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consulting structural & civil engineers

22 Lawn Road, NW3 2XR

Basement Impact Assessment

Project no: 3197

December 2021

Contents

Revision	Date	Status
P1	09.12.21	Planning
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Checked By:		Dave Heeley
Approved By:		Dave Rayment

Non-Technical Summary

The site location is 22 Lawn Road, The National Grid Reference for the site is TQ 27574 85250.

The current site arrangement is a four-storey terraced house, built between 1916-1938.

The proposed development comprises the extension of the lower ground rear garage space to the rear wall line of the main house, the demolition of the existing conservatory and replacement with a single-storey rear extension, internal reconfiguration of internal walls and stairs at ground, first and second floor and the removal of the front chimney breast to second floor level.

The following assessments are presented:

- Desk Study
- Screening
- Scoping
- Site investigation
- Arboricultural report
- Ground movement assessment
- Impact Assessment

The authors of the assessments are Eleana Savvidi MEng CEng MIStructE and Dave Heeley MEng CEng MIStructE. Annabel Maxted BSc ACSM Madeleien Monnickendam MSci GMICE FGS Madeleine Groves MSci CEng MICE and Adam Branson MGeol FGS CMgr MCMI GMICE.

The ground and groundwater conditions beneath the site are Made ground overlying London Clay. Groundwater was detected as seepage only.

The construction methods proposed are reinforced concrete walls, reinforced supsended basement slab and beam and block lower ground floor. Neighbouring foundations will be underpinned in mass concrete.

A structural monitoring strategy to control the works and impacts to neighbouring structures will comprise monitoring deflections at key points against preset trigger values.

The BIA has assessed land stability and the impacts of the proposed development on neighbouring structures will be 0-1 on the Burland Scale.

The following mitigation measures are proposed: a ground movement assessment has been undertaken and monitoring strategy stipulated. The residual impacts to slope stability are assumed to be very low.

The BIA has identified no potential hydrological impacts.

The BIA has identified no potential hydrogeological impacts.

The BIA has identified no potential flood risk impacts.

A preliminary review of ground movements at the Belsize tunnel predicted movements at the approximate tunnel crown of less than 1mm.

2 Introduction

The purpose of this assessment is to consider the effects of a proposed basement development at 22 Lawn Road on the local hydrology, geology and hydrogeology and potential impacts to neighbours and the wider environment.

This report covers the work undertaken during the initial stage of the project. A description of the main elements of the structure is given, plus the assumed sequence of construction which has influenced the structural design.

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 Authors

The authors of this report are Eleana Savvidi MEng CEng MIStructE and Dave Heeley MEng CEng MIStructE Annabel Maxted BSc ACSM Madeleien Monnickendam MSci GMICE FGS Madeleine Groves MSci CEng MICE and Adam Branson MGeol FGS CMgr MCMI GMICE.

2.2 Sources of Information

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

- Site walkover and discussion with residents and geotechnical investigation engineer CGL (07.10.21);
- Current/historical mapping (OS Maps, old-maps.co.uk);
- Geological mapping (refer to CGL report);
- Hydrogeological data (refer to CGL report);
- Current/historical hydrological data (refer to CGL report);
- Flood risk mapping (refer to CGL report);
- 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;

2.3
Existing and Proposed Development

EXISTING SITE

The property is located in Camden, Northwest London, approximately 4.0 miles north of Central London. The site is in the London Borough of Camden. The site is bounded by neighbouring terraced housing, Garnett Road to the North, Upper Park Road to the South, to the West Lawn Road and to the East a private culdesac.

The neighbouring properties appear to be of a similar age and construction.

The National Grid Reference for the site TQ 27574 85250. The ground level is approximately 61m above sea level.

There is a Thames Water asset under the existing garage ground floor slab which will require bridging over during the proposed works.

The Belsize tunnel runs directly beneath the site, which records show appears to be around 8m from the proposed excavation level of the site.

EXISTING TREES

There are some minor trees/ bushes present in the front and rear gardens of the property.

The trees within the site are short (maximum 2m in height) and as the surrounding soils are not cohesive they are unlikely to affect the development with regards to soil shrinkage. Some larger trees are present beyond the garden Party wall but due to their distance are unlikely to affect the development.

