Technical Note

P/2017/00141
Received
03/02/2017

ATKINS

Project:	**Albion Gateway, Burton Upon Trent, Phase 3**	**To:**	**St Modwen Developments Ltd**
Subject:	**Ground Condition Review and Summary**	**From:**	**Atkins Limited**
Date:	**October 2016**	**cc:**	

1. Introduction

1.1. General

Atkins Limited (Atkins) has been commissioned by St. Modwen Developments Limited (SMD) to carry out a geo-environmental assessment for the overall site at Derby Road, Burton upon Trent, Staffordshire.

This technical note summarises the scope and findings of investigative works and recommendations for works in line with the proposed redevelopment of the Phase 3 area of the site for a commercial/retail end use.

1.2. Project References

The recommendations made in this report are based on information contained within the following sources of information:

- IFA Factual Ground Investigation Report, January 2015 (Appendix A)

2. Site Details

2.1. Site Location and Description

The Derby Road site comprises land formerly operated by Pirelli, located off Derby Road in Stretton, Burton upon Trent. The Ordnance Survey National Grid Reference for the approximate centre of the site is SK25465 25237.

The site is predominantly flat, although overgrown in places and uneven under foot, with a slight raised hardcore road running northwest-southeast across the centre of the site. The gravel road marks a slight change in level of approximately 1m between the northern portion of the site and the southern portion.

The site is bound to the northwest by the existing Pirelli factory, to the north by Phases 1-2 of the Albion Gateway development and by Derby Road to the east. Burton Albion football stadium borders the site to the south.

2.2. Surrounding Area

The site lies within an area of mixed use. Land to the north and northeast of the site predominantly comprises residential properties whilst land to the east, south and west predominantly comprise industrial/commercial units and factories.

2.3. Proposed Redevelopment

The proposed development is to comprise a supermarket development (use class A1), drive through coffee shop / restaurant (use class A1 / A3 / A5), retail units (use class A1), a gymnasium (use class D2), employment units (use class B1 / B2 / B8), with access, car parking, landscaping

and associated works (full). A builders' merchant (sui generis) use is also proposed, but this is considered to have similar character to B8 activity.

3. Ground Investigation Summary

3.1. Investigation Scope

Ian Farmer and Associates (IFA) Limited were appointed as the specialist ground investigation contractor to undertake the intrusive works which were carried out for the overall site area between the 3rd and 12th November 2014.

The scope of work designed by Atkins was carried out in general accordance with BS5930. The location of exploratory holes is shown on the Exploratory Hole Location Plan contained within the IFA Factual Report.

The sampling strategy was designed to obtain representative soil and water samples from each of the stratum encountered. Groundwater samples were obtained as part of the monitoring exercise and geotechnical testing was undertaken to assist with determination of engineering properties of identified soils for preliminary foundation design. The locations of all known exploratory holes within the site are shown on Drawing 5121643-ATK-DR-D-0143.

3.2. Cable Percussive Boreholes

Standard penetration tests (SPTs) were completed at regular intervals throughout the depth of the boreholes in order to assess the relative density and shear strength of the materials encountered. SPT results (N Values) are presented on the boreholes logs contained within the Factual Ground Investigation Report.

Cable percussion boreholes were logged by the IFA Engineer. Observations of groundwater were made during drilling and are included on the relevant exploratory hole logs.

3.3. Trial Pits

Trial pits were scheduled across the site in order to inspect both man-made and natural ground across the site. Trial pits were advanced, using a JCB 3CX excavator, to depths of between 1.75 – 2.8m bgl. Due to poor ground conditions trial pits could excavation beyond 2.8m bgl was not possible within any of the pits due to instability of the granular material and groundwater ingress.

Logging and sampling of soils was undertaken by the IFA engineer. All trial pits were backfilled with excavated soil arisings and nominally compacted with the excavator bucket. Any excess arisings were mounded on top of the trial pits to allow for settlement.

3.4. Standpipe Installations

50mm diameter gas and groundwater monitoring standpipes were constructed within the cable percussion boreholes in order to permit the collection of groundwater samples and the monitoring of groundwater levels and ground gas concentrations.

Gas valves were placed in the top of the installation and the installation were finished with a lockable raised metal cover at ground level. Construction details and the strata in which the response zone is located are provided upon the borehole logs and within the table below.

Table 1. Standpipe Installation Details

Location	Response Zone (mbgl)		Response Zone (mAOD)		Stratum Monitored
	Top	Bottom	Top	Bottom	
ATKCP001	3.0	5.0	42.25	40.25	Superficial sand and gravel deposits
ATKCP002	2.5	5.5	42.10	39.10	Superficial sand and gravel deposits
ATKCP003	2.5	6.5	42.62	39.12	Superficial sand and gravel deposits
ATKCP004	2.0	5.0	41.93	38.93	Superficial sand and gravel deposits

3.5. Ground Gas Monitoring

Ground gas monitoring was undertaken, by IFA, using a GA2000 infra-red gas analyser with the following parameters measured:

- Oxygen concentrations (by volume in air (%v/v));
- Methane concentrations (%v/v);
- Carbon dioxide concentrations (%v/v);
- Carbon monoxide (parts per million (ppm));
- Hydrogen sulphide (ppm);
- Barometric pressure (mb); and
- Gas flow rates (l/hr)

Ground gas monitoring has been undertaken on five occasions, between 19th November 2013 and 2nd January 2014. The data collected during the ground gas monitoring is presented in the IFA Factual Report.

4. Ground Conditions Proven

A summary of the ground conditions identified during the investigation is discussed below. Copy of the relevant exploratory hole logs are attached to this technical note and presented within the IFA Factual Report, which should be consulted for further detail.

4.1. Topsoil

Grass cover was present at all locations in the south western half of the site with an average approximate thickness of 0.15m.

4.2. Made Ground

Made Ground deposits were recorded in each of the exploratory hole locations to depths ranging between 0.3m and 1.55m. Made Ground was noted to be deeper within the southwest of the site beneath the former sports fields where it was encountered to depths of around 1.55m bgl. The thickness of Made Ground was noted to be less in the north of the site.

Made Ground across the site was found to be variable in composition and comprised quantities of sand, clay and gravel with fragments of brick, ceramics, rootlets and occasional concrete. No visual or olfactory evidence was observed.

4.3. Superficial Deposits

Superficial Deposits were encountered within each of the borehole locations underlying topsoil/surface coverings or beneath Made Ground. The Superficial Deposits were encountered from depths ranging between 0.3m and 1.65m.

4.4. Bedrock – Mercia Mudstone Group

Bedrock was encountered at depths of between 5.5m bgl and 7.4m within the boreholes. The depths at which bedrock were encountered were consistent ranging between 38.71m and 38.17m AOD. The depth to bedrock appears to increase from northeast to southwest across the site.

Where encountered, the bedrock typically comprised a very weak red/brown mudstone, presenting itself as stiff, friable red to brown clay with gravel size mudstone lithorelicts. Occasionally the mudstone was recorded as an extremely weak greenish grey weathered siltstone.

4.5. Groundwater

Groundwater was identified during the wider investigation and was generally found to lie within the superficial soils beneath the site.

Table 2: Groundwater Strikes

Borehole Number	Groundwater strikes mbgl	Groundwater level after 20 minutes mbgl	Stratum encountered
CP001	3.00	2.00	Superficial sand and gravel deposits
CP002	3.00	2.50	Superficial sand and gravel deposits
CP003	3.00	2.90	Superficial sand and gravel deposits
CP004	3.00	2.50	Superficial sand and gravel deposits

A total of six groundwater level monitoring visits have been completed, as summarised below.

Table 3: Groundwater Monitoring

Borehole	Depth to Groundwater (mbgl)		Groundwater Levels Monitored (mAOD)		Cover levels (mAOD)	Comments
	Range	Average	Range	Average		
CP001	2.06 – 2.42	2.22	43.21 – 43.47	43.41	45.63	No comment
CP002	1.23 – 1.49	1.33	43.36 – 43.62	43.52	44.85	No comment
CP003	1.70 – 1.92	1.81	43.43 – 43.65	43.54	45.35	No comment
CP004	0.46 – 0.76	0.60	43.41 – 43.71	43.57	44.17	No comment

4.6. Soil Borne Gas

Six ground borne gas monitoring visits were scheduled as part of the Atkins investigation, as summarised below.

Table 4: Gas Monitoring Results

Borehole	CH_4 (peak) (%vol)		CO_2 (peak) (%vol)		O_2 (min) (%vol)		Flow Rate (l/hr)	
	Range	Average	Range	Average	Range	Average	Range	Average
CP001	<0.1	<0.1	<0.1	<0.1	19.8 – 20.4	19.8	0.0 – 0.1	0.0
CP002	<0.1	<0.1	<0.1 – 0.3	0.1	20.0 – 20.4	20.4	-2.8 – 0.0	-0.6
CP003	<0.1	<0.1	<0.1 – 1.0	0.3	19.9 – 21.9	20.4	0.0 – 0.1	0.0
CP004	<0.1	<0.1	0.1 – 1.1	0.4	19.5 – 21.5	20.2	-2.8 – 0.1	-0.5

Recorded concentrations of Methane were found to be below the detection limit of the GA2000 (<0.1l/hr) within all the holes monitored. Carbon dioxide concentrations were identified as ranging between <0.1%v/v and 4.3% v/v.

5. Site Assessment and Recommendations

5.1. Development Considerations

5.1.1. Clean Cover/Imported Materials

It is envisaged that any fill materials, as required in order to raise or provide final clean cover ground levels across Derby Road, will comprise imported soils.

All imported soils should be tested at source, prior to import onto site. The frequency of testing will need to be agreed by the developer with the relevant authorities. Samples should be tested for a range of chemical determinants, and shall include (as a minimum) the priority contaminants covered in the factual report.

5.1.2. BRE Concrete Classification

Chemical Testing of soils for concrete classification (refer to section 6.3), suggests a need for a concrete classification sulphate class DS-1 and Aggressive Chemical Environment for Concrete (ACEC) class of AC-1 for below ground concrete within the final development.

5.1.3. Soil Borne Gas Mitigation Measures

Based on monitoring data to date (refer to section 4.6), the site has been classified as Characteristic Gas Situation 1 or Green classification. This classification requires no special precautions however CIRIA C665 states;

'it is recommended that 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. Foundation design should minimise differential settlement particularly between structural elements and ground-bearing slabs.

5.1.4. Ground and Construction Workers

Due to the presence of isolated contamination within Made Ground underlying the site, a short term risk could exist to construction and ground workers involved in the remedial/reclamation works. The adoption of good hygiene procedures and suitable Personal Protective Equipment (PPE) should be sufficient to minimise the risks posed by exposure to such soils.

5.2. Reclamation Objectives

The primary objective of the works is to remove or minimise potential ground abnormals associated with the proposed redevelopment of the site and enable a stable platform for subsequent development.

5.3. Reclamation

5.3.1. Remediation Criteria

The remediation criteria have been derived based on the available data for the site and using the Atkins derived SSVs, details of which are presented in the Atkins Assessment Report. These are considered appropriate based on development proposals for Derby Road.

5.3.2. Preferred Reclamation Option

The preferred reclamation option for the site is a civil engineering based solution. This technique involves excavating the source of any contaminated material encountered.

It has the advantage that it is an observational technique and potentially contaminated material can be identified and/or investigated further during excavation in order to determine whether a source is evident and/or the contaminated material has been removed. Dependent upon the type and nature of the material encountered during reclamation/remediation one or a combination of the following methodologies may be employed.

a) Unsuitable material can be disposed of off-site however, this is a potentially expensive and environmentally unsustainable solution requiring disposal of the contaminated material to a suitable disposal facility

b) On-site accommodation of unsuitable materials in a location considered suitable based upon the proposed development layout and/or the incorporation of suitable mitigation measures.

A source of clean inert material may be required to backfill excavations associated with both options.

5.3.3. Validation

Plate Load Tests shall be undertaken using a 600mm diameter plate to demonstrate that the factor of safety against failure is not less than 3 and a pressure of up to 240kN/m^2 shall be applied during the test with settlement not exceeding 25mm at the maximum load of 240kN/m^2.

The degree of compaction shall also seek where possible to achieve a minimum of 95% maximum dry density established using the 2.5 kg rammer compaction test, with actual dry densities achieved confirmed by field testing, where material particle size is appropriate.

Plate load tests will be performed at a rate of 1 per 500m^2.

The suite of testing for priority contaminants will include, as a minimum the following to be tested at a frequency of one sample per 500m^3:

- pH (0.1 unit)
- Soil Organic Matter
- Metals (detection limit of 1mg/kg)
- Speciated PAHs (detection limit of 0.1mg/kg)
- TPH (aliphatic/aromatic split with carbon banding as per the TPH Criteria Working Group suite) (detection limit of 10mg/kg)
- Asbestos (detection limit 0.001%)

5.3.4. Validation Reporting

A validation report for the works will be prepared to demonstrate compliance with reclamation objectives and criteria.

As a minimum, the validation report will include:

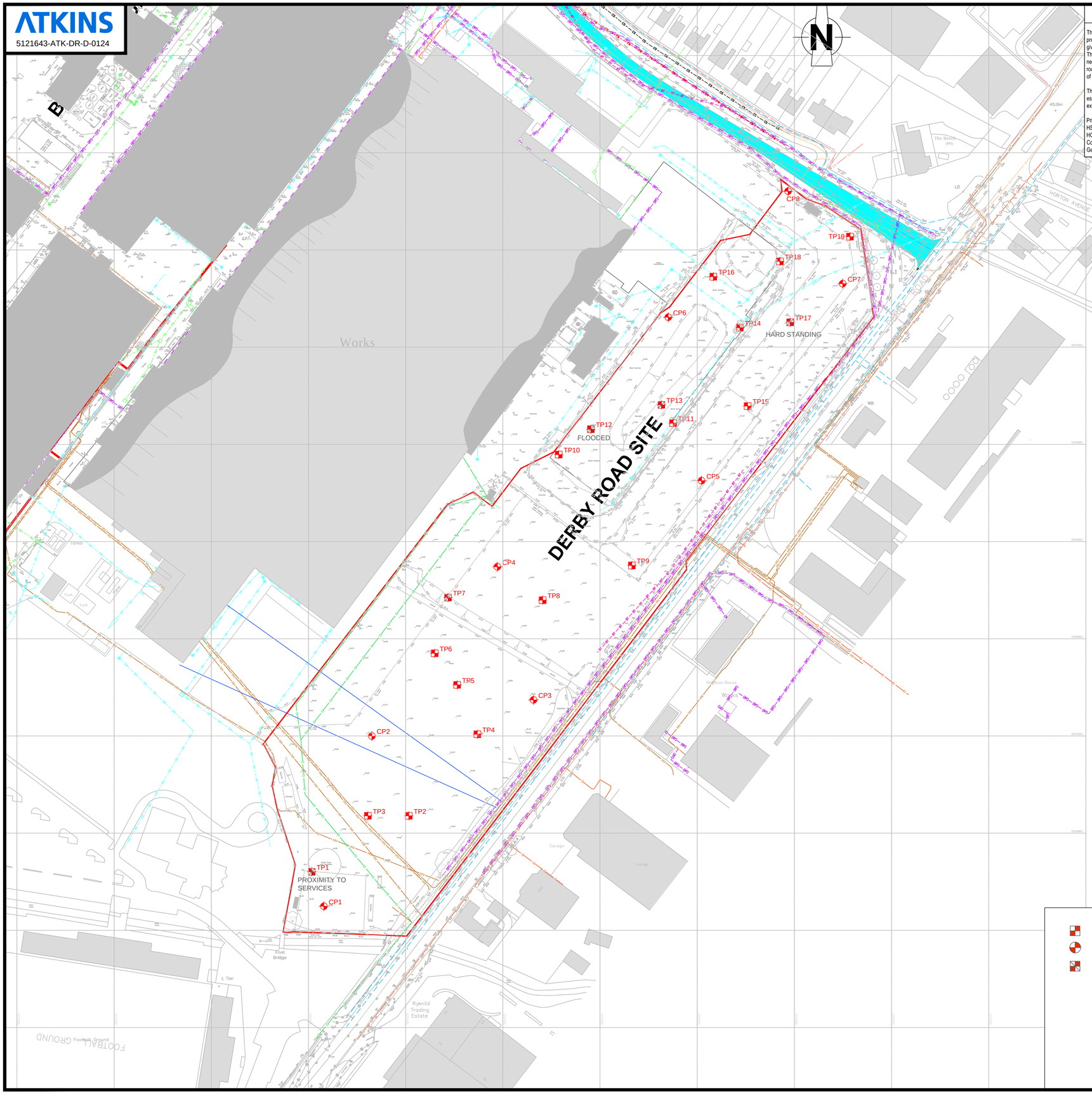
- Background information – project and site details, Employer's requirements and remediation objectives,
- Reclamation - design package including design of classification and acceptance criteria for material, verification test results including geotechnical laboratory and field plate load test results,
- Final site conditions i.e. an account of the state of the site following works,
- Third party contacts – correspondence and approvals/agreements from regulators, site visits, statutory guidance, third party agreements,
- Supporting information – plans, as–built drawings, progress photographs, environmental monitoring.

Drawings/Figures

Atkins Drawing 5121643-ATK-DR-D-0143

ATKINS

5121643-ATK-DR-D-0124



IMPORTANT WARNING

The information concerning the location and/or depth of the public utility apparatus is provided on this drawing as an indicative guide only. No guarantee as to their correctness is given or implied.
These drawings should not be relied upon in the event of excavations or other works made near to the apparatus, which may exist at various depths and may deviate from the marked route. It should also be noted that a single line shown on the plan may indicate the presence of more than one cable or duct.

The contractor is required to ensure that the locations of below ground services are established/confirmed on site prior to any excavations or other works which may effect the existing services.

Prior to any works on site, the contractor shall refer to;
HSG47 - Avoiding Danger from Underground Services (by HSE)
HGS185 - Health & Safety in Excavations (by HSE)
Construction Information Sheet (CIS) 8 - Safety in Excavations (by HSE)
General Series (GS) 6 - Avoidance of Danger from Overhead Electric Lines (by HSE)

KEY

- BEECH AVENUE SITE BOUNDARY
- PUBLIC WATER MAIN (SOUTH STAFFS)
- PUBLIC SURFACE WATER SEWER (STW)
- PUBLIC FOUL WATER SEWER (STW)
- PUBLIC COMBINED SEWER (STW)
- PRIVATE SURFACE WATER SEWER
- PRIVATE FOUL WATER SEWER
- 11KV UNDERGROUND ELECTRICITY CABLE
- 33kV UNDERGROUND ELECTRICITY CABLE
- LOW VOLTAGE UNDERGROUND ELECTRICITY CABLE
- BT UNDERGROUND PLANT
- BT OVERHEAD PLANT
- SKY UNDERGROUND PLANT
- VIRGIN MEDIA
- EX-ENERGIS NETWORK (NOW VODAFONE) PLANT
- LOW PRESSURE GAS MAIN
- MEDIUM PRESSURE GAS MAIN
- INTERMEDIATE PRESSURE GAS MAIN
- CULVERTED WATER COURSE
- EXISTING DITCH

NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. TOPOGRAPHICAL SURVEY TAKEN FROM DRAWING REFERENCE 9347MASTER_1 TOPOGRAPHICAL SURVEY BY GREENHATCH LTD.
3. TP/CP LOCATIONS FOR REFERENCE ONLY AND WILL BE SUPERSEDED BY SURVEYED LOCATIONS WHEN AVAILABLE.

- ATKINS TRIAL PIT LOCATION
- ATKINS BOREHOLE LOCATION
- ATKINS CANCELED TRIAL PIT

REVISIONS	Drawn By	Checked By	Date
FOR TECHNICAL INFORMATION	P1	MAS	18/02/14
PURPOSE OF ISSUE	Rev.	Authorised for Issue	Date

Atkins Ltd
Consulting Engineers
The Axis, 10 Holliday Street
Birmingham West Midlands B1 1TF
Tel 0121 483 5000
Fax 0121 483 5252

THIS DRAWING IS NOT TO BE SCALED

CLIENT: ST.MODWEN

PROJECT:
PIRELLI REDEVELOPMENT
BURTON

DRAWING TITLE:
DERBY ROAD SITE
PRELIMINARY GI LOCATIONS INCLUDING KNOWN SERVICE LOCATIONS

SCALE	DRAWN	CHECKED	TECHNICAL CHECK
1 : 1,000	MB	ML	MAS
	DATE 27/01/15	DATE 27/01/15	DATE 18/02/14

0 | SHEET A1 | PLOT DATE 27/01/15

DRAWING NO: 5121643-ATK-DR-D-0143 | REV: P1

Appendix A – Ian Farmer and Associates (IFA) Limited, Factual Report

ST MODWEN DEVELOPMENTS LIMITED

DERBY ROAD SITE
BURTON-UPON-TRENT

FACTUAL GROUND INVESTIGATION REPORT

Contract: 21321

Date: January 2015

Ian Farmer Associates (1998) Limited
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road, Coventry, CV3 4LJ
Tel: 024 7630 3422
www.ianfarmer.co.uk

FACTUAL GROUND INVESTIGATION REPORT

Carried out at

DERBY ROAD SITE

BURTON-UPON-TRENT

Prepared for

ST MODWEN DEVELOPMENTS LIMITED
Park Point
17 High Street
Longbridge
Birmingham
B31 2UQ

Contract No: 21321

Date: January 2015

Issue	Date	Description / Revision Details	Prepared	Approved	Distribution
01	12/01/15	First Issue	PB	AO	PDF to Atkins

Ian Farmer Associates (1998) Limited
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road, Coventry, CV3 4LJ
Tel: 024 7630 3422
www.ianfarmer.co.uk

EXECUTIVE SUMMARY

On the instructions of Atkins Limited consulting engineers, on behalf of St Modwen Developments Limited, an investigation was undertaken to determine ground conditions to help develop the ground model for the site. It is understood that the proposed development comprises commercial / industrial facilities.

The site is situated adjacent to Beech Avenue, just off Derby Road (A5121), approximately 2.5km to the north of Burton-upon-Trent at a Grid Reference of SK252255 and comprises a redundant rubber works. Published geology indicates the site to be underlain by Alluvium and river terrace deposits, with the Mercia Mudstone Group forming the solid geology.

Site work comprised the sinking of eight cable percussive boreholes and the excavation of fourteen trial pits. Falling head tests were carried out in three of the boreholes and a gas and groundwater standpipe installed in each borehole and subsequently monitored during return visits.

Selected samples recovered from the exploratory holes were dispatched to the laboratory for geotechnical analysis.

CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 2

2.0 SITE SETTING 3
2.1 Site Location 3
2.2 Site Description 3
2.3 Geological Setting 3

3.0 SITE WORK 4

4.0 LABORATORY TESTS 6
4.1 Geotechnical Testing 6

5.0 REFERENCES 7

APPENDIX 1 - DRAWINGS
Figure A1.1 - Site Location Plan
Drawing No.1215/2060/1 - Exploratory Hole Location Plan

APPENDIX 2 - SITE WORK
General Notes on Site Work ii/i-ii/iii
- SPT Calibration Certificate
- Cable Percussive Borehole Records
- Summary of Standard Penetration Tests
- Results of Falling Head Permeability Tests
- Trial Pit Records

APPENDIX 3 - GEOTECHNICAL TESTS
General Notes on Geotechnical Tests iii/i-iii/i
Test Report 21321 - Results of Geotechnical Tests – Soils

APPENDIX 4 - GAS AND GROUNDWATER
- Gas and Groundwater Monitoring Records
- In-situ Groundwater Quality Records

1.0 INTRODUCTION

1.1 On the instructions of Atkins Limited consulting engineers, on behalf of St Modwen Developments Limited, an investigation was undertaken to determine ground conditions to help develop the ground model for the site.

1.2 It is understood that the proposed development comprises commercial / industrial facilities.

1.3 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.

1.4 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.

1.5 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.

1.6 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 adjacent to Beech Avenue, just off Derby Road (A5121), approximately 2.5km to the north of Burton-upon-Trent.

