

LAND FUND LIMITED

INTERPETIVE REPORT

on

SITE INVESTIGATION

at

WESTERGATE

MAY 2013

REPORT NO: 727897

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1 INTRODUCTION

This investigation was carried out on the instructions of Upton McGougan Limited and on behalf Land Fund Limited. The purpose of the work was to investigate ground conditions, assess the contamination status of the site and provide preliminary information for the design of foundations for a potential large residential development. The work included a Preliminary Risk Assessment, intrusive investigation, laboratory testing, a quantitative risk assessment and the preparation of a report.

This report details the work carried out both on site and in the chemical testing laboratory; it contains a description of the site and the works undertaken, the exploratory hole logs and laboratory testing results, and it gives preliminary recommendations relating to foundation design etc.

It presents an appraisal of geoenvironmental aspects such as soil contamination and gives recommendations on risk reduction. It should not be assumed that these would meet the requirements of the local authority, whose advice should be sought regarding planning permission. This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese Knotweed). It is recommended that these be considered as part of the assessment of development constraints for the site.

The ground investigation has been carried out using cable percussive drilling and machine dug trial pitting techniques 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. The investigation has also been carried out in accordance with BS10175 *Investigation of Potentially Contaminated Sites: Code of Practice* (2011).

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 Land Fund Limited in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.



2 SITE DESCRIPTION

2.1 Location and Topography

The site is located to the north of Nyton Road in Westergate, approximately 6.5 miles east of Chichester (see Site Location Plan in Appendix A). The British National Grid Reference of the site is SU 942 058.

The site, a broadly rectangular shape, was approximately 575m by 288m in size (~11ha) and accessed from Fontwell Avenue to the south east and Northfields Lane to the west. The site comprised several fields, defined by hedgerows, and was generally flat and grass covered, and gently sloping downwards to the east.

At the time of investigation a garden centre was present in the south east corner and a farmhouse was present on the eastern side. The remainder of the site was open farmland.

The site is bounded by housing to the south, further housing and Northfields Lane to the west and a scrap yard and by Eastergate Lane to the east. To the north lay further farmland.

The nearest water course is a stream, flowing north to south, along the western perimeter of the site.

Services on site include a underground electricity cable and a water main. No other services were identified during the course of the investigation.

2.2 Geology

The British Geological Survey map (sheet 317/322, scale 1:50,000, published 1996) shows the site to be underlain by Head Deposits (*gravel, sand, silt and clay*) which are in turn underlain by London Clay Formation (*clay, silt and sand*). The published map describes the Head Deposits as variable deposits of *impure clays, silts and sand, locally gravelly; chalky and flinty in dry valleys*.

It is noted that two areas of River Terrace Deposits (Undifferentiated) (*Sand, Silt and Clay*) are recorded on the map; one in the central southern section of the site, and the second just to the north east of the site. These deposits are referred to as Brickearth (*mainly silts, impure contaminated with gravel*) on the 1996 map; however they have more recently been reclassified as River Terrace Deposits.



2.3 Hydrogeology

The Environment Agency (EA) website has classified the site's Drift Deposits (Head and River Terrace Deposits) as a Secondary 'A' Aquifer (variably permeable).

Secondary' aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary 'A' Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The Environment Agency (EA) website has classified the site's solid geology (London Clay Formation) as an Unproductive Strata. 'Unproductive Strata' are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

2.4 Hydrology

The nearest surface water to the site is a stream flowing north south along the western perimeter of the site. Groundwater contained within the drift deposits likely to be in potential continuity with this feature.



2.5 Preliminary Risk Assessment (Desk Study)

2.5.1 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 G of this report. Unless otherwise stated, all quoted distances are measured from the site boundary that is marked on the maps.

