100 Chalk Farm Road

Basement Impact Assessment

Prepared by

Pell Frischmann

Submitted on behalf of Regal Chalk Farm Ltd

January 2024

Pell Frischmann

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1 Non- Technical Summary

1.1 Site Location

100 Chalk Farm Road, London as shown in Figure 1.

	
Ordnance Survey (OS) Open Mapping	**Google Satellite Image**

Site information	Details
Site area	0.29Ha
National Grid Reference (centre of the site) (NGR)	528300, 184300
Nearest (central) postcode	NW1 8EH

Figure 1 Site Location

1.2 Current Site Arrangement

The site predominantly comprises two vacant office blocks and a two-story car parking area, with the rest of the area comprising of hardstanding for pathways and roads. There is a small area of overgrown vegetation to the east of the carpark. The site is located in the centre of the London Borough of Camden, approximately 165m to the southeast of Chalk Farm Underground Station (Northern Line), as shown in Figure 1.

The site is currently accessed from the northeast corner off Chalk Farm Road via vehicle (double width) or a pedestrian gate. A second pedestrian gate is located in the north-western corner of the site adjacent to a set of wide pedestrian gates located at the base of a staircase associated with the Roundhouse Theatre. It is possible to access the site via the Roundhouse Theatre gates.

The site is bound by the A502 Chalk Farm Road to the north, the carpark and supermarket to the east, railway lines to the south and the Roundhouse (Grade II listed building) to the west. A 3D view of the site and topographical information for the site are shown in Figure 2 and Figure 3.

Mapping indicates that the site is typically sloping towards the north (Chalk Farm Road) with the elevation dropping from 32.7m to 28.5mAOD. The existing carpark has been partially cut into the slope to provide two parking levels (lower ground and roof). The soft standing area over the westernmost part of this site is typically flat and lies at an elevation of ~30.4mAOD.

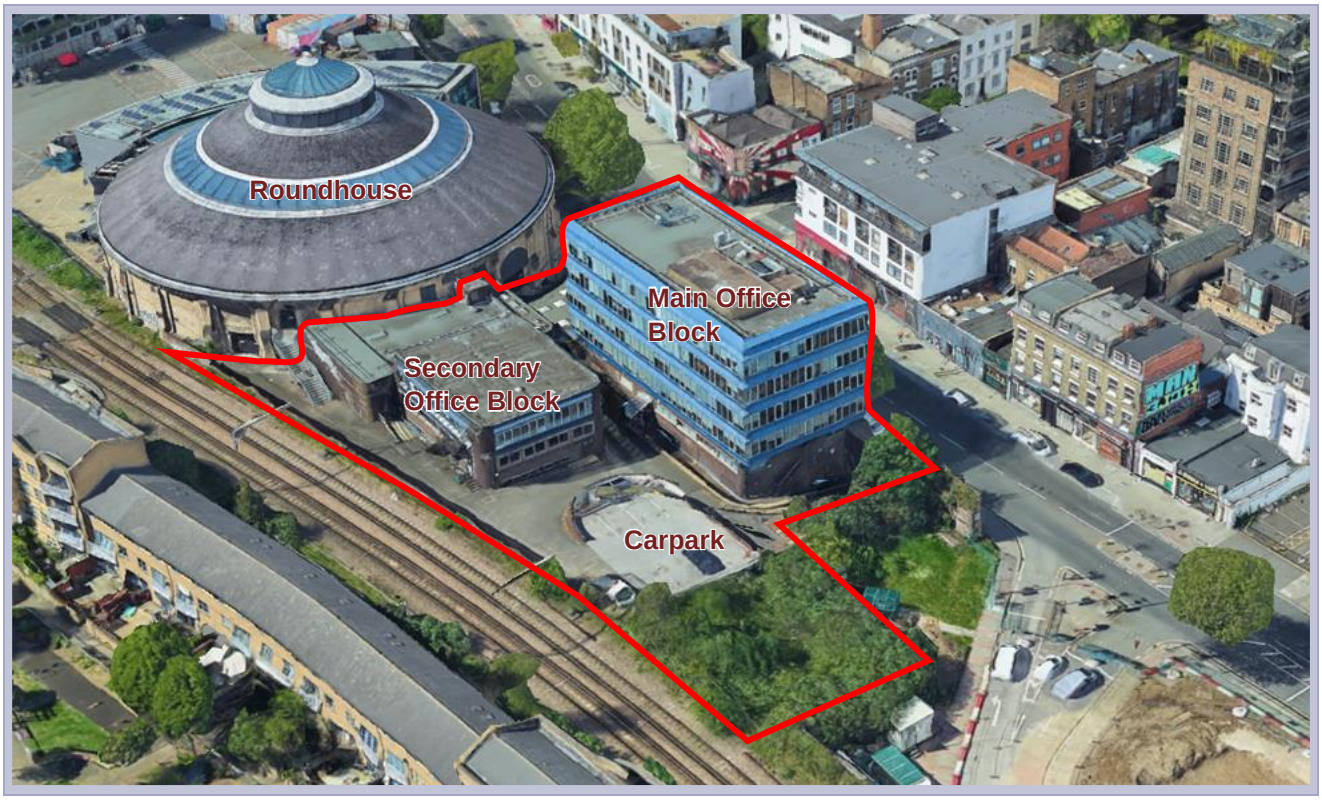


Figure 2 3D view of the site looking NW.

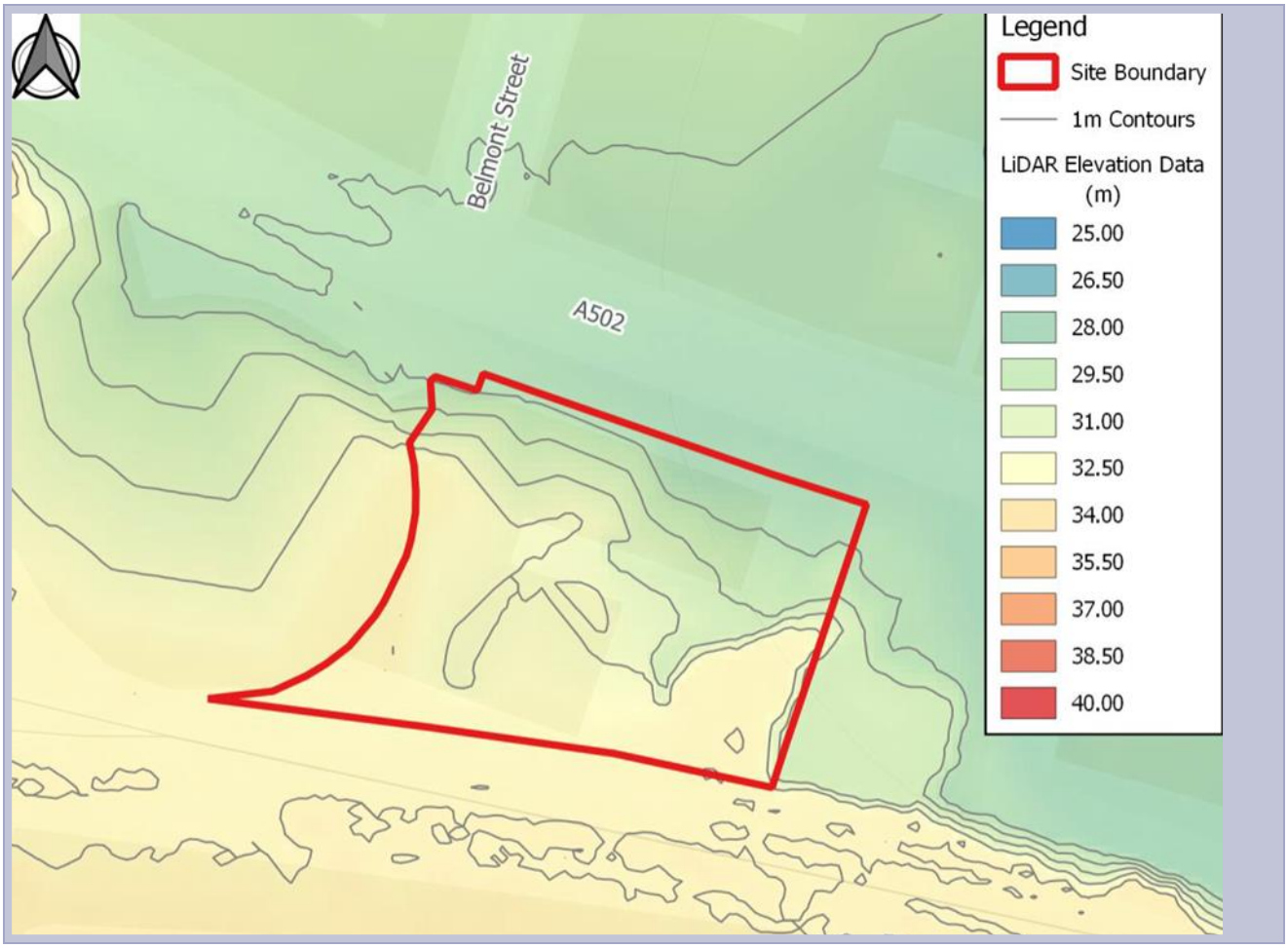


Figure 3 Site topography

1.3 The Proposed Development

The proposed development will see the demolition of existing buildings and redevelopment of the site to provide two buildings ranging in height from [6] to [12] storeys containing purpose-built student accommodation (PBSA) with 265 rooms, associated amenity and ancillary space (Sui Generis), 24 affordable residential homes (Class C3), ground floor commercial space (Class E) together with public realm, access, servicing, and other associated works. The proposed structures shown in the elevation extract in Figure 4. A basement is part of the student housing buildings as shown in Figure 5. The basement is proposed to have finished floor level (FFL) of 24.180m OD as shown in Figure 4.

