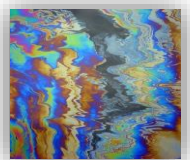
INVESTIGATE



REMEDIATE

REGENERATE

TECHNICAL REPORT

GROUND INVESTIGATION
AT
ENTERPRISE ZONE, TRAINING FACILITY,
BAE SAMLESBURY, LANCASHIRE
FOR
WILSON MASON LLP

REPORT NO. 5887A
NOVEMBER 2014

SUB SURFACE NORTH WEST LIMITED
3 Peel Street
Preston
Lancashire
PR2 2QS
Tel: (01772) 561135 Fax: (01772) 204907
Email: preston@subsurface.co.uk

CONTENTS

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

GROUND INVESTIGATION AT ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

CLIENT: WILSON MASON LLP

ENGINEER: TRP CONSULTING

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1. INTRODUCTION

This report has been prepared in accordance with emails, dated 29th May 2014 and 23rd June 2014 from the Engineer on behalf of the Client.

The brief was set out in our estimate, ref. E9686 and dated 22nd April 2014, with amendments as the investigation proceeded and includes:

- 6 No. cable percussive boreholes
- 6 No. trial pits
- 2 No. soakaway tests
- Geotechnical laboratory testing
- Contamination analysis
- Installation of standpipes followed by groundwater and ground gas monitoring
- Provision of an interpretative report on the above.

1.1 Site Location and Description

The site is located in the eastern end of the Samlesbury Aerodrome, near Preston, Lancashire as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is SD633312.

The site comprises an irregular shaped grassed area measuring some 450m by 320m at the eastern end of the main runway. The site is bound to the north and east by the perimeter road, to the south east by an area of hardstanding and storage containers, to the south and north west by grassed areas, and to the south west by the runway.

1.2 Proposed Development and Purpose of the Ground Investigation

We understand that it is proposed to develop the site as an enterprise zone, as shown on Figure 3.

The purpose of the investigation was to obtain an indication of the ground conditions, at the positions of the boreholes and trial pits, to assess the likelihood of a general pattern of strata being present below the site and to establish the load bearing characteristics of the strata deriving if possible an assessment of the suitability of appropriate founding techniques.

In addition a contamination assessment was required in order to determine necessary precautions and/or remedial measures required for the proposed development and to ascertain the need for any further sampling and analysis.

Ground gas monitoring and assessment was also required to determine necessary precautions and/or remedial measures.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

2. INVESTIGATION

2.1 Investigation Details

Six 150mm diameter boreholes were put down by cable percussive boring techniques at the positions determined and set out by Sub Surface North West Limited, as shown on Figure 2. The boreholes were put down to depths of between 10.00m and 15.50m, samples taken were logged in accordance with BS. EN. 14688 and 14689: 2002-2004 and the resulting Borehole Records are appended.

Six trial pits were taken out by a mechanical excavator at the positions determined and set out by Sub Surface North West Limited, as shown on Figure 2. The trial pits were excavated to depths of between 0.50m and 2.50, representative samples were taken and the materials were logged in accordance with BS. EN. 14688 and 14689: 2002-2004. The resulting Trial Pit Records are appended.

2.2 Sub Surface Detail

Details of the strata encountered in the ground investigation are given on the appended Borehole and Trial Pit Records. The exploratory holes found made ground and topsoil overlying natural cohesive strata. A general summary of the strata found is as follows:

2.2.1 Made Ground

Made ground was encountered in BH1, BH2, BH6, TP1, TP2, TP3 and TP6 to depths of between 0.25m and 1.60m and comprised mainly brown and dark greyish brown slightly gravelly, slightly sandy clay with localised low brick, stone, concrete and slag cobble content. The gravel sized fragments comprised mainly fine to coarse brick and stone with localised fragments of timber, concrete, clinker and slag. A localised zone of deeper made ground was encountered in TP1 to a depth of 1.60m

2.2.2 Drift Deposits

Drift deposits were encountered in all of the exploratory holes except TP3 which was terminated on a field drain, and comprised mainly firm medium strength locally high strength dark brown and brown slightly gravelly locally sandy silty clay. The gravel comprised mainly subrounded to rounded fine to coarse siltstone, sandstone and quartz. A localised zone of soft low strength clay, possibly made ground, was encountered in BH1 to a depth of some 2.50m.

2.2.3 Groundwater

No groundwater was encountered in any of the exploratory holes although it should be noted that they were only left open for a short period of time. Also groundwater levels and rates of inflow may be subject to seasonal and/ or climatic variations.

A perched water seepage was encountered in TP1 at 1.30m.

Monitoring of standpipes installed in BH1, BH4 and BH6 between found groundwater levels to be between 0.05m and 5.30m.

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3. SAMPLING, TESTING AND MONITORING

3.1 Sampling

Thirty 100mm diameter undisturbed samples were taken at appropriate intervals in cohesive strata, for testing in the laboratory.

Small disturbed and bulk disturbed samples were obtained for the strata encountered and were subjected to careful examination and hand penetrometer tests, where appropriate.

The samples will be retained for a period of one month after the issue of this report, for reference purposes, and then disposed of unless otherwise instructed.

3.2 Field Testing

Nineteen hand shear vane tests were undertaken in the trial pits and the results are given on the appended Trial Pit Records.

Thirty Standard Penetration Tests (SPTs) were performed in the natural clay strata, the results of which are recorded on the appended Standard Penetration Test Results Sheet with 'N' values and indicative states of compaction and consistency, where appropriate, given on the appended Borehole Records.

On completion of TP4 and TP5 soakaway tests were undertaken in the natural clay strata. Water was added to the pits from a bowser and water levels were subsequently monitored over a period of 300 minutes. Water levels were found to have fallen insufficiently to determine the Soil Infiltration Rate and hence soakaways are not feasible on this site. Details of the soakaway tests are appended.

3.3 Installations and Monitoring

On completion of BH1, BH4 and BH6 hdpe standpipes were installed to a depth of 6.0m. The standpipes are slotted from 1.0m depth, have an internal diameter of 50mm and have removable quick release gas valves to enable both ground gas and groundwater monitoring and sampling to be undertaken. Details of the installations are given on the appended Borehole Records.

Monitoring of the standpipes for ground gas and groundwater has been undertaken on six occasions using portable equipment. A Gas Data GFM 435 was used for monitoring methane, carbon dioxide, oxygen, gas flows and atmospheric pressure. The results of the monitoring are given on the appended Ground Gas and Groundwater Monitoring Results sheet.

3.4 Laboratory Testing

The following laboratory tests were carried out in accordance with BS.1377: 1990, where applicable, and the results are appended.

- Moisture content, plastic limit and liquid limit tests
- Quick undrained triaxial tests
- Oedometer consolidation tests
- California bearing ratio tests on samples remoulded at natural moisture content
- Soluble sulphate content and pH value tests

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

Contamination analyses have been performed on nineteen soil samples to determine: pH and concentrations of sulphate, sulphide, cyanide, arsenic, boron (soluble), cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, zinc, speciated total petroleum hydrocarbons (TPHs), the speciated polynuclear aromatic hydrocarbons (PAHs) suite, the benzene/ ethylbenzene/ toluene/ xylene (BTEX) suite and phenols. In addition eleven soil samples were subjected to an asbestos screen.

Contamination analyses have been performed on three water samples to determine: pH and concentrations of sulphate, sulphide, cyanide, arsenic, boron (soluble), cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, zinc, speciated total petroleum hydrocarbons (TPHs), the speciated polynuclear aromatic hydrocarbons (PAHs) suite, the benzene/ ethylbenzene/ toluene/ xylene (BTEX) suite and phenols.

The results of the above analyses are appended.

4. APPRAISAL AND RECOMMENDATIONS

4.1 Comments on the Profile

At the outset it should be appreciated that only a small proportion of the area to be developed has been sampled and consequently the recommendations made and opinions expressed in this report can only be applied to such conditions as were encountered in the exploratory holes.

In our opinion the exploratory holes indicate a nature and degree of similarity to the extent that we consider them likely to be representative of the natural ground conditions, although clearly no guarantee can be given.

Due to the nature of made ground localised variations in thickness and composition should be anticipated and hence interpolation or extrapolation from the exploratory holes to adjoining areas should only be undertaken with caution.

Details of the findings of the investigation are given on the appended Borehole and Trial Pit Records and a summary of the ground conditions is given in Section 2.2.

4.2 Foundations

We understand that it is proposed to construct a two storey training facility with associated car parking and landscaping as depicted in Figure 3. However, at the time of writing this report no specific details regarding the design loadings were available and consequently the recommendations given are in general terms only.

The ground investigation generally found made ground and topsoil to depths of up to 1.60m overlying natural firm medium and high strength clay.

We would not recommend founding in the made ground in its present condition because of its inherent variability in consistency and compaction, and in parts the nature of its constituents.

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Providing there is sufficient load bearing capability we recommend that the proposed building is founded on strip footings for wall loads and pad foundations for column loads in the natural firm medium and high strength clay strata.

Atterberg limit tests on the cohesive strata indicate clays of intermediate plasticity which are considered to have a medium susceptibility to shrinkage and swelling with varying moisture content. Consequently we recommend that any foundations are placed at a minimum depth of 0.90m below finished ground level to avoid the zone which is subject to seasonal moisture content variation and frost action. If buildings are to be constructed adjacent to existing trees, trees are to be removed and/or trees are to be planted then the guidelines given in the National House Building Council (NHBC) Standards Chapter 4.2, 'Building Near Trees', should be followed for clays of medium shrinkage and swelling potential.

It should be noted that in parts of the site the natural strata is at a depth of in excess of 0.90m and in these areas foundations should be taken down to a minimum 0.10m below the base of the made ground unless the NHBC guidelines indicate a greater depth.

In view of the depth of foundations required it is anticipated that trench fill will be used in places to bring levels back up to the surface. We would anticipate that trench fill would normally be economically viable providing foundation depths do not exceed about 2.50 to 3.00m.

Taking the results of the field and laboratory tests we have determined the safe bearing capacity of the natural strata, as follows:

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

TABLE 1 SAFE BEARING CAPACITY

Expl Hole No.	Depth (m)	SPT 'N' Value	Shear Strength (kN/m^2)	Safe Bearing Pressure (kN/m^2)		Minimum Foundation Depth (m)
				Strip Footing	Square Pad	
BH1	1.20	-	23#	40*	50*	2.50
	2.15	3	12	20	25	
	3.00	-	79	150	180	
	4.00	14	56	105	125	
BH2	1.30	14	56	105	125	0.90
	2.00	-	159	300*	360*	
	3.15	11	44	80	100	
BH3	1.20	-	111	210*	250*	0.90
	2.15	19	76	140	170	
	3.00	-	83	155	185	
BH4	1.35	9	36	65	80	2.00
	2.00	-	82	155*	185*	
	3.15	11	44	80	100	
BH5	1.20	-	77	145*	175*	0.90
	2.15	12	48	90	105	
	3.00	-	69	130	155	
BH6	1.20	-	96#	180*	215*	0.90
	2.15	12	48	90	105	
	3.00	-	161	305	365	

Shear strength determined by hand shear vane test probably less accurate than determination by triaxial tests or SPTs.

* Consideration must be given to weaker underlying strata which might be overstressed if loading is not reduced.

Appreciable variations in safe bearing capacity are indicated in Table 1 and as a consequence of this and the need to utilise a generally applicable safe bearing pressure to enable designs to be reasonably formulated we recommend that values of 90kN/m^2 for strip footings and 105kN/m^2 for square pads should not be exceeded for the minimum foundation depth given. The presence of low strength clays in BH4 should be noted and we recommend that where similar strata are present the foundations should be taken down to the medium strength clays. If the footprint of the proposed building extends into the zone of low and very low strength ground encountered in BH1 then we recommend the foundations are taken down to a minimum depth of 2.50m in this area.

All formation levels should be carefully inspected by an experienced and qualified engineer to confirm the appropriateness of the design figures used with any softer zones removed and replaced with lean mix concrete. The formation should then be blinded with lean mix concrete as soon as possible after exposure, if there is to be a delay before construction, to prevent water softening or disturbance.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

It should be noted that the safe bearing pressures given for the cohesive strata do not take into consideration settlement. Settlement is dependent upon loading intensity, the width of footings/pads and the coefficient of volume compressibility (Mv) of the compressible strata. Mv values are given on the appended oedometer consolidation test results sheets. When details of the foundations are formulated we recommend that total and differential settlements should be calculated to ensure that they are within acceptable limits.

In strata similar to that found in BH4 the oedometer consolidation tests indicate that, for a strip footing 1.0m wide at a depth of 2.00m and exerting a ground bearing pressure of 90kN/m^2, consolidation settlement in the order of 10mm might be expected. Similarly oedometer consolidation tests indicate that, for a pad foundation 1.5m square at a depth of 2.00m exerting a ground bearing pressure of 105kN/m^2, consolidation settlement in the order of 15mm might be expected. We recommend that detailed settlement calculations are carried out for the final design scheme.

In view of the nature of the proposed development the safe bearing pressures determined above may not be sufficient and shallow foundations in natural ground may not feasible , in which case alternative foundations will need to be considered. These might include ground improvement by vibroflotation with shallow reinforced foundations or piled foundations.

The most common form of the vibroflotation treatment technique is vibro replacement whereby dense stone columns are formed through the full depth of any made ground that is present and variable near surface strata, utilising the passive resistance of cohesive soils and compacting granular soils to improve the bearing capacity and minimise differential settlements of the composite mass of near surface materials and compacted stone columns.

Due to the varying types, sizes and power of vibroflotation machines currently in use, the advice of a Specialist Contractor should be sought to ascertain the feasibility of applying the particular technique, the allowable bearing capacity and expected differential settlements each machine will achieve and in formulating the most economic scheme.

With the use of a vibroflotation ground treatment programme great care must be taken to prevent the transmission of vibrations to adjacent/ nearby buildings, structures or services that may be founded at shallow depth and already be in a highly stressed condition. Such vibrations could lead to structural damage. In this respect any Specialist Contractor tendering for the work should be asked to confirm that the vibrations set up by the ground treatment process will not give rise to structural damage to adjacent/ nearby buildings, structures or services.

Sub Surface North West Limited
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With regard to the choice of pile type, consideration could be given to driven piles, continuous flight auger (CFA) piles or cast in-situ bored piles with the driven pile option probably being the most economical. However, in considering piles driven to a pre-determined set in the more competent strata at depth, it is essential to ensure that any vibrations set up during the driving process are not transmitted to nearby buildings, structures or services. This is because nearby buildings, structures or services could well be founded at shallow depth and already be in a highly stressed state and susceptible to structural damage as a direct result of such induced vibration. Consequently, we recommend that any Specialist Piling Contractor tendering in respect of driven piles should be asked to confirm that the process to be adopted will not affect or cause damage to nearby buildings, structures or services. If such confirmation cannot be given then we would recommend using either CFA or cast in-situ bored piles.

Care must be taken to space the piles in any group to ensure the adequate utilisation of skin friction where this has been assumed in the calculation of the load bearing capacity of an individual pile. Checks must also be undertaken to confirm that the underlying ground supporting the pile group is not overstressed.

To provide assistance for estimating purposes only, we have undertaken a preliminary pile design calculation for a 15.5m long pile taking into consideration the ground conditions at BH4, as follows:

Preliminary Pile Design based on strata in BH4

Bored Cast In-situ or CFA Pile Factor of Safety: 2.5 (shaft), 3.0 (end)
Dia. = 0.30m, Perimeter = 0.94m, Cross Section Area = 0.07m^2, Length = 15.5m

0.00 to 0.20m	TOPSOIL	- Ignore
0.20 to 1.50m	Low strength CLAY	-ignore, shallow depth
1.50 to 2.00m	Low strength brown slightly gravelly silty CLAY	c = 36kN/m^2
	Allowable Shaft Friction	= 11.5kN/m^2
	Allowable Shaft Friction Load	= 5kN
2.00 to 15.50m	Medium strength locally high strength brown slightly gravelly silty CLAY	$\bar{c}$ = 70kN/m^2
	Allowable Shaft Friction	= 22.4kN/m^2
	Allowable Shaft Friction Load	= 284kN
15.50m	High strength brown slightly gravelly silty CLAY	c = 75 kN/m^2
	Allowable End Bearing	= 225kN/m^2
	Allowable End Bearing Load	= 15kN

Total Allowable Working Load = 5 + 284 + 15 = 304kN

In order to use the load carrying capacity attributable to both shaft friction and end bearing, the final design figures should be checked to ensure that the ultimate shaft friction is greater than or equal to the allowable working load, otherwise end bearing only should be used.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

To formulate the most satisfactory and economic scheme we suggest that competitive tenders and designs from Specialist Piling Contractors should be sought using the borehole information obtained.

4.3 Floor Slab Construction

With regard to the design and construction of floor slabs we would recommend the removal of any topsoil and/or made ground and the level brought up as required using a graded granular hardcore placed and compacted in layers of not greater than 150mm followed by the construction of a concrete ground bearing floor slab.

In the area of the deeper made ground encountered in TP1, in order to obviate any significant damaging settlements we would recommend using a suspended floor slab with intermediate support designed on the same basis as the main foundations where the spans are too large for economical single suspended slab design.

Should vibroflotation ground treatment be proposed for the main foundations consideration could be given to extending the ground treatment in a grid pattern beneath the whole of the building followed by the construction of a suitably reinforced concrete ground bearing floor slab cast on a granular base layer.

4.4 Excavations and Groundwater

In our opinion, there should be no particular difficulties in excavating the strata indicated in the exploratory holes utilising an appropriate and suitably sized mechanical excavator. However, it should be noted that old brick foundations were encountered in TP2 at 0.30m which may need to be broken out prior to excavation.

The trial pit sides were found to remain vertical and stable for the relatively short period that they were left open and unsupported.

It is recommended that all excavations to greater than 1.20m depth, or for shallower excavations where groundwater is encountered above this level, are closely supported, especially where man entry is required. Alternatively, where space permits, the excavations might be battered back to an appropriate angle.

No groundwater was encountered in any of the exploratory holes although it should be noted that they were only left open for a short period of time. Also groundwater levels and rates of inflow may be subject to seasonal and/ or climatic variations.

A perched water seepage was encountered in TP1 at 1.30m. Monitoring of standpipes installed in BH1, BH4 and BH6 between found groundwater levels to be between 0.05m and 5.30m, but these are likely to be due to accumulation in the standpipes not being able to soakaway.

Should groundwater seepages occur and water accumulate in the excavation it should be able to be removed by pumping from a filtered sump.

4.5 Buried Concrete

For the design of buried concrete the recommendations given in Building Research Establishment (BRE) Special Digest 1 (September 2005 revision), “Concrete in Aggressive Ground”, should be followed.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

Determination of pH on the soil and groundwater samples gave values in the range of 7.3 to 8.8.

Soluble sulphate concentrations were also determined for the soil and groundwater samples and the results ranged from 0.01 to 0.11 g/l and 0.31 to 0.64 g/l respectively.

The results indicate that the Design Sulphate Class for the site should be DS-2.

Our knowledge of the site and ground conditions indicates that the site is “brownfield” with potentially mobile groundwater.

Consequently, in accordance with the Design Sulphate Class for the site together with the site and groundwater conditions an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-2 should be used as detailed on the appended extract.

4.6 Roads, Hardstandings and Car Parks

Laboratory California Bearing Ratio (CBR) tests have been undertaken on six samples of natural clay recompacted at their natural moisture content and the results of the tests are appended. A summary of the laboratory CBR test results is as follows:

TABLE 2 CBR RESULTS

Expl. Hole No.	Depth (m)	Dry Density (Mg/m^3)	Moisture Content (%)	CBR Value (%)	Sample
TP1	0.40 – 0.60	1.64	22	3.6	Dark brown and grey slightly gravelly silty CLAY with occasional rootlets.
TP2	0.40 – 0.60	1.74	19	4.3	Brown and occasional greyish brown slightly gravelly silty CLAY with occasional rootlets.
TP3	0.40 – 0.60	1.73	19	2.0	Dark brown and occasional grey silty CLAY.
TP4	0.30 – 0.50	1.63	23	3.2	Brown and occasional grey slightly gravelly silty CLAY with occasional rootlets.
TP5	0.30 – 0.50	1.77	19	1.9	Brown and occasional grey slightly gravelly silty CLAY with occasional rootlets.
TP6	0.40 – 0.60	1.79	17	2.3	Brown and occasional grey slightly gravelly slightly sandy silty CLAY.

It should be noted that the above values are moisture dependent and it is possible that the CBR values would reduce with increased moisture content; this being particularly so for cohesive strata.

Given the above it would be advisable to design on a CBR value of 1.9% for the proposed car park. If there is to be a delay before construction, to prevent water softening, loosening and disturbance, the formation strata should not be exposed.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

4.7 Contamination Considerations

At the outset it should be noted that this contamination investigation is an initial survey in order to provide a preliminary risk assessment on the level of contamination present. Based upon the findings of this investigation additional sampling, analysis and assessment may be required.

