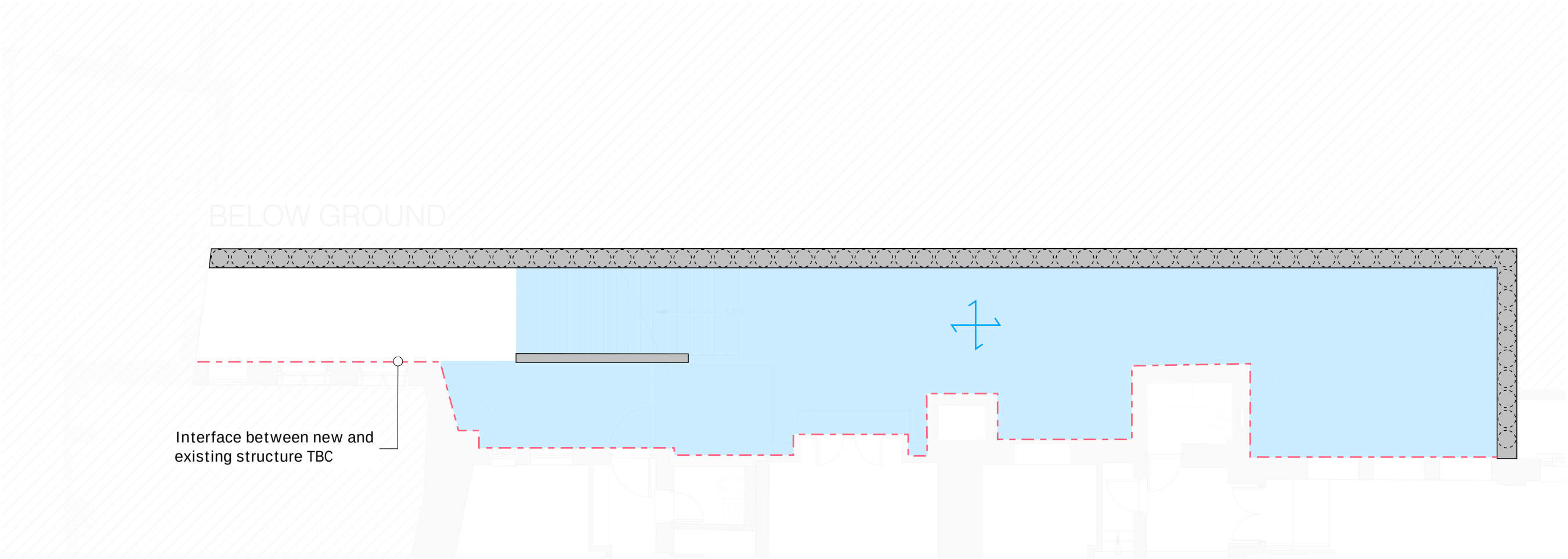
Piled wall below

160x240 glulam column

Glulam column below

100x240 timber beam

50x200 timber joists @ 400c/c



Preliminary
only

HEYNE
TILLET
STEEL

KEY:

250mm RC slab

Ground bearing RC slab

400thk piled wall

200thk RC wall

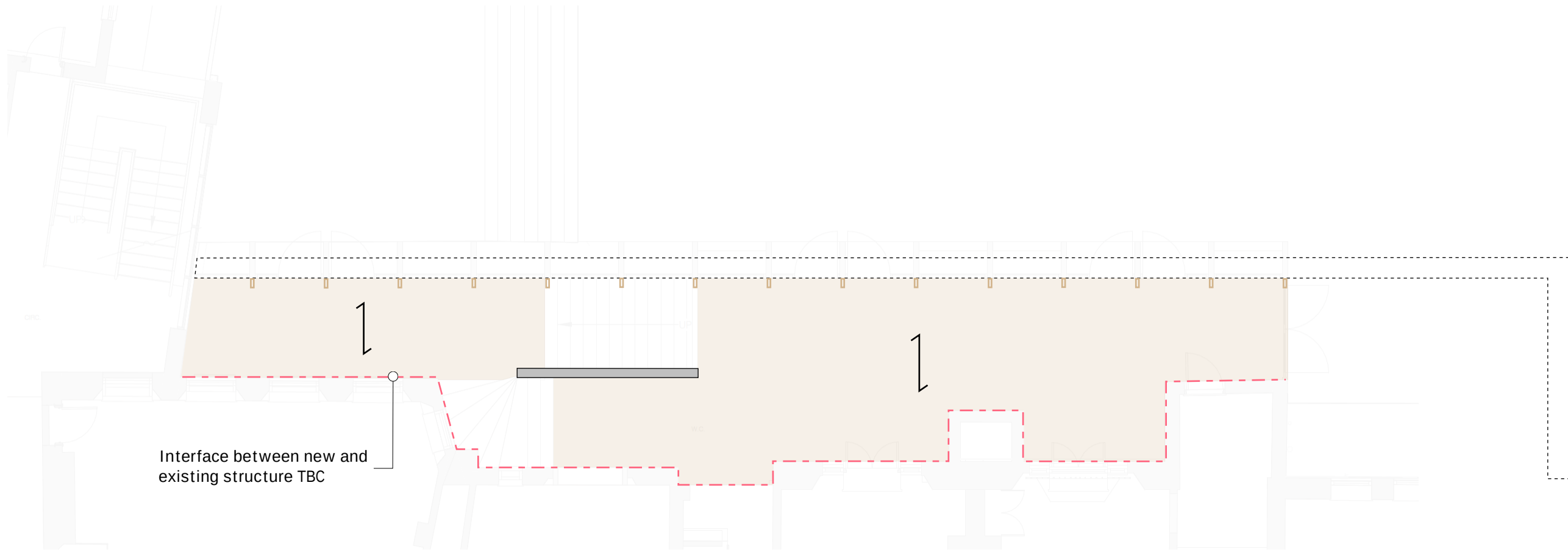
Piled wall below

160x240 glulam column

Glulam column below

100x240 timber beam

50x200 timber joists @ 400c/c



Preliminary
only

HEYNE
TILLET
STEEL

KEY:

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250mm RC slab

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Ground bearing RC slab

400thk piled wall

200thk RC wall

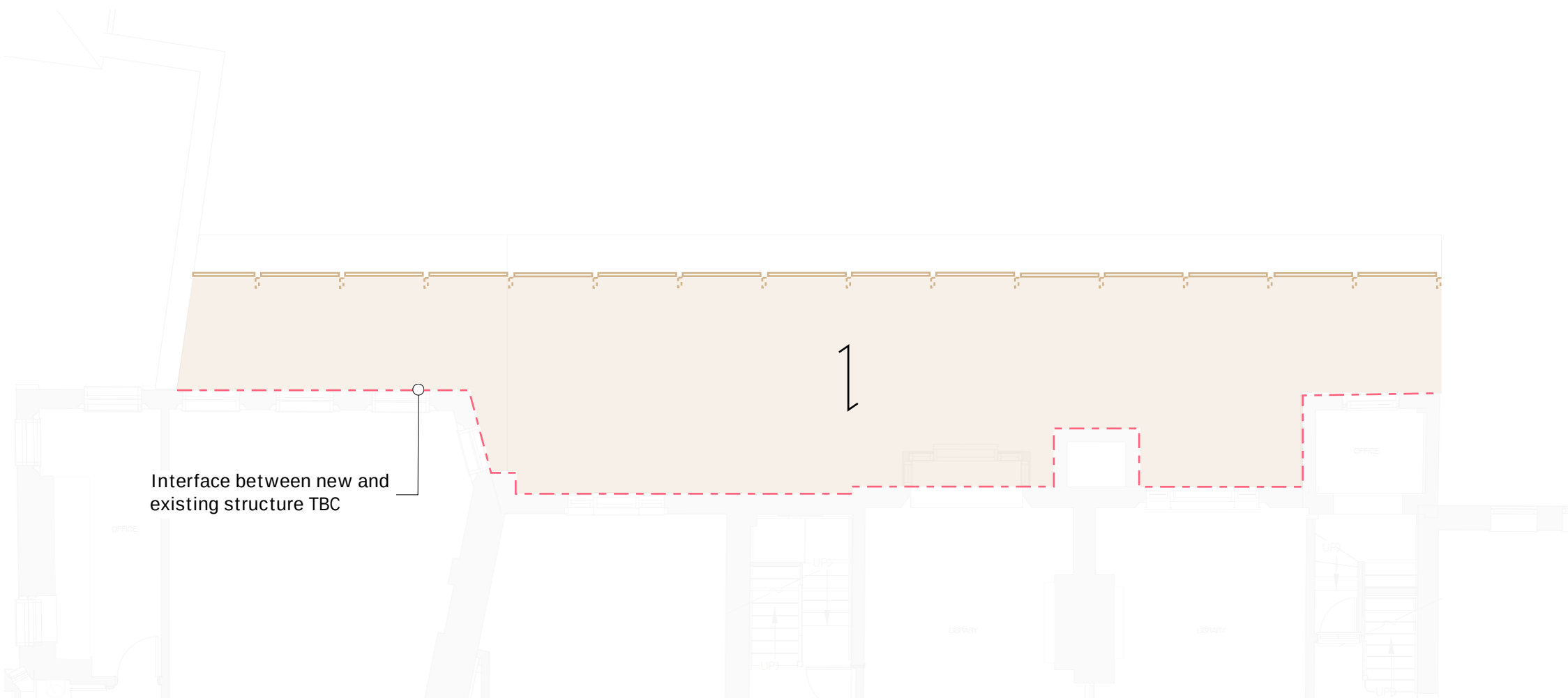
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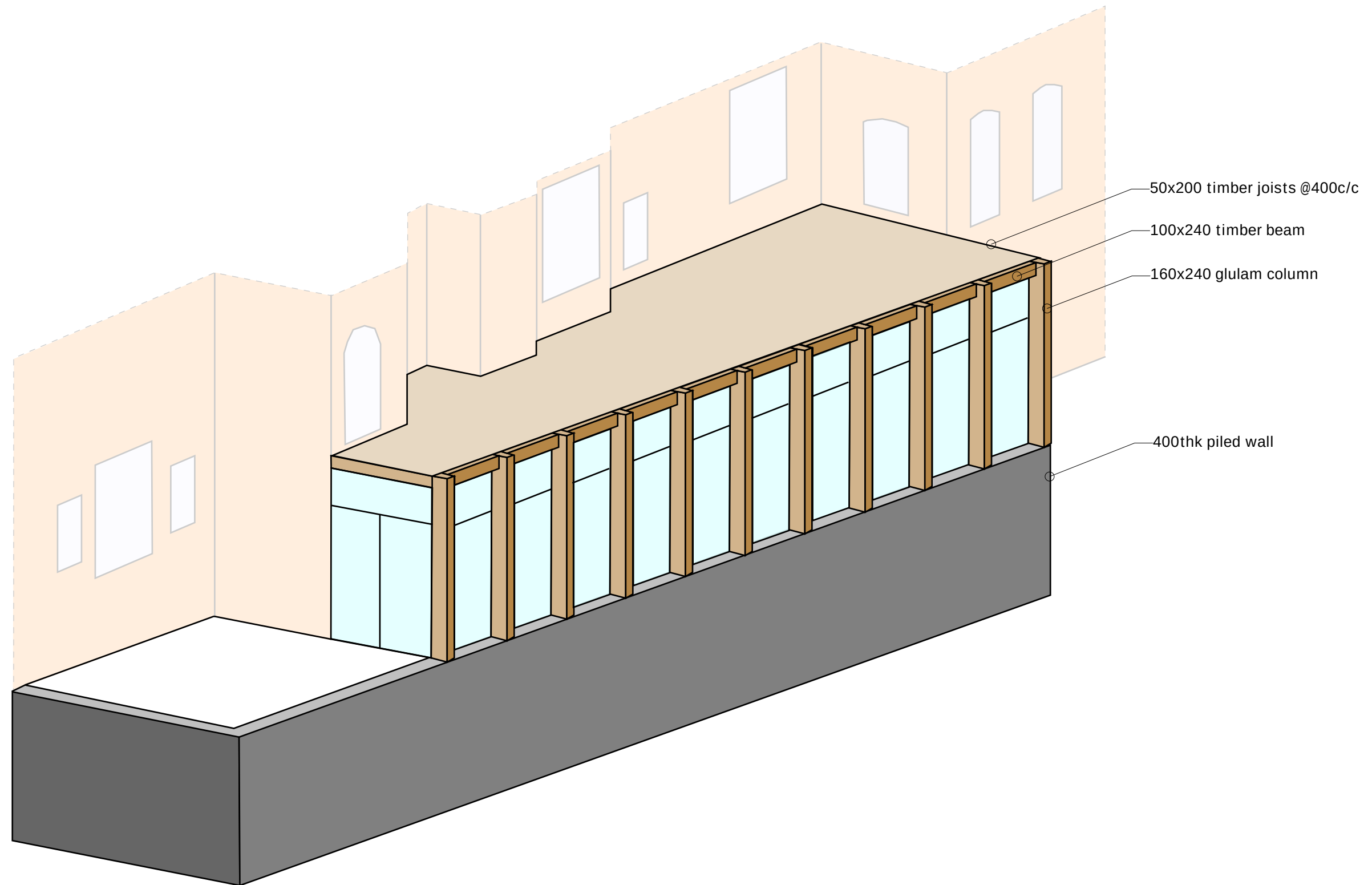
160x240 glulam column

