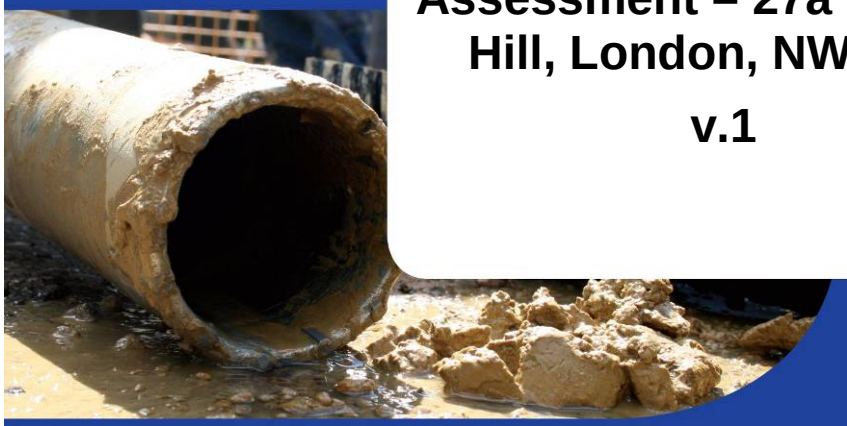
# Basement Impact Assessment – 27a Rosslyn Hill, London, NW3 5UJ

**v.1**



Report

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Report

# Basement Impact Assessment - 27a Rosslyn Hill, London, NW3 5UJ

# v.1

## Prepared for:

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**London**

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**Title: Basement Impact Assessment – 27a Rosslyn Hill, London, NW3 5UJ v.1**

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## Appendices

# 1. Introduction

## 1.1 Background

Ecologia were instructed by Neale and Norden Ltd. (Architects to the property owners) to undertake a Basement Impact Assessment (BIA) at the property: 27A Rosslyn Hill, London NW3 5UJ. The scope of works undertaken is based on the Ecologia proposal dated 26th October 2012, which addresses the need for a BIA to accompany a forthcoming Planning Application.

## 1.2 Regulatory Context

This assessment has been undertaken in accordance with guidance provided in the following documents:

- Camden Planning Guidance for Basements and Lightwells, ref. CPG4
- Camden Geological, Hydrogeological and Hydrological Study (ref: CGHHS). ARUP Consultants, November 2010

This guidance applies to all developments in the London Borough of Camden (LBC) that propose a new basement or an extension to a basement, where planning permission is required. As defined by the guidance, a BIA provides a method or determining whether a basement will cause, or will not cause, harm to the built or natural environment.

In accordance with the guidance, any BIA should involve the following sequence of steps:

1. Screening – identification of potential geological, hydrogeological or ground stability risk that might necessitate further assessment.
2. Scoping – defines further assessment procedures based on identification of risk at the screening stage.
3. Site Investigation and study – baseline conditions are established using existing or newly acquired information.
4. Impact assessment – determination of the potential impact that a basement will have on baseline conditions, and any mitigation measures that may then be proposed.
5. Review and Decision making – Undertaken by L.B.Camden, involves an audit of the data and ultimately decision on the acceptability of the basement development.

## 1.3 Scope of Works

The scope of works undertaken as part of this BIA is based on the completion of steps 1 - 4 listed in Section 1.2. Step 5, with the determination and the decision making to be completed by LB Camden. The Reporting is undertaken by a Chartered Civil Engineer (MICE, C.Eng) & Chartered Water and Environment Manager (FCIWEM, C.WEM) with both hydrological and geotechnical expertise, and supplemented/reviewed by a Chartered Geologist (CGeol, FGS) with hydrogeological expertise. The main author is also a registered SiLC.

The screening and scoping exercise (Steps 1 - 2) are based on the assessment of specific parameters applicable to hydrogeology, hydrology and ground stability as defined within the

ARUP 2010 Guidance (CGHHS). These parameters have been assessed using freely available literature and by completing a site walkover visit completed on 23rd October 2012.

Step 3 is a site investigation, typically involving a desk study and/or collection of new soil and groundwater data, in order to establish baseline conditions.

Step 4 (impact assessment) involves a comparison between the present situation (as defined by Steps 1-3) with an assessment of the future situation assuming the basement construction goes ahead. This Report contains that Assessment, and also appends a Screening Flowchart for easy reference of the relevant locational risks as defined in the 2010 Guidance document CPG4.

# 2. Site Setting

## 2.1 Geographical Setting

The site is located at Ordnance Survey Grid Reference TQ 269 854, approximately 500m south of Hampstead Heath. Rosslyn Hill runs in a northwest-southeast direction, a main highway but also connecting Hampstead and Belsize Park Underground Stations. Located equidistant of the two stations (approximately 600m from both) is the site, 27A Rosslyn Hill.

The area is characterised by large Victorian semi-detached and terraced houses. Rosslyn Hill slopes from Hampstead station down towards Belsize Park, with the site situated at approximately 80m above ordnance datum (AOD).

## 2.2 Site Description

The site is occupied by a large (3-storey) semi-detached house understood to have been constructed approximately at the turn of last century (c. 1900). Early maps from the 19th Century have been obtained, and are included in Appendix I. This location then was an elliptical driveway for a larger house, set back from the then named Haverstock Road.

A small, paved front garden fronts onto Rosslyn Hill and the neighbouring (attached) property has a similarly paved front garden but at a slightly lower level. However, the neighbouring property has already undergone a basement construction in recent years, and there are a pair of light wells evident within their front garden (and an elevated platform).

## 2.3 Proposed Development

Ecologia's understanding of the proposed development is based on plans provided by the Client's architect, dated May and September 2012.

The proposed development indicates that the basement footprint will follow that of the original house, with the exception of two (2 No.) small light wells at the front of the house.

The majority of the proposed basement is to be 3m below the current ground surface; however, beneath the swimming pool (in the rear section) the basement will extend to a maximum depth of 5m.

## 2.4 Ground Conditions

Reference to the British Geological Survey (BGS) Map for the area: Sheet 256, North London, Solid and Drift Edition (1994) indicates that the site is directly underlain by solid geology of the London Clay, described as "*Clay, silty in part*". However, the site is positioned just 50m from the mapped boundary with the overlying Claygate Member, described as "*Silt and fine-grained sand*".

The Claygate Member forms the uppermost unit of the London Clay Formation and is described in the relevant British Geological Survey memoir (Ellison et al, 2004) as

"*alternating beds of clayey silt, very silty clay, sandy silt and glauconitic silty fine sand. Beds are generally 1 to 5m thick, although the boundaries are generally diffuse as a result of bioturbation*". The Claygate Member was 16.0m thick in the BGS Hampstead Heath borehole (located near the top of the Heath), where it occurred between the levels of 93.71m and 109.71m AOD).

The British Geological Survey's database of borehole logs has been checked for relevant boreholes in the vicinity of No.27A. On the opposite side of Rosslyn Hill from No.27A borehole TQ28NE/7 recorded 51 feet of "Clay", presumably London Clay.

More useful were a set of four boreholes drilled in 1963 at Henderson Court, 102 Fitzjohn's Avenue (on the east side of its junction with Prince Arthur Road, 400m west of the site); these included the following descriptions of the uppermost part of the Claygate Member:

- *BHs 1, 2 & 4: "Stiff (or firm to stiff, or stiff to very stiff) laminated grey sandy clay and brown silty fine sand", with thicknesses proven of 3.8m to 4.7m below the Bagshot-Claygate interface which occurred at 104.2m to 105.5mAOD.*
- *BH3: The interface with the Bagshot Formation was much lower, at 96.9mAOD, below which the Claygate member comprised: "Coarsely laminated grey sandy clay and orange/brown silty sand" (1.2m) over "Brown silty very fine sand with trace of clay" (0.9m).*

No groundwater records were provided in these borehole records.

Through a search of the London Borough of Camden's website for nearby planning applications, it was found that a borehole had been drilled in the rear lightwell position at No.25 Rosslyn Hill in January 2012 (for a basement there); this was reported by Chelmer Site Investigations, report ref:2919. That borehole recorded "*Stiff mid brown/orange grey veined silty CLAY with partings of orange and brown silt and fine sand, claystone nodules and crystals*"; this clay became very stiff below 2.4m and was proven to a depth of 4.0m. No groundwater entry was recorded and **the borehole was dry on completion.**

This property is immediately downhill from Nos. 27/27A and has a broadly similar ground floor level, so this borehole was at approximately the same level as the strata immediately below the level of the proposed basement floor to No.27A. Thus, if it is assumed that the strata are laterally uniform, the soil types recorded in this borehole (considered from the log to be London Clay, with a weathered upper profile) would represent the ground conditions onto which the new basement will be founded and in which the swimming pool will be excavated.

## 2.5 Hydrogeology

The Claygate Member is classified by the Environment Agency as a 'Secondary A aquifer', whereas the underlying London Clay is an 'Unproductive Stratum'. Under the old groundwater vulnerability classification scheme, which now applies only to the superficial soils, the Claygate Member is classified as having 'Minor Aquifer - High Vulnerability'.

