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Basement Impact Assessment

Surface Water BIA & Engineering Design and Construction Proposals

Site Address

Vine House
Hampstead Square,
Hampstead,
Camden
NW3 1AB

Client

Julia Gosmond

Rev	Date	Author	Comment
-	11.12.2019	GW	First Issue

Contents

Basement Impact Assessment for Vine House

1. Non-Technical Summary

1.1. Existing Property, Site & Neighbouring Sites

Vine House is located in the Hampstead Conservation Area of the London Borough of Camden
The site comprises a three storey detached residential property with a single storey side annex. The original building is known to have been constructed in early 18th century and is listed.

The land within the site boundary is largely occupied with soft landscaping and is relatively flat. The surrounding area is on a gentle slope.

1.2. Proposed Development

The proposed development involves the construction of a single storey basement below the footprint of the existing property.

1.3. Geology and Land Stability

The assessment of impacts relating to Geology and Land Stability are summarised in the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019]. The key features and concerns are reproduced below:

- The formation level of the basement will be in 'Bagshot Formation' (sand, gravel and clay)
- Mitigation measures are required to minimise potential ground movements. This includes the use of propping throughout the works (proposed temporary works are appended to this report)
- Perched water is unlikely but as a precaution arrangements should be made for pumping this away
- Monitoring of existing structures should be carried out (proposals are included in this report)

Maund Geo-consulting carried out a Ground Movement Assessment for the nearest neighbouring property. The building damage category is 'Negligible' (Damage Category 0).

1.4. Hydro-geology

The assessment of impacts relating to Hydro-geology are summarised in the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019]. The report concluded that groundwater is not a concern given that the water table is below the formation level of the proposed basement. However, as a precaution, arrangements should be made to remove any perched water that may be encountered on site.

1.5. Drainage, Surface Water & Flooding

The BIA has identified:

- The construction of the basement will not have any significant impacts on the surface water to other properties in the area and will not affect catchment areas of the Hampstead Heath Ponds.
- No further assessment is required to be carried forward from the initial Screening Stage. However, the site is in a critical drainage area and therefore a flood risk assessment is required.

2. Introduction

The London Borough of Camden requires a BIA (Basement Impact Assessment) to be prepared for developments that include basements and lightwells. This document forms the main part of the BIA and gives details on the impact of surface water flow. The scheme design for the proposed subterranean structure is also included.

This document should be used in conjunction with the Land Stability and Groundwater BIA [MGC-BIA-19-34]. This is a separate report and is referred to, where relevant, within this document.

This BIA follows the requirements contained within Camden Planning Guidance - Basements (March 2018). In summary, the council will only allow basement construction to proceed if it does not cause significant harm to the built or natural environment and local amenity.

In order to comply with the above clauses, a BIA must undertake five stages detailed in the Camden Planning Guidance. This report has been produced in line with the guidance and associated supporting documents such as DP23, DP26, DP25 and DP27. Technical information from 'Camden geological, hydrogeological and hydrological study - Guidance for subterranean development', Issue 01, November 2010 (GSD, hereafter) was also used and is referred to in this assessment.

This report should be used in conjunction with the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

2.1. Report Authors and Qualifications

Croft has appointed the following suitably qualified professional to review the impacts related to Land Stability and Hydro-geology:

Julian Maund
BSc PhD CEng MIMMM CGeol FGS

The following individuals have reviewed the impacts related to Surface Water and Flooding:

Phil Henry
BEng MEng MICE

Chris Tomlin
MEng CEng MIStructE

2.2. Site & Location

The site is located in Hampstead Village and occupies brick-walled corner plot, forming a boundary with Hampstead Square to the south and with Holford Road to the east. To the north the boundary is defined by a 4-5m high brick wall shared with the neighbouring property High Close which fronts on to Holford Road. To the east a 3m high wall is shared with the neighbouring properties of Northcote House and Northcote Mansions.

Figure 1: Plan view of site (approx. area outlined in red) and the surrounding properties

For further information refer to the Desk Study & Walk-over Survey.

2.3. Proposed works

The proposed development involves the construction of a new single-storey basement below the existing footprint of the building.

Plans showing the extent of the structural alterations and the temporary works construction sequence for the new basement are appended. Architectural drawings that show the extent of the proposed alterations have been produced by Hertford Planning Service and are available separately.

A site location plan is shown above. This site is indicated. In addition to the basement area, this also includes areas that are likely to be temporarily occupied for construction purposes.

3. Desk Study & Walk over Survey

For Camden BIAs, site investigations are expected to follow after Screening and Scoping stages. In this assessment initial inspections and studies were carried out to give a more informed view for the screening and scoping. These are presented in this section. More detailed investigations are referred to after the scoping stage.

3.1. General Desk Study

Vine House is a detached property situated in Hampstead Village. The land surrounding the site has a gentle downward slope from north-west to south-east. From inspection of OS maps and aerial photos, there are no natural open water features, significant steep slopes or cuttings in the immediate vicinity.

3.1.1. Site History

The property has been surveyed by heritage research specialists Archangel Heritage. The report tor this is available separately [ref AH0268, dated 24 June 2019]. This includes a detailed description of the property, which is reproduced in part below:

> *Vine House is a double fronted, three-storey detached property with half-depth basement. It has its origins in the early Georgian (Queen Anne) period with its earliest elements likely to date from the first decade of the 1700s. It has, however, been repeatedly altered since at least the late Georgian period, with work to the roof being carried out as late as the mid-20th century.*
>
> *The entire property is of brown and yellow stock brick (rear elevation is painted) laid in Flemish bond with red brick dressings. The slate hung roof of the front half of the house is low pitched in keeping with a late Georgian style. To the rear there are two projecting ranges with tiled, pitched roofs and a flat roofed range.*

In addition to alterations to the roof, alterations were made at lower level in the 20th century.

3.1.2. Listed Buildings and Conservation Areas

The existing building is listed and is in the Hampstead Conservation Area.

Figure 2: Extract from Historic England map with property indicated; listed properties close by also shown

3.1.3. London Underground and Network Rail Infrastructure

The site is more than 100m away from the nearest national rail line and the nearest subterranean train line. No train lines are likely to be affected by the development. These are unlikely to be affected by the new basement.

3.1.4. Highways

The site is within 5m of a public highway. However, the proposed construction will be more than 5m away from the road.

3.1.5. UK Power Network

There are no significant items of electrical infrastructure (such as pylons, substations or tunnels) in the immediate vicinity.

3.1.6. Utility Search

The most obstructing utilities likely to be traversing any domestic site are drainage assets belonging to the sewage undertaker. This site is understood to have a private drain connected to the public sewer below the main road. A Thames Water asset search is therefore not considered necessary. A site specific search for other utilities was carried out, resulting in assets belonging to UK Power Networks identified on or close to the site. The relevant record drawing for this is appended. This should be made available to the contractor before construction. After the planning application is concluded, and before construction, the contractor should carry out a survey with hand dug trial excavations to determine the locations of any other services below ground level.

3.2. Walk Over Survey

A structural engineer from Croft Structural Engineers visited the site on 11th November 2019.

3.2.1. Site and Existing Property

The existing property is a detached three storey-building constructed from traditional building materials (brickwork and timber).

Figure 3: Front Elevation

The surrounding garden is dominated with soft-landscaping. The land immediately surrounding the building has a gentle slope from north to south and from west to east.

The ground floor is raised above street level.

Figure 4: Elevation of front boundary wall

No significant watercourses or bodies of water were noted in the immediate vicinity.

3.2.2. Proximity of Trees

Three nearby trees were identified and assessed in detail in an arboricultural survey (TreeSense 2019). The report for this is available separately.