Glulam column below

100x240 timber beam

50x200 timber joists @ 400c/c





Preliminary
only

Job Channing School, Brunner House

Date 18.10.23

Title Perspective View of Proposed Extension

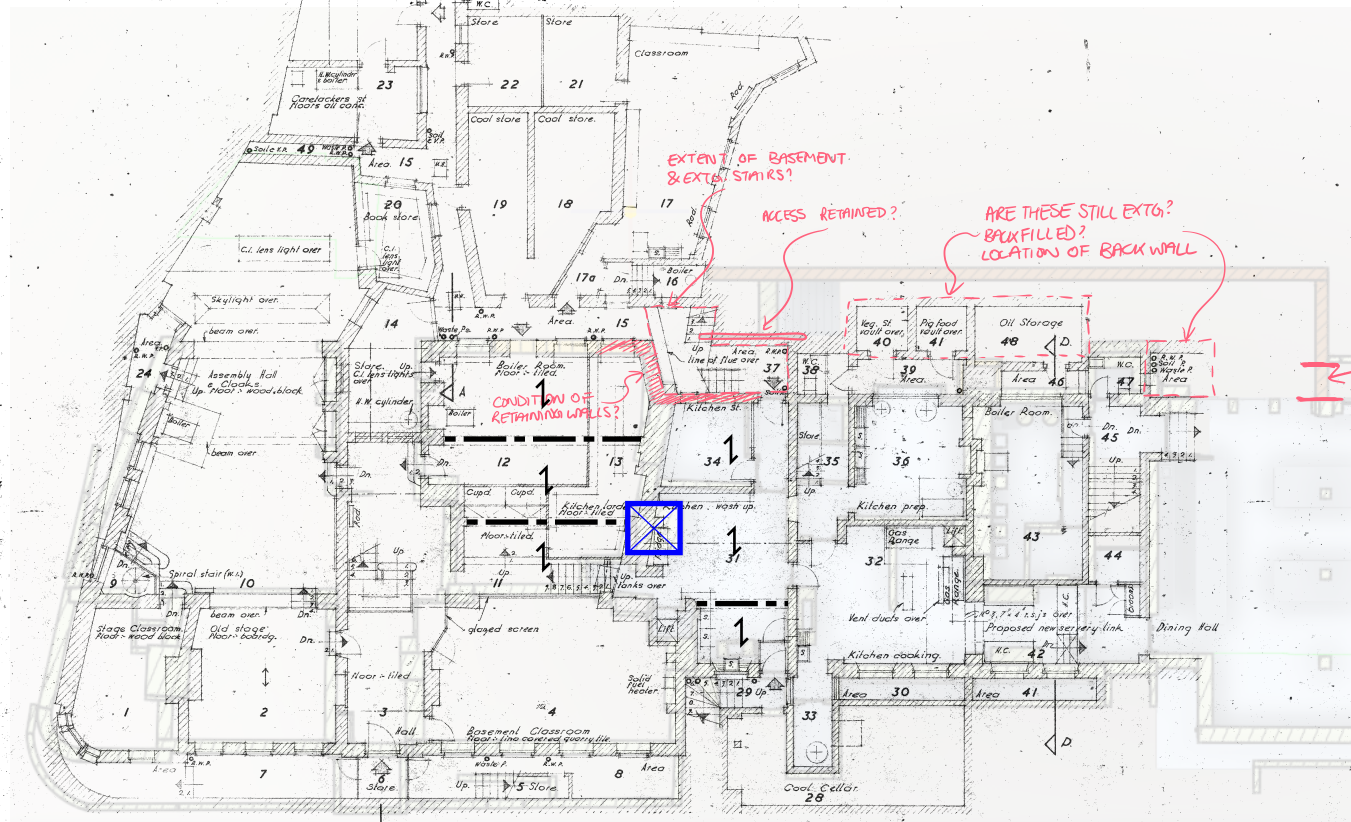
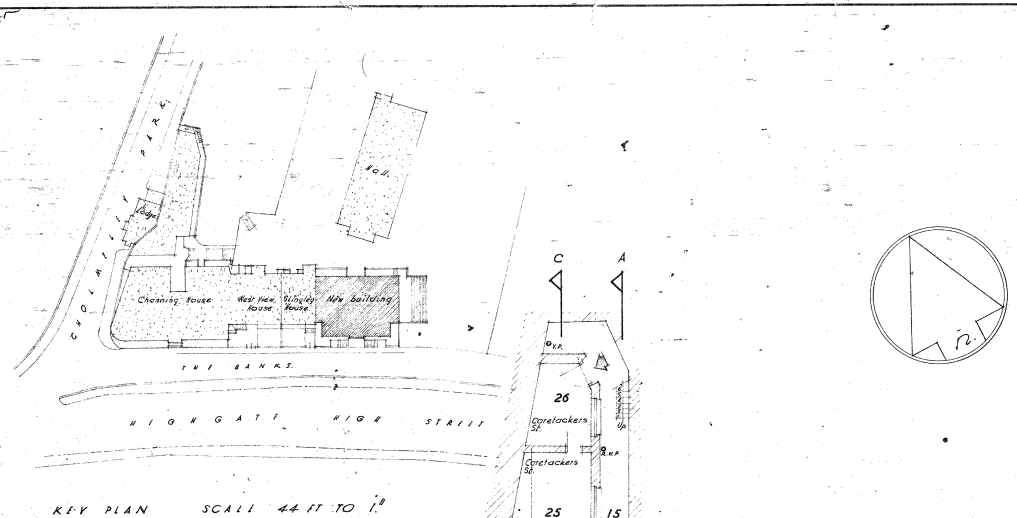
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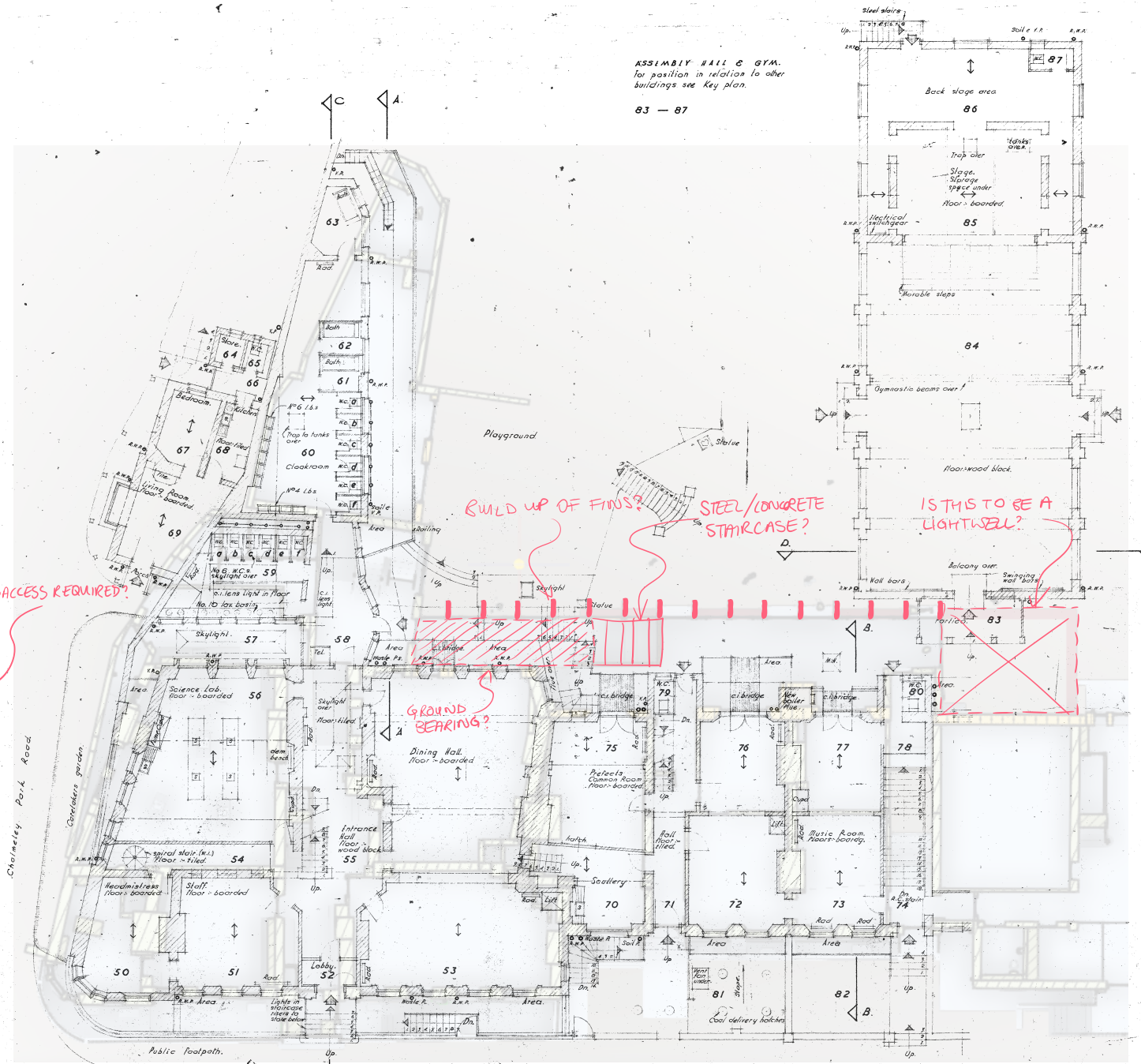
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HEYNE
TILLET
STEEL



