GA Site Investigation Limited

76 Thames Avenue
Guisborough
North Yorkshire
TS14 8AR
Tel: 07875 761729
Email: gasiltd@btinternet.com

GEOTECHNICAL REPORT

Report Reference:	GA079Q.11
Location:	Land to the rear of 14-16 Beever Lane Gawber Barnsley, S75 2RP
For:	Mr S Sanger
Prepared by:	Gordon M Anderson
Date of Investigation:	11th April 2011
Report Date:	25th April 2011

Company Registration Number: 06998509
Vat Registration Number: 977 9732 42

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1 INTRODUCTION:

GA Site Investigation Limited was commissioned by Mr Sanger, the proposed developer, take undertake a site investigation at land to the rear of 14-16 Beever Lane, Gawber, Barnsley, S75 2RP, where it is intended to construct a detached domestic dwelling and garage block.

2 LIMITATION OF INVESTIGATION:

This investigation is limited to a geotechnical intrusive investigation to determine potential foundation and shallow substrata details and does not include potential shallow mine or other mineral extraction work within the vicinity of or below the property nor is it a geo-environmental assessment of the site as these criteria are beyond the scope of our brief for this contract.

The comments and opinions are based on the ground conditions encountered during the site work and on the results of the tests carried out in the field and in the laboratory. There may, however, be other ground conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken in to consideration by this report.

3 SITE DESCRIPTION:

The site is located to the west of Beever Lane, Gawber and comprises a grassed and lightly wooded sloping section of land, the land rising in an east to west direction, (see Appendix A).

A proposed site development plan is enclosed in Appendix B.

The approximate centre of the site can be located by National Grid Reference 432310 407300.

The proposed development has been located to the eastern portion of the site as the western area is classified as ‘Greenbelt’ and cannot be developed for this reason.

4 SITE WORK

The investigation took the form of four sampling borehole and in-situ soil strength tests to determine substrata details beneath the area of the proposed structures.

Pre-excavation Services Scanning:

Prior to the commencement of excavation operation the areas under investigation were first scanned for buried services utilising a Cable Avoidance Tool (CAT scanner).

Boreholes:

The boreholes were excavated using dynamic drilling equipment the sampling equipment comprising of a driven steel sampler containing a plastic liner tube into which the soil samples are driven.

Standard Penetration Tests:

The standard penetration test (SPT) comprises recording the number of blows required from a falling drive mass of 63.5 kilogram weight, falling through a constant drop of 0.75m, to drive an “open spoon sampler” 0.30m into the deposits under test, after an initial penetration of 0.15m has been achieved.

The recorded resistance to penetration, number of blows for 0.30m penetration, known as the N_{300} value, allows determination of the compactness of the deposits to be undertaken.

5 EXPLORATORY EXCAVATION FINDINGS:

Made Ground:

Discrete layers of Made Ground were encountered at each test location with these varying in thickness between 0.40m and 2.50m.

To the northern side of the development the Made Ground deposits are between 0.40m and 1.00m in thickness with the deepest made ground, which includes probable Made Ground in Borehole 2, being to the southern side of the site with these deposits with these being between 1.80m to 2.50m in thickness.

The made ground comprises an initial layer of topsoil and silt in Boreholes 1, 2, 3 with a 0.40m of gravel being placed over the topsoil/silt deposits in the area of Borehole 4. Borehole 4 was located on the recently disused construction traffic access road into a recently constructed housing development to the south of the site.

The 'Probable' Made Ground deposits beneath the topsoil/silt layer comprise weathered mudstone/siltstone in the area of Borehole 2 whilst the Made Ground deposits in Borehole 4 comprise further silt material to 1.00m below ground level (bgl) over weathered siltstone/mudstone and a 0.40m band of red shale and a further 0.10m band of shale and silt at 2.40m bgl.

Natural Strata:

Directly below the Made Ground deposits the boreholes encountered weathered mudstone/siltstone with inclusions/bands of coal over hard siltstone.

In the area of Borehole 1, taken to the northwest corner of the building, weak weathered mudstone is present between 1.00m and 4.10m depth with bands of coal being located in these deposits between 2.70m to 3.00m and 4.00m to 4.10m depth. Between 4.10m and 6.00m bgl the mudstone encountered is moderately strong and is underlain by a further 0.20m band of coal, which in turn overlays hard mudstone/siltstone.

