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APRIL 2017

GEOENVIRONMENTAL APPRAISAL

of land off
CARRS LANE, CUDWORTH, BARNSLEY

prepared for
BARRATT & DAVID WILSON HOMES

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PREPARED FOR:	BARRAT & DAVID WILSON HOMES		
PREPARED BY:	Sirius Geotechnical and Environmental Ltd 4245 Park Approach Thorpe Park Leeds LS15 8GB	Tel: 01132 649 960 Fax: 01132 649 962	

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CONTENTS

EXECUTIVE SUMMARY

1. INTRODUCTION 1

2. SITE DETAILS AND DESCRIPTION 4

3. ENVIRONMENTAL SETTING 6
3.1. Introduction 6
3.2. Site History 6
3.3. Published Geological Information 6
3.4. Hydrology and Hydrogeology 8
3.5. Landfilling and Waste Management 8
3.6. Radon Risk 9
3.7. Other 9
3.8. Preliminary Conceptual Site Model 10

4. PREVIOUS INVESTIGATION FINDINGS 11

5. FIELDWORK 12
5.1. Scope of Investigation 12
5.2. Strata Description 12
5.3. Exploratory Hole Locations 13
5.4. Geotechnical Testing 14
5.5. Chemical Testing 14

6. GROUND CONDITIONS AND MATERIAL PROPERTIES 15
6.1. Strata Profile 15
6.2. Subsurface Mine Workings 16
6.3. Trial Trenching 17
6.4. Material Properties 17
6.5. Groundwater 19
6.6. Stability 19

6.7. Soakaway Infiltration Tests 19
6.8. Visual / Olfactory Evidence of Contamination 20
6.9. Ground Gas 20

7. RESULTS OF CHEMICAL TESTING 21
7.1. Assessment Methodology 21
7.2. Soil Analysis 21
7.3. Leachability Testing 23

8. REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES 26
8.1. Summary of Identified Pollutant Linkages 26

9. CONCLUSIONS AND RECOMMENDATIONS 27
9.1. General 27
9.2. Flood Risk 27
9.3. Geotechnical 27
9.4. Asbestos-Containing Materials 35
9.5. Soil and Groundwater Contamination 35
9.6. Ground Gas 36
9.7. Invasive Plants 36
9.8. Disposal of Soils 36
9.9. High Speed 2 36

10. REGULATORY APPROVALS 38

TABLES

Table 2.1 Current Site Overview 4
Table 5.1 Exploratory Hole Rationale 13
Table 6.1 Strata Profile 15
Table 6.2 Summary of Gas Monitoring (1 visit to date) 20
Table 7.1 Summary of Total Soil Concentrations 21
Table 7.2 Summary of Total Leachate Concentrations 24
Table 9.1 Soakaway Results 33

APPENDICES

APPENDIX A FIGURES AND DRAWINGS

Drawing No.	Title	Scale
C6138A/01	Site Location Plan	1:25,000
C6138A/02	Proposed Development Layout	1:1,250
C6138A/03	Site Features Plan (showing historical/geological features)	1:2,000
C6138A/04	Preliminary Conceptual Site Model	NTS
C6138A/05	Exploratory Hole Location Plan	1:2000
C6138A/06	Revised Conceptual Site Model	NTS

NTS: Not to Scale

APPENDIX B EXPLORATORY HOLE RECORDS

APPENDIX C LABORATORY TEST RESULTS

APPENDIX D SOAKAWAY RESULTS

APPENDIX E GROUND GAS AND GROUNDWATER MONITORING RESULTS

APPENDIX F SIRIUS GENERIC ASSESSMENT CRITERIA

EXECUTIVE SUMMARY

Introduction	Sirius Geotechnical and Environmental Ltd (Sirius) were commissioned by Barratt & David Wilson Homes (BDW), to undertake a geoenvironmental appraisal at land off Carrs Lane, Cudworth, Barnsley, South Yorkshire (the "site"), to assist with planning, design and abnormal cost assessment. It is understood that BDW are considering developing the site for a low-rise residential end-use, comprising 263 two storey residential properties and 15 bungalows, with private gardens, areas of soft landscaping, Public Open Space (POS), areas of hardstanding, and highways. No loadings or development levels were known at the time of writing. **Sirius has previously compiled a geoenvironmental appraisal for the site in October 2014 (Report Ref: C6138A). Since the issue of the report the development layout, including the south eastern and south western site boundaries, have altered slightly and subsequently the development area has reduced. This current report makes reference to the updated development layout, however the conclusions and recommendations given within are based on the original, larger development area. Therefore this desk study should be read with consideration to the revised development layout plan. In addition, the revised proposed development includes for an attenuation pond within the far southern part of the site. Geotechnical recommendations for this feature are beyond the remit of this report and it is understood that this will be undertaken by others.**
Site Details	The site forms an irregular shaped plot of land, which broadly slopes downwards from north to south east, with an elevation difference of up to c. 23m. The north western part of the site slopes downward from north to south west. The site generally comprises a set of agricultural fields defined by a combination of semi-mature / mature trees and low-lying shrubs. A set of electricity pylons are recorded within the southern portion of the site, aligned east to west and north to south. An unknown brick structure was identified to the sites north eastern portion during the initial walkover survey in September 2014. Upon closer inspection during the recent intrusive investigation, it is considered that this may be representative of a well. Along the sites northern and north eastern perimeters, are a number of areas of fly-tipped material including wood, soil, plastic, fabrics, glass, brick and concrete. The sites western and north western flanks are formed by retaining walls and a quarry high wall.
Site History	Review of historical Ordnance Survey maps indicates that the site has been agricultural fields since at least 1854. A number of buildings and a pump (latterly demolished) were shown to the sites south eastern portion between 1854 and 1955. Significant off-site features include a former railway line, with historic associated airshaft / mine entry, gasometer and goods shed to the immediate west of the site. In addition, to the west / north west was a quarry. A reservoir was shown to the immediate north west of the site between c. 1906 and 1984, which was later infilled and is referred to as a historical landfill site.
Fieldwork	Fieldwork was undertaken between 16th and 24th September 2014 and comprised: • Boring of 10 window sample boreholes (WS1 to WS10) to a maximum depth of 4.50m bgl. • Eight openhole rotary probes (RO1 to RO7, and RO1A), drilled to a maximum depth of 30.00m bgl using a combination of water and air flush techniques. • Excavation of 37 trial pits (TP1 to TP37) and six trial trenches (TT1 to TT6), to a maximum depth of 3.50m bgl. • Soakaway tests undertaken within five trial pits (SA1 – SA5), excavated to a maximum depth of 2.50m bgl, to determine the suitability of the soils for soakaways. Permanent monitoring installations for both groundwater and ground gas monitoring were

	installed within selected window sample boreholes, namely WS1, WS2, WS3, WS4, WS5, WS6 and WS7, all sealed into the made ground.
Laboratory Testing	Samples of soil and soil leachate were submitted for analysis of a range of metals, other inorganic and organic components. Geotechnical testing was scheduled on selected samples. All testing was undertaken at accredited laboratories.
Ground Conditions	Reworked topsoil, and locally made ground, was encountered across the site to depths between 0.15m and 0.55m bgl, which was found to be underlain by, in the main, granular residual soils. Cohesive residual soils were encountered in the eastern and south eastern parts of the site. Residual granular soils were generally described as medium dense to dense gravelly sand / sandy gravel / sand and gravel / gravelly clayey sand, of sandstone. The residual cohesive soils were described as firm to very stiff, generally medium to high strength, slightly sandy clay, with occasional gravel of sandstone, siltstone and locally mudstone. Bedrock, generally described as extremely / very weak and weak sandstone, with interbeds of siltstone, mudstone and coal, was proven at depths between 0.50m and 2.80m bgl. Locally, within WS3, WS4 and WS5, at depths between 1.40m and 4.20m bgl, very weak thinly bedded siltstone was recorded. Rotary drilling undertaken at the site has identified one coal seam, considered representative of the Sharlston Low Coal. The coal seam was proven to be worked in one of the eight boreholes drilled. This investigation has proven that potentially workable coal exists within influencing distance of the surface in the western part of the site. Elsewhere the coal should, even if worked, be too deep to affect surface stability.
Ground Stability	Based on published geological information, a mining report and the results of rotary drilling, it is considered that there is a risk of surface subsidence as a result of potential shallow coal mining in the western portion of the site. A supplementary rotary probing investigation is recommended to confirm the presence / absence of mine workings beneath this part of the site. If workings are found within influencing distance of the surface, drilling and grouting will be required (or coal removal), with appropriate precautions taken in foundations. For adoptable highways, the scope of works would need to be approved by the local highways department. A strip to natural ground is recommended as part of the enabling works to inspect for any disturbed ground associated with possible historic bell pits / mine entries / shallow crop workings. Inspection of historical OS plans has revealed the presence of a former quarry / quarry high wall to the sites north western / western perimeter. The possibility of encountering unrecorded quarries on site cannot be wholly discounted. It is therefore recommended that all excavations be examined for evidence of such features. If evidence of these features is suspected works should cease and the advice sought of a suitably qualified consultant. Furthermore with regards to the quarry high wall it would be prudent to undertake a visual assessment of the rock face by a suitably qualified Engineer in order to ascertain the stability of the feature and the potential risk of impacting the development site.
Foundations and Floor Slabs	**The recommendations provided below are based on the assumption that appropriate treatment of shallow mine workings (i.e. drilling and pressure grouting) will be undertaken, if proven necessary.** Reinforced spread foundations (strip/trench fill) are considered generally appropriate, taken through reworked topsoil and made ground to found within the underlying cohesive or granular residual soils of adequate bearing capacity. If foundation excavations encounter bedrock, all foundations should be placed within this material. Alternative foundation solutions may be required where deep made ground exists or very shallow coal mine workings are proven/treated. If coal is encountered in foundation excavations, the foundation excavation should be extended through the coal seam into competent strata below. At this stage ground bearing slabs are anticipated across the majority of the site, but this will need to be confirmed following completion of a tree survey, and when gas monitoring is completed and final levels established.
Sulphate Class	DS-1 and an ACEC Class of AC-1.

Contamination	No specific remedial measures are anticipated for a proposed residential end-use.
Gas Protection	Based on the gas monitoring results recorded to date, it is considered that in accordance with Table 2 presented in BS8485:2015, the soil gas regime can be classed as Characterisitc Situation (CS) 1. For the proposed residential development, CS1 does not require special precautions with regards to ground gas. The above assessment should be regarded as interim only however, prior to completion of the monitoring programme. A further five gas/groundwater monitoring visits are programmed prior to finalising gas protective measures. Radon protection measures are not required for the proposed development.
HS2	The property is located a short distance to the east of the proposed HS2 network railway line, the position of which is still to be confirmed. BDW should be cognisant of the proposed rail line in any future transaction for the site, and it would be prudent to take legal advice in determining its implication on the proposed development.

The executive summary is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the report which puts into context the findings of the executive summary. No reliance should be placed on the executive summary in isolation, particularly when deriving design detail/abnormal costs.

1. INTRODUCTION

Sirius Geotechnical and Environmental Ltd (Sirius) were commissioned by Barratt & David Wilson Homes (BDW), to undertake a geoenvironmental appraisal of land off Carrs Lane, Cudworth, Barnsley, South Yorkshire (the "site"), to assist with planning purposes, design and abnormal cost assessment.

It is understood that BDW are considering developing the site for a low-rise residential end-use, comprising 263 two storey residential properties and 15 bungalows, with private gardens, areas of soft landscaping, Public Open Space (POS), areas of hardstanding, and highways. A proposed development layout plan (as reproduced from Urban Design's Proposed Site Layout, Ref. YW-04-03, Revision AA, dated 25th April 2017) is included in Appendix A, as Drawing No. C6138/02/Rev B. No loadings or development levels were known at the time of writing.

The geoenvironmental appraisal has been undertaken in two phases; an initial preliminary appraisal (desk study), followed by an intrusive investigation. The desk study was completed by Sirius in April 2017 (Sirius Report Ref. C6138 Rev 3) and included an assessment of information provided by Landmark Information Group (LIG), the Coal Authority (CA) and the British Geological Survey (BGS). The desk study presented an initial conceptual site model (CSM) from which the intrusive investigation rationale was derived.

Sirius has previously compiled a geoenvironmental appraisal for the site in October 2014 (Report Ref: C6138A). Since the issue of the report the development layout, including the south eastern and south western site boundaries, have altered slightly and subsequently the development area has reduced. This current report makes reference to the updated development layout, however the conclusions and recommendations given within are based on the original, larger development area. Therefore this desk study should be read with consideration to the revised development layout plan. In addition, the revised proposed development includes for an attenuation pond within the far southern part of the site. Geotechnical recommendations for this feature are beyond the remit of this report and it is understood that this will be undertaken by others.

This report details the results of the intrusive investigation and makes recommendations relating to the proposed development. This report should be read in conjunction with the Sirius desk study. The objectives of this appraisal were to:

- Summarise the historical development and environmental setting of the site and surrounding area from a review of a previous desk study report;
- Investigate near surface soil and groundwater conditions;
- Determine the potential risks posed by any ground contamination and provide recommendations on remedial measures to manage such risks;
- Determine the potential risk to the development from hazardous ground gas sources, including radon;
- Evaluate whether past mining or other extractive industries could have an influence on the surface stability of the site;
- To determine infiltration characteristics of shallow soils to enable others to design soakaways, if viable; and,
- Provide recommendations for foundations, floor slabs and highway/pavement design for the proposed development.

Fieldworks undertaken by Sirius comprised the boring of 10 window sample boreholes, the drilling of eight open hole rotary probeholes, the excavation of 37 trial pits, six trial trenches and an additional five trial pits to enable soakaway tests to be completed. The fieldwork was undertaken by Sirius between 16th and 24th September 2014.

This report presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

It has been assumed in the production of this report that the site is to be developed for a low-rise (two storey) residential with gardens end-use. In addition, it is assumed that ground levels will not change significantly from those described in this report. If this is not the case, then amendments to the recommendations made in this report may be required.

Where the report refers to the potential presence of invasive plants (such as Japanese Knotweed) or asbestos-containing materials (ACMs), such observations are for information only and should be verified by a suitably qualified expert.

The comments and opinions presented in this report are based on the findings of a previous desk study, ground conditions encountered during intrusive investigation works performed by Sirius and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site, which have not been revealed by this investigation and which have not been

taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of strata, contamination or other spatially variable features between or beyond investigation positions is conjectural and given for guidance only. Confirmation of ground conditions between exploratory holes should be undertaken if deemed necessary. Evaluation of ground gas and groundwater is based on observations made at the time of the investigation and subsequent monitoring visits. It should be noted that ground gas, groundwater levels and quality may vary due to seasonal variations and other effects.

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2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview

Location	The site is located off Carrs Lane, Cudworth, approximately 4km north east of Barnsley town centre. A site location plan is included as Drawing No. C6138A/01 within Appendix A.
National Grid Reference (NGR)	438650mE, 408150mN.
Topography and Features	The site forms an irregular shape, with its long axis running north to south. The site broadly slopes downwards from north to south east, with an approximate elevation difference of up to 23m. Locally, within the northern part of the site, there is an approximate elevation difference of between 9-16m, with the downward slope recorded from the central portion of the site to the east and west. The north western perimeter of the site forms part of a presumed historical quarry high wall; vertical remnants of the quarry high wall are visible. The quarry high wall has an elevation difference of between c. 1.50m and 20m between the site and the base of the quarry / former dismantled railway line to the west. In addition, along part of the sites western / north western boundary is a c. 0.50m to c. 1.50m high brick retaining wall. The retaining wall was noted to be in relatively 'good' condition, apart from some minor evidence of cracking. Access to the site is via Carrs Lane, to the south east and Newlands Avenue to the north west, both by vehicular traffic. A rough footpath is recorded off Newland Avenue, aligned north to south, from the residential estate to the former dismantled railway line. The site generally comprises a set of agricultural fields, defined by a combination of semi-mature / mature trees and low-lying shrubs. A set of electricity pylons are recorded within the southern portion of the

	site, aligned east to west and north to south. A Yorkshire Water manhole cover was identified within the north western portion of the site. An unknown brick structure was identified to the sites north eastern portion, within an area of dense vegetation. On closer inspection, during the fieldworks, it was considered this feature could be representative of a former well, although there is no evidence within any historical OS mapping. Along the northern and north eastern perimeters of the site, in close proximity to the off-site residential properties, are a number of areas of fly-tipped materials including wood, soil, plastic, fabrics, glass, brick, concrete etc. In addition, to the south eastern perimeter were a number of discarded telegraph poles. Evidence of a small bonfire was noted to the sites northern perimeter.
Approximate Site Area	12.4 hectares.
Site Boundaries	The site boundaries are generally delineated by a combination of wooden panelled and metal palisade fencing, brick, stone and concrete walls, and semi-mature and mature trees, hedges and shrubs. The site is predominantly surrounded by residential dwellings to the north and east. To the sites southern boundary is a large grassed field, beyond which is Small Bridge Dike, aligned north west to south east. Ring Farm, a stable's, is recorded to the south east. To the west of the site is a dismantled railway line, which is currently utilised as a public footpath. This feature is in a cutting to the north and an embankment to the south.
Current Land Use	Agricultural fields.
Invasive Plant Species	None noted. An ecological survey should be carried out to confirm if any invasive plant species are present, most specifically around the perimeter of the site and where the fields are delineated by dense vegetation.

The main existing and historical site features are shown on Drawing No. C6138A/03 within Appendix A.

3. ENVIRONMENTAL SETTING

3.1. Introduction

Published environmental, geological and historical data relating to the site were reviewed as part of the previous preliminary appraisal (desk study). A summary of salient information is provided below. However, the previous desk study report should be referred to for further detail.

3.2. Site History

Review of historical Ordnance Survey maps indicates that the site has been occupied by agricultural fields since at least 1854. A number of buildings and a pump (latterly demolished/removed) were shown to the sites south eastern portion between 1854 and 1955.

Significant off-site features include a former railway line, with historic associated airshaft / mine entry, gasometer and goods shed to the immediate west of the site. In addition, to the west / north west was a quarry. A reservoir was shown to the immediate north west of the site between c. 1906 and 1984, which was later infilled and is referred to as a historical landfill site and has since been developed upon with housing.

3.3. Published Geological Information

Published geological information indicates the site to be underlain by a combination of sandstone (Glass Houghton Rock) and undifferentiated strata (Pennine Middle Coal Measures). The Glass Houghton Rock is recorded across the majority of the site, with the Pennine Middle Coal Measures shown within the western portion of the site.

Although no made ground is indicated on the geological plans, localised made ground deposits are likely to be encountered within the south eastern portion of the site owing to the former presence of a number of buildings.

A number of areas of worked and made ground are recorded within 500m of the site. Made Ground forming part of the dismantled railway line is shown along the western boundary of the site. Further areas of made / worked ground are identified along the former railway line, between c. 350m and 450m. Worked ground comprising “mainly railway and road cuttings, quarries and brick pits” is shown c. 200m to the north east of the site, which may be associated with a number of former quarries.

A further area of worked / made / infilled ground comprising “backfilled opencast coal sites and quarries” is shown c. 400m to the north east of the site.

No superficial deposits are shown to underlie the site; however the BGS map sheet does indicate the presence of Alluvial Deposits in the vicinity of the Small Bridge Dike c. 20m, to the west (at its nearest point) to the site.

An un-named fault, aligned approximately south west / north east, is conjectured within the north western portion of the site, downthrowing strata to the north west.

The Sharlston Low Coal Seam (reported to be 0.30m to 0.48m thick on the vertical section provided within the 1:10,000 scale map for the area) is conjectured to outcrop within the western portion of the site dipping to the east (below the site).

The Sharlston Top Coal Seam (reported to be 0.69m to 1.07m thick on the vertical section of the 1:10,000 scale map) is shown to outcrop on and / or around the eastern boundary of the site again dipping to the east (away from the site).

No workable coal seams are recorded at shallow depth below the Sharlston Low Coal Seam.

The CA mining report obtained for the site records the following salient information:

- *The property is in the likely zone of influence from workings in 7 seams of coal at 250m to 660m depth, last worked in 1991. Any ground movement from these coal workings should have stopped by now.*
- ***The property is in an area where the CA believes there is coal at or close to the surface. This may have been worked at some time in the past.***
- *There is 1 known coal mine entry within, or within 20 metres of, the boundary of the property.* This feature is recorded c. 20m to the south west of the site and coincides with a former airshaft, as seen within historical OS mapping. *There is no record of what steps, if any have been taken to treat the mine entry. Records may therefore be incomplete. Consequently, there may exist in the local area mine entries of which the CA has no knowledge.*
- *The CA is aware of 1 damage notice or claim for alleged subsidence damage to a property to the immediate east of the site (40 Carrs Lane, Cudworth) in September 1995. However, the claim was rejected*. A further two claims are recorded within c. 50m to the east of the site boundary.

From historical OS maps several presumed sandstone quarries have been noted within c. 100m and 1km of the site. In addition, to the immediate north west / west of the site, in proximity to the former Cudworth railway station is a former quarry.

The LIG Envirocheck report confirms the presence of a number of ceased sandstone quarries; the nearest is located 195m to the north east (opencast).

3.4. Hydrology and Hydrogeology

The nearest Environment Agency (EA) GQA Classified watercourse is Small Bridge Dike, located 41m to the south west of the site. Review of the EA website indicates that the current ecological quality of the watercourse is classified as 'bad'. The ecological quality is predicted for 2015 to improve to 'moderate'.

There are four unclassified watercourses recorded within 500m of the site. These features relate to a number of tributaries and drainage channels associated with Small Bridge Dike. The closest feature is recorded 181m to the west, and relates to a 'Tertiary River'.

The solid geology across the site and the Alluvial Deposits recorded in proximity to Small Bridge Dike are both classified as Secondary A Aquifers. The site is not located within an EA Source Protection Zone (SPZ).

There are no active/current surface water and / or groundwater abstraction licenses within 1km of the site.

The site is not indicated within the LIG Envirocheck report and EA website as being located within an indicative Zone 2 or Zone 3 floodplain. However, the site is located c. 29m to the north east of an indicative floodplain at risk from flooding from river and sea (Zone 2 and 3). This is associated with Small Bridge Dike.

3.5. Landfilling and Waste Management

According to information provided within the LIG Envirocheck report, there are three historical landfill sites within 1km of the property. The closest record is shown 1m to the west of the property and is referred to as 'Newlands Avenue', in the location of the former reservoir. The waste materials deposited are not known. This area has now been developed with housing.

There is one landfill site recorded 29m to the south west of the property and is referred to as 'former Cudworth railway station', which deposited inert material.

A further record is shown 285m to the south east of the property, which deposited wastes including inert, commercial/industrial and household materials.

There are 10 Local Authority Landfill Sites within 1km of the property. The closest is recorded on the site boundary, to the immediate west, presumably associated with the former reservoir.

There are six registered landfill sites within 1km of the property; the closest facility is located 103m to the west, referred to as 'former Cudworth railway station', which accepted wastes including inert non-combustible construction / demolition wastes.

There is one inactive Licensed Waste Management Facility recorded within 500m of the property, this is associated with the 'former Cudworth railway station'.

In addition, historical OS mapping indicates the presence of a number of areas of infilled land off-site, including deep made ground associated with the infilled railway cutting, infilled reservoir, infilled quarries and infilled ponds (some of which are licensed landfills). All of which could present a potential gas source / risk to the site.

Other potential gas sources include; mine gases associated with the presence of shallow coal seams on site and marsh gases associated with the alluvial/organic soils recorded to the west of the site.

3.6. Radon Risk

The site lies within an area in which **no radon protective measures are required**.

3.7. Other

Other potentially contaminative activities or environmental constraints identified as part of the previous desk study are listed below. The entries relate to activities within approximately 250m of the site, with the exception of Control of Major Accident Hazard (COMAH) facilities and Notification of Installations Handling Hazardous Substances (NIHHS) facilities where the assessment was extended to a distance of approximately 1km from the site.

- There are three discharge consents within 250m of the site; the closest is located 64m to the south east of the property and relates to sewage discharge – storm water overflow / storm tank (water company) to a freshwater stream / river, namely Small Bridge Dike. The license is referred to as 'revoked'.

- There is one local authority pollution prevention and control within 250m of the site. The entry is recorded to the immediate west of the site, for a mobile screening and crushing processes. The license is referred to as 'permitted'.

- There are 16 pollution incidents to controlled waters within 250m of the property. The closest, which involved mud / clay / soil, occurred at a location 90m south east of the site in 1993 and was described as "Category 3 - Minor Incident".

- There are no active trades within 250m of the site. There are, however, three inactive trades within 250m of the property, these include a printers, automation systems and equipment and electrical engineers.

- The south western portion of the site is located within an area of adopted green belt.

3.8. Preliminary Conceptual Site Model

A combined preliminary conceptual site model and conceptual exposure model (PCSM) was developed for the proposed future land use (residential with gardens) as part of the October 2015 desk study.

The PCSM is presented in schematic form as Drawing No. C6138A/04, in Appendix A.

In summary, the preliminary CSM identified the following potential pollutant linkages which could result in an unacceptable risk to the proposed end-use:

- Ingestion, inhalation of dust and dermal contact with potential heavy metals, asbestos fibres, hydrocarbons (including Polycyclic Aromatic Hydrocarbons – PAH / Total Petroleum Hydrocarbons - TPH) and pesticides in topsoil and locally made ground posing a **low to moderate** risk to site end users, adjacent site users and construction workers.

- Possible leachable (and mobile) heavy metals and organic contaminants in topsoil and locally made ground posing a **low** risk to controlled waters (underlying Secondary A Aquifer and Small Bridge Dike).

- Risk from hazardous ground gas sources including mine gases and marsh gases, located both on and off-site, posing a **moderate** risk to site end-users and construction workers.

4. PREVIOUS INVESTIGATION FINDINGS

No previous site investigation reports relating to this property have been made available.

5. FIELDWORK

5.1. Scope of Investigation

The information contained in this report is limited to areas of land accessible during the investigation within the site boundary, as indicated on the site plan, presented within Appendix A as Drawing No. C6138A/05.

Sirius scoped the intrusive ground investigation, using guidance presented in BS 5930:1999+A2:2010, BS10175:2011+A1:2013 and BS EN ISO 1997:2004 and 2007.

The investigation, which was supervised by a Sirius Geoenvironmental Engineer, took place between 16th and 24th September 2014 and comprised:

- Boring of 10 window sample boreholes (WS1 to WS10) to a maximum depth of 4.50m bgl.
- Eight openhole rotary probes (RO1 to RO7, and RO1A) drilled to a maximum depth of 30.00m bgl using a combination of water and air flush techniques.
- Excavation of 37 trial pits (TP1 to TP37) and six trial trenches (TT1 to TT6) to a maximum depth of 3.20m bgl.
- Soakaway tests were undertaken within five trial pits (SA1 – SA5), excavated to a maximum depth of 2.50m bgl, to determine the suitability of the soils for soakaways.

Gas and groundwater monitoring wells were installed within seven selected window sample boreholes (WS1, WS2, WS3, WS4, WS5, WS6 and WS7), all sealed into natural strata.