3.2.3. Adjacent Properties

The exterior of the neighbouring properties were inspected. The locations of the neighbouring properties in relation to the new basements are shown below:

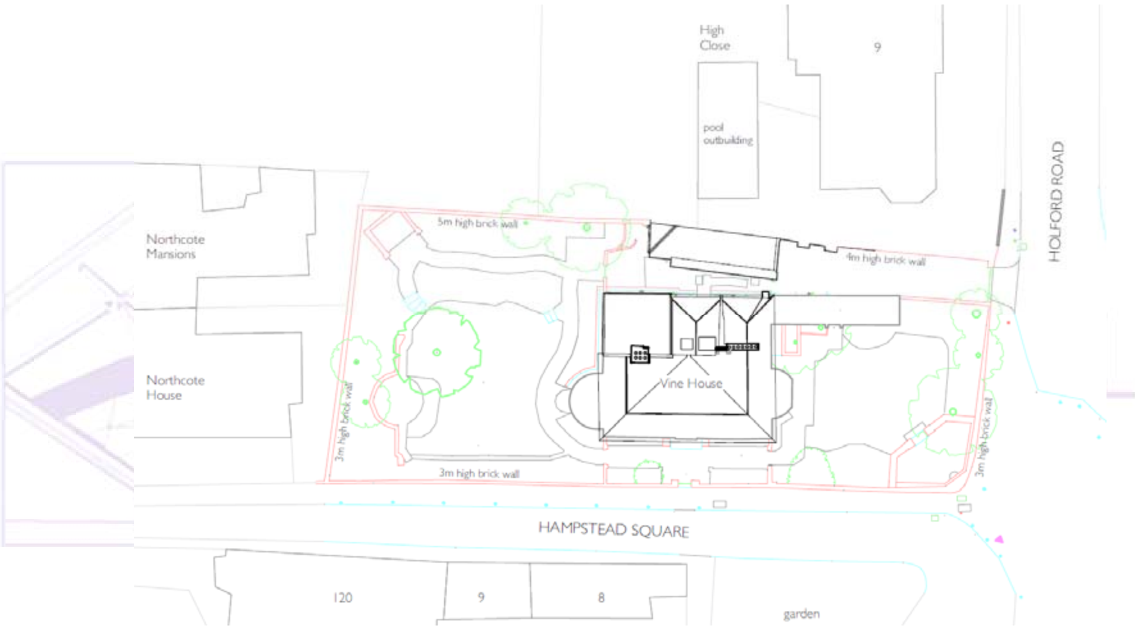


Figure 5: Location plan of neighbouring properties.

Figure 6: Aerial view from south with neighbouring properties shown.

Descriptions of the properties below are given in an anti-clockwise order starting from the neighbouring land to the west.

3.2.3.1. Northcote Mansions and Northcote House – Properties to west

Northcote House and Northcote Mansions are four-storey high semi-detached buildings built from traditional building materials. A search on the Camden Planning website shows that they have basement below part of the foot-print of the above ground structure. The buildings are over 20m away from the proposed basement. It is unlikely that the proposed basement will affect these properties and vice-versa.

3.2.3.2. 8 and 9 Hampstead Square - Properties to the south

8 and 9 Hampstead Square are listed properties constructed from traditional building materials. A search on the Camden Planning website shows these properties to do not have basements. However, the level of the foundations relative the existing ground level surrounding the perimeter walls of Vine House would be at least -2m, owing to the slope and the lower level of the house

Figure 7: View looking west with rear face of 8 and 9 Hampstead Square on the left, rising to two storeys above street level.

Figure 8: View looking north, with south and east face of 8 Hampstead Square in foreground, at three storeys above street level.

Accounting for the level and the distance from the proposed basement, the works are unlikely to have any effect on these buildings and vice-versa.

3.2.3.3. 9 Holford Road

A 4 to 5m high wall separates 9 Holford Road from the site. From inspection from Holford Road, a garage is present at street level. The building at this level is understood to extend towards the rear of the property.

Figure 9: Street view of side entrance to Vince House and partial view of 9 Holford Road

A search on the Camden Planning website did not find any proposals for basements below street level.

3.3. Land Stability and Hydro-geology: Ground Investigation

The ground investigation report, which has data from initial site investigations and data from subsequent monitoring, is available as a separate report [GWPR3410/GI/December 2019].

3.4. Surface Water and Drainage Walk Over Survey

3.4.1. Hardstanding

The hardstanding on the site is limited to existing structure and paving areas outside of the external walls of the building. The remainder of the site is covered with soft landscaping.

Figure 10: East elevation of building and surrounding garden

3.4.2. Site Drainage

Rainwater downpipes discharge surface water from the building into conventional drainage. There is a drain that connects to a combined sewer below Holford Road.

Surface water from the porch discharges directly into the soft landscaped areas.

3.4.3. Surface Water

No areas of surface water in the form of ponds lakes, streams or rivers were noted on the site.

3.4.4. Summary Surface Water Desk Study and Walk-over Survey

A walk over survey has confirmed that there are no surface water features, either within or close to the site. The survey has also confirmed that hard surfaces are present around the perimeter of the building.

4. Screening Stage

This stage identifies any areas for concern that should be investigated further.

4.1. Geology and Land Stability

For the screening of features relating to Land Stability, refer to the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

4.2. Hydro-geology

For the screening of features relating to Land Stability, refer to the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

4.3. Surface Flow and Flooding

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

No. The site lies outside the areas denoted by Figure 14 of the GSD (extract shown below)

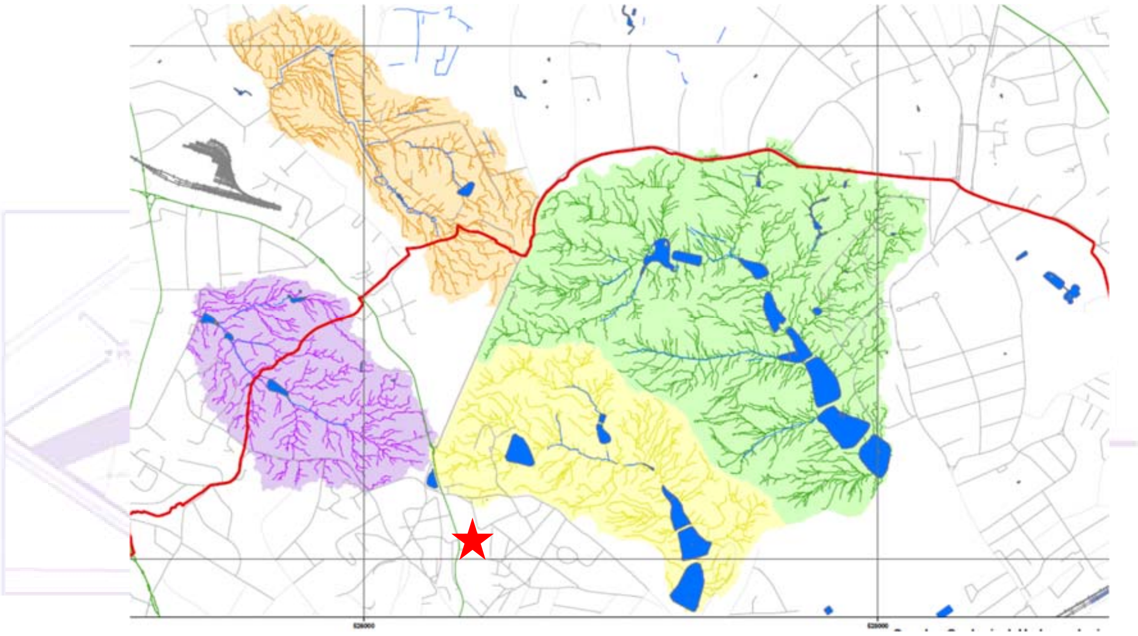


*Figure 11: Extract from Figure 14 of the GSD (site indicated with *)*

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?

No – The surface water that flows from the proposed development will be routed the same way as before: water collected from the building will enter the existing drainage system; water on soft-landscaped areas and external paving areas will discharge to the ground.

Question 3. Will the proposed basement development result in a change to the hard surfaced /paved external areas?

No. The amount of hard standing will remain unchanged

Question 4. Will the proposed basement result in changes to the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?

No. Surface water that is received by adjacent properties and downstream watercourses is not from the site. This is will remain the case with the proposed development.

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

No. Collected surface water will be from building roofs and paving, as before. The quality of the water received downstream will therefore not change.

Question 6 : Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature?

No. The site does not lie in an area identified by EA floodplain maps as having a high risk of surface water flooding. Furthermore, the site is not on a street that was recorded as flooded in either 1975 or 2002.

Summary

Negative answers apply to all of the Screening questions in this section. However, Camden Council request that a flood risk assessment be carried out for properties in Critical Drainage Areas. These need to be identified to determine whether the property is within the boundaries of one of these.

Carry forward to Scoping Stage.

