GEOTHETA CONSULTING ENGINEERS AND SCIENTISTS

PORTION 260 OF THE FARM RIETFONTEIN 189-IQ, MULDERSDRIFT

NEAR-SURFACE GEOTECHNICAL INVESTIGATION REPORT

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Unit 10, Second Floor
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Roodepoort

1911547/01 December 2019

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PORTION 260 OF THE FARM RIETFONTEIN 189-IQ, MULDERSDRIFT

Geotechnical Investigation and Report

Report Reference Number: 1911547/01

Revision date: December 2019

1. Executive Summary

Victor and Partners commissioned Geotheta (Pty) Limited to prepare a geotechnical investigation report at Portion 260 of the Farm Rietfontein 189-IQ in Muldersdrift, Gauteng.

A near-surface geotechnical investigation was done, and representative soil samples were retrieved.

The typical soil strata encountered on site comprised a layer of topsoil underlain by loose to dense transported material overlying loose to dense residual material. Hardpan ferricrete was encountered in one test pit on site during the investigation.

No groundwater seepage was encountered during the investigation.

The residual granites on site are susceptible to collapse, and therefore the following is recommended.

Remove the in-situ material below the foundations to a depth and width of 1.5 x the width of the foundation. Replace the excavated material with suitable G6 material compacted in maximum 150mm layers to 95% Mod AASHTO density at -1% to +1% of OMC. Excavation through the ferricrete layer is recommended to ensure that the soils within the foundation zone of influence comprises the compacted G6 material.

Taller buildings (greater than 2 stories) will need to be supported on piles. Further penetrative testing is required to determine the depth to bedrock. We suggest using DPSH testing and drilling (to determine if rock are core stones or not).

Adequate storm water control needs to be implemented to direct the water away from excavations and foundations. Foundations should be protected from moisture ingress.

The material tested conforms to a G6 material classification, indicating that material similar to the samples tested is suitable for use as structural fill. This can also be used for backfilling of strip footing foundations.

Excavatability of the material on site is classed as *soft* to *intermediate*, and *hard* through the hardpan ferricrete.

Soil classification of the site in terms of the NHBRC Home Building Manual is C1.

2. Disclaimer

2.1 Data provided to Geotheta

The opinions expressed in this Report have been based on the information supplied to Geotheta (Pty) Ltd (Geotheta) by Victor and Partners. The opinions in this report are provided in response to a specific request from Victor and Partners to do so. Geotheta has exercised all due care in reviewing the supplied information. Whilst Geotheta has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. Geotheta does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

2.2 Data obtained by Geotheta

Opinions presented in this report apply to the site conditions and features as they existed at the time of Geotheta's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which Geotheta had no prior knowledge nor had the opportunity to evaluate.

3. Statement of Geotheta Independence

Neither Geotheta nor any of the authors of this report have any material present or contingent interest in the outcome of this report, nor do they have any monetary or other interest that could be reasonably regarded as being capable of affecting their independence or that of Geotheta.

Geotheta has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence.

Geotheta's fee for completing this report is based on its normal professional rates and/or fees plus incidental expenses. The payment of that professional fee or expense is not contingent upon the outcome of the report.

4. Table of Contents

5. List of abbreviations

CBR	:	California Bearing Ratio
Civilab	:	Civilab (Pty) Limited
DPSH	:	Dynamic Probe Super Heavy
Geotheta	:	Geotheta (Pty) Limited
kPa	:	kilo Pascal
Mod	:	Modified
N	:	Weinert N-value
OMC	:	Optimum Moisture Content
TP	:	Test Pit

6. Introduction

6.1 Victor and Partners commissioned Geotheta (Pty) Limited to prepare a geotechnical investigation report at Portion 260 of the Farm Rietfontein 189-IQ in Muldersdrift, Gauteng.

6.2 A near-surface geotechnical investigation was done to determine the foundation conditions and appropriate founding depth for the proposed development.

6.3 The investigation comprised test pit excavations and retrieval of samples for laboratory testing. The test results were analysed to determine the foundation conditions and the suitability of the in-situ soil for use in the construction works.

6.4 The site investigation work commenced on 15 November 2019 and the laboratory test results were received on 06 December 2019.

7. Terms of reference

7.1 Geotheta submitted proposal reference 1911547 - Victor and Partners - Ptn 260 Rietfontein Geotech - P01 on 07 November 2019.

7.2 Victor and Partners confirmed the appointment on 11 November 2019.

8. Scope of work

The scope of work done is:

8.1 Site geotechnical investigation

The following was done to determine the foundation geotechnical characteristics of the area:

8.1.1 Test Pits

8.1.2 A Tractor Loader Backhoe (TLB) excavator was deployed on site to excavate test pits.

8.1.3 The test pits were profiled to determine the strata layers and characteristics. Soil samples were retrieved as necessary for laboratory testing.

8.2 Laboratory testing

8.2.1 The soil samples were sent to a SANAS certified geotechnical soils laboratory for testing and analysis. Foundation indicator and Mod CBR tests were undertaken.

8.3 Report

8.3.1 This geotechnical report was written.

9. Site Location and Description

9.1 The site is situated on Bayers Naude Drive in Muldersdrift, to the southeast of the N14 Highway (see Figure1).

9.2 The site comprises a grassed open plot. A small area located on the northern side of the property has been excavated in the past. Satellite images show that this has been in existence before 2007. The site slopes from east to west at an average gradient of 5.9%.

