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SUPPLEMENTARY PHASE 2: GROUND INVESTIGATION REPORT

ESH CONSTRUCTION LTD

PROPOSED RESIDENTIAL DEVELOPMENT

HILL END ROAD

MAPPLEWELL

BARNSLEY

S75 6DX

Project No: 16-737

Prepared By:

Matt Bradford

Date: 28th June 2017

Checked By:

John Ditchburn

Date: 28th June 2017

The information and/or advice contained in this Phase 2: Ground Investigation Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared in order to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and/or sketches contained within the report, and/or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

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APPENDICES

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Appendix II	Laboratory Results (Ground Contamination)
Appendix III	Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd
Appendix IV	Remediation Method Statement by GRM Development Solutions Ltd.

1.0 Introduction June 2017

As requested by Esh Construction Ltd, Supplementary Phase 2: Ground Investigation works have been carried out by Arc Environmental Ltd. on a site on Hill End Road in Mapplewell, Barnsley, where it is proposed to develop new residential properties with associated access road, soft and hard landscaping.

The following reports which were undertaken for the site, should be read in conjunction with this Supplementary Phase 2: Ground Investigation Report, with investigation data contained within it utilised to aid the completion of the supplementary intrusive investigation report;

- Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, (Ref no: 2012/93-001-CON-RevA – April 2013)
- Remediation Method Statement by GRM Development Solutions Ltd (Ref no: P6671 – August 2014)

The Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, concluded that there is sufficient bedrock cover to 'possible' deep coal workings at a depth of between c.21.90m to c.28.00m below the site. However, it was recommended that further investigation works be undertaken across the site to determine the risk to the proposed development from potential shallow coal workings. Furthermore, a northeast / southwest trending fault, with a downthrow to the southeast, is shown to cross the southeastern portion of the site which may impact on the depth to potential shallow coal workings. The Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd can be seen attached in Appendix III.

The Remediation Method Statement by GRM Development Solutions Ltd recommended that prior to remedial works being undertaken across the site, a further 12 no. made ground samples should be obtained from a depth up to c.0.60m within proposed rear garden areas, and analysed for the presence of Asbestos. If the presence of asbestos was confirmed, the proposed capping layer should include a 150mm thick anti dig layer. If not, a geotextile at the base of the capping layer would be adequate. The Remediation Method Statement by GRM Development Solutions Ltd can be seen attached in Appendix IV.

Therefore, the supplementary intrusive investigation works comprised the excavation of 12 no. manually excavated trial pits (labelled TP's 01 - 12) to address potential asbestos contamination and 12 no. rotary open boreholes (RBH's 01 - 12) to address possible shallow coal workings. The positions of the investigation locations can be seen on the Exploratory Hole Location Plan, a copy of which can be seen in Appendix I. It should be noted that this plan is for orientating purposes only, as the positions shown are approximate and the plan is not to a standard scale.

2.0 Site Details

Table 2.1 N = north, S = south, E = east, W = west

Site Name & Address:	Proposed Residential Development, Hill End Road, Mapplewell, Barnsley S75 6DX.
National Grid Reference:	433393, 409504 (representative for the central part of the site).
Site Surfacing:	The site is rough open land with several stockpiles present from recently demolished buildings.
Above Ground Structures:	There are no above ground structures present on site.
Sub-surface Structures & Services:	Current and relic services together with possible relic foundations from previous buildings on site may be present which may pass below the proposed development area.

3.0 Scope of Works

Table 3.1

Client:	Esh Construction Ltd.
Project type:	Proposed Residential Development.
Supplementary Investigation Works:	12 no. manually excavated trial pits (TP's 01 - 12) & 12 no. rotary open boreholes (BH's 01 - 12).
Laboratory Testing:	Asbestos Contamination screening only.

3.0 Scope of Works (Cont'd)

The information contained in this report is limited to the area of the proposed development, as indicated on the Exploratory Hole Location Plan shown in Appendix I, and to those areas accessible during the ground investigation. When considering the full scope of the development any features and / or issues not specifically mentioned in this report cannot be assumed to have been covered.

3.1 Investigation Rationale:-

This supplementary ground investigation has been designed to provide further information on the general ground conditions where access would allow, in the area of the proposed development. The boreholes were created for geotechnical purposes to assist in the design of new foundations for the proposed development with asbestos contamination screening undertaken to aid in assessing the risks to Human Health.

The rationale behind the location of each supplementary exploratory hole is summarised in Table 3.2 below.

Table 3.2

Potential issue	Exploratory Hole
Determine risk to the development from potential shallow coal workings.	RBH's 01 - 12
Determine possible asbestos contamination within initial soil deposits with a view to determining the risks posed towards the future site end-users.	TP's 01 - 12

3.2 Sampling & Site Protocols:-

All works associated with this ground contamination assessment and investigations have generally been completed in accordance with BS10175: British Standard Code of Practice for the Investigation of Potentially Contaminated Sites (2011) & CLR11, with the following precautions specific to this project.

3.2.1 Contamination Sampling:-

Samples were recovered by a representative of ARC Environmental Ltd. during the intrusive investigation works. All samples were stored at approximately 4°C using cool boxes and ice packs prior to delivery to a UKAS/MCERTS accredited laboratory. Sampling was carried out in accordance with 'Technical Policy Statement 63: UKAS Policy on Deviating Samples'.

3.2.2 Onsite Health & Safety Requirements:-

All site representatives wore relevant and appropriate PPE including (where appropriate) safety footwear, high visibility jacket/vest, hard hat, eye protection and overalls. In addition, disposable latex gloves, and face masks were used when handling any potentially contaminated materials and when rinsing all sampling tools. Each site vehicle contained a suitable First Aid kit with hand wash station/cleansing products (i.e. sanitary wipes).

3.2.3 Avoiding Cross-Contamination between Sample Locations:-

To avoid cross-contamination of materials between soil horizons, the samples were recovered manually using dedicated disposable plastic gloves, replaced between each sample recovery with the equipment being cleaned between each investigation position.

4.0 Ground Conditions

For an accurate description of the ground conditions encountered at each borehole position, reference should be made to the borehole and trial pit logs attached in Appendix I. It should be noted that there is always the possibility of variation in the ground conditions around and between the borehole locations.

4.0 Ground Conditions (Cont'd)

4.1 Soil Profile:-

A summary of the supplementary boreholes undertaken across this site can be found in Table 4.1 below. The descriptions are based on cuttings brought to surface and drilling rates maintained. For a more detailed summary of the ground conditions present across this site, reference should be made to the Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd.

Table 4.1

Type of Strata	Depths Recorded (BGL)	Description & General Comments
MADE GROUND:	From 0.00m up to c.0.70m and c.2.70m.	Concrete and gravelly sand.
DRIFT GEOLOGY:	From c.0.70m and c.2.70m to c.1.70m and c.3.70m.	Brown CLAY.
SOLID GEOLOGY:	From c.1.70m and c.3.70m to c.>20.00m.	Interbedded MUDSTONE, SANDSTONE and COAL. No soft ground indicative of broken ground associated with historic mine workings was encountered during the supplementary ground investigation works. Consistent drilling rates and 100% flush medium was maintained during the drilling period.

bgl = Below ground level.

4.2 Shallow Coal Mining Assessment:-

As recommended within the Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, further investigation works were required to determine the risk to the proposed development from potential shallow coal workings. Furthermore, a northeast / southwest trending fault, with a downthrow to the southeast, is shown to cross the southeastern portion of the site which may impact on the depth to potential shallow coal workings.

Therefore, a series of shallow open hole rotary boreholes have been completed on site to determine the level of risk to the proposed development with details of each rotary borehole shown in Table 4.2 below and continued on the following page. Detailed Geological Cross Sections through the site can be seen attached in Appendix I also.

Table 4.2

Position	Position in Relation To Inferred Fault Location	Drift Thickness (m BGL)	Evidence of Coal Y/N	Evidence of Workings Y/N	Depth to Coal (m BGL)	Thickness (m)	Possible Seam Name
RBH01	SE	2.10	Y	N	2.90	1.10	Meltonwood
RBH02	SE	1.70	Y	N	1.70 & 7.80	1.30 & 0.20	Meltonwood & Un-named
RBH03	NW	3.10	N	N	~	~	~
RBH04	NW	2.00	N	N	~	~	~
RBH05	NW	2.40	N	N	~	~	~
RBH06	NW	2.20	N	N	~	~	~
RBH07	NW	2.20	N	N	~	~	~
RBH08	NW	2.20	N	N	~	~	~
RBH09	NW	3.20	N	N	~	~	~

4.0 Ground Conditions (Cont'd)

4.2 Shallow Coal Mining Assessment (Cont'd):-

Table 4.2 (Cont'd)

Position	Position in Relation To Inferred Fault Location	Drift Thickness (m BGL)	Evidence of Coal Y/N	Evidence of Workings Y/N	Depth to Coal (m BGL)	Thickness (m)	Possible Seam Name
RBH10	NW	3.50	Y	N	5.60	0.90	Kents Thin
RBH11	NW	3.60	Y	N	6.80	0.60	Kents Thin
RBH12	NW	3.70	Y	N	5.00	0.50	Kents Thin

Shallow intact coal was encountered across the south eastern portion of the site within RBH's 01 & 02 (SE of the fault) and also across the north western portion of the site within RBH's 10 – 12 (NW of the fault). The fault highlighted within the Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, that trends across the south eastern portion of the site is anticipated to run between RBH01 & 04 and between RBH02 & 03 as shown on the Detailed Geological Cross Sections and Exploratory Hole Location Plan attached in Appendix I.

There was no evidence of workings in the form of broken ground or voids during the excavation of the supplementary boreholes with 100% flush return noted within all boreholes which were taken to a terminal depth of between c.10.00m and c.20.00m.

5.0 Laboratory Testing

Ground contamination testing was undertaken by Chemtech Environmental of Stanley, Co. Durham (UKAS & MCERTS accredited).

5.1 Contamination Screening:-

12 no. representative samples of the made ground materials recovered from areas of proposed rear gardens across the site (See Exploratory Hole Location Plan in Appendix I) were passed onto Chemtech Environmental of Stanley, Co. Durham, so that asbestos screening could be carried out. The catalogue of testing results can be found in the Chemtech Environmental Analytical Report (ref no.: 65215), a copy of which is contained in Appendix II, and the total analysis carried out is summarised below:

- 12 no. Asbestos screens (presence).

The soil contamination results have been used to carryout risk assessments for Human Health for potential asbestos contamination present, and these are discussed in Section 6.0 below and continued on the following page.

6.0 Ground Contamination Risk Assessment

6.1 Level 1 Generic Quantitative Risk Assessment - Human Health:-

6.1.1 Human Health –Asbestos Screening:-

The results of the asbestos screening is summarised in Table 6.1 on the following page and the results have identified the following;

- As can be seen from the samples screened, the results have not identified the presence of any asbestos fibres.

6.0 Ground Contamination Risk Assessment (Cont'd)

6.1 Level 1 Generic Quantitative Risk Assessment - Human Health (Cont'd):-

6.1.1 Human Health –Asbestos Screening (Cont'd):-

Table 6.1

Position	Depth (m)	Chrysotile (white)	Amosite (brown)	Crocidolite (blue)	Anthophyl-lite	Actinolite	Tremolite
TP01	0.00-0.30	NAD	NAD	NAD	NAD	NAD	NAD
TP02	0.00-0.40	NAD	NAD	NAD	NAD	NAD	NAD
TP03	0.00-0.35	NAD	NAD	NAD	NAD	NAD	NAD
TP04	0.20-0.40	NAD	NAD	NAD	NAD	NAD	NAD
TP05	0.15-0.40	NAD	NAD	NAD	NAD	NAD	NAD
TP06	0.10-0.35	NAD	NAD	NAD	NAD	NAD	NAD
TP07	0.00-0.35	NAD	NAD	NAD	NAD	NAD	NAD
TP08	0.00-0.30	NAD	NAD	NAD	NAD	NAD	NAD
TP09	0.00-0.30	NAD	NAD	NAD	NAD	NAD	NAD
TP10	0.15-0.45	NAD	NAD	NAD	NAD	NAD	NAD
TP11	0.15-0.40	NAD	NAD	NAD	NAD	NAD	NAD
TP12	0.00-0.35	NAD	NAD	NAD	NAD	NAD	NAD

NAD = No Asbestos detected, Y = Yes asbestos present, N = No asbestos present.

7.0 Conclusions & Recommendations

7.1 Coal Mining Risk Assessment (Updated):-

For an accurate description of the shallow ground conditions present across the site, reference should be made to the Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, (Ref no: 2012/93-001-CON-RevA – April 2013) which can be seen attached in Appendix III.

From the supplementary investigation works completed, which were undertaken to determine the risk of shallow coal workings and from possible Asbestos contamination, made ground has been recorded generally to a depth of between c.0.70m and c.2.70m below current ground levels (bcgl's) underlain by natural clay deposits to a depth of between c.1.70m and c.3.70m.

Solid deposits comprising interbedded mudstone, sandstone and coal was encountered to a depth in excess of c.20.00m.

Shallow intact coal was encountered across the south eastern portion of the site and also across the north western portion of the site as detailed in Section 4.2. The fault highlighted to trend across the south eastern portion of the site is anticipated to run between RBH01 & 04 and between RBH02 & 03 as shown on the Detailed Geological Cross Sections and Exploratory Hole Location Plan attached in Appendix I.

There was no evidence of workings in the form of broken ground or voids during the excavation of the supplementary boreholes with 100% flush return noted within all boreholes which were taken to a terminal depth of between c.10.00m and c.20.00m.

Therefore, from the results of these supplementary works and also from the Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, (Ref no: 2012/93-001-CON-RevA – April 2013), it is felt that the proposed development can be constructed without the need for incorporating any remedial measures to mitigate against future shallow mining related ground movement.

8.0 Conclusions & Recommendations (Cont'd)

7.2 Ground Contamination (Asbestos Risk Assessment):-

The Remediation Method Statement by GRM Development Solutions Ltd recommended that prior to remedial works being undertaken across the site, a further 12 no. made ground samples should be obtained from a depth up to c.0.60m within proposed rear garden areas, and analysed for the presence of Asbestos. If the presence of asbestos was confirmed, the proposed capping layer should include a 150mm thick anti dig layer. If not, a geotextile at the base of the capping layer would be adequate.

The results of the asbestos screening are summarised in Section 6.0 and have not identified the presence of any asbestos fibres.

Therefore, a geotextile at the base of the capping layer would be adequate for the proposed soft landscaped areas across the site. Further recourse should be made to the Remediation Method Statement by GRM Development Solutions Ltd which can be seen attached in Appendix IV.

END OF REPORT

GENERAL REFERENCES

- Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd, (Ref no: 2012/93-001-CON-RevA – April 2013)
- Remediation Method Statement by GRM Development Solutions Ltd (Ref no: P6671 – August 2014)

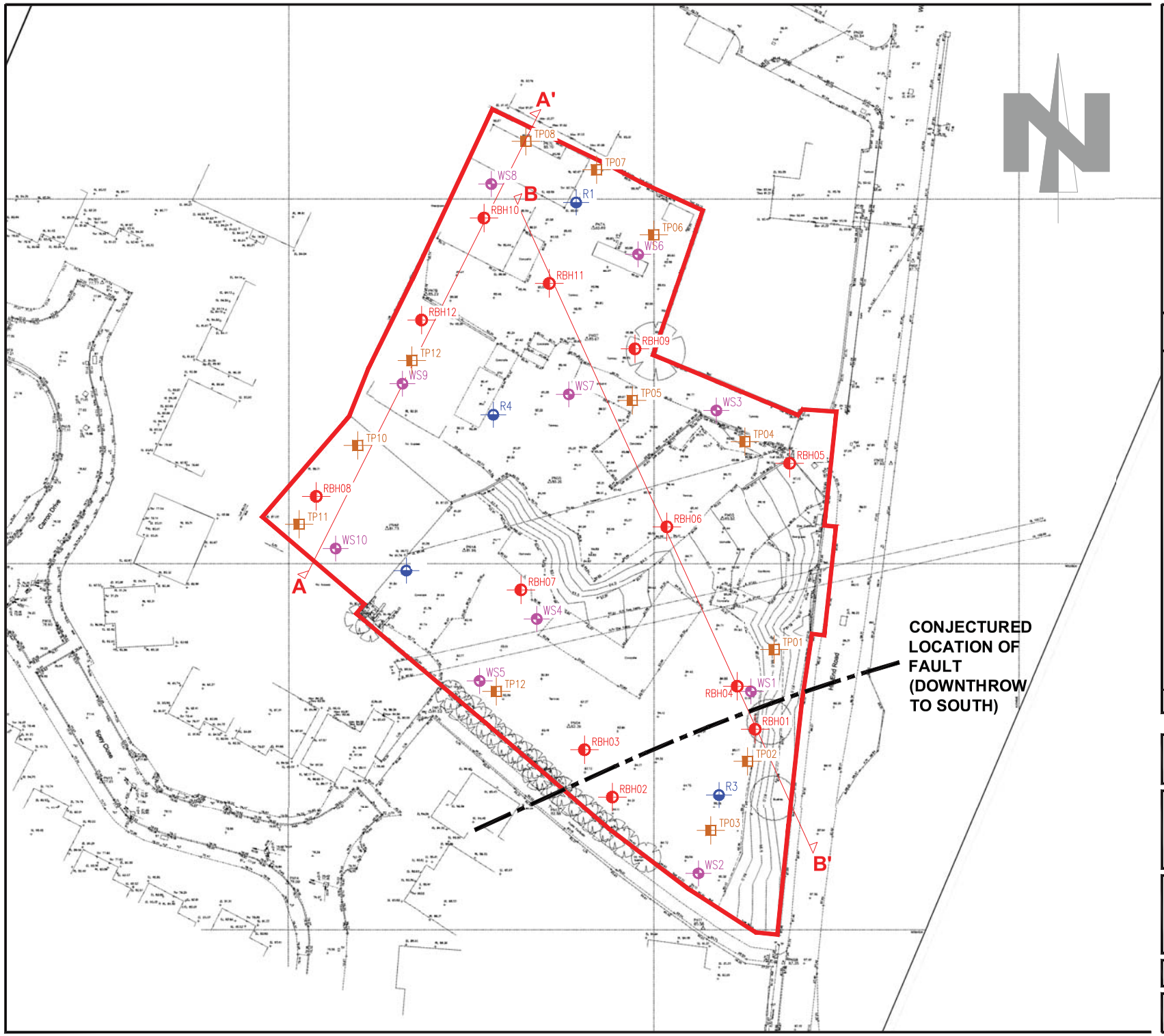
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- BS 5930: 2015: Code of practice for site investigations. British Standards Institution
- BS EN 1997-1: 2004: Eurocode 7 - Geotechnical design. Part 1: General rules. British Standards Institution
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- BS EN ISO 14689-1: 2003: Geotechnical investigation and testing - Identification and classification of rock. Identification and description. British Standards Institution. Amended 2007 (Partially supersedes BS 5930:1999)
- BS EN ISO 22476-3: 2005: Geotechnical investigation and testing. Field testing. Standard penetration test. British Standards Institution
- BS5837: 2012: Trees in relation to design, demolition and construction - recommendations
- NHBC Standards 2007: Chapter 4.2 – Building near trees
- BRE Special Digest 1 2005: Concrete in Aggressive Ground 3rd Edition
- BS10175:2011 + A1:2013: Investigation of potentially contaminated sites – Code of practice
- Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66, 2008 (NHBC, EA, CIEH)
- Asbestos in soil and made ground: a guide to understanding and managing risks, CIRIA C733, 2014
- Assessing Risks Posed by Hazardous Ground Gases to Buildings, CIRIA C665, 2007
- Methane and Associated Hazards to Construction - CIRIA Reports 149,150,151 & 152
- BS8485:2015 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- BS8576:2013: Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds

APPENDIX I

Exploratory Hole Location Plan
Borehole & Trial Pit Record Sheets
Detailed Geological Cross Sections



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The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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LEGEND	
	ROTARY BOREHOLE LOCATIONS RBH01–RBH12
	HAND DUG TRIAL PITS TP01–TP12
	PREVIOUS ROTARY BOREHOLE LOCATIONS R1–R4
	PREVIOUS WINDOW SAMPLE BOREHOLES WS1–WS10

rev.	date	amendments	drawn	chckd

Client:
ESH CONSTRUCTION LTD

Project Title:
Proposed Residential Development
Hill End Road, Mapplewell
Barnsley, S75 6DX

Drawing Title:
Exploratory Hole Location Plan (Existing Layout)

Scale at A3:	Date:	Drawn by:	Approved by:
1:500 @ A3	22.06.17	P.D	M.P.B

Job Ref:	Drg no:	Rev:
16–737	–	–



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LEGEND	
	ROTARY BOREHOLE LOCATIONS RBH01–RBH12
	HAND DUG TRIAL PITS TP01–TP12
	PREVIOUS ROTARY BOREHOLE LOCATIONS R1–R4
	PREVIOUS WINDOW SAMPLE BOREHOLES WS1–WS10

rev.	date	amendments	drawn	chckd

Client:
ESH CONSTRUCTION LTD

Project Title:
Proposed Residential Development
Hill End Road, Mapplewell
Barnsley, S75 6DX

Drawing Title:
Exploratory Hole Location Plan (Proposed Layout)

Scale at A3:	Date:	Drawn by:	Approved by:
1:500 @ A3	22.06.17	P.D	M.P.B

Job Ref:	Drg no:	Rev:
16–737	–	–

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DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	85.18		
Contractor				Sheet
Arc Environmental Ltd				1 of 2

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(1.00) 1.00			Gravelly sand (MADE GROUND).		
					(1.10) 2.10			Brown CLAY.		
					(0.80) 2.90			Brown MUDSTONE.		
					(1.10) 4.00			Black intact COAL.		
					(2.40) 6.40			Yellow brown MUDSTONE.		
					(3.20) 9.60			Grey MUDSTONE.		
					(2.60)			Grey and yellow SANDSTONE.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		2.10			

Rotary Flush

From	To	Type	Returns
0	20	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

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DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	85.18		
Contractor				Sheet
Arc Environmental Ltd				2 of 2

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION			Geology	Instrument/ Backfill
						Discontinuities	Detail	Main		
					12.20			Grey MUDSTONE with sandstone bands.		
					(7.80)					
					20.00			Borehole terminated at 20.00m.		

Drilling Progress and Water Observations						
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing

Rotary Flush			
From	To	Type	Returns

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

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Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	84.11		
Contractor				Sheet
Arc Environmental Ltd				1 of 2

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(0.80) 0.80			Concrete (MADE GROUND).		
					(0.90) 1.70			Brown CLAY.		
					(1.30) 3.00			Black intact COAL.		
					(3.40) 6.40			Yellow brown MUDSTONE.		
					(1.40) 7.80			Grey MUDSTONE.		
					8.00			Black intact COAL.		
					(3.90) 11.90			Grey MUDSTONE.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		1.70			

Rotary Flush

From	To	Type	Returns
0	20	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

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DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	84.11		
Contractor				Sheet
Arc Environmental Ltd				2 of 2

RUN DETAILS			STRATA							
						DESCRIPTION				
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(3.30)			Grey SANDSTONE. *(continued)*		
					15.20			Brown and grey MUDSTONE.		
					(4.80)					
					20.00			Borehole terminated at 20.00m.		

Drilling Progress and Water Observations						
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing

Rotary Flush			
From	To	Type	Returns

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH03
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	83.72		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(0.80) 0.80			Gravelly sand (MADE GROUND).		
					(2.30) 3.10			Yellow CLAY.		
					(2.10) 5.20			Yellow brown MUDSTONE.		
					(1.10) 6.30			Grey MUDSTONE.		
					(3.70) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		3.10			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH04
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	84.88		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(0.70) 0.70			Gravelly sand (MADE GROUND).		
					(1.30) 2.00			Yellow brown CLAY.		
					(4.30) 6.30			Yellow brown MUDSTONE.		
					(2.10) 8.40			Grey MUDSTONE.		
					(1.60) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		2.00			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH05
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	87.12		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(0.80) 0.80			Gravelly sand (MADE GROUND).		
					(1.60) 2.40			Yellow CLAY.		
					(4.00) 6.40			Yellow brown MUDSTONE.		
					(2.40) 8.80			Grey MUDSTONE.		
					(1.20) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		2.40			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH06
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	31-05-17	84.91		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(0.70) 0.70			Gravelly sand (MADE GROUND).		
					(1.50) 2.20			Yellow CLAY.		
					(6.10) 8.30			Yellow brown MUDSTONE.		
					(1.70) 10.00			Yellow SANDSTONE with mudstone bands.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
31-05-17	00.00		2.20			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH07
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	82.54		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(1.00) 1.00			Gravelly sand (MADE GROUND).		
					(1.20) 2.20			Yellow brown CLAY.		
					(3.40) 5.60			Brown MUDSTONE.		
					(2.60) 8.20			Yellow SANDSTONE.		
					(1.80) 10.00			Grey MUDSTONE with sandstone bands.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		2.20			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH08
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	81.73		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(1.30) 1.30			Gravelly sand (MADE GROUND).		
					(0.90) 2.20			Yellow CLAY.		
					(7.80) 10.00			Yellow brown MUDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		1.50			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH09
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	85.72		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(2.50) 2.50			Gravelly sand (MADE GROUND).		
					(0.70) 3.20			Yellow brown CLAY.		
					(3.60) 6.80			Yellow brown MUDSTONE.		
					(2.30) 9.10			Grey MUDSTONE.		
					(0.90) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		3.20			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				**RBH10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	85.64		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(2.70) 2.70			Gravelly sand (MADE GROUND).		
					(0.80) 3.50			Yellow brown CLAY.		
					(2.10) 5.60			Yellow brown MUDSTONE.		
					(0.90) 6.50			Black intact COAL.		
					(1.00) 7.50			Grey brown MUDSTONE.		
					(2.50) 10.00			Yellow and grey SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		3.50			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

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St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH11
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	85.60		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	Geology	Instrument/ Backfill
					(2.60) 2.60			Gravelly sand (MADE GROUND).		
					(1.00) 3.60			Yellow brown CLAY.		
					(3.20) 6.80			Yellow brown MUDSTONE.		
					(0.60) 7.40			Black intact COAL.		
					(0.80) 8.20			Grey brown MUDSTONE.		
					(1.80) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations

Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		3.60			

Rotary Flush

From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

DRILLHOLE LOG

Project				DRILLHOLE No
Hill End Road, Mapplewell				RBH12
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17	85.35		
Contractor				Sheet
Arc Environmental Ltd				1 of 1

RUN DETAILS			STRATA							
Depth	TCR (SCR) RQD	(SPT) Fracture Spacing	Red'cd Level	Legend	Depth (Thick-ness)	DESCRIPTION			Geology	Instrument/ Backfill
						Discontinuities	Detail	Main		
					(2.60) 2.60			Gravelly sand (MADE GROUND).		
					(1.10) 3.70			Yellow brown CLAY.		
					(1.30) 5.00			Yellow brown MUDSTONE.		
					5.50			Black intact COAL.		
					(4.50) 10.00			Yellow SANDSTONE.		
								Borehole terminated at 10.00m.		

