CampbellReith
consulting engineers

251 Goldhurst Terrace, London, NW6 3EP

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-47

Revision: F1

May 2017

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Document History and Status

Revision	Date	Purpose/Status	File Ref	Author	Check	Review
D1	February 2017	Comment	GHgk12466-47-210217-251 Goldhurst Terrace-D1.doc	GH	GK	GK
F1	May 2017	For planning	GHgk12466-47-260517-251 Goldhurst Terrace-F1.doc	GH	AJM	AJM

Document Details

Last saved	26/05/2017 10:33
Path	GHgk12466-47-260517-251 Goldhurst Terrace-F1.doc
Author	G Harper, BEng (Hons) PrEng
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Project Number	12466-47
Project Name	251 Goldhurst Terrace, London, NW6 3EP
Planning Reference	2016/6697/P

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Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 251 Goldhurst Terrace, London, NW6 3EP (planning reference 2016/6697/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The Basement Impact Assessment (BIA) has been carried out by ADS Consultancy, and the authors involved in its production possess the relevant qualifications.

1.5. It is proposed to form the basement structure by mass concrete underpins to the existing perimeter walls with a new reinforced concrete ground bearing slab. The underpins are proposed to be constructed in 1.0m sections in a typical staggered underpinning sequence.

1.6. Outline structural calculations for the basement retaining wall, basement slab and foundations are presented that demonstrate the viability of the proposal, including soil properties and assumed water levels. Temporary propping details are presented in the revised BIA. A construction sequence with an indicative bay sequence is presented in Appendix A.

1.7. The BIA has confirmed that the proposed basement will be founded in London Clay. An indicative assessment of the likely heave pressures is presented, with appropriate mitigation measures proposed.

1.8. A quantitative Ground Movement Assessment (GMA) was presented. It was confirmed that damage does not exceed Burland Category 1, with appropriate mitigation measures proposed in the revised BIA.

1.9. A movement monitoring programme is detailed in the revised BIA and should be agreed as part of the Party Wall procedure.

1.10. Groundwater is likely to be below the proposed depth of the basement based on groundwater monitoring conducted.

1.11. A Flood Risk Assessment has been provided with mitigation measures proposed to address the potential effects of surface flooding.

1.12. It is accepted that the site is not located within the catchment area of the Hampstead Heath pond chain.

1.13. It is accepted that there are no hydrogeological or slope stability concerns caused by the development to the surrounding area.

1.14. Queries and requests for further information are discussed in Section 4 and Appendix 2. Considering the revised submissions, the BIA is considered to meet the criteria of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) on 19 January 2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 251 Goldhurst Terrace, London, NW6 3EP.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

d) evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as "Basement excavation with front lightwell and sunken terrace with steps for access to the rear; various alterations to the rear elevation including the increase in height of the existing ground floor projection with terrace at the first floor level, privacy screen and timber balustrade; rear dormer, all to dwellinghouse (Class C3)".

2.6. The Audit Instruction also confirmed that the basement proposal does not involve a listed building nor does the site neighbour any listed buildings.

2.7. CampbellReith accessed LBC's Planning Portal on 30 January 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) dated January 2017 by ADS Consultancy,
- Design and Access Statement dated December 2016 by GML Architects,
- Planning Statement dated December 2016 by Martin Robeson Planning Practice (MRPP),
- Construction Traffic Management Plan (CTMP) not dated by MRPP,
- Ground Investigation Report dated October 2016 by Ground & Water Geotechnical and Environmental Consultants,
- Planning application drawings by GML Architects consisting of:

  Existing Plans (dated December 2016)

  Proposed Plans (dated December 2016)

2.8. Following the issue of CampbellReith's D1 audit report in February 2017, additional information was submitted in order to respond to the comments and concerns identified. The following information has been provided for audit purposes:

- Basement Impact Assessment (BIA) Revision 6 dated January 2017 by ADS Consultancy,
- Ground Investigation Report dated April 2017 by Ground & Water Geotechnical and Environmental Consultants,
- Flood Risk Assessment (FRA) dated April 2017 by Nimbus Engineering Consultants.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	Accepted.
Is data required by Cl.233 of the GSD presented?	Yes	Revised BIA and correspondence.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	Revised BIA and FRA.
Are suitable plan/maps included?	Yes	BIA Drawing Appendix.
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	BIA Drawing Appendix.
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 5.3. Response to Question 1 should be "no", although this does not affect the outcome.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 5.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA Section 5.1.
Is a conceptual model presented?	Yes	Ground Investigation Report, although presence of groundwater was not established.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	Items identified during the Screening exercise are addressed in the revised BIA.

Item	**Yes/No/NA**	**Comment**
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	As above.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	As above.
Is factual ground investigation data provided?	Yes	Ground Investigation Report (GIR).
Is monitoring data presented?	Yes	Revised GIR.
Is the ground investigation informed by a desk study?	Yes	BIA Section 5.0.
Has a site walkover been undertaken?	Yes	Confirmed via email correspondence.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA Section 5.3 and 6.0.
Is a geotechnical interpretation presented?	Yes	Revised GIR.
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	Site investigation included within BIA. Flood Risk Assessment completed.
Are the baseline conditions described, based on the GSD?	Yes	Revised BIA and GIR.
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	BIA Sections 5.4 and 5.5.
Are estimates of ground movement and structural impact presented?	Yes	BIA Sections 5.4 and 5.5.

Item	Yes/No/NA	Comment
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	BIA Section 5.6.
Has the need for monitoring during construction been considered?	Yes	BIA Section 5.7.
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Flood Risk Assessment.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	Revised BIA and FRA.
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	BIA Section 5.5.
Are non-technical summaries provided?	No	Although the BIA is easy to follow.

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) has been carried out by ADS Consultancy. The authors were identified via correspondence and it is accepted that they have suitable qualifications in accordance with the requirements of CPG4.

4.2. The existing property is located at 251 Goldhurst Terrace and comprises a three-storey semi-detached residential property including an existing basement beneath the entire building footprint to a depth of 1.2m bgl.

4.3. The scheme consists of the demolition of the existing lower ground floor to the existing basement/cellar level and constructing a new basement to a depth of approximately 3.5m bgl with lightwells at the front and rear of the property. Dimensioned sketches are presented in the BIA that provide clarity on the proposed development.

4.4. The BIA and Ground Investigation Report has identified that on site ground conditions comprise a variable depth of Made Ground (0.60m to 1.12m thick) underlain by Head Deposits (0.30 to 1.20m thick) and London Clay from 1.60 to 1.80m bgl. The proposed basement will therefore be founded in London Clay.

4.5. It is proposed to form the basement structure by mass concrete underpins to the existing perimeter walls with a new reinforced concrete ground bearing slab. The underpins are proposed to be constructed in 1.0m sections in a typical staggered underpinning sequence. This is an acceptable methodology using established techniques.

4.6. Outline structural designs are presented in the revised BIA, including the basement retaining wall, basement slab and foundations, including soil properties and assumed water levels used in the analysis.

4.7. The construction methodology is discussed in the revised BIA with accompanying sketches included in Appendix A. Temporary propping and associated bracing is discussed in the BIA with the construction sequence and indicative bay sequence presented.

4.8. The basement will be founded in London Clay with an indicative assessment of the likely heave forces presented in Appendix B. Mitigation measures have been incorporated into the floor slab design.

4.9. A Ground Movement Assessment (GMA) was performed in the revised BIA. The methodology of the GMA as presented is not accepted as the movements due to the basement wall installation have not been determined correctly. However, an in-house calculation by CampbellReith has confirmed damage to be no worse than Category 1 for 253 Goldhurst Terrace. The GMA and damage assessment is therefore assessed to be satisfactory.

Mitigation measures are proposed in the revised BIA based on the outcome of the assessment carried out.

4.10. A movement monitoring programme is detailed in the revised BIA that includes the adjoining structures. The monitoring strategy should be agreed as part of the Party Wall procedure and should include trigger levels linked to the GMA, and condition surveys as necessary.

4.11. Although 'yes' responses identified during the screening exercise were not explicitly carried forward to scoping stage, all matters identified were addressed in the revised BIA and supporting documents.

4.12. Although the basement footprint will extend marginally into the rear garden, there will not be an increase in the proportion of hard surfaced areas due to existing hardstanding in this area. The lightwells at the front and rear of the property will cause an increase the proportion of hard surfaces. Suitable mitigation measures to offset the impacts of the development, together with drainage proposals, are presented in the BIA, and consider the findings as presented in the Flood Risk Assessment.

4.13. Groundwater was not encountered during the ground investigation, with groundwater monitoring confirming that it was not encountered in the top 5m bgl. Groundwater is therefore likely to be below the proposed depth of the basement. Mitigation measures, however, should be proposed in the unlikely event of perched water being encountered during construction.

4.14. No known tunnels or railway lines are located within the vicinity of the site. The presence of utility infrastructure within the development's zone of influence was confirmed and has been incorporated in the proposed scheme as applicable.

4.15. It is acknowledged that no trees will be removed due to the proposed development.

4.16. The BIA has shown that the surrounding slopes to the development are stable.

4.17. It is accepted that the site is not located within the catchment area of the Hampstead Heath pond chain.

5.0 CONCLUSIONS

5.1. The Basement Impact Assessment (BIA) has been carried out by ADS Consultancy, and the authors involved in its production possess the relevant qualifications.

5.2. The basement structure proposed is an acceptable methodology using established techniques with outline structural designs presented in the revised BIA. These include the basement retaining wall, basement slab and foundations, including soil properties and assumed water levels.

5.3. Temporary propping and associated bracing is discussed in the BIA with the construction sequence and indicative bay sequence presented.

5.4. It is accepted that the basement will be founded in London Clay. An indicative assessment of the likely heave pressures is presented, with appropriate mitigation measures proposed.

5.5. A quantitative Ground Movement Assessment (GMA) was presented. It was confirmed that damage does not exceed Burland Category 1, with appropriate mitigation measures proposed in the revised BIA.

5.6. A movement monitoring programme is detailed in the revised BIA and should be agreed as part of the Party Wall procedure.

5.7. Groundwater is likely to be below the proposed depth of the basement based on groundwater monitoring conducted.

5.8. A Flood Risk Assessment has been provided with mitigation measures proposed to address the potential effects of surface flooding.

5.9. It is accepted that the site is not located within the catchment area of the Hampstead Heath pond chain.

5.10. It is accepted that there are no hydrogeological or slope stability concerns caused by the development to the surrounding area.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
Katerina Gould	188 Goldhurst Terrace, NW6 3HN	12/02/2017	Structural stability issues.	See Section 4.7 to 4.10, 4.13 and 4.16.

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	BIA format	BIA Author qualifications.	Closed – BIA Author qualifications provided and accepted.	May 2017
2	BIA format	Works programme not provided. Outline duration to be provided.	Closed – Provided in BIA Rev 6 Section 4.	May 2017
3	Hydrology	Responses to Surface flow and flooding screening to be reviewed.	Closed – Provided in BIA Rev 6 Sections 5.1 to 5.3.	May 2017
4	Hydrology	Mitigation measures / SUDS assessment as per CPG4 3.51.	Closed – Provided in FRA (C1799) Section 3.4 and 4.0	April 2017
5	Hydrology	Flood Risk Assessment required.	Closed – Flood Risk Assessment document C-1799 prepared by Nimbus Engineering Consultants.	April 2017
6	Hydrogeology	Subterranean (groundwater) flow screening flowchart to be completed.	Closed – Addressed in BIA Rev 6.	May 2017
7	Hydrogeology	Groundwater monitoring to be conducted and mitigation measures to be proposed as required.	Closed – Provided in Ground & Water Factual Ground Investigation Report Section 4.4.	April 2017
8	Stability	Outline structural calculations for the basement retaining wall, basement slab and foundations are required to demonstrate the viability of the proposals, including soil properties and assumed water levels. Geotechnical parameters as per GSD	Closed – Provided in BIA Rev 6 Appendix B.	May 2017

		Appendix G3 to be provided.		
9	Stability	Construction sequence to be described in the text with sketches illustrating each stage and temporary works propping scheme to be provided. Dimensioned drawings required to provide clarity on the proposed development.	Closed – Provided in BIA Rev 6 Section 6 and Appendix A.	May 2017
10	Stability	Ground Movement Assessment and Structural Impact Assessment to be performed. Appropriate mitigation measures to be considered as required.	Closed – Provided in BIA Rev 6 Section 5.3. Although the methodology of the GMA as presented is not accepted, an in-house calculation has confirmed damage to be no worse than Category 1 for 253 Goldhurst Terrace.	May 2017
11	Stability	Condition survey and monitoring programme to be commissioned for both the existing and neighbouring properties.	Closed – Provided in BIA Rev 6 Section 5.5 and Structural Engineer's drawing *2016104/09 Movement Monitoring*.	May 2017
12	Stability	Assessment required, and mitigation of, likely heave pressures. This would inform the floor slab design.	Closed – Assessment provided in BIA Rev 6 Appendix B.	May 2017
13	Hydrology, hydrogeology and stability	'Yes' responses identified in the screening stages to be carried forward to scoping stage and explicitly presented in BIA.	Closed – Addressed in BIA Rev 6.	May 2017

