



MONDLI CONSULTING SERVICES

BOTHAS HILL SERVICE STATION & RETAIL CENTRE

Geotechnical Investigation Report

May 2021

S.M Binda

sihle@geoprocivils.co.za

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I. INTRODUCTION

Geopro Civils Material Testing Laboratory was appointed by Mr BM Mthembu from Mondli Consulting Services to conduct a geotechnical investigation for the proposed construction of a Convenience Centre comprising of a service station and a retail centre. The proposed convenience centre is to be situated on ERF363 in Bothas Hill. Bothas Hill is located under the Ethekewini Metropolitan Municipality in Durban, in the Kwa-Zulu Natal province of South Africa.

The objective of the investigation was to establish the nature and engineering properties of the underlying soil. As well as to assess the suitability of the proposed areas, from a geotechnical perspective, and give an overview of the subsurface conditions for the proposed development which will be situated in this area.

A total of four (4) trial pits were excavated, as directed by Mr BM Mthembu. Trial pits were profiled to a minimum and maximum permissible depth of 1450mm and 1600mm. Four (4) Dynamic Cone Penetration tests were carried out to a maximum permissible depth of 1000mm. Twelve (12) soil samples were collected from the four (4) trial pits and sent to Geopro Civil Material Testing Laboratory for analysis.

It must be noted that the interpretation of the overall subsurface conditions across the site is inferred from the interpolation and extrapolation of point information assimilated from the various test positions. In the unlikely event of significant variations from the inferred conditions becoming apparent during subsequent phases of the project then these must be referred to a geotechnical professional for verification.

II. SITE DESCRIPTION

For the purposes of assisting with this investigation, Mr BM Mthembu provided Geopro Civils with the trial pit location(s) in the study area. As mentioned above, the site is located in Bothas Hill outside Hillcrest, which is on the Outer West region of Durban, Kwa-Zulu Natal.



Figure 1: Image showing the proposed site for development, located on ERF363, Bothas Hill, Outer West Durban, Kwa-Zulu Natal.

Topographically, the trial pits are located on a tree and grass covered area. The proposed area for development is currently a zoned area with an existing old, demolished building. The site is surrounded by land uses including shops and a hotel opposite the proposed developmental site. Please see Annexure E for the site topography.

III. SITE INVESTIGATIONS

The site investigation was carried out on the 17th of May 2021; in order to investigate the nature and engineering properties of the underlying soil(s). The investigation involved the following:

- The excavation of trial pit 1 to a maximum permissible depth of 1450mm,
- The excavation of trial pit 2 to a maximum permissible depth of 1600mm,
- The excavation of trial pit 3 to a maximum permissible depth of 1500mm,
- The excavation of trial pit 4 to a maximum permissible depth of 1500mm,
- The collection of twelve (12) soil samples from the four (4) trial pits excavated,
- The completion of four (4) Dynamic Cone Penetration (DCP) tests,
- The profiling of four (4) trial pits that were excavated.

Trial Pits

All four (4) Trial pits excavated were profiled to their different maximum permissible depths as indicated above. During the logging process of concern, the side walls of the trial pits were excavated vertically and there was no evidence of potential collapse within the sidewalls of the trial pit (s). This indicates that the material encountered in the trial pits was not too coarse.

The trial pits were profiled in accordance with the standard method of profiling recommended by the Guidelines for Soil and Rock Logging in South Africa. The trial pit profiling is presented as Annexure A.

Table 1 below gives the GPS location of the four (4) trial pits profiled at the proposed developmental site in Bothas Hill, Kwa-Zulu Natal.

TABLE 1
Trial Pit GPS Location

TRIAL PIT No.	GIS LATITUDE	GIS LONGITUDE
TP1	-29° 45' 6.398'' S	30° 44' 22.468'' E
TP2	-29° 45' 8.348'' S	30° 44' 23.867'' E
TP3	-29° 45' 7.822'' S	30° 44' 25.013'' E
TP4	-29° 45' 6.074'' S	30° 44' 28.792'' E

Dynamic Cone Penetration Testing (DCP)

Four (4) DCP tests were conducted adjacent to the above-mentioned trial pit areas. All four (4) tests were conducted to a maximum permissible depth of 1000mm below the existing surface. The results are presented as Annexure B.

Table 2 below gives an indication of the consistency of the non-cohesive and cohesive soils according to the DCP results. It should be noted that the results are specific to our testing equipment and should be used with caution as it is only provided as a guideline.

