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TONY MORRIS BUILDERS

ST MARY'S COURT
BARWELL LE9 8AY

REPORT ON PHASE 2 GROUND INVESTIGATION

Contract: 20970

Date: December 2012

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REPORT ON PHASE 2 GROUND INVESTIGATION

carried out at

ST MARY'S COURT

BARWELL LE9 8AY

Prepared for

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c/o Hayward Architects
19 Station Road
Hinckley
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LE10 1AW

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EXECUTIVE SUMMARY

On the instructions of Hayward Architects on behalf of Tony Morris Builders, a ground investigation was undertaken to determine ground conditions to enable foundation and road/hard standing design to be carried out, together with a contamination risk assessment and a review of gas emissions. It is understood that it is proposed to develop the site for new residential housing with associated gardens, car parking and storm water drainage infrastructure.

The site consists of a small parcel of development land situated in St Mary's Court, Barwell, approximately 2.8km to the north east of the town centre of Hinckley, and may be located by Grid Reference SP442964.

The geological map indicates the site to be underlain by superficial deposits of Wolston Sand and Gravel. Wolston Clay is indicated to underlie the sites southeastern corner. The solid geology is indicated to be the Mercia Mudstone Group.

Site work consisted of the excavation of four trial pits and the sinking of two cable percussive boreholes. Representative disturbed and 'undisturbed' samples were collected and dispatched to the laboratory for geotechnical and geoenvironmental analysis. Gas and groundwater monitoring standpipes were installed in the two boreholes and subsequently monitored.

Shallow ground conditions at the site were relatively poor, and therefore piled foundations have been recommended for the structures, with floor slabs being suspended. Relatively benign chemical conditions indicate that concrete may be used based on Class AC-1.

None of the contaminants tested exhibited concentrations above the Guidance Levels and the engineering logs do not show any evidence for any significant thickness of Made Ground as anticipated, other than some reworking of natural underlying strata. No visual or olfactory evidence of contamination was noted and no remedial measures are deemed necessary for the proposed development. No further assessment of the risk to controlled waters is required and no remedial measures are deemed necessary in terms of the ingress of ground gas, all subject to agreement from the regulators.

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1.0 INTRODUCTION

1.1 On the instructions of Hayward Architects on behalf of Tony Morris Builders, a ground investigation was undertaken to determine ground conditions to enable foundation and road/hard standing design to be carried out, together with a contamination risk assessment and a review of gas emissions.

1.2 It is understood that it is proposed to develop the site for new residential housing with associated gardens, car parking and storm water drainage infrastructure.

1.3 This report should be read in conjunction with the Preliminary Investigation Report (PIR) which was reported under reference 20970 in October 2012.

1.4 It is recommended that a copy of this report be submitted to the relevant authorities to enable them to carry out their own site assessments and provide any comments.

1.5 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.6 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.7 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated in St Mary's Court, Barwell, approximately 2.8km to the north east of the town centre of Hinckley, and may be located by Grid Reference SP442964. A site location plan is included in Appendix 1, Figure A1.1.

2.1.2 A site plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 At the time of the trial pitting, the site was as per the description given in the PIR. Much of the undergrowth was cleared back during this phase.

2.2.2 At the time of the borehole drilling, the site had not changed apart from the vegetation clearance undertaken during the first phase of work.

2.3 Geological Setting

2.3.1 Details of the geology underlying the site have been obtained from BGS Sheet 169 'Coventry', ref. 9.1.

2.3.2 The geological map indicates the site to be underlain by superficial deposits of Wolston Sand and Gravel, described as 'sand and gravel, locally with lenses of silt, clay or peat'. Wolston Clay is indicated to underlie the sites southeastern corner, described as 'grey glacial clay and silt'.

2.3.3 The superficial deposits are underlain by Mercia Mudstone, described as 'red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units. Thin beds of gypsum, anhydrite and sandstones are also present'.

2.3.4 Although not indicated as present on the site from the geological maps, there is the possibility that Made Ground may exist on the site. It is possible that the shallow subsurface strata may be formed from Made Ground associated with the site's use as a compound for the adjacent development.

3.0 SITE WORK

3.1 The site work was carried out on the 16th October and on the 22nd and 23rd November 2012. The locations of exploratory holes have been planned, where possible, in general accordance with CLR 4, ref. 9.1 and the site work carried out on the basis of the practices set out in BS 10175:2011, ref. 9.3, BS 5930:2010 ref. 9.4 and ISO 1997:2007, ref 9.5.

3.2 Two boreholes, designated BH1 and BH2, were sunk by light cable percussion method, and four trial pits, designated TP1 to TP4, were dug by mechanical excavator at the positions shown on the exploratory hole location plan, Appendix 1, Figure A1.2. The depths of boreholes and trial pits, descriptions of strata encountered and comments on groundwater conditions are given in the borehole and trial pit records, Appendix 2, Figures 20970.BH1 to BH2, and 20970.TP1 to TP4.

3.3 Representative disturbed and undisturbed samples were taken at the depths shown on the borehole and trial pit records and dispatched to the laboratory. Standard (split-barrel and cone) penetration tests, ref. 9.6, were carried out in the boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are given in the borehole records.

3.4 Samples were collected for environmental purposes in amber glass jars and kept in a cool box.

3.5 Perforated standpipes, surrounded by pea shingle and protected by a stopcock cover were installed in each of the boreholes, as detailed in the borehole records.

3.6 The ground levels at the borehole and trial pit locations were not determined.

3.7 Falling head permeability tests were carried out in the standpipes installed in boreholes BH1 and BH2, in line with guidelines given in BS 5930: 1999, ref 9.4. The results are included in Appendix 2.

3.8 Upon completion of the siteworks, the boreholes instrumented with standpipes were monitored for groundwater and gas levels. The gas levels monitored were oxygen, carbon dioxide, methane, carbon monoxide and hydrogen sulphide. The flow rate of each borehole was also monitored. The results are given in Appendix 7.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 All soil samples were prepared in accordance with BS1377: Part One: 1990 ref. 9.10 and representative sub-samples were taken for testing. The following tests were carried out:

- 6 No. Moisture contents
- 3 No. Plasticity indices
- 2 No. Particle size distribution by wet sieving
- 1 No. Particle size distribution by sedimentation
- 3 No. Water soluble sulphate contents
- 3 No. pH values
- 3 No. Undrained triaxial compression tests
- 1 No. Oedometer consolidation

4.1.2 The results of the testing are given in Appendix 3, Test Report 20970/1.

4.2 Chemical Testing

4.2.1 The suite of chemical analyses has been based upon the findings of the desk study, to investigate the potential sources of contamination identified in the conceptual model. The chemical analyses were carried out on five samples of soil. The nature of the analyses is detailed below:

4.2.2 **Metals Suite** - arsenic, cadmium, chromium (total and hexavalent), lead, mercury, selenium, copper, nickel and zinc

4.2.3 **Organic Suite -** petroleum hydrocarbons (TPH) – CWG speciated analysis, TPH C_{10} to C_{40} total, polycyclic aromatic hydrocarbons (PAH) – USEPA 16 suite, phenols

4.2.4 **Inorganics Suite** - cyanide (free), sulphate (water soluble)

4.2.5 **Others** - pH, organic matter content, asbestos

4.2.6 The results of these tests are shown in Appendix 4, Test Report 12-70403.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Sequence

5.1.1 The sequence of the strata encountered during the investigation generally confirms the anticipated geology as interpreted from the geological map.

5.1.2 The sequence and indicative thicknesses of strata are provided below:

Strata Encountered	Depth Encountered (m)		Strata Thickness (m)
	From	To	
Made Ground	0.00	0.70 to 1.60	0.70 to 1.60
Wolston Sand and Gravel	0.70 to 1.60	6.20 to 7.20	>0.60 to 6.10
Wolston Clay	6.20 to 7.20	10.45 to 10.95	>3.25 to >4.75

5.2 Made Ground

5.2.1 Made Ground was found at each location across the site, and generally consisted of soft, dark brown clay topsoil containing fragments of brick. This material was present to a depth of between 0.7m and 1.6mbgl.

5.3 Wolston Sand and Gravel

5.3.1 The Wolston Sand and Gravel was present beneath the Made Ground in each exploratory hole, and varied between soft, sandy or very sandy clays to begin with, becoming a clayey silty fine to medium sand or relatively coarse silt. The more granular material tended to have frequent thin bands of sandy clayey present also.

5.3.2 The sandy clay tended to be present to a depth of 2 to 3mbgl, ranging from a base depth of 1.7m in TP3 to 3.1m in BH2.

5.3.3 In-situ and laboratory tests indicated the cohesive material to be soft and of low strength, and of low plasticity. The granular material was medium dense.

5.4 Wolston Clay

5.4.1 This was proven only in the two boreholes, from a depth of 6.2m in BH1 and 7.2mbgl in BH2. The base of the deposit was unproven at least 10.95mbgl.

5.4.2 The stratum was recovered as a firm, becoming stiff / very stiff, high strength, intermediate plasticity silty clay, frequently with thin bands of sandy silt or silty sand present.

5.5 Groundwater

5.5.1 Groundwater was not encountered in each of the exploratory holes, with strikes ranging in depth from 1.2m in BH1, to 3.1mbgl in BH2. Generally the strikes were consistent with the base of the sandy clay / top of the more granular part of the Wolston Sand and Gravel.

5.5.2 The strike at 1.2mbgl in BH1 was at the base of the Made Ground, and rose to 0.5mbgl after 20 minutes. Subsequent monitoring of the installed standpipes has indicated standing water levels of 0.8m to 0.9m in BH1, and 1.24m in BH2.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Structural Details

6.1.1 It is understood that the proposed development is to consist of two-storey housing with associated parking and infrastructure.

6.1.2 Structural details were not known at the time of writing, but line loads in the region of 50kN/m run have been assumed for the purpose of this report.

6.2 Assessment of Soil Condition

6.2.1 The Made Ground encountered at the site was relatively weak and compressible, and is not considered suitable as a founding stratum.

6.2.2 The granular part of the Wolston Sand and Gravel has been assessed based on its composition and in-situ density measurements taken in the boreholes.

6.2.3 The upper part of the Wolston Sand and Gravel, and the Wolston Clay encountered on the site was principally cohesive in nature but contained differing proportions of sand.

6.2.4 In such materials it may be possible to recover undisturbed samples, however, frequently the sampler cannot be driven past the coarse particles. Therefore, quite often the samples recovered may be of limited length and disturbed by coarse particles.

6.2.5 In some cases, in-situ testing is more advantageous when compared with taking undisturbed samples followed by laboratory tests.

6.2.6 Work undertaken by Stroud, ref. 9.13 determined a relationship between SPT 'N' values and the undrained shear strengths of many over-consolidated clays. Further work by Stroud and Butler, ref. 9.14, in which data was analysed from sites covering a wide range of glacial deposits, confirmed there to be a correlation between the 'N' value and undrained shear strength.

6.2.7 The relationship was of the form:

$$Cu = F_1 \times N$$

and

$$mv = \frac{1}{F_2 \times N}$$

where Cu = Undrained shear strength
mv = Coefficient of compressibility
F_1 and F_2 = Factors

6.2.8 It was determined by Stroud that F_1 varied between 4kN/m² for material of high plasticity and 6kN/m² for material of low plasticity. Similarly F_2 varied between 400kN/m² and 600kN/m².

6.2.9 It is considered that for the strata encountered on this site a value of F_1 = 5kN/m² would be appropriate.

6.3 Foundation Design

6.3.1 The results of laboratory tests indicate the shallow clay of the Wolston Sand and Gravel is of low to intermediate plasticity and of low to medium volume change potential as defined by the National House Building Council, ref 9.15 and other published data, refs 9.16 and 9.17. Changes in moisture content will result in moderate / small changes in volume, seasonal changes being exacerbated by the presence of trees. It is recommended that for design purposes, medium volume change potential should be adopted.

6.3.2 On the basis of observations made on site together with results of in-situ and laboratory tests, it is considered that due to the relatively weak nature of the shallow clay of the Wolston Sand and Gravel, shallow spread foundations would not be suitable for supporting the proposed structures.

6.3.3 It is considered that piled foundations would be an appropriate solution at this site. Guidelines for the design of piles are given in Appendix 5, which may be used with the plots of shear strength with depth for clays, and the angle of internal resistance based on SPT values, both included in Appendix 5.

6.3.4 Within the zone of influence of trees the piles should be sleeved to depths equivalent to those specified by the NHBC for a foundation at the same location in soils of medium volume change potential. Compressible material should be placed below and on the inside faces of pile caps and beams, as specified by the NHBC.

6.3.5 The carrying capacity of piles depends not only on their size and the ground conditions but also on their method of installation. Pile design and installation are continuously evolving processes and state-of-the-art techniques are often employed before they reach the public domain, perhaps several years down the line. Therefore, it is recommended that specialist Piling Contractors be contacted as to the suitability and carrying capacity of their piles in the ground conditions pertaining to the site.

6.3.6 It should be noted that groundwater was present which could affect the installation of the piles.

6.3.7 It is recommended that the Building Control Officer at the local council is contacted as to whether they have any special design requirements in this area.

6.4 Ground Floor Slabs

6.4.1 On the basis of observation on site together with the results of laboratory tests it is recommended that consideration is given to suspending the ground floor slab from the pile caps and beams.

6.5 Excavations

6.5.1 On the basis of observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to less than 1.20m may not stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those in excess of 1.20m deep, in accordance with Health and Safety Regulations.

6.5.2 Groundwater may be expected in shallow excavations for foundations or services. However, it is also possible that perched groundwater could be present in the Made Ground overlying the clay of the Wolston Sand and Gravel. It is considered that this could be dealt with by the use of pumping.

6.6 Road and Hard Standing Design

6.6.1 On the basis of observations from site, it is recommended that for formation prepared in the Made Ground, a subgrade CBR value of <2% be adopted for design purposes. The assessment assumes there to be a high water table, average construction conditions and a thin pavement construction.

6.6.2 It may be worth considering improving the subgrade by a suitable compaction programme or the importation of a more suitable subgrade material. In-situ CBR testing may then be carried out to ascertain the 'improved' subgrade value.

6.7 Soakaways

6.7.1 The results of in-situ permeability tests gave coefficients of permeability in both the clays and sands of the Wolston Sand and Gravel of between $6.7x10^{-7}$m/s and $7.1x10^{-7}$m/s. These indicate the Wolston Sand and Gravel to be of poor drainage characteristics, ref 9.21.

6.7.2 It should also be noted that the groundwater table is relatively high at this site.

6.8 Chemical Attack on Buried Concrete

6.8.1 The site has been classified in accordance with BRE Special Digest 1, ref. 9.22, as brownfield without the presence of pyrite and laboratory testing undertaken accordingly. It is recommended that the guidelines given in Special Digest 1 be adopted.

6.8.2 The results of chemical tests in the non-pyritic soils indicate a sulphate concentration in the soil of between 24mg/l and 100mg/l as a 2:1 water/soil extract, with pH values in the range of 6.8 to 8.5.

6.8.3 It is recommended that for conventional shallow foundations the groundwater should be regarded as mobile.

6.8.4 On the basis of the laboratory test results it is considered that a Design Sulphate Class for the material encountered at this site may be taken as DS-1. The site conditions would suggest that an ACEC class for the site of AC-1 would be appropriate.

7.0 ENVIRONMENTAL RISK ASSESSMENT IN RELATION TO PROPOSED DEVELOPMENT

7.1 Contaminated Land

7.1.1 The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, ref 9.23, which was introduced by the Environment Act 1995, ref 9.25, as;

- '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 –
- significant harm is being caused or there is a significant possibility of such harm being caused; or
- significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.'

7.2 Risk Assessment

7.2.1 The definition of contaminated land is based on the principles of risk assessment. Risk is defined as a combination of:

- The probability, or frequency of exposure to a substance with the potential to cause harm, and:
- The seriousness of the consequence.

7.3 Pollutant Linkage

7.3.1 The basis of an environmental risk assessment involves identifying a 'source' of contamination, a 'pathway' along which the contamination may migrate and a 'receptor' at risk from the contamination.

7.3.2 Current legislation defines the various elements of the pollution linkage as:

- A contaminant is a substance which is in or under the ground and which has the potential to cause harm or to cause pollution of controlled waters.
- A pathway is one or more routes through which a receptor is being exposed to, or affected by, a contaminant, or could be so affected.
- A receptor is either a living organism, an ecological system, a piece of land or property, or controlled water.

7.3.3 A pollutant linkage indicates that all three elements have been identified. The site can only be defined as 'Contaminated Land' if a pollutant linkage exists and the contamination meets the criteria in Section 7.1 above.

7.3.4 The guidance proposes a four-stage approach for the assessment of contamination and the associated risks. The four stages are listed below:

- Hazard Identification
- Hazard Assessment

- Risk Assessment
- Risk Evaluation

7.3.5 The hazard identification and hazard assessment have been based upon the Phase 1 Desk Study and formed the conceptual site model, detailed in our report, reference 20970, dated October 2012.

7.3.6 The risk assessment and evaluation stages are presented in this phase 2 interpretive report, after an intrusive ground investigation has taken place.

7.4 Risk Assessment – Human Health

7.4.1 The proposed development consists of four new dwellings with associated gardens and hardstanding. The risk assessment has therefore been based on guidelines for a residential end use. Should the proposed development be changed in the future then further risk assessment may be required, particularly should a more sensitive end-use be envisaged.

7.4.2 The results of the soil analyses have been compared to CLEA SGVs published in Environment Agency Science Reports SC050021/SR3, ref 9.27 and SC050021, ref 9.28, where available, and Generic Assessment Criteria (GAC), determined by LQM and CIEH, ref 9.29, as well as Assessment Criteria (AC) derived in-house using the CLEA Software Version 1.06, ref 9.30. The CLEA AC have been derived by Ian Farmer Associates in accordance with current legislation and guidance.

7.4.3 The guidance values used within this contamination assessment have been tabulated and are detailed within Appendix 6.

7.4.4 The results of chemical analyses have been processed in accordance with recommendations set out in the CIEH and CL:AIRE document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration', ref 9.31. Where the concentrations determined on site are at or below the respective Guidance Level, they are considered not to pose a risk and are removed from further consideration, unless otherwise stated.

7.4.5 None of the contaminants tested exhibited concentrations above the Guidance Levels and the engineering logs do not show any evidence for any significant thickness of Made Ground as anticipated, other than some reworking of natural underlying strata. No visual or olfactory evidence of contamination was noted and no remedial measures are deemed necessary for the proposed development.

7.5 Risk Assessment - Controlled Waters

7.5.1 The site is located on a Secondary A aquifer (Wolston Sand and Gravel), is not within a groundwater source protection zone and there are no groundwater abstractions within 500m of the site.

7.5.2 Given the ground conditions encountered at the site and the absence of any significantly elevated contamination concentrations, it is considered that no further assessment of the risk to controlled waters is required.

7.6 Gas Generation

7.6.1 Data contained within the PIR identified two small areas noted as historical landfill to the northeast of the site. Details such as accurate boundaries or type of waste are

unknown, although this had been considered as part of the previous development adjacent to the site, during which two monitoring wells were installed and subsequently monitored on six occasions. The result of the risk assessment of these wells was that the site would fall under Characteristic Situation 1 and no gas protection measures would be required. This assessment is provided in Appendix 7.

7.6.2 One visit was made to monitor the wells installed within the boreholes undertaken for this project, on the 29th November 2012, the results of which are included within Appendix 7, Figure A7.1. Further monitoring was not possible as the standpipes were destroyed during vegetation clearance works preceding the second scheduled visit on the 14th December 2012.

7.6.3 Taking into account the historical data, which is considered suitable to assess any off-site migration, along with the absence of any significant source of ground gas on site, no further monitoring is deemed necessary, and the data considered sufficient to characterise the site as Situation 1.

7.6.4 No remedial measures are therefore deemed necessary in terms of the ingress of ground gas.

7.7 Protection Of Services

7.7.1 Guidance from the UKWIR, ref 9.36, sets out the material requirements for newly laid water supply pipes within Brownfield sites. However, the exact requirements should be clarified with the relevant local water utility supplier for the site.

7.7.2 An assessment of the contamination testing has been undertaken, which indicates no elevated levels of contaminants are present above UKWIR guidelines and therefore there are no specialist material requirements for newly laid water pipes.

7.8 Risk Evaluation

7.8.1 The above assessment has not identified any significant 'source – pathway – receptor' linkage potentially occurring at the site. No further investigation or remedial measures are deemed necessary for the proposed development.

7.9 Waste

7.9.1 An initial assessment of the likely waste classification for any material to be disposed of has been conducted on the basis of the chemical test results obtained as part of the contamination risk assessment.

7.9.2 This assessment has been conducted using the HazWasteOnline™ tool, ref. 9.37, the output sheets from which are included within Appendix 6, Waste Report 20970.

7.9.3 This initial assessment indicates that material represented by the samples tested may be disposed of to landfill as non-hazardous waste, should it be required. However, reuse of material should be considered in the first instance.

8.0 MANAGEMENT OF CONTAMINATION

8.1 Remediation and Verification

8.1.1 The risk management framework set out in the Model Procedures for the Management of Land Contamination, CLR 11, ref. 9.38, is applicable to the redevelopment of sites that may be affected by contamination.

8.1.2 The risk management process set out in the Model Procedures has three main components:

- Risk assessment
- Options appraisal
- Implementation

8.1.3 This initial risk assessment has not identified the presence of elevated contaminant concentrations across the site. No significant pollutant linkages have been identified and the site is therefore considered fit for purpose.

8.1.4 An important part of the risk management process is identifying and informing all stakeholders with an interest in the outcome of the risk management project. To this end, if the regulators have not yet been contacted with regard to the redevelopment of this site, it is recommended that they be supplied with a copy of both the Report on Preliminary Investigation and this Report on Phase 2 Site Investigation report in order to enable liaison to be undertaken with them.

8.1.5 No remediation measures are deemed necessary, subject to agreement from the relevant regulatory bodies for this development.

8.2 Management of Unidentified Sources of Contamination

8.2.1 There is the possibility that other sources of contamination may be present on the site, which were not detected during the investigation. Should such contamination be identified or suspected during the site clearance or ground works, these should be dealt with accordingly. A number of options are available for handling this material, which include:

- The removal from site and disposal to a suitably licensed tip of all material suspected of being contaminated. The material would need to be classified prior to disposal.

- Short-term storage of the suspected material while undertaking verification testing for potential contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area.

- Having a suitably experienced environmental engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

8.3 Consultation

8.3.1 During the development of a site, consultation may be required for a number of reasons with a number of regulatory Authorities. The following provides an indication as to the most likely Authorities with which consultation may be required.

- **Local Authority.** There may be a planning condition regarding contamination and consultation will be required with a designated Contaminated Land Officer within the Environmental Health Department. The Local Authority is generally concerned with human health risks. Some Authorities now require 'Completion Certificates' to be signed off following remediation works.

- **Environment Agency.** Where a site is within a groundwater protection zone or has been designated as a special site, the Environment Agency is likely to be involved to ensure that controlled waters are protected.

- **National House Building Council, NHBC.** Section 4.1 of the NHBC Standards requires land management to be addressed. For a new housing development to be approved by the NHBC, any remediation will require a validation report.

8.3.2 Based on the results of any consultation, there may be specific remediation requirements imposed by one or more of the Authorities.

8.4 Risk Management During Site Works

8.4.1 During ground works, some simple measures may have to be put in place to mitigate the risk of contamination affecting the site workers and the environs. The majority of the proposed measures represent good practice for the construction industry and include:

- Informing the site workers of any contamination on site and the potential health effects from exposure.

- Where appropriate, the provision of suitable Personal Protective Equipment (PPE) for workers who may be potentially impacted by working in areas of the contamination.

- Ensuring good hygiene is enforced on site and washing facilities are maintained on the site. Workers are discouraged from smoking, eating or drinking without washing their hands first.

