19th January 2012

Our ref: GE8535

Rob Mclean
Corner Studio Limited
The Design Studio
94 High Street
Steyning
West Sussex
BN44 3RD

Dear Rob,

106 FROGNAL, CAMDEN, LONDON, NW3 6XU – GEOLOGY, HYDROGEOLOGY & HYDROLOGY

The following information is based on the anticipated ground and groundwater conditions from our experience of sites we have investigated in the London Borough of Camden and published information from the Environment Agency and British Geological Survey (BGS). Reference has also been made to the ARUP report 'London Borough of Camden, Camden geological, hydrogeological and hydrological study, Guidance for subterranean development'.

Ground Conditions

According to information published by the BGS the site was indicated to be underlain by clayey sands and sandy clays of the Bagshot Beds and Claygate Beds, underlain in turn by London Clay. Geo-Environmental Services Ltd has confirmed these ground conditions during previous investigations in close proximity to the site.

The **Bagshot Beds** comprise mainly of fine grained yellow, pink and brown sands with ferruginous concretions. Beds of grey clay "pipe clay" occur frequently as do beds of black flint gravel.

The **Claygate Beds** comprise alternating layers of clayey sand and sandy clays. The sands usually overlie the clays. The clays are typically brown to mauve mottled and are overconsolidated. The bed is a transitional and overlays the London Clay. It has been used extensively for brick making.

London Clay comprises a stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.

The lowest part of the formation is a sandy bed with black rounded gravel and occasional layers of sandstone and is known as the Basement Beds.

In the north London area the upper part of the London Clay has been disturbed by glacial action and may contain pockets of sand and gravel.

A review of BGS boreholes from within the surrounding area confirmed the underlying geology, for further details please refer to the borehole logs appended.

Groundwater

It is anticipated that groundwater would be present within the Bagshot Beds and Claygate Beds, but at depths greater than the proposed basement. Based on the historical river mapping of London the former rivers Westbourne and Tyburn flow in a southerly direction within culverts to the south (The Lost Rivers of London, Nicholas Barton, 1992).

In general, based on the topography of the area groundwater flows are likely to be in a southerly direction. According to the review of BGS borehole records in the vicinity of the site the groundwater level is likely to be around 8.0m bgl.

Hydrogeology

With reference to the Environment Agency website, the site is indicated to overlie bedrock classified as a Secondary 'A' Aquifer (formerly referred to as a Minor Aquifer).

Secondary 'A' aquifers are defined as fractured or potentially fractured rocks which do not normally have a high primary permeability. Although these formations will seldom produce large quantities of water for abstraction they are important both for local supplies and in supplying base flow to rivers.

Furthermore, according to the Environment Agency the site is not located within a groundwater Source Protection Zone, (SPZ). An SPZ is a protection zone placed around a well or borehole that supplies groundwater of potable quality and an SPZ is divided into three zones defined as follows:

- Zone I - the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50m.
- Zone II - a 400 day travel time from a point below the water table.
- Zone III - the area around a source within which all groundwater recharge is presumed to be discharged at the source.

The site is underlain by two aquifers divided by the impermeable cohesive London Clay; the aquifers are referred to as an Upper Aquifer and Lower Aquifer:

- Upper Aquifer – This comprises the groundwater within the River Terrace Deposits (absent at this site) and Bagshot Formation overlying the London Clay comprising a granular material.
- Lower Aquifer – This comprises the groundwater within the Lambeth Group and Upper, Middle and Lower Chalk formations underlying the London Clay.

Hydrology

The site is indicated to be outside of any current indicative tidal or fluvial flood plain, or any associated flood warning area. The nearest surface water feature is indicated approximately 350m north of the site (pond).

Conceptual Ground Model

The site is within the London Borough of Camden, London. The local geology comprises the Bagshot Formation overlying London Clay (including the Claygate Member). The latter is more than 90-130m thick and is in turn underlain by the Lambeth Group forming a lower aquifer. The thickness of the London Clay is sufficient enough to form a geological barrier between the lower aquifers and the secondary A aquifer of the Bagshot Formation.

The proposed development is for the extension of an existing basement for a terraced house within a residential street, the majority of adjoining properties include gardens and it is likely that adjoining terrace houses would have existing basements.

The local topography slopes gently down towards the south with the general hydrogeological trend being for groundwater flows towards the River Thames to the south. Nearby culverted rivers including the River Westbourne and River Tyburn flow down to and the River Thames. In addition, based on the borehole logs for the surrounding area groundwater is likely to be encountered at depths of c.8.0m bgl and is therefore unlikely to be encountered within the depth of a single storey basement c.3.50m to 4.00m bgl.

The proposal is to extend an existing basement of a terraced property the size of which is unlikely to disturb the groundwater flow.

Basement Design and Construction

The following table summarises the groundwater conditions anticipated at this site.

Groundwater	No	Depending on the location and depth of the proposed basement, standing groundwater unlikely to be encountered. BGS logs indicate groundwater to be c.10.00m bgl.
Perched water	Yes	Water may seep from within localised granular materials or possible fissured horizons. Localised seepages should be anticipated.
Ponded water	Yes	The clayey sands are of a relatively high permeability; however where more cohesive materials are present ponding may result. Drainage or tanking will be required.

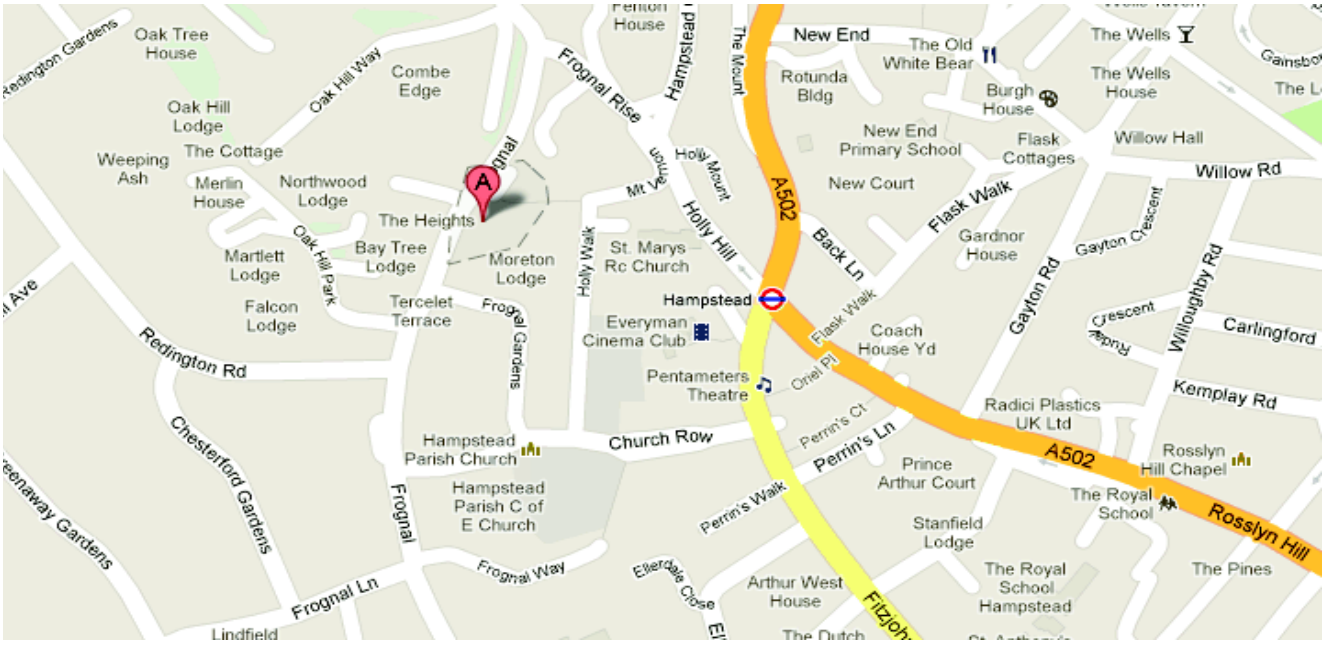
Localised water seepages and associated instability should be anticipated during excavation. Water may pond at the base of excavations. Stability and the ingress of water would be best assessed by means of excavating trial pits on site prior to construction. However, at this stage, it may be assumed that water ingress could be controlled by sumps and pumps.

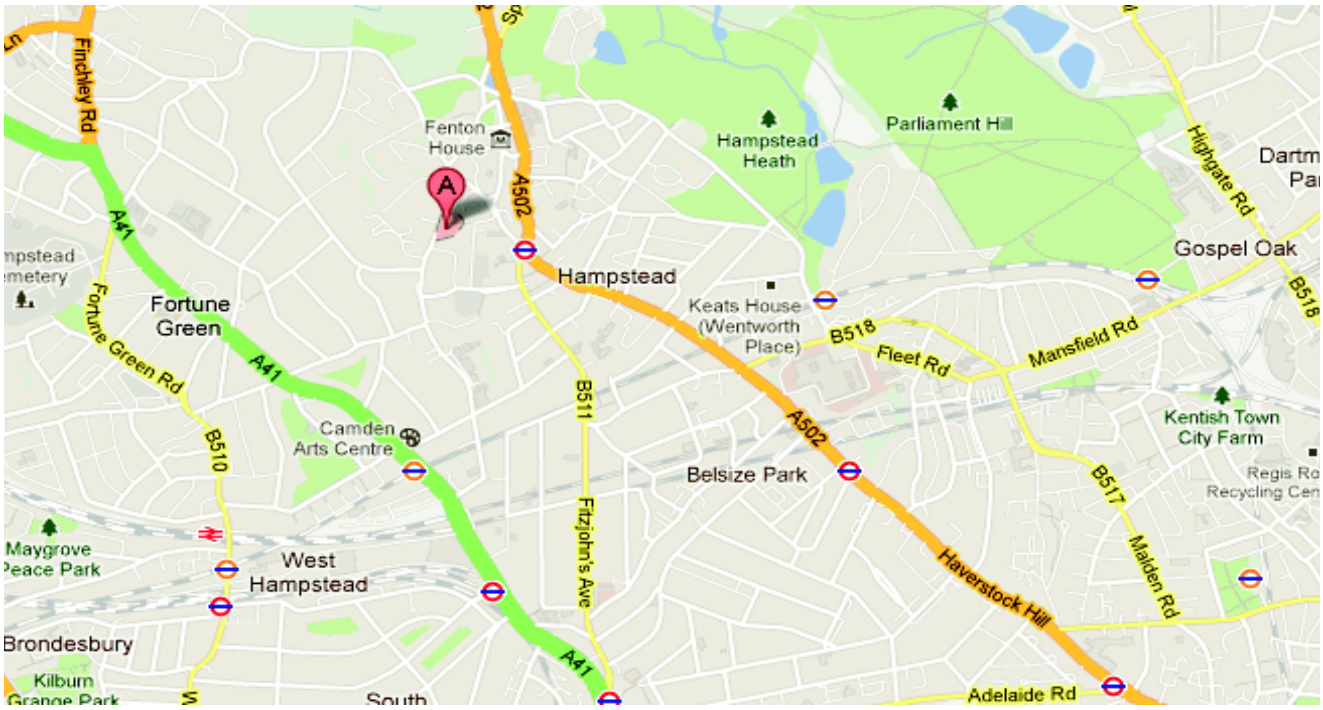
The construction of a new basement is unlikely to have any detrimental effect on the long term hydrological regime at the site or within the surrounding area.