Appendix 3: Supplementary Supporting Documents

Basement Impact Assessment Revision 6 by ADS Consultancy dated January 2017

January 2017

ads
consultancy

251 GOLDHURST TERRACE, LONDON, NW6 3EP

STRUCTURAL ENGINEER'S REPORT: BASEMENT IMPACT ASSESSMENT

The Institution of Structural Engineers

16198/R_006/AZ

1.0 Introduction

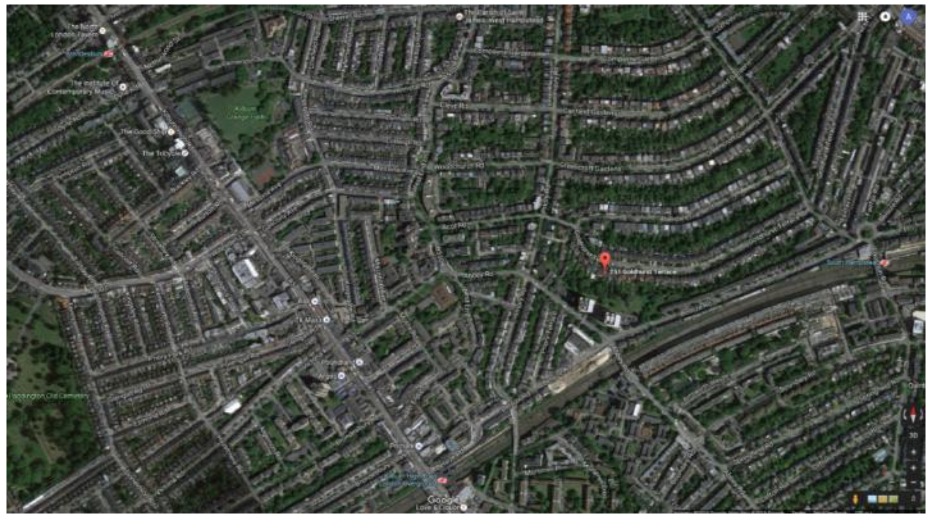
We, *ads consultancy*, were requested by *GML Architects* to compile a structural report consisting of a *Basement Impact Assessment (BIA)* for the proposed basement at 251 Goldhurst Terrace to supplement the planning application for the proposed development at the aforementioned site. To carry out our report, we have referred to ARUP's report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010"* and *"Camden Planning Guidance CPG4: Basements & Lightwells, July 2015"*. We are Chartered Engineers (Engineering Council UK) and Members of both the Institution of Structural Engineers and the Institution of Engineering and Technology. We have considerable experience in the design and construction of new build and retro-fitted basements in London and have worked on several prestigious basement developments with the UK's top basement Contractors as both Design and Build Engineers and Project Engineers for the Client. This report has also been reviewed by Andrew Long of *Nimbus Engineering Consultants ltd,* who is a Chartered Member of the Chartered Institute of Water and Environmental Management. Nimbus Engineering Consultants' comments and input are included.

2.0 Site Description

The site is situated on 251 Goldhurst Terrace, and comprises a three storey semi-detached residential property. The northern boundary is formed by Goldhurst Terrace, the southern boundary is formed by gardens, the eastern boundary is formed by a terraced residential property. The site is circa 500m East of South Hampstead Overground Station and circa 800m West of Kilburn High Road Overground Station.

3.0 Scheme Proposal

The scheme consists of the demolition of the existing lower ground floor slab to the existing basement/cellar level and constructing a new basement at a slightly lower level with light wells at the front and rear of the property. The scheme also proposes the part-refurbishment of the existing first floor and the construction of a new loft conversion on the third floor. The new lower ground floor excavated void will be formed via mass concrete underpins to the existing perimeter walls with a new reinforced concrete bearing slab. The underpins will be constructed in circa 1.0m sections and in a typical staggered underpinning sequence similar to that of typical underpinning. This would negate the need for major temporary works to the existing building and the existing solid masonry party walls. The "underpinned" retaining walls below the party walls will be detailed in such a way as to not obstruct the adjoining neighbouring buildings from creating basements below their properties in the future should that be required (refer to the attached drawings and sketches in the Drawing Appendix at the rear of this report).



Aerial View 251 Goldhurst Terrace (image taken from Google Maps)

4.0 Works Programme

- The total anticipated construction length will be circa 9-12 months.
- The total duration of the basement works will be circa 5-6 months.

With the works proposed commence

5.0 Site Investigation

A detailed site investigation had been carried out on site in October 2016 to determine the structural characteristics of the soil along with determining whether any contaminants are present in the soil.

From consultation with the British Geological Survey (BGS) maps and the 2016 site investigation report, it appears that the site is located over the London clay formation. (http://mapapps.bgs.ac.uk/geologyofbritain/home.html)

In accordance with the ARUP report *"Camden Geological, hydrogeological and hydrological study: Guidance for subterranean development", Issue 1, November 2010, Appendix E"* a desktop study screening has been carried out taking into account:

1. Surface flow and flooding;
2. Subterranean (groundwater) flow; and
3. Slope Stability, respectively:

5.1 Surface flow and flooding

"Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?"

No, the site falls within the unproductive Strata. (see attached map below Figure 6)

"Question 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, the proposed site drainage and volume of rainfall runoff will be increased due to the rear extensions and new rear lightwell, details and documentation from Thames Water justifying increased volume of surface runoff into their main sewers to be forwarded by Architect.

"Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?"

No, proportion of hard surfaced or paved external areas will remain proportionately the same as existing.

"Question 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, the surface water collected by the proposed development (during construction and long-term) will not affect the profile of surface water inflow received by adjacent properties or downstream watercourses. The surface water will remain within the footprint of the property and discharge via the existing outfall drain and not be able to discharge to any adjoining properties.

"Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?"

No, see question 4 above.

"Question 6: Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?"

Yes, the site is in an area known to be at risk of surface water flooding or below the water level of any nearby water features. Flood risk assessment required.

Streets at risk of surface water flooding

Abbey Road	1975	Jeffreys Street	2002
Aberdare Gardens	1975	Kelly Street	1975 and 2002
Achilles Road	2002	Kentish Town Road	1975
Adamson Road	2002	Kidderpore Gardens	1975
Agamemnon Road	2002	Kilburn High Road	1975
Ajax Road	2002	Kilburn Priory	1975
Aldred Road	2002	Kingdon Road	2002
Arkwight Road	1975 and 2002	Kingsgate Road	1975
Arkwright Road	1975 and 2002	Lady Margaret Road	2002
Avenue Road	2002	Lambolle Road	1975
Belsize Lane	1975 and 2002	Lancaster Drive	2002
Belsize Park Gardens	1975	Lancaster Grove	1975 and 2002
Belsize Road	1975 and 2002	Langland Gardens	1975
Boundary Road	1975	Lowfield Road	1975
Broadhurst Gardens	1975	Lyncroft Gardens	2002
Broomsleigh Street	1975	Lyndurst Gardens	1975
Bullbarrow, Abbey Road Estate	1975	Mansfield Road	1975
Canfield Gardens	1975 and 2002	Maygrove Road	1975
Cannon Hill	1975 and 2002	Menelik Road	2002
Caversham Road	2002	Messina Avenue	1975
Chalcot Gardens	1975	Mill Lane	1975 and 2002
Chesterford Gardens	2002	Nassington Road	2002
Cotleigh Road	1975	Oak Village	1975
Dennington Park Road	1975 and 2002	Ornan Road	2002
Edis Street	1975	Pandora Road	1975 and 2002
Egbert Street	1975	Park End	1975
Fairfax Road	2002	Parkhill Road	1975 and 2002
Fairhazel Gardens	1975 and 2002	Parliament Hill	2002
Fellows Road	1975	Platt's Lane	1975 and 2002
Ferncroft Avenue	1975	Primrose Hill Road	1975 and 2002
Finchley Road	2002	Prince of Wales Road	2002
Fleet Road	2002	Princess Road	1975
Fordwych Road	1975	Priory Road	2002
Frognal Gardens	1975	Priory Terrace	1975
Gaisford Street	2002	South End Road	2002
Glenhurst Avenue	2002	South Hill Park	2002
Gloucester Avenue	1975	South Hill Park Gardens	2002
Goldhurst Terrace	1975 and 2002	Sumatra Road	1975 and 2002
Gospel Oak Estate	1975	Swains Lan	1975
Greencroft Gardens	1975 and 2002	Tanza Road	2002
Hampstead Lane N6	1975	Templewood Avenue	2002
Harben Road	2002	Templewood Gardens	2002
Harley Road	1975	Wendling, Haverstock Road	2002
Hawley Road	1975	West End Lane	2002
Heath Street	1975	Westbere Road	2002
Hemstal Road	1975	Willow Road	1975 and 2002
Highgate Road	1975	Winchester Road	1975
Hillfield Road	1975 and 2002	Windmill Hill	1975
Holmdale Road	1975 and 2002	Woodchurch Road	2002
Ingestre Road	2002	Woodsome Road	1975
Inglewood Road	2002	York Rise	1975

Source: Floods in Camden, Report of the Floods Scrutiny Panel, London Borough of Camden 2003, Appendix 4, Flooded Roads in Camden 1975 and 2002.

Historic flooding of Camden
(extract from Camden Planning Guidance, CPG4, Basements and Lightwells)

5.2 Subterranean flow

"Question 1a: Is the site located directly above an aquifer?"
No, the site falls within the unproductive Strata. (see attached map below Figure 6)

"Question 1b: Will the proposed basement extend beneath the water table surface?"
No, from the detailed site investigation, there is no evidence that the proposed basement extend beneath the water table surface

"Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?"
No.

"Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?"
No.

"Question 4: Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?"
No, proportion of hard surfaced or paved external areas will remain proportionately the same as existing.

"Question 5: As part of the 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, no surface water will be discharged into the ground

"Question 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

5.3 Ground Movements and Slope Stability

"Question 1: Does the existing site include slopes, natural or manmade, greater than 7°? (approximately 1 in 8)"
Yes, the existing garden falls from front to rear garden.

"Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°? (approximately 1 in 8)"
No, the proposed site is relatively level.

"Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°? (approximately 1 in 8)"
No, the existing adjoining properties, etc are relatively level.

"Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7°? (approximately 1 in 8)"
No, the existing adjoining wider landscape, etc is relatively level.

"Question 5: Is the London Clay the shallowest strata at the site?"
Yes, from the review of the historical boreholes data, it is evident that there is a circa 1.0m of made ground over London Clay. This is confirmed by the detailed site investigation.

"Question 6: Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?
No, there is no intension to cut any existing trees.

"Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?"
There is no such evidence to indicate seasonal shrink-swell subsidence in the vicinity of the site.

"Question 8: Is the site within 100m of a watercourse or a potential spring line?"
No, the site is not within 100mm of a watercourse or a potential spring line (see attached Figure 4 on sheet 12).

"Question 9: Is the site within an area of previously worked ground?"
No. Based on the historical boreholes samples the site is not within an area of previously worked ground. This can be accurately determined by the detailed site investigation.

"Question 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 site falls within the unproductive Strata. (see attached map below Figure 6)

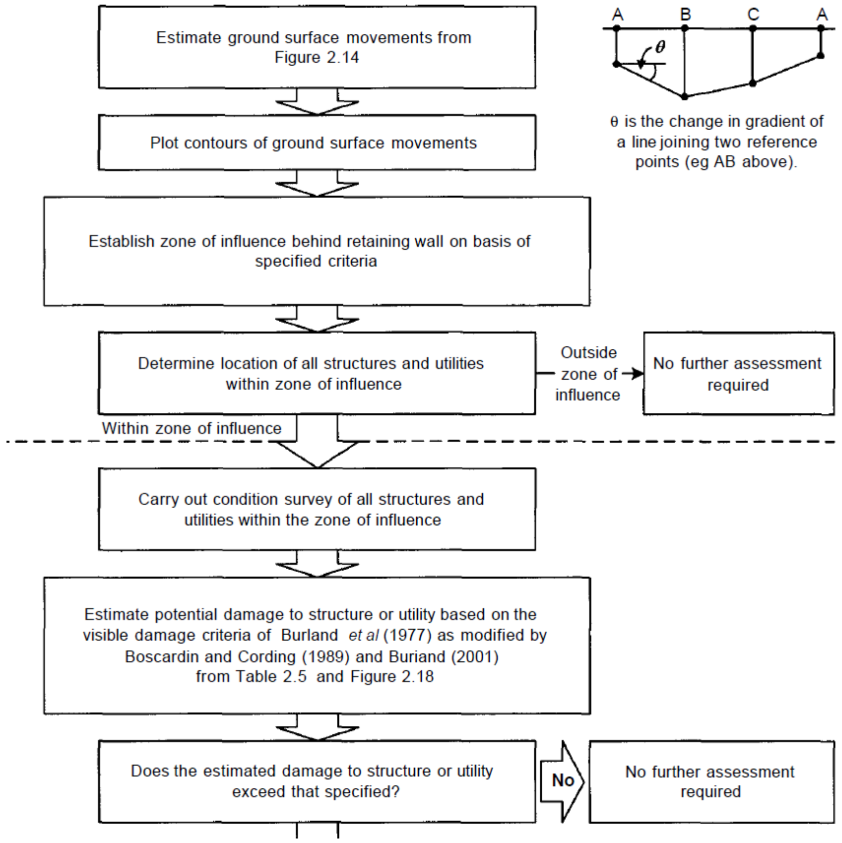
"Question 11: Is the site within 50m of Hampstead Heath ponds?"
No, the site is not within 50m of Hampstead Heath ponds.