It should be appreciated that the suite of determinants consist of a range of common contaminants and the analysis is restricted to these in the absence of historical evidence of the source of the made ground. However, the absence of other specific contaminants cannot be guaranteed.

4.7.1 Assessment (Soil)

In order to provide an assessment of the presence of contamination nineteen soil samples have been analysed for a suite of determinants and the results are appended.

The Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) withdrew the soil guideline values (SGVs) and replaced the old CLR 10 document covering derivation of soil guideline values in 2008. This had the effect that any values derived using the old CLR 10 assumptions and parameters were no longer valid. DEFRA and EA published new soil guideline values (SGVs) for mercury, selenium, benzene, toluene, ethylbenzene and xylene on 31 March 2009, arsenic and nickel on 12 May 2009 and cadmium and phenols in June 2009.

In July 2009 a substantial number of Generic Assessment Criteria (GACs) were published by Land Quality Management (LQM), in conjunction with the Chartered Institute of Environmental Health. Contaminated Land: Applications in Real Environments (CL:AIRE) guideline values were also published in December 2009 to supplement the above. The guideline values (SGVs, GACs and CL:AIRE) vary dependent upon the land use; allotment and residential use being the most sensitive and commercial/ industrial use being the least sensitive.

For the purposes of assessment, as the proposed development is a training facility, contamination analyses have been compared with the guideline values for a standard land use of commercial and industrial.

The contamination analysis determined no elevated levels of contaminants when compared with the guideline values for a standard land use of commercial and industrial. Guideline values for the assessment can be supplied directly to the Regulator, if requested. No asbestos fibres were found in any of the samples tested.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

In addition to the above, an assessment of risk to personnel who will come into contact with on-site materials throughout the site has been undertaken.

4.7.3 Assessment (Groundwater)

Three samples of groundwater have been analysed for a suite of determinants and the results are appended.

None of the levels of contamination exceeded the Environment Agency's Environmental Quality Standards (EA EQS) or the United Kingdom Drinking Water Standards (UK DWS).

4.7.4 Conclusions and Recommendations

Section 78a(2) of the Environmental Protection Act: 1990 as amended by the Contaminated Land (England) (Amendment) regulations 2012, and Section 86 of the Water Act 2003, defines CONTAMINATED LAND for the purposes of Part IIA as:

"any land which appears to the LOCAL AUTHORITY in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

(a) SIGNIFICANT HARM is being caused or there is a SIGNIFICANT POSSIBILITY of such harm being caused; or

(b) SIGNIFICANT POLLUTION OF CONTROLLED WATERS is being, or is likely to be, caused"

Before a LOCAL AUTHORITY can make the judgement that land appears to be CONTAMINATED LAND on the basis that SIGNIFICANT HARM is being caused, or that there is a SIGNIFICANT POSSIBILITY of such harm being caused, the LOCAL AUTHORITY must identify a SIGNIFICANT POLLUTANT LINKAGE. This means that each of the following has to be identified:

(a) a CONTAMINANT;

(b) a relevant RECEPTOR (defined as living organisms, ecological systems, controlled waters or property); and

(c) a PATHWAY by means of which either:

(i) the CONTAMINANT is causing SIGNIFICANT HARM to that RECEPTOR, or

(ii) there is a SIGNIFICANT POSSIBILITY of such harm being caused by that CONTAMINANT to that RECEPTOR

It should be noted that the above words in capitals have a legal definition within the legislation.

Without a clear identification of all three elements of the pollutant linkage, land cannot be identified as contaminated under the regime.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

The National Planning Policy Framework states that, “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. Therefore, the general principles detailed above apply to this assessment.

Our assessment, based on the results of the soil and water samples only, indicates that there are no contaminants requiring remediation and/or precautions to be taken for the proposed development.

Should it be necessary to remove on-site materials from the site, classification of the waste should be undertaken before submitting analysis to appropriate waste carriers and/ or waste disposal site operators to determine the most appropriate tip to use and the associated costs.

SGVs, GACs and CL:AIRE assume long term contact with contamination and assess chronic health risk. The risk of short term acute exposure to site personnel is dealt with in the remit of the Health and Safety Executive under the Health and Safety at Work Act: 1974 and Regulations made under the Act, including the Control of Substances Hazardous to Health (COSHH) Regulations. The levels of contamination and risk to site personnel should be considered under the Construction Design and Management (CDM) Regulations at the planning stage and in the development of the designers and contractors Health and Safety Plans and Method Statements. The risk of contact with on-site soils should be minimised.

4.8 Ground Gas Considerations

Ground gas monitoring has been undertaken on six occasions and the results of the monitoring visits are appended.

Ground gases: methane, carbon dioxide and oxygen and flow rate have been monitored and the ranges of ground gases and flow rate during the monitoring period are as follows:

TABLE 3 GROUND GAS CONCENTRATIONS AND FLOW RATE

Methane (% vol. In air)	**Carbon Dioxide (% vol. in air)**	**Oxygen (% vol. in air)**	**Gas Flow Rate (litres/ hour)**
0.0 – 1.3	0.1 – 6.5	13.1 – 19.1	<0.1

It can be seen from the monitoring that elevated levels of methane and carbon dioxide, and depleted levels of associated oxygen, have been detected.

Methane gas when present between 5% volume in air (Lower Explosive Limit - L.E.L.) and 15% volume in air (Upper Explosive Limit - U.E.L.) is potentially explosive and inflammable whilst carbon dioxide in conjunction with depleted oxygen is an asphyxiant. Both methane and carbon dioxide are a by-product of the anaerobic and aerobic decomposition of biodegradable materials.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

The levels of gas have been assessed in accordance with British Standard BS8485, "Code of practice for the characterisation and remediation from ground gas in affected developments", published in October 2007 (BS8485:2007).

The characteristic hazardous gas flow rate (Q_{hgs}) is calculated by dividing the maximum gas (methane or carbon dioxide) concentration by 100 and multiplying by the maximum flow rate in litres per hour (minimum 0.1 l/hr for Sub Surface monitoring equipment). For this site Q_{hgs} = 0.0065 l/hr.

BS8485:2007, Table 1, indicates that the site falls into Characteristic Situation CS1 (very low). However, the carbon dioxide levels were >5% during the first two monitoring visits and subsequent readings may have been impaired by the shallow standing water level. Consequently the CS1 is increased by one to CS2 in accordance with the guidance given in BS8485:2007.

BS8485:2007 Table 3 indicates that the following protection and remedial measures will provide adequate protection:

- Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into the slab, in conjunction with a taped and sealed membrane to reasonable levels of workmanship in line with current good practice with validation.

Or

- Proprietary gas resistant membrane to reasonable levels of workmanship in line with current good practice under CQA with integrity testing and independent validation.

All excavations of greater than 1.20m depth should be routinely checked for air quality prior to man entry and appropriate precautions taken.

Any manholes, inspection chambers or other void spaces formed beneath the sites ground surface are potential ground gas traps. Precautions, as per the excavations above, should be taken.

4.9 Soakaways

On completion of TP4 and TP5 soakaway tests were undertaken in the natural clay strata. Water was added to the pits from a bowser and water levels were subsequently monitored over a period of 300 minutes. Water levels were found to have fallen insufficiently to determine the Soil Infiltration Rate and hence soakaways are not feasible on this site due to the relative impermeability of the strata. Details of the soakaway tests are appended.

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4.10 General

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Miss Anna Marsden at our Preston office.

SUB SURFACE NORTH WEST LIMITED
REPORT No. 5887A
NOVEMBER 2014

D. B. Jones BSc (Hons), Cert Nat Sci (Open), CEnv, MSEE, AIEMA, MIEnvSc.
Senior Environmental Engineer
For and on behalf of
Sub Surface Consultants Limited

C. A. Marsden B.Sc.(Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

Sub Surface North West Limited
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Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

INSITU TEST RESULTS

SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Standard Penetration Test Results

Site : ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client : WILSON MASON LLP

Engineer : TRP CONSULTING

Job Number 5887

Sheet 1 / 1

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
BH1	2.00	2.15	2.45	SPT	1	0	1	0	1	1	N=3	
BH1	4.00	4.15	4.45	SPT	3	3	4	3	4	3	N=14	
BH1	6.00	6.15	6.45	SPT	3	2	5	4	3	5	N=17	
BH1	9.00	9.15	9.45	SPT	4	5	4	3	4	5	N=16	
BH2	1.20	1.35	1.65	SPT	2	3	3	4	3	4	N=14	
BH2	3.00	3.15	3.45	SPT	3	4	3	2	3	3	N=11	
BH2	5.00	5.15	5.45	SPT	3	4	3	4	4	5	N=16	
BH2	7.50	7.65	7.95	SPT	3	3	3	5	4	5	N=17	
BH2	10.50	10.65	10.95	SPT	4	4	5	4	4	5	N=18	
BH2	13.50	13.65	13.95	SPT	4	5	6	7	7	7	N=27	
BH3	2.00	2.15	2.45	SPT	4	4	5	4	5	5	N=19	
BH3	4.00	4.15	4.45	SPT	3	3	4	3	4	4	N=15	
BH3	6.00	6.15	6.45	SPT	4	4	3	4	5	4	N=16	
BH3	9.00	9.15	9.45	SPT	4	5	5	4	4	5	N=18	
BH4	1.20	1.35	1.65	SPT	1	1	1	2	3	3	N=9	
BH4	3.00	3.15	3.45	SPT	2	3	3	2	3	3	N=11	
BH4	5.00	5.15	5.45	SPT	3	4	4	3	4	3	N=14	
BH4	7.50	7.65	7.95	SPT	4	4	5	4	4	4	N=17	
BH4	10.50	10.65	10.95	SPT	3	4	4	5	4	4	N=17	
BH4	13.50	13.65	13.95	SPT	4	4	5	4	5	4	N=18	
BH5	2.00	2.15	2.45	SPT	3	3	2	3	4	3	N=12	
BH5	4.00	4.15	4.45	SPT	3	2	3	4	4	4	N=15	
BH5	6.00	6.15	6.45	SPT	4	4	3	4	4	4	N=15	
BH5	9.00	9.15	9.45	SPT	2	2	4	4	4	5	N=17	
BH6	2.00	2.15	2.45	SPT	2	3	3	3	3	3	N=12	
BH6	4.00	4.15	4.45	SPT	4	4	3	4	4	4	N=15	
BH6	6.00	6.15	6.45	SPT	3	3	3	4	4	3	N=14	
BH6	9.00	9.15	9.45	SPT	4	4	3	3	4	3	N=13	
BH6	12.00	12.15	12.45	SPT	4	4	4	3	4	4	N=15	
BH6	15.00	15.15	15.45	SPT	4	4	3	3	3	4	N=13	

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Insitu Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY

Client: BAE SYSTEMS LIMITED

Engineer: TRP CONSULTING

Job Number 5887

Sheet: 1 / 1

Ground Gas and Groundwater Monitoring Results Sheet

Date	Hole No.	Methane (% Volume)	Carbon Dioxide (% Volume)	Oxygen (% Volume)	Gas Flow Rate (l/hr)	Atmospheric Pressure (m bars)	Depth to Groundwater (m)
18/07/2014	BH1	***1.2***	***5.7***	***13.1***	<0.1	1003	5.30
	BH4	0.0	***2.2***	***17.0***	<0.1	1003	3.60
	BH6	0.7	***2.3***	18.9	<0.1	1003	3.00
06/08/2014	BH1	0.5	***6.5***	***15.4***	<0.1	996	1.45
	BH4	0.0	***1.8***	19.1	<0.1	996	0.95
	BH6	0.9	***2.7***	18.9	<0.1	996	1.55
22/08/2014	BH1*	_	_	_	_	998	0.20
	BH4*	_	_	_	_	998	0.10
	BH6	0.0	***3.5***	18.5	<0.1	998	1.25
10/09/2014	BH1	0.5	***4.8***	***12.1***	<0.1	1011	_
	BH4	0.0	0.1	20.3	<0.1	1011	_
	BH6	0.0	***1.8***	19.5	<0.1	1011	_
13/10/2014	BH1	_	_	_	_	_	0.20
	BH4	0.0	0.8	***17.7***	<0.1	996	0.40
	BH6	***1.3***	0.9	20.1	<0.1	996	0.80
31/10/2014	BH1	_	_	_	_	_	0.10
	BH4	_	_	_	_	_	0.05
	BH6	0.0	0.1	20.2	<0.1	999	0.50

Remarks: Elevated levels of methane and carbon dioxide and depleted levels of oxygen are shown in ***bold/italics.***

*No gas readings possible due to high water level.

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Insitu Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SYSTEMS, SAMLESBURY

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

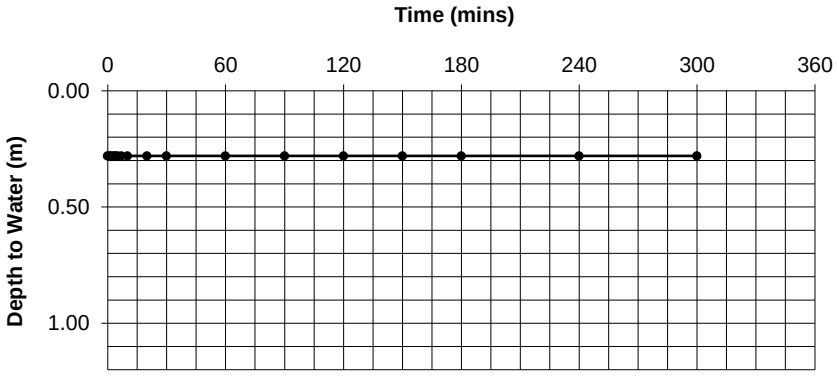
Sheet: 1/2

Soakaway Test

Hole No: TP4

TEST NO: 1

DATE: 02/07/14



Length of pit:	L =	1.40	m
Width of pit:	W =	0.50	m
Depth of pit	D =	1.20	m
Base area of pit:	A =	0.70	m^2
100% effective depth	D100 =	0.28	m
75% effective depth	D75 =	0.51	m
50% effective depth	D50 =	0.74	m
25% effective depth	D25 =	0.97	m
time to D75	T75 =	_	sec
time to D25	T25 =	_	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	N/A	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.32	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	2.45	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = N/A* m/sec

Time (min)	Depth (m)
0	0.28
1	0.28
2	0.28
3	0.28
4	0.28
5	0.28
7	0.28
10	0.28
20	0.28
30	0.28
60	0.28
90	0.28
120	0.28
150	0.28
180	0.28
240	0.28
300	0.28

Test Strata: (see Trial Pit)
0.28 - 0.30m: Dark grey and orange brown mottled gravelly slightly sandy CLAY (Topsoil).
0.30 - 1.20m: Brown, grey and occasional grey brown and green brown mottled slightly gravelly slightly sandy silty CLAY.

Remarks: *Soil infiltration rate unable to be determined due to relative impermeability of the test strata.

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Insitu Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SYSTEMS, SAMLESBURY

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

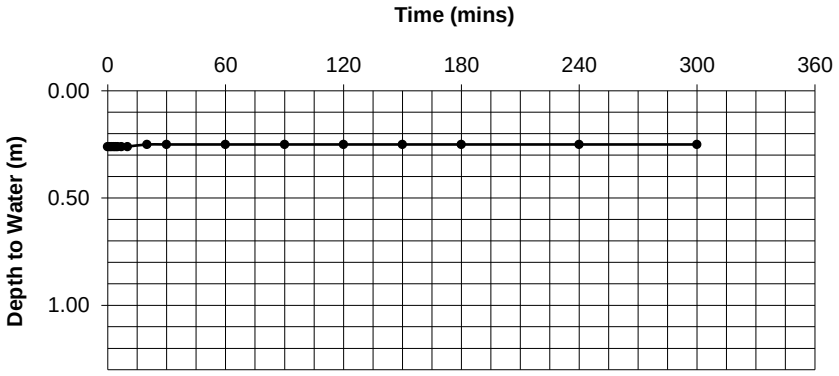
Sheet: 2/2

Soakaway Test

Hole No: TP5

TEST NO: 1

DATE: 02/07/14



Length of pit:	L =	1.40	m
Width of pit:	W =	0.50	m
Depth of pit	D =	1.30	m
Base area of pit:	A =	0.70	m^2
100% effective depth	D100 =	0.26	m
75% effective depth	D75 =	0.52	m
50% effective depth	D50 =	0.78	m
25% effective depth	D25 =	1.04	m
time to D75	T75 =	_	sec
time to D25	T25 =	_	sec
time from D75 to D25 (T25 - T75)	t_{p75-25} =	N/A	sec
volume between D75 & D25 (A x (D25 - D75))	V_{p75-25} =	0.36	m^3
surface area to D50 inc. base ((2x(D-D50)x(W+L)) + A)	a_{p50} =	2.68	m^2

SOIL INFILTRATION RATE **f =** $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = N/A* m/sec

Time (min)	Depth (m)
0	0.26
1	0.26
2	0.26
3	0.26
4	0.26
5	0.26
7	0.26
10	0.26
20	0.25
30	0.25
60	0.25
90	0.25
120	0.25
150	0.25
180	0.25
240	0.25
300	0.25

Test Strata:
(see Trial Pit) 0.25 - 1.40m: Brown, light grey and occasional green grey mottled gravelly slightly sandy silty CLAY.

Remarks: *Soil infiltration rate unable to be determined due to relative impermeability of the test strata.

LABORATORY TEST RESULTS

SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Laboratory Test Results

Site : ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client : WILSON MASON LLP

Engineer : TRP CONSULTING

Job Number 5887

Sheet 1 / 1

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

Borehole/ Trial Pit	Depth (m)	Sample	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Group Symbol	Laboratory Description
				Percentage %	Moisture Content %						
BH1	3.00	U	19	91	21	39	17	22	0.18	CI	Brown slightly gravely silty CLAY.
BH2	2.00	U	17	98	17	46	18	28	-0.04	CI	Brown slightly gravelly silty CLAY.
BH3	1.20	U	18	100	18	41	17	24	0.04	CI	Brown slightly gravelly silty CLAY.
BH4	0.50	B	19	91	21	38	14	24	0.29	CI	Brown and occasionally grey mottled slightly gravelly silty CLAY.
BH5	1.20	U	19	95	20	39	17	22	0.14	CI	Brown slightly gravelly silty CLAY.
BH6	1.20	U	19	73	26	42	17	25	0.36	CI	Brown slightly gravelly silty CLAY.

Method of Preparation : BS 1377:PART 1:1990:7.4 Preparation of samples for classification tests BS 1377:PART 2:1990:4.2 & 5.2 Sample preparations

Method of Test : BS 1377:PART 2:1990:3 Determination of moisture content 1990:4 Determination of the liquid limit BS 1377:PART 2:1990:5 Determination of the plastic limit and plasticity index

Remarks :

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Laboratory Test Results

Site : ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client : WILSON MASON LLP

Engineer : TRP CONSULTING

Job Number 5887

Sheet 1 / 2

DETERMINATION OF DENSITY, MOISTURE CONTENT AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole/ Trial Pit	Depth (m)	Sample	Moisture Content %	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Cell Pressure (kN/m^2)	Deviator Stress (kN/m^2)	Apparent Cohesion (kN/m^2)	Angle of Shearing Resistance (degrees)	Laboratory Description
BH1	1.20	U*						23		Dark greyish brown slightly gravelly silty CLAY.
BH1	3.00	U	19	2.13	1.79	25 125 175	157 159 160	79	0.0	Brown slightly gravely silty CLAY.
BH1	5.00	U	17	2.18	1.87	100 150 200	150 155 157	77	0.0	Brown slightly gravelly silty CLAY.
BH1	7.50	U	17	2.29	1.96	150 200 250	121 129 134	64	0.0	Brown gravelly silty CLAY.
BH2	2.00	U	17	2.22	1.89	50 100 150	309 320 323	159	0.0	Brown slightly gravelly silty CLAY.
BH2	4.00	U	17	2.16	1.84	100 150 200	178 180 188	91	0.0	Dark brown slightly gravelly silty CLAY.
BH2	6.00	U	15	2.19	1.90	125 175 225	208 215 222	108	0.0	Brown gravelly silty CLAY.
BH2	9.00	U	21	2.02	1.66	200 250 300	137 142 145	71	0.0	Brown slightly gravelly silty CLAY.
BH2	12.00	U	15	2.18	1.90	250 300 350	204 209 0	103	0.0	Brown slightly gravelly silty CLAY.
BH2	15.00	U	19	2.07	1.75	300 350 400	319 0 0	110	0.0	Brown gravelly silty CLAY.
BH3	1.20	U	18	2.12	1.80	25 75 125	217 221 227	111	0.0	Brown slightly gravelly silty CLAY.
BH3	3.00	U	17	2.13	1.81	75 125 175	161 167 170	83	0.0	Brown slightly gravelly silty CLAY.
BH3	5.00	U	15	2.16	1.88	100 150 200	145 148 148	74	0.0	Brown slightly gravelly silty CLAY.
BH3	7.50	U	15	2.17	1.88	150 200 250	210 213 217	107	0.0	Greyish brown slightly gravelly silty CLAY.
BH4	2.00	U	18	2.18	1.84	50 100 150	158 164 170	82	0.0	Greyish brown slightly gravelly silty CLAY.
BH4	4.00	U	18	2.14	1.81	100 150 200	135 139 142	69	0.0	Brown slightly gravelly silty CLAY.
BH4	6.00	U	17	2.10	1.79	125 175 225	112 115 115	57	0.0	Brown slightly gravelly silty CLAY.
BH4	9.00	U	16	2.17	1.88	200 250 300	187 195 204	98	0.0	Brown slightly gravelly silty CLAY.