BASEMENT PLAN 1 - 49



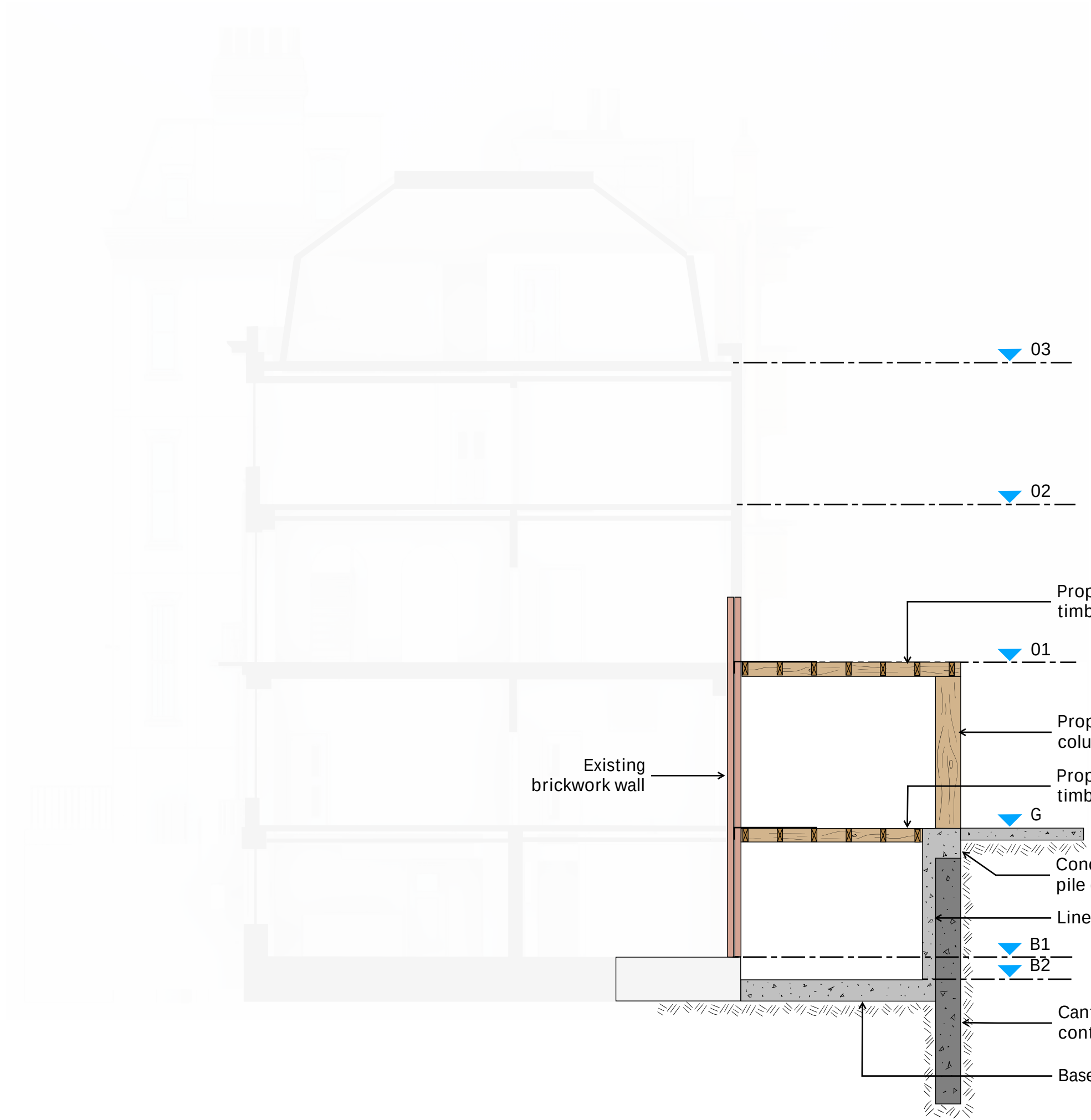
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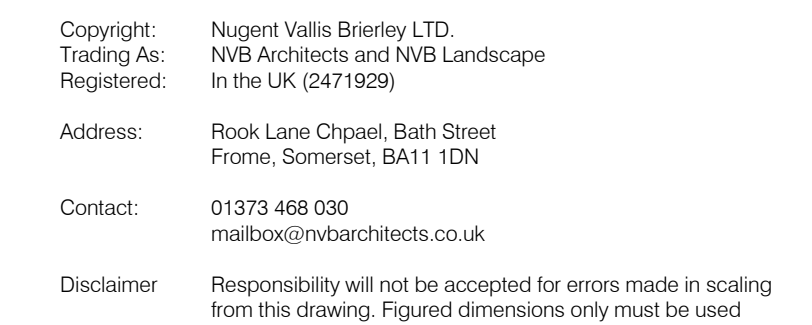
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Gollins Melvin Ward & Partners
Chartered Architects
17, Manchester Sq.
London W.1

