

**REPORT SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL SUBDIVISION
LOT 1 (DP167380) WALMSLEY ROAD
BILAMBIL HEIGHTS**

For
Mr Peter Walmsley
c/- Martin Findlater & Associates Pty. Ltd.

June/July 2004
Job No. JU/04/810

MAIDEN GEOTECHNICS

Consulting Geotechnical/Environmental Engineers

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OKY/al
Our Ref: JU/04/810
29 July, 2004

Mr Peter Walmsley
C/- Martin Findlater & Associates Pty. Ltd.
PO Box 6389
TWEED HEADS SOUTH NSW 2486

Dear Sir,

**RE: REPORT SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL SUBDIVISION
LOT 1 (DP167380) WALMSLEYS ROAD
BILAMBIL HEIGHTS**

1.0 INTRODUCTION

Maiden Geotechnics is pleased to present, herein, a report on the geotechnical assessment of the site's slope stability at Lot 1 (DP 167380) Walmsley Road, Bilambil Heights.

The assessment followed the acceptance of Maiden Geotechnics fee proposal of 22 June, 2004 (ref. Q-JU/04/534) on the subject matter by Blueand Engineers.

It is understood the site is to be subdivided for residential development. Soil Survey Engineering Pty. Limited has previously investigated the subject site. The objectives of the present investigation are as follows:

- To review the previous investigation findings, particular on the areas of reported landslide, and provide a second opinion on the matter.
- To provide mitigation measures for areas where the existing ground conditions are likely to pose some problems to intended development.

2.0 THE SITE

2.1 Location and Topography

The subject site extends over the area between the southern end (cul-de-sac) of Stott Street and Walmsleys Road. Current access are via Stott Street at the northern end, and a continuation of Walmsleys Road at the southern end.

The proposed subdivision layout extends over the crest of a north-south bending ridge and adjoining side slopes gradients are typically 5 to 10, and 10 to 20 degrees, respectively.

It is understood the site had previously be used for banana plantation and other cash crop farming activities. No signs of the farming activities existed at the time of the investigation.

Grass covered the ridge crest and the adjacent slopes. The northern and part of the eastern boundaries had lines of planted and matured trees. A deep gully exists to the south-west side of the access road. The areas along the south-west boundaries and below the slopes at the western end were covered by weed species.

The following topographical features are identified for review and discussion in this report.

- An existing depression along sections of the eastern boundary. This area has been retained by a rock wall and backfilled against the main slope. This area shall be referred to as eastern depression for the remaining section of this report.
- A deep gully at the southwest corner, which grades into a gentle slope towards the western extremities. Boulders and clayey silt/silty clay soils cover this area. Stockpile of fill is located at the top of the gully. This area shall be referred to as southwest depression for the remainder of this report.
- A previous dam site at the southeast corner, which has been backfilled, is also identified. This section extends between the eastern

depression and a naturally occurring steep slope along the southern boundary. For the remainder of this report, this area shall be referred to as "the previous dam site".

2.2 Regional Geology

A reference to the Geological Survey of New South Wales, 1:250000 Tweed Heads Series (Sheet SH56.3), indicates that, the geology of the region is dominated by the meta-sedimentary, Neranleigh-Fernvale Beds and the tertiary aged Lamington Volcanics.

The Neranleigh-Fernvale Beds appear to dominate the subject site. However, some occurrence of the Lamington Volcanics are expected.

3.0 BACKGROUND INFORMATION

Soil Survey Engineering Pty. Ltd has previously investigated the subject site. The investigation involved site inspection by an experienced geotechnical engineer and engineering geologist, and subsurface exploration with test pits.

The test pits extended to maximum depth of 2.9m. Copies of the test pits logs are provided in the appendix of this report.

4.0 METHOD OF INVESTIGATION

The previous investigation by Soil Survey Engineering Pty. Limited raised some concerns about the stability of the eastern depression, the deep gully and the steep slope overlooking the previous dam site.

The present investigation concentrated at these areas. Eight (8) test pits were excavated with a 20-tonne Kato hydraulic excavator. The test pits were advanced to maximum depth of 5.5 metres at the previous dam site, and to refusal at depths of between 1.4 and 2.5 metres at the other locations.



TEST PIT 1



TEST PIT 1

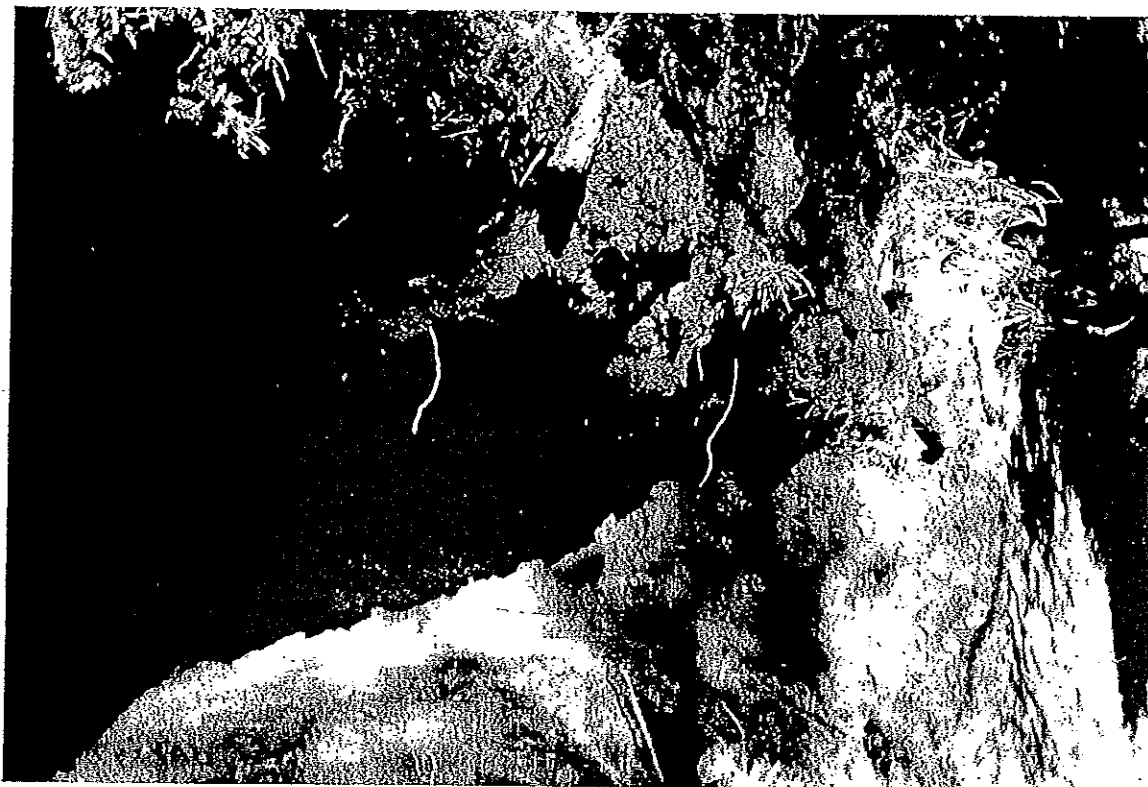
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Lot 1 Walmsley Road
Bilambil Heights