"Question 12: Is the site within 5m of a highway or pedestrian right of way?"
No. the site is not within 5m of a highway or pedestrian street.

"Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?"
The property is a semi-detached residential building and therefore said neighbouring buildings will surcharge the proposed basement, so we will need to underpin neighbouring buildings foundations.

"Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?"
No.

5.4 Procedure for building damage assessment



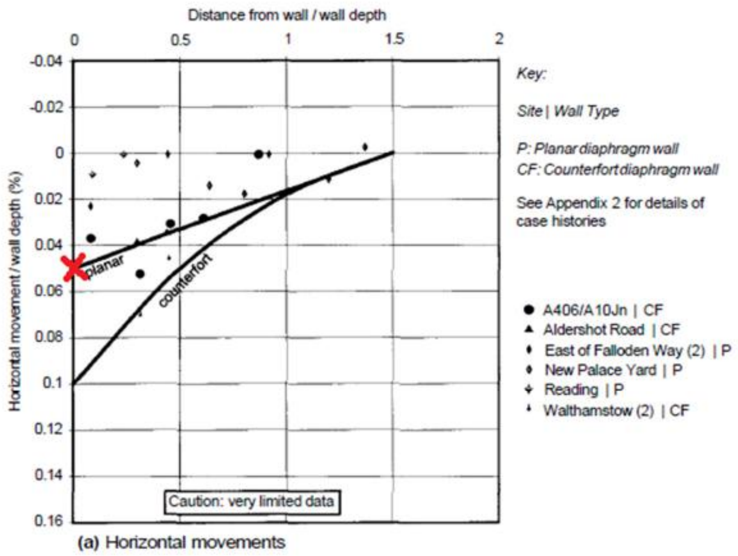
- ➢ Referring to Figure 2.14 (CIRIA 580) we estimate the ground movements due to wall installation

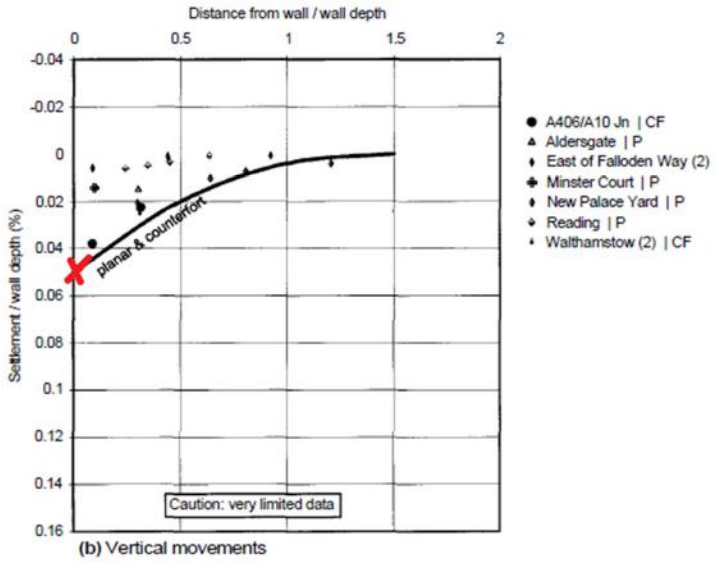
Table 2.2 *Ground surface movements due to bored pile and diaphragm wall installation in stiff clay*

Wall type	Horizontal movements: Surface movement at wall (per cent of wall depth)	Horizontal movements: Distance behind wall to negligible movement (multiple of wall depth)	Vertical movements: Surface movement at wall (per cent of wall depth)	Vertical movements: Distance behind wall to negligible movement (multiple of wall depth)
Bored piles				
Contiguous	0.04	1.5	0.04	2
Secant	0.08	1.5	0.05	2
Diaphragm walls				
Planar	0.05	1.5	0.05	1.5
Counterfort	0.1	1.5	0.05	1.5

Ground movement due to bored diaphragm wall installation in stiff clay

(Extract from Embedded retaining walls – guidance for economic design, CIRIA C580)





Ground movement due to excavation in front of wall in stiff clay

(Extract from Embedded retaining walls – guidance for economic design, CIRIA C580)

Horizontal ground Movement = 1.5

Vertical ground Movement = -0.95

Determine system stiffness

$\rho_s = EI/(\gamma_w h^4) = 29.8\text{MPa}$ (Box2.4 - Clough et al, 1989)

Where h=1.0m

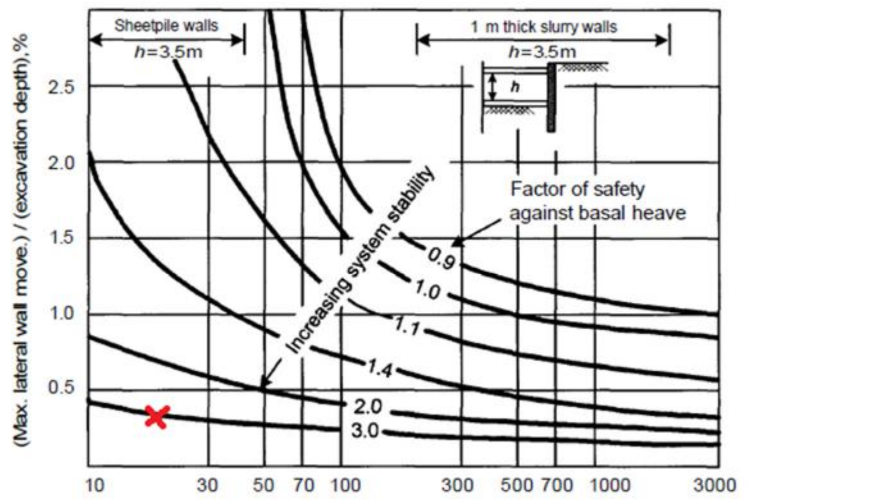


Figure 2.13 *Maximum lateral wall movement versus system stiffness (after Clough et al, 1989)*

Maximum lateral wall movement versus system stiffness

(Extract from Embedded retaining walls – guidance for economic design, CIRIA C580)

- ➢ From section A2.1, A2.2, A2.3 (Appendix 2) and Figures 2.13 the wall deflections acceptable.
- ➢ From talbe 2.2 and F.igures 2.8 and 2.9 ground movement is acceptable.

The contours of ground surface movements can be seen on page 20

5.5 Damage Category Assessment

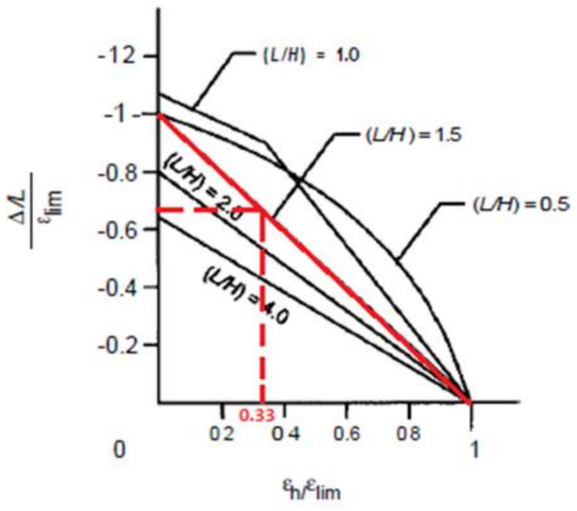
The following steps indicate the procedure in making a stage 2 assessment of the damage to a structure.

L= 20m and H = 12.5m

L/H = 1.5 $\Delta = -0.95$ Δ/L = -0.0475

From table 2.5 - Classification of visible damage to walls (after Burland et al, 1977, Boscardin and Cording, 1989; and Burland, 2001) we get a Limiting tensile strain (ε_{lim}) of 0.075 (per cent)

$(\Delta/L) / \varepsilon_{lim} = -0.63$ so $\varepsilon_h / \varepsilon_{lim} = 0.33$



(b) Influence of horizontal strain on $\Delta/L / \varepsilon_{lim}$ (after Burland. 2001)

(Extract from Embedded retaining walls – guidance for economic design, CIRIA C580)

From ground movement assessment

Horizontal ground Movement (δ_h) = 1.5

$\varepsilon_h = \delta_h / L = 7.5 \times 10^{-5}$

From figure 2.18(b) we have $\varepsilon_h = 0.075 \times 0.33 = 0.0225$

So the damage to structure does not exceed that specified.

5.6 Mitigation of Ground Movements

- Good workmanship is essential. Supports should be installed tight to the wall. The prop, and any packing between the prop and waling, should not rely on friction or adhesion between the prop end and waling to hold it in place.
- Minimise the first-stage excavation and install the first (stiff) support as early as possible in the construction sequence.
- Minimise the extent of the dig beyond the proposed support levels.
- Minimise delays to the construction of the wall and its support system.
- Prevent deterioration of lateral support from a clay berm by blinding it or covering it with a waterproof membrane to maintain the berm's natural moisture content.
- Avoid over-excavation.
- Minimise removal of fines during dewatering.
- Minimise drawdown outside excavation.

5.7 Monitoring programme

For movement monitoring, refer to Structural Engineer's drawings and details for detailed requirements, including respective trigger values.

In essence, several survey target points will be positioned around the existing building and the adjoining properties' buildings and measurements (x, y & z coordinates) will be taken at weekly intervals to determine any potential movement (refer to Structural Engineer's drawing "2016104/09 Movement Monitoring" for detailed proposals)

6.0 Construction Methodology

1) Once the existing lower ground floor slab to the existing basement/cellar has been sufficiently demolished and the site is made safe, underpinning of the existing perimeter masonry walls from inside of the building will commence (16198_SK05). The front & rear elevation load bearing masonry walls can be supported by means of steel box frames at ground floor level, thus can be demolished at basement level & rebuilt as required at a new level.

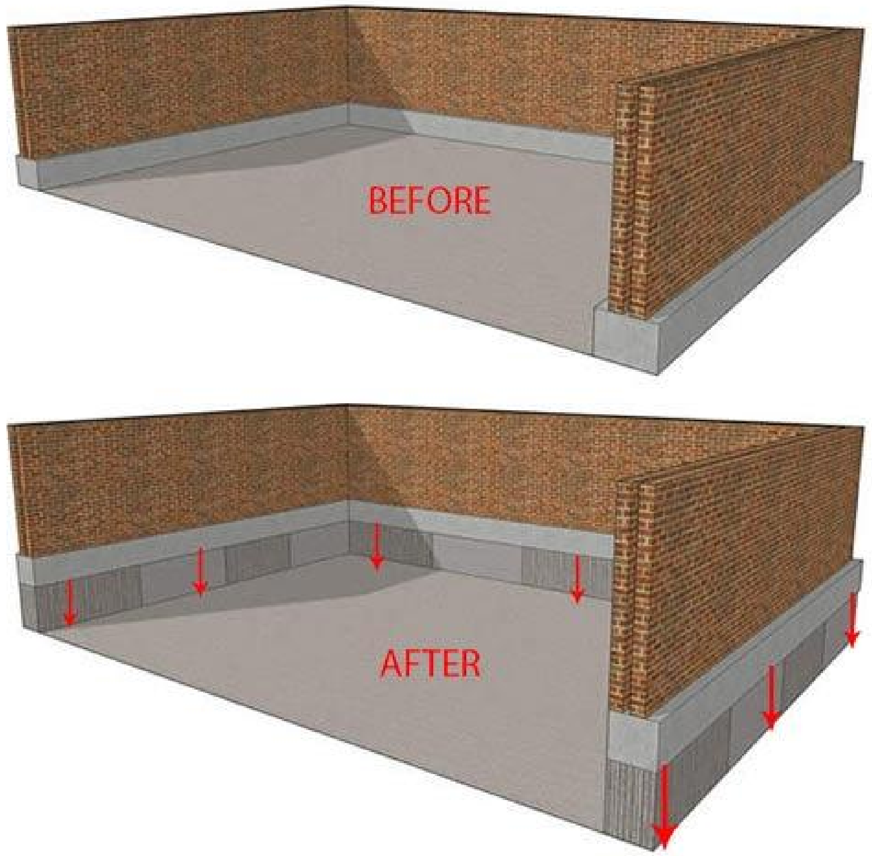
2) Commence mass concrete underpinning of existing surrounding walls to the property as indicated on the proposed lower ground floor plan (16198_SK01 & 16198_SK05). Sequencing of underpinning is to be agreed with the Contractor and Structural Engineer prior to works commencing. **The proposed mass concrete underpins will be designed to provide permanent lateral stability for the retained soil** (16198_SK01 & 16198_SK02 & 16198_SK05).

