STRUCTURAL METHODOLOGY STATEMENT

AND BASEMENT IMPACT ASSESSMENT.

13 ST CROSS STREET

LONDON EC1N 8UB

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1.0 Brief

Ellis and Moore have been instructed by Alexander Developments Ltd. to prepare a report to cover the requirements in Camden Development Policies 2010. Particular attention has been paid to DP27.3 on page 105 as it is felt that this was the most appropriate part of the document to be considered with regard to this property.

The following is a quote from DP27.3 which is considered to relate to this scheme "smaller schemes will be expected to submit information which relates to any specific concerns for that particular scheme of location (eg any history of flooding at the site or in the vicinity of the site, the presence of underground water courses, proximity to water bodies such as the ponds on Hampstead Heath, structural instability of the neighbouring properties or unstable land) the Council will assess whether any predicted damage to the neighbouring properties from the development is acceptable or can be satisfactorily ameliorated by the developer".

1.2 The proposal is to prepare a desk top study Flood Appraisal and Structural Methodology for the building plus use an existing soils investigation which was undertaken in 1986.

Given the size of the project it is considered unnecessary to undertake further physical exploratory work on the site at this time in addition to what has already been done. It is intended if the project proceeds then an intrusive investigation to determine the soil conditions on the site currently will be undertaken which will include investigating the groundwater conditions.

2.0 Structural Methodology

2.1 At the present time the site is overgrown but empty. The existing building that once occupied the site has been demolished for many years. It contained a basement and hence the soil has been reduced to approximately 3 metres below the existing pavement level in St. Cross Street.

The proposed development is to build a block of flats of 8 storeys including the basement. It is intended that the footprint of the building will cover the majority of the site to give 8 flats.

2.2 The building to the west of this property consists of a 1930's block of flats and to the east is 73 Farringdon Road which is a late Victorian office building.

2.3 The structure of the new building has been considered as follows. It is proposed that the building will be founded on clay on bored piles such that there will be minimal interference with any groundwater movements beneath the site. The geological maps indicate that the site is underlain with Taplow Gravel with London Clay below. The borehole in the soils investigation found that there was 6.5 metres of medium dense brown silky sandy clay with some gravel which has been classified as made ground. Below this there is a silty clay going into a very stiff clay 7.7 metres below the existing ground level. Groundwater was found at a minimum depth of 6.5 metres below ground level at the base of the made ground.

It is proposed that the new building will be supported on bored piles which will take their support in the clay by means of skin friction and end bearing. The building will consist of a reinforced concrete frame with flat slab construction and reinforced concrete columns. It is hoped to avoid underpinning any of the adjacent structures by providing a piled structure which will cantilever up to the existing walls of the properties on the boundary. The basement slab will be set approximately at the existing basement level. There are no trees on the site merely bushes which have grown up since the existing property was demolished.

The excavations for the piling will be self-supporting in the clay so there is no need for any temporary support except for casings near the surface. Some minor lateral propping of the existing foundations on the boundaries may be required. This would particularly apply on the Victorian building on Farringdon Road. Formed movement joints will be provided between the new structure and any existing structure.

It is intended that storm water will be directed into the existing underground sewers by gravity following the lines of the existing drainage drawing which is included in the Appendix 4. If necessary the outflow from the site will be restricted by the use of attenuation in the ground to the Thames Water requirements. At the east of the site backing onto the property in Farringdon Road there is the remains of a flank wall of the existing building. This is independent from the building in Farringdon Road and will be removed as part of the construction.

3.0 Discussions and conclusions

From the desk top study that has been undertaken it is concluded that the construction of this building will not in any way impose any restriction on the flow of groundwater under the site. The underground rivers map is attached in Appendix 4. This indicates that the River Fleet runs down Farringdon Road but has been culverted many years ago and is part of the main sewer. This should have no effect on this site. As far as surface flooding is concerned the existing drains should be able to cope as the building is replacing an existing structure which had drainage.

Various flood maps have been consulted and the Flood Appraisal Report that has been prepared indicates that the site is in an area of low flood risk. Therefore no flood protection precautions are required on this development.

