



Russel House, Mill Road
Langley Moor, Durham
DH7 8HJ

t: 0191 378 9972

f: 0191 378 1537

e: info@thesiriusgroup.com

Mark Bayliss
Miller Homes (North East) Ltd
Nautilus House
Redburn Court
Earl Grey Way
Royal Quays
North Shields
NE29 6AR

Date: 18th November 2016

Our Ref:C7074/6519/CR/CR

Dear Mark

Re: Former Siemens Factory, Hebburn – Report on Proof Drilling Exercise

Introduction

Sirius Geotechnical and Environmental Ltd (Sirius) was instructed by Miller Homes (North East) Ltd (Miller Homes) to carry out probe drilling to conclude whether the above site is at risk from shallow unrecorded underground coal workings within the Bottom Hebburn Fell coal seam.

This Letter Report should be read in conjunction with the following documents:

- Geoenvironmental Appraisal of land at Former Siemens Factory, Hebburn, Gateshead, dated August 2016.

The comments and opinions presented in this letter report are based on the ground conditions encountered during the several phases of intrusive investigation works performed by Sirius. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation. Any diagram or opinion on the possible configuration of strata, or other spatially variable features between or beyond investigation positions is conjectural and given for guidance only.

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Previous works

Mining geology

The site is shown to overlie Devensian Till over Carboniferous Middle Coal Measures strata, comprising interbedded sequences of mudstone, siltstone, sandstone and coal.

The Top Hebburn Fell (THF) coal seam is conjectured on British Geological Survey (BGS) mapping to subcrop northwest to southeast across the centre of the site, dipping to the southeast. This seam is recorded to be thin.

The Bottom Hebburn Fell (BHF) coal seam, recorded on BGS mapping to be circa 6m below the THF, is conjectured to subcrop west to east across the northern area of the site, dipping to the southeast. This seam is recorded to be between 1.07 and 1.63m thickness, and present in two or three leaves.

Intrusive mining investigation previously undertaken

Sirius undertook an intrusive geoenvironmental investigation of the above site in June and July 2016 which included eight rotary open hole boreholes (RO 101 to 106 including RO101A and RO103A) to investigate the mining risk from the THF and BHF coal seams.

From a review of the findings of the initial ground investigation together with a review of the published stratigraphic information it was conjectured that the BHF was encountered in RO103A at 1.1m thick just southeast of its subcrop at 4.7m below rockhead and was further encountered in boreholes RO104 and RO105 where it was found up to 1.7m in thickness including mudstone bands. A second coal seam encountered at 22.7m bgl in RO105 at 1.2m below rockhead and 0.3m thick was conjectured to be the THF seam. The inferred position and the subcrop beneath drift of the THF and BHF coal seams appear to be largely consistent with the published geology and inferred dip and dip direction.

The THF coal seam was considered too thin to have been economically worked. However, the BHF was considered to be of workable thickness.

For typical Coal Measures bedrock (e.g. mudstone), it is generally accepted that there is a risk of surface instability where the thickness of competent bedrock above the worked coal seam is less than 10x the seam thickness. The BHF was found of workable thickness and with insufficient competent rock cover across the central and southern part of the site, from its inferred subcrop position in the north west until it generally had sufficient competent bedrock cover toward the south and south east.

However, there was no evidence uncovered of any working of the BHF beneath the site from the boreholes drilled. Furthermore, there were no mine entries on or close to the site, and the majority of the site was underlain by a significant thickness of drift, and therefore, historic early mining through drifts, adits or bell pits was considered unlikely.

Therefore, it was considered that the overall risk to the site from unrecorded shallow workings was low. However, the risk could not be ruled out with certainty on the basis of eight boreholes alone and a programme of proof drilling was recommended, targeting the central and south-eastern part of the site where the risk from coal (if worked) was considered to be greatest. The approximate area requiring proof drilling was determined from the inferred position of the BHF subcrop, dip of the seam and depth to bedrock, and this is shown the Drawing No. C7074/01 presented in Appendix A.



