elliottwood

# 81 Avenue Road,
# London,
# NW8 6JD

## Flood Risk Assessment

| | |
|---|---|
| Job number: | 2150623 |
| Revision: | P1 |
| Status: | Preliminary |
| Date: | Sep 2016 |

## Document Control

| | | | | | | | |
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| date: | 20/09/16 | signature: | | signature: | | signature: | |

## Contents

## 1.0 Executive Summary

No. 81 Avenue Road is located within the London Borough of Camden (LBC), North West of Regent's Park. The existing site includes a three storey detached residential property. The total area of the existing site is approximately 1450m$^2$.

The site is identified by the LBC Strategic Flood Risk Assessment (SFRA) as being within a Critical Drainage Area (CDA). LBC have also listed Avenue Road as a street which is at a high risk of surface water flooding, due to a previous flood event in 2002.

The proposed works involve the demolition of the existing building, and the construction of a new basement beneath the footprint of the proposed dwelling partially extending out beneath the rear and front gardens. A new three storey building will be constructed over the basement.

The site has been assessed for all forms of flood risk and is considered to be at low risk. The below ground drainage proposals and the use of proposed SuDS devices are outlined in Chapter 6 of this report. The final drainage design is subject to agreement with the LBC and Thames Water (TW).

## 2.0 Introduction

### 2.1 General Information

Elliott Wood have been commissioned to undertake a Flood Risk Assessment (FRA) in support of a development at No. 81 Avenue Road, Camden. The National Planning Policy Framework requires a Flood Risk Assessment to assess the flood risk to both the proposed development and the impact on surrounding properties. This FRA has been prepared in accordance with the Environment Agency's (EA) Flood Risk Assessment Guidance Note 1: Development within a Critical Drainage Area or greater than 1 hectare in Flood Zone 1.

### 2.2 Scope of Study

The site will be assessed for potential flood risk over its expected lifetime from all sources of flooding. There will also be a consideration to flood risk in the surrounding sites, in terms of the site's effect on surface water runoff and potential flood flows, to ensure the proposed development will not increase the risk of flood elsewhere.

## 3.0 Site Description

### 3.1 Location

No. 81 Avenue Road is located within the London Borough of Camden (LBC), North West of Regent's Park. The National Grid reference for the site is 526882E, 183887N. (Refer to Figure 1 for the site location map.)


**Figure 1 – Site Location Plan** ***(Microsoft product screen shot reprinted with permission from Microsoft Corporation)***

### 3.2 Existing Development

The existing site includes a three storey detached residential property. The total area of the existing site is approximately 1450m$^2$. Approximately 710m$^2$ of the existing site is positively drained impermeable area. The remaining site area is either soft or is not positively connected to the onsite drainage network.

### 3.3 Topographic Survey

A topographic survey has been completed by On Centre Surveys Ltd in July 2015, this can be found in Appendix 1. The site consists of a shallow slope from southwest (approx. 46.90m AoD) to north east (approx. 46.00m AoD).

### 3.4 Ground Investigation

A site investigation consisting of three boreholes was undertaken by SAS in July 2016. These indicate that the underlying ground is London Clay overlaid by up to 1.2m of made ground. This is in line with geological records for the area. Water was not encountered in any of the three boreholes at the time of drilling.

Standpipe monitoring has subsequently been carried out after a period of 3-4 weeks and water was still not found in either BH1 or BH2. However water was experienced at 2.30m below ground level in BH3. Given the ground conditions, SAS suggest that the water levels observed in BH3 are likely to be due to isolated pockets of groundwater that may be perched within less permeable material found at shallower depths, especially within any Made Ground.

### 3.5 Proposed Development

The proposed works involves the demolition of the existing building, and the construction of a new 3 storey residential building in its place, which will include a new single storey basement.

## 4.0 Planning and Flood Risk Management Policy

### 4.1 Camden Strategic Flood Risk Assessment

The LBC Strategic Flood Risk Assessment (SFRA) was completed by URS in July 2004. This report aims to provide a reference and policy document to inform the local development framework and any subsequent plans.

### 4.2 Sequential Test and Exception Test

The Sequential and Exception Tests should be applied when choosing the location of new development and the layout of the development site. The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The Exception Test is utilised if no suitable development areas can be found in low risk areas. As the proposed development is located within Flood Zone 1, both the sequential test and the exception test are not required.

## 5.0 Potential Flooding on Site

### 5.1 Flooding from Rivers and Sea

Flood Zone information published by the EA shows that the proposed site lies within Flood Zone 1 (low risk). Sites within Flood Zone 1 have a chance of flooding of less than 1 in 1000 years (0.1%), due to coastal or river flooding. Flood Risk in the surrounding area can be seen in Figure 2.

A review of the Flood Maps found within the LBC SFRA confirms that this site is located within Flood Zone 1, and as noted within the SFRA, no historic flooding has occurred within the borough as a result of fluvial or tidal sources.

After review of the relevant information, this development is considered to be at low risk of flooding from rivers and seas.

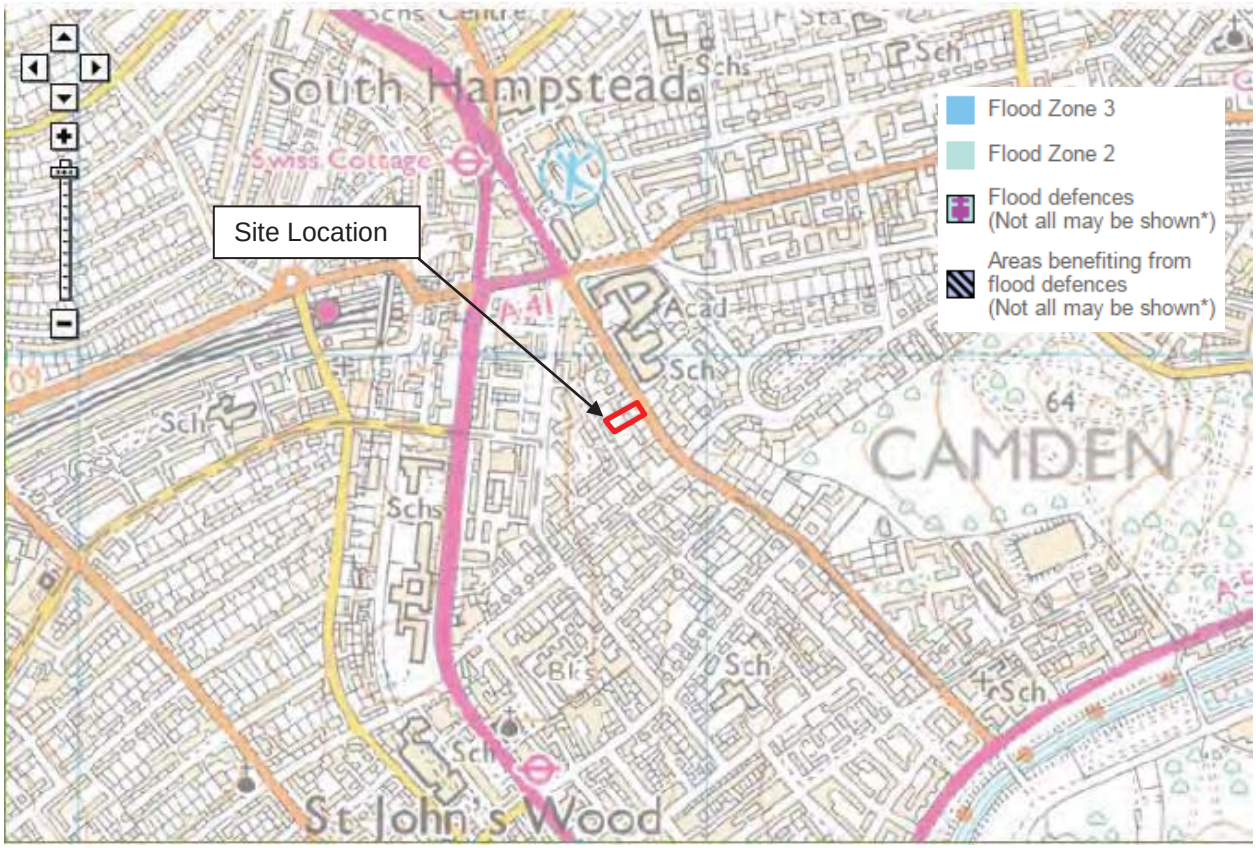


**Figure 2 - Flood Zones in Surrounding Area *(Contains Environment Agency information © Environment Agency and/or database rights. Based on information © Local Authorities)***

### 5.2 Flooding from Overland Surface Water Flow

Overland rainwater flows occur when the infiltration capacity of land or the drainage capacity of a local sewer network is exceeded. The extents of overland flooding will depend upon the rainfall event, the degree of saturation of the soil, the permeability of soils and the topography of the site.

Following review of the 'Risk of Flooding from Surface Water' map (refer to Figure 3), this site is considered to be at low risk of flooding from overland flow i.e. between a 1 in 1000 (0.1%) and 1 in 100 (1%) chance of flooding any given year. Avenue Road is however defined as an area of high risk, where the chance of flooding in any given year is greater than 1 in 30 (3.3%).

The site is also shown to be located in a low / very low risk area in the LBC SFRA 'Updated Flood Maps for Surface Water Flooding' map (uFMfSW) as shown in Figure 4.

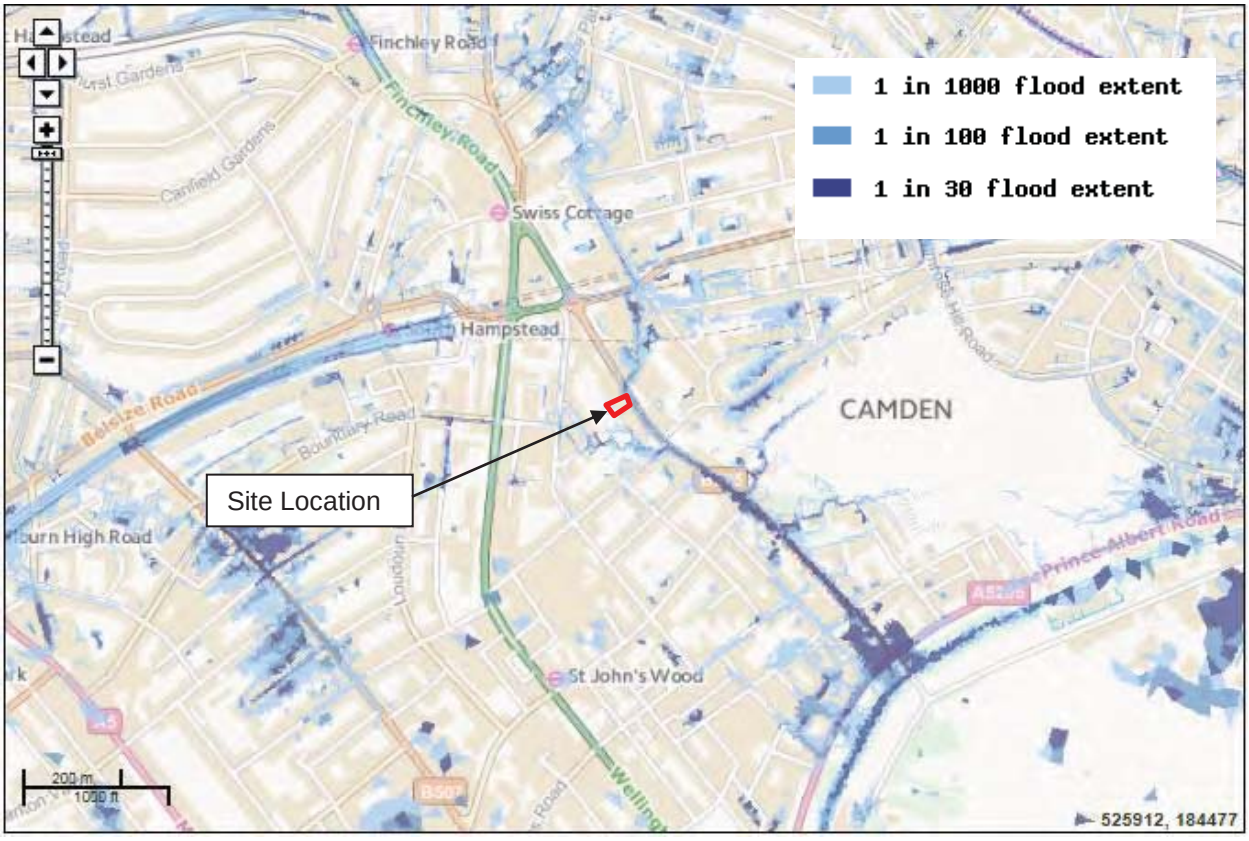


**Figure 3 - Risk of surface water flooding** ***(Contains Environment Agency information © Environment Agency and/or database rights. Based on information © Local Authorities)***


**Figure 4 – LBC SFRA Figure 3v uFMfSW**

The levels along the north east boundary of the site are above those along the pavement of Avenue Road. Therefore surface water within the road will ultimately flow away from the site, towards Regent's Park, discharging into local highway gullies. Refer to Appendix 1 for the site topographical survey.

After review of the relevant information, this development is considered to be a low risk from overland flow.

## 5.3 Flooding from Sewers

Public sewer records have been obtained from Thames Water and are included in Appendix 4. Sewer records show that the offsite sewer network is combined (sewers carry both foul and surface water flows). Records show that a 1372x914mm combined water sewer is located in Avenue Road.

Thames Water are responsible for operating and maintaining their sewer infrastructure, therefore the likelihood of sewer surcharging is expected to be low. Sewer flooding history has been also been procured from Thames Water which notes that there have been no incidents of flooding within the area as a result of surcharging public sewers.

The LBC SFRA shows that the site is located within an area which has had one reported incidence of internal sewer flooding. Refer to Figure 5 for an extract of the SFRA 'DG5 Internal Sewer Flooding' map.

The LBC SFRA also shows that the site is located outside of areas which have previously had issues as a relating to external sewer flooding. Refer to Figure 6 for an extract of the SFRA 'DG5 External Sewer Flooding' map.

All new drainage on site will be designed to protect the local drainage network against public sewer surcharge. Appliances at basement levels will be routed to submersible packaged pumping stations which will incorporate non-return valves (to help protect the lower levels from public sewer surcharge). Anti-flood valves will also be considered as part of the proposed below ground drainage strategy.

After review of the relevant information, this development is considered to be a low risk from flooding from sewers.

