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Our Ref: P8364-DG1
Date: 24th September 2018

Mr M McCabe
Cubic Surveying Solutions Limited
63 Wilmslow Road
Handforth
Wilmslow
Cheshire
SK9 3EN

Dear Mr McCabe

RE: Drill and Grout Works at 2 Inchfield Close, Rochdale.

1.0 Introduction

This letter should be read in conjunction with the GRM Phase I Desk Study (referenced GRM/P8364/DS.1, dated March 2018) and the GRM Coal Mining Risk Assessment (referenced GRM/P8364/CMRA-1, dated 13th March 2018).

In order to mitigate the identified risks a drill and grout exercise and mine shaft investigation and assessment of the status of the recorded shafts was advised in accordance with the recommendations made in the Coal Mining Risk Assessment. The risk assessment concluded the following:

Recorded and unrecorded workings - **High** - may be reduced to negligible by drill and grout works.

Recorded mine entries 386413-001 - **High** - may be reduced to negligible by completing a site strip exercise.

Un-recorded mine entries - **Low**.

Opencast workings - **Negligible**.

Spontaneous combustion - **Low**.

The recommended works advised within the Coal Mining Risk Assessment were carried out on two separate occasions, detailed as follows:

- 1) The mine entry investigation was carried out on the 27th July 2018.
- 2) The drill and grout works were carried out between 31st July 2018 and 13th August 2018.

2.0 Proposed Development

The client proposes to develop the site with a single storey residential building with associated soft and off-road parking to be built over the footprint of a previous dwelling which was destroyed by a fire.

A site location plan is presented in Appendix A.

A proposed development plan is presented in Appendix B.

3.0 Drill and Grout Works

It was proposed to carry out a drill and grout programme for the proposed development, beneath the site to prove either treat shallow workings or to at least 6m of competent rock. The drilling grid proposed comprised of a grid with 6m spacing, which was reduced by drilling centre holes across the proposed building footprint. A total of 23 holes were drilled to maximum depths ranging between 12 and 13m below existing ground level (begl). A Probe Hole Location Plan and Probe Hole Logs are presented in Appendix C and Appendix D, respectively.

In summary, rockhead was encountered at depths of between 3.00m and 4.00m begl. The overlying strata comprised made ground, mainly colliery spoil type material or generally cohesive deposits that may have been of either superficial origin or weathered rock. It was not possible to determine the boundary between the made ground and natural superficial deposits due to the nature of the probe drilling techniques used. The solid strata comprised shale, and mudstone with subordinate coal seams.

Two separate coal seams were encountered during the works. The shallowest coal seam was encountered intact within two probe holes, namely C4 and C7 at depths ranging between 5.00m and 6.00m begl. The thickness of this seam varied from 0.70 to 1.00m. This coal seam was either not recorded or accompanied by 'weak' or 'soft' drilling or 'loss of flush' drilling descriptions in the surrounding probe holes across the site which varied in thickness between 0.80m and 1.90m, taken to represent the recorded workings anticipated in the Coal Mining Risk Assessment.

A second coal seam was encountered at depths ranging between 9.40m and 10.50m begl. The thickness of this seam varied from 0.30 to 0.70m. This coal seam was also either not recorded or accompanied by 'weak' or 'soft' drilling or 'broken ground' drilling descriptions in surrounding probe holes across the site which varied in thickness between 0.30m and 1.00m. This seam was taken to represent unrecorded workings which weren't anticipated in the Coal Mining Risk Assessment.

Within the shallower coal seam, 'lost flush' records were generally recorded at shallower depths in the northernmost probeholes advanced at the site (i.e. along the 'A' gridline) when compared to the southernmost probeholes (i.e. along the 'E' gridline). It can therefore be inferred that the general dip of the strata is to the south.

With regard to grout takes, all holes were treated with a 1:10 OPC/sand grout mix. The most significant quantities were expended in 4no. probeholes, namely A1, A5, A7, and E7 where >10 tonnes of grout was used at each position. A total of 10no. exploratory holes recorded grout takes of between 1.0 tonne and 10 tonnes. Five exploratory holes, namely B3, C2, C4, C6 and D3, were used to prove the efficacy of the grout works, which saw 'grout returns' observed within the drillers descriptions. The remaining probeholes saw grout takes of <1.00 tonne. A summary table detailing the grout records from the site works is presented overleaf.

Probehole Reference	Observations	Maximum depth of hole (m)	Total Grout Take (tonnes)
A1	6.00 - 6.80m - Weak drilling, lost flush	13	10.13
A3	Solid strata encountered throughout 9.70 - 10.00m - Coal seam	12	0.06
A5	4.80 - 6.00m - Weak drilling, lost flush 9.70 - 10.0m - Weak drilling	12	13.63
A7	5.30 - 6.30m - Soft drilling, lost flush 9.40 - 9.80m - Soft drilling	13	14.97
B2	5.50 - 6.90m - Weak drilling, lost flush	13	1.00
B3*	5.00 - 6.00m - Grout returns noted 9.40 - 9.80m - Coal seam	12	0.08
B4	4.50 - 6.00m - Weak drilling, lost flush	12	2.00
B6	5.00 - 6.00m - Soft drilling, lost flush 9.30 - 9.70m - Soft drilling	12	1.41
C1	6.00 - 7.00m - Weak drilling, lost flush	13	2.67
C2*	6.00 - 7.00m - Soft drilling, grout returns 10.00 - 10.50m - Coal seam	12	0.08
C3	Solid strata encountered throughout 9.80 - 10.20m - Coal seam	12	0.07
C4*	Solid strata encountered throughout 5.00 - 6.00m - Coal seam 9.60 - 10.00m - Coal seam	12	0.08
C5	5.00 - 6.00m - Soft drilling, lost flush 9.50 - 10.10m - Soft drilling	12	2.90
C6*	6.20 - 6.80m - Soft drilling, grout returns 9.60 - 10.20m - Coal seam	12	0.08
C7	Solid strata encountered throughout 6.00 - 6.70m - Coal seam 9.50 - 10.00m - Coal seam	12	0.06
D2	5.00 - 6.90m - Weak drilling, lost flush 10.00 - 10.70m - Broken ground	13	5.77
D3*	5.00 - 6.60m - Soft drilling, grout returns 9.80 - 10.50m - Coal seam	12	0.08
D4	6.30 - 6.80m - Weak drilling, lost flush 9.50 - 10.00m - Weak drilling	12	7.20
D6	4.70 - 5.90m - Soft drilling, lost flush 9.80 - 10.30m - Soft drilling	12	1.00
E1	Solid strata encountered throughout 10.50 - 11.20m - Coal seam	12	0.07
E3	6.00 - 6.70m - Weak drilling, lost flush 9.50 - 10.50m - Broken ground	12	5.68
E5	6.00 - 7.00m - Soft drilling, lost flush 10.30 - 11.00m - Soft drilling	13	6.76
E7	9.80 - 10.30m - Soft drilling	12	14.40

*Check holes following completion of grouting exercise

From the grout takes it is apparent that workings were encountered, being more prominent in probeholes A1, A3, A7, and E7, indicative of more heavily worked areas being present in the north and southwest of the site. It is inferred from the overall grout-take pattern that certain locations were underlain by collapsed / closed-up workings where the void space was minimal (i.e. A3, C3, C7, and E1), and provides explanation as to why grout-takes in these locations was relatively low. The grout take values seen in other locations suggest that the site was predominantly underlain by partially collapsed workings associated with the shallowest coal seam encountered during the works. Due to the thickness of the workings, this has been interpreted to be the Lower Mountain Coal, and thus represents the recorded workings anticipated in the Coal Mining Risk Assessment.

The deeper coal seam was not anticipated as part of the drilling programme advanced during the works and therefore represents the unrecorded workings anticipated in the Coal Mining Risk Assessment.

Notwithstanding the above, the grout takes recorded as part of this exercise have resulted in all probeholes being 'topped-out'; therefore, the risks to the proposed development from recorded and unrecorded workings can be reduced to **negligible**.