Yours sincerely
For and on Behalf of GESL

ANTHONY POTTER B.Sc (Hons.), M.Sc., F.G.S.
Senior Geo-Environmental Engineer
Email: anthony@gesl.net

Geo-Environmental





locations are indicative unless dimensions are given

Project:	106 Frognal, London, NW3 6XU			**Title**	Site Location Plan
Client:	Corner Studio Limited			**Geo-Environmental Services Ltd**	
Ref No:	GE8535	**Revision:**	v1	**28 Crescent Road, Brighton, BN2 3RP**	
Drawn:	AP	**Date:**	19/01/2012	**T: 01273 699 399 F: 01273 699 388**	
Figure:	1	**Scale:**	Not To Scale	**E: mail@gesl.net W: www.gesl.net**	

Geo-Environmental

Project:	106 Frognal, London, NW3 6XU			**Title**	Aerial & Street View Imaging
Client:	Corner Studio Limited			**Geo-Environmental Services Ltd**	
Ref No:	GE8535	**Revision:**	v1	**28 Crescent Road, Brighton, BN2 3RP**	
Drawn:	AP	**Date:**	19/01/2012	**T: 01273 699 399 F: 01273 699 388**	
Figure:	2	**Scale:**	Not To Scale	**E: mail@gesl.net W: www.gesl.net**	

Enter a postcode or place name: Go

Other topics for this area... Risk of Flooding from Rivers and Sea

Risk of Flooding from Rivers and Sea

Map legend

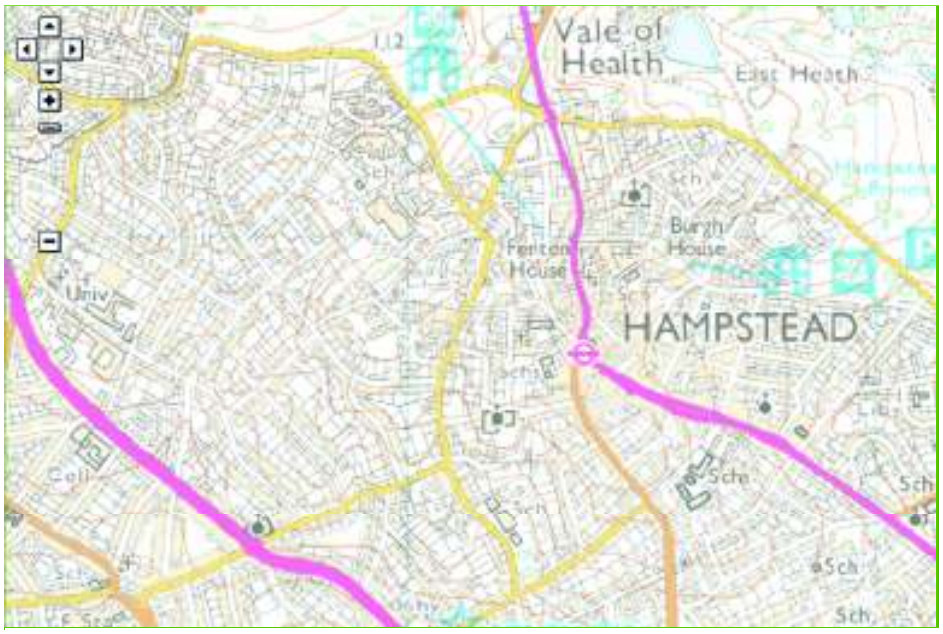
Click on the map to see what is the Risk of Flooding at a particular location.

Flood Maps

- Flooding from rivers or sea without defences
- Extent of extreme flood
- Flood defences
- Areas benefiting from flood defences
- Main rivers

X: 526,140;Y: 185,827 at scale 1:10,000

Text only version



Flood Map – Information Warnings

Manchester Ship Canal

Flood Mapping of the Manchester Ship Canal in Trafford, Salford and Warrington may be subject to revision as a result of representations. For further information please contact the Environment Agency on 03708 506 506.
Users of the Flood Zone Map should be aware that we have received a Judicial review challenge to the mapping of the Manchester Ship Canal at Trafford, Salford and Warrington on the ground that the preparation of the map is flawed In respect of our consideration of the role of the sluice gates in preventing flooding.
We are defending the challenge and believe and are advised that it is ill-founded. Nevertheless, pending determination of the challenge, users of the map need to consider whether the existence of the Challenge, and the basis of it, affects the weight they judge may be given to the zoning of the Manchester Ship Canal within the Flood Map.

More about flooding:

Understanding the flood map

A more detailed explanation to help you understand the flood map shown above.

Current flood warnings

We provide flood warnings online 24 hours a day. Find out the current flood warning status in your local area.

Flood map - your questions answered

Answers to commonly asked questions about the flood map.

creating a better place

Enter a postcode or place name: NW3 6XU Go

Other topics for this area... Groundwater

Groundwater

NW3 6XU at scale 1:75,000

Text only version

Map legend

The map displays the extents of groundwater zones

- Groundwater source protection zones
  - Inner zone (Zone 1)
  - Outer zone (Zone 2)
  - Total catchment (Zone 3)
  - Special interest (Zone 4)
- Aquifer Maps - Superficial Deposits Designation
  - Principal
  - Secondary A
  - Secondary B
  - Secondary (undifferentiated)
  - Unknown (lakes and landslip)
- Aquifer Maps - Bedrock Designation
  - Principal
  - Secondary A
  - Secondary B
  - Secondary (undifferentiated)
- Groundwater Vulnerability Zones
  - Major Aquifer High
  - Major Aquifer Intermediate
  - Major Aquifer Low
  - Minor Aquifer High
  - Minor Aquifer Intermediate
  - Minor Aquifer Low

Tell me more

British Geological Survey Aquifer data:

The Aquifer Extents are not displayed at scales greater than 1:75,000 (Ordnance Survey 1:250,000 scale) as the data was only modelled to this level and is not accurate pass this.

New BGS Aquifer Designation Maps

From 1st April 2010 new aquifer designations replace the old system of classifying aquifers as Major, Minor and Non-Aquifer. This new system is in line with our Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) and is based on British Geological Survey mapping.

Groundwater Source Protection Zones data:

The Source Protection Zones are not displayed at scales greater than 1:20,000 (Ordnance Survey 1:50,000 scale) as the data was only modelled to this level and is not accurate pass this. They should not be compared against field boundaries.

Groundwater Source Protection Zones

Groundwater provides a third of our drinking water. We ensure that your water is safe to drink defining Source Protection Zones. These zones help to monitor the risk of contamination from any activities that might cause pollution in the area.

Facts and figures of our groundwater resources

Find out more about groundwater and groundwater levels.

Enter a postcode or place name: NW3 6XU Go

Other topics for this area... Groundwater

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NW3 6XU at scale 1:75,000

Text only version

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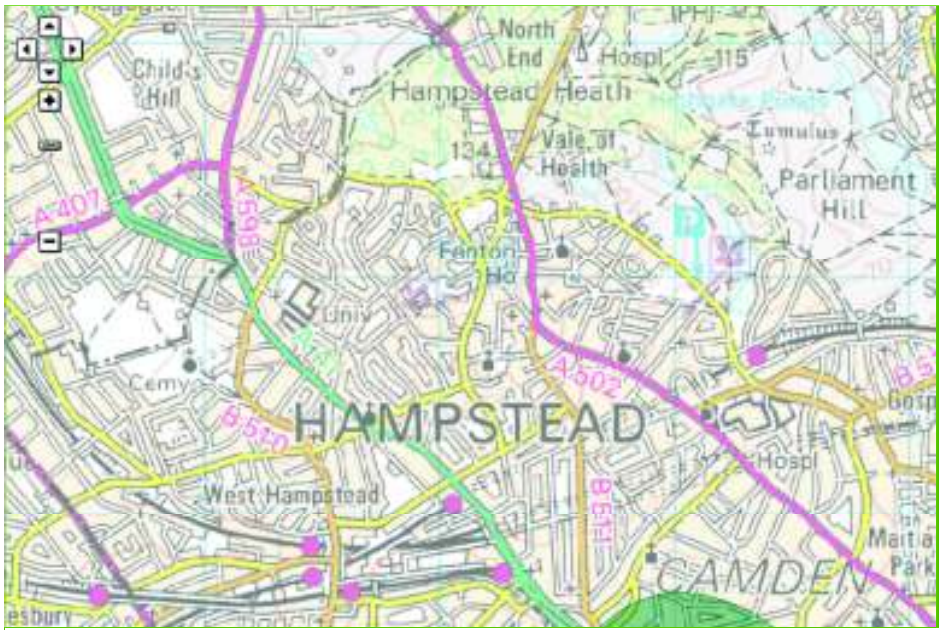
  - Minor Aquifer Low

NW3 6XU at scale 1:20,000

Text only version



Tell me more

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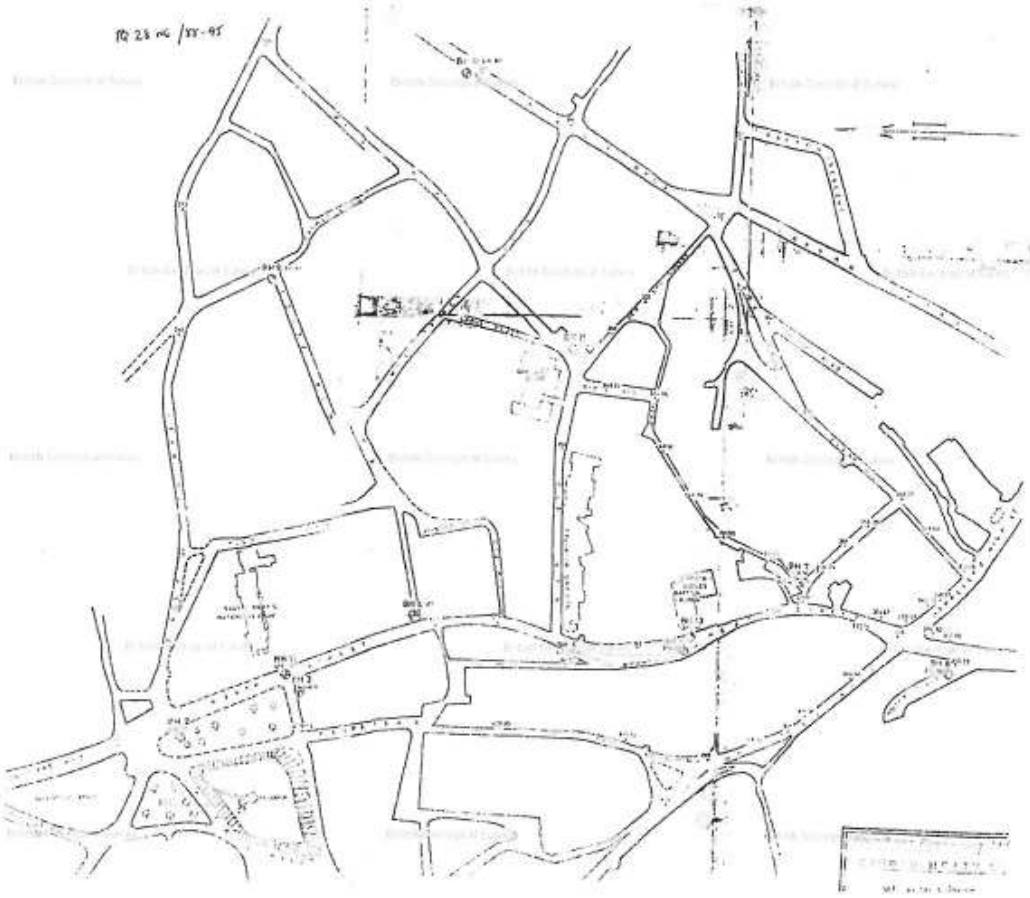
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