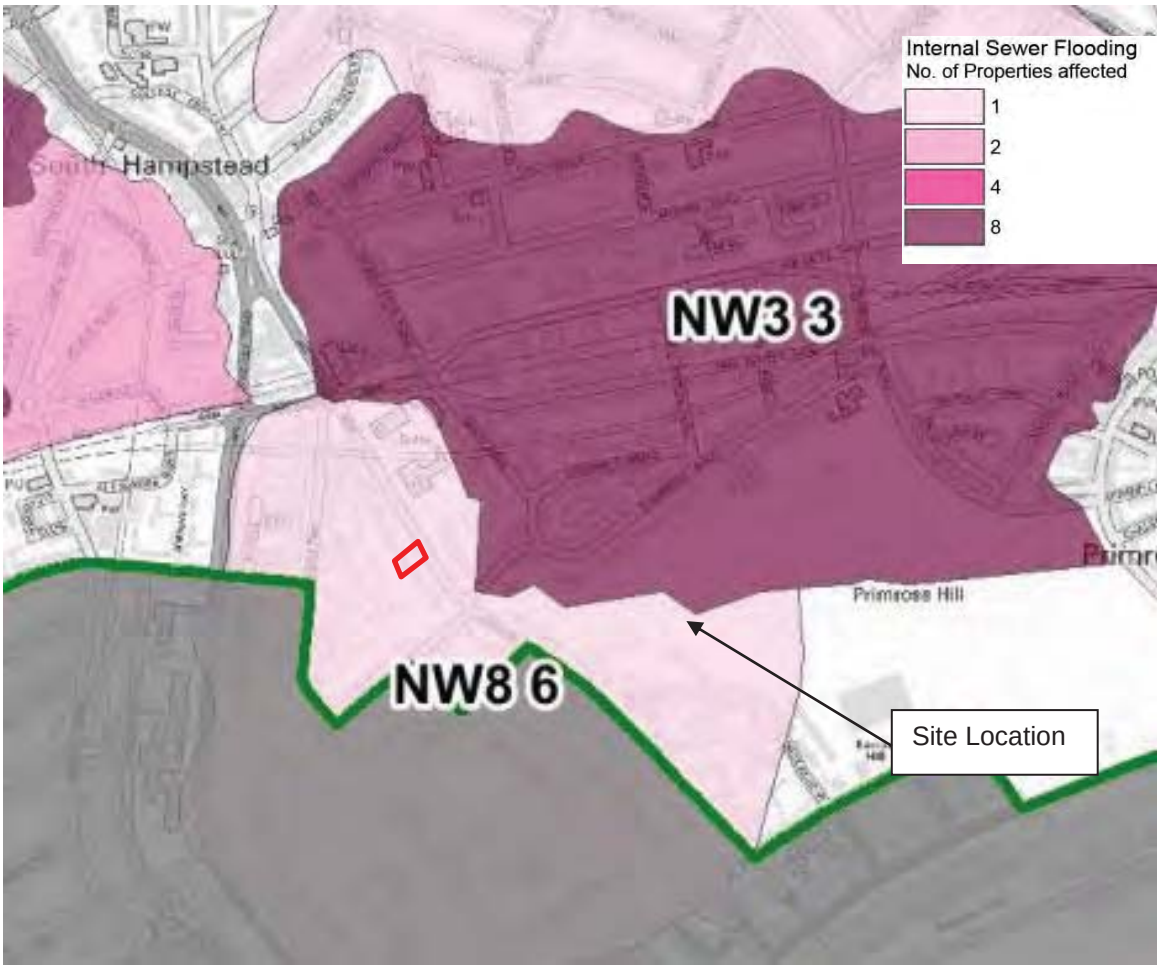


**Figure 5 – LBC SFRA DG5 Internal Sewer Flooding Map**


**Figure 6 – LBC SFRA DG5 External Sewer Flooding Map**

## 5.4 Flooding from Groundwater

Groundwater flooding can occur following an extended prolonged period of low intensity rainfall. The future risk from this source is more uncertain than surface water as the climate change predictions indicate that although sea levels will rise, thus possibly raising groundwater levels, overall summer rainfall will decrease, therefore having a long-term effect of lowering the groundwater levels. However, long periods of wet weather are predicted to increase and these are the type of weather patterns that can cause groundwater flooding to occur.

As noted in section 3.4 of this report, Groundwater monitoring was undertaken on site, which showed that the groundwater was not found in either BH1 or BH2. However, water was experienced at 2.30m below ground level in BH3. Given the ground condition, SAS suggest that the water levels observed in BH3 are likely to be due to isolated pockets of groundwater that may be perched within less permeable material found at shallower depths, especially within any Made Ground.

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The LBC SFRA shows areas within the borough that are susceptible to elevated ground water (refer to Figure 7), the development site is not located within one of these areas. It is noted however that there has been an EA reported groundwater flooding incident nearby.

After review of the relevant information, this development is considered to be a low risk from ground water flooding.

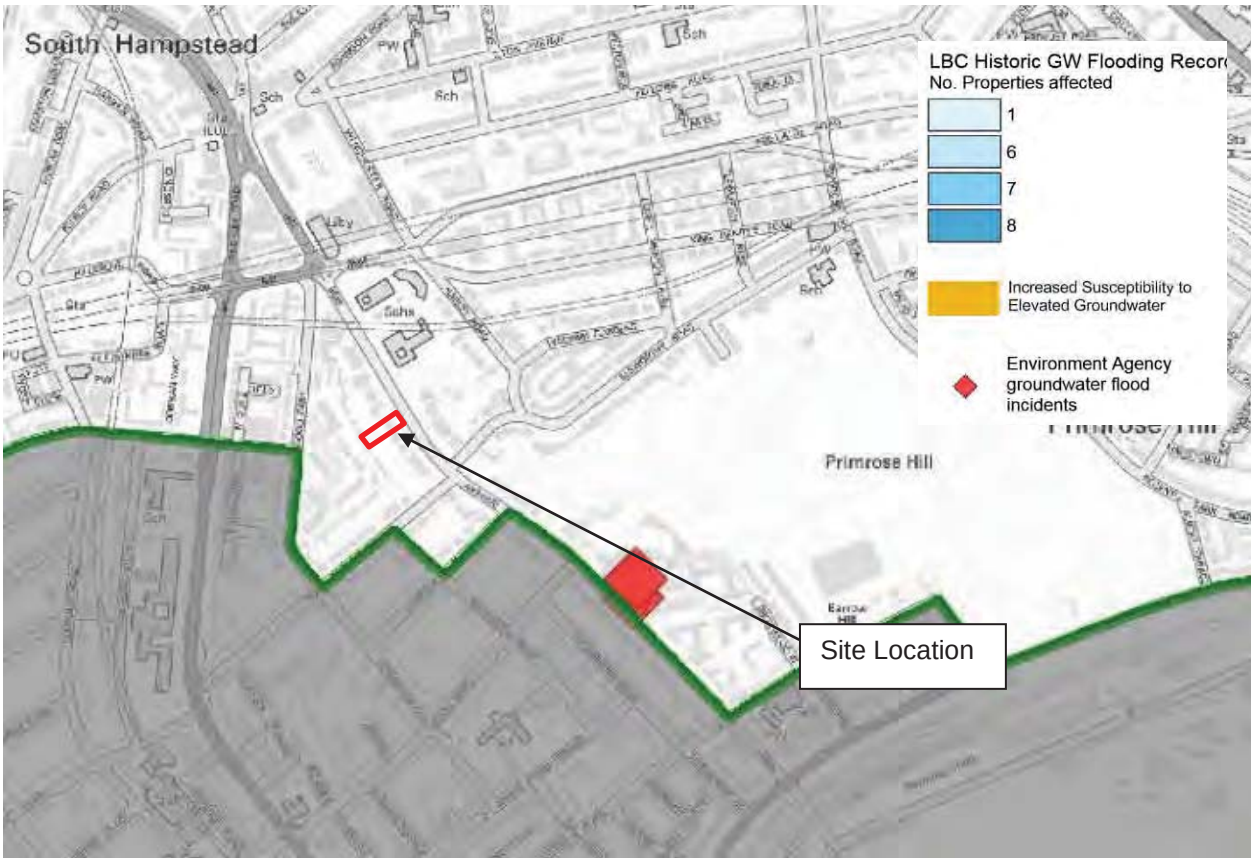



**Figure 7 – LBC SFRA Increased Susceptibility to Elevated Groundwater Map**

## 5.5 Flooding from Artificial Water Bodies

The closest watercourse to the site is the Regents Canal (which is located approximately 750m southeast of the site). Refer to Figure 8 which shows the 'Risk of Flooding from Reservoirs' map found on the EA's website.

The LBC SFRA confirms that no flooding incidents associated with the Regents Canal have been recorded within the borough, and that the risk of flooding as a result of overtopping or breaching of the canal is considered to be low.

After review of the relevant information, this development is considered to be a low risk from flooding from artificial water bodies.

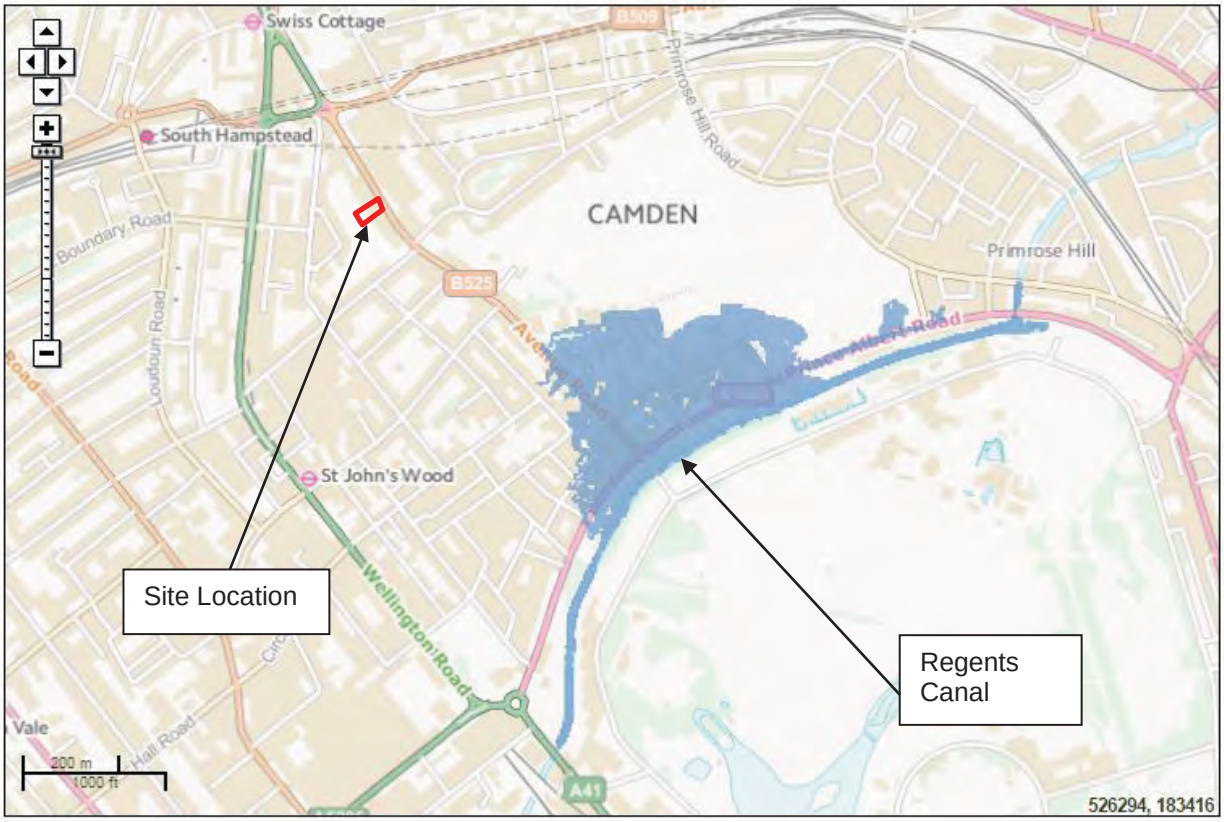



**Figure 8 – Risk of Flooding from Reservoirs Map*(Contains Environment Agency information © Environment Agency and/or database rights. Based on information © Local Authorities)***

## 5.6 Summary of Flood Risk

A review of all potential sources of flooding has found the site be at low risk providing a suitable drainage scheme is in place. The new proposed drainage network should ensure that the building remains safe from flooding in the event of a localised drainage failure. In addition, levels across the site should ensure that surface water is directed away from building entrances.

## 6.0 Surface Water Management

### 6.1 Existing Site Drainage

Following a review of the Thames Water sewer records, there is a 1372x914mm offsite combined water sewer located in Avenue Road. Refer to Appendix 4 for a copy of the sewer records.

A CCTV survey of the existing below ground drainage has been conducted on the site, which demonstrates the existing property drains via a 150mm diameter combined water outfall, into the sewer in Avenue Road. Refer to Appendix 5 for the CCTV survey report plan.

### 6.2 Existing Surface Water Discharge

The surface water runoff rate associated with the existing building and hardstanding areas has been calculated as follows, based on a positively drained area of 710m$^2$, and a rainfall intensity of 50mm/hr.

Q = 2.78 x 1 x 50mm/hr x 0.071
$Q_{Total}$ = 9.87 l/s

The size of the impermeable area associated with the new development is approximately 680m$^2$. This decrease in impermeable area will ensure that the peak surface water discharge from the site will be reduced post development.

### 6.3 Sustainable Drainage Systems (SuDS)

The surface water drainage system has been designed in accordance with the London Plan Policies 5.11 (Green Roofs), 5.12 (Flood Risk Management) and 5.13 (Sustainable Drainage). The following drainage hierarchy has therefore been considered:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer.

The current proposals include a green roof as indicated on the architect's drawings. This will help to improve the thermal performance of the building, reduce the urban heat island effect, reduce both the total and peak surface water discharge and enhance biodiversity in the surrounding area.

Drainage via infiltration has been considered for the site, however following a review of the ground conditions, it is considered that soakaways are not viable for this project.

There are no nearby accessible water courses and the existing offsite Thames Water sewer network is combined use. Surface water generated by the development will therefore continue to discharge to the offsite combined water sewer, via the existing outfall pipe.

