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environmental and geotechnical consultants

Proposed artificial sports pitch
Havant RFC
Havant

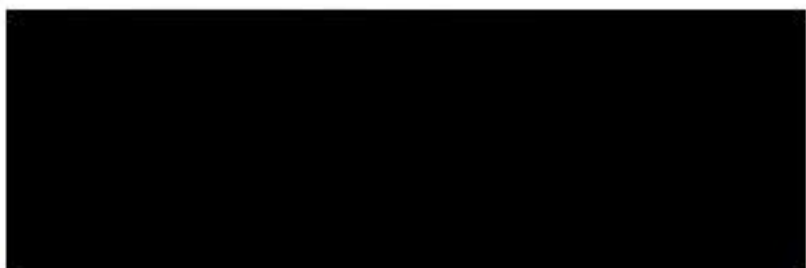
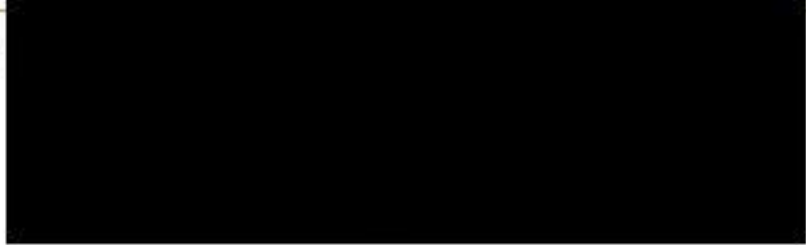
Ground Investigation Report

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Havant Rugby Football Club
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PO9 3EJ**

GROUND INVESTIGATION REPORT

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Aerial photograph of site



The approximate location of the proposed pitch boundary is highlighted in **magenta**

Report status and format

Report section	Principal coverage	Report status	
		Revision	Comments
1	Executive summary		
2	Brief		
3	Desk study information and site observations		
4	Fieldwork		
5	Ground conditions encountered		
6	Laboratory testing		
7	Engineering assessment		
8	Contamination issues		
9	Evaluation of Topsoil test data		
10	Classification of waste soils for off-site disposal under waste acceptance criteria		
11	Further investigations		

List of drawings

Drawing	Principal coverage	Status	
		Revision	Comments
01	Site location plan		
02	Plan with aerial photograph overlay showing existing site features, extent of proposed pitch and approximate location of exploratory points		
03a	Plot summarising results of pocket penetrometer determinations by geology		
03b	Plot summarising results of pocket penetrometer determinations by location		
04a	Plot summarising in-situ density testing (SPT) by location		
04b	Plot summarising in-situ density testing (SPT) by geology		

List of appendices

Appendix	Content
A	Definitions of geotechnical terms used in this report
B	Definitions of geo-environmental terms used in this report
C	Investigation data sheets
D	Borehole records (driven tube sampling techniques)
E	TRL-DCP test results
F	Soil infiltration test records and calculations
G	Copies of laboratory test result certificates – chemical testing
H	Copies of laboratory test result certificates – classification testing
I	Landfill waste acceptance criteria – primary classification
J	Landfill waste acceptance criteria – secondary classification
K	Landfill waste acceptance criteria – basic categorisation schedules
L	Copies of Statutory Undertakers replies

1 Executive summary

1.1 General

- 1.1.1 We recommend the following executive summary is not read in isolation to the main report which follows.

1.2 Site description, history and development proposals

- 1.2.1 The site is situated toward the centre of Havant and comprises a grass surfaced rugby pitch within the grounds of Havant RFC. A clubhouse is present to the south of the site, with grass surfaced recreation ground to the west, north and east. Residential housing surrounds the recreational ground.
- 1.2.2 The nearest surface watercourse is Hermitage Stream, some 250m to the east. General topography falls gently toward the south. Levels on site slope gently downward from northwest to southeast, dropping by some 1.5m. 16m high coniferous trees line the site on the western, northern and eastern boundaries.
- 1.2.3 The site was open fields with hedgerows until 1954 after which time the site is recorded as Hook's Lane recreation ground. A structure, likely to be the Havant RFC clubhouse is shown just off the southern boundary of the site from 1991.

1.3 Ground conditions encountered

- 1.3.1 Exploratory excavations generally encountered a soil profile considered to be Reworked Topsoil overlying Made Ground-Reworked Head / Head, which in turn overlies the London Clay Formation deposits.
- 1.3.2 Groundwater was encountered within DTS01 and DTS05 at depths of around 2m. Groundwater was not encountered elsewhere during the fieldworks.

1.4 CBR and infiltration potential

- 1.4.1 It is recommended that a CBR of 5% is adopted for the proposed pitch.
- 1.4.2 In our opinion the naturally deposited Head and London Clay will adequately support the proposed floodlights on pad foundations. Allowable bearing capacities are provided in Section 7.
- 1.4.3 The near surface Head and sandy London Clay soils display a degree of permeability. In our opinion, the near surface soils are considered capable of disposing of storm water via infiltration systems though any variability in ground conditions requires consideration in the design and full depth soakage tests in trial pits would confirm this assessment.

1.5 Contamination

- 1.5.1 It was considered outside of our brief to provide a full risk assessment with respect to environmental aspects however desk study information and laboratory testing undertaken does not highlight any likely sources of significant contamination likely to affect human or controlled water receptors.

1.6 Topsoil

- 1.6.1 Laboratory testing has deemed the Topsoil/Reworked Topsoil at the site unsuitable for multipurpose use.

1.7 Classification of waste soils

- 1.7.1 Analysis of test data, and ground conditions at the site indicate the following classifications for offsite disposal of soil wastes generated at the site.

Soil type	Classification	Comments
Made Ground	Non-hazardous	Classification based on laboratory test data and desk study information. Cannot be classified as inert due to elevated mineral oils (C10-C40 range)
Natural soils (Head and London Clay)	Inert	Classification based on desk study information and soils are unlikely to be affected by artificial contamination

Table 1.7.1

2 Introduction and brief

2.1 Objectives

- 2.1.1 This report describes a ground investigation carried out for a proposed artificial sports pitch at Havant Rugby Football Club, Hooks Lane, PO9 3DT.
- 2.1.2 The principal objective of the ground investigation was to establish ground conditions at the site sufficient to assess the infiltration potential and provide information necessary to allow design of the artificial sports pitch and flood light foundations.
- 2.1.3 Our brief also included investigations and testing to allow classification of soils at the site to be disposed of to landfill.

2.2 Client instructions and confidentiality

- 2.2.1 The investigation was carried out in September 2017 and reported in October 2017 acting on instructions received from SIS Pitches.
- 2.2.2 This report has been prepared for the sole benefit of our above named instructing client, but this report, and its contents, remains the property of Soiltechnics Limited until payment in full of our invoices in connection with production of this report.

2.3 Site location and project proposals

- 2.3.1 The National Grid reference for the site is 470791, 106925. A plan showing the location of the site is presented on Drawing 01.
- 2.3.2 We understand proposals are for the construction of an artificial turf sports pitch within the footprint of the existing grassed rugby football pitch. We understand that flood lighting is proposed as part of the development. The approximate extent of the proposed pitch is shown on Drawing 02.

3 Desk study information and site observations

3.1 Site Description

- 3.1.1 The site is situated toward the centre of Havant and comprises a grass surfaced rugby pitch within the grounds of Havant RFC. The site is bound to the east, north and west by coniferous trees of some 16m to 20m in height. A clubhouse and car park were present to the south of the site, with tennis courts to the south west and residential properties to the east and southeast. The site is located within a larger recreational field which extends out to the west, north and northeast of the site. The second XV pitch being located on the recreation ground to the north.
- 3.1.2 The nearest surface watercourse is Hermitage Stream located approximately 250m to the east. Local topography falls gently to the south but levels across the site slope gently downward from northwest to southeast, dropping by some 1.5m in total. Along the western and north-western site boundary there is a roughly 1m drop from the pitch down on the recreation ground. This drop is likely to be the result of previous levelling that has taken place on site to accommodate the pitch. A plan showing existing site features is presented on Drawing 02.

3.2 Site history

- 3.2.1 Review of publicly available historical maps dating back to 1867 indicates the site comprised open fields with hedgerows until 1954 after which time the site is recorded as Hook's Lane recreation ground. From this time, significant development of residential housing also took place around the perimeter of the recreation ground and continued at least until the 1970s. A structure, likely to be the Havant RFC clubhouse is shown just off the southern boundary of the site from 1991.

3.3 Geology and geohydrology of the area

3.3.1 Geology

- 3.3.1.1 We have reviewed geological mapping of the produced by the British Geological Survey (BGS) at a scale of 1:50,000 scale. A summary of the recorded geological information for the site is presented in the table below:

Summary of Geology and likely aquifer containing strata					
Strata	Bedrock/ Superficial	Approximate thickness	Typical soil Type	Likely permeability	Likely aquifer designation
Head	Superficial	Unknown	Clay, Silt, Sand, Gravel	Limited permeability	Secondary undifferentiated
London Clay Formation	Bedrock	~30m	Clay to the south. Sand to the north.	Impermeable Variable permeability	Unproductive strata
Lambeth Group	Bedrock	~35m	Clay, silt and sand	Limited permeability	Secondary A aquifer

Portsdown Chalk Formation	Bedrock	>200m cumulatively. No information available on individual units	Chalk	Permeable	Principal aquifer
Spetisbury Chalk Member	Bedrock		Chalk	Permeable	Principal aquifer
Tarrant Chalk Member	Bedrock		Chalk	Permeable	Principal aquifer
Newhaven Chalk Formation	Bedrock		Chalk	Permeable	Principal aquifer
Table 3.3.1.1					

3.3.1.2 It should be noted strata names in accordance with the BGS Lexicon of Named Rock Units have superseded commonly used local names for specific strata.

3.3.1.3 The soil types and assessments of permeability are based on geological memoirs, in combination with our experience of investigations in these soil types.

3.3.1.4 For brevity and ease of reading within the text London Clay Formation deposits will be referred to as London Clay from now on.

3.3.2 Geohydrology

3.3.2.1 Head is designated as a Secondary undifferentiated aquifer. A Secondary undifferentiated aquifer is a designation used when it is not possible to attribute fully one of either Secondary A or Secondary B, due to the variable nature of the soils. The unit will therefore be a mix of both, which are defined as follows:

- Secondary A can be defined as: Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
- Secondary B can be defined as: layers which may store limited amounts of ground water. These groundwater stores are generally the water bearing parts of former aquifers.

3.3.2.2 The London Clay is unproductive strata. Unproductive strata are defined as deposits exhibiting low permeability with negligible significance for water supply or river base flow. Unproductive Strata are generally regarded as not containing groundwater in exploitable quantities.

3.3.3 Source protection zone

3.3.3.1 The site lies within an Inner zone (Zone 1c) which relates to subsurface activity only. The zone is most likely associated with a drinking water abstraction point located some 6km to the north west. It should be noted that the edge of the Source Protection Zone 1c, lies some 800m to the north of the site.

3.3.3.2 An SPZ Inner zone 1c extends beyond zone 1 where the aquifer is confined and may be impacted by deeper drilling activities.

3.4 Coal Mining

- 3.4.1 We have reviewed the Coal Authority web site, to determine if the site is located within an area which has been affected by coal mining or brine extraction (within the Cheshire Brine Compensation District only). The web site advises the site is not located within an area affected by past or present coal mining, or minerals worked in association with coal or indeed brine extraction.

3.5 Landfilling

- 3.5.1 The site and immediately surrounding areas are not recorded as landfill sites. Based on available data, there are two recorded historical / authorised landfill sites within 1km of the subject site: An authorised landfill named as Bedhampton landfill is shown some 400m south west of the site. The landfill is shown to have accepted inert waste. An historical landfill named Scratchface Lane is located some 730m west of the site. The imported waste was reported to be inert although the date that waste was accepted is not shown.
- 3.5.2 Inert wastes are not usually considered as a risk for generation of ground gases and we would consider the site to be of low risk based on the information available. This, however does not constitute a full gas risk assessment for the site.

3.6 Flood risk

- 3.6.1 Publicly available sources indicate that the site is not in a flood risk area.

3.7 Enquiries with statutory undertakers

- 3.7.1 We have contacted the following Statutory Undertakers (SUs) to obtain copies of their records in order to avoid damaging their apparatus during our fieldwork activities: -
- a) National Grid Gas plc
 - b) UK Power Networks
 - c) Scotia gas Networks
 - d) Thames Water
 - e) BT Openreach
- 3.7.2 Copies of responses received prior to publication of this report are presented in Appendix L. These records have been obtained solely for the purposes described above. Some of these records have been obtained from the Internet and from our database without contacting the statutory undertaker direct. Occasionally, SU information is recorded on drawings larger than A3, and thus cannot be easily presented in this report. In such cases we will copy the correspondence but not incorporate the drawing in this report, and maintain the records on our office file.
- 3.7.3 In addition, we have visited the linesearch web site (www.linesearch.org) which provides a report on national grid networks (National Gas and Electricity Transmission Networks). Again, a copy of their report is presented in Appendix L.

- 3.7.4 Normally Statutory Undertakers drawings record the approximate location of their services. We recommend further on site investigations be undertaken to confirm the position of the apparatus and thus establish the effect on the proposed development and the necessity or otherwise for the permanent or temporary diversion of the service to allow the construction of the development to safely and successfully proceed.
- 3.7.5 It should be noted that statutory undertakers' records normally exclude private services. The club themselves provided a drawing showing some of the private services located within / near to the pitch which is also included within Appendix L. This shows the pitch drainage and electrical cables that run adjacent to the southern and eastern touch lines of the first XV pitch to feed the flood lights for the second XV pitch.
- 3.7.6 The service drawings from S&S electric show a service running along the southern touch line. This service shows several branches, one serving the club house and one the adjacent property and then runs to the residential properties to the north east of the site. It is unclear if this is a separate service to the one shown on the client's drawings or if the feed for the second XV pitch is a branch off this service run.

3.8 Unexploded Ordnance (UXO) risk

- 3.8.1 Prior to our fieldwork activities we obtained a desk study risk review report from MACC International. The risk review concluded that there was a credible risk of encountering UXO during the ground investigation. During our intrusive investigations, each position was checked and cleared by a UXO specialist. It is recommended that a Detailed UXO Risk Assessment Report is obtained for the site to determine the risk for the construction phase. UXO specialist attendance may be required during the construction phase to provide advice and scan positions to allow intrusive works to safely proceed.

4 Fieldwork

4.1 General

4.1.1 Fieldwork was carried out the 5th September and comprised the following activities:

- Excavation of five exploratory boreholes using driven tube techniques
- TRL DCP testing in five locations

4.1.2 The approximate position of the exploratory points is presented on Drawing 02.

4.1.3 The extent of fieldwork activities and position of the exploratory point was defined by Soiltechnics Ltd.

4.2 Site restrictions

4.2.1 The investigations were undertaken using small diameter borehole equipment to reduce damage that may be caused by machine excavated trial pits. A power cable is known to run along the southern and western touchlines and exploratory excavations were positioned accordingly, to avoid this service run.

4.3 Driven tube sampling

4.3.1 Boreholes DTS01 to DTS05 were formed using driven tube sampling equipment. Driven tube sampling comprises driving 1m long steel sample tubes, which are screw coupled together or coupled to extension rods and fitted with a screw on cutting edge. The sample tubes are of various diameters, generally commencing with 100mm and reducing, with depth, to 50mm, and include a disposable plastic liner which is changed between sampling locations in order to limit the risk of cross contamination. On completion of excavation the liner containing the sample is cut open and the soil sample logged by a geo-environmental engineer.

4.3.2 Samples for determination concentration of chemical contaminants were taken from samples obtained in the disposable tubes as sub-samples, using stainless steel sampling equipment, which is cleaned with de-ionised water.

4.3.3 The driven tube sampler obtains samples under category A allowing laboratory test quality classes 3 to 5 as described in BS EN ISO 22475-1:2006.

4.3.4 Standard Penetration Testing (SPT) was carried out at regular frequencies in two boreholes (DTS01, DTS02, DTS03 and DTS05). The test was carried out in accordance with BS EN ISO 22476-3:2005. Details of the test, as required by BS EN ISO 22476-3 are recorded in borehole records and in the summary table in Appendix C.

4.3.5 Records of boreholes formed using driven tube sampling techniques are presented in Appendix D.

- 4.3.6 Indicative soil infiltration testing was carried out in boreholes DTS01 and DTS04. The infiltration testing was carried out generally in accordance with the procedure described in Building Research Establishment (BRE) Digest 365 (2007) "*Soakaway Design*". Records of test results and calculations to determine a soil infiltration rate are presented in Appendix F. It should be noted that testing has not been carried out strictly in accordance with the BRE publication, as this does not specifically provide for calculating an infiltration rate in a borehole. We have adapted the BRE method and calculations in order to provide an indicative infiltration rate.

4.4 TRL DCP testing

- 4.4.1 Transport Research Laboratory Dynamic Cone Penetration (TRL DCP) testing was carried out in five locations across the site. TRL DCP testing consists of manually dropping an 8kg hammer through a height of 575mm and driving a 20mm diameter, 60° cone into the ground. The amount of penetration per blow or set number of blows is recorded.

- 4.4.2 Field data was then processed using the software *UK Dynamic Cone Penetrometer (DCP) Software Version 3.1*, provided by the Transport Research Laboratory. The software divides the tested soil into layers based on the rate of penetration, and then calculates an equivalent CBR (California Bearing Ratio) value for the layer from the rate of penetration in blows/mm using the following equation:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{blow/mm})$$

This relationship has been proved empirically by the Transport Research Laboratory.

- 4.4.3 It should be noted that TRL DCP testing is not a test defined by British Standards. It is however, widely used and accepted in the industry for determination of equivalent CBR values.
- 4.4.4 The TRL positions were undertaken adjacent to a driven tube sample location and are named in sequential order to match the adjacent driven tube. Results and analysis of TRL dynamic cone penetration test data is presented in Appendix E.

5 Ground conditions encountered

5.1 The exploratory excavations encountered a profile of soils considered to be Reworked Topsoil, overlying Made Ground – Reworked Head and Head, which ultimately overlies the London Clay Formation deposits.

5.2 Reworked Topsoil (Made Ground)

5.2.1 Reworked Topsoil was encountered in all locations and comprised grey sandy silt with frequent rootlets and localised pockets of gravel consisting of flint and brick. Reworked Topsoil extended to depths between 0.05 and 0.4m.

5.3 Made Ground – Reworked Head

5.3.1 Made Ground was encountered in all locations. Made Ground generally comprised greyish brown sandy / gravelly silty clay. Sand and gravel proportions varied across the site and the gravel consisted of flint and occasional brick fragments. Made Ground extended to depths in the range of 0.8m to 1.4m.

5.3.2 Made Ground is considered to be reworked natural materials (Head) resulting from levelling of the existing playing field. Accordingly, the Made Ground was generally deeper toward the northwest of the site.

5.3.3 The clay soils around the perimeter of the site were noted to be particularly stiff most likely due to the close proximity of large coniferous trees resulting in desiccation of the near surface soils.

5.4 Head

5.4.1 Head deposits were encountered in DTS01, DTS03 and DTS05 only and comprised of greyish brown sandy gravel and gravelly silty clay. Gravel consisted of flint. Head deposits extended to depths in the range of 0.6 to 2.1m. They were absent toward the north and generally became deeper toward the southwest.

5.5 London Clay Formation

5.5.1 The London Clay Formation deposits were encountered within all exploratory positions and at generally shallower depths to the northeast. London Clay Formation deposits comprised of orangish brown firm to stiff medium to high strength silty clay on the west of the site with orangish brown speckled black clayey sand predominant on the eastern area of the proposed pitch. Contrary to the general perception of London Clay, geological records indicate the London Clay comprises sand deposits locally and thus our findings confirm the geological maps.

5.6 Groundwater

5.6.1 Groundwater inflows were observed in some of the exploratory excavations. A summary of our observations is tabulated below:

Table summarising groundwater observations			
Exploratory point	Date of observation	Depth (m) below ground levels	Observations
DTS01	05/09/2017	2-2.75	Seepages noted from 2-2.75m depth
	05/09/2017	3-3.8	Groundwater inflows observed from 3-3.8m depth. Standing at 2.21m after 30 minutes.
DTS05	05/09/2017	2.1	Groundwater inflows observed from 2.4-3m depth. Standing at 2.1m depth after 1 hour.
Table 5.6.1			

5.6.2 It should be noted that water levels will vary depending generally on recent weather conditions and only long-term monitoring of levels in standpipes will provide a measure of seasonal variations in groundwater levels.

6 Laboratory testing

6.1 Classification testing

- 6.1.1 Laboratory testing was carried out on samples retrieved from site. The method of testing is recorded on the laboratory test certificate. The following table summarises the classification testing scheduled:

Table summarising classification testing			
Exploratory point	Depth (m)	Soil type	Testing scheduled
DTS01	1.1-1.2	Head	Liquid limit/plasticity limit and plasticity index/moisture
DTS03	1.3-1.4	London Clay Formation	Liquid limit/plasticity limit and plasticity index/moisture

Table 6.1.1

- 6.1.2 Laboratory test certificates are presented in Appendix H.

6.2 Chemical testing

- 6.2.1 Chemical testing was carried out based on ground conditions encountered. The test methods are recorded on the chemical test certificates. The following table summarises the chemical testing scheduled:

Table summarising chemical testing			
Exploratory point	Depth (m)	Medium/soil type	Testing scheduled (Refer to Appendix A for details)
DTS01	0.5-0.6	Made Ground – Reworked Head	Suite 1
DTS02	0.05-0.15	Reworked Topsoil	Topsoil Assessment BS3882:15
DTS03	0.1-0.2	Reworked Topsoil	Topsoil Assessment BS3882:15
DTS03	1.3-1.4	London Clay	Suite 8
DTS04	0.1-0.2	Reworked Topsoil	Suite 1 Topsoil Assessment BS3882:15
DTS04	0.3-0.4	Head	Suite 8
DTS05	0.1-0.2	Reworked Topsoil	Topsoil Assessment BS3882:15

Table 6.2.1

- 6.2.2 Laboratory test certificates for chemical testing are presented in Appendix G.

7 Engineering assessment

7.1 Flood lights

7.1.1 In our opinion, the naturally deposited Head and London Clay soils will adequately support the proposed pad foundations for the flood light bases. Laboratory testing indicates the soils are medium volume change potential and thus foundations should extend a minimum of 0.9m depth subject to penetrating the naturally deposited soils by minimum of 0.3m. It should be noted that there are a number of trees and major vegetation on the site which will require foundation depths exceeding the minimum depth defined above. Further guidance on this is provided in the following report paragraphs.

7.1.2 The lighting column foundations will be eccentrically loaded thus stresses imparted to the ground will not be uniform. As a result settlement will not be uniform if long term stresses imposed on the foundation supporting soils are not reasonably uniform. Such stresses generating settlements are likely to be from dead loads only and not from live loads (such as wind) which will be transient and not likely to contribute to settlement. Live loads will increase the eccentricity of loads and thus increase the concentration of stresses potentially to an edge of the foundation. In such cases there is a risk of foundation failure about one edge of the foundation as soils fail in a circular mode under with the foundation edge modelled as a strip. In order to minimise the risk of such a foundation failure the presumed bearing capacity (which includes a factor of safety of 3 against failure) should not exceed $5.52 \times$ undrained shear strength ($=65\text{kN/m}^2$) / 3 ie 119kN/m^2 .

7.1.3 The near surface Head and London Clay deposits exhibit a degree of plasticity and potentially adopting a conservative approach, our assessment of bearing values is based on the assumption that the soils exhibit cohesion. Calculations, based on a conservative undrained shear strength of say 65kN/m^2 (derived from measured insitu shear strengths taken below proposed founding levels), indicate the following bearing values for pad type foundations.

Table of bearing values				
Plan size of pad (m)	Ultimate bearing value kN/m^2	Presumed bearing value kN/m^2	Allowable pressure kN/m^2	bearing
1 x 1	595	119	115	
2 x 2	570	119	115	
3 x 3	555	119	115	
Table 7.1.3				

7.1.4 The presumed bearing value has been derived from the ultimate bearing value by applying a factor of safety of 3 to limit total settlement to around 20mm under constantly applied uniform loading, and the allowable bearing pressure derived to limit total settlement. Higher bearing capacities could be achieved by deepening foundations beyond the minimum outlined above. The bearing capacity is limited further for eccentrically loaded foundations. **Notably, ground strength decreases with depth and thus footings located beyond say 1.0m will not achieve the bearing capacities provided above.**

7.1.5 Trees of significant height and maturity are present around the perimeter of the site and as such foundation may require deepening to reduce the risk posed by roots. Further details regarding deepening of foundation in the vicinity of tree roots are outlined below. Upon determining the final depths of footings we would advise that bearing capacities are reassessed.

7.1.6 **Influence of trees and other major vegetation**

7.1.6.1 The results of plastic and liquid limit determinations performed on a sample of the Head deposits indicate the deposits are soils of low volume change potential, however the cohesive London Clay are classified as medium volume change potential, when classified in accordance with National House Building Council (NHBC) Standards, Chapter 4.2.

7.1.6.2 Adopting a conservative approach, foundations taken down onto a depth of 0.9m will penetrate the zone of shrinkage and swelling caused by seasonal wetting and drying. Trees and other major vegetation extend this zone and will require deeper foundations. A good guide to this subject is provided in NHBC Standards, Chapter 4.2.

7.1.6.3 As outlined above, the final depth of the foundations may impact the bearing capacities provided above and should final foundation depths extend beyond say 1.0m, we recommend this report be referred back to Soiltechnics for reassessment.

7.1.7 **Tree species identification**

7.1.7.1 There are a number of large trees (some 16m in height) that line the eastern, northern and western boundaries and other major vegetation at the site. We recommend a qualified Arboriculturist (listed in the Arboricultural Association Directory of Consultants – www.trees.org.uk) be appointed to determine the location, height (and mature height) and water demand of all trees/major hedgerows at the site, information, which will be necessary to design foundations in accordance with NHBC Standards, Chapter 4.2.

7.2 **Artificial pitch foundations**

7.2.1 It is anticipated that the proposed artificial sports pitch will be located at or about existing ground levels with formation potentially located on Made Ground – Reworked Head deposits, Head or London Clay. We recommend that all Topsoil-type material, or cohesive soils which are likely to be impact by trees are fully removed from within the footprint of the proposed pitch.

7.2.2 TRL-DCP testing produced CBR values in the range of 5 to 25% at 300mm below current ground levels. Results are presented in Appendix E.

7.2.3 Equilibrium CBR (California Bearing Ratio) values (with reference to Transport and Road Research Laboratory (TRRL) Report LR1132 '*Structural design of Bituminous Roads*') are derived from knowledge of soil classification data (plasticity index for soils exhibiting cohesion (clay type) and particle size distribution for granular soils), the location of the water table pavement thickness, and weather conditions at the time of construction. It is anticipated that excavations to formation levels will encounter cohesive soils. Assuming an average plasticity index of say 20 for cohesive soils, a low water table, a 'thin' pavement the following equilibrium CBR values are derived for varying construction conditions.

Equilibrium CBR values for differing construction conditions		
Poor	Average	Good
CBR = 3%	CBR = 4%	CBR = 4%

Table 7.2.3

7.2.4 It is possible to derive the 'insitu' CBR value at formation from undrained shear strength data by applying a conversion factor of 23 (refer TRRL laboratory report LR889). Thus, adopting pessimistic undrained shear strength of say 100kN/m² at formation level (based on insitu shear strength measurements) then an equivalent CBR value can be obtained i.e.

$$\text{Insitu CBR} = \text{undrained shear strength } C / 23 = 4.3\%$$

7.2.5 The 'insitu' CBR derived above, is susceptible to change dependent upon weather conditions during construction. The equilibrium CBR value derived in the paragraph above is an estimate of the CBR value, which will predominate during the life of the pavement.

7.2.6 In view of all of the data above, we recommend a CBR of 5% be utilised for design purposes, based predominantly on results of PI and TRL-DCP testing results. This value should be reassessed immediately prior to construction. Soils at the site are considered frost susceptible and this may override the CBR criteria for pavement foundation design purposes. It should also be noted that the thickness of the pavement foundation also relates to the amount and loading from construction traffic, which is discussed in detail in the Transport and Road Research Laboratory (TRRL) Report LR1132 '*Structural design of Bituminous Roads*'.

7.2.7 The silty nature of the near surface soils will render them moisture susceptible with small increases in moisture content giving rise to a rapid loss of support to construction plant. We therefore recommend, as soon as formation is trimmed and rolled, that sub-base is laid in order to avoid deterioration of the subgrade in wet or frosty conditions.

7.3 Infiltration potential

7.3.1 The permeability of the soils was measured in two locations generally following the principles described in Building Research Establishment (BRE) Digest 365 (2016) *“Soakaway Design”*. It should be noted that testing has not been carried out strictly in accordance with the BRE publication, as this does not provide for calculating an infiltration rate in a borehole. We have adapted the BRE method and calculations in order to provide an indicative soil infiltration rate.

7.3.2 Our observations are summarised as follows:

Table of indicative infiltration rates					
Location	Cycle	Target unit	Depth range under test (m)	Infiltration (m/s)	rate
DTS01	1	Head	0.0-2.09	3.62*10 ⁻²	
	2		0.0-2.06	2.14*10 ⁻²	
	3		0.0-1.99	2.32*10 ⁻²	
DTS04	1	London Clay	0.07-1.74	2.89*10 ⁻²	
	2		0.0-1.74	2.38*10 ⁻²	
	3		0.23-0.87	4.55*10 ⁻²	

Table 7.3.2

7.3.3 The Head and London Clay soils were variable in composition across the site. More granular soils were targeted for infiltration testing. Based on the observations of the infiltration testing we are of the opinion that the near surface soils are considered capable of disposing of storm water via infiltration systems. Due to the potential variability in consistency of the Head and London Clay soils and as the granular London Clay may have limited continuity with the aquifer, we would recommend that full depth soakage tests are undertaken in location specific positions to confirm the infiltration rates determined above.

7.4 Sulphate classification

7.4.1 The hazard of sulphate attack is addressed by reference to procedures described in Building Research Establishment (BRE) Special Digest 1: 2005 *‘Concrete in Aggressive Ground’* to establish a design sulphate class (DS) and the *‘Aggressive Chemical Environment for Concrete’* (ACEC). These procedures have been followed during our investigation and are described in the following paragraphs.

7.4.2 The site is not considered a brownfield site. The near surface soils are deposits known to contain pyrites in some locations. Based on the above it is necessary to follow the procedures described in figure C4 (*‘natural ground sites where soils may contain pyrite’*).