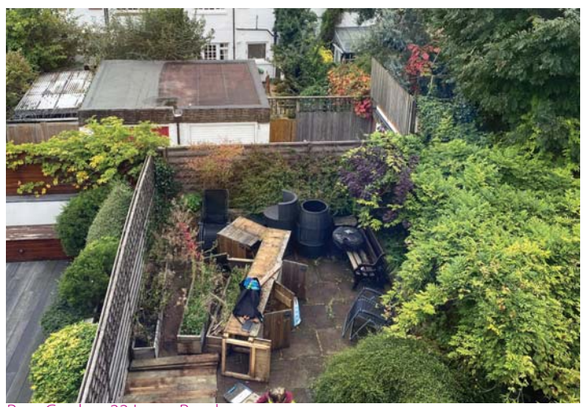
EXISTING DEVELOPMENT

The existing building is a four-storey terraced property built in the early-mid 1900s. The suspended floors comprise timber joists spanning front to back, supported by perimeter masonry walls and internal loadbearing masonry spine walls.

Intrusive investigative were undertaken to confirm the composition of the existing structure, particularly existing retaining walls and foundations as well as the presence of internal masonry spine walls in the superstructure which will be incorporated in the detailed design drawings.

The general condition of the structure appears in good condition with no evidence of significant movement to external walls.


Existing Facade, 22 Lawn Road


Rear Garden, 22 Lawn Road


Existing Garage, 22 Lawn Road

PROPOSED DEVELOPMENT - SUPERSTRUCTURE

The proposed works involve the demoltion of the existing conservatory and replacement with a single-storey rear extension, removal of the existing ground floor rear perimeter wall - requiring a stability frame - and the reconfiguration of the existing superstructure of the main house. This will involve the removal of some loadbearing elements that will be replaced by steel beams and columns.

PROPOSED DEVELOPMENT - SUBSTRUCTURE

The proposal is to extend the existing rear garage space to the rear wall line of the main house to full width, maintaining the existing lower ground level.

GROUND FLOOR

A beam and block floor will span onto the new perimeter retaining walls and an internal structural blockwork wall and act as a diapragm restraining the tops of the retaining walls.

NEW LOWER GROUND FLOOR

The new lower ground floor slab will be suspended between slab thickenings along the perimeter.

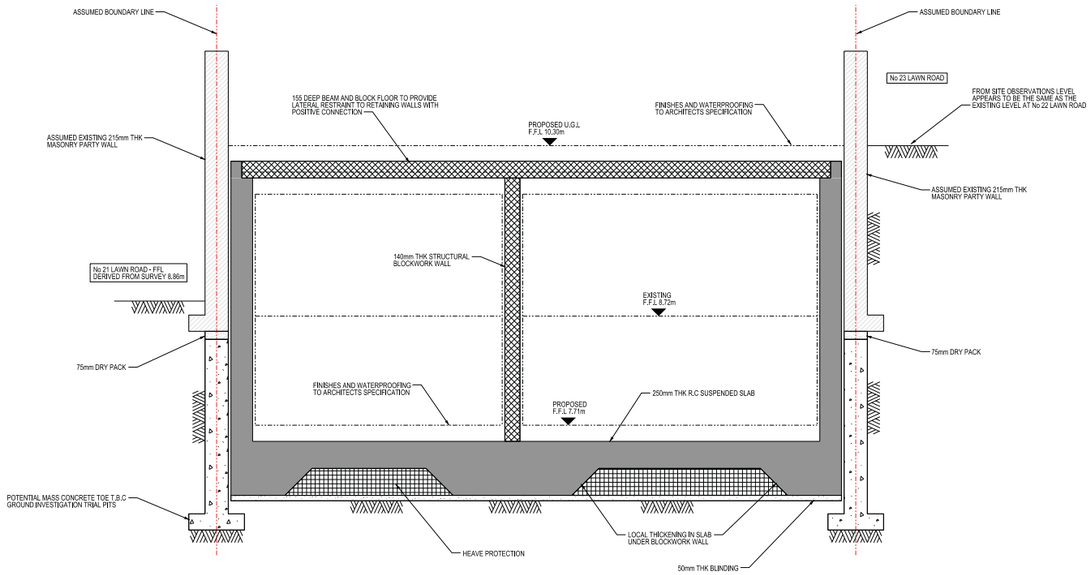
Due to the presence of clay below the Made Ground, the excavation of the basement has the potential to cause heave to the basement slab. A proprietary compressible void former will be used under the suspended basement slab to accommodate this withough overstressing the slab.