5. Scoping Stage

5.1. Geology and Land Stability

For the scoping of features relating to Land Stability, refer to the combined Land Stability and Hydro-geology BIA by by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

5.2. Hydro-geology

For the scoping of features relating to Hydro-geology, refer to the combined Land Stability and Hydro-geology BIA by by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

5.3. Surface Flow and Flooding

No further study is required in the context of the initial screening questions. However, the site lies in a CDA (Critical Drainage Area). This is identified as 'Group3_010' and is indicated below.

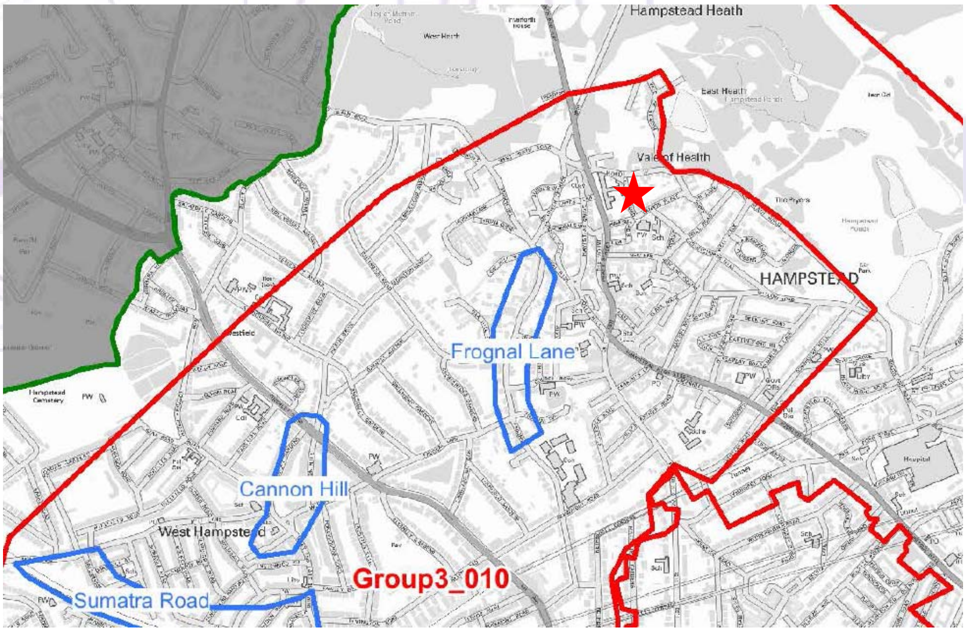


*Figure 12: Extract from Camden CDA map (site indicated with *)*

A flood risk assessment is therefore required. This is available under a separate cover.

6. Site Investigation / Additional Assessments

Investigations for Land Stability and Hydrogeology are described within the BIA by Maund Geo-Consulting. An arboricultural assessment has also been carried out. The relevant trees were been surveyed by Tree Sense. The report for this is under a separate cover.

As mentioned previously, within the context of the initial screening, no further assessments are required for Surface Water and Flooding.

7. Construction Methodology and Engineer Statements

7.1. Loading and Geotechnical Design Parameters

From sections 5 and 6 of the combined Land Stability and Hydrogeology BIA by Maund Geo-consulting, the following soil properties are proposed:

Soil density γ = 17 kN/m^3

Active and passive co-efficient for overall stability

K_a = 0.3

K_p = 4.8

7.1.1. Intended Use & Loadings

Below ground level, the reinforced concrete retaining walls are designed to carry the lateral loading applied from above.

The lateral earth pressure exerts a horizontal force on the retaining walls. The retaining walls will be checked for resistance to the overturning force this produces.

Lateral forces will be applied from:

- Soil loads
- Hydrostatic pressures
- Surcharge loading from behind the wall

These produce retaining wall thrust. This will be restrained by the opposing retaining wall.

7.1.2. Surcharge Loading

Where applicable, the following will be applied as surcharge loads to the front and rear retaining walls:

- 5kN/m^2 if within 45° of pavement
- Garden Surcharge 2.5kN/m^2
- Surcharge for adjacent property 1.5kN/m^2 + 4kN/m^2 for concrete ground bearing slab

Adjacent Properties:

All adjacent property footings within 45° to have additional geotechnical engineers input. A line at 45º from the base of the neighbours' wall footing would be intersected by the basement retaining wall. This should be accounted for in the design.

7.1.3. Hydrostatic Pressure

The ground investigations show that no water is present above the formation level of the basement. The walls however will be designed to resist a hydrostatic pressure. Design of retaining walls should account for the anticipated worst-case scenario for ground water levels. It is possible that a water main may break causing a local high-water table. To account for this, the wall is designed for water at ¾ the height of the wall. This will be applied to the front basement which is likely to be in proximity of the incoming water mains.

7.2. Permanent Design Proposals

The foundation of the new structure will consist of RC (reinforced concrete) cantilevered retaining walls. These will be designed to resist the lateral loads around the perimeter of the basement. The lateral thrust on the basement walls will be resisted by the friction between the basement structure and the surrounding soil, and the passive pressures mobilised on the opposite sides. The basement floor structure will comprise reinforced concrete slabs internal foundation pads to support internal columns. The RC walls will also transfer vertical loads to the ground.

Calculations of one of the most heavily loaded retaining walls are appended. The most critical parameters have been used for this.

7.2.1. Temporary works

Walls are designed to be structural stable with top and bottom propping . Temporary propping details should be provided by the contractor and must be designed by a suitability qualified professional.

To demonstrate the feasibility of the works, a proposed basement construction sequence is appended.

7.3. Ground Movement Assessment

All excavations minor movement in the surrounding ground. The degree of movement is partly dependent on depth of the excavation and the control of the construction procedures. For an analysis of the predicted ground movement, refer to the combined Land Stability and Hydro-geology BIA by Maund Geo-consulting [ref MGC-BIA-19-34, dated December 2019].

The proposed method (appended) is such that it minimises the risk of movement to the above structure and any properties close by. The method statement should be followed carefully to limit any possible movement. Croft does not expect any movement greater than Category 1 (Very Slight) on the Burland Scale.

7.4. Control of Construction Works

7.4.1. Pre-construction Procedures

A construction sequence has been formulated with Croft's experience of over 500 basements. The procedures described in this statement will mitigate the impacts that the construction of the basement will have on nearby properties.

To reduce the risk to the development:

- Employ a reputable firm that has extensive knowledge of basement works.
- Employ suitably qualified consultants Croft Structural Engineers has completed over 500 basements in the last five years.
- Provide method statements for the contractors to follow; this should be in accordance with guidance from ASUC (Association of Specialist Underpinning Contractors)
- Investigate the ground this has now been done.
- Record and monitor the properties close by. This is completed by a condition survey under the Party Wall Act, before and after the works are completed.

7.4.2. Noise and Nuisance Control

The contractor is to follow the good working practices and guidance laid down in the 'Considerate Constructors Scheme'.

The hours of working will be limited to those allowed; 8am to 5pm Monday to Friday and Saturday Morning 8am to 1pm.

None of the practices cause undue noise that one would typically expect from a construction site (a conveyor belt typically runs at around 70dB).

The site has car parking within the site boundary, in which a skip can be stored.

The site will be hoarded with 8' site hoarding to prevent access and minimise the level of direct noise from the site.

The hours of working will further be defined within the Party Wall Act.

Working on domestic basement excavations generally requires hand tools to be used. The level of noise generally will be no greater than that of digging of soil. The noise is reduced and muffled by the works being undertaken underground. The level of noise from basement construction works is therefore lower than typical ground level construction.

7.4.3. Tree Root Protection

As mentioned previously, trees in the garden have been surveyed by an arboriculturalist. The root protection area should be observed during site set-up. To minimise excavations close to the roots, the soil should not be battered back to form a slope but instead should have vertically cut excavations that should be propped as the works progress. Additional protection measures advised by the arboriculturalist should be put in place. After the Planning stage is concluded, the design team may wish to consider appointing an arboriculturalist to view the extent on the works and advise on any site-specific tree protection arrangements.

7.4.4. Construction Management Plan

For the Construction Phase it may be beneficial to compile a Construction Management Plan (CMP). A suitably qualified person, typically the contractor, would provide the CMP. The items that should be considered are:

- Delivery routes and times
- Expected working hours
- Times when local roads may become busy (due to schools and other construction sites)
- Volume of muck-away, how this is managed and when.
- Required plant
- Noise dust and vibration
- Waste Management

This is outside the brief of the Basement Impact Assessment and is not within Croft's remit.

