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Construction Method Statement for Subterranean Development

MBP-7749- September 2019

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Revision	Issued For	Description	Date	By
1.0	CMS for planning	First Issue.	06/12/19	ASC & RAS

PREAMBLE

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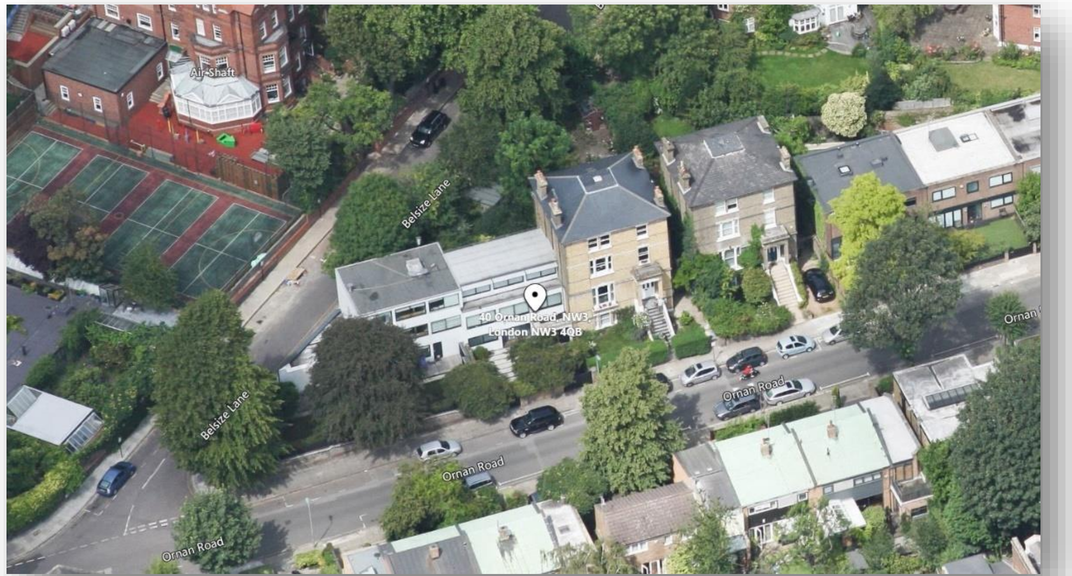
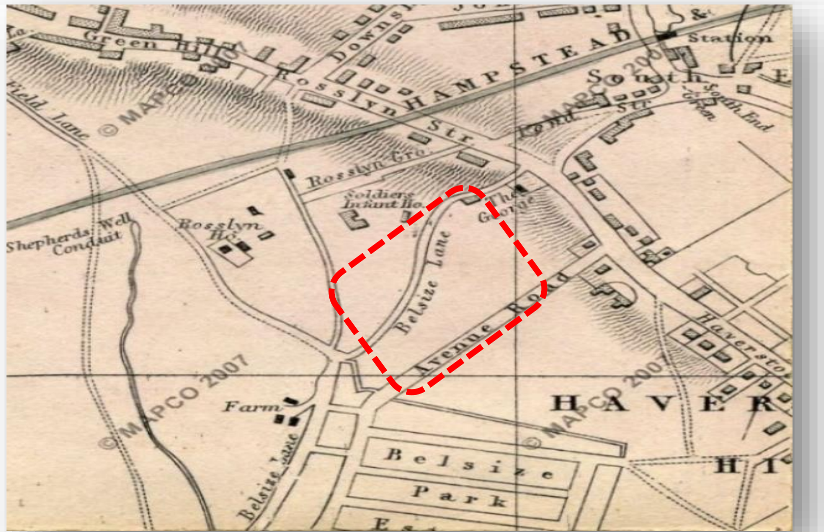
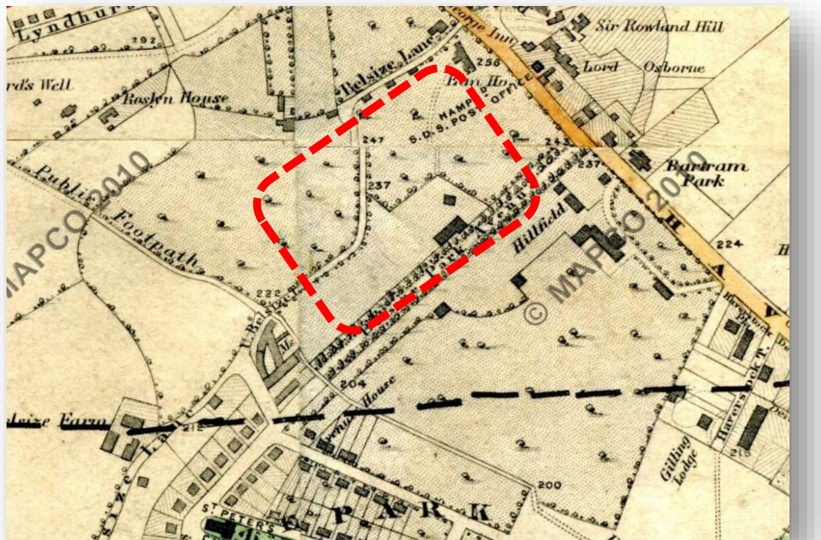




Cross's Map of London 1861



Stanford's Map of London 1864

1.0 PREMISE

Nº.40 Ornan Road is a semi-detached residential property, built in late 1960's and early 1970's. The original dwelling was arranged over two levels from ground to first and the construction is assumed to be traditional with a ground bearing concrete slab and strip foundations supporting loadbearing masonry walls and piers supporting timber upper floor joists. Since, an additional storey has been added above the original construction and it is assumed that this is a lightweight structure, likely steel frame with timber infill to create the flat roof structure.

Under the development proposed, a new single level basement will be constructed beneath the central part of the house and the existing ground floor slab will be replaced above the new basement and extended to the front and the rear of the house to create additional living accommodation. In addition, further alternations have also been proposed for the upper floors and a garden room is proposed within the external landscaping.

This report describes the likely structural solution for constructing the basement development, the interaction of the subterranean extension with the local geology and hydrogeology and its impact on surrounding buildings. Construction techniques are highlighted along with particular requirements for temporary works and excavations.

2.0 THE SITE AND AREA

Nº. 40 Ornan Road is in the London Borough of Camden, in between Belsize Lane to the West, Ornan Road to the South and Perceval Ave to the East.

The area between Lyndhurst Road and Belsize Park Avenue, which stretched south west from Roslyn Street, was largely still open ground and fields during the 17th century except for a few farms and large mansions which owned the estates. In the 1869 Sir Richard Pierce Barker exchanged his lease for lives of the portion of estate south of Belsize Lane for a building lease and planned a new road, Ornan Road. Ornan Road, and the northern side of Belsize Avenue, was to be developed for high class detached and semi-detached houses. Building, mostly by William Willett, proceeded on both sides of Belsize Avenue from 1871 and in Ornan Road from 1878. Further development continued around Belsize Lane into the late 19th century, however the housing built varied greatly in style and occupant.

Charles Booth's Poverty Map categorised Ornan Road in 1886 as middle class and well-to-do (red) albeit surrounded by upper class areas to the north and south (yellow) and some poor or lower-class areas to the east (blue and black).

In 1929 a "comparatively modern" house at the junction of Haverstock Hill and Ornan Road was replaced by a "great garage", which, it was feared, would change the character of the area. In the 1970 the garage which was at the junction of Haverstock Hill and Ornan Road was replaced by the Post House hotel.

London was heavily bombed during WWII and many areas suffered ordnance damage including a few in this area, according to the LCC Records from the time. No. 40 Ornan Road did not suffer bomb damage during WWII, however some properties in the area were either damaged beyond repair (pink shading) or suffered blast damage (orange – general but non-structural and yellow – minor in nature). The main problem after the war was to provide accommodation for those bombed out. Low-rise council housing was built at the eastern end of Fleet Road between 1967 and 1977.

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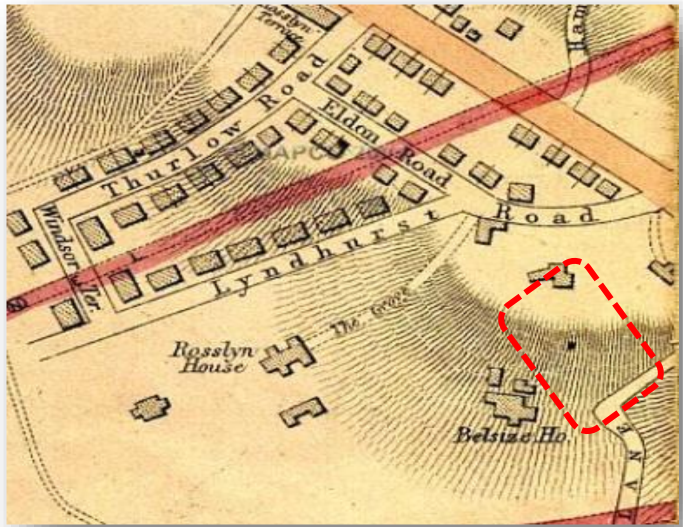
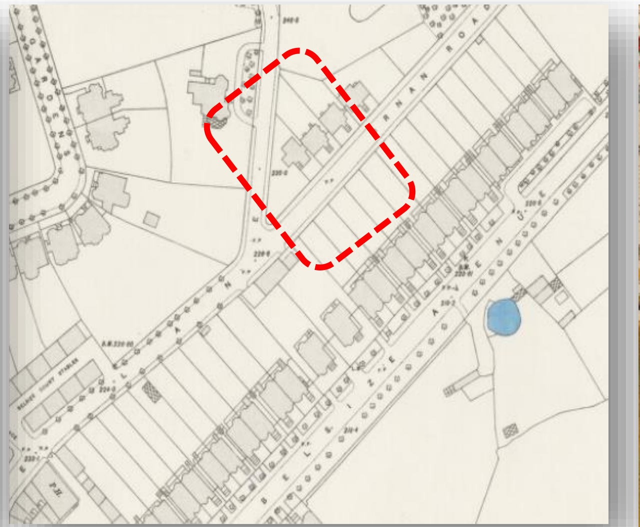
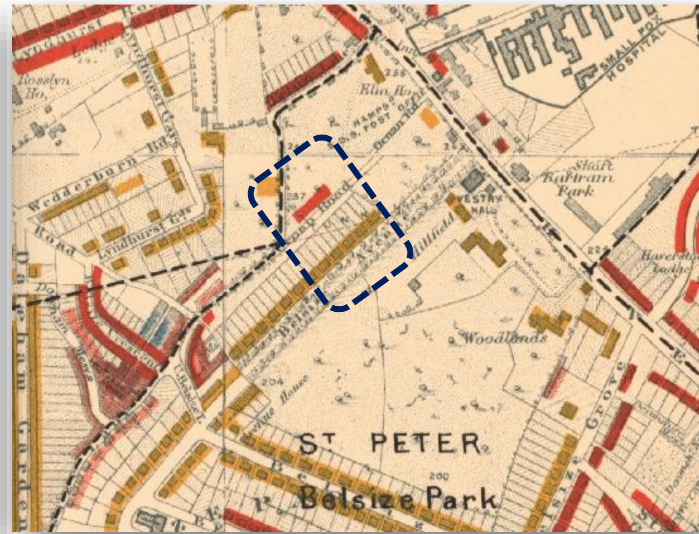


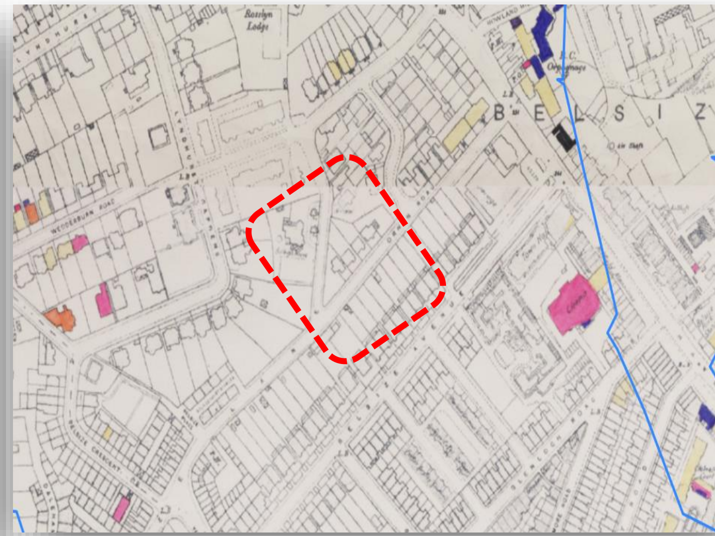
Weller's map 1868



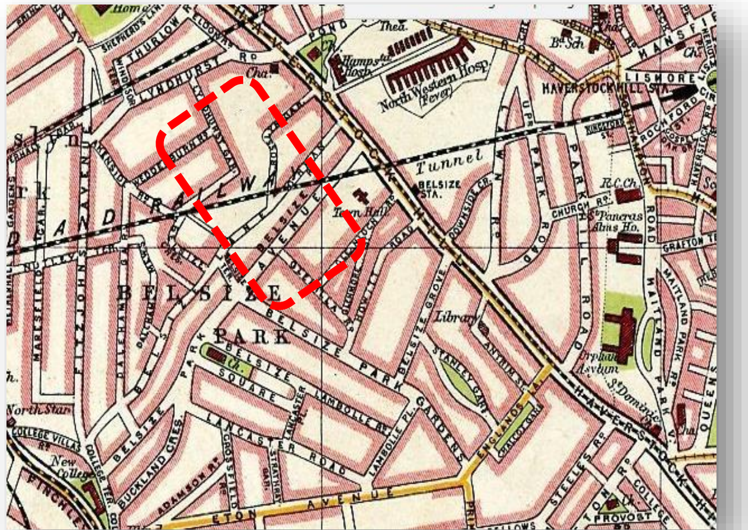
OS Map 1894



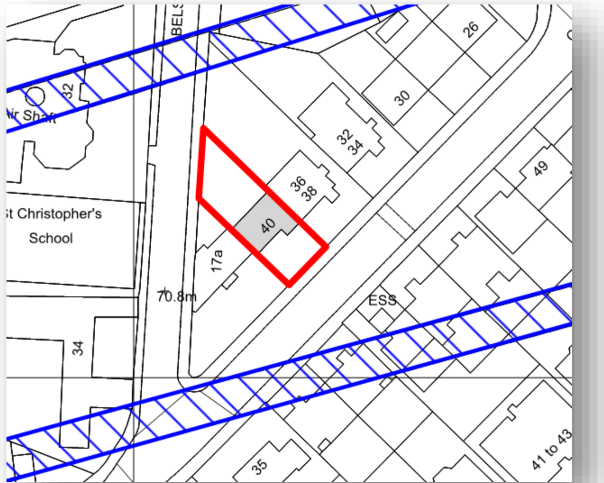
Booth's Poverty Map of London 1886 -1903