TABLE 1: SUMMARY OF HISTORICAL MAP DATA			
Dates	Scale	Significant features, changes and developments:	
		On site	In surroundings [distance(m)]
1859-1897	1:10,560 & 1:2,500	The Site comprises sections of four fields. A Pond is located in the NW corner (not shown after 1896).	Smithy (2 no.) 80m S and SW. Old Gravel pit 378m NE Well 252m NE Northfields farm 336m NE Fishpond 378m SW. Site is bound to the north by fields, limited residential development to the south, to the west by Northfields lane and Eastergate Lane to the East.
1910-1912	1:10,560 & 1:2,500	Site remains unchanged.	No significant changes.
1937-1940	1:10,560 & 1:2,500	New site boundaries and small building in SW corner of the site.	Residential developments to the east and southeast. New site boundary recorded in the east. Nursery 50m to the east. Sport Ground 50m to the E.
1961-1968	1:10,560 & 1:2,500	Hedge boundaries no longer shown in SW corner of the site. Small building shown towards central southern site boundary.	No significant changes.
1973-1985	1:10,000 & 1:2,500	Track appears on the north east perimeter of the site which stops at the middle of the site.	Allotment garden immediately to the SE. Nyton Road 60m to the S. Oak tree 10m to the NE. Garage 30m to the S. Nursery 5m to the SW. Poultry House 30m to the N. Car Breakers Yard 140m to the NE



TABLE 1: SUMMARY OF HISTORICAL MAP DATA

Dates	Scale	Significant features, changes and developments:	
		On site	In surroundings [distance(m)]
1992-2002	1:10,000 & 1:2,500	Farmhouse on the NE corner with an access path leading to the eastern boundary of the site. Part of the new rectangular building appears at the SW with two small buildings on either sides.	Garage 30m to the S now recorded as <i>Filling Station</i> <i>Pond</i> 10m to the SW. <i>Pond</i> 15m to the W. <i>Car Breakers Yard</i> 140m to the NE now marked as <i>Scarp Yard</i> with a building in it.
2012	1:10,000 & 1:1,250	Rectangular building now marked as Nyton Nursery Small building on the left hand side of the nyton nursery is now marked as <i>Nyton Nursery Bungalow</i> .	<i>Tank</i> 5m to the SE.

2.5.2 Summary of Site History

The review of the historical maps has shown that the site has remained undeveloped over time, barring the construction of the farmhouse and Nursery that are present on the site today. The surrounding area has undergone continual residential and commercial development over time.

2.5.3 Environmental Data

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

TABLE 2: SUMMARY OF SIGNIFICANT ENVIRONMENTAL DATA

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Data Types Showing <u>Notable</u> Issues	No. of <u>Notable</u> Listings (or Yes/No) and Distance (m) from Site				Details of <u>Notable</u> Listings
	On site	0-250	250-500	>500	
ENVIRONMENTAL PERMITS, INCIDENTS & REGISTER					
Licensed Discharge Consents	0	1	10	-	226m N Sewage discharges-Final/Treated Effluent 283m S Miscellaneous Discharges- Surface Water. 333m NE Sewage discharges-Final/Treated Effluent
EA Recorded Pollution Incidents	0	2	-	-	17m SW, Other Pollutant, Water impact: category 3 (Minor), Land impact: category 3 (Minor). 144m N, Noise pollutant, Air impact: category 3 (Minor).