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Figure 1 : Site Location

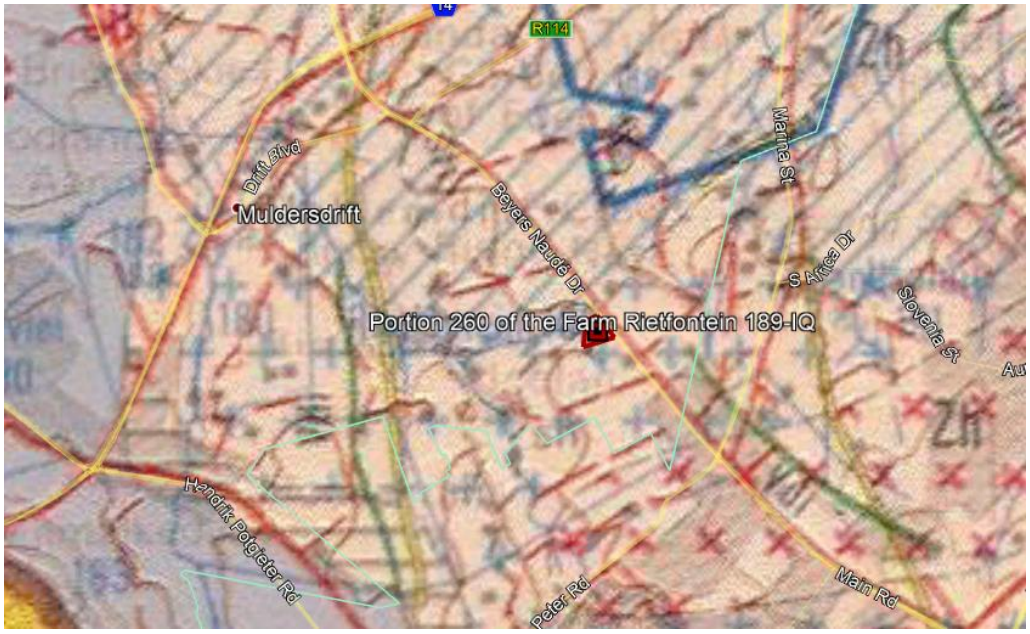
10. Geology

10.1 Figure 2 indicates the regional geology of the area.

10.2 According to the 1:250 000 West Rand 2626 geological map, the site is underlain by grey, medium grained porphyritic granodiorite of the Swazian Era.

10.3 The residual materials of this rock formation are usually highly collapsible.

10.4 During the near-surface investigation, the typical soil strata encountered on site comprised a layer of topsoil underlain by loose to dense transported material overlying loose to dense residual material. Hardpan ferricrete was also encountered in test pit TP6.



GEOTHETA CONSULTING ENGINEERS AND SCIENTISTS	Ptn 260 Rietfontein	1911547

Figure 2: Regional Geology

11. Engineering Geology

11.1 The influence of climate on weathering is expressed by the N-value (H.H. Weinert 1980). The most important is where N=5. Where N is more than 5, disintegration is dominant, and where N is less than 5, decomposition is dominant.

11.2 The Weinert N-value is 2.4 for this region, indicating that decomposition is the overriding process.

11.3 Weinert also mentions that where N is between 2 and 5, weathering profiles develop upwards from fresh rock to residual soil.

12. Method of Investigation

12.1 Desk study

12.1.1 The local geology was determined from the geological maps. The results of this study are discussed in sections 10 and 11 above.

12.2 Test Pits

12.2.1 No formal grid spacing was used in setting out the test pit positions. Positions were selected to adequately cover the site and to determine any variations in the site geology.

12.2.2 Seven test pits were excavated. The test pit positions are indicated in Figure 3.

12.2.3 The test pits were excavated with a JCB Tractor Loader Backhoe (TLB) and soil profiles were logged according to the standard method of Jennings, Brink and Williams (1973).

12.2.4 Test pit profiles and photographs are included in Appendix A and Appendix B respectively.

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Figure 3: Test Pit Positions

12.3 Soil Sampling

12.3.1 Disturbed samples were taken from test pits TP2 and TP7 to determine the material classification and the parameters of the soil types as well as the potential of the excavated material to be used as backfill material.

12.4 Laboratory Testing

12.4.1 The retrieved samples were submitted to Civilab in Booysens Reserve, Johannesburg South, for testing.

12.4.2 Foundation Indicator and Mod CBR tests were conducted.

12.4.3 The laboratory test results are included as Appendix C.

12.4.4 The results are discussed below.

13. Results

13.1 Site soils

13.1.1 The soil profiles from the test pits encountered on the site are as follows:

Test Pit No	Topsoil	Transported Material	Residual Material	Test pit depth (m)
TP1	0 – 0.2	0.2 – 2.4	2.4 – 2.8	2.8 – Max reach
TP2	0 – 0.2	0.2 – 1.2	1.2 – 2.4	2.4 – Max reach
TP3	0 – 0.2	0.2 – 1.6	1.6 – 2.7	2.7 – Max reach
TP4	0 – 0.3	0.3 – 1.2	1.2 – 2.3	2.3 – Max reach
TP5	0 – 0.3	0.3 – 2.3		2.3 – Max reach
TP6	0 – 0.3	0.3 – 1.7		1.7 – Refusal
TP7	0 – 0.5	0.5 – 1.5	1.5 – 2.3	2.3 – Max reach

13.1.2 No groundwater seepage was encountered in any of the test pits.

13.1.3 All test pits, with the exception of test pit TP6, were excavated until the maximum reach of the TLB at depths ranging from 2.3m to 2.8m below natural ground level. Test pit TP6 was excavated until refusal of the TLB on hardpan ferricrete at a depth of 1.7m below natural ground level.

13.2 Laboratory Results

13.2.1 TP2

- The residual material from test pit TP2 classified as a clayey sand (SC). The Plasticity Index is 13, the Liquid Limit 29 and the Linear Shrinkage 6.0. The value of the Grading Modulus is 1.91.
- The residual material plotted as LOW activity on the van der Merwe Activity Diagram.
- With a CBR value of 42 compacted to 95% MOD AASHTO, the material classifies as a G6 according to TRH14 specifications. The material tested is therefore suitable for structural fill.

13.2.2 TP7

- The residual material from test pit TP7 classified as a clayey sand (SC). The Plasticity Index is 19, the Liquid Limit 40 and the Linear Shrinkage 8.0. The value of the Grading Modulus is 1.46.
- The residual material plotted as LOW activity on the van der Merwe Activity Diagram.

