SINCLAIR JOHNSTON

BASEMENT IMPACT ASSESSMENT FOR

26 NETHERHALL GARDENS, NW3

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REVISIONS

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-	23.07.14	Issued for planning.

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1. INTRODUCTION

The following Basement Impact Assessment (BIA) has been produced for inclusion with the planning application submitted for the proposed residential development at 26 Netherhall Gardens, London, NW3 5TL.

In preparing this BIA reference has been made to the following London Borough of Camden documents:

- Camden Local Development Framework (LDF) Policy DP27.
- Camden Planning Guidance – Basement and Lightwells CPG4.
- Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development prepared by ARUP.

As stated in paragraph 2.8 of CPG4 *'the purpose of this document is to enable the Council to assess whether any predicted damage to neighbouring properties and the water environment is acceptable or can be satisfactorily ameliorated by the developer as stated in DP27.3'*.

This BIA has been prepared by Mr Thomas Musson BEng CEng MIStructE; Technical Director at Sinclair Johnston & Partners.

2. PROPOSED DEVELOPMENT

The site address is 26 Netherhall Gardens, London, NW3 5TL and is located at approximate National Grid reference 550453 178948.

The site is located within the London Borough of Camden within the Frognal & Fitzjohns ward. See Figure 1.

The property is not listed but lies within the Netherhall and Fitzjohns Conservation area.

The site comprises:

- A three storey detached property (26 Netherhall Gardens) arranged over lower ground floor, raised ground floor, first floor and attic storey.
- The property has been converted into flats at some point in the past and a modern garage with extension over built to the right of the property.
- The local area is on a hillside setting sloping down in a generally east-west direction toward Finchley Road. Figure 3.
- The lower ground floor is raised some 1.0m to 1.5m from general street level with the ground floor level being some 3.5m to 4.0m above general street level.
- The property has a raised front garden with steps up to the ground floor entrance and a modern hard standing front drive to the left of the property giving level access to Netherhall Gardens.
- The rear garden gently slopes up from a rear light well to the rear boundary.
- The site is bounded to the left by 28 Netherhall Gardens, to the right by 24A & 24 Netherhall Gardens, to the rear by single storey outbuildings understood to belong to 47 Maresfield Gardens and to the front by Netherhall Gardens.
- Access onto site is directly off Netherhall Gardens.
- There are several mature trees within the rear and front gardens.
- As identified in the Camden Flood Risk Management Strategy the site is not in area at risk of flooding from rivers or the sea. Nor is it in an area that has historically been at risk from surface runoff, groundwater and sewer flooding.

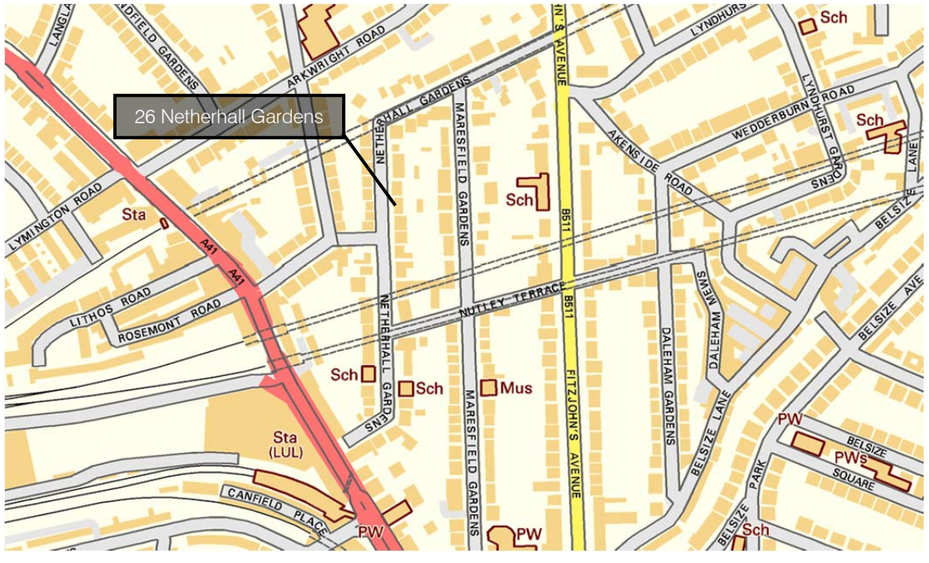

Figure 1. Site Location Map

Figure 2. Aerial View of Site looking North

2. PROPOSED DEVELOPMENT

The proposed development comprises:

- Demolition of the existing property.
- Construction of a new three storey above ground apartment block arranged over ground, first and second floors and attic storey.
- Construction of a single storey habitable basement with sub-basement plant room below.
- Re-profiling of the front and rear gardens including the removal of several trees.

The specific structural proposals are set out in Sinclair Johnston & Partners' Structural Design & Construction Statement'.

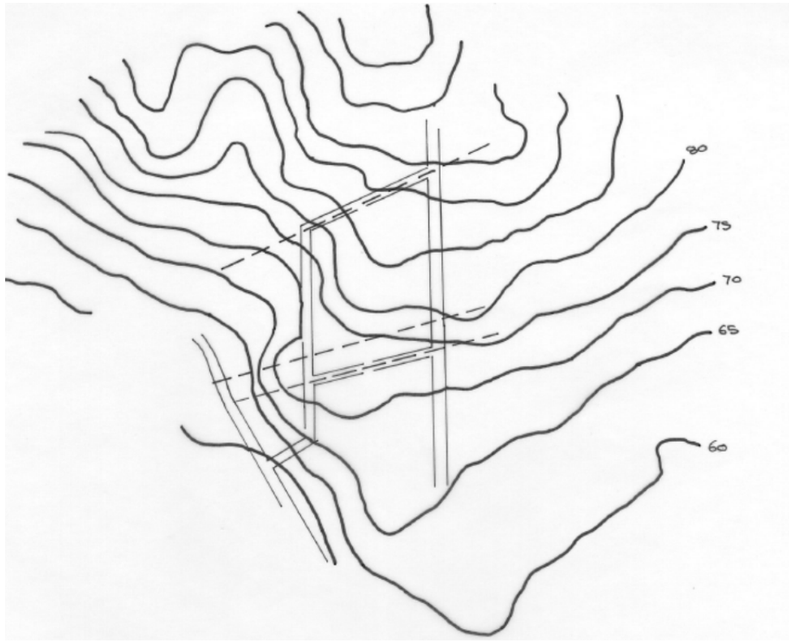

Figure 3 – Approximate Ground Contours

3. NON-TECHNICAL SUMMARY OF EVIDENCE

Stage	Evidence	Description
Stage 1 – Screening	• Camden Geological, Hydrogeological and Hydrological Study – Figure 3 and Figure 4. • Local 1:50,000 British Geological Survey maps. • The Camden Geological, Hydrogeological and Hydrological Study Table 2 & Figure 8, 11, 13, 14 & 15. • Site walk-over survey. • Ordnance Survey Maps.	The evidence indicates that the site ground conditions comprise Clay to significant depth. This clay ground is not a water-bearing material from which ground water can be extracted (an aquifer). Ground of this nature is designated by the Environment Agency as unproductive. The site is not situated within the catchment area of the Hampstead ponds. The site walk-over and maps have shown that the site is not located on a hillside with a slope greater than 7°.
Stage 2 – Scoping	• No additional evidence other than stated in Stage 1.	The evidence collected in Stage 1 has been used to prepare a conceptual ground model from which potential impacts have been produced.
Stage 3 – Site Investigation	• A site investigation has been undertaken by Site Analytical Services Limited.	Reference should be made to Site Analytical Services' 'Phase 1 Preliminary Risk Assessment' (Ref. 14/22068-1), 'Report on a Ground Investigation' (Ref. 14/22068) and 'Basement Impact Assessment' (Ref. 14/22068-2) for details.
Stage 4 – Impact Assessement	• Sinclair Johnston & Partners 'Structural Design and Construction Statement' included in Appendix A. • CIRIA publication C580. • Site Analytical Services reports.	The proposed basement is to be formed using secant piled walls. A secant piled wall is a form of embedded retaining wall where the piles are constructed so that they intersect one another. This form of construction provides a relatively water-resistant structure in the temporary case thus avoiding the need for significant de-watering or ground water management. CIRIA publication C580 provides best practice on the selection and design of vertical embedded retaining walls. It provides an empirical approach to assessing ground surface movements due to the installation of piled walls and excavation of basements within London Clay. This guidance has been used to assess likely ground surface movements at the planning stage and an assessment of predicted building damage undertaken.