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Data Types Showing <u>Notable</u> Issues	No. of <u>Notable</u> Listings (or Yes/No) and Distance (m) from Site				Details of <u>Notable</u> Listings
	On site	0-250	250-500	>500	
LANDFILL					
EA Historic landfill sites	-	-	-	4	Historical landfill: 575m NE (Site at Easter gate Lane, Easter gate) –Inert, commercial, household waste 582m NE (Wandley's Lane, Easter gate) - Inert waste.
OTHER WASTE SITES					
EA Licensed Waste Sites	-	-	3	-	419m NE (Sussex Recovery, Frontwell Avenue, Eastergate-Metal recycling site)-3Nos.
GEOLOGY					
Superficial Geology	Yes				Head Deposits and River Terrace Deposits
Bedrock and Solid geology	Yes				London Clay Formation.
Radon Affected Area	Yes	-	-	-	The property is in a radon affected area, as between 1 and 3% of properties are above the action level. No protection measures are necessary.
GROUND WORKINGS					
Historical Surface Workings	-	-	-	-	
Current Ground Workings	-	-	1	2	3 no ceased Sand & Gravel pits 315m NW, 681m NE and 772m NE
MINING, EXTRACTION and NATURAL CAVITIES					
Non-Coal Mining	-	1	1	7	167m N, 296m N, 638m N, 793m N, 795m W, 835m NE, 856m N, 910m N, 914m N and 927m N – Chalk Mines.
Natural Cavities	-	-	-	-	Based on Peter Brett Associates natural cavities database.
HYDROGEOLOGY & HYDROLOGY					
Groundwater Abstraction Licences	1	-	-	6	On site-Spray irrigation-Direct (Southern region Groundwater) 777m NE and 907mN Portable water supply-Direct (Southern region Groundwater 1108mN Spray irrigation-Direct (Southern region Groundwater)
Surface Water Abstraction Licences	-	-	-	5	1170m SW, 1239mSW, 1318mS, 1727mW Spray irrigation –Direct (Southern Region Surface Waters) 1816m W Process water (Southern Region Surface Waters)
Surface Water Features	No	Yes	Yes	-	
River Quality		1			Biological: 160m S, Lidsey Rife Reach Chemical: No data available

2.5.4 Summary of Environmental Data

The environmental data has identified no significant current or historical potentially contaminative processes occurring on the site. A Nursery occupies the central southern section



of the site, and as such consideration should be given to potential historical pesticide use. Radon protection measures will not be required for any new residences constructed.

2.6 Outline Conceptual Model and Risk Assessment

2.6.1 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.

2.6.2 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.

2.6.3 Potential Sources and Contaminants

The potential primary contaminants associated with the sources identified in the desk study are discussed in more detail below:

TABLE 3: POTENTIAL SOURCES AND CONTAMINANTS	
Potential Sources: On site	Likely contaminants
Made Ground	Heavy metals, PAH from bonfires etc.
Made Ground & Natural soils (Nursery area)	Pesticides
Potential Sources: Off site	Likely contaminants
Infilled gravel workings, historic landfill and pond	Ground gas-carbon dioxide and methane

2.6.4 Outline Conceptual Site Model

The information presented in previous sections has been used to compile an Outline Conceptual Model. 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 on the following page:

TABLE 4: OUTLINE CONCEPTUAL MODEL				
Potential Source	Potential Pathway	Potential Receptor	Potential Complete Linkage?	Comments (e.g. regarding pathways, impermeable strata, site upstream of source, etc)
Soil contaminants (i.e. PAH's, heavy metals) (including naturally occurring arsenic, lead, etc)	Ingestion/ Dermal Contact	Future on-site users (residents)	Yes	In areas of soft landscaping
		Maintenance workers	No	When handling soil during construction phase. **
		Adjacent commercial/ residential land users	Yes	Potential for dust generation
	Permeation	Subsurface plastic water pipes	Yes	If pipes are laid in direct contact with soil.
	Leaching	Groundwater in Secondary B Aquifer/ surface watercourse	Yes	Leaching into the underlying secondary B aquifer
	Root uptake	Soft landscaping on-site (e.g. phytotoxicity)	Yes	Through areas of soft landscaping

**TABLE 4: OUTLINE CONCEPTUAL MODEL**

Potential Source	Potential Pathway	Potential Receptor	Potential Complete Linkage?	Comments (e.g. regarding pathways, impermeable strata, site upstream of source, etc)
Groundwater contaminants	Ingestion/ Dermal Contact	Future on-site users (residents)	No	Groundwater levels anticipated to be deep
		Adjacent commercial/ residential land users		
		Maintenance workers		
	Permeation	Subsurface plastic water pipes		
	Lateral Groundwater migration	Groundwater in Secondary B Aquifer/ surface watercourse		
Vapours associated with soil and groundwater contaminants and/or bulk ground gases (e.g. asphyxiation, toxicity, explosion and fire)	Migration along backfill around services, more permeable strata inhalation/ explosion	Future on-site users (residents)	No	Sources considered too small to generate significant gas flux to impact upon the study site. Especially as there are no particular mechanisms with respect to the site situations to concentrate flow towards the site, rather than diffusion in all directions.
		Maintenance workers		