5.2. Strata Description

Detailed descriptions of strata and groundwater observations made during investigation works, together with samples recovered, are presented on the Engineer's exploratory hole records in Appendix B.

Standard strata descriptions are compliant with BS EN ISO 14688:2002 and 2004 and BS EN ISO 14689:2003. The depths of strata on the record sheets are recorded from current ground levels at each location, unless indicated otherwise.

5.3. Exploratory Hole Locations

The exploratory hole locations were based on the findings of the preliminary conceptual site model in order to target specific areas of interest and achieve a general site coverage. Procedures and principles recommended in CLR4, BS10175:2011+A1:2013 and BS EN ISO 1997:2004 and 2007 were followed when determining exploratory hole locations.

Table 5.1 details the exploratory hole rationale:

Table 5.1 Exploratory Hole Rationale

Exploratory Hole	Rationale
TP1 – TP37	General site coverage based on a c. 50m grid, with the exception of TP14 and TP22, which were targeted within areas where a number of former buildings were positioned.
TT1 – TT6	Positioned to try to ascertain the location of the conjectured outcrop of the Sharlston Low Coal Seam and the un-named geological fault.
SA1 – SA5	Soakaways completed across the site, to provide general site coverage, based on the geological conditions encountered within TP1 – TP37.
R01 – R07 (inclusive of R01A)	To confirm the shallow stratigraphy below the site, and the presence of workable coal within influencing distance of the surface.
WS1 –WS10	Positioned across the site to allow derivation of geotechnical parameters for the shallow soil, and selected locations for gas well installation. • WS1 positioned to target the off-site gas source of the infilled reservoir. • WS2, 3 & 7 positioned to target the off-site gas sources of the infilled railway cutting, historic gasometer, historical airshaft / mine entry and potentially the Alluvial Deposits. • WS4 positioned to target the potential off-site gas source of an infilled quarry. All wells were also to be used to monitor for mines gas.

Exploratory hole locations are shown on Drawing No. C6138A/05, within Appendix A of this report.

5.4. Geotechnical Testing

Geotechnical laboratory testing was carried out on selected samples in accordance with techniques outlined in BS 1377:1990 “Methods of Test for Soils for Civil Engineering Purposes” at the laboratory of Professional Soils Laboratory (PSL), a UKAS accredited laboratory.

Geotechnical and geochemical test results are included within Appendix C of this report.

5.5. Chemical Testing

Selected samples of soil and soil leachate were tested for a range of potential contaminants under subcontract with Derwentside Environmental Testing Services (DETS), a UKAS and MCERTS accredited laboratory.

The potential contaminants of concern identified by the preliminary conceptual site model were selected as the analytes for analysis, for the samples recovered from the site. The results of soil and leachate analysis, as received from the laboratory, are presented within Appendix C of this report.

6. GROUND CONDITIONS AND MATERIAL PROPERTIES

6.1. Strata Profile

A summary of the strata profile is provided in Table 6.1 below.

Table 6.1 Strata Profile

Strata	Depth Range (Thickness Range)	Description and Comments
Reworked Topsoil	Ground Level (0.15 to 0.55m)	Reworked topsoil was encountered within all the exploratory holes, comprising sandy silt with rare gravel sized fragments of coal.
Made Ground	0.20m to 0.30m (0.20m)	Made ground was encountered locally within the western and eastern portions of the site, namely WS2 and TP14, respectively, comprising clayey fine to coarse sand with gravel sized fragments of sandstone and rare coal, brick and pottery.
Residual Soils (weathered bedrock)	0.15m to 0.55m (0.20m to 3.65m)	Natural strata was encountered below the reworked topsoil / made ground soils within all of the exploratory holes, comprising granular, and locally cohesive, residual soils Granular residual soils were described as medium dense to dense, gravelly sand/sandy gravel/sand and gravel/gravelly clayey sand. The gravel fraction comprising angular sandstone and rare coal and siltstone. Locally, the granular deposits were recorded as loose material in the upper 2.00m of WS3, to the western portion of the site. Cohesive residual soils were recorded within a number of the exploratory holes to the sites south eastern / eastern portions, and, on occasion, on the western boundary (WS3). Cohesive residual soils were recorded to depths between 1.40m and 3.85m bgl, described as firm to very stiff, medium to high strength, slightly sandy clay, with gravel of sandstone, siltstone and locally mudstone. Within WS3 a 0.35m thick seam of very weak coal was encountered at a depth of 3.85m bgl (33.68m above ordnance Datum (AOD)), below the cohesive residual soils and above the competent bedrock.
Bedrock	0.50m to 4.20m (NR)	Bedrock was recorded at depths of between 0.50m and 4.20m bgl. Bedrock was generally recorded as very weak and weak, weathered sandstone, with interbeds of siltstone, mudstone and coal seams. Locally, within WS3, WS4 and WS5, to the eastern and

Strata	Depth Range (Thickness Range)	Description and Comments
		western portions of the site, the competent bedrock comprised extremely / very weak thinly bedded siltstone, at depths of between 1.40m and 4.20m bgl. The competent strata were proven to a maximum depth of 30.00m bgl within the rotary boreholes.

NR - not recorded

6.2. Subsurface Mine Workings

Rotary drilling undertaken at the site has identified one coal seam, considered likely to represent the Sharlston Low Coal Seam.

The Sharlston Low Coal Seam was encountered at depths of between 3.85m and 26.80m bgl (at levels of between 25.19m and 35.25m AOD) within four test holes (namely R02, R04, R07 and WS3), with recorded thicknesses of between 0.35m and 0.70m.

Based on the rotary drilling completed, the Sharlston Low Coal Seam is near to crop to the sites western boundary, with coal recorded at depths of between 3.85m bgl (33.68m AOD) and 5.80m bgl (34.59m AOD).

Triangulation of the rotary hole data indicates the Sharlston Low Coal Seam to be dipping at approximately 3.5° to 4.0° to the south east.

0.8m broken ground was recorded at the anticipated depth of the Sharlston Low Coal seam in R03 (28m bgl~26.7mAOD), in the north eastern corner of the site.

Based on the estimated dip, and the associated strike lines, the absence of coal from R05 and R06 is thought to be because the coal is beyond the base of the boreholes

Within RO1 and RO1A a zone of broken and soft ground was encountered at a depth of 5.00m to 9.00m bgl and 4.50m to 4.80m bgl, respectively. The cause of this anomaly is currently unknown.

Based on the findings of this investigation it is appears that the Sharlston Low Coal seam has been worked, however it only has the potential to affect surface stability along the western flank of the site; as shown broadly on Drawing No. C6128A/05, presented in Appendix A. This area should be further investigated to determine the presence/absence of mine workings and the need, or

otherwise for drilling and grouting. At this stage the area potentially at risk from shallow coal mining has been extended to include R01 and R01A, due to the recorded anomaly in the ground conditions at this location.

6.3. Trial Trenching

Six trial trenches were excavated, within the north western / western and central portions of the site, in order to try to locate an un-named fault and a shallow coal seam (Sharlston Low), which is recorded to outcrop along the sites western flank. The trial trenches did not however indicate any distinguishable features.

6.4. Material Properties

Reworked Topsoil

Water soluble sulphate (SO_4) concentrations recorded from four samples taken in the reworked topsoil recorded concentrations of between <10mg/l and 19mg/l, together with pH conditions of between 6.5 and 6.8. These results indicate a design sulphate class of DS-1 and an ACEC class of AC-1, in accordance with BRE Special Digest 1 (2005) for the design of buried concrete in made ground soils, based on brownfield site designation and mobile groundwater conditions.

Made Ground

Water soluble sulphate (SO_4) concentrations recorded from two samples taken in the made ground recorded concentrations of between 16mg/l and 25mg/l, together with pH conditions of between 6.5 and 7.2. These results indicate a design sulphate class of DS-1 and an ACEC class of AC-1, in accordance with BRE Special Digest 1 (2005) for the design of buried concrete in made ground soils, based on brownfield site designation and mobile groundwater conditions.

Residual Soils

Water soluble sulphate (SO_4) concentrations recorded from four samples taken in the residual soils recorded concentrations of between 13mg/l and 29mg/l, together with pH conditions of between 5.2 and 7.6. These results indicate a design sulphate class of DS-1 and an ACEC class of AC-1, in accordance with BRE Special Digest 1 (2005) for the design of buried concrete in natural soils, assuming mobile groundwater conditions.

Atterberg limit determinations undertaken on five samples of the cohesive residual soils revealed liquid limits of between 28% and 45%, plastic limits of between 16% and 23% and plasticity indices

of between 10% and 22%. This data indicates the material tested to be clay of low to intermediate plasticity.

Calculation of the modified Plasticity Index indicates the residual cohesive soils strata to have a low to medium volume change potential.

Hand shear vane tests undertaken (in the field) within the cohesive residual soils recorded undrained shear strengths ranging between 44kN/m^2 to 130kN/m^2, indicative of medium to high strength material. The mean and median undrained shear strength was calculated to be 77kN/m^2 and 75kN/m^2, respectively, giving a characteristic shear strength in the high strength range.

SPTs undertaken within the cohesive residual soils recorded uncorrected 'N' values of between 14 and 18 (mean and median N value of 16).

Indicative undrained shear strengths of cohesive soils can be derived by applying a correlation to SPT 'N' values according to the material's plasticity, after Stroud (1975)[1]. Based on a plasticity index of 20% for the cohesive residual soils, a correlation factor of 5 can be derived. Using Stroud's correlation the SPT 'N' values indicate undrained shear strengths of between 70kN/m^2 and 90kN/m^2, indicating the cohesive residual soils tested to be of medium and high strength.

Eight SPTs undertaken within the granular residual soils recorded uncorrected 'N' values of between 7 and 35 (mean and median N value of 21 and 19, respectively), indicative of loose to dense material.

A Particle Size Distribution (PSD) test was undertaken on one selected sample of residual granular soils obtained from TP17 between 0.60 – 0.70m bgl. The results of the laboratory tests are summarised on the PSD plots, included within Appendix C.

California Bearing Ratio (CBR) tests were undertaken in the laboratory on compacted bulk samples of granular residual soils obtained from TP27 at 0.60m – 0.80m bgl and TP35 at 0.40m – 0.60m bgl. The results of the laboratory CBR tests recorded a moisture content of 11 and 12% respectively, a bulk density of between 2.07 - 2.16Mg/m^3, a dry density of between 1.86 - 1.94Mg/m^3, and a CBR value of between 67.8 – 90.6% top and between 55.8 - 81.3% bottom.

[1] Stroud, M. A. The standard penetration test in insensitive clays and soft rocks, *Proceedings of the European Symposium on Penetration Testing,* 2, 367 – 375 (1975)

Competent Bedrock

Water soluble sulphate (SO_4) concentrations recorded from two samples taken in competent bedrock recorded concentrations of between <10mg/l and 32mg/l, together with pH conditions of between 6.6 and 7.4. These results indicate a design sulphate class of DS-1 and an ACEC class of AC-1, in accordance with BRE Special Digest 1 (2005) for the design of buried concrete in natural soils, assuming mobile groundwater conditions.

SPTs undertaken in the competent bedrock recorded uncorrected 'N' values of 50 blows for between 40mm and 295mm penetration, indicative of very dense soil/extremely weak rock.

6.5. Groundwater

No significant ingresses of groundwater were noted during the drilling of the window sample boreholes or the excavation of the trial pits / trial trenches.

It should be noted that due to the nature of the rotary drilling method (water flush) undertaken in RO1, RO1A, RO3 and RO6 it was not possible to detect seepages or low flow water strikes. However, within the holes where air flush techniques were used, RO2 and RO5 identified groundwater at 27.00m bgl and 18.30m bgl, respectively.

One subsequent groundwater monitoring visit completed to date has recorded the majority of the wells to be 'dry', with the exception of WS3 and WS4, to the north eastern and western portions of the site, with standing water levels recorded between 1.30m and 2.92m bgl.

6.6. Stability

All the trial pits / trenches excavated as part of this intrusive investigation were stable in the short term.

6.7. Soakaway Infiltration Tests

Soakaway tests were carried out in five trial pits (SA1 – SA5) in general accordance with the test method specified in BRE Digest 365 - Soakaway Design. Water was added to the excavation, to fill the test zone, using 1,000 litre water containers. Due to the slow speed of infiltration and time restraints, soakaway tests were not repeated three times in all locations as defined within BRE 365, with the exception of SA5.

Soakaway tests were completed within both the granular and cohesive residual soils / completely weathered bedrock and the underlying bedrock i.e. sandstone and sandstone with interbedded siltstone.

The soakaway tests were completed to provide an indication as to the potential use / installation of soakaways on site.

Plots of water level against time are provided on the soakaway result sheets, contained within Appendix D of this report.

6.8. Visual / Olfactory Evidence of Contamination

No visual or olfactory evidence of hydrocarbon contamination was noted during the fieldwork.

6.9. Ground Gas

Table 6.2 Summary of Gas Monitoring (1 visit to date)

Well	Methane (range) %v/v	Carbon Dioxide (range) %v/v	Oxygen (range) %v/v	Flow (range) l/hr
WS1	ND	0.1	21.2	ND
WS2	ND	0.9	20.3	0.5
WS3	ND	1.6 – 1.7	19.9	ND
WS4	ND	1.3	20.0	ND
WS5	ND	1.4 – 1.5	21.5	ND
WS6	ND	1.8	19.7	ND
WS7	ND	2.1 – 2.2	19.8	0.5

Results received to date (1 visit); ND Not Detected. Gas monitoring is currently on-going.

Low / background concentrations of hydrogen sulphide and carbon monoxide were detected, with maximum recorded concentrations of 2ppm and 4ppm in comparison to Generic Assessment Criteria (GAC) based on HSE Workplace Exposure Limits of 5ppm and 30ppm, respectively.

The monitoring programme includes six visits over a three month period (five visits remaining over a three month period). On completion of the monitoring, a full set of results will be issued in an addendum letter.

A copy of the gas and groundwater monitoring data received to date is presented in Appendix E.

7. RESULTS OF CHEMICAL TESTING

7.1. Assessment Methodology

The results of the laboratory testing have been compared against generic assessment criteria (GAC) values, the derivations of which are detailed in Appendix F.

Usually statistical testing is undertaken for the Planning Scenario by the methods described in CL:AIRE & CIEH "Guidance on Comparing Soil Contamination Data with a Critical Concentration", May 2008. This statistical testing is undertaken to determine whether there was sufficient evidence that the true mean concentration of each determinand was less than the relevant critical concentration for that component. However, as all the results are significantly less than the GAC values no further assessment has been carried out.

7.2. Soil Analysis

Results of chemical analysis as received from the laboratory are presented in full within Appendix C.

For this site, measured values were compared to GACs derived for a residential with plant uptake end use. The chemical analysis results (for five topsoil samples and one made ground sample) and screening criteria are summarised in Table 7.1.

Table 7.1 Summary of Total Soil Concentrations

Determinand	No. of Samples Tested	Range of Results (mg/kg unless specified)	GAC (1% SOM)	No. of Samples >GAC	Sample Exceeding GAC
Metals					
Arsenic (inorganic)	6	8.4 – 28	37	0	
Cadmium	6	0.3 – 0.9	11	0	
Chromium (III)	6	17 – 32	910	0	
Copper	6	21 – 55	200	0	
Lead	6	22 – 76	200	0	
Mercury (inorganic)	6	<0.05 – 0.29	40	0	
Nickel	6	16 – 25	180	0	
Selenium	6	<0.5 – 0.7	250	0	

Determinand	No. of Samples Tested	Range of Results (mg/kg unless specified)	GAC (1% SOM)	No. of Samples >GAC	Sample Exceeding GAC
Zinc	6	44 – 110	450	0	
Inorganics					
pH	12	5.2 – 7.6	<5 or >9	0	
Total Sulphate	6	300 – 1300	2400	0	
Water Sol. Sulphate	12	<0.01 – 0.029	0.5 g/l	0	
Speciated PAH					
Acenaphthene	6	<0.1	200	0	
Anthracene	6	<0.1 – 0.3	2300	0	
Acenaphthylene	6	< 0.1	170	0	
*Benzo(a)anthracene**	6	<0.1 – 0.9	*b(a)p**	0	
*Benzo(b)fluoranthene**	6	<0.1 – 0.9	*b(a)p**	0	
*Benzo(k)fluoranthene**	6	<0.1 – 0.5	*b(a)p**	0	
*Benzo(g,h,i)perylene**	6	<0.1	*b(a)p**	0	
Benzo(a)pyrene	6	<0.1 – 0.9	2.1	0	
*Chrysene**	6	<0.1 – 1.0	*b(a)p**	0	
*Dibenzo(a,h)anthracene**	6	<0.1	*b(a)p**	0	
Fluoranthene	6	<0.1 – 1.6	280	0	
Fluorene	6	<0.1 – 0.2	170	0	
Indeno(1,2,3-cd)pyrene	6	<0.1	*b(a)p**	0	
Naphthalene	6	<0.1 – 0.3	1.0	0	
Pyrene	6	<0.1 – 1.5	620	0	
Phenanthrene	6	<0.1 – 0.6	95	0	
TPH					
Aliphatic EC 5-6	2	<0.01	24	0	
Aliphatic EC >6-8	2	<0.01	53	0	
Aliphatic EC >8-10	2	<0.01	13	0	
Aliphatic EC >10-12	2	<1.5	62	0	
Aliphatic EC >12-16	2	<1.2	510	0	
Aliphatic EC >16-35	2	<4.9	41000	0	
Aromatic EC 5-7	2	<0.01	53	0	
Aromatic EC >7-8	2	<0.01	100	0	
Aromatic EC >8-10	2	<0.01	20	0	
Aromatic EC >10-12	2	<0.9	63	0	
Aromatic EC >12-16	2	<0.5	140	0	
Aromatic EC >16-21	2	<0.6	260	0	
Aromatic EC >21-35	2	<1.4	1100	0	

Determinand	No. of Samples Tested	Range of Results (mg/kg unless specified)	GAC (1% SOM)	No. of Samples >GAC	Sample Exceeding GAC
Others					
Phenol	6	<0.3 – 0.8	110	0	
TOC	6	0.7 – 3.6 w/w%	3 w/w%	1	WS5 at 0.10m bgl
Calorific Value	3	<1.0 – 1.3MJ/kg	2MJ/kg	0	
Asbestos	3	NAD	Fibres present	0	

Table based on a Residential with Gardens end-use.
* assessed using benzo(a)pyrene as a surrogate marker.
# Laboratory detection limits are higher than GAC values; GAC -generic assessment criterion; NAD – No Asbestos Detected: NA - not applicable; LoD – Limit of detection.

None of the determinands tested for within the selected soil samples exceeded the relevant GACs, with the exception of Total Organic Carbon (TOC).

TOC was recorded at a concentration marginally exceeding the relevant GAC within one sample of reworked topsoil obtained from WS5 at 0.10m bgl. The GAC for TOC is based on the Hazardous Waste (England and Wales) Regulations 2005. TOC content in itself does not represent a potential risk to human health. This GAC is provided for indicative assessment of disposal options, in the case that off-site landfill of soil is undertaken. This GAC is specified at the 'Inert' waste threshold and should therefore be considered as for information purposes only.

In addition to the above soil analyses, one sample of reworked topsoil (TP2 at 0.10m bgl) was analysed for a range of pesticide compounds. The results have returned all determinands below the laboratory's limit of detection.

7.3. Leachability Testing

Given the environmental setting of the site, consideration has been taken of both groundwater and surface water as potential controlled water receptors of contamination. Hence, the results of leachate analysis have been evaluated against both Drinking Water Standards (DWS) and Inland Waters Environmental Quality Standards (EQS) levels. For EQS levels where a threshold concentration is determined from the hardness of the receiving waters, the most conservative hardness value has been used, as the receiving waters themselves have not been tested.

The derivation of the GAC values is described in Appendix F.

The analytical results for leachate samples and the outcome of screening are summarised in Table 7.2.

Table 7.2 Summary of Total Leachate Concentrations

Determinand	No. of Samples Tested	No. Samples Above Limit of Detection	Range of Results (μg/l unless specified)	GAC value (μg/l unless specified)		No. of Samples >GAC
Metals				**EQS (Note 1)**	**DWS (Note 2)**	
Arsenic	3	3	1.1 – 2.2	50	10	0
Cadmium +	3	0	<0.03	0.08	5	0
Chromium	3	0	<0.25	4.7	50	0
Lead	3	3	0.45 – 1.1	7.2	10	0
Mercury	3	0	<0.01	0.05	1	0
Copper +	3	3	2.5 – 3.7	1	2000	3 (EQS)
Nickel	3	1	<0.5 – 0.6	20	20	0
Zinc +	3	3	1.93 – 3.78	8	5000	0
Organics						
Naphthalene	3	0	<0.01	2.4	NA	0
Benzo(a)pyrene	3	1	<0.01 – 0.01	0.05	0.01	0
Anthracene	3	0	<0.01	0.1	NA	0
Fluoranthene	3	1	<0.01 – 0.02	0.1	NA	0
Sum of benzo(b)fluoranthene and benzo(k)fluoranthene	3	1	<0.02 – 0.03	0.03	NA	0
Sum of benzo(ghi)perylene and indeno(1,2,3-cd)pyrene	3	0	<0.02*	0.002	NA	0
Sum of four PAHs benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene	3	1	<0.04 – 0.05	NA	0.1	0
Phenol	3	0	<0.50	7.7	0.5	0

+ – EQS is hardness related; 1 – Inlands Waters EQS values; 2 – DWS values; * – Laboratory detection limits are higher than EQS value; # – Laboratory detection limits are higher than DWS value.

None of the determinands tested for within the selected soil leachate samples exceeded the relevant GACs, with the exception of leachable copper.

Marginally elevated concentrations of leachable copper were detected within three samples tested in comparison to the most conservative EQS values.

It is considered that laboratory leachate testing is not truly reflective of natural hydraulic processes, but represents a much more aggressive process often resulting in elevated concentrations of leachable determinands being identified. With this in mind, the marginal nature of exceedances, the "greenfield" history of the site, and its environmental setting, the identified concentrations are considered to pose a negligible risk to controlled waters. These elevated concentrations are therefore not considered further.

8.

8. REVISED CONCEPTUAL SITE MODEL AND GENERIC QUANTITATIVE RISK ASSESSMENT OF POLLUTANT LINKAGES

The preliminary combined conceptual site model and conceptual exposure model, developed as part of the 2014 desk study and summarised in Section 3.8, has been revised in light of the ground investigation and the chemical analysis results presented above.

The revised conceptual site model has been developed for the proposed future land use (residential with gardens). This summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors.

The revised conceptual site model is presented in schematic form in Appendix A, as Drawing No. C6138A/06.

8.1. Summary of Identified Pollutant Linkages

In summary, the revised CSM has identified the following potential pollutant linkages which could result in an unacceptable risk to the proposed end-use:

- Risk from hazardous ground gas sources, including mine gases and marsh gases, located both on and off-site, posing a **low to moderate** risk to site end-users and construction workers. A fully risk assessment will be provided upon completion of the remaining monitoring visits, presented in an addendum letter report.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1. General

This geoenvironmental appraisal has been performed at land off Carrs Lane, Cudworth, Barnsley, in order to assist with planning purposes, design and abnormal cost assessment.

It is understood that BDW are considering developing the site for a low-rise residential end-use, comprising 263 two storey residential properties and 15 bungalows, with private gardens, areas of soft landscaping, Public Open Space (POS), areas of hardstanding, and highways. No loadings or development levels were known at the time of writing. In addition, the revised proposed development includes for an attenuation pond within the far southern part of the site. Geotechnical recommendations for this feature are beyond the remit of this report and it is understood that this will be undertaken by others.

This report has been compiled to assist with planning purposes for the proposed residential end-use, assuming development levels will remain broadly as existed at the time of the preliminary investigation.

9.2. Flood Risk

According to the LIG Envirocheck report and the EA website, the site does not lie within an indicative flood plain (zone 2 or 3) at risk of flooding from rivers or sea.

9.3. Geotechnical

Mining

This investigation has proven that potentially workable coal exists within influencing distance of the surface within the western portion of the site; ie in the vicinity of WS3 and RO7, and potentially around R01 and R01A (see Drawing No. C6138A/4). Elsewhere the coal should, even if / where worked, be too deep to affect surface stability.

A supplementary rotary probing investigation is recommended to confirm the presence / absence of mine workings beneath the site, concentrated where insufficient rock cover has been identified (ie the western flank). If workings are found within influencing distance of the surface, drilling and grouting will be required (or coal removal) with appropriate precautions taken in foundations. For adoptable highways, the scope of works would need to be approved by the local highways department.

The CA mining report records that no mine entries are known to exist on the site (although one is shown 20m to the south west), but warns of their potential unrecorded presence. It is therefore recommended that as part of the enabling works the site be stripped back to natural strata in order to inspect for mine entries / bell pits / crop workings. If evidence of a mine entry, bell pit, coal workings or ground disturbance is suspected, advice regarding treatment / foundation precautions should be sought from a suitably qualified engineer.

At this stage a contingency should be included for drilling and pressure grouting potential mine workings (including potential crop workings) below the western part of the site, and, in addition, treating yet unproven mine entries (i.e. shafts, adits and / or bell pits).

Inspection of historical OS plans has revealed evidence of a former quarry / quarry high wall to the sites north western / western perimeter, in addition to a number of former sandstone quarries within the vicinity of the site. As such the possibility of encountering unrecorded quarries on site cannot be wholly discounted. It is recommended that all excavations be examined for evidence of such features. If evidence of an infilled quarry is suspected works should cease and the advice sought of a suitably qualified consultant.

With regards to the former quarry high wall located to the sites north western boundary it would be prudent to undertake a visual assessment of the rock face by a suitably qualified Engineer in order to ascertain the stability of the feature, particularly owing to the ground conditions identified within RO1 and RO1A i.e. broken / soft ground and the potential risk of impacting the development site, particularly if residential properties are proposed in its proximity.

Foundations

The recommendations provided below are based on the assumption that the surface stability of the site is not affected by shallow mine workings. If this proves not to be the case, the recommendations will need to be revised; including treatment of shallow mine workings, and modification to foundation design.

Reworked topsoil, and locally made ground soils, were encountered to depths of between 0.15m and 0.55m bgl, underlain by, across the majority of the site, granular residual soils, and in the east and south east, cohesive residual soils.

Granular residual soils were proven to depths of between 0.50m and 2.80m bgl, recorded as comprising medium dense to dense (locally loose within WS3) gravelly sand / sandy gravel / sand and gravel / and gravelly clayey sand, of sandstone, with rare coal and siltstone. Cohesive

residual soils were proven to depths between 1.40m and 3.85m bgl, recorded as firm to very stiff, generally medium to high strength, slightly sandy clay with gravel of sandstone, siltstone and locally mudstone.

Bedrock was generally described as very / extremely weak and weak weathered sandstone, with, on occasion, interbeds of siltstone, mudstone and coal. Locally, within WS3, WS4 and WS5, the residual soils were underlain by extremely weak / very weak siltstone bedrock at depths between 1.40m and 4.20m bgl.