RETAINING WALLS

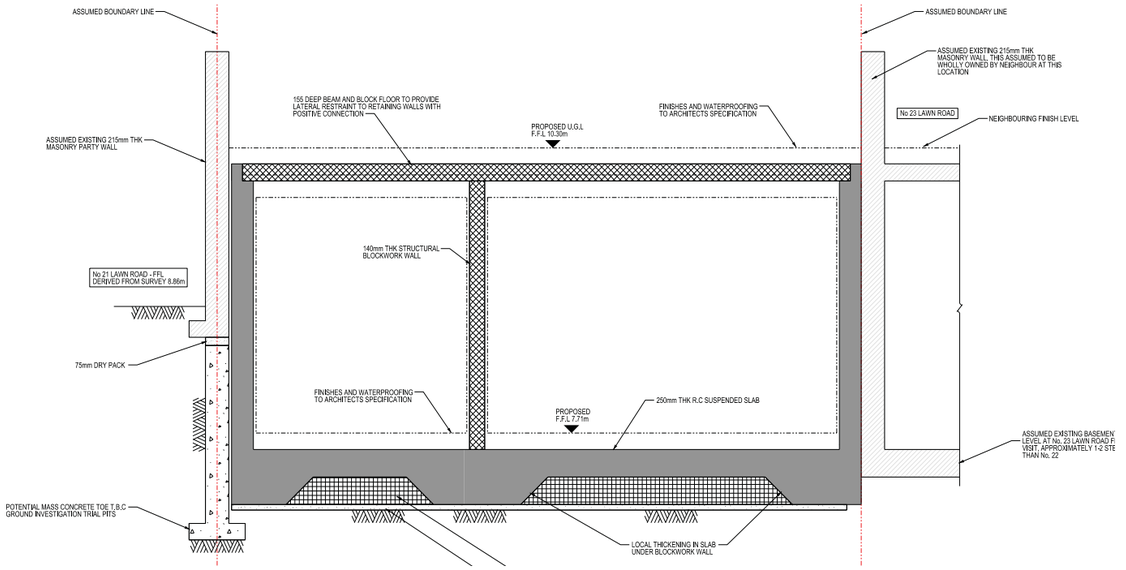
The Party wall with 21 Lawn Road will require underpinning to transfer the vertical load of the existing garden Party wall to the lower level to avoid surcharging the new retaining walls. This will be formed in a sequence to ensure support is always provided to at least two thirds of the wall. The new retaining wall will then be constructed infront to resist the lateral earth pressures and props removed.

The Party wall with 23 Lawn Road will require partial underpinning as there is already an existing lower ground floor at the neighbouring property to the same extent as proposed for 22 Lawn Road. Similary, this will be formed in a sequence to ensure support is always provided to at least two thirds of the wall and then a retaining wall will be constructed infront to resist the lateral earth pressures.

The retaining walls located to the rear of the main house perimeter wall will be formed after the existing masonry rear wall is replaced with a new stability frame and underpinned.



Proposed Basement Section A-A



Proposed Basement Section B-B

Desk Study

3.1
Site History

The earliest maps available for the area date back to 1850 when only a few adjacent roads were present, but no building development in or around the site.

The original building, along with several dwellings to the South, appear to have been built between 1876 and 1894. The street pattern to the immediate North was not developed until around 1934. Following this, the area appears largely unchanged apart from 'Lower Cross Road' to the North becoming 'Garnett Road' somewhere between 1938 and 1954.

From historic bomb map information, the general area appears to have been targeted from bomb attacks in the Second World War, with some properties on street suffering damage however no damage was recorded at 22 Lawn Road.

3.2
Geology

Published geotechnical maps from the British Geological Survey indicate that the local geological strata comprise London Clay Formation with no recorded superficial deposits.

The nearest available borehole from the British Geological Survey is located on Cressy Road and shows approximately 2.9m of Made Ground above 1.85m of stiff brown clay with crystals and then 3.85m of stiff fissured brown silty clay with crystals. Other nearby boreholes indicate a similar soil formation.

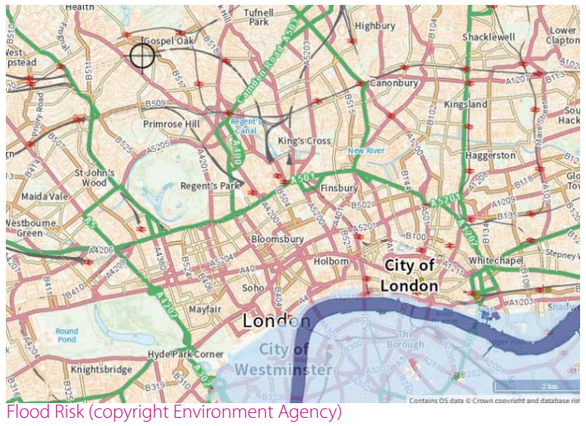
Trial pits undertaken on site reveal the ground conditions to be Made ground / Head deposits over stiff London clay.