The source of the Tyburn stream/river is recorded (Barton, 1992) as being the Shepherds Well, at the junction of Lyndhurst Road, Fitzjohn's Avenue and Akenside Road - which is just over 400m to the south-west of No.27A. This location can be seen on the 1871-79 Map,

shown as 'Conduit Wells'. The geological map indicates that this site is in the lower half of the Claygate Member, somewhat above the stratigraphic level of No.27A. If the horizon(s) which feed the source of the Tyburn are laterally continuous, then a spring line might also be found somewhat upslope of No.27A's garden.

*40. Shepherds Well at the junction of today's Fitzjohn's Avenue and Akenside Road, Hampstead. Until recently it was marked by a fountain but, due to vandalism, this has been replaced by a plaque.*

It is understood that groundwater entries were experienced when the basement to No.27 was constructed (information from Mr. Norden); some similar water-bearing soil horizon(s) are likely to be encountered in the excavations for No.27A's basement. These were dealt with by simple sump pumping to keep the excavation free of water during construction works.

Current design standards require use of a 'worst credible' approach to selection of groundwater pressures. As no site-specific groundwater monitoring data is available at this time, use of a Eurocode 7 / BS8002 -compliant assumption of a groundwater level equal to that of ground level will need to be employed.

### 2.6 Walkover

Visits to the site/property were made by Mike Summersgill on 16th November, and to the vicinity/frontage by Keith Gabriel on 21st November; selected Photographs from Mike's visit are included in Appendix III. The property has no basement/cellar, and the rear garden is generally laid to hard cover (with patio paving and with astroturf); the front garden is generally block paved (for parking) but has two low retaining walls and two small garden areas. The lower retaining wall contained 5 weepholes at its foot (Plate 3), with no sign that these had exuded any pore-water.

The sides of the rear garden constitute a metre high retaining wall (Plate4), behind which there is a sloping flower bed/border up to the adjacent boundaries. The property behind, on Eldon Grove, stands at a (ground floor) level approximately 2m higher than Nos. 27/27a. The garden of No 29 Rosslyn Hill is at the same level as No. 27a, but is retained behind higher walls; examination of that property from the boundary would suggest that there was formerly a cellar which has been converted into a 'lower ground floor' and the rear garden has been excavated out by half a metre or so, to provide open access to the lower ground floor (No.29's ground floor house level is at least a metre above No.27a, with a flight of steps)

There are 5 Plane trees close to the boundary but in the garden of the Eldon Grove property (to the rear of No. 27a); these are mature, but heavily and recently pollarded (Plate 4). There is also a mature Silver Birch tree in the garden of No. 29 Rosslyn Hill, stretching to the roof level, and planted close to the property boundary (Plate 5); roots from this tree (but not the Planes at the rear) may be present beneath the footprint of No. 27a. The NHBC Standards Chapter 4.2 for protection of trees and depth of foundation should be utilised for design work.

Roof waters drain through downpipes to a combined sewer system, and then out to the main sewer in Rosslyn Hill (information from the Architect). Rainwaters falling onto the rear garden appear to discharge to a gully and lateral collector drain, which it is assumed also to pass to the combined sewer. Rain falling on the front driveway will discharge by gravity out onto the footpath and highway.

Land in the vicinity slopes gradually down from Hampstead High Street, but the road levels out quite soon after No. 25 Rosslyn Hill; there is a slight cross-fall on the main road from west to east (and a steeper ground fall away to the east, down Pond Street). Land to the west and north-west is elevated above Rosslyn Hill, along Eldon Grove, but then falls away further to the west – this tends to reflect the geological mapping, which indicates a 'lobe' of Bagshot Beds extending south from Hampstead centre.

No sign of springs, spring lines or unstable slopes were found in the vicinity of the property, in any direction for 100m. It was noted that several properties along Rosslyn Hill had 'new' basements or cellar enlargements in place, or under construction. Many of these properties (on the west side of the road) had originally been set above street level, with lower ground floors probably used as living quarters for staff.

As can be noted on the 1870's maps in Appendix I, the route of the London Transport tunnel beneath this area passed beneath several 'vacant' plots at that time, although some plots in Windsor Terrace to the west had already been built over the line in 1871. It was apparent, along Rosslyn Hill and adjacent roads, that some individual buildings were of a post-Victorian era, and these could be seen to generally 'mark' the line of the railway tunnel (and were not bomb damaged re-builds, as seen in other locales in London).

# 3. Basement Impact Assessment

## 3.1 Stage 1 – Screening

The screening has been undertaken in accordance with the three screening flowcharts presented in LBC's CPG4 guidance document. Information to assist with answering these screening questions has been obtained from various sources including the Camden geological, hydrogeological and hydrological study (Arup, 2010), and historic maps.

Subterranean (groundwater) flow screening flowchart:

| Question | | Response, with justification of 'No' answers | Clauses where considered further |
|---|---|---|---|
| **1a** | Is the site located directly above an aquifer? | No – Underlying bedrock is London Clay | 2.4 |
| **1b** | Will the proposed basement extend beneath the water table surface? | Probably yes – There may be perched groundwaters here. | 2.6, 3.4.1 |
| **2** | Is the site within 100m of a watercourse or spring line? | No watercourse but potential for spring line | 2.4, 2.5 |
| **3** | Is the site within the catchment of the pond chains on Hampstead Heath? | No | |
| **4** | Will the proposed basement development result in a change in the proportion of hard surfaced/ paved areas? | No – currently 90-95% hardcover for whole site | 2.3 |
| **5** | As part of the site drainage, will more surface water than at present be discharged to the ground (eg: via soakaways and/or SUDS)? | No – virtually same footprint for property with basement and discharge to sewer as before | 2.3 |
| **6** | 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 or spring line? | No - No local ponds and no evidence from spring lines research | 3.4.1.3 |

Slope/ground stability screening flowchart:

| Question | | Response, with justification of 'No' answers | Clauses where considered further |
|---|---|---|---|
| **1** | Does the existing site include slopes, natural or man-made, greater than 7°? (approximately 1 in 8) | No – Fig 16 of Arup Report | |
| **2** | Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°? | No – landscaping not re-profiled at rear | |
| **3** | Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°? | No – Fig 16 of Arup Report | |
| **4** | Is the site in a wider hillside setting in which the general slope is greater than 7°? | No – Fig 16 of Arup Report | |
| **5** | Is the London Clay the shallowest strata at the site? | Yes – but not confirmed by investigations on this site | 2.4 |
| **6** | Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree root protection zones where trees are to be retained? | No – but design needs to recognise a mature tree in adjacent garden | 2.6 |
| **7** | Is there a history of seasonal shrink/swell subsidence in the local area, | Yes – but no evidence on site of cracking in this or | 3.4.4 |

| | | | |
|---|---|---|---|
| | and/or evidence of such effects at site? | adjacent properties | |
| **8** | Is the site within 100m of a watercourse or potential spring line? | No to watercourse, Yes to potential spring line | 2.4, 2.5 |
| **9** | Is the site within an area of previously worked ground? | No – Database Consulted | |
| **10** | 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 – EA database consulted | |
| **11** | Is the site within 50m of the Hampstead Heath ponds? | No | |
| **12** | Is the site within 5m of a highway or a pedestrian right of way? | No – it is more than 5m from house front to pathway | |
| **13** | Will the proposed basement substantially increase the differential depth of foundations relative to neighbouring properties? | No re. No.27 - conjoined building already has a (new) basement. Yes re. adjacent No.29 which has no basement. | 3.4.7 |
| **14** | Is the site over or within the exclusion zone of any tunnels, eg railway lines. | Yes | 3.4.8 |

Surface Flow and flooding screening flowchart:

| **Question** | | **Response, with justification of 'No' answers** | **Clauses where considered further** |
|---|---|---|---|
| **1** | Is the site within the catchment of the pond chains on Hampstead Heath? | No | |
| **2** | As part of the proposed site drainage, will surface water flows (eg volume of rainfall and peak run-off) be materially changed from the existing route? | No – same discharge sewer/drainage used | |
| **3** | Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas? | No – on same footprint | |
| **4** | Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by the adjacent properties or downstream watercourses? | No – roof of No. 27A remains as was | |
| **5** | Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses? | No – continues as before | |

## 3.2 Stage 2 - Scoping

The scoping stage is required to identify the potential impacts from the aspects of the proposed basement which have been shown by the screening process to need further investigation.

Subterranean (groundwater) flow scoping:

| **Issue (=Screening Question)** | | **Potential Impacts and actions** |
|---|---|---|
| **1b** | Will the proposed basement extend beneath the water table surface? | **Potential impact**: Local restriction of groundwater flow through any Made Ground or Head deposits overlying the London Clay, or within permeable horizons in the London Clay. |
| **2** | Is the site within 100m of a watercourse or spring line? | **Potential Impact:** Instability of excavation and water ingress<br>**Action:** Sump pumping during dig |

Slope/ground stability scoping:

| Issue (=Screening Question) | | Potential Impacts and actions |
|---|---|---|
| **5** | Is the London Clay the shallowest strata at the site? | **Potential impact:** Heave from removal of bushes and unloading caused by the basement excavations. |
| **6** | Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree root protection zones where trees are to be retained? | Tree in adjacent garden; not to be felled.<br>**Potential impact:** Excavation cuts roots.<br>**Action:** Need to check root zone effects |
| **7** | Is there a history of seasonal shrink/swell subsidence in the local area, and/or evidence of such effects at the site? | Tree in adjacent garden<br>**Potential impact:** Heave from removed roots.<br>**Action:** Need to check root zone effects |
| **8** | Is the site within 100m of a watercourse or potential spring line? | **Potential Impact:** Instability of excavation and water ingress<br>**Action:** Sump pumping during dig |
| **13** | Will the proposed basement substantially increase the differential depth of foundations relative to neighbouring properties? | **Potential Impact:** Instability of foundations of No. 29 Rosslyn Hill<br>**Action:** Investigate as part of Party Wall work. |
| **14** | Is the site over or within the exclusion zone of any tunnels, eg railway lines. | **Potential impact:** Stress changes on the tunnel lining due to soil excavation.<br>**Action:** Designer to Liaise with LT & LUL. |

No potential impacts were detected from the surface flow and flooding screening. Therefore there are no scoping requirements for that section.