The evaluation of SuDS is demonstrated in the following table.

| SuDS technique | Y/N | Comment |
|---|---|---|
| Green Roofs | Y | Green roofs will be incorporated within the scheme. Refer to the architects drawings for location and details. |
| Rainwater reuse | Y | A rainwater butt for irrigation is proposed on the rear elevation of the dwelling. This will assist with reducing the surface water run off from the site and will reduce water usage. |
| Basins and ponds | N | The site is very limited for space and is located within an urban area, as such there is no feasible location or space for a detention basin or pond. |
| Filter strips and swales | N | Filter strips and swales are not appropriate due to the spatial restrictions on site and unsuitable ground conditions. |
| Infiltration devices | N | Infiltration is not feasible for this site due to the existing ground conditions. |
| Permeable surfaces | N | Permeable paving is not deemed feasible for this project due to the extent of the proposed basement and the location of the tree root protection zones. |
| Tanked systems | N | Tanked systems are not deemed feasible due to the extent of the proposed basement and the location of the tree root protection zones. |

## 6.4 Proposed Site Drainage

It is proposed that the existing 150mm diameter connection to the public combined sewer in Avenue Road is retained. Due to the location the proposed basement, the final manhole (demarcation chamber) will need to removed and relocated downstream.

Drainage from ground floor level and above will designed to drain via gravity. Drainage from basement level will be pumped via a submersible packaged pumping station (with dual pumps) and will include a non-return valve and appropriate alarm/telemetry.

The existing surface water run-off rate from site has been calculated to be 9.87l/s. The impermeable area associated with the new development is approximately 680m$^2$. This decrease in impermeable area will ensure that the peak surface water run-off rate from the site will be reduced post development.

The inclusion of a green roof and rainwater butt will also help reduce the peak surface water run-off rate from site as well as providing additional benefits.

## 7.0 Conclusions and Recommendations

A review of risk of flooding from all sources has found the site to be at low risk providing a suitable surface water drainage strategy is in place. The proposed development will not increase the risk of flood elsewhere.

Proposed levels across the site must direct water away from the building and the existing overland surface water flooding path from Avenue Road should be considered.

The use of SuDS to manage surface water will be incorporated into the design where possible, as outlined in Chapter 6 of this report.

## 8.0 Appendices

Appendix 1

Topographic Survey

Appendix 2

Proposed Architectural Plans

Appendix 3

Site Investigation Borehole Logs

Appendix 4

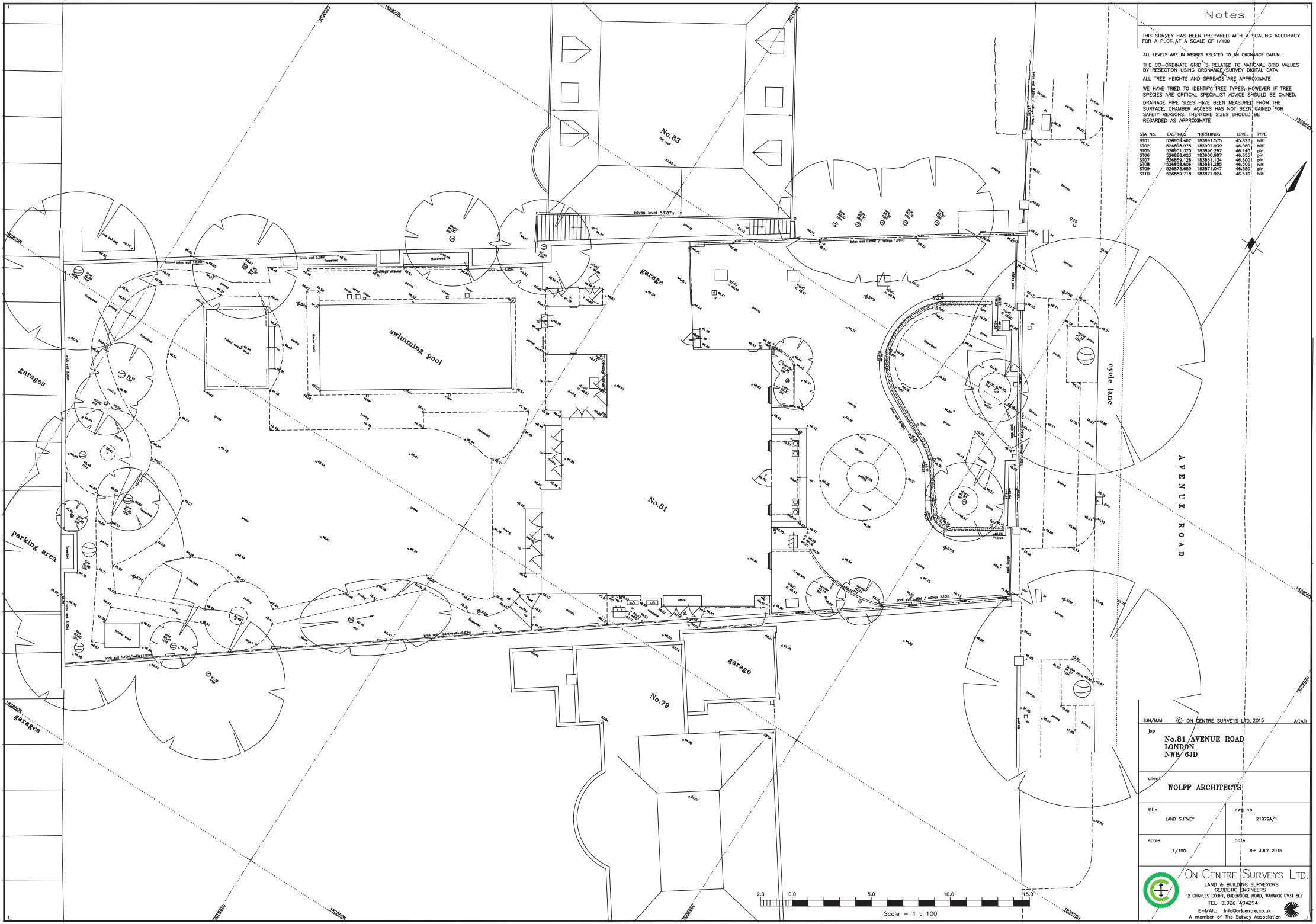
Thames Water sewer records

Appendix 5

CCTV Survey Report Plan

Appendix 1

Topographic Survey




## Notes

THIS SURVEY HAS BEEN PREPARED WITH A SCALING ACCURACY FOR A PLOT AT A SCALE OF 1/100

ALL LEVELS ARE IN METRES RELATED TO AN ORDNANCE DATUM.

THE CO-ORDINATE GRID IS RELATED TO NATIONAL GRID VALUES BY RESECTION USING ORDNANCE SURVEY DIGITAL DATA

ALL TREE HEIGHTS AND SPREADS ARE APPROXIMATE

WE HAVE TRIED TO IDENTIFY TREE TYPES, HOWEVER IF TREE SPECIES ARE CRITICAL SPECIALIST ADVICE SHOULD BE GAINED.

DRAINAGE PIPE SIZES HAVE BEEN MEASURED FROM THE SURFACE, CHAMBER ACCESS HAS NOT BEEN GAINED FOR SAFETY REASONS, THEREFORE SIZES SHOULD BE REGARDED AS APPROXIMATE

| STA No. | EASTINGS | NORTHINGS | LEVEL | TYPE |
|---|---|---|---|---|
| ST01 | 526908.462 | 183891.575 | 45.823 | hiltl |
| ST02 | 526898.975 | 183907.939 | 46.080 | hiltl |
| ST05 | 526901.370 | 183890.287 | 46.140 | pin |
| ST06 | 526888.623 | 183900.987 | 46.355 | pin |
| ST07 | 526859.126 | 183861.134 | 46.600 | pin |
| ST08 | 526858.606 | 183881.285 | 46.506 | hiltl |
| ST09 | 526878.689 | 183871.047 | 46.380 | pin |
| ST10 | 526889.718 | 183877.924 | 46.510 | hiltl |

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job
**No.81 AVENUE ROAD**
**LONDON**
**NW8 6JD**

client
**WOLFF ARCHITECTS**

| title | dwg no. |
|---|---|
| LAND SURVEY | 21972A/1 |
| scale: 1/100 | date: 8th JULY 2015 |


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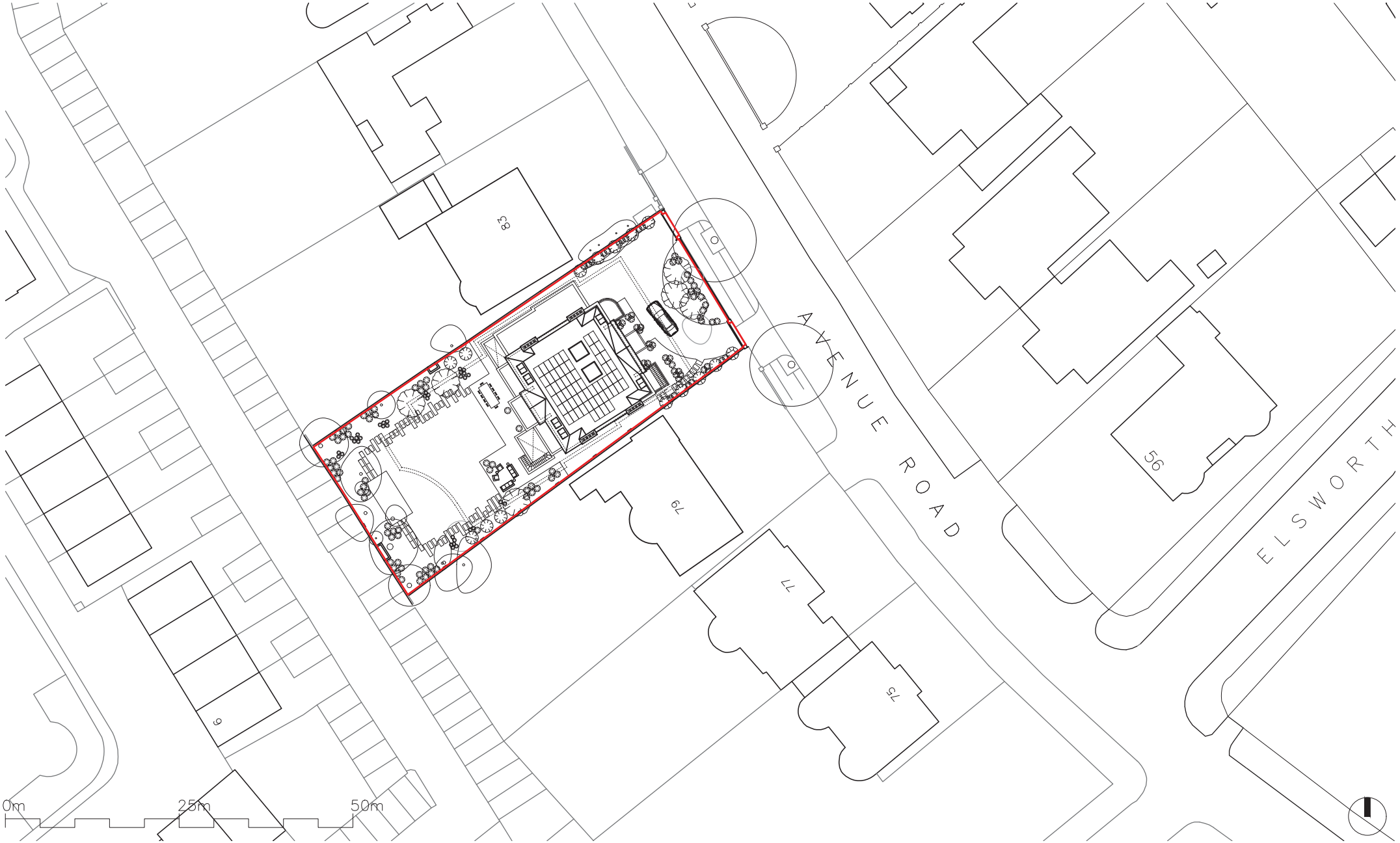
A member of The Survey Association

Appendix 2

Proposed Architectural Plans

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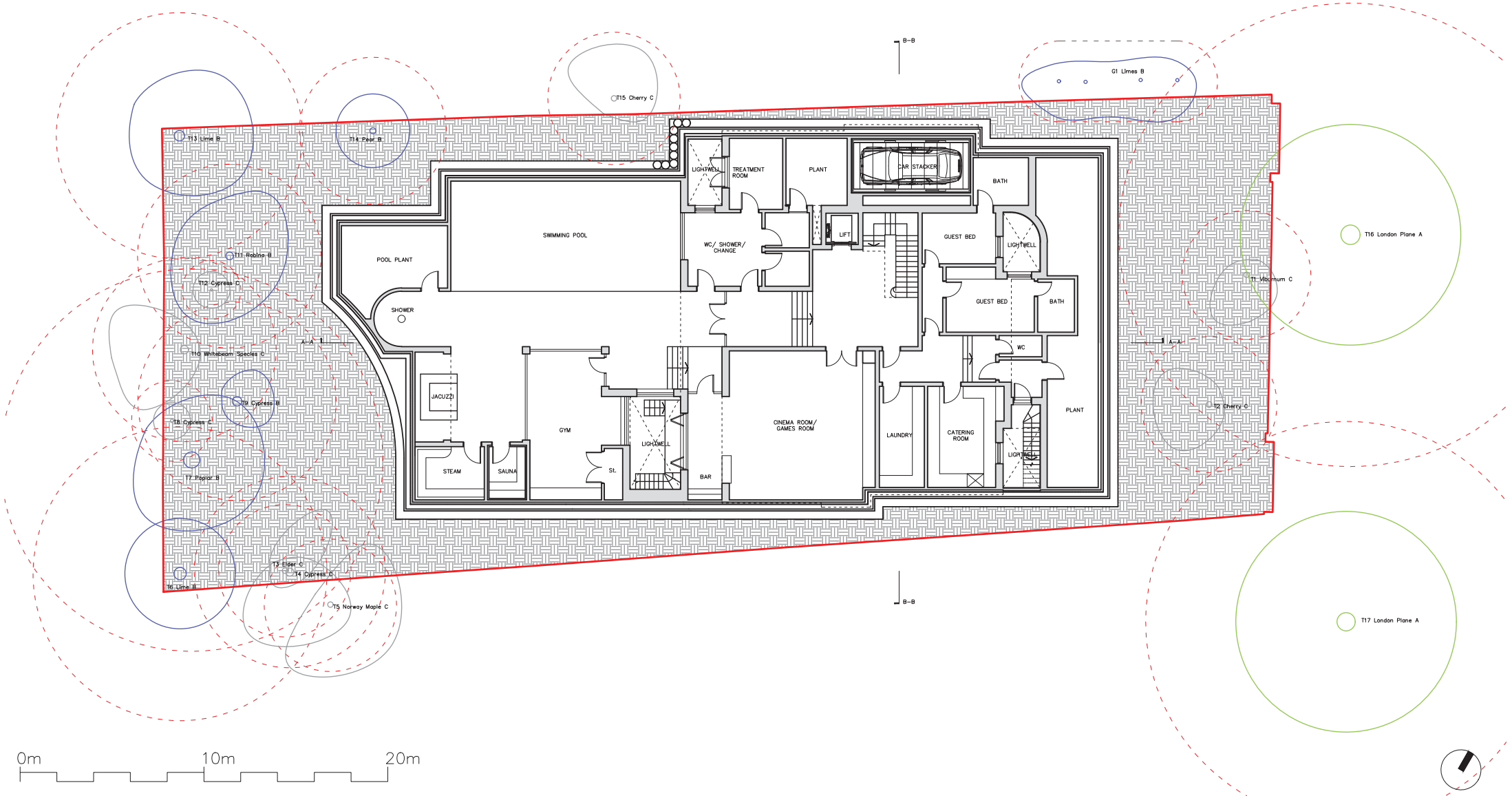
rev no: 0