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Date: 30/7/2004

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TEST PIT 1

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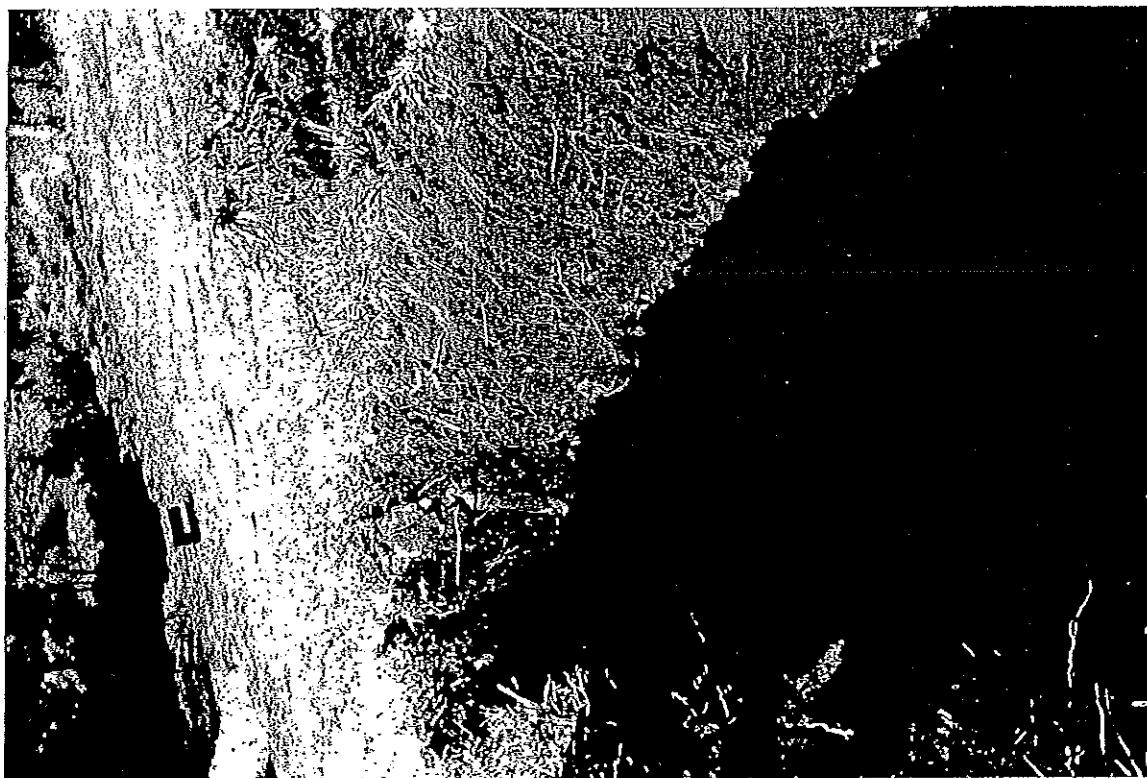
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TEST PIT 2



TEST PIT 2

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Bilambil Heights

Job No:JU/04/810

Date: 30/7/2004

PHOTO
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TEST PIT 3



TEST PIT 3

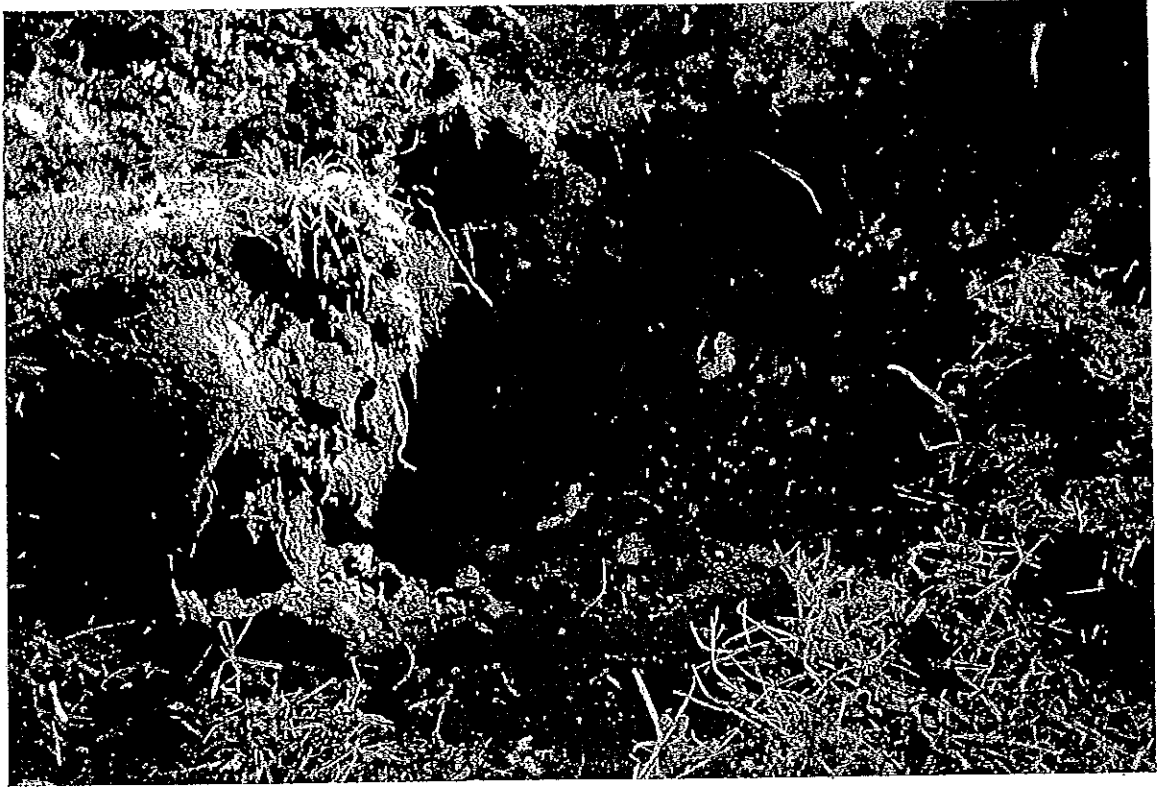
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Date: 30/7/2004

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TEST PIT 3

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TEST PIT 4



TEST PIT 4

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TEST PIT 4



TEST PIT 4

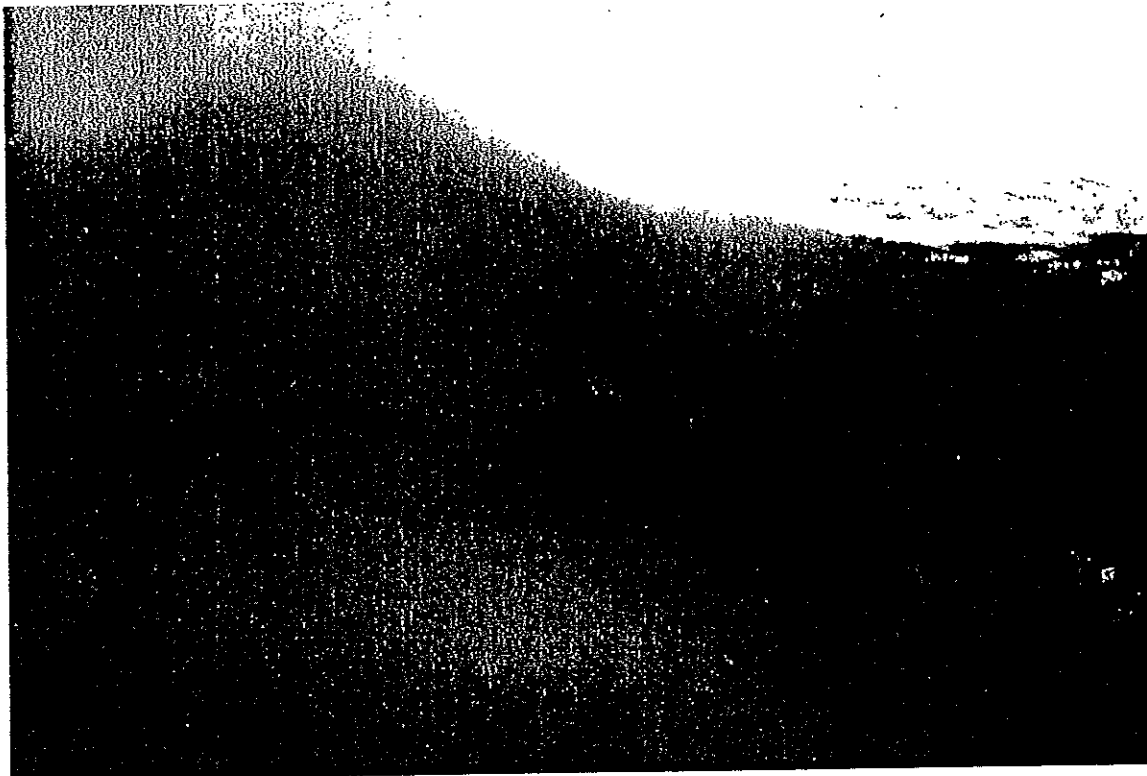
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Lot 1 Walmsley Road
Bilambil Heights