3) At the same time, construction of the front and rear light wells can commence. Then the soil between can be excavated & the retaining mass walls along the boundaries of the property where it neighbours with 249 & 253 Goldhurst Terrace will be built. Then the remaining retaining walls (i.e. to the front & rear) can be constructed (16198_SK04). Ensuring at all times that Health and Safety Procedures have been adhered to.

4) After all the underpinning works have been completed commence on the excavation of the remaining central section of the existing basement/cellar to the proposed formation level.

5) Once the excavations have been completed complete construction of the new reinforced concrete raft slabs as indicated on the proposed drawings (16198_SK01 & 16198_SK05).

6) In the event that minor ingress of ground water occurs during the execution of the works this will be dealt with by the use of temporary sump pumps. In the permanent condition waterproofing to the new basement will be based on the Architects proposed details.



Underpins and RC retaining wall construction & method

Drawing Appendix A

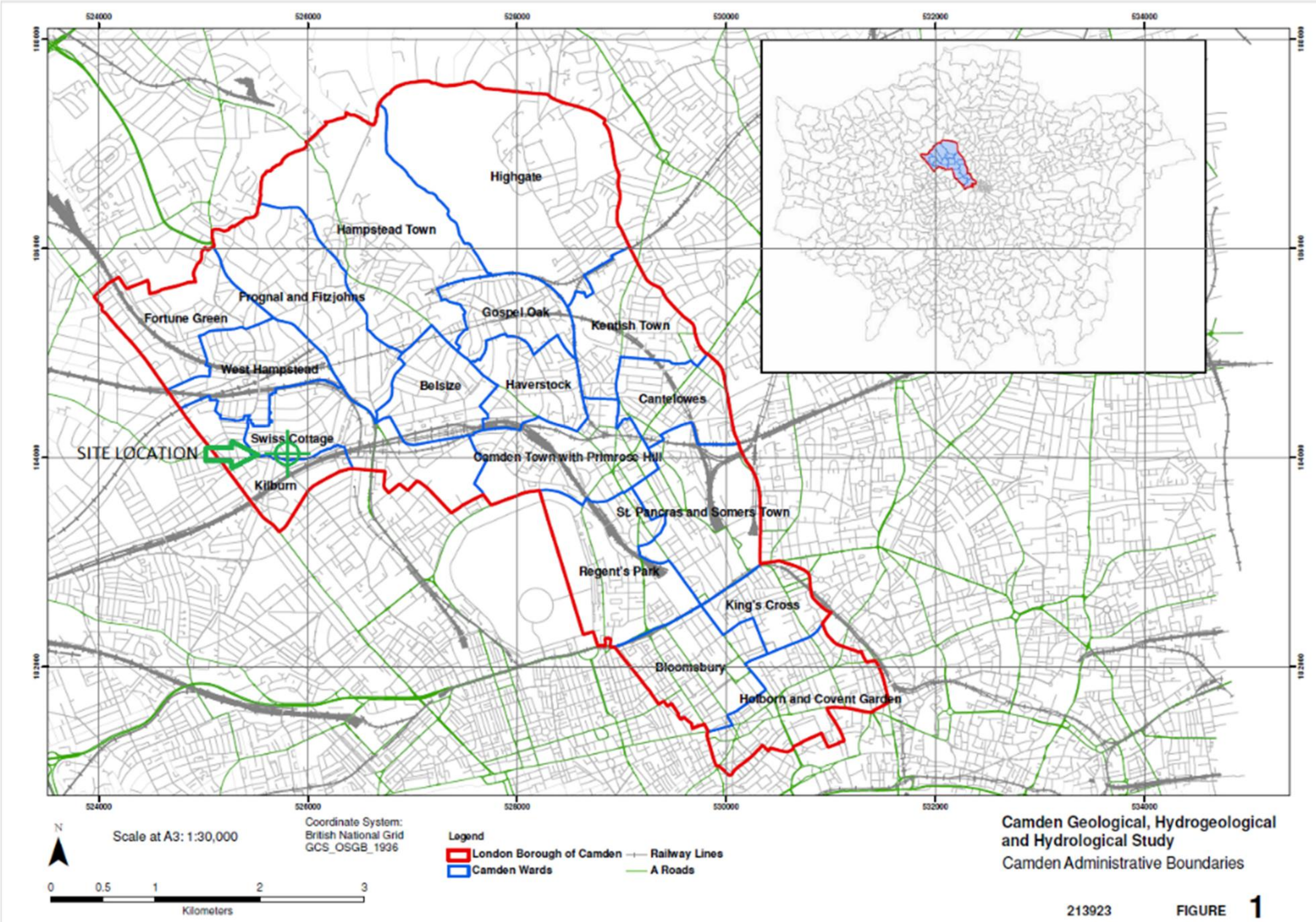


Figure 1: The site's location within London Borough of Camden.

(Extract from ARUP report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010")*

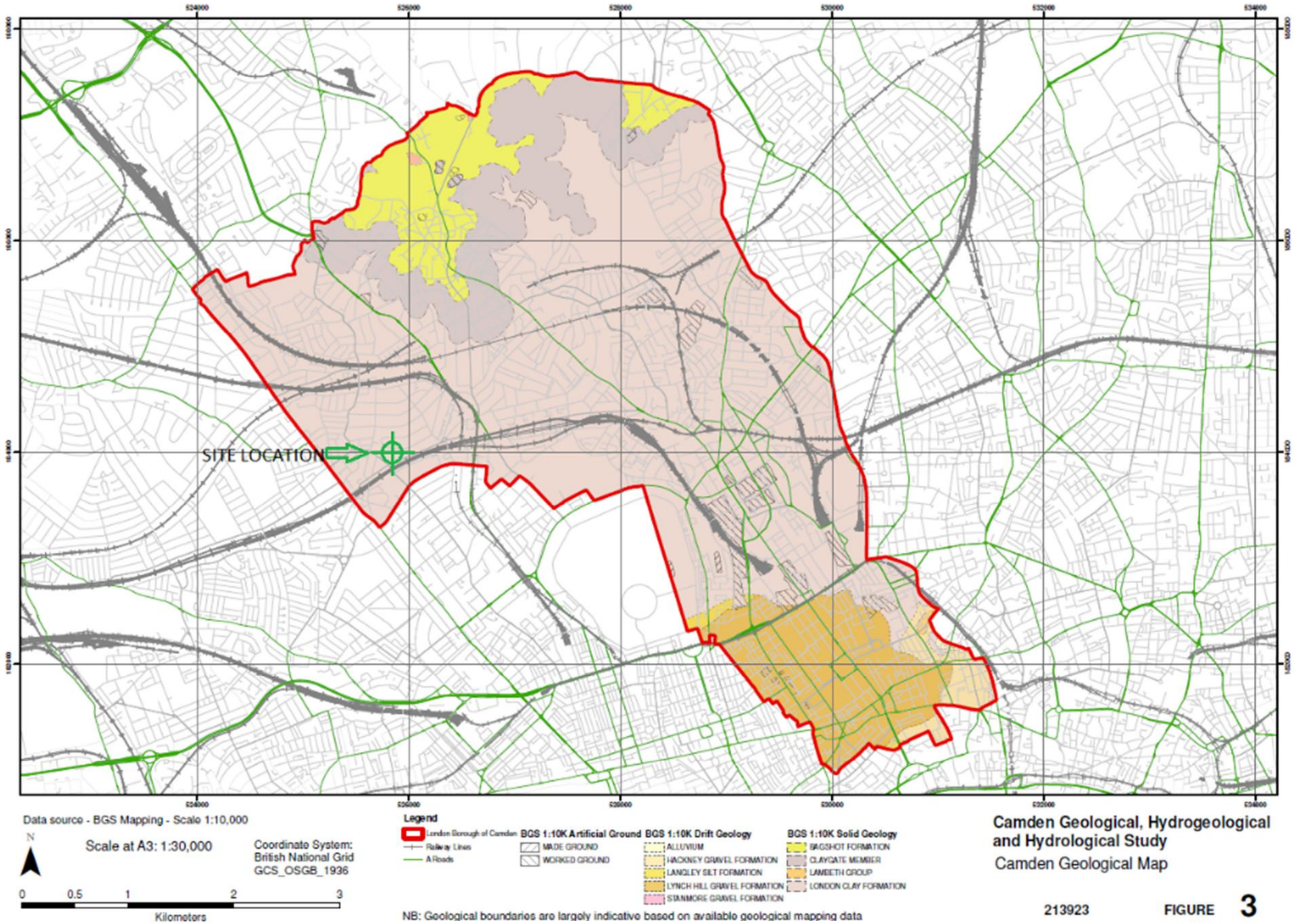


Figure 2: General Topography/Geology within London Borough of Camden.

(Extract from ARUP report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010"*)

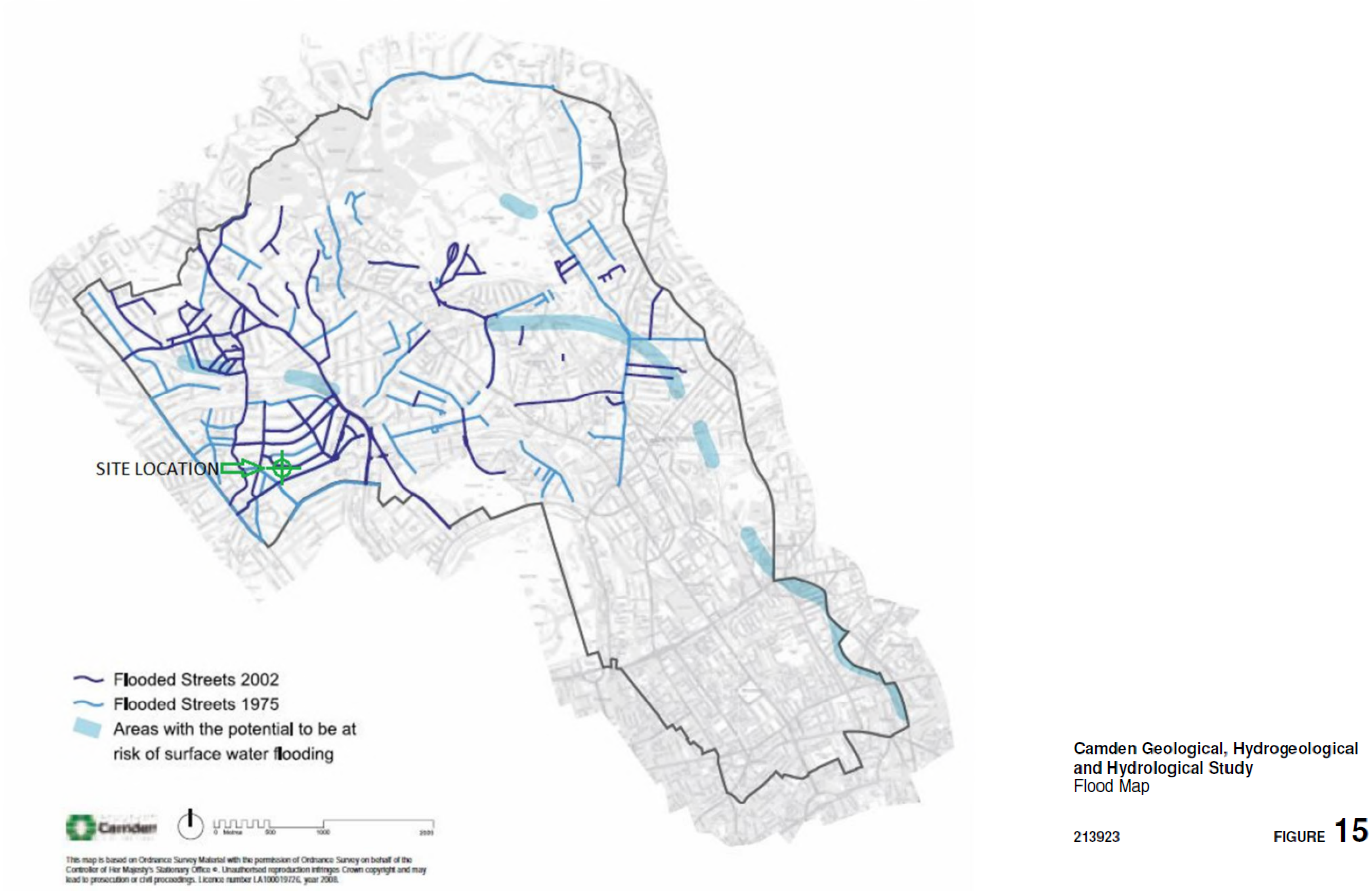


Figure 3: Risk of flooding from reservoir within London Borough of Camden.