Site Plan (copyright Google)

1894 Map (copyright Old Maps)

1996 Map (copyright Old Maps)

Surface Water (copyright Environment Agency)



Flood Risk (copyright Environment Agency)

TFL Asset Search (copyright TFL)

3.3
Hydrogeology

The underlying London Clay cannot support a water table or effectively transmit ground water floor due to its low permeability. Any permeability through this stratum is secondary, through fissures in the clay.

This is described in further detail in the full CGL report in the appendix.

3.4
Hydrology, Drainage and Flood Risk

A desk study of available Environment Agency/ Government flood information reveals a vey low risk from flooding from the sea or from reservoirs and a low risk of flooding from surface water. These is no evidence of current or historic watercourse in or around the site.

No change to the existing site drainage is proposed.

3.5
Other Information

A TfL Asset search shows the site is almost directly above the Belsize tunnel – a Victorian tunnel connecting Kentish Town to West Hampstead.

TfL and Network rail have been contacted regarding this matter with a view to obtaining the required approvals to proceed with the project. TFL and Network rail are still to formally respond, however it is understood that issues are not likely to be raised given the depth to crown.

A manhole was visible to the rear of the building however there was no evidence of other services or utilities across the site.

Screening

A screening assessment has been undertaken by CGL to assess the potential risk posed to local hydrology, hydrogeology and land stability due to the proposed basement construction.

The assessment is undertaken in the form of a series of tables, setting out the questions with regard to the primary concerns associated with the proposed construction. Where 'yes' or 'unknown' can be simply answered with no analysis, these answers have been provided.

Where questions have been indentified as requiring further investigation, these have been summarised below.

4.1
Subterranean (groundwater) flow

No further investigations identified. Please refer to appendix C for their detailed report.

4.2
Slope Stability

QUESTION	RESPONSE
Q5. Is the London Clay the shallowest strata at the site?	Yes. Confirmatory investigation required.
Q7. Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Unknown. The London Clay Formation is susceptible to shrink/ swell. The impact of this on the proposed development and adjacent properties should be assessed, though as no trees are to be felled the development will not significantly change the ground/ structure interaction.

Please refer to appendix C for their detailed report.

QUESTION	RESPONSE
Q13. Will the proposed basement significantly increase the differential depth of foundation relative to neighbouring properties?	Yes. The underpinning of the basement will deepen the foundations relative to the existing foundations. The level of the neighbouring foundations should be investigated and used to inform a impact assessment.
Q14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	Yes. The Belsize Tunnel runs directly beneath the site.

Please refer to Appendix C for their detailed report.

4.3
Surface Water and Flooding

No further investigations identified. Please refer to Appendix C for their detailed report.

4.4
Non Technical Summary of Screening Process

The screening process has identified issues that require assessment to be carried forward to scoping for further assessment:

- Confirm that the London Clay Formation is the shallowest stratum present below the site
- Determine the volume-change potential of the formation level soil
- The proposed development will increase the differential foundation depth between the new basement and the neighbouring properties, impact assessment is required
- The proposed development is above a railway tunnel, impact assessment is required - this is not within the scope of the CGL report

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

Scoping

Based on the screening, CGL have identified issues for scoping and further assessment.

A brief summary is provided below:

- Confimation that the London Clay Formation is the shallowest stratum present below the site.
- Determine the impact of the proposed basement on the volume-change potential of the surrounding soil, particularly from the nearby trees.
- Increasing the differential foundation depth with the neighbouring properties
- Presence of a railway tunnel beneath the proposed development.

Site Investigation / Additional Assessments

6.1
Geotechnical Investigation

CGL were appointed to carry out a geotechnical investigation of the site including trial pits. A borehole was proposed during the initial planning of the ground investigation, however approval is considered unlikely to be given by Network Rail due to the underground railway beneath the property.