Method of Preparation : BS 1377:PART 1:1990:7.4.2 Moisture content 1990: Preparation of undisturbed samples for testing BS 1377:PART 2:1990:7.2

Method of Test : BS 1377:PART 2:1990:3 Determination of moisture content 1990:7 Determination of density BS 1377:PART 7:1990:8 Undrained shear strength 1990:9 Multistage loading

Remarks : *No test possible, poor recovery. Hand Shear Vane only

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Laboratory Test Results

Site : ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client : WILSON MASON LLP

Engineer : TRP CONSULTING

Job Number 5887

Sheet 2 / 2

DETERMINATION OF DENSITY, MOISTURE CONTENT AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole/ Trial Pit	Depth (m)	Sample	Moisture Content %	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Cell Pressure (kN/m^2)	Deviator Stress (kN/m^2)	Apparent Cohesion (kN/m^2)	Angle of Shearing Resistance (degrees)	Laboratory Description
BH4	12.00	U	16	2.21	1.90	250 300 350	151 159 162	79	0.0	Brown slightly gravelly silty CLAY.
BH4	15.00	U	17	2.27	1.94	300 350 400	146 150 151	75	0.0	Brown slightly gravelly silty CLAY.
BH5	1.20	U	19	2.17	1.82	25 75 125	153 0 0	77	0.0	Brown slightly gravelly silty CLAY.
BH5	3.00	U	20	2.10	1.75	75 125 175	134 137 141	69	0.0	Brown slightly gravelly silty CLAY.
BH5	5.00	U	18	2.12	1.80	100 150 200	149 155 156	77	0.0	Brown slightly gravelly silty CLAY.
BH5	7.50	U	19	2.16	1.81	150 200 250	103 104 105	52	0.0	Brown slightly gravelly silty CLAY.
BH6	1.20	U*	19	2.17	1.83			96		Brown slightly gravelly silty CLAY.
BH6	3.00	U	18	2.15	1.83	75 125 175	318 322 324	161	0.0	Brown slightly gravelly silty CLAY.
BH6	5.00	U	18	2.23	1.88	100 150 200	140 144 147	72	0.0	Brown slightly gravelly silty CLAY.
BH6	7.50	U	16	2.17	1.87	150 200 250	181 184 186	92	0.0	Brown slightly gravelly silty CLAY.
BH6	10.50	U	18	2.19	1.85	225 275 325	197 204 205	101	0.0	Brown slightly gravelly silty CLAY.
BH6	13.50	U	15	2.23	1.94	275 325 375	222 227 233	114	0.0	Brown slightly gravelly silty CLAY.

Method of Preparation : BS 1377:PART 1:1990:7.4.2 Moisture content 1990: Preparation of undisturbed samples for testing BS 1377:PART 2:1990:7.2

Method of Test : BS 1377:PART 2:1990:3 Determination of moisture content 1990:7 Determination of density BS 1377:PART 7:1990:8 Undrained shear strength 1990:9 Multistage loading

Remarks : *No test possible, poor recovery. Hand Shear Vane only

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SITE INVESTIGATION SPECIALISTS AND CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel. 01772 561135 Fax. 01772 204907 info@subsurface.co.uk

Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	223 (WAC)
Project	Enterprise Zone Training Facility, BAE systems Samlesbury, Lancashire	**Job**	5887
Borehole	BH 1	**Sample**	223

Test Details

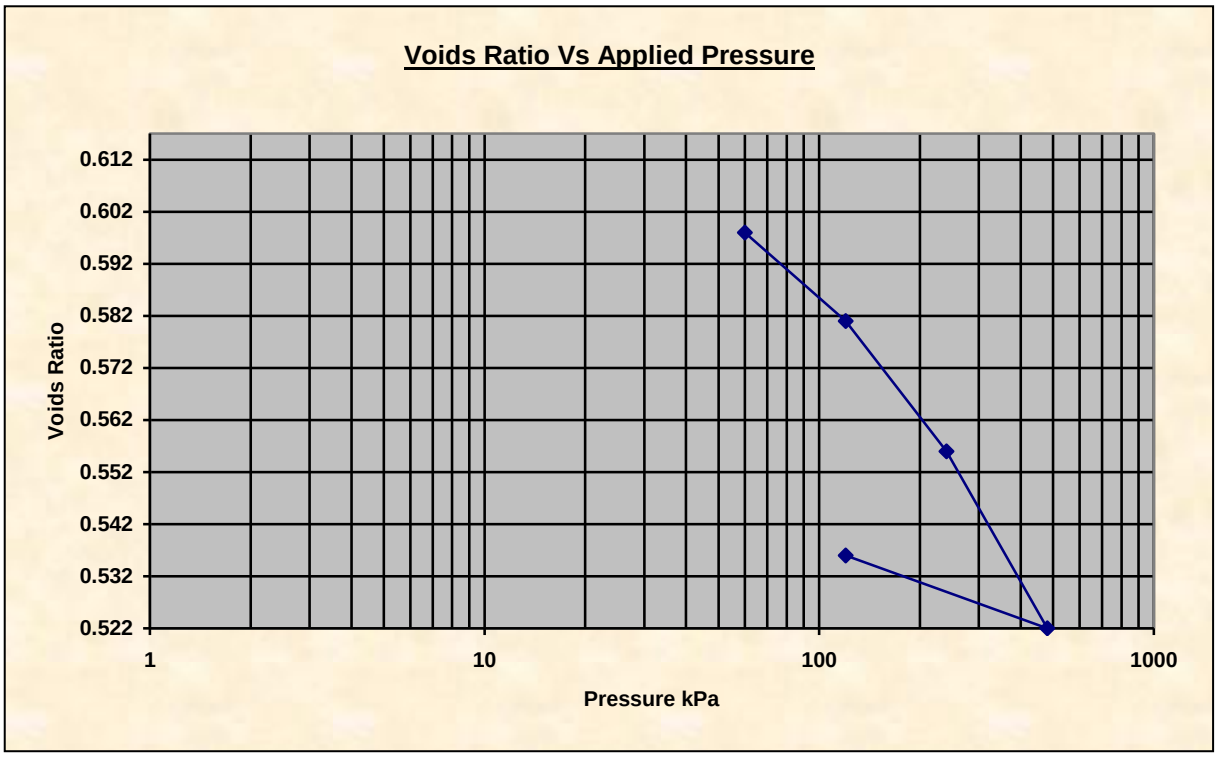
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	3.00 m		
Sample Description	Dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz.		
Variations from Procedure	None		

Specimen Details

Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	172.29 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus

Ring Number	1	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	113.15 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.37 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	223 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 1	**Sample**	223

Initial Moisture Content*	19.0 %	**Final Moisture Content**	17.3 %
Initial Bulk Density	1.95 Mg/m3	**Final Bulk Density**	2.02 Mg/m3
Initial Dry Density	1.64 Mg/m3	**Final Dry Density**	1.73 Mg/m3
Initial Void Ratio	0.6169	**Final Void Ratio**	0.5360
Initial Degree of Saturation	81.51%	**Final Degree of Saturation**	85.60 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
60.0 kPa	0.19 m2/MN	2.12 m2/yr
120.0 kPa	0.18 m2/MN	1.49 m2/yr
240.0 kPa	0.13 m2/MN	1.75 m2/yr
480.0 kPa	0.09 m2/MN	1.23 m2/yr
120.0 kPa	0.02 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

SUB SURFACE
GEOTECHNICAL & GEOENVIRONMENTAL
SITE INVESTIGATION SPECIALISTS AND CONSULTANTS
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel. 01772 561135 Fax. 01772 204907 info@subsurface.co.uk

Laboratory Test Results

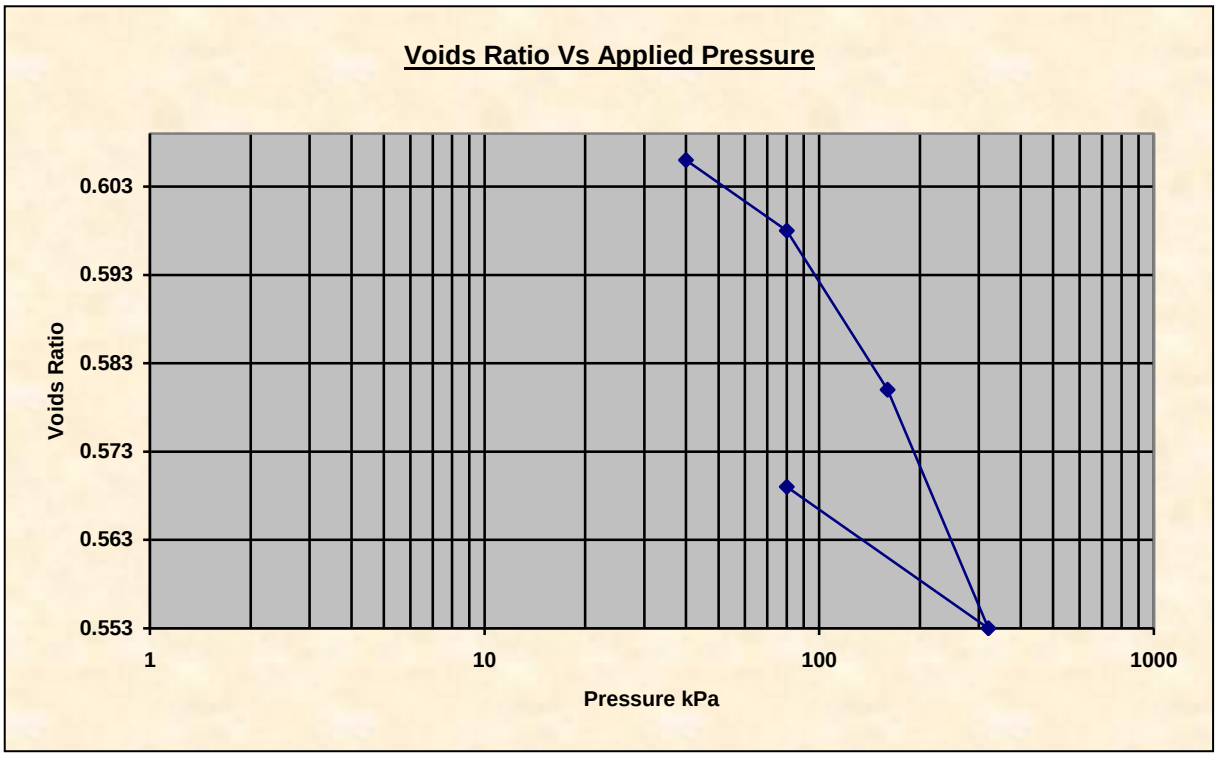
One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	243 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 2	**Sample**	243

Test Details			
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	2.00 m		
Sample Description	Dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz.		
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	172.88 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus			
Ring Number	2	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	112.81 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.43 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	243 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 2	**Sample**	243

Initial Moisture Content*	18.8 %	**Final Moisture Content**	18.6 %
Initial Bulk Density	1.96 Mg/m3	**Final Bulk Density**	2.00 Mg/m3
Initial Dry Density	1.65 Mg/m3	**Final Dry Density**	1.69 Mg/m3
Initial Void Ratio	0.6086	**Final Void Ratio**	0.5686
Initial Degree of Saturation	81.73%	**Final Degree of Saturation**	86.87 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
40.0 kPa	0.04 m2/MN	---------
80.0 kPa	0.13 m2/MN	3.27 m2/yr
160.0 kPa	0.13 m2/MN	2.32 m2/yr
320.0 kPa	0.11 m2/MN	1.17 m2/yr
80.0 kPa	0.04 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	275 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 3	**Sample**	275

Test Details

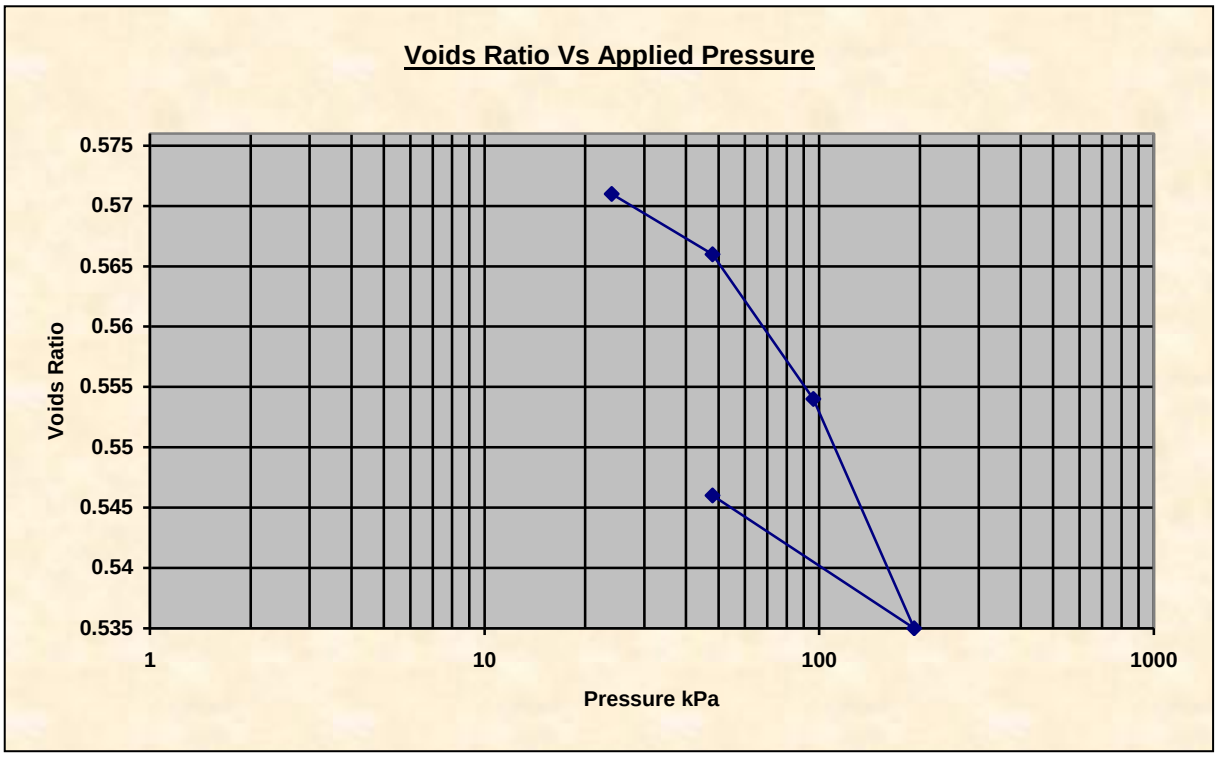
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	1.20 m		
Sample Description	Dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz and siltstone.		
Variations from Procedure	None		

Specimen Details

Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	175.05 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus

Ring Number	3	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	112.96 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.69 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	275 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 3	**Sample**	275

Initial Moisture Content*	17.8 %	**Final Moisture Content**	17.8 %
Initial Bulk Density	1.98 Mg/m3	**Final Bulk Density**	2.02 Mg/m3
Initial Dry Density	1.68 Mg/m3	**Final Dry Density**	1.71 Mg/m3
Initial Void Ratio	0.5758	**Final Void Ratio**	0.5459
Initial Degree of Saturation	81.96%	**Final Degree of Saturation**	86.58 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
24.0 kPa	0.13 m2/MN	---------
48.0 kPa	0.14 m2/MN	2.58 m2/yr
96.0 kPa	0.15 m2/MN	2.39 m2/yr
192.0 kPa	0.13 m2/MN	1.20 m2/yr
48.0 kPa	0.05 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	300 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 4	**Sample**	300

Test Details

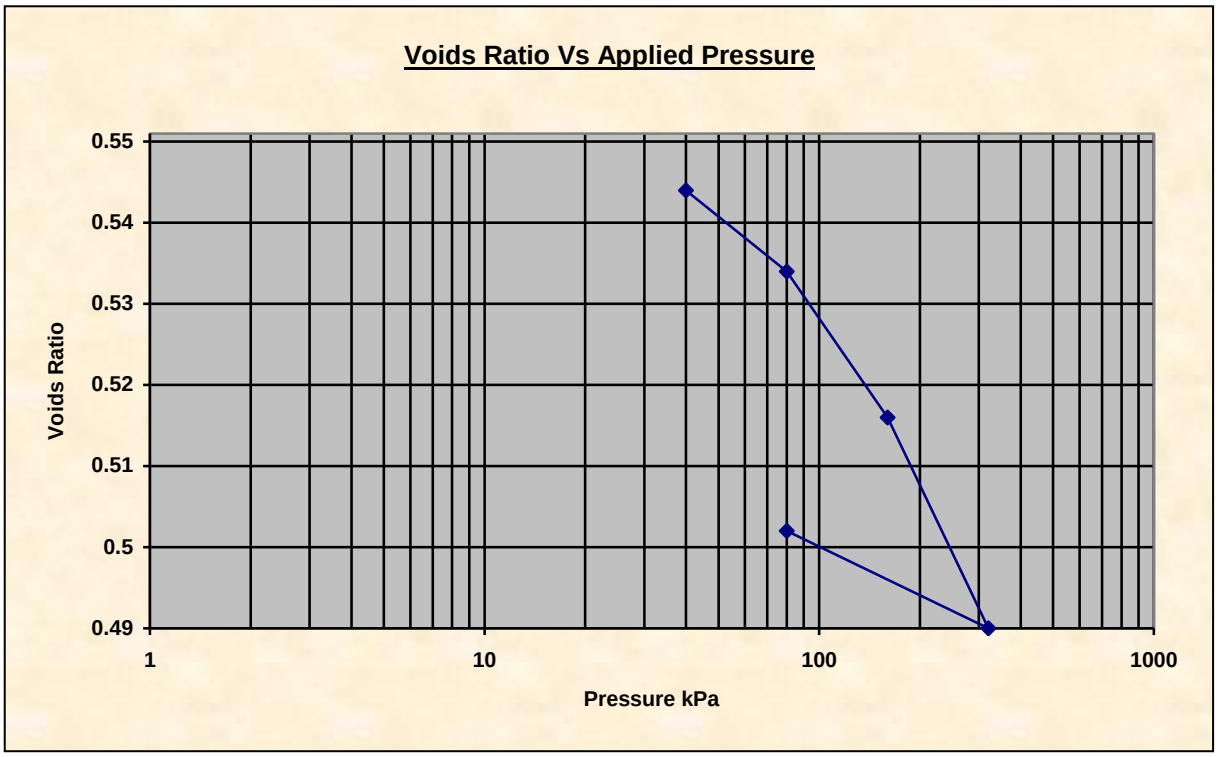
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	2.00 m		
Sample Description	Dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz.		
Variations from Procedure	None		

Specimen Details

Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	177.62 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus

Ring Number	4	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	114.91 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.90 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	300 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 4	**Sample**	300

Initial Moisture Content*	17.7 %	**Final Moisture Content**	17.0 %
Initial Bulk Density	2.01 Mg/m3	**Final Bulk Density**	2.06 Mg/m3
Initial Dry Density	1.71 Mg/m3	**Final Dry Density**	1.76 Mg/m3
Initial Void Ratio	0.5509	**Final Void Ratio**	0.5020
Initial Degree of Saturation	84.91%	**Final Degree of Saturation**	89.65 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
40.0 kPa	0.11 m2/MN	1.94 m2/yr
80.0 kPa	0.16 m2/MN	2.60 m2/yr
160.0 kPa	0.15 m2/MN	1.93 m2/yr
320.0 kPa	0.11 m2/MN	1.44 m2/yr
80.0 kPa	0.03 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

