Ground Investigation Report

43/ 45 Broadwater Road
Welwyn Garden City
Hertfordshire
AL7 3AX

Prepared for:

Stratton II Sarl.
c/o Corum Advisors Ltd
17 Cavendish Square
London
W1G 0PH

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43/ 45 BROADWATER ROAD, WELWYN GARDEN CITY

NON TECHNICAL SUMMARY

This report presents the findings of a Phase II Ground Investigation undertaken to identify the presence, nature and extent of contaminants arising from potential sources of contamination at the site as well as providing a geotechnical appraisal of the ground conditions encountered. Pertinent findings and conclusions may be summarised as follows:

- A desk study (Phase I Investigation) has been previously undertaken by others that has shown the site to have been previously developed and that some low level contamination was present, although this was not considered a risk to the land use at the time of the production of the desk study.
- The intrusive investigation comprised the forming of seven small diameter window sampler boreholes to depths of 3m. These found the ground conditions to consist of a layer of Made Ground overlying sandy, gravelly Clay (Glacial Till). The plasticity of the Glacial Till has been found to be very variable, ranging from low to high, and it is therefore recommended that a high volume change potential is adopted for the clay soils.
- Chemical analysis undertaken on soil samples recovered from the site showed only one slight exceedance of the screening criteria for polyaromatic hydrocarbons (PAH's). However, statistical analysis was performed on the contamination dataset that indicated that this did not pose a particular risk.
- Whilst no remediation is currently considered necessary, due to the physical nature of the Made Ground, i.e. containing brick and concrete, is it suggested that 300mm of topsoil should be provided to gardens and landscaping areas.

ENGINEERING SUMMARY

- The ground conditions are considered suitable for the use of conventional spread foundations, bearing on the Glacial Till and adopting an allowable bearing pressure of 100kN/m^2.
- Suspended ground floor construction is recommended.
- A CBR value of 2% is considered appropriate for the site.
- A design sulphate class of DS2 is considered suitable for the site, with an aggressive chemical environment for concrete (ACEC) of AC-1s.

The above points represent a simplified summary of the findings of this assessment and should not form the basis for key decisions for the proposed development. A thorough review of the details contained within the following report, or discussion with EPS is recommended.

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1 INTRODUCTION

In October 2013, Environmental Protection Strategies Ltd (EPS) was commissioned by Corum Advisors Limited, on behalf of Stratton II Sarl. to complete a Ground Investigation Report at 43/ 45 Broadwater Road, Welwyn Garden City, Hertfordshire, AL7 3AX ('the site'); see Figure 1. Selected photographs and a photograph location plan are included in Appendix A.

This report presents a summary of a previously undertaken Phase I Desk Study and the findings, conclusions, and recommendations of the Phase II intrusive investigation.

1.1 Objectives

The objectives of this investigation were as follows:

a) To establish the presence of potential contaminant linkages identified by the Conceptual Site Model, defined in the Phase I Desk Study, by means of investigating shallow soil and groundwater (if present).
b) To determine the potential risks posed by the site and make recommendations for any further work that may be required, to ensure safe development in accordance with the Model Procedures for the Management of Land Contamination - Contaminated Land Report 11.
c) To collect information on ground conditions and make appropriate recommendations for foundation and drainage design.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRA Circular 01/2006, BS10175 –'Investigation of Potentially Contaminated Sites', and BS EN 1997 'Geotechnical Design'.

Site Work:

a) Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
b) Health and safety briefing / site supervision.
c) Drilling of boreholes to a maximum depth of 3.0m below ground level (bgl) at seven locations with Cone Penetration Tests undertaken in granular materials.
d) Continual logging of ground conditions including inspection of samples for any visual and olfactory contamination, and laboratory analysis of selected soil samples.

Reporting:

e) Data collection and interpretation.
f) Reporting.

The findings of these investigations and their conclusions are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of a soil sampling investigation conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements.

No investigation method is capable of completely identifying all the contaminants that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath the site by constructing a number of boreholes and/or trial pits to recover soil and/or groundwater samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface. However, ground conditions are naturally variable and it may be possible that localised ground controls could influence the spread of contaminants within the site subsurface. For this reason it is possible that samples collected during the investigation may not represent the conditions across the entire site.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made.

No visible evidence of Japanese Knotweed was identified during the site walkover, however this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its presence at certain times of the year. For this reason EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

If third parties have been contracted / consulted during compilation of this report, the validity of any data they may have supplied, and which are included in the report, have been assessed as far as possible by EPS. However, EPS cannot guarantee the validity of these data.

The report has been prepared for the client(s) listed on the report title page and has been subject to standard internal EPS review procedures. EPS accepts no liability or responsibility for use of, or reliance upon, this report and or the information contained within it by third parties.

No part of this report, or references to it, may be included in published documents of any kind without prior approval from EPS.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Environmental Protection Strategies Ltd until paid for in full.

2 SUMMARY OF PREVIOUS REPORTS

This investigation supplements a Phase I Desk Study for the site undertaken by Paragon LLP in May 2009. For background information, it is recommended that the reader review the following report:

- *Environmental Desk Study – Highways House, 41-45 Broadwater Road, Welwyn Garden City* (Report Ref:09.0027)

It has been noted that further phases of environmental assessment were undertaken at the site in 1999 and 2001 respectively, however these reports have not been made available for review by EPS Ltd.

The information in this section is provided to summarise the pertinent findings of the Phase I Desk Study.

2.1 Geo-Environmental Setting

Site Location and Description	The site is located on Broadwater Road, Welwyn Garden City and is in close proximity of the railway station and town centre respectively, around National Grid Reference 524179, 212453. The area is mixed residential and commercial with housing located to the east and south and further trade premises to the north and west (beyond Broadwater Road). The site currently comprises a disused office building, occupying its southern half with areas of hardstanding used as car parking to the north. Few areas of soft landscaping were identified during the site walkover, however, a number of mature and semi-mature trees were identified nearby particularly adjacent to the eastern boundary of the site. A current site layout plan is included within this report as Figure 2.
Geology	Geological maps of the area show the site to lie on the Glacial Till overlying Upper Chalk.
Hydrogeology	Groundwater vulnerability maps for the area show that the Glacial Till and Upper Chalk are classified as unproductive and principal aquifers respectively and the area lies within an Total Catchment Area of Source Protection Zone (SPZ) for nearby groundwater abstraction.
Hydrology	No significant surface water features are reported in the vicinity of the study site and no surface water abstractions are indicated within a 1km search radius. The Environment Agency public database reports the site to lie within flood zone 1, which is defined as the area with a low risk of flooding from fluvial or tidal sources.

Environmental Databases	No currently active or historic landfill sites are highlighted within a 1km search radius.
Site History	A review of the site history indicates the site remained as Greenfield land until approximately however by roughly 1960 the site had been developed for multiple commercial uses including an electrode manufacturer and an unnamed works. The southern section of the site was later redeveloped to comprise one large unspecified factory but was dismantled by the mid 1980's for use as a large office space.

2.2 Desk Study Conclusions and Recommendations

Previous phases of investigation have identified isolated impacts of a limited number of contaminants of concern which did not exceed relative guidance values for commercial site use and therefore, were not considered to represent a significant possibility of significant harm occurring to environmental or human receptors. Despite the potential for further contamination to be present at the site, no further environmental assessment or investigation was deemed necessary whilst the site was being used for commercial practices.

Future intrusive investigation was recommended in order to determine the presence and nature of the identified contaminant linkages should the site be redeveloped for residential purposes, which could potentially lead to an increases risk to environmental and human receptors from identified sources of contamination.

3 SUMMARY OF INTRUSIVE INVESTIGATION

The intrusive ground investigation was undertaken on the 28th October 2013 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of the findings of the investigation is presented in the following sections:

3.1 Exploratory Hole and Trial Pit Locations

Borehole locations were selected through consideration of the proposed development layout, plausible contaminant linkages, below ground utilities and operation, health & safety considerations and access restrictions.

A total of seven window-sampler boreholes (WS1-WS7) were drilled across the site to assess the nature and quality of underlying soils to depths of up to 3.0m below ground level (bgl) using a track-mounted window sampling rig.

The overall objective in terms of the exploratory locations was to provide an appropriate lateral and vertical coverage of the site, where accessible, with regard to the proposed development in order to provide information relating to the ground conditions present.

Each borehole was formed in accordance with standard EPS drilling/ excavation methodologies, and subcontractors were supervised at all times by an EPS engineer. A detailed site layout plan showing the locations of the boreholes drilled during the investigation is presented as Figure 3.

3.2 Soil Sampling and In-Situ Testing

Each exploratory hole was logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids.

Cone penetration tests (CPT's) were carried out in granular materials using an automatic trip hammer, to provide information on the in-situ strength of the soils. The number of blows required to advance a solid 60° nose cone over the final 300mm of a 450mm total drive was recorded, and is shown on the borehole records at the penetration resistance ("N" value).

Soil samples were obtained throughout the exploratory investigation for future laboratory testing and record purposes. Selection of samples for chemical laboratory analysis focused on providing an assessment of the contamination of any shallow made ground. Samples for geotechnical testing were selected in order to provide information relating to classification of the soils encountered.

A laboratory testing schedule is included as Table 1.

3.3 Ground Gas and Organic Vapour Monitoring

The presence of organic vapours within soil samples was also monitored on site by placing soil samples into sealed bags. The 'headspace' in the bag was then pierced using the tip of a Photoionisation Detector (PID) to measure the concentration of total organic volatiles.

3.4 Laboratory Testing

3.4.1 Chemical Analysis

Samples obtained for analysis of identified contaminants of concern were submitted to Chemtest Ltd of Newmarket, who hold appropriate UKAS/ MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

3.4.2 Geotechnical Testing

Geotechnical testing was undertaken by Soil Property Testing, Huntingdon, a UKAS accredited laboratory.

Copies of chain of custody documentation are held by EPS and will be made available on request.

4 FINDINGS OF THE INVESTIGATION

This section provides a summary of the findings of the ground investigation.

4.1 Ground Conditions

A total of seven window sampler boreholes (WS1 to WS7) were formed across the site and the ground conditions encountered, from ground level, were generally found to comprise:-

- Made Ground
- Glacial Till

A summary of the strata encountered during the investigation is provided below.

Geological Strata	Maximum Depth to Base of Strata(m bgl)	Strata Thickness (m)
Made Ground	1.10	0.35-0.90
Glacial Till	>3.00	>1.90-2.65

4.1.1 Made Ground

Made ground materials were identified within each borehole location, to a maximum depth of 1.10mbgl (WS3) and were generally recorded as a thin layer of concrete or block paving overlying light brownish grey sandy gravel, with common fine to coarse brick and concrete fragments, brick and concrete cobbles. Rare broken up asphalt was also identified within made ground materials in WS4 only.

4.1.2 Glacial Till

Material interpreted as Glacial Till was identified underlying made ground materials within each of the window sampler locations. This material was generally described as firm to stiff fissured orangey brown gravelly slightly sandy gravelly silty clay (becoming very silty with depth).

Window sampler borehole records are presented Appendix B and give both descriptions and depths of the strata encountered, together with details of samples obtained and in-situ testing carried out.

4.1.3 Groundwater

Groundwater was not encountered to beyond the maximum depth of the borehole locations (3.0mbgl) during and immediately after intrusive investigations were completed.

4.2 Physical Evidence of Contamination and Field Analysis

With the exception of the presence of made ground, no other visual or olfactory evidence of contamination was recorded across the site. Made ground materials were identified to contain building materials including brick and concrete fragments however, broken up asphalt was identified within the sample obtained from WS4. No visual evidence of asbestos containing material (ACM) was identified within any of the shallow soils recovered from the site.

Headspace analysis by PID did not identify any concentrations of organic vapour above minimum instrument detection limits (0.1ppmV).

4.3 Laboratory Testing

4.3.1 Chemical Analysis

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix C.

Results of chemical analysis of soil samples may be summarised as follows:

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (mbgl)
			Min	Max	
Arsenic	8	8	11	23	WS2/ 0.8-1.0
Cadmium	8	6	0.11	0.19	WS6/ 0.2-0.35
Chromium	8	7	10	40	WS2/ 0.8-1.0
Copper	8	1	20	20	WS2/ 0.8-1.0
Mercury	8	5	0.15	0.29	WS1/ 0.15-0.45
Nickel	8	8	12	45	WS2/ 0.8-1.0
Lead	8	8	6.9	49	WS6/ 0.2-0.35
Selenium	8	5	0.20	1.00	WS6/ 0.2-0.35
Zinc	8	8	18	77	WS2/ 0.8-1.0
Benzo[a]pyrene (BAP)	8	3	0.31	1.00	WS4/ 0.15-0.5
TPH CWG	6	2	23	45	WS6/ 0.2-0.35
Benzene	4	-	-	-	-
Toluene	4	1	0.0011	0.0011	WS4/ 0.15-0.5
Ethylbenzene	4	-	-	-	-
Xylenes	4	1	0.0018	0.0018	WS4/ 0.15-0.5
MTBE	4	-	-	-	-
Asbestos Screening (%)	7	-	-	-	-
Soil Organic Matter (%)	8	3	0.52	2.2	WS4/ 0.15-0.5

- Relatively small, but notable concentrations of heavy metals were identified within the majority of samples collected from across the site with the majority of the greatest impacts attributed to the sample collected from WS1 (0.8-1.0m).
- Limited concentrations of certain PAH compounds were identified within shallow soils recovered, with the most significant concentrations attributed to BaP.
- Small, but again notable concentrations of TPH CWG were analysed within two of the samples collected from site.
- Further analysis of the TPH fractions identified, found that impacts were attributed to aliphatic/ aromatic hydrocarbon fractions C12-C35.
- Minimal concentrations of BTEX compounds Toluene and Xylenes were analysed within one of four samples analysed (WS4 0.5-0.5m) recorded at a maximum concentration of 0.0018mg/kg.
- MTBE compound (an additive of unleaded petrol) was not identified above MDL within any sample collected from across the site.
- No trace of asbestos containing material was identified within seven samples submitted for laboratory analysis.
- Where identified above MDL, Soil Organic Matter (SOM) content within the samples ranged from 0.52-2.2%.

4.3.2 Geotechnical Testing

The results of in-situ geotechnical testing are summarised in the table below.

Tests were carried out in gravel lenses within Glacial Till materials described within section 4.1.2 (above).

Approximate Relative Level (mAOD)	**Representative 'N' Value**
88.0	15
87.0	20

The results of geotechnical laboratory testing are summarised in the following table.