**Please note that construction workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures, such as the use of appropriate PPE, and application of the CDM Regulations.

2.7 Outline Risk Assessment Conclusions & Recommendations

The review of information and the construction of the Outline Conceptual Model highlights potential pollutant linkages from contamination in the near surface soils to potential end residents. In order to investigate any unacceptable risk presented by these, intrusive investigation is recommended. The following intrusive investigation has been completed with consideration for the collection of further information on actual contaminants present and viable pathways to sensitive receptors.



3 FIELDWORK

3.1 Scope of Works

2 no. cable percussion boreholes (BH1 to BH2) and 5 no. machine dug trial pits (TP2a, TP2b and TP3 to TP5) were completed between 18 and 26 March 2013 at locations shown on the Exploratory Hole Location Plan in Appendix A. In-situ testing comprising 5 no. soakaway infiltration tests (TP2a, TP2b and TP3 to TP5) was also undertaken.

The scope of investigation and choice of investigation equipment was decided by Structural Soils Limited. The positions were selected by Upton McGougan Limited and set out by Structural Soils Limited, and adjusted where necessary to take account of buried or overhead services, or other restrictions.

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930: 1999 (2010 Amendment 2, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1). Detailed descriptions, together with relevant comments, are given in the logs included in Appendix C.

Prior to the commencement of any exploratory hole or intrusive test a cable avoidance scan was carried out using a cable avoidance tool (CAT) and signal generator ('genny'), and inspection pits were hand dug at the borehole locations.

3.2 Cable Percussion Boreholes

The boreholes were drilled using a cable tool percussion drilling rig and were 150mm diameter. The depths of the boreholes were 10m. 100mm diameter undisturbed samples were recovered from the cohesive strata. Small disturbed and bulk soil samples were taken from the boreholes at regular intervals. Water samples were taken at each water strike.

Standard Penetration Tests (SPT) were carried out at regular intervals in the boreholes (see Section 3.6, In-Situ Testing).

3.3 Trial Pits

The trial pits were excavated using a mechanical excavator and were approximately 2.80m x 0.70m in plan area and up to 1.50m deep. Hand vane tests were carried out in the cohesive strata in the trial pits, and the results are given in the logs. Small disturbed and bulk soil samples were taken from the trial pits at regular intervals.



3.4 Chemical Contamination Sampling

Samples for contamination testing were taken from the boreholes and trial pits. Samples were placed in appropriate sample containers that were supplied by the laboratory. Containers for volatiles testing of soil samples were filled to capacity. All samples were then kept in cool boxes with ice packs and were transported to the laboratories under Chain of Custody documentation, as promptly as possible to maintain sample integrity.

3.5 Backfill

On completion 50mm diameter gas/groundwater monitoring standpipes were installed in BH1 and BH2, the design having been decided by Structural Soils Limited. The well details are shown on the exploratory hole logs in Appendix B. On completion all the trial pits were backfilled with arisings.

3.6 In-Situ Testing

Standard Penetration Tests (SPT) were carried out in the exploratory holes, where noted in the preceding sections, in accordance with BS EN ISO 22476-3 using a hammer or hammers which had been calibrated for efficiency. The calibration certificate is included in Appendix C.

The SPT N-values are reported on the exploratory hole logs, on which the serial number of the hammer used is recorded. The full results are presented in tabular format on the Summary of Standard Penetration Tests in Appendix C, on which the normalised N_{60} values are also reported (equivalent N-value for a hammer delivering 60% of the theoretical drop energy). Plots showing both N and N_{60} values versus depth elevation are also included.