## 3.3 Stage 3 – Site Investigation

As already mentioned, stage 3 is a site investigation, involving the review of existing data and the collection of new, site-specific data, if considered necessary. Whilst it would be useful/informative to drill a borehole on this specific site, recent information on the excavation in No. 27 and a 2012 borehole drilled in No. 25 (related to basements in both places) is available to confirm the expected clay type and strength, for initial design work. It is not envisaged that soil conditions will vary greatly from these, but it cannot be discounted.

## 3.4 Stage 4 – Impact Assessment

### 3.4.1 Hydrogeology and Hydrology

This section of the report collates data pertinent to both groundwater and surface water, based on parameters identified in Guidance CGHHS and in CPG4.

The requirement for examination of the subterranean flow aspect is primarily that the property lies “within 100m of a watercourse, well or potential spring line”, with the Claygate Member being so close. No wells or water courses are evident within 100m.

#### 3.4.1.1 Existing situation and Hydrogeological Ground Model

A preliminary hydrogeological ground model has been compiled based on the mapped geology, the BGS memoir and the nearby borehole records as described in Section 2:

- Geology: The site is directly upon the London Clay; however the boundary with the Claygate Member is likely to be within 50m (upslope). The Claygate Member is generally interbedded clays, silts and sands overlying clays of the London Clay Formation (which may also contain thin partings/laminations/beds of silt and fine sand). The precise level of the interface between these two units is not confirmed at present, but the local topography gives 'clues'.
- Hydrogeology: From the experience gained when constructing the basement beneath the adjoining No.27, it is known that there is always the possibility to be one or more water-bearing horizons within the depth of excavation for No.27A's proposed basement. Groundwater flows and the extent of the groundwater catchment are discussed further below. Perched groundwater may also be present within any overlying made ground and within the backfill to the original house's foundation footing trenches.
- The proposed swimming pool in No.27A's basement will extend deeper than any part of No.27's existing/recent basement. Provided that the strata are laterally uniform, the silty CLAY with partings of silt and fine sand recorded by the borehole drilled in the rear lightwell to No.25 Rosslyn Hill (at 3m below patio level), should be representative of the ground conditions within which the swimming pool will be excavated, and onto which the remainder of the new basement will be founded. *[Note*: *The lack of groundwater entry recorded in this borehole should not be taken as evidence that no groundwater was present; it reflects only the small diameter of the borehole and the short time for which the hole was left open.]*

#### 3.4.1.2 Aquifer and Catchment Designation

The Environment Agency website indicates that the underlying London Clay geology is defined as unproductive with respect to groundwater status, a non-aquifer. The Claygate Member, however, is an aquifer with a Secondary A classification for bedrock.

According to ARUP, the site is not located within any of the specified relevant drainage catchment areas mentioned in their report.

#### 3.4.1.3 Groundwater Presence

The nature of the solid geology, which is characterised by sandier capping soils on Hampstead Heath overlying a substantial thickness of low permeability London Clay, suggests that a continuous groundwater body is unlikely to be present in the immediate location of this site (which is proven to be underlain by Clay), but it is clear that rainwaters that fall on the Heath do emerge downslope in the vicinity, and have been captured as wells/springs in the historical past.

As the underlying London Clay was eroded into major and minor valleys in previous geological timescales, so 'slopewash' material will subsequently have been transported into the contoured 'valleys' and this can be found as a near-surface layer which is more permeable than the very stiff London Clay. It is envisaged that any sub-surface groundwater will gravitate, with the topography, into these valley features from the 'capping' soil strata on the Heath, generally following the 'visible' surface watershed/boundaries and slope profiles.

3.4.1.4 Depth and Orientation of Groundwater

The depth to groundwater at this site is unknown, as no investigations have been undertaken precisely here. A 4m deep borehole at No. 25 Rosslyn Hill, down-hill, remained '*dry when open on completion*.'

The extent of groundwater flow within the more permeable horizons will be controlled in part by the degree of interconnections between the units. Human activities such as the construction of wells, and service trenches, are likely to have created pathways between many potential upslope permeable horizons; as a result the groundwater catchment area for No.27A could possibly be substantial. The direction of groundwater flow will be determined by a combination of the hydraulic 'head' (pressure difference) driving the flow, the orientation of the strata, slope profile and the outcrop alignment of the permeable horizons on the slope.

The contours on the OS map indicate that the overall fall of the slope is towards the northeast at angles of 3.5° to 4.5°, while the intersection of the Claygate-London Clay interface (as mapped) with the contours suggests that the strata may be dipping to the southeast; a broadly easterly groundwater flow would therefore be expected here, although that will have been modified by excavations into the slope and other man-made influences.

Groundwater levels/pressures will also be affected by seasonal and long-term climatic fluctuations.

3.4.1.5 Surface Rainfall Catchment and Surface Cover

At this site, there is no significant "open" ground within the property's own gardens. The rear garden is covered in paved patio areas and artificial grass, with narrow perimeter soil boundaries. The front garden is also paved with two small flower beds.

The proposed development will not significantly alter the proportion of hard surface/paved areas at the site (one of the front garden planted areas will become a light well), and therefore not result in a significant increase in surface water being discharged to the ground.

3.4.1.6 Springs, Wells and Watercourses

The closest surface water features to the site are the Hampstead Ponds situated approximately 300m due north-east. The ARUP Guidance indicates that these ponds are part of a former surface water course that originated from high ground (approximately 120-130m AOD) at Hampstead Heath. The River flowed in a south-easterly direction, via the current Hampstead Ponds, eventually forming the River Fleet, with a second arm that originated from the vicinity of Highgate Ponds.

Of greater concern, however, is the likelihood of springs in the close vicinity. As previously mentioned, the site is within 50m of the boundary between the London Clay and the overlying Claygate Member. The presence of a less permeable clay layer (London Clay) acting as an aquitard beneath potentially more permeable sandy layer (Claygate Member) creates a conduit along which the groundwater can flow and escape as springs at the surface.

3.4.1.7 Sewer Drainage

The property is apparently served by a combined sewer system, which discharges foul sewerage and rainwaters into the public system. The entire footprint of this property is

'sealed' from the ground below (there is no significant 'open' garden vegetated area at the rear or front of the house, and no change to these post-development).

3.4.1.8 Flood Risk - Hydrology

Figure 15 in the ARUP study clearly indicates that Rosslyn Hill was not a flooded street in both 1975 and 2002. It is also not highlighted as having the potential to be at risk of flooding.

### 3.4.2 Slope Stability and Ground Condition

Rosslyn Hill is built upon an underlying geology of London Clay at its southern end, and climbing onto the Claygate Member, then the Bagshot Formation, as it heads northwards.

Figure 16 in the CGHHS gives an indication of where slopes in the area are in excess of 7 degrees and 10 degrees, which the Arup report considers to be the critical angles at which slope instability may occur, with the lower angle related to groundwater/spring issues. This property is not in that 'slope angle' zone, nor is there any adjacent.

Figure 17 of the same Report gives an indication of 'Areas of significant landslide potential', which (as this Figure is of a small scale, based upon the British Geological Survey mapping) shows a 'red zone' which this property is in. This is due to its proximity to the Claygate/ London Clay boundary.

No local signs of instability were observed in the vicinity; nor is the local slope along Rosslyn Hill of significance. The rear garden has been excavated out in the past, and a metre high retaining wall built (no signs of stress or cracking were noted there).

### 3.4.3 Shrink/Swell Clays

According to the BGS Shink/Swell potential map, the area is of Moderate risk, due to the London Clay geology. Tests on samples taken from the borehole in No. 25 earlier this year indicated 'very high plasticity' clays from 0.5m down, at 0.5m intervals.

The site walkover revealed the presence of five (5 No.) pollarded plane trees in the garden to the west of the site. On the north side of the site, next door, is a mature silver birch tree.

### 3.4.4 Compressible/Collapsible Ground

According to the BGS collapsible/compressible potential map, this site has a low to nil compressibility potential and does not have a significant collapsible potential.

### 3.4.5 Mining, Quarrying and Landfilling

There is no evidence (from historical maps, walkover observations and the Environment Agency website) that suggests the presence of mines, quarries or landfills in the vicinity of 27A Rosslyn Hill.

### 3.4.6 Structural Stability of Adjacent Properties

A single-storey basement has already been constructed next door (No.27) in recent years, details of which were available from LBC planning website. The footprint of this basement is larger than that of the proposed basement here. It extends 1.5m further than the house footprint into the rear garden and 4m further into the front garden. This basement, at a

maximum of approximately 3m deep, is not as deep as a proportion of the proposed basement at 27A (which beneath the pool is 5m), but is at the same level of most of the proposed basement here.