Proof Drilling Exercise

Scope of Investigation

Sirius were instructed by Miller Homes to conduct probe drilling to confirm if workings were present within the BHF coal which is present beneath the site. The investigation targeted an area extending from the inferred subcrop position of the BHF in the north west to the central and south-eastern part of the site where the risk from the coal (if worked) was considered to be greatest, as shown on Drawing No. C7074/01 presented in Appendix A.

The aim of the proof drilling was to investigate for the presence of workings rather than prove competent cover.

The investigation took place between 31st October and 7th November 2016 and comprised the advancement of 19 rotary open hole boreholes using air mist and water flush (RO01, RO03 and RO04 to RO20) to a maximum depth of 40.3m below ground level (m bgl). Water flush was used for boreholes in the north east of the site which were situated within 50m of residential properties. Rotary borehole logs are appended to this Letter Report.

In addition, ten windowless sampler boreholes (WS201 to WS210) were drilled in the south east of the site for the installation of monitoring wells for further gas monitoring. Six additional gas monitoring rounds are to be undertaken over a three month period, and results will be reported under separate cover once completed.

Proof drilling findings

Drillers logs are appended to this letter. The depths of strata on the record sheets are recorded from current ground levels at each location, unless indicated otherwise.

Depth to rockhead was found to vary across the site from 9.9m bgl (RO06) in the north east of the site to 19.4m bgl (RO04) in the north of the site. Coal was found to absent in the north-west of the site to a depth of up to 40m bgl, indicating the subcrop of the BHF was possibly a little further south than inferred. Intact coal seams varying in thickness from 0.1m to 0.8m (RO016 in the centre west) were identified towards the south and south east, although it was locally absent (RO14) and often interbedded with mudstone. In RO11 an intact seam of coal up to 1.3m thick was identified although with a 0.4m thick band of mudstone in its centre.

Towards the southern and south eastern extent of the proof drilling exercise the BHF coal seam generally comprised of thin coal bands interbedded with mudstone.

No broken ground, voids, loss of air or water flush or any other evidence of workings were encountered within any of the holes drilled during the proof drilling exercise.



Conclusions

This proof drilling exercise along with the mining investigation undertaken previously by Sirius has not identified any evidence of coal workings at shallow depth beneath the site. Furthermore, as previously discussed there are no recorded mine entries on or close to the site, and the majority of the site is underlain by a significant thickness of drift, and therefore, historic early mining through drifts, adits or bell pits is considered unlikely

This proof drilling exercise has provided a much more detailed assessment of the nature of the BHF coal seam beneath the site, which indicates that it is inter-persistent and often of thin unworkable thickness and/or interbedded with mudstone, which in turn lowers the overall likelihood that it may have been worked.

Therefore, based on the evidence obtained, the site is not considered to be at significant risk from unrecorded underground coal workings, and remedial measures are not considered necessary.

In the unlikely event that any suspected mining features are uncovered during the site preparation/construction works (i.e. shaft, adit) then Sirius should be contact immediately for advice.

We trust that this is satisfactory. However, should you require any further information please do not hesitate to contact the undersigned.

Yours sincerely

Chris Rudd
Regional Manager

For and on behalf of
Sirius Geotechnical & Environmental Ltd

Encs: Probe Hole Drillers Logs
 Drawing No. C7074/01 – Exploratory Hole Location Plan



BOREHOLE RECORD

BH No. **RO01**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 31/10/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.40		MADE GROUND: Concrete	
								Light brown grey gravelly CLAY with occasional sandy bands.	
						16.50		Light grey interbedded SANDSTONE and weathered MUDSTONE.	
						27.00		Light brown grey MUDSTONE.	
								Continued next sheet	

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO01



BOREHOLE RECORD

BH No. **RO01**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
31/10/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						31			
						32			
						33			
						34			
						35			
						36			
						37			
						38			
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			
							33.50		

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO01
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO02**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 31/10/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.30			
						0.80			
1					MADE GROUND: Concrete fragments and brick				
					MADE GROUND: Concrete				
					Light to dark grey CLAY.				
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
18.40					Interbedded SANDSTONE and weathered MUDSTONE.	18.40			
20.00					Light brown SANDSTONE.	20.00			
21.20					Light grey MUDSTONE	21.20			
22									
23									
24									
25									
26									
27									
28									
28.8					Groundwater level				
29									
30									
Continued next sheet									

Remarks and Groundwater Observations:
 1. Groundwater encountered at 28.8mbgl. 2. Drilled with air mist flush. 3. Cased to 9.0m.

