Basement Impact Assessment: 10a Oakhill Avenue.

(Surface Water and Groundwater)

Basement impact assessment: hydrology and hydrogeology. 10a Oakhill Avenue.

Prepared for

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Surface Water

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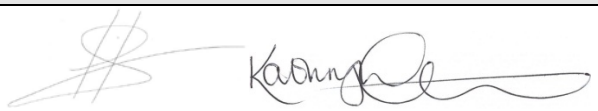
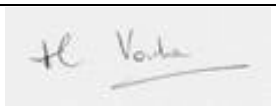
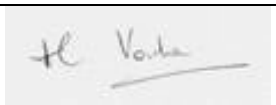
Author	Kathryn Mair Henry Kelly	
Checked by	Helen Vonka (M.CIWEM)	
Reviewed by	Helen Vonka (M.CIWEM)	

Groundwater

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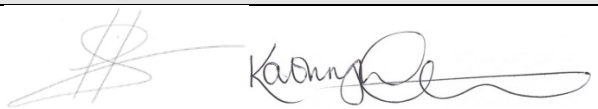
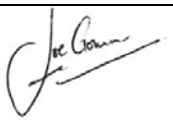
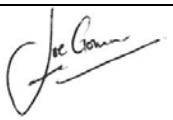
Author	Kathryn Mair Henry Kelly	
Checked by	Joe Gomme (C.Geol)	
Reviewed by	Joe Gomme (C.Geol)	

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Issue	Report ref	Comment	Author	Checker/Reviewer		Issue date	Issued to
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2	61458R1Rev1 D1	Draft for external review	HJK/KXM	HCV	PAE	06/02/2014	Martin Evans Architects
3	61458R1Rev1	Final Report	HJK/KXM	HCV	PAE	06/02/2014	Martin Evans Architects
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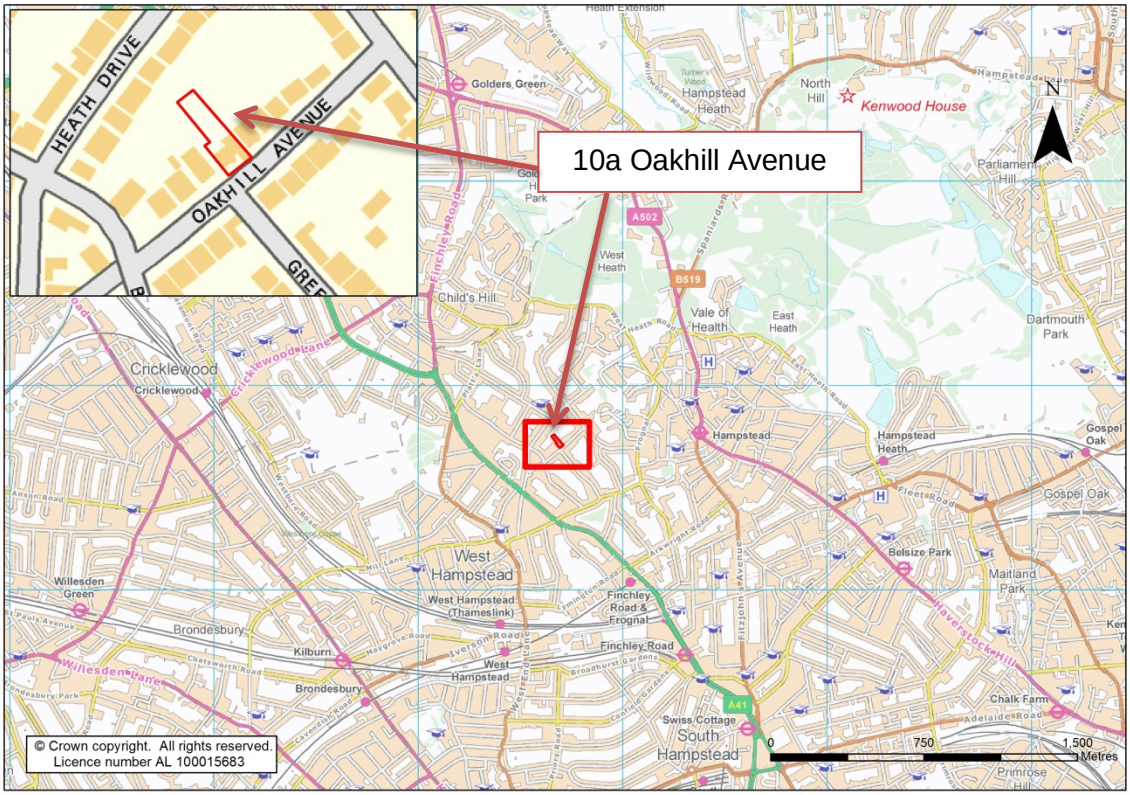
1 INTRODUCTION

1.1 This Document

ESI Ltd (ESI) was commissioned by Martin Evans Architects in January 2014 to undertake a Basement Impact Assessment for the proposed development at 10a Oakhill Avenue NW3 7RE, (at approximate grid reference TQ 256 857) in the Frognal and Fitzjohns Ward of the London Borough of Camden (Figure 1.1).

Figure 1.1 Site location



This document is a desk study which considers the potential impact relating to the proposed basement development in terms of surface water and groundwater flow and flooding.

1.2 Scope of Works

The following scope of works was requested: an assessment of the impacts of the proposed development on surface water and groundwater flow, levels and drainage. This report outlines the hydrogeological conditions with relevance to construction of the basement at the property. The assessment conforms to the requirements of guidance set out by the London Borough of Camden, which provides comprehensive guidance on planning applications for basement extensions. These guidelines for basement impact assessments (ARUP (2010), Camden Borough Council, (2011)) have been consulted in order to complete a screening analysis of key hydrological and hydrogeological issues that will satisfy the relevant planning requirements.

The Site is also the subject of further reports conducted by Soil Consultants Limited: A Factual Ground Investigation (Soil Consultants Ltd, 2013) and a Slope Stability Report (Soil Consultants Ltd, 2014).

1.3 Proposed Basement Works

The proposed development is for the excavation of a new, single storey basement for a residential property. The basement is to be developed below the a proposed lower ground

floor with the underside of the basement slab completed to a final depth of approximately 88.66 meters Above Ordnance Datum (mAOD).

The vertical depth of the basement below ground level varies across Site due to the variation in ground level. The basement lies approximately 7.45 meters below ground level (mbgl) to the north-western extent of the proposed development and 3.58 mbgl at the south-eastern extent of the proposed development.

The proposed development on Site is for the demolition of existing buildings and the construction of a new development incorporating a lower ground floor and basement. Plans are included at Appendix A and show that the proposed lower ground floor development has an external area of 545.87 m^2. The underlying proposed basement development has an external area of 526.18 m^2.

The majority of the proposed basement (498.04 m^2) will lie beneath the footprint of the lower ground floor of the proposed development, with the exception of the northern and western corners which will form lightwells (35.5 m^2).)

2 SCREENING AND SCOPING

The screening and scoping stage for Impact Assessment has been considered as set out in CPG4 (Camden Council, 2011) as follows.

2.1 SURFACE WATER (Surface flow and flooding screening flowchart (Figure 3, CPG4 (Camden Council, 2011))			
Impact question	**Answer**	**Justification**	**Reference**
1) Is the Site within the catchment of the pond chains on Hampstead Heath?	**No**	The Site is not located within the catchment for any of the Hampstead Heath ponds.	Arup, 2008.
2) As part of the proposed Site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	**Yes**	The proposed development, (inclusive of the basement) is larger than the current development on Site. A detailed drainage design will be incorporated at detailed design stage to adjust drainage routes to deal with the excess volume of rain fall and peak run-off generated on-Site.	Site Plans.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**Yes**	The proposed basement will be located almost entirely beneath the footprint of the proposed development. The northern and western corners of the basement will protrude into the garden area and form lightwells. However as the entire development, inclusive of the basement, will extend beyond the current development on Site, there will be reduction in permeable surface on Site. The total Site area is 1240.45 m^2. Prior to development, the Site consisted of and impermeable surface area amounting to 645.75 m^2 which will increase to 772.92 m^2. This is an increase in impermeable surface at the Site of 127.17 m^2 from pre-development conditions.	Site plans.
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	**No**	A culverted tributary of the "lost" river Westbourne exists approximately 105 m to the north of the proposed basement (at their closest point) and flows in a SW direction. No other surface water bodies are known to exist within 500 m of the Site. Despite a change in the proportion of impermeable surfaces on the Site, there is not expected to be any change in profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses given their distance and direction from Site.	Ordnance Survey Mapping. Barton, 1992.
5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	**No**	The "lost" river Westbourne runs approximately to the north of the Site as stated above. It is possible that the Site falls within the catchment of this underground river; however, the size and position of the proposed development mean it is highly unlikely to impact on the quality of this water course or the receiving waters of adjacent properties.	Ordnance Survey Mapping. Barton, 1992.

6) Is the Site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	**No**	Oakhill Avenue is not a road which has previously experienced surface water flooding nor is it at risk from surface water flooding according to Arup (2008). The area is not at risk from flooding from rivers or reservoirs as defined by the Environment Agency (2013). The Site has no history of sewer flooding (Appendix C).	Arup, 2008. Environment Agency, 2013.

2.2 GROUND WATER (Subterranean (ground water) flow screening chart (Figure 1, CPG4 (Camden Council, 2011))

Impact question	Answer	Justification	Reference
1a) Is the Site located directly above an aquifer?	**Yes**	The Site is located upon the Claygate Member; a sedimentary bedrock comprising chiefly low permeability clay, with pockets of silt and sand. This may contain permeable horizons within the generally low permeability material and is classified as a Secondary A aquifer by the Environment Agency. Beneath the Claygate Member lies the London Clay (classed as unproductive strata) at a depth of around 5 mbgl according to on-Site window sample logs (Appendix B). There are no superficial deposits recorded at the Site.	British Geological Survey, 2013 (A). Environment Agency, 2012.
1b) Will the proposed basement extend beneath the water table surface?	**Yes**	Monitoring of boreholes installed 02/05/13 was conducted on 16/05/13 and 24/05/13; this established stabilised ground water levels to be between 91.3 mAOD and 92.53 mAOD); the groundwater gradient across Site reflects the topographic gradient, descending towards the south. The proposed basement will extend down below these water table elevations by approximately 3.9 m (calculated from the difference between the maximum recorded stabilised water level (92.53 mAOD) and the maximum proposed depth of the basement (88.66 mAOD)). As stated previously, the groundwater will be confined to thin localised layers of higher permeability sediment.	British Geological Survey, 2013 (A). British Geological Survey, 2013 (B). Soil Consultants Ltd, 2013.
2) Is the Site within 100m of a watercourse, well (used/disused) or potential spring line?	**No**	As stated above, a culverted tributary of the river Westbourne runs 105 m to the north of the proposed basement. The nearest surface watercourse is 800 m to the north; this is a small stream originating from the Leg of Mutton Pond. This watercourse is up gradient from the Site and will not be affected by the development. There are no wells within 100m of the Site. The change in geological strata from Claygate to London Clay occurs to the west of the Site and has the potential to produce springs; the distance of this is thought to be greater than 100m. The Claygate Member does have the potential to produce springs where permeable horizons crop out. No springs were identified at the Site	British Geological Survey, 2013 (A). British Geological Survey, 2013 (B). Barton, 1992. Soil Consultants Ltd, 2013

		during the Site investigation	
3) Is the Site within the catchment of the pond chains on Hampstead Heath?	**No**	The Site is not located within the catchment for any of the Hampstead Heath ponds.	Arup, 2008.
4) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**Yes**	The proposed basement will be located almost entirely beneath the footprint of the existing building. The northern and western corners of the basement will protrude into the garden area and form lightwells. However as the entire development, inclusive of basement, will extend beyond the current development on Site, the net result will be a reduction in permeable surface on Site. The total Site area is 1240.45 m^2. Prior to development, the Site consisted of an impermeable surface area amounting to 645.75 m^2, which will increase to 772.92 m^2. This is an increase in impermeable surface at the Site of 127.17 m^2 from pre-development conditions.	Site Plans.
5) As part of the Site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	**Yes**	Due to the increase in impermeable surface at the Site which will result from the proposed development, inclusive of the basement development, more surface water run-off is anticipated.	Site Plans.
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**	There are no known ponds or spring lines within close proximity of the Site.	Ordnance Survey Mapping.

3 SITE CONCEPTUAL MODEL

3.1 CONCEPTUAL UNDERSTANDING		
Geology	Superficials	No superficial deposits are known to exist at the Site.
	Bedrock	The Site is located directly upon the Claygate Member; a sedimentary bedrock comprising clay, silt and sand. The depth of the Member beneath the Site is around 5 m according to a Site investigation carried out in 02/05/2013 (Appendix B & D)). This is supported by historical boreholes 280 m to the west of the Site gave depth of between 4.15 m – 4.45 m (appendix B). On-site window sample logs show that the Claygate Member extends to approximately 5 mbgl and state that the strata comprise chiefly sandy silty clay, with partings of silty sand. The Site investigation determined that the partings were no thicker than a few millimetres and no discrete water bearing horizons were encountered. Beneath the Claygate Member lies the London Clay aquiclude, proven to a thickness of at least 22.27 by borehole TQ28NE103 approximately 500 m to the north east (Appendix B) and to a thickness of around 50 m by other boreholes within 1.5 km of the Site (TQ28SW73, TQ28SE1490, TQ28NE48). This is a hydrogeologically unproductive layer overlying the principal chalk aquifer beneath.
Aquifers	The Claygate Member is classified as a Secondary A aquifer by the Environment Agency. The definition of this is as follows: "Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers." The generally low permeability Claygate member is known to contain horizons of higher permeability material capable of transmitting water. Borehole logs from the Site included in Appendix B indicate that the Claygate at this location comprised homogenous material containing numerous thin (several mm) partings of silty sand. The pockets and partings of sand that are present do not form continuous horizons of permeable material. Based upon the changes in groundwater elevation recorded over the observed period, migration of groundwater through the Site appears to be occurring. The Claygate member was proven to a thickness of around 5 m during the Site investigation and shown to be underlain by London Clay.	

Groundwater levels	The presence of groundwater beneath the Site was confirmed during Site investigation at a maximum stabilised level of 92.53 mAOD, up-gradient of the proposed development. This is based on the maximum recorded dip measurements from three separate locations and therefore presents the most conservative (worst case) scenario (the details of all recorded water levels for each dip location are presented in Appendix B). The water levels will be subject to seasonal variation beyond what has been observed, in response to rainfall recharge. It is therefore possible that they will rise above the recorded levels during particularly wet periods. *Note; the levels recorded during the Site investigation have not been considered as they do not represent stabilised water levels.* This indicates that the basement (underside of the basement slab) would extend up to approximately 3.9 m below the water table. Dewatering of the Site will need to be conducted during construction to lower the water table beyond the final elevation of the underside of the basement slab. The highest groundwater elevations were found to the north of the Site (WS1) with WS2 to the east and WS3 to the south both having similar values on both days signifying a preferential flow direction of approximately north to south across the Site. As the proposed basement is likely to protrude below the recorded groundwater elevations, there will likely be some interference to groundwater flow, and this has been modelled in section 4. As stated previously, the Claygate Member comprises chiefly low permeability clay. This means the overall magnitude of groundwater flow passing through the Site is likely to be relatively low (as stated in section 3.1). Using Darcy's law an estimate of the flow passing beneath the Site has been made assuming that the permeable horizons make up a total of 1 % of the Claygate Member thickness, and using a hydraulic conductivity of 10 m/day (within the range commonly ascribed to fluvial deposits (Hiscock 2009)). This yielded an estimate of 0.75 m^3/day (0.009 l/s), assuming the presence of a continuous aquifer. Due to the proposed depth of the development, the Claygate Member will be removed across up to two thirds of the footprint of the basement development (figure 3.1). This means that the groundwater flow would be diverted around the proposed basement. This is likely to cause a slight increase in groundwater levels on the up-gradient side of the property and a corresponding decrease on the down-gradient side. Groundwater modelling has been undertaken to clarify the impact of the basement development on the groundwater levels (see section 4).