The site will require an additional intrusive soils investigation to be undertaken to confirm the foundations to the existing buildings on the perimeter and to check for contamination as the original report did not include any of the tests for contaminants in the ground which are required as part of an investigation currently.

4.0 Summary

It is concluded that this site can be successfully developed without causing any problem to the subterranean drainage.

APPENDIX 1

SOILS INVESTIGATION

13688.

SOILS LIMITED

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REPORT ON A GEOTECHNICAL

INVESTIGATION

AT

13 ST CROSS STREET, LONDON EC2

FOR

ALEXANDER BUILDERS LTD

J1394

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1986

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J1394

REPORT ON A GEOTECHNICAL INVESTIGATION

at

13 St. CROSS STREET, LONDON EC2

for

ALEXANDER BUILDERS LTD

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation of the sub-surface ground conditions at 13 St. Cross Street, London EC2.

In the following sections, we present a summary of the regional geology, discuss site conditions and give recommendations for the design of foundations.

In Appendix A we present a description of the method of field investigation together with the boring log.

In Appendix B we present the results of laboratory tests made on samples of soil obtained from the boreholes.

1.2 LOCATION

The site was located at 13 St. Cross Street, London EC2., at O.S. Grid Reference TQ 315 819. The location of the borehole is shown on Figure 1, which is a sketch site plan prepared by Soils Ltd.

1.3 PROPOSED DEVELOPMENT

The proposed development comprises medium-rise office accommodation.

1.4 SCOPE OF WORK

The scope of work was as outlined by Alexander Builders Ltd.

Briefly, this was for a borehole site investigation comprising a single borehole, drilled to a depth of 19.0 metres below existing ground level. The borehole was sunk using a light percussion drilling rig. The investigation was to include sampling for laboratory testing and *in situ* testing.

The field investigation was performed in accordance with the recommended practices of B.S. 5930:1981. The laboratory testing was performed in accordance with the methods given in B.S. 1377:1975.

The engineering analyses, conclusions and recommendations relate to the development at 13 St, Cross Street, London EC2. Attention is drawn to the fact that these analyses are based on data obtained from the borehole and associated laboratory and in situ testing. The possibility of variation in ground conditions around the borehole should not be overlooked. Any opinion or diagram of a possible configuration of strata beyond the borehole or extrapolated to greater depth is conjectural and given for guidance only. No liability can be accepted for such variations.

2.0 SITE CONDITIONS

2.1 REGIONAL GEOLOGY

The 1:63360 Geological Survey Map of Great Britain (England & Wales) sheet number 256 of the North London area indicates the following succession of strata:

Taplow Gravel

London Clay

Woolwich Beds

The geological map shows the Taplow Gravel to be overlain by Alluvium immediately to the east of the site.

Alluvium is the most recent river or estuarine deposit and generally comprises silty clays usually with an appreciable organic content. Lenses of sand and gravel are also commonly found, as are pockets of peat.

The rivers of the south-east of England, including the River Thames and its tributaries, have been subject to at least three changes of level since Pleistocene times. One result has been the formation of a complex series of River Terrace Gravels. The Lower River Terraces are numbered one to four, the lowest and most recent being number one. Geographical terms formerly used, such as Boyn Hill or Taplow Terrace, have generally now been abandoned due to problems of correlation. The River Terrace Gravels are found on slightly higher ground than the existing flood plains and comprise sands and gravels of roughly bedded flint or chert gravels in a matrix of sand of varying degrees of coarseness.

The Woolwich Beds are a sedimentary complex comprising a basal bed (the Bottom Bed) composed of glauconitic sands, sandy clays and gravels, with laterally variable sands and clays above. In the eastern part of the area the basal bed is mostly overlain by a shelly grey sandy clay or silty sand. Lignite, or brown coal, a carbonaceous rock composed of plant remains which has

not been subject to the same intensity of heat and pressure as has ordinary coal, is occasionaly found within the Woolwich Beds, as are individual logs and groups of logs indicating the position of a former log jam, which was covered by sands and clays at the time of deposition.