GL (m AOD)	Fig No. RO02
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO02**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
31/10/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
					31				
					32				
					33				
					34				
					35				
					36				
					37				
					38				
					39				
					40				
					41				
					42				
					43				
					44				
					45				
					46				
					47				
					48				
					49				
					50				
					51				
					52				
					53				
					54				
					55				
					56				
					57				
					58				
					59				
					60				
					61				
						40.00			

End of Borehole at 40.00m

40.00

Remarks and Groundwater Observations:

1. Groundwater encountered at 28.8mbgl. 2. Drilled with air mist flush. 3. Cased to 9.0m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO02



BOREHOLE RECORD

BH No. **RO04**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
31/10/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.80			
1					MADE GROUND: Dark brown gravelly CLAY. Gravel is fine to coarse brick fragements sandstone and wood.				
2					Grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone.				
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
19.40					Light grey SANDSTONE.	19.40			
20									
21									
22									
23					Black COAL.	23.00			
23.20					Grey to dark grey interbedded SANDSTONE and MUDSTONE.	23.20			
24									
25									
26									
27									
27.50					Brown SANDSTONE.	27.50			
28					Dark grey SANDSTONE	28.10			
28.10									
29									
30									
Continued next sheet									

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO04
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO04**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
31/10/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
								•••••	▨▨▨▨
						31			
						32			
						33			
						34			
						35			
						36			
						37			
						38			
					End of Borehole at 38.30m	38.30			
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO04
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO05**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 31/10/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.20			
					MADE GROUND: Brown slightly sandy gravelly CLAY. Gravel is fine to medium brick and concrete.	0.40			
					MADE GROUND: Concrete				
					MADE GROUND: Concrete and brick				
					MADE GROUND: Brown grey SANDSTONE	2.80			
					MADE GROUND: Brick and sandstone GRAVEL with black rubber material with a hydrocarbon odour.	3.40			
					MADE GROUND: Brick and sandstone GRAVEL with black rubber material with a hydrocarbon odour.	4.40			
					Grey slightly gravelly CLAY. Gravel is fine to coarse sandstone and mudstone				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
					Light grey weathered MUDSTONE.	19.30			
					Light grey SANDSTONE.	19.90			
					Grey MUDSTONE	20.40			
21									
22									
23									
24									
25									
					<i>Below 25.7m; Mudstone turns dark grey.</i>				
26									
27									
					Grey and brown interbedded SANDSTONE and MUDSTONE.	27.80			
28									
29									
30									

Continued next sheet

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 2.8m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO05



BOREHOLE RECORD

BH No. **RO05**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
31/10/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						31			
						32			
						33			
						34			
						35	34.80		
					Dark grey MUDSTONE.				
						36			
						37			
						38	38.30		
					End of Borehole at 38.30m				
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 2.8m.

GL (m AOD)	Fig No. RO05
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO06**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
02/11/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						1		[Cross-hatch pattern]	[Diagonal hatch pattern]
					MADE GROUND: Dark brown gravelly CLAY. Gravel is fine to coarse brick fragements sandstone concrete and wood. Brown CLAY.	0.70			
						2		[Horizontal line pattern]	[Diagonal hatch pattern]
						3			
						4			
						5	4.30	[Stippled pattern]	[Diagonal hatch pattern]
					Grey slightly gravelly CLAY. Gravel is fine to coarse sandstone and mudstone.				
						6			
						7			
						8		[Horizontal line pattern]	[Diagonal hatch pattern]
						9			
						10			
						11	9.90	[Horizontal line pattern]	[Diagonal hatch pattern]
					Grey weathered mudstone.				
						12		[Horizontal line pattern]	[Diagonal hatch pattern]
						13			
						14			
						15		[Horizontal line pattern]	[Diagonal hatch pattern]
						16			
						17	16.60	[Solid black]	[Diagonal hatch pattern]
					Black COAL.	16.70			
						18	16.90	[Stippled pattern]	[Diagonal hatch pattern]
					Dark grey weathered MUDSTONE.	16.90			
						19	17.10	[Stippled pattern]	[Diagonal hatch pattern]
					Black COAL.	17.10			
						20	17.70	[Stippled pattern]	[Diagonal hatch pattern]
					Light grey MUDSTONE.	17.70			
						21	18.40	[Stippled pattern]	[Diagonal hatch pattern]
					Interbedded SANDSTONE and MUDSTONE.	18.40			
						22		[Stippled pattern]	[Diagonal hatch pattern]
					Light grey MUDSTONE.				
						23		[Stippled pattern]	[Diagonal hatch pattern]
						24			
						25		[Stippled pattern]	[Diagonal hatch pattern]
						26			
						27	25.50	[Stippled pattern]	[Diagonal hatch pattern]
					Grey MUDSTONE				
						28		[Stippled pattern]	[Diagonal hatch pattern]
						29			
						30	27.30	[Stippled pattern]	[Diagonal hatch pattern]
					GREY SANDSTONE.				
						30	30.00		
						End of Borehole at 30.00m			

