



Warkworth Surveyors Ltd
P O Box 143
WARKWORTH 0941

7 April 2014

Attention: Mr Rupert Mather

Dear Rupert,

**RE: M.R AND M.G DASHPER - PROPOSED SUBDIVISION AT 207, 209 and 215
GOATLEY RD, WARKWORTH
Geotechnical Investigation**

1.0 INTRODUCTION

As requested, we have carried out a geotechnical investigation for Resource Consent purposes, for a proposed seven lot subdivision of the above property to assess the suitability of building sites and foundation conditions on each lot. The scheme plan is shown on your drawing ref 3099, 18/3/14, Rev A, and consists of the proposed subdivision of Allotment 185 and Part Allotment 186, Parish of Mahurangi and Lot 1 DP126222.

The subdivision will comprise seven lots. Lots 1 and 2 contain existing dwellings. This report covers the proposed building sites on Lots 3 to 7 having areas of between about 1 and 1.4Ha, as well as the proposed upgrade of an existing bridge and culvert on the access driveways.

Our investigation has consisted of a 'walk over' inspection of the land by a Geotechnical Engineer, together with the drilling of ten hand auger boreholes, at the locations shown on the attached Drawing 7636-1. The boreholes were drilled to depths up to 4.8m. The boreholes for the bridge and culvert were drilled to about 3m and were terminated when the holes started to collapse in soft ground. They were then continued using a Scala Penetrometer until hard ground was encountered. Undrained shear strengths of the soil were measured during drilling using a field shear vane and the test results are shown on the attached borelogs.

2.0 SITE DESCRIPTION

The subdivision comprises a 65.58Ha block of flat to very gently sloping pasture and bush covered land in a valley below rising bush covered hill country of the Dome Forest to the North. Access to the lots is off an existing farm track which is to be upgraded. The access track crosses swampy water courses in two areas by means of an existing wooden bridge and a culvert. The proposed building sites are all on level terraces or very gently sloping land with bush clad gullies forming steep banks around the terrace edges. Development of the lots would require only relatively minor earthworks to create level building platforms.



None of the sites are at risk from instability provided building is kept back from the top of the steep banks above the watercourses. Ample areas exist on the lots to form hazard free building areas of at least 1,000m².

3.0 GROUND CONDITIONS

The IGNS Geological Map of New Zealand, 1:250,000, 'Auckland', indicates that the underlying geology of the area consists of weathered siltstones and sandstones of the Upper Tertiary Waitemata Group (Pakiri Formation), overlain in part by Pleistocene to Holocene alluvial sediments.

The boreholes at the building sites (BH's 1, 2, 3, 8, 9 and 10) mainly encountered alluvial sediments overlying Waitemata sediments, except in BH10 where no alluvium was present. In BH's 1 and 8 the alluvium was present over the full depth of the boreholes. The alluvial soils consist of mainly very stiff, clayey to sandy silts and silty clays in places containing minor fibrous organic inclusions. However, in BH8 several highly organic layers were present below 3m. The alluvium is mostly of fairly high strength and between about 120 and 200kPa, except in the lower part of BH8 below 2.5m where the strengths were between about 50 and 70kPa. The underlying soils of the Waitemata Group comprise very stiff clayey silts and silty clays and some sands, with shear strengths between 100 and 200kPa.

The boreholes at the swampy bridge and culvert sites (BH's 4, 5, 6 and 7) all encountered soft, weak, partly organic alluvial soils. An upper layer of mostly weak fill was present in BH's 5, 6 and 7, between 0.6 and 1.6m deep. Undrained shear strengths in these holes typically varied from 15 to 50kPa and the soils are likely to be highly compressible. Below about 3m, hand augering could not be continued due to squeezing and collapsing of the holes. Scala Penetrometer tests in the holes indicated that harder ground occurs at around 5m at the culvert site and 5 to 6m plus at the bridge site.

Based on visual characteristics, we assess the near surface soils on the lots as likely to be moderately reactive, i.e. susceptible to seasonal soil shrinkage and swelling (Class M in terms of AS2870:1996)

In the building site boreholes ground water seepage was only encountered at the time of drilling in BH's 8 and 9 at 4.4m and 3.3m respectively, the remainder of the boreholes being dry on completion of drilling. However, water levels may not have stabilised at the time of measurement and could rise during the winter. The holes at the bridge and culvert sites encountered ground water at high levels varying between 0.3 and 1.5m depth and the groundwater is likely to be at about ground level.