Trial pits were dug by hand to establish position, size and depth of existing foundations

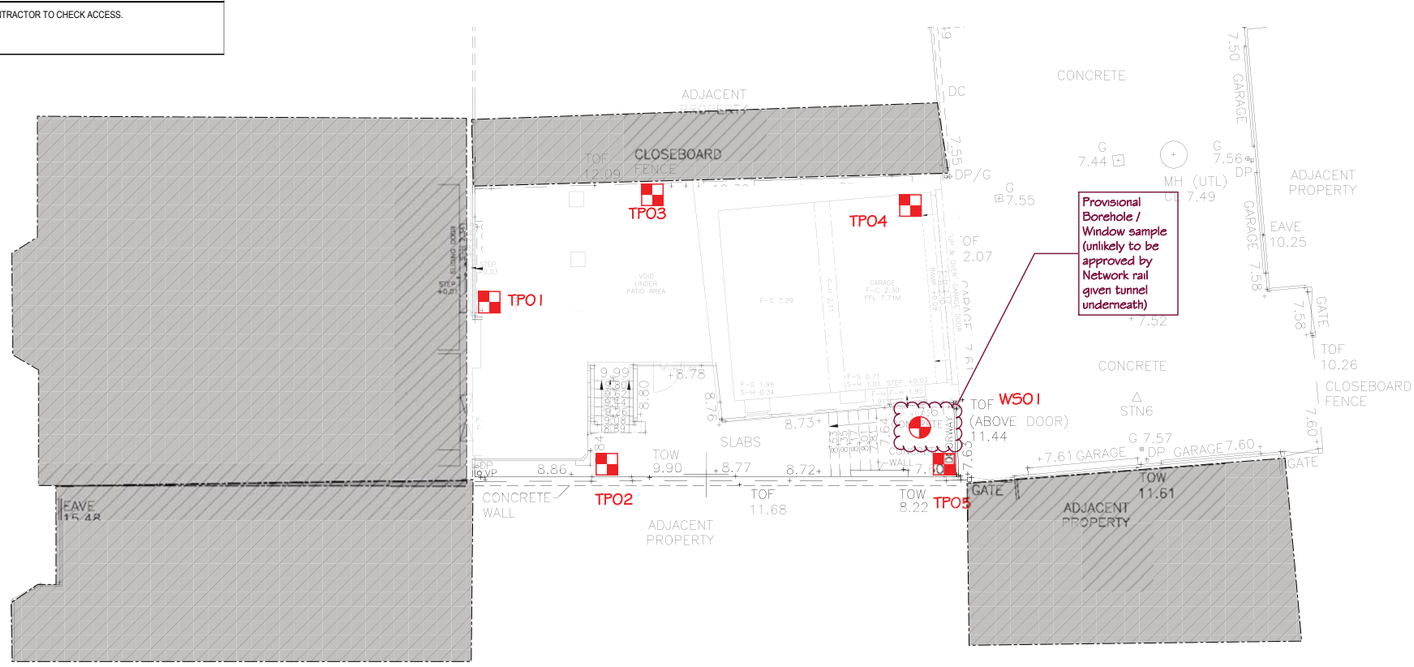
The soil was tested using in-situ SPT and Hand Shear Vane tests. Samples were collected and used in laboratory tests.

The key conclusions were:

- The ground conditions are 0.5m Made Ground / over London Clay Formation. Base depth not proven.
- Heave protection is required due to high plasticity and medium volume change potential.
- The allowable bearing pressure at formation level is 50-60kN/m2 at 0.3m below ground level.
- The concrete design class is DS2 / AC-2s for foundations in the Made Ground.

Please refer to appendix H for CGL's detailed report

GEOTECHNICAL INVESTIGATIONS		
REF	DESCRIPTION OF WORKS	COMMENTS
	REMOVE FINISHES LOCAL TO PROPOSED TRIAL PITS, EXCAVATE DOWN TO ESTABLISH DEPTH OF EXISTING FOUNDATIONS	DEPTH OF EXCAVATION SUBJECT TO DEPTH OF EXISTING FOOTINGS - ALLOW FOR 1.2M DEPTH OF DIG. BACKFILL UPON INSPECTION
	BOREHOLE INVESTIGATIONS TO BE CARRIED OUT IN ACCORDANCE WITH GEOTECHNICAL BRIEF.	CONTRACTOR TO CHECK ACCESS.



Geotechnical Investigations Plan

6.2
Arboricultural Report

At the time of writing, no report has been produced. There are no trees to the rear of the property at 22 Lawn Road. Some trees are visible at the rear of 21 Lawn Road.

Construction Methodology / Engineering Statements

The methodology set out below has been assumed for the purposes of undertaking the planning stage structural design and is provided to demonstrate that the works can be executed with due consideration of the surrounding buildings.