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 1.5m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO06



BOREHOLE RECORD

BH No. **RO07**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 01/11/2016

Method: Rotary openhole drilling using water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
0.30 - 1.00					MADE GROUND: grey gravelly CLAY. Gravel is fin to medium quartz sandstone and brick	0.30		XXXX	
1.00 - 2.00					Grey brown slightly gravelly CLAY. Gravel is fine to coarse mudstone and sandstone.				
2.00 - 3.00									
3.00 - 4.00									
4.00 - 5.00									
5.00 - 6.00									
6.00 - 7.10									
7.10 - 8.00					Brown grey interbedded SANDSTONE and MUDSTONE.	7.10			
8.00 - 9.00									
9.00 - 10.00									
10.00 - 10.80					Grey MUDSTONE	10.80			
10.80 - 11.90					Black COAL.	11.90			
11.90 - 12.50					Grey MUDSTONE	12.50			
12.50 - 13.00									
13.00 - 14.00									
14.00 - 15.30					Black COAL.	15.30			
15.30 - 15.40					Grey SANDSTONE.	15.40			
15.40 - 16.00									
16.00 - 17.00									
17.00 - 18.00									
18.00 - 19.00									
19.00 - 20.00									
20.00 - 21.30					Grey MUDSTONE with occasional sandstone band.	21.30			
21.30 - 22.00									
22.00 - 23.00									
23.00 - 24.00									
24.00 - 25.00									
25.00 - 26.00									
26.00 - 26.80					Grey SANDSTONE.	26.80			
26.80 - 27.00									
27.00 - 28.00									
28.00 - 29.00									
29.00 - 30.00					End of Borehole at 30.00m	30.00			

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with water flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO07
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO08**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.30			
						0.60			
						17.50			



BOREHOLE RECORD

BH No. **RO08**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						31			
						32			
						33			
						34			
						35			
					End of Borehole at 35.00m	35.00			
						36			
						37			
						38			
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO08



BOREHOLE RECORD

BH No. **RO09**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date: 02/11/2016

Method: Rotary openhole drilling using air and water flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						1		MADE GROUND: brick and concrete rubble.	
						2			
						3			
						4			
						5			
						6			
						6	5.90	MADE GROUND: light and dark SANDSTONE.	
						7	7.10	Grey CLAY.	
						8			
						9			
						10			
						11			
						11	10.70	Grey slightly gravelly CLAY. Gravel is fine to coarse sandstone and mudstone.	
						12			
						13			
						14			
						15			
						16			
						17			
						18			
						18	18.20	Grey MUDSTONE.	
						19	18.40	Black COAL.	
						19	18.50	Brown and grey interbedded SANDSTONE and MUDSTONE.	
						20	18.90	Grey MUDSTONE.	
						21			
						22			
						22	22.20	Brown and grey interbedded SANDSTONE and MUDSTONE.	
						23			
						23	23.40	Grey MUDSTONE.	
						24			
						25			
						26			
						26	25.90	Black COAL.	
						27	26.20	Grey MUDSTONE.	
						27	26.80	Grey SANDSTONE.	
						28			
						29			
						30	30.00	End of Borehole at 30.00m	

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with water flush to 7.1mbgl and air flush beyond. 3. Cased to 6.0m.