Drilling Progress and Water Observations						
Date	Time	Depth	Casing	Core Dia mm	Water Strike	Water Standing
30-05-17	00.00		3.70			

Rotary Flush			
From	To	Type	Returns
0	10	Water	100

GENERAL REMARKS

No voids or soft drilling encountered

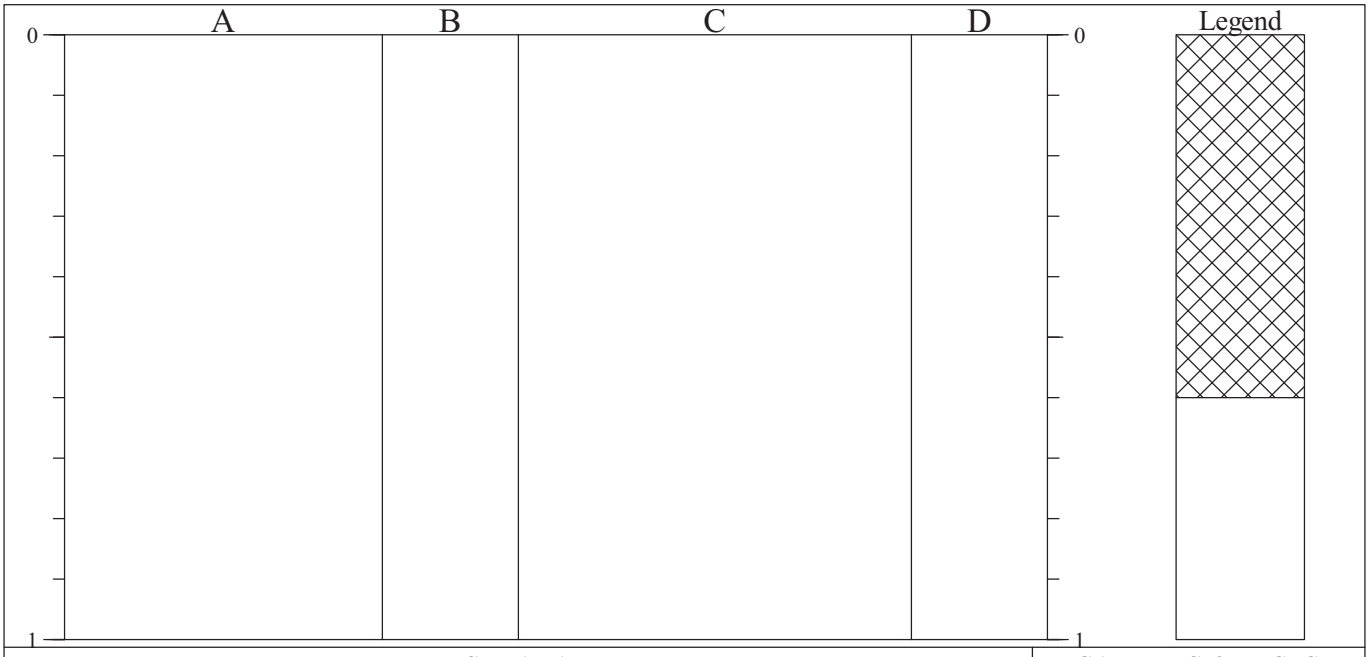
All dimensions in metres Scale 1:75	Client Esh Build	Method/ Plant Used Rotary Open Hole	Logged By AC

AGS3 UK DH LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

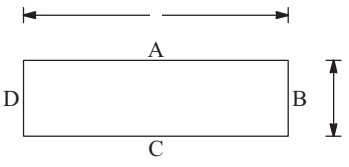
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Dark brown sandy gravelly clayey soil with fragments of plastic, pottery, brick and concrete (MADE GROUND).	0.00-0.30	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

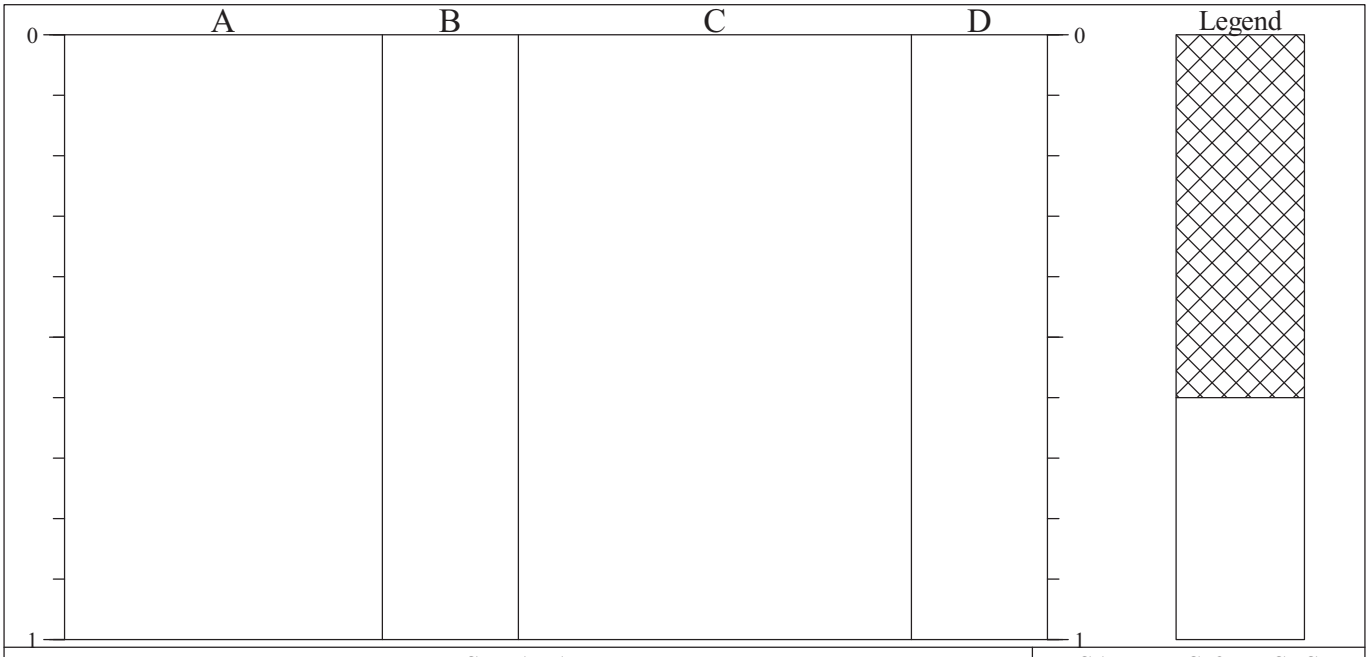
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

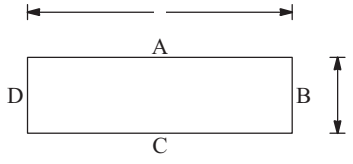
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Grass overlying brown sandy gravelly soil with fragments of brick, slate, glass and dolomitic stone (MADE GROUND).	0.00-0.40	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

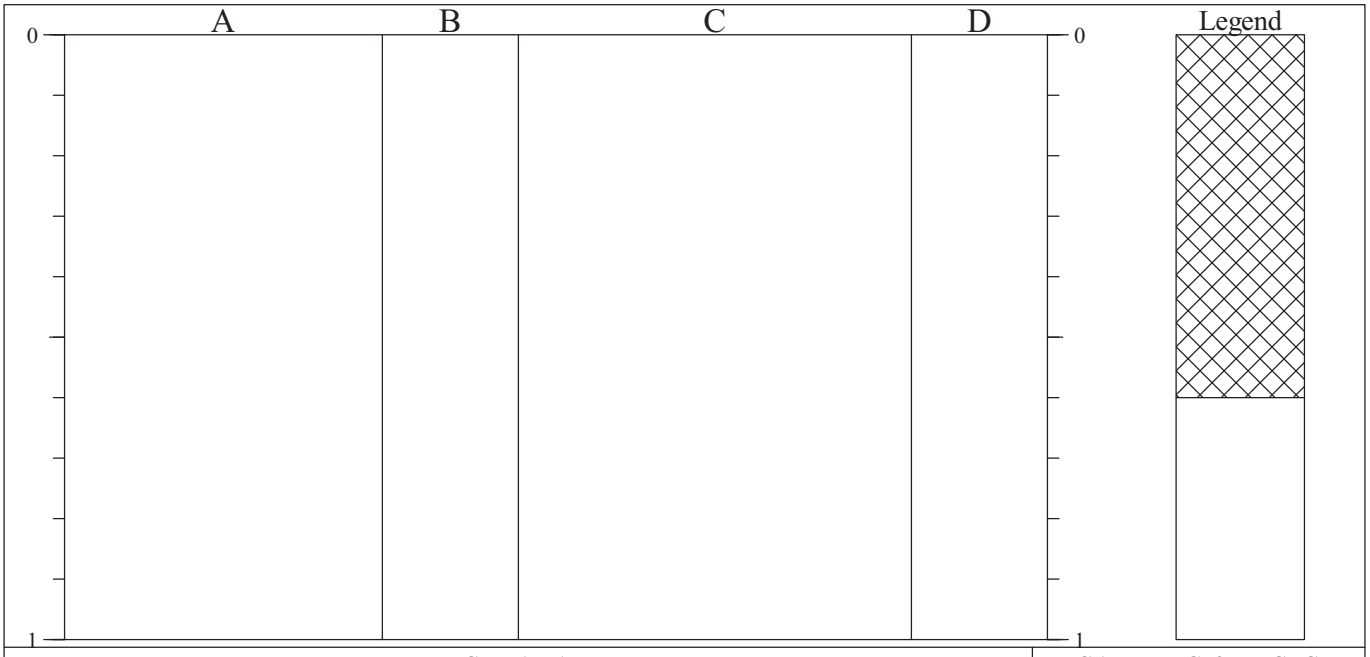
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

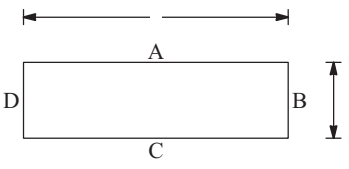
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP03
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Dark brown sandy gravelly clayey soil with fragments of brick, ash and concrete (MADE GROUND).	0.00-0.35	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

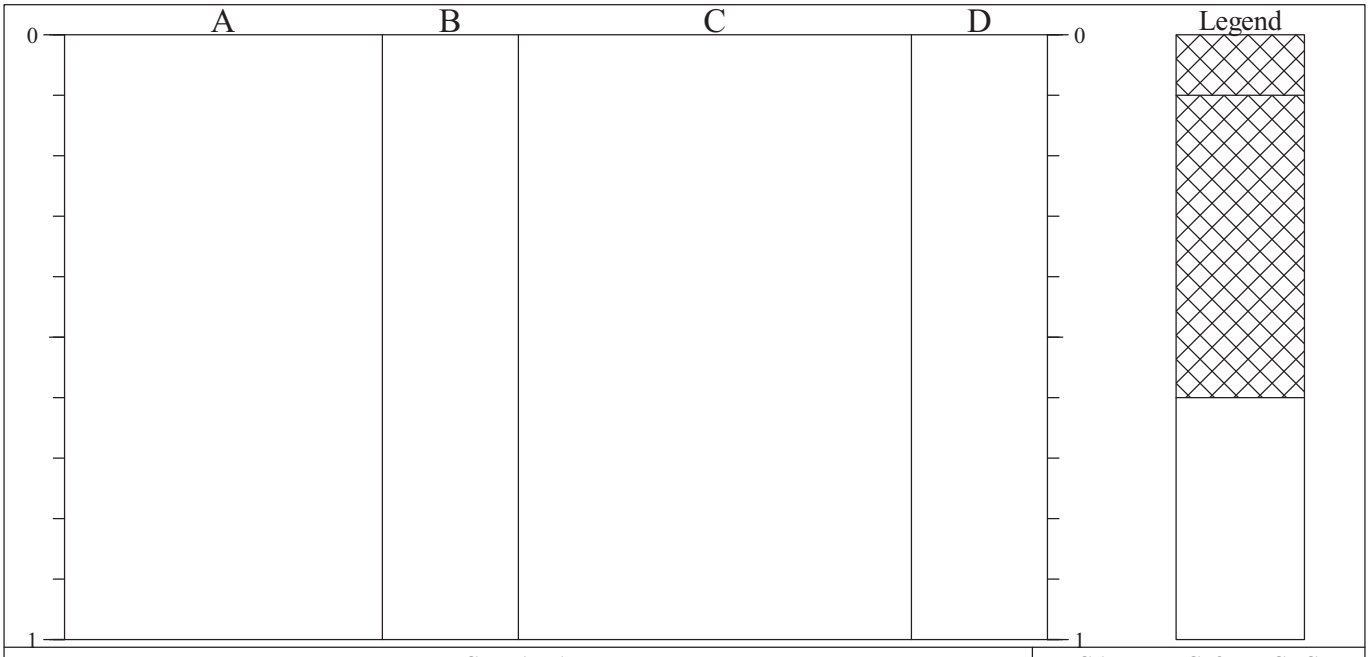
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

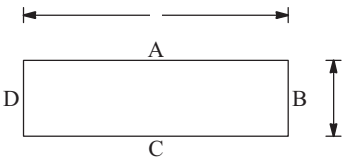
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP04
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		Dark brown sandy gravelly soil (MADE GROUND).			
0.10-0.60		Brown sandy sandstone and brick rubble with fragments of ash (MADE GROUND).	0.20-0.40	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

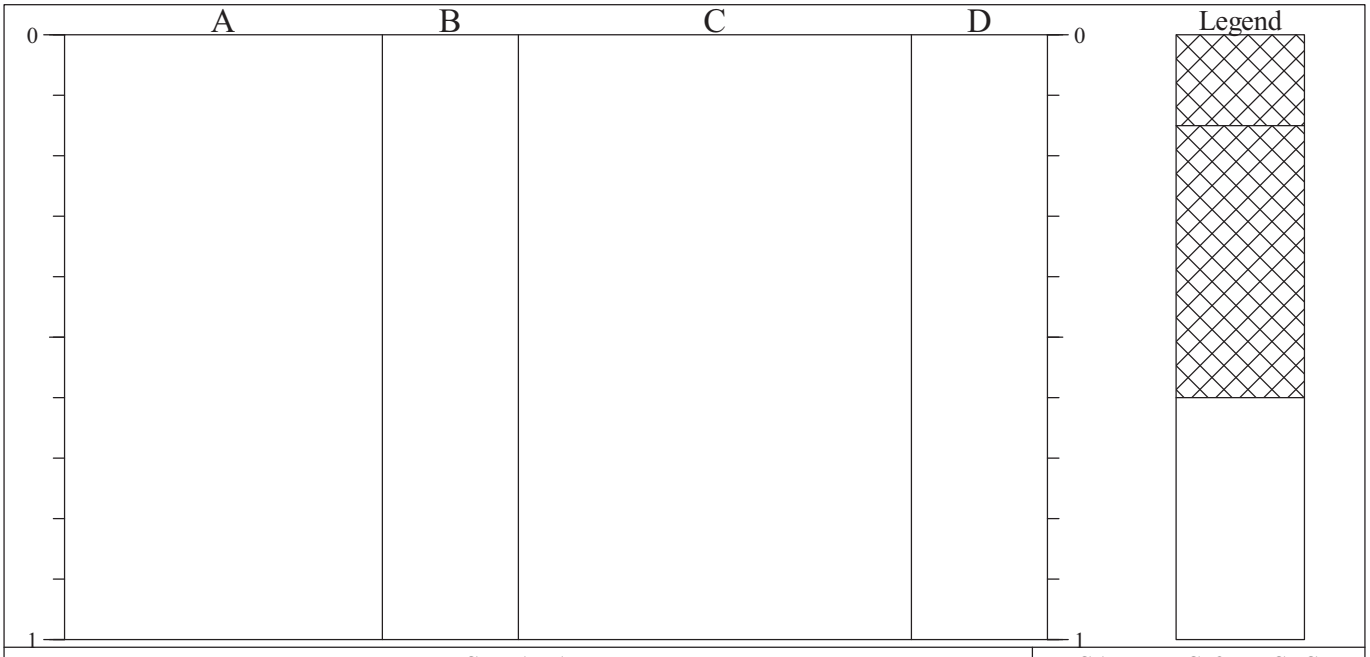
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

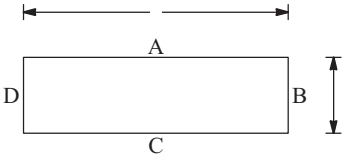
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP05
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		Compact hardcore (MADE GROUND).			
0.15-0.60		Brown sandy sandstone and brick rubble with fragments of ash (MADE GROUND).	0.15-0.40	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

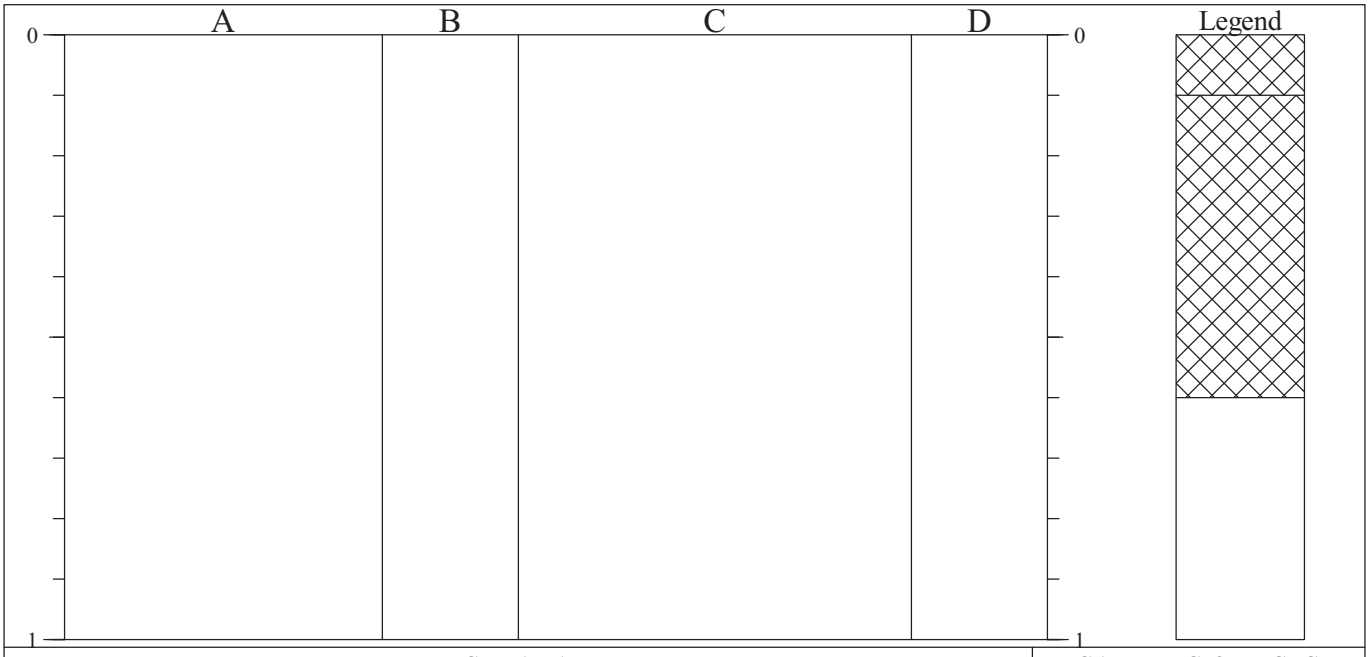
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

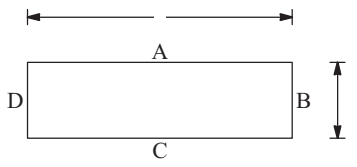
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP06
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		Bituminous surfacing (MADE GROUND).			
0.10-0.60		Dark brown sandy gravelly soil with dolomitic stone and fragments of brick and ash (MADE GROUND).	0.10-0.35	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

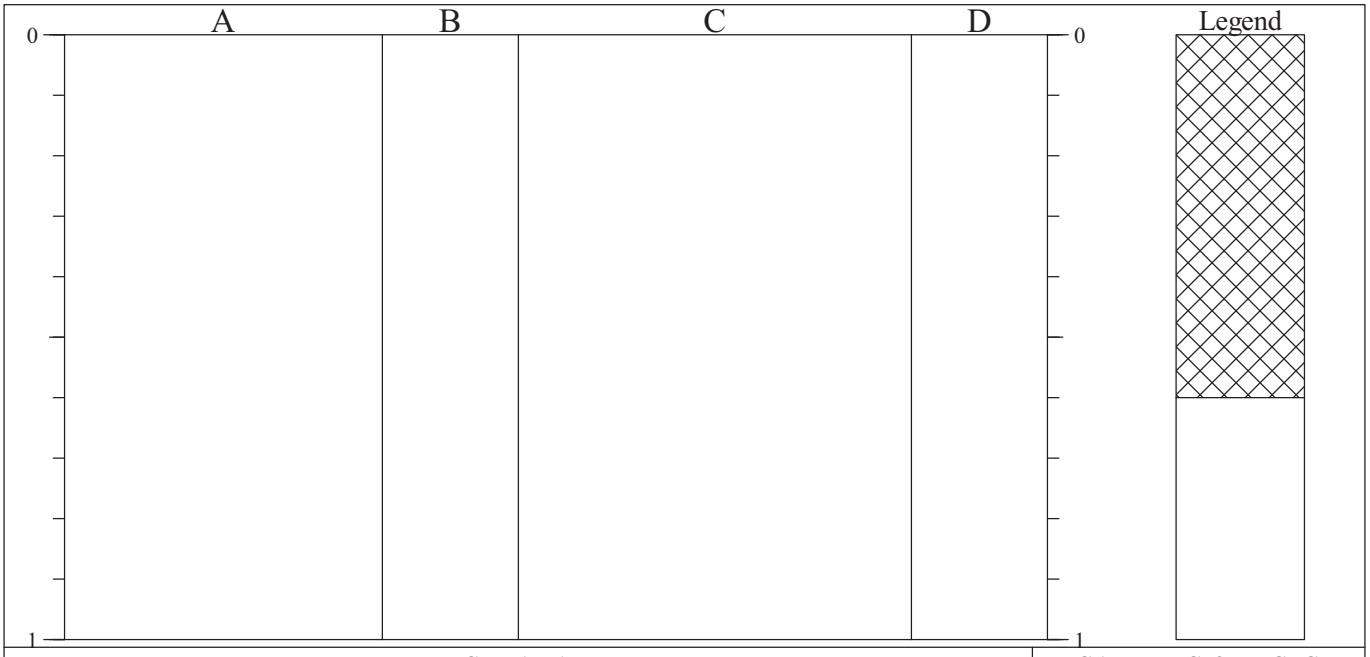
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

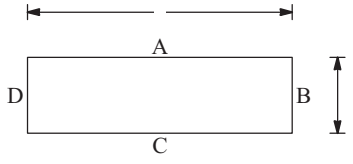
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP07
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Black gravelly ashy soil with occasional whole and half bricks (MADE GROUND).	0.00-0.35	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

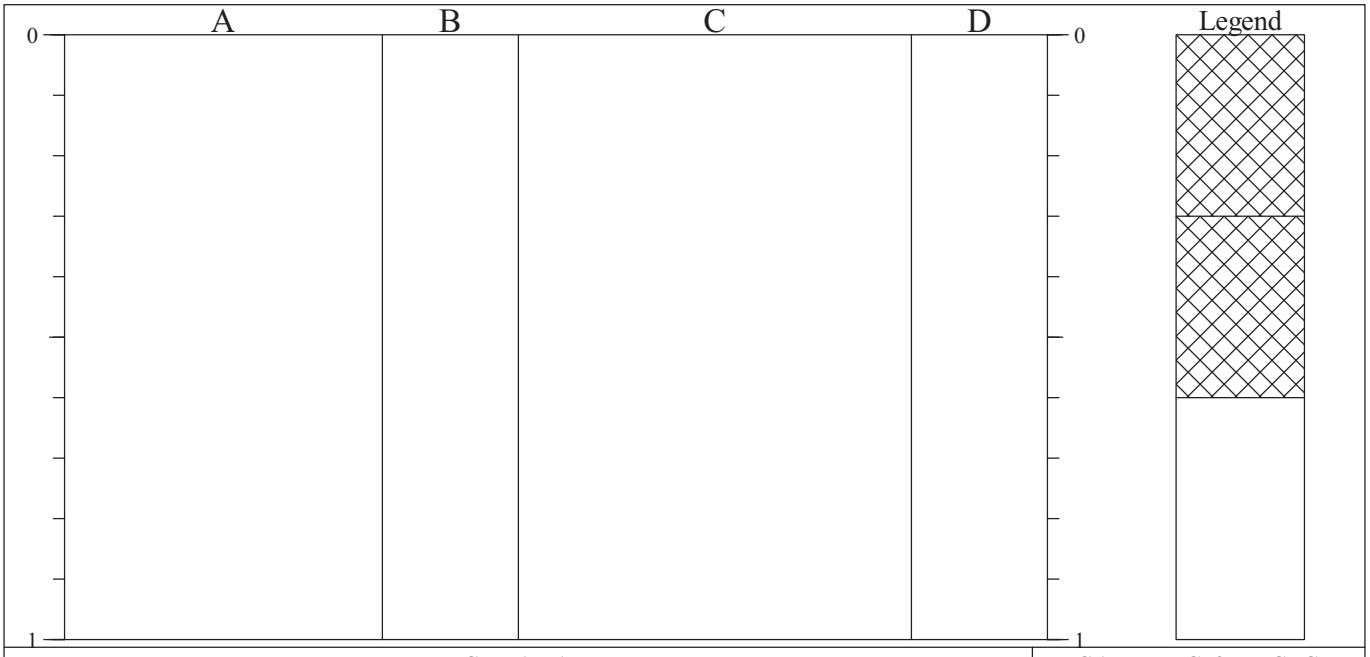
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

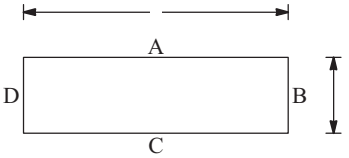
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP08
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		Dark brown sandy gravelly clayey soil with fragments of ash, glass and occasional whole bricks (MADE GROUND).	0.00-0.30	J	
0.30-0.60		Light brown mottled dark brown slightly sandy clay (MADE GROUND).			