7.1 Outline Geotechnical Design Parameters

The reasonably conservative geotechnical parameters have been determined, based on the site investigation data presented and relevant technical guidance.

The following design parameters have been assumed:

- A bearing capacity of 50kPa is recommended for strip foundations at new basement level
- Concrete should be designed for class DS-2 / AC-2s for disturbed ground
- No groundwater table was present, although local seepage present. Conservatively, the retaining walls have been designed assumed ground water table at surface.

The following design loads have been assumed:

- Imposed load surcharge 10kN/m^2 assumed throughout
- Existing vertical load paths are maintained into formation level below

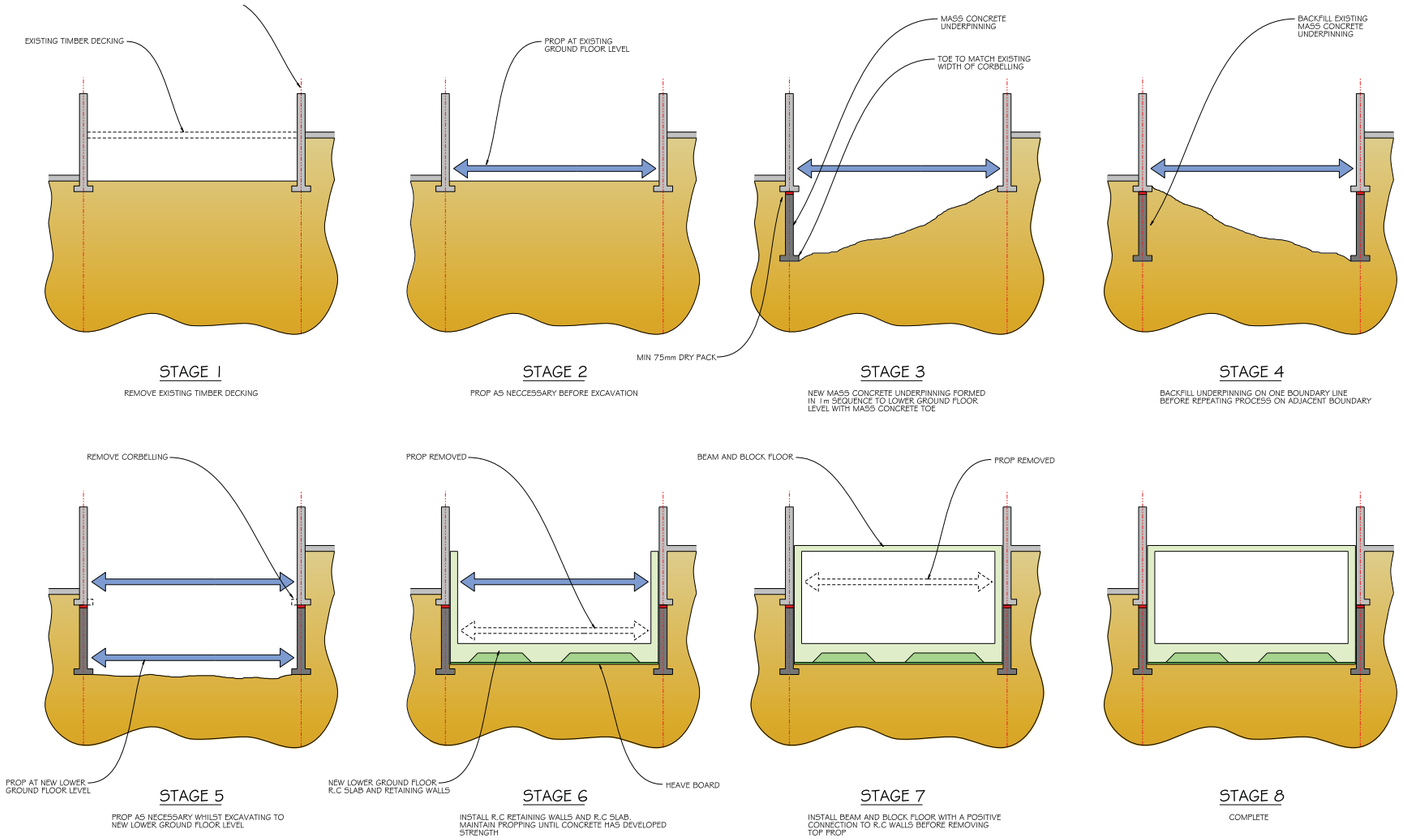
7.2 Outline Temporary and Permanent Works

It is currently proposed that the construction of the basement is undertaken using a traditional underpinning sequence, with a bottom-up methodology.

