NICOLAE AND SASHA RATIU

INTERPRETIVE REPORT

on

SITE INVESTIGATION

at

18-20 LANCASTER GROVE

LONDON

SEPTEMBER 2008

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1 INTRODUCTION

This investigation was carried out on the instructions of Upton McGougan Plc on behalf of Nicolae and Sasha Ratiu. The purpose was to provide information for the design of foundations for a new house, and to assess the contamination status of the site.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains the exploratory hole logs and laboratory testing results, and it gives recommendations relating to foundation design and settlement, and it was also to assess the contamination status of the site in general accordance with the recommendations of BS 10175: 2001 *Investigation of potentially contaminated sites: Code of practice*. It should not be assumed that these would meet the requirements of the local authority, whose advice should be sought regarding planning permission.

The ground investigation has been carried out using cable percussive drilling techniques of soft ground boring and hand dug trial pits, in general accordance with the recommendations of BS5930: 1999 *Code of Practice for Site Investigations.* Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

No testing has been undertaken to detect the presence of gas in the ground.

All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those measured during the investigation.

All information, comments and opinions given in the desk study in this report are based on the information obtained. The information search cannot be exhaustive and there may be records that have not come to light. There may also be circumstances at the site that are not documented.

This report was prepared by Structural Soils Ltd for the sole and exclusive use of Nicolae and Sasha Ratiu, the funding partner, tenants and two successors in title in response to particular instructions. However no liability will be accepted after a period of 6 years from the date of the

report. Any other parties using the information contained in this report do so at their own risk and a duty of care to those parties is excluded.

2 SITE DESCRIPTION

2.1 Location and Topography

Lancaster Grove is a residential street in the Belsize Park area of north London. The British National Grid Reference of the site is TQ 271 845.

Numbers 18 and 20 are a single building, and may always have been a single property, despite the numbering. The site has a 20m frontage on the south side of Lancaster Grove, and extends southwards from the road by some 50m. The building lies toward the north of the property, with a paved drive to the front, and a larger garden area to the south which is mostly under lawn. An attached garage has been built on the front of no. 20 to the east. The site is surrounded by residential properties.

There are shrubs and bushes within the property, a mature horse chestnut tree in the pavement to the north, and trees along the southern boundary of the garden.

The site and surrounding area are generally level. A spot height shows the pavement outside the house to be at 58.4m AOD, and spot heights in the surrounding streets vary between 56.6m AOD and 59.2m AOD to the north.

Services on the site include gas, electric, water and sewage utilities. The site is bounded entirely by a six foot high wall predominantly composed of brick. There are no surface water features in the vicinity of the property.

2.2 Geology

The Geological Survey map of North London (sheet 256, scale 1:50,000) shows the site to be underlain by the London Clay Formation which is part of the Thames Group, and consists predominantly of clay with some silts and sands. There is also likely to be a thin cover of Quaternary Deposits overlying the London Clay Formation.

2.3 Hydrogeology

The Environment Agency's Groundwater Vulnerability map of West London (sheet 39, scale 1:100,000) shows the site to lie on a non-aquifer. These are formations that are generally regarded as containing insignificant quantities of groundwater. However, groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants.

2.4 Desk Study

2.4.1 Site History from Ordnance Survey Maps

A search of Ordnance Survey maps was undertaken to establish the land-use history of the site and surroundings. Extracts of the maps that are discussed below can be found in Appendix E of this report. Unless otherwise stated, all quoted distances are measured from the site boundary that is marked on the maps.

Dates	Scale	Significant features, changes and developments:	
		On site	**In surroundings [distance(m)]**
1865-1871	1:10,560 1:2,500	The site occupies the north eastern corner of a large open field.	Open fields to S Area to north beginning to be developed. Ponds 50m, 100m and 170m SW and 230m, 280m and 290m E
1894-96	1:10,560	Western part of site is small enclosed area, eastern half at edge of saw mill site.	*Saw Mill* 30m E Residential development surrounding the site
1912-1915	1:10,560 1:2,500	Site boundary as at present, no buildings on site.	*Saw Mill* demolished
1935	1:2,500	Large detached house with greenhouses and garden now occupy the site	No significant change
1940	1:10,560	No significant change on site	No significant change
1953-1955	1:1,250	Building numbered 18, 18a and 20 and 2 no. greenhouses removed.	*Garage* 220m E
1957-1958	1:10,560	No significant change on site	No significant change
1962-1967	1:2,500	Site not displayed on map	No significant change
1965-1968	1:10,560	No significant change on site	No significant change
1967-1972	1:1,250	Building is now only numbered 18 and 20	*Surgery* 200m SE Some residential development
1973-41974	1:10,000	No significant change on site	No significant change
1984-1987	1:1,250	Site not shown on map	No significant change
1989-1991	1:10,000	No significant change on site	No significant change
1995	1:10,000	Site not shown on map	Not shown on map
2002-2005	1:10,000	No significant change on site	No significant change
2007	1:2,500	No significant change on site	*Electrical substation* 54m NW

2.4.2 Summary of Historical Data

The site was originally part of a large open field until 1871. Between 1871 and 1894 the site straddled the western boundary of a sawmill site. By 1915 the sawmill had been demolished, and the boundary of the site took its present form. In 1935 a large detached house with garden and greenhouses occupied the site. The site remained the same until 1953 when the house was divided into three separate residences. The house later became only 2 residences by 1967 after which there has been no significant change to date.

The area surrounding the site has seen residential development since 1865. Between 1865 and 1896 ponds were still present in the vicinity of the site, but were subsequently built over. An electrical sub station is located 54m to the north west of the site and has been present since 2007.

2.4.3 Environmental Data

Environmental features such as landfills, groundwater abstraction points, etc, are detailed on data sheets that can be found in Appendix E of this report. 'Notable' features in these data sets are listed below.

Data Types Showing Notable Issues	No. of Notable Listings (or Yes/No) and Distance (m) from Site				Details of Notable Listings
	On site	0-250	250-500	>500	
GENERAL					
Records of LAPPC Authorisations			1		476m SW; Petrol Express Ltd, Swiss Cottage, London NW3 3HF; Petrol Vapour Recovery; Licence revoked
WATER RELATED					
Groundwater Abstraction Licences within 2000m			1	8	404m SW; Spray Irrigation-direct; Thames Groundwater; Swiss Cottage open space 986m SE; Potable Water Supply – direct; Thames groundwater; Barrow Hill pumping station
Potable Water Abstraction Licences within 2000m				5	986m SE; Potable Water Supply – direct; Thames groundwater; Barrow Hill pumping station
WASTE					
Historic Landfill Sites within 1500m				1	1052m W; Canfield Place, London NW6
GEOLOGICAL					
Historical Underground Workings Features			19	56	267m S; Tunnel; 1973 323m S: Tunnels: 1957 376m S: Air Shaft: 1940

Data Types Showing Notable Issues	No. of Notable Listings (or Yes/No) and Distance (m) from Site				Details of Notable Listings
	On site	0-250	250-500	>500	
Historical Mining			7	26	376m S; Air Shaft: 1940 448m S; Air Shaft; 1957 449m S; Air Shaft; 1894
Shrink-Swell Clays	Yes				0m On site: moderate potential for shrinkage and swelling of clays; Predominantly highly plastic; Consideration should be given to advice published by NHBC and BRE.
Recorded Boreholes		1			103m E; 3.73m deep; Fire Station Eton Avenue, St Johns Wood
Radon					The property is not in a radon affected area, as less than 1 % of properties are above the action level. No radon protective measures required.
LAND USE					
Current Industrial Sites		19	44		65m NW; Electrical substation 104m E; Belsize Fire Station 119m S; Electrical substation 166m E; Hampstead Motor Services Ltd
Local Nature Reserves				1	732m NE; Belsize Woods

2.4.4 Summary of Desk Study

There are no significant contemporary trade directory entries in the vicinity of the site and there have been no significant pollution incidents.

The site is not affected by radon as less than 1% of properties are below the action level, therefore no radon protection measures are required in the construction of new extensions or dwellings.

The site is at moderate risk from shrinking and swelling clays which are known to be of high plasticity. All other geological hazards are of low or negligible potential on the site.

There are numerous historical mining features within 500m of the site, and are generally tunnels and air shafts, presumably related to the railways in the area.

2.5 Outline Contamination Conceptual Model and Preliminary Risk Assessment

2.5.1 General

This section of the report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

The assessment also aims to identify land which would be regarded as 'contaminated land' under the terms of the Environmental Protection Act 1990, Part IIa. This act includes a stricter test for contaminated land than that outlined above. Land is considered to be contaminated if either:

- the land is causing significant harm to people, ecosystems or infrastructure; or
- there is a significant possibility that such harm could be caused; or
- pollution of controlled waters is being, or is likely to be, caused.

The following situations are defined as being where harm is to be regarded as significant:

- chronic or quite toxic effect, serious injury or death to humans;
- irreversible or other adverse harm to the ecological system;
- substantial damage to or failure of buildings;
- death of, or disease or other physical damage affecting, livestock or crops;

pollution of controlled waters.

2.5.2 Risk Assessment Methodology

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: Preliminary, Generic Quantitative and Detailed Quantitative. An Outline Conceptual Model should be formed at the preliminary risk assessment stage. This identifies potentially complete (termed *possible*) pollutant linkages (source–pathway–receptor) and is used as the basis for design of the site investigation. The Outline Conceptual Model is updated as further information becomes available, for example as a result of the site investigation.

2.5.3 Potential Sources and Contaminants

A sawmill was present on site until 1915 and may be regarded as a potentially contaminative activity (e.g. in CLR 8 *Potential Contaminants for the Assessment of Land*).

Potential Sources: On site	Likely contaminants
Sawmill	Heavy metals, asbestos, hydrocarbons
Made Ground	Heavy metals, asbestos, hydrocarbons
Potential Sources: Off site	**Likely contaminants**
As above	As above

The sawmill would not necessarily have carried out timber treatment, but if it did the treatments existing at that time would be likely to be detected using a standard analytical suite.

2.5.4 Receptors

The main receptors are the future residents on the site. Future plantings in gardens are also receptors, as are buildings and underground services. Construction workers are short-term receptors. Similar receptors in the vicinity are also potential targets.

2.5.5 Preliminary Risk Assessment

The information presented in previous sections has been used to compile a Preliminary Risk Assessment. The identified potential contaminants and potential receptors have been considered, along with any possible pathways that may link them.

The resulting pollutant linkages are considered in the table below:

Potential Source	Potential Pathway	Potential Receptor	Potential Complete Linkage?	Comments (e.g. regarding pathways, impermeable strata, site upstream of source, etc)
Soil contaminants	Ingestion/ Dermal Contact	Future on-site users (residents)	Yes	
		Construction workers	Yes	Appropriate PPE must be worn
		Maintenance workers	Yes	Appropriate PPE must be worn

		Adjacent commercial/residential land users	No	
	Permeation	Subsurface plastic water pipes	No	
	Leaching	Groundwater in Non Aquifer/ surface watercourse	No	
	Root uptake	Soft landscaping on-site (e.g. phytotoxicity)	Yes	
Groundwater contaminants (i.e. arsenic, lead)	Ingestion/ Dermal Contact	Future on-site users (residents)	No	
		Adjacent commercial/ residential land users		
		Construction workers		
		Maintenance workers		
	Permeation	Subsurface plastic water pipes		
	Lateral Groundwater migration	Groundwater in Minor Aquifer/ surface watercourse		
Vapours associated with soil and groundwater contaminants and/or bulk ground gases (e.g. methane/carbon dioxide)	Migration along backfill around services, more permeable strata inhalation/ explosion	Future on-site users (residents)	No	
		Construction/ Maintenance workers		
Natural radon gas	Flow through ground	End users	No	No protection necessary as less than 1% of homes are above the action level

2.5.6 Preliminary Risk Assessment Conclusions

The review of information and the construction of the Outline Conceptual Model highlights potential pollutant linkages. In order to investigate any unacceptable risk presented by these, intrusive investigation is recommended. An intrusive investigation will be able to provide further information on actual contaminants present and viable pathways to sensitive receptors.

2.6 Recommendations

Intrusive investigation is required to assess any significant contaminant sources, pathways and receptors. The construction of a residential property and private garden will require consideration of the former use of the site in terms of any potentially contaminative processes that may have caused contamination of the ground and groundwater.

The objectives of an investigation are to:

- Clarify the 'Outline Contamination Conceptual Model'
- Clarify the Outline Risk Assessment
- Provide data for the design of any remedial works that may be required
- Benchmark the contamination status of the site

To achieve these objectives, an investigation was undertaken. Where possible the exploratory holes passed through all made ground and into underlying natural soils. Also where possible, the holes extended beyond the base of any obvious soil contamination and where groundwater could be at risk, the holes attempted to reach groundwater level.

3 FIELDWORK

1 no. cable percussion borehole (BH1) and 3 no. hand dug trial pits (TP1 to TP3) were completed between on 13 August 2008 at locations shown on the Exploratory Hole Location Plan in Appendix A.

The scope of investigation and choice of investigation equipment was decided by Upton McGougan Plc. The positions were selected by Upton McGougan and set out by Structural Soils Limited. The positions of exploratory holes TP1 to TP3 were selected to provide information about the existing foundations of 18-20 Lancaster Grove and BH1 was positioned in the front drive of the property due to poor access to the garden to the south.

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930: 1999 including amendment 1 (2007). Detailed descriptions, together with relevant comments, are given in the logs included in Appendix B.

Sampling details were specified by Structural Soils Limited. Geotechnical samples were taken and returned to the laboratory for classification and potential testing. Samples for contamination testing were placed in appropriate 'contamination sample containers' (supplied by the laboratory and with preservatives for waters, where required). They were then kept in cool boxes with ice packs and were transported to the laboratories as promptly as possible to maintain sample integrity. Contamination sampling was specified by Structural Soils Limited.

An inspection pit was excavated by hand to 1.20m depth at the BH1 hole location prior to the commencement of drilling. The borehole was drilled using a cable tool percussion drilling rig and was 150mm diameter. The depth of the borehole was 15.45m.

100mm diameter undisturbed samples were recovered from the cohesive strata in the borehole. Standard Penetration Tests were carried out at regular intervals in accordance with BS1377: Part 9: 1990: 3.3. Test results are given in detail in tabular format on the Summary of Standard Penetration Tests in Appendix B, and also summarised on the borehole logs.

The hand dug trial pits were approximately 0.45m x 0.45m in plan and up to 0.83m deep.On completion all exploratory holes were backfilled.

4 LABORATORY TESTING

The following laboratory tests were carried out on samples generally in accordance with BS1377: 1990, *Methods of test for soils for civil engineering purposes*, parts 1 to 8. Where non-standard procedures have been undertaken, this will be recorded on the report sheet. The results are reported in tabular and/or graphical form included as Appendices C and D of this report.

4.1 Moisture Content

6 no. moisture content tests were undertaken using the oven-drying method in accordance with BS1377: Part 2: 1990. The results are tabulated below the A-line plot (see Section 4.2, below).

4.2 Liquid Limit, Plastic Limit and Plasticity Index

6 no. liquid and plastic limit tests were performed in accordance with BS1377: Part 2: 1990. The results are tabulated in an A Line Plot (in accordance with BS5930: 1999).

4.3 One - Dimensional Consolidation Test

1 no. one-dimensional consolidation test was undertaken in accordance with BS1377: Part 5: 1990. 3 no. loading and 2 no. unloading stages were undertaken on the sample with pressures of between 50kPa and 200kPa. The results are represented as voids ratio e/log pressure together with values of the coefficients of compressibility (m_v) and consolidation (c_v).

4.4 Unconsolidated Undrained Triaxial Compressive Shear Strength Tests (without the measurement of pore pressure)

1 no. single stage unconsolidated undrained triaxial compression test without the measurement of pore pressure were undertaken in accordance with BS1377: Part 7: 1990. The test was carried out on a single specimen nominally 100mm in diameter and 200mm in length. The confining pressure was 50kPa.

4.5 Chemical Analyses

2 no. soil samples were tested to determine their pH values and water soluble sulphate contents in accordance with BS1377:Part 3:1990 clause 5.

4.6 Contamination

2 no. soil samples were analysed in accordance with UKAS/MCERTS standards for arsenic, cadmium, chromium (total), lead, mercury, selenium, copper, nickel, zinc, speciated polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons, organic matter, water soluble sulphate and pH.

5 GROUND CONDITIONS

5.1 General

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930: 1999 including amendment 1 (2007). Detailed descriptions, together with relevant comments, are given in the logs included in Appendix B.

5.2 Made Ground

Made ground was encountered by all exploratory holes from ground level to a minimum depth of 0.40m in TP3, to a maximum depth of 1.80m in BH1. All holes encountered paving over concrete to a depth of between 0.05m and 0.20m depth. Exploratory holes BH1 and TP3 encountered reinforced concrete, containing circular steel rods 5mm in diameter.

Beneath the paving stones and concrete, trial pits TP1 and TP3 encountered soft brown slightly sandy gravelly clay between a minimum of 0.05m and 0.20m to a maximum depth of 0.50m in TP1. The gravel consisted of fine to coarse subangular brick, charcoal, ceramic, slate, concrete and chert. This material became firm with the presence of occasional cobbles from a minimum depth of 0.20m and from a maximum depth of 0.50m until termination of the trial pits which occurred between 0.40m and 0.83m deep.

Trial pit TP2 encountered made ground consisting of loose brown slightly clayey sandy gravel, of fine to coarse brick, concrete and charcoal beneath the paving and concrete to a maximum depth of 0.60m. From 0.60m depth until termination at 0.75m depth TP2 encountered firm dark brown slightly sandy slightly gravelly clay. The gravel consisted of fine to coarse, brick, charcoal, concrete and chert.

Borehole BH1 encountered loose brown clayey sandy gravel from 0.20m to 1.20m depth. The gravel consisted of fine to coarse angular to subrounded chert, slate, brick and charcoal. Borehole BH1 similarly to the trial pits encountered firm brown slightly sandy gravelly clay between 1.20m and 1.80m depth. The gravel consisted of fine to coarse subangular brick, sandstone, charcoal and chert.

5.3 London Clay Formation

The London Clay Formation was encountered directly beneath the made ground in BH1 from a depth of 1.80m. The London Clay Formation was stiff light brown closely fissured slightly sandy clay with occasional fine subrounded calcareous nodules, and gypsum crystals of sand to fine

gravel size. Below 8.00m, the clay contained rare fine shell fragments. The clays are on the boundary between high and very high plasticity, and show little variation with depth.

In general the strength of the London Clay Formation gradually increases with depth from an SPT N value of N=22 at 5.00m increasing to N=40 at 15.00m (see the Standard Penetration Test 'N' Value vs. Depth table in Appendix B).

5.4 Groundwater

No groundwater was encountered in any of the exploratory holes during the investigation.

5.5 Existing Foundations

3 no. hand dug trial pits (TP1-TP3) were excavated in order to expose the existing foundations of 18-20 Lancaster Grove (see Exploratory Hole Plan in Appendix A). Trial pit TP1 excavated to the south exposed the foundations of the current conservatory. The foundations consisted of concrete, and were present from ground level to 0.50m depth.

Trial pit TP2 was excavated beneath the western exterior wall, encountered foundations to a total depth of 0.75m. Between ground level and 0.26m depth brick wall was exposed and from 0.26m to the base, the foundations consisted of concrete.

Trial pit TP3 was excavated beneath the western wall of the present garage. No foundations were present at this location. At the trial pit location a void was present beneath the garage wall from ground level to 0.05m depth which extended horizontally beneath the wall in excess of 0.50m. Two yellow pipes were exposed in this trial pit at 0.40m depth and the trial pit had to be terminated.

Due to the vast number of services to the north of property no further trial pits were able to be completed safely.

6 DISCUSSION AND RECOMMENDATIONS

6.1 Proposed Development

The new house is to be two storeys high above ground level, with a basement under the whole building, and a swimming pool excavated down through the centre of the basement. The basement floor level is shown to be 3.6m below external ground level, and the swimming pool floor some 6.3m below ground level, making the swimming pool foundation level of the order of 6.7m below ground level.

6.2 Site Preparation and Excavation

All excavations should be planned and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in *Health and Safety in Construction* (Ref 8.8). Excavations or below ground voids should be checked for the presence of harmful gases prior to personnel entry.

6.3 Shrinkage and Swelling

Atterberg Limits tests performed on samples taken from the London Clay Formation showed them to be of groups CH and CV as defined in BS 5930:1999. After correction where necessary for their >0.425mm fraction, these samples show high volume change potentials with changes in moisture content, according to the criteria of NHBC Standards, Chapter 4.2 (2007) *Building Near Trees*. Based on these results, it is recommended that a high volume change potential be assumed for all cohesive soils on the site for design purposes.

The NHBC Standards recommend a minimum foundation depth of 1.00m in a soil of high volume change potential outside the influence of any roots. Greater foundation depths may be required in proximity to trees or large shrubs, whether retained or removed. The building is adjacent to shrubs along the boundary, and there is a mature tree in the pavement to the front of the building. Although the main building has a basement which will take foundations below the effects of trees, we recommend that the NHBC guidelines be used for the design of any ancilliary structures, if they are sensitive to foundation movements.

6.4 Foundations

The main building will be supported by the basement walls, and therefore foundation level will be of the order of 3.6m below ground level, in the stiff London Clay Formation. The drawings supplied indicate that the basement wall foundations will be integral with the basement floor slab. The allowable bearing pressures will be of the order of 250kN/m^2 in the clay at this depth.

The unloading due to the excavation of the basement will be of the order of 70kN/m^2, rising to 120kN/m^2 under the swimming pool. Based on the unloading stage results from the oedometer tests, the long-term heave of the base of the excavation is estimated to be of the order of 15mm, rising to 25mm under the swimming pool area. The actual heave would be less due to the weight of the building carried by the basement floor, and the weight of water within the pool. Swelling pressures beneath the swimming pool, when empty, would be of the order of 40kN/m^2, based on data from swelling tests on London Clay Formation from 6.00m depth at other sites. The pool base will need to be designed to resist this pressure.

6.5 Retaining Wall Design: Geotechnical Parameters

Based on the results of laboratory and in-situ testing, the geotechnical parameters that may be used for design purposes for the strata encountered are listed in the table below.

TABLE ONE: GEOTECHNICAL DESIGN PARAMETERS (From BH1)

Depth m bgl	Description	Range of Measured Values				Correlated Values		
		Bulk Density, Mg/m^3	SPT-N value	Moisture content %	Plasticity Index PI %	Undrained Shear Strength, c_u, kN/m^2		Effective angle of shearing resistance, ϕ'
						UU-triaxial test	SPT-PI correlation	
MADE GROUND								
0.0-1.8	Made Ground	-	-	-	-	-	-	30°
SUPERFICIAL DEPOSITS								
1.80-3.0	Stiff Clay	-	9	26-30	45	91	-	25°
LONDON CLAY FORMATION								
3.00-8.0	Stiff CLAY	1.88-1.96	17-22	26-30	45-46	-	75-100	25°
8.0-15.45	Very stiff CLAY	1.88-1.96	30-40	27-30	42-49	-	135-180	25°

The tabulated results show the London Clay Formation to be relatively homogenous. The standard penetration test (SPT) N-values, and hence undrained shear strength of the soil, show a gradual increase in depth, in the manner typical of the London Clay Formation (see graph in Appendix B).

The undrained shear strength (c_u) values correlated from SPT N-values have been derived using the relationship described by Stroud (Ref. 8.10), although the triaxial and hand penetrometer tests indicate that this may be an underestimate.

The values given above are based on a relationship between plasticity index (PI) and ϕ' described by Tomlinson (Ref. 8.11) and Clayton (Ref. 8.12) An effective cohesion value, c' of zero should be used with ϕ' values derived in this way.

6.6 Protection of Buried Concrete

The water-soluble sulphate results for soil fall into Design Sulphate Class DS-2 in Table C2 of BRE Special Digest 1 (Ref. 8.13). The site is classed as brownfield and groundwater is static. pH values varying from 8.39 to 10.11 were recorded indicating alkaline soil pH conditions. Therefore according to Table C2 the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1s and the designer should utilise this classification in order to produce the concrete specification.