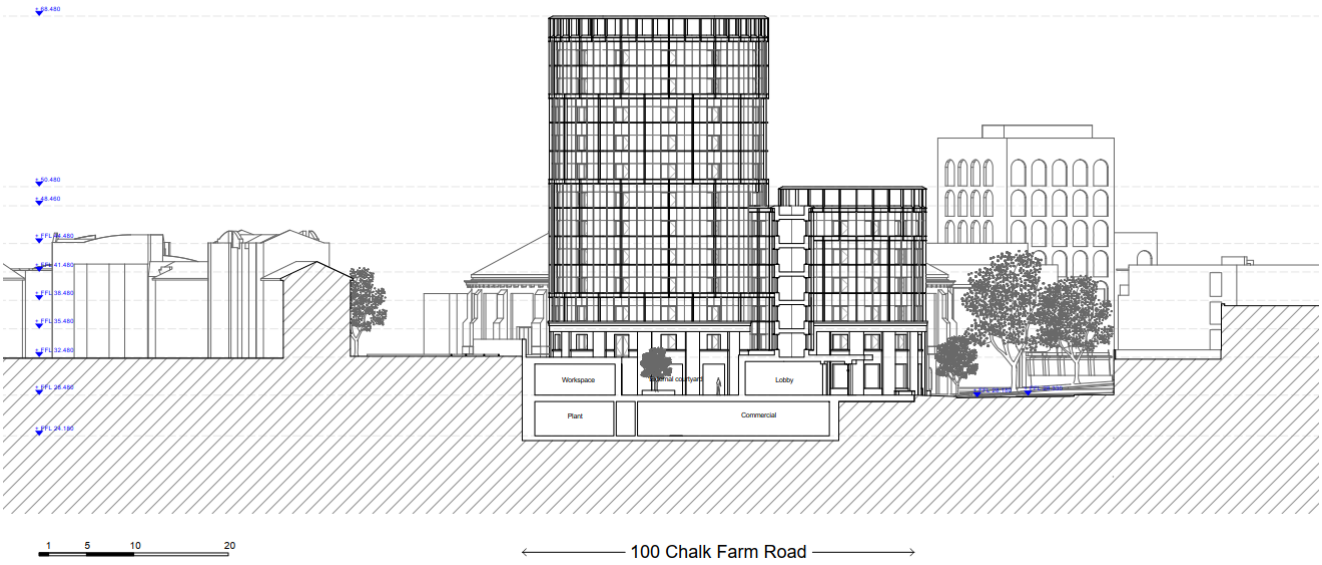


Figure 4 Proposed Elevation View (Section CC)

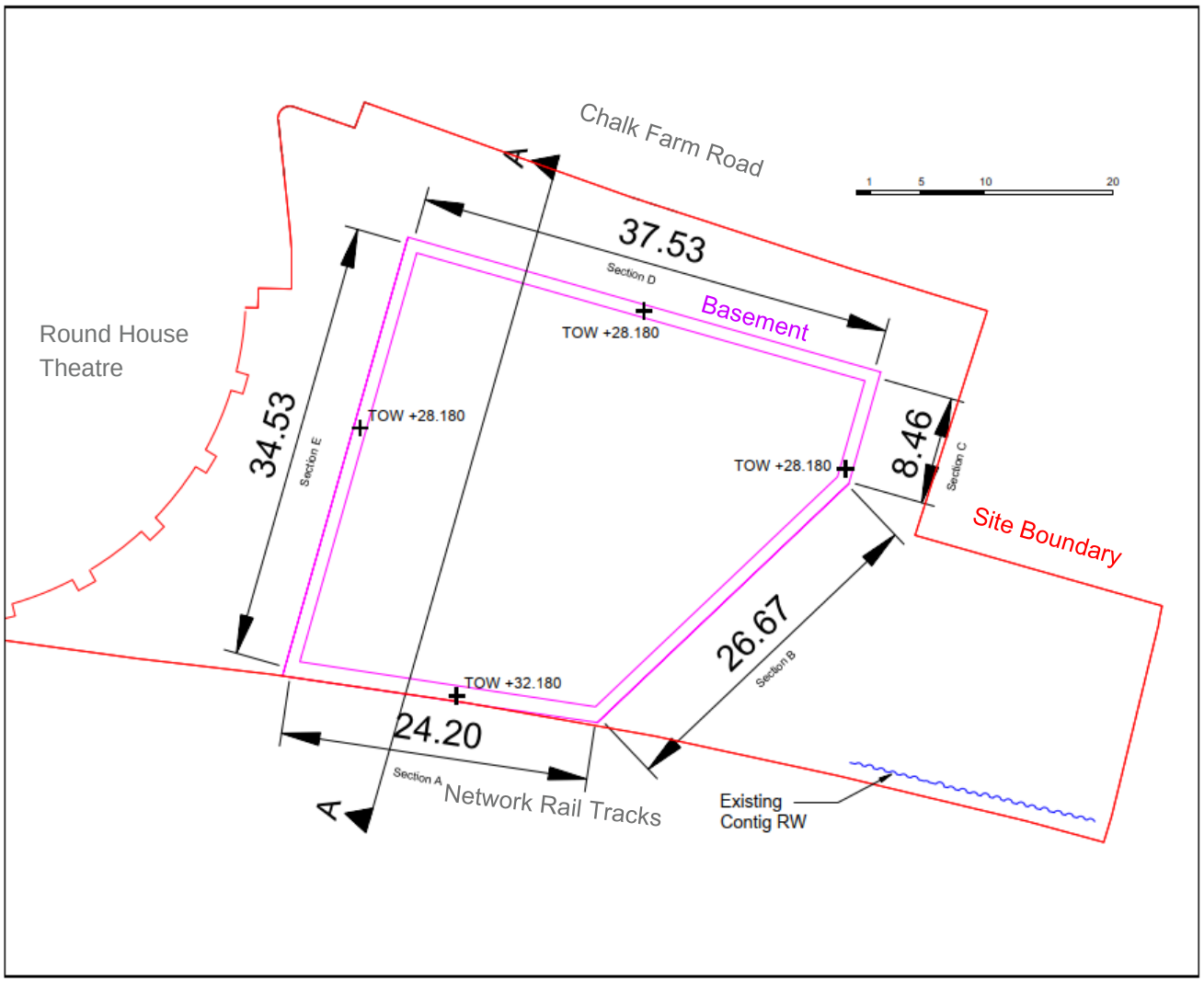


Figure 5 Proposed basements' footprint.

1.4 Assessments Covered by this Document.

The following are covered by this document:

1. Desk Study
2. Screening
3. Scoping
4. Additional evidence/assessments such as:

- Geoenvironmental factual data (site and lab)
- Arboricultural report
- Ground movement assessment
- Consultation with adjacent infrastructure/asset owners
- Flood risk assessments
- Surface water drainage strategy/SUDS assessment
- Others

5. Impact Assessment

1.5 Groundwater

In the ground investigation monitoring undertaken in the winter of 1972 a groundwater level as high as 28.2m OD, 4.32m higher than the FFL of the proposed basement (23.88m OD) was recorded. However, the GI undertaken in summer 2022 which extended to maximum depth of 24.893m OD did not record any incident of water strike. As the underlying strata is London Clay formation and MG is still present between 2.4-4.1m thick, it is assumed that the recorded water table in 1972 is perched and since it was only recorded in 1972, it is assumed to be seasonal. See Table 1 for summary of GI logs. These GI field data are within the IDOM report (Appendix B).

Table 1 Groundwater Level on Site

Date	BH #	Top of BH	Depth of inspection (m OD)	GWL (m OD)
Jul-22	MWS101	32.783	27.783	Not encountered
Jul-22	MWS102	32.73	27.73	Not encountered
Jul-22	MWS103	32.29	27.29	Not encountered
Jul-22	MWS104	29.893	24.893	Not encountered
Jul-22	MWS105	31.25	26.25	Not encountered
Jan-72	BH1	32.8696	14.5816	21.592
Jan-72	BH2	32.83	20.3332	27.6484
Jan-72	BH3	32.827	11.491	27.3406
Jan-72	BH4	32.772	14.484	28.2

1.6 Construction Method

1.6.1 Foundation

Piled foundation is considered to be viable be the most desirable option.