In the area of Borehole 3, to the northeast corner of the building, lies weak siltstone to 2.50m depth with coal being present from 2.50m to 6.10m bgl. The coal contains 0.10m thick bands of weak mudstone at 3.30m and 3.70m depth, with the coal being underlain by hard siltstone at 6.00m bgl.

In Borehole 2, southwest corner, the deposits between 0.30m and 1.80m depth are described as 'Probable' Made Ground and are underlain by weak mudstone/siltstone to 4.40m bgl with coal being present from 4.40m to 4.55m bgl. Between 4.55m and 5.50m depth the borehole encountered moderately strong siltstone with the borehole terminating at 5.60m bgl in hard siltstone.

Borehole 4 was excavated in the area of the proposed detached garages, southeast corner, and encountered natural hard mudstone below the Made Ground from 2.50m bgl. The borehole was terminated at 2.90m depth due to the hardness of the mudstone preventing further sampling progress.

Groundwater:

No groundwater was encountered during or immediately after drilling operations.

Borehole Records:

Details of the strata encountered their thickness, depth and description, together with the level's at which testing and sampling were undertaken, are shown on the borehole record sheets contained in Appendix C of this report.

6 IN-SITU TEST DATA

Standard Penetration Tests:

The results of the Standard Penetration Tests recorded N_{300} values between 4 to in excess of 80 with tests in the 'hard siltstone' to the base of the boreholes recording the highest values.

The lower values were generally recorded in the coal and upper weathered siltstone and mudstone deposits.

8 CONCLUSIONS

From the evidence of this investigation the area of the proposed dwelling (BH's 1-3) is overlain by between 0.40m to potentially 1.80m of made ground, overlying weak to moderately strong mudstone/silt and bands of weak coal.

In the area of the proposed garages (BH4) Made Ground deposits are present to 2.50m depth.

Consultation with South Yorkshire Mining Advisory Services (SYMAS) indicates the general area around the site has been subjected to mining operations, which includes opencast and shallow post and stall working.

During post and stall mining pillars of coal are left in-situ to support the ground above the coal and worked seams. This type of mine extraction exists in areas to the east of the site and is a source of potential ground gas emissions.

During opencast working coal was extracted by mass excavation with local excavations to the site often being reinstated using red shale or granular excavated overburden materials, which includes weathered fractured rock deposits.

With the presence of the significant coal seams in Borehole 3, northeast corner of the development, and the presence of deep Made Ground and associated granular Made Ground, including red shale deposits in BH 4, it is considered possible that opencast coal extraction may have occurred in the area of southeast corner of the proposed development.

With the localised presence of the thick coal deposits to the northeast corner of the main dwelling there is a potential for differential settlement of the proposed building towards this area as the coal deposits have a much lower bearing capacity than adjacent deposits at similar depths.

The coal deposits are also loose in compaction and are considered at risk of potential long term consolidations under imposed load and are also subject to potential 'spontaneous combustion' when exposed to air during open excavation.

With the presence of the deep Made Ground, indicating potential shallow coal extraction to the southeast section of the site there is also a potential for differential foundation movement in or towards this area.

On the basis of this investigation the following recommendations are given;

Foundations:

Main Dwelling:

Foundations solutions are; Reinforced raft or piled reinforced raft.

The use of a rigid reinforced raft with thickened edge beams would be acceptable for this development providing ground bearing pressures can be kept below 40kN/m^2 to reduce potential ground consolidation, especially in the area of the deep coal deposits.

If bearing pressures cannot be kept below 40kN/m^2 the use of piles to support the rigid reinforced raft will be required with piles being taken into the underlying hard/competent rock deposits at depths indicated on the enclosed Borehole Record sheets, indicated as the depths the boreholes terminated in hard deposits.

Piles lengths of between 4.0m to in excess of 7.0m are anticipated for this development. Piles seated at depths in excess of those achieved in the sampling boreholes will have an N_{300} value of 50 for use in foundation design.