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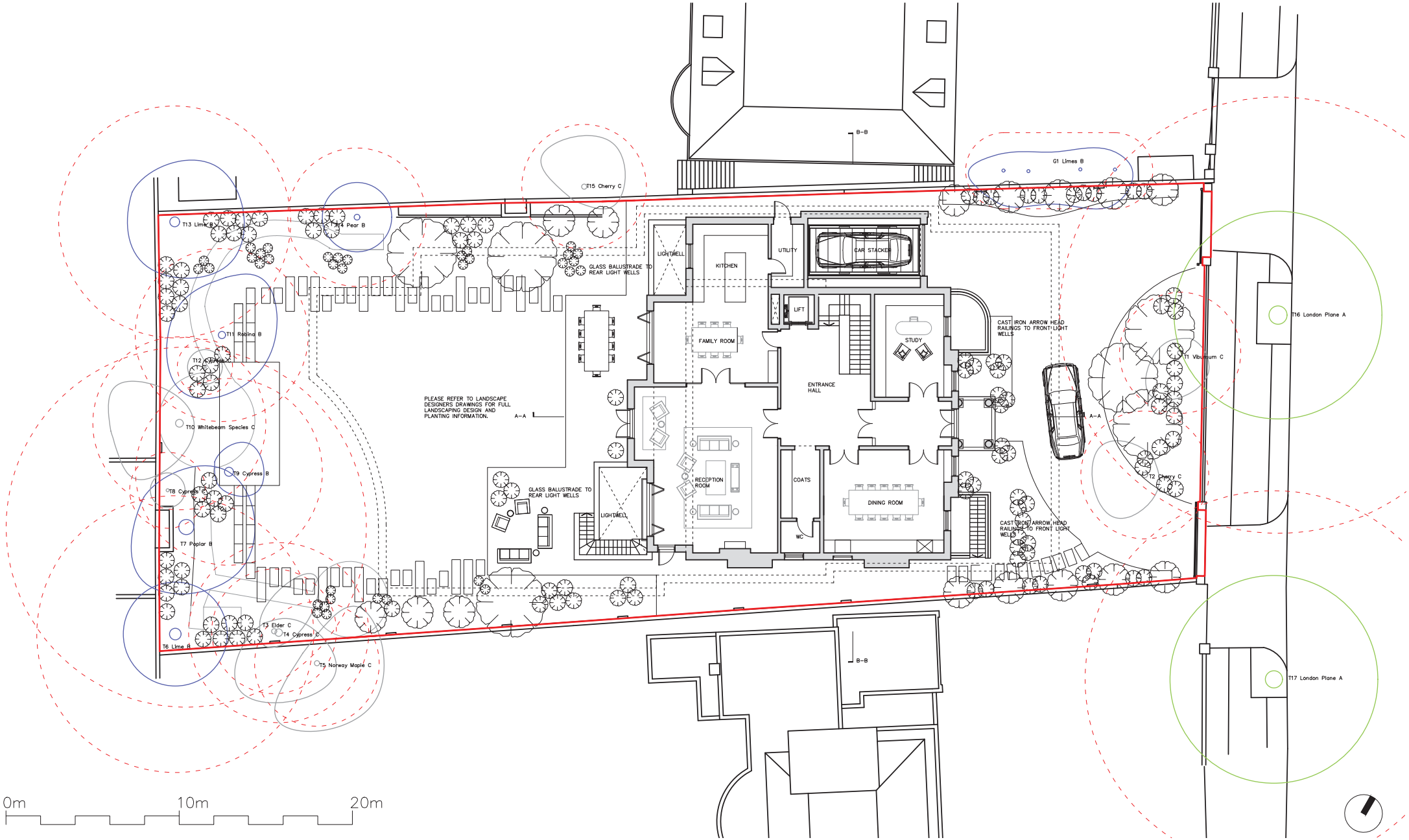
rev no: 0

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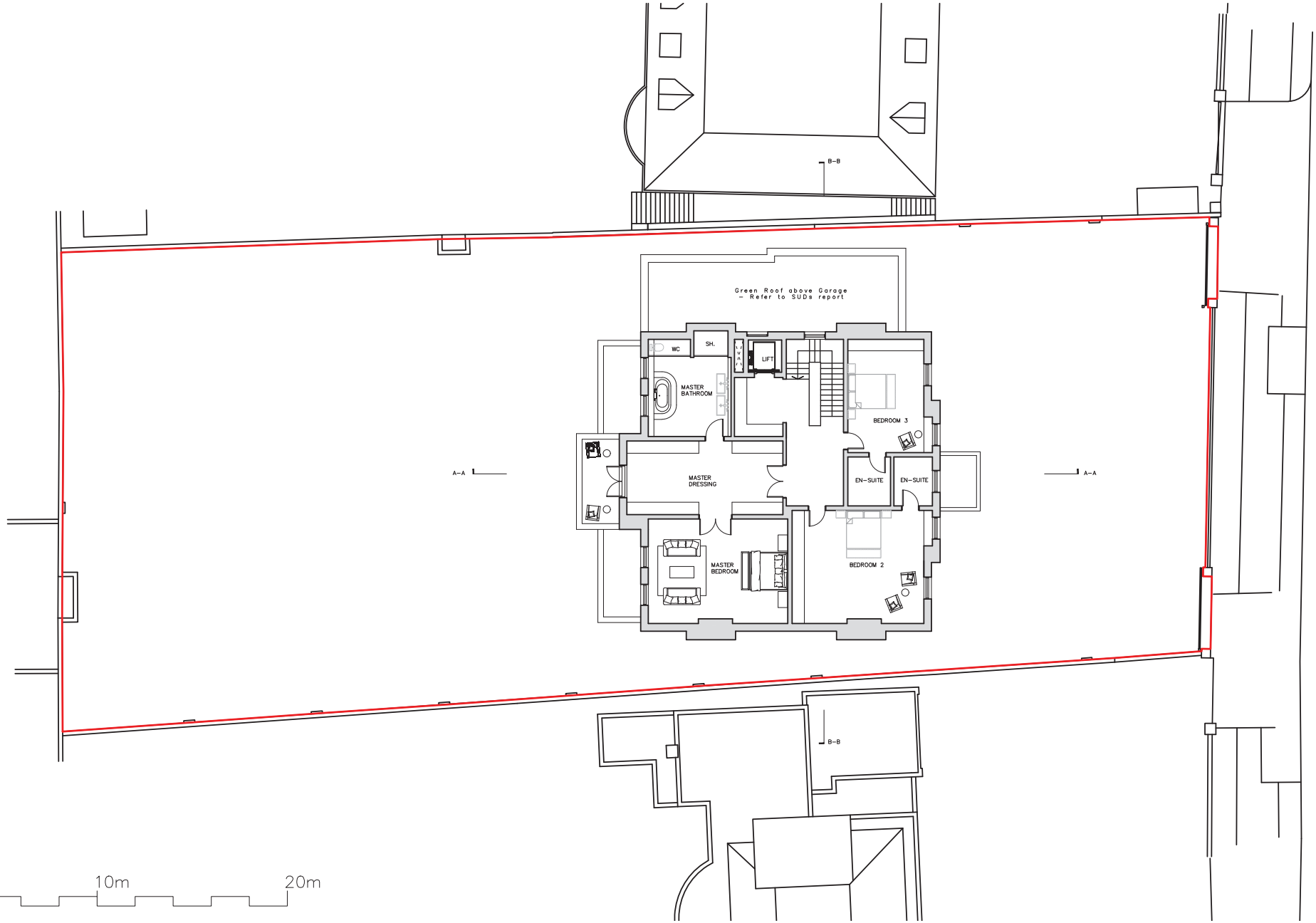


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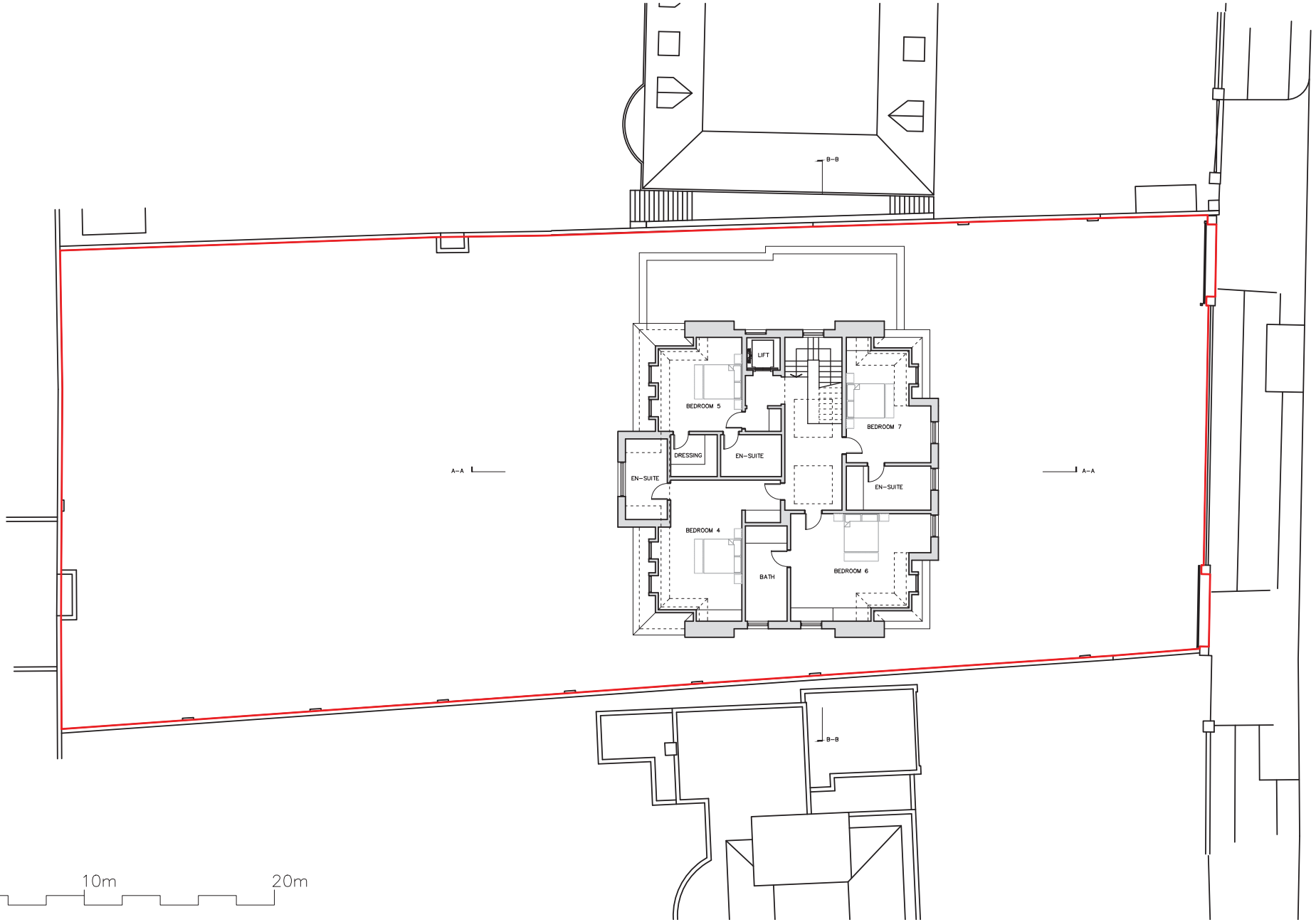


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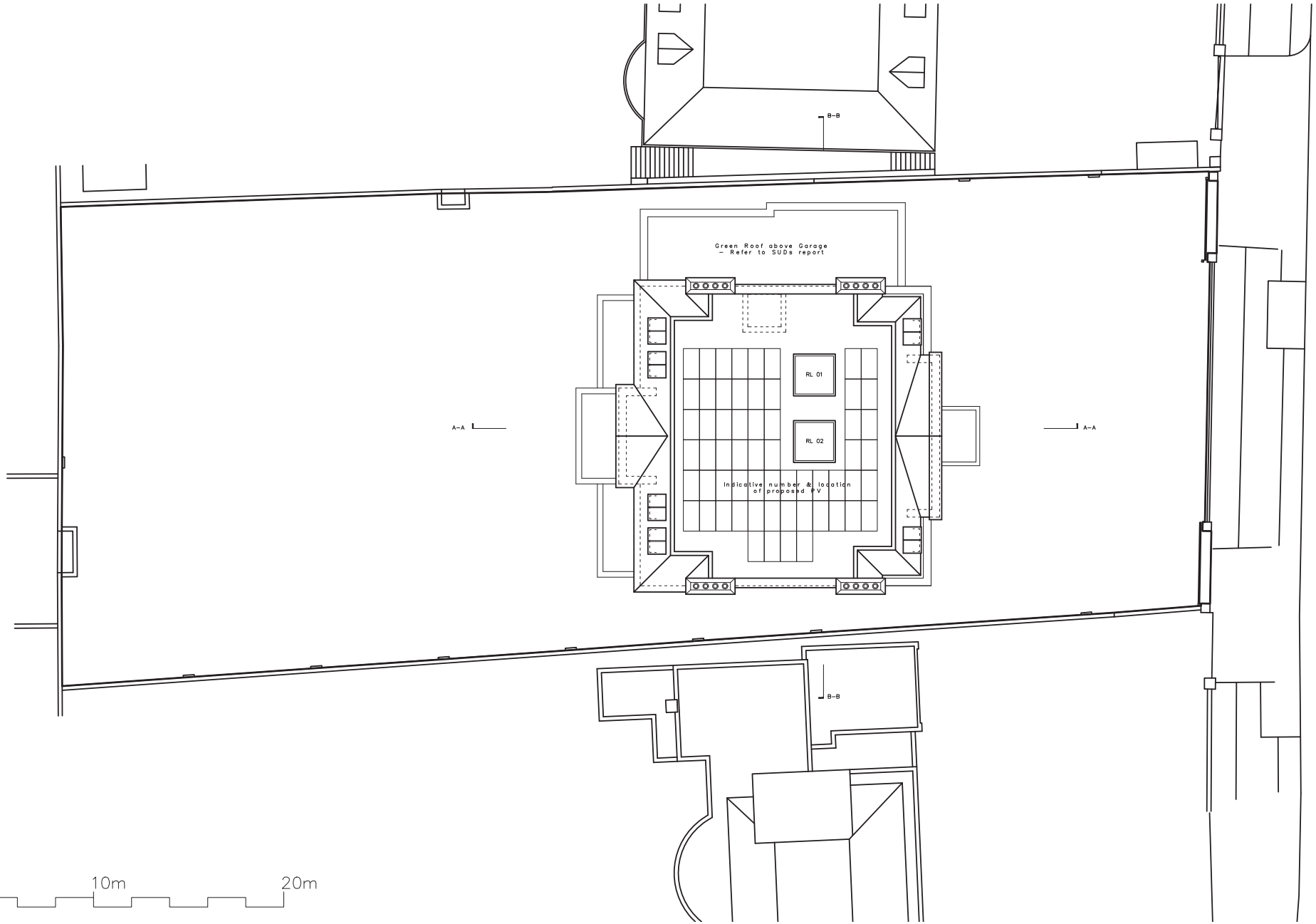
rev no: 0