2.1.2 The site may be located by Landranger Grid Reference SK252255.

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

2.2 Site Description

2.2.1 The site is roughly oblong in shape covering an area of approximately 8 hectares, and comprises a redundant rubber works, which formed part of a larger Pirelli site.

2.2.2 The site is bound to the northwest by retained Pirelli land, to the north by Beech Avenue, to the East by the A38 Derby Road and to the south by Burton Albion Football Club. The site is partially used for car parking. The remainder of the site comprises demolition arising from structures previously located on the site and former sports fields which now comprise rough vegetated ground.

2.2.3 The site is predominantly flat although there is a rise of approximately 1m in the centre where the sports pitches are present at two distinct levels separated by a tarmac road. The break of slope is defined by a grass slope dipping to the north/northeast. The site lies at an approximate altitude of 45mAOD.

2.2.4 An exploratory hole location plan is given in Appendix 1, Drawing No.1215/2060/1.

2.3 Geological Setting

2.3.1 Details of the geology underlying the site have been obtained from BGS Sheet 141, ref. 5.1, and from information provided by Atkins.

2.3.2 The geological map indicates the site to be covered by superficial deposits of Alluvium, with river terrace deposits (the Holme Pierrepoint Sand and Gravel Member) potentially beneath.

2.3.3 The superficial deposits are underlain by the Mercia Mudstone Group, described as ‘red marl with beds of sandstone and bands of gypsum’.

2.3.4 Although not indicated as present on the site from the geological maps, Made Ground was anticipated to exist on the site, particularly in the northern part due to the previously developed nature of the site.

3.0 SITE WORK

3.1 The site work was carried out between the 3rd and 11th November 2014. The locations of the exploratory holes have been stipulated by Atkins.

3.2 The site work has been carried out on the basis of the practices set out in BS 10175:2011, ref. 5.2, BS 5930:1999 ref. 5.3 and BS EN 1997-2:2007, ref 5.4. Additional references are noted within the table.

Exploratory Hole Type	Quantity	Hole Reference	Depths	Notes
Cable percussive boreholes	8	CP001 to CP008	7.45m to 8.5m	
Trial pits – machine excavated	14	TP002 to TP006, TP008 to TP011, TP014 to TP016, TP018, TP019	1.75m to 2.8m	
Falling head permeability tests, ref.5.3	3	CP001, CP004, CP008	1.5m to 2.0m	Carried out during the sinking of the boreholes
Slotted standpipe installations	8	CP001 to CP008	3.0m to 7.0m	Installed to monitor groundwater and gas levels, each with gas valve and flush cover fitted.

3.3 The positions of the above are shown on the exploratory hole location plan, Appendix 1, Drawing No.1215/2060/1.

3.4 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given in the site work records in Appendix 2.

3.5 Representative disturbed samples were taken, ref.5.6, at the depths shown on the exploratory hole records and dispatched to the laboratory. Samples for environmental purposes were collected in appropriate containers and retained in cool boxes.

3.6 Standard (split-barrel and cone) penetration tests (SPT), ref.5.5, 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.

3.7 An approximate assessment of soil strengths was made by undertaking hand-held vane tests in the trial pits. The results of these tests are included in the trial pit records.

3.8 The coordinates and ground levels at the exploratory hole locations, reported on the records, were surveyed in by MSURV, based on OS National Grid.

3.9 Upon completion of the siteworks, the boreholes instrumented with standpipes were monitored at intervals specified by Atkins 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 4.

3.10 Groundwater samples from the borehole instruments were recovered and dispatched for testing on one occasion. Groundwater quality measurements were taken as the groundwater was being purged, the results of which are given in Appendix 4.

3.11 The groundwater testing was undertaken separately by Atkins.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 The suite of geotechnical analyses has been scheduled by Atkins.

4.1.2 All soil samples were prepared in accordance with BS1377: Part One: 1990 ref. 5.8 and representative sub-samples were taken for testing. The following tests were carried out:

- 19 No. Moisture contents
- 10 No. Plasticity indices
- 19 No. Particle size distributions by wet sieving
- 8 No. Particle size distributions by sedimentation
- 6 No. 2.5kg compactions
- 2 No. Remoulded California bearing ratios (CBR)

4.1.3 The results of the testing are given in Appendix 3, Test Report 21321.

5.0 REFERENCES

5.1 BGS Sheet No.141, '*Loughborough*', solid and drift edition, 1:50000 scale. British Geological Survey, 1976.

5.2 BS 10175: 2011 '*Investigation of potentially contaminated sites. Code of practice*', British Standards Institute, 2011

5.3 BS 5930:1999+A2:2010 '*Code of practice for site investigations*', British Standards Institute, 2010

5.4 BS EN 1997, Part 2:2007, '*Eurocode 7 – Geotechnical Design – Part 2, Ground Investigation and Design*' British Standards Institute, 2007

5.5 BS EN ISO 22476 – 3:2005, '*Geotechnical Investigation and Testing – Field Testing - Part 3: Standard Penetration Test*', British Standards Institute, 2005

5.6 BS EN ISO 22475-1:2006, '*Geotechnical Investigation and Testing – Sampling Methods and Groundwater Measurements*' *Part 1: Technical Principles for Execution*', British Standards Institute, 2006

5.7 BS EN ISO 14688 Part 1:2002 and Part 2:2004, '*Geotechnical Investigation and Testing – Identification and Classification of Soil*', British Standards Institute, 2004

5.8 BS 1377:1990, Part 9, '*Methods of Test for Soils for Civil Engineering Purposes*' British Standards Institute, 1990

5.9 HSG 185, '*Health and Safety in Excavations*', Health and Safety Executive, 1999

5.10 BRE Special Digest 1, '*Concrete in Aggressive Ground*', Building Research Establishment, 2005.

For and on behalf of Ian Farmer Associates (1998) Limited

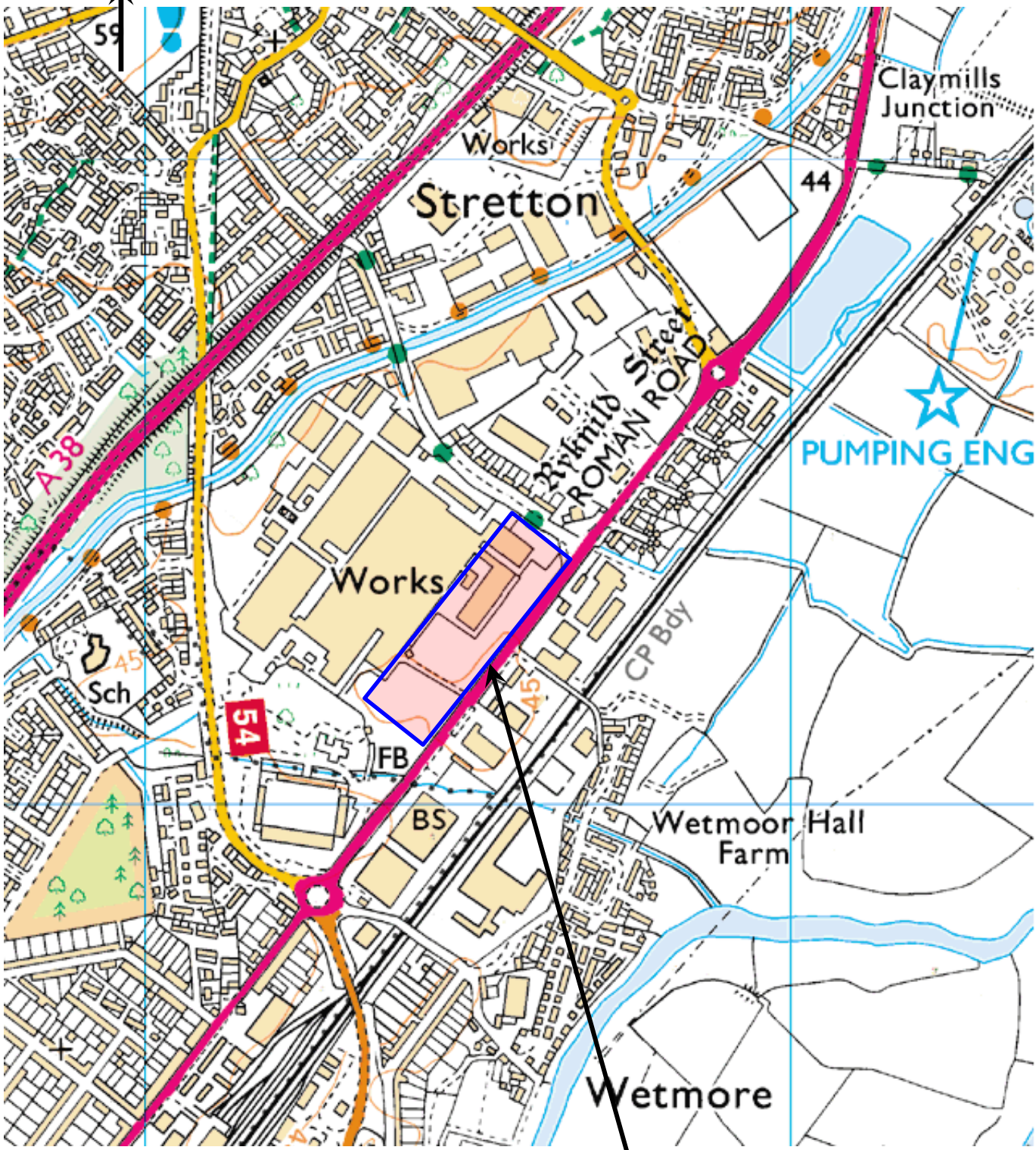
A.C Owen
MESci(Hons) MRes FGS
Principal Environmental Geologist

P.C.G Bailey
BEng(Hons) MSc ACSM FGS
Principal Engineering Geologist

APPENDIX 1

DRAWINGS

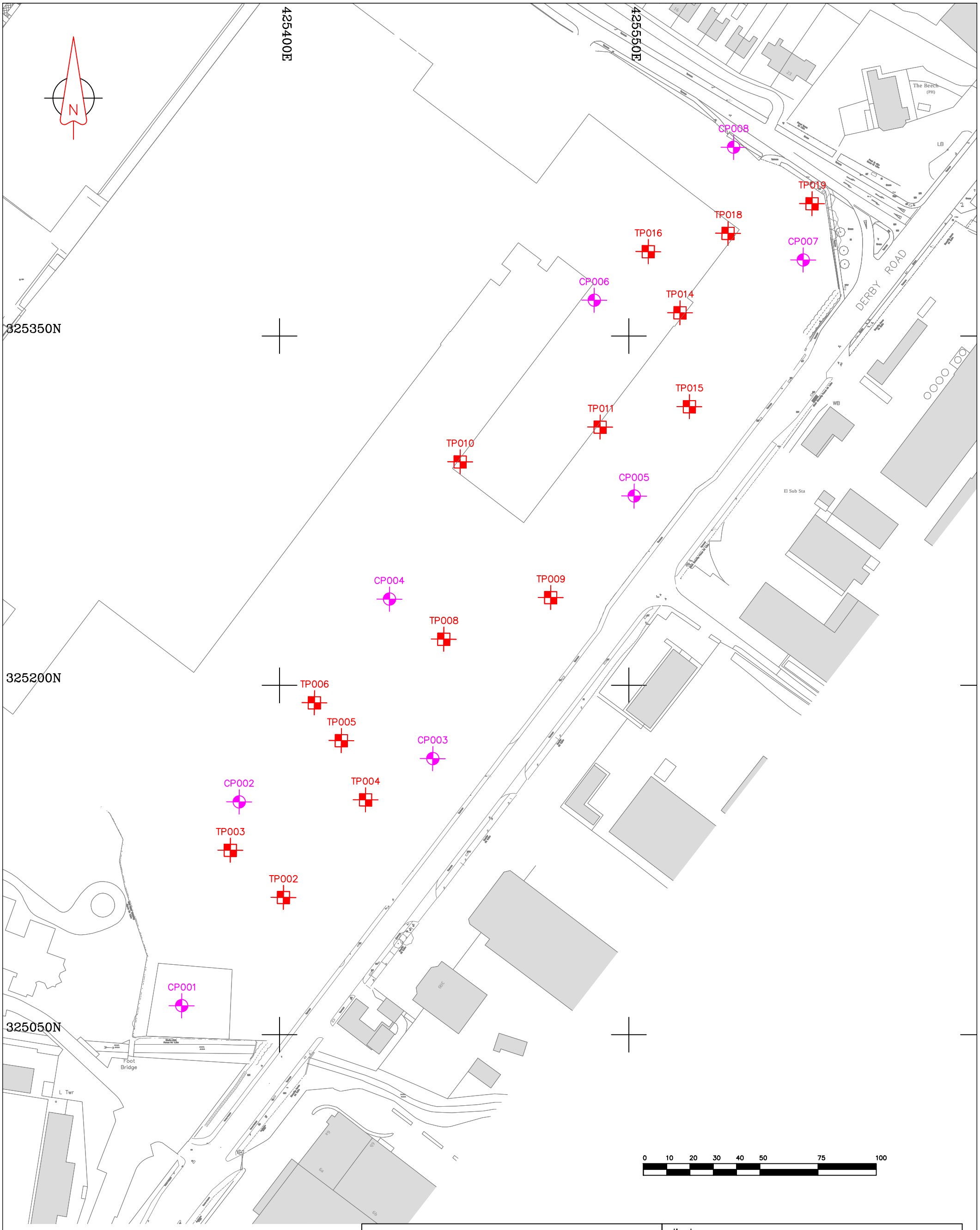
21321
Derby Road, Burton-upon-Trent



Site Location Plan

Scale: NTS

Figure A1.1



MSURV
your surveying solution

Rainsborough Barns
Charlton
Banbury, Oxon
OX17 3DT

client: Ian Farmer Associates			
project: Derby Road, Burton Upon Trent GI Locations			
drawing no. 1215/2060/1	Drawn JG	Date 23/12/14	Scale 1:1500@A3

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 BS EN 1997, 5.4 and BS 5930, ref 5.3, and BS 10175, ref.5.2.

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 may 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 may be 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

The light cable percussion rig is generally employed for boring through soils and weak rocks, ref 5.3. 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 an inspection pit 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 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 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 BS EN ISO 22476-3 ref 5.5.

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 'N' value reported on the borehole logs is as measured but may be corrected for the energy ratio (E_r) of the specific test equipment to give a normalised N_{60} value.

E_r for the drilling apparatus used for this ground investigation is referenced within the exploratory hole records.

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 with the general descriptions 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

A2.2.2 Hand Vane (HV)

The hand vane is intended to be used as a tool to provide a crude assessment of the shear strength of a particular soil.

The hand vane gives a direct reading of approximate shear strength, with three different diameter vanes for materials of increasing consistency. The vane measures the intact shear strength of only a small portion of the soil, and therefore readings in relation to the mass characteristics of the soil should be treated with caution, particularly where there is a proportion of granular material or where there is fissuring present.

A2.3 SAMPLES / TESTS

HV represents Hand Vane test with equivalent undrained shear strength in kPa.

B represents large bulk disturbed samples

D represents small disturbed sample

E represents environmental sample, consisting of amber jar, vial and plastic tub

W represents water sample

$\underline{\nabla}$ represents water strike

$\underline{\blacktriangledown}$ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

The procedures and principles given in BS EN ISO 14688 Parts 1 and 2, ref 5.7, supplemented by section 6 of BS 5930, ref. 5.3 have been used in the soil descriptions contained within this report.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP001

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 7.00m	45.25	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425358 E 325062.4 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10	D1				45.15	0.10	Grass over TOPSOIL.			
0.10-1.00	B1						MADE GROUND: Black, clayey, slightly gravelly, fine to medium sand. Gravel is subrounded, fine to medium quartzite and rootlets.			
0.50	E1					(1.55)				
1.20-1.65	SPT N=2			1,0/0,0,1,1			Below 1.20m: Very loose.			
1.20-1.65	B2									
1.20-1.65	D2				43.60	1.65				
1.70-1.90	B3					(0.25)	Soft to firm black/dark brown, slightly sandy CLAY (Alluvium)			
2.00-2.45	SPT(C) N=32			6,4/5,11,7,9	43.35	1.90			▼1	
2.00-2.45	B4						Dense, dark brown/grey, very gravelly medium to coarse SAND. Gravel is subangular to subrounded fine to coarse quartzite. (River Terrace Deposits)			
2.00-2.45	D3									
3.00-3.45	B5			Water strike(1) at 3.00m, rose to 2.00m in 20 mins.			At 3.00m: Very dense.		▽1	
3.00-3.45	D4									
3.00-3.31	SPT(C) 50/160			11,9/25,17,8		(3.70)				
4.00-4.45	SPT(C) N=37			4,4/5,7,8,17						
4.00-4.45	B6									
4.00-4.45	D5									
5.00-5.45	SPT(C) N=20			4,4/4,4,6,6			Below 5.00m: Medium dense.			
5.00	E2									
5.00-5.45	B7									
5.00-5.45	D6				39.65	5.60				
6.00-6.45	SPT N=26			3,3/5,7,7,7			Stiff, slightly friable, red brown and grey CLAY with occasional fine gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa)			
6.00-6.45	B8									
6.00-6.45	D7					(1.85)				
7.00-7.45	SPT N=35			4,3/8,8,9,10			Below 7.00m: Very stiff.			
7.00	E3									
7.00-7.45	D8				37.80	7.45				
							Complete at 7.45m			

Remarks
Permeability test carried out in borehole at 1.50m.
Chiselling from 3.00m to 3.30m for 0.5 hours.

Scale (approx)	Logged By
1:50	MD

Figure No. 21321.CP001

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP002

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 7.50m	44.60	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425382.7 E 325150 N	11/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.20	D1				44.40	(0.20) 0.20	Grass over soft, black, slightly gravelly, very sandy clay TOPSOIL with occasional rootlets			
0.20-1.30	B1						MADE GROUND: Dark brown, very clayey fine to medium grained sand with occasional gravels of subangular brick fragments and subrounded quartzite.			
0.50	E1					(1.10)				
1.20-1.65	SPT N=6			1,1/1,2,1,2	43.30	1.30	Soft to firm, dark brown/black mottled grey and yellow silty CLAY (Alluvium)			
1.20-1.65	B2					(0.30)				
1.20-1.65	D2				43.00	1.60	Soft, brown, very sandy, slightly gravelly CLAY. Gravel is subrounded, fine to medium quartzite (Alluvium)			
1.80	D3						Below 2.00m: Stiff			
2.00-2.45	SPT N=23			2,4/4,4,4,11		(0.90)				
2.00-2.45	B3									
2.00-2.45	D4				42.10	2.50	Grey brown, very gravelly medium to coarse SAND. Gravel is subangular to subrounded fine to coarse quartzite (River Terrace Deposits)		▼1	
3.00-3.45	B4			Water strike(1) at 3.00m, rose to 2.50m in 20 mins.			Below 3.00m: Medium dense.		▽1	
3.00-3.45	D5									
3.00-3.45	SPT(C) N=29			4,4/5,8,7,9						
4.00-4.45	SPT(C) N=27			4,4/5,6,8,8						
4.00-4.45	B5					(3.50)				
4.00-4.45	D6									
5.00-5.45	SPT(C) N=41			3,6/7,10,10,14			Below 5.00m: Dense.			
5.00	E2									
5.00-5.45	B6									
5.00-5.45	D7									
6.00-6.45	SPT N=19			3,3/3,4,6,6	38.60	6.00	Stiff, slightly friable, red brown and grey CLAY with occasional fine gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa)			
6.00-6.45	B7									
6.00-6.45	D8									
6.50	E3									
7.00-7.45	SPT N=33			4,6/6,7,10,10						
7.00-7.45	B8					(2.45)				
7.00-7.45	D9									
8.00-8.45	SPT N=48			6,5/10,10,12,16			Below 8.00m: With fine to coarse gravel size lithorelicts. (Grade III)			
8.00-8.45	D10				36.15	8.45	Complete at 8.45m			

Remarks

Scale (approx)	Logged By
1:50	MD

Figure No. 21321.CP002

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP003

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 8.00m	45.12	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425465.8 E 325168.5 N	06/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					45.02	0.10	MADE GROUND: Topsoil.			
0.10-0.25	B1				44.87	(0.15) 0.25				
0.25-1.20	B2					(0.20)	MADE GROUND: Brown, clay bound sandy, fine to coarse, angular to subrounded gravel.			
					44.67	0.45				
0.50	E1				44.62	0.50	MADE GROUND: Light brown, fine to coarse sand and fine to coarse, angular to rounded gravel.			
							MADE GROUND: Concrete.			
						(1.50)				
1.20-1.65	SPT N=6			1,1/1,2,1,2			Light brown, fine to medium SAND and fine to coarse, angular to subrounded GRAVEL of mainly quartzite. (Possible Made Ground)			
1.20-1.65	B3						Below 1.2m: Loose			
1.20-1.65	D1									
					43.12	2.00				
2.00-2.45	SPT N=6			1,2/1,2,1,2			Soft, brown, silty, sandy CLAY (Alluvium)			
2.00-2.45	B4									
2.00-2.45	D2					(0.60)				
					42.52	2.60				
2.60-3.00	B5						Medium dense, grey brown, fine to medium SAND and fine to coarse, subangular to subrounded quartzite GRAVEL. (River Terrace Deposits)		▼1	
3.00-3.45	B6			Water strike(1) at 3.00m, rose to 2.90m in 20 mins.					▽1	
3.00-3.45	D3									
3.00-3.45	SPT(C) N=17			3,3/4,3,5,5						
4.00-4.45	SPT(C) N=26			4,4/4,6,6,10						
4.00-4.45	B7									
4.00-4.45	D4									
						(3.90)				
5.00-5.45	SPT(C) N=32			4,3/5,7,10,10			Below 5.00m: Dense.			
5.00	E2									
5.00-5.45	B8									
5.00-5.45	D5									
6.00-6.32	SPT(C) 50/170			10,8/10,27,13			Below 6.00m: Very dense.			
6.00-6.45	B9									
6.00-6.45	D6									
					38.62	6.50	Stiff, slightly friable, red brown CLAY with occasional fine gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa)			
7.00-7.45	SPT N=21			3,3/3,6,6,6						
7.00-7.45	B10									
7.00-7.45	D7									
						(2.00)				
7.50	E3									
8.00-8.45	SPT N=36			4,4/7,8,10,11			Below 8.00m: Very stiff, fine to medium lithorelicts.			
8.00-8.45	D8									
					36.62	8.50	Complete at 8.50m			

Remarks
Water added from 3.00m to 8.00m.

Scale (approx)	Logged By
1:50	PB

Figure No. 21321.CP003

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP004

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 7.00m	43.93	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425447.2 E 325237 N	06/11/2014- 07/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.10 0.10-1.20	D1 B1				43.78	(0.15) 0.15	MADE GROUND: Topsoil.			
0.50	E1					(1.05)	MADE GROUND: Soft to firm, dark brown, sandy, gravelly clay with rare cobbles. Gravel is fine to coarse, angular to rounded including brick and quartzite.			
1.20-1.65 1.20-1.65 1.20-1.65	SPT N=9 B2 D2			1,1/1,2,4,2	42.73	1.20	Medium dense, light brown grey, fine to medium SAND and fine to coarse, subangular to subrounded GRAVEL of mainly quartzite (River Terrace Deposits)			
2.00-2.45 2.00-2.45 2.00-2.45	SPT(C) N=25 B3 D3			4,4/4,4,7,10			Below 2.00m: Light greyish brown.		▼1	
3.00-3.45 3.00-3.45 3.00-3.45	B4 D4 SPT(C) N=20			Water strike(1) at 3.00m, rose to 2.50m in 20 mins. 3,2/3,4,6,7		(4.30)			▽1	
4.00-4.45 4.00-4.45 4.00-4.45	SPT(C) N=33 B5 D5			3,4/4,10,10,9			Below 4.00m: Dense.			
5.00-5.38 5.00 5.00-5.45 5.00-5.45	SPT(C) 50/230 E2 B6 D6			6,6/10,10,23,7			Below 5.00m: Very dense.			
					38.43	5.50	Stiff, slightly friable, red brown CLAY with occasional fine gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa)			
6.00-6.45 6.00-6.45 6.00-6.45	SPT(C) N=17 B7 D7			3,3/3,4,4,6						
6.50	E3					(2.00)				
7.00-7.45 7.00-7.45	SPT N=31 D8			4,6/6,7,8,10			Below 7.00m: Very stiff with fine to medium size lithorelicts.			
					36.43	7.50	Complete at 7.50m			

Remarks
Permeability test carried out in borehole at 2.00m.