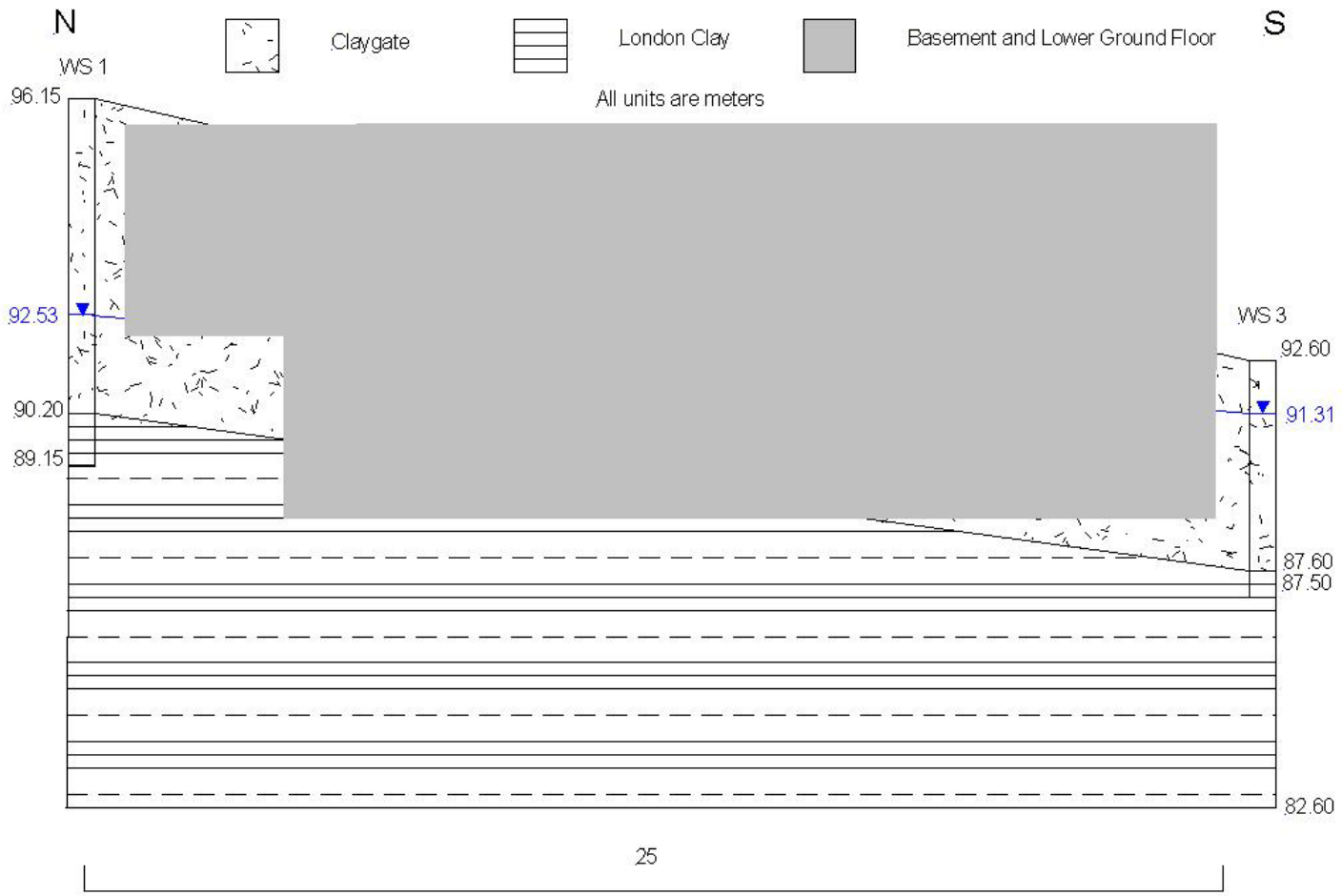


Figure 3.1 Cross section A – Generalised cross section from north to south across the Site
Figure not to scale. Water levels shown were recorded on the 24/05/2013.

4 GROUNDWATER MODELLING

4.1 Model Design

A two-dimensional scoping model has been developed of the area around the Site, to estimate the magnitude of groundwater level change in the vicinity of the proposed basements at the Site. The details of the model are as follows:

The basement is represented in the model as a block of impermeable cells (it is reasonable to assume that it is sealed as it penetrates the whole aquifer and therefore must be constructed to limit groundwater ingress). The basement adjacent to the property (to the north east) was included into the model in the same manner.

Model results are compared between two scenarios, with and without a basement, where the model with a basement fully penetrates the superficial aquifer across approximately two thirds of area covered by the proposed basement.

The conceptual model is of a thin aquifer (Claygate Member) overlying an essentially impermeable base (London Clay). The model has not been calibrated to groundwater level except to match approximately the observed hydraulic gradient and saturated thickness at the Site.

A sample output from the model, showing geometry, boundary conditions and groundwater heads (0.04 m contours) is presented in Figure 4.1 below.

4.2 Model Parameters

- The model was developed using Groundwater Vistas, running MODFLOW in steady state mode.
- The model is made up from 22,500 cells arranged in a 150 x 150 cell grid; cell size is 1 m x 1 m.
- The aquifer is constructed of two homogenous layers; layer 1 thickness is 3.5 m and layer 2 thickness is 1.5 m, giving a total of 5m. Two layers were modelled to represent the different footprints of the lower ground floor and the basement.
- Hydraulic conductivity is set to 0.1 m/day (within the range commonly ascribed to fluvial deposits (Hiscock 2009) multiplied by 0.01 given that only around 1% is estimated to be alluvial deposits, and the rest low permeability clay).
- Hydraulic gradient utilised was 0.03 (average gradient in the London Clay established using up-gradient and down-gradient boreholes at a distance of approximately 500 m from the Site: borehole IDs NE102, NE104, NE21, NE32, NE129, NE130).

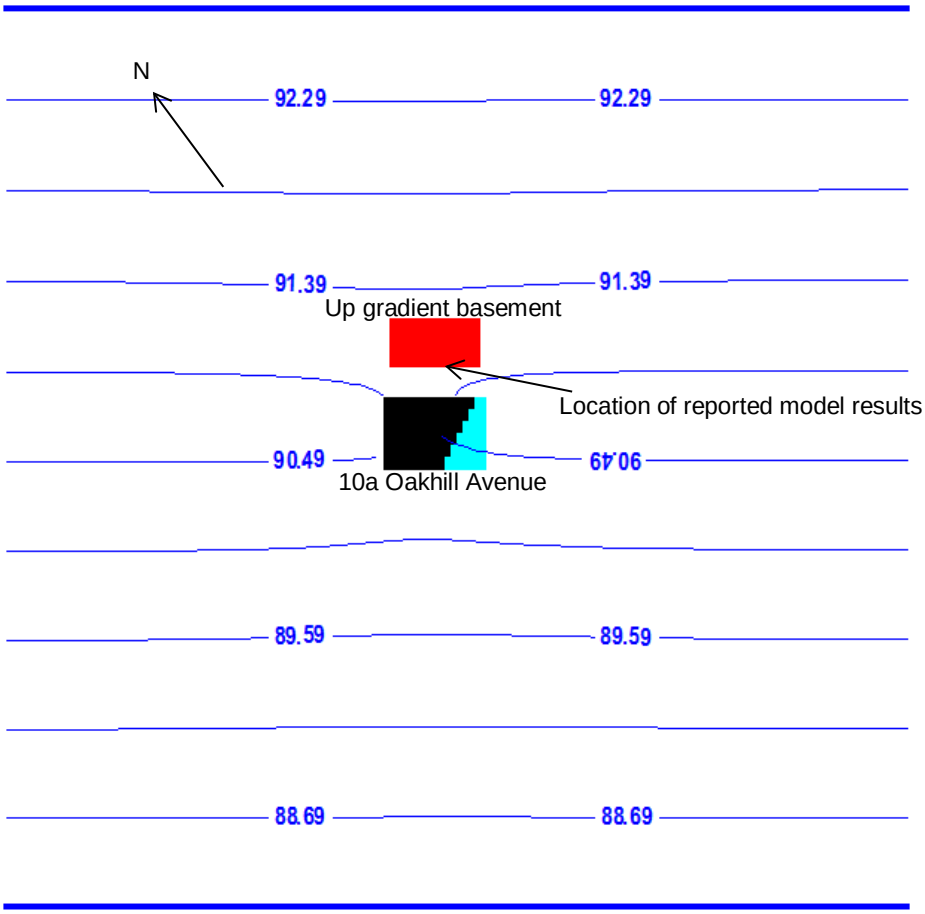


Figure 4.1 Scoping model grid and example results

4.3 Model results

Without the proposed basement in the model, simulated groundwater level in the cell immediately to the northeast of the basement (marked in Figure 4.1) was 90.71 m above an arbitrary datum. When the proposed basement was added to the model, the simulated groundwater level in the same cell rose to 90.94 m above datum: an increase in water table elevation of 0.23 m.

4.4 Sensitivity analysis

There are few parameters that lend themselves to sensitivity analysis in this simple, steady state model but hydraulic gradient has been varied to assess the range of likely outcomes. The range of sensitivity values used was 0.02 to 0.04; this was conducted by raising or lowering the general head boundary to the north and south of the model domain. These are not based upon observed values but used to check that the model is operating as expected, i.e. to see how perturbation of parameters alters model output and increases in the hydraulic gradient causes an increase in the groundwater flow leading to an increase in up-gradient groundwater level rise.

Under these parameters, the likely range of increase in groundwater level in the cell immediately to the southwest of the up gradient basement are as follows:

Table 4.1 Simulated rise in water table elevation post construction

Hydraulic gradient:	Change in head
0.02	0.19 m
0.03	0.23 m
0.04	0.13 m

These results indicate the model was sensitive to changes hydraulic gradient. The modelled water level rise is 0.23 m in the model cell adjacent to the neighbouring basements.

Furthermore, the hydraulic conductivity used in the model represents interconnected higher permeability horizons rather than isolated lenses which are typical of the Claygate Member. This represents a conservative modelling approach. However, when modelled hydraulic conductivities were reduced (to 0.01), there was little if no variation in the modelled change in head.

5 IMAPACT ASSESSMENT

5.2 IMPACTS ON GROUNDWATER FLOWS

The up-gradient adjacent property (to the NE) has a single-storey basement. It is 5 m away from the proposed basement and the lowest point is approximately 2.5 m above the estimated lowest point of the proposed basement. Given that the adjacent basement exists up-gradient of the Site it is probable that transmissive horizons of permeable material would be intersected up-gradient of the proposed development. In this case the volume of water currently transmitted through this body would be reduced and the estimate of 0.75 m^3/day could, in reality, be much smaller.

The Claygate Member will be entirely removed beneath the proposed development (figure 3.1). This means that the groundwater flow will be diverted around the proposed basement.

The development is expected to cause a relatively minor obstruction of groundwater flow leading to slightly increased flows around the proposed basement and a negligible increase in groundwater elevation on the up-gradient side of the Site. Groundwater modelling was used determine the likely scale of the impact (see section 4).

Groundwater modelling shows that the proposed development would likely cause a 0.23 m rise in water levels adjacent to the neighbouring basement. As stabilised water levels are shown to between 3.62 and 4.14 m below ground level up-gradient of the proposed development, the 0.23 m rise is within the natural fluctuation recorded at Site. Furthermore, the 0.23 m rise against the adjacent basement is a considered a maximum rise as the rise in water level would dissipate away from the proposed basement.

Down-gradient properties are also not expected to be affected by the development, because of their distance from the development and the small predicted changes to groundwater levels.

5.3 IMPACTS ON SURFACE WATER FLOWS AND FLOODING

The proposed basement will be located almost entirely beneath the footprint of the proposed lower ground floor. The northern and western corners of the basement will protrude into the garden area and form lightwells.

However as the entire development, inclusive of basement will extend beyond the current development on Site, resulting in reduction in permeable surface on-Site.

The total Site area is 1240.45 m^2. Prior to development, the Site consisted of and impermeable surface area amounting to 645.75 m^2 which will increase to 772.92 m^2 as result of the proposed development. This is an increase in impermeable surface at the Site of 127.17 m^2 from pre-development conditions.

Due to the increase in impermeable surface at the Site as a result of the proposed development, inclusive of the basement development, additional surface water (e.g. rainfall and run-off) is expected at the Site. Subsequently measures will have to be taken to attenuate this additional surface water following the competition of a sustainable drainage system assessment and detailed drainage design.

6 CONCLUSIONS

Potential impacts of the proposed basement development at 10a Oakhill Avenue have been considered as set out in the scope of works. The following summary conclusions are drawn.

6.1 Surface Water

- The Site does not fall within the catchment of the pond chain on Hampstead Heath and will therefore not impact on the water supply to the pond chain.
- The development will be located almost entirely beneath the footprint of the proposed lower ground floor development on-Site. The northern and western corners of the basement extend beyond the footprint of the overlying upper ground floor by 35.5 m^2; this area will form light wells.
- Given that the proposed development on-Site, inclusive of the basement development, will result in an increase in impermeable surface on Site, additional surface water (e.g. rainfall run-off) is expected at the Site.
- There are no known watercourses within 100 m of the Site; thus the change in permeable/impermeable surface at the Site is unlikely to cause any detrimental impact to surrounding surface water courses.
- The Site is at low risk from surface water flooding. There is no documented historical surface water flooding at the Site and the Site falls outside of identified flood risk zones. Furthermore, the Site is not at risk of flooding from from rivers or reservoirs
- The “lost river” Westbourne is located approximately 105 m north of the proposed basement (at its closest point) and flows in a south-westerly direction. However, given the distance from the proposed basement, it is unlikely that there will be any influence on the proposed development.
- The overall risk from the proposed development, inclusive of basement, is considered to be **low to medium** in terms of impact to surface water, subject to a Sustainable Drainage System assessment and detailed drainage design.

6.2 Groundwater

- The proposed basement will be constructed to an elevation of 88.66 mAOD into the underlying Claygate Member (approximately 5m thick) and London Clay Formation. The Claygate Member is a Secondary A Aquifer, and is of generally low permeability with horizons of higher permeability material. Groundwater flow within the Claygate member will preferentially occur along these horizons at an estimated hydraulic conductivity of 10 metres per day.
- The underlying London Clay is classed as unproductive Strata and is unlikely to permit significant groundwater flow. No superficial deposits are anticipated on Site.
- Groundwater modelling used to assess the impact of the basement development on groundwater suggests that the proposed development would likely cause a 0.23 m rise in water levels adjacent to the neighbouring basement. This rise falls within the natural fluctuation recorded at Site. Furthermore, the rise against the adjacent basement is a considered a maximum rise as the rise in water level would dissipate away from the basement.
- There are no known watercourses, wells (used/disused), ponds or potential spring lines within 100 m of the Site.
- Given the evidence to date, the overall risk from the proposed development is considered to be **low** in terms of impact to groundwater.

6.3 Recommendations

- A Sustainable Drainage System Assessment and detailed drainage design is recommended as part of the detailed development design to assess and manage the additional surface water/run-off that will need to be attenuated on Site and/or discharged appropriately.
- Dewatering should be undertaken during development and a watching brief should be maintained throughout construction. Any change in groundwater conditions from those anticipated (e.g. significant changes in groundwater levels or flows) should be alerted to the Local Authority.