(Extract from ARUP report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010"*)

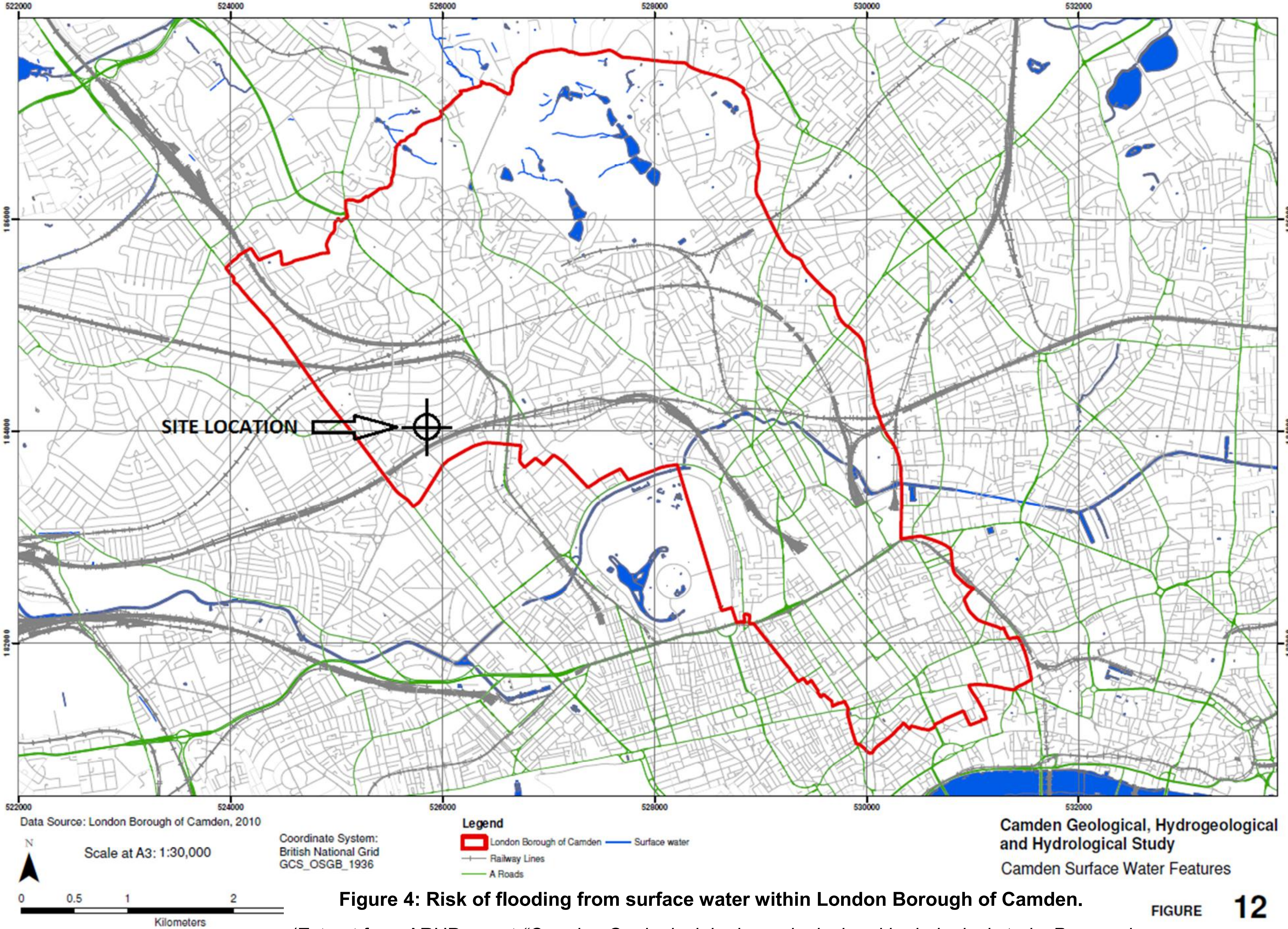


Figure 4: Risk of flooding from surface water within London Borough of Camden.

(Extract from ARUP report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010")*

Figure 5: Flood risk zone for rivers and sea within London Borough of Camden.

(Extract from UK Government website: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=525796&northing=184025&address=5022090)

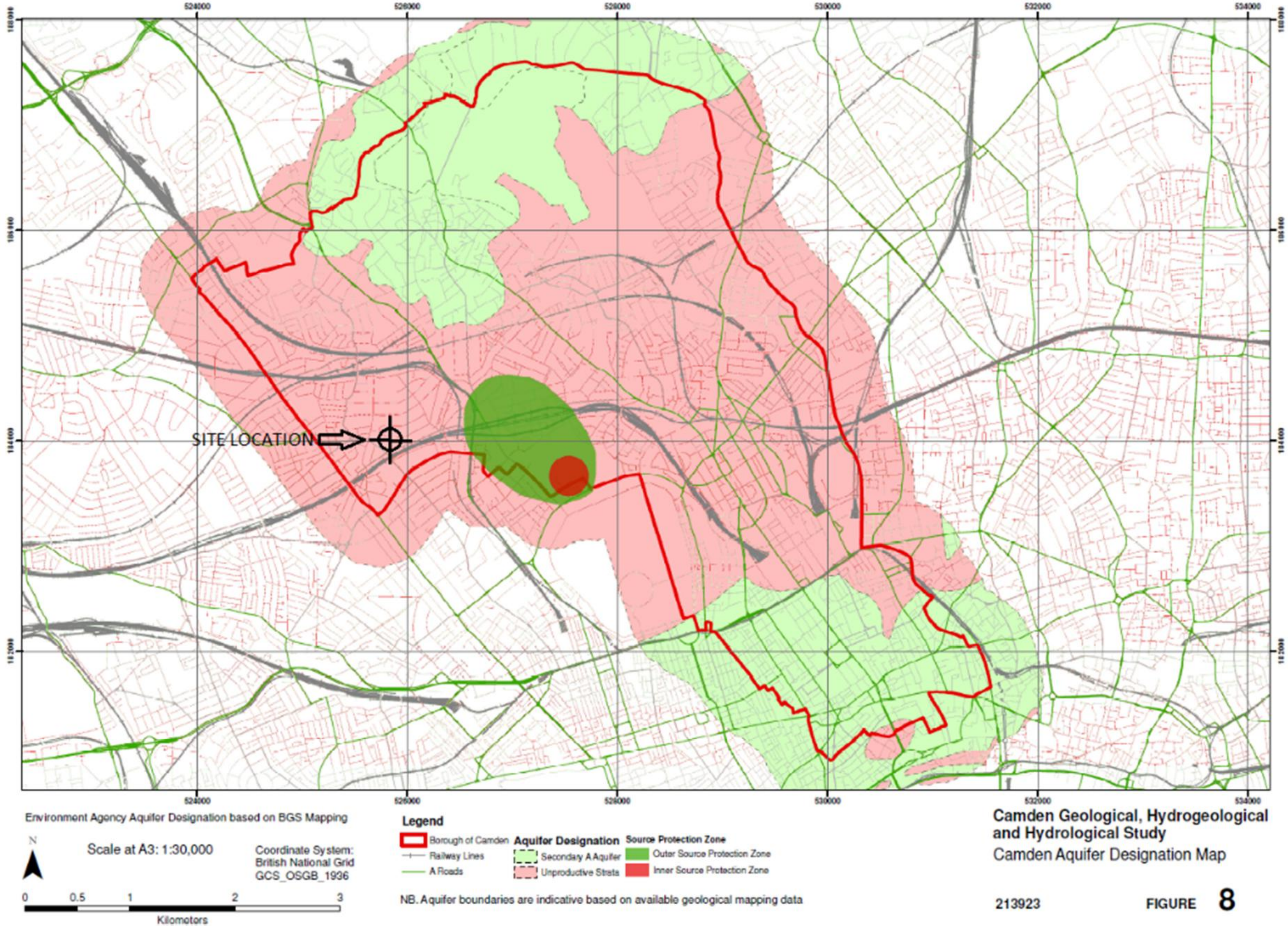
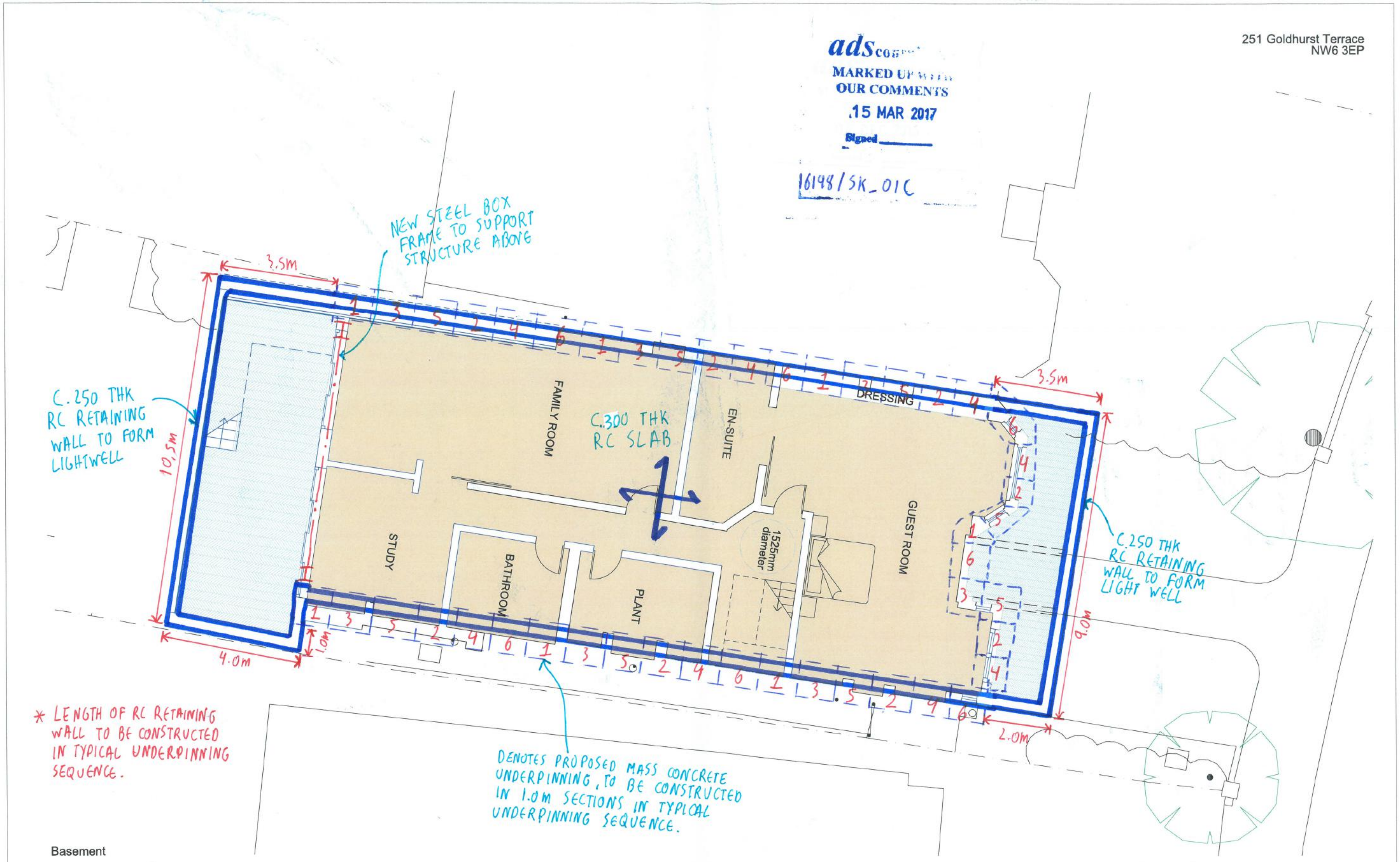


Figure 6: Aquifer Designation map within London Borough of Camden.