Scale (approx)	Logged By
1:50	PB

Figure No. 21321.CP004

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP005

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 7.00m	44.21	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425552.3 E 325281.3 N	03/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.35	B1					(0.35)	MADE GROUND: Light brown, slightly clayey, sandy gravel of subangular, fine to medium quartzite, with plastic membrane at base.			
					43.86	0.35				
0.35-0.60	B2					(0.25)				
0.50	E1				43.61	0.60	MADE GROUND: Soft, light brown, sandy, gravelly, clay. Gravel is subangular to subrounded, fine to medium quartzite.			
0.60-1.20	B3					(0.60)				
					43.01	1.20	Soft, light brown, sandy, gravelly CLAY. Gravel is subrounded, fine to medium quartzite (River Terrace Deposits)			
1.20-1.55	SPT 50/200			6,7/14,20,16			Very dense, light brown, sandy GRAVEL of subangular to subrounded, fine to coarse mixed lithologies of mainly quartzite. Occasional coarser gravel bands. (River Terrace Deposits)			
1.20-1.65	B4									
1.20-1.65	D1									
2.00-2.27	SPT(C) 50/115			10,14/27,23						
2.00-2.45	B5									
2.00-2.45	D2									
3.00-3.45	SPT(C) N=30			4,4/4,6,10,10			Below 3.00m: Dense, very sandy.			
3.00-3.45	B6									
3.00-3.45	D3					(4.30)				
4.00-4.45	B7			Water strike(1) at 4.00m, rose to 3.90m in 20 mins.					▼1	
4.00-4.45	D4								▽1	
4.00-4.45	SPT(C) N=44			4,5/7,10,10,17						
5.00-5.38	SPT(C) 50/225			10,9/14,15,21			Below 5.00m: Very dense.			
5.00	E2									
5.00-5.45	B8									
5.00-5.45	D5									
					38.71	5.50	Stiff, slightly friable, light grey mottled red CLAY with frequent fine gravel sized mudstone lithorelicts. (Mercia Mudstone Grade IVa)			
6.00-6.45	SPT(C) N=27			3,4/4,7,7,9						
6.00-6.45	B9									
6.00-6.45	D6					(1.95)				
7.00-7.45	SPT N=44			7,10/10,9,12,13			Below 7.00m: Very stiff, with fine to coarse gravel size lithorelicts. (Grade III)			
7.00	E3									
7.00-7.45	B10									
7.00-7.45	D7				36.76	7.45	Complete at 7.45m			

Remarks
Chiselling from 2.20m to 2.50m for 0.5 hours. Chiselling from 5.30m to 5.50m for 0.5 hours.

Scale (approx)	Logged By
1:50	MT

Figure No. 21321.CP005

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP006

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 7.00m	43.67	St Modwen Developments Limited	21321
	Location 425535.1 E 325365.4 N	**Dates** 04/11/2014	**Engineer** Atkins Limited	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.30	B1					(0.30)	MADE GROUND: Concrete.			
0.30-1.10	B2				43.37	0.30	MADE GROUND: Soft, black mottled grey, slightly sandy clay with rare gravels of sub fine to medium quartzite, occasional slightly peaty.			
0.50	E1					(0.80)			▼1	
1.20	D1			Water strike(1) at 1.20m, rose to 0.90m in 20 mins.	42.57	1.10	Medium dense, grey, very sandy GRAVEL of subrounded, fine to medium quartzite. (Anoxic odour to begin with - old pond?) (River Terrace Deposits)		▽1	
1.20-1.65	B3									
1.20-1.65	D2									
1.20-1.65	SPT N=26			3,5/5,5,6,10		(1.40)				
2.00-2.45	SPT(C) N=35			3,6/7,7,7,14			Below 2.00m: Dense.			
2.00-2.45	B4									
2.00-2.45	D3				41.17	2.50	Medium dense, red brown, very gravelly, medium to coarse SAND. Gravel is subangular to subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)			
3.00-3.45	SPT(C) N=23			3,5/6,6,5,6						
3.00	E2									
3.00-3.45	B5									
3.00-3.45	D4									
4.00-4.45	SPT(C) N=31			4,4/6,6,9,10		(3.00)	Below 4.00m: Dense.			
4.00-4.45	B6									
4.00-4.45	D5									
5.00-5.38	SPT 50/230			6,8/10,15,20,5			Below 5.00m: Very dense			
5.00-5.45	B7									
5.00-5.45	D6									
5.50	B8				38.17	5.50	Very stiff, red brown, slightly friable CLAY with frequent fine to medium gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa to III)			
6.00-6.45	SPT N=39			2,4/4,6,13,16						
6.00-6.45	B9									
6.00-6.45	D7									
6.50	E3					(1.95)				
7.00-7.43	SPT 50/275			7,7/12,14,14,10			Below 7.00m: With frequent fine to coarse lithorelicts. (Grade III)			
7.00-7.45	D8									
					36.22	7.45	Complete at 7.45m			

Remarks
Chiselling from 5.20m to 5.50m for 0.5 hours.

Scale (approx)	Logged By
1:50	MT

Figure No.
21321.CP006

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP007

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 8.00m	44.46	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425624.9 E 325382.7 N	05/11/2014- 06/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
0.00-0.30	B1				44.26	(0.20) 0.20	MADE GROUND: Concrete hardstanding.
0.30-0.90	B2				44.16	0.30	MADE GROUND: Light brown gravel of subangular, medium quartzite.
0.50	E1					(0.60)	MADE GROUND: Medium brown, very sandy subangular, fine to medium quartzite gravel. (Sub-base)
0.90-1.20	B3				43.56	0.90 (0.30)	
1.20-1.65 1.20-1.65 1.20-1.65	SPT N=19 B4 D1			3,3/3,3,6,7	43.26	1.20	Soft to firm, dark brown mottled grey and yellow, slightly gravelly CLAY. Gravel is subangular to subrounded, fine to medium quartzite (Alluvium)
							Medium dense, light brown grey, fine grained SAND and GRAVEL of subrounded, fine to medium quartzite. (River Terrace Deposits)
2.00-2.45 2.00-2.45 2.00-2.45	SPT(C) N=19 B5 D2			2,3/2,4,6,7		(1.80)	
3.00-3.45 3.00-3.45	B6 D3			Water strike(1) at 3.00m, rose to 2.20m in 20 mins.	41.46	3.00	Medium dense, dark brown, medium to coarse SAND and subrounded, fine to coarse quartzite GRAVEL. (River Terrace Deposits)
3.00-3.45	SPT(C) N=20			3,4/4,4,6,6			Below 3.00m: Dense.
4.00-4.45 4.00-4.45 4.00-4.45	SPT(C) N=30 B7 D4			3,6/5,4,10,11		(3.20)	
5.00-5.31 5.00-5.45 5.00-5.45	SPT(C) 50/155 B8 D5			10,10/17,28,5			Below 5.00m: Very dense.
6.00-6.45 6.00-6.45 6.00-6.45	SPT N=40 B9 D6			7,10/9,14,7,10	38.26	6.20	Stiff, slightly friable, red brown CLAY with occasional fine gravel size mudstone lithorelicts. (Mercia Mudstone Grade IVa)
7.00-7.45 7.00 7.00-7.45 7.00-7.45	SPT N=17 E2 B10 D7			2,3/4,4,4,5		(2.25)	
8.00-8.45 8.00-8.45	SPT N=40 D8			4,3/7,9,10,14			Below 8.00m: Very stiff, with frequent lithorelicts.
					36.01	8.45	Complete at 8.45m

Water: ▼1 ▽1

Remarks

Scale (approx)	Logged By
1:50	MT

Figure No. 21321.CP007

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP008

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion	Pit to 1.20m 150mm cased to 8.00m	44.49	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425595 E 325431.1 N	05/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description
0.00-0.25	B1				44.24	(0.25) 0.25	MADE GROUND: Concrete.
0.25-0.60	B2				43.89	(0.35) 0.60	MADE GROUND: Brownish grey, sandy gravel of fine to coarse, angular to subrounded concrete of mixed lithologies.
0.60-1.20	B3				43.29	(0.60) 1.20	MADE GROUND: Soft to firm, dark brown, sandy, gravelly clay. Gravel is fine to coarse,angular to rounded and includes concrete and brick.
1.20-1.65 1.20-1.65 1.20-1.65	SPT N=7 B4 D1			1,1/1,1,2,3		(0.70)	Soft to firm, brown to dark brown, sandy CLAY with rare fine gravels (Alluvium)
1.90-2.00 2.00-2.45 2.00-2.45 2.00-2.45	D2 SPT(C) N=27 B5 D3			3,3/4,4,8,11	42.59 42.49	1.90 2.00	Soft, light brown, gravelly CLAY (Alluvium) Medium dense, brownish grey, fine to medium SAND and fine to coarse, subangular to subrounded GRAVEL of mainly quartzite. (River Terrace Deposits)
3.00-3.45 3.00-3.45 3.00-3.45	B6 D4 SPT(C) N=17			Water strike(1) at 3.00m, rose to 1.70m in 20 mins. 3,4/4,3,4,6			
4.00-4.45 4.00-4.45 4.00-4.45	SPT(C) N=14 B7 D5			2,3/1,2,3,8		(5.40)	
5.00-5.45 5.00-5.45 5.00-5.45	SPT(C) N=25 B8 D6			3,4/3,6,8,8			
6.00-6.45 6.00-6.45 6.00-6.45	SPT(C) N=26 B9 D7			3,3/5,7,7,7			Below 6.50m: Greyish brown.
7.00-7.31 7.00-7.45 7.00-7.45	SPT(C) 50/160 B10 D8			10,10/17,23,10			Below 7.00m: Very dense.
7.90-8.04 7.90-8.10 7.90-8.10	SPT 25*/70 50/70 B11 D9			25/50	37.09 36.39	7.40 (0.70) 8.10	Extremely weak, greenish grey, weathered SILTSTONE with a little red brown friable CLAY. (Mercia Mudstone Group - Skerry) Complete at 8.10m

Water: ▼1 ▽1

Instr

Remarks
Permeability test carried out in borehole at 2.00m.
Chiselling from 7.80m to 8.00m for 0.5 hours. Water added from 2.00m.

Scale (approx)	Logged By
1:50	PB

Figure No. 21321.CP008

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP001

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425358 E 325062.4 N	45.25	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			45.05	0.20	Concrete
					Bentonite Seal
	▼1				
	▽1		42.25	3.00	
					Slotted Standpipe
			40.25	5.00	
					Bentonite Seal
			37.80	7.45	

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)
		3.00			2.00	2.00	2.00	2.00	

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 and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP002

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425382.7 E 325150 N	44.60	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			44.40	0.20	Concrete
					Bentonite Seal
	▼1		42.10	2.50	
	▽1				Slotted Standpipe
			39.10	5.50	
					Bentonite Seal
			36.15	8.45	

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)
		3.00			2.50	2.50	2.50	2.50	

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 and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP003

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425465.8 E 325168.5 N	45.12	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			44.92	0.20	Concrete
					Bentonite Seal
	▼1 ▽1		42.62	2.50	
					Slotted Standpipe
			38.62	6.50	
					Bentonite Seal
			36.62	8.50	

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)
		3.00			2.90	2.90	2.90	2.90	

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 and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP004

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425447.2 E 325237 N	43.93	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			43.73	0.20	Concrete
					Bentonite Seal
	▼1		41.93	2.00	
	▽1				Slotted Standpipe
			38.93	5.00	
					Bentonite Seal
			36.43	7.50	

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)
		3.00			2.50	2.50	2.50	2.50	

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 and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP005

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425552.3 E 325281.3 N	44.21	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			44.01	0.20	Concrete
					Bentonite Seal
			42.21	2.00	
	▼1 ▽1				Slotted Standpipe
			39.21	5.00	
					Bentonite Seal
			37.21	7.00	

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)
03/11/14		4.00			3.90	3.90	3.90	3.90	

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

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

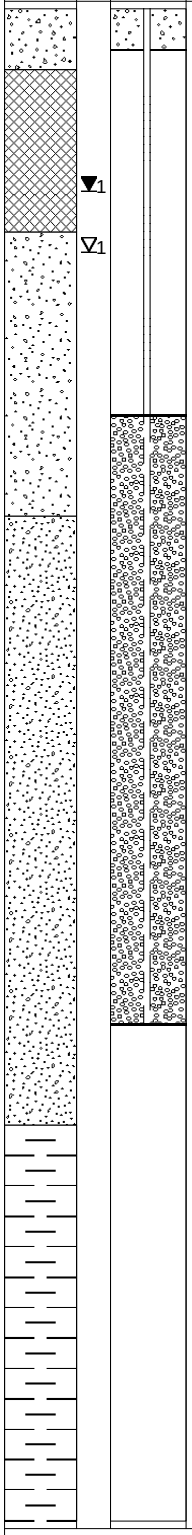
Remarks
Gas valve and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP006

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425535.1 E 325365.4 N	43.67	Atkins Limited	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)
04/11/14		1.20			0.90	0.90	0.90	0.90	

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

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

Remarks
Gas valve and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP007

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425624.9 E 325382.7 N	44.46	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			44.26	0.20	Concrete
					Bentonite Seal
	▼1		42.46	2.00	
	▽1				Slotted Standpipe
			38.46	6.00	
					Bentonite Seal
			36.46	8.00	

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)
06/11/14		3.00						2.20	

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 and cover fitted.

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP008

Installation Type	Dimensions	Client	Job Number
Standpipe	Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm	St Modwen Developments Limited	21321

Location	Ground Level (mOD)	Engineer	Sheet
425595 E 325431.1 N	44.49	Atkins Limited	1/1

Legend	Water	Instr (A)	Level (mOD)	Depth (m)	Description
			44.29	0.20	Concrete
					Bentonite Seal
	▼1		42.49	2.00	
	▽1				Slotted Standpipe
			37.49	7.00	
					Bentonite Seal
			36.39	8.10	

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)
		3.00			1.70	1.70	1.70	1.70	

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 and cover fitted.

IAN FARMER ASSOCIATES

Standard Penetration Test Results

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Engineer : Atkins Limited

Job Number 21321

Sheet 1 / 2

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
CP001	1.20	1.35	1.65	SPT	1	0	0	0	1	1	N=2	
CP001	2.00	2.15	2.45	CPT	6	4	5	11	7	9	N=32	
CP001	3.00	3.15	3.31	CPT	11	9	25	17	8		50/160mm	
CP001	4.00	4.15	4.45	CPT	4	4	5	7	8	17	N=37	
CP001	5.00	5.15	5.45	CPT	4	4	4	4	6	6	N=20	
CP001	6.00	6.15	6.45	SPT	3	3	5	7	7	7	N=26	
CP001	7.00	7.15	7.45	SPT	4	3	8	8	9	10	N=35	
CP002	1.20	1.35	1.65	SPT	1	1	1	2	1	2	N=6	
CP002	2.00	2.15	2.45	SPT	2	4	4	4	4	11	N=23	
CP002	3.00	3.15	3.45	CPT	4	4	5	8	7	9	N=29	
CP002	4.00	4.15	4.45	CPT	4	4	5	6	8	8	N=27	
CP002	5.00	5.15	5.45	CPT	3	6	7	10	10	14	N=41	
CP002	6.00	6.15	6.45	SPT	3	3	3	4	6	6	N=19	
CP002	7.00	7.15	7.45	SPT	4	6	6	7	10	10	N=33	
CP002	8.00	8.15	8.45	SPT	6	5	10	10	12	16	N=48	
CP003	1.20	1.35	1.65	SPT	1	1	1	2	1	2	N=6	
CP003	2.00	2.15	2.45	SPT	1	2	1	2	1	2	N=6	
CP003	3.00	3.15	3.45	CPT	3	3	4	3	5	5	N=17	
CP003	4.00	4.15	4.45	CPT	4	4	4	6	6	10	N=26	
CP003	5.00	5.15	5.45	CPT	4	3	5	7	10	10	N=32	
CP003	6.00	6.15	6.32	CPT	10	8	10	27	13		50/170mm	
CP003	7.00	7.15	7.45	SPT	3	3	3	6	6	6	N=21	
CP003	8.00	8.15	8.45	SPT	4	4	7	8	10	11	N=36	
CP004	1.20	1.35	1.65	SPT	1	1	1	2	4	2	N=9	
CP004	2.00	2.15	2.45	CPT	4	4	4	4	7	10	N=25	
CP004	3.00	3.15	3.45	CPT	3	2	3	4	6	7	N=20	
CP004	4.00	4.15	4.45	CPT	3	4	4	10	10	9	N=33	
CP004	5.00	5.15	5.38	CPT	6	6	10	10	23	7	50/230mm	
CP004	6.00	6.15	6.45	CPT	3	3	3	4	4	6	N=17	
CP004	7.00	7.15	7.45	SPT	4	6	6	7	8	10	N=31	
CP005	1.20	1.35	1.55	SPT	6	7	14	20	16		50/200mm	
CP005	2.00	2.15	2.27	CPT	10	14	27	23			50/115mm	
CP005	3.00	3.15	3.45	CPT	4	4	4	6	10	10	N=30	
CP005	4.00	4.15	4.45	CPT	4	5	7	10	10	17	N=44	
CP005	5.00	5.15	5.38	CPT	10	9	14	15	21		50/225mm	
CP005	6.00	6.15	6.45	CPT	3	4	4	7	7	9	N=27	
CP005	7.00	7.15	7.45	SPT	7	10	10	9	12	13	N=44	
CP006	1.20	1.35	1.65	SPT	3	5	5	5	6	10	N=26	
CP006	2.00	2.15	2.45	CPT	3	6	7	7	7	14	N=35	
CP006	3.00	3.15	3.45	CPT	3	5	6	6	5	6	N=23	
CP006	4.00	4.15	4.45	CPT	4	4	6	6	9	10	N=31	
CP006	5.00	5.15	5.38	SPT	6	8	10	15	20	5	50/230mm	

IAN FARMER ASSOCIATES

Standard Penetration Test Results

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Engineer : Atkins Limited

Job Number 21321

Sheet 2 / 2

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
CP006	6.00	6.15	6.45	SPT	2	4	4	6	13	16	N=39	
CP006	7.00	7.15	7.43	SPT	7	7	12	14	14	10	50/275mm	
CP007	1.20	1.35	1.65	SPT	3	3	3	3	6	7	N=19	
CP007	2.00	2.15	2.45	CPT	2	3	2	4	6	7	N=19	
CP007	3.00	3.15	3.45	CPT	3	4	4	4	6	6	N=20	
CP007	4.00	4.15	4.45	CPT	3	6	5	4	10	11	N=30	
CP007	5.00	5.15	5.31	CPT	10	10	17	28	5		50/155mm	
CP007	6.00	6.15	6.45	SPT	7	10	9	14	7	10	N=40	
CP007	7.00	7.15	7.45	SPT	2	3	4	4	4	5	N=17	
CP007	8.00	8.15	8.45	SPT	4	3	7	9	10	14	N=40	
CP008	1.20	1.35	1.65	SPT	1	1	1	1	2	3	N=7	
CP008	2.00	2.15	2.45	CPT	3	3	4	4	8	11	N=27	
CP008	3.00	3.15	3.45	CPT	3	4	4	3	4	6	N=17	
CP008	4.00	4.15	4.45	CPT	2	3	1	2	3	8	N=14	
CP008	5.00	5.15	5.45	CPT	3	4	3	6	8	8	N=25	
CP008	6.00	6.15	6.45	CPT	3	3	5	7	7	7	N=26	
CP008	7.00	7.15	7.31	CPT	10	10	17	23	10		50/160mm	
CP008	7.90	7.97	8.04	SPT	25		50				25*/70mm 50/70mm	

IAN FARMER ASSOCIATES

			Site Derby Road, Burton-upon-Trent	**Borehole Number** **CP001**
In Situ Permeability Type Falling Head	**Test No.** 1	**Ground Level (mOD)** 45.25	**Client** St Modwen Developments Limited	**Job Number** 21321
	Location 425358 E 325062.4 N	**Dates** 10/11/2014	**Engineer** Atkins Limited	**Sheet** 1/1

Height of casing above ground level:	0.00 **m**
Depth to Base of Borehole:	1.50 **m bgl**
Depth to Base of Casing:	1.00 **m bgl**
Depth to equilibrium water level:	1.50 **m bgl**
Test Length L:	0.50 **m**
Diameter of Test Length D:	0.15 **m**
Area of Test Section:	0.0177 **m2**
Intake Factor F: (after condition D, figure 6, BS 5930)	1.6372

PERMEABILITY (after Hvorslev, 1951)

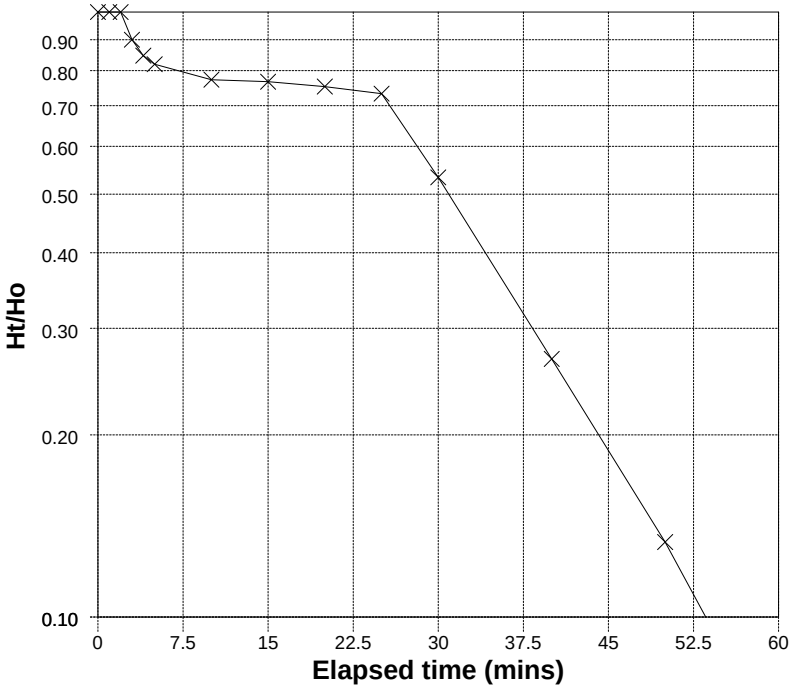
Basic Time Lag Analysis

The value T when Ht/Ho = 0.37 is the basic time lag, T

T = 36.13

k = 4.98E-06 **ms-1**

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.0	0.000	1.500	1.000
1.0	0.000	1.500	1.000
2.0	0.000	1.500	1.000
3.0	0.150	1.350	0.900
4.0	0.230	1.270	0.847
5.0	0.270	1.230	0.820
10.0	0.340	1.160	0.773
15.0	0.350	1.150	0.767
20.0	0.370	1.130	0.753
25.0	0.400	1.100	0.733
30.0	0.700	0.800	0.533
40.0	1.100	0.400	0.267
50.0	1.300	0.200	0.133
60.0	1.410	0.090	0.060



Remarks

Key: bgl = Below Ground Level btoc = Below Top of Casing

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP004

In Situ Permeability Type	Test No.	Ground Level (mOD)	Client	Job Number
Falling Head	1	43.93	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425447.2 E 325237 N	06/11/2014-07/11/2014	Atkins Limited	1/1

Height of casing above ground level:	0.00	**m**
Depth to Base of Borehole:	2.00	**m bgl**
Depth to Base of Casing:	1.50	**m bgl**
Depth to equilibrium water level:	2.00	**m bgl**
Test Length L:	0.50	**m**
Diameter of Test Length D:	0.15	**m**
Area of Test Section:	0.0177	**m2**
Intake Factor F: (after condition D, figure 6, BS 5930)	1.6372	

PERMEABILITY (after Hvorslev, 1951)

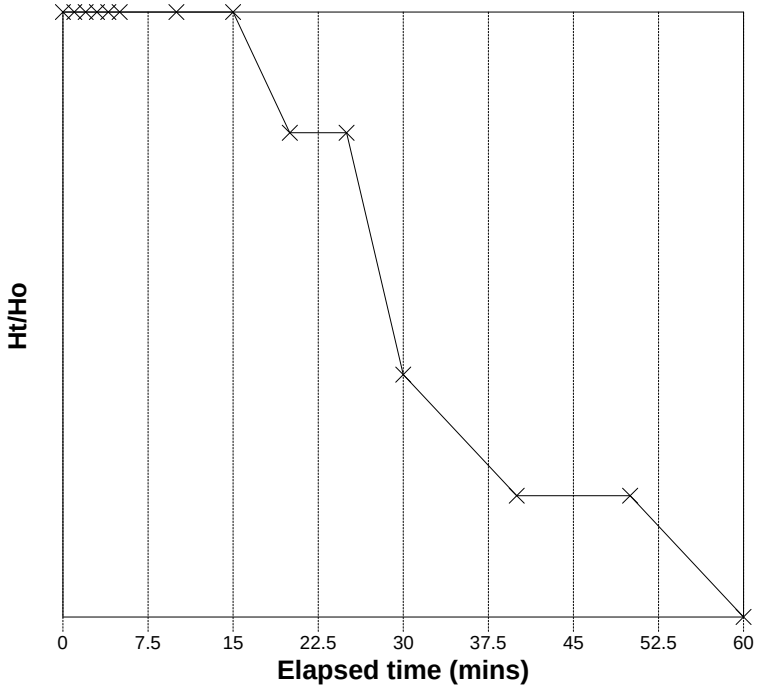
Basic Time Lag Analysis

The value T when Ht/Ho = 0.37 is the basic time lag, T

T =

k = **ms-1**

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.0	0.000	2.000	1.000
1.0	0.000	2.000	1.000
2.0	0.000	2.000	1.000
3.0	0.000	2.000	1.000
4.0	0.000	2.000	1.000
5.0	0.000	2.000	1.000
10.0	0.000	2.000	1.000
15.0	0.000	2.000	1.000
20.0	0.003	1.997	0.999
25.0	0.003	1.997	0.999
30.0	0.007	1.993	0.997
40.0	0.008	1.992	0.996
50.0	0.009	1.991	0.996
60.0	0.010	1.990	0.995



Remarks

Only 10mm fall in head after 1 hour. Permeability calculation not possible.