Bomb Damage Map



Bart's Map of London 1908

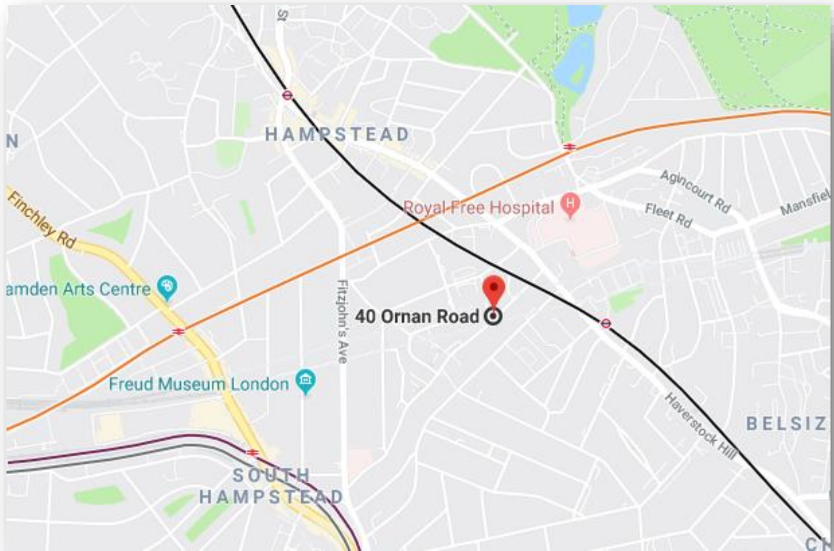


Location of Belsize Tunnels in Relation to 40 Ornan Road

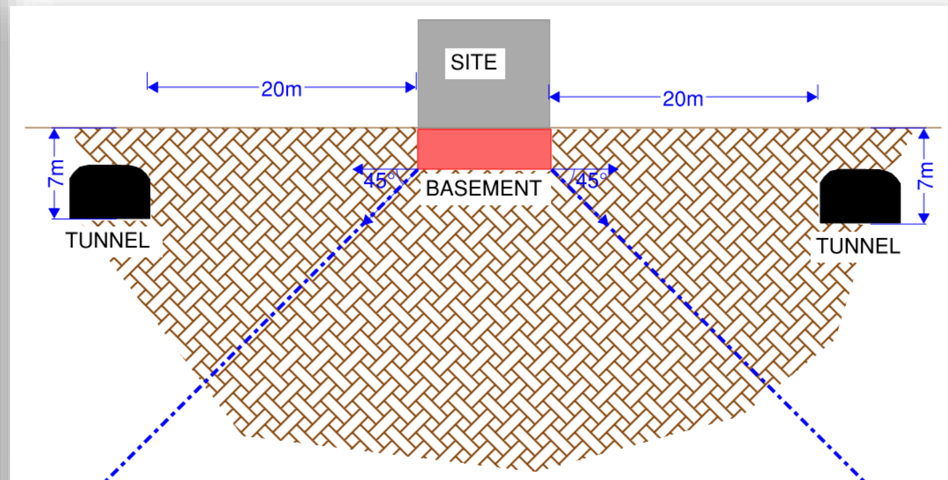
Records suggest that the development of this area was within the last 150 years and, generally, was undertaken with some consideration and deliberation, using good practices and competent materials. The area was light agricultural, grazing or perhaps hunting land before it was developed and has not been used in the past for industrial purposes, nor has it been repeatedly developed.

The London Underground Northern Line tunnel is located to the North East of the site, approximately 120m away, and the Jubilee and Metropolitan tunnels are located approximately 800m to the South West of the site and are both therefore sufficiently far enough away not to have any impact on the proposed excavation or cause any vibration issues to the property at Nº. 40 Ornan Road.

Two railway tunnels, Belsize and New Belsize, which are on the Midland Main Line connecting Kentish Town and West Hampstead Thameslink are located to the North and South of the site approximately 20m away. The tunnels are sufficiently far enough away and deeper than the subterranean development not to have any impact on the proposed excavation.



London Underground Northern Line and Jubilee and Metropolitan Lines



Zone of influence from basement towards railway lines

There are trees present to the front and rear of the property within the boundary and also some large trees in the adjacent properties close to site. Consideration of the ground conditions and distance of the basement away, using the NHBC guidelines for building near trees, has concluded that the basement will be founded below the depth of the desiccation zone and so the trees will not impact on the subterranean development.

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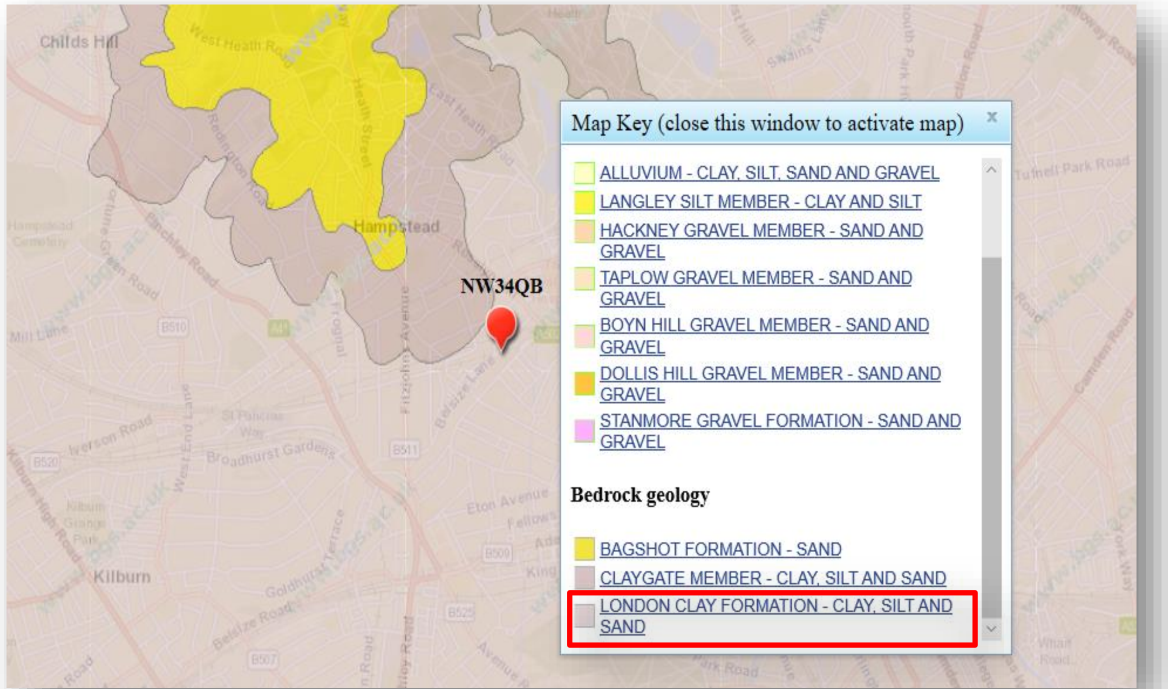
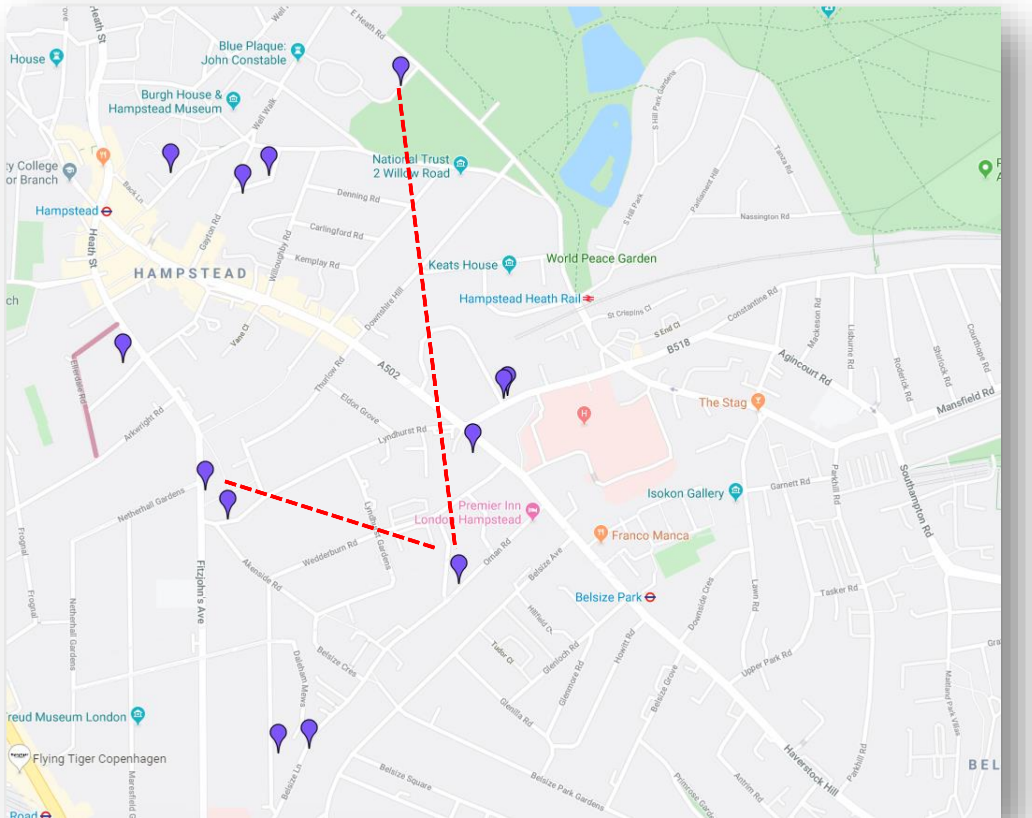


British Geological Map



Site Investigations near 40 Ornan Road

3.0 LOCAL GEOLOGY & HYDROGEOLOGY

The British Geological Survey maps show that that superficial deposits are not expected, and the area is underlain by the London Clay Formation (clay, silt and sand) to depth A number of nearby investigations from other Michael Barclay Partnership's projects provide more detail:

(1) From an MBP Borehole in Fitzjohn's Avenue:

Up to 1.75m of MADE GROUND over CLAYGATE MEMBER which comprised of interbedded horizons of stiff orange-brown mottled greyish brown and greenish grey silty sandy clay and clayey silty sand which extended to18m (depth of the borehole). Groundwater was encountered at 7m bgl in one of the boreholes.

(2) From an MBP Borehole on Heathside:

Up to 1.0m of MADE GROUND over CLAYGATE MEMBER to 6.7m bgl over LONDON CLAY to 15m bgl (depth of borehole). Groundwater was encountered at 2.5m bgl.

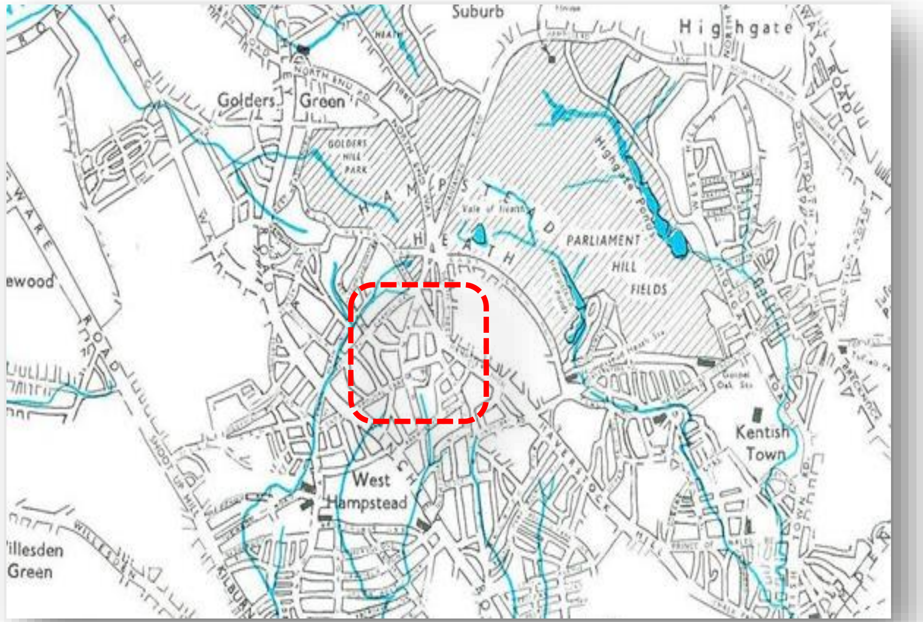
The investigation on Fitzjohn's Avenue is within 500m of the Ornan Road site and the investigation on Heathside within 1000m so are both representative of the near-surface geology in the area. It can be expected with a high degree of certainty that the geology at Ornan Road will be similar, although it is expected that the Claygate member may not be present.

A site-specific investigation completed by **GEA Ltd. in September 2019** confirmed the near-surface geology to be made ground extending to depth of between 0.30m and 1.2m. The made ground generally comprised of dark brown silty clayey gravelly sand with fragments of concrete and bricks.

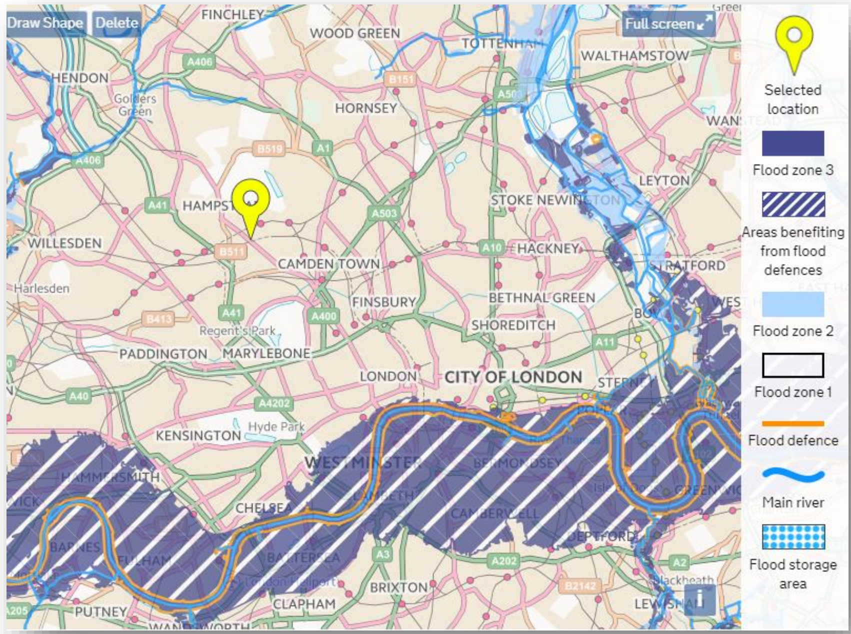
The made ground is underlain by the undisturbed London Clay which comprised firm becoming stiff occasionally mottle bluish greay becoming greyish brown silty clay with some cystals. Plasticity index tests indicate that this layer has a high volume change potential. The boreholes were dry during drilling, however following monitoring visits recorded water levels between 1.3m and 5.45m below ground level. It was noted that the groundwater levels measured are thought to be as a result of rainwater infiltration and are not representaitve of a continuous groundwater table.

The SI report noted that based on preliminary assessment, the allowable bearing capacity of the underlying clay at the proposed basement formation level can be taken as 150kPa. The basement excavation will cause unloading of the underlying clay at proposed basement level resulting in potential long term heave. However, generally more than half of the rebound occurs immediately during excavation and construction and before reload of the new structure. Any residual heave pressures will be taken into account in the design of the basement structure.