4. STAGE 1 - SCREENING

The purpose of the screening stage of the BIA is to identify any matters of concern which should be investigated further through the BIA process.

The screening process has been undertaken as outlined in the Camden Planning Guidance – Basement and Lightwells CPG4 and the Camden geological, hydrogeological and hydrological study prepared by ARUP.

The screening flow charts, as given in Camden Planning Guidance – Basements and Lightwells CP4, are used and provided on the following pages.

The screening flow charts have identified the following areas that should be investigated further during the scoping stage of the BIA:

Subterranean (ground water) flow screening

Q1b. *Will the proposed basement extend beneath the water table surface?*

The level of the existing water table surface on site is not known. A site specific site investigation should be undertaken to address this. This site investigation should include continued ground water monitoring in order to identify seasonal fluctuations.

Q2. *Is the site within 100m of a watercourse, well or potential spring line?*

Camden Geological, Hydrogeological and Hydrological Study 'Camden Aquifer Designation Map' – Figure 11 and other historical data shows that the site may be close to a tributary of the Westbourne. A site specific desktop study should be undertaken to investigate the proximity of any watercourses, wells, or potential spring lines.

Q4. *Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?*

The proposed development has a greater area of hard surfacing than presently on site.

Q6. *Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?*

A site specific desktop study should be undertaken to identify the presence or otherwise of any local ponds or spring lines.

Slope stability screening

Q5. Is the London Clay the shallowest strata at the site?

The shallowest stratum on site is likely to be the London Clay formation excluding the made ground.

Q6. *Will any tree/s be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained?*

Yes. The existing trees on site are to be felled and replaced as part of the redevelopment.

Q8. *Is the site within 100m of a watercourse or potential spring line?*

Camden Geological, Hydrogeological and Hydrological Study 'Camden Aquifer Designation Map' – Figure 11 and other historical data shows that the site maybe within 100m of tributaries of the Westbourne.

Q9. *Is the site within an area of previously worked ground?*

A site specific desktop study should be undertaken to investigate this.

Q12. *Is the site within 5m of a highway or pedestrian right of way?*

The site is adjacent to Netherhall Gardens.

Q13. *Will the proposed basement significantly increase the differential depth of foundation relative to neighbouring properties?*

The proposed basement is likely to extend the differential depth of foundations relative to the neighbouring properties on Netherhall Gardens and Maresfield Gardens.

Surface water and flooding screening

Q3. *Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?*

The proposed development has a greater area of hard surfacing than presently on site.

Q4. *Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?*

The proposals may affect local ground water flows running down the hill. A site specific desktop study should, backed up with site investigations, should be undertaken to investigate the existing ground water flow paths.

Q5. *Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?*

The proposals may affect local ground water flows and quality of water running down the hill. A site specific desktop study should, backed up with site investigations, should be undertaken to investigate the existing ground water flow paths.

As several questions have returned “yes” or “unknown” answers a full basement impact assessment (BIA) is to be undertaken to investigate and assess the specific impacts of the basement proposals and to demonstrate that the these impacts are acceptable or can be satisfactorily ameliorated.