Key: bgl = Below Ground Level btoc = Below Top of Casing

IAN FARMER ASSOCIATES

Site	Borehole Number
Derby Road, Burton-upon-Trent	CP008

In Situ Permeability Type	Test No.	Ground Level (mOD)	Client	Job Number
Falling Head	1	44.49	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425595 E 325431.1 N	05/11/2014	Atkins Limited	1/1

Height of casing above ground level:	0.00	**m**
Depth to Base of Borehole:	2.00	**m bgl**
Depth to Base of Casing:	1.50	**m bgl**
Depth to equilibrium water level:	2.00	**m bgl**
Test Length L:	0.50	**m**
Diameter of Test Length D:	0.15	**m**
Area of Test Section:	0.0177	**m2**
Intake Factor F: (after condition D, figure 6, BS 5930)	1.6372	

PERMEABILITY (after Hvorslev, 1951)

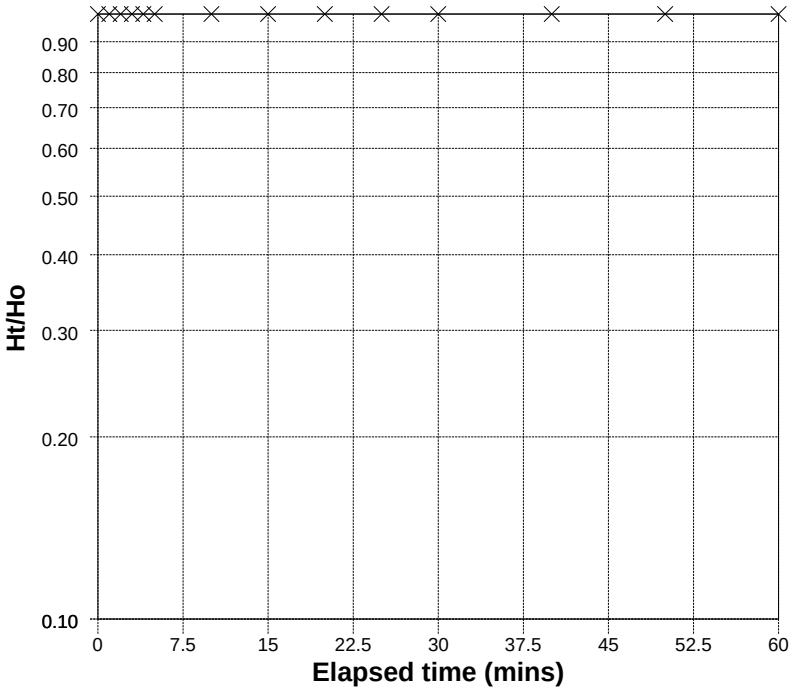
Basic Time Lag Analysis

The value T when Ht/Ho = 0.37 is the basic time lag, T

T =

k = **ms-1**

Elapsed time (mins)	Depth to water (m bgl)	Head of Water, H (m)	Ht / Ho
0.0	0.000	2.000	1.000
1.0	0.000	2.000	1.000
2.0	0.000	2.000	1.000
3.0	0.000	2.000	1.000
4.0	0.000	2.000	1.000
5.0	0.000	2.000	1.000
10.0	0.000	2.000	1.000
15.0	0.000	2.000	1.000
20.0	0.000	2.000	1.000
25.0	0.000	2.000	1.000
30.0	0.000	2.000	1.000
40.0	0.000	2.000	1.000
50.0	0.000	2.000	1.000
60.0	0.000	2.000	1.000



Remarks

No fall in head after 1 hour. No permeability calculation possible.

Key: bgl = Below Ground Level btoc = Below Top of Casing

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP002

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.8 x 0.7m	44.56	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425401.7 E 325108.9 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL		
				44.41	0.15	MADE GROUND: Dark brown, clayey, gravelly sand. Gravel is subrounded, fine to medium quartzite, brick, ceramic pipe and rootlets.		
0.50	B1				(0.55)			
0.50	E1							
				43.86	0.70	Soft to firm, grey mottled yellow and black slightly sandy CLAY. Slight organic odour (Alluvium)		
1.20	B2				(1.00)			
1.20	E2							
			Water strike(1) at 1.50m.					▽1
				42.86	1.70	Grey and light brown, very gravelly medium to coarse SAND. Gravel is subrounded fine to medium quartzite (River Terrace Deposits)		
					(0.60)			
2.10	B3							
2.10	E3			42.26	2.30	Complete at 2.30m		

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP002

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP003

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.8 x 0.7m	44.52	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425378.9 E 325129.2 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL.		
				44.37	0.15	MADE GROUND: Dark brown black, slightly clayey, gravelly sand. Gravel is subrounded, fine to medium quartzite.		
0.50 0.50	B1 E1				(0.65)			
				43.72	0.80	Soft to firm, dark brown mottled grey and yellow slightly sandy CLAY (Alluvium)		
1.50 1.50	B2 E2				(1.00)			
				42.72	1.80	Light brown, very gravelly, medium to coarse SAND. Gravel is subrounded fine to coarse quartzite (River Terrace Deposits)		▽1
			Slow seepage(1) at 2.00m.		(0.50)			
2.30 2.30	B3 E3			42.22	2.30	Complete at 2.30m		

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP003

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP004

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.7 x 0.7m	44.88	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425437 E 325150.9 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL.		
				44.73	0.15	MADE GROUND: Brown, clayey, gravelly, sand. Gravel is subangular to subrounded, fine to coarse quartzite, brick, roots and rootlets.		
0.50 0.50	B1 E1				(0.95)			
				43.78	1.10	Soft to firm, grey mottled yellow and black, slightly sandy CLAY. Organic odour (Alluvium)		
1.50 1.50	B2 E2				(0.90)			
2.00	HV 54kPa		Seepage(1) at 2.00m. 56,52,56/Av. 54.67	42.88	2.00	Grey and light brown, very gravelly, medium to coarse SAND. Gravel is subrounded fine to medium quartzite (River Terrace Deposits)		▽1
					(0.80)			
2.80 2.80	B3 E3			42.08	2.80	Complete at 2.80m		

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP004

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP005

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.5 0.7m	45.14	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425426.6 E 325176.3 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL.		
				44.99	0.15	MADE GROUND: Dark brown black, clayey, gravelly, sand. Gravel is subrounded, fine to medium quartzite, pieces of brown ceramics (plate edge).		
0.50	B1							
0.50	E1				(0.95)			
				44.04	1.10	Firm grey/blue mottled yellow and black sandy CLAY. Slight organic odour (Alluvium)		
1.20	HV 78kPa		76, 82,76/Av. 78.00					
1.20	B2							
1.20	E2				(0.80)			
				43.24	1.90	Brown, slightly clayey, very gravelly medium to coarse SAND. Gravel is subrounded fine to medium quartzite. Slight organic odour (River Terrace Deposits)		
					(0.80)			
			Seepage(1) at 2.50m.					▽1
2.70	B3			42.44	2.70	Complete at 2.70m		
2.70	E3							

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP005

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP006

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.6 x 0.7m	45.03	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425415 E 325192.5 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL		
				44.88	0.15	MADE GROUND: Dark brown, slightly clayey, gravelly, sand. Gravel is subrounded, fine to medium quartzite.		
0.50 0.50	B1 E1				(0.95)			
				43.93	1.10	Soft to firm grey/blue mottled black and yellow, occasional oxide red staining, slightly sandy CLAY. Organic odour (Alluvium)		
1.50 1.50	B2 E2				(0.90)			
				43.03	2.00	Red/orange and grey gravelly, medium to coarse SAND. Gravel is subrounded fine to coarse quartzite (River Terrace Deposits)		
			Water strike(1) at 2.20m.		(0.80)			▽1
				42.23	2.80	Complete at 2.80m		
2.80 2.80	B3 E3							

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP006

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP008

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.4 x 0.7m	44.03	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425470.5 E 325219.8 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Grass over TOPSOIL.		
				43.88	0.15	MADE GROUND: Brown black, clayey, gravelly sand. Gravel is subrounded quartzite and rootlets.		
					(0.35)			
0.50	B1			43.53	0.50	Soft yellow, mottled black and grey, slightly sandy CLAY with occasional gravels of subrounded fine to medium quartzite (Alluvium)		
0.50	E1							
					(0.60)			
1.00	B2							
1.00	E2			42.93	1.10	Light brown, very gravelly, medium to coarse SAND. Gravel is subrounded to fine to medium quartzite (River Terrace Deposits)		
					(0.70)			
			Water strike(1) at 1.70m.					▽1
1.80	B3			42.23	1.80	Complete at 1.80m		
1.80	E3							

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP008

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP009

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.5 x 0.7m	44.34	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425516.4 E 325237.7 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	B1				(0.60)	Grass over dark brown, slightly clayey, fine to medium sand TOPSOIL with occasional gravels of subrounded, fine to medium quartzite.		
0.30	D1							
0.30	E1							
				43.74	0.60			
					(0.60)	Orange brown, slightly clayey, gravelly, medium SAND. Gravel is subrounded, fine to coarse quartzite. (River Terrace Deposits)		
1.00	B2							
1.00	D2							
				43.14	1.20			
			Seepage(1) at 1.50m.			Light brown, medium to coarse, gravelly to very gravelly SAND. Gravel is subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		▽1
					(1.00)			
2.00	B3							
2.00	D3							
2.00	E2							
				42.14	2.20			
						Complete at 2.20m		

Plan

Remarks

Pit terminated at 2.20m due to collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP009

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP010

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.6 x 0.7m	43.93	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425477.6 E 325296 N	10/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	MADE GROUND: Brown, clayey, gravelly, fine to medium sand. Gravel is subangular to subrounded brick and concrete fragments, quartzite.		
0.50 0.50	B1 E1			43.33	0.60	MADE GROUND: Light brown, very gravelly medium to coarse sand. Gravel is subangular to subrounded, fine to coarse quartzite, brick fragments, whole bricks.		
			Water strike(1) at 0.80m.		(0.60)			▽1
1.10 1.10	B2 E2			42.73	1.20	Brown, very gravelly coarse SAND. Gravel is subrounded, fine to medium quartzite (River Terrace Deposits)		
					(0.55)			
1.70 1.70	B3 E3			42.18	1.75	Complete at 1.75m		

Plan

Remarks

Terminated due to sidewall collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP010

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP011

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.8 x 0.7m	43.59	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425537.7 E 325310.9 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Dark brown, clayey, gravelly, fine to medium sand. Gravel is subangular to subrounded, fine to coarse quartzite, and brick.		
0.30	B1			43.19	0.40			
0.30	D1					Soft, very sandy CLAY with occasional gravels of subangular to subrounded, fine to medium quartzite (Alluvium)		
0.30	E1				(0.30)			
0.50	B2							
0.50	D2			42.89	0.70			
						Brown, gravelly to very gravelly, medium to coarse SAND. Gravel is subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		
					(1.60)			
2.00	B3							
2.00	D3							
2.00	E2							
				41.29	2.30			
						Complete at 2.30m		

Plan

Remarks

Pit terminated at 2.30m due to collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP011

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP014

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.6 x 0.7m	44.04	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425572 E 325360 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADE GROUND: Soft, dark brown, very sandy gravelly clay. Gravel is subangular to subrounded quartzite and brick.		
				43.74	0.30			
0.30	B1					Soft, light brown mottled orange grey, sandy CLAY with occasional gravels of subrounded, fine to medium quartzite (Alluvium)		
0.30	D1				(0.30)			
0.30	E1							
0.50	B2							
0.50	D2			43.44	0.60			
						Brown, very gravelly, medium to coarse SAND. Gravel is subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		
			Seepage(1) at 1.30m.		(1.60)			▽1
2.00	B3							
2.00	D3							
2.00	E3			41.84	2.20			
						Complete at 2.20m		

Plan

Remarks

End of pit at 2.20m due to collapse

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP014

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP015

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.5 x 0.7m	44.25	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425576 E 325319.7 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Light brown, sandy gravel of subangular quartzite with membrane at base. Occasional clay pockets. (Car park compacted surface)		
0.30	B1			43.85	0.40			
0.30	D1					Soft to firm, light brown mottled orange grey, sandy CLAY with occasional gravel of subrounded quartzite (Alluvium)		
0.30	E1							
0.60	HV 33kPa		28,28,44/Av. 33.33		(0.50)			
0.70	B2							
0.70	D2							
				43.35	0.90	Light brown, gravelly, medium to coarse SAND. Gravel is subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		
1.50	B3							
1.50	D3				(1.40)			
			Seepage(1) at 2.00m.					▽1
				41.95	2.30			
2.30	D4					Complete at 2.30m		
2.30	E2							

Plan

Remarks

Pit terminated at 2.30m due to collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP015

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP016

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.8 x 0.7m	43.90	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425558.4 E 325386.3 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	MADE GROUND: Black, very gravelly, coarse sand. Gravel is subangular quartzite.		
0.30	B1			43.60	0.30			
0.30	D1					Soft to firm, grey mottled black and yellow CLAY with occasional gravels of subrounded quartzite (Alluvium)		
0.30	E1				(0.50)			
0.50	B2							
0.50	D2			43.10	0.80			
						Grey, gravelly, medium to coarse SAND. Gravel is subangular to subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		
1.00	B3							
1.00	D3							
1.00	E2				(1.30)			
2.00	E3		Water strike(1) at 2.00m.					▽1
				41.80	2.10	Complete at 2.10m		

Plan

Remarks

Pit terminated at 2.10m due to collapse.
Entire pit exhibiting strong odour. Possibly anoxic. Not hydrocarbon. (Site of old pond?)

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP016

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP018

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.4 x 0.7m	44.15	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425592.6 E 325394.1 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	MADE GROUND: Light brown, very sandy, fine to coarse gravel of subangular quartzite, sandstone and bricks. Membrane at base.		
0.30 0.30 0.30	B1 D1 E1			43.75	0.40	Soft, light brown mottled yellow and grey CLAY with occasional gravels of subrounded quartzite (Alluvium)		
					(0.90)			
1.00 1.00	B2 D2							
			Seepage(1) at 1.30m.	42.85	1.30	Light brown, slightly clayey, very gravelly, medium to coarse SAND. Gravel is fine to coarse, subangular to rounded of mainly quartzite. (River Terrace Deposits)		▽1
					(0.80)			
2.00 2.00 2.00	B3 D3 E2			42.05	2.10	Complete at 2.10m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP018

IAN FARMER ASSOCIATES

Site	Trial Pit Number
Derby Road, Burton-upon-Trent	TP019

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit	2.8 x 0.7m	44.46	St Modwen Developments Limited	21321
	Location	**Dates**	**Engineer**	**Sheet**
	425628.7 E 325406.8 N	04/11/2014	Atkins Limited	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				44.36	(0.10) 0.10	MADE GROUND: Grass over topsoil.		
				44.16	(0.20) 0.30	MADE GROUND: Dark brown, slightly clayey, gravelly, fine to medium sand. Gravels of subangular to subrounded, fine to coarse quartzite, brick fragments, roots and rootlets. Membrane at base.		
0.30	B1					Soft to firm, brown, slightly sandy, gravelly CLAY. Gravel is subrounded, fine to medium quartzite (Alluvium)		
0.30	D1							
0.30	E1							
1.00	B2				(1.50)			
1.00	D2							
				42.66	1.80	Light brown, gravelly to very gravelly, medium to coarse SAND. Gravel is subangular to subrounded, fine to medium of mainly quartzite. (River Terrace Deposits)		
2.00	B3							
2.00	D3							
2.00	E3		Seepage(1) at 2.20m.		(0.80)			▽1
				41.86	2.60	Complete at 2.60m		

Plan

Remarks

Pit terminated at 2.60m due to collapse.

Scale (approx)	Logged By	Figure No.
1:25	MD	21321.TP019

APPENDIX 3

LABORATORY TESTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS

A3.1 ACCREDITATION

A3.1.1 The geotechnical analyses were carried out as detailed below:

Test	British Standard Reference	Notes
Moisture Content	BS 1377: Part 2: Clause 3.2	For comparison with Atterberg limits (if required) the measured moisture content would have to be corrected to give the equivalent moisture content of the fraction passing the 425 micron sieve.
Atterberg Limits	BS 1377: Part 2: Clause 4.3 and Clause 5	The samples were prepared in accordance with Clause 4.2.
Particle Size Distribution	BS 1377: Part 2: Clause 9.2	Samples prepared in accordance with Clause 7.3 and 7.4.5.
Sedimentation	BS 1377: Part 2: Clause 9	Results were directly linked to the particle size distribution curve.
CBR (California Bearing Ratio)	BS 1377: Part 4: Clause 7.4	Using penetration test procedure, samples prepared in accordance with Clause 7.2.4.4.
Compactions 2.5kg Rammer	BS 1377: Part 4: Clause 3.3 and 3.4	Samples prepared in accordance with Clause 3.2A

The results of these tests are shown in Appendix 3.

A3.1.2 Subcontracted results are presented directly on headed paper from the subcontracting laboratory.

IAN FARMER ASSOCIATES

Unit 4 Faraday Close, Pattinson North Industrial Estate, Washington, Tyne & Wear, NE38 8QJ.
Tel. 0191 4828500 Fax. 0191 4828520 Email. washington@ianfarmer.co.uk Internet.www.ianfarmer.co.uk

Ian Farmer Associates (1998) Ltd
1 Fairfield court Seven Stars industrial estate
Wheler Road
Coventry,
CV3 4LJ

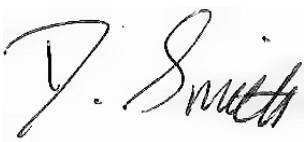
F.A.O. Roy Smith

TEST REPORT - 21321

Site :	Derby Road, Burton-upon-Trent
Job Number :	21321
Originating Client :	St Modwen Developments Limited
Originating Reference :	Not Given
Date Sampled :	
Date Scheduled :	19/11/14
Date Testing Started :	28/11/14
Date Testing Finished :	17/12/14

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:  Daniel Smith

Position : Laboratory Supervisor Date : 17/12/14

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

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 %						
CP001	1.20	B2	Natural	35								Brown silty clayey gravelly SAND
CP001	2.00	B4	Natural	6.7								Brown silty clayey sandy GRAVEL
CP002	1.20	B2	Natural	52	99	52	100	43	57	0.16	ME	Brown gravelly silty clayey SAND
CP003	1.20	B3	Natural	8.1	26	17		NP				Brown clayey silty gravelly SAND
CP004	0.10	B1	Natural	29								Brown gravelly silty clayey SAND
CP005	0.60	B3	Natural	16	89	17	29	15	14	0.14	CL	Brown silty gravelly clayey SAND
CP006	0.30	B2	Natural	65								Brown gravelly silty clayey SAND
CP006	1.20	B3	Natural	9.7								Brown silty clayey sandy GRAVEL
CP007	0.30	B2	Natural	5.1								Brown silty clayey sandy GRAVEL
CP008	1.20	B4	Natural	41	96	43	76	35	41	0.20	CV	Brown sandy gravelly silty CLAY
CP008	4.00	B7	Natural	5.8								Brown silty clayey sandy GRAVEL includes cobbles
TP002	1.20	B2	Natural	36	60	57		NP				Brown clayey silty gravelly SAND
TP004	0.50	B1	Natural	17								Brown clayey sandy silty GRAVEL
TP005	0.50	B1	Natural	19								Brown gravelly sandy silty CLAY
TP006	1.50	B2	Natural	60	98	61	93	36	57	0.44	CE	Brown gravelly clayey sandy SILT
TP009	1.00	B2	Sieved	8.8	21	23		NP				Brown silty clayey gravelly SAND
TP011	2.00	B3	Natural	7.1	12	23		NP				Brown clayey silty sandy GRAVEL
TP015	0.70	B2	Natural	16	100	16	30	17	13	-0.08	CL	Brown gravelly clayey silty SAND
TP019	1.00	B2	Natural	23	98	24	51	24	27	0.00	CH	Brown sandy gravelly clayey SILT

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

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

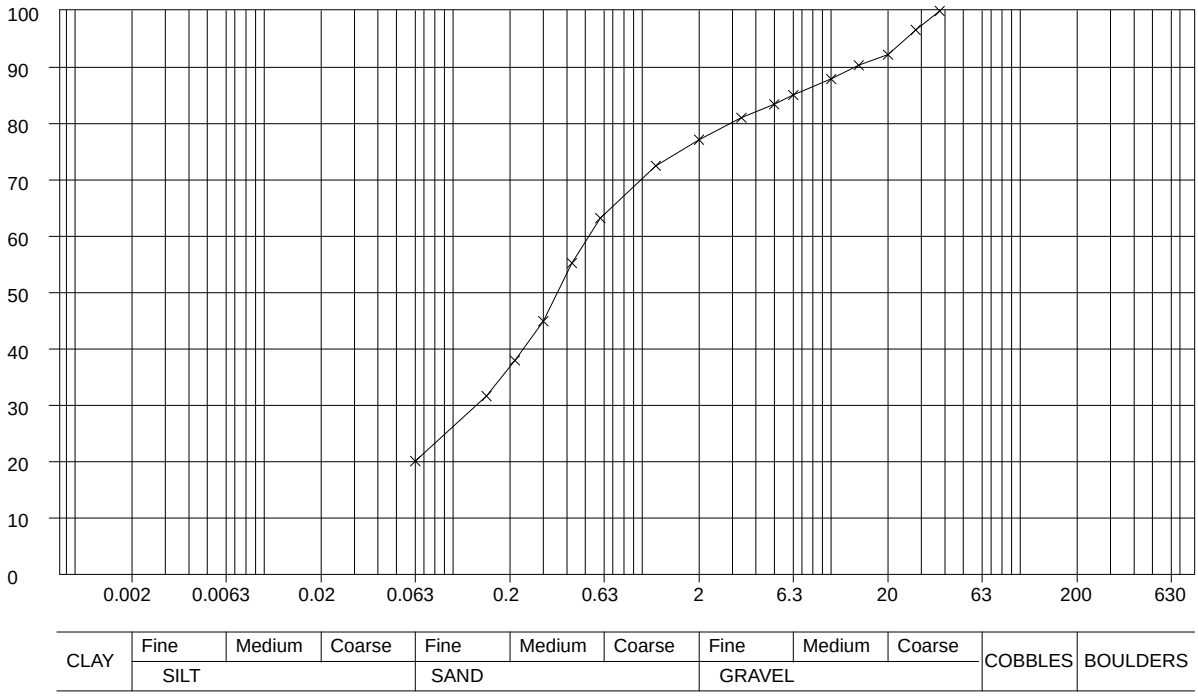
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP001	1.20	B2	N/A	Brown silty clayey gravelly SAND