Groundwater monitoring, undertaken by Sirius (to date), of the standpipes installed within selected window sample boreholes revealed groundwater levels, to be standing between 1.30m and 2.92m bgl within only WS3 and WS4, all other installed wells were recorded as 'dry'.

The reworked topsoil and made ground soils are considered unsuitable as bearing strata using conventional spread foundations due to the potential for excessive total and differential settlements. It is considered that structural loads associated with the proposed development could be supported on reinforced spread foundations (such as strip / trench fill) taken down through any reworked topsoil / made ground into the underlying natural ground of adequate bearing capacity. If shallow coal requires consolidation, overlying foundations may need to be rafts or piles.

For preliminary foundation design a 0.60m wide strip footing within the granular residual soils identified across the majority of the site (based on a typical SPT N-value of 10 (medium dense) and a minimum angle of shearing resistance (Φ') of 30º) at 1.00m bgl, is assumed to support a design load of 80kN/m run, with settlements being below 25mm.

In the eastern and south eastern part of the site, beneath the reworked topsoil / made ground soils are cohesive soils. The settlement characteristics of sand / gravel and clay are different. It would be prudent for all foundations to bear upon one consistent stratum i.e. granular residual soils or cohesive soils, in order to prevent differential settlements occurring between foundations.

The residual cohesive soils (of at least medium strength) are considered to have an characteristic undrained shear strength (C_u) of 50kPa at a founding depth of 1.00m bgl. By way of example, calculations indicate a 0.60m wide strip bearing on the cohesive medium to high strength residual soils at a depth of 1.00m bgl, can impose a maximum line load of 80kN/m run. The application of such a pressure would keep settlements to 25mm or less.

If foundations encounter bedrock all of the foundation should be placed in this material in order to limit the potential for unacceptable differential settlements. By way example and in accordance with

Eurocode 7, for a 0.60m wide strip founded on competent bedrock placed at 2.00m depth, a design load of 150kN/m^2, can be assumed for the very weak sandstone / siltstone.

Locally, loose granular residual soils were encountered within WS3. It is considered that within this area spread foundations may have to be locally deepened in order to found onto competent strata and / or thickened, widened and strengthened to accommodate variations in ground conditions.

If foundations are to bear upon a mix of residual soils (cohesive and granular), it is recommended that settlement performance between the foundation types be calculated / assessed. Reinforcement of foundations to cater for potential differential settlement of the residual should be anticipated.

The above calculations for the proposed residential development are based on theoretical foundations. The loading regime and settlement of foundations is dependent on foundation loadings, and dimensions. It is therefore recommended that foundation settlements are reviewed by a qualified engineer once final loading arrangements and foundation sizes are known.

If shallow coal is encountered during foundation excavations, the foundation excavation should be extended through the coal seam into competent strata below. If the depth to the base of coal increases to greater than 2.50m bgl within the foundation excavation, then an alternative engineer designed foundation may be required. In addition, if foundations extend through any shallow coal seams these will require protection from potential spread of fire; this typically involves the installation of a sacrificial concrete barrier to the external faces of foundations. Advice should be sought from a suitably qualified engineer.

Further rotary probing is required to confirm the presence / absence of mine workings beneath the western most part of the site. Following this, appropriate treatment and foundation design can be determined in this area.

Trial trenching undertaken as part of this investigation to attempt to locate a conjectured fault and / or a shallow coal seam (Sharlston Low) did not generally identify any distinguishable features. As a precaution against residual movement along the fault plan, foundations over and within say 25m either side of its conjectured position, should be reinforced. Reinforcement should be detailed by an appropriately qualified Engineer.

The natural cohesive soils have been found to be of low to medium volume change potential in accordance with NHBC Standards Chapter 4.2. Foundations placed into natural insitu clay soils should be a minimum of 900mm deep (from existing or finished ground level, whichever is the

lower of the two), deepened / protected within the zone of influence of existing or proposed trees in accordance with NHBC guidance. A tree survey was beyond the scope of this investigation but should be undertaken to enable production of a detailed plot specific foundation schedule. The removal of trees during development of the site may cause heave of cohesive soils and heave protection measures should be adopted in foundation design where appropriate.

Foundations placed into granular deposits and bedrock should be at least 500mm below finished or original ground level (whichever is the lower of the two), to alleviate any affects arising from frost heave.

Foundations should be taken below a line drawn up at 45° from the base of any existing or proposed services, including a sewer which is understood to cross the site. Consultation should be undertaken with the appropriate regulator to determine the implication of the sewer on development plans.

It should be noted that locally (WS3), groundwater has been encountered at shallow depth beneath the site. This may have an adverse effect on foundation construction and performance, particularly in winter months. This should be considered when designing foundations.

Other Geotechnical Considerations

Assessment of the suitability / stability of the retaining wall structure recorded to the sites western / north western perimeter (if maintained and incorporated into the proposed development) within the context of the proposed development levels is recommended.

As mentioned within Section 2, an unknown brick structure was identified to the sites north eastern flank, within an area of dense vegetation. On closer inspection, it may be possible that the feature is representative of a former well, although there is no evidence of such a feature on historical OS mapping. In addition, historical OS mapping has identified a former pump to the sites south eastern portion; trial pitting and window sampling completed within its proximity did not reveal any significant evidence of this feature. As such it is recommended as part of the enabling works that further investigations are undertaken in the vicinity of both features. This may comprise of a small surface strip to confirm the presence / absence of these features and if present, determine the construction details and size. Treatment will be subject to the findings, development proposals in the affected areas and regulatory requirements.

Floors

In accordance with NHBC Standards 2008 (Chapters 4.2, 4.6 and 5.1), suspended ground floor slabs are required in the following situations:

- Made ground greater than 600mm thick.
- Where soil swelling may occur.
- Where vibratory ground improvement has been carried out.
- Where the ground has insufficient bearing capacity.

On the basis of the above, and assuming that gas measures are not required in buildings (which is still to be confirmed) ground bearing slabs should be feasible across the majority of the site. Suspended slabs will be required where trees are present and soils are cohesive.

Floor design should be confirmed when final site levels are known, a tree survey is competed and gas measures are finalised.

Sulphate Attack

Based on the samples tested, a Design Sulphate Class of DS-1 and an ACEC Class of AC-1 should be used for buried concrete structures in contact with both reworked topsoil/made ground and natural soils.

Groundworks, Excavation Stability and Groundwater Dewatering

Excavations into existing reworked topsoil/made ground and the underlying natural soils should be assumed to be unstable. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA report 97 should be made to establish suitable means of support or battering of excavation sides.

Based on the results of this investigation, significant groundwater flow into shallow excavations (<1.50m) is not be expected. If groundwater is encountered at shallow depth it should be possible to deal with these seepages through normal site pumping practices for any shallow excavations open for short periods of time. Disposal/discharge of water will require appropriate treatment/consent.

It is recommended that an adequate drainage system for surface water be installed by a competent contractor, in order to prevent surface water ponding or collecting both during and post construction, as this may lead to deterioration of the founding stratum.

It is recommended that in order to reduce the possibility of softening or swelling of cohesive soils at the base of foundation trenches, it should be suitably blinded with concrete.

Competent bedrock strata will be identified at relatively shallow depth. For deep excavations, for example, for services, competent bedrock may require breaking-out using heavy mechanical plant.

Soakaways

Soakaway tests were undertaken within five trial pits (SA1 to SA5) to determine infiltration rates.

At the time of the intrusive works, the invert level of the soakaway discharge pipe or soakaway base was not known.

The infiltration rate is calculated from the gradient of the graph between 75% and 25% effective depth. The water level in soakaway tests SA3 and SA4 did not fall to below 75% and 50% of their effective depth, respectively. As a result a soil infiltration rate was not calculated for these soakaway tests.

The results of the soakaway tests are summarised below:

Table 9.1 Soakaway Results

Trial Pit	Test Number	Soil Infiltration Rate (m/s)	Stratum
SA1	1	5.31×10^{-5}	Residual granular soils/Sandstone
	2	6.84×10^{-5}	
SA2	1	7.82×10^{-5}	Sandstone
	2	6.10×10^{-5}	
SA3	1	N/A Water level did not fall below 75% effective depth within 5.15 hours	Residual cohesive soils/Sandstone with interbedded siltstone
SA4	1	N/A Water level did not fall below 50% effective depth within 2.55 hours	Residual granular soils/Sandstone
SA5	1	4.42×10^{-4}	Residual granular soils/Sandstone
	2	1.59×10^{-4}	
	3	8.74×10^{-5}	

N/A – Not Applicable

Final soakaway design is to be undertaken by others, based on the infiltration rates provided. The size of the required soakaway is a function of the area to be drained, anticipated rainfall and soil infiltration rate.

The low infiltration rates recorded in a number of the soakaway trial pits is thought likely to be a result of the fines content / cohesive nature of the soils.

It should be borne in mind that water levels are likely to fluctuate with seasonal/rainfall and may therefore be substantially higher at wetter times of year and subsequently reduce the capacity of soakaways.

It is recommended that the EA be consulted with respect to soakaway drainage for the site, as the underlying bedrock (Glass Houghton Sandstone) is classified as a Secondary A Aquifer.

Pavements and Highways

Based on a visual examination of the shallow soils and Atterberg test results, a CBR value of 3% is suggested for the natural residual cohesive soils.

Laboratory CBR tests undertaken on two samples of the residual granular soils indicates a CBR value of between 56% and 91%. For preliminary design purposes in these materials it is suggested that 10% is assumed.

It is recommended that insitu CBR testing is carried out during the enabling works, when final site levels will be known, to confirm design. An allowance should be included for proof-rolling of roads and car park formations, and excavation of any identified soft-spots and replacement with granular materials placed and compacted in layers.

All road design should be discussed with the relevant local authority if highways are to be subject to a Section 38 agreement.

Should supplementary rotary probing prove shallow mine workings within influential distance of the surface, it is recommended that an allowance be made for the consolidation/treatment of mine workings beneath proposed highways.

Advice should be sought from an appropriately qualified Highway Engineer to assess the impact of the site gradient on the development aspirations.

9.4. Asbestos-Containing Materials

Asbestos-containing materials were not observed within the soils encountered during this investigation.

9.5. Soil and Groundwater Contamination

Risk Evaluation for the Proposed Residential Land Use

The revised conceptual site model confirms that no significant pollutant linkages exist from the shallow soils for construction workers and site end-users.

The risk to end-users with regards to hazardous ground gas is discussed below.

Utilities

It is recommended that the results of the chemical testing and details of the proposed enabling works are provided to the appropriate utility companies to determine the necessity for service protection.

Should coal / coal rich soils be encountered within utility excavations (electrical services), it should be removed 1m in all directions and replaced with 'clean' stone to prevent the possibility of spontaneous combustion.

Construction and Maintenance Workers

Contamination may pose a short-term (acute) or long-term (chronic) risk to workers during construction and maintenance. The potential risks must be specifically assessed as part of the health and safety evaluation for the works to be performed in accordance with prevailing legislation. Site practices must conform to the specific legislative requirements and follow appropriate guidance (e.g., HSE, 1991; CIRIA, 1996).

Outline Remediation Requirements

No specific remedial measures are required for a proposed residential with gardens end-use.

It is possible (although highly unlikely) that areas of more significant contamination, not identified to date, may be encountered on site during excavation and construction works. If any areas of noxious, odorous, brightly coloured, fibrous, liquid etc contamination are encountered, further advice should be sought from a suitably qualified consultant.

9.6. Ground Gas

The results of the gas monitoring undertaken to date has revealed low concentrations of carbon dioxide (maximum concentration of 2.2% v/v), non-detectable concentrations of methane, coupled with non-detectable/low initial and constant gas flow rate, and well oxygenated soils.

Based on the gas monitoring results recorded to date, a worst case gas screening value of 0.0105 l/hr for carbon dioxide has been calculated. Based on the GSV dervived, and in accordance with Table 2 presented in BS8485:2015, the soil gas regime can be classed as **Characterisitc Situation (CS) 1**. For the proposed residential development, CS1 does not require special precautions with regards to ground gas.

The above assessments should be regarded as interim only, prior to completion of the monitoring programme. **A further five gas/groundwater monitoring visits are programmed prior to finalising gas protective measures.**

No radon protection measures are required for the proposed development on this site.

9.7. Invasive Plants

Invasive plant species were not observed on this site at the time of investigation.

It is recommended that the absence of invasive plant species is confirmed by a qualified consultant ecologist and their advice taken on any required appropriate treatment. The treatment of any invasive species should take place in advance of the proposed construction works.

9.8. Disposal of Soils

Any materials removed from site should be undertaken in accordance with the Duty of Care Regulations 1991. There will also be a requirement to classify the waste in accordance with the European Waste Catalogue. The waste could also be subject to Waste Acceptance Criteria (WAC) testing. In light of the regulations it is recommended that discussion with landfill operators takes place at an early stage.

9.9. High Speed 2

The property is located a short distance to the east of the proposed HS2 network railway line, the position of which is still to be confirmed. BDW should be cognisant of the proposed rail line, in any

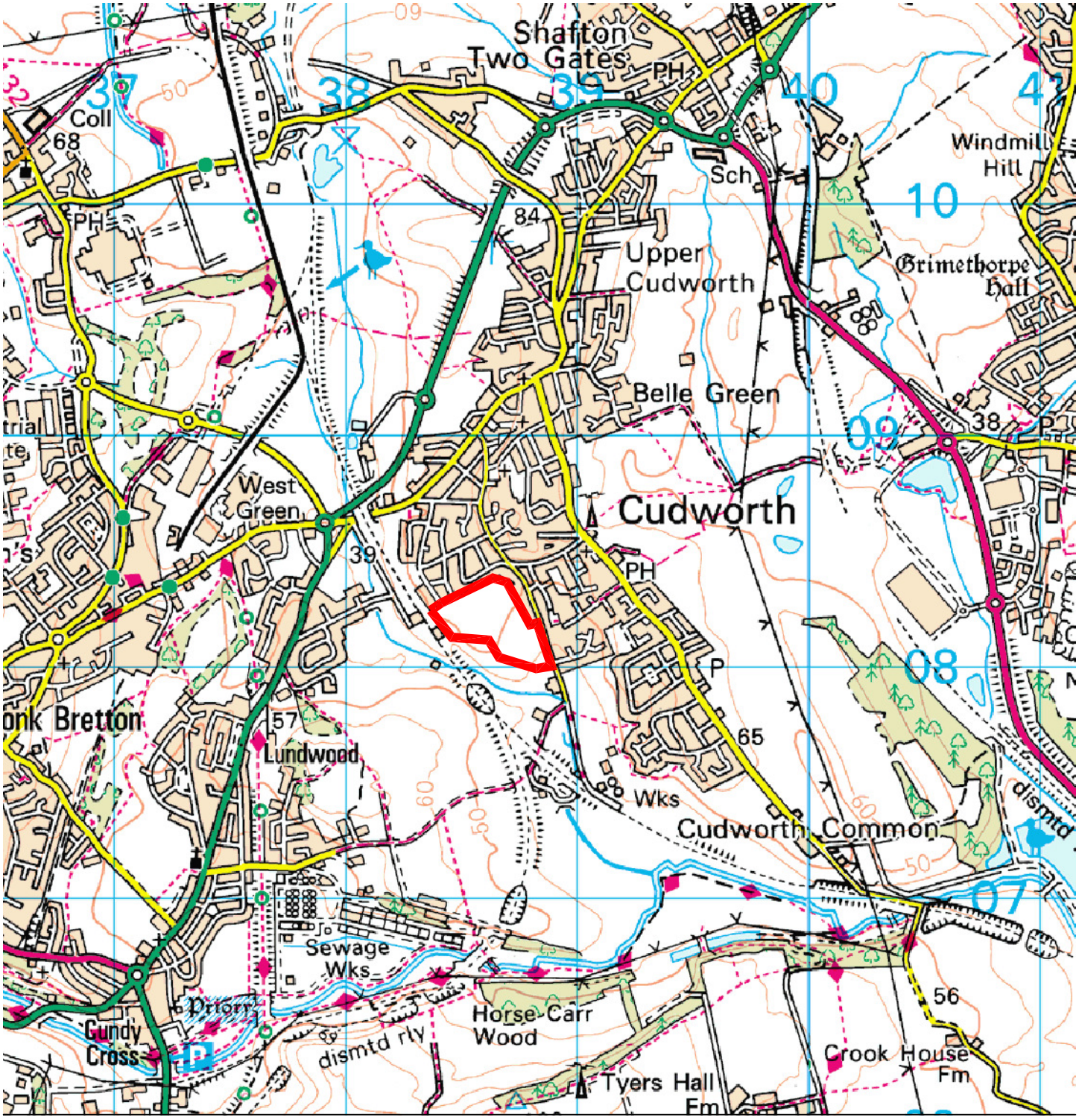
future transactions for the site and it would be prudent to take legal advice in determining its implication of the proposed development.

10. REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval prior to undertaking any works on site.

APPENDIX A

FIGURES AND DRAWINGS



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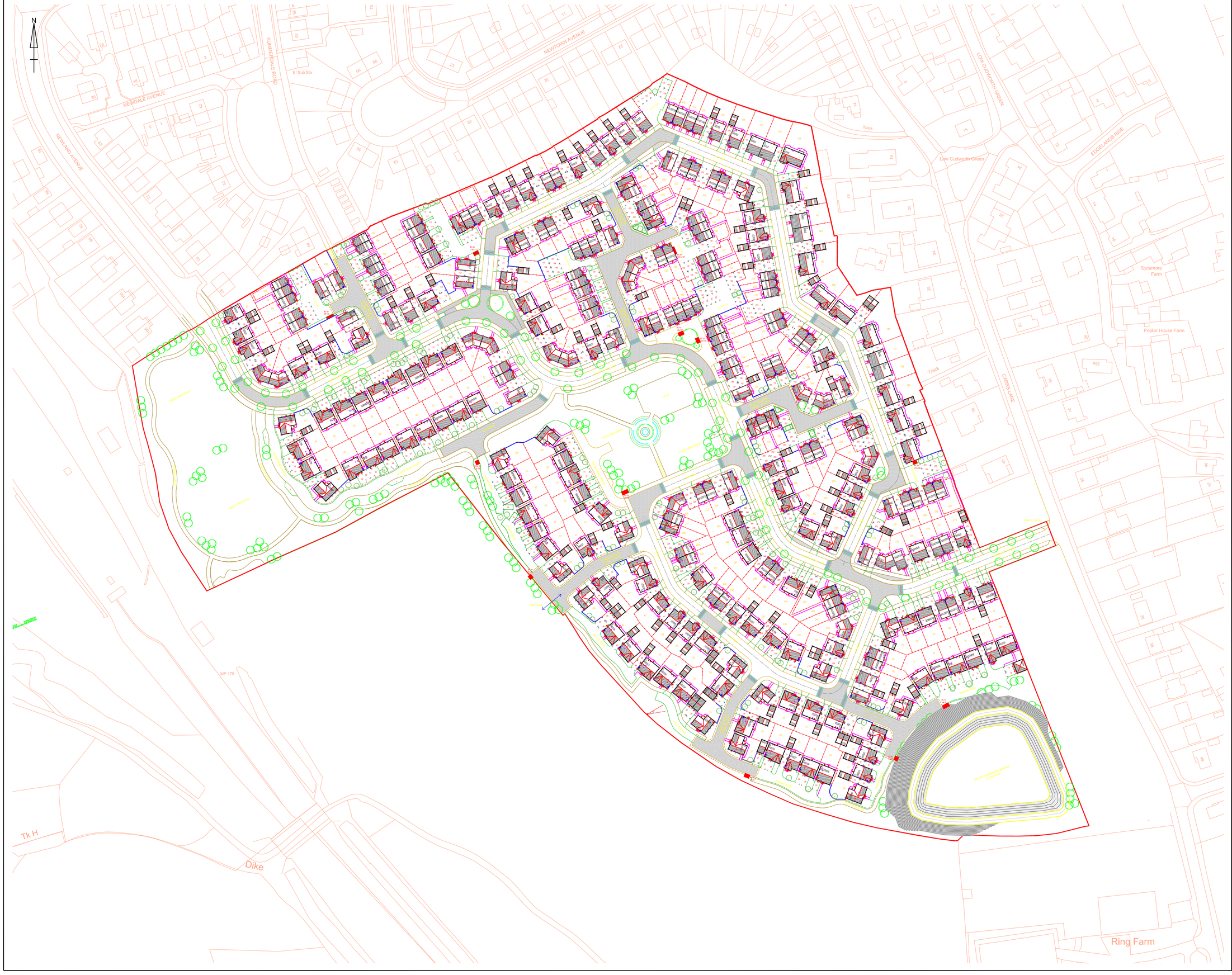
NOTES

Approximate Site Location

REVISION	
1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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4245 Park Approach,
Thorpe Park,
Leeds,
LS15 8GB
www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962

CLIENT: Barratt & David Wilson Homes	DRAWING NO.: C6138A/01	REVISION NO.: 1	
SITE: Carrs Lane, Cudworth, Barnsley	DRAWN BY: DT	APPROVED BY: JL	
DRAWING TITLE: Site Location Plan	DATE: October 2015	SCALE: 1:25,000	A4



NOTES

Drawing reproduced from Urban Design's Proposed Site Layout - Ref. YW-04-03-Revision AA, dated 25th April 2017

REVISION

0	Updated development layout plan
A	Updated development layout plan
B	>>
C	>>
D	>>

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Thorpe Park,
Leeds
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www.thesiriusgroup.com
TEL: 0113 264 9960
FAX: 0113 264 9962

CLIENT

Barratt & David Wilson Homes

SITE

Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Proposed Development Layout Plan

DRAWING NO.	REVISION NO.
C6138A/02	B
DRAWN BY	**APPROVED BY**
MB	MB

DATE	SCALE	PAPER SIZE
April 2017	1:1,250	A2



View of Fly-Tipping



View to South West



View to East



View of Unknown Brick Structure



View to West



View to North West

Approximate Location of Former Reservoir as Seen on OS Mapping Between C.1906 - C. 2006

Location of Former Quarry

Sharlston Top Coal

Pollutant Incident to Controlled Water, Involving Sewage Between 1996 - 1997 as Seen in LIG Report

Approximate Location of Presumed Quarry / Quarry High Wall as Seen on Historical OS Mapping

Ploughed Field

Sharlston Low Coal

Approximate Location of Brick Retaining Wall

Historical Gasometer as Seen on OS Maps (1893-1894)

Approximate Location of Air Shaft as Seen on Historical OS Mapping Between C. 1906 - 1932. Also Refered to as a Dissused Adit/Mine Entry on Coal Authority Mining Report

As Refered to in LIG Report as Historical Landfill Site

Approximate Location of Former Buildings on OS Mapping between C.1854 - 1955

Grassed Field

Grassed Field

Ring Farm

Pollutant Incident to Controlled Water, Involving Mud/Soil/Clay Between 1996 - 1997 as Seen in LIG Report

Approximate Route of Former Railway Line + Associated Infastructure As Seen on OS Mapping Between C. 1854 - 1993

Burton Abbey Farm

NOTES

- Approximate Site Boundary
- Flow Direction
- Site Access
- Overhead Cables
- General Site Slope
- Local Site Slope
- Old Telegraph Poles
- Yorkshire Water Manhole
- Fly-Tipped Material - Including Soil, Wood, Plastic, Cardboard, Metal, Glass, Fabric
- Rough Footpath
- Unknown Brick Stucture
- Fault as Seen on BGS Map Sheet (Cross Mark on Downthrowing Side)
- Coal Outcrop (approximate positions taken from 1:10,000 scale geological sheet)

REVISION	
1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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LS15 8GB
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SITE

Carrs Lane, Cudworth, Barnsley

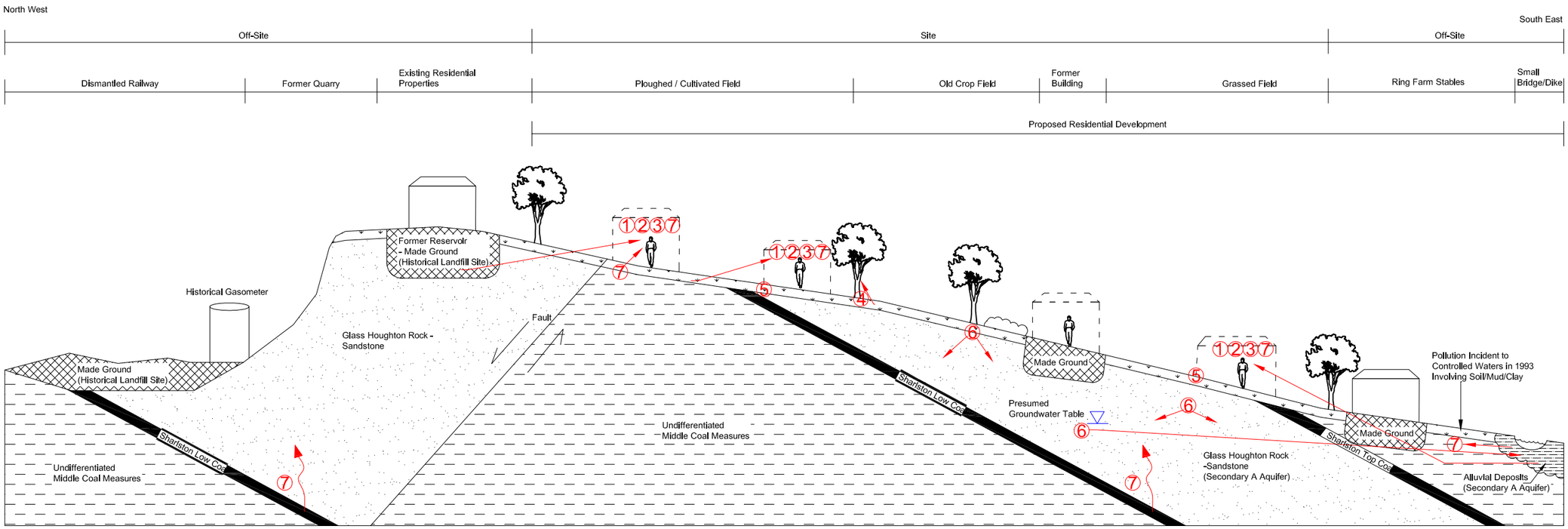
DRAWING TITLE

Site Features Plan (Showing Historical / Geological Features)

DRAWING NO.	REVISION NO.
C6138A/03	1

DRAWN BY	APPROVED BY
DT	JL

DATE	SCALE	PAPER SIZE
October 2015	1:2000	A2



Contamination Sources	Contamination Pathways	Potential Receptors	Likelihood of significant pollutant linkage
Elevated metals, organic and inorganic contaminants, including asbestos, hydrocarbons and pesticides, in topsoil and locally made ground.	1 Direct and indirect inhalation 2 Inhalation of contaminated particles / dust 3 Dermal Contact	Future site users, construction site workers and adjacent land users	Low to Moderate
	4 Plant Uptake	Gardens and landscaping	Low
	5 Direct contact with construction materials	Sulphate attack on buried concrete, other construction materials and buried services	Low to moderate
Leachable and mobile metals, organic and inorganic contaminants within topsoil and locally made ground.	6 Leaching to controlled waters	Secondary A Aquifer & Small Bridge Dike	Low
Ground gas from on and off-site sources.	7 Generation and accumulation of gas	Future site users, construction workers, built environment	Moderate