Uphill, the property (No. 29 Rosslyn Hill) appears to have converted a cellar into a lower ground floor living space (and perhaps amended the back garden level); this may or may not have involved excavation but the back garden level is now the same as in Nos. 27A and 29.

### 3.4.7 Tunnels

There are three tunnels in the vicinity, belonging to London Underground and London Transport.

#### 3.4.7.1 London Underground

Two Northern Line Tunnels run along the line of the main road, Rosslyn Hill. The information obtained from London Underground is in Appendix V. The crowns of the two tunnels are 43 and 42.2m AOD. With the site/road located at 80mAOD, these tunnels are a minimum of 37 metres deeper, and therefore the basement dig will not significantly affect these.

#### 3.4.7.2 London Overground

A shallower tunnel runs beneath 27A Rosslyn Hill on a bearing of ENE-WSW. It is also seen in the 1871 historical map, crossing under the elliptical driveway. A cover thickness of 20m was mentioned in the 'Structural Stability Report' for the basement at No.25 Rosslyn Hill (based upon road levels at Rosslyn Hill and Hampstead Heath Station bridge). Thus a basement dig of 3m generally (5m locally) will not represent a substantial unloading on the soils above tunnel lining, nor was any concern raised when the basement at No.27 was dug; however, the consent of LT may need to be sought by the designer.

### 3.4.8 Constructional Aspects

#### 3.4.8.1 Impact of the proposed Permanent Works (Hydrogeology)

The anticipated broadly easterly direction of groundwater flow means that the flow is likely to cross diagonally beneath the site, from roughly the rear right corner of No.27A to the front left corner of No.27. No.29 Rosslyn Hill, on the uphill side of No.27A, has a lower ground floor which is slightly below the level of No.27A's ground floor, but has no basement as far as we are aware.

Because any groundwater 'flow' is thought to cross the site diagonally, the proposed basement beneath No.27A will create only a slight increase in the width of the obstruction across the direction of flow, than that which is already caused by the basement to No.27. A corridor for continued 'flow' will remain between No.27A and No.29, and beneath No.29, so it is anticipated that, at worst, the proposed basement could possibly cause only a slight increase in groundwater levels (or piezometric water pressures) at the rear of the property.

The proposed swimming pool at the rear of No.27A's basement will be deeper than all the surrounding structures, so will represent only a localised obstruction to any groundwater flow

at that deeper level which, on the evidence of stiff London Clay at depth from the borehole drilled behind No.25, is anyway likely to be minimal.

To conclude, whilst the proposed basement could possibly cause a slight increase in groundwater levels/pressures at the rear of the property, flow in any permeable horizons which are intersected by the basement will continue to be possible in the 'gap' between Nos 27A and 29, and beneath No.29. As a result, no special mitigation measures are likely to be required, and it is assumed that the No. 27 basement is itself 'tanked' against groundwater.

3.4.8.2 Impact of the proposed Permanent Works (Structural Stability)

The excavation for No.27A basement will go lower than the probable foundation level of the flank wall of No.29, but there is a lateral gap between the properties of around 1.5m. There is a possible potential to affect the flank wall foundations of No.29 by this basement excavation at No.27a, but mitigation/support works would generally be designed as part of any Party Wall Agreement for basement construction (the current foundations to No.29 may need to be exposed, levelled and logged, as part of a future ground investigation).

3.4.8.3 Temporary Works (Groundwater)

Groundwater control may be required during the basement construction works, which it is assumed will be undertaken by underpinning methods. Water entries may be manageable by sump pumping, but alternative groundwater control methods might be required. It should be noted no site-specific ground investigation has yet been undertaken.

The proposed basement will be close enough to the boundary with No.29 for the sump pumping to influence groundwater pressures beyond that boundary. The pressure reduction is unlikely to exceed that which will have occurred naturally during past fluctuations of groundwater levels, although some increase in vertical stresses could possibly be expected below the foundations to No.29; the acceptability of which will need to be assessed further during the design phase.

Before the works start, an appropriate discharge location must be identified for the groundwater removed by sump pumping or well pointing.

3.4.8.4 Waterproofing

The proposed basement will need to be fully waterproofed in order to provide adequate long-term control of moisture ingress from the ground. Detailed recommendations for the waterproofing system are beyond the scope of this report although it is noted that, as a minimum, it would be prudent for the system to be designed in compliance with the requirements of BS8102:2009.

# 4. Conclusions

These conclusions consider only the primary findings of this assessment; the whole report should be read to obtain a full understanding of matters concerned.

The proposed basement **is considered acceptable** in relation to subterranean (groundwater) flow and the only mitigation measures expected would be sump pumping for any temporary groundwater ingress. This evaluation is based upon information from the adjacent basement dig and a recent borehole in a nearby garden; no specific ground information is available for the site itself, but similarity/continuity is to be expected for the London Clay found nearby.

The basement needs to be fully waterproofed. A provisional design groundwater level equal to ground level is proposed, which means that the basement (particularly the swimming pool) must be able to resist buoyant uplift pressures (un-factored) of up to 36kN/$m^2$.

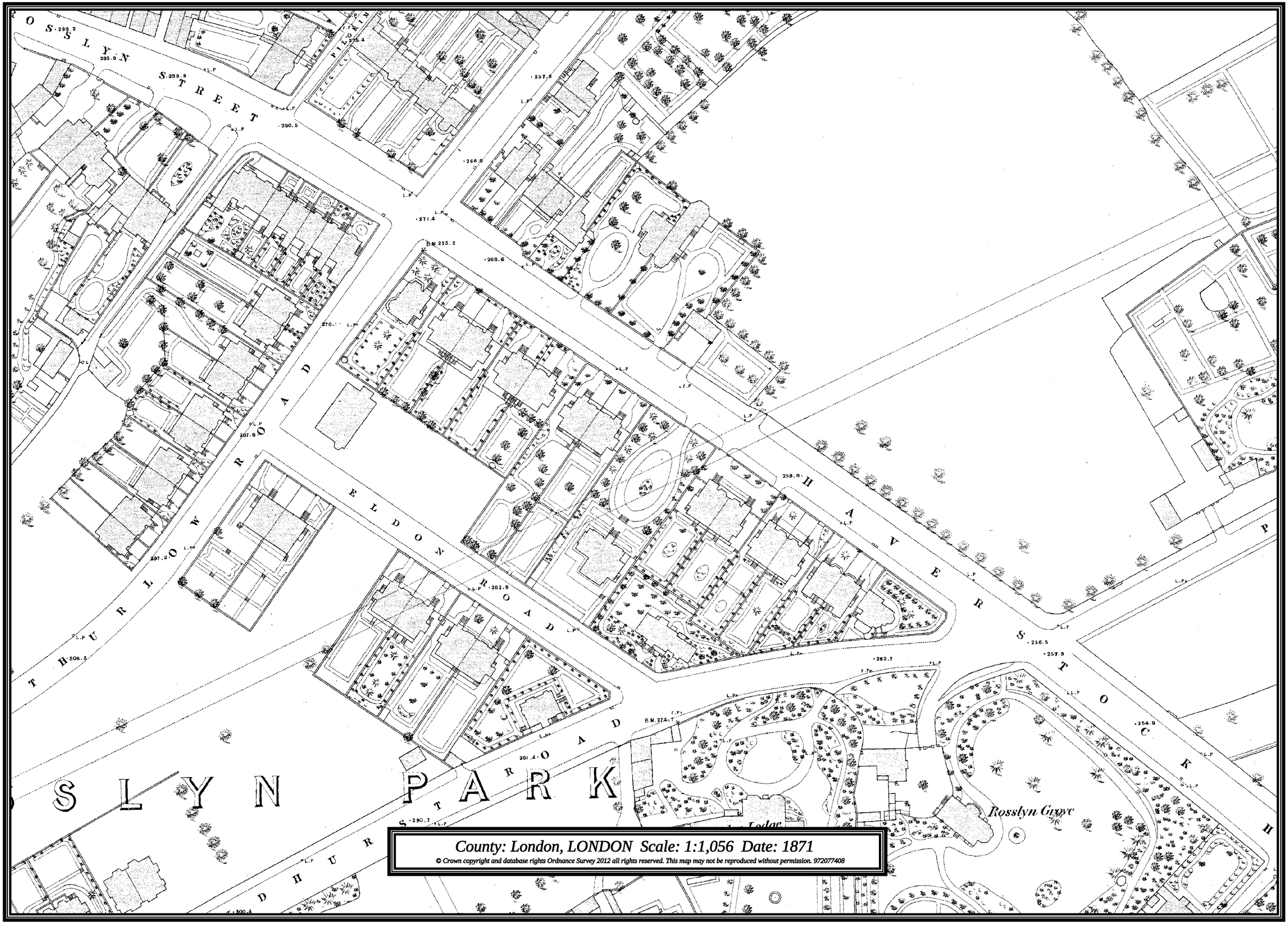
In slope/ground stability terms, as there is a basement beneath (conjoined) No.27 at the same (or similar) depth to that proposed here, then the construction of the (southeast) wall at No.27a will tend to be contiguous with that basement wall, apart from an apparent small offset at the rear. Particular care will be needed for the swimming pool 'extra' dig at the rear of the basement, to ensure the adjacent basement support wall is not undermined by lateral movements (or heave).