7.4.5. Monitoring

In order to safeguard the existing structures during underpinning and new basement construction, movement monitoring using total stations or similar should be undertaken.

Before the works begin, a detailed monitoring report is required to confirm the implementation of the monitoring. The items that this should cover are:

- Risk Assessment to determine level of monitoring
- Scope of Works
- Applicable standards
- Frequency of monitoring
- Specification for Instrumentation
- Monitoring of existing cracks
- Monitoring of movement
- Reporting

As a minimum, monitoring target locations should be attached at 2m intervals on the boundary wall with 9 Holford Road.

Proposed locations are shown below

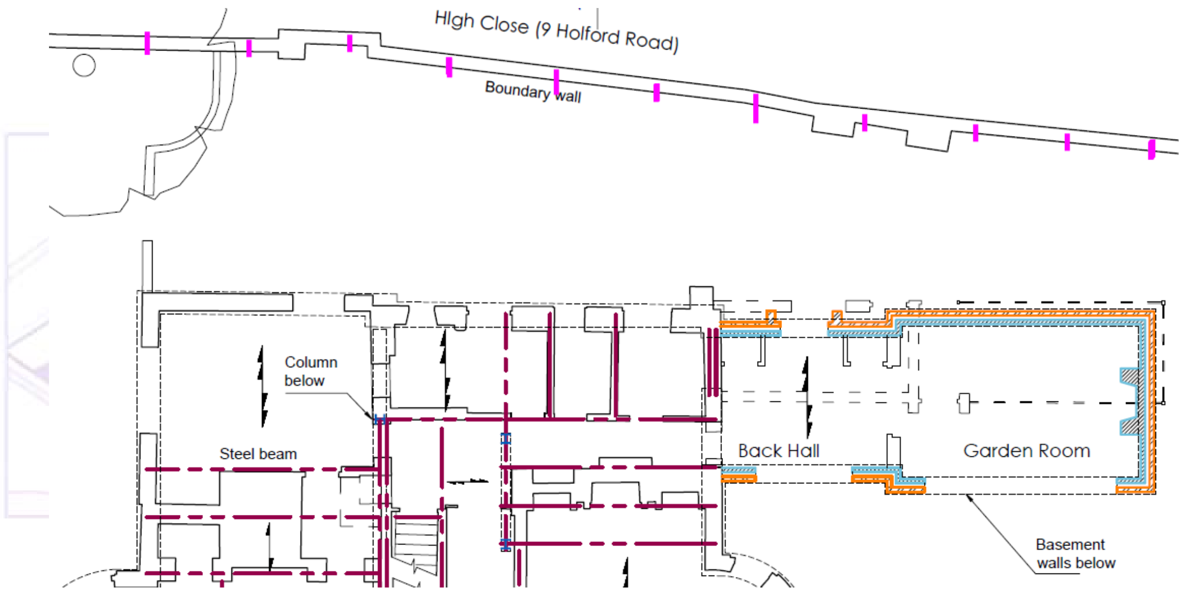


Figure 13: Extract from Ground Floor Plan with proposed monitoring locations indicated in pink

The final locations should be advised by the design team at detailed design stage.

Croft would recommend that the monitoring frequency should follow:

Pre-construction: Monitored once.

During construction: Monitored after every pin is cast for first 4 no. pins to gauge effect of underpinning. If all is well, monitor after every other pin.

Post construction works: Monitored once.

Trigger values and contingency actions are noted in the table below.

MOVEMENT		CATEGORY	ACTION
Vertical	Horizontal		
0mm-4mm	0-3mm	Green	No action required
4mm-10mm	3-8mm	AMBER	Detailed review of Monitoring: Check studs are OK and have not moved. Ensure site staff have not moved studs. If studs have moved reposition. Relevel to ensure results are correct and tolerance is not a concern. Inform Party Wall surveyors of amber readings. Double the monitoring for 2 further readings. If stable revert back. Carry out a local structural review and inspection. Preparation for the implementation of remedial measures should be required. Double number of lateral props Implement remedial measures review method of working and ground conditions
>10mm	>8mm	RED	Implement structural support as required; Cease works with the exception of necessary works for the safety and stability of the structure and personnel; Review monitoring data and implement revised method of works

8. Basement Impact Assessment

8.1. Conceptual Site Model

A conceptual site model is described in Section 8 of Land Stability and Hydrogeology BIA by Maund Geo-consulting. This, and other areas of the report, highlight the following:

- Temporary works (require careful consideration to minimise ground movement)
- Any retaining walls should be appropriately designed.
- Mitigation measures to minimise potential movements (these are proposed and appended. This includes the use of propping throughout the works)
- Perched water is unlikely but as a precaution arrangements should be made for pumping this away
- Monitoring of existing structures should be carried out

Examples of permanent design calculations and temporary works proposals are appended.

8.2. Geology and Land stability

For impacts relating to Land Stability, refer to the combined Land Stability and Hydrogeology BIA by Maund Geo-consulting,

8.3. Hydro-geology

For impacts relating to Hydrogeology, refer to the combined Land Stability and Hydrogeology BIA by Maund Geo-consulting,

8.4. Surface Water and Flooding

As described previously, there are no impacts relating to surface water and flooding that need to be considered for further assessment within the context of the initial screening. However, the planning requirements focus mainly on the potential for the development to cause flooding to other properties and assets; they do not assess the potential for flooding within the subject property. A flood risk assessment to assess these risks further is available under a separate cover. This is also required given that the site is within a Critical Drainage Area.

8.5. Conclusion

For the proposed development, there is minor concern over the movement of the ground nearby. This assessment has demonstrated that the impacts of these can be adequately mitigated with appropriate design and construction measures. The proposed development can be constructed without any significant adverse effects on the immediate neighbouring properties or the surrounding vicinity.

Appendix A : Structural Calculations

Building Regulations will be required after the Planning Application. As part of the Building Control package, full calculations must be undertaken and provided at detailed design stage once planning permission is granted. The calculations must be completed to a recognised Standard (BS or Euro Codes). The calculations must take into account the findings of this report and the recommendations of the auditors.

The design must resist:

- Vertical loads from the proposed works and adjacent properties
- Lateral loads from wind, soil water and adjacent properties where applicable
- Loadings in the temporary condition
- All other applied loads on the building

The final proposed scheme must:

- Provide stability in the temporary condition to all forces
- Provide stability to all forces in the permanent condition

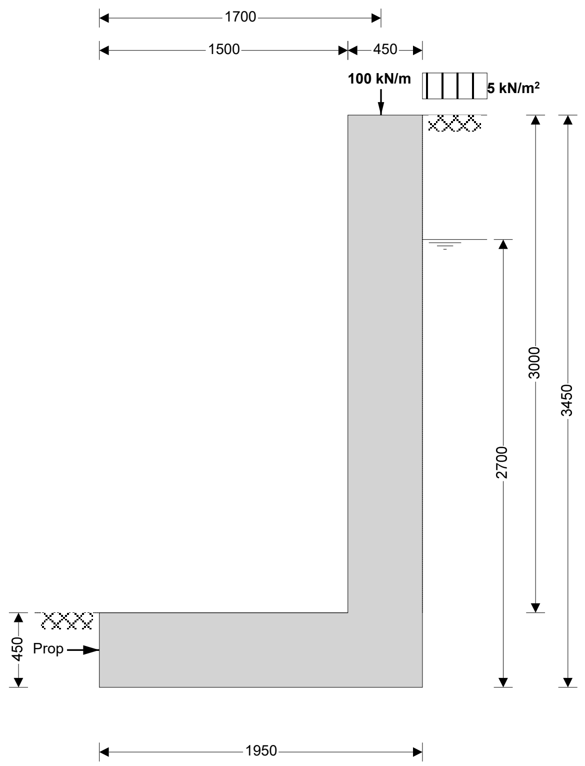
As part of the planning Croft structural engineers has considered some of the pertinent parts of the basement structure to ensure that it can be constructed. The following calculations are not a full set of calculations for the final design.