1.6.2 Retaining Walls

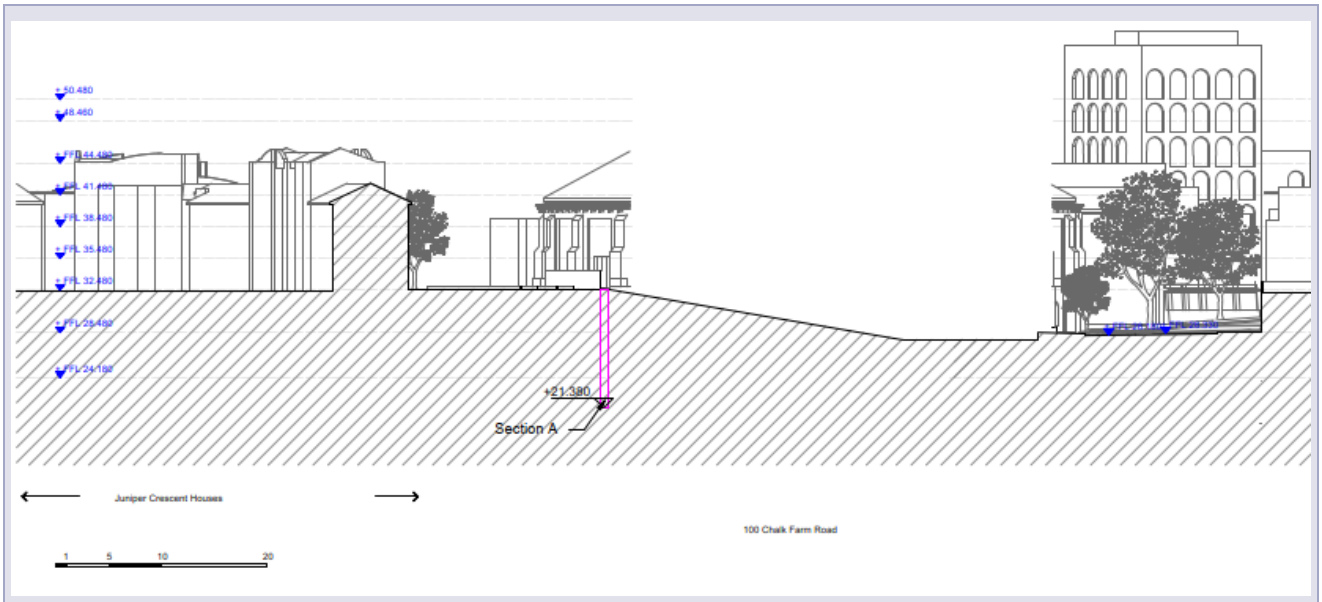
It is assumed for this report that the construction of the basement is bottom-up with temporary props installed to provide a high wall stiffness. The basement walls shall be embedded piles walls to a depth of 21.380m aOD and 17.98m aOD formed as Contiguous Pile Walls with grouting, both of which are considered to be viable options. The maximum excavated level is considered to be 1m below the proposed FFL in DSDHA drawing 356_P40.004 (See Appendix C .

1.6.3 Methodology with site constraints

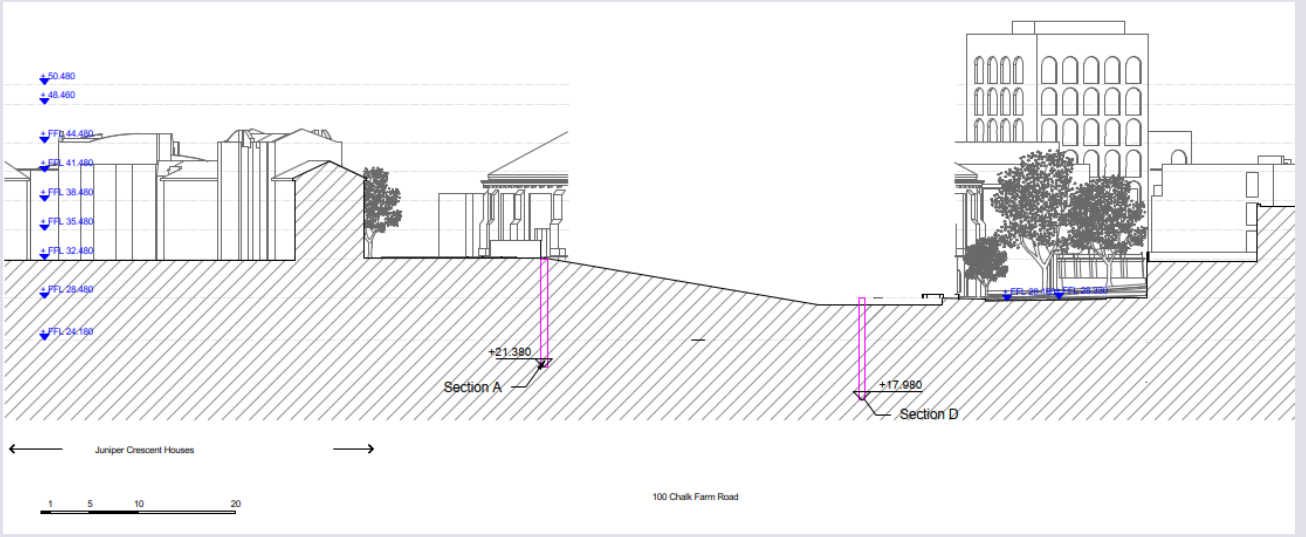
The proposed basement locations do not offer the possibility of excavating using battered slopes due to adjacent infrastructure; therefore, as noted above, a bottom-up sequencing of works can be considered as shown schematically in Table 2. See 106885-PEL-XX-098-SK-C-000002 (See Appendix C for a preliminary plan and section view of the proposed basement. The following sections shown are cross section A from Figure 5.

Table 2 Bottom-Up Construction Method - Simplified

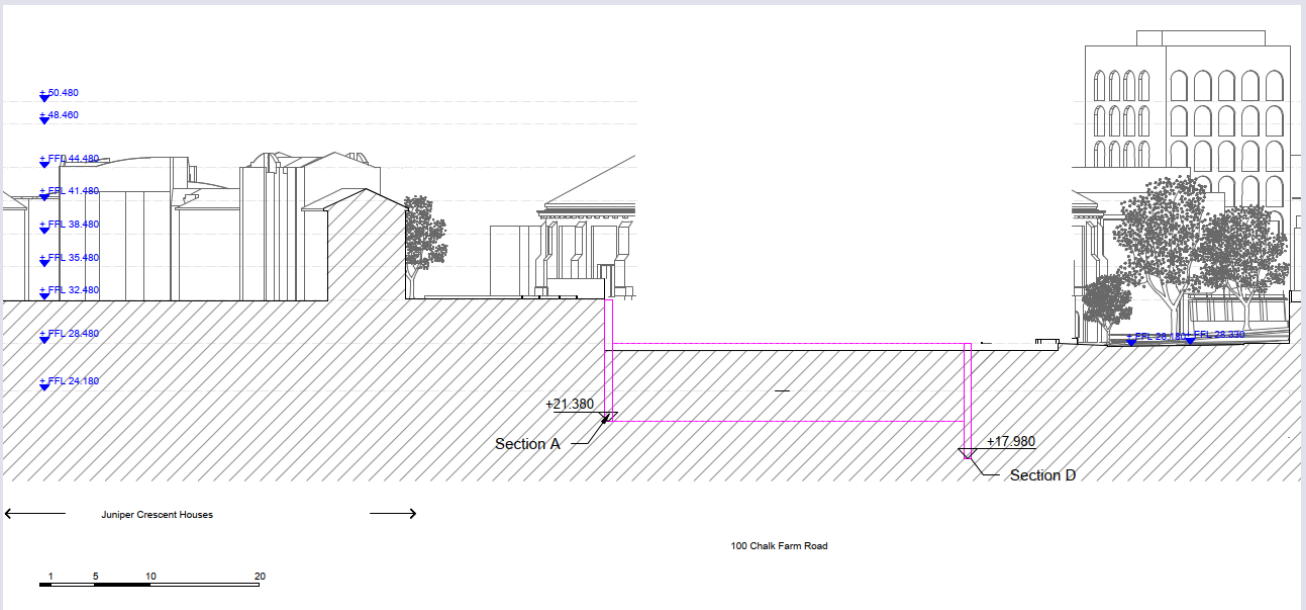
Monitoring installations shall be adequate with response plans in place before piling and excavation work. Monitoring shall be undertaken for existing retaining wall, Network Rail tracks, Round House theatre, Chalk Farm road footpath and Chalk Farm road.



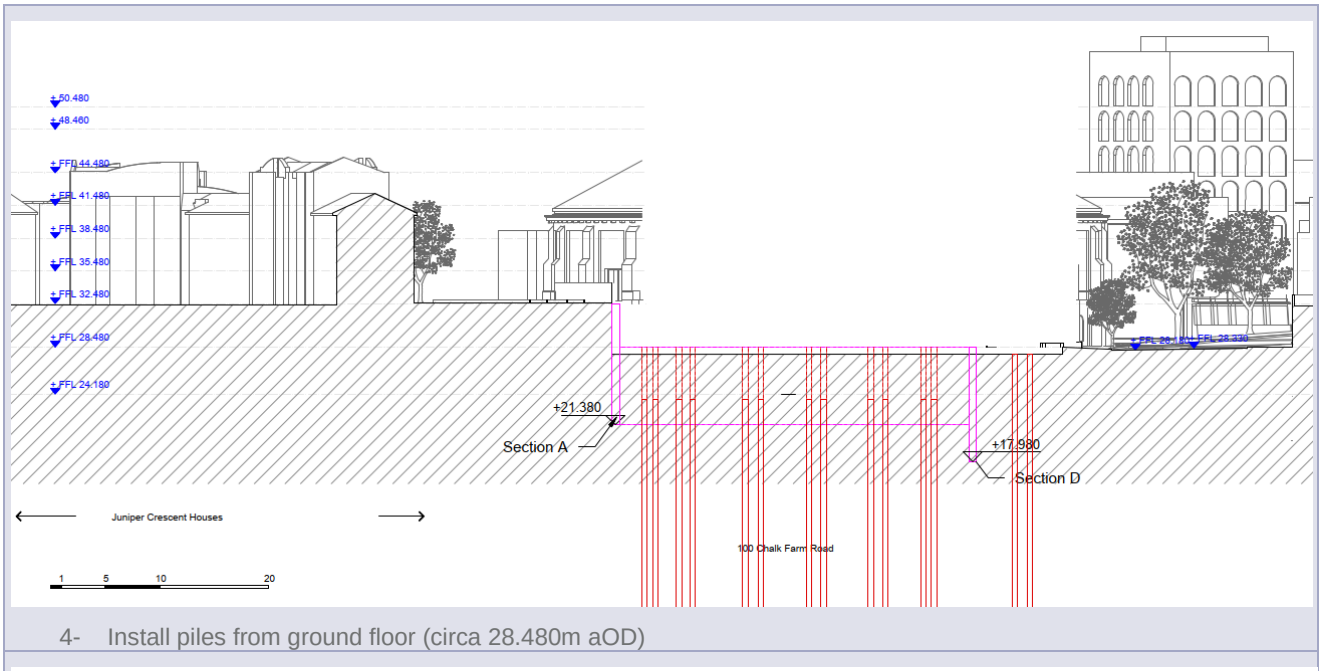
1- Install section C contig RW piles with toe level 21.380m aOD (see Figure 5).