- Dust monitoring, and if necessary, suppression measures should be put into practice where contamination is becoming airborne.

8.4.2 Where contaminated materials are being removed from the site they should be disposed of at a suitably licensed landfill, with a 'duty of care' system in place and maintained throughout the disposal operations.

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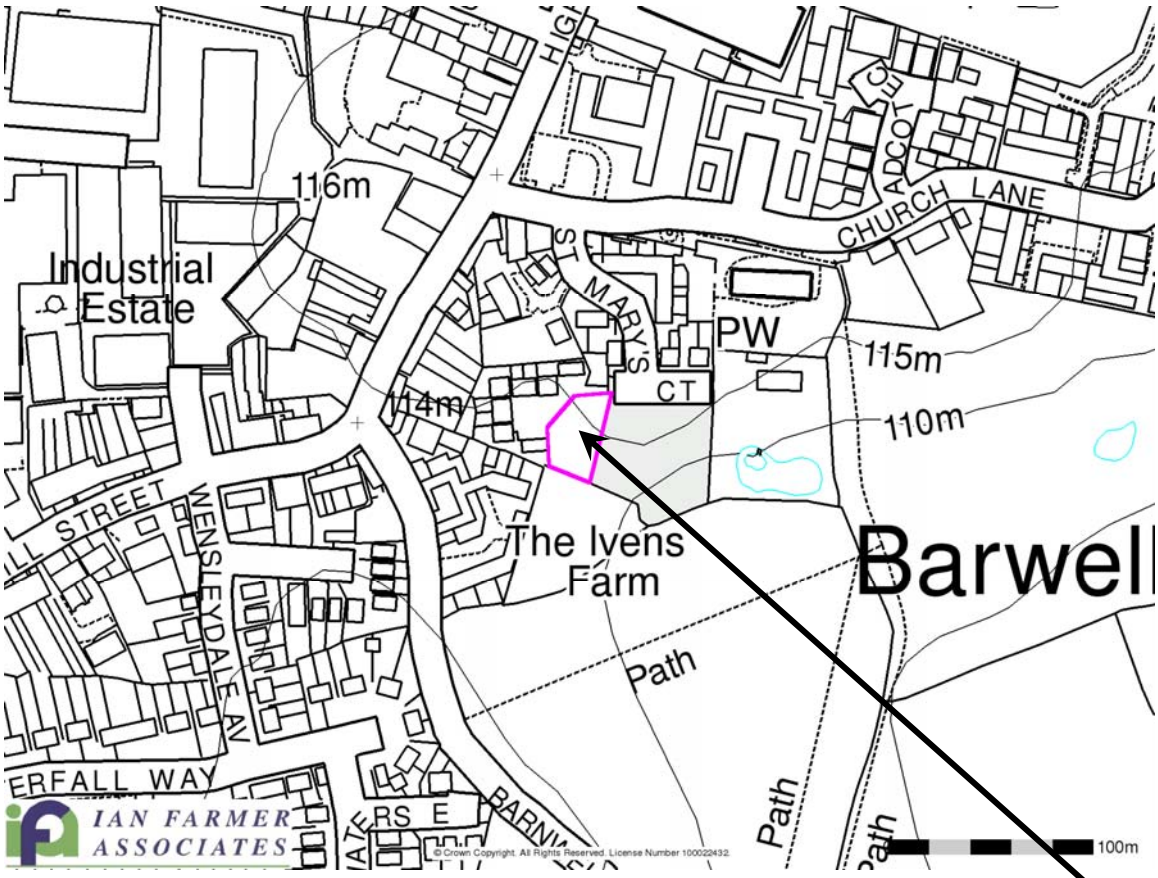
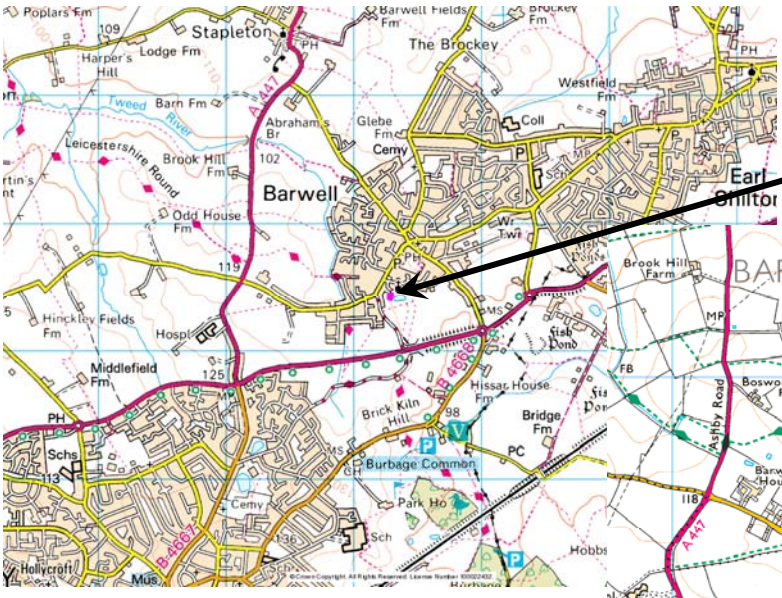
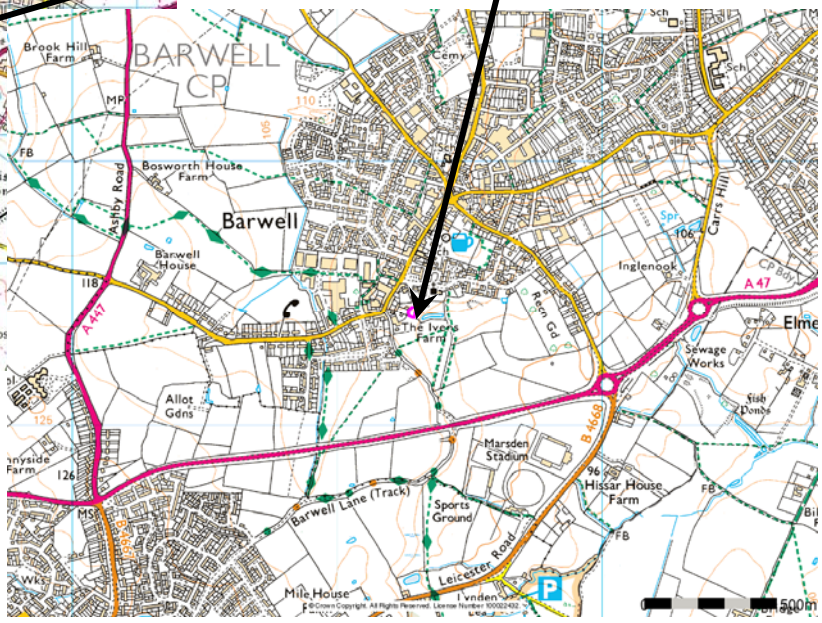
APPENDIX 1

DRAWINGS

20970
St Mary's Court, Barwell





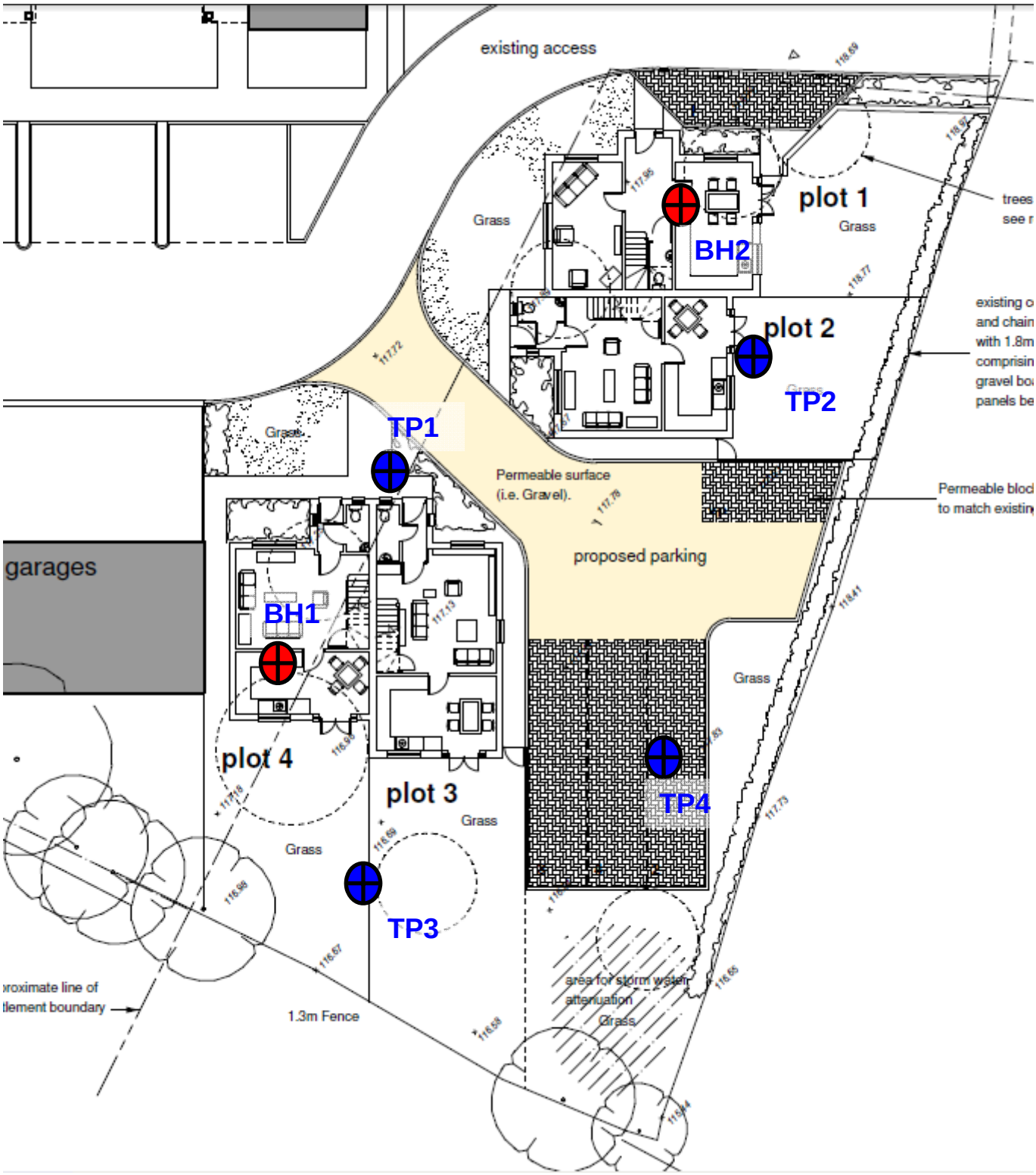


Site Location Plan

Scale: NTS

Figure A1.1

20970
St Mary's Court, Barwell



Exploratory Hole Location Plan

Scale: NTS

Figure A1.2

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 General

Site work is carried out in general accordance with the guidelines given in ISO 1997, 9.5 and BS 5930, ref 9.4.

A2.1.2 Trial Pits

Shallow trial pits are generally dug by mechanical excavator, however, in difficult access locations or adjacent to structures, such pits may be hand dug. Pits are best used where the ground will stand unsupported and generally, the maximum depth of machine dug pits is 4m to 5m. Where personnel are required to enter pits, it is essential that side support is provided. Entry by personnel into unsupported pits deeper than 1.2m is not allowed for health and safety reasons.

Trial pits allow the in-situ condition of the ground to be examined both laterally and vertically and also allow discontinuities to be recorded. The field record should give the orientation of the pit with details of which face was logged, assessment of stability of sides of pit and groundwater as well as the strata encountered. Photographs of the pit should also be taken.

In-situ testing, such as hand penetrometer, hand vane, Macintosh probe, or similar, can be undertaken in the sides or base of pits while both disturbed and undisturbed samples recovered.

It is generally advisable to backfill the pits as soon as possible, open pits should not be left unattended.

A2.1.3 Light Cable Percussion Boring

For routine soil exploration to depths in excess of 3m, the light cable percussion rig is generally employed for boring through soils and weak rocks, refs 9.4, 9.5 and 9.6. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and a trial hole dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a ‘shell’, otherwise known as a ‘bailer’ or ‘sand pump’, which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent ‘piping’ and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The general purpose open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

Standard penetration tests are generally carried out in non-cohesive soils but also in stiff clays and soft rocks at frequencies similar to that of undisturbed sampling.

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended by ISO 1997, ref 9.5, BS 1377, Part 9, 1990 ref 9.10 and ISO 22476 ref 9.6.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.5kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT.**

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.
- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.
- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels as follows:

Term	SPT N-Value : Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES

U represents undisturbed 100mm diameter sample, the number of blows to obtain the sample also recorded.

U fail indicates undisturbed sample not recovered

B represents large bulk disturbed samples

D represents small disturbed sample

E represents contamination sample in appropriate containers

W represents water sample

▽ represents water strike

▼ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in ISO 14688 Parts 1 and 2, ref 9.9, supplemented by section 6 of BS 5930, ref. 9.4 have been used in the soil descriptions contained within this report.

IAN FARMER ASSOCIATES	Site: St Mary's Court, Barwell	Borehole Number: BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m		Hayward Architects	20970
	Location	**Dates** 22/11/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.50	B1					(0.50)	MADE GROUND: Soft, reddish brown and dark brown, slightly gravelly, sandy silty clay with frequent pockets of topsoil, and with frequent rootlets. Gravel is fine to coarse, angular to rounded		▼1	
0.50-1.00	B2					0.50	MADE GROUND: Very soft, brown, slightly gravelly, very sandy clay. Gravel is fine to coarse, subangular to subrounded, with rare cobble		▽1	
1.20 1.20-1.65 1.20-1.65	W1 B3 D1			Water strike(1) at 1.20m, rose to 0.50m in 20 mins, sealed at 1.50m.		1.30	Soft, intermediate plasticity, reddish brown, slightly sandy to sandy CLAY (Wolston Sand and Gravel)			
1.20-1.65	SPT N=5		DRY	2,1/1,1,1,2		(1.20)				
2.00-2.45 2.00-2.45	B4 U1 No Recovery	2.00	DRY	5 blows					▼*	
				Water strike(2) at 2.50m, no rise after 20 mins, sealed at 7.50m.		2.50	Medium dense, reddish brown, clayey, silty, fine to medium SAND, with frequent thin bands of soft, red brown sandy clay (Wolston Sand and Gravel)			
3.00-3.45 3.00-3.45 3.00-3.45	SPT N=12 B5 D2	3.00	2.50	2,2/3,3,3,3						
4.00-4.45 4.00-4.45 4.00-4.45	SPT N=16 B6 D3	4.00	2.50	2,2/3,4,4,5		(3.70)				
5.00-5.45 5.00-5.45 5.00-5.45	SPT N=19 B7 D4	5.00	2.50	3,3/4,5,5,5						
6.00-6.45 6.00-6.45 6.00-6.45	SPT N=12 B8 D5	6.00	2.50	2,2/2,3,3,4		6.20	Firm, intermediate plasticity, greyish / reddish brown, laminated and rarely fissured, slightly sandy silty CLAY. Fissures occasionally have grey gleyed surfaces. Some thin bands of reddish brown silt and silty fine sand (Wolston Clay)			
7.00	D6									
7.50-7.95	U2 100%	7.00	DRY	50 blows			Below 7.50m: Firm to stiff, high strength			
8.00	D7					(4.75)				
9.50-9.95 9.50-9.95 9.50-9.95	SPT N=31 B9 D8	9.00	DRY	5,6/7,8,8,8			Below 9.50m: Very stiff			

Remarks
Excavating from 0.00m to 1.20m.

Scale (approx)	Logged By
1:50	PB

Figure No. 20970.BH1

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IAN FARMER ASSOCIATES

Site	Borehole Number
St Mary's Court, Barwell	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 9.00m		Hayward Architects	20970
	Location	**Dates** 22/11/2012	**Engineer** Ian Farmer Associates	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
							... as previous			
10.50-10.95 10.50-10.95	SPT N=31 D9	9.00	DRY	3,5/6,8,8,9		(4.75) 10.95	Complete at 10.95m			

Remarks

Scale (approx)	Logged By
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IAN FARMER ASSOCIATES

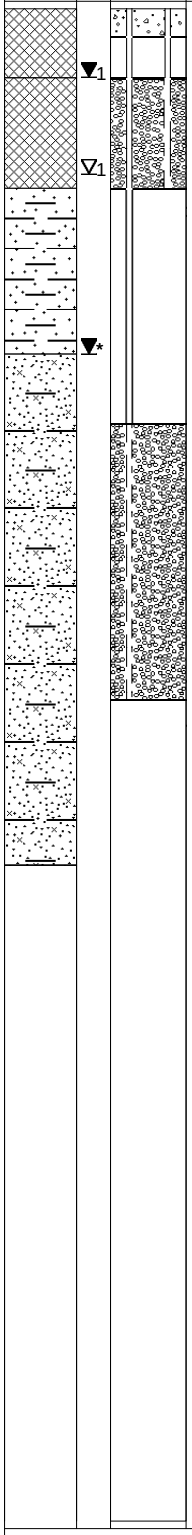
Site	Borehole Number
St Mary's Court, Barwell	BH1

Installation Type
Double Installation

Dimensions
Internal Diameter of Tube [A] = 50 mm
Internal Diameter of Tube [B] = 50 mm
Diameter of Filter Zone = 150 mm

Client	Job Number
Hayward Architects	20970

Location	Ground Level (mOD)	Engineer	Sheet
		Ian Farmer Associates	1/1



Depth (m)	Description
0.20	Concrete
0.50	Bentonite Seal
	Slotted Standpipe
1.30	
	Bentonite Seal
3.00	
	Slotted Standpipe
5.00	
	Bentonite Seal
10.95	

Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
22/11/12		1.20			0.50	0.50	0.50	0.50	1.50
22/11/12		2.50	2.00		2.50	2.50	2.50	2.50	7.50

Groundwater Observations During Drilling

Date	Start of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)	End of Shift: Time	Depth Hole (m)	Casing Depth (m)	Water Depth (m)	Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe **Inst. [B] Type :** Slotted Standpipe

Date	Instrument [A] Time	Depth (m)	Level (mOD)	Instrument [B] Time	Depth (m)	Level (mOD)	Remarks

Remarks
Gas valves, geosock and flush cover fitted.

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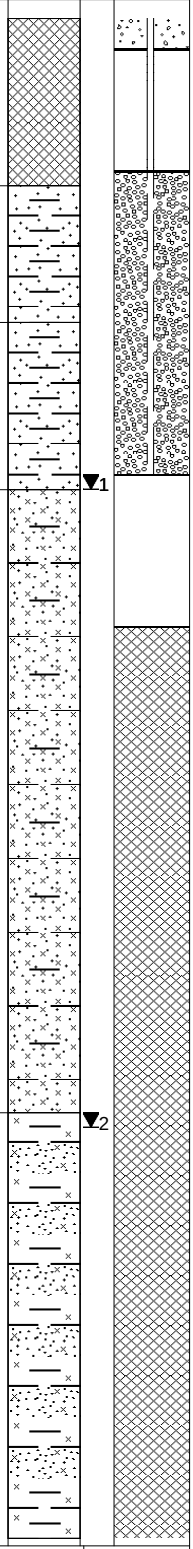
IAN FARMER ASSOCIATES

Site	Borehole Number
St Mary's Court, Barwell	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.50m		Hayward Architects	20970
	Location	**Dates** 23/11/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
0.00-1.00	B1					(1.10)	MADE GROUND: Very soft, dark brown, gravelly, sandy clayey topsoil, with frequent disturbed vegetation and rootlets. Gravel is fine to coarse, angular to rounded
						1.10	
1.20-1.65	U1 100%		DRY	30 blows		(0.90)	Soft, low strength, low plasticity, reddish brown, sandy to very sandy CLAY with lenses / bands of clayey fine sand (Wolston Sand and Gravel)
1.70	D1						
						2.00	
2.00-2.45 2.00-2.45 2.00-2.45	SPT N=3 B2 D2	2.00	DRY	1,1/1,0,1,1		(1.10)	Very soft, reddish brown, very sandy CLAY with lenses / bands of clayey fine sand (Wolston Sand and Gravel)
3.00-3.45 3.00-3.45	B3 U2 No Recovery	3.00	3.10	9 blows Water strike(1) at 3.10m, no rise after 20 mins.		3.10	Soft, reddish brown, sandy clayey SILT (Wolston Sand and Gravel)
4.00-4.45 4.00-4.45 4.00-4.45	SPT N=11 B4 D3	4.00	3.10	2,2/3,3,3,2			Below 4.00m: Firm
5.00-5.45 5.00-5.45 5.00-5.45	SPT N=13 B5 D4	5.00	3.10	2,3/3,3,3,4		(4.10)	
6.00-6.45 6.00-6.45 6.00-6.45	SPT N=11 B6 D5	6.00	3.10	2,2/2,3,3,3			
						7.20	
7.20	D6						Firm, high to very high strength, greyish / reddish brown, silty CLAY, with some faint thick lamination, and bands of reddish brown silt and very silty fine SAND (Wolston Clay)
7.50-7.95	U3 100%	7.50	DRY	47 blows			
8.00	D7						Below 8.00m: Firm to stiff, dark greyish brown, fainly laminated with rare fissures
						(3.25)	
9.00-9.45 9.00-9.45 9.00-9.45	SPT N=25 B7 D8	7.50	DRY	3,5/6,6,6,7			Below 9.00m: Stiff, with frequent bands of medium dense silt / very silty fine sand
10.00-10.45	SPT N=27	7.50	7.30	3,5/6,6,7,8			



Remarks
Excavating from 0.00m to 1.20m.

Scale (approx)	Logged By
1:50	PB

Figure No. 20970.BH2

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IAN FARMER ASSOCIATES

Site	Borehole Number
St Mary's Court, Barwell	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	150mm cased to 7.50m		Hayward Architects	20970
	Location	**Dates** 23/11/2012	**Engineer** Ian Farmer Associates	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45	D9			Water strike(2) at 10.30m, rose to 7.30m in 20 mins.		(3.25) 10.45	... as previous Complete at 10.45m		▽2	

Remarks

Scale (approx)	Logged By
1:50	PB

Figure No. 20970.BH2

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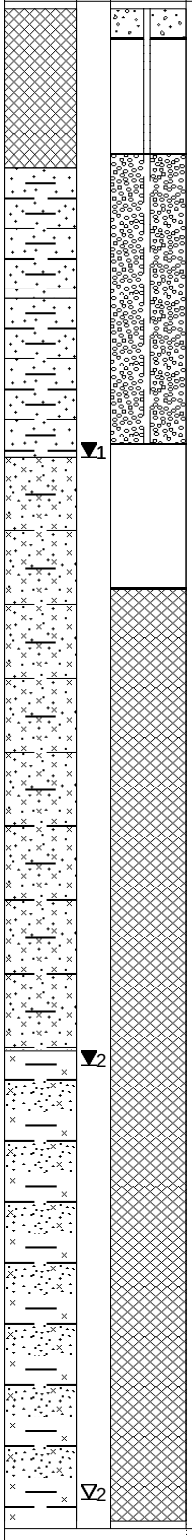
IAN FARMER ASSOCIATES

Site	Borehole Number
St Mary's Court, Barwell	BH2

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	Hayward Architects	20970

Location	Ground Level (mOD)	Engineer	Sheet
		Ian Farmer Associates	1/1



Groundwater Strikes During Drilling

Date	Time	Depth Struck (m)	Casing Depth (m)	Inflow Rate	Readings 5 min	Readings 10 min	Readings 15 min	Readings 20 min	Depth Sealed (m)
23/11/12		3.10	3.00		3.10	3.10	3.10	3.10	
23/11/12		10.30	7.50		7.30	7.30	7.30	7.30	

Groundwater Observations During Drilling

Date	Start of Shift Time	Start of Shift Depth Hole (m)	Start of Shift Casing Depth (m)	Start of Shift Water Depth (m)	Start of Shift Water Level (mOD)	End of Shift Time	End of Shift Depth Hole (m)	End of Shift Casing Depth (m)	End of Shift Water Depth (m)	End of Shift Water Level (mOD)

Instrument Groundwater Observations

Inst. [A] Type : Slotted Standpipe

Date	Instrument [A] Time	Instrument [A] Depth (m)	Instrument [A] Level (mOD)	Remarks

Remarks
Gas valve, geosock and flush cover fitted.