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

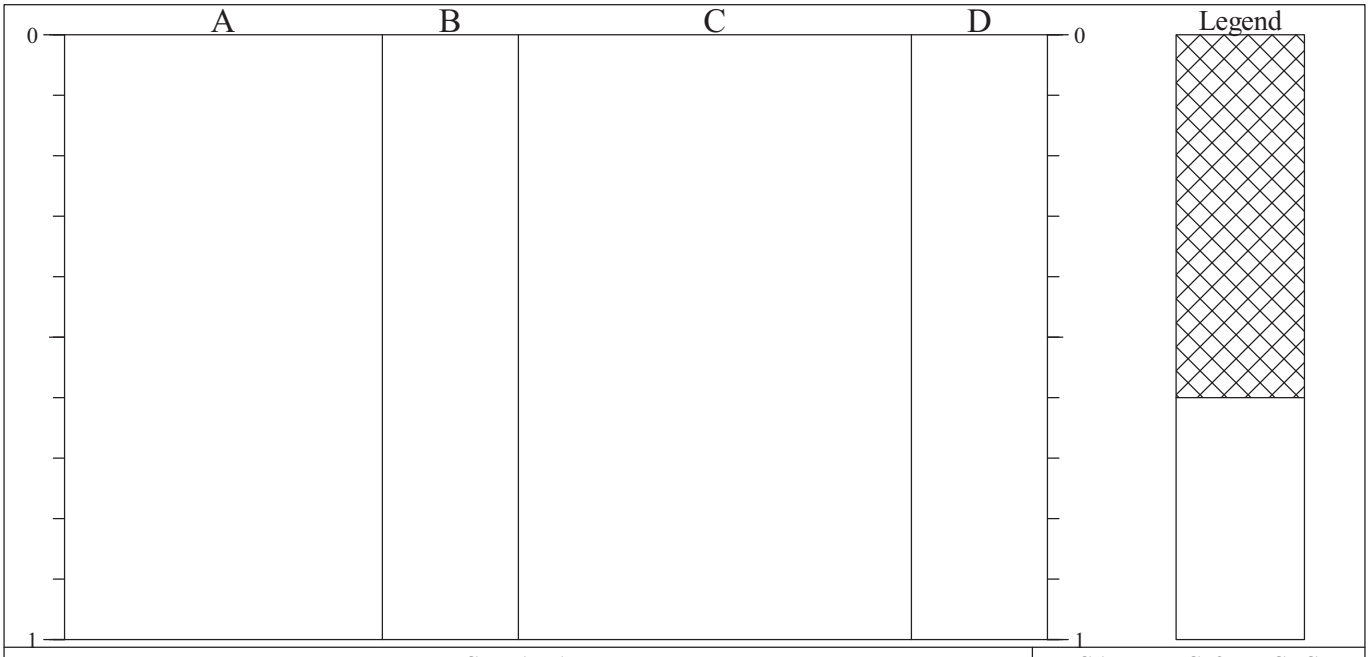
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

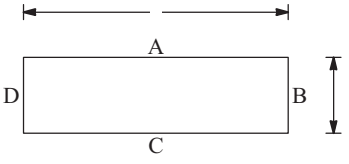
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP09
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Dark brown sandy gravelly clayey soil with whole and half bricks and occasional fragments of ash and concrete (MADE GROUND).	0.00-0.30	J	

Shoring/Support:
Stability:





GENERAL REMARKS

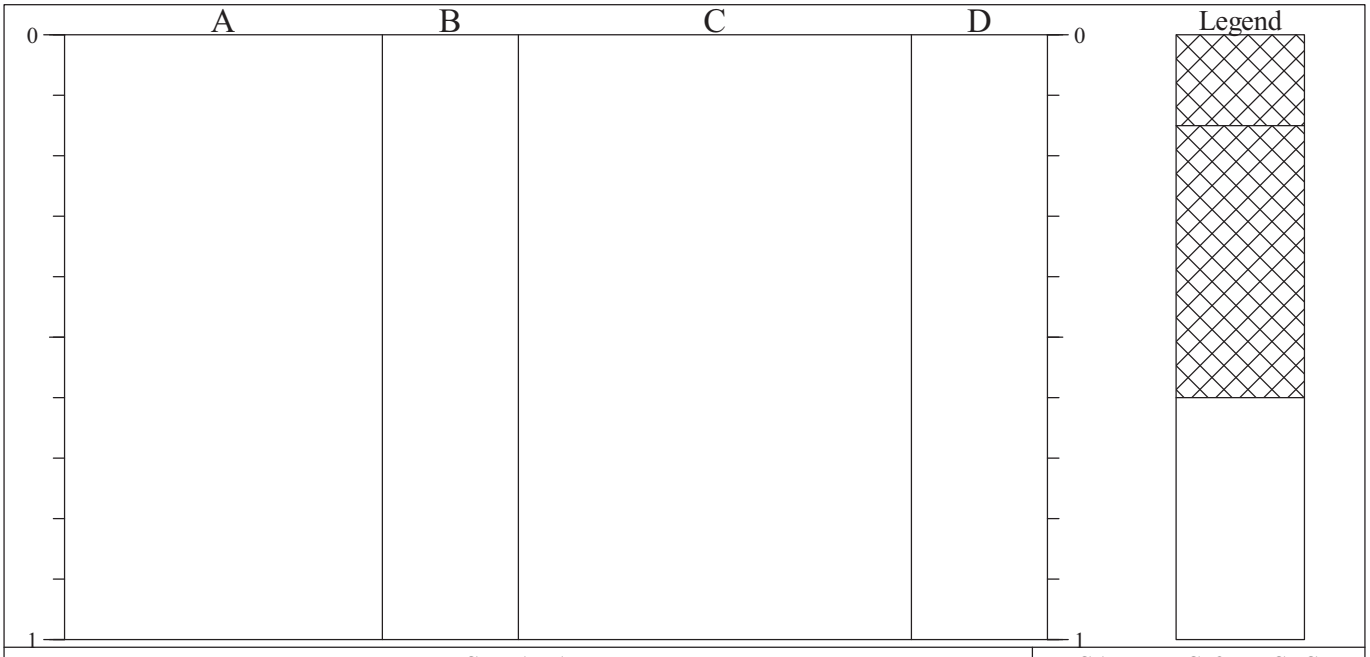
WATER: Trial Pit dry.

All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

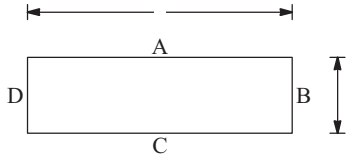
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP10
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		Concrete (MADE GROUND).			
0.15-0.60		Dark brown soily gravelly sand with fragments of dolomitic stone, brick and ash (MADE GROUND).	0.15-0.45	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

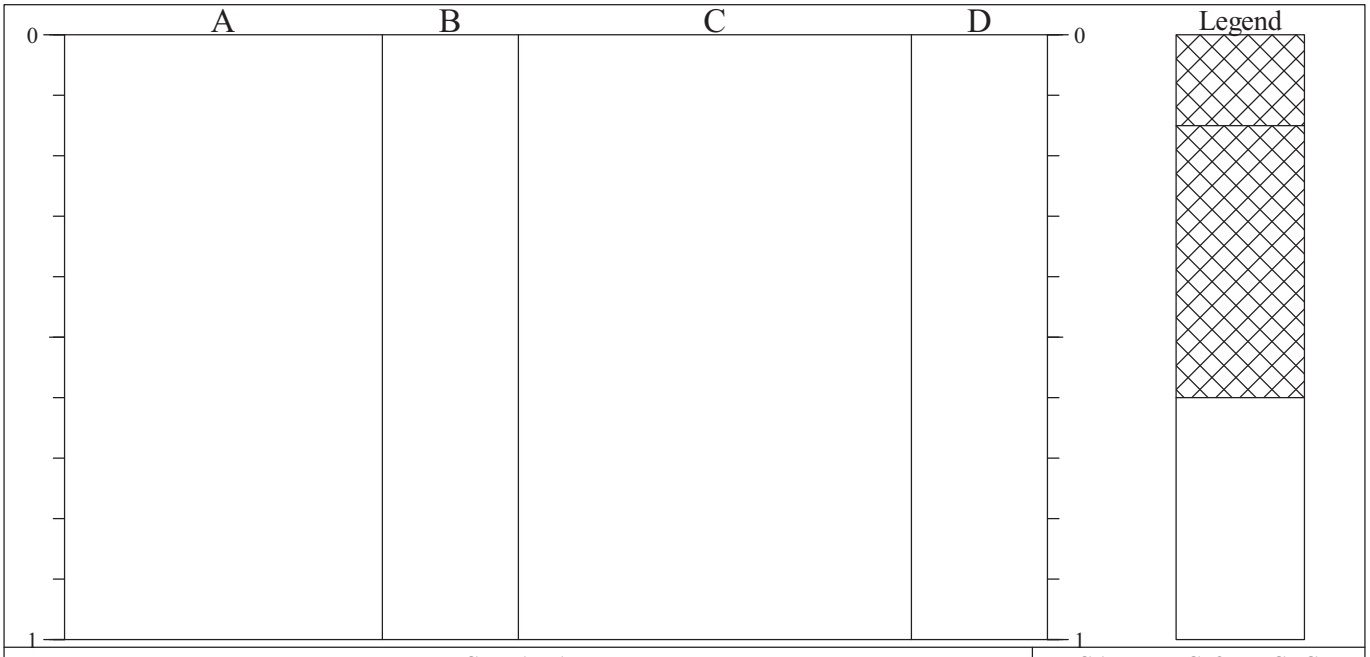
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

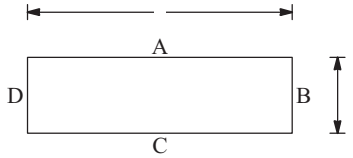
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP11
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.15		Concrete (MADE GROUND).			
0.15-0.60		Dark brown soily gravelly sand with fragments of dolomitic stone, brick and ash (MADE GROUND).	0.15-0.40	J	

Shoring/Support:
Stability:





GENERAL REMARKS

WATER: Trial Pit dry.

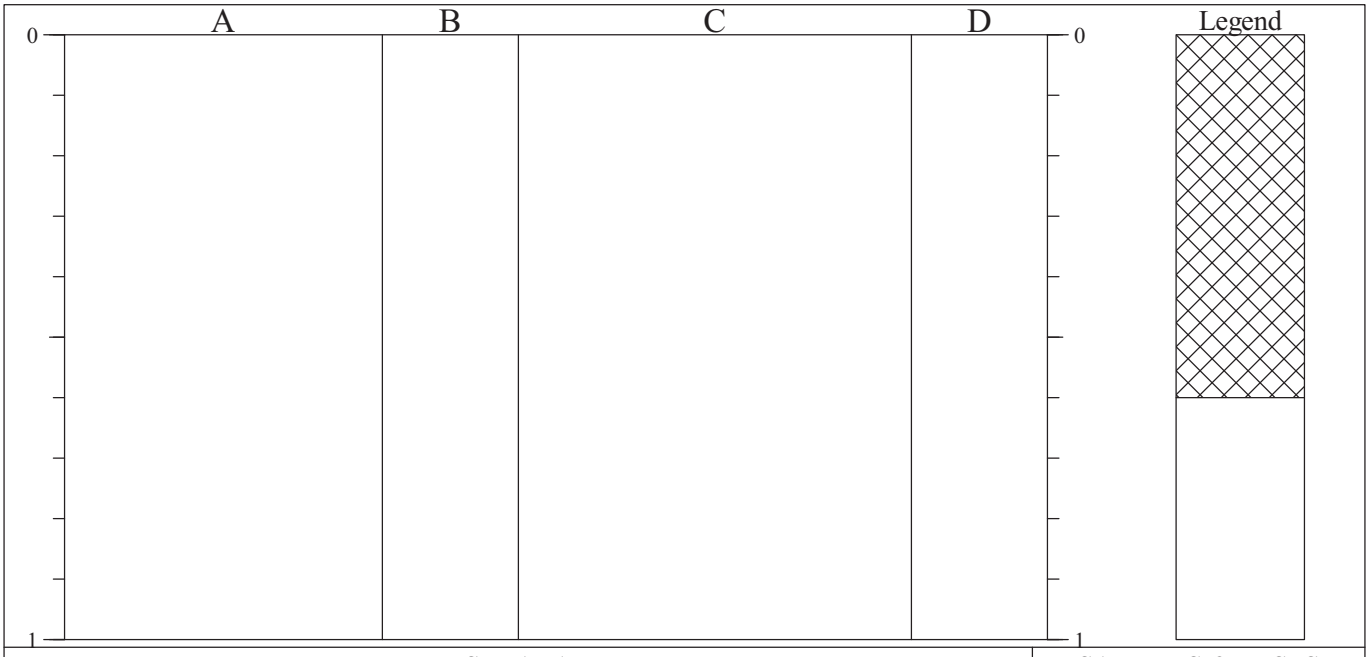
All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17

Solum House, Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham, DH7 8PN
Telephone: 01913786380

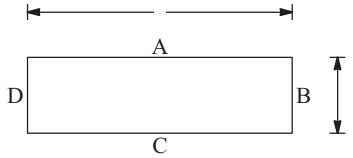
TRIAL PIT LOG

Project				TRIAL PIT No
Hill End Road, Mapplewell				TP12
Job No	Date	Ground Level (m)	Co-Ordinates ()	
16-737	30-05-17			
Contractor				Sheet
Arc Environmental Ltd				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.60		Grass overlying brown sandy gravelly soil with fragments of brick, dolomitic stone and ash (MADE GROUND).	0.00-0.35	J	

Shoring/Support:
Stability:



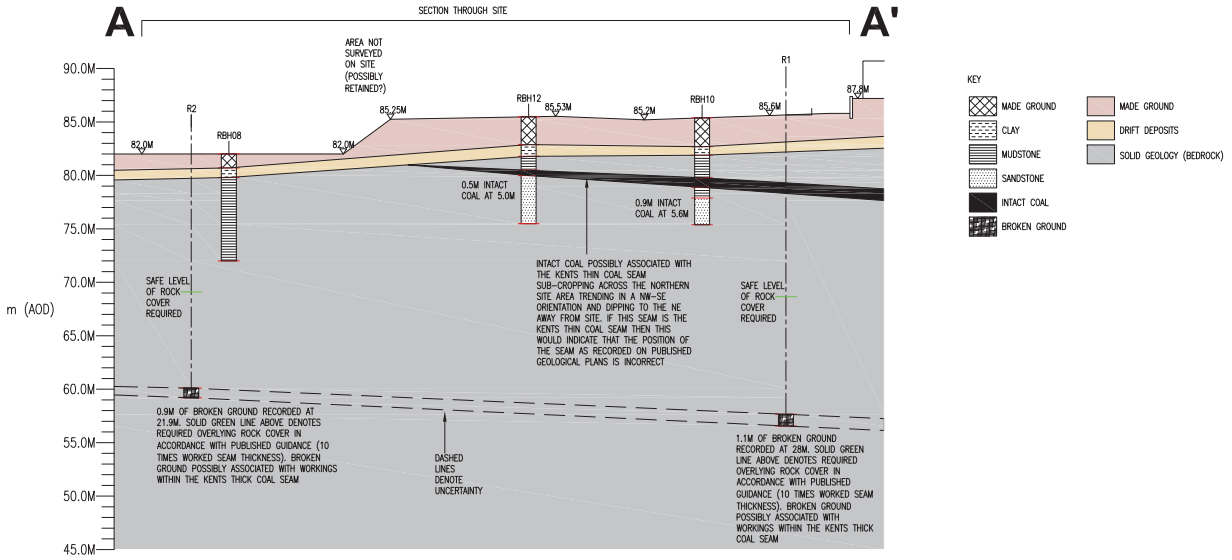


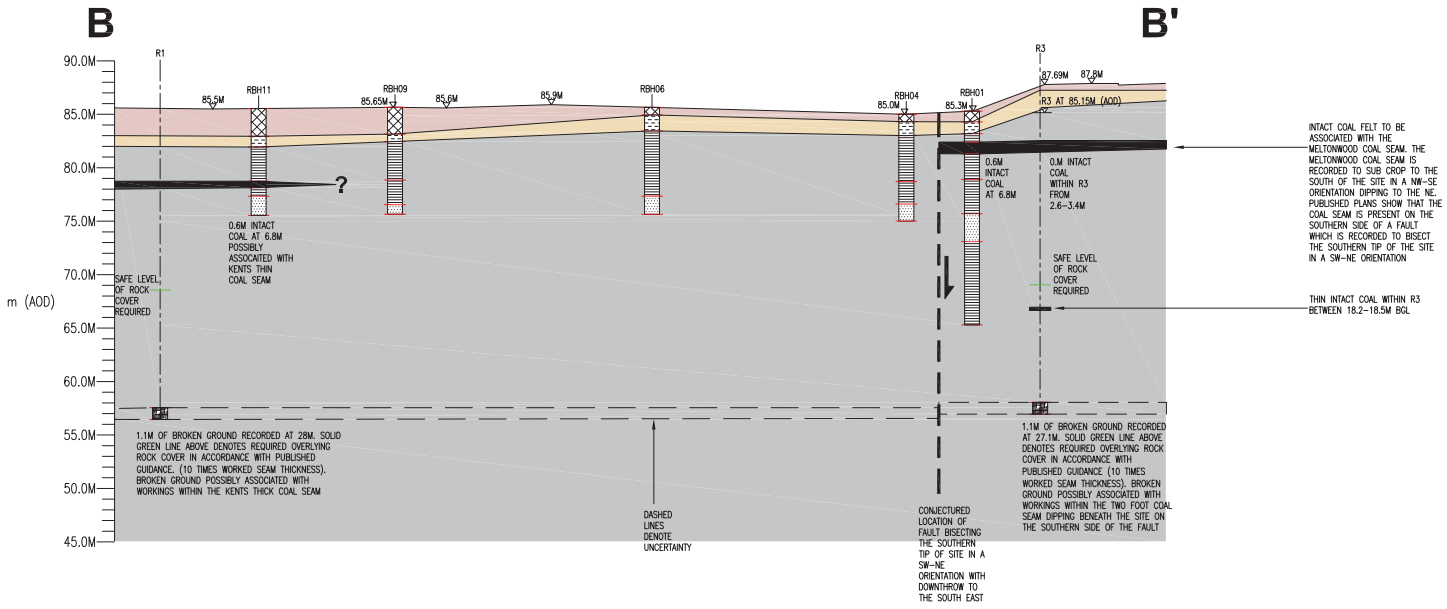
GENERAL REMARKS

WATER: Trial Pit dry.

All dimensions in metres Scale 1:12.5	Client Esh Build	Method/ Plant Used Manual Sampling	Logged By DMC

AGS3 UK TP LOGS 16-737.GPJ AGS3_ALL.GDT 5/6/17





ARC ENVIRONMENTAL LTD
Solum House
Unit 1 Elliott Court
St. John's Road
Meadowfield
Durham, DH7 8PN
Tel: (0191) 378 6380
Fax: (0191) 378 0494
e-mail: admin@arc-environmental.com
web: www.arc-environmental.com

The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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rev.	date	amendments	drawn	chckd

Client:
ESH CONSTRUCTION LTD

Project Title:
Proposed Residential Development
Hill End Road, Mapplewell
Barnsley, S75 6DX

Drawing Title:
Site Cross Sections

Scale at A3:	Date:	Drawn by:	Approved by:
1:500 @ A3	22.06.17	P.D	M.P.B

Job Ref:	Drg no:	Rev:
16-737	–	–

APPENDIX II

Laboratory Results (Ground Contamination)

ANALYTICAL TEST REPORT

Contract no: 65215

Contract name: Mapplewell, Barnsley

Client reference: 16-737

Clients name: ARC Environmental

Clients address: Solum House, Unit 1 Elliot Court
St Johns Road
Meadowfield
DH7 8PN

Samples received: 02 June 2017

Analysis started: 02 June 2017

Analysis completed 09 June 2017

Report issued: 09 June 2017

Notes:
Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

Key:
U UKAS accredited test
M MCERTS & UKAS accredited test
$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:



James Spittle
Customer Services Team Leader

Chemtech Environmental Limited

SOILS

Lab number			65215-1	65215-2	65215-3	65215-4	65215-5	65215-6
Sample id			TP1	TP2	TP3	TP4	TP5	TP6
Depth (m)			0.00-0.30	0.00-0.40	0.00-0.35	0.20-0.40	0.15-0.40	0.10-0.35
Date sampled			31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017
Test	**Method**	**Units**						
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

SOILS

Lab number			65215-7	65215-8	65215-9	65215-10	65215-11	65215-12
Sample id			TP7	TP8	TP9	TP10	TP11	TP12
Depth (m)			0.00-0.35	0.00-0.30	0.00-0.30	0.15-0.45	0.15-0.40	0.00-0.35
Date sampled			31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017	31/05/2017
Test	**Method**	**Units**						
Subcontracted analysis								
Asbestos (qualitative)	$	-	NAD	NAD	NAD	NAD	NAD	NAD

Chemtech Environmental Limited

METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

APPENDIX III

Phase 2 (Ground Investigation) Report by Sub Soil Surveys Ltd

Report No 2012/93-001-CON-RevA

Seddon Construction Ltd
Plodder Lane
Edge Fold
Bolton
BL4 0NN

Carley Daines & Partners
11 Bridgewater Road
Walkden
Worsley
Manchester
M28 3JE

Order Number:S0163/S0004

Phase 2 (Ground Investigation) Report

for the Site of a

Proposed Residential Development

at

Hill End Road, Mapplewell

Barnsley, S75 6DX

30 April 2013

Sub Soil Surveys Ltd.
Manchester

CONTENTS

Foreword

1 Introduction and Object

2 Site Investigation and Soil Profile

3 Groundwater and Excavations

4 Chemical Testing and Appraisal

5 Ground Gas Monitoring

6 Soil Tests and Bearing Capacities

7 Comments

APPENDIX 'A'

Windowless Sampler Borehole Logs

Rotary Borehole Logs

APPENDIX 'B'

i) Classification and Strength Tests - Undrained Triaxial Compression Tests
- Plasticity Index Tests

ii) Chemical Tests - SAL Report 304008-1
- pH and Sulphate Tests

iii) Ground Gas and Groundwater Monitoring (6 of 6 visits completed)

APPENDIX 'C'

Soil Section

Bedrock Section

Fig. 1 Exploratory Hole Location Plan

Fig. 2 Existing Site Plan and Exploratory Hole Locations

Fig. 3 Proposed Site Layout

Report Issue Record

Revision	Date of Issue	Comments
0	07/01/2013	First issue
A	30/04/2013	Updated for final gas monitoring data and recommendations

FOREWORD

This report has been prepared for the sole internal use of and reliance by the named Client. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Sub Soil Surveys Limited. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

The named Client may only place reliance upon the report after full payment of all invoices relating to such reports has been received.

The report should be read in its entirety, including all associated drawings and appendices. Sub Soil Surveys Limited cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third party reports) are based on information obtained from a variety of sources as detailed within this report, and which Sub Soil Surveys Limited believes are reliable. All reasonable care and skill has been applied in examining the information obtained. Nevertheless, Sub Soil Surveys Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

Intrusive investigation can only investigate relatively shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation, whilst fully appropriate, may not have encountered all significant subsurface conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy.

It should be borne in mind that the timescale over which the investigation was undertaken may not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during wetter periods than those encountered during this commission.

Sub Soil Surveys Limited reserve the right to amend their conclusions and recommendations in the light of further information that may become available.

Any queries in relation to this report must be submitted in writing within three months of the date of issue. Any input required from Sub Soil Surveys Limited after this period will be chargeable at standard rates.

1 INTRODUCTION AND OBJECT

1.1 This report has been prepared at the request of Carley Daines & Partners on behalf of Seddon Construction Ltd for a proposed residential development at a Former Builders / Scrap Yard off Hill End Road, Mapplewell, Barnsley, S75 6DX.

1.2 The site lies to the northeast of properties fronting onto Spey Close, to the immediate west of Hill End Road and south of Edward Street. The site is located approximately 3 km north northwest of Barnsley town centre, at approximate National Grid Reference SE 334 951. The site is shown on the appended location plan (Fig. 1).

1.3 It is understood that a planning application has not been submitted to the Local Authority to date. However, information provided by the Client indicates that proposals comprise fourteen two bedroom houses and eleven three bedroom houses with associated access, car parking and private gardens. Existing poplar trees are to remain along the southern boundary of the site.

Details of proposed site levels, preferred foundation type and/or loadings have not been provided at this time.

The proposed layout is outlined on the appended Fig. 3.

1.4 A Preliminary Risk Assessment was undertaken by Carley Daines & Partners in November 2011 and reference should be made to report no. 11-B-9849 dated 16th November 2011 for details of the site history, environmental setting, geology etc.

Copies of the report text and Coal Authority report were provided by the Client for information purposes. A copy of the supplementary data (historical maps, envirocheck data sheets, etc) was not provided.

1.5 The scope of the subsequent investigation works, as agreed with the Client prior to commencement, comprised the drilling of four rotary boreholes, and the sinking of ten windowless sampler boreholes with associated in-situ and laboratory testing for assessment of geotechnical parameters and potential contamination.

Works also included the installation of four standpipes for subsequent monitoring of groundwater and ground gases (six visits over a three month period).

1.6 The object of the investigation was to

a) report on the type, thickness and variability of the strata proved underlying the site

b) to assess the shallow bedrock geology, with specific reference to coal seams and potential mine workings

c) establish local groundwater conditions, if possible

d) determine the maximum safe bearing capacities of the various strata encountered

e) carry out testing for chemical contamination at the exploratory hole positions

f) carry out monitoring for potentially hazardous ground gases in wells established in a number of the exploratory holes

g) comment on the findings

A site walkover survey was outside the scope of work to be undertaken by this company.

2 SITE GEOLOGY

2.1 A desk study of available geological data was undertaken prior to the scoping of the site investigation works.

The following British Geological Survey (BGS) data has been reviewed for the site (NGR 433394, 409509):

- 1:63,360 scale plan Solid with Drift Edition (Sheet 87 - Barnsley)
- 1:25,000 Solid and Drift Edition (SE30 - Barnsley)
- Sheet 87 Geological Memoirs
- Generic online data available from the BGS website

2.2 The site is situated in an area where the geological succession is estimated to be as follows:

i)	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams	- Pennine Middle Coal Measures Strata (Westphalian B)

2.2.1 The 1:63,360 geological solid and drift map of the area indicates the development site to be underlain by outcropping Pennine Middle Coal Measures formation, with general dips of 1 in 21 and 3^0 (1 in 19), to the north northeast, indicated on the mapping to the north of the site.

Alluvial deposits associated with the River Dearne are indicated approximately 100 m south of the proposed development site with boulder clay approximately 65 m to the east.

2.2.2 A northeast - southwest trending fault, with downthrow to the southeast, is shown to cross the southeastern area of the site and is indicated to be conjectured on the more recent 1:25,000 geological scale mapping. Woolley Edge Rock is indicated to subcrop to the east of the fault.

2.2.3 To the west of the fault line, the conjectured outcrops at rockhead of the northwest - southeast trending Kent's Thin Coal seam and Kent's Thick Coal seam are indicated in close proximity to the northeastern site boundary, and approximately 75 m southwest of the site, respectively. The 1:25,000 geology map indicates the Kent's

Thick Coal seam to have been worked in opencast approximately 300 m west of the site.

2.2.4 To the east of the fault line the conjectured outcrops at rockhead of the Meltonfield Coal seam and the Two Foot Coal seams are indicated in close proximity to the southwestern site boundary and approximately 60m southwest of the site respectively. The subcrop of the Abdy Coal seam is indicated a further 100m (approx.) southwest of the site.

2.2.5 The generalised stratigraphical section associated with the 1:25,000 geological map indicates the Meltonfield Coal seam approximately 19 m above the Two Foot Coal seam, which in turn is approximately 15 m above the Abdy Coal seam.

The Kent's Thin Coal seam is indicated approximately 25 m above the Kent's Thick Coal seam.

2.2.6 The New Lidget Shaft (ref. 22) associated with North Gawber Colliery is shown approximately 425 m northwest of the site. The Colliery Shaft section provided on the 1:25,000 geological mapping indicates the Kent's Thin Coal seam approximately 23 m above the Kent's Thick Coal seam.

Details obtained from the BGS website indicate the dip of the strata to be 1 in 12 (3^0) to the northeast, with thicknesses of 2' 6" (760 mm) for the Kent's Thin Coal seam and 3' 7" (1090 mm) for the Kent's Thick Coal Seam.

2.2.7 The memoirs associated with geology sheet no. 87 indicate the Kent's Thick Coal (known locally as the Mapplewell or High Hazles Coal) to range from 24" to 39" (610 mm - 990mm) thick, being thickest around the village of Mapplewell where it was extensively worked as house coal.

The 60 ft to 100 ft (18m - 30m) measures between the Kent's Thick and Kent's Thin Coals are indicated to consist of shales with occasionally a thin coal and rarely a development of sandstone.