The Soakaway tests were undertaken in TP2a, TP2b, TP3, TP4 and TP5 in general accordance with recommended practice given in BRE Digest 365. Three fillings of the pits were not undertaken due to slow infiltration rates. The results are contained in Appendix C.

3.7 Monitoring and Post Fieldwork Environmental Sampling

Gas concentrations and groundwater levels were recorded in the monitoring wells on 4 no. occasions. The results together with the temporal (weather) conditions are tabulated in Appendix F.

Ground gas monitoring was carried out over 4 no. monitoring rounds. This included periods of low and/or falling atmospheric pressures and after rainfall.



An infrared gas meter was used to measure concentrations of carbon dioxide (CO₂), methane (CH₄) and oxygen (O₂) in percentage by volume, whilst hydrogen sulphide (H₂S) and carbon monoxide (CO) were recorded in parts per million. Initial and steady state concentrations were recorded, as were borehole flow rates (initial and steady state) in litres per hour (l/hr). In addition the atmospheric pressure before and during monitoring, together with the weather conditions were recorded.



4 LABORATORY TESTING

Samples for potential contamination testing were sent to an accredited chemical testing laboratory. Contamination tests were scheduled by Structural Soils Ltd. No geotechnical testing has been undertaken as part of this project.

Contamination testing was carried out in accordance with MCERTs/UKAS standards. The results are reported in Appendix D of this report, along with the accreditation certificate for the laboratory.

4.1 Contamination

7 no. soil samples were analysed for arsenic, cadmium, chromium (total), lead, mercury, selenium, copper, nickel, zinc, speciated polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (banded TPH), organic matter, soluble sulphate and pH.

No testing has been undertaken on soil samples from the Nursery site, as works within this are have not formed part of this investigation.



5 GROUND CONDITIONS

5.1 General

The exploratory holes were logged by an engineer and the ground conditions encountered are detailed on the logs contained in Appendix B and are summarised below.

5.2 Topsoil

Grass over topsoil of soft/firm greyish brown slightly sandy gravelly clay in all the exploratory holes to depths ranging between 0.10m and 0.50m. The gravel fraction included fine to coarse subangular to subrounded flint.

5.3 River Terrace Deposits (Undifferentiated) (previously Brickearth)

Soft to firm brown slightly gravelly silty clays were recorded in all the exploratory holes underlying the topsoil to depths ranging from 0.35m (TP2A) to 2.50m (BH1). In BH1 the clay becomes gravelly between 1.65m and 2.10m whereas in all other holes clay is slightly gravelly with less than 5% of gravel.

5.4 Head Deposits

Head deposits were recorded in all the exploratory holes below the River Terrace Deposits. These deposits generally comprised a mixture of brown very clayey very sandy gravel and orange brown and white gravelly slightly sandy clay. Gravel included angular to subrounded flint and chalk.

TP2A, TP2B, TP3, TP4 and TP5 terminated within the Head Deposits gravel at 0.55m, 1.50m, 1.40m, 1.30m and 0.80m respectively. No gravel layer was recorded in BH2.

Further Head Deposits were recorded in BH1 and BH2 to their termination depths of 10m. These soils comprised a variable mixture of firm to stiff orange brown, greyish brown slightly gravelly slightly sandy clay, to between 6.00m and 7.00m, which were in turn underlain by medium dense orange brown, brown and grey silty fine to medium sand.

Grey or brown thin/thick laminations of clay were recorded within the silty sand between 8.45m and 10.45m in BH2.



5.5 Groundwater

Groundwater was encountered in BH1 and BH2 at 1.80m and 3.60m respectively. Groundwater was encountered in several of the trial pits at depths ranging from 0.70m to 1.70m. Subsequent monitoring of the standpipes installed in BH1 and BH2 has recorded following groundwater levels:

Exploratory Hole	Depth to Groundwater			
	12 April 2013	16 April 2013	22 April 2013	30 April 2013
BH1	1.92m	1.95m	2.04m	2.24m
BH2	1.20m	1.21m	1.30m	1.44m

5.6 Indications of Contamination

There were no olfactory or visual indications of contamination in any of the exploratory holes.



6 DISCUSSION AND RECOMMENDATIONS

6.1 Proposed Development

It is understood that the site may be developed with approximately 300 no. houses and associated infrastructure. The footprint of the proposed development is shown on the Indicative Site Plan contained in Appendix A.

6.2 Site Preparation and Excavation

The soils encountered at the site are considered suitable for excavation by standard mechanical plant such as a wheeled backhoe excavator. Where trees are removed to facilitate construction, the root boles should be grubbed out to prevent re-growth. Any resulting voids from this operation should be backfilled with an acceptable, adequately compacted fill.

Our site works indicate that groundwater ingress into excavations to the recommended founding depths is likely, though the monitoring results suggest that water levels may be slightly below the placement depth of shallow foundations. Inflows are likely to be controllable by sump pumping. Advice on suitable dewatering techniques is given in CIRIA Report C515 *Groundwater Control – design and practice*. Also, our site works revealed that unsupported excavations to the recommended founding depths (or services excavations, etc) are likely to be stable in the short term, however any excavations that pass through the water table are likely to become unstable.

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*. Excavations or below ground voids should be checked for the presence of harmful gases and vapours (e.g. hydrocarbons and solvents) prior to personnel entry.

6.3 Foundations

This investigation has revealed a thin layer of topsoil which overlies generally firm slightly sandy slightly gravelly clay to depths ranging from 0.35m to 2.50m. This is in turn underlain by brown very clayey sandy gravel to a depth of 3.50m (BH1). Underlying this gravel is a mixture of clay and sand soils to a maximum proven depth of 10m.

No geotechnical testing has been undertaken as part of this project and the following discussion is for indicative purpose only. Assuming foundations are to be designed in accordance with the NHBC Standards, then strip foundations are likely to be placed within the very clayey sandy



gravel deposits that have been recorded on the site. If greater thicknesses of clay soils are encountered (such as those seen in BH2) then minimum depths will be determined by the volume change potential of the soils, which will likely result in a minimum depth of between 0.90m and 1.00m.

The clay soils should offer a net allowable bearing capacity of approximately 100kN/m^2 for strip foundations up to 1.00m wide, increasing to approximately 150kN/m^2 for strip foundations up to 1.20m wide placed within the gravel soils.

A more detailed investigation including geotechnical laboratory testing is recommended if the site is to be developed.

6.4 Soakaway/SUDS Design

5 no. soakaway tests were undertaken and gave the following results.

Trial Pit	Test Depth (m)	Infiltration Coefficient (m/s)
TP2A	0.55	1.33×10^{-5}
TP2B	1.50	1.52×10^{-4}
TP3	1.40	N/A
TP4	1.30	1.52×10^{-6}
TP5	0.80	1.41×10^{-5}

Soakaways are therefore likely to be suitable for the site, but this depends on a number of factors including their plan size and depth, the ‘design storm’ and the site area to be drained.

The values above (factored in accordance CIRIA 156 (1996) *Infiltration Drainage – Manual of Good Practice*) may be used for design of soakaways in accordance with BRE Digest 365. Soakaways should be constructed at a minimum of 5m away from any building foundations.

6.5 Protection of Buried Concrete

The site is classed as natural and groundwater is assumed to be static above about 1m depth and mobile below. Soil pH values varying from 6.65 to 7.69 were recorded. From these results a ‘Characteristic Value’ of 6.97 is derived.

The water-soluble sulphate results range from $<10\text{mg/l}$ to 20mg/l . The ‘Characteristic Value’ is therefore 20mg/l and this falls into Design Sulphate Class DS-1 in Table C1 of BRE Special Digest 1 (SD1).