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IAN FARMER ASSOCIATES

Site	Trial Pit Number
St Mary's Court, Barwell	TP1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.70 x 0.70m		Hayward Architects	20970
	Location	**Dates** 16/10/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(1.20)	MADE GROUND: Grass and vegetation over brown and orange brown, friable, very sandy clay, with occasional cobbles of brick and rare wood.		
0.30	E1					Below 0.60m: Old plastic water pipe		
						At 0.90m: Grey fibrous waste with hydrocarbon odour		
1.00	D1 Possible Asbestos					At 1.00m: Brick bound within clay with a hydrocarbon odour		
1.00	E2				1.20			
						Soft, moist, light brown, orange and grey, sandy CLAY, very sandy in parts (Wolston Sand and Gravel)		
1.30	E3							
1.40	B1							
					(1.40)	Below 1.90m: Becoming red		
2.00	B2		Seepage(1) at 2.20m.					▽1
2.50	B3				2.60			
						Complete at 2.60m		

Plan

Remarks

Trial pit was stable.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	MC	20970.TP1

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IAN FARMER ASSOCIATES

Site	Trial Pit Number
St Mary's Court, Barwell	TP2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.70 x 0.70m		Hayward Architects	20970
	Location	**Dates** 16/10/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	MADE GROUND: Grass over dark brown, very sandy, slightly gravelly, clayey topsoil. Gravel is fine to medium, subangular to rounded mudstone, with rare brick fragments and roots		
0.30	E1					MADE GROUND: Soft, friable, dark grey and brown, occasional orange brown, very sandy clay, with some fine to coarse, subrounded to rounded mudstone gravel		
					(1.50)			
1.00	E2							
1.30	B1							
			Water strike(1) at 1.60m.		1.60			▽1
1.70	B2				(0.20) 1.80	Soft, moist, light brown, orange and grey mottled, very sandy CLAY, with rare relic wood and rare fine to coarse, subangular to rounded mudstone gravel (Wolston Sand and Gravel)		
2.00	B3				(0.40)	Red brown, occasional grey, wet, very clayey SAND (Wolston Sand and Gravel)		
					2.20	Terminated at 2.20m		

Plan

Remarks

Trial pit terminated at 2.20m due to continual collapse of side walls from 1.60m.
Trial pit backfilled upon completion.
At 1.60m: Blue redundant water pipe (possibly for irrigation) encountered in north end of pit. Breeze blocks of strip footing encountered in south west end of pit

Scale (approx)	Logged By	Figure No.
1:25	MC	20970.TP2

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Site	Trial Pit Number
St Mary's Court, Barwell	TP3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.70 x 0.70m		Hayward Architects	20970
	Location	**Dates** 16/10/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	MADE GROUND: Rough vegetation over dark brown, very sandy, gravelly clay, with roots and rootlets		
0.30	E1				(1.40)	MADE GROUND: Soft, dark brown to grey, very sandy clay, with occasional fine to coarse, rounded to subrounded mudstone gravel and tree roots		
1.00	B1							
1.00	E2					Between 1.30 - 1.50m: Band of black organic matter		
					1.50 (0.20)	Soft, wet, orange, brown and grey mottled, very sandy CLAY (Wolston Sand and Gravel)		▽1
1.60	B2		Seepage(1) at 1.60m.		1.70 (0.50)	Wet, orange brown and grey becoming red brown and grey, very clayey SAND (Wolston Sand and Gravel)		
2.00	B3				2.20	Terminated at 2.20m		

Plan

Remarks

Trial pit terminated at 2.20m due to continual collapse of walls from 1.60m.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	MC	20970.TP3

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IAN FARMER ASSOCIATES

Site	Trial Pit Number
St Mary's Court, Barwell	TP4

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.70 x 0.70m		Hayward Architects	20970
	Location	**Dates** 16/10/2012	**Engineer** Ian Farmer Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	MADE GROUND: Grass / rough vegetation over dark brown, sandy, gravelly, clayey topsoil, with rare brick fragments		
0.20	E1				(0.60)	MADE GROUND: Soft, brown and red brown with occasional red mottling, sandy, gravelly clay. Gravel is fine to coarse, subangular to subrounded mudstone and brick, with occasional brick cobbles		
0.50	B1					At 0.15m: Metal bar		
					0.70	At 0.50m: Plastic pipe		
0.80	E2					Soft, dark brown, slightly friable, very sandy CLAY, with pockets of dark grey, sandy, organic clay. Occasional fine to coarse, subrounded flint gravel and fine rootlets (Possible Made Ground)		
1.00	B2				(1.30)			
1.80	E3		Seepage(1) at 1.80m.					▽1
					2.00			
					(0.30)	Soft, damp, brown grey and orange mottled, very sandy CLAY interbedded with clayey sand (Wolston Sand and Gravel)		
2.30	B3				2.30			
						Terminated at 2.30m		

Plan

Remarks

Trial pit terminated at 2.30m due to instability of pit from 1.90m.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	MC	20970.TP4

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Rising) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH1
CONTRACT	20970	DEPTH	: 5.00m

INITIAL CONDITIONS

Base of Response Zone	5.00	mBGL
Top of Reponse Zone	3.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	0.90	mBGL

Operator	JT
Date	29/11/2012
Test No.	1
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .Ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m
D=	0.150	m
L/D=	13.33	
t1=	0	s
t2=	1200	s
H1=	-1.64	m
H2=	-0.04	m
a=	0.00196	m^2
F=	4.3436	From (i)
T=	600	s
K=	1.40E-06	m/s From (ii)
K=	7.54E-07	m/s From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	2.540	-1.64	-1.822
0.2	10	2.470	-1.57	-1.744
0.3	20	2.430	-1.53	-1.700
0.5	30	2.400	-1.50	-1.667
0.7	40	2.370	-1.47	-1.633
0.8	50	2.330	-1.43	-1.589
1.0	60	2.290	-1.39	-1.544
1.5	90	2.200	-1.30	-1.444
2.0	120	2.120	-1.22	-1.356
3.0	180	1.960	-1.06	-1.178
4.0	240	1.830	-0.93	-1.033
5.0	300	1.700	-0.80	-0.889
10.0	600	1.230	-0.33	-0.367
13.0	780	1.110	-0.21	-0.233
15.0	900	1.040	-0.14	-0.156
18.0	1080	0.970	-0.07	-0.078
20.0	1200	0.940	-0.04	-0.044
24.0	1440	0.900	0.00	0.000

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Rising) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH1
CONTRACT	20970	DEPTH	: 5.00m

INITIAL CONDITIONS

Base of Response Zone	5.00	mBGL
Top of Reponse Zone	3.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	0.90	mBGL

Operator	JT
Date	29/11/2012
Test No.	2
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .Ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m
D=	0.150	m
L/D=	13.33	
t1=	0	s
t2=	1440	s
H1=	-1.80	m
H2=	-0.02	m
a=	0.00196	m^2
F=	4.3436	From (i)
T=	700	s
K=	1.41E-06	m/s From (ii)
K=	6.46E-07	m/s From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	2.700	-1.80	-2.000
0.2	10	2.630	-1.73	-1.922
0.3	20	2.590	-1.69	-1.878
0.5	30	2.560	-1.66	-1.844
0.7	40	2.520	-1.62	-1.800
0.8	50	2.480	-1.58	-1.756
1.0	60	2.440	-1.54	-1.711
1.5	90	2.350	-1.45	-1.611
2.0	120	2.240	-1.34	-1.489
3.0	180	2.080	-1.18	-1.311
4.0	240	1.930	-1.03	-1.144
5.0	300	1.790	-0.89	-0.989
7.0	420	1.570	-0.67	-0.744
10.0	600	1.330	-0.43	-0.478
13.0	780	1.160	-0.26	-0.289
15.0	900	1.070	-0.17	-0.189
18.0	1080	0.990	-0.09	-0.100
20.0	1200	0.960	-0.06	-0.067
24.0	1440	0.920	-0.02	-0.022
26.0	1560	0.900	0.00	0.000

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Rising) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH1
CONTRACT	20970	DEPTH	: 5.00m

INITIAL CONDITIONS

Base of Response Zone	5.00	mBGL
Top of Reponse Zone	3.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	0.90	mBGL

Operator	JT
Date	29/11/2012
Test No.	3
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .Ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m
D=	0.150	m
L/D=	13.33	
t1=	0	s
t2=	1440	s
H1=	-1.75	m
H2=	-0.01	m
a=	0.00196	m^2
F=	4.3436	From (i)
T=	680	s
K=	1.62E-06	m/s From (ii)
K=	6.65E-07	m/s From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	2.650	-1.75	-1.944
0.2	10	2.580	-1.68	-1.867
0.3	20	2.540	-1.64	-1.822
0.5	30	2.520	-1.62	-1.800
0.7	40	2.470	-1.57	-1.744
0.8	50	2.430	-1.53	-1.700
1.0	60	2.400	-1.50	-1.667
1.5	90	2.300	-1.40	-1.556
2.0	120	2.200	-1.30	-1.444
3.0	180	2.040	-1.14	-1.267
4.0	240	1.890	-0.99	-1.100
5.0	300	1.760	-0.86	-0.956
7.0	420	1.540	-0.64	-0.711
10.0	600	1.310	-0.41	-0.456
13.0	780	1.140	-0.24	-0.267
16.0	960	1.030	-0.13	-0.144
20.0	1200	0.950	-0.05	-0.056
22.0	1320	0.930	-0.03	-0.033
24.0	1440	0.910	-0.01	-0.011
25.0	1500	0.900	0.00	0.000

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH2
CONTRACT	20970	DEPTH	: 3.00m

INITIAL CONDITIONS

Base of Response Zone	3.00	mBGL
Top of Reponse Zone	1.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.24	mBGL

Operator	JT
Date	29/11/2012
Test No.	1
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .Ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m	
D=	0.150	m	
L/D=	13.33		
t1=	0	s	
t2=	1680	s	
H1=	0.72	m	
H2=	0.22	m	
a=	0.00196	m^2	
F=	4.3436		From (i)
T=	320	s	
K=	3.19E-07	m/s	From (ii)
K=	1.41E-06	m/s	From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	0.520	0.72	0.581
0.2	10	0.540	0.70	0.565
0.3	20	0.550	0.69	0.556
0.5	30	0.560	0.68	0.548
0.7	40	0.560	0.68	0.548
0.8	50	0.570	0.67	0.540
1.0	60	0.580	0.66	0.532
1.5	90	0.590	0.65	0.524
2.0	120	0.600	0.64	0.516
3.0	180	0.650	0.59	0.476
4.0	240	0.720	0.52	0.419
5.0	300	0.770	0.47	0.379
8.0	480	0.870	0.37	0.298
10.0	600	0.890	0.35	0.282
17.0	1020	0.960	0.28	0.226
28.0	1680	1.020	0.22	0.177

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH2
CONTRACT	20970	DEPTH	: 3.00m

INITIAL CONDITIONS

Base of Response Zone	3.00	mBGL
Top of Reponse Zone	1.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.24	mBGL

Operator	JT
Date	29/11/2012
Test No.	2
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .Ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m	
D=	0.150	m	
L/D=	13.33		
t1=	0	s	
t2=	720	s	
H1=	0.82	m	
H2=	0.24	m	
a=	0.00196	m^2	
F=	4.3436		From (i)
T=	130	s	
K=	7.72E-07	m/s	From (ii)
K=	3.48E-06	m/s	From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	0.420	0.82	0.661
0.2	10	0.510	0.73	0.589
0.3	20	0.540	0.70	0.565
0.5	30	0.570	0.67	0.540
0.7	40	0.600	0.64	0.516
0.8	50	0.620	0.62	0.500
1.0	60	0.650	0.59	0.476
1.5	90	0.720	0.52	0.419
2.0	120	0.770	0.47	0.379
3.0	180	0.850	0.39	0.315
4.0	240	0.900	0.34	0.274
5.0	300	0.910	0.33	0.266
6.0	360	0.930	0.31	0.250
7.0	420	0.950	0.29	0.234
8.0	480	0.960	0.28	0.226
10.0	600	0.980	0.26	0.210
12.0	720	1.000	0.24	0.194

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH2
CONTRACT	20970	DEPTH	: 3.00m

INITIAL CONDITIONS

Base of Response Zone	3.00	mBGL
Top of Reponse Zone	1.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.24	mBGL

Operator	JT
Date	29/11/2012
Test No.	3
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .\mathrm{Ln}(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m	
D=	0.150	m	
L/D=	13.33		
t1=	0	s	
t2=	900	s	
H1=	0.74	m	
H2=	0.23	m	
a=	0.00196	m^2	
F=	4.3436		From (i)
T=	265	s	
K=	5.87E-07	m/s	From (ii)
K=	1.71E-06	m/s	From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	0.500	0.74	0.597
0.2	10	0.560	0.68	0.548
0.3	20	0.580	0.66	0.532
0.5	30	0.580	0.66	0.532
0.7	40	0.580	0.66	0.532
0.8	50	0.590	0.65	0.524
1.0	60	0.600	0.64	0.516
1.5	90	0.640	0.60	0.484
2.0	120	0.670	0.57	0.460
3.0	180	0.720	0.52	0.419
4.0	240	0.770	0.47	0.379
5.0	300	0.800	0.44	0.355
6.0	360	0.850	0.39	0.315
7.0	420	0.900	0.34	0.274
8.0	480	0.920	0.32	0.258
9.0	540	0.940	0.30	0.242
10.0	600	0.950	0.29	0.234
12.0	720	0.970	0.27	0.218
14.0	840	1.000	0.24	0.194
15.0	900	1.010	0.23	0.185

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VARIABLE HEAD PERMEABILITY TEST

Variable Head (Falling) Permeability Test in Borehole Standpipe

SITE	St Mary's Court	Borehole	: BH2
CONTRACT	20970	DEPTH	: 3.00m

INITIAL CONDITIONS

Base of Response Zone	3.00	mBGL
Top of Reponse Zone	1.00	mBGL
Diameter of borehole	150.00	mm
Diameter of standpipe	50.00	mm
Height of casing		mAGL
Elevation of Borehole		mAOD
Groundwater Level	1.24	mBGL

Operator	JT
Date	29/11/2012
Test No.	4
Weather	
Calculated Test Zone	
2.00 m	

TEST CALCULATION

Intake Factor, F

F= 4.34 (i)

Borehole Case 7
BS 5930: 1999

Permeability, K

$$K = \frac{a}{F * (t2 - t1)} .\ln(H1/H2) \quad \text{(ii)}$$

or

$$K = \frac{a}{F . T} \quad \text{(iii)}$$

1 Where T is the Basic Time Lag Factor corresponding to an H/Ho value of 0.37
2 a is diameter of standpipe

L=	2.00	m
D=	0.150	m
L/D=	13.33	
t1=	0	s
t2=	900	s
H1=	0.94	m
H2=	0.23	m
a=	0.00196	m^2
F=	4.3436	From (i)
T=	240	s
K=	7.07E-07	m/s From (ii)
K=	1.88E-06	m/s From (iii)

Remarks

Elapsed (minutes)	Total seconds	Water Depth (m)	Head (metres)	H/Ho
0.0	0	0.300	0.94	0.758
0.2	10	0.560	0.68	0.548
0.3	20	0.570	0.67	0.540
0.5	30	0.590	0.65	0.524
0.7	40	0.600	0.64	0.516
0.8	50	0.610	0.63	0.508
1.0	60	0.630	0.61	0.492
1.5	90	0.660	0.58	0.468
2.0	120	0.690	0.55	0.444
3.0	180	0.740	0.50	0.403
4.0	240	0.780	0.46	0.371
5.0	300	0.830	0.41	0.331
6.0	360	0.880	0.36	0.290
7.0	420	0.910	0.33	0.266
8.0	480	0.930	0.31	0.250
9.0	540	0.950	0.29	0.234
10.0	600	0.960	0.28	0.226
12.0	720	0.980	0.26	0.210
14.0	840	1.000	0.24	0.194
15.0	900	1.010	0.23	0.185

APPENDIX 3

LABORATORY TESTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS ON SOILS

A3.1 GENERAL

A3.1.1 Where applicable all tests are carried out in accordance with the relevant British Standard. The laboratory test procedures are as below:

Test Name	Procedures BS1377:1990 Part:Clause
Moisture Content	2:3
Liquid Limit	2:4
Plastic Limit and Plastic Index	2:5
Particle Size Distribution	9.2
Sedimentation	9.4
Sulphate content	3:5
pH Value	3:9
Consolidation	5:3
Bulk Density	7:2
Triaxial Compression	
Total Stress Multi-Stage	7:9

A3.1.2 Where an external laboratory carried out testing, their report, including test methods is included in this Appendix.

A3.1.3 Any discussion in this report is based on the values and results obtained from the appropriate tests. Due allowance should be made, when considering any result in isolation, of the possible inaccuracy of any such individual result. Details of the accuracy of results are included in this section, where applicable.

A3.2 MOISTURE CONTENT

A3.2.1 Unless stated to the contrary, the moisture content of a soil sample was determined by the standard oven drying method, BS 1377, Part 1, Test 3. The result is reported to an accuracy of ±0.5%

A3.3 ATTERBERG LIMITS

A3.3.1 The Liquid Limit, **LL**, is the moisture content at which the soil passes from the liquid to plastic state. Unless stated to the contrary, the Liquid Limit was determined using the four point, cone penetrometer method, Test 4. The value is reported to the nearest whole number, to an accuracy of ±0.5%.

A3.3.2 The Plastic Limit, **PL**, is the moisture content at which soil passes from the plastic to solid state and becomes too dry to remain in a plastic condition. The Plastic Limit was determined using the method described in Test 5. The value is reported to the nearest whole number, to an accuracy of ±0.5%.

A3.3.3 The Plasticity Index, **PI**, is the numerical difference between the liquid and plastic limits, corresponding to the range of moisture contents over which a soil is in a plastic state. The determination of the Plasticity Index is covered by Test 5.

A3.4 SOIL CLASSIFICATION

A3.4.1 Classification of soils is usually undertaken by means of the Plasticity Classification Chart, sometimes called the A-Line Chart. This is graphical plot of PI against LL with the A-Line defined as PI = 0.73(LL - 20).

A3.4.2 This line is defined from experimental evidence and does not represent a well defined boundary between soil types, but forms a useful reference datum. When the values of LL

and PI for inorganic clays are plotted on the chart they generally lie just above the A-Line in a narrow band parallel to it, while silts and organic clays plot below this line.

A3.4.3 Clays and silts are divided into five zones of plasticity:

Low Plasticity (L)	LL less than 35
Intermediate Plasticity (I)	LL between 35 and 50
High Plasticity (H)	LL between 50 and 70
Very High Plasticity (V)	LL between 70 and 90
Extremely High Plasticity (E)	LL greater than 90

A3.4.4 In general, clays of high plasticity are likely to have a lower permeability, are more compressible and consolidate over a longer period of time under load than clays of low plasticity. Clays of high plasticity are more difficult to compact as fill material.

A3.5 SHEAR STRENGTH TESTS

A3.5.1 The shear strength tests have been carried out in accordance with the procedures given in BS1377, Part 7.

The type of test referred to is:

A3.5.2 UM(100) - Multi-stage undrained triaxial compression test on a specimen of 100mm diameter. An initial low cell pressure is applied and the deviator stress increased until failure is imminent. The cell pressure is then increased and the procedure repeated until the failure stress at three different cell pressures have been determined.

A3.6 CHEMICAL TESTS

A3.6.1 The water soluble sulphate content of soil was determined using the gravimetric method detailed in BS1377: Part 3: 1990, Test 5. The results are recorded to an accuracy of ±0.1g/l.

A3.6.2 The pH value was determined electrometrically using the procedures given in BS 1377: Part 3: 1990, Test 9. The results are recorded to an accuracy of ±0.1 pH units.

A3.7 CONSOLIDATION TESTS

A3.7.1 The consolidation test covers the determination of the magnitude and rate of consolidation of a saturated or near saturated specimen of soil, BS 1377, Part 5, Test 3. The specimen is confined laterally and subjected to a vertical axial pressure and allowed to drain freely from the top and bottom surfaces.

A3.7.2 Unless the specific gravity has been measured a value has been assumed on the basis of a visual examination of the specimen. The specific gravity of most soils generally lies within the range of 2.60 to 2.80. Clays consist of various minerals, most of which are heavier than quartz (s.g. of 2.65) and typically the specific gravity of many British soils lies in the range of 2.68 to 2.72.

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1 Fairfield Court,
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F.A.O. Roy Smith

TEST REPORT - 20970/1

Site :	St Mary's Court, Barwell
Job Number :	20970
Originating Client :	Hayward Architects
Originating Reference :	20970
Date Sampled :	Not Given
Date Scheduled :	26/11/12
Date Testing Started :	28/11/12
Date Testing Finished :	10/12/12

Remarks :

- First Report for above Job Number
- Samples will be disposed of 28 days after the report is issued unless otherwise agreed
- This report may contain results from tests which are not included within the scope of the UKAS accreditation. Please see final sheet for details.