4.0 GEOTECHNICAL ASSESSEMENT AND RECOMMENDATIONS

On the basis of our investigation, we consider that suitable stable, hazard free building sites of at least 1000m² exist on all of the lots of the proposed subdivision at the approximate locations shown on Drawing 7636 -1. All building areas are on level ground or very gentle slopes and the sites are not likely to be subject to instability provided building is kept back from the steep gully slopes around the edges of the terraces. The subsoils appear to be of moderately high strength, however the soils could be subject to moderate shrinkage and swelling due to seasonal moisture changes. Weaker soils occur below 2.5m on Lot 3 (BH8), but the upper soils layer appears to be of high strength. The ground conditions

appear generally suitable for shallow foundations on level cut benches. Weak soils exist at the culvert and bridge sites which will require special treatment to upgrade these structures.

Our geotechnical recommendations are therefore as follows:

A) Bridge and Culvert

The right-of-way driveway serving the lots should be designed and supervised by a Chartered Professional engineer. For initial design we recommend using a CBR value of 4 for the subgrade strength.

In view of the weak swampy ground conditions, upgrading the access drive bridge would require supporting the structure on driven timber piles taken down to harder ground at a depth of at least 5m. The design of the piles should be carried out in consultation with a Geotechnical Engineer to determine appropriate design parameters to calculate the safe founding depth. If any fill is used for the approach to the bridge then the piles could be subject to negative skin friction. Confirmation of the founding depth on site should be based on a minimum depth determined by calculation and confirmed on site using a pile set. If the piles are subject to any negative skin friction then the pile load used to determine the pile set must take into account the negative skin friction. Pile driving should be supervised by a Geotechnical Engineer to confirm that the piles have reached an appropriate depth to carry the design loads.

Based on the borehole results the culvert site will need to be sub excavated to at least 1.5m to remove very soft ground and backfilled with compacted hardfill, over a geotextile layer, prior to culvert placement. The work should be carried out under the supervision of a Geotechnical Engineer.

Approach embankment fills for both the bridge and culvert will require stripping of weak unsuitables and placement of geotextile, prior to fill placement. Only free draining hardfill should be used for fill construction below water level and to at least 0.5m above flood water level. Fills should be compacted to an acceptable engineering standard under the supervision of a Geotechnical Engineer.

B) Building Development

- 1) The final building areas on each lot should be defined by survey by pegging the areas in conjunction with a Geotechnical Engineer. Building proposals on the lots should be reviewed by a Geotechnical Engineer who should also check the locations of the building sites at the time of Building Consent application to ensure buildings are located within the intended areas and kept well clear of any steep slopes surrounding the building areas. Additional geotechnical investigations could be necessary to confirm foundation design parameters for specific developments on the lots.
- 2) On all lots, building foundations on level cut benches may consist of conventional strip footings designed under Ultimate Limit State for a Dependable bearing pressure of 150kPa (300kPa Ultimate), and generally in accordance with NZS3604:2011. However all foundations should be a minimum of 600mm below final cut ground level and into very stiff undisturbed natural ground ($C_u > 100\text{kPa}$) as a precaution against settlement effects due to seasonal soil shrinkage and swell. Alternatively surface concrete waffle raft slabs such as 'ribrasts' could be used designed for Class M soil conditions.