14. Discussion of results

14.1 Soil profiles

14.1.1 The site is underlain by loose to dense transported material overlying loose to dense residual material. Hardpan ferricrete was encountered in test pit TP6.

14.1.2 Although no groundwater seepage was encountered in any of the test pits during the investigation a perched water table could arise during the rainy season.

14.2 Construction material

14.2.1 The material tested conforms to a G6 material classification, indicating that material similar to the samples tested is suitable for use as structural fill.

14.3 Foundation conditions

14.3.1 For smaller rise structures (max 2 stories), foundations can be constructed on compacted layers comprising G6 material. The following is the recommended foundation design:

- Remove the in-situ residual material to a depth and width of 1.5 x the width of the foundation from the underside of the proposed foundation.
- Backfill the excavation with suitable G6 material compacted in maximum 150mm layers to 95% Mod AASHTO density at -1% to +1% of OMC. This alleviates any potential collapse from the residual granites.
- Excavation through the ferricrete layer is recommended to ensure that the soils within the foundation zone of influence comprises the compacted G6 material.

14.3.2 This will provide a foundation with 150kPa safe bearing capacity.

14.3.3 The base of the foundations should be cleared of all loose material prior to layer works or concrete works.

14.3.4 Precautions should be taken to protect the foundations from moisture ingress. Adequate storm water control needs to be implemented to direct the water away from excavations and foundations.

14.3.5 Piles are recommended to support larger load bearing structures. The depth of piling can only be determined by doing additional penetrative testing on site.

14.4 Excavatability

14.4.1 Excavatability of the material on site is classed as *soft* to *intermediate,* and *hard* through the hardpan ferricrete.

15. Summary, conclusions and recommendations

15.1 The typical soil strata encountered on site comprised a layer of topsoil underlain by loose to dense transported material overlying loose to dense residual material. Hardpan ferricrete was also encountered in test pit TP6.

15.2 Seven test pits were excavated using a TLB to determine the subsoil conditions. All test pits, with the exception of test pit TP6, were excavated until the maximum reach of the TLB at depths ranging from 2.3m to 2.8m below natural ground level. Test pit TP6 was excavated until refusal of the TLB on hardpan ferricrete at a depth of 1.7m below natural ground level.

15.3 The material excavatability is classed as soft to intermediate, and *hard* through the hardpan ferricrete.

15.4 No groundwater was encountered in any of the test pits during the investigation.

15.5 Precautions should be taken to protect the foundations from moisture ingress. Adequate storm water control needs to be implemented to direct the water away from excavations and foundations.

15.6 The residual granites on site are susceptible to collapse, therefore suitable soil amelioration within the foundation zone of influence is required as specified in this report.

15.7 Piled foundations are necessary for larger structures (greater than two storeys).

15.8 Soil classification of the site in terms of the NHBRC Home Building Manual is C1.

Prepared by

Massimo Gollino – BSc Civil Eng

In terms of Geotheta Quality Policy, this report has been reviewed, product corrected and certified okay for distribution and use.

Reviewed by

Ian Hammond Pr Eng

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

16. References

16.1 WEINERT, HH. 1980. The natural road construction materials of southern Africa. Pretoria: Academica.

16.2 JENNINGS JE, BRINK ABA, and WILLIAMS AAB. 1973. Revised guide to soil profiling for civil engineering purposes in southern Africa, The Civil Engineer in South Africa, Jan 1973 Trans SAICE, Vol 15 No 1.

16.3 VAN DER MERWE, DH. 1964. The prediction of heave from the plasticity index and the percentage clay fraction of soils. The Civil Engineer in South Africa. June 1964, pp 103-107.

16.4 UNIFIED SOIL CLASSIFICATION SYSTEM. CALTRANS

APPENDICES

Appendix A: Test Pit Profiles

GEOTHETA

Victor and Partners
Ptn 260 Rietfontein Geotech

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: 1911547

0.00 Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.

0.20 Moist, dark brown-red, medium dense to loose with depth, intact, gravelly silty SAND with occasional roots. Transported.

2.40 Moist, yellow-orange and grey mottled black, medium dense, intact, silty gravelly SAND. Residual.

2.80 End of TP.

NOTES
1) No groundwater seepage.
2) No refusal.
3) No sample taken.

CONTRACTOR : Client
MACHINE : JCB TLB
DRILLED BY :
PROFILED BY : Massimo Gollino
TYPE SET BY : Massimo Gollino
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM : 600mm Trench
DATE : 15 November 2019
DATE : 15 November 2019
DATE : 09/12/2019 11:55
TEXT : ..11547TPProfilesInput.doc

ELEVATION : NGL
X-COORD :
Y-COORD :