4.0 Mine Entry 386413-001

Following the findings of the CMRA, GRM performed a site strip in the area of the site immediately adjacent to the southern site boundary in the southwest of the site in the overall 8m departure zone associated with the recorded location of the shaft using a JCB mechanical excavator. The shaft was not located in this area as part of GRM's investigation.

It is considered through the findings noted above that the development is not underlain by the recorded shaft; however, part of the site maybe within the influencing distance of mine entry 386413-001, i.e. it maybe just to the south of the property's boundary line. The closest probe hole to the recorded shaft encountered rockhead at 3.0m begl. Taking an area of influence of 45° from the edge of the shaft, it is recommended that any soft landscaping or infrastructure 3m from the southern site boundary in this area is underlain by geogrid to mitigate against catastrophic collapse of the off-site recorded mine entry. Furthermore, it is recommended that this area be designated a 'no build' area. The risk to the proposed development from the recorded mine entry is reduced to **low**. Employing the measures above will result in the risk of the recorded mine entry 386413-001 being reduced to **negligible**.

The area investigated as part of these site works is presented in Appendix E.

5.0 Unrecorded Mine Entries

The site has been probe drilled on a grid with 6m spacing with centre holes and extra probeholes through the centre of the proposed building footprint. No evidence of mine entries has been identified. However, it is recognised that the local recorded mine entries are thought to be 2.50m wide and so may not have been encountered by the probe drilling. Given the presence of the off site recorded shaft, the risk of an unrecorded mine entry on site, that has not been found by the grouting works, is considered to be very low. However, to fully mitigate against this risk we would recommend that a total site strip be undertaken to natural strata by the developers. Should any anomalies be encountered during this exercise advice from GRM should be sought.

6.0 Spontaneous Combustion

The probe drilling exercise encountered rockhead at levels between 3.00 and 4.00m begl. Therefore, it is considered that the risk from spontaneous combustion to the proposed development can be reduced to **negligible**.

6.0 Conclusion

The risks amended in line with the above can be summarised as follows:-

Recorded workings – **Negligible**.

Un-recorded workings – **Negligible**.

Recorded Mine entries – **Low**.

Un-recorded mine entries – **Very low.**

Opencast workings – **Negligible.**

Spontaneous combustion – **Negligible.**

7.0 Relevant Appendices

Appendix A – Site Location and Boundary Plan

Appendix B – Proposed Development Plan

Appendix C – Probe Hole Location Plan

Appendix D – Probe Hole Logs

Appendix E – Mine Shaft Investigation Area

We trust that the information provided is sufficient for your current requirements. if you require any additional information or clarification of the contents of this letter then do not hesitate to contact me.

Yours sincerely
For GRM Development Solutions Ltd



Andrew Brown BSc CGeol FGS ProfGradIOM3
Principal Geotechnical Engineer



A P P E N D I X A

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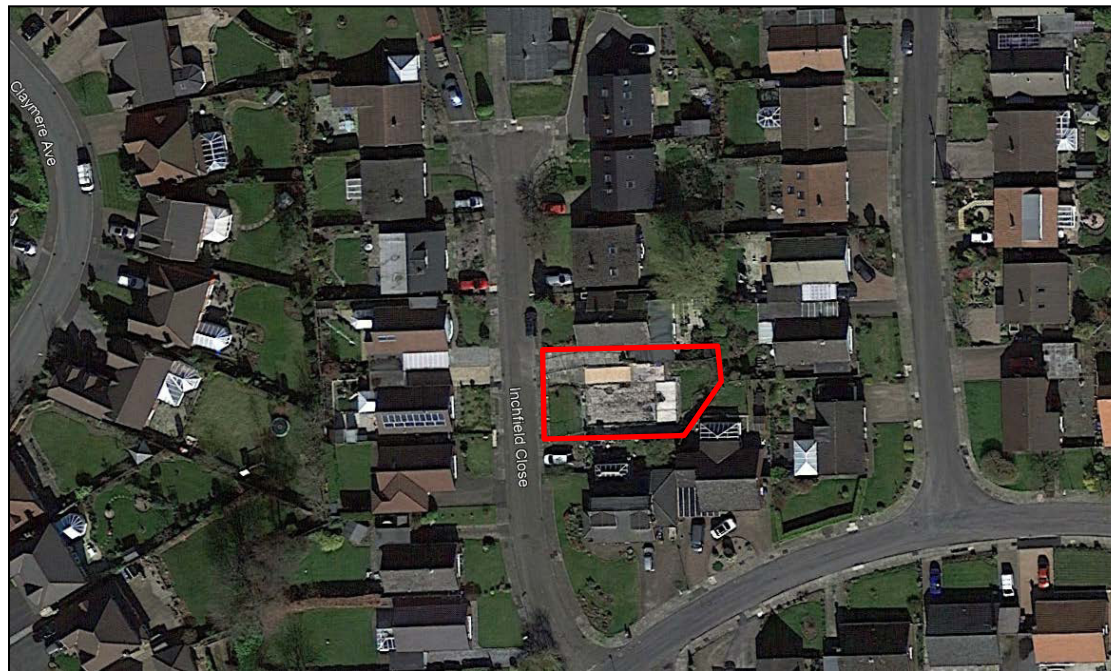
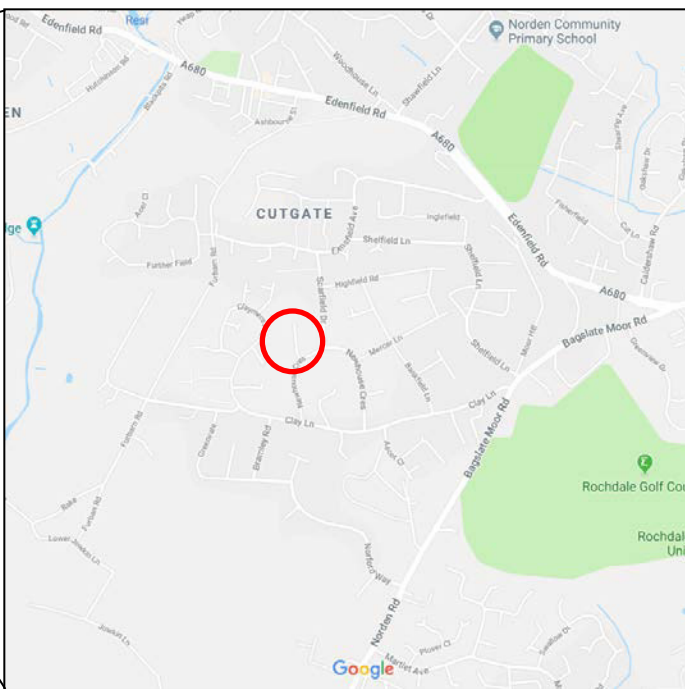
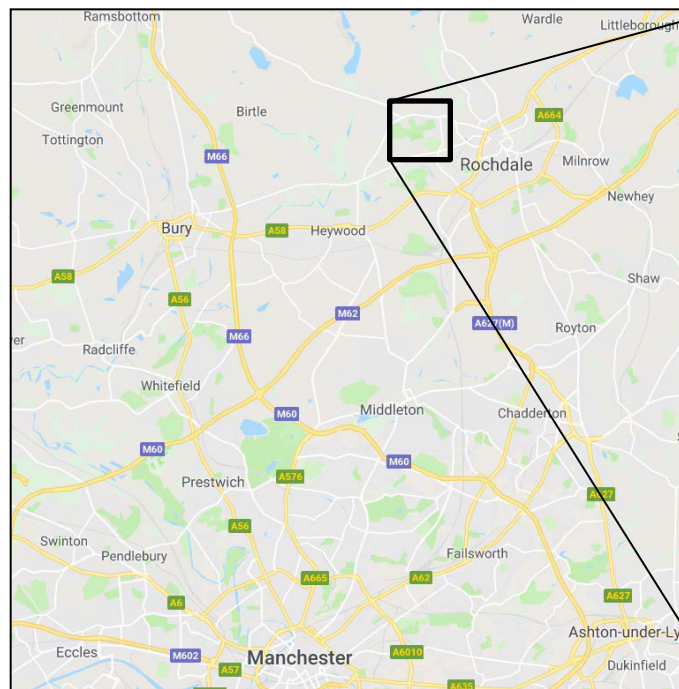
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CLIENT:

Cubic Surveying

PROJECT:

2 Inchfield Close

TITLE:

Site Location and Boundary Plan

SCALE@SIZE

NTS

ISSUE:

Final

DESIGN/DRAWN :

GS

DATE: _____

March 2018

PROJECT No:

P8364

DRAWING No:

2

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Site boundary.