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status: PLANNING

scale: 1:200 @ A3

project: 81 Avenue Road London, NW8

title: Proposed Roof Plan

no: 1510–PL–205

rev no: 0

Appendix 3

Site Investigation Borehole Logs

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH1 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| ROTARTY PERCUSSIVE | 128mm cased to 0.00m | | | 1625552 |
| | **Location** TQ270837 | **Dates** 26/07/2016-26/08/2016 | **Engineer** ELLIOTT WOOD PARTNERSHIP LTD. | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.04 | | | |
| | | | | | | (0.06) | MADE GROUND: Stone paving slab. | | |
| | | | | | | 0.10 | | | |
| 0.25 | D1 | | | | | (0.30) | MADE GROUND: Cement. | | |
| | | | | | | 0.40 | | | |
| 0.50 | D2 | | | | | (0.20) | MADE GROUND: Reinforced concrete. | | |
| | | | | | | 0.60 | | | |
| 0.75 | D3 | | | | | | MADE GROUND: Grey concrete with fragments of brick rubble. | | |
| 1.00-1.45 | SPT(C) N=12 | | DRY | 2,3/3,3,3,3 | | (1.00) | MADE GROUND: Slightly pink sand and gravel with type 1 fill. | | |
| 1.00 | D4 | | | | | | | | |
| | | | | | | 1.60 | MADE GROUND: Light brown mottled silty sandy clay containing occassional fragments of brick and concrete rubble. | | |
| 1.75 | D5 | | | | | (0.40) | | | |
| | | | | | | 2.00 | Firm brown mottled silty sandy CLAY. | | |
| 2.00-2.45 | U1 | | | 50 blows | | | Firm brown gravelly CLAY. Gravels are fine to coarse grained sub-angular to sub-rounded flint. | | |
| | | | | | | (1.20) | | | |
| 2.75 | D6 | | | | | | | | |
| 3.00-3.45 | SPT(C) N=16 | | DRY | 3,3/3,4,4,5 | | | | | |
| 3.00 | D7 | | | | | 3.20 | Firm becoming stiff then very stiff slightly silty sandy CLAY. | | |
| 3.75 | D8 | | | | | | | | |
| 4.00-4.45 | U2 | | | 70 blows | | | | | |
| 4.75 | D9 | | | | | | | | |
| 5.00-5.45 | SPT N=32 | | DRY | 7,8/7,8,8,9 | | | | | |
| 5.00 | D10 | | | | | | | | |
| | | | | | | (5.30) | | | |
| 6.00 | D11 | | | | | | | | |
| 6.50-6.95 | U3 | | | 110 blows | | | | | |
| 7.50 | D12 | | | | | | | | |
| 8.00-8.45 | SPT N=39 | | DRY | 8,8/9,10,10,10 | | | | | |
| 8.00 | D13 | | | | | | Claystones present at 8.30m depth. | | |
| | | | | | | 8.50 | Very stiff dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 9.00 | D14 | | | | | | | | |
| | | | | | | (1.50) | | | |
| 9.50-9.95 | U4 | | | 120 blows | | | | | |

**Remarks**
D= Disturbed Sample
C= Standard Penetration Test- Cone
S= Standrad Penetration Test
Groundwater was not encountered during excavation
Excavating from 0.00m to 1.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.** 1625552.BH1

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH1 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| ROTARTY PERCUSSIVE | 128mm cased to 0.00m | | | 1625552 |
| | **Location** TQ270837 | **Dates** 26/07/2016-26/08/2016 | **Engineer** ELLIOTT WOOD PARTNERSHIP LTD. | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 10.00 | Very stiff becoming hard dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 10.50 | D15 | | | | | | | | |
| 11.00-11.45<br>11.00 | SPT N=50<br>D16 | | DRY | 10,12/12,12,12,12,14 | | | | | |
| 12.00 | D17 | | | | | | | | |
| 12.50-12.95 | U5 | | | 230 blows | | (5.00) | | | |
| 13.75 | D18 | | | | | | | | |
| 14.55-15.00<br>14.55 | SPT N=80<br>D19 | | DRY | 16,18/20,20,20,20 | | | | | |
| | | | | 26/07/2016:DRY | | 15.00 | Complete at 15.00m | | |

**Remarks**
D= Disturbed Sample
C= Standard Penetration Test- Cone
S= Standrad Penetration Test
Groundwater was not encountered during excavation

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.** 1625552.BH1

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH2 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| ROTARTY PERCUSSIVE | 128mm cased to 0.00m | | | 1625552 |
| | **Location** TQ270837 | **Dates** 27/07/2016 | **Engineer** ELLIOTT WOOD PARTNERSHIP LTD. | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0.04 | | | |
| | | | | | | 0.10 | MADE GROUND: Stone paving slab. | | |
| 0.25 | D1 | | | | | 0.20 (0.30) | MADE GROUND: Cement. | | |
| 0.50 | D2 | | | | | 0.50 | MADE GROUND: Reinforced Concrete. | | |
| 0.75 | D3 | | | | | (0.70) | MADE GROUND: Grey sandy gravelly concrete crush containing frequent fragments of concrete rubble. | | |
| 1.00-1.45<br>1.00 | SPT(C) N=12<br>D4 | | DRY | 1,2/3,3,3,3 | | 1.20 | MADE GROUND: Brown molttled clay containing occassional fragments of brick and concrete rubble. | | |
| | | | | | | (0.70) | Firm brown mottled silty sandy CLAY. | | |
| 1.75 | D5 | | | | | 1.90 | | | |
| 2.00-2.45<br>2.00 | SPT(C) N=15<br>D6 | | DRY | 3,4/3,4,4,4 | | | Firm brown mottled very silty sandy gravelly CLAY. Gravels are fine to corase grained, sub-angular to sub-rounded flint. | | |
| | | | | | | (1.50) | | | |
| 2.75 | D7 | | | | | | | | |
| 3.00 | D8 | | | | | 3.40 | | | |
| | | | | | | | Firm becoming stiff then very stiff brown mottled silty sandy CLAY. | | |
| 3.75 | D9 | | | | | | | | |
| 4.00-4.45 | U1 | | | 80 blows | | | | | |
| 4.75 | D10 | | | | | (2.80) | | | |
| 5.00-5.45<br>5.00 | SPT N=34<br>D11 | | DRY | 7,7/8,8,9,9 | | | | | |
| 6.00 | D12 | | | | | 6.20 | | | |
| | | | | | | | Very stiff brown silty sandy CLAY. | | |
| 6.50-6.95 | U2 | | | 100 blows | | | | | |
| 7.50 | D13 | | | | | (2.50) | | | |
| 8.00-8.45<br>8.00 | SPT N=40<br>D14 | | DRY | 9,9/10,10,10,10 | | | Claystones present at 5.90m depth. | | |
| | | | | | | 8.70 | | | |
| | | | | | | | Very stiff dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 9.00 | D15 | | | | | | | | |
| | | | | | | (1.30) | | | |
| 9.50-9.95 | U3 | | | 130 blows | | | | | |

**Remarks**
D= Disturbed Sample
C= Standard Penetration Test- Cone
S= Standrad Penetration Test
Groundwater was not encountered during excavation
Excavating from 0.00m to 1.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.** 1625552.BH2

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH2 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| ROTARTY PERCUSSIVE | 128mm cased to 0.00m | | | 1625552 |
| | **Location** TQ270837 | **Dates** 27/07/2016 | **Engineer** ELLIOTT WOOD PARTNERSHIP LTD. | **Sheet** 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 10.00 | Very stiff becoming hard dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 10.50 | D16 | | | | | | | | |
| 11.00-11.45 | SPT N=52 | | DRY | 11,12/12,12,14,14 | | | | | |
| 11.00 | D17 | | | | | | | | |
| 12.00 | D18 | | | | | | | | |
| 12.50-12.95 | U4 | | | 220 blows | | (5.00) | | | |
| 13.75 | D19 | | | | | | | | |
| 14.55-15.00 | SPT N=86 | | DRY | 20,20/20,22,22,22 | | | | | |
| 14.55 | D20 | | | | | | | | |
| | | | | 27/07/2016:DRY | | 15.00 | Complete at 15.00m | | |

**Remarks**

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.** 1625552.BH2

# Site Analytical Services Ltd.

## Standard Penetration Test Results

**Site** : 81 AVENUE ROAD, LONDON, NW8 6HR

**Client** :

**Engineer** : ELLIOTT WOOD PARTNERSHIP LTD.

**Job Number** 1625552

**Sheet** 1 / 1

| Borehole Number | Base of Borehole (m) | End of Seating Drive (m) | End of Test Drive (m) | Test Type | Seating Blows per 75mm | | Blows for each 75mm penetration | | | | Result | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 1 | 2 | 3 | 4 | | |
| BH1 | 1.00 | 1.15 | 1.45 | CPT | 2 | 3 | 3 | 3 | 3 | 3 | N=12 | |
| BH1 | 3.00 | 3.15 | 3.45 | CPT | 3 | 3 | 3 | 4 | 4 | 5 | N=16 | |
| BH1 | 5.00 | 5.15 | 5.45 | SPT | 7 | 8 | 7 | 8 | 8 | 9 | N=32 | |
| BH1 | 8.00 | 8.15 | 8.45 | SPT | 8 | 8 | 9 | 10 | 10 | 10 | N=39 | |
| BH1 | 11.00 | 11.15 | 11.45 | SPT | 10 | 12 | 12 | 12 | 12 | 14 | N=50 | |
| BH1 | 14.55 | 14.70 | 15.00 | SPT | 16 | 18 | 20 | 20 | 20 | 20 | N=80 | |
| BH2 | 1.00 | 1.15 | 1.45 | CPT | 1 | 2 | 3 | 3 | 3 | 3 | N=12 | |
| BH2 | 2.00 | 2.15 | 2.45 | CPT | 3 | 4 | 3 | 4 | 4 | 4 | N=15 | |
| BH2 | 5.00 | 5.15 | 5.45 | SPT | 7 | 7 | 8 | 8 | 9 | 9 | N=34 | |
| BH2 | 8.00 | 8.15 | 8.45 | SPT | 9 | 9 | 10 | 10 | 10 | 10 | N=40 | |
| BH2 | 11.00 | 11.15 | 11.45 | SPT | 11 | 12 | 12 | 12 | 14 | 14 | N=52 | |
| BH2 | 14.55 | 14.70 | 15.00 | SPT | 20 | 20 | 20 | 22 | 22 | 22 | N=86 | |

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH3 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| CONTINUOUS FLIGHT AUGER | 100mm cased to 0.00m | | | 1625552 |
| | **Location** TQ270837 | **Dates** 26/07/2016 | **Engineer** ELLIOTT WOOD PARTNERSHIP LTD. | **Sheet** 1/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 0.25 | D1 | | | | | (0.60) | MADE GROUND: Grass surface iver dark brown slightly sandy slightly gravelly clay, containing occassional fragments of brick and concrete rubble. | | |
| 0.50 | D2 | | | | | 0.60 | Stiff brown silty CLAY. | | |
| 0.75 | D3 | | | | | (0.80) | | | |
| 1.00 | D4 | | | | | | | | |
| 1.00 | V1 84 | | | | | 1.40 | Stiff light brown silty CLAY. | | |
| 1.50 | D5 | | | | | | | | |
| 1.50 | V2 81 | | | | | | | | |
| 2.00 | D6 | | | | | (1.60) | | | |
| 2.00 | V3 100 | | | | | | | | |
| 2.50 | D7 | | | | | | | | |
| 2.50 | V4 130+ | | | | | 3.00 | Stiff brown silty slightly gravelly CLAY. Gravels are fine grained, sub-angular to sub-rounded flint. | | |
| 3.00 | D8 | | | | | (0.50) | | | |
| 3.00 | V5 130+ | | | | | 3.50 | Stiff brown silty sandy CLAY. | | |
| 3.50 | D9 | | | | | | | | |
| 3.50 | V6 130+ | | | | | | | | |
| 4.00 | D10 | | | | | | | | |
| 4.00 | V7 130+ | | | | | | | | |
| 4.50 | D11 | | | | | | | | |
| 4.50 | V8 130+ | | | | | | | | |
| 5.00 | D12 | | | | | | | | |
| 5.00 | V9 130+ | | | | | (3.50) | | | |
| 6.00 | D13 | | | | | | | | |
| 6.00 | V10 130+ | | | | | | | | |
| 7.00 | D14 | | | | | 7.00 | Stiif dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 7.00 | V11 130+ | | | | | | | | |
| 8.00 | D15 | | | | | | | | |
| 8.00 | V12 130+ | | | | | (3.00) | | | |
| 9.00 | D16 | | | | | | | | |
| 9.00 | V13 130+ | | | | | | | | |

**Remarks**
D= Disturbed Sample
V= Vane Test- Result in kPa
Groundwater was not encountered during boring
Excavating from 0.00m to 1.00m for 1 hour.