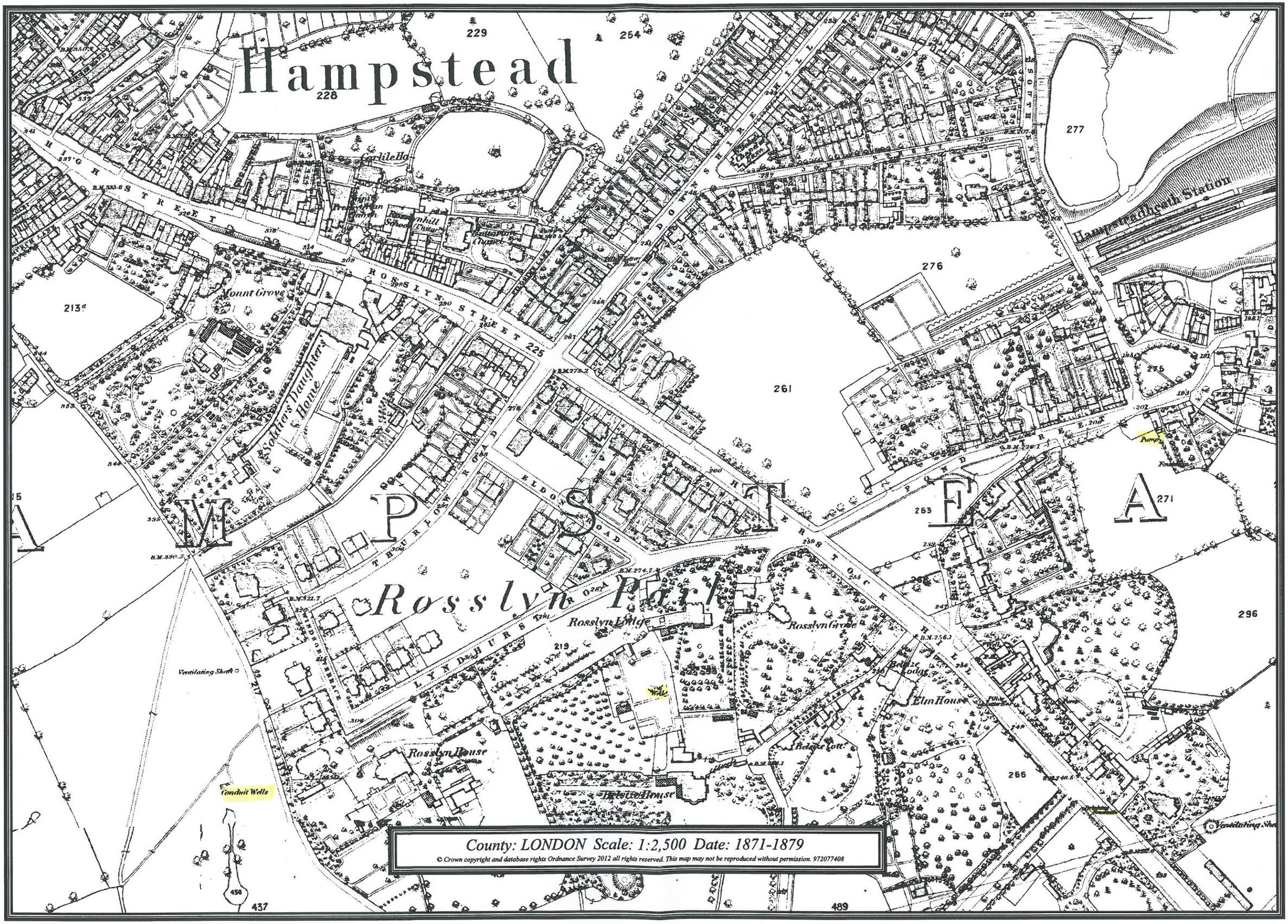
In order to adequately control ground movements alongside the basement dig (northwest), a construction sequence must be set out to protect the foundations of the three-storey flank wall. Following examination of the current foundations of No.29, the construction sequence and support arrangements for the basement dig should utilise the charts presented in CIRIA C580 to calculate the maximum expected/induced horizontal & vertical ground movements.

No surface water/flooding measures are considered necessary/applicable to the basement development, as it is not envisaged there is to be any additional on-site, or off-site, flows.

# APPENDIX I

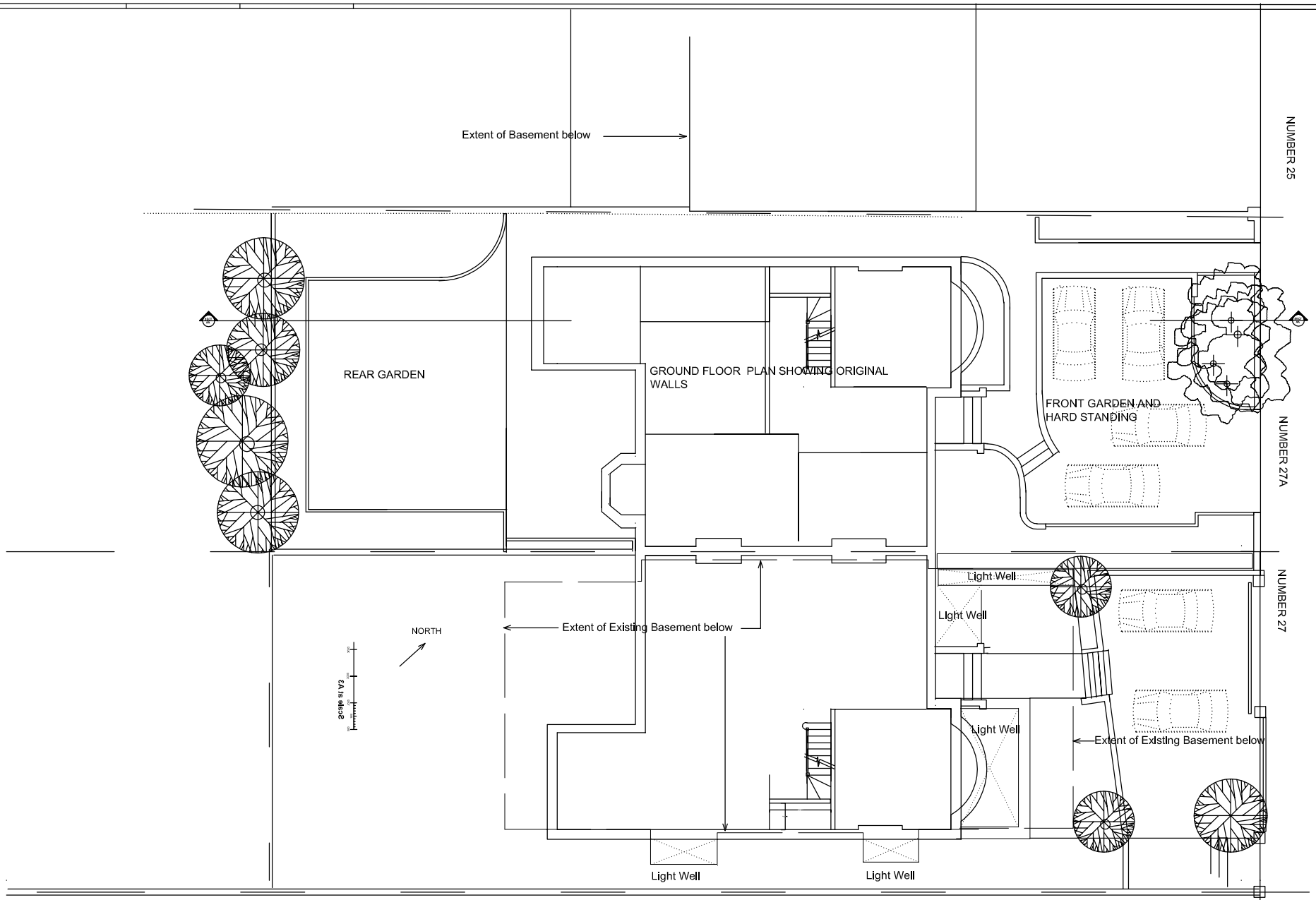
# HISTORICAL MAPS (LATE 19TH CENTURY)