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CLIENT:

Cubic Surveying

PROJECT:

2 Inchfield Close

TITLE:

**Site Layout and
Boundary Plan**

SCALE@SIZE

NTS

ISSUE:

Final

DESIGN/DRAWN:

GS

DATE:

March 2018

PROJECT No:

P8364

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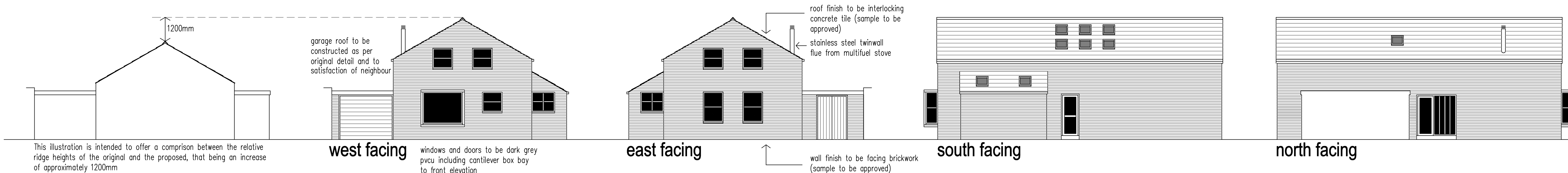
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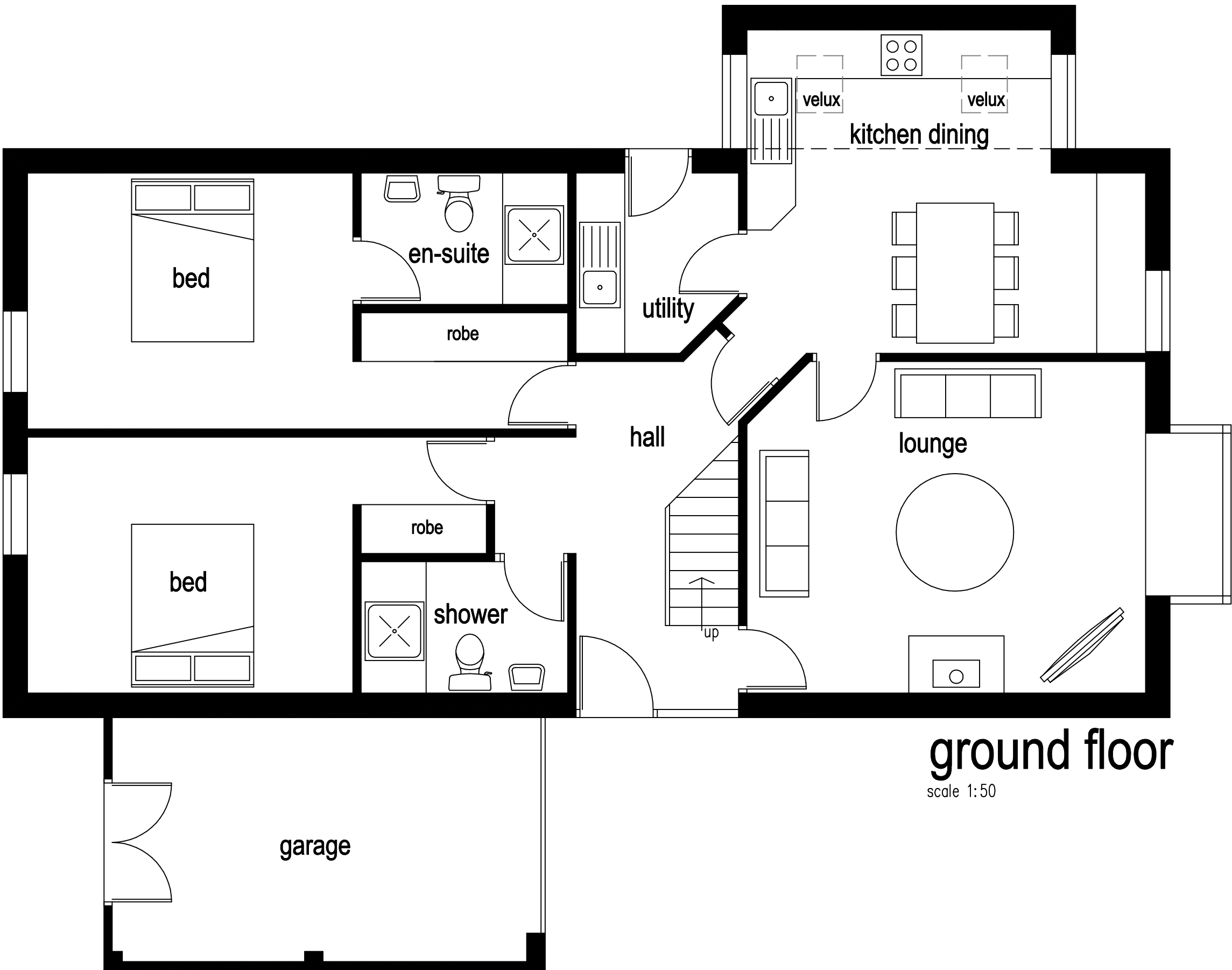
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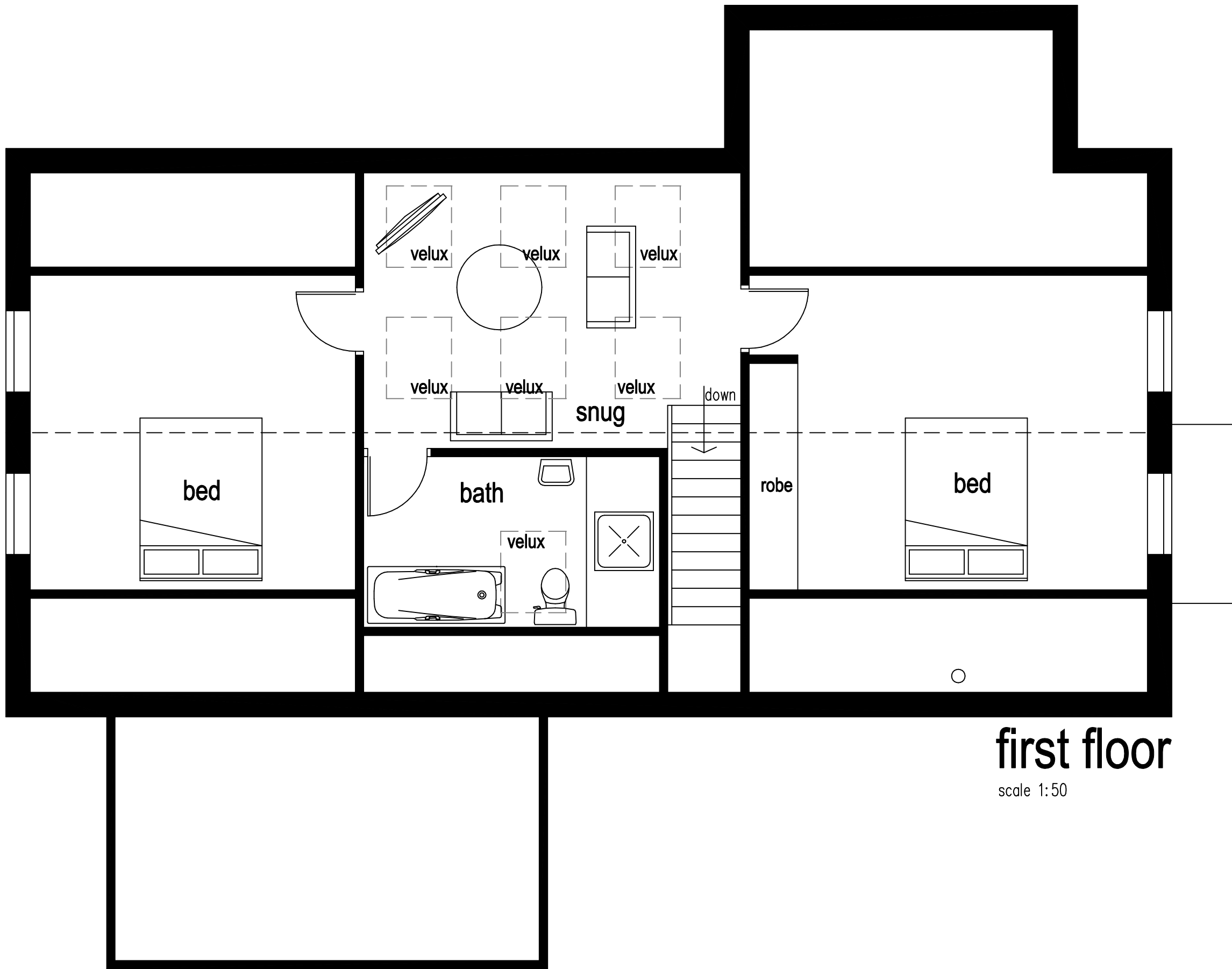