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.** 1625552.BH3

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH3 |

| Boring Method | Casing Diameter | Ground Level (mOD) | Client | Job Number |
|---|---|---|---|---|
| CONTINUOUS FLIGHT AUGER | 100mm cased to 0.00m | | | 1625552 |
| | **Location** | **Dates** | **Engineer** | **Sheet** |
| | TQ270837 | 26/07/2016 | ELLIOTT WOOD PARTNERSHIP LTD. | 2/2 |

| Depth (m) | Sample / Tests | Casing Depth (m) | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|---|---|---|---|---|---|---|---|---|---|
| 10.00<br>10.00 | D17<br>V14 130+ | | | | | 10.00 | Stiif dark grey blue silty sandy CLAY, containing occassional gypsum crystals. | | |
| 11.00<br>11.00 | D18<br>V15 130+ | | | | | | | | |
| 12.00<br>12.00 | D19<br>V16 130+ | | | | | (5.00) | | | |
| 13.00<br>13.00 | D20<br>V17 130+ | | | | | | | | |
| 14.00<br>14.00 | D21<br>V18 130+ | | | | | | | | |
| 15.00<br>15.00 | D22<br>V19 130+ | | | 26/07/2016:DRY | | 15.00 | Complete at 15.00m | | |

**Remarks**
D= Disturbed Sample
V= Vane Test- Result in kPa
Groundwater was not encountered during boring

| Scale (approx) | Logged By |
|---|---|
| 1:50 | MH |

**Figure No.**
1625552.BH3

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH1 |

**Installation Type**
Single Installation

**Dimensions**
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 128 mm

**Client**

**Job Number**
1625552

**Location**
TQ270837

**Ground Level (mOD)**

**Engineer**
ELLIOTT WOOD PARTNERSHIP LTD.

**Sheet**
1/1

| Legend | Water | Instr (A) (B) | Level (mOD) | Depth (m) | Description |
|---|---|---|---|---|---|
| | | | | 1.00 | Bentonite Seal |
| | | | | | Slotted Standpipe |
| | | | | 6.00 | Bentonite Seal |
| | | | | 7.00 | |
| | | | | | General Backfill |
| | | | | 15.00 | |

**Groundwater Strikes During Drilling**

| Date | Time | Depth Struck (m) | Casing Depth (m) | Inflow Rate | Readings 5 min | Readings 10 min | Readings 15 min | Readings 20 min | Depth Sealed (m) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**Groundwater Observations During Drilling**

| Date | Start of Shift Time | Start of Shift Depth Hole (m) | Start of Shift Casing Depth (m) | Start of Shift Water Depth (m) | Start of Shift Water Level (mOD) | End of Shift Time | End of Shift Depth Hole (m) | End of Shift Casing Depth (m) | End of Shift Water Depth (m) | End of Shift Water Level (mOD) |
|---|---|---|---|---|---|---|---|---|---|---|
| 26/07/16 | | | | | | | 15.00 | | DRY | |

**Instrument Groundwater Observations**

**Inst. [A] Type :** **Inst. [B] Type :** Slotted Standpipe

| Date | Instrument [A] Time | Instrument [A] Depth (m) | Instrument [A] Level (mOD) | Instrument [B] Time | Instrument [B] Depth (m) | Instrument [B] Level (mOD) | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**Remarks**

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH2 |

**Installation Type**
Single Installation

**Dimensions**
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 128 mm

**Client**

**Job Number**
1625552

**Location**
TQ270837

**Ground Level (mOD)**

**Engineer**
ELLIOTT WOOD PARTNERSHIP LTD.

**Sheet**
1/1

| Legend | Water | Instr (A) | Level (mOD) | Depth (m) | Description |
|---|---|---|---|---|---|
| | | | | 1.00 | Bentonite Seal |
| | | | | | Slotted Standpipe |
| | | | | 6.00 | Bentonite Seal |
| | | | | 7.00 | General Backfill |
| | | | | 15.00 | |

**Groundwater Strikes During Drilling**

| Date | Time | Depth Struck (m) | Casing Depth (m) | Inflow Rate | Readings 5 min | Readings 10 min | Readings 15 min | Readings 20 min | Depth Sealed (m) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**Groundwater Observations During Drilling**

| Date | Start of Shift Time | Start of Shift Depth Hole (m) | Start of Shift Casing Depth (m) | Start of Shift Water Depth (m) | Start of Shift Water Level (mOD) | End of Shift Time | End of Shift Depth Hole (m) | End of Shift Casing Depth (m) | End of Shift Water Depth (m) | End of Shift Water Level (mOD) |
|---|---|---|---|---|---|---|---|---|---|---|
| 27/07/16 | | | | | | | 15.00 | | DRY | |

**Instrument Groundwater Observations**

**Inst. [A] Type :** Slotted Standpipe

| Date | Instrument [A] Time | Instrument [A] Depth (m) | Instrument [A] Level (mOD) | Remarks |
|---|---|---|---|---|
| | | | | |

**Remarks**

# Site Analytical Services Ltd.

| Site | Borehole Number |
|---|---|
| 81 AVENUE ROAD, LONDON, NW8 6HR | BH3 |

**Installation Type**
Single Installation

**Dimensions**
Internal Diameter of Tube [A] = 50 mm
Diameter of Filter Zone = 100 mm

**Client**

**Job Number**
1625552

**Location**
TQ270837

**Ground Level (mOD)**

**Engineer**
ELLIOTT WOOD PARTNERSHIP LTD.

**Sheet**
1/1

| Legend | Water | Instr (A) | Level (mOD) | Depth (m) | Description |
|---|---|---|---|---|---|
| | | | | 1.00 | Bentonite Seal |
| | | | | | Slotted Standpipe |
| | | | | 6.00 | Bentonite Seal |
| | | | | 7.00 | General Backfill |
| | | | | 15.00 | |

**Groundwater Strikes During Drilling**

| Date | Time | Depth Struck (m) | Casing Depth (m) | Inflow Rate | Readings 5 min | Readings 10 min | Readings 15 min | Readings 20 min | Depth Sealed (m) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

**Groundwater Observations During Drilling**

| Date | Start of Shift Time | Start of Shift Depth Hole (m) | Start of Shift Casing Depth (m) | Start of Shift Water Depth (m) | Start of Shift Water Level (mOD) | End of Shift Time | End of Shift Depth Hole (m) | End of Shift Casing Depth (m) | End of Shift Water Depth (m) | End of Shift Water Level (mOD) |
|---|---|---|---|---|---|---|---|---|---|---|
| 26/07/16 | | | | | | | 15.00 | | DRY | |

**Instrument Groundwater Observations**

**Inst. [A] Type :** Slotted Standpipe

| Date | Instrument [A] Time | Instrument [A] Depth (m) | Instrument [A] Level (mOD) | Remarks |
|---|---|---|---|---|
| | | | | |

**Remarks**

Appendix 4

Thames Water Sewer Records

# Asset Location Search Sewer Map - ALS/ALS Standard/2016_3367215

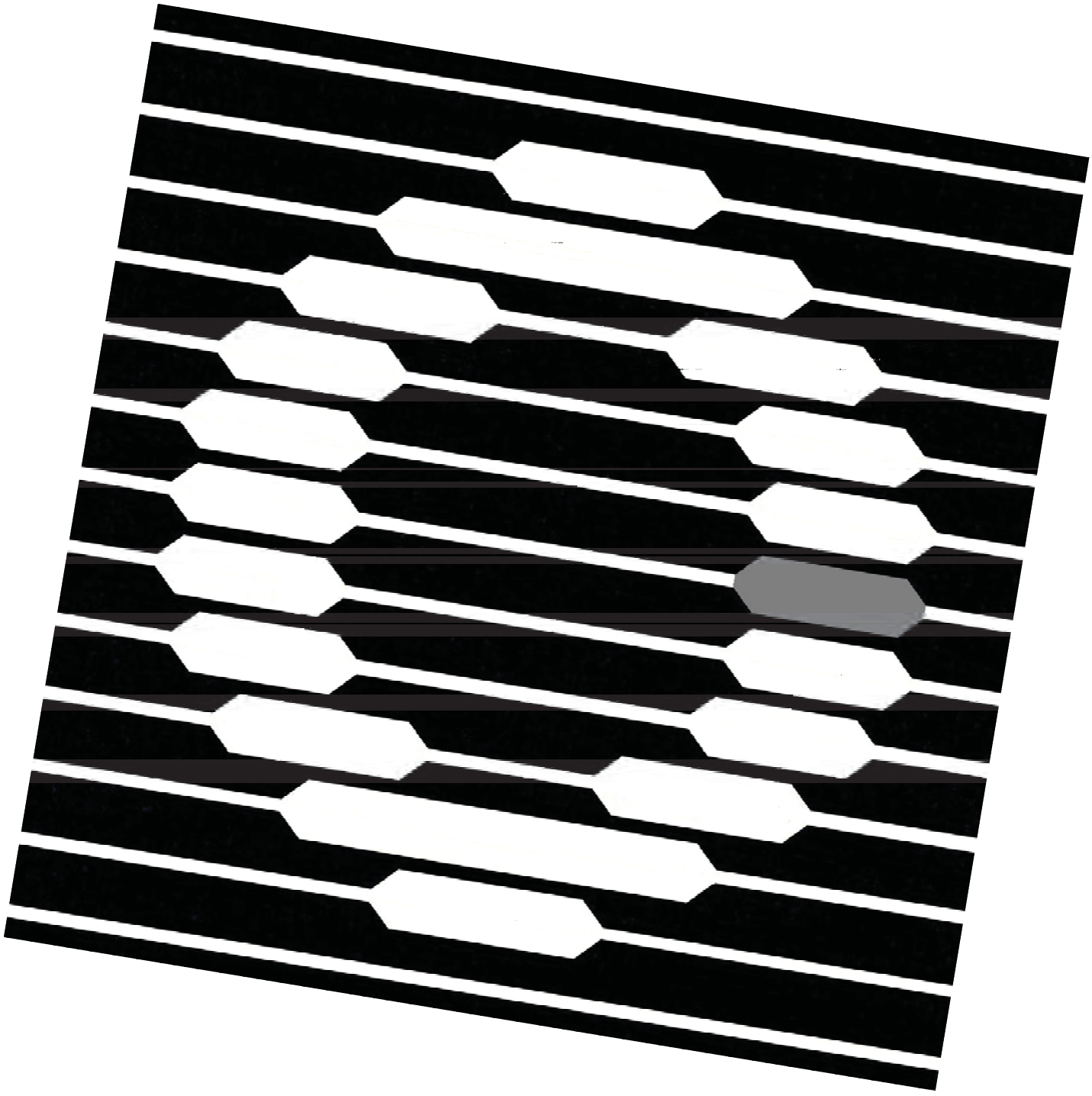

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526874,183905

**The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.**

Appendix 5

CCTV Survey Report Plan

# G.O. DRAINAGE SERVICES LTD



CV.1098 81 AVENUE ROAD LONDON NW8 6JD

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## CCTV SURVEY HEADER SHEET

**CLIENT.**

ELLIOTTWOOD PARTNERSHIP LLP
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
241 THE BROADWAY
LONDON
SW19 1SD

**LOCATION.**

81 AVENUE ROAD
LONDON
NW8 6JD

**JOB NO.** CV.1098

**SEWER USE.** COMBINED DRAINAGE

**WEATHER.** DRY

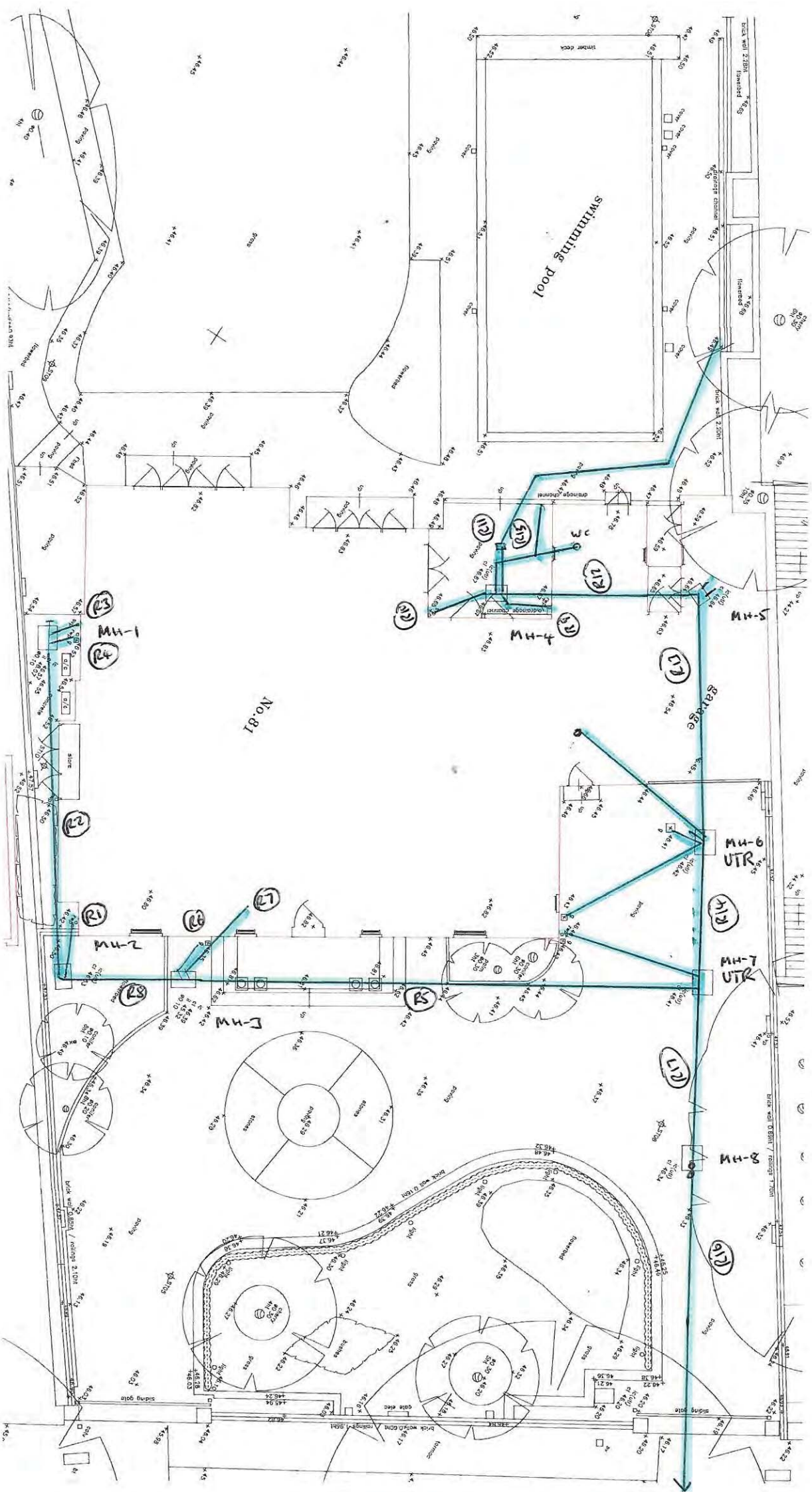
**DATE.** 02/08/16

**OPERATOR.** GO

**CLEANED.** NO

**ORDER NO.** E-MAIL TIM KENNING

**TOTAL LENGTH SURVEYED.** 79.5 metres


swimming pool
No.81
garage
MH-1
MH-2
MH-3
MH-4
MH-5
MH-6
UTR
MH-7
UTR
MH-8
R1
R2
R3
R4
R5
R6
R7
R8
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15
L16
L17
WC