7 REFERENCES

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APPENDICES

APPENDIX A

Site Plans

N

Martin Evans
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18 Charlotte Road
London EC2A 3PB
tel 020 7729 2474

JOB
10A OAKHILL AVENUE
HAMPSTEAD
LONDON,
NW3 7RE

TITLE
LOCATION PLAN

DATE	22.04.2013
SCALE	1:1250 @ A4
DRAWN	S.N.D

DRAWING NO. OHA-PL-EX-00A

0 1 2 3 4 8m

N

LINE OF LOWER GROUND ABOVE

Gym

Games Room

Sauna

Change Change

Cinema Room

Flat 2.

231 sqm

Games Room

Games Room

Flat 1.

217 sqm

Change Change

Sauna

Gym

Games Room

Cinema Room

LINE OF LOWER GROUND ABOVE

LINE OF LOWER GROUND ABOVE

NOTES

PLANNING

REV G 24.03.14_ Removal of the swimming-pool in the basement.

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18 Charlotte Road
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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
PROPOSED BASEMENT PLAN

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	S.N.D.

DRAWING NO. OHA-PL-PR-02 G

0 1 2 3 4 8m

NOTES

PLANNING

REV K 22.04.14_ New entrance door

Bed 4
28 sqm

Bed 3
25 sqm

En-suite
5 sqm

En-suite
5 sqm

Bed 2
33 sqm

Bed 3
19 sqm

36 sqm

29 sqm

En-suite
5 sqm

Bed 4
12 sqm

En-suite
4 sqm

Bed 2
31 sqm

Flat 1.
139 sqm

Flat 2.
129 sqm

lift

Recycling
6 sqm

En-suite
9 sqm

En-suite
17 sqm

Parking
Flat 1

Parking
Flat 2

Parking
Flat 3

Parking
2nd space
No. 8

Store
13 sqm

Parking
Flat 5

Parking
Flat 4

Parking
1st space
No. 8

Bins

EXISTING WALL
RETAINED TO SUPPORT
EXISTING TREE

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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
LOWER GROUND FLOOR PLAN

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	A.F

DRAWING NO. OHA-PL-PR-03K

0 1 2 3 4 8m

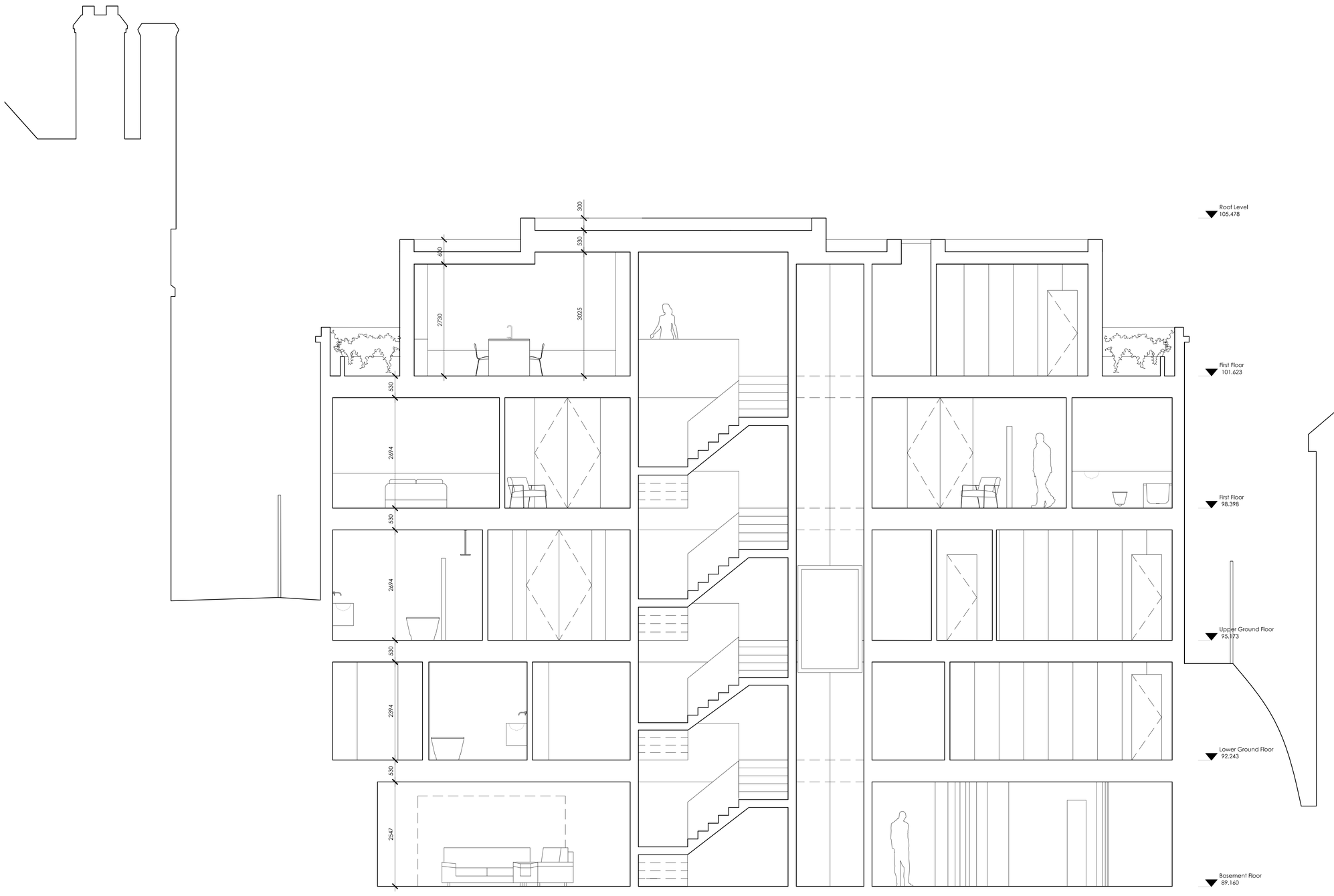
NOTES

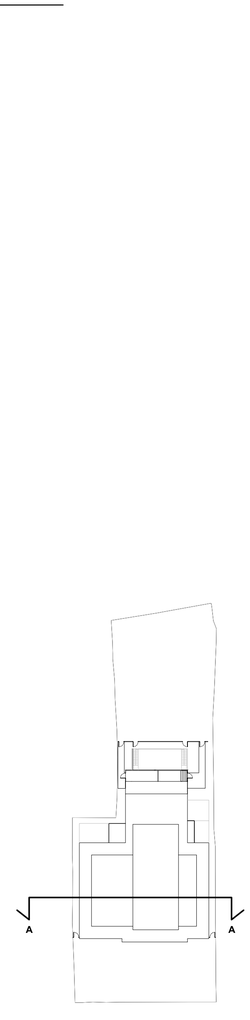
PLANNING

NOTE:

REV B 24.02.14_ Reduction of window and roof in second floor

REV C 22.04.14_ Levels corrected





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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
PROPOSED SECTION A-A

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	B.A
DRAWING NO.	OHA-PL-PR-10 C

NOTES

PLANNING

NOTE:

REV F 24.02.14_ Reduction of window and roof in second floor

REV G 22.04.14_ Levels corrected & New entrance door

0 1 2 3 4 8m

10 Oakhill Avenue

10 A Oakhill Avenue

8 Oakhill Avenue

GREEN ROOF, BEHIND & BELOW PARAPET

Roof Level 105.475

BRONZE FRAME WINDOWS

PRIVACY PLANTING

BRICK

First Floor 101.615

STONE

BRONZE FRAME WINDOWS

DARK BRONZED METAL PANEL

First Floor 98.390

TIMBER FRONT DOOR

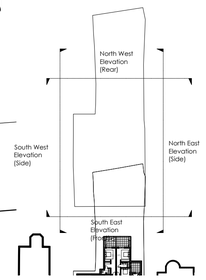
BRICK

Upper Ground Floor 95.165

ALUMINIUM GARAGE DOORS

BRICK

Lower Ground Floor 92.240



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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
PROPOSED ELEVATION
SOUTH-EAST (FRONT)

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	B.A
DRAWING NO.	OHA-PL-PR-20G

NOTES

PLANNING

NOTE:

REV B 24.02.14_ Reduction of window and roof in second floor

REV C 22.04.14_ Levels corrected

0 2 4 6 8 16m

Roof Level
105.475

Second Floor
101.615

First Floor
98.390

Upper Ground Floor
95.165

Lower Ground Floor
92.240

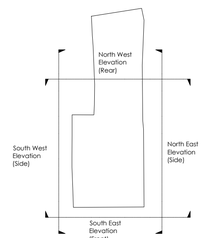
Basement Floor
89.160

Outline of No.8
Oakhill Avenue

GREEN ROOF, BEHIND & BELOW PARAPET

BRONZE FRAME WINDOW

BRICK



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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
PROPOSED ELEVATION
SOUTH-WEST (SIDE)
PRELIMINARY

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	B.A

DRAWING NO. OHA-PL-PR-21 C

0 1 2 3 4 8m

Roof Level
105.475

Second Floor
101.415

First Floor
98.390

Upper Ground Floor
95.165

Lower Ground Floor
92.240

Basement Floor
89.160

GREEN ROOF, BEHIND & BELOW PARAPET

BRONZE FRAME WINDOWS

BRICKS

PRIVACY PLANTING

PRIVACY PLANTING

BRONZE FRAME WINDOWS

BRICKS

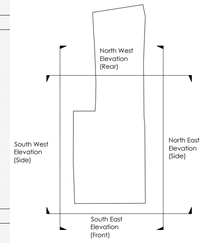
NOTES

PLANNING

NOTE:

REV C 24.02.14_ Reduction of window and roof in second floor

REV D 22.04.14_ Levels corrected



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JOB
OAKHILL AVENUE
LONDON
NW3 7RE

TITLE
PROPOSED ELEVATION
NORTH-WEST (REAR)

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	B.A
DRAWING NO.	OHA-PL-PR-22 D

0 2 4 6 8 16m

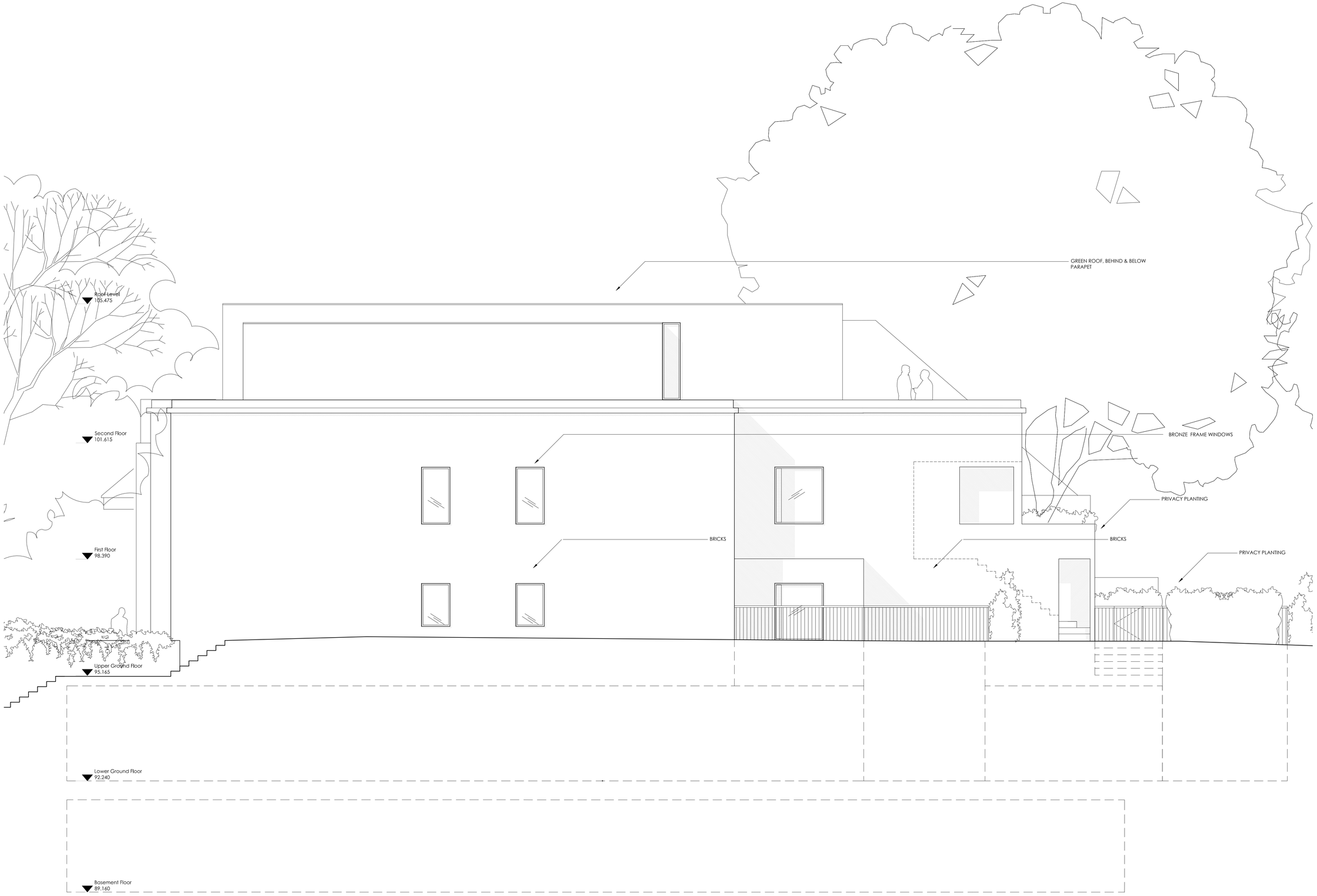
NOTES

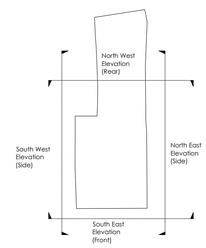
PLANNING

NOTE:

REV B 24.02.14_ Reduction of window and roof in second floor

REV C 22.04.14_ Levels corrected





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tel 020 7729 2474

JOB
OAKHILL AVENUE
LONDON
NW3 7RE

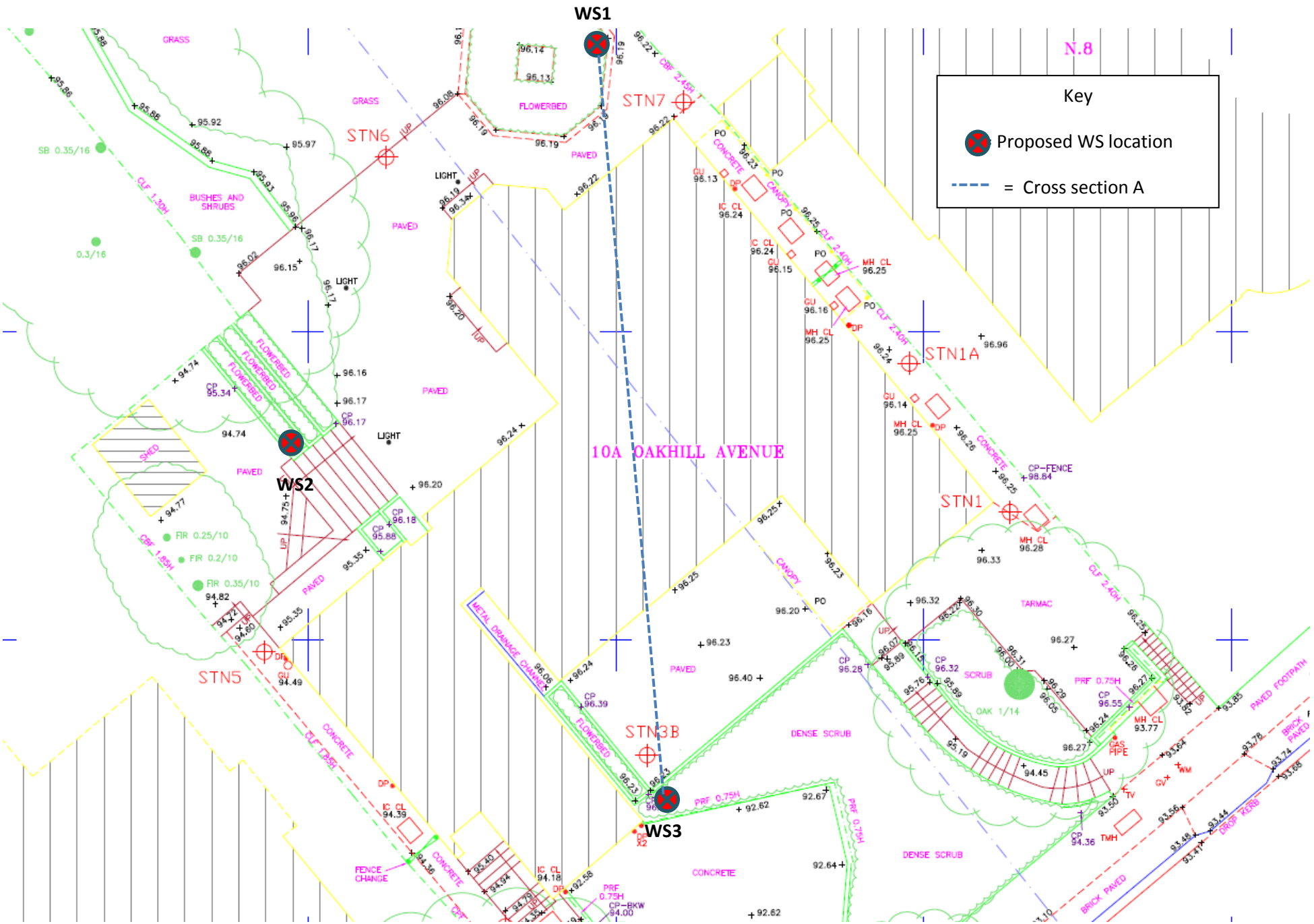
TITLE
PROPOSED ELEVATION
NORTH-EAST (SIDE)

DATE	06.02.2014
SCALE	1:50 @ A1
DRAWN	S.N.D

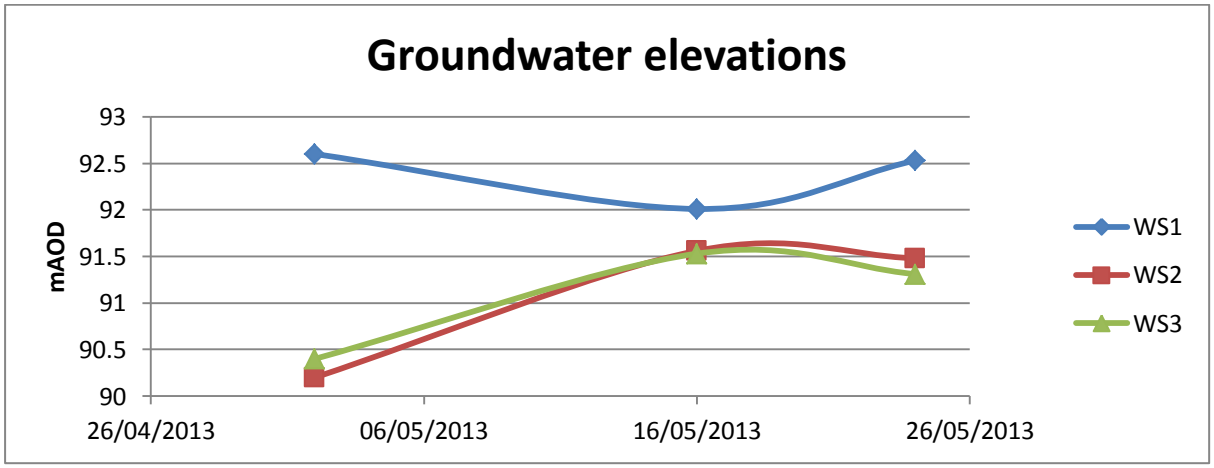
DRAWING NO. OHA-PL-PR-23 C

APPENDIX B

BGS Borehole log data


WS1
WS2
WS3
Key
Proposed WS location
= Cross section A
10A OAKHILL AVENUE
N.8
STN1
STN1A
STN3B
STN5
STN6
STN7
GRASS
PAVED
FLOWERBED
CONCRETE
TARMAC
DENSE SCRUB
SCRUB
BUSHES AND SHRUBS
METAL DRAINAGE CHANNEL
FENCE CHANGE
BRICK PAVED
PAVED FOOTPATH
DROP KERB
CANOPY
SHED
LIGHT
OAK 1/14
FIR 0.25/10
FIR 0.2/10
FIR 0.35/10
SB 0.35/16
0.3/16
CP-FENCE
CP-BKW
GAS PIPE
TWH

Groundwater data						
	02/05/2013		16/05/2013		24/05/2013	
	GW Strike (mAOD)	Rest water Level (mAOD)	Rest water Level (mAOD)	Change (m)	Rest water Level (mAOD)	Change (m)
WS1	91.75	92.6	92.01	-0.59	92.53	0.52
WS2		90.2	91.56	1.36	91.48	-0.08
WS3		90.4	91.53	1.13	91.31	-0.22



Groundwater data from site investigation report (Soil Consultants Ltd 2013 (B))

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**1 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+96.15	Grey stone dressing over TOPSOIL: Soft, very dark grey-brown, slightly sandy and gravelly, organic silt. Gravel is of ash, glass and slate.	0
	D	0.20		0.30		+95.85	Soft, locally firm, becoming stiff, locally soft and firm, below 2.7m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.50						
	D	0.90			1			1
	D	1.20						
	D	1.50						
	D	1.80			2			2
	D	2.10						
	D	2.40						
	D	2.70			3			3
	D	3.00						
	D	3.30						
Groundwater depth 3.55m [60 minutes after completion].								
	D	3.80			4			4
	D	4.30						
Groundwater strike around 4.4m depth								
	D	4.80						
					5			5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 3 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

Borehole No: **WS1**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
					5		*...continued from previous* Stiff, locally soft and firm, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	5
	D	5.30						
	D	5.80		5.95	6	+90.20	Stiff, fissured, dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	6
	D	6.30						
	D	6.80		7.00	7	+89.15	End of borehole at 7.00m.	7
					8			8
					9			9
					10			10

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :-

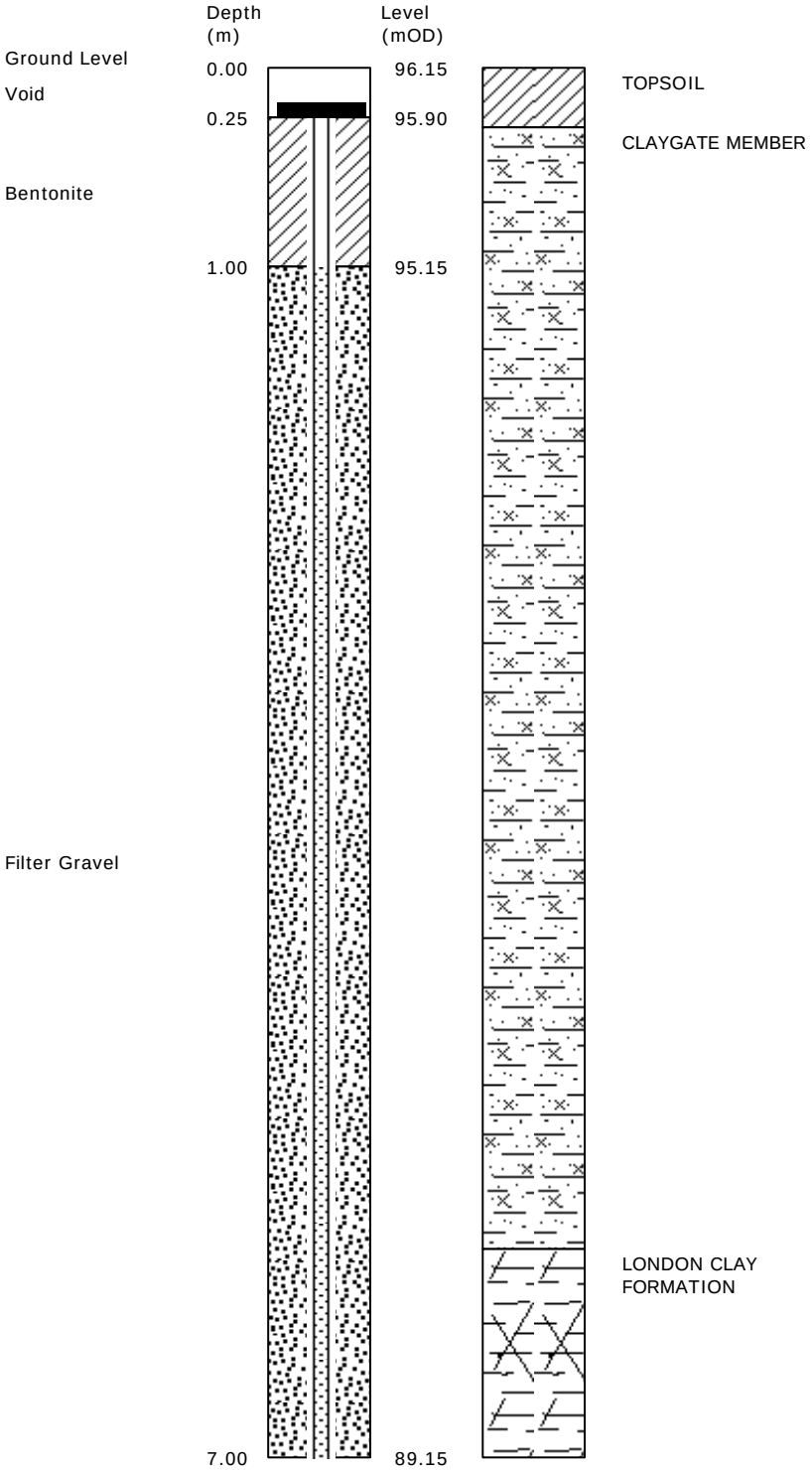
Borehole No: **WS1**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**3 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

Remarks :- [i] Pipe diameter: 19mm
[ii] Tip at 7m depth [89.15m OD approx]
[iii] Bung fitted

Borehole No: **WS1**

Site	**10a Oakhill Avenue**	Borehole No: **WS2**
Location	**London NW3 7RE**	
Client:	**Eli Nathenson**	Sheet **1 of 2**
Engineer:	**ESI Ltd**	Report No: **9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+94.75	MADE GROUND: Paving slab over light orange-brown, slightly silty sand.	0
				0.10		+94.65		
	D	0.25					TOPSOIL: Soft, very dark grey-brown, slightly sandy and gravelly, organic silt. Gravel is of brick and flint.	
	D	0.50						
				0.70		+94.05	Soft, locally firm, becoming stiff, locally soft and firm, below 3.4m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.80			1			1
	D	1.10						
	D	1.40						
	D	1.70			2			2
	D	2.00						
	D	2.30						
Rootlets at 2.5m depth.	D	2.60						
	D	2.90			3			3
	D	3.40						
	D	3.90			4			4
	D	4.40						
Groundwater depth 4.55m [10 minutes after completion].								
Borehole dry throughout boring	D	4.90						
				5.00	5	+89.75	End of borehole at 5.00m.	5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 2 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

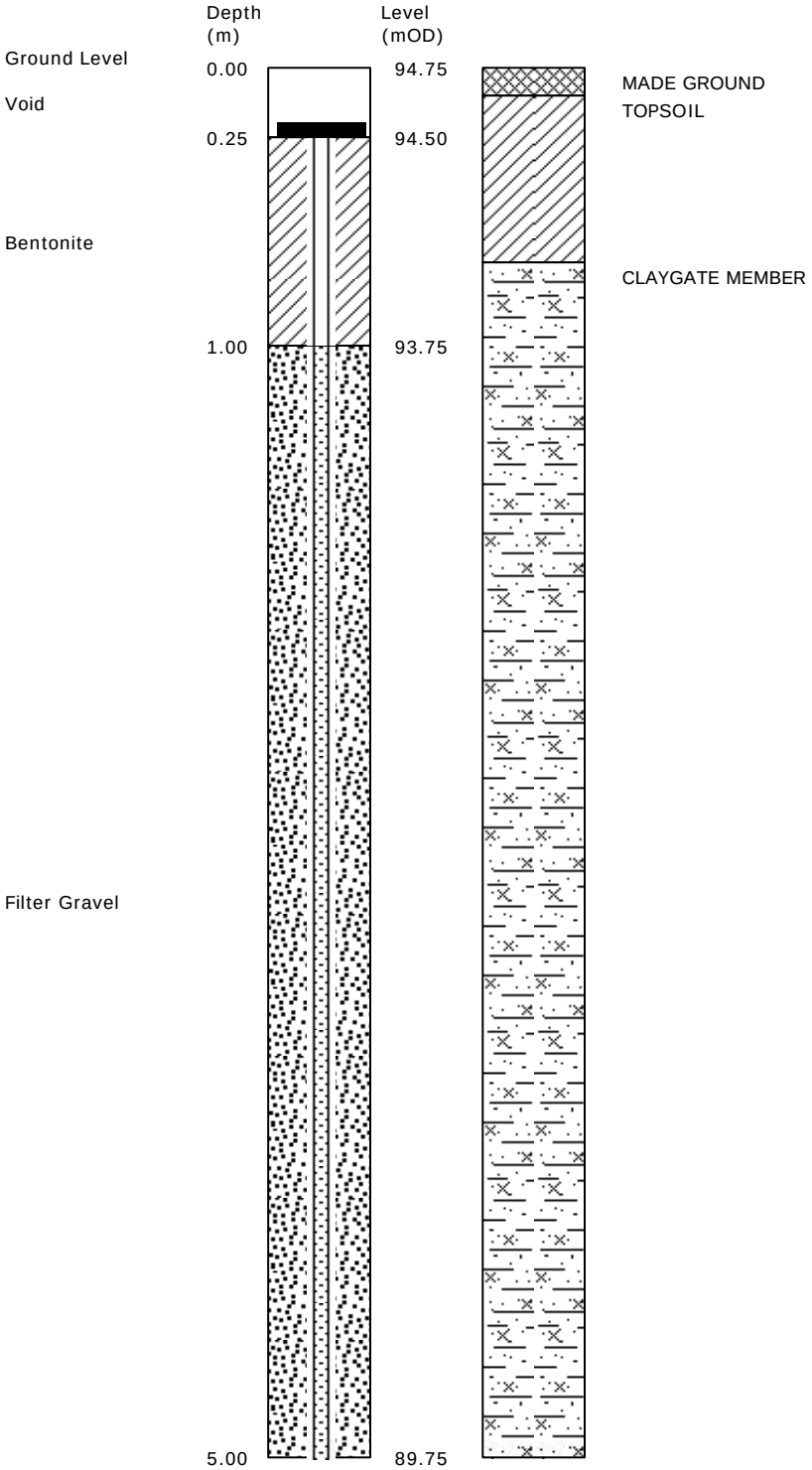
Borehole No: **WS2**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS2**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

Remarks :- [i] Pipe diameter: 35mm
[ii] Tip at 5m depth [89.75m OD approx]
[iii] Bung fitted

Borehole No: **WS2**

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS3**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**1 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+92.60	MADE GROUND: Reinforced concrete slab.	0
				0.15		+92.45	Firm, becoming stiff, locally firm, below 1.8m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.25						
	D	0.50						
	D	0.70						
	D	1.00			1			1
	D	1.30						
	D	1.60						
	D	1.90						
					2			2
Groundwater depth 2.20m [10 minutes after completion].	D	2.20						
	D	2.70						
	D	3.00			3			3
	D	3.50						
Groundwater strike around 3.6m depth								
	D	4.00			4			4
	D	4.50						
							Stiff, fissured, dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	
				4.90		+87.70		
				5.00	5	+87.60	End of borehole at 5.00m.	5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 2 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