SUBTERRANEAN (GROUND WATER) FLOW SCREENING CHART

	Question	*Answer*	*Evidence*
Q1a.	Is the site located directly above an aquifer?	No	Camden Geological, Hydrogeological and Hydrological Study – Figure 3 and Figure 4 indicate the site geology to comprise the London Clay. This is further confirmed on the local 1:50,000 British Geological Survey maps. The Camden Geological, Hydrogeological and Hydrological Study Table 2 indicates the London Clay Formation is classified by the EA as an Unproductive Strata. Again, confirmed by the Camden Geological, Hydrogeological and Hydrological Study 'Camden Aquifer Designation Map' – Figure 8.
Q1b.	Will the proposed basement extend beneath the water table surface?	Unknown	The level of the existing water table surface on site is not known. A site specific site investigation should be undertaken to address this. This site investigation should include continued ground water monitoring in order to identify seasonal fluctuations.
Q2.	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	Unknown	Camden Geological, Hydrogeological and Hydrological Study 'Camden Aquifer Designation Map' – Figure 11 and other historical data shows that the site may be close to a tributary of the Westbourne. A site specific desktop study should be undertaken to investigate the proximity of any watercourses, wells, or potential spring lines.
Q3.	Is the site within the catchment of the pond chains on Hampstead Heath?	No	Camden Geological, Hydrogeological and Hydrological Study 'Hampstead Heath Surface Water Catchments and Drainage' – Figure 14 shows that the site does not sit within the catchment of the ponds chains on Hampstead Heath.
Q4.	Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	Yes	The proposed development has a greater area of hard surfacing than presently on site.
Q5.	As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	The surface water flow paths are not to be materially changed. Similar volumes of surface water drainage is to be discharged to the sewer system.
Q6.	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?	Unknown	A site specific desktop study should be undertaken to identify the presence or otherwise of any local ponds or spring lines.

4. STAGE 1 - SCREENING

SLOPE STABILITY SCREENING CHART

	Question	*Answer*	*Evidence*
Q1.	Does the existing site include slopes, natural or manmade, greater than 7°? (approximately 1 in 8)	No	The site and street is set on a hillside which slopes generally down to south-west. The ground contours show that the slope is less than 7°.
Q2.	Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°? (approximately 1 in 8)	No	It is not proposed to re-profile the slopes at the property boundary to more than 7°.
Q3.	Does the developed neighbour land, including railway cutting and the like, with a slope greater than 7°? (approximately 1 in 8)	No	The site and street is set on a hillside which slopes generally down to south-west. The ground contours show that the slope is less than 7°.
Q4.	Is the site within a wider hillside setting in which the general slope is greater than 7°? (approximately 1 in 8)	No	The site and street is set on a hillside which slopes generally down to south-west. The ground contours show that the slope is less than 7°.
Q5.	Is the London Clay the shallowest strata at the site?	Yes	The shallowest stratum on site is likely to be the London Clay formation excluding the made ground.
Q6.	Will any tree/s be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained?	Yes	Existing trees are to be felled and replaced.
Q7.	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	A site walkover and a walk around the local area has not identified any obvious evidence of seasonal shrink-swell subsidence.
Q8.	Is the site within 100m of a watercourse or a potential spring line?	Unknown	Camden Geological, Hydrogeological and Hydrological Study 'Camden Aquifer Designation Map' – Figure 11 and other historical data shows that the site may be close to a tributary of the Westbourne. A site specific desktop study should be undertaken to investigate the proximity of any watercourses, wells, or potential spring lines.
Q9.	Is the site within an area of previously worked ground?	Unknown	A site specific desktop study should be undertaken to investigate this.

Q10.	Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No.	The site is within unproductive strata. See Q1 within the subterranean (ground water) flow screening chart.
Q11.	Is the site within 50m of the Hampstead Heath ponds?	No	Camden Geological, Hydrogeological and Hydrological Study 'Hampstead Heath Surface Water Catchments and Drainage' - Figure 14 and 'Hampstead Heath Map' – Figure 13 indicate that the site is not within 50m of the Hampstead Heath Ponds.
Q12.	Is the site within 5m of a highway or pedestrian right of way?	**Yes**	**The site is adjacent to Netherhall Gardens.**
Q13.	Will the proposed basement significantly increase the differential depth of foundation relative to neighbouring properties?	**Yes**	**The proposed basement is likely to extend the differential depth of foundations relative to the neighbouring properties on Netherhall Gardens and Maresfield Gardens.**
Q14.	Is the site over (or within the exclusion zone of) any tunnels e.g. railway lines?	No	The site is not over or within the exclusion zone of any tunnels.