Job No:JU/04/810

Date: 30/7/2004

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TEST PIT 5

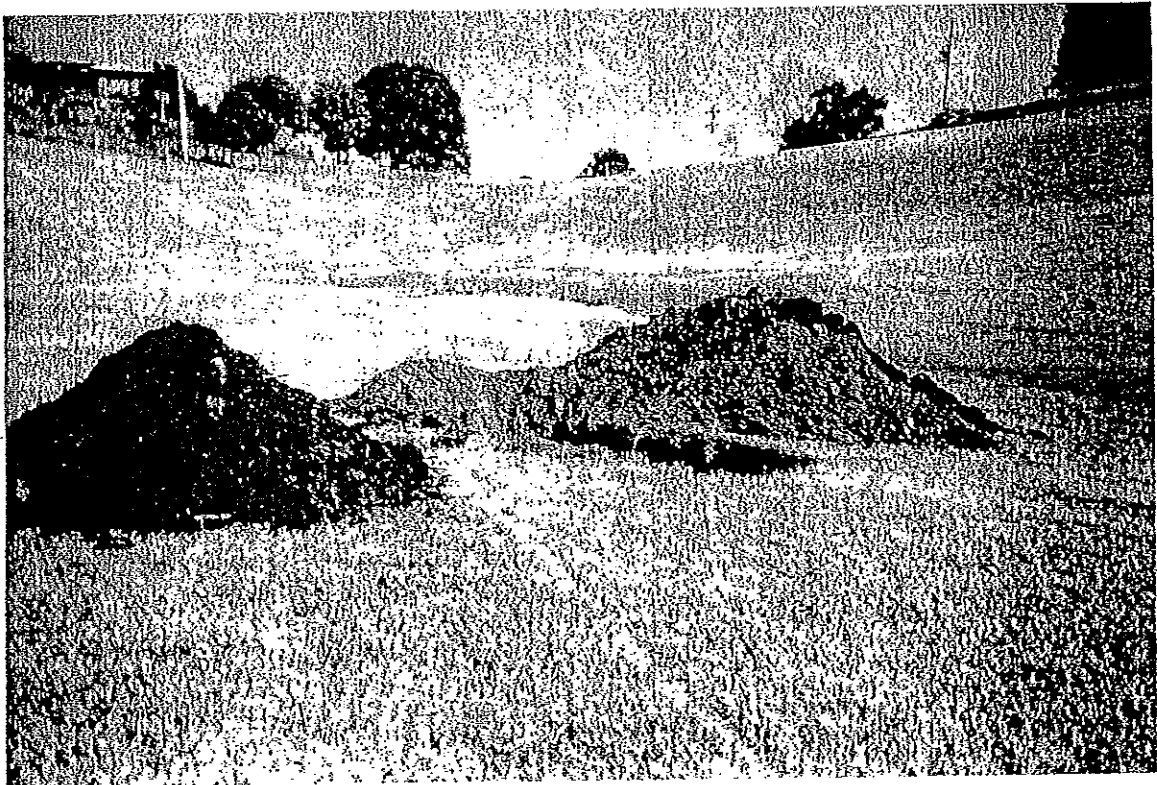


TEST PIT 5

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		Job No:JU/04/810	Date: 30/7/2004	



TEST PIT 6



TEST PIT 6

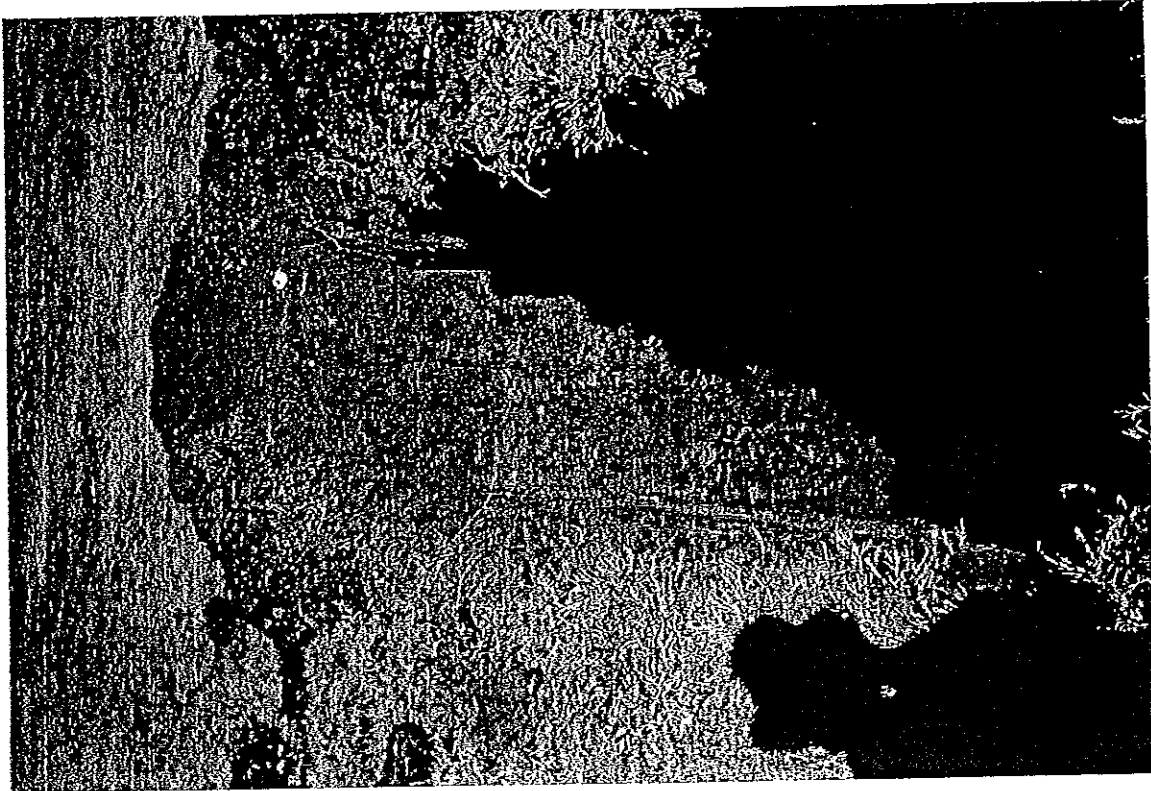
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PHOTO
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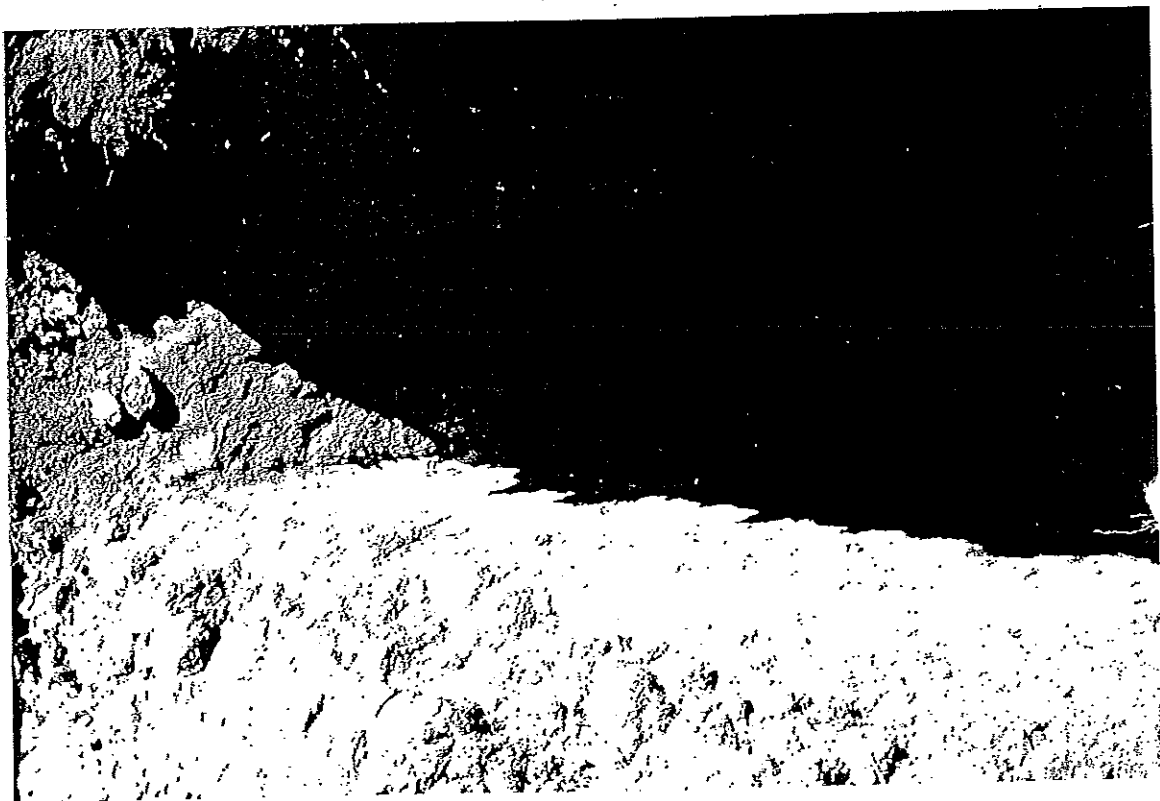