NOTES

REVISION	
1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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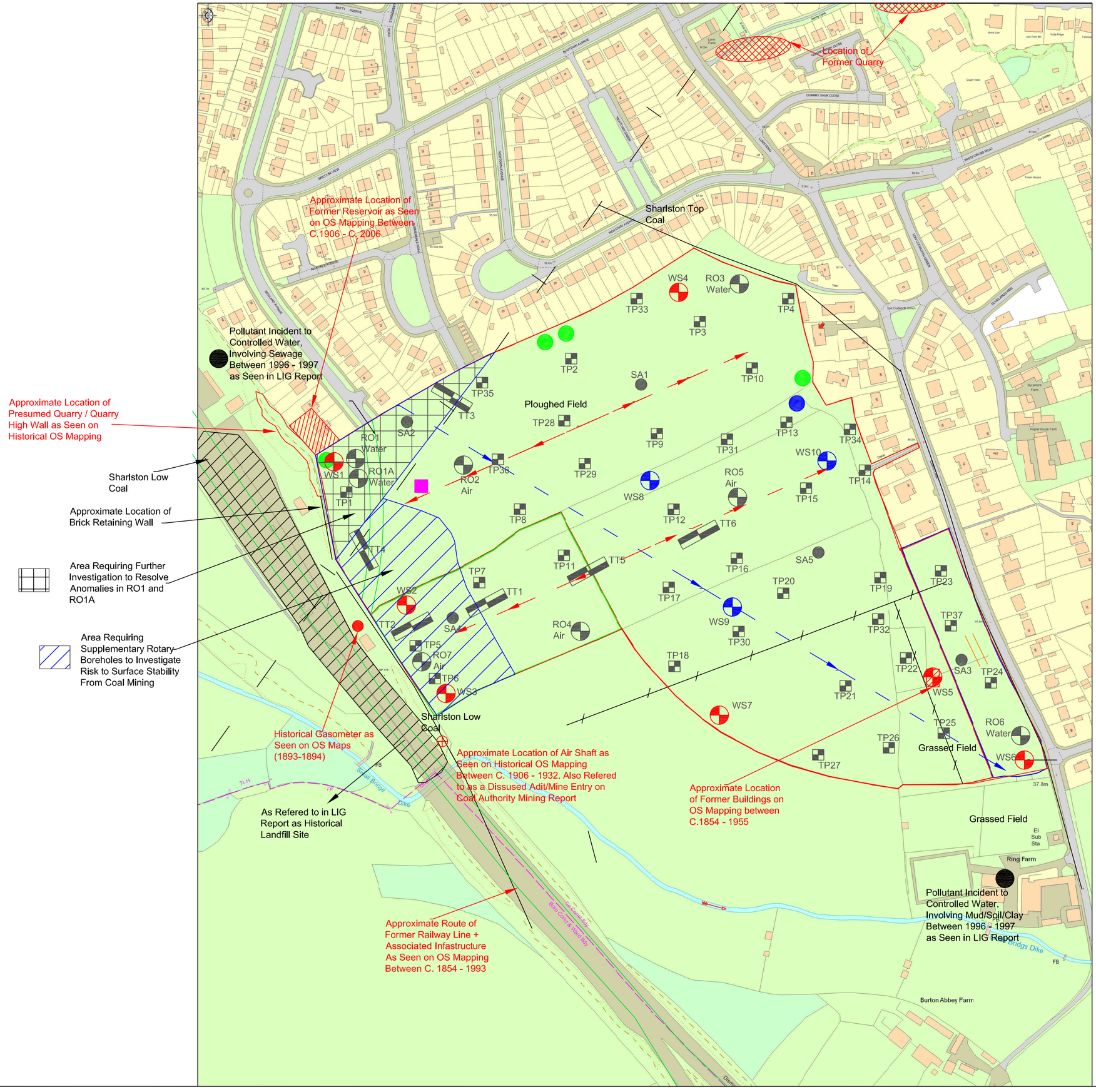
Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Preliminary Conceptual Site Model

DRAWING NO.	REVISION NO.
C6138A/04	1
DRAWN BY	APPROVED BY
DT	JL

DATE	SCALE	PAPER SIZE
October 2015	NTS	A3



NOTES

- Approximate Site Boundary
- Flow Direction
- Site Access
- Overhead Cables
- General Site Slope
- Local Site Slope
- Old Telegraph Poles
- Yorkshire Water Manhole
- Fly-Tipped Material - Including Soil, Wood, Plastic, Cardboard, Metal, Glass, Fabric
- Rough Footpath
- Unknown Brick Structure
- Fault as Seen on BGS Map Sheet (Cross Mark on Downthrowing Side)
- Coal Outcrop (approximate positions taken from 1:10,000 scale geological sheet and information obtained from the Site investigation)
- Window Sample Positions (Non Installed)
- Rotary Holes
- Window Sample Positions (Installed)
- Trial Pits
- Trial Trenching
- Soakaway

REVISION

1	New Planning Layout
A	>>
B	>>
C	>>
D	>>

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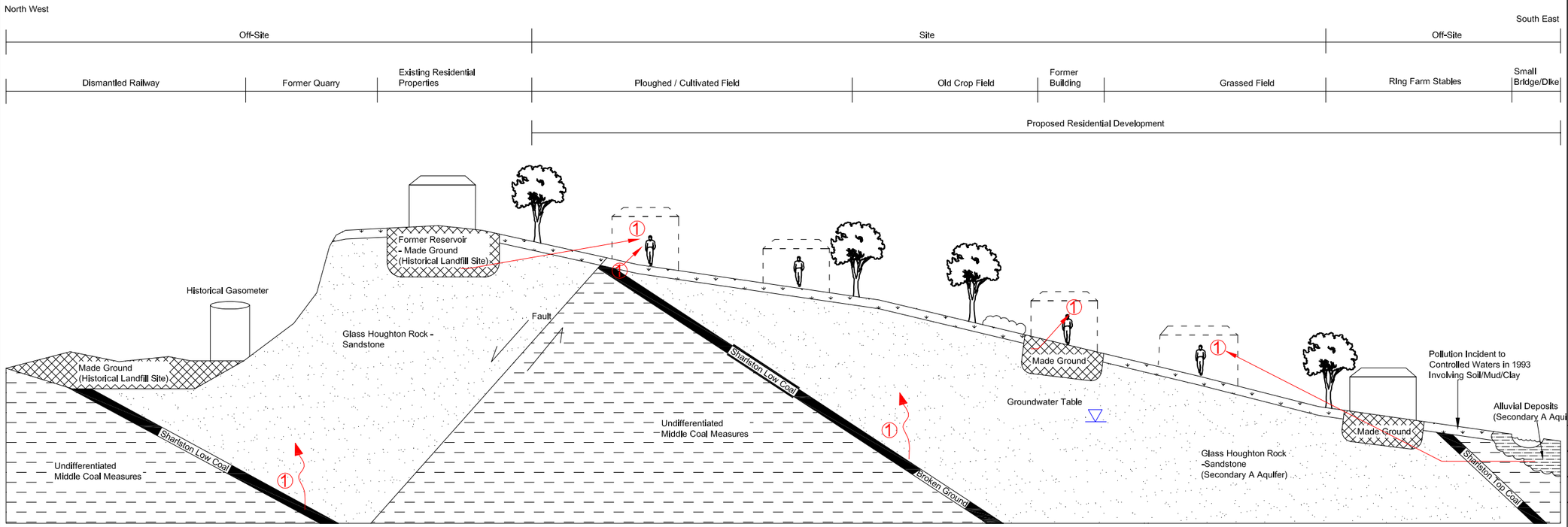
SITE

Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Exploratory Hole Location Plan

DRAWING NO.	REVISION NO.
C6138A/05	1
DRAWN BY	APPROVED BY
DT	JL
DATE	SCALE	PAPER SIZE
October 2015	1:2000	A2



Contamination Sources	Contamination Pathways	Potential Receptors	Likelihood of significant pollutant linkage
Ground gas from on and off-site sources.	1 Generation and accumulation of gas	Future site users, construction workers, built environment	Low to Moderate

NOTES

REVISION

1	New Planning Layout
A	>>
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Carrs Lane, Cudworth, Barnsley

DRAWING TITLE

Revised Conceptual Site Model

DRAWING NO.	REVISION NO.
C6138A/06	1
DRAWN BY: DT	APPROVED BY: JL
DATE: October 2015	SCALE: NTS	PAPER SIZE: A3

APPENDIX B

EXPLORATORY HOLE RECORDS

BOREHOLE RECORD

BH No. **RO1**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with water flush

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND	0.30	54.29		
							Brown SANDSTONE				
							BROKEN GROUND (No flush, no returns)	5.00	49.59		
							End of Borehole at 9.00 m	9.00	45.59		

Remarks and Water Observations

1. No groundwater encountered.
2. Water flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 54.59
Easting: 438387.92
Northing: 408228.74

Fig. No. RO1

BOREHOLE RECORD

BH No. **RO1A**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with water flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND	0.30			
							Brown SANDSTONE (Partial flush)				
							SOLID GROUND (No flush, no returns).	3.00			
							SOFT GROUND (No flush, no returns)	4.50			
							SOLID GROUND (No flush, no returns)	4.80			
							End of Borehole at 12.00 m	12.00			

Remarks and Water Observations

1. No groundwater encountered.
2. Water flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
RO1A

BOREHOLE RECORD

BH No. **RO2**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with air flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (Fl)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND	0.30	55.95		
							Loose brown SANDSTONE				
							Brown SANDSTONE	5.40	50.85		
							Grey brown MUDSTONE	12.30	43.95		
							Brown SANDSTONE	14.20	42.05		
							Dark brown SANDSTONE	18.00	38.25		
							COAL	21.00	35.25		
							Grey MUDSTONE	21.60	34.65		
						▽ 27					
							End of Borehole at 30.00 m				

Remarks and Water Observations

1. Groundwater encountered from 27.00m.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 56.25
Easting: 438485.24
Northing: 408212.20

Fig. No. RO2

BOREHOLE RECORD

BH No. **RO3**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with water flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND	0.30	54.38		
							Dark brown SANDSTONE	1.40	53.28		
							Brown SANDSTONE	3.00	51.68		
							Grey SANDSTONE				
							BROKEN GROUND	28.00	26.68		
							SOLID STRATA (No flush).	28.80	25.88		

End of Borehole at 30.00 m

Remarks and Water Observations

1. No groundwater encountered.
2. Water flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 54.68
Easting: 438673.17
Northing: 408365.04

Fig. No. RO3

BOREHOLE RECORD

BH No. **RO4**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with water flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND.	0.30	51.69
Orange SANDSTONE.		
Grey SANDSTONE.	20.70	31.29
COAL.	26.80	25.19
Grey MUDSTONE.	27.50	24.49

Legend

Well

End of Borehole at 30.00 m

Remarks and Water Observations

1. No groundwater encountered.
2. Water flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD)
51.99
Easting:
438605.40
Northing:
408105.00

Fig. No.
RO4

BOREHOLE RECORD

BH No. **RO5**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with air flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD				
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)		Description	Depth (m)	Level (mAOD)	Legend	Well
							MADE GROUND	0.30	48.98		
							Orange SANDSTONE.				
							Grey SANDSTONE.	6.50	42.78		
						18					

End of Borehole at 30.00 m

Remarks and Water Observations

1. Groundwater encountered at 18.30m bgl.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 49.28
Easting: 438675.19
Northing: 408184.94

Fig. No. RO5

BOREHOLE RECORD

BH No. **RO6**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with water flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS

Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)

Groundwater (Casing)

STRATA RECORD

Description	Depth (m)	Level (mAOD)
MADE GROUND	0.30	35.95
Orange SANDSTONE		
Grey SANDSTONE	1.50	34.75
Grey MUDSTONE	4.20	32.05
Grey SANDSTONE	6.00	30.25

Legend

Well

End of Borehole at 30.00 m

GL (m AOD)
36.25
Easting:
438900.91
Northing:
408011.45

Fig. No.
RO6

Remarks and Water Observations

1. No groundwater encountered.
2. Water flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

BOREHOLE RECORD

BH No. **RO7**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 19/09/2014

Method: Open hole techniques with air flush.

Scale 1:150

Logged By: GB | Checked By: JL

Driller: RE

SAMPLE DETAILS						Groundwater (Casing)	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
Type	Depth From - To (m)	TCR (%)	SCR (%)	RQD (%)	N (FI)						
							MADE GROUND	0.30	40.09		
							Loose brown SANDSTONE				
							Brown SANDSTONE	4.50	35.89		
							COAL	5.80	34.59		
							Grey SANDSTONE with interbedded mudstone	6.50	33.89		
							End of Borehole at 20.00 m	20.00	20.39		

Remarks and Water Observations

1. No groundwater encountered.
2. Air flush techniques used.
3. Hole backfilled with arisings and a bentonite seal.

GL (m AOD) 40.39
Easting: 438456.27
Northing: 408077.16

Fig. No. RO7

TRIAL PIT RECORD

TP No. **SA1**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 24/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.40		
				Yellowish brown sandy GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.60		
				Extremely weak becoming weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.10		
				End of Trial Pit at 1.30 m	1.30		

Remarks and Water Observations

1. Trial pit terminated at 1.30m due to bedrock.
2. Groundwater not encountered.
3. Soakaway tests carried out.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
SA1

TRIAL PIT RECORD

TP No. **SA2**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 24/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.30		
				Extremely weak becoming weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	0.50		
				End of Trial Pit at 1.40 m	1.40		

Remarks and Water Observations

1. Trial pit terminated at 1.40m due to bedrock.
2. Groundwater not encountered.
3. Soakaway tests carried out.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
SA2

TRIAL PIT RECORD

TP No. **SA3**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 24/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: Grassed TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
				Friable grey mottled orange/brown slightly sandy slightly gravelly CLAY. Low plasticity (field description). Gravel is angular to sub-angular of sandstone.	0.60		
				... From 1.80m becoming grey/brown			
				Extremley weak brownish grey weathered fine grained SANDSTONE with interbedded SILTSTONE recovered as sandy clayey GRAVEL of angular sandstone.	2.30		
				End of Trial Pit at 2.50 m	2.50		

Remarks and Water Observations

1. Trial pit terminated at 2.50m due to bedrock.
2. Groundwater not encountered.
3. Soakaway test carried out.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
SA3

TRIAL PIT RECORD

TP No. **SA4**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 24/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30			
				Yellowish brown slightly gravelly clayey fine to coarse SAND. Gravel is angular of sandstone.	0.80			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.40			
				Weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	2.40 2.45			
				End of Trial Pit at 2.45 m				

Remarks and Water Observations

1. Trial pit terminated at 2.45m due to bedrock.
2. Groundwater not encountered.
3. Soakaway test carried out.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
SA4

TRIAL PIT RECORD

TP No. **SA5**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 24/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50			
				Yellowish brown fine to coarse SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.90			
				Weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.60			
				End of Trial Pit at 1.90 m	1.90			

Remarks and Water Observations

1. Trial pit terminated at 1.90m due to bedrock.
2. Groundwater not encountered.
3. Soakaway tests carried out.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
SA5

TRIAL PIT RECORD

TP No. **TP1**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
					0.30		
J	0.40m			Light grey mottled orange slightly clayey slightly gravelly fine to coarse SAND. Gravel is angular of sandstone.			
B	0.50m - 0.70m						
				... From 0.90m rare pockets of clay.			
B	1.00m - 1.20m						
					2.60		
B	2.70m - 2.80m			Very weak light grey weathered fine to coarse SANDSTONE recovered as slightly clayey sandy COBBLES of angular fine to coarse grained sandstone with occasional gravel. Gravel is angular of sandstone.			
				End of Trial Pit at 2.90 m	2.90		

Remarks and Water Observations

1. Trial pit terminated at 2.90m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP1

TRIAL PIT RECORD

TP No. **TP2**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
					0.30		
J	0.40m			Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is fine to coarse angular of sandstone.			
					0.50		
				Yellowish brown SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone. Sand is fine to coarse.			
					1.30		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.40		
				End of Trial Pit at 1.40 m			

Remarks and Water Observations

1. Trial pit terminated at 1.40m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP2

TRIAL PIT RECORD

TP No. **TP3**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
J	0.20m						
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30 0.40		
J	0.50m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.10 1.20		
				End of Trial Pit at 1.20 m			

Remarks and Water Observations

1. Trial pit terminated at 1.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP3

TRIAL PIT RECORD

TP No. **TP4**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
					0.30		
J	0.50m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare coal fragments.			
					0.70		
D	0.90m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is fine to coarse angular of sandstone.			
B	1.30m - 1.50m						
					1.60		
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Gravel is angular of sandstone.	1.70		
				End of Trial Pit at 1.70 m			

Remarks and Water Observations

1. Trial pit terminated at 1.70m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP4

TRIAL PIT RECORD

TP No. **TP5**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
J	0.20m						
				Redish brown slightly gravelly fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.40		
J	0.70m			... From 0.80m becoming clayey.			
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.00		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Gravel is angular of sandstone.	1.75		
				End of Trial Pit at 1.80 m	1.80		

Remarks and Water Observations

1. Trial pit terminated at 1.80m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP5

TRIAL PIT RECORD

TP No. **TP6**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
J	0.20m				0.30		
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.			
J	0.60m						
D	0.80m						
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.00		
B	1.20m - 1.50m						
				... From 2.20m occasional clayey pockets.			
D	2.60m						
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of	2.80		
				Continued next sheet	2.90		

Remarks and Water Observations

1. Trial pit terminated at 2.90m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP6

TRIAL PIT RECORD

TP No. **TP6**
Sheet 1+ of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				sandstone.				
				End of Trial Pit at 2.90 m				

Remarks and Water Observations

1. Trial pit terminated at 2.90m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP6

TRIAL PIT RECORD

TP No. **TP7**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
J	0.20m							
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.25			
				... From 0.60m increasing gravel content.				
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.00			
				End of Trial Pit at 1.05 m	1.05			

Remarks and Water Observations

1. Trial pit terminated at 1.05m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP7

TRIAL PIT RECORD

TP No. **TP8**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
J	0.20m						
				Redish brown slightly gravelly clayey fine to course SAND with occasional roots and rootlets. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.30		
J	0.40m						
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.10		
				End of Trial Pit at 1.20 m	1.20		

Remarks and Water Observations

1. Trial pit terminated at 1.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP8

TRIAL PIT RECORD

TP No. **TP9**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
J	0.20m							
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30			
				Yellowish brown clayey gravelly fine to coarse SAND. Low cobble content of angular sandstone. Gravel is angular of sandstone.	0.50			
J	0.60m							
				Stiff high strength orangish brown mottled grey slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of sandstone.	0.90			
		81.0						
D	1.30m							
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.50			
					1.60			
				End of Trial Pit at 1.60 m				

Remarks and Water Observations

1. Trial pit terminated at 1.60m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP9

TRIAL PIT RECORD

TP No. **TP10**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
J	0.60m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone with rare coal fragments.	0.50		
		55.0		Firm medium strength orangish brown mottled grey slightly gravelly sandy CLAY with occasional pockets of sand. Low plasticity (field description). Gravel is angular to sub-angular of sandstone.	0.70		
D	1.20m						
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.60		
				End of Trial Pit at 1.70 m	1.70		

Remarks and Water Observations

1. Trial pit terminated at 1.70m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP10

TRIAL PIT RECORD

TP No. **TP11**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
J	0.30m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.25			
B	0.70m - 0.90m							
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.00			
				End of Trial Pit at 1.10 m	1.10			

Remarks and Water Observations

1. Trial pit terminated at 1.10m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP11

TRIAL PIT RECORD

TP No. **TP12**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
					0.25		
J	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare coal fragments.			
					0.45		
				Yellowish brown clayey gravelly fine to coarse SAND with occasional clayey pockets. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
					1.30		
				Very weak light yellowish brown orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Gravel is angular of sandstone.	1.40		
				End of Trial Pit at 1.40 m			

Remarks and Water Observations

1. Trial pit terminated at 1.40m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP12

TRIAL PIT RECORD

TP No. **TP13**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
J	0.50m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.60		
				... From 0.80m becoming very gravelly.			
B	1.50m - 1.60m						
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.75		
				End of Trial Pit at 1.85 m	1.85		

Remarks and Water Observations

1. Trial pit terminated at 1.85m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP13

TRIAL PIT RECORD

TP No. **TP14**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
B	0.20m - 0.40m				0.20		
J	0.30m			MADE GROUND: Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare pottery fragments.			
					0.40		
J	0.50m			Firm medium to high strength orangish brown mottled grey slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.			
D	0.90m	75.0					
					1.40		
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
				... From 1.80m becoming clayey.			
D	1.90m						
					1.95		
D	2.00m			Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Gravel is angular of sandstone.	2.00		
				End of Trial Pit at 2.00 m			

Remarks and Water Observations

1. Trial pit terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP14

TRIAL PIT RECORD

TP No. **TP15**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX 180 hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.30		
J D	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare coal fragments.			
					0.50		
D	0.70m			Friable orangish brown mottled grey slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.			
					0.80		
D	1.50m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
					1.90		
D	2.00m			Very stiff grey mottled orange gravelly very sandy CLAY. Intermediate plasticity (field description). Gravel is angular to sub-angular of sandstone.			
					2.20		
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	2.22		
				End of Trial Pit at 2.22 m			

Remarks and Water Observations

1. Trial pit terminated at 2.22m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP15

TRIAL PIT RECORD

TP No. **TP16**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/08/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25		
J	0.40m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.20 1.25		
				End of Trial Pit at 1.25 m			

Remarks and Water Observations

1. Trial pit terminated at 1.25m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP16

TRIAL PIT RECORD

TP No. **TP17**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS Type	Depth From - To(m)	Vane Results kN/m²	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.22		
J B	0.60m 0.60m - 0.70m			Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone. ... Between 0.70m and 1.20m becoming clayey.	0.50		
D	1.10m						
				Yellowish brown gravelly SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.40		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.90		
				End of Trial Pit at 2.00 m	2.00		

Remarks and Water Observations

1. Trial pit terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP17

TRIAL PIT RECORD

TP No. **TP18**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25		
J	0.40m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.35		
B	0.60m - 0.80m						
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.00		
				End of Trial Pit at 1.05 m	1.05		

Remarks and Water Observations

1. Trial pit terminated at 1.05m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP18

TRIAL PIT RECORD

TP No. **TP19**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.25		
J	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.			
D	0.75m			... From 0.70m becoming very clayey.			
					0.80		
		44.0		Firm medium strength yellowish brown gravelly very sandy CLAY. Low content of angular cobbles of sandstone. Low plasticity (field description). Gravel is angular of sandstone.			
D	1.20m						
					1.40		
				Very weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Gravel is angular of sandstone.	1.50		
				End of Trial Pit at 1.50 m			

Remarks and Water Observations

1. Trial pit terminated at 1.50m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP19

TRIAL PIT RECORD

TP No. **TP20**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
J	0.20m							
J	0.30m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25			
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.40			
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.10			
				End of Trial Pit at 1.20 m	1.20			

Remarks and Water Observations

1. Trial pit terminated at 1.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP20

TRIAL PIT RECORD

TP No. **TP21**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
J	0.45m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.40		
B	0.90m - 1.10m			... Between 1.20m and 1.50m rare pockets of clay.			
B	1.40m - 1.60m			... From 1.50m increased gravel content.			
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.95		
				End of Trial Pit at 2.00 m	2.00		

Remarks and Water Observations

1. Trial pit terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP21

TRIAL PIT RECORD

TP No. **TP22**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS Type	Depth From - To(m)	Vane Results kN/m²	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.20m			MADE GROUND: Grassed TOPSOIL comprising friable light brown sandy SILT with roots and rootlets.			
					0.40		
J	0.50m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.			
B	0.50m - 0.60m				0.60		
				Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
B	1.30m - 1.50m			... From 1.30m becoming very gravelly with increased cobble content			
					1.90		
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	2.00		
				End of Trial Pit at 2.00 m			

Remarks and Water Observations

1. Trial pit terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP22

TRIAL PIT RECORD

TP No. **TP23**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
J	0.10m			MADE GROUND: Grassed TOPSOIL comprising friable light brown sandy SILT with roots and rootlets.				
					0.20			
J	0.30m			Brownish yellow slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with some iron staining. Low content of sub-angular cobbles of sandstone.				
B	0.40m - 0.50m							
					0.60			
				Stiff high strength orangish brown mottled grey slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.				
D	1.00m	130.0						
					1.70			
				Friable brown/grey gravelly sandy CLAY. Low plasticity (field description). Low content of angular cobbles of sandstone. Gravel is angular to sub-angular of siltstone and sandstone.				
D	2.00m							
					2.20			
				Brownish grey extremely weak thinly bedded weathered fine to coarse SANDSTONE interbedded with siltstone. Recovered as sandy clayey GRAVEL of angular sandstone and siltstone.	2.30			
				End of Trial Pit at 2.30 m				

Remarks and Water Observations

1. Trial pit terminated at 2.30m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP23

TRIAL PIT RECORD

TP No. **TP24**
Sheet 1 of 2

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J B	0.10m 0.10m - 0.20m			MADE GROUND: Grassed TOPSOIL comprising friable light brown sandy SILT with roots and rootlets.			
					0.25		
J	0.30m			Brownish yellow slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with some iron staining. Low content of sub-angular cobbles of sandstone.			
B	0.40m - 0.50m						
					0.70		
				Friable orangish brown mottled grey slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.			
D	1.30m						
					2.20		
				Friable brown/grey gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone.			
D	2.50m						
					2.90		
				Continued next sheet			

Remarks and Water Observations

1. Trial pit terminated at 3.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP24

TRIAL PIT RECORD

TP No. **TP24**
Sheet 2 of 2

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
B	3.00m - 3.20m			Extremely weak brownish grey weathered fine to coarse grained SANDSTONE interbedded with siltstone. Recovered as sandy clayey GRAVEL of angular sandstone and siltstone.				
				End of Trial Pit at 3.20 m	3.20			

Remarks and Water Observations

1. Trial pit terminated at 3.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP24

TRIAL PIT RECORD

TP No. **TP25**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
					0.40			
J	0.50m			Friable brownish yellow slightly gravelly very sandy CLAY. Low plasticity (field description). Gravel is angular to subangular of siltstone and sandstone.				
D	0.60m							
					0.80			
		101.0		Very stiff high strength orangish brown mottled grey slightly gravelly sandy CLAY. Intermediate plasticity. Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.				
D	1.20m							
					2.00			
				Friable brown/grey gravelly sandy CLAY. Low plasticity (field description). Gravel is fine angular to sub-angular of siltstone and sandstone.				
D	2.20m							
					2.35			
				Extremely weak brownish grey weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular sandstone.	2.40			
				End of Trial Pit at 2.40 m				