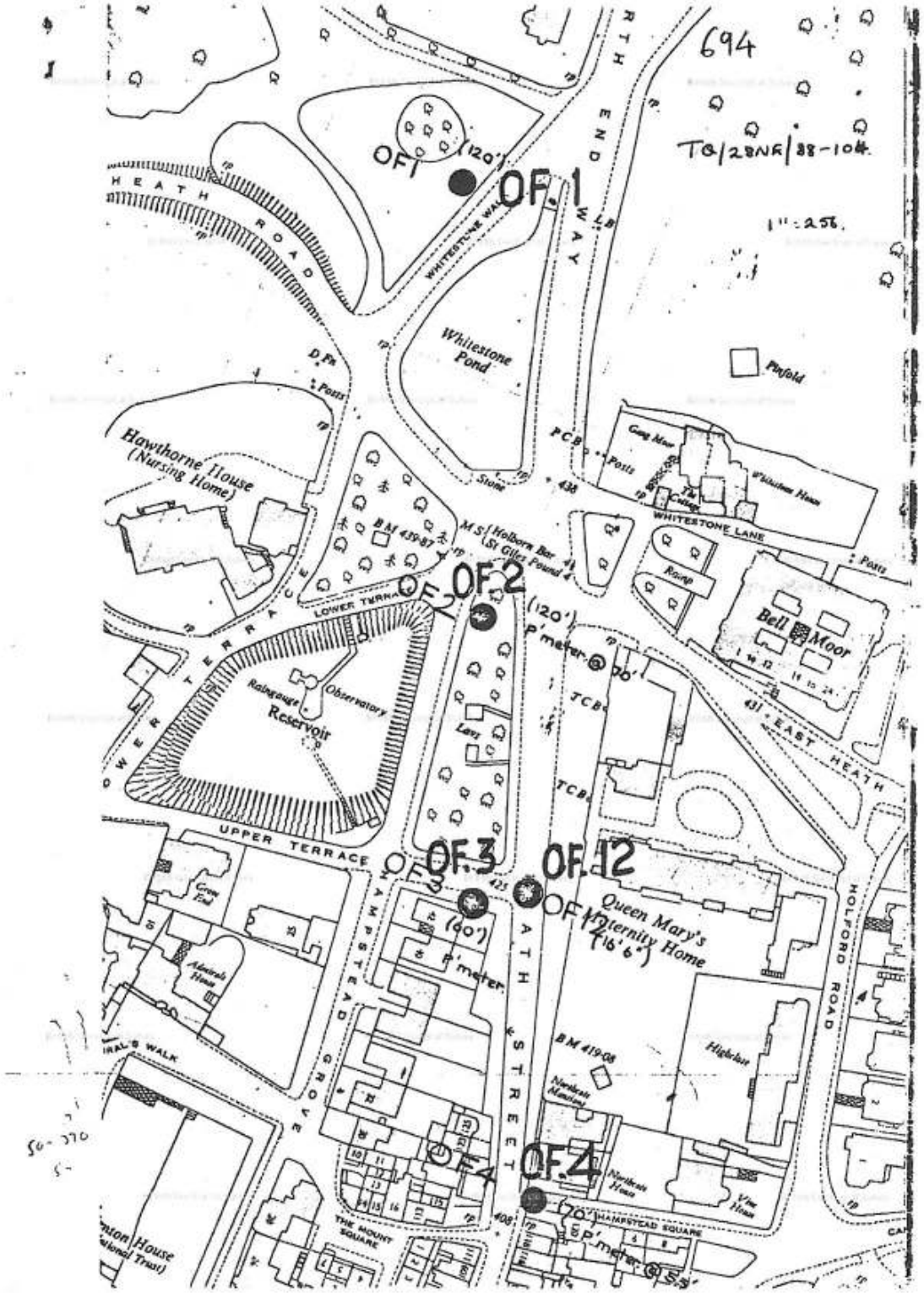
Report an issue with this borehole

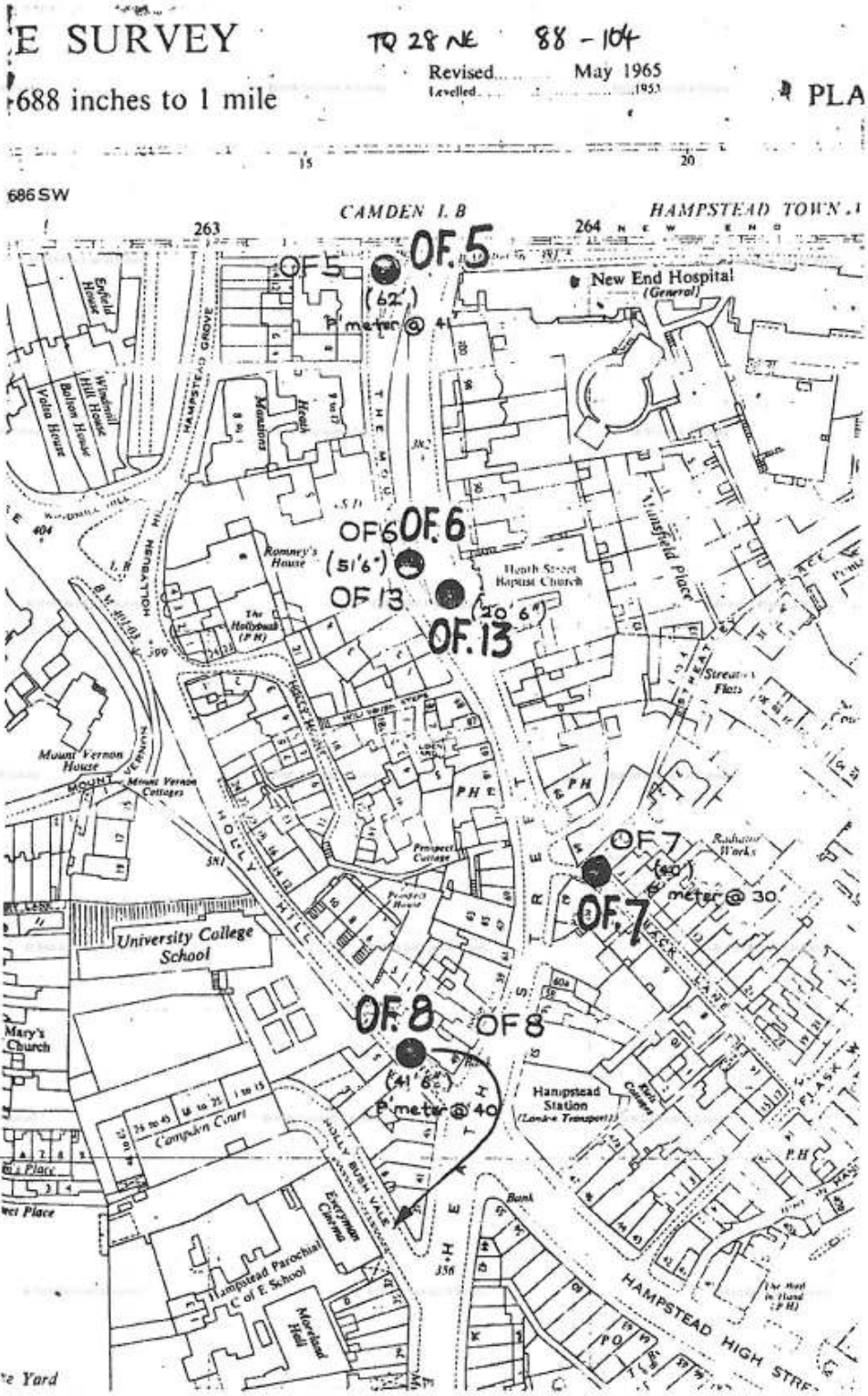


British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Report an issue with this borehole