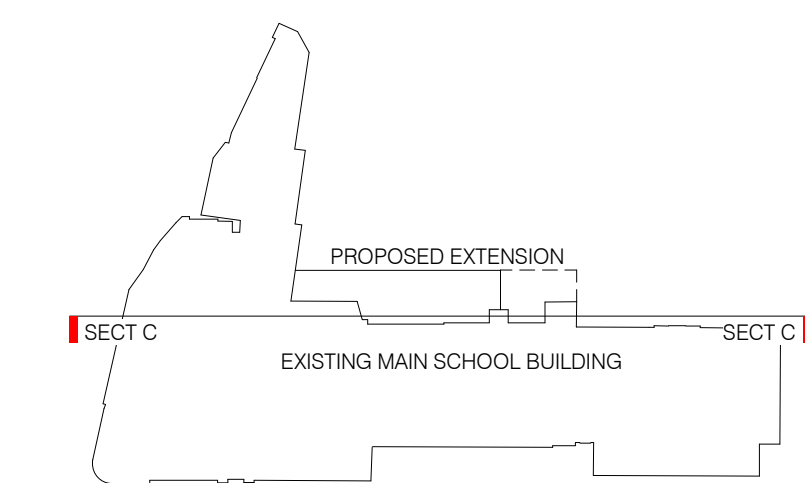




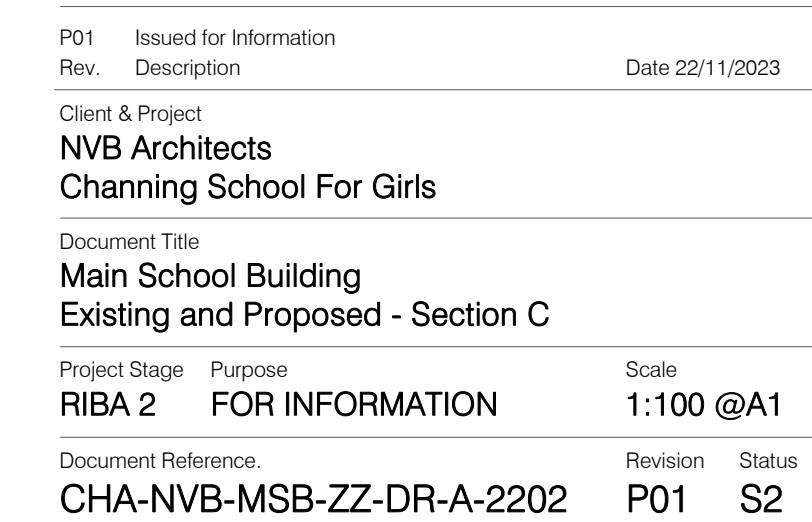
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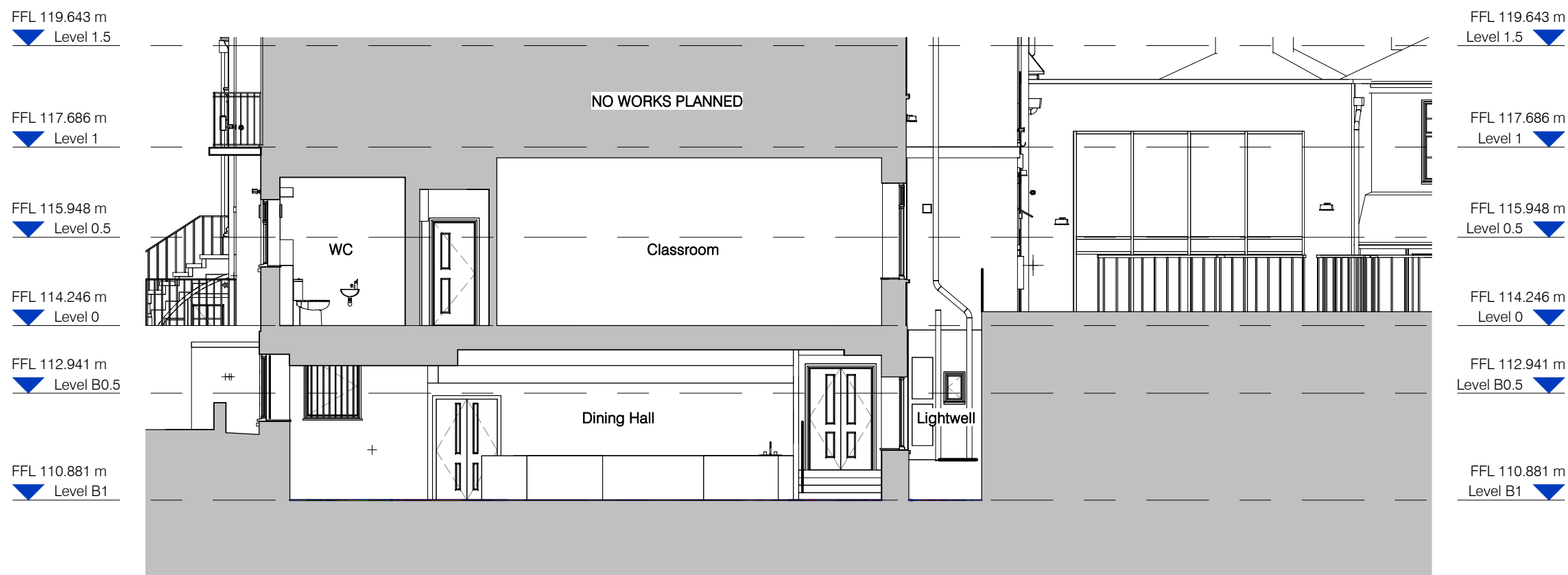
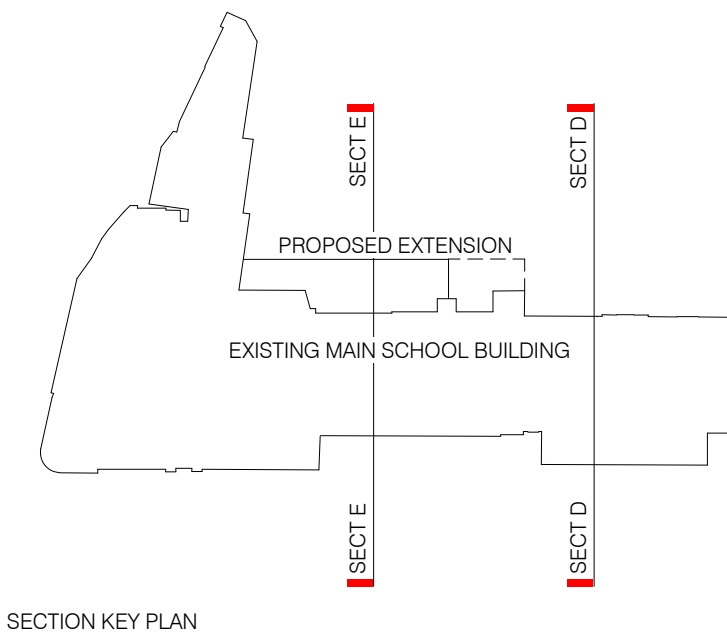
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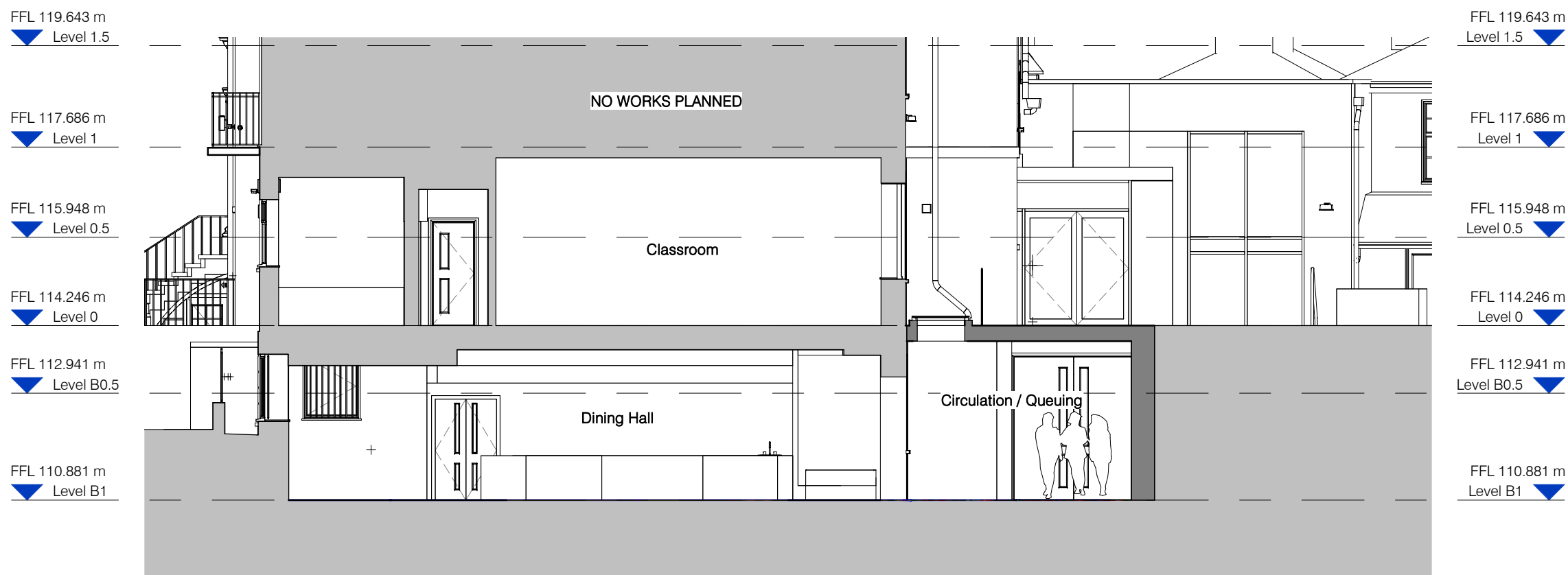
 **NVB Architects**
ROOK LANE

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- Key
- Existing
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Proposed Section D
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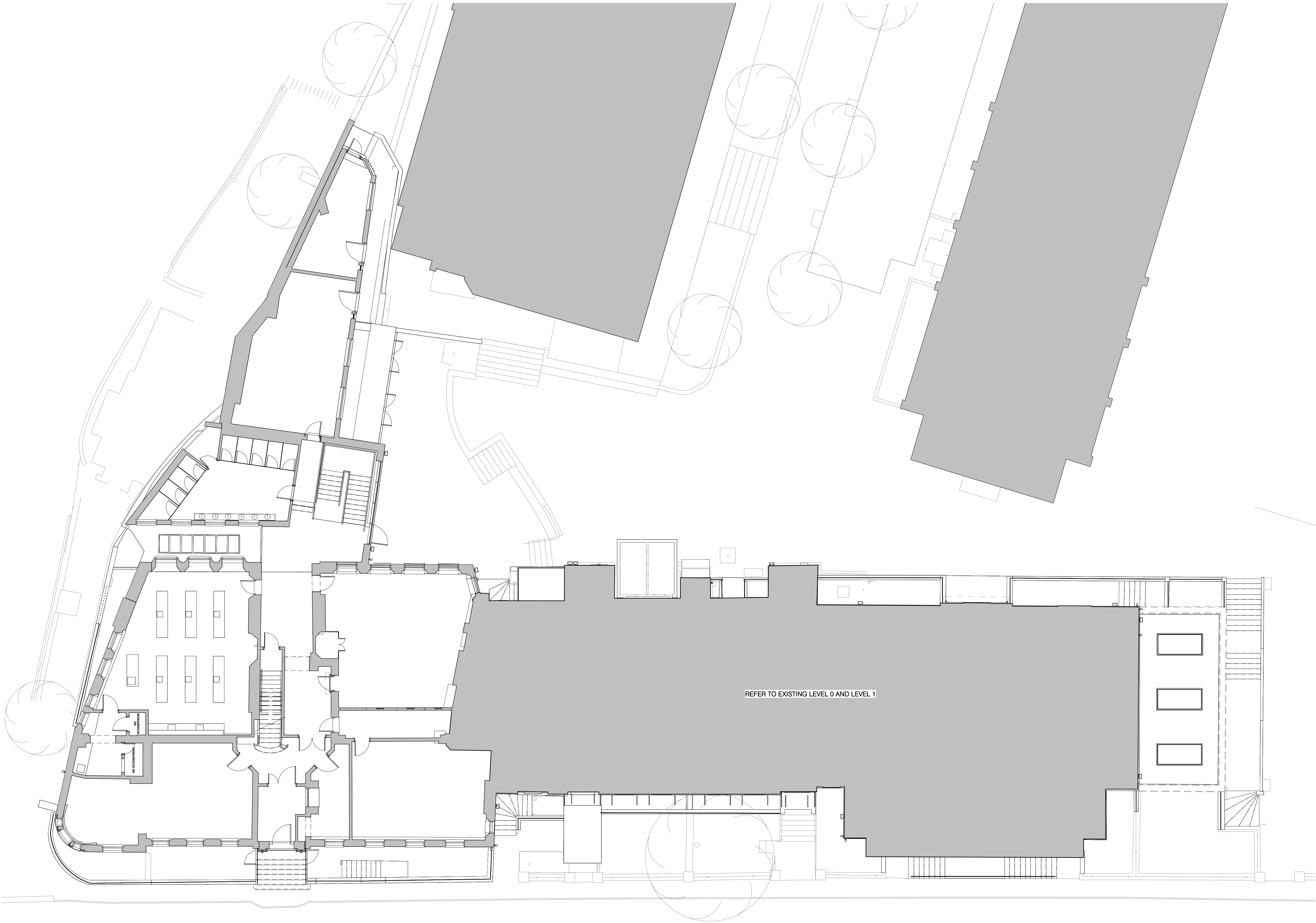