- 3) Building foundations on sloping ground steeper than 5H to 1V (11°) or within 8m of any steeper slopes (greater than 4H to 1V) should consist of bored concrete encased timber poles or reinforced concrete piles to a minimum depth of 2m. Bored piles may be designed under Ultimate Limit State Design for a Dependable end bearing pressure of 450kPa (900kPa Ultimate) and a Dependable skin friction of 15kPa (30kPa Ultimate), ignoring friction over the upper 1m of shaft length. The layout of pile foundations should be subject to confirmation by a Geotechnical Engineer.
- 4) Floor slabs may be cast-on-grade provided all vegetation, topsoil, loose fill and any weak soils are removed and subject to the inspection and approval of the sub-grade by a Geotechnical Engineer. Only good quality hardfill should be used under floor slabs compacted to a satisfactory engineering standard. Floor slabs and footings should be designed for Class M reactive soil conditions.
- 5) Any proposals for building in areas other than the intended building sites or within 10m of slopes steeper than 4H to 1V, would need to be subject to further geotechnical advice and investigations and would require specific design of foundations.
- 6) Any cuts into the slopes for the building sites in excess of 1m deep should be retained by Engineer designed retaining walls or battered back no steeper than 3H to 1V. However, any proposals for substantial cut and fill earthworks greater than 1m depth in relation to building developments must be subject to the advice and recommendations of a Geotechnical Engineer. Significant depth of fill could result in substantial long term settlement.
- 7) Any filling for the building developments should be properly compacted at appropriate moisture content and subject to testing by a Geotechnical Engineer to ensure that it is placed to an adequate engineering standard for residential development. Soil fills should be compacted to achieve an average undrained shear strength of no less than 140kPa with no single tests under 100kPa and with Air voids no greater than 10%. Prior to placing fill, topsoil must be stripped and sloping ground benched to key the fill into the slope.
- 8) Retaining walls may be designed assuming the following soil parameters:

Effective friction angle	= 30°
Effective cohesion	= 0
Unit weight of soil	= 18kN/m ³
Coefficient of sliding resistance	= 0.36 (i.e. tan δ)
Undrained shear strength (Ultimate)	= 75kPa

A strength reduction factor of 0.5 should be applied to the passive resistance or undrained shear strength, depending on the wall design, and 0.8 for sliding resistance. The bearing pressure should be determined as for shallow foundations above.

- 9) The soils on the site are considered to be moderately susceptible to seasonal shrinkage and swelling, the effects of which can be exacerbated by trees (especially exotic varieties), hedges and plants having a high water demand which should not be planted near shallow building foundations as they can withdraw moisture from the soil and cause the foundations to settle. Trees should be planted no closer to the building than 0.75 times the mature height of the tree.

- 10) Care should be taken with disposal of stormwater to prevent any uncontrolled concentrated discharge of water which could lead to erosion. Stormwater from tank overflows and driveways should be piped to discharge into the natural watercourses well clear of the building sites or into specifically designed dispersal pipes.
- 11) Ample areas exist on the lots for on-site effluent disposal, such as appropriately designed irrigation systems.
- 12) We recommend that during construction, driveway formation, earthworks and foundation excavations including pile installations, be checked by a Geotechnical Engineer to confirm the nature and strength of the subsoils and footings depths as well as to provide any further geotechnical advice or subsoil investigations considered to be necessary for particular development on the lots.

5.0 LIMITATION

Recommendations and opinions in this report are based on data from ten boreholes. While the nature and continuity of the subsoil conditions away from the boreholes is inferred it is possible that actual conditions could vary from those assumed. Should variations in subsoil conditions from those described in this report, be found to exist, then it is essential that Engineering Geology Ltd be contacted as it may affect the design parameters recommended above.

This report has been prepared solely for the benefit of Mr and Mrs M and M Dashper as our clients with respect to the brief for the purposes of subdivision of the land and Engineering Geology Ltd accepts no liability to any other party in relation to this report. The reliance by other parties on the information or opinions contained in this report shall, without our prior review and agreement in writing, be at such party's sole risk.

We would be pleased to provide any further advice you may require.