SURFACE FLOW AND FLOODING SCREENING CHART

	Question	*Answer*	*Evidence*
Q1.	Is the site within the catchment of the pond chains on Hampstead Heath?	No	Camden Geological, Hydrogeological and Hydrological Study'Hampstead Heath Surface Water Catchments and Drainage' – Figure 14 shows that the site does not sit within the catchment of the ponds chains on Hampstead Heath.
Q2.	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 proposed drainage scheme will not result in a material change in existing route. As existing, a small proportion of surface water will flow into the natural ground while the majority will discharge into the main sewers.
Q3.	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	The proposed development has a greater area of hard surfacing than presently on site.
Q4.	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	Unknown	The proposals may affect local ground water flows running down the hill. A site specific desktop study should, backed up with site investigations, should be undertaken to investigate the existing ground water flow paths.
Q5.	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	Unknown	The proposals may affect local ground water flows and quality of water running down the hill. A site specific desktop study should, backed up with site investigations, should be undertaken to investigate the existing ground water flow paths.
Q6.	Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No	The site is not within an area known to be at risk from surface water flooding as shown on Camden Geological, Hydrogeological and Hydrological Study 'Flood Map' – Figure 15.

5. STAGE 2 – SCOPING

The purpose of the scoping stage of the BIA is to define further the potential impacts identified within the screening stage of the BIA as requiring additional investigation.

The scoping process has been undertaken as outlined in the Camden Planning Guidance – Basement and Lightwells CPG4 and the Camden geological, hydrogeological and hydrological study prepared by ARUP.

From the information obtained during the screening stage of the BIA, and using further readily available published data and application of hydrogeological principles, the following 'conceptual ground model' has been developed:

Site location:	North London (Hampstead)
Local geology:	Nominal depth of topsoil and Made Ground over London CLAY.
Local ground levels:	The site is set on a hillside setting gently sloping down to the south-west.
Local surface water or below ground water features:	Local surface ground water or below ground water features are unknown.
Local ground water level:	The local ground water level is not known.
Local surface finishes:	The local area is predominantly residential properties with landscaped gardens intersected by highways. The site has a garden across approximately 25% of the site with the remaining site comprising the existing building and hard surfacing.
Current local surface water path way:	A large proportion of local rainfall will be retained in the near surface soil. This ground water is likely to follow the natural gradient of the hill side setting and running across the tops of the Clay. A proportion of local rainfall will run off the hard surfaced areas (highways, hard standing gardens, roofs) into the main combined sewer. While a further proportion will evaporate into the atmosphere or be taken up by plant and trees root systems.
Levels and infrastructure:	The site is located in a wider hill side setting of shallow gradient. The site has Netherhall Gardens a single lane highway directly to the south west.

Using the above conceptual ground model the following potential impacts have been identified:

SUBTERRANEAN (GROUND WATER) FLOW SCOPING CHART

Q1b.	Will the proposed basement extend beneath the water table surface?	Should the basement extend below the water table surface there is the potential to cause the ground water level within the zone encompassed by the new flow route to increase or decrease locally. This may affect neighbouring basements and structures.
Q2.	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	The basement may alter the groundwater flow regime supporting the watercourse or potential spring lines. Diverting the groundwater flow route may cause new springs to form or the reactivation of old springs. Seasonal spring lines and changes in groundwater may also affect slope stability.
Q4.	Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	Sealing off of the ground through increased hard surfacing may result in changes to the moisture content of the Clay ground affecting ground stability.
Q6.	*Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line?*	Ground water may drain from a local pond or spring and flow into the basement / excavation space.