Remarks and Water Observations

1. Trial pit terminated at 2.40m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP25

TRIAL PIT RECORD

TP No. **TP26**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
J	0.30m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25		
B	0.50m - 0.70m						
B	1.40m - 1.60m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.90		
				... From 1.60m increased gravel content.			
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	2.25 2.30		
				End of Trial Pit at 2.30 m			

Remarks and Water Observations

1. Trial pit terminated at 2.30m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP26

TRIAL PIT RECORD

TP No. **TP27**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS Type	Depth From - To(m)	Vane Results kN/m²	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
J	0.20m						
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
				Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50		
J	0.60m						
B	0.60m - 0.80m						
				... From 1.20m increased gravel content.			
B	1.50m - 1.70m						
				Very weak brownish grey weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.75		
				End of Trial Pit at 1.80 m	1.80		

Remarks and Water Observations

1. Trial pit terminated at 1.80m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP27

TRIAL PIT RECORD

TP No. **TP28**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
J	0.20m						
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25		
					0.35		
				Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
B	0.80m - 1.00m						
					1.40		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.45		
				End of Trial Pit at 1.45 m			

Remarks and Water Observations

1. Trial pit terminated at 1.45m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP28

TRIAL PIT RECORD

TP No. **TP29**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25		
J	0.40m			Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.35		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.10		
				End of Trial Pit at 1.20 m	1.20		

Remarks and Water Observations

1. Trial pit terminated at 1.20m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP29

TRIAL PIT RECORD

TP No. **TP30**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 18/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
B	0.30m - 0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare coal fragments.	0.25		
J	0.40m			Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.50		
				End of Trial Pit at 1.60 m	1.60		

Remarks and Water Observations

1. Trial pit terminated at 1.60m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP30

TRIAL PIT RECORD

TP No. **TP31**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
J	0.20m						
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
				Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50		
J	0.60m						
B	1.55m - 1.60m			Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.55		
					1.60		
				End of Trial Pit at 1.60 m			

Remarks and Water Observations

1. Trial pit terminated at 1.60m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP31

TRIAL PIT RECORD

TP No. **TP32**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 16/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.30		
J	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.			
					0.70		
B	0.90m - 1.10m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
				... From 1.10m becoming very gravelly with increased cobble content.			
					1.60		
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.65		
				End of Trial Pit at 1.65 m			

Remarks and Water Observations

1. Trial pit terminated at 1.65m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP32

TRIAL PIT RECORD

TP No. **TP33**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25			
J	0.70m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles and boulders of sandstone. Gravel is angular of sandstone.	0.80			
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.00			
				End of Trial Pit at 1.05 m	1.05			

Remarks and Water Observations

1. Trial pit terminated at 1.05m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP33

TRIAL PIT RECORD

TP No. **TP34**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 17/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: Grassed TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.20		
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.			
J	0.60m						
					0.70		
				Friable orangish brown slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone.			
D	1.30m						
					1.40		
				Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
					1.60		
				Very weak orangish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.65		
				End of Trial Pit at 1.65 m			

Remarks and Water Observations

1. Trial pit terminated at 1.65m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP34

TRIAL PIT RECORD

TP No. **TP35**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.25		
J	0.30m			Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
B	0.40m - 0.60m				0.40		
				Yellowish brown fine to coarse SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.			
					1.55		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	1.60		
				End of Trial Pit at 1.60 m			

Remarks and Water Observations

1. Trial pit terminated at 1.60m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP35

TRIAL PIT RECORD

TP No. **TP36**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
					0.30		
J	0.40m			Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
					0.80		
				Very weak light yellowish brown mottled orange weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	0.90		
				End of Trial Pit at 0.90 m			

Remarks and Water Observations

1. Trial pit terminated at 0.90m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP36

TRIAL PIT RECORD

TP No. **TP37**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothless bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30		
D	1.00m	53.0		Firm medium strength blueish grey mottled brown slightly gravelly sandy CLAY. Low plasticity (field description). Gravel is angular to sub-angular of siltstone and sandstone with occasional iron staining.	0.75		
				Extremely weak brown orange weathered fine to coarse grained SANDSTONE interbedded with siltstone. Recovered as sandy GRAVEL of angular sandstone and siltstone.	1.75		
				End of Trial Pit at 1.80 m	1.80		

Remarks and Water Observations

1. Trial pit terminated at 1.80m due to bedrock.
2. Groundwater not encountered.
3. Reported hand vanes are an average of a set of three.
4. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TP37

TRIAL PIT RECORD

TP No. **TT1**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25	43.64		
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.55	43.34		
				Yellowish brown fine to coarse SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.40	42.49		
				Weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of anuglar sandstone. Low content of angular boulders of sandstone (upto 500mm width). Gravel is angular of sandstone.	2.00	41.89		
				End of Trial Pit at 2.10 m	2.10	41.79		

Remarks and Water Observations

1. Trial trench terminated at 2.10m due to bedrock.
2. Groundwater not encountered.
3. Trial trench backfilled with arisings upon completion.

GL (m AOD) 43.89
Easting: 438472.61
Northing: 408090.66

Fig. No. TT1

TRIAL PIT RECORD

TP No. **TT2**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.40			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.60			
				Yellowish brown fine to coarse SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.60			
				Continued next sheet	2.90			

Remarks and Water Observations

1. Trial pit terminated at 3.00m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT2

TRIAL PIT RECORD

TP No. **TT2**
Sheet 1+ of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				Very weak light yellowish brown mottled orange weathered fine to coarse SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	3.00			
				End of Trial Pit at 3.00 m				

Remarks and Water Observations

1. Trial pit terminated at 3.00m due to bedrock.
2. Groundwater not encountered.
3. Trial pit backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT2

TRIAL PIT RECORD

TP No. **TT3**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 19/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Yellowish brown slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.25			
				Yellowish brown SAND and GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.60			
				Very weak light grey weathered fine to coarse SANDSTONE recovered as slightly clayey sandy COBBLES of angular sandstone with occasional gravel. Gravel is angular of sandstone.	1.00			
				... Between 1.70m and 1.75m band of thinly bedded brown fine grained SANDSTONE recovered as sandy GRAVEL of sandstone with orange/brown iron staining.	1.80			
				End of Trial Pit at 1.80 m				

Remarks and Water Observations

1. Trial trench terminated at 1.80m due to bedrock.
2. Groundwater not encountered.
3. Trial trench backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT3

TRIAL PIT RECORD

TP No. **TT4**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.50			
				Very weak light yellowish brown weathered fine to coarse SANDSTONE recovered as slightly gravelly COBBLES and BOULDERS of angular sandstone. Gravel is angular of sandstone.	2.00			
				Very weak micaceous orangish brown weathered fine to coarse grained SANDSTONE with occasional coal recovered as slightly sandy angular GRAVEL of sandstone.	2.60			
				End of Trial Pit at 2.80 m	2.80			

Remarks and Water Observations

1. Trial trench terminated at 2.80m due to bedrock.
2. Groundwater not encountered.
3. Trial trench backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT4

TRIAL PIT RECORD

TP No. **TT5**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD			
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.			
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30 0.40		
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.			
				Yellowish brown sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone.	0.90		
				Weak light yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Low content of angular boulders of sandstone (upto 500mm width). Gravel is angular of sandstone.	1.20 1.30		
				End of Trial Pit at 1.30 m			

Remarks and Water Observations

1. Trial trench terminated at 1.30m due to bedrock.
2. Groundwater not encountered.
3. Trial trench backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT5

TRIAL PIT RECORD

TP No. **TT6**
Sheet 1 of 1

Site : Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client : Barratt & David Wilson Homes

Dates: 22/09/2014

Method : JCB 3CX back hoe excavator with 600mm wide toothed bucket

Scale 1:15

Logged By: GB

Checked By: JL

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	Vane Results kN/m²		Description	Depth (m)	Level (mAOD) PID (ppm)	Legend	
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets.				
				Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30 0.40			
				Yellowish brown slightly clayey slightly gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.				
				Yellowish brown sandy gravelly COBBLES of angular sandstone. Gravel is angular of sandstone. Between 1.10m and 1.50m bgl the top of the weathered bedrock is noted to be shallower in the west at 1.10m bgl than to the east at 1.50m bgl by c. 0.40m bgl.	1.00			
				Weak light yellowish brown weathered fine to coarse SANDSTONE recovered as slightly sandy gravelly COBBLES of angular sandstone. Low content of angular boulders of sandstone (upto 500mm width). Gravel is angular of sandstone.	1.50 1.55			
				End of Trial Pit at 1.55 m				

Remarks and Water Observations

1. Trial trench terminated at 1.55m due to bedrock.
2. Groundwater not encountered.
3. Trial trench backfilled with arisings upon completion.

GL (m AOD)
-
Easting:
-
Northing:
-

Fig. No.
TT6

WINDOW SAMPLING RECORD

BH No. **WS1**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
				Yellowish brown gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.27	53.86		
J B	0.50m 0.50m - 1.00							
				Yellowish brown sandy GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	0.60	53.53		
		N=17 (5,5,4,4,4,5)		Medium dense yellowish brown gravelly SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.00	53.13		
				Yellowish brown sandy GRAVEL. High content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.60	52.53		
					1.75	52.38		
D	1.90m			Extremely weak brown orange weathered fine to coarse grained SANDSTONE interbedded with siltstone. Recovered as sandy GRAVEL of angular sandstone and siltstone.	2.00	52.13		
		50/245mm (10,13,13,12,18,7)		End of Window Sample at 2.00 m				

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD)
54.13
Easting:
438382.53
Northing:
408225.78

Fig. No.
WS1

WINDOW SAMPLING RECORD

BH No. **WS2**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.20m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
					0.30	42.09		
J	0.40m			MADE GROUND: Reddish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone with rare coal and brick fragments.	0.50	41.89		
		N=14 (5,5,4,4,3,3)		Medium dense yellowish brown gravelly fine to coarse SAND. Low content of subangular cobbles of sandstone. Gravel is fine to coarse angular of sandstone.				
				Between 1.50m and 1.80m becoming clayey.				
D	1.90m							
		N=18 (4,3,4,5,4,5)						
					2.80	39.59		
		50/210mm (8,14,20,14,16)		Very weak yellowish brown weathered fine to coarse grained SANDSTONE recovered as slightly sandy GRAVEL of angular sandstone.	3.00	39.39		
				End of Window Sample at 3.00 m				

Remarks and Water Observations

1. Borehole terminated at 3.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 42.39
Easting: 438415.29
Northing: 408121.05

Fig. No. WS2

WINDOW SAMPLING RECORD

BH No. **WS3**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

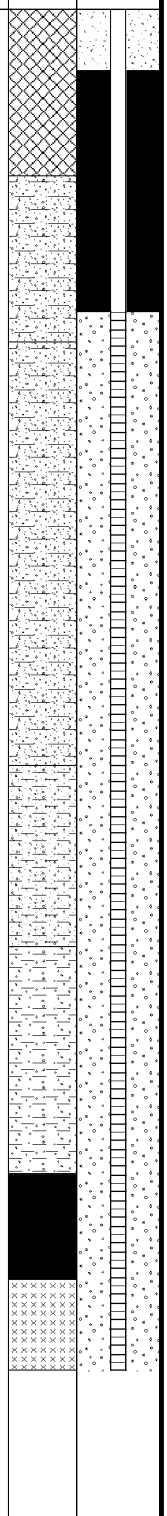
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Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)
J	0.20m			MADE GROUND: TOPSOIL comprising friable light brown sandy SILT with roots and rootlets. Rare coal and brick fragments.		
				Redish brown slightly gravelly clayey SAND with occasional roots and rootlets. Gravel is angular of sandstone. Rare coal fragments.	0.55	36.98
J	1.00m	N=7 (1,1,1,2,2,2)		Loose yellowish brown clayey gravelly SAND with low cobble content of sandstone. Gravel is angular of sandstone.	1.10	36.43
		N=21 (6,6,5,5,6,5)		At 2.00m: Becoming medium dense.		
				Firm brown slightly sandy gravelly CLAY. Low plasticity (field description). Gravel is angular of sandstone and siltstone.	2.50	35.03
D	2.70m					
		N=14 (2,2,2,4,4,4)		From 3.00m rare coal fragments.		
				Firm medium strength light grey gravelly CLAY with rare relic rootlets. Low plasticity (field description). Gravel is fine angular siltstone.	3.10	34.43
D	3.40m					
				From 3.75m becoming stained black.		
				Very weak black COAL recovered as angular gravel.	3.85	33.68
J	4.00m	N=31 (4,3,6,7,1,17)				
				Very weak grey mottled orange thinly bedded SILTSTONE interbedded with fine sandstone. Recovered as slightly sandy GRAVEL of angular siltstone and sandstone.	4.20	33.33
D	4.30m					
D	4.45m - 4.82	50/240mm (13,12,16,24,10)				
				End of Window Sample at 4.50 m	4.50	33.03

Legend / Well



Remarks and Water Observations

1. Borehole terminated at 4.50m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 37.53
Easting: 438467.85
Northing: 408040.44

Fig. No. WS3

WINDOW SAMPLING RECORD

BH No. **WS4**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: TOPSOIL comprising friable light brown sandy SILT with roots and rootlets. Rare coal fragments.				
J	0.30m			Stiff medium strength orange/brown mottled light grey slightly sandy gravelly CLAY. Intermediate plasticity. Gravel is angular to sub-angular of sandstone.	0.26	55.30		
D	0.60m							
		N=15 (2,3,3,3,4,5)		From 1.00m becoming friable.				
				Extremely weak brown very thinly bedded SILTSTONE interbedded with mudstone. Recovered as slightly sandy clayey GRAVEL of angular siltstone and mudstone. Occasional iron stainnig and clayey along bedding fractures.	1.40	54.16		
D	1.80m							
		50/255mm (7,10,12,14,17 ,7)		End of Window Sample at 2.00 m	2.00	53.56		

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 55.56
Easting: 438649.59
Northing: 408367.32

Fig. No. WS4

WINDOW SAMPLING RECORD

BH No. **WS5**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: Grassed TOPSOIL comprising friable light brown sandy SILT with roots and rootlets. Rare coal fragments.	0.15	38.55		
J	0.30m			Stiff friable orange brown gravelly very sandy CLAY with rare cobbles. Low plasticity (field description). Gravel and cobbles are of angular sandstone.				
D	0.40m				0.60	38.10		
D	0.80m			Very stiff brown sandy gravelly CLAY. Low plasticity. Gravel is angular sandstone and siltstone.				
		N=18 (3,4,4,5,5,4)		Stiff high strength orange brown mottled light grey very sandy gravelly CLAY. Low plasticity (field description). Gravel is angular of sandstone and siltstone.	1.00	37.70		
D	1.80m			Extremely weak brown very thinly bedded SILTSTONE interbedded with mudstone. Recovered as slightly sandy clayey GRAVEL of angular siltstone and mudstone with frequent iron staining.	1.60	37.10		
		50/75mm (21,4,50)		End of Window Sample at 2.00 m	2.00	36.70		

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 38.70
Easting: 438834.94
Northing: 408062.75

Fig. No. WS5

WINDOW SAMPLING RECORD

BH No. **WS6**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
					0.24	35.26		
J	0.40m			Stiff friable grey mottled brown very sandy CLAY with roots and rootlets. Low plasticity (field description).				
					0.50	35.00		
D	0.70m			Stiff friable bluish grey grey mottled orangish brown very sandy CLAY. Low plasticity (field description).				
		N=17 (3,4,3,4,5,5)						
					1.10	34.40		
D	1.40m			Very stiff high strength brown slightly gravelly sandy CLAY with rare coal. Low plasticity. Gravel is angular to sub-angular of sandstone, siltstone and mudstone.				
					1.50	34.00		
D	1.90m			Stiff friable brown mottled grey gravelly sandy CLAY with rare black speckling (coal). Low plasticity (field description). Gravel is angular of siltstone and sandstone. From 1.70m becoming very gravelly.				
					1.95	33.55		
		50/105mm (5,12,24,26)		Extremely weak brown orange weathered fine to coarse SANDSTONE interbedded with siltstone. Recovered as sandy GRAVEL of sandstone and siltstone.	2.00	33.50		
				End of Window Sample at 2.00 m				

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 35.50
Easting: 438904.49
Northing: 407994.71

Fig. No. WS6

WINDOW SAMPLING RECORD

BH No. **WS7**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
J	0.30m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.25 0.35	41.75 41.65		
B	0.50m - 1.00			Dense yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.				
		N=35 (3,3,6,9,10,10)						
				Extremely weak orange brown weathered fine to coarse grained SANDSTONE recovered as sandy GRAVEL of angular sandstone .	1.75 1.85	40.25 40.15		
D	1.90m							
		50/40mm (25,50)		Very weak yellowish brown weathered SANDSTONE recovered as slightly sandy GRAVEL of angular sandstone.	2.00	40.00		
				End of Window Sample at 2.00 m				

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Monitoring well installed as detailed above.

GL (mAOD) 42.00
Easting: 438734.04
Northing: 407999.96

Fig. No. WS7

WINDOW SAMPLING RECORD

BH No. **WS8**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.20m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.	0.25	53.63		
J	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone. Rare coal fragments.	0.50	53.38		
		N=34 (5,6,8,9,9,8)		Yellowish brown slightly clayey gravelly fine to coarse SAND. Low content of angular to subangular cobbles of sandstone. Gravel is angular of sandstone.	1.00	52.88		
				Dense yellowish brown gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.	1.70	52.18		
		50/100mm (12,13,20,30)		Very weak orange mottled brown weathered fine to coarse grained SANDSTONE recovered as sandy GRAVEL of angular sandstone.	2.00	51.88		
				End of Window Sample at 2.00 m				

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Borehole backfilled with arisings upon completion.

GL (mAOD) 53.88
Easting: 438608.79
Northing: 408200.95

Fig. No. WS8

WINDOW SAMPLING RECORD

BH No. **WS9**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS			Groundwater	STRATA RECORD				
Type	Depth From - To(m)	(N) Shear vane		Description	Depth (m)	Level (mAOD)	Legend	Well
				MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Gravel is angular of coal.				
J	0.20m							
J	0.35m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone.	0.30	47.43		
					0.40	47.33		
D	0.80m			Yellowish brown clayey gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.				
		50/295mm (6,11,11,14,12 ,13)		Very weak brown orange weathered SANDSTONE recovered as slightly sandy GRAVEL of angular sandstone.	0.95	46.78		
					1.00	46.73		
				End of Window Sample at 1.00 m				

Remarks and Water Observations

1. Borehole terminated at 1.00m due to bedrock.
2. Groundwater not encountered.
3. Borehole backfilled with arisings upon completion.

GL (mAOD) 47.73
Easting: 438668.90
Northing: 408119.82

Fig. No. WS9

WINDOW SAMPLING RECORD

BH No. **WS10**
Sheet 1 of 1

Site: Carrs Lane, Cudworth, Barnsley

Contract No: C6138

Client: Barratt & David Wilson Homes

Dates: 23/09/2014

Method: Tracked window sampler

Scale 1:25

Logged By: GB | Checked By: JL

Driller: RP Drilling

SAMPLE DETAILS Type	Depth From - To(m)	(N) Shear vane	Groundwater	STRATA RECORD Description	Depth (m)	Level (mAOD)	Legend	Well
J	0.10m			MADE GROUND: TOPSOIL comprising friable brown sandy SILT with roots and rootlets. Rare coal fragments.				
					0.30	46.86		
J	0.40m			Redish brown slightly gravelly clayey fine to coarse SAND with occasional roots and rootlets. Gravel is angular of sandstone. Rare coal fragments.	0.50	46.66		
				Medium dense yellowish brown gravelly fine to coarse SAND. Low content of angular cobbles of sandstone. Gravel is angular of sandstone.				
		N=20 (2,3,4,5,5,6)						
				From 1.60m becoming slightly clayey.				
					1.90	45.26		
		50/230mm (5,6,8,10,22,10)		Very weak orange mottled brown weathered fine to coarse grained SANDSTONE recovered as slightly clayey slightly sandy GRAVEL of angular sandstone.	2.00	45.16		
				End of Window Sample at 2.00 m				

Remarks and Water Observations

1. Borehole terminated at 2.00m due to bedrock.
2. Groundwater not encountered.
3. Borehole backfilled with arisings upon completion.

GL (mAOD) 47.16
Easting: 438752.05
Northing: 408238.27

Fig. No. WS10

APPENDIX C

LABORATORY TEST RESULTS

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL14/4935

Client's Reference: Report Date: 07 October 2014

Client Name: Sirius Leeds
4245 Park Approach
Century Way
Thorpe Park
Leeds
LS15 8GB

For the attention of: Jenny Levitt

Contract Title: Carrs Lane Cudworth

Date Received: 1/10/2014
Date Commenced: 1/10/2014
Date Completed: 7/10/2014

Notes: **Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director) | A Watkins (Director) | M Beastall (Laboratory Manager)

D Lambe (Senior Technician) | S Royle (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS4		D	0.60	Brown mottled grey slightly gravelly sandy silty CLAY.
WS5		D	0.80	Brown gravelly very sandy CLAY.
WS6		D	1.40	Brown slightly gravelly very sandy CLAY.
TP15		D	2.00	Brown slightly gravelly sandy CLAY.
TP17		B	0.60-0.80	Brown gravelly clayey silty SAND.
TP27		B	0.60-0.80	Brown very gravelly slightly clayey SAND.
TP25		D	1.20	Brown slightly gravelly sandy silty CLAY.
TP35		B	0.40-0.60	Brown very sandy slightly clayey GRAVEL.

PSL
Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	07/10/14		07/10/14		07/10/14

CARRS LANE, CUDWORTH.

Contract No: PSL14/4935

Client Ref: C61838

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS4		D	0.60	27				45	23	22	94	Intermediate plasticity CI.
WS5		D	0.80	12				28	16	12	82	Low plasticity CL.
WS6		D	1.40	15				29	19	10	95	Low plasticity CL.
TP15		D	2.00	21				40	22	18	94	Intermediate plasticity CI.
TP25		D	1.20	18				37	20	17	93	Intermediate plasticity CI.

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

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Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	07/10/14		07/10/14		07/10/14

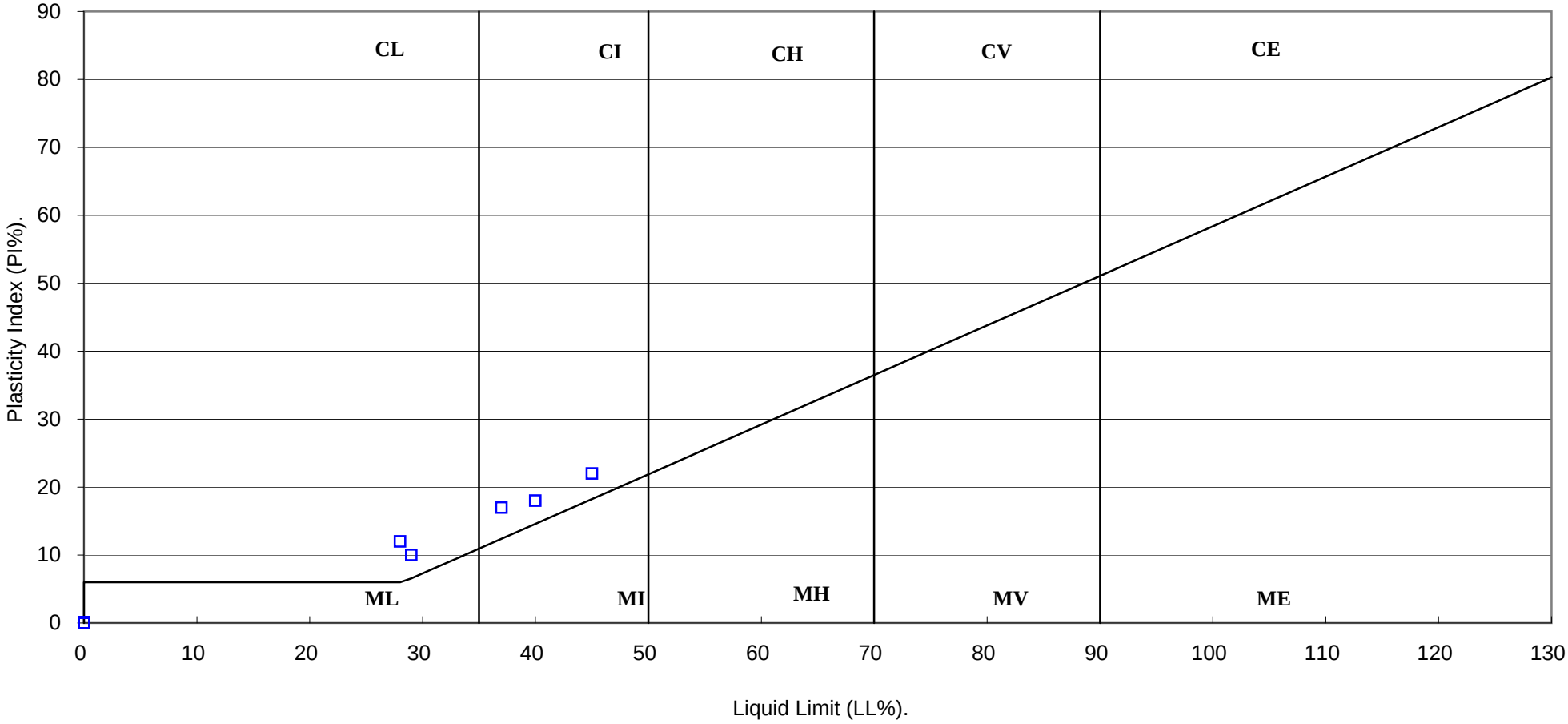
CARRS LANE, CUDWORTH.