Detached Garages:

With the presence of the deep loose Made Ground deposits in the area of Borehole 4 it is recommended that the existing deposits are subject to remediation to improve their bearing capacities.

This should take the form of removal of at least the upper 1.5m of the Made Ground and the replacement of this material with inert imported graded crushed stone, placed and compacted in layers not exceeding 0.2m thickness so as to provide a compact base off which to construct a rigid reinforced raft.

General Requirements:

A suitable 'ground gas membrane' is required beneath the all buildings to prevent the ingress of potential mine gas/ground gases into the finished structure. A suitable membrane must have lapped and taped joints with all utility/service ducts/inlets into the building being adequately sealed to form a homogenous barrier against gas ingress.

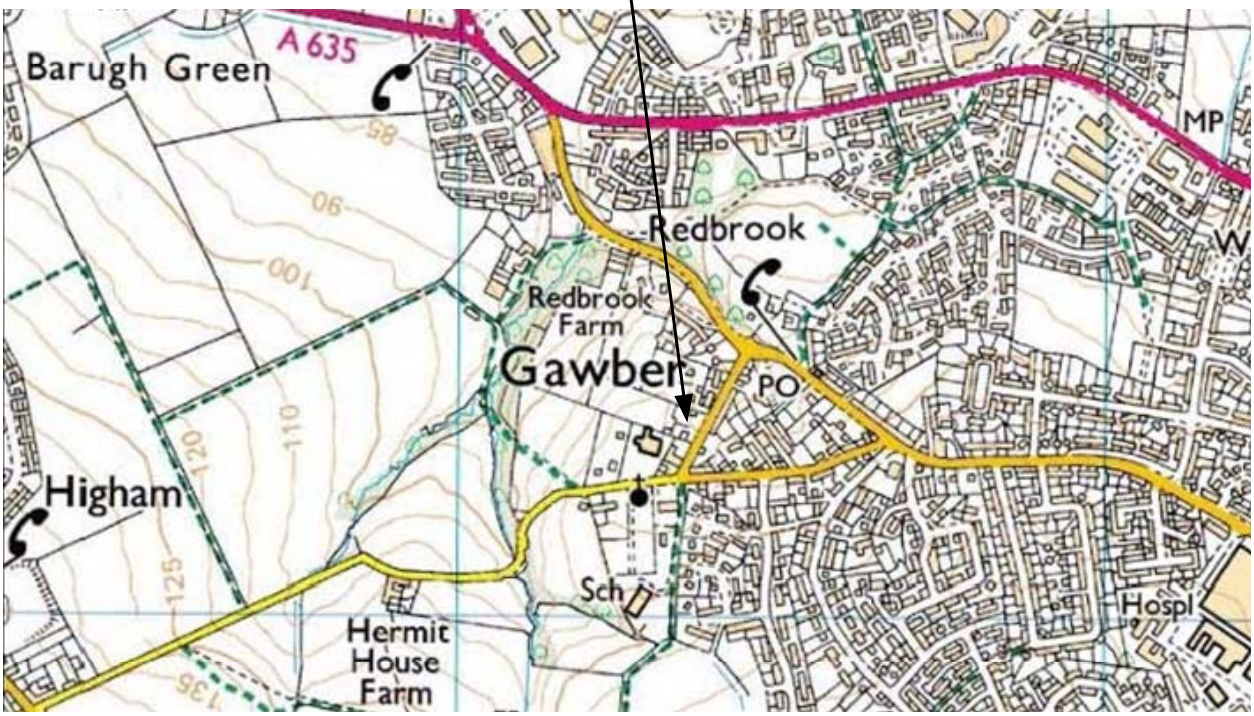
Any coal deposits encountered during excavation for the raft foundation will require removing or encapsulating in concrete to reduce/prevent access for air which would increase the potential for spontaneous combustion of these deposits. Due to the presence of the coal deposits the installation of a basement is not recommended with such work requiring the mass excavation of the coal deposits to a depth of 6.0m in the area of Borehole 3 with the excavated material being replaced with inert crushed stone sub-base material with the added costs for excavation, reinstatement and spoil disposal

With the presence of the red shale deposits in the area of Borehole 4 it is recommended that sulphate protection is provided to all buried concrete or mortar to at least Design Sulphate Class DS-3 of BRE Special Digest 1: 2005 'Concrete in aggressive ground'.