HOLE No: TP01

D0D4 Geotheta

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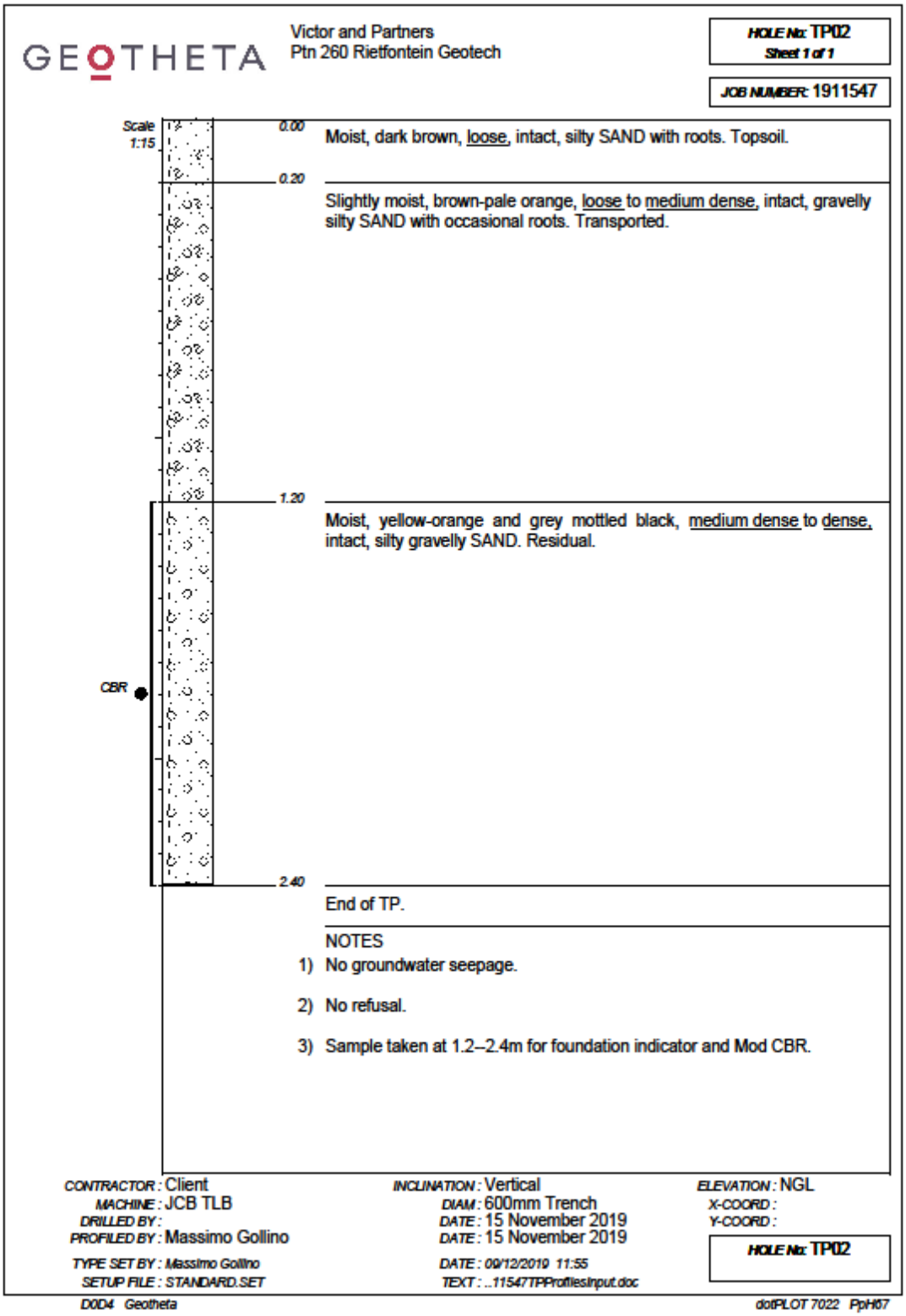
GEOTHETA
Victor and Partners
Ptn 260 Rietfontein Geotech
HOLE No: TP02
Sheet 1 of 1
JOB NUMBER: 1911547
Scale 1:15
0.00
Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.
0.20
Slightly moist, brown-pale orange, loose to medium dense, intact, gravelly silty SAND with occasional roots. Transported.
1.20
Moist, yellow-orange and grey mottled black, medium dense to dense, intact, silty gravelly SAND. Residual.
CBR
2.40
End of TP.
NOTES
1) No groundwater seepage.
2) No refusal.
3) Sample taken at 1.2--2.4m for foundation indicator and Mod CBR.
CONTRACTOR : Client
MACHINE : JCB TLB
DRILLED BY :
PROFILED BY : Massimo Gollino
TYPE SET BY : Massimo Gollino
SETUP FILE : STANDARD.SET
INCLINATION : Vertical
DIAM : 600mm Trench
DATE : 15 November 2019
DATE : 15 November 2019
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ELEVATION : NGL
X-COORD :
Y-COORD :
HOLE No: TP02
D0D4 Geotheta
dotPLOT 7022 PpH67

GEOTHETA

Victor and Partners
Ptn 260 Rietfontein Geotech

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: 1911547

Scale 1:15

0.00 Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.

0.20 Slightly moist, dark red-brown mottled black, medium dense, intact, gravelly silty SAND with occasional roots. Transported.

1.00 Moist, yellow-orange and grey, loose to medium dense, intact, silty gravelly SAND. Residual.

2.70 End of TP.

NOTES

1) No groundwater seepage.
2) No refusal.
3) No sample taken.

CONTRACTOR: Client
MACHINE: JCB TLB
DRILLED BY:
PROFILED BY: Massimo Gollino
TYPE SET BY: Massimo Gollino
SETUP FILE: STANDARD.SET

INCLINATION: Vertical
DIAM: 600mm Trench
DATE: 15 November 2019
DATE: 15 November 2019
DATE: 09/12/2019 11:55
TEXT: ..11547TPProfilesInput.doc

ELEVATION: NGL
X-COORD:
Y-COORD:

HOLE No: TP03

D0D4 Geotheta

dotPLOT 7022 PpH07

GEOTHETA

Victor and Partners
Ptn 260 Rietfontein Geotech

HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: 1911547

Scale 1:15

0.00	Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.
0.30	Slightly moist, brown-pale orange, dense, intact, gravelly silty SAND with occasional roots. Transported.
0.60	Slightly moist, brown-orange mottled black, dense, intact, gravelly silty sand with ferricrete nodules and occasional roots. Transported.
1.20	Moist, dark red-brown, loose to medium dense, intact, clayey SAND. Residual.
1.80	Slightly moist, pale green and grey stained black, dense, intact, silty SAND. Residual.
2.30	End of TP.

NOTES

1) No groundwater seepage.
2) No refusal.
3) No sample taken.

CONTRACTOR: Client
MACHINE: JCB TLB
DRILLED BY:
PROFILED BY: Massimo Gollino
TYPE SET BY: Massimo Gollino
SETUP FILE: STANDARD.SET

INCLINATION: Vertical
DIAM: 600mm Trench
DATE: 15 November 2019
DATE: 15 November 2019
DATE: 09/12/2019 11:55
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ELEVATION: NGL
X-COORD:
Y-COORD:

HOLE No: TP04

D0D4 Geotheta

dotPLOT 7022 PpH07

GEOTHETA

Victor and Partners
Ptn 260 Rietfontein Geotech

HOLE No: TP05
Sheet 1 of 1

JOB NUMBER: 1911547

0.00 Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.