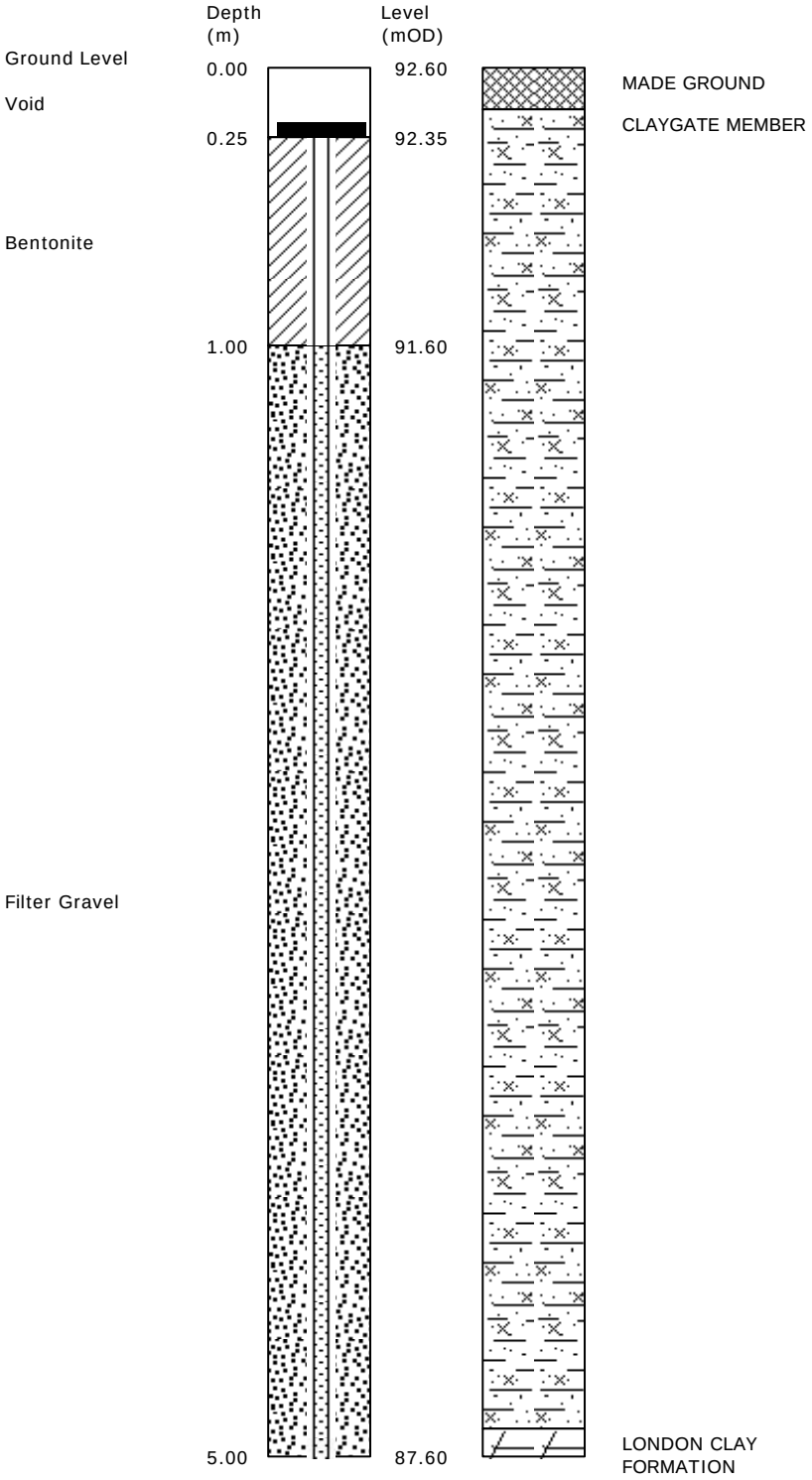
Borehole No: **WS3**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS3**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

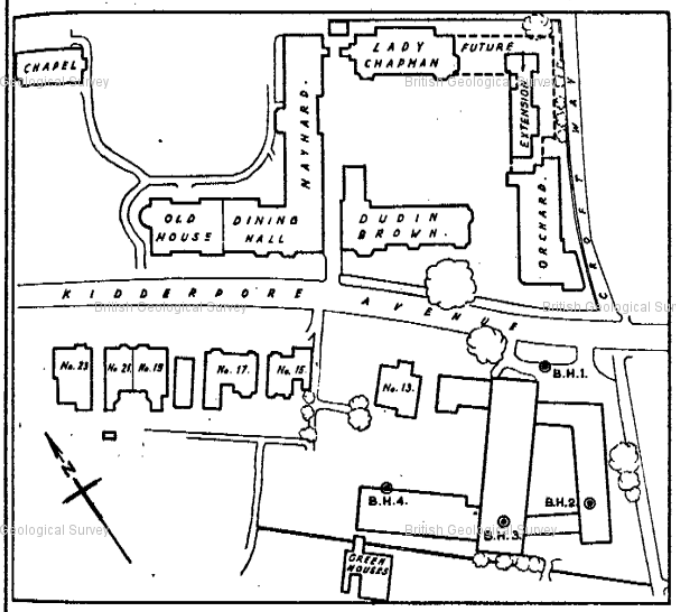
Remarks :- [i] Pipe diameter: 35mm
[ii] Tip at 5m depth [87.6m OD approx]
[iii] Bung fitted

Borehole No: **WS3**

TQ/28NE/119

1" : 256

Fig. 6.



SCALE:- 1:1000

3119

BOREHOLE	DEPTH FT.	GROUND LEVEL Ft.	LONDON CLAY Ft.	WATER LEVEL Ft.	TRIAXIAL TEST RESULTS: SAMPLE DEPTH Ft.	SHEAR STRENGTH OR COHESION (C) lb/sq ft.	ANGLE OF SHEARING RESISTANCE (ϕ)°
1	50·5	71·7	32·7	51·3	5	(1) 2230	
					15	(2) 2580	0
					21	(3) 2090	
					41	(4) 2598	0
2	35·0	62·0	48·0	37·5	-	-	-
3	50·0	62·3	47·3	55·6	7	(1) 790	
					16	(2) 1080	0
					26	(3) 1800	0
4	35·0	69·1	51·1	62·9	10	(1) 1730	
					30	2230	0

NOTE: ALL LEVELS REFERRED TO CLIENT'S DATUM WHICH IS 326·44 ft. ABOVE N.D.

LOC. 3117. WESTFIELD COLLEGE, HAMPSTEAD N.W.3.
PLAN SHOWING BOREHOLES POSITIONS ON SITE OF NEW SCIENCE BUILDING.

SOIL MECHANICS LTD.
63, OLD CHURCH STREET, LONDON, S.W.3

TQ28NE/119

2587 8575

Fig. 1

BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead, N.W.3.

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 1 DIAMETER: 8 Inch

GROUND LEVEL: 71.7 above Clients arbitrary datum DATE: 14th to 16th March, 1959

Description	Reduced Level	Legend	Sample	Depth	Thickness	M/c %
	+71.7			0'10"		
Rubble, clinker and gravel MADE GROUND	+69.9		1	1'9"	1'9"	
			2			26
Firm mottled grey and brown sandy clayey SILT becoming brown and more sandy below 7 ft. (CLAYGATE BEDS)			3			24
			4			25
			5		12'9"	24
			6			25
	+57.2		7	14'6"		24
Firm becoming stiff light grey-brown sandy clayey SILT, more clayey below 17 ft. (Probably Claygate Beds)			8		4'6"	30
	+52.7		9	19'0"		26
Stiff dark grey silty CLAY fissured and very stiff below 40 ft. Fine gypsum throughout. (LONDON CLAY)			10			29
			11			25
			12			29
			13			27
			14		31'6"	26
			15			25
			16			25
			17			24
			18			25
			19			25
			20			25
			22 21			29
	+21.2			50'6"		

END OF BOREHOLE

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
16 3 59	0730	14'6"	14'6"	7'4"
17 3 59	0730	50'6"	-	20'6"

Scale: 1 in. = 5 ft. • Disturbed Sample ▮ Core Sample △ Water Sample

SOIL MECHANICS LTD., 65 OLD CHURCH ST., S.W.3

TQ28NE/119

2587. 8575

Fig. 2

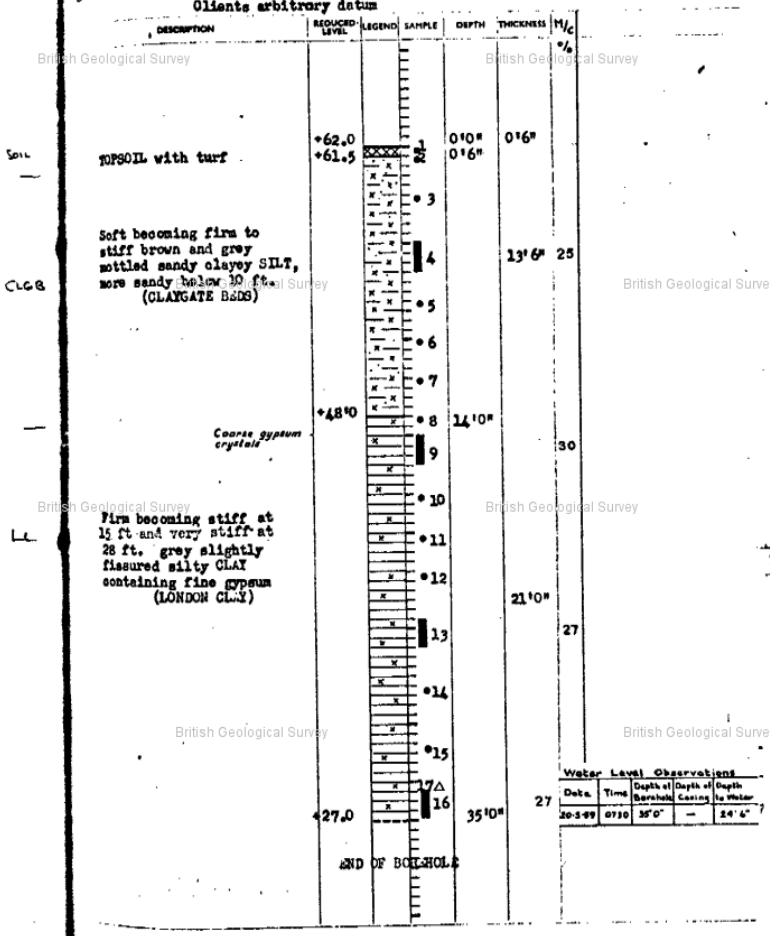
BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 2 DIAMETER: 8 inches

GROUND LEVEL: 62.0 ft. above Clients arbitrary datum DATE: 19th March, 1959



SOIL MECHANICS LTD., 65, OLD CHURCH ST., S.W.3.

TQ/28NE/119
2537.8575

Fig. 3

BOREHOLE LOG

LOCATION NO. 3117 Westfield College

CARRIED OUT FOR Council of Westfield College

BOREHOLE NO. 3 DIAMETER : 8 inches

GROUND LEVEL : 62.3 ft. above clients arbitrary datum DATE : 20th and 21st March, 1959

Description	Reduced Level	Legend	Sample	Depth	Thickness	M/C %
SOIL with turf	+62.3 +61.3		1 2	0'0" 1'0" 0.31	1'0"	
Firm becoming stiff brown and grey mottled sandy silty CLAY. Very sandy at 5 ft. 6 in. (CLAYGATE BEDS)			3 4 5 6		14'0"	28
	+47.3		7	15'0" 4.57		29
Stiff grey slightly fissured silty CLAY with fine gypsum (LONDON CLAY)			8 9 10 11 12 13 14 15		35'0"	20
Each find gypsum 39 ft. and 1 large septarian nodule.			16 17 18 19 20			29
	+12.3		21	50'0" 15.24		

END OF BOREHOLE

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
21-3-59	0730	41'0"	20' 0"	6' 6"

Scale: 1 in. = 5 ft. • Disturbed Sample ▮ Core Sample △ Water Sample

SOIL MECHANICS LTD, 65 OLD CHURCH ST, S.W.3.

3119 3120 3123 3124 3125

TQ/28NE/119

2537.8575.

Fig. 4

BOREHOLE LOG

LOCATION NO. 3117 Westfield College, Hampstead

CARRIED OUT FOR Council of Westfield College.

BOREHOLE NO. 4 DIAMETER: 8 inches

GROUND LEVEL: 69.1 ft. above clients arbitrary datum DATE: 17th and 18th March, 1959

DESCRIPTION	REDUCED LEVEL	LEGEND	SAMPLE	DEPTH	THICKNESS	M/c %
TOPSOIL with turf.	+69.1 +68.6	XXXX	1 2	0'0" 0'6"	0'6"	
Soft becoming firm (below 5 ft.) grey and brown mottled sandy silty CLAY (CLAYGATE BEDS)			3 4 5 6 7		14'6"	30
More Sandy	+54.1		8	15'0"	3'0"	28
Firm brown and grey mottled sandy clayey SILT (Probably Claygate Beds)	+51.1		9	18'0"		
Firm to stiff grey sandy silty CLAY with shell fragments and fine gypsum. (LONDON CLAY)			10 11 12 13 14		12'0"	26
Stiff grey slightly fissured silty CLAY with fine silt laminations and shell fragments (LONDON CLAY)	+39.1		15	30'0"	5'0"	24
	+34.1		17	35'0"		26

END OF BOREHOLE

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
19-3-59	0730	35' 0"	-	6' 2"

Cored 15 ft. • Disturbed Sample | Core Sample △ Water Sample

SOIL MECHANICS LTD., 65, OLD CHURCH ST., S.W.3.

B/1 (1965)

Height 405.08 O.D.

TQ/28NE/103

2608. 8603.

	Thickness (ft)	Depth (ft)	
Top Soil	¼		
Brown sand with stones	4½	¼	
Brown sandy mottled clay	4¼	4½	
Firm brown clay with layers of sand	32	9	
Very sandy brown clay	8½	41	? 81/10 of Wash
Silt with layers of silty clay	11	49½	
Soft brown mottled silty clay	2½	60½	
Silt with layers of silty clay	8	63	DB
Firm silty blue clay	11	71	CB
Hard blue clay with layers of sand	37½	82	
	119½		

B/HL (1968)

TQ/28NE/104 c. 370'+OD

2603. 8603.

	Thickness (ft)	Depth (ft)	
Dirty sand	4		
Silty clayey sand	38	4	
Silty grey clay	2	42	
Silty sand	6	44	BB
Grey silt (liquid)	10	50	
Grey clay	10	60	CB
	70		

KEY PLAN AT BACK OF REPORT.