TEST PIT 6

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		Job No:JU/04/810	Date: 30/7/2004	



TEST PIT 7



TEST PIT 7

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		Job No:JU/04/810	Date: 30/7/2004	



TEST PIT 7

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Bilambil Heights

Job No:JU/04/810

Date: 30/7/2004

PHOTO
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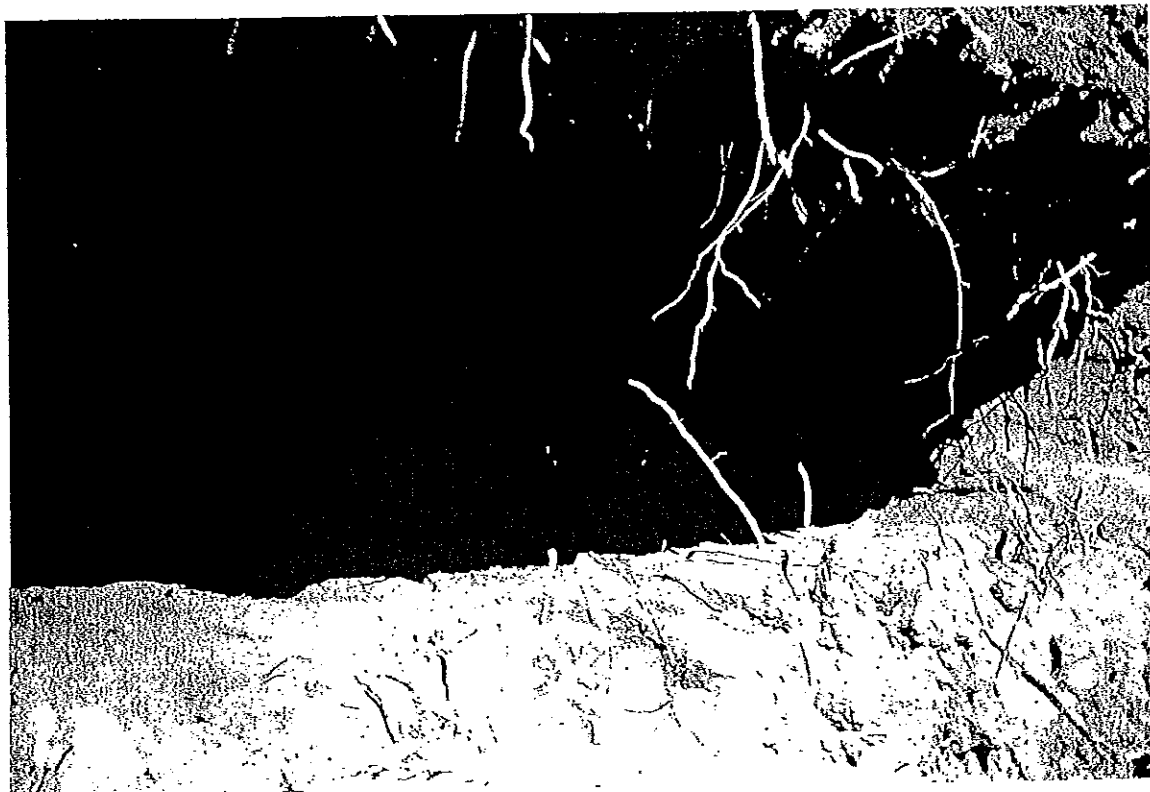


TEST PIT 8



TEST PIT 8

MAIDEN GEOTECHNICS	Mr Peter Walmsley Lot 1 Walmsley Road Bilambil Heights			PHOTO JU/04/810
		Job No:JU/04/810	Date: 30/7/2004	



TEST PIT 9

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Lot 1 Walmsley Road
Bilambil Heights

Job No:JU/04/810

Date: 30/7/2004

PHOTO
JU/04/810

Dynamic cone penetrometer (DCP) test was conducted through the existing fill at the previous dam site. The test was advanced to 5.7m below the existing ground surface.

A site plan contained in the appendix shows the test pits and the DCP test locations. An experienced geotechnical engineer from this office supervised the fieldwork.

5.0 GROUND CONDITIONS

5.1 Eastern Depression (Refer Test Pit 1)

A deposit of colluvium, comprising loose aggregate of cobbles, boulders and high plasticity silty clay, extends to an approximate depth of 2.3m. 0.3m of hard residual clay underlies the colluvium. Decomposed shale (bedrock) underlies the residual soil at depths. No ground water seepage was observed within the formation.

5.2 Previous Dam Site (Refer Test Pit 4, 5 & 6)

Up to 3.8m of stiff or medium dense silty/gravelly clay fill overlies soft silty (organic) clay. Rotten timbers and other organic materials were contained in the soft clay layer. Stiff residual clay underlies the organic layer.

5.3 Bottom of Deep Gully (Refer Pits 8 & 9)

Cobbles, boulders and silty clay fill (colluvium) occur at the bottom of the gully. The colluvial deposits extend to depths typically in the vicinity of 2.0m in the test pit, but may be deeper at some other locations. The overlooking natural slope formation (refer test pit 7) consists of 2.4m or more of stiff to hard silty clay.

5.4 Top of Eastern Depression (Refer Test Pits 2 & 3)

At the top of the eastern depression slope, some 0.6m of top soil predominantly clay, and up to 0.8m of colluvium, overlies the bedrock. The colluvium was revealed mostly along the eastern boundary.

5.5 The Southern Steep Slope (Refer Test Pit 7)

Medium to high plasticity silty clay extends to depths in excess of 2.4 metres. The profile is stiff and very stiff to approximate depths of 1.0 and 2.0 metres, respectively. Hard silty clay extends thereon. Decomposed shale (bedrock) is envisaged within a few metres below the depth reached with the excavator.

5.6 Other Sections

At the other sections of the site, soil survey test pits Nos. 13, 14, 15, 16, and 17 indicates that, the subsurface profile is characterised by stiff to very stiff and hard clays and weathered siltstone. Depths to the bedrock ranges from 1.4 to over 3.6 metres.

5.7 Groundwater Conditions

The test pits revealed no ground water seepage. Wet conditions were noted in the organic layer revealed at the previous dam site.

6.0 STABILITY ASSESSMENT

6.1 General

Presence of colluvium on steep slopes generally signifies potential slope instability. However, where depths of the colluvium is shallow or where the deposits are highly "consolidated" to form strong matrix, the area can be engineered to ensure adequate stability for development processes.

Similarly, historical landslide may not necessarily imply potential instability. In some cases, landslides only eradicate hazardous strata, leaving behind stable formation.

6.2 The Southern Steep Slope

The topography of the naturally occurring southern slope can be regarded as being "excessive" for the subsurface strata. No potential threat to stability of the slope is indicated.

6.3 The Ridge Crest and Adjacent Slopes

These sections show no sections of slope instability. The subsurface stratification include stiff to hard, silty clays/clayey silt, which are adequately stable.

The area along the edges to the eastern depression contains some colluvium, generally up to 1.0 metre. These areas would have to be specifically engineered if the long-term stability is to be maintained.

6.4 The Eastern Depression

The eastern depression contains significant depths of colluvium, which are unsuitable for use as structural foundation. The deposits would not, however, affect or worsen the stability of the adjacent slope. Some ground improvement measures are recommended for this area. Details of the ground improvement techniques are discussed at a later section of this report.

6.5 The Previous Dam Site

The existing fill at the previous dam site is established over soft organic clays, and could undergo significant settlement with time. It is believed the majority of the area shall be re-developed into a recreational park and therefore minor settlements can be accommodated.

However, the proposed road alignment may extend to some sections. Any section within the road alignment should be excavated to the natural, competent formation, and the excavated area backfill with suitable material.

6.6 The Deep Gully

This area is currently dominated by colluvium depth of which may exceed 2.0 metres at some locations. The area can be reclaimed by backfilling with suitable material. Proper engineering supervision is recommended for the backfilling operations.

7.0 DISCUSSIONS & RECOMMENDATIONS

7.1 Ground Improvement Techniques – eastern depressions

The existing ground conditions at this area can be rectified as follows:

- Excavate the colluvium and stockpile the material.
- Remove cobbles, boulders and oversize rocks from the stockpile.
- Backfill with sorted material (less the oversize rocks, cobbles and boulders).