Authorised By: C. Lilley Craig Lilley

Position : Quality Manager Date : 10/12/12

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constructionline
AGS ASSOCIATION OF GEOTECHNICAL & GEOENVIRONMENTAL SPECIALISTS
UKAS TESTING
1464

IAN FARMER ASSOCIATES

Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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

Borehole/ Trial Pit	Depth (m)	Sample	Natural / Sieved	Natural Moisture Content %	Sample Passing 425µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
					Percentage %	Moisture Content %						
BH1	1.20	D1	Natural	24	100	24	47	20	27	0.15	CI	Brown sandy clayey SILT
BH1	7.00	D6	Natural	22	100	22	45	20	25	0.08	CI	Brown silty CLAY
BH2	1.20	U1	Natural	22								Brown silty CLAY
BH2	1.70	D1	Natural	25	100	25	30	17	13	0.62	CL	Brown sandy silty CLAY
BH2	2.00	D2	Natural	28								Brown sandy silty CLAY
BH2	7.50	U3	Natural	21								Brown 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 2:1990:3.2 Determination of moisture content 4.3 Determination of the liquid limit 5.3 Determination of the plastic limit and plasticity index

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Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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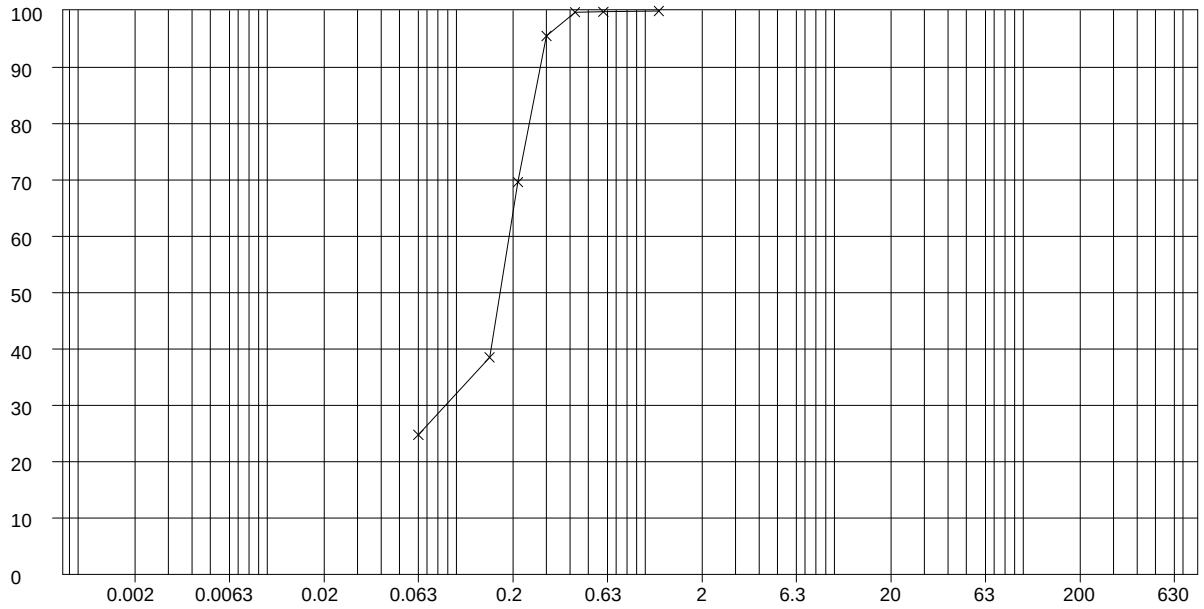
DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH1	3.00	B5	N/A	Brown silty clayey SAND



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

Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	96
212 µm	70
150 µm	39
63 µm	25

Grading Analysis	
D60	192.8 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	0%
Sand	75%
Silt/Clay	25%

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110℃

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

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Laboratory Test Report - 20970/1

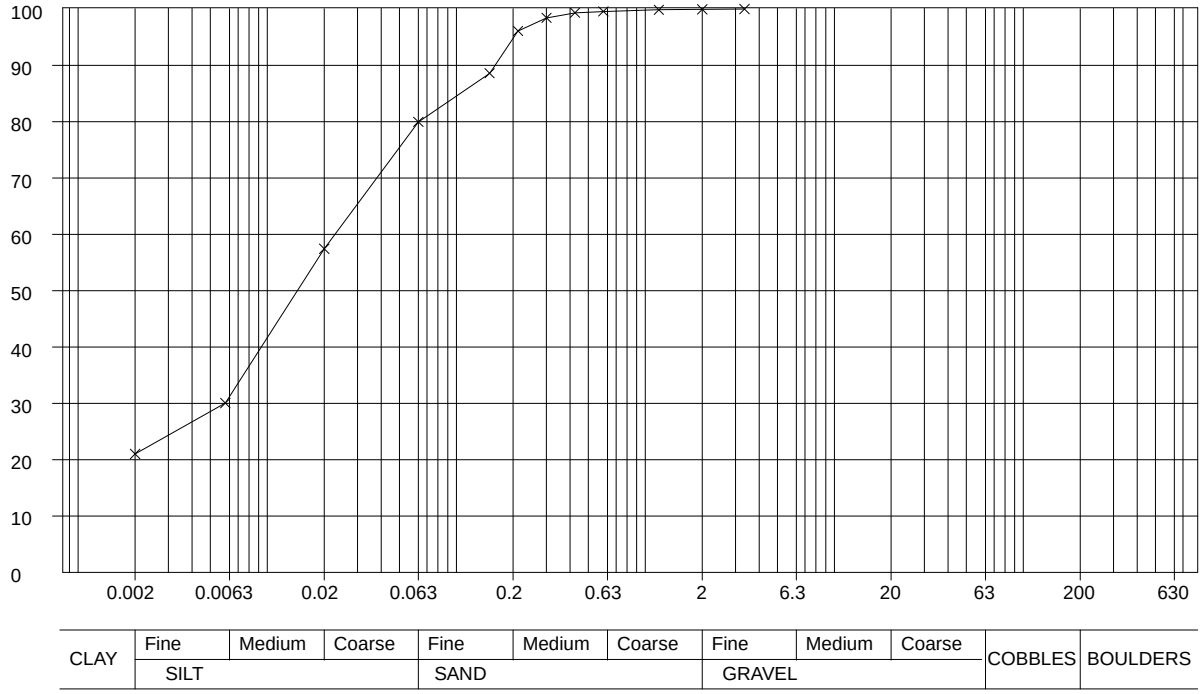
Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
BH2	4.00	B4	Pipette	Brown sandy clayey SILT



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

Grading Analysis	
D60	24.9 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	0%
Sand	21%
Silt	58%
Clay	21%

Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	100
50 mm	100
37.5 mm	100
28 mm	100
20 mm	100
14 mm	100
10 mm	100
6.3 mm	100
5 mm	100
3.35 mm	100
2 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	98
212 µm	96
150 µm	89
63 µm	80
20 µm	57
6 µm	30
2 µm	21

Method of Preparation : BS 1377:PART 1:1990:7.3 Initial preparation 7.4.5 Particle size tests

Preparation Details : Sample washed with no dispersant used, Oven Dried at 105 - 110℃

Method of Test : BS 1377:PART 2:1990:9 Determination of particle size distribution

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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	Description / Remarks
			Soil		Groundwater g /l			
			Total S04 %	S04 in 2:1 water:soil g /l				
BH1	2.00	B4		<0.1		100	6.8	Brown sandy silty CLAY
BH2	4.00	B4		<0.1		100	7.0	Brown sandy clayey SILT
BH2	8.00	D7		0.1		100	8.1	Brown silty slightly organic CLAY

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 : BS 1377:PART 3:1990:5 Determination of the sulphate content of soil and ground water BS 1377:PART 3:1990:9 Determination of the pH value

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Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

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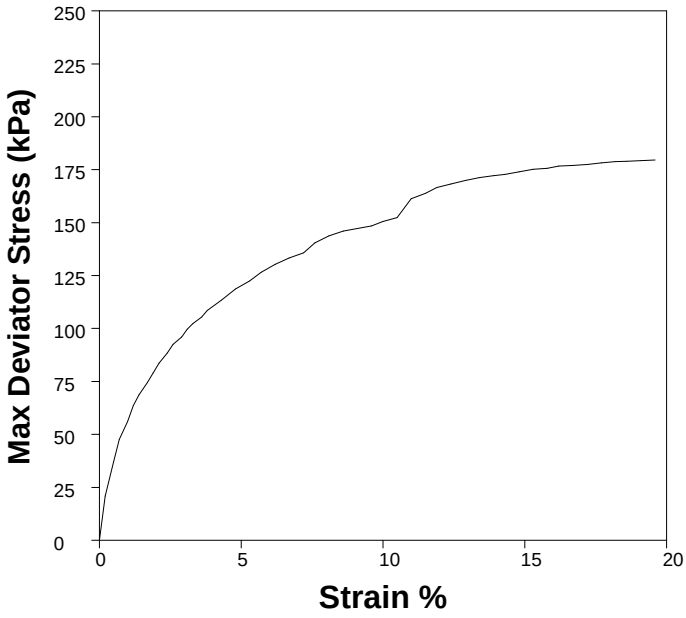
DETERMINATION OF MOISTURE CONTENT, DENSITY AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITH MULTISTAGE LOADING AND WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole / Trial Pit	Depth (m)	Sample	Description
BH1	7.50	U2	Brown silty CLAY



Initial Specimen		Length of Sample (mm)		450
		Depth from top of sample (mm)		52
		Condition of Sample:	Undisturbed	
		Orientation:	Vertical	
Test Type			Multistage	
Length of Specimen (mm)			209.3	
Diameter of Specimen (mm)			102.1	
Moisture Content (%)			25	
Bulk Density (Mg/m³)			2.31	
Dry Density (Mg/m³)			1.85	
Membrane Thickness (mm)			0.21	
Membrane Type			Latex	
Rate of Strain (%/min)			1.43	
Test Results	Measured Cell Pressure (kPa)	75	150	300
	Strain at Failure (%)	7.2	10.5	19.6
	Membrane Correction (kPa)	0.3	0.5	0.8
	Corrected Deviator Stress (kPa)	135	152	179
	Shear Stress (kPa)	**68**	**76**	**89**
	Mode of Failure (B/P/C)		**Compound**	

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of moisture content, BS 1377:PT2:1990:7.2 Determination of density by linear measurement and BS1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure

Remarks : Membrane Type: Latex

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Laboratory Test Report - 20970/1

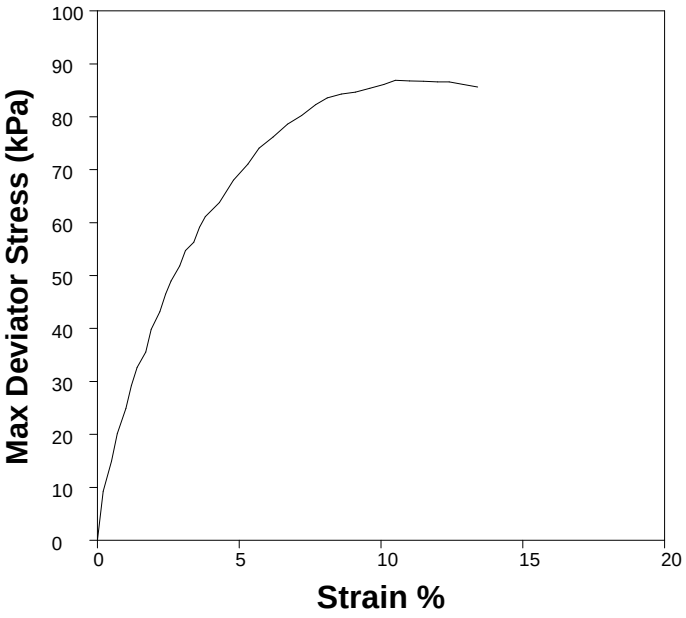
Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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

Borehole / Trial Pit	Depth (m)	Sample	Description
BH2	1.20	U1	Brown silty CLAY



Initial Specimen	Length of Sample (mm)			450
	Depth from top of sample (mm)			39
	Condition of Sample:	Undisturbed		
	Orientation:	Vertical		
Test Type		Multistage		
Length of Specimen (mm)		208.9		
Diameter of Specimen (mm)		101.4		
Moisture Content (%)		23		
Bulk Density (Mg/m³)		2.30		
Dry Density (Mg/m³)		1.87		
Membrane Thickness (mm)		0.31		
Membrane Type		Latex		
Rate of Strain (%/min)		1.44		
Test Results	Measured Cell Pressure (kPa)	12	24	48
	Strain at Failure (%)	3.4	6.7	10.5
	Membrane Correction (kPa)	0.2	0.5	0.7
	Corrected Deviator Stress (kPa)	56	78	86
	Shear Stress (kPa)	**28**	**39**	**43**
	Mode of Failure (B/P/C)	**Plastic**		

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of moisture content, BS 1377:PT2:1990:7.2 Determination of density by linear measurement and BS1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure

Remarks : Membrane Type: Latex

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Laboratory Test Report - 20970/1

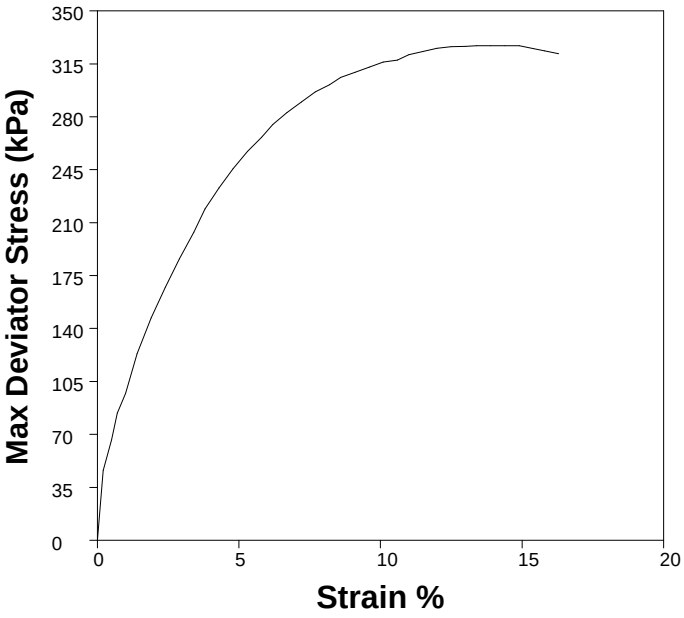
Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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

Borehole / Trial Pit	Depth (m)	Sample	Description
BH2	7.50	U3	Brown silty CLAY



Initial Specimen	**Length of Sample (mm)**	450
	Depth from top of sample (mm)	230
	Condition of Sample:	Undisturbed
	Orientation:	Vertical

Test Type		Multistage		
Length of Specimen (mm)		208.3		
Diameter of Specimen (mm)		101.2		
Moisture Content (%)		21		
Bulk Density (Mg/m³)		2.17		
Dry Density (Mg/m³)		1.80		
Membrane Thickness (mm)		0.21		
Membrane Type		Latex		
Rate of Strain (%/min)		1.92		
Test Results	**Measured Cell Pressure (kPa)**	75	150	300
	Strain at Failure (%)	9.1	10.6	14.9
	Membrane Correction (kPa)	0.4	0.5	0.6
	Corrected Deviator Stress (kPa)	309	317	326
	Shear Stress (kPa)	**154**	**158**	**163**
	Mode of Failure (B/P/C)	**Brittle**		

Method of Preparation : BS 1377:PT1:1990:7.4.2 Moisture Content, BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing.

Method of Test : BS 1377:PT2:1990:3.2 Determination of moisture content, BS 1377:PT2:1990:7.2 Determination of density by linear measurement and BS1377:PT7:1990:9.4 Determination of undrained shear strength in triaxial compression with multistage loading and without measurement of pore pressure

Remarks : Membrane Type: Latex

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Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Description
BH2	1.20	U1	Brown silty CLAY

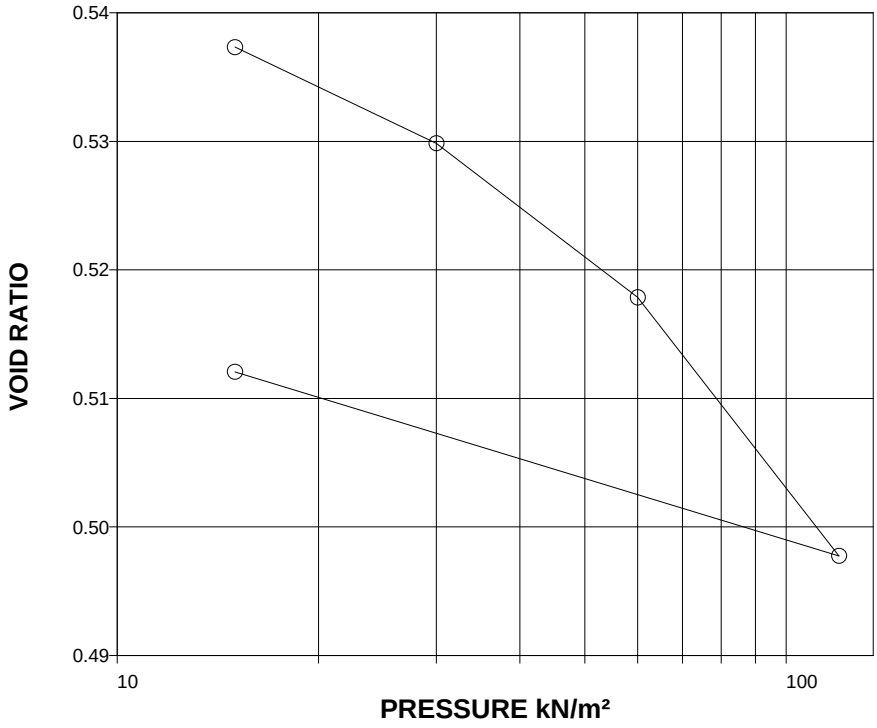
Initial Specimen



Length of Sample (mm)	450
Depth from top of sample (mm)	50
Condition of Sample:	Undisturbed
Orientation:	Vertical

Diameter (mm)	74.81
Particle Density (Mg/m³)	2.65 (Assumed)
Swelling Pressure (kN/m²)	
Lab Temp (℃)	21

	Inital	Final
Height (mm)	19.15	18.79
Wet Weight (g)	175.59	175.96
Moisture Content (%)	22	21
Bulk Density (Mg/m³)	2.09	2.13
Dry Density (Mg/m³)	1.72	1.76
Void Ratio	0.541	0.506
Degree of Saturation (%)	105.80	111.81



Pressure kN/m²	Mv m²/MN	Cv m²/year	Void Ratio
15	0.16	51	0.537
30	0.33	0.86	0.530
60	0.28	0.76	0.518
120	0.23	0.77	0.498
15	0.10	0.51	0.512

Pressure kN/m²	Mv m²/MN	Cv m²/year	Void Ratio

Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

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Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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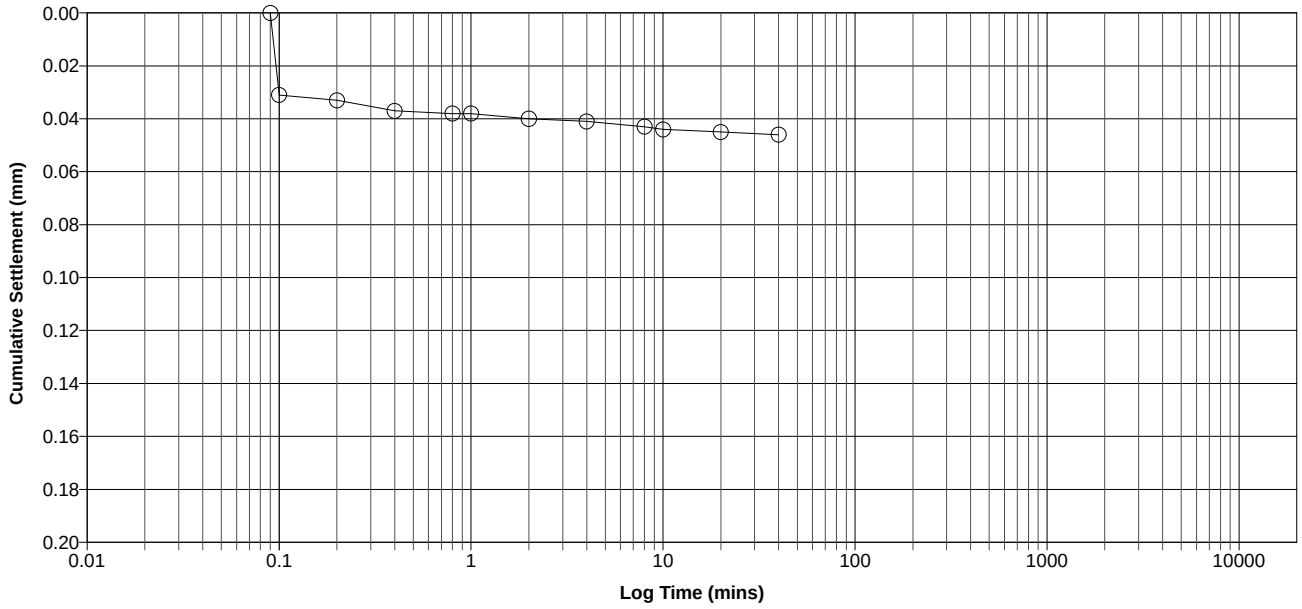
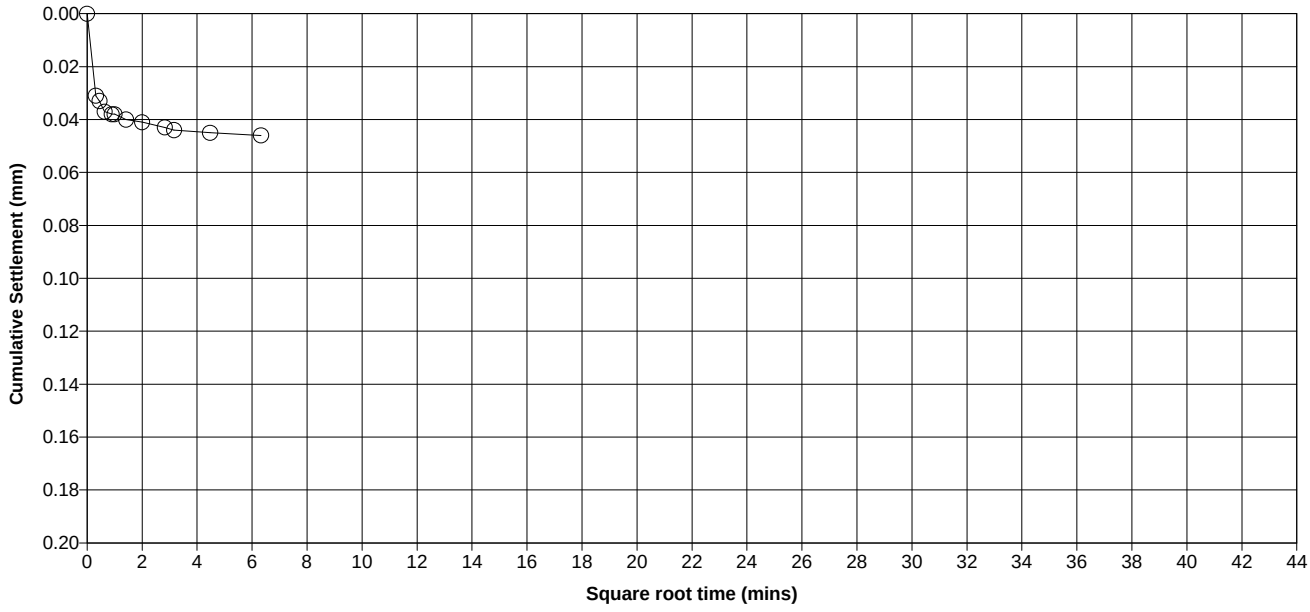
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH2	1.20	U1	1	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

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Laboratory Test Report - 20970/1