APPENDIX C

Thames Water Sewer Flooding History Enquiry

Sewer Flooding

History Enquiry

Thames Water Property Searches
12
Vastern Road
Reading
RG1 8DB

Search address supplied 10 A
Oakhill Avenue
London
NW3 7RE

Your reference N/A

Our reference SFH_SFH_Standard_2013_2460512

Search date **29 April 2013**

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
F 0118 923 6655/57
E searches@thameswater.co.uk
I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Sewer Flooding

History Enquiry

Search address supplied: 10 A, Oakhill Avenue, London, NW3 7RE

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
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E searches@thameswater.co.uk
I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Sewer Flooding

History Enquiry

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

Although Thames Water does not have records of public sewer flooding within the vicinity, please be aware that property owners are not legally obliged to report this flooding to Thames Water. In addition flooding from private sewers, watercourses and highways drains are not the responsibility of Thames Water, and such incidents may not be noted in our records. We therefore strongly advise you to contact the current owners and occupiers of the premises and inquire about sewer flooding.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0845 9200 800 or website www.thameswater.co.uk

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
F 0118 923 6655/57
E searches@thameswater.co.uk
I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

APPENDIX D

Site Investigation Report

Report Reference: 61458R1D1
Report Status: First Draft

Soil Consultants
Ground Investigation
Geotechnical Analysis
Contamination Assessment

FACTUAL REPORT ON GROUND INVESTIGATION

PROPOSED REDEVELOPMENT:

10a OAKHILL AVENUE, LONDON NW3 7RE

Client:	**Eli Nathenson** **43 Burghley Road** **London** **NW5 1UH**
Environment Specialists:	**ESI Ltd** **New Zealand House** **160 Abbey Foregate** **Shrewsbury** **SY2 6FD**
Report ref:	**9374/MC/AW**
Date:	**24th May 2013 [Rev 0]**

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Holmer Green, High Wycombe
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Registered in England No 1814762 – 36 Harefield Road, Uxbridge, Middlesex UB8 1PH
VAT No 491 8249 15

FACTUAL REPORT ON GROUND INVESTIGATION

PROPOSED REDEVELOPMENT:

10a OAKHILL AVENUE, LONDON NW3 7RE

DOCUMENT ISSUE STATUS:

Issue	Date	Description	Author	Checked / approved
Rev 0	24 May 2013	First issue	Matthew Clarke BSc(Hons) MSc(Dipl) CGeol FGS	Alan Watson BSc (Eng) CEnv CEng MICE

TABLE OF CONTENTS

APPENDIX

1.0 INTRODUCTION

It is proposed to demolish the existing buildings of No. 10a Oakhill Avenue, London NW3 7RE, and to construct a new residential building with four storeys above ground. The design will extend the existing front-aspect lower ground floor level to become a rear-aspect basement and, across some of the existing footprint, extend down for an additional basement level and a swimming pool.

This report presents the findings of a geotechnical ground investigation.

The site is also the subject of a further report: Soil Consultants Limited's, 'Land Stability Report' [Ref 9374A/MC/TSR, dated May 2013].

This Report has been prepared for the benefit of the Client and associated parties directly involved with the design and construction of the project under direction of the Client. No reliance can be assumed by others without written agreement from Soil Consultants Limited.

2.0 SITE DESCRIPTION

The site of our investigation comprises the existing residential buildings, at number 10a Oakhill Avenue, in the Frognal and Fitzjohns district of the London Borough of Camden, at postcode NW3 7RE and approximate National Grid Reference 525690E, 185715N.

The site, which is approximately rectangular on plan, extends for some 23m along the northern side of Oakhill Avenue and 60m towards the north-west - covering an area of around 1135m². The existing buildings have a maximum of four above-ground storeys, including the front-aspect lower ground floor and are set amidst hardstanding with peripheral soft landscaping to the front and a garden to the rear. The site is bounded by further residential properties along Oakhill Avenue to the front and side and also to the rear, on Heath Drive.

The general topography slopes gently down, from Parliament Hill 500m to the NE, towards the River Westbourne, some 2.9km to the SW. The site is at an approximate elevation of +93mOD, although there are various elevation changes across the site: from a maximum of +96.25mOD near to the northern corner of the existing building, to +92.20mOD at the southern street boundary. Oakhill Avenue descends the hill along the steepest gradient and there is a fall across the length of the property of around 2.0m. The property is partially cut into the hillside and the southern half has been cut [by some 2.5m] to form an area of level hardstanding, providing access to lower ground floor garages, that are at street level at that end of the site. The northern half of the property is fronted by a terrace garden, which is accessed by stairway; rising from street level to the general 'ground floor' level of +96.2mOD. This general level extends, apart from a western corner of the rear garden which is at a lower elevation, to a point approximately mid-way along the property's length. From here the site slopes down by around 2.0m to the northern boundary.

There are rows of mature trees within the pavement on both sides of Oakhill Avenue and several mature trees, including oaks, within the gardens of the property and neighbouring properties. It is understood that the site has been the subject of an arboricultural survey and it is recommended that this be consulted with regard to tree locations, conditions, height and species.

The current site features are shown on the Site Plan which is included in the Appendix.

3.0 EXPLORATORY WORK

The ground investigation was carried out in May 2013 and the property was in residential occupancy. Potential locations for exploratory holes were therefore limited to those deemed suitable to avoid impeding site usage.

Our investigation comprised the following elements.

Window sample boreholes

Three window sample boreholes [WS1 to WS3] were completed using hand held/operated equipment under the supervision of an experienced geotechnical engineer. This technique involves driving hollow tubes of gradually reducing diameter into the ground using a hydraulically driven jackhammer. After each tube reaches the desired depth, it is removed using hydraulic jacks and the next tube is then driven. This method provides a near-continuous profile of the soil. Pocket penetrometer shear strength testing was performed at various depths and representative samples were taken for geotechnical and environmental testing. Monitoring pipes were installed in each borehole.

Groundwater monitoring

Water monitoring was carried out on two occasions following completion of the site works on 16th May and 24th May 2013.

Geotechnical laboratory testing

The following geotechnical laboratory testing was completed:

- moisture content profiling
- index properties tests [Atterberg Limits]
- pH and water-soluble sulphate tests [by QTS Environmental]

The engineering logs of the exploratory holes and the laboratory testing results to-date are included in the Appendix. The pH and sulphate results are pending and will be appended.

4.0 GROUND CONDITIONS

The geological survey map of the area indicates that the site is underlain by horizons of the London Clay Formation, with the uppermost unit, the Claygate Member at surface. Our investigation confirmed this sequence, beneath a thin cover of topsoil and made ground.

4.1 Made ground

Boreholes WS2 and WS3 were located in areas of existing hard-standing, which was 0.10m and 0.15m thick and comprised paving slabs and tarmac hardstanding, respectively.

4.2 Topsoil

Beneath the paving slab in WS2 and from surface in WS1 was soft, very dark grey-brown, slightly sandy and gravelly, organic silt topsoil. This extended to 0.30m in WS1 and included gravel-size pieces of ash, glass and slate; and in WS2 it extended to 0.70m and included gravel of brick and flint.

4.3 Claygate Member

The Claygate Member was met beneath the made ground and topsoil and, where proven, extended to depths of between 5.95m [+90.20mOD] and 4.90m [+87.70mOD]. This deposit comprised orange-brown and light orange-brown, sandy, silty clay, with pockets and partings of silty sand.

The Claygate Member was of soft, locally firm, becoming stiff consistency, but was locally soft and firm amidst the stiff. Atterberg Limits tests show these to be of low to intermediate plasticity in the Casagrande classification and, in the NHBC definition, to be soils of low volume-change potential.

Live rootlets were observed only within WS2, at a depth of 2.5m.

4.4 London Clay

The London Clay comprised fissured, dark grey-brown, slightly sandy, silty clay, with occasional pockets and partings of silty sand. The proportion of sand was lower than in the Claygate Member and the sandy pockets less frequent. Where proven the upper surface was present at depths of 4.90m and 5.95m. The London Clay was of stiff consistency.

This formation extended to the base of boreholes WS1 and WS3, at depths of 7.00m [89.15mOD] and 5.00m [87.60mOD].

4.5 Ground-water

Ground-water was encountered within the Claygate Member and rest levels of between 1.07m and 4.14m were measured during monitoring of the standpipes. The range in depths reflects the topographical variation across the site.

Water data are summarised in the table below:

BH WS	Inflows [depth & level]	Monitoring results [depth and level] 2 May 2013	16 May 2013	24 May 2013
1	Around 4.4m [+91.75mOD]	3.55m [+92.60mOD]	4.14m [+92.01mOD]	3.62m [+92.53mOD]
2	Dry	4.55m [+90.20mOD]	3.19m [+91.56mOD]	3.27m [+91.48mOD]
3	Around 3.6m [+89.00mOD]	2.20m [+90.40mOD]	1.07m [+91.53mOD]	1.29m [+91.31mOD]

GENERAL LIMITATIONS AND EXCEPTIONS

The recommendations made and opinions expressed in this report are based on exploratory techniques such as borehole/probes/trial pits, published information, examination of samples and the results of in-situ and laboratory tests.

The report is issued on the condition that Soil Consultants Ltd will under no circumstances be liable for any loss arising directly or indirectly from ground conditions between the exploratory points which differ from those identified during our investigation. In addition Soil Consultants Ltd will not be liable for any loss arising directly or indirectly from any opinion given on the possible configuration of strata both between the exploratory points and/or below the maximum depth of the investigation; such opinions, where given, are for guidance only and no liability can be accepted as to their accuracy.

Comments made relating to ground-water or ground-gas are based upon observations made during our investigation unless otherwise stated. Ground-water and ground-gas conditions may vary with time from those reported due to factors such as seasonal effects, atmospheric effects and and/or tidal conditions.

Specific geotechnical features/hazards such as [but not limited to] areas of root-related desiccation and dissolution features in chalk/soluble rock can exist in discrete localised areas - there can be no certainty that any or all of such features/hazards have been located, sampled or identified.

Where a risk of ground dissolution features as been identified in our report [anything above a 'low' risk rating], reference should be made to the local building control to establish whether there are any specific local requirements for foundation design and appropriate allowances should be incorporated into the design. If such a risk assessment was not within the scope of our investigation and where it is deemed that the ground sequence may give rise to such a risk [for example near-surface chalk strata] it is recommended that an appropriate assessment should be undertaken prior to design of foundations.

Where inspection of foundation excavations is recommended, this should be undertaken by a suitably experienced and qualified ground specialist in a comprehensive and thorough manner; appropriate inspection records should be kept.

Ground contamination often exists in small discrete areas - there can be no certainty that any or all such areas have been located, sampled or identified.

The findings and opinions conveyed in this report may be based on information from a variety of sources such as previous desk studies, investigations or chemical analyses. Soil Consultants Limited cannot and does not provide any guarantee as to the authenticity, accuracy or reliability of such information.

Our report is written in the context of an agreed scope of work between Soil Consultants Ltd and the Client and should not be used in any different context. In light of additional information becoming available, improved practices and changes in legislation, amendment or re-interpretation of the assessment or the report in part or in whole may be necessary after its original publication.

Unless otherwise stated our investigation does not include an arboricultural survey, asbestos survey, ecological survey or flood risk assessment and these should be deemed to be outside the scope of our investigation.

APPENDIX

Fieldwork, in-situ testing and monitoring

- Window sample borehole records
- Pocket Penetrometer Test results
- Ground-water monitoring results

Laboratory testing

- Index property testing
- Plasticity chart
- Volume-change potential chart

Plans and drawings

- Site Plan
- Location Maps

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**1 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+96.15	Grey stone dressing over TOPSOIL: Soft, very dark grey-brown, slightly sandy and gravelly, organic silt. Gravel is of ash, glass and slate.	0
	D	0.20		0.30		+95.85	Soft, locally firm, becoming stiff, locally soft and firm, below 2.7m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.50						
	D	0.90			1			1
	D	1.20						
	D	1.50						
	D	1.80			2			2
	D	2.10						
	D	2.40						
	D	2.70			3			3
	D	3.00						
	D	3.30						
Groundwater depth 3.55m [60 minutes after completion].								
	D	3.80			4			4
	D	4.30						
Groundwater strike around 4.4m depth								
	D	4.80						
					5			5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 3 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

Borehole No: **WS1**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
					5		*...continued from previous* Stiff, locally soft and firm, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	5
	D	5.30						
	D	5.80		5.95	6	+90.20	Stiff, fissured, dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	6
	D	6.30						
	D	6.80		7.00	7	+89.15	End of borehole at 7.00m.	7
					8			8
					9			9
					10			10

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :-

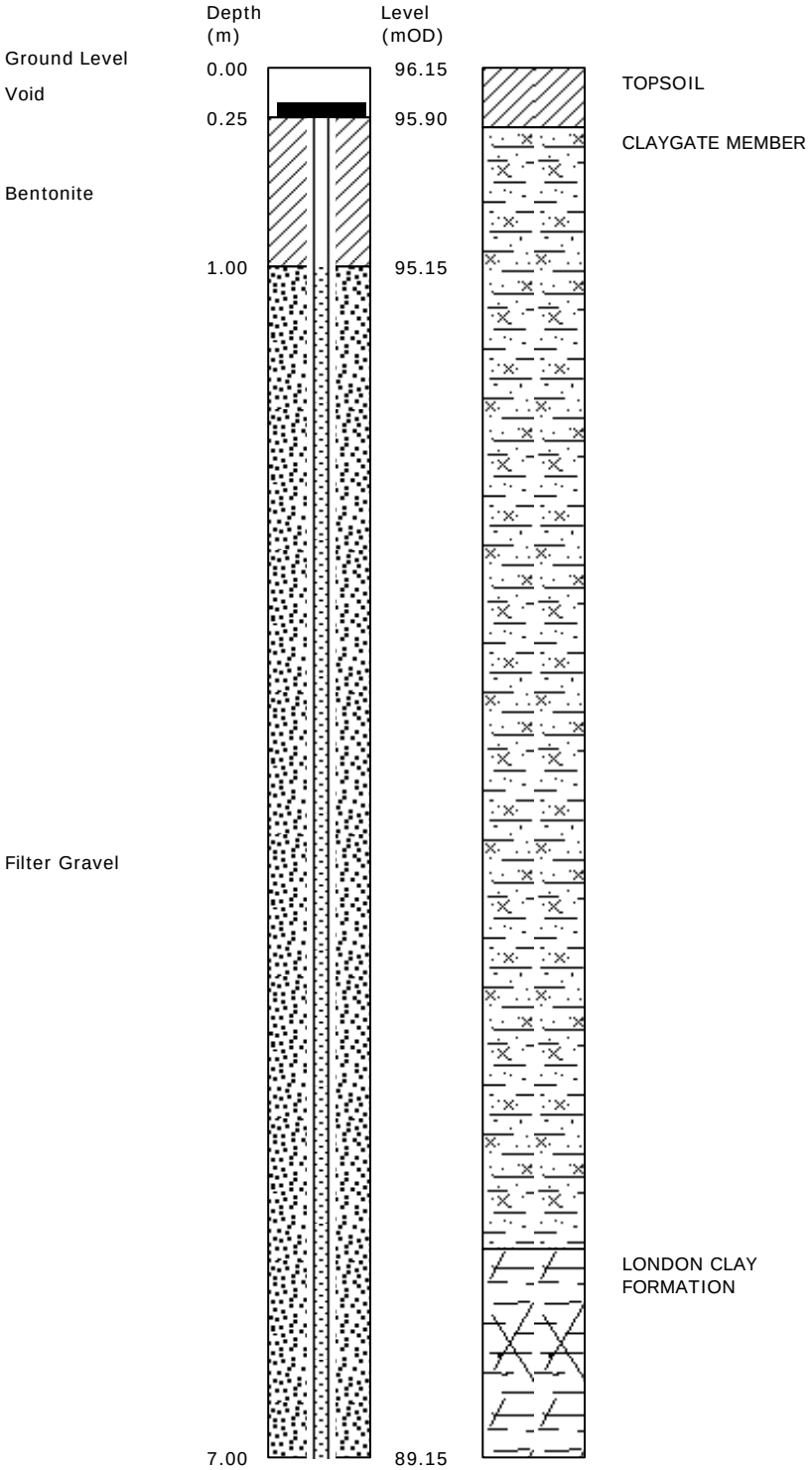
Borehole No: **WS1**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS1**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**3 of 3**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

Remarks :- [i] Pipe diameter: 19mm
[ii] Tip at 7m depth [89.15m OD approx]
[iii] Bung fitted