The backfill shall be placed in layers not exceeding 0.5m (uncompacted) and compacted to at least 100% standard dry density ratio.

Each layer should be tested. Full-time supervision of the earthworks operation is strongly recommended.

Along the top of the slope, the construction of the proposed road should involve removal of the colluvium. The new pavement should be established over the bedrock.

7.2 The Southern Slopes

Buildings should be limited to lightweight pole homes. Foundations should be either steel posts or reinforced concrete piers. They should extend at least 1.0 metre past the toe of the slope, or be socketed into bedrock. The rock socket length shall not be less than 50% of the total post or pier length.

7.3 The Deep Gully Area

The existing colluvium at the deep gully should be removed. The area may be backfilled with suitable material to the design formation level. The fill shall be placed at slopes of not steeper than 1 in 2.5, and compacted to standard dry ratio of at least 100%.

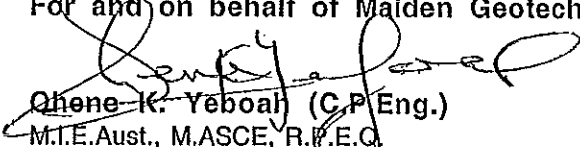
7.4 Other Areas

The ridge crest and adjacent slopes are adequately stable for normal residential development. Independent soils tests and site classifications are recommended for the individual allotments.

It is believe the information contained, herein, are adequate for the proposed development. However, should you have any queries or require any additional information, do not hesitate to contact this office.

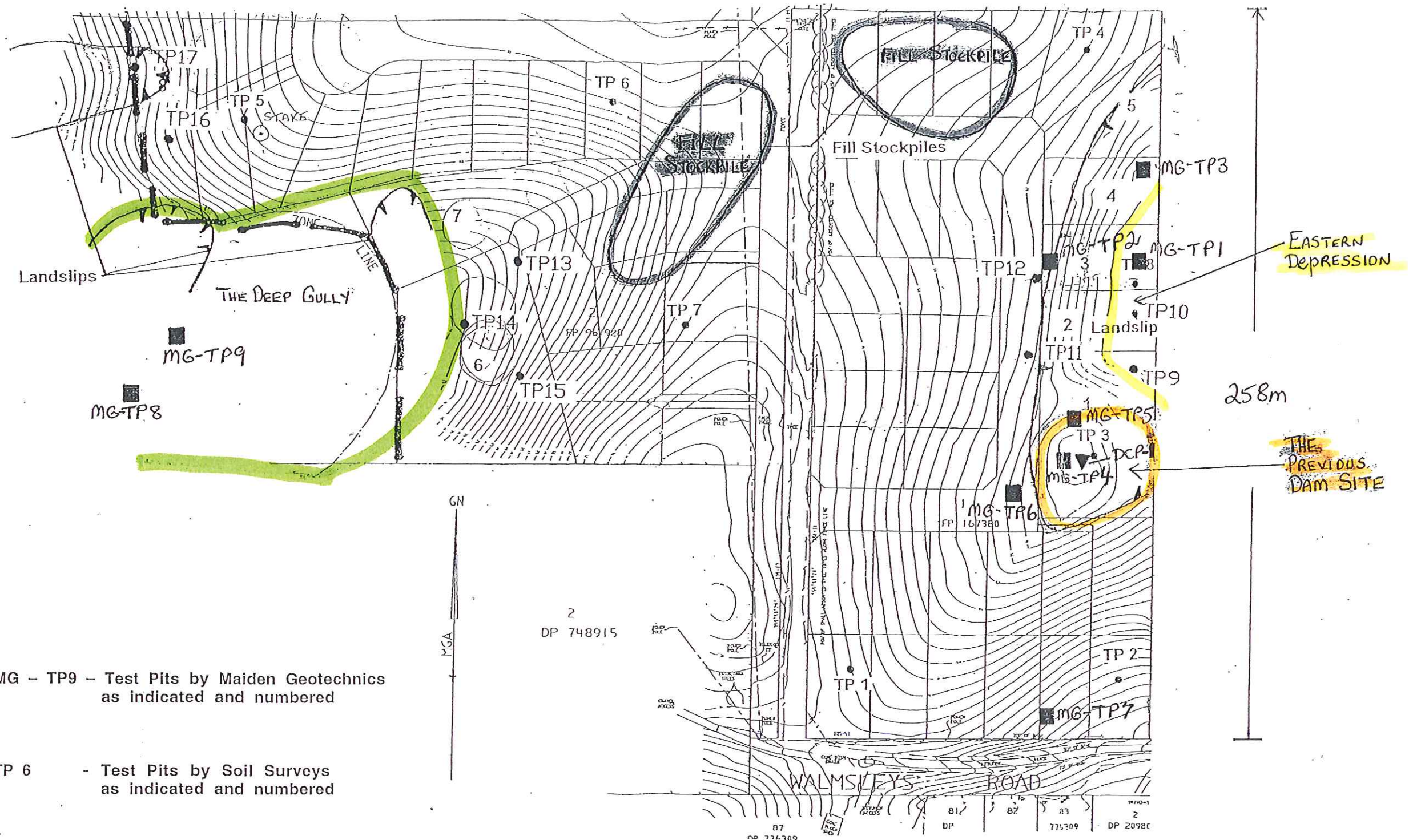
Please note that Maiden Geotechnics cannot take responsible for geotechnical testing or inspected relating to the proposed development that may be undertaken by other organisations.

For and on behalf of Maiden Geotechnics



Oghene K. Yeboah (C.P. Eng.)
M.I.E.Aust., M.ASCE, R.P.E.C.
B.Sc.(Hons. Civil), M.Eng.Sc.(Melb.),
Grad.Dip.Comp.(Monash)
Director

APPENDIX



- MG - TP9 - Test Pits by Maiden Geotechnics as indicated and numbered
- TP 6 - Test Pits by Soil Surveys as indicated and numbered

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TEST PIT LOG

CLIENT	Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No.	JU/04/810
PROJECT	Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No:	1
LOCATION	Walmsleys Road, Bilambil Heights	Test Pit Incl.	
TEST PIT LOCATION R.L.	-	Page 1 of 1	

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		COLLUVIUM - Silty CLAY (CH) with cobbles and boulders, dark brown, medium to high plasticity, dry.				
1.0						
1.5						
2.0						
2.3						
2.5		RESIDUAL - Silty CLAY (CH), pale grey mottling red, high plasticity, hard, dry	hard			
2.7						
3.0	*****	DECOMPOSED SHALE				
3.5	*****					
4.0	*****					
4.5	*****					
5.0	*****					
		Total depth = 4.0m				

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

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Postal Address: PO Box 2079 Nerang East, Qld 4211, Australia Email: gmaiden@winshop.com.au

TEST PIT LOG

CLIENT Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd				Job No. JU/04/810	
PROJECT Slope Stability Assessment - Lot 1 (DP167380)				Test Pit No: 2	
LOCATION Walmsleys Road, Bilambil Heights				Test Pit Incl.	
TEST PIT LOCATION R.L. -				Page 1 of 1	
Logged By: O.K.Y.		Date: 8/7/2004		Checked By: O.K.Y.	