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

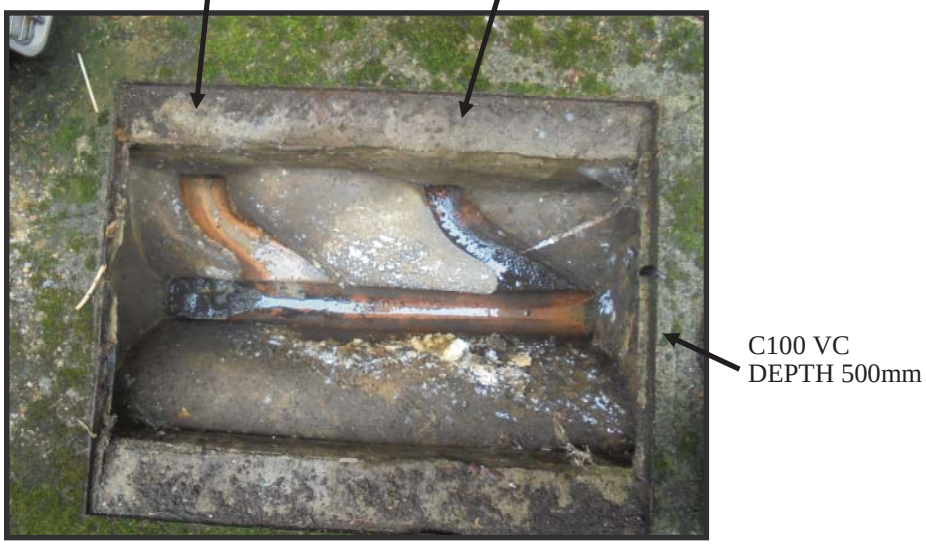
## MANHOLE SURVEY

| | | | |
|---|---|---|---|
| CLIENT. | ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | LOCATION. | 81 AVENUE ROAD LONDON NW8 6JD |
| DATE | 02/08/16 | JOB. | **CV.1098** |

MANHOLE NO.01

COVER 770X670mm

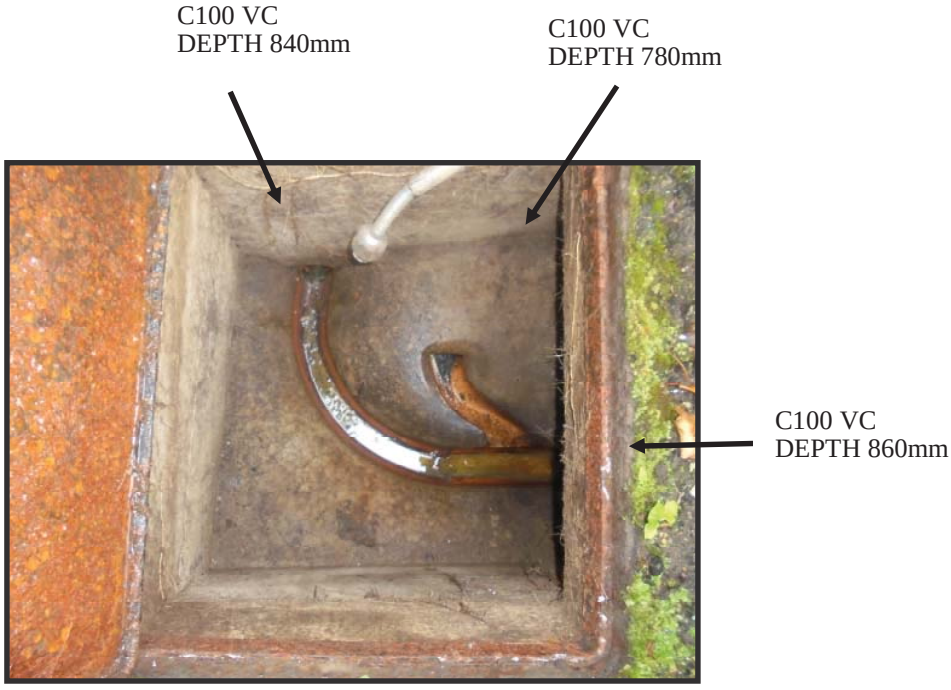
CHAMBER 900X450mm




MANHOLE NO.02

COVER 810X650mm

CHAMBER 80X750mm



# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## MANHOLE SURVEY

| | | | |
|---|---|---|---|
| CLIENT. | ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | LOCATION. | 81 AVENUE ROAD LONDON NW8 6JD |
| DATE | 02/08/16 | JOB. | **CV.1098** |

MANHOLE NO.03

COVER 680X530mm

CHAMBER 600X450mm

C100 VC
DEPTH 960mm

C100 VC
DEPTH 960mm

C100 VC
DEPTH mm

C100 VC
DEPTH 1070mm

C100 CI
DEPTH 1080mm

ROOTS IN CHAMBER

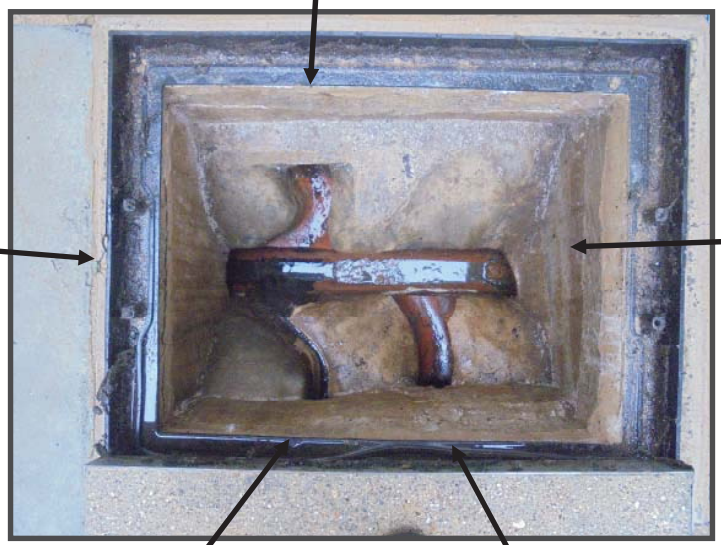
MANHOLE NO.04

COVER 810X510mm

CHAMBER 750X450mm

C100 VC
DEPTH 480mm

C100 VC
DEPTH 580mm



C100 VC
DEPTH 570mm

C100 VC
DEPTH 510mm

C100 VC
DEPTH 510mm

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

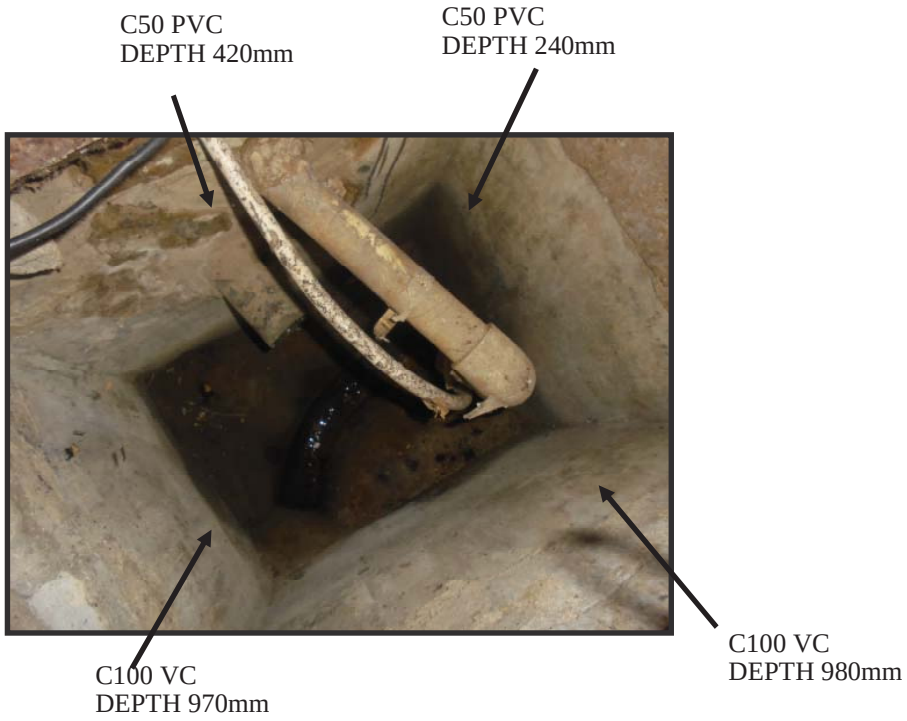
## MANHOLE SURVEY

| | | | |
|---|---|---|---|
| CLIENT. | ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | LOCATION. | 81 AVENUE ROAD LONDON NW8 6JD |
| DATE | 02/08/16 | JOB. | **CV.1098** |

MANHOLE NO.05

COVER 650X510mm

CHAMBER 600X450mm




MANHOLE NO.06

COVER 800X650mm

UTR

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## MANHOLE SURVEY

| | | | |
|---|---|---|---|
| CLIENT. | ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | LOCATION. | 81 AVENUE ROAD LONDON NW8 6JD |
| DATE | 02/08/16 | JOB. | **CV.1098** |

MANHOLE NO.07

COVER 800X650mm

UTR

MANHOLE NO.08

COVER 800X650mm

CHAMBER 900X800mm

C150 VC
DEPTH 3160mm

C150 VC
DEPTH 3170mm

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

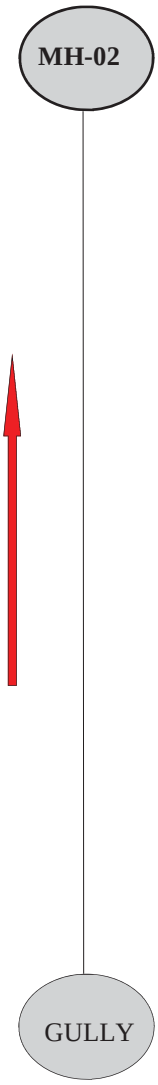
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 01 | 02/08/16 | COMBINED | 780mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 02 CONNECTION- 2

FINISH

FH. GULLY




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | RM | ROOTS MASS 40% |
| 000.3 | FH | FINISH OF SURVEY ( UNABLE TO PASS ) |

**END OF RUN NO.01**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

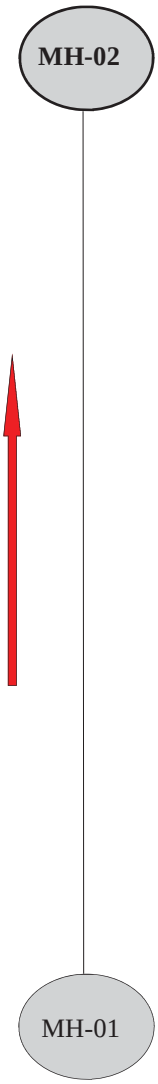
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 02 | 02/08/16 | COMBINED | 840mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 02 CONNECTION- 1

FINISH

FH. MANHOLE NO.01




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | FC | FRACTURE, CIRCUMFERENTIAL FROM 07 TO 05 O'CLOCK |
| 000.3 | R | ROOTS FINE |
| 000.6 | FC | FRACTURE, CIRCUMFERENTIAL FROM 07 TO 05 O'CLOCK |
| 001.5 | CC | CRACK,CIRCUMFERENTIAL FROM 07 TO 01 O'CLOCK |
| 005.3 | CC | CRACK,CIRCUMFERENTIAL FROM 12 TO 05 O'CLOCK |
| 009.6 | MH | MANHOLE NO.01 |
| 009.6 | FH | FINISH OF SURVEY |

**END OF RUN NO.02**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

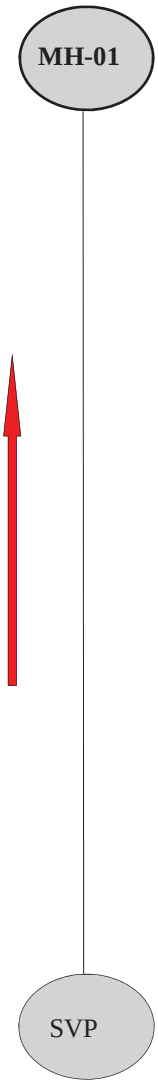
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 03 | 02/08/16 | COMBINED | 410mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 01 CONNECTION- 1

FINISH

FH. SOIL VENT PIPE




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | LU | LINE OF DRAIN DEVIATES UP ( SHARP ) |
| 000.3 | FH | FINISH OF SURVEY ( SOIL VENT PIPE ) |

**END OF RUN NO.03**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

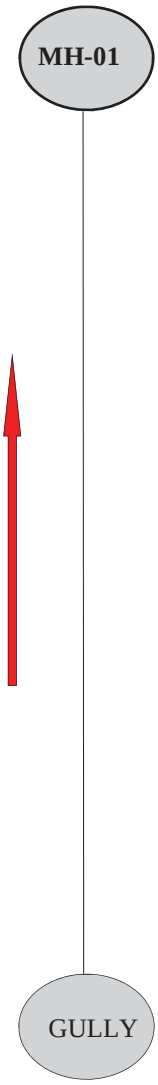
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 04 | 02/08/16 | COMBINED | 410mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No.01 CONNECTION- 2

FINISH

FH. GULLY




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | LD | LINE OF DRAIN DEVIATES DOWN ( SHARP ) |
| 000.3 | FH | FINISH OF SURVEY ( GULLY ) |