GL (m AOD)	Fig No. RO09
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO10**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
01/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Well
						CONCRETE				
						MADE GROUND: Red brick.	0.40			
						Light brown CLAY.	0.60			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19						Light grey MUDSTONE.	18.50			
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30							30.10			
							30.40			

Continued next sheet

Remarks and Groundwater Observations:

1. No Groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO10



BOREHOLE RECORD

BH No. **RO10**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
01/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
					31				
					32				
					33				
					34				
					35		34.50		
					36				
					37				
					38				
					39				
					40				
					41				
					42				
					43				
					44				
					45				
					46				
					47				
					48				
					49				
					50				
					51				
					52				
					53				
					54				
					55				
					56				
					57				
					58				
					59				
					60				
					61				

Black COAL.
Light grey SANDSTONE.

End of Borehole at 34.50m

Remarks and Groundwater Observations:

1. No Groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO10
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO11**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
03/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						1	0.60		
					MADE GROUND: brown gravelly CLAY. Gravel is fine to medium brick concrete sandstone.				
					Brown CLAY.				
					2	1.70			
					Grey CLAY.				
					3				
					4				
					5				
					6				
					7				
					8				
					9				
					10				
					11				
					12				
					13				
					14				
					15				
					16	15.60			
					Grey weathered MUDSTONE.				
					17				
					18	17.80			
					Grey brown interbedded SANDSTONE and MUDSTONE.				
					19				
					20	19.90			
					Grey SANDSTONE.				
					21				
					22	22.20			
					Black COAL.				
					23	22.40			
					Grey SANDSTONE.				
					24				
					25				
					26	26.40			
					Black COAL.				
					27	26.70			
					Grey SANDSTONE.				
					28	27.30			
					Black COAL.				
					28	27.70			
					Grey SANDSTONE.				
					29				
					30				
						30.40			
					Continued next sheet				

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO11
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO11**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
03/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
					31			.....
					Brown SANDSTONE.			.....
					Grey SANDSTONE.	31.10		.....
					32			.....
					33			.....
					End of Borehole at 33.00m	33.30		.....
					34			.....
					35			.....
					36			.....
					37			.....
					38			.....
					39			.....
					40			.....
					41			.....
					42			.....
					43			.....
					44			.....
					45			.....
					46			.....
					47			.....
					48			.....
					49			.....
					50			.....
					51			.....
					52			.....
					53			.....
					54			.....
					55			.....
					56			.....
					57			.....
					58			.....
					59			.....
					60			.....
					61			.....

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO11
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO12**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water		Depth (m)	Level (m AOD)	Legend	Well
						1	0.40			
						MADE GROUND: brown gravelly CLAY. Gravel is fine to medium brick concrete sandstone. Brown CLAY.	1.60			
						2	2.80			
						3				
						Grey slightly gravelly CLAY. Gravel is fine to coarse sandstone and mudstone.				
						4				
						5				
						6				
						7				
						8				
						9				
						10				
						11				
						12				
						13	12.30			
						Grey CLAY with weathered mudstone bands.				
						14				
						15				
						16				
						17				
						18				
						19				
						20	19.30			
						Grey weathered MUDSTONE.				
						21				
						22	21.70			
						Grey MUDSTONE with sandstone bands.				
						23				
						24				
						25	24.30			
						Black COAL.	24.40			
						Grey MUDSTONE.	25.30			
						26	25.60			
						Black COAL.				
						Grey MUDSTONE.				
						27				
						28	27.50			
						Light brown SANDSTONE.				
						Grey SANDSTONE.	28.20			
						29				
						30				
						Continued next sheet				

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO12
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO12**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						31			
						32			
						33	33.00		
						34			
						35			
						36			
						37			
						38			
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO12
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO13**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
02/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Strata Description	Depth (m)	Level (m AOD)	Legend	Well
						CONCRETE	0.35			
						MADE GROUND: red brick and sandstone	0.60			
						Light brown CLAY with occasional sandstone cobbles.				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19						Light grey interbedded SANDSTONE and MUDSTONE .	18.50			
20										
21										
22										
23										
24						Black COAL .	23.60			
25						Light grey MUDSTONE .	24.20			
26						End of Borehole at 26.00m	26.00			
27										
28										
29										
30										