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		TOPSOIL - Silty CLAY (CH), dark brown, medium plasticity, stiff, dry.	stiff			
0.6						
1.0		BEDROCK				
1.5		Excavator refusal at 1.5m				
2.0						
2.5						
3.0						
3.5						
4.0						
4.5						
5.0						

DRILL TYPE: HD-5 20 tonne Kato	Groundwater: NIL
---------------------------------------	-------------------------

U50 = Undisturbed 50mm diameter Tube Sample	"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit
SPT = Standard Penetration Test	"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit
D = Disturbed Sample	PS = Piston Sample
S = Vane Shear Value (kPa)	
PP = Pocket Penetrometer Reading (kPa)	
PT = Penetration Test	

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TEST PIT LOG

CLIENT Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No. JU/04/810
PROJECT Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No: 3
LOCATION Walmsleys Road, Bilambil Heights	Test Pit Incl.
TEST PIT LOCATION R.L. -	Page 1 of 1

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		COLLUVIUM - CLAY (CH), dark brown, high plasticity, stiff, dry. Cobbles and boulders up to 600mm	stiff			
0.8						
1.0		BEDROCK				
1.4						
1.5		Excavator refusal at 1.4m				
2.0						
2.5						
3.0						
3.5						
4.0						
4.5						
5.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample
 SPT = Standard Penetration Test
 D = Disturbed Sample
 S = Vane Shear Value (kPa)
 PP = Pocket Penetrometer Reading (kPa)
 PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit
 "T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit
 PS = Piston Sample

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TEST PIT LOG

CLIENT	Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No.	JU/04/810
PROJECT	Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No:	4
LOCATION	Walmsleys Road, Bilambil Heights	Test Pit Incl.	
TEST PIT LOCATION R.L.	-	Page 1 of 1	

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		FILL - Silty CLAY (CH), dark brown, medium plasticity, stiff, moist.	stiff			
0.8						
1.0						
1.5						
1.6		FILL - Gravelly CLAY (CI), greenish mottling grey, medium plasticity, stiff, moist.	stiff			
2.0						
3.0						
3.8						
4.0		TOPSOIL - Silty CLAY (CH), dark brown, high plasticity, soft, wet.	soft			
5.0						
5.5						
6.0						
		Total depth = 5.5m				

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

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TEST PIT LOG

CLIENT Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No. JU/04/810
PROJECT Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No: 5
LOCATION Walmsleys Road, Bilambil Heights	Test Pit Incl.
TEST PIT LOCATION R.L. -	Page 1 of 1

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		FILL - Silty CLAY (CI) with gravel, dark brown, medium plasticity, stiff, moist. Contains some cobbles and minor boulders.	stiff			
0.8						
1.0						
1.5		Silty CLAY (CI), brown, medium plasticity, very stiff, dry.	very stiff			
1.6						
2.0						
3.0						
3.4		BEDROCK intercepted at 3.4m				
3.5						
4.0		Excavator refusal at 3.5m				
5.0						
5.5						
6.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

MAIDEN GEOTECHNICS

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152 Gerler Road, HENDRA

Phone: (07) 3875 2488 Fax: (07) 3268 4977

TEST PIT LOG

CLIENT	Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No.	JU/04/810
PROJECT	Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No:	6
LOCATION	Walmsleys Road, Bilambil Heights	Test Pit Incl.	
TEST PIT LOCATION R.L.	-	Page 1 of 1	

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.5		FILL - Silty CLAY (CI) with gravel, brown, medium plasticity, very stiff, dry.	very stiff			
1.0						
1.5						
2.0						
3.0		FILL - Silty CLAY (OH) and rotten timber, dark grey, high plasticity, soft, wet.	soft			
4.0						
5.0		Total depth = 4.0m				
5.5						
6.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

MAIDEN GEOTECHNICS

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TEST PIT LOG

CLIENT Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd				Job No. JU/04/810	
PROJECT Slope Stability Assessment - Lot 1 (DP167380)				Test Pit No: 7	
LOCATION Walmsleys Road, Bilambil Heights				Test Pit Incl.	
TEST PIT LOCATION R.L. -				Page 1 of 1	
Logged By: O.K.Y.		Date: 8/7/2004		Checked By: O.K.Y.	

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.2		TOPSOIL - CLAY (CI), dark brown, medium plasticity, hard, dry.	hard			
0.5		Silty CLAY (CI), reddish brown, medium plasticity, stiff to very stiff, moist.	stiff to very stiff			
1.0		Silty CLAY (CI), greenish, medium plasticity, very stiff.	very stiff			
1.5						
2.0						
2.4		Silty CLAY (CI), grey mottling red, high plasticity, hard, moist.	hard			
3.0		Total depth = 2.4m				
4.0						
5.0						
5.5						
6.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

MAIDEN GEOTECHNICS

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TEST PIT LOG

CLIENT	Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd	Job No.	JU/04/810
PROJECT	Slope Stability Assessment - Lot 1 (DP167380)	Test Pit No:	8
LOCATION	Walmsleys Road, Bilambil Heights	Test Pit Incl.	
TEST PIT LOCATION R.L.	-	Page 1 of 1	

Logged By: O.K.Y.

Date: 8/7/2004

Checked By: O.K.Y.

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.2		FILL - Silty CLAY (CI), dark brown, medium plasticity, loose, dry. With cobbles and boulders. Contains root matter.	loose			
0.5						
0.6						
1.0		Silty CLAY (CI), dark brown, medium plasticity, stiff to very stiff, moist.	stiff to very stiff			
1.5						
2.0						
2.5		Silty CLAY (CH), grey mottling red, high plasticity, very stiff to hard, moist.	very stiff to hard			
3.0						
3.5						
4.0		Total depth = 2.5m				
5.0						
5.5						
6.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

U50 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

MAIDEN GEOTECHNICS

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TEST PIT LOG

CLIENT Mr Peter Walmsley c/- Martin Findlater & Associates Pty Ltd				Job No. JU/04/810	
PROJECT Slope Stability Assessment - Lot 1 (DP167380)				Test Pit No: 9	
LOCATION Walmsleys Road, Bilambil Heights				Test Pit Incl.	
TEST PIT LOCATION R.L. -				Page 1 of 1	
Logged By: O.K.Y.		Date: 8/7/2004		Checked By: O.K.Y.	

DEPTH (m)	GRAPHIC LOG	PROFILE DESCRIPTION	CONSISTENCY	INSITU TESTING		COMMENTS
				Depth(m)	Results	
0.2		TOPSOIL - Silty CLAY (CI), dark brown, medium plasticity, loose, dry. With cobbles and boulders sizes up to 0.8m.	loose			
0.5						
0.6						
1.0		COLLUVIUM - Silty CLAY (CI), dark brown, medium plasticity, stiff, moist.	stiff			
1.5						
2.0						
2.5		Excavator refusal on large boulder at 2.0m				
3.0						
4.0						
5.0						
5.5						
6.0						

DRILL TYPE: HD-5 20 tonne Kato

Groundwater: NIL

US0 = Undisturbed 50mm diameter Tube Sample

SPT = Standard Penetration Test

D = Disturbed Sample

S = Vane Shear Value (kPa)

PP = Pocket Penetrometer Reading (kPa)

PT = Penetration Test

"V" Bit Refusal - Maximum Depth of Penetration by "V" Bit

"T/C" Bit Refusal - Maximum Depth of Penetration by "T/C" Bit

PS = Piston Sample

MAIDEN GEOTECHNICS

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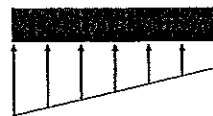
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DYNAMIC CONE PENETROMETER TEST

CLIENT		Mr Peter Walmsley/- Martin Findlater & Associates Pty Ltd		JOB NO:	JU/04/810
PROJECT		Slope Stability Assessment - Lot 1 (DP167380)		DATE:	7/7/04
LOCATION		Walmsleys Road, Bilambil Heights		PAGE NO:	1 of 1
Tested By:		V.V.		Checked By: O.K.Y.	
TEST NUMBER	DCP-1				
TEST LOCATION	TP4				
DEPTH (m)	BLOWS	BLOWS	BLOWS		
0.1	16	3.2	8		
0.2	15	3.3	6		
0.3	11	3.4	5		
0.4	11	3.5	5		
0.5	13	3.6	4		
0.6	10	3.7	2		
0.7	7	3.8	5		
0.8	9	3.9	2		
0.9	10	4.0	5		
1.0	10	4.1	3		
1.1	8	4.2	6		
1.2	6	4.3	6		
1.3	6	4.4	6		
1.4	7	4.5	4		
1.5	6	4.6	3		
1.6	4	4.7	5		
1.7	4	4.8	4		
1.8	4	4.9	5		
1.9	11	5.0	4		
2.0	7	5.1	4		
2.1	6	5.2	3		
2.2	5	5.3	5		
2.3	4	5.4	4		
2.4	2	5.5	5		
2.5	3	5.6	5		
2.6	6	5.7	5		
2.7	8				
2.8	6				
2.9	5				
3.0	5				
3.1	6				
SOIL DESCRIPTION: REFER BOREHOLE LOGS					



PLASTICITY OF SOIL REPORT

Form No: R008
Revision 07/03

Client:	BlueLand Engineer	Job No.:	JU/04/810
Project:	Proposed Subdivision	Document No:	36017
Date Sampled:	07/07/2004	Issue Date:	21/07/2004
Sampling location:	TP2@0.0m-1.5m	Registered Sample No:	996479
Sample Description:	Silty Clay		

HISTORY OF SAMPLE

☐ Natural State	☐ Wet Seived	Curing Time	24Hrs
☐ Air Dried	☐ Dry Seived		
☐ Oven Dried (45 - 50 C)			
☐ Unknown			