RETAINING WALL BELOW FRONT WALL

No ground water is present above the formation level. To account for the worst case (eg burst mains) wall should resist hydrostatic pressures up to ¾ the height of the retaining wall

RETAINING WALL ANALYSIS (BS 8002:1994)

TEDDS calculation version 1.2.01.06



Wall details

Retaining wall type **Cantilever**

Height of wall stem h_{stem} = **3000** mm | Wall stem thickness t_{wall} = **450** mm

Length of toe l_{toe} = **1500** mm | Length of heel l_{heel} = **0** mm

Overall length of base l_{base} = **1950** mm | Base thickness t_{base} = **450** mm

Height of retaining wall h_{wall} = **3450** mm

Depth of downstand d_{ds} = **0** mm | Thickness of downstand t_{ds} = **450** mm

Position of downstand l_{ds} = **1100** mm

Depth of cover in front of wall d_{cover} = **0** mm | Unplanned excavation depth d_{exc} = **0** mm

Height of ground water h_{water} = **2700** mm | Density of water γ_{water} = 9.81 kN/m³

Density of wall construction γ_{wall} = **23.6** kN/m³ | Density of base construction γ_{base} = **23.6** kN/m³

Angle of soil surface β = **0.0** deg | Effective height at back of wall h_{eff} = **3450** mm

Mobilisation factor M = **1.5**

Moist density γ_m = **18.0** kN/m³ | Saturated density γ_s = **21.0** kN/m³

Design shear strength ϕ' = **19.5** deg | Angle of wall friction δ = **14.9** deg

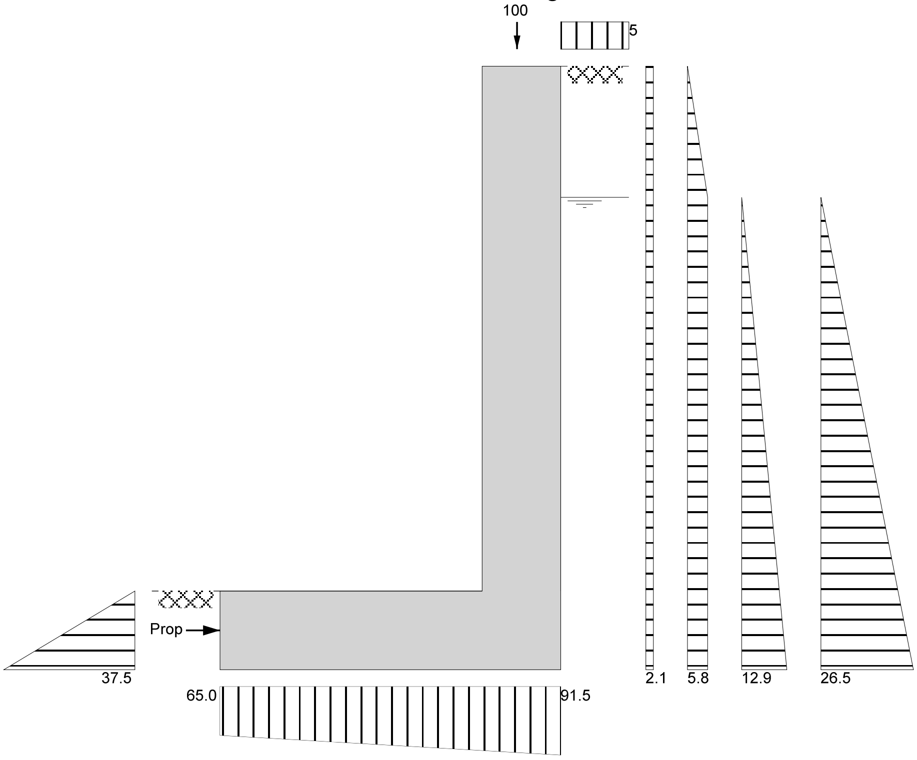
Design shear strength ϕ'_b = **24.2** deg
Design base friction δ_b = **18.6** deg
Moist density γ_{mb} = **21.0** kN/m^3
Allowable bearing $P_{bearing}$ = **100** kN/m^2

Using Coulomb theory

Active pressure K_a =**0.442**
Passive pressure K_p = **4.187**
At-rest pressure K_0 = **0.666**

Loading details

Surcharge load Surcharge = **5.0** kN/m^2
Vertical dead load W_{dead} = **80.0** kN/m
Vertical live load W_{live} = **20.0** kN/m
Horizontal dead load F_{dead} = **0.0** kN/m
Horizontal live load F_{live} = **0.0** kN/m
Position of vertical load l_{load} = **1700** mm
Height of horizontal load h_{load} = **0** mm



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

Calculate propping force

Propping force F_{prop} = **25.3** kN/m

Check bearing pressure

Total vertical reaction R = **152.6** kN/m
Distance to reaction x_{bar} = **1030** mm
Eccentricity of reaction e = **55** mm

Reaction acts within middle third of base

Bearing pressure at toe p_{toe} = **65.0** kN/m^2
Bearing pressure at heel p_{heel} = **91.5** kN/m^2

PASS - Maximum bearing pressure is less than allowable bearing pressure

RETAINING WALL DESIGN (BS 8002:1994)

TEDDS calculation version 1.2.01.06

Ultimate limit state load factors

Dead load factor γ_{f_d} = **1.4** Live load factor γ_{f_l} = **1.6**

Earth pressure factor γ_{f_e} = **1.4**

Calculate propping force

Propping force F_{prop} = **25.3** kN/m

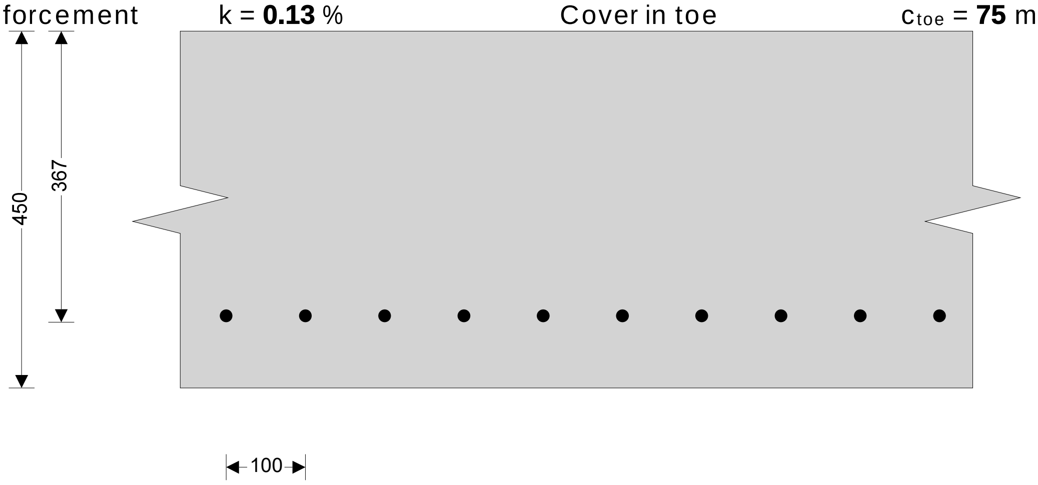
Design of reinforced concrete retaining wall toe (BS 8002:1994)

Material properties

Strength of concrete f_{cu} = **40** N/mm² Strength of reinforcement f_y = **500** N/mm²

Base details

Minimum reinforcement k = **0.13** % Cover in toe c_{toe} = **75** mm



Design of retaining wall toe

Shear at heel V_{toe} = **163.1** kN/m Moment at heel M_{toe} = **175.7** kNm/m

Compression reinforcement is not required

Check toe in bending

Reinforcement provided **16 mm dia.bars @ 100 mm centres**

Area required $A_{s\_toe\_req}$ = **1158.3** mm²/m Area provided $A_{s\_toe\_prov}$ = **2011** mm²/m

PASS - Reinforcement provided at the retaining wall toe is adequate

Check shear resistance at toe

Design shear stress v_{toe} = **0.444** N/mm² Allowable shear stress v_{adm} = **5.000** N/mm²

PASS - Design shear stress is less than maximum shear stress

Concrete shear stress v_{c_toe} = **0.618** N/mm²

v_{toe} < v_{c_toe} - No shear reinforcement required

Design of reinforced concrete retaining wall stem (BS 8002:1994)