2.2 SURFACE CONDITIONS

The site comprised the basement area, approximately 3 metres deep, of a demolished building that formerly fronted onto St. Cross Street.

The site was bounded to the east, south and west by existing buildings and to the north by a retaining wall up to pavement level in St. Cross Street.

2.3 GROUND CONDITIONS

Ground conditions were broadly as anticipated from the desk study with the exception that Made Ground was found to overlie the natural soils.

A summary of the ground conditions encountered is presented below, though for detailed information reference should be made to the borehole log.

3. Bulk Samples

Bulk samples of cohesionless soils are taken, the amount being dependent on the grading of the soil. The samples are placed in stout plastic bags to prevent loss of the fine fraction.

The following plates are attached and complete this appendix:-

Legends

Key to Log of Borehole

Log of Borehole

APPENDIX A

FIELD WORK

DRILLING METHOD

The drilling work was carried out using a Dando 150, or Pilcon Wayfarer, Shell and Auger rig. These are light cable percussion drilling rigs which have a derrick about 6 metres high and a 1.5 tonne capacity winch driven by a diesel engine. The clay cutter (an open-ended steel tube with a cutting edge) is used in cohesive soils. For granular soils a shell (an open-ended steel tube with a flap-valve and cutting edge at its lower end) is used. When boring through rock or boulders a heavy chisel is used to break up the rock and the fragments cleaned out using the shell. The tools have a diameter of 150mm and are worked on a wire rope using the clutch of the winch for the percussive action.

SAMPLING

1. Disturbed Samples

   Representative samples of the different strata encountered are taken from the boring tools and placed in jars with tight-fitting lids. These samples are examined for soil description.

2. Undisturbed Core Samples

   Samples of cohesive soils are taken in 101mm diameter by 450mm long thick-walled sample tubes with a machined cutting shoe. The samples are thus obtained in a relatively undisturbed condition. The sample tubes are sealed with wax and capped to minimise moisture content changes prior to testing in the laboratory.

Description	Depth (m)	Thickness (m)
Loose to medium dense brown silty sandy clay with abundant gravel, ash, brick and occasional concrete fragments. (MADE GROUND)	0.00 - 6.50	6.50
Dark grey brown silty CLAY with occasional rotted roots and pockets dark brown silty clayey fine SAND. (ALLUVIUM)	6.50 - 7.70	1.20
Stiff to very stiff grey brown strongly fissured silty CLAY with occasional silt partings. (LONDON CLAY)	7.70 -15.70	8.00
Very stiff grey and khaki brown fissured silty CLAY. (WOOLWICH BEDS)	15.70 -16.20	0.50
Very dense pale grey brown silty fine SAND. (WOOLWICH BEDS)	16.20 -19.00+	2.80+

2.4 GROUND WATER

Ground water was encountered as a seep at a minimum depth of 6.5 metres below ground level, at the base of the Made Ground.

Ground water equilibrium conditions may only be conclusively established after a series of measurements in a standpipe or piezometer installed in the ground after drilling. Variations in ground water level may arise from such causes as seasonal effects, changes in drainage conditions, etc.

3.0 DISCUSSION OF TEST RESULTS

3.1 STANDARD PENETRATION TEST RESULTS

The results of the Standard Penetration Tests indicate the Made Ground to be in a loose to medium dense state of compaction.

The Standard Penetration Tests made in the sands of the Woolwich Beds indicate the soils tested to be in a very dense state of compaction.

The test results are given on the borehole log.

3.2 TRIAXIAL TEST RESULTS

The results of the quick undrained single stage U100 triaxial tests show the samples tested from the London Clay to be of a stiff to very stiff consistency, with a general trend of increasing stiffness with depth.

The test results are given on Tables 1-3, Appendix B.

3.3 ATTERBERG LIMIT TEST RESULTS

The Atterberg Limit Test results made on samples of the London Clay indicate the soils tested to fall into Classes CH and CV on the British Soils Classification System. These are fine grained soils of high to very high plasticity and as such generally have medium bearing and settlement characteristics; are practically impermeable; non frost susceptible and have a high to very susceptibility to shrinkage and swelling movements with changes in soil moisture content.