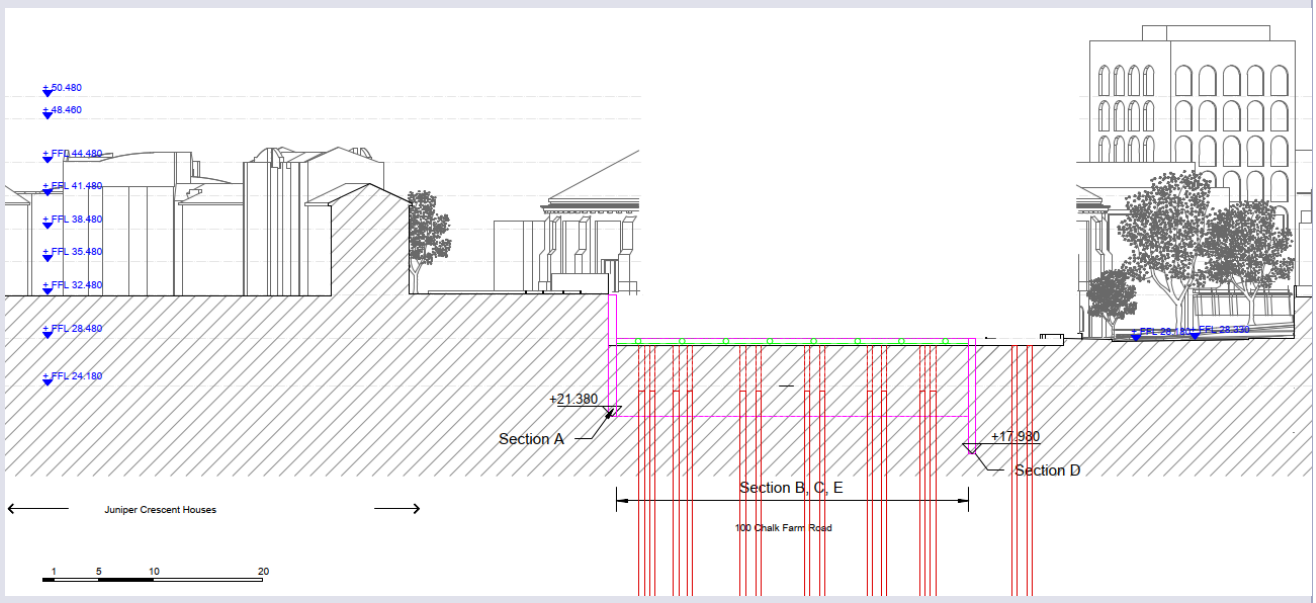
2- Install section D RW piles with toe level 17.980m aOD.



3- Excavate to 24.48m aOD and install RW piles for sections B, C, and E.

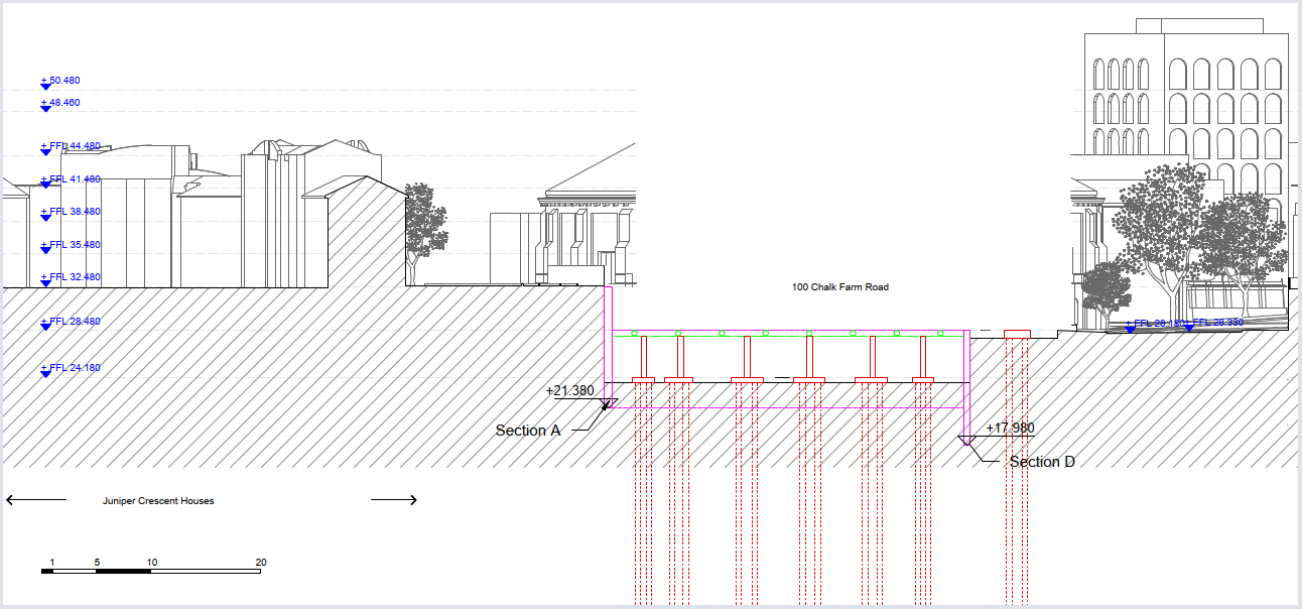


4- Install piles from ground floor (circa 28.480m aOD)

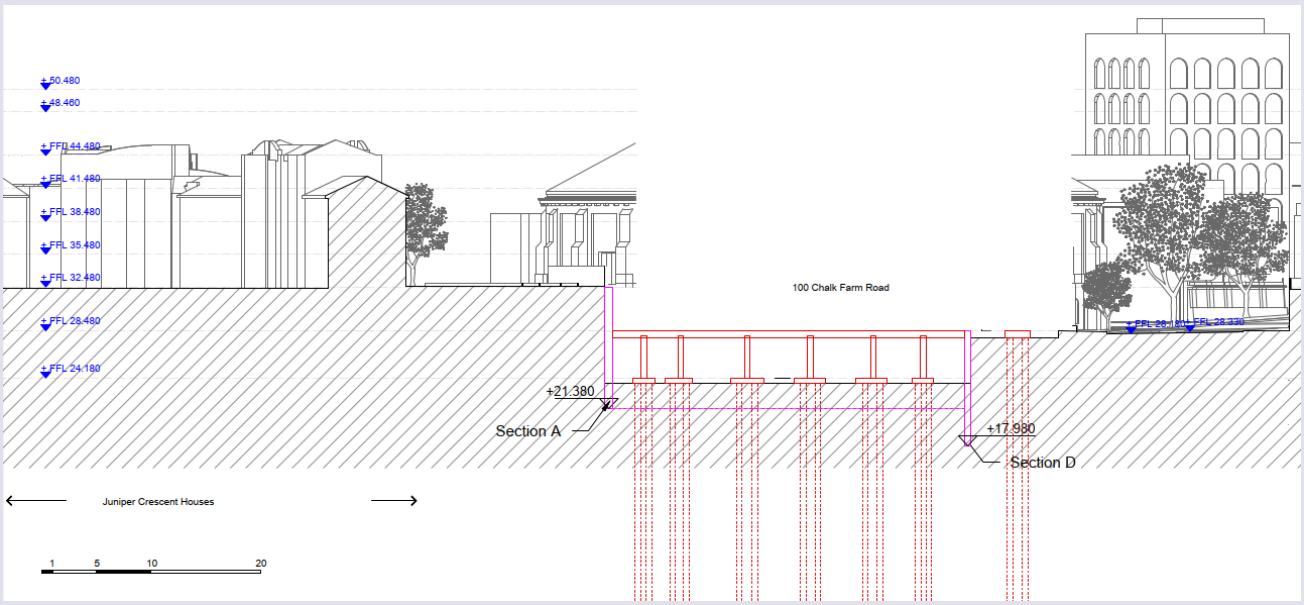


5- Excavate to 28.000m aOD and install temporary propping at (4 m) spacing. Temporary propping to span between section A and section D (~32.5m span) and between Sections BC and E (~37m max span).