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Laboratory Test Results

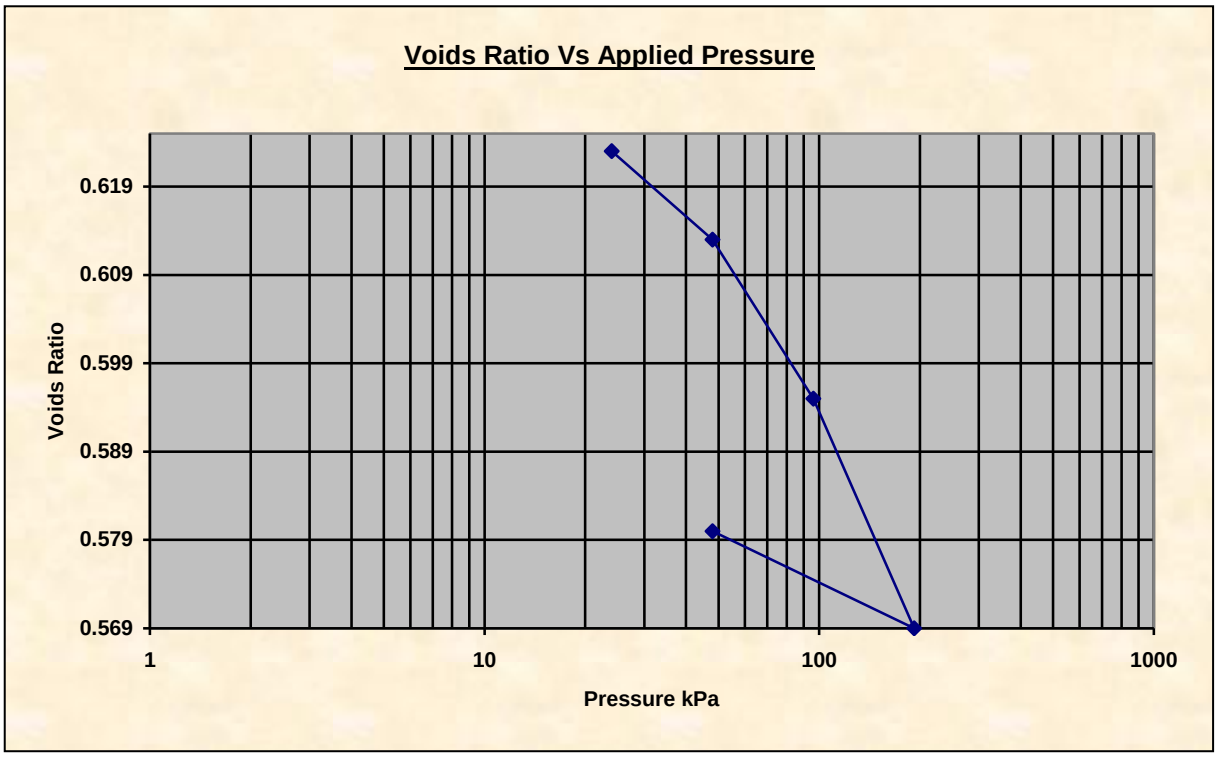
One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	366 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 5	**Sample**	366

Test Details			
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	1.20 m		
Sample Description	Dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz.		
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	172.44 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus			
Ring Number	5	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	112.52 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.31 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason	**Lab Ref**	366 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH 5	**Sample**	366

Initial Moisture Content*	19.7 %	**Final Moisture Content**	18.8 %
Initial Bulk Density	1.95 Mg/m3	**Final Bulk Density**	1.99 Mg/m3
Initial Dry Density	1.63 Mg/m3	**Final Dry Density**	1.68 Mg/m3
Initial Void Ratio	0.6251	**Final Void Ratio**	0.5797
Initial Degree of Saturation	83.44%	**Final Degree of Saturation**	86.15 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
24.0 kPa	0.05 m2/MN	0.60 m2/yr
48.0 kPa	0.26 m2/MN	1.13 m2/yr
96.0 kPa	0.23 m2/MN	1.27 m2/yr
192.0 kPa	0.17 m2/MN	1.18 m2/yr
48.0 kPa	0.05 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	332 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH6	**Sample**	332

Test Details

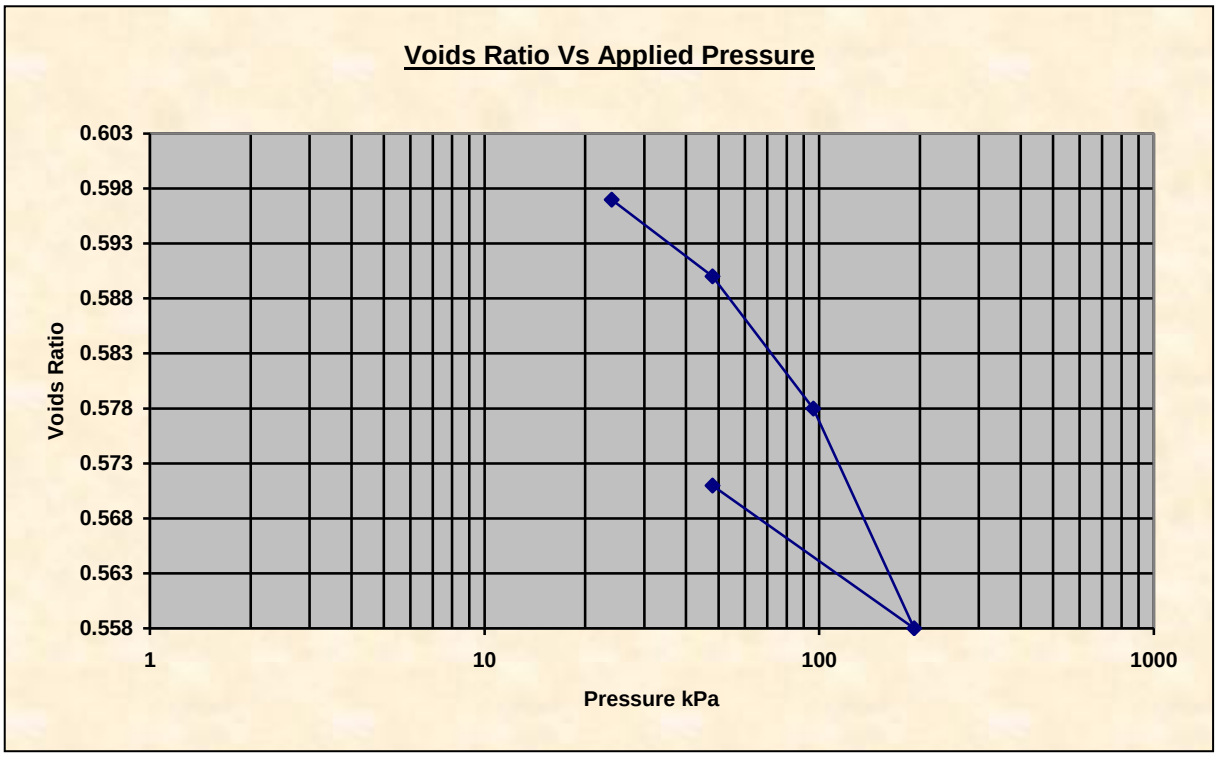
Standard	BS 1377: Part 5 : 1990 : Clause 3	**Particle Density**	2.65 Mg/m3
Sample Type	Undisturbed sample - open drive	**Lab Temperature**	21.0 deg.C
Sample Depth	1.20 m		
Sample Description	Dark brown and occasional grey slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium quartz and siltstone.		
Variations from Procedure	None		

Specimen Details

Specimen Reference	A	**Description**	As Above
Depth within Sample	0.00mm	**Orientation within Sample**	None
Specimen Mass	174.52 g	**Condition**	Natural Moisture
Specimen Height	20.00 mm	**Preparation**	Natural Undisturbed
Comments			

Test Apparatus

Ring Number	3	**Ring Diameter**	75.00 mm
Ring Height	20.00 mm	**Ring Weight**	112.79 g
Lever Ratio	9.00 : 1		



Height of Solid Particles	12.48 mm	**Swelling Pressure**	0.0 kPa

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Laboratory Test Results

One Dimensional Consolidation Properties (Oedometer)

Client	Wilson Mason LLP	**Lab Ref**	332 (WAC)
Project	Enterprise Zone Training Facility, BAE Systems, Samlesbury, Lancashire	**Job**	5887
Borehole	BH6	**Sample**	332

Initial Moisture Content*	19.5 %	**Final Moisture Content**	19.8 %
Initial Bulk Density	1.98 Mg/m3	**Final Bulk Density**	2.02 Mg/m3
Initial Dry Density	1.65 Mg/m3	**Final Dry Density**	1.69 Mg/m3
Initial Void Ratio	0.6030	**Final Void Ratio**	0.5705
Initial Degree of Saturation	85.60%	**Final Degree of Saturation**	91.97 %

- Calculated from initial and dry weights of whole specimen

Pressure (Loading Stages)	**Coefficient of Volume Compressibility (m_v)**	**Coefficient of Consolidation (c_v)**
0.00		
24.0 kPa	0.17 m2/MN	---------
48.0 kPa	0.18 m2/MN	1.47 m2/yr
96.0 kPa	0.16 m2/MN	2.69 m2/yr
192.0 kPa	0.13 m2/MN	1.79 m2/yr
48.0 kPa	0.05 m2/MN	---------

Method of Time Fitting Used	Square Root Time

Tested By and Date:	WAC 29 Aug 14
Checked By and Date:	
Approved By and Date:	

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Laboratory Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number 5887

Sheet: 1/6

CALIFORNIA BEARING RATIO

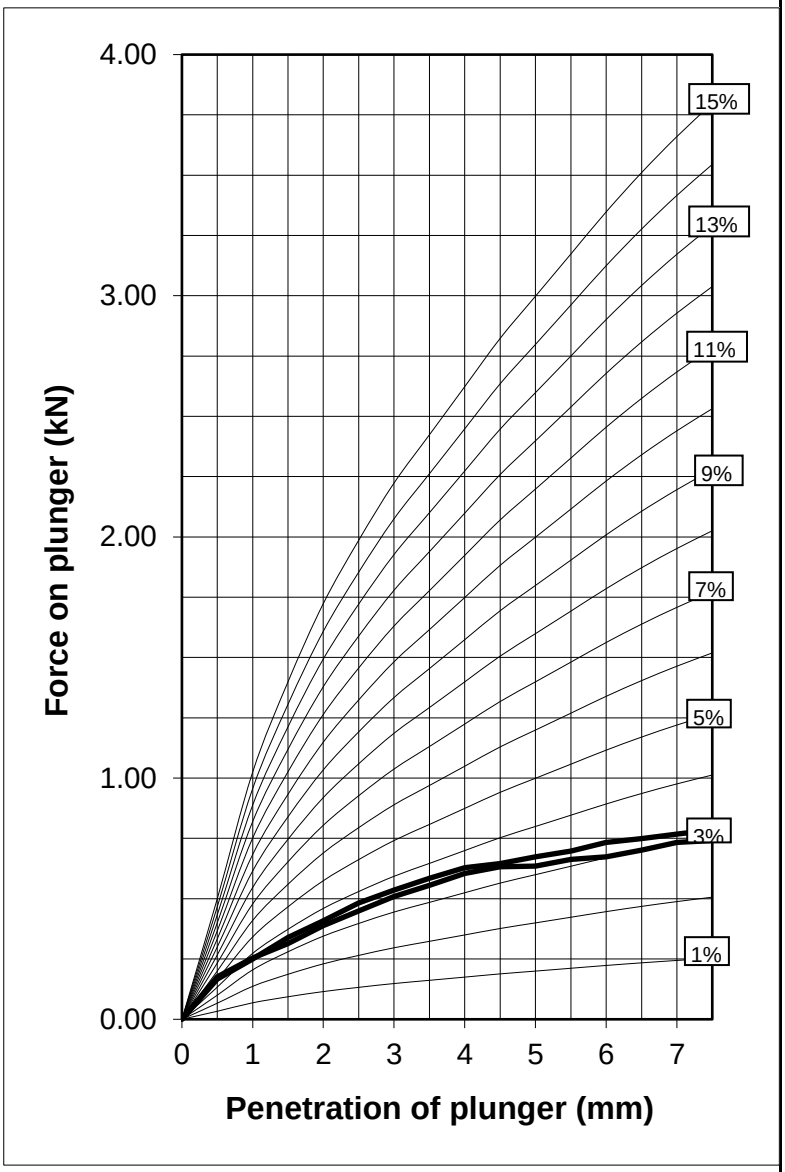
Position: TP 1 Sample No: 123 Depth: 0.40-0.60 m

Description:

Dark brown and grey slightly gravelly silty CLAY with occasional rootlets. Gravel is subrounded to rounded fine to medium quartz.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	44.0	0.18	41.5	0.17
1.0	63.5	0.25	62.5	0.25
1.5	78.5	0.31	84.5	0.34
2.0	97.0	0.39	102.0	0.41
2.5	112.0	0.45	120.5	0.48
3.0	127.0	0.51	133.5	0.53
3.5	138.5	0.55	146.0	0.59
4.0	151.0	0.61	157.0	0.63
4.5	158.0	0.63	161.0	0.65
5.0	158.5	0.64	168.0	0.67
5.5	165.5	0.66	174.0	0.70
6.0	168.0	0.67	183.0	0.73
6.5	175.0	0.70	187.0	0.75
7.0	183.0	0.73	191.5	0.77
7.5	185.0	0.74	196.0	0.79



	CBR % Value at:	
	2.5mm	5.0mm
Top	**3.4%**	**3.2%**
Bottom	**3.7%**	**3.4%**

Passing 20mm Sieve = **93 %**

Moisture Content = **22 %**

Bulk Density = **1.99 Mg/m^3**

Dry Density = **1.64 Mg/m^3**

Comments:	Operator	Checked	Approved
	GDR & WAC		

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Laboratory Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

Sheet: 2/6

CALIFORNIA BEARING RATIO

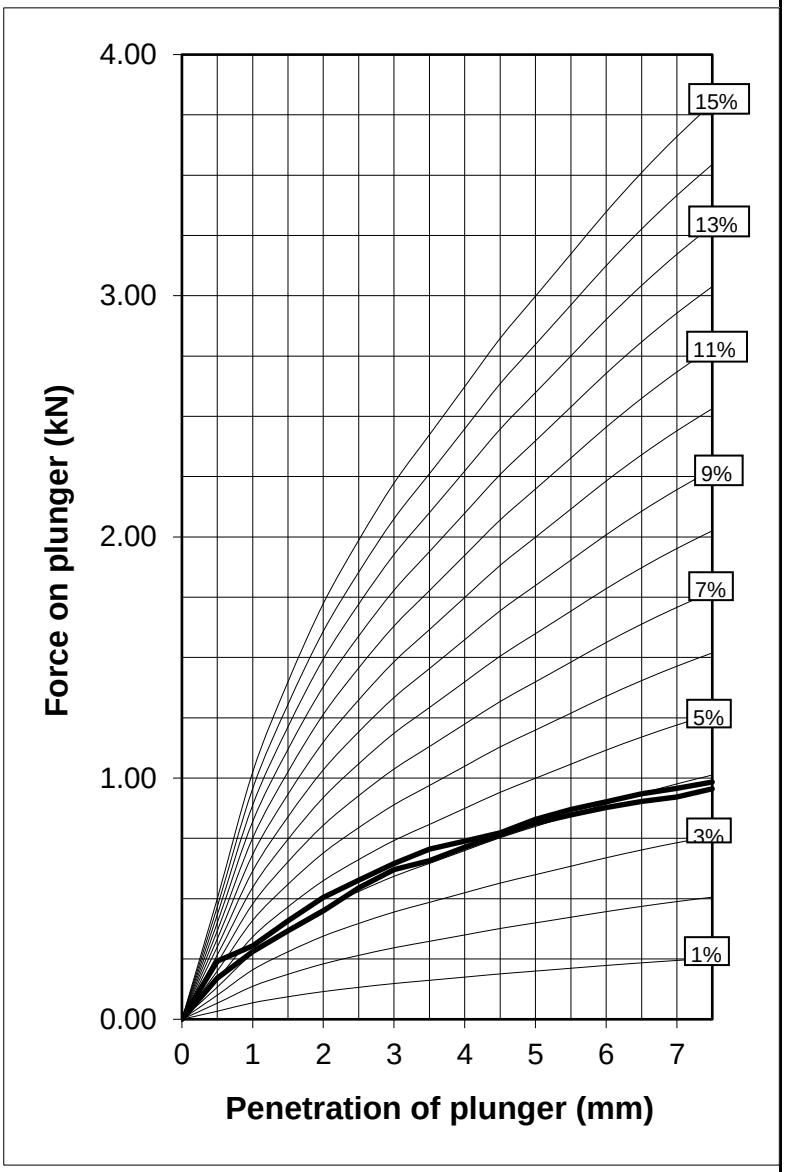
Position: TP 2 Sample No: 113 Depth: 0.40-0.60 m

Description:

Brown and occasional greyish brown slightly gravelly silty CLAY with occasional rootlets. Gravel is subrounded to rounded fine to medium quartz and siltstone.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	42.5	0.17	60.0	0.24
1.0	70.0	0.28	76.0	0.30
1.5	91.5	0.37	102.0	0.41
2.0	112.0	0.45	126.0	0.50
2.5	136.0	0.54	144.0	0.58
3.0	155.0	0.62	161.0	0.65
3.5	164.0	0.66	176.0	0.71
4.0	178.0	0.71	184.5	0.74
4.5	191.0	0.77	193.0	0.77
5.0	203.0	0.81	207.0	0.83
5.5	211.5	0.85	217.0	0.87
6.0	219.0	0.88	225.0	0.90
6.5	225.5	0.90	233.5	0.94
7.0	230.0	0.92	239.0	0.96
7.5	238.5	0.96	245.5	0.98



	CBR % Value at:	
	2.5mm	5.0mm
Top	**4.1%**	**4.1%**
Bottom	**4.4%**	**4.1%**

Passing 20mm Sieve = **97 %**

Moisture Content = **19 %**

Bulk Density = **2.07 Mg/m^3**

Dry Density = **1.74 Mg/m^3**

Comments:

Operator	Checked	Approved
GDR & SJG		

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Laboratory Test Results

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Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

Sheet: 3/6

CALIFORNIA BEARING RATIO

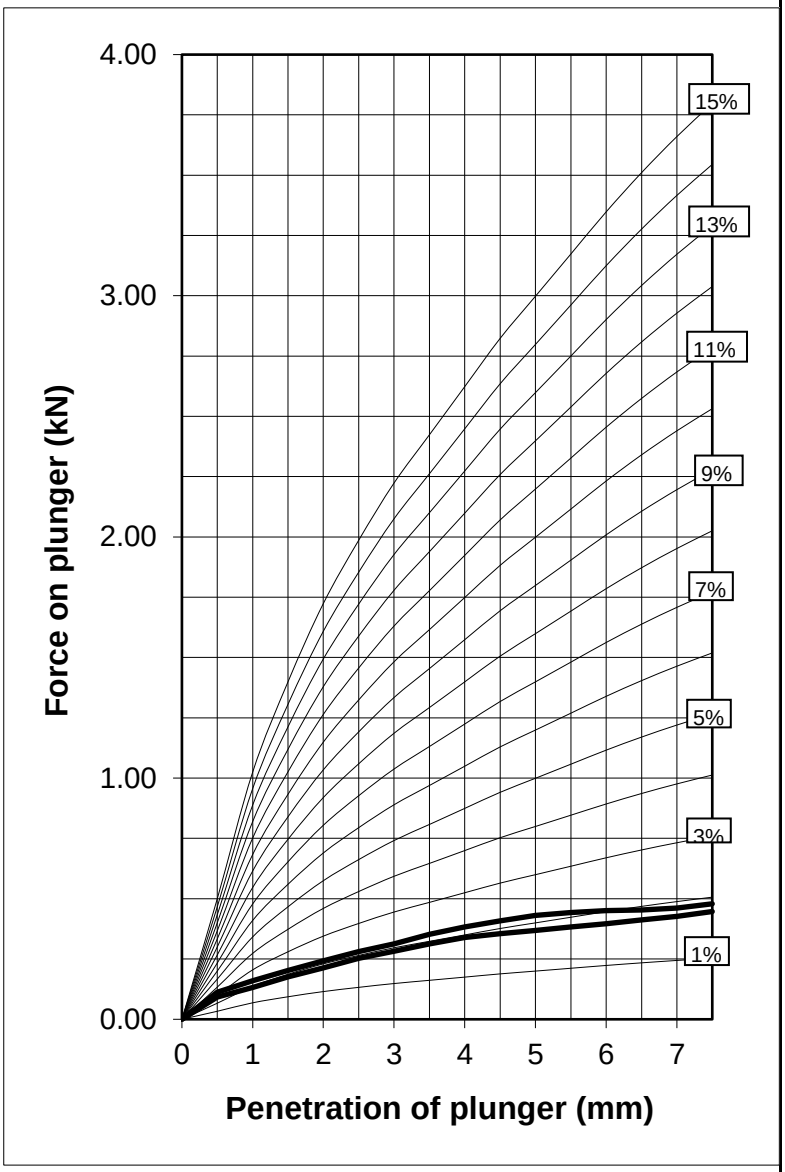
Position: TP 3 Sample No: 99 Depth: 0.40-0.60 m

Description:

Dark brown and occasional grey silty CLAY.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	28.0	0.11	23.0	0.09
1.0	40.0	0.16	33.0	0.13
1.5	50.5	0.20	44.0	0.18
2.0	60.5	0.24	53.0	0.21
2.5	70.0	0.28	63.0	0.25
3.0	78.0	0.31	70.5	0.28
3.5	88.0	0.35	78.0	0.31
4.0	95.5	0.38	84.5	0.34
4.5	102.0	0.41	88.5	0.35
5.0	107.5	0.43	92.0	0.37
5.5	110.5	0.44	95.5	0.38
6.0	112.5	0.45	99.0	0.40
6.5	113.0	0.45	103.0	0.41
7.0	115.0	0.46	106.5	0.43
7.5	119.5	0.48	111.5	0.45



	CBR % Value at:	
	2.5mm	5.0mm
Top	**2.1%**	**2.2%**
Bottom	**1.9%**	**1.8%**

Passing 20mm Sieve = **99 %**

Moisture Content = **19 %**

Bulk Density = **2.07 Mg/m^3**

Dry Density = **1.73 Mg/m^3**

Comments:	Operator	Checked	Approved
	GDR & WAC		

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Laboratory Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

Sheet: 4/6

CALIFORNIA BEARING RATIO

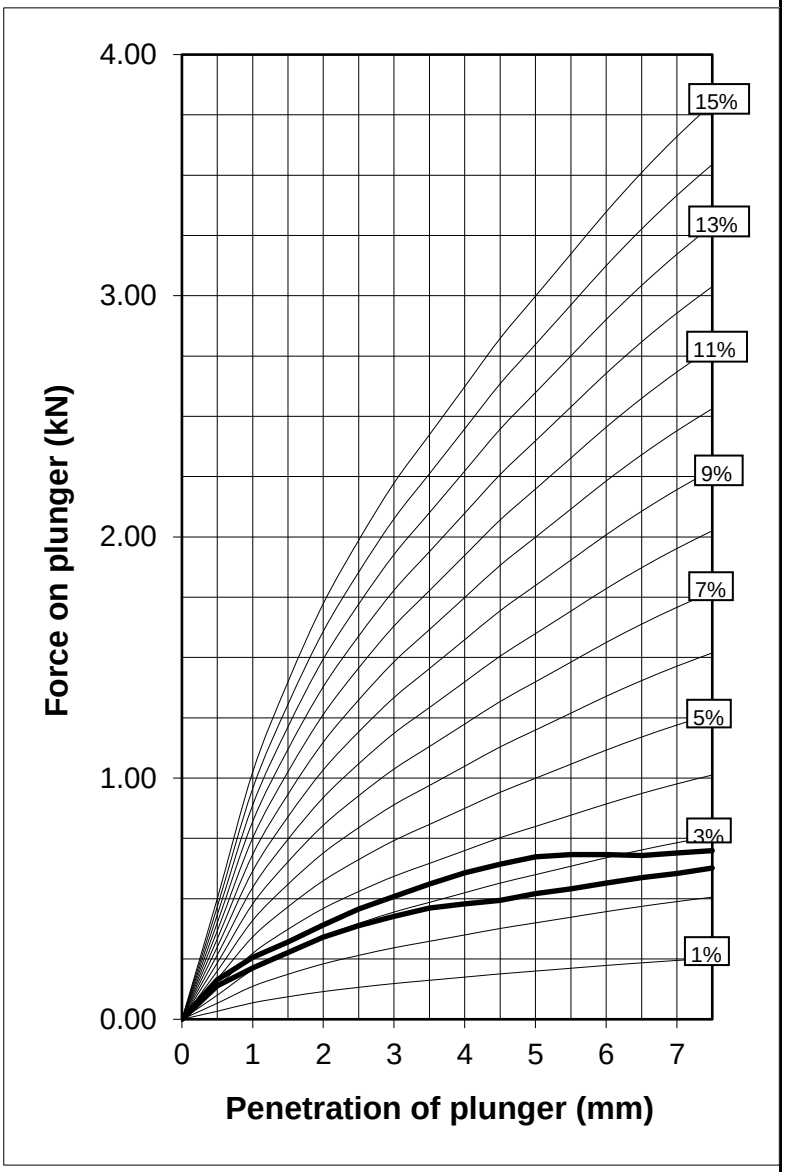
Position: TP 4 Sample No: 82 Depth: 0.30-0.50 m

Description:

Brown and occasional grey slightly gravelly silty CLAY with occasional rootlets. Gravel is subrounded to rounded fine to medium quartz and siltstone.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	41.0	0.16	34.5	0.14
1.0	64.0	0.26	53.0	0.21
1.5	80.0	0.32	69.0	0.28
2.0	97.5	0.39	85.0	0.34
2.5	114.0	0.46	97.0	0.39
3.0	127.0	0.51	106.5	0.43
3.5	140.0	0.56	115.0	0.46
4.0	151.5	0.61	119.5	0.48
4.5	160.5	0.64	123.0	0.49
5.0	168.0	0.67	130.0	0.52
5.5	170.5	0.68	135.0	0.54
6.0	170.5	0.68	141.0	0.57
6.5	169.5	0.68	146.5	0.59
7.0	172.0	0.69	151.0	0.61
7.5	174.5	0.70	156.5	0.63



	CBR % Value at:	
	2.5mm	5.0mm
Top	**3.5%**	**3.4%**
Bottom	**2.9%**	**2.6%**

Passing 20mm Sieve = **100 %**

Moisture Content = **23 %**

Bulk Density = **2.00 Mg/m^3**

Dry Density = **1.63 Mg/m^3**

Comments:	Operator	Checked	Approved
	GDR & WAC		

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Laboratory Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number 5887

Sheet: 5/6

CALIFORNIA BEARING RATIO

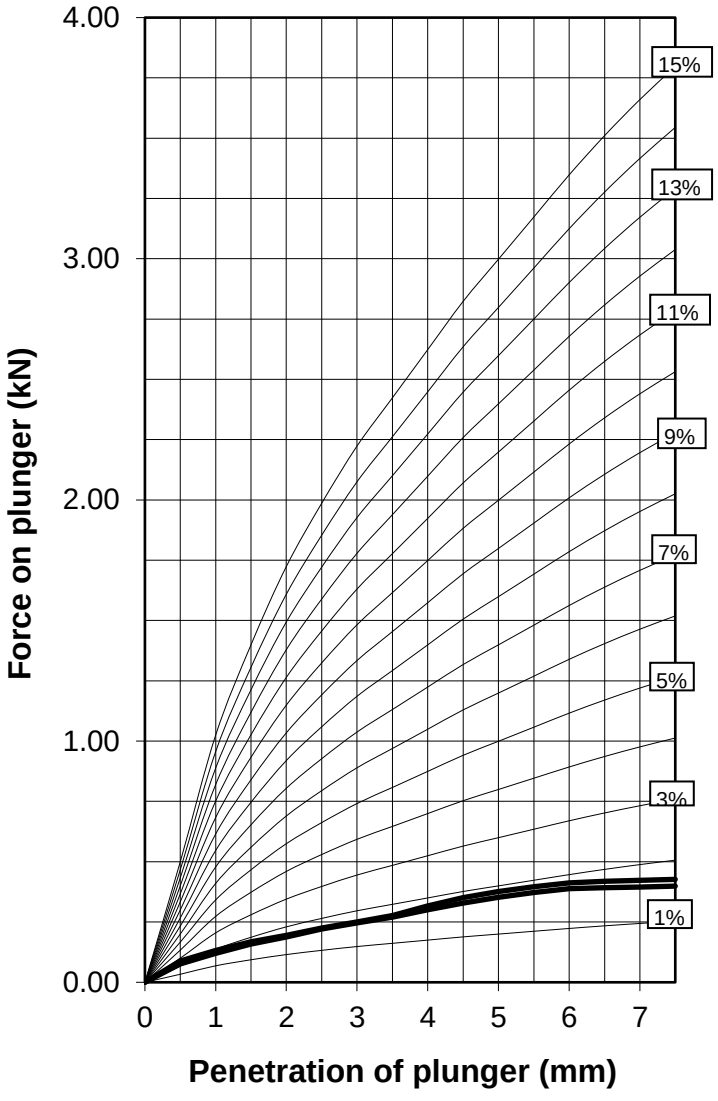
Position: TP 5 Sample No: 90 Depth: 0.30-0.50 m

Description:

Brown and occasional grey slightly gravelly silty CLAY with occasional rootlets. Gravel is subrounded to rounded fine to medium quartz and siltstone.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	19.0	0.08	22.0	0.09
1.0	30.0	0.12	33.0	0.13
1.5	39.5	0.16	42.0	0.17
2.0	47.0	0.19	48.5	0.19
2.5	55.0	0.22	56.0	0.22
3.0	61.5	0.25	62.5	0.25
3.5	67.5	0.27	69.0	0.28
4.0	75.0	0.30	79.0	0.32
4.5	82.0	0.33	87.5	0.35
5.0	88.0	0.35	94.0	0.38
5.5	93.0	0.37	99.0	0.40
6.0	97.0	0.39	103.0	0.41
6.5	98.0	0.39	104.5	0.42
7.0	98.5	0.39	105.5	0.42
7.5	99.5	0.40	106.5	0.43



	CBR % Value at:	
	2.5mm	5.0mm
Top	**1.7%**	**1.8%**
Bottom	**1.7%**	**1.9%**

Passing 20mm Sieve = **99 %**

Moisture Content = **19 %**

Bulk Density = **2.10 Mg/m^3**

Dry Density = **1.77 Mg/m^3**

Comments:	Operator	Checked	Approved
	GDR & SJG		

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Laboratory Test Results

Site: ENTERPRISE ZONE TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client: WILSON MASON LLP

Engineer: TRP CONSULTING

Job Number: 5887

Sheet: 6/6

CALIFORNIA BEARING RATIO

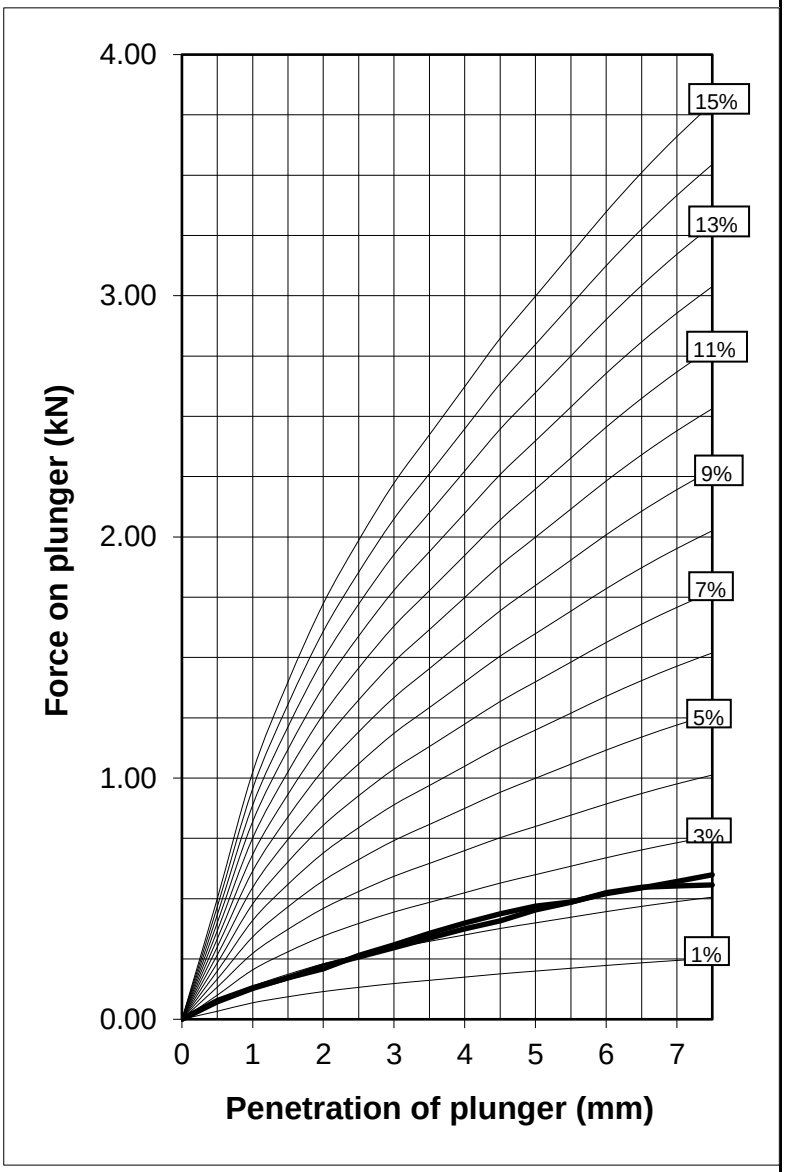
Position: TP 6 Sample No: 104 Depth: 0.40-0.60 m

Description:

Brown and occasional grey slightly gravelly slightly sandy silty CLAY. Gravel is subrounded to rounded fine to coarse quartz and siltstone.

Preparation of sample: 4.5 Kg Rammer Method

Penetration of Plunger mm	Force on Plunger			
	Top	kN Top	Bottom	kN Bottom
0.0	0.0	0.00	0.0	0.00
0.5	19.5	0.08	18.0	0.07
1.0	32.5	0.13	32.0	0.13
1.5	43.0	0.17	43.0	0.17
2.0	55.0	0.22	52.0	0.21
2.5	64.5	0.26	66.0	0.26
3.0	74.0	0.30	77.0	0.31
3.5	84.0	0.34	89.0	0.36
4.0	93.5	0.37	99.5	0.40
4.5	102.0	0.41	109.0	0.44
5.0	113.0	0.45	117.0	0.47
5.5	121.0	0.48	121.5	0.49
6.0	131.0	0.52	130.0	0.52
6.5	136.5	0.55	136.0	0.54
7.0	138.0	0.55	142.5	0.57
7.5	139.0	0.56	149.5	0.60



	CBR % Value at:	
	2.5mm	5.0mm
Top	**2.0%**	**2.3%**
Bottom	**2.0%**	**2.3%**

Passing 20mm Sieve = **98 %**

Moisture Content = **17 %**

Bulk Density = **2.10 Mg/m^3**

Dry Density = **1.79 Mg/m^3**

Comments:	Operator	Checked	Approved
	GDR & SJG		

SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Laboratory Test Results

Site : ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE

Client : WILSON MASON LLP

Engineer : TRP CONSULTING

Job Number 5887

Sheet 1 / 1

DETERMINATION OF THE pH VALUE AND THE SULPHATE CONTENT OF SOIL AND GROUNDWATER

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Soluble Sulphate			Percentage of sample passing 2mm Sieve %	pH	Classification	Laboratory Description
			Soil		Groundwater g /l				
			Total S03 %	S04 in 2:1 water:soil g /l					
BH1	1.00	D		0.11			8.0	DS-1	Brown and occasional greyish brown slightly gravelly silty CLAY with occasional roots.
BH1	2.70	D		0.02			8.4	DS-1	Brown slightly gravelly silty CLAY.
BH1	5.30	W			0.64		7.5	DS-2	GROUNDWATER.
BH2	0.50	B		0.01			8.2	DS-1	Brown and occasional grey mottled slightly gravelly silty CLAY.
BH2	3.70	D		0.02			8.7	DS-1	Brown slightly gravelly silty CLAY.
BH3	0.50	B		0.01			8.7	DS-1	Brown and dark brown silty CLAY.
BH3	5.50	D		0.02			8.8	DS-1	Brown slightly gravelly silty CLAY.
BH4	0.50	B		0.01			8.5	DS-1	Brown and occasionally grey mottled slightly gravelly silty CLAY.
BH4	3.00	D		0.04			8.5	DS-1	Brown slightly gravelly silty CLAY.
BH4	3.60	W			0.47		7.6	DS-2	GROUNDWATER
BH5	1.00	D		0.01			8.6	DS-1	Brown and occasional grey mottled silty CLAY.
BH5	3.50	D		0.02			8.6	DS-1	Brown slightly gravelly silty CLAY.
BH6	0.50	B		0.01			8.1	DS-1	Brown and grey mottled slightly gravelly silty CLAY.
BH6	1.70	D		0.01			8.6	DS-1	Brown and occasional grey mottled silty CLAY.
BH6	3.00	W			0.31		7.3	DS-1	GROUNDWATER

Method of Preparation : BS 1377:PART 1:1990:7.5 Preparation of soil for chemical tests BS 1377:PART 3:1990:5.2, 5.3, 5.4 & 9.4

Method of Test : Laboratory in-house methods based on BS1377: Part 3 for contents of water soluble sulphate, total sulphate and pH.

Remarks : Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE (ACEC) SITE CLASSIFICATION

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations[a]

Sulfate				Groundwater		
Design Sulfate Class for Location	2:1 water/soil extract[b]	Groundwater	Total potential sulfate[c]	Static water	Mobile water	ACEC Class for location
1	2 (SO_4 mg/l)	3 (SO_4 mg/l)	4 (SO_4 %)	5 (pH)	6 (pH)	7
DS-1	<500	<400	<0.24	≥2.5		AC-1s
					>5.5d	AC-1d
					2.5 - 5.5	AC-2z
DS-2	500 - 1500	400 - 1400	0.24 - 0.6	>3.5		AC-1s
					>5.5	AC-2z
				2.5-3.5		AC-2s
					2.5 - 5.5	AC-3z
DS-3	1600-3000	1500-3000	0.7 - 1.2	>3.5		AC-2s
					>5.5	AC-3
				2.5 - 3.5		AC-3s
					2.5 - 5.5	AC-4
DS-4	3100 - 6000	3100 - 6000	1.3 - 2.4	>3.5		AC-3s
					>5.5	AC-4
				2.5 - 3.5		AC-4s
					2.5 - 5.5	AC-5
DS-5	>6000	>6000	>2.4	>3.5		AC-4s
				2.5 - 3.5	≥2.5	AC-5

Notes

a Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie not brownfield - Table C2) or clean fill derived from such ground

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions (SO4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

d For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

Table C1 Aggressive Chemical Environment for Concrrete (ACEC) classification for brownfield locations[a]

Sulfate						Groundwater		
Design Sulfate Class for Location	2:1 water/soil extract[b]		Groundwater		Total potential sulfate[c]	Static water	Mobile water	ACEC Class for location
1	2 (SO_4 mg/l)	3 (Mg mg/l)	4 (SO_4 mg/l)	5 (Mg mg/l)	6 (SO_4 %)	7 (pH)[d]	8 (pH)[d]	9
DS-1	<500		<400		<0.24	≥2.5		AC-1s
							>6.5[d]	AC-1
							5.5 - 6.5	AC-2z
							4.5 - 5.5	AC-3z
							2.5 - 4.5	AC-4z
DS-2	500 - 1500		400 - 1400		0.24 - 0.6	>5.5		AC-1s
							>6.5	AC-2
						2.5 - 5.5		AC-2s
							5.5 - 6.5	AC-3z
							4.5 - 5.5	AC-4z
							2.5 - 5.5	AC-5z
DS-3	1600 - 3000		1500 - 3000		0.7 - 1.2	>5.5		AC-2s
							>6.5	AC-3
						2.5 - 5.5		AC-3s
							5.5 - 6.5	AC-4
							2.5 - 5.5	AC-5
DS-4	3100 - 6000	≤1200	3100 - 6000	≤1000	1.3 - 2.4	>5.5		AC-3s
							>6.5	AC-4
						2.5 - 5.5		AC-4s
							2.5 - 6.5	AC-5
DS-4m	3100 - 6000	>1200[e]	3100 - 6000	>1000[e]	1.3 - 2.4	>5.5		AC-3s
							>6.5	AC-4m
						2.5 - 5.5		AC-4ms
							2.5 - 6.5	AC-5m
DS-5	>6000	≤1200	>6000	≤1000	>2.4	>5.5		AC-4s
						2.5 - 5.5	≤1000	AC-5
DS-5m	>6000	>1200[e]	>6000	>1000[e]	>2.4	>5.5		AC-4ms
						2.5 - 5.5	≥2.5	AC-5m

Notes

a Brownfield sites are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions (SO4) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).

d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).

e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000mg/l and 17000 mg/l). This allows 'm' to be omitted from the relevant ACEC Classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that included the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.
- Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

CONTAMINATION ANALYSIS RESULTS

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report Number:	14-05914 Issue-1
Initial Date of Issue:	23-Jul-14
Client:	Sub Surface
Client Address:	3 Peel Street Preston Lancashire PR2 2QS
Contact(s):	Simon Gabbatt
Client Reference:	5887 Enterprise Zone Training Facility

Quotation No.:		**Date Received:**	15-Jul-14
Order No.:	5887	**Date Instructed:**	15-Jul-14
No. of Samples:	10	**Results Due:**	23-Jul-14
Turnaround: (Weekdays)	7		
Date Approved:	23-Jul-14		

Approved By:

Details: Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results Summary - Soil