The Kent's Thin Coal is stated to usually be between 1 ft 6" and 2 ft thick (450mm - 600mm) with a bed of sandstone lying on or a few feet above the Kent's Thin Coal. It is understood that the seam has been little worked in the district.

2.2.8 From information contained within the geological memoirs, the thickness of the Meltonfield Coal seam is understood to range between 3' 6" and 4' 6" (1065mm - 1370mm). The thickness of the Two Foot Coal seam was noted to be about 2 ft (610mm) thick, as suggested by the name, and is known to have been worked.

The Abdy Coal seam is noted to average a yard (915 mm) in thickness in the north, whilst to the south it is somewhat thinner. The top portion of the seam, with from 27" to 33" (685mm - 838mm) of coal is indicated to be present everywhere in the northern part of the area, where the coal is of good quality and has been considerably mined.

2.3 **Coal Authority Report**

2.3.1 A 'Non Residential' Coal and Brine report (dated 13th November 2012) was provided by the Client for information purposes.

The report states that, according to the records in the possession of the Coal Authority, *"the property is within the likely zone of influence from workings in 4 seams of coal at 100m to 190m depth and last worked in 1949. Any ground movement from these coal workings should have stopped by now.*

In addition, the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past." "The property is not in the likely zone of influence of any present underground coal workings" or "in an area that is likely to be affected at the surface from any planned future workings. However, reserves of coal existing in the local area which could be worked at some time in the future."

2.3.2 Although the Coal Authority report states that *"there is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property",* the document indicates that *"developers should be aware that the investigation of coal seams / former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals".*

2.3.3 The Coal Authority report notes that *"there are no known coal mine entries within, or within 20 metres of, the boundary of the property. Records are incomplete.*

Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge".

2.4 Desk Study Recommendations

Based on the reviewed data it was considered possible that coal seams could lie at shallow depth below rockhead below the site, and further investigation was appropriate.

If the seams were proved to be sufficiently shallow any workings would require infilling with grout, prior to construction works, to prevent major ground movements developing due to their future collapse.

2.4.1 Site works have subsequently been undertaken to establish the shallow bedrock geology and details are provided in section 3. The initial scope of work, comprising three rotary rockbit boreholes, was agreed with the Client prior to commencement.

3 SITE INVESTIGATION AND SOIL PROFILE

3.1 Site works were undertaken between 30 October and 30 November 2012.

Ten windowless sampler boreholes (WS1-WS10) were sunk to depths of between 2.30m and 4.45m bgl at the locations indicated on the appended exploratory hole location plan (Fig 2).

3.2 Ground levels at the exploratory hole locations have been extrapolated from the Topographical Survey Plan (drg. no. SSL:14721:200:1:1 dated July 2012).

Standpipes were installed in boreholes WS2, WS6, WS7 and WS10 for subsequent monitoring of groundwater and ground gases.

The exploratory hole logs are detailed in Appendix A and a soil section is appended.

3.2.1 From these results it can be seen that the soil strata vary between the boreholes but can be approximated as follows:-

Soil Profile

Description of stratum	**Depth to top of stratum (m)**	**Thickness of stratum (m)**	**Remarks**
Concrete, Bitmac, Brick and Topsoil Brown and grey mottled gravelly sandy Clay with fine roots. Dark grey, orange and black sand and gravel with rootlets. Dark grey gravelly Sand / sandy Gravel Dark brown, dark grey, brown and light brown slightly clayey to clayey Sand and Gravel Gravel includes brick fragments, coal fragments, cemented brick pieces, quartzite, concrete, glass pieces, cloth with occasional bitmac, wood, ash, cloth, ceramics and plastic. 'Burnt Shale' noted in WS 3 between 0.35-1.20m. 'Strong Hydrocarbon' odour noted in WS4 between 0.35-0.80m.	0	0.35 - 3.90	Made Ground
Firm, firm/stiff and stiff brown, orange, grey and black mottled	0.35 - 2.90	0.30 - 1.1	Clay

Description of stratum	Depth to top of stratum (m)	Thickness of stratum (m)	Remarks
slightly gravelly very sandy CLAY. Firm, firm/stiff and stiff brown and grey mottled slightly silty slightly gravelly to gravelly CLAY. Noted as possible Made or Disturbed Ground in WS5. Gravel is fine to medium grained, including coal fragments, mudstone and sandstone. Firm greyish brown silty sandy CLAY with roots and a 'strong organic' odour noted in WS7 at 2.9m bgl. Soft zone noted at 3.80-4.00m.			Not proved in WS1, WS5, WS8 and WS9.
Orange, grey and brown slightly silty/clayey/sandy MUDSTONE, very weak Light grey and brown slightly sandy SILTSTONE, very weak (WS3) Brown SANDSTONE (possible cobble or bedrock) noted at 3.9m bgl in WS9. Black COAL (>0.3m thick) encountered at 2.0m bgl in WS2 - recovered as sand and gravel	1.20 - 4.00	>0.45 - >1.35	Mudstone/Siltstone/Sandstone

3.2.2 There could be greater variation in the depths to, and thicknesses of, the various strata between and away from the exploratory hole positions than indicated by the above table or appended Soil Section.

3.2.3 The maximum proved thickness of Made Ground was 3.90 m in WS9. Thicker zones of Made Ground may be present below the site, between and away from the exploratory hole positions (e.g. associated with scrap and building yard buildings foundations, service trenches, levelling and filling materials, etc.).

3.2.4 A strong organic odour was noted in samples retrieved from WS7 (approximately 2.90m - 3.80m bgl). A 'Strong Hydrocarbon' odour was identified in WS4 between 0.35m - 0.80m bgl.

3.2.5 ‘Burnt Shale’ was identified in samples from WS3 (approximately 0.35m - 1.20m bgl). This ground may have a high sulphur content which could affect concrete design.

3.3 **Bedrock Information**

3.3.1 Three rotary boreholes (R1, R2 and R3) were initially drilled to depths of 28m - 30m bgl at the locations indicated on the appended Fig 2.

However, due to the apparent discrepancies in the encountered bedrock geology, a fourth rotary borehole (R4) was drilled within the central western area of the site, as indicated on the appended plan.

3.3.2 The rotary boreholes were advanced by a rock bit with the strata descriptions and boundaries being logged by the foreman driller, based on the rate of penetration and an examination of cuttings in the flush return, hence these can only be considered to be approximate. It is clear, therefore, that strata variation in the ground will only be revealed by Rockbit drilling if there is a contrast between strata types, for example between grey and brown material or a weaker/stronger material. The converse is also true in that where there is little contrast between strata types the technique will not detect a strata boundary, for example a well packed coal working filled with dark grey rock debris etc., into which there was no loss of flush return would not necessarily be distinguished from say a weathered dark grey mudstone deposit. Where the flush return is lost, any logged information is given by the foreman driller based only on the rate of penetration. In this situation the drilling process will only give an indication of either "steady drilling" i.e., indicating solid ground or "loose" or "fast" and "variable" drilling indicating broken ground, voids etc.

3.3.3 The following details which are salient to the shallow mining situation below the site were proved within the rotary boreholes:

Borehole	Stratum	Depth (m bgl)	Thickness (m)	Remarks
R1	Rockhead	2.6	-	
	Brown Mudstone	2.6	5.0	
	Dirty Coal	7.6	0.5	COAL (0.50m thick) 'C'
	Grey Brown Mudstone	8.1	0.9	
	Brown Shaly Sandstone	9.0	0.8	
	Sandstone	9.8	0.2	Fractured - Lost Flush
	Hard Steady Drilling	10.0	17.3	Flush returned at 13.6m - lost again at 15.0m
	Fractured Drilling	27.3	0.3	Fractured
	Hard Steady Drilling	27.6	0.4	
	Firm Steady Drilling	28.0	1.1	*Possible collapsed workings
	Hard Drilling	29.1	>0.9	
R2	Rockhead	1.6	-	

Borehole	Stratum	Depth (m bgl)	Thickness (m)	Remarks
	Weathered Mudstone with bands of fractured sandstone	1.6	10.4	Weathered
	Grey Mudstone	12.0	3.5	
	Grey and Brown Sandstone	15.5	1.5	
	Fractured Sandstone	17.0	0.9	Partial Loss of Flush.
	Grey Brown Sandstone	17.9	2.8	
	Dark Grey Shale with traces of coal	20.7	0.3	Coal traces
	Grey Sandstone	21.0	0.9	
	Soft Drilling	21.9	0.9	Lost flush. *Possible collapsed workings
	Hard Drilling	22.8	2.2	
	Grey Sandstone	25.0	>3.0	Poor return approx. 30%
R3	Rockhead	2.2	-	
	Black Shale	2.2	0.4	
	Coal	2.6	0.8	COAL (0.8m thick) 'A'
	Dark grey Shale	3.4	0.6	
	Brown Mudstone with bands of Sandstone	4.0	5.5	
	Grey and Brown Sandstone	9.5	8.7	
	Coal	18.2	0.3	COAL (0.3m thick) 'B'
	Grey Brown Sandstone	18.5	3.5	
	Fissured Brown Sandstone	22.0	5.1	Fissured - Lost flush between 24.2m, returned between 25.5m- 25.70m
	Soft Drilling	27.1	1.1	*Possible collapsed workings
	Hard Drilling	28.2	>1.8	
R4	Rockhead	4.4	-	
	Weathered grey Mudstone	4.4	3.4	
	Brown Mudstone	7.8	0.4	
	Fractured Sandstone	8.2	>0.30	Lost Flush

*tentative assessment

3.3.4 A section taken approximately south southwest - north northeast through the rotary rockbit boreholes (i.e. at the approximate direction of dip for the strata, as indicated on the geological plans) is appended.

3.3.5 Two of the rotary boreholes (R1 and R3) and one of the windowless sampler boreholes (WS2) encountered coal/dirty coal - at 7.60m bgl (0.50m thick) in R1, at 2.60m bgl (0.80m thick) and 18.20m bgl (0.30m thick) in R3, and at 2.00m bgl (>0.30m thick) in WS2.

3.3.6 Soft and firm drilling, possibly indicative of collapsed workings, was encountered in R1 at 28.0m bgl, in R2 at 21.9m bgl and in R3 at 27.1m bgl.

3.3.7 Loss of flush return, thought to be associated with fissured / fractured Sandstone, was encountered in all the rotary boreholes.

3.3.8 Based on our review of the available geological information we are of the opinion that exploratory holes WS2 and R3, indicated on the appended Bedrock Section, may be located to the east of the northeast - southwest trending fault with boreholes R1, R2 and R4 located to the west.

It is considered that Coal Seam A (0.80m thick in borehole R3) may be the Meltonfield Coal seam.

It is considered that Coal Seam C (0.50m thick in borehole R1) may be the Kent's Thin Coal seam.

The soft and firm drilling may represent collapsed workings in the Abdy Coal seam, to the east of the fault, and the Kent's Thick Coal seam to the west.

It should be appreciated that only a speculative assessment can be provided based on the information currently available.

3.3.9 Where very shallow old coal workings are present below a site it is normal practice to consider that they do not present a risk of major ground movements at the ground surface, due to their collapse, if they are in excess of 10 times the seam thickness below rockhead.

We are of the opinion that there is sufficient bedrock cover to the 'possible' deep workings encountered in R1 at 28.0m bgl, in R2 at 21.9m bgl and in R3 at 27.1m bgl.

Whilst shallow coal was encountered to the east of the fault it is considered that a suitable foundation solution (for example, piled foundations through the coal seam) may be possible to reduce the risks associated with any potential workings. However, since the location of the fault is unknown it is recommended that further investigation is undertaken in the north eastern area of the site to confirm the depth of the shallow coal seam/potential workings. Where piles are to be considered into the bedrock careful consideration should be given to the requirement to maintain adequate bedrock cover to the underlying 'possible' workings.

Further investigation is also recommended into the coal seams and potential shallow workings to the west of the fault in the northwestern area of the site.

3.4 Although the Coal Authority Report states that there are no known coal mine entries within, or within 20 metres of, the boundary of the property, there are many unrecorded old mine entries or trial shafts in these old mining areas. All excavations on the site should be carefully inspected for signs of old mine entries etc. and if any are suspected they should be carefully investigated and stabilised prior to the development proceeding.

4 GROUNDWATER AND EXCAVATIONS

4.1 Standpipes were installed in four of the windowless sampler boreholes (WS2, 6, 7 & 10), with the response zone details presented on the relevant borehole logs.

4.2 Groundwater observations during the drilling operations are detailed in the exploratory hole logs and tabulated below, together with a summary of the observations during the subsequent monitoring of the standpipes:

Groundwater Observations

Exploratory Hole	Depth on striking groundwater (m bgl)	Level after 20 mins (m bgl)	Estimated seepage	Stratum in which observed during drilling	Highest recorded water level in standpipe[#] (m bgl)
WS1, WS3-WS5, WS8 and WS9	-	-	-	-	Not installed
WS2	-	-	-	-	0.30 (initial site visit) 1.27
WS6	-	-	-	-	1.39
WS7	-	-	-	-	2.64
WS10	-	-	-	-	2.70

#Gravel response zones are indicated on the appended exploratory hole logs

4.3 Water flush was used throughout the drilling of the three rotary rockbit boreholes (R1 - R4) in accordance with the Coal Authority's document "Guidance on Managing Risks of Hazardous Gases When Drilling or Piling Near Coal". As a consequence groundwater levels could not be recorded in these holes.

4.4 The observations within the windowless sampler boreholes indicate that groundwater was not encountered, suggesting that the groundwater table was either below the base of the hole, or that the ingress of groundwater was not noted due to the nature of the drilling process.

4.5 Six groundwater monitoring visits have been undertaken over a three to four month period. During the initial monitoring visit on 28th November 2012 the standpipes were purged following the recording of water levels to allow the groundwater to equilibrate within the wells prior to the succeeding monitoring visits.

The water levels in the individual boreholes have remained relatively consistent during the subsequent monitoring period ; 1.27 - 1.95 m bgl in BH3, 1.39 - >2.00 m bgl (standpipe dry) in WS6, 2.64 - 2.70 m bgl in WS7 and 2.70 - >3.00m bgl (standpipe dry) in WS10.

4.6 Higher water levels and groundwater in the Made Ground should be expected during and after periods of wet weather with correspondingly lower levels during protracted dry spells.

4.7 Groundwater control may be required in excavations to be taken below any water table in order to prevent the onset of 'running' conditions or the 'piping' and 'heaving' of the base of excavations. Any system of groundwater control to be adopted at this site should be designed and operated so as to prevent the loss of 'fines' from the surrounding ground thereby causing a loss of support and attendant settlement to the ground and any nearby structures, etc.

4.8 Adequate lateral support should be provided for the vertical sides of all deep excavations at this site in accordance with CIRIA Report 97 “Trenching Practice.

5 CHEMICAL TESTING AND APPRAISAL

5.1 Human Health Risk Assessment

A Preliminary Risk Assessment report was produced by Carley Daines & Partners in November 2011 and reference should be made to report no. ES11-B-9849 dated 16th November 2011 for details of site history, environmental setting, potential contaminants and recommendations for further investigation.

5.2 Chemical testing was undertaken on eleven soil samples (appended SAL Report 304008-1) obtained from varying shallow depths within the exploratory holes. In order to address the recommendations of the Preliminary Risk Assessment, all samples were tested for the following determinands:

i) Metals, Semi-Metals

ii) pH and Sulphate

iii) Speciated Polycyclic Aromatic Hydrocarbons (PAHs)

iv) Carbon Banded Hydrocarbons (fuel and oil)

In addition the following testing was undertaken on a selected number of samples

i) Asbestos ID

ii) Semi Volatile Organic Compounds (SVOC).

iii) Volatile Organic Compounds (VOC).

5.3 A detailed asbestos survey lies outside the scope of this investigation, although any strata suspected of containing such materials during any physical investigation or groundwork on the site should be subjected to appropriate analysis/appraisal.

Eight soil samples were tested as part of the human health risk assessment and Chrysotile asbestos was detected in two samples: WS1 at 0.5m bgl and WS4 at 0.50m bgl.

5.3.1 The table below provides a summary of the appended chemical results and presents a comparison with published SGV's for the CLEA ‘Residential with the consumption of homegrown produce' scenario. At present the Environment Agency is in the process of producing new SGV using the recently updated CLEA model, these being released sporadically on a piecemeal basis. They are also taking the opportunity to revisit the Health Criteria Values (HCV) used as inputs to the model, and in some cases the advised exposure routes within the model compared to previously published figure. Where an SGV is not currently available we have referred to the Atkins ATRISKsoil SSV which have been derived for the same exposure scenario although they cannot

reflect changes to the HCV/exposure routes yet to be published. As new SGV are released, therefore, the following appraisal will need to be reassessed against them. The ATRISKsoil SSV are Confidential and the values quoted are specific to this site and should not be disclosed to third parties, or used for any other site, by any reader of this report under any circumstance.

Summary of Chemical Test Results

Contaminant/ Parameter	Concentration (mg/kg except pH)			DEFRA/ EA Generic SGV or Atkins SSV (see text[1]) for Residential end use - mg/kg (CLEA 1.04-1.06)	Comments
	Min.	Max.	Mean		
Asbestos	Eight samples tested. Chrysotile detected in the sample from WS1 0.5m and WS4 0.5m				
Arsenic	3	170	26	32 (SGV)	Exceeds SGV in 2 samples WS3 D2 0.50m WS10 D2 0.50m
Cadmium	<1	1	<1	10 (SGV)	Low concentrations
Chromium (total)	8	330	85	Sum of Chromium III and VI is 12915	Low concentrations
Chromium VI	<1	<1	<1	14.2 (SSV)	Low concentrations
Copper	22	530	97	3,970 (SSV)	Low concentrations
Lead	24	670	148	276 (SSV)	Exceeds SSV in 2 samples WS5 D1 0.20m WS10 D2 0.50m
Mercury	<1	<1	<1	170 (SGV see text[3])	Low concentrations
Nickel	8	79	27	130 (SGV)	Low concentrations
Selenium	<3	<3	<3	350 (SGV)	Low concentrations
Zinc	65	1,000	188	16,900 (SSV)	Low concentrations
pH	6.4	9.8	-		
Polyaromatic Hydrocarbons (PAH)	0.03	73	-	-	
Naphthalene	<0.01 *<0.1*	0.20 *0.2*	0.09	0.585 (SSV)	Low concentrations
Acenaphthene	<0.01 *<0.1*	1.4 *0.1*	0.25	588 (SSV see text[4])	Low concentrations
Fluorene	<0.01 *<0.1*	0.43 *0.7*	0.15	615 (SSV see text[4])	Low concentrations
Anthracene	<0.01 *<0.1*	1.2 *0.3*	0.38	8,270 (SSV see text[4])	Low concentrations
Fluoranthene	<0.01 *<0.1*	11 *2.2*	3.0	822 (SSV see text[4])	Low concentrations
Pyrene	<0.01 *<0.1*	11 *2.0*	3.0	563 (SSV see text[4])	Low concentrations

Contaminant/ Parameter	Concentration (mg/kg except pH)			DEFRA/ EA Generic SGV or Atkins SSV (see text[1]) for Residential end use - mg/kg (CLEA 1.04-1.06)	Comments
	Min.	Max.	Mean		
Benzo(a)Anthracene	0.01 *<0.1*	5.6 *1.0*	1.3	4.52 (SSV see text[4])	Exceeds SSV in 1 sample WS7 D2 0.50m
Chrysene	<0.01 *<0.1*	6.0 *0.9*	1.3	585 (SSV see text[4])	Low concentrations
Benzo(b)Fluoranthene	<0.01 *<0.1*	9.6 *1.1* *(b/k)*	1.8	7.72 (SSV see text[4])	Exceeds SSV in 1 sample WS7 D2 0.50m
Benzo(k)Fluoranthene	<0.01 *<0.1*	6.9 *1.1* *(b/k)*	1.4	84.4 (SSV see text[4])	Low concentrations
Benzo(a)Pyrene	<0.01 *<0.1*	7.0 *0.6*	1.5	0.818 (SSV)	Exceeds SSV in 5 samples WS3 D2 0.50m, WS6 D1 0.20m, WS7 D1 0.20m, WS7 D2 0.50m, WS8 D1 0.40m
Indeno(123-cd)Pyrene	<0.01 *<0.1*	4.3 *0.3*	1.0	7.31 (SSV see text[4])	Low concentrations
Dibenzo(ah)Anthracene	<0.01 *<0.1*	1.2 *0.1*	0.27	0.838 (SSV see text[4])	Exceeds SSV in 1 sample WS7 D2 0.50m
Benzo(ghi)Perylene	<0.01 *<0.1*	4.8 *0.4*	1.1	96.2 (SSV see text[4])	Low concentrations
Phenol	*<0.1*	*<0.1*	<0.1	162	Low concentrations
2,4,6-Trichlorophenol	*<0.1*	*0.3*	-	-	Proved in WS4 0.50m
2,6-Dinitrotoluene	*<0.1*	*0.4*	-	-	Proved in WS4 0.50m
2-Methylnaphthalene	*<0.1*	*0.3*	-	-	Proved in WS4 0.50m & WS10 0.50m
2-Nitrophenol	*<0.1*	*0.3*	-	-	Proved in WS4 0.50m
4-Nitroaniline	*<0.1*	*0.4*	-	-	Proved in WS4 0.50m
4-Nitrophenol	*<0.1*	*0.4*	-	-	Proved in WS4 0.50m
VOCs	All measured VOC concentrations (USEPA 624) were below the level of detection.				
Total Petroleum Hydrocarbons (TPH)	<6	3,657	-		
C8-C10	<1 & <10	12	<7	9.79 (SSV see text[5])	Exceeds SSV in 1 sample WS8 D1 0.40m

Contaminant/ Parameter	Concentration (mg/kg except pH)			DEFRA/ EA Generic SGV or Atkins SSV (see text[1]) for Residential end use - mg/kg (CLEA 1.04-1.06)	Comments
	Min.	Max.	Mean		
C10-C12	<1 & <10	90	<17	57.3 (SSV see text[5])	Exceeds SSV in 1 sample WS8 D1 0.40m
C12-C16	<1 & <10	280	<45	142 (SSV see text[5])	Exceeds SSV in 1 sample WS4 0.50m
C16-C21	<1 & <10	460	146	272 (SSV see text[5])	Exceeds SSV in 3 samples WS4 D1 0.50m WS6 D1 0.20m WS7 D1 0.20m
C21-C35	2	3,300	888	888 (SSV see text[5])	Exceeds SSV in 4 samples WS6 D1 0.20m WS7 D1 0.20m WS7 D2 0.50m WS8 D1 0.40m

In the comments column 'Low Concentrations' etc. refers to the measured concentration relative to the assessment criteria noted in the text.

Analysis has been based on 1% SOM (conservative).

[1]Atkins Revision 3, dated 31/03/2011

[2]Not Used

[3]In the table we have compared the measured mercury concentrations with the SGV for inorganic mercury since the equilibrium concentrations of elemental and methylmercury compounds are likely to be very low.

[4]The PAH SSV values are the ATRISKsoil values derived for the situation where no free product is visible.

[5]In the table the measured TPH concentrations have been compared with the lowest of the published SSV for Aliphatic or Aromatic compounds. As any given sample will contain a mixture of Aliphatic and Aromatic compounds this approach is conservative.

5.3.2 The tests have been carried out on 'spot' samples hence higher (or lower) concentrations of contaminants may well be present below the site between and away from the exploratory hole positions.

5.3.3 The results of the above contamination testing indicate levels of Arsenic, Lead, PAH, (Benzo(a)Anthracene, Benzo(b)Fluranthene, Benzo(a)Pyrene, Dibenzo(ah)Anthracene) and TPH (C8-C10, C12-C16, C16-C21 and C21-C35) above the SSV/SGV derived for the 'Residential with the consumption of homegrown produce' end use scenario.

In addition Chrysotile asbestos was detected in two samples from WS1 0.5m bgl and WS4 0.50m bgl.

5.4 **Environmental Risk Assessment**

Although testing of leachate/groundwater was outside the scope of works, it is our opinion that it would be prudent to undertake testing based on the measured concentrations of various contaminants.

5.5 Sulphate and pH tests were carried out on samples of the soil. The results are detailed and tabulated in Appendix B and summarised below:

Soil

Sulphate Concentration = 0.05 - 0.06 g/l SO_3 in 2:1 water/soil extract
= <0.1- 0.5 g/l SO_4 in 2:1 water/soil extract (SALReport)

pH = 5.0 - 9.8

Reference should be made to BRE Special Digest 1 (2005) for further details regarding ACEC classification.

6 GROUND GAS MONITORING

6.1 The Preliminary Risk Assessment (Report ref 11-B-9849 dated 16th November 2011) identified a risk to site end users from ground gas migration. Table 5 of the document identified surrounding refuse heaps/infilling, Made Ground and Coal measures as potential sources of ground gas.

6.2 Standpipes were installed in four boreholes (WS2, WS6, WS7 & WS10) with the response zone details presented on the borehole logs. The standpipes were fitted with gas taps and have been monitored on six occasions over a three to four month period for the presence of Methane, Carbon Dioxide and Oxygen using a Gas Data LMS Xi instrument. Subsequent to the gas readings being obtained, the gas taps were briefly removed to allow measurement of the groundwater level in the standpipes and then replaced to allow the standpipe atmosphere to equilibrate prior to the succeeding monitoring visit.

6.3 During the initial monitoring visit on the 28th November 2012 the standpipe installations were purged following the recording of the water level to allow the groundwater to equilibriate within the well prior to the succeeding visit.

6.4 The results for the ground gas monitoring visits are appended.

From the results it may be seen that a relatively consistent set of gas data has been obtained with no Methane measured within the standpipes. Carbon Dioxide concentrations up to 3.9% by volume were measured in the standpipes.

The ground gas concentrations and gas flow readings produce a Gas Screening Value (GSV) of 0.027 l/hr, based on the maximum gas flow of 0.7 l/hr. Taking into account the site conditions, the general trend of the data and the low recorded gas flows it is our opinion that the site should be placed within Characteristic Situation 1 (CS1) / NHBC ‘Green’ category of CIRIA document C665, which is very low risk.

From CIRIA C665, table 8.6 it can be seen that no special ground gas precautions are required, beyond the adoption of a well constructed ground floor slab with DPM as standard guidance.

Our recommendations are provided for guidance purposes and should be submitted to the Local Authority for comment/approval.

All service ducts, entries and other confined spaces in contact with the ground on the site should be assumed to contain potentially hazardous concentrations of potentially explosive and/or asphyxiating gases, Carbon Dioxide and depleted Oxygen levels and hence should be tested and ventilated prior to man access.

6.5 As noted in section 3.0 of the ‘Preliminary Risk Assessment Report’ “the site is indicated as being within an area affected by Radon, and Radon protection measures are recommended".

6.6 Any excavations through the coal stratum should ensure that exposed coal surfaces are sealed to prevent ingress of air (combustion risk) or egress of gases.

7 SOIL TESTS AND BEARING CAPACITIES

7.1 The following in-situ and laboratory tests were carried out in order to provide the required data for assessment of soil characteristics and for estimation of the maximum safe bearing capacities of the various deposits:

i) Standard Penetration Tests carried out in the boreholes. Detailed results are tabulated in the borehole logs (Appendix 'A') and "N" values (blows per 300mm) are plotted in Fig 1.

It should be noted that although the window sampling equipment utilises the Standard Penetration Test weight and drop height (detailed in BS 1377), the constraints on the falling weight may affect the test outcome.

ii) Plasticity Index Tests on disturbed/undisturbed samples.

iii) Hand penetrometer tests carried out on disturbed and undisturbed samples.