0.30 Slightly moist, dark red-brown, dense, intact, gravelly silty SAND. Transported.

1.30 Slightly moist, dark red-brown, loose, intact, silty SAND. Transported.

2.30 End of TP.

NOTES

1) No groundwater seepage.
2) No Refusal.
3) No sample taken.

CONTRACTOR : Client
MACHINE : JCB TLB
DRILLED BY :
PROFILED BY : Massimo Gollino
TYPE SET BY : Massimo Gollino
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM : 600mm Trench
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DATE : 15 November 2019
DATE : 09/12/2019 11:55
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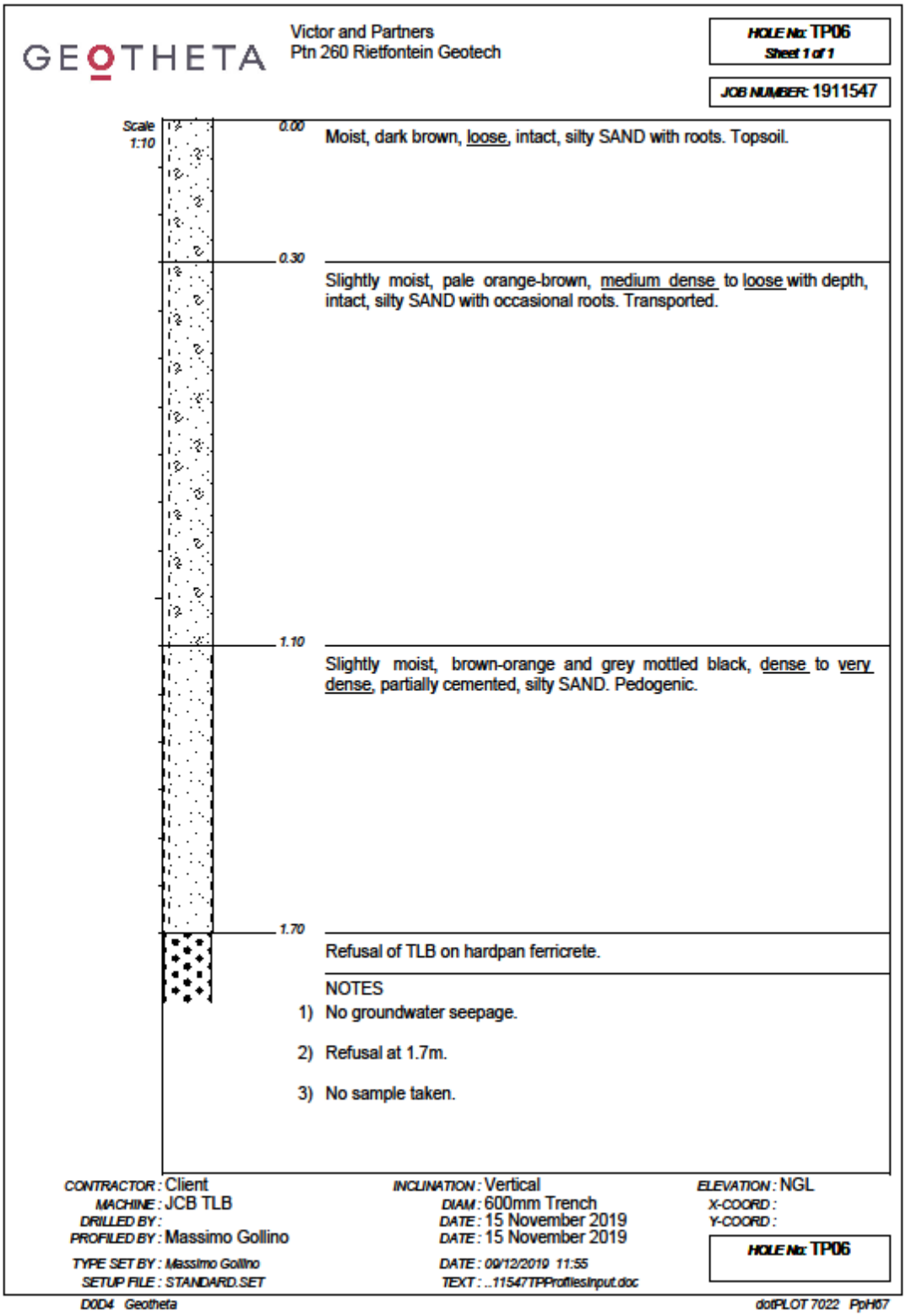
ELEVATION : NGL
X-COORD :
Y-COORD :

HOLE No: TP05

D0D4 Geotheta

dotPLOT 7022 PpH07


GEOTHETA
Victor and Partners
Ptn 260 Rietfontein Geotech
HOLE No: TP06
Sheet 1 of 1
JOB NUMBER: 1911547
Scale 1:10
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Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.
0.30
Slightly moist, pale orange-brown, medium dense to loose with depth, intact, silty SAND with occasional roots. Transported.
1.10
Slightly moist, brown-orange and grey mottled black, dense to very dense, partially cemented, silty SAND. Pedogenic.
1.70
Refusal of TLB on hardpan ferricrete.
NOTES
1) No groundwater seepage.
2) Refusal at 1.7m.
3) No sample taken.
CONTRACTOR: Client
MACHINE: JCB TLB
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PROFILED BY: Massimo Gollino
TYPE SET BY: Massimo Gollino
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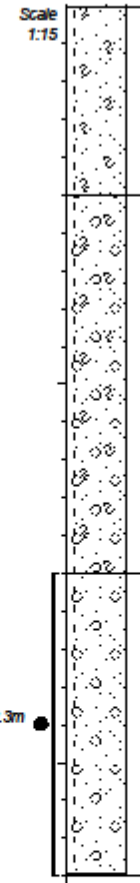
GEOTHETA

Victor and Partners
Ptn 260 Rietfontein Geotech

HOLE No: TP07
Sheet 1 of 1

JOB NUMBER: 1911547



0.00 Moist, dark brown, loose, intact, silty SAND with roots. Topsoil.

0.50 Dry, pale yellow and grey, dense, intact, gravelly silty SAND with occasional roots. Transported.

1.50 Slightly moist, light brown and grey, medium dense, intact, gravelly silty SAND. Residual.

2.30 End of TP.

NOTES

1) No groundwater seepage.
2) No refusal.
3) Sample taken at 1.5–2.3m for foundation indicator.