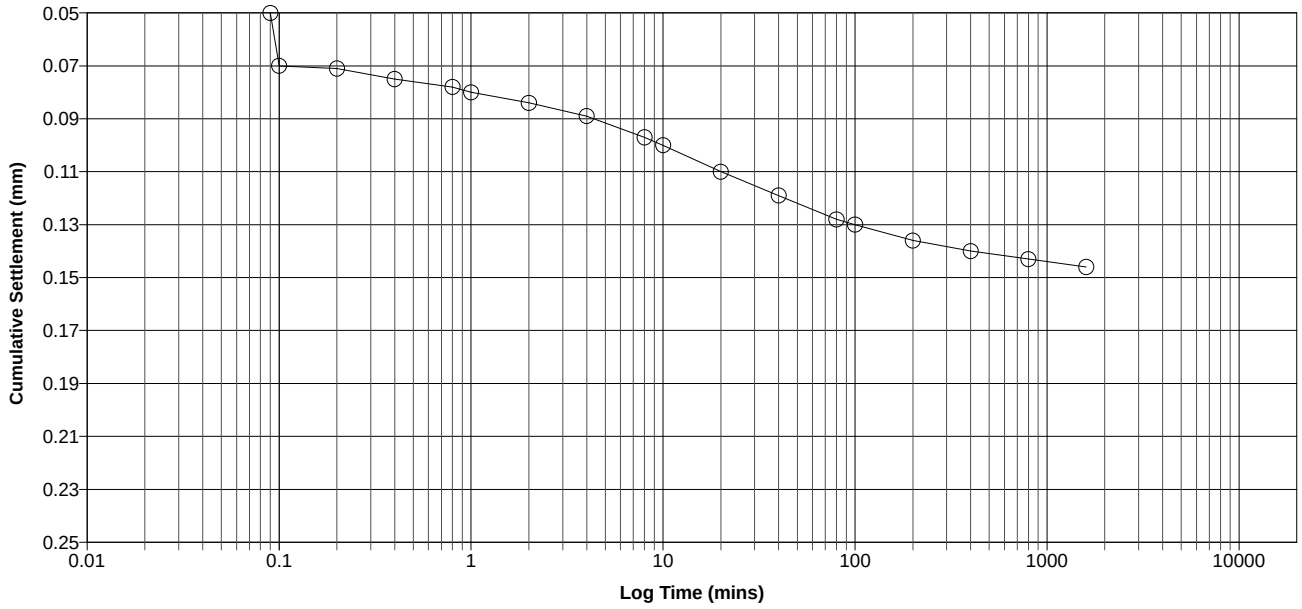
Site : St Mary's Court, Barwell

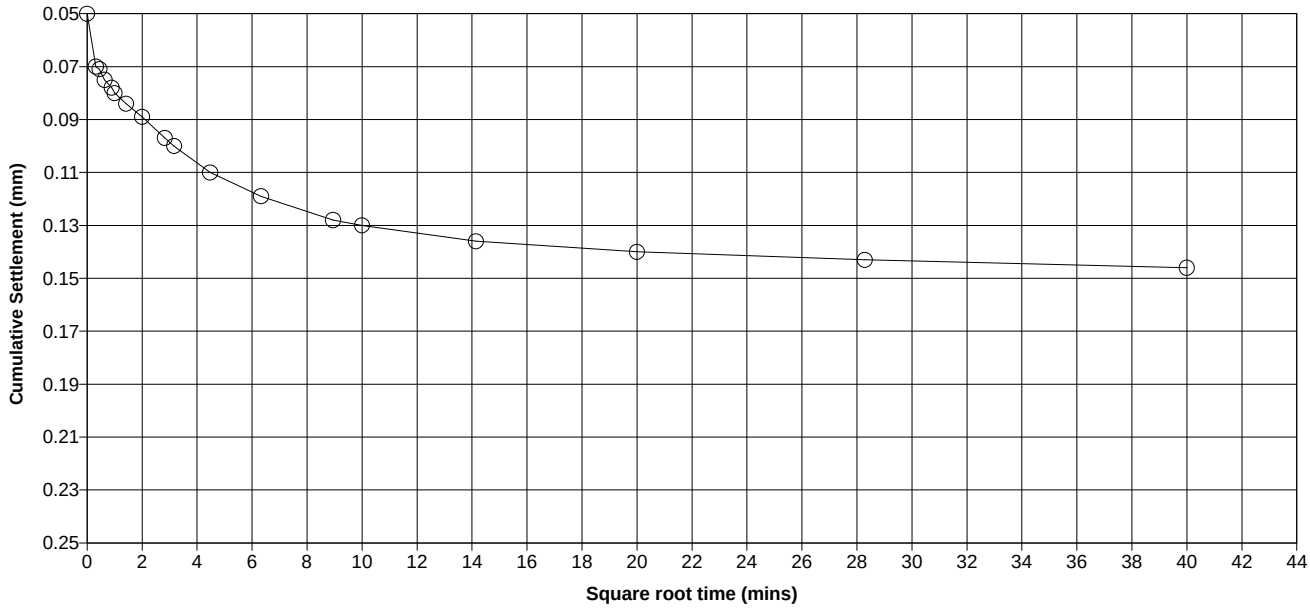
Client : Hayward Architects

Job Number 20970

ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH2	1.20	U1	2	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

IAN FARMER ASSOCIATES

Laboratory Test Report - 20970/1

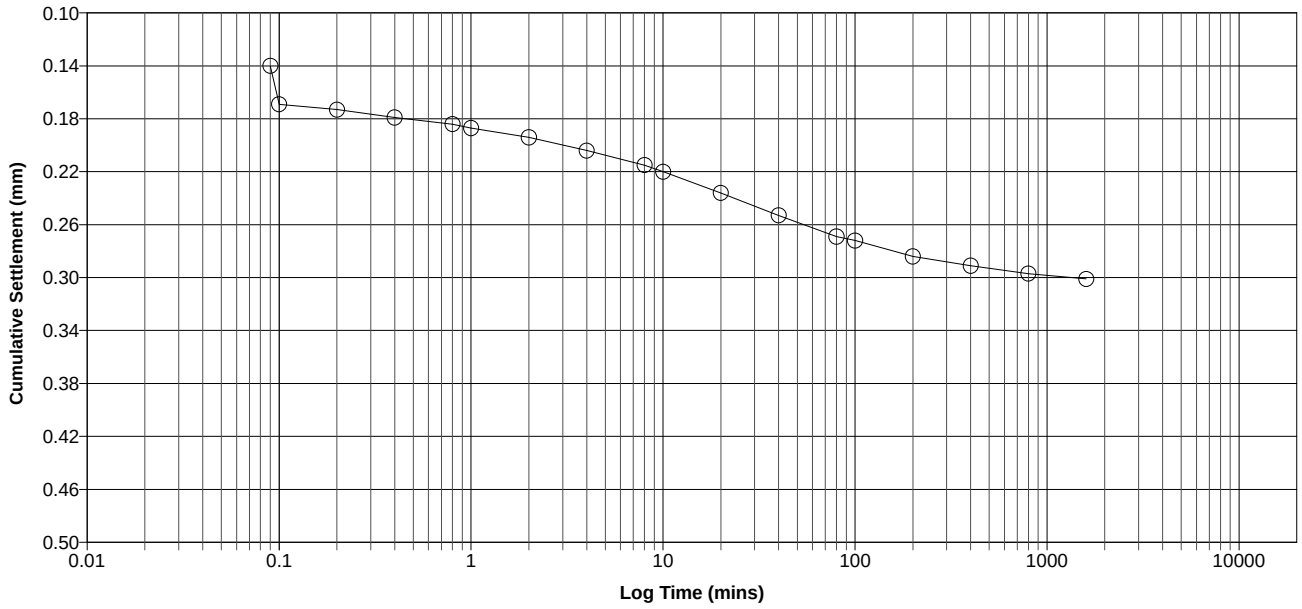
Site : St Mary's Court, Barwell

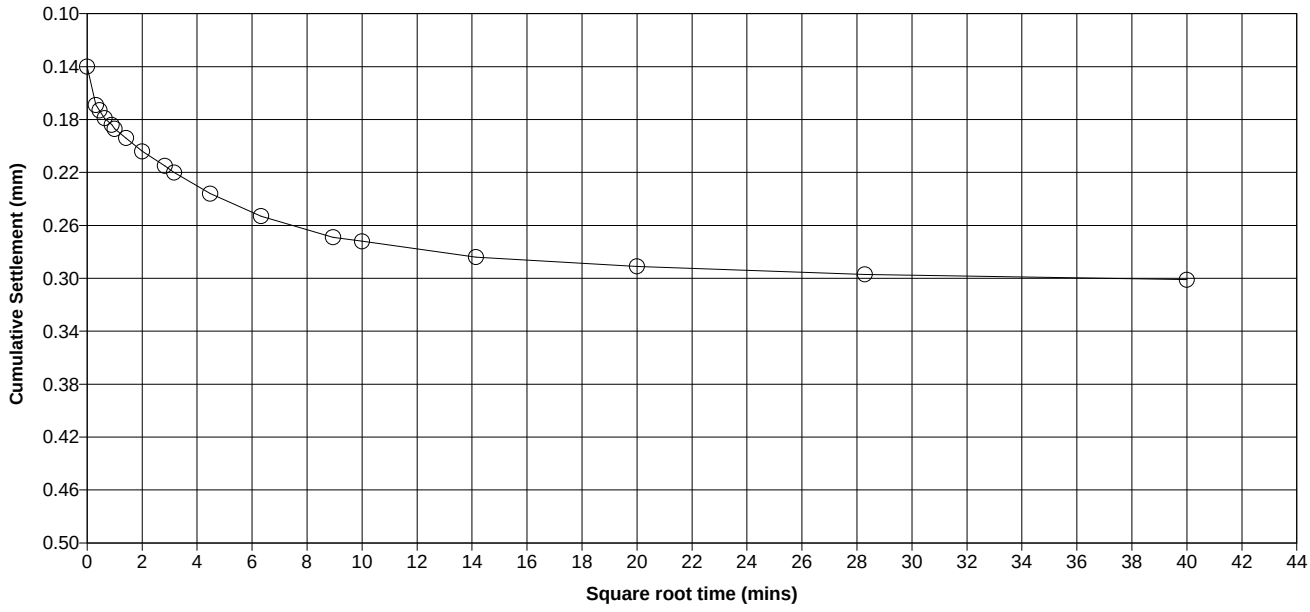
Client : Hayward Architects

Job Number 20970

ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH2	1.20	U1	3	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

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Laboratory Test Report - 20970/1

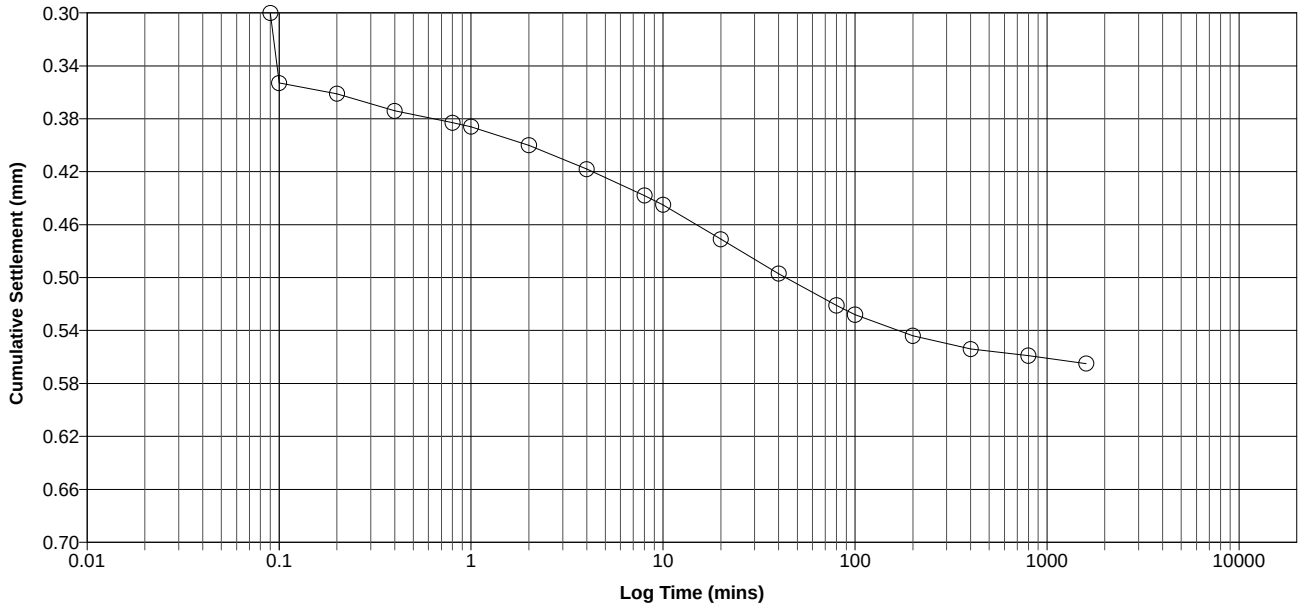
Site : St Mary's Court, Barwell

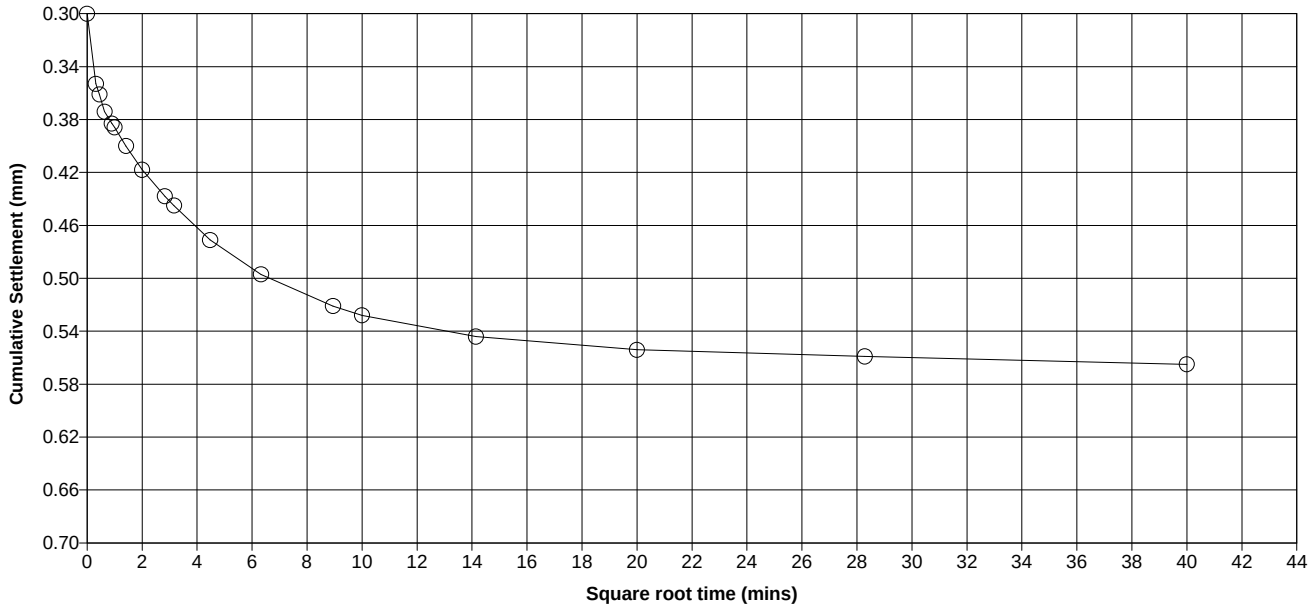
Client : Hayward Architects

Job Number 20970

ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH2	1.20	U1	4	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

IAN FARMER ASSOCIATES

Laboratory Test Report - 20970/1

Site : St Mary's Court, Barwell

Client : Hayward Architects

Job Number 20970

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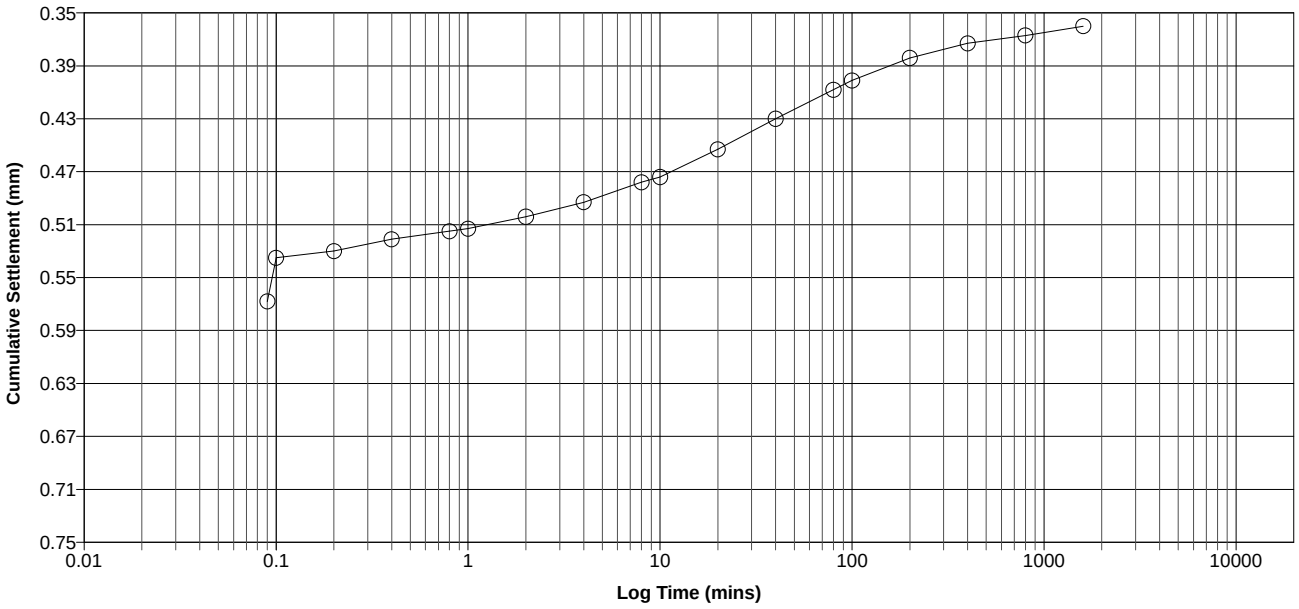
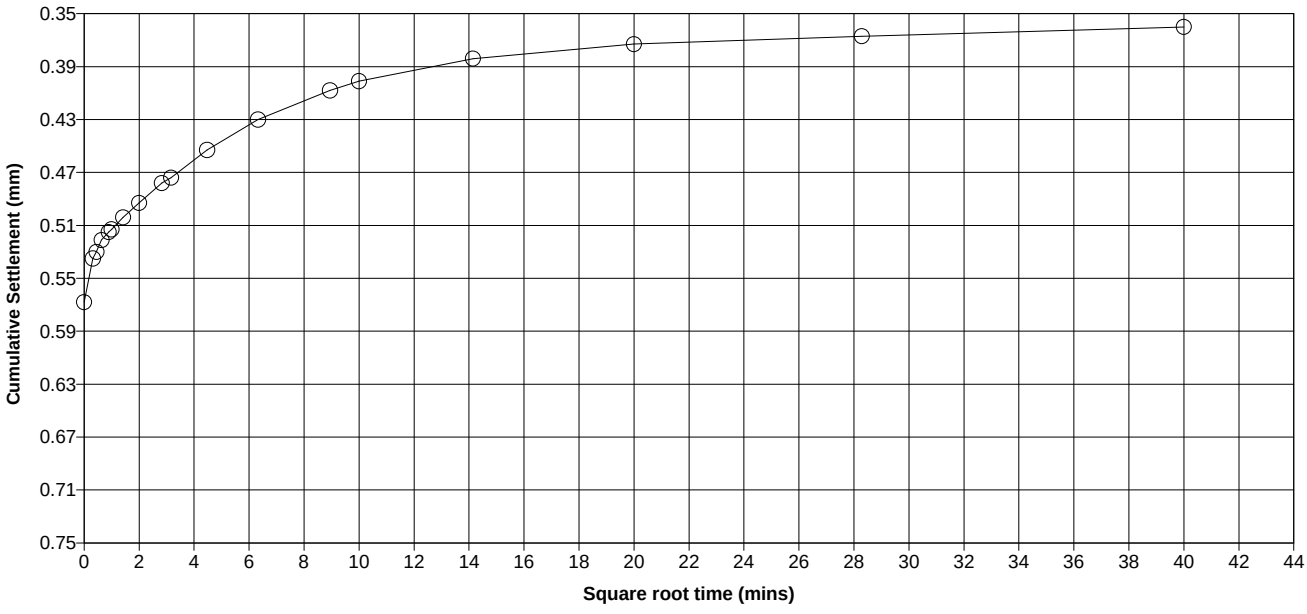
ONE-DIMENSIONAL CONSOLIDATION TEST

Borehole / Trial Pit	Depth (m)	Sample	Stage	Description
BH2	1.20	U1	5	Brown silty CLAY





Method of Preparation : BS 1377:PART 5:1990:3.3, 3.4

Method of Test : BS 1377:PART 5:1990:3.5. Using Log Time method

Remarks : Log Time

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

Test Report : **20970/1**

Site : St Mary's Court, Barwell
Job Number : 20970
Originating Client : Hayward Architects

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

The following tests contained within this report are not UKAS Accredited.

Date of Issued : 10/12/12

APPENDIX 4

CHEMICAL TESTS

Certificate of Analysis

2139

Certificate Number: 12-70403

Date: 29/10/2012

Client:	Ian Farmer Associates Unit 1 Fairfield Court Seven Stars Industrial Estate Wheler Road Coventry West Midlands CV3 4LJ
Our Reference:	12-70403
Client Reference:	20970
Contract Title:	St Mary's Court, Barwell
Description:	5 soil samples
Date Received:	19 October 2012
Date Started:	19 October 2012
Date Completed:	29 October 2012
Test Procedures:	Identified by prefix DETSn (details on request), Asbestos Analysis (DETS 082).
Notes:	Observations and interpretations are outside the scope of UKAS accreditation
Approved By:	Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample.

Key

*	Denotes test not included in laboratory scope of accreditation
#	Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
$	Denotes tests completed by an approved subcontractor
I/S	Denotes insufficient sample to carry out test
U/S	Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month
Liquids - 2 weeks
Asbestos (test portion) - 6 months

Summary of Chemical Analysis
Matrix Descriptions

Our Ref: 12-70403
Client Ref: 20970
Contract Title: St Mary's Court, Barwell

Sample ID	Other ID	Depth	Sample No	Completed	Matrix Description
TP1	2	1.00	454841	29/10/2012	Dark brown gravelly sandy CLAY
TP2	1	0.30	454842	29/10/2012	Dark brown gravelly sandy CLAY
TP3	1	0.30	454843	29/10/2012	Dark brown gravelly sandy CLAY
TP4	1	0.20	454844	29/10/2012	Dark brown light brown gravelly sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-70403
Client Ref: 20970
Contract Title: St Mary's Court, Barwell

			Lab No.	454841	454842	454843	454844
			Sample ID	TP1	TP2	TP3	TP4
			Depth	1.00	0.30	0.30	0.20
			Sample Ref	2	1	1	1
			Sample Type				
			Sampling Date	15/10/2012	15/10/2012	15/10/2012	15/10/2012
			Sampling Time				
Test	**Units**	**DETSxx**	**LOD**				
Arsenic	mg/kg	DETS 042#	0.2	7.1	16	6.3	12
Cadmium	mg/kg	DETS 042#	0.1	0.4	0.6	0.3	0.5
Chromium	mg/kg	DETS 042#	0.15	17	18	15	17
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0	< 1.0
Copper	mg/kg	DETS 042#	0.2	18	26	23	21
Lead	mg/kg	DETS 042#	0.3	45	56	180	38
Mercury	mg/kg	DETSC 2325#	0.05	0.06	0.08	0.06	0.07
Nickel	mg/kg	DETS 042#	1	14	18	9.9	15
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	1	62	93	71	71
Cyanide free	mg/kg	DETSC 2130#	0.1	0.1	< 0.1	0.1	< 0.1
Organic matter	%	DETSC 2002#	0.1	2.2	2.3	3.2	1.9
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10	95	24	39	47
pH		DETSC 2008#		8.0	8.4	7.3	8.5
Aliphatic C5-C6	mg/kg	DETSC 3321*	0.01	< 0.01			
Aliphatic C6-C8	mg/kg	DETSC 3321*	0.01	< 0.01			
Aliphatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01			
Aliphatic C10-C12	mg/kg	DETSC 3072#	1.5	< 1.5			
Aliphatic C12-C16	mg/kg	DETSC 3072#	1.2	< 1.2			
Aliphatic C16-C21	mg/kg	DETSC 3072#	1.5	< 1.5			
Aliphatic C21-C35	mg/kg	DETSC 3072#	3.4	< 3.4			
Aromatic C5-C7	mg/kg	DETSC 3321*	0.01	< 0.01			
Aromatic C7-C8	mg/kg	DETSC 3321*	0.01	< 0.01			
Aromatic C8-C10	mg/kg	DETSC 3321*	0.01	< 0.01			
Aromatic C10-C12	mg/kg	DETSC 3072#	0.9	< 0.9			
Aromatic C12-C16	mg/kg	DETSC 3072#	0.5	< 0.5			
Aromatic C16-C21	mg/kg	DETSC 3072#	0.6	< 0.6			
Aromatic C21-C35	mg/kg	DETSC 3072#	1.4	< 1.4			
Aliphatic C5-C35	mg/kg	DETSC 3072*	10	< 10			
Aromatic C5-C35	mg/kg	DETSC 3072*	10	< 10			
TPH Ali/Aro	mg/kg	DETSC 3072*	10	< 10			
Acenaphthene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	DETSC 3301	0.1	< 0.1	0.3	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	DETSC 3301	0.1	< 0.1	0.5	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	DETSC 3301	0.1	< 0.1	0.6	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	DETSC 3301	0.1	< 0.1	0.2	< 0.1	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETSC 3301	0.1	< 0.1	0.6	< 0.1	< 0.1
Chrysene	mg/kg	DETSC 3301	0.1	< 0.1	0.5	< 0.1	< 0.1
Dibenzo(a,h)anthracene	mg/kg	DESTC 3301	0.1	< 0.1	0.3	< 0.1	< 0.1
Fluoranthene	mg/kg	DETSC 3301	0.1	< 0.1	0.6	< 0.1	< 0.1
Fluorene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis
Soil Samples

Our Ref: 12-70403
Client Ref: 20970
Contract Title: St Mary's Court, Barwell

			Lab No.	454841	454842	454843	454844
			Sample ID	TP1	TP2	TP3	TP4
			Depth	1.00	0.30	0.30	0.20
			Sample Ref	2	1	1	1
			Sample Type				
			Sampling Date	15/10/2012	15/10/2012	15/10/2012	15/10/2012
			Sampling Time				
Test	**Units**	**DETSxx**	**LOD**				
Indeno(1,2,3-c,d)pyrene	mg/kg	DETSC 3301	0.1	< 0.1	0.6	< 0.1	< 0.1
Naphthalene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	DETSC 3301	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	DETSC 3301	0.1	< 0.1	0.6	< 0.1	< 0.1
PAH	mg/kg	DETSC 3301	1.6	< 1.6	5.0	< 1.6	< 1.6
EPH (C10-C40)	mg/kg	DETSC 3311#	10		110	42	
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Asbestos Analysis
Soil Samples

Our Ref: 12-70403
Client Ref: 20970
Contract Title: St Mary's Court, Barwell

Lab No	Sample Ref	Material Type*	Result	Comment	Analyst
454840	TP1 1 1.00	Soil	NAD	None	Emrhys Sheldon
454844	TP4 1 0.20	Soil	NAD	None	Emrhys Sheldon

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. NAD = No Asbestos Detected. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETS 082 using polarised light microscopy in accordance with HSG248 and documented in-house methods. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'.