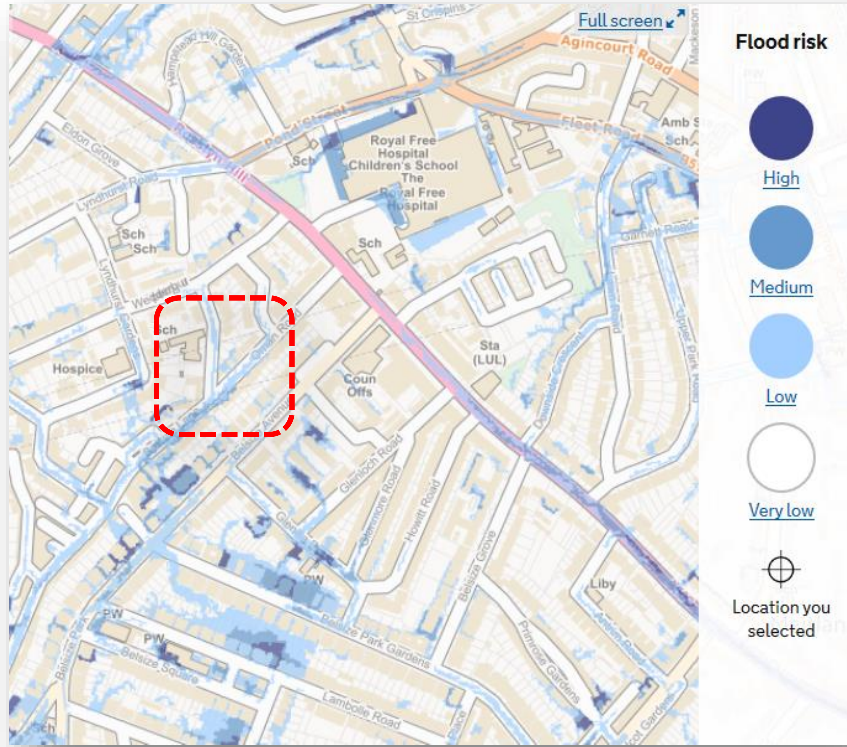
Although the continuous water table is likely lower than formation level, the basement will be designed to accommodate groundwater in line with the current design standards (British or Euro) which require the water table to be considered to a reasonable height. Allowing for the impact and influence of burst water mains etc., the basement will be designed for water to full height.



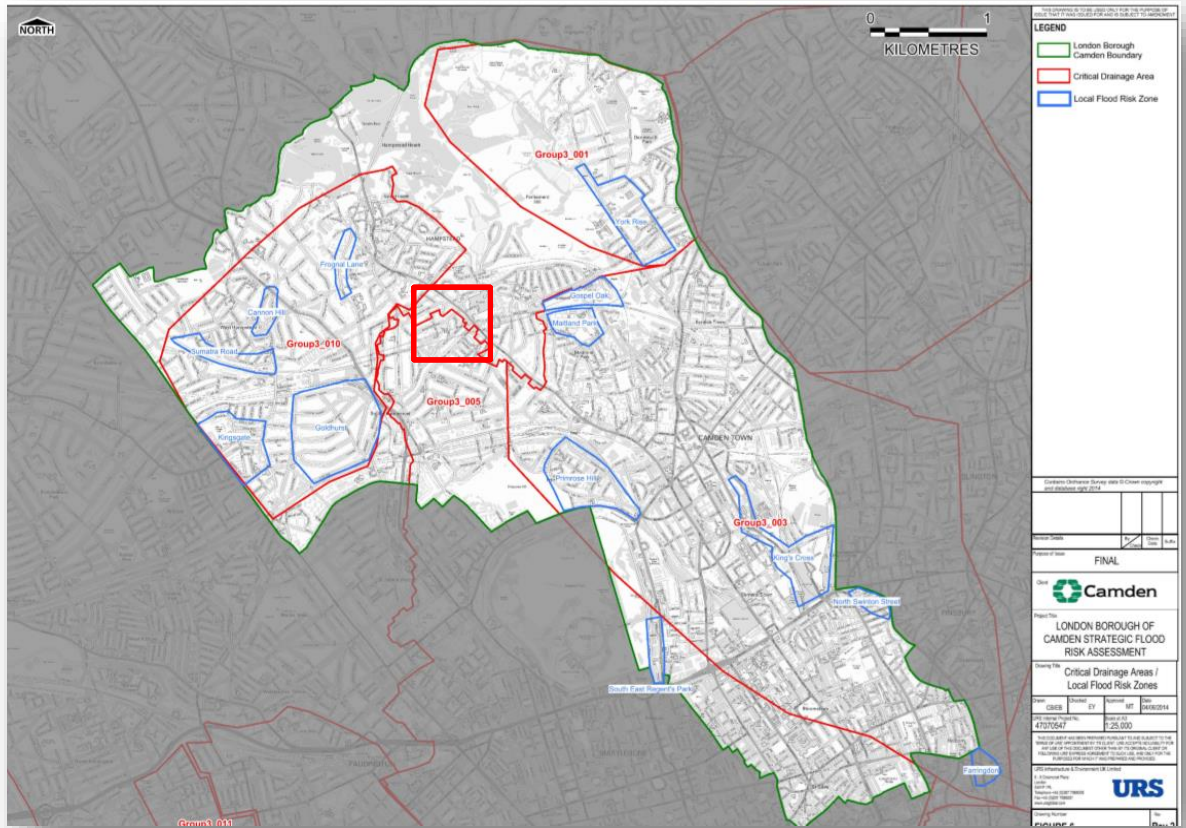
Lost Rivers of London



Flood Risk from rivers or the sea Zone Map



Map showing Flood Risk from Surface Water



LBC's Critical Drainage Area – Ornan Road

There are numerous 'lost' rivers running below the ground in London, however, it can be seen that the site is situated approximately 250m from a tributary of the Tyburn river to the east and approximately 400m from a tributary to the west which is not close enough to raise concern with regards to the proposed basement excavations.

The Environment Agency's Flood Map for planning indicates that the land and property at Nº. 40 Ornan Road lies outside Flood Zone 3 and is within Flood Zone 1 Low Risk, having a less than 1 in 1,000 annual probability of river or sea flooding and therefore does not require a full Flood Risk Assessment (FRA) for planning.

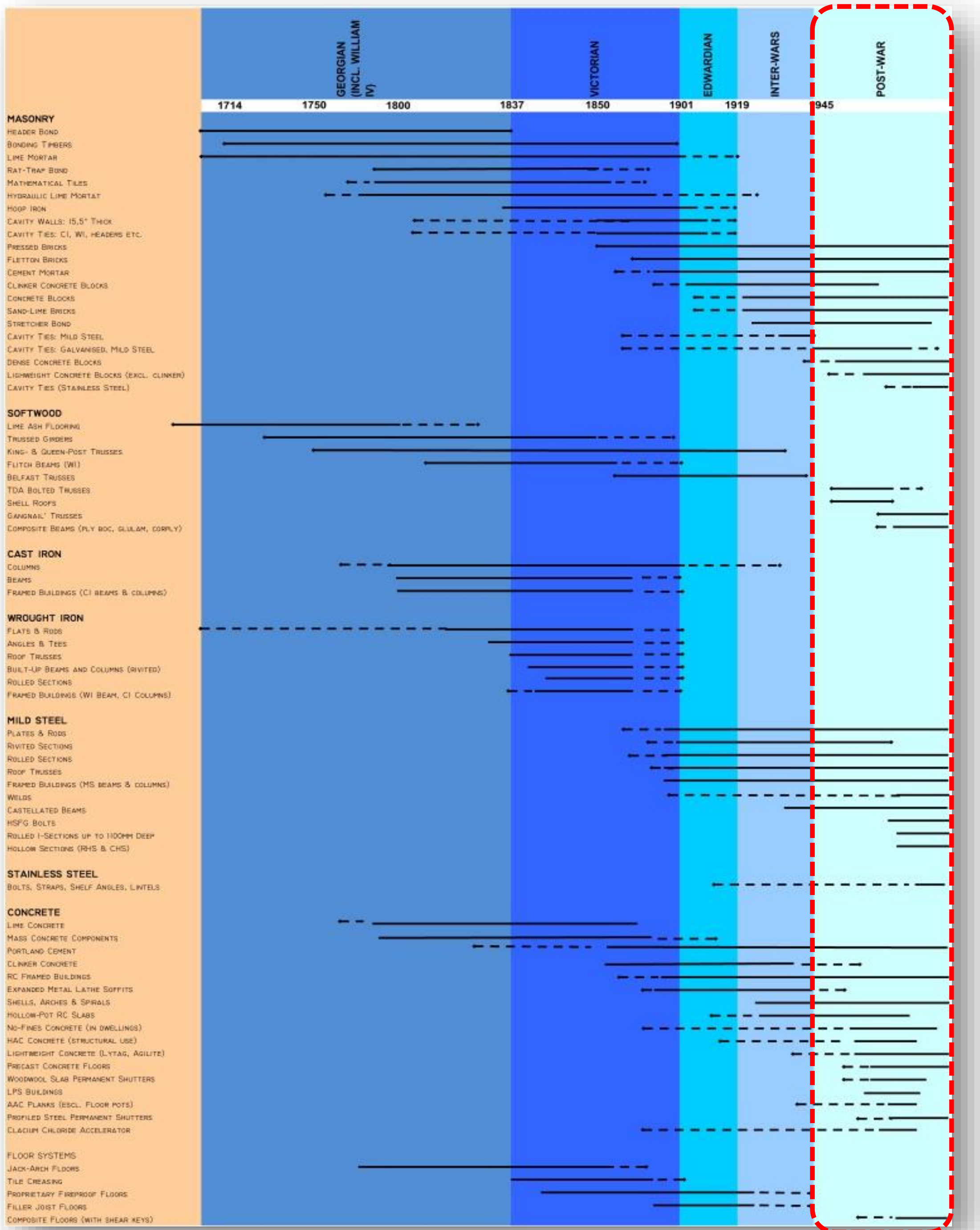
The London Borough of Camden strategic flood risk assessment plan identifies and provides maps showing critical drainage areas within the borough. Nº. 40 Ornan Road lies inside the Camden critical drainage area boundary, however according to the Environment Agency's flood maps, the site is within an area noted as having low to medium risk of the drains being surcharged during periods of heavy rainfall. The new drainage system for both rain water and wastewater will be designed in accordance with the latest regulations, which will also include a one-way valve to reduce the risk related to surcharges from the public sewers.

4.0 THE EXISTING BUILDING

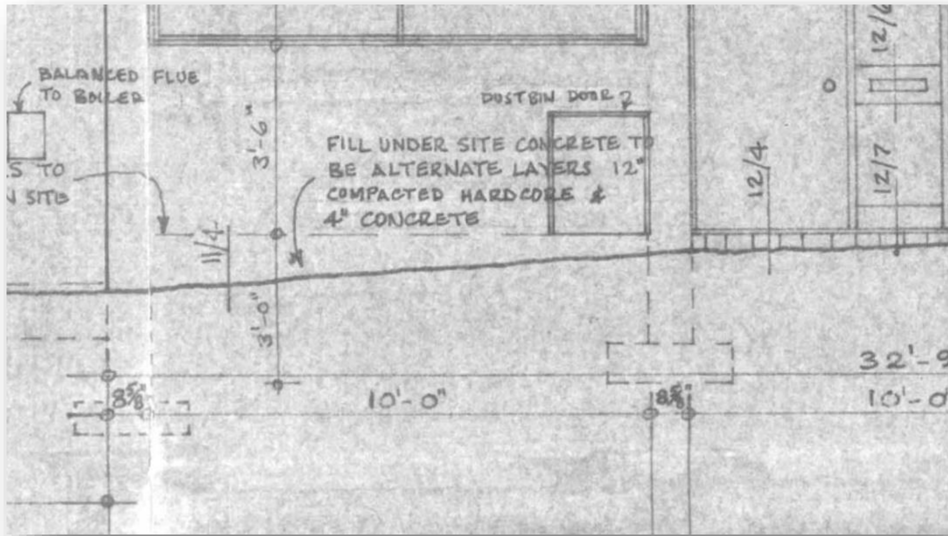
According to the desk study conducted on the site, the existing building on Ornan Road was originally built as one of a pair in 1970 to a design by eminent architect John Winter. It extends to approximately 2,138 sq ft including the two garages (one integral) and has off-street parking and extremely private walled gardens at the front and rear. As is typical of buildings constructed during this period, it is assumed to have a ground bearing concrete slab, likely to be a thin concrete slab bearing onto hardcore, and concrete strip foundations which are typically 600mm wide. The foundations support loadbearing masonry walls and piers; blockwork for the internal leaf and brickwork external leaf for the external walls and blockwork for the internal walls. The walls support timber upper floor joists covered with tongue and groove boarding. Originally consisting of two stories, a third story was added to the house in 2004 above the original construction and it is assumed that this is a lightweight structure, likely steel frame with timber infill to create the walls and flat roof structure.

The assumed existing structure is confirmed on the record drawings; the existing foundations of the house are shown as concrete strip footings supporting the load bearing masonry walls above, founded around 900mm below ground level. Trial pits excavated along the boundary with No. 38 Ornan Road confirmed that the masonry garden wall is founded on a shallow mass concrete footing.

The building is in good condition and benefits from recent internal improvements although the original loadbearing walls are still in place. There is no evidence of distress or damage to the construction or fabric of the building, such as bulges, cracks, significant dampness or decay, the floors are level and the walls are plumb and sound. The house was built originally on good foundations and formations and has been well maintained. There is therefore no evidence or suggestion that its construction cannot tolerate the proposed works, both in their execution or when complete.