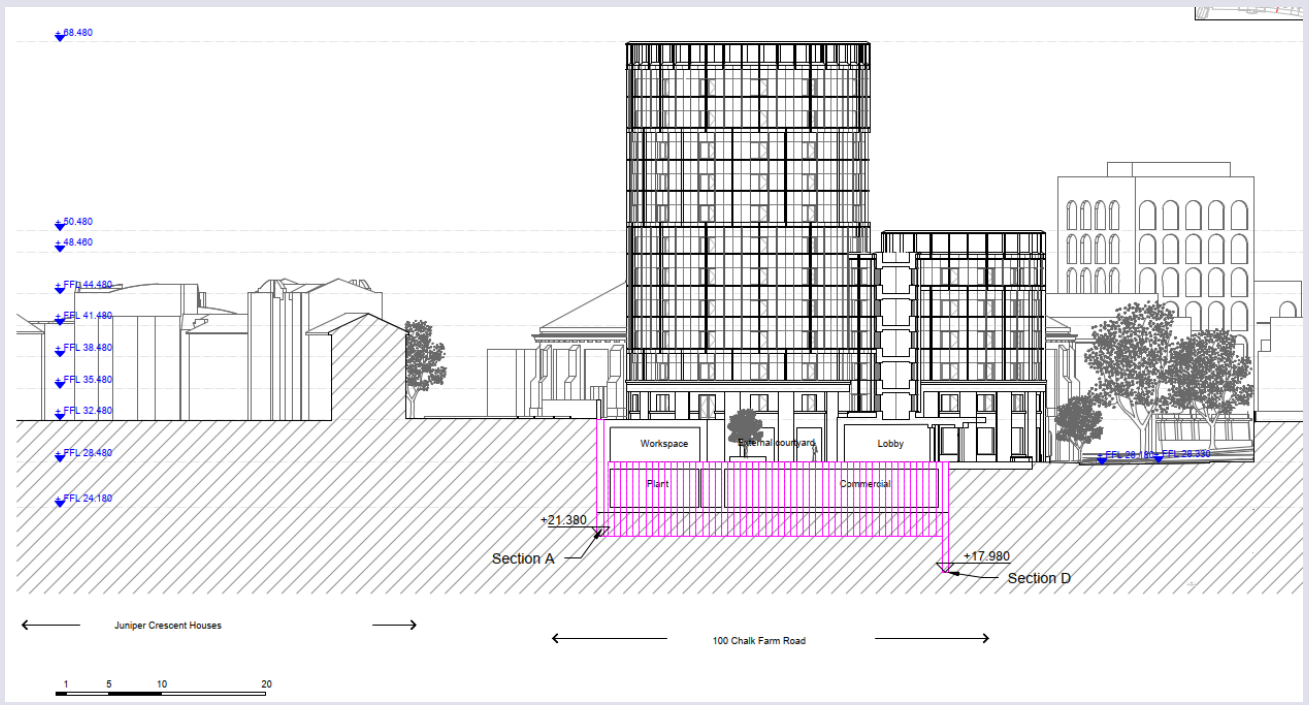
6- Excavate to 23.38m OD and install pile caps.



7- Install basement slab with FFL at 24.180m OD and columns.



8- Install ground floor slab (permanent propping) with FFL at 28.480m OD and remove temporary propping.



9- Construct super structure.

1.7 Structural Monitoring Strategy

A structural monitoring strategy to control impacts of the works to neighbouring structures will comprise of vibration monitoring and displacement monitoring. Baseline readings should be undertaken for at least two weeks before the commencement of foundation and basement works and monitored in real time during the substructure construction. Monitoring should continue for the duration of the superstructure construction and for a period after completion of the works. The monitoring requirements and frequency of monitoring shall be detailed in a Monitoring Specification, but typically monitoring would extend for a period of six months after the completion of construction.

1.8 Burland Scale Impact

A summary of the damage category assessment for building structures affected by the sub-structure works is summarised in Table 1. Camden's Policy A5 for Basements permits a Burland Damage Category of no greater Category 1. It is noted that this Category is not exceeded for the adjacent buildings within the zone of influence of the basement excavation.

Table 3 Burland Category for Neighbouring Structures

Structure #	Burland Category
Roundhouse Theatre (West)	0
Juniper Crescent Houses (South)	1

Other structures besides buildings have also been assessed for estimated ground movements. As shown in It is noted that the impact of construction works on Thames Water infrastructure is the subject of a separate detailed assessment.

It is noted that the impact of construction works on Chalk Farm Road and its associated footpath is minimal, less than 10mm.

Table 4, the railway track experiences some potential ground movement and consequently a monitoring regime shall need to be agreed with Network Rail to safeguard the asset in accordance with Network Rail standard NR/L2/CIV/177.

Table 4 Estimated Maximum Ground Movements for non-building structures.

Structure #	Horizontal Movement (mm)	Vertical Movement (mm)
Network Rail Tracks (South)	21	12
Chalk Farm Road, site adjacent Footpath (North)	6	4
Chalk Farm Road (North)	4	2
NR Boundary Retaining Wall (Southeast)	4	2
Thames Lee Tunnel (Southeast and below site)	Separate assessment	

1.9 Slope Stability Impacts

The BIA has identified no potential slope stability impacts at the site. No mitigation measures are therefore required. However, proposed basement induces some ground movements which requires monitoring of the neighbouring structures.

1.10 Hydrological Impacts

The BIA has identified no potential hydrological impacts at the site. No mitigation measures are therefore required.

1.11 Hydrogeological Impacts

The BIA has identified no potential hydrogeological impacts at the site. No mitigation measures are therefore required.

1.12 Flood Risk

The BIA has identified a low flood risk for the proposed development as presented in the Flood Risk Assessment (Appendix I). No mitigation measures are therefore required.

2 Introduction

The purpose of this assessment is to consider the effects of a proposed basement development at 100 Chalk Farm Road, London, NW1 8EH on the local hydrology, geology and hydrogeology and potential impacts to neighbours and the wider environment. The site location is presented in Figure 1.

The BIA approach follows current planning procedure for basements and lightwells adopted by LB Camden and comprises the following elements (CPG Basements):

- Desk Study
- Screening
- Scoping
- Site Investigation, monitoring, interpretation, and ground movement assessment
- Impact Assessment

2.1 Sources of Information

Description	Date	Author
London Borough of Camden: Camden geological, hydrogeological, and hydrological study (GHHS) Guidance for subterranean development. Issue 01	November 2010	Ove Arup & Partners Ltd
Basement Impact Assessments: Defining the scope of Engineering input, Guidance note 1v0	Accessed (August 2023)	London Borough of Camden
Geotechnical Desktop Study	October 2022	Pell Frischmann
Geoenvironmental Assessment, 100 Chalk Farm Rd, London Ref: GEA-22484-22-33. (factual report included)	August 2022	IDOM
Flood Risk Assessment	April 2023	Pell Frischmann Consultant Ltd.
London Borough of Camden Strategic Flood Risk Assessment (SFRA)	July 2014	URS Infrastructure & Environment UK Ltd.
Topographical survey	October 2022	Cloud 10 Ltd
Tree Survey and Schedule	October 2022	Tim Moya Associates
Sustainable Drainage Report, Ref: 106885-PEF-ZZ-XX-RP-CD-000001	December 2022	Pell Frischmann
Land Contamination Desk Study	October 2022	Pell Frischmann
Historic Borehole Data	January 1972	BGS
NR/L2/CIV/177: Monitoring track over or adjacent to Construction Works	March 2021	Network Rail
Guidance on piling, heavy loads, excavations, tunnelling and dewatering	Accessed on August 2023	Thames Water
G0023: Infrastructure Protection -Special Conditions for Outside Parties Working On or Near the Railway. Issue no: A4	November 2015	TfL London Underground

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Site walkover survey in Appendix A (14th September 2022);
- Current/historical mapping (Historic County Series and Ordnance Survey (OS) map editions, Google & Landmark, and Britain from Above);
- Geological mapping (British Geological Survey);
- Hydrogeological data (Environment Agency);
- Current/historical hydrological data (BGS, The Lost Rivers of London by Nicholas Barton, and Geoenvironmental Assessment by IDOM);

- Flood risk mapping (See FRA, Appendix I);
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) – Basements (March 2018);
- LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);
- LB Camden's Audit Process Terms of Reference.
- Other relevant technical references pertinent to the proposed development, construction methods, etc.

2.2 Existing and Proposed Development

1. The Application site is located outside a wider hillside setting with slope angles greater than 7 degrees.
2. The site is typically sloping from south (Railway Lines) to north (Chalk Farm Road) with the elevation dropping from 32.7m to 28.5mAOD. The site slope angle is on average less than 7 degrees but slopes angles between 7 and 10 degrees exist at the east part of site locally. This is due to the presence of the two storey carpark which elevates the GL locally which is proposed to be demolished and built over.
3. The site is currently vacant with the buildings left with abandoned office furniture inside. There were no obvious signs of any spills or leaks within the surrounding hardstanding. Piles of construction rubble were observed in the overgrown area of soft standing over the eastern part of the site.
4. The site is bound by the A502 Chalk Farm Road to the north, carpark and construction site to the east, railway lines to the south and the Roundhouse theatre to the west. This is shown in Figure 2.
5. The Round House Theatre is a Grade II listed building. There are two additional Grade II listings offsite within 5m of the north-western perimeter boundary for the following: "*Drinking fountain set in the wall next to the Roundhouse*" and for the "*Cattle trough opposite Debouchment of Belmont St*".
6. Neighbouring gardens and trees are present along the North boundary and will be protected in accordance with A5 Basements (Local Plan 2017).
7. Adjacent infrastructure includes Chalk Farm Road to the North, and Railway Line to the South of the site. Asset owners have been consulted and the correspondences are presented in (Appendix G).
8. Underground infrastructure present beneath/close to the site includes Thames-Lee Tunnel to the East, London underground and rail to the North. Asset owners have been consulted and the correspondences are presented in (Appendix G).
9. Existing and Proposed development drawings are presented in Appendix C .
10. The proposed basement development will utilise contig piling with bottom-up construction methods with high level propping.
11. The outline construction programme for the proposed development will be developed at a later stage of the project.

3 Desk Study

In Line with *GHHS Appendix G1*, a desk study was prepared and attached as Appendix A . This document is also submitted as part of the planning approval documents with Pell Frischmann document reference 106885-PEF-XX-XX-RP-GG-600001.