The garden Party walls will be underpinned in sequence with mass concrete, then propped in the temporary case until an RC lining wall is formed infront to retain the earth pressures.

The existing external rear wall footings will also be underpinned with mass concrete, then propped in the temporary case until a reinforced concrete retaining wall has been formed.

The basement slab will then be cast, with perimeter thickenings to support the walls above and allow the slab to be suspended between them. The slab will be formed above heath protection boarding. The lower ground floor slab will then be installed, after which the propping will be removed.



Construction Methodology Sketches

CONSTRUCTION GENERALLY

The works are required to be undertaken in accordance with all statutory legislation relating to construction works.The

Contractor will be required to demonstrate a positive attitude and commitment toward minimising environmental disturbance to local residents and will be required to be registered with the Considerate

Contractors Scheme.Noise, dust and vibration will be controlled by employing Best Practicable Means (BPM) as prescribed in the following legislative documents and the approved code of practice BS 5228:

- The Control of Pollution Act 1972
- The Health & Safety at Work Act 1974
- The Environmental Protection Act 1990
- Construction (Design and Management) Regulations 1994
- The Clean Air Act 1993

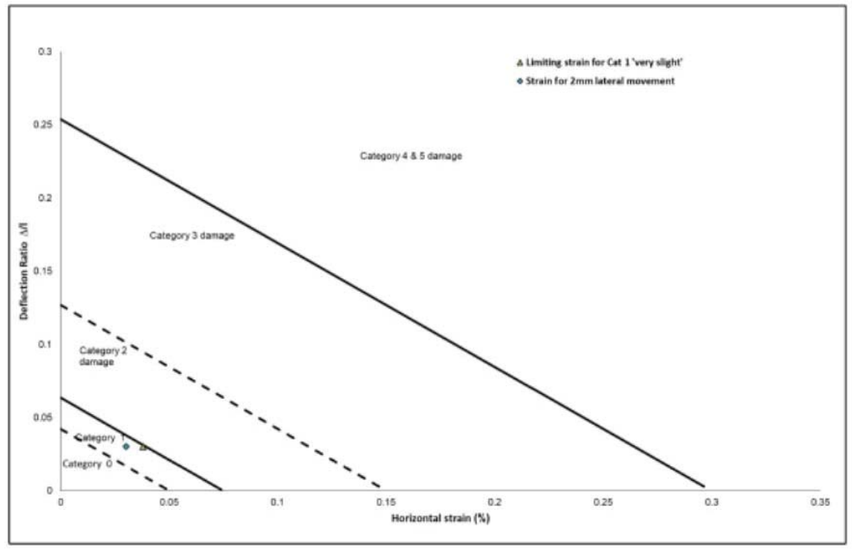
General measures to be adopted by the Contractor to reduce noise, dust and vibration.

7.3
Ground Movement and Damage Impact Assessment

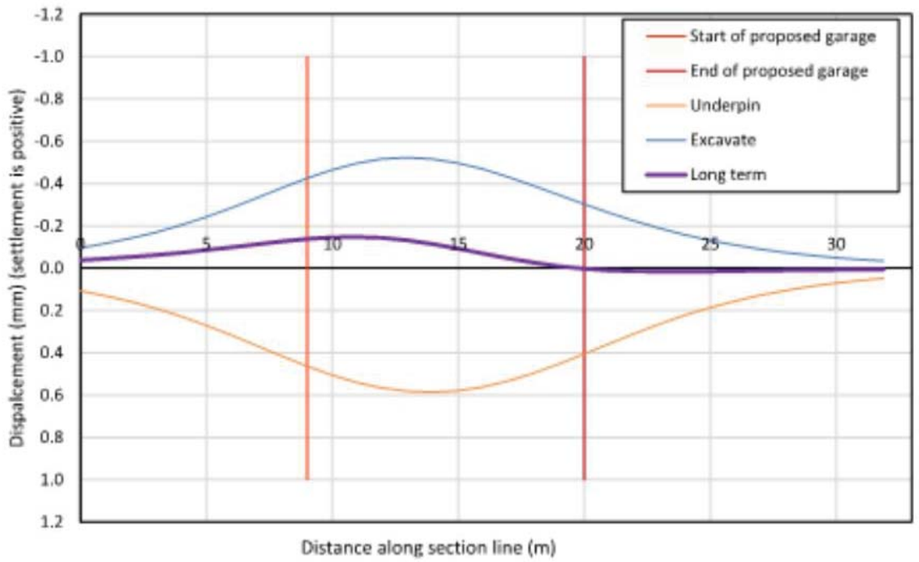
CGL were appointed to carry out a Ground Movement and Damage Impact Assessment. This is described in detail in Part 8 of their report, the results shown in the tables opposite, and summarised below:

The analysis has concluded that the predicted damage to the neighbouring properties from the construction of the basement or retaining walls would generally be 'negligible'.