TEST METHOD

Liquid Limit

☐	AS1289 3.1.1 Four point Casagrande Method
☐	AS1289 3.1.2 One point Casagrande Method (Subsidiary Method)
☐	AS1289 3.9.1 Drop Cone Method

Plastic Limit

☐	AS1289 3.2.1 Plastic Limit of Soil
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Linear Shrinkage

☐	AS1289 3.4.1 Linear Shrinkage of Soil
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Plasticity Index

☐	AS1289 3.3.1 Plasticity Index of Soil
☐	AS1289 3.3.2 Plasticity Index of Soil Cone Method

Moisture Content

☐	AS1289 2.1.1 Moisture Content (Oven)
--------------------------	--------------------------------------

RESULTS

LIQUID LIMIT	51 %
PLASTIC LIMIT	44 %
PLASTICITY INDEX	7 %
LINEAR SHRINKAGE	10 %
INSITU MOISTURE CONTENT	27 %

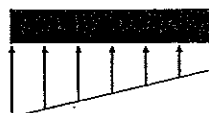


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Offene K. Yeboah



PLASTICITY OF SOIL REPORT

Form No: R008
Revision 07/03

Client:	Blueland Engineer	Job No.:	JU/04/810
Project:	Proposed Subdivision	Document No:	36018
Date Sampled:	07/07/2004	Issue Date:	21/07/2004
Sampling location:	TP5@4.5m	Registered Sample No:	996479
Sample Description:	Silly Clay		

HISTORY OF SAMPLE

☐ Natural State	☐ Wet Sieved	Curing Time	24Hrs
☐ Air Dried	☐ Dry Sieved		
☒ Oven Dried (45 - 50 C)			
☐ Unknown			

TEST METHOD

Liquid Limit

☐	AS1289 3.1.1 Four point Casagrande Method
☒	AS1289 3.1.2 One point Casagrande Method (Subsidiary Method)
☐	AS1289 3.9.1 Drop Cone Method

Plastic Limit

☒	AS1289 3.2.1 Plastic Limit of Soil
-------------------------------------	------------------------------------

Linear Shrinkage

☒	AS1289 3.4.1 Linear Shrinkage of Soil
-------------------------------------	---------------------------------------

Plasticity Index

☒	AS1289 3.3.1 Plasticity Index of Soil
☐	AS1289 3.3.2 Plasticity Index of Soil Cone Method

Moisture Content

☒	AS1289 2.1.1 Moisture Content (Oven)
-------------------------------------	--------------------------------------

RESULTS

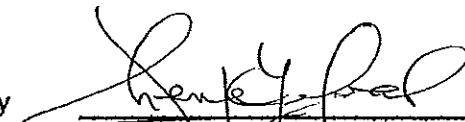
LIQUID LIMIT	48 %
PLASTIC LIMIT	32 %
PLASTICITY INDEX	16 %
LINEAR SHRINKAGE	9 %
INSITU MOISTURE CONTENT	29.3 %

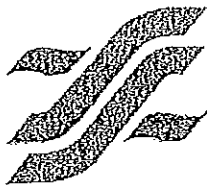


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Othene K. Yeboah



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TEST PIT RECORD SHEET

Test Pit Number : 1

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting :

Northing :

RL :

Location : Walmsleys Road, Bilambil Heights

Logger : PK

Machine : 8 Tonne Excavator

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		NATURAL Silty CLAY (CH) Very stiff to hard, high plasticity, brown.	U50 PP=400-500
1.0		Silty CLAY (CH) Hard, high plasticity, pale grey mottled pale red brown residual.	U50 PP>600
1.5			
2.0			
2.20			
2.40		METASILTSTONE (XW) Very low strength, pale yellow brown and cream.	
2.5		Test Pit Terminated 2.40m	
3.0			
3.5			
4.0			
4.5			
5.0			

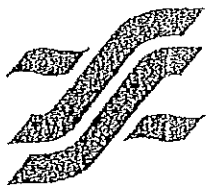
COMMENTS

- 1) Groundwater not observed.

Approved :

Date :

21/9/03



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Buddina Q 4578
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Fax 61 7 5403 2831

TEST PIT RECORD SHEET

Test Pit Number : 2

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Eastling :
Logger : PK

Northing :
Machine : 8 Tonne Excavator

RL :

Depth	Graphic	Description	Samples and Remarks
0.40		NATURAL Clayey SILT (MH) Hard, high plasticity, red brown.	US0 PP=300-600
0.5		Clayey SILT (MH) Hard, high plasticity, red brown.	US0 PP>600
0.90		Clayey SILT (MH) Hard, high plasticity, grey.	
1.0			
1.5			
2.0		Clayey SILT (MH) Hard, high plasticity, grey, with some basalt fragments.	
2.5			
2.60		Test Pit Terminated 2.60m	
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

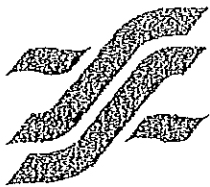
1) Groundwater not observed.

Approved :

Date :

Handwritten signature

21 9 103



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TEST PIT RECORD SHEET

Test Pit Number : 3

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Easting :

Northing :

RL :

Logger : PK

Machine : 8 Tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.5		FILL Silty CLAY (CH) Stiff, high plasticity, with some basalt cobbles and boulders, rock fragments.	
1.0			
1.5			
2.0			
2.5			
2.90			
3.0		Test Pit Terminated 2.90m	
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :

Date :

21/7/03



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TEST PIT RECORD SHEET

Test Pit Number : 4

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Easting :

Northing :

RL :

Logger : PK

Machine : .8 Tonne Excavator

Depth	Graphic	Description	Samples and Remarks
0.30		Silty CLAY (CH) Stiff, high plasticity, brown, with numerous basaltic boulders and cobbles.	U50 PP=100-200
0.5		Silty CLAY (CH) Stiff, high plasticity, red brown, with numerous basaltic boulders and cobbles.	
1.0			
1.5			
2.0			
2.40			
2.5		Test Pit Terminated 2.40m	
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :

Date :

21/7/03



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TEST PIT RECORD SHEET

Test Pit Number : 5

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting :

Northing :

RL :

Location : Walmsleys Road, Bilambil Heights

Logger : PK

Machine : 8 Tonne Excavator

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown.	P=200-400
1.0			
1.5			
2.0			
2.5		Clayey SILT (MH) Stiff to very stiff, high plasticity red brown, with some basalt fragments.	
2.60		Test Pit Terminated 2.60m	
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :

[Signature]



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TEST PIT RECORD SHEET

Test Pit Number : 6

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting : Northing : RL :

Location : Walmsleys Road, Bilambil Heights

Logger : PK Machine : 8 Tonne Excavator

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, brown.	
0.60			
1.0		Clayey SILT (MH) Stiff to very stiff, high plasticity, grey.	
1.00			
1.5		Silty CLAY (CH) Very stiff, high plasticity, mottled paler red and grey brown, slickensided with some metasiltstone fragments.	
2.0			
2.5			
2.90			
3.0		Test Pit Terminated 2.90m	
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :



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Fax 61 7 5493 2837

TEST PIT RECORD SHEET

Test Pit Number : 7
Project Number : 203-4172

Project Name : Proposed Subdivision

Easting :
Logger : PK
Northing :
Machine : 8 Tonne Excavator
RL :

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 21/07/2003

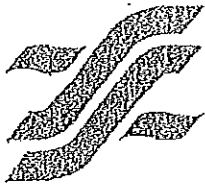
Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, brown	
1.0		Clayey SILT (MH) Stiff to very stiff, high plasticity, grey.	
1.5			
2.0			
2.5			
2.70		Test Pit Terminated 2.70m	
3.0			
3.5			
4.0			
4.5			
5.0			

REMARKS

1) Groundwater not observed.

Approved :



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TEST PIT RECORD SHEET

Test Pit Number : 8
Project Number : 203-4172

Project Name : Proposed Subdivision

Easting : Northing : RL :
Logger : PK Machine : 8 Tonne Excavator

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 21/07/2003

Page : 1

Depth	Graphic	Description	Samples and Remarks
0.5 0.50		Silty CLAY (CH) Stiff, high plasticity, brown, with some basalt boulders (colluvium).	
1.0		Silty CLAY (CI) Stiff, medium plasticity, yellow brown mottled pale red brown, with some fine grained sand.	
1.5 1.50		METASILTSTONE (XW) Very low strength, yellow brown, pale red brown, with some sandy bands.	
2.0 2.00		Test Pit Terminated 2.00m	
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

COMMENTS

1) Groundwater not observed.