Contract No: **PSL14/4935**

Client Ref: **C6138**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



PSL Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		07/10/14		07/10/14		07/10/14
	CARRS LANE, CUDWORTH.				Contract No:	PSL14/4935
					Client Ref:	

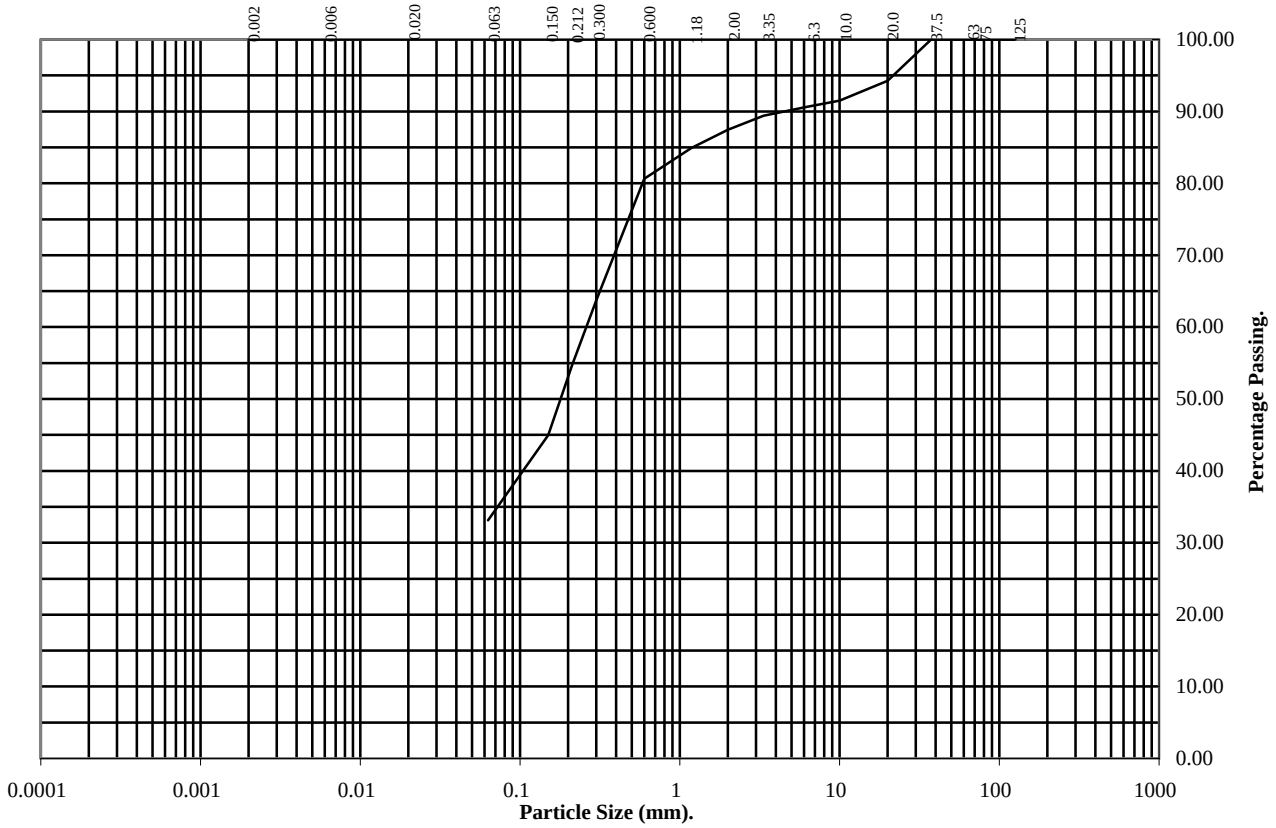
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP17** **Depth (m):** **0.60-0.70**

Sample Number: **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	94
10	91
6.3	91
3.35	89
2	87
1.18	85
0.6	81
0.3	64
0.212	55
0.15	45
0.063	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	13
Sand	54
Silt / Clay	33

Remarks:
See summary of soil descriptions.

Checked By	Date	Approved By	Date
	07/10/14		07/10/14

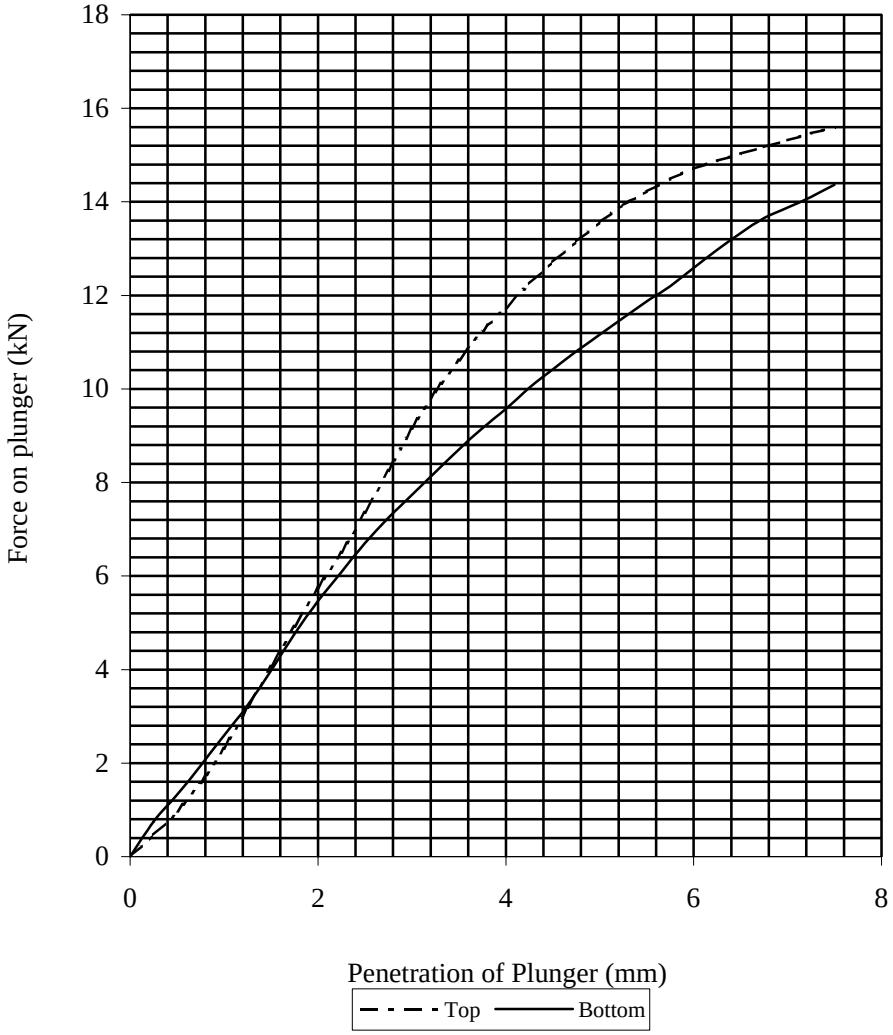
PSL Professional Soils Laboratory	**CARRS LANE, CUDWORTH.**	**Contract No.: PSL14/4935**

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: **TP27** **Depth (m):** **0.60-0.80**

Sample Number: **Sample Type:** **B**



Initial Sample Conditions		Test Conditions		Method of compaction	2.5Kg Rammer		
Moisture Content:	12	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	2.16	Soaking Time hrs	0	Sample Top	12	Sample Top	67.8
Dry Density Mg/m3:	1.94	Swelling mm:	0	Sample Bottom	12	Sample Bottom	55.8
Percentage retained on 20mm BS test sieve:	16	Remarks:	See Summary of Soil Description.				

Checked by	Date	Approved By	Date
M.Smith	07/10/14	M.Smith	07/10/14

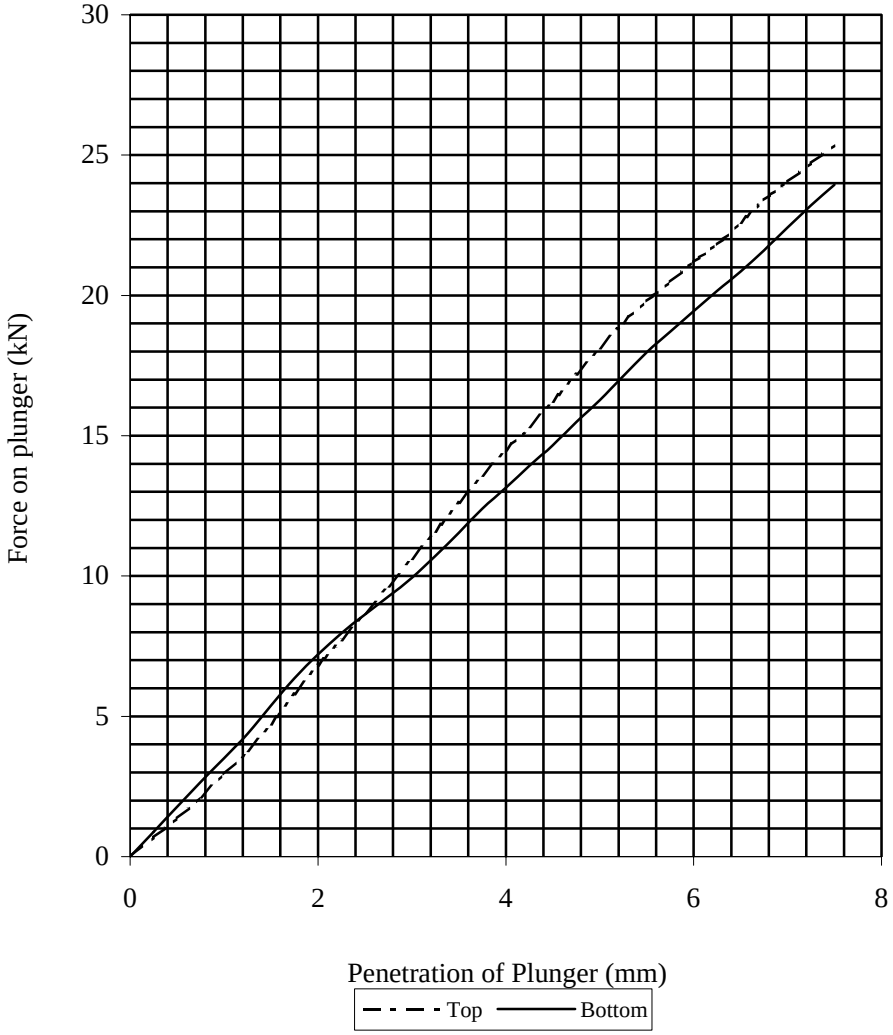
PSL Professional Soils Laboratory	CARRS LANE, CUDWORTH.	Contract No. PSL14/4935

California Bearing Ratio Test.

BS 1377 : Part 4 : 1990

Hole Number: **TP35** **Depth (m):** **0.40-0.60**

Sample Number: **Sample Type:** **B**



Initial Sample Conditions		Test Conditions		Method of compaction	2.5Kg Rammer		
Moisture Content:	11	Surcharge Kg:	4.20	Final Moisture Content %		C.B.R. Value %	
Bulk Density Mg/m3:	2.07	Soaking Time hrs	0	Sample Top	11	Sample Top	90.6
Dry Density Mg/m3:	1.86	Swelling mm:	0	Sample Bottom	11	Sample Bottom	81.3
Percentage retained on 20mm BS test sieve:	57	Remarks:	See Summary of Soil Description.				

Checked by	Date	Approved By	Date
M.Burns	07/10/14	M.Burns	07/10/14

PSL Professional Soils Laboratory	CARRS LANE, CUDWORTH.	Contract No. PSL14/4935

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 14-17161

08-Oct-14

Client Sirius Geotechnical & Environmental
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

Our Reference	14-17161
Client Reference	C6138
Contract Title	Carrs Lane, Cudworth
Description	6 Soil samples.
Date Received	02-Oct-14
Date Started	02-Oct-14
Date Completed	08-Oct-14
Test Procedures	Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

Summary of Chemical Analysis
Matrix Descriptions

Our Ref 14-17161
Client Ref C6138
Contract Title Carrs Lane, Cudworth

Sample ID	Depth	Lab No	Completed	Matrix Description
TP4	0.9	707894	08/10/2014	Brown clayey SAND
WS9	0.8	707895	08/10/2014	Brown gravelly clayey SAND
WS4	1.8	707896	08/10/2014	Brown sandy CLAY
WS7	1.9	707897	08/10/2014	Light brown gravelly SAND
TP23	1	707898	08/10/2014	Brown grey sandy CLAY
TP23	2	707899	08/10/2014	Brown grey gravelly sandy CLAY

Summary of Chemical Analysis
Soil Samples

Our Ref 14-17161
Client Ref C6138
Contract Title Carrs Lane, Cudworth

			Lab No	707894	707895	707896	707897	707898	707899
			Sample ID	TP4	WS9	WS4	WS7	TP23	TP23
			Depth	0.90	0.80	1.80	1.90	1.00	2.00
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	17/09/14	23/09/14	23/09/14	23/09/14	16/09/14	16/09/14
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Inorganics									
pH	DETSC 2008#			7.6	7.6	6.6	7.4	5.2	5.7
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	18	13	32	< 10	29	25

Key: # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 14-17161
Client Ref C6138
Contract Carrs Lane, Cudworth

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
707894	TP4 0.90 SOIL	17/09/14	PT 1L	pH (7 days)	
707895	WS9 0.80 SOIL	23/09/14	PT 1L	pH (7 days)	
707896	WS4 1.80 SOIL	23/09/14	PT 1L	pH (7 days)	
707897	WS7 1.90 SOIL	23/09/14	PT 1L	pH (7 days)	
707898	TP23 1.00 SOIL	16/09/14	PT 1L	pH (7 days)	
707899	TP23 2.00 SOIL	16/09/14	PT 1L	pH (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

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

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 14-16985-1

13-Oct-14

Client Sirius Geotechnical & Environmental
4245 Park Approach
Thorpe Park
Leeds
LS15 8GB

Our Reference	14-16985-1
Client Reference	C6138
Contract Title	Cudworth
Description	7 Soil samples, 3 Leachate samples.
Date Received	30-Sep-14
Date Started	30-Sep-14
Date Completed	06-Oct-14
Test Procedures	Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

Notes **This report supersedes 14-16985, Extra Testing**

Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By



Rob Brown
Business Manager

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UKAS TESTING
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Summary of Chemical Analysis
Matrix Descriptions

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

Sample ID	Other ID	Depth	Lab No	Completed	Matrix Description
WS2	ES	0.4	707082	06/10/2014	Brown gravelly clayey SAND
WS5	ES	0.1	707083	06/10/2014	Dark brown gravelly clayey SAND with numerous rootlets
WS10	ES	0.1	707084	06/10/2014	Dark brown gravelly sandy CLAY with odd rootlets
TP2		0.1	707085	06/10/2014	Dark brown gravelly clayey SAND
TP14		0.3	707086	06/10/2014	Brown gravelly clayey SAND with odd rootlets
TP17		0.1	707087	06/10/2014	Dark brown gravelly clayey SAND
TP25		0.3	707088	06/10/2014	Brown gravelly clayey SAND with numerous rootlets

Summary of Chemical Analysis
Soil Samples

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

			Lab No	707082	707083	707084	707085	707086	707087	707088
			Sample ID	WS2	WS5	WS10	TP2	TP14	TP17	TP25
			Depth	0.40	0.10	0.10	0.10	0.30	0.10	0.30
			Other ID	ES	ES	ES				
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/09/14	23/09/14	23/09/14	19/09/14	18/09/14	18/09/14	18/09/14
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	8.4	24	28	17	14	19	
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.9	0.8	0.6	0.6	0.6	
Chromium	DETSC 2301#	0.15	mg/kg	17	32	24	20	25	21	
Copper	DETSC 2301#	0.2	mg/kg	21	42	55	32	30	42	
Lead	DETSC 2301#	0.3	mg/kg	22	76	70	50	54	54	
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.13	0.21	0.09	0.08	0.29	
Nickel	DETSC 2301#	1	mg/kg	16	24	25	18	21	19	
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	0.7	< 0.5	
Zinc	DETSC 2301#	1	mg/kg	44	100	110	69	110	89	
Inorganics										
pH	DETSC 2008#			7.2	6.5	6.8	6.5	6.5	6.7	
Calorific Value	DETSC 5008	1	MJ/kg	< 1.0		1.3				< 1.0
Total Organic Carbon	DETSC 2002	0.1	%	0.7	3.6	2.7	1.5	1.4	2.2	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	25	19	13	< 10	16	10	
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.03	0.13	0.06	0.06	0.05	0.06	
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5					
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2					
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5					
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4					
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10					
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01					
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9					
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5					
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6					
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4					
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10					
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10					

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

			Lab No	707082	707083	707084	707085	707086	707087	707088
			Sample ID	WS2	WS5	WS10	TP2	TP14	TP17	TP25
			Depth	0.40	0.10	0.10	0.10	0.30	0.10	0.30
			Other ID	ES	ES	ES				
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/09/14	23/09/14	23/09/14	19/09/14	18/09/14	18/09/14	18/09/14
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
PAHs										
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	0.2	< 0.1	< 0.1	< 0.1	
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	0.6	< 0.1	< 0.1	< 0.1	
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	0.3	< 0.1	< 0.1	< 0.1	
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	1.6	0.3	< 0.1	< 0.1	
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	1.5	0.3	< 0.1	< 0.1	
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.9	< 0.1	< 0.1	< 0.1	
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	1.0	< 0.1	< 0.1	< 0.1	
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.9	< 0.1	< 0.1	< 0.1	
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.5	< 0.1	< 0.1	< 0.1	
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.9	< 0.1	< 0.1	< 0.1	
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
PAH	DETSC 3301	1.6	mg/kg	< 1.6	1.8	8.5	< 1.6	< 1.6	< 1.6	
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.8	0.5	0.5	0.4	0.7	
OCPs										
alpha-BHC	DETSC 3441*	0.1	mg/kg				< 0.1			
gamma-BHC (Lindane)	DETSC 3441*	0.1	mg/kg				< 0.1			
beta-BHC	DETSC 3441*	0.1	mg/kg				< 0.1			
delta-BHC	DETSC 3441*	0.1	mg/kg				< 0.1			
Heptachlor	DETSC 3441*	0.1	mg/kg				< 0.1			
Aldrin	DETSC 3441*	0.1	mg/kg				< 0.1			
Heptachlor epoxide	DETSC 3441*	0.1	mg/kg				< 0.1			
gamma-Chlordane	DETSC 3441*	0.1	mg/kg				< 0.1			
Endosulphan I & Alpha-chlorodane	DETSC 3441*	0.1	mg/kg				< 0.1			
4,4-DDE	DETSC 3441*	0.1	mg/kg				< 0.1			
Dieldrin	DETSC 3441*	0.1	mg/kg				< 0.1			
Endrin	DETSC 3441*	0.1	mg/kg				< 0.1			
Endosulphan II & 4,4-DDD	DETSC 3441*	0.1	mg/kg				< 0.1			
Endrin aldehyde	DETSC 3441*	0.1	mg/kg				< 0.1			
4,4-DDT	DETSC 3441*	0.1	mg/kg				< 0.1			
Endosulphan sulphate	DETSC 3441*	0.1	mg/kg				< 0.1			
Methoxychlor	DETSC 3441*	0.1	mg/kg				< 0.1			
Endrin ketone	DETSC 3441*	0.1	mg/kg				< 0.1			

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

Lab No	707082	707083	707084	707085	707086	707087	707088
Sample ID	WS2	WS5	WS10	TP2	TP14	TP17	TP25
Depth	0.40	0.10	0.10	0.10	0.30	0.10	0.30
Other ID	ES	ES	ES				
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	23/09/14	23/09/14	23/09/14	19/09/14	18/09/14	18/09/14	18/09/14
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	**Method**	**LOD**	**Units**							
OPPs										
Dichlorvos	DETSC 3443*	0.1	mg/kg				< 0.1			
Mevinphos	DETSC 3443*	0.1	mg/kg				< 0.1			
Demeton-O	DETSC 3443*	0.1	mg/kg				< 0.1			
Ethoprop	DETSC 3443*	0.1	mg/kg				< 0.1			
Naled	DETSC 3443*	0.1	mg/kg				< 0.1			
Phorate	DETSC 3443*	0.1	mg/kg				< 0.1			
Demeton-S	DETSC 3443*	0.1	mg/kg				< 0.1			
Diazinon	DETSC 3443*	0.1	mg/kg				< 0.1			
Disulfoton	DETSC 3443*	0.1	mg/kg				< 0.1			
Methylparathion	DETSC 3443*	0.1	mg/kg				< 0.1			
Ronnel	DETSC 3443*	0.1	mg/kg				< 0.1			
Fenthion	DETSC 3443*	0.1	mg/kg				< 0.1			
Chlopyrifos	DETSC 3443*	0.1	mg/kg				< 0.1			
Trichlorinate	DETSC 3443*	0.1	mg/kg				< 0.1			
Merphos	DETSC 3443*	0.1	mg/kg				< 0.1			
Stirofos	DETSC 3443*	0.1	mg/kg				< 0.1			
Tokuthion	DETSC 3443*	0.1	mg/kg				< 0.1			
Fensulfothion	DETSC 3443*	0.1	mg/kg				< 0.1			
Bolstar	DETSC 3443*	0.1	mg/kg				< 0.1			
Azinphos methyl	DETSC 3443*	0.1	mg/kg				< 0.1			
Coumaphos	DETSC 3443*	0.1	mg/kg				< 0.1			

Key: * -not accredited. # -MCERTS (accreditation only implied if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

			Lab No	710585	710586	710587
			Sample ID	WS2	WS5	WS10
			Depth	0.40	0.10	0.10
			Other ID			
			Sample Type	LEACHATE	LEACHATE	LEACHATE
			Sampling Date	23/09/14	23/09/14	23/09/14
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Preparation						
BS EN 12457 10:1	DETS 036*			Y	Y	Y
Metals						
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.4	1.1	2.2
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.7	3.0	2.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.56	1.1	0.45
Mercury, Dissolved	DETSC 2306	0.01	ug/l	< 0.01	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.6	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25	< 0.25
Zinc, Dissolved	DETSC 2306	1.25	ug/l	2.80	3.78	1.93
Inorganics						
pH	DETSC 2008			8.2	8.2	8.0
PAHs						
Naphthalene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Acenaphthylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Acenaphthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Fluorene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Phenanthrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.02
Pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.01
Benzo(a)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Chrysene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.02
Benzo(k)fluoranthene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.01
Benzo(a)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	0.01
Benzo(g,h,i)perylene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETS 074*	0.01	ug/l	< 0.01	< 0.01	< 0.01
PAH	DETS 074*	0.2	ug/l	< 0.20	< 0.20	< 0.20
Phenols						
Phenol	*	0.5	ug/l	< 0.50	< 0.50	< 0.50

Key: * -not accredited. n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 14-16985-1
Client Ref C6138
Contract Title Cudworth

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
707082	WS2 ES 0.40	SOIL	NAD	none	Colin Patrick
707084	WS10 ES 0.10	SOIL	NAD	none	Colin Patrick
707086	TP14 0.30	SOIL	NAD	none	Colin Patrick

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 14-16985-1
Client Ref C6138
Contract Cudworth

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
707082	WS2 0.40 SOIL	23/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707083	WS5 0.10 SOIL	23/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707084	WS10 0.10 SOIL	23/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707085	TP2 0.10 SOIL	19/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707086	TP14 0.30 SOIL	18/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707087	TP17 0.10 SOIL	18/09/14	GJ 1L, GJ 60ml	pH (7 days)	
707088	TP25 0.30 SOIL	18/09/14	GJ 1L, GJ 60ml		
710585	WS2 0.40 LEACHATE	23/09/14	GJ 1L (1L)		
710586	WS5 0.10 LEACHATE	23/09/14	GJ 1L (1L)		
710587	WS10 0.10 LEACHATE	23/09/14	GJ 1L (1L)		

Key: G-Glass J-Jar

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

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

APPENDIX D

SOAKAWAY RESULTS

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA1 - 1

CALCULATION OF SOIL INFILTRATION RATE

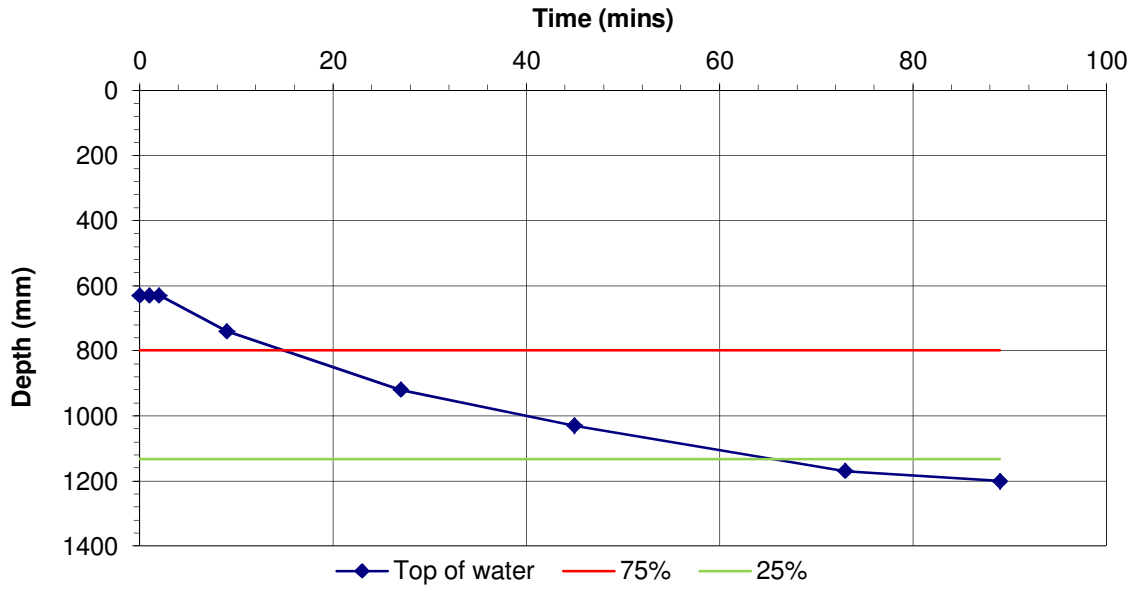
Time (min)	Depth (mm)
0	630
1	630
2	630
9	740
27	920
45	1030
73	1170
89	1200

Size of Soakaway		
	Length (m) =	3.00
	Width (m) =	0.80
	Depth (m) =	1.30

Depth at start of test (mm)=	630mm
Depth of trial pit (mm)=	1300mm
75% effective depth (mm)=	798mm
50% effective depth =	965mm
25% effective depth =	1133mm
Base area of pit (m^2) =	2.400
Effective area of loss 50% (m^2) =	4.946
Volume outflow 75 - 25% (m^3) =	0.804

From the graph:	
tp 75 (min) =	15
tp 25 (min) =	66

Soil infiltration rate, f, (m/s) =	5.31E-05	Normal test
Input by:	GB	Date: 3.10.2014
Checked by:	JL	Date: 7.10.2014



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA1 - 2

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)
0	700
1	700
4	720
15	780
26	860
32	890
37	920
42	950
47	1000
54	1075

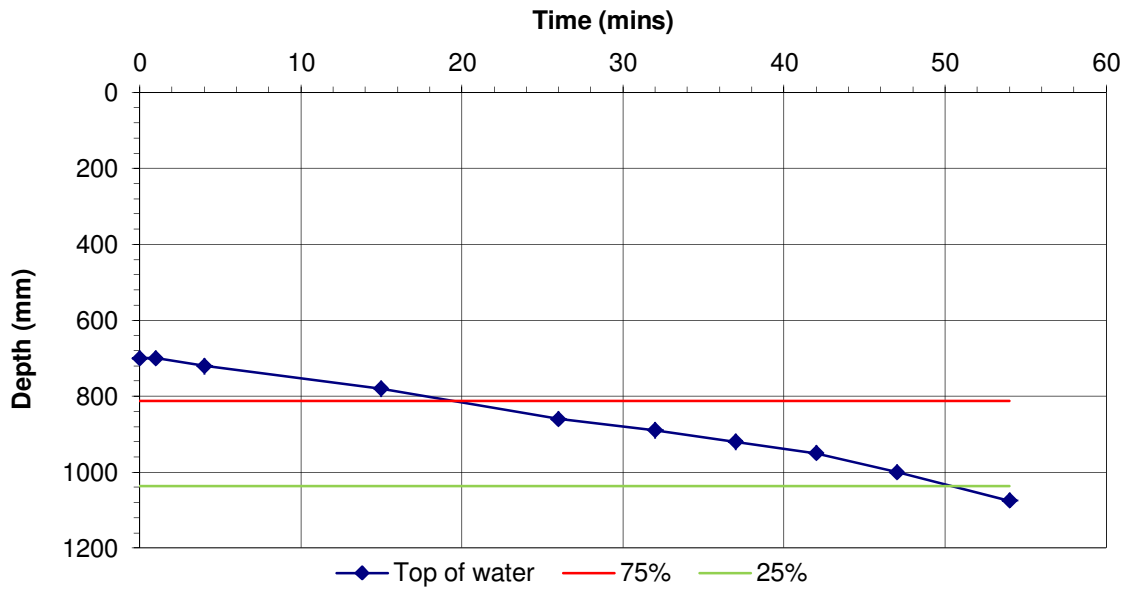
Size of Soakaway		
	Length (m) =	3.00
	Width (m) =	0.80
	Depth (m) =	1.15