TABLE 2
Consistencies of Cohesive and Non-Cohesive Soils

COHESIVE SOILS CLAYEY SANDS		NON-COHESIVE SOILS SANDY COLLUVIUM	
No. of blows/300mm	Consistency	No. of blows/300mm	Consistency
0 – 4	Very Soft	0 – 7	Very Loose
4 – 7	Soft	7 – 18	Loose
8 – 12	Firm	19 – 54	Medium Dense
15 – 28	Stiff	55 – 90	Dense
29 – 54	Very Stiff	>90	Very Dense
>54	Hard		

IV. GEOTECHNICAL CONSIDERATIONS

Excavatability

In terms of SANS 1200DA

“Soft excavations” shall be excavation in material that can be efficiently removed and loaded without prior ripping.

“Intermediate excavations” shall be excavation (excluding soft excavation) in material that can be efficiently ripped.

“Hard rock excavations” shall be excavation in material that cannot be efficiently removed without blasting or without wedging and splitting before removal.

Table 3 below gives the excavatability of the materials encountered at certain depths in the trial pits.

TABLE 3**Excavatability of the materials**

TRIAL PIT No.	DEPTH (mm)	EXCAVATABILITY	MATERIAL DESCRIPTION (as per DCP results)
1	0 – 90	Intermediate Excavations	Stiff to very stiff clay material
	90 – 1000	Soft Excavations	Firm clay material
2	0 – 1000	Soft Excavations	Firm clay material
3	0 – 75	Intermediate Excavations	Stiff to very stiff clay material
	870 – 1000		
	240 – 820	Soft Excavations	Firm clay material
4	0 – 1000	Soft Excavations	Firm clay material

Test Pit 1 DCP test results show that, from the depth of 0mm – 90mm, stiff to very dense clay material was encountered, this is shown by the high kPa readings obtained at these depths, ranging from 300kPa to above 600kPa readings. The kPa readings obtained from the depth of 220mm – 1000mm significantly decrease to below 200kPa's suggesting that the layers encountered at these depths are firm clay layers.

Test Pit 2 DCP test results show that, from the depth of 0mm – 1000mm, the kPa readings obtained are low, below 200kPa, this suggests that the layers encountered at these depths are firm clay layers.

Test Pit 3 DCP test results show that, from the depth of 0mm – 75mm and 870mm – 1000mm, stiff clay material was encountered, this is shown by the average kPa readings obtained at these depths, above 200kPa. The kPa readings obtained from the depth of 240mm – 820mm decrease to below 200kPa's suggesting that the layers encountered at these depths are firm clay layers

Test Pit 4 DCP test results show that, from the depth of 0mm – 1000mm, the kPa readings obtained are low, below 200kPa, this suggests that the layers encountered at these depths are firm clay layers.

The in-situ DCP test results for the above are further presented and elaborated on Annexure B, attached.

Material Sampling

Representative disturbed samples were retrieved from the four (4) trial pits excavated. The samples were taken to Geopro Civil Material Testing Laboratory for full indicator analysis and material classification which included the following tests:

- Particle size distribution / grading,
- Mechanical analysis,
- Determination of Atterberg limits,

- Moisture Density Relationship and
- California Bearing Ratio Analysis

Subsurface Water Conditions

Table 4 below shows the subsurface moisture conditions encountered at the bottom of the trial pits excavated. The subsurface water conditions were as follows:

TABLE 4
Subsurface moisture conditions

TRIAL PIT No.	SLIGHTLY MOIST	MOIST	VERY MOIST	DAMP / WET	WATER SEEPAGE
1		•			
2		•			
3		•			
4		•			

Existing Layer Conditions

In order to assess more accurately the engineering properties of the various materials encountered on site and to provide information on their potential behaviour below the surface; the following results were obtained from the retrieved disturbed samples of the trial pits that were investigated. The pertinent test parameters are summarised and the soils classified in terms of the TRH 14 Guidelines for Construction Materials. These are as follows:

TP	MAT. DEPTH (mm)	SHORT MATERIAL DESCRIPTION	GM	% SILT & CLAY	% LL	% PI	% MC	MOD (kg/m ³)	CBR DATA	TRH14 CLASS
TP 1	0 – 680	Dark brown to black topsoil	1.20	22.0	40.5	18.7	-	-	-	-
	680 – 1050	Orange ferruginous sand	1.36	16.6	45.0	18.9	25.2	1544	2 @ 90%	G10
	1050 – 1450	Dark red ferruginous sand	1.31	25.3	51.0	18.0	23.7	1590	3 @ 90%	G10
TP 2	0 – 690	Dark brown to black topsoil	1.55	18.0	40.8	12.2	20.7	1591	2 @ 90%	G10
	690 – 1600	Orange ferruginous sand	1.16	47.3	41.7	13.3	16.0	1792	4 @ 90%	G10
	>1600	Dark red ferruginous sand	1.16	51.2	41.8	11.7	-	-	-	-
TP 3	0 – 670	Dark brown to black topsoil	1.50	29.6	43.8	17.4	20.3	1598	3 @ 90%	G10
	670 – 1090	Brwn orange ferruginous sand	1.49	32.6	40.3	13.5	18.1	1664	3 @ 90%	G10
	1090 – 1500	Light pink ferruginous sand	1.32	47.6	38.8	11.5	-	-	-	-
TP 4	0 – 530	Dark brown to black topsoil	1.41	23.2	39.7	14.0	20.3	1594	2 @ 90%	G10
	530 – 1500	Brwn orange ferruginous sand	1.42	39.0	46.3	18.9	15.1	1788	4 @ 90%	G10
	>1500	Orange yellow ferruginous sand	1.09	48.8	43.0	11.3	-	-	-	-

GM - Grading Modulus

S/P - Slightly Plastic

LL - Liquid Limit

N/P - Non-Plastic

PI - Plasticity Index

MC - Moisture Content

UND. - Undefined

Existing Layer Assessment

The trial pits were investigated and the material was classified according to the TRH 14 Manual through laboratory testing. Table 6 below gives the materials that the engineer can consider reusing either as base, subbase or selected layer material.

TABLE 6

Reusable Materials

TP No.	MATERIAL DEPTH (mm)	TRH14 Classification	BASE MATERIAL	SUBBASE MATERIAL	SELECTED LAYER MATERIAL	SUBGRADE
1	0 – 1450	G10				•
2	0 – 1600	G10				•
3	0 – 1500	G10				•
4	0 – 1500	G10				•

Table 7 below shows the site classes for single storey residential structures as per the NHBRC Manual. We advise that the structural engineer assess and consider the foundation design and building procedures on Table 7.

TABLE 7

NHBRC Site Classes

TP No.	SITE CLASS	CHARACTER OF FOUNDING MATERIAL	MATERIAL DESCRIPTION	CONSTRUCTION TYPE	FOUNDATION DESIGN AND STRUCTURE PROCEDURES
1	H1	Expansive Soils	Soils are subjected volume changes associated with changes in water contents	Soil raft	<p>Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with inert backfill compacted 93% MOD AASHTO density at -1% to +2% of optimum moisture content.</p> <p>Normal construction with lightly reinforced strip footing and light reinforcement in masonry if residual movements are < 7.5mm, or construction type appropriate to residual movements</p>

					Site drainage and plumbing/service precautions
2	H1	Expansive Soils	Soils are subjected volume changes associated with changes in water contents	Soil raft	<p>Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with inert backfill compacted 93% MOD AASHTO density at -1% to +2% of optimum moisture content.</p> <p>Normal construction with lightly reinforced strip footing and light reinforcement in masonry if residual movements are < 7.5mm, or construction type appropriate to residual movements</p> <p>Site drainage and plumbing/service precautions</p>
3	H1	Expansive Soils	Soils are subjected volume changes associated with changes in water contents	Soil raft	<p>Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with inert backfill compacted 93% MOD AASHTO density at -1% to +2% of optimum moisture content.</p> <p>Normal construction with lightly reinforced strip footing and light reinforcement in masonry if residual movements are < 7.5mm, or construction type appropriate to residual movements</p> <p>Site drainage and plumbing/service precautions</p>
4	H1	Expansive Soils	Soils are subjected volume changes associated with changes in water contents	Soil raft	<p>Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with inert backfill compacted 93% MOD AASHTO density at -1% to +2% of optimum moisture content.</p> <p>Normal construction with lightly reinforced strip footing and light reinforcement in masonry if residual movements are < 7.5mm, or construction type appropriate to residual movements</p> <p>Site drainage and plumbing/service precautions</p>

V. GEOLOGY

According to the 1:250 000 Geological Map Series, attached, and from the available literature, as well as the observations during the site investigation, the general area within which the site is located consists mainly of deposits from the Natal Metamorphic Province Group, consisting of granite and gneiss. These sandy soils belong to the Natal metamorphic Province Supergroup that is estimated to be 1000 million years old.

Generally, rocks will decompose insitu, forming residual soils that may be clayey and silty. These soils are often blanketed by a considerable thickness of transported soils of colluvial and alluvial origin that consist of silty sands.