Approved :



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TEST PIT RECORD SHEET

Test Pit Number : 9

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting :

Northing :

RL :

Location :

Walmsleys Road, Bilambil Heights

Logger : PK

Machine : 20 tonne Excavator

Client :

Peter Walmsley

Date :

16/12/2003

Page :

1

Depth	Graphic	Description	Samples and Remarks
0.5		Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with some high strength basalt boulders, (colluvium).	
1.0			
1.5			
1.60			
2.0		Clayey SILT (MH) Very stiff to hard, high plasticity, pale yellow brown, with some high strength basalt boulders, (colluvium).	
2.5			
3.0			
3.5			
3.50			
		Test Pit Terminated 3.50m	
4.0			
4.5			
5.0			

REMARKS

1) Groundwater not observed. 2) Refusal on boulders at 3.5m.

Approved :

Date :

J. R. R. R.
12/12/2003



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BOREHOLE RECORD SHEET

Borehole Number : 10

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting : Northing : RL :
Logger : PK Driller : PK Drilling Rig : 20 tonne

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 16/12/2003

Page : 1

Drilling Method		Depth	Graphic	Description	Samples and Remarks
TC	WB				
		1.0		Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with some high strength basalt boulders, (colluvium).	
		1.80			
		2.0		Clayey SILT (MH) Very stiff to hard, high plasticity, pale yellow brown, with some high strength basalt boulders, (colluvium).	
		2.00			
				Borehole Terminated 2.00m	
		3.0			
		4.0			
		5.0			

REMARKS

Groundwater not observed. 2) Refusal on boulders pit 4.0m long and 2.0m deep.

Approved :
Date :

J. Brown
10/1/104



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BOREHOLE RECORD SHEET

Borehole Number : 11

Project Number : 203-4172

Project Name : Proposed Subdivision

Eastling :

Northing :

RL :

Location :

Walmsleys Road, Bilambil Heights

Logger : PK

Driller : PK

Drilling Rig : 20 tonne

Client :

Peter Walmsley

Date :

16/12/2003

Page :

1

Drilling Method		Depth	Graphic	Description	Samples and Remarks
TC	WB				
		0.60		Clayey SILT (MH) Stiff to very stiff, high plasticity, brown, with some small basalt boulders, (topsoil).	
		1.0		Clayey SILT (MH) Hard, high plasticity, red brown, with XW basalt fragments and occasional high strength basalt corestones.	
		2.0			
		3.0			
		3.90			
		4.0		Borehole Terminated 3.90m	
		5.0			

COMMENTS

1) Groundwater not observed. 2) Refusal on basalt corestones at 3.9m.

Approved :

Date :

J. Anon
21.12.04



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BOREHOLE RECORD SHEET

Borehole Number : 12

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 16/12/2003

Page : 1

Easting :

Northing :

RL :

Logger : PK

Driller : PK

Drilling Rig : 20 tonne

Drilling Method	Depth	Graphic	Description	Samples and Remarks
TS WB RF HMLC Dens	0.60		Clayey SILT (MH) Stiff to very stiff, high plasticity, brown, with some small basalt boulders, (topsoil).	
	1.0		Clayey SILT (MH) Hard, high plasticity, red brown, with XW basalt fragments and occasional high strength basalt corestones.	
	1.40			
	1.90		BASALT (XW) Very low strength, with high strength DW-SW corestones.	
	2.0		Borehole Terminated 1.90m	
	3.0			
	4.0			
	5.0			

REMARKS

Groundwater not observed. 2) Refusal on basalt corestones at 1.9m.

Approved :

BOREHOLE RECORD SHEET

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Borehole Number : 13

Project Number : 203-4172

Project Name : Proposed Subdivision

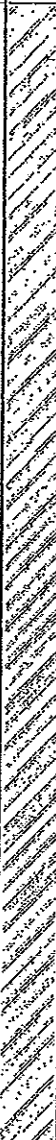
Location : Walmsleys Road, Bilambil Heights

Client: Peter Walmsley

Date: 06/01/2004

Page : 1

Eastling : Northling : RL :
 Logger : PK Driller : PK Drilling Rig : 20 tonne

Drilling Method					Depth	Graphic	Description	Samples and Remarks
PT	UP	PP	HAAG	Coring				
					1.0		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with occasional basalt cobbles.	U50 PP=200-300
					1.40		Clayey SILT (MH) Hard, high plasticity, brown, with occasional basalt cobbles.	U50 PP>600
					2.0			
					3.0			
					3.60			
							Borehole Terminated 3.60m	
					4.0			
					5.0			

COMMENTS

1) Groundwater not observed. 2) Maximum excavator reach at 3.6m.

Approved :

Date :

J. Anon



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BOREHOLE RECORD SHEET

Borehole Number : 14

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 06/01/2004

Page : 1

Easting :

Northing :

RL :

Logger : PK

Driller : PK

Drilling Rig : 20 tonne

Drilling Method	Depth	Graphic	Description	Samples and Remarks
P WS AC Casing	1.0		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with occasional basalt cobbles.	U50 PP=200-400
	1.80		Borehole Terminated 1.80m	
	2.0			
	3.0			
	4.0			
	5.0			

REMARKS

1) Groundwater not observed. 2) Refusal on boulder at 1.8m.

Approved :

J. Anon
10.1.04



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BOREHOLE RECORD SHEET

Borehole Number : 15

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting : Northing : RL :
Logger : PK Driller : PK Drilling Rig : 20 tonne

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 06/01/2004

Page : 1

Drilling Method				Depth	Graphic	Description	Samples and Remarks
P	WB	RR	HALC				
				0.60		Clayey SILT (MH) Stiff to very stiff, high plasticity, brown, with some small basalt boulders, (topsoil).	U50 PP>600
				1.0		Silty CLAY (CH) Hard, high plasticity, yellow brown and mottled red brown, (XW Metasiltstone).	
				1.40		METASILTSTONE (XW) Extremely to very low strength, pale red yellow brown and mottled white.	
				2.0			
				2.70			
				3.0		Borehole Terminated 2.70m	
				4.0			
				5.0			

REMARKS

) Groundwater not observed.

Approved :

J. Almon
19.1.04



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BOREHOLE RECORD SHEET

Borehole Number : 16

Project Number : 203-4172

Project Name : Proposed Subdivision

Easting : Northing : RL :
ogger : PK Driller : PK Drilling Rig : 20 tonne

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 06/01/2004

Page : 1

Drilling Method	Depth	Graphic	Description	Samples and Remarks
TC WB BR NCLC Coring	1.0 1.40 2.0 2.30 2.40 2.90		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with occasional basalt cobbles, with some boulders and XW Basalt fragments. Clayey SILT (MH) Very stiff to hard, high plasticity, brown, with occasional basalt cobbles, with some boulders and XW Basalt fragments Clayey SILT (CH) Very stiff to hard, pink brown, fissured. Sandy CLAY (CH) Hard, high plasticity, yellow brown, (Metasandstone XW).	
	3.0 4.0 5.0		Borehole Terminated 2.90m	

COMMENTS

1) Groundwater not observed. 2) Maximum excavator reach at 2.9m.

Approved :
Date :

J. R. R. R.
10/1/04



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BOREHOLE RECORD SHEET

Borehole Number : 17

Project Number : 203-4172

Project Name : Proposed Subdivision

Location : Walmsleys Road, Bilambil Heights

Client : Peter Walmsley

Date : 06/01/2004

Page : 1

Easting : Northing : RL :
Logger : PK Driller : PK Drilling Rig : 20 tonne

Drilling Method	Depth	Graphic	Description	Samples and Remarks
PC WD RK HSLC Casing	0.50		NATURAL Clayey SILT (MH) Stiff to very stiff, high plasticity, red brown, with occasional basalt cobbles, with some boulders and XW Basalt fragments.	
	1.0		Silty CLAY (CH) Very stiff to hard, high plasticity, orange brown.	U50 PP=400>600
	1.80		Silty CLAY (CH) Hard, high plasticity, orange brown, with XW Metasiltstone fragments (XW Metasiltstone).	
	2.0			
	2.30		Borehole Terminated 2.30m	
	3.0			
	4.0			
	5.0			

COMMENTS

1) Groundwater not observed.

Approved :

Date :

P. Walmsley
12/1/04