(Extract from ARUP report *"Camden Geological, hydrogeological and hydrological study: Prepared for London Borough of Camden, November 2010"*)



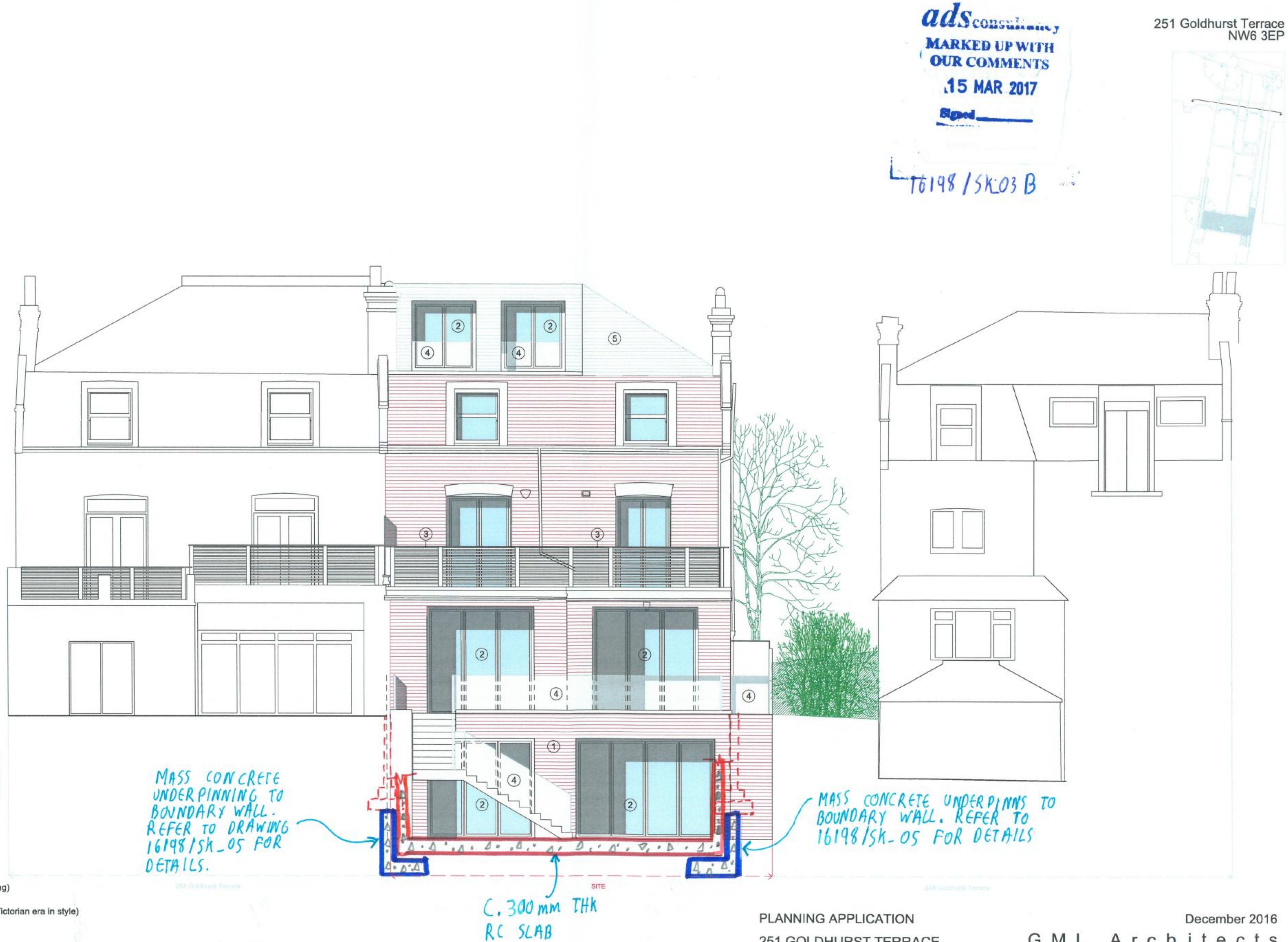
NOTES:
Do not scale from this drawing

PLANNING APPLICATION
251 GOLDHURST TERRACE
Proposed Basement Plan

December 2016
GML Architects
UNIT 3,1-4 Christina Street, London EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
SCALE: 1:100@A3, 1:50@A1
ISSUED FOR: PLANNING
4536/PA/10

251 Goldhurst Terrace
NW6 3EP
ads consultancy
MARKED UP WITH
OUR COMMENTS
15 MAR 2017
Signed
16198/SK_02B
MASS CONCRETE UNDERPINNING TO BOUNDARY WALL. REFER TO DRAWING 16198/SK_05 FOR DETAILS
MASS CONCRETE UNDERPINNING TO BOUNDARY WALL. REFER TO DRAWING 16198/SK_05 FOR DETAILS
C.300mm THK RC SLAB
SITE
Note:
New glazing - Timber frame windows to match existing at front, and aluminium frame to rear.
1 Brick (to match existing)
2 New Glazing
3 Timber Balustrade
4 Glass Balustrade
5 Roof Tiles (to match existing)
6 Metal Balustrade (to be wrought in iron late Victorian era in style)
7 Brick Soldier course lintels
0 1 2 3 5 10
NOTES:
Do not scale from this drawing
PLANNING APPLICATION
251 GOLDHURST TERRACE
Proposed Front Elevation
December 2016
G M L Architects
UNIT 3,1-4 Christina Street, London EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
SCALE: 1:100@A3, 1:50@A1
ISSUED FOR: PLANNING
4536/PA/13

ads consultancy



Note:
New glazing - Timber frame windows to match existing at front, and aluminium frame to rear.

1. Brick (to match existing)
2. New Glazing
3. Timber Balustrade
4. Glass Balustrade
5. Roof Tiles (to match existing)
6. Metal Balustrade (to be wrought in iron late Victorian era in style)
7. Brick Soldier course lintels

0 1 2 3 5 10

NOTES:
Do not scale from this drawing

PLANNING APPLICATION
251 GOLDHURST TERRACE
Proposed Rear Elevation

December 2016

GML Architects
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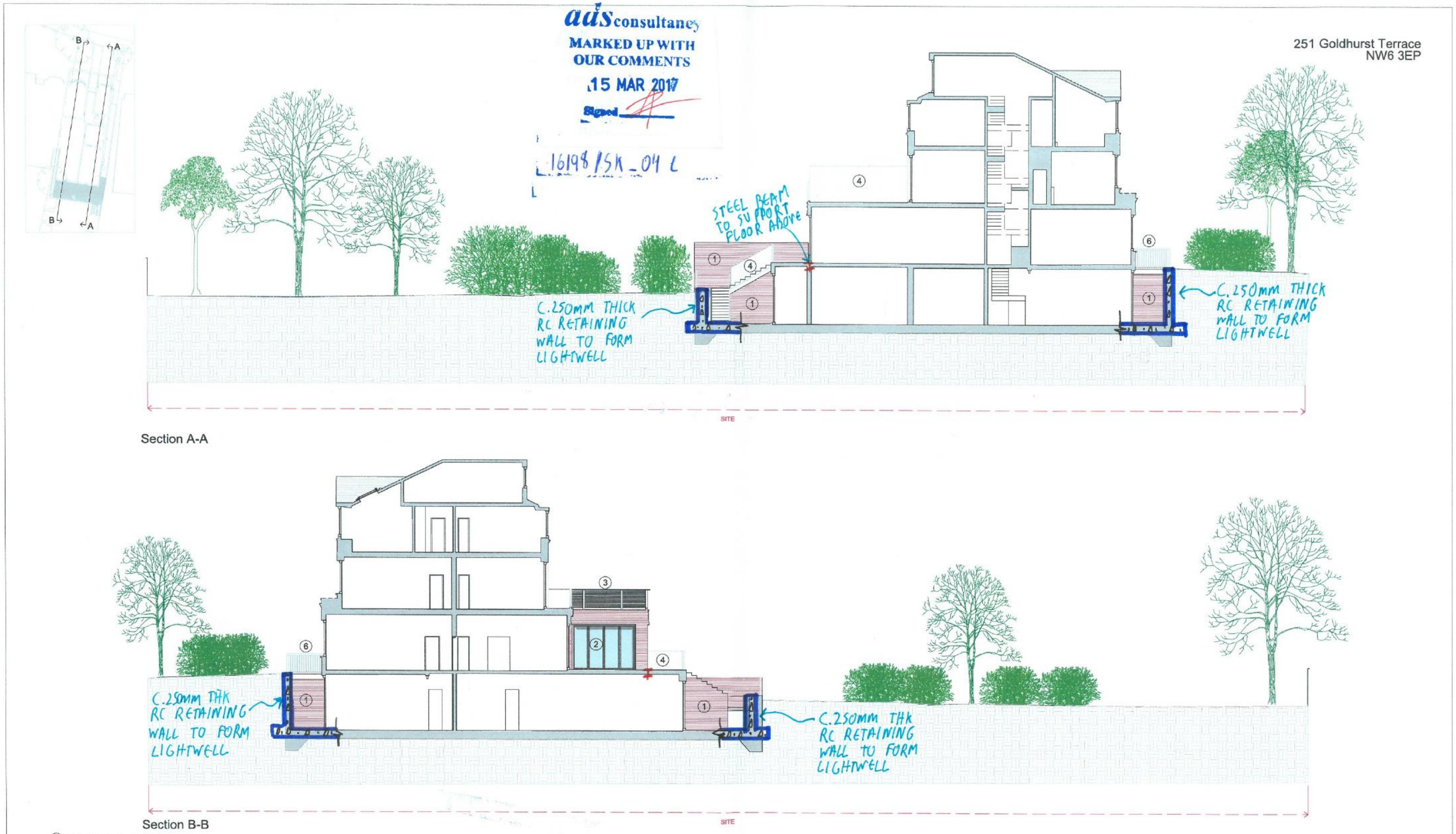
SCALE: 1:100@A3, 1:50@A1
ISSUED FOR: PLANNING

4536/PA/14

ads consultancy



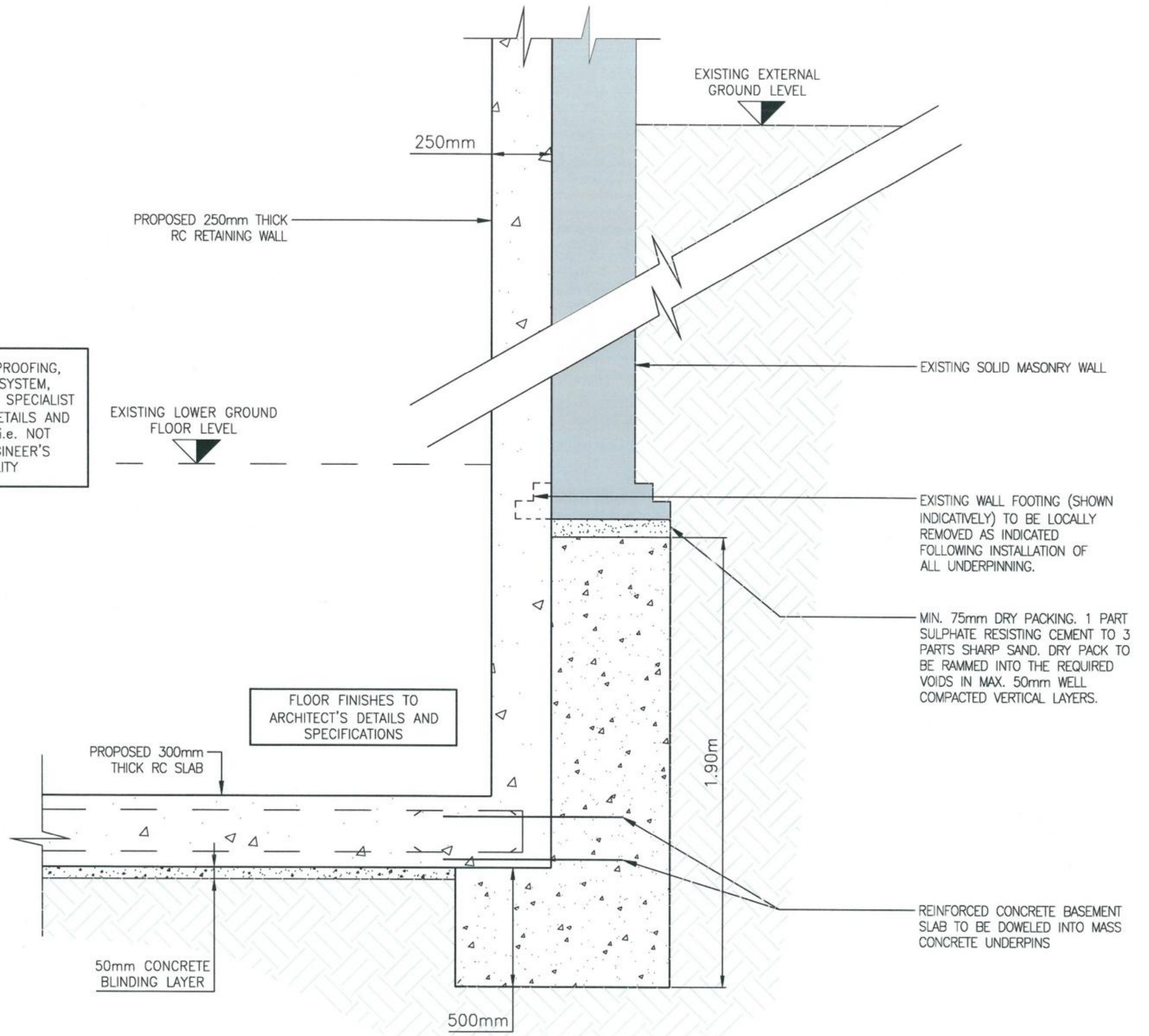
1. Brick (to match existing)
2. New Glazing
3. Timber Balustrade
4. Glass Balustrade
5. Roof Tiles (to match existing)
6. Metal Balustrade