During the investigation, ferruginous sand was encountered at the bottom of the trail pits. The ferruginous sands contained small particles of the quartz minerals from weathered granite. Ferruginous sand is reddish-brown to a rusty-coloured sand containing iron oxides or rust. Ferruginous sand(s) turns to ferricrete and laterite rock(s) over hundreds of years. Ferricrete is a horizon, at the land surface, made up of the cementation of near surface materials by iron oxides, and often forming a resistant duricrust. Typically, between 1 – 20m in thickness, it can form extensive sheets which may extend over a few, to hundreds, or even thousands of kms.

A simplified geological map has been attached as Annexure F.

VI. CONCLUSION

The investigation undertaken has established the various founding conditions and material types that are likely to be encountered during the construction phase. Four (4) areas were assessed of the likely material to be encountered and their mechanical properties were assessed.

Excavation Stability

The excavation of the trial pits showed that all of the pits were stable. As a safety precaution all excavations exceeding 1.5m must adhere to the safety regulations and must receive adequate shoring.

Excavatability

Generally, soft to intermediate excavations can be anticipated between the average depth of 0 – 1600mm.

The DCP results show that no refusal was encountered in any of the trial pits during the DCP test

The DCP test results were used as a guide to determine the excavation conditions. The above anticipated or prevalent excavation conditions should be used as estimates only. Table 3 shows the anticipated excavation conditions at a particular depth adjacent to each trial pit.

Subsurface Seepage

No subsurface water seepage was encountered in any of the trial pits.

Founding Depths

All structures are to be found on hard solid ground. The NHBRC was referenced for the foundation design and building procedures. However, the services of a structural engineer should be acquired for the designing of the foundation to the appropriate forces that the structure is expected to exert the foundation and in turn on the ground.

Please note that the above site classifications and or interpretations are not intended for dolomitic areas. We hope that this report meets your requirements. Please do not hesitate to contact us should you have any inquiries.

Kindest Regards

Miss Siphesihle Binda

For Geopro Civils:

A handwritten signature in black ink, appearing to read 'S. Binda', is written over a horizontal line.

VII. REFERENCES

Committee of State Road Authorities (1985). Technical Recommendations for Highways (TRH14), Guide for Road Construction Materials.

Das M Braja (2006). Fundamentals of Geotechnical Engineering, 3rd Edition.

Jennings J.E., Brink A.B.A., Williams A.A.B. (1973). Revised Guide to Soil Profiling for Civil Engineering Purposes in South Africa.

National Home Builders Registrations Council (1999). Home Building Manual Part 1 & 2, Revision No.1.

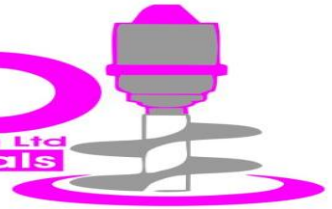
National Transport Commission (1986). Standard Methods of Testing Road Construction Materials, Technical Methods for Highways (TMH1). Second Edition.

The Government Printers (1988). The 1:250 000 Geological Map, No. 2730 Vryheid Cartography.

Van Der Merwe D.H. (1964). The prediction of heave from the plasticity index and percentage clay fraction of soils.

ANNEXURE A

TRIAL PIT PROFILES



CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 1
CO-ORDINATES	-29° 45' 6.398" S 30° 44' 22.468" E
DATE ASSESSED	17.05.2021

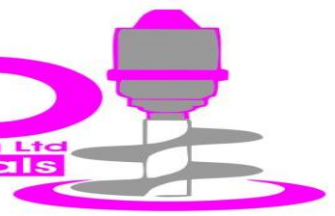
FIELD SOIL SURVEY TEST REPORT

<u>THICKNESS</u>	<u>PROFILE</u>	<u>DEPTH</u>	<u>DESCRIPTION</u>
680mm	¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥	0mm	Moist, dark brown black, firm, intact, fine grained, topsoil
370mm	===== ===== ===== ===== ===== ===== ===== ===== ===== =====	680mm	Moist, light brown orange, firm, intact, medium - coarse grained, ferruginous sand, weathered granite
400mm	===== ===== ===== ===== ===== ===== ===== ===== ===== =====	1050mm	Moist, dark red, firm, intact, medium - coarse grained, ferruginous sand, weathered granite
		1450mm	No water Seepage

NOTES:

- Sidewalls are stable
- No water seepage was encountered at the bottom of the Test Pit
- Sample 1 was taken at 0mm – 680mm
- Sample 2 was taken at 680mm – 1050mm
- Sample 3 was taken at 1050mm – 1450mm

For Geopro:

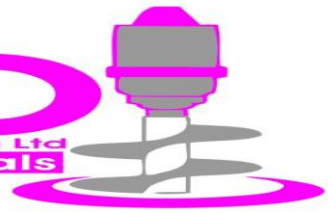


CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 1
CO-ORDINATES	-29° 45' 6.398" S 30° 44' 22.468" E
DATE ASSESSED	17.05.2021

FIGURE 2: TEST PIT 1 PROFILING



For Geopro: 

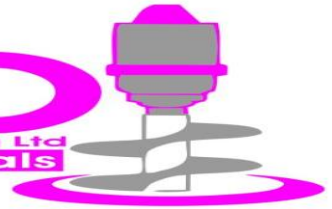


CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 2
CO-ORDINATES	-29° 45' 8.348" S 30° 44' 23.867" E
DATE ASSESSED	17.05.2021

FIGURE 3: TEST PIT 2 PROFILING



For Geopro:



CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 3
CO-ORDINATES	-29° 45' 7.822" S 30° 44' 25.013" E
DATE ASSESSED	17.05.2021

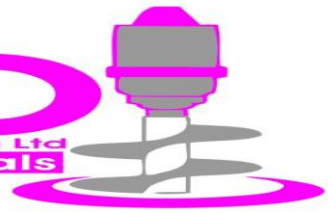
FIELD SOIL SURVEY TEST REPORT

<u>THICKNESS</u>	<u>PROFILE</u>	<u>DEPTH</u>	<u>DESCRIPTION</u>
670mm	¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥ ¥¥¥¥	0mm	Moist, dark brown black, firm, intact, fine grained, topsoil
420mm	===== ===== ===== ===== ===== ===== ===== ===== ===== =====	670mm	Moist, light brown orange, firm, intact, medium - coarse grained, ferruginous sand, weathered granite
410mm	===== ===== ===== ===== ===== ===== ===== ===== ===== =====	1090mm	Moist, light pinkish, firm, intact, medium - coarse grained, ferruginous sand, weathered granite
		1500mm	No water Seepage

NOTES:

- Sidewalls are stable
- No water seepage was encountered at the bottom of the Test Pit
- Sample 1 was taken at 0mm – 670mm
- Sample 2 was taken at 670mm – 1090mm
- Sample 3 was taken at 1090mm – 1500mm

For Geopro: _____

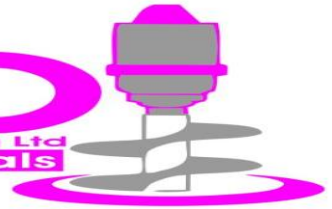


CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 3
CO-ORDINATES	-29° 45' 7.822" S 30° 44' 25.013" E
DATE ASSESSED	17.05.2021

FIGURE 4: TEST PIT 3 PROFILING



For Geopro:



CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 4
CO-ORDINATES	-29° 45' 6.074" S 30° 44' 23.792" E
DATE ASSESSED	17.05.2021

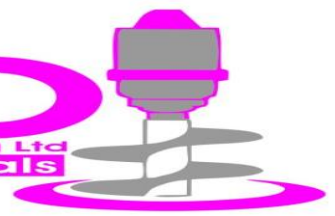
FIELD SOIL SURVEY TEST REPORT

THICKNESS	PROFILE	DEPTH	DESCRIPTION
530mm	¥¥¥¥	0mm	Moist, dark brown black, firm, intact, fine grained, topsoil
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
	¥¥¥¥		
970mm	=====	530mm	Moist, orange yellowish, firm, intact, medium - coarse grained, ferruginous sand, weathered granite
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
	=====		
		1500mm	No water Seepage

NOTES:

- Sidewalls are stable
- No water seepage was encountered at the bottom of the Test Pit
- Sample 1 was taken at 0mm – 530mm
- Sample 2 was taken at 530mm – 1500mm
- Sample 3 was taken at >1500mm

For Geopro:



CLIENT NAME	Mondli Consulting Services
PROJECT NAME	Bothas Hill Service Station & Retail Centre
POSITION IN FIELD	Test Pit 4
CO-ORDINATES	-29° 45' 6.074" S 30° 44' 23.792" E
DATE ASSESSED	17.05.2021

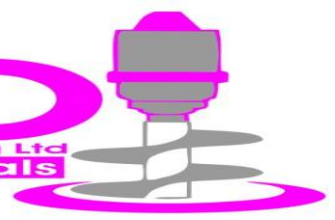
FIGURE 5: TEST PIT 4 PROFILING



For Geopro: 

ANNEXURE B

DYNAMIC CONE PENETRATION TEST RESULTS



DYNAMIC CONE PENETROMETER (DCP) TEST REPORT

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 1	Job Card No.	0600

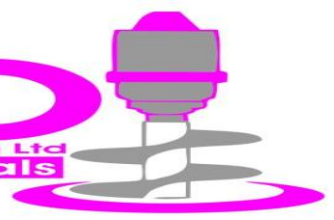
Test Method TMH6 – Method ST6

Number of blows	Penetration Readings (Fieldwork-mm)	Penetration (Depth- mm)	Cumulative Penetration (depth – mm)	Calculated Penetration (mm / blow)	In-situ CBR	kPa
					(Method ST6, Table 1)	
0	0	0	0	0,0	0	0
5	25	25	25	5,0	55	510
10	40	15	40	3,0	110	939
15	50	10	50	2,0	110	939
20	60	10	60	2,0	110	939
25	90	30	90	6,0	45	427
30	220	130	220	26,0	7	83
35	400	180	400	36,0	4	51
40	590	190	590	38,0	4	51
45	740	150	740	30,0	5	62
50	840	100	840	20,0	9	104
55	920	80	920	16,0	13	143
60	1000	80	1000	16,0	13	143

Remarks:

The above DCP test results show that, from the depth of 0mm – 90mm, stiff to very dense clay material was encountered, this is shown by the high kPa readings obtained at these depths, ranging from 300kPa to above 600kPa readings. The kPa readings obtained from the depth of 220mm – 1000mm significantly decrease to below 200kPa’s suggesting that the layers encountered at these depths are firm clay layers.