Depth at start of test (mm)=	700mm
Depth of trial pit (mm)=	1150mm
75% effective depth (mm)=	813mm
50% effective depth =	925mm
25% effective depth =	1038mm
Base area of pit (m^2) =	2.400
Effective area of loss 50% (m^2) =	4.110
Volume outflow 75 - 25% (m^3) =	0.540

From the graph:	
tp 75 (min) =	20
tp 25 (min) =	50.5

Soil infiltration rate, f, (m/s) =	7.18E-05	Normal test

Input by:	GB	Date:	3.10.2014
Checked by:	JL	Date:	7.10.2014



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA2 - 1

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)
0	700
1	750
2	780
3	800
4	820
5	840
10	950
20	1100
25	1120
36	1190
43	1250
47	1260

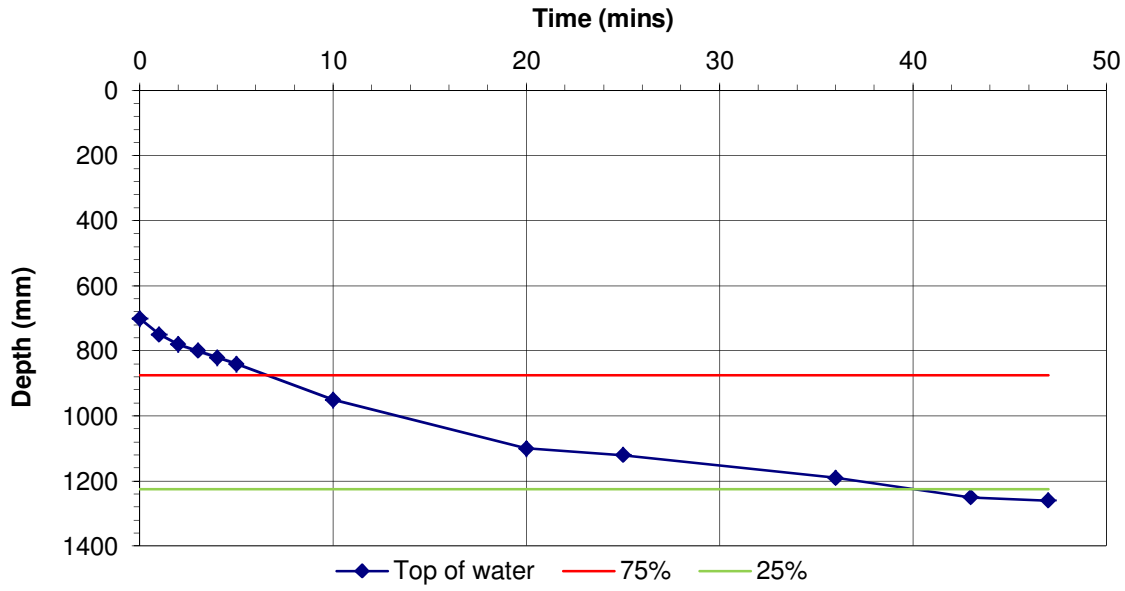
Size of Soakaway		
	Length (m) =	3.10
	Width (m) =	0.70
	Depth (m) =	1.40

Depth at start of test (mm)=	700mm
Depth of trial pit (mm)=	1400mm
75% effective depth (mm)=	875mm
50% effective depth =	1050mm
25% effective depth =	1225mm
Base area of pit (m^2) =	2.170
Effective area of loss 50% (m^2) =	4.830
Volume outflow 75 - 25% (m^3) =	0.760

From the graph:	
tp 75 (min) =	6.5
tp 25 (min) =	40

Soil infiltration rate, f, (m/s) =	7.82E-05	Normal test

Input by:	GB	Date:	3.10.2014
Checked by:	JL	Date:	7.10.2014



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007

Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA2 - 2

CALCULATION OF SOIL INFILTRATION RATE

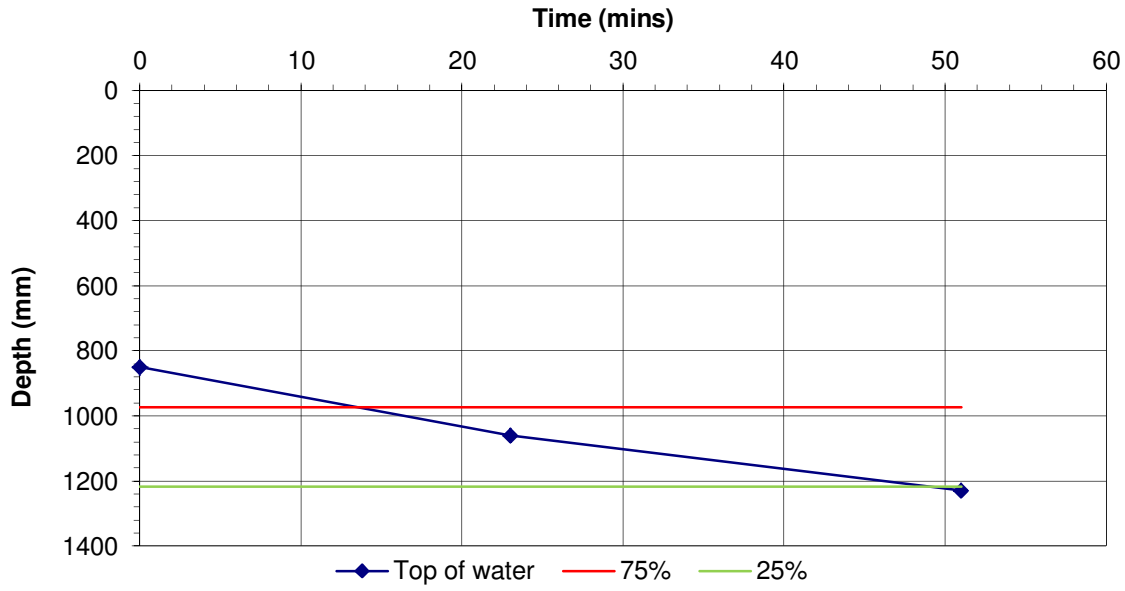
Time (min)	Depth (mm)
0	850
23	1060
51	1230

Size of Soakaway		
	Length (m) =	3.10
	Width (m) =	0.70
	Depth (m) =	1.34

Depth at start of test (mm)=	850mm
Depth of trial pit (mm)=	1340mm
75% effective depth (mm)=	973mm
50% effective depth =	1095mm
25% effective depth =	1218mm
Base area of pit (m^2) =	2.170
Effective area of loss 50% (m^2) =	4.032
Volume outflow 75 - 25% (m^3) =	0.532

From the graph:	
tp 75 (min) =	13.5
tp 25 (min) =	49

Soil infiltration rate, f, (m/s) =		6.19E-05	Normal test
Input by:	GB	Date:	3.10.2014
Checked by:	JL	Date:	7.10.2014



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007

Client:	**Barratt & David Wilson Homes**		
Site:	**Carrs Lane, Cudworth**		
Job No:	**C6138**	**Test No:**	**SA3 - 1**

CALCULATION OF SOIL INFILTRATION RATE

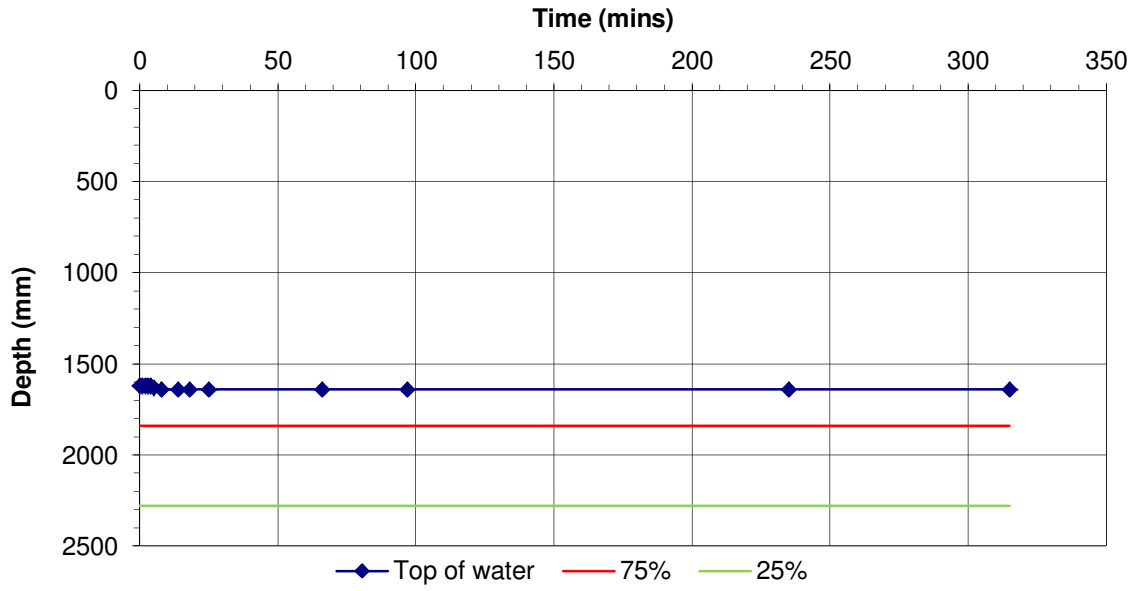
Time (min)	Depth (mm)
0	1620
1	1620
2	1620
3	1620
4	1620
5	1630
8	1640
14	1640
18	1640
25	1640
66	1640
97	1640
235	1640
315	1640

Size of Soakaway		
	Length (m) =	2.70
	Width (m) =	0.60
	Depth (m) =	2.50

Depth at start of test (mm)=	1620mm
Depth of trial pit (mm)=	2500mm
75% effective depth (mm)=	1840mm
50% effective depth =	2060mm
25% effective depth =	2280mm
Base area of pit (m^2) =	1.620
Effective area of loss 50% (m^2) =	4.524
Volume outflow 75 - 25% (m^3) =	0.713

From the graph:	
tp 75 (min) =	Not achieved
tp 25 (min) =	Not achieved

Soil infiltration rate, f, (m/s) =		**Not calculated**	**Normal test**
Input by:	**GB**	**Date:**	**3.10.2014**
Checked by:	**JL**	**Date:**	**7.10.2014**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA4 - 1

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)
0	1200
1	1250
2	1270
3	1270
4	1270
5	1280
8	1300
12	1310
15	1310
17	1320
43	1370
86	1480
144	1570
175	1600

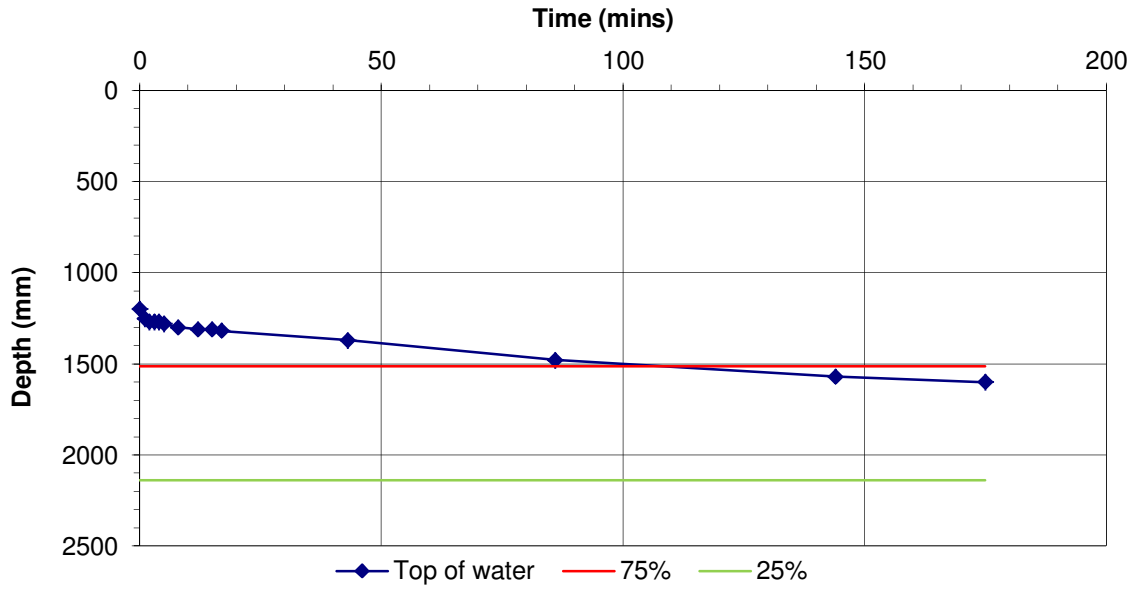
Size of Soakaway		
	Length (m) =	3.40
	Width (m) =	0.80
	Depth (m) =	2.45

Depth at start of test (mm)=	1200mm
Depth of trial pit (mm)=	2450mm
75% effective depth (mm)=	1513mm
50% effective depth =	1825mm
25% effective depth =	2138mm
Base area of pit (m^2) =	2.720
Effective area of loss 50% (m^2) =	7.970
Volume outflow 75 - 25% (m^3) =	1.700

From the graph:	
tp 75 (min) =	100
tp 25 (min) =	Not achieved

Soil infiltration rate, f, (m/s) =	Not calculated	Normal test

Input by:	GB	Date:	3.10.2014
Checked by:	JL	Date:	6.10.2014



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
Client:	Barratt & David Wilson Homes		
Site:	Carrs Lane, Cudworth		
Job No:	C6138	Test No:	SA5 - 1

CALCULATION OF SOIL INFILTRATION RATE

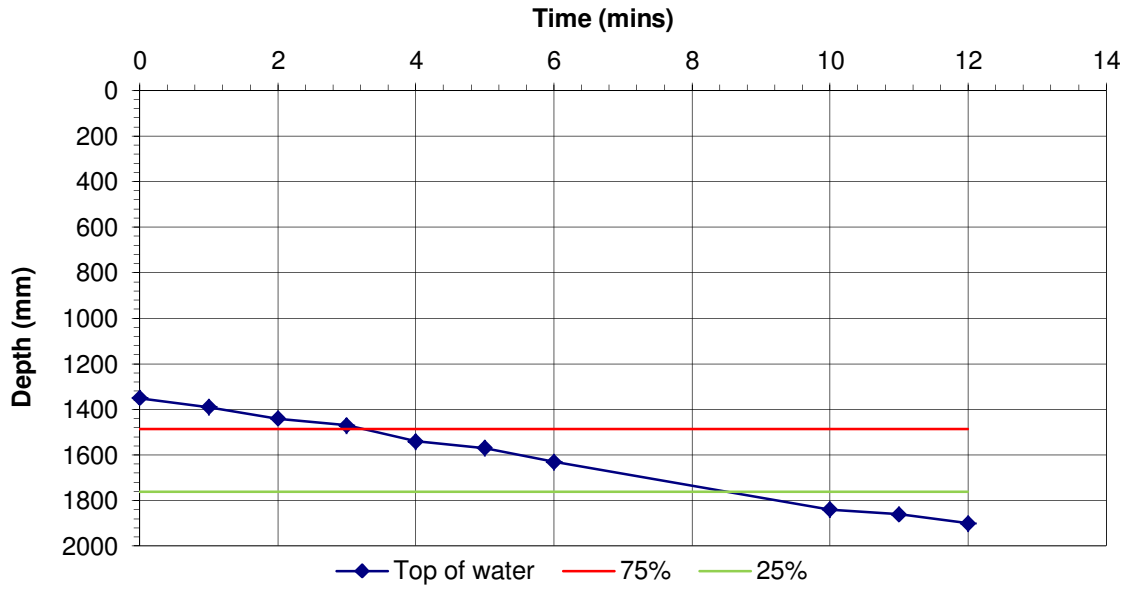
Time (min)	Depth (mm)
0	1350
1	1390
2	1440
3	1470
4	1540
5	1570
6	1630
10	1840
11	1860
12	1900

Size of Soakaway		
	Length (m) =	3.20
	Width (m) =	0.70
	Depth (m) =	1.90

Depth at start of test (mm)=	1350mm
Depth of trial pit (mm)=	1900mm
75% effective depth (mm)=	1488mm
50% effective depth =	1625mm
25% effective depth =	1763mm
Base area of pit (m^2) =	2.240
Effective area of loss 50% (m^2) =	4.385
Volume outflow 75 - 25% (m^3) =	0.616

From the graph:	
tp 75 (min) =	3.2
tp 25 (min) =	8.45

Soil infiltration rate, f, (m/s) =	4.46E-04	Normal test
Input by: GB	Date:	3.10.2014
Checked by: JL	Date:	6.10.2014



	SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007			
	Client:	**Barratt & David Wilson Homes**		
	Site:	**Carrs Lane, Cudworth**		
	Job No:	**C6138**	**Test No:**	**SA5 - 2**

CALCULATION OF SOIL INFILTRATION RATE

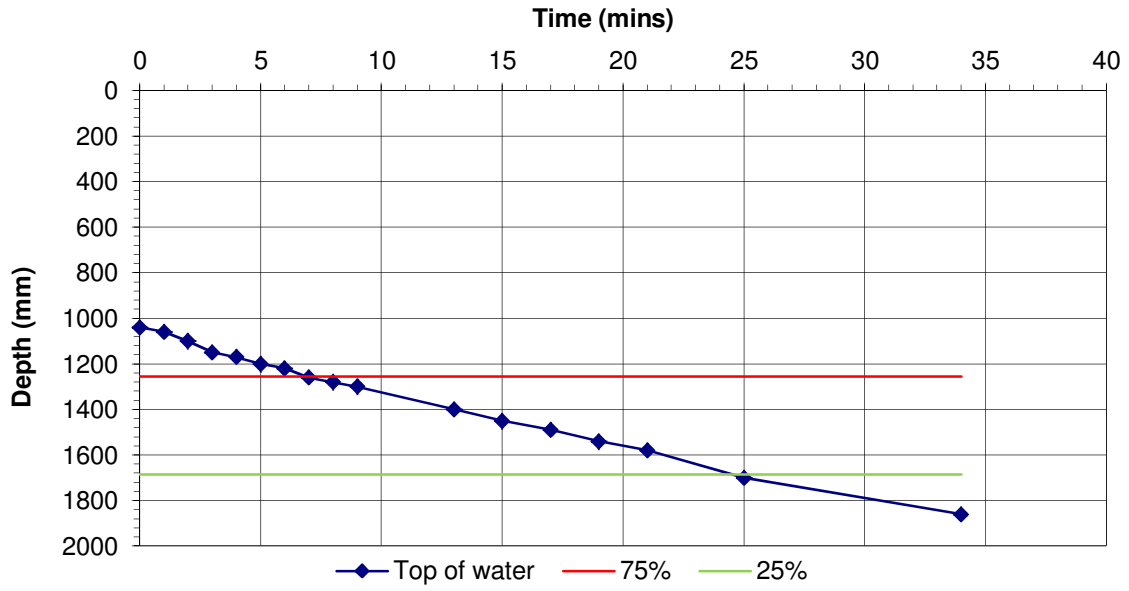
Time (min)	Depth (mm)
0	1040
1	1060
2	1100
3	1150
4	1170
5	1200
6	1220
7	1260
8	1280
9	1300
13	1400
15	1450
17	1490
19	1540
21	1580
25	1700
34	1860

Size of Soakaway	Length (m) =	3.20
	Width (m) =	0.70
	Depth (m) =	1.90

Depth at start of test (mm)=	1040mm
Depth of trial pit (mm)=	1900mm
75% effective depth (mm)=	1255mm
50% effective depth =	1470mm
25% effective depth =	1685mm
Base area of pit (m^2) =	2.240
Effective area of loss 50% (m^2) =	5.594
Volume outflow 75 - 25% (m^3) =	0.963

From the graph:	
tp 75 (min) =	6.9
tp 25 (min) =	24

Soil infiltration rate, f, (m/s) =		**1.68E-04**	**Normal test**
Input by:	**GB**	**Date:**	**3.10.2014**
Checked by:	**JL**	**Date:**	**6.10.2014**



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007

Client:	**Barratt & David Wilson Homes**		
Site:	**Carrs Lane, Cudworth**		
Job No:	**C6138**	**Test No:**	**SA5 - 3**

CALCULATION OF SOIL INFILTRATION RATE

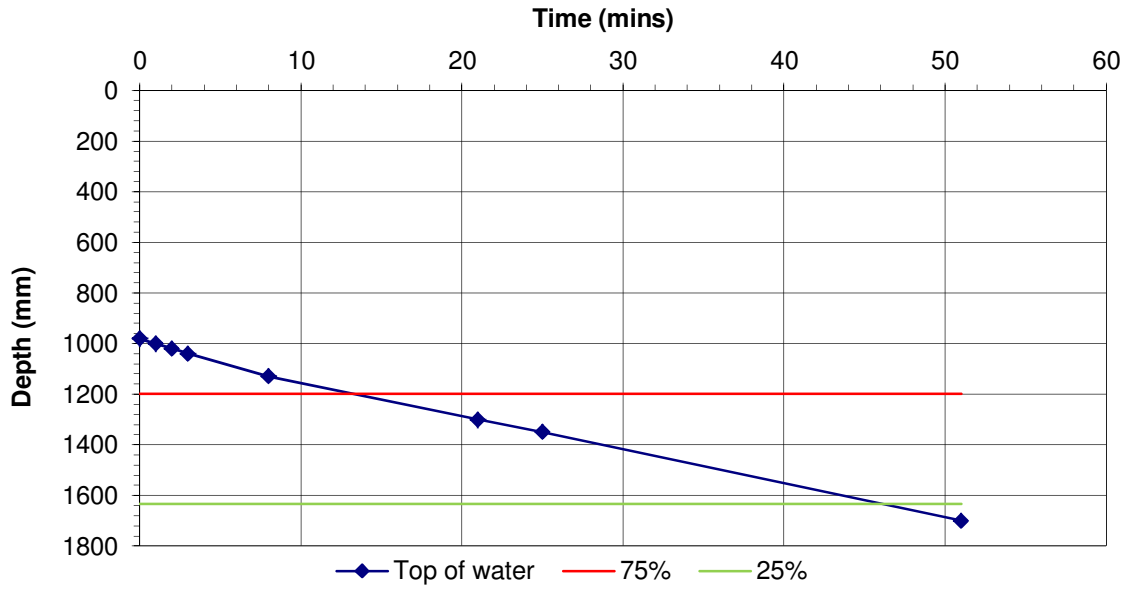
Time (min)	Depth (mm)
0	980
1	1000
2	1020
3	1040
8	1130
21	1300
25	1350
51	1700

Size of Soakaway	Length (m) =	3.20
	Width (m) =	0.70
	Depth (m) =	1.85

Depth at start of test (mm)=	980mm
Depth of trial pit (mm)=	1850mm
75% effective depth (mm)=	1198mm
50% effective depth =	1415mm
25% effective depth =	1633mm
Base area of pit (m^2) =	2.240
Effective area of loss 50% (m^2) =	5.633
Volume outflow 75 - 25% (m^3) =	0.974

From the graph:	
tp 75 (min) =	13
tp 25 (min) =	45.5

Soil infiltration rate, f, (m/s) =		**8.87E-05**	**Normal test**
Input by:	**GB**	**Date:**	**3.10.2014**
Checked by:	**JL**	**Date:**	**6.10.2014**



APPENDIX E

GROUND GAS AND GROUNDWATER MONITORING RESULTS

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Barratt & David Wilson Homes **Job No:** C6138
Site: Cudworth **Visit No:** 1 **of** 1
Date: 03/10/2014 **Operator:** Alex Edward **Project Manager:** Jenny Levitt

	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				Worst-credible GSVs		WELL AND WATER DATA					Comments
Monitoring Point	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Min.	Steady			Peak	Steady										
WS1	ND	ND	ND	ND	0.1	0.1	2	1	2	1	21.2	21.2	ND	ND	ND	ND	ND	ND	NA	0.0001	ND	2.10	54.13	NA	NAT - G & Bed	
WS2	ND	ND	ND	ND	0.9	0.9	4	1	2	1	20.3	20.3	ND	ND	0.5	0.5	1	5	NA	0.0045	ND	3.00	42.39	NA	NAT - G & Bed	Cover smashed, well tap missing. Replaced well tap and left for 2 hours before monitoring.
WS3	ND	ND	ND	ND	1.7	1.6	3	1	2	1	19.9	19.9	ND	ND	ND	ND	ND	ND	NA	0.0016	2.92	4.50	37.53	34.61	NAT - G, C, Coal & Bed	Cover smashed, well tap missing. Replaced well tap and left for 2 hours before monitoring. C. 1.5m of water in well. Purged approx 1 litre Very slow recharge, came back to do gas monitoring and had only recharged c.200mm No odour, no sheen, brown in colour.
WS4	ND	ND	ND	ND	1.3	1.3	3	1	2	1	20.0	20.0	ND	ND	ND	ND	ND	ND	NA	0.0013	1.30	2.05	55.56	54.26	NAT - C & Bed	
WS5	ND	ND	ND	ND	1.5	1.4	3	1	1	0	21.5	21.5	ND	ND	ND	ND	ND	ND	NA	0.0014	ND	2.05	38.70	NA	NAT - C & Bed	Cover removed , well tap missing. Replaced well tap and left for 2 hours before monitoring.
WS6	ND	ND	ND	ND	1.8	1.8	2	1	2	1	19.7	19.7	ND	ND	ND	ND	ND	ND	NA	0.0018	ND	2.05	35.50	NA	NAT - C	
WS7	ND	ND	ND	ND	2.2	2.1	4	1	2	1	19.8	19.8	ND	ND	0.5	0.5	1	5	NA	0.0105	ND	2.05	41.99	NA	NAT - G & Bed	Cover removed and well tap missing. Replaced well tap and left for 2 hours before monitoring.
Max	ND	ND	ND	ND	2.2	2.1	4	1	2	1	21.5	21.5	ND	ND	0.5	0.5	1.0	5	NA	0.0105	2.92	4.50	55.56	54.26		
Min	ND	ND	ND	ND	0.1	0.1	2	1	1	0	19.7	19.7	ND	ND	ND	ND	ND	5	NA	0.0001	1.30	2.05	35.50	34.61		

Worst-possible GSVs	
NA	0.0105

ND - Not detected
NR - Not recorded
NA - Non applicable

MG - Made ground
NAT - Natural
C - Cohesive
G - Granular
Bed - Bedrock

NB: Where no flow (ND) recorded, GSVs are calculated using equiment limit of detection (0.1l/hr). Where negative flows recorded, these are converted to positive values for calculation of GSVs.