4 Screening

4.1 Hydrology and Hydrogeology

Question	Response	Details
1a. Is the site located directly above an aquifer?	No	The site is located on unproductive strata of the London Clay Formation as evidenced in Appendix A . However, BGS borehole records indicate that the Thanet and Chalk aquifers are likely to underlie the site at a depth of approximately 70m bgl.
1b. Will the proposed basement extend beneath the water table surface?	Yes	Ground investigation from 1972 show water strike in Made Ground above the proposed basement level. Carry forward to scoping.
2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line?	No	The nearest watercourse is the Regents Canal/ Grand Union Canal circa 300m SE.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No	Circa 1800m away from the pond on Hamstead Heath. LBC- Strategic Flood Risk Assessment (2014).
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	The four proposals made by BB UK Landscape Architecture have an urban greening factor between 28% to 41%. All options provided at this stage decreases the current hardstanding (83.5%).
5. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Clause 2.6.1 from the Sustainable Drainage Report (0) by Pell Frischmann proposes a use of attenuation tank. This tank is to be designed to accommodate the water inflow from the SUDs. The unproductive strata will not be able to absorb the surface water.
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 water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	No	There are no local ponds present in the near vicinity of the site.

4.2 Slope Stability

Question	Response	Details
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	No	Recent topographic survey undertaken by Cloud 10 Ltd shows the site to be sloping less than 7 degrees.
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	No	The proposed development doesn't have slopes greater than 7 degrees. DSDHA elevation drawings (31/07/2023).
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	Yes	A retaining wall exist southeast of the site. Carried Forward to scoping
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately 1 in 8)?	No	Figure 16 from GHHS shows that the site is not within a wider hillside with a general slope greater than 7 degrees.
5. Is the London Clay the shallowest strata at the site?	No	The shallowest natural strata are London Clay, but it is overlain with 2.4 to 4.1 m thick made

		ground as shown in the most recent GI undertaken by IDOM (July 2022).
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?	Unknown	Carried forward for scoping. It is likely that trees G7 and G9 from the survey undertaken by Tim Moyo Associates (0) will be removed as it clashes with the proposed development. Detailed assessment to be undertaken once the trees to be removed is confirmed.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?`	Unknown	Carried Forward to scoping.
8. Is the site within 100m of a watercourse or a potential spring line?	No	The nearest watercourse, Regent Canal/ Grand Union Canal, is circa 300m from the site.
9. Is the site within an area of previously worked ground?	Yes	Carried forward to scoping.
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	The London Clay formation is considered an unproductive strata.
11. Is the site within 50m of the Hampstead Heath Ponds?	No	No further assessment required.
12. Is the site within 5m of a highway or pedestrian right of way?	Yes	Carried forward to scoping
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Carried forward to scoping
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Yes	Carried forward to scoping.

4.3 Surface Water and Flooding

Question	Response	Details
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	No	Figure 14 of GHHS show that the catchment area of the ponds chains is approximately 1800m from 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?	Yes	Not carried forward to scoping. The Sustainable Drainage Report (SDR) recommends that the rainwater passes through the appropriate planters/small rain gardens/tree pits and permeable paving (non-infiltration) under the external surfaces before getting collected in the attenuation tank. It also recommends an attenuation tank (265m^3) with a capacity to handle 1 in 100 years plus a 40% climate change allowance of a design storm. The proposed run off rate from the site is 2l/s minimum required flow for system to reach self-cleansing velocity.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The impermeable area remains 0.28 hectares for the proposed development, same as existing site.
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?	Yes	Not carried forward to scoping. The proposed SUDs will is put in place to control flow to desired rate of 2l/s for a self-cleaning velocity.

5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	Yes	Not carried forward to scoping. The proposed SUDs will help improve the quality of the inflows into the neighbouring properties through the filtering properties of the SUDs. See SDR.
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	Figure 15 from the GHHS shows that the site is not in an area at risk of surface water flooding. This is seconded by the FRA which identifies the site to be at a *Low Risk* from surface water flooding.

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 proposed basement level is below the recorded groundwater strikes.
- The proposed development shows new retaining walls with a retained height of 4.638m to 8.93m at the south boundary of the site immediately adjacent to the NR railway track embankment.
- The proposed development will increase the differential foundation depth with the Category II building, Roundhouse, to the West of the site.
- The shrink-swell ability of the London Clay Formation.
- The proposed development will likely result in the removal of some trees and shrubs on the site.
- The site is within 5m of Chalk Farm Road and its pedestrian walkway.
- The site is within the exclusion zone of Thames-Lee Tunnel, Network Rail lines and London underground lines.

4.4.2 The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

- The site includes a slope angle greater than 7 degrees.
  It can be seen from the topographical survey that this is due to the presence of a two-story carpark which elevates the ground level locally. The existing SSL of the car park is 29.565m OD for the underside of the car park base and 32.91m OD for the roof of the car park. However, the proposed development replaces the car park with an affordable housing building which has the South wall of the first floor as a retaining. This removes the existing slope that is greater than 7 degrees.

- The proposed development will result in change in surface water runoff, hard surfaces on site and change in profiles of inflows into neighbouring structures.
  All three proposals made by BBUK landscapes improves these situations for better with implementation of attenuation tanks with SUDs as detailed in SDR (Appendix H).

5 Scoping

5.1 The Proposed Basement Level is Below the Recorded Standing Groundwater Level.

As discussed in Section 1.5. Therefore, further GI and monitoring extending beyond the proposed basement level (lower than 22m OD) is recommended during later part of winter.

If the proposed monitoring does not prove the existence of seasonal perched water table, the impact of the basement below the existing GW level can be removed. However, if the existence of seasonal perched GW level is proved, it is considered that the development proposals can be suitably designed to prevent hydrogeological impacts. The basement walls likely contig piles shall be constructed to be impermeable to remove the risk of flooding.

In order to demonstrate this, a site-specific ground investigation is presented in Section 6, with structural information presented in Section 7. A hydrogeological assessment, considering the design of the proposed basement and the ground and groundwater conditions is presented in full in 0. Conclusions of the impact assessment are provided in Section 8.

5.2 Retaining Walls Next to NR Railway Track.

The survey in 0 shows that the railway runs along the whole length of the site's south boundary. Existing surveys show a retaining wall southeast of the site starting immediately from the edge of the site boundary. However, there is no record of existing retaining walls at this stage immediately at the south boundary of the site, but a new retaining wall has been proposed up to a retained height of 9m within 5m of the railway tracks. See DSDHA cross-section drawings in **0**.

It is considered that the development proposals can be suitably designed to maintain stability. In order to demonstrate this, a site-specific ground investigation is presented in Section 6, with structural information and a ground movement assessment presented in Section 7. Conclusions of the impact assessment are provided in Section 8.

5.3 Differential Foundation Depth

Table 8 shows that the proposed development will increase the differential foundation depth with the neighbouring structure. This can lead to ground movements that can adversely affect the existing structures. Therefore, ground movement assessment has been undertaken in Section 7.3. Furthermore, as the GMA undertaken were based on assumptions, a detailed investigation of neighbouring existing structures' foundation depth and type can help to determine the impact on the structure more accurately.

It is considered that the development proposals and monitoring can be suitably designed to maintain stability and keep the ground movement and vibration to acceptable levels (Burland scale <1, TWUL's asset requirement and NR asset requirements). In order to demonstrate this, a site-specific ground investigation is presented in Section 6, with structural information and a ground movement assessment presented in Section 7. Conclusions of the impact assessment are provided in Section 8.

5.4 Shrink-Swell of London Clay Formation

0 shows that the proposed FFL of the structures lowers the GL outside the structures to approximately 28.18m OD. This exposes the existing deep London Clay. The LC is susceptible to shrink-swell behaviour as it is a high plasticity clay. Foundation depths shall be designed to accommodate seasonal variation in moisture content and the effect of any vegetation. A site-specific ground investigation and arbocultural investigation is presented in Section 6. Conclusions of the impact assessment are provided in Section 8.

6 Site Investigation/ Additional Assessments

6.1 Site Investigation

A factual report on Geoenvironmental assessment is presented in a report by IDOM (Appendix B) and is in accordance with the *GHHS, Appendix G2*. However, the ground investigation reported by IDOM do not go to the full depth of expected excavation. The deepest borehole terminates at 24.893m OD, 1m higher than the proposed FFL of 23.88m OD (it is expected that the proposed excavation will be at least 1m below the proposed FFL). Therefore, new GI will be undertaken at least to a depth of 22m OD.

6.2 Additional Assessments

- Arboricultural report: Appendix E
- Conditions Survey: To be undertaken at a later stage.
- Asset Owner's Correspondence: Appendix G
- Flood Risk Assessment: Appendix I
- Surface Water Drainage Strategy: Appendix H
- Land Contamination Desktop study: Appendix A

7 Construction Methodology/ Engineering Statements

7.1 Geotechnical Design Parameters

The following outline, reasonably conservative geotechnical parameters have been determined as shown in Preliminary geotechnical parameters utilised as part of this report at depths greater than 5m were based on previous borehole logs undertaken by Sirius Drilling (C8321, dated Jul/Aug 2010) within the Camden Goods Yard approximately 150m south-east of the site. Table 5, based on the site investigation data presented (in Section 6 and Appendix B) and relevant technical guidance (as referenced in Section 2.1 of this BIA). Preliminary geotechnical parameters utilised as part of this report at depths greater than 5m were based on previous borehole logs undertaken by Sirius Drilling (C8321, dated Jul/Aug 2010) within the Camden Goods Yard approximately 150m south-east of the site. Table 5 Chalk Farm Geotechnical Parameters.