A preliminary review of ground movements at the Belsize tunnel predicted movements at the tunnel crown of less than 1mm. This will be discussed with Network Rail at the next stage of the design.



CGL Section B-B building damage assessment



CGL - Belsize Tunnel approximate crown level vertical movements

7.4
Control of Construction Works

The adjacent properties are of traditional load bearing masonry construction.

Post-planning, as part of the party wall process, a more detailed structural inspection of the adjacent properties including internal inspections will be undertaken prior to completing any detailed designs.

PARTY WALL CONSIDERATIONS

The works comprise the excavation for a single storey basement within close proximity of adjacent properties on Lawn Road. These works will fall under The Party Wall etc. Act 1996.

The structural scheme adopted has been designed with due regard to maintaining the structural stability and integrity of neighbouring buildings & structures and surrounding land. The structural form of the basement and the method of construction have been developed to ensure that lateral deflections, and associated ground movements, are kept within acceptable limits during and post construction.

MONITORING OF NEIGHBOURING PROPERTIES

The category of damage to adjacent buildings, as classified under Burland et al, anticipated from the proposed construction of the new basement is expected to be category 2 - slight. The Contractor will be required to monitor ground movements during the works to check the validity of the ground movement analysis and the performance of the temporary works and working methods. A 'traffic light' system of green, amber, red trigger values will be set with specific Contractor actions set against each trigger values.

The monitoring method is to be developed further during detailed design but may take the form of precise levelling, geospatial surveying, crack width gauges, strain gauges, inclinometers, or extensometers or a combination of these methods. The monitoring will be undertaken prior to demolition and continue through to completion of the structure.

SUPERVISION OF WORKS

The construction of the basement will be montored at key stages by a suitably qualified engineering professional.

Detailed contractor temporary works methodologies and calculations for all major elements of the works will be produced by the contractor and reviewed by this qualified person prior to any works taking place.

TRAFFIC LIGHT	TRIGGER VALUE (mm)	CONTRACTOR ACTION
Green	<8	No action required
Amber	8-12	Notify the CA and Party Wall Surveyor(s). Increase frequency of monitoring. Implement contingency measures if movement continues.
Red	>12	Notify the CA and the Party Wall Surveyor(s). Implement measures to cease movement and stop work.

Indicative Ground Movement Trigger Values

Basement Impact Assessment

The following section summarises the findings from the CGL report.

8.1
Conceptual Site Model

The Conceptual Site Model (CSM) is described below and presented in CGL's report in the appendices

- The foundation investigation found the shallowest soils on site to comprise of Made Ground. The Made Ground was underlain by London Clay Formation at approximately 0.5m below ground level.
- The monitored groundwater level is below maximum depth of investigations, although local seepages were present.
- Preliminary review of movements at the approximate Belsize tunnel crown level and position indicate movements less than 1mm and vertical stress changes of approximately 4kPa. Base on these results, the risk to the tunnel is excpected to be very low.
- The predicted movements at the private gated road are less than 1mm and are not considered significant.

8.2
Land Stability/Slope Stability

- The site investigation has identified a suitable founding stratum of Made Ground.
- The risk of movement and damage to this developmemt due to shrinkage and swelling of the London Clay Formation is low considering the design of the slab and foundations.
- The Damage Impact to surrounding structures within the zone of influence has been assessed as Category 0-1 in accordance with the Burland Scale.
- The BIA has concluded that there will not be risks or stability impacts to the development and/or adajacent sites due to slopes.

8.3
Hydrogeology and Groundwater Flooding

- The BIA has concluded there is a low risk of groundwater flooding
- The BIA has concluded there are no impacts to the wider hydrogeological environment.

8.4
Hydrology, Surface Water Flooding and Sewer Flooding

- The site is underlain directly by the London Clay Formation which is impermeable and an unproductive aquifer. The proposed basement extension will not extend below the water table, therefore the proposed basement would not impact the subterranean water flow.
- Surface water flows are not anticpated to be materially changed from the existing route or to change the profile of inflows of surface water received by adajacent properties.