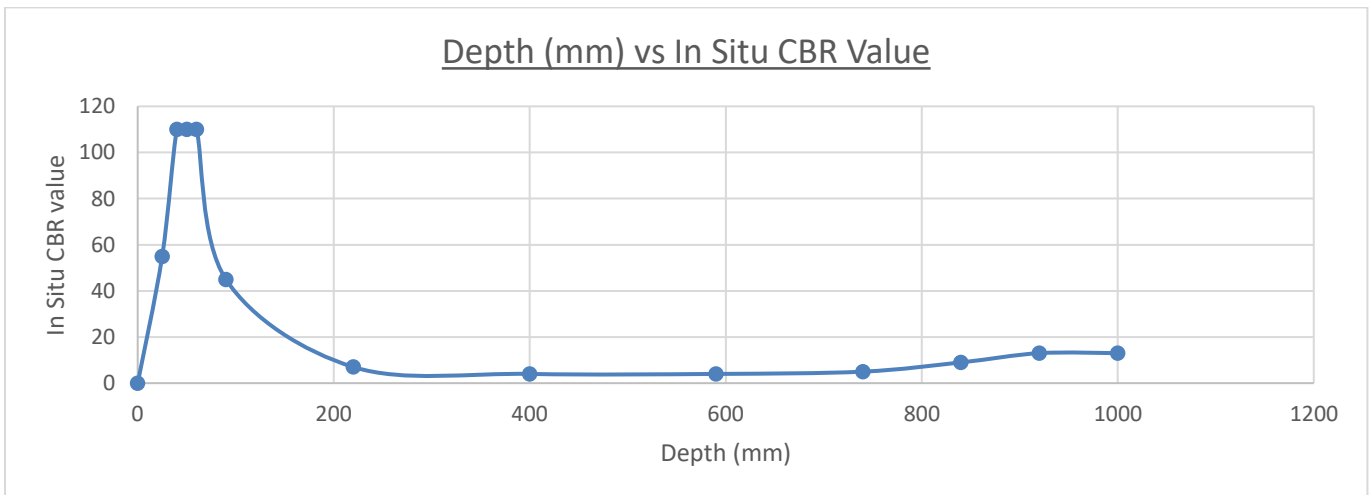
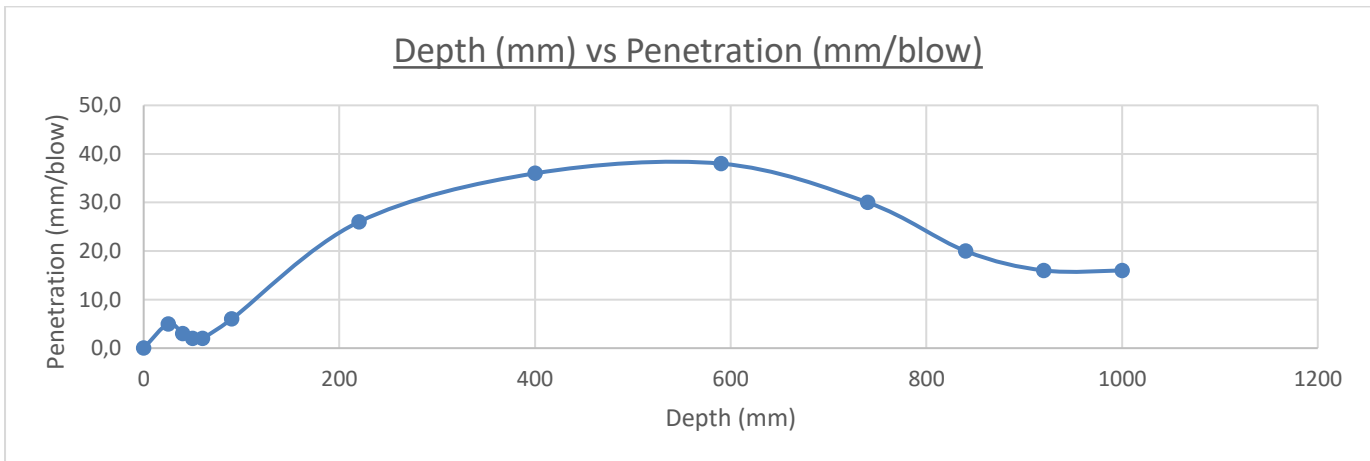
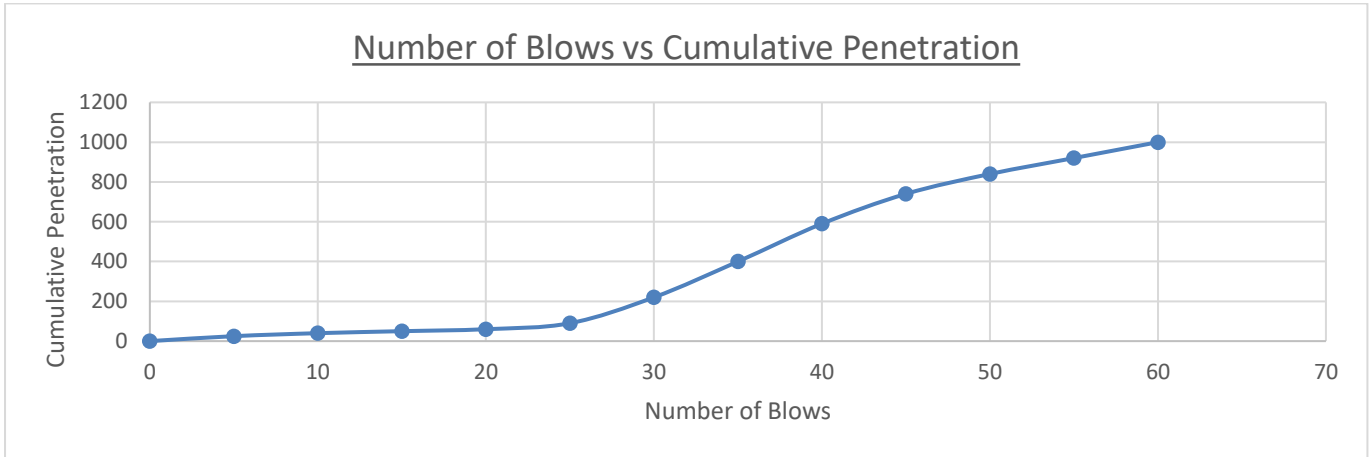
For Geopro: _____



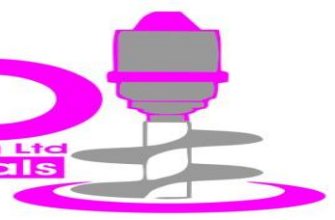
DYNAMIC CONE PENETROMETER (DCP)

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 1	Job Card No.	0600

Test Method TMH 6 – Method ST6



For Geopro:



DYNAMIC CONE PENETROMETER (DCP) TEST REPORT

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 2	Job Card No.	0600

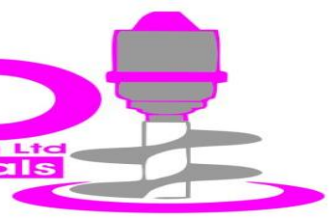
Test Method TMH6 – Method ST6

Number of blows	Penetration Readings (Fieldwork-mm)	Penetration (Depth- mm)	Cumulative Penetration (depth – mm)	Calculated Penetration (mm / blow)	In-situ CBR	kPa
					(Method ST6, Table 1)	
0	0	0	0	0,0	0	0
5	130	130	130	26,0	6	73
10	250	120	250	24,0	7	83
15	370	120	370	24,0	7	83
20	470	100	470	20,0	9	104
25	670	200	670	40,0	4	51
30	830	160	830	32,0	5	62
35	930	100	930	20,0	9	104
40	1000	70	1000	14,0	15	163

Remarks:

The above DCP test results show that, from the depth of 0mm – 1000mm, the kPa readings obtained are low, below 200kPa, this suggests that the layers encountered at these depths are firm clay layers.