Anticipated Thickness	Top of the Stratum	Geological Unit	Typical Description	Dry Unit Weight	Saturated Unit Weight	Youngs Modulus (E')	Undrained Shear Strength (cu)	Friction Angle
m	**m AoD**			**kN/m^3**	**kN/m^3**	**MPa**	**kPa**	**°**
0-4.5m	~33	Made Ground	Sandy gravelly clay, sandy gravel, or clayey gravelly sand. Gravel comprised flint, chalk, concrete, brick, slate, and coal.	-	-	-	-	-
4.5-20	30.4	London Clay	Greyish brown/bluish grey slightly gravelly clay. The gravel was described as flint.	19	20	5 - 20	45 – 200	
>20-35	18.5	London Clay		19	20	20 - 45	200-350	

7.2 Temporary and Permanent Works Proposals

The works proposals include:

- Demolition of all Existing Structures, i.e. office block, dressing room, rehearsal room and carpark extension. (Existing drawing called General Layout in Appendix C)
- Piling and excavation of proposed basement. The retaining walls of the basement will be bottom-up construction with contig pilling of high stiffness as shown in 106885-PEL-XX-098-SK-C-000002. (Appendix C)
- Foundations constructions (106885-PEF-ZZ-ZZ-SK-S-000801 and 106885-PEF-ZZ-ZZ-SK-S-000802.
- Permanent superstructure DSDHA drawings (Appendix C).
- Drainage strategy/SUDS proposals (Appendix H)

7.3 Ground Movement and Damage Impact Assessment

The assessment of building damage potential is based on the empirical method from CIRIA C760, which determines the estimated horizontal and vertical movements induced to the neighbouring structures as the result of the basement construction. Details of the assessment undertaken for the proposed large basement construction are presented in Table 10. Based on these ground movements and the associated Deflection Ratio and Horizontal Strains relevant to the structures under assessment, then a prediction of the possible Building Damage Category can be made in accordance with the damage category assessment of Burland et al, 1977, Boscardin and Cording, 1989, and Burland, 2001 which is summarised below in Table 6.

Table 6 Classification of visible damage to walls (after Burland et al, 1977, Boscardin and Cording, 1989, and Burland, 2001)

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain, εlim (%)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible	<0.1	0.0 to 0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection	<1	0.05 to 0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	<5	0.075 to 0.15
3 Moderate	The cracks require some opening up and can be patched by a mason . Recurrent cracks can be masked by suitable lining . Repointing of external brickwork and possibly a small amount of brickwork to be replaced Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5 to 15 or a number of cracks >3	0.15 to 0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Services pipes disrupted.	15 to 25, but also depends on number. of cracks	>0.3
5 Very severe	This requires a major repair, involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	Usually >25, but depends on numbers of cracks	

A Ground Movement Assessment (GMA) has been carried out in accordance with CIRIA C760 and takes into account the construction methodology and site-specific ground conditions.

The zone of influence (ZoI) is based on the depth of basement or excavation and is defined as per CIRIA C760. See Figure 6 and Table 7 to see the structures within the different ZoI. See Appendix C for full sketch.

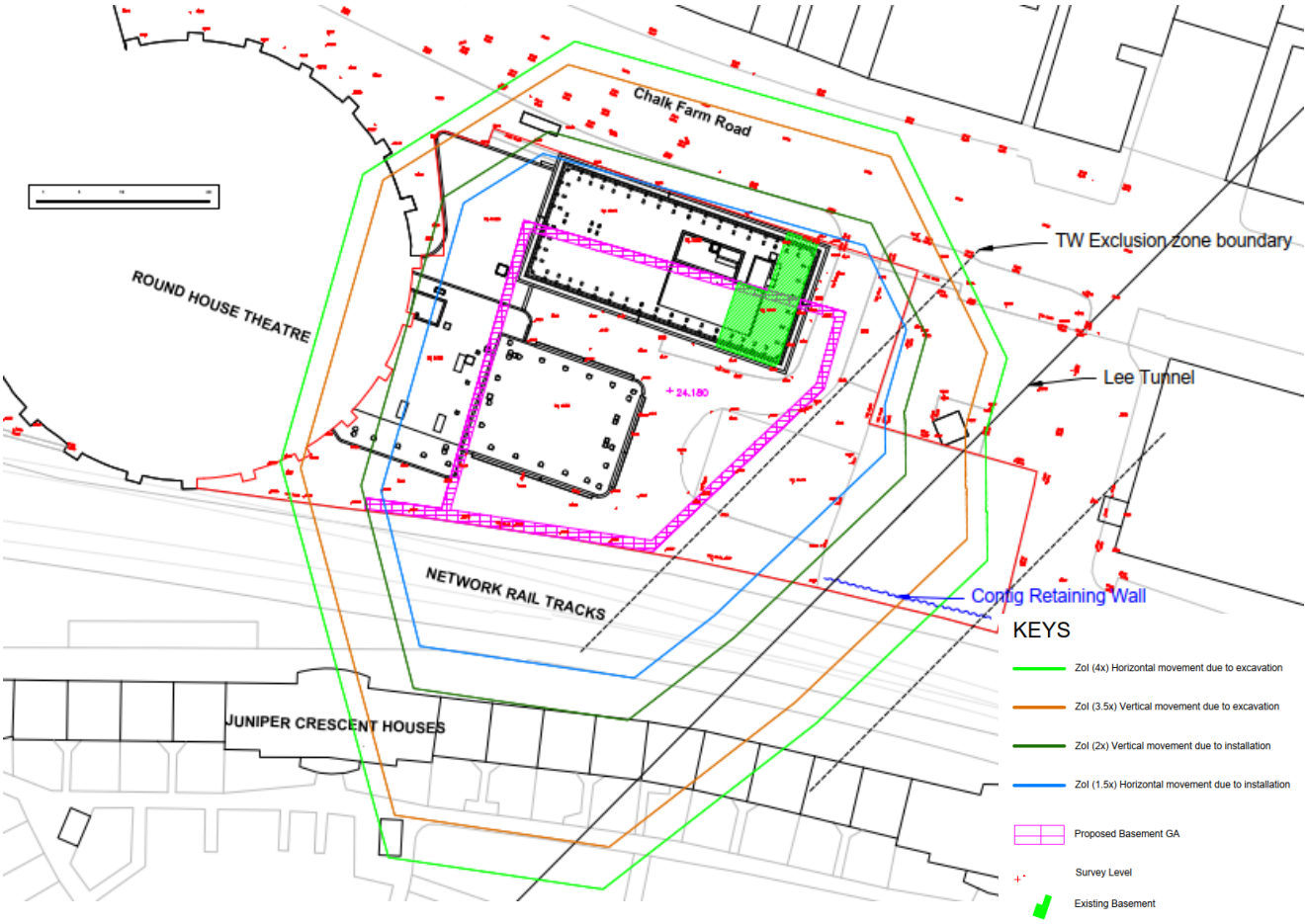


Figure 6 Structures within Zone of Influence

Table 7 Structures within zone of influence

Structure	Direction in relation to site	Structure Type	Additional Info	Assessed in this BIA (Yes or No)
Round House Theatre	West	Building	Grade II Listed structure and partially within ZoI	Yes.
Cattle Trough	North West	Building	N/A	No, outside ZoI.
Chalk Farm Road	North	Road	N/A	Yes.
London Underground	North	Underground track	TfL owned	Yes, but to be assessed separately.
Thames- Lee Tunnels	South East	Underground channel	TWUL owned	Yes, but to be assessed separately.
Contig Retaining wall	South East	Retaining wall	2.4m retained	Yes.
Network Rail Tracks	South	Railway Tracks	NR owned	Yes, but monitoring plan to be established separately with NR.
Juniper Crescent Houses	South	Buildings	South of NR tracks	Yes.

The following reasonably conservative assumptions have been made within the empirical GMA:

- Contig piling system with high wall stiffness.
- The piles are fully embedded in stiff clay.

7.3.4. The ground movements resulting from the works are movements due to (i) installation of the retaining wall and (ii) excavation are presented in Table 8.

7.3.5. The following structures were assessed, having been identified as potentially within the zone of influence. They include the Roundhouse Theatre to the west, Chalk Farm Road, and Footpath to the north, proposed South Railway track to the south, and the Southeast Railway retaining walls. Foundation depths are as shown in Table 8. The foundation depth has been assumed conservatively based on topographic survey undertaken by Cloud10 Ltd (Appendix J) using the ground levels adjacent to the structures.

7.3.6. In accordance with the Burland Scale, the damage impacts are assessed as presented in Table 3.

7.3.7. No mitigation is proposed to reduce ground movements, but damage impacts shall be monitored and appropriate intervention to be in place.

7.3.8. N/A

Table 8 Neighbouring Structures

Structure #	Minimum Distance from Basement (m)	Foundation Assumed	Assumed Neighbouring Structure Foundation (m OD)	Difference in Vertical height due to excavation (-1.5m below FFL)	Notes
Roundhouse Theatre (West)	9.1	Shallow Foundation	28.0	4.82	Foundation level assumed to be 1m below the adjacent GL at northeast. Ground movement assessed using Empirical Method from CIRIA C760
Juniper Crescent houses (South)	18.7	Shallow Foundation	33.0	9.82	Foundation level assumed to same as GL at South boundary. Empirical Method from CIRIA C760
Network Rail Tracks (South)	2.0	Earthworks	33.0	9.82	Foundation level assumed to same as GL at South boundary. Empirical Method from CIRIA C760
Chalk Farm Road, site adjacent Footpath (North)	6.8	Earthworks	28.5	5.32	Empirical Method from CIRIA C760
Chalk Farm Road (North)	10.7	Earthworks	28.3	5.32	Empirical Method from CIRIA C760
NR Boundary Retaining Wall (Southeast)	15.9	Contig Pile	30.0	6.82	Level in front of the retaining wall assumed to be same as the GL at east of the retaining wall. The wall wasn't accessible at the time of topographical survey. Empirical Method from CIRIA C760
Thames Lee Tunnel (Southeast	16	Concrete	N/A	N/A	In TWL appointed exclusion zone, Pdisp assessment recommend

and below site)					

Table 9 Estimated Ground movements due to installation of RW.