5. STAGE 2 - SCOPING

SLOPE STABILITY SCOPING CHART

Q5.	Is the London Clay the shallowest strata at the site?	Near surface Clay ground is prone to seasonal shrink-swell.
Q6.	Will any tree/s be felled as part of the proposed development and/or any works proposed within any tree protection zones where trees are to be retained?	Felled trees could lead to loss of binding effect of tree roots and instability of slopes due to changes in moisture content.
Q8.	Is the site within 100m of a watercourse or a potential spring line?	Seasonal spring lines and changes in ground water may affect slope stability.
Q12.	Is the site within 5m of a highway or pedestrian right of way?	Installation of the proposed basement and excavation for the basement may result in structural damage to highways.
Q13.	Will the proposed basement significantly increase the differential depth of foundation relative to neighbouring properties?	Installation of the proposed basement and excavation for a basement may result in structural damage to neighbouring properties if there is a significant differential depth between adjacent foundations.

SURFACE FLOW AND FLOODING SCREENING CHART

Q3.	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Changes in surface water flow rates could affect ecosystems or amenity or increase flow that could result in flooding.
Q4.	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	Changes in surface water flow rates could affect ecosystems or reduce amenity or increase flow that could result in flooding.
Q5.	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	Changes in quality could affect ecosystems or reduce amenity.

6. STAGE 3 – BIA SITE INVESTIGATION

A site specific ground investigation has been undertaken by Site Analytical Services Limited and the following reports produced:

- Phase 1 Preliminary Risk Assessment (ref. 14/22068-1).
- Report on a Ground Investigation (ref. 14/22068).
- Basement Impact Assessment (ref. 14/22068-2).

In summary the site ground profile comprises:

Ground	Depth below ground level (m)	Thickness (m)	Notes
Made Ground	0	0.3 - 06	
London Clay	0.3 – 0.6	To depth	Clay was encountered to full depth of investigation (20m bgl)

Figure 4 – Summary of Ground Conditions

Ground water was monitored at approximately 1.14m and 1.88m below existing ground level and is likely to be due to minor seepages within permeable Silty lens within the Clay.

The site investigation has confirmed that the conceptual ground model is valid and that the 'no' answers provided at the screening stage are correct.

The site investigation has shown that the ground water table level is some 1.0m to 2.0m approximately below ground level.

Site Analytical Services' 'Basement Impact Assessment' (Ref. 14/22068-2) confirms that there are no surface water features on or close to the site. It also confirms that the site maybe within 100m of a tributary of the form the former River Westbourne.

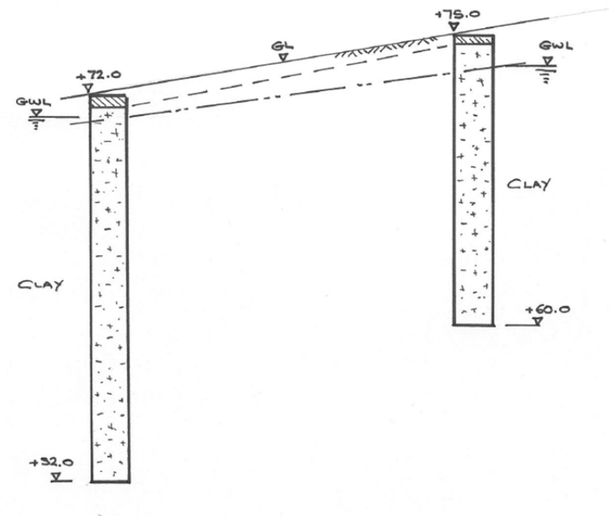

Figure 5 – Indicative Borehole Logs

7. STAGE 4 IMPACT ASSESSMENT

The impact assessment stage of the BIA describes the impacts of the proposed basement development on the environment; this is achieved by comparing the baseline situation with the hypothetical as constructed' basement situation. Refer to the tables on the following pages.