From the above it may be seen that:

7.2 Made Ground

Standard Penetration Tests undertaken in this deposit returned results of:

N = 3 - 27 blows for 300 mm penetration.

Due to the variable nature of the deposit the Made Ground is considered unsuitable for supporting foundations in its current state.

7.3 Glacial Clay

This deposit was generally proved to be a firm to stiff slightly gravelly silty sandy Clay. However, a 0.20 m thick layer of soft stratum was noted at 3.8 m bgl in WS7.

Measured undrained shear strength values ranged from :

Cu = 26 kN/m^2 (WS7) to 131 kN/m^2

Standard Penetration Tests undertaken in this deposit returned results of:

N = 12 - 21 blows for 300 mm penetration

We estimate the maximum safe bearing capacity of the firm to stiff deposit to be:

100 kN/m^2 (strip foundations)

Plasticity Index Tests undertaken on the shallow strata gave results of:

Borehole	Depth (m bgl)	% passing 0.425mm	Moisture Content	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
WS4	1.20-1.65	98.1	17	39.6	21.9	17.7
WS5	1.20-2.0	98.5	23	44.7	22.7	22.0

which indicates the clay to be of intermediate plasticity (BS:1377 and BS:5930) and low to medium shrinkage (volume change) potential soil with respect to tree root action (NHBC; Building Near Trees).

7.4 Bedrock

This deposit was generally proved to be very weak Mudstone/Siltstone, with coal proved at 2.0 m bgl in WS2.

Standard Penetration Tests (SPT's) undertaken in the deposit returned results of

N = 21 - 60 blows for 300mm penetration

We estimate the safe bearing capacity for the very weak bedrock to be at least:

150 kN/m^2 for SPT >20 (strip foundations)

450 kN/m^2 for SPT >30 (end bearing pile foundations)

A specialist piling contractor may consider that, with his piling system, a higher maximum safe end bearing capacity can be safely adopted for the competent mudstone. If so, this should be justified from his experience on similar deposits and/or pile loading tests.

7.5 The above maximum safe bearing capacities are nett values. The gross maximum safe bearing capacities can be obtained by adding the pressure at formation level of the soil surrounding the footing to the nett values.

$$\text{i.e. MSBC (gross)} = \text{MSBC (nett)} + \frac{\gamma D}{102} \text{ kN/m}^2$$

where D = depth of soil surrounding footing (m)

γ = average density of soil strata above formation level (kg/m^3)

8 COMMENTS

8.1 It is understood that a planning application has not been submitted to the Local Authority to date. However, information provided by the Client indicates that proposals comprise fourteen two bedroom houses and eleven three bedroom houses with associated access, car parking and private gardens. Existing poplar trees are to remain along the southern boundary of the site.

Details of proposed site levels, preferred foundation type and/or loadings have not been provided at this time.

The proposed layout is outlined on the appended Fig. 3.

8.2 Coal Mining Recommendations

8.2.1 The 1:63,360 geological solid and drift map of the area indicates the development site to be underlain by outcropping Pennine Middle Coal Measures formation, with general dips of 1 in 21 and 3^0 (1 in 19), to the north northeast.

A northeast - southwest trending fault, with downthrow to the southeast, is shown to cross the southeastern area of the site and is indicated to be conjectured on the more recent 1:25,000 geological scale mapping.

To the west of the fault line, the conjectured outcrops at rockhead of the northwest - southeast trending Kent's Thin Coal seam and Kent's Thick Coal seam are indicated in close proximity to the northeastern site boundary, and approximately 75 m southwest of the site, respectively. The 1:25,000 geology map indicates the Kent's Thick Coal seam to have been worked in opencast approximately 300 m west of the site.

To the east of the fault line the conjectured outcrops at rockhead of the Meltonfield Coal seam and the Two Foot Coal seams are indicated in close proximity to the southwestern site boundary and approximately 60m southwest of the site respectively. The subcrop of the Abdy Coal seam is indicated a further 100m (approx.) southwest of the site.

8.2.2 The Coal Authority report, provided by the Client, states that *"the property is within the likely zone of influence from workings in 4 seams of coal at 100m to 190m depth and last worked in 1949. Any ground movement from these coal workings should have stopped by now. In addition, the property is in an area where the Coal*

Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past."

8.2.3 Four rotary boreholes (R1, R2, R3 and R4) were initially drilled to depths of 28m - 30m bgl at the locations indicated on the appended Fig 2.

Two of the rotary boreholes (R1 and R3) and one of the windowless sampler boreholes (WS2) encountered coal/dirty coal - at 7.60m bgl (0.50m thick) in R1, at 2.60m bgl (0.80m thick) and 18.20m bgl (0.30m thick) in R3, and at 2.00m bgl (>0.30m thick) in WS2.

Soft and firm drilling, possibly indicative of collapsed workings, was encountered in R1 at 28.0m bgl, in R2 at 21.9m bgl and in R3 at 27.1m bgl.

8.2.4 We are of the opinion that there is sufficient bedrock cover to the 'possible' deep workings encountered in R1 at 28.0m bgl, in R2 at 21.9m bgl and in R3 at 27.1m bgl.

Where very shallow old coal workings are present below a site it is normal practice to consider that they do not present a risk of major ground movements at the ground surface, due to their collapse, if they are in excess of 10 times the seam thickness below rockhead.

We are of the opinion that there is sufficient bedrock cover to the 'possible' deep workings encountered in R1 at 28.0m bgl, in R2 at 21.9m bgl and in R3 at 27.1m bgl.

Whilst shallow coal was encountered to the east of the fault it is considered that a suitable foundation solution (for example, piled foundations through the coal seam) may be possible to reduce the risks associated with any potential workings. However, since the location of the fault is unknown it is recommended that further investigation is undertaken in the north eastern area of the site to confirm the depth of the shallow coal seam/potential workings. Where piles are to be considered into the bedrock careful consideration should be given to the requirement to maintain adequate bedrock cover to the underlying 'possible' workings.

Further investigation is also recommended into the coal seams and potential shallow workings to the west of the fault in the northwestern area of the site.

8.3 Although the Coal Authority Report states that there are no known coal mine entries within, or within 20 meters of, the boundary of the property, there are many unrecorded old mine entries or trial shafts in these old mining areas. All excavations on the site should be carefully inspected for signs of old mine entries etc. and if any are suspected they should be carefully investigated and stabilised prior to the development proceeding.

8.4 Geotechnical Recommendations

8.4.1 Made Ground up to 3.90m thick was proved in the exploratory holes, although thicker zones may be present elsewhere (e.g. associated with old foundations, service trenches, levelling and filling materials, coal measures, etc.).

The Made Ground was generally underlain by a relatively thin band of firm to stiff Clay. However a band of soft Clay was proved in borehole WS7 at 3.8 m bgl.
A very weak Mudstone/Siltstone bedrock was proved in all boreholes at 1.20 - 4.00 m bgl, with black coal proved at 2.0mbgl in WS2.

8.4.2 We are of the opinion that the Made Ground, in its current state, is unsuitable for the support of structures within the proposed development due to the risks of excessive total and differential settlements developing.

Foundations should therefore be taken below the Made Ground and established into the natural deposits.
Taking into account the variable thickness of the Made Ground and the potential issues associated with the shallow coal seams/'possible' workings it is recommended that a foundation strategy be formulated following the results of the recommended additional investigation works.

8.4.3 It should be appreciated that differential movements will tend to develop where foundations for the same structure are formed in different strata. It is advised therefore that wherever possible the foundations are kept within the same strata.

8.4.4 Foundation / slab design should take into account the shrinkage potential of the cohesive strata, the impact of existing trees/shrubs and the potential effect of any landscaping proposals.

It is understood that existing poplar trees are to remain along the southern boundary of the site. Consideration should be given to the proximity of proposed structures and the potential impact of any groundworks on the stability of the trees.

8.4.5 Any excavations through the coal stratum should ensure that exposed coal surfaces are sealed to prevent ingress of air (combustion risk) or egress of gases.

8.4.6 Should piled foundations be considered for the development it is possible that further investigation will be required. Advice should be sought from a specialist piling contractor in this respect.

8.4.7 It would be advisable for the formation of any shallow foundations to be checked by an experienced Geotechnical Engineer in order to confirm the suitability of the strata.

8.4.8 It should be noted that obstructions (floor slabs, foundations, large pieces of masonry etc.) and relatively thick fill may be encountered as a result of the historical site use.

8.5 Recommendations for Remediation

8.5.1 The results of the above contamination testing indicate levels of Arsenic, Lead, PAH, (Benzo(a)Anthracene, Benzo(b)Fluranthene, Benzo(a)Pyrene, Dibenzo(ah)Anthracene) and TPH (C8-C10, C12-C16, C16-C21 and C21-C35) above the SSV/SGV derived for the 'Residential with the consumption of homegrown produce' end use scenario.

In addition Chrysotile asbestos was detected in two samples from WS1 0.5m bgl and WS4 0.50m bgl.

8.5.2 Due to the proved levels of contaminants on the site it may be prudent to undertake leachate and groundwater testing on the site to assess any potential risks to controlled waters. Advice should be sought from the Environment Agency in this respect.

8.5.3 In addition further investigation is recommended to determine the extent of the ‘hydrocarbon’ contamination in the central and northern areas of the site (WS4, WS6, WS7 and WS8), with any contaminated material removed from site prior to construction works.

8.5.4 We are of the opinion that the measured levels of contamination may safely remain in place below the proposed structures and hardstanding of the development, subject to satisfactory resolution of the additional investigation works recommended above. However, in any unsurfaced, soft landscaped areas or patio area, where prolonged human contact with the soil is possible it is recommended that a remediation exercise be undertaken. This should ensure that the average contamination levels in the

surface 600mm of material (min 150mm topsoil overlying approved subsoil) should lie below the relevant SGV/SSV.

Where Made Ground is to remain insitu at the formation level of the unsurfaced, soft landscaped or patio areas it is recommended that a 150 granular break layer with underlying geotextile is provided.

Alternatively, a specialist contractor should be consulted regarding non-landfill solutions.

8.5.5 Any material to be imported should be confirmed by testing to be suitable for use prior to placement to avoid any removal / replacement costs should exceedences be found. The Local Authourity may, however, also require testing to be undertake post placement to demonstrate that the material remaining on site is appropriately uncontaminated.

8.5.6 At this stage our outline recommendations for site remediation are provided for guidance purposes only and our report should be submitted to the Local Authority for comment/approval.

It is likely that a detailed remediation strategy document will be required following Local Authority approval of the Phase 2 Report but prior to commencement of construction.

8.5.7 As part of the development work to be undertaken on the site a careful inspection of all excavations should be undertaken and any materials which may be suspected to contain higher levels of or different contaminants (in particular oils or other hydrocarbons) than those reported in this investigation should be subject to further relevant testing and appraisal.

8.5.8 Construction personnel should be adequately protected from contact with the soils by the use of appropriate construction hygiene precautions e.g. suitable protective clothing, gloves, no smoking or eating, etc. and dust minimisation measures should be adopted to minimise risks to construction personnel and the general public.

8.5.9 Disposal of soil from the site may attract a premium, however reference should be made to the relevant tip operators and waste disposal authority regarding this issue. More detailed testing may be needed to fully classify the waste and achieve the most economic disposal route.

8.5.10 Sulphate and pH tests were carried out on samples of the soil. Reference should be made to BRE Special Digest 1 (2005) for further details regarding ACEC classification.

8.5.11 Details of proposed service routes have not been provided at this stage. Protection should be provided to site utilities as deemed appropriate by the service providers, with particular reference to potable water supply.

It is possible that the water supply company will require sampling and testing of ground along the route of proposed water supply pipelines, to a depth of approximately 500mm below the based of the pipe.

8.6 As noted in Section 3 of the Desk Study Report (Report ES11-B-9849 - 16th November 2011) “the site is indicated as being within an area affected by Radon and Radon protection measures are recommended” this should be checked with the Local Authority before proceeding.

8.6.1 As noted in section 3.0 of the ‘Preliminary Risk Assessment Report’ “the site is indicated as being within an area affected by Radon, and Radon protection measures are recommended". Requirements should be confirmed with the Local Authority.

8.6.2 Monitoring of ground gases for the presence of Methane, Carbon Dioxide and Oxygen has been undertaken, with six site visits completed over a three to four month period.

Taking into account the site conditions, the general trend of the data and the low recorded gas flows it is our opinion that the site should be placed within Characteristic Situation 1 (CS1) / NHBC ‘Green’ category of CIRIA document C665, which is very low risk.

From CIRIA C665, table 8.6 it can be seen that no special ground gas precautions are required, beyond the adoption of a well constructed ground floor slab with DPM as standard guidance.

All service ducts, entries and other confined spaces in contact with the ground on the site should be assumed to contain potentially hazardous concentrations of potentially explosive and/or asphyxiating gases, Carbon Dioxide and depleted Oxygen levels and hence should be tested and ventilated prior to man access.

As noted in section 3.0 of the ‘Preliminary Risk Assessment Report’ “the site is indicated as being within an area affected by Radon, and Radon protection measures are recommended".

8.6.3 At this stage our outline recommendations for site remediation are provided for guidance purposes only and our report should be submitted to the Local Authority for comment/approval.

.....	.....
H A Hendry	K J Alderman
Environmental Scientist	Principal Engineer

APPENDIX ‘A ’

STANDARD PENETRATION TEST

This test is carried out in accordance with BS 1377 Test 19.
On the following logs the test example given would be reported as shown.

TEST DATA

LOG PRESENTATION

Start of Test (m bgl.)	Blow Count	Penetration of Sampler From	To	No. of Blows	
1.0	2.3/3.4.4.3	1.15	1. 45	14	
1.0	2.3/17.34.50 for 50mm	1.15	1.35	101	
1.0	38.50 for 50mm	1.0	1.13	88	SP
1.0	50 for 38mm	1.0	1.04	50	SP

The note 'SP' refers to the test being terminated within the seating penetration.
The number of blows is only the 'N' value if a full penetration has been achieved.
The note 'NR' refers to no recovery being made in the SPT sampler.

SOIL STRENGTHS

Soil strengths are assessed from undrained shear strengths values obtained from triaxial compression tests and/or hand penetrometer tests using the following scale.

	Undrained Shear Strength (kN/m^2)
Very Soft	< 20
Soft	20 - 40
Firm	40 - 75
Stiff	75 - 150
Very Stiff	150 - 300
Very Stiff/Hard	> 300

In addition we also use the following subdivisions	
Undrained Shear Strength (kN/m^2)	
Soft/Firm	40-50
Firm/Stiff	75-100

Morning and Evening Water Levels

This column contains water level observations taken in the borehole at the start and end of each shift. The values given are the depths below ground level to a free water surface in the borehole at the time. Where no free water surface is observed, the hole is recorded as "dry". Clearly if a low permeability water bearing stratum is exposed in the borehole and sufficient water has not entered the borehole by then to give a free water surface, the borehole is noted 'dry' although the stratum penetrated is not. A more detailed appraisal can be obtained from a geotechnical analysis of the strata proved.

SUB SOIL *Surveys Ltd*

MANCHESTER
M29 7LD
0942 883565

Ground Level	Site Reference	Borehole No.
85.20m AOD	2012/93	**WS1** 1 of 1

Boring Method	CASING	Site	Client
Window Sampler	100mm to depth of 1.2m	Mapplewell, Barnsley	Carley Daines & Partners

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
01.11.12				Brown and grey mottled gravelly sandy clay with fine roots. Gravel includes brick, coal and concrete fragments		1D	0.20			
						2D	0.50			
						3D	1.00			
						4X	1.35	1.65	3	
						5R	1.20	2.00		
			1.80	Grey and brown slightly clayey MUDSTONE, very weak	83.40	6X	2.15	2.45	40	
01.11.12	1.2		2.45		82.75					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Pit excavated 1 hour.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.20m AOD	Site Reference 2012/93	Borehole No. WS2	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Inst. Details	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
01.11.12			0.25	Concrete (MADE GROUND)						
			0.35	Brick (MADE GROUND)						
				Stiff brown, grey and black mottled slightly gravelly very sandy CLAY. Gravel is fine to medium mudstone, coal fragments and sandstone		1D	0.40			
						2D	1.00			
			1.20			3X	1.35	1.65	21	
				Brown and grey slightly clayey MUDSTONE, very weak		4R	1.20	2.00		
			2.00			5X	2.15	2.30	78	
				Black COAL recovered as sand and gravel						
01.11.12	1.2		2.3							

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour.
Standpipe inserted to 2.0m, gravel response zone 1.0 - 2.0m bgl.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 86.00m AOD	Site Reference 2012/93	Borehole No. WS3	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
30.10.12			0.05	Bitmac (MADE GROUND)	85.95					
				Dark grey sand and gravel with rootlets.		1D	0.20			
			0.30	Gravel includes brick fragments, quartzite	85.70					
			0.35	and ash (MADE GROUND)	85.65	2D	0.50			
				Bitmac (MADE GROUND)						
				Orange and black sand and gravel. Gravel includes ash, brick fragments, burnt shale and coal		3D	1.00			
			1.20	(MADE GROUND)	84.80	4X	1.35	1.65	5	
				Dark grey gravelly sand. Gravel includes		5R	1.20	2.00		
			1.50	brick fragments and ceramics (MADE GROUND)	84.50					
				Firm and firm/stiff brown orange and grey mottled slightly gravelly very sandy CLAY.						
				Gravel is fine to medium mudstone, sandstone		6X	2.15	2.45	26	
			2.10	and coal fragments	83.90	7R	2.00	3.00		
				Light grey and brown slightly sandy SILTSTONE, very weak						
						8X	3.15	3.45	57	
30.10.12	1.2		3.45		82.55					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating - 1 hour 30 minutes

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 82.50m AOD	Site Reference 2012/93	Borehole No. WS4	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
01.11.12				Topsoil						
			0.15	Concrete (MADE GROUND)	82.35					
			0.35	Dark grey clayey sand and gravel with a strong 'hydrocarbon' odour. Gravel includes concrete pieces and brick fragments (MADE GROUND)	82.15	1D	0.50			
			0.80	Firm and firm/stiff brown and grey mottled slightly silty gravelly CLAY. Gravel is fine to medium sandstone and mudstone	81.70	2D	1.00			
						3X	1.35	1.65	24	
						4R	1.20	2.00		
			1.50	Grey and brown slightly sandy MUDSTONE, very weak	81.00					
						5X	2.15	2.45	40	
01.11.12	1.2		2.45		80.05					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour 30 mins.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 82.70m AOD	Site Reference 2012/93	Borehole No. WS5	1 of 1
Boring Method Window Sampler		CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley		
			Client Carley Daines & Partners		

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
01.11.12			0.10	Bitmac (MADE GROUND) Dark brown clayey sand and gravel. Gravel includes concrete pieces and cemented brick pieces (MADE GROUND)	82.60	1D 2D	0.20 0.50			
			0.80	Firm to stiff brown, brown/greyish yellowish brown slightly gravelly slightly silty CLAY with a band of sand and gravel. Gravel includes brick (POSSIBLE MADE OR DISTURBED GROUND)	81.90	3D 4X 5R	1.00 1.35 1.20	 1.65 2.00	 12	
			1.80	Orange, grey and brown silty MUDSTONE, very weak	80.90	6X	2.15	2.45	37	
01.11.12	1.2		2.45		80.25					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour.

SUB SOIL *Surveys Ltd*

MANCHESTER
M29 7LD
0942 883565

Ground Level	Site Reference	Borehole No.	
85.70m AOD	2012/93	**WS6**	1 of 1

Boring Method	CASING	Site	Client
Window Sampler	100mm to depth of 1.2m	Mapplewell, Barnsley	Carley Daines & Partners

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Inst. Details	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
30.10.12			0.05	Bitmac (MADE GROUND) Dark grey and black sand and gravel. Gravel includes ash, glass, concrete pieces, brick fragments and coal (MADE GROUND)		1D 2D 3D 4X 5R	0.20 0.50 1.00 1.15 1.00	 1.45 2.00	5	
			1.80							
			2.10	Firm orange brown slightly gravelly sandy CLAY with occasional coal fragments Orange brown and grey mottled clayey MUDSTONE, very weak		6X 7R	2.15 2.00	2.45 3.00	21	
30.10.12	1.2		3.0							

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating - 1 hour 30 minutes
Standpipe inserted to 2.0m, gravel response zone 1.0-2.0m bgl

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.60m AOD	Site Reference 2012/93	Borehole No. WS7	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 2.0m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Inst. Details	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
30.10.12			0.20	Bitmac (MADE GROUND)		1D	0.20			
				Dark grey sand and gravel. Gravel includes brick fragments, ash and glass pieces (MADE GROUND)		2D	0.50			
						3D	1.00			
						4X	1.35	1.65	4	NR
						5R	1.20	2.00		
						6X	2.15	2.45	16	
						7R	2.00	3.00		
			2.90	Firm greyish brown silty sandy CLAY with roots and a strong organic odour		8X	3.15	3.45	12	NR
						9R	3.00	4.00		
			3.80	Soft yellowish orange, grey and brown slightly gravelly, slightly sandy silty CLAY. Gravel is fine to medium angular sandstone		10X	4.15	4.45	28	
			4.00	Orange, grey and brown sandy MUDSTONE, very weak						
30.10.12	2.0		4.45							

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating - 1 hour 30 minutes
Standpipe inserted to 3.0m, gravel response zone 1.0-3.0m bgl

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.50m AOD	Site Reference 2012/93	Borehole No. WS8	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
31.10.12				Concrete (MADE GROUND)						
			0.30	Dark grey and brown slightly clayey sand and gravel. Gravel includes brick fragments, concrete, ceramics, ash, sandstone, cloth, coal, glass and bitmac (MADE GROUND)	85.20	1D	0.40			
						2D	1.00			
						3X	1.35	1.65	3	NR
						4R	1.20	2.00		
						5X	2.15	2.45	14	
						6R	2.00	3.00		
			2.80	Brown and grey sandy MUDSTONE, very weak	82.70	7X	3.15	3.45	60	
31.10.12	1.2		3.45		82.05					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour 30 mins.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.30m AOD	Site Reference 2012/93	Borehole No. WS9	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Reduced Level	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
31.10.12				Concrete (MADE GROUND)						
			0.15	Stone (MADE GROUND)	85.15					
			0.30	Dark brown, light brown and dark grey slightly clayey sand and gravel. Gravel includes brick fragments, concrete pieces, plastic and ash (MADE GROUND)	85.00	1D	0.50			
						2D	1.00			
			1.20	Dark grey sand and gravel. Gravel includes concrete, brick fragments, sandstone and ash (MADE GROUND)	84.10	3X 4R	1.35 1.20	1.65 2.00	36	
						5X 6R	2.15 2.00	2.45 3.00	15	NR
						7X 8R	3.15 3.00	3.45 4.00	27	
			3.90		81.40					
31.10.12	1.2		4.0	Brown SANDSTONE, possible bedrock or cobble	81.30					

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour 30 mins.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 81.70m AOD	Site Reference 2012/93	Borehole No. WS10	1 of 1
Boring Method Window Sampler	CASING 100mm to depth of 1.2m	Site Mapplewell, Barnsley			
		Client Carley Daines & Partners			

Date	Depth of Casing Below G.L.	Water Level Morning & Evening	Depth of Strata Below G.L.	Description of Strata (all depths given in metres)	Inst. Details	No. & Type of Sample	Penetration of Sampler From	Penetration of Sampler To	Number of Blows	Symbolic Log
31.10.12			0.15	Concrete (MADE GROUND)		1D	0.20			
				Dark grey sandy gravel. Gravel includes brick fragments, ceramics, concrete pieces, wood, ash and plastic pieces (MADE GROUND)		2D	0.50			
						3D	1.00			
						4X	1.35	1.65	8	
						5R	1.20	2.00		
			1.80	Firm/stiff brown and grey slightly gravelly sandy CLAY. Gravel is fine to medium sandstone and coal fragments		6X	2.15	2.45	21	
						7R	2.00	3.00		
			2.50	Brown and grey silty sandy MUDSTONE, very weak		8X	3.15	3.45	48	
31.10.12	1.2		3.45							

Sample Key: B.Bulk D.Disturbed U.Open Tube V.Vane W.Water X.Standard Penetration Test

Water Level Observations during boring depths below ground level

depth observed	after 5 mins.	after 10 mins.	after 15 mins.	after 20 mins.	Estimated Seepage	Depth of Casing when sealed N.S. - Not Sealed
None						

Water Added to Assist Boring at:

Water level in Cased/Uncased Borehole on Completion depth below ground level

Date	Water Level	Depth of Casing

REMARKS

Breaking out and excavating 1 hour 30 mins.
Standpipe inserted to 3.0m, gravel response zone 1.0 - 3.0m bgl.

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.80m AOD	Site Reference 2012/93	Borehole No. R1	1 of 2
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
27.11.12	0.00				0.10	Tarmac (MADE GROUND) Brick (MADE GROUND)	85.70		
					1.80	Soft CLAY	84.00		
					2.60	Brown MUDSTONE	83.20		
CASING									
					7.60	Dirty COAL	78.20		
					8.10	Grey brown MUDSTONE	77.70		
					9.00	Brown shaly SANDSTONE	76.80		
					9.80		76.00		
					10.00	Fractured SANDSTONE, lost flush Hard steady drilling (flush came back 13.6m - 15.0m)	75.80		
		ROCKBITTING							
					20.00		65.80		

REMARKS

Pit excavated.
The strata descriptions during rockbitting by foreman driller based on rate of penetration and examination of cuttings in flush return.
Borehole backfilled with bentonite on completion.
Flush lost at 9.8m, returned at 13.6m. Flush lost at 15.0m. No return of cuttings from 15.0m to 30.0m.

Scale: 1:100

Logged By: IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.80m AOD	Site Reference 2012/93	Borehole No. R1	2 of 2
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
						Hard steady drilling (flush came back 13.6m - 15.0m)			
					27.30	Fractured drilling	58.50		
					27.60	Hard steady drilling	58.20		
					28.00	Firm steady drilling	57.80		
					29.10	Hard drilling	56.70		
27.11.12	30.00				30.00		55.80		

REMARKS

Scale: 1:100

Logged By: IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 81.70m AOD	Site Reference 2012/93	Borehole No. R2	1 of 2
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
29.11.12	0.00				0.10	Concrete (MADE GROUND)	81.60		
						Brick			
					0.70	(MADE GROUND)	81.00		
						Brown CLAY			
					1.60	Weathered brown MUDSTONE with bands of fractured sandstone	80.10		
CASING									
		ROCKBITTING			12.00	Grey MUDSTONE	69.70		
					15.50	Grey and brown SANDSTONE	66.20		
					17.60	Fractured SANDSTONE, partial loss of flush	64.10		
					17.90	Grey brown SANDSTONE	63.80		
					20.00		61.70		

REMARKS

Pit excavated.
The strata descriptions during rockbitting by foreman driller based on rate of penetration and examination of cuttings in flush return.
Borehole backfilled with bentonite on completion.
Partial loss of flush between 17.6 - 17.9m. Loss of flush between 21.9 - 25.00m.