Borehole No: **WS1**

Site	**10a Oakhill Avenue**	Borehole No: **WS2**
Location	**London NW3 7RE**	
Client:	**Eli Nathenson**	Sheet **1 of 2**
Engineer:	**ESI Ltd**	Report No: **9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+94.75	MADE GROUND: Paving slab over light orange-brown, slightly silty sand.	0
				0.10		+94.65		
	D	0.25					TOPSOIL: Soft, very dark grey-brown, slightly sandy and gravelly, organic silt. Gravel is of brick and flint.	
	D	0.50						
				0.70		+94.05	Soft, locally firm, becoming stiff, locally soft and firm, below 3.4m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.80			1			1
	D	1.10						
	D	1.40						
	D	1.70			2			2
	D	2.00						
	D	2.30						
Rootlets at 2.5m depth.	D	2.60						
	D	2.90			3			3
	D	3.40						
	D	3.90			4			4
	D	4.40						
Groundwater depth 4.55m [10 minutes after completion].								
Borehole dry throughout boring	D	4.90						
				5.00	5	+89.75	End of borehole at 5.00m.	5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 2 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

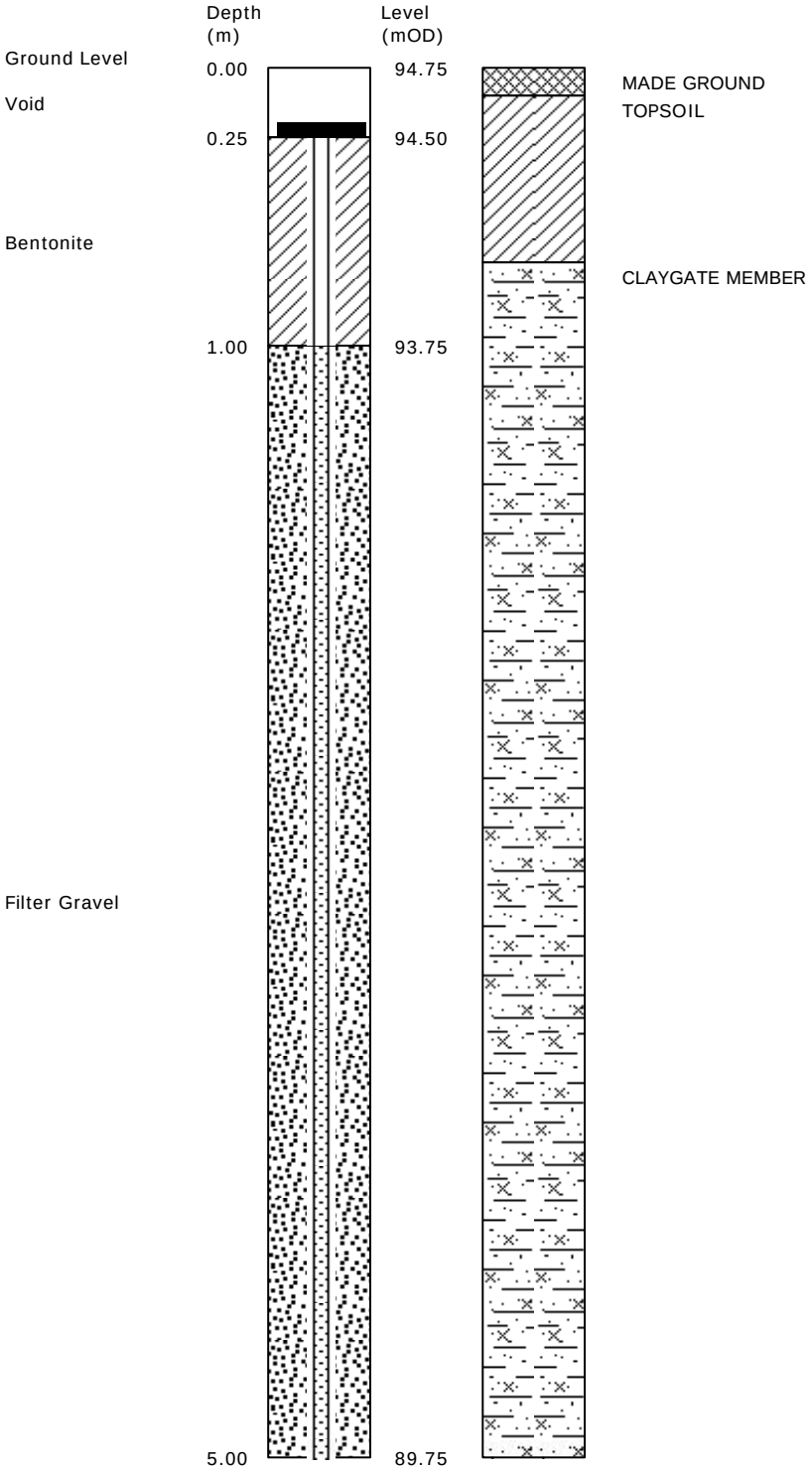
Borehole No: **WS2**

[* = extrapolated SPT 'N' value]

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS2**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

Remarks :- [i] Pipe diameter: 35mm
[ii] Tip at 5m depth [89.75m OD approx]
[iii] Bung fitted

Borehole No: **WS2**

Soil Consultants

Site	**10a Oakhill Avenue**	Borehole No:	**WS3**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**1 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Comments	Samples Type	Samples Depth[m]	Field Test	Strata Depth[m]		Strata Level[mOD]	Strata Description	Legend
Borehole conducted: 02 May 2013				0.00	0	+92.60	MADE GROUND: Reinforced concrete slab.	0
				0.15		+92.45	Firm, becoming stiff, locally firm, below 1.8m, orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	
	D	0.25						
	D	0.50						
	D	0.70						
	D	1.00			1			1
	D	1.30						
	D	1.60						
	D	1.90						
					2			2
Groundwater depth 2.20m [10 minutes after completion].	D	2.20						
	D	2.70						
	D	3.00			3			3
	D	3.50						
Groundwater strike around 3.6m depth								
	D	4.00			4			4
	D	4.50						
							Stiff, fissured, dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	
				4.90		+87.70		
				5.00	5	+87.60	End of borehole at 5.00m.	5

Constructed using tracked rig with cased percussive sampling system [plastic liner]

Key: U = Undisturbed B = Bulk D = Small disturbed W = Water S = SPT 'N' [split spoon sampler] C = SPT 'N' [solid cone] HV = Hand Vane [kPa] PP = Pocket Penetrometer [kg/cm^2]

Remarks :- Groundwater monitoring well installed on completion - see Sheet 2 for details

Ground level interpolated from Kings Land and Architectural Surveyors' survey drawing (ref. 95274.0001)

Borehole No: **WS3**

[* = extrapolated SPT 'N' value]

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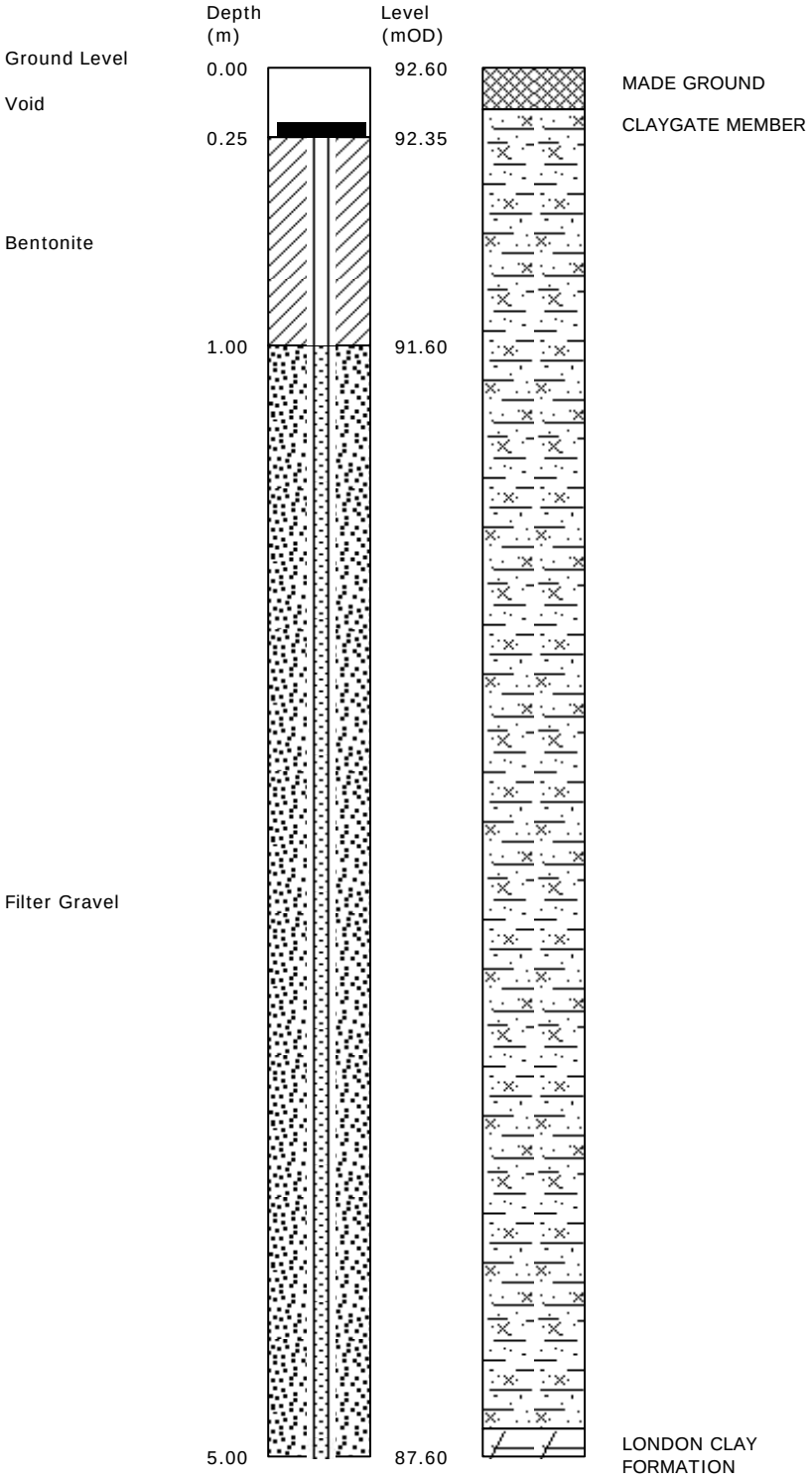
Site	**10a Oakhill Avenue**	Borehole No:	**WS3**
Location	**London NW3 7RE**		
Client:	**Eli Nathenson**	Sheet	**2 of 2**
Engineer:	**ESI Ltd**	Report No:	**9374/MC**

Borehole Installation and Backfill Details



Constructed using tracked rig with cased percussive sampling system [plastic liner]

Remarks :- [i] Pipe diameter: 35mm
[ii] Tip at 5m depth [87.6m OD approx]
[iii] Bung fitted

Borehole No: **WS3**

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

Pocket Penetrometer Test Results

WS1		WS2		WS3							
Depth [m]	Value [kg/cm²]	Depth [m]	Value [kg/cm²]	Depth [m]	Value [kg/cm²]	Depth [m]	Value [kg/cm²]	Depth [m]	Value [kg/cm²]	Depth [m]	Value [kg/cm²]
0.50	1.7	0.90	1.5	0.60	1.8						
0.75	1.2	1.20	1.3	0.90	1.6						
1.00	1.0	1.50	1.7	1.20	1.8						
1.25	0.7	1.80	1.8	1.50	1.3						
1.50	1.7	2.10	1.8	1.80	2.7						
1.75	1.7	2.40	2.0	2.10	1.9						
2.00	1.5	2.70	1.8	2.40	2.5						
2.25	1.1	3.00	1.8	2.70	2.9						
2.50	1.7	3.30	1.5	3.00	2.8						
2.75	1.9	3.60	2.2	3.30	2.4						
3.00	1.5	3.90	2.2	3.60	1.8						
3.25	1.4	4.20	2.7	3.90	2.2						
3.50	1.6	4.50	1.8	4.40	1.6						
3.75	1.4	4.80	3.4	4.90	1.6						
4.00	2.2	5.00	3.4								
4.25	2.0										
4.50	0.8										
4.75	1.2										
5.00	2.0										
5.25	2.9										
5.50	3.2										
5.75	2.6										
6.00	2.6										
6.25	1.7										
6.50	1.7										
6.75	1.6										
7.00	1.8										

Notes

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Site Location: **10a Oakhill Avenue, London NW3 7RE**

Ref: **9374/MC**

Record of groundwater monitoring

Date	Time	Well Ref	Groundwater depth from surface [m]	Depth of base of monitoring pipe from surface [m]	Comments	Recorded by
16/05/2013	10:45	WS1	4.14	6.15		AC
		WS2	3.19	4.95		
		WS3	1.07	3.40		
24/05/2013	12:00	WS1	3.62	-		MvR
		WS2	3.27	-		
		WS3	1.29	-		

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

Index Property Test Results

Sample Location	Depth (m)	Sample Description	Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Percent Passing [%]	Remarks
WS1	0.90	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	25	33	17	16	100	
	1.20	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	26					
	1.50	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	28					
	1.80	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	28					
	2.10	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	29					
	2.40	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	26					
	2.70	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	29					
	3.00	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	29	33	19	14	100	
	3.30	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	30					
	3.80	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	30					
	4.30	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	4.80	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	30					
	5.30	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	29					

Notes

- Moisture content test: BS 1377:Part 2 [1990] Clause 3.2 [value in brackets = calculated matrix moisture content for comparison with LL and PL]
- Liquid and Plastic Limit: BS 1377:Part 2 [1990] Clauses 4.4, 5.2, 5.3, 5.4 is carried out on fine grained soil matrix
- Percent passing 425 micron sieve is by estimation, by hand* or by wet sieving**
- LOI = Loss on Ignition

Sample examined by MC (Engineer)

Results checked by MC (Engineer) Certificate date : 24/05/2013

Soil Consultants

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

Index Property Test Results

Sample Location	Depth (m)	Sample Description	Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Percent Passing [%]	Remarks
WS1	5.80	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	31	39	20	19	100	
	6.30	Dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	29					
	6.80	Dark grey-brown, slightly sandy silty CLAY, with occasional pockets and partings of silty sand.	26					
WS2	0.80	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	25					
	1.10	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	24					
	1.40	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	24					
	1.70	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	2.00	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	2.30	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	28					
	2.60	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	26					
	2.90	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	3.40	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	25					
	3.90	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	26					

Notes

- Moisture content test: BS 1377:Part 2 [1990] Clause 3.2 [value in brackets = calculated matrix moisture content for comparison with LL and PL]
- Liquid and Plastic Limit: BS 1377:Part 2 [1990] Clauses 4.4, 5.2, 5.3, 5.4 is carried out on fine grained soil matrix
- Percent passing 425 micron sieve is by estimation, by hand* or by wet sieving**
- LOI = Loss on Ignition

Sample examined by MC (Engineer)

Results checked by MC (Engineer) Certificate date : 24/05/2013

Soil Consultants

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

Index Property Test Results

Sample Location	Depth (m)	Sample Description	Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Percent Passing [%]	Remarks
WS2	4.40	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	30					
	4.90	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
WS3	0.70	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	28					
	1.00	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	24					
	1.30	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	1.60	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	1.90	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					
	2.20	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	30					
	2.70	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	26					
	3.00	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	25					
	3.50	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	31					
	4.00	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	29					
	4.50	Orange-brown and light orange-brown, sandy silty CLAY, with pockets and partings of silty sand.	27					