6.7 Radon

BRE Report 211 is the current guidance to the building industry and is referred to in the Building Regulations. The report applies to residential development. New residential buildings in certain areas may require basic or full radon protection. Basic protection consists of a radon-proof barrier across the ground floor. Full radon protection consists of a radon proof barrier across the ground floor supplemented by either a radon sump or a ventilated subfloor void. For this site the BRE report indicates that no radon protection is necessary as less than 1% of homes are above the action level. This concurs with the findings of the desk study (see Section 2.4).

6.8 Contamination

6.8.1 Human Health Risks: General

To determine whether contaminants are present at levels that may be deemed to pose a significant hazard to human health, measured contamination levels in soil at the site are compared against derived guideline values ('Tier 2' soil screening), either directly or following statistical analysis. Where contaminants are present near, or above, the screening values it is probable that site-specific information will be required to further examine the potential risk of harm arising from such contamination.

The Soil Guideline Values (SGVs) derived from the CLEA model and published by DEFRA, provide initial screening criteria to establish whether sources of contamination are significant.

These can then be compared with the site-specific analytical data to establish whether the hazards have the potential to cause unacceptable health risks.

The CLEA model does not provide SGVs for all contaminants and so historically guidelines form other countries have been used. In March 2004 the Environment Agency released a policy statement concerning the assessment of chronic risk to human health from contaminated soils. This states the application of non-UK derived screening values such as Dutch, American or Canadian is not appropriate, since they do not ensure compliance with UK policy (for example health criteria, exposure scenario and receptor characteristics). RSK Group Plc has followed the same approach as CLEA to derive screening values (Generic Assessment Criteria (GAC)) for relevant contaminants for which SGVs are as yet not published. The rationale behind the derivation of these values is presented in Appendix D. Furthermore the policy states that in the absence of appropriate UK derived Soil Guideline Values (SGVs) a 'Tier 3' detailed quantitative risk assessment (DQRA) should be carried out.

The CLEA system also introduces some statistical testing of the test results. In principle, the mean (average) of the results for a given contaminant could be compared with the SGV. However, the measured mean could differ significantly from the true mean if only a limited number of results were available. Therefore in the mean value test, the value below which the true mean value for the site lies (US_{95}), is calculated at the 95% confidence limit. Therefore if the US_{95} is below the SGV then there is 95% confidence that the true mean is below the SGV and that there is no significant risk to health. If the mean value exceeds the SGV then this may indicate a requirement for remediation or further investigation.

If the mean value lies below the SGV, then remediation is not likely to be required. This may be the case even if some individual results exceed the SGV, as long as the elevated results fall within the same sample population, as discussed below.

There is also a *maximum value test* and this determines whether individual results which exceed a SGV, fall within the range that can be expected from the sample population, or whether they are indicative of an area of greater contaminant concentrations (e.g. a hotspot). In this latter case such elevated results are called "outliers" and if present, then again this may indicate a requirement for remediation or further investigation

The end-use of the site will be a two storey detached house with a basement and indoor swimming pool excavated in the centre of the basement, therefore the GACs for residential use

with plant uptake have been used to assess the results. Since only two samples were tested the results have been assessed directly rather than using mean values.

6.8.2 Human Health Risks: Contaminants arsenic, cadmium, chromium, lead, mercury, nickel, selenium, Polycyclic Aromatic Hydrocarbons (PAH) & Total Petroleum Hydrocarbons (TPH).

Except as stated below the individual test results were below the GACs and SGVs for residential use with plant uptake.

The sample from TP1 at 0.25m depth in the made ground showed the following elevated results:

- arsenic of 36mg/kg which exceeds the SGV of 20mg/kg
- lead of 1500mg/kg which exceeds the SGV of 450mg/kg
- benzo(a)pyrene of 1.51mg/kg which exceeds the GAC of 1.1mg/kg.

6.8.3 Risks to Plants (phytotoxicity): Contaminants copper, nickel and zinc.

Copper, nickel and zinc can inhibit plant growth. Except for those stated below, all the individual test results were below the GACs.

TP1 at 0.25m showed 490mg/kg zinc which slightly exceeds the GAC of 450mg/kg.

6.8.4 Risks to Water Supply Pipes: Various contaminants

Risks to water supply pipes have been assessed in accordance with guidance from the Water Regulations Advisory Scheme (WRAS). The following exceedances were noted:

- arsenic results of 14 and 36mg/kg exceeding the guideline of 10mg/kg
- a lead result of 1500 exceeding the guideline of 500mg/kg
- a mercury result of 1.9mg/kg exceeding the guideline of 1mg/kg.

Therefore the water supply company may advise that alternative water pipe materials are required. It should be noted that the local water supply companies occasionally do not strictly adhere to the WRAS guidelines and thus they should be contacted in this respect.

6.8.5 Other Contaminants

Testing was undertaken to determine concentrations of pH, water soluble sulphate, and organic content. The sulphate and pH results do not pose significant risk to Human Health, but sulphates can pose a risk to concrete in the ground see Section 6.6.

6.8.6 Summary of Contamination

The investigation has shown elevated levels of arsenic, lead and benzo(a)pyrene in the soil which can pose a risk to human health. Zinc, which can inhibit plant growth, was also recorded at a slightly elevated concentration.

6.9 Final Conceptual Site Model & Risk Assessment

6.9.1 General

This section of the report aims to refine the 'Initial Contamination Conceptual Model', in the light of the findings of the ground investigation.

6.9.2 Sources, Pathways & Receptors

The potential sources and receptors of contamination (which have been outlined in Section 2 of this report) are considered to have not changed from the 'Outline Contamination Conceptual Model'.

Elevated arsenic, lead, benzo(a)pyrene and zinc have been encountered in the made ground.

6.9.3 Risk Assessment Methodology

Risk is a combination of the 'likelihood' of an even occurring and the magnitude of its 'consequences'. Therefore, in order to assess risk, both the likelihood and the consequences of an event must be taken into account. RSK Group Plc has adopted guidance provided in CIRIA C552 for use in the production of risk assessments.

The likelihood of an event can be classified on a four point system using the following terms and definitions based on CIRIA C552:

- **Highly likely**: The event appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution;
- **Likely**: It is probable that an event will occur, or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;

- **Low likelihood**: Circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term;

- **Unlikely**: Circumstances are such that it is improbably the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- **Severe**: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);

- **Medium**: Chronic damage to human health ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);

- **Mild**: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment; and

- **Minor**: Harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned the table below.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**Highly likely**	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

6.9.4 Final Conceptual Site Model

The complete linkages and resulting risks have been identified and are presented in the table below:

Source	Pathway	Receptor	Probability	Consequence	Risk
Soil contaminants (arsenic, cadmium, chromium, nickel)	Ingestion/Dermal Contact	Future on-site users (residents)	Likely	Medium	Moderate
		Construction workers	Low Likelihood	Mild	Low**
		Maintenance workers	Low Likelihood	Mild	Low
		Adjacent residential land users	Unlikely	Mild	Very Low
	Permeation	Subsurface plastic water pipes	Low Likelihood	Medium	Moderate/Low
	Leaching	Groundwater in Minor Aquifer and partly on Non-Aquifer Surface watercourse	Low Likelihood	Mild	Low
	Root uptake	Soft landscaping on-site (e.g. phytotoxicity)	Likely	Mild	Moderate / Low
Groundwater contaminants	Ingestion/Dermal Contact	Future on-site users (residents)	Low likelihood	Mild	Low
		Adjacent residential land users	Low likelihood	Mild	Low
		Construction workers	Low likelihood	Mild	Low
		Maintenance workers	Low likelihood	Mild	Low
	Permeation	Subsurface plastic water pipes	Low likelihood	Mild	Low
	Lateral Groundwater migration	Groundwater in Min Aquifer and Non aquifer Surface water	Low likelihood	Mild	Low
Vapours associated with soil and groundwater contaminants and/or bulk ground gases	Migration along backfill around services, more permeable strata inhalation	Future on-site users (residents/)	Low likelihood	Mild	Low
		Construction/ Maintenance workers	Low likelihood	Mild	Low
Natural radon gas	Flow through ground	End users	Low likelihood	Mild	Low

** assumes basic PPE is used, strict hygiene is undertaken and excessive dust creation is avoided.

This Generic Quantitative Risk Assessment (GQRA) indicates that complete and significant pollutant linkages exist at the site that require further action (e.g. remediation or other risk reduction measures).

6.10 Outline Strategy for Risk Reduction

Given the existence of potential made ground on the site it would be prudent to maintain vigilance during site clearance and construction, in case any further areas of suspected

contamination are encountered. If areas are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

A practical solution to the presence of soil contaminants is often to provide a clean cover layer in any garden or landscaped areas. This could be achieved either by placing uncontaminated soil directly onto the made ground, hence raising ground levels, or by removal of contaminated soil and backfilling with uncontaminated topsoil and subsoil, or by a combination of these means. The cover system is designed to reduce the exposure to contaminants of residents and other site users to an acceptable level. The cover layer should also reduce any risks to plant growth.

The required depth of clean cover can be calculated using BRE report BR465 and this shows that 450 mm should be provided for garden areas. The following assumptions have been made:

- a mixing depth of 600mm,
- using US_{95} values for the existing ground contamination and
- clean cover concentrations that are one quarter the guideline values (half for arsenic). If actual clean cover concentrations are higher or lower, then the cover thickness will increase or decrease respectively. Any soils used as clean cover should be tested to ensure that they are uncontaminated and so the validity of this clean cover model can be checked.

The report recommends that any clean cover layer should ideally incorporate a topsoil layer at least 150mm thick (or 30% of the total cover depth, whichever is the greater). The report also states that clean cover should not be used on slopes greater than 1 in 12.

The BRE report contains a spreadsheet that does the calculations, a copy of which in contained in Appendix C. The total thickness of clean cover is subject to council approval and the type of soil should be adequate for plant cultivation.

The Local Environmental Health Officer (and the NHBC if involved) will usually require a 'Validation Report' to confirm that all risk reduction strategies recommended below, and any others subsequently required, have been undertaken. If required, then Structural Soils can produce such a report.

Concentrations of arsenic, lead, zinc and benzo(a)pyrene have to date been found in TP1 only, however as only 2 no. samples were tested for contaminants, the elevated concentration of contaminants in TP1 may not be restricted to this area. Therefore remediation measures should

be utilised over the entire site unless further data acquisition is undertaken to confidently identify the limits of the contamination at TP1 and prove that no further contamination exists on the site.

Site, landscape and maintenance workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided.

6.11 Off-site Disposal of Surplus Soil

6.11.1 General

All excavated material and excess spoil must be classified for waste disposal purposes prior to disposal at landfill. Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal all wastes must be classified as:

- 'inert', or
- 'non-hazardous', or
- 'stable non-reactive hazardous', or
- 'hazardous'.

The Environment Agency guidance document WM2 outlines the methodology for classifying wastes.

Samples classified, as 'hazardous' wastes must be disposed of at a suitably licensed 'hazardous' waste landfill. Please note that if more than 200kg of hazardous waste is to be removed from the site within a 12 month period, the site is required to notify the Environment Agency under the Hazardous Waste Regulations 2005 and obtain a premise code/registration number for use on Hazardous Waste Consignment notes.

Samples classified as 'inert' waste must be disposed of at a suitably licensed 'inert' waste landfill or a site that has a valid exemption from the Waste Management Licensing Regulations 1994 (as amended) registered with the Environment Agency.

Asbestos is classified as a 'stable non-reactive hazardous' waste and, as such, can be disposed of within a 'stable non-reactive hazardous' waste cell in a 'non-hazardous' waste landfill.

Currently 'inert', 'stable non-reactive hazardous', and 'hazardous' wastes may require pre-treatment prior to disposal at landfill. Please note that from 31/10/2007 this will extend to 'non-hazardous' wastes.

Initial Waste Characterisation: CAT-WASTE^{SOIL}

CAT-WASTE^{SOIL} is a waste soil characterisation assessment tool that follows the guidance within WM2 and it was developed by WS Atkins and McArdles. The analytical results from this investigation have been run the through this assessment tool to aid potential future off-site disposal of materials. This assessment produces an 'initial' characterisation of the waste.

The sample tested from BH1 between 0.20 and 1.00m depth has been classed as not being hazardous waste but the sample tested from trial pit TP1 at 0.25m depth has been classed as hazardous.

Currently the acceptance criteria of landfill sites vary widely and it is recommended that the chemical testing results contained within this report be submitted to the preferred landfill site to ascertain whether they will accept soils arising from the site.

7 SUMMARY

7.1 A ground investigation was completed at 18-20 Lancaster Grove, Belsize Park in London. The proposed development for the site is that of a two storey detached house, with a basement, which is to include an indoor swimming pool.

7.2 A desk study was completed prior to the start of the ground investigation. The desk study indicated that the site was originally part of a large open field until 1871 when a sawmill straddled the western boundary of the site, becoming disused in 1915. In 1935 a large detached house with garden and greenhouses occupied the site. The site remained the same until 1953 when the house was divided into three separate residences, and later in 1967 when the house was divided in two residences. The site has remained the same to date.

7.3 A ground investigation was completed on 13 August 2008 and comprised of 1 no. cable percussion borehole (BH1) and 3 no. hand dug trial pits (TP1 to TP3). The exploratory holes encountered paving over concrete above made ground. The made ground generally consisted of loose brown slightly clayey sandy gravel, of fine to coarse brick, concrete and charcoal over firm brown slightly sandy gravelly clay. Directly beneath the made ground, from a depth of 1.80m the London Clay Formation was encountered, and comprised of stiff light brown closely fissured slightly sandy clay with occasional fine subrounded calcareous nodules, and gypsum crystals of sand to fine gravel size.

7.4 Atterberg Limits tests performed on samples taken from the London Clay Formation showed them to be of groups CH and CV as defined in BS 5930:1999. After correction where necessary for their >0.425mm fraction, these samples show high volume change potentials with changes in moisture content, according to the criteria of NHBC Standards, Chapter 4.2 (2007) *Building Near Trees*. Based on these results, it is recommended that a high volume change potential be assumed for all cohesive soils on the site for design purposes.

7.5 The main building will be supported by the basement walls, and therefore foundation level will be 3.6m below ground level, in stiff London Clay Formation. The allowable bearing pressures will be of the order of 250kN/m^2 in the clay at this depth. The unloading due to the excavation of the basement will be of the order of 70kN/m^2, rising to 120kN/m^2 under the swimming pool. The long-term heave of the base of the excavation is estimated to be of the order of 15mm, rising to 25mm under the swimming pool area. The actual heave would be less due to the weight of the building

carried by the basement floor, and the weight of water within the pool. Swelling pressures beneath the swimming pool, when empty, would be of the order of 40kN/m^2, based on data from swelling tests on London Clay Formation from 6m depth at other sites. The pool base will need to be designed to resist this pressure.

7.6 The Aggressive Chemical Environment for Concrete (ACEC) class is AC-1s and the designer should utilise this classification in order to produce the concrete specification.

7.7 No radon protection measures are necessary.

7.8 Elevated individual levels of arsenic, lead and benzo(a)pyrene that may be hazardous to human health are present in the soil. Therefore a 450mm depth clean cover should be provided in all proposed garden areas.

7.9 The initial waste characterisation has shown that the sample tested from BH1 between 0.20 and 1.00m depth has been classed as not being hazardous waste but the sample tested from trial pit TP1 at 0.25m depth has been classed as hazardous.

STRUCTURAL SOILS LIMITED

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S Pond BSc CChem MRSC

A R Handcock MA CEng MICE CGeol FGS

8 REFERENCES

8.1 BS 5930:1999 Code of Practice for Site Investigations

8.2 BS 5930:1999 Code of Practice for Site Investigations: amendment 1 (2007)

8.3 BS 10175: 2001 Investigation of potentially contaminated sites: Code of practice.

8.4 Geological Survey of Great Britain, sheet 256, scale 1:50,000

8.5 NRA Groundwater Vulnerability Map, sheet 39, scale 1:100,000

8.6 CIRIA Report C552 (2001), Contaminated Land Risk Management; A Guide to Good Practice.

8.7 BRE Report 279 Sulphate and acid attack on concrete in the ground: recommended procedures for soil analysis

8.8 Health and Safety in Construction, HSG150, HSE, 1996

8.9 NHBC Standards, Chapter 4.2, 2007 Building Near Trees

8.10 Stroud M (1974) *The standard penetration test in insensitive clays and soft rocks* Proc European Symposium on Penetration Testing, Stockholm

8.11 Tomlinson M J (2001) Foundation Design and Construction. Seventh Edition.

8.12 Clayton C R I (1993) *The Standard Penetration Test (SPT): Methods and Use,* Construction Industry Research and Information Association, Funder Report CP/7

8.13 BRE Special Digest 1 (SDI)(2005) Concrete in Aggressive Ground Part 1: Assessing the aggressive chemical environment. Third Edition

8.14 BRE Report 211 (2007) Radon: Guidance on Protective Measures for New Dwellings

8.15 R & D Publication CLR 7 (March 2002) Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research. Environment Agency.

8.16 R & D Publication CLR 8 (March 2002) Potential Contaminants for the Assessment of Land. Environment Agency.

8.17 R & D Publication CLR 10 (March 2002) The Contaminated Land Exposure Assessment Model (CLEA): Technical basis and algorithms. Environment Agency.

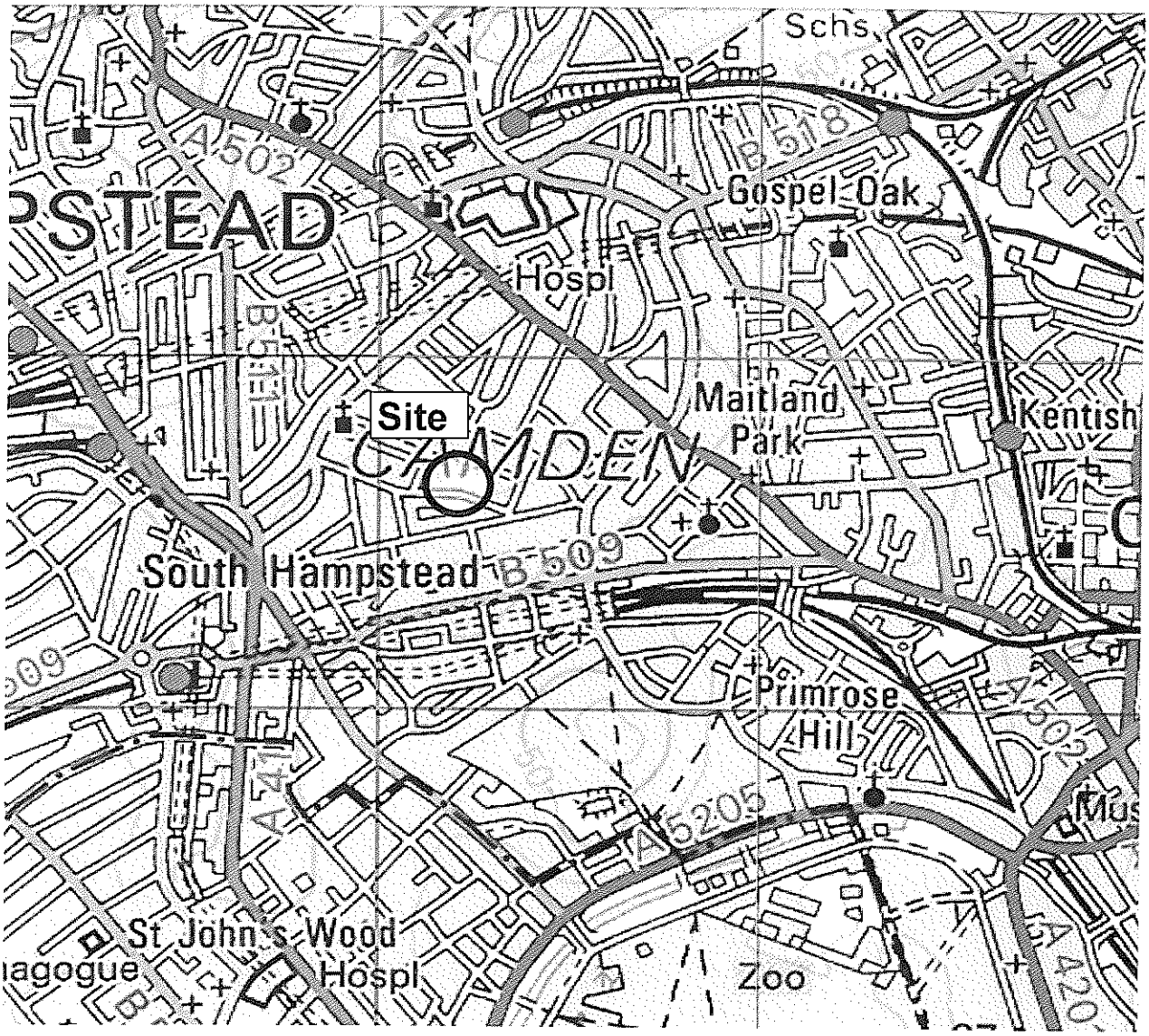
8.18 R & D Publication CLR 11 (September 2004). Model Procedures for the Management of Contaminated Land. Contaminated Land. Environment Agency

8.19 BRE Report 465 (2004) Cover Systems for Land Regeneration

APPENDIX A

(i) Site Location Plan

(ii) Exploratory Hole Location Plan



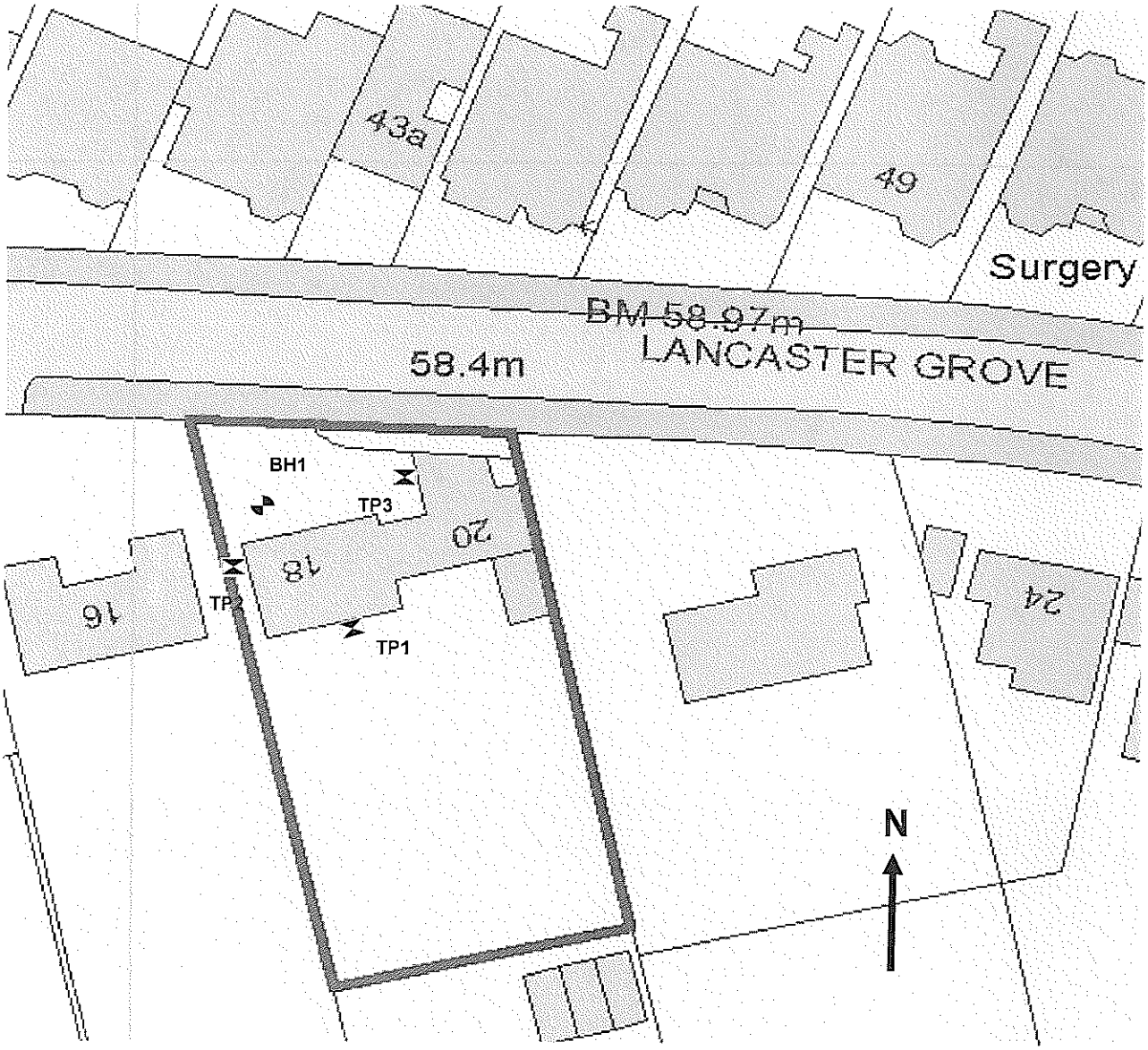
National Grid Reference TQ 271 845

1km

SITE INVESTIGATION LOCATION MAP

Structural Soils Limited
The Old School
Stillhouse Lane
Bedminster
BS3 4EB

Site	**18-20 Lancaster Grove** **Belsize Park** **London**
Client	**Upton McGougan**
Job no.	722146
Drawing no.	01
Date	Sep-08
Drawn by	MB