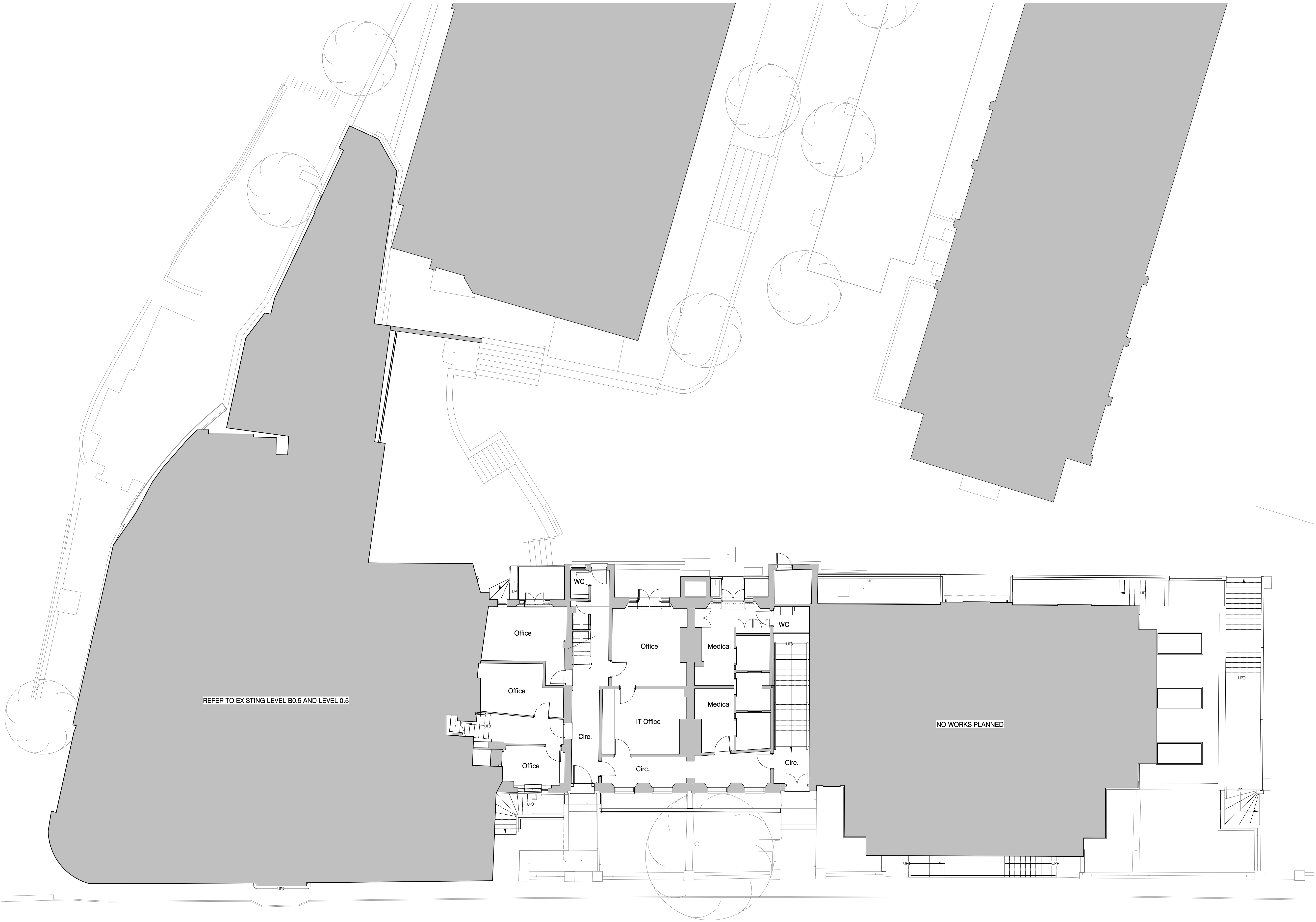
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Proposed Section E
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Channing School For Girls		
Document Title		
Main School Building		
Existing and Proposed - Section D and E		
Project Stage	Purpose	Scale
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Document Reference.	Revision	Status
CHA-NVB-MSB-ZZ-DR-A-2203	P01	S2