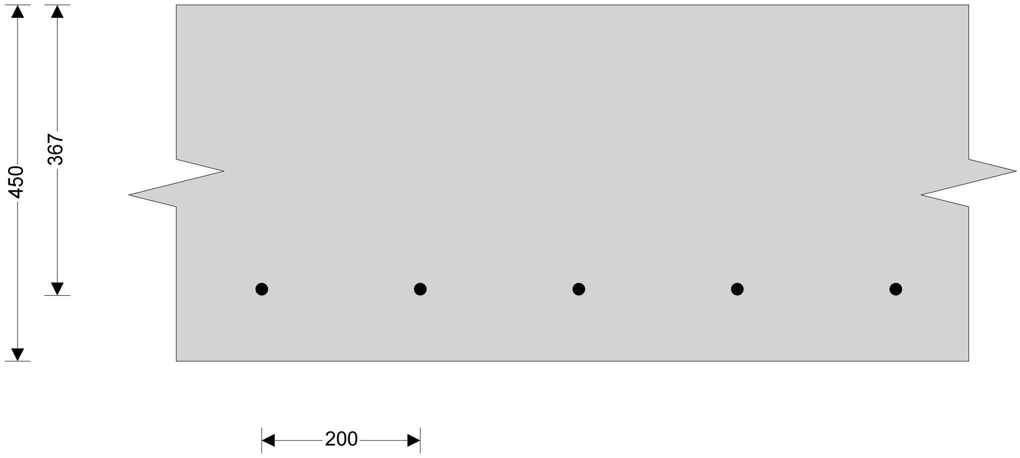
Material properties

Strength of concrete f_{cu} = **40** N/mm² Strength of reinforcement f_y = **500** N/mm²

Wall details

Minimum reinforcement k = **0.13** %

Cover in stem c_{stem} = **75** mm Cover in wall c_{wall} = **75** mm



Design of retaining wall stem

Shear at base of stem V_{stem} = **39.3** kN/m Moment at base of stem M_{stem} = **118.2** kNm/m

Compression reinforcement is not required

Check wall stem in bending

Reinforcement provided **16 mm dia.bars @ 200 mm centres**

Area required $A_{s\_stem\_req}$ = **779.4** mm^2/m Area provided $A_{s\_stem\_prov}$ = **1005** mm^2/m

PASS - Reinforcement provided at the retaining wall stem is adequate

Check shear resistance at wall stem

Design shear stress v_{stem} = **0.107** N/mm^2 Allowable shear stress v_{adm} = **5.000** N/mm^2

PASS - Design shear stress is less than maximum shear stress

Concrete shear stress v_{c_stem} = **0.491** N/mm^2

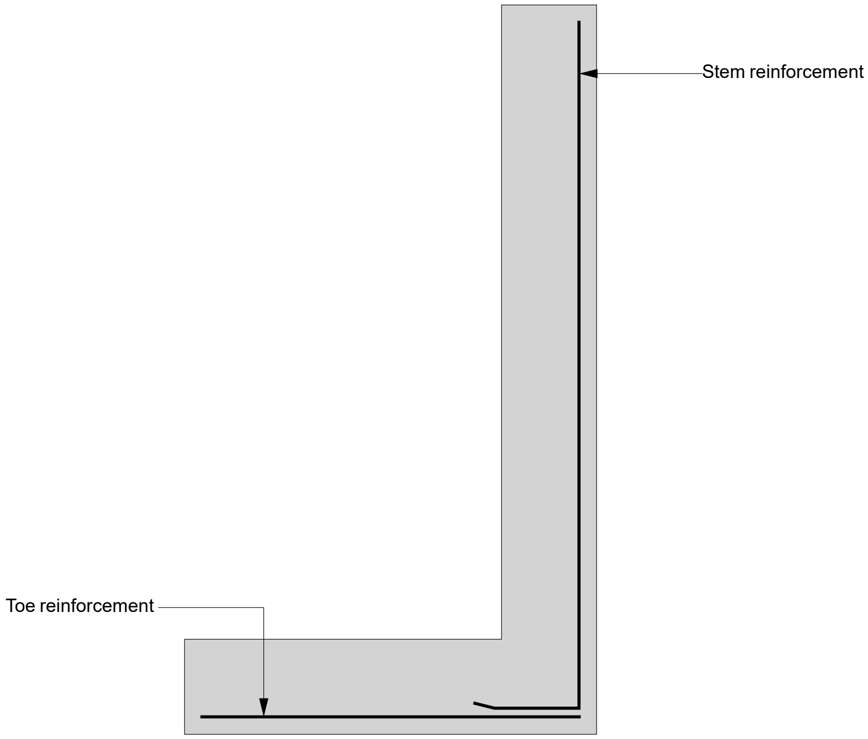
$v_{stem} < v_{c\_stem}$ - No shear reinforcement required

Check retaining wall deflection

Max span/depth ratio $ratio_{max}$ = **11.02** Actual span/depth ratio $ratio_{act}$ = **8.17**

PASS - Span to depth ratio is acceptable

Indicative retaining wall reinforcement diagram



Toe bars - 16 mm dia.@ 100 mm centres - (2011 mm²/m)
Stem bars - 16 mm dia.@ 200 mm centres - (1005 mm²/m)

Appendix B: Construction Programme

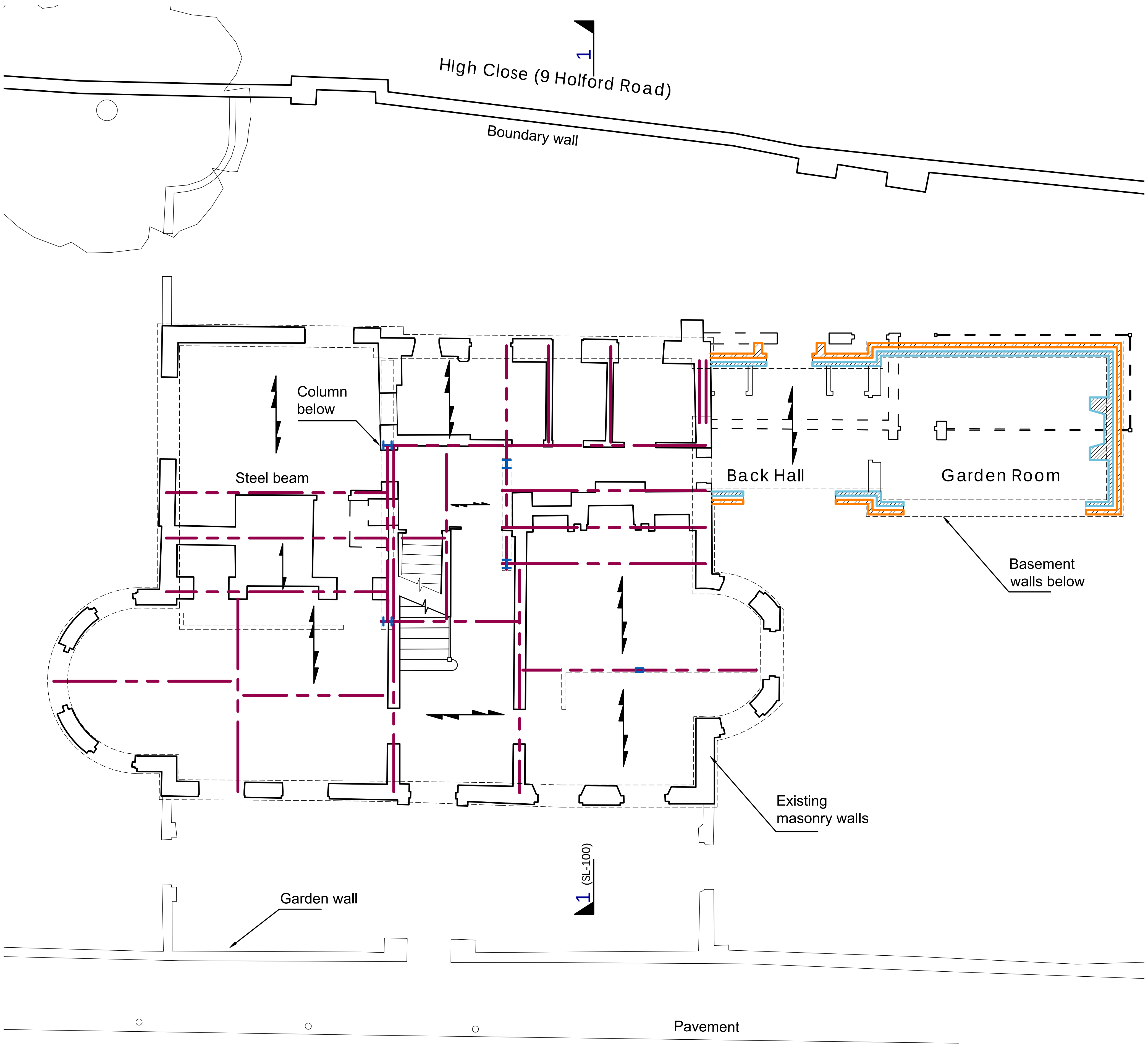
<u>The Contractor is responsible for the final construction programme</u>