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test	Deviating due to inappropriate container for test
454840	TP1 1.00 SOIL	15/10/2012	Plastic Tub 1 litre (1kg)		
454841	TP1 1.00 SOIL	15/10/2012	Glass Jar 250ml or less (250ml), Glass Vial (40ml)		
454842	TP2 0.30 SOIL	15/10/2012	Glass Jar 250ml or less (250ml), Glass Vial (40ml), Plastic Tub 1 litre (1kg)		
454843	TP3 0.30 SOIL	15/10/2012	Glass Jar 250ml or less (250ml), Glass Vial (40ml), Plastic Tub 1 litre (1kg)		
454844	TP4 0.20 SOIL	15/10/2012	Glass Jar 250ml or less (250ml), Glass Vial (40ml), Plastic Tub 1 litre (1kg)		

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETSC 2003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETSC 2119	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DETS 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETSC 3301	PAH by GC-FID	mg/kg	0.10	As Received	No	Yes	No
DETSC 3311	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETSC 3401	PCB	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzne	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Easily Liberatable Cyanide	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Complex Cyanide	mg/kg	0.30	Air Dried	No	Yes	No
DETSC 2130	Total Cyanide	mg/kg	0.40	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3431	VOC	mg/kg	0.01	As Received	No	No	No
DETSC 3303	PAH by GCMS (see list below)						
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Anthracene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Chrysene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Fluorene	mg/kg	0.03	As Received	No	Yes	No

APPENDIX 5

DESIGN CONSIDERATIONS

APPENDIX 5

GUIDELINES FOR THE DESIGN OF PILES

FIRST APPROXIMATION OF WORKING LOAD

A5.1 GENERAL

The ultimate carrying capacity, Qu, of a particular pile is taken as the sum of the ultimate shaft friction resistance, Qs, and the ultimate end bearing resistance, Qb. This may be expressed as follows:-

$$Qu = Qs + Qb$$

$$= f.As + q.Ab$$

where f = unit shaft resistance

As = embedded surface area of pile

q = unit end bearing resistance

Ab = effective cross-sectional area of pile base

A5.2 COHESIVE SOILS

A5.2.1 Shaft Resistance

The ultimate shaft resistance, f, for piles in both compression or tension in cohesive soils is determined by applying a factor to the undrained shear strength, Cs, which exists in the soils along the embedded length of the pile, and is given by:-

$$f = \alpha.Cs$$

Where α is an adhesion factor, which for straight-shafted bored piles may be taken as 0.45 to 0.60.

Ultimate unit shaft friction should not exceed 100kN/m².

A5.2.2 End Bearing

For piles terminating in cohesive soils, the ultimate unit end bearing resistance q, is given by:-

$$q = Nc.Cb$$

where Cb is the undrained shear strength at the base of the pile

and Nc is a bearing capacity factor

The value of Nc for a cohesive material is variable, depending on the depth of the penetration of the pile into the bearing stratum. Generally, Nc could be taken to have a value of 9, except in the case of large diameter short piles where a lesser value should be used.

A5.3 COHESIONLESS SOILS

A5.3.1 Shaft Resistance

For piles driven in cohesionless soils the ultimate unit shaft resistance, f, may be calculated using the following method, which gives:-

$$f = 0.5\gamma' (D+d) Ks \tan \delta$$

where γ' = average effective unit weight of soil surrounding the pile

D = depth to the pile toe or to the base of the granular stratum whichever is the lesser

d = depth to the top of the granular stratum

δ = angle of friction between pile and soil (see below)

Ks = a coefficient (see below)

VALUES OF Ks AND δ

Pile Type	δ	Ks		
		Relative Density		Tension Piles
		Low	High	
Steel	20°	0.5	1.5	0.5
Concrete	0.75ϕ	1.0	2.0	0.5

The value of ϕ may be interpreted from standard penetration tests, see Figure A5.2.

For bored and cast-in-place piles, δ = 22° and Ks = 1 should be used to allow for loosening of the soil during boring.

It has been found that the ultimate unit shaft resistance does not exceed 100kN/m² and therefore this value should not be exceeded in design.

A5.3.2 End Bearing

The unit ultimate end bearing resistance (q) of piles in cohesionless soils may be calculated as follows:-

$$q = \gamma'.D.Nq$$

where γ' = average effective unit weight of soil surrounding the pile

D = depth to pile toe

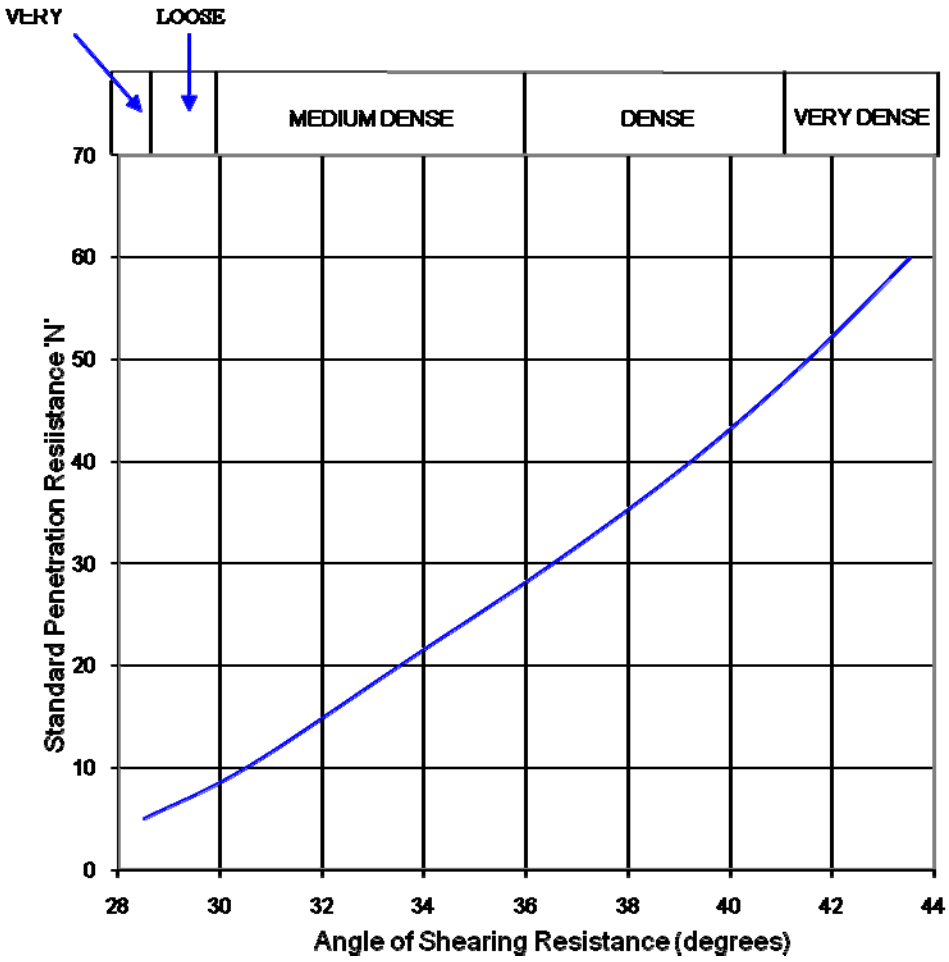
Nq = bearing capacity factor

Values for Nq, where piles penetrate the bearing stratum by more than five diameters may be taken from work carried out by Berezantsev, ref.9.23. The ultimate unit base resistance should not exceed a value of 11,000kN/m². For bored and cast-in-place piles the value of Nq used should correspond to loose soil conditions.

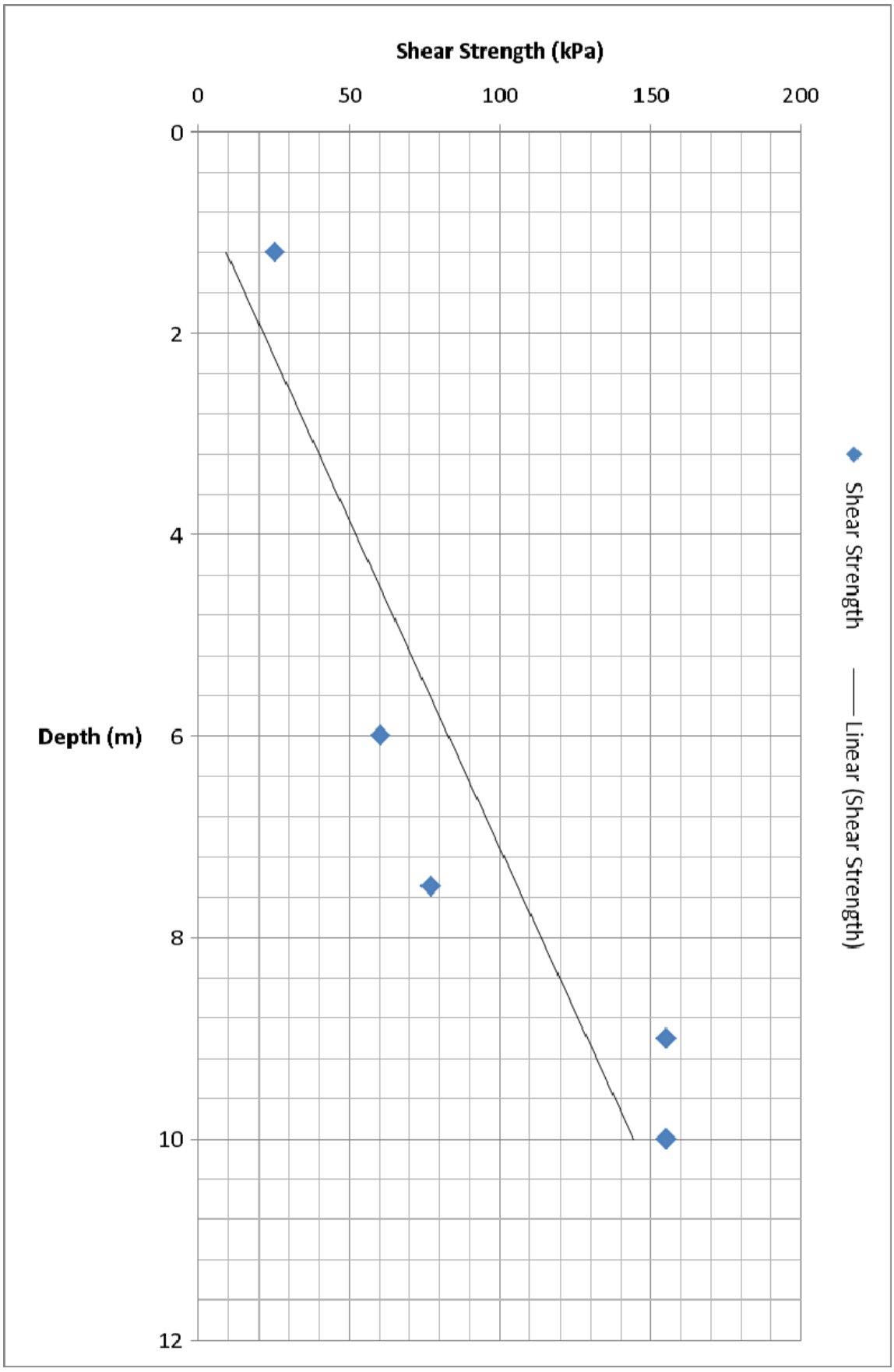
A5.4 FACTORS OF SAFETY

A5.4.1 Cohesive and Non-cohesive Soils

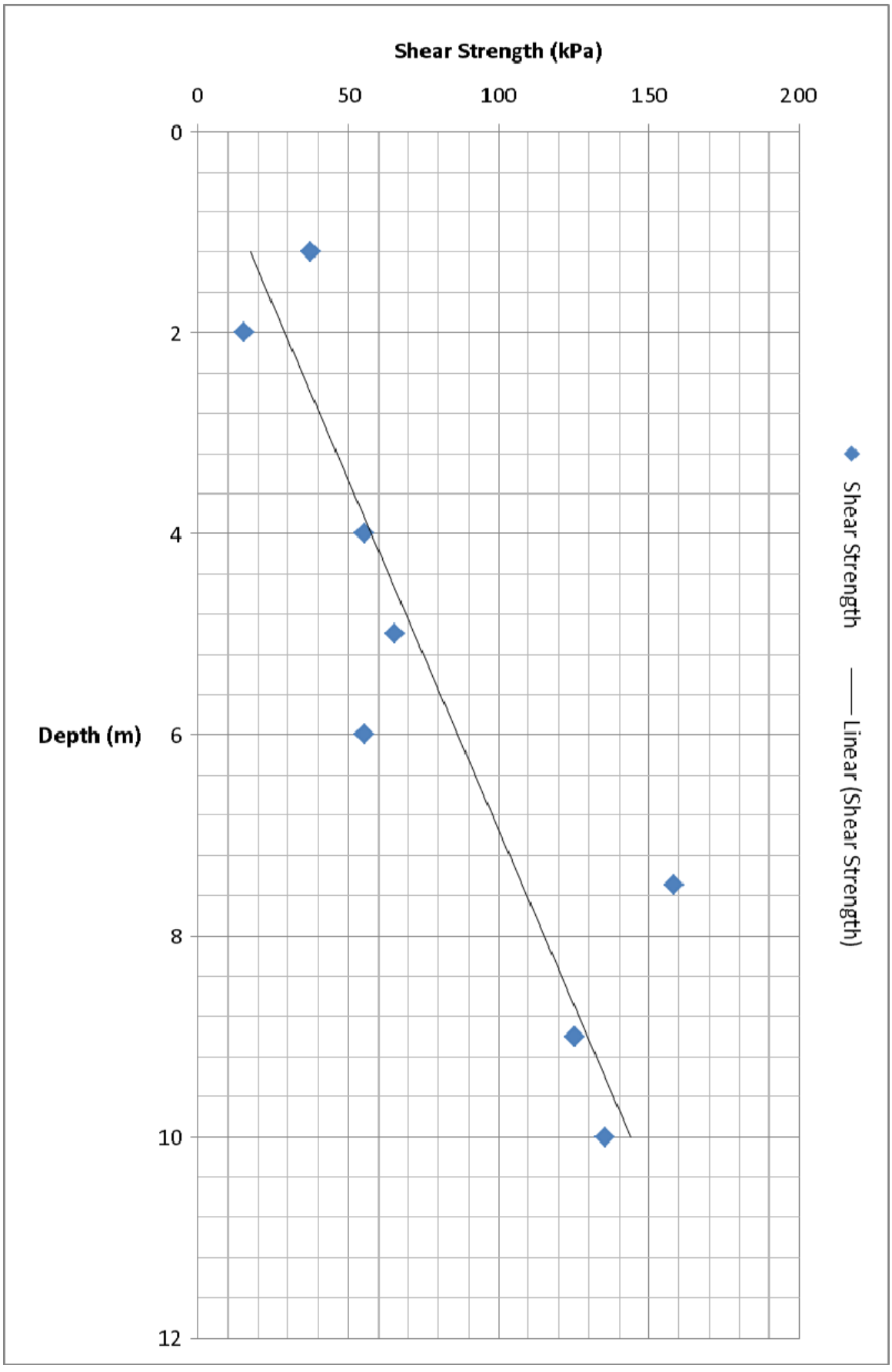
For cohesive and non-cohesive soils a factor of safety of 3 may be used to obtain the allowable or safe carrying capacity of piles from the ultimate carrying capacity.



	Relationship of SPT and Angle of Internal Resistance (Sands)	Job no. 20970
	St Mary's Court, Barwell	Fig. A5.1



	Strength Vs Depth in Clays – BH1	Job no. 20970
	St Mary's Court, Barwell	Fig. A5.2



	Strength Vs Depth – BH2	Job no. 20970
	St Mary's Court, Barwell	Fig. A5.3

APPENDIX 6

CONTAMINATION ASSESSMENT

APPENDIX 6

GENERAL NOTES ON CONTAMINATION ASSESSMENT

A6.1 STATUTORY FRAMEWORK AND DEFINITIONS

A6.1.1 The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, ref 9.23, which was introduced by the Environment Act 1995, ref 9.25;

'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) pollution of controlled waters is being, or is likely to be, caused.'

A6.1.2 The UK guidance on the assessment of contaminated has developed as a direct result of the introduction of these two Acts. The technical guidance supporting the legislation was originally summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs), a proposed series of twelve documents. Seven were originally published in March 1994, four more were published in April 2002, while the final guidance document, CLR 11, ref 9.38 was published in 2004. CLR7 to 10 were withdrawn in 2008, with CLR 9 and 10 effectively replaced by the Environment Agency in the form of Science Reports SR2, ref 9.34 and SR3, ref 9.27. CLR11 remains valid and sets out the framework of the investigation process.

A6.1.3 In establishing whether a site fulfils the statutory definition of 'contaminated land' it is necessary to identify, whether a pollutant linkage exists in respect of the land in question and whether the pollutant linkage:

- is resulting in significant harm being caused to the receptor in the pollutant linkage,
- presents a significant possibility of significant harm being caused to that receptor,
- is resulting in the pollution of the controlled waters which constitute the receptor, or
- is likely to result in such pollution.

A6.1.4 A *'pollutant linkage'* may be defined as the link between a contaminant *'source'* and a *'receptor'* by means of a *'pathway'*.

A6.2 ASSESSMENT METHODOLOGY

A6.2.1 The guidance proposes a four-stage assessment process for identifying potential pollutant linkages on a site. These stages are set out in the table below:

No.	Process	Description
1	Hazard Identification	Establishing contaminant sources, pathways and receptors (the conceptual model).
2	Hazard Assessment	Analysing the potential for unacceptable risks (what linkages could be present, what could be the effects).
3	Risk Estimation	Trying to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it).
4	Risk Evaluation	Deciding whether the risk is unacceptable.

A6.2.2 Stages 1 and 2 develop a *'conceptual model'* based upon information collated from desk based studies, and frequently a walkover of the site. The walkover survey should be conducted in general accordance with CLR 2, ref 9.39. The formation of a conceptual model is an iterative process and as such, it should be updated and refined throughout each stage of the project to reflect any additional information obtained.

A6.2.3 The extent of the desk studies and enquiries to be conducted should be in general accordance with CLR 3, ref 9.26. The information from these enquiries is presented in a desk study report with recommendations, if necessary, for further work based upon the conceptual model. In the absence of specific information on contamination anticipated to be encountered, specific DoE 'Industry Profiles' provide guidance on the nature of contaminants relating to a variety of industrial processes and should be used as the basis for determining which contaminants are more likely to be present on a site.

A6.2.4 If potential pollutant linkages are identified within the conceptual model, a Phase 2 site investigation and report will be recommended. The investigation should be planned in general accordance with CLR 4, ref 9.1. The number of exploratory holes and samples collected for analysis should be consistent with the size of the site and the level of risk envisaged. This will enable a generic quantitative risk assessment (GQRA) to be conducted, at which point the conceptual model can be updated and relevant pollutant linkages can be identified.

A6.2.5 A two-stage investigation may be more appropriate where time constraints are less of an issue. The first stage investigation being conducted as an initial assessment for the presence of potential sources, a second being a more refined investigation to delineate wherever possible the extent of the identified contamination.

A6.2.6 All site works should be in general accordance with the British Standards, BS 5930:2010, ref. 9.4, ISO 1997, ref 9.5 and BS 10175:2011, ref 9.3.

A6.2.7 The GQRA screens the results of the chemical analysis against generic guidance values, appropriate to the end-use of the site. Soils will be compared to Soil Guideline Values (SGV) where published, Generic Assessment Criteria (GAC) developed by LQM/CIEH, ref 9.29, or internal screening values generated using the Contaminated Land Exposure Assessment (CLEA) Software, Version 1.06, ref 9.30. Toxicological and physico-chemical/fate and transport data used to generate the AC has been derived from a hierarchy of data sources as follows:

1. Environment Agency or Department of Environment Food and Rural Affairs

   (DEFRA) documents;

2. Other documents produced by UK Government or state organisations;

3. European institution documents;

4. International organisation documents;

5. Foreign government institutions.

A6.2.8 For many of the contaminants considered, input data has been drawn from the relevant SGV where available, or existing toxicological reports published by the Environment Agency which have not yet been withdrawn/replaced. Fate and transport data has been derived in the first instance from Environment Agency (2008), ref 9.40.

A6.2.9 Recommendations for tolerable intakes of lead are based on evaluation of the relationship between exposure and blood lead levels. The existing toxicological report for lead considers a health criteria value based on an uptake dose, whereas the CLEA model estimates exposure in terms of an intake dose. At present, the CLEA model is not considered appropriate for determining a screening value for lead. In the absence of a current published assessment criterion, the SGV for lead reported in R&D Publication CLR 10 ref 9.35 have been used in this assessment. This will be updated in due course in light of any further published information.

A6.2.10 Chemical laboratory test results are processed as follows. A statistical analysis of the results is conducted, as detailed in CIEH and CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration', ref 9.31. Individual concentrations are compared to the selected guideline values to identify concentrations of contaminants that are above the selected screening criteria.

A6.2.11 Initially the distribution of the data set is tested using the Shapiro-Wilk normality test, ref 9.33 to determine if the data set is, or is not, normally distributed. Where the distribution of the data is shown to be normal, the mean value test is applied to determine whether the mean characteristics of the selected soil unit present a significant possibility of significant harm to human health. Where the data is not normally distributed a method based on the Chebychev Theorem can be applied to test the same hypothesis. The significance of the data is further tested using the maximum value test. This determines whether the highest recorded contaminant concentrations are from the same statistical distribution or whether they may represent a 'hot spot'.

A6.2.12 Where the risk estimation identifies significant concentrations of one or more contaminants, a further risk evaluation needs to be undertaken.

A6.2.13 The risk evaluation will address the potential pollutant linkages between an identified source of contamination and the likely receptors both on and off site.