Scale: 1:100

Logged By: IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 81.70m AOD	Site Reference 2012/93	Borehole No. R2	2 of 2
Boring Method Rotary, Water Flush.			Site Mapplewell, Barnsley		
			Client Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
						Grey brown SANDSTONE			
					20.70	Dark grey SHALE with traces of coal	61.00		
					21.00	Grey SANDSTONE	60.70		
					21.90	Soft drilling, lost flush	59.80		
					22.80	Hard drilling	58.90		
					25.00	Grey SANDSTONE, poor return 30% approx.	56.70		
29.11.12	28.00				28.00		53.70		

REMARKS

Scale 1:100

Logged By IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.20m AOD	Site Reference 2012/93	Borehole No. R3	1 of 2
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
30.11.12	0.00				0.10	Concrete (MADE GROUND)	85.10		
						Ash and brick (MADE GROUND)			
					0.80		84.40		
						Clay			
					1.40	(MADE GROUND)	83.80		
						Brown CLAY			
					2.20		83.00		
						Black SHALE			
CASING					2.60		82.60		
						COAL			
					3.40		81.80		
						Dark grey SHALE			
					4.00		81.20		
						Brown MUDSTONE with bands of sandstone			
					9.50		75.70		
						Grey and brown SANDSTONE			
		ROCKBITTING							
					18.20	COAL	67.00		
					18.50		66.70		
						Grey brown SANDSTONE			
					20.00		65.20		

REMARKS

Pit excavated.
The strata descriptions during rockbitting by foreman driller based on rate of penetration and examination of cuttings in flush return.
Borehole backfilled with bentonite on completion.
Flush lost at 24.20m, returned between 25.5m - 25.70m

Scale: 1:100

Logged By: IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.20m AOD	Site Reference 2012/93	Borehole No. R3	2 of 2
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
						Grey brown SANDSTONE			
					22.00		63.20		
						Fissured brown SANDSTONE (lost flush 24.2m returned between 25.5m - 25.70m)			
					27.10		58.10		
						Soft drilling			
					28.20		57.00		
						Hard drilling			
30.11.12	30.00				30.00		55.20		

REMARKS

Scale: 1:100

Logged By: IN

SUB SOIL Surveys Ltd	MANCHESTER M29 7LD 0942 883565	Ground Level 85.30m AOD	Site Reference 2012/93	Borehole No. R4	1 of 1
Boring Method: Rotary, Water Flush.			Site: Mapplewell, Barnsley		
			Client: Carley Daines & Partners		

Date	Penetration of Core Barrel	TCR%	SCR%	RQD%	Depth B.G.L.	Description of Strata (all depths given in metres)	Reduced Level	Dip on Sample	Symbolic Log
29.11.12	0.00				0.05	Tarmac (MADE GROUND)	85.25		
					0.40	Ash and brick (MADE GROUND)	84.90		
					0.50	Tarmac (MADE GROUND)	84.80		
						Ash and brick, lost flush 2.50m (MADE GROUND)			
					3.00		82.30		
						Brown CLAY (POSSIBLE MADE GROUND)			
		ROCKBITTING			4.40		80.90		
						Weathered grey MUDSTONE			
CASING									
					7.80	Brown MUDSTONE	77.50		
					8.20	Factured SANDSTONE, lost flush	77.10		
29.11.12	8.50				8.50		76.80		

REMARKS

Pit excavated.
The strata descriptions during rockbitting by foreman driller based on rate of penetration and examination of cuttings in flush return.
Borehole backfilled with bentonite on completion.
Loss of flush at 2.5m. Flush return normal following casing of borehole. Loss of flush 8.20m. No return of cuttings between 8.20 - 8.50m.

Scale: 1:100

Logged By: IN

APPENDIX ‘B ’

TEST RESULTS - EXPLANATION OF TABLE HEADINGS

CLASSIFICATION & STRENGTH

Classification

I_P - Plasticity Index

W_L - Liquid Limit — Atterberg Limits

W_p - Plastic Limit

W% - Moisture Content

Strength

Test - U1 - Single 38mm Undrained Triaxial
U2 - Set of Two 38mm Undrained Triaxials
U3 - Set of Three 38mm Undrained Triaxials

Test - M1 - Single Stage 100mm Undrained Triaxial
M2 - Two Stage 100mm Undrained Triaxial
M3 - Three Stage 100mm Undrained Triaxial

Test- UC - Unconfined compressive strength

γ_b - Bulk Density

σ_3 - Cell Pressure

$\sigma_1-\sigma_3$ - Maximum Deviator Stress

c_u - Shear Strength

ϕ_u - Angle of Friction

CHEMICAL ANALYSIS

Total (%) - Percentage sulphate (SO_3) in dried soil sample

2:1 Extract (g/l) - Grams per litre sulphate (SO_3) in 2:1 water:soil extract

Groundwater (g/l) - Grams per litre sulphate (SO_3) in groundwater sample

To convert SO_3 to SO_4 multiply SO_3 by 1.2

LABORATORY RESULTS-Classification, Strength, U100 Descriptions

Project: Mapplewell, Barnsley

Project No: 2012/93

Sample				Classification					Strength					
Hole	Depth	Type	Description	% pass. .425 mm	I_P	W_L	W_P	W%	Test	γ_b Mg/m^3	σ_3 kN/m^2	σ_1-σ_3 kN/m^2	c kN/m^2	ϕ deg
WS 4	1.20 1.65	3X	Very stiff grey and brown mottled slightly gravelly silty CLAY. Gravel is fine to medium including mudstone	98.1	17.7	39.6	21.9	17						
WS 5	1.20 2.00	5R	Stiff greyish yellowish brown slightly gravelly slightly silty CLAY with a band of sand and gravel and occasional brick fragments (POSSIBLE MADE GROUND)	98.5	22.0	44.7	22.7	23	U2	1.98	138 414	181 343	131	0
WS 7	3.80 4.00	9R	Soft yellowish grey, orange grey and brown slightly gravelly slightly sandy slightly silty CLAY. Gravel is fine to medium, including angular sandstone					28	U2	2.00	138 414	49 56	26	0

Remarks

SUB SOIL

M29 7LD 01942 883565

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

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Report Number: 304008-1

Date of Report: 23-Nov-2012

Customer: Sub Soil Testing Ltd
Kennedy Road
Astley
Manchester
M29 7LD

Customer Contact: Ms Julie Alderman

Customer Job Reference: 2012/93
Customer Purchase Order: 12/740
Customer Site Reference: MAPPLEWELL
Date Job Received at SAL: 08-Nov-2012
Date Analysis Started: 14-Nov-2012
Date Analysis Completed: 21-Nov-2012

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

UKAS TESTING
1549

Report checked and authorised by :
Mr Ross Walker
Customer Services Manager (Land)

Issued by :
Mr Ross Walker
Customer Services Manager (Land)

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SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil
Metals

SAL Reference					**304008 001**	**304008 003**	**304008 004**	**304008 005**	**304008 006**	**304008 008**	**304008 010**	**304008 011**	**304008 012**	**304008 014**	**304008 017**
Customer Sample Reference					**WS1 D1 0.20**	**WS2 D1 0.40**	**WS3 D2 0.50**	**WS4 D1 0.50**	**WS5 D1 0.20**	**WS6 D1 0.20**	**WS7 D1 0.20**	**WS7 D2 0.50**	**WS8 D1 0.40**	**WS9 D1 0.50**	**WS10 D2 0.50**
Date Sampled					**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**30-OCT-2012**	**30-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**											
Arsenic	T6	AR	1	mg/kg	**9**	**8**	**41**	**17**	**7**	**3**	**4**	**3**	**7**	**13**	**170**
Cadmium	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	**1**	<1	<1
Chromium	T6	AR	1	mg/kg	**22**	**22**	**45**	**26**	**8**	**65**	**330**	**320**	**47**	**11**	**40**
Chromium VI	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Copper	T6	AR	1	mg/kg	**51**	**39**	**98**	**54**	**69**	**110**	**22**	**23**	**30**	**43**	**530**
Lead	T6	AR	1	mg/kg	**81**	**24**	**65**	**67**	**670**	**96**	**42**	**37**	**80**	**46**	**420**
Mercury	T6	AR	1	mg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Nickel	T6	AR	1	mg/kg	**27**	**24**	**50**	**33**	**8**	**9**	**20**	**15**	**16**	**11**	**79**
Selenium	T6	AR	3	mg/kg	<3	<3	<3	<3	<3	<3	<3	<3	**3**	<3	<3
Zinc	T6	AR	1	mg/kg	**160**	**65**	**100**	**120**	**91**	**120**	**78**	**67**	**150**	**120**	**1000**

SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil
pH and Sulphate

SAL Reference					**304008 001**	**304008 003**	**304008 004**	**304008 005**	**304008 006**	**304008 008**	**304008 010**	**304008 011**	**304008 012**	**304008 014**	**304008 017**
Customer Sample Reference					**WS1 D1 0.20**	**WS2 D1 0.40**	**WS3 D2 0.50**	**WS4 D1 0.50**	**WS5 D1 0.20**	**WS6 D1 0.20**	**WS7 D1 0.20**	**WS7 D2 0.50**	**WS8 D1 0.40**	**WS9 D1 0.50**	**WS10 D2 0.50**
Date Sampled					**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**30-OCT-2012**	**30-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**											
pH	T7	AR			**7.4**	**6.4**	**7.8**	**7.3**	**8.4**	**7.7**	**9.4**	**9.3**	**8.5**	**9.8**	**8.2**
SO4(2:1)	T6	AR	0.1	g/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.5**	**0.5**

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SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil

PAH US EPA 16 (B and K split)

				SAL Reference	**304008 001**	**304008 003**	**304008 004**	**304008 005**	**304008 006**	**304008 008**	**304008 010**	**304008 011**	**304008 012**	**304008 014**	**304008 017**
				Customer Sample Reference	**WS1 D1 0.20**	**WS2 D1 0.40**	**WS3 D2 0.50**	**WS4 D1 0.50**	**WS5 D1 0.20**	**WS6 D1 0.20**	**WS7 D1 0.20**	**WS7 D2 0.50**	**WS8 D1 0.40**	**WS9 D1 0.50**	**WS10 D2 0.50**
				Date Sampled	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**30-OCT-2012**	**30-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**											
Naphthalene	T149	AR	0.01	mg/kg	**0.02**	<0.01	**0.09**	**0.08**	**0.06**	**0.20**	**0.06**	**0.16**	**0.19**	**0.03**	**0.14**
Acenaphthylene	T149	AR	0.01	mg/kg	**0.01**	**0.01**	**0.06**	**0.02**	**0.04**	**0.04**	**0.07**	**0.04**	**0.04**	<0.01	<0.01
Acenaphthene	T149	AR	0.01	mg/kg	**0.11**	<0.01	**1.4**	**0.07**	**0.02**	**0.19**	**0.29**	**0.47**	**0.19**	<0.01	**0.01**
Fluorene	T149	AR	0.01	mg/kg	**0.09**	<0.01	**0.43**	**0.29**	**0.03**	**0.13**	**0.15**	**0.33**	**0.13**	**0.01**	**0.01**
Phenanthrene	T149	AR	0.01	mg/kg	**0.68**	**0.01**	**1.4**	**0.16**	**0.74**	**1.8**	**1.8**	**3.8**	**1.8**	**0.08**	**0.15**
Anthracene	T149	AR	0.01	mg/kg	**0.17**	<0.01	**0.65**	**0.02**	**0.25**	**0.60**	**0.62**	**1.2**	**0.62**	**0.03**	**0.01**
Fluoranthene	T149	AR	0.01	mg/kg	**0.94**	<0.01	**2.9**	**0.12**	**1.6**	**4.8**	**6.3**	**11**	**4.8**	**0.17**	**0.15**
Pyrene	T149	AR	0.01	mg/kg	**0.76**	<0.01	**3.2**	**0.18**	**1.3**	**4.6**	**6.7**	**11**	**4.5**	**0.14**	**0.17**
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	**0.38**	**0.01**	**1.0**	**0.05**	**0.79**	**1.5**	**2.7**	**5.6**	**1.5**	**0.09**	**0.10**
Chrysene	T149	AR	0.01	mg/kg	**0.34**	<0.01	**1.0**	**0.07**	**0.62**	**1.7**	**3.0**	**6.0**	**1.7**	**0.09**	**0.12**
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	**0.38**	<0.01	**0.89**	**0.04**	**0.55**	**2.2**	**3.6**	**9.6**	**2.7**	**0.10**	**0.16**
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	**0.37**	<0.01	**0.86**	**0.04**	**0.65**	**2.7**	**1.7**	**6.9**	**2.4**	**0.06**	**0.11**
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	**0.34**	<0.01	**0.94**	**0.03**	**0.49**	**2.1**	**2.9**	**7.0**	**2.1**	**0.06**	**0.11**
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	**0.22**	<0.01	**0.66**	**0.03**	**0.31**	**1.5**	**2.1**	**4.3**	**1.6**	**0.05**	**0.11**
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	**0.06**	<0.01	**0.15**	**0.01**	**0.12**	**0.39**	**0.58**	**1.2**	**0.41**	**0.02**	**0.05**
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	**0.21**	<0.01	**0.73**	**0.04**	**0.28**	**1.8**	**2.5**	**4.8**	**1.9**	**0.07**	**0.13**
PAH(total)	T149	AR	0.01	mg/kg	**5.1**	**0.03**	**16**	**1.3**	**7.9**	**26**	**35**	**73**	**27**	**1.0**	**1.5**

SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil

Total Petroleum Hydrocarbons Banded Default (C8-35)

				SAL Reference	**304008 001**	**304008 003**	**304008 004**	**304008 005**	**304008 006**	**304008 008**	**304008 010**	**304008 011**	**304008 012**	**304008 014**	**304008 017**
				Customer Sample Reference	**WS1 D1 0.20**	**WS2 D1 0.40**	**WS3 D2 0.50**	**WS4 D1 0.50**	**WS5 D1 0.20**	**WS6 D1 0.20**	**WS7 D1 0.20**	**WS7 D2 0.50**	**WS8 D1 0.40**	**WS9 D1 0.50**	**WS10 D2 0.50**
				Date Sampled	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**01-NOV-2012**	**01-NOV-2012**	**30-OCT-2012**	**30-OCT-2012**	**30-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**											
TPH (C8-C10)	T8	AR	1	mg/kg	(9) <10	<1	(9) <10	<1	<1	(9) <10	(9) <10	(9) <10	**12**	<1	(9) <10
TPH (C10-C12)	T8	AR	1	mg/kg	(9) <10	<1	(9) <10	**35**	<1	**13**	(9) <10	(9) <10	**90**	<1	(9) <10
TPH (C12-C16)	T8	AR	1	mg/kg	(9) <10	<1	(9) <10	**280**	<1	**34**	**110**	**15**	**17**	**2**	(9) <10
TPH (C16-C21)	T8	AR	1	mg/kg	(9) <10	<1	**52**	**350**	**3**	**300**	**460**	**160**	**150**	**17**	**100**
TPH (C21-C35)	T8	AR	1	mg/kg	**75**	**2**	**360**	**150**	**32**	**3300**	**2600**	**1400**	**1200**	**170**	**480**

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SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil

Volatile Organic Compounds (USEPA 624)

				SAL Reference	**304008 001**	**304008 003**	**304008 005**	**304008 017**
				Customer Sample Reference	**WS1 D1 0.20**	**WS2 D1 0.40**	**WS4 D1 0.50**	**WS10 D2 0.50**
				Date Sampled	**01-NOV-2012**	**01-NOV-2012**	**01-NOV-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
1,1,1,2-Tetrachloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1,1-Trichloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1,2,2-Tetrachloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1,2-Trichloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1,2-Trichloroethylene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1-Dichloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1-Dichloroethylene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,1-Dichloropropene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2,3-Trichloropropane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2,4-Trimethylbenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2-dibromoethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2-Dichlorobenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2-Dichloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,2-Dichloropropane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,3,5-Trimethylbenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,3-Dichlorobenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,3-Dichloropropane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
1,4-Dichlorobenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
2,2-Dichloropropane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
2-Chlorotoluene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
4-Chlorotoluene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Benzene	T54	AR	1	µg/kg	(13) <1	(13) <1	(13) <1	(13,2) <2
Bromobenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Bromochloromethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Bromodichloromethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Bromoform	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Bromomethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Carbon tetrachloride	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Chlorobenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Chlorodibromomethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Chloroethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Chloroform	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Chloromethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Cis-1,2-Dichloroethylene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Cis-1,3-Dichloropropene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Dibromomethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Dichlorodifluoromethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Dichloromethane	T54	AR	50	µg/kg	<50	<50	<50	(2) <100
EthylBenzene	T54	AR	1	µg/kg	<1	<1	<1	(2) <2
Isopropyl benzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
M/P Xylene	T54	AR	1	µg/kg	<1	<1	<1	(2) <2
n-Propylbenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
O Xylene	T54	AR	1	µg/kg	<1	<1	<1	(2) <2
p-Isopropyltoluene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
S-Butylbenzene	T54	AR	5	µg/kg	<5	<5	**15**	(2) <10
Styrene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
T-Butylbenzene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Tetrachloroethene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Toluene	T54	AR	1	µg/kg	<1	<1	<1	(2) <2
Trans-1,2-Dichloroethene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Trans-1,3-Dichloropropene	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Trichlorofluoromethane	T54	AR	5	µg/kg	<5	<5	<5	(2) <10
Vinyl chloride	T54	AR	5	µg/kg	<5	<5	<5	(2) <10

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SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil

Semi-Volatile Organic Compounds (USEPA 625)

				SAL Reference	**304008 001**	**304008 003**	**304008 005**	**304008 017**
				Customer Sample Reference	**WS1 D1 0.20**	**WS2 D1 0.40**	**WS4 D1 0.50**	**WS10 D2 0.50**
				Date Sampled	**01-NOV-2012**	**01-NOV-2012**	**01-NOV-2012**	**31-OCT-2012**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
1,2,4-Trichlorobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
1,2-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
1,3-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
1,4-Dichlorobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4,5-Trichlorophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4,6-Trichlorophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.3**	<0.1
2,4-Dichlorophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.1**	<0.1
2,4-Dimethylphenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4-Dinitrophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4-Dinitrotoluene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2,6-Dinitrotoluene	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.4**	<0.1
2-Chloronaphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2-Chlorophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2-methyl phenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2-Methylnaphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.2**	**0.3**
2-Nitroaniline	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
2-Nitrophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.2**	<0.1
3-Nitroaniline	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
3/4-Methylphenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
4-Bromophenyl phenylether	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
4-Chloro-3-methylphenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
4-Chloroaniline	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
4-Chlorophenyl phenylether	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
4-Nitroaniline	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.4**	<0.1
4-Nitrophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.4**	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.1**	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Anthracene	T16	AR	0.1	mg/kg	**0.3**	<0.1	**0.2**	<0.1
Azobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	**1.0**	<0.1	**0.3**	**0.2**
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	**0.6**	<0.1	<0.1	<0.1
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	**1.1**	<0.1	**0.2**	**0.2**
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	**0.4**	<0.1	**0.1**	**0.2**
Bis (2-chloroethoxy) methane	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Bis (2-chloroethyl) ether	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Bis (2-chloroisopropyl) ether	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Bis (2-ethylhexyl)phthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Butyl benzylphthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Carbazole	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Chrysene	T16	AR	0.1	mg/kg	**0.9**	<0.1	**0.2**	**0.2**
Di-n-butylphthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Di-n-octylphthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	**0.1**	<0.1	<0.1	<0.1
Dibenzofuran	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.2**	<0.1
Diethyl phthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethyl phthalate	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	T16	AR	0.1	mg/kg	**2.2**	<0.1	**0.4**	**0.2**
Fluorene	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.7**	<0.1
Hexachlorobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Hexachlorobutadiene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Hexachlorocyclopentadiene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Hexachloroethane	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	**0.3**	<0.1	<0.1	**0.1**
Isophorone	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Naphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	**0.2**
Nitrobenzene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Pentachlorophenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	**1.1**	<0.1	**0.2**	**0.2**
Phenol	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	T16	AR	0.1	mg/kg	**2.0**	<0.1	**0.5**	**0.2**

SAL Reference: 304008
Project Site: MAPPLEWELL
Customer Reference: 2012/93

Soil Analysed as Soil
Miscellaneous

	SAL Reference	304008 002	304008 004	304008 005	304008 007	304008 009	304008 013	304008 015	304008 016
	Customer Sample Reference	WS1 D2 0.50	WS3 D2 0.50	WS4 D1 0.50	WS5 D2 0.50	WS6 D2 0.50	WS8 D2 1.00	WS9 D2 1.00	WS10 D1 0.20
	Date Sampled	01-NOV-2012	30-OCT-2012	01-NOV-2012	01-NOV-2012	30-OCT-2012	31-OCT-2012	31-OCT-2012	31-OCT-2012
Determinand	Method / Test Sample / LOD / Units								
Asbestos ID	T27 / AR / /	Chrysotile Detected -	N.D.	Chrysotile Detected -	N.D.	N.D.	N.D.	N.D.	N.D.

Index to symbols used in 304008-1

Value	Description
AR	As Received
N.D.	Not Detected
2	LOD Raised Due to Matrix Interference
13	Results have been blank corrected.
9	LOD raised due to dilution of sample
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Method Index

Value	Description
T8	GC/FID
T16	GC/MS
T7	Probe
T54	GC/MS (Headspace)
T27	PLM
T149	GC/MS (SIR)
T6	ICP/OES

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Asbestos ID	T27	AR			SU	002,004-005,007,009,013,015-016
1,2,4-Trichlorobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
1,2-Dichlorobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
1,3-Dichlorobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
1,4-Dichlorobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4,5-Trichlorophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4,6-Trichlorophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4-Dichlorophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4-Dimethylphenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4-Dinitrophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2,4-Dinitrotoluene	T16	AR	0.1	mg/kg	U	001,003,005,017
2,6-Dinitrotoluene	T16	AR	0.1	mg/kg	U	001,003,005,017
2-Chloronaphthalene	T16	AR	0.1	mg/kg	U	001,003,005,017
2-Chlorophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2-methyl phenol	T16	AR	0.1	mg/kg	U	001,003,005,017
2-Methylnaphthalene	T16	AR	0.1	mg/kg	U	001,003,005,017
2-Nitroaniline	T16	AR	0.1	mg/kg	U	001,003,005,017
2-Nitrophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
3-Nitroaniline	T16	AR	0.1	mg/kg	U	001,003,005,017
3/4-Methylphenol	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Bromophenyl phenylether	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Chloro-3-methylphenol	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Chloroaniline	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Chlorophenyl phenylether	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Nitroaniline	T16	AR	0.1	mg/kg	U	001,003,005,017
4-Nitrophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
Acenaphthene	T16	AR	0.1	mg/kg	U	001,003,005,017

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Acenaphthylene	T16	AR	0.1	mg/kg	U	001,003,005,017
Anthracene	T16	AR	0.1	mg/kg	U	001,003,005,017
Azobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	U	001,003,005,017
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	U	001,003,005,017
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	U	001,003,005,017
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	U	001,003,005,017
Bis (2-chloroethoxy) methane	T16	AR	0.1	mg/kg	U	001,003,005,017
Bis (2-chloroethyl) ether	T16	AR	0.1	mg/kg	U	001,003,005,017
Bis (2-chloroisopropyl) ether	T16	AR	0.1	mg/kg	U	001,003,005,017
Bis (2-ethylhexyl)phthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Butyl benzylphthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Carbazole	T16	AR	0.1	mg/kg	U	001,003,005,017
Chrysene	T16	AR	0.1	mg/kg	U	001,003,005,017
Di-n-butylphthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Di-n-octylphthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	U	001,003,005,017
Dibenzofuran	T16	AR	0.1	mg/kg	U	001,003,005,017
Diethyl phthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Dimethyl phthalate	T16	AR	0.1	mg/kg	U	001,003,005,017
Fluoranthene	T16	AR	0.1	mg/kg	U	001,003,005,017
Fluorene	T16	AR	0.1	mg/kg	U	001,003,005,017
Hexachlorobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
Hexachlorobutadiene	T16	AR	0.1	mg/kg	U	001,003,005,017
Hexachlorocyclopentadiene	T16	AR	0.1	mg/kg	U	001,003,005,017
Hexachloroethane	T16	AR	0.1	mg/kg	U	001,003,005,017
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	U	001,003,005,017
Isophorone	T16	AR	0.1	mg/kg	U	001,003,005,017
Naphthalene	T16	AR	0.1	mg/kg	U	001,003,005,017
Nitrobenzene	T16	AR	0.1	mg/kg	U	001,003,005,017
Pentachlorophenol	T16	AR	0.1	mg/kg	U	001,003,005,017
Phenanthrene	T16	AR	0.1	mg/kg	U	001,003,005,017
Phenol	T16	AR	0.1	mg/kg	U	001,003,005,017
Pyrene	T16	AR	0.1	mg/kg	U	001,003,005,017
Arsenic	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Cadmium	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Chromium	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Chromium VI	T6	AR	1	mg/kg	N	001,003-006,008,010-012,014,017
Copper	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Lead	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Mercury	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Nickel	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Selenium	T6	AR	3	mg/kg	U	001,003-006,008,010-012,014,017
Zinc	T6	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
Naphthalene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Acenaphthylene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Acenaphthene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Fluorene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Phenanthrene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Anthracene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Fluoranthene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Pyrene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Chrysene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
PAH(total)	T149	AR	0.01	mg/kg	U	001,003-006,008,010-012,014,017
TPH (C8-C10)	T8	AR	1	mg/kg	N	001,003-006,008,010-012,014,017
TPH (C10-C12)	T8	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
TPH (C12-C16)	T8	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
TPH (C16-C21)	T8	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
TPH (C21-C35)	T8	AR	1	mg/kg	U	001,003-006,008,010-012,014,017
1,1,1,2-Tetrachloroethane	T54	AR	5	µg/kg	U	001,003,005,017
1,1,1-Trichloroethane	T54	AR	5	µg/kg	U	001,003,005,017
1,1,2,2-Tetrachloroethane	T54	AR	5	µg/kg	U	001,003,005,017
1,1,2-Trichloroethane	T54	AR	5	µg/kg	U	001,003,005,017