0 2 4 6 10 20 N

NOTES:
Do not scale from this drawing

PLANNING APPLICATION
251 GOLDHURST TERRACE
Proposed Sections

December 2016
GML Architects
UNIT 3,1-4 Christina Street, London EC2A 4PA
Tel: 020 7729 9595 Fax: 020 7729 1801 info@gmlarchitects.co.uk
SCALE: 1:200@A3
ISSUED FOR: PLANNING
4536/PA/15



TYPICAL MASS CONCRETE UNDERPIN WALL DETAIL

SCALE 1:20 @ A3

Revision	Description	By	Appd.	Date

Drawing Status: PRELIMINARY

ads consultancy
consulting structural engineers
130 East Barnet Road
New Barnet
Herts EN4 8RE
tel : 020 8441 4123
fax: 020 8441 7114
mail@adsconsultancy.com

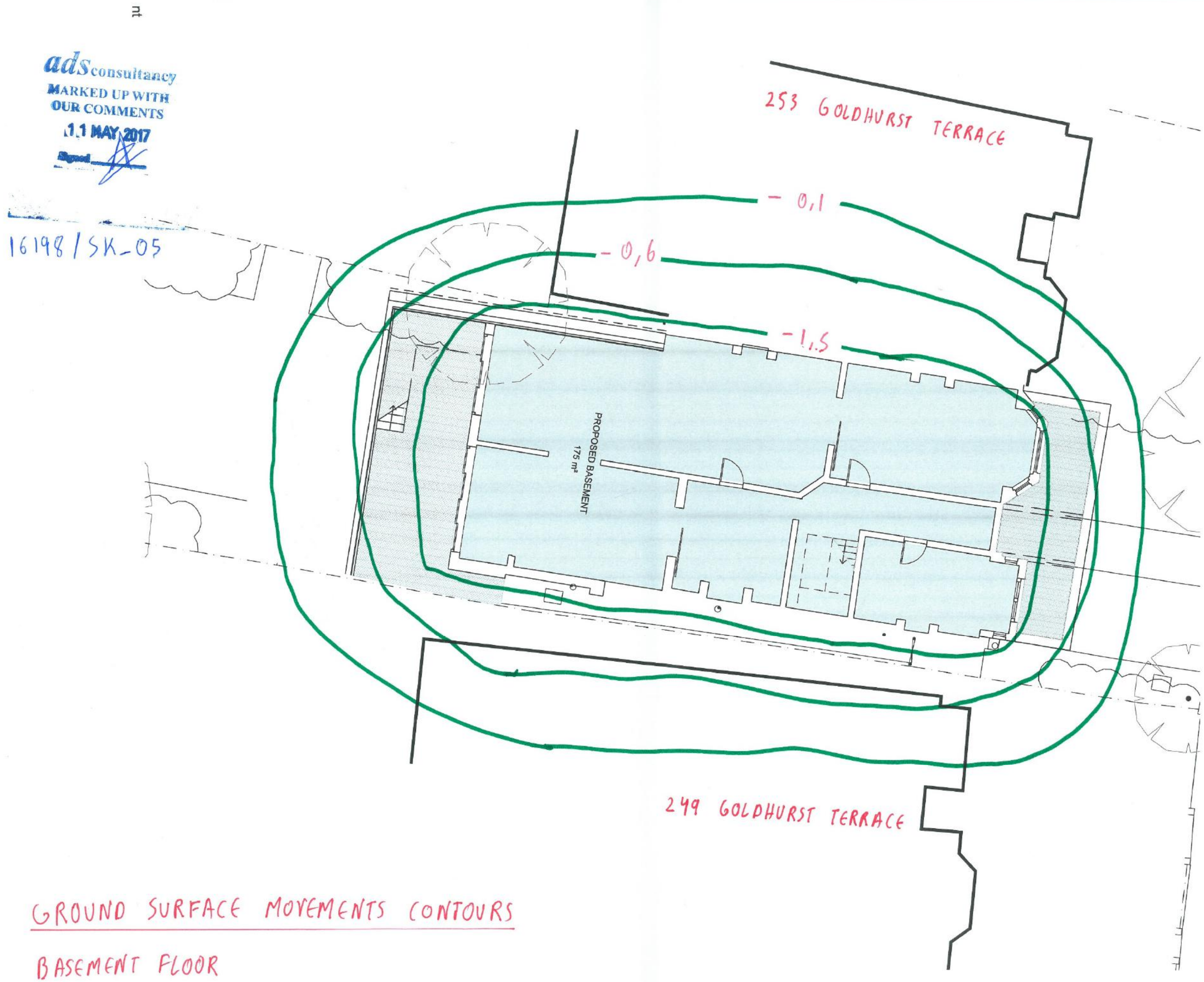
Client: 483 NCR Ltd

Architect: GML Architects

Project: 251 Goldhurst Terrace
LONDON, NW6 3EP

Title: TYPICAL UNDERPIN WALL DETAIL

Drawn: AZ	Chkd/Appd: SN	Date: NOV 16
Cad File: 16198_CURRENT.dwg		Scale: 1:20 @ A3
Drawing Number: 16198/SK05		Revision: P2

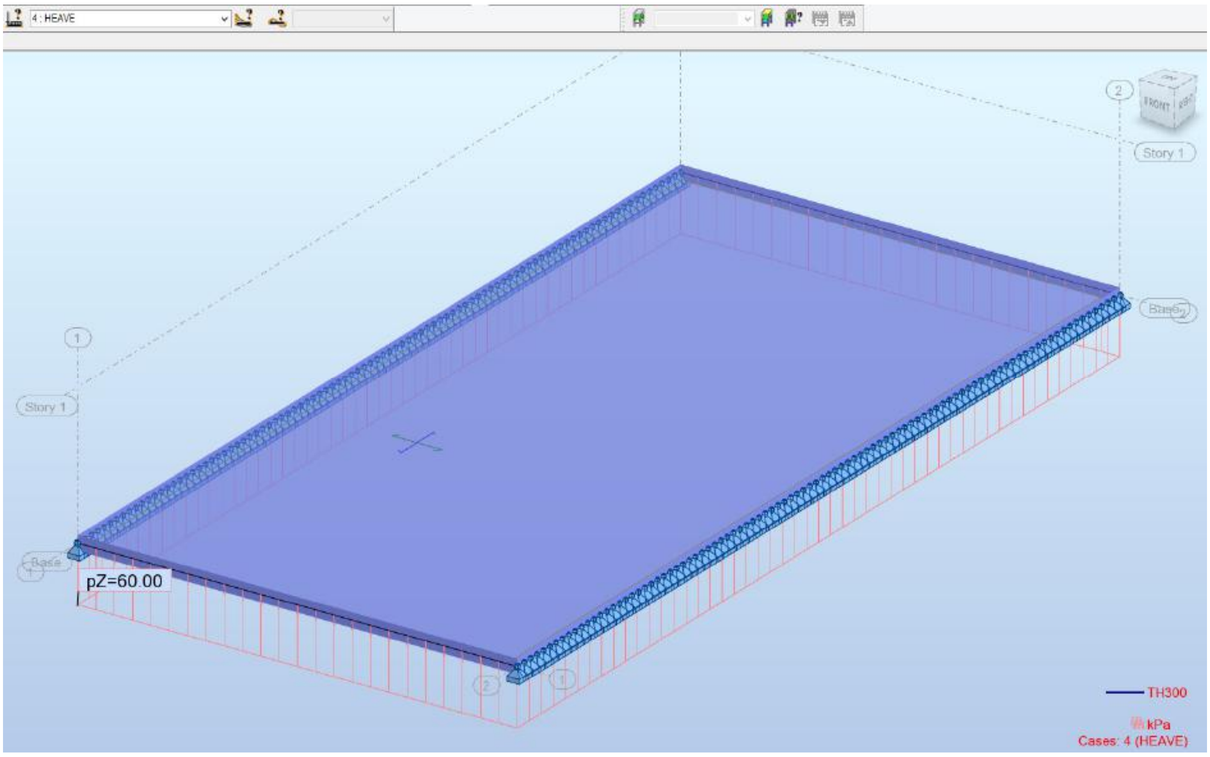


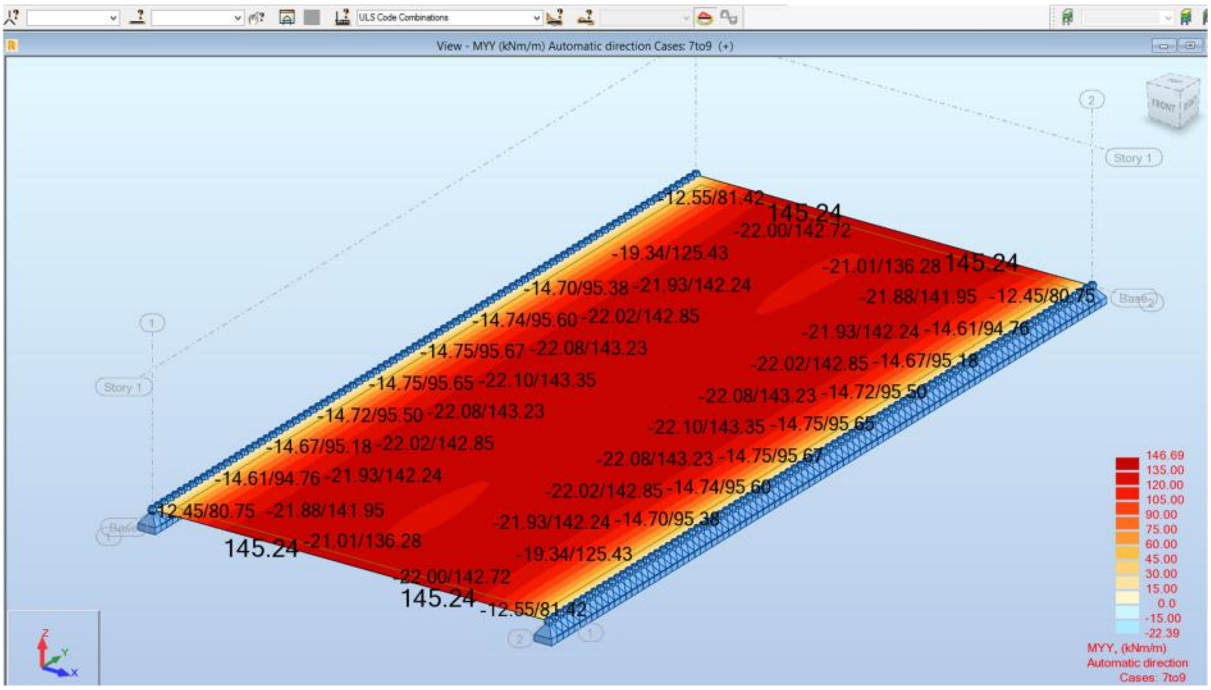
GROUND SURFACE MOVEMENTS CONTOURS

BASEMENT FLOOR

Drawing Appendix B

BASEMENT FLOOR SLAB DESIGN





RC BASEMENT SLAB DESIGN (BS8110:PART1:1997)

TEDDS calculation version 1.0.04

CONCRETE SLAB DESIGN (CL 3.5.3 & 4)

SIMPLE ONE WAY SPANNING SLAB DEFINITION

; Overall depth of slab; h = **300** mm

; Cover to tension reinforcement resisting sagging; c_b = **35** mm

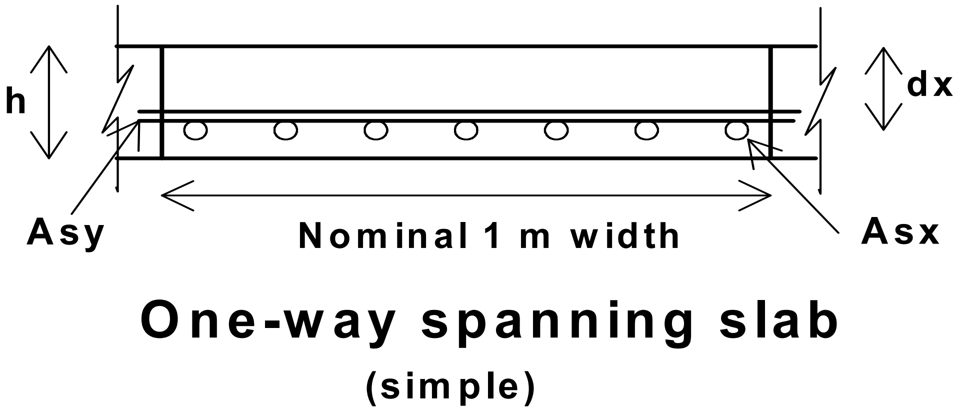
; Trial bar diameter; D_{tryx} = **16** mm