Construction Timeline



Extract from Previous Drawing showing Existing Strip Footing

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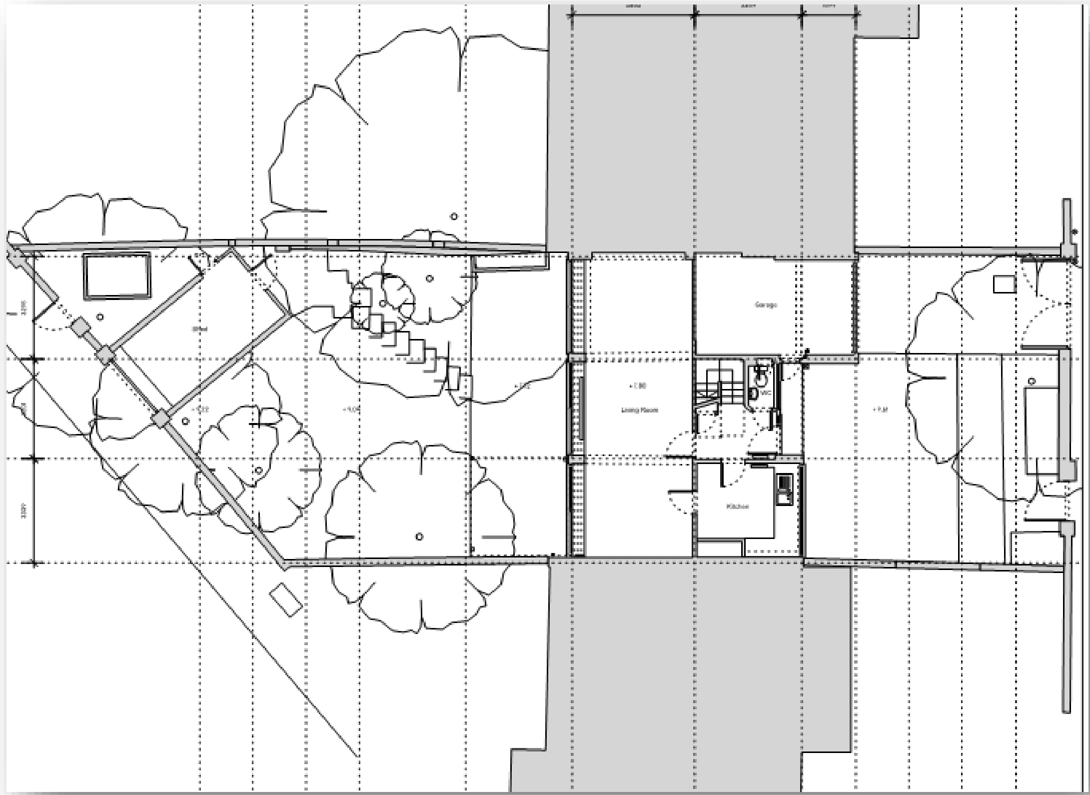
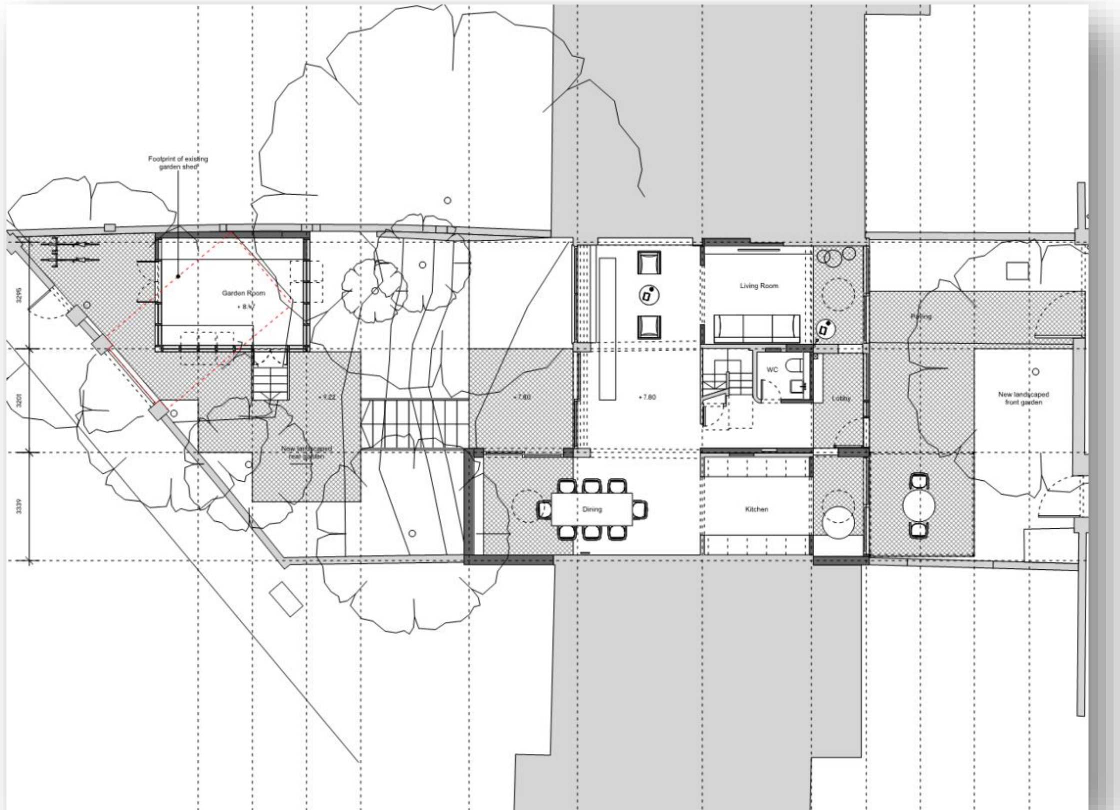


Plan of the existing ground floor



Plan of the proposed ground floor

5.0 THE PROPOSED DEVELOPMENT

The proposed development will construct a single level of basement beneath the middle 1/3 of the house, inside the existing footprint of the house, including a new ground bearing basement slab. The construction and stability of this property is not shared with its neighbours, however the construction of this basement will have to be undertaken with care and due consideration to the surroundings. The section of the ground floor over the proposed basement, assumed to be a ground bearing concrete slab, is to be removed and replaced with new reinforced concrete slab supported on the basement walls.

BELOW GROUND LEVEL

The proposed development will construct a single level of basement beneath the middle 1/3 of the house. Removing underlying soil to accommodate the basement will relieve some of the pressure on the underlying London Clay however, there will be the weight of the construction above imposed around the perimeter and we estimate that this relief will not be significant, will not lead to noticeable swelling of the clay and so will not impact significantly on the surrounding buildings and foundations, which has been our experience empirically and theoretically in similar developments in this area of London. There are no known services in the rear garden but a survey before works commence will be required to identify, establish and protect if necessary during the construction process.

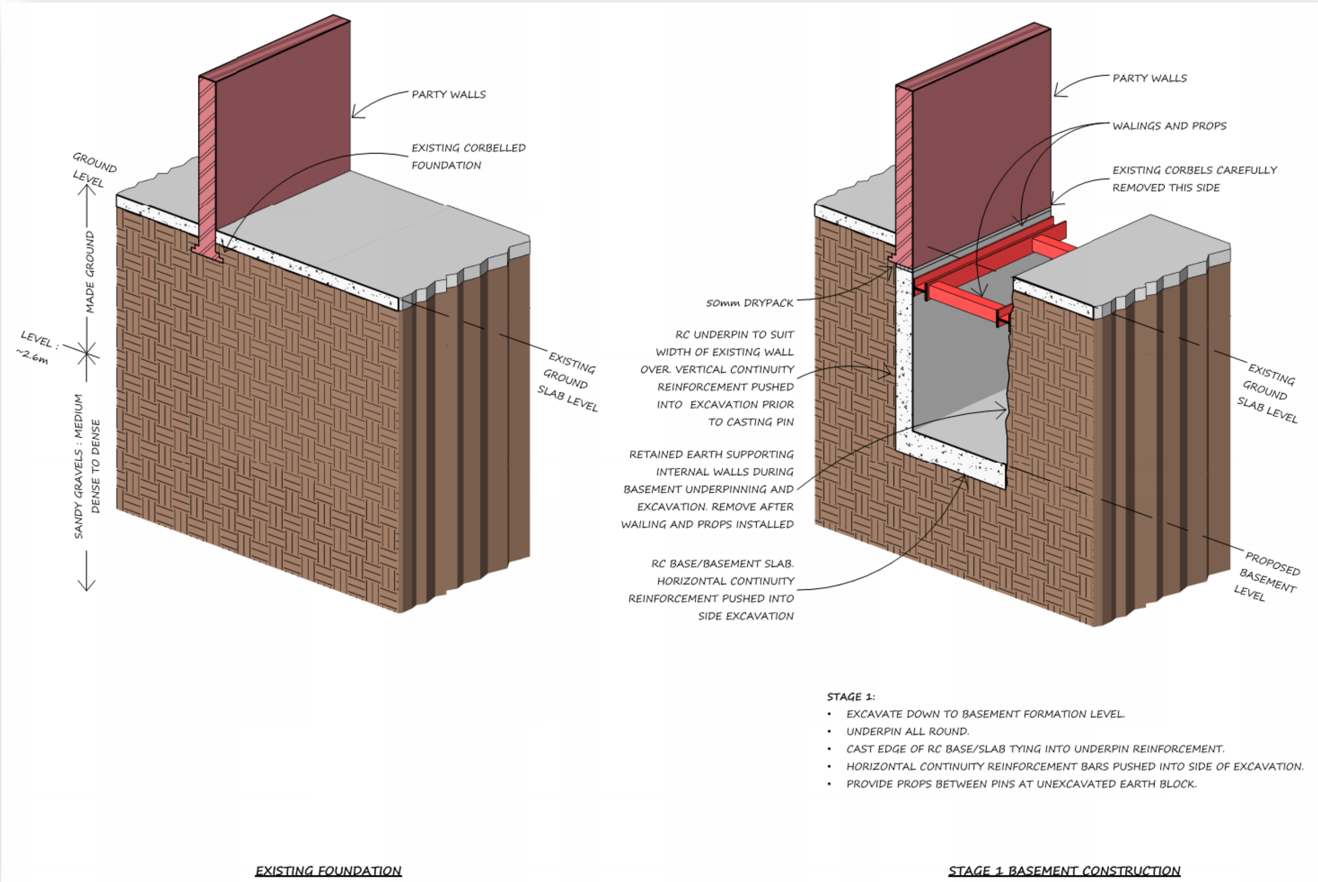
The new basement, along with the ground slab it will support, will be constructed in reinforced concrete. Although considerably above the prevailing groundwater level the new construction will be provided with either a *Type A (barrier)*, *Type B (structurally integrated)* or *Type C (Drained)* protection against ingress of water, as defined by BS 8102:2009 and constructed and detailed to achieve a Grade 3 Level of Performance, as defined by BS 8102:2009. Advice relating to the correct materials and detailing should be sought from a Certificated Surveyor in Structural Waterproofing (CSSW) at the design stage to ensure that the required levels of watertightness are achieved.

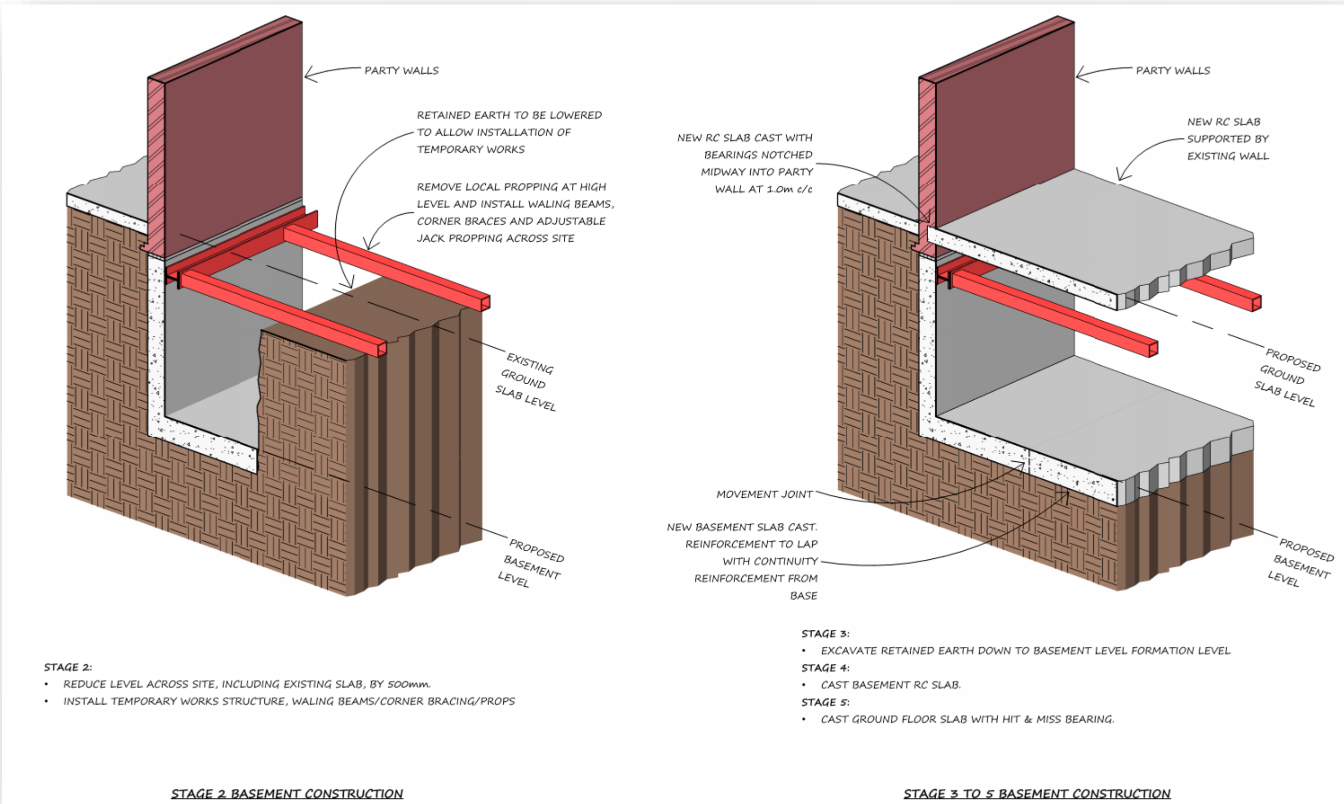
Table 2 **Grades of waterproofing protection**

Grade	Example of use of structure [A)]	Performance level
1	Car parking; plant rooms (excluding electrical equipment); workshops	Some seepage and damp areas tolerable, dependent on the intended use [B)] Local drainage might be necessary to deal with seepage
2	Plant rooms and workshops requiring a drier environment (than Grade 1); storage areas	No water penetration acceptable Damp areas tolerable; ventilation might be required
3	Ventilated residential and commercial areas, including offices, restaurants etc.; leisure centres	No water penetration acceptable Ventilation, dehumidification or air conditioning necessary, appropriate to the intended use

A) The previous edition of this standard referred to Grade 4 environments. However, this grade has not been retained as its only difference from Grade 3 is the performance level related to ventilation, dehumidification or air conditioning (see BS 5454 for recommendations for the storage and exhibition of archival documents). The structural form for Grade 4 could be the same or similar to Grade 3.

B) Seepage and damp areas for some forms of construction can be quantified by reference to industry standards, such as the ICE's *Specification for piling and embedded retaining walls* [1].





We propose that this construction is achieved using a combination of retained excavations and underpinning techniques and sequencing to build in the walls in stages, horizontally and vertically. The existing internal walls will be directly underpinned to form the walls to the sides of the basement while the walls to the front and rear of the basement will be constructed following a hit & miss sequence.

Although a lengthy process, underpinning by hit-&miss-sequencing is a low-impact technique that permits the maximum space to be achieved and has the least impact on existing constructions, boundaries and the like. Casting the wall in pins controls the extent of soil exposed, avoids extensive temporary works and they can be controlled in size and sequence to reflect and accommodate the condition and capability of the walls they will be built beneath.

The material removed will be made ground and London Clay, and while their excavation will relieve pressure on the underlying, stiffer London Clay, our determination and expectation are that this relief will not be significant, will not lead to noticeable swelling of the clay and so will not impact significantly on the surrounding buildings and foundations. Such heave that may occur will mostly, i.e >50%, occur immediately on excavation, much of the remainder during the works leaving a small residual pressure that the new construction will accommodate.

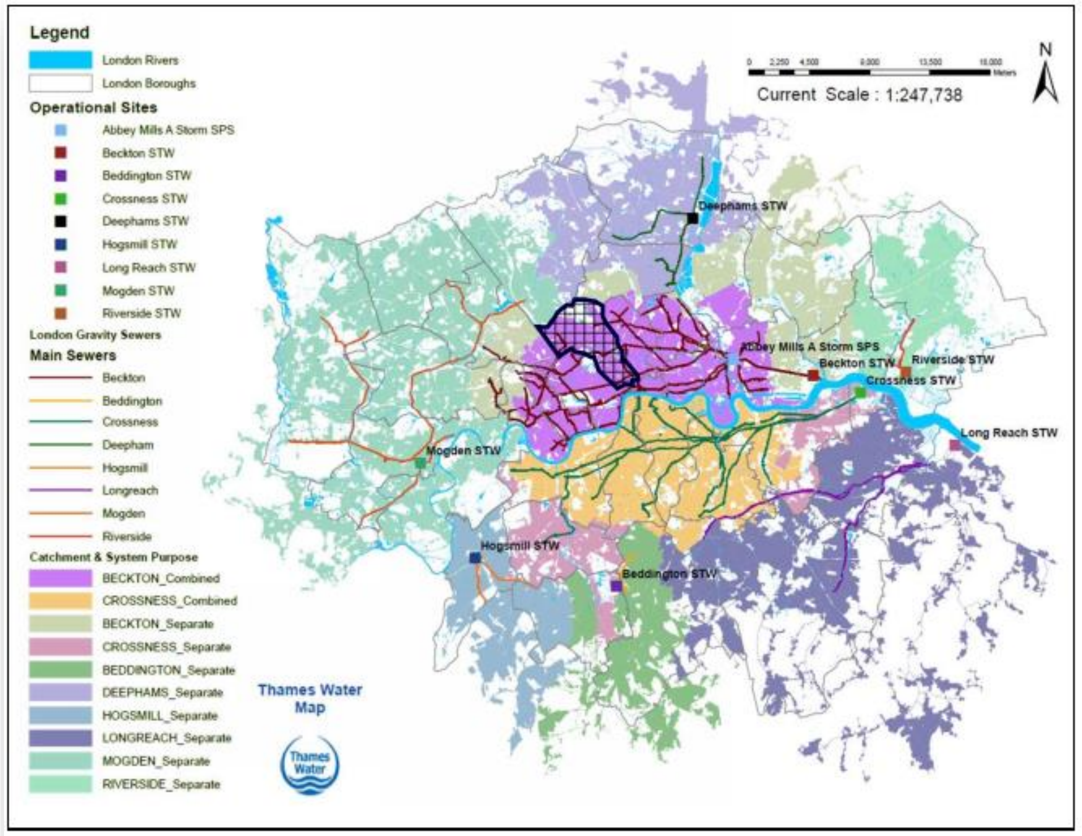
There is no active groundwater within the proposed construction zone but to achieve Grade 3 Performance we propose a bentonite-impregnated membrane is installed between the back of the concrete wall elements and the retained soil and have specified VOLCAY supplied by CETCO.