<< < Prev Page 2 of 8 Next > >>

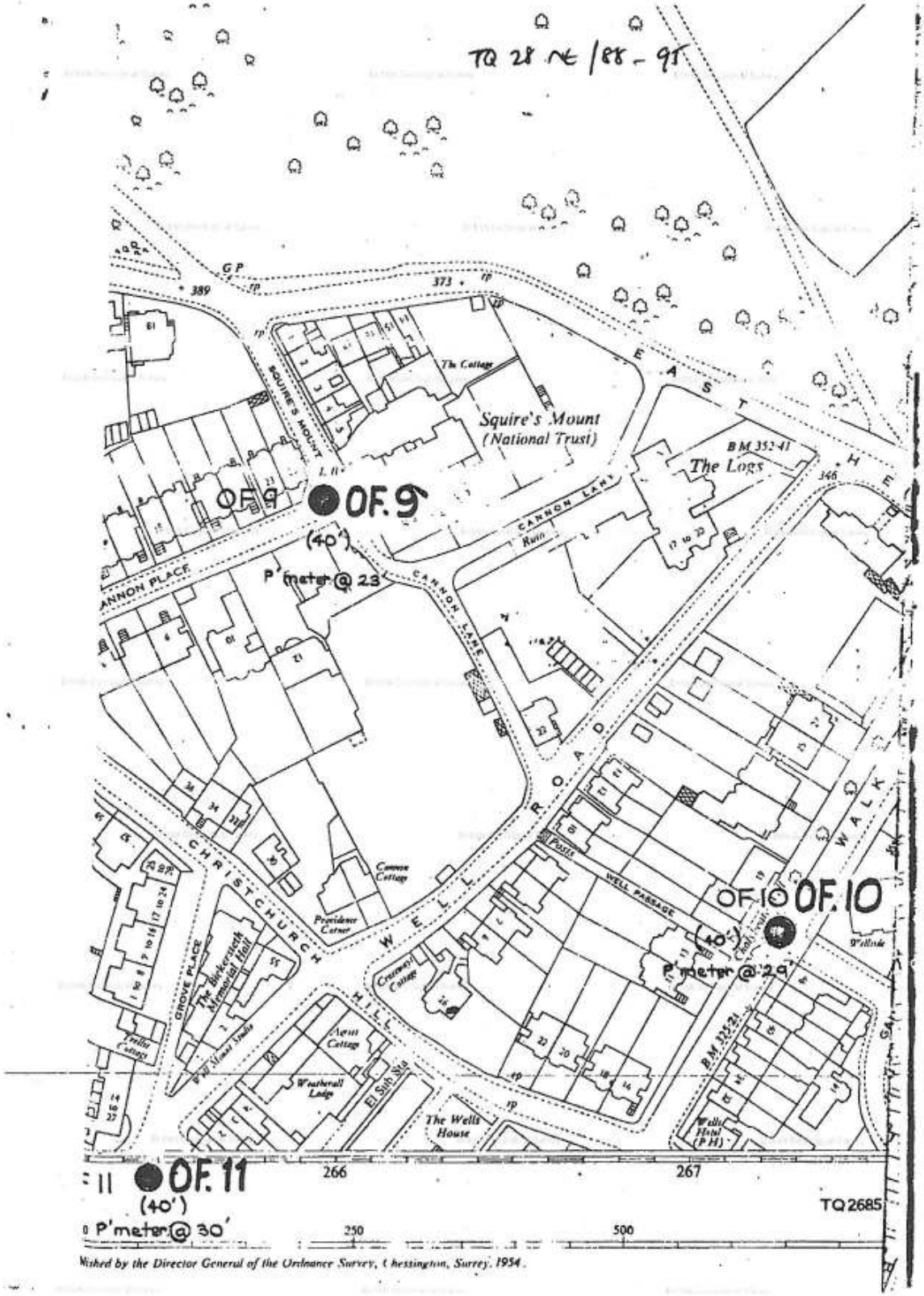




British Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Report an issue with this borehole



Printed by the Director General of the Ordnance Survey, Chessington, Surrey. 1954.

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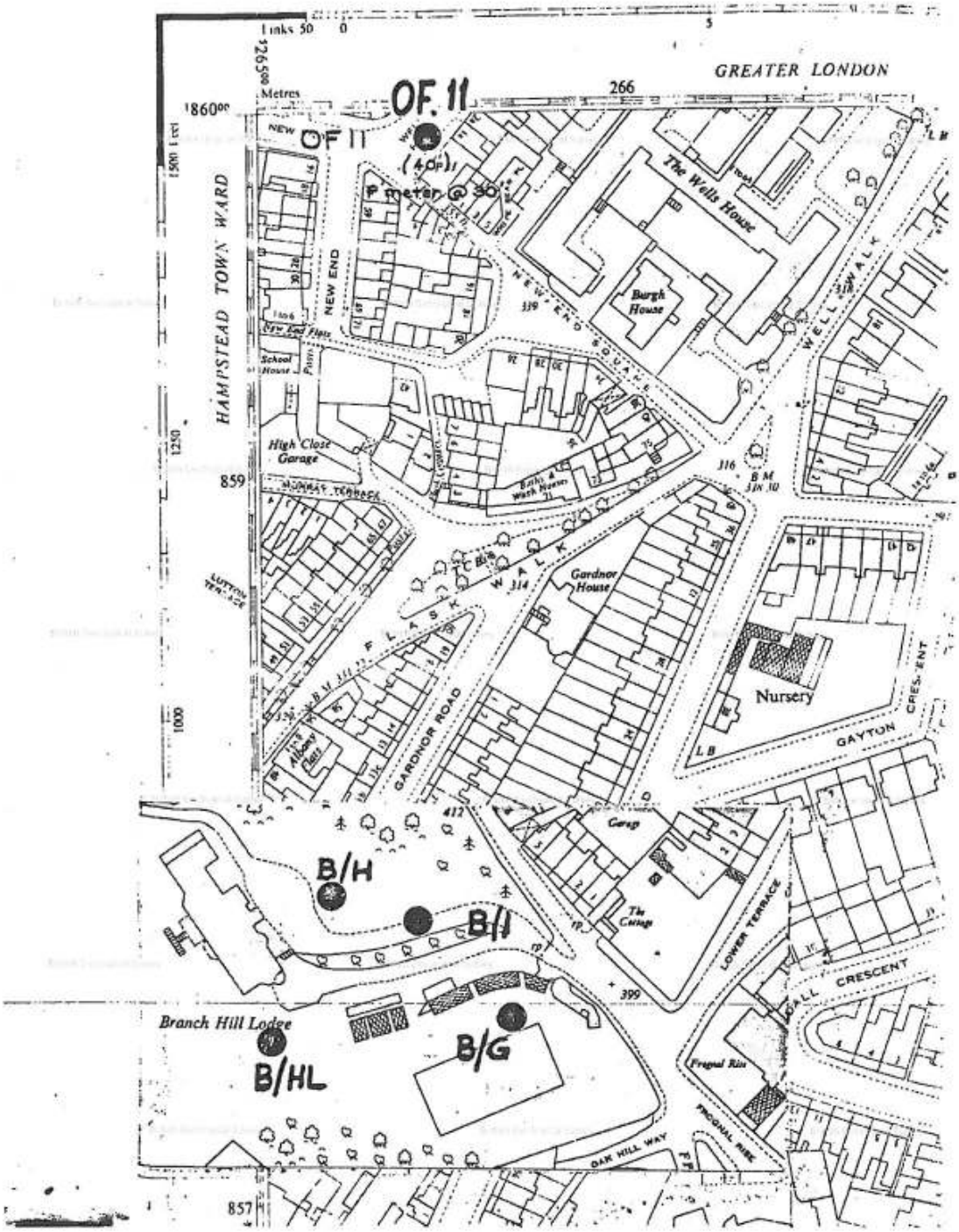
NATURAL ENVIRONMENT RESEARCH COUNCIL

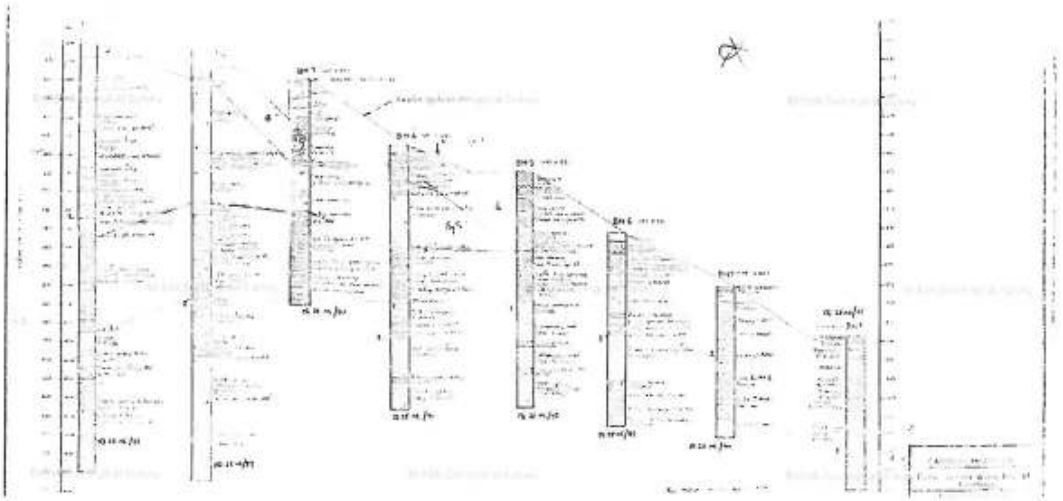
Report an issue with this borehole

PLAN TQ 2685 NE TQ 28 NE/88-95 Sc



British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Report an issue with this borehole



TQ28NE/93
2634.8593. OF.6

RECORD OF BOREHOLE No: OF6

THE MOUNT/HEATH ST, HAMPSTEAD HEATH

Location
Contract No. : A31
Type of Boring : Shell + Auger
Date (started) : 16. 5. '60

Borehole Dia : 8"
Casing :
Ground Level : 386.34'

Sheet 1 of 2

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
	DRY							MADE GROUND
		2:6	D	1			6:0	(dark brown poorly sorted sand, with some clay brick frag. roots & pebbles)
		5:0	U	2		6:0		
		7:6	D	3			5:0	Firm / stiff brown micaceous CLAY with abundant coarse & med. angular sand fragments.
		10:6	U	4		11:0		
		12:6	D	5		12:0	1:0	Compact brown sandy CLAY
		15:0	D	6		15:0	3:0	Pale fawn / pale grey CLAY, predominates over a fine SAND or clayey sand.
		17:6	D	7			7:0	Orange / brown fine SAND light grey / cream soft CLAY + grey clayey SAND (SAND predominates)
		20:0	U	8		22:0		
		22:6	D	9		23:0	1:0	Stiff cream CLAY predom. over fine SAND
							2:0	Fine brown SAND
		25:0 (N=31)	D	10		25:0	2:0	Soft / firm brown silty sandy CLAY
		27:6	D	11		27:0 28:0	1:0	Soft / firm silty sandy CLAY
		30:0 (N=25)	D	12				
32:0	4:0	32:6	D	13				extremely wet running fine brown silty SAND
32:0	4:0						12:0	
		35:0	D	14				
		37:6	D	15				
		40:0 (N=19)	D	16		(40:6)		

Water first met at 29:0 and then again at 47:0

Foundation Engineering Ltd.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Report an issue with this borehole

<< < Prev Page 8 of 8 Next > >>

TQ|28NE|93
2634.8693. OF 6

RECORD OF BOREHOLE No: OP6

THE MOUNT/HEATH ST.,
HAMPSTEAD HEATH

Borehole Dia : 8"
Casing :
Ground Level : 386.34'

No. : 491
Boring : Shell & Auger
(started) : 16 5 69

Sheet 2 of 2

Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
					40·0	1·0	Soft/firm brown silty/sandy CLAY
					41·0		
	42·6	D	17			4·0	Dark brown silty clayey SAND
	45·0	U	18		45·0		
	47·6	D	19			4·0	Firm dark grey silty sandy CLAY
					49·0		
2·0	50·0	U	20			2·6	Firm grey silty sandy CLAY
					51·6		
							Borehole Complete

Foundation Engineering Ltd.

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)
6-inch Map Registered No.
TQ 28NE/8

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: B 2

Nat. Grid Reference 2636.9592

For whom made

Town or Village Hampstead County

Exact site Junction of Finchley Rd and Holly Bush Attach a tracing from a map, or a sketch-map, if possible.