Grading Analysis	
D85	6.2 mm
D60	528.8 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	23%
Sand	57%
Silt/Clay	20%

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	97
20 mm	92
14 mm	90
10 mm	88
6.3 mm	85
5 mm	83
3.35 mm	81
2 mm	77
1.18 mm	73
600 µm	63
425 µm	55
300 µm	45
212 µm	38
150 µm	32
63 µm	20

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 - 21321

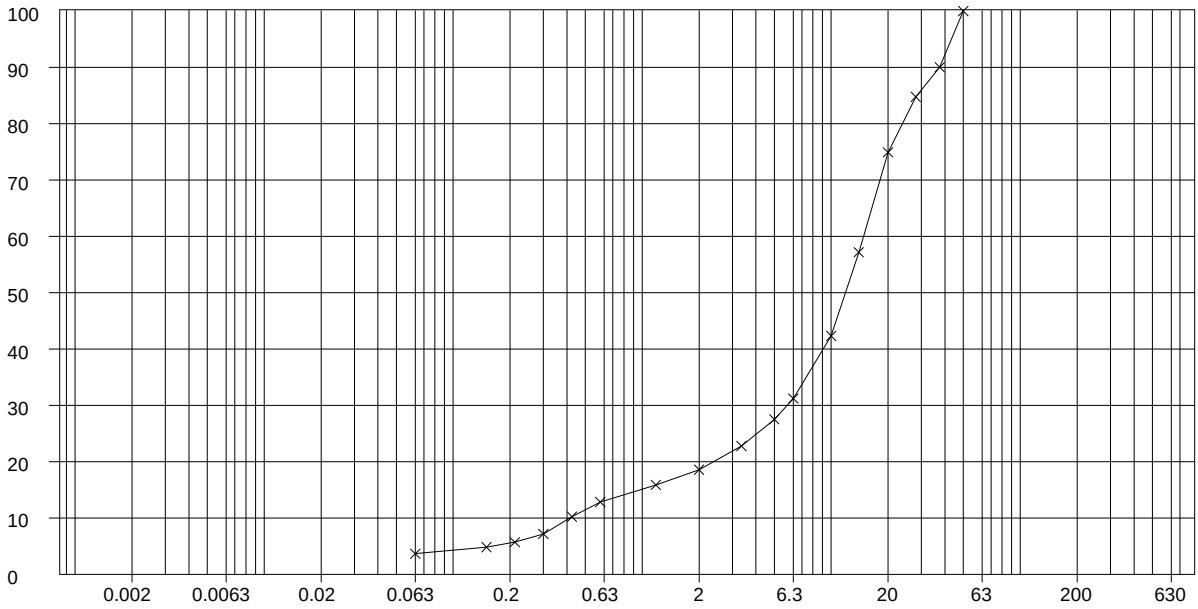
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP001	2.00	B4	N/A	Brown silty clayey sandy GRAVEL



Grading Analysis	
D85	28.4 mm
D60	15.0 mm
D10	416.0 µm
Uniformity Coefficient	35.9

Particle Proportions	
Cobbles + Boulders	0%
Gravel	81%
Sand	15%
Silt/Clay	4%

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	90
28 mm	85
20 mm	75
14 mm	57
10 mm	42
6.3 mm	31
5 mm	28
3.35 mm	23
2 mm	19
1.18 mm	16
600 µm	13
425 µm	10
300 µm	7
212 µm	6
150 µm	5
63 µm	4

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 - 21321

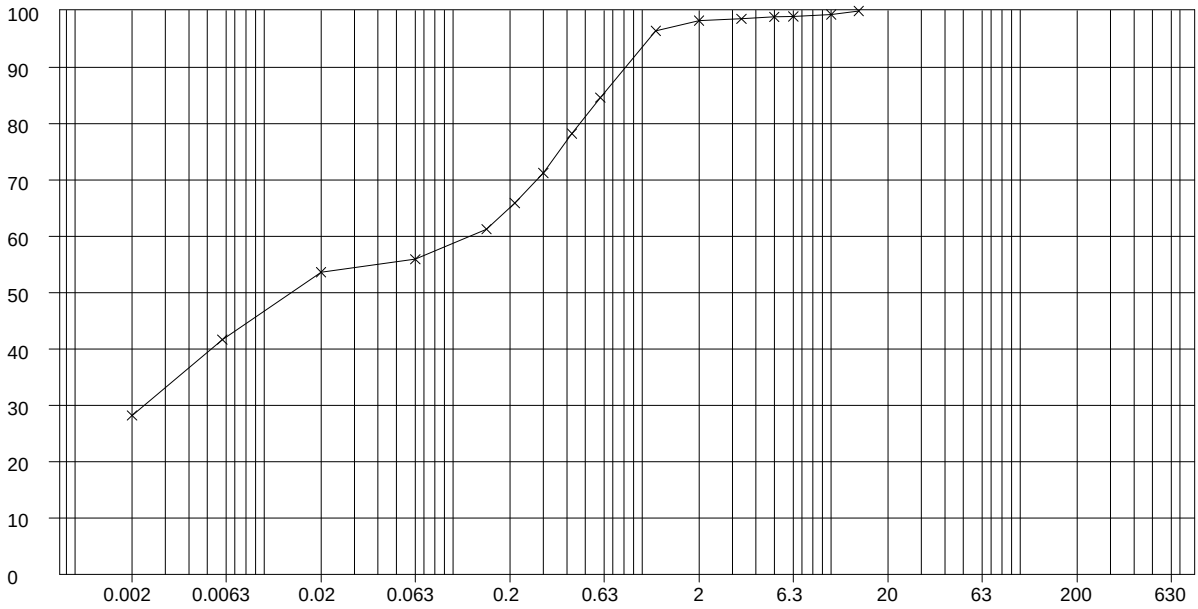
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP002	1.20	B2	Pipette	Brown gravelly 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	99
6.3 mm	99
5 mm	99
3.35 mm	99
2 mm	98
1.18 mm	96
600 µm	85
425 µm	78
300 µm	71
212 µm	66
150 µm	61
63 µm	56
20 µm	54
6 µm	42
2 µm	28

Grading Analysis	
D85	618.1 µm
D60	129.1 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	2%
Sand	42%
Silt	28%
Clay	28%

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 - 21321

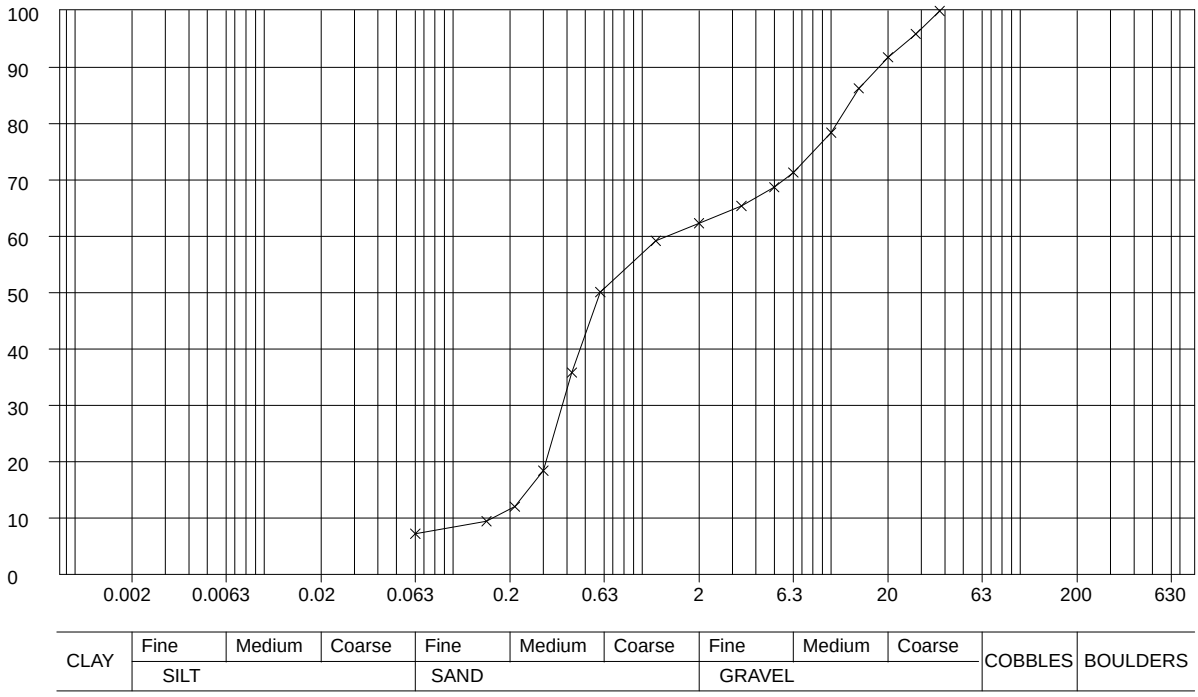
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP003	1.20	B3	N/A	Brown clayey silty gravelly SAND



Grading Analysis	
D85	13.3 mm
D60	1.4 mm
D10	164.0 µm
Uniformity Coefficient	8.5

Particle Proportions	
Cobbles + Boulders	0%
Gravel	38%
Sand	55%
Silt/Clay	7%

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	96
20 mm	92
14 mm	86
10 mm	78
6.3 mm	71
5 mm	69
3.35 mm	65
2 mm	62
1.18 mm	59
600 µm	50
425 µm	36
300 µm	18
212 µm	12
150 µm	9
63 µm	7

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 - 21321

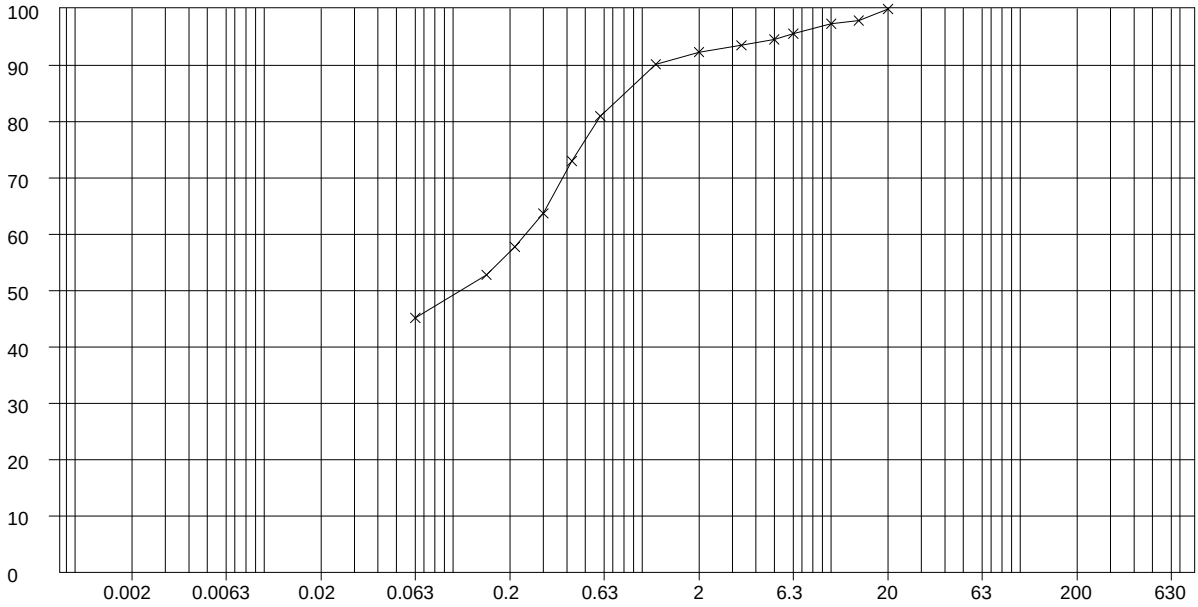
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP004	0.10	B1	N/A	Brown gravelly 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	98
10 mm	97
6.3 mm	96
5 mm	95
3.35 mm	94
2 mm	92
1.18 mm	90
600 µm	81
425 µm	73
300 µm	64
212 µm	58
150 µm	53
63 µm	45

Grading Analysis	
D85	852.2 µm
D60	244.7 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	8%
Sand	47%
Silt/Clay	45%

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 - 21321

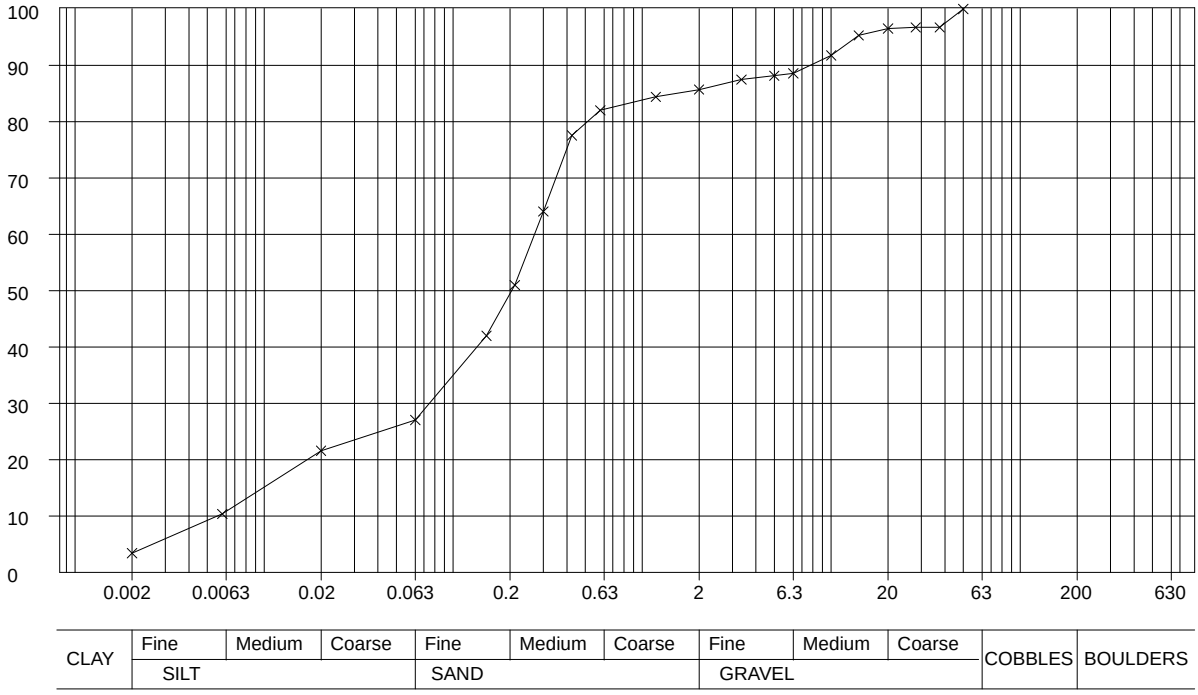
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP005	0.60	B3	Pipette	Brown silty gravelly clayey SAND



Grading Analysis	
D85	1.5 mm
D60	272.6 µm
D10	6.0 µm
Uniformity Coefficient	45.4

Particle Proportions	
Cobbles + Boulders	0%
Gravel	14%
Sand	59%
Silt	23%
Clay	3%

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	97
28 mm	97
20 mm	97
14 mm	95
10 mm	92
6.3 mm	89
5 mm	88
3.35 mm	87
2 mm	86
1.18 mm	84
600 µm	82
425 µm	78
300 µm	64
212 µm	51
150 µm	42
63 µm	27
20 µm	22
6 µm	10
2 µm	3

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 - 21321

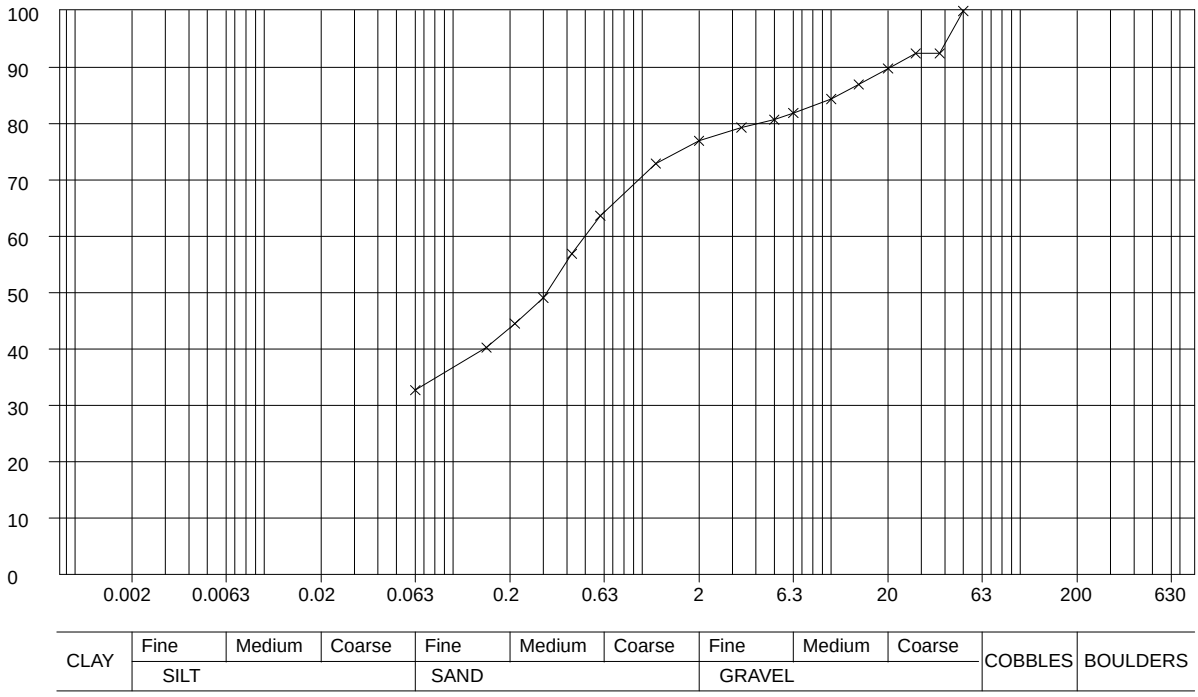
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP006	0.30	B2	N/A	Brown gravelly 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	92
28 mm	92
20 mm	90
14 mm	87
10 mm	84
6.3 mm	82
5 mm	81
3.35 mm	79
2 mm	77
1.18 mm	73
600 µm	64
425 µm	57
300 µm	49
212 µm	45
150 µm	40
63 µm	33

Grading Analysis	
D85	10.9 mm
D60	505.1 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	23%
Sand	44%
Silt/Clay	33%

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 - 21321

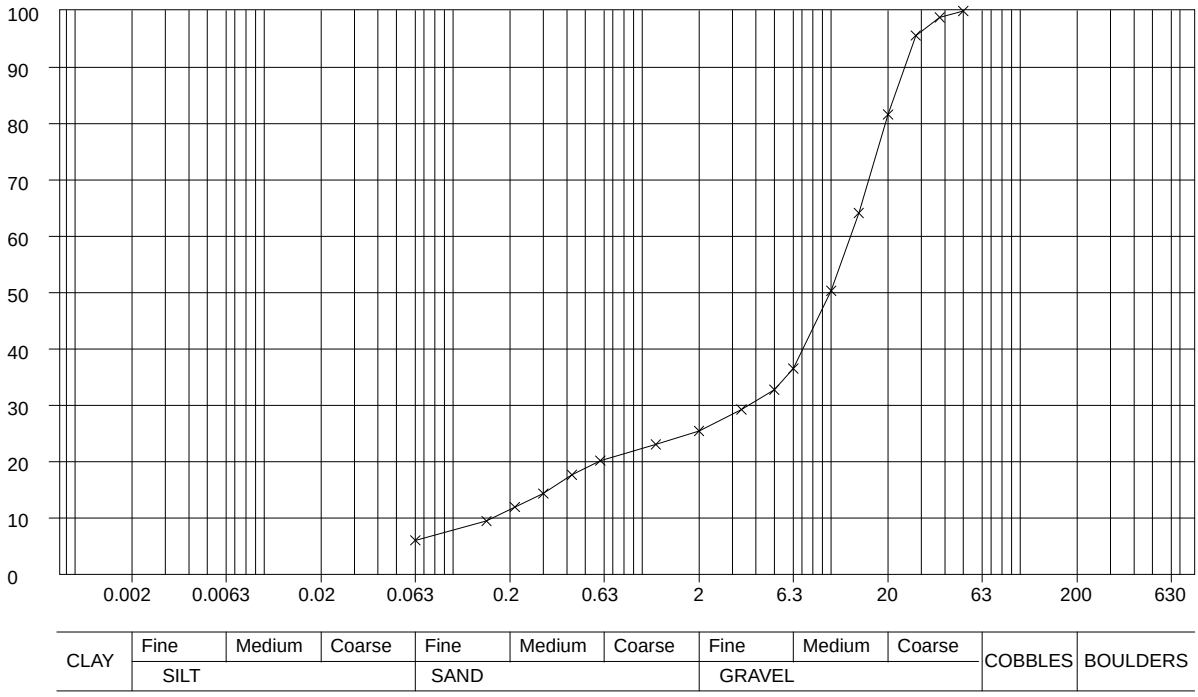
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP006	1.20	B3	N/A	Brown silty clayey sandy GRAVEL



Grading Analysis	
D85	21.9 mm
D60	12.8 mm
D10	163.0 µm
Uniformity Coefficient	78.5

Particle Proportions	
Cobbles + Boulders	0%
Gravel	75%
Sand	19%
Silt/Clay	6%

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	99
28 mm	96
20 mm	82
14 mm	64
10 mm	50
6.3 mm	37
5 mm	33
3.35 mm	29
2 mm	25
1.18 mm	23
600 µm	20
425 µm	18
300 µm	14
212 µm	12
150 µm	9
63 µm	6