elevations

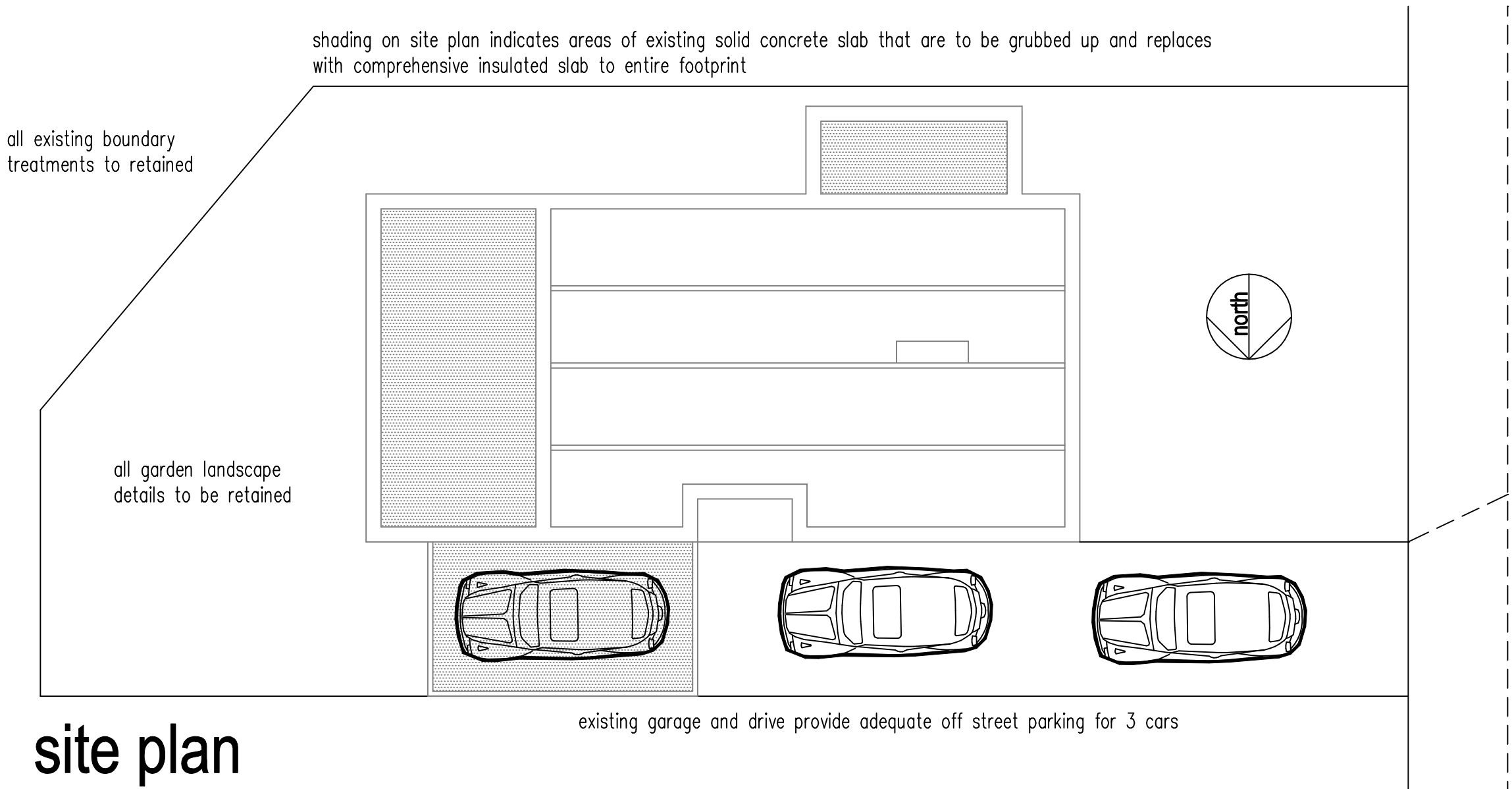
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ground floor

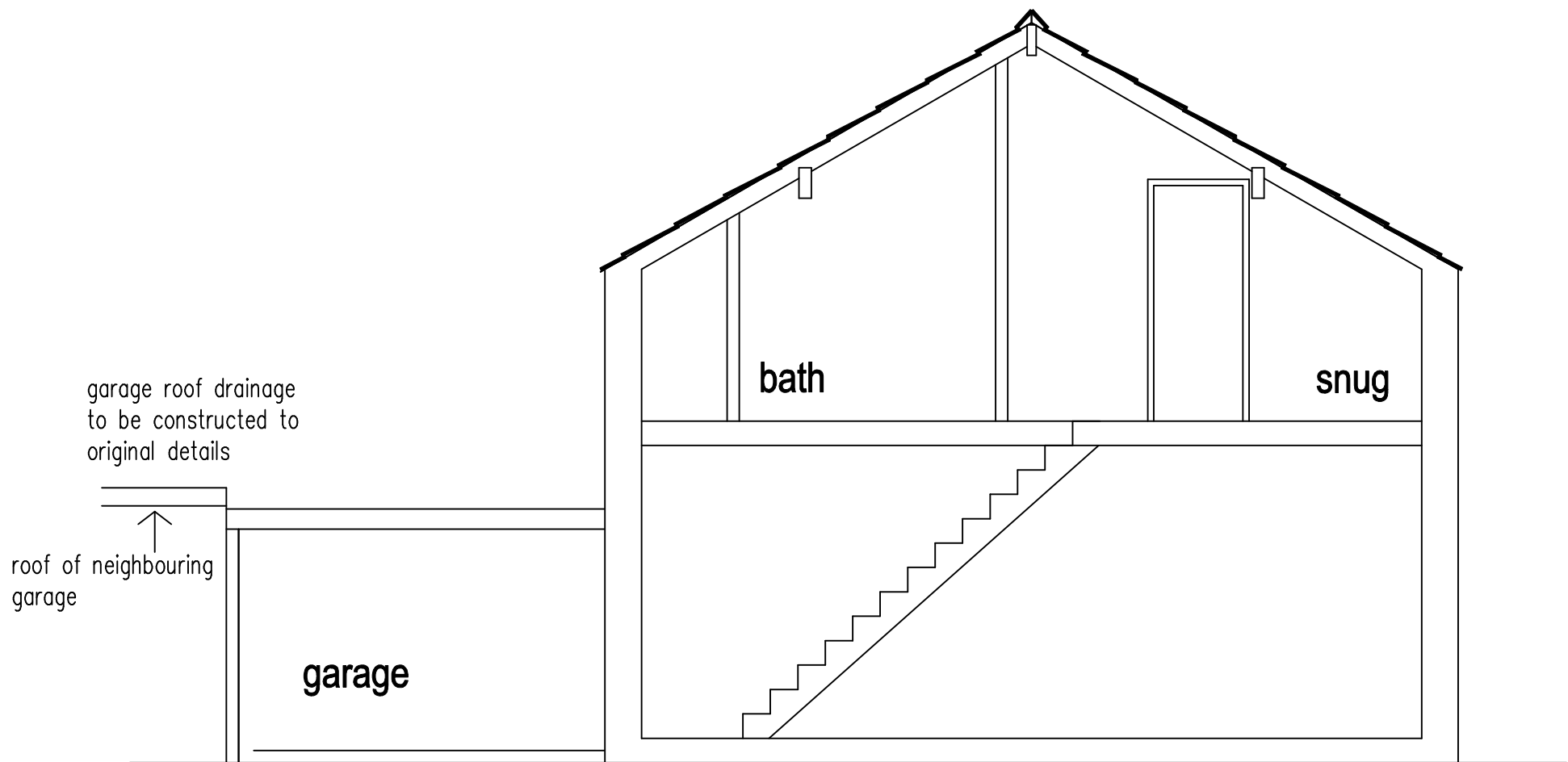


first floor



site plan

INCHFIELD CLOSE



cross section

amended 12-03-17
garage roof detail altered in response to comments from neighbour

proposed new 4 bed dwelling to sit of foundation of former burnt out bungalow at

2 Inchfield Close Rochdale

scale 1:100 1:50 @ A1
0m 10m
linear scale 1:100 @ A1



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Probehole Location



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CLIENT:

Cubic Surveying

PROJECT:

**2 Inchfield Close,
Rochdale**

TITLE:

**Probehole Location
Plan**

SCALE@SIZE

NTS

ISSUE:

Final

DESIGN/DRAWN:

AB

DATE:

September 2018

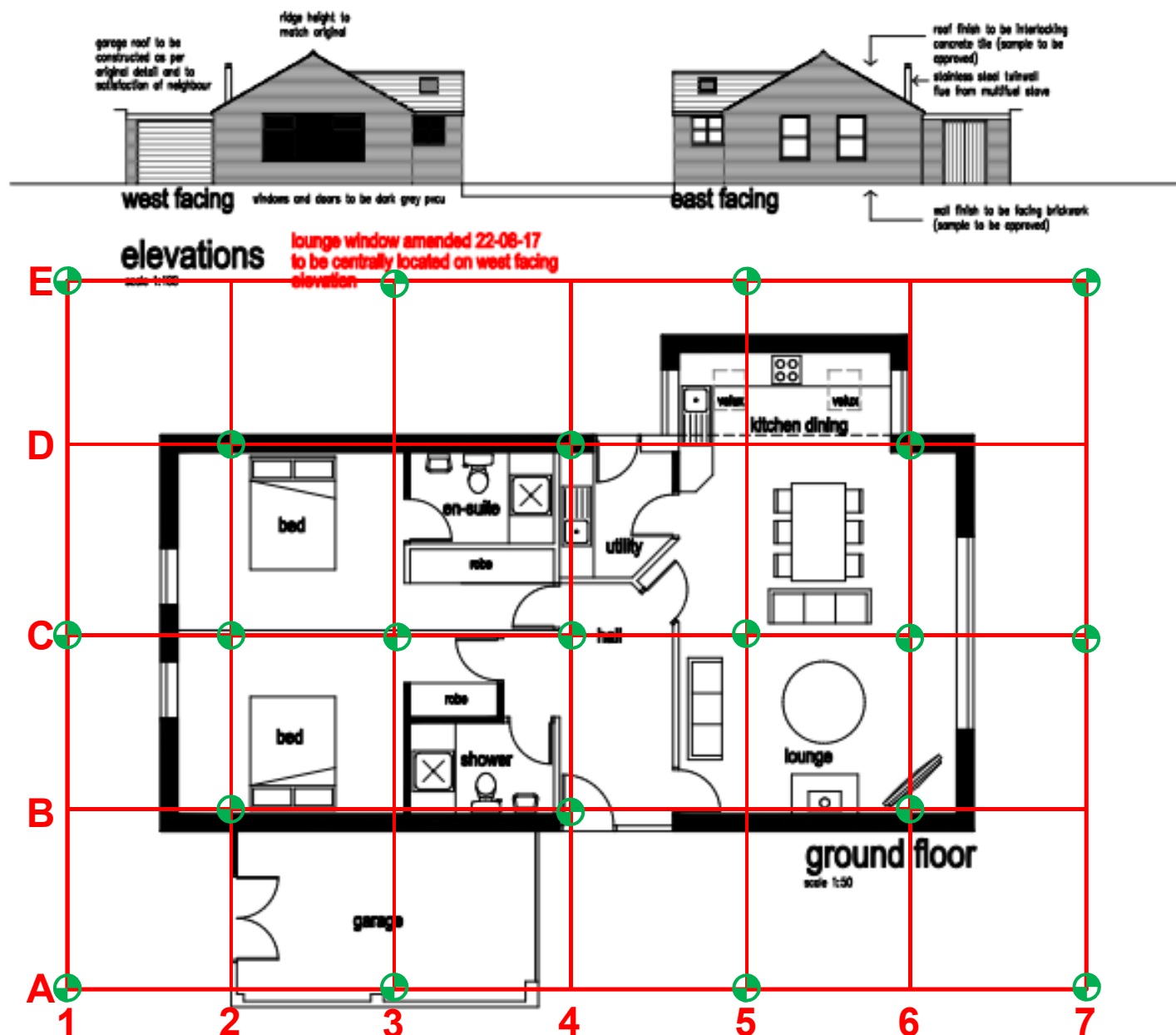
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Figure 4

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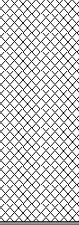
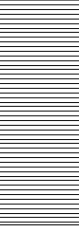
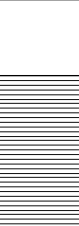
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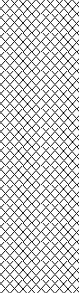
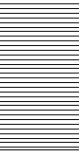
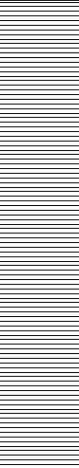
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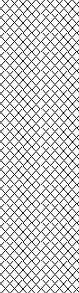
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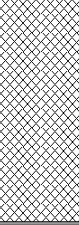
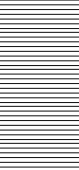
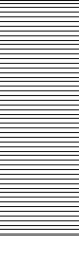
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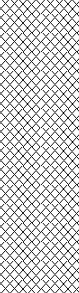
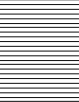
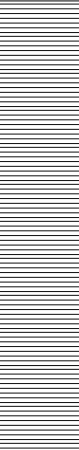
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			100	Water	3.00			FILL and CLAY. MADE GROUND		1	
			0	Water			6.00		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2
									Soft drilling, lost flush. PENNINE LOWER COAL MEASURES		3
									Firm drilling. PENNINE LOWER COAL MEASURES		4
									Firm drilling. PENNINE LOWER COAL MEASURES		5
			0	Water			7.00		Soft drilling. PENNINE LOWER COAL MEASURES		6
									Firm drilling. PENNINE LOWER COAL MEASURES		7
									Firm drilling. PENNINE LOWER COAL MEASURES		8
									Firm drilling. PENNINE LOWER COAL MEASURES		9
			0	Water			10.30		Soft drilling. PENNINE LOWER COAL MEASURES		10
Firm drilling. PENNINE LOWER COAL MEASURES		11									
0	Water	11.00		Firm drilling. PENNINE LOWER COAL MEASURES		12					
				Firm drilling. PENNINE LOWER COAL MEASURES		13					
					13.00		End of Borehole at 13.000m		14		
									15		
									16		
									17		
									18		
									19		
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
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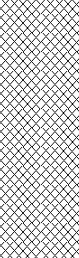
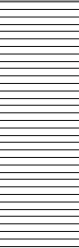
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			2								
			3								
			4								
			5								
			6								
			7								
			8								
			9								
			10								
			0	Water	4.00			SHALE. PENNINE LOWER COAL MEASURES		4	
			6.00								
			6.80								
					13.00			Firm drilling PENNINE LOWER COAL MEASURES		7	
End of Borehole at 13.000m									13		
14											
15											
16											
17											
18											
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

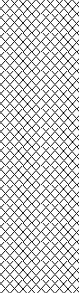
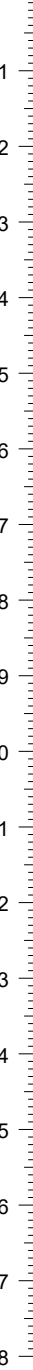
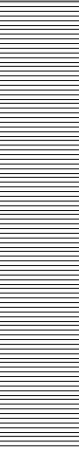
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					5.00			Black SHALE and COAL. PENNINE LOWER COAL MEASURES	2	
					6.50			MUDSTONE. PENNINE LOWER COAL MEASURES	3	
					9.70			COAL. PENNINE LOWER COAL MEASURES	4	
					10.00			MUDSTONE. PENNINE LOWER COAL MEASURES	5	
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									7	
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									10	
									11	
									12	
									13	
									14	
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	Crew: M&J Drilling Services						Equipment: Klemm		Logger: Driller	
	General Remarks: Drillers descriptions.									
Groundwater Remarks: No groundwater encountered.										
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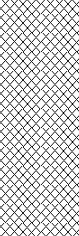
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Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
										2	
										3	
										4	
										5	
										6	
										7	
										8	
										9	
						0		Water	4.00		
			4.80			Weak drilling, lost flush.		11			
			6.00			Firm drilling. PENNINE LOWER COAL MEASURES		12			
			9.70			Weak drilling. PENNINE LOWER COAL MEASURES		13			
			10.00			Firm drilling. PENNINE LOWER COAL MEASURES		14			
			12.00			End of Borehole at 12.000m		15			
								16			
								17			
								18			
Crew: M&J Drilling Services			Equipment: Klemm				Logger: Driller				
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

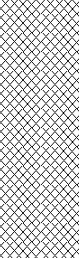
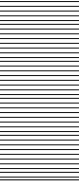
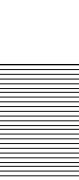
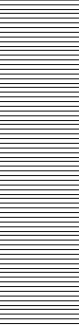
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. A7					
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)					
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N					
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description							
			100	Water				FILL and CLAY. MADE GROUND		1					
								3.00		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2			
								5.30		Soft drilling, lost flush.		3			
								6.30		Firm drilling. PENNINE LOWER COAL MEASURES		4			
								9.40		Soft drilling.		5			
								9.90		Firm drilling. PENNINE LOWER COAL MEASURES		6			
								13.00		End of Borehole at 13.000m		7			
															8
															9
															10
									11						
									12						
									13						
									14						
									15						
									16						
									17						
									18						
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller							
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.															
Groundwater Remarks: No groundwater encountered.															
Hole Started: 02/08/2018			Hole Complete: 02/08/2018			Version: FINAL		Scale: 1:100							

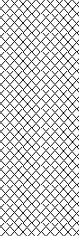
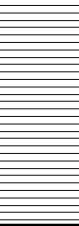
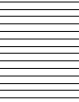
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. B2	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364		Coordinates E N		
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
					4.00					2	
										3	
										4	
			0	Water	5.50			SHALE. PENNINE LOWER COAL MEASURES		5	
					6.90			Weak drilling, lost flush.		6	
										7	
								Firm drilling. PENNINE LOWER COAL MEASURES		8	
										9	
										10	
										11	
										12	
						13.00				13	
								End of Borehole at 13.000m		14	
										15	
										16	
										17	
										18	
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

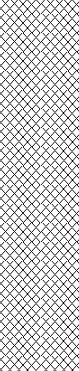
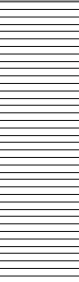
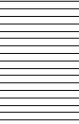
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. B3						
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)						
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N						
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description								
			100	Water				FILL and CLAY. MADE GROUND		1						
			0	Water				3.50		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2				
								5.00		Soft drilling, grout returns.		3				
			6.00					MUDSTONE. PENNINE LOWER COAL MEASURES		4						
			9.40					COAL. PENNINE LOWER COAL MEASURES		5						
			9.80					MUDSTONE. PENNINE LOWER COAL MEASURES		6						
												End of Borehole at 12.000m		7		
												12.00			8	
													9			
													10			
										11						
										12						
										13						
										14						
										15						
										16						
										17						
										18						
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller								
General Remarks: Check hole to prove efficacy of works.																
Groundwater Remarks: No groundwater encountered.																
Hole Started: 13/08/2018			Hole Complete: 13/08/2018			Version: FINAL		Scale: 1:100								

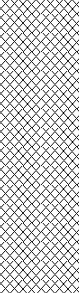
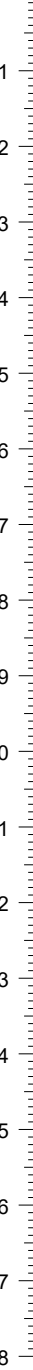
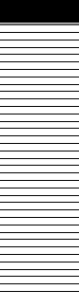
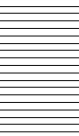
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)		
Client: Cubic Surveying							GRM Project Ref: P8364		Coordinates E N			
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description				
			100	Water				FILL and CLAY. MADE GROUND				
			0	Water	4.00							SHALE. PENNINE LOWER COAL MEASURES Weak drilling, lost flush.
				4.50								
				6.00								
	12.00		End of Borehole at 12.000m									
Crew: M&J Drilling Services			Equipment: Klemm			Logger: Driller						
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.												
Groundwater Remarks: No groundwater encountered.												
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100				

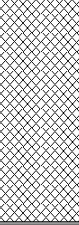
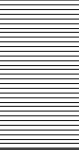
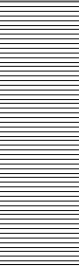
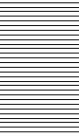
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)				
Client: Cubic Surveying							GRM Project Ref: P8364		Coordinates E N					
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description						
			100	Water				FILL and CLAY. MADE GROUND	1					
			0	Water			3.20		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES	2				
							5.00		Soft drilling, lost flush.	3				
							6.00		Firm drilling PENNINE LOWER COAL MEASURES	4				
							9.30		Soft drilling.	5				
							9.70		Firm drilling. PENNINE LOWER COAL MEASURES	6				
							12.00		End of Borehole at 12.000m	7				
														8
														9
														10
														11
													12	
									13					
									14					
									15					
									16					
									17					
									18					
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller						
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.														
Groundwater Remarks: No groundwater encountered.														
Hole Started: 02/08/2018			Hole Complete: 02/08/2018			Version: FINAL		Scale: 1:100						

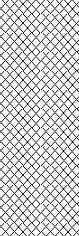
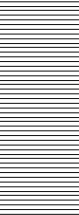
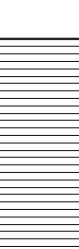
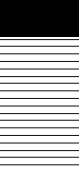
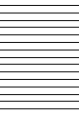
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
					3.50				SHALE. PENNINE LOWER COAL MEASURES		2
											3
				0	Water	6.00				Weak drilling, lost flush.	
					7.00					5	
										6	
								Firm drilling. PENNINE LOWER COAL MEASURES		7	
										8	
										9	
						13.00		End of Borehole at 13.000m		10	
										11	
										12	
										13	
										14	
										15	
										16	
										17	
										18	
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

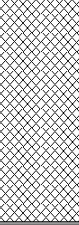
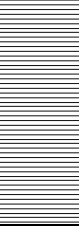
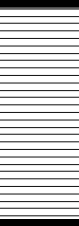
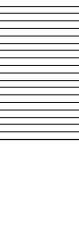
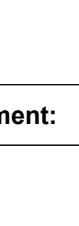
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
											2
											3
											4
											5
											6
											7
											8
											9
								0	Water	6.00	
					7.00			Soft drilling, grout returns.		11	
					10.00			MUDSTONE. PENNINE LOWER COAL MEASURES		12	
					10.50			COAL. PENNINE LOWER COAL MEASURES		13	
					12.00			MUDSTONE. PENNINE LOWER COAL MEASURES		14	
								End of Borehole at 12.000m		15	
										16	
										17	
										18	
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Check hole to prove efficacy of works.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 13/08/2018			Hole Complete: 13/08/2018			Version: FINAL		Scale: 1:100			