The basement slab will be a reinforced concrete raft cast on a suitable sub-base and will be formed off the underlying London Clay. While neither pad nor strip foundations are intended, the slab will be thicker beneath the lines of the walls above. The ground floor, assumed to be ground bearing concrete slab, is to be removed and replaced with new reinforced concrete supported on the new basement walls.

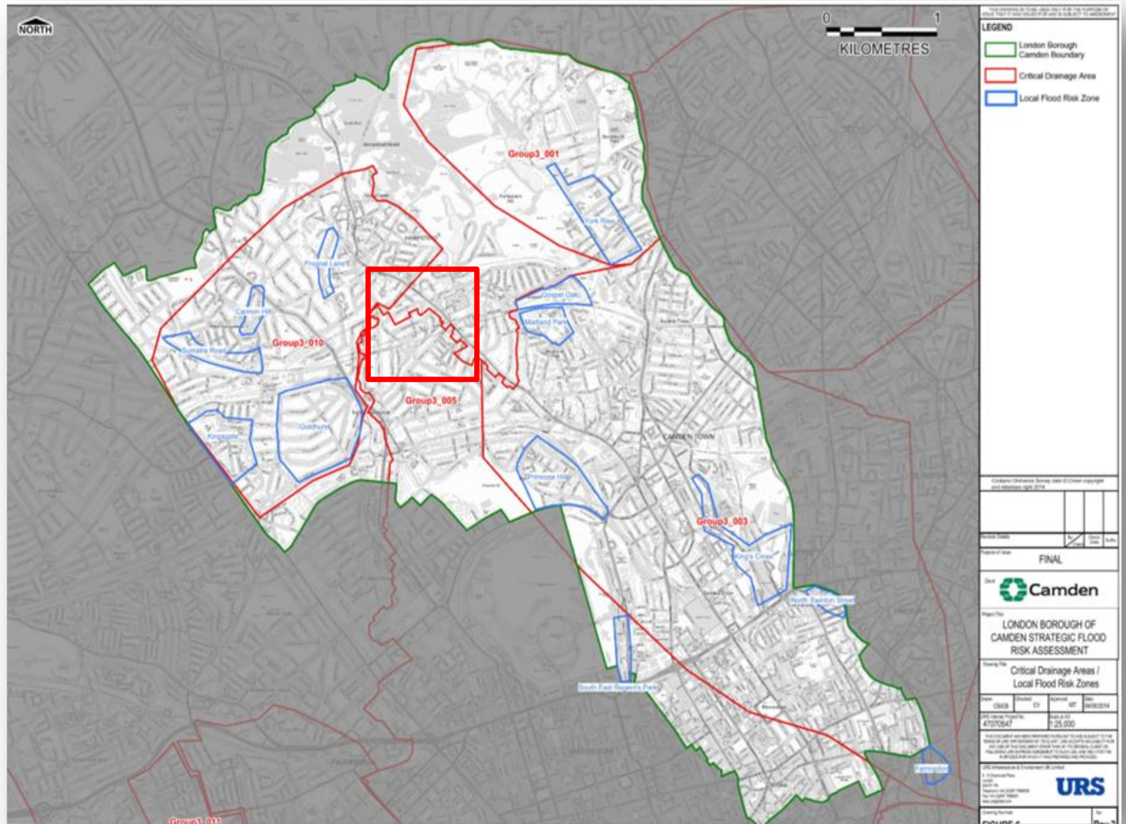
ABOVE GROUND LEVEL

There are planned remodelling works to the upper floors of the house; single storey extensions to the front and the rear at ground floor level plus some layout changes to the first and second floors. Any works to the upper floors which may impact the new basement will be accommodated by the design, detailing and construction.

A garden room is proposed within the landscaping, however the construction for this will not impact the new basement.



Extract from London Sustainable Drainage Action Plan – black hatched area shows London Borough of Camden has combined drainage system



LBC's Critical Drainage Area – 40 Ornan Road

6.0 DRAINAGE & SuDS

The proposed development will occupy a slightly larger plan area than the existing but will provide the same level of accommodation and occupancy, so the site will not generate any greater discharge to the public sewer than it has the potential to currently and in the past. The proposed main building roof area remains unchanged, however there are two single storey ground floor extensions which will provide additional roof area to the building as a whole. Overall, the footprint of the development will remain unchanged and so the run-off to the public storm water sewer will remain the same.

The scale and scope of the development works will combine existing gravity flow from the upper floors and roof and new pumped flow from the basement. The final connection between this system and the combined public sewer, as highlighted in the London Sustainable Drainage Action Plan, will include an anti-flood valve to protect the property from surcharges in the public sewers. The system will be designed to cope with local surface flooding as well as the required uplift for climate change.

The underlying soil profile does not support natural percolation of surface water, however it is proposed that some run off will be collected to maintain the soft landscaping. There will be additional soft landscaping as a result of the inclusion of green rooves, however there may not be sufficient space within the soft landscaping to accommodate soakaway drainage so all run-off is proposed to discharge to the public system, based on an accumulative roof area just over 100m^2 and a discharge rate of 5 l/s for 100year storm + 30% for climate change. The basement will be pumped via a **Flygt Compit Pump Station f**itted with a non-return check valve.

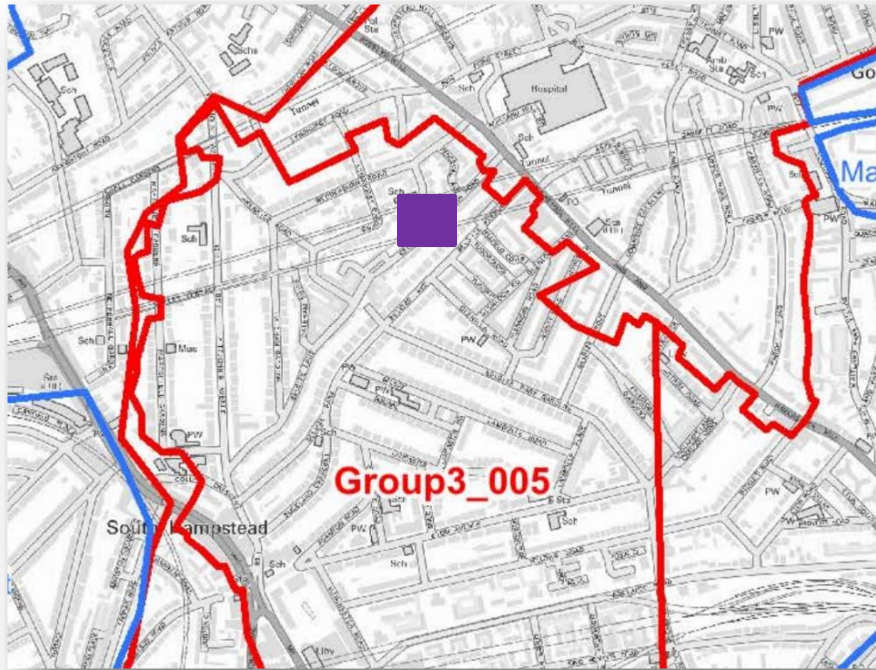
This area of LBC lies inside a Critical Drainage Areas so may be susceptible to flooding from Overland Flow, Surface Ponding, Sewers & Groundwater:

(1) **Ponding** is a risk around the exposed area of the TfL network, which does not include this site.

(2) **Overland Flow** runs to the west of the CDA whereas this site is to the east of the CDA.

(3) Risk form a **Sewer Surcharge**, which could run at near-capacity during an extreme event will be accommodated by inclusion of a non-return valve.

(4) The basement construction will be protected from **Groundwater** ingress by bentonite-impregnated membrane externally and by a drained cavity internally.



Extract from LBC's Critical Drainage Area showing location of site within critical drainage area (red)

Damage Category	Description of Typical Damage	Approximate Individual Crack Width
Negligible (0)	Hairline cracks	< 0.1 mm
Very Slight (1)	Very slight damage includes fine cracks which can be easily treated during normal decoration, perhaps an isolated slight fracture in building, and cracks in external brickwork visible on close inspection.	1 mm
Slight (2)	Slight damage includes cracks which can be easily filled and redecoration would probably be required, several slight fractures may appear showing the inside of the building, cracks which are visible externally and some repointing may be required, and doors and windows may stick.	< 5 mm
Moderate (3)	Moderate damage includes cracks that require some opening up and can be patched by a mason, recurrent cracks that can be masked by suitable linings, repointing of external brickwork and possibly a small amount of brickwork replacement may be required, doors and windows stick, service pipes may fracture, and weather-tightness is often impaired.	5 mm to 15 mm or a number of cracks > 3 mm
Severe (4)	Severe damage includes large cracks requiring extensive repair work involving breaking-out and replacing sections of walls (especially over doors and windows), distorted windows and door frames, noticeably sloping floors, leaning or bulging walls, some loss of bearing in beams, and disrupted service pipes.	15 mm to 25 mm but also depends on the number of cracks
Very Severe (5)	Very severe damage often requires a major repair job involving partial or complete rebuilding, beams lose bearing, walls lean and require shoring, windows are broken with distortion, and there is danger of structural instability.	> 25 mm

Table 1: Severity of Cracking Damage[4, 5]

7.0 RISKS TO & IMPACT ON SURROUNDING BUILDINGS

The proposed development is a relatively low-level, low-density construction and it will occupy similar overall footprint and will incorporate the existing boundaries in its envelope.

The surrounding buildings fall in to both Group 1a and 1b as defined by BS ISO 4866:2010, i.e. **Ancient, Historical** or **Old** and **modern buildings constructed in older, traditional style using traditional kinds of materials, methods and workmanship**; the foundations to the building fall in to Classes A, B & C and the soil as Type e: from Table B1 of BS ISO 4866 the surrounding buildings fall within Category 5 and can be considered to have a medium resistance to vibration. From Table B.2 of BS ISO 4866 the surrounding buildings fall in to Class 7 & 10, which are deemed to have a medium level of resistance to vibration and, conversely, to require no or little protection against vibration for the types of works intended.

- Although the construction will be further below ground level than the existing building it will not be significantly deeper than the lowest level of the surrounding buildings.
- The basement construction will not be lower than the prevailing groundwater level in this area so will not interfere with the natural flow of the groundwater.
- The building will be formed off of the stiff underlying London Clay, which has a significant bearing capacity, and the foundations will be designed to reflect the recommended permissible pressures and ensure they will not be compressed by more than 5mm.
- Removal of the existing construction will generate little or no relief and consequent heave in the underlying London Clay.
- The existing house and boundary walls can be retained and underpinned safely following industry-standard practices and, by following a pre-determined sequence will allow the basement wall to be constructed without detriment to the existing, surrounding construction.
- Excavations for the pins that will form the new basement walls can be undertaken using small excavators, which will be low-impact technique and known not to generate excessive vibration.

Adopting a controlled and sequenced work process will limit any damage to surrounding buildings. The analysis of the ground movements, undertaken by GEA Ltd (refer to BIA in Appendix A), predicted that following wall installation up to 2mm of settlement is predicted on the proposed underpinning. The report concludes that the building damage reports as a result of the ground movements would not exceed Category 0 (negligible) classification on The Burland Scale.

The predicted ground movements are satisfactory; however, the work should be undertaken by a contractor with experience of this type of construction and with a high quality of workmanship. A well designed support system should be used to limit ground movements and a monitoring programme should be in place (refer to Appendix D).

8.0 CONSTRUCTION METHODS & SEQUENCE

The existing building will be retained in place, form and construction during these works so the techniques adopted will reflect and accommodate that; the excavation for, and construction of the basement will need to be completed without involving or disturbing the existing ground and upper floors and finishes throughout the building. The sequence of the works for the demolition and construction phases of this project will, ultimately, be prepared by the contractor who will undertake the works but we expect, and will guide them towards a sequence similar to the following:

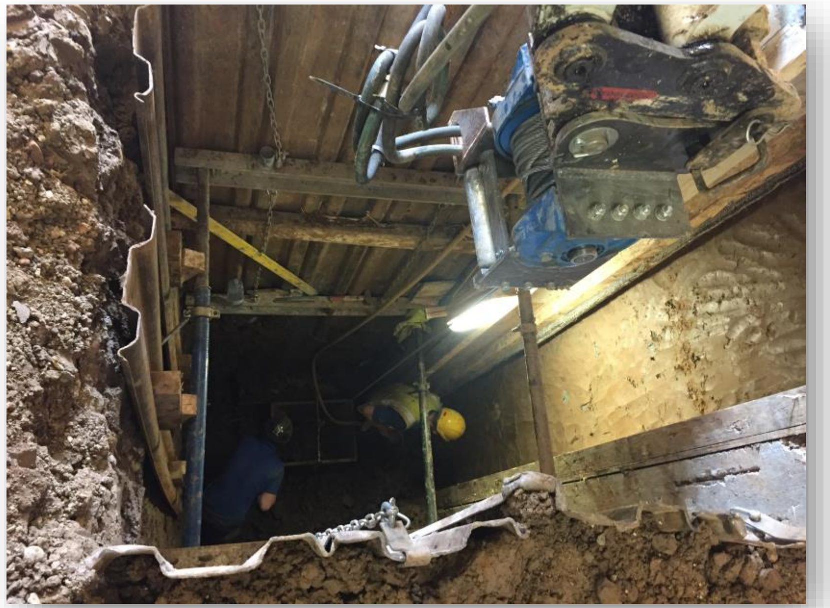
- Removal of the existing ground floor slab over the proposed basement location.
- Sequenced construction of the basement walls using an underpinning technique and hit and miss sequence beneath the existing house walls starting from the sides,
- Pins to start at four or five locations reducing to one at completion,
- Arisings removed by conveyor to skips or wagons. The contractor may opt to store arisings temporarily before removal from site,
- Installation of lateral props between the newly formed basement walls just below the proposed top slab level.
- Excavation down to formation level,
- Formation of basement slab,
- Formation of top slab,
- Removal of temporary lateral pro

By adopting an underpinning technique and following a hit-&-miss sequence it will be possible to construct the basement without extensive temporary works; local props and sheeting may be required to support excavations and at the conclusion of the perimeter walls and before the remainder of the existing ground is removed, bracing props will be installed between the basement walls, and maintained in place until the basement slab and top slabs are constructed. Continuity reinforcement between the pins will allow lateral props to be provide at 2-3m c/c rather than to each pin.