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 - 21321

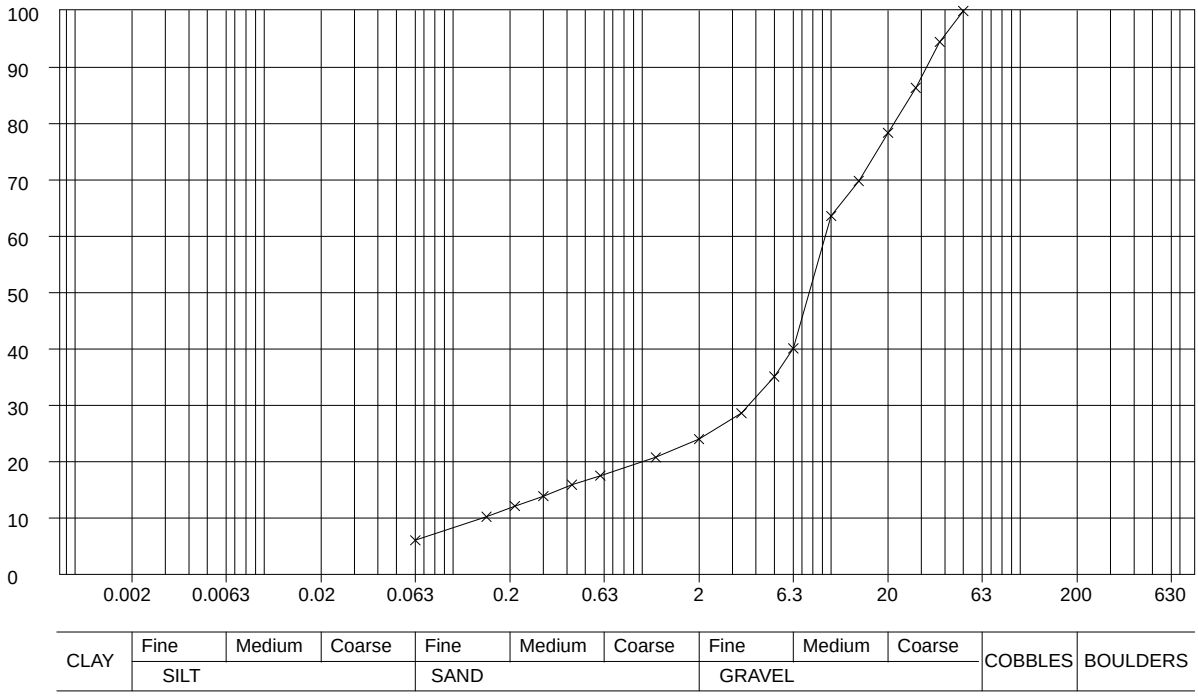
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP007	0.30	B2	N/A	Brown silty clayey sandy GRAVEL



Grading Analysis	
D85	26.6 mm
D60	9.4 mm
D10	145.0 µm
Uniformity Coefficient	65.0

Particle Proportions	
Cobbles + Boulders	0%
Gravel	76%
Sand	18%
Silt/Clay	6%

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	95
28 mm	86
20 mm	78
14 mm	70
10 mm	64
6.3 mm	40
5 mm	35
3.35 mm	29
2 mm	24
1.18 mm	21
600 µm	18
425 µm	16
300 µm	14
212 µm	12
150 µm	10
63 µm	6

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 - 21321

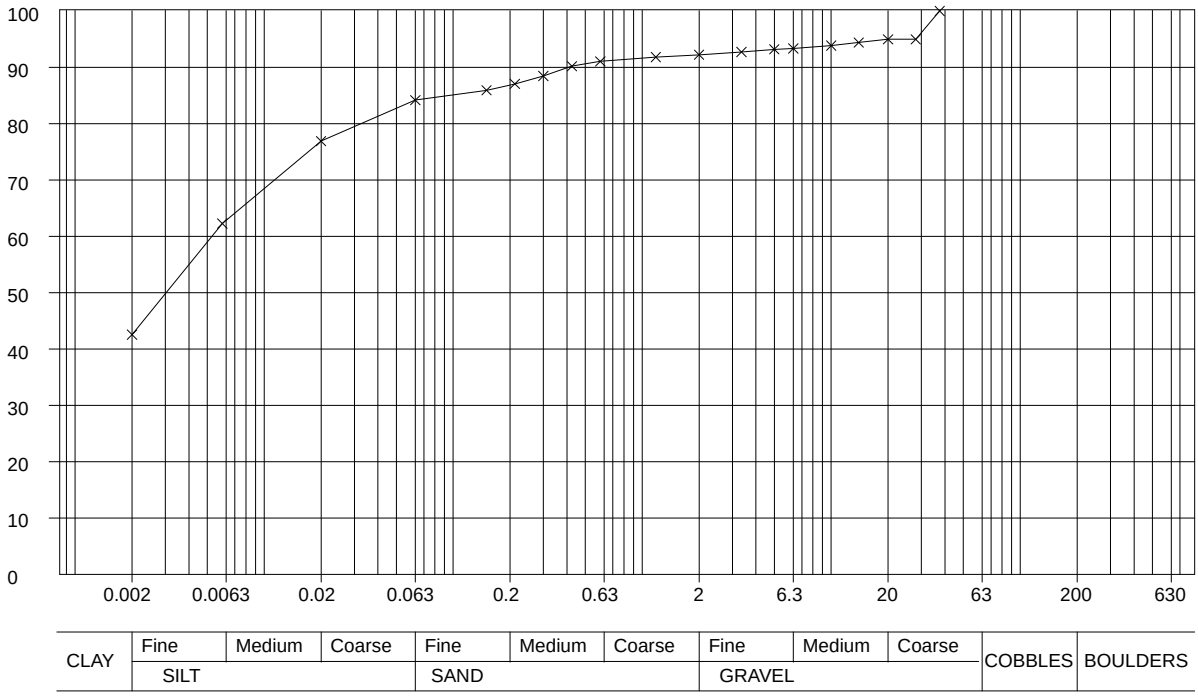
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP008	1.20	B4	Pipette	Brown sandy gravelly silty CLAY



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

Grading Analysis	
D85	103.3 µm
D60	5.5 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	8%
Sand	8%
Silt	41%
Clay	43%

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	95
20 mm	95
14 mm	94
10 mm	94
6.3 mm	93
5 mm	93
3.35 mm	93
2 mm	92
1.18 mm	92
600 µm	91
425 µm	90
300 µm	88
212 µm	87
150 µm	86
63 µm	84
20 µm	77
6 µm	62
2 µm	43

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 - 21321

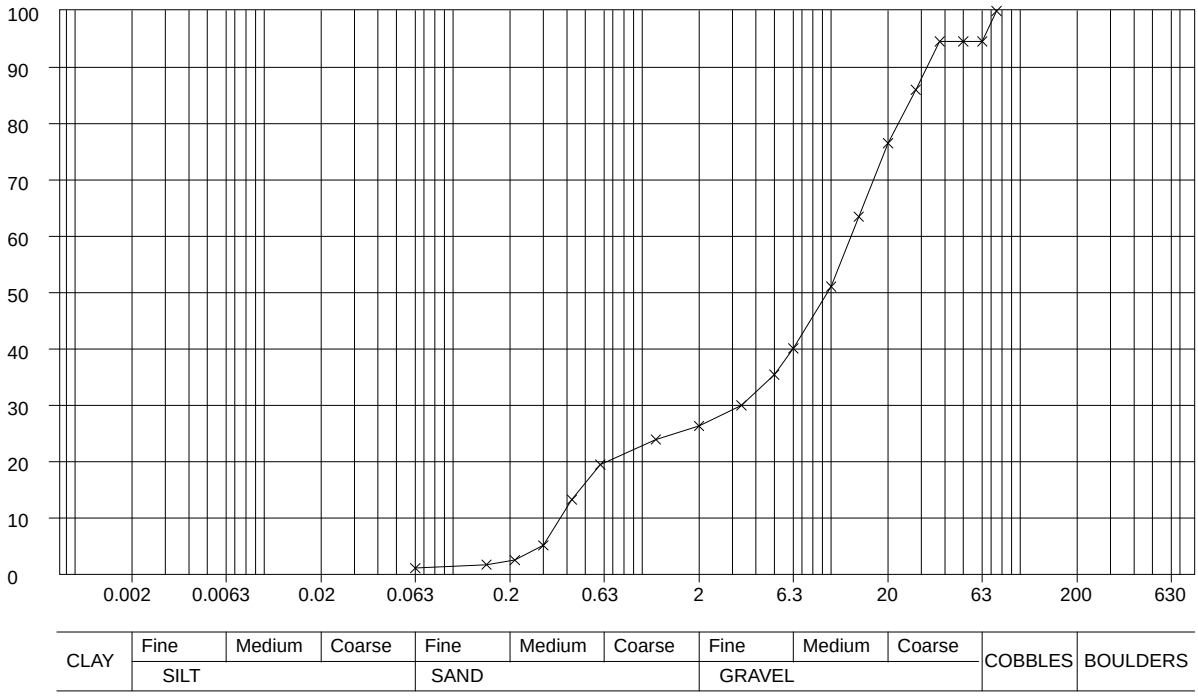
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
CP008	4.00	B7	N/A	Brown silty clayey sandy GRAVEL includes cobbles



Grading Analysis	
D85	27.1 mm
D60	12.9 mm
D10	375.0 µm
Uniformity Coefficient	34.3

Particle Proportions	
Cobbles + Boulders	5%
Gravel	68%
Sand	25%
Silt/Clay	2%

Sieve / Particle Size	% Passing
200 mm	100
150 mm	100
125 mm	100
90 mm	100
75 mm	100
63 mm	95
50 mm	95
37.5 mm	95
28 mm	86
20 mm	77
14 mm	64
10 mm	51
6.3 mm	40
5 mm	35
3.35 mm	30
2 mm	26
1.18 mm	24
600 µm	20
425 µm	13
300 µm	5
212 µm	3
150 µm	2
63 µm	1

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 - 21321

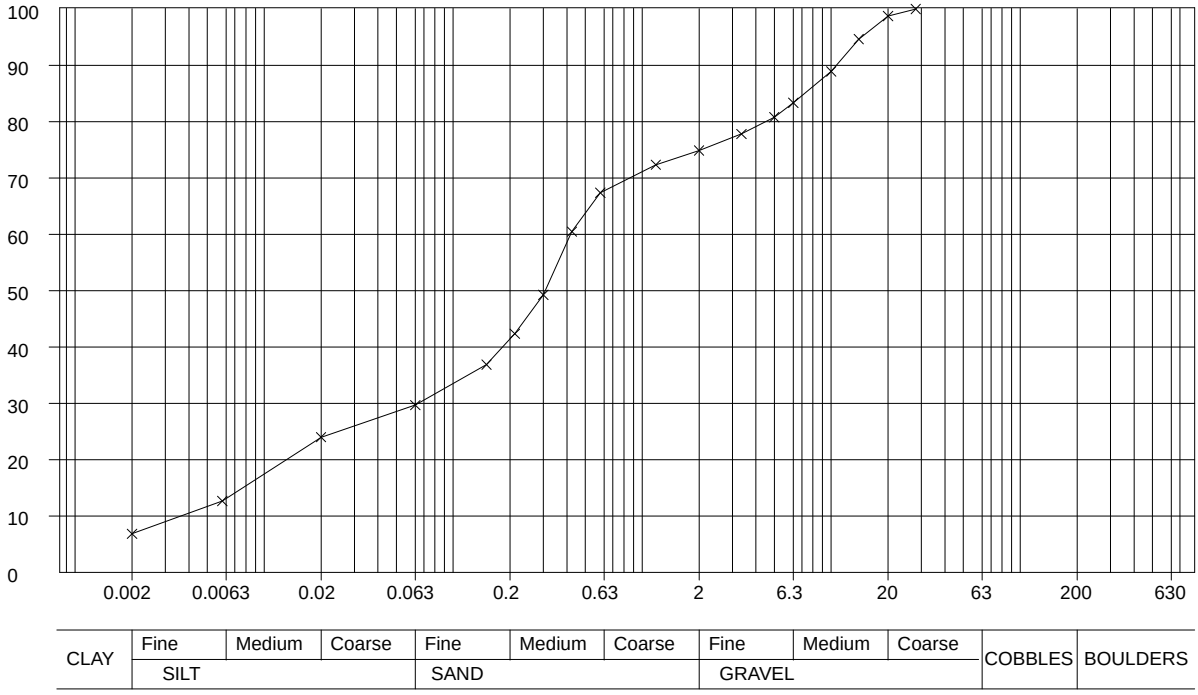
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP002	1.20	B2	Pipette	Brown clayey silty gravelly SAND



Grading Analysis	
D85	7.4 mm
D60	419.4 µm
D10	4.0 µm
Uniformity Coefficient	104.9

Particle Proportions	
Cobbles + Boulders	0%
Gravel	25%
Sand	45%
Silt	23%
Clay	7%

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	99
14 mm	95
10 mm	89
6.3 mm	83
5 mm	81
3.35 mm	78
2 mm	75
1.18 mm	72
600 µm	67
425 µm	61
300 µm	49
212 µm	42
150 µm	37
63 µm	30
20 µm	24
6 µm	13
2 µm	7

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 - 21321

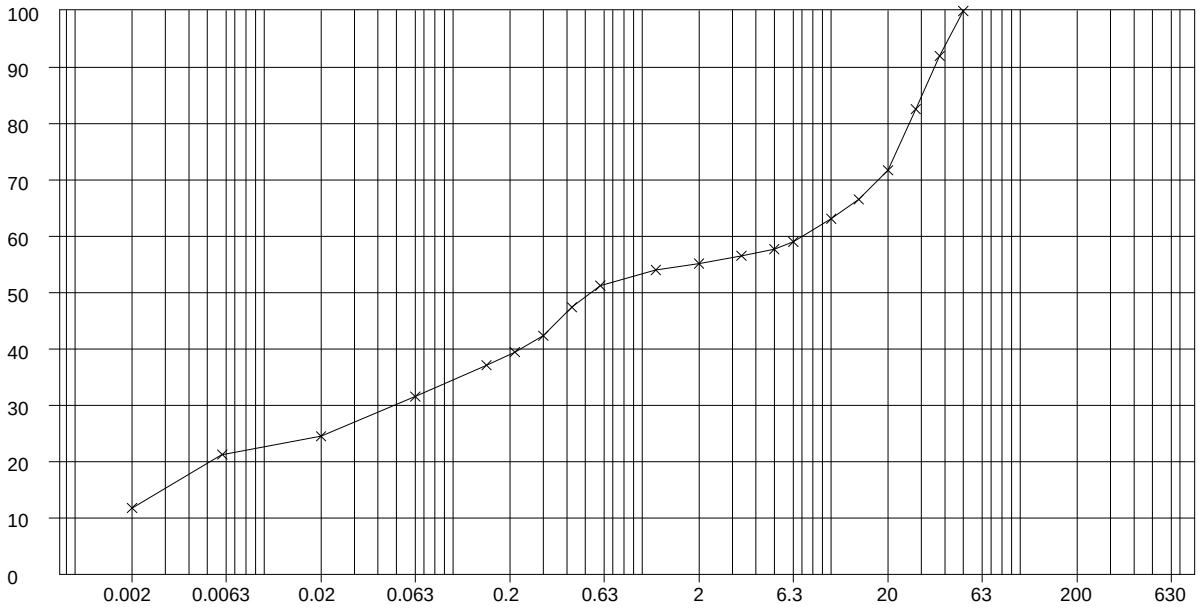
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP004	0.50	B1	Pipette	Brown clayey sandy silty GRAVEL



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	92
28 mm	83
20 mm	72
14 mm	67
10 mm	63
6.3 mm	59
5 mm	58
3.35 mm	57
2 mm	55
1.18 mm	54
600 µm	51
425 µm	47
300 µm	42
212 µm	39
150 µm	37
63 µm	32
20 µm	25
6 µm	21
2 µm	12

Grading Analysis	
D85	30.4 mm
D60	7.2 mm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	45%
Sand	24%
Silt	19%
Clay	12%

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 - 21321

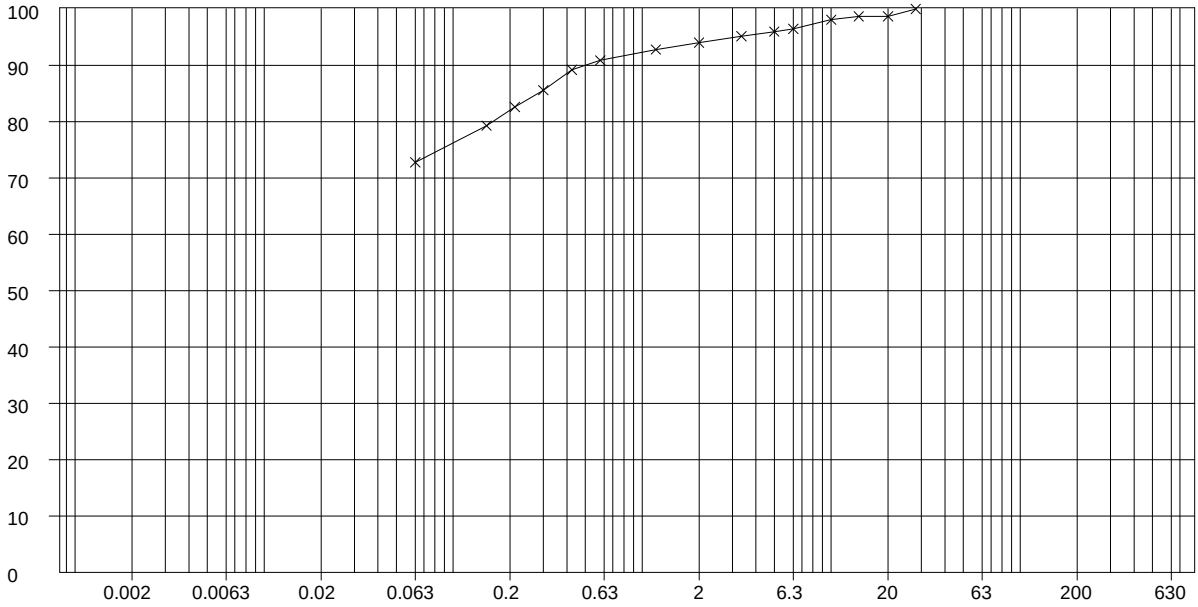
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP005	0.50	B1	N/A	Brown gravelly sandy silty CLAY



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

Grading Analysis	
D85	282.3 µm
D60	-
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	6%
Sand	21%
Silt/Clay	73%

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	99
14 mm	99
10 mm	98
6.3 mm	96
5 mm	96
3.35 mm	95
2 mm	94
1.18 mm	93
600 µm	91
425 µm	89
300 µm	86
212 µm	83
150 µm	79
63 µm	73

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 - 21321

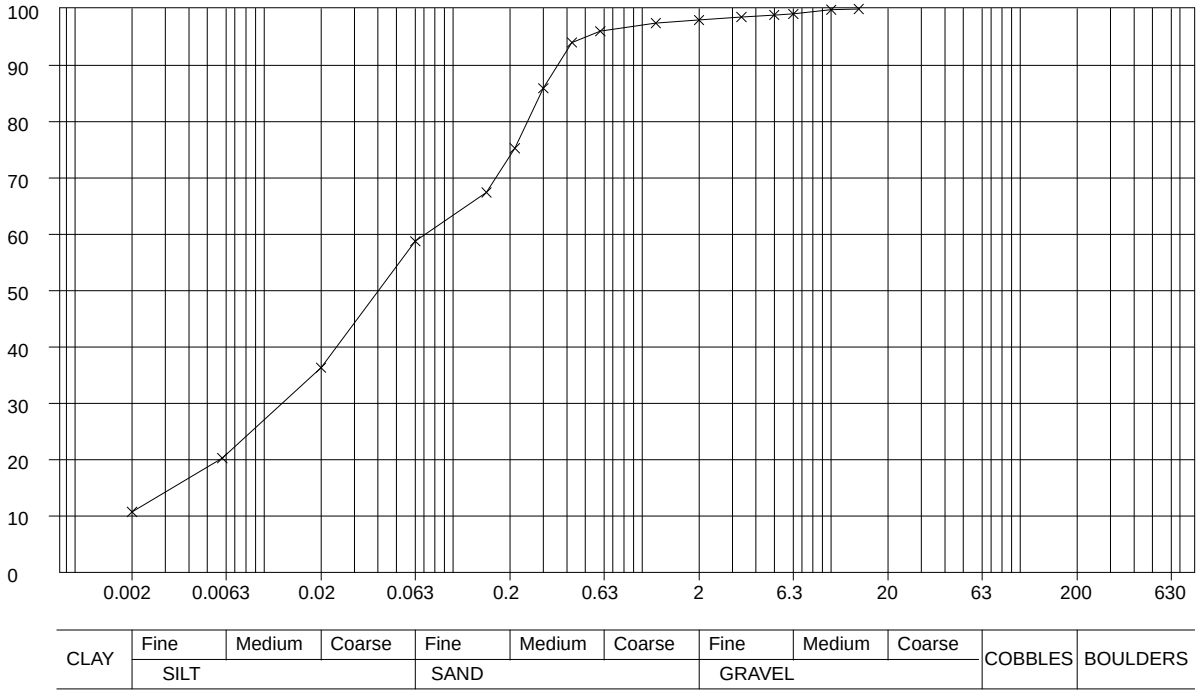
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP006	1.50	B2	Pipette	Brown gravelly clayey sandy SILT



Grading Analysis	
D85	292.2 µm
D60	75.1 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	2%
Sand	40%
Silt	47%
Clay	11%

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	99
5 mm	99
3.35 mm	99
2 mm	98
1.18 mm	98
600 µm	96
425 µm	94
300 µm	86
212 µm	75
150 µm	67
63 µm	59
20 µm	36
6 µm	20
2 µm	11

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 - 21321

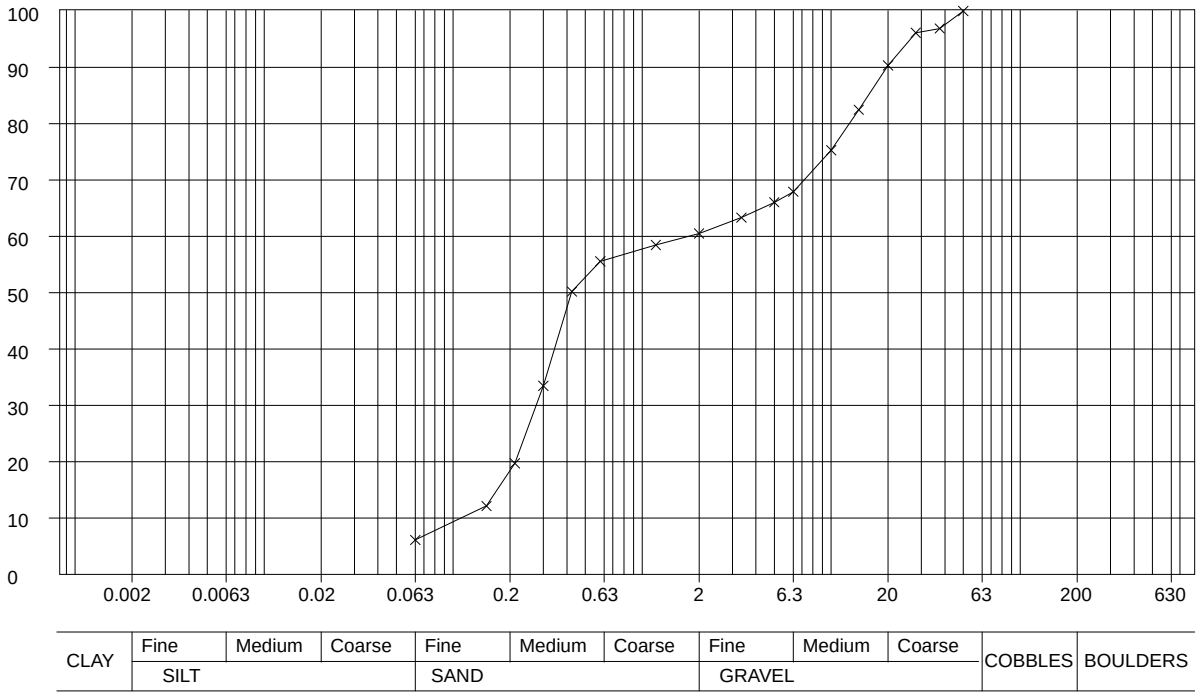
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP009	1.00	B2	N/A	Brown silty clayey gravelly SAND



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	97
28 mm	96
20 mm	90
14 mm	82
10 mm	75
6.3 mm	68
5 mm	66
3.35 mm	63
2 mm	61
1.18 mm	58
600 µm	56
425 µm	50
300 µm	33
212 µm	20
150 µm	12
63 µm	6

Grading Analysis	
D85	15.9 mm
D60	1.8 mm
D10	119.0 µm
Uniformity Coefficient	15.1