# APPENDIX II

# PROPERTY LOCATION PLANS

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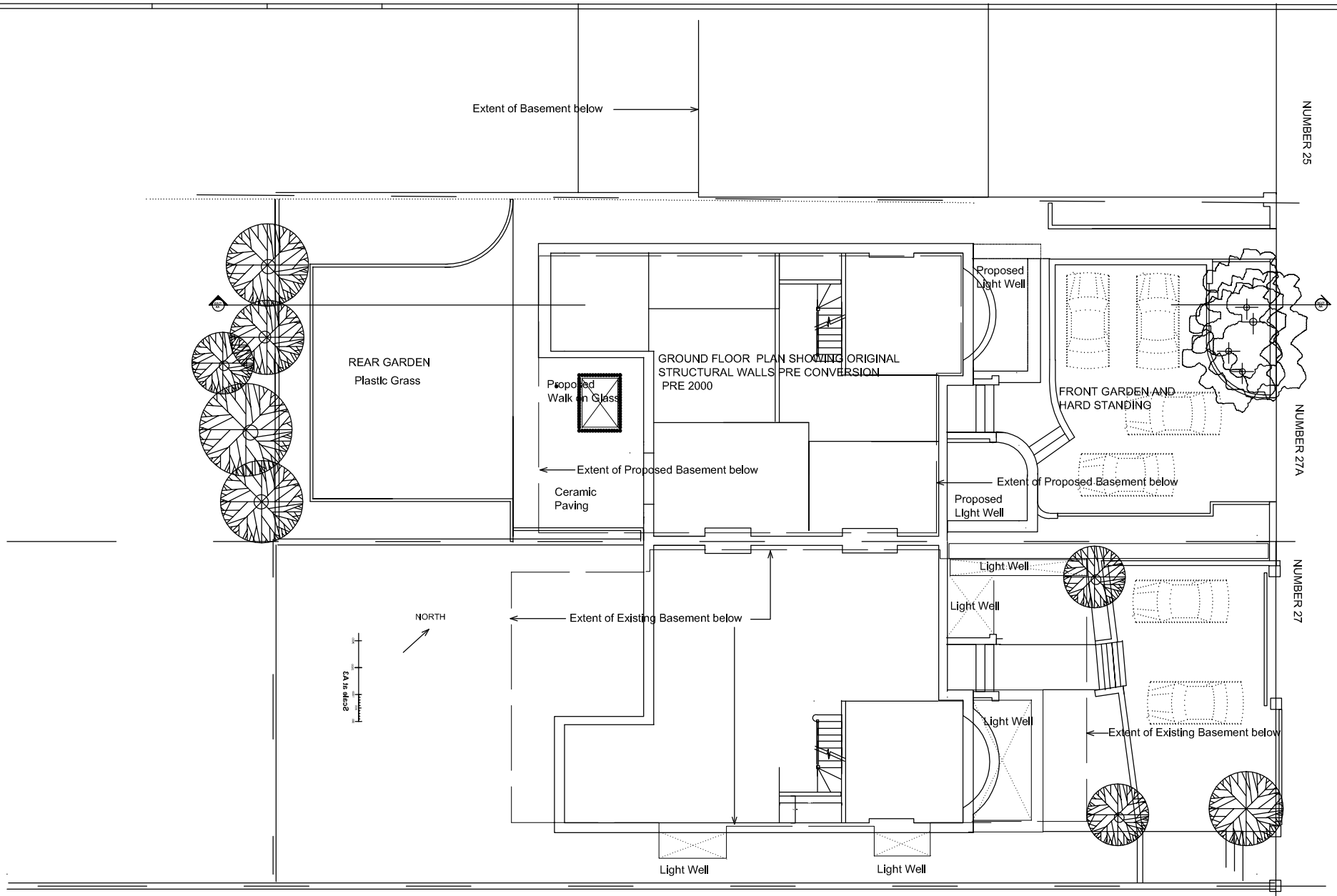
|---|---|---|---|---|---|
| **NEALE & NORDEN** CONSULTANTS<br>17 DARTMOUTH PARK AVENUE LONDON NW5 1JL<br>f 0207 813 4223 e- nnorden717@aol.com | title: GROUND EXISTING SITE PLAN | REVISIONS<br>NO. DATE DESCRIPTION | project: 27A ROSSLYN HILL | SHEET TITLE: D1<br>all dimensions to be verified on site<br>job no. 296/D1<br>scale 1:200<br>date 20/02/12 | DRN : CHK : |





NEALE & NORDEN
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17 DARTMOUTH PARK AVENUE LONDON NW5 1JL
f 0207 813 4223 e- nnorden717@aol.com


title
GROUND PROPOSED
SITE PLAN

REVISIONS
NO. DATE DESCRIPTION

project
27A ROSSLYN HILL

SHEET TITLE:
D2
all dimensions to be verified on site

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|---|---|
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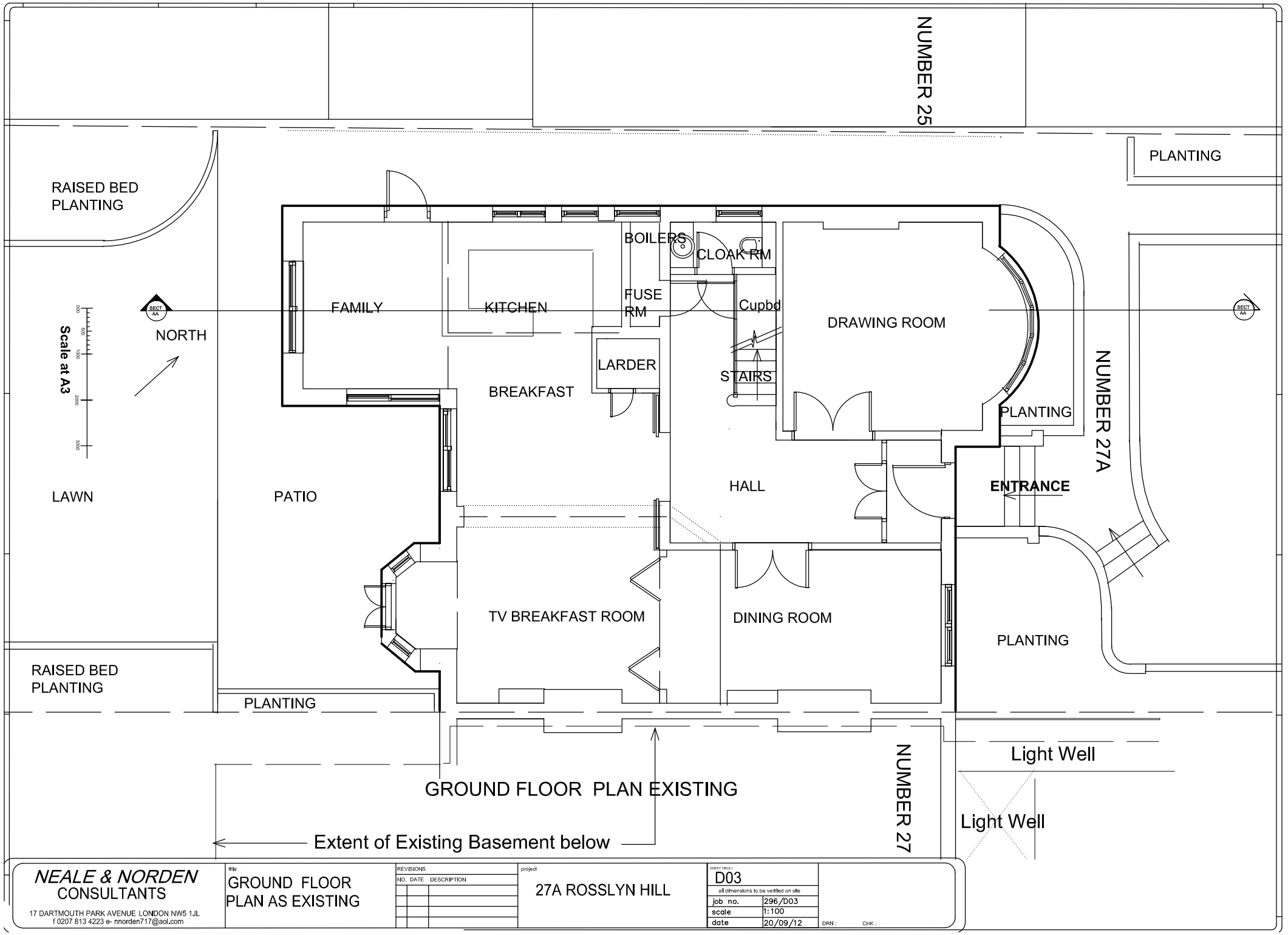


NEALE & NORDEN
CONSULTANTS
17 DARTMOUTH PARK AVENUE LONDON NW5 1JL
f 0207 813 4223 e- nnorden717@aol.com