Depth to tension steel (resisting sagging)

$d_x = h - c_b - D_{tryx}/2$ = **257** mm

; Characteristic strength of reinforcement; f_y = **500** N/mm^2

; Characteristic strength of concrete; f_{cu} = **35** N/mm^2



ONE WAY SPANNING SLAB (CL 3.5.4)

MAXIMUM DESIGN MOMENTS IN SPAN

; Design sagging moment (per m width of slab); m_{sx} = **150.0** kNm/m

CONCRETE SLAB DESIGN – SAGGING – OUTER LAYER OF STEEL (CL 3.5.4)

; Design sagging moment (per m width of slab); m_{sx} = **150.0** kNm/m

; Moment Redistribution Factor; β_{bx} = **1.0**

Area of reinforcement required

;; $K_x = \text{abs}(m_{sx}) / (d_x^2 \times f_{cu})$ = **0.065**

$K'_x = \min (0.156 , (0.402 \times (\beta_{bx} - 0.4)) - (0.18 \times (\beta_{bx} - 0.4)^2))$ = **0.156**

Outer compression steel not required to resist sagging

Slab requiring outer tension steel only - bars (sagging)

;; $z_x = \min ((0.95 \times d_x),(d_x \times (0.5+\sqrt{(0.25-K_x/0.9)})))$ = **237** mm

Neutral axis depth; $x_x = (d_x - z_x) / 0.45$ = **45** mm

Area of tension steel required

;;; $A_{sx\_req} = \text{abs}(m_{sx}) / (1/\gamma_{ms} \times f_y \times z_x)$ = **1456** mm^2/m

Tension steel

;;Provide 20 dia bars @ 200 centres; outer tension steel resisting sagging

A_{sx_prov} = A_{sx} = **1570** mm^2/m

Area of outer tension steel provided sufficient to resist sagging

TRANSVERSE BOTTOM STEEL - INNER

;;**Inner layer of transverse steel**;

Provide 20 dia bars @ 200 centres

A_{sy_prov} = A_{sy} = **1570** mm^2/m

Check min and max areas of steel resisting sagging

;Total area of concrete; A_c = h = **300000** mm^2/m

; Minimum % reinforcement; k = **0.13** %

A_{st_min} = k × A_c = **390** mm^2/m

A_{st_max} = 4 % × A_c = **12000** mm^2/m

Steel defined:

; Outer steel resisting sagging; A_{sx_prov} = **1570** mm^2/m

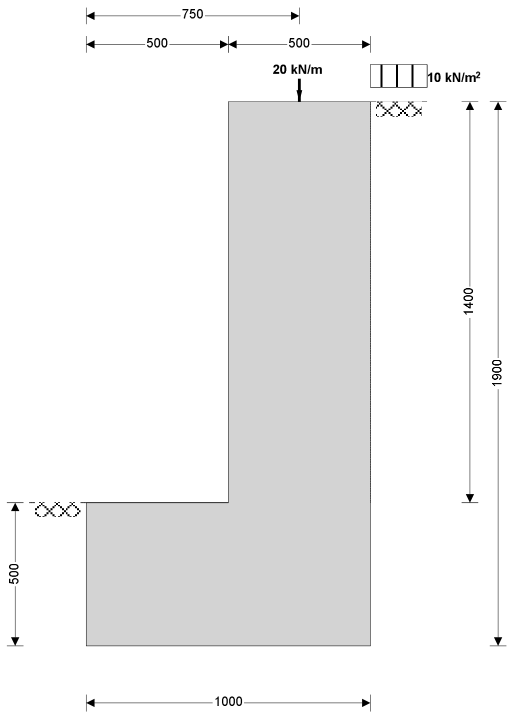
Area of outer steel provided (sagging) OK

; Inner steel resisting sagging; A_{sy_prov} = **1570** mm^2/m

Area of inner steel provided (sagging) OK

MASS CONCRETE UNDERPIN ANALYSIS (BS 8002:1994)

TEDDS calculation version 1.2.01.06



Wall details

Retaining wall type; **Unpropped cantilever**

Height of retaining wall stem; h_{stem} = **1400** mm

Thickness of wall stem; t_{wall} = **500** mm

Length of toe; l_{toe} = **500** mm

Length of heel; l_{heel} = **0** mm

Overall length of base; $l_{base} = l_{toe} + l_{heel} + t_{wall}$ = **1000** mm

Thickness of base; t_{base} = **500** mm

Depth of downstand; d_{ds} = **0** mm

Position of downstand; l_{ds} = **500** mm

Thickness of downstand; t_{ds} = **500** mm

Height of retaining wall; $h_{wall} = h_{stem} + t_{base} + d_{ds}$ = **1900** mm

Depth of cover in front of wall; d_{cover} = **0** mm

Depth of unplanned excavation; d_{exc} = **0** mm

Height of ground water behind wall; h_{water} = **0** mm

Height of saturated fill above base; $h_{sat} = \max(h_{water} - t_{base} - d_{ds}, 0 \text{ mm})$ = **0** mm

Density of wall construction; γ_{wall} = **23.6** kN/m^3

Density of base construction; γ_{base} = **23.6** kN/m^3

Angle of rear face of wall; α = **90.0** deg

Angle of soil surface behind wall; β = **0.0** deg

Effective height at virtual back of wall; $h_{eff} = h_{wall} + l_{heel} \times \tan(\beta)$ = **1900** mm

Retained material details

Mobilisation factor; M = **1.5**

Moist density of retained material; γ_m = **18.0** kN/m^3

Moist density of retained material; γ_m = **18.0** kN/m^3
Saturated density of retained material; γ_s = **21.0** kN/m^3
Design shear strength; ϕ' = **24.2** deg
Angle of wall friction; δ = **0.0** deg

Base material details

Moist density; γ_{mb} = **18.0** kN/m^3
Design shear strength; ϕ'_b = **24.2** deg
Design base friction; δ_b = **18.6** deg
Allowable bearing pressure; $P_{bearing}$ = **100** kN/m^2

Using Coulomb theory

Active pressure coefficient for retained material

$K_a = \sin(\alpha + \phi')^2 / (\sin(\alpha)^2 \times \sin(\alpha - \delta) \times [1 + \sqrt{(\sin(\phi' + \delta) \times \sin(\phi' - \beta) / (\sin(\alpha - \delta) \times \sin(\alpha + \beta)))}]^2)$ = **0.419**

Passive pressure coefficient for base material

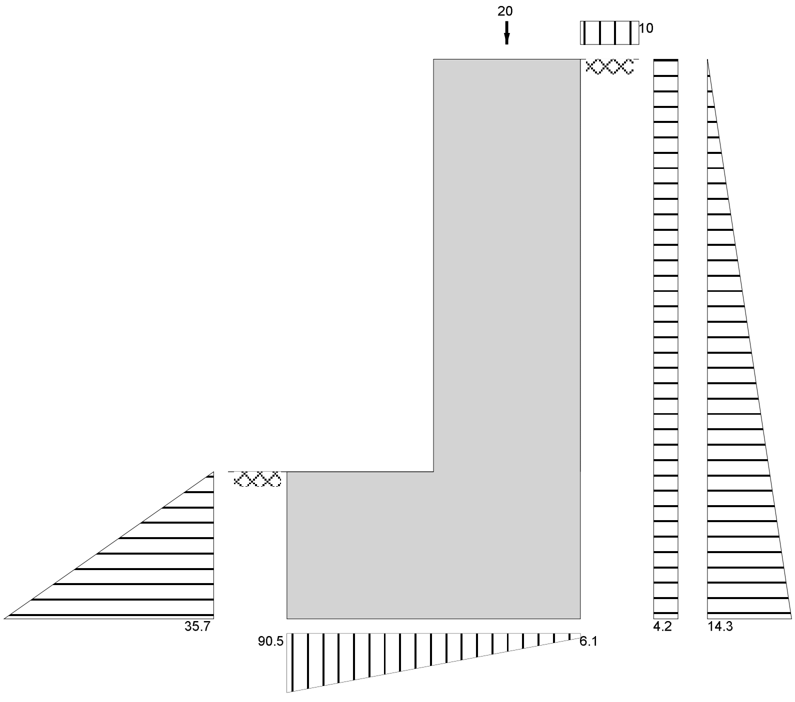
$K_p = \sin(90 - \phi'_b)^2 / (\sin(90 - \delta_b) \times [1 - \sqrt{(\sin(\phi'_b + \delta_b) \times \sin(\phi'_b) / (\sin(90 + \delta_b)))}]^2)$ = **4.187**

At-rest pressure

At-rest pressure for retained material; $K_0 = 1 - \sin(\phi')$ = **0.590**

Loading details

Surcharge load on plan; Surcharge = **10.0** kN/m^2
Applied vertical dead load on wall; W_{dead} = **20.0** kN/m
Applied vertical live load on wall; W_{live} = **0.0** kN/m
Position of applied vertical load on wall; l_{load} = **750** mm
Applied horizontal dead load on wall; F_{dead} = **0.0** kN/m
Applied horizontal live load on wall; F_{live} = **0.0** kN/m
Height of applied horizontal load on wall; h_{load} = **0** mm



Loads shown in kN/m, pressures shown in kN/m^2

Vertical forces on wall

Wall stem; $w_{wall} = h_{stem} \times t_{wall} \times \gamma_{wall}$ = **16.5** kN/m

Wall base; $w_{base} = l_{base} \times t_{base} \times \gamma_{base}$ = **11.8** kN/m

Applied vertical load; $W_v = W_{dead} + W_{live}$ = **20** kN/m

Total vertical load; $W_{total} = w_{wall} + w_{base} + W_v$ = **48.3** kN/m

Horizontal forces on wall

Surcharge; $F_{sur} = K_a \times Surcharge \times h_{eff}$ = **8** kN/m

Moist backfill above water table; $F_{m\_a} = 0.5 \times K_a \times \gamma_m \times (h_{eff} - h_{water})^2$ = **13.6** kN/m

Total horizontal load; $F_{total} = F_{sur} + F_{m\_a}$ = **21.5** kN/m

Calculate stability against sliding

Passive resistance of soil in front of wall; $F_p = 0.5 \times K_p \times \cos(\delta_b) \times (d_{cover} + t_{base} + d_{ds} - d_{exc})^2 \times \gamma_{mb}$ = **8.9** kN/m

Resistance to sliding; $F_{res} = F_p + W_{total} \times \tan(\delta_b)$ = **25.2** kN/m

PASS - Resistance force is greater than sliding force

Overturning moments

Surcharge; $M_{sur} = F_{sur} \times (h_{eff} - 2 \times d_{ds}) / 2$ = **7.6** kNm/m

Moist backfill above water table; $M_{m\_a} = F_{m\_a} \times (h_{eff} + 2 \times h_{water} - 3 \times d_{ds}) / 3$ = **8.6** kNm/m

Total overturning moment; $M_{ot} = M_{sur} + M_{m\_a}$ = **16.2** kNm/m

Restoring moments

Wall stem; $M_{wall} = w_{wall} \times (l_{toe} + t_{wall} / 2)$ = **12.4** kNm/m

Wall base; $M_{base} = w_{base} \times l_{base} / 2$ = **5.9** kNm/m

Design vertical load; $M_v = W_v \times l_{load}$ = **15** kNm/m

Total restoring moment; $M_{rest} = M_{wall} + M_{base} + M_v$ = **33.3** kNm/m

Check stability against overturning

Total overturning moment; M_{ot} = **16.2** kNm/m

Total restoring moment; M_{rest} = **33.3** kNm/m

PASS - Restoring moment is greater than overturning moment

Check bearing pressure

Total moment for bearing; $M_{total} = M_{rest} - M_{ot}$ = **17.1** kNm/m

Total vertical reaction; $R = W_{total}$ = **48.3** kN/m

Distance to reaction; $x_{bar} = M_{total} / R$ = **354** mm

Eccentricity of reaction; $e = abs((l_{base} / 2) - x_{bar})$ = **146** mm

Reaction acts within middle third of base

Bearing pressure at toe; $p_{toe} = (R / l_{base}) + (6 \times R \times e / l_{base}^2)$ = **90.5** kN/m^2

Bearing pressure at heel; $p_{heel} = (R / l_{base}) - (6 \times R \times e / l_{base}^2)$ = **6.1** kN/m^2

PASS - Maximum bearing pressure is less than allowable bearing pressure

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