Outline Construction Programme

(For Planning purposes only)

	Months															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Planning Approval																
Detailed Design																
Tender																
Monitoring of Adjacent structures																
Enabling works																
Basement Construction																
Super-structure construction																

Appendix C : Structural Drawings



Ground Floor Plan
Scale 1:100

- PLANNING ISSUE - NOT FOR CONSTRUCTION

Rev	Date	Amendments
-	10.12.2019	First issue for comment

Job No. 191025	Drawn GW	Scale As shown @ A3
	Chk'd -	
Dwg No. SL-200	Rev. -	Date Nov 2019

Client: Julia Gosmond

Project: Vine House, Hampstead Square, Camden, NW3 1AB

Title : Structural Scheme Design: Ground Floor

Croft Structural Engineers
Clockshop Mews,
r/o 60 Saxon Rd,
London, SE25 5EH.
020 8684 4744
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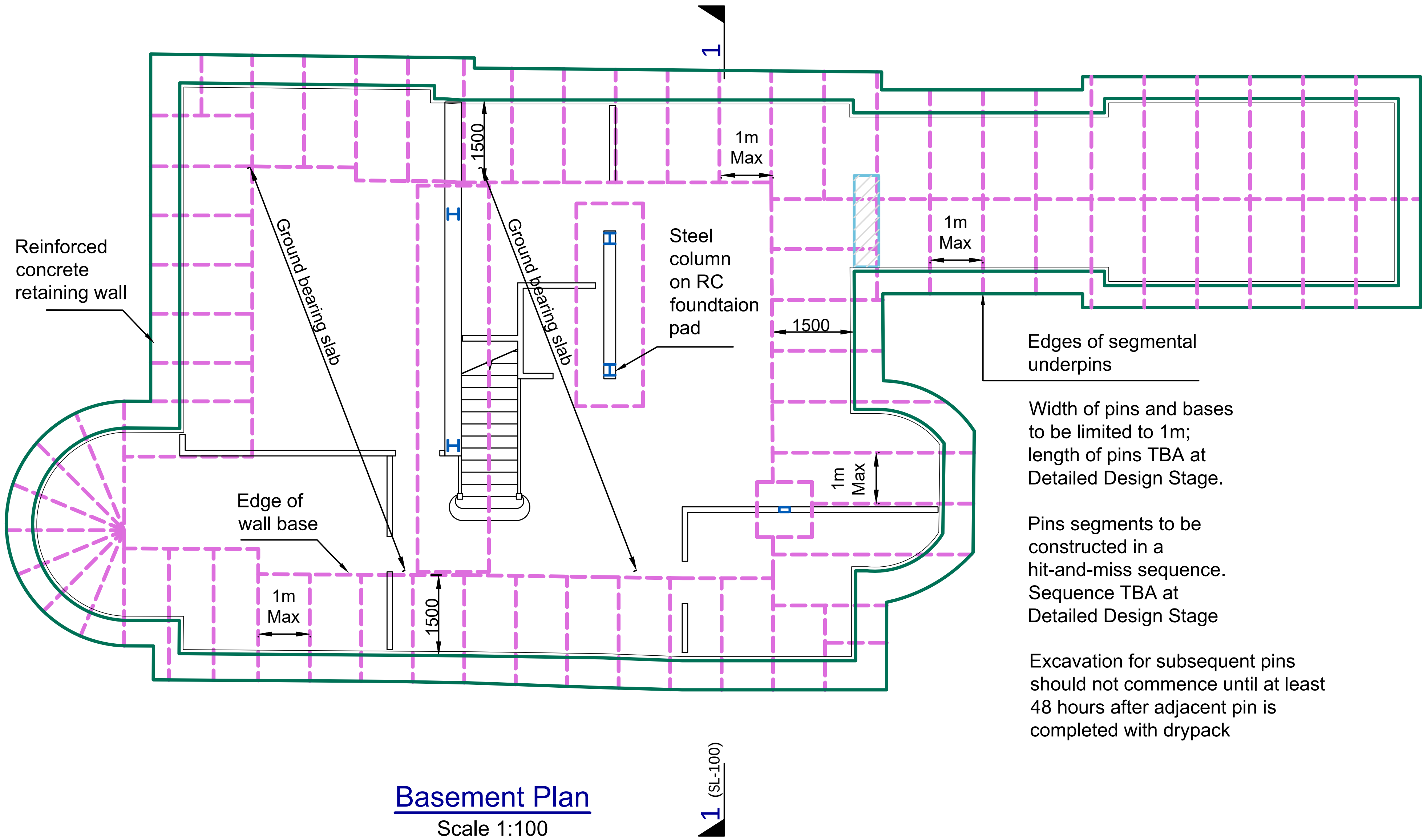
- PLANNING ISSUE -
NOT FOR
CONSTRUCTION

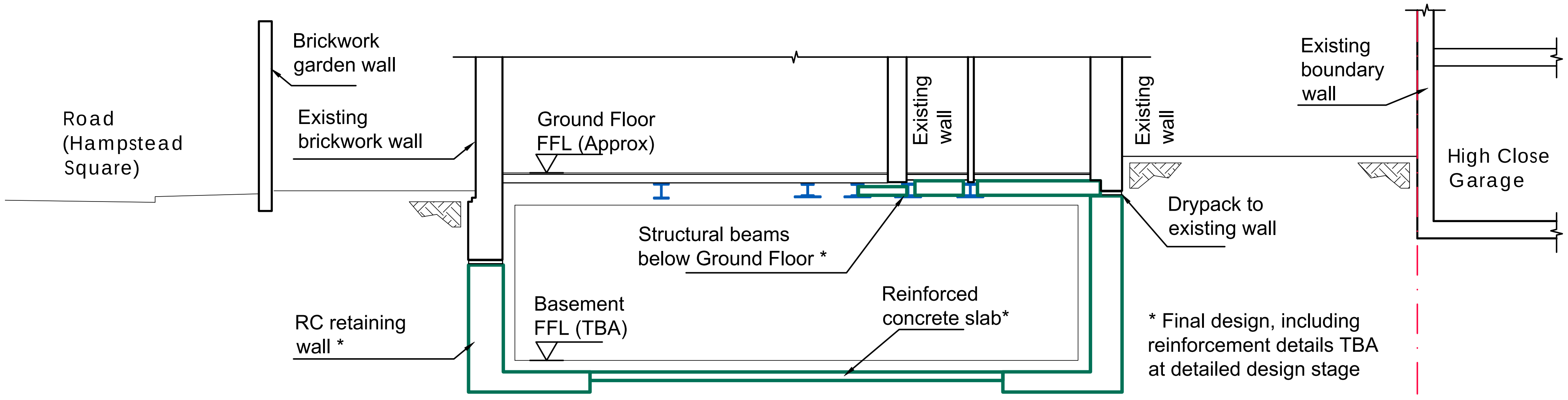


Width of pins and bases to be limited to 1m; length of pins TBA at Detailed Design Stage.