title: GROUND FLOOR PLAN AS EXISTING

REVISIONS
NO. DATE DESCRIPTION

project: 27A ROSSLYN HILL

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all dimensions to be verified on site
job no. 296/D03
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date 20/09/12
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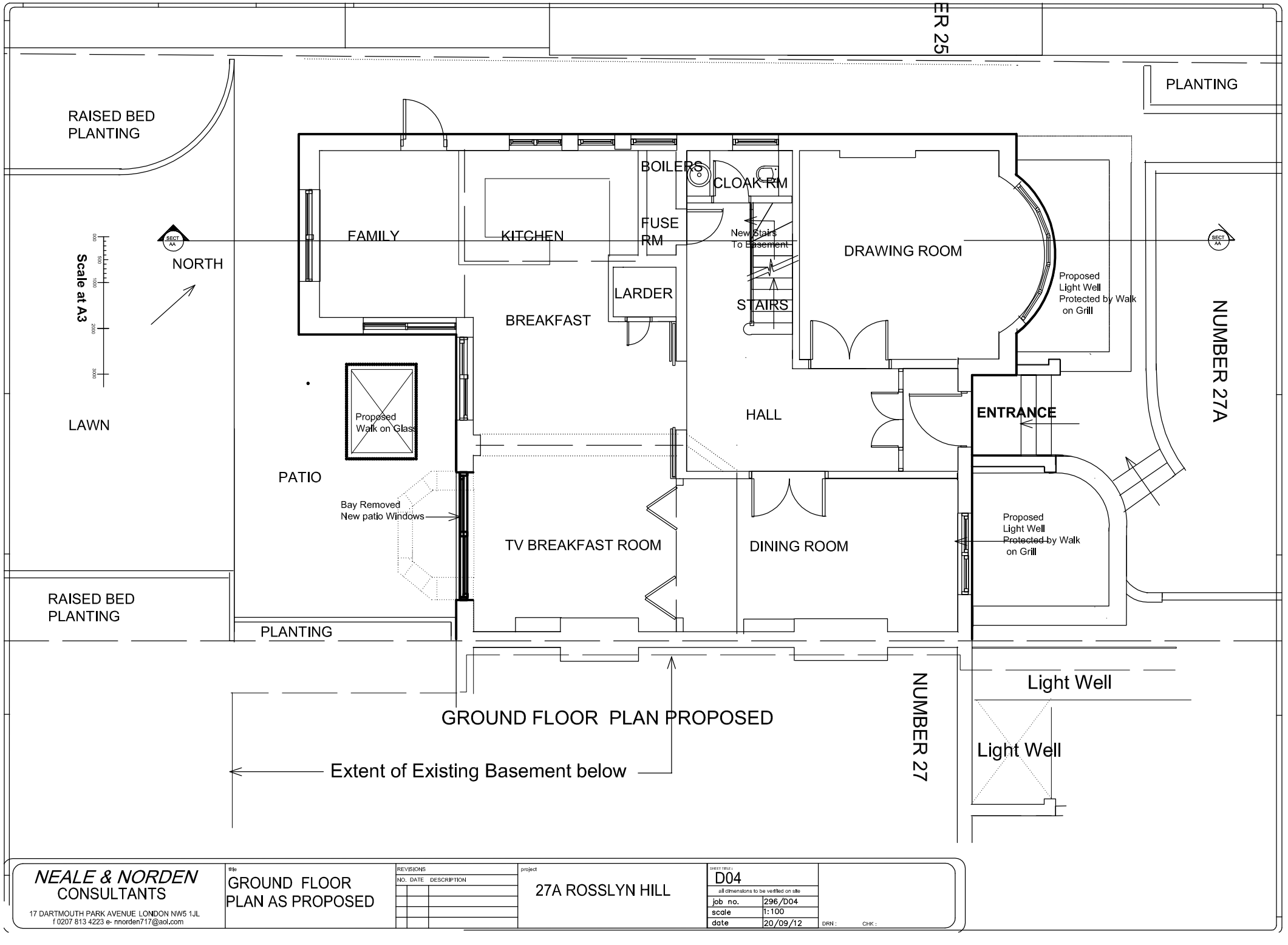


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title
GROUND FLOOR PLAN AS PROPOSED

REVISIONS
NO. DATE DESCRIPTION

project
27A ROSSLYN HILL

SHEET TITLE:
D04
all dimensions to be verified on site

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|---|---|
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| scale | 1:100 |
| date | 20/09/12 |

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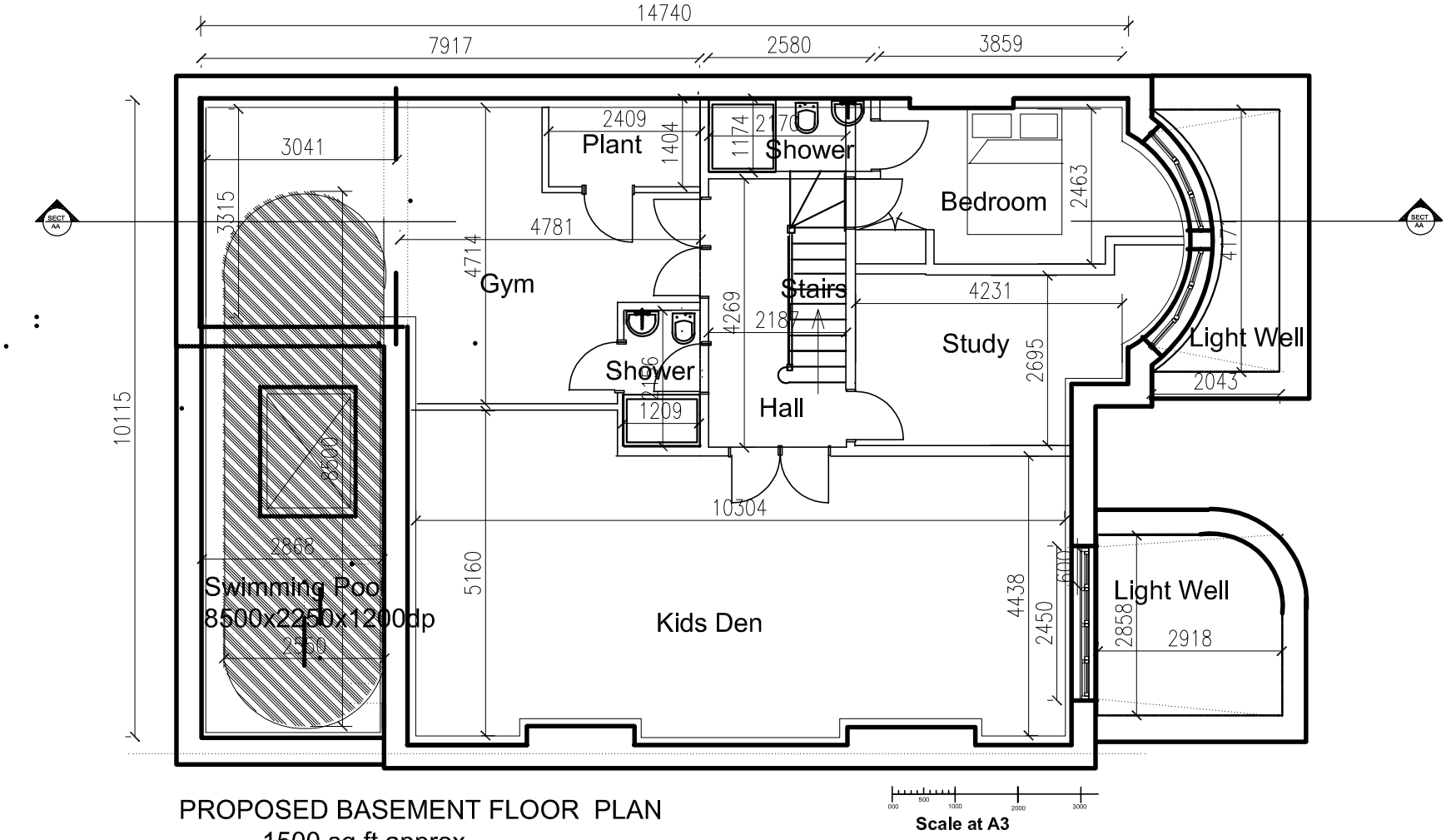


PROPOSED BASEMENT FLOOR PLAN
1500 sq ft approx


NEALE & NORDEN
CONSULTANTS
17 DARTMOUTH PARK AVENUE LONDON NW5 1JL
f 0207 813 4223 e- nnorden717@aol.com