Report No.: 14-05914 Issue-1

Project: 5887 Enterprise Zone Training Facility

Client: Sub Surface					**Chemtest Sample ID.:**	29992	29993	29994	29995	29996	29997	29998	29999	30000
Quote:					Client Sample Ref.:	120 121 122	125 126 127	105 106 107	109 110 111	091 092 093	095 096 097	078 079 080	082	084 085 086
Order No.: 5887					**Client Sample ID.:**	TP1	TP1	TP2	TP2	TP3	TP3	TP4	TP4	TP4
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.40	0.80	0.05	0.15	0.05	0.20	0.10	0.30	0.05
					Bottom Depth(m):									
					Date Sampled:	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192				-	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.02		17	23	18	15	24	16	32	87	25
pH	M	2010				8.4	8.0	6.6	7.0	6.0	7.9	5.6	7.0	6.7
Boron (Hot Water Soluble)	M	2120	mg/kg	0.4		0.40	0.62	0.76	0.43	0.83	< 0.40	< 0.40	0.42	< 0.40
Cyanide (Total)	M	2300	mg/kg	0.5		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5		1.7	6.0	1.4	2.6	1.5	1.5	1.4	1.4	1.3
Sulphate (Total)	M	2430	%	0.01		0.050	0.090	0.077	0.048	0.093	0.036	0.15	0.078	0.10
Arsenic	M	2450	mg/kg	2		13	15	15	8.9	17	14	19	24	15
Cadmium	M	2450	mg/kg	0.1		0.13	0.13	0.29	0.12	0.26	0.13	0.28	0.11	0.27
Chromium	M	2450	mg/kg	5		36	39	29	25	33	38	36	44	27
Copper	M	2450	mg/kg	5		22	25	29	16	27	22	27	18	26
Mercury	M	2450	mg/kg	0.1		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.15	< 0.10	< 0.10
Nickel	M	2450	mg/kg	5		36	41	29	21	25	43	22	42	21
Lead	M	2450	mg/kg	5		33	33	73	26	66	20	90	21	71
Selenium	M	2450	mg/kg	0.2		< 0.20	< 0.20	< 0.20	0.39	0.42	< 0.20	0.80	< 0.20	0.23
Zinc	M	2450	mg/kg	5		43	50	72	27	64	47	68	34	57
Chromium (Hexavalent)	N	2490	mg/kg	0.5		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
TPH >C6-C10	N	2670	mg/kg	1		< 1.0	< 1.0	< 1.0	2.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C21	N	2670	mg/kg	1		19	< 1.0	15	14	4.0	< 1.0	11	< 1.0	7.4
TPH >C21-C40	N	2670	mg/kg	1		54	< 1.0	6.3	32	18	< 1.0	41	< 1.0	20
Total TPH >C6-C40	M	2670	mg/kg	10		72	< 10	22	48	22	< 10	51	< 10	28
Naphthalene	M	2700	mg/kg	0.1		< 0.10	0.30	0.22	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.22
Acenaphthylene	M	2700	mg/kg	0.1		< 0.10	0.89	0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.25
Acenaphthene	M	2700	mg/kg	0.1		< 0.10	0.71	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.23
Fluorene	M	2700	mg/kg	0.1		< 0.10	0.78	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.23
Phenanthrene	M	2700	mg/kg	0.1		0.52	6.8	0.69	< 0.10	0.83	< 0.10	1.1	< 0.10	1.5
Anthracene	M	2700	mg/kg	0.1		0.29	4.4	0.17	< 0.10	0.20	< 0.10	0.62	< 0.10	0.48
Fluoranthene	M	2700	mg/kg	0.1		1.7	12	1.8	0.47	2.0	< 0.10	2.2	0.26	3.4
Pyrene	M	2700	mg/kg	0.1		1.7	12	2.0	0.35	2.0	0.13	1.7	0.24	3.6
Benzo[a]anthracene	M	2700	mg/kg	0.1		1.4	6.0	2.0	< 0.10	1.5	< 0.10	2.5	< 0.10	2.2
Chrysene	M	2700	mg/kg	0.1		1.3	7.0	1.9	< 0.10	0.17	< 0.10	0.40	< 0.10	1.4

Results Summary - Soil

Report No.: 14-05914 Issue-1

Project: 5887 Enterprise Zone Training Facility

Client: Sub Surface					Chemtest Sample ID.:	29992	29993	29994	29995	29996	29997	29998	29999	30000
Quote:					Client Sample Ref.:	120 121 122	125 126 127	105 106 107	109 110 111	091 092 093	095 096 097	078 079 080	082	084 085 086
Order No.: 5887					Client Sample ID.:	TP1	TP1	TP2	TP2	TP3	TP3	TP4	TP4	TP4
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.40	0.80	0.05	0.15	0.05	0.20	0.10	0.30	0.05
					Bottom Depth(m):									
					Date Sampled:	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14	02-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Benzo[b]fluoranthene	M	2700	mg/kg	0.1		1.8	7.0	2.1	< 0.10	< 0.10	< 0.10	3.4	< 0.10	3.1
Benzo[k]fluoranthene	M	2700	mg/kg	0.1		0.94	3.0	0.74	< 0.10	< 0.10	< 0.10	0.73	< 0.10	0.92
Benzo[a]pyrene	M	2700	mg/kg	0.1		1.1	4.8	0.73	< 0.10	< 0.10	< 0.10	0.96	< 0.10	1.1
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1		0.98	3.6	0.98	< 0.10	< 0.10	< 0.10	1.9	< 0.10	1.3
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1		0.19	0.86	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1		0.73	2.6	0.64	< 0.10	< 0.10	< 0.10	0.73	< 0.10	0.88
Total Of 16 PAH's	M	2700	mg/kg	2		13	73	14	< 2.0	6.7	< 2.0	16	< 2.0	21
Benzene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.3		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Results Summary - Soil

Report No.: 14-05914 Issue-1

Project: 5887 Enterprise Zone Training Facility

Client: Sub Surface			**Chemtest Sample ID.:**		30001
Quote:			Client Sample Ref.:		101 102 103
Order No.: 5887			**Client Sample ID.:**		TP6
			Sample Type:		SOIL
			Top Depth (m):		GL
			Bottom Depth(m):		
			Date Sampled:		02-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192			-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.02	30
pH	M	2010			6.9
Boron (Hot Water Soluble)	M	2120	mg/kg	0.4	0.54
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	1.2
Sulphate (Total)	M	2430	%	0.01	0.12
Arsenic	M	2450	mg/kg	2	13
Cadmium	M	2450	mg/kg	0.1	0.19
Chromium	M	2450	mg/kg	5	20
Copper	M	2450	mg/kg	5	22
Mercury	M	2450	mg/kg	0.1	< 0.10
Nickel	M	2450	mg/kg	5	19
Lead	M	2450	mg/kg	5	68
Selenium	M	2450	mg/kg	0.2	0.48
Zinc	M	2450	mg/kg	5	48
Chromium (Hexavalent)	N	2490	mg/kg	0.5	< 0.50
TPH >C6-C10	N	2670	mg/kg	1	< 1.0
TPH >C10-C21	N	2670	mg/kg	1	1.1
TPH >C21-C40	N	2670	mg/kg	1	< 1.0
Total TPH >C6-C40	M	2670	mg/kg	10	< 10
Naphthalene	M	2700	mg/kg	0.1	0.35
Acenaphthylene	M	2700	mg/kg	0.1	0.20
Acenaphthene	M	2700	mg/kg	0.1	0.12
Fluorene	M	2700	mg/kg	0.1	0.11
Phenanthrene	M	2700	mg/kg	0.1	0.78
Anthracene	M	2700	mg/kg	0.1	0.13
Fluoranthene	M	2700	mg/kg	0.1	1.2
Pyrene	M	2700	mg/kg	0.1	1.2
Benzo[a]anthracene	M	2700	mg/kg	0.1	1.2
Chrysene	M	2700	mg/kg	0.1	0.32

Results Summary - Soil

Report No.: 14-05914 Issue-1

Project: 5887 Enterprise Zone Training Facility

Client: Sub Surface			**Chemtest Sample ID.:**		30001
Quote:			Client Sample Ref.:		101 102 103
Order No.: 5887			**Client Sample ID.:**		TP6
			Sample Type:		SOIL
			Top Depth (m):		GL
			Bottom Depth(m):		
			Date Sampled:		02-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.1	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2	5.6
Benzene	M	2760	µg/kg	1	< 1.0
Toluene	M	2760	µg/kg	1	< 1.0
Ethylbenzene	M	2760	µg/kg	1	< 1.0
m & p-Xylene	M	2760	µg/kg	1	< 1.0
o-Xylene	M	2760	µg/kg	1	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1	< 1.0
Total Phenols	M	2920	mg/kg	0.3	< 0.30

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, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry 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

Sample Retention and Disposal

All soil samples will be retained for a period of 1 month following the date of the test report
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report Number:	14-06098 Issue-1
Initial Date of Issue:	25-Jul-14
Client:	Sub Surface
Client Address:	3 Peel Street Preston Lancashire PR2 2QS
Contact(s):	Simon Gabbatt
Client Reference:	5887 - Enterprise Zone Training Facility, Samlesbury
Quotation No.:	
Order No.:	5887
No. of Samples:	9
Turnaround: (Weekdays)	7
Date Approved:	25-Jul-14
Approved By:	
Details:	Keith Jones, Technical Manager

Date Received:	17-Jul-14
Date Instructed:	17-Jul-14
Results Due:	25-Jul-14

Chemtest
The right chemistry to deliver results

Results Summary - Soil

Report No.: 14-06098 Issue-1

Project: 5887 - Enterprise Zone Training Facility, Samlesbury

Client: Sub Surface		**Chemtest Sample ID.:**			31007	31008	31009	31010	31011	31012	31013	31014	31015
Quote:		Client Sample Ref.:			385	216	386	239	387	388	363	389	330
Order No.: 5887		**Client Sample ID.:**			BH1	BH1	BH2	BH2	BH3	BH4	BH5	BH6	BH6
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			GL	0.50	GL	0.50	GL	GL	GL	GL	0.50
		Bottom Depth(m):											
		Date Sampled:			07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192											-
Asbestos Identification	U	2192	%	0.001									No Asbestos Detected
Moisture	N	2030	%	0.02	37	19	30	14	19	36	28	9.3	12
pH	M	2010			6.3	7.7	5.6	8.2	7.8	5.6	7.0	8.1	8.1
Boron (Hot Water Soluble)	M	2120	mg/kg	0.4	1.2	0.42	0.64	< 0.40	0.78	1.2	0.97	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/L	0.01				< 0.010					< 0.010
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	0.86	7.2	0.92	3.9	1.1	0.81	1.5	12	1.8
Sulphate (Total)	M	2430	%	0.01	0.14	0.074	0.10	0.019	0.087	0.16	0.15	0.064	0.057
Arsenic	M	2450	mg/kg	2	6.2	6.1	8.4	8.4	14	7.2	9.6	8.0	11
Cadmium	M	2450	mg/kg	0.1	0.33	0.19	0.22	0.16	0.29	0.31	0.30	0.22	0.23
Chromium	M	2450	mg/kg	5	22	29	22	35	37	22	28	22	32
Copper	M	2450	mg/kg	5	22	25	19	21	26	19	37	18	41
Mercury	M	2450	mg/kg	0.1	0.75	0.48	0.79	0.18	0.77	0.72	0.89	0.29	0.43
Nickel	M	2450	mg/kg	5	20	33	17	42	31	19	26	25	39
Lead	M	2450	mg/kg	5	62	44	60	21	66	61	73	29	40
Selenium	M	2450	mg/kg	0.2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	0.24	< 0.20	< 0.20
Zinc	M	2450	mg/kg	5	54	51	44	47	61	50	62	47	54
Chromium (Hexavalent)	N	2490	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
TPH >C6-C10	N	2670	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C21	N	2670	mg/kg	1	2.7	< 1.0	3.2	< 1.0	1.7	6.0	1.9	< 1.0	1.2
TPH >C21-C40	N	2670	mg/kg	1	16	< 1.0	15	< 1.0	17	25	15	< 1.0	9.4
Total TPH >C6-C40	M	2670	mg/kg	10	19	< 10	18	< 10	19	31	17	< 10	11
Naphthalene	M	2700	mg/kg	0.1	1.6	0.98	1.4	< 0.10	0.81	5.3	0.80	0.44	0.83
Acenaphthylene	M	2700	mg/kg	0.1	0.72	2.5	< 0.10	< 0.10	0.62	0.70	0.46	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.1	0.33	0.65	< 0.10	< 0.10	0.16	1.0	0.24	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.1	0.29	1.5	< 0.10	< 0.10	0.32	1.1	0.31	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.1	1.3	3.7	< 0.10	< 0.10	1.0	6.1	1.2	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.1	0.22	0.92	< 0.10	< 0.10	0.17	0.95	0.26	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.1	1.2	6.0	1.0	< 0.10	1.0	6.6	1.6	0.81	0.85
Pyrene	M	2700	mg/kg	0.1	1.5	5.3	0.87	< 0.10	1.2	6.4	1.6	0.90	0.76
Benzo[a]anthracene	M	2700	mg/kg	0.1	2.0	2.9	< 0.10	< 0.10	< 0.10	1.3	< 0.10	< 0.10	< 0.10

Results Summary - Soil

Report No.: 14-06098 Issue-1

Project: 5887 - Enterprise Zone Training Facility, Samlesbury

Client: Sub Surface					Chemtest Sample ID.:	31007	31008	31009	31010	31011	31012	31013	31014	31015
Quote:					Client Sample Ref.:	385	216	386	239	387	388	363	389	330
Order No.: 5887					Client Sample ID.:	BH1	BH1	BH2	BH2	BH3	BH4	BH5	BH6	BH6
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	GL	0.50	GL	0.50	GL	GL	GL	GL	0.50
					Bottom Depth(m):									
					Date Sampled:	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14	07-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Chrysene	M	2700	mg/kg	0.1		1.3	4.2	< 0.10	< 0.10	< 0.10	3.8	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.1		1.3	3.7	< 0.10	< 0.10	< 0.10	3.1	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.1		1.1	2.2	< 0.10	< 0.10	< 0.10	2.1	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.1		0.93	2.5	< 0.10	< 0.10	< 0.10	2.2	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1		0.84	1.9	< 0.10	< 0.10	< 0.10	1.3	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1		1.4	1.8	< 0.10	< 0.10	< 0.10	1.9	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2		16	41	3.3	< 2.0	5.3	44	6.5	2.2	2.4
Benzene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Phenols	M	2920	mg/kg	0.3		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Report Information

Key

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The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry 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

Sample Retention and Disposal

All soil samples will be retained for a period of 1 month following the date of the test report
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

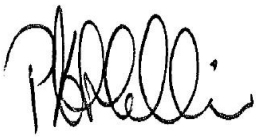
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report Number:	14-06317 Issue-1
Initial Date of Issue:	29-Jul-14
Client:	Sub Surface
Client Address:	3 Peel Street Preston Lancashire PR2 2QS
Contact(s):	Simon Gabbatt
Client Reference:	5887 Enterprise Zone training Facility, BAE Systems

Quotation No.:		**Date Received:**	22-Jul-14
Order No.:	5887	**Date Instructed:**	22-Jul-14
No. of Samples:	3	**Results Due:**	30-Jul-14
Turnaround: (Weekdays)	7		
Date Approved:	29-Jul-14		

Approved By:



Details: Phil Hellier, Project Director

Results Summary - Water

Report Number: 14-06317 Issue-1

Client Reference: 5887 Enterprise Zone training Facility, BAE Systems

Client: Sub Surface		**Chemtest Sample ID.:**			32020	32021	32022
Quotation No.:		Client Sample Ref.:			620 621 622	617 618 619	614 615 616
Order No.: 5887		**Client Sample ID.:**			BH1	BH4	BH6
		Sample Type:			WATER	WATER	WATER
		Top Depth (m):			5.30	3.60	3.00
		Bottom Depth(m):					
		Date Sampled:			18-Jul-14	18-Jul-14	18-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
pH	U	1010			7.5	7.6	7.3
Sulphate	U	1220	mg/l	1	640	470	310
Cyanide (Total)	U	1300	mg/l	0.05	< 0.050	< 0.050	< 0.050
Sulphide	U	1325	mg/l	0.05	< 0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1	< 1.0	< 1.0	< 1.0
Boron (Dissolved)	U	1450	µg/l	20	51	< 20	31
Cadmium (Dissolved)	U	1450	µg/l	0.08	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1	< 1.0	< 1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1	1.6	< 1.0	< 1.0
Mercury (Dissolved)	U	1450	µg/l	0.5	< 0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1	6.4	2.0	3.1
Lead (Dissolved)	U	1450	µg/l	1	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1	3.8	5.3	3.4
Zinc (Dissolved)	U	1450	µg/l	1	17	19	12
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
TPH >C6-C10	N	1670	µg/l	0.1	< 0.10	< 0.10	< 0.10
TPH >C10-C21	N	1670	µg/l	0.1	< 0.10	< 0.10	< 0.10
TPH >C21-C40	N	1670	µg/l	0.1	< 0.10	< 0.10	< 0.10
Total TPH >C6-C40	N	1670	µg/l	10	< 10	< 10	< 10
Naphthalene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Acenaphthene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Fluorene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Phenanthrene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Anthracene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Fluoranthene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Pyrene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Chrysene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.1	< 0.10	< 0.10	< 0.10

Results Summary - Water

Report Number: 14-06317 Issue-1

Client Reference: 5887 Enterprise Zone training Facility, BAE Systems

Client: Sub Surface					Chemtest Sample ID.:	32020	32021	32022
Quotation No.:					Client Sample Ref.:	620 621 622	617 618 619	614 615 616
Order No.: 5887					Client Sample ID.:	BH1	BH4	BH6
					Sample Type:	WATER	WATER	WATER
					Top Depth (m):	5.30	3.60	3.00
					Bottom Depth(m):			
					Date Sampled:	18-Jul-14	18-Jul-14	18-Jul-14
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Dibenz(a,h)Anthracene	U	1700	µg/l	0.1		< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1700	µg/l	0.1		< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	1700	µg/l	2		< 2.0	< 2.0	< 2.0
Benzene	U	1760	µg/l	1		< 1.0	< 1.0	< 1.0
Toluene	U	1760	µg/l	1		< 1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1		< 1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1		< 1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1		< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1		< 1.0	< 1.0	< 1.0
Total Phenols	U	1920	mg/l	0.03		< 0.030	< 0.030	< 0.030

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, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry 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

Sample Retention and Disposal

All soil samples will be retained for a period of 1 month following the date of the test report
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

BOREHOLE RECORD SHEETS

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 8.90m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	02/07/2014	TRP CONSULTING	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
0.00-0.20	B					(0.50)	MADE GROUND: grass over dark greyish brown slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone.
0.50-1.00	B					0.50 (0.50)	MADE GROUND: brown and occasional grey mottled slightly gravelly silty clay. Gravel sized fragments are angular to subangular fine to medium brick and stone.
1.00	D					1.00	
1.20-1.65	U NTP			HV@1.20m, c=23kPa			Soft low strength brown and dark greyish brown mottled slightly gravelly slightly sandy silty CLAY with low cobble content and occasional lenses of sand. Gravel is subangular to rounded fine to coarse quartz, sandstone and siltstone (possible made ground).
1.70	D					(1.50)	
2.00-2.45	SPT N=3			1,0/1,0,1,1			.... at 2.00m : very low strength
2.00-2.45	B						
2.00-2.45	D					2.50	
2.70	D						Firm medium strength locally high strength brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to coarse siltstone and quartz.
3.00-3.45	U c=79kPa						
3.50	D						
4.00-4.45	SPT N=14			3,3/4,3,4,3			
4.00-4.45	B						
4.00-4.45	D						
4.70	D						
5.00-5.45	U c=77kPa						
5.50	D						
6.00-6.45	SPT N=17			3,2/5,4,3,5			.... at 6.00m : with low quartz cobble content
6.00-6.45	B						
6.00-6.45	D					(7.50)	
7.30	D						
7.50-7.95	U c=64kPa						
8.00	D						
8.70	D						
9.00-9.45	SPT N=16			4,5/4,3,4,5			
9.00-9.45	B						
9.00-9.45	D						
10.00	D			02/07/2014:DRY		10.00	

Remarks

Hand dug inspection pit from GL to 1.20m to check for services - 1hr
On completion backfilled with arisings and installed a 50mm hdpe gas monitoring standpipe with a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.
NTP = No Test Possible
HV = Hand Shear Vane test

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH1

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 13.40m		WILSON MASON LLP	5887