7.4.3 A summary of the design sulphate class, characteristic value of pH and assessment of groundwater mobility is provided below which has been utilised to determine the ACEC classes for the Made Ground – Reworked Head, Head and the London Clay with reference to table C1 of SDI: 2005:

Summary of concrete classification						
Soil type	No. of samples	Characteristic pH	Groundwater mobility	Characteristic sulphate (mg/l)	DS class	ACEC class
Made Ground – Reworked Head	1	8	Mobile	10	DS-1	AC-1
Head	1	7.8	Mobile	10	DS-1	AC-1
London Clay	1	8	Mobile	10	DS-1	AC-1
Table reference 7.4.3						

8 Contamination issues

- 8.1 Development of the site as an artificial sports pitch significantly restricts pathways between potential contamination in the ground and end users. It is considered outside of our brief to provide a risk assessment with respect to environmental aspects. We can however make the following comments with respect to the risk of harm to human health from ground conditions encountered specific to construction operatives who are likely to come into contact with soils during the construction of the pitch.
- 8.2 Review of desk study information together with observations on site and intrusive investigations have not highlighted any potential sources of significant chemical contamination from historic or current site uses or ground conditions encountered.
- 8.3 For assessment of the risk to construction operatives, we have directly compared measured concentrations of metals and commonly occurring organic contaminants from two samples; one of surface Topsoil material and one of Made Ground - Reworked Head deposits with available published guideline values.
- 8.4 Copies of laboratory test result certificates are presented in Appendix G. Essentially, our comparison indicates that all measured concentrations fall below assessment criteria considered to be appropriate for construction operatives and thus the overall risk is considered to be low.

9 Evaluation of Topsoil test data

9.1 Topsoil assessment BS3882

- 9.1.1 Laboratory testing and analysis undertaken on four samples of the Topsoil indicate that the material is not fully compliant with the multipurpose range.
- 9.1.2 We recommend that potential purchasers or landscape consultants for the development site and any receiver site review this report together with the laboratory test result certificates presented in Appendix G to assess the suitability for use of the Topsoil on their specific site.

9.2 Recommendations for handling of topsoil

- 9.2.1 With reference to BS3882, some natural Topsoil, especially clayey and low organic matter might not be able to survive the handling involved in trading Topsoil. Minimal handling is therefore recommended to maintain its structure and composition, ideally only one move from stripping the subject site to an appropriate receiver site and avoiding stockpiling.
- 9.2.2 Where stockpiling cannot be avoided, these shall be tipped loosely and the surface firmed and shaped to shed water. Once excavated, Topsoil loses physical quality with diffusion of oxygen and biological activity reduced. It is recommended that Topsoil stockpiles are as low and narrow as possible with the Topsoil within 1m of the surface to allow sufficient diffusion of oxygen.
- 9.2.3 Where topsoil is to be stockpiled for more than 6 months, it is recommended that it is planted appropriate to its specific nature and intended use to maintain the soil structure and minimise weed colonisation.

10 Classification of waste soils for off-site disposal under Waste Acceptance Criteria

10.1 The Landfill Directive

10.1.1 The Landfill Directive represents an important change in the way we dispose of waste. It encourages waste minimisation by promoting increased levels of recycling and recovery. The Landfill Directive became law in 1999 and transcribed into the Landfill (England and Wales) Regulations which came into force in 2002. These Regulations were amended in 2005 by introducing criteria to classify soils for disposal to landfill. It is the duty of the waste producer (the client) to classify the soils for this purpose.

10.2 Classification of soil types

10.2.1 Our investigations consider two soil types which may be generated as wastes as part of construction operations, potentially contaminated soil and uncontaminated soil. A full hazard assessment and subsequent testing for waste acceptance criteria is undertaken on soils which are not considered to be naturally deposited or are likely to be affected by artificial contamination. For soils that are unlikely to be affected by artificial contamination (such as natural soils), specific testing in relation to the classification process is not necessary.

10.3 Waste acceptance criteria (WAC)

10.3.1 The Environment Agency publication, *'Framework for the classification of contaminated soils as hazardous wastes'* (July 2004), provides an appropriate procedure for establishing if the soils are hazardous or non-hazardous and applies to soils that are identified as potentially contaminated. Uncontaminated, natural soils are considered separately.

10.3.2 Primary classification

10.3.2.1 The first stage is classifying a potentially 'contaminated' soil for disposal to landfill is to establish its chemical status by first identifying potential sources/types of chemical contamination (desk study) followed by intrusive site investigations to obtain samples for undefined testing of soil samples to measure concentrations of chemical contaminants. Such data provides information to partly complete the basic characteristic checklist.

10.3.2.2 Laboratory test data is then compared with the Environment Agency publication '*hazardous waste – Interpretation of the definition and classification of hazardous waste (second edition, version 2.1)*'. Where the waste is suspected to contain oil, we have referred to the Environment Agency draft consultation paper '*How to Find Out if Waste Oil and Wastes that Contain Oil are Hazardous*' (Draft Version 2.5 – October 2006). With reference to these documents a hazard assessment has been carried out to enable categorisation of the material as hazardous or non-hazardous and to subsequently establish the European Waste Catalogue (EWC) code (ref Section 10.2.4 below).

10.3.3 Secondary classification

10.3.3.1 If the soil is deemed hazardous then measurement of organic contaminants and leachable inorganic contaminants is necessary for comparison with values listed in the Environment Agency publication '*Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures*' (April 2005) Table 5.1. Similarly should the soil be deemed as non-hazardous then such testing may also be undertaken to determine if it is potentially inert. This document also provides guidance on sampling materials and frequency as well as test procedures and quality assurance of testing.

10.3.3.2 The above procedures are described with respect to the subject site in the following sections Section 10.3 (primary) and 10.4 (secondary), leading to basic characterisation of soils for disposal. Subject to the results of the categorisation, and anticipated development methodology, consideration should be given by the developer to reduce volumes of disposal or treatment to allow reclassification.

10.3.4 European waste catalogue (EWC) coding

10.3.4.1 The EWC 2002 is a catalogue of all wastes, grouped according to generic industry, process or waste type. It is divided into twenty main chapters, each with a two digit code between 01 and 20. Following the EWC, in our opinion, soils considered as part of this investigation would be categorised within 'Group 17' of the EWC catalogue, which comprises 'Construction and Demolition Wastes (including excavated soils from contaminated sites)'.

10.3.4.2 The Catalogue further categorises the waste, such that soils considered as part of this investigation would be classified as either 17 05 04 defined as '*soil and stones (other than those mentioned in 17 05 03)*'; or 17 05 03* defined as soil or stones containing dangerous substances (where hazardous wastes are described by entries followed by an asterisk).

10.4 Primary classification

10.4.1 Soil types

10.4.1.1 Based on soils exposed in exploratory excavations, in combination with anticipated construction works, we assume soils requiring off-site disposal will comprise Topsoil, Made Ground, Head and London Clay generated from general site clearance for the proposed pitch, foundation and service trench excavations.

10.4.2 Classification as hazardous or non-hazardous waste

- 10.4.2.1 The Environment Agency publication '*Framework for the classification of contaminated soils as hazardous wastes*' (July 2004) provides the following procedure for establishing if the soils are hazardous or non-hazardous. The first stage in classifying a potentially 'contaminated' soil for disposal is to establish its chemical status by first identifying potential sources/types of chemical contamination (desk study) followed by intrusive site investigations to obtain samples for laboratory testing of soil samples to measure concentrations of chemical contaminants.
- 10.4.2.2 Based on our desk study and intrusive investigations, we have no evidence to identify any past or recent uses of the site or neighbouring sites which may have generated specific contamination. In order to carry out a qualitative assessment however, we have scheduled testing to measure the concentration of commonly occurring inorganic and organic contaminants. Copies of test result certificates are presented in Appendix G.
- 10.4.2.3 We have carried out an analysis of test data for each chemical contaminant considered in this investigation. A conservative approach has been adopted for the analysis whereby the maximum test value for each contaminant has been adopted as a preliminary screening process to determine if the soils are hazardous or non-hazardous. Should the analysis indicate potentially hazardous properties then a process of zoning by further analysing the site history, geological conditions and analytical data may be undertaken.
- 10.4.2.4 Laboratory test data measures the concentration of anions, which are unlikely to exist in the pure metallic form in the soil, but probably exist as a compound. Following guidance provided in the Environment Agency Technical Guidance WM3 '*Guidance on the classification and assessment of waste*' (2015), we have reviewed a variety of compounds for each of the metallic and semi metallic elements we have tested.
- 10.4.2.5 To determine the hazardous waste properties for each element, we have reviewed chemical compounds listed in Table 3.2 of Annex VI of the European Regulation (1272/2008) for Classification, Labelling and Packaging (CLP) of chemicals which has now superseded the Approved Supply List (Published by the Health and Safety Executive) for the classification of hazardous chemicals in the UK. In order to provide a 'worst case' scenario, initially we adopt the most severe hazardous properties (risk phrases) associated with the various compounds for each element under review. If measured concentrations produce a hazardous outcome then the element or elements are reassessed on a site specific basis. For review of organic contamination, we have directly adopted the threshold concentrations for the appropriate organic compounds listed in Table 3.2.
- 10.4.2.6 The compound or compounds adopted for each element is used to convert the measured metallic concentration to the substance concentration using their respective molecular weights. This derived conversion factor is then used in the threshold concentration spreadsheet (refer paragraph 10.3.2.8 below).

- 10.4.2.7 Our assessment of each of the chemical substances is maintained on our files and is available for confidential review/audit by the Environment Agency.
- 10.4.2.8 A spreadsheet detailing the hazard assessment following the procedures described in *'framework for the classification of contaminated soils as hazardous wastes'* is presented in Appendix I.
- 10.4.2.9 The spreadsheet indicates the soils are **non-hazardous**.

10.5 Secondary assessment

- 10.5.1 Following *'Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures'* produced by the Environment Agency (Version 1, April 2005) we have scheduled testing of **one** sample to measure the parameters listed in table 5.1 (landfill waste acceptance criteria) included in the above publication. A copy of the test result certificate is presented in Appendix J. The source of the composite sample(s) is detailed below:

Composition of soil samples for classification testing		
Strata	Source	Soil Type
Topsoil/ Reworked topsoil and Made Ground	DTS01 – 0.05-1m	Dark grey sandy silt with frequent rootlets and occasional brick fragments / greyish brown sandy/ gravelly silty clay with the gravel fraction comprising flint with occasional brick fragments.
	DTS02 – 0.1-1.4m	
	DTS03 - 0.1-0.8m	
	DTS04 – 0.1-0.2m	
	DTS05 - 0.1-0.4m	

Table 10.5.1

- 10.5.2 The sample was deemed representative of Topsoil and Made Ground soils as described in Section 5. The sample was formed by combining individual samples taken from exploratory excavations. The combined sample was then quartered in the laboratory to produce a representative sample for subsequent testing.
- 10.5.3 Laboratory test data has been compared with the landfill waste acceptable criteria (table 5.1) to allow the secondary assessment to be completed. A copy of table 5.1 is presented in Appendix I with test result data added for ease of comparison.
- 10.5.4 Comparison of test data with landfill waste acceptance criteria indicates that Made Ground soils are suitable for disposal as **non-hazardous waste**, but are not suitable for disposal as inert due to elevated mineral oils (C10-C40 range). It is considered likely that the high value may be from the organic matter noted in DTS02 which was blackened, indicating the material could be relict coal fragments or possible burnt organic material that has resulted in an elevated value. Such material was localised and thus appropriate segregation, stockpiling and re-testing of separate waste streams could enable reclassification and a possible reduction in classification of soils not impacted by mineral oil, to inert. We would be pleased to provide costings for the additional testing.

10.6 Naturally deposited soils not affected by artificial contaminants

- 10.6.1 With reference to the European Waste Catalogue and table 5.1 of the Environment Agency publication '*a better place – guidance for waste destined for disposal in landfills – version 2 June 2006*', naturally occurring soils not likely to be affected by contamination can be classified as inert waste, with a EWC code of 17 05 04. Should any of the naturally deposited soils be suspected to contain contamination (by virtue of visual or olfactory evidence) upon excavation, then such soils should be stockpiled appropriately and additional testing carried out as considered necessary. Based on evidence obtained during our investigations, we are of the opinion that the Head and London Clay deposits at the site are not likely to be affected by chemical contamination and thus can be classified as **inert waste**.

10.7 Basic categorisation

- 10.7.1 Based on the preceding assessment, we have produced **three** basic categorisation schedules relating to the Made Ground, Head and London Clay, which are presented in Appendix L. These schedules should be provided together with a copy of this report to an appropriately licensed landfill facility to demonstrate the material can be deposited at this facility.
- 10.7.2 We understand that some landfill sites have licences which have restrictions on concentrations of chemical contaminants, and thus we recommend this report is provided to the selected landfill facility to confirm (or otherwise) it can accept the waste. Please be aware that landfill sites are obligated to undertake in house quality assurance tests, and thus may require further WAC testing for any soils encountered as part of this investigation. There is no obligation on any landfill operator to accept waste if they choose not to and waste operators may require additional testing of untested waste soils prior to acceptance at landfill in accordance with the landfill regulations.

10.8 Treatment of waste

- 10.8.1 Treatment of wastes is now a requirement of the landfill directive applied by the Landfill (England and Wales) Regulations 2002. Landfill cannot accept untreated waste (be it hazardous or non-hazardous), thus waste producers have the choice of treating it themselves on site or treating it elsewhere prior to disposal to landfill. The regulations require:

'10 – (1) The operator of a landfill shall ensure that the landfill is only used for landfilling waste which is subject to prior treatment unless:

- a) It is inert waste for which treatment is not technically feasible; or*
- b) It is waste other than inert waste and treatment would not reduce its quantity or the hazards which it poses to human health or the environment.'*

10.8.2 Regulation 2 defines treatment as: *'physical, thermal, chemical or biological processes (including sorting) that change the characteristics of waste in order to reduce its volume or hazardous nature, facilitate its handling or enhance recovery.'*

10.8.3 A treatment option must comply with the definition of treatment. This involves a 'three point test' against which treatment is assessed i.e.

1. It must be a physical, thermal, chemical or biological process including sorting
2. It must change the characteristics of the waste: and
3. It must do so in order to:
 - a) Reduce its volume: or
 - b) Reduce its hazardous nature: or
 - c) Facilitate its handling: or
 - d) Enhance its recovery.

10.8.4 Treatment of inert wastes

10.8.4.1 Inert waste does not need to be treated if it is not technically feasible however treatment should reduce the amount of waste which goes to landfill and enhance its recovery (by re-use or recycling). Inert wastes are often suitable for recycling, for example as an aggregate or an engineering fill material. A fact sheet on treatment of inert wastes is available on the following website www.environment-agency.gov.uk

10.8.4.2 Clearly, excavations in the Head and White Chalk Subgroup (not affected by artificial contamination) will generate inert wastes which could be reused on site or off site for bulk filling, subject of course to maintenance of an acceptable water content and provided that it is fit for its intended purpose.

10.8.5 Treatment of non-hazardous waste

10.8.5.1 Guidance and indeed examples of treatment is provided in the Environment Agency publication *'Treatment of non-hazardous wastes for landfill - your waste – your responsibility,'* again available on the EA website.

10.8.6 Landfill operators

10.8.6.1 It is a requirement of the landfill operator to check if the waste soils taken to the facility have been treated.

10.9 Reuse of Soils - Materials Management Plans

10.9.1 Where soils are to be moved and reused onsite, or are to be imported to the site, a Waste Exemption or an Environmental Permit is required.

- 10.9.2 An alternative is the use of a Materials Management Plan (MMP) to determine where soils are and are not considered to be a waste. By following *'The Definition of Waste: Development Industry Code of Practice'* published by CL:AIRE (produced in 2008 and revised in March 2011), soils that are suitable for reuse without the need for remediation (either chemical or geotechnical) and have a certainty of use, are not considered to be waste and therefore do not fall under waste regulations. In addition, following this guidance may present an opportunity to transfer suitable material between sites, without the need for Waste Exemptions or Environmental Permits.
- 10.9.3 MMPs offering numerous benefits, including maximising the use of soils onsite, minimising soils going to landfill and reducing costs and time involved in liaising with waste regulators.
- 10.9.4 We can provide further advice on this and provide fees for producing a Materials Management Plan on further instructions.

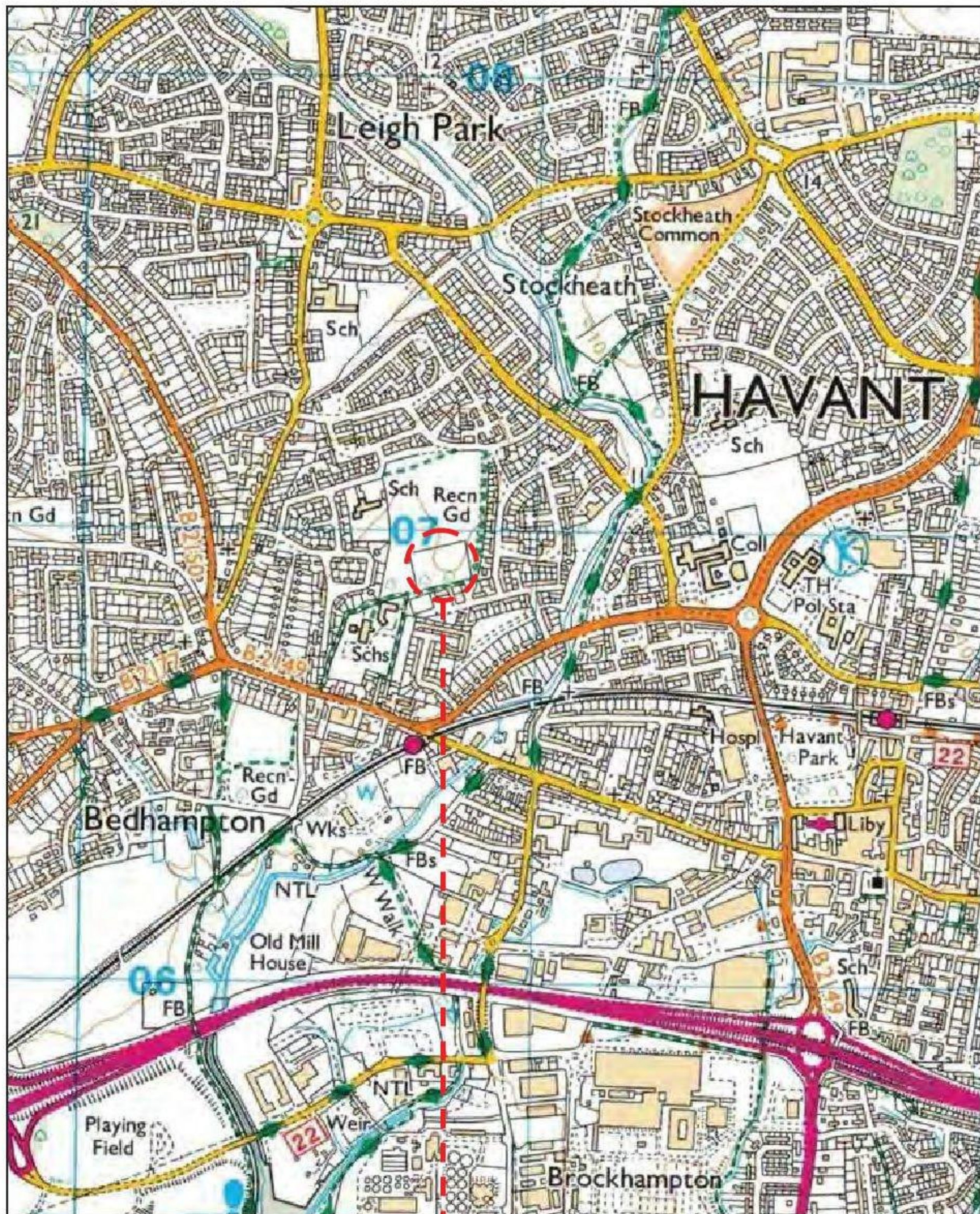
11 Further investigations

11.1 Further investigations

11.1.1 Although we have endeavoured to provide a comprehensive investigation for the proposed development within budgetary constraints, the following testing would enable refinement of the assessment:

- Additional sampling and testing of segregated Made Ground soils, in an attempt to limit the waste classification of some Made Ground waste streams to inert.
- Indicative infiltration tests suggest a high infiltration rate, but due to the variability in Head and London clay soils, full depth soakage tests are recommended to be undertaken in location specific positions to confirm the infiltration rates determined in the above report.
- Due to a decrease in observed soil strength with depth, should foundation depths be required to extend beyond 1.0m below existing ground levels, we recommend this report be referred back to Soiltechnics for reassessment of allowable bearing capacities.

11.2 We would be happy to provide costings for these additional works on further instruction.



Site location

Title

Site location plan

Scale

Not to scale

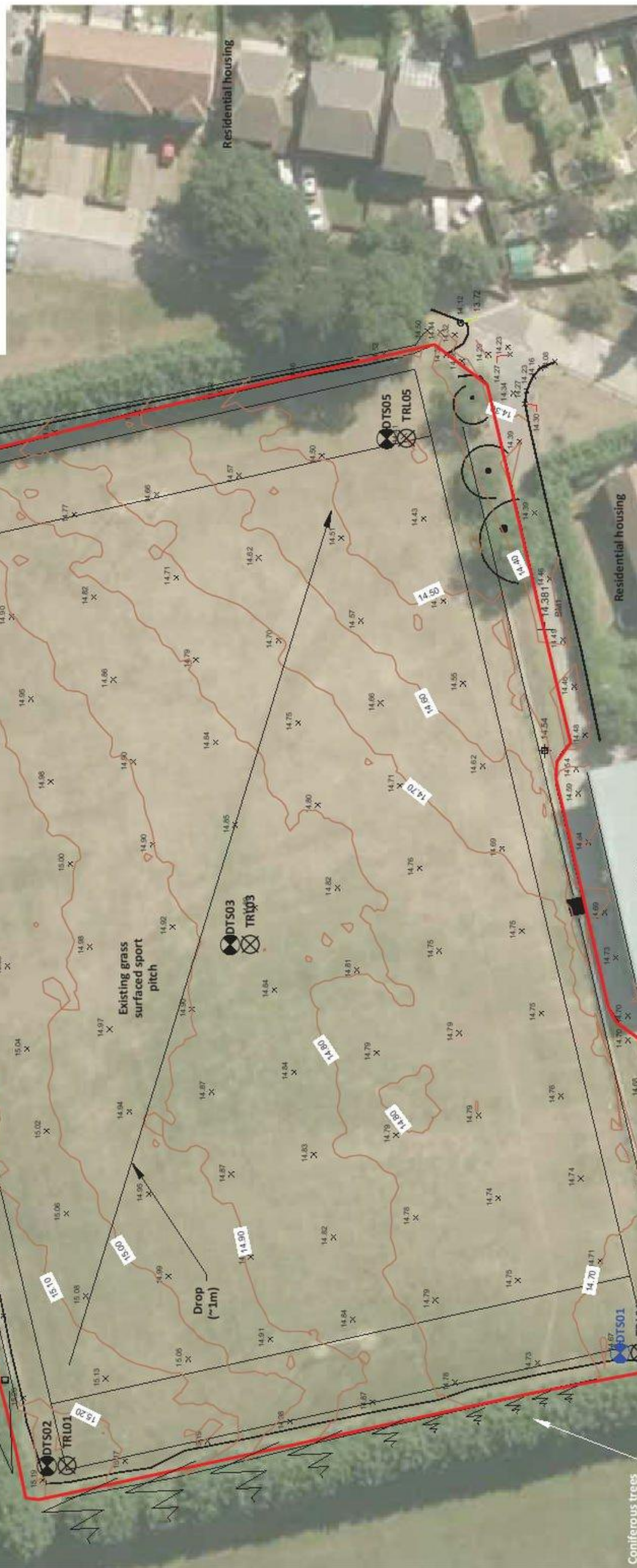
Drawing number

01



Key

- DTS Approximate location of borehole formed by Driven Tube Sampling techniques
- DTS Approximate location of borehole formed by Driven Tube Sampling techniques with infiltration testing
- TRL Approximate location of TRL testing



Drawing number

02

Scale

1:500 at A3

Title

Plan showing existing site features and location of exploratory points

Tennis courts

3 Storey height brick structure containing sports hall/clubhouse/changing rooms

Coniferous trees (~height 15m)

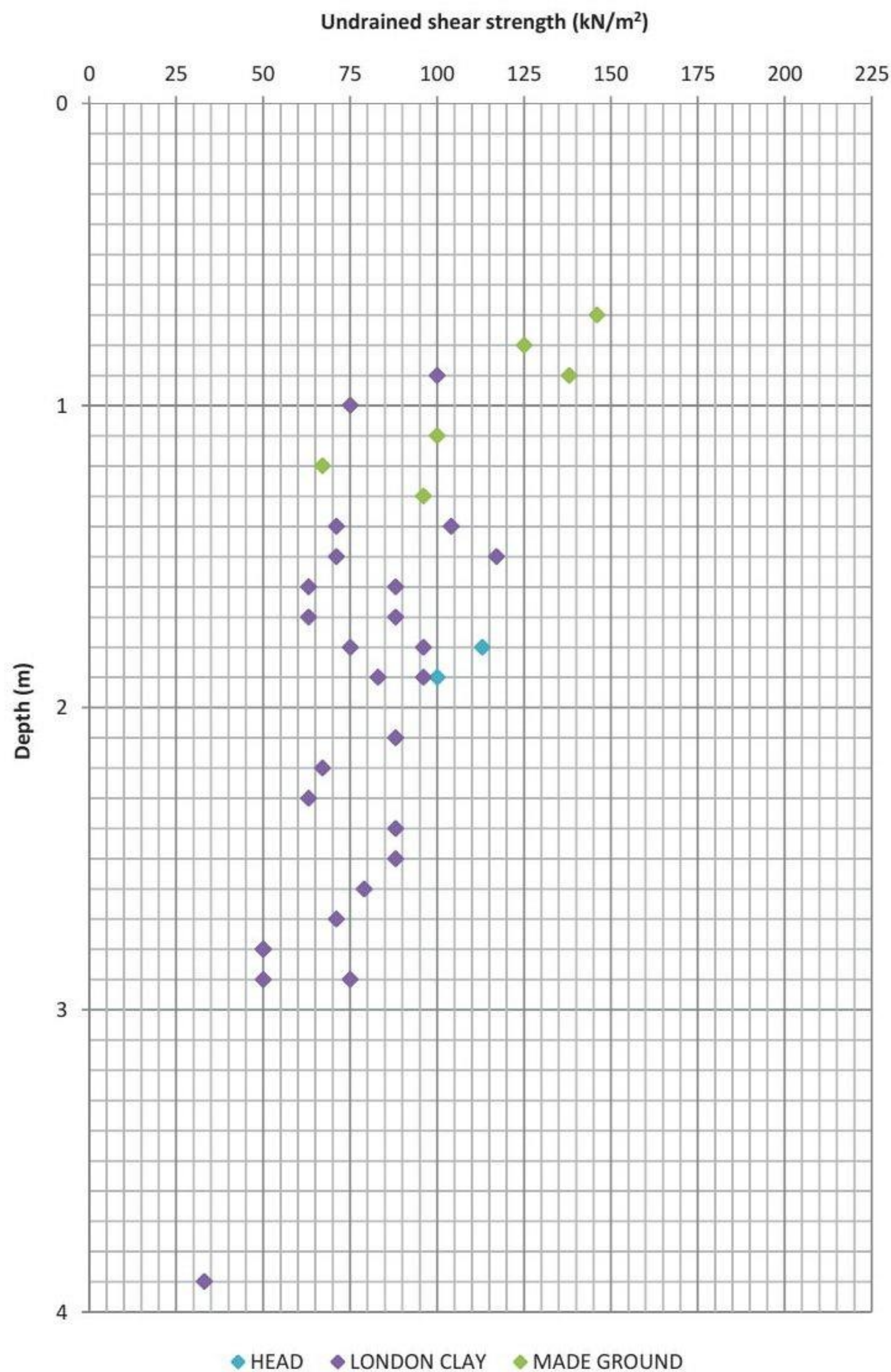
Existing grass surfaced sport pitch

Residential housing

Residential housing

Stand

Proposed artificial sports pitch, Havant RFC, Havant



Notes

- 1) Equivalent undrained shear strength derived by multiplying Pocket Penetrometer (PP) results by 50

Title

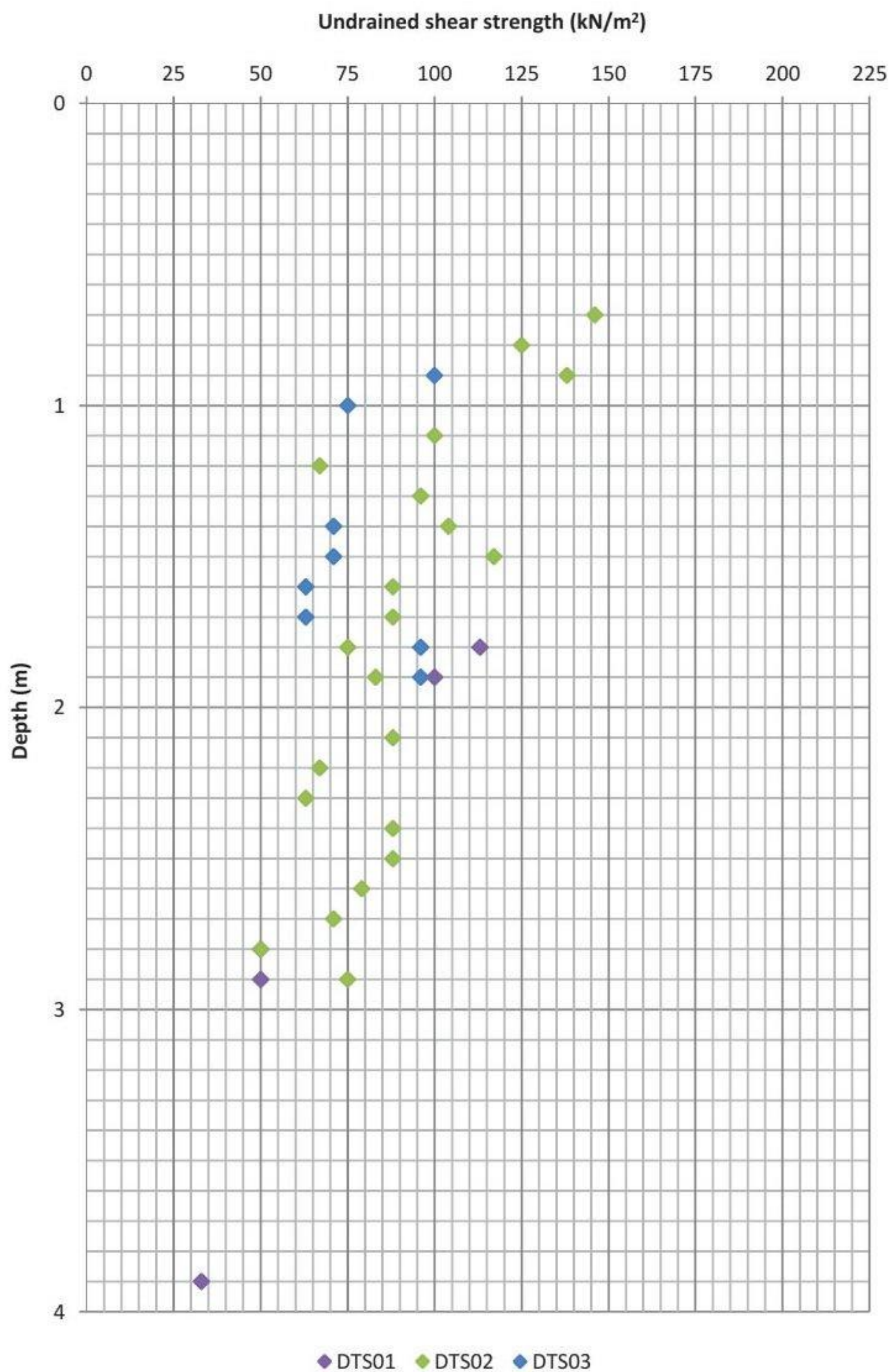
Plot summarising results of pocket penetrometer determinations by geology

