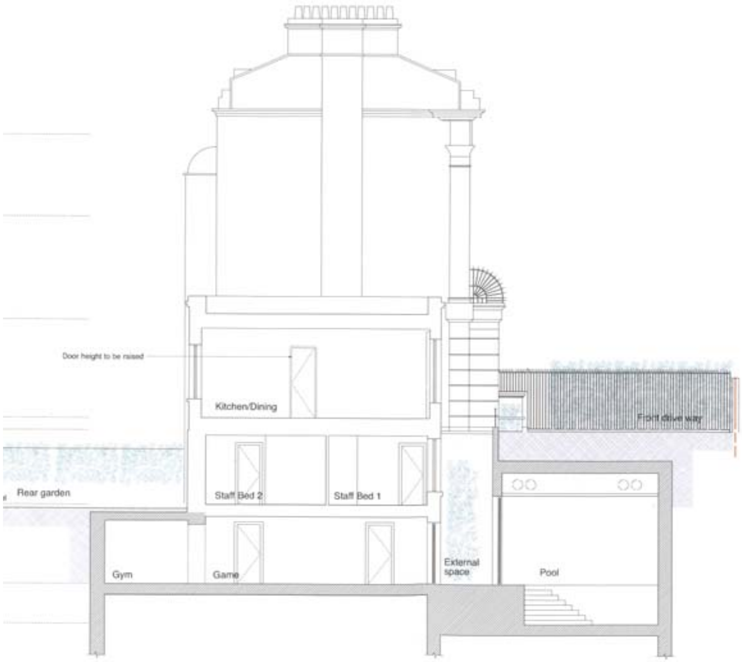
Ground Investigation Report

13 Prince Albert Road
London
NW1 7SR



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EXECUTIVE SUMMARY

This executive summary contains an overview of the key findings and conclusions. No reliance should be placed on any part of the executive summary until the whole of the report has been read. Other sections of the report may contain information that puts into context the findings that are summarised in the executive summary.

BRIEF

This report describes the findings of a site investigation carried out by Geotechnical and Environmental Associates Limited (GEA), on the instructions of Richard Tant Associates, on behalf of Sharon Waterman, with respect to the proposed construction of a basement beneath the existing house and front drive. The purpose of the investigation has been to research the history of the site with respect to possible contaminative uses, to determine the ground conditions, to assess the extent of any contamination and to provide information to assist with the design of the basement and suitable foundations for the proposed development. A Desk Study and Basement Impact Assessment has previously been carried out by GEA, (report ref: J11186 Issue 3, dated December 2011) and relevant details from the previous report are included herein.

DESK STUDY FINDINGS

Greenwood's Map of London, dated 1827, shows Prince Albert Road to have been developed and labelled as Primrose Hill Road at that time, although no houses had been constructed. By 1859, John Snow's map shows the site to have been developed and the outline of the existing house can clearly be seen on the earliest OS map studied, dated 1876. Very little change is shown on subsequent maps throughout the 20th Century.

GROUND CONDITIONS

The investigation has encountered a moderate thickness of made ground overlying the London Clay Formation, which was proved to the maximum depth investigated of 20.0 m. The made ground extended to depths of 0.5 m and 1.8 m below lower ground floor level and to a depth of 1.1 m below ground level. The London Clay initially comprised firm brown mottled grey fissured clay with partings of grey fine sand which extended to the base of the window sampler boreholes, and to 13.0 m in Borehole No 1. Below the weathered clay, stiff grey fissured clay was encountered and extended to the maximum depth investigated, of 20.0 m. Seepage of groundwater was recorded at a depth of 4.0 m below lower ground floor level. No inflows were recorded in the cable percussion borehole at the front of the site. A standpipe was installed to a depth of 7.0 m at the front of the site and was subsequently recorded to be dry to a depth of 2.0 m, but the pipe was noted to be blocked at that depth.

Elevated concentrations of lead have been recorded in the made ground.

RECOMMENDATIONS

Excavations for the proposed basement structure will require temporary support to maintain stability and to prevent any excessive ground movements. Based on the groundwater observations to date, significant groundwater inflows are not expected within the basement excavation, although groundwater may be encountered associated with partings of silt within the London Clay. Monitoring should be carried out to confirm the equilibrium water level. Traditional mass concrete underpinning is likely to provide the most appropriate method of extending the existing foundations and supporting the basement excavation. Moderate width pad or strip foundations, excavated from basement level to bear in the stiff clay, may be designed to apply a net allowable bearing pressure of 160 kN/m^2.

Only a limited number of samples have been tested to provide a preliminary indication of the possible presence of contamination. At this stage it is recommended that additional testing of the topsoil in the garden areas is carried out to determine the risk to end users and the requirement for remediation.

Part 1: INVESTIGATION REPORT

This section of the report details the objectives of the investigation, the work that has been carried out to meet these objectives and the results of the investigation. Interpretation of the findings is presented in Part 2.

1.0 INTRODUCTION

Geotechnical and Environmental Associates (GEA) has been commissioned by Richard Tant Associates, on behalf of Sharon Waterman, to carry out a site investigation at 13 Prince Albert Road, London NW1 7SR. A Desk Study and Basement Impact Assessment (BIA) has previously been carried out by GEA, (report ref: J11186 Issue 3, dated December 2011). The previous report was initially produced in September 2011 but was subsequently revised in December to include the findings of the boreholes. The BIA did not highlight any outstanding issues with respect to groundwater or the construction of the basement.

1.1 Proposed Development

It is proposed to construct a basement to a depth of 3 m below the existing lower ground floor level and a swimming pool will be constructed from basement level, with the underside of the pool excavation extending to a depth of 4.5 m below existing lower ground floor level. The proposed basement will extend beneath the existing house and the front driveway.

This report is specific to the proposed development and the advice herein should be reviewed if the proposals are amended.

1.2 Purpose of Work

The principal technical objectives of the work carried out were as follows:

- to check the history of the site with respect to previous contaminative uses;
- to determine the ground conditions and their engineering properties;
- to provide advice with respect to the design of suitable foundations and retaining walls;
- to provide an indication of the degree of soil contamination present; and
- to assess the risk that any such contamination may pose to the proposed development, its users or the wider environment.

1.3 Scope of Work

In order to meet the above objectives, a desk study was carried out, followed by a ground investigation. The desk study comprised:

- a review of readily available geological and hydrogeological maps;
- a review of historical Ordnance Survey (OS) maps and environmental searches sourced from the Envirocheck database; and

- a walkover survey of the site carried out in conjunction with the fieldwork.

In the light of this desk study an intrusive ground investigation was carried out which comprised, in summary, the following activities:

- a single cable percussion borehole, advanced to a depth of 20 m;
- standard penetration tests (SPTs), carried out at regular intervals in the borehole, to provide additional quantitative data on the strength of the soils;
- the installation of a single groundwater monitoring standpipe;
- two window sampler boreholes advanced to a depth of 6.0 m to provide additional coverage of the site;
- laboratory testing of selected soil samples for geotechnical purposes and for the presence of contamination; and
- provision of a report presenting and interpreting the above data, together with our advice and recommendations with respect to the proposed development.

The report includes a contaminated land assessment which has been undertaken in accordance with the methodology presented in Contaminated Land Report (CLR) 11[1] and involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the United Kingdom. The risk assessment is thus divided into three stages comprising Preliminary Risk Assessment, Generic Quantitative Risk Assessment, and Site-Specific Risk Assessment.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the investigation. The results of the work should be viewed in the context of the range of data sources consulted, the number of locations where the ground was sampled and the number of soil, gas or groundwater samples tested; no liability can be accepted for information in other data sources or conditions not revealed by the sampling or testing. Any comments made on the basis of information obtained from the client or other third parties are given in good faith on the assumption that the information is accurate; no independent validation of such information has been made by GEA.

2.0 THE SITE

2.1 Site Description

The site lies on the northern side of Regent's Park and is located 500 m to the southwest of Camden Town London Underground station and may be additionally located by National Grid Reference 528350, 183700.

The site fronts onto Prince Albert Road to the south and is bordered by similar semi-detached villas to the east and west, and semi-detached houses to the north. The site is roughly rectangular in shape, measuring approximately 30 m by 15 m. It is occupied by a semi-detached Regency villa of four storeys plus a basement. The house is centrally positioned on

1 *Model Procedures for the Management of Land Contamination* issued jointly by the Environment Agency and the Department for Environment, Food and Rural Affairs (DEFRA) Sept 2004

the site with a hard covered driveway to the front and garden at the rear. The rear garden is at lower ground floor level, is accessed by steps on the western side of the house and comprises a central lawn with bushes along the northern and western boundaries; a paved path runs along the back of the house and a small patio area is present in the east of the garden. There are two semi-mature silver birch trees located on the southern boundary of the site.

The site and surrounding area are essentially level at an Ordnance datum (OD) level of approximately 34.0 m OD according to the most recent Ordnance Survey (OS) map.

2.2 Previous Desk Study

By 1859, John Snow's Map of London shows the site to have been developed and the outline of the existing house can clearly be seen on the earliest OS map studied, dated 1876. Very little change is shown on subsequent maps throughout the 20th Century.

2.3 Other Information

The British Geological Survey (BGS) map of the area (Sheet 256) shows the site to be directly underlain by London Clay.

The Regent's Canal lies in a relatively steep sided cutting roughly 30 m to the south of the site. The canal forms part of the Grand Union Canal and connects with the River Thames at Limehouse, 8.5 km to the southeast.

The underlying London Clay is classified as Unproductive Strata. The site does not lie within an Environment Agency designated Source Protection Zone (SPZ), but the Barrow Hill reservoir, located 700 m to the west of the site is identified as a groundwater source. The site is not within an area indicated by the Environment Agency to be at risk from flooding.

2.4 Preliminary Risk Assessment

Part IIA of the Environmental Protection Act 1990, which was inserted into that Act by Section 57 of the Environment Act 1995, provides the main regulatory regime for the identification and remediation of contaminated land. The determination of contaminated sites is based on a "suitable for use" approach which involves managing the risks posed by contaminated land by making risk-based decisions. This risk assessment is carried out on the basis of a source-pathway-receptor approach.

2.4.1 Source

The historical usage of the site that has been established by the desk study and the site walkover indicates that the site does not have a potentially contaminative history by virtue of it having been occupied by a house. No sources of landfill gas have been identified by the desk study.

2.4.2 Receptor

The site will continue to have a residential end use following the excavation of the basement and no new receptors will result. The end use is therefore considered to be of moderate to high sensitivity. Buried services are likely to come into contact with any contaminants present within the soils through which they pass and site workers are likely to come into contact with any contaminants present in the soils during demolition and construction works. Being underlain by unproductive strata, groundwater is not considered a sensitive target.

2.4.3 Pathway

End users will be isolated from any potential contaminants in the ground by the presence of buildings and no new pathways will be created. The presence of relatively impermeable London Clay at shallow depths will inhibit infiltration of surface run-off and hence migration of contaminants onto adjacent sites is unlikely. Except for the pathway of direct contact for site workers, no new pathways will be created by the basement excavation.

2.4.4 Preliminary Risk Appraisal

On the basis of the above it is considered that there is a very low risk of there being a significant contaminant linkage at this site which would result in a requirement for major remediation work. Furthermore, there is not considered to be a significant potential for hazardous soil gas to be present on or migrating towards the site: there should thus be no need to consider landfill gas exclusion systems.

3.0 EXPLORATORY WORK

In order to meet the objectives described in Section 1.2, a single cable percussion borehole was drilled to a depth of 20 m from ground level in the front driveway. Standard penetration tests (SPTs) were carried out at regular intervals in the borehole and disturbed and undisturbed samples were recovered for subsequent laboratory examination, geotechnical testing and contamination analysis. To supplement the deep borehole, two window sampler boreholes were advanced to a depth of 6.0 m and a single trial pit was hand excavated to expose the existing foundations.

A groundwater monitoring standpipe was installed in one of the boreholes to a depth of 6.0 m, and has been monitored on a single occasion.

The borehole records and results of the laboratory analyses are appended, together with a site plan indicating the exploratory positions.

3.1 Sampling Strategy

The boreholes were positioned in accessible external locations determined by GEA and confirmed to avoid areas of known underground services.

Two samples of made ground were subjected to analysis for a range of common industrial contaminants and contamination indicative parameters. For this investigation the analytical suite for the soil included a range of metals, speciation of total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), total cyanide and monohydric phenols. The soil samples were selected to provide a general view of the chemical conditions of the soils that are likely to be involved in a human exposure or groundwater pathway and to provide advice in respect of re-use or for waste disposal classification.

The contamination analyses were carried out at an MCERTs accredited laboratory with the majority of the testing suite accredited to MCERTS standards. Details of the MCERTs accreditation and test methods are included in the Appendix together with the analytical results.

4.0 GROUND CONDITIONS

The investigation has confirmed the expected ground conditions in that, beneath a moderate thickness of made ground, London Clay was encountered and proved to the full depth of the investigation.

4.1 Made Ground

The made ground extended to depths of 0.5 m and 1.8 m below lower ground floor level and to a depth of 1.1 m below ground level. It comprised topsoil and clay with gravel, brick, concrete and charcoal in the rear garden, whereas 'Type 1'aggregate was recorded beneath the driveway at the front of the site.

No visual or olfactory evidence of contamination was observed within these soils, although fragments of charcoal were noted within the made ground, which can commonly contain elevated concentrations of PAH, including benzo(a)pyrene and naphthalene. Two samples of the made ground have been analysed for a range of contaminants and the results are summarised in Section 4.4.

4.2 London Clay

This stratum initially comprised firm brown mottled grey fissured clay with partings of grey fine sand which extended to the base of the window sampler boreholes, and to 13.0 m in Borehole No 1. Below the weathered clay, stiff grey fissured clay was encountered and extended to the maximum depth investigated, of 20.0 m. The clay was noted to be silty at 13.0 m and 20.0 m.

Laboratory plasticity index tests have indicated the clay to be of high shrinkability. Quick undrained triaxial tests have indicated the clay to be initially medium strength, becoming high strength below about 5.0 m and very high strength below 10.0 m.

4.3 Groundwater

Seepage of groundwater was recorded at a depth of 4.0 m in one of the window sampler boreholes advanced from lower ground floor level. No inflows were recorded in the cable percussion borehole at the front of the site. A standpipe was installed to a depth of 7.0 m at the front of the site and has been monitored on a single occasion. The standpipe was recorded to be dry to a depth of 2.0 m, but the pipe was noted to be blocked at that depth. Nearby investigations did not encounter groundwater within the London Clay.

4.4 Soil Contamination

The table below sets out the values measured within two samples of made ground which have been analysed; all concentrations are in mg/kg unless otherwise stated.

Determinant	TP1 at 0.5 m	BH3 at 0.3 m
Arsenic	17	9.7
Cadmium	<0.1	0.14
Chromium	19	20
Copper	55	49

Determinant	TP1 at 0.5 m	BH3 at 0.3 m
Mercury	1.0	1.3
Nickel	13	11
Lead	**1800**	**570**
Selenium	<0.2	0.26
Zinc	130	120
Total Cyanide	<0.5	<0.5
Total Phenols	<0.3	<0.3
Sulphide	4.8	3.6
Total PAH	<2	<2
Benzo(a)pyrene	<0.1	<0.1
Naphthalene	<0.1	<0.1
TPH	<10	<10
Total Organic Carbon %	2.3	2.2
Figure in bold indicates concentration in excess of risk-based soil guideline values, as discussed in Part 2 of this report		

4.4.1 Generic Quantitative Risk Assessment

The use of a risk-based approach has been adopted to provide an initial screening of the test results to assess the need for subsequent site-specific risk assessments. To this end contaminants of concern are those that have values in excess of a generic human health risk based guideline values which are either that of the CLEA[2] Soil Guideline Value where available, or is a Generic Guideline Value calculated using the CLEA UK Version 1.06 software assuming a residential with plant uptake end use. The key generic assumptions for this end use are as follows:

- that groundwater will not be a critical risk receptor;
- that the critical receptor for human health will be young female children aged zero to six years old;
- that the exposure duration will be six years;
- that the critical exposure pathways will be direct soil and indoor dust ingestion, consumption of homegrown produce, consumption of soil adhering to homegrown produce, skin contact with soils and indoor dust, and inhalation of indoor and outdoor dust and vapours; and
- that the building type equates to a two-storey small terraced house.

It is considered that these assumptions are acceptable for this generic assessment of this site, which is underlain by unproductive strata. The tables of generic screening values derived by

2 *Updated Technical Background to the CLEA Model (Science Report SC050021/SR3) Jan 2009* and Soil Guideline Value reports for specific contaminants; all DEFRA and Environment Agency.

GEA and an explanation of how each value has been derived are included in the Appendix.

Where contaminant concentrations are measured at concentrations below the generic screening value it is considered that they pose an acceptable level of risk and thus further consideration of these contaminant concentrations is not required. However where concentrations are measured in excess of these generic screening values there is considered to be a potential that they could pose an unacceptable risk and thus further action will be required which could include;

- additional testing to zone the extent of the contaminated material and thus reduce the uncertainty with regard to its potential risk;
- site specific risk assessment to refine the assessment criteria and allow an assessment to be made as to whether the concentration present would pose an unacceptable risk at this site; or
- soil remediation or risk management to mitigate the risk posed by the contaminant to a degree that it poses an acceptable risk.

A comparison of the measured concentrations against the generic screening values has indicated elevated concentrations of lead in both samples of made ground. This assessment is based upon the potential for risk to human health, which is considered to be the critical risk receptor.

The significance of these results is considered further in Part 2 of the report.

4.5 Existing Foundations

The existing foundations were exposed in a single trial pit excavated adjacent to the northern elevation of the house at lower ground floor level. The foundations comprised a concrete footing extending to a depth of 1.3 m and bearing on London Clay.

Part 2: DESIGN BASIS REPORT

This section of the report provides an interpretation of the findings detailed in Part 1, in the form of a ground model, and then provides advice and recommendations with respect to foundation options and contamination issues.

5.0 INTRODUCTION

Consideration is being given to the construction of a single level basement below the existing house and front driveway, with a swimming pool constructed from basement level.

The new basement will extend beneath the house and front drive, and partially below the rear garden. Formation level is therefore anticipated to be within the London Clay. The proposed loads to be applied by the new structure have not been provided but are expected to be light.

6.0 GROUND MODEL

The desk study has revealed that the site has not had a potentially contaminative history, having been occupied by a house, and on the basis of the fieldwork, the ground conditions at this site can be characterised as follows.

- Beneath a moderate thickness of made ground, the London Clay was proved to the maximum depth investigated;
- the made ground extends to a depth of 1.1 m at the front of the site and up to 1.8 m at the rear;
- firm brown mottled grey fissured clay with partings of grey fine sand extends to the base of the window sampler boreholes, and to 13.0 m in Borehole No 1;
- below the initial weathered clay, stiff grey fissured clay was encountered and extended to the maximum depth investigated, of 20.0 m;
- seepage of groundwater was recorded at a depth of 4.0 m from lower ground floor level. No inflows were recorded in the cable percussion borehole at the front of the site;
- the standpipe was recorded to be dry to a depth of 2.0 m below ground level, but the pipe was noted to be blocked at that depth; and
- elevated concentrations of lead were measured in both samples tested but no other contaminants were recorded in the made ground.

7.0 ADVICE AND RECOMMENDATIONS

The excavation for the proposed basement structure will require temporary support to maintain stability of the existing and surrounding structures and to prevent any excessive ground movements. The formation level of the new basement is anticipated to be roughly 3 m below existing lower ground floor level, and is assumed to be approximately 5 m to 6 m below the level of Prince Albert Road. The basement level will be locally deepened in the south of the site to accommodate the proposed swimming pool.

Based on the groundwater observations to date, significant groundwater inflows are not expected within the basement excavation. The existing foundations will need to be underpinned prior to construction of the proposed basement or will need to be supported by new retaining walls.

Formation level for the proposed development will be within the London Clay, which should provide an eminently suitable bearing stratum for spread foundations excavated from basement level. Piled foundations or a basement raft would also provide suitable alternatives.

7.1 Basement Excavation

Groundwater was encountered as seepage at a depth of 4 m below lower ground floor level during the investigation and on this basis groundwater inflows are not anticipated within the bulk of the basement excavation, but may be encountered in the deeper section at the front of the site. The seepage was associated with a parting of silt within the clay. The London Clay has a low horizontal permeability and an even lower vertical permeability, as such the rate of potential inflow of groundwater into an excavation is expected to be slow. In addition potential groundwater flow within the London Clay is primarily along fissures or partings of fine sand / silt which are localised and unlikely to extend extensively across neighbouring sites. The standpipe should be unblocked or repaired to enable monitoring to be carried out to confirm the equilibrium groundwater level.

The design of basement support in the temporary and permanent conditions needs to take account of the need to maintain the stability of the excavation, the existing building and surrounding structures and to protect against groundwater inflows. The choice of wall may be governed to a large extent by the access restrictions. The most cost effective method of forming the proposed basement is likely to be traditional mass concrete underpinning constructed by means of a “hit and miss” approach with localised pumping to deal with groundwater inflows.

Consideration may be given to the use of a bored pile retaining wall, which could have the advantage of being incorporated into the permanent works and being able to provide support for structural loads. On the basis of the groundwater observations to date, it should be possible to adopt a contiguous bored pile wall, with the use of localised grouting and / or sump pumping if necessary in order to deal with groundwater inflows. A contiguous bored piled wall would however have the disadvantage of reducing usable space in the basement, and in this respect a secant wall may be preferable as it would overcome the requirement for any secondary groundwater protection in the permanent works and maximise the basement area.

The ground movements associated with the basement excavation will depend on the method of excavation and support and the overall stiffness of the basement structure in the temporary condition. Thus, a suitable amount of propping will be required to provide the necessary rigidity. In this respect the timing of the provision of support to the wall will have an important effect on movements.

7.1.1 Basement Retaining Walls

The following parameters are suggested for the design of the permanent basement retaining walls.

Stratum	Bulk Density (kg/m^3)	Effective Cohesion (c' – kN/m^2)	Effective Friction Angle (Φ' – degrees)
Made ground	1700	Zero	27
London Clay	1950	Zero	25

Groundwater may be encountered within the deeper excavation, although monitoring of the standpipe should be carried out to confirm the equilibrium levels. At this stage, it is recommended that the basement is designed with a water level assumed to be two-thirds of the basement depth, unless a fully effective drainage system can be ensured. It may however be possible to review this requirement following additional investigation by means of trial excavations and further monitoring and the advice in BS8102:2009[3] should be followed in this respect.

7.1.2 Basement Heave

The excavation of a 5 m thickness of soil will result in an unloading of approximately 100 kN/m^2. The unloading will result in heave of the underlying clay, which will comprise short term elastic movement and longer term swelling that will continue over a number of years. These movements will be mitigated to some extent by the continued pressure applied by the existing building, which will be retained, although it is considered that a more detailed analysis of the possible heave should be carried out once the basement design has been finalised. In addition, the variation in unloading is likely to lead to differential movement and could impact on the adjacent buildings, which should also be considered.

7.2 Spread Foundations

Moderate width pad or strip foundations, excavated from basement level to bear in the stiff clay, may be designed to apply a net allowable bearing pressure of 160 kN/m^2. This value incorporates an adequate factor of safety against bearing capacity failure and should ensure that settlement remains within normal tolerable limits.

7.3 Basement Raft Foundation

The suitability of a raft foundation will depend on the net foundation pressure that will be applied following excavation of the basement and whether the structural loads can be relatively evenly distributed. If the use of a basement raft is to be considered, further analysis of likely movements will need to be carried out on the basis of the proposed loadings.

7.4 Piled Foundations

For the ground conditions at this site some form of bored pile is likely to be the most appropriate type. A conventional rotary augered pile would be appropriate but given the available space is unlikely to be suitable. Alternatively, consideration could be given to the use of bored piles installed using continuous flight auger (cfa) techniques, which would not require the provision of casing. The final choice of pile type will be largely governed by the access restrictions and working area.

The following table of ultimate coefficients may be used for the preliminary design of bored piles, which have been based on the SPT & Cohesion / depth graph in the appendix.

3 BS8102 (2009) *Code of practice for protection of below ground structures against water from the ground*

Ultimate Skin Friction		**kN/m²**
Made Ground and London Clay	GL to 6 m	Ignore (basement excavation)
London Clay ($\alpha = 0.5$)	6 m to 20 m	Increasing linearly from 45 to 105
Ultimate End Bearing		**kN/m²**
London Clay	15 m to 20 m	Increasing linearly from 1485 to 1890

In the absence of pile tests, guidance from the London District Surveyors Association[4] (LDSA) suggests that a factor of safety of 2.6 should be applied to the above coefficients in the computation of safe theoretical working loads. On the basis of the above coefficients and a factor of safety of 2.6, it has been estimated that a 450 mm diameter pile founding at a depth of 20 m below existing ground floor level should provide a safe working load of about 685 kN.

The above example is not intended to constitute any form of recommendation with regard to pile size or type, but merely serve to illustrate the use of the above coefficients. Specialist piling contractors should be consulted with regard to the design of a suitable piling scheme for this site. Their attention should be drawn to the presence of sand partings and associated groundwater seepage within the clay.

7.5 Basement Floor Slab

Following the excavation of the basement, it should be possible to adopt a ground bearing floor slab bearing on the London Clay. Consideration will however need to be given to designing the slab to withstand heave and theoretical water pressure.

7.6 Effect of Sulphates

Low concentrations of soluble sulphate have been measured in selected soil samples and therefore indicate that buried concrete should be designed in accordance with Class DS-1 conditions of Table C1 of BRE Special Digest 1: SD1 Third Edition (2005). The measured pH conditions are mildly alkaline and therefore on the basis of static groundwater conditions being assumed for buried concrete an ACEC classification of AC-1s may be adopted. The guidelines contained in the above digest should be followed in the design of foundation concrete.

7.7 Basement Impact Assessment Summary

The previous desk study and BIA identified five potential impacts of the development which comprised groundwater, the Regent's Canal, seasonal shrink-swell, the location of the public highway and founding depths relative to neighbours.

It was concluded that the majority of these impacts could be mitigated by appropriate design and standard construction practice, particularly with respect to seasonal shrink / swell, the founding depth relative to the neighbours, and the stability of the highway. The canal is at

4 LDSA (2009) *Foundations No 1 – Guidance notes for the design of straight shafted bored piles in London Clay*. LDSA Publication

sufficient distance and depth to be unaffected by the development. It was determined that protection from groundwater inflows may be required in the basement excavation, subject to repair of the standpipe and further monitoring. In any case, inflows from within the London Clay would be expected at a slow rate which could be suitably controlled by sump pumping.

It was concluded that standard safe working practices and measures that will be adopted to construct the basement mean that the proposed development is unlikely to result in any specific groundwater, surface water, land or slope stability issues.

7.8 Site Specific Risk Assessment

Consideration is being given to the construction of a basement extension beneath the footprint of the existing building and front driveway. No sources of contamination were identified on site during the desk study, although chemical analysis has indicated elevated concentrations of lead in the made ground.

The excavation of the basement will result in the removal of the made ground at the front of the site and below a small part of the garden at the rear, where the highest concentration of lead was measured in Trial Pit No 1. In addition, the concentration of lead measured in Borehole No 3 is unlikely to be in soluble form as the location of this borehole is soft covered and would have been subject to infiltration of surface run-off for a long period of time. However, the measured concentrations present a potential risk to end users of the site who could be exposed to the made ground in soft landscaped areas.

Only a limited number of samples have been tested to provide a preliminary indication of the possible presence of contamination. At this stage it is recommended that additional testing of the topsoil in the garden areas is carried out to determine the risk to end users and the requirement for remediation. Apart from the adoption of standard safe working practices in accordance with good standards of health and safety for site workers, additional precautions with respect to other sensitive receptors will not be necessary at this stage.

7.9 Waste Disposal

Any spoil arising from excavations or landscaping works will need to be disposed of to a licensed tip. Under the European Waste Directive landfills are classified as accepting inert, non-hazardous or hazardous wastes in accordance with the EU waste Directive.

Based upon on the results of the contamination tests and the technical guidance provided by the Environment Agency[5] the made ground would be generally classified as a Non-Hazardous waste, whilst the natural soils may be classified as an Inert waste. WAC leaching tests should then be carried out on any material to be disposed of to landfill that is likely to be classified as being hazardous. Such WAC leaching tests may not be necessary upon samples of natural soils which are to be disposed of as an inert waste as the site may be considered as having had an uncontaminated history.

Under the requirements of the European Waste Directive all waste needs to be pre-treated prior to disposal. The pre-treatment process must be physical, thermal, chemical or biological, including sorting. It must change the characteristics of the waste in order to reduce its volume, hazardous nature, facilitate handling or enhance recovery. The waste producer can carry out the treatment but they will need to provide documentation to prove that this has been carried

5 Environment Agency May 2008. Hazardous Waste: Interpretation of the definition and classification of hazardous waste. Technical Guidance WM2 Second Edition Version 2.2

out. Alternatively, the treatment can be carried out by an approved contractor. The Environment Agency has issued a position paper[6] which states that in certain circumstances, segregation at source may be considered as pre-treatment and thus excavated material may not have to be treated prior to landfilling if the soils can be segregated onsite prior to excavation by sufficiently characterising the soils insitu prior to excavation.

The above opinion with regard to the classification of the excavated soils is provided for guidance only and should be confirmed by the receiving landfill once the soils to be discarded have been identified.

The local waste regulation department of the Environment Agency (EA) should be contacted to obtain details of tips that are licensed to accept the soil represented by the test results. The tips will be able to provide costs for disposing of this material but may require further testing.

8.0 OUTSTANDING RISKS AND ISSUES

This section of the report aims to highlight areas where further work is required as a result of limitations on the scope of this investigation, or where issues have been identified by this investigation that warrant further consideration. The scope of risks and issues discussed in this section is by no means exhaustive, but covers the main areas where additional work is considered to be required.

The ground is a heterogeneous natural material and variations will inevitably arise between the locations at which it is investigated. This report provides an assessment of the ground conditions based on the discrete points at which the ground was sampled, but the ground conditions should be subject to review as the work proceeds to ensure that any variations from the Ground Model are properly assessed by a suitably qualified person.

The existing standpipe should be unblocked / repaired to enable monitoring to be carried out to determine the equilibrium water level. The investigation has indicated elevated concentrations of lead within the made ground and recommendations have been made for further testing to be carried out of soil in soft landscaped areas.

6 *Regulatory Position Statement 'Treating non-hazardous waste for landfill - Enforcing the new requirement' Environment Agency 23 Oct 2007*

APPENDIX

Borehole Records

Trial Pit Record

Geotechnical Test Results

SPT & Cohesion / Depth Graph

Contamination Test Results

Generic Guideline Values

Site Plan

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site	Borehole Number
13 Prince Albert Road, London NW1 7SR	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 1.50m		Ms Sharon Waterman	J11186
	Location	**Dates**	**Engineer**	**Sheet**
		24/11/2011	Richard Tant Associates	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.20) 0.20	Made ground (granite setts over sand and cement)		
0.40	D1					(0.90)	Made ground (crushed aggregate over dark brown clayey sand with gravel, brick and tarmac fragments)		
0.90	D2					1.10			
1.20-1.65	U3						Firm orange-brown mottled grey medium strength CLAY with carbonaceous fragments. Discoloured with a slight malodour from 2.4 m to 3.4 m		
1.60	D4								
2.00-2.45 2.00	SPT N=7 D5	1.50	DRY	1,1/1,2,2,2					
2.80	D6								
3.00-3.45	U7					(4.40)			
3.50	D8								
4.00-4.45 4.00	SPT N=12 D9	1.50	DRY	2,2/2,3,3,4					
4.80	D10								
5.00-5.45	U11								
5.50	D12					5.50	Stiff brown mottled grey high strength fissured silty CLAY with occasional partings of orange-brown silt and selenite crystals		
6.00-6.45 6.00	SPT N=15 D13	1.50	DRY	2,3/3,4,4,4					
7.50-7.95	U14								
8.00	D15								
9.00-9.45 9.00	SPT N=21 D16	1.50	DRY	3,4/4,5,6,6		(7.50)			

Remarks
Services inspection pit excavated to 1.2 m for 1 hour 30 mins
Groundwater monitoring standpipe installed to a depth of 6.0 m on completion
Groundwater not encountered

Scale (approx)	Logged By
1:50	JF

Figure No.
J11186.BH1

GEA Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Site	Borehole Number
13 Prince Albert Road, London NW1 7SR	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 1.50m		Ms Sharon Waterman	J11186
	Location	**Dates**	**Engineer**	**Sheet**
		24/11/2011	Richard Tant Associates	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.50-10.95	U17								
11.00	D18								
						(7.50)			
12.00-12.45 12.00	SPT N=23 D19	1.50	DRY	4,5/5,5,6,7					
						13.00	Stiff grey very high strength fissured locally silty CLAY		
13.10	D20								
13.50-13.95	U21								
14.00	D22								
15.00-15.45 15.00	SPT N=25 D23	1.50	DRY	4,5/5,6,7,7					
						(7.00)			
16.50-16.95	U24								
17.00	D25								
18.00-18.45 18.00	SPT N=28 D26	1.50	DRY	5,5/6,7,7,8					
19.50-19.95	U27								
20.00	D28					20.00			

Remarks	Scale (approx)	Logged By
	1:50	JF
	Figure No. J11186.BH1	

Geotechnical & Environmental Associates Tyttenhanger House Coursers Road St Albans AL4 0PG			Site 13 Prince Albert Road, London NW1 7SR	Number **BH2**
Excavation Method Drive-in Window Sampler	**Dimensions**	**Ground Level (mOD)**	**Client** Ms Sharon Waterman	**Job Number** J11186
	Location	**Dates** 28/11/2011	**Engineer** Richard Tant Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	D1				(1.00)	Made Ground (topsoil overlying dark brown silty sandy clay with rootlets, gravel, charcoal and brick fragments)		
1.00	D2				1.00	Made Ground (orange-brown mottled grey clay with pockets of sand, chalk fragments, black carbonaceous deposits and rare brick fragments)		
1.50	D3				(0.80)			
1.80	D4				1.80	Firm brown mottled grey fissured CLAY with roots and a layer of grey fine to coarse sand at 2.76 m		
					(1.20)			
3.00	D5				3.00 (0.10)	Grey fine to coarse SAND		
					3.10	Firm brown mottled grey fissured CLAY		
3.50	D6							
			seepage(1) at 4.00m.					∇1
4.50	D7				(2.90)			
6.00	D8				6.00	Complete at 6.00m		

Remarks	**Scale (approx)** 1:50	**Logged By** AV
	Figure No. J11186.BH2	

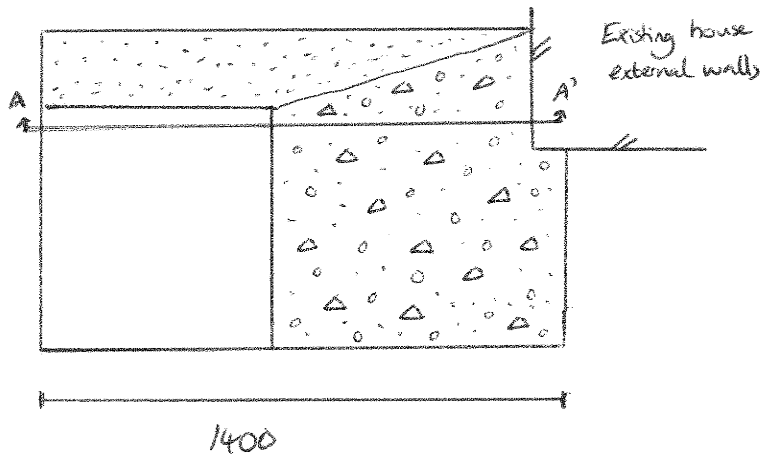
GEA Geotechnical & Environmental Associates, Tyttenhanger House, Coursers Road, St Albans, AL4 0PG			Site: 13 Prince Albert Road, London NW1 7SR	Number: BH3
Excavation Method: Drive-in Window Sampler	Dimensions:	Ground Level (mOD):	Client: Ms Sharon Waterman	Job Number: J11186
	Location:	Dates: 28/11/2011	Engineer: Richard Tant Associates	Sheet: 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D1				(0.50)	Made Ground (topsoil overlying dark brown silty sandy clay with brick, mortar, charcoal, concrete rubble, roots and rootlets)		
					0.50			
1.20	D2					Firm orange-brown mottled grey fissured CLAY with partings of orange-brown sand and rare selenite crystals		
1.80	D3							
3.00	D4				(5.50)			
4.00	D5							
5.00	D6							
6.00	D7				6.00	Complete at 6.00m		

Remarks	Scale (approx)	Logged By
Groundwater was not encountered	1:50	AV
	Figure No. J11186.BH3	

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans Herts AL4 0PG	Site 13 Prince Albert Road, London	Trial Pit Number 1
Excavation Method Hand dug	**Dimensions** 0.85 x 1.4 x 1.4	**Ground Level (mOD)**	Client Ms Sharon Waterman	**Job Number** J11186
	Location	**Dates** 30/11/2011	**Engineer** Richard Tant Associates	**Sheet** 1 / 1.

Plan: -



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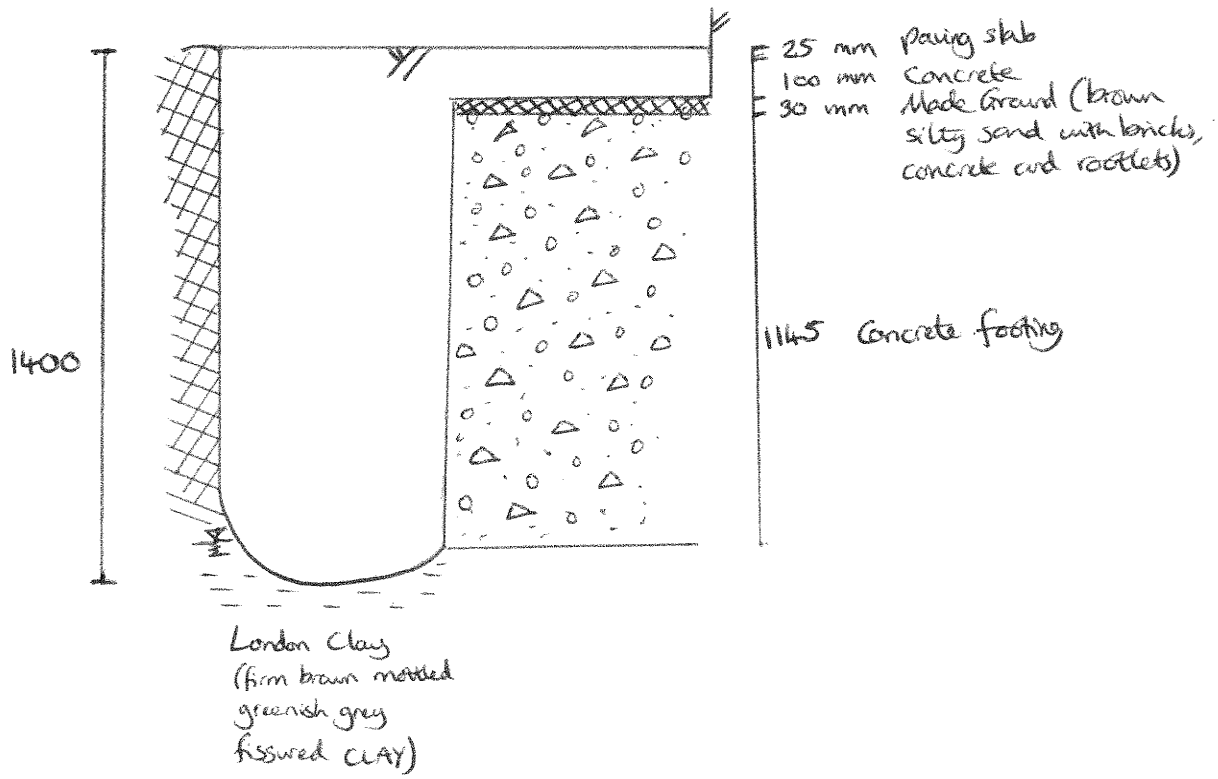


Remarks:	Scale:
All dimensions in millimetres	1:20
Sides of trial pit remained stable during excavation	Logged by:
Seepage of groundwater at base of made ground	AV

Client :	GEA	Our Job/report no:	11963	Samples Rec :	25/11/2011	Testing Started:	05/12/2011
Project name:	Tower Bridge	Project No:	J	Project Started:	02/12/2011	Date reported:	19/01/2012

BH / TP No	Sample no / ref	Sample depth (m)	Description	Moisture content (%)	Bulk Density (Mg/m3)	Dry density (Mg/m3)	Cell Pressure (kPa)	Strain at failure (%)	Max Deviator Stress (kPa)	Mode of failure	Shear Strength (kPa)	Phi (deg)
BH1	-	1.20	Medium strength brown fissured silty CLAY	25	2.01	1.61	24	13	134	Brittle	67	NA
BH1	-	3.00	Medium strength greenish brown slightly mottled blue grey fissured CLAY	30	1.90	1.46	60	10	118	Brittle	59	NA
BH1	-	5.00	High strength brown slightly mottled blue grey CLAY with occasional pockets of orange brown sand and scattered selenite crystals	32	1.93	1.46	100	8.0	173	Brittle	87	NA
BH1	-	7.50	High strength brown fissured CLAY	31	2.00	1.53	150	4.0	227	Brittle	114	NA
BH1	-	10.50	Very high strength brown fissured CLAY with scattered selenite crystals	28	1.99	1.55	210	4.5	308	Brittle	154	NA
BH1	-	13.50	Very high strength grey fissured CLAY	27	2.05	1.61	270	5.0	515	Brittle	258	NA
BH1	-	16.50	Very high strength grey fissured CLAY	27	2.05	1.62	330	6.0	391	Brittle	196	NA
BH1	-	19.50	Very high strength grey fissured CLAY	25	2.01	1.61	390	11	356	Brittle	178	NA

K4 SOILS

Summary of Undrained Triaxial Compression Testing

BS 1377 : Part 7 : Clause 8 : 1990

Checked and approved

Initials kp

UKAS TESTING 2519

Project Name:	Prince Albert Road	Samples Received:	25/11/2011
		Project Started:	20/02/2012
Client:	GEA	Testing Started:	29/02/2012
Project No:	J — Our job/report no: 11963	Date Reported:	01/03/2012

K4 SOILS

Borehole No:	Sample No:	Depth (m)	Description	Moisture content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 0.425 mm (%)	Remarks
BH1	D3	1.60	Brown slightly sandy CLAY with occasional carbonaceous deposits and roots	26	57	21	36	100	
BH1	D6	4.80	Brown slighlty sandy CLAY	32	77	29	48	100	
BH1	D9	11.00	Brown and grey CLAY with scattered traces of selenite	29	77	26	51	100	
BH1	D12	17.00	Grey CLAY	26	75	23	52	100	

UKAS TESTING 2519

Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.
BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

Checked and Approved
Initials: K.P
Date: 01/03/2012

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Test Results relate only to the sample numbers shown above. Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Project Name:	Prince Albert Road		
Client:	GEA	Project no:	J
		Our job no:	11963

K4 SOILS

Borehole No:	Sample No:	Depth m	Description	pH	Sulphate content (g/l)
BH1	D	0.90	Dark grey brown and black slightly sandy slightly gravelly CLAY with occasional fm brick and ash fragments (gravel is fm and sub-angular to sub-rounded)	7.5	0.17
BH1	D	3.50	Brown CLAY	7.3	0.17
BH1	D	6.00	Brown slightly mottled blue grey CLAY	7.3	0.31

Date
01/03/2012

Summary of Test Results

BS 1377 : Part 3 :Clause 5 : 1990

Determination of sulphate content of soil and ground water : gravimetric method

Checked and Approved
Initials : kp

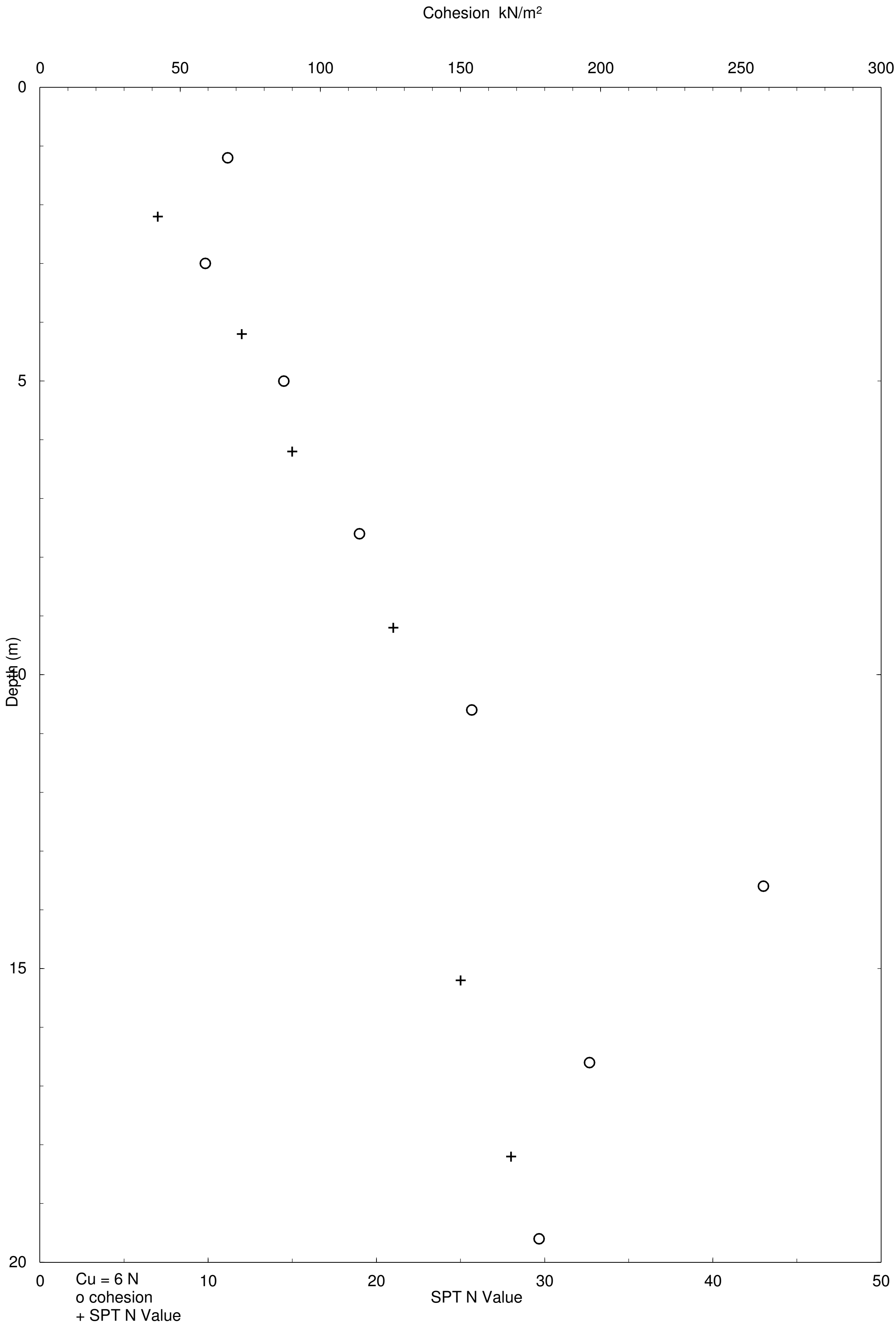
Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

SPT & Cohesion / Depth Graph

Site	13 Prince Albert Road, London	**Job Number**	J11186
Client	Sharon Waterman	**Sheet**	1 / 1
Engineer	Richard Tant Associates		



GEA
Tyttenhanger House
Coursers Road
St Albans Herts
AL4 0PG

FAO J Fulller

LABORATORY TEST REPORT

Results of analysis of 2 samples
received 13 March 2012

13 Prince Albert Road

Chemtest
The right chemistry to deliver results

Report Date
19 March 2012

Login Batch No					**202377**	
Chemtest LIMS ID					AH09963	AH09966
Sample ID					TP 1	BH3
Sample No						
Sampling Date					30/12/1899	30/12/1899
Depth					0.5m	0.3-0.5m
Matrix					*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*		
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50
2325	Sulfide (Easily Liberatable)	18496258	mg kg-1	M	4.8	3.6
2625	Total Organic Carbon		%	M	2.3	2.2
2220	Chloride (extractable)	16887006	g l-1	M	<0.010	<0.010
2430	Sulfate (total) as SO4		mg kg-1	M	1500	900
2450	Arsenic	7440382	mg kg-1	M	17	9.7
	Cadmium	7440439	mg kg-1	M	<0.10	0.14
	Chromium	7440473	mg kg-1	M	19	20
	Copper	7440508	mg kg-1	M	55	49
	Mercury	7439976	mg kg-1	M	1.00	1.3
	Nickel	7440020	mg kg-1	M	13	11
	Lead	7439921	mg kg-1	M	1800	570
	Selenium	7782492	mg kg-1	M	<0.20	0.26
	Zinc	7440666	mg kg-1	M	130	120
2670	TPH >C5-C6		mg kg-1	U	< 0.1	< 0.1
	TPH >C6-C7		mg kg-1	U	< 0.1	< 0.1
	TPH >C7-C8		mg kg-1	M	< 0.1	< 0.1
	TPH >C8-C10		mg kg-1	M	< 0.1	< 0.1
	TPH >C10-C12		mg kg-1	M	< 0.1	< 0.1
	TPH >C12-C16		mg kg-1	M	< 0.1	< 0.1
	TPH >C16-C21		mg kg-1	M	< 0.1	< 0.1
	TPH >C21-C35		mg kg-1	M	< 0.1	< 0.1
	Total Petroleum Hydrocarbons		mg kg-1	U	< 10	< 10
2700	Naphthalene	91203	mg kg-1	M	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-1	M	< 0.1	< 0.1
	Acenaphthene	83329	mg kg-1	M	< 0.1	< 0.1
	Fluorene	86737	mg kg-1	M	< 0.1	< 0.1

All tests undertaken between 13/03/2012 and 16/03/2012

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

LIMS sample ID range AH09963 to AH09966

GEA
Tyttenhanger House
Coursers Road
St Albans Herts
AL4 0PG

FAO J Fulller

LABORATORY TEST REPORT

Chemtest
The right chemistry to deliver results

Results of analysis of 2 samples
received 13 March 2012

Report Date
19 March 2012

13 Prince Albert Road

					202377	
					AH09963	AH09966
					TP 1	BH3
					30/12/1899	30/12/1899
					0.5m	0.3-0.5m
					SOIL	*SOIL*
2700	Phenanthrene	85018	mg kg-1	M	< 0.1	0.31
	Anthracene	120127	mg kg-1	M	< 0.1	< 0.1
	Fluoranthene	206440	mg kg-1	M	< 0.1	0.48
	Pyrene	129000	mg kg-1	M	< 0.1	0.4
	Benzo[a]anthracene	56553	mg kg-1	M	< 0.1	0.21
	Chrysene	218019	mg kg-1	M	< 0.1	0.24
	Benzo[b]fluoranthene	205992	mg kg-1	M	< 0.1	< 0.1
	Benzo[k]fluoranthene	207089	mg kg-1	M	< 0.1	< 0.1
	Benzo[a]pyrene	50328	mg kg-1	M	< 0.1	< 0.1
	Dibenzo[a,h]anthracene	53703	mg kg-1	M	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M	< 0.1	< 0.1
	Benzo[g,h,i]perylene	191242	mg kg-1	M	< 0.1	< 0.1
	Total (of 16) PAHs		mg kg-1	M	< 2	< 2
2920	Phenols (total)		mg kg-1	N	<0.3	<0.3
2010	pH			M	8.4	8.2
2030	Moisture		%	n/a	15.9	17.8
	Stones content (>50mm)		%	n/a	<0.02	<0.02
2040	Soil colour			n/a	brown	brown
	Soil texture			n/a	sand	sand
	Other material			n/a	stones	stones

All tests undertaken between 13/03/2012 and 16/03/2012

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page.

Geotechnical & Environmental Associates

Tyttenhanger House
Coursers Road
St Albans
AL4 0PG

Generic Risk-Based Soil Guideline Values

Site	13 Prince Albert Road	**Job Number**	J11186A
Client	Sharon Waterman	**Sheet**	1 / 1
Engineer	Richard Tant Associates		

Proposed End Use Residential with plant uptake

Soil pH 8

Soil Organic Matter content % 2.5

Contaminant	Guideline Value mg/kg	Data Source
Metals		
Arsenic	32	SGV
Cadmium	10	SGV
Chromium (III)	3000	LQM/CIEH
Chromium (VI)	4.3	LQM/CIEH
Copper	2,330	LQM/CIEH
Lead	450	withdrawn SGV
Elemental Mercury	1	SGV
Inorganic Mercury	170	SGV
Nickel	130	LQM/CIEH
Selenium	350	SGV
Zinc	3,750	LQM/CIEH
Hydrocarbons		
Benzene	0.18	SGV
Toluene	320	SGV
Ethyl Benzene	180	SGV
Xylene	120	SGV
Aliphatic C5-C6	55	LQM/CIEH
Aliphatic C6-C8	160	LQM/CIEH
Aliphatic C8-C10	46	LQM/CIEH
Aliphatic C10-C12	230	LQM/CIEH
Aliphatic C12-C16	1700	LQM/CIEH
Aliphatic C16-C35	64,000	LQM/CIEH
Aromatic C6-C7	See Benzene	LQM/CIEH
Aromatic C7-C8	See Toluene	LQM/CIEH
Aromatic C8-C10	65	LQM/CIEH
Aromatic C10-C12	160	LQM/CIEH
Aromatic C12-C16	310	LQM/CIEH
Aromatic C16-C21	480	LQM/CIEH
Aromatic C21-C35	1100	LQM/CIEH
PRO (C_5 – C_{10})	646	Calc
DRO (C_{12} – C_{28})	66,490	Calc
Lube Oil (C_{28} – C_{44})	65,100	Calc
TPH	**500**	Trigger for speciated testing

Contaminant	Guideline Value mg/kg	Data Source
Anions		
Soluble Sulphate	0.5 g/l	Structures
Sulphide	50	Structures
Chloride	400	Structures
Others		
Organic Carbon (%)	6	Methanogenic potential
Total Cyanide	140	WRAS
Total Mono Phenols	290	SGV
PAH		
Naphthalene	3.70	LQM/CIEH
Acenaphthylene	400	LQM/CIEH
Acenaphthene	480	LQM/CIEH
Fluorene	380	LQM/CIEH
Phenanthrene	200	LQM/CIEH
Anthracene	4,900	LQM/CIEH
Fluoranthene	460	LQM/CIEH
Pyrene	1,000	LQM/CIEH
Benzo(a) Anthracene	4.7	LQM/CIEH
Chrysene	8	LQM/CIEH
Benzo(b) Fluoranthene	6.5	LQM/CIEH
Benzo(k) Fluoranthene	9.6	LQM/CIEH
Benzo(a) pyrene	0.94	LQM/CIEH
Indeno(1 2 3 cd) Pyrene	3.9	LQM/CIEH
Dibenzo(a h) Anthracene	0.86	LQM/CIEH
Benzo (g h i) Perylene	46	LQM/CIEH
Total PAH	**6.3**	B(a)P / 0.15
Chlorinated Solvents		
1,1,1 trichloroethane (TCA)	12.9	LQM/CIEH
tetrachloroethane (PCA)	2.1	LQM/CIEH
tetrachloroethene (PCE)	2.1	LQM/CIEH
trichloroethene (TCE)	0.22	LQM/CIEH
1,2-dichloroethane (DCA)	0.008	LQM/CIEH
vinyl chloride (Chloroethene)	0.00064	LQM/CIEH
tetrachloromethane (Carbon tetra	0.039	LQM/CIEH
trichloromethane (Chloroform)	1.3	LQM/CIEH

Notes

Concentrations measured below the above values may be considered to represent 'uncontaminated conditions' which do not pose a risk to human health. Concentrations measured in excess of these valuesindicate a potential risk, and thus require further, site specific risk assessment.

SGV - Soil Guideline Value, derived from the CLEA model and published by Environment Agency 2009

withdrawn SGV - Former SGV, derived from the CLEA 2000 model and published by DEFRA pending confirmation of new approach to modeling lead

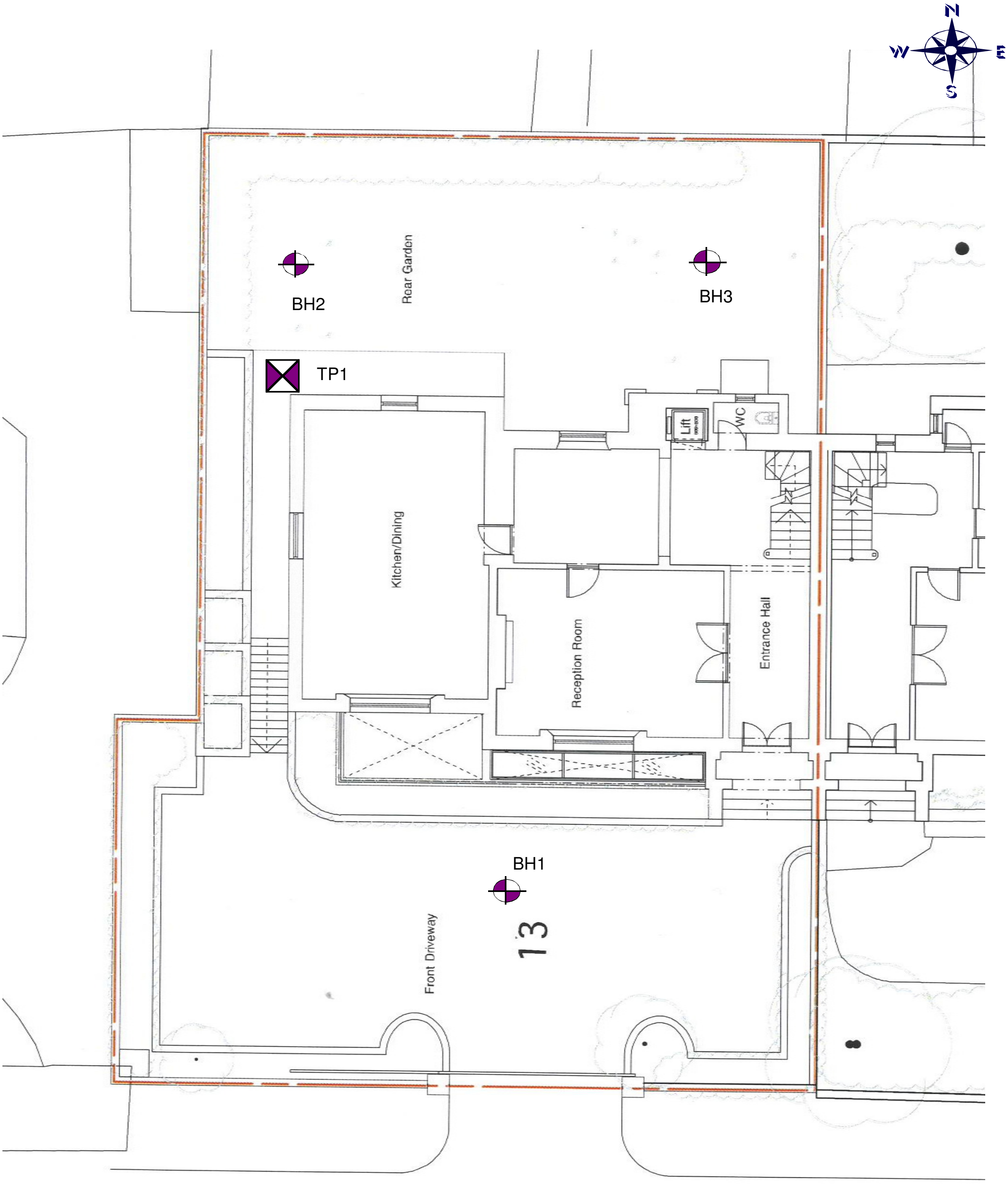
LQM/CIEH - Generic Assessment Criteria for Human Health Risk Assessment 2nd edition (2009)derived using CLEA 1.04 model 2009

Calc - sum of nearest available carbon range specified including BTEX for PRO fraction

B(a)P / 0.15 - GEA experince indicates that Benzo(a) pyrene (one of the most common and most carcenogenic of the PAHs) rarely exceeds 15% of the total PAH concentration, hence this Total PAH threshold is regarded as being conservative

GEA Geotechnical & Environmental Associates	Tyttenhanger House Coursers Road St Albans AL4 0PG	**Site Plan**

Site	13 Prince Albert Road, London NW1 7SR	**Job Number** J11186A
Client	Sharon Waterman	
Engineer	Richard Tant Associates	**Sheet** 1 / 1



Prince Albert Road

Approximate Scale in metres

0 5 10 15

Geotechnical & Environmental Associates (GEA) is an engineer-led and client-focused independent specialist providing a complete range of geotechnical and contaminated land investigation, analytical and consultancy services to the property and construction industries.

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where information can be found
on all of the services that we offer.

Geotechnical & Environmental Associates