The test results are given in Table 4, Appendix B.

3.4 SULPHATE ANALYSES

The significance of the Sulphate Test results are discussed later in this report.

The tests results are given in Table 5, Appendix B.

3.5 GRADING ANALYSES

The grading analysis made on a sample of the sands of the Woolwich Beds from a depth of 18.5 metres indicates the soil tested to be a silty fine to medium sand.

The test result is given in Table 6, Appendix B.

4.0 FOUNDATION DESIGN

4.1 GENERAL

Made Ground and Alluvium is, by the nature of its variable composition, usually unpredictable in terms of bearing capacity and settlement characteristics and is unsuitable as a bearing strata for conventional foundations.

Due to the thickness of Made Ground and Alluvium found to overlie the London Clay, we conclude that a piled foundation scheme should be adopted.

4.2 PILED FOUNDATIONS

The construction of a piled foundation is a specialist job, and the advice of a reputable piling contractor, familiar with the ground conditions encountered on this site, should be sought prior to finalising the foundation design, as the actual pile working load will depend on the particular type of pile and method of working adopted.

In Table A we present preliminary load capacities estimated for varying diameters of pile. These values should be used for preliminary design purposes only as the actual working load is strongly dependent on the type of pile and method of installation. A driven pile might well result in damage to adjacent structures and this possibility should be discussed with the piling contractor prior to finalising the choice of pile type.

TABLE A

PRELIMINARY PILE WORKING LOADS

Depth	Diameter (metres)		
	Ø.3	Ø.45	Ø.6
9.Ø	25	5Ø	9Ø
	ØØ	ØØ	ØØ
	25	5Ø	9Ø
1Ø.Ø	3Ø	6Ø	11Ø
	15	25	35
	45	85	145
11.Ø	3Ø	7Ø	12Ø
	35	55	7Ø
	65	125	19Ø
12.Ø	35	8Ø	135
	6Ø	85	115
	95	165	25Ø
13.Ø	4Ø	85	155
	8Ø	12Ø	165
	12Ø	2Ø5	32Ø
14.Ø	4Ø	95	17Ø
	11Ø	16Ø	22Ø
	15Ø	255	39Ø

Note:

4Ø	-pile base capacity
11Ø	-pile shaft capacity
15Ø	-total pile capacity

Pile capacities in kN rounded to the nearest 5kN.

The upper 9.Ø metres of the pile has been ignored in the calculation of the pile shaft resistance.

No allowance has been made for negative skin friction acting on the portion of the pile passing through the Made Ground and Alluvium. Allowance for negative skin friction can be made by either reducing the working load of the pile or by sleeving the portion of the pile passing through the Made Ground and Alluvium, though for the conditions found on the site we consider it unlikely that significant negative skin friction forces would be developed.

The pile working loads given in Table A incorporate a factor of safety of 2.5 on both the ultimate base and ultimate skin frictional values. In the calculations a bearing capacity factor (N_c) of 9 was adopted. An adhesion value of Ø.45 was adopted in the calculation of the skin friction value. These values are typical of those for the soils found, though it may be possible to justify an increase, depending on the results of pile loading tests made on site. To be of value such tests need to be carried out in advance of the main piling contract and this should be discussed with the piling contractor.

The bearing values given in Table A are applicable to single piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about Ø.8.

An alternative piling scheme, comprising piles extending at least five diameters into the very dense sand found at a depth of 16.2 metres below ground level, could be considered, though it should be noted that this depth was only established in one borehole and also that the maximum depth of the borehole was 19 metres.

4.3 EXCAVATIONS

Excavations will be unstable and require adequate support. Excavations taken below the ground water level will in addition require dewatering by pumping from sumps.

Normal safety precautions should be adopted if excavations are to be entered.

4.4 SULPHATES

Total sulphates falling into Class 1 of the BRE Digest 250 were measured in the soil. The pH of the soil was near neutral.