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:	X	Dry		Moist		Wet		Snow		Frozen		
Wind:		Calm	X	Light		Moderate		Strong				
Cloud cover:		None	X	Slight		Cloudy		Overcast				
Precipitation:	X	None		Slight		Moderate		Heavy				
Time monitoring performed:			09:30	Start			15:30	End				
Barometric pressure (mbar):			1012	Start			1010	End				
Pressure trend (Daily):			X	Falling		Steady		Rising				
Source:	BBC											
Air Temperature (Deg. C):			18	Before			25	After				

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM400
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/03/2014
Date of next calibration: 12/03/2015

Ambient air check: **CH_4** 0.0 **CO_2** 0.0 **O_2** 21.1

PID: Phocheck3000
Calibrated range: 0-100ppm
Calibration gas: isobutylene
Response time: 0.1
Accuracy: plus/ minus 5% displayer reading
Date of last calibration: 25/11/2013
Date of next calibration: 26/11/2014

APPENDIX F

SIRIUS GENERIC ASSESSMENT CRITERIA

SIRIUS GENERIC ASSESSMENT CRITERIA

Context

The framework for conducting site investigations, risk assessments and undertaking any necessary remedial works in the UK is provided by Environment Agency report CLR11 "Model Procedures for the Management of Contaminated Land". This presents a phased approach to risk assessment, involving: identification and qualitative assessment of potential pollutant linkages (source-pathway-receptor relationships) by means of a Conceptual Site Model; Generic Quantitative Risk Assessment (GQRA) of potentially significant pollutant links by comparing contaminant concentrations with appropriate Generic Assessment Criteria (GAC) values; and, if required, a Detailed Quantitative Risk Assessment (DQRA) based on site-specific conditions.

Assessment of Risk to Human Health

Except where otherwise stated, GACs have been derived by Sirius using CLEA version 1.06.

The GAC values have been derived for a sandy soil type will be conservative for the majority of soils (including made ground) encountered on historically contaminated sites. For organic contaminants of concern, criteria have been derived for a number of Soil Organic Matter (SOM) contents.

Genotoxic PAHs are assessed by the "Surrogate Method" using benzo(a)pyrene. Further information on this approach is appended.

The parameter values for the land use cases are consistent with those given in Environment Agency (2009) "Updated Technical Background to the CLEA Model", report SC050021/SR3 but have been updated (where relevant) for respiration rate, exposure frequency for dermal contact outdoors, soil adherence factors for children and plant uptake concentration factors in line with CL:AIRE (2013) "Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination", report SP1010. The respiration rates replace the original values used in the original development of CLEA version 1.06, as the guidance on which they were based has been superseded by a later version; the other parameter changes incorporate consensus expert opinion on reasonable exposure parameters based on review of the scientific literature and receptor behaviour. However, no correction has been made in deriving the GACs for the "Top Two" crop types in the Residential with Homegrown Produce land use; the criteria will therefore be conservative in this regard.

Unless specifically stated, chemical properties and Health Criteria Values (HCVs) were obtained from:

- Environment Agency Science Report SC050021 series;
- Nathanail *et al*. (2009) "The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment", 2nd edition, Land Quality Press, Nottingham;
- CL:AIRE - AGS - EIC (2010) "Soil Generic Assessment Criteria for Human Health Risk Assessment". CL:AIRE, London.

GACs for arsenic, benzene, benzo(a)pyrene, cadmium and chromium (VI) have been derived using the Low Level of Toxicological Concern (LLTC) criteria given in CL:AIRE (2013). These criteria are considered a reasonable basis for assessment as they are still highly precautionary and definitely do not approach an intake level that could be defined as approaching Significant Possibility of Significant Harm to human health in the context of Part 2A of the Environmental Protection Act 1990. It must be further understood that the GACs derived will still incorporate a residual level of conservatism resulting from the exposure parameters used and the assumptions inherent in the model algorithms.

For the specific case of lead, the Category 4 Screening Level criteria given in CL:AIRE (2013) have been adopted directly as GACs and are considered to provide a reasonable level of protection for initial data screening as they are based on expert interpretation of current toxicological evidence. In some areas, background lead concentrations may exceed the GACs and it may therefore be appropriate to consider relative site and background concentration data as part of a more detailed assessment of the data.

Controlled Waters

The Environment Agency's "Remedial Targets Methodology" (2006) provides a framework for assessing the potential for pollution of controlled waters and for deriving remedial target concentrations in soil and groundwater.

There are no generic groundwater or surface water quality standards that are applicable to all sites. However, legislative Drinking Water Standards and the Environment Agency's Environmental Quality Standards (EQS) are considered appropriate assessment criteria for many cases and these are therefore used by Sirius where appropriate to the potential pollutant linkages under consideration.

Soil Leachability

The Environment Agency's Remedial Targets Methodology recommends the use of the BS EN 12475 leachate methods and this is the standard test specified by Sirius.

The results of the leachate analysis are compared to the relevant GAC values for controlled waters.

Other Criteria

Sulphate, TOC and calorific value to not pose a potential risk to human health and therefore exceedance of the GACs for these does not indicate a human health risk.

A generic assessment is made in relation to the potential impact of soil pH and sulphate content on buried concrete by reference to BRE Special Digest No. 1; 3rd Edition (2005) "Concrete in Aggressive Ground".

The GAC for TOC content is provided for indicative assessment of disposal options in the case that off-site landfill of soil is considered. This GAC is set at the 'Inert' waste threshold and should be considered as for information purposes only.

The GAC for calorific value is set to assist in initial assessment of the potential fire risk posed by made ground or natural soils containing elevated concentrations of potentially combustible organic matter.

Assessment of Genotoxic PAHs

The use of benzo(a)pyrene as a surrogate marker for genotoxic PAHs is consistent with the recommendations given in HPA (2010) "Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)", version 5. The approach enables land contamination risk assessors to consider the combined carcinogenic risk associated with all genotoxic PAHs[1] that might be present at a site, despite the absence of detailed toxicological information for many of them on an individual basis.

The approach estimates the toxicity of the mixture of genotoxic PAHs in an environmental matrix by using toxicity data for a PAH mixture of known composition. Exposure to the surrogate marker is taken to represent exposure to all genotoxic PAHs in that matrix and therefore it represents the toxicity of the mixture.

To use the GAC for benzo(a)pyrene as a surrogate marker for genotoxic PAHs a number of requirements must be met (HPA, 2010):

- Benzo(a)pyrene must be present in all soil samples from the site at which this method of assessment is being used;
- A similar profile of the genotoxic PAHs relative to benzo(a)pyrene should be present in all of the samples being assessed;
- The PAH profile of PAHs in the soil samples should be similar to that present in the pivotal toxicity study on which toxicological criterion for benzo(a)pyrene was based (the Culp study). Table 1, overleaf, provides the basis for defining the acceptable range.

Data indicate that UK soils generally meet these criteria (Bull, S. & Collins, C. (2013) *Environ. Geochem. Health*, **31**, 101-109) but the assessor must review their dataset before adopting this approach. If the above criteria are not met, then the surrogate marker approach must not be adopted and individual GAC or SSAC values are to be applied[2].

[1] The genotoxic PAHs included in the USEPA PAH 16 analysis reported by analytical labs are: benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, benzo(a)pyrene, chrysene, dibenz[a,h]anthracene and indeno[1,2,3-c,d]pyrene.

[2] For all genotoxic PAHs, CL:AIRE (2013) recommends assessment of oral, inhalation and dermal exposures as additive since these compounds are systemic carcinogens; the inhalation HCV or LLTC will be based on local pulmonary effects only. Where a combination of these exposure pathways operates, then the lower of the GACs derived on this basis will provide a conservative assessment of the risk from both systemic and local effects.

Table 1. Profile of Genotoxic PAHs Relative to Benzo(a)pyrene that are Considered Acceptable for Application of Benzo(a) pyrene as a Surrogate Marker.

PAH	Acceptable Ratio of PAH Concentration to Benzo(a)pyrene for Application of Surrogate Marker Assessment	
	Lower Limit	Upper Limit
Benz[a]anthracene	0.12	12.43
Benzo[b]fluoranthene	0.11	10.85
Benzo[k]fluoranthene	0.04	3.72
Benzo[g,h,i]perylene	0.08	8.22
Chrysene	0.12	11.61
Dibenz[a,h]anthracene	0.01	1.38
Indeno[1,2,3-c,d]pyrene	0.07	7.27

For further information see: HPA (2010) and CL:AIRE (2013).

The Sirius Group
Generic Assessment Criteria for Soils

Revision: 1 June 2014 (F)

Parameter	Residential (mg/kg, unless otherwise stated)						Commercial / Industrial (mg/kg, unless otherwise stated)			Note
	With Homegrown Produce			Without Homegrown Produce						
	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	
Metals/Metalloids										
Arsenic (inorganic)	37			40			630			[1]
Cadmium	11			87			220			[2]
Chromium (III)	4000			4000			28000			
Chromium (VI)	6.1			6.1			33			[3]
Copper	200			7200			68000			[4]
Lead	200			310			2330			[5]
Mercury (inorganic)	170			240			3600			[6]
Nickel	180			180			1700			[7]
Selenium	350			600			13000			
Vanadium	76			200			3000			
Zinc	450			40000			600000			[4]
Other Inorganics										
pH	<5 or >9			<5 or >9			<5 or >9			
Total Sulphate	2400			2400			2400			[8]
Water-Soluble Sulphate	0.5 g/l			0.5 g/l			0.5 g/l			[8]
Free Cyanide	34			34			1400			[9]
Organics										
PAHs										
Acenaphthene	200	490	920	2000	3500	4800	75000	92000	100000	
Acenaphthylene	170	400	760	2000	3600	4900	75000	92000	100000	
Anthracene	2300	5300	9300	29000	34000	36000	500000	500000	500000	[10]
Benzo(a)anthracene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(a)pyrene	2.3	2.3	2.3	2.5	2.5	2.5	22	22	22	[11]
Benzo(b)fluoranthene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(k)fluoranthene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Benzo(g,h,i)perylene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Chrysene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Dibenzo(a,h)anthracene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Fluoranthene	2300	5300	9300	29000	34000	36000	500000	500000	500000	
Fluorene	280	560	820	1500	1500	1500	22000	22000	22000	
Indeno(1,2,3-c,d)pyrene	Assessed using benzo(a)pyrene as a surrogate marker									[10]
Naphthalene	0.96	2.3	4.6	1.0	2.4	4.7	100	260	500	
Phenanthrene	95	220	380	1200	1400	1500	22000	22000	22000	
Pyrene	620	1200	1800	3600	3700	3700	54000	54000	54000	
BTEX and related										
Benzene	0.063	0.13	0.24	0.16	0.30	0.55	15	28	49	
Toluene	100	230	460	360	810	1500	56000	100000	160000	
Ethylbenzene	50	120	240	100	230	450	16000	33000	56000	
Xylenes (total)	27	64	120	31	75	140	5800	13000	25000	[12]
1,2,4-trimethylbenzene	0.2	0.5	1.1	0.2	0.6	1.2	39	93	170	
Iso-propylbenzene	6.6	16	32	6.8	17	33	1300	3100	6100	
Propylbenzene	21	51	100	23	57	110	3800	9100	17000	
Styrene	6.9	16	32	21	49	93	3100	6100	9500	
TPH										
Aliphatic EC 5-6	24	40	67	24	40	67	3100	5700	10000	
Aliphatic EC >6-8	52	110	200	52	110	200	7500	17000	32000	
Aliphatic EC >8-10	13	30	60	13	30	60	1900	4700	9200	
Aliphatic EC >10-12	61	150	300	61	150	300	9400	22000	40000	
Aliphatic EC >12-16	500	1200	2200	500	1200	2200	58000	81000	88000	
Aliphatic EC >16-35	41000	69000	89000	41000	69000	90000	>1E6	>1E6	>1E6	[13]
Aromatic EC >5-7	53	110	200	150	300	540	26000	46000	75000	
Aromatic EC >7-8	100	240	460	370	810	1500	56000	100000	160000	
Aromatic EC >8-10	19	47	93	22	53	100	3300	7900	14000	
Aromatic EC >10-12	63	150	280	110	280	550	15000	27000	33000	
Aromatic EC >12-16	500	1200	2200	500	1200	2200	58000	81000	88000	
Aromatic EC >16-21	260	540	840	1800	1800	1900	28000	28000	28000	
Aromatic EC >21-35	1100	1500	1600	1900	1900	1900	28000	28000	28000	

The Sirius Group
Generic Assessment Criteria for Soils

Parameter	Residential (mg/kg, unless otherwise stated)						Commercial / Industrial (mg/kg, unless otherwise stated)			Note
	With Homegrown Produce			Without Homegrown Produce						
	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	
Chlorinated Organics										
Chlorobenzene	0.19	0.44	0.86	0.19	0.45	0.87	56	120	240	
Dichloromethane (DCM)	0.47	0.78	1.2	1.2	1.7	2.4	250	340	470	
1,1-dichloroethane (DCA)	1.4	2.4	4.0	1.4	2.4	4.1	260	420	690	
1,2-dichloroethane (DCA)	0.0031	0.0048	0.0076	0.0035	0.0053	0.0084	0.67	0.97	1.5	
1,1-dichloroethene (DCE)	0.15	0.26	0.45	0.15	0.26	0.46	24	43	74	
cis -1,2-dichloroethene (DCE)	0.066	0.12	0.20	0.069	0.12	0.21	14	23	38	
trans -1,2-dichloroethene (DCE)	0.11	0.21	0.38	0.12	0.22	0.39	21	37	65	
Pentachlorophenol	0.55	1.3	2.6	38	58	68	1200	1300	1300	
1,1,1,2-tetrachloroethane	0.56	1.3	2.6	0.63	1.5	2.9	100	240	470	
1,1,2,2-tetrachloroethane	0.98	2.1	4.0	1.6	3.4	6.3	270	540	970	
Tetrachloroethene (PCE)	0.57	1.3	2.5	0.61	1.4	2.7	120	270	520	
Tetrachloromethane (CT)	0.011	0.024	0.046	0.011	0.024	0.046	2.9	6.3	12	
1,1,1-trichloroethane (TCA)	3.7	7.8	15	3.8	7.9	15	660	1300	2500	
1,1,2-trichloroethane (TCA)	0.39	0.85	1.6	0.51	1.1	2.0	89	180	320	
Trichloroethene (TCE)	0.064	0.14	0.26	0.065	0.14	0.26	11	23	44	
Trichloromethane (CF)	0.46	0.86	1.5	0.52	0.97	1.7	101	170	300	
Vinyl Chloride	0.00034	0.00045	0.00062	0.00037	0.00048	0.00066	0.059	0.077	0.11	
Miscellaneous Organics										
Carbon disulphide	0.066	0.13	0.25	0.066	0.13	0.25	11	22	40	
Di-(2-ethylhexyl)-phthalate	290	660	1100	3900	4000	4100	85000	85000	8600	
MTBE	31	55	94	39	68	120	7400	12000	19000	
Phenol	270	550	950	740	1300	2100	3200			[14]
Methylphenols (cresols), total	78	170	330	5600	8200	9900	160000	170000	18000	[15]
2,4-dimethylphenol (m-xylenol)	18	43	82	200	430	720	15000	23000	28000	
Other Parameters										
TOC	3% w/w			3% w/w			3% w/w			[16]
Calorific Value	2 MJ/kg			2 MJ/kg			2 MJ/kg			[17]
Asbestos	Fibres present			Fibres present			Fibres present			

All concentration-based criteria are rounded to 1 or 2 significant figures.

The criteria assume a sandy soil type, which will be conservative for the great majority of soils (including made ground) encountered on historically contaminated sites.

Except where otherwise stated, criteria have been derived by Sirius using CLEA version 1.06. Parameters for the land use cases are consistent with those given in Environment Agency (2009) "Updated Technical Background to the CLEA Model", report SC050021/SR3 but updated (where relevant) for respiration rate, exposure frequency for dermal contact outdoors, soil adherence factors for children and plant uptake concentration factors given in CL:AIRE (2013) "Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination", report SP1010. No correction has been made for the "Top Two" crop types in the Residential with Homegrown Produce land use and the criteria will therefore be conservative in this regard.

Health Criteria Values (HCVs) and (except where specifically noted) chemical property data were obtained from:
- Environment Agency Science Report SC050021 Series;
- Nathanail et al. (2009) "The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment", 2nd edition, Land Quality Press, Nottingham;
- CL:AIRE - AGS - EIC (2010) "Soil Generic Assessment Criteria for Human Health Risk Assessment". CL:AIRE, London.

Footnotes

[1] Plant uptake concentration factors applied were as given in CL:AIRE (2013). The oral GAC is adopted as this is the lower value and reflects a cancer risk many orders of magnitude greater than for inhalation.

[2] Determined for lifetime exposure. Plant uptake concentration factors applied were as given in CL:AIRE (2013). The GAC values are based on data for soils having a pH value in the range 6-8; caution should be applied in applying them at pH values outside this range, especially at pH values <5.

[3] Plant uptake concentration factors applied were as given in CL:AIRE (2013). Both oral and inhalation HCVs are based on local toxicological effects and therefore the lowest (oral) GAC value is adopted.

[4] For the Residential with Homegrown Produce land use, the GAC values for Cu and Zn are based on potential phytotoxic effects and have been set at the maximum allowable concentrations for sewage sludge-amended soils presented in the "Sludge (Use in Agriculture) Regulations" (SI 1263/1989); these criteria may also be applied in any land use where plants are to be grown. The equivalent GAC values for human health protection in the Residential with Homegrown Produce land use are: Cu, 2400 mg/kg; Zn, 3700 mg/kg. The GAC values for the other land uses presented were derived by Sirius as described above.

[5] The Category 4 Screening Levels for lead defined in CL:AIRE (2013) have been adopted directly to provide an acceptable basis for initial assessment of data. Where background concentrations of lead exceed the GAC value, then site-specific evaluation will be required.

[6] The SGV for mercury is based on inorganic mercury which represents the most common form encountered within the environment. This is considered appropriate for most sites as: "…the SGV for inorganic mercury can normally be compared with chemical analysis for total mercury content because the equilibrium concentrations of elemental and methylmercury compounds are likely to be very low" (SC050021/Mercury SGV). Analysis and specific assessment for elemental or methylated forms of mercury will need to be considered if historical land use or site-specific factors indicate that these forms of mercury are likely to be present.

[7] Toxicological effects by inhalation are localised; consistent with the SGV for nickel, the lower of the GAC values for oral and inhalation HCVs have been adopted in each case.

Parameter	Residential (mg/kg, unless otherwise stated)						Commercial / Industrial (mg/kg, unless otherwise stated)			Note
	With Homegrown Produce			Without Homegrown Produce						
	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	1% SOM	2.5% SOM	5% SOM	

[8] BRE (2005) Special Digest 1, 3rd Edition "Concrete in aggressive ground". Sulphate is not considered to pose a potential risk to human health under normal circumstances – this GAC

[9] GAC calculated for acute risk. Further information can be provided upon request.

[10] The genotoxic PAHs (benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene) are routinely assessed using benzo(a)pyrene as a surrogate (HPA (2010) "Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)", version 5). Separate information on this approach is provided.

[11] Determined using oral HCV value for assessment of all pathways to determine systemic carcinogenic effect; inhalation HCV values are based on local pulmonary effects only and result in a less conservative GAC. Specific plant uptake concentration factors given in CL:AIRE (2013) have been applied in model parameterisation.

[12] For screening purposes, a single GAC has been set for total xylene. This is the lowest of the values calculated for the three individual xylene isomers.

[13] "No GAC" indicates that no value has been specified for this land use as the HCV cannot be exceeded at achievable soil concentrations.

[14] The GAC for Commercial/Industrial land use is based on the threshold protective for direct skin contact with phenol (See SR050021/Phenol SGV).

[15] For screening purposes, a single GAC has been set for total methylphenol. This is the lowest of the values calculated for the three individual methylphenol isomers.

[16] The Hazardous Waste (England and Wales) Regulations 2005. TOC content in itself does not represent a potential risk to human health. This GAC is provided for indicative assessment of disposal options, in the case that off-site landfill of soil is undertaken. This GAC is specified at the 'Inert' waste threshold and should be considered as for information purposes only.

[17] ICRCL (1986) Guidance Note 61/84, 2nd Edition, Notes on the Fire Hazards of Contaminated Land. Calorific value is not an indication of direct human health risk but may be useful in assessment of the potential fire risk posed by made ground or natural soils containing elevated concentrations of potentially combustible organic matter.

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GAC VALUES FOR CONTROLLED WATERS IN ENGLAND AND WALES

Parameter	GAC (µg/l, unless stated)			Notes
	Inland waters		Coastal and transition waters	
	EQS	DWS	EQS	
Metals and metalloids				
Arsenic	50	10	25	1
Cadmium	See separate table	5	0.2	1, 2
Chromium (total)	4.7	50	4.7	1, 3
Copper	See separate table	2000	5	1, 2
Lead	7.2	10	7.2	1
Mercury	0.05	1	0.05	1
Nickel	20	20	20	1
Zinc	See separate table	5000	40	1, 2
Misc. inorganics				
Ammonia (total, as N)	See separate table	N.A.	N.A.	2, 4
Ammonia (total, as $NH4^+$)	N.A.	500	N.A.	
Ammonia (un-ionised (NH3), as N)	N.A.	N.A.	21	
Sulphate	400 mg/l	250 mg/l	N.A.	5
Petroleum hydrocarbons and related				
TPH	See notes	See notes	See notes	6, 7
Benzene	10	1	8	
Toluene	50	700	40	8
Xylenes (sum)	30	500	30	8
MTBE	2600	200	2600	9, 10
PAHs				
Anthracene	0.1	N.A.	0.1	
Benzo(b)fluoranthene + Benzo(k)fluoranthene (sum)	0.03	Sum of 4 = 0.1	0.03	
Benzo(g,h,i)perylene + indeno(1,2,3-c,d)pyrene (sum)	0.002		0.002	
Benzo(a)pyrene	0.05	0.01	0.05	
Fluoranthene	0.1	N.A.	0.1	
Naphthalene	2.4	N.A.	1.2	
Phenol				
Phenol	7.7	0.5	7.7	

Cadmium - inland waters EQS	
Hardness (as mg/l CaCO3)	EQS (µg/l)
<40	0.08
40-50	0.08
50-100	0.09
100-200	0.15
>=200	0.25

Copper & zinc - inland waters EQS		
Hardness (as mg/l CaCO3)	EQS (µg/l)	
	Cu	Zn
0-50	1	8
50-100	6	50
100-250	10	75
>250	28	125

Ammonia - inland waters EQS		
Alkalinity (as mg/l CaCO3)	Altitude	EQS (µg/l)
<10	Any	300
10-50	Any	300
50-100	<80m	600
50-100	>80m	300
100-200	<80m	600
100-200	>80m	300
>200	Any	600

Parameter	GAC (µg/l, unless stated)			Notes
	Inland waters		Coastal and transition waters	
	EQS	DWS	EQS	
Chlorinated organics				
Dichloromethane	20	N.A.	20	
Trichloromethane (chloroform)	2.5	100	2.5	11
Tetrachloromethane (carbon tetrachloride)	12	3	12	
1,2-dichloroethane (1,2-DCA)	10	N.A.	10	
1,1,1-trichloroethane (1,1,1-TCA)	100	N.A.	100	
1,1,2-trichloroethane (1,1,2-TCA)	400	N.A.	300	
Trichloroethene (TCE)	10	Sum of 2 = 10	10	
Tetrachloroethene (PCE)	10		10	
Vinyl chloride	N.A.	0.5	N.A.	

Notes referenced in table:

1. Metals and metalloid EQS relate to dissolved contamination only (i.e. analysis of filtered samples).
2. Inland waters EQS for these parameters is dependent upon hardness or alkalinity of the *receiving water* . See separate tables.
3. Separate EQS standards exist for Cr III and CrVI in fresh water. Cr III value adopted as screening purposes for total Cr analysis as it is normally the predominant form in solution. Specific EQS for Cr VI (3.4µg/l in freshwater; 0.6µg/l in transition and coastal waters) must be applied where relevant.
4. EQS for ammonia in inland waters also depends on altitude of receptor water body. See separate table.
5. Inland waters EQS for sulphate is non-statutory.
6. No concentration based EQS exists for TPH. Hydrocarbons must not: form a visible film on the surface of the water; form coatings on the beds of water bodies: impart a detectable 'hydrocarbon' taste to fish; or, produce harmful effects in fish.
7. No concentration based DWS exists for TPH. Subject to justification on a case-specific basis, it may be appropriate to apply 200 µg/l TPH as a GAC on the basis that this is the DW2 Class threshold limit specified in the Surface Water (Abstraction for Drinking Water) (Classification) Regulations 1996. DW2 waters are generally suitable for abstraction as drinking water supplies, subject to standard filtration and chemical treatment.
8. World Health Organisation (WHO) Guidelines for Drinking Water Quality, 1984 - health value.
9. EQS for MTBE is the PNEC value for fresh and sea water life given in: EU Risk Assessment Report (2002) MTBE, 3rd Priority List, volume 19.
10. DWS for MTBE is a 5-fold dilution of the USEPA (1997) Drinking Water Advisory value for taint, EPA-822-F-97-009. Toxicological thresholds are significantly higher.
11. Sum trihalomethanes limit is 100µg/l but chloroform is only compound of this class normally encountered at contaminated sites.

Sources and general comments

Unless otherwise stated, EQS-based GACs relate to "Good Standard" annual average surface water quality criteria as given in: The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010.

Unless otherwise stated, drinking water standard-based GACs are taken from the Water Supply (Water Quality) (Amendment) Regulations 2000, 2001 and 2007 and relate to concentration at the supply point and/or consumers' taps.

This list presents recommended GAC values for commonly monitored analytes but is not exhaustive. A comprehensive database of criteria is available at: http://evidence.environment-agency.gov.uk/ChemicalStandards/home.aspx.

Other EQS-based criteria may apply in specific cases and regulatory guidance should be sought in case of doubt.

Sirius Geotechnical & Environmental Ltd

Suite 2 Russel House
Mill Road
Langley Moor
Durham
DH7 8HJ

t. 0191 378 9972
f. 0191 378 1537

4245 Park Approach
Century Way
Thorpe Park
Leeds
LS15 8GB

t. 0113 264 9960
f. 0113 264 9962

35 St Pauls Square
Birmingham
B3 1QX

t. 0121 232 4670
f. 0121 212 3363

Cinnamon House
Cinnamon Park
Crab Lane
Fearnhead
Warrington
WA2 0XP

t. 01925 661 700
f. 01925 378 1537



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