Particle Proportions	
Cobbles + Boulders	0%
Gravel	39%
Sand	54%
Silt/Clay	7%

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 - 21321

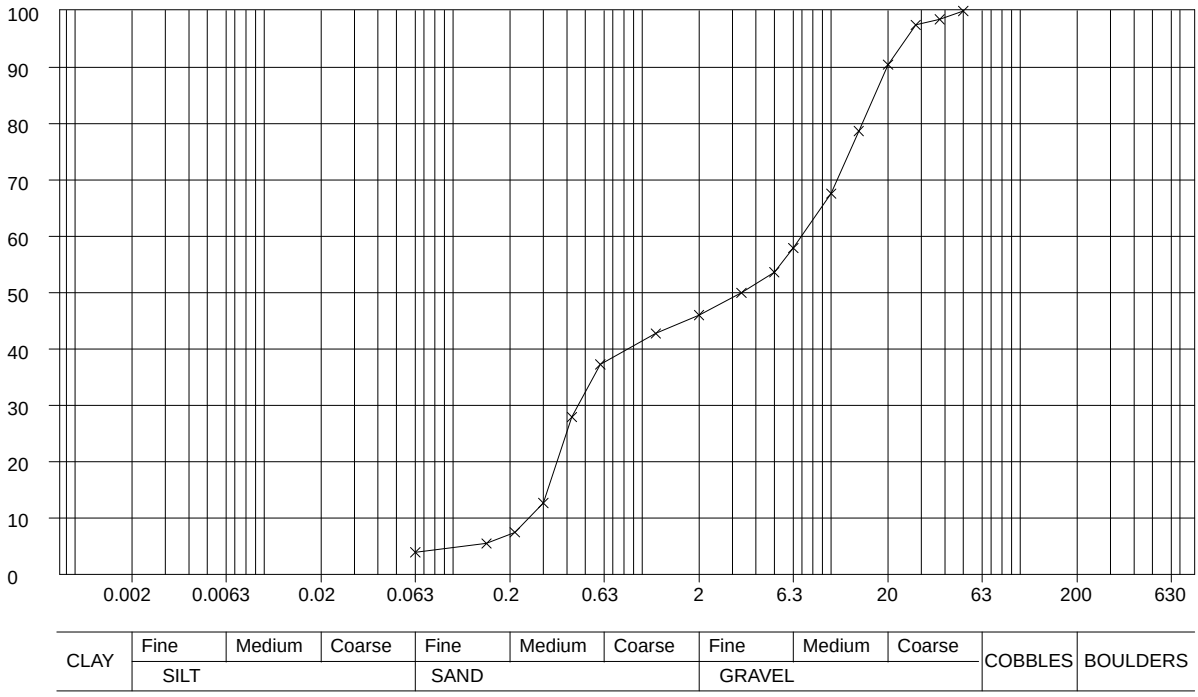
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP011	2.00	B3	N/A	Brown clayey silty sandy 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	99
28 mm	98
20 mm	90
14 mm	79
10 mm	68
6.3 mm	58
5 mm	54
3.35 mm	50
2 mm	46
1.18 mm	43
600 µm	37
425 µm	28
300 µm	13
212 µm	7
150 µm	5
63 µm	4

Grading Analysis	
D85	17.2 mm
D60	7.1 mm
D10	255.0 µm
Uniformity Coefficient	27.8

Particle Proportions	
Cobbles + Boulders	0%
Gravel	54%
Sand	42%
Silt/Clay	4%

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 - 21321

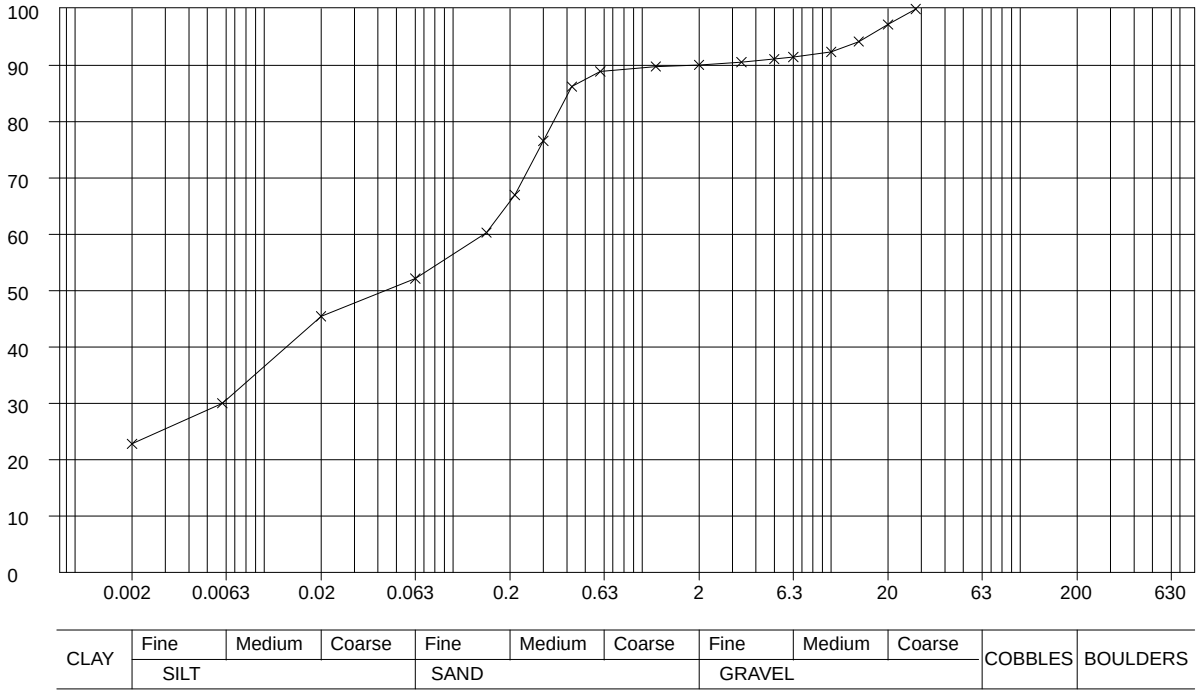
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP015	0.70	B2	Pipette	Brown gravelly clayey silty SAND



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

Grading Analysis	
D85	408.9 µm
D60	146.7 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	10%
Sand	38%
Silt	29%
Clay	23%

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	97
14 mm	94
10 mm	92
6.3 mm	91
5 mm	91
3.35 mm	91
2 mm	90
1.18 mm	90
600 µm	89
425 µm	86
300 µm	77
212 µm	67
150 µm	60
63 µm	52
20 µm	45
6 µm	30
2 µm	23

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 - 21321

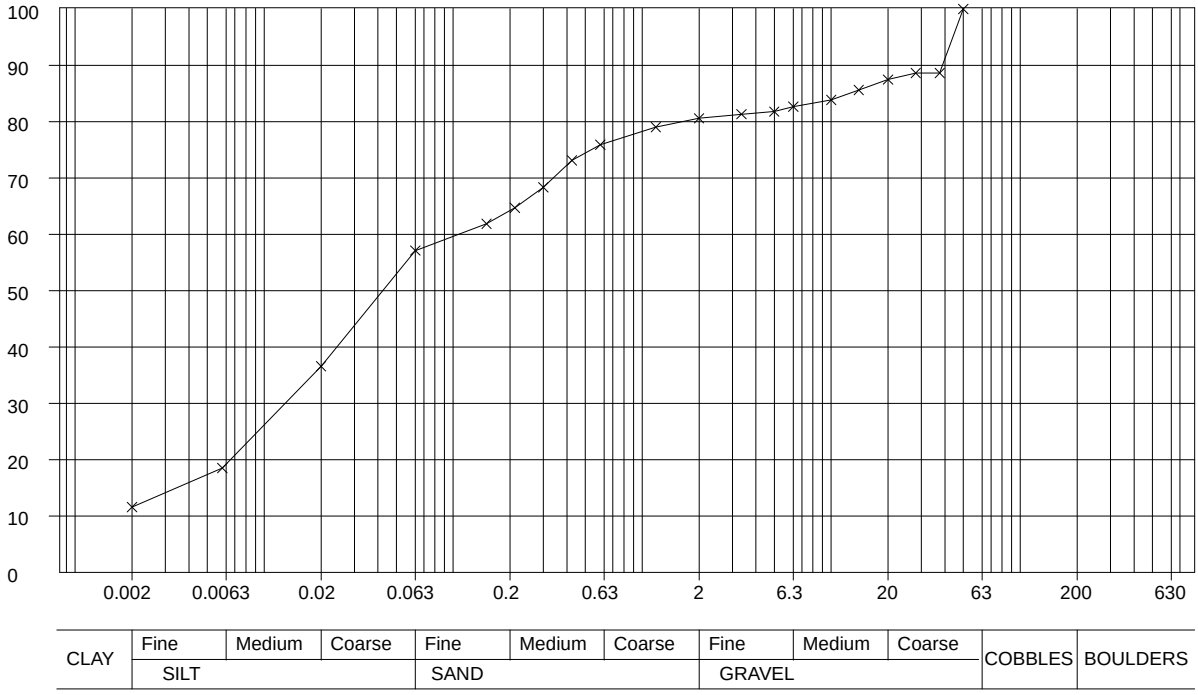
Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Pipette/ Hydrometer	Description
TP019	1.00	B2	Pipette	Brown sandy gravelly clayey SILT



Grading Analysis	
D85	12.6 mm
D60	115.7 µm
D10	-
Uniformity Coefficient	-

Particle Proportions	
Cobbles + Boulders	0%
Gravel	19%
Sand	24%
Silt	45%
Clay	12%

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	89
28 mm	89
20 mm	87
14 mm	86
10 mm	84
6.3 mm	83
5 mm	82
3.35 mm	81
2 mm	81
1.18 mm	79
600 µm	76
425 µm	73
300 µm	68
212 µm	65
150 µm	62
63 µm	57
20 µm	37
6 µm	19
2 µm	12

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 - 21321

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

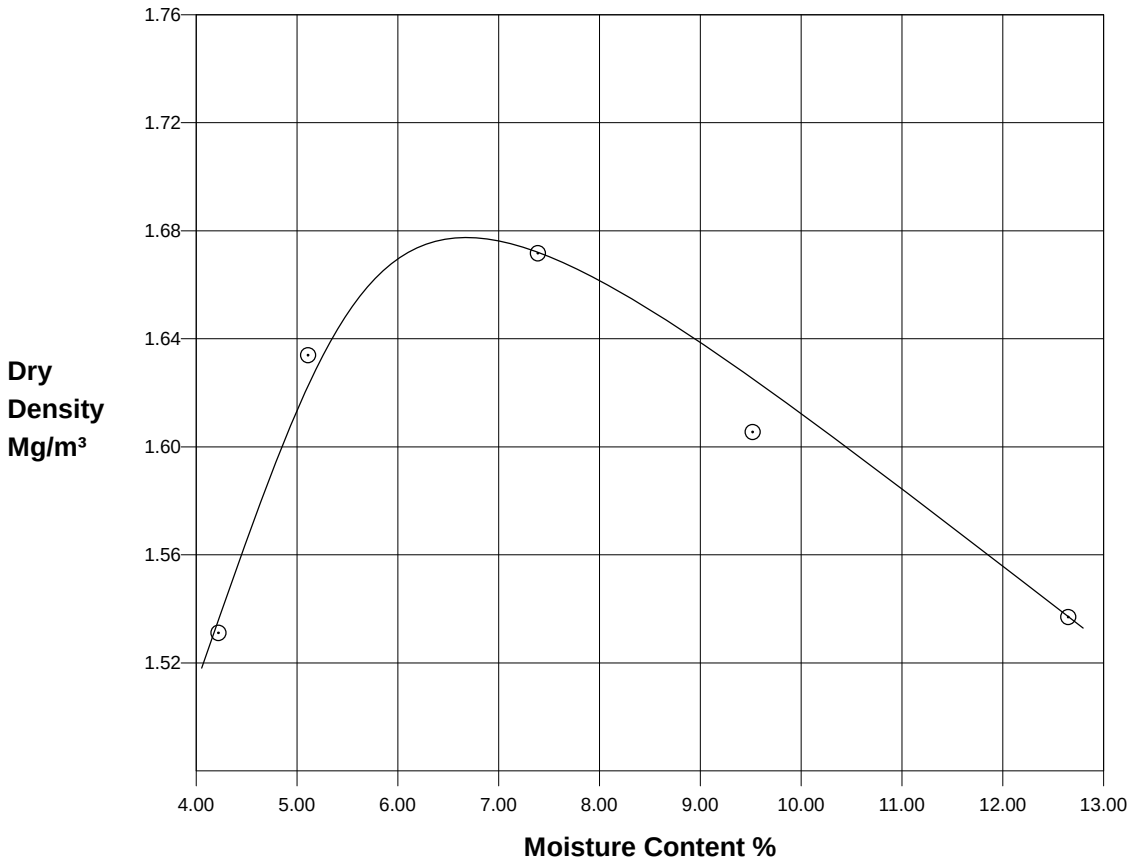
DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
CP004	0.10	B1	Brown gravelly silty clayey SAND

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	2 %	**Single or separate samples**	Single
Grading Zone	2	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer

MAX DRY DENSITY 1.68 **Mg/m³**

OPTIMUM MOISTURE CONTENT 6.7 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

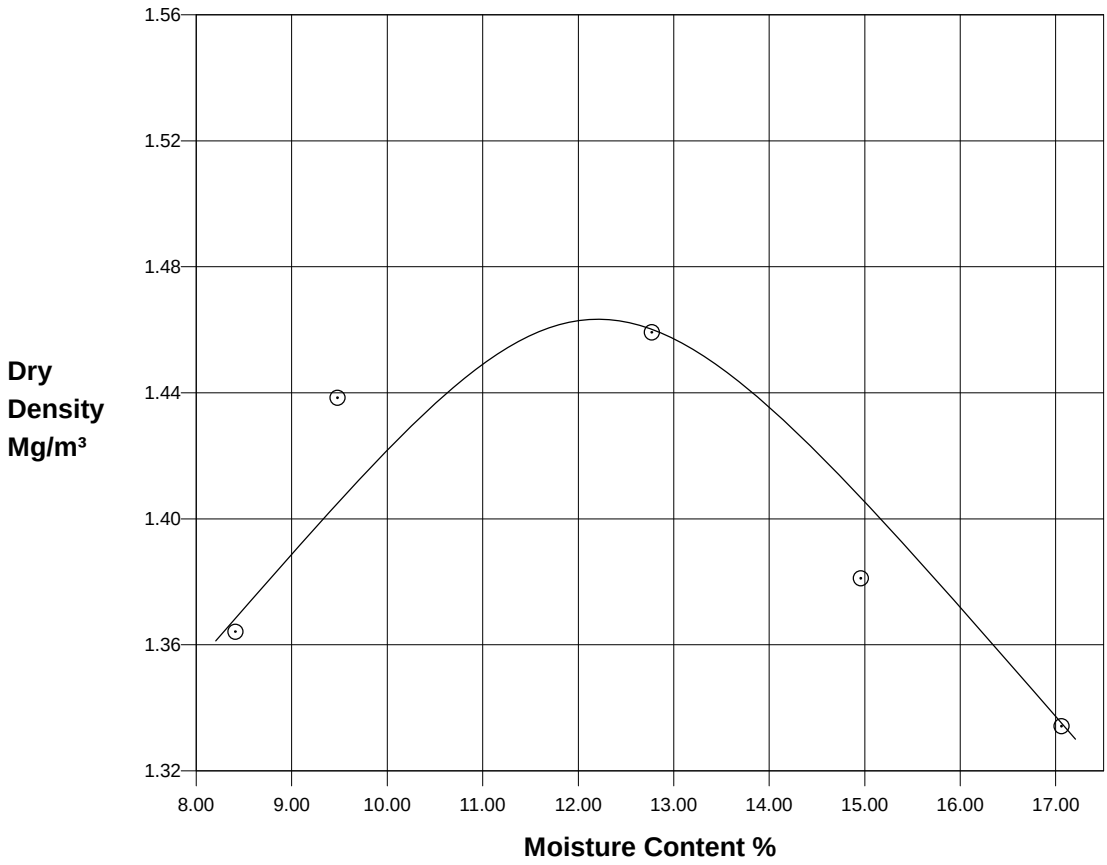
Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
CP008	1.20	B4	Brown sandy gravelly silty CLAY

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	0 %	**Single or separate samples**	Single
Grading Zone	1	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer
MAX DRY DENSITY	1.46 **Mg/m³**	**OPTIMUM MOISTURE CONTENT**	12 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

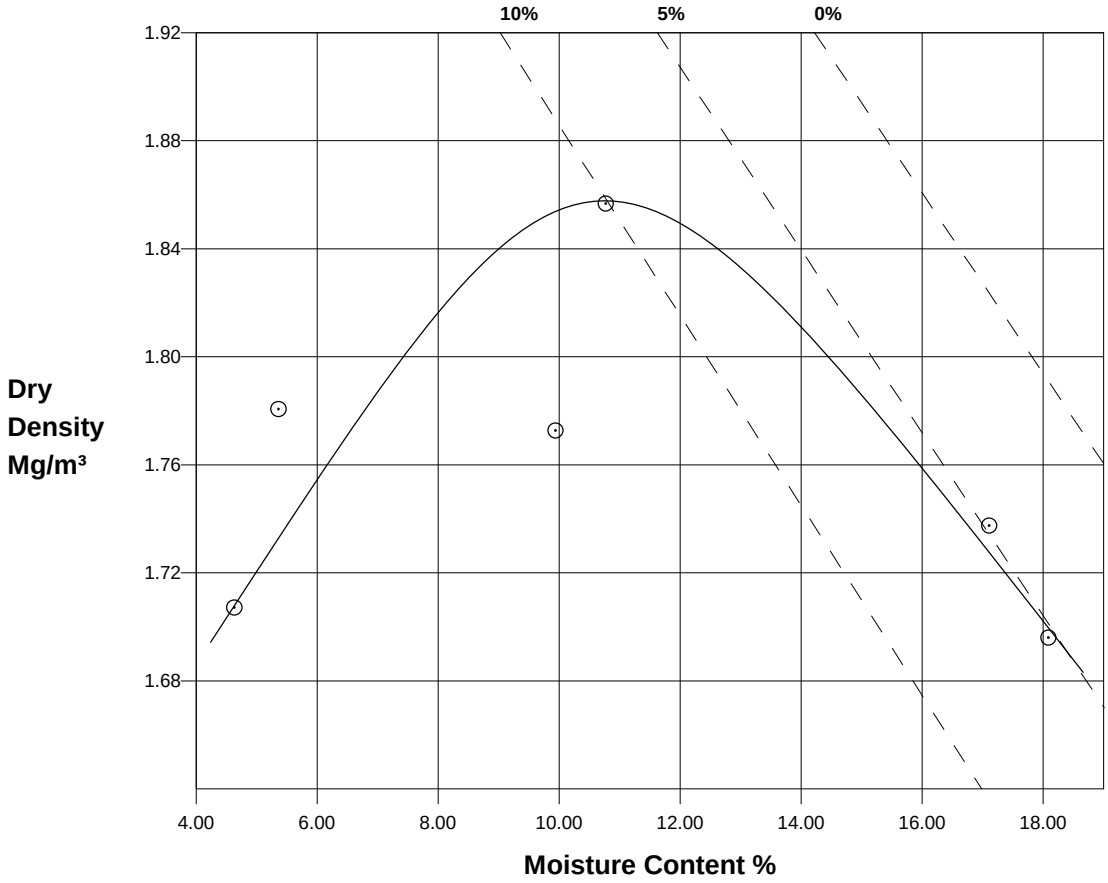
Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP004	0.50	B1	Brown clayey sandy silty GRAVEL

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	2 %	**Single or separate samples**	Single
Grading Zone	2	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer
MAX DRY DENSITY	1.86 **Mg/m³**	**OPTIMUM MOISTURE CONTENT**	11 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

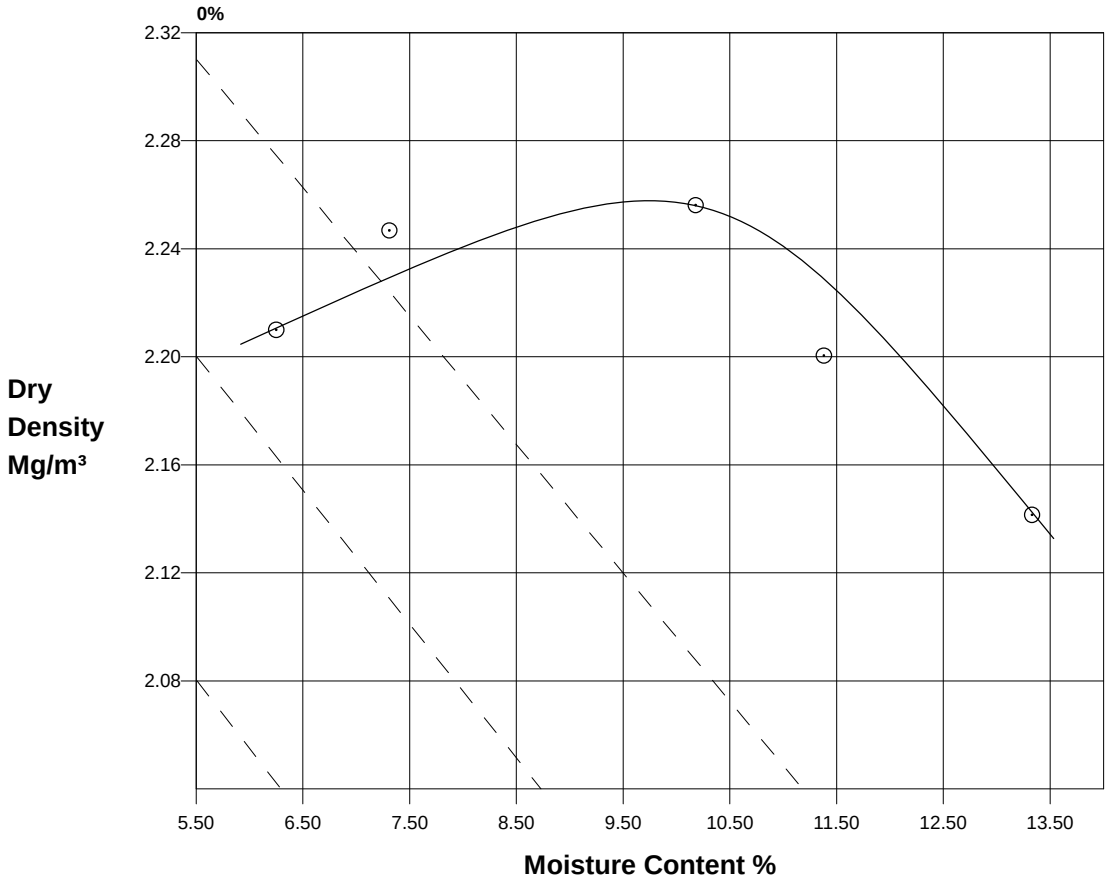
Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP009	1.00	B2	Brown silty clayey gravelly SAND

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	12 %	**Single or separate samples**	Single
Grading Zone	3	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer
MAX DRY DENSITY	2.26 **Mg/m³**	**OPTIMUM MOISTURE CONTENT**	9.8 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