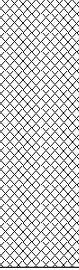
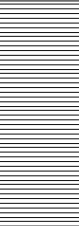
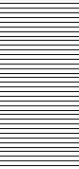
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)			
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N			
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description					
			100	Water				FILL and CLAY. MADE GROUND		1			
										2			
										3			
										4			
									5.00		Black SHALE and COAL. PENNINE LOWER COAL MEASURES		5
									6.00				
										MUDSTONE. PENNINE LOWER COAL MEASURES		6	
										7			
										8			
										9			
									9.80		COAL. PENNINE LOWER COAL MEASURES		10
									10.20				
										MUDSTONE. PENNINE LOWER COAL MEASURES		11	
										12.00			
									End of Borehole at 12.000m		12		
											13		
											14		
											15		
				16									
				17									
				18									
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller					
General Remarks: Drillers descriptions.													
Groundwater Remarks: No groundwater encountered.													
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100					

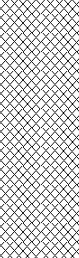
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Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364		Coordinates E N		
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND			
								COAL. PENNINE LOWER COAL MEASURES			
								MUDSTONE. PENNINE LOWER COAL MEASURES			
								COAL. PENNINE LOWER COAL MEASURES			
								MUDSTONE. PENNINE LOWER COAL MEASURES			
							End of Borehole at 12.000m				
Crew: M&J Drilling Services		Equipment: Klemm			Logger: Driller						
General Remarks: Check hole to prove efficacy of works.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 13/08/2018		Hole Complete: 13/08/2018		Version: FINAL		Scale: 1:100					

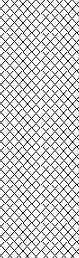
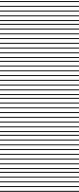
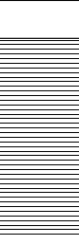
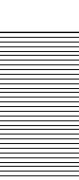
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Rotary Openhole				Borehole No. C5						
Site Name: 2 Inchfield Close, Rochdale								Sheet 1 of 1 Ground Level (mAOD)						
Client: Cubic Surveying						GRM Project Ref: P8364		Coordinates E N						
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description						
			100	Water				FILL and CLAY. MADE GROUND	1					
			0	Water				3.00		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES	2			
								5.00			Soft drilling, lost flush. PENNINE LOWER COAL MEASURES	3		
								6.00				Firm drilling. PENNINE LOWER COAL MEASURES	4	
								9.50				Soft drilling. PENNINE LOWER COAL MEASURES	5	
			10.10					Firm drilling. PENNINE LOWER COAL MEASURES	6					
			12.00					End of Borehole at 12.000m			7			
											8			
											9			
											10			
											11			
											12			
								13						
								14						
								15						
								16						
								17						
								18						
Crew: M&J Drilling Services			Equipment: Klemm			Logger: Driller								
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.														
Groundwater Remarks: No groundwater encountered.														
Hole Started: 02/08/2018		Hole Complete: 02/08/2018		Version: FINAL		Scale: 1:100								

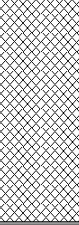
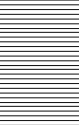
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. C6					
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)					
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N					
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description							
			100	Water				FILL and CLAY. MADE GROUND		1					
								3.20		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2			
												3			
												4			
												5			
								0	Water	6.20			Soft drilling, grout returns. PENNINE LOWER COAL MEASURES		6
								6.80		MUDSTONE. PENNINE LOWER COAL MEASURES			7		
														8	
													9		
													10		
										9.60			COAL.		
								10.20		PENNINE LOWER COAL MEASURES MUDSTONE. PENNINE LOWER COAL MEASURES			11		
										12.00					12
											End of Borehole at 12.000m		13		
													14		
													15		
													16		
													17		
									18						
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller							
General Remarks: Check hole to prove efficacy of works.															
Groundwater Remarks: No groundwater encountered.															
Hole Started: 13/08/2018			Hole Complete: 13/08/2018			Version: FINAL		Scale: 1:100							

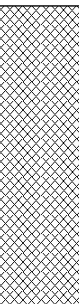
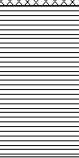
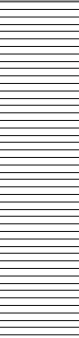
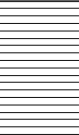
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. C7	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water	3.00			FILL and CLAY. MADE GROUND		1	
									SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2
									COAL. PENNINE LOWER COAL MEASURES		3
										MUDSTONE. PENNINE LOWER COAL MEASURES	
										COAL. PENNINE LOWER COAL MEASURES	
									MUDSTONE. PENNINE LOWER COAL MEASURES		6
									COAL. PENNINE LOWER COAL MEASURES		7
									MUDSTONE. PENNINE LOWER COAL MEASURES		8
									COAL. PENNINE LOWER COAL MEASURES		9
									MUDSTONE. PENNINE LOWER COAL MEASURES		10
							End of Borehole at 12.000m		11		
									12		
		13									
		14									
		15									
		16									
		17									
		18									
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 02/08/2018			Hole Complete: 02/08/2018			Version: FINAL		Scale: 1:100			

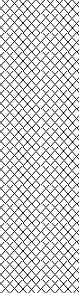
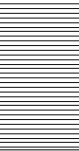
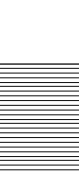
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Rotary Openhole				Borehole No. D2						
Site Name: 2 Inchfield Close, Rochdale								Sheet 1 of 1 Ground Level (mAOD)						
Client: Cubic Surveying						GRM Project Ref: P8364		Coordinates E N						
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description						
			100	Water				FILL and CLAY. MADE GROUND	1					
								3.60		SHALE. PENNINE LOWER COAL MEASURES	2			
								5.00		Weak drilling, lost flush. PENNINE LOWER COAL MEASURES	3			
								6.90		Firm drilling. PENNINE LOWER COAL MEASURES	4			
								10.00		Broken ground. PENNINE LOWER COAL MEASURES	5			
								10.70		Firm drilling. PENNINE LOWER COAL MEASURES	6			
								13.00		End of Borehole at 13.000m	7			
														8
														9
														10
														11
														12
									14					
									15					
									16					
									17					
									18					
Crew: M&J Drilling Services			Equipment: Klemm			Logger: Driller								
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.														
Groundwater Remarks: No groundwater encountered.														
Hole Started: 31/07/2018		Hole Complete: 31/07/2018		Version: FINAL		Scale: 1:100								

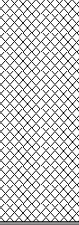
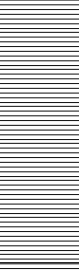
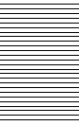
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. D3							
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)							
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N							
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description									
			100	Water				FILL and CLAY. MADE GROUND		1							
			0	Water				3.50		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2					
								5.00			Soft drilling, grout returns. PENNINE LOWER COAL MEASURES		3				
								6.60			MUDSTONE. PENNINE LOWER COAL MEASURES		4				
								9.80			COAL. PENNINE LOWER COAL MEASURES		5				
								10.50			MUDSTONE. PENNINE LOWER COAL MEASURES		6				
								12.00			End of Borehole at 12.000m		7				
																8	
																9	
																10	
																11	
																12	
									13								
									14								
									15								
									16								
									17								
									18								
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller									
General Remarks: Check hole to prove efficacy of works.																	
Groundwater Remarks: No groundwater encountered.																	
Hole Started: 13/08/2018			Hole Complete: 13/08/2018			Version: FINAL		Scale: 1:100									