Location	Dates	Engineer	Sheet
AS PLAN	02/07/2014-03/07/2014	TRP CONSULTING	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	B					(0.20) 0.20	MADE GROUND: dark brown slightly sandy silty clay with many roots and rootlets.		
						(0.20) 0.40	MADE GROUND: gravelly clay. Gravel sized fragments are brick (driller's description).		
0.50-1.00	B					(0.80)	Stiff brown and occasional grey mottled slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to coarse siltstone and quartz.		
1.00	D					1.20			
1.20-1.65	SPT N=14			2,3/3,4,3,4			Firm medium strength locally high strength dark brown slightly gravelly silty CLAY. Gravel is subangular to rounded fine to coarse quartz, siltstone and sandstone.		
1.20-1.65	B								
1.20-1.65	D								
2.00-2.45	U c=159kPa								
2.50	D								
3.00-3.45	SPT N=11			3,4/3,2,3,3					
3.00-3.45	B								
3.00-3.45	D								
3.70	D								
4.00-4.45	U c=91kPa								
4.50	D								
5.00-5.45	SPT N=16			3,4/3,4,4,5					
5.00-5.45	B								
5.00-5.45	D								
5.70	D								
6.00-6.45	U c=108kPa								
6.50	D			02/07/2014:DRY					
				03/07/2014:DRY					
7.30	D								
7.50-7.95	SPT N=17			3,3/3,5,4,5					
7.50-7.95	B								
7.50-7.95	D								
						(14.30)			
8.70	D								
9.00-9.45	U c=71kPa								
9.50	D								

Remarks

Hand dug inspection pit from GL to 1.20m to check for services - 1hr

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH2

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 13.40m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	02/07/2014-03/07/2014	TRP CONSULTING	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.30	D						Firm medium strength dark brown slightly gravelly silty CLAY. Gravel is subangular to rounded fine to coarse quartz, siltstone and sandstone.		
10.50-10.95	SPT N=18			4,4/5,4,4,5			.... below 10.50m : high strength		
10.50-10.95	B								
10.50-10.95	D								
11.70	D								
12.00-12.45	U c=103kPa								
12.50	D								
13.30	D								
13.50-13.95	SPT N=27			4,5/6,7,7,7					
13.50-13.95	B								
13.50-13.95	D								
14.70	D								
15.00-15.45	U c=110kPa								
15.50	D			03/07/2014:DRY		15.50	Complete at 15.50m		

Remarks

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH2

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH3

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABEL PERCUSSIVE	150mm to 8.70m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/07/2014	TRP CONSULTING	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	B					(0.20) 0.20	Grass over dark brown slightly gravelly slightly sandy silty CLAY with some rootlets and roots. Gravel is subangular to subrounded fine to medium quartz.		
0.50-1.00	B						Firm high strength dark brown slightly gravelly silty CLAY with low cobble content. Gravel is subangular to rounded fine to coarse siltstone, quartz and sandstone.		
1.00	D								
1.20-1.65	U c=111kPa								
1.70	D								
2.00-2.45	SPT N=19			4,4/5,4,5,5					
2.00-2.45	B								
2.00-2.45	D								
2.70	D								
3.00-3.45	U c=83kPa						.... between 3.00m and 7.50m : medium strength		
3.50	D								
4.00-4.45	SPT N=15			3,3/4,3,4,4					
4.00-4.45	B								
4.00-4.45	D								
4.70	D								
5.00-5.45	U c=74kPa					(9.80)			
5.50	D								
6.00-6.45	SPT N=16			4,4/3,4,5,4					
6.00-6.45	B								
6.00-6.45	D								
7.30	D								
7.50-7.95	U c=107kPa								
8.00	D								
8.70	D								
9.00-9.45	SPT N=18			4,5/5,4,4,5					
9.00-9.45	B								
9.00-9.45	D								
				03/07/2014:DRY					
10.00	D					10.00			

Remarks
Hand dug inspection pit from GL to 1.20m to check for services - 1hr

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH3

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH4

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 14.90m		WILSON MASON LLP	5887
Location	**Dates**	**Engineer**		**Sheet**
AS PLAN	04/07/2014	TRP CONSULTING		1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.20	B					(0.20) 0.20	Grass over dark brown slightly sandy silty CLAY with many roots and rootlets.			
0.50-1.00	B					(1.00)	Firm brown and occasional grey mottled slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium siltstone.			
1.00	D					1.20				
1.20-1.65	SPT N=9			1,1/1,2,3,3			Firm low strength becoming medium strength, locally high strength brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to coarse siltstone, sandstone and quartz.			
1.20-1.65	B									
1.20-1.65	D									
2.00-2.45	U c=82kPa						.... below 2.00m : medium locally high strength			
2.50	D									
3.00-3.45	SPT N=11			2,3/3,2,3,3						
3.00-3.45	B									
3.00-3.45	D									
3.70	D									
4.00-4.45	U c=69kPa									
4.50	D									
5.00-5.45	SPT N=14			3,4/4,3,4,3						
5.00-5.45	B									
5.00-5.45	D									
5.70	D									
6.00-6.45	U c=57kPa									
6.50	D									
7.30	D									
7.50-7.95	SPT N=17			4,4/5,4,4,4						
7.50-7.95	B									
7.50-7.95	D					(14.30)				
8.70	D									
9.00-9.45	U c=98kPa									
9.50	D									

Remarks

Hand dug inspection pit from GL to 1.20m to check for services - 1hr
On completion backfilled with arisings and installed a 50mm hdpe gas monitoring standpipe with a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH4

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH4

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 14.90m		WILSON MASON LLP	5887
Location	**Dates**	**Engineer**		**Sheet**
AS PLAN	04/07/2014	TRP CONSULTING		2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.30	D						Firm medium strength locally high strength brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to coarse siltstone, sandstone and quartz.			
10.50-10.95	SPT N=17			3,4/4,5,4,4						
10.50-10.95	B									
10.50-10.95	D									
11.70	D									
12.00-12.45	U c=79kPa									
12.50	D									
13.30	D									
13.50-13.95	SPT N=18			4,4/5,4,5,4						
13.50-13.95	B									
13.50-13.95	D									
14.70	D									
15.00-15.45	U c=75kPa									
15.50	D			04/07/2014:DRY		15.50	Complete at 15.50m			

Remarks

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH4

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH5

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 8.90m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	07/07/2014	TRP CONSULTING	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30	B					(0.30)	Grass over brown and greyish brown slightly gravelly silty CLAY with many roots and rootlets. Gravel is subrounded fine to medium quartz.		
						0.30			
0.50-1.00	B						Firm medium strength locally high strength brown slightly gravelly silty CLAY. Gravel is subangular to rounded fine to coarse quartz, siltstone, sandstone and mudstone.		
1.00	D								
1.20-1.65	U c=77kPa								
1.70	D								
2.00-2.45	SPT N=12			3,3/2,3,4,3					
2.00-2.45	B								
2.00-2.45	D								
3.00-3.45	U c=69kPa								
3.50	D								
4.00-4.45	SPT N=15			3,2/3,4,4,4					
4.00-4.45	B								
4.00-4.45	D								
4.70	D								
5.00-5.45	U c=77kPa					(9.70)			
5.50	D								
6.00-6.45	SPT N=15			4,4/3,4,4,4					
6.00-6.45	B								
6.00-6.45	D								
7.30	D								
7.50-7.95	U c=52kPa								
8.00	D								
9.00-9.45	SPT N=17			2,2/4,4,4,5					
9.00-9.45	D								
9.00-9.45	D								
				07/07/2014:DRY					
10.00	D					10.00			

Remarks
Hand dug inspection pit from GL to 1.20m to check for services - 1hr

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH5

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH6

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 14.90m		WILSON MASON LLP	5887

Location	Dates	Engineer	Sheet
AS PLAN	04/07/2014-07/07/2014	TRP CONSULTING	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.20	B					(0.80)	MADE GROUND: grass over brown slightly gravelly slightly sandy silty clay with some roots and rootlets. Gravel sized fragments are angular to subangular fine to coarse brick.			
0.50-1.00	B					0.80				
1.00	D						Firm high strength locally medium and very high strength brown and grey mottled slightly gravelly silty CLAY with some plant remains. Gravel is subangular to rounded fine to medium sandstone, mudstone, siltstone and quartz.			
1.20-1.65	U NTP			HV@1.20m, c=96kPa						
1.70	D									
2.00-2.45	SPT N=12			2,3/3,3,3,3		(2.70)				
2.00-2.45	B									
2.00-2.45	D									
2.70	D									
3.00-3.45	U c=161kPa						.... at 3.00m : very high strength			
3.50	D					3.50	Firm medium strength locally high strength dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium siltstone, sandstone and quartz.			
4.00-4.45	SPT N=15			4,4/3,4,4,4						
4.00-4.45	B									
4.00-4.45	D									
4.70	D									
5.00-5.45	U c=72kPa									
5.50	D			04/07/2014:DRY						
				07/07/2014:DRY						
6.00-6.45	SPT N=14			3,3/3,4,4,3						
6.00-6.45	D									
7.30	D									
7.50-7.95	U c=92kPa									
8.00	D									
8.70	D									
9.00-9.45	SPT N=13			4,4/3,3,4,3						
9.00-9.45	B									
9.00-9.45	D					(11.95)				

Remarks

Hand dug inspection pit from GL to 1.20m to check for services - 1hr
On completion backfilled with arisings and installed a 50mm hdpe gas monitoring standpipe with a gravel surround to 6.00m, a Bentonite seal from 1.00m to 0.20m and a concreted in lockable steel protective cover from 0.20m to GL.
NTP = No Test Possible
HV = Hand Shear Vane test

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH6

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Borehole Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	BH6

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
LIGHT CABLE PERCUSSIVE	150mm to 14.90m		WILSON MASON LLP	5887

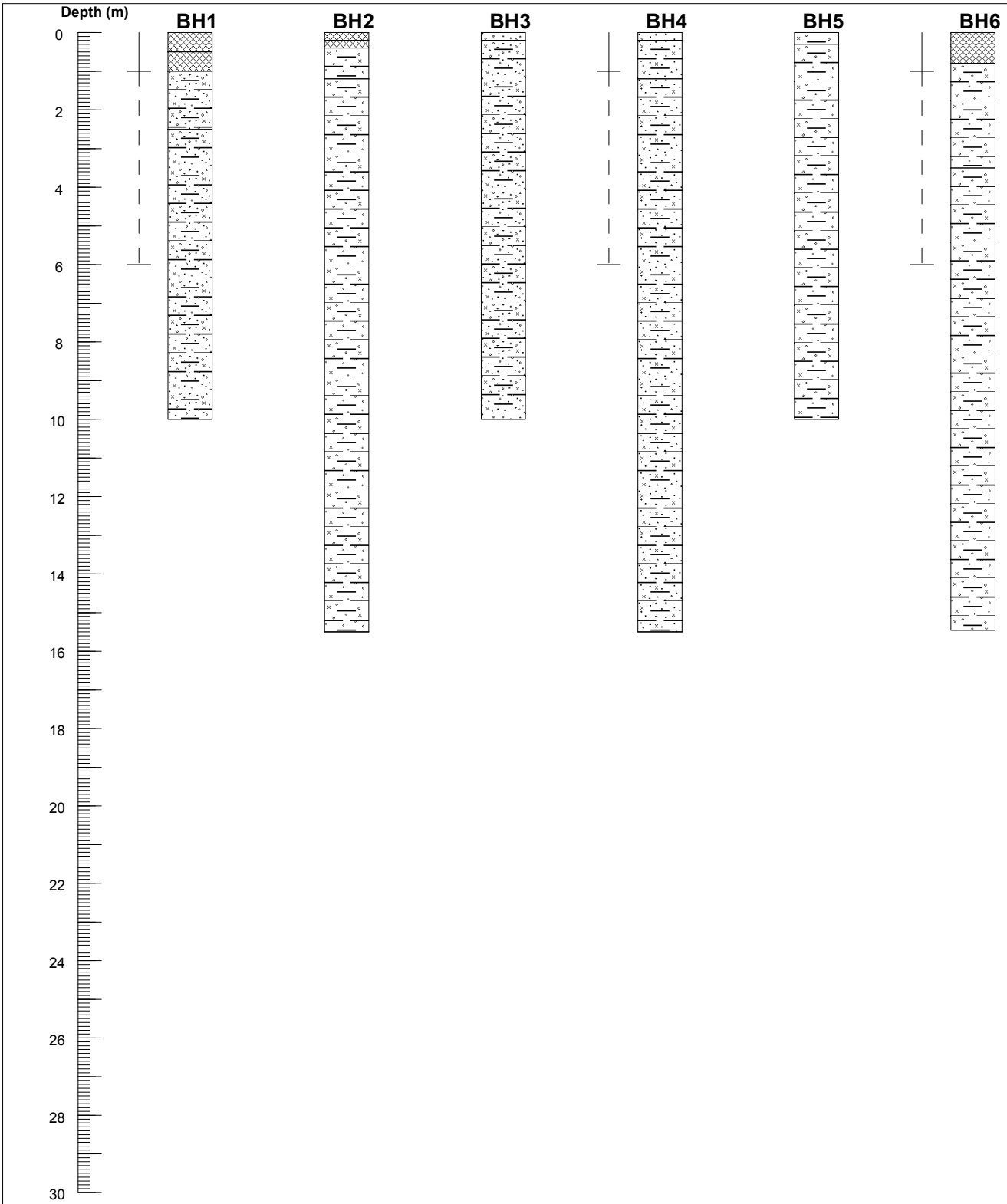
Location	Dates	Engineer	Sheet
AS PLAN	04/07/2014-07/07/2014	TRP CONSULTING	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.30	D						Firm medium strength locally high strength dark brown slightly gravelly silty CLAY. Gravel is subrounded to rounded fine to medium siltstone, sandstone and quartz.			
10.50-10.95	U c=101kPa									
11.00	D									
11.70	D									
12.00-12.45	SPT N=15			4,4/4,3,4,4						
12.00-12.45	B									
12.00-12.45	D									
13.30	D									
13.50-13.95	U c=114kPa									
14.00	D									
14.70	D									
15.00-15.45	SPT N=13			4,4/3,3,3,4						
15.00-15.45	D									
				07/07/2014:DRY		15.45	Complete at 15.45m			

Remarks

Scale (approx)	Logged By
1:50	DM/SJ

Figure No. 5887.BH6



Key

- Groundwater Strike
- Strike Rise Level
- Highest recorded piezo level
- Piezometer Tip
- Slotted Standpipe
- MADE GROUND
- Silty sandy CLAY
- Silty gravelly CLAY
- Silty sandy gravelly CLAY

SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	16/09/2014		1/1	5887
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
WILSON MASON LLP			1:150[V]	5887.1

TRIAL PIT RECORD SHEETS

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.50m x 1.50m x 2.50m		WILSON MASON LLP	5887
	Location AS PLAN	**Dates** 03/07/2014	**Engineer** TRP CONSULTING	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05-0.20	D*				(0.40)	MADE GROUND: grass over dark grey brown and dark orange brown mottled gravelly slightly sandy clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone and occasional brick (topsoil to 0.15m)		
0.20-0.40	B					....below 0.20m: with occasional pieces of timber		
0.40-0.50	D*				0.40			
0.40-0.60	B				(0.40)	MADE GROUND: brown dark brown and dark grey brown mottled slightly gravelly slightly sandy clay with occasional roots and low cobble content of stone and concrete. Gravel sized fragments are fine to coarse stone, concrete, slag and brick		
0.60-0.80	B				0.80			
0.80-1.00	D*				(0.80)	MADE GROUND: soft very low strength dark grey and brown slightly gravelly slightly sandy clay with some plant remains and roots and a large piece of decayed tree branch (organic odour). Gravel sized fragments are fine to coarse stone, wood and brick		
			HV@1.10m, c=19kPa					
			Seepage(1) at 1.30m.					▽1
			HV@1.50m, c=44kPa			.... at 1.50m : medium strength		
			HV@1.69m, c=48kPa		1.60			
1.90	D				(0.90)	Stiff medium becoming high strength brown and occasional light grey mottled slightly gravelly slightly sandy CLAY with some roots and plant remains. Gravel sized fragments are subangular to rounded fine to coarse quartz, sandstone and siltstone		
			HV@2.10m, c=87kPa					
			HV@2.40m, c=87kPa					
2.50	D		03/07/2014:		2.50	Complete at 2.50m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Seepage below 1.30m.
HV = Hand Shear Vane test.

Scale (approx)	Logged By	Figure No.
1:25	ALM/DK	5887.TP1

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.5m x 1.50m x 1.50m		WILSON MASON LLP	5887
	Location AS PLAN	**Dates** 03/07/2014	**Engineer** TRP CONSULTING	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05-0.15	B				(0.15)	MADE GROUND: grass over dark brown and orange brown mottled gravelly slightly sandy silty clay with many rootlets and roots with low cobble content of quartz. Gravel sized fragments are fine to coarse stone and occasional brick and clinker (topsoil) .... at 0.30m : possible old brick foundation		
0.05-0.15	D*				0.15			
0.15-0.30	D*				(0.20)			
0.40-0.60	B				0.35	MADE GROUND: dark grey brown, dark brown and orange brown mottled slightly gravelly slightly sandy clay with many rootlets and low cobble content of brick and slag. Gravel sized fragments are fine to coarse stone and occasional brick and clinker		
			HV@0.70m, c=105kPa		(0.35)			
			HV@0.80m, c=98kPa		0.70	Firm brown grey brown orange brown and grey gravelly slightly sandy CLAY with occasional roots and lenses of fine to medium sand and with low cobble content of quartz. Gravel is subangular to subrounded fine to coarse quartz, sandstone and siltstone		
1.00	D				(0.80)			
			HV@1.10m, c=130kPa			Stiff high strength brown and light grey mottled slightly gravelly slightly sandy CLAY with occasional lenses of fine sand and with some relic rootlets. Gravel is subangular to rounded fine to coarse ash, sandstone, siltstone and with low cobble content of quartz. ....below 1.00m: occasional plant remains		
1.50	D		HV@1.50m, c=130kPa 03/07/2014:DRY		1.50	Complete at 1.50m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.
HV = Hand Shear Vane test.
Possible old brick foundation encountered between 0.30m and 1.00m

Scale (approx)	Logged By	Figure No.
1:25	ALM/DK	5887.TP2

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.5m x 1.90m x 1.40m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	03/07/2014	TRP CONSULTING	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05-0.20 0.05-0.20 0.20-0.40 0.20-0.40	B D* B D*		03/07/2014:DRY		(0.20) 0.20 (0.30) 0.50	MADE GROUND: grass over dark grey brown and occasional orange brown mottled slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone (topsoil) MADE GROUND: dark grey brown and brown mottled slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone and brick ....at 0.50m: field drain so moved over (TP3A) Complete at 0.50m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.

Scale (approx)	Logged By	Figure No.
1:25	DM/DK	5887.TP3

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP3A

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.5m x 1.90m x 1.40m		WILSON MASON LLP	5887
	Location AS PLAN	**Dates** 03/07/2014	**Engineer** TRP CONSULTING	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25) 0.25	MADE GROUND: grass over dark grey brown and occasional orange brown mottled slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone (topsoil)		
					(0.15) 0.40	MADE GROUND: dark grey brown and brown mottled slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone and brick		
0.40-0.60	B		HV@0.50m, c=129kPa			Stiff high strength brown orange brown and occasional grey mottled slightly gravelly slightly sandy silty CLAY with some fine sand lenses and occasional rootlets. Gravel is subangular to rounded fine to coarse sandstone, siltstone and quartz		
			HV@0.75m, c=130kPa		(1.00)	....below 0.60m: brown and grey mottled		
1.00	D*					....below 1.00m: with occasional plant/root remains and occasional lenses of green silty fine sand		
			03/07/2014:DRY		1.40	Complete at 1.40m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.
HV = Hand Shear Vane test.

Scale (approx)	Logged By	Figure No.
1:25	DM/DK	5887.TP3A

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP4

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.50m x 1.40m x 1.20m		WILSON MASON LLP	5887
	Location AS PLAN	**Dates** 02/07/2014	**Engineer** TRP CONSULTING	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30	B				(0.30)	Long grasses over dark grey and orange brown mottled gravelly slightly sandy CLAY with medium roots and rootlets (topsoil). Gravel is subangular to rounded fine to coarse quartz		
0.10-0.30	D*							
					0.30			
0.30-0.50	B		HV@0.30m, c=105kPa			Stiff high strength brown and grey and occasional grey brown and green brown mottled slightly gravelly slightly sandy CLAY with low cobble content of quartz. Gravel is subangular to rounded fine to coarse quartz, sandstone and siltstone becoming brown and light grey mottled with depth		
			HV@0.60m, c=115kPa		(0.90)			
			HV@0.80m, c=89kPa					
			HV@1.00m, c=117kPa					
1.10	D				1.20			
1.10	D		02/07/2014:DRY			Complete at 1.20m		
1.10	D							

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.
HV = Hand Shear Vane test.
Soakaway tests undertaken on completion.