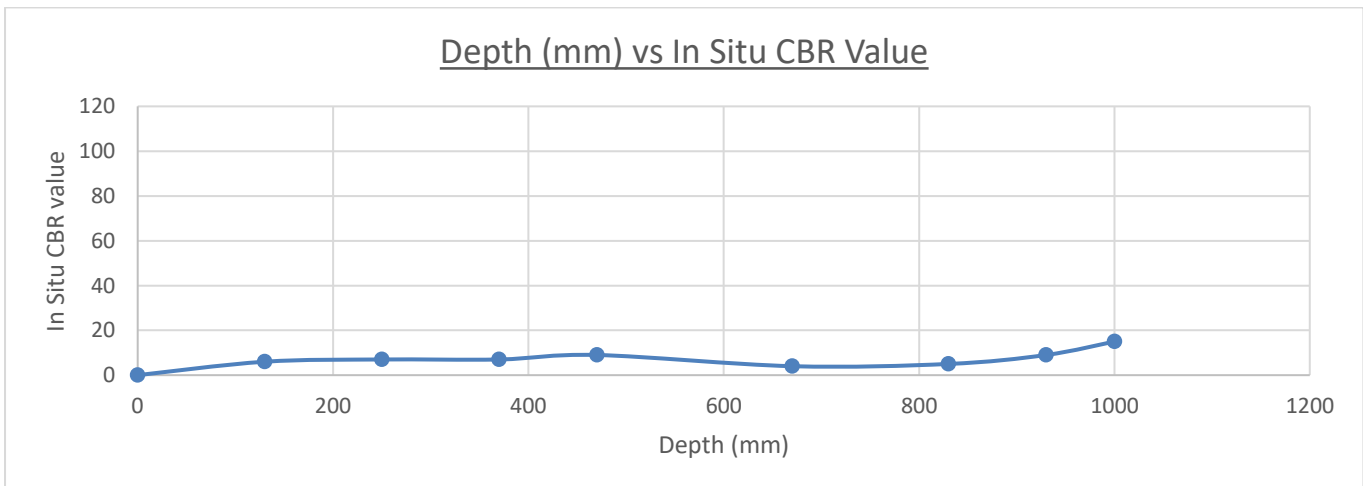
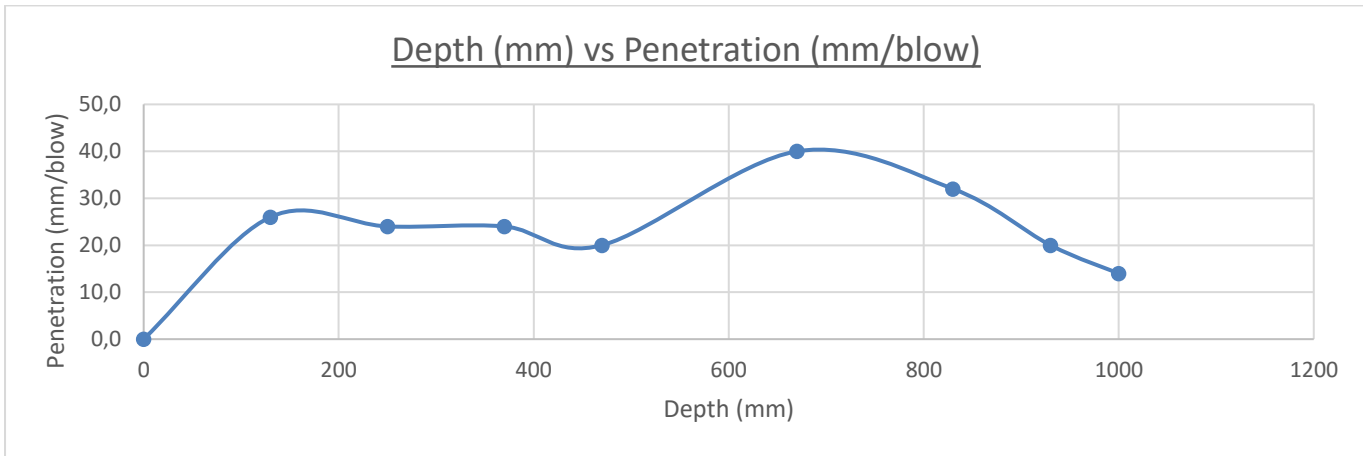