Ornan Road is a two-way two lane residential road with parking on both sides and Belsize Lane to the rear of the property is a two-way single lane residential road with parking on one side; both will accommodate construction traffic. The site has limited space for storage. A traffic management plan by the Contractor will therefore be necessary to manage construction traffic and deliveries and storage of construction materials on site.

Shored excavation for an underpin using timber

Small wagon



Shored excavation for an underpin using trench sheets

Temporary storage of arisings

MICHAEL BARCLAY PARTNERSHIP

MBP

9.0 NOISE & NUISANCE

An Example of a Covered Basement Excavation

Small Excavator

Construction works generally are a source of noise and nuisance which can affect both operatives with the work site as well as neighbours and passing members of the public. Demolition and excavation works are particular sources of this potential harm so it will be necessary during these works at Nº. 40 Ornan Road for the contractor to mitigate the extent and impact of noise, dust, traffic and vibration.

Noise: Generated by the mechanical equipment used to demolish existing construction and excavate for the new basement; Mitigated by using electrical equipment where possible and mufflers or attenuators on diesel engines or generators and by working only within agreed and designated hours.

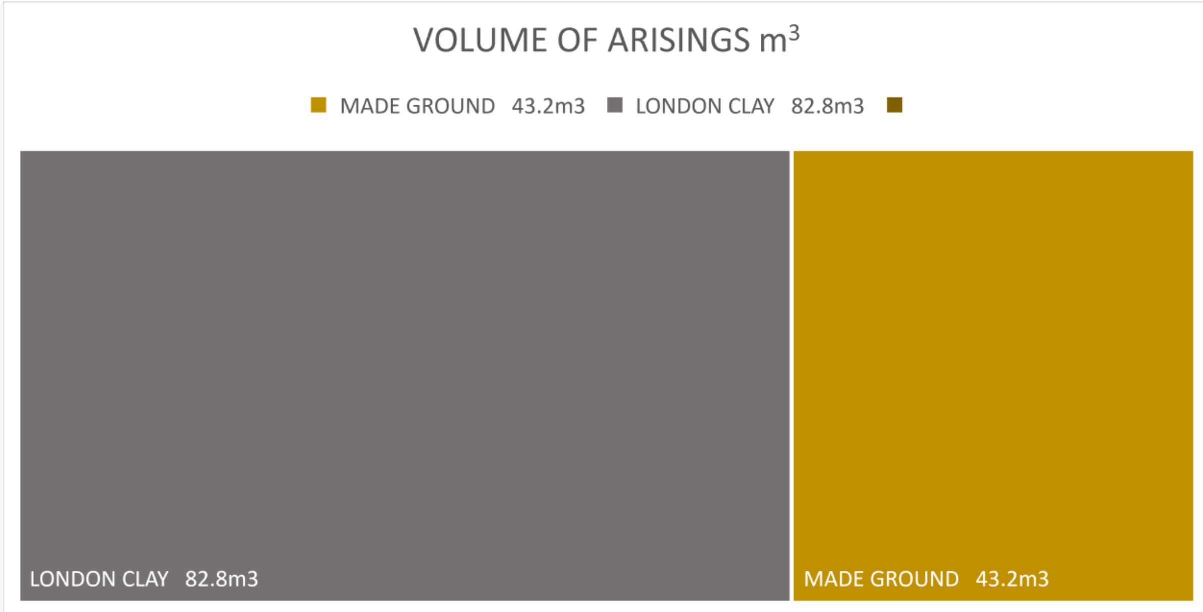
Dust: Generated by excavation works and the transfer of arisings from the works area to the disposal skip or wagon; Mitigated by damping conveyors when in operation, by installing a weatherproof cover over the site and by washing-down vehicle wheels before leaving site.

Traffic: Generated by delivery and removal vehicles travelling to and from site; Mitigated by establishing a traffic management plan, by identifying and using routes appropriate to the vehicles, by scheduling vehicle movements to avoid peak traffic periods and by ensuring vehicles are low-emission standard.

Vibration: Generated by use of heavy breakers for sustained periods and by heavy vehicles; Mitigated by using light, hand-held and electrical breakers and by avoiding excessively heavy vehicles.

Protection: Robust hoarding will be erected around the site, front rear and sides, to secure the site from intrusion as well as provide protection to neighbours and passing public from noise, dust and material arisings.

The excavation works will cover around 36m^2 and excavate to 3.5m over the area, which will generate around 126m^3 of spoil as follows:



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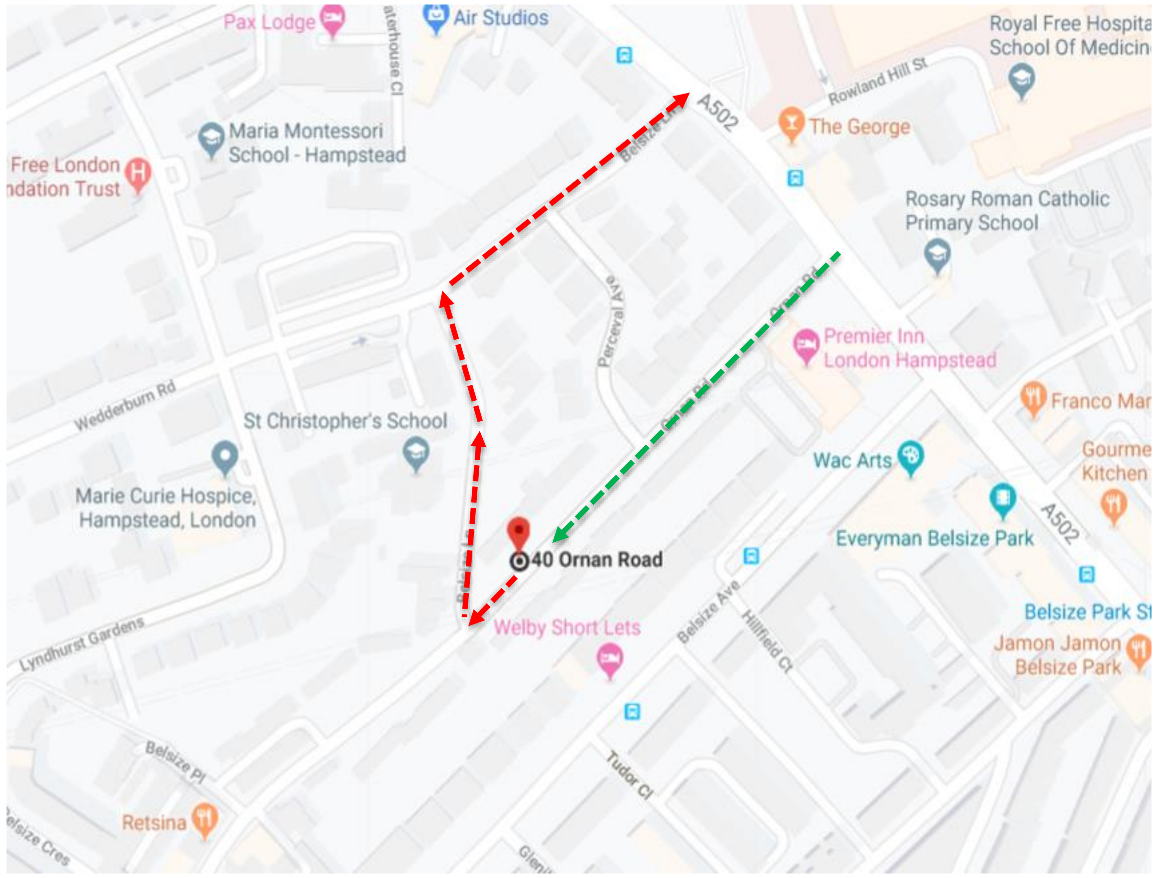


CONSTRUCTION TRAFFIC ROUTE OUT

CONSTRUCTION TRAFFIC ROUTE IN

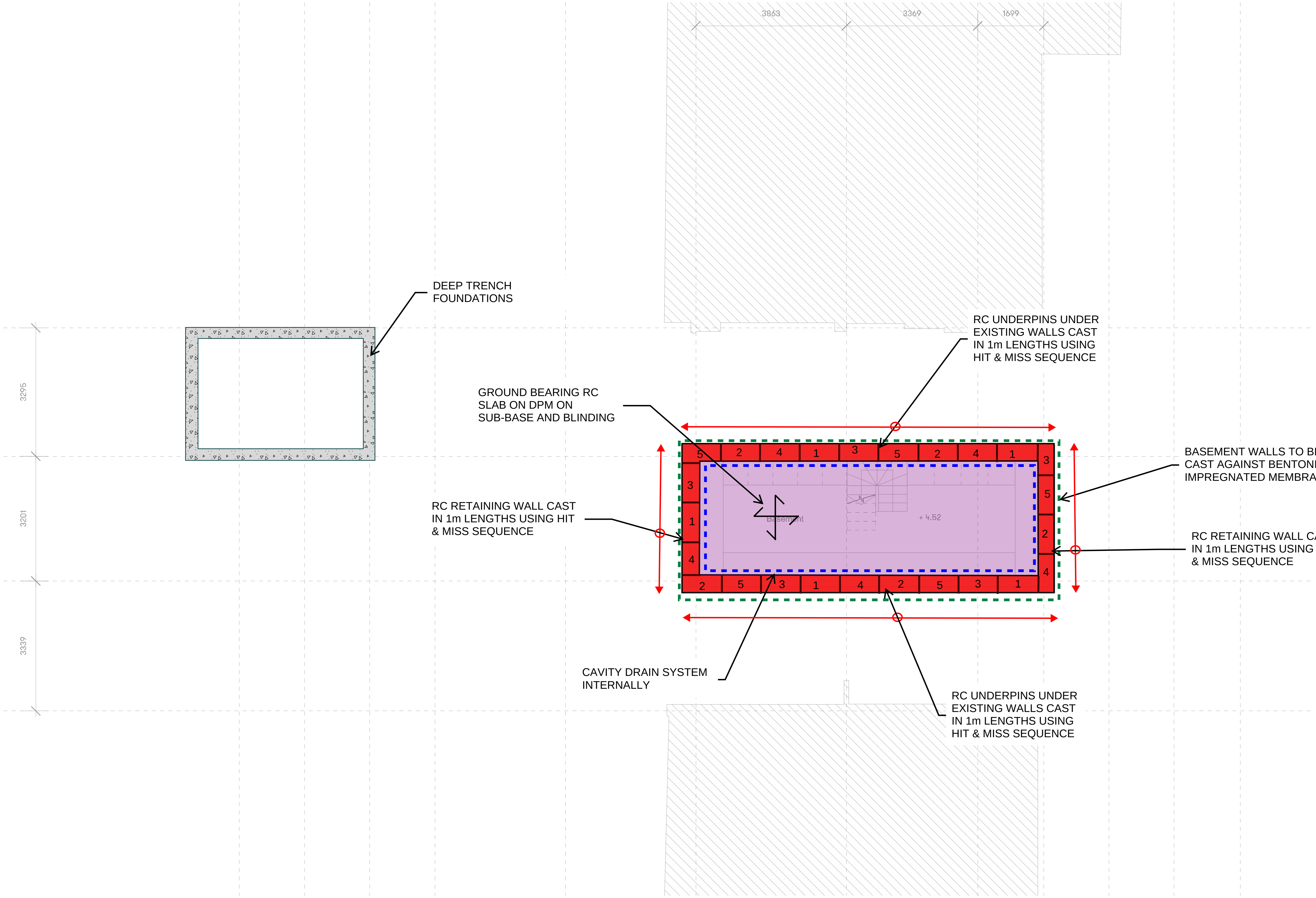
10.0 CONCLUSIONS

- The proposed development of No. 40 Ornan Road can be achieved using standard construction techniques and materials.
- The site specific site investigation has established the near-surface soil profile and the construction and loadpaths calculated to ensure that the building will be adequately supported by the existing geology.
- As outlined in Section 5 above, the construction of the subterranean basement will not affect the integrity of the surrounding building stock, will not disturb underlying hydrogeology or overload the near-surface geology.
- The site is on level ground in any case but, notwithstanding this, the construction techniques and sequences proposed minimises the risk of instability, ground slip and movement.
- There are no critical utilities or infrastructure beneath the site that cannot be relocated easily to accommodate the construction and, as there is no change in use or level of occupancy proposed there will be no significant increase in foul discharge to the public sewer.
- The proposed construction will not be beneath the prevailing groundwater level. The basement can be constructed using relatively light techniques, in controlled and pre-determined sequences and without the need for a large open excavation before construction can start and consequent extensive temporary works. Where mechanical means are necessary to construct permanent works these can be of a type that generates low vibrations to which the surrounding buildings have a form and construction that is robust and resistant to.
- The excavation for, and construction of the basement will need to be completed without involving or disturbing the existing ground and upper floors and finishes throughout the building. Underpinning will commence from the middle of the existing walls and will be cast in 1m-sections of reinforced concrete. Temporary props will be installed between the basement walls before the ground is excavated. Refer to sections 7, 8 and 9 above.
- The subterranean works have been positioned to avoid any impact to nearby retained trees.
- By adopting an underpinning technique and following a hit-&-miss sequence, as described in Section 8 it will be possible to construct the basement without extensive temporary works.
- Any temporary works will be designed by the Contractor to current British Standards.
- The surrounding roads are wide enough and without tight bends or corners that will hinder or prevent site traffic and will not cause site traffic to hinder or delay local and residential traffic.