Appendix A
Site Location

SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	CONTRACT No.	GA078Q.00
CLIENT	Mr Sanger	TITLE	Site Location

SITE



DRAWN BY		DATE	
GMA		11th April 2011	
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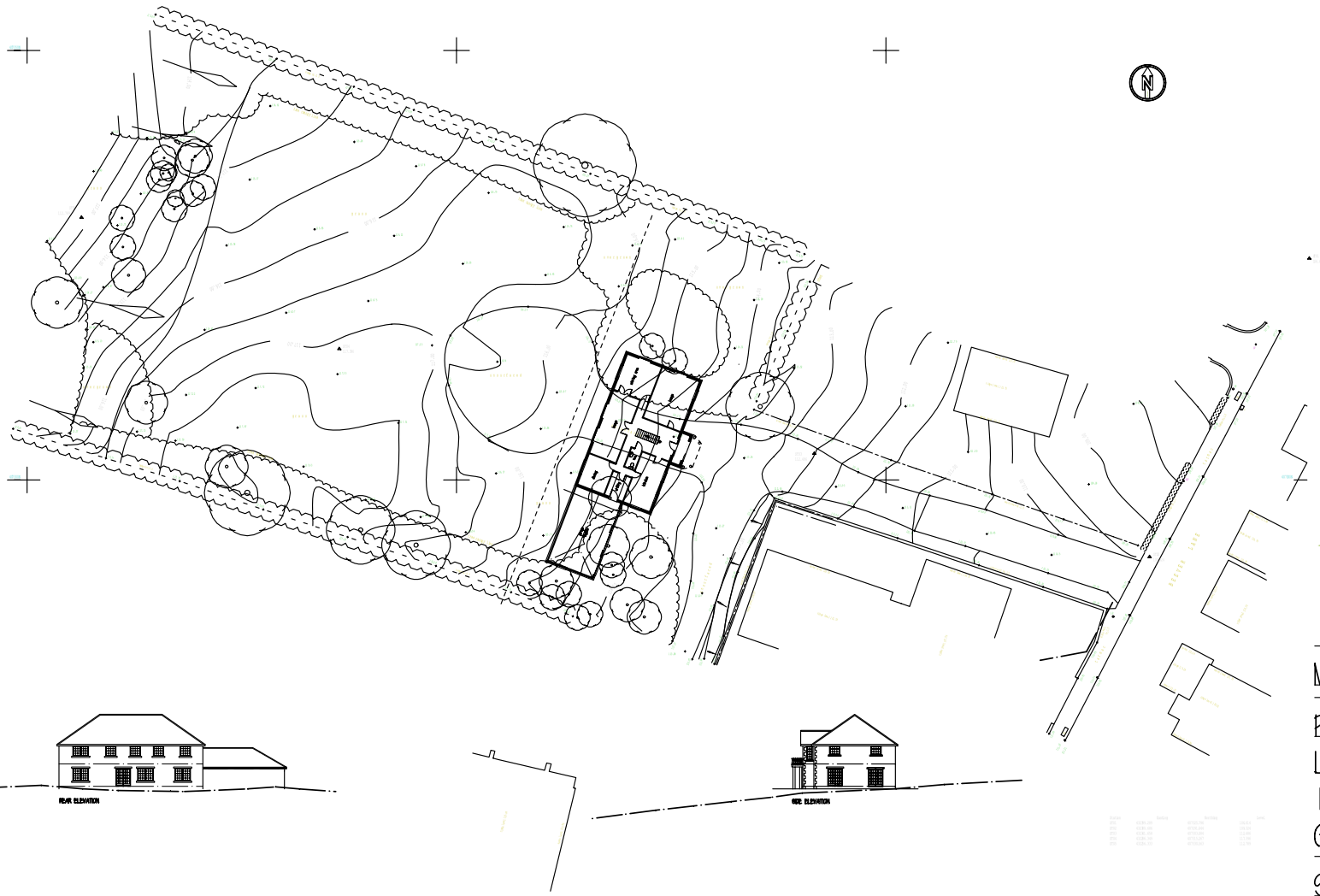
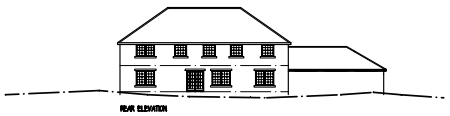
GA Site Investigation Limited

76 Thames Avenue
Guisborough
North Yorkshire
TS14 8!R
Tel: 07875 761 729

Appendix B
Proposed Layout Plan and Exploratory Hole location Sketch





Mr SANGER

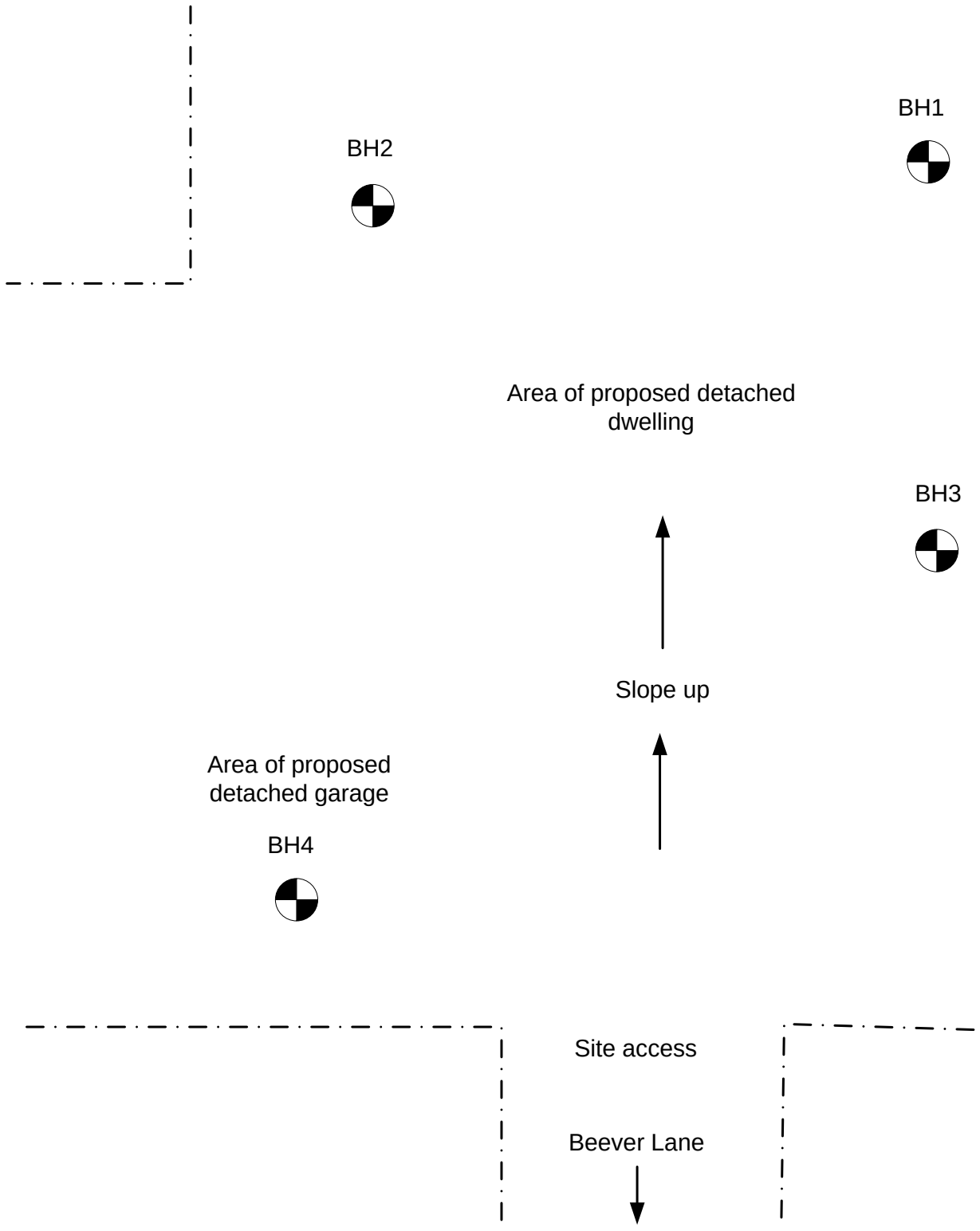
PROPOSED DWELLING
LAND REAR OF
14-16 BEEVER LANE
GAWBER

SITE PLAN

1:500 NOV 10

Peter Thompson
M.B.I.A.T.
Linwood
Barnsley Road
Dodworth
Barnsley S753JR
tel & 01226
fax 201391

SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	CONTRACT No.	GA078Q.00
CLIENT	Mr Sanger	TITLE	Borehole Location



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GMA		11th April 2011	
SCALE	Not to scale	SHEET	1/1

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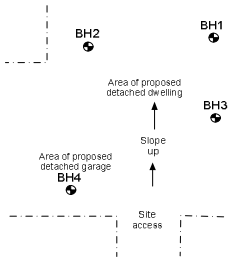
Appendix C
Exploratory Hole Records

SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH1
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	6.00
SPT		6.30

DEPTH (m)	DESCRIPTION	LEGEND	SAMPLES & TESTS DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	FIELD OBSERVATIONS DETAILS
	MADE GROUND: Loose SAND and TOPSOIL with fine to medium angular gravel		0.20	D			
0.40			0.40	D			
	MADE GROUND: Loose black SAND and GRAVEL including ash, glazed glazed tile, brick and pottery						
1.00			1.00	D			
	Weak light brown and grey fractured weathered MUDSTONE - recovered recovered as loose fine to medium angular gravel		1.50	D			
			2.00	D, P	N300=4		Blows: 2, 1, 1, 1, 1, 1
2.70			2.70	D			
	Weak black fractured COAL - recovered as fine to medium angular to tabular gravel						
3.00			3.00	D, P	N300=13		Blows: 2, 2, 2, 3, 3, 5
	Weak brown and grey weathered MUDSTONE - recovered as fine to medium angular to tabular gravel		3.50	D			
4.00			4.00	D,P	N300=4		Blows: 1, 1, 1, 1, 1, 1
4.10	Weak black COAL		4.10	D			
	Moderately strong brown and grey weathered MUDSTONE - recovered as fine to medium angular gravel		4.50	D			
5.00			5.00	D, P	N300=7		Blows: 1, 1, 1, 2, 2, 2
	Borehole continued						

KEY

D. Small disturbed.	P. Standard Penetration Tests (SPT)
B. Bulk disturbed.	P.P. Pocket Penetrometer (Kg/cm2)
R. Root.	S.V. Shear Vane (Kpa)
W. Water	M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 6.30m - no penetration
2) No water struck

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ENGINEER	Sheet 1 of	2
GMA		

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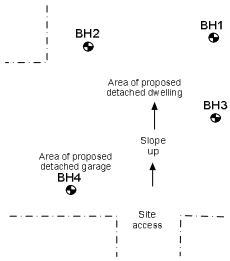
SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH1
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	6.00
SPT		6.30

DEPTH (m)	DESCRIPTION	LEGEND
5.00	Borehole continuation	
	Moderately strong brown and grey weathered MUDSTONE	
5.80		
	Moderately strong becoming strong grey MUDSTONE	
6.00		
	Hard black COAL	
6.20		
6.30	Strong/hard grey MUDSTONE/SILTSTONE	

SAMPLES & TESTS				FIELD OBSERVATIONS
DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	DETAILS
6.00	D, P	N300=88+		Blows: 4, 12, 36, 52, terminated

KEY

D. Small disturbed.	P. Standard Penetration Tests (SPT)
B. Bulk disturbed.	P.P. Pocket Penetrometer (Kg/cm2)
R. Root.	S.V. Shear Vane (Kpa)
W. Water	M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 6.3m - no penetration
2) No water struck

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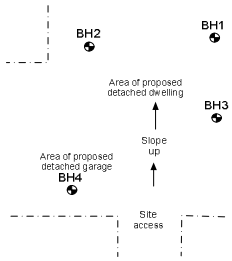
ENGINEER	Sheet 2 of	2
GMA		

GA Site Investigation Limited

SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH2
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	5.60

DEPTH (m)	DESCRIPTION	LEGEND	SAMPLES & TESTS DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	FIELD OBSERVATIONS DETAILS
	MADE GROUND: Loose TOPSOIL with =medium angular gravel		0.10				
0.30			0.30				
	Weak red brown and light brown weathered MUDSTONE/SILTSTONE - recovered as fine to medium angular to tabular gravel		0.50				
	POSSIBLE MADE GROUND		1.00	D			
			1.50	D			
1.80			1.80	D			
	Weak weathered red brown MUDSTONE - recovered as fine angular to tabular gravel		2.00	P	N300=17		Blows: 3, 4, 5, 4, 4, 4
2.10			2.10	D			
	Weak light brown and occasionally red brown weathered SILTSTONE - recovered as fine to medium angular to tabular gravel		2.50	D			
3.00			3.00	D, P	N300=10		Blows: 2, 2, 3, 3, 2, 2
	Weak red brown weathered MUDSTONE - recovered as fine to medium angular gravel						
3.40			3.40	D			
	Weak to moderately strong dark red MUDSTONE - recovered as fine to medium tabular gravel						
3.80			3.80	D			
	Weak grey and red brown rust stained weathered MUDSTONE - recovered as fine to medium angular gravel		4.00	D, P	N300=9		Blows: 2, 2, 2, 2, 2, 3
4.30			4.30	D			
4.40	Weak light grey weathered SILTSTONE - recovered as medium angular gravel		4.40	D			
4.55	Weak black COAL		4.55	D			
	Moderately strong red brown, purple and grey weathered SILTSTONE recovered as fine to medium angular to tabular gravel						
5.00			5.00	D, P	N300=20		Blows: 2, 2, 3, 4, 5, 8
	Borehole continued						

KEY

D. Small disturbed.
B. Bulk disturbed.
R. Root.
W. Water
P. Standard Penetration Tests (SPT)
P.P. Pocket Penetrometer (Kg/cm2)
S.V. Shear Vane (Kpa)
M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 5.60m
2) No water struck

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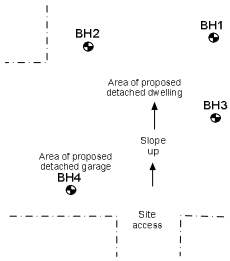
SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH2
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	5.60

DEPTH (m)	DESCRIPTION	LEGEND	SAMPLES & TESTS				FIELD OBSERVATIONS
			DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	DETAILS
5.00	Borehole continuation						
	Moderately strong red brown, purple and grey weathered SILTSTONE recovered as fine to medium angular gravel						
5.50			5.50	D			
5.60	Hard grey SILTSTONE						
	Borehole terminated - no penetration						

KEY

D. Small disturbed.	P. Standard Penetration Tests (SPT)
B. Bulk disturbed.	P.P. Pocket Penetrometer (Kg/cm2)
R. Root.	S.V. Shear Vane (Kpa)
W. Water	M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 5.60m
2) No water struck

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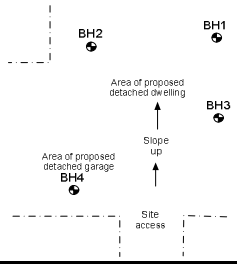
GMA		

GA Site Investigation Limited

SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH3
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	6.00
SPT		6.20

DEPTH (m)	DESCRIPTION	LEGEND	SAMPLES & TESTS DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	FIELD OBSERVATIONS DETAILS
	MADE GROUND: Loose TOPSOIL						
			0.20	D			
0.40			0.40	D			
	Stiff orange brown and grey SILT/weak SILTSTONE						
0.90							
	Weak brown and grey weathered SILTSTONE recovered as firm silt and fine to medium angular gravel		1.00	D, P	N300=17		Blows: 3, 3, 4, 4, 5, 4
			1.50	D			
			2.00	D, P	N300=9		Blows: 2, 2, 2, 2, 1, 2
2.50			2.50	D			
	Weak black COAL - recovered as fine to medium angular to tabular gravel						
			3.00	D, P	N300=4		Blows:1, 1, 1, 1, 0, 1, 2
3.30			3.30	D			
3.40	Weak brown weathered MUDSTONE - recovered as fine to medium angular gravel		3.50	D			
	Weak black COAL - recovered as fine to medium angular to tabular gravel						
3.70			3.70	D			
3.80	Weak brown and grey weathered MUDSTONE						
	Weak black COAL - recovered as fine to medium angular to tabular gravel		4.00	D,P	N300=4		Blows: 1, 1, 1, 1, 1, 1
5.00			5.00	D, P	N300=5		Blows: 1, 1, 1, 2, 1, 1
	Borehole continued						

KEY

D. Small disturbed.
B. Bulk disturbed.
R. Root.
W. Water
P. Standard Penetration Tests (SPT)
P.P. Pocket Penetrometer (Kg/cm2)
S.V. Shear Vane (Kpa)
M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 6.2m
2) No water struck

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GMA		

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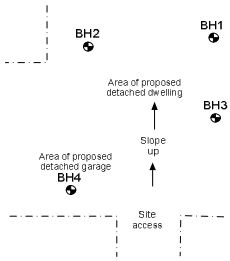
SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH3
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	3.00
101mm	86mm	5.00
90mm	76mm	6.00
SPT		6.20

DEPTH (m)	DESCRIPTION	LEGEND	SAMPLES & TESTS				FIELD OBSERVATIONS
			DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	DETAILS
5.00	Borehole continuation						
	Weak black COAL - recovered as fine to medium angular gravel						
			6.00	D, P	N300=50+		Blows: 14, 22, 42, 8 for <10mm
6.10							
6.20	Hard grey SILTSTONE						
	Borehole terminated						

KEY

D. Small disturbed.	P. Standard Penetration Tests (SPT)
B. Bulk disturbed.	P.P. Pocket Penetrometer (Kg/cm2)
R. Root.	S.V. Shear Vane (Kpa)
W. Water	M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 6.20m
2) No water struck

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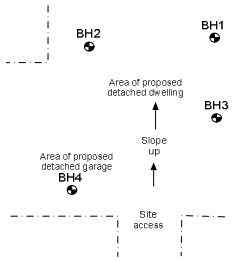
SITE ADDRESS	Land at Beever Lane, Gawber, Barnsley	TP/BH REF	BH4
CLIENT	Mr Sanger	DATE	11-Apr-11
METHOD	Windowless Sampler	CONTRACT no.	GA079Q.11

LOCATION PLAN:



BOREHOLE DIAMETER/SAMPLE SIZE & D

External BH Dia	Sample Dia	Depth to (m)
126mm	102mm	2.00
101mm	86mm	2.50
SPT		2.90

DEPTH (m)	DESCRIPTION	LEGEND
	MADE GROUND: Medium dense fine to medium subangular GRAVEL including ash and concrete	
0.40		
	MADE GROUND: Firm dark brown sandy TOPSOIL/SILT with medium gravel	
0.55		
	MADE GROUND: Firm brown SILT	
1.00		
	MADE GROUND: Loose orange brown weak weathered MUDSTONE - recovered as fine angular gravel	
2.00		
	MADE GROUND: Loose red brown fine to medium angular SHALE - recovered as fine to medium angular to tabular gravel	
2.40		
2.50	MADE GROUND: Firm black SILT and weak weathered SHALE	
	Hard purple, brown and grey MUDSTONE	
2.90		
	Borehole terminated - no penetration	

SAMPLES & TESTS				FIELD OBSERVATIONS
DEPTH (m)	TYPE	RESULTS	MOISTURE (%)	DETAILS
0.20	D			
0.40	D			
0.55	D			
1.00	D			
1.50	D	N300=5		Blows: 1, 1, 2, 1, 1, 1,
2.00	D			
2.40	D			
2.50	D, P	N300=66+		Blows: 2, 4, 11, 18, 37, terminated

KEY

D. Small disturbed.	P. Standard Penetration Tests (SPT)
B. Bulk disturbed.	P.P. Pocket Penetrometer (Kg/cm2)
R. Root.	S.V. Shear Vane (Kpa)
W. Water	M.C. Moisture Content

GENERAL REMARKS

1) Hole terminated at 2.90m
2) No water struck

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