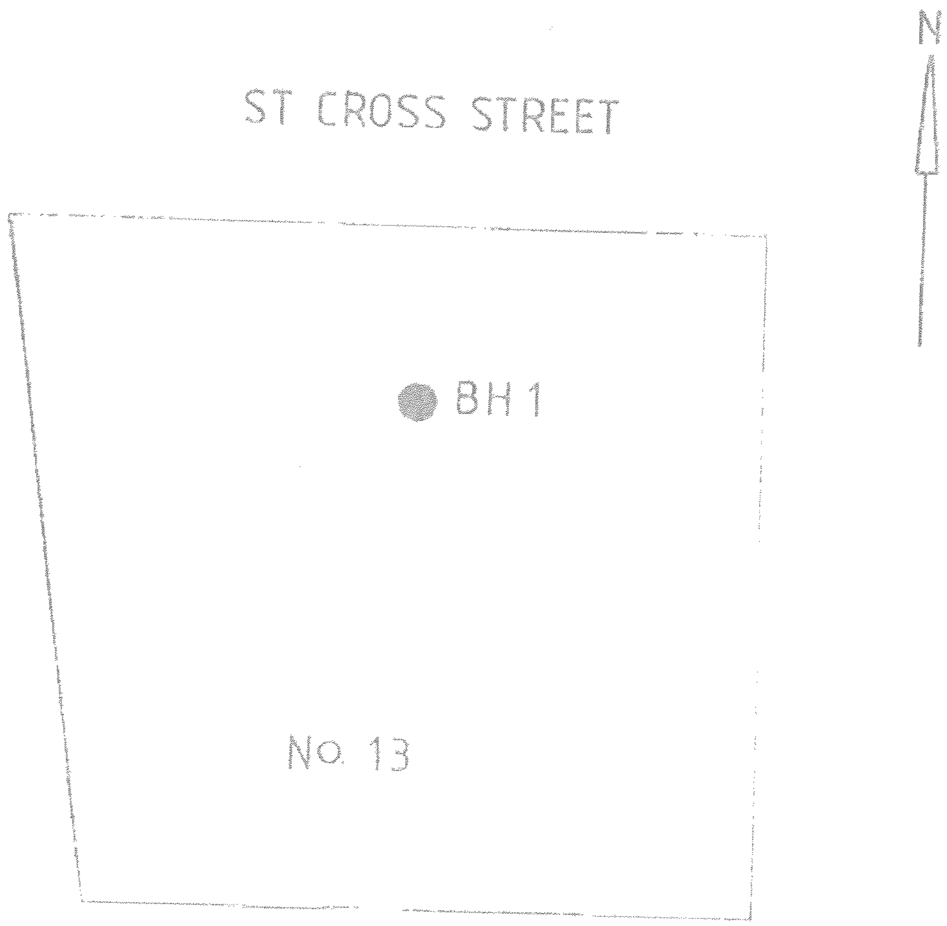
Concrete in contact with the soil or ground water should, therefore, be designed in accordance with the recommendations for sulphates falling into Class 1 of the Digest, an abstract of which is appended.

The following figures and appendices complete this report:

Figure 1	Borehole Location
Appendix A	Field Work
Appendix B	Laboratory Testing

R. B. Higginson B.Sc.,PG.Dip.,C Eng.,MICE.,FGS.

N.J. Lambert B.Sc.