title: BASEMENT PLAN AS PROPOSED

| REVISIONS | | |
|---|---|---|
| NO. | DATE | DESCRIPTION |
| | | |

project: 27A ROSSLYN HILL

SHEET TITLE: D05

all dimensions to be verified on site

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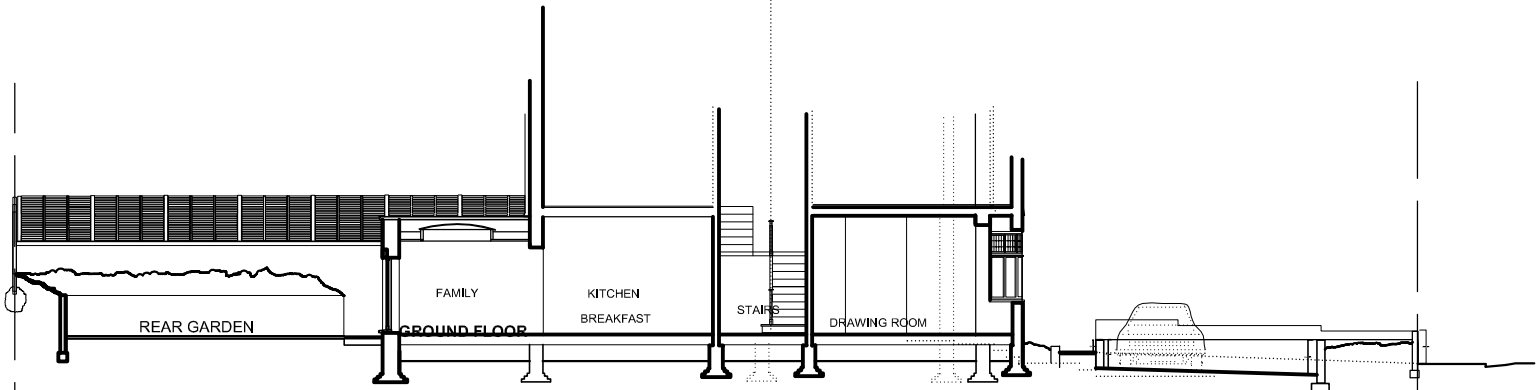
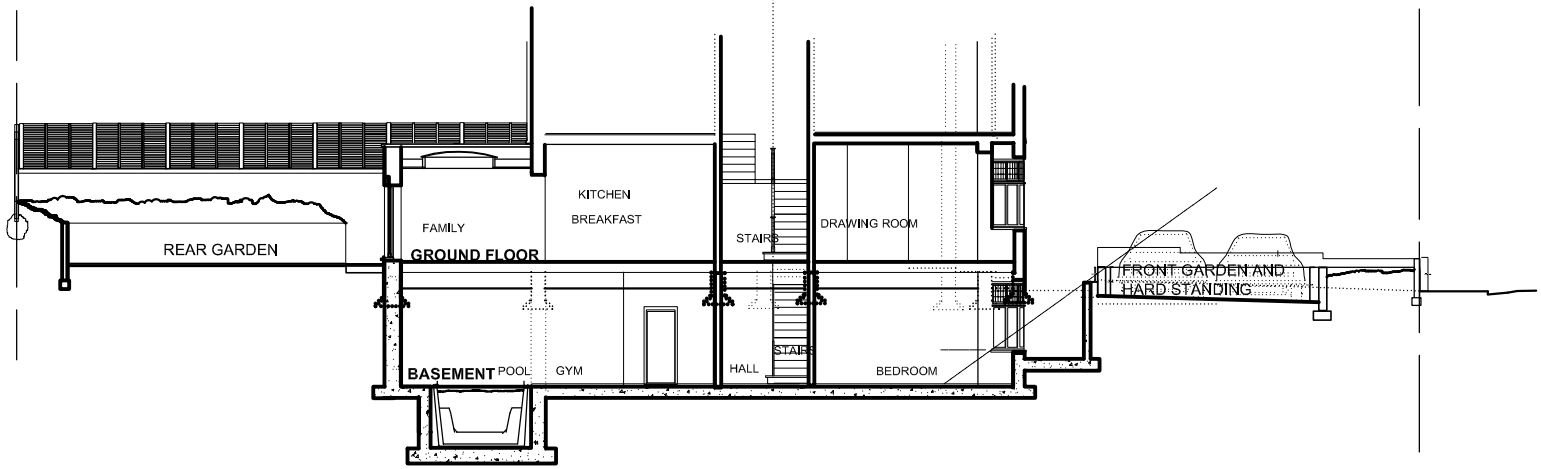



LONG SECTION AA AS EXISTING




LONG SECTION AA AS PROPOSED

*NEALE & NORDEN*
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17 DARTMOUTH PARK AVENUE LONDON NW5 1JL
f 0207 813 4223 e- nnorden717@aol.com

title
LONG SECTION AA
AS EXISTING

REVISIONS

| NO. | DATE | DESCRIPTION |
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project
27A ROSSLYN HILL

SHEET TITLE
D06

all dimensions to be verified on site

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| job no. | 296/D06 |
| scale | 1:200 |
| date | 20/09/12 |

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# APPENDIX III

# PHOTOGRAPHS FROM WALKOVER


1 **Front Driveway**

2 **Front of the house. Raised entrance visible.**

3 **Raised entrance, weep holes visible.**

4 **View to the rear of the property. Pollarded Plane Trees visible.**

5 **View of the rear of the property. Change in building height visible. Large silver birch also visible in top left of photo.**

6 **View of the northern boundary of the property from the rear garden. Raised beds visible.**

# APPENDIX IV

# TUNNEL CORRESPONDENCE

Date 14 November 2012

Our Ref 20878-SI-N044

Your Ref

To Neale & Norden
NNorden717@aol.com

London Underground Limited

Hello Neale,

**27 and 27A Rosslyn Hill London NW3 5UJ**

Thank you for your communication of 13th November 2012.

Attached is a 1:1250 plan @A4 showing the alignment and tunnel crown levels of the Northern line in relation to the above location.

**Please note:**

- shaded areas represent sub-surface structures which can be as shallow as 0.2 metres below surface level
- the positions of the tunnels on this plan are indicative only and must not be used for design purposes
- for more accurate tunnel location information a survey will need to be undertaken
- this letter must be distributed with the drawing which it refers to

If you or any other intends undertaking the following at the above location London Underground Infrastructure Protection must be provided with details of the proposals so that the safety of our railway can be assured:

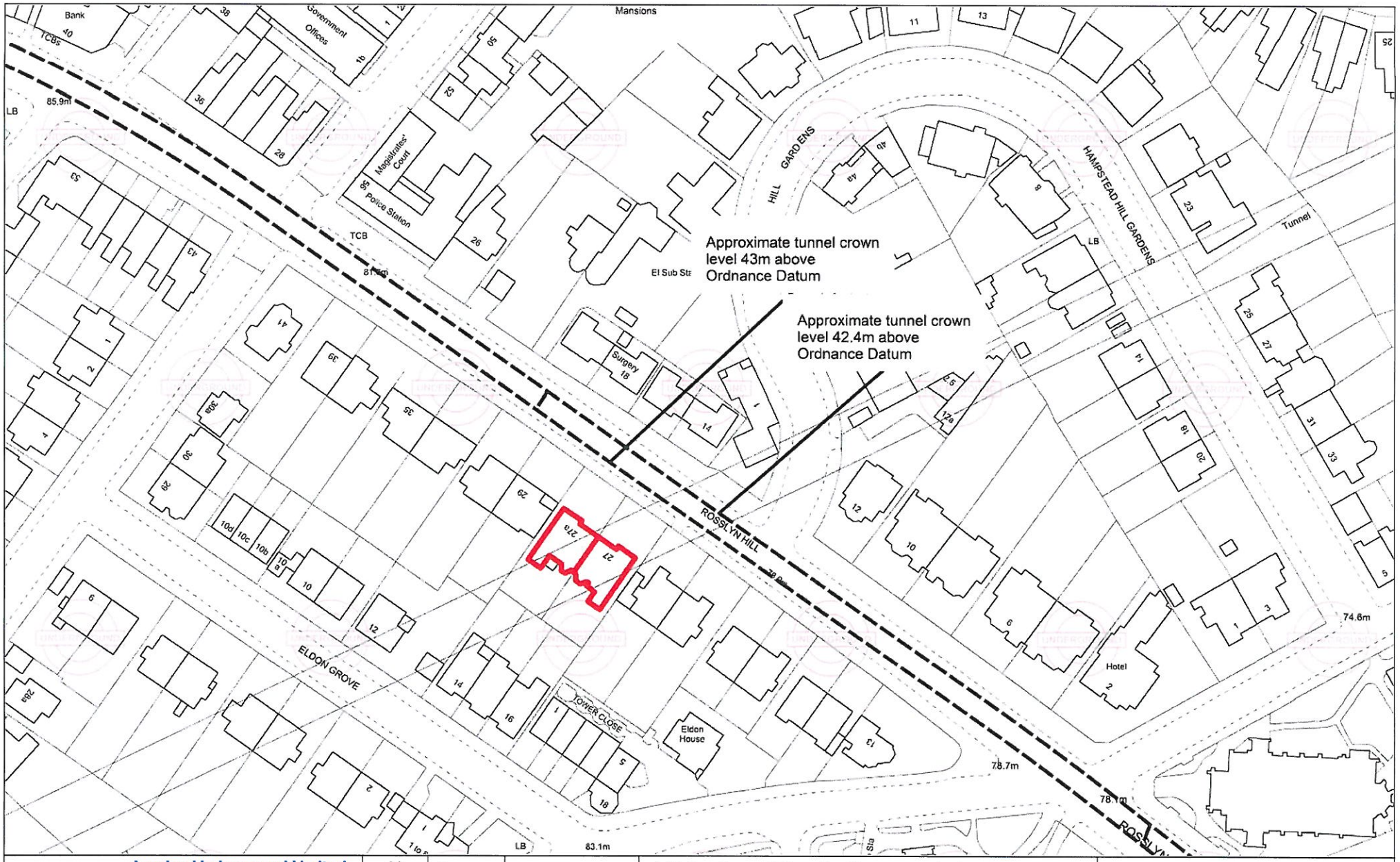
- demolition
- structural works
- excavation
- boreholes or piling
- highway works above shaded areas

This site is adjacent to and above the East London Line which is owned by London Rail a subsidiary of TfL.

As such I advise that you contact:

Mahesh Jethwa,
3rd Floor - West Wing
55 Broadway
London
SW1H 0BD
Tel: 020 7918 4932

Email: maheshjethwa@tfl.gov.uk




**London Underground Limited**
Infrastructure Protection
3rd Floor Albany House, 55 Broadway,
London, SW1H 0BD
Tel: 0207 918 0016
(auto: 40016)
Email: Shahina.Inayathusein@tube.tfl.gov.uk

N

| | |
|---|---|
| Date | 14 November 2012 |
| LCS Code | N044 |
| Drawn by | S.Inayathusein |
| Scale | 1:1250 at A4 |

1. All dimensions and LUL asset locations are approximate
2. This drawing must be read in conjunction with the accompanying letter sent by LUL
3. This drawing is for planning purposes only
4. For more accurate tunnel location information a survey will need to be undertaken.

27 and 27A Rosslyn Hill
London
NW3 5UJ