Scale

As shown

Drawing number

03a



Notes

- 1) Equivalent undrained shear strength derived by multiplying Pocket Penetrometer (PP) results by 50

Title

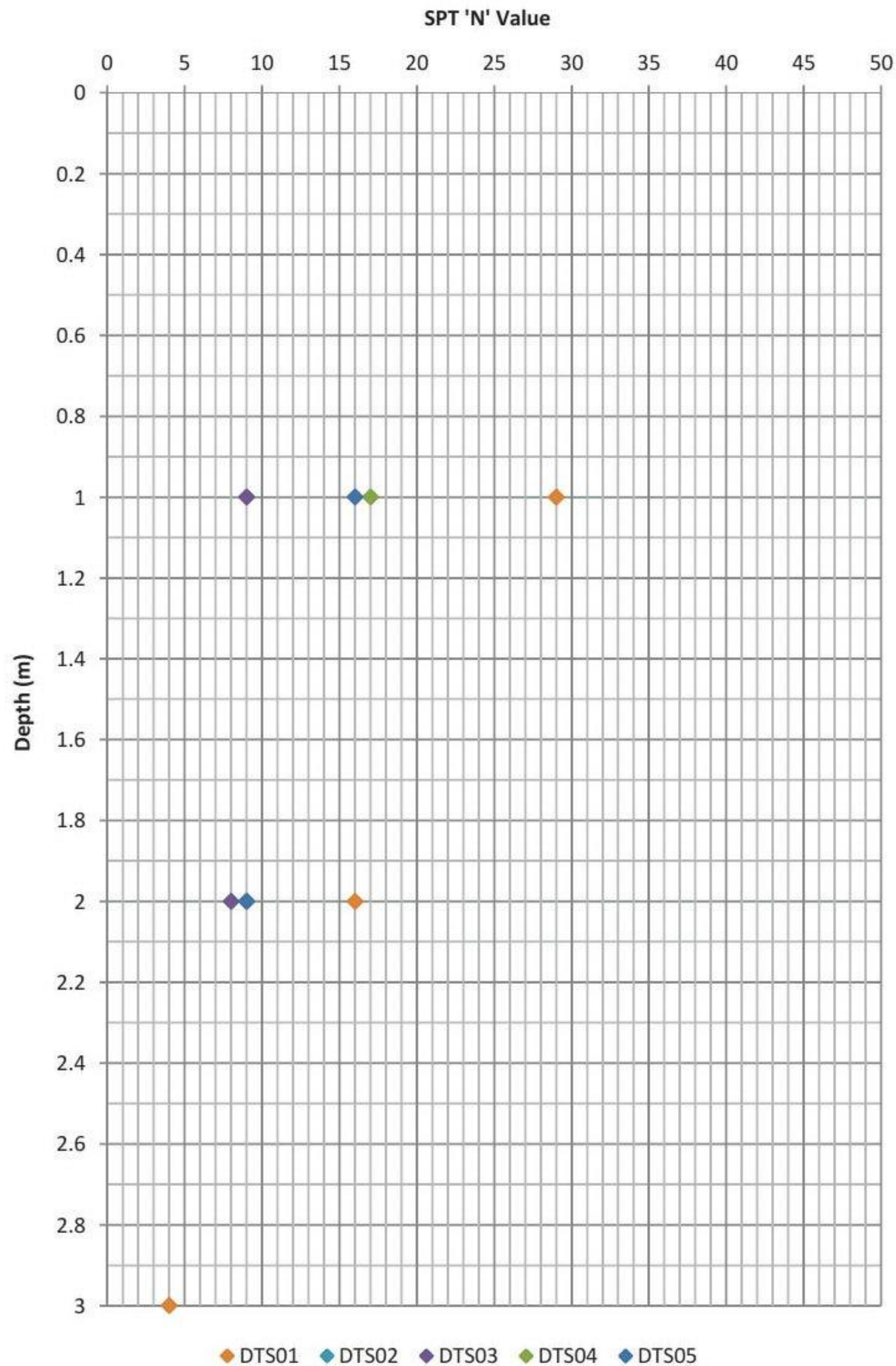
Plot summarising results of pocket penetrometer
determinations by location

Scale

As shown

Drawing number

03a



Title

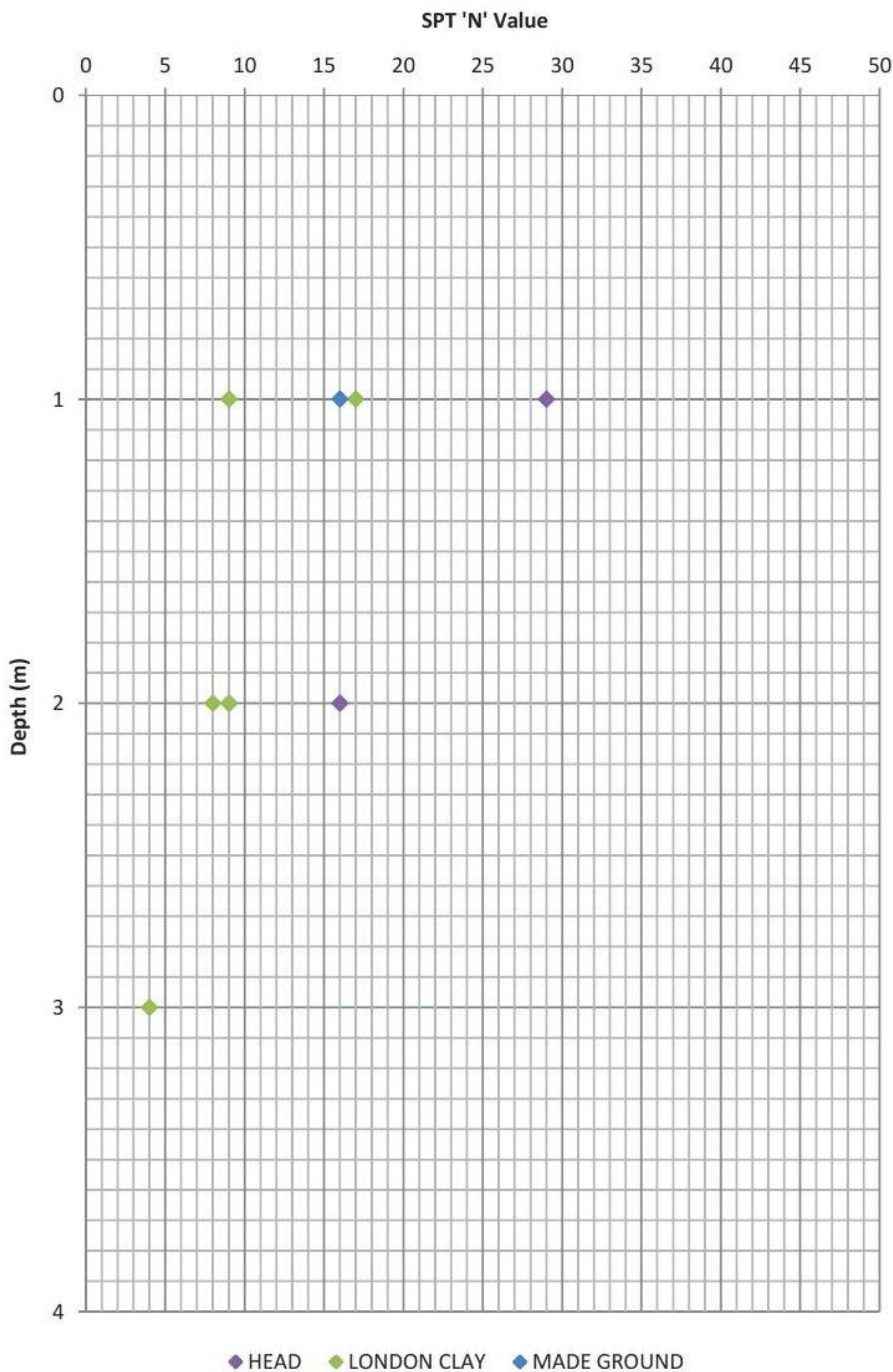
Plot summarising results of standard penetration test results
by location

Scale

As shown

Drawing number

04a



Title

Plot summarising results of standard penetration test results
by geology

Scale

As shown

Drawing number

04b

Definition of geotechnical terms used in this report - foundations

Strip foundations.

A foundation providing a continuous longitudinal ground bearing.

Trench fill concrete foundation.

A trench filled with mass concrete providing continuous longitudinal ground bearing.

Pad foundation.

An isolated foundation to spread a concentrated load.

Raft foundation.

A foundation continuous in two directions, usually covering an area equal to or greater than the base area of the structure.

Substructure.

That part of any structure (including building, road, runway or earthwork) which is below natural or artificial ground level. In a bridge this includes piers and abutments (and wing walls), whether below ground level or not, which support the superstructure.

Piled foundations and end bearing piles. A pile driven or formed in the ground for transmitting the weight of a structure to the soil by the resistance developed at the pile point or base and the friction along its surface. If the pile supports the load mainly by the resistance developed at its point or base, it is referred to as an end-bearing pile; if mainly by friction along its surface, as a friction pile.

Bored cast in place pile.

A pile formed with or without a casing by excavating or boring a hole in the ground and subsequently filling it with plain or reinforced concrete.

Driven pile.

A pile driven into the ground by the blows of a hammer or a vibrator.

Precast pile.

A reinforced or prestressed concrete pile cast before driving.

Driven cast in place pile.

A pile installed by driving a permanent or temporary casing, and filling the hole so formed with plain or reinforced concrete.

Displacement piles.

Piled formed by displacement of the soil or ground through which they are driven.

Skin friction.

The frictional resistance of the surrounding soil on the surface of cofferdam or caisson walls, and pile shafts.

Downdrag or negative skin friction. A downwards frictional force applied to the shaft of a pile caused by the consolidation of compressible strata, e.g. under recently placed fill. Downdrag has the effect of adding load to the pile and reducing the factor of safety.

Definition of geotechnical terms used in this report – bearing values

Ultimate bearing capacity.

The value of the gross loading intensity for a particular foundation at which the resistance of the soil to displacement of the foundation is fully mobilised.

Presumed bearing value.

The net loading intensity considered appropriate to the particular type of ground for preliminary design purposes. The particular value is based on calculation from shear strength tests or other field tests incorporating a factor of safety against shear failure.

Allowable bearing pressure.

The maximum allowable net loading intensity at the base of the foundation, taking into account the ultimate bearing capacity, the amount and kind of settlement expected and our estimate of ability of the structure to accommodate this settlement.

Factor of safety.

The ratio of the ultimate bearing capacity to the intensity of the applied bearing pressure or the ratio of the ultimate load to the applied load.

Definition of geotechnical terms used in this report – road pavements

The following definitions are based on Transport and Road Research Laboratory (TRRL) Report LR1132.

Equilibrium CBR values.

A prediction of the CBR value, which will be attained under the completed pavement.

Thin pavement.

A thin pavement (which includes both bound and unbound pavement construction materials 1 in 300mm thick and a thick pavement is 1200mm thick (typical of motorway construction).

Definition of geo-environmental terms used in this report

Conceptual model

Textual and/or schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information obtained from the investigatory process.

Contamination

Presence of a substance which is in, on or under land, and which has the potential to cause harm or to cause pollution of controlled water.

Controlled water

Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three mile limit of territorial waters.

Harm

Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of humans, including property.

Pathway

Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.

Receptor

Persons, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by the contaminant(s).

Risk

Probability of the occurrence of, and magnitude of the consequences of, an unwanted adverse effect on a receptor.

Risk Assessment

Process of establishing, to the extent possible, the existence, nature and significance of risk.

Definition of environmental risk/hazard terms used in this report.

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice*'.

Potential hazard severity definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non sensitive ecosystems or species.

Probability of risk definition

Category	Definition
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

Level of risk for potential hazard definition

Probability of risk	Potential severity			
	Severe	Medium	Mild	Minor
High Likelihood	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low Likelihood	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very low	Very low

Refer sheet 2 for definitions of 'very high' to 'low'

Definition of environmental risk/hazard terms used in this report.

Based on CIRIA report C552 '*Contaminated land risk assessment – A guide to good practice*'.

Risk classifications and likely action required:

Very high risk

High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk

Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk

It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk

It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk

It is a low possibility that harm could arise to a designated receptor. On the event of such harm being realised it is not likely to be severe.

List of documents used in assessment of chemical contamination

No.	Title	Publication reference / publisher
1	Human health toxicological assessment of contaminants in soil	EA Science Report – SC050021/SR2
2	Updated technical background to the CLEA model	EA Science Report – SC050021/SR3
3	CLEA Software (Version 1.03 beta) Handbook	EA Science Report - SC050021/SR4
4	Guidance on comparing Soil Contamination Data with a Critical Concentration	CIEH
5	The LQM/CIEH S4ULs for Human Health Risk Assessment (2015)	LQM/CIEH
6	Assessment of Risks to Human Health from Land Contamination: An overview of the development of soil guideline values and related research	R&D Publication, Contaminated Land Report CLR 7
7	Contaminants of Soil: Collation of Toxicological Data and Intake Values for Humans	R&D Publication, Contaminated Land Report CLR 9
8	The Contaminated Land Exposure Assessment Model (CLEA): Technical Basis and Algorithms	R&D Publication, Contaminated Land Report CLR 10
9	Model Procedures for the Management of Land Contamination	R&D Publication, Contaminated Land Report CLR 11
10	Contaminants in Soil: Collection of Toxicological Data and Intake Values for Human Values	R&D Publications, Tox. 6
11	Soil Guideline Values for Contamination (2002)	R&D Publications, SGV 10
12	Soil Guideline Values (2009)	EA Science Reports – SC050021
13	Atkins ATRISK ^{SOIL} (2011)	http://www.atrisksoil.co.uk
14	Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination (September 2014)	CL:AIRE

CIEH Chartered institute of Environmental Health
 LQM Land Quality Management
 EA Environment Agency
 CL:AIRE Contaminated Land: Applications in Real Environments

Testing suite summary

Table summarising testing suites		
Suite	Parameters	Medium
Suite 1	Arsenic, beryllium, boron, cadmium, chromium (total and VI), copper, lead, mercury, nickel, selenium, vanadium zinc, cyanide (free, total and complex), organic matter content, PAH (16 speciated), pH, phenol (total), TOC	Soil
Suite 2	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Leachate
Suite 3	Arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, PAH (16 speciated), pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Water
Suite 4	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated), TOC	Soil
Suite 5	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated)	Leachate
Suite 6	TPH Texas Banding Aliphatic/Aromatic Split, PAH (16 speciated)	Water
Suite 7	TPH Texas Banding Aliphatic/Aromatic Split, TOC, organic matter	Soil
Suite 8	Sulphur (total), sulphate (water and acid soluble), pH	Soil
Suite 9	Sulphate, ammoniacal nitrogen, dissolved magnesium, pH	Water
Suite 10	VOC, SVOC, TOC, organic matter	Soil
Suite 11	VOC, SVOC	Leachate
Suite 12	VOC, SVOC	Water
Suite 13	Organotins dibutyltin/ tributyl-tin/tetrabutyltin/triphenyl-tin, Tetraethyl-lead/tetramethyl-lead	Soil
Suite 14	Organotin	Leachate
Suite 15	Organotin	Water
Suite 16	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, VOC, SVOC	Soil, water, leachate
Suite 17	TPH Texas Banding Aliphatic/Aromatic Split, BTEX, SVOC, VOC, arsenic, boron (water soluble), beryllium, cadmium, chromium (total), copper, lead, mercury, nickel, selenium, vanadium, zinc, cyanide (free, total and complex, pH, phenol (total), sulfate (water soluble), sulfide, nitrate	Soil, water, leachate
Concrete BRE suite	pH, sulphate (water and acid soluble), magnesium (water soluble), ammonia (water soluble), chloride, nitrate	Soil

Summary log for dynamic probing

Dynamic Probing Test Number: DTS02

Easting:

Northing:

Ground level (mAOD):

Date of test: 05/09/2017

Cone type:

Anvil type: Fixed

Type of dynamic probing: V

Manufacturer:

Model:

Model Number:

Equipment checked and in accordance with EN ISO 22476-2, 5.1:

Record of measured values and test results for dynamic probing:

Increment (m)												
Run (m)		Torque	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
	0-1	-	1	2	3	3	3	4	2	2	2	2
	1-2	0	2	1	1	1	1	1	1	1	1	1
	2-3	30	1	2	1	1	1	1	1	1	1	1
	3-4	30	1	1	1	1	2	2	4	3	3	5
	4-5	15	5	3	3	3	2	4	4	3	4	4
	5-6	45										
	6-7											
	7-8											
	8-9											
	9-10											

Reason(s) for early end of test (if applicable):

Title

Summary of dynamic probing log for location DTS02

Appendix

C

Summary log for dynamic probing

Dynamic Probing Test Number: DTS04

Easting:

Northing:

Ground level (mAOD):

Date of test: 05/09/2017

Cone type:

Anvil type: Fixed

Type of dynamic probing: V

Manufacturer:

Model:

Model Number:

Equipment checked and in accordance with EN ISO 22476-2, 5.1:

Record of measured values and test results for dynamic probing:

Increment (m)												
Run (m)		Torque	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
	0-1	-	0	1	4	5	7	10	9	4	3	6
	1-2	25	6	4	4	3	3	3	5	3	3	4
	2-3	40	4	4	2	2	3	2	2	2	2	2
	3-4	15	1	1	2	2	2	2	2	2	2	3
	4-5	15	3	3	2	3	3	3	4	5	4	5
	5-6	0										
	6-7											
	7-8											
	8-9											
	9-10											

Reason(s) for early end of test (if applicable):

Title

Summary of dynamic probing log for location DTS04

Appendix

C

Summary log for dynamic probing

Dynamic Probing Test Number: DTS05

Easting:

Northing:

Ground level (mAOD):

Date of test: 05/09/2017

Cone type:

Anvil type: Fixed

Type of dynamic probing: V

Manufacturer:

Model:

Model Number:

Equipment checked and in accordance with EN ISO 22476-2, 5.1:

Record of measured values and test results for dynamic probing:

Increment (m)												
Run (m)		Torque	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
	0-1	-	2	3	3	3	3	3	4	6	13	18
	1-2	55	17	11	5	2	2	2	3	3	4	3
	2-3	20	3	3	2	3	3	3	2	2	2	2
	3-4	20	2	3	2	3	3	3	2	3	3	3
	4-5	30	3	4	4	4	3	4	5	4	5	5
	5-6	0										
	6-7											
	7-8											
	8-9											
	9-10											

Reason(s) for early end of test (if applicable):

Title

Summary of dynamic probing log for location DTS05

Appendix

C

Pocket Penetrometer Results

Location	Depth (m)	Results				Undrained Shear Strength (kN/m ²)	Strength Term	Strata
		1	2	3	Av.			
DTS01	1.8	2	1.75	3	2.3	113	High	HEAD
	1.9	2	2.5	1.5	2.0	100	High	HEAD
	2.8	1	1	1	1.0	50	Medium	LONDON CLAY
	2.9	1	1	1	1.0	50	Medium	LONDON CLAY
	3.9	0.5	0.75	0.75	0.7	33	Low	LONDON CLAY
DTS02	0.7	2.76	2.5	3.5	2.9	146	High	MADE GROUND - REWORKED HEAD
	0.8	2.75	2.25	2.5	2.5	125	High	MADE GROUND - REWORKED HEAD
	0.9	2.5	3	2.75	2.8	138	High	MADE GROUND - REWORKED HEAD
	1.1	2.5	1.75	1.75	2.0	100	High	MADE GROUND
	1.2	1.5	0.75	1.75	1.3	67	Medium	MADE GROUND
	1.3	2.25	1.5	2	1.9	96	High	MADE GROUND
	1.4	2	2.5	1.75	2.1	104	High	LONDON CLAY
	1.5	2.25	2	2.75	2.3	117	High	LONDON CLAY
	1.6	1.75	1.75	1.75	1.8	88	High	LONDON CLAY
	1.7	1.75	1.75	1.75	1.8	88	High	LONDON CLAY
	1.8	1.25	1.25	2	1.5	75	High	LONDON CLAY
	1.9	1.75	1.75	1.5	1.7	83	High	LONDON CLAY
	2.1	1.75	1.75	1.75	1.8	88	High	LONDON CLAY
	2.2	1.5	1.25	1.25	1.3	67	Medium	LONDON CLAY
	2.3	1.25	1.25	1.25	1.3	63	Medium	LONDON CLAY
	2.4	2	1.5	1.75	1.8	88	High	LONDON CLAY
	2.5	1.5	2	1.75	1.8	88	High	LONDON CLAY
	2.6	1.75	1.75	1.25	1.6	79	High	LONDON CLAY
	2.7	1.75	1.25	1.25	1.4	71	Medium	LONDON CLAY
	2.8	1.25	0.75	1	1.0	50	Medium	LONDON CLAY
	2.9	2	1.25	1.25	1.5	75	High	LONDON CLAY
DTS03	0.9	1.75	2	2.25	2.0	100	High	LONDON CLAY
	1	1.5	1.5	1.5	1.5	75	High	LONDON CLAY
	1.4	1.5	1.25	1.5	1.4	71	Medium	LONDON CLAY

Notes

1. Pocket penetrometer determinations converted to undrained shear strength using a factor of 50.
2. Undrained shear strength is based on average pocket penetrometer determination.
3. Strength terms in accordance with BS EN ISO 14688-2 2004.

Title

Table summarising results of pocket penetrometer determinations

Appendix

C

[illegible]

1. Pocket penetrometer determinations converted to undrained shear strength using a factor of 50.
2. Undrained shear strength is based on average pocket penetrometer determination.
3. Strength terms in accordance with BS EN ISO 14688-2 2004.

Appendix

C

Standard Penetration Test Results

Location	Depth to top of SPT (m)	Results								Penetration (mm)			
		Seating 1	Seating 2	Main 1	Main 2	Main 3	Main 4	Total Seating	Total Main	Total Seating	Total Main	Relative Density	Strata
DTS01	1	5	5	6	8	8	7	10	29	150	300		HEAD
DTS01	2	3	2	3	4	4	5	5	16	150	300		HEAD
DTS01	3	1	0	1	1	1	1	1	4	150	300	Loose	LONDON CLAY
DTS02	2	1	1	2	2	2	3	2	9	150	300		LONDON CLAY
DTS03	1	1	2	2	2	2	3	3	9	150	300		LONDON CLAY
DTS03	2	3	2	2	2	2	2	5	8	150	300		LONDON CLAY
DTS04	1	3	4	4	4	4	5	7	17	150	300	Medium dense	LONDON CLAY
DTS05	1	8	9	7	4	2	3	17	16	150	300	Medium dense	MADE GROUND - REWORKED HEAD
DTS05	2	2	1	2	2	2	3	3	9	150	300	Loose	LONDON CLAY

Notes

1) Relative Density in accordance with BS 5930 2015 - Table 10 for granular soils only.

Title	Appendix
Table summarising results of standard penetration testing	C

Key to legends

Composite materials, soils and lithology

	Topsoil		Made Ground		Boulders
	Chalk		Clay		Coal
	Cobbles		Cobbles & Boulders		Concrete
	Gravel		Limestone		Mudstone
	Peat		Sand		Sand and Gravel
	Sandstone		Silt		Silt / Clay
					Siltstone

Note: Composite soil types are signified by combined symbols.

Key to 'test results' and 'sampling' columns

Test result		Sampling	
Depth	Records depth that the test was carried out (i.e.: at 2.10m or between 2.10m and 2.55m)	From (m) To (m)	Records depth of sampling
Result	PID - Photo Ionisation Detector result (ppm equivalent Isobutylene)		D Disturbed sample
	PP - Pocket penetrometer result (kN/m ²)		B Bulk disturbed sample
	HVP - Hand held shear vane result (kN/m ²)		ES Environmental sample comprising plastic and/or glass container
	PP result converted to an equivalent undrained shear strength by applying a factor of 50. Where at least 3 results obtained at same depth then an average value may be reported.	Type	W Water sample
	SPT - Standard Penetration Test result (uncorrected)		U (32) Undisturbed sample 100mm diameter sampler with number of blows of driving equipment required to obtain sample
	SPT(c) - Standard Penetration Test result (solid cone) (uncorrected)		

Water observations

Described at foot of log and shown in the 'water strike' column.

= water level observed after specified delay in drilling

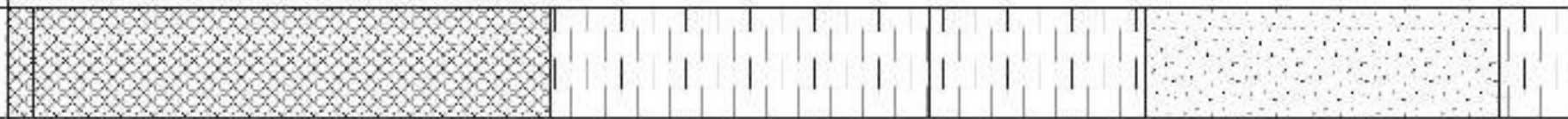
= water strike

Standpipe details

	Gravel filter		Arisings
	Bentonite		
	Slotted pipe		
	Unslotted pipe		

Density

Density recorded in brackets inferred from density testing and soil descriptions from across the site (i.e.: [Medium dense]).

WELL	STRATA			WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING			
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)		LEGEND	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto dark grey sandy SILT with frequent rootlets. (MADE GROUND - REWORKED TOPSOIL) Very stiff greyish brown slightly sandy gravelly silty CLAY. Gravel consists of sub-angular to sub-rounded fine to coarse flint and occasional brick fragments. (MADE GROUND - REWORKED HEAD)	0.05									0.10	0.20	D	
												0.20	0.50	D
												0.30	0.60	D
												0.50	0.60	D
		1.00				S 1.00-1.45	(10) 29	1.00				1.10	1.20	D
		1.70												
	Stiff very high strength orangish brown slightly sandy slightly gravelly CLAY. Gravel consists of rounded to sub-rounded fine to coarse flint. (HEAD)				S 2.00-2.45	(5) 16	1.00				1.80	1.90	D	
	Medium dense orangish brown occasionally speckled black SAND. (LONDON CLAY)	2.10									2.20	2.40	D	
	Firm to stiff medium strength orangish brown mottled light grey sandy CLAY. (LONDON CLAY)	2.75												
											2.80	2.90	D	
CONTINUED ON NEXT SHEET														

Key	Notes	Title				
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer test SV Shear Vane test PID Photo Ionisation Detector test	Large coniferous trees some 3.3m to the west of borehole position. UXO specialist in attendance. Infiltration testing undertaken within borehole. No evidence (staining or odour) of contamination observed. Driven tube collapsed to 2.3m depth upon completion.	Recovery details		Method	Logged by	
		Range (m)	Recovery (%)	Driven tube sampler	SJF	
		0.00 - 1.00	100	Level (m OD)	Compiled by	
		1.00 - 2.00	100			
	2.00 - 3.00	80				
	3.00 - 4.00	100	Co-ordinates	Checked by		
	Groundwater observations		470739mE, 106878mN			
	Groundwater seepage from 2-2.75m depth. Groundwater inflow encountered from 3-3.8m depth. Groundwater standing at 2.21m 30 minutes after completion.		DTS01			
	Report ref: STP4148D-G01		Revision: 0			

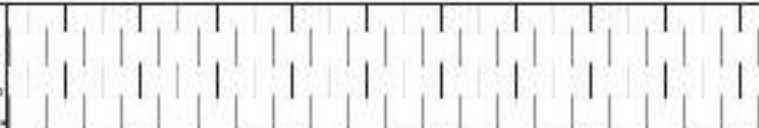
WELL	STRATA				WATER STRIKES	SPT TESTING				OTHER IN SITU TESTING		SAMPLING										
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE								
	Firm to stiff medium strength orangish brown mottled light grey sandy CLAY. (LONDON CLAY)	3.00			S 3.00-3.45	(1) 4	1.00				3.10	3.30	D									
	Loose orangish brown occasionally speckled black SAND. (LONDON CLAY)																					
	Soft to firm low strength orange brown mottled light grey sandy CLAY. (LONDON CLAY)	3.80																PP 3.90	PP=33	3.90	4.00	D
	BOREHOLE TERMINATED AT 4.00m					4.00																

Key		Notes	Title			
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) pp Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test		Large coniferous trees some 3.3m to the west of borehole position. UXO specialist in attendance. Infiltration testing undertaken within borehole. No evidence (staining or odour) of contamination observed. Driven tube collapsed to 2.3m depth upon completion. Groundwater observations Groundwater seepage from 2-2.75m depth. Groundwater inflow encountered from 3-3.8m depth. Groundwater standing at 2.21m 30 minutes after completion.	Driven tube sampler record			
			Recovery details		Method	Logged by
			Range (m)	Recovery (%)	Driven tube sampler	SJF
			0.00 - 1.00	100	Level (m OD)	Compiled by
			1.00 - 2.00	100		
2.00 - 3.00	80					
3.00 - 4.00	100	Co-ordinates	Checked by			
			470739mE, 106878mN			
Report ref: STP4148D-G01		Revision: 0				
		DTS01				

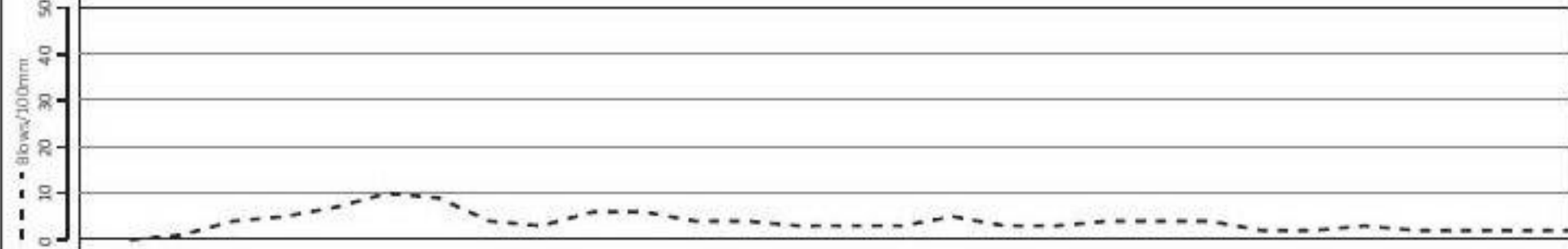
WELL	STRATA			WATER STRIKES	DYNAMIC PROBING		SPT TESTING			OTHER IN SITU TESTING		SAMPLING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)		LEGEND	0 10 20 30 40 50 Blows/100mm	TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	Grass onto dark grey sandy SILT with frequent rootlets. (MADE GROUND - REWORKED TOPSOIL)	0.15										0.05	0.15	D																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	Very stiff very high strength becoming high strength greyish brown slightly sandy gravelly silty CLAY. Gravel consists of sub-angular to sub-rounded fine to coarse flint and occasional brick fragments. (MADE GROUND - REWORKED HEAD)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													

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Key D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core Sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector Test	Notes UXO specialist in attendance. No evidence (staining or odour) of contamination observed. Driven tube remained upright and stable upon completion. Groundwater observations No groundwater encountered.	Title Driven tube sampler record	Recovery details Range (m) Recovery (%) 0.00 - 1.00 100 1.00 - 2.00 100 2.00 - 3.00 95	Method Driven tube sampler	Logged by SJF	Date(s) 05/09/2017	Sheet number Sheet 2 of 2	Checked by DTS02	Revision: 0
--	--	--	--	--	---	--	---	--	---

WELL	STRATA				WATER STRIKES	SPT TESTING			OTHER IN SITU TESTING		SAMPLING			
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND		TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE
	Grass onto dark grey sandy SILT with frequent rootlets. (MADE GROUND - REWORKED TOPSOIL)	0.20									0.10	0.20	D	
	Greyish brown clayey sandy GRAVEL. Gravel consists of sub-angular to sub-rounded fine to coarse flint. (MADE GROUND - REWORKED HEAD)	0.50									0.50	0.60	D	
	Orangish brown slightly clayey sandy GRAVEL. Gravel consists of sub-angular to sub-rounded fine to coarse flint. (HEAD)	0.80												
	Firm to stiff medium to high strength orangish brown mottled light grey sandy CLAY. Very sandy and occasionally mottled red from 0.8m - 1.2m depth. (LONDON CLAY)					S 1.00-1.45 (3) 9				PP 0.90 PP 1.00	PP=100 PP=75	0.90 1.00	1.00	D D
			2.00				S 2.00-2.45 (5) 8			PP 1.40 PP 1.50 PP 1.60 PP 1.70 PP 1.80 PP 1.90	PP=71 PP=71 PP=63 PP=63 PP=96 PP=96	1.30 1.40	1.40	D
	BOREHOLE TERMINATED AT 2.00m													

Key	Notes	Title			
		Driven tube sampler record			
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test	UXO specialist in attendance. No evidence (staining or odour) of contamination observed. Driven tube remained upright and stable upon completion.	Recovery details		Method	Logged by
Groundwater observations No groundwater encountered.		Range (m)	Recovery (%)	Driven tube sampler	SJF
		0.00 - 1.00	100	Level (m OD)	Compiled by
		1.00 - 2.00	80	Co-ordinates 470787mE, 106924mN	SJF Checked by
Report ref: STP4148D-G01		Date(s) 05/09/2017			Sheet number Sheet 1 of 1
		DTS03			
Revision: 0					

WELL	STRATA				WATER STRIKES	DYNAMIC PROBING	SPT TESTING				OTHER IN SITU TESTING		SAMPLING			
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND			TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)	TYPE	
	Grass onto dark grey slightly gravelly sandy SILT with frequent rootlets. Gravel consists of sub-angular fine to coarse flint. (MADE GROUND - REWORKED TOPSOIL) Very stiff greyish brown slightly sandy gravelly silty CLAY. Gravel consists of sub-angular to sub-rounded fine to coarse flint. (MADE GROUND - REWORKED HEAD)	0.20									0.10	0.20	D			
													0.30	0.40	D	
		0.60											0.70	0.80	D	
	Medium dense orangish brown clayey SAND. (LONDON CLAY)												1.10	1.40	D	
													1.70	1.90	D	
													2.10	2.30	D	

... from 2m depth becoming mottled grey and very clayey.