Strata	**Range of Parameters**					
	Moisture Content (%)		Plasticity Index (%)		Undrained Shear Strength (kPa)	
	Min	Min	Min	Max	Min	Max
Glacial Till	16	27	16 (12)	53	42	143

() indicates plasticity modified for granular content

It should be noted that Glacial Till materials were found to become very silty and occasionally gravelly with depth and therefore Undrained Shear Strength values may not be wholly representative of true ground conditions.

The natural moisture content was established for four samples of cohesive soil in accordance with BS1377 Part 1:7.3 and BS1377: Part 2:3.2.

Atterberg limit tests were undertaken on four samples of cohesive soils in accordance with BS1377: Part 1:7.4 and BS1377: Part 2:3.2&4.2.

A laboratory analysis testing schedule is presented as Table 1 and all geotechnical sample results obtained from the laboratory are included as Appendix D.

5 TIER 1 QUALITATIVE RISK ASSESSMENT

5.1 Tier 1 Screening – Generic Assessment Criteria (GAC)

5.1.1 Tier 1 Screening - Soils

In order to screen laboratory data for concentrations of contaminant in soil with potential to cause harm to human health at a residential setting UK Soil Guideline Values (SGVs) and Generic Assessment Criteria (GACs) for contaminants in soil have been used. The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- EA Science Reports (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- EA Soil Guideline Value Science Reports
- Generic Assessment Criteria for Human Health Risk Assessment – LQM and CIEH 2nd edition (2009).

For concentrations of Lead in soil, there are currently no published human health screening criteria available and EPS has used the previously withdrawn SGV for lead as an appropriate guide for professional judgement with respect to reasonable 'minimal risk' levels in the context of this site.

In addition to screening the concentrations of contaminant in soil for risks to human health, EPS has also screened the concentrations for potential to cause harm to water resources. The criteria used for this process were derived by EPS using the following technical guidance:

- Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination

A summary of the screening criteria and the methodology used to derive them is included in Appendix E.

5.1.2 Tier 1 Risk Screening - Groundwater

EPS has screened the reported groundwater concentrations at an initial Tier 1 level for potential to cause harm to controlled waters within the local area. The criteria used for this process has been taken as follows:

Resource Sensitivity of Area	Basis of Tier 1 Criteria
High Groundwater Resource Potential (HGwRP) - Principal aquifers	UK Drinking Water Standards (UKDWS)
Low Groundwater Resource Potential (LGwRP) - Secondary aquifers not being abstracted and Non-productive aquifers	UK Environmental Quality Standards (EQS)

Tier 1 Risk Screening criteria for High Groundwater Resource Potential (HGwRP) have been adopted for this site due to the presence of the underlying principal aquifer which is locally abstracted.

5.2 Assessment of Soil Results

The results of the screening process for on-site human receptors show that Generic Assessment Criteria, representative of minimal risk values for residential land use were not exceeded for the vast majority of contaminants of concern.

The concentration of PAH compound Benzo[a]pyrene (BaP), considered as the 'risk driver' for shallow soil quality within a residential setting was found to exceed the relative GAC of 0.83mg/kg within one of eight samples collected (WS4 0.15-0.5m) at a concentration of 1.0mg/kg. However, it should be recognised that this sample was noted to have contained increased organic matter content with broken up asphalt also present which can result in elevated concentrations of contaminants of concern in comparison to samples where otherwise absent.

The Generic Assessment Criteria for minimal risk from soils to controlled waters were not exceeded within any sample recovered from any of the borehole locations formed across the site.

5.2.1 Statistical Analysis

In order to further assess the potential risks posed to site residents by these contaminants in soil, statistical analysis was carried out on the soil concentration dataset collected for BaP, which is considered to pose the greatest potential risks on account of their relative frequency of occurrence and abundance relative to the minimum guideline values for residential land use.

Initially, outlier tests were carried out and revealed that no BaP result varied significantly from the rest of the datasets and therefore consideration could not be given to designating any single result as a statistical outlier, which would otherwise be representative of either a secondary 'population' of contamination or the result of error such as an error in sampling or analytical methods.

An upper 95th percentile confidence limit on the true mean (U95) was calculated for the dataset so that a better comparison for lifetime exposure to future site users can be made for the site. This was carried out in line with recent guidance from CIEH and CL:AIRE entitled 'Guidance on Comparing Soil Contamination Data with a Critical Concentration' and the result showed a U95 value of 0.78mg/kg for BaP for the site as a whole, which falls below the GAC value of 0.83mg/kg and is therefore not considered to pose a particular risk.

The summary of the calculations for statistical testing referred to in this subsection are provided as Appendix F of this report, with detailed information regarding the calculations undertaken available on request.

5.3 Conclusions

The contaminant linkages considered to pose the greatest potential risks at this site comprise human health risks primarily associated with the exposure of future site residents and construction workers with potentially contaminated made ground arising from the sub-base underlying current/ historic buildings and areas of hardstanding and historic commercial activities including a number of factories and works sites.

Aside from a notable thickness of made ground, the Phase II intrusive investigation did not identify any visual or olfactory evidence of contaminated material including hydrocarbon impacted/ waste or putrefiable material within any samples recovered from borehole locations formed across the site. This was quantified by laboratory analysis of selected soils samples, which indicated neither human or environmental receptors are at risk from concentrations of associated contaminants of concern.

Laboratory analysis of shallow made ground materials assessed the remaining uncertainty for the development and found that PAH compound BaP (contaminant commonly associated with made ground materials), was identified at slightly elevated level in one location only. However, subsequent statistical analysis has concluded that shallow soils present are of suitable chemical quality for use within residential gardens. However, the physical nature of this made ground may not be entirely appropriate, given the presence of brick, concrete and asphalt. Therefore, it is suggested that at least 300mm of clean imported topsoil should be provided to both gardens and areas of landscaping throughout the site.

The investigation has not revealed any significant depths of made ground and within the made ground encountered, no putrefiable or decaying materials have been recorded. In addition, there are no landfills in the immediate area and therefore ground gases are not considered to pose a risk to future development of the site.

5.4 Recommendations

The site is currently used for commercial use, with a significant office building to the south with the majority of the remaining areas finished to hardstanding. No evidence of significantly contaminated material was identified during the Phase II site investigation and shallow soils were deemed suitable for use within a residential setting according to laboratory analysis. As a result, no potentially active contaminant linkage which could pose a significant risk of significant harm to future residents/site users has been identified at this site.

However, given the variable nature of made ground, it is recommended that confirmatory spot sampling and testing is undertaken in areas of garden and landscaping once the layout of such areas has been established to confirm that these soils are suitable for use beneath the advised 300mm of topsoil.

In accordance with the Model Procedures for Management of Land Contamination (Contaminated Land Report 11) no risks have been identified by this work which will require further assessment. A summary of the approach outlined in CLR11, marking the work completed under the risk assessment phase, is presented as a flow diagram in Figure 4 of this report.

In the unlikely event that potentially contaminative substances not identified through this assessment are encountered during site redevelopment, it is recommended that EPS personnel are contacted to assess the situation and provide appropriate advice. An example method statement for construction workers encountering unexpected contamination is included as Appendix G.

It is also recommended that a copy of this report is provided to the Environmental Health Department of Welwyn Hatfield Borough Council so that the information may be incorporated into their land quality records

6 GEOTECHNICAL APPRAISAL

The ground conditions have been found to comprise made ground overlying cohesive Glacial Till that has been shown to be of variable plasticity..

6.1 Structural Foundations

The ground conditions are considered suitable for the use of conventional spread foundations bearing upon the Glacial Till materials. The made ground materials are not considered as appropriate bearing strata due to their generally low and inconsistent strength profiles.

A minimum foundation depth of 1m, below existing or proposed ground, level is considered suitable for the site, subject to the provisos below:-

a) Foundations should fully penetrate all disturbed ground arising from the removal of existing trees or founding's and should again extend a minimum of 150mm in to undisturbed natural soils.

b) The Glacial Till materials have been recorded as a cohesive soil and will therefore be subject to volume change (subsidence and/or heave) due to the presence of trees. Foundations will therefore need to take in to account the presence of trees, both those to remain and those to be planted as well as to be removed from site. The Glacial Till materials should be considered as having a generally moderate to high volume change potential in accordance with NHBC Standards Chapter 4.2 'Building Near Trees'.

Anti-heave precautions will be required when foundation depths exceed 1.5m due to the presence of trees, to control the effects of potential future ground movements.

It is recommended that a full tree survey is undertaken in order that their effects on foundations can be fully taken in to account in the design.

An allowable bearing capacity of 100kN/m² is considered appropriate for the Glacial Till materials at approximately 1m.

At the above bearing pressure total settlements are unlikely to exceed approximately 25mm. Settlements in cohesive (clay) soils will comprise both immediate and long term (consolidation) settlement and will take place over a long period of time.

6.2 Ground Floor Construction

NHBC Standards require the use of suspended ground floors where cohesive surface soils are likely to become seasonally desiccated, such as in summer and autumn. Additionally, where greater than 0.6m of made or disturbed ground exists, suspended ground floor construction would be required.

Therefore it is recommended that suspended ground floor construction is adopted throughout the development.

6.3 External Works

6.3.1 Pavement Design

The subgrade across the site is likely to comprise either Made Ground or possibly cohesive Glacial Till materials, depending upon the final levels.

The site is considered suitable for the use of flexible, composite or rigid pavement construction, subject to the approval of the Local Authority for adoptable areas.

A CBR value of 2% is recommended for the Made Ground.

To further assess CBR values for the natural soils, reference has been made to the Department of Transport Design Manual for Roads and Bridges, Volume 7, Pavement Design and Maintenance. This publication gives estimates of CBR values based upon plasticity index. For a thin pavement, constructed under average conditions with a low water table and a plasticity of approximately 50%, as for the shallow soils, a CBR value of 2% is again recommended.

Once the formation level for the new pavement has been achieved, proof rolling should be carried out using a heavy roller, and any soft areas revealed should be excavated and a greater depth of sub-base provided.

Exposed subgrades will likely deteriorate rapidly on exposure to wet weather and should be shaped to shed water. Sub-base should be placed as soon as possible to minimise the exposure of the subgrade to adverse weather conditions.

6.4 Groundworks

Excavations in the Glacial Till are likely to remain stable for short periods during construction. The stability of made ground materials encountered must not be relied upon in unsupported excavations.

Safe working conditions must be provided at all times where persons are required to work in excavations.

Heavy plant and stockpiles of materials should not be permitted close to the edges of open excavations.

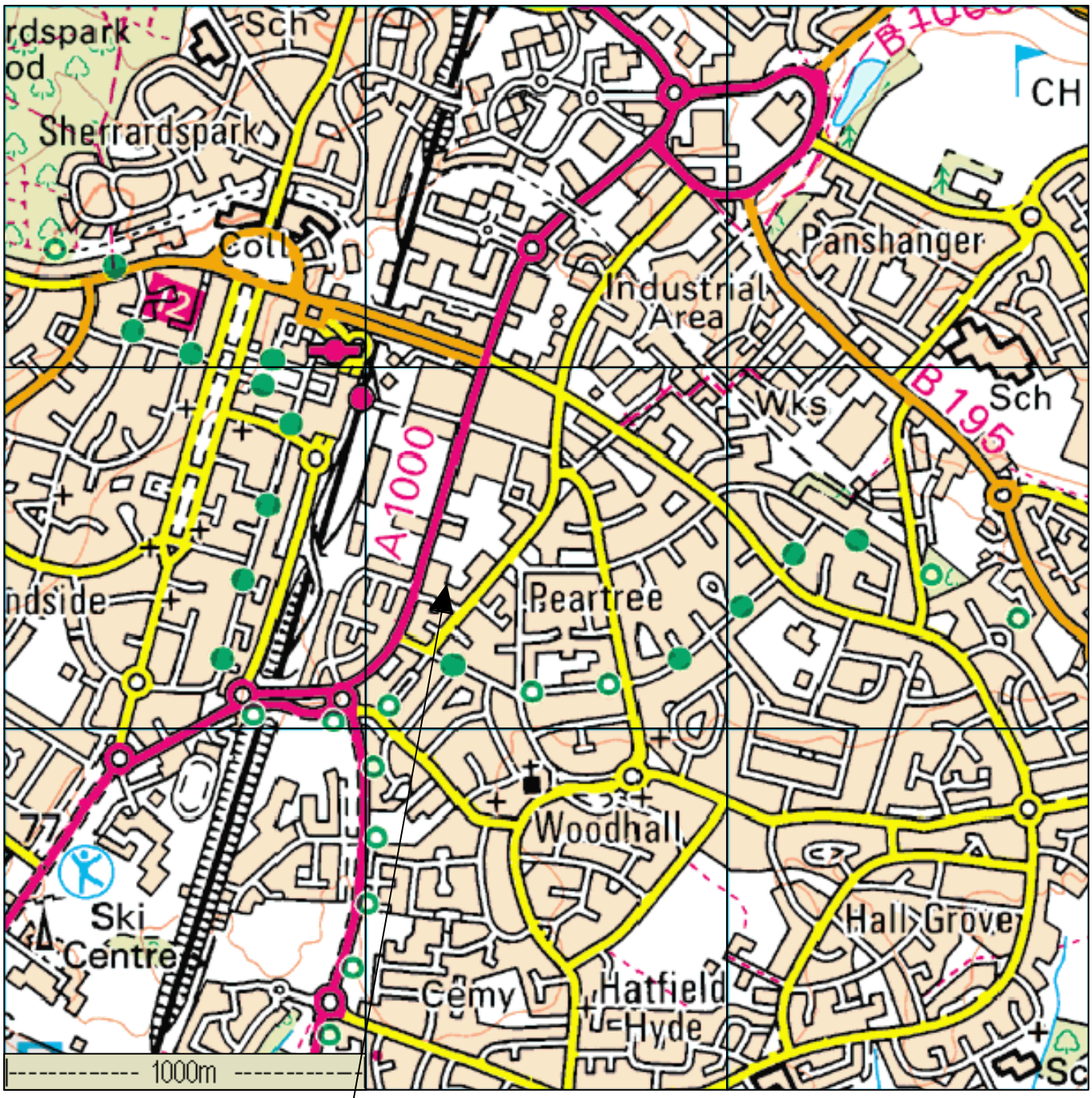
Based on the observations made during the investigation, groundwater is unlikely to be encountered in shallow excavations for foundations and services at depth of approximately 1.0-3.0mbgl.