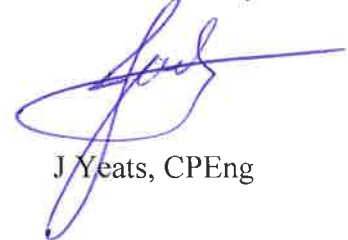
Yours faithfully

ENGINEERING GEOLOGY LTD



C P Gulliver, CPEng, PEngGeol

Reviewed by



J Yeats, CPEng

Enclosure: Borelogs – BH's 1 to 10
Scala logs BH's 4 to 7
Drawing 7636 - 1

Engineering Geology Ltd

BOREHOLE No. 1

SITE: LOT 6 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)				
							50	100	150		
Top soil	Organic SILT; dark brown. Moist, non plastic	~ ~ ~ ~ ~									
Alluvium	SILT, minor clay; light brown. Hard, moist, low plasticity	/ / / / /	1						>200		
	some clay, light brown, light orange, very stiff								100		
	clayey, light brown, orange										
	hard										
	some clay, trace sand(f), light orange, orange										>200
	very stiff										
	minor clay, light orange, orange, light grey										162
	trace clay, light orange, light grey, orange, pink, non plastic										150
	trace limonite, light orange, light grey, orange, dark orange, pink										137
	pink, light grey, light orange, no limonite, no clay										143
	trace sand(f-m), pink-orange, pink, light grey, light orange										161
	pink, pink-orange, moist-wet										124
	minor sand(f-m), pink, orange, light orange										159
	minor clay, pink, light grey, hard, no sand, low plasticity										146
trace clay, light orange, light grey, non plastic very stiff								>200			
no clay								138			
some sand(f-m)								181			
minor clay, low plasticity								121			
dark grey, blue-grey, dark brown, tr. organics stiff								80			
	E.O.B. @ 4.8m		5								

Dry - 10/03/14

NOTES

LOGGED BY: DC
 DATE DRILLED: 26-Feb-14
 DRILL METHOD: 50 mm Hand Auger

Engineering Geology Ltd

BOREHOLE No. 2

SITE: LOT 7 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa) <small>● Field vane (BS 1377) ○ Remoulded Field vane</small> 50 100 150
Topsoil	Organic SILT; dark brown. Very stiff, moist, non plastic	~ ~ ~ ~					
Alluvium	SILT with minor clay; light brown. Very stiff, moist, low plasticity clayey, light brown, light grey light grey, orange, moderate plasticity	/ / / /	1				184 ● 136 ● 142 ● 155 ●
	CLAY with some silt; light grey, orange. Very stiff, moist, high plasticity trace limonite, hard very stiff trace organics (fibrous)	/ / / /	2				152 ● >200 ● 167 ● 150 ●
Waitemata Group	SILT with minor clay; grey, orange. Very stiff, moist, low plasticity stiff	/ / / /	3				142 ● 121 ● 92 ●
	CLAY with minor silt; dark grey. Very stiff, moist-wet, high plasticity	/ / / /	4				118 ● 138 ● 161 ● 126 ●
	E.O.B @ 4.8m		5				107 ●

Dry - 26/02/14

NOTES

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 DATE DRILLED: 26-Feb-14
 DRILL METHOD: 50 mm Hand Auger

Engineering Geology Ltd

BOREHOLE No. 3

SITE: LOT 6 - 215 Goatley Road, WARWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)
							○ Remoulded Field vane ● Field vane (BS 1377)
							50 100 150
Top soil	Organic SILT; dark brown. Moist, non plastic	~ ~ ~					
Alluvium	SILT, some clay; light brown. Hard, moist, low plasticity						>200
	very stiff light brown, light grey light grey, light brown clayey, trace wood fragments some clay		1				183 146 167 191
Waitemata Group	CLAY, some silt; light grey, light orange. Very stiff, moist, high plasticity hard						>200
	silty, very stiff SILT, some clay; light grey, light pink, light orange. Very stiff, moist, low plasticity clayey		2				173 127
	CLAY, some silt; light grey, light orange. Very stiff, moist, moderate plasticity hard silty, orange, dark orange, trace limonite		3				100 >200
	grey, no limonite		4				>200 UTP >200 UTP >200 UTP >200 UTP
	E.O.B. @ 4.2m (hard augering)		5				>200

Dry - 10/03/14

NOTES

LOGGED BY: DC
 DATE DRILLED: 26-Feb-14
 DRILL METHOD: 50 mm Hand Auger

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)		
							50	100	150
Topsoil	Organic SILT; dark brown. Stiff, moist, non plastic	~ ~ ~ ~ ~							
Alluvium	SILT; light brown, grey. Stiff, moist, low plasticity	/ / / / /					69		
	firm						38		
	some clay, bluish grey, brown trace organics, very soft minor clay		1				28		
	soft								
	very stiff								
	no organics, trace fine sand clasts						130		
	stiff		2				107		
							104		
							83		
							84		
			3				64		
E.O.B @ 3.0m (hole collapsing) Continued with Scala Penetrometer									
			4						
			5						
NOTES					LOGGED BY: MK DATE DRILLED: 10-Mar-14 DRILL METHOD: 50 mm Hand Auger				