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO13
Eastings:	
Northings:	

**BOREHOLE RECORD**BH No. **RO14**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
07/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS**STRATA RECORD**

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

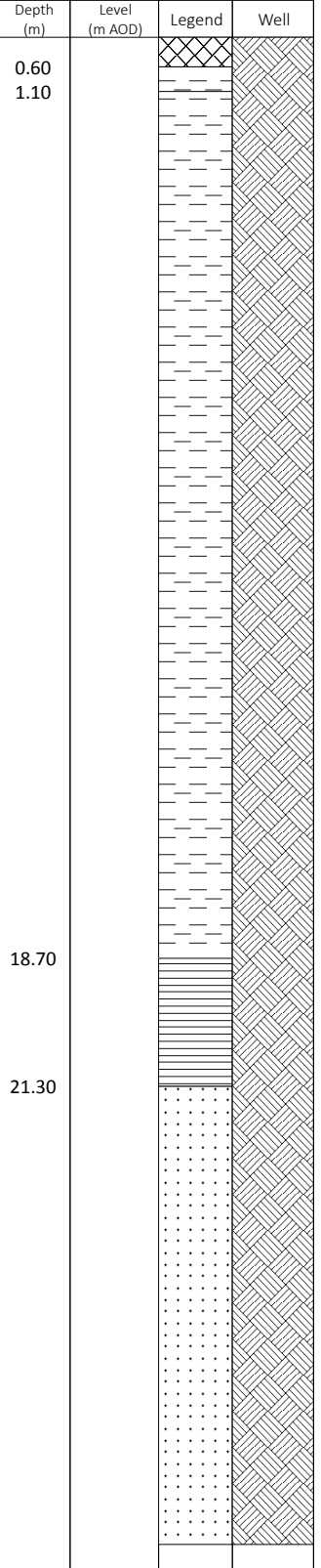
MADE GROUND: Dark brown sandy gravelly CLAY. Gravel is fine to coarse brick concrete fragments sandstone and wood.

Brown CLAY.

Grey CLAY occasional sandy and weathered mudstone bands.

Grey MUDSTONE.

Grey SANDSTONE with occasional brown sandstone bands.



Continued next sheet

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)**Eastings:****Northings:**

Fig No.

RO14



BOREHOLE RECORD

BH No. **RO14**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
07/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water		Depth (m)	Level (m AOD)	Legend	Well
					31	End of Borehole at 40.30m	40.30			
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					
					41					
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50					
					51					
					52					
					53					
					54					
					55					
					56					
					57					
					58					
					59					
					60					
					61					

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO14
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO15**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						0.30		XXXX	
					MADE GROUND: brown gravelly CLAY. Gravel is fine to coarse brick concrete sandstone.	0.90			
					Brown CLAY.				
					Grey slightly gravelly CLAY. Gravel is fine to coarse sandstone and mudstone				
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17					Grey SANDSTONE.	16.90			
18					Grey MUDSTONE with occasional SANDSTONE bands.	17.70			
19									
20					Grey MUDSTONE.	19.70			
21									
22									
23									
24									
25									
26					Black COAL.	25.80			
27					Grey MUDSTONE.	25.90			
28									
29					Black COAL.	28.70			
30					Grey SANDSTONE.	29.00			

Continued next sheet

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)

Eastings:

Northings:

Fig No.

RO15



BOREHOLE RECORD

BH No. **RO15**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
04/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
						31			
						32			
						33			
						34			
						35	35.00		
					End of Borehole at 35.00m				
						36			
						37			
						38			
						39			
						40			
						41			
						42			
						43			
						44			
						45			
						46			
						47			
						48			
						49			
						50			
						51			
						52			
						53			
						54			
						55			
						56			
						57			
						58			
						59			
						60			
						61			

Remarks and Groundwater Observations:

1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 1.5m.