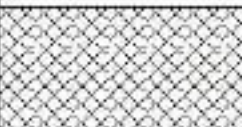
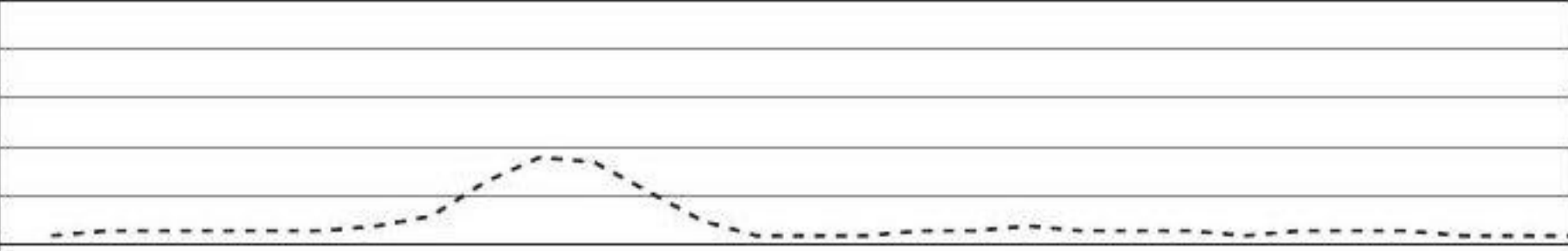
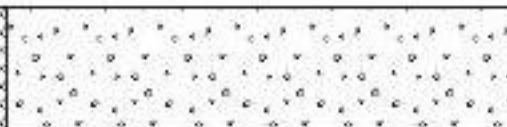
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Key		Notes		Title				
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test		UXO specialist in attendance. No evidence (staining or odour) of contamination observed. Infiltration testing undertaken. Driven tube remained upright and stable upon completion.		Driven tube sampler record				
				Recovery details		Method	Logged by	Date(s)
		Groundwater observations		Range (m)	Recovery (%)	Driven tube sampler	SJF	05/09/2017
				0.00 - 1.00	100	Level (m OD)	Compiled by	Sheet number
				1.00 - 2.00	100			
		2.00 - 3.00	100	Co-ordinates	Checked by			
				470830mE, 106969mN				
Report ref: STP4148D-G01						Revision: 0		
						DTS04		

WELL	STRATA				WATER STRIKES	DYNAMIC PROBING	SPT TESTING				OTHER IN SITU TESTING		SAMPLING	
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND			TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)
	Medium dense orangish brown clayey SAND. (LONDON CLAY)	3.00				0 10 20 30 40 50								

Key	Notes	Title			
		Driven tube sampler record			
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test	UXO specialist in attendance. No evidence (staining or odour) of contamination observed. Infiltration testing undertaken. Driven tube remained upright and stable upon completion.	Recovery details		Method	Logged by
		Range (m)	Recovery (%)	Driven tube sampler	SJF
	Groundwater observations No groundwater encountered.	0.00 - 1.00	100	Level (m OD)	Compiled by SJF
		1.00 - 2.00	100		
		2.00 - 3.00	100	Co-ordinates 470830mE, 106969mN	Checked by
					Date(s) 05/09/2017
					Sheet number Sheet 2 of 2
					DTS04
Report ref:	STP4148D-G01	Revision: 0			

WELL	STRATA				WATER STRIKES	DYNAMIC PROBING 80mm/200mm 0 10 20 30 40 50	SPT TESTING			OTHER IN SITU TESTING		SAMPLING		
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND			TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)	TO (m)
	Grass onto dark grey sandy SILT with frequent rootlets and occasional brick fragments. (MADE GROUND - REWORKED TOPSOIL)										0.10	0.20	D	
	Medium dense light greyish brown slightly sandy very clayey GRAVEL. (MADE GROUND - REWORKED HEAD)	0.40										0.50	0.60	D
	Medium dense orangish brown slightly clayey slightly sandy GRAVEL. (HEAD)	0.80				S 1.00-1.45	(17) 16					0.80	0.90	D
	Loose orangish brown occasionally speckled black SAND. (LONDON CLAY)	1.60				S 2.00-2.45	(3) 9					1.70	1.80	D
	CONTINUED ON NEXT SHEET													D

Key		Notes	Title				
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test			Driven tube sampler record		Logged by SJF	Date(s) 05/09/2017	
			Recovery details				
			Range (m)	Recovery (%)	Method Driven tube sampler	Compiled by SJF	Sheet number Sheet 1 of 2
			0.00 - 1.00 1.00 - 2.00 2.00 - 3.00	100 100 80	Level (m OD)	Co-ordinates 470847mE, 106905mN	Checked by
Groundwater observations Groundwater inflows encountered from 2.4-3m depth. Standing at 2.1m depth, 1 hour after completion.		DTS05					
Report ref: STP4148D-G01		Revision: 0					

WELL	STRATA				WATER STRIKES	DYNAMIC PROBING	SPT TESTING			OTHER IN SITU TESTING		SAMPLING	
	DESCRIPTION	DEPTH (m)	REDUCED LVL (m OD)	LEGEND			TYPE / DEPTH (m)	RESULT	CASING DEPTH (m)	WATER LEVEL (m)	TYPE / DEPTH (m)	RESULT	FROM (m)
	Loose orangish brown occasionally speckled black SAND. (LONDON CLAY)	3.00				0 10 20 30 40 50 <							

Key	Notes	Title			
		Recovery details		Method	Logged by
D Small Disturbed Sample B Bulk Disturbed Sample ES Environmental Sample W Water Sample C Core sample UT Undisturbed Sample S Standard Penetration Test C Standard Penetration Test (solid cone) PP Pocket Penetrometer Test SV Shear Vane Test PID Photo Ionisation Detector test	UXO specialist in attendance. No evidence (staining or odour) of contamination observed. Driven tube collapsed to 2.65m depth upon completion.	Range (m)	Recovery (%)	Driven tube sampler	SJF
	Groundwater observations Groundwater inflows encountered from 2.4-3m depth. Standing at 2.1m depth, 1 hour after completion.	0.00 - 1.00	100	Level (m OD)	Compiled by SJF
		1.00 - 2.00	100		
		2.00 - 3.00	80	Co-ordinates 470847mE, 106905mN	Checked by
					Sheet number Sheet 2 of 2
					Date(s) 05/09/2017
					DTS05
Report ref:	STP4148D-G01	Revision: 0			

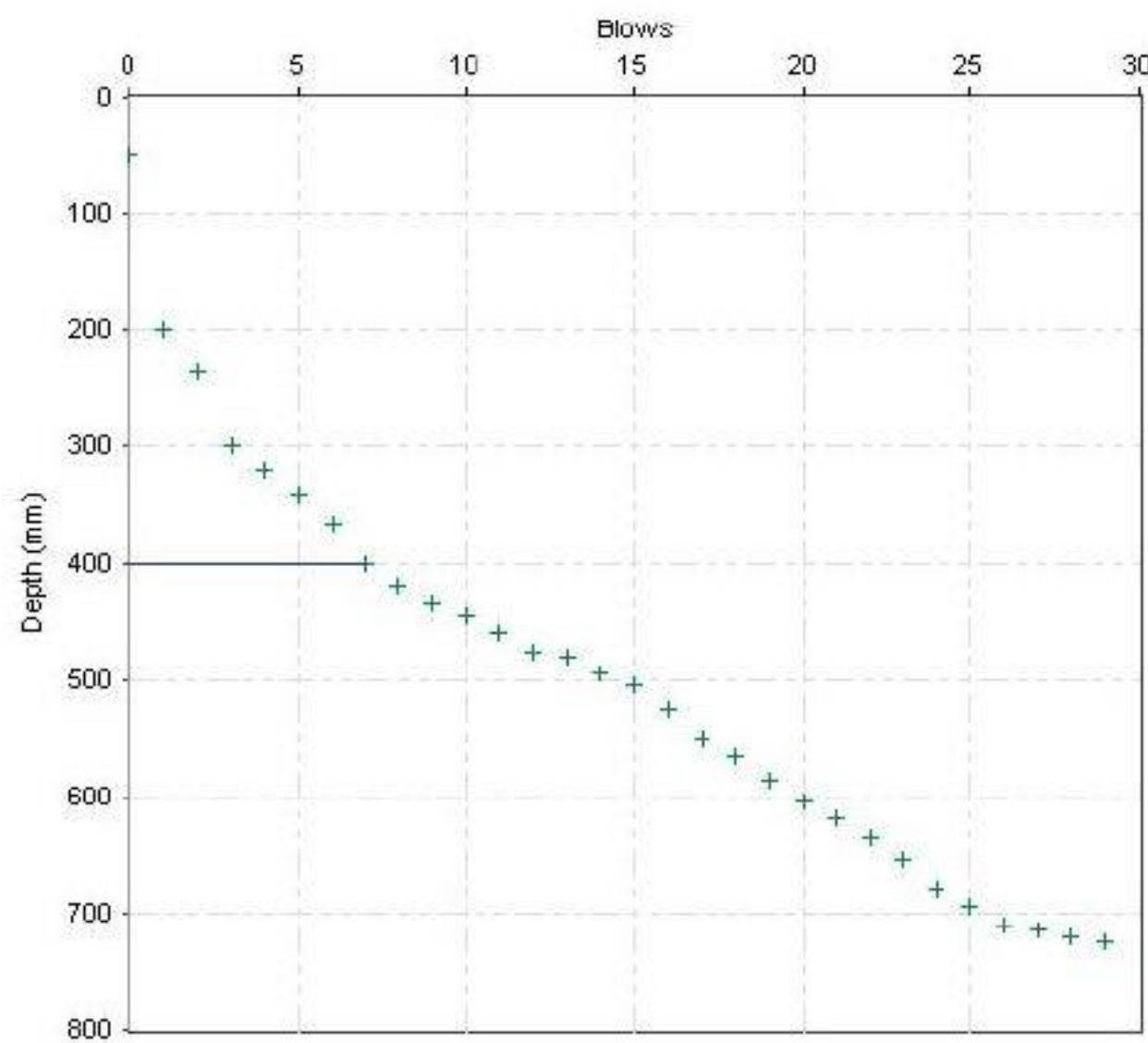
DCP Layer Strength Analysis Report

Project Name: W-STP4148D-TRL01-DTS01

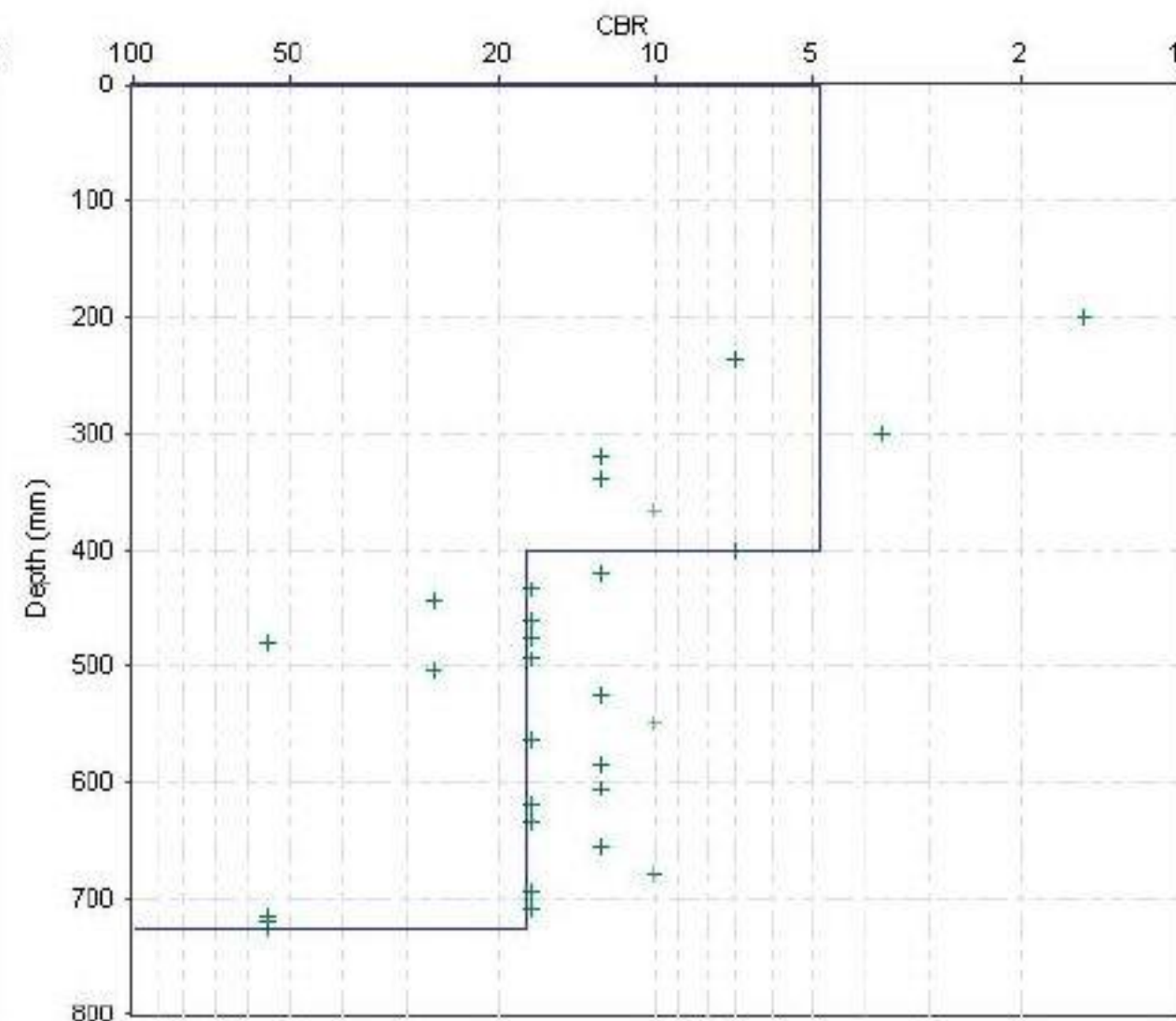
Chainage (km): 1.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 05/09/2017

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Moderate
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 1.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	50.00	5	400	400
2	14.77	18	325	725

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: W-STP4148D-TRL01-DTS01

Chainage (km): 1.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 05/09/2017

Surface Type:

Unpaved

Thickness (mm):

0

Base Type:

Thickness (mm):

Surface Moisture:

Moderate

Moisture adjustment factor:

Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	50	0.00	26	1	25	695	15.00
2	1	1	200	150.00	27	1	26	710	15.00
3	1	2	235	35.00	28	1	27	715	5.00
4	1	3	300	65.00	29	1	28	720	5.00
5	1	4	320	20.00	30	1	29	725	5.00
6	1	5	340	20.00					
7	1	6	365	25.00					
8	1	7	400	35.00					
9	1	8	420	20.00					
10	1	9	435	15.00					
11	1	10	445	10.00					
12	1	11	460	15.00					
13	1	12	475	15.00					
14	1	13	480	5.00					
15	1	14	495	15.00					
16	1	15	505	10.00					
17	1	16	525	20.00					
18	1	17	550	25.00					
19	1	18	565	15.00					
20	1	19	585	20.00					
21	1	20	605	20.00					
22	1	21	620	15.00					
23	1	22	635	15.00					
24	1	23	655	20.00					
25	1	24	680	25.00					

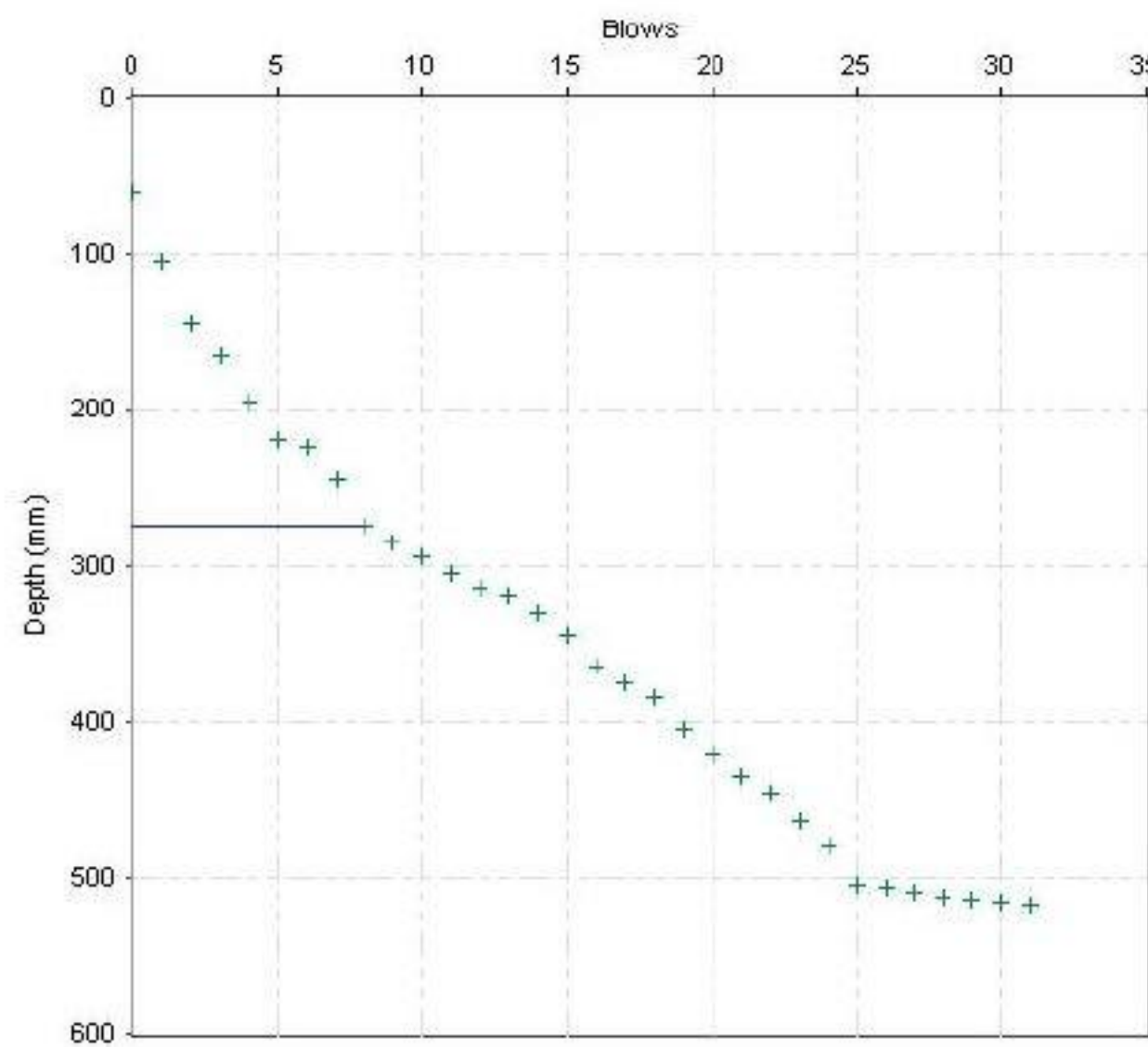
DCP Layer Strength Analysis Report

Project Name: W-STP4148D-TRL02-DTS02

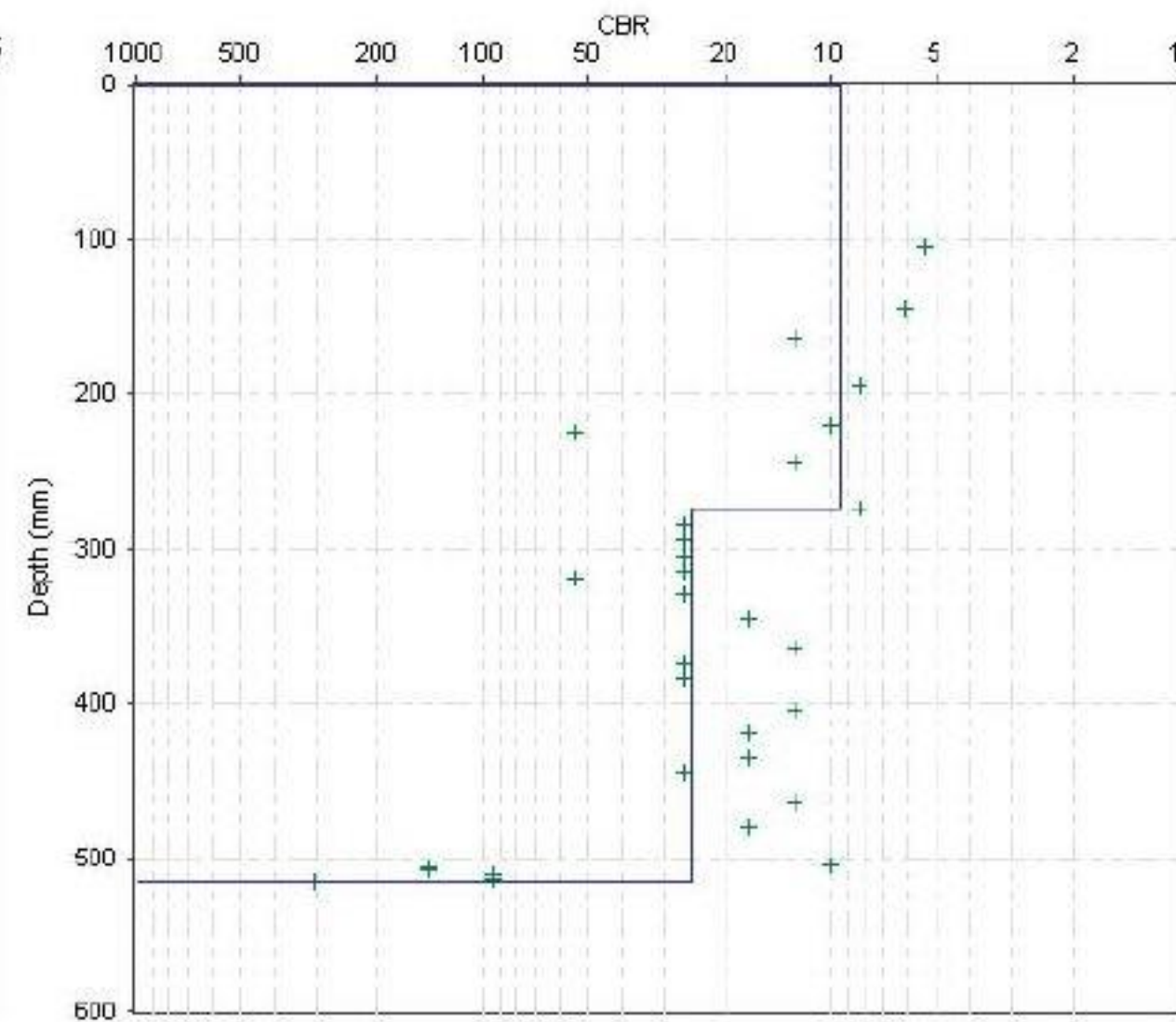
Chainage (km): 2.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 05/09/2017

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Moderate
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 2.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	26.88	9	275	275
2	10.52	25	242	517

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: W-STP4148D-TRL02-DTS02

Chainage (km): 2.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 05/09/2017

Surface Type:

Unpaved

Thickness (mm):

0

Base Type:

Thickness (mm):

Surface Moisture:

Moderate

Moisture adjustment factor:

Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	60	0.00	26	1	25	505	25.00
2	1	1	105	45.00	27	1	26	507	2.00
3	1	2	145	40.00	28	1	27	509	2.00
4	1	3	165	20.00	29	1	28	512	3.00
5	1	4	195	30.00	30	1	29	515	3.00
6	1	5	220	25.00	31	1	30	516	1.00
7	1	6	225	5.00	32	1	31	517	1.00
8	1	7	245	20.00					
9	1	8	275	30.00					
10	1	9	285	10.00					
11	1	10	295	10.00					
12	1	11	305	10.00					
13	1	12	315	10.00					
14	1	13	320	5.00					
15	1	14	330	10.00					
16	1	15	345	15.00					
17	1	16	365	20.00					
18	1	17	375	10.00					
19	1	18	385	10.00					
20	1	19	405	20.00					
21	1	20	420	15.00					
22	1	21	435	15.00					
23	1	22	445	10.00					
24	1	23	465	20.00					
25	1	24	480	15.00					