Notes

- Moisture content test: BS 1377:Part 2 [1990] Clause 3.2 [value in brackets = calculated matrix moisture content for comparison with LL and PL]
- Liquid and Plastic Limit: BS 1377:Part 2 [1990] Clauses 4.4, 5.2, 5.3, 5.4 is carried out on fine grained soil matrix
- Percent passing 425 micron sieve is by estimation, by hand* or by wet sieving**
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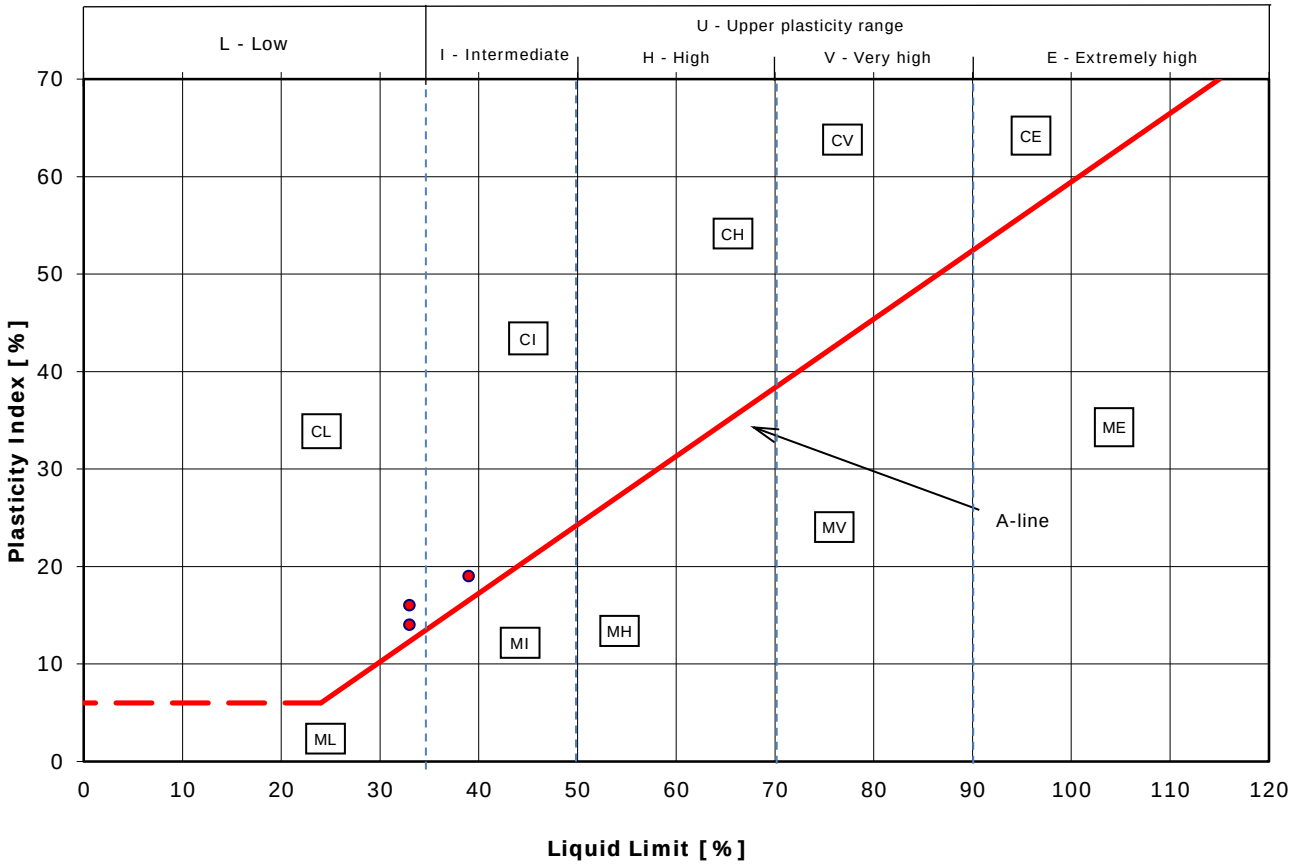
Sample examined by MC (Engineer)

Results checked by MC (Engineer) Certificate date : 24/05/2013

Soil Consultants

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

PLASTICITY CHART - BS5930 classification



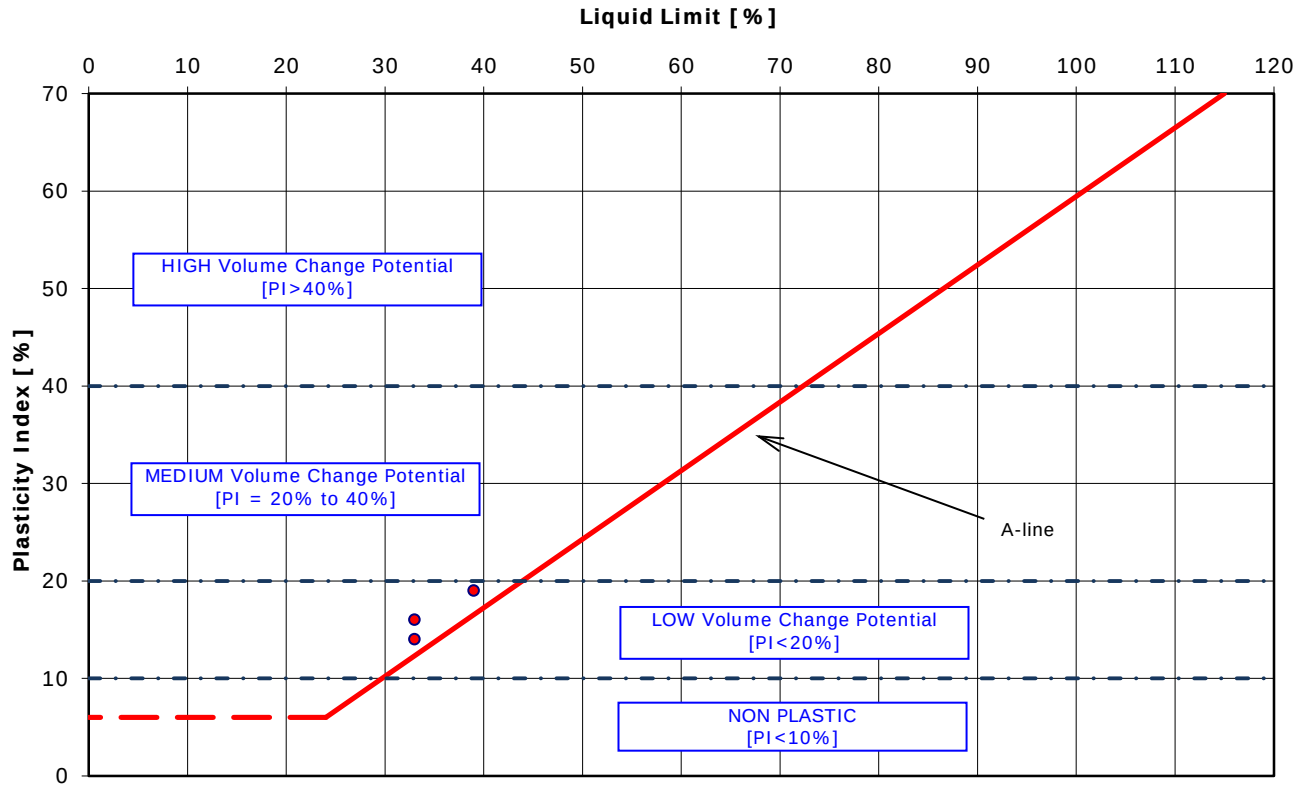
M - Silt [M-soil] plots below the A-line
C - Clay plots above the A-line

Notes:

Classification based upon BS5930:1999 'Code of practice for site investigations'

Site Location	**10a Oakhill Avenue London NW3 7RE**	Report No:	**9374/MC**

PLASTICITY CHART - NHBC classification

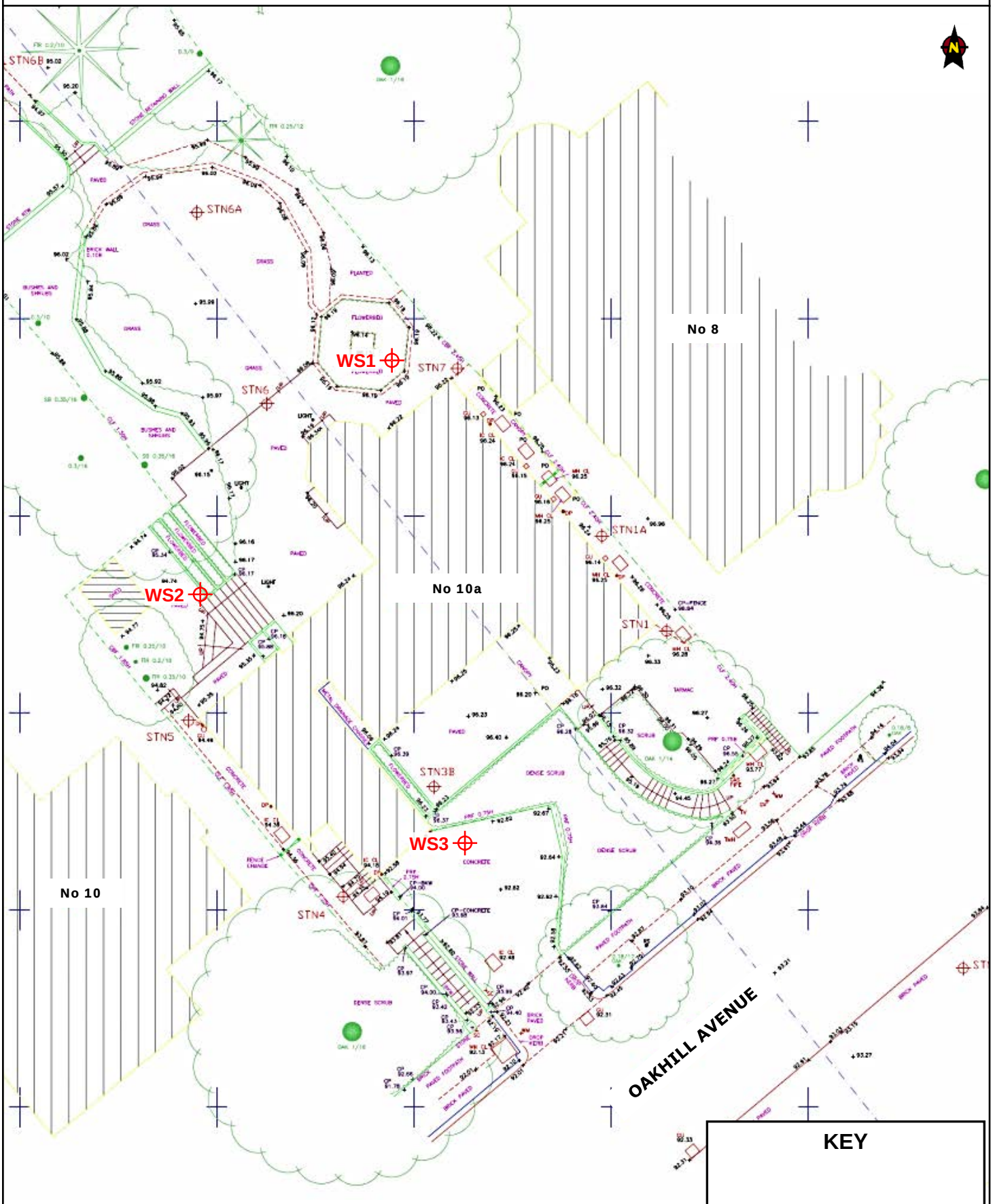


Notes:

Classification based upon NHBC Standards, Part 4 'Foundations', Chapter 4.2 'Building near trees'

Site & Location	10a Oakhill Avenue London NW3 7RE	Report No: 9374/MC

Site Plan – showing locations of exploratory holes



Based on extract from Kings Land and Architectural Surveyors' drawing 95274.0001, dated April 2013

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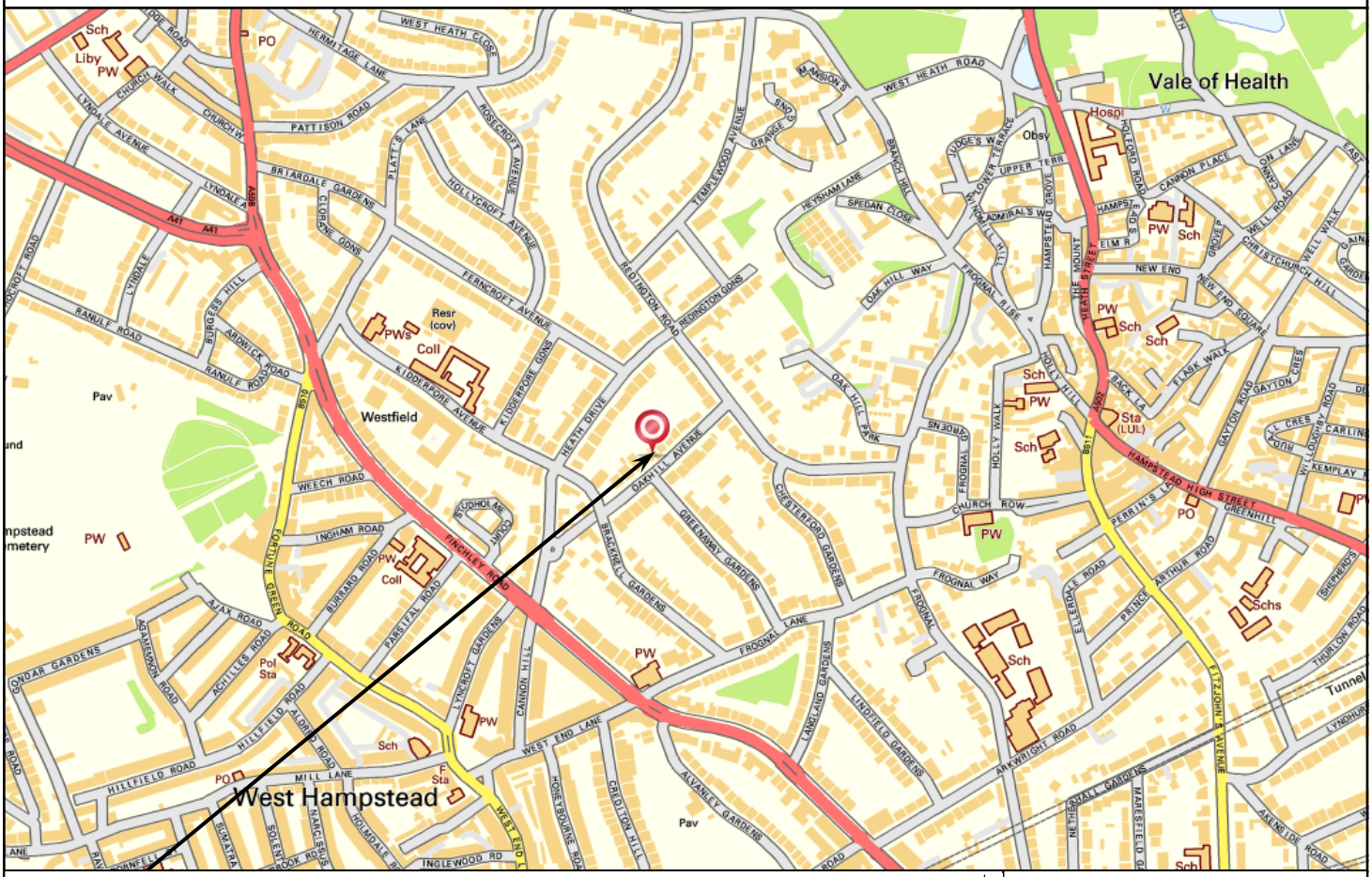
Site & Location	**10a Oakhill Avenue London NW3 7RE**	Report No: **9374/MC**

Location Maps



SITE LOCATION: approximate NGR 525690E, 185715N

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