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
1,1,2-Trichloroethylene	T54	AR	5	µg/kg	U	001,003,005,017
1,1-Dichloroethane	T54	AR	5	µg/kg	U	001,003,005,017
1,1-Dichloroethylene	T54	AR	5	µg/kg	U	001,003,005,017
1,1-Dichloropropene	T54	AR	5	µg/kg	U	001,003,005,017
1,2,3-Trichloropropane	T54	AR	5	µg/kg	U	001,003,005,017
1,2,4-Trimethylbenzene	T54	AR	5	µg/kg	U	001,003,005,017
1,2-dibromoethane	T54	AR	5	µg/kg	U	001,003,005,017
1,2-Dichlorobenzene	T54	AR	5	µg/kg	U	001,003,005,017
1,2-Dichloroethane	T54	AR	5	µg/kg	U	001,003,005,017
1,2-Dichloropropane	T54	AR	5	µg/kg	U	001,003,005,017
1,3,5-Trimethylbenzene	T54	AR	5	µg/kg	U	001,003,005,017
1,3-Dichlorobenzene	T54	AR	5	µg/kg	U	001,003,005,017
1,3-Dichloropropane	T54	AR	5	µg/kg	U	001,003,005,017
1,4-Dichlorobenzene	T54	AR	5	µg/kg	U	001,003,005,017
2,2-Dichloropropane	T54	AR	5	µg/kg	U	001,003,005,017
2-Chlorotoluene	T54	AR	5	µg/kg	U	001,003,005,017
4-Chlorotoluene	T54	AR	5	µg/kg	U	001,003,005,017
Benzene	T54	AR	1	µg/kg	U	001,003,005,017
Bromobenzene	T54	AR	5	µg/kg	U	001,003,005,017
Bromochloromethane	T54	AR	5	µg/kg	U	001,003,005,017
Bromodichloromethane	T54	AR	5	µg/kg	U	001,003,005,017
Bromoform	T54	AR	5	µg/kg	U	001,003,005,017
Bromomethane	T54	AR	5	µg/kg	U	001,003,005,017
Carbon tetrachloride	T54	AR	5	µg/kg	U	001,003,005,017
Chlorobenzene	T54	AR	5	µg/kg	U	001,003,005,017
Chlorodibromomethane	T54	AR	5	µg/kg	U	001,003,005,017
Chloroethane	T54	AR	5	µg/kg	U	001,003,005,017
Chloroform	T54	AR	5	µg/kg	U	001,003,005,017
Chloromethane	T54	AR	5	µg/kg	U	001,003,005,017
Cis-1,2-Dichloroethylene	T54	AR	5	µg/kg	U	001,003,005,017
Cis-1,3-Dichloropropene	T54	AR	5	µg/kg	U	001,003,005,017
Dibromomethane	T54	AR	5	µg/kg	U	001,003,005,017
Dichlorodifluoromethane	T54	AR	5	µg/kg	U	001,003,005,017
Dichloromethane	T54	AR	50	µg/kg	N	001,003,005,017
EthylBenzene	T54	AR	1	µg/kg	U	001,003,005,017
Isopropyl benzene	T54	AR	5	µg/kg	U	001,003,005,017
M/P Xylene	T54	AR	1	µg/kg	U	001,003,005,017
n-Propylbenzene	T54	AR	5	µg/kg	U	001,003,005,017
O Xylene	T54	AR	1	µg/kg	U	001,003,005,017
p-Isopropyltoluene	T54	AR	5	µg/kg	U	001,003,005,017
S-Butylbenzene	T54	AR	5	µg/kg	U	001,003,005,017
Styrene	T54	AR	5	µg/kg	U	001,003,005,017
T-Butylbenzene	T54	AR	5	µg/kg	U	001,003,005,017
Tetrachloroethene	T54	AR	5	µg/kg	U	001,003,005,017
Toluene	T54	AR	1	µg/kg	U	001,003,005,017
Trans-1,2-Dichloroethene	T54	AR	5	µg/kg	U	001,003,005,017
Trans-1,3-Dichloropropene	T54	AR	5	µg/kg	U	001,003,005,017
Trichlorofluoromethane	T54	AR	5	µg/kg	U	001,003,005,017
Vinyl chloride	T54	AR	5	µg/kg	U	001,003,005,017
pH	T7	AR			U	001,003-006,008,010-012,014,017
SO4(2:1)	T6	AR	0.1	g/l	N	001,003-006,008,010-012,014,017

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LABORATORY RESULTS - Chemical Analysis

Project: Mapplewell, Barnsley

Project No: 2012/93

Sample				Sulphate (Expressed as SO_3)				pH
Hole	Depth	Type	Description	Soil			Ground Water (g/l)	pH
				Total (%)	2:1 Extract (g/l)	% passing 2mm sieve		
WS 1	2.00 2.45	6X	Grey and brown MUDSTONE		0.06	100		5.0
WS 4	1.20 1.65	3X	Very stiff grey and brown mottled slightly gravelly silty CLAY. Gravel is fine to medium including mudstone		0.05	98		7.1

Remarks

SUB SOIL

M29 7LD 01942 883565

SITE TESTING - Gas and Groundwater Level Monitoring

Project: Mapplewell, Barnsley

Project No: 2012/93

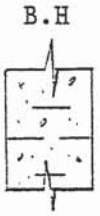
Position	Date	Explosive Gas conc		Oxygen Concentration	Carbon Dioxide Concentration	Atmospheric Pressure	Water Level	Gas Flow	Gas Pressure	Remarks
		% LEL	% VOL	% VOL	% VOL	mb	m bgl	l/hr	mb	
WS 10	28.11.12									NO READINGS
	05.12.12	0.0	0.0	19.1	0.7	998 R	DRY	-0.1	0.0	
	09.01.13	0.0	0.0	19.0	0.5	1009 F	DRY	-0.1	0.0	
	28.01.13	0.0	0.0	20.0	0.3	990 R	2.70	-0.1	0.0	
	20.02.13	0.0	0.0	20.5	0.0	1014 R	DRY	-0.2	0.0	
	05.03.13	0.0	0.0	19.6	0.2	992 F	DRY	0.0	0.0	
WS 2	28.11.12	0.0	0.0	17.9	2.9	1003 R	0.30	-0.7	0.0	
	05.12.12	0.0	0.0	17.4	3.6	997 R	1.27	0.0	0.0	
	09.01.13	0.0	0.0	14.3	3.9	1009 F	1.89	-0.2	0.0	
	28.01.13	0.0	0.0	17.6	1.7	989 R	1.41	0.0	0.0	
	20.02.13	0.0	0.0	16.2	3.0	1014 R	1.87	-0.1	0.0	
	05.03.13	0.0	0.0	16.2	3.3	992 F	1.95	0.0	0.0	
WS 6	28.11.12	0.0	0.0	19.6	0.8	1003 R	1.39	-0.1	0.0	
	05.12.12	0.0	0.0	18.8	1.4	996 R	1.62	-0.3	0.0	
	09.01.13	0.0	0.0	18.9	1.3	1009 F	1.72	-0.1	0.0	
	28.01.13	0.0	0.0	19.7	0.7	989 R	1.63	-0.3	0.0	
	20.02.13	0.0	0.0	19.4	0.9	1013 R	1.73	0.0	0.0	
	05.03.13	0.0	0.0	18.9	1.0	992 F	DRY	0.0	0.0	
WS 7	28.11.12	0.0	0.0	20.2	0.1	1003 R	2.64	-0.8	0.0	
	05.12.12	0.0	0.0	19.6	0.4	997 R	2.65	0.3	0.0	
	09.01.13	0.0	0.0	19.6	0.3	1009 F	2.67	-0.1	0.0	
	28.01.13	0.0	0.0	20.2	0.1	989 R	2.67	-0.2	0.0	
	20.02.13	0.0	0.0	20.2	0.2	1014 R	2.70	0.0	0.0	
	05.03.13	0.0	0.0	20.1	0.1	992 F	2.70	0.0	0.0	

Notes:
1. Gas Data LMSXi instrument used
2. Atmospheric press: S- Steady, R - Rising, F - Falling
3. Gas Pressure - Differential Pressure relative to atmospheric

SUB SOIL
M29 7LD 01942 883565

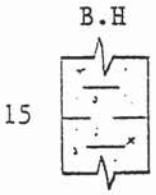
APPENDIX ‘C ’

KEY - FOR SOIL SECTION



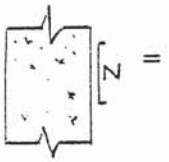
UNDRAINED SHEAR STRENGTH - Cu Value (KN/m^2)

- approximated to the nearest whole number



MOISTURE CONTENT (%)

- approximated to the nearest whole number



STANDARD PENETRATION TEST

- Number of blows per 300mm unless otherwise stated

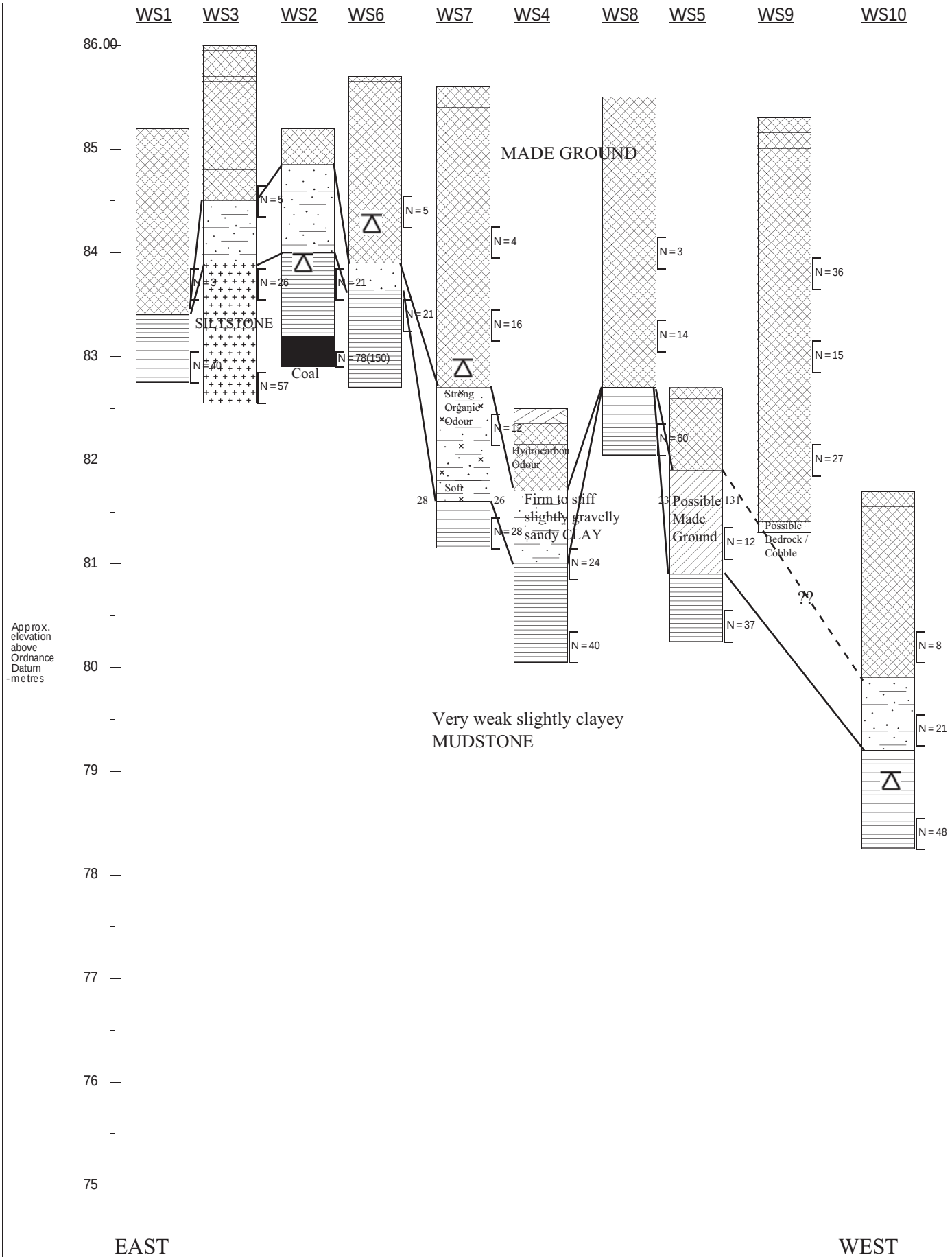
- SP - test terminated within the seating penetration



HIGHEST STANDING WATER LEVEL

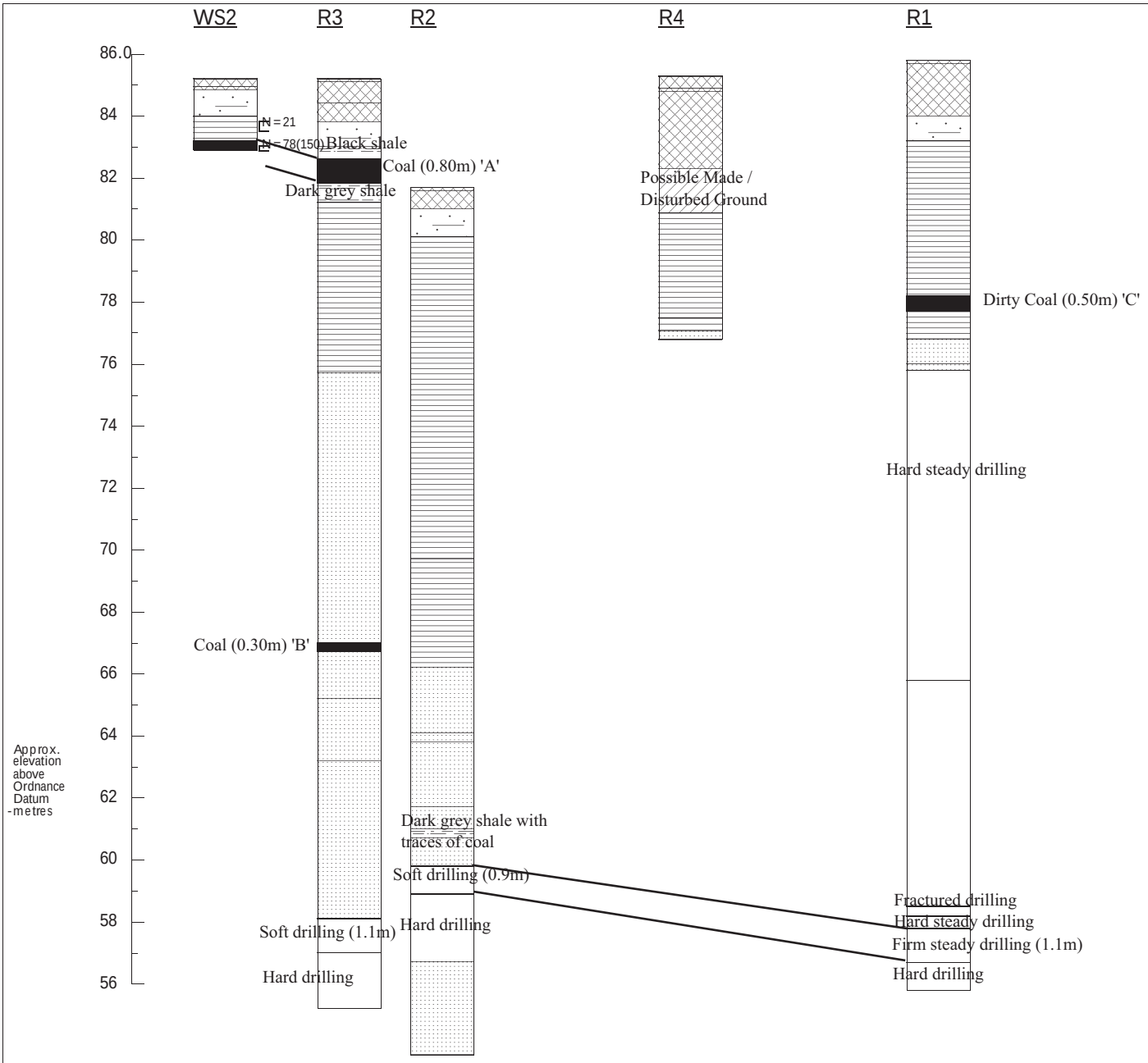


OBSERVED GROUNDWATER SEEPAGE



Scale 1:50 V

Soil Sections through boreholes.	No Horizontal Scale	2012/93 Page 1 of 1	



South southwest

North northeast

Scale 1:200 V

Bedrock section through boreholes



SUB SOIL Surveys Ltd

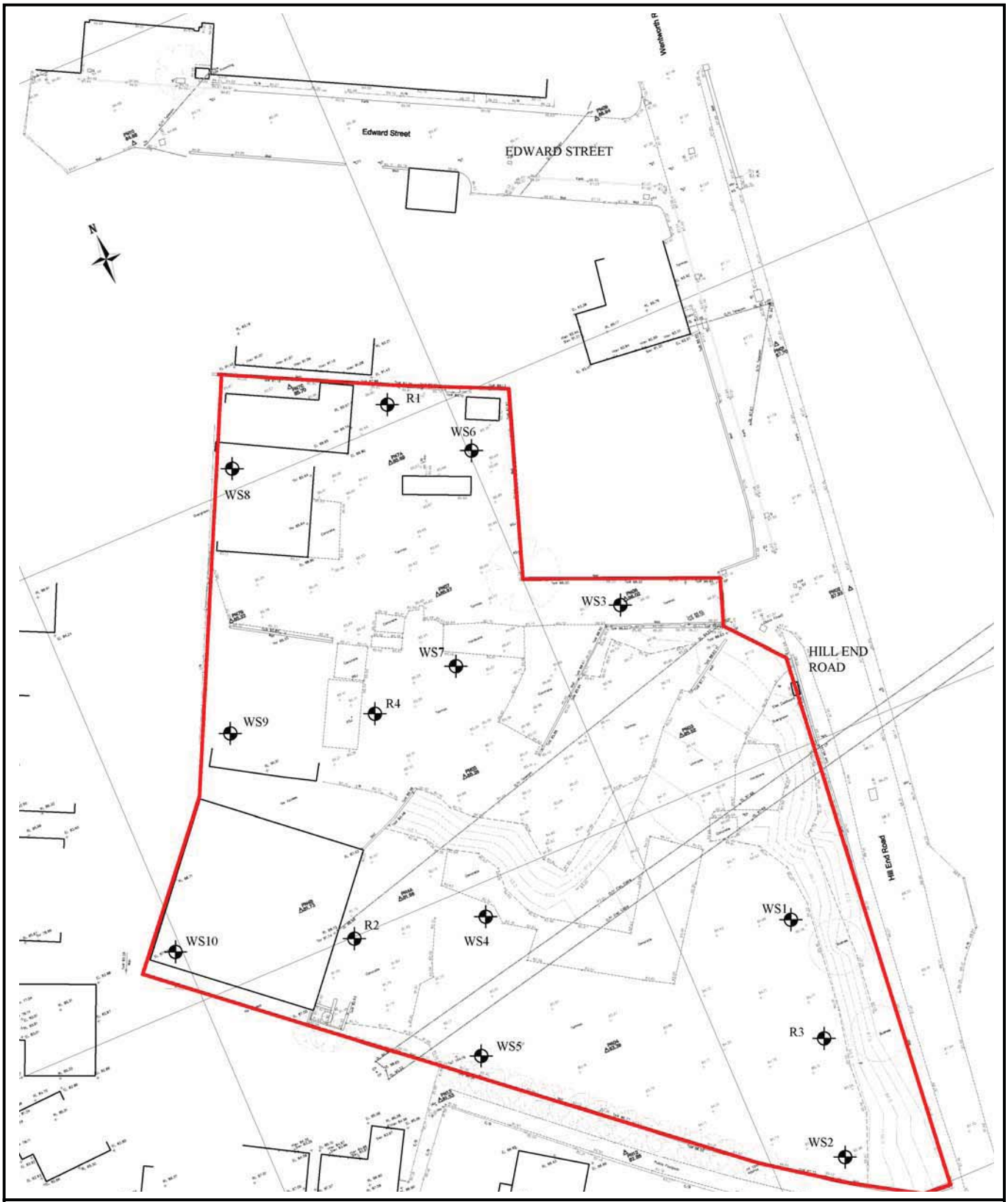
Specialists in Geotechnical Engineering

2012/93 MAPPLEWELL

SITE LOCATION PLAN

FIG 1

SCALE : NTS



SUB SOIL Surveys Ltd

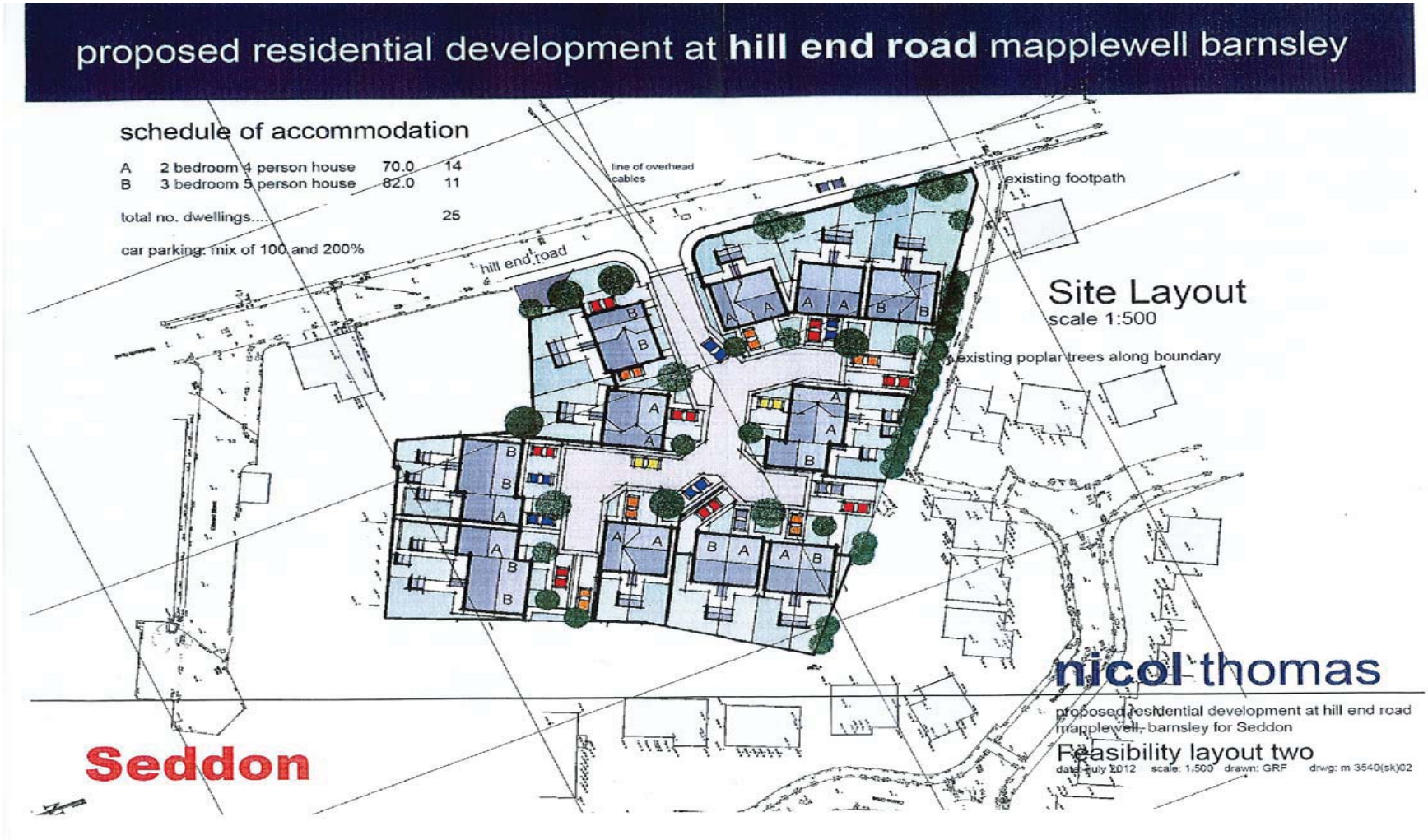
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EXISTING SITE LAYOUT AND EXPLORATORY HOLE LOCATIONS

FIG 2

SCALE : NTS



SUB SOIL Surveys Ltd

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2012/93 MAPPLEWELL, BARNSLEY

PROPOSED SITE LAYOUT

FIG 3

SCALE : NTS

APPENDIX IV

Remediation Method Statement by GRM Development Solutions Ltd.

Report type:	Remediation Method Statement
Site:	Hill End Road, Mapplewell
Client's Agent:	Carley Daines & Partners
Date:	August 2014

REMEDIATION METHOD STATEMENT

SITE NAME	**Hill End Road, Mapplewell**
CLIENT'S AGENT	**Carley Daines & Partners**
ENGINEER	**GRM Development Solutions Ltd**

INFORMATION/REPORTS USED

- Phase 2 (Ground Investigation) Report by Sub Soils Survey Ltd., Manchester (Report no. 2012/93-001-CON-RevA) dated April 2013.

INTRODUCTION

GRM Development Solutions Ltd (GRM) has been instructed by the Client's Agent (Carley Daines & Partners) on behalf of Seddon Construction Ltd (Client) to produce a Remediation Method Statement.

The information provided within the above referenced report is summarised below and has been used in this report to provide an updated conceptual site model and remediation statement.

A Proposed Development Layout Plan is presented in Appendix A.

GENERAL SITE SETTING – PRIOR TO REMEDIATION

Site Location and History
The site is located approximately 3km north northwest of Barnsley town centre.

Historically the site was open fields with a few small buildings (that were probably residential dwellings) until the site was re-developed for use as a scrap yard and vehicle scrap yard, sometime during the 1960s or 70s. A quarry, later a landfill site, was situated to the immediate east of the site and the North Gawber Colliery was situated some distance to the north west of the site during much of the site's history.

Geology & Hydrogeology
The site is indicated to be underlain by a solid geology of the Pennine Middle Coal Measures (mudstone, sandstone, siltstone and coal).

The Environment Agency has classified the underlying Pennine Middle Coal Measures as a Secondary A Aquifer.

SITE INVESTIGATION AND RISK ASSESSMENT

Ground Investigation
The ground investigation works undertaken at the site to date have identified made ground thicknesses of between 0.35m and 4.4m, which are on average 1.6m across most of the site outside of the area of deeper fill identified towards the central western boundary. Most of the exploratory holes encountered a surfacing of tarmac or concrete. The made ground underlying the surface materials comprised a predominance of granular made ground with brick, ash, concrete, ceramics, glass, cloth, bitmac, sandstone, plastic and wood fragments and pieces. Burnt shale was encountered in WS3. Subordinate clayey fill containing brick, coal and concrete fragments and pieces was also encountered. Hydrocarbon odours were recorded in the made ground in WS4.

The made ground is underlain by weathered Coal Measures strata comprising sandy clays grading to mudstone or locally sandstone and by mudstone.

Groundwater was not encountered in the exploratory holes. During the monitoring programme, groundwater at depths of between 1.39m and 2.70m begl was recorded in the made ground, perched on the completely weathered mudstone. Highly variable groundwater levels were recorded in the shallow mudstone and were between 0.30m to 2.70m begl and were often absent.

Ground Gas Risk Assessment
Maximum ground gas concentrations recorded were 3.9%v/v for carbon dioxide and 0.0%v/v for methane. A positive gas flow rate of 0.3l/hr was recorded but more often than not the gas flow rates were between 0.0 and -0.8l/hr.

The ground gas regime has been assessed as Characteristic Situation 1 (CS1) and 'Traffic Light – Green'.

Human Health Risk Assessment
The near surface soils have been confirmed to be contaminated with PAHs and locally with hydrocarbons, asbestos, arsenic and lead.

Controlled Waters Risk Assessment
Leachate testing was recommended by Sub Soils Survey to investigate the risk that the made ground poses to the underlying aquifer.

FURTHER INVESTIGATION

In order to assess the risk to controlled waters from the high concentrations of TPH recorded in the Sub Soils Survey report in exploratory holes WS6, WS7 and WS8, speciated testing to TPHCWG, was commissioned to more accurately determine the nature and concentration of the TPH contamination encountered on the site.

A total number of four soils samples were obtained from the Made Ground in TP01, TP02 and TP03. The locations of the trial pits, trial pit logs and results of the testing are presented in Appendix C.

It is considered that the concentrations of TPH revealed by the testing are not high enough to represent a source that could significantly impact controlled waters. Furthermore there is not a plausible or consistent pathway since the TPH contamination was concentrated in the heavier species, which do not tend to be mobile.

It is concluded that no plausible source of TPH contamination exists on the site that is a risk to controlled waters and there is no plausible or continuous pathway between the source and receptor due to the cohesive nature of the clay and mudstone bedrock.

CONCEPTUAL MODEL – PRIOR TO REMEDIATION

Source-Pathway-Receptor
The consideration of contamination is based upon the principles of risk assessment. Risk assessment is founded upon the use of so called 'source-pathway-receptor' principles in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied:

- The presence of substances that may cause harm (SOURCE),
- The presence of a target which may be harmed (RECEPTOR),
- The existence of a plausible pollutant linkage between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage or pathway there is no risk. For this site not to pose a risk to the end-users or environment the source-pathway-receptor model must be broken.