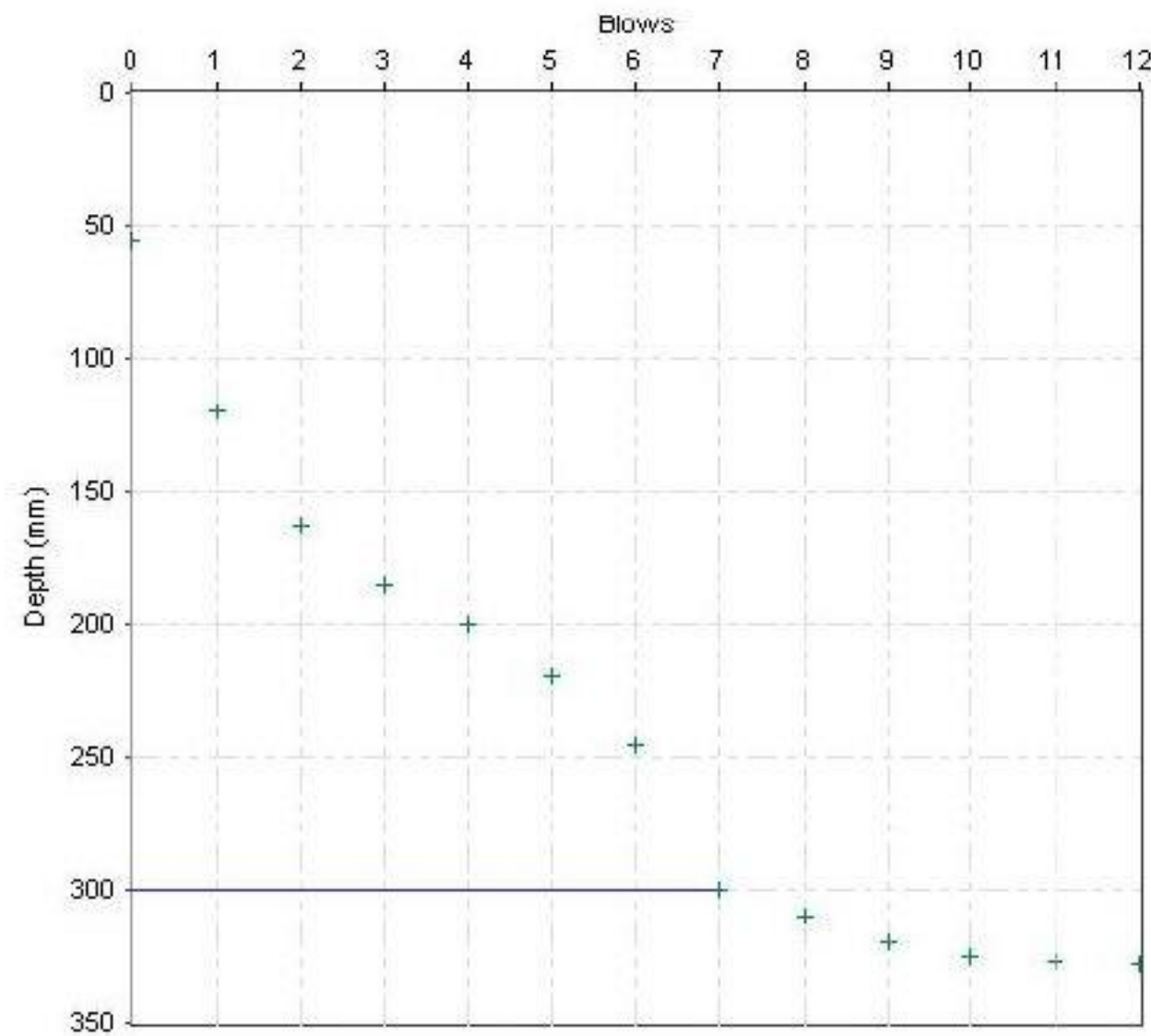
DCP Layer Strength Analysis Report

Project Name: W-STP4148D-TRL03-DTS03

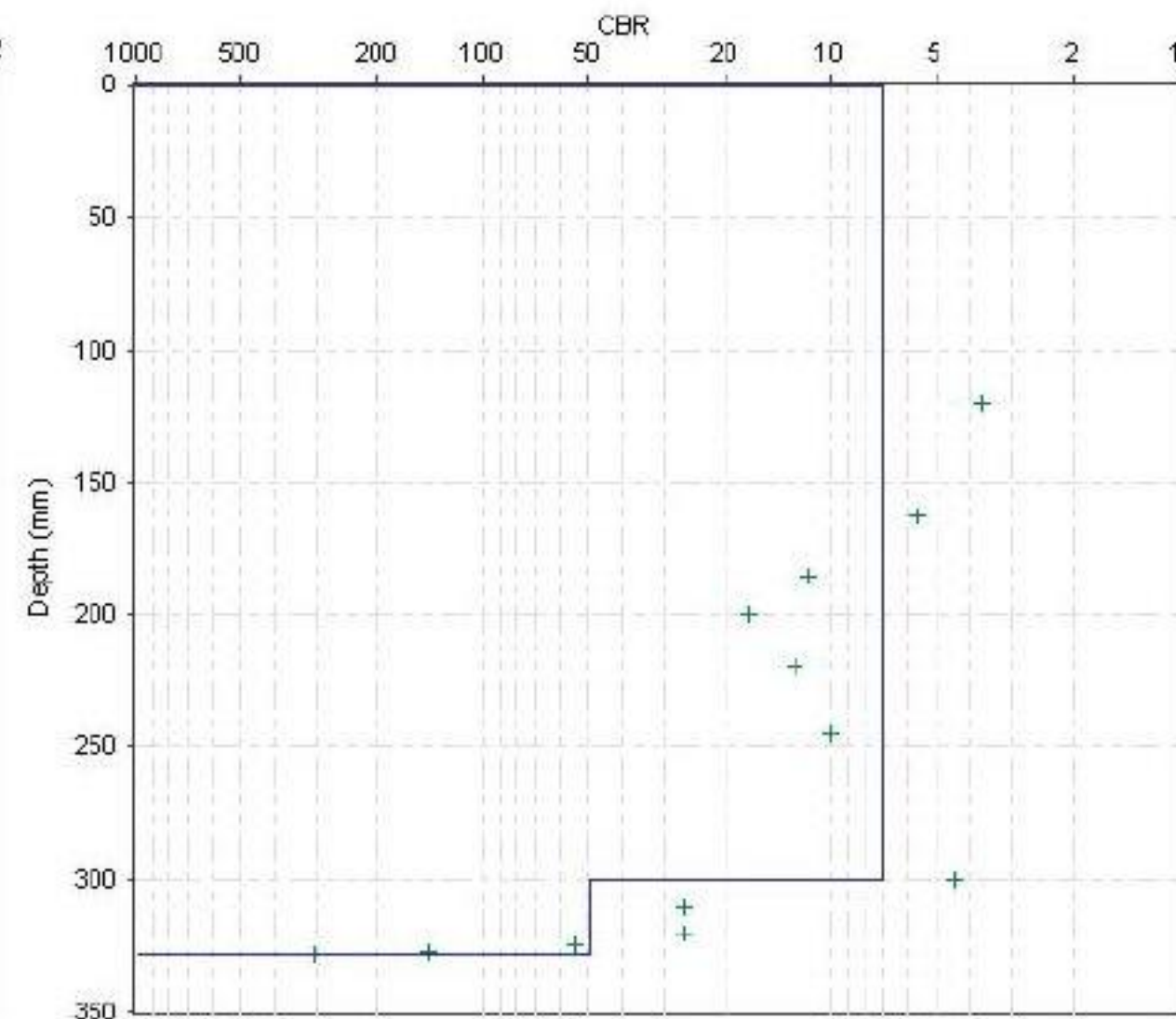
Chainage (km): 3.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 05/09/2017

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Moderate
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 3.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	35.00	7	300	300
2	5.60	49	28	328

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: W-STP4148D-TRL03-DTS03

Chainage (km): 3.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 05/09/2017

Surface Type:

Thickness (mm):

Base Type:

Thickness (mm):

Surface Moisture:

Moisture adjustment factor:

Unpaved

0

Moderate

Not adjusted

[illegible]

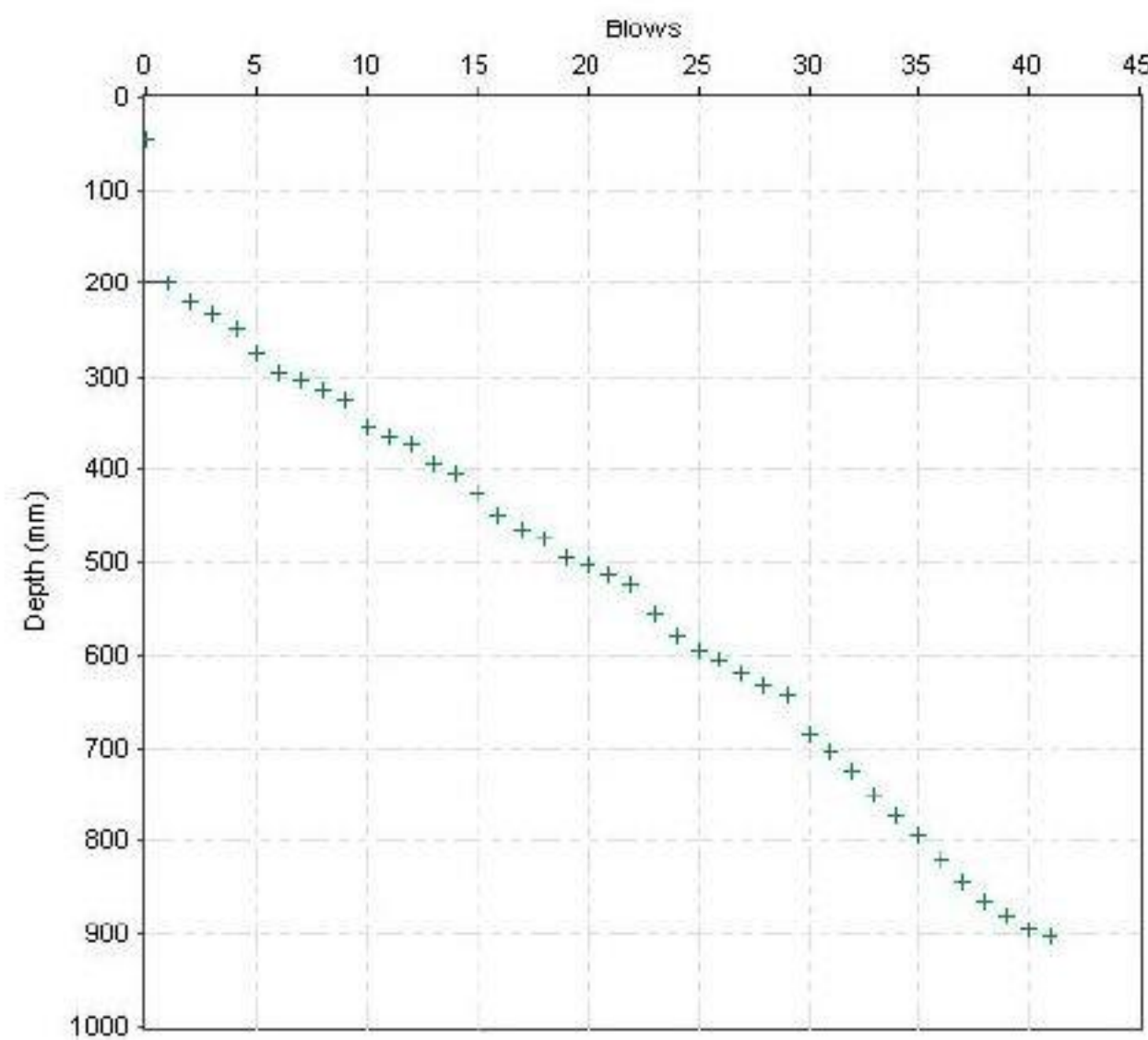
DCP Layer Strength Analysis Report

Project Name: W-STP4148D-TRL04-DTS04

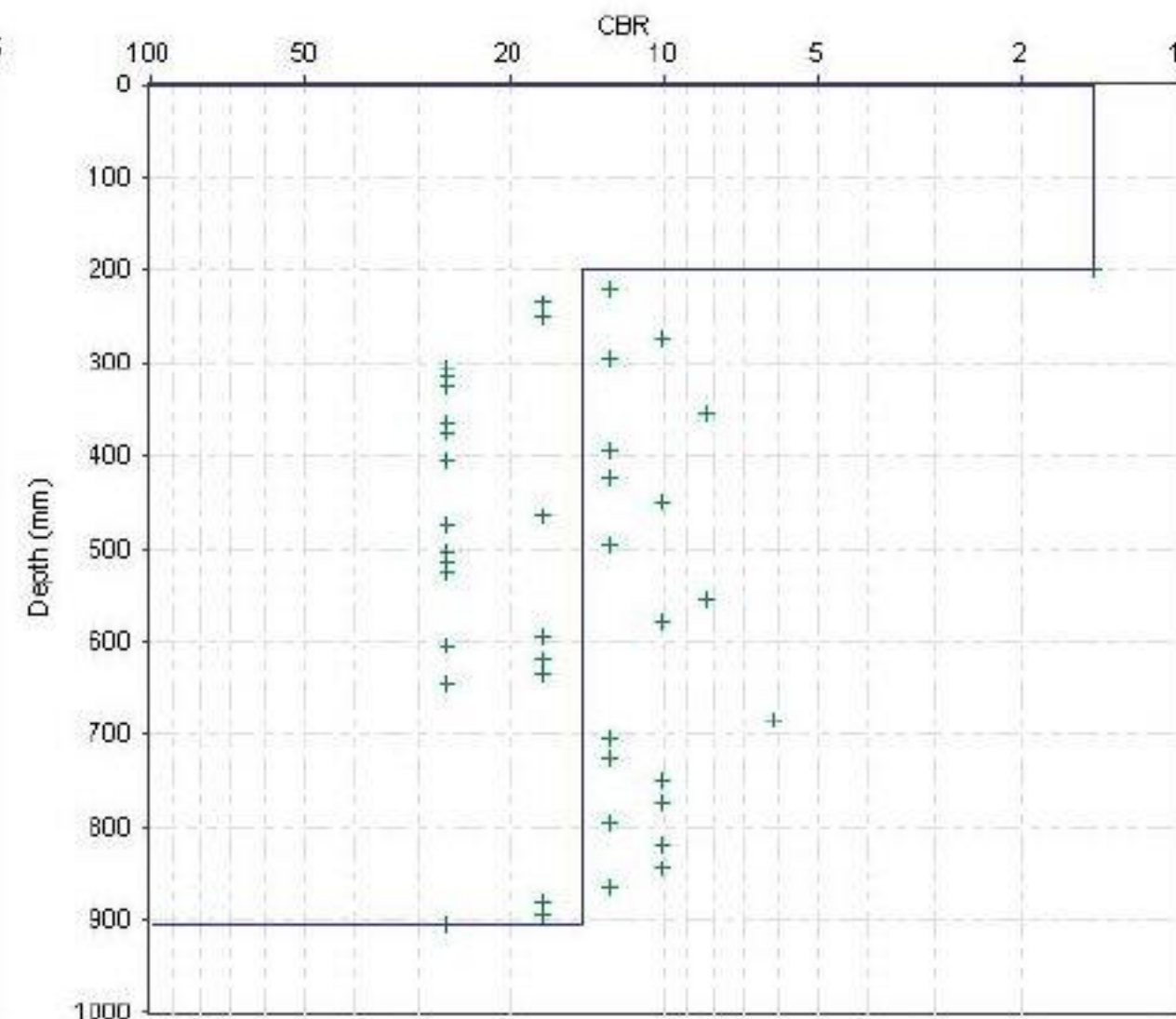
Chainage (km): 4.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 05/09/2017

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Moderate
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 4.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	155.00	1	200	200
2	17.63	15	705	905

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: W-STP4148D-TRL04-DTS04

Chainage (km): 4.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 05/09/2017

Surface Type:

Unpaved

Thickness (mm):

0

Base Type:

Thickness (mm):

Surface Moisture:

Moderate

Moisture adjustment factor:

Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	45	0.00	26	1	25	595	15.00
2	1	1	200	155.00	27	1	26	605	10.00
3	1	2	220	20.00	28	1	27	620	15.00
4	1	3	235	15.00	29	1	28	635	15.00
5	1	4	250	15.00	30	1	29	645	10.00
6	1	5	275	25.00	31	1	30	685	40.00
7	1	6	295	20.00	32	1	31	705	20.00
8	1	7	305	10.00	33	1	32	725	20.00
9	1	8	315	10.00	34	1	33	750	25.00
10	1	9	325	10.00	35	1	34	775	25.00
11	1	10	355	30.00	36	1	35	795	20.00
12	1	11	365	10.00	37	1	36	820	25.00
13	1	12	375	10.00	38	1	37	845	25.00
14	1	13	395	20.00	39	1	38	865	20.00
15	1	14	405	10.00	40	1	39	880	15.00
16	1	15	425	20.00	41	1	40	895	15.00
17	1	16	450	25.00	42	1	41	905	10.00
18	1	17	465	15.00					
19	1	18	475	10.00					
20	1	19	495	20.00					
21	1	20	505	10.00					
22	1	21	515	10.00					
23	1	22	525	10.00					
24	1	23	555	30.00					
25	1	24	580	25.00					

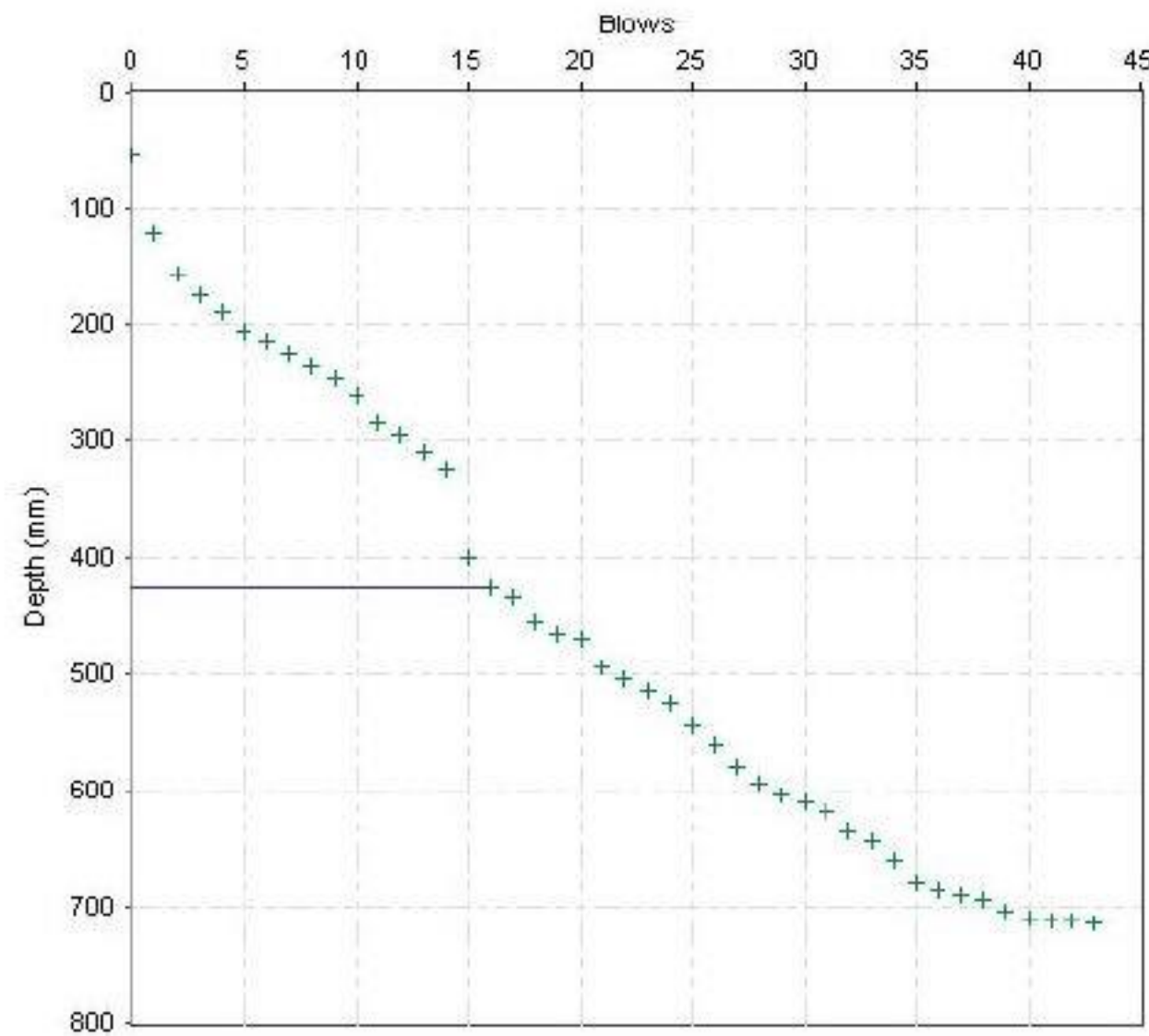
DCP Layer Strength Analysis Report

Project Name: W-STP4148D-TRL05-DTS05

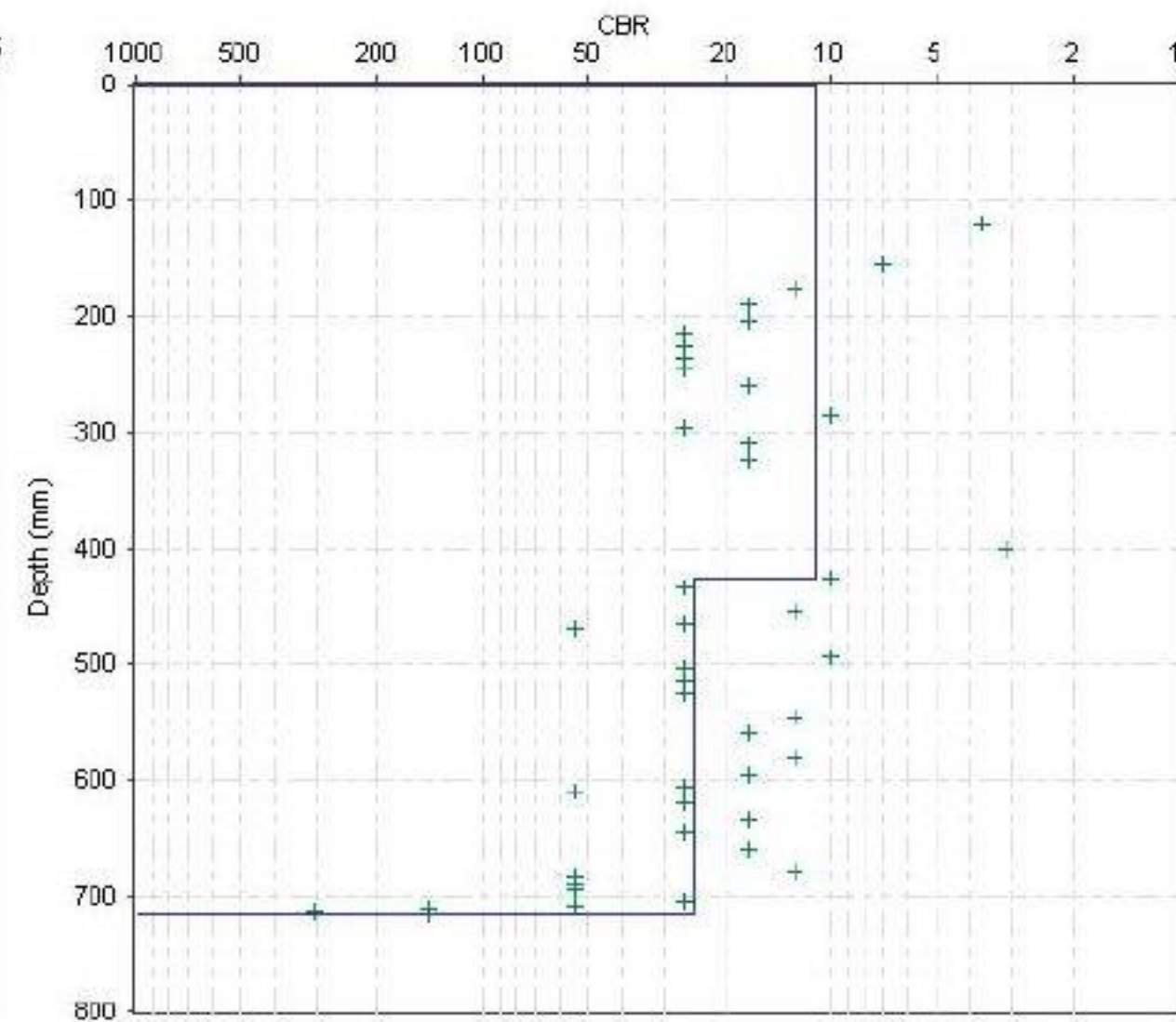
Chainage (km): 5.000
 Direction:
 Location/Offset: Lay-by / other
 Cone Angle: 60 degrees
 Zero Error (mm): 0
 Test Date: 05/09/2017

Surface Type: Unpaved
 Thickness (mm): 0
 Base Type:
 Thickness (mm):
 Surface Moisture: Moderate
 Moisture adjustment factor: Not adjusted

Layer Boundaries: Chainage 5.000



Layer Boundaries Chart



CBR Chart

Layer Properties

No.	Penetration Rate (mm/blow)	CBR (%)	Thickness (mm)	Depth to layer bottom (mm)
1	23.13	11	425	425
2	10.74	25	290	715

CBR Relationship:

TRL equation: $\log_{10}(\text{CBR}) = 2.48 - 1.057 \times \log_{10}(\text{Strength})$

Report produced by

Penetration Data Report

Project Name: W-STP4148D-TRL05-DTS05

Chainage (km): 5.000

Direction:

Location/Offset: Lay-by / other

Cone Angle: 60 degrees

Zero Error (mm): 0

Test Date: 05/09/2017

Surface Type:

Thickness (mm):

Base Type:

Thickness (mm):

Surface Moisture:

Moisture adjustment factor:

Unpaved

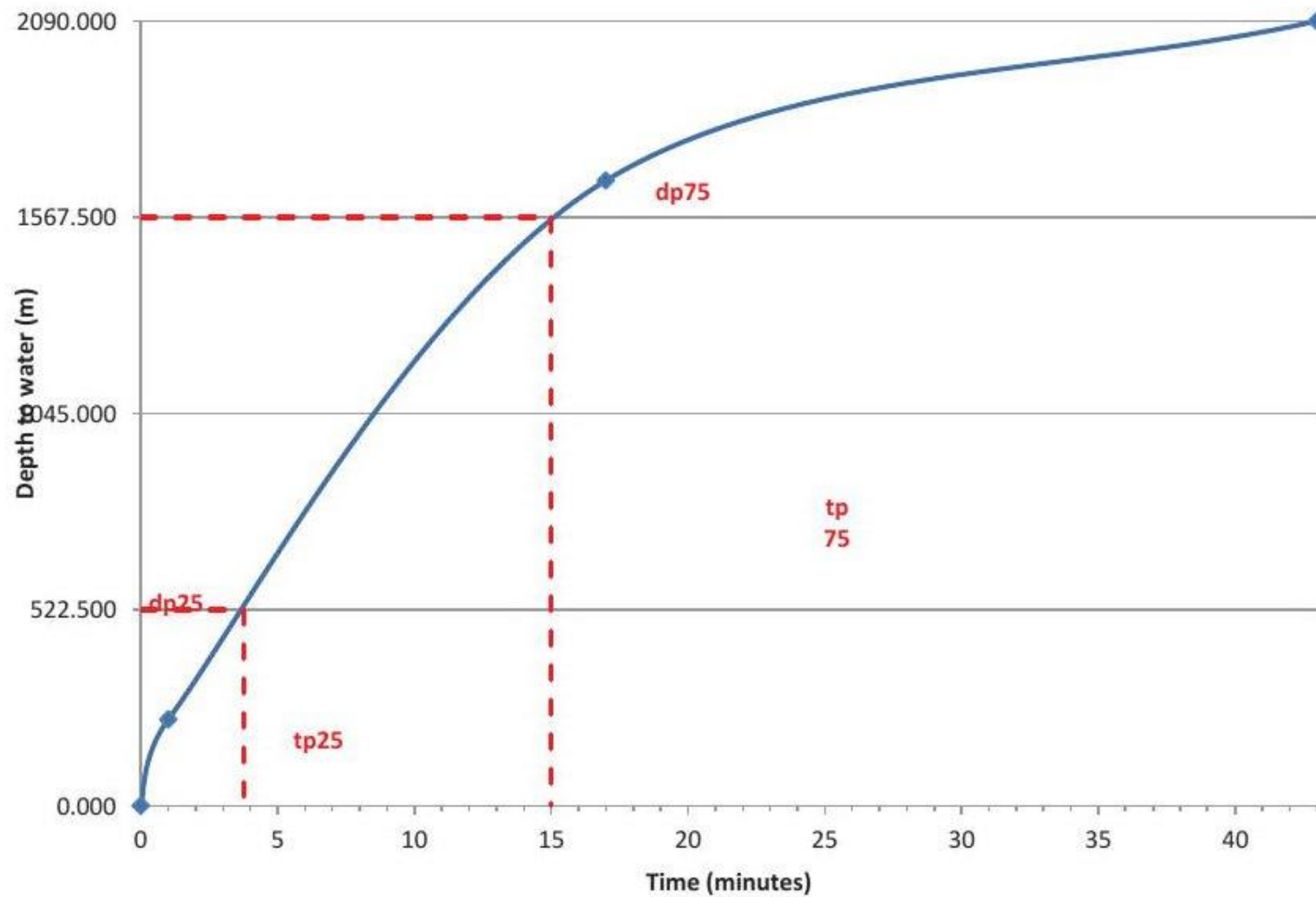
0

Moderate

Not adjusted

No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)	No.	Blows	Cumulative Blows	Penetration Depth (mm)	Penetration Rate (mm/blow)
1	0	0	55	0.00	26	1	25	545	20.00
2	1	1	120	65.00	27	1	26	560	15.00
3	1	2	155	35.00	28	1	27	580	20.00
4	1	3	175	20.00	29	1	28	595	15.00
5	1	4	190	15.00	30	1	29	605	10.00
6	1	5	205	15.00	31	1	30	610	5.00
7	1	6	215	10.00	32	1	31	620	10.00
8	1	7	225	10.00	33	1	32	635	15.00
9	1	8	235	10.00	34	1	33	645	10.00
10	1	9	245	10.00	35	1	34	660	15.00
11	1	10	260	15.00	36	1	35	680	20.00
12	1	11	285	25.00	37	1	36	685	5.00
13	1	12	295	10.00	38	1	37	690	5.00
14	1	13	310	15.00	39	1	38	695	5.00
15	1	14	325	15.00	40	1	39	705	10.00
16	1	15	400	75.00	41	1	40	710	5.00
17	1	16	425	25.00	42	1	41	712	2.00
18	1	17	435	10.00	43	1	42	713	1.00
19	1	18	455	20.00	44	1	43	715	2.00
20	1	19	465	10.00					
21	1	20	470	5.00					
22	1	21	495	25.00					
23	1	22	505	10.00					
24	1	23	515	10.00					
25	1	24	525	10.00					

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	0		
1	230		
17	1665		
43	2090		

Calculations:

Soil infiltration rate (SIR), $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= **8207410.8075m³**

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= **336150.41393m²**

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= **11.25 (minutes)**
= **675 (seconds)**

$$f = 3.62E-02 \text{ m/s}$$

Groundwater observations

Seepage from 2-2.75m depth. Groundwater inflow encountered from 3-3.8m depth. Standing at 2.21m 30 minutes after completion

Borehole diameter

100m

Depth of borehole at start of test (m)

2090

Title

Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates

-

Ground level

N/A

Borehole number

DTS01

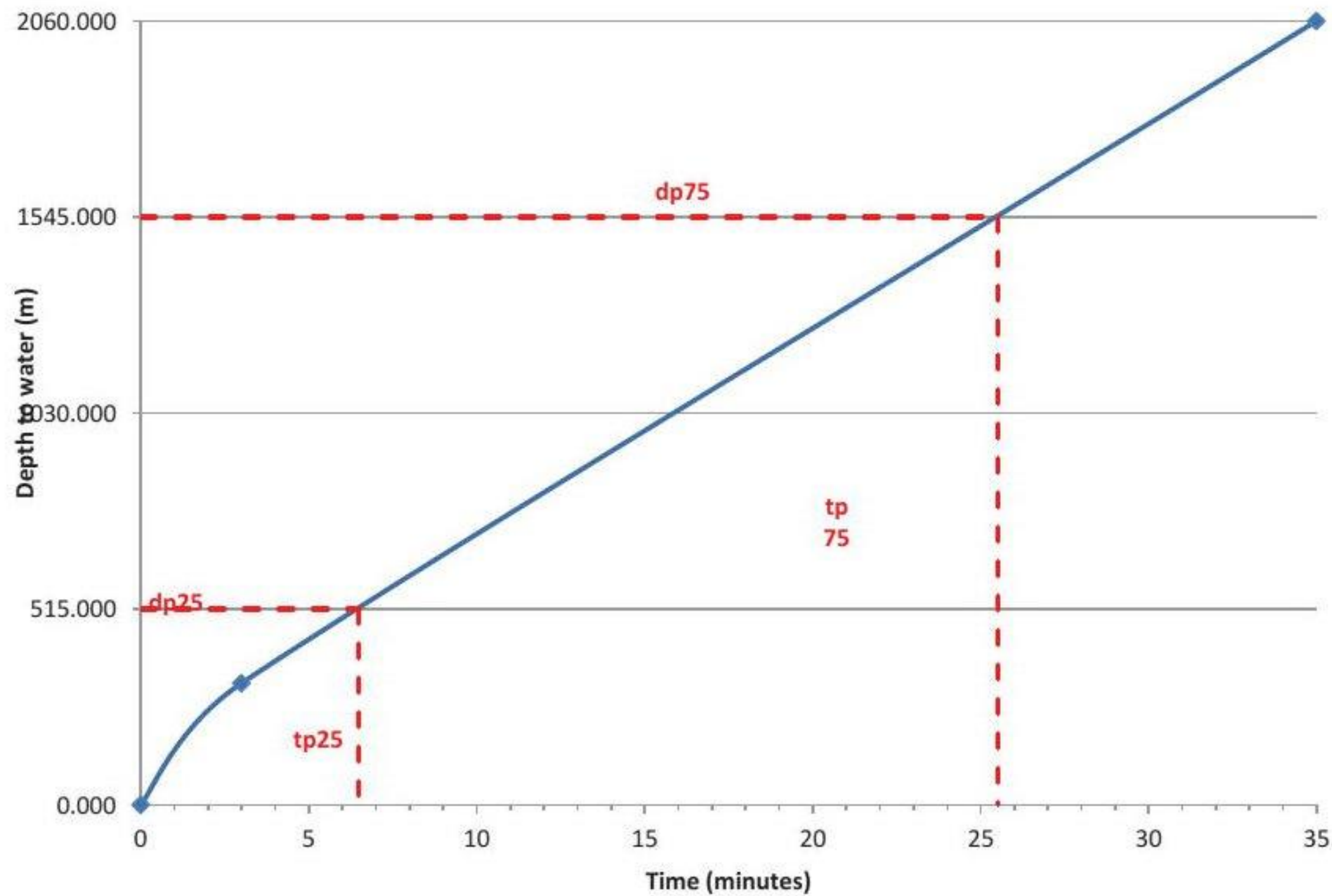
Cycle number

1

Date of excavation

05/09/2017

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	0		
3	320		
35	2060		

Calculations:

Soil infiltration rate (SIR), $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= **8089601.08299m³**

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= **331438.02495m²**

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= **19 (minutes)**
= **1140 (seconds)**

$f = 2.14E-02$ m/s

Groundwater observations

Seepage from 2-2.75m depth. Groundwater inflow encountered from 3-3.8m depth. Standing at 2.21m 30 minutes after completion

Borehole diameter

100m

Depth of borehole at start of test (m)

2060

Title

Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates

-

Ground level

N/A

Borehole number

DTS01

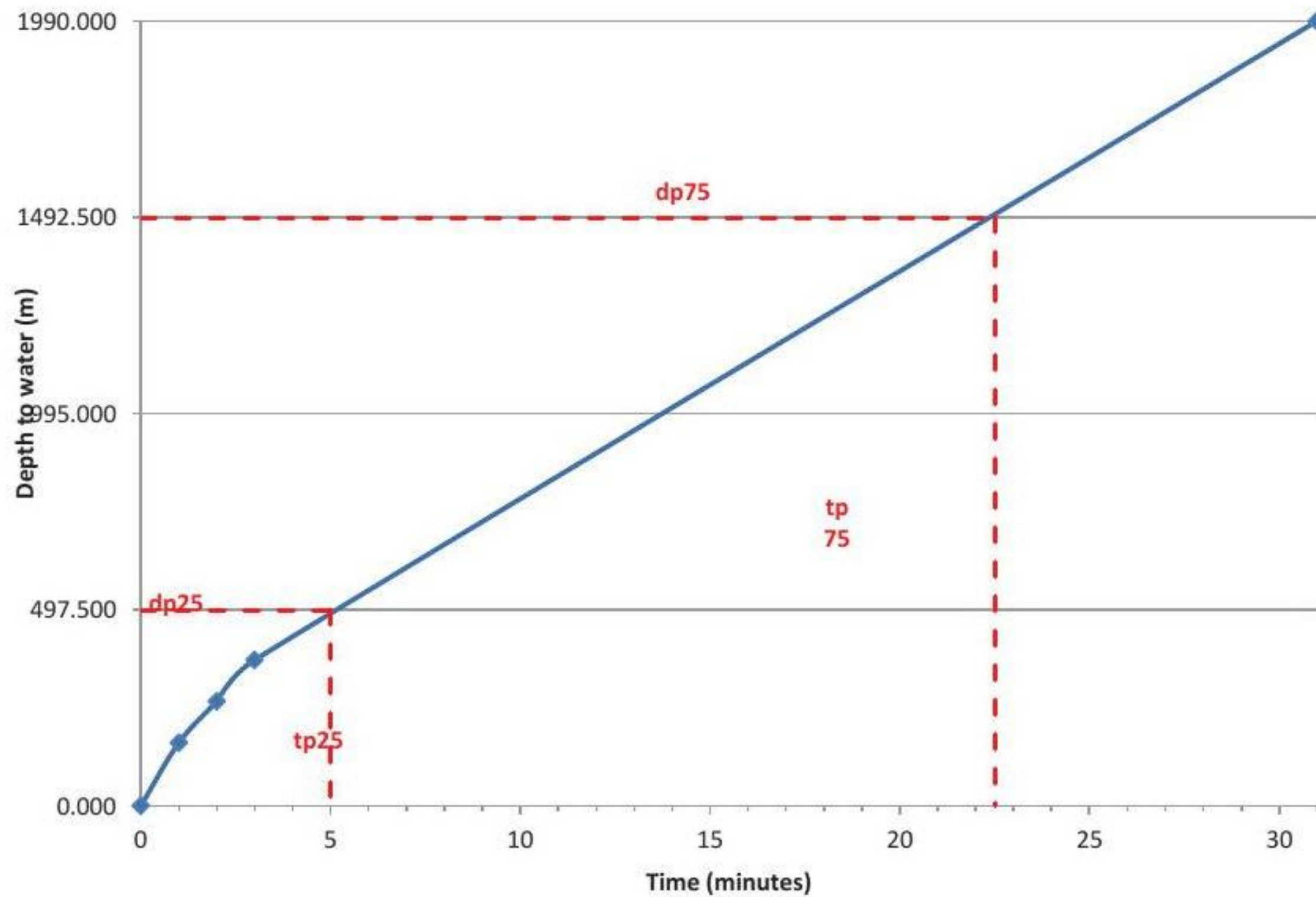
Cycle number

2

Date of excavation

05/09/2017

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	0		
1	160		
2	265		
3	370		
31	1990		

Calculations:

Soil infiltration rate (SIR), $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= **7814711.7258m³**

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= **320442.45067m²**

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= **17.5 (minutes)**
= **1050 (seconds)**

$f = 2.32E-02 \text{ m/s}$

Groundwater observations

Seepage from 2-2.75m depth. Groundwater inflow encountered from 3-3.8m depth. Standing at 2.21m 30 minutes after completion

Borehole diameter

100m

Depth of borehole at start of test (m)

1990

Title

Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates

-

Ground level

N/A

Borehole number

DTS01

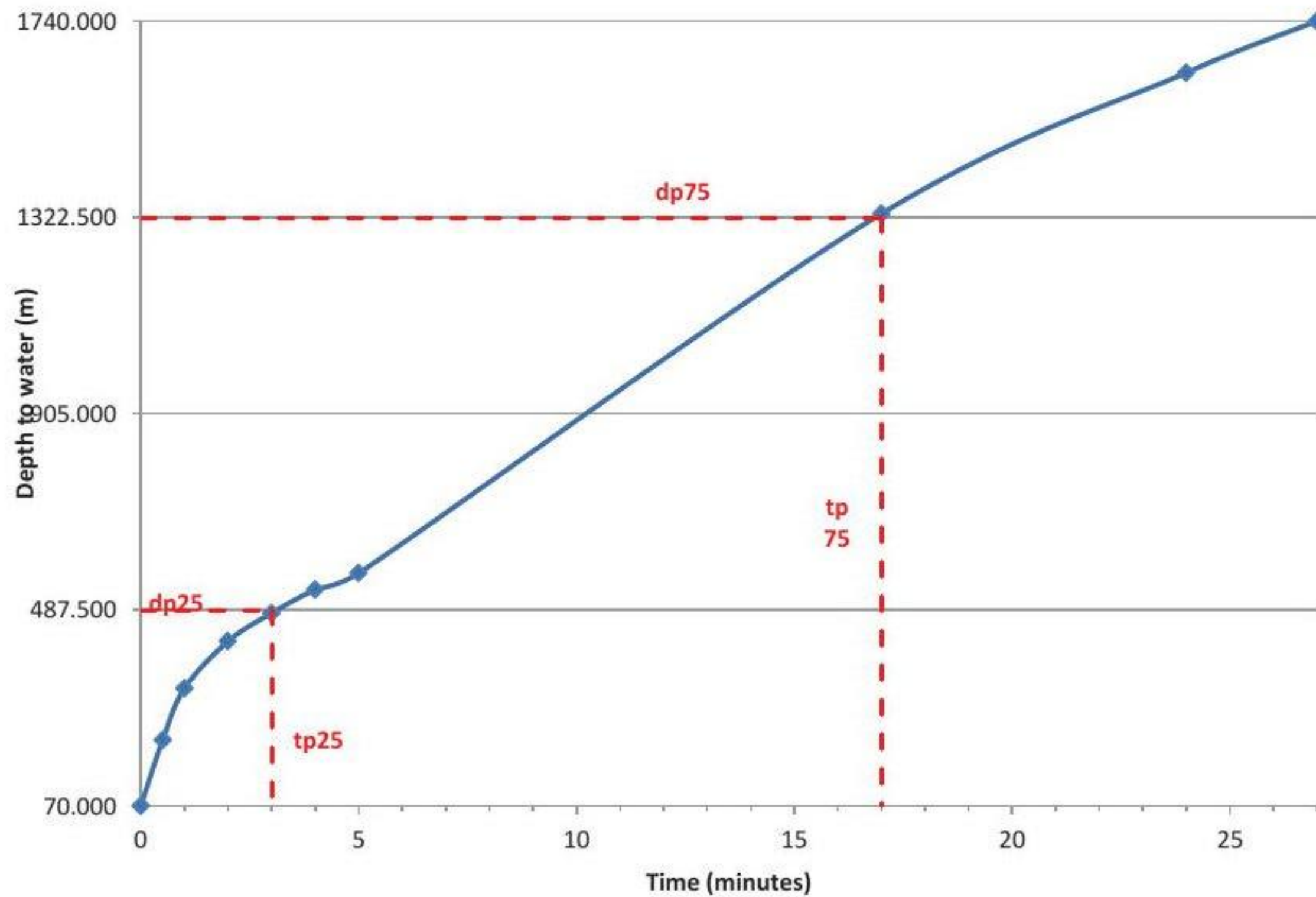
Cycle number

3

Date of excavation

05/09/2017

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	70		
0.5	210		
1	320		
2	420		
3	480		
4	530		
5	565		
17	1330		
24	1630		
27	1740		

Calculations:

Soil infiltration rate (SIR),
$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= $6558074.66437m^3$

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= $270176.96821m^2$

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= 14 (minutes)
= 840 (seconds)

$f = 2.89E-02 \text{ m/s}$

Groundwater observations

No groundwater encountered.

Borehole diameter

100m

Depth of borehole at start of test (m)

1740

Title

Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates

-

Ground level

N/A

Borehole number

DTS04

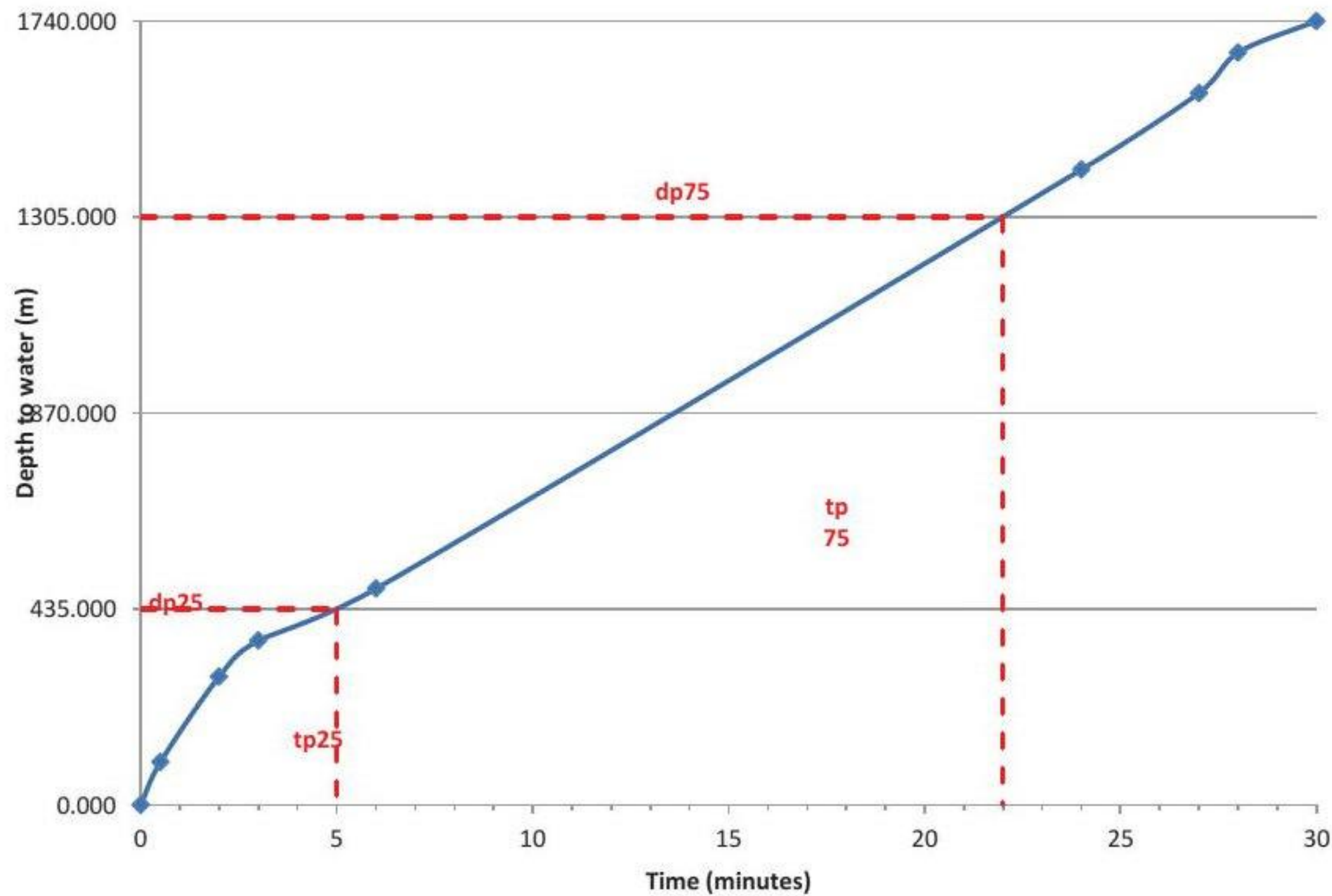
Cycle number

1

Date of excavation

05/09/2017

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	0		
0.5	95		
2	285		
3	365		
6	480		
24	1410		
27	1580		
28	1670		
30	1740		

Calculations:

Soil infiltration rate (SIR), $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= **6832964.02156m³**

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= **281172.5425m²**

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= **17 (minutes)**
= **1020 (seconds)**

$f = 2.38E-02 \text{ m/s}$

Groundwater observations
No groundwater encountered.

Borehole diameter
100m

Depth of borehole at start of test (m)
1740

Title
Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates
-

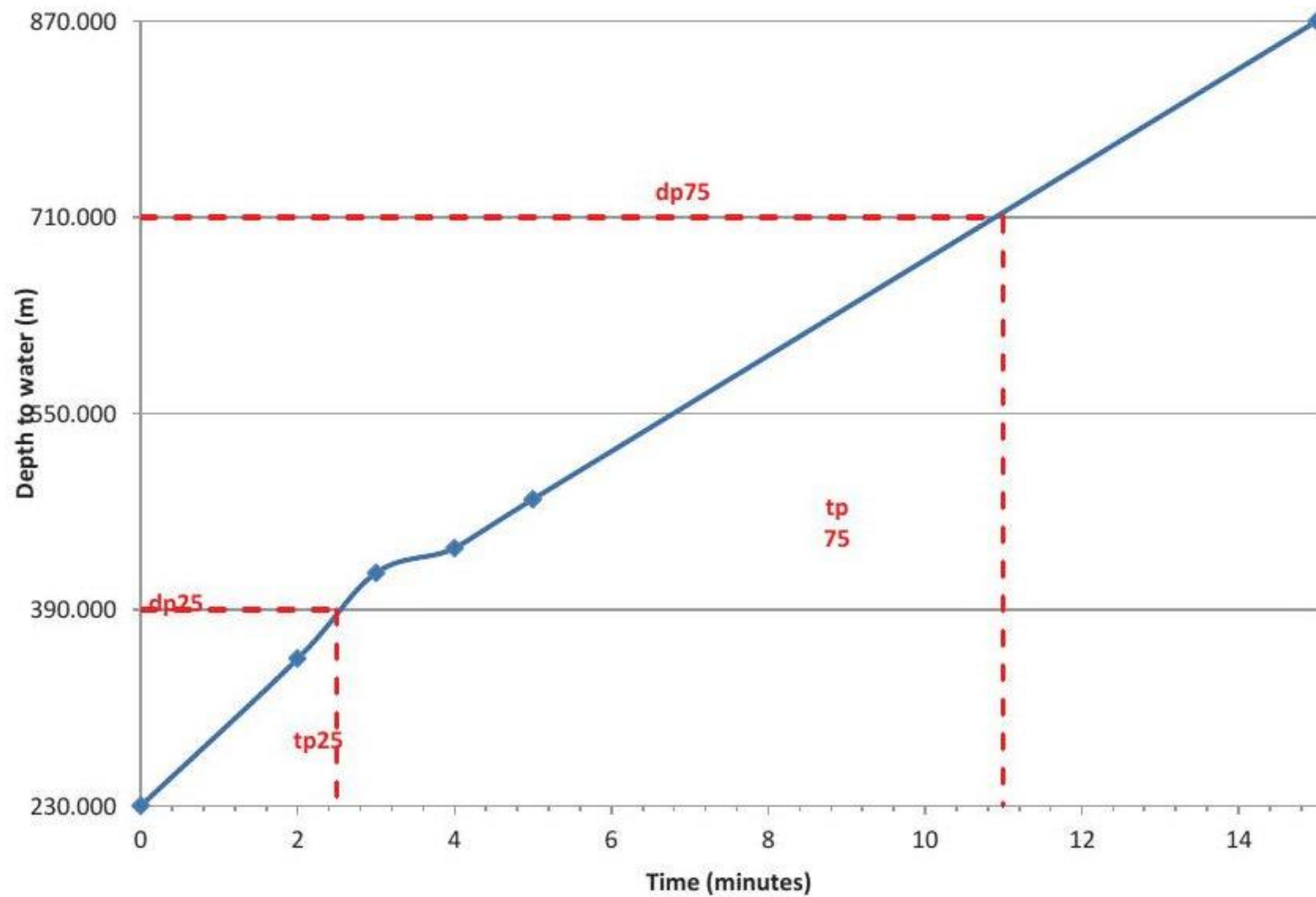
Ground level
N/A

Borehole number
DTS04

Cycle number
2

Date of excavation
05/09/2017

Plot showing time against depth to water:



Test observations:

TIME (mins)	DEPTH TO WATER (m)	TIME (mins)	DEPTH TO WATER (m)
0	230		
2	350		
3	420		
4	440		
5	480		
15	870		

Calculations:

Soil infiltration rate (SIR), $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

V_{p75-25} = effective storage volume of water in the borehole between 75% (d_{p75}) and 25% (d_{p25}) effective depth
= **2513274.12287m³**

a_{p50} = the internal surface area of the borehole up to 50% effective depth and including the base area
= **108384.94655m²**

$t_{p75} - t_{p25}$ = the time for the water level to fall from 75% to 25% effective depth
= **8.5 (minutes)**
= **510 (seconds)**

$$f = 4.55E-02 \text{ m/s}$$

Groundwater observations
No groundwater encountered.

Borehole diameter
100m

Depth of borehole at start of test (m)
870

Title
Soil infiltration test (following principles of BRE Digest 365 2007)

Co-ordinates
-

Ground level
N/A

Borehole number
DTS04

Cycle number
3

Date of excavation
05/09/2017



Final Report

Report No.: 17-23980-1

Initial Date of Issue: 15-Sep-2017

Client Soiltechnics Limited

Client Address: Cedar Barn
White Lodge
Walgrave
Northampton
Northamptonshire
NN6 9PY

Contact(s): Rachel Brown

Project STP4148D - Havant RFC

Quotation No.:		Date Received:	12-Sep-2017
Order No.:	POR001309	Date Instructed:	12-Sep-2017
No. of Samples:	7		
Turnaround (Wkdays):	5	Results Due:	18-Sep-2017
Date Approved:	15-Sep-2017		

Approved By:



Details: Keith Jones, Technical Manager

Results - Soil

Client: Soiltechnics Limited		Chemtest Job No.:		17-23980	17-23980	17-23980	17-23980	17-23980	17-23980	17-23980	17-23980
Quotation No.:		Chemtest Sample ID.:		509901	509902	509903	509904	509905	509906	17-23980	17-23980
Order No.: POR001309		Client Sample Ref.:		DTS01	DTS02	DTS03	DTS03	DTS04	DTS04	509907	DTS05
		Client Sample ID.:		DTS010.501-002	DTS020.051-009	DTS030.101-016	DTS031.301-020	DTS040.101-022	DTS040.301-023	DTS050.101-029	SOIL
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.50	0.05	0.10	1.30	0.10	0.30	0.10	0.10
		Bottom Depth (m):		0.60	0.15	0.20	1.40	0.20	0.40	0.20	0.20
		Date Sampled:		05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017
Determinand	Accred.	SOP	Units	LOD							
Moisture	N	2030	%	0.020	7.2	9.2	5.9	18	6.9	4.9	13
Soil Colour	N	2040		N/A	Brown			Brown	Brown		
Other Material	N	2040		N/A	Stones			NONE	Stones	Stones	
Soil Texture	N	2040		N/A	Sand			Clay	Sand	Sand	
pH	M	2010		N/A	8.0			8.0	7.2	7.8	
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	< 0.40				0.50		
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010			< 0.010	< 0.010	< 0.010	
Total Sulphur	M	2175	%	0.010	0.042			0.013	0.022		
Cyanide (Complex)	M	2300	mg/kg	0.50	< 0.50				< 0.50		
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50				< 0.50		
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50				< 0.50		
Sulphate (Acid Soluble)	M	2430	%	0.010	0.018			< 0.010	< 0.010	< 0.010	
Arsenic	M	2450	mg/kg	1.0	13				18		
Beryllium	U	2450	mg/kg	1.0	< 1.0				< 1.0		
Cadmium	M	2450	mg/kg	0.10	0.56				0.12		
Chromium	M	2450	mg/kg	1.0	26				31		
Copper	M	2450	mg/kg	0.50	58				12		
Mercury	M	2450	mg/kg	0.10	0.10				< 0.10		
Nickel	M	2450	mg/kg	0.50	19				14		
Lead	M	2450	mg/kg	0.50	130				36		
Selenium	M	2450	mg/kg	0.20	< 0.20				< 0.20		
Vanadium	U	2450	mg/kg	5.0	37				39		
Zinc	M	2450	mg/kg	0.50	140				36		
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50				< 0.50		
Organic Matter	M	2625	%	0.40	2.1				2.6		
Naphthalene	M	2800	mg/kg	0.10	< 0.10				< 0.10		
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10				< 0.10		
Acenaphthene	M	2800	mg/kg	0.10	< 0.10				< 0.10		
Fluorene	M	2800	mg/kg	0.10	0.14				< 0.10		
Phenanthrene	M	2800	mg/kg	0.10	1.6				< 0.10		
Anthracene	M	2800	mg/kg	0.10	0.51				< 0.10		
Fluoranthene	M	2800	mg/kg	0.10	3.2				< 0.10		
Pyrene	M	2800	mg/kg	0.10	2.3				< 0.10		
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.6				< 0.10		
Chrysene	M	2800	mg/kg	0.10	1.7				< 0.10		
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	2.2				< 0.10		
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.78				< 0.10		

Results - Soil

Client: Soiltechnics Limited		Chemtest Job No.:		17-23980	17-23980	17-23980	17-23980	17-23980	17-23980	17-23980
Quotation No.:		Chemtest Sample ID.:		509901	509902	509903	509904	509905	509906	509907
Order No.: POR001309		Client Sample Ref.:		DTS01	DTS02	DTS03	DTS03	DTS04	DTS04	DTS05
		Client Sample ID.:		DTS010.501-002	DTS020.051-009	DTS030.101-016	DTS031.301-020	DTS040.101-022	DTS040.301-023	DTS050.101-029
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.50	0.05	0.10	1.30	0.10	0.30	0.10
		Bottom Depth (m):		0.60	0.15	0.20	1.40	0.20	0.40	0.20
		Date Sampled:		05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017	05-Sep-2017
Determinand	Accred.	SOP	Units	LOD						
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.8			< 0.10		
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	1.4			< 0.10		
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.23			< 0.10		
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.1			< 0.10		
Total Of 16 PAH's	N	2800	mg/kg	2.0	19			< 2.0		
Total Phenols	M	2920	mg/kg	0.30	< 0.30			< 0.30		

Chemtest Job No.: 17-23980

Chemtest Sample ID.: 509902

Client Sample Ref.: DTS02

Client Sample ID.: DTS020.051-009

Top Depth (m): 0.05

Bottom Depth (m): 0.15

Date Sampled: 05-Sep-2017

Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					Acid	Low F	Calc.
Clay content	%		18				
Silt content	%		24				
Sand content	%		58				
Soil texture class		See Attached Chart	Sandy Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	2.9	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	% m/m						
>2mm		0-30	29	YES			
>20mm		0-10	8.7	YES			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.8	YES	NO	YES	YES
Carbonate (Calcareous only)	%		1.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2100	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.94	YES	YES		YES
Extractable phosphorus	mg/l	16-140	20	YES	YES	YES	YES
Extractable potassium	mg/l	121-1500	95	NO	NO		NO
Extractable magnesium	mg/l	51-600	34	NO	NO		NO
Carbon : Nitrogen Ratio		<20:1	1.8/1	YES	YES	YES	YES
Exchangeable sodium	%	<15	0.57				
Available Calcium	mg/l		2500				
Available Sodium	mg/l		17				
Phytotoxic Contaminants (by soil pH)		< 6.0 6.0-7.0 > 7.0					
Zinc (Nitric Acid extract)	mg/kg	<200 <200 <300	74	YES			
Copper (Nitric Acid extract)	mg/kg	<100 <135 <200	21	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 <75 <110	11	YES			
Visible Contaminants	% mm						
>2mm		<0.5	0.000	YES			
..... of which plastics		<0.25	0.000	YES			
..... man-made sharps		zero in 1kg	0.000	YES			

Chemtest Job No.: 17-23980

Chemtest Sample ID.: 509903

Client Sample Ref.: DTS03

Client Sample ID.: DTS030.101-016

Top Depth (m): 0.10

Bottom Depth (m): 0.20

Date Sampled: 05-Sep-2017

Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					Acid	Low F	Calc.
Clay content	%		6.5				
Silt content	%		9.7				
Sand content	%		84				
Soil texture class		See Attached Chart	Loamy Sand	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	3.8	YES	YES	YES	YES
Clay 20-35%		5.0-20					
Stone Content	% m/m						
>2mm		0-30	37	NO			
>20mm		0-10	43	NO			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	8.0	YES	NO	YES	YES
Carbonate (Calcareous only)	%		1.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2100	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.12	NO	NO		NO
Extractable phosphorus	mg/l	16-140	25	YES	YES	NO	YES
Extractable potassium	mg/l	121-1500	49	NO	NO		NO
Extractable magnesium	mg/l	51-600	12	NO	NO		NO
Carbon : Nitrogen Ratio		<20:1	18.7/1	YES	YES	YES	YES
Exchangeable sodium	%	<15	0.46				
Available Calcium	mg/l		850				
Available Sodium	mg/l		4.7				
Phytotoxic Contaminants (by soil pH)		< 6.0	6.0-7.0	> 7.0			
Zinc (Nitric Acid extract)	mg/kg	<200	<200	<300	15	YES	
Copper (Nitric Acid extract)	mg/kg	<100	<135	<200	7.9	YES	
Nickel (Nitric Acid extract)	mg/kg	<60	<75	<110	8.6	YES	
Visible Contaminants	% mm						
>2mm		<0.5	0.000	YES			
..... of which plastics		<0.25	0.000	YES			
..... man-made sharps		zero in 1kg	0.000	YES			

Chemtest Job No.: 17-23980

Chemtest Sample ID.: 509905

Client Sample Ref.: DTS04

Client Sample ID.: DTS040.101-022

Top Depth (m): 0.10

Bottom Depth (m): 0.20

Date Sampled: 05-Sep-2017

Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					Acid	Low F	Calc.
Clay content	%		13				
Silt content	%		23				
Sand content	%		65				
Soil texture class		See Attached Chart	Sandy Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	4.0	YES	YES	YES	YES
Clay 20-35%		5.0-20					
Stone Content	% m/m						
>2mm		0-30	37	NO			
>20mm		0-10	45	NO			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	7.2	YES	NO	YES	NO
Carbonate (Calcareous only)	%		< 0.10				NO
Electrical Conductivity	µS/cm	If >3300 do ESP	2100	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.23	YES	YES		YES
Extractable phosphorus	mg/l	16-140	12	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	41	NO	NO		NO
Extractable magnesium	mg/l	51-600	35	NO	NO		NO
Carbon : Nitrogen Ratio		<20:1	10.1/1	YES	YES	YES	YES
Exchangeable sodium	%	<15	1.2				
Available Calcium	mg/l		1300				
Available Sodium	mg/l		19				
Phytotoxic Contaminants (by soil pH)		< 6.0	6.0-7.0	> 7.0			
Zinc (Nitric Acid extract)	mg/kg	<200	<200	<300	13	YES	
Copper (Nitric Acid extract)	mg/kg	<100	<135	<200	6.9	YES	
Nickel (Nitric Acid extract)	mg/kg	<60	<75	<110	8.1	YES	
Visible Contaminants	% mm						
>2mm		<0.5	0.000	YES			
..... of which plastics		<0.25	0.000	YES			
..... man-made sharps		zero in 1kg	0.000	YES			