Scale (approx)	Logged By	Figure No.
1:25	DM/DK	5887.TP4

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
MECHANICAL EXCAVATOR	0.50m x 1.30m x 1.40m		WILSON MASON LLP	5887
	Location	**Dates**	**Engineer**	**Sheet**
	AS PLAN	02/07/2014	TRP CONSULTING	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.05-0.20	B				(0.20)	TOPSOIL: grass over dark grey brown and orange brown mottled slightly gravelly slightly sandy clay with roots and rootlets. Gravel is subangular to rounded fine to coarse stone		
0.05-0.20	D*				0.20			
0.30-0.50	B		HV@0.40m, c=130kPa			Stiff high strength brown light grey and occasional green grey mottled gravelly slightly sandy CLAY with low cobble content of quartz. Gravel is subangular to rounded fine to coarse quartz, sandstone and siltstone		
			HV@0.70m, c=121kPa		(1.20)	....below 0.70m: occasional lenses of green silty sand ....below 0.80m: fissured		
1.00	D		HV@1.00m, c=130kPa			....at 1.00m: large quartz boulder		
1.40	D		HV@1.40m, c=115kPa 02/07/2014:DRY		1.40	Complete at 1.40m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.
HV = Hand Shear Vane test.
Soakway test undertaken on completion.

Scale (approx)	Logged By	Figure No.
1:25	ALM/DK	5887.TP5

SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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Site	Trial Pit Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	TP6

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
HAND EXCAVATION	0.30m x 0.30m		WILSON MASON LLP	5887
	Location AS PLAN	**Dates** 02/07/2014	**Engineer** TRP CONSULTING	**Sheet** 1/1

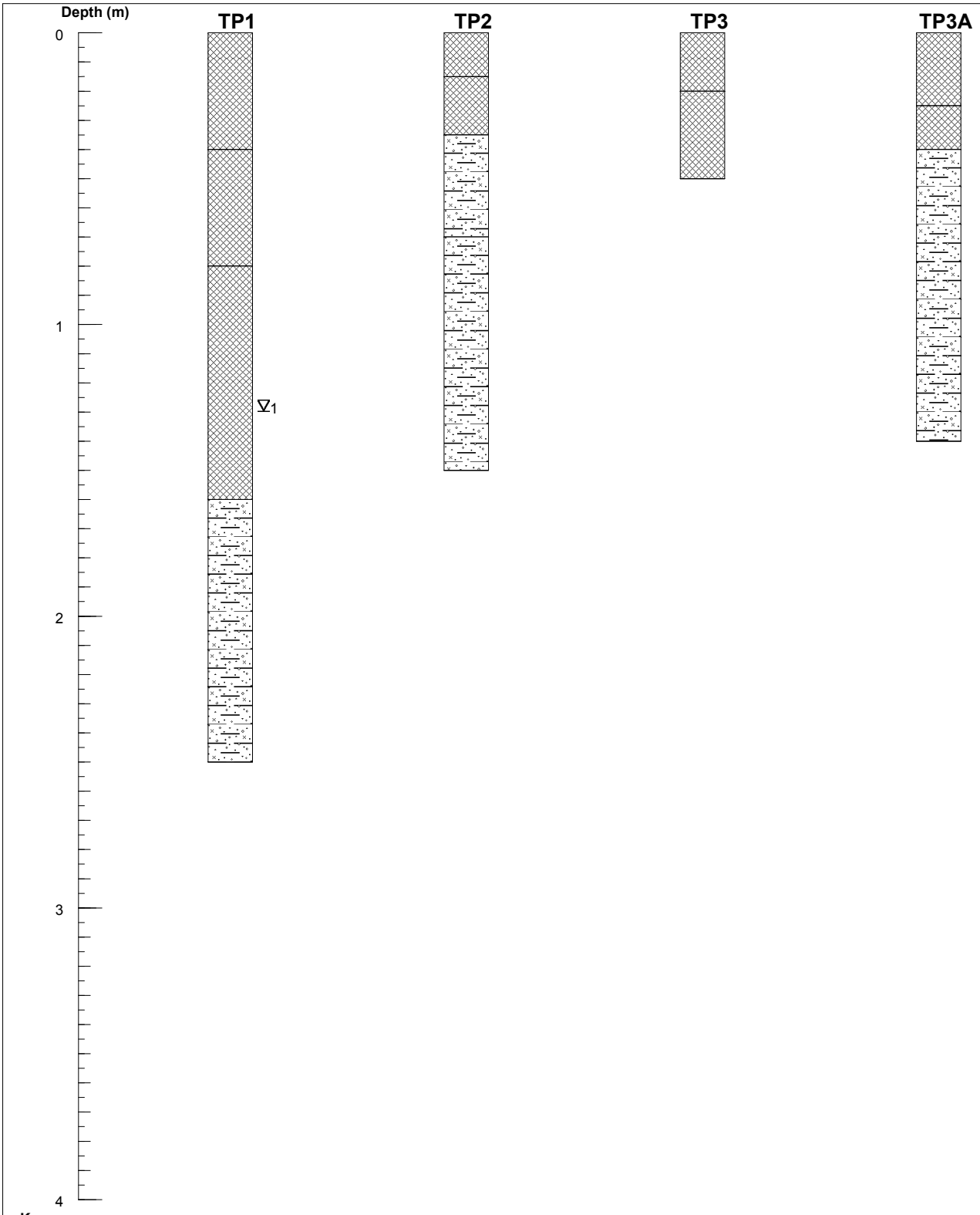
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.20	D*				(0.25) 0.25	MADE GROUND: grass over dark brown slightly gravelly slightly sandy silty clay with many roots and rootlets. Gravel sized fragments are fine to coarse stone and brick (topsoil)		
0.40-0.60	B		02/07/2014:DRY		(0.15) 0.40	Orangish brown, brown and grey mottled very clayey fine to medium SAND		
					(0.20) 0.60	Firm brown, grey and occasional orange brown silty CLAY with some sand bands and occasional rootlet remains		
						Complete at 0.60m		

Plan

Remarks

D* = 1 Plastic Jar Sample, 1 Amber Glass Jar Sample, 1 Vial Sample, taken for chemical testing.
Pit sides remained stable and vertical.
Trial Pit remained dry.
Hand excavated due to possible presence of services in the area.

Scale (approx)	Logged By	Figure No.
1:25	DM/DK	5887.TP6



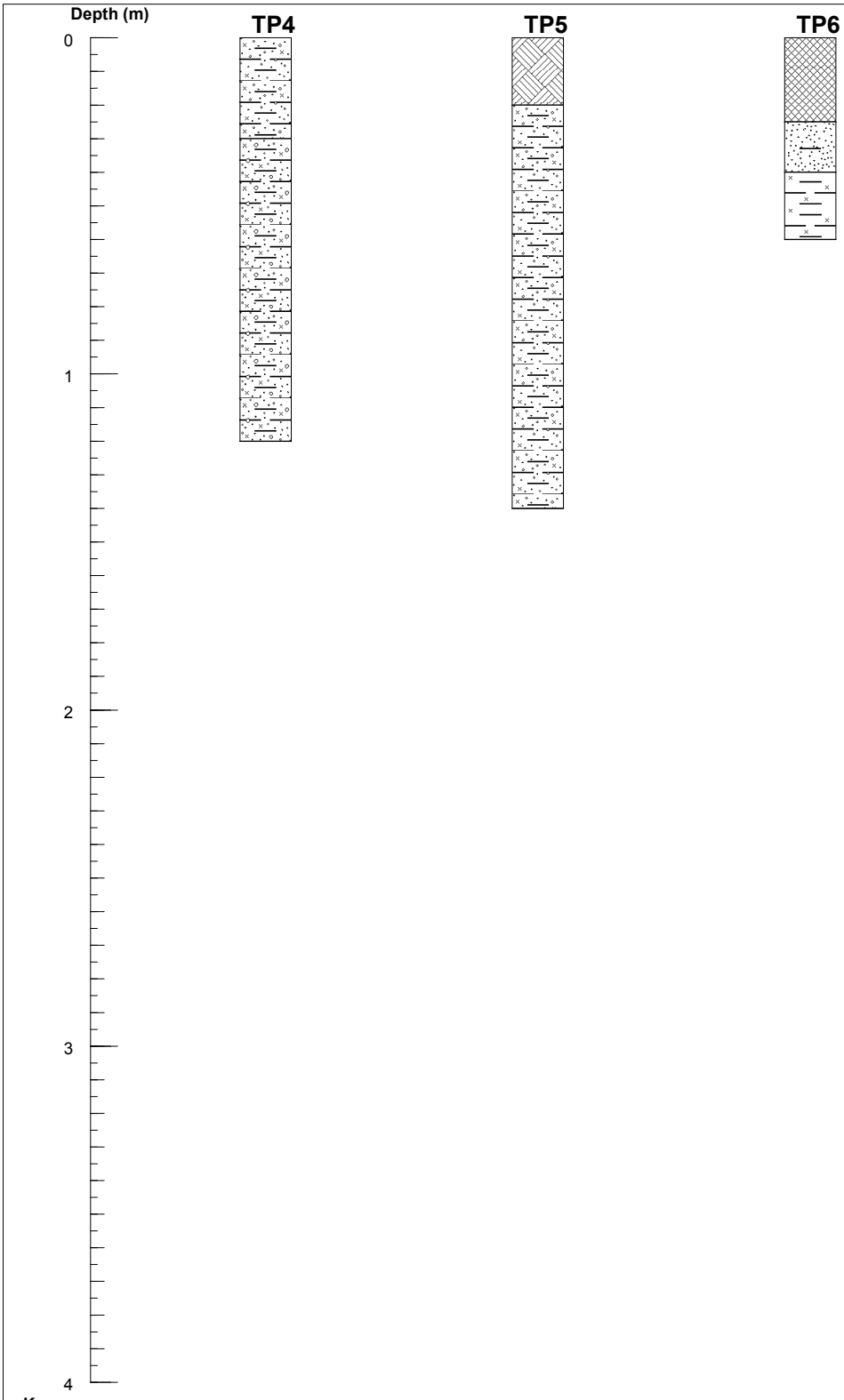
Key

- Groundwater Strike
- Strike Rise Level
- MADE GROUND
- Silty sandy gravelly CLAY
- TOPSOIL
- Silty CLAY
- Silty sandy gravelly cobbly CLAY
- Clayey SAND

SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	16/09/2014		1/2	5887
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
WILSON MASON LLP			1:20[V]	5887.1



Key

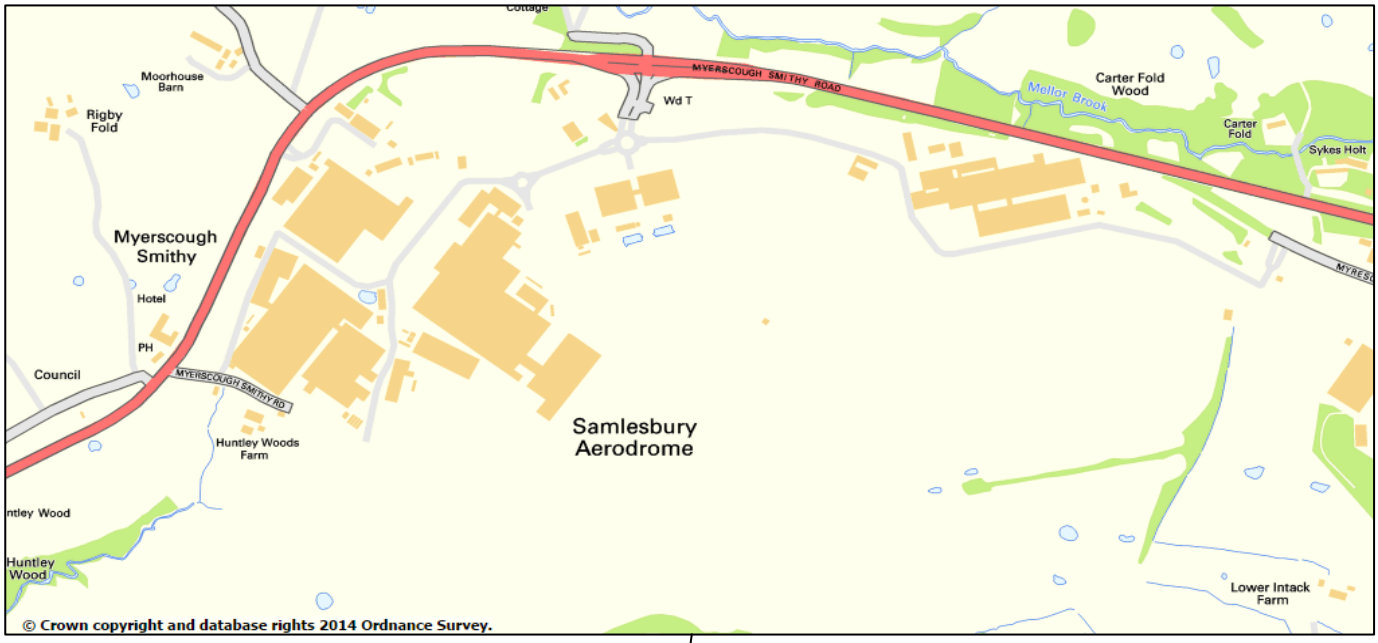
- Groundwater Strike
- Strike Rise Level
- MADE GROUND
- Silty sandy gravelly CLAY
- TOPSOIL
- Silty CLAY
- Silty sandy gravelly cobbly CLAY
- Clayey SAND

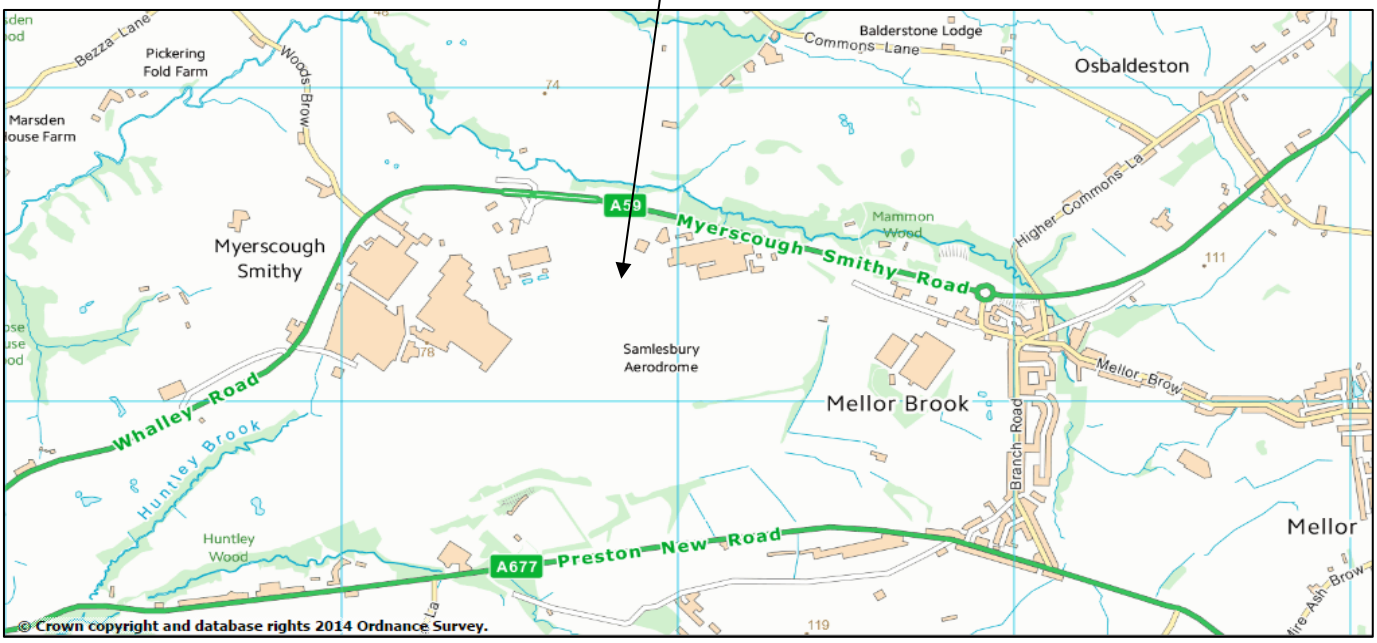
SUB SURFACE
SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Nominal Section

Site	Date Drawn	Date Checked	Sheet	Job Number
ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	16/09/2014		2/2	5887
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
WILSON MASON LLP			1:20[V]	5887.1

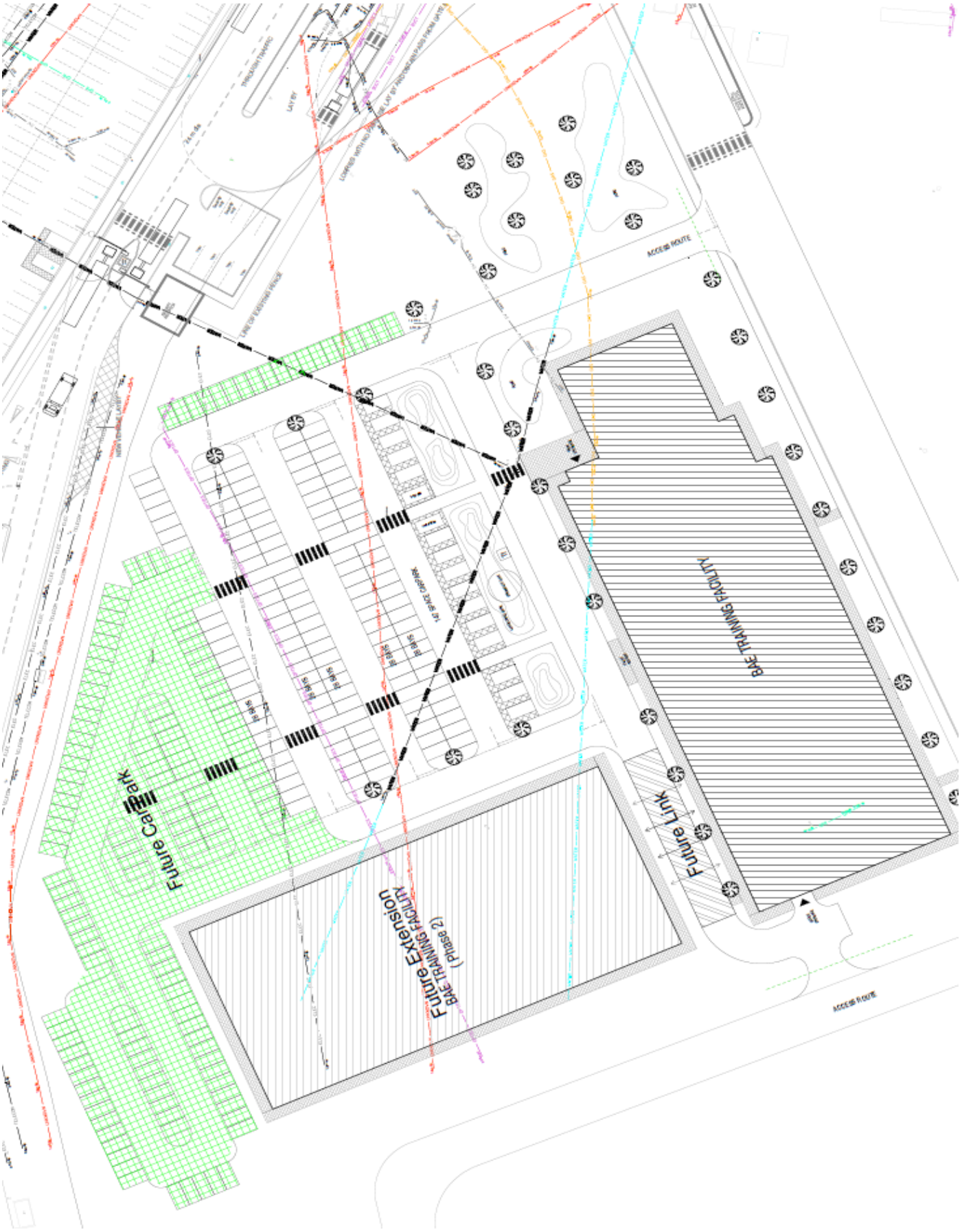
FIGURES





SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907		General Site Location		
Site ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	Date Drawn 12/09/2014	Date Checked	Orientation N	Job No. 5887
Client WILSON MASON LLP	Drawn By DJ	Checked By	Scale _	Figure No. 1

SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Site location & Positions of Boreholes and Trial Pits			
Site ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	Date Drawn 12-Sep-14	Date Checked	Orientation	Job No. 5887
Client WILSON MASON LLP	Drawn By DJ	Checked By	Scale _	Figure No. 2



SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Proposed Development			
Site ENTERPRISE ZONE, TRAINING FACILITY, BAE SAMLESBURY, LANCASHIRE	Date Drawn 12-Sep-14	Date Checked	Orientation	Job No. 5887
Client WILSON MASON LLP	Drawn By DJ	Checked By	Scale _	Figure No. 3