GL (m AOD)	Fig No. RO15
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO16**
Sheet 1 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
01/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Strata Description	Depth (m)	Level (m AOD)	Legend	Well
						MADE GROUND: red brick and gravel				
						MADE GROUND: Sandstone boulder	0.50			
						Light brown grey gravelly CLAY with occasional sandy bands.	0.80			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17						Light brown grey interbedded MUDSTONE and SANDSTONE.	17.20			
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
								30.10		
Continued next sheet										

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO16
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **R016**
Sheet 2 of 2

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
01/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Depth (m)	Level (m AOD)	Legend	Well
					31				
					31				
					32				
					32				
					33				
					34				
					35				
					36				
					37				
					38				
					39				
					40				
					41				
					42				
					43				
					44				
					45				
					46				
					47				
					48				
					49				
					50				
					51				
					52				
					53				
					54				
					55				
					56				
					57				
					58				
					59				
					60				
					61				

Black COAL.
Light grey MUDSTONE.
End of Borehole at 31.50m

30.90
31.50

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)
Eastings:
Northings:

Fig No.
R016



BOREHOLE RECORD

BH No. **RO17**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
02/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Strata Description	Depth (m)	Level (m AOD)	Legend	Well
						MADE GROUND: Concrete	0.40			
						MADE GROUND: red brick and concrete fragementes.	0.70			
						Light brown grey gravelly CLAY with occasional sandy bands.				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17						Light grey interbedded MUDSTONE and SANDSTONE	17.10			
18										
19										
20										
21										
22										
23										
24						Black COAL.	24.00			
25						Light grey MUDSTONE.	24.50			
26						End of Borehole at 25.50m	25.50			
27										
28										
29										
30										

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO17
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO18**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
07/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

Logged By: JW Checked By: CR

Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Strata Description	Depth (m)	Level (m AOD)	Legend	Well
						MADE GROUND: gravel tarmac and brick fragments.				
						Light brown grey gravelly CLAY with occasional sandy bands.	0.90			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18						Light grey interbedded SANDSTONE and MUDSTONE.	17.80			
19										
20										
21										
22										
23						Black COAL.	23.00			
24						Light grey MUDSTONE.	23.50			
						End of Borehole at 24.00m	24.00			
25										
26										
27										
28										
29										
30										

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO18
Eastings:	
Northings:	



BOREHOLE RECORD

BH No. **RO20**
Sheet 1 of 1

Site: Former Siemens Factory, Hebburn

Contract No: C7074

Client: Miller Homes (NE) Ltd

Date:
03/11/2016

Method: Rotary openhole drilling using air mist flush.