Report Prepared By	Qualifications	Position	Signature	Date
Aleksandra Susic Castro Rebecca Sherren	M.Eng	Graduate Engineer		06/12/2019
Report Approved By	**Qualifications**	**Position**	**Signature**	**Date**
Malcolm Brady	BEng CEng MIStructE	Principal		06/12/2019

APPENDIX A SI REPORT & BIA (SEPARATE DOCUMENT)

APPENDIX B MBP DRAWING SET 7749



NOTES:

Scale Bar: 0m 1m 2m 4m

Rev	Date	Description	By
P1	18/11/19	ISSUED FOR PLANNING	RAS

Job: 40 ORNAN ROAD

Title: PROPOSED BASEMENT PLAN

Scale	Date	By	Checked
NTS	NOV 19	RAS	MB

Status: PLANNING

Drawing Number: MBP / 7749 / 300

Revision: P1

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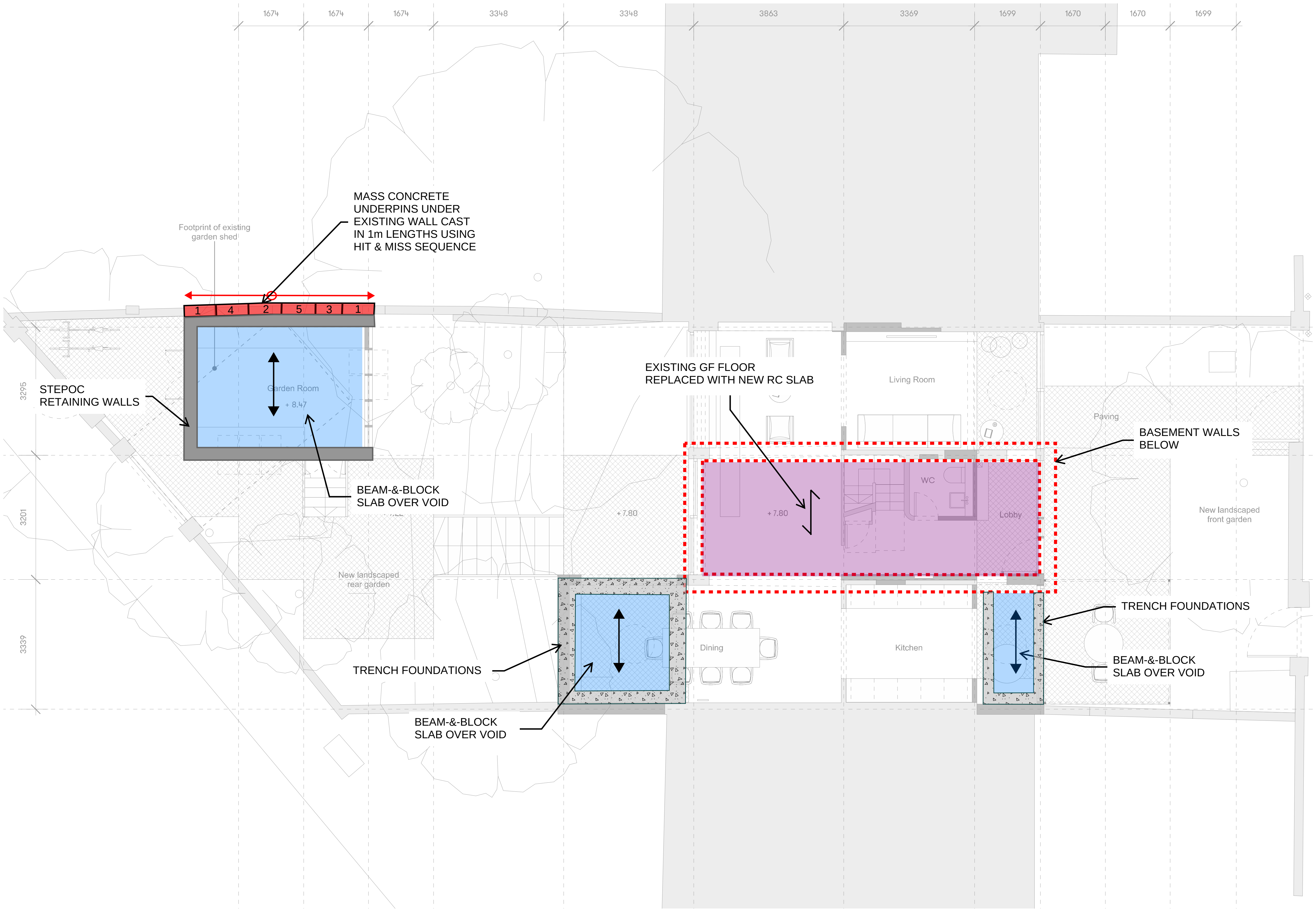

NOTES:

Scale Bar: 0m 1m 2m 4m

Rev	Date	Description	By
P1	18/11/19	ISSUED FOR PLANNING	RAS

Job: 40 ORNAN ROAD

Title: PROPOSED GROUND FLOOR PLAN

Scale	Date	By	Checked
NTS	NOV 19	RAS	MB

Status: PLANNING

Drawing Number: MBP / 7749 / 301

Revision: P1

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APPENDIX C MBP CALCULATION SET 7749

DEAD LOAD CONSTRUCTION

Basement

Material	Thickness (mm)	γ (kN/m³)	Weight (kN/m²)
Finishes	50		0.500
Cement screed	75	23	1.725
Concrete reinforced	300	24	7.200
Polystyrene	100	2	0.200
Services	50		0.150
Totals	**575**		**9.775**

Ground Floor

Material	Thickness (mm)	γ (kN/m³)	Weight (kN/m²)
Finishes	50		0.500
Cement screed	65	23	1.495
Concrete reinforced	200	24	4.800
Polystyrene	100	2	0.200
Services	50		0.150
Plasterboard	25	9	0.225
Plaster	3	11	0.033
Totals	**493**		**7.403**

Upper Floors

Material	Thickness (mm)	γ (kN/m³)	Weight (kN/m²)
Finishes	50		0.500
Plywood	18	7	0.126
Timber Joists	200	24	0.200
Polystyrene	100	2	0.200
Services	50		0.150
Plasterboard	25	9	0.225
Plaster	3	11	0.033
Totals	**446**		**1.434**

Brickwork Walls

Material	Thickness (mm)	γ (kN/m³)	Weight (kN/m²)
Brickwork clay	215	20	4.300
Totals	**215**		**4.300**

Blockwork Walls

Material	Thickness (mm)	γ (kN/m³)	Weight (kN/m²)
Blockwork solid	100	15	1.500

Totals	**100**	**1.500**

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Job title	Job number	Sheet number	Revision
40 ORNAN RD.	7749	1	
Calculation/Sketch title	**Date**	**Author**	**Checked**
BUILD UPS / LOADS	NOV 19	RAS	

ALLOWANCES FOR PROPOSED BUILD UPS / STRUCTURE.

TIMBER ROOF WITH SINGLE PLY MEMBRANE
DL 1.5kN/m^2 (INCL. STEEL FRAME)
LL 0.75kN/m^2

TIMBER FLOORS - RESIDENTIAL
DL 1.5kN/m^2
LL 1.5kN/m^2

CONCRETE FLOORS - RESIDENTIAL
DL 7.5kN/m^2
LL 1.5kN/m^2

BRICKWORK WALLS
DL 20kN/m^3

BLOCKWORK WALLS
DL 15kN/m^3

EXT. TIMBER WALLS
DL 1kN/m^2

GLAZING
DL 1kN/m^2

BASEMENT SLAB FINISHES (excl. SLAB)
DL 2.5kN/m^2
LL 1.5kN/m^2

BASEMENT WALLS
DL 24kN/m^3 x 0.3m x 3.3m = 23.8kN/m

MBP	Michael Barclay Partnership consulting engineers	Job title: 40 ORNAN RD	Job number: 7749	Sheet number: 2	Revision
	72-78 Fleet Street London EC4Y 1HY	Calculation/Sketch title: BASEMENT WALL LOADS	Date: NOV19	Author: RAS	Checked

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LOADS ON BASEMENT WALL (1) - PINK

→ ROOF

DL 1.5kN/m² × 3.27m × 5m = 24.5kN
LL 0.75kN/m² × 3.27m × 5m = 12.3kN

∴ DL 24.5kN ÷ 8.9m = 2.75kN/m
LL 12.3kN ÷ 8.9m = 1.38kN/m

→ SECOND FLOOR

DL 1.5kN/m² × 1.6m × 7.2m
+ 1.5kN/m² × 1.67m × 1.93m
+ 1.5kN/m² × 1.67m × 1.68m = 26.3kN

LL AS ABOVE = 26.3kN

∴ DL 26.3kN ÷ 8.9m = 2.96kN/m
LL 2.96kN/m

→ FIRST FLOOR.

DL. AS ABOVE + 1.5kN/m² × 3.27m × 1.7m
+ 1.5kN/m² × 1.67m × 1.7m = 38.9kN

LL AS ABOVE + 0.75kN/m² × 3.27m × 1.7m
+ 0.75kN/m² × 1.67m × 1.7m = 32.6m

∴ DL 38.9kN ÷ 8.9m = 4.37kN/m
LL 32.6kN ÷ 8.9m = 3.66kN/m

→ GROUND FLOOR

DL 7.5kN/m² × 1.6m = 12kN/m
LL 1.5kN/m² × 1.6m = 2.4kN/m

→ WALLS

2nd - RF GLAZING 1kN/m² × 4.94m × 2.5m = 12.4kN
WALL 1kN/m² × 1.6m × 2.5m = 4kN

1st - 2nd GLAZING 1kN/m² × 6.54m × 2.8m = 18.3kN
WALL 15kN/m³ × 0.1m × 2.8m × 6.1m/2
+ 15kN/m³ × 0.1m × 2.8m × 6.3m
+ 20kN/m² × 0.215m × 2.8m × 1.18m = 53.4kN

CONT...

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Job title	Job number	Sheet number	Revision
40 ORNAN RD.	7749	3	
Calculation/Sketch title	**Date**	**Author**	**Checked**
BASEMENT WALL LOADS	NOV 19	RAS	

→ WALLS CONT...

GF-1 WALL 15kN/m³ x 0.1m x 2.8m x 1.7m
+ 20kN/m³ x 0.1025m x 2.8m x 0.9m
+ 20kN/m³ x 0.215m x 2.8m x 2.6m
+ 15kN/m³ x 0.1m x 2.8m x 2.6m
+ 15kN/m³ x 0.1m x 2.8m x 4.9m/2 = 152.9kN

∴ DL 241 kN ÷ 8.9m = 27.1kN/m

TOTAL DL 49.2kN/m
LL 10.4kN/m

Project	40 Ornan Road	The Concrete Centre		
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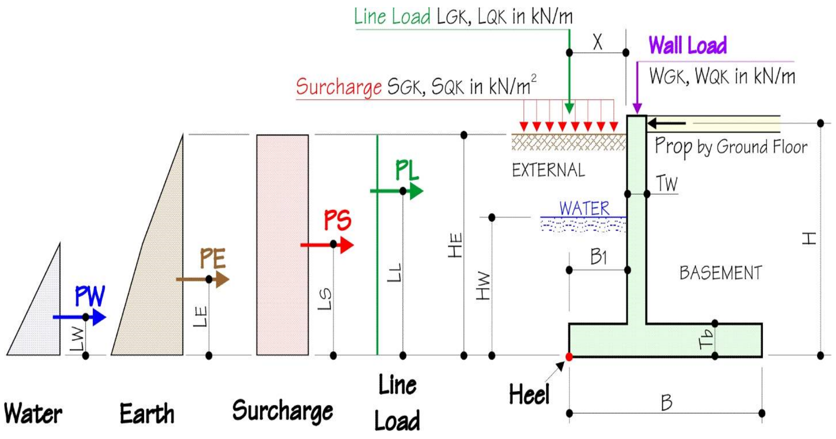
Location	Basement Wall	ASC	18-Nov-2019	
	Basement wall design to BS8110:2005	Checked	Revision	Job No
	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	RAS	-	MBP-7749

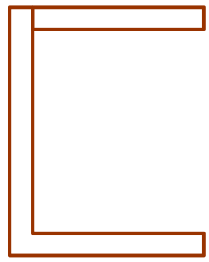
IDEALISED STRUCTURE and FORCE DIAGRAMS

DESIGN STATUS : VALID



DIMENSION (mm)

H =	3200	B =	2500	Tw =	300
Hw =	3000	Bl =	0	Tb =	300
He =	3200				



Wall Geometry

MATERIAL PROPERTIES

steel class A

fcu = 35 N/mm^2 γm = 1.50 concrete

fy = 500 N/mm^2 γm = 1.15 steel

Cover to tension reinforcement (co) = 40 mm

Max. allowable design surface crack width (W) = 0.3 mm (0.2 or 0.3 mm only)

Concrete density = 24.0 kN/m3

SOIL PROPERTIES

Design angle of int'l friction of retained mat'l (Ø) = 30 degree

Design cohesion of retained mat'l (C) = 0 kN/m2 (Only granular backfill considered, ie "C" = 0)

Density of retained mat'l (q) = 20 kN/m3

Submerged Density of retained mat'l (qs) = 13.33 kN/m3 (default=2/3 of q), only apply when Hw >0 = 13.33

Design angle of int'l friction of base mat'l (Øb) = 20 degree

Design cohesion of base mat'l (Cb) = 0 kN/m2

Density of base mat'l (qb) = 10 kN/m3

Allowable gross ground bearing pressure (GBP) = 150 kN/m2

ASSUMPTIONS

a) Wall friction is zero

b) Minimum active earth pressure = 0.25qH

c) Granular backfill

h) Design not intended for walls over 3.5 m high

i)Does **not** include check for temp or shrinkage

LOADINGS (unfactored)

Surcharge load -- live (SQK) = 10 kN/m2

Surcharge load -- dead (SGK) = 0 kN/m2

Line load -- live (LQK) = 0 kN/m

Line load -- dead (LGK) = 0 kN/m

Distance of line load from wall (X) = 0 mm

Wall load -- live (WQK) = 15 kN/m

Wall load -- Dead (WGK) = 50 kN/m

LATERAL FORCES

Ko = 0.50 default Ko = (1-SIN Ø) 0.50

Kac = 1.41 = 2Ko$^{0.5}$

Force (kN)		Lever arm (m)		γ_f	Ultimate Force (kN)
PE =	36.19	LE =	1.094	1.40	50.67
PS(GK) =	0.00	LS =	1.60	1.40	0.00
PS(QK) =	16.00	LS =	1.60	1.60	25.60
PL(GK) =	0.00	LL =	3.20	1.40	0.00
PL(QK) =	0.00	LL =	3.20	1.60	0.00
PW =	45.00	LW =	1.00	1.40	63.00
Total	97.19				139.27

EXTERNAL STABILITY STABILITY CHECK : OK

ANALYSIS - Assumptions & Notes

1) Wall idealised as a propped cantilever (i.e. pinned at top and fixed at base)
2) Wall is braced.
3) Maximum slenderness of wall is limited to 15, i.e [0.9*(He-Tb/2)/Tw < 15]
4) Maximum Ultimate axial load on wall is limited to 0.1fcu times the wall cross-sectional area
5) Design Span (Effective wall height) = He - (Tb/2)
6) -ve moment is hogging (i.e. tension at external face of wall)
   +ve moment is sagging (i.e. tension at internal face of wall)
7) " Wall MT. " is maximum +ve moment on the wall.
8) Estimated lateral deflections are used for checking the **PΔ** effect .