1" N.S.Map No.	1" O.S.Map No.	Confidential or not
256		

Purpose for which made Tube boring

Ground Level at shaft bore relative to O.D. 404 If not ground level give O.D. of beginning of shaft bore

Made by Date of sinking 1900

Information from LCC Date received

Examined by

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft.	Thickness In.	Depth Ft.	Depth In.
	Bagshot Beds: Macadam	1	-		
BB	Gravel & clay	2	-	3	-
	sand	12	6	15	6
	Yellow clay	32	6	48	-
	clay	120	6	168	6
CB	light clay in memoir				
In Memoir	claygate beds: Sand and stone layers 6" to 6'			175	
	Blue sandy clay	75'	-	129	-
	Blue clay	30	-	159	-
LC	London clay: Blue sandy clay (top bed of L. clay)	10	-	169	-
	stiff blue clay	36	-	205	-
	Lobes unreached Rods				

C.W.B.Ltd. Gp.863

TQ|28NE|94
2641.8584. OF 7

RECORD OF BOREHOLE No: OF 7

BACK LANE,
HAMPSTEAD HEATH

No : 431
Boring : Shell + Auger
Started) : 19.5.69

Borehole Dia : 8"
Casing : 6" to 40·0
Ground Level : 369·350

Water Level	SAMPLES Depth	Type	No	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
					1·0	1·0	MADE GROUND + Topsoil
	2·6	D	1				Light brown fine compact micaceous clayey SAND
	5·0	U	2			7·0	(= pale grey CLAY + brown SAND)
	7·6	D	3		8·0		
	10·0	U	4		10·0	2·0	Compact golden brown + grey clayey SAND
	12·6	D	5			4·0	Firm cream/grey CLAY, predominates over golden brown fine sand.
					14·0		
	15·0	U	6				Cream/light grey soft + firm CLAY, + wet very fine brown sand
	17·6	D	7			9·0	(= wet mottled micaceous silty sandy clay)
	20·0 (N=16)	D	8				
	22·6	D	9		23·0		(as above)
25·0	25·0 (N=19)	D	10			5·6	darker in colour
25·0	27·6	D	11		28·6		Silty SAND predom. over clay bands + lenses.
	30·0	U	12			6·6	(= dark grey micaceous silty clayey sand)
	32·6	D	13				
	35·0	U	14		35·0		(as above)
	37·6	D	15			5·0	CLAY content now firm/stiff is very much increased.
40·0	40·0	U	16		40·0		

Borehole Complete.

Water first met at 18·0

Piezometer installed at 30·0

Foundation Engineering Ltd.

TQ/28NE/95
2638.8078. OF 8

RECORD OF BOREHOLE No: OF 8

HOLLY BUSH VALE,
:HAMPSTEAD HEATH

: No. : 481
Boring : Shell + Auger
(started) : 20.5.65

Borehole Dia : 6"
Casing :
Ground Level : 356.863'

Sheet 1 of 2

Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
					2:0	2:0	MADE GROUND (Brick Rubble)
	2:6"	D	1				Mottled grey, orange brown + light brown firm slightly sandy CLAY
	5:0	U	2		6:0	4:0	
	7:6	D	3				Loose dry golden brown fine micaceous SAND (very local soft grey clay pockets)
	10:0	U	4		11:0	5:0	
	12:6	D	5		13:0	2:0	Light brown silty soft/ firm CLAY + fine orange brown sand.
	15:0	U	6		16:0	3:0	Firm brown sandy CLAY
	17:6	D	7		18:0	2:0	Grey silty firm CLAY + fine brown sand.
	20:0	U	8				
	22:6	D	9				
	25:6	U	10				Dark grey stiff silty micaceous CLAY, (locally greenish tinge)
	27:6	D	11			23:6	
	30:6	U	12				358 / 345
	32:6	D	13				
	35:0	U	14				
	37:6	D	15				
4:0	40:0"	U	16		40:0		

Water first met at 32:0
Piezometer installed at 40:0

Foundation Engineering Ltd.

TQ28NE/95
2685. 8578. OF.8

RECORD OF BOREHOLE No: OF3

HOLLY BUSH VALE,
HAMPSTEAD HEATH

Borehole Dia : 6"
Casing :
Ground Level : 356.863'

No. : 431
Boring : Shell + Auger
(started) : 20.5.'69

Sheet 2 of 2

Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
							as on sheet 1.
					41·6		Borehole Complete

Foundation Engineering Ltd.

TQ28NE/100. 2636 8591. OF.13

RECORD OF BOREHOLE No: OF13

HEATH ST./THE MOUNT
:HAMPSTEAD HEATH

Borehole Dia : 6"
Casing :
Ground Level : 360·38'

:ct No. : 431
/ Boring : Shell & Auger
(started) : 28. 5.'69

Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
						2:6	MADE GROUND (Asphalt & Concrete)
					2:6		
						3·6	Compact very sandy GRAVEL
	6:0	U	1		6:0		
	7:6	U	2				
							Firm brown sandy silty CLAY
	11:0	U	3			11:0	
	14:0	U	4				
	15:6	U	5				
	17:6	U	6		17:0		Med. dense brown SAND
						3:6	
					20:6		
							Borehole Complete

Probable cavity from 9:0 to 11:0

Foundation Engineering Ltd.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

TQ28NE/91 2628 8609 OF 4

RECORD OF BOREHOLE No: 01-4

Location : HAMPSTEAD SQUARE, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell + Auger
Date (started) :
Borehole Dia : 8"
Casing :
Ground Level : 407.040'

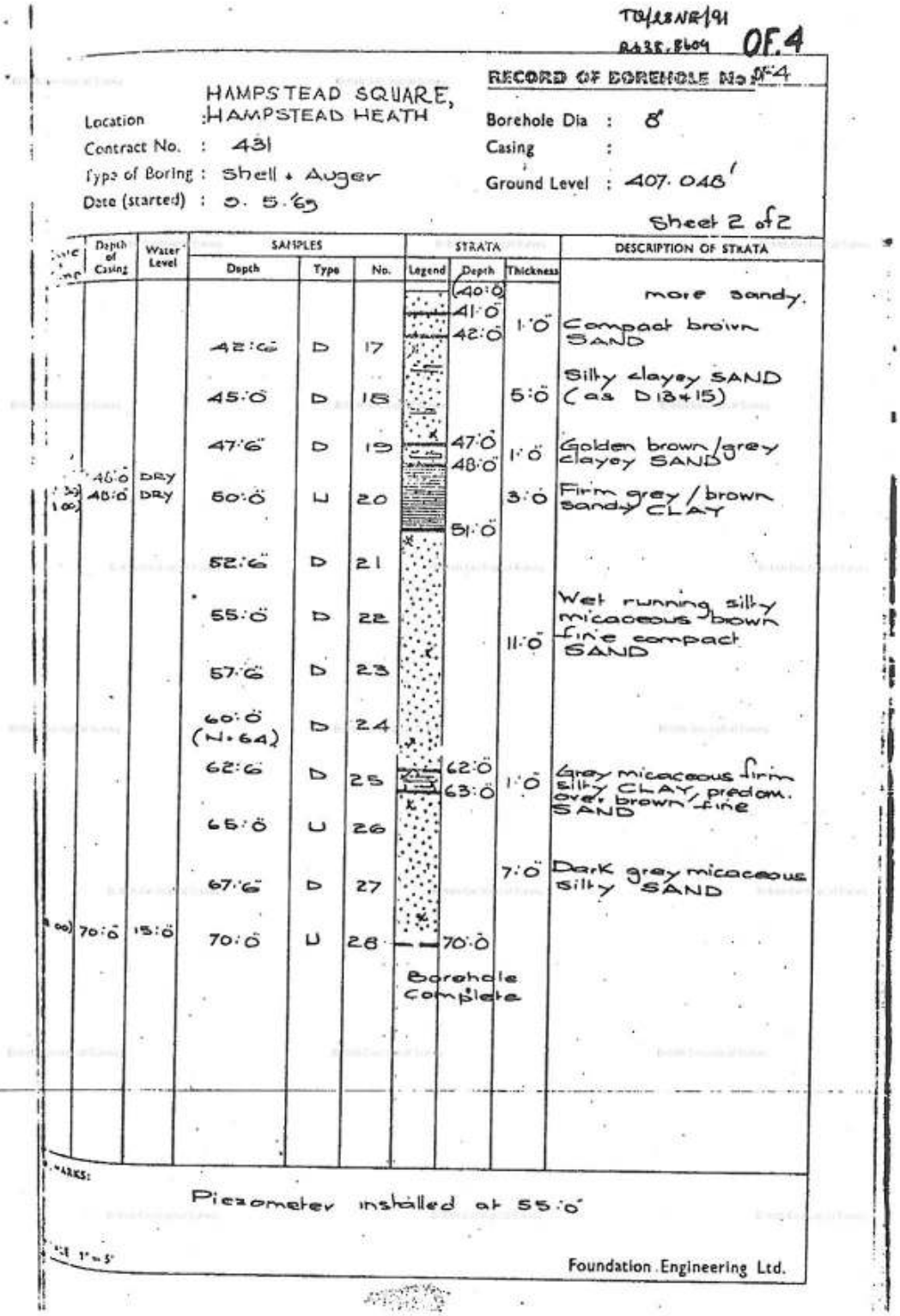
Sheet 1 of 2

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
						2:0	2:0	MADE GROUND / Topsoil
		2:6	D	1		4:0	2.0	Loose dark brown sandy GRAVEL (up to 1" rounded pebbles)
		5:0 (N=13)	D	2		6:0	2.0	Brown firm sandy CLAY matrix + abundant large fragments + pebbles
7:6	DRY	7:6	D	3		9:6	3:6	Abundant rounded hard 1" pebbles predominates over finer sand matrix.
30:0	DRY	10:0	U	4		10:6	1:0	Firm brown sandy CLAY
						12:0	1:6	Compact grey SAND
		12:6	D	5		13:0	1:0	Fine silty clayey SAND
		15:6	U	6				
		17:6	D	7				Fine dense silty SAND
		20:0 (N=32)	D	8			14:0	(especially wet towards base)
		22:0	D	9				
		25:0 (N=31)	D	10				
		27:6	D	11		27:0 28:0	1:0	Stiff/hard grey CLAY + little fine sand.
30:0	DRY	30:0	U	12			4:0	Firm brown sandy CLAY
		32:6	D	13		32:0		mottled brown, fawn mixture soft/firm silty CLAY + fine sand.
		35:0	U	14			9:0	(+ silty clayey SAND)
		37:6	D	15				
		40:0	U	16		40:0		

REMARKS:

SCALE 1"=5

Foundation Engineering Ltd.



TQ28NE/91
R435.8604 OF.4

RECORD OF BOREHOLE No OF.4

Location : HAMPSTEAD SQUARE, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell + Auger
Date (started) : 9. 5. 69

Borehole Dia : 8"
Casing :
Ground Level : 407.048'

Sheet 2 of 2

Depth of Casing	Water Level	Depth	Type	No.	Legend	Depth	Thickness	DESCRIPTION OF STRATA
						(40·0)		more sandy.
						41·0		
		42·6	D	17		42·0	1·0	Compact brown SAND
		45·0	D	18			5·0	Silty clayey SAND (as D18+15)
		47·6	D	19		47·0		
46·0	DRY					48·0	1·0	Golden brown/grey clayey SAND
48·0	DRY	50·0	U	20			3·0	Firm grey/brown sandy CLAY
						51·0		
		52·6	D	21				
		55·0	D	22				Wet running silty micaceous brown fine compact SAND
		57·6	D	23			11·0	
		60·0 (N=64)	D	24				
		62·6	D	25		62·0		
						63·0	1·0	Grey micaceous firm silty CLAY, predom. over brown fine SAND
		65·0	U	26				
		67·6	D	27			7·0	Dark grey micaceous silty SAND
70·0	15·0	70·0	U	28		70·0		
								Borehole complete

REMARKS:
Piezometer installed at 55·0'

SCALE 1" = 5'

Foundation Engineering Ltd.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)
6-inch Map Registered No. TQ 28NE/8

Name of Shaft or Bore given by Geological Survey:

Name and Number given by owner: B 2

Nat. Grid Reference 2636.9592

For whom made

Town or Village Hampstead County

Exact site Junction Reginald Rise and Holly Bush { Attach a tracing from a map, or a sketch-map, if possible.