	Pile Installation		Excavation Infront of RW	
Structure #	**Expected Horizontal Movement (mm)**	**Expected Vertical Movement (mm)**	**Expected Horizontal Movement (mm)**	**Expected Vertical Movement (mm)**
Roundhouse Theatre (West)	0	0	4	2
Juniper Crescent houses (South)	0	0	8	4
Chalk Farm Road houses (North)	Outside of zone of influence of the basement construction.			
Network Rail Tracks (South)	7	4	14	8
Chalk Farm Road Footpath, adjacent to site (North)	1	1	5	3
Chalk Farm Road (North)	0	0	4	2
*NR Boundary Retaining Wall (Southeast)	0	0	4	2
*Thames Lee Tunnel (Southeast and below site)	Pdisp assessment recommended to assess the expected movements due to demolition and basement construction.			

Table 10 Burland Scale.

Structure #	**L (m)**	**H (m)**	**Maximum Deformations (mm)**		**Minimum Deformations**		**Δv**	**Δh**	**Δv/L (%)**	**εh(%)**	**Burland Category**
			Horizontal	**Vertical**	**Horizontal**	**Vertical**					
Roundhouse Theatre (West)	14	13.1	3.82	2.22	0.00	0.00	2.22	3.82	0.02	0.03	0
Juniper Crescent houses (South)	7.1	8.1	7.72	4.48	5.06	2.45	2.03	2.66	0.03	0.04	1

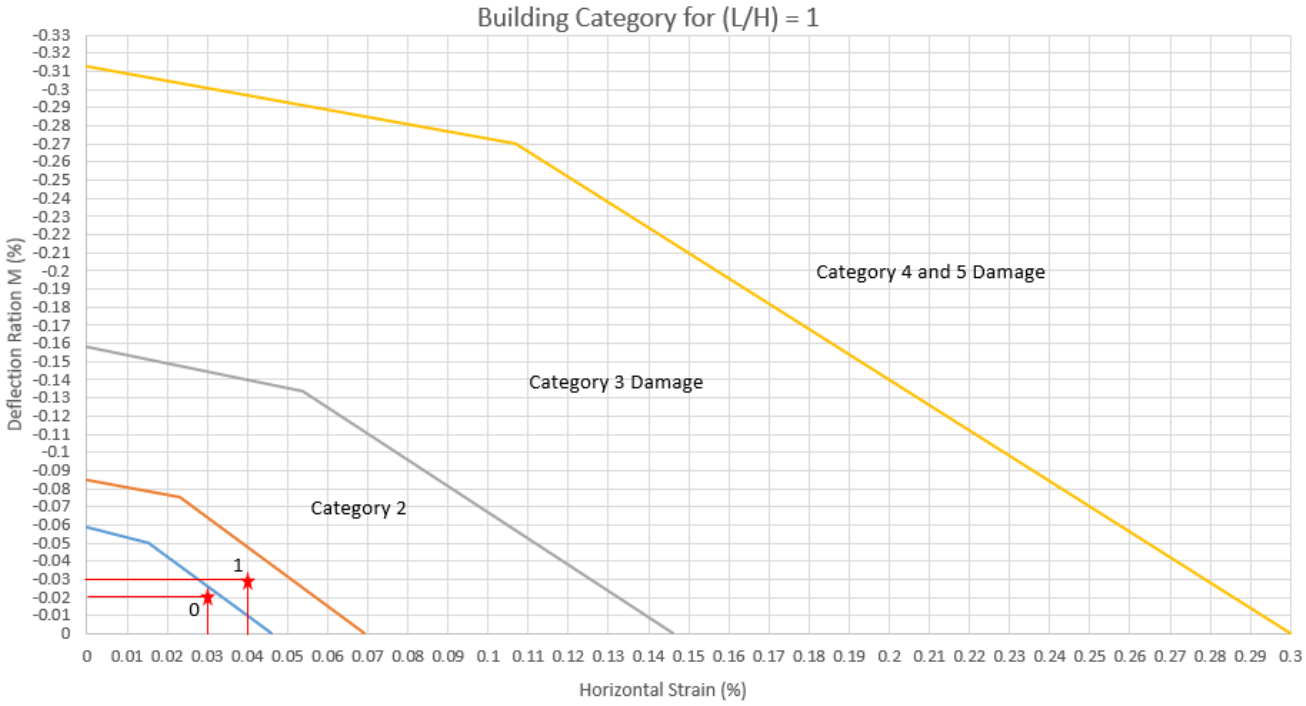


Figure 7 Building damage category for L/H ratio of 1.

7.4 Control of Construction Works

7.4.1. The construction works will be closely controlled in accordance with relevant technical guidelines for underpinning piling to describe control of construction works in relation to proposed basement.

7.4.2. A structural monitoring strategy will be developed to control construction works and maintain movements/damage impacts within the predicted limits 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.
- Contingency actions

7.4.3 Waterproofing

Details of waterproofing of below ground substructure has not been confirmed. However, the current preferred solution consists of the provision of a membrane in conjunction with a waterproof concrete lining wall to the contiguous piled wall. The design of the substructure walls and slabs shall be to achieve a Grade 3 (BS8102) basement environment typically suitable for habitable spaces.

8 Basement Impact Assessment

8.1 Conceptual Site Model (CSM)

- The proven ground conditions are 2.4 to 4.1 m of MG overlying London Clay.
- The groundwater level was encountered to a depth of 28.2m OD in winter of 1972 but no strike was recorded to a depth of 24.9m OD in summer of 2022. Therefore, the GWL is considered to be perched.
- The site is slopes south to north falling from 32.7m to 28.5m OD over an approximate distance of 38m.
- The existing buildings are founded at various levels as shown in Table 11. For dimension details see archive drawings (Appendix C).

Table 11 Founding level of existing structures.

Existing structures	Foundation level (m OD)	levels taken from
Car Park	29.56	U/S slab
Primary Building	29.77	U/S wall footing
Secondary Building	28.5	Pile cap soffit
NW Basement	27.432	U/S slab

- The proposed development will be founded at approximately 23.180m OD (a meter below FFL). See drawing 356_P40.003 in Appendix C .
- The depths of neighbouring foundations/basements are unknown. Therefore, the foundation is conservatively assumed to be 1m below the existing lowest GL adjacent to the structure. This shall be confirmed at a later stage when a condition survey is undertaken.
- The distance to the Chalk Farm Road's footpath is 0m from the site boundary (circa 6.8m from the proposed basement).
- Adjacent Thames-Lee Tunnel is approximately 33.6m below existing ground level and ~16m horizontally away from the proposed basement.
- Potential impacts are that the neighbouring structures (buildings) are not induced to Burland's scale higher than 1 which is in line with paragraph 4.33 of Camden Planning Guidance: Basements.
- No proposed mitigation is required but a further assessments shall be undertaken at the design stage, as required by design construction control methods, and monitoring regime.
- Residual impacts shall be within acceptable limits and verified with monitoring.

8.2 Land Stability/Slope Stability

8.2.1. The site investigation has identified a suitable founding stratum of London Clay Formation.

8.2.2. The risk of movement and damage to this development due to shrink and swell of the London Clay is moderate considering the proposed GL to the north exposes the London Clay Formation layer.

8.2.3. A Ground Movement Assessment has concluded that ground movements caused by the excavation and construction of the proposed development will be as shown in Section 7.3. The Damage Impact to surrounding structures within the zone of influence has been assessed to be no higher than Burland Scale of 1.

8.2.4. The BIA has concluded that the Network Rail Tracks and existing contig wall (southeast boundary) will be affected due to installation and excavation of the proposed basement. Therefore, a separate assessment in line with NR/L2/CIV/177 shall be undertaken.

8.3 Hydrogeology and Groundwater Flooding

8.3.1. The BIA has concluded there is a low risk of groundwater flooding. However, the basement walls shall be designed and constructed to be impermeable to remove the risk from seasonal perched ground water.

8.3.2. The BIA has concluded there are no impacts to the wider hydrogeological environment.

8.4 Hydrology, Surface Water Flooding and Sewer Flooding

8.4.1. The BIA has concluded there is a low risk of surface water/sewer flooding.

8.4.2. The BIA has concluded there are no impacts to the wider hydrological environment.

Appendix A Land Contamination Desk Study

SUBMITTED SEPARATELY

Appendix B Site Investigation Data (IDOM)

SUBMITTED SEPARATELY

Appendix C Existing and Proposed Development Drawings

SUBMITTED SEPARATELY

Appendix D Structural Engineer's Statement and Calculations

SUBMITTED SEPARATELY

Appendix E Arboricultural Report and Landscaping Proposals

SUBMITTED SEPARATELY

Appendix F Utility and Infrastructure Consultations

SUBMITTED SEPARATELY

Appendix G Correspondence with Asset Managers

SUBMITTED SEPARATELY

Appendix H Sustainable Drainage Report

SUBMITTED SEPARATELY

Appendix I Flood Risk Assessment

SUBMITTED SEPARATELY

Appendix J Cloud 10 Ltd Topographical Survey

SUBMITTED SEPARATELY