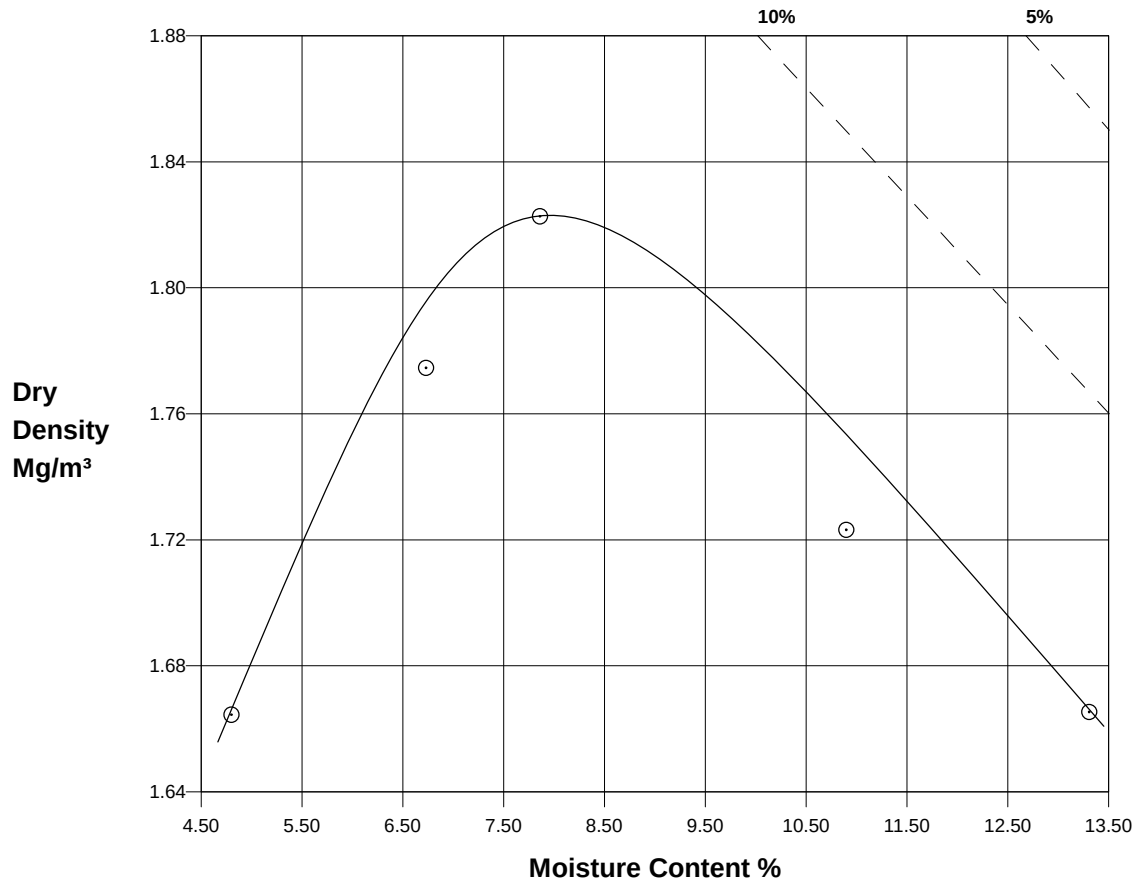
Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP015	0.70	B2	Brown gravelly clayey silty SAND

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	1 %	**Single or separate samples**	Single
Grading Zone	2	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer
MAX DRY DENSITY	1.82 **Mg/m³**	**OPTIMUM MOISTURE CONTENT**	8.1 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

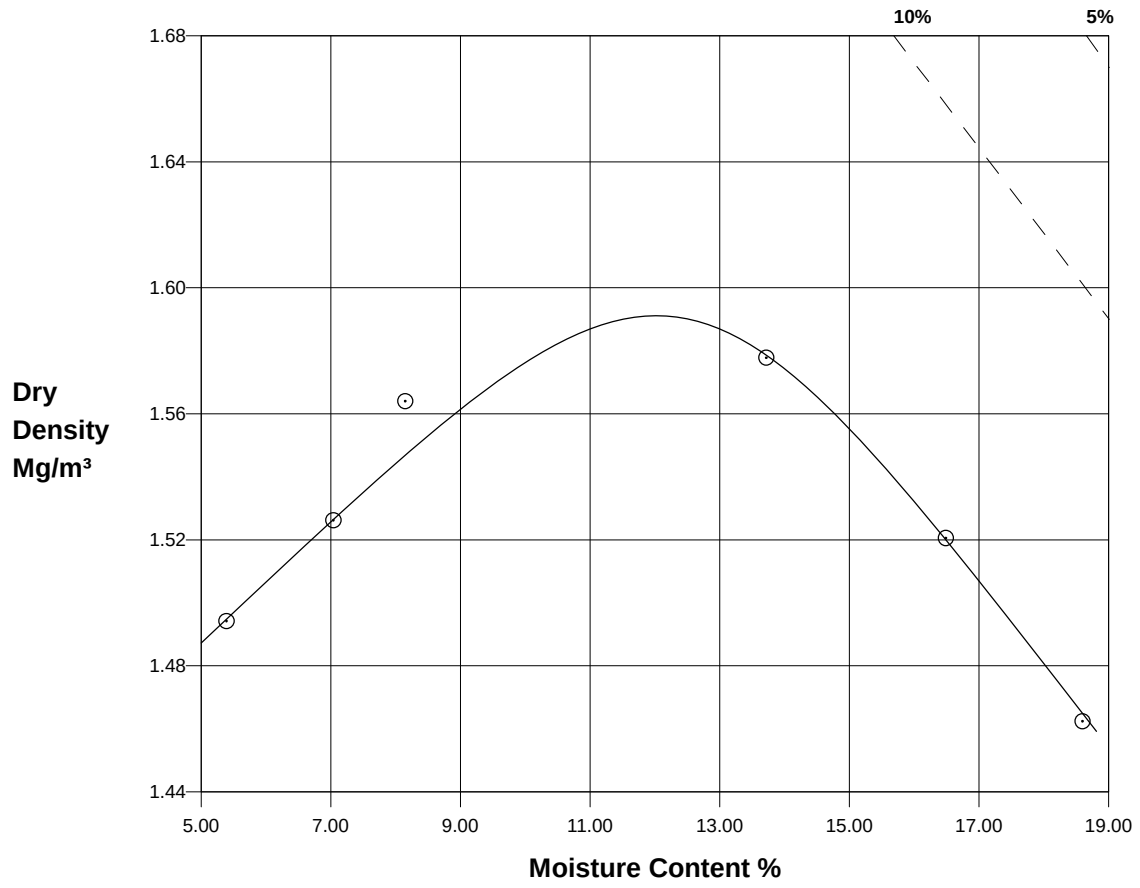
Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP019	1.00	B2	Brown sandy gravelly clayey SILT

Percentage retained 37.5 mm	0 %	**Max size of cohesive lumps**	20 mm
Percentage retained 20.0 mm	2 %	**Single or separate samples**	Single
Grading Zone	2	**Particle density**	2.65 Assumed
Mould Type	1 Litre/proctor	**Method of compaction**	2.5kg Rammer
MAX DRY DENSITY	1.59 **Mg/m³**	**OPTIMUM MOISTURE CONTENT**	12 **%**



Method of Preparation : BS 1377:PART 1:7.6, BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Method of Test : BS 1377:PART 4:1990:3.4/3.4 Determination using 2.5 kg rammer or 3.5/3.6 Determination using 4.5kg rammer: PART 2:1990:8.2 Determination of particle density

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF CALIFORNIA BEARING RATIO (CBR)

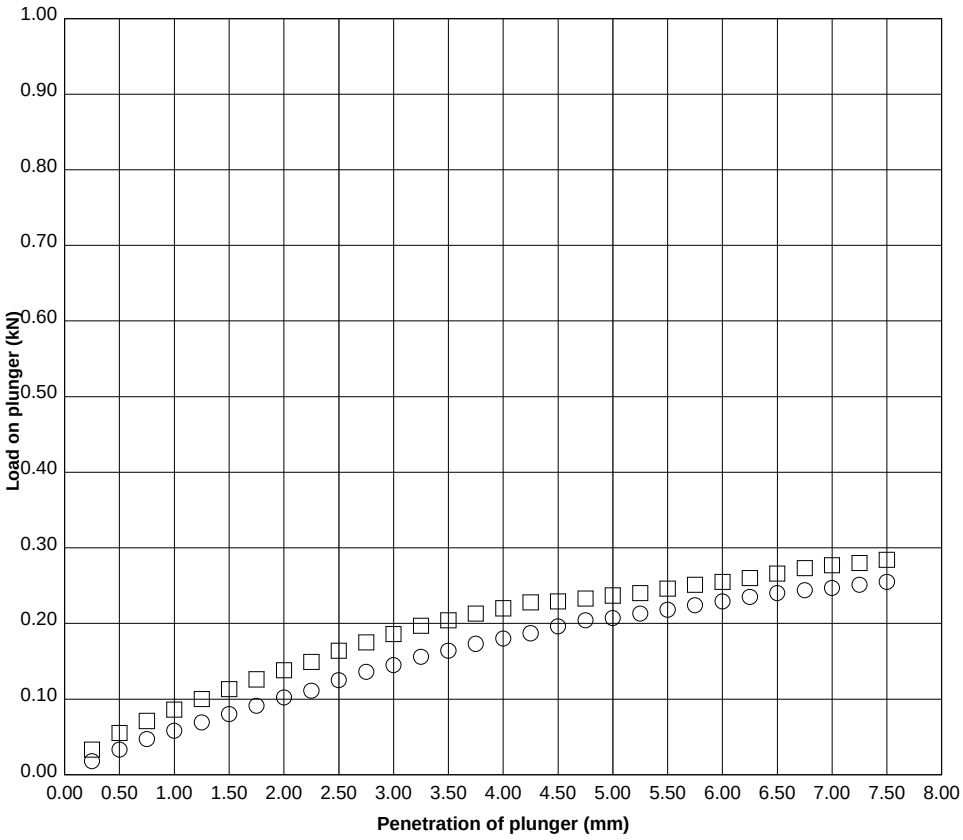
Borehole / Trial Pit	Depth (m)	Sample	% Passing 20 mm Sieve	Description
TP004	0.50	B1	78 %	Brown clayey sandy silty GRAVEL

Moisture Content %	
Bulk Density Mg/m³	2.05
Dry Density Mg/m³	1.71
Soaked Test	No

Test on	☐ TOP	
Moisture Content %	21	
Surcharge weight kg	4.20	
Penetration mm	2.5	5.0
Force kN	0.16	0.24
Corrected CBR %	1.2	1.2

Test on	○ BOTTOM	
Moisture Content %	20	
Surcharge weight kg	4.20	
Penetration mm	2.5	5.0
Force kN	0.12	0.21
Corrected CBR %	0.95	1.0

Test on	TOP	BOTTOM
Reported CBR %	1.2	1.0
Mean CBR %	1.1	



Method of Preparation : The specimen was prepared by Dynamic compression/Specified Effort using a 2.5 kg Rammer
BS 1377:PART 1:1990:7.6.1 General 1990:7.6.5 California bearing ratio test BS 1377:PART 4:1990:7.2 Preparation of test sample

Method of Test : BS 1377:PART 4:1990:7.4 Penetration test procedure

Remarks :

IAN FARMER ASSOCIATES

Laboratory Test Report - 21321

Site : Derby Road, Burton-upon-Trent

Client : St Modwen Developments Limited

Job Number 21321

DETERMINATION OF CALIFORNIA BEARING RATIO (CBR)

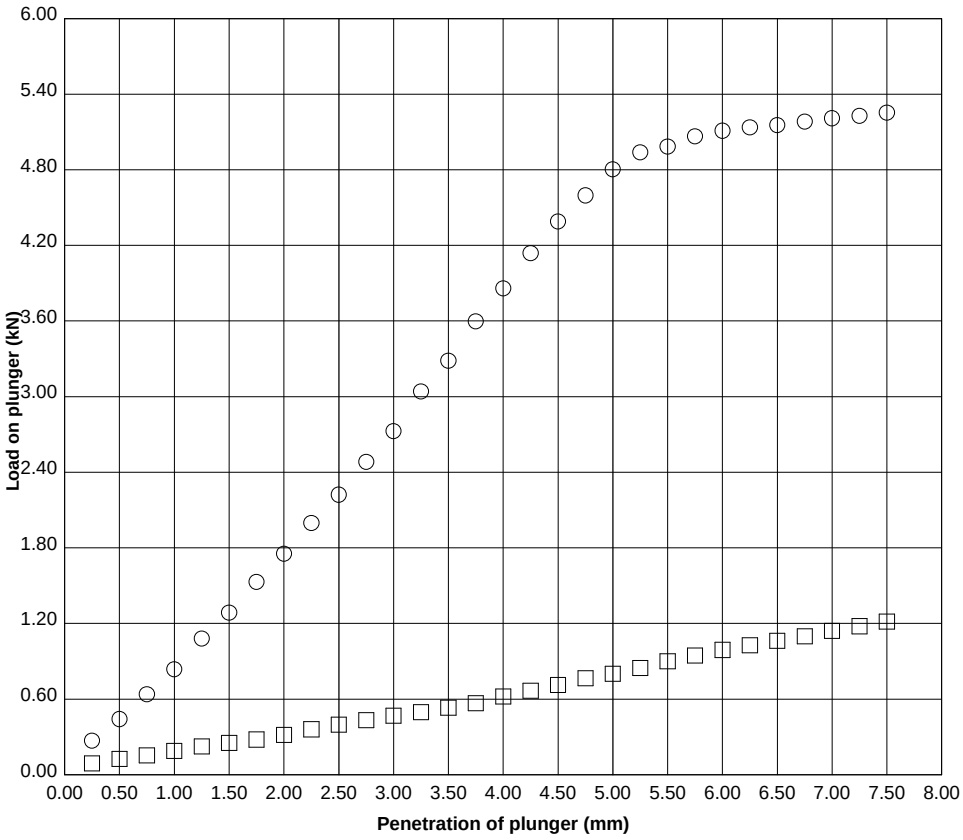
Borehole / Trial Pit	Depth (m)	Sample	% Passing 20 mm Sieve	Description
TP009	1.00	B2	90 %	Brown silty clayey gravelly SAND

Moisture Content %	
Bulk Density Mg/m³	2.23
Dry Density Mg/m³	2.05
Soaked Test	No

Test on	☐ TOP	
Moisture Content %	8.6	
Surcharge weight kg	4.20	
Penetration mm	2.5	5.0
Force kN	0.40	0.80
Corrected CBR %	3.0	4.0

Test on	○ BOTTOM	
Moisture Content %	8.6	
Surcharge weight kg	4.20	
Penetration mm	2.5	5.0
Force kN	2.2	4.8
Corrected CBR %	17	24

Test on	TOP	BOTTOM
Reported CBR %	4.0	24



Method of Preparation : The specimen was prepared by Dynamic compression/Specified Effort using a 2.5 kg Rammer
BS 1377:PART 1:1990:7.6.1 General 1990:7.6.5 California bearing ratio test BS 1377:PART 4:1990:7.2 Preparation of test sample

Method of Test : BS 1377:PART 4:1990:7.4 Penetration test procedure

Remarks :

IAN FARMER ASSOCIATES

Test Report : **21321**

Site : Derby Road, Burton-upon-Trent
Job Number : 21321
Originating Client : St Modwen Developments Limited

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 : 17/12/14

APPENDIX 4

GAS AND GROUNDWATER

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

Contract Name :	**Derby Road, Burton**
Contract No :	**21321**
Date :	**19/11/2014**

Background Readings:								
O_2% v/v :	20.1	**CO_2% v/v :**	0.0	**CH_4% v/v :**	0.0	**Weather Conditions :**	Dry, 100% cloud, low wind, 10°C	
H_2S ppm :	0	**CO ppm :**	0	**Pressure Trend :**	Decreasing	**Ground Conditions :**	Damp	

Location	**Time**	**Atmospheric Pressure (mb)**	**O_2(% v/v)**		**CO_2(% v/v)**		**CH_4(% v/v)**		**H_2S (ppm)**	**CO (ppm)**	**Gas Flow Rate (l/hr)**		**PID**	**Water Depth**	**Total Depth**
			Low	**Steady**	**High**	**Steady**	**High**	**Steady**	**Peak**	**Peak**	**Peak**	**Steady**	**ppm**	**(mbgl)**	**(mbgl)**
CP001	8.45	1013	20.2	20.2	0.0	0.0	0.0	0.0	0	0	0.0	0.0	1.0	2.06	5.05
CP002	8.50	1013	20.2	20.2	0.1	0.1	0.0	0.0	0	10	0.0	0.0	1.0	1.33	5.30
CP003	8.40	1014	19.9	19.9	0.3	0.3	0.0	0.0	0	0	0.0	0.0	1.0	-	-
CP004	8.35	1014	20.1	20.1	0.2	0.2	0.0	0.0	0	0	0.0	0.0	1.0	0.60	5.22
CP005	7.50	1015	19.9	19.9	0.3	0.3	0.0	0.0	0	0	-0.4	-0.1	1.0	0.84	4.92
CP006		COULD NOT LOCATE - AREA FLOODED													
CP007	8.00	1015	17.3	17.3	3.0	2.8	0.0	0.0	0	0	-0.1	0.0	1.0	1.28	6.05
CP008	8.16	1015	13.4	14.6	2.4	2.1	0.0	0.0	0	0	-0.1	0.0	1.0	1.40	6.98

Remarks : Bung stuck in CP003 pipe so unable to obtain water level and total depth.

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

Contract Name :	**Derby Road, Burton**
Contract No :	**21321**
Date :	**28/11/2014**

Background Readings:								
O_2% v/v :	20.5	**CO_2% v/v :**	0.0	**CH_4% v/v :**	0.0	**Weather Conditions :**	Damp, drizzle, cloud, 10°C	
H_2S ppm :	0	**CO ppm :**	0	**Pressure Trend :**	Increasing	**Ground Conditions :**	Damp	

Location	**Time**	**Atmospheric Pressure (mb)**	**O_2(% v/v)**		**CO_2(% v/v)**		**CH_4(% v/v)**		**H_2S (ppm)**	**CO (ppm)**	**Gas Flow Rate (l/hr)**		**PID**	**Water Depth**	**Total Depth**
			Low	**Steady**	**High**	**Steady**	**High**	**Steady**	**Peak**	**Peak**	**Peak**	**Steady**	**ppm**	**(mbgl)**	**(mbgl)**
CP001	2.47	999	19.8	19.8	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	2.16	5.17
CP002	2.52	999	20.1	20.1	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	1.23	5.36
CP003	2.40	1001	20.0	20.0	1.0	0.9	0.0	0.0	0	0	0.0	0.0	0.0	1.70	6.21
CP004	2.32	1001	20.2	20.2	0.4	0.4	0.0	0.0	0	0	0.0	0.0	0.0	0.46	4.95
CP005	1.53	999	20.5	20.5	0.1	0.1	0.0	0.0	0	0	0.0	0.0	0.0	1.76	4.93
CP006		COULD NOT LOCATE - AREA FLOODED													
CP007	2.00	999	19.5	19.5	1.8	1.7	0.0	0.0	0	0	0.0	0.0	0.0	1.15	6.01
CP008	2.10	999	9.1	9.1	3.5	3.5	0.0	0.0	0	0	0.0	0.0	0.0	1.30	6.98

Remarks : Replacement bung fitted in CP003

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

Contract Name :	**Derby Road, Burton**
Contract No :	**21321**
Date :	**09/12/2014**

Background Readings:								
O_2% v/v :	20.4	**CO_2% v/v :**	0.0	**CH_4% v/v :**	0.0	**Weather Conditions :**	Damp, drizzle, cloud, 10°C	
H_2S ppm :	0	**CO ppm :**	0	**Pressure Trend :**	Decreasing	**Ground Conditions :**	Damp	

Location	**Time**	**Atmospheric Pressure (mb)**	**O_2(% v/v)**		**CO_2(% v/v)**		**CH_4(% v/v)**		**H_2S (ppm)**	**CO (ppm)**	**Gas Flow Rate (l/hr)**		**PID**	**Water Depth**	**Total Depth**
			Low	**Steady**	**High**	**Steady**	**High**	**Steady**	**Peak**	**Peak**	**Peak**	**Steady**	**ppm**	**(mbgl)**	**(mbgl)**
CP001	12.37	1015	20.1	20.2	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	2.22	5.17
CP002	12.45	1015	20.1	20.1	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	1.25	5.36
CP003	12.29	1015	20.3	20.3	0.0	0.0	0.0	0.0	0	0	0.0	0.0	0.0	1.80	6.20
CP004	12.18	1015	19.9	19.8	1.0	0.9	0.0	0.0	0	0	0.1	0.0	0.0	0.58	4.85
CP005	11.48	1015	20.2	20.2	0.1	0.1	0.0	0.0	0	0	0.0	0.0	0.0	1.89	4.93
CP006		COULD NOT LOCATE - AREA FLOODED													
CP007	12.00	1015	19.0	19.0	1.6	1.5	0.0	0.0	0	0	0.0	0.0	0.0	1.19	6.03
CP008	12.10	1015	11.3	11.3	2.2	2.2	0.0	0.0	0	0	0.0	0.0	0.0	1.33	6.99

Remarks :

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

Contract Name :	**Derby Road, Burton**
Contract No :	**21321**
Date :	**23/12/2014**

Background Readings:								
O_2% v/v :	21.6	**CO_2% v/v :**	0.0	**CH_4% v/v :**	0.0	**Weather Conditions :**	Sunny, cool, strong breeze	
H_2S ppm :	0	**CO ppm :**	0	**Pressure Trend :**	Falling	**Ground Conditions :**	Damp	

Location	**Time**	**Atmospheric Pressure (mb)**	**O_2(% v/v)**		**CO_2(% v/v)**		**CH_4(% v/v)**		**H_2S (ppm)**	**CO (ppm)**	**Gas Flow Rate (l/hr)**		**PID**	**Water Depth**	**Total Depth**
			Low	**Steady**	**High**	**Steady**	**High**	**Steady**	**Peak**	**Peak**	**Peak**	**Steady**	**ppm**	**(mbgl)**	**(mbgl)**
CP001	10:58	1008	21.8	21.8	0.0	0.0	0.0	0.0	0	0	0.1	0.0	0.0	2.42	5.17
CP002	10:48	1008	21.5	21.5	0.1	0.0	0.0	0.0	0	0	-2.9	-2.8	0.0	1.49	5.36
CP003	11:06	1008	21.9	21.9	0.1	0.0	0.0	0.0	0	0	0.1	0.1	0.0	1.92	6.20
CP004	10:38	1008	21.5	21.5	0.1	0.0	0.0	0.0	0	0	-2.8	-1.5	0.0	0.76	4.85
CP005	11:26	1008	21.8	21.8	0.1	0.0	0.0	0.0	0	0	0.0	0.2	0.1	0.75	4.93
CP006		AREA FLOODED													
CP007	12.00	BENEATH PARKED CAR													
CP008	11:17	1008	21.8	21.8	0.1	0.1	0.0	0.0	0	0	0.2	0.2	0.2	1.36	6.99

Remarks :

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

GAS AND GROUNDWATER MONITORING RESULTS

Contract Name :	**Derby Road, Burton**
Contract No :	**21321**
Date :	**02/01/2015**

Background Readings:								
O_2% v/v :	19.9	**CO_2% v/v :**	0.2	**CH_4% v/v :**	0.0	**Weather Conditions :**	Wet, breezy, 9°C	
H_2S ppm :	0	**CO ppm :**	0	**Pressure Trend :**	Falling	**Ground Conditions :**	Wet	

Location	**Time**	**Atmospheric Pressure (mb)**	**O_2(% v/v)**		**CO_2(% v/v)**		**CH_4(% v/v)**		**H_2S (ppm)**	**CO (ppm)**	**Gas Flow Rate (l/hr)**		**PID**	**Water Depth**	**Total Depth**
			Low	**Steady**	**High**	**Steady**	**High**	**Steady**	**Peak**	**Peak**	**Peak**	**Steady**	**ppm**	**(mbgl)**	**(mbgl)**
CP001		1002	20.1		0.0		0.0	0.0	0	0	0.0	0.0	0.0	1.96	5.02
CP002		1002	20.0		0.3		0.0	0.0	0	0	0.0	0.0	0.0	1.46	5.35
CP003		1002	19.9		0.1		0.0	0.0	0	0	0.0	0.0	0.0	1.73	6.09
CP004		1002	19.5		1.1		0.0	0.0	0	0	0.0	0.0	0.0	0.45	5.04
CP005		1002	20.1		0.2		0.0	0.0	0	0	0.0	0.0	0.0	0.86	4.90
CP006		COULD NOT LOCATE - AREA FLOODED													
CP007		1002	17.2		4.3		0.0	0.0	0	0	0.0	0.0	0.0	1.24	6.00
CP008		1002	14.9		1.7		0.0	0.0	0	0	0.0	0.0	0.0	1.44	6.02

Remarks :