1" N.S.Map No.	1" O.S.Map No.	Confidential or not
256		

Purpose for which made Tube boring

Ground Level at shaft bore relative to O.D. 409 If not ground level give O.D. of beginning of shaft bore

Made by Date of sinking 1900

Information from LCC Date received

Examined by

SPECIMEN NUMBERS AND ADDITIONAL NOTES

(For Survey use only) Geological Classification	DESCRIPTION OF STRATA	Thickness Ft.	Thickness In.	Depth Ft.	Depth In.
	Bagshot Beds { Macadam	1	-		0·10
BB	Gravel & clay	2	-	3	- 0·91
	sand	12	6	15	6 4·72
	Yellow clay	32	6	48	- 14·63
	clay	120	6	168	6 51·36
CB	light clay in memoir				
In Memoir	claygate beds { Sand and stone layers 6'	6'	-	175 ft	- 54·86
	Blue sandy clay	75'	-	129	- 39·32
	Blue clay	30	-	159	- 48·46
LC	London clay { Blue sandy clay (top bed Coff. clay)	10	-	169	- 51·51
	stiff blue clay	36	-	205	- 62·48
	Logs unreliable Ross				

C.W.B.Ltd. Gp.843

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

TQ/28NE/90 OF.3
2632. 8615.

RECORD OF BOREHOLE No: OF3

Location : UPPER TERRACE, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell & Auger
Date (started) : 20.4.'69
Borehole Dia : 8"
Casing :
Ground Level : 488.425'

Sheet 1 of 2

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
		2:0	D	1			5:0	Loose sandy GRAVEL brown (fine med. & coarse SAND & frequent larger (4½") rounded pebbles) minute amounts of clayey material
		5:0	D	2		5:0	
		7:6	D	3		7:6	2:6 Brown micaceous fine wet firm SAND
		10:0 (N=106)	D	4			3:6 Golden brown fine micaceous firm SAND local larger fragments.
		12:6	D	5		11·0	4:0 Large mainly 1" pebbles cobbles hard & rounded v. loose poorly sorted SANDY matrix (fine med & coarse)
		15:0 (N=143)	D	6		15:0	Very coarse sandy GRAVEL
		17:6	D	7			Large rounded extremely hard 1" pebbles
		20:0 (N=109)	D	8			7:6 matrix is v. wet poorly sorted SAND orange/brown coarse sandy GRAVEL
4·0		22:6	D	9		22:6	
30	23:0 DRY					23:0	0:6 Firm pale grey micaceous CLAY, predominates over micaceous brown sand
100	23:0 DRY						
		25:0 (N=62)	D	10			
		27:6	D	11			12·0 Pale brown fine soft wet micaceous SAND
		30:0	D	12			local very soft creamy pale grey CLAY pockets
		32:6	D	13			local orange/brown iron staining.
		35:0	D	14		35:0	
		37:6	D	15			Fawn/brown firm micaceous silty sandy CLAY
		40:0 (N=51)	D	16		(40·0)	

REMARKS: All the sand are fairly dense compact & firm
Piezometer Installed.

SCALE 1" = 5'

Foundation Engineering Ltd.

TQ/28NE/10 OF 3
2632.8615

RECORD OF BOREHOLE No OF 3

Location : UPPER TERRACE, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell + Auger
Date (started) : 29.4.65

Borehole Dia : 8"
Casing :
Ground Level : 433.425'

Sheet 2 of 2

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
						40:0		
41:0	DRY							
41:0	5:0	42:6	D	17		42:6	2:6	Stiff grey micaceous CLAY, predominates over sandy brown clay
		45:0	D	18		45:0		
45:0								
		47:6	D	19				
		50:0 (N=20)	D	20				Orange brown/brown soft/firm grey pale CLAY, with fine loose clayey sand and SAND
45:0	DRY						15:0	
45:0	DRY	52:6	D	21				Sand predominates, overall is a soft/ firm sandy CLAY. ie. clayey sand
		55:0	D	22				
		57:6	D	23				
45:0	DRY	60:0 (N=26)	D	24		60:0		
						Borehole Complete		

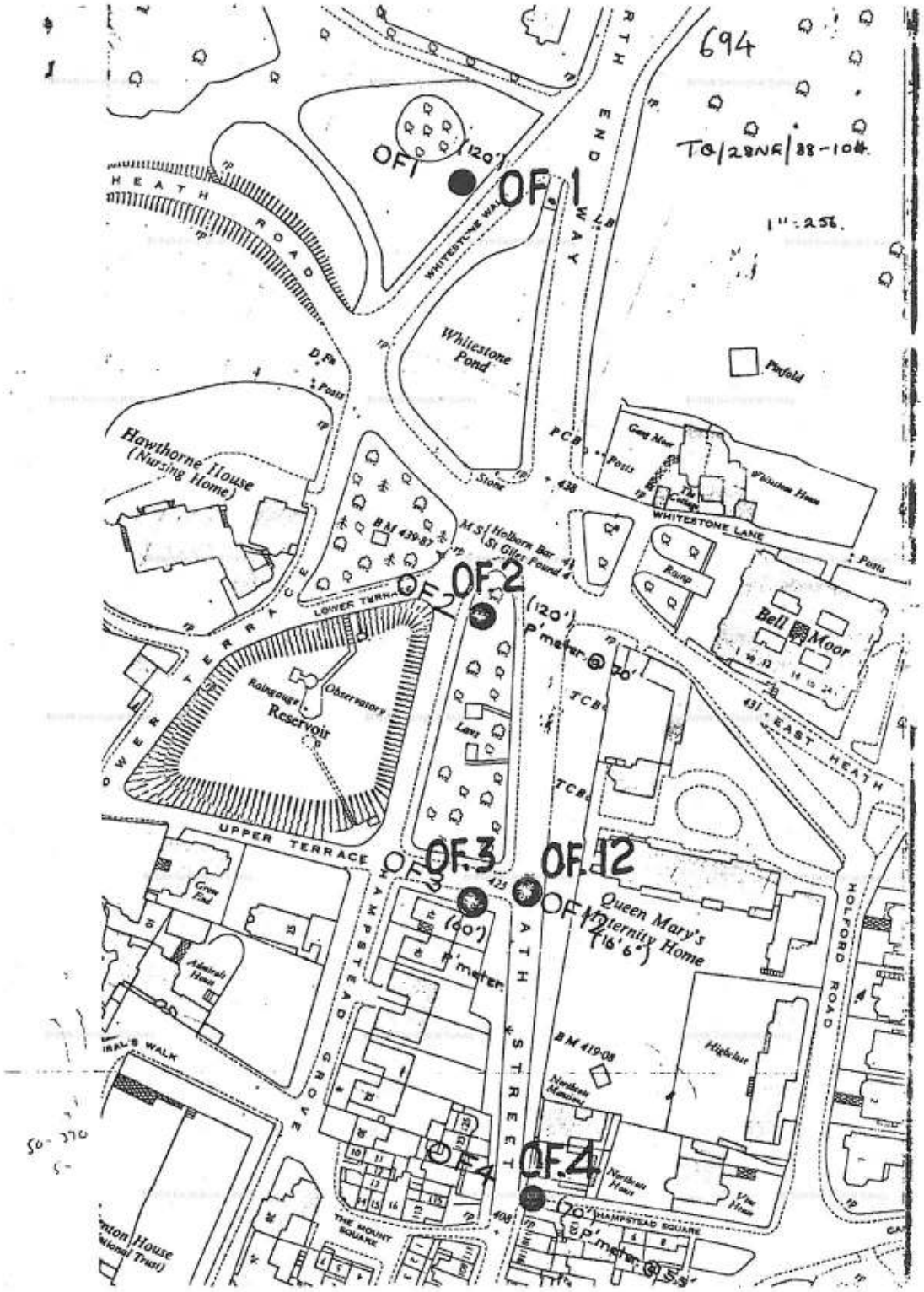
REMARKS:

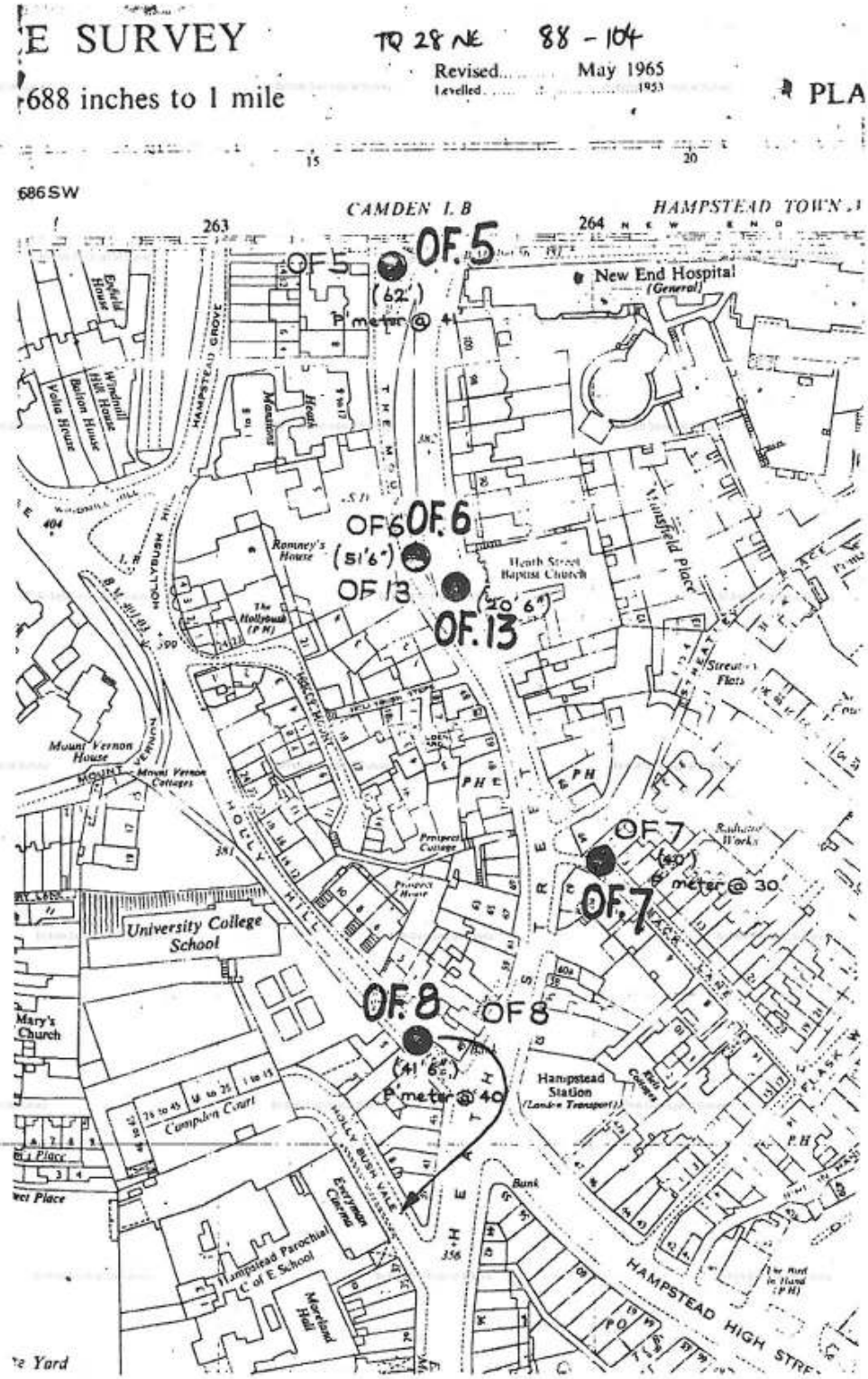
SCALE 1" : 5'