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. D4	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
					3.50				SHALE. PENNINE LOWER COAL MEASURES		2
											3
				0	Water	6.30				Weak drilling, lost flush. PENNINE LOWER COAL MEASURES	
					6.80		Firm drilling. PENNINE LOWER COAL MEASURES			5	
										6	
					9.50			Weak drilling. PENNINE LOWER COAL MEASURES		7	
					10.00			Firm drilling. PENNINE LOWER COAL MEASURES		8	
										9	
					12.00					10	
										11	
										12	
								End of Borehole at 12.000m		13	
										14	
										15	
										16	
										17	
										18	
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. D6		
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)		
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N		
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description				
			100	Water				FILL and CLAY. MADE GROUND		1		
			0	Water				3.00		SHALE and weathered MUDSTONE. PENNINE LOWER COAL MEASURES		2
								4.70		Soft drilling, lost flush. PENNINE LOWER COAL MEASURES		3
								5.90		Firm drilling PENNINE LOWER COAL MEASURES		4
								9.80		Soft drilling. PENNINE LOWER COAL MEASURES		5
			10.30	Firm drilling. PENNINE LOWER COAL MEASURES				6				
			12.00	End of Borehole at 12.000m				7				
								13				
								14				
								15				
								16				
								17				
		18										
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller				
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.												
Groundwater Remarks: No groundwater encountered.												
Hole Started: 02/08/2018			Hole Complete: 02/08/2018			Version: FINAL		Scale: 1:100				

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. E1	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
					4.00				Black SHALE and COAL. PENNINE LOWER COAL MEASURES		2
				6.00					MUDSTONE. PENNINE LOWER COAL MEASURES		3
					10.50					COAL. PENNINE LOWER COAL MEASURES	
				11.20				MUDSTONE. PENNINE LOWER COAL MEASURES		5	
					13.00			End of Borehole at 13.000m		6	
										7	
										8	
										9	
										10	
										11	
										12	
										13	
									14		
									15		
									16		
									17		
									18		
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. E3	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL & CLAY. MADE GROUND		1	
					4.00				SHALE. PENNINE LOWER COAL MEASURES		2
			0	Water	6.00						3
					6.70			Weak drilling, loss of flush. PENNINE LOWER COAL MEASURES		4	
								Firm drilling. PENNINE LOWER COAL MEASURES		5	
					9.50			Broken ground. PENNINE LOWER COAL MEASURES		6	
					10.50			Firm drilling. PENNINE LOWER COAL MEASURES		7	
					12.00		End of Borehole at 12.000m		8		
									9		
									10		
									11		
									12		
									13		
									14		
									15		
									16		
									17		
									18		
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 31/07/2018			Hole Complete: 31/07/2018			Version: FINAL		Scale: 1:100			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com					Rotary Openhole			Borehole No. E7	
Site Name: 2 Inchfield Close, Rochdale										Sheet 1 of 1 Ground Level (mAOD)	
Client: Cubic Surveying							GRM Project Ref: P8364			Coordinates E N	
Well	Water Strikes	Depth (m)	Flush Returns (%)	Flush Type	Depth (m)	Level (m)	Legend	Stratum Description			
			100	Water				FILL and CLAY. MADE GROUND		1	
			0	Water	3.00				SHALE. PENNINE LOWER COAL MEASURES		2
					6.50		Firm drilling. PENNINE LOWER COAL MEASURES		3		
					9.80		Soft drilling. PENNINE LOWER COAL MEASURES		4		
					10.30			Firm drilling. PENNINE LOWER COAL MEASURES		5	
					12.00			End of Borehole at 12.000m		6	
										7	
										8	
										9	
										10	
									11		
									12		
									13		
									14		
									15		
									16		
									17		
									18		
Crew: M&J Drilling Services					Equipment: Klemm			Logger: Driller			
General Remarks: Driller descriptions. Void treated with 1:10 OPC/sand grout.											
Groundwater Remarks: No groundwater encountered.											
Hole Started: 02/08/2018			Hole Complete: 02/08/2018			Version: FINAL		Scale: 1:100			



A P P E N D I X E

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

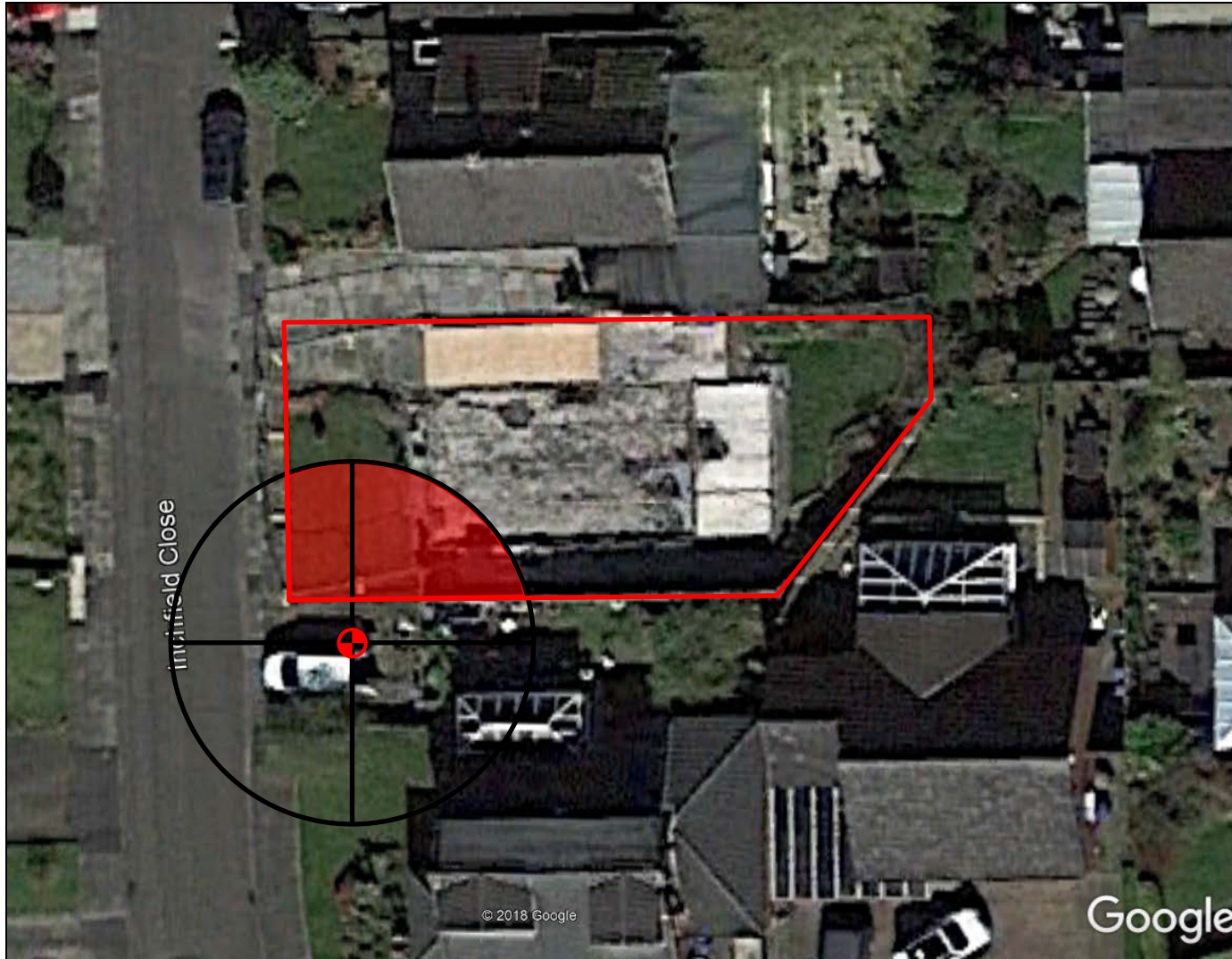
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

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Fax: 01283 211968

www.grm-uk.com



DO NOT SCALE



Potential location area of mine shaft based on an 8m departure



Approximate CA location of mine shaft.



Site boundary.



Area of site potentially affected by mine shaft.



GRM Development Solutions Ltd
Laurus House, Centrum 100
Burton-on-Trent, Staffs, DE14 2WH
Tel: 01283 551249 Fax: 01283 211968
info@grm-uk.com www.grm-uk.com

CLIENT:

Cubic Surveying

PROJECT:

2 Inchfield Close

TITLE:

**Potential Mine Shaft
Location Area**

SCALE@SIZE

NTS

ISSUE:

Final

DESIGN/DRAWN:

GS

DATE:

March 2018

PROJECT No:

P8364

DRAWING No:

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