WATER LEVEL
 1.5m - 10/03/14
 1.8m

Engineering Geology Ltd

BOREHOLE No. 5

SITE: LOT 7 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)		
							50	100	150
Fill	Organic SILT; dark brown. Moist, non plastic		0						
	SILT, some clay; light brown, light grey. Very stiff, moist, low plasticity								
Alluvium	trace sand(f-m), light brown, grey		1			1.1m - 10/03/14			
	minor sand(f-m), brown, grey, light brown								
	CLAY, some silt, tr. sand(f); brown-grey, blue-l. grey. Firm, wet, mod. plasticity, tr. organics saturated (seepage encountered @ 0.9m)								
	SILT, some sand(f); blue-green. Firm, wet, non plastic								
	Silty CLAY, trace sand(f); blue-green. Firm, wet, low plasticity								
	grey-blue, green-brown, stiff		2						
	firm		3						
	E.O.B. @ 3.2m (hole squeezing/collapsing) Continued with Scala Penetrometer		4						
			5						

NOTES

LOGGED BY: DC
 DATE DRILLED: 10-Mar-14
 DRILL METHOD: 50 mm Hand Auger

Engineering Geology Ltd

BOREHOLE No. 6

SITE: LOT 1 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)
							● Field vane (BS 1377) ○ Remoulded Field vane 50 100 150
Fill	GRAVEL (fine-coarse); light grey, moist, well-graded	X					46
Alluvium	SILT with some organics; dark brown. Stiff, saturated, non plastic	~	1			0.5m - 10/03/14 ▼	92
	minor organics, dark brown, grey	~	2				61
	firm	~	3				92
	E.O.B @ 3.0m (hole collapsing) Continued with Scala Penetrometer	~	4				63
		~	5				43
		~					46
		~					37
		~					23
		~					50

NOTES

LOGGED BY: MK
 DATE DRILLED: 28-Feb-14
 DRILL METHOD: 50 mm Hand Auger

Engineering Geology Ltd

BOREHOLE No. 7

SITE: LOT 1 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)
							○ Remoulded Field vane ● Field vane (BS 1377) 50 100 150
Fill	Organic SILT; dark brown. moist, low plasticity	[X-pattern symbol]	1			0.3m	
	GRAVEL(f-m); light grey. dry-moist, non plastic SILT, trace clay; brown, dark brown. saturated, non plastic (seepage encountered @ 0.3m) stiff minor gravel(f) firm hard gravel+tar no gravel+tar, trace gravel(f), firm						75 38 32 54 >200 UTP >200 UTP
Alluvium	Silty CLAY; grey-brown. Firm, saturated, trace - organics, low plasticity	[Wavy-line symbol]	2				
	E.O.B. @ 2.0m (hole collapsing) Continued with Scala Penetrometer		3				
			4				
			5				

NOTES

LOGGED BY: DC
 DATE DRILLED: 26-Feb-14
 DRILL METHOD: 50 mm Hand Auger

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)
							○ Remoulded Field vane ● Field vane (BS 1377)
							50 100 150
Top soil	Organic SILT; dark brown. Moist, non plastic						
Alluvium	SILT, some clay, trace sand(f); light brown, brown. Hard, moist, low plasticity						>200
	light brown, light orange, no sand						>200
	clayey, light brown, light orange, light grey						>200
	Silty CLAY; light brown, orange, light grey. Hard, moist, moderate plasticity		1				153
	Clayey SILT; light brown, light grey, orange. Very stiff, moist, low plasticity						169
	Silty CLAY, trace sand(f); light grey, orange. Very stiff, moist, moderate plasticity						156
	Clayey SILT, minor sand(f); light grey, orange. Very stiff, moist, low plasticity		2				158
	Silty CLAY; light grey, orange. Very stiff, moist, moderate plasticity						121
	Clayey SILT, trace sand(f-m); light grey, light - brown. Very stiff, moist, low plasticity some clay, minor sand(f-m) stiff light brown, grey+black+orange mottles firm		3				72
	CLAY, some silt; grey-brown, dark brown. Firm, moist-wet, low plasticity very stiff, wet, minor organics seepage encountered @ 3.5m						48
SILT, some clay, minor sand(f-m); grey-brown. stiff, saturated, low plasticity, some organics highly organic					3.5m	76	
Silty CLAY; brown. Stiff, moist-wet, low plasticity, minor organics firm		4				60	
stiff, some organics						48	
very stiff						67	
E.O.B. @ 4.8m			5				100