6.5 Concrete Grade

Sulphate contents and pH values determinations were carried out by the analytical laboratory. Sulphate contents ranged from less than 0.01g/l SO_4 to 1.5g/l SO_4 and the pH values ranged from 5.3 to 11.6.

In accordance with Part 1 of the BRE Special Digest 1 'Concrete in Aggressive Ground' 2005, a design sulphate class of DS2 is considered suitable for the site, with an aggressive chemical environment for concrete (ACEC) of AC-1s.

FIGURES



Approximate Site Location

Title: Site Location Plan

Project: 43/43 Broadwater Road, Welwyn Garden City, AL7 3AX

Client: Corum

Fig No: 1

Scale:	As Shown
Drawn By:	BV
Approved By:	SB
Job No:	UK13.1385
Dwg No:	Corum/Broadwater/1213/01
Date:	December 2013

Approximate Site Boundary

Title: Current Site Layout Plan

Project: 43/43 Broadwater Road, Welwyn Garden City, AL7 3AX

Client: Corum

Fig No: 2

Scale:	Not to Scale
Drawn By:	BV
Approved By:	SB
Job No:	UK13.1385
Dwg No:	Corum/Broadwater/1213/02
Date:	December 2013

KEY

Approximate Site Boundary

Approximate Borehole Location

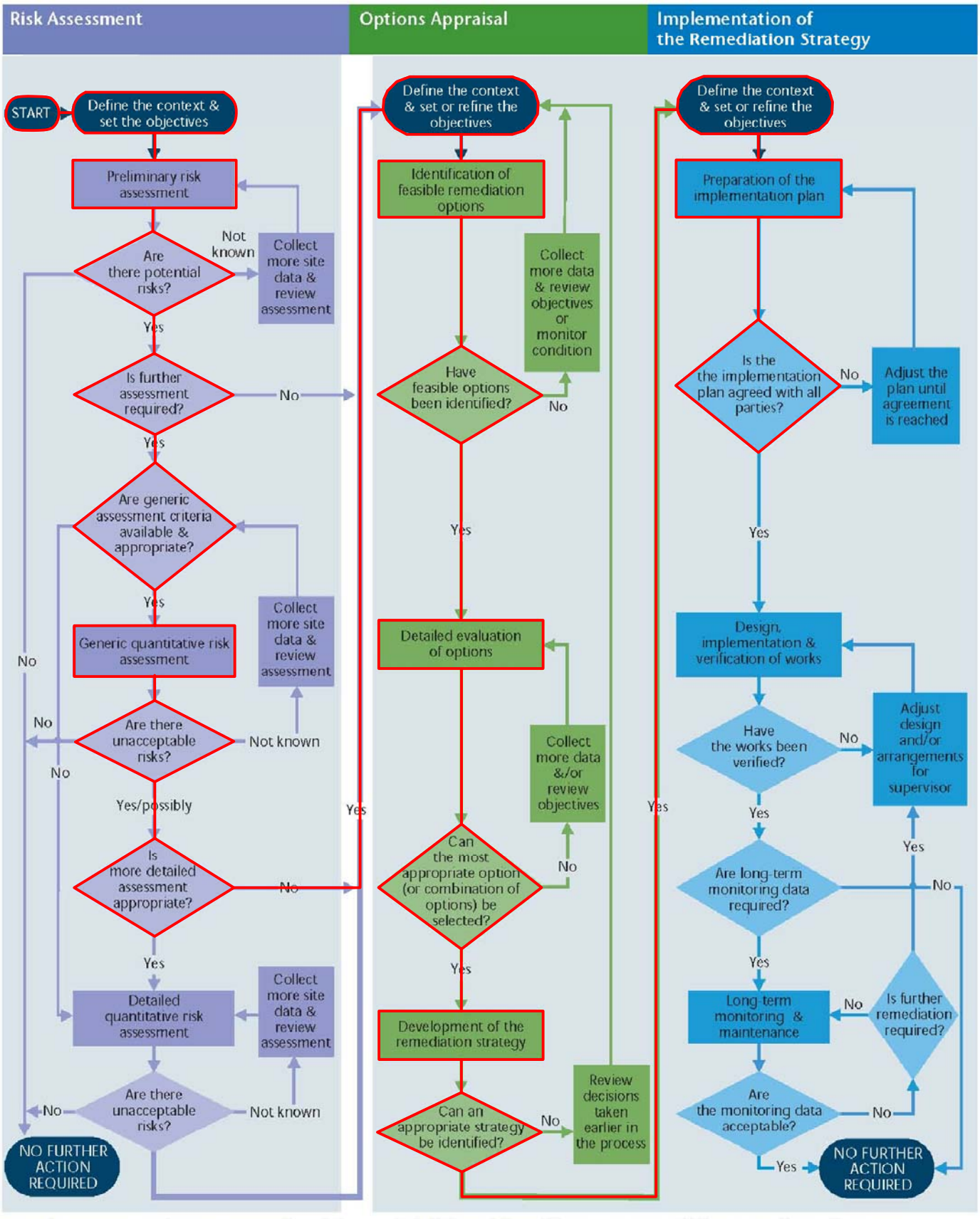
Title: Borehole Location Plan

Project: 43/43 Broadwater Road, Welwyn Garden City, AL7 3AX

Client: Corum

Fig No: 3

Scale:	Not to Scale
Drawn By:	BV
Approved By:	SB
Job No:	UK13.1385
Dwg No:	Corum/Broadwater/1213/03
Date:	December 2013



Assessment Pathway for Site

	Title:	**Site Context - CLR11**	
	Project:	43/45 Broadwater Road, Welwyn Garden City, AL7 3AX	Scale: n/a
	Client:	Corum	Drawn By: BV Approved By: SB
	Fig No:	4	Job No: UK13.1385 Dwg No: Corum/Broadwater/1213/4 Date: December 2013

TABLES

Table 1-Laboratory Testing Schedule

Sample ID	Sample Depth (mbgl)	EPS Minisuite	Asbestos Screening	TPH CWG	VOC	Liquid & Plastic Limit	Moisture Content	Particle Size Distribution	California Bearing Ratio	pH & Water Soluble Sulphate
WS1	0.15-0.45	1	1	1	1	-	-	-	-	-
WS1	0.8-1.0	-	-	-	1	-	-	-	-	-
WS1	1.8-2.0	-	-	-	-	1	1	-	-	1
WS2	0.1-0.5	1	1	-	-	-	-	-	-	-
WS2	0.8-1.0	1	-	-	-	1	1	-	-	1
WS3	0.15-0.5	1	1	1	-	-	-	-	-	-
WS3	2.8-3.0	-	-	-	-	-	-	1	-	-
WS4	0.15-0.5	1	1	1	1	-	-	-	-	-
WS4	0.8-1.0	-	-	1	1	1	1	-	-	1
WS5	0.15-0.5	1	1	-	-	-	-	-	-	-
WS5	1.8-2.0	-	-	-	-	1	1	-	-	1
WS5	2.8-3.0	-	-	-	-	1	1	-	-	1
WS6	0.2-0.35	1	1	1	-	-	-	-	-	-
WS6	0.5-1.0	-	-	-	-	1	1	-	1	1
WS7	0.15-0.5	1	1	1	-	-	-	-	-	-

Notes:

Mbgl	meters below ground level
EPS Minisuite	Comprises Metals, PAH (Polycyclic Aromatic Hydrocarbons), Water Soluble Sulphate, Cyanide, Phenol, pH
TPH CWG	Total Petroleum Hydrocarbons Criteria Working Group
VOC	Volatile Organic Compounds
1	Sample Taken
-	Sample not analysed

APPENDICES

APPENDIX A

Selected Site Photographs & Photograph Location Plan

KEY

Approximate Site Boundary

1 Approximate Photograph Location and Direction

Title: Photograph Location Plan

Project: 43/43 Broadwater Road, Welwyn Garden City, AL7 3AX

Client: Corum

Appendix: A

Scale:	Not to Scale
Drawn By:	BV
Approved By:	SB
Job No:	UK13.1385
Dwg No:	Corum/Broadwater/1213/A
Date:	December 2013

Photo 1: View looking roughly south along the western boundary of the site.	Photo 2: View looking roughly north east across the northern section of the site.
	
Photo 3: Image looking north along the eastern boundary of the site at the approximate locations of borehole locations WS2 and WS3.	Photo 4: View looking approximately east adjacent to southern site boundary.
	
Photo 5: View looking approximately west across the car park.	Photo 6: View looking north east at the location of WS5.
	

APPENDIX B

Window Sampler Borehole Records

Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING. Occasional recently active/ decayed rootlets noted
		0.10-0.50	D					MADE GROUND: Light brownish grey sandy gravel (Type 1).
					0.45			MADE GROUND: Soft light brownish grey clay with rare fine brick fragments and brick cobbles noted.
		0.90	IVN 1	55				
		0.80-1.00	D		1.00			Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium.
		1.10	IVN 2	52				
		1.30	IVN 3	84				
		1.50	IVN 4	102				
		1.70	IVN 5	128				
		1.90	IVN 6	104				
		1.80-2.00	D					
		2.10	IVN 7	111				
		2.30	IVN 8	114				
		2.50	IVN 9	128				
		2.70	IVN 10	143				
		2.80-3.00	D		3.00			End of Borehole at 3.00 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.

AGS

Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING. Rare decayed rootlets noted
		0.10-0.50	D					MADE GROUND: Orangey light brown dense gravelly sand with rare fine to coarse brick fragments noted.
					0.80			
		0.90	IVN 1	110				Firm to stiff fissured orangey brown slightly sandy CLAY becoming gravelly with depth.
		0.80-1.00	D					
		1.10	IVN 2	117				
		1.30	IVN 3	135				
		1.50	IVN 4	131				
		1.80-2.00	D					
					3.00			End of Borehole at 3.00 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.

AGS

Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING.
		0.10-0.50	D					MADE GROUND: Light brownish grey loose sandy gravel with rare fine brick fragments and concrete cobbles noted.
					1.10			Firm fissured orangey brown slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium. Gravel is fine and medium angular to subangular flint.
		1.80-2.00	D					
		2.80-3.00	D					
					3.00			End of Borehole at 3.00 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.

AGS

Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS4
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING.
		0.10-0.50	D					MADE GROUND: Light brownish grey loose sandy gravel with rare fine brick fragments and broken up asphalt noted.
					0.60			Concrete cobble noted
		0.80-1.00	D					Firm becoming stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY with silty lenses.
		2.00	CPT	N=24 (4,4/ 5,6,6,7)				Becoming very silty with depth
		2.80-3.00	D					
		3.00	CPT	N=20 (3,4/ 4,5,5,6)	3.00			End of Borehole at 3.00 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.

AGS

Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS5
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING.
		0.10-0.50	D					MADE GROUND: Light brownish grey loose sandy gravel with rare fine brick fragments and concrete cobbles noted.
					0.50			
		0.60	IVN 1	102				Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY. Gravel is fine and medium. Gravel is fine and medium angular to subangular flint.
		0.80	IVN 2	84				
		0.80-1.00	D					
		1.50	IVN 3	50				
		1.70	IVN 4	42				
		1.80-2.00	D					
		2.00	CPT	N=15 (2,3/ 2,3,4,6)				
		2.20	IVN 5	53				
		2.80-3.00	D					
		3.00	CPT	N=20 (3,4/ 4,5,5,6)	3.00			End of Borehole at 3.00 m
			Type	Results				

1 2 3 4

Remarks: Groundwater not encountered.

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Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS6
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
								CONCRETE.
					0.20			
		0.10-0.50	D					MADE GROUND: Light brown greyish sandy clayey gravel with rare fine brick fragments noted.
					0.35			
		0.40	IVN 1	98				Stiff orangey brown sandy silty CLAY with rare fine to medium subangular to subrounded gravel.
		0.60	IVN 2	84				
		0.50-1.00	D					
		0.80	IVN 3	88				
		1.00-1.20	D					
					3.00			End of Borehole at 3.00 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.

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Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No
WS7
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Hole Type
43/ 45 Broadwater Road, WGC	UK13.1385		WLS
Location: 43/ 45 Broadwater Road, WGC, Hertfordshire, AL7 3AX		Level: -	Scale 1:25
Client: Corum		Dates: 28/10/2013	Logged By BV

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			BLOCK PAVING.
		0.15-0.50	D					MADE GROUND: Light brownish grey loose sandy gravel with rare fine brick fragments and concrete cobbles noted.
					0.90			End of Borehole at 0.90 m
			Type	Results				

1
2
3
4

Remarks: Groundwater not encountered.
Obstruction encountered at 0.90mbgl.

AGS

APPENDIX C

Laboratory Data-Chemical Analysis

Environmental Protection Strategies Ltd
Unit 7B Caxton House
Broad Street
Cambourne, Cambs
CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 1 November 2013

UK13.1385 - 43/45 Broadwater Road

Chemtest
The right chemistry to deliver results

Report Date
11 November 2013

Login Batch No						**243451**					
Chemtest LIMS ID						AJ37294	AJ37295	AJ37296	AJ37297	AJ37298	AJ37299
Sample ID						WS1	WS2	WS2	WS3	WS4	WS5
Sample No											
Sampling Date						28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013
Depth						0.15m - 0.45m	0.1m - 0.5m	0.8m - 1.0m	0.15m - 0.5m	0.15m - 0.5m	0.15m - 0.5m
Matrix						*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*							
2030	Moisture		%	M		2.24	9.12	16.6	9.46	5.23	8.5
	Stones content (>50mm)		%	M		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			M		brown	brown	brown	brown	brown	brown
	Soil texture			M		sand	sand	clay	sand	sand	sand
	Other material			M		stones	stones	stones	stones	stones	stones
2010	pH			M		9.2	8.8	5.3	7.6	11.6	11.3
2300	Cyanide (total)	57125	mg kg-¹	M		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
2625	Organic matter		%	M		< 0.40	< 0.40	< 0.40	< 0.40	2.2	0.52
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M		<0.01	<0.01	0.21	0.07	0.15	1.5
2490	Chromium (hexavalent)	18540299	mg kg-¹	N		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2450	Arsenic	7440382	mg kg-¹	M		11	12	23	21	17	11
	Cadmium	7440439	mg kg-¹	M		<0.10	<0.10	0.11	0.12	0.17	0.14
	Chromium	7440473	mg kg-¹	M		10	13	40	17	15	13
	Copper	7440508	mg kg-¹	M		<5.0	<5.0	20	<5.0	<5.0	<5.0
	Mercury	7439976	mg kg-¹	M		0.29	0.19	0.28	<0.10	0.19	0.15
	Nickel	7440020	mg kg-¹	M		13	14	45	18	18	12
	Lead	7439921	mg kg-¹	M		10	6.9	28	7.3	24	22
	Selenium	7782492	mg kg-¹	M		<0.20	<0.20	0.41	<0.20	0.27	0.53
	Zinc	7440666	mg kg-¹	M		31	18	77	27	35	62
2675	TPH aliphatic >C5-C6		mg kg-¹	N		< 0.1			< 0.1	< 0.1	
	TPH aliphatic >C6-C8		mg kg-¹	N		< 0.1			< 0.1	< 0.1	
	TPH aliphatic >C8-C10		mg kg-¹	N		< 0.1			< 0.1	< 0.1	
	TPH aliphatic >C10-C12		mg kg-¹	M		< 1			< 1	< 1	
	TPH aliphatic >C12-C16		mg kg-¹	M		< 1			< 1	< 1	

All tests undertaken between 01/11/2013 and 11/11/2013

* Accreditation status

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

Environmental Protection Strategies Ltd
Unit 7B Caxton House
Broad Street
Cambourne, Cambs
CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 1 November 2013

UK13.1385 - 43/45 Broadwater Road

Chemtest
The right chemistry to deliver results

Report Date
11 November 2013

Login Batch No					**243451**			
Chemtest LIMS ID					AJ37300	AJ37301	AJ37302	AJ37303
Sample ID					WS6	WS7	WS4	WS1
Sample No								
Sampling Date					28/10/2013	28/10/2013	28/10/2013	28/10/2013
Depth					0.2m - 0.35m	0.15m - 0.5m	0.8m - 1.0m	0.8m - 1.0m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
2030	Moisture		%	M	8.98	7.08	10.6	19.5
	Stones content (>50mm)		%	M	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			M	brown	brown	brown	brown
	Soil texture			M	sand	sand	clay	clay
	Other material			M	stones	stones	stones	stones
2010	pH			M	11.6	10.1		
2300	Cyanide (total)	57125	mg kg-1	M	<0.50	<0.50		
2625	Organic matter		%	M	0.83	< 0.40		
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l-1	M	0.77	0.03		
2490	Chromium (hexavalent)	18540299	mg kg-1	N	<0.5	<0.5		
2450	Arsenic	7440382	mg kg-1	M	13	22		
	Cadmium	7440439	mg kg-1	M	0.19	0.15		
	Chromium	7440473	mg kg-1	M	13	15		
	Copper	7440508	mg kg-1	M	<5.0	<5.0		
	Mercury	7439976	mg kg-1	M	<0.10	<0.10		
	Nickel	7440020	mg kg-1	M	13	20		
	Lead	7439921	mg kg-1	M	49	14		
	Selenium	7782492	mg kg-1	M	1.00	0.20		
	Zinc	7440666	mg kg-1	M	55	35		
2675	TPH aliphatic >C5-C6		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aliphatic >C6-C8		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aliphatic >C8-C10		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aliphatic >C10-C12		mg kg-1	M	< 1	< 1	< 1	
	TPH aliphatic >C12-C16		mg kg-1	M	3.8	< 1	< 1	

* Accreditation status

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

Environmental Protection Strategies Ltd
Unit 7B Caxton House
Broad Street
Cambourne, Cambs
CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 1 November 2013

UK13.1385 - 43/45 Broadwater Road

Chemtest
The right chemistry to deliver results

Report Date
11 November 2013

					243451					
					AJ37294	AJ37295	AJ37296	AJ37297	AJ37298	AJ37299
					WS1	WS2	WS2	WS3	WS4	WS5
					28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.15m - 0.45m	0.1m - 0.5m	0.8m - 1.0m	0.15m - 0.5m	0.15m - 0.5m	0.15m - 0.5m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C16-C21		mg kg-1	M	< 1			< 1	< 1	
	TPH aliphatic >C21-C35		mg kg-1	M	< 1			< 1	< 1	
	TPH aliphatic >C35-C44		mg kg-1	N	< 1			< 1	< 1	
	TPH aromatic >C5-C7		mg kg-1	N	< 0.1			< 0.1	< 0.1	
	TPH aromatic >C7-C8		mg kg-1	N	< 0.1			< 0.1	< 0.1	
	TPH aromatic >C8-C10		mg kg-1	N	< 0.1			< 0.1	< 0.1	
	TPH aromatic >C10-C12		mg kg-1	M	< 1			< 1	< 1	
	TPH aromatic >C12-C16		mg kg-1	M	< 1			< 1	1.2	
	TPH aromatic >C16-C21		mg kg-1	M	< 1			< 1	7.9	
	TPH aromatic >C21-C35		mg kg-1	M	< 1			< 1	13	
	TPH aromatic >C35-C44		mg kg-1	N	< 1			< 1	< 1	
	Total Petroleum Hydrocarbons		mg kg-1	N	< 10			< 10	23	
2700	Naphthalene	91203	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Acenaphthylene	208968	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Acenaphthene	83329	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Fluorene	86737	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Phenanthrene	85018	mg kg-1	M	0.1	< 0.1	< 0.1	< 0.1	1.6	< 0.1
	Anthracene	120127	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	0.63	< 0.1
	Fluoranthene	206440	mg kg-1	M	0.22	< 0.1	< 0.1	< 0.1	3	1.1
	Pyrene	129000	mg kg-1	M	0.16	< 0.1	< 0.1	< 0.1	2.6	0.98
	Benzo[a]anthracene	56553	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	1.4	0.49
	Chrysene	218019	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	1.3	0.5
	Benzo[b]fluoranthene	205992	mg kg-1	N	< 0.1	< 0.1	< 0.1	< 0.1	1.3	0.49
	Benzo[k]fluoranthene	207089	mg kg-1	N	< 0.1	< 0.1	< 0.1	< 0.1	0.72	0.35
	Benzo[a]pyrene	50328	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	1	0.48

All tests undertaken between 01/11/2013 and 11/11/2013

* Accreditation status

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

Environmental Protection Strategies Ltd
Unit 7B Caxton House
Broad Street
Cambourne, Cambs
CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 1 November 2013

UK13.1385 - 43/45 Broadwater Road

Chemtest
The right chemistry to deliver results

Report Date
11 November 2013

					243451			
					AJ37300	AJ37301	AJ37302	AJ37303
					WS6	WS7	WS4	WS1
					28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.2m - 0.35m	0.15m - 0.5m	0.8m - 1.0m	0.8m - 1.0m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C16-C21		mg kg-1	M	6.6	< 1	1.4	
	TPH aliphatic >C21-C35		mg kg-1	M	17	< 1	7.0	
	TPH aliphatic >C35-C44		mg kg-1	N	< 1	< 1	< 1	
	TPH aromatic >C5-C7		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aromatic >C7-C8		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aromatic >C8-C10		mg kg-1	N	< 0.1	< 0.1	< 0.1	
	TPH aromatic >C10-C12		mg kg-1	M	< 1	< 1	< 1	
	TPH aromatic >C12-C16		mg kg-1	M	< 1	< 1	< 1	
	TPH aromatic >C16-C21		mg kg-1	M	4.7	< 1	< 1	
	TPH aromatic >C21-C35		mg kg-1	M	10	< 1	< 1	
	TPH aromatic >C35-C44		mg kg-1	N	< 1	< 1	< 1	
	Total Petroleum Hydrocarbons		mg kg-1	N	45	< 10	< 10	
2700	Naphthalene	91203	mg kg-1	M	< 0.1	< 0.1		
	Acenaphthylene	208968	mg kg-1	M	< 0.1	< 0.1		
	Acenaphthene	83329	mg kg-1	M	< 0.1	< 0.1		
	Fluorene	86737	mg kg-1	M	< 0.1	< 0.1		
	Phenanthrene	85018	mg kg-1	M	0.44	< 0.1		
	Anthracene	120127	mg kg-1	M	0.18	< 0.1		
	Fluoranthene	206440	mg kg-1	M	0.98	< 0.1		
	Pyrene	129000	mg kg-1	M	1	< 0.1		
	Benzo[a]anthracene	56553	mg kg-1	M	0.5	< 0.1		
	Chrysene	218019	mg kg-1	M	0.44	< 0.1		
	Benzo[b]fluoranthene	205992	mg kg-1	N	0.47	< 0.1		
	Benzo[k]fluoranthene	207089	mg kg-1	N	0.3	< 0.1		
	Benzo[a]pyrene	50328	mg kg-1	M	0.31	< 0.1		

Environmental Protection Strategies Ltd
Unit 7B Caxton House
Broad Street
Cambourne, Cambs
CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT

Results of analysis of 10 samples
received 1 November 2013

UK13.1385 - 43/45 Broadwater Road

Chemtest
The right chemistry to deliver results

Report Date
11 November 2013

					243451					
					AJ37294	AJ37295	AJ37296	AJ37297	AJ37298	AJ37299
					WS1	WS2	WS2	WS3	WS4	WS5
					28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.15m - 0.45m	0.1m - 0.5m	0.8m - 1.0m	0.15m - 0.5m	0.15m - 0.5m	0.15m - 0.5m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2700	Dibenzo[a,h]anthracene	53703	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
	Indeno[1,2,3-cd]pyrene	193395	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	0.66	0.27
	Benzo[g,h,i]perylene	191242	mg kg-1	M	< 0.1	< 0.1	< 0.1	< 0.1	0.66	0.2
	Total (of 16) PAHs		mg kg-1	M	< 2	< 2	< 2	< 2	15	4.9
2760	Methyl tert-butylether	1634044	µg kg-1	M	< 1.0				< 1.0	
	Dichlorodifluoromethane	75718	µg kg-1	U	< 1.0				< 1.0	
	Chloromethane	74873	µg kg-1	M	< 1.0				< 1.0	
	Vinyl chloride	75014	µg kg-1	M	< 1.0				< 1.0	
	Bromomethane	74839	µg kg-1	M	< 20				< 20	
	Chloroethane	75003	µg kg-1	U	< 2.0				< 2.0	
	Trichlorofluoromethane	75694	µg kg-1	M	< 1.0				< 1.0	
	1,1-Dichloroethene	75354	µg kg-1	M	< 1.0				< 1.0	
	Dichloromethane	75092	µg kg-1	N	ne				ne	
	trans-1,2-Dichloroethene	156605	µg kg-1	M	< 1.0				< 1.0	
	1,1-Dichloroethane	75343	µg kg-1	M	< 1.0				< 1.0	
	cis-1,2-Dichloroethene	156592	µg kg-1	M	< 1.0				< 1.0	
	Bromochloromethane	74975	µg kg-1	U	< 1.0				< 1.0	
	Trichloromethane	67663	µg kg-1	M	< 1.0				< 1.0	
	1,1,1-Trichloroethane	71556	µg kg-1	M	< 1.0				< 1.0	
	Tetrachloromethane	56235	µg kg-1	M	< 1.0				< 1.0	
	1,1-Dichloropropene	563586	µg kg-1	U	< 1.0				< 1.0	
	Benzene	71432	µg kg-1	M	< 1.0				< 1.0	
	1,2-Dichloroethane	107062	µg kg-1	M	< 2.0				< 2.0	
	Trichloroethene	79016	µg kg-1	U	< 1.0				< 1.0	
	1,2-Dichloropropane	78875	µg kg-1	M	< 1.0				< 1.0	

All tests undertaken between 01/11/2013 and 11/11/2013

* Accreditation status

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Environmental Protection Strategies Ltd
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					243451			
					AJ37300	AJ37301	AJ37302	AJ37303
					WS6	WS7	WS4	WS1
					28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.2m - 0.35m	0.15m - 0.5m	0.8m - 1.0m	0.8m - 1.0m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2700	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	< 0.1		
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	0.28	< 0.1		
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	0.36	< 0.1		
	Total (of 16) PAHs		mg kg-¹	M	5.3	< 2		
2760	Methyl tert-butylether	1634044	µg kg-¹	M			< 1.0	< 1.0
	Dichlorodifluoromethane	75718	µg kg-¹	U			< 1.0	< 1.0
	Chloromethane	74873	µg kg-¹	M			< 1.0	< 1.0
	Vinyl chloride	75014	µg kg-¹	M			< 1.0	< 1.0
	Bromomethane	74839	µg kg-¹	M			< 20	< 20
	Chloroethane	75003	µg kg-¹	U			< 2.0	< 2.0
	Trichlorofluoromethane	75694	µg kg-¹	M			< 1.0	< 1.0
	1,1-Dichloroethene	75354	µg kg-¹	M			< 1.0	< 1.0
	Dichloromethane	75092	µg kg-¹	N			ne	ne
	trans-1,2-Dichloroethene	156605	µg kg-¹	M			< 1.0	< 1.0
	1,1-Dichloroethane	75343	µg kg-¹	M			< 1.0	< 1.0
	cis-1,2-Dichloroethene	156592	µg kg-¹	M			< 1.0	< 1.0
	Bromochloromethane	74975	µg kg-¹	U			< 1.0	< 1.0
	Trichloromethane	67663	µg kg-¹	M			< 1.0	< 1.0
	1,1,1-Trichloroethane	71556	µg kg-¹	M			< 1.0	< 1.0
	Tetrachloromethane	56235	µg kg-¹	M			< 1.0	< 1.0
	1,1-Dichloropropene	563586	µg kg-¹	U			< 1.0	< 1.0
	Benzene	71432	µg kg-¹	M			< 1.0	< 1.0
	1,2-Dichloroethane	107062	µg kg-¹	M			< 2.0	< 2.0
	Trichloroethene	79016	µg kg-¹	U			< 1.0	< 1.0
	1,2-Dichloropropane	78875	µg kg-¹	M			< 1.0	< 1.0

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					243451					
					AJ37294	AJ37295	AJ37296	AJ37297	AJ37298	AJ37299
					WS1	WS2	WS2	WS3	WS4	WS5
					28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.15m - 0.45m	0.1m - 0.5m	0.8m - 1.0m	0.15m - 0.5m	0.15m - 0.5m	0.15m - 0.5m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	Dibromomethane	74953	µg kg-¹	M	< 10				< 10	
	Bromodichloromethane	75274	µg kg-¹	M	< 5.0				< 5.0	
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N	< 10				< 10	
	Toluene	108883	µg kg-¹	M	< 1.0				1.1	
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N	< 10				< 10	
	1,1,2-Trichloroethane	79005	µg kg-¹	M	< 10				< 10	
	Tetrachloroethene	127184	µg kg-¹	M	< 1.0				< 1.0	
	1,3-Dichloropropane	142289	µg kg-¹	U	< 2.0				< 2.0	
	Dibromochloromethane	124481	µg kg-¹	U	< 10				< 10	
	1,2-Dibromoethane	106934	µg kg-¹	M	< 5.0				< 5.0	
	Chlorobenzene	108907	µg kg-¹	M	< 1.0				< 1.0	
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M	< 2.0				< 2.0	
	Ethylbenzene	100414	µg kg-¹	M	< 1.0				< 1.0	
	m- & p-Xylene	1330207	µg kg-¹	M	< 1.0				1.8	
	o-Xylene	95476	µg kg-¹	M	< 1.0				< 1.0	
	Styrene	100425	µg kg-¹	M	< 1.0				< 1.0	
	Tribromomethane	75252	µg kg-¹	U	< 10				< 10	
	Isopropylbenzene	98828	µg kg-¹	M	< 1.0				< 1.0	
	Bromobenzene	108861	µg kg-¹	M	< 1.0				< 1.0	
	1,2,3-Trichloropropane	96184	µg kg-¹	N	< 50				< 50	
	n-Propylbenzene	103651	µg kg-¹	U	< 1.0				< 1.0	
	2-Chlorotoluene	95498	µg kg-¹	M	< 1.0				< 1.0	
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M	< 1.0				< 1.0	
	4-Chlorotoluene	106434	µg kg-¹	U	< 1.0				< 1.0	
	tert-Butylbenzene	98066	µg kg-¹	U	< 1.0				< 1.0	

All tests undertaken between 01/11/2013 and 11/11/2013

* Accreditation status

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

Environmental Protection Strategies Ltd
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					AJ37300	AJ37301	AJ37302	AJ37303
					WS6	WS7	WS4	WS1
					28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.2m - 0.35m	0.15m - 0.5m	0.8m - 1.0m	0.8m - 1.0m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2760	Dibromomethane	74953	µg kg-¹	M			< 10	< 10
	Bromodichloromethane	75274	µg kg-¹	M			< 5.0	< 5.0
	cis-1,3-Dichloropropene	10061015	µg kg-¹	N			< 10	< 10
	Toluene	108883	µg kg-¹	M			< 1.0	< 1.0
	trans-1,3-Dichloropropene	10061026	µg kg-¹	N			< 10	< 10
	1,1,2-Trichloroethane	79005	µg kg-¹	M			< 10	< 10
	Tetrachloroethene	127184	µg kg-¹	M			< 1.0	< 1.0
	1,3-Dichloropropane	142289	µg kg-¹	U			< 2.0	< 2.0
	Dibromochloromethane	124481	µg kg-¹	U			< 10	< 10
	1,2-Dibromoethane	106934	µg kg-¹	M			< 5.0	< 5.0
	Chlorobenzene	108907	µg kg-¹	M			< 1.0	< 1.0
	1,1,1,2-Tetrachloroethane	630206	µg kg-¹	M			< 2.0	< 2.0
	Ethylbenzene	100414	µg kg-¹	M			< 1.0	< 1.0
	m- & p-Xylene	1330207	µg kg-¹	M			< 1.0	< 1.0
	o-Xylene	95476	µg kg-¹	M			< 1.0	< 1.0
	Styrene	100425	µg kg-¹	M			< 1.0	< 1.0
	Tribromomethane	75252	µg kg-¹	U			< 10	< 10
	Isopropylbenzene	98828	µg kg-¹	M			< 1.0	< 1.0
	Bromobenzene	108861	µg kg-¹	M			< 1.0	< 1.0
	1,2,3-Trichloropropane	96184	µg kg-¹	N			< 50	< 50
	n-Propylbenzene	103651	µg kg-¹	U			< 1.0	< 1.0
	2-Chlorotoluene	95498	µg kg-¹	M			< 1.0	< 1.0
	1,2,4-Trimethylbenzene	95636	µg kg-¹	M			< 1.0	< 1.0
	4-Chlorotoluene	106434	µg kg-¹	U			< 1.0	< 1.0
	tert-Butylbenzene	98066	µg kg-¹	U			< 1.0	< 1.0

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LABORATORY TEST REPORT

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					AJ37294	AJ37295	AJ37296	AJ37297	AJ37298	AJ37299
					WS1	WS2	WS2	WS3	WS4	WS5
					28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.15m - 0.45m	0.1m - 0.5m	0.8m - 1.0m	0.15m - 0.5m	0.15m - 0.5m	0.15m - 0.5m
					SOIL	*SOIL*	*SOIL*	*SOIL*	*SOIL*	*SOIL*
2760	1,3,5-Trimethylbenzene	108678	µg kg-¹	M	< 1.0				< 1.0	
	sec-Butylbenzene	135988	µg kg-¹	U	< 1.0				< 1.0	
	1,3-Dichlorobenzene	541731	µg kg-¹	M	< 1.0				< 1.0	
	4-Isopropyltoluene	99876	µg kg-¹	U	< 1.0				< 1.0	
	1,4-Dichlorobenzene	106467	µg kg-¹	M	< 1.0				< 1.0	
	n-Butylbenzene	104518	µg kg-¹	U	< 1.0				< 1.0	
	1,2-Dichlorobenzene	95501	µg kg-¹	M	< 1.0				< 1.0	
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U	< 50				< 50	
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M	< 1.0				< 1.0	
	Hexachlorobutadiene	87683	µg kg-¹	U	< 1.0				< 1.0	
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

All tests undertaken between 01/11/2013 and 11/11/2013

* Accreditation status

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Environmental Protection Strategies Ltd
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LABORATORY TEST REPORT

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					243451			
					AJ37300	AJ37301	AJ37302	AJ37303
					WS6	WS7	WS4	WS1
					28/10/2013	28/10/2013	28/10/2013	28/10/2013
					0.2m - 0.35m	0.15m - 0.5m	0.8m - 1.0m	0.8m - 1.0m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2760	1,3,5-Trimethylbenzene	108678	µg kg-¹	M			< 1.0	< 1.0
	sec-Butylbenzene	135988	µg kg-¹	U			< 1.0	< 1.0
	1,3-Dichlorobenzene	541731	µg kg-¹	M			< 1.0	< 1.0
	4-Isopropyltoluene	99876	µg kg-¹	U			< 1.0	< 1.0
	1,4-Dichlorobenzene	106467	µg kg-¹	M			< 1.0	< 1.0
	n-Butylbenzene	104518	µg kg-¹	U			< 1.0	< 1.0
	1,2-Dichlorobenzene	95501	µg kg-¹	M			< 1.0	< 1.0
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U			< 50	< 50
	1,2,4-Trichlorobenzene	120821	µg kg-¹	M			< 1.0	< 1.0
	Hexachlorobutadiene	87683	µg kg-¹	U			< 1.0	< 1.0
2920	Phenols (total)		mg kg-¹	M	<0.3	<0.3		

Environmental Protection Strategies Ltd
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CB23 6JN

FAO B Virtue / S Smith

LABORATORY TEST REPORT
Asbestos in Soils

Results of analysis of 7 samples
received 1 November 2013
UK13.1385 - 43/45 Broadwater Road

Chemtest

Report Date
11 November 2013

Login Batch No: 243451

Qualitative Results

				SOP 2190	
				ACM Type	Asbestos Identification
Chemtest ID	Sample ID	Sample Desc	Depth (m)	UKAS Accredited	UKAS Accredited
AJ37294	WS1		0.15 - 0.45	-	No Asbestos Detected
AJ37295	WS2		0.1 - 0.5	-	No Asbestos Detected
AJ37297	WS3		0.15 - 0.5	-	No Asbestos Detected
AJ37298	WS4		0.15 - 0.5	-	No Asbestos Detected
AJ37299	WS5		0.15 - 0.5	-	No Asbestos Detected
AJ37300	WS6		0.2 - 0.35	-	No Asbestos Detected
AJ37301	WS7		0.15 - 0.5	-	No Asbestos Detected

The detection limit for this method is 0.001%

Si [redacted]

Lauren Quinn
Asbestos Analyst

APPENDIX D

Laboratory Data-Geotechnical Analysis

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : 19/11/13 PAGE 1 of 15 Pages

Contract: UK13.1385 - 43/45 Broadwater Road

Serial No. S27038

UKAS TESTING 0998

CLIENT:

Environmental Protection
Strategies Ltd
7B Caxton House
Broad Street
CAMBOURNE
CAMBRIDGE
CB23 6JN

Soil Property Testing

18 Halcyon Court, St Margarets Way,
Stukeley Meadows, Huntingdon,
Cambs. PE29 6DG.

Telephone (01480) 455579 Fax (01480) 453619
Email SPTownend@btclick.com

SAMPLES SUBMITTED BY:

Environmental Protection

APPROVED SIGNATORIES:

☐ **S.P.TOWNEND FGS**
Technical Director

☐ **W.JOHNSTONE**
Deputy Technical/Quality Manager

☑ **J.C.GARNER B.Eng (Hons.) FGS**
Quality Manager

[redacted]

SAMPLES LABELLED:

UK13.1385 - 43/45 Broadwater Road

DATE RECEIVED: 01/11/13

SAMPLES TESTED BETWEEN 01/11/13 **and** 19/11/13

REMARKS: For the attention of Mr B Virtue
Your Order No.: PO-13/2636

NOTES:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. (a) UKAS - United Kingdom Accreditation Service.
   (b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 2 of 15

Contract: UK13.1385 - 43/45 Broadwater Road

Serial No.: S27038

SCHEDULE OF LABORATORY TESTS

Bh./ Tp No.	Sample Ref	Depth (from)	1:Moisture Content Determination	4:Liquid/Plastic limit 1 point	5:Wet Sieve Preparation for Limit	700:Sulphate Test (2:1 Water Soil	702:pH value of Soil or Water	7:PSD by Wet Sieve BS1377	20:CBR Compaction 2.5 Kg method	19:California Bearing Ratio Test	Remarks
WS1	D1	1.80	*	*	*	*	*				
WS2	D2	0.80	*	*		*	*				
WS3	D3	2.80						*			
WS4	D4	0.80	*	*	*	*	*				
WS5	D5	1.80	*	*	*	*	*				
	D6	2.80	*	*	*	*	*				
WS6	B7	0.50	*	*	*	*	*		*	*	CBR @ PL+2%
-	-	-	6	6	5	6	6	1	1	1	<— Total Number of Tests —

Scheduled by: Environmental Protection

Target Date: 15/11/13

SPTSCHED

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 3 of 15

Contract: UK13.1385 - 43/45 Broadwater Road

Serial No. S27038

UKAS TESTING 0998

SUMMARY OF MOISTURE CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)	SAMPLE PREPARATION				Description	CLASS
								Method S/N	Ret'd 0.425mm (%)	Corr'd M/C <0.425mm	Curing Time (hrs.)		
WS1	1.80 -2.00	D1	21	49	21	28	0.11*	S	11(M)	24	24	Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium	CI
WS2	0.80 -1.00	D2	27	79	26	53	0.02	N	0(A)		27	Stiff fissured orangey brown slightly sandy CLAY with occasional grey mottling and rare decayed roots	CV
WS4	0.80 -1.00	D4	23	41	20	21	0.57*	S	28(M)	32	25	Firm orangey brown slightly gravelly slightly sandy silty CLAY with occasional reddish yellow and brown mottling. Gravel is fine and medium angular to subrounded	CI
WS5	1.80 -2.00	D5	20	42	20	22	0.23*	S	19(M)	25	27	Stiff slightly fissured orangey brown slightly gravelly slightly sandy silty CLAY with rare black carbonaceous speckling. Gravel is fine and medium angular and subangular	CI
WS5	2.80 -3.00	D6	16	36	18	18	0.33*	S	33(M)	24	25	Stiff orangey brown slightly gravelly sandy silty CLAY with occasional yellowish red mottling and rare black carbonaceous specks	CI
WS6	0.50 -1.00	B7	16	32	16	16	0.38*	S	26(M)	22	25	Stiff orangey brown sandy silty CLAY with occasional brown mottling and rare fine and medium subangular and subrounded gravel	CL

METHOD OF PREPARATION : BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2 S = Wet Sieved Specimen
N = prepared from Natural

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter. A = Assumed, M = Measured

COMMENTS :

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample. Oven drying temperature if not 105-110 deg C.

TEST REPORT.

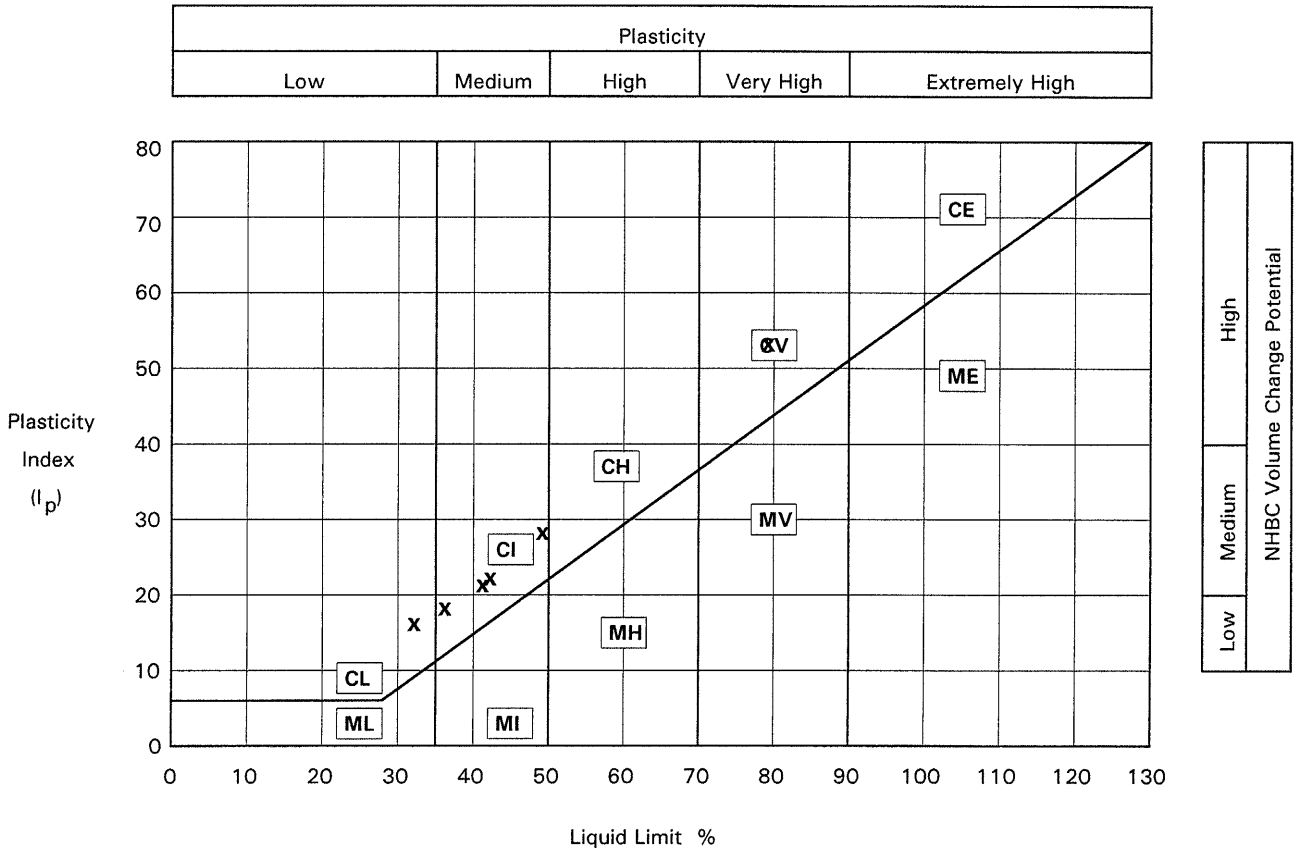
ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 4 of 15

Contract: UK13.1385 - 43/45 Broadwater Road

Serial No.: S27038

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index PLASTICITY CHART BS5930:1999:Figure 18

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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UKAS TESTING 0998

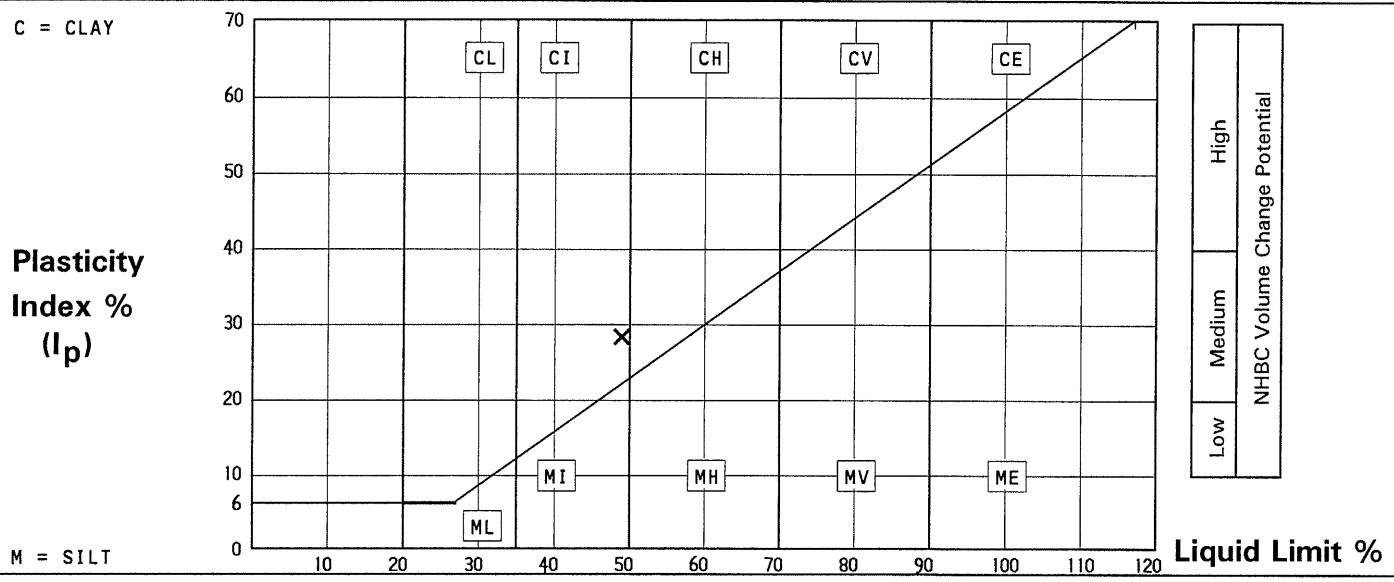
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS1	1.80 -2.00	D1	21	Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium	

PREPARATION

Method of Preparation	Sieved Specimen		
Sample retained 0.425 sieve	(Measured)	11	%
Corrected moisture content for material passing 0.425mm		24	%
Curing Time		24	Hours

Liquid Limit	49	%
Plastic Limit	21	%
Plasticity Index	28	%
Liquidity Index	0.11	
Clay Content	Not analysed.	%
Derived Activity (PI/CC)	Not analysed.	



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)
5% RETAINED ON 2mm SIEVE
Corrected moisture content and calculated liquidity index assume material greater than 0.425mm non porous. See BS1377:Part2:1990 Clause 3 Note 1.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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Contract: UK13.1385 - 43/45 Broadwater Road

Serial No.: S27038

UKAS TESTING 0998

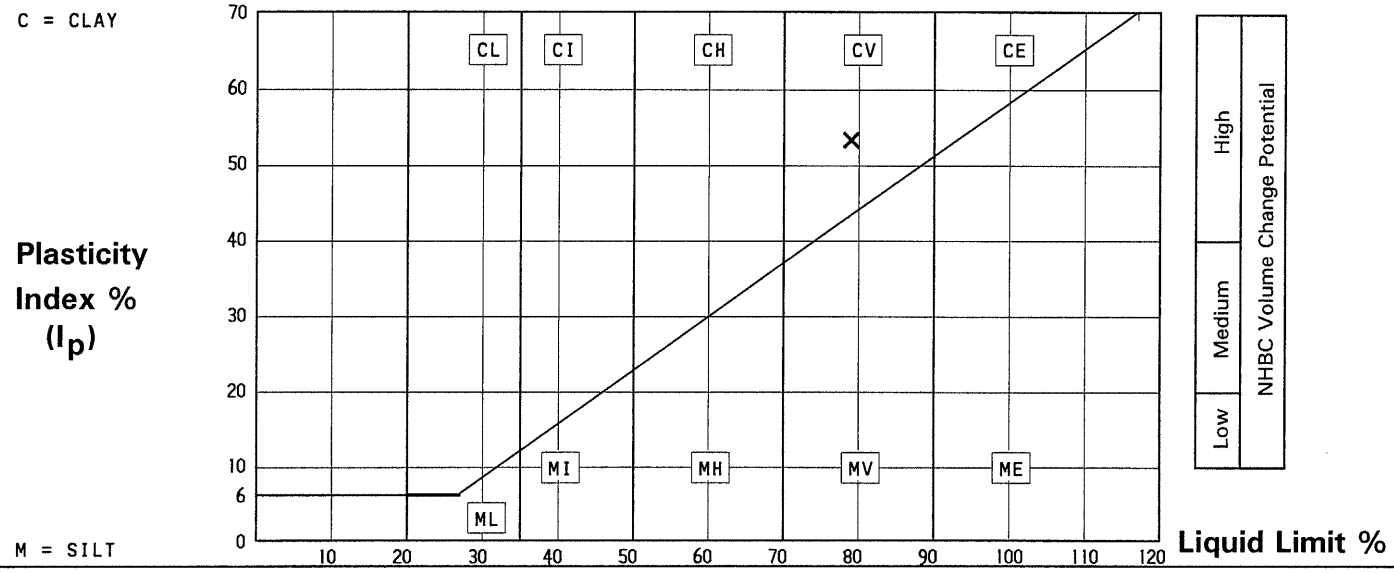
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS2	0.80 -1.00	D2	27	Stiff fissured orangey brown slightly sandy CLAY with occasional grey mottling and rare decayed roots	

PREPARATION

Method of Preparation	Specimen from Natural Soil
Sample retained 0.425 sieve (Assumed)	0 %
Corrected moisture content for material passing 0.425mm	%
Curing Time	27 Hours

Liquid Limit	79 %
Plastic Limit	26 %
Plasticity Index	53 %
Liquidity Index	0.02
Clay Content	Not analysed. %
Derived Activity (PI/CC)	Not analysed.



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)

TEST REPORT.

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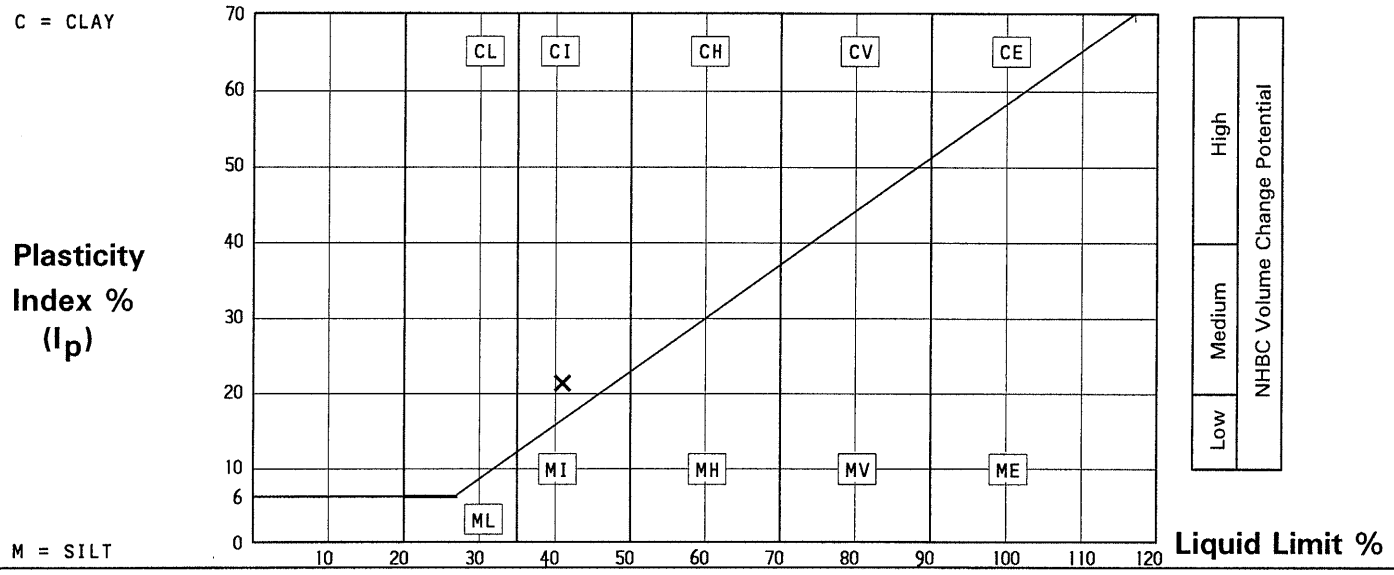
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS4	0.80 -1.00	D4	23	Firm orangey brown slightly gravelly slightly sandy silty CLAY with occasional reddish yellow and brown mottling. Gravel is fine and medium angular to subrounded	

PREPARATION

Method of Preparation	Sieved Specimen
Sample retained 0.425 sieve (Measured)	28 %
Corrected moisture content for material passing 0.425mm	32 %
Curing Time	25 Hours

Liquid Limit	41 %
Plastic Limit	20 %
Plasticity Index	21 %
Liquidity Index	0.57
Clay Content	Not analysed. %
Derived Activity (PI/CC)	Not analysed.



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)
23% RETAINED ON 2mm SIEVE
Corrected moisture content and calculated liquidity index assume material greater than 0.425mm non porous. See BS1377:Part2:1990 Clause 3 Note 1.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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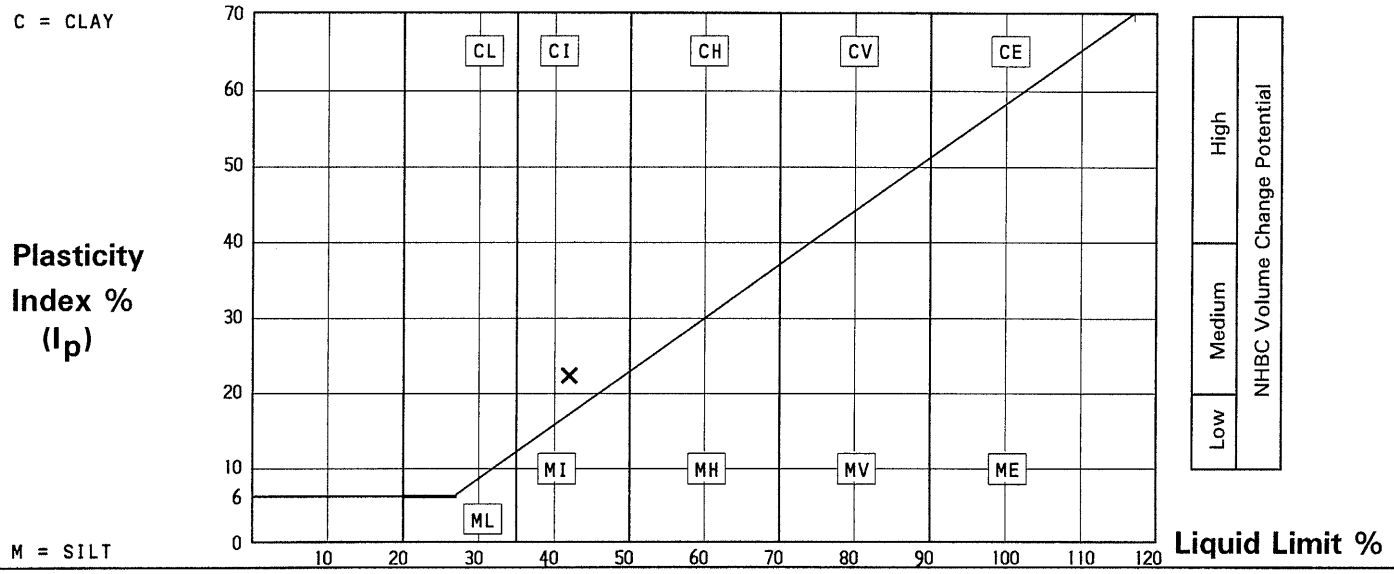
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS5	1.80 -2.00	D5	20	Stiff slightly fissured orangey brown slightly gravelly slightly sandy silty CLAY with rare black carbonaceous speckling. Gravel is fine and medium angular and subangular	

PREPARATION

Method of Preparation	Sieved Specimen		
Sample retained 0.425 sieve	(Measured)	19	%
Corrected moisture content for material passing 0.425mm		25	%
Curing Time		27 Hours	

Liquid Limit	42	%
Plastic Limit	20	%
Plasticity Index	22	%
Liquidity Index	0.23	
Clay Content	Not analysed.	%
Derived Activity (PI/CC)	Not analysed.	



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)
12% RETAINED ON 2mm SIEVE
Corrected moisture content and calculated liquidity index assume material greater than 0.425mm non porous. See BS1377:Part2:1990 Clause 3 Note 1.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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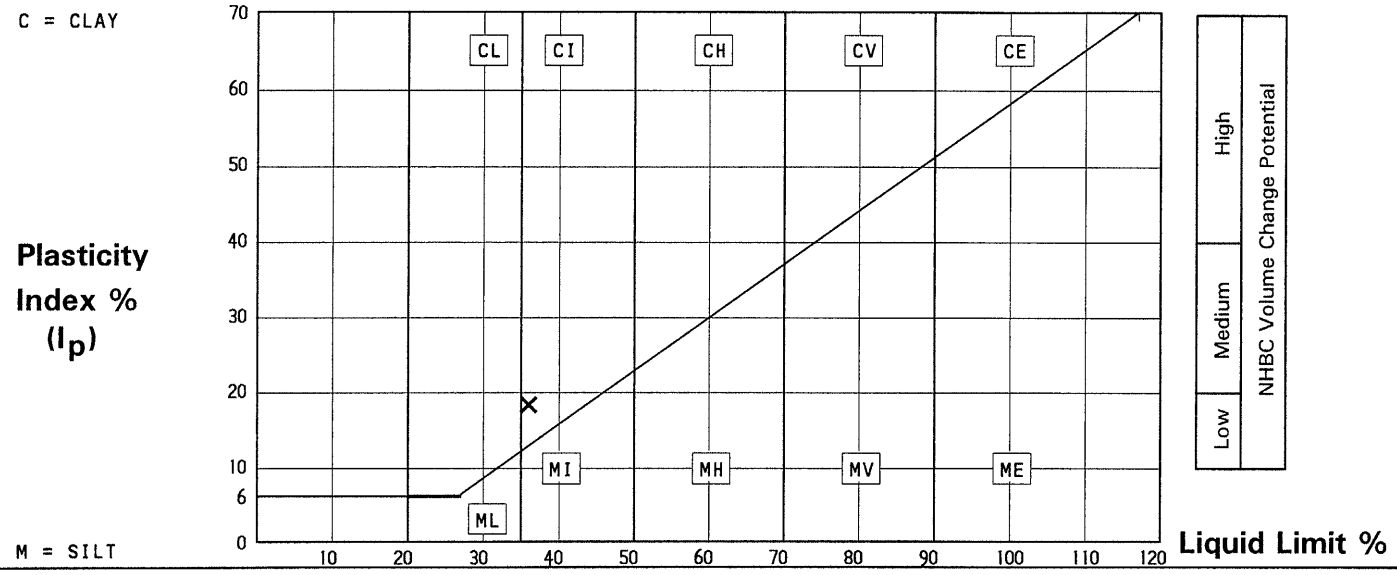
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS5	2.80 -3.00	D6	16	Stiff orangey brown slightly gravelly sandy silty CLAY with occasional yellowish red mottling and rare black carbonaceous specks	

PREPARATION

Method of Preparation	Sieved Specimen		
Sample retained 0.425 sieve	(Measured)	33	%
Corrected moisture content for material passing 0.425mm		24	%
Curing Time		25	Hours

Liquid Limit	36	%
Plastic Limit	18	%
Plasticity Index	18	%
Liquidity Index	0.33	
Clay Content	Not analysed.	%
Derived Activity (PI/CC)	Not analysed.	



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4 , 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)
1% RETAINED ON 2mm SIEVE
Corrected moisture content and calculated liquidity index assume material greater than 0.425mm non porous. See BS1377:Part2:1990 Clause 3 Note 1.

TEST REPORT.

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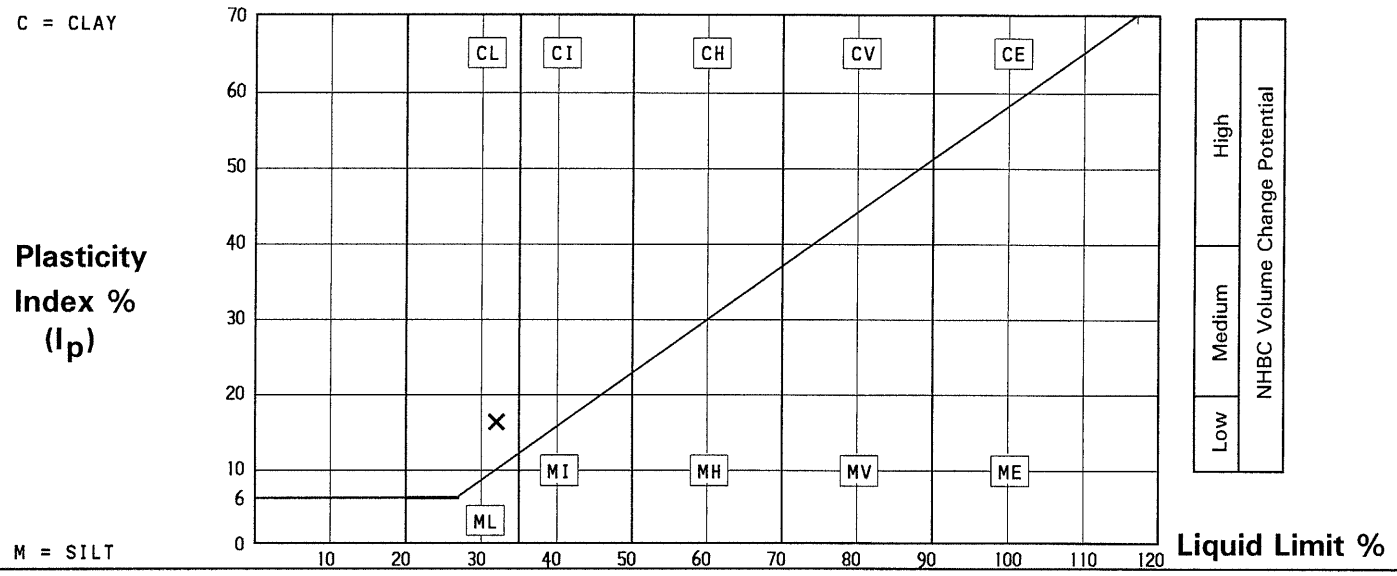
DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS6	0.50 -1.00	B7	16	Stiff orangey brown sandy silty CLAY with occasional brown mottling and rare fine and medium subangular and subrounded gravel	

PREPARATION

Method of Preparation	Sieved Specimen	Liquid Limit	32 %
Sample retained 0.425 sieve	(Measured) 26 %	Plastic Limit	16 %
Corrected moisture content for material passing 0.425mm	22 %	Plasticity Index	16 %
Curing Time	25 Hours	Liquidity Index	0.38
		Clay Content	Not analysed. %
		Derived Activity (PI/CC)	Not analysed.



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4 , 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'p = Ip x (% less than 425 microns/100)
<1% RETAINED ON 2mm SIEVE
Corrected moisture content and calculated liquidity index assume material greater than 0.425mm non porous. See BS1377:Part2:1990 Clause 3 Note 1.

TEST REPORT.

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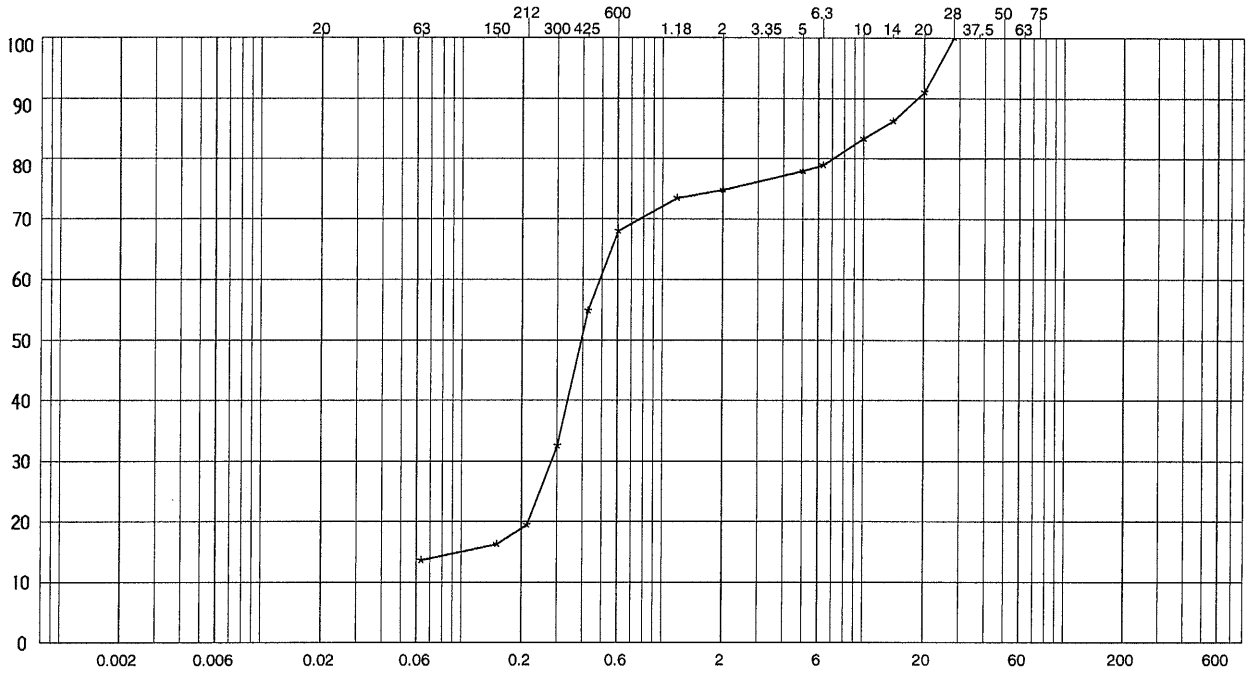
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole/ Pit No.	Depth m.	Sample	Description	Remarks
WS3	2.80 -3.00	D3	Yellowish brown and reddish brown slightly clayey silty very gravelly SAND with rare concrete fragments. Gravel is white, black and brown angular to subrounded	

Method of Test: Wet Sieve

Method of pre-treatment:

Size (microns)														Size (mm)												
Sieve Size													63	150	212	300	425	600	1.18	2	5	6.3	10	14	20	28	37.5	50	75
Percentage by Mass passing Sieve													14	16	19	32	55	68	73	75	78	79	83	86	91	100	-	-	-



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

METHOD OF PREPARATION: BS 1377:PART 1:1990:7.3 & 7.4.5

METHOD OF TEST : BS 1377:PART 2:1990:9.2

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS :

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample. Oven drying temperature if not 105-110 deg C.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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LABORATORY CALIFORNIA BEARING RATIO TESTS ADJUSTED FOR SEASONAL MOISTURE CONTENT CHANGES.

Due to seasonal variations of water content in near surface soils, many clients require CBR test samples to be subjected to sample preparation in the laboratory before testing. With Clay soils, liquid and plastic limits and moisture contents are carried out to classify them on material passing 20mm. The plastic limit is then compared against the moisture content with due regard to the proportion of material then retained on a 0.425mm sieve. If the moisture content is already 2% or more above the plastic limit, compaction may take place immediately. If this is not the case a calculated amount of water is added to the sample and cured for 24 hours before compaction. The samples are then cured for a further 24 hours before CBR tests are carried out at both the top and bottom of the sample.

CALCULATION OF ADJUSTED MOISTURE CONTENT FOR CBR TESTING

When a significant proportion of a basically clay material is >0.425mm, the adjusted moisture content (MC) for test shall be derived as follows:

Obtain test specimens for CBR, Limits and Moisture content from Material Passing 20mm. (If the sample is large enough a moisture content may also be carried out on a representative portion of the whole sample including material greater than 20mm, and reported for information)

The Plastic Limit (PL) for the fine fraction is obtained by testing material passing the 0.425mm sieve. A notional 5% Moisture Content is to be allowed for material passing 20mm, and retained on the 0.425mm sieve. The proportion passing the 0.425mm is obtained by the wet sieve preparation method.

If X% passes 0.425mm, (100-X) % is retained on 0.425mm and with the 5% MC required to be incorporated for the retained 0.425mm portion, the adjusted MC for test shall be at least:

$$\frac{X(PL+2) + (100-X)5\%}{100} \text{ for the sample passing 20mm}$$

CALCULATIONS:

S27038– UK13.1385 43/45 Broadwater Road

WS6 – B7 @ 0.50m

74% passing 0.425mm therefore X = 74
Plastic limit of specimen = 16.3%
Moisture content as received = 15.7%

$$\frac{74(16.3+2) + (100-74)5}{100} = 14.8\%$$

Therefore moisture content adjustment not required
Moisture Content after CBR Test = 16%

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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Contract: UK13.1385 - 43/45 Broadwater Road

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UKAS TESTING 0998

DETERMINATION OF CALIFORNIA BEARING RATIO (CBR)

Borehole/ Pit No./ Chainage	Depth m.	Sample	Description	Remarks
WS6	0.50 -1.00	B7	Stiff orangey brown sandy silty CLAY with occasional brown mottling and rare fine and medium subangular and subrounded gravel	

Moisture Content % TOP: 16 BOTTOM: 16 Average: 16

Bulk Density Mg/m^3 2.15

Dry Density Mg/m^3 1.85

CBR VALUES

Penetration mm		Force kN	Calculated CBR %	Corrected CBR %	Highest CBR %	Average CBR % (Shown if Top & Bottom CBR Values are within 10% of their Mean value)
TOP *	2.5	0.35	2.7		3.6	4.0
	5.0	0.73	3.6			
BOTTOM ⊙	2.5	0.47	3.6		4.4	
	5.0	0.88	4.4			

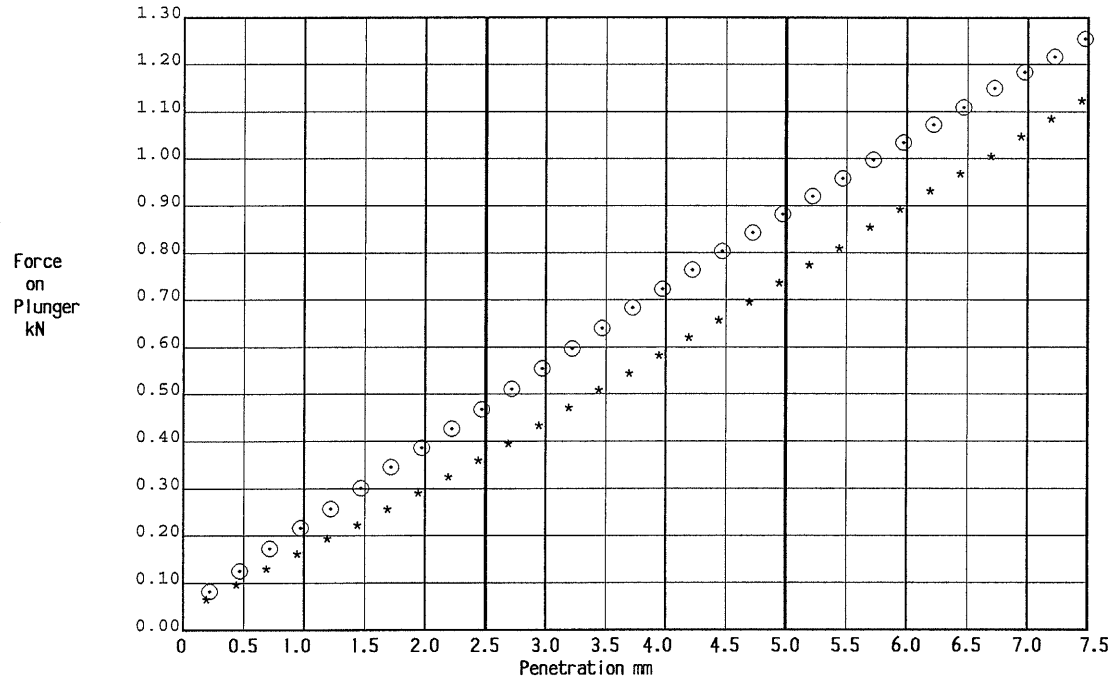
% material retained on 20mm sieve and removed before test : 0

METHOD OF PREPARATION

BS 1377:Part 4:1990 7.2.4 2.5kg Rammer Method.

Surcharge weights (kg) : 15

SOAKED TEST : NO



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.6.1 & 7.6.5 & PART 4:1990:7.2

METHOD OF TEST : BS 1377:PART 4:1990:7.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS :

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample. Oven drying temperature if not 105-110 deg C.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 14 of 15

Contract: UK13.1385 - 43/45 Broadwater Road

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DETERMINATION OF THE SULPHATE CONTENT OF SOIL AND GROUNDWATER

Borehole/ Pit No.	Depth m.	Sample	Concentration of Soluble Sulphate			% of sample passing 2mm sieve	Description	Remarks
			Soil		Groundwater			
			Acid Soluble SO3 %	Water Soluble 2:1 SO3 g/l	g/l			
WS1	1.80 -2.00	D1		0.12		95	Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium	
WS2	0.80 -1.00	D2		0.23		100	Stiff fissured orangey brown slightly sandy CLAY with occasional grey mottling and rare decayed roots	
WS4	0.80 -1.00	D4		0.02		77	Firm orangey brown slightly gravelly slightly sandy silty CLAY with occasional reddish yellow and brown mottling. Gravel is fine and medium angular to subrounded	
WS5	1.80 -2.00	D5		0.09		88	Stiff slightly fissured orangey brown slightly gravelly slightly sandy silty CLAY with rare black carbonaceous speckling. Gravel is fine and medium angular and subangular	
WS5	2.80 -3.00	D6		0.08		99	Stiff orangey brown slightly gravelly sandy silty CLAY with occasional yellowish red mottling and rare black carbonaceous specks	
WS6	0.50 -1.00	B7		0.11		100	Stiff orangey brown sandy silty CLAY with occasional brown mottling and rare fine and medium subangular and subrounded gravel	

METHOD OF PREPARATION: BS 1377:PART 1:1990:7.5 BS1377:PART 3:1990:5.2 Acid Soluble, 5.3 Soil/Water Extract :5.4 Groundwater

METHOD OF TEST : BS 1377:PART 3:1990:5.5

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : Test not UKAS accredited.

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample. Oven drying temperature if not 105-110 deg C.

TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 15 of 15

Contract: UK13.1385 - 43/45 Broadwater Road

Serial No.: S27038

DETERMINATION OF THE pH VALUE

Borehole/ Pit No.	Depth m.	Sample	pH Value	Description	Remarks
WS1	1.80 -2.00	D1	4.2	Stiff fissured orangey brown slightly gravelly slightly sandy silty CLAY with occasional decayed roots. Gravel is fine and medium	pH value retested and result verified
WS2	0.80 -1.00	D2	4.0	Stiff fissured orangey brown slightly sandy CLAY with occasional grey mottling and rare decayed roots	pH value retested and result verified
WS4	0.80 -1.00	D4	7.0	Firm orangey brown slightly gravelly slightly sandy silty CLAY with occasional reddish yellow and brown mottling. Gravel is fine and medium angular to subrounded	
WS5	1.80 -2.00	D5	6.5	Stiff slightly fissured orangey brown slightly gravelly slightly sandy silty CLAY with rare black carbonaceous speckling. Gravel is fine and medium angular and subangular	
WS5	2.80 -3.00	D6	6.1	Stiff orangey brown slightly gravelly sandy silty CLAY with occasional yellowish red mottling and rare black carbonaceous specks	
WS6	0.50 -1.00	B7	6.7	Stiff orangey brown sandy silty CLAY with occasional brown mottling and rare fine and medium subangular and subrounded gravel	

METHOD OF PREPARATION: BS 1377:PART 1:1990:7 BS 1377:PART 3:1990:9.4

METHOD OF TEST : BS 1377:PART 3:1990:9.5

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : Test not UKAS accredited.

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample. Oven drying temperature if not 105-110 deg C.

APPENDIX E

Tier I Screening Criteria

EPS Tier 1 Qualitative Risk Assessment

Generic Assessment Criteria - Residential Land Use

Contaminant	Tier 1 Soil Targets			Tier 1 Groundwater Targets	
	Human Health	Controlled Waters		Controlled Waters	
		LGwRP	HGwRP	LGwRP	HGwRP
Unit	**mg/kg**			**ug/l**	
Arsenic	32	n/c	n/c	50	10
Cadmium	10	n/c	n/c	5	5
Chromium	3000	n/c	n/c	250	50
Chromium VI	4.3	n/c	n/c	n/c	n/c
Copper	2330	n/c	n/c	28	2000
Mercury	170	n/c	n/c	1	1
Nickel	130	n/c	n/c	200	50
Lead	450	n/c	n/c	250	10
Selenium	350	n/c	n/c	10	10
Zinc	3750	n/c	n/c	500	5000
Benzene	0.33	0.252	0.008	30	1
Toluene	6.10E+02	1.17	1.17	50	50
Ethylbenzene	3.50E+02	15.0	10.0	300	200
Xylene	2.30E+02	0.885	0.885	30	30
MTBE	-	0.138	0.0276	75	15
Benzo(a)Pyrene	8.30E-01	10	1.44	0.7	0.1
Napthalene	1.50E+00	0.934	0.02	10	0.1
Dibenz(ah)anthracene	7.60E-01	n/c	n/c	n/c	n/c
Aliphatic C5-C6	3.00E+01	5.27	1.05	50	10
Aliphatic C6-C8	7.30E+01	23.2	4.64	50	10
Aliphatic C8-C10	1.90E+01	175	35.1	50	10
Aliphatic C10-C12	9.30E+01	1380	276	50	10
Aliphatic C12-C16	7.40E+02	27500	5490	50	10
Aliphatic C16-C35	4.50E+04	3.46E+06	6.91E+05	50	10
Aromatic C8-C10	2.70E+01	8.74	1.75	50	10
Aromatic C10-C12	6.90E+01	13.8	2.76	50	10
Aromatic C12-C16	1.40E+02	27.5	5.5	50	10
Aromatic C16-C21	2.50E+02	86.9	17.4	50	10
Aromatic C21-C35	8.90E+02	690	138	50	10

Notes:
LGwRP - Low Groundwater Resource Potential
HGwRP - High Groundwater Resource Potential
>SOL - GAC exceeds solubility saturation limit
n/c - not calculated

Tier 1 Soil Targets

Targets for Human Health have been taken from available Soil Guideline Values (SGVs), derived using standard sandy loam soil with 6% SOM. For contaminants where SGVs are not currently available, GACs from LQM & CIEH '*Generic Assessment Criteria for Human Health Risk Assessment - 2nd edition (2009)*' derived using standard sandy loam soil with 1% SOM were used as alternatives. For sites where ground conditions differ significantly from sandy loam or site-specific SOM and pH are available, the Tier 1 human health targets may be revised.

Targets for Controlled waters have been derived using EA Remedial Targets Worksheet (v3.1) - using standard Sandy Loam ground conditions as described in Science Report SC050021/SR3, assuming no degradation for a 10m compliance distance with criteria of EQS or UKDWS for LGwRP and HGwRP respectively (see notes for Tier 1 GW targets)

Tier 1 Groundwater Targets

For LGwRP, targets have been taken as Freshwater EQS where available. For Ethylbenzene and BaP the WHO Health limit has been used and for MTBE and individual TPH fractions a 5 times multiplier of taste threshold and UKDWS has been taken repectively.
For HGwRP, targets have been taken as UKDWS where available. For Ethlylbenzene the upper WHO ATO limit has been used. For Toluene and Xylene, the WHO ATO limit is higher than the EQS and so the lower value has been taken. For MTBE the taste threshold has been taken.

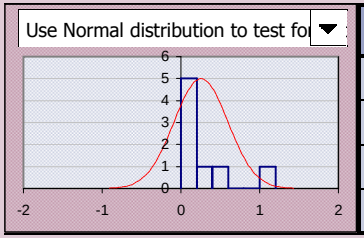
APPENDIX F

Summary of Statistical Analysis

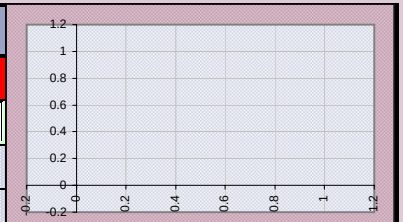
Test Results

Client/client ref: Corum
Project ref: UK13.1385
Site ref: 43/ 45 Broadwater Road, WGC
Data description: Statistical analysis of eight soil sa
Date: 04-Dec-2013
User details: BV

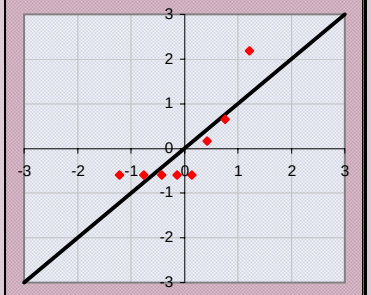
Dataset: BaP (mg/kg)	
Sample mean, $\overline{X}$(mg/kg)	0.255
Sample standard deviation, s	0.342
Sample size, n	8
Critical concentration, Cc (mg/kg)	0.83



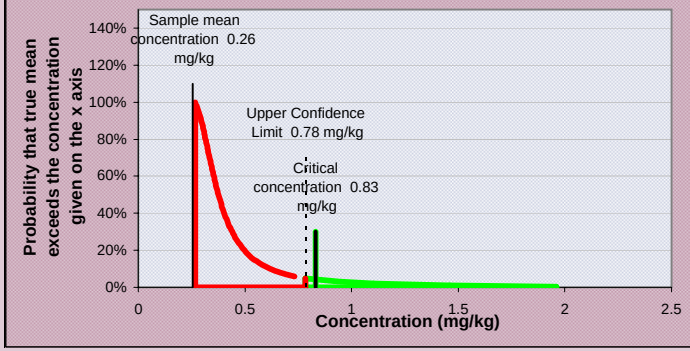
Outliers & non-detects	
Outliers present?	YES
Significance level	5%
Outliers removed?	0
Non-detects	5



Normality test	
Significance level:	5%
Non-normal distribution	
Use:	Auto: Chebychev



Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?
Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	**96%**
Base decision on:	evidence level
Evidence level required:	**95%**
Balance of probability?	N/A
Reject Null Hypothesis?	Yes

μ < Cc (re this dataset)

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX G

Example Method Statement for Construction Workers Encountering Unexpected Contamination

METHOD STATEMENT

ACTIONS TO BE TAKEN IN THE EVENT OF DISCOVERING UNEXPECTED CONTAMINATION DURING INTRUSIVE GROUNDWORKS

If at any point during intrusive groundworks at a site, evidence of unforeseen contamination is encountered in the form of significant noxious odours, discolouration, or instability within soils or sheen / discolouration in groundwater, the following actions will be taken:

- Intrusive works in the immediate area of the impacted ground will be suspended and the continuation of work in other areas of the site will be considered within the context of the site specific health & safety plan.
- Environmental Protection Strategies Ltd (EPS) will be contacted and appraised of the situation so that arrangements can be made to characterise the impact and determine what action may be necessary in addition to the scheduled site works. Where possible / health & safety plan permits, digital photographs of the impacted ground will be taken and emailed to EPS at the address below to assist in the initial assessment.
- It may well be necessary for EPS to attend site to undertake visual inspection and obtain samples for field and/or laboratory analysis, although the actions taken will be dependent on the nature of what is encountered.
- In cases where EPS consider the unforeseen contamination likely to pose a significant risk of significant harm to adjacent site users or local environmental receptors, the local authority and the Environment Agency will be informed of the situation and the actions being taken.
- Once appropriate action has been agreed and undertaken a written summary will be produced by EPS for submission to the Local Authority (and where relevant, the Environment Agency) in accordance with planning requirements. The submission will include details of work undertaken, analytical results of investigative and validation samples obtained and conclusions and recommendations for any further actions considered necessary.
- Where regulatory bodies have been involved, site works should only recommence following their agreement and in all cases should only recommence when the site manager considers it safe to do so within the context of the site specific health & safety plan.

EPS Contact Details:

Principal Contact	Giles Lock	Director	Tel: 0781 253 9656
Secondary Contact	Will Evans	Director	Tel: 0781 253 9655

Email: info@epstrategies.co.uk (automatically forwarded to both of the above and office based personnel)