**END OF RUN NO.04**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

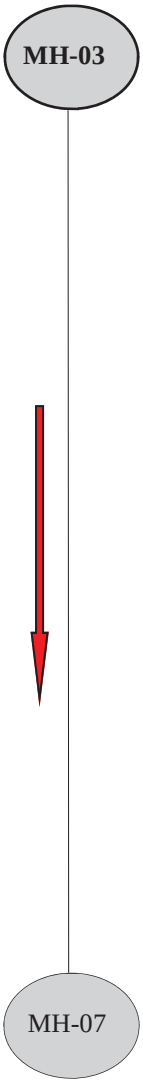
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 05 | 02/08/16 | COMBINED | 1090mm | DOWNSTREAM | 100mm | CAST IRON | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 03 CONNECTION- X

FINISH

FH. MANHOLE NO.07




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 006.5 | MC | MATERIAL OF DRAIN CHANGES TO AT THIS POINT |
| 014.5 | FC | FRACTURE, CIRCUMFERENTIAL FROM 12 TO 12 O'CLOCK |
| 015.4 | R | ROOTS FINE |
| 015.9 | MH | MANHOLE NO.07 |
| 015.9 | FH | FINISH OF SURVEY |

**END OF RUN NO.05**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

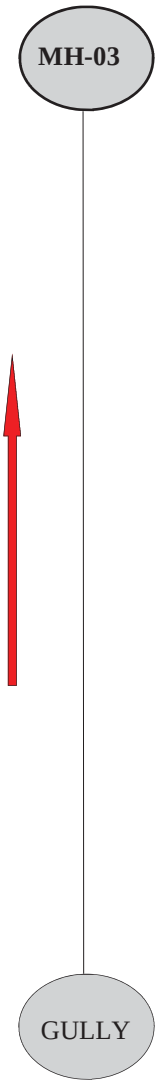
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 06 | 02/08/16 | COMBINED | 960mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 03 CONNECTION- 2

FINISH

FH. GULLY




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.4 | LU | LINE OF DRAIN DEVIATES UP ( SHARP ) |
| 000.4 | FH | FINISH OF SURVEY ( GULLY ) |

**END OF RUN NO.06**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

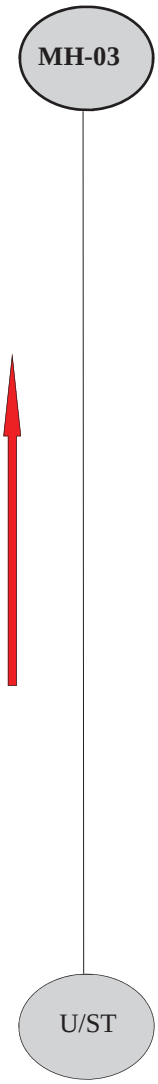
## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 03 | 02/08/16 | COMBINED | 960mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START FINISH

ST. MANHOLE No. 03 CONNECTION- 3 FH. UPSTREAM




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | LL | LINE OF DRAIN DEVIATES LEFT ( SLIGHT ) |
| 002.3 | LR | LINE OF DRAIN DEVIATES RIGHT ( SLIGHT ) |
| 002.3 | FH | FINISH OF SURVEY ( UNABLE TO PASS ) |

**END OF RUN NO.07**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

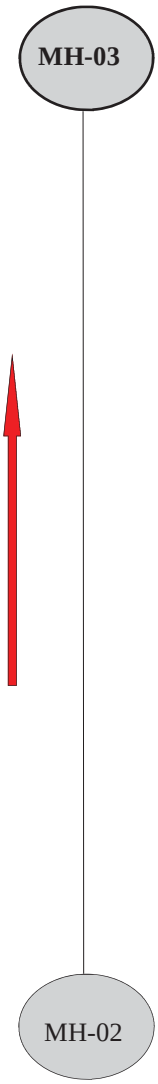
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 08 | 02/08/16 | COMBINED | 1080mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 03 CONNECTION- 1

FINISH

FH. MANHOLE NO.02




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | FC | FRACTURE, CIRCUMFERENTIAL FROM 07 TO 05 O'CLOCK |
| 000.3 | R | ROOTS FINE |
| 002.4 | FC | FRACTURE, CIRCUMFERENTIAL FROM 07 TO 05 O'CLOCK |
| 002.8 | RM | ROOTS MASS 20% |
| 002.8 | FC | FRACTURE, CIRCUMFERENTIAL FROM 07 TO 05 O'CLOCK |
| 003.2 | MH | MANHOLE NO.02 |
| 003.2 | FH | FINISH OF SURVEY |

**END OF RUN NO.08**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

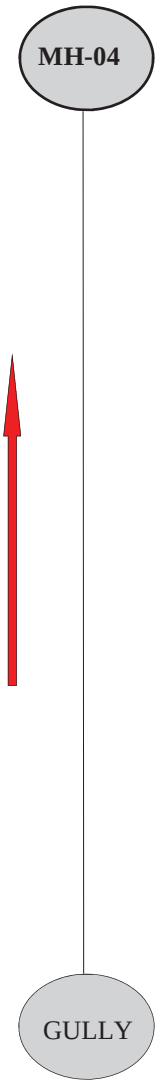
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 09 | 02/08/16 | COMBINED | 480mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 04 CONNECTION- 1

FINISH

FH. GULLY




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.3 | LL | LINE OF DRAIN DEVIATES LEFT ( SLIGHT ) |
| 001.3 | LD | LINE OF DRAIN DEVIATES DOWN ( SHARP ) |
| 001.3 | FH | FINISH OF SURVEY ( GULLY ) |

**END OF RUN NO.09**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

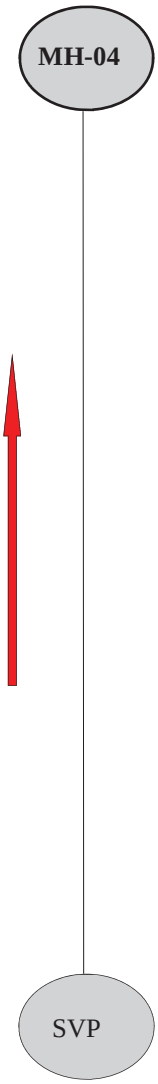
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 10 | 02/08/16 | COMBINED | 570mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No.04 CONNECTION- 2

FINISH

FH. SOIL VENT PIPE




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 001.9 | LU | LINE OF DRAIN DEVIATES UP ( SHARP ) |
| 001.9 | FH | FINISH OF SURVEY ( SOIL VENT PIPE ) |

**END OF RUN NO.10**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

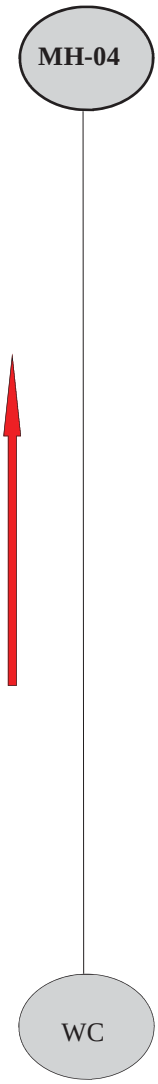
## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 11 | 02/08/16 | COMBINED | 510mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START FINISH

ST. MANHOLE No. 04 CONNECTION- 3 FH. WC




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.7 | LU | LINE OF DRAIN DEVIATES UP ( SHARP ) |
| 001.2 | LR | LINE OF DRAIN DEVIATES RIGHT ( SLIGHT ) |
| 002.6 | JN | JUNCTION AT 09 O'CLOCK,DIAMETER 100mm STRIP GULLY |
| 003.5 | LU | LINE OF DRAIN DEVIATES UP ( SHARP ) |
| 003.5 | FH | FINISH OF SURVEY ( WC ) |

**END OF RUN NO.11**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 12 | 02/08/16 | COMBINED | 580mm | DOWNSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 04 CONNECTION- X

FINISH

FH. MANHOLE NO.05

| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 006.0 | MH | MANHOLE NO.05 |
| 006.0 | FH | FINISH OF SURVEY |

MH-04

MH-05

**END OF RUN NO.12**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 13 | 02/08/16 | COMBINED | 980mm | DOWNSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 05 CONNECTION- X

FINISH

FH. MANHOLE NO.06

| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 006.3 | MH | MANHOLE NO.06 |
| 006.3 | FH | FINISH OF SURVEY |

**MH-05**

**END OF RUN NO.13**

MH-06

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 14 | 02/08/16 | COMBINED | N/A | DOWNSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 06 CONNECTION- X

FINISH

FH. MANHOLE NO.07

| | CHAINAGE | CODE | OBSERVATION |
|---|---|---|---|
| MH-06 | | | |
| | 000.0 | ST | START OF SURVEY |
| | 000.0 | WL | WATER LEVEL 05% |
| | 003.9 | MH | MANHOLE NO.07 |
| | 003.9 | FH | FINISH OF SURVEY |

**END OF RUN NO.14**

MH-07

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

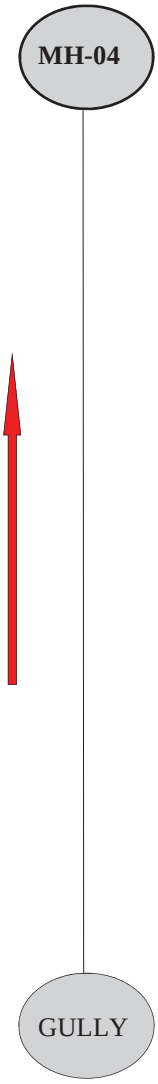
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 15 | 02/08/16 | COMBINED | 480mm | UPSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 04 CONNECTION– 4

FINISH

FH. GULLY




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 002.3 | LD | LINE OF DRAIN DEVIATES DOWN ( SHARP ) |
| 002.3 | FH | FINISH OF SURVEY ( GULLY ) |

**END OF RUN NO.15**

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

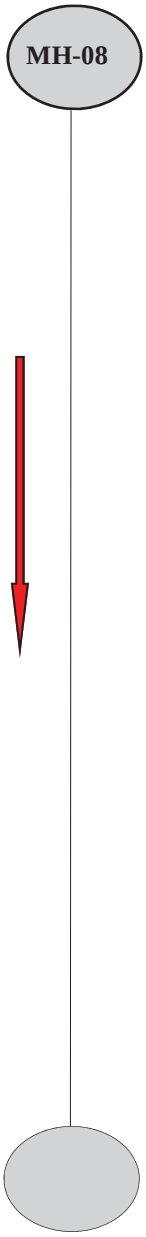
| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 16 | 02/08/16 | COMBINED | 3120mm | DOWNSTREAM | 100mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 08 CONNECTION- X

FINISH

FH. MAIN SEWER




| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| | | **ACCESS 100mm RODDING EYE** |
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 000.4 | JN | JUNCTION AT 06 O'CLOCK,DIAMETER 150mm TRAP |
| 000.4 | SC | DIMENSION OF DRAIN CHANGES TO 150mm |
| 002.9 | R | ROOTS FINE |
| 002.9 | R | ROOTS FINE |
| 004.6 | DEE | ATTACHED DEPOSITS,ENCRUSTATION FROM 05 TO 07 O'CLOCK 10% |
| 007.3 | R | ROOTS FINE |
| 009.1 | R | ROOTS FINE |
| 009.6 | R | ROOTS FINE |
| 010.6 | R | ROOTS FINE |
| 011.6 | R | ROOTS FINE |
| 012.6 | R | ROOTS FINE |
| 012.5 | FC | FRACTURE, CIRCUMFERENTIAL FROM 12 TO 05 O'CLOCK |
| 012.5 | FH | FINISH OF SURVEY ( MAIN SEWER ) |

**END OF RUN NO.16**

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## INSPECTION REPORT

| CLIENT. | LOCATION. |
|---|---|
| ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | 81 AVENUE ROAD LONDON NW8 6JD |

| JOB NO. | RUN NUMBER | DATE | SEWER USE | DEPTH | DIRECTION | PIPE SIZE | MATERIAL | WEATHER | CLEANED | OPERATOR | PAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CV.1098 | 17 | 02/08/16 | COMBINED | 3120mm | UPSTREAM | 150mm | V/CLAY | DRY | NO | GO | 1 |

START

ST. MANHOLE No. 08 CONNECTION- 1

FINISH

FH. MANHOLE NO.07

| CHAINAGE | CODE | OBSERVATION |
|---|---|---|
| 000.0 | ST | START OF SURVEY |
| 000.0 | WL | WATER LEVEL 05% |
| 004.8 | MH | MANHOLE NO.07 |
| 004.8 | FH | FINISH OF SURVEY |

**MH-08**

**END OF RUN NO.17**

MH-07

# G.O. DRAINAGE SERVICES LTD

53 PREMIER AVENUE GRAYS RM16 2SJ TEL:01375 373302 MOB:07792 815977 E-MAIL: godrainage@aol.com

## SUMMARY AND RECOMMENDATIONS

| | | | |
|---|---|---|---|
| CLIENT. | ELLIOTTWOOD 241 THE BROADWAY LONDON SW19 1SD | LOCATION. | 81 AVENUE ROAD LONDON NW8 6JD |
| DATE | 02/08/16 | JOB. | CV.1098 |

**RUN NO.01 ROOTS**

**RUN NO.02 FRACTURES**

**RUN NO.03 NO WORK NEEDED**

**RUN NO.04 NO WORK NEEDED**

**RUN NO.05 ROOTS FRACTURE**

**RUN NO.06 NO WORK NEEDED**

**RUN NO.07 NO WORK NEEDED**

**RUN NO.08 ROOTS**

**RUN NO.09 NO WORK NEEDED**

**RUN NO.10 NO WORK NEEDED**

**RUN NO.11 NO WORK NEEDED**

**RUN NO.12 NO WORK NEEDED**

**RUN NO.13 NO WORK NEEDED**

**RUN NO.14 NO WORK NEEDED**

**RUN NO.15 NO WORK NEEDED**

**RUN NO.16 FRACTURES AND ROOTS**

**RUN NO.17 NO WORK NEEDED**

DRAIN & PIPEWORK CCTV SURVEYS

-

DRAINS
PIPEWORK
CULVERTS
DUCTS
CHUTES
CHIMNEY FLUES
TANKS

HIGH PRESSURE
WATER JETTING

-

SEWER & DRAIN BLOCKAGES
DESCALING
SILT REMOVAL
ROOT CUTTING
GREASE REMOVAL

REMEDIAL WORKS

-

POLYESTER RESIN LINING
DRAINAGE EXCAVATIONS & REPAIRS

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Structural and Civil Engineers