CONTRACTOR: Client
MACHINE: JCB TLB
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PROFILED BY: Massimo Gollino
TYPE SET BY: Massimo Gollino
SETUP FILE: STANDARD.SET

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Y-COORD:

HOLE No: TP07

D0D4 Geotheta

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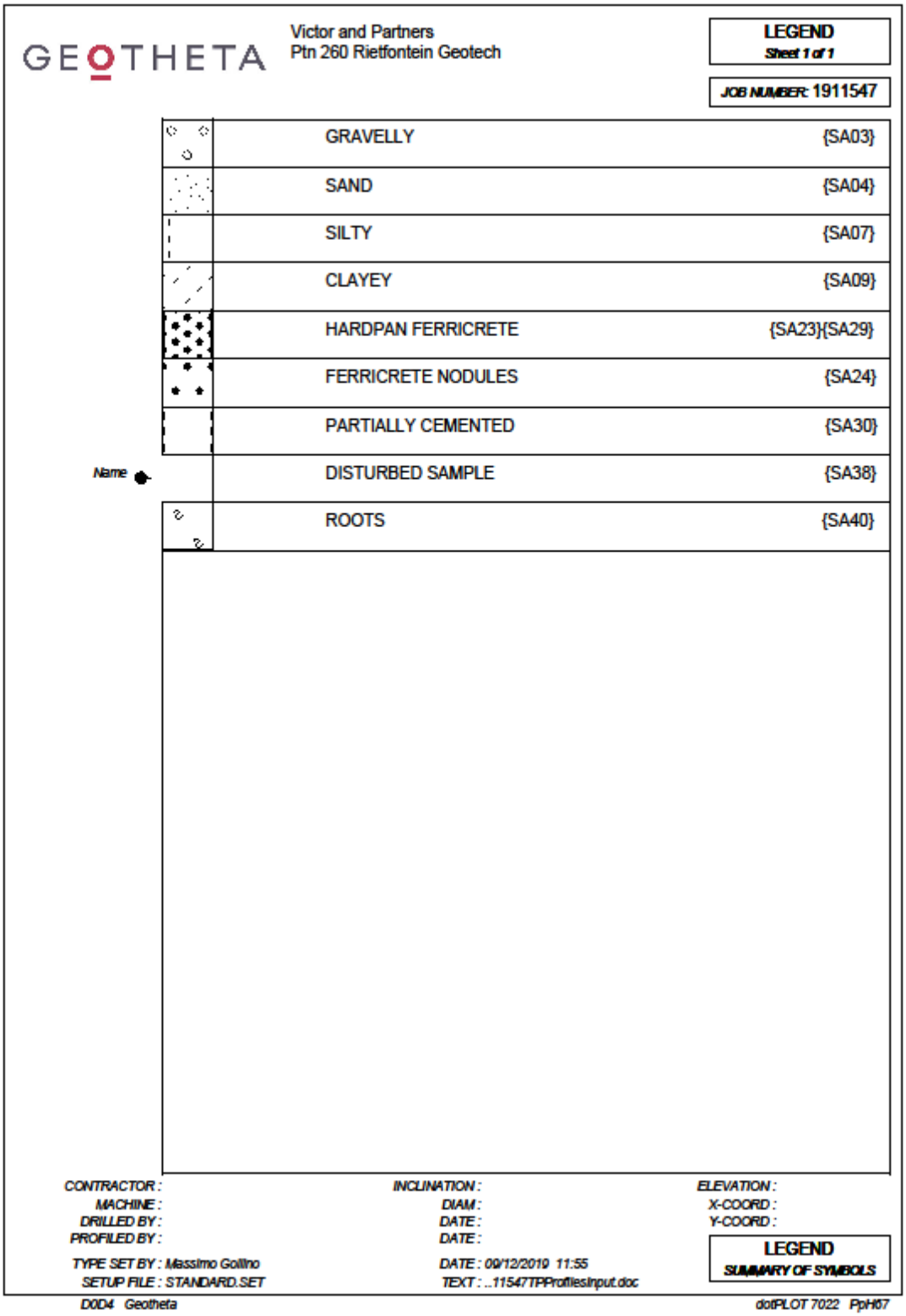
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Victor and Partners
Ptn 260 Rietfontein Geotech
LEGEND
Sheet 1 of 1
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SAND {SA04}
SILTY {SA07}
CLAYEY {SA09}
HARDPAN FERRICRETE {SA23}{SA29}
FERRICRETE NODULES {SA24}
PARTIALLY CEMENTED {SA30}
Name
DISTURBED SAMPLE {SA38}
ROOTS {SA40}
CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :
TYPE SET BY : Massimo Gollino
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DIAM :
DATE :
DATE :
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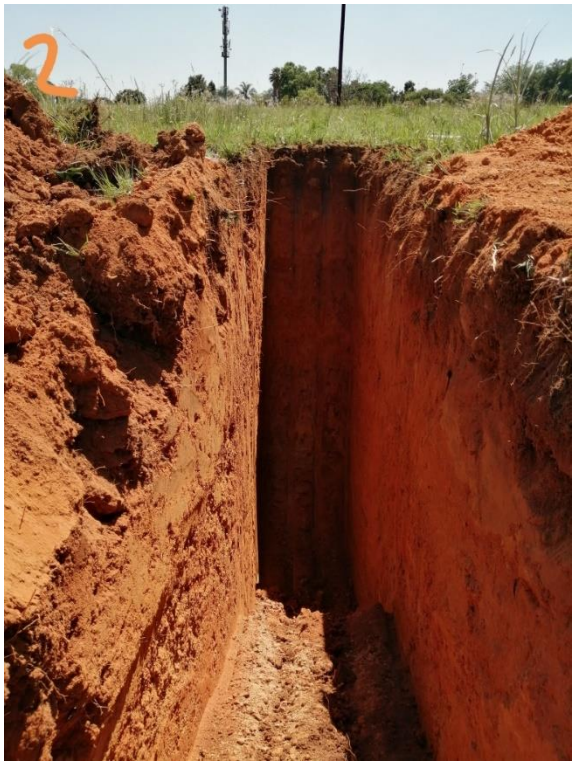
ELEVATION :
X-COORD :
Y-COORD :
LEGEND
SUMMARY OF SYMBOLS
D0D4 Geotheta
dotPLOT 7022 PpH67

Appendix B: Test Pit Photos

TP 1



TP 2

TP 3

TP 4

TP 5

TP 6

TP7

Appendix C: Laboratory Results

38 Fourth Street, Booysens Reserve, Johannesburg 2091
PO Box 82223, Southdale 2135
Tel: +27 (0)11 835 3117•Fax: +27 (0)11 835 2503
E-mail: jhb@civilab.co.za•Website: www.civilab.co.za

sanas TC062

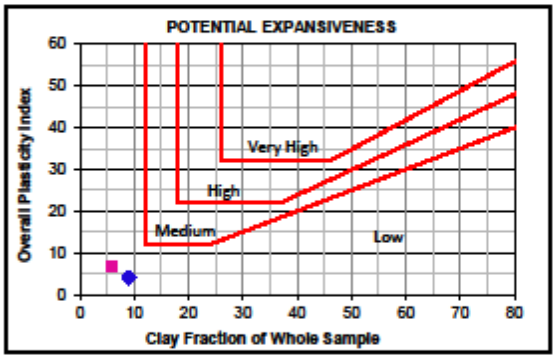
Civilab

Civil Engineering Testing Laboratories

Client	:	GEOTHETA (PTY) LTD	Date Received:	15/11/2019
Project	:	Ptn 260 Rietfontein	Date Reported:	06/12/2019
Project No	:	2019-B-1946	Page No. :	2 of 4

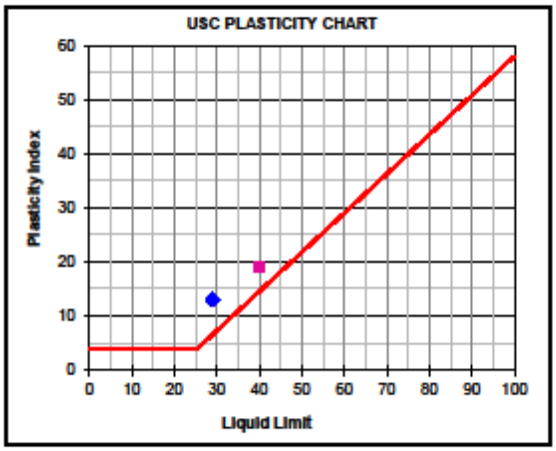
FOUNDATION INDICATOR

Laboratory Number		1	2
Field Number		TP2	TP7
Client Reference			
Depth (m)		1.2-2.4	1.5-2.3
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			



Moisture Content & Relative Density	SANS 3001 GR30		
Moisture Content (%)			
Relative Density (S.G.)			

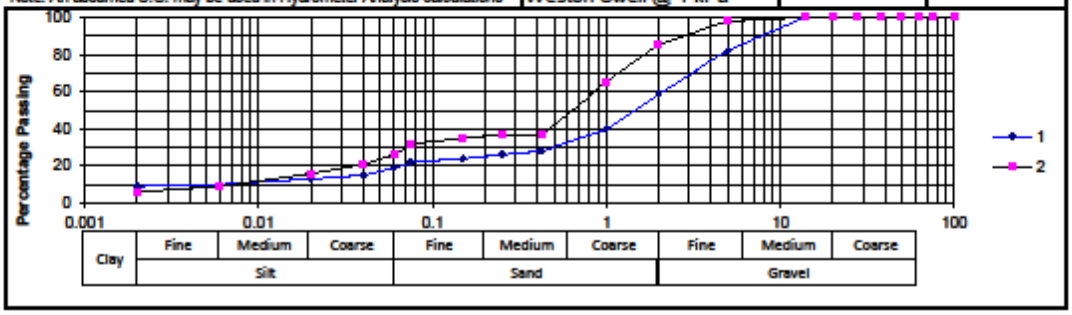
Sieve Analysis (Wet Prep)		SANS 3001 GR1	
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	82	98
	2 mm	59	85
	1 mm	40	65
	0.425 mm	28	37
	0.250 mm	26	37
	0.150 mm	24	35
	0.075 mm	22	32
Grading Modulus		1.91	1.46



Hydrometer Analysis		SANS 3001 GR3	
Percentage Passing	0.060 mm	19	26
	0.040 mm	15	21
	0.020 mm	13	16
	0.006 mm	10	9
	0.002 mm	9	6
Gravel	%	41	15
Sand	%	40	59
Silt	%	10	20
Clay	%	9	6

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		1	2
Atterberg Limits -425µ		SANS 3001 GR10	
Liquid Limit	%	29	40
Plasticity Index	%	13	19
Linear Shrinkage	%	6.0	8.0
Overall PI	%	4	7
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-6(2)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			



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Civilab
Civil Engineering Testing Laboratories

Client	:	GEOTHETA (PTY) LTD	Date Received: 15/11/2019
Project	:	Ptn 260 Rietfontein	Date Reported: 06/12/2019
Project No:		2019-B-1946	Page No. : 3 of 4

MOISTURE DENSITY RELATIONSHIP

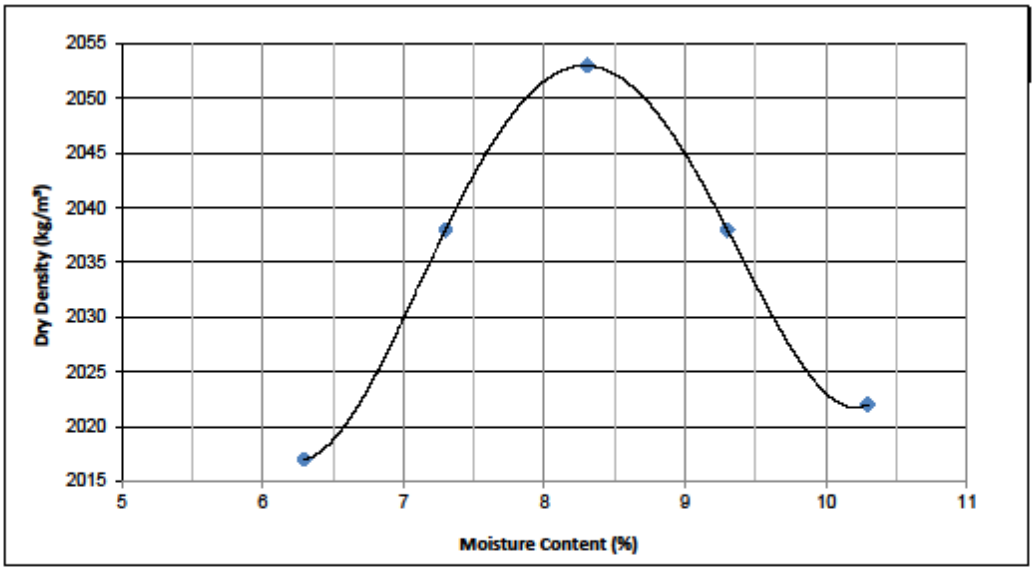
Laboratory Number		1
Field Number		TP2
Client Reference		
Depth (m)		1.2-2.4
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
Calcrete / Crushed Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	2017	2038	2053	2038	2022	
Moisture Content	%	6.3	7.3	8.3	9.3	10.3	

Max. Dry Density	kg/m³	2053
Optimum Moisture	%	8.3



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Project No.	:	2019-B-1946	Page No.	:	4 of 4

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		1	
Field Number		TP2	
Client Reference			
Depth (m)		1.2-2.4	
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) — SANS 3001 GR1

Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	100
	20 mm	100
	14 mm	100
	5 mm	82
	2 mm	59
	1 mm	40
	0.425 mm	28
	0.250 mm	26
	0.150 mm	24
	0.075 mm	22
Grading Modulus		1.9

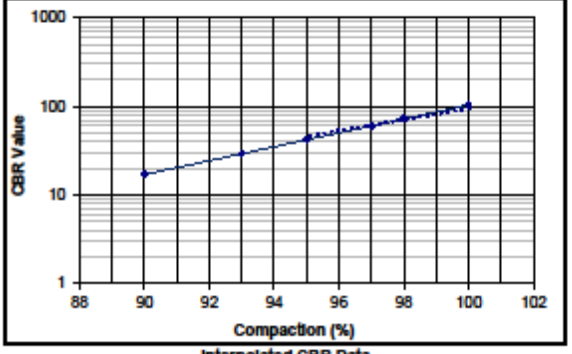
Soil Mortar Analysis

Coarse Sand	53
Coarse Fine Sand	3
Medium Fine Sand	4
Fine Fine Sand	4
Silt and Clay	37

Atterberg Limits — SANS 3001 GR10

Liquid Limit (%)	29
Plasticity Index (%)	13
Linear Shrinkage (%)	6.0

Laboratory No.		1		
Maximum Dry Density & Optimum Moisture Content				**SANS 3001 GR30**
MDD	kg/m³	2053		
OMC	%	8.3		
California Bearing Ratio				**SANS 3001 GR40**
Compaction Data				
Moisture	%	8.3		
Dry Density	kg/m³	2083	1978	1874
Compaction	%	100.0	95.0	90.0
Penetration Data				
CBR at	2.50 mm	94	46	17
	5.00 mm	95	43	16
	7.50 mm	88	39	15
Swell	%	0.1	0.2	0.3
Final Moisture (%)		10.5	12.3	15.5

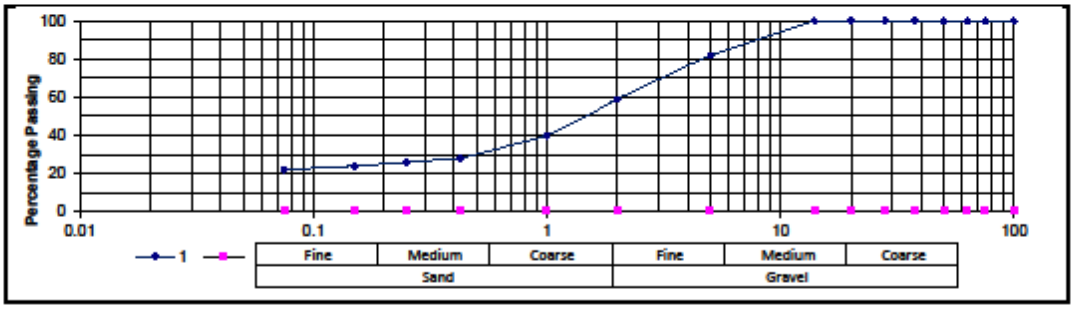


Interpolated CBR Data

CBR @	100%	Mod. AASHTO	104
@	98%		73
@	97%		61
@	95%		42
@	93%		29
@	90%		17
@	SANS3001 Midpoint		66

Classifications

HRB (AASHTO)	A-2-6(0)
COLTO	G7
TRH14	G6



Geotheta Report Distribution Record

Report No.	1911547/01
Copy No.	Electronic

Name/Title	Company	Copy	Date	Authorised by
Robert Victor	Victor and Partners	Electronic	Dec '19	Ian Hammond

Approval Signature: