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

The data from the EA website shows that the site is not within a zone at risk of flooding from rivers.
On Figure 15 of the Camden Geological, Hydrogeological and Hydrological Study (Arup), the street is noted to have flooded in 1975 and 2002. However the precise extent of this along the length of the road is not known.
Carry forward to scoping stage.

3. Basement Impact: Screening Maps

Maps supporting the Screening information are included in Appendix A.

4. Basement Impact: Scoping

Waterflow	**Subterranean flow** Knowledge of the groundwater table is required to see if the basement will impact on the groundwater flow. This is covered by a Soil Investigation. Soil investigation to be completed with bore holes. The bores holes are to have a stand pipe inserted to confirm the water level. **Summary of points raised –** The site is over 200m away from the nearest railway tunnels.
Slope Stability	London Clay is expected to be the top layer. A soil Investigation will confirm this. The slope stability of theses beds is in the region of 40˚. The design of the RC retaining walls will take this into account. The soil investigation confirms 0.7m deep made ground below the building. Neither the basement nor the light-well walls are within 5m of the public footpath; a garden surcharge of 2.5kN/m^2 will be applied to retaining walls at the front of the property. <u>Both adjoining properties have had basement extensions completed. The impact on these adjoining properties from this development will be minimal and one could argue that this development will be to the benefit of this property in order to eliminate any differential settlement by having the front and rear elevations underpinned</u>
Surface Flow and flooding	This proposal is not considered to be in an area where there is a significant risk of flooding. The flow of surface water from the lightwells is minimal and will be incorporated in the basement drainage.

5. Desk Study

Subsoil conditions

The North London Geological Maps Indicates the site is underlain by London Clay. This is as expected in the area. A soil investigation has confirmed this.

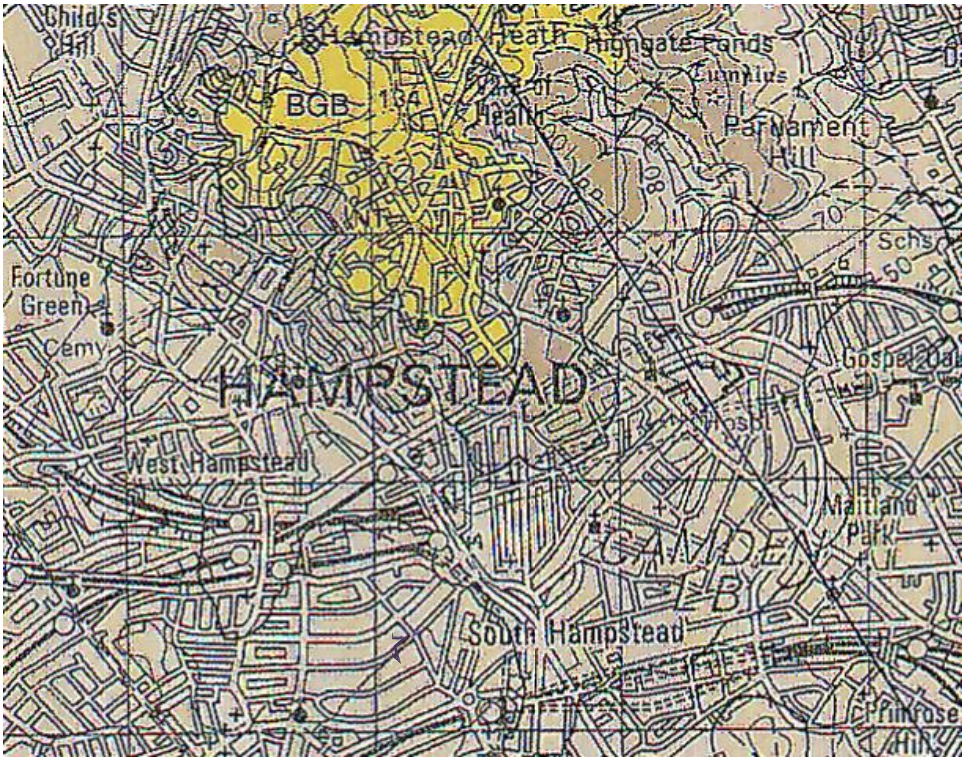


Figure 14: Extract From North London Drift Sheet

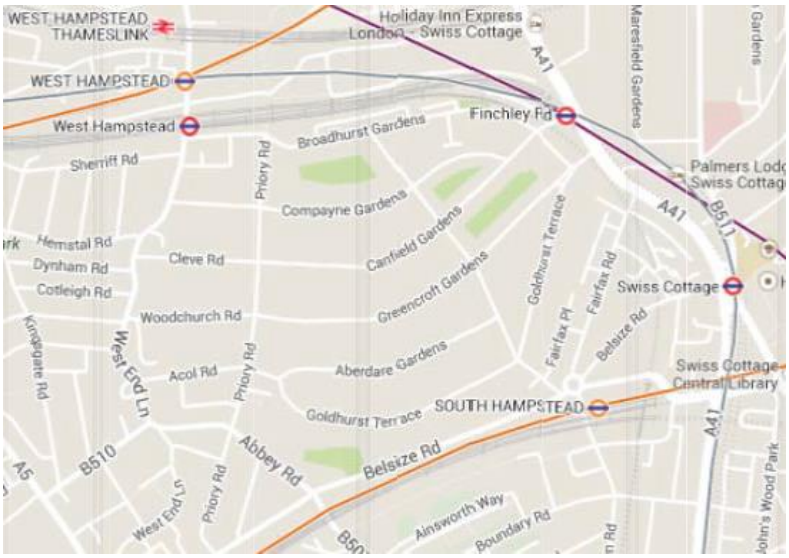


Figure 20: Location of nearby underground railways.

Contaminant Sources

From the Historic Maps it can be seen that the ground use has not been conducive to activities leading to poor ground.

During the walk-over survey no items were noted that may lead to contamination.

Water Course

From inspection of current OS maps, no natural water courses or wells exist nearby.

Figures 2 and 11 on the Guidance for subterranean development (Arup's report) indicate approximate water course locations. These are contradictory and the precise location is therefore questionable. Thames Water have relief sewer in the vicinity. This is likely to be carrying the water that would have flown through the watercourses believed to exist as shown on aforementioned Figures 2 and 1. Further investigation will be required to determine the depth and location of the relief sewer.

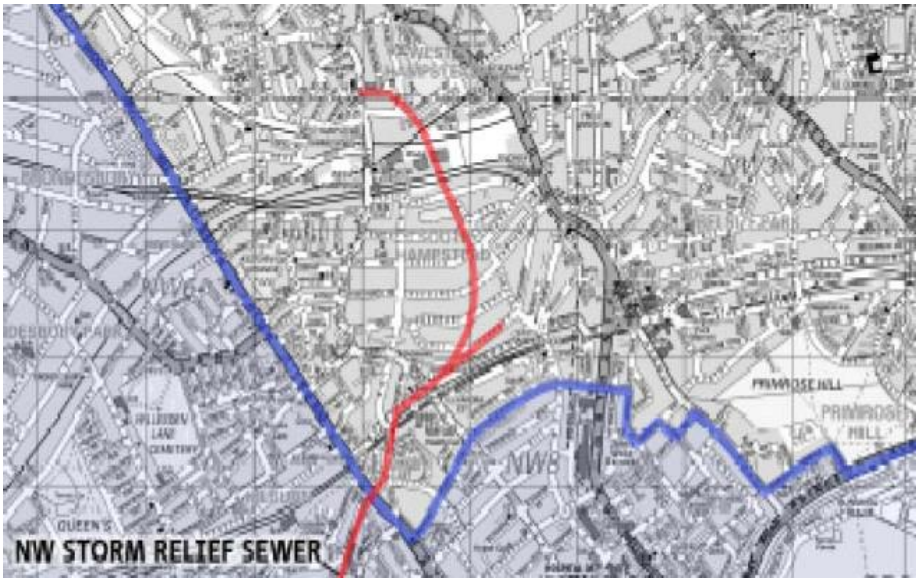


Figure 21: Location of Thames Water's North-west storm relief sewer

The Camden Hydrogeological Study (Arup's report) shows that the nearest street was subject to local flooding in 2002 but the area surrounding the site is not identified as having the potential to be at risk of surface water flooding.

The site is not within the Hampstead pond catchment area as shown Figure 14 of Arup's report.

6. Historic Maps

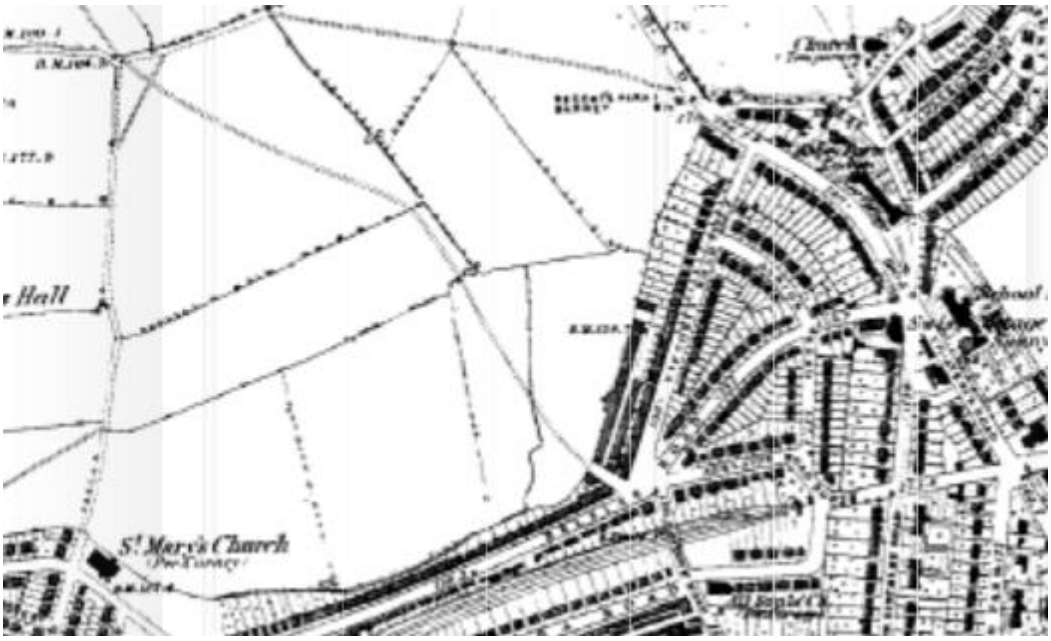


Figure 22: Historic map from 1882

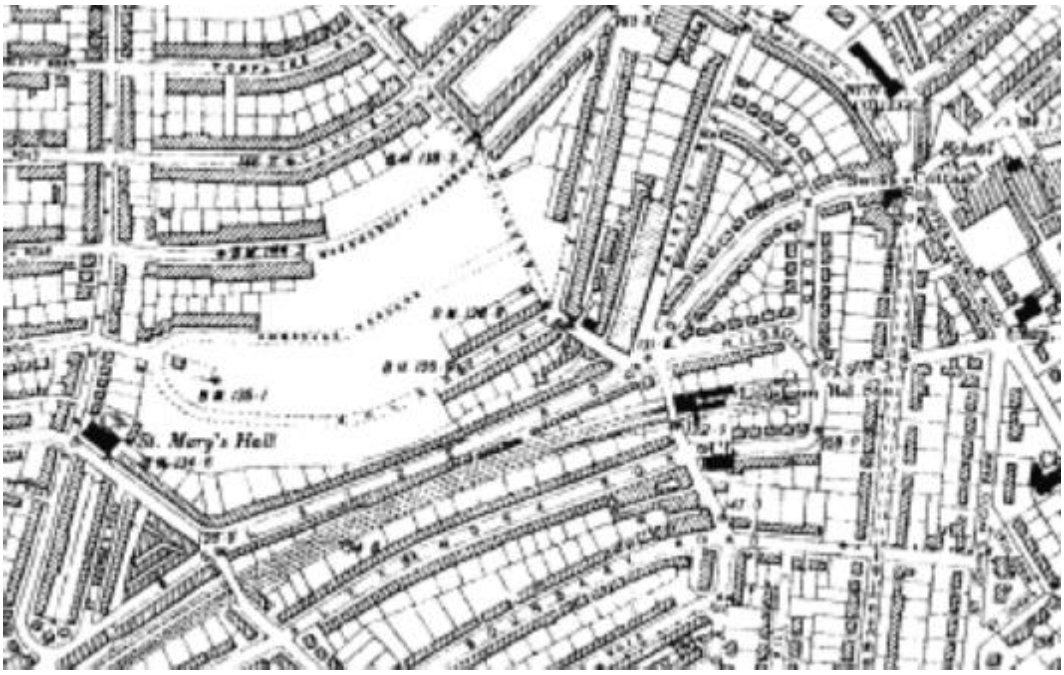


Figure 23: Historic map from 1896

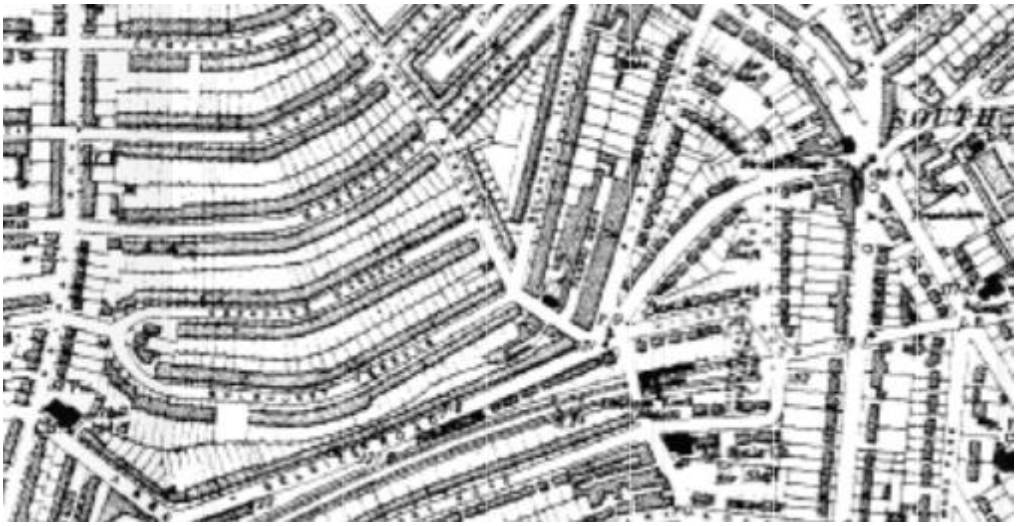


Figure 24: Historic map from 1920

7. Flood Risk Assessment

In accordance with guidance from CIRIA and the National Planning Policy Framework, the basement will be designed to be sustainable in terms of the risk to flooding. Amongst other considerations, the design will include provisions to minimise the adverse impacts of flooding on operation of the building, the users, the surroundings and the occupants of nearby properties. This is preceded by a Flood Risk Assessment (FRA) staged as follows:

- A screening study to identify potential sources of flooding.
- A subsequent scoping study to consider further the identified sources, assessing the risks proposing measures to mitigate them.

7.1. Site Location

The site is approximately 260m² in size. It is located in a densely built-up area. From inspection of OS contours, the site appears to lie on ground which slopes down from north to south, by approximately 1 in 50.
Residential houses exist either side of the site. These buildings are at the same level. There are gardens/hard landscaping to the front and rear of the site.
Aberdare Gardens runs to the front of the site. Immediately to the front, this road is relatively flat.

The nearest water course is the Thames Water relief sewer (mentioned previously in Section 5 – Watercourse). This passes within 10m of the proposed basement. The EA has not identified any flood risks associated with the nearby water courses.

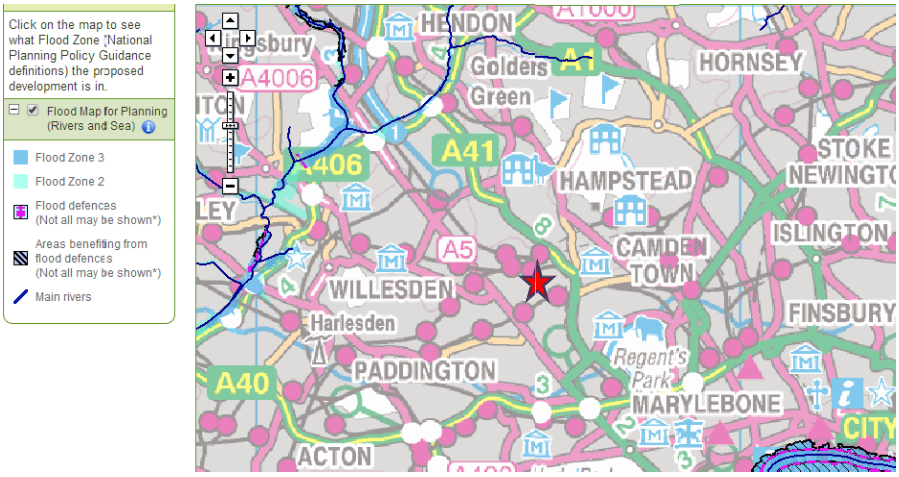


Figure 25: Flood map for planning (Environment Agency)

The site is within Zone 1, a low probability flood risk area. However, Camden Panning Guidance CPG4 'Basements and Lightwells requires

that a FRA be carried for sites on streets which have been flooded by surface water in 1975 and 2002. Aberdare Gardens is one of these streets.

7.2. Proposed Basement

The proposed basement will be beneath the full extent of the footprint of the ground floor of the building. This will include two lightwells to the front and rear respectively. Both adjoining properties have completed almost identical basements.

7.3. Screening

The potential sources of flooding are summarized below:

Potential Source	**Potential Flood Risk at**	**Justification**
Fluvial flooding	No	EA Flood Mapping shows Flood Zone 1. Distance from nearest surface watercourse >1km
Tidal flooding	No	Site location is 'inland' and topography > 40mAOD.
Flooding from rising / high groundwater	No	Site is located on low permeability London Clay.
Surface water (pluvial) flooding	Yes	Recorded in unspecified part of Aberdare Gardens in 2002
Flooding from infrastructure failure	Yes	Drainage at or near the site could potentially become blocked or cracked and overflow or leak. Drainage of the basement terrace areas may rely on pumping.
Flooding from reservoirs, canals and other artificial sources	No	There are no reservoirs, canals or other artificial sources in the vicinity of the site that could give rise to a flood risk.

7.4. Scoping Study

It is evident from the screening study that the only significant flood risks are due surface water (pluvial) flooding and failure of existing sewers in the vicinity of the site.

We have obtained further information to clarify the risks and propose mitigation measures.

7.5.1 Potential surface water (pluvial) flooding

As described in section 7.1, the site basement lies on a high point on Aberdare Gardens.

Any surface water runoff would be directed to this section of the road

It is likely that this area of road would have been flooded in 2002. It is understood that this flooding was due to the Thames Water relief sewer being overloaded. It is also understood Thames Water subsequently increased the capacity of this relief system.

The likelihood of flooding of this nature is now significantly reduced.

7.5.2 Potential flooding from infrastructure failure

In addition to the storm water relief sewer previously mentioned, there is believed to be a trunk sewer running along road.

Blockage or failure of either of these may result in the following sequential events:

- Excess flow from Aberdare Gardens will move, owing to the slight fall on the road outside.
- This flow would travel in the direction away from the front elevation of the property owing to the site being on a slightly higher level than the opposite side of the street, and the raised level of the pavement above the road (see photo below).

Figure 26: Street level view showing kerb raised above road

The likelihood of flow into the front light wells is also reduced by the existing landscaped areas in the front garden: these would partially relieve any excess flow that would migrate towards the front of the building.

A pumping mechanism will be installed for the proposed basement.

There is a likelihood that this may fail and allow excess water to accumulate. If this were to occur, the build-up of water would be gradual and noticeable before it becomes a significant life-threatening hazard.

7.6 Mitigation measures

We would recommend the following measures to reduce the risks mentioned above:

- Construct an upstand around the front lightwells to form a barrier against excess flow.
- Install a dual pumping system to maintain operation in the event of a failure.

7.7 Summary

The risk of flooding from excess surface water is not considered significant. There is a risk of flooding due to the failure of the pumping system but this can be reduced to acceptable levels with appropriate design and installation measures.

8. Site Investigation

Monitoring and Reporting

Chelmer Site Investigations completed a borehole investigation. From the Scoping stage we considered the following for the brief:

- A borehole to a depth of 15 metres.
- Two boreholes would have been preferable. However, it was only possible to access the rear of the property. Considering the size of the development and the knowledge we already have of soil in this area, we do not expect there to be a large variation in soil across the relatively small area under examination.
- Site testing to determine in-situ soil parameters.
- Laboratory testing to confirm soil make up and properties.
- Actual Report on soil type and conditions.
- The Historic maps and walk over survey did not highlight any significant contamination sources, therefore no site test of the ground has been requested.

Refer to Appendix E for the Soil Investigation Report.

At detailed designed stage, a soil investigation with an extended brief and detailed interpretative geotechnical report should be completed.

9. OS Map extract showing location of Railway

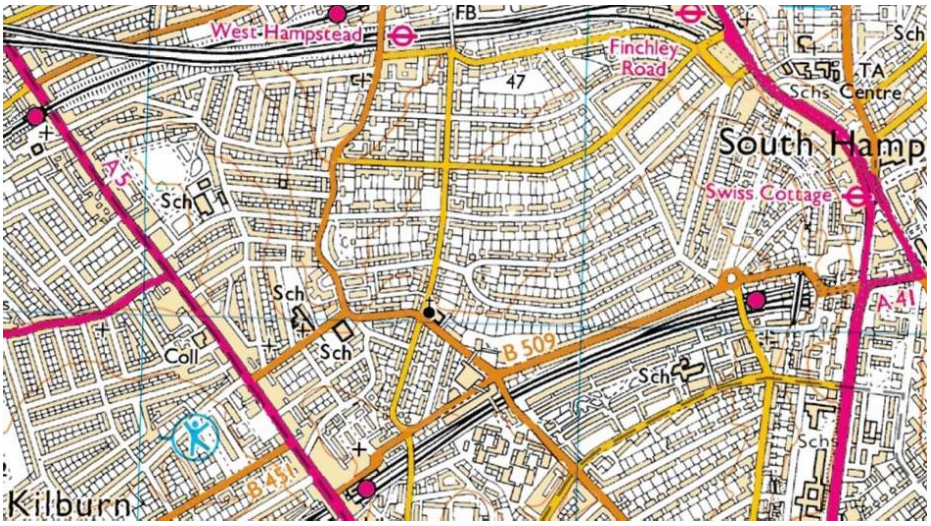


Figure 27: Extract from OS map showing proximity to nearest railways

Refer to Section 5 for more details.

10. Impact Assessment

Subterranean flow

The site is not within the catchment of the Hampstead Heath Ponds. It is a considerable distance from the ponds and standing water courses in the area.

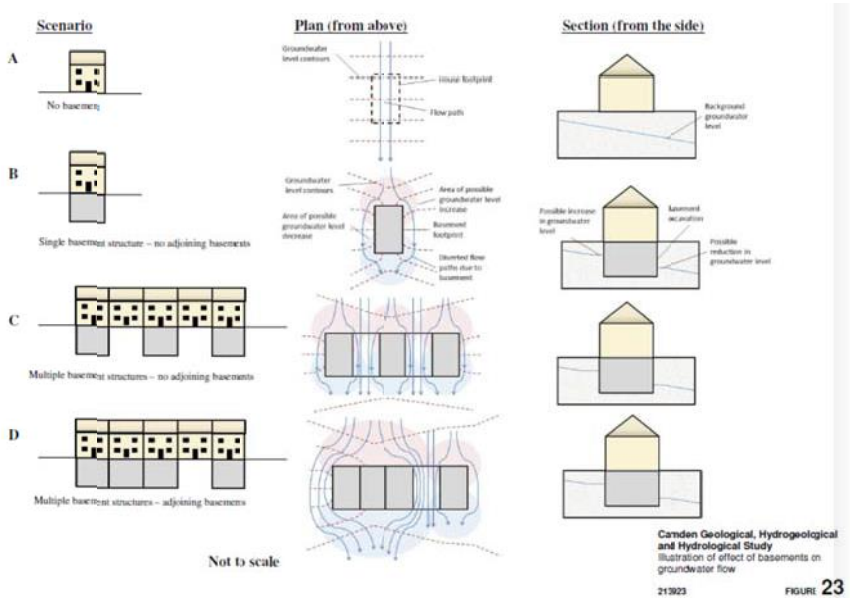
The development will not have an impact on the Hampstead Heath ponds nor their catchment.

The proposed development depth is expected to be at 3.8m below external ground level.

The ground below the proposed lightwell is London Clay. This is not very permeable and is unlikely to allow ground water to pass through it.

The site investigation indicated that no water is present down to a depth of 6m.

The local effect of the deepened basement and the lightwells will be to divert any flowing ground water away from the foot print of the building. To the front, side and rear of the property large areas over 6m wide are present. With a large dispersal area for the flow to be diverted around, the effects on the surrounding area will be minimal.



Without field testing in the neighbouring properties or along the road there is a low residual risk that the ground wall flow may affect the external ground.

The basement design must allow for variants in ground water. The

retaining walls must be designed to provide lateral resistance to water up to 1m from the top of the wall. The design must follow the recommendations as noted in BS8102.

For the level of development a full hydrology report is not suitable.

Slope Stability

From the walk over survey, the OS map and the Arups report, the general slope of the surrounding area is less is less than 7°.

Land slide is not a problem due to any circular failure patterns.

The retaining walls must be designed to accommodate the lateral pressures from the soils.

Foundation type

Reinforced concrete cantilevered retaining walls will be specified.

The designs for the retaining walls have been calculated using software specifically designed for retaining walls. This ensures the design is kept to a limit to prevent damage to the adjacent property.

The calculations for these are in Appendix C

The overall stability of the walls are designed using K_a & K_p values, while the design of the wall uses K_o values. This approach minimizes the level of movement from the concrete affecting the adjacent properties.

The walls are designed to cope with the hydrostatic pressure. The design of the walls considers the long term items. It is possible that a water main may break causing local high water table. To account for this, the wall is designed for this,

The wall is designed for water 1m from the wall.

The design also considers floatation as a risk. The design has considered the weight of the building and the uplift forces from the water. The weight of the building is greater than the uplift resulting in a stable structure.

Below are the design pressures and loadings.

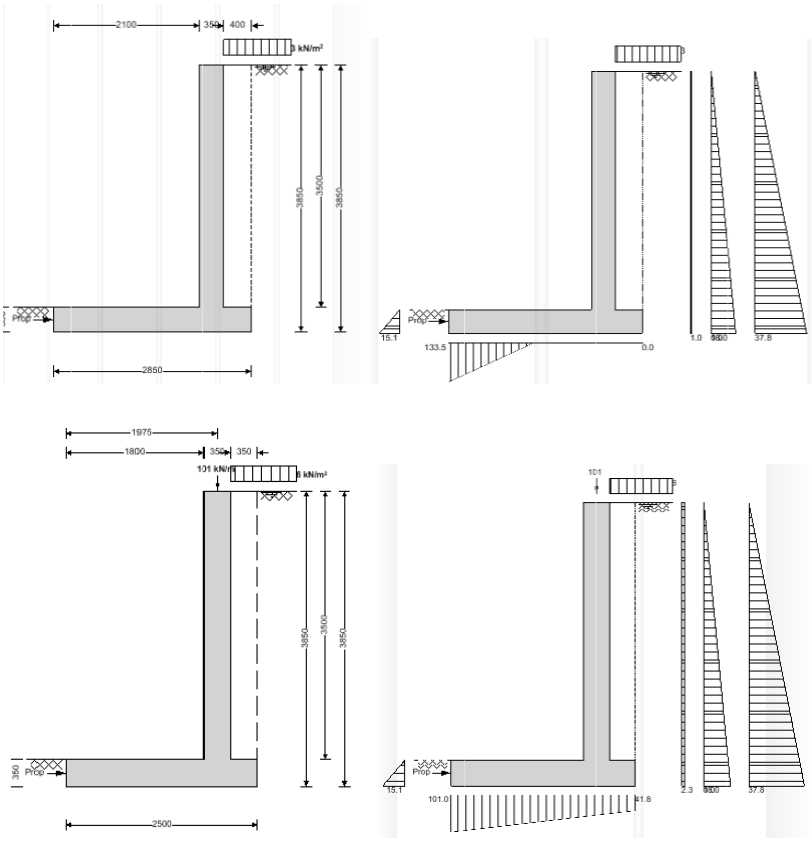


Figure 28 Loadings and Lateral pressure patterns

Vicinity of Trees	There are minor shrubs and smalls trees, none of which are affected
Special precautions due to trees	The foundations will be below the zone of influence of these trees. The current trees roots will be limited by the existing foundations. No tree root protection zones are known to be present. Root protection barriers will be required. No build over agreements known of.
Drainage effects on Structure	Flooding. The site is not in an area of high risk flooding. The building does not undermine the highway.
Roads and Surcharge	Garden Surcharge 2.5kN/m^2 Surcharge for adjacent property 1.5kN/m^2 + 4kN/m^2 for concrete ground bearing slab
Intended use of structure and user requirements	Family/domestic use
Loading Requirement (EC1-1)	2

	UDL N/m^2	**Concentrated Loads kN**	Is Live Load
Domestic Single Dwellings	1.5	2.0	

The basement does not lie within a 45° angle of the highway. Therefore Highways Agency (HA) loading is not required to be applied.

APPLICABLE CLACIFICATIONS	
Class 2A	Flats, apartments and other residential buildings not exceeding 4 storeys
Class 2B	Hotels, flats, apartments and other residential buildings greater than 4 storeys but not exceeding 15 storeys

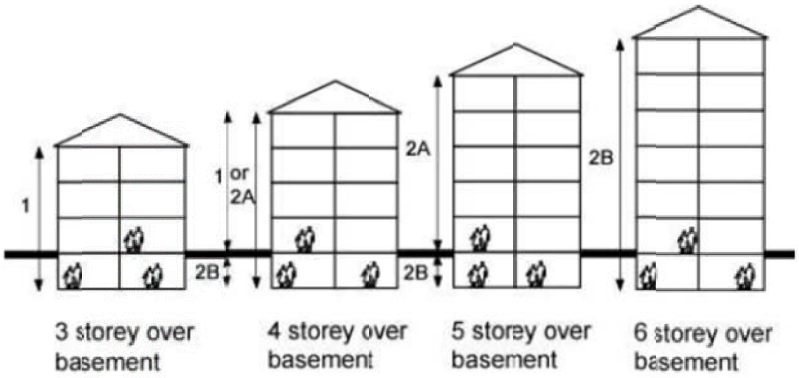
<u>Existing Main Building</u>

Proposed Building Class	2A
If class has changed material change has occurred	N/A

<u>Proposed Basement</u>

Proposed Building Class	2A

Progressive Collapse	Design for consequences of localized failure in building from an unspecified cause
Is the Building Multi Occupancy?	Yes
Part A3 Progressive collapse	EN 1991-1-7:1996 Table A1



Change of use	To NHBC guidance compliance is only required to other floors if a material change of use occurs to the property.
Additional Design Requirements to Comply with Progressive Collapse	**Class 2A – Design provision of effective horizontal ties or, or effective anchorage of suspended floor to walls.**

Lateral Stability Exposure and wind loading conditions	Basic wind speed V_b = 21 m/s to EC1-2 Site level +75.000 m above sea level. Topography not considered significant.
Stability Design	The cantilevered walls are suitable to carry the lateral loading applied from above The soil loads apply a lateral load on the retaining walls.
Lateral Actions	Hydrostatic pressure will be applied to the wall Imposed loading will surcharge the wall.

Adjacent Properties

Any ground works would normally pose an elevated risk to adjacent properties. However, the proposed work does not undermine the adjacent properties as said adjoining properties have already had almost identical basement extensions completed by the same intended contractor for this development and movement risks to the adjoining properties have largely been removed.

The works must be carried out in accordance with the Party Wall Act and condition surveys will be necessary at the beginning and end of the works.

The method statement provided at the end of this report has been formulated with our experience of over 200 basements completed without error.

The design of the retaining walls is completed to K_0 lateral design stress values. This increases the design stresses in the concrete retaining walls and limits the overall deflection of the retaining wall.

It is not expected that any cracking will occurring during the works.

To reduce the risk the development must:

- Employ a reputable firm for extensive knowledge of basement works.
- Employ suitably qualified consultants. AND Designs has completed over 250 basements in the last 5 years.
- Design the underpins to the stable without the need for elaborate temporary propping or needing the floor slab to be resent.
- Provide method statements for the contractors to follow
- Investigate the ground, now completed.
- Record and monitor the external properties. This is completed by a condition survey on under the Party Wall Act before and after the works are completed. See end of method statement.
- Allow for unforeseen ground conditions: Loose ground is always a concern. The method statement and drawings show the use of precast lintels to areas of soft ground; this follows the guidance by the underpinning association.

With the above the maximum level of cracking anticipated is Hairline

cracking, which can be repaired with decorative cracking and can be repaired with decorative repairs. Under the party wall Act damage is allowed (although unwanted) to occur to a neighbouring property as long as repairs are suitability undertaken to rectify this. To mitigate this risk The Party Wall Act is to be followed and a Party Wall Surveyor will be appointed.

Extract from The Institution of Structural Engineers "Subsidence of Low- Rise Buildings"
Table 6.2 Classification of visible damage to walls with particular reference to type of repair, and rectification consideration

Category of Damage	Approximate crack width	Definitions of cracks and repair types/considerations
0	**Up to 0.1**	**HAIRLINE – Internally cracks can be filled or covered by wall covering, and redecorated. Externally, cracks rarely visible and remedial works rarely justified.**
1	0.2 to 2	FINE – Internally cracks can be filled or covered by wall covering, and redecorated. Externally, cracks may be visible, sometimes repairs required for weather tightness or aesthetics. NOTE: Plaster cracks may, in time, become visible again if not covered by a wall covering.
2	2 to 5	MODERATE – Internal cracks are likely to need raking out and repairing to a recognised specification. May need to be chopped back, and repaired with expanded metal/plaster, then redecorated. The crack will inevitably become visible again in time if these measures are not carried out. External cracks will require raking out and repointing, cracked bricks may require replacement.
3	5 to 15	SERIOUS – Internal cracks repaired as for MODERATE, plus perhaps reconstruction if seriously cracked. Rebonding will be required. External cracks may require reconstruction perhaps of panels of brickwork. Alternatively, specialist resin bonding techniques may need to be employed and/or joint reinforcement.
4	15 to 25	SEVERE Major reconstruction works to both internal and external wall skins are likely to be required. Realignment of windows and doors may be necessary.
5	Greater than 25	VERY SEVERE –Major reconstruction works, plus possibly structural lifting or sectional demolition and rebuild may need to be considered. Replacement of windows and doors, plus other structural elements, possibly necessary.

NOTE – Building & CDM Regulations will probably apply to this category of work, see sections 10.4, 10. and Appendix F.

Monitoring and Predicted Category of Damage

Monitoring - In order to safeguard the existing structures during underpinning and new basement construction movement monitoring is to be undertaken. Surveying studs are to be attached to the adjacent structures at ground, first, second and third floor levels at front and rear.

The surveying points on the adjacent structures are to be set up using an EDM prior to commencement of the works and to be read daily and reported against the following control values.

Limits on ground and adjacent structures movement during underpinning and throughout the construction works.

Movement of survey points must not exceed:

Settlement:
Action values: 5mm (stop work)
Trigger values: 65% of action values (submit proposals for ensuring action values are not exceeded)

Lateral displacement:
Action values: 6mm (stop work)
Trigger values: 65% of action values (submit proposals for ensuring action values are not exceeded)

Movement approaching critical values:

Trigger: Submit proposals for ensuring action values are not exceeded Action: Stop work

The reporting format will be in the form of a table as attached.

Predicted Category of Damage

The predicted category of damage is likely to be within BRE Category Slight, with possible localised crack widths 2mm to 5mm Classification Aesthetic.

Drainage and Damp proofing	Assumed that drainage and damp proofing is by others: Details are provided at the end of this document by Delta Membrane systems.

Our recommendation is that drained cavity systems are used to habitable basements with pumped sumps. This is a specialist contractor design item.

Concrete is not designed BS 8007. But where possible BS 8007 detailing is observed to help limit crack widths of concrete

Party Wall

Underpinning basement works has a risk associated to it.

To mitigate these risks a Party Wall Surveyor must be appointed

Temporary Works

Temporary works are the contractor's responsibility. Loads can be provided on request.

Foundations; All trenches deeper than 1.0m must be shored. Where works undermine existing foundations contractor must allow for additional support.

The Method Statement lays out the process for constructing the basement

Noise and Nuisance

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. The conveyor belt typically runs at around 70dB.

The site has car parking to the front to which the skip will be stored.

The site will be hoarded with 'Chapter 8' site hoarding to prevent access.

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

The site is to be hoarded to minimise the level of direct noise from the site.