Qualitative Risk Assessment
Qualitative risk assessment has been undertaken and has identified the following:

Risk to End-Users
Prior to remediation, the conceptual site model for end-users demonstrated the following:

Source – Made ground containing PAHs, TPH, asbestos, arsenic and lead contamination.
Pathway – Indoor and outdoor inhalation of soil dust, ingestion of, and direct contact with, contaminated soil and soil dust, ingestion of vegetables that may have taken up the contamination and soil attached to vegetables.
Receptor – Human health.
Conclusion – Remediation required.

Risk to Controlled Waters
Source – Made ground containing PAHs, TPH, asbestos, arsenic and lead contamination.
Pathway – Infiltration of water through the made ground causing the vertical migration of leached or mobile contaminants to the groundwater. Considering that much of the site is underlain by impermeable clays and low permeability mudstone the potential for vertical migration of leached or mobile contaminants will be reduced to negligible levels.
Receptor – Secondary A aquifer.
Conclusion – No remediation required.

Risk to Construction Materials
Source – Made ground containing soluble sulphates and acid conditions.
Pathway – Infiltration of water mobilising soluble sulphates and acid conditions.
Receptor – Buried concrete.
Conclusion – Concrete design to DS2, ACEC class AC2.

Risk to Construction Materials
Source – Made ground containing TPH.
Pathway – Made ground.
Receptor – Water supply pipes.
Conclusion – Concentrations of TPH are in excess of that recommended for the use of PE/PVC water supply pipes. Upgraded water pipes such as metal (copper) pipes or copper sheathed placed in clean backfill are required.

REMEDIATION STRATEGY

Ground Gas
Characteristic Situation 1 (CS1) and 'Traffic Light – Green' for all plots.

Contaminated Made Ground
Remedial measures to protect human health with regard to the identified contaminated made ground include:

- Hand picking of visible asbestos containing materials if encountered.
- Minimum 600mm clean capping in gardens and 300mm in other soft landscaping areas unless underlain by uncontaminated natural soils.
- Capping layer to be underlain by 150mm thick anti-dig layer (as part of the minimum 600m thick layer) or by geotextile as appropriate (see below).
- Remedial measures below hardstanding and houses are considered not to be necessary.

Construction Materials
Current UKWIR guidance suggests that TPH are in excess of that recommended for the use of PE/PVC water supply pipes. Upgraded water pipes such as metal (copper) pipes or copper sheathed placed in clean backfill are required. Buried concrete should be designed to DS2, ACEC class AC2.

REMEDIAL WORKS

Prior to the remedial works it is recommended that made ground soil samples are obtained for asbestos analysis from a minimum of 12 locations, spread evenly over the site and situated within proposed rear garden areas, and at a depth equivalent to 600mm below final site levels. If the presence of asbestos is confirmed the capping layer shall include a 150mm thick anti dig layer. If not a geotextile at the base of

the capping layer will be adequate.

Sufficient made ground shall be removed from garden and soft landscaped area to accommodate the capping layer. The capping layer may terminate on uncontaminated natural strata and in these cases an anti dig / geotextile will not be required. Excavated made ground (from whatever source) should be visually screened to ensure the absence of asbestos containing materials. Should asbestos containing materials be encountered they should be hand picked and the asbestos containing materials segregated to await disposal off-site.

Following successful visual screening for asbestos containing materials, arisings from excavations can be re-used beneath hard standing provided they are successfully analysed for the absence of traces of asbestos. Alternatively they can be stockpiled on-site for future disposal, however, additional analysis and quantification for asbestos may be required for disposal purposes. Materials surplus to requirements will require disposal off-site. The Local Authority will require the submission of the associated waste transfer notes and haulage notes as part of the remediation validation.

VALIDATION

Thickness of Capping Layer
Validation of the capping thickness should comprise one validation hole per three gardens to the base of the capping material.

Imported Capping Material
Following importation of topsoil / subsoil for capping, inspection and chemical analysis will be undertaken to confirm that the imported material is suitable for use.

A minimum of three samples will be taken per source of imported material, with further samples being taken at the rate of one sample per 250m^3 for soils from a confirmed Greenfield source and one sample per 50m^3 for generated soils. Confirmation of the location of greenfield sources, including a location plan and address should be provided for inclusion in the validation report and if required for the local authority.

The chemical analysis should comprise a general suite of contaminants, including but not limited to metals, inorganics and speciated PAH, TPHCWG and asbestos. GRMs TACs/SGVs are presented in Appendix B. Imported materials are to be screened against a residential with plant uptake end-use.

Gas Protection Measures
Gas protection measures are not required, therefore, validation is not necessary.

VALIDATION REPORTING

A validation report confirming that all of the above measures have been undertaken will be required by local authority.

The report should include confirmation of the removal of the identified contaminated soils and placement of capping materials to the required depth. Chemical validation analysis and confirmation of the suitability for use of imported topsoil/subsoil should also be included. Additionally, copies of haulage notes confirming the export of excavated soil and import of topsoil/subsoil will also be required.

DISPOSAL AND CLASSIFICATION

It is recommended that further analysis and quantification of asbestos from the Made Ground is undertaken for waste disposal purposes.

Given the concentrations of TPH encountered in the Made Ground it is likely that some of Made Ground will be classified as hazardous for disposal purposes, however, this assessment will need to be confirmed by the receiving landfill

APPROVALS

The above recommended remediation measures will need to be approved by the local authority and if appropriate the NHBC or other warranting body.

Should any other material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM can be contacted to undertake additional investigation if necessary. The local Environmental Health Officer should be contacted and informed of any additional remedial work required.

Document prepared by	 **Clive Kirby** FGS CGeol (Principal Engineering Geologist)
Reviewed and Approved by	 **Chris Jerram** FGS CGeol (Director)
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.	

APPENDICES

A	Proposed Development Plan
B	GRM TAC
C	Trial Pit Location Plan, Trial Pit Logs and TPHCWG Test Results.

APPENDIX A

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

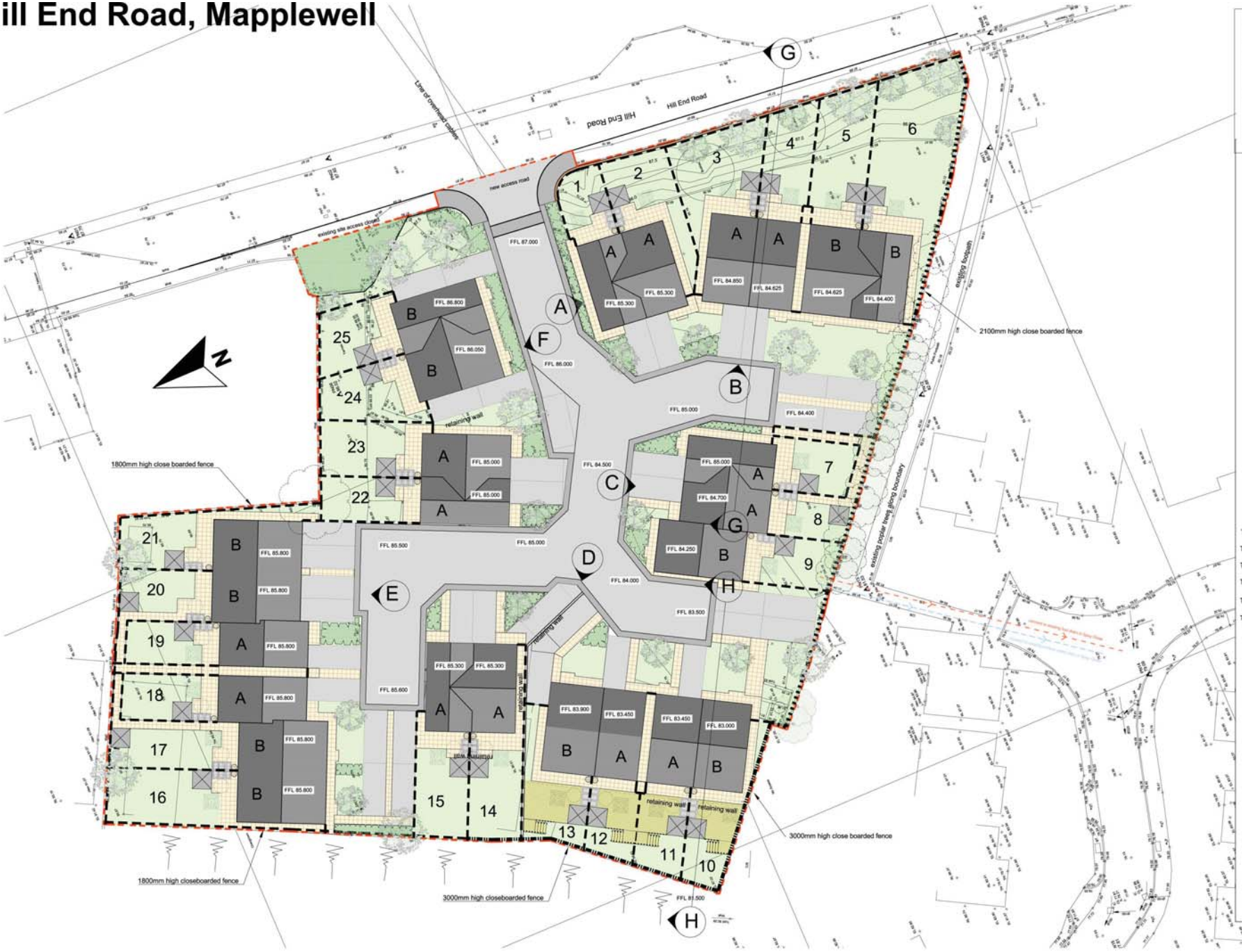
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info@grm-uk.com

www.grm-uk.com

Hill End Road, Mapplewell



SCHEDULE OF ACCOMMODATION

Type A	2 bedroom 4 person house @ 70m²	14
Type B	3 bedroom 5 person house @ 82m²	11
Total No. units		25
Car parking:	2 bed	100% min
	3 bed	200% min
Site area:	4800m²	
	0.48Ha	

Legend

- Precast concrete paving flags; Colour buff
- Hedge planting - see drawing M3540 (PL) 06 for landscape details
- Grass
- Tarmac
- Timber decking
- Exiting trees retained
- Exiting trees removed
- New trees, generally standards.

Type 1	2100mm highClose boarded timber fence to site perimeter
Type 2	1800mm high close boarded timber fence to plot boundaries
Type 3	1200mm high close boarded timber fence with 600mm high trellis to plot boundaries
Type 4	1200mm high timber fence between plots
Type 5	900mm high metal railings
Type 6	3000mm high close boarded fence
	1800mm high brick wall

Shed with steel hoops for cycle security embedded into concrete floor and garden equipment storage space. 2 no. cycles - shed size 2.0m x 2.0m

Rotary drier with; 6.0m line length

Water Butt - 200 litre with:
- no open access at the top (childproof lid is allowed)
- tap for drawing off water
- detachable from down pipe with removeable top or base for cleaning the interior
- connected to down pipe with automatic overflow to surface water system
- stable ansd adequately supported
- made from durable material, opaque to sunlight.

Bin store with 1500mm dia turning circle

External light position

0 5 10 20

nicol thomas

Revision	Date	Details
A	Nov 2013	3000 high fence to rear of plots 10 to 14

nicol thomas
architects project managers construction cost consultants CDM co-ordinators
Registered in England and Wales: Reg No. 2140639
Quality Assured to BS EN ISO 9001:1994 Certificate Number GB 4723

Heyside House Blackshaw Lane Heyside Royton Oldham OL2 6NS
t:01706 290088 f:01706 290099 e:oldham@nicolthomas.com

Also at Birmingham (Registered office)

Do not scale from this drawing. All dimensions must be checked and verified before preparing production drawings or commencing works. This drawing and its design is the copyright of Nicol Thomas Ltd and may not be reproduced in any form whatsoever without their prior express written consent.

Client:	SEDDON			
Job:	HILL END ROAD, MAPPLEWELL			
Drawing title:	PROPOSED LAYOUT			
Drawing Number: (Job number)	M3540	(PL)	03	Revision: A
Scale:	1:200 @ A1			
Date:	DEC 2012			
Drawn by/ checked by:	CH/RF			

APPENDIX B

GRM Development Solutions provides multi-disciplinary consultancy services, UK-wide:

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- Structural Engineering Services
- Construction Management
- Site Services

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	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	**1%**	**2.50%**	**6%**
a **Arsenic**	32	32	32
a **Cadmium**	10	10	10
b **Chromium III**	614	614	614
b **Chromium VI**	4.15	4.15	4.15
c **Lead**	450	450	450
d **Mercury**	170	170	170
a **Selenium**	350	350	350
a **Nickel**	130	130	130
b **Phenols**	184	290	415
b **Copper**	2330	2330	2330
b **Zinc**	3,750	3750	3750
e **Cyanide**	34	34	34
b **Benzene**	0.08	0.157	0.332
b **Toluene**	119	270	611
b **Ethylbenzene**	65	154	354
b ***o* - xylene**	45	106	246
b ***m* - xylene**	44	103	240
b ***p* - xylene**	42	98.2	228
b/f **Acenaphthene**	210(326)	480	1000
b/f **Acenaphthylene**	168	400	850
b/f **Anthracene**	2300	4900	9200
b **Benzo(a)anthracene**	3.1	4.7	5.9
b **Benzo(a)pyrene**	0.83	0.94	1
b **Benzo(b)fluoranthene**	5.6	6.5	7
b **Benzo(ghi)perylene**	40	46	47
b **Benzo(k)fluoranthene**	8.5	9.6	10
b **Chrysene**	6	8	9.3
b **Dibenzo(ah)anthracene**	0.76	0.86	0.9
b **Fluoranthene**	260	460	670
b/f **Fluorene**	160	380	780
b **Ideno(1,2,3-cd)pyrene**	3.2	3.9	4.2
b **Napthalene**	1.5	3.7	8.7
b/f **Phenanthrene**	92	200	380
b **Pyrene**	560	1000	1600
ALIPHATIC HYDROCARBONS			
b/f **C5-C6**	30	55	110
b/f **C6-C8**	73	160	370
b/f **C8-C10**	19	46	110
b/f **C10-C12**	93(48)	230(118)	540(283)
b/f **C12-C16**	740(24)	1700(59)	3000(142)
f **C16-35**	45,000	64,000	76,000
AROMATIC HYDROCARBONS			
b/f **C5-7 (benzene)**	65	130	280
b/f **C7-8 (toluene)**	120	270	611
b/f **C8-C10**	27	65	151
b/f **C10-C12**	69	160	346
b/f **C12-C16**	140	310	593
f **C16-C21**	250	480	770
f **C21-C35**	890	1110	1230

Notes

a SGV (2009)
b LQM/CIEH values or derived using CLEAv1.06 with LQM/CIEH Data.
c 2002 SGV values used until further guidance is pubished
d SGV for inorganic Hg used (ref.2009 SGV, Pg5, Para.4)
e Atkins ATRISKsoil Value
f Oral, dermal and inhalation exposure compared with Oral HCV
Values in brackets present TAC exceeding solubility & vapour saturation limits

GRM.TAC.03.11

APPENDIX C

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DO NOT SCALE

NOTES:

N

TP Trial Pit Location

SA Soakaway Pit Location

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Burton-on-Trent, Staffs, DE14 2WH
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info@grm-uk.com www.grm-uk.com

CLIENT:
Carley Daines & Partners

PROJECT:
Hill End Road, Mapplewell, Barnsley.

TITLE:
Trial Pit Location Plan

SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
CIK	08/2014
PROJECT No:	DRAWING No:
P6671	

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Laurus House
First Avenue
Centrum 100
Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **SA01**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433409E 409462N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
		0.20 - 0.30/ES 0.20 - 0.30/D			0.15			Tarmacadam. (MADE GROUND)
					0.40			Red-brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular including brick and concrete. Some cobbles of brick. (MADE GROUND)
	1							Firm and locally firm to stiff orange-brown mottled red-brown slightly sandy slightly gravelly clay. Gravel is fine angular including mudstone, sandstone and coal fragments. (WEATHERED PENNINE MIDDLE COAL MEASURES)
					1.30			Stiff dark grey silty slightly gravelly CLAY. Gravel is fine to coarse angular including mudstone, siltstone and coal. (WEATHERED PENNINE MIDDLE COAL MEASURES)
					1.40			End of borehole at 1.40 m
	2							
	3							
	4							

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	0.50	
Date backfilled:		2.10	
Shoring:	None available		
Stability:	Minor collapse of granular made ground.		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 1.40	

General Remarks:
Soakaway Test Pit

Strata strength/densities determined by observation only.

Scale: 1:25

GRM Development Solutions Ltd
Laurus House
First Avenue
Centrum 100
Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **SA02**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433387E 409480N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
		0.40 - 0.50/ES 0.40 - 0.50/D			0.15			Tarmacadam. (MADE GROUND)
								Red-brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular including brick and red shale. (MADE GROUND)
					0.60			Firm and locally friable red-brown locally grey slightly sandy to sandy slightly gravelly CLAY. Gravel is fine to medium angular to subangular mudstone, siltstone and sandstone. (WEATHERED PENNINE MIDDLE COAL MEASURES)
					1.60			End of borehole at 1.60 m

1 2 3 4

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	0.50	
Date backfilled:		2.10	
Shoring:	None available		
Stability:	Minor instability in granular made ground.		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 1.60	

General Remarks:
Soakaway Test Pit

Strata strength/densities determined by observation only. Scale: 1:25

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Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **SA03**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433372E 409500N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
		0.30 - 0.40/ES 0.30 - 0.40/D			0.10			Tarmacadam. (MADE GROUND)
					0.20			Loose red-brown slightly sandy to sandy gravel. Gravel is fine to coarse angular including brickwork block and occasional sandstone. (MADE GROUND)
								Loose black-brown mottled red gravelly fine to coarse sand. (MADE GROUND)
					0.90			Firm dark grey mottled orange-brown and locally grey slightly gravelly CLAY. Gravel is fine to medium subangular coal, mudstone, siltstone and sandstone. (WEATHERED PENNINE MIDDLE COAL MEASURES)
	1	1.00 - 1.10/ES 1.00 - 1.10/D			1.10			Firm to stiff grey mottled orange-brown silty gravelly CLAY. Gravel is fine to medium angular siltstone, mudstone and sandstone. (WEATHERED PENNINE MIDDLE COAL MEASURES)
					1.80			End of borehole at 1.80 m
	2							
	3							
	4							

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	0.75	
Date backfilled:		2.30	
Shoring:	None available		
Stability:	Moderate instability in granular made ground.		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 1.80	

General Remarks:
Soakaway Test Pit

Strata strength/densities determined by observation only. Scale: 1:25

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Centrum 100
Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **TP01**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433392E 409541N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
		0.20/ES 0.20/D			0.10			Tarmacadam. (MADE GROUND)
					0.50			Pale grey locally red-brown fine to coarse sandy gravel. Gravel is fine to coarse angular including brick, concrete. Strong hydrocarbon / bitumen odour. (MADE GROUND)
	1	1.10 - 1.20/ES 1.10 - 1.20/D 1.20/B 1.30 - 1.40/D 1.30 - 1.40/ES			1.25			Loose to medium dense grey-brown locally pale grey and orange-brown slightly clayey sandy gravel. Gravel is fine to coarse angular including brick, concrete, plastic and metal pipework and possible asbestos. Abundant cobbles and boulders of concrete and tarmacadam. Moderate hydrocarbon odour. (MADE GROUND)
		1.90 - 2.00/ES 1.90 - 2.00/D			1.80			Medium dense grey-brown very sandy fine to coarse gravel. Gravel is fine to coarse angular including brick, concrete and paint flakes. No odour perceived. (MADE GROUND)
	2	2.10 - 2.20/D			2.10			Soft to firm dark grey silty slightly gravelly CLAY. Gravel is fine angular including coal and mudstone. (WEATHERED PENNINE MIDDLE COAL MEASURES)
								End of borehole at 2.00 m
	3							
	4							

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	1.00	
Date backfilled:		2.50	
Shoring:	None available.		
Stability:	Moderately unstable in made ground. Sides collapsing from 0.0m-1.8m		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 2.00	

General Remarks:
Pit unstable, unable to clear fallen debris

Strata strength/densities determined by observation only. Scale: 1:25

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Laurus House
First Avenue
Centrum 100
Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **TP02**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433375E 409538N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
					0.10			Tarmacadam. (MADE GROUND)
		0.30 - 0.40/ES 0.30 - 0.40/D			0.50			Black-brown gravelly fine to coarse sand. Gravel is fine to coarse angular to subrounded gravel including concrete, brick and tarmacadam fragments. (MADE GROUND)
					0.70			Dense pale grey fine to medium subrounded gravel including limestone (sub-base). (MADE GROUND)
	1	1.00 - 1.10/ES 1.00 - 1.10/D			0.90			Loose red-brown fine to coarse sand and gravel. Gravel is fine to coarse angular including brick. Occasional cobbles of brick. (MADE GROUND)
					1.20			Medium dense brown very gravelly fine to coarse sand. Gravel is fine to coarse angular to subangular including brick and concrete. Some cobbles of brick. (MADE GROUND)
	2	2.00 - 2.10/D			2.10			Medium dense gravelly to very gravelly fine to coarse sand. Gravel is fine to coarse angular brick, concrete, metal fragments, steel work and rubber hoses. Slight hydrocarbon odour to 1.8m, no odour below. (MADE GROUND)
					2.20			Medium dense brown gravelly, locally clayey fine to coarse sand. Gravel is fine to coarse angular including brick, metal and plastic fragments. Occasional cobbles and boulders of brick and paving slabs. (MADE GROUND)
	3							End of borehole at 2.20 m
	4							

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	1.00	
Date backfilled:		2.50	
Shoring:	None available.		
Stability:	Moderately unstable. Frequent localised collapse from 0.5m-2.1m.		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 2.20	

General Remarks:
Pit unstable. Unable to clear fallen debris.

Strata strength/densities determined by observation only. Scale: 1:25

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First Avenue
Centrum 100
Burton upon Trent

Tel: 01283 551 249

Trial Pit Log

Borehole Number **TP03**

Ground Level mAOD

Site: Hill End Road, Mapplewell, Barnsley

Coordinates: 433388E 409521N

Client: Carley Daines

GRM Project ref: **P6671**

Groundwater		Samples	Insitu Testing		Strata		Strata Record	
Strike	Depth (m)	Depth/Type (m)	Depth (m)	Hand Vane Strength (kN/m2)	Depth (m)	Level (mAOD)	Legend	Description
					0.10			Tarmacadam. (MADE GROUND)
		0.25 - 0.35/ES 0.25 - 0.35/D			0.30			Black-brown gravelly fine to coarse sand. Gravel is fine to medium angular to subrounded including brick. (MADE GROUND)
					0.40			Pale grey coarse angular gravel including concrete (possible floor slab). (MADE GROUND)
	1	1.00 - 1.10/ES 1.00 - 1.10/D						Black-brown sandy gravel. Gravel is (MADE GROUND)
					1.20			Grey-brown sandy gravel. Gravel is fine to coarse angular to subangular including limestone. (MADE GROUND)
					1.30			Loose to medium dense black-brown gravelly fine to coarse sand. Gravel is fine to coarse angular including brick, concrete, sandstone, metal fragments and car tyres. Abundant cobbles and boulders of brick and sandstone. No odours.()
	2	2.00 - 2.10/ES 2.00 - 2.10/D						
					2.30			End of borehole at 2.30 m
	3							
	4							

Excavation Details		Dimensions (m)	Groundwater Observations
Date excavated:	06/08/2014	1.30	
Date backfilled:		2.50	
Shoring:	None available.		
Stability:	Moderately unstable. Frequent collapse of the granular made ground 0.3m-2.3m.		
Plant:	CAT 423E		
Logged by:	PW	Final Depth (m): 2.30	

General Remarks:
Pit unstable, unable to clear fallen debris. In-situ brick wall encountered at 0.8m begl to base in east wall of pit.

Strata strength/densities determined by observation only. Scale: 1:25

Nicholls Colton Analytical
7 - 11 Harding Street
Leicester
LE1 4DH

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton Upon Trent
Staffs
DE14 2WH

Analytical Test Report: L14/1595/GRM/001

Your Project Reference:	**Hill End Road, Mapplewell**	Samples Received on:	07.08.2014
Your Order Number:	P6671	Testing Instruction Received:	07.08.2014
Report Issue Number:	1	Sample Tested:	07 to 18.08.2014
Samples Analysed:	4 Soils	Report issued:	18.08.2014

Signed

James Gane
Manager - Data Logistics
Nicholls Colton Analytical

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report.

Moisture Content was determined in accordance with NCA method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NCA method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer.

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Leicester
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L14/1595/GRM/001

Project Reference - Hill End Road, Mapplewell

Analytical Test Results - TPH CWG

NCA Reference			14-26753	14-26754	14-26755	14-26756
Client Sample Reference			TP01	TP02	TP03	TP03
Client Sample Location			TP01	TP02	TP03	TP03
Depth (m)			1.1-1.2	1.0-1.1	1.0-1.1	2.0-2.1
Date of Sampling			06.08.2014	06.08.2014	06.08.2014	06.08.2014
Time of Sampling			Not provided	Not provided	Not provided	Not provided
Sample Matrix			Sand	Sand	Sand	Sand
Determinant	**Units**	**Accreditation**				
Aliphatics						
$>C_5$ to C_6	(mg/kg)	None	0.69	0.08	<0.03	0.08
$>C_6$ to C_8	(mg/kg)	None	2.1	0.15	0.35	0.26
$>C_8$ to C_{10}	(mg/kg)	None	0.39	<0.03	<0.03	<0.03
$>C_{10}$ to C_{12}	(mg/kg)	None	<11	<11	<11	<12
$>C_{12}$ to C_{16}	(mg/kg)	None	11	34	13	17
$>C_{16}$ to C_{21}	(mg/kg)	None	32	78	38	51
$>C_{21}$ to C_{35}	(mg/kg)	None	353	509	324	442
Aromatics						
$>C_5$ to C_7	(mg/kg)	None	<0.12	<0.03	<0.03	<0.03
$>C_7$ to C_8	(mg/kg)	None	0.12	<0.03	<0.03	<0.03
$>C_8$ to C_{10}	(mg/kg)	None	2.6	<0.03	<0.03	<0.03
$>C_{10}$ to C_{12}	(mg/kg)	None	<11	<11	<11	<12
$>C_{12}$ to C_{16}	(mg/kg)	None	11	35	<11	<12
$>C_{16}$ to C_{21}	(mg/kg)	None	44	164	27	34
$>C_{21}$ to C_{35}	(mg/kg)	None	297	715	399	355

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L14/1595/GRM/001

Project Reference - Hill End Road, Mapplewell

Sample Descriptions

NCA Reference	Client Sample Reference	Sample Depth (m)	Description	Moisture Content (%)	Stone Content (%)
14-26753	TP01	1.1-1.2	Dark brown gravelly silty sand with crushed brick, paint scrapings and crushed rock. (Fill)	14	44
14-26754	TP02	1.0-1.1	Dark brown gravelly silty sand with crushed brick and crushed rock. (Fill)	12	21
14-26755	TP03	1.0-1.1	Dark brown gravelly silty sand with crushed brick and crushed rock. (Fill)	12	53
14-26756	TP03	2.0-2.1	Dark brown gravelly silty sand with crushed brick and crushed rock. (Fill)	15	29

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L14/1595/GRM/001

Project Reference - Hill End Road, Mapplewell

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	CWG	As Received	In house method statement - MS - CL - EPH and VPH

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