NOTES

LOGGED BY: DC
 DATE DRILLED: 10-Mar-14
 DRILL METHOD: 50 mm Hand Auger

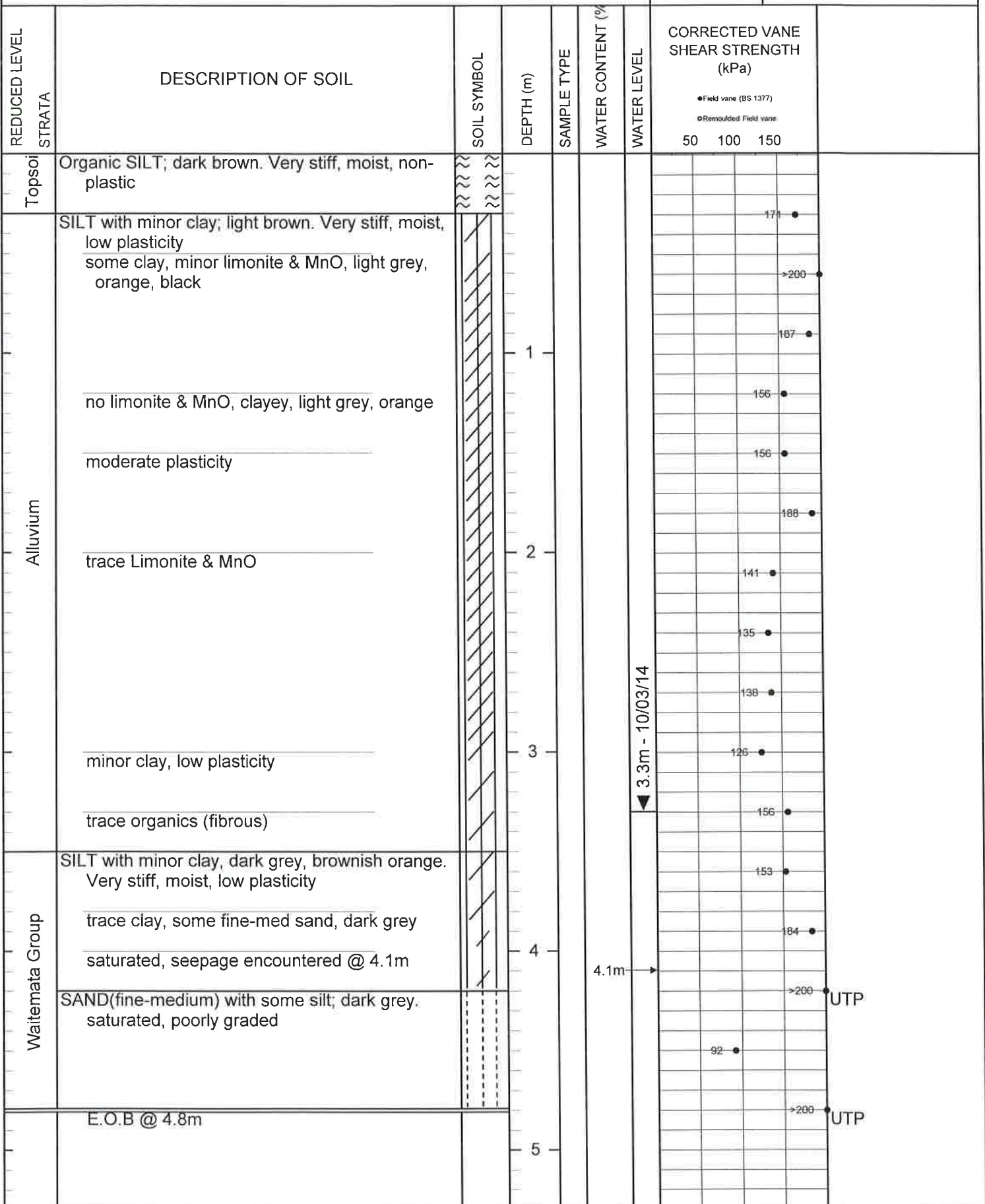
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BOREHOLE No. 9