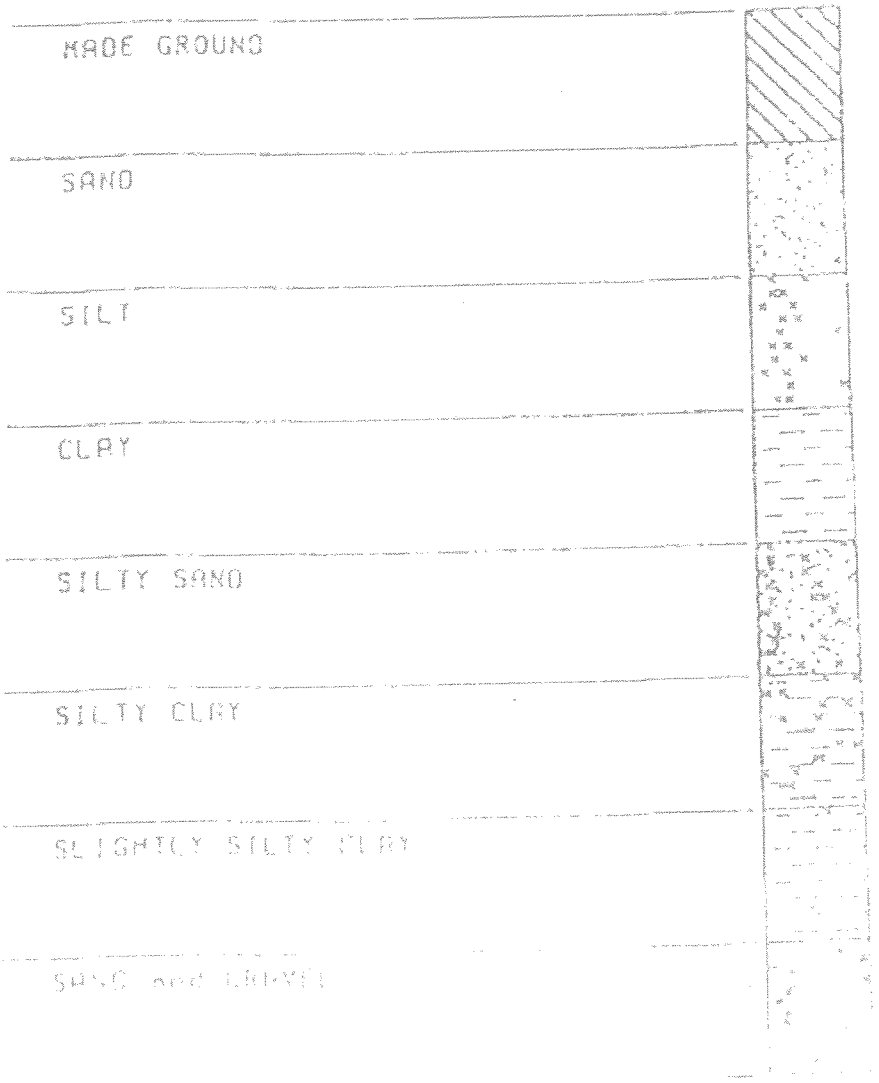


N.T.S

J.794 12 St. Cross Street London EC2 Fig

SOILS LIMITED

LEGEND


MADE GROUND
SAND
SILT
CLAY
SILTY SAND
SILTY CLAY
SLIGHTLY SILTY CLAY

Sampling In-situ Testing

Depth m	Type	Penetration Blows				N
1	C	2	2	5	2	11
1.75	B					
2.5	C	2	1	1	1	5
3.25	B					
4	C	7	5	1	2	10
4.75	B					
5.5	C	1	2	1	2	6
6.25	B					
6.7	J					
7	U 39					
7.5	J					
7.75	J					
8.5	U 35					
9	J					
9.25	J					
10	U 38					
10.5	J					
10.75	J					
11.5	U 40					
12	J					

Description of Strata

Loose to medium dense brown silty sandy clay with abundant gravel, ash, brick and occasional concrete fragments.
(MADE GROUND)

Dark grey brown silty CLAY with occasional rotted roots and pockets dark brown silty clayey fine sand.
(ALLUVIUM)

Stiff to very stiff grey brown strongly fissured silty CLAY with occasional silt partings.
(LONDON CLAY)

Strata

Legend	Reduced Level	Depth m	Thickness m
		6.5	6.5
		7.7	1.2

Ground Water Record

Date	Time	B-Hole m	Casing m	Strike m	Standing m

Chiselling Record

Date	Duration Hrs	Depth Start	Depth Finish

PROJECT
13 St Cross Street

CLIENT
Alexander Builders Ltd

BOREHOLE LOG

DATE Nov 1988

DIA 150mm

REF J1394

BH 1

SHEET 1 OF 2

SOILS LIMITED