A6.2.14 The potential receptors include:

1) Humans – current site occupants, construction workers, future site users and neighbouring site users.

2) Controlled Waters – surface water and groundwater resources

3) Plants – current and future site vegetation

4) Building materials

A6.2.15 The potential hazards to be considered in relation to contamination are:

a) Ingestion and inhalation.

b) Uptake of contaminants via cultivated vegetables.

c) Dermal contact

d) Phytotoxicity (the prevention or inhibition of plant growth)

e) Contamination of water resources

f) Chemical attack on building materials and services

g) Fire and explosion

A6.2.16 Dependent on the outcome of the initial, generic contamination risk assessment, further detailed assessment of the identified risks may be required.

A6.3 Generic Guidance Values Used Within Contamination Risk Assessment

Residential End Use

	Determinant	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Guidance Value (mg/kg)	Primary Data Source
		1% SOM	2.5% SOM	6% SOM	
PAH	Acenaphthene	210	480	1000	LQM CIEH GAC
	Acenaphthylene	170	400	850	
	Anthracene	2300	4900	9200	
	Benz(a)anthracene	3.1	4.7	5.9	
	Benzo(a)pyrene	0.83	0.94	1	
	Benzo(b)fluoranthene	5.6	6.5	7	
	Benzo(ghi)perylene	44	46	47	
	Benzo(k)fluoranthene	8.5	9.6	10	
	Chrysene	6	8	9.3	
	Dibenzo(ah)anthracene	0.76	0.86	0.90	
	Fluoranthene	260	460	670	
	Fluorene	160	380	780	
	Indeno(123-cd)pyrene	3.2	3.9	4.2	
	Napthalene	1.5	3.7	8.7	
	Phenanthrene	92	200	380	
	Pyrene	560	1000	1600	
Other Organics	Phenol	210	390	780	LQM CIEH GAC
Metals	Arsenic	32			EA 2009
	Beryllium	51			LQM CIEH GAC
	Boron	291			LQM CIEH GAC
	Cadmium	10			EA 2009
	Chromium (III)	3000			LQM CIEH GAC
	Chromium (VI)	4.3			LQM CIEH GAC
	Copper	2330			LQM CIEH GAC
	Lead	450			CLEA SGV 10
	Inorganic Mercury	169			EA 2009
	Nickel	130			EA 2009
	Selenium	350			EA 2009
	Vanadium	75			LQM CIEH GAC
	Zinc	3750			LQM CIEH GAC

[1] SOM – Soil Organic Matter

A6.3.1 Generic Assessment Criteria for Petroleum Hydrocarbons

Residential	Guidance Value (mg/kg) 1% SOM	Guidance Value (mg/kg) 2.5% SOM	Guidance Value (mg/kg) 6% SOM	Primary Data Source
Aliphatic				
EC 5-6	30	55	110	LQM CIEH GAC
EC >6-8	73	160	370	
EC >8-10	19	46	110	
EC >10-12	93 (48)	230 (120)	540 (280)	
EC >12-16	740 (24)	1700 (60)	3000 (140)	
EC >16-35	45000 (8.5)	64000 (21)	76000	
EC >35-44				
Aromatic				
EC 5-7 (benzene)	65	130	280	LQM CIEH GAC
EC >7-8 (toluene)	120	270	611	
EC >8-10	27	65	151	
EC >10-12	69	160	346	
EC >12-16	140	310	593	
EC >16-21	250	480	770	
EC >21-35	890	1100	1230	
EC >35-44				
Aliphatic and Aromatic				
EC >44-70	1200	1300		LQM CIEH GAC
BTEX				
Benzene	0.08	0.18	0.33	EA 2009
Toluene	120	320	610	EA 2009
Ethylbenzene	65	180	350	EA 2009
Xylenes	45	130	230	EA 2009

SOM = Soil Organic Matter
Values in brackets indicate the solubility or vapour saturation limit where this is exceeded by the GAC
Residential xylene screening values are based on data for p-xylene

IAN FARMER ASSOCIATES

HazWasteOnline™

Job name

20970 St Mary's Court

Waste stream

Con Land Waste - Tony

Comments

Report

Created by: Owen, Tony
Created date: 20/12/2012 14:00

Job summary

#	Sample name	Depth	Classification result	Hazardous properties
1	TP1	1	Non Hazardous	
2	TP2	0.3	Non Hazardous	
3	TP3	0.3	Non Hazardous	
4	TP4	0.2	Non Hazardous	

Classification

Non Hazardous Waste
Classified as **17 05 04**
in the European Waste Catalogue 2002

Classified by

Name:
Owen, Tony
Date:
20/12/2012 13:59
Telephone:
024 7630 3422

Company:
Ian Farmer Associates
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road
Coventry
CV3 4LJ

Sample details

Sample Name:
TP1
Site:

Project:

Sample Depth:
1 m
Wet Weight Moisture Content:
0%
Comments:

EWC 2002 code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Additional: Additional Risk Phrases "Additional risk phrases apply, please check potential effects. NOTE: These are additional risk phrases and such a risk phrases alone will not cause a waste to be hazardous."

Risk phrases hit:

R33 "Danger of cumulative effects"

Because of determinand:

Lead chromate: (0.0070%)

Determinands (Wet Weight Moisture Content:0%)

Arsenic trioxide: (Cation conc. entered: 7.1 mg/kg, converted to compound conc.:9.37 mg/kg or 0.00094%)
Cadmium sulphide: (Cation conc. entered: 0.4 mg/kg, converted to compound conc.:0.51 mg/kg or 0.000051%)
Chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.92 mg/kg or <0.00019%) IGNORED Because: "<LOD"
Copper (I) oxide: (Cation conc. entered: 18 mg/kg, converted to compound conc.:20.27 mg/kg or 0.0020%)
Lead chromate: (Cation conc. entered: 45 mg/kg, converted to compound conc.:70.19 mg/kg or 0.0070%)
Mercury dichloride: (Cation conc. entered: 0.06 mg/kg, converted to compound conc.:0.081 mg/kg or 0.0000081%)
Nickel dihydroxide: (Cation conc. entered: 14 mg/kg, converted to compound conc.:22.11 mg/kg or 0.0022%)
Selenium compounds (with the exception of cadmium sulphoselenide and sodium selenite): (Cation conc. entered: <0.5 mg/kg, converted to compound conc.:<0.75 mg/kg or <0.000075%) IGNORED Because: "<LOD"
Zinc chromate: (Cation conc. entered: 62 mg/kg, converted to compound conc.:172.00 mg/kg or 0.017%)
Cyanides (with the exception of complex cyanides): (Cation conc. entered: 0.1 mg/kg, converted to compound conc.:0.10 mg/kg or 0.000010%)

pH: (Whole concentration entered as: 8 pH or 8.00 pH)
Acenaphthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Acenaphthylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]pyrene; benzo[def]chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[b]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[k]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[ghi]perylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Dibenz[a,h]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluorene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Indeno[123-cd]pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Naphthalene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenanthrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenol: (Whole concentration entered as: <0.3 mg/kg or <0.000030%) IGNORED Because: "<LOD"

Test settings

H12 on R29, R31, R32: Test not run because: "Not deemed hazardous at concentration equivalent to LoD"

Notes utilised in assessment

Additional Risk Phrase Comments
from section: Table 3.1 in the document: "WM2 - Hazardous Waste Technical Guidance"
"This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous."

Note used on:

Test: "Additional on R33" for determinand: "Lead chromate"

C14.5.5: Step 5
from section: C14.5 in the document: "WM2 - Hazardous Waste Technical Guidance"
"Remove dangerous substances below the trace impurity thresholds concentrations from further consideration. Where an individual dangerous substance is present at a very low concentration it can be excluded from further consideration."

Note used on:

Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Arsenic trioxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Copper (I) oxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Nickel dihydroxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Mercury dichloride"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Zinc chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cyanides (with the exception of complex cyanides)"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

Test: "H14 on R50/53" for determinand: "Lead chromate"
Test: "H14 on R50, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Substance notes

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

determinand: "Lead chromate"
determinand: "Cadmium sulphide"

Note A
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

Note used on:

determinand: "Zinc chromate"
determinand: "Cyanides (with the exception of complex cyanides)"

Note E (Table 3.2)
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Substances with specific effects on human health (see Chapter 4 of Annex VI to Directive 67/548/EEC) that are classified as carcinogenic, mutagenic and/or toxic for reproduction in categories 1 or 2 are ascribed Note E if they are also classified as very toxic (T+), toxic (T) or harmful (Xn). For these substances, the risk phrases R20, R21, R22, R23, R24, R25, R26, R27, R28, R39, R68 (harmful), R48 and R65 and all combinations of these risk phrases shall be preceded by the word 'Also'."

Note used on:

determinand: "Arsenic trioxide"
determinand: "Nickel dihydroxide"
determinand: "Cadmium sulphide"
determinand: "Zinc chromate"

Version

Classification utilises the following:
CLP Regulations - Regulation (EC) No 1272/2008 of the European Parliament and of the Council: 16 December 2008
1st ATP - 1st Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 26 September 2009; binding date 1 Dec 2010
2nd ATP - 2nd Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 30 March 2011; binding date 1 Dec 2012 in respect of substances and 1 June 2015 in respect of mixtures
3rd ATP - 3rd Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 31 July 2012; binding date 1 Dec 2013

HazWasteOnline Engine: WM2 version 2.3 (April 2011) using HWR08
HazWasteOnline Engine Version: 1.0.2152.4915 (07 Dec 2012)
HazWasteOnline Database: 1.0.2152.4915 (08 Dec 2012)

Classification

Non Hazardous Waste
Classified as **17 05 04**
in the European Waste Catalogue 2002

Classified by

Name:
Owen, Tony
Date:
20/12/2012 13:57
Telephone:
024 7630 3422

Company:
Ian Farmer Associates
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road
Coventry
CV3 4LJ

Sample details

Sample Name:
TP2
Site:

Project:

Sample Depth:
0.3 m
Wet Weight Moisture Content:
0%
Comments:

EWC 2002 code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Additional: Additional Risk Phrases "Additional risk phrases apply, please check potential effects. NOTE: These are additional risk phrases and such a risk phrases alone will not cause a waste to be hazardous."

Risk phrases hit:

R33 "Danger of cumulative effects"

Because of determinand:

Lead chromate: (0.0087%)

Determinands (Wet Weight Moisture Content:0%)

Arsenic trioxide: (Cation conc. entered: 16 mg/kg, converted to compound conc.:21.13 mg/kg or 0.0021%)
Cadmium sulphide: (Cation conc. entered: 0.6 mg/kg, converted to compound conc.:0.77 mg/kg or 0.000077%)
Chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.92 mg/kg or <0.00019%) IGNORED Because: "<LOD"
Copper (I) oxide: (Cation conc. entered: 26 mg/kg, converted to compound conc.:29.27 mg/kg or 0.0029%)
Lead chromate: (Cation conc. entered: 56 mg/kg, converted to compound conc.:87.35 mg/kg or 0.0087%)
Mercury dichloride: (Cation conc. entered: 0.08 mg/kg, converted to compound conc.:0.11 mg/kg or 0.000011%)
Nickel dihydroxide: (Cation conc. entered: 18 mg/kg, converted to compound conc.:28.43 mg/kg or 0.0028%)
Selenium compounds (with the exception of cadmium sulphoselenide and sodium selenite): (Cation conc. entered: <0.5 mg/kg, converted to compound conc.:<0.75 mg/kg or <0.000075%) IGNORED Because: "<LOD"
Zinc chromate: (Cation conc. entered: 93 mg/kg, converted to compound conc.:258.00 mg/kg or 0.026%)
Cyanides (with the exception of complex cyanides): (Cation conc. entered: <0.1 mg/kg, converted to compound conc.:<0.10 mg/kg or <0.000010%) IGNORED Because: "<LOD"

pH: (Whole concentration entered as: 8.4 pH or 8.40 pH)
Acenaphthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Acenaphthylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]anthracene: (Whole concentration entered as: 0.3 mg/kg or 0.000030%)
Benzo[a]pyrene; benzo[def]chrysene: (Whole concentration entered as: 0.5 mg/kg or 0.000050%)
Benzo[b]fluoranthene: (Whole concentration entered as: 0.6 mg/kg or 0.000060%)
Benzo[k]fluoranthene: (Whole concentration entered as: 0.2 mg/kg or 0.000020%)
Benzo[ghi]perylene: (Whole concentration entered as: 0.6 mg/kg or 0.000060%)
Chrysene: (Whole concentration entered as: 0.5 mg/kg or 0.000050%)
Dibenz[a,h]anthracene: (Whole concentration entered as: 0.3 mg/kg or 0.000030%)
Fluoranthene: (Whole concentration entered as: 0.6 mg/kg or 0.000060%)
Fluorene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Indeno[123-cd]pyrene: (Whole concentration entered as: 0.6 mg/kg or 0.000060%)
Naphthalene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenanthrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Pyrene: (Whole concentration entered as: 0.6 mg/kg or 0.000060%)
Phenol: (Whole concentration entered as: <0.3 mg/kg or <0.000030%) IGNORED Because: "<LOD"

Notes utilised in assessment

Additional Risk Phrase Comments
from section: Table 3.1 in the document: "WM2 - Hazardous Waste Technical Guidance"
"This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous."

Note used on:

Test: "Additional on R33" for determinand: "Lead chromate"

C14.5.5: Step 5
from section: C14.5 in the document: "WM2 - Hazardous Waste Technical Guidance"
"Remove dangerous substances below the trace impurity thresholds concentrations from further consideration. Where an individual dangerous substance is present at a very low concentration it can be excluded from further consideration."

Note used on:

Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Arsenic trioxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Copper (I) oxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Mercury dichloride"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Nickel dihydroxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Zinc chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Benzo[a]anthracene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Benzo[a]pyrene; benzo[def]chrysene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Benzo[b]fluoranthene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Benzo[k]fluoranthene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Benzo[ghi]perylene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Chrysene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Dibenz[a,h]anthracene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Fluoranthene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Pyrene"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

Test: "H14 on R50/53" for determinand: "Lead chromate"

Test: "H14 on R50, R52, R53, R52/53" for determinand: "Cadmium sulphide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Substance notes

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

determinand: "Cadmium sulphide"
determinand: "Lead chromate"

Note A
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

Note used on:

determinand: "Zinc chromate"

Note E (Table 3.2)
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Substances with specific effects on human health (see Chapter 4 of Annex VI to Directive 67/548/EEC) that are classified as carcinogenic, mutagenic and/or toxic for reproduction in categories 1 or 2 are ascribed Note E if they are also classified as very toxic (T+), toxic (T) or harmful (Xn). For these substances, the risk phrases R20, R21, R22, R23, R24, R25, R26, R27, R28, R39, R68 (harmful), R48 and R65 and all combinations of these risk phrases shall be preceded by the word 'Also'."

Note used on:

determinand: "Arsenic trioxide"
determinand: "Cadmium sulphide"
determinand: "Nickel dihydroxide"
determinand: "Zinc chromate"

Version

Classification utilises the following:
CLP Regulations - Regulation (EC) No 1272/2008 of the European Parliament and of the Council: 16 December 2008
1st ATP - 1st Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 26 September 2009; binding date 1 Dec 2010
2nd ATP - 2nd Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 30 March 2011; binding date 1 Dec 2012 in respect of substances and 1 June 2015 in respect of mixtures
3rd ATP - 3rd Adaptation to Technical Progress for European Regulation 1272/2008: Date entered into force 31 July 2012; binding date 1 Dec 2013

HazWasteOnline Engine: WM2 version 2.3 (April 2011) using HWR08
HazWasteOnline Engine Version: 1.0.2152.4915 (07 Dec 2012)
HazWasteOnline Database: 1.0.2152.4915 (08 Dec 2012)

Classification

Non Hazardous Waste
Classified as **17 05 04**
in the European Waste Catalogue 2002

Classified by

Name:
Owen, Tony
Date:
20/12/2012 14:00
Telephone:
024 7630 3422

Company:
Ian Farmer Associates
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road
Coventry
CV3 4LJ

Sample details

Sample Name:
TP3
Site:

Project:

Sample Depth:
0.3 m
Wet Weight Moisture Content:
0%
Comments:

EWC 2002 code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Additional: Additional Risk Phrases "Additional risk phrases apply, please check potential effects. NOTE: These are additional risk phrases and such a risk phrases alone will not cause a waste to be hazardous."

Risk phrases hit:

R33 "Danger of cumulative effects"

Because of determinand:

Lead chromate: (0.028%)

Determinands (Wet Weight Moisture Content:0%)

Arsenic trioxide: (Cation conc. entered: 6.3 mg/kg, converted to compound conc.:8.32 mg/kg or 0.00083%)
Cadmium sulphide: (Cation conc. entered: 0.3 mg/kg, converted to compound conc.:0.39 mg/kg or 0.000039%)
Chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.92 mg/kg or <0.00019%) IGNORED Because: "<LOD"
Copper (I) oxide: (Cation conc. entered: 23 mg/kg, converted to compound conc.:25.90 mg/kg or 0.0026%)
Lead chromate: (Cation conc. entered: 180 mg/kg, converted to compound conc.:280.77 mg/kg or 0.028%)
Mercury dichloride: (Cation conc. entered: 0.06 mg/kg, converted to compound conc.:0.081 mg/kg or 0.0000081%)
Nickel dihydroxide: (Cation conc. entered: 9.9 mg/kg, converted to compound conc.:15.64 mg/kg or 0.0016%)
Selenium compounds (with the exception of cadmium sulphoselenide and sodium selenite): (Cation conc. entered: <0.5 mg/kg, converted to compound conc.:<0.75 mg/kg or <0.000075%) IGNORED Because: "<LOD"
Zinc chromate: (Cation conc. entered: 71 mg/kg, converted to compound conc.:196.96 mg/kg or 0.020%)
Cyanides (with the exception of complex cyanides): (Cation conc. entered: 0.1 mg/kg, converted to compound conc.:0.10 mg/kg or 0.000010%)

pH: (Whole concentration entered as: 7.3 pH or 7.30 pH)
Acenaphthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Acenaphthylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]pyrene; benzo[def]chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[b]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[k]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[ghi]perylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Dibenz[a,h]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluorene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Indeno[123-cd]pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Naphthalene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenanthrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenol: (Whole concentration entered as: <0.3 mg/kg or <0.000030%) IGNORED Because: "<LOD"

Test settings

H12 on R29, R31, R32: Test not run because: "Not deemed hazardous at concentration equivalent to LoD"

Notes utilised in assessment

Additional Risk Phrase Comments
from section: Table 3.1 in the document: "WM2 - Hazardous Waste Technical Guidance"
"This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous."

Note used on:

Test: "Additional on R33" for determinand: "Lead chromate"

C14.5.5: Step 5
from section: C14.5 in the document: "WM2 - Hazardous Waste Technical Guidance"
"Remove dangerous substances below the trace impurity thresholds concentrations from further consideration. Where an individual dangerous substance is present at a very low concentration it can be excluded from further consideration."

Note used on:

Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Arsenic trioxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Mercury dichloride"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Zinc chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cyanides (with the exception of complex cyanides)"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Copper (I) oxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Nickel dihydroxide"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

Test: "H14 on R50/53" for determinand: "Lead chromate"
Test: "H14 on R50, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R50/53, R51/53, R52, R53, R52/53" for determinand: "Cadmium sulphide"

Substance notes

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

determinand: "Cadmium sulphide"
determinand: "Lead chromate"

Note A
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

Note used on:

determinand: "Zinc chromate"
determinand: "Cyanides (with the exception of complex cyanides)"

Note E (Table 3.2)
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Substances with specific effects on human health (see Chapter 4 of Annex VI to Directive 67/548/EEC) that are classified as carcinogenic, mutagenic and/or toxic for reproduction in categories 1 or 2 are ascribed Note E if they are also classified as very toxic (T+), toxic (T) or harmful (Xn). For these substances, the risk phrases R20, R21, R22, R23, R24, R25, R26, R27, R28, R39, R68 (harmful), R48 and R65 and all combinations of these risk phrases shall be preceded by the word 'Also'."

Note used on:

determinand: "Arsenic trioxide"
determinand: "Zinc chromate"
determinand: "Cadmium sulphide"
determinand: "Nickel dihydroxide"

Version

Classification utilises the following:
CLP Regulations - Regulation (EC) No 1272/2008 of the European Parliament and of the Council: 16 December 2008
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HazWasteOnline Engine Version: 1.0.2152.4915 (07 Dec 2012)
HazWasteOnline Database: 1.0.2152.4915 (08 Dec 2012)

Classification

Non Hazardous Waste
Classified as **17 05 04**
in the European Waste Catalogue 2002

Classified by

Name:
Owen, Tony
Date:
20/12/2012 13:57
Telephone:
024 7630 3422

Company:
Ian Farmer Associates
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road
Coventry
CV3 4LJ

Sample details

Sample Name:
TP4
Site:

Project:

Sample Depth:
0.2 m
Wet Weight Moisture Content:
0%
Comments:

EWC 2002 code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Additional: Additional Risk Phrases "Additional risk phrases apply, please check potential effects. NOTE: These are additional risk phrases and such a risk phrases alone will not cause a waste to be hazardous."

Risk phrases hit:

R33 "Danger of cumulative effects"

Because of determinand:

Lead chromate: (0.0059%)

Determinands (Wet Weight Moisture Content:0%)

Arsenic trioxide: (Cation conc. entered: 12 mg/kg, converted to compound conc.:15.84 mg/kg or 0.0016%)
Cadmium sulphide: (Cation conc. entered: 0.5 mg/kg, converted to compound conc.:0.64 mg/kg or 0.000064%)
Chromium(VI) oxide: (Cation conc. entered: <1 mg/kg, converted to compound conc.:<1.92 mg/kg or <0.00019%) IGNORED Because: "<LOD"
Copper (I) oxide: (Cation conc. entered: 21 mg/kg, converted to compound conc.:23.64 mg/kg or 0.0024%)
Lead chromate: (Cation conc. entered: 38 mg/kg, converted to compound conc.:59.27 mg/kg or 0.0059%)
Mercury dichloride: (Cation conc. entered: 0.07 mg/kg, converted to compound conc.:0.095 mg/kg or 0.0000095%)
Nickel dihydroxide: (Cation conc. entered: 15 mg/kg, converted to compound conc.:23.69 mg/kg or 0.0024%)
Selenium compounds (with the exception of cadmium sulphoselenide and sodium selenite): (Cation conc. entered: <0.5 mg/kg, converted to compound conc.:<0.75 mg/kg or <0.000075%) IGNORED Because: "<LOD"
Zinc chromate: (Cation conc. entered: 71 mg/kg, converted to compound conc.:196.96 mg/kg or 0.020%)
Cyanides (with the exception of complex cyanides): (Cation conc. entered: <0.1 mg/kg, converted to compound conc.:<0.10 mg/kg or <0.000010%) IGNORED Because: "<LOD"

pH: (Whole concentration entered as: 8.5 pH or 8.50 pH)
Acenaphthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Acenaphthylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[a]pyrene; benzo[def]chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[b]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[k]fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Benzo[ghi]perylene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Chrysene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Dibenz[a,h]anthracene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluoranthene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Fluorene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Indeno[123-cd]pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Naphthalene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenanthrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Pyrene: (Whole concentration entered as: <0.1 mg/kg or <0.000010%) IGNORED Because: "<LOD"
Phenol: (Whole concentration entered as: <0.3 mg/kg or <0.000030%) IGNORED Because: "<LOD"

Notes utilised in assessment

Additional Risk Phrase Comments
from section: Table 3.1 in the document: "WM2 - Hazardous Waste Technical Guidance"
"This is an additional risk phrase and such a risk phrase alone will not cause a waste to be hazardous."