Pins segments to be constructed in a hit-and-miss sequence. Sequence TBA at Detailed Design Stage

Excavation for subsequent pins should not commence until at least 48 hours after adjacent pin is completed with drypack

Basement Plan
Scale 1:100



* Final design, including reinforcement details TBA at detailed design stage

Section 1-1
Scale 1:100

Rev	Date	Amendments
-	10.12.2019	First issue for comment

Job No. 191025	Drawn GW	Scale As shown @ A3
	Chk'd -	
Dwg No. SL-100	Rev. -	Date Dec 2019

Client: Julia Gosmond

Project: Vine House, Hampstead Square, Camden, NW3 1AB

Title : Structural Scheme Design: Basement

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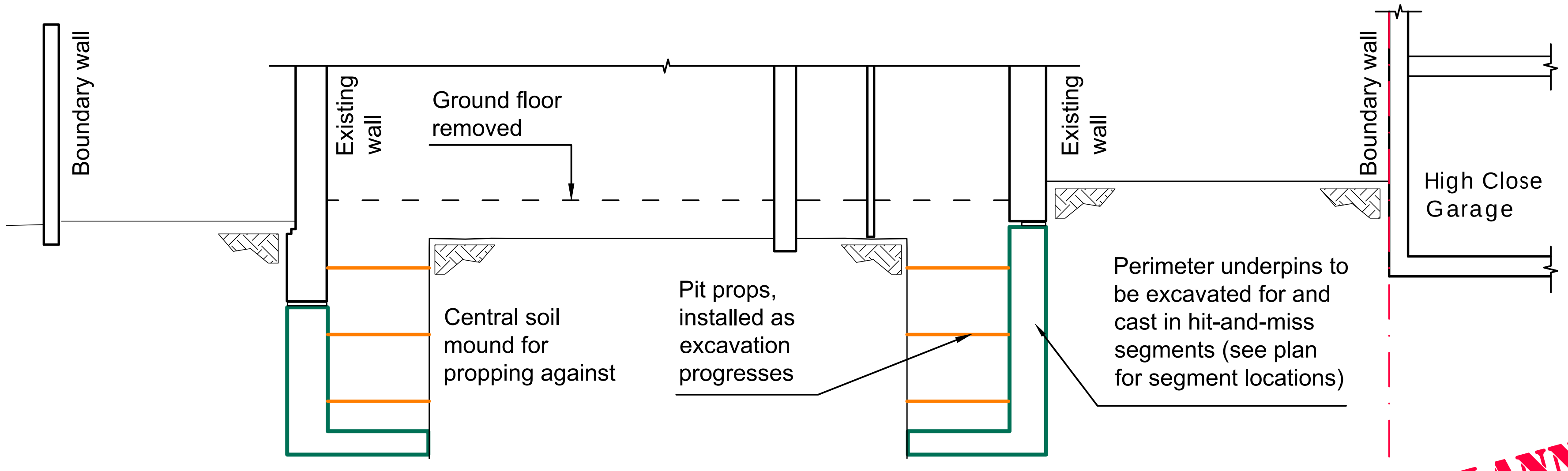
Appendix D : Temporary Works Sequence

PHASE 1

1.3. Demolish ground floor and excavate to level of existing footings
1.4. Excavate pits and cast underpins in a hit and miss procedure (segmental outlines shown on plan)
  1.4.1. Prop pits against central soil mound as excavation progresses
  1.4.2. Do not commence excavation for pin until at least 48 hours after drypacking for adjacent pin is complete (24hours minimum is possible if Conbextra 100 cement accelerator is added to dry pack mix)
  1.4.3. For every second pin, extend excavation to allow for subesquent construction of mass concrete thrust block below formation level

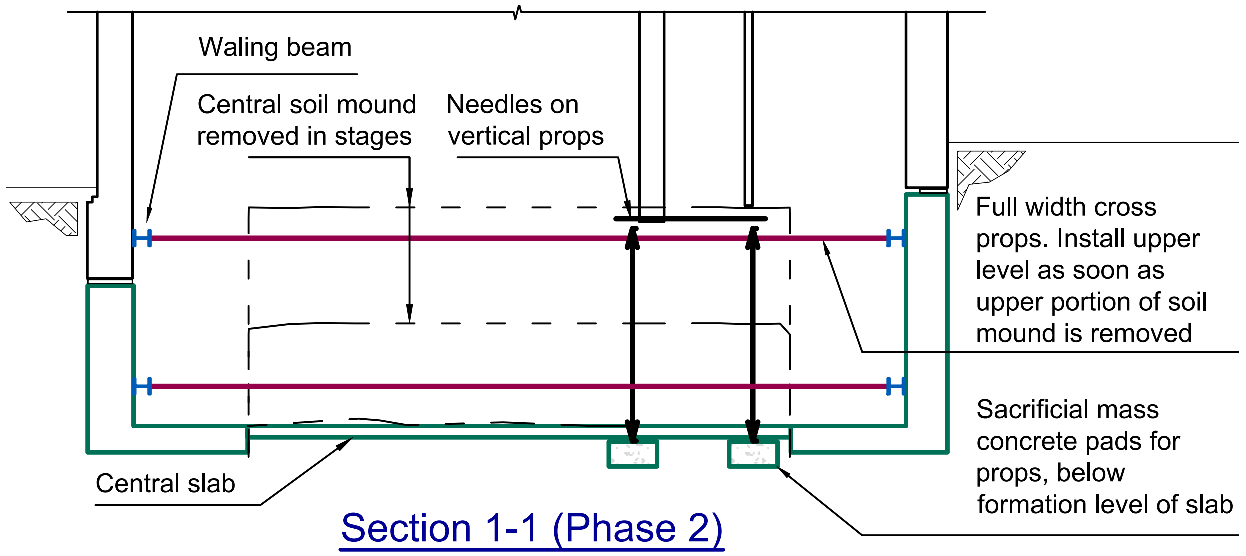


Section 1-1 (Phase 1)
Scale 1:100

- PLANNING ISSUE - NOT FOR CONSTRUCTION

PHASE 2

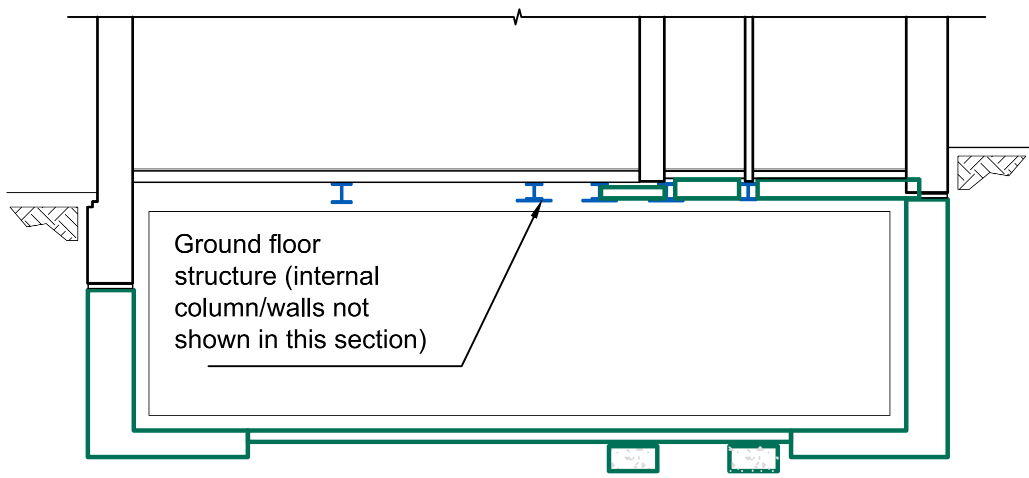
2.1. After perimeter underpins are complete, excavate remaining soil mass below building
  2.1.1. Initial horizontal props may be removed as excavation progresses
  2.1.2. Central soil mound to be removed in stages except where vertical propping to internal walls is required
  2.1.3. Install full width cross props before excavating to the next stage
2.2. Cast sacrificial pads and install needles and props to inernals walls as excavation progresses
  2.2.1. Full height of central soil mound may be removed locally at vertical propping locations
  2.2.2. Do not excavate more than 1mx1m in plan of soil without installing vertical props to the wall above
  2.2.3. As excavatnion progresses downwards for sacrifical pads, install additional horizontal pit props
2.3. After central soil mass is completely removed, construct internal concrete pads and floor slab
  2.3.1. Place below-slab drainage prior to placing reinforcement for slab



Section 1-1 (Phase 2)
Scale 1:100

PHASE 3

3.1. Proceed with construction of internal walls and columns from Basement to Ground Floor level
3.2. Complete Ground floor structure
3.3. After ground floor structure is complete, props may be removed.



Section 1-1 (Phase 3)
Scale 1:100

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-	10.12.2019	First issue for comment

Job No. 1910 25	Drawn GW / Chk'd -	Scale As shown @ A3
Dwg No. TW-100	Rev. -	Date Dec 2019

Client: Julia Gosmond

Project: Vine House, Hampstead Square, Camden, NW3 1AB

Title : Temporary Works

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