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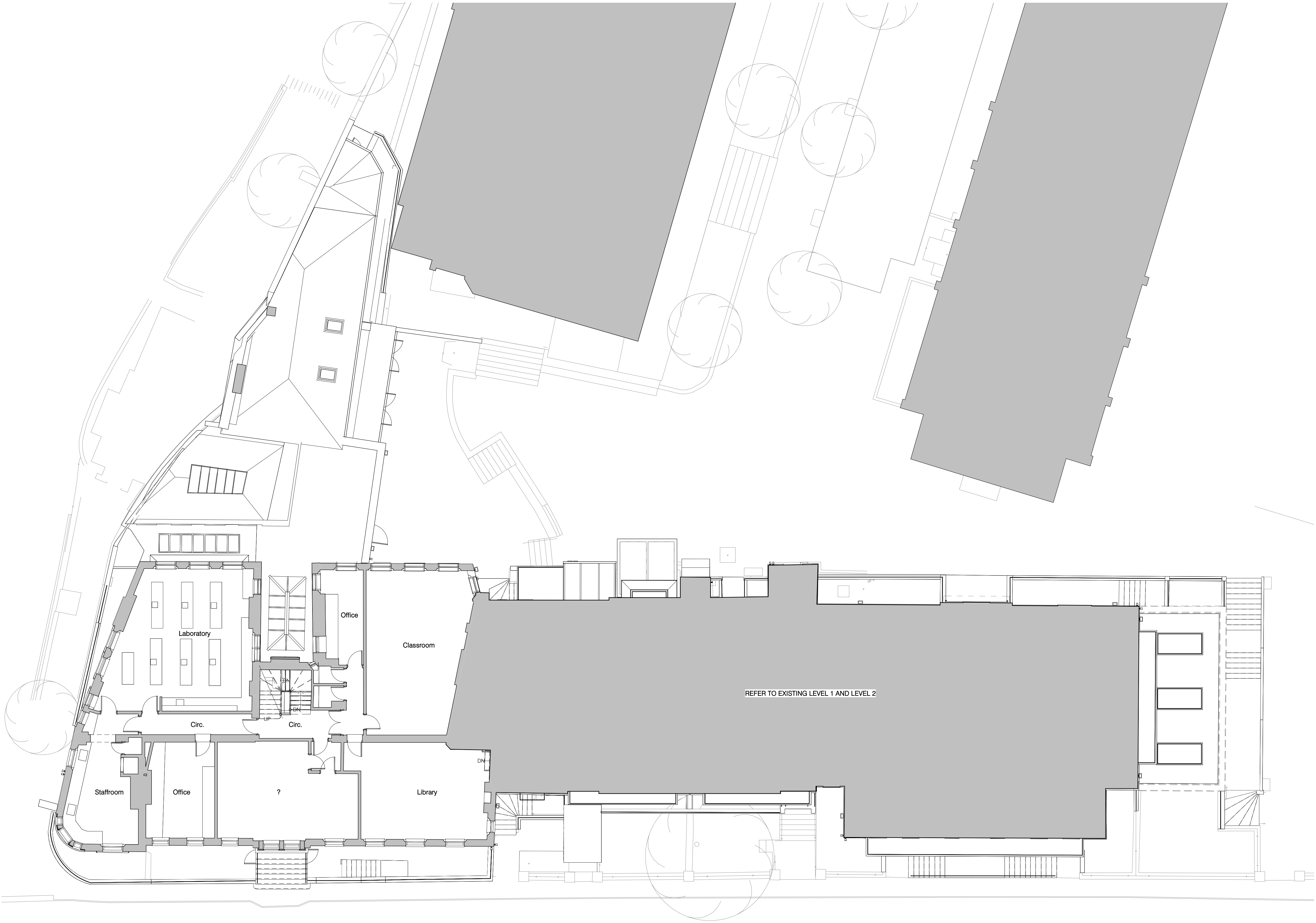
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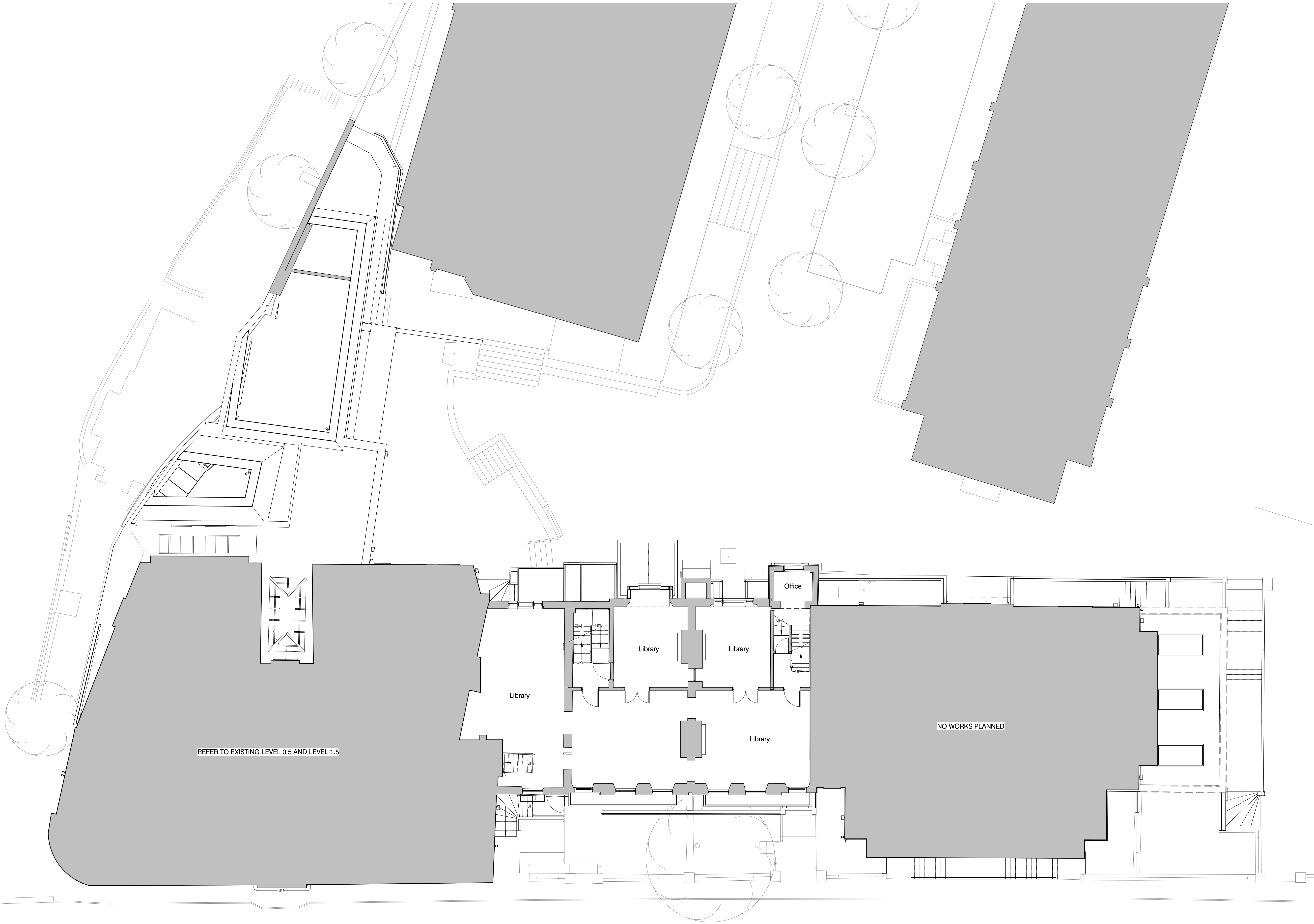
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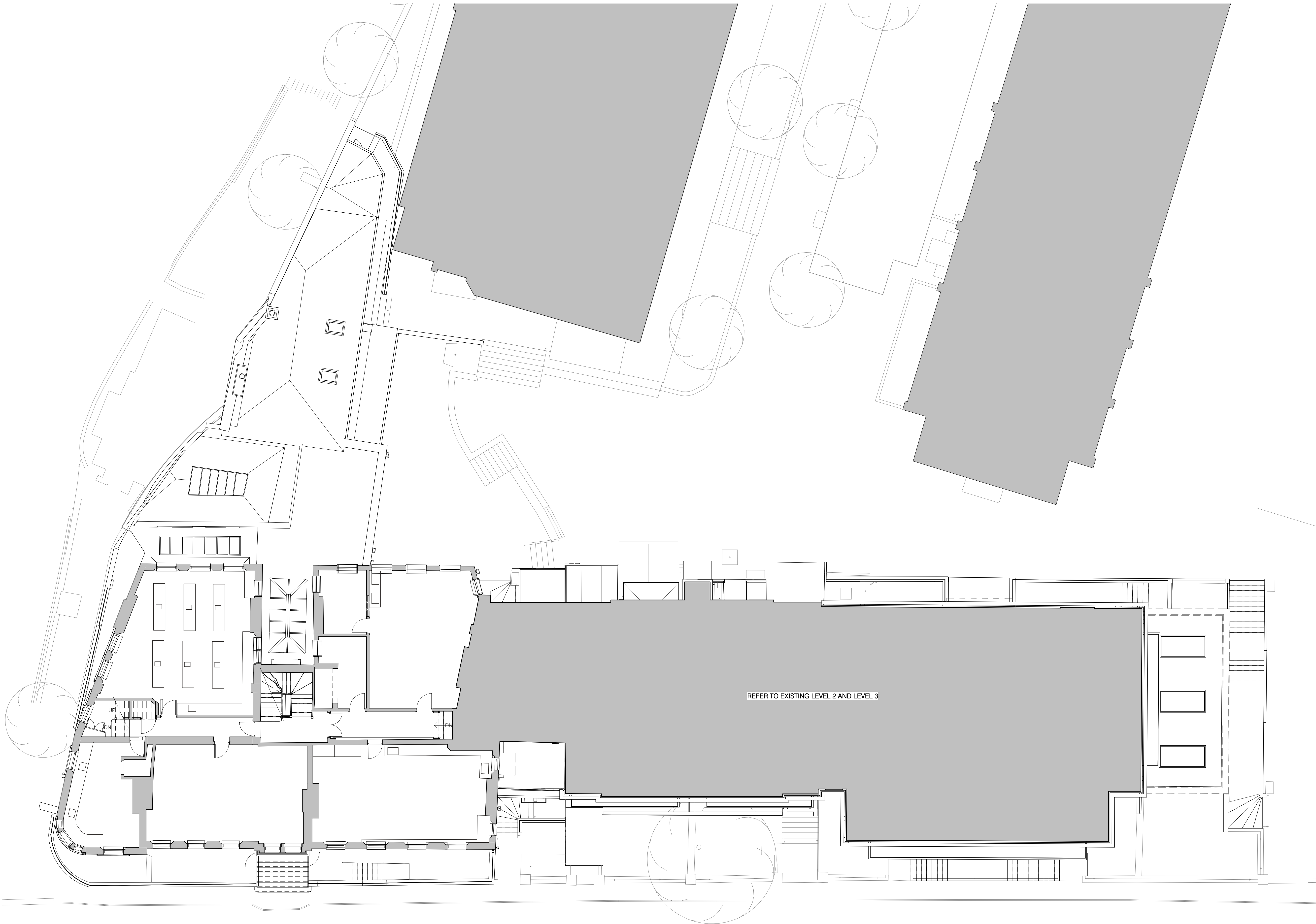
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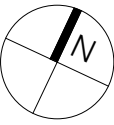
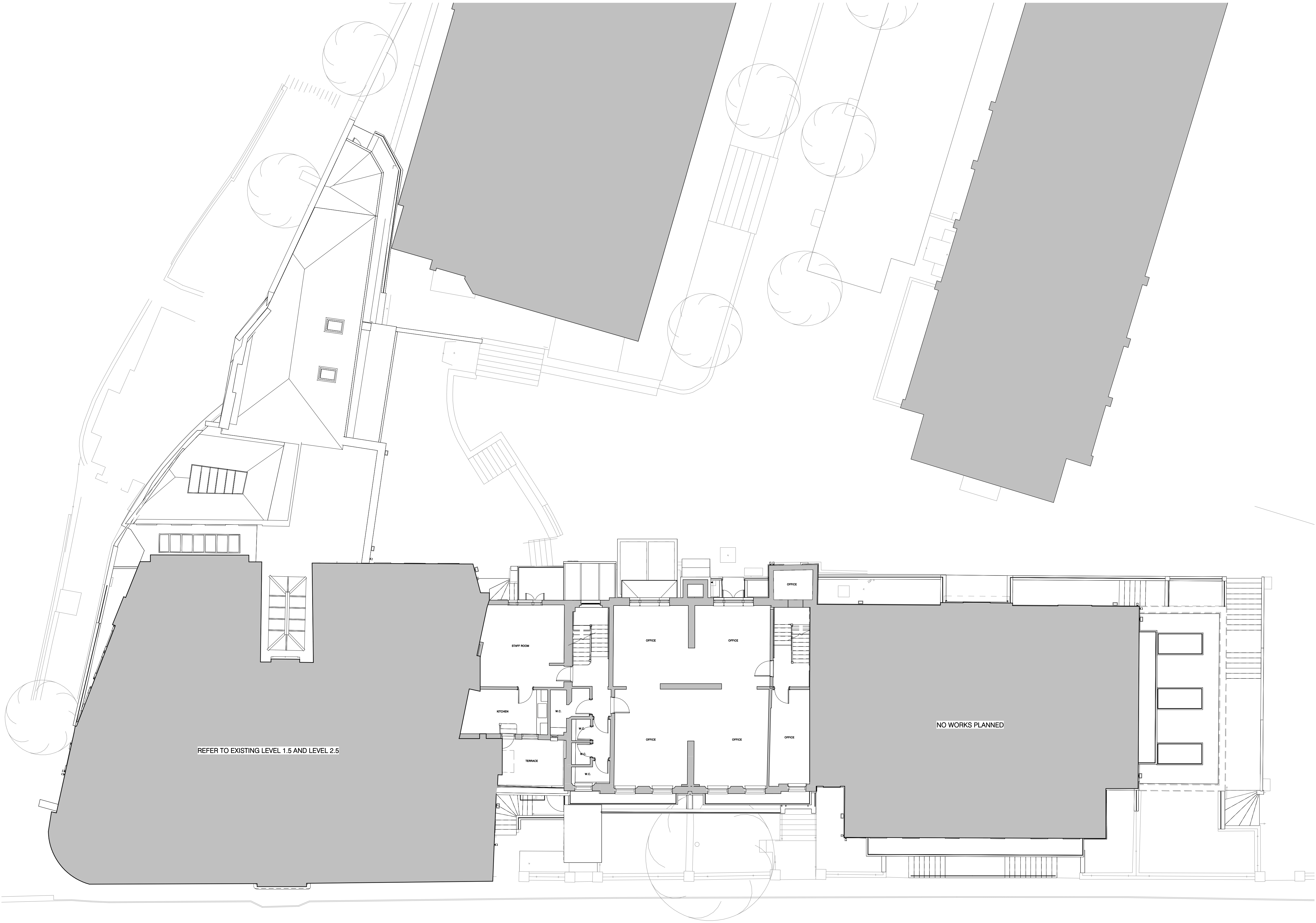
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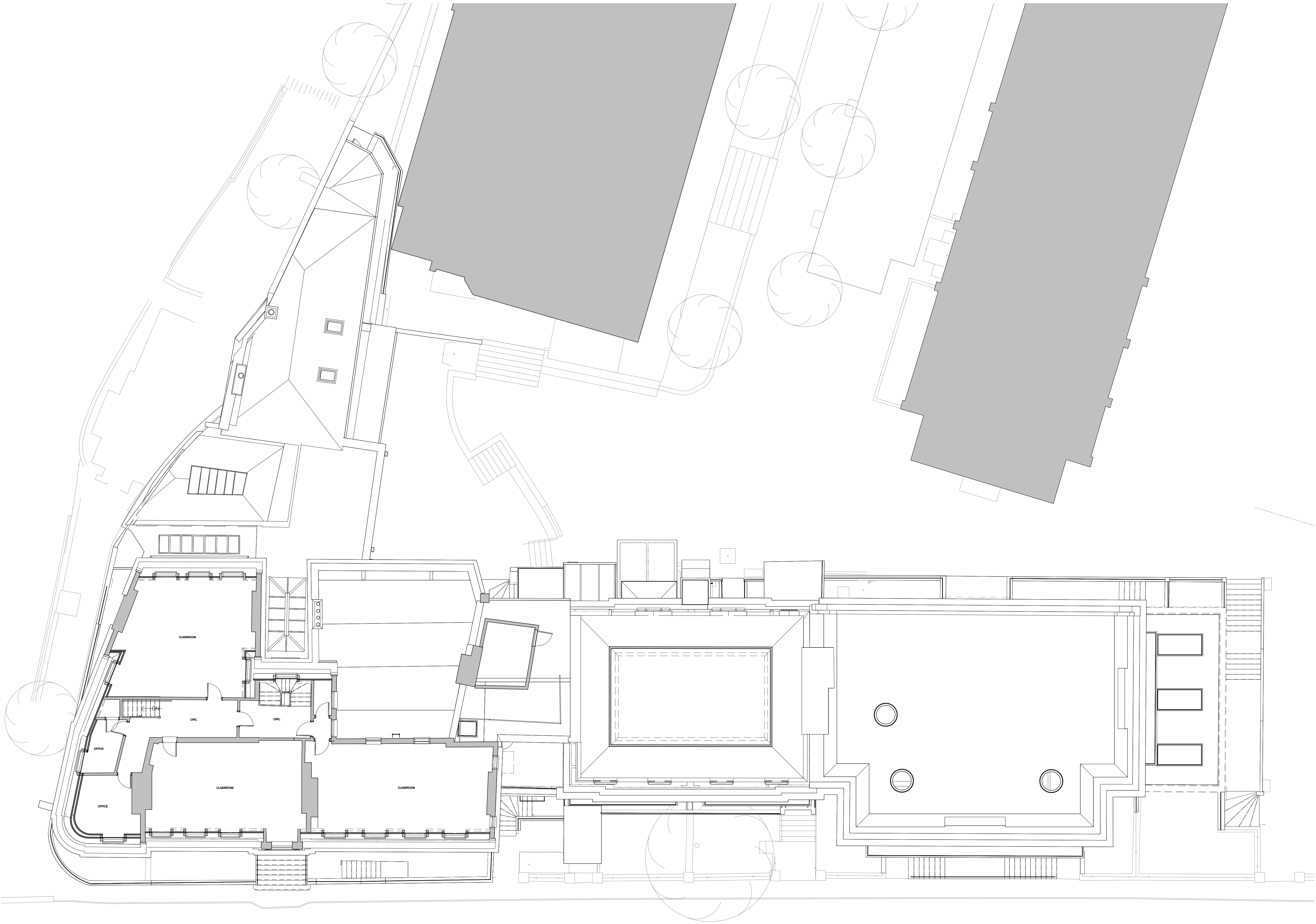