National Grid Reference: TQ 271 845

Key

Trial Pits (TP) Cable Percussive Borehole (BH)

EXPLORATORY HOLE LOCATION PLAN

Structural Soils Limited The Old School Stillhouse Lane Bedminster BS3 4EB	Site 18-20 Lancaster Grove Belsize Park London	Job no. 722146	
		Drawing no. 02	
		Date Sep-08	
	Client Upton McGougan	Drawn by MB	

APPENDIX B

(i) Borehole Logs

(ii) Trial Pit Logs

(iii) Standard Penetration Test Results

(iv) Graph of SPTs vs. Depth

APPENDIX B

(i) Borehole Logs

(ii) Trial Pit Logs

(iii) Standard Penetration Test Results

(iv) Graph of SPTs vs. Depth

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
18-20 Lancaster Grove, London	**Upton McGougan Plc**	**BH1**

Contract Ref:	Start:	Ground Level (m):	National Grid Co-ordinate:	Sheet:
722146	**13.08.08** End: **13.08.08**	**---**	**---**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20-1.00	1	B				MADE GROUND: CONCRETE paving.	0.05	
						MADE GROUND: Reinforced CONCRETE. Steel bars approximately 5mm in diameter.	0.20	
						MADE GROUND: Loose brown clayey sandy GRAVEL of fine to coarse angular to subrounded chert, slate, brick and charcoal.	(1.00)	
1.20-1.65	1	SPT(c)	N=9				1.20	
1.20-1.60	3	B				MADE GROUND: Firm brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular brick, sandstone, chert and charcoal.	1.80	
1.80-2.25	4	U	70 blows			Stiff light brown slightly sandy CLAY with occasional to rare very fine gypsum crystals (1mm in length) and rare decomposing rootlets. (London Clay Formation)		
2.25-2.35	5	D					(1.20)	
2.40-3.00	6	B				. . . from 2.40m depth slighty gravelly very fine subrounded calcareous nodules, occasional pockets of orange sandy CLAY with gypsum crystals.	3.00	
3.00-3.45	2	SPT	N=17			Stiff light brown and grey thinly laminated slightly sandy CLAY with gypsum crystals 2mm in length. (London Clay Formation)		
3.00-3.45	8	B						
4.00-4.45	9	U	80 blows				(2.00)	
4.45-4.55	10	D						
4.50-5.00	11	B				. . . closely fissured from 4.45m depth.	5.00	
5.00-5.45	3	SPT	N=22			Stiff light brown closely fissured slightly sandy CLAY with occasional gypsum crystals (2-5mm in length). (London Clay Formation)		
5.00-5.45	13	B						
6.50-6.95	14	U	80 blows				(3.00)	
6.95-7.05	15	D						
7.30-7.80	16	B					8.00	
8.00-8.45	4	SPT	N=30			Very stiff dark brown grey slightly sandy CLAY with fine occasional gypsum crystals (>1mm-10mm in length) and rare fine shell fragments (1mm in length). (London Clay Formation)		
8.00-8.45	18	B					(1.56)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
13/08/08	16:00	15.45	1.70	150	Dry

Chiselling		
From	To	Duration (hh:mm)

General Remarks

1. Inspection pit excavated to 1.20m depth.
2. No groundwater encountered.
3. Backfilled on completion.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2000**	**MR**	**MBaker**	

STRUCTURAL SOILS

BOREHOLE LOG

Contract:	Client:	Borehole:
18-20 Lancaster Grove, London	**Upton McGougan Plc**	**BH1**

Contract Ref:	Start:	Ground Level (m):	National Grid Co-ordinate:	Sheet:
722146	**13.08.08** End: **13.08.08**	---	---	**2** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
9.50-9.80	19	U	120 blows				9.56	
9.80-9.90	20	D				Very stiff grey thinly laminated slightly sandy CLAY with occasional fine gypsum crystals (<1mm in length), rare fine shell fragments (<1mm in length) and rare fine to medium subangular calcareous nodules. (London Clay Formation)		
10.00	21	D						
10.50-10.95	5	SPT	N=31					
11.50	23	D						
12.00-12.45	6	SPT	N=33			. . . from 12.00m depth no calcareous nodules but very fine (<1mm in length) gypsum crystals persent.	(5.89)	
13.00	25	D						
13.50-13.95	7	SPT	N=34					
14.50	27	D				. . . from 14.50m depth frequent shell fragments and gypsum crystals (1-5mm in length).		
15.00-15.45	8	SPT	N=40				15.45	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling		
From	To	Duration (hh:mm)

General Remarks

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Cable percussion	**Dando 2000**	**MR**	**MBaker**	

STRUCTURAL SOILS

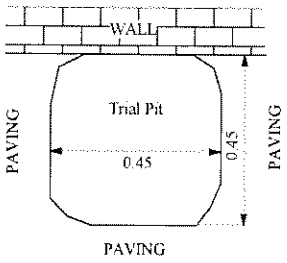
TRIAL PIT LOG

Contract:	Client:	Trialpit:
18-20 Lancaster Grove, London	**Upton McGougan Plc**	**TP1**

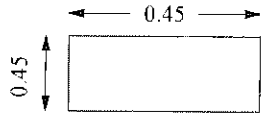
Contract Ref:	Date:	Ground Level (m):	National Grid Co-ordinate:	Sheet:
722146	**13.08.08**	---	---	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						CROSS SECTION		
						WALL / CONCRETE (0.50)		
						MADE GROUND: Paving over CONCRETE.	0.05	
0.25	1	ES				MADE GROUND: Soft dark brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to subrounded brick, charcoal, ceramic, slate and chert.	0.50	
0.30	2	ES						
0.40	3	D						
0.70	4	D				MADE GROUND: Firm dark and light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to rounded, chert, brick and charcoal.	0.83	
0.80	5	D				Trial pit terminated at 0.83 m depth.		

PLAN VIEW



Plan (Not to Scale)



General Remarks

1. No groundwater encountered.
2. Backfilled on completion.

All dimensions in metres | Scale: 1:20

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MBaker**	

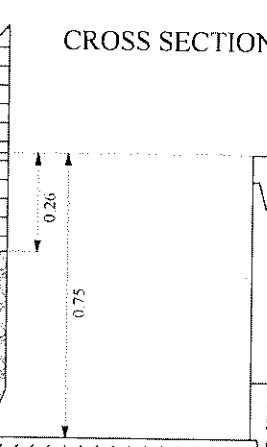
STRUCTURAL SOILS

TRIAL PIT LOG

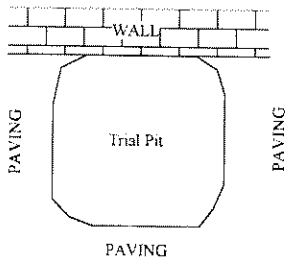
Contract:	Client:	Trialpit:
18-20 Lancaster Grove, London	**Upton McGougan Plc**	**TP2**

Contract Ref:	Date:	Ground Level (m):	National Grid Co-ordinate:	Sheet:
722146	**13.08.08**	**---**	**---**	**1 of 1**

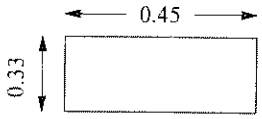
Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						CROSS SECTION		
0.00-0.35	3	B				MADE GROUND: Paving over CONCRETE.	0.07	
0.25	1	ES				MADE GROUND: Loose brown slightly clayey sandy GRAVEL of fine to coarse brick, concrete and charcoal.	0.60	
0.25	2	D						
0.60	4	D				MADE GROUND: Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, brick charcoal, chert and concrete.	0.75	
0.60	5	ES				Trial pit terminated at 0.75 m depth.		



PLAN VIEW



Plan (Not to Scale)



General Remarks

1. No groundwater encountered.
2. Backfilled on completion.

All dimensions in metres | Scale: **1:20**

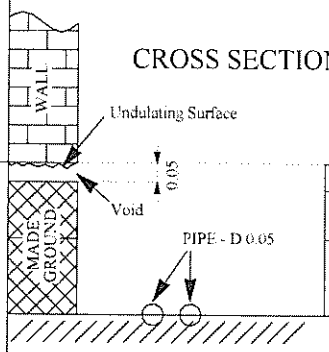
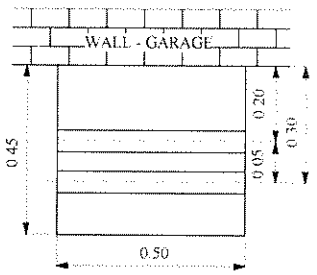
Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MBaker**	

STRUCTURAL SOILS

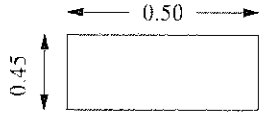
TRIAL PIT LOG

Contract:	Client:	Trialpit:
18-20 Lancaster Grove, London	**Upton McGougan Plc**	**TP3**

Contract Ref:	Date:	Ground Level (m):	National Grid Co-ordinate:	Sheet:
722146	**13.08.08**	**---**	**---**	**1 of 1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						CROSS SECTION  		
0.13	1	D				MADE GROUND: Paving over reinforced CONCRETE. Circular steel bars 5mm in diameter.	0.07	
0.13	2	ES				MADE GROUND: Soft brown sandy slightly gravelly friable CLAY. Gravel is fine to coarse subangular brick and concrete.	0.20	
0.35	3	D				MADE GROUND: Firm dark brown soft to firm sandy slightly gravelly CLAY. Gravel is fine to coarse subangular brick, concrete, slate and charcoal and occasional cobbles.	0.40	
0.40	4	ES				Trial pit terminated at 0.4 m depth due to unknown services.		
0.40	5	D						
						PLAN VIEW  		

Plan (Not to Scale)



General Remarks

1. No groundwater encountered.
2. Backfilled on completion.
3. Beneath the garage was a void from 0.00m to 0.05m depth. The void extended beneath the wall in excess of 0.50m, and the garage floor had a rough undulating surface.

All dimensions in metres | Scale: **1:20**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MBaker**	

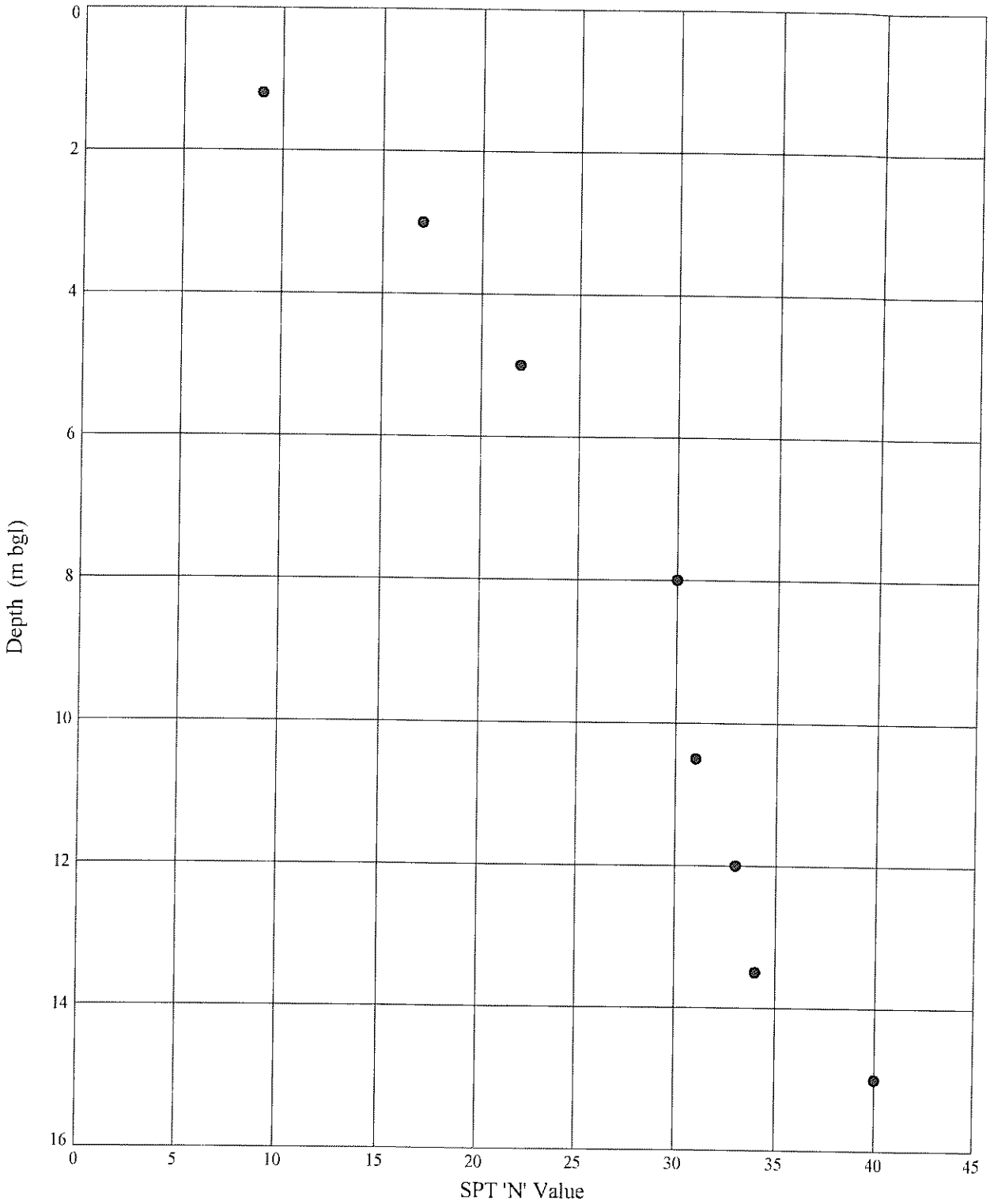
STRUCTURAL SOILS

STANDARD PENETRATION TEST SUMMARY TABLE

Contract:					Client:					Job No:
18-20 Lancaster Grove, London					**Upton McGougan Plc**					**722146**
BH	Depth (m)	Hole Dia (mm)	Casing Depth (m)	Water Depth (m)	Seating Drive		Test Drive			Comments
					Blows	Pen (mm)	Blows	R (mm)	Result	
BH1	1.20	150	1.70	DRY	1,1	150	2,2,2,3		N=9	CPT
	3.00	150	1.70	DRY	2,3	150	3,4,5,5		N=17	
	5.00	150	1.70	DRY	2,3	150	3,5,7,7		N=22	
	8.00	150	1.70	DRY	4,4	150	7,7,7,9		N=30	
	10.50	150	1.70	DRY	4,6	150	7,7,7,10		N=31	
	12.00	150	1.70	DRY	4,5	150	7,8,8,10		N=33	
	13.50	150	1.70	DRY	5,5	150	8,8,8,10		N=34	
	15.00	150	1.70	DRY	4,8	150	10,9,10,11		N=40	

Notes:
1. **Tests carried out in accordance with BS1377: Part 9: 1990: 3.3.**
2. **Reported blows are for 75mm penetration unless indicated "+".**
3. **Where full test drive was not achieved, actual penetration (R) and extrapolated N value (N*) reported.**
4. **Tests carried out using a split spoon sampler unless noted as CPT in comments column.**

STANDARD PENETRATION TEST 'N' VALUE vs DEPTH



Exploratory Hole : **BH1**

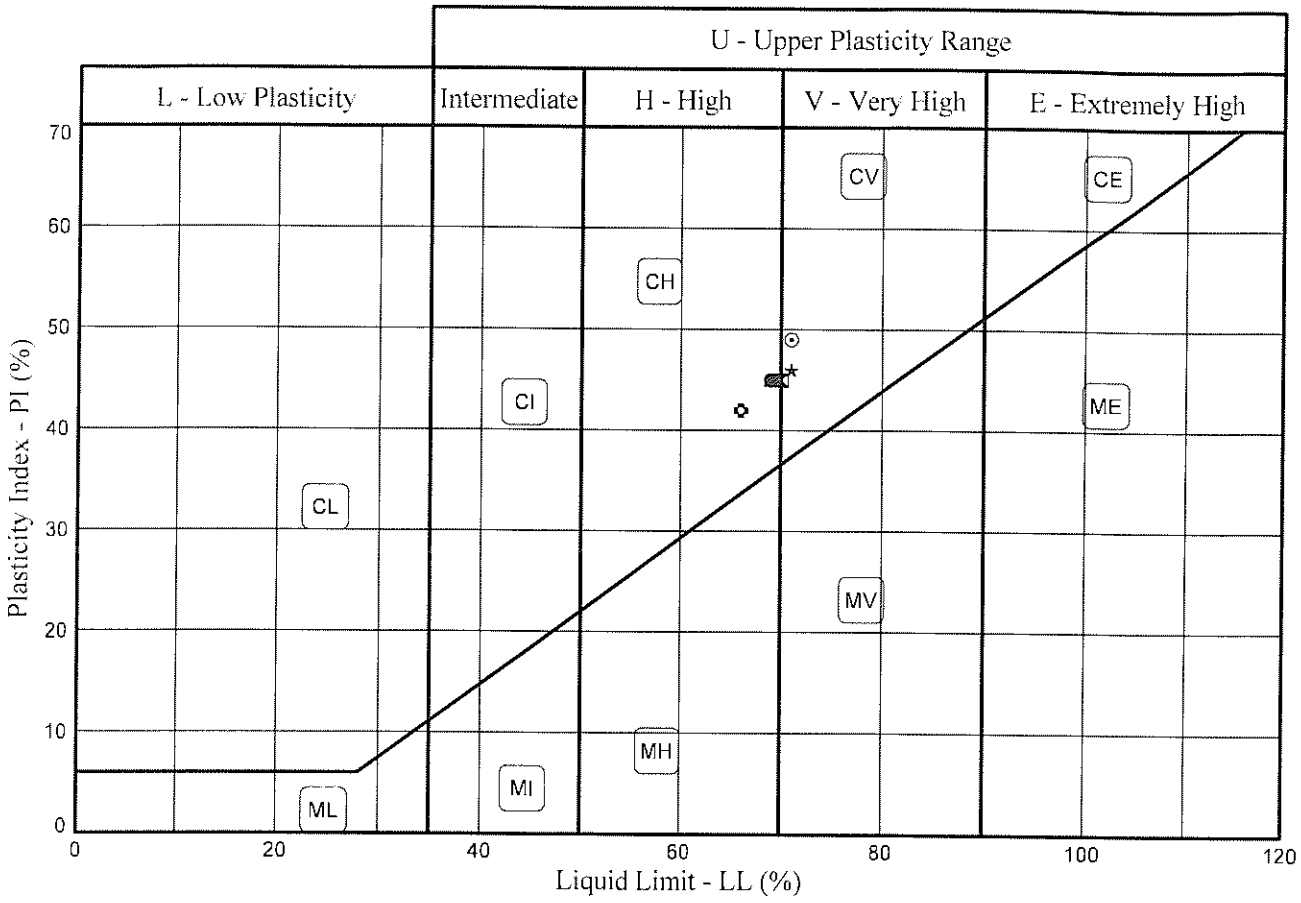
STRUCTURAL SOILS The Old School Stillhouse Lane Bedminster Bristol BS3 4EB	Contract **18-20 Lancaster Grove, London**	Date **19.09.08**	Checked By	Date
	Client **Upton McGongan Plc**	Job No **722146**		

APPENDIX C

(i) Laboratory Test Results

PLASTICITY CHART - PI Vs LL

In accordance with clause 42.3 of BS5930:1981
Testing in accordance with clauses 3.2,4.3,4.4,5.3,5.4 of BS1377:Part 2:1990



Sample Identification			MC	LL	PL	PI	<425um	Specimen Description
HoleID	Sample	Depth	%	%	%	%	%	
BH1	5D	2.40	26	69	24	45	99	Brown mottled yellow slightly gravelly CLAY.
BH1	6B	3.00	30	70	25	45	100	Brown mottled yellow and grey CLAY.
BH1	8D	4.45	28	69	24	45	100	Brown mottled yellow and grey slightly sandy CLAY.
BH1	12D	6.95	27	71	25	46	98	Brown slightly gravelly CLAY.
BH1	17D	10.00	28	71	22	49	100	Grey mottled brown CLAY.
BH1	19D	13.00	27	66	24	42	100	Grey mottled brown CLAY.

* Non-standard test Approved Signatories: D. TROWBRIDGE A. FROST F. HAMILTON L. MARTIN

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date
A. D. Tre	05/09/08	D Trowbridge	5/9/08

Contract: **18-20 Lancaster Grove, London**

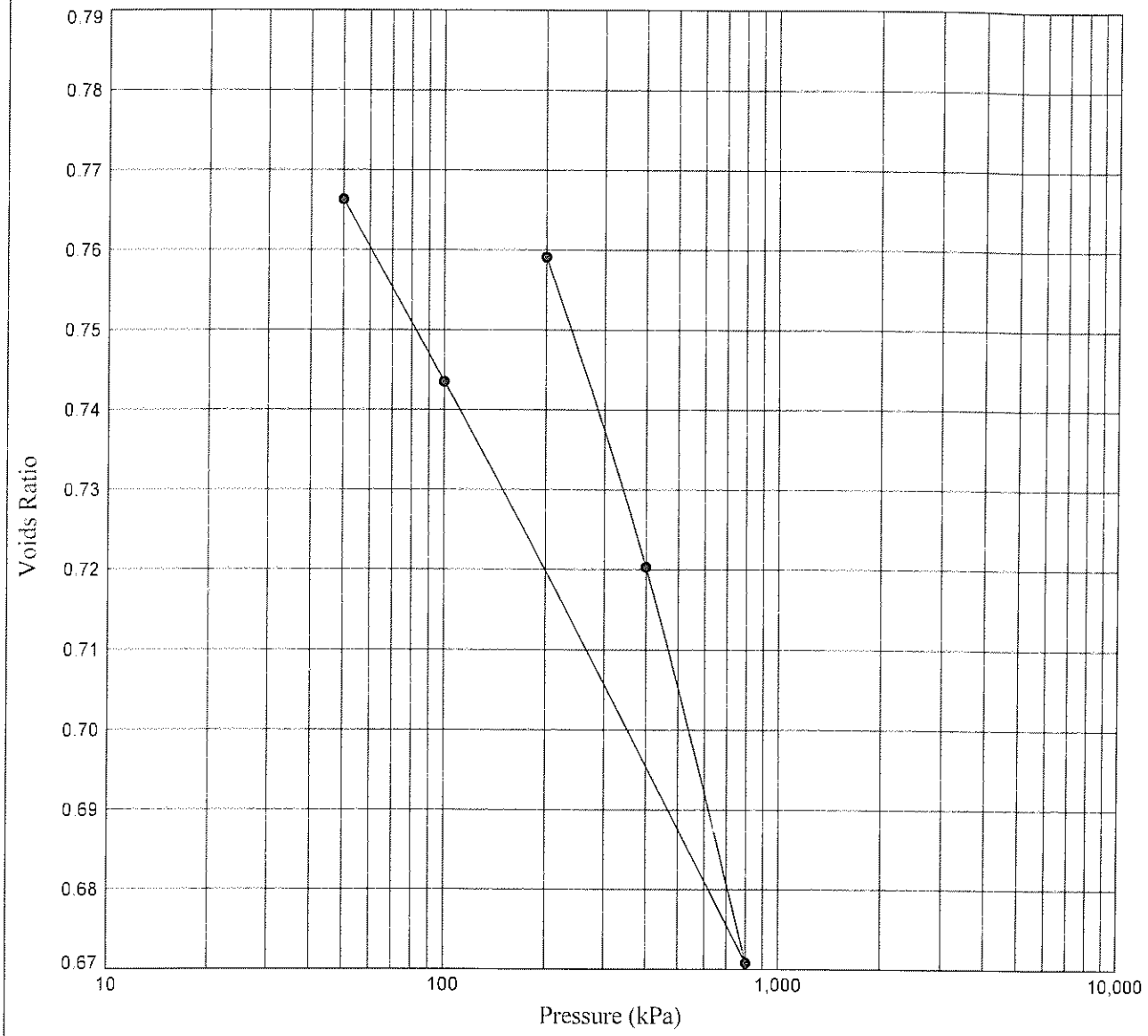
Job No: **722146**

AGS

ONE DIMENSIONAL CONSOLIDATION TEST

In accordance with BS1377:Part 5:1990

Borehole : **BH1** Sample Ref: **7** Sample Type: **U** Depth (m): **4.10**



Initial Specimen Condition			Final Specimen Condition		
Moisture Content (%)	:	**31**	Moisture Content (%)	:	**31**
Bulk Density (Mg/m^3)	:	**1.93**	Bulk Density (Mg/m^3)	:	**1.96**
Dry Density (Mg/m^3)	:	**1.48**	Dry Density (Mg/m^3)	:	**1.50**
Void Ratio	:	**0.7914**	Void Ratio	:	**0.7663**

Specimen Details			
Description	Height (mm)	:	**20.08**
Brown CLAY.	Diameter (mm)	:	**75.10**
	Particle Density (Mg/m^3) (assumed)	:	**2.65**
	Swelling Pressure (kPa)	:	**NA**

Test Results		
Pressure Range (kPa)	Mv (m^2/MN)	Cv (m^2/yr)
0 - 50	**Sample**	**Swelling**
50 - 100	**Sample**	**Swelling**
100 - 200	**0.12**	**8.4**
200 - 400	**0.11**	**1.0**
400 - 800	**0.072**	**0.44**
800 - 100	**0.062**	**4.1**
100 - 50	**0.26**	**0.14**

Approved Signatories: D. TROWBRIDGE A. FROST F. HAMILTON L. MARTIN

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date
A.D.Le	05/09/08	D Trowbridge	5/9/08

Contract: **18-20 Lancaster Grove, London**

Job No: **722146**

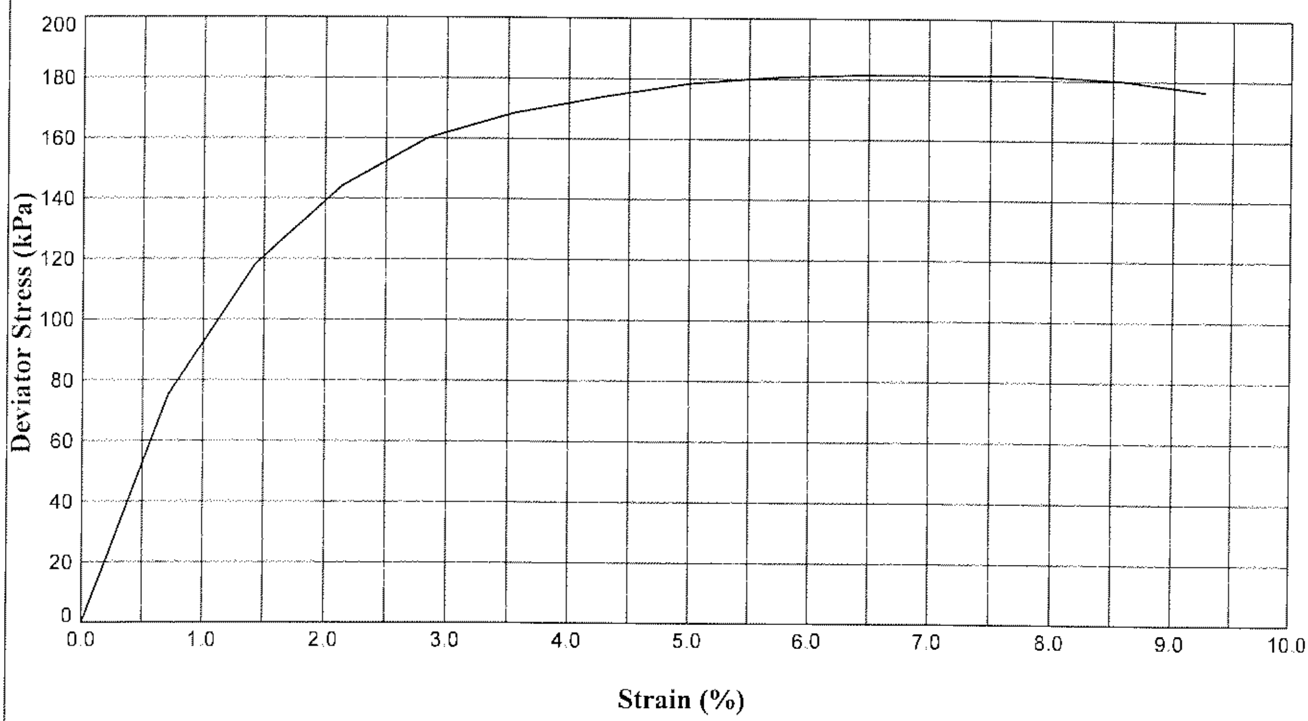
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377:Part 7:1990, Clause 8

Borehole : **BH1** Sample Ref: **3** Sample Type: **U** Depth (m): **1.80**

Description : **Brown CLAY.**

STAGE NUMBER			1	2	3
SAMPLE DETAILS	Sample Condition		Undisturbed		
	Orientation of sample		Vertical		
	Diameter	(mm)	102.83		
	Height	(mm)	207.00		
	Moisture Content	(%)	27		
	Bulk Density	(Mg/m^3)	1.88		
	Dry Density	(Mg/m^3)	1.48		
TEST DETAILS	Membrane Thickness	(mm)	0.25		
	Rate of Axial Displacement	(%/min)	1.45		
	Cell Pressure	(kPa)	50		
	Membrane Correction	(kPa)	0.39		
	Corrected Deviator Stress	(kPa)	181		
	Undrained Shear Strength	(kPa)	91		
	Strain at Failure	(%)	6.4		
	Mode of Failure		Brittle		



Approved Signatories: D. TROWBRIDGE A. FROST F. HAMILTON L. MARTIN

STRUCTURAL SOILS The Old School Stillhouse Lane Bedminster Bristol BS3 4EB	Compiled By	Date	Checked By	Date
	A.D [signature]	05/09/08	[signature]	5/9/08
	Contract **18-20 Lancaster Grove, London**		Job No **722146**	

STRUCTURAL_SOILS_GINT_LIBRARY.GLB - TRIAXIAL TEST - BS VERSION : 722146_LANCASTER_GROVIS_BELSIZE_PARK.GPJ - v8_01 : 05/09/08 - 12:15

SUMMARY OF CHEMICAL ANALYSES

In accordance with clauses 9 of BS1377:Part 3:1990 where applicable.

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Aqueous Extract Sulphate (g/l SO_4)	pH	% passing 2mm sieve	Description
BH1	2	B	1.20	1.4	9.4	60	Brown slightly sandy gravelly CLAY.
BH1	5	D	2.40	0.68	9.2	99	Brown mottled yellow slightly gravelly CLAY.

NOTES:- All chemical tests were undertaken by an external laboratory.

Approved Signatories: D. TROWBRIDGE A. FROST F. HAMILTON L. MARTIN

STRUCTURAL SOILS
The Old School
Stillhouse Lane
Bedminster
Bristol BS3 4EB

Compiled By	Date	Checked By	Date	Job No
A.D. Trc	05.09.08	D Trowbridge	5/9/08	722146

Contract: **18-20 Lancaster Grove, London**

APPENDIX D

(i) Contamination Test Results

(ii) Clean Cover System

(iii) CAT-WASTE^{SOIL} Results Input and Output Sheets

(iv) Generic Assessment Criteria for Residential Scenario

STRUCTURAL
SOILS LTD

SUMMARY OF CONTAMINATION ANALYSIS: SOIL

SITE: BELSIZE PARK, LONDON
REF: 722146
DATE: SEPTEMBER 2008

SAMPLE LOCATION	BH1	TP1
DEPTH (m)	**0.30-1.00**	**0.25**
Arsenic	14	36
Cadmium	0.3	1.0
Chromium (total)	20	34
Copper	42	98
Mercury	1.0	1.9
Nickel	15	25
Lead	350	1500
pH (units)	10.11	8.39
Selenium	<3	<3
Sulphate (SO4 in 2.1 extract g/l)	0.11	0.019
Zinc	130	490
Total Organic Matter (%)	4.3	5.6
PAHs		
Naphthalene	<0.01	0.30
Acenaphthylene	<0.01	0.11
Acenaphthene	<0.01	0.24
Fluorene	<0.01	0.19
Phenanthrene	<0.01	2.00
Anthracene	<0.01	0.69
Fluoranthene	<0.01	3.08
Pyrene	<0.01	2.63
Benzo (a) anthracene	<0.01	1.26
Chrysene	0.01	2.71
Benzo (b) fluoranthene Benzo (k) fluoranthene	<0.01	2.44
Benzo (a) pyrene	<0.01	1.51
Indeno (1,2,3-cd) pyrene	<0.01	1.45
Dibenzo (ah) anthracene	<0.01	0.02
Benzo (g,h,i) perylene	<0.01	1.58
VOLATILE PETROLEUM HYDROCARBONS		
MTBE	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethyl Benzene	<0.01	<0.01
Total Xylene	<0.01	<0.01
Aliphatics C5-C6	<0.01	<0.01
Aliphatics >C6-C8	<0.01	<0.01
Aliphatics >C8-C10	<0.01	<0.01
Aliphatics >C10-12	<0.1	<0.1
Aliphatics >C12-16	<0.1	<0.1
Aliphatics >C16-21	<0.1	<0.1
Aliphatics >C21-35	<0.1	<0.1
Aromatics C5-C7	<0.01	<0.01
Aromatics >C7-C8	<0.01	<0.01
Aromatics >C8-C9	<0.01	<0.01
Aromatics >C9-C10	<0.01	<0.01
Aromatics >C10-12	<0.1	<0.1
Aromatics >C12-16	<0.1	<0.1
Aromatics >C16-21	<0.1	<0.1
Aromatics >C21-35	<0.1	<0.1

Results are expressed as mg/kg unless otherwise stated
Any outlier values which exceed relevant guidelines are shown in bold.

Input by/Date

Checked by/Date M.M. Baker 16/09/08

STRUCTURAL
SOILS LTD

SUMMARY OF CONTAMINATION ANALYSIS: SOIL

SITE: BELSIZE PARK, LONDON
REF: 722146
DATE: SEPTEMBER 2008

	Mean Value Test *	CLEA Guidelines For Residential use (mg/kg)		GAC Guidelines for Residential Scenario - Private Gardens (mg/kg)
	US_{95}	With plant uptake	Without plant uptake	
Arsenic	94.45	20	20	-
Cadmium	2.86	1 (pH 6) 2 (pH 7) 8 (pH 8)	30	-
Chromium (total)	71.20	130	200	-
Copper	246.79	-	-	440
Mercury	4.29	8	15	-
Nickel	51.57	50	75	-
Lead	4555.55	450	450	-
Selenium	3.00	35	260	-
Zinc	1446.52	-	-	880
Total Organic Matter (%)	9.05	-	-	
PAHs				
Naphthalene	1.07	-	-	6.6
Acenaphthylene	0.38	-	-	1.3
Acenaphthene	0.85	-	-	15
Fluorene	0.67	-	-	6500
Phenanthrene	7.29	-	-	1900
Anthracene	2.50	-	-	51000
Fluoranthene	11.24	-	-	93
Pyrene	9.59	-	-	930
Benzo (a) anthracene	4.58	-	-	9.3
Chrysene	9.88	-	-	5.4
Benzo (b) fluoranthene	8.90	-	-	9.3
Benzo (k) fluoranthene		-	-	9.3
Benzo (a) pyrene	5.50	-	-	1.1
Indeno (1,2,3-cd) pyrene	5.28	-	-	9.3
Dibenzo (ah) anthracene	0.05	-	-	0.93
Benzo (g,h,i) perylene	5.75	-	-	1400
VOLATILE PETROLEUM HYDROCARBONS				
MTBE	0.01	-	-	19
Benzene	0.01	-	-	0.17
Toluene	0.01	$3, 7, 14_A$	$3, 8, 150_A$	-
Ethyl Benzene	0.01	$9, 21, 41_A$	$16, 41, 80_A$	-
Total Xylene	0.01	-	-	11
Aliphatics C5-C6	0.01	-	-	93,000
Aliphatics >C6-C8	0.01	-	-	170,000
Aliphatics >C8-C10	0.01	-	-	53
Aliphatics >C10-12	0.10	-	-	5,500
Aliphatics >C12-16	0.10	-	-	5,500
Aliphatics >C16-21	0.10	-	-	110,000
Aliphatics >C21-35	0.10	-	-	110,000
Aromatics >C5-C7	0.01	-	-	0.31
Aromatics >C7-C8	0.01	-	-	21
Aromatics >C8-C9	0.01	-	-	11_B
Aromatics >C9-C10	0.01	-	-	11_B
Aromatics >C10-12	0.10	-	-	31
Aromatics >C12-16	0.10	-	-	160
Aromatics >C16-21	0.10	-	-	1,400
Aromatics >C21-35	0.10	-	-	1,700

* - The calculations for the mean value test include outliers
A - for 1.0%, 2.5% and 5.0% SOM respectively
B: Guideline given is for aromatics C8-C10
GACs given assume 1% SOM for metals and 2.5% SOM for hydrocarbons
SOM Soil organic matter
Hydrocarbon GACs assumes free phase contamination is not present.

Input by/Date:

Checked by/Date: M. M. Butler 16/09/08

CALCULATION OF CLEAN COVER DEPTH (From BRE report BR 465)

Site 18-20 Lancaster Grove, Belsize Park
Ref 722146
Date 15/09/08

Calculations based on mixed zone (M)	600	mm

Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground	Contamination of Cover	Target Guideline Value 1	Target Guideline Value 2	Target Guideline Value 1 Soil /	Target Guideline Value 1 Cover /	Target Guideline Value 2 Soil /	Target Guideline Value 2 Cover /	Target Guideline Value 1	Target Guideline Value 2
	mg/kg		mg/kg		Fraction				(mm)	
Arsenic	36	10	20		1.8	0.5			369	
Cadmium (Soil pH8)										
Chromium										
Chromium (VI)										
Mercury										
Selenium										
Copper*										
Nickel										
Zinc	490	112.5	450		1.1	0.3			64	
Lead	1500	112.5	450		3.3	0.3			454	
Boron (Water sol)										
Sulphate (total)										
Phenols										
Sulphide										
dibenzo										
ACEN										
benzo a ant										
chry										
benzo b										
benzo ap	1.51	0.27	1.1		1.4	0.2			198	
indeno										

Summary

	Target Guideline Value 1	Target Guideline Value 2
Number of contaminants	21	21
Number of contaminants **with no** thickness calculation	16	20
Breakdown - Number for which no TV specfied	17	21
Breakdown - Number for which no soil specified	17	17
Breakdown - Number for which no cover specified	17	17
Breakdown - Number for which cover > TV	0	0
Number of contaminants **with** thickness calculation	5	1
Breakdown - Number for which no cover required	0	0
Breakdown - Number for which cover required	5	1

* Outlying result

Overall thickness of cover required	**454**	**0**

CAT-WASTE SOIL

Classification Assessment Tool of Soil Wastes - Hazard Summary Sheet

Ardle ATKINS

Site Name	BELSIZE PARK
Location	LONDON
Site ID	MB
Job Number	722146
Date	9/8/2008 12:08:17 PM
User Name	Enviro@soils.co.uk
Company Name	Structural Soils Ltd

Hole ID	Sample Depth	Hazardous Waste Y/N	H1	H2	H3A	H3B	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14
BH1	0.20-1.00m	N	False	False	False	False	False	False	False	False	False	False	False	False	False	False	False
TP1	0.25m		False	False	False	False	False	False	False	False	False	False	False	False	False	False	

This output data has been generated by the CAT-Waste Soil waste classification tool provided by Atkins Consultants Ltd and J.McArdle Contracts and should be read in conjuntion with the standard Terms and Conditions

CAT-WASTE 2.4

Classification Assessment Tool of Soil Wastes - Individual Compound Information

Ardle ATKINS

Site Name	BELSIZE PARK
Location	LONDON
Site ID	MB
Job Number	722146
Date	9/8/2008 12:09:17 PM
User Name	Enviro@soils.co.uk
Company Name	Structural Soils Ltd

Hole ID	Sample Depth	Contaminant	Contaminant Concentration (%)	Hazardous Waste Y/N	Hazard Class	Risk Phrases Exceeded	Additive Risk Phrases Exceeded	Additional Risk Phrases (see notes section)
BH1	0.20-1.00m	Benzene	1E-06	N				R11 test
BH1	0.20-1.00m	Toluene	1E-06	N				R11 test
BH1	0.20-1.00m	Ethylbenzene	1E-06	N				R11 test
BH1	0.20-1.00m	m,p-xylene	1E-06	N				R10 test flash point
BH1	0.20-1.00m	o-xylene	1E-06	N				R10 test flash point
BH1	0.20-1.00m	Chromium (Total) when no Cr VI results	0.01243008	N				R43 see comment
BH1	0.20-1.00m	Nickel	0.003954653	N				R42 see comment, R43 see comment
TP1	0.25m	Benzene	1E-06	N				R11 test
TP1	0.25m	Toluene	1E-06	N				R11 test
TP1	0.25m	Ethylbenzene	1E-06	N				R11 test
TP1	0.25m	m,p-xylene	1E-06	N				R10 test flash point
TP1	0.25m	o-xylene	1E-06	N				R10 test flash point
TP1	0.25m	Naphthalenene	3E-05	Y	H14		(R50 AND R53)	
TP1	0.25m	Acenaphthene	2.4E-05	Y	H14		(R50 AND R53)	
TP1	0.25m	Anthracene	6.9E-05	Y	H14		(R50 AND R53)	
TP1	0.25m	Pyrene	0.000263	Y	H14		(R50 AND R53)	
TP1	0.25m	Benzo(a)anthracene	0.000126	Y	H14		(R50 AND R53)	
TP1	0.25m	Chrysene	0.000271	Y	H14		(R50 AND R53)	
TP1	0.25m	Benzo(b)fluoranthene	0.000244	Y	H14		(R50 AND R53)	
TP1	0.25m	Benzo(k)fluoranthene	0.000244	Y	H14		(R50 AND R53)	
TP1	0.25m	Benzo(a)pyrene	0.000151	Y	H14		(R50 AND R53)	
TP1	0.25m	Di-benz(a,h,)anthracene	2E-06	Y	H14		(R50 AND R53)	
TP1	0.25m	Arsenic	0.00552232	Y	H14		(R50 AND R53)	
TP1	0.25m	Cadmium	0.0001854599	Y	H14		(R50 AND R53)	
TP1	0.25m	Chromium (Total) when no Cr VI results	0.02113114	Y	H14		(R50 AND R53)	R43 see comment
TP1	0.25m	Copper	0.02461693	Y	H14		(R50 AND R53)	
TP1	0.25m	Leadx	0.219555	Y	H14		(R50 AND R53)	
TP1	0.25m	Mercury	0.00019	Y	H14		(R50 AND R53)	
TP1	0.25m	Nickel	0.006591089	Y	H14		(R50 AND R53)	R42 see comment, R43 see comment
TP1	0.25m	Selenium	0.001128244	Y	H14		(R50 AND R53)	
TP1	0.25m	Zincx	0.1209877	Y	H14		(R50 AND R53)	

Notes - Additional Information on Risk Phrases

R1 to R6	Test for explosives except when the waste is covered by the Explosives Act 1875	Test to establish whether a substance or preparation presents a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R7, R8 and R9	Test/calculation for oxides	Applicable to solid compounds that are not explosive, highly flammable, organic peroxides or combustible. A test for the compounds oxidising properties as described in Directive 92/69/EEC, Test Method A17. For organic peroxides calculate the available oxygen content (%). For liquids and oxidising materials not covered by those previously listed no testing available.
R10	R10 test flash point	Flashpoint test as per Directive 92/62/EEC, Test Method A9
R11	R11 test flash point	For liquid substances, undertake the flashpoint test as per Directive 92/62/EEC, Test Method A9. For solid substances undertake flammability test as per directive 92/62/EEC, Test Method A10
R12	R12 test flammability	Flammability of gasses test as per Directive 92/62/EEC Test Method A11.
R15	R15 test flammability	To test the flammability of a substance when in contact with water test as per Directive 92/62/EEC, Test Method A12.
R16	R16 test for explosives	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R17	R17 pyrophoric test	To test the pyrophoric properties of solids and liquids test as per Directive 92/62/EEC, Test Method A13.
R18	R18 test for flammable explosive vapour air mixture	Test to establish whether a substance or preparation presents a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R19	R19 test for flammable explosive peroxides	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R29	R29 test or calculation	Undertake test as per Directive 92/62/EEC, Test Method A12.
R31	R31 test or calculation	Undertake testing as per Directive 92/62/EEC, Test Method A12 modified to replace water with an acid which will not cause a displacement reaction to occur. Method to measure SO2 evolved when a waste is in contact with an acid (see Environment Agency SWEN 068).
R32	R32 test or calculation	Undertake testing as per Directive 92/62/EEC, Test Method A12 modified to replace water with an acid which will not cause a displacement reaction to occur).
R42 and R43	No test available	No test available for sensitisation
R44	R44 test for explosives	Test to establish whether a substance or preparation present a danger of explosion when submitted to the effect of a flame (thermal sensitivity), impact or friction. Undertake Test Method A14 from EC Directive 92/62/EEC
R54 to R58	see comment	Classification of waste as ecotoxic (on the basis of terrestrial non-aquatic toxicity) is not applicable due to the lack of detailed information. Until more data becomes available R54 to R58 should not be considered when assessing the ecotoxic hazard of wastes and classifications should be based upon aquatic toxicity data. Where there is reason to believe that a waste contains substances that only have effects on the terrestrial environment, guidance on the approapriate test method should be obtained from the Environment Agency.

Notes:

Testing of compounds which would be classified under H14 should only be undertaken where the hazards cannot be adequately identified. (i.e. where the waste contains a substance/s for which there is no aquatic toxicity data and/or where the waste is an uncharacterised mixture and/or there is the potential that the waste may contain unknown substances or breakdown products.
Aquatic toxicity testing should be undertaken in accordance with the Environmental Health and Safety Publication, series on Testing and Assessment No. 23 ENV/JM/MONO(2000) 6 June 2000

Generic Assessment Criteria for Human Health
Residential Scenario – Private Gardens

1. Model Selection

The Generic Assessment Criteria (GAC) were calculated using Risk-Based Corrective Action (RBCA) and Risk-Integrated Software for Clean-ups (RISC). RBCA was chosen for two reasons. Firstly, it uses the Johnson and Ettinger (J&E) model, which has been incorporated into the current beta version of the UK Contaminated Land Exposure Assessment (CLEA) model and secondly, RBCA accounts for differential pressure in the indoor air inhalation pathway from both soil and groundwater. RISC only accounts for differential pressure for indoor air inhalation from soil. However, it is the only model available to generate values for the vegetable ingestion pathway and was used for this pathway. One disadvantage is that the model only accounts for dissolved phase hydrocarbons. CLEA was not used following the Environment Agency's Frequently Asked Question Number 26 regarding the suitability of the Briggs et al algorithm for chemicals with a log Kow >5.

2. Pathway Selection

Pathways considered in the residential end use include indoor air inhalation from soil and groundwater, ingestion of soil/indoor dust, dermal contact with soil and ingestion of vegetables. CLEA also includes the outdoor air inhalation and soil attached to vegetables pathways. Outdoor air inhalation was not modelled, as the indoor air pathway is typically more conservative. Soil attached to vegetables was not included owing to a calculation method not being available within RISC. A conceptual model illustrating the linkages modelled is included in Figure 1.

Within the model, the solubility limit of the determinant limits the extent of volatilisation, which in turn drives the indoor air inhalation pathway. In cases where the contaminant solubility is exceeded, a reliable method to derive GAC has not been determined, and the values calculated for the soil ingestion and dermal contact pathways are selected as the GAC.

3. Input Selection

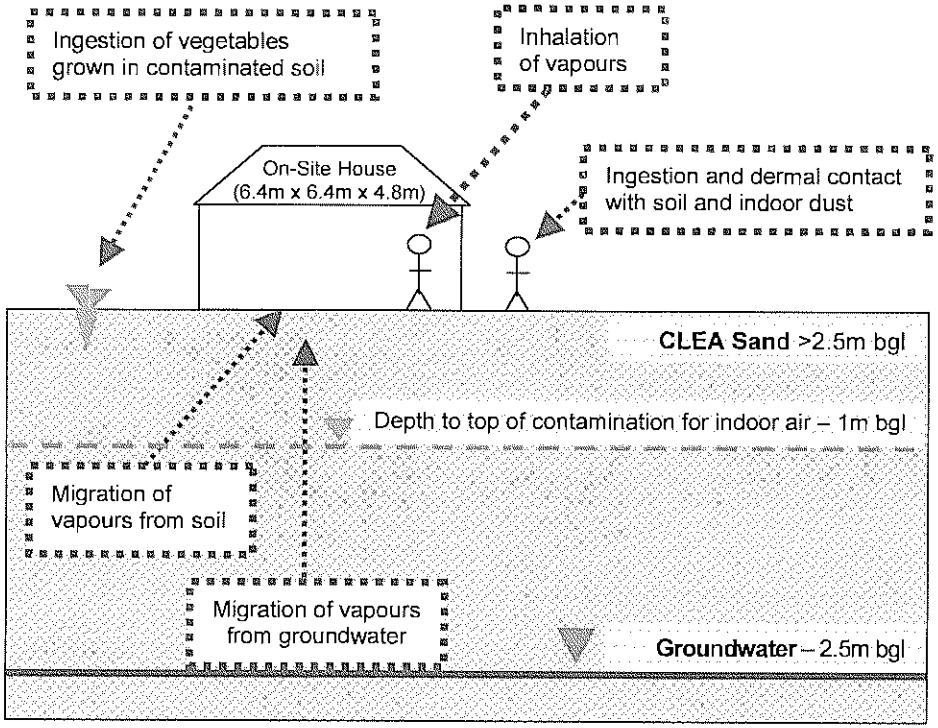
Where available, the published UK toxicity data has been used. For compounds where Tolerable Daily Soil Intakes (TDSI) for both a child and an adult are published, the value for the child was used in line with CLEA. For Total Petroleum Hydrocarbons (TPH), toxicity and chemical specific parameters from the TPH Criteria Working Group (TPHCWG) were used. Due to the lack of UK-specific data, default information in the RBCA model was used to evaluate MTBE. No published UK toxicity data was available for 1,2,4- and 1,3,5-trimethylbenzene. Data was collected from Syracuse Research Corporation database (http://www.syrres.com/esc/physdemo.htm) and the Risk Assessment Information System (http://risk.lsd.ornl.gov/cgi-bin/tox/). Toxicity reports have been generated by RSK in line with guidance in CLR9 for 14 of the 16 USEPA Polycyclic Aromatic Hydrocarbons (PAHs). The chemical and toxicity data used to generate the GAC was derived from these reports.

Building size, particularly height, is a sensitive parameter when considering the indoor air pathway. Building parameters for a CLEA house (two floors) and a sand soil type were used in line with published SGVs. An average groundwater depth of 2.5m was assumed based on typical UK conditions. This is also a sensitive parameter for the indoor air pathway. If groundwater is shallower than 2.0m bgl or deeper than 3.0m bgl, the GAC should be used with caution since they could be over or under conservative.

4. GAC

The GAC were produced using the input parameters in Tables 1 to 3 and the GAC are presented by pathway in Table 4. The final selected GAC are presented in Table 5.

Figure 1
Conceptual Model for Residential Scenario – Private Gardens



Note: Exposure parameters shown on Table 1.

Table 1
Exposure Assessment Parameters for Residential Scenario - Private Gardens – Inputs for RBCA Model

Parameter	Value	Justification
Averaging time	6 years	Equals exposure duration for residential use in line with Table 3.2, CLR10
Body weight	14.5kg	Average 0-6 year old female child in line with Table 5.6, CLR10 for residential use
Exposure frequency	365 days	In line with Tables 3.2, 4.3, 4.4, CLR10 for a residential end use.
Exposure duration	6 years	
Ingestion rate for soil	100mg/day	Table 6.1, CLR10 value for a 0-6 year old ingesting soil and indoor dust.
Total exposed skin surface area	1634cm^2	Equation: Total skin area (6167cm^2) x max fraction skin exposed outdoors (0.265) Mean of total skin area for 0-6 year old female, calculated from Appendix 1, BN 1 and mean of max fraction for outdoor exposure of a 0-6 year old female taken from Table 2, BN 1. Indoor exposure fraction is 0.33 but was not selected since a lower adherence factor is relevant for indoor exposure. This value is within the range of indoor and just above that for outdoor exposed skin in Appendix 1, BN1 and therefore is considered appropriate for use.
Soil/skin adherence factor	1mg/cm^2	In line with recommendations for a child resident for outdoor exposure. Table 3, BN1. Note indoor adherence factor is 0.06mg/cm^2, but 1mg/cm^2 is considered more conservative.

Note: Briefing Notes (BN) are CLEA publications. BN1, Version 1.1, (March 2005).

Table 2
Additional Exposure Parameters used in the RISC Model – Ingestion of Vegetable Pathway

Parameter	Value	Justification
Exposure frequency	365 No.	In line with paragraph 4.34, CLR10 for a residential end use.
Ingestion rate for root veg	61.7g/day	In line with CLR10 for a 1–4 year old, averaged for 1–4 year old age from Tables 6.3 and 5.6 as the 1–4 year age group is nearest to 0–6 year old used in CLEA to assess residential end use.
Ingestion rate for above ground veg	16.5g/day	
Fraction of veg grown in contaminated soil	0.28 [-]	Average home-grown fraction calculated from Table 6.4, CLR10.
Fraction of organic carbon	0.0058 [-]	Published SGVs use a soil organic matter of 1%. This is the equivalent of 0.58% TOC.

Note: Fraction of vegetables grown in contaminated soil is taken from CLR10 that CLAN6/06 recognises as being overly conservative.

Table 3
Additional Parameters for Residential Scenario - Private Gardens - Inputs for RBCA Model

Parameter	Value	Justification
Depth to water bearing unit	2.5m	Assumed typical depth to groundwater based on RSK experience.
Depth to top of affected soil	1m	Default from BN 2 for the depth to impacted soil.
Depth to base of affected soil	2.5m	Taken equal to depth to water-bearing unit to reflect unsaturated zone thickness.
Affected soil area	40.96m^2	Taken equal to foundation area (6.4m x 6.4m) of CLEA house. BN 3.
Soil type – Sand in line with CLEA		
Total porosity	0.46 [-]	CLEA sand from Table 3, BN2 as this is the most permeable CLEA soil and was used to produce the published SGVs.
Volumetric water content	0.15 [-]	
Dry bulk density	1.6	
Vertical hydraulic conductivity	5.6m/d	
Vapour permeability	7.20E-12m^2	Calculated for a CLEA sand using equations in Appendix 2, BN 2.
Capillary zone thickness	0.05m	Default value for sand from RBCA as RBCA sand is similar to CLEA sand and value is not included in BN 2.
Fraction of organic carbon	0.0058	Modelling used 1% SOM (0.58% TOC) in line with the published CLEA SGVs.
Soil/water pH	6.8	Taken as model default, which is considered reasonably conservative for UK.
Groundwater plume width at source	6.4m	Equal to width of CLEA house (6.4m x 6.4m). Appendix 1, BN 3.
Foundation area	40.96m^2	CLEA house dimensions used (6.4m x 6.4m). Appendix 1, BN 3.
Foundation perimeter	25.6m	
Building volume/area ratio	4.8m	CLEA house. Appendix 1, BN 3.
Building air exchange rate	12 No./day	CLEA BN 3 for a residential property.
Depth to slab base	0.15m	CLEA house. Appendix 1, BN 3 for foundation or slab thickness.
Foundation crack fraction	0.00125	Calculated using building perimeter and foundation area in line with last paragraph of BN 3 (0.002m x perimeter/area).
Volumetric air content of cracks	0.31 [-]	Assumed equal to underlying soil type in assumption that cracks become filled with soil over time. Discussion for Equation 6 - BN 2. Underlying soil is assumed to be CLEA sand.
Volumetric water content of cracks	0.15 [-]	
Indoor/outdoor differential pressure	30g/cm/s^2	CLEA house, Appendix 1, BN 3.

Note: Briefing Notes (BN) are CLEA publications. BN2, Version 1.1 (July 2004), BN3, Version 1.1 (July 2004).

Table 4
Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound		GAC for Inhalation of Indoor Air from Groundwater (a) (mg/l)	SSV Appropriate to Pathway			Selected SSV for Soil with Vegetable Uptake (c) (mg/kg)	
			Soil Ingestion/ Dermal Contact (mg/kg)	Inhalation of Indoor Air (mg/kg)	SSV for Vegetable Uptake (b) (mg/kg)		
Metals							
Arsenic		-	NC	NC	NC	2.00E+01	(d)
Cadmium (pH 6 - see note k)		-	NC	NC	NC	1.00E+00	(d,k)
Chromium (total)		-	NC	NC	NC	1.30E+02	(d)
Copper	(b)	-	5.80E+03	-	4.40E+02	4.40E+02	
Lead		-	NC	NC	NC	4.50E+02	(d)
Mercury		-	NC	NC	NC	8.00E+00	(d)
Nickel		-	NC	NC	NC	5.00E+01	(d)
Selenium		-	NC	NC	NC	3.50E+01	(d)
Zinc	(b)	-	4.40E+04	-	8.80E+02	8.80E+02	
Volatile Organic Compounds (f)							
Benzene		7.39E-02	1.60E+01	1.67E-01	2.00E+00	1.67E-01	
Toluene (1% SOM - see note e)	(g)	5.15E+00	NC	NC	NC	3.00E+00	(d)
Ethylbenzene (1% SOM - see note e)	(g)	1.16E+01	NC	NC	NC	9.00E+00	(d)
Xylene	(g)	3.50E+00	9.80E+03	1.10E+01	2.50E+03	1.10E+01	
Methyl t-Butyl ether	(h)	3.66E+02	4.77E+02	1.58E+02	1.90E+01	1.90E+01	
Trichloroethene		2.20E-01	2.86E+02	9.57E-01	4.30E+01	9.57E-01	
Tetrachloroethene		1.41E+00	7.71E+02	1.21E+01	1.40E+02	1.21E+01	
1,1,1-Trichloroethane		1.75E+01	9.49E+03	1.09E+02	5.80E+03	1.09E+02	
1,1,1,2 & 1,1,2,2-Tetrachloroethane		1.11E+01	9.17E+01	6.84E+00	5.20E+01	6.84E+00	
Carbon Tetrachloride		4.18E-02	2.21E+01	3.68E-01	1.70E+01	3.68E-01	
1,2-Dichloroethane		4.40E-02	1.90E+00	2.21E-02	4.00E-01	2.21E-02	
Vinyl Chloride		4.03E-03	2.21E-01	5.52E-02	4.80E-02	4.80E-02	
1,2,4-Trimethylbenzene	(i)	8.07E-02	2.75E+03	3.13E-01	6.70E+02	3.13E-01	
1,3,5-Trimethylbenzene	(i)	5.93E-02	2.75E+03	3.13E-01	8.00E+02	3.13E-01	
Semi-Volatile Organic Compounds (j)							
Acenaphthene		7.59E-01	9.28E+02	1.53E+01	1.00E+03	1.53E+01	
Acenaphthylene		1.08E-01	9.28E+01	1.27E+00	7.00E+01	1.27E+00	
Anthracene		ND	5.11E+04	ND	9.50E+04	5.11E+04	
Benzo(a)anthracene		ND	9.28E+00	ND	8.00E+01	9.28E+00	
Benzo(b)fluoranthene		ND	9.28E+00	ND	4.40E+01	9.28E+00	
Benzo(g,h,i)perylene		ND	1.39E+03	ND	1.70E+03	1.39E+03	
Benzo(k)fluoranthene		ND	9.28E+00	ND	6.70E+01	9.28E+00	
Chrysene		ND	9.28E+01	ND	5.40E+00	5.40E+00	
Dibenzo(a,h)anthracene		ND	9.28E-01	ND	6.40E+00	9.28E-01	
Fluoranthene		ND	9.28E+01	ND	2.40E+02	9.28E+01	
Fluorene		ND	6.45E+03	ND	9.10E+03	6.45E+03	
Indeno(1,2,3-cd)pyrene		ND	9.28E+00	ND	6.80E+01	9.28E+00	
Phenanthrene		ND	1.86E+03	ND	2.90E+03	1.86E+03	
Pyrene		ND	9.28E+02	ND	2.40E+03	9.28E+02	
Benzo(a)pyrene	(f)	ND	1.10E+00	ND	5.50E+00	1.10E+00	
Naphthalene	(f,g)	1.68E+00	1.10E+03	6.56E+00	4.70E+02	6.56E+00	
Phenol	(d)	-	NC	NC	NC	7.80E+01	(d)

Table 4
Human Health Generic Assessment Criteria by Pathway for Residential Scenario - Private Gardens

Compound	GAC for Inhalation of Indoor Air from Groundwater (a) (mg/l)	SSV Appropriate to Pathway			Selected SSV for Soil with Vegetable Uptake (c) (mg/kg)
		Soil Ingestion/ Dermal Contact (mg/kg)	Inhalation of Indoor Air (mg/kg)	SSV for Vegetable Uptake (b) (mg/kg)	
Table 4 Continued					
Total Petroleum Hydrocarbons (h)					
Aliphatic Hydrocarbons EC_5-EC_6	1.39E+00	2.75E+05	ND	9.30E+04	9.30E+04
Aliphatic Hydrocarbons >EC_6-EC_8	9.39E-01	2.75E+05	ND	1.70E+05	1.70E+05
Aliphatic Hydrocarbons >EC_8-EC_{10}	3.13E-02	5.50E+03	5.26E+01	7.30E+03	5.26E+01
Aliphatic Hydrocarbons >EC_{10}-EC_{12}	2.01E-02	5.50E+03	ND	1.50E+04	5.50E+03
Aliphatic Hydrocarbons >EC_{12}-EC_{16}	ND	5.50E+03	ND	3.80E+04	5.50E+03
Aliphatic Hydrocarbons >EC_{16}-EC_{21}	-	1.10E+05	-	-	1.10E+05
Aliphatic Hydrocarbons >EC_{21}-EC_{35}	-	1.10E+05	-	-	1.10E+05
Aromatic Hydrocarbons EC_5-EC_7	6.29E-02	1.65E+02	3.13E-01	1.20E+03	3.13E-01
Aromatic Hydrocarbons >EC_7-EC_8	3.54E+00	1.10E+04	2.10E+01	2.10E+03	2.10E+01
Aromatic Hydrocarbons >EC_8-EC_{10}	1.02E+00	2.20E+03	1.05E+01	9.80E+02	1.05E+01
Aromatic Hydrocarbons >EC_{10}-EC_{12}	3.63E+00	2.20E+03	3.07E+01	1.30E+03	3.07E+01
Aromatic Hydrocarbons >EC_{12}-EC_{16}	ND	2.20E+03	1.61E+02	1.70E+03	1.61E+02
Aromatic Hydrocarbons >EC_{16}-EC_{21}	-	1.65E+03	-	1.40E+03	1.40E+03
Aromatic Hydrocarbons >EC_{21}-EC_{35}	-	1.65E+03	-	3.70E+04	1.65E+03

Notes:
"-" - GAC or SSV not calculated owing to low volatility of substance and therefore an absence of toxicity data for this pathway.
EC - Equivalent Carbons.
GAC - Generic Assessment Criteria.
NC - Not calculated as published screening value exists.
ND - Not determined. Calculated screening value exceeded the solubility limit used in RBCA. Theoretically, these compounds could not dissolve into a solution with high enough concentrations to pose a risk as the solubility limit is exceeded and the RBCA model cannot consider free phase.
RBCA - Risk-Based Corrective Action model. Version 1.3b (2000), (ASTM, 1998).
RISC - Risk-Integrated Software for Clean-ups, Version 4.03a (BP, 2003).
SGV - Soil Guideline Values.
SSV - Soil Screening Values.
(a) Unless otherwise noted, values were calculated by the RBCA model using default values shown in Table 1, Table 2 and Table 3 of this Appendix.
(b) Toxicity data taken from the RISC model.
(c) Value selected is the lowest calculated from the soil ingestion/dermal contact, inhalation of indoor air and vegetable uptake pathways.
(d) GAC taken as published residential with plant uptake SGV.
(e) The SGVs for toluene and ethylbenzene are dependent on Soil Organic Matter (SOM) (%) content. To obtain SOM from total organic carbon (TOC) (%) divide by 0.58%. 1% SOM is 0.58% TOC. DL Rowell Soil Science: Methods and Applications, Longmans, 1994.
(f) Unless otherwise noted toxicity information and chemical parameters obtained from Environment Agency publications.
(g) Child values for Total Daily Soil Intake were used for both the oral and inhalation pathways (oral values substituted for dermal pathway in absence of dermal values).
(h) RBCA default values used for MTBE and hydrocarbon fractions. Hydrocarbons consistent with TPH Criteria Working Group (TPHCWG).
(i) No UK data available, see Input Selection section for references.
(j) Unless otherwise noted RSK toxicity values used. These were derived following the CLR9 hierarchy in absence of UK data. Toxicity reports available upon request.
(k) Cadmium is dependent on soil pH. 1 mg/kg is the SGV at a pH of 6, 2 mg/kg is the SGV at a pH of 7, and 8 mg/kg is the SGV at a pH of 8.

Table 5
Selected Human Health Generic Assessment Criteria for Residential Scenario - Private Gardens

Compound	GAC for Groundwater (a) (mg/l)	GAC for Soils (a) (mg/kg)
Metals		
Arsenic	-	20
Cadmium (pH 6, 7, 8)	-	1,2,8
Chromium (total)	-	130
Copper	-	440
Lead	-	450
Mercury	-	8
Selenium	-	35
Nickel	-	50
Zinc	-	880
Volatile Organic Compounds		
Benzene	0.074	0.17
Toluene (SOM 1%, 2.5%, 5%)	5.2	3.0, 7.0, 14
Ethylbenzene (SOM 1%, 2.5%, 5%)	12	9.0, 21, 41
Xylene	3.5	11
Methyl t-Butyl ether	370	19
Trichloroethene	0.22	0.96
Tetrachloroethene	1.4	12
1,1,1-Trichloroethane	18	110
1,1,1,2 & 1,1,2,2-Tetrachloroethane	11	6.8
Carbon Tetrachloride	0.042	0.37
1,2-Dichloroethane	0.044	0.022
Vinyl Chloride	0.0040	0.048
1,2,4-Trimethylbenzene	0.081	0.31
1,3,5-Trimethylbenzene	0.059	0.31
Semi-Volatile Organic Compounds		
Acenaphthene	0.76	15
Acenaphthylene	0.11	1.3
Anthracene	ND	51,000
Benzo(a)anthracene	ND	9.3
Benzo(b)fluoranthene	ND	9.3
Benzo(g,h,i)perylene	ND	1,400
Benzo(k)fluoranthene	ND	9.3
Chrysene	ND	5.4
Dibenzo(a,h)anthracene	ND	0.93
Fluoranthene	ND	93
Fluorene	ND	6,500
Indeno(1,2,3-cd)pyrene	ND	9.3
Phenanthrene	ND	1,900
Pyrene	ND	930
Benzo(a)pyrene	ND	1.1
Naphthalene	1.7	6.6
Phenol	-	78
Total Petroleum Hydrocarbons		
Aliphatic Hydrocarbons EC_5-EC_6	1.4	93,000
Aliphatic Hydrocarbons >EC_6-EC_8	0.9	170,000
Aliphatic Hydrocarbons >EC_8-EC_{10}	0.031	53
Aliphatic Hydrocarbons >EC_{10}-EC_{12}	0.020	5,500
Aliphatic Hydrocarbons >EC_{12}-EC_{16}	ND	5,500
Aliphatic Hydrocarbons >EC_{16}-EC_{21}	-	110,000
Aliphatic Hydrocarbons >EC_{21}-EC_{35}	-	110,000
Aromatic Hydrocarbons EC_5-EC_7	0.063	0.31
Aromatic Hydrocarbons >EC_7-EC_8	3.5	21
Aromatic Hydrocarbons >EC_8-EC_{10}	1.0	11
Aromatic Hydrocarbons >EC_{10}-EC_{12}	3.6	31
Aromatic Hydrocarbons >EC_{12}-EC_{16}	ND	160
Aromatic Hydrocarbons >EC_{16}-EC_{21}	-	1,400
Aromatic Hydrocarbons >EC_{21}-EC_{35}	-	1,700

Notes:
"-" Value not applicable due to low volatility of substance. No value in table as groundwater ingestion not considered a plausible pathway.
GAC - Generic Assessment Criteria.
ND - Not determined. Value exceeded solubility limit used in RBCA. Theoretically these compounds could not dissolve into a solution with high enough concentrations to pose a risk, as solubility limit is exceeded the potential pathway is incomplete.
RBCA - Risk-Based Corrective Action model, Version 1.3b (2000). (ASTM, 1998).
(a) See Table 4 for calculation notes, values shown rounded to two significant figures.

APPENDIX E

(i) Envirocheck Data Sheets

(ii) Historical Mapping

GroundSure Environmental Data Report

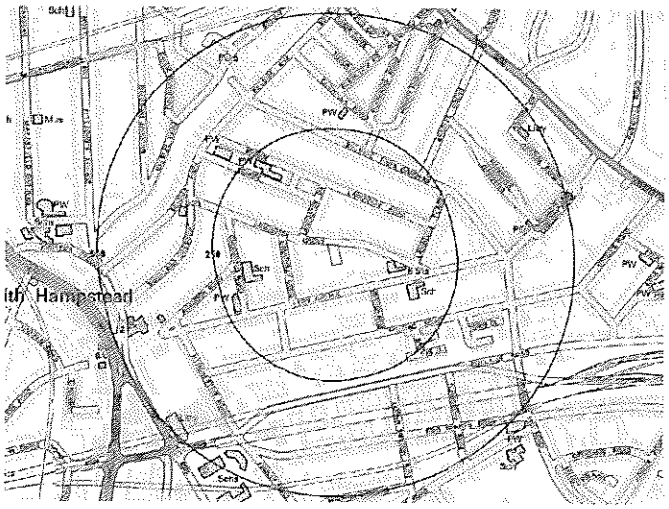
Address: 18-20, LANCASTER GROVE, LONDON, NW3 4PB

Date: Aug 12, 2008

GroundSure Reference: HMD-24-195381

Your Reference: 722146/MB

Client: Structural Soils



Brought to you by GroundSure

Aerial Photograph of Study Site

Site Name: 18-20, LANCASTER GROVE, LONDON, NW3 4PB
Grid Reference: 527112,184563

Overview of Findings

For further details on each dataset, please refer to each individual section in the main Report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary					
1. Authorisations, Incidents and Registers	on-site	0-50	51-250	251-500	501-1000	1000-1500
1.1 Industrial Sites Holding Licenses and/or Authorisations						
Records of IPC Authorisations	0	0	0	0	0	-
Records of IPPC Authorisations	0	0	0	0	0	-
Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0	-	-
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0	-	-
Records of List 1 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of List 2 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of LAPPC (LAPC) Authorisations	0	0	0	1	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0	-	-
Records of Licensed Discharge Consents	0	0	0	0	-	-
1.2 Records of COMAH and NIHHS sites	0	0	0	0	-	-
1.3 Environment Agency Recorded Pollution Incidents						
National Incidents Recording System, List 2	0	0	0	-	-	-
National Incidents Recording System, List 1	0	0	0	-	-	-
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0	0	0	-	-
2. Landfill and Other Waste Sites	on-site	0-50	51-250	251-500	501-1000	1000-1500
2.1 Landfill Sites						
Environment Agency Registered landfill Sites	0	0	0	0	0	0
Landfill Data - Operational Landfill Sites	0	0	0	0	0	0
Environment Agency Historic Landfill Sites	0	0	0	0	0	1
Landfill Data - Non-Operational Landfill Sites	0	0	0	0	0	0
BGS/DoE Landfill Site Survey	0	0	0	0	0	0
GroundSure Local Authority Landfill Sites Data	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						
Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Environment Agency (REGIS) Waste Sites	0	0	0	0	0	0
3. Current Land Uses	on-site	0-50	51-250	251-500	501-1000	1000-1500
3.1 Current Industrial Sites Data	0	0	19	44	-	-
3.2 Records of Petrol and Fuel Sites	0	0	0	0	-	-
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0	-	-

4. Geology

	Description
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site? *	None
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None
4.3 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section. Source: Scale - 1:50,000 BGS Sheet 256	

* This includes an automatically generated 50m buffer zone around the site.

5. Hydrogeology and Hydrology

	on-site	0-50	51-250	251-500	501-1000	1001-2000*
5.1 Environment Agency Groundwater Vulnerability and Soil Classification						
Minor Aquifer (within 200m)	No	No	No	-	-	-
Major Aquifer (within 200m)	No	No	No	-	-	-
Soil Classification (within 200m)	No	No	No	-	-	-
5.2 Groundwater Abstraction Licences (within 2000m of the study site).	0	0	0	1	2	6
5.3 Surface Water Abstraction Licences (within 1000m of the study site).	0	0	0	0	0	-
5.4 Source Protection Zones						
Source Protection Zones within 500m of the study site.	0	0	0	0	-	-
5.5 Potable Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	2	3
5.6 River Quality						
Is there any Environment Agency information on river quality within 500m of the study site?	No	No	No	No	-	-
5.7 Main Rivers						
Main Rivers within 500m of the study site	0	0	0	0	-	-

6. Flooding

6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	No
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	No
6.3 Are there any Areas benefiting from Flood Defences within 250m of the study site?	No
6.4 Are there any Areas used for Flood Storage within 250m of the study site?	No
6.5 What is the maximum BGS groundwater flooding susceptibility within 50m of the study site?	Not Applicable
6.6 What is the BGS confidence rating for the groundwater flooding susceptibility areas?	Moderately High

7. Ecological Designated Sites

	on-site	0-50	51-250	251-500	501-1000	1001-1500
7.1 Records of Sites of Special Scientific Interest (SSSI):	0	0	0	0	0	-
7.2 Records of National Nature Reserves (NNR) :	0	0	0	0	0	-
7.3 Records of Local Nature Reserves (LNR):	0	0	0	0	1	-
7.4 Records of Special Areas of Conservation (SAC):	0	0	0	0	0	-
7.5 Records of Special Protection Areas (SPA):	0	0	0	0	0	-
7.6 Records of Ramsar sites:	0	0	0	0	0	-
7.7 Records of World Heritage Sites:	0	0	0	0	0	-

8. Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Moderate

9. Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Negligible

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Authorisations, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by the Environment Agency, and sites determined as Contaminated Land. This search is conducted using radii up to 1000m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on artificial and superficial deposits and bedrock beneath the study site. These searches are conducted onsite and includes a 50m buffer zone.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on groundwater vulnerability, soil leaching potential, abstraction licenses, Source Protection Zones (SPZ) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Ecological Designated Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR) and World Heritage Sites. These searches are conducted using radii of up to 1000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These searches are conducted using radii of up to 75m.

9. Mining

Provides information on areas of coal and shallow mining. These searches are conducted using radii of up to 150m.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (01273 819700) for further information and guidance.

Note: Maps

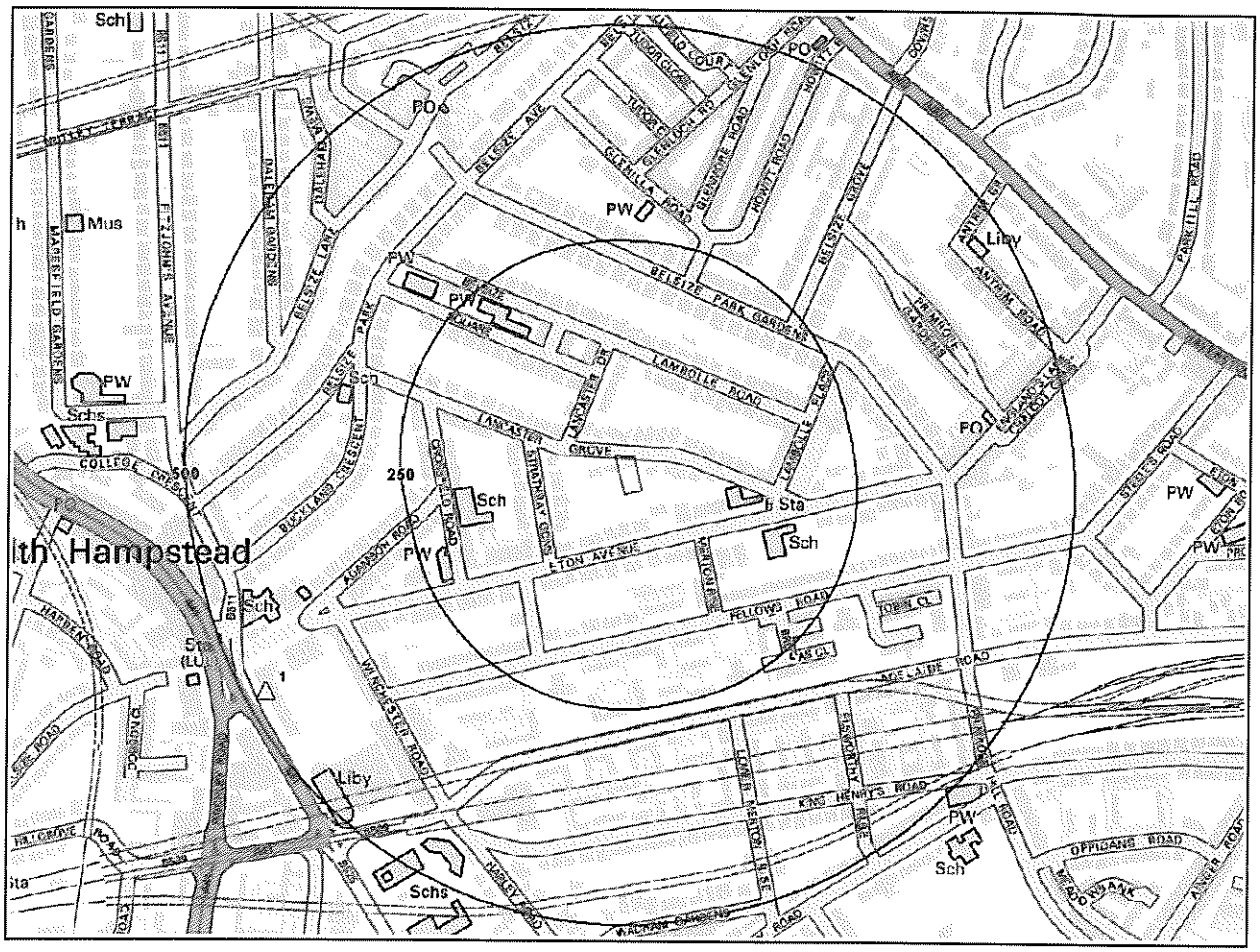
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Authorisations, Incidents and Registers Map

NW N NE



W E

S

SW SE

Incidents and Registers Legend

- Site Outline
- Search Buffers (m) — 250, 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- IPPC & IPC Authorisations
- LAPPC Authorisations
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land

1. Authorisations, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

Records of Part A Licences (IPC Processes) within 1000m of the study site: 0

Database searched and no data found.

Records of Part A Licences (IPPC Processes) within 1000m of the study site: 0

Database searched and no data found.

Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site: 0

Database searched and no data found.

Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site: 0

Database searched and no data found.

Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site: 0

Database searched and no data found.

Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site: 0

Database searched and no data found.

Records of LAPPC (LAPC) Authorisations within 500m of the study site: 1

The following LAPPC (LAPC) Authorisations are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
1	476.0	SW	526700,184300	Address: Petrol Express Ltd, 100 Avenue Road ,swiss Cottage London,nw3 3hf (antelope Service Station) Process: Petrol Vapour Recovery	Status: Revoked Date: 2003

Records of Category 3 or 4 Radioactive Substance Licences within 500m of the study site: 0

Database searched and no data found.

Records of Licenced Discharge Consents within 500m of the study site: 0

Database searched and no data found.

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

Records of National Incidents Recording System, List 2 within 250m of the study site: 0

Database searched and no data found.

Records of National Incidents Recording System, List 1 within 250m of the study site: 0

Database searched and no data found.

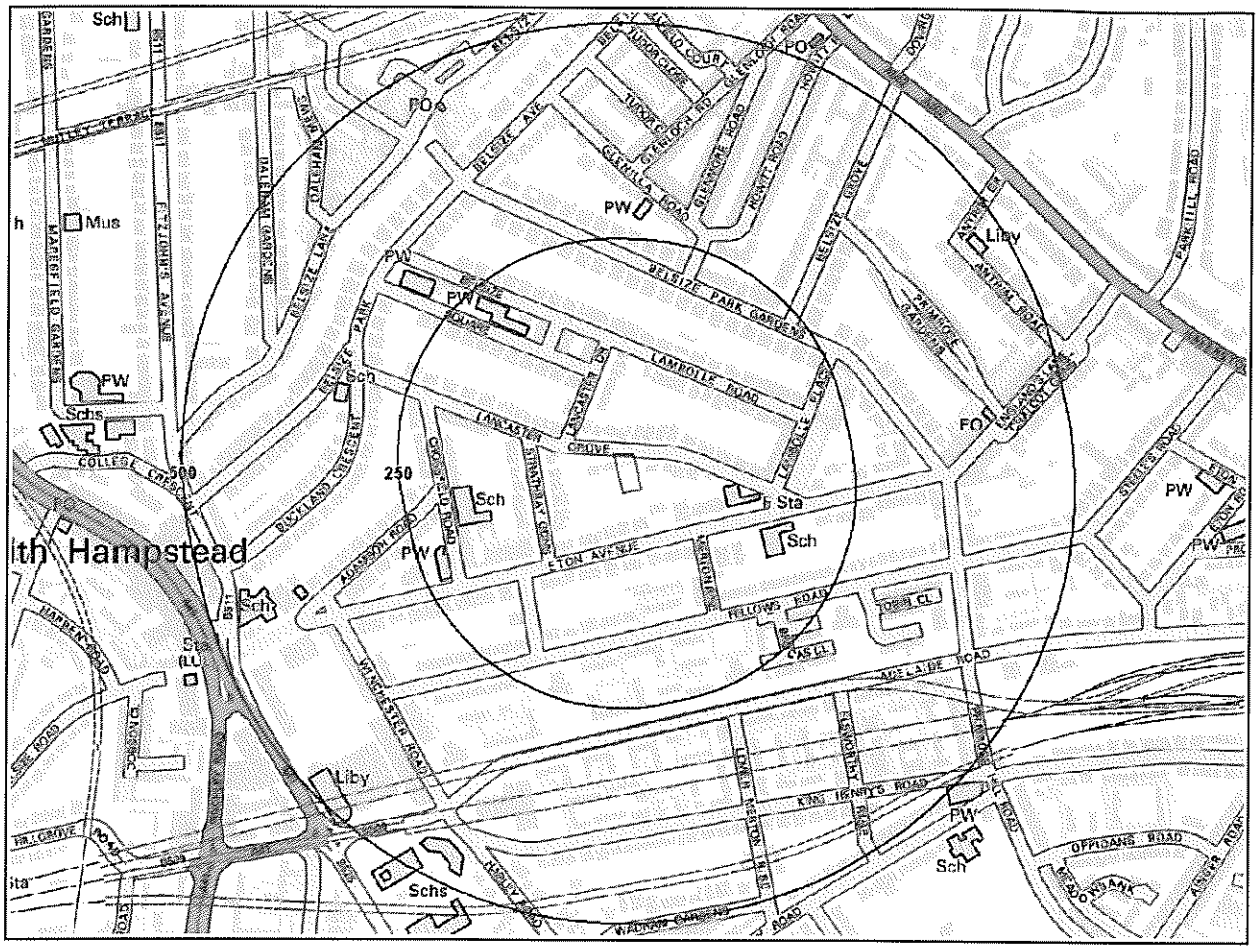
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990[1]

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

[1]Further information on sites that have been determined under the Contaminated Land Regime is maintained by Local Authorities under Section 78R of the Environmental Protection Act 1990. Information should be available on both sites currently determined as Contaminated Land and Special Sites.

2. Landfill and Other Waste Sites Map



Landfill & Other Waste Sites Legend

- Site Outline
- Search Buffers (m) — 250, 500
- E.A. Active Landfill
- E.A. Historic Landfill (Area Data)
- E.A. Historic Landfill (Point Data)
- BGS / DoE Survey Landfill
- Local Authority Landfill (Area Data)
- Local Authority Landfill (Point Data)
- Operational Waste Treatment Licence
- Closed Waste Treatment Licence
- REGIS Waste Licence
- Operational Landfill
- Closed Landfill

2. Landfill and Other Waste Sites

2.1 Landfill Sites[1]

Records from Environment Agency landfill data within 1000m of the study site: 0

Database searched and no data found.

Records of operational landfill sites sourced from Landmark within 1500m of the study site: 0

Database searched and no data found.

Records of Environment Agency historic landfill sites within 1500m of the study site: 1

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
Not shown	1052.0	W	526000,184800	Site Address: Canfield Place, London NW6 Waste Licence: - Site Reference: DON009 Waste Type: No data Regis Reference: -	Data Type: Polygon Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: -

Records of non-operational landfill sites sourced from Landmark within 1500m of the study site: 0

Database searched and no data found.

Records of BGS/DoEnon-operational landfill sites within 1500m of the study site: 0

Database searched and no data found.

Records of Local Authority landfill sites within 1500m of the study site: 0

Database searched and no data found.

2.2 Other Waste Sites[2]

Records of operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

Records of non-operational waste treatment, transfer or disposal sites within 500m of the study site: 0

[1]This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited©. Data supplied by Landmark Information Group Limited© and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

[2]This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited©. Data supplied by Landmark Information Group Limited© and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

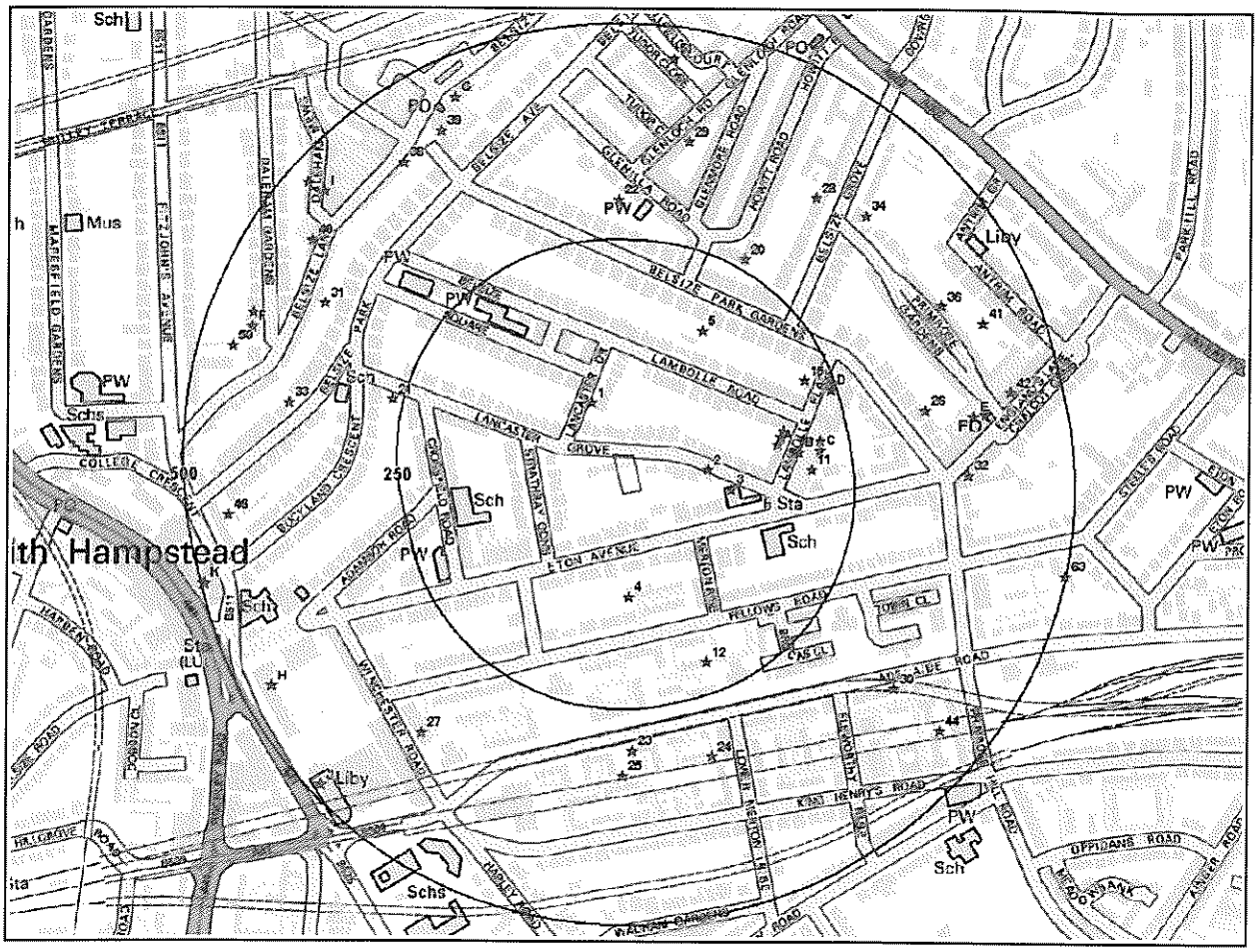
Database searched and no data found.

Records of Environment Agency (REGIS) waste sites within 1500m of the study site: **0**

Database searched and no data found.

3. Current Land Use Map

NW N NE



W E

SW S SE

Current Land Use Legend

Site Outline

250 / 500 Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Underground High Pressure Oil & Fuel Pipelines

3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 500m of the study site: 63

The following records are represented as points on the Current Land Uses map.

ID	Distance	Direction	Company	Address	Activity	Category
1	65.0	NW	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
2	80.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
3	104.0	E	Belsize Fire Station	Belsize Fire Station 36, Lancaster Grove, London, NW3 4PB	Fire Brigade Stations	Central And Local Government
4	119.0	S	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
5	165.0	NE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
6A	166.0	E	Hampstead Motor Services Ltd	4, Lambolle Place, London, NW3 4PD	Vehicle Repair and Servicing	Repair And Servicing
7A	172.0	E	Autotech London Ltd	3, Lambolle Place, London, NW3 4PD	Vehicle Repair and Servicing	Repair And Servicing
8A	177.0	E	Porsheworx	2, Lambolle Place, London, NW3 4PD	Vehicle Repair and Servicing	Repair And Servicing
9B	188.0	E	Anita (UK) Ltd	15-16a Eton Garages, Lambolle Place, London, NW3 4PE	Lingerie and Hosiery	Consumer Products
10B	197.0	E	Rayden Car Repairs	17 Eton Garages, Lambolle Place, London, NW3 4PE	Vehicle Repair and Servicing	Repair And Servicing
11	200.0	E	Blue Team	5-6 Eton Garages, Lambolle Place, London, NW3 4PE	Distribution and Haulage	Transport, Storage And Delivery
12	213.0	S	Rightfields (UK) Ltd	6, Huson Close, London, NW3 3JW	Stationery, Stamps, Tags and Labels	Industrial Products
13C	214.0	E	Little & Pace Motors	3 Eton Garages, Lambolle Place, London, NW3 4PE	Vehicle Repair and Servicing	Repair And Servicing
14C	217.0	E	Little & Pace Motors	2-3 Eton Garages, Lambolle Pl, London, NW3 4PE	Vehicle Repair and Servicing	Repair And Servicing
15	218.0	NE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
16D	242.0	E	Capacity (UK) Ltd	22a, Lambolle Place, London, NW3 4PG	Clothing, Components and Accessories	Consumer Products
17D	242.0	E	Sound Management Associates	A 22, Lambolle Place, London, NW3 4PG	Recording Studios and Record Companies	It, Advertising, Marketing And Media Services
18D	246.0	E	Belsize Motors	A 23, Lambolle Place, London, NW3 4PG	Secondhand Vehicles	Motoring
19D	248.0	E	Haywood Motors	A 23, Lambolle Place, London, NW3 4PG	Vehicle Repair and Servicing	Repair And Servicing
20	262.0	NE	Cyber Medic	43, Hewitt Close, London, NW3 4LX	Electrical Equipment Repair and Servicing	Repair And Servicing
21	263.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
22	296.0	N	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
23	298.0	S	Piano Advisory Service	181, Adelaide Road, London, NW3 3NN	Sports and Leisure Equipment Repair	Repair And Servicing
24	320.0	S	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
25	327.0	S	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
26	343.0	E	Soie-Meme Bridal & Eveningwear Ltd	76, Belsize Park Gardens, London, NW3 4NG	Clothing	Clothing And Accessories
27	362.0	SW	Hills Pharmacy	6, Winchester Road, London, NW3 3NT	Chemists and Pharmacies	Health Practitioners And Establishments

28	367.0	NE	Pearl & Black English Originals	13, Belsize Grove, London, NW3 4UX	Stationery, Stamps, Tags and Labels	Industrial Products
29	370.0	N	47 Jours Design	19, Glenloch Road, London, NW3 4DJ	Carpets, Flooring, Rugs and Soft Furnishings	Consumer Products
30	375.0	SE	Atton Fleet Care Ltd	45, Quickswood, London, NW3 3SA	Vehicle Repair and Servicing	Repair And Servicing
31	378.0	NW	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
32	381.0	E	R K P Hardware	51, Englands Lane, London, NW3 4YD	General Construction Supplies	Industrial Products
33	381.0	W	Prestige Creations	46, Belsize Park, London, NW3 4EG	Baking and Confectionery	Foodstuffs
34	389.0	NE	The Belsize Plumbing Co Ltd	24, Belsize Grove, London, NW3 4TR	Industrial Repairs and Servicing	Repair And Servicing
35E	395.0	E	Red Grey Ltd	32, Englands Lane, London, NW3 4UE	Electronic Equipment	Industrial Products
36	398.0	NE	Alphatech Computer Services Ltd	34, Primrose Gardens, London, NW3 4TN	Electrical Equipment Repair and Servicing	Repair And Servicing
37E	409.0	E	Allchin Chemist	28, Englands Lane, London, NW3 4UE	Chemists and Pharmacies	Health Practitioners And Establishments
38	416.0	NW	Zarka Marble Ltd	43, Belsize Lane, London, NW3 5AU	Stone Quarrying and Preparation	Extractive Industries
39	424.0	NW	Village Pharmacy	8-9, Belsize Terrace, London, NW3 4AX	Chemists and Pharmacies	Health Practitioners And Establishments
40	429.0	NW	Computer Care Centre UK Ltd	102, Belsize Lane, London, NW3 5BB	Electrical Equipment Repair and Servicing	Repair And Servicing
41	433.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
42	441.0	E	Paul & Co (London) Ltd	20, Englands Lane, London, NW3 4TG	Beds and Bedding	Consumer Products
43F	445.0	W	Daleham House	5, Daleham Gardens, London, NW3 5BY	Hospitals	Health Practitioners And Establishments
44	446.0	SE	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
45F	450.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
46	453.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
47G	453.0	NW	Activity Magazines Ltd	27, Belsize Lane, London, NW3 5AS	Published Goods	Industrial Products
48I	454.0	NW	Auto Reliant Suspension Co	25, Daleham Mews, London, NW3 5DB	Vehicle Repair and Servicing	Repair And Servicing
49G	458.0	N	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
50	460.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
51	463.0	N	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities
52H	463.0	SW	Hampstead & Highgate Express	100a, Avenue Road, London, NW3 3HF	Published Goods	Industrial Products
53H	463.0	SW	Highbury & Islington Express	100a, Avenue Road, London, NW3 3HF	Published Goods	Industrial Products
54I	475.0	NW	Daleham Garage	14, Daleham Mews, London, NW3 5DB	Vehicle Repair and Servicing	Repair And Servicing
55J	487.0	SW	Gee Publishing Ltd	100, Avenue Road, London, NW3 3PG	Published Goods	Industrial Products
56J	487.0	SW	Thomson Legal & Regulatory	100, Avenue Road, London, NW3 3PF	Published Goods	Industrial Products
57K	496.0	W	Uncini Menswear	13, Northways Parade, London, NW3 5EN	Clothing	Clothing And Accessories
58K	496.0	W	Sevenoaks	21, Northways Parade, London, NW3 5EN	Electronic Equipment	Industrial Products
59K	496.0	W	St James Photographic	24, Northways Parade, London, NW3 5DN	Photographic and Optical Equipment	Household, Office, Leisure And Garden
60K	496.0	W	Richer Sounds Plc	25, Northways Parade, London, NW3 5DN	Electrical Goods and Components	Household, Office, Leisure And Garden

61K	496.0	W	Hideh's Happy Gems	A 8, Northways Parade, London, NW3 5EN	Jewellery and Fashion Accessories	Clothing And Accessories
62K	496.0	W	1 Central	17, Northways Parade, London, NW3 5EN	Electrical Contractors	Construction Services
63	499.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure And Facilities

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

3.3 Underground High Pressure Oil and Gas Pipelines

Records of underground pipelines within 500m of the study site: 0

Database searched and no data found.

4. Geology

4.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.2 Superficial Ground and Drift Geology

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

Distance (m)	Direction	LEX Code	Description	Rock Type
0.0	On Site	LC-CLSS	London Clay Formation	Clay, Silt and Sand

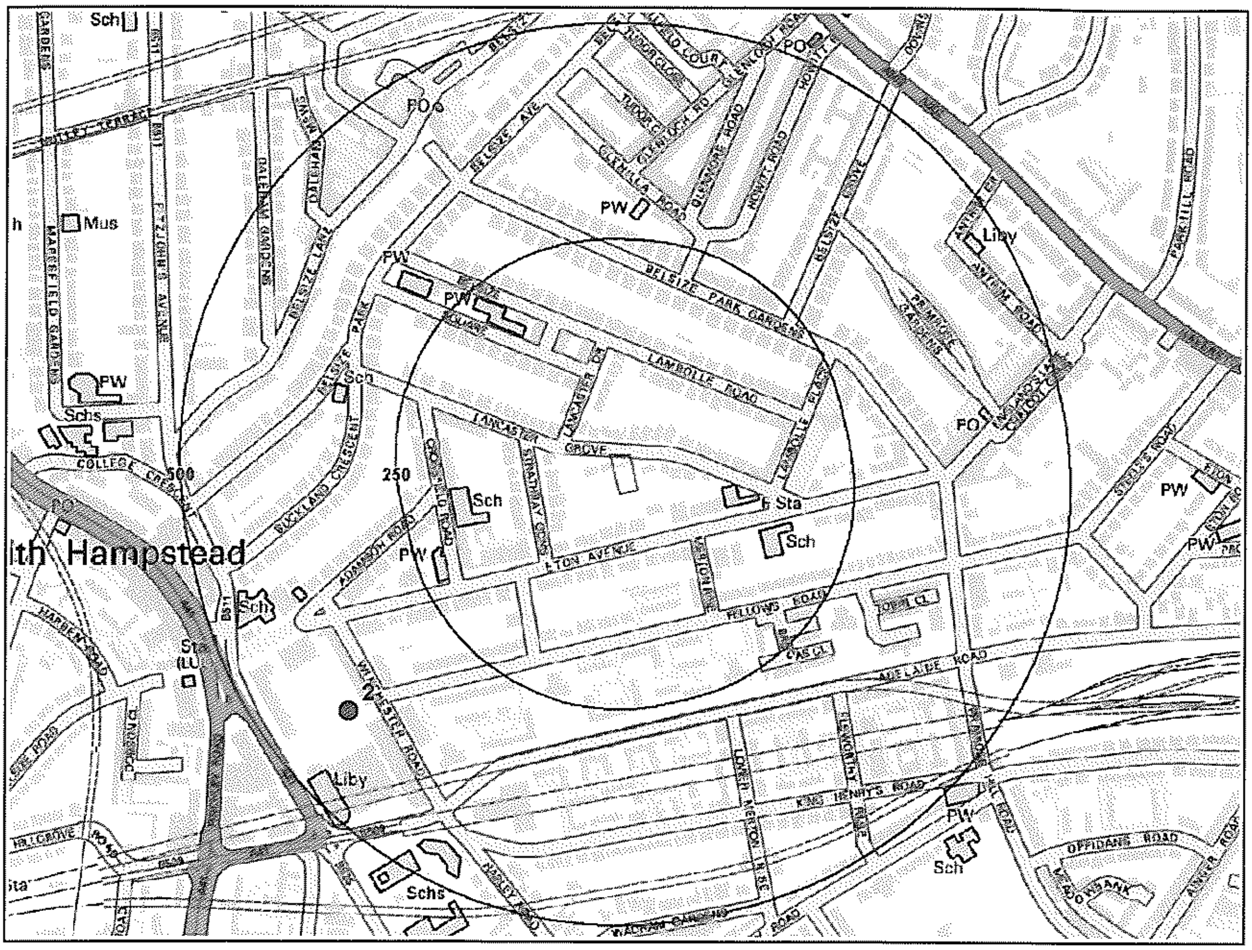
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

For more detailed geological and ground stability data please refer to the "GroundSure Geology and Ground Stability Report". Available from our website.

5. Hydrogeology and Hydrology: - Aquifer and Abstraction Licence Map

NW N NE

W E



SW S SE

Hydrogeology and Hydrology Legend

Enabled by Ordnance Survey

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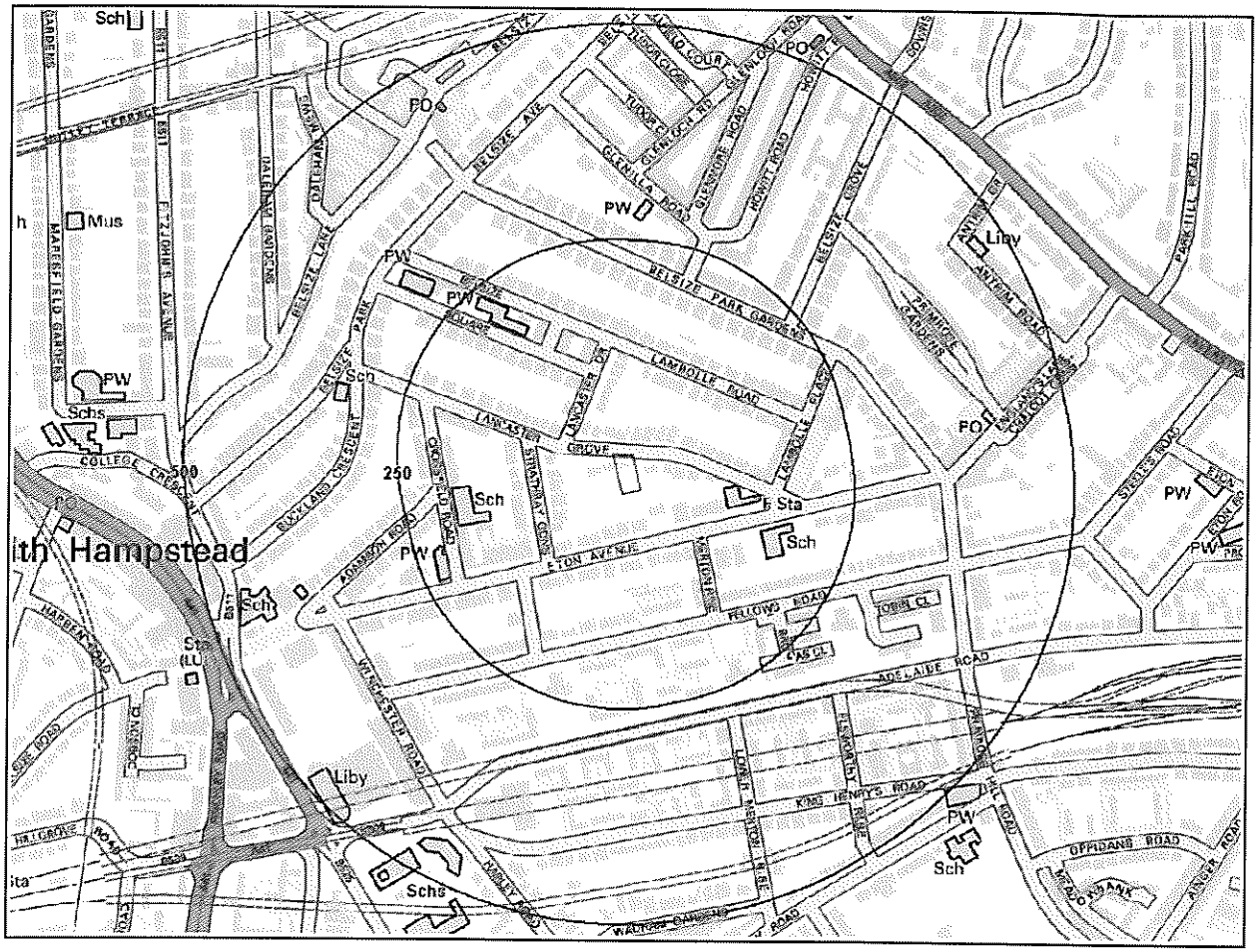
Licence Number: 100035207

- Site Outline
- Search Buffers (m) 250 / 500
- Minor Aquifer - Low Leaching Potential
- Minor Aquifer - Intermediate Leaching Potential
- Minor Aquifer - High Leaching Potential
- Major Aquifer - Low Leaching Potential
- Major Aquifer - Intermediate Leaching Potential
- Major Aquifer - High Leaching Potential
- Main River
- Groundwater Abstraction Licence
- Surface Water Abstraction Licence

5b. Hydrogeology and Hydrology: - SPZ and Potable Water Abstraction Map



Hydrogeology and Hydrology Legend

- Site Outline
- Search Buffers (m): 250, 500
- Source Protection Zone 1 - Inner Catchment
- Source Protection Zone 2 - Outer Catchment
- Source Protection Zone 3 - Total Catchment
- Source Protection Zone 4 - Zone of Special Interest
- Potable Water Abstraction Licence

5. Hydrogeology and Hydrology

5.1 Groundwater Vulnerability and Soil Classification

Records of aquifer and soil classification within 200m of the study site: **No**

Database searched and no data found.

5.2 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? **Yes**

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer and Abstraction Licence Map:

ID	Distance	Direction	NGR	Details	
2	404.0	SW	526800,184280	Licence No: 28/39/39/0219 Details: Spray Irrigation - Direct Direct Source: Thames Groundwater Point: Swiss Cottage Open Space- Borehole Data Type: Point	Original Application No: WRA/N/1407 Original Start Date: 12/8/2005 Expiry Date: 31/3/2013 Issue No: 1 Version Start Date: 12/8/2005 Version End Date: -
Not shown	986.0	SE	527640,183690	Licence No: 28/39/39/0202 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Barrow Hill Pumping Station - Borehole Data Type: Point	Original Application No: WRA/2/2[24] Original Start Date: 26/9/2002 Expiry Date: 31/3/2007 Issue No: 1 Version Start Date: 26/9/2002 Version End Date: -
Not shown	986.0	SE	527640,183690	Licence No: 28/39/39/0231 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Barrow Hill Pumping Station - Borehole Data Type: Point	Original Application No: WRA/R/1026 Original Start Date: 1/4/2007 Expiry Date: 31/3/2013 Issue No: 1 Version Start Date: 1/4/2007 Version End Date: -
Not shown	1428.0	SE	528000,183400	Licence No: 28/39/39/0035 Details: Animal Watering & General Use in non Farming situations Direct Source: Thames Groundwater Point: Borehole At Regent's Park, London Nw1 Data Type: Point	Original Application No: - Original Start Date: 4/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 4/4/1966 Version End Date: -
Not shown	1671.0	E	528800,184700	Licence No: 28/39/39/0091 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Two Bores At Kentish Town Sports Centre, Prince Of Wales St Data Type: Point	Original Application No: - Original Start Date: 13/6/1966 Expiry Date: - Issue No: 100 Version Start Date: 13/6/1966 Version End Date: -
Not shown	1671.0	E	528800,184700	Licence No: 28/39/39/0091 Details: Laundry Use Direct Source: Thames Groundwater Point: Two Bores At Kentish Town Sports Centre, Prince Of Wales St Data Type: Point	Original Application No: - Original Start Date: 13/6/1966 Expiry Date: - Issue No: 100 Version Start Date: 13/6/1966 Version End Date: -
Not shown	1671.0	E	528800,184700	Licence No: 28/39/39/0091 Details: Process Water Direct Source: Thames Groundwater Point: Two Bores At Kentish Town Sports Centre, Prince Of Wales St Data Type: Point	Original Application No: - Original Start Date: 13/6/1966 Expiry Date: - Issue No: 100 Version Start Date: 13/6/1966 Version End Date: -
Not shown	1937.0	S	527420,182620	Licence No: 28/39/39/0115 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Abbey Lodge, Park Road, London Nw8- two Boreholes Data Type: Point	Original Application No: - Original Start Date: 5/9/1966 Expiry Date: - Issue No: 101 Version Start Date: 1/6/2006 Version End Date: -

Not shown	1937.0	S	527420,182620	Licence No: 28/39/39/0115 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Two Boreholes At Abbey Lodge, Park Road, London Nw8 Data Type: Point	Original Application No: - Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 28/11/1991 Version End Date: -

5.3 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 1000m of the study site? **No**

Database searched and no data found.

5.4 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? **No**

Database searched and no data found.

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? **Yes**

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Map:

ID	Distance	Direction	NGR	Details	
Not shown	986.0	SE	527640,183690	Licence No: 28/39/39/0202 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Barrow Hill Pumping Station - Borehole Data Type: Point	Original Application No: Original Start Date: 26/9/2002 Expiry Date: 31/3/2007 Issue No: 1 Version Start Date: Version End Date: -
Not shown	986.0	SE	527640,183690	Licence No: 28/39/39/0231 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Barrow Hill Pumping Station - Borehole Data Type: Point	Original Application No: Original Start Date: 1/4/2007 Expiry Date: 31/3/2013 Issue No: 1 Version Start Date: Version End Date: -
Not shown	1671.0	E	528800,184700	Licence No: 28/39/39/0091 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Two Bores At Kentish Town Sports Centre, Prince Of Wales St Data Type: Point	Original Application No: Original Start Date: 13/6/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date: -
Not shown	1937.0	S	527420,182620	Licence No: 28/39/39/0115 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Two Boreholes At Abbey Lodge, Park Road, London Nw8 Data Type: Point	Original Application No: Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date: -
Not shown	1937.0	S	527420,182620	Licence No: 28/39/39/0115 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Abbey Lodge, Park Road, London Nw8- two Boreholes Data Type: Point	Original Application No: Original Start Date: 5/9/1966 Expiry Date: - Issue No: 101 Version Start Date: Version End Date: -

5.6 River Quality

Is there any Environment Agency information on river quality within 500m of the study site? **No**

Database searched and no data found.

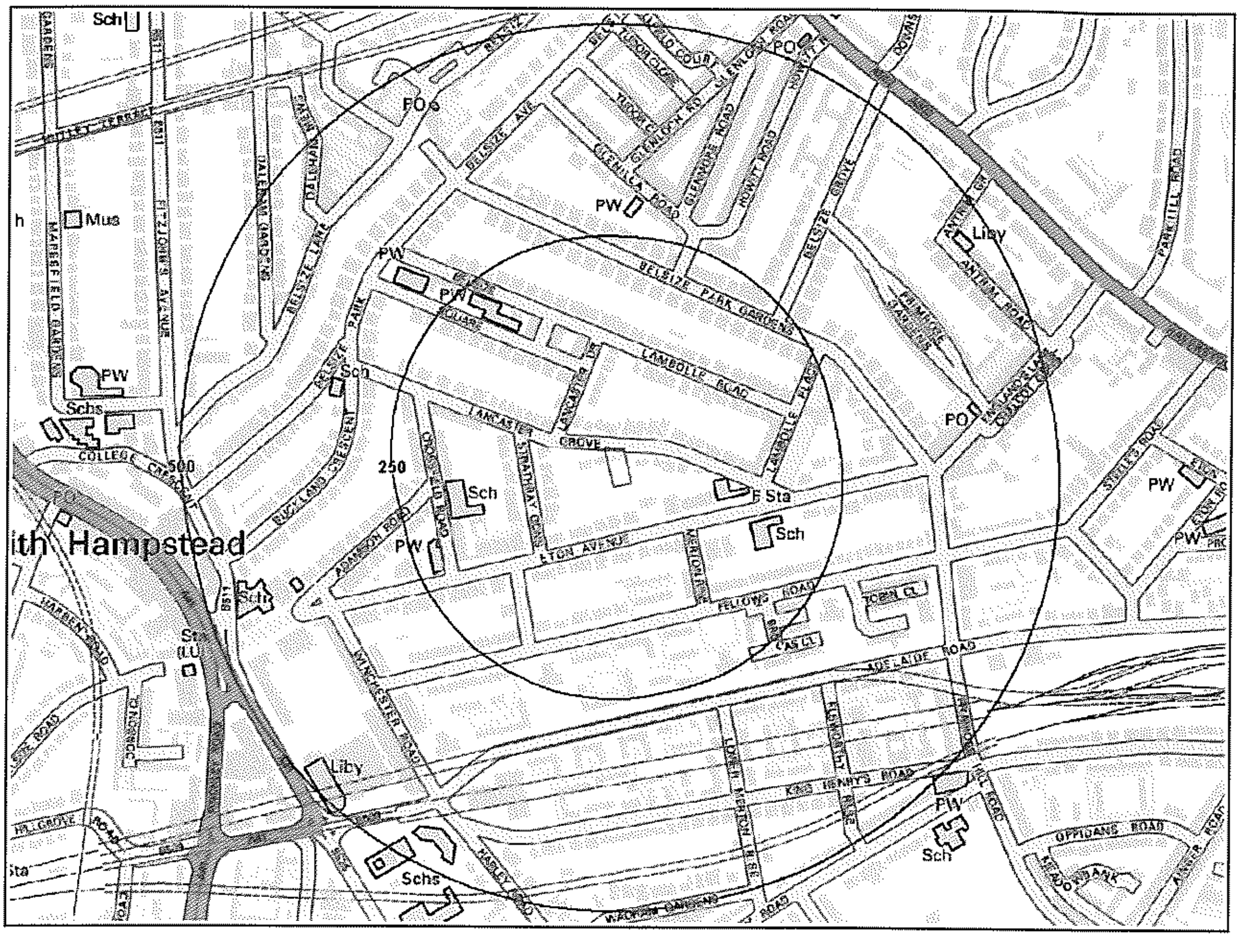
5.7 Main Rivers

Are there any Main Rivers within 500m of the study site? **No**

Database searched and no data found.

6. Surface Water Flood Map

N



S

Flood Legend

Enabled by Ordnance Survey

Site Outline

Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Storage Area

Area Benefiting from Flood Defences

Flood Defences

6. Flooding

6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

Database searched and no data found.

6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

Database searched and no data found.

6.3 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.4 Areas used for Storage Areas

Are there any areas used for Flood Storage within 250m of the study site? **No**

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.5. Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the centre of the study site? **No**

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? **Not Applicable**

6.6 Groundwater Flooding Confidence Areas

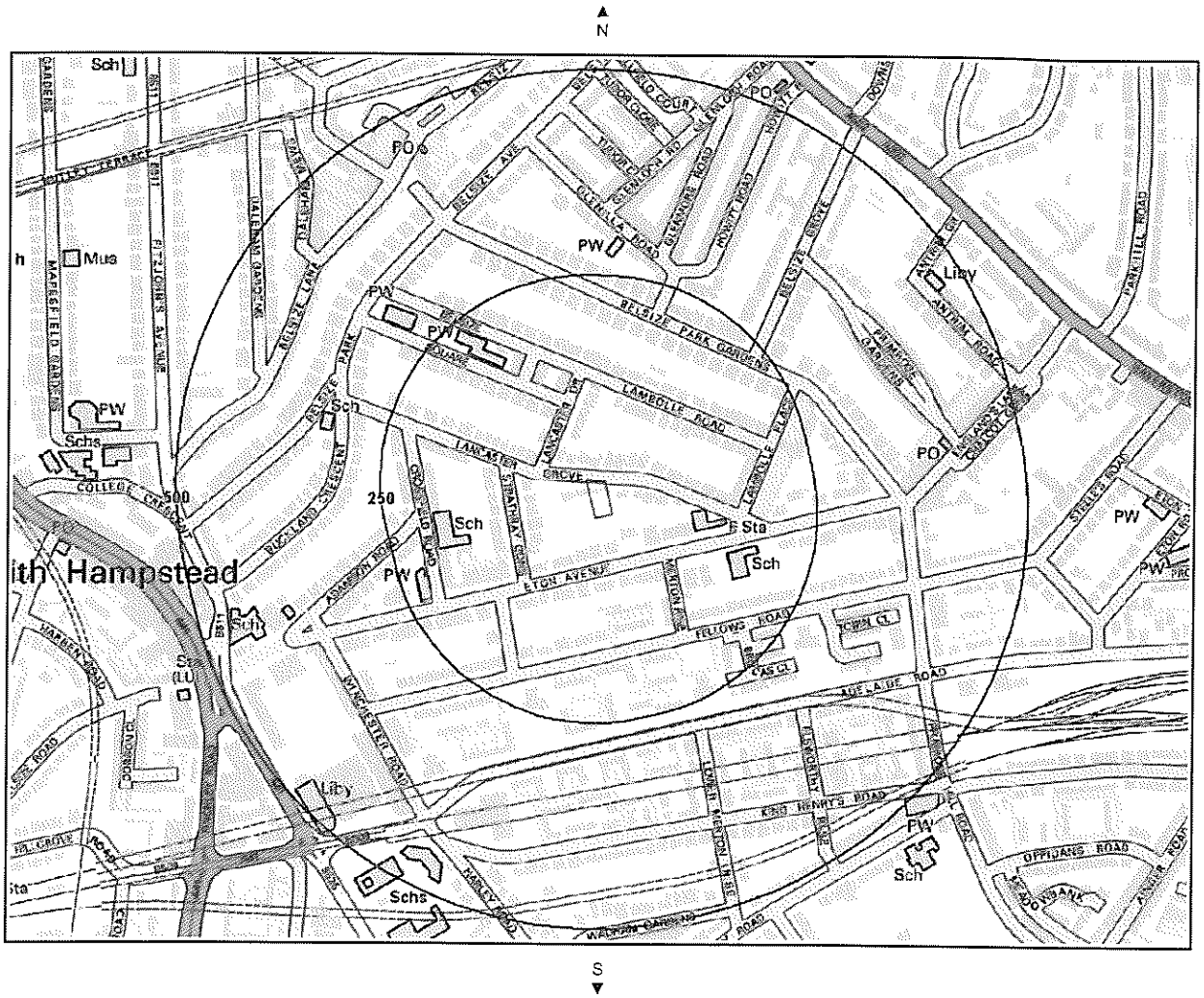
What is the British Geological Survey confidence rating in this result?	Moderately High

Notes:

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a fivefold scale - Low, Moderately Low, Moderate, Moderately High and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7. Ecological Designated Sites Map



Ecological Designated Sites Legend

Site Outline
Search Buffers (m) 250 500
SAC
SPA
SSSI
Ramsar
NNR
LNR
World Heritage Sites

7. Ecological Designated Sites

Presence of sites of ecological value within 1000m of the study site? Yes

Records of Sites of Special Scientific Interest (SSSI) within 1000m of the study site: 0

Database searched and no data found.