The form of basement structure proposed is outlined in the 'Structural Design and Construction Statement' provided in Appendix A and is summarised as follows:

- Secant (hard / firm) bored piled retaining walls to the perimeter of the basement providing temporary and permanent earth support.
- Contiguous bored piled retaining walls internally to form the sub-basement providing temporary and permanent earth support.
- A reinforced concrete box structure inboard of, but acting integral with, the bored piled walls to providing the permanent earth support.
- Reinforced concrete retaining walls are to be adopted along the site boundaries to deal with varying levels between adjacent properties.

As described in the 'Structural Design and Construction Statement' ground movement predicted for the proposed development is estimated to result in a structural damage category to adjoining properties as Category 2 'slight' as defined under the Burland Category.

By comparing the baseline situation with the hypothetical 'as constructed' situation the effects of the proposed basement on the local environment have been assessed as follows:

a) The site is within 5m of a high way and a pedestrian right of way.

b) The development is likely to increase the differential depth of foundations relative to neighbouring properties which may result in structural damage.

c) The proposals increase the area of hard standing from the as existing condition with a potential for increased surface water runoff volumes.

d) The basement is to be constructed in a hillside setting, albeit with a slope less than 7°.

The structural proposals, as outlined in the 'Structural Design and Construction Statement' have been developed to mitigate against the effects listed above are as follows:

- The form of basement is to be sufficiently stiff to ensure the stability of adjacent highways, public right of way and nearby structures. Secant piled embedded retaining walls with a reinforced concrete box structure inboard of these piles are proposed.
- SuD's drainage systems, designed and detailed by the appointed Drainage Designer, should be provided to reduce the potential impacts of the increase in hard standing area.

Reference should be made to the 'Structural Design and Construction Statement' provided in Appendix D for further explanation of the various structural considerations specific to the proposals.

The basement is to be formed within low permeable Clay ground. Ground water flows through the Clay are therefore negligible and confined to seepage through more permeable silty layers within the soil mass. Any changes to these flows resulting from the construction of the basement will be minor and localised to the immediate vicinity of the basement. Water would simply flow around the basement and continue on its existing flow path.

During construction of the basement the Contractor should be required to undertake the following monitoring to ensure that the assumptions and findings of this BIA remain valid:

- Ground movement monitoring.
- Monitoring of ground conditions encountered to confirm expected ground model.
- Monitoring of ground water levels.

Through the BIA process and with due consideration to the various site specific issues all potential impacts of the proposed basement can be mitigated. The proposed basement therefore is unlikely to cause detriment to the local ground water flow regime, slope stability and surface water flow regime.

SUBTERRANEAN (GROUND WATER) FLOW

Attribute	*Baseline value*	*As constructed value*
Groundwater levels	The ground water table was monitored at approximately 1.1-1.8m below the existing ground level.	The proposed basement extends below the recorded ground water table. Secant piled walls are proposed to avoid the need for de-watering. Ground water flows through the Clay are therefore negligible and confined to seepage through more permeable silty layers within the soil mass. Any changes to these flows resulting from the construction of the basement will be minor and localised to the immediate vicinity of the basement. Water would simply flow around the basement and continue on its existing flow path.
Soil moisture	As existing.	Surface water flow rates are drainage pathways are not to be significantly or materially changed. Soil moisture levels are therefore not likely to be altered by the proposals.
Water quality	As existing.	Surface water runoff and subterranean (ground water) pathways and flow rates are not to be material affected by the proposals. Therefore, the water quality of any downstream water courses or features, of which none have been identified by the investigation, will not be affected.

SLOPE STABILITY EFFECTS

Attribute	Baseline value	As constructed value
Slope angle	The site slopes gently east to west down to Netherhall Gardens. The existing property is cut into the slope.	The basement excavation extends across the whole site. The earth boundaries are to be supported by the proposed retaining walls.
Existing tree regime	Several trees on site.	Existing trees onsite to be felled and replaced. As the site is to be fully excavated the loss of tress is considered not to detrimentally affect slope stability.
Stiffness and support to highways	As existing.	The proposed basement construction is to be sufficiently stiff to ensure integrity of the local ground. Temporary lateral propping to walls during construction will be installed by the Contractor to maintain the soil stability. No adverse effects.