Foundation Engineering Ltd.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Report an issue with this borehole





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
Silt with layers of silty clay	11	49½
Soft brown mottled silty clay	2½	60½
Silt with layers of silty clay	8	63
Firm silty blue clay	11	71
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
Grey silt (liquid)	10	50
Grey clay	10	60
	70	

KEY PLAN AT BACK OF REPORT.

LT3 Junction of Hampstead High Street and Heath Street.
Height 344 ft. O.D.

	Thickness (ft)	Depth (ft)
Concrete	2¼	
Rubble, bricks & stones	6¾	2¼
Brown loamy clay	5¾	
Blue clay	12½	14¾
Blue sandy clay	50¾	27¼
	78	

London Clay NO KEY PLAN
(Station tunnel intrados 177 ft. below ground level).

BOREHOLES SUNK AT BRANCH HILL LODGE

B/G (1951)
Height 381.99 ft. O.D.

TQ/28NE/101
2610.8604.

	Thickness (ft)	Depth (ft)
Made ground	4	
Brown sandy clay	4	4
Loamy sand	1	8
Brown sandy clay	6	9
Grey sandy clay	3	15
Brown sandy clay	12	18
Blue sandy clay	6	30
	36	

B/H (1951)
Height 427.44 ft. O.D.

TQ/28NE/102.
2605.8608.

	Thickness (ft)	Depth (ft)
Soil and stones	6	
Brown sandy clay	4	6
Sandy clay and pebbles	6	10
Brown sandy clay	5½	16
Loamy sand	8½	21½
Brown sandy clay	7	30
White loamy sand	3	37

B/I (1965)
Height 405.08 O.D.

TQ/28NE/103
2608. 8603.

	Thickness (ft)	Depth (ft)
Top Soil	½	
Brown sand with stones	4½	½
Brown sandy mottled clay	4½	4½
Firm brown clay with layers of sand	32	9
Very sandy brown clay	8½	41
Silt with layers of silty clay	11	49½
Soft brown mottled silty clay	2½	60½
Silt with layers of silty clay	8	63
Firm silty blue clay	11	71
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
Grey silt (liquid)	10	50
Grey clay	10	60
	70	

KEY PLAN AT BACK OF REPORT.

LT3 Junction of Hampstead High Street and Heath Street.
Height 344 ft. O.D.

	Thickness (ft)	Depth (ft)
Concrete	2½	
Rubble, bricks & stones	6¾	2¼
Brown loamy clay	5¾	
Blue clay	12½	14¾
Blue sandy clay	50¾	27½
	78	

London Clay NO KEY PLAN
(Station tunnel intrados 177 ft. below ground level).

BOREHOLES SUNK AT BRANCH HILL LODGE

B/G (1951)
Height 381. 99 ft. O.D.

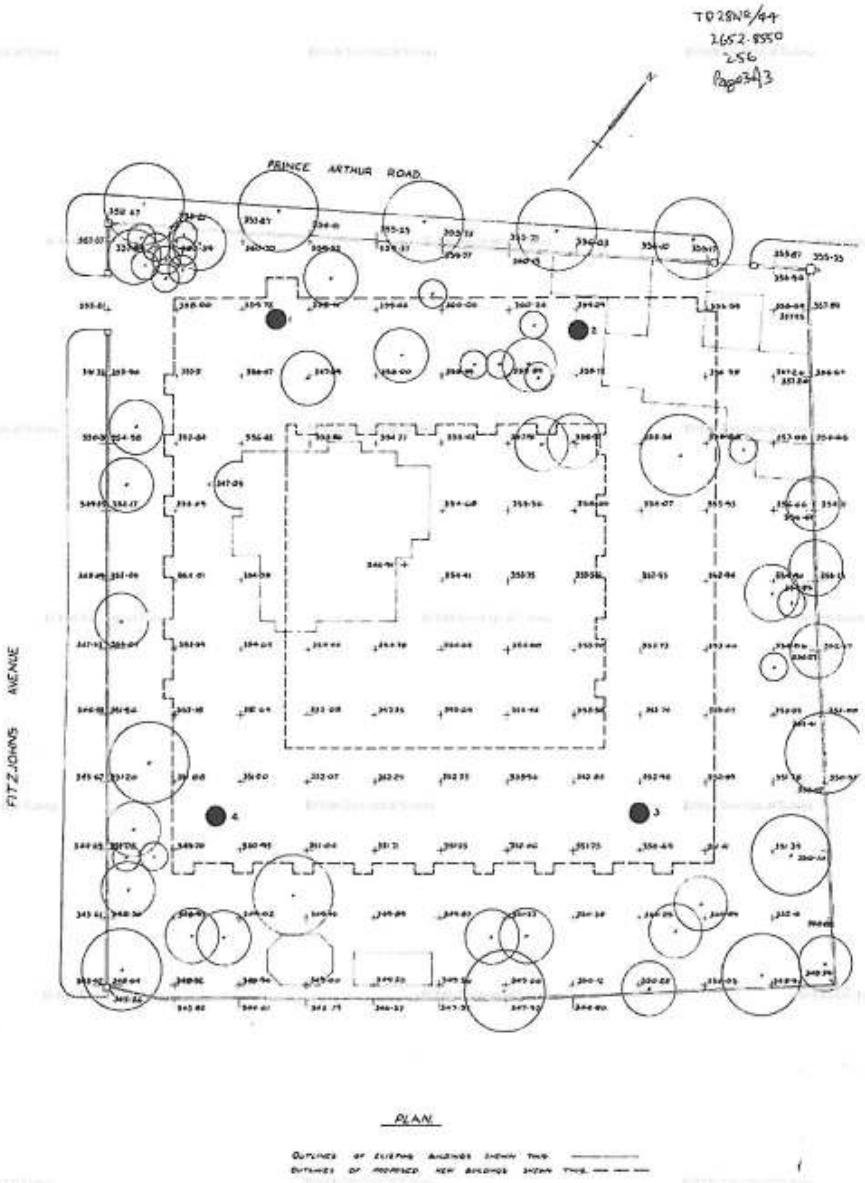
TQ/28NE/101
2610. 8604.

	Thickness (ft)	Depth (ft)
Made ground	4	
Brown sandy clay	4	4
Loamy sand	1	8
Brown sandy clay	6	9
Grey sandy clay	3	15
Brown sandy clay	12	18
Blue sandy clay	6	30
	36	

B/H (1951)
Height 427. 44 ft. O.D.

TQ/28NE/102.
2605. 8608.

	Thickness (ft)	Depth (ft)
Soil and stones	6	
Brown sandy clay	4	6
Sandy clay and pebbles	6	10
Brown sandy clay	5½	16
Loamy sand	8½	21½
Brown sandy clay	7	30
White loamy sand	3	37



TQ 28 NE/44

BOROUGH OF HAMPSTEAD. 2652,8550
256
Page #1 of 5

HOUSING ARCHITECT'S DEPARTMENT,
222, HAVERSTOCK HILL,
N.W.3.

CHARLES E. JACOB
A.R.I.B.A.
CHARTERED ARCHITECT

HOUSING ARCHITECT

TELEPHONE: HAMPSTEAD 7131

YOUR REF.....

MY REF.....MW/PA.....P/43

11th December, 1963.

Rec'd by P.M. 12 Dec '63

The Director,
Geological Survey & Museum,
Exhibition Road,
South Kensington, S.W.7.

Dear Sir,

102, Fitzjohn's Avenue. N.W.3.

I refer to Circular No.18/62 from the Ministry of Housing and Local Government and enclose copies of the following documents, for your information, giving details of the trial boreholes that were sunk on this site during July 1963:-

1/1250 O.S.Sheet showing the location of the site
Drawing No.899/4 showing the position of the boreholes on the site.

The following deposits were encountered in the boreholes:-

No.1 Boring	Thickness	Depth below surface.
Topsoil	3'0"	3'0"
Brown fine sand with a little silt and small clay pockets	14'0"	17'0"
Stiff to very stiff laminated grey sandy clay and brown silty fine sand	13'0"	30'0"
Total from surface	30'0"	30'0"

No.2 Boring		
Made ground (sand, ashes, stones etc.)	2'0"	2'0"
Yellow/brown fine sand with a little silt and small clay pockets	15'6"	17'6"
Stiff laminated grey sandy clay and orange/ brown silty fine sand	12'6"	30'0"
Total from surface	30'0"	30'0"

/contd:

TQ28NE/44
2652 8550
256.

The Director,
Geological Survey & Museum

Continuation Sheet No.1. Page 2 of 3

No.3 Boring 125'00" (+ 106.68 m)

	Thickness	Depth below surface.
Topsoil	2'6"	2'6"
Bagshot Beds: Stiff laminated grey sandy clay and brown silty fine sand	11'6"	14'0"
Bagshot Beds: Yellow/brown silty fine sand, clayey at some levels	19'0"	33'0"
Claygate Beds: Coarsely laminated grey sandy clay and orange/brown silty sand	4'0"	37'0"
Claygate Beds: Brown silty very fine sand with trace of clay	3'0"	40'0"
Total from surface	40'0"	40'0"

No.4 Boring 125'0"

Made ground (clayey sand, gravel, topsoil, etc.)	3'6"	3'6"
Sandy clay with stones	1'0"	4'6"
Firm to stiff laminated grey sandy clay and silty fine sand	15'6"	20'0"
Total from surface	20'0"	20'0"

Yours faithfully,

H.B. Jacob.