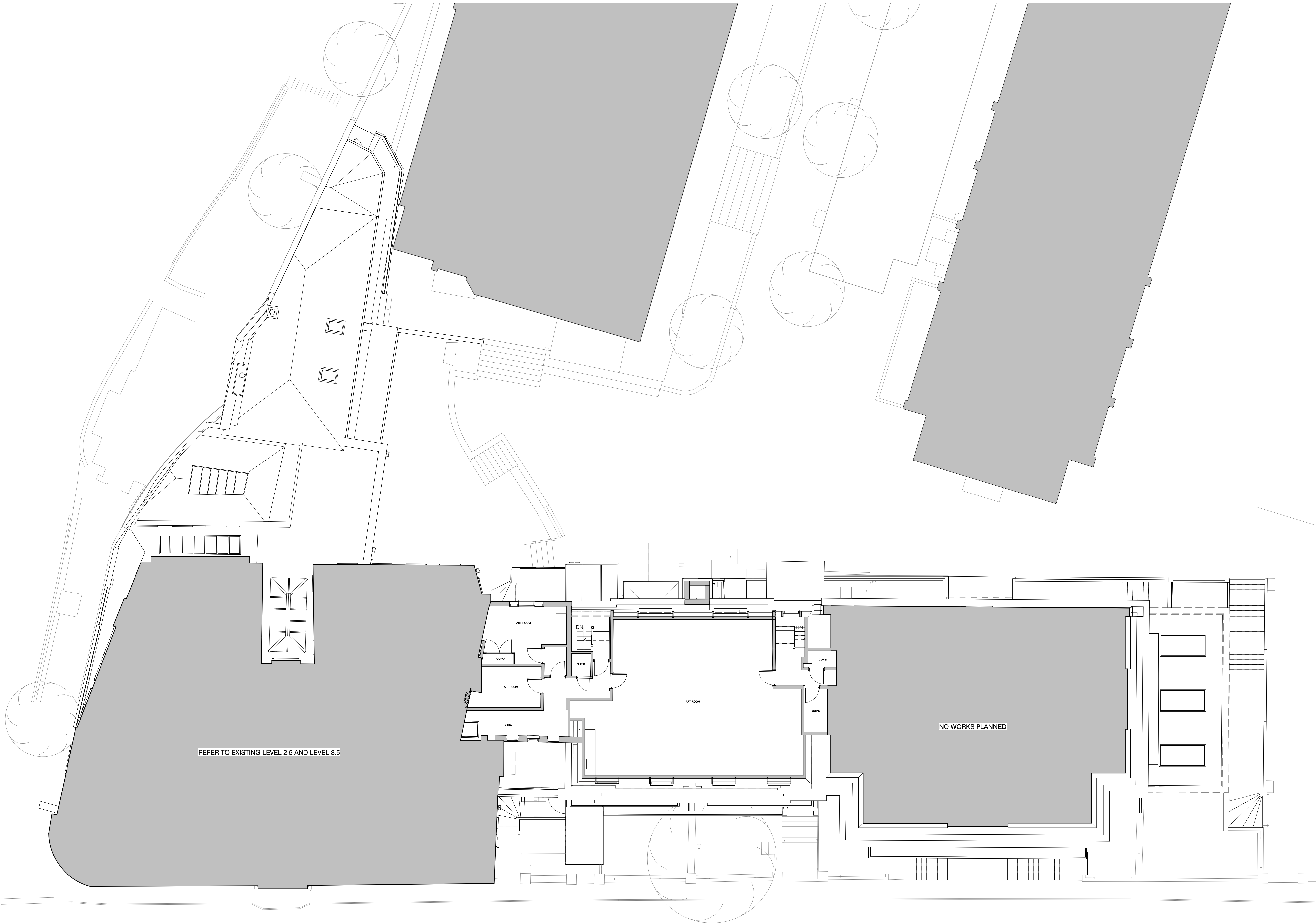




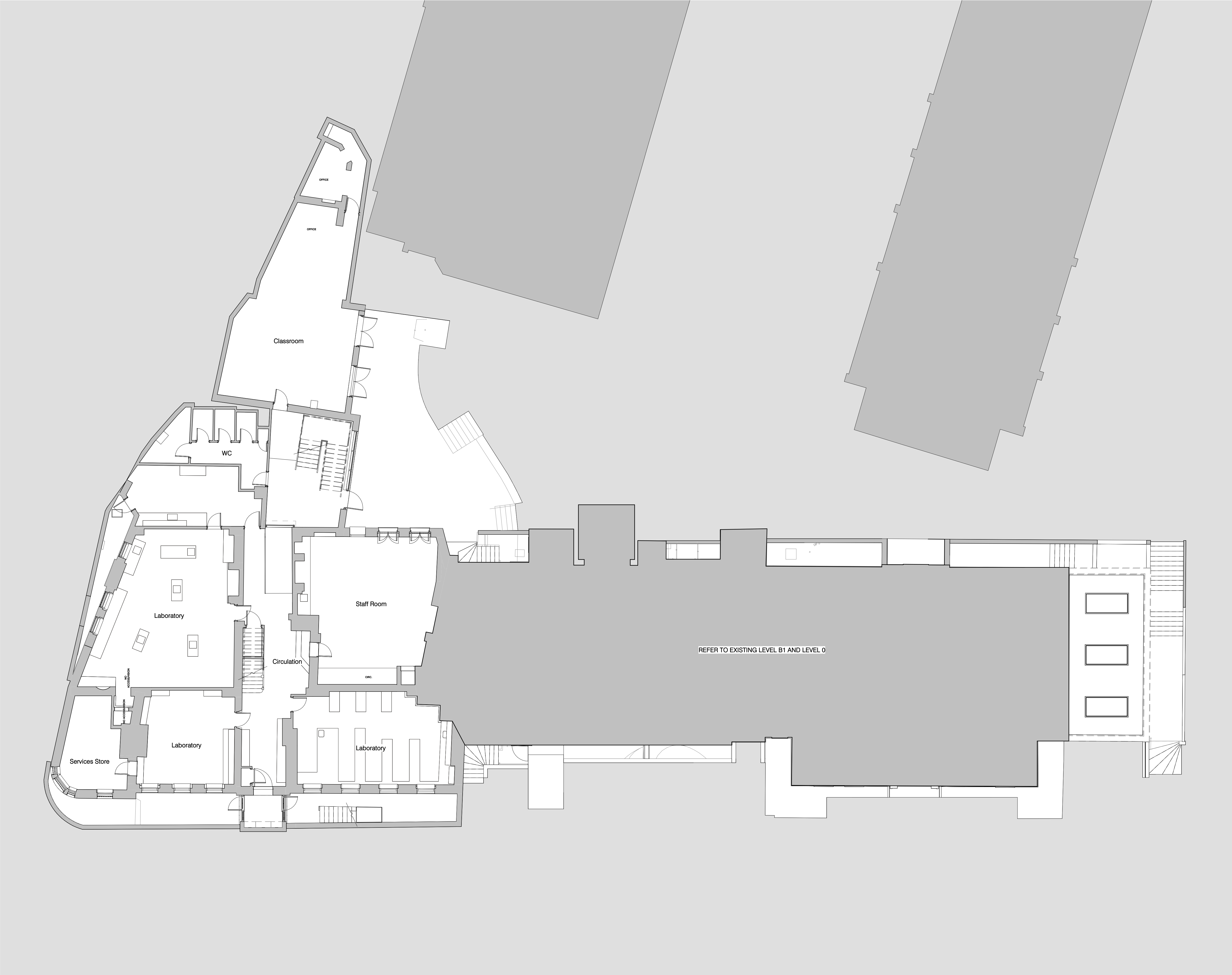


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Channing School For Girls		
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Project Stage Purpose Scale		
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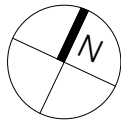
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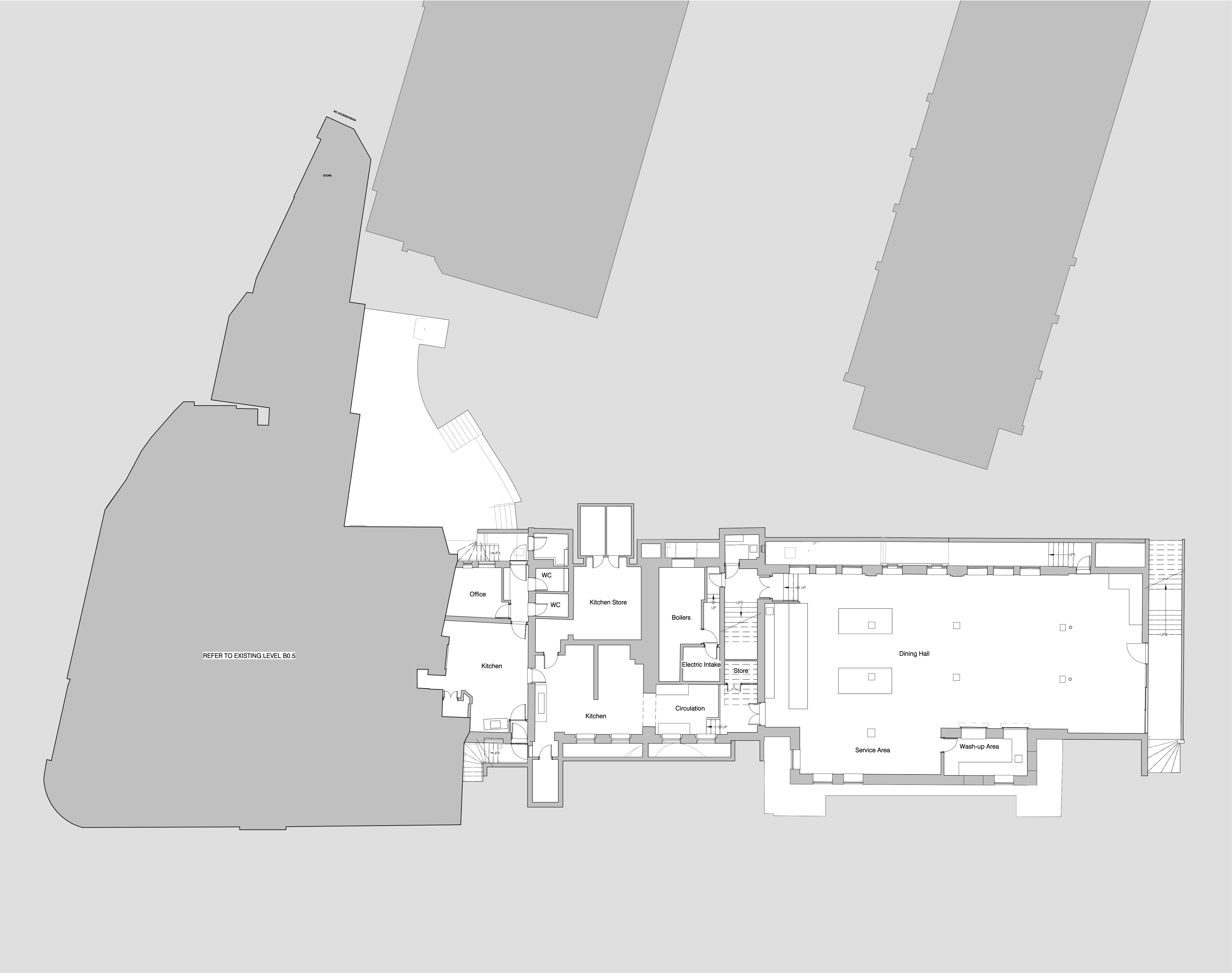
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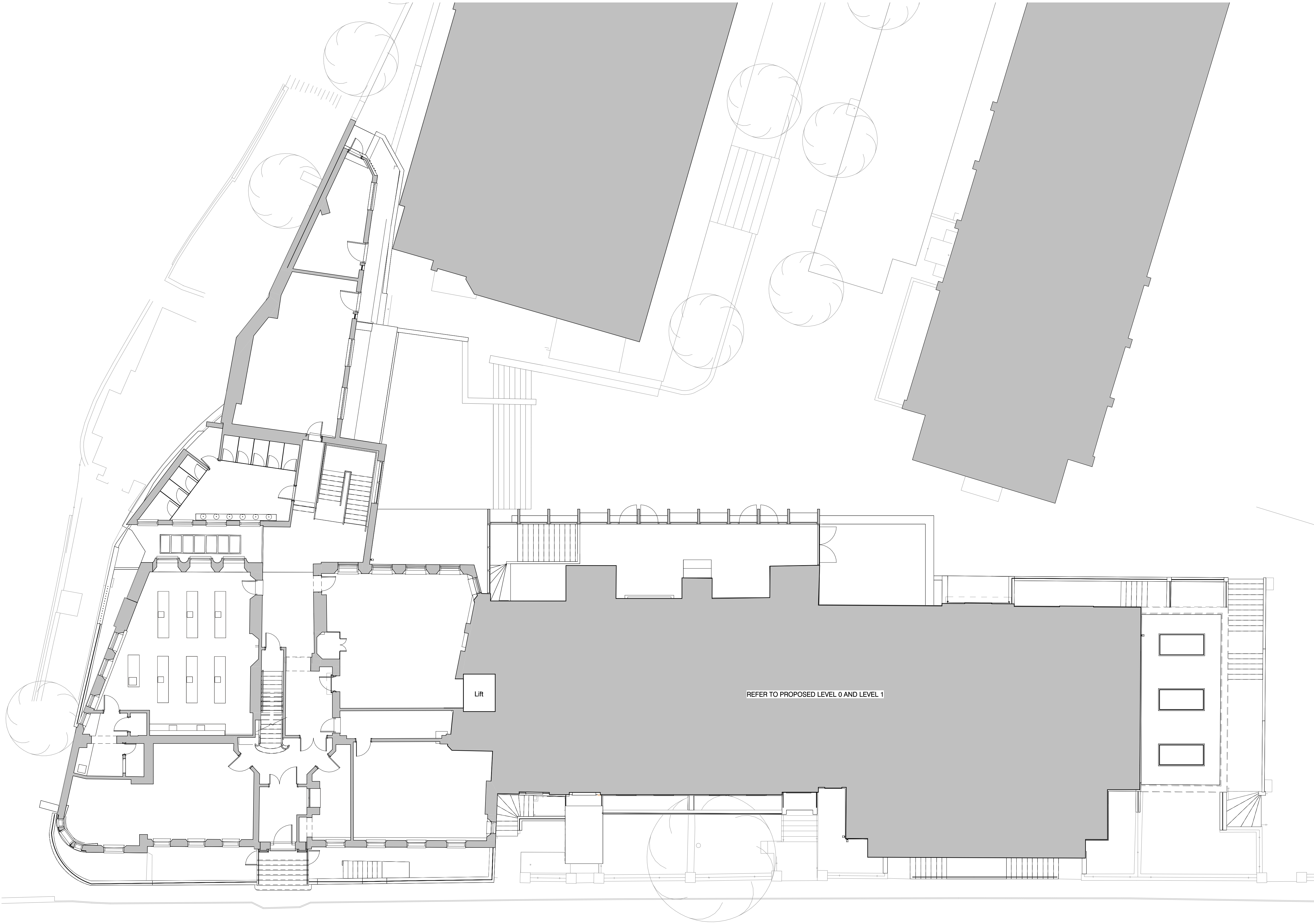
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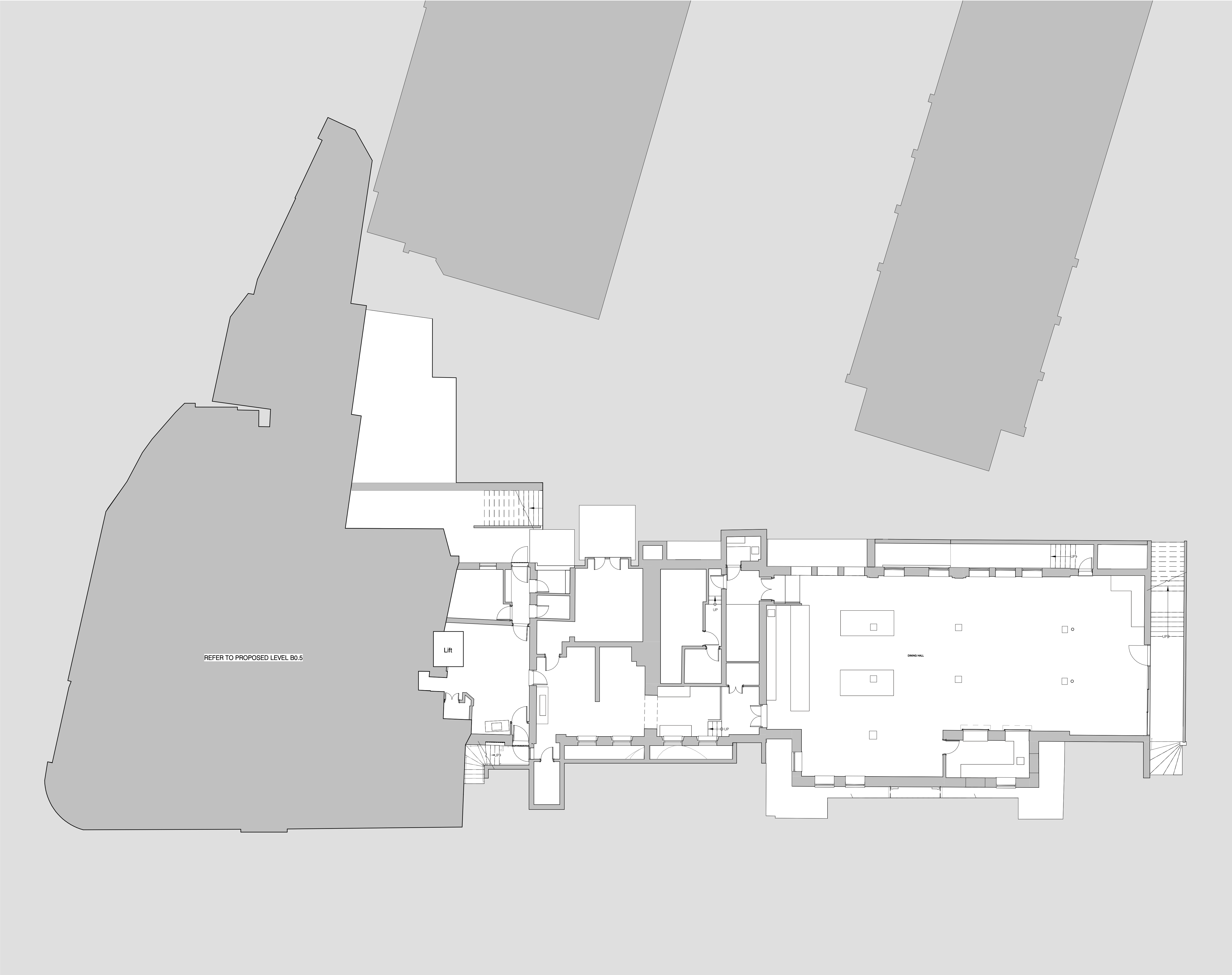
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1	2	3	4	5	6	7	8	9	10m
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Issued for Information		Date 04/10/2023
Rev.	Description	
Client & Project		
NVB Architects		
Channing School For Girls		
Document Title		
Existing Level B1 Plan		
Project Stage Purpose		
RIBA 2	INFORMATION	
Document Reference:		
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Scale		
1:100 @A1		
Revision Status		
A	S1	



A	Issued for Information	Date 04/10/2023
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NVB Architects		
Channing School For Girls		
Document Title		
Proposed Level 0.5 GA Plan		
Project Stage Purpose Scale		
RIBA 2	INFORMATION	1:100 @A1
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Responsibility will not be accepted for errors made in scaling
from this drawing. Figured dimensions only must be used

Scale

1:100 @ A1 (1:200 @ A3)

1	2	3	4	5	6	7	8	9	10m
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A		Issued for Information		Date 04/10/2023
Rev.	Description			
Client & Project				
NVB Architects				
Channing School For Girls				
Document Title				
Proposed Level B1 GA Plan				
Project Stage		Purpose		Scale
				1:100 @A1
Document Reference:		Revision	Status	
CHA-NVB-MSB-00-DR-A-2100		A		