SURFACE FLOW AND FLOODING EFFECTS

Attribute	Baseline value	As constructed value
Rate of runoff	Existing area of hard surfacing: 420m^2 (including front drive and roof). Runoff directed into main sewer. Existing soft landscaping: 350m^2 (approximately)	Proposed area of hard surfacing: 650m^2 SuD's systems to be provided to reduce surface water volumes and peak flow rates into main sewer.
Direction of overland flow	A large proportion of local rainfall will be retained in the near surface soil. This ground water is likely to follow the natural gradient of the hill side setting and running across the tops of the Clay. A proportion of local rainfall will run off the hard surfaced areas (highways, hard standing gardens, roofs) into the main combined sewer. While a further proportion will evaporate into the atmosphere or be taken up by plant and trees root systems.	Rainfall will either fall onto the hard surfacing (roof's, parking, external yards) or onto soil build-up over proposed basement. This rainfall should discharge into a SuD's system with land drainage to mimic the existing surface water flow regime.

8. CONCLUSION

A basement impact assessment, as required for planning by the London Borough of Camden, has been undertaken by Sinclair Johnston & Partners Limited for the proposed basement redevelopment at 26 Netherhall Gardens, London, NW3 7LT.

The following site conceptual ground model has been developed:

Site location:	North London (Hampstead)
Local geology:	Nominal depth of topsoil and Made Ground over London CLAY.
Local ground levels:	The site is set on a hillside setting gently sloping down to the south-west.
Local surface water or below ground water features:	Local surface ground water or below ground water features are unknown.
Local ground water level:	The local ground water level is not known.
Local surface finishes:	The local area is predominantly residential properties with landscaped gardens intersected by highways. The site has a garden across approximately 25% of the site with the remaining site comprising the existing building and hard surfacing.
Current local surface water path way:	A large proportion of local rainfall will be retained in the near surface soil. This ground water is likely to follow the natural gradient of the hill side setting and running across the tops of the Clay. A proportion of local rainfall will run off the hard surfaced areas (highways, hard standing gardens, roofs) into the main combined sewer. While a further proportion will evaporate into the atmosphere or be taken up by plant and trees root systems.
Levels and infrastructure:	The site is located in a wider hill side setting of shallow gradient. The site has Netherhall Gardens a single lane highway directly to the south west.

This site conceptual ground model has been verified by Site Analytical Services' site investigation, and subsequent reports.

The proposed basement construction comprises:

- Secant (hard / firm) bored piled retaining walls to the perimeter of the basement providing temporary and permanent earth support.
- Contiguous bored piled retaining walls internally to form the sub-basement providing temporary and permanent earth support.
- A reinforced concrete box structure inboard of, but acting integral with, the bored piled walls to providing the permanent earth support.

The potential impacts to the local environment identified with the proposed basement construction are:

a) The site is within 5m of a high way and a pedestrian right of way.

b) The development is likely to increase the differential depth of foundations relative to neighbouring properties which may result in structural damage.

c) The proposals increase the area of hard standing from the as existing condition with a potential for increased surface water runoff volumes.

d) The basement is to be constructed in a hillside setting, albeit with a slope less than 7°.

These impacts are mitigated by:

- The adoption of a propped, secant embedded retaining walls to provide an inherently stiff form of basement construction. Ground movements will be limited to ensure that the structural integrity of neighbouring structures and surrounding land is maintained.
- Adoption of SuD's drainage systems, designed and detailed by the appointed Drainage Designer, to limit potential impacts resulting from the increase in hard surface area.
- Adoption of good construction practices by a competent and experienced Contractor.

Through the BIA process and with due consideration to the various site specific issues all potential impacts of the proposed basement can be mitigated. The proposed basement therefore is unlikely to cause detriment to the local ground water flow regime, slope stability and surface water flow regime.