UNFACTORED LOADS AND FORCES

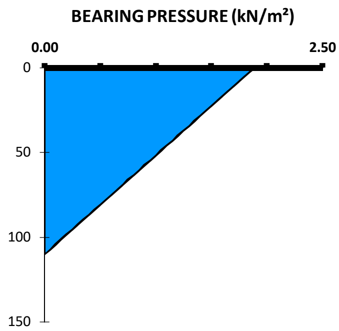
Lateral Force	Force (kN)	Lever arm to base (m)	Base MT. (kNm)	Wall MT. (kNm)	Reaction at Base (kN)	Reaction at Top (kN)	Estimated Elastic Deflection Δ (mm)
PE =	32.97	1.04	-13.38	6.41	26.07	6.90	0.2
PS(GK) =	0.00	1.53	0.00	#DIV/0!	0.00	0.00	0.0
PS(QK) =	15.25	1.53	-5.81	3.27	9.53	5.72	0.1
PL(GK) =	0.00	3.05	0.00	0.00	0.00	0.00	0.0
PL(QK) =	0.00	3.05	0.00	0.00	0.00	0.00	0.0
PW =	40.61	0.95	-16.60	7.21	33.40	7.21	0.2
Total	88.83		-35.79	#DIV/0!	69.00	19.83	0.4

GROUND BEARING FAILURE

LOAD CASE: Wall Load **MAX**
Surcharge **MIN**

Taking moments about centre of base (anticlockwise "+")

Vertical FORCES (kN)		Lever arm (m)	Moment (kNm)
Wall load =	65	1.10	71.49999935
Wall (sw) =	20.88	1.10	22.97
Base =	18.00	0.00	0.00
Earth =	0.00	1.25	0.00
Water =	0.00	1.25	0.00
Surcharge =	0.00	1.25	0.00
Line load =	0.00	1.25	0.00
∑ V =	103.88		∑ Mv = 94.47



MOMENT due to LATERAL FORCES, Mo = -29.98 kNm

RESULTANT MOMENT, M = Mv + Mo = 64.49 kNm

ECCENTRICITY FROM BASE CENTRE, M / V = 0.62 m
MAXIMUM GROSS BEARING PRESSURE = 110.07 kN/m^2 < 150 OK

SLIDING AT BASE (using overall factor of safety instead of partial safety fac F.O.S = 1.50

SUM of LATERAL FORCES, **P** = 69.00 kN
BASE FRICTION, $\mathbf{F_b}$ = - (**V** TANØb + B.Cb) = -37.81 kN

Factor of Safety, F_b / P = 0.55 < 1.50 FAIL .. but

therefore, LATERAL RESISTANCE to be provided by BASEMENT SLAB = 65.70 kN

Project	40 Ornan Road	The Concrete Centre		
Client	0	Made by	Date	Page
Location	Basement Wall	ASC	18-Nov-2019	
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STRUCTURAL DESIGNS (ultimate)

DESIGN CHECKS : OK

BS8110 reference

WALL (per metre length)

AXIAL LOAD CAPACITY (Limited to 0.1fcu) = 1050.00 kN > 94 OK 3.4.4.1

Lateral Force	Force (kN)	γ_f	Ultimate Force (kN)	Ult. Moment at base (kNm)	Ult. Shear at base (kN)	Ult. Shear at top (kN)
PE =	32.97	1.40	46.16	-18.73	36.50	9.66
PS(GK) =	0.00	1.40	0.00	0.00	0.00	0.00
PS(QK) =	15.25	1.60	24.40	-9.30	15.25	9.15
PL(GK) =	0.00	1.40	0.00	0.00	0.00	0.00
PL(QK) =	0.00	1.60	0.00	0.00	0.00	0.00
PW =	40.61	1.40	56.86	-23.23	46.77	10.09
Total	88.83		127.41	-51.27	98.51	28.90

Design Bending Moments

On INTERNAL face due to lateral forces, M_{int} = 23.62 kNm

On EXTERNAL face due to lateral forces, M_{ext} = -51.27 kNm

Eccentricity of Axial Loads = 125 mm

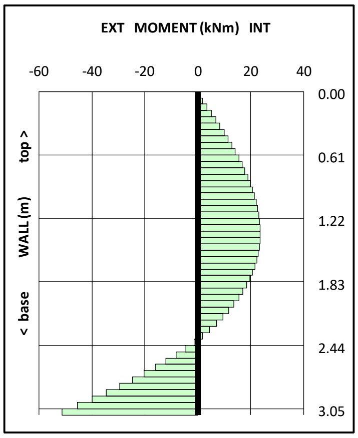
LATERAL DEFLECTION " Δ " = 0.4 mm

Due to eccentricity of axial loads, M_{ecc} = 11.8 kNm

Due to **P**Δ effect, M_p = 0.04 kNm

Total Mmt on INTERNAL face (M_{int}+0.5M_{ecc}+M_p) = 29.5 kNm

Total Mmt on EXTERNAL face (M_{ext}+0.5M_{ecc}) = -57.1 kNm



		EXTERNAL FACE		INTERNAL FACE				
WALL REINFORCEMENT :	Min. As =	390		390		mm^2		Table 3.25
	ϕ =	16		16		mm		
	centres =	200	< 659	200	< 766	mm	OK	3.12.11.2.7(b)
	As =	1005	> 390	1005	> 390	mm^2	OK	
MOMENT of RESISTANCE :	d =	252		252		mm		
	z =	238		238		mm		3.4.4.4
	As' =	0		0		mm^2		3.4.4.4
	M_{res} =	104.0	> 57.14	104.0	> 29.54	kNm	OK	

		BASE of WALL		TOP of WALL				
SHEAR RESISTANCE:	As =	1005	ϕ =	16	@200 mm 1005	mm^2/m		
	100As/bd =	0.40%	=	0.40%				
	vc =	0.58		0.58		N/mm^2		Table 3.8
	V_{res} =	147.2	> 98.51	147.2	> 28.90	kN	OK	3.5.5.2

CRACK WIDTH to BS8100/8007 X = 73.51 mm ε_m = 0.00052 BS8007

Temp & shrinkage effects not included Acr = 102.92 mm **W =** 0.10 < 0.30 mm OK App. B.2

REINFORCEMENT SUMMARY for WALL

	Type	ϕ mm	centres mm	As mm^2	Min. As mm^2	
INTERNAL FACE	H	16	200	1005	390	OK
EXTERNAL FACE	H	16	200	1005	390	OK
TRANSVERSE	H	12	200	565	390	OK

Project	40 Ornan Road	**The Concrete Centre**			
Client	0	Made by	Date	Page	
Location	Basement Wall	ASC	18-Nov-2019		
	Basement wall design to BS8110:2005	Checked	Revision	Job No	
	Originated from 'RCC61 Basement Wall.xls' v4.0 © 2006 TCC	RAS	-	MBP-7749	

OUTER BASE (per metre length) — BS8110 reference

γ_f = 1.50 (ASSUMED)

Ult. Shear = 25.32 kN (AT d from FACE of WALL)
Ult. MT. = 0.00 kNm TENSION - TOP FACE

BOTTOM REINFORCEMENT : (Table 3.25)

Min. As =	390	mm^2		
ϕ =	16	mm		
centres =	200	mm	< 766	OK
As =	1005	mm^2	> 390	OK

MOMENT of RESISTANCE : (3.4.4.4)

d =	252	mm		
Z =	238	mm		
As' =	0	mm^2		
Mres =	104.04	kNm	> 0.00	OK

SHEAR RESISTANCE: (Table 3.8, 3.5.5.2)

100As/bd =	0.40%			
vc =	0.58	N/mm^2		
Vres =	147.22	kN	> 25.32	OK

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/8(Temp & shrinkage effects not included (BS8007 App. B.2)

X = 73.51 mm ε_m = -0.00048
Acr = 102.92 mm W = -0.09 mm < 0.30 OK

NO CRACKING

INNER BASE (per metre length)

Ult. Shear = -53.28 kN (AT d from FACE of WALL)
Ult. MT. = 53.69 kNm TENSION - BOTTOM FACE

BOTTOM REINFORCEMENT : (Table 3.25)

Min. As =	390	mm^2		
ϕ =	16	mm		
centres =	200	mm	< 701	OK
As =	1005	mm^2	> 390	OK

MOMENT of RESISTANCE : (3.4.4.4)

d =	252	mm		
Z =	238	mm		
As' =	0	mm^2		
Mres =	104.04	kNm	> 53.69	OK

SHEAR RESISTANCE: (Table 3.8, 3.5.5.2)

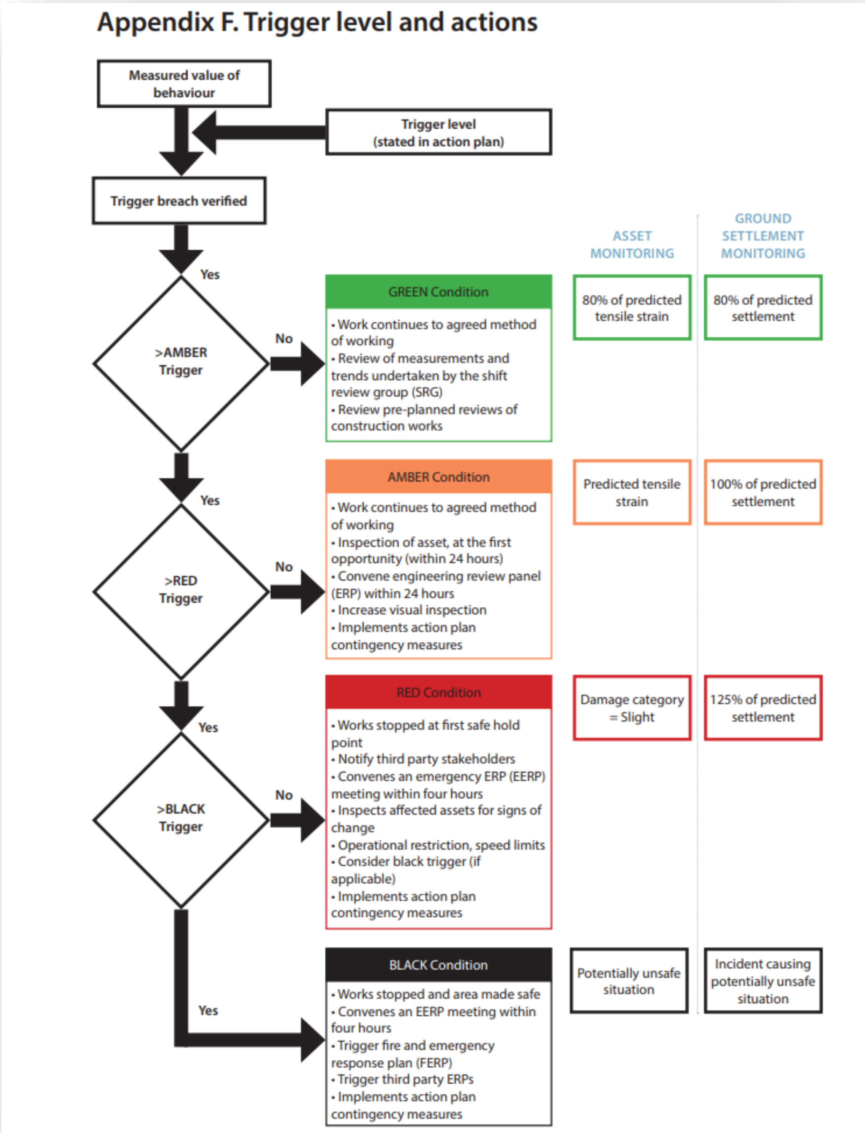
100As/bd =	0.40%			
vc =	0.58	N/mm^2		
Vres =	147.22	kN	> 53.28	OK

CHECK CRACK WIDTH IN ACCORDANCE WITH BS8100/8(Temp & shrinkage effects not included (BS8007 App. B.2)

X = 73.51 mm ε_m = 0.000516
Acr = 102.92 mm W = 0.10 mm < 0.30 OK

REINFORCEMENT SUMMARY for BASE

	Type	ϕ mm	centres mm	As mm^2	Min. As mm^2	
TOP	H	16	200	1005	390	OK
BOTTOM	T	16	200	1005	390	OK
TRANSVERSE	T	16	200	1005	390	OK



APPENDIX D PROCEDURE FOR MONITORING ADJACENT BUILDINGS

The contractor will monitor the adjacent structures and party walls for movements throughout the principal demolition & construction works and, in the event of any movements exceeding the agreed target levels the method of works will be reviewed and altered as necessary.

- The proposed monitoring points will be agreed with the contractor
- The Green/Amber trigger level will be 3mm
- The Amber/Red trigger level will be 5mm

The monitoring regime and frequency proposed is:

Activity	Frequency of monitoring
Site set up	Bi-Weekly
Demolition & Excavation	Weekly
Underpinning & Ground Works	Weekly
Principal Construction Works	Bi-Weekly

Target monitoring will monitor the party walls and front and rear elevations with an accuracy of +/- 2mm. The results of the monitoring are to be recorded and issued by email to the project engineer, CA and engineers for the adjoining properties, on the day that the results are taken. The results are to be presented both in table and graphical form with the graphs for each point plotting the readings taken against time. The following actions will be taken if the trigger levels are exceeded:

Trigger Level	Action
Green/Amber	Immediately notify the engineers. Increase frequency of monitoring to a daily basis.
Amber/Red	Contractor to stop all works and immediately notify the engineers. Contractor and project engineer to put forward proposals, such as additional propping, to limit further movement to an acceptable level.

APPENDIX E PROCEDURES FOR CONTROL OF NOISE, DUST & NUISANCE

To control the disturbance do to noise and vibrations, all works on site will be restricted to the hours of Monday to Friday 8am to 6pm, Saturdays 8am to 1pm. Works that create excessive noise and/or vibration are prohibited, as are any works on Sundays and the bank holidays. The contractor employed to undertake the work will be a member of the considerate constructor scheme.

Appropriate measures will be taken to keep dust pollution to a minimum. These measures are compliant with the RBKC Basements SPD. Such measures will include the use of water to suppress dust and soil being excavated from basement level, covers for conveyors and skips, and barriers installed around dusty activities that are undertaken externally.

All work will be carried out in accordance with BS 5228-1:2009 and BS 5228-2:2009. All works will employ Best Practicable Means as defined by section 72 of the Control of Pollution Act 1972 to minimise the effects of noise and vibration. All means of managing and reducing noise and vibration which can be practicably applied at reasonable cost will be implemented.

The following measures will be taken:

- Consultation/ communication with neighbours/affected others prior to the start of the works.
- Use only of modern, quiet and well-maintained equipment, all of which will comply with the EC Directives and UK regulations set out in BS 5228-1:2009.
- Use of electrically powered hand tools rather than air powered tools and a compressor will be used for to the minimum extent practicable.
- Avoidance of unnecessary noise (such as engines idling between operations or excessive engine revving, no radios, no shouting)
- Use of screws and drills rather than nails for fixing hoarding.
- Careful handling of materials, so no dropping off materials from an excessive height (no more than 2m) into skip etc.
- Ensuring that the conveyor is well maintained with rollers in good working order and well oiled.
- Isolating the neighbouring properties from vibration /breaking out work where practicable. In particular, the edges of the existing concrete slab at ground floor will be broken out first (isolating the remaining slab at ground floor) before the main part of the existing ground floor slab is removed.
- Collection /delivery times will be as given in the CTMP.
- Collection/delivery vehicles will not loiter/wait in the area before the allowed times.
- No site run-off of water or mud until the water has been left to settle and is free from particles.
- During Demolition:
    - Special Care to ensure the site is closed-over
    - Dust suppression with water if necessary if needed (recommended)
    - Cutting equipment to use water suppressant or local extraction & ventilation

If measures to control dust are unsuccessful, works will be stopped and alternative methods proposed and implemented.

A detailed CTMP will be required for the execution of these works.

APPENDIX F SUBTERRANEAN DEVELOPMENT CMS CHECKLIST

A desk study including the following: the site history, age of the property, the topography, the geology and ground conditions information for this should be obtained through SI's and borehole logs. River and watercourses existing and/or old. Surface water and ground water regimes. Flood risk issues including critical drainage and Fluvial flooding.	Included
Underground infrastructure, particularly London Underground assets, main drains and utilities.	Included
Site investigations should be carried out, with visual evidence presented in the CMS, accompanied by drawings of the and sketches including plans and sections to show layout and details of the existing structure and foundations.	Included
A visual assessment of the existing building and the adjoining buildings should be undertaken to establish whether there is any historic or ongoing movement, this assessment should inform the feasibility of the proposed basement.	Included
Physical Site Investigation to establish the ground conditions including geological strata and the presence of the upper Aquifer. Trial pits to establish the details of the existing foundations.	Included
Engineering detailed proposal illustrated in drawings covering:	
Groundwater	Included
Drainage	Considered
SuDS	Considered
Flooding	Considered
Vertical Loads	Considered
Lateral Loads	Considered
Movements	Considered
Ground Conditions	Included
Trees and Planting	Considered
Infrastructure	Considered
Vaults	Included
Existing Structures	Included
Adjoining Buildings	Included
Overall Stability	Included
Underpinning (if proposed)	Included
Piling (if proposed)	N/A
Special Considerations	Considered
Details of any building or site-specific issues which may be affected by the basement proposal should be included.	Considered