Scale: 1:150

SAMPLE DETAILS

STRATA RECORD

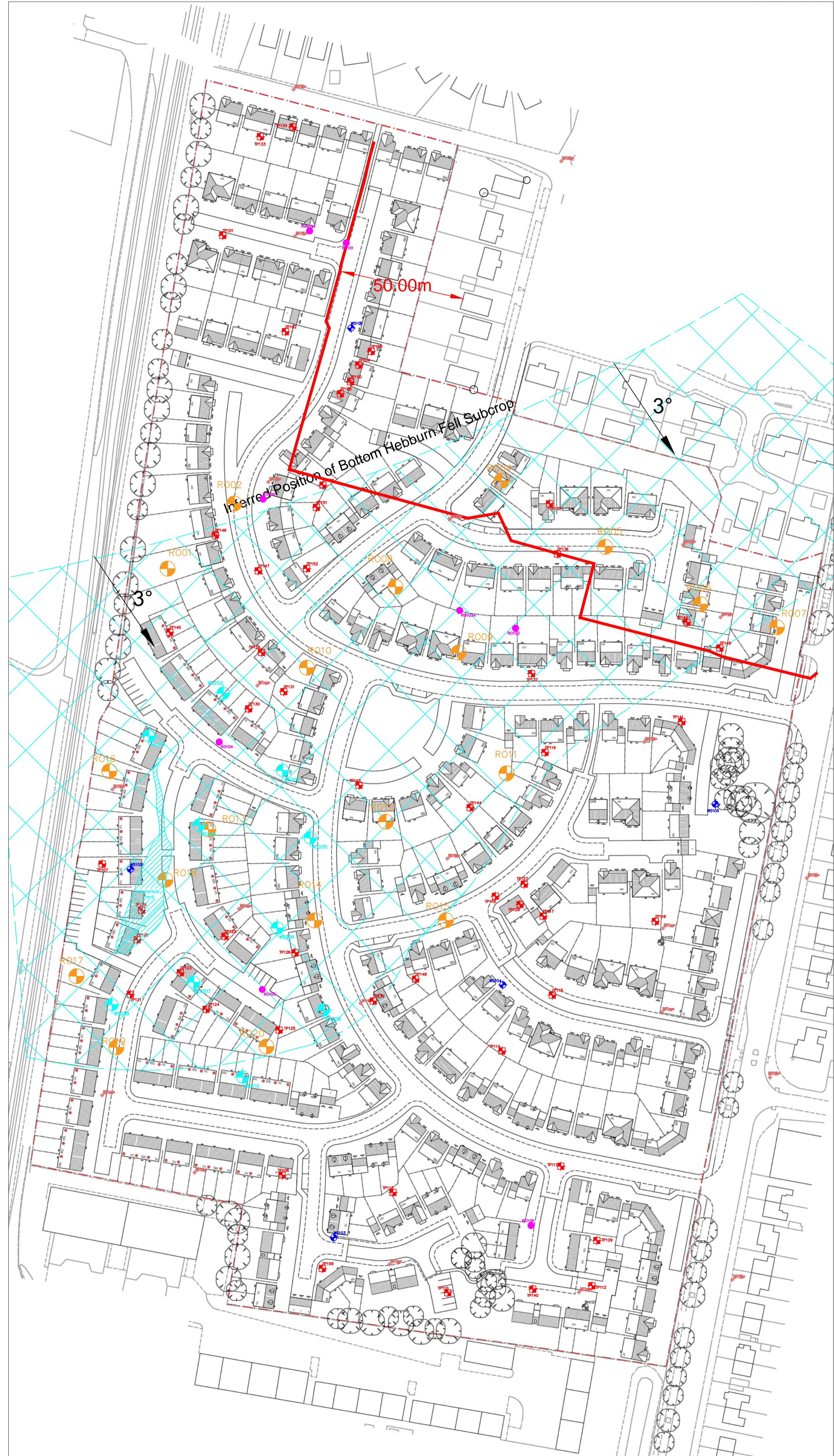
Logged By: JW Checked By: CR





Driller: Geocore Ltd.

Depth From - To(m)	TCR	SCR	RQD	FI	Ground -water	Description	Depth (m)	Level (m AOD)	Legend	Well
						MADE GROUND: Concrete	0.35			
						MADE GROUND: Red brick and sandstone.	0.90			
						Light brown grey gravelly CLAY with occasional sandy bands.				
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18						Light brown grey interbedded MUDSTONE and SANDSTONE.	18.20			
19										
20										
21										
22										
23										
24						Black COAL.	24.30			
25						Light grey MUDSTONE.	24.70			
26										
27										
28										
29										
30						End of Borehole at 30.00m	30.00			

Remarks and Groundwater Observations:
1. No groundwater encountered. 2. Drilled with air mist flush. 3. Cased to 4.5m.

GL (m AOD)	Fig No. RO20
Eastings:	
Northings:	



- NOTES**
-  Approximate extent of Bottom Hebburn Fell without competent cover
 -  Inferred dip direction and angle from BGS data.
 -  50m Stand Off From Existing Properties
 -  Proposed Rotary Borehole

The Top Hebburn Fell has been ignored as it considered too thin to be a risk. Zone of influence and absence of workings to be confirmed by proof rotary drilling.

REVISION	
0	For Information
A	>>
B	>>
C	>>
D	>>

SIRIUS GEOTECHNICAL & ENVIRONMENTAL
 Russel House,
 Mill Lane,
 Langley Moor
 Durham DH7 8HJ
www.the-siriusgroup.com
 TEL: 0191 378 9972
 FAX: 0191 378 1537



CLIENT

Miller Homes North East Ltd

SITE

Former Siemens Works, Hebburn

DRAWING TITLE

Rotary Borehole Location Plan

DRAWING NO. C7074/01	REVISION NO. 0
DRAWN BY DT	APPROVED BY CR
DATE October 2016	SCALE 1:1000
	PAPER SIZE A2