Chemtest Job No.: 17-23980

Chemtest Sample ID.: 509907

Client Sample Ref.: DTS05

Client Sample ID.: DTS050.101-029

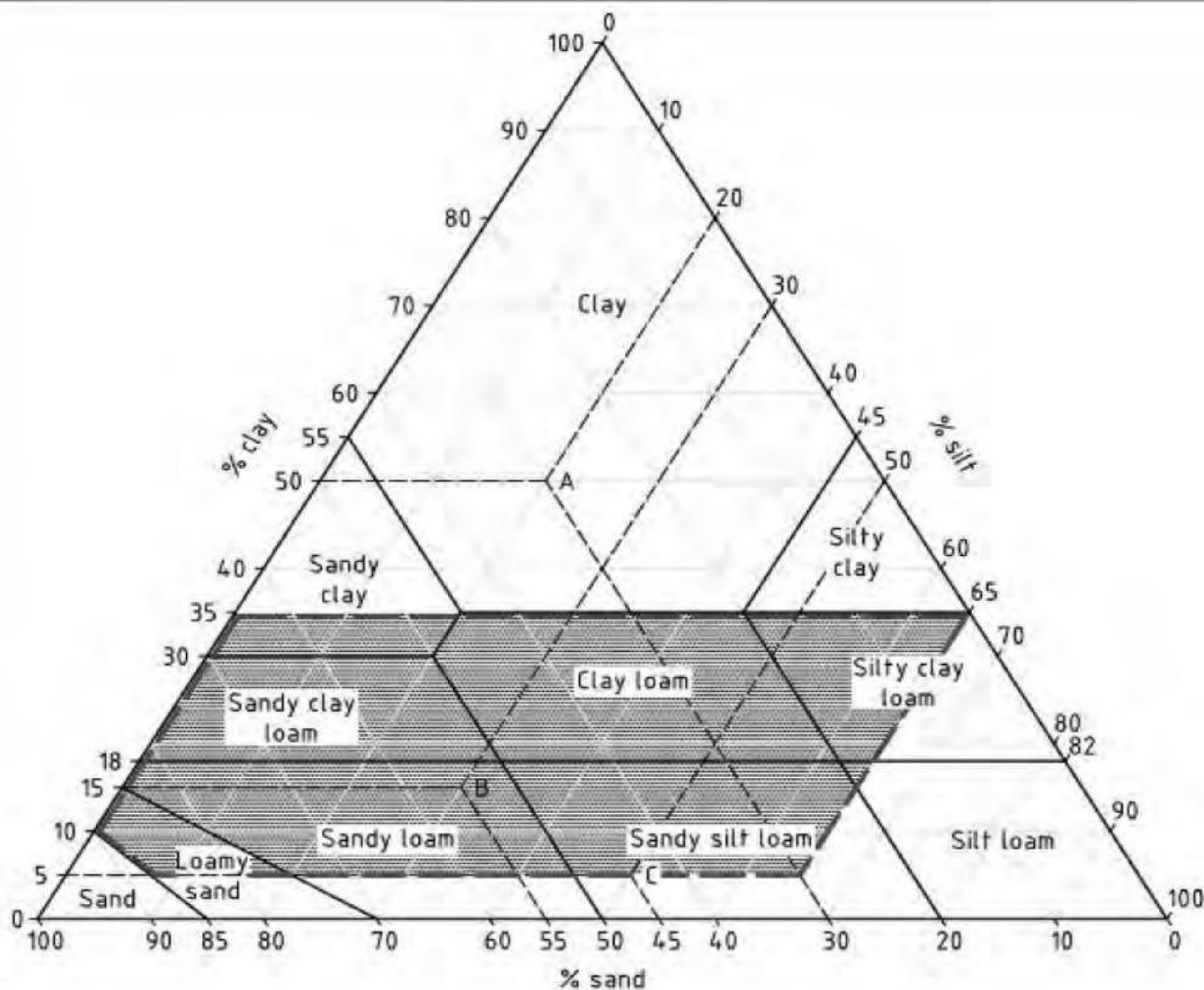
Top Depth (m): 0.10

Bottom Depth (m): 0.20

Date Sampled: 05-Sep-2017

Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					Acid	Low F	Calc.
Clay content	%		26				
Silt content	%		23				
Sand content	%		52				
Soil texture class		See Attached Chart	Sandy Clay Loam	YES			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	3.5	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	% m/m						
>2mm		0-30	45	NO			
>20mm		0-10	15	NO			
>50mm		0	< 0.020	YES			
Soil pH value		5.5-8.5	8.0	YES	NO	YES	YES
Carbonate (Calcareous only)	%		4.0				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2100	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.18	YES	YES		YES
Extractable phosphorus	mg/l	16-140	22	YES	YES	NO	YES
Extractable potassium	mg/l	121-1500	95	NO	NO		NO
Extractable magnesium	mg/l	51-600	25	NO	NO		NO
Carbon : Nitrogen Ratio		<20:1	11.5/1	YES	YES	YES	YES
Exchangeable sodium	%	<15	0.37				
Available Calcium	mg/l		2700				
Available Sodium	mg/l		12				
Phytotoxic Contaminants (by soil pH)		< 6.0	6.0-7.0	> 7.0			
Zinc (Nitric Acid extract)	mg/kg	<200	<200	<300	25	YES	
Copper (Nitric Acid extract)	mg/kg	<100	<135	<200	10	YES	
Nickel (Nitric Acid extract)	mg/kg	<60	<75	<110	7.9	YES	
Visible Contaminants	% mm						
>2mm		<0.5	0.000	YES			
..... of which plastics		<0.25	0.000	YES			
..... man-made sharps		zero in 1kg	0.000	YES			



Key



Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.
- Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.
- Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.

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SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2115	Total Nitrogen in Soils	Nitrogen	Determination by elemental analyser
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2260	Carbonate	Carbonate	Titration
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2400	Cations	Cations	ICP-MS
2420	Phosphate	Phosphate	Spectrophotometry - Discrete analyser
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2620	LOI 440	LOI 440	Determination of the proportion by mass that is lost from a soil by ignition at 440°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk



Final Report

Report No.: 17-23988-1

Initial Date of Issue: 20-Sep-2017

Client Soiltechnics Limited

Client Address: Cedar Barn
White Lodge
Walgrave
Northampton
Northamptonshire
NN6 9PY

Contact(s): Rachel Brown

Project STP4148D Havant RFC, Havant

Quotation No.:		Date Received:	12-Sep-2017
Order No.:	POR001306	Date Instructed:	12-Sep-2017
No. of Samples:	1		
Turnaround (Wkdays):	7	Results Due:	20-Sep-2017
Date Approved:	20-Sep-2017		

Approved By:



Details: Keith Jones, Technical Manager

Project: STP4148D Havant RFC, Havant

Chemtest Job No: 17-23988

Chemtest Sample

Sample Ref: WAC01

Sample Ref: WAC01
Sample ID: WAC010.101-035

Top Depth(m): 0.10

Top Depth(m):
Bottom Depth(m):

05-Sep-2017 0:00
Sampling Date:
Location Depan(m):

Determinand	SOP	Accred.	Units
Total Organic Carbon	2625	U	%
Loss On Ignition	2610	U	%
Total BTEX	2760	U	mg/kg
Total PCBs (7 Congeners)	2815	U	mg/kg
TPH Total WAC (Mineral Oil)	2670	U	mg/kg
Total (Of 17) PAH's	2700	N	mg/kg
pH	2010	U	
Acid Neutralisation Capacity	2015	N	mol/kg

Eluate Analysis		2:1 mg/l
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	
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94	94	
95	95	
96	96	
97	97	
98	98	
99	99	
100	100	

Element	Atomic Number	Symbol	Group	Period	Block	Electron Configuration	Atomic Weight	Density (g/cm³)	Melting Point (°C)	Boiling Point (°C)	Phase at STP	Common Oxidation States	Electronegativity (Pauling)	Ionization Energy (kJ/mol)	Electron Affinity (kJ/mol)	Half-life (years)	Radioactive
Arsenic	33	As	15	4	p	[Ar] 3d ¹⁰ 4s ² 4p ³	74.9216	5.727	613	630	Solid	+3, +5	2.2	786	-78	Stable	No
Barium	56	Ba	2	6	s	[Xe] 4f ¹⁴ 5d ⁰ 6s ²	137.327	3.51	850	1212	Solid	+2	0.9	419	-40	Stable	No
Cadmium	48	Cd	12	5	d	[Kr] 4d ¹⁰ 5s ²	112.414	8.65	321	938	Solid	+2	1.5	364	-10	Stable	No
Chromium	24	Cr	6	4	d	[Ar] 3d ⁵ 4s ¹	51.9961	7.19	1907	2671	Solid	+3, +6	1.6	419	-64	Stable	No
Copper	29	Cu	11	4	d	[Ar] 3d ¹⁰ 4s ¹	63.546	8.96	1083	2567	Solid	+1, +2	1.9	364	-119	Stable	No
Mercury	80	Hg	12	6	d	[Xe] 4f ¹⁴ 5d ¹⁰ 6s ²	200.592	13.534	-38.83	356.73	Liquid	+2	2.0	1007	-63	Stable	No

Mercury	1450	U	< 0.00030
Molybdenum	1450	U	0.0049
Nickel	1450	U	< 0.0010
Lead	1450	U	< 0.0010
Antimony	1450	U	0.0021
Selenium	1450	U	< 0.0010

Zinc	1450	U	0.0012
Chloride	1220	U	3.4
Fluoride	1220	U	0.79
Sulphate	1220	U	10
Total Dissolved Solids	1020	N	110
Phenol Index	1920	U	< 0.030

Dissolved Organic Carbon	1610	U	14
--------------------------	------	---	----

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	7.8

Leachate Test Information	
Leachant volume 1st extract/l	0.335
Leachant volume 2nd extract/l	1.400
Eluent recovered from 1st extract/l	0.172

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk

Determination of Moisture Content and Atterberg Limits

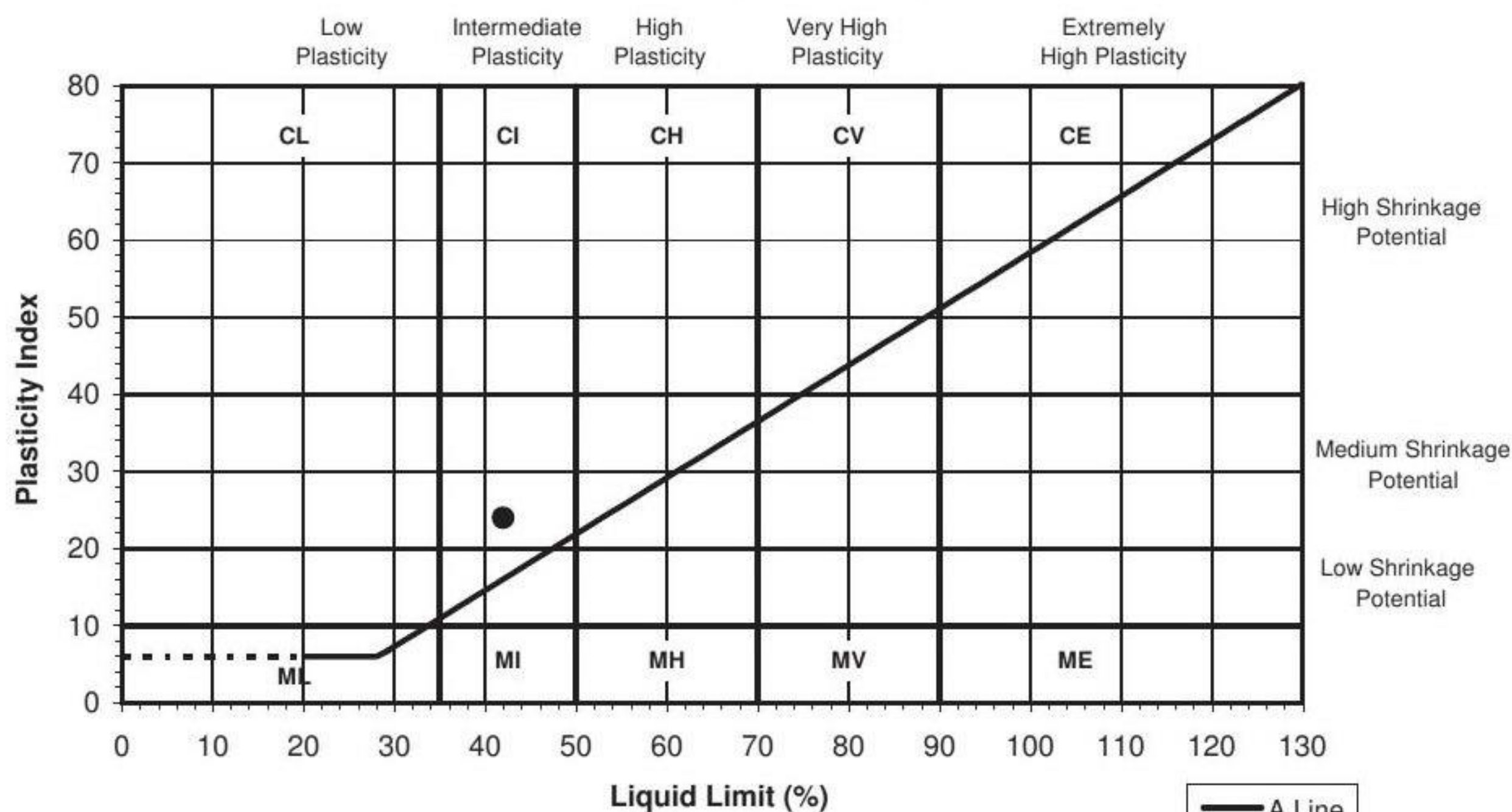
Client: Soiltechnics Limited
Client Address: Cedar Barn,
White Lodge
Walgrave
Postcode: NN6 9PY
Contact: Andy Keeler
Site: Havant RFC

Report No: 51036401/17/01
Batch Number: DAM0069882
Client Reference: STP4148D
Sampled by: Client
Date Sampled: 05.09.17
Date Received: 11.09.17
Tested From: 18.09.17-19.09.17
Sample Type: Disturbed

Test Results:

Description: Brown sandy gravelly CLAY

Laboratory Reference	Location	Depth (m)	As Received Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	% Passing 425µm
45328672	DTS01	1.10-1.20	6.3	42	18	24	34

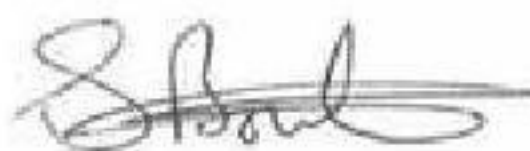


Sample Preparation: Washed over 425µm BS Test Sieve
Estimated % passing 425µm BS Test Sieve

Certified that the laboratory testing was carried out in accordance with BS 1377-2: 1990: Method 3.2, 4.4 and 5

Page: 1 of 1
Date: 21.09.17

Signed



[] J. Pullar - Materials Section Manager
[✓] S. Bourton - Laboratory Manager

For and on behalf of Environmental Scientifics Group

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

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Determination of Moisture Content and Atterberg Limits

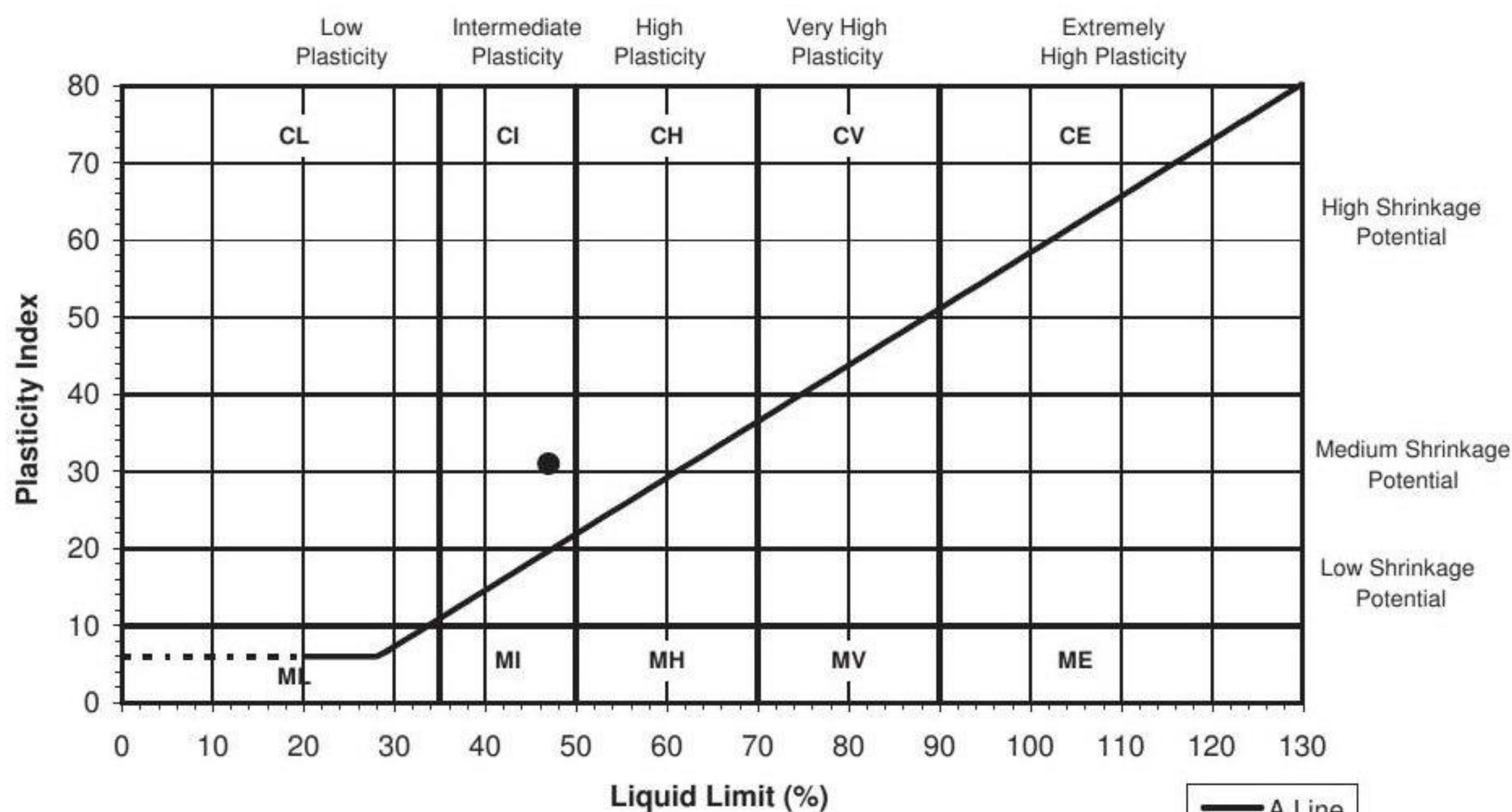
Client: Soiltechnics Limited
Client Address: Cedar Barn,
White Lodge
Walgrave
Postcode: NN6 9PY
Contact: Andy Keeler
Site: Havant RFC

Report No: 51036401/17/02
Batch Number: DAM0069882
Client Reference: STP4148D
Sampled by: Client
Date Sampled: 05.09.17
Date Received: 11.09.17
Tested From: 14.09.17-15.09.17
Sample Type: Disturbed

Test Results:

Description: Orange grey sandy CLAY with Silt

Laboratory Reference	Location	Depth (m)	As Received Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	% Passing 425µm
45328673	DTS03	1.30-1.40	21	47	16	31	100



Sample Preparation: As Received, Coarse particles removed by hand prior to test
Estimated % passing 425µm BS Test Sieve

Certified that the laboratory testing was carried out in accordance with BS 1377-2: 1990: Method 3.2, 4.4 and 5

Page: 1 of 1
Date: 21.09.17

Signed



[] J. Pullar - Materials Section Manager
[✓] S. Bourton - Laboratory Manager

For and on behalf of Environmental Scientifics Group

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Table comparing cumulative compound concentrations with hazardous waste threshold values

Category of danger		Irritant	Harmful	Toxic		Carcinogenic		Corrosive		Toxic for reproduction			Mutagenic		Ecotoxic																		
Contaminant	Highest concentration	Xi	Xn	T+	H6	H6	Carc Cat 1		Carc Cat 3		Repr Cat 1 or 2		H10	H11	H14	ΣN : R50-53/0.25																	
							H4	H5	H7	H7	H8	H8				H10	H10	H11	H11	H14	H14												
																						H4	H5	H7	H7	H8	H8	H10	H10	H11	H11	H14	H14
H4	H5	H7	H7	H8	H8	H10	H10	H11	H11	H14	H14	ΣN : R51-53/2.5	ΣN : R50-53																				
Metals																																	
Arsenic	18.00			0.0024	0.0028	0.0028	0.0028								0.5651	0.0028	ΣN : 50-53																
Beryllium	1.00	0.0003		0.0003	0.0003	0.0003	0.0003									0.0003	ΣN : 51-53																
Copper	58.00	0.0145	0.0145													0.0145	ΣN : 52-53																
Cadmium	0.56		0.0001		0.0001	0.0001	0.0001										ΣN : R53																
Chromium	31.00						0.0050																										
Lead	130.00		0.0140								0.0140	0.0140				0.0050																	
Mercury	0.10			0.0000												0.0140																	
Nickel	19.00		0.0024					0.0024			0.0024					0.0000																	
Selenium	0.20				0.0000											0.0024	0.0024																
Zinc	140.00	0.1015	0.1015				0.0388		0.0292				0.0658			0.0000	0.0000																
Vanadium	39.00	0.0057			0.0057					0.0057			0.0057			0.1015	0.0057																
PAH																																	
Naphthalene	0.10		0.0000													0.0000	0.0000																
Benzo(a)anthracene	1.60				0.0002	0.0002	0.0002									0.0002	0.0002																
Chrysene	1.70				0.0002	0.0002	0.0002					0.0002				0.0002	0.0002																
Benzo(b)fluoranthene	2.20				0.0002	0.0002	0.0002									0.0002	0.0002																
Benzo(k)fluoranthene	0.78				0.0001	0.0001	0.0001									0.0001	0.0001																
Benzo(a)pyrene	1.80						0.0002				0.0002		0.0002			0.0002	0.0002																
Dibenzo(a,h)anthracene	0.23				0.0000	0.0000	0.0000									0.0000	0.0000																
Total (or greatest)		0.1220	0.1325	0.0027	0.0095	0.0095	(0.0388)	(0.0024)	0.0292	0.0000	(0.014)	(0.0002)	(0.0658)	0.5651	0.1411	0.1471																	
Threshold		1%	1%	0.10%	3%	3%	0.10%	1%	5%	1%	0.50%	0.10%	1%	1	25%	25%																	
Exceeded Y/N		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N																

Title	Table number
Hazard assessment spreadsheet	1 of 1

Landfill Waste Acceptance Criteria				Laboratory test data
Parameter	Inert waste landfill	Stable non-reactive hazardous waste in non-hazardous landfill	Hazardous waste landfill	Made Ground (WAC01)
Parameters determined on the waste				
Total organic carbon (w/w %)	3%	5%	6%*	1.0
Loss on ignition			10%*	7.0
BTEX (mg kg ⁻¹)	6			< 0.010
PCBs (7 congeners) (mg kg ⁻¹)	1			< 0.10
Mineral oil C ₁₀ - C ₄₀ (mg kg ⁻¹)	500			690
PAH (17 congeners)	100			13
pH		>6		8.1
Acid neutralisation capacity pH 6 (mol kg ⁻¹)		To be evaluated	To be evaluated	
Acid neutralisation capacity pH 4 (mol kg ⁻¹)		To be evaluated	To be evaluated	
Limit values (mg kg⁻¹) for compliance test using BN 12457-3 at L/S 10 l kg⁻¹				
As (arsenic)	0.5	2	25	< 0.050
Ba (barium)	20	100	300	< 0.50
Cd (cadmium)	0.04	1	5	< 0.010
Cr (chromium (total))	0.5	10	70	< 0.050
Cu (Copper)	2	50	100	< 0.050
Hg (mercury)	0.01	0.2	2	< 0.0050
Mo (molybdenum)	0.5	10	30	< 0.050
Ni (nickel)	0.4	10	40	< 0.050
Pb (lead)	0.5	10	50	0.059
Sb (antimony)	0.06	0.7	5	0.014
Se (selenium)	0.1	0.5	7	< 0.010
Zn (zinc)	4	50	200	< 0.50
Cl (chloride)	800	15,000	25,000	17
F (fluoride)	10	150	500	6.0
SO ₄ (sulphate)	1000#	20,000	50,000	45
Total Dissolved Solids (TDS) ⁺	4,000	60,000	100,000	660
Phenol index	1			< 0.50
Dissolved organic carbon at own pH or pH 7.5-8.0 [@]	500	800	1000	100

Notes

* Either TOC or LOI must be used for hazardous waste
If an inert waste does not meet the SO₄ L/S10 limit, alternative limit values of 1500 mg l⁻¹ SO₄ at Co (initial eluate from the percolation test (prCEN/TS 14405:2003)) AND 6000 mg kg⁻¹ SO₄ at L/S10 (either from the percolation test or batch test BS EN 12457-3), can be used to demonstrate compliance with the acceptable criteria for inert wastes.
+ The value for TDS can be used instead of the values for Cl and SO₄
@ DOC at pH 7.5-8.0 and L/S10 can be determined or eluate derived from a modified version of the pH dependence Test, prEN 14429, if the limit value at own pH (BS EN 12457 eluate) is not met.

PRIMARY CLASSIFICATION	NON-HAZARDOUS
SECONDARY CLASSIFICATION	NON-HAZARDOUS

Title

Comparison of test data to landfill waste acceptance criteria (table 5.1) (Secondary classification)

Table number

1 of 1

Basic categorisation schedule for Made Ground

**Produced following the requirements of The Landfill (England and Wales) (Amendment)
Regulations 2004 Part 2 (5)**

(a) *Source and origin of waste*

Proposed development at Havant RFC, Havant, PO9 3EJ

(b) *Process producing the waste*

Foundation and service trench excavations / general site clearance

(c) *Statement on waste treatment*

Refer to pre-treatment confirmation form

(d) *Composition of the waste*

Dark grey sandy silt with frequent rootlets and occasional brick fragments and greyish brown sandy/ gravelly silty clay with the gravel fraction comprising flint with occasional brick fragments

(e) *Appearance of the waste*

As above

(f) *European waste catalogue code*

17-05-04 (for non-hazardous waste)

(g) *Hazardous waste properties*

None

(h) *Is the waste prohibited under regulation 9?*

No

(i) *Landfill class*

Non-hazardous but cannot be classified as inert due to marginally elevated mineral oils (C10 to C40 range)

(j) *Additional precautions required at landfill*

None

(k) *Can waste be recycled or recovered?*

Yes

(l) *Name and address of waste producer*

TBC

(m) *Name and address of consultant*

Soiltechnics Limited, Cedar Barn, White Lodge, Walgrave, Northampton. NN6 9PY.

Tel: (01604) 781877

E-mail: mail@soiltechnics.net

Fax: (01604) 781007

Website: www.soiltechnics.net

Schedule Date:

signed

October 2017

Soiltechnics reference:

STP4148D

Stephen J Fisk B.Sc. (Hons), FGS

Basic categorisation schedule for Head soils

**Produced following the requirements of The Landfill (England and Wales) (Amendment)
Regulations 2004 Part 2 (5)**

(a) *Source and origin of waste*

Proposed development at Havant RFC, Havant, PO9 3EJ

(b) *Process producing the waste*

Foundation and service trench excavations / general site clearance

(c) *Statement on waste treatment*

Refer to pre-treatment confirmation form

(d) *Composition of the waste*

Greyish brown sandy / gravelly silty clay. Gravel consists of flint.

(e) *Appearance of the waste*

As above

(f) *European waste catalogue code*

17-05-04 (for non-hazardous waste)

(g) *Hazardous waste properties*

None

(h) *Is the waste prohibited under regulation 9?*

No

(i) *Landfill class*

Inert based on soils being of natural origin and unlikely to be affected by artificial contamination

(j) *Additional precautions required at landfill*

None

(k) *Can waste be recycled or recovered?*

Yes

(l) *Name and address of waste producer*

TBC

(m) *Name and address of consultant*

Soiltechnics Limited, Cedar Barn, White Lodge, Walgrave, Northampton. NN6 9PY.

Tel: (01604) 781877

E-mail: mail@soiltechnics.net

Fax: (01604) 781007

Website: www.soiltechnics.net

Schedule Date:

signed

October 2017

Soiltechnics reference:

STP4148D



Stephen J Fisk B.Sc. (Hons), FGS

Basic categorisation schedule for London Clay soils

Produced following the requirements of The Landfill (England and Wales) (Amendment)
Regulations 2004 Part 2 (5)

(a) *Source and origin of waste*

Proposed development at Havant RFC, Havant, PO9 3EJ

(b) *Process producing the waste*

Foundation and service trench excavations / general site clearance

(c) *Statement on waste treatment*

Refer to pre-treatment confirmation form

(d) *Composition of the waste*

Orangish brown speckled black sandy clay / clayey sand.

(e) *Appearance of the waste*

As above

(f) *European waste catalogue code*

17-05-04 (for non-hazardous waste)

(g) *Hazardous waste properties*

None

(h) *Is the waste prohibited under regulation 9?*

No

(i) *Landfill class*

Inert based on soils being of natural origin and unlikely to be affected by artificial contamination

(j) *Additional precautions required at landfill*

None

(k) *Can waste be recycled or recovered?*

Yes

(l) *Name and address of waste producer*

TBC

(m) *Name and address of consultant*

Soiltechnics Limited, Cedar Barn, White Lodge, Walgrave, Northampton. NN6 9PY.