Records of National Nature Reserves (NNR) within 1000m of the study site: 0

Database searched and no data found.

Records of Special Areas of Conservation (SAC) within 1000m of the study site: 0

Database searched and no data found.

Records of Special Protection Areas (SPA) within 1000m of the study site: 0

Database searched and no data found.

Records of Ramsar sites within 1000m of the study site: 0

Database searched and no data found.

Records of Local Nature Reserves (LNR) within 1000m of the study site: 1

The following Local Nature Reserves (LNR) records provided by English Nature/Countryside Council are represented as polygons on the Ecological Designated Sites Map:

ID	Distance	Direction	LNR Name	Data Source
Not shown	732.0	NE	Belsize Wood	Declared

Records of World Heritage Sites within1000m of the study site: 0

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information, please obtain a GroundSure Geology and Ground Stability Report. Available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site?	**Moderate**

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site?	**Very Low**

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site?	**Null - Negligible**

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site?	**Negligible**

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site?	**Null - Negligible**

8.1.6 Running Sand

What is the maximum Running Sand* hazard rating identified on the study site?	**Negligible**

9.Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site? **No**

Database searched and no data found.

9.2 Shallow Mining

What is the hazard of subsidence relating to shallow mining onsite? (this includes a 150m buffer) **Negligible**

10.Contacts

GroundSure Helpline
Telephone: 01273 819700
info @ groundsure.com

GroundSure

British Geological Survey (England & Wales)
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3136. www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency
North East
Apollo Court - 2, Bishops Square Business Park. St. Albans Road West, Hatfield, Herts, AL10 9EX Tel: (01707) 632 300
Thames Tel: (0118) 953 5000

Environment Agency

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848. DX 716176 Mansfield 5
www.coal-authority.co.uk
Coal mining reports and related enquiries

The COAL AUTHORITY

Ordnance Survey
Romsey Road
Southampton SO16 4GU
Tel: 08456 050505

Enabled by Ordnance Survey

Local Authority
Camden London Borough Council Tel: 0207 278 4444

Get Mapping PLC
Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
Tel: 01252 845444

getmapping

Acknowledgements

searchcode

Search Code

GroundSure are committed to providing market leading environmental reports. GroundSure has therefore registered with the Property Codes Compliance Board and is committed to comply with all the regulations and obligations contained within the Search Code of Practice.

Important Protection

The Search Code provides protection for homebuyers, sellers, conveyancers and mortgage lenders, who rely on property search reports carried out on residential property within the United Kingdom. It sets out minimum standards which organisations compiling and/or selling search reports have to meet. This information is designed to introduce the Search Code to you.

By giving you this information, GroundSure is confirming that they keep to the principles of the Search Code. This provides important protection for you.

The Code's main commitments

The Search Code's key commitments say that search organisations will:

Provide search reports which include the most up-to-date available information when compiled and an accurate report of the risks associated with the property.

- Deal promptly with queries raised on search reports.
- Handle complaints speedily and fairly.
- At all times maintain adequate and appropriate insurance cover to protect you.
- Act with integrity and ensure that all search services comply with relevant laws, regulations and industry standards.

Keeping to the Search Code
How search organisations keep to the Search Code is monitored independently by the Property Codes Compliance Board. And, complaints under the Code may be referred to the Independent Property Codes Adjudication Scheme. This gives you an extra level of protection as the service can award compensation of up to £5,000 to you if you suffer as a result of GroundSure failing to keep to the Code.

Contact Details
The Property Codes Compliance Board - please contact:

Telephone: 020 7917 1817

Email: info@propertycodes.org.uk

You can also get more information about the Property Codes Compliance Board from our website at: www.propertycodes.org.uk.

Please contact GroundSure on 01273 819500 or email info@groundsure.com if you would like a copy of the full Search Code

1 Definitions
In these conditions unless the context otherwise requires
"Beneficiary" means the Customer or the client of the Customer for whom the Customer has procured the Services
"Consultancy Services" mean consultancy services provided by GroundSure including, without limitation, carrying out interpretation of third party and in-house environmental data, provision of environmental consultancy advice, undertaking environmental audits and assessments, site investigation, site monitoring and related items
"Content" means any data, database or other information contained in a Report or Mapping which is provided to GroundSure by a Data Provider
"Contract" means the contract between GroundSure and the Customer for the performance of the Services which shall incorporate these conditions, the relevant GroundSure user guide, proposal by GroundSure and the content of any subsequent report, and any agreed amendments in accordance with condition 12.
"Customer" means the party that submits an Order or commissions GroundSure further to a written proposal for environmental consultancy services
"Data Provider" means any third party providing Content to GroundSure
"Data Report" means reports comprising factual data with no professional interpretation in respect of the level of likely risk and/or liability available from GroundSure
"GroundSure" means GroundSure Limited, a company registered in England and Wales under number 02421029 and whose registered office is at Greater London House, Hampstead Road, London NW1 7EJ.
"Intellectual Property" means any patent, copyright, registered design rights, service marks, moral rights, data protection rights, know-how, trade mark or other intellectual property rights
"Mapping" an historical map or a combination of historical maps of various ages, time periods and scales available from GroundSure
"Order" means an order form submitted by or for the Beneficiary requiring Services from GroundSure in respect of a specified site.
"Report" means a Risk Screening or Data Report for commercial or residential property available from GroundSure relating to a site identified in the Order prepared in accordance with the specifications set out in the relevant user guide.
"Risk Screening" means one of GroundSure's risk screening reports such as GroundSure Homebuyers, GroundSure Home Environmental, GroundSure SiteGuard, GroundSure Screening, GroundSure Review, GroundSure Developer Review, or any other risk screening report available from GroundSure
"Services" means the provision of any Report, Mapping and Consultancy Services which GroundSure has agreed to carry out for the Customer/Beneficiary on these terms and conditions in respect of a site detailed in the Order
2Scope of Services
2.1GroundSure agrees to carry out the Services in accordance with the Contract and to the extent set out therein
2.2GroundSure shall exercise all reasonable skill, care and diligence in the performance of the Services
2.3The Customer acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in the Contract.
2.4Terms and conditions appearing on a Customer's order form, printed stationery or other communication, including invoices, to GroundSure, its employees, servants, agents or other representatives shall be of no effect and these terms and conditions shall prevail over all others.
2.5In the event that a Customer/Beneficiary opts to take out insurance in conjunction with or as a result of the Services, such insurance shall be subject solely to the terms of any policy issued to it in that respect and GroundSure will have no liability therefore.
3The Customer's obligations
3.1The Customer shall be solely responsible for ensuring that the Report/Mapping ordered is appropriate and suitable for the Beneficiary's needs.
3.2The Customer shall (or shall procure that the Beneficiary shall) supply to GroundSure as soon as practicable and without charge all information necessary and accurate relevant data including any specific and/or unusual environmental information relating to the site known to the Customer/Beneficiary which may pertain to the Services and shall give such assistance as GroundSure shall reasonably require in the performance of the Services including, without limitation, access to a site, facilities and equipment as agreed in the Contract.
3.3Where Customer/Beneficiary approval or decision is required, such approval or decision shall be given or procured in reasonable time so not to delay or disrupt the performance of any other part of the Services.
3.4The Customer shall not and shall procure that the Beneficiary shall not, save as expressly permitted by these terms and conditions, re-sell, alter, add to, amend or use out of context the content of any Report, Mapping or in respect of any service or information given by GroundSure. For the avoidance of doubt, the Customer and Beneficiary may make the Report, Mapping or GroundSure's findings available to a third party, but such third party cannot rely on the same unless expressly permitted under condition 4.
3.5The Customer is responsible for maintaining the confidentiality of its user name and password if using GroundSure's internet ordering service and accepts responsibility for all activity that occurs under such account and password
4Reliance
4.1Upon full payment of all relevant fees and subject to the provisions of these terms and conditions, the Customer and Beneficiary are granted an irrevocable royalty-free licence to use the information contained in the Report, Mapping or in a report prepared by GroundSure in respect of or arising out of the Consultancy Services. The Services may only be used for the benefit of the Customer and those persons listed in conditions 4.2 and 4.3.
4.2 In relation to Data Reports, Mapping and Risk Screening, reliance shall be limited to the Customer, Beneficiary and subsequent first purchaser or first tenant of the site including the professional advisers and lenders of each. For the avoidance of doubt, such persons shall include any entity necessary under the Housing Act 2004 or as legally required because of the Home Information Pack.
4.3 In relation to Consultancy Services, reliance shall be limited to the Customer, Beneficiary and named parties on the GroundSure proposal and subsequent report
4.4 No party referred to in conditions 4.2 and 4.3 shall assign any rights or obligations under these terms and conditions without the prior written consent of GroundSure. GroundSure reserves the right to charge an assignment fee which will be no higher than 15% of the original fee or £250 whichever is the highest. GroundSure may assign its rights and obligations under these terms.
4.5Save as set out in conditions 4.2 and 4.3, unless otherwise agreed in writing with GroundSure, any other party considering the information within a Report, Mapping or proposal and subsequent report in respect of Consultancy Services, including insurance underwriters, does so at their own risk and GroundSure has no legal obligations to such party unless otherwise agreed in writing
4.6The Customer shall not and shall procure that any person (including the Beneficiary) who is provided with a copy of any Report shall not: (a) remove, suppress or modify any trade mark, copyright or other proprietary marking from the Report or Mapping; (b) create any product which is derived directly or indirectly from the data contained in the Report or Mapping; (c) combine the Report or Mapping with, or incorporate the Report or Mapping into any other information data or service; or (d) re-format or otherwise change (whether by modification, addition or enhancement) data or images contained in the Report or Mapping save to the extent that the Customer is adding its assessment to the Report or Mapping solely for the purposes of providing its services to the Beneficiary.
4.7Without prejudice to any other right or remedy available to GroundSure including without limitation any claim for infringement of copyright, breach of confidence or contract or otherwise howsoever arising if the Customer or a person to whom a Report or Mapping is provided, breaches any of the provisions of this condition 4, the Customer shall fully and effectually indemnify GroundSure and hold it harmless against any claim by any third party who may claim to have sustained injury loss or damage by reason of their reliance upon any report or document which GroundSure may have prepared for the Customer or upon the contents thereof.
5Fees and Disbursements
5.1GroundSure shall charge the Customer fees at the rate and frequency specified in the Contract together with all proper disbursements made in performing the Services. The Customer shall in addition pay all value added tax or other tax payable on such fees and disbursements in the country concerned in relation to the provision of the Services.
5.2Unless GroundSure requires prepayment, the Customer shall promptly pay all fees disbursements and other monies due to GroundSure in full without deduction, counterclaim or set off together with such Value Added Tax or equivalent local tax as may be required within 30 days from the date of GroundSure's invoice. GroundSure reserves the right to charge interest which shall accrue on a daily basis from the date of invoice until the date of payment (whether before or after judgment) at the rate of two per cent per month
5.3In the event that the Customer disputes the amount payable in respect of GroundSure's invoice it shall notify GroundSure no later than 28 days after the date thereof that it is in dispute. In default of such notification the Customer shall be deemed to have agreed the amount thereof which shall thereupon be due and payable. As soon as reasonably practicable following receipt of any disputed invoice, a member of the management team at GroundSure shall contact the Customer and the parties shall use all reasonable endeavours to resolve the dispute.
6 Intellectual Property
6.1Unless expressly agreed in writing to the contrary GroundSure and its Data Providers (where relevant) retain all intellectual Property rights and proprietary rights in all information, Content and data reproduced in a Report or as part of the Consultancy Services.
6.2Data Providers may enforce any breach of condition 6.1 against the Customer or Beneficiary.
7 Liability
7.1GroundSure shall not be liable to pay compensation to the Customer or any person to whom the Customer provides a copy of the Report, Mapping or results of the Consultancy Services in any circumstances whatsoever unless arising out of a breach on its part of the obligations set out in the Contract.
7.2GroundSure shall not be liable if the Services are used otherwise than as provided or referred to in these conditions.
7.3Where any person is engaged whether by the Customer or by GroundSure on the Customer or Beneficiary's behalf in the performance of the Services or any part thereof GroundSure shall not be liable for acts of negligence, default or omission by such person.
7.4GroundSure makes no representation, warranties, express or implied, as to the accuracy, reliability, completeness, validity or fitness for purpose of the Content shall not be liable for any omission, error or inaccuracy in relation thereto.
7.5GroundSure shall not be liable for any inaccurate statement or risk rating in a Report which resulted from a reasonable interpretation of the Content.
7.6GroundSure shall not be liable for any indirect losses, loss of profit nor consequential loss caused by the suspension or reduction of activity on the site.
7.7 Notwithstanding anything to the contrary contained elsewhere in the Contract, and irrespective of whether multiple parties make use of the same Services, the total liability of GroundSure under or in connection with the Contract, whether in contract in tort for breach of statutory duty or otherwise shall not exceed the amount of GroundSure's insurance as provided for below
7.8GroundSure shall maintain professional indemnity insurance in respect of its liabilities in respect of the Services (provided it is available at reasonable commercial rates) giving cover of not less than £5 million in the aggregate which amount shall first include the whole of any sum payable for death or personal injury. GroundSure shall produce evidence of such insurance if requested by the Customer. A greater level of cover may be available upon request and agreement with the Customer.
7.9The Customer shall be liable to indemnify GroundSure where any loss arises as a result of any breach on the part of the Customer of its obligations under these terms and conditions.
7.10GroundSure's liability under the Contract shall cease upon the expiry of six years from the date when the Customer/Beneficiary became aware that it may have a claim against GroundSure in respect of the Services provided always that there shall be no liability at the expiration of twelve years from the completion of the Contract.
7.11Whilst GroundSure will use all reasonable endeavours to maintain operability of its internet ordering service it will not be liable for any loss or damages caused by a delay or loss of use of such service. The Customer shall use GroundSure's internet ordering service at its own risk. GroundSure shall not be responsible for any damage to a Customer or permitted assignee's computer, software, modem, telephone or other property resulting from the use of GroundSure's internet ordering service

7.12The Customer accepts, and shall procure that anyone who is provided with a copy of the Report accepts, that it has no claim or recourse to any Data Provider or to GroundSure in respect of the acts or omissions of such Data Providers including Content supplied by them.
7.13Nothing in these terms and conditions shall limit GroundSure's liability for causing death or personal injury through negligence or wilful default.
7.14GroundSure accepts no liability for use of any residential Reports or any data or information contained therein for development or other commercial property purposes in respect of which a commercial Report should have been obtained.
8 Remediation
8.1 For the purpose of this condition 8, 'Claimant' shall mean one of: (a) the Beneficiary, (b) the purchaser of the site from the Beneficiary or (c) the funder of (a) or (b) as applicable.
8.2 This condition 8 shall apply solely to GroundSure Homebuyers and GroundSure Home Environmental with passed rather than failed status.
8.3 GroundSure may, at its sole discretion without any admission of liability, make a contribution to the Claimant towards the costs of any clean up works required to be carried out under a notice served on a Claimant in respect of a site under Part II (A) Environmental protection Act 1990 ("Remediation Notice") on the terms of this condition 8 ("Clean up Award").
8.4 The Clean up Award:
(a) is only available once in respect of a site and to one Claimant only,(b) shall only apply where the site is a single residential dwelling house or a single residential flat within a block of flats. For the avoidance of doubt, a Clean up Award will not be considered in respect of commercial property or to any site being developed or redeveloped whether for residential purposes or otherwise, and (c) shall only apply to contamination or a pollution occurring as at or prior to the date of GroundSure Homebuyers.
8.5 The Clean up Award will not be paid in respect of any of the following, including without limitation:
(a) asbestos, (b) radioactive contamination arising directly or indirectly from or in connection with ionising radiations or contamination by radioactivity from any nuclear waste or fuel, from the combustion of nuclear fuel or the radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof; (c) naturally occurring materials or their removal except where such materials are present in excess of their natural concentration, (d) any condition caused by acts of war or an act of terrorism,(e) any condition which is known or ought reasonably to have been known to the Claimant prior to the purchase of GroundSure Homebuyers; (f) non-compliance by the Claimant or any other person with respect to the site with any statute, regulation, byelaws complaint, or notice from any regulatory authority; (g) any property belonging to or in the custody or control of the Claimant which does not form a fixed part of the site or the structure; (h)any losses incurred following a material change in use of, alteration or development of the site; or (i) financial loss in respect of loss of rental, profit, revenue, savings, business or any consequential, indirect or economic loss, damages or expenses, including the cost of temporary accommodation or business interruption.
8.6 In the event the Claimant wishes to apply for a Clean up Award, it shall notify GroundSure in writing within 3 months of the date of the Remediation Notice. The Claimant shall comply with all reasonable requirements of GroundSure with regard to the commission and conduct of the clean up works to be carried out under the Remediation Notice. In the event that the Claimant breaches this provision including, without limitation, failing to obtain GroundSure's prior written consent in respect of estimates for such works GroundSure shall not be required to pay a Clean up Award.
8.7 GroundSure shall only pay a Clean up Award where a Remediation Notice is served within 36 months of the date of GroundSure Homebuyers.
8.8 The maximum sum of any Clean up Award shall be £40,000 and shall be paid subject to the Claimant having paid to GroundSure an excess in respect of its claim of £5,000.
8.9 GroundSure reserves the right at any time to withdraw the offer of payment of a Clean up Award.
8.10 The Claimant shall take all reasonable steps to appeal such Remediation Notice and mitigate any costs incurred in connection with the remediation works required under the terms of any Remediation Notice. GroundSure reserves the right to withhold or reduce the amount of its Clean up Award in the event of a breach of this condition or an appeal is still active.
9 GroundSure's right to suspend or terminate
9.1In the event that GroundSure reasonably believes that the Customer or Beneficiary as applicable has not provided the information or assistance required to enable the proper performance of the Services, GroundSure shall be entitled on fourteen days written notice to suspend all further performance of the Services until such time as any such deficiency has been made good.
9.2 GroundSure may additionally terminate the Contract immediately on written notice in the event that:
(a)the Customer shall fail to pay any sum due to GroundSure within 28 days of the due date for payment; or (b) the Customer (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an Administration Order made against it or if a Receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Customer is struck off the Register of Companies or dissolved; or(c) the Customer being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Customer shall enter into a composition or arrangement with the Customer's creditors or shall suffer distress or execution to be levied on his goods; or (e)the Customer breaches any material term of the Contract (including, but not limited to, the obligations in condition 4) incapable of remedy then and in any such case GroundSure shall be entitled to a fair and reasonable amount on account of the fees due commensurate with the services performed to the date of such termination and any outstanding expenses or other disbursements that it may have incurred in respect of the Contract including without limitation equipment hire costs for the remainder of any lease, storage costs, transportation costs, labour costs or sub-contractor fees.
10 Customer's Right to Terminate and Suspend
10.1Subject to condition 11.2, the Customer may at any time after commencement of the Services by notice in writing to GroundSure require GroundSure to terminate or suspend immediately performance of all or any of the Services.
10.2 The Customer waives all and any right of cancellation it may have under the Consumer Protection (Distance Selling) Regulations 2000 (as amended) in respect of the Order of a Report/Mapping.
11 Consequences of Withdrawal, Termination or Suspension
11.1 Upon termination or any suspension of the Services, GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any site with all reasonable speed and shall deliver to the Customer/Beneficiary any property of the Customer/Beneficiary in GroundSure's possession or control.
11.2 The Customer shall pay to GroundSure all and any fees so are due in respect of the Services performed up to or in respect of such termination or suspension.
12General
12.1GroundSure and the Customer agree not to rescind or vary these terms and conditions to Ordnance Survey's or its successor's detriment without obtaining Ordnance Survey's or its successor's prior written consent.
12.2Subject to condition 12.1, GroundSure reserves the right to amend these terms and conditions. No variation to these terms shall be valid unless signed by GroundSure or made in accordance with condition 12.1.
12.3No failure on the part of GroundSure to exercise and no delay in exercising, any right, power or provision under these terms and conditions shall operate as a waiver thereof.
12.4 Save as expressly provided in conditions 6.2 and 12.5, no person other than the Customer, Beneficiary and GroundSure shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of these terms and conditions.
12.5 The Secretary of State for Communities and Local Government acting through Ordnance Survey, may enforce breach of conditions 6.1 or 12.1 of these terms and conditions against the Customer in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.6 GroundSure shall not be liable to the Customer if the provision of the Services is delayed or prevented by any circumstance which is beyond GroundSure's reasonable control including without limitation one or more of the following circumstances:
(i) the Customer or Beneficiary's failure to provide facilities, access or information, (ii)fire, storm, flood, tempest or epidemic, (iii)process shutdown; (iv) Acts of God or the public enemy; (v)riot, civil commotion or war; (vi)strikes, labour disputes or industrial actions; (vii) acts or regulations of any governmental or other agency, (viii)suspension or delay of services at public registries by Data Providers, or (ix) changes in law.
12.7Any notice provided for shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.
12.8Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email and on the second working day after the day of posting if sent by first class post.
12.9The Contract constitutes the entire contract between the parties and shall supersede all previous arrangements between the parties.
12.10Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.
12.11 These terms and conditions shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with these terms and conditions shall be subject to the exclusive jurisdiction of the English courts.
12.12These terms and conditions were produced on 28 May 2008.

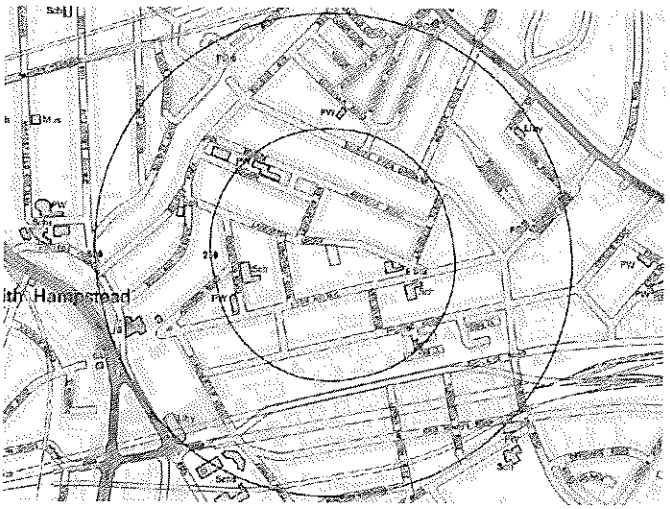
GroundSure Geology & Ground Stability Report

Address: 18-20, LANCASTER GROVE, LONDON, NW3 4PB

Date: Aug 12, 2008

GroundSure Reference: HMD-24-195382

Your Reference: 722146/MB



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