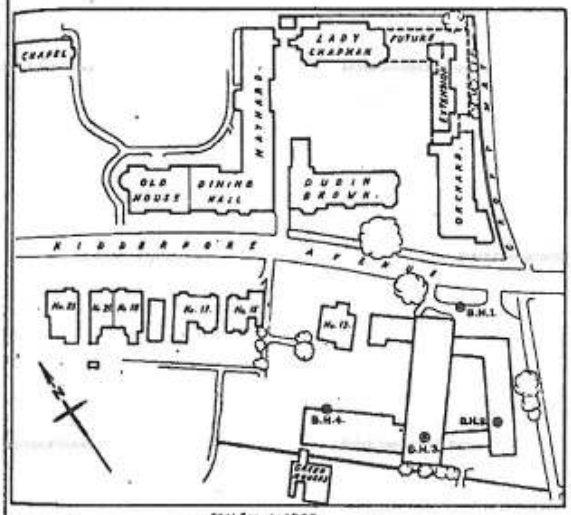
Housing Architect.

Encls:

TQ28NE/119

1" : 256

Fig. 6.



SCALE:- 1:1000

BOREHOLE	DEPTH Ft	GROUND LEVEL Ft	LONDON CLAY Ft	WATER LEVEL Ft	TRIAXIAL TEST RESULTS: SAMPLE DEPTH Ft	UNDRAINED SHEAR STRENGTH (½ DEVIATOR STRESS) Lbs/Sq.Ft.	ANGLE OF SHEARING RESISTANCE (ϕ°)
1	50·5	71·7	22·7	51·0	5	(1) 3330	0
					10	(2) 3360	
					21	(1) 3048	0
					21	(2) 2598	
2	35·0	82·0	48·0	37·5	–	–	–
3	50·0	85·2	47·3	55·6	5	(1) 780	0
					16	(2) 1905	
					26	(1) 4089	0
4	35·0	82·1	50·1	42·5	15	(1) 1950	0
					29	(2) 2132	

NOTE: ALL LEVELS REFERRED TO CLIENT'S DATUM WHICH IS 100·00 ft. ABOVE O.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

3119

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 Ordnance arbitrary datum DATE : 14th to 16th March, 1949

Description	Reduced Level	Legend	Sample	Depth	Thickness	Ft/6
Gravel, cobbles and gravel MADE GROUND	+71.7			0'0"		
	+69.9		1	1'9"	1'9"	
			2			26
Firm mottled grey and brown sandy clayey SILT warning brown and more sandy below 7 ft. (CLAYGATE BEDS)			3			24
			4			23
			5		12'9"	24
			6			25
	+57.2		7	14'6"		24
Firm becoming stiff light grey-brown sandy clayey SILT, more clayey below 29 ft. (Probably Claygate Beds)			8		4'6"	30
	+52.7		9	19'0"		24
			10			29
Stiff dark grey silty CLAY with slightly fissured and very stiff below 40 ft. fine gypsum throughout. (LONDON CLAY)			11			25
			12			29
			13			27
			14		31'6"	24
			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
14.3.49	0130	14'6"	14'6"	7'4"
15.3.49	0730	50'6"	-	20'6"

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

SOIL MECHANICS LTD., 45 OLD CHURCH ST., S.W.3

TQ28NE/119
2587. 8575

Fig. 2

BOREHOLE LOG

LOCATION NO. X117 Westfield College, Hampstead
CARRIED OUT FOR Council of Westfield College.
BOREHOLE NO. 2 DIAMETER: 8 inches
GROUND LEVEL: 62.0 ft. above DATE: 19th March, 1959
Clients arbitrary datum

DESCRIPTION	SAMPLES	DEPTH	THICKNESS
TOPSOIL with turf	+62.0 +61.5	0'6"	0'6"
Soft becoming firm to stiff brown and grey mottled sandy clayey SILT, more sandy below 10 ft. (CLAYGATE BEDS)	1 2 3 4 5 6 7	13'6"	13'6"
Coarse gypsum crystals	+48'0 8	14'0"	14'0"
Firm becoming stiff at 15 ft. and very stiff at 24 ft. grey slightly fissured silty CLAY containing fine gypsum (LONDON CLAY)	9 10 11 12 13 14 15 17 16	21'0"	35'0"
	+27.0 END OF BOREHOLE		

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Height to Water
20-3-59	0930	36'0"	—	24'4"

27

Key: 1 in = 5 ft. ▪ Standard Sample | Core Sample Δ Water Sample

SOIL MECHANICS LTD., 45, 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 : 6 inches

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

Description	Reduced Level	Legend	Sample	Depth	Thickness	%
Soil						
Clay with turf	+62.3 +61.3		1 2	0'10" 1'0"	1'0"	
Clay becoming stiff brown and grey mottled sandy silty CLAY. Very sandy at 4 ft. 6 in. (BLACKHEATH BEDS)			3 4 5 6		14'0"	28
	+47.3		7	15'0"		29
Stiff grey slightly fissured silty CLAY with fine gypsum (LONDON CLAY)			8 9 10 11 12 13 14 15		35'0"	30
Rock fine gypsum 39 ft. and 1 large septarian nodule.			16 17 18 19 20			29
	+12.3		21	50'0"	13'3"	
END OF BOREHOLE						

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
21-3-59	0730	41'0"	28'0"	4'0"

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

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

TQ28NE/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 DATE: 17th and 18th March, 1959
clients arbitrary datum

DESCRIPTION	REDUCED LEVEL	SAMPLES	DEPTH	THICKNESS
TOPSOIL with turf.	+69.1 +68.8	1 2	0'10" 0'6"	0'6"
Soft becoming firm (below 5 ft.) grey and brown mottled sandy silty CLAY (GLAYGATE BEDS)		3 4 5 6 7		14'6"
More sandy				
	+54.1	8	15'0"	3'0"
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"
	+39.1	15	30'0"	5'0"
Stiff grey slightly fissured silty CLAY with fine silt laminations and shell fragments (LONDON CLAY)	+34.1	16 17	35'0"	
END OF BOREHOLE				

Water Level Observations

Date	Time	Depth of Borehole	Depth of Casing	Depth to Water
18-3-59	0930	35' 0"	-	6' 1"

5 ft. = 1 in. ▪ Standard Sample ▮ Core Sample △ Water Sample

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TQ/28NE/89
2624 . 8635 OF.1

RECORD OF BOREHOLE No: OF1

Location : WHITESTONE WALK, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell + Auger
Date (started) : 21 . 4 . 69
Borehole Dia : 8"
Casing :
Ground Level : 439 . 602'

Sheet 1 of 3

Depth of Casing	Water Level	SAMPLES Depth	Type	No	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
	DRY						1'5"	TOPSOIL
		2'6"	D	1		1'5"	3'3"	Very loose sandy GRAVEL, frequent larger (1½") rounded fragments local smal grey soft clay pockets.
	DRY	5'0" (N=120)	D	2		5'0"	2'6"	Wet orange/brown compact fine SAND, local larger (⅛") angular frag. Local v. soft pale grey clay pockets
		7'6"	D	3		7'6"		
		10'0" (96 for 3")	D	4				
		12'6"	D	5				Compact drier fine brown SAND, slightly micaceous Local soft pale grey/ cream silty clay pockets. Local iron stained patches.
		15'0" (108 for 1½")	D	6			16'0"	
		17'6"	D	7				
		20'0" (N=56)	D	8				
		22'6"	D	9		23'6"		Fine dry brown SAND local small grey soft clay pockets. Local iron staining.
25'0"	DRY	25'0" (N=76)	D	10			4'0"	
25'0"	DRY	27'6"	D	11		27'6"		
		30'0" N=100	D	12				Fine dry brown SAND abundant small laminated zones Soft/firm pale grey /cream silty or sandy clays. Local orange/brown iron staining.
		32'6"	D	13			10'0"	
		35'0"	D	14				
		37'6"	D	15		37'6"		Wet compact brown fine micaceous SAND, local brown iron staining
30'0"	DRY	40'0" (N=89)	D	16		(40'0")		

REMARKS: Test Pit down to 3'6"

SCALE 1" : 5'

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TQ/28NE/88
2624 .8630 OF.1

RECORD OF BOREHOLE No OF1

Location : WHITESTONE WALK, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell & Auger
Date (started) :
Borehole Dia : 8"
Casing :
Ground Level : 439.602'

Sheet 2 of 3

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
40:0	DRY					(40:0)		Wet compact brown fine micaceous SAND
		42:6	D	17		42:6	1:6	Firm grey homogenous CLAY
		45:0	D	18		43:6	4:0	Wet fine brown micaceous SAND, v. slightly clayey local soft grey/cream clays. abundant orange/ brown iron staining.
		47:6	D	19		47:6		Richer brown fine
50:0	DRY	50:0 (N=62)	D	20			5:6	SAND abundant small
50:0	DRY					51:0		lenses & pockets pale
55:0	58:0 & 52:6	52:6	D	21				grey/ cream soft/ firm silty clays.
		55:0	D	22			6:0	Wettish compact fine brown micaceous SAND
		57:6	D	23		57:0	0:6	Soft clay predominant over loose fine SAND
55:0	54:0	60:0 (N=103)	D	24		57:6		
		62:6	D	25				
		65:0	D	26				Mixture of soft pale grey/ cream CLAY, and fine orange/ brown SAND micaceous.
		67:6	D	27			22:6	Overall is soft silty clayey SAND
		70:0 (N=18)	D	28				
		72:6	D	29				
70:0	DRY	75:0	D	30				
		77:6	D	31				
		80:0 (N=78)	D	32		80:0		

REMARKS: Test Pit down to 3:6"

SCALE 1" = 5'

Foundation Engineering Ltd.

TQ/28NE/88
2124.8625 OF 1

RECORD OF BOREHOLE No: OF 1

Location : WHITESTONE WALK, HAMPSTEAD HEATH
Contract No. : 431
Type of Boring : Shell & Auger
Date (started) :

Borehole Dia : 8"
Casing :
Ground Level : 439.602'

Sheet 3 of 3

Depth of Casing	Water Level	SAMPLES Depth	Type	No.	STRATA Legend	Depth	Thickness	DESCRIPTION OF STRATA
						80:0	2:6	Brown firm micaceous silty CLAY, orange/brown iron staining.
		82:6	D	33		82:6		
		85:0	D	34			5:0	Very soft wet fine brown micaceous homogenious SAND
		87:6	D	35		87:6		
		90:0 (N=48)	D	36			4:6	Dark grey/blue and brown firm micaceous silty CLAY, orange/brown iron staining.
		92:6	D	37		92:0		
	93:0						3:0	Firm/stiff grey micaceous CLAY, predominants over brown soft micaceous clayey SILT.
		95:0	D	38		95:0		
		97:6	D	39				
		100:0	U	40				
		102:6	D	41				Dark grey & brown soft CLAY, and fine sand interlaminated
4:6 30 4:6 00	95:0 95:0	10:0 98:0	D	42			25:0	overall is a dark grey & brown soft/firm micaceous clayey SILT with some sand.
		107:6	D	43				
		110:0 (N=47)	D	44				
		112:6	D	45				
		115:0	D	46				
		117:6	D	47				
30	110:6	110:0	120:0 (N=60)	D	48	120:0		Borehole Complete

441
27
353

REMARKS: Test Pit down to 3:6'

SCALE 1"=5'

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