SITE: LOT 4 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1



3.3m - 10/03/14

4.1m

NOTES

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 DATE DRILLED: 10-Mar-14
 DRILL METHOD: 50 mm Hand Auger

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BOREHOLE No. 10

SITE: LOT 5 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

REDUCED LEVEL STRATA	DESCRIPTION OF SOIL	SOIL SYMBOL	DEPTH (m)	SAMPLE TYPE	WATER CONTENT (%)	WATER LEVEL	CORRECTED VANE SHEAR STRENGTH (kPa)		
							50	100	150
Top soil	Organic SILT; dark brown. Moist, non plastic	~ ~ ~							
Waitemata Group	SILT, some clay, trace sand(f); light brown, light orange. Very stiff, moist, low plasticity clayey							175	
	CLAY, some silt; light brown, orange, light grey. Very stiff, moist, moderate plasticity light brown, orange		1					162	
	SILT, some clay, trace sand(f-m); light brown, dark orange. Very stiff, moist, low plasticity hard light grey, dark orange, orange, trace limonite some sand(f-m), very stiff, no clay		2					135	
	hard dark orange very stiff trace MnO		3					153	
	hard wet light brown, black mottles minor clay, trace sand(f)		4					124	
	E.O.B. @ 4.8m		5					>200	

Dry - 10/03/14

UTP
UTP
UTP
UTP

NOTES

LOGGED BY: DC
 DATE DRILLED: 10-Mar-14
 DRILL METHOD: 50 mm Hand Auger

Engineering Geology Ltd

SCALA PENETROMETER LOG

SITE: LOTS 7 & 1 - 215 Goatley Road, WARKWORTH

REF: 7636

Sheet 1 of 1

SCALA BH4			SCALA BH5			SCALA BH6		
Blows / 100 mm	Depth (m)	Interpret. / Comments	Blows / 100 mm	Depth (m)	Interpret. / Comments	Blows / 100 mm	Depth (m)	Interpret. / Comments
0	3.3		0	3.1		0	3.1	
3	3.5		1	3.5		2	3.3	
4	3.7		2	3.7		5	3.5	
3	3.9		2	3.9		6	3.7	
5	4.1		2	4.1		7	3.9	
3	4.3		2	4.3		5	4.1	
8	4.5		6	4.5		5	4.3	
7	4.7		4	4.7		5	4.5	
6	4.9		9	4.9		9	4.7	
7	5.1		2	5.1		5	4.9	
7	5.3		6	5.3		5	5.1	
7			9			9		
8			7			7		
8			7			7		
5			8			12		
9			8			12		
10			9			14		
15			9			11		
17			13			15		
19			15			>20		
>20			18			>20		
			>20					

NOTES:

OPERATOR: MK+DC
DATE:10/03/14

Engineering Geology Ltd

SCALA PENETROMETER LOG

SITE: LOT 1 - 215 Goatley Road, WARKWORTH

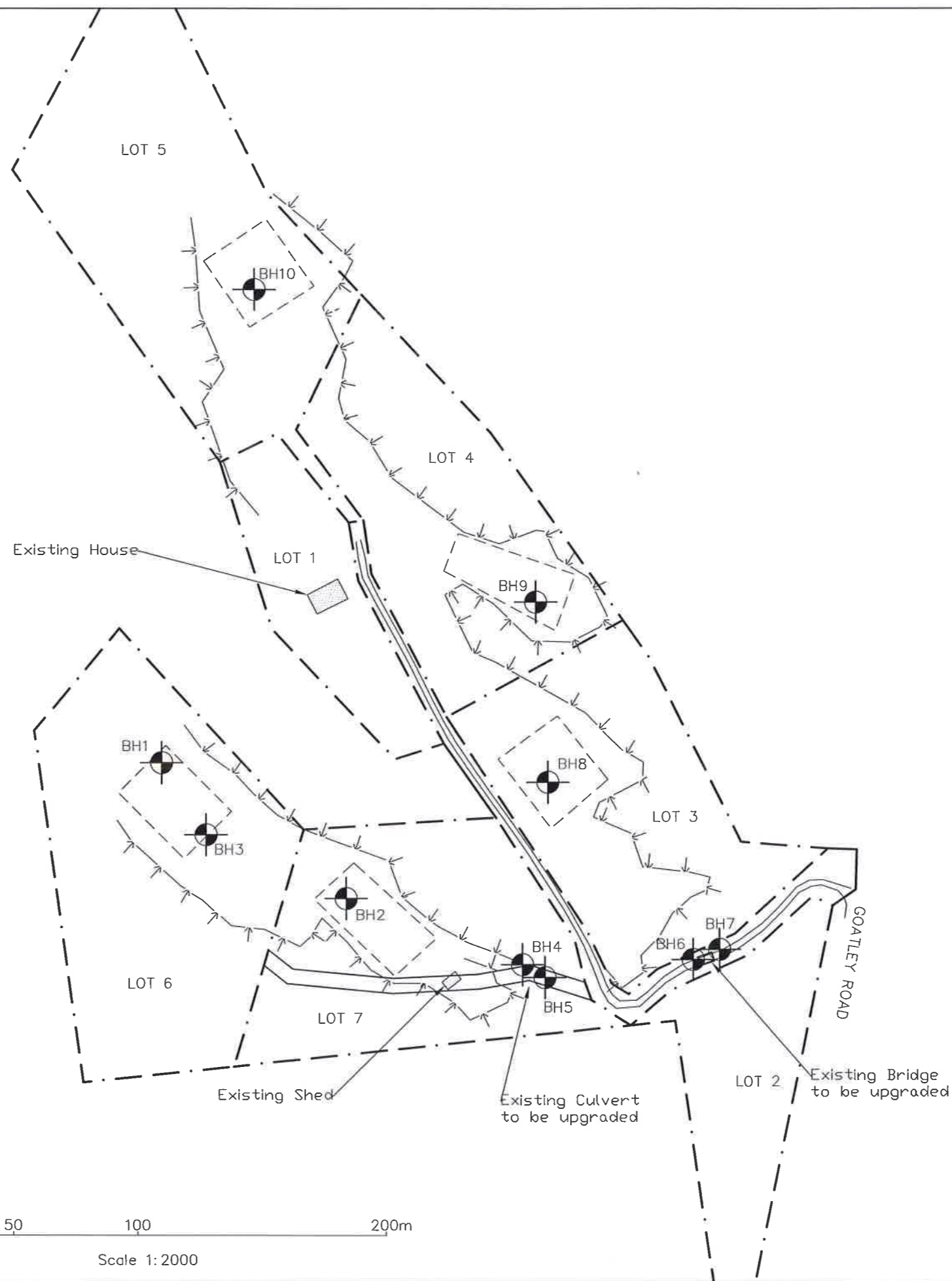
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Sheet 1 of 1

SCALA BH7			SCALA BH 7 continued					
Blows / 100 mm	Depth (m)	Interpret. / Comments	Blows / 100 mm	Depth (m)	Interpret. / Comments	Blows / 100 mm	Depth (m)	Interpret. / Comments
0	2.1		8					
0			7					
2	2.3		9	5.3				
3			8					
3	2.5		9	5.5				
3			6					
3	2.7		7	5.7				
3			10					
5	2.9		9	5.9				
6			9					
7	3.1		13	6.1				
7			11					
8	3.3		13	6.3				
7			15					
7	3.5		16	6.5				
11			17					
9	3.7		17	6.7				
9			15					
10	3.9		14	6.9				
10								
14	4.1							
13								
11	4.3							
13								
13	4.5							
15								
12	4.7							
11								
10	4.9							
9								

NOTES:

OPERATOR: MK+DC
DATE:10/03/14



Legend	
	Proposed Building Site
	Hand Auger Borehole
	Lot Boundary
	Top of Bank
	Contours 0.5m Intervals

0 10 30 50 100 200m
Scale 1:2000

Reference:
Warkworth Surveyors
Engineering Geotechnical Plan
Job No. 3099
Date: 18 March 2014



ENGINEERING GEOLOGY LTD
Unit 7C, 331 Rosedale Rd, PO Box 301054, Albany
Ph (09)486-2546, Fax (09)486-2556

215 Goatley Road, WARKWORTH Borehole Location Plan

Drawing No. 7636-1
Date: March 2014
Drawn: MK
Scale: 1:2000 (A3)
Filename: 7636.dwg