Note used on:

Test: "Additional on R33" for determinand: "Lead chromate"

C14.5.5: Step 5
from section: C14.5 in the document: "WM2 - Hazardous Waste Technical Guidance"
"Remove dangerous substances below the trace impurity thresholds concentrations from further consideration. Where an individual dangerous substance is present at a very low concentration it can be excluded from further consideration."

Note used on:

Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Cadmium sulphide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Arsenic trioxide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Copper (I) oxide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Lead chromate"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Mercury dichloride"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Nickel dihydroxide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Zinc chromate"

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

Test: "H14 on R50/53" for determinand: "Lead chromate"
Test: "H14 on R50, R52, R53, R52/53" for determinand: "Cadmium sulphide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Cadmium sulphide"
Test: "H14 on R50, R52, R53, R50/53, R51/53, R52/53" for determinand: "Lead chromate"

Substance notes

Note 1
from section: 1.1.3.2, Annex VI in the document: "CLP Regulations"
"The concentration stated or, in the absence of such concentrations, the generic concentrations of this Regulation (Table 3.1) or the generic concentrations of Directive 1999/45/EC (Table 3.2), are the percentages by weight of the metallic element calculated with reference to the total weight of the mixture."

Note used on:

determinand: "Cadmium sulphide"
determinand: "Lead chromate"

Note A
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Without prejudice to Article 17(2), the name of the substance must appear on the label in the form of one of the designations given in Part 3. In Part 3, use is sometimes made of a general description such as '... compounds' or '... salts'. In this case, the supplier is required to state on the label the correct name, due account being taken of section 1.1.1.4."

Note used on:

determinand: "Zinc chromate"

Note E (Table 3.2)
from section: 1.1.3.1, Annex VI in the document: "CLP Regulations"
"Substances with specific effects on human health (see Chapter 4 of Annex VI to Directive 67/548/EEC) that are classified as carcinogenic, mutagenic and/or toxic for reproduction in categories 1 or 2 are ascribed Note E if they are also classified as very toxic (T+), toxic (T) or harmful (Xn). For these substances, the risk phrases R20, R21, R22, R23, R24, R25, R26, R27, R28, R39, R68 (harmful), R48 and R65 and all combinations of these risk phrases shall be preceded by the word 'Also'."

Note used on:

determinand: "Arsenic trioxide"
determinand: "Cadmium sulphide"
determinand: "Nickel dihydroxide"
determinand: "Zinc chromate"

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HazWasteOnline Database: 1.0.2152.4915 (08 Dec 2012)

APPENDIX 7

GAS GENERATION

APPENDIX 7

GENERAL NOTES ON GAS GENERATION

A7.1 GENERAL

A7.1.1 In the past, a series of guidance documents were published by CIRIA, ref. 9.41, providing advice on hazards associated with methane. This earlier guidance was consolidated in CIRIA Document C659 to provide a risk based approach to gas contaminated land. This was subsequently re-issued as CIRIA Document C665, ref 9.42. In 2007, British Standard, BS8485, ref 9.43, dealing with ground gas was published. It is recommended that guidance in C665 and BS8485 is adopted to provide a consistent approach in dealing with ground gas contamination, the principal details being as follows.

A7.1.2 This guidance is based on a similar approach to that for dealing with contaminated soil. The presence of hazardous gases could be deemed to be the 'source' in a 'pollutant linkage' that could lead to the conclusion that significant harm is or could be caused to people, buildings or the environment. In such circumstances the land could be deemed 'contaminated', ref. 9.23.

A7.1.3 Should a potential source of gas be identified in the conceptual model, a gas risk assessment should be carried out, sufficient to demonstrate to the local authority that the proposals mitigate any hazards associated with ground gas. The authority enforces compliance with Approved Document Part C of the Building Regulations, ref. 9.44.

A7.2 APPROACH

A7.2.1 A flow chart detailing the approach to assessing a site is given in CIRIA document C665, Figure 1.1. This may be summarised as follows.

- Carry out Phase 1 desk study, including initial conceptual model
- Assess site, potential presence of gas / potential unacceptable risk / identify further action, if necessary
- Monitor gas concentrations
- Assessment of Risk
- Recommendations / remediation
- Validation

A7.3 POLLUTANT LINKAGE ASSESSMENT

A7.3.1 A pollutant linkage assessment is presented in Appendix 3 of the Phase 1 Desk Study Report.

A7.3.2 Using the risk model in the desk study, the pollutant linkage can be identified and a preliminary estimate of risk undertaken. If there is no relevant pollutant linkage identified there is no risk. If there is a very low risk, it is likely that no further assessment is required. If further assessment is necessary, then gas monitoring is required.

A7.4 SITE MONITORING

A7.4.1 For sites with low generation potential, giving consistently low concentrations of soil gas under the worst-case conditions, a limited programme of monitoring would be appropriate. Where high or variable concentrations are anticipated or recorded, an extended programme of monitoring would be appropriate. The following guideline has been proposed, ref. 9.46.

Table A7.1

		Generation potential of source				
Sensitivity of development		**Very low**	**Low**	**Moderate**	**High**	**Very high**
	Low (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with gardens)	6/3*	9/6	12/6	24/12	24/24

Notes

1. First number is minimum number of readings and second number is minimum period in months, for example 4/1 – Four sets of readings over 1 month.

2. At least two sets of readings must be at low and falling atmospheric pressure (but not restricted to periods below <1000mb) known as worst case conditions (see Boyle and Witherington, 2006).

3. The frequency and period stated are considered to represent typical minimum requirements. Depending on specific circumstances fewer or additional readings may be required (e.g. any such variation subject to site specific justification). * The NHBC guidance is also recommending these periods/frequency of monitoring (Boyle and Witherington, 2006)

4. Historical data can be used as part of the data set.

5. Not all sites will require gas monitoring however, this would need to be confirmed with demonstrable evidence.

6. Placing high sensitivity end use on a high hazard site is not normally acceptable unless the source is removed or treated to reduce its gassing potential. Under such circumstances long-term monitoring may not be appropriate or required.

A7.4.2 Before taking any readings, zero the instrument, record atmospheric pressure and temperature.

A7.4.3 Gas flow should be recorded, giving the range of pressures, ensuring positive or negative flow is recorded.

A7.4.4 Record gas levels, recording peak and steady. Where steady state not obtained within 3 minutes, record change in concentration, where concentrations are decreasing, always record peak value. For very high concentrations, record for longer period of up to 10 minutes.

A7.5 ASSESSMENT OF RISK AND RECOMMENDATIONS

A7.5.1 The main method of characterising a site is the method described by Wilson and Card, ref. 9.47 and is termed Situation A. This can be used for all types of development except conventional low-rise housing with suspended ground floor and ventilated underfloor void.

A7.5.2 Low rise housing, Situation B, was developed by Boyle and Witherington, ref. 9.48 and was developed for the NHBC for classifying gassing sites for houses with suspended ground floor slab with ventilated void.

A7.5.3 Although the Code of Practice, ref 9.43, assesses the characteristic gas situation as CIRIA recommend for Situation A, see Table A7.2 below, their solution for gas protection systems is different, see section A7.10.

A7.6 SITUATION A - ASSESSMENT

A7.6.1 This system proposed by Wilson and Card, ref. 9.47 was originally developed in CIRIA Report 149, ref. 9.41.

A7.6.2 The method uses both gas concentrations and borehole flow rate for methane and carbon dioxide to define a Characteristic Situation for a site.

A7.6.3 Gas Screening Value (litre/hr) = borehole flow rate (litre/hr) x gas concentration (%). The GSV is determined for methane and carbon dioxide and the worst case adopted. The Characteristic Situation can then be determined from the table below. The GSV can be exceeded if the conceptual model indicates it is safe to do so, and other factors may lead to a change in the Characteristic Situation.

Table A7.2

Characteristic Situation	Risk Classification	Gas screening value (CH_4 or CO_2(1/hr)[1]	Additional factors	Typical source of generation
1	Very low risk	<0.07	Typically methane ≤1% and/or carbon dioxide ≤5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" Made Ground
2	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to Characteristic Situation 3	Natural soil, high peat/organic content. "Typical" Made Ground
3	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
5	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	Very high risk	>70		Recent landfill site

1. Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods defined in Table A7.1
2. Source of gas and generation potential/performance must be identified.
3. If there is no detectable flow use the limit of detection of the instrument.

A7.7 SITUATION A – SOLUTION

A7.7.1 The Characteristic Situation can be used to define the scope of gas protective measures required.

A7.7.2 The CIRIA approach uses the characteristic situation to define the level of gas protection as follows:

Table A7.3

Characteristic situation	Residential building (Not low-rise traditional housing)		Office/commercial/industrial development	
	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a) Reinforced concrete cast in situ floor slab (suspended non-suspended or raft) with at least 1200g DPM and underfloor venting b) Beam and block or pre-cast concrete and 2000g DPM / reinforced gas membrane and underfloor venting All joints and penetrations sealed	1 to 2	a) Reinforced concrete cast in-situ floor slab (suspended non-suspended or raft) with at least 1200g DPM b) Beam and block or pre cast concrete slab and minimum 2000g DPM/reinforced gas membrane c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use All joints and penetrations sealed
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space
4	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and	2 to 3	All types of floor slab as above. All joints and penetration sealed. Proprietary gas resistant membrane and passively

Characteristic situation	Residential building (Not low-rise traditional housing)		Office/commercial/industrial development	
		passively ventilated underfloor subspace or positively pressurised underfloor sub-space, oversite capping or blinding and in ground venting layer		ventilated or positively pressurised underfloor sub-space with monitoring facility
5	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in ground venting wells or barriers	3 to 4	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers
6	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design	4 to 5	Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

1. Typical scope of protective measures may be rationalised for specific developments on the basis of quantitative risk assessments.

2. Note the type of protection is given for illustration purposes only. Information on the detailing and construction of passive protection measures is given in BR414, ref. 9.45.

3. In all cases there should be minimum penetration of ground slabs by services and minimum number of confined spaces such as cupboards above the ground slab. Any confined spaces should be ventilated.

4. Foundation design must minimise differential settlement particularly between structural elements and ground-bearing slabs.

5. Commercial buildings with basement car parks, provided with ventilation in accordance with the Building Regulations, may not require gas protection for characteristic situations 3 and 4.

6. Floor slabs should provide an acceptable formation on which to lay the gas membrane. If a block and beam floor is used it should be well detailed so it has no voids in it that membranes have to span, and all holes for service penetrations should

be filled. The minimum density of the blocks should be 600kg/m^3 and the top surface should have a 4:1 sand cement grout brushed into all joints before placing any membrane (this is also good practice to stabilise the floor and should be carried out regardless of the need for gas membrane).

7. The gas-resistant membrane can also act as the damp-proof membrane.

A7.8 SITUATION B -ASSESSMENT

A7.8.1 The NHBC has developed a characterisation system that is similar to Situation A but is specific to low-rise housing development with a clear ventilated underfloor void. The gas emission rates are compared to generic 'Traffic Lights'.

A7.8.2 The Traffic Lights include a Typical Maximum Concentration that is used for initial screening purposes. Where the Typical Maximum Concentration is exceeded the risk-based Gas Screening Value, GSV, should be adopted. The GSVs are determined for the 'model' low rise development and where they differ from this model, the GSV should be reassessed, ref. 9.42.

A7.8.3 The calculations should be made for both methane and carbon dioxide, and the worst case adopted. The GSV is only a guideline.

Table A7.4

Traffic light	Methane		Carbon dioxide	
	Typical maximum concentration[2] (% v/v)	**Gas screening value (GSV)[3] (litres per hour)**	**Typical maximum concentration[2] (% v/v)**	**Gas screening value (GSV)[1,2] (litres per hour)**
Green				
	1	**0.16**	5	**0.78**
Amber 1				
	5	**0.63**	10	**1.56**
Amber 2				
	20	**1.56**	30	**3.13**
Red				

1. Generic GSVs are based on guidance contained within latest revision of Department of the Environment and the Welsh Office (2004 edition) "The Building Regulations: Approved Document C" and used a sub-floor void of 150mm thickness.

2. The Typical Maximum Concentrations can be exceeded in certain circumstances should the conceptual site model indicate it is safe to do so. This is where professional judgement will be required, based on a thorough understanding of the gas-regime identified at the site where monitoring in the worst temporal conditions has occurred.

3. The GSV thresholds should not generally be exceeded without completion of a detailed gas risk assessment taking into account site-specific conditions.

A7.9 SITUATION B – SOLUTION

A7.9.1 On the basis of this Traffic Light classification the following protection should be applied to low-rise housing.

Table A7.5

Traffic Light Classification	Protection measures required
Green	Negligible gas regime identified and gas protection measures are not considered necessary.
Amber 1	Low to intermediate gas regime identified, which requires low-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to limit the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. Ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours.
Amber 2	Intermediate to high gas regime identified, which requires high-level gas protection measures, comprising a membrane and ventilated sub-floor void to create a permeability contrast to prevent the ingress of gas into buildings. Gas protection measures should be as prescribed in BRE Report 414. A specialist contractor should always fit membranes. As with Amber 1, ventilation of the sub-floor void should facilitate a minimum of one complete volume change per 24 hours. Certification that these passive protection measures have been installed correctly should be provided.
Red	High gas regime identified. It is considered that standard residential housing would not normally be acceptable without a further Gas Risk Assessment and/or possible remedial mitigation measures to reduce and/or remove the source of gas.

A7.10 CODE OF PRACTICE – SOLUTIONS

A7.10.1 The Characteristic Gas Situation is determine in a similar manner to that recommended by CIRIA, see Table A7.2 above.

A7.10.2 Having selected the Characteristic Gas Situation, the appropriate gas protection could be selected for the building. The tables below give a guide as to the relative performance of the various designs and systems.

A7.10.3 A guidance value for the required gas protection, in the range 0 to 7 should be obtained from Table A7.6 below. Then, a combination of ventilation and/or barrier system should be chosen from Table A7.7 to meet that requirement.

Table A7.6

Characteristic gas situation, CS	NHBC *traffic light*	Required gas protection			
		Non-managed property, e.g. private housing	Public building [A]	Commercial buildings	Industrial buildings [B]
1	*Green*	0	0	0	0
2	*Amber 1*	3	3	2	1[C]
3	*Amber 2*	4	3	2	2
4	*Red*	6[D]	5[D] 6[E]	4 5 7	3 4 6

NOTE: Traffic light indications are taken from NHBC Report no.: 10627-R01 (04) [3] and are mainly applicable to low-rise residential housing. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.

A) Public buildings include, for example, managed apartments, schools and hospitals.
B) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.
C) Maximum methane concentration 20% otherwise consider an increase to CS3.
D) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
E) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any protection scheme.

A7.10.4 Having determined the appropriate guidance value from Table A7.6, an element or combination of elements from a), b), c) or d) in Table A7.7, should be chosen to achieve the required level of protection .

Table A7.7

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
a) Venting/dilution			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]	Very good performance	2.5	*Ventilation performance in accordance with Annex A, ref. 9.43*
	Good performance	1	*If passive ventilation is poor this is generally unacceptable and some form of active system will be required*
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.)[A]		2.5	*There have to be robust management systems in place to ensure the continued maintenance of any ventilation system.* *Active ventilation can always be designed to meet good performance.* *Mechanically assisted systems come in two main forms: extraction and positive pressurization.*

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
Ventilated car park (basement or undercroft)		4	*Assumes car park is vented to deal with car exhaust fumes, designed to Building Regulations Document F and IstructE guidance*
b) Barriers			
Floor slabs			
Block and beam floor slab		0	*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum.* *Breached in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances*
Reinforced concrete ground bearing floor slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation[B), C)]		0.5	*The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation, and the integrity of joints*
Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA)[B), C)]		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	*Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.*
Permanent monitoring and alarm system[A)]	Installed in the underfloor venting/ dilution system	2	
	Installed in the building	1	
e) Pathway intervention			
Pathway intervention		-	*This can consist of site protection measures for off-site or on-site sources (see Annex A, ref. 9.43)*
NOTE: In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection			

A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.

B) If a 1200 g DPM material is to function as a gas barrier it should be installed according to BRE 414, ref. 9.45 being taped and sealed to all penetrations.

C) Polymeric Materials >1200g can be used to improve confidence in the barrier. Remember that their gas resistance is little more than the standard 1200g (proportional to thickness) but their physical properties mean that they are more robust and resistant to site damage.

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

CONTRACT NAME:	**St Mary's Court, Barwell**
CONTRACT NO:	**20970**
DATE:	**29/11/2012**

Background Readings:			
O_2% v/v 20.5	**CO_2% v/v 0.1**	**CH_4% v/v 0.0**	**WEATHER CONDITIONS: Cold, sunny spells, slight wind, 2°C**
H_2S ppm 0	**CO ppm 0**		**GROUND CONDITIONs: Frosty**

BOREHOLE	TIME	ATMOSPHERIC PRESSURE	O_2% v/v		CO_2% v/v		CH_4% v/v		H_2S ppm	CO ppm	Gas Flow Rate (l/hr)		DEPTH TO LNAPL	WATER DEPTH	DEPTH TO DNAPL	TOTAL DEPTH
			LOW	STEADY	HIGH	STEADY	HIGH	STEADY	PEAK	PEAK	PEAK	AVERAGE	mBGL	mBGL	mBGL	mBGL
BH1A		1008	19.3	19.3	0.9	0.9	0.0	0.0	0	0	0.1	0.0	-	0.90	-	5.07
BH1B		1008	19.8	19.8	0.8	0.8	0.0	0.0	0	0	0.0	0.0	-	0.80	-	1.35
BH2		1008	20.4	20.4	0.4	0.4	0.0	0.0	0	0	0.0	0.0	-	1.24	-	2.86

REMARKS:

Figure A7.1

JMS Consulting Engineers Ltd
114D Abbey Street
NUNEATON
Warwickshire
CV11 5BX

20th October 2006

For the Attention of Mr D Staines

Dear Daniel,

ST MARY'S COURT, BARWELL (20106)

Introduction

Ian Farmer Associates (IFA) were instructed to carry out a ground investigation at the site known as St Mary's Court, Barwell. The purpose of this investigation was to determine the potential for harmful gas emissions as a result of possible nearby landfilling activity. Three window sample boreholes were sunk at the locations shown on the attached site plan. The borehole logs are attached.

Published Geology

Details of the geology underlying the site have been obtained from the British Geological Survey map, Sheet No.169, 'Coventry', solid and drift edition, 1:50,000 scale, published 1994. The geological map indicates the site to be underlain by superficial deposits of the Wolston Glacial Succession, consisting sands and gravels, and clays and gravelly clays. The superficial deposits are underlain by the Mercia Mudstone Group, described as red gypsiferous mudstones.

Materials Encountered

Each of the three window sample holes encountered the deposits of the Wolston Glacial Succession, varying between orange or red clayey sands to red sandy clays. Each hole had a layer of topsoil or topsoil fill from surface.

Assessment of Gas Emission

Six visits were made to site to monitor the standpipes installed in WS2 and WS3. The results of this monitoring are attached.

Slightly elevated levels of carbon dioxide, along with slightly depleted levels of oxygen have been measured in the two standpipes installed. However, no flow has been recorded from the instruments. By following the work of S A Wilson and G B Card (1999), ref. 1.1, the Limiting Volume Flow Rate of Gas was calculated to fall under Characteristic Situation 1. As such, it is considered that no specific design measures are required against the ingress of toxic gases. This is based on the assumption that the values remain the same over a six month period.

Should you require any further information, then please do not hesitate to contact me.

Yours Sincerely
For Ian Farmer Associates (1998) Limited

P.C.G Bailey
Principal Engineering Geologist

1.1 Wilson S A and Card G B, 'Reliability and Risk in Gas Protection Design', 2004.

Enc. Site Plan
Window Sample Borehole Logs
Gas & Groundwater Monitoring

IAN FARMER ASSOCIATES

Site	Number
St Mary's Court, Barwell	WS1

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Tony Morris Builders and Co	20106
	Location	**Dates** 15/09/2006	**Engineer** JMS Consulting Engineers Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.40) 0.40	MADE GROUND: Soft, orange brown mottled dark brown, slightly gravelly, slightly sandy clay. Gravel is fine to coarse, angular to rounded			
0.50	D1				(0.20) 0.60	MADE GROUND: Dark brown, very gravelly topsoil fill			
					(0.30) 0.90	Dark brown, slightly gravelly, sandy TOPSOIL			
1.10	D2				(0.70) 1.60	Moist, light orange brown, clayey, fine SAND			
1.80	D3				(0.40) 2.00	Firm to stiff, red brown mottled light brown CLAY, occasional slightly sandy with occasional fine sandy pockets			
2.60	D4		Slight Seepage(1) at 2.60m.		(0.80) 2.80	Soft, red brown, very sandy CLAY, with some sand pockets		▽1	
					(0.20) 3.00	Red brown, clayey, fine SAND			
						Complete at 3.00m			

Remarks

Scale (approx)	Logged By
1:25	PB

Figure No. 20106.WS1

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IAN FARMER ASSOCIATES

Site	Number
St Mary's Court, Barwell	WS2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Tony Morris Builders and Co	20106
	Location	**Dates** 15/09/2006	**Engineer** JMS Consulting Engineers Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(1.00)	Dark brown, slightly gravelly, sandy TOPSOIL			
0.70	D1				1.00	Soft, red brown, very sandy CLAY with some clayey sand pockets			
1.60	D2				(1.00)				
					2.00	Wet, red brown, clayey, fine SAND			
2.70	D3				(1.00)				
					3.00	Complete at 3.00m			

Remarks

Scale (approx)	Logged By
1:25	PB

Figure No. 20106.WS2

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IAN FARMER ASSOCIATES

Site	Number
St Mary's Court, Barwell	WS3

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Window Sampler			Tony Morris Builders and Co	20106
	Location	**Dates** 15/09/2006	**Engineer** JMS Consulting Engineers Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	D1				(0.70)	MADE GROUND: Dark brown, sandy topsoil fill			
0.70	D2				0.70	Firm, red brown mottled light brown, sandy CLAY, with occasional sand pockets			
					(0.90)				
1.60	D3				1.60	Soft to firm, red brown, sandy to very sandy CLAY/SILT, with some pockets of fine sand			
					(1.40)				
2.70	D4				3.00	Complete at 3.00m			

Remarks

Scale (approx)	Logged By
1:25	PB

Figure No. 20106.WS3

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Contract Name: St Mary's Court, Barwell
Contract No: 20106

IAN FARMER ASSOCIATES

Gas and Groundwater Monitoring

Date	18/09/2006	25/09/2006	29/09/2006	03/10/2006	06/10/2006	09/10/2006
WS2						
Atmospheric Pressure (mb)	995	996	990	987	986	1003
Depth to Water (m)	0.84	0.80	0.75	0.50	0.56	0.62
O_2	19.7%	19.8%	19.6%	20.4%	21.1%	21.2%
CO_2	1.8%	1.6%	1.8%	0.8%	0.0%	0.0%
CH_4	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
H_2S (ppm)	0	0	0	0	0	0
CO (ppm)	0.0	0.0	0.0	0.0	0.0	0.0
Flow l/hr	0.0	0.0	0.0	0.0	0.0	0.0
WS3						
Atmospheric Pressure (mb)	995	996	990	987	986	1003
Depth to Water (m)	2.60	2.50	1.51	2.10	2.24	2.3
O_2	17.0%	15.4%	16.8%	17.8%	21.4%	21.5%
CO_2	2.4%	3.8%	3.1%	2.1%	2.1%	0.0%
CH_4	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
H_2S (ppm)	0	0	0	0	0	0
CO (ppm)	0.0	0.0	0.0	0.0	0.0	0.0
Flow l/hr	0.0	0.0	0.0	0.0	0.0	-0.3

- Geotechnical Investigation and Advice
- Environmental Investigation and Advice
- Structural and Condition Surveys
- Desk Studies
- Compliance Testing of Material
- Concrete Technology
- Asbestos Survey and Management
- Insitu Testing
- Archaeological Studies and Surveys



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