Tel: (01604) 781877

E-mail: mail@soiltechnics.net

Fax: (01604) 781007

Website: www.soiltechnics.net

Schedule Date:

signed

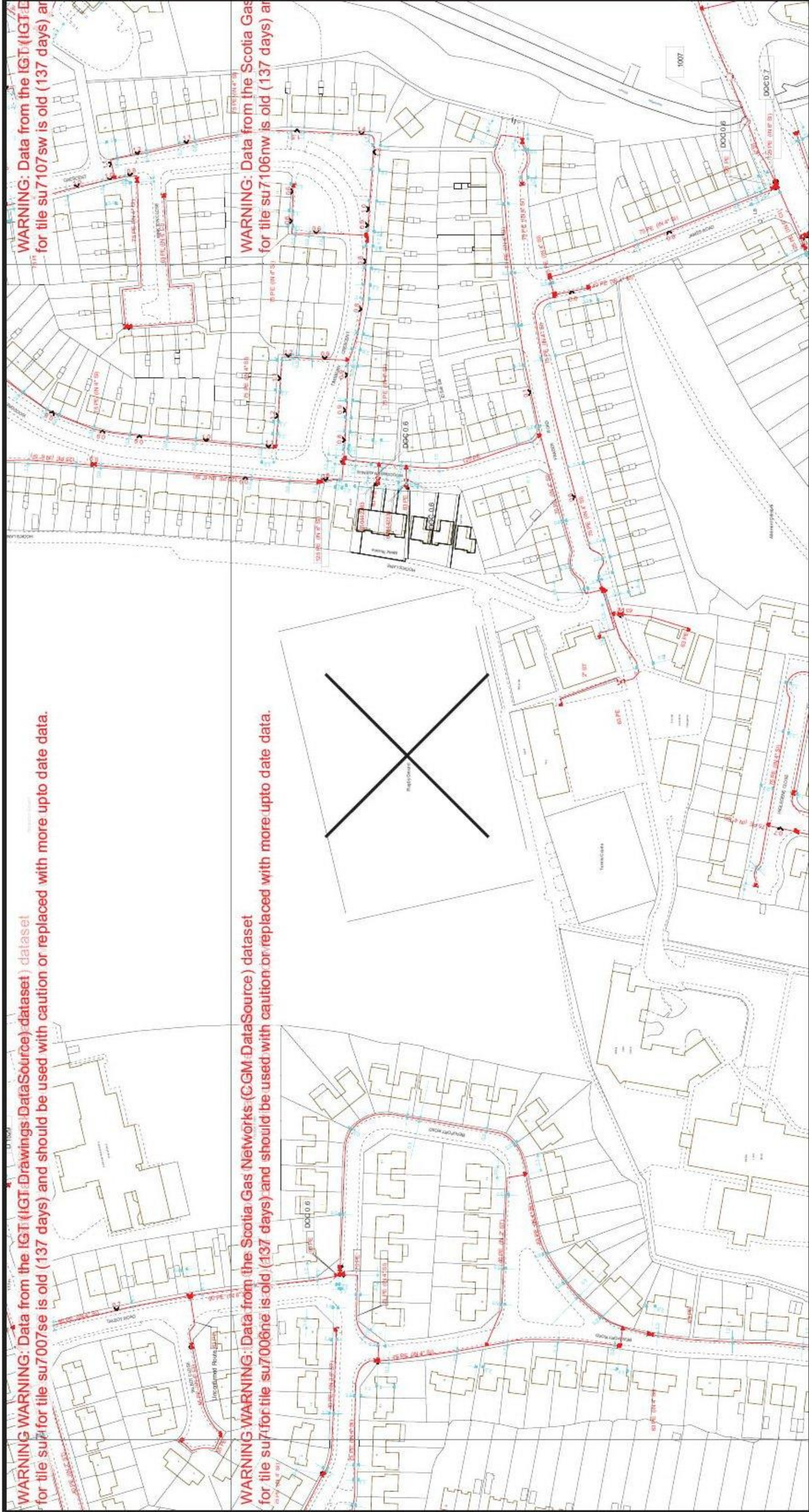
October 2017

Soiltechnics reference:

STP4148D



Stephen J Fisk B.Sc. (Hons), FGS



WARNING WARNING: Data from the IGT (IGT Drawings DataSource) dataset for tile su7 for tile su7007se is old (137 days) and should be used with caution or replaced with more upto date data.

WARNING WARNING: Data from the Scotia Gas Networks (CGM DataSource) dataset for tile su7 for tile su7006ne is old (137 days) and should be used with caution or replaced with more upto date data.

WARNING: Data from the IGT (IGT Drawings DataSource) dataset for tile su7107sw is old (137 days) and should be used with caution or replaced with more upto date data.

WARNING: Data from the Scotia Gas Networks (CGM DataSource) dataset for tile su7106nw is old (137 days) and should be used with caution or replaced with more upto date data.

USER ID: LaurenW
DATE: 16 Aug 2017
EXTRACT DATE: 01 Apr 2017
MAP REF: SU7006NE
CENTRE: 470791, 106925
SCALE: 1:2,316

- LP Mains
- MP Mains
- IP Mains
- LHP Mains
- NHP Mains

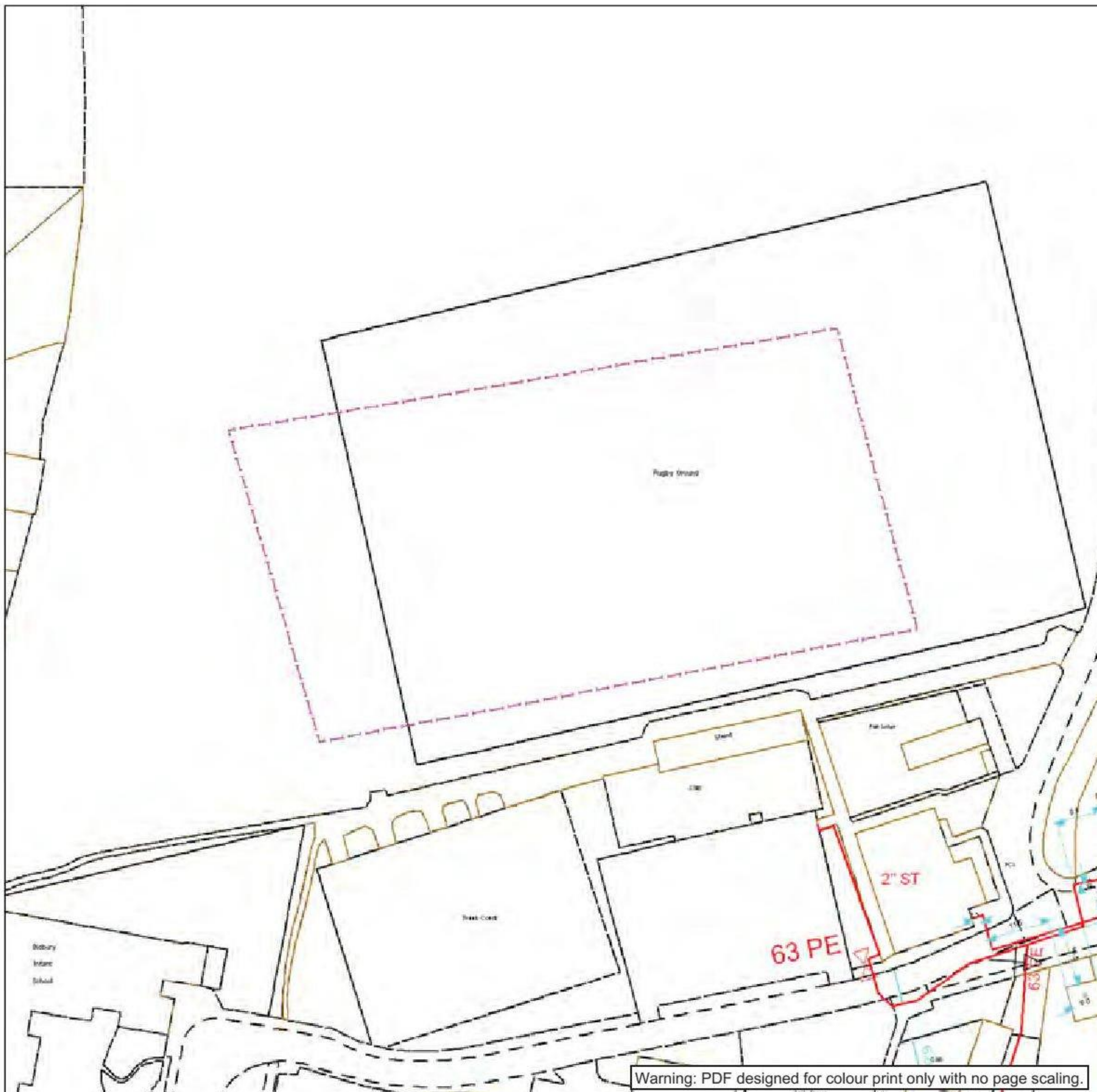
This plan shows those pipes owned by Scotia Gas Networks plc in their role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Scotia Gas Networks plc or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Product: UtilityMaps
Version: 1.6.8.1
Template: 'Scotia Gas Networks (A4 Landscape)'

- Valve
- Depth of Cover
- Syphon
- Diameter Change
- Material Change



This plan is reproduced from or based on the OS map by Scotia Gas Networks plc, with the sanction of the controller of HM Stationery Office.
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0800 912 1722
Email:
plantlocation@sgn.co.uk

Low Pressure Mains

Medium Pressure Mains

Intermediate Pressure Mains

High Pressure Mains

Some Examples Of Plant Items

Valve



Syphon



Depth of
Cover



Diameter
Change



Material
Change



History Data

LAs

GTs



SSSIs



Warning: PDF is designed for colour print only, with no page scaling. This information is given as a guide only and its accuracy cannot be guaranteed.



This plan shows the location of those pipes owned by Scotia Gas Networks (SGN) by virtue of being a licensed Gas Transporter (GT). Gas pipes owned by other GTs or third parties may also be present in this area but are not shown on this plan. Information with regard to such pipes should be obtained from the relevant owners. No warranties are given with regard to the accuracy of the information shown on this plan. Service pipes, valves, siphons, sub-connections etc. are not shown but their presence should be anticipated. You should be aware that a small percentage of our pipes/assets may be undergoing review and will temporarily be highlighted in yellow. If your proposed works are close to one of these pipes, you should contact the SGN Safety Admin Team on 0800 912 1722 for advice. No liability of any kind whatsoever is accepted by SGN or its agents, servants or sub-contractors for any error or omission contained herein. Safe digging practices, in accordance with HS (G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that plant location information is provided to all persons (whether direct labour or sub-contractors) working for you on or near gas apparatus. Information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

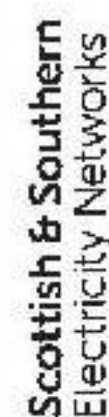
Report damage immediately – KEEP EVERYONE AWAY FROM THE AREA
0800 111 999

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Plans generated by DigSAFE Pro (tm) software provided by LineasearchbeforeUdig

Date Requested: 16/08/2017
Job Reference: 11030484
Site Location: 470767 106914
Requested by:
Miss Lauren Wenham
Your Scheme/Reference:
STP4148D

Exact Scales:
1:1000 Area or Circle dig site
1:1000 Line dig site



ic Primary School



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PORTSMOUTH

023-9262-4200

Y

Scale 1:1250

Date: 16/08/2017

Grid Ref:su70790692

105

lauren.wenham

Plot 2 of 2

UNCONTROLLED COPY

Subject to Revision without Notice.

Template: S1AS NRSWA BW A4 plat3

NORMAL DEPTH TO THE TOP OF THE
CABLE WHEN LAID.

	seconds	hr	day
FOOTPATH	0.40m	0.45m	0.60m 0.75m

LOAD CROSSING 0.65m 0.60m 0.75m 0.90m

- v./services -up to 1000V
- over 1000V to 11,000V
- 11V.
- 22,000V and 132,000V

WARNING

There may have been subsequent alterations to the surface levels. Trial holes must be taken to determine positions and depths of cables. HS (c) - Buried at from the Health and Safety Executive - Avoiding Danger from Buried Cables - should be consulted before commencing excavation work. (available from THE HSE)

WHEN WORKING IN THE VICINITY OF OVERHEAD LINES
THE HEALTH AND SAFETY GUIDANCE NOTE G58 SHOULD
BE CONSULTED.

BE CONSULTED.
(AVAILABLE FROM THE HSE)



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Southern Electric Power Distribution plc
Registered in England No. 04004280, Registered Office:
55 Western Road, Reading, Berkshire, RG1 8BU

PORTSMOUTH

023-9262-4200

HV

Scale 1:1250

Date: 16/08/2017

Grid Ref:su70790692

S01

lauren.wenham

Plot 1 of 2

UNCONTROLLED COPY

Subject to Revision without Notice

Template: SIAS NESWA BW A4 plot3

NORMAL DEPTH TO THE TOP OF THE CABLE WHEN LAID.

FOOTPATH 0.40m 0.45m 0.60m 0.75m
ROAD CROSSING 0.65m 0.60m 0.75m 0.90m

L.v./services -up to 1000V
h.v. -over 1000V to 11,000V
e.h.v -22,000V and 132,000V

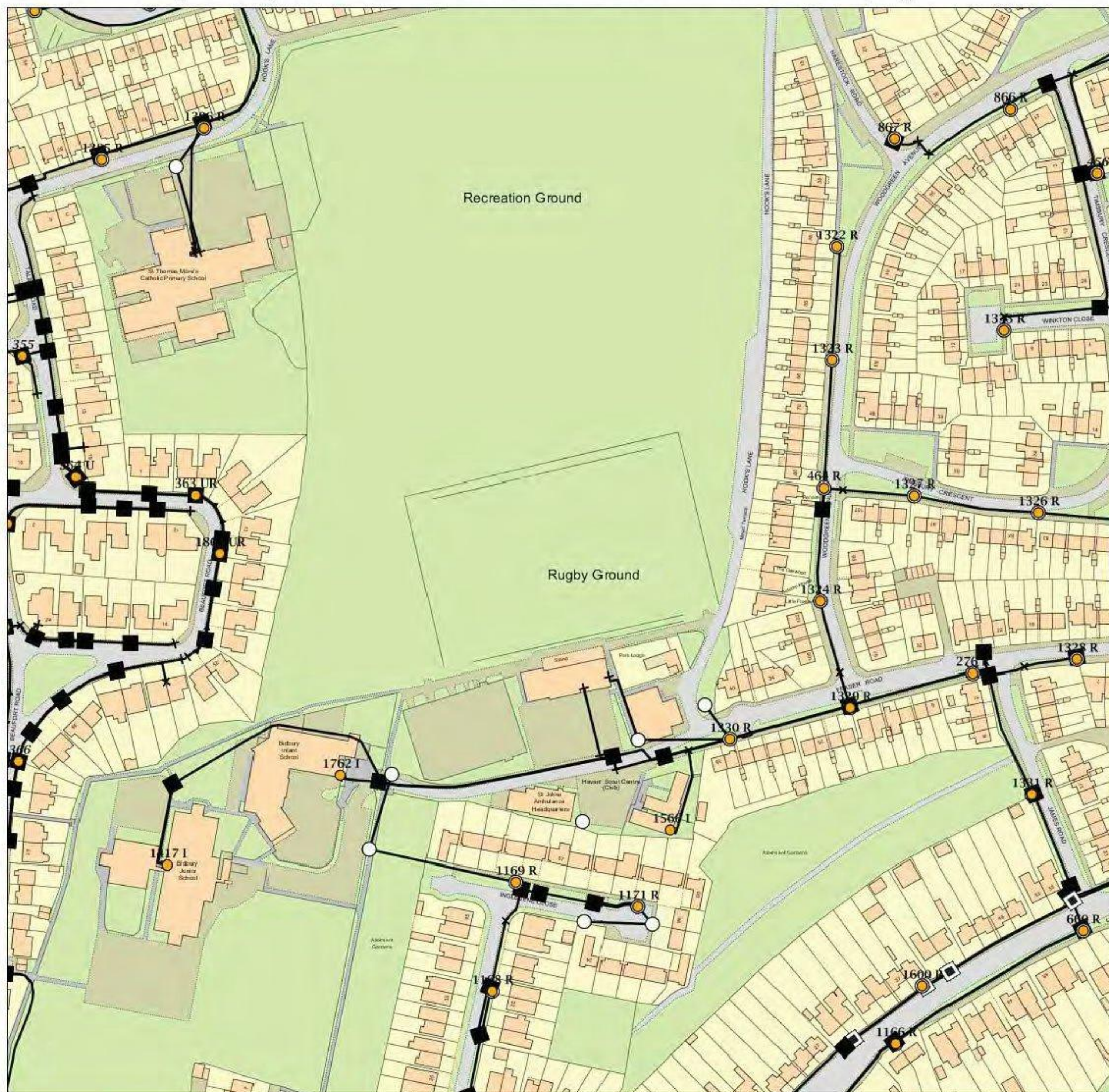
WARNING

There may have been subsequent alterations to the surface levels. Trial holes must be taken to determine positions and depths of cables. HS (c) 47 Booklet from the Health and Safety Executive - Avoiding Danger from Buried Cables - should be consulted before commencing excavation work. (available from THE HSE)

WHEN WORKING IN THE VICINITY OF OVERHEAD LINES THE HEALTH AND SAFETY GUIDANCE NOTE G58 SHOULD BE CONSULTED.
(AVAILABLE FROM THE HSE)



Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only.
No guarantee is given of its accuracy.

It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.



openreach

CLICK BEFORE YOU DIG

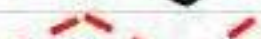
FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR
TO COMMENCEMENT OF EXCAVATION WORKS
INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

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Controller of Her Majesty's Stationary Office
(C) Crown Copyright British Telecommunications plc 100028040

KEY TO BT SYMBOLS

DP		Planned Pole	
Planned DP		Joint Box	
PCP		Change Of State	
Planned PCP		Split Coupling	
Built		Duct Tee	
Planned		Planned Box	
Inferred		Manhole	
Building		Planned Manhole	
Kiosk		Cabinet	
Hatchings		Planned Cabinet	

Other proposed plant is shown using dashed lines.

BT Symbols not listed above maybe disregarded.

Existing BT Plant may not be recorded.

Information valid at time of preparation

openreach

BT Ref : OER02314C

Map Reference : (centre) SU7079106925

Easting/Northing : (centre) 470791.1069

Issued: 16/08/2017 14:31:24

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk



Soiltechnics
Cedar Barn
White Lodge
Walgrave
NN6 9PY

Your ref STP4148D
Our ref 258014
Date 23 August 2017
Contact searches@southernwater.co.uk
Tel 0845 272 0845
0330 303 0276
Fax 01634 844514

Attention: Rachel Brown

Dear Customer

Re: Provision of public sewer record extract

Location: Havant RFC, PO9 3EJ

Thank you for your order regarding the provision of extracts of our sewer and/or water main records. Please find enclosed the extracts from Southern Water's records for the above location.

We confirm payment of your fee in the sum of £49.92 and enclose a VAT receipt for your records.

Customers should be aware that there are areas within our region in which there are neither sewers nor water mains. Similarly, whilst the enclosed extract may indicate the approximate location of our apparatus in the area of interest, it should not be relied upon as showing that further infrastructure does not exist and may subsequently be found following site investigation. Actual positions of the disclosed (and any undisclosed) infrastructure should therefore be determined on site, because Southern Water does not accept any responsibility for inaccuracy or omission regarding the enclosed plan. Accordingly it should not be considered to be a definitive document.

Should you require any further assistance regarding this matter, please contact the LandSearch team.

Yours faithfully

LandSearch

VAT receipt

Ordered by:

Soiltechnics
White Lodge
Walgrave
NN6 9PY

VAT registration number: 813 0378 56
Order reference: 258014
Your reference: STP4148D

Receipt for provision of an extract from the public sewer and/or water main records.

Location	Costs
Havant RFC PO9 3EJ	£41.60
Net total	£41.60
VAT	£8.32
Total	£49.92
Paid	Paid in full

Thank you for your payment:

Received on: 16 August 2017

For enquiries regarding the information provided in this receipt, please contact the LandSearch team:

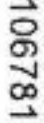
Tel: 0845 270 0212
0330 303 0276 (individual consumers)

Email: searches@southernwater.co.uk

Web: www.southernwater.co.uk

LandSearch
Southern Water Services
Southern House
Capstone Road
Chatham
Kent
ME5 7QA





O.S. REF.
SU70

Date: 23/08/2017

Drawn by:

Scale:

Date: 23/08/2017

The positions of pipes shown in the event of inaccuracy. The actual positions show.

WARNING: SAC pipes are constructed from plastic. They are not suitable for use as a structural element.

WARNING: Unknown (UNK) materials.

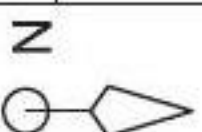
Based upon Ordnance Survey Licence No. WU 298530.

The positions of pipes shown on this plan are believed to be in the event of inaccuracy.
The actual positions should be determined on site.
WARNING: BAC pipes are constructed of Bonded Asbestos Cement (WRAPING: Unwrap (UNIK) materials may include Bonded Asbestos Cement).
Based upon Ordnance Survey Digital Data with the permission No. WU 298530.

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.
The actual positions should be determined on site.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

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Southern
Water

SEWER RECORDS PAGE 2 OF 2

[illegible][illegible]

Drawn by:	kumaria
Title:	256014_Havant RFC, PO9 3EU
Date:	23/08/2017



Enquirer

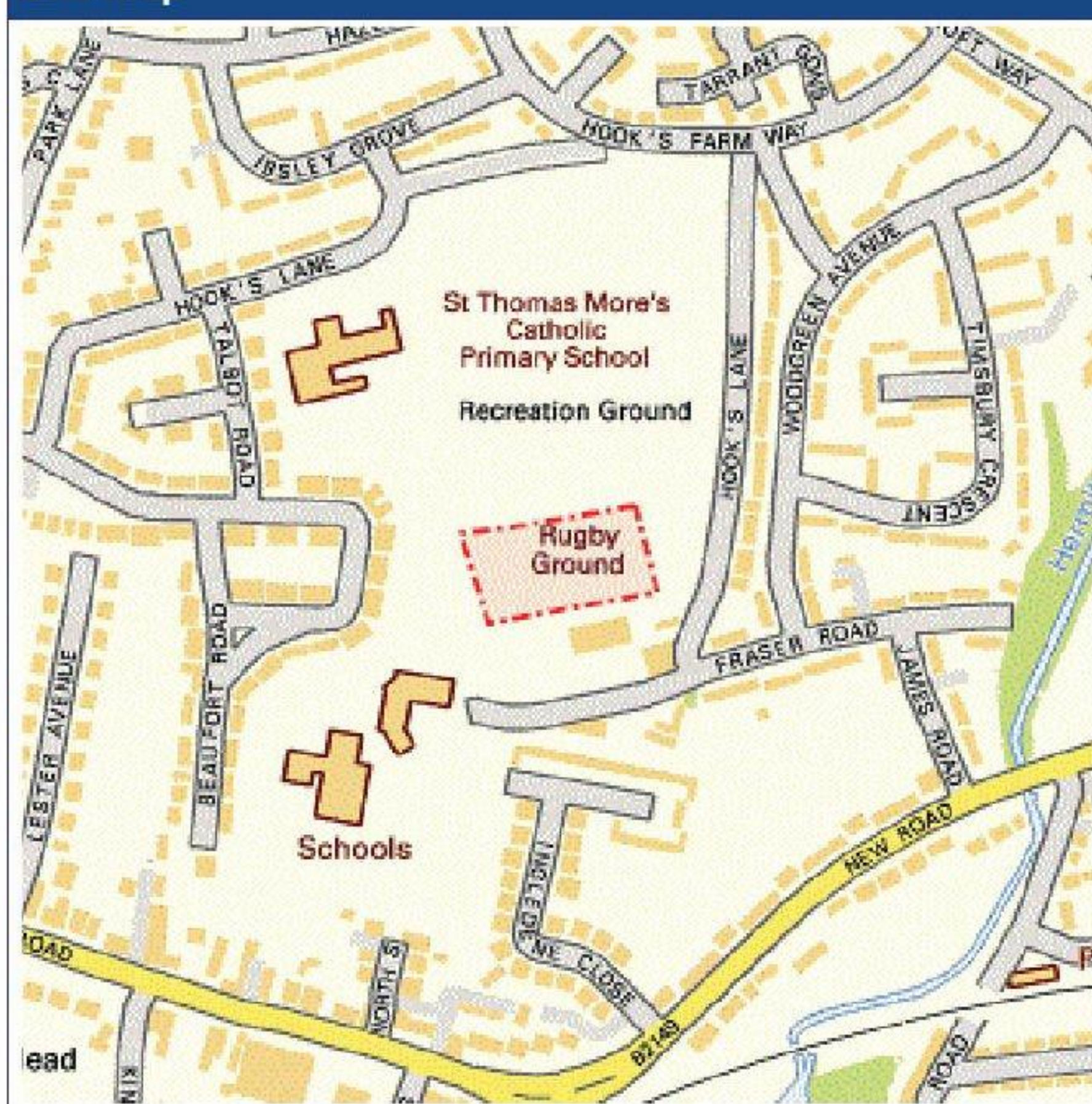
Name	Miss Lauren Wenham	Phone	01604781877
Company	Soiltechnics	Mobile	07966275096
		Fax	01604781007
Address	Cedar Barn White Lodge Walgrave Northamptonshire NN6 9PY		
Email	lauren.wenham@soiltechnics.net		
Notes	Please ensure your contact details are correct and up to date on the system in case the LSBUD Members need to contact you.		

Enquiry Details

Scheme/Reference	STP4148D		
Enquiry type	Initial Enquiry	Work category	Development Projects
Start date	17/08/2017	Work type	Commercial/industrial
End date	17/08/2017	Site size	6687 metres square
Searched location	XY= 470791, 106925 Easting/Northing	Work type buffer*	25 metres
Confirmed location	470767 106915		

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.

Site Map



Asset Owners

Terms and Conditions. Please note that this enquiry is subject always to our standard terms and conditions available at www.lineasearchbeforeudig.co.uk ("Terms of Use") and the disclaimer at the end of this document. Please note that in the event of any conflict or ambiguity between the terms of this Enquiry Confirmation and the Terms of Use, the Terms of Use shall take precedence.

Validity and search criteria. The results of this enquiry are based on the confirmed information you entered and are valid only as at the date of the enquiry. It is your responsibility to ensure that the Enquiry Details are correct, and LineasearchbeforeUdig accepts no responsibility for any errors or omissions in the Enquiry Details or any consequences thereof. LSBUD Members update their asset information on a regular basis so you are advised to consider this when undertaking any works. It is your responsibility to choose the period of time after which you need to resubmit any enquiry but the maximum time (after which your enquiry will no longer be dealt with by the LSBUD Helpdesk and LSBUD Members) is 28 days. If any details of the enquiry change, particularly including, but not limited to, the location of the work, then a further enquiry must be made.

Asset Owners & Responses. Please note the enquiry results include the following:

1. "LSBUD Members" who are asset owners who have registered their assets on the LSBUD service.
2. "Non LSBUD Members" are asset owners who have not registered their assets on the LSBUD service but LSBUD is aware of their existence. Please note that there could be other asset owners within your search area.

Below are three lists of asset owners:

1. **LSBUD Members who have assets registered within your search area. ("Affected")**
 - a. These LSBUD Members will either:
 - i. Ask for further information ("Email Additional Info" noted in status). The additional information includes: Site contact name and number, Location plan, Detailed plan (minimum scale 1:2500), Cross sectional drawings (if available), Work Specification.
 - ii. Respond directly to you ("Await Response"). In this response they may either send plans directly to you or ask for further information before being able to do so, particularly if any payments or authorisations are required.
2. **LSBUD Members who do not have assets registered within your search area. ("Not Affected")**
3. **Non LSBUD Members who may have assets within your search area.** Please note that this list is not exhaustive and all details are provided as a guide only. It is your responsibility to identify and consult with all asset owners before proceeding.

National Grid. Please note that the LSBUD service only contains information on National Grid's Gas above 7 bar asset, all National Grid Electricity Transmission assets and National Grid's Gas Distribution Limited above 2 bar asset.

For National Grid Gas Distribution Ltd below 2 bar asset information please go to www.beforeyoudig.nationalgrid.com

LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area.

List of affected LSBUD members			
Asset Owner	Phone/Email	Emergency Only	Status
SGN	08009121722	0800111999	Await response

LSBUD Members who do not have assets registered on the LSBUD service within the vicinity of your search area. Please be aware that LSBUD Members make regular changes to their assets and this list may vary for new enquiries in the same area.

List of not affected LSBUD members		
AWE Pipeline	Fulcrum Pipelines Limited	Premier Transmission Ltd (SNIP)
BOC Limited (A Member of the Linde Group)	Gamma	Prysmian Cables & Systems Ltd (c/o Western Link)
BP Midstream Pipelines	Gateshead Energy Company	Redundant Pipelines - LPDA
BPA	Gigaclear PLC	RWEpower (Little Barford and South Haven)
Carrington Gas Pipeline	Humbly Grove Energy	SABIC UK Petrochemicals
CATS Pipeline c/o Wood Group PSN	IGas Energy	Scottish Power Generation
Cemex	INEOS Manufacturing (Scotland and TSEP)	Seabank Power Ltd
Centrica Energy	INOVYN Enterprises Limited	Shell (St Fergus to Mossmorran)
Centrica Storage Ltd	Interger (Coryton Energy or Spalding Energy)	Shell Pipelines
CLH Pipeline System Ltd	Mainline Pipelines Limited	SSE (Peterhead Power Station)
Concept Solutions People Ltd	Manchester Jetline Limited	Total (Finaline, Colnbrook & Colwick Pipelines)
ConocoPhillips (UK) Ltd	Manx Cable Company	Transmission Capital
DIO (MOD Abandoned Pipelines)	Marchwood Power Ltd (Gas Pipeline)	UK Power Networks
Dong Energy (UK) Ltd	Melbourn Solar Limited	Uniper UK Ltd
E.ON UK CHP Limited	National Grid Gas (Above 7 bar), National Grid Gas Distribution Limited (Above 2 bar) and National Grid Electricity Transmission	Vattenfall
EirGrid	Northumbrian Water Group	Veolia ES SELCHP Limited
Electricity North West Limited	NPower CHP Pipelines	Western Power Distribution
ENI & Himor c/o Penspen Ltd	Oikos Storage Limited	Wingas Storage UK Ltd
ESP Utilities Group	Perenco UK Limited (Purbeck Southampton Pipeline)	Zayo Group UK Ltd c/o JSM Group Ltd
ESSAR	Petroineos	
Esso Petroleum Company Limited	Phillips 66	

The following Non-LSBUD Members may have assets in your search area. It is **YOUR RESPONSIBILITY** to contact them before proceeding. Please be aware this list is not exhaustive and it is your responsibility to identify and contact all asset owners within your search area.

Non-LSBUD members (Asset owners not registered on LSBUD)			
Asset Owner	Preferred contact method	Phone	Status
BT	https://www.swns.bt.com/pls/mbe/welcome.home	08009173993	Not Notified
CityFibre	asset.team@cityfibre.com	033 3150 7282	Not Notified
Colt	plantenquiries@catelecomuk.com	01227768427	Not Notified
Energetics Electricity	plantenquiries@energetics-uk.com	01698404646	Not Notified
ENGIE	nrsua@cofely-gdfsuez.com	01293 549944	Not Notified
GTC	https://pe.gtc-uk.co.uk/PlantEnqMembership	01359240363	Not Notified
GTT (formerly Hibernia Networks)	owen.maguire@gtt.net	01704 322 300	Not Notified
Interoute	interoute.enquiries@plancast.co.uk	02070259000	Not Notified
KPN (c/-Instalcom)	kpn.plantenquiries@instalcom.co.uk	n/a	Not Notified
Level 3 Communications UK Ltd (C/-Instalcom)	plantenquiries@instalcom.co.uk	02087314613	Not Notified
Mobile Broadband Network Limited	mbnl.plant.enquiries@turntown.com	01212 621 100	Not Notified
Portsmouth Water	asset.enquiries@portsmouthwater.co.uk	02392449082	Not Notified
Scottish and Southern Energy	asset.data@sse.com	01256337294	Not Notified
Sky UK Limited	nrsua@sky.uk	02070323234	Not Notified
Southern Water	searches@southernwater.co.uk	08452700212	Not Notified
Tata (c/-McNicholas)	plantenquiries@mcnicholas.co.uk	03300558469	Not Notified
Utility assets Ltd	assetrecords@utilityassets.co.uk		Not Notified
Verizon Business	osp-team@uk.verizonbusiness.com	01293611736	Not Notified
Virgin Media	http://www.digdat.co.uk	08708883116	Not Notified
Vodafone	osm.enquiries@atkinsglobal.com	01454662881	Not Notified
Vtesse Networks	https://plant.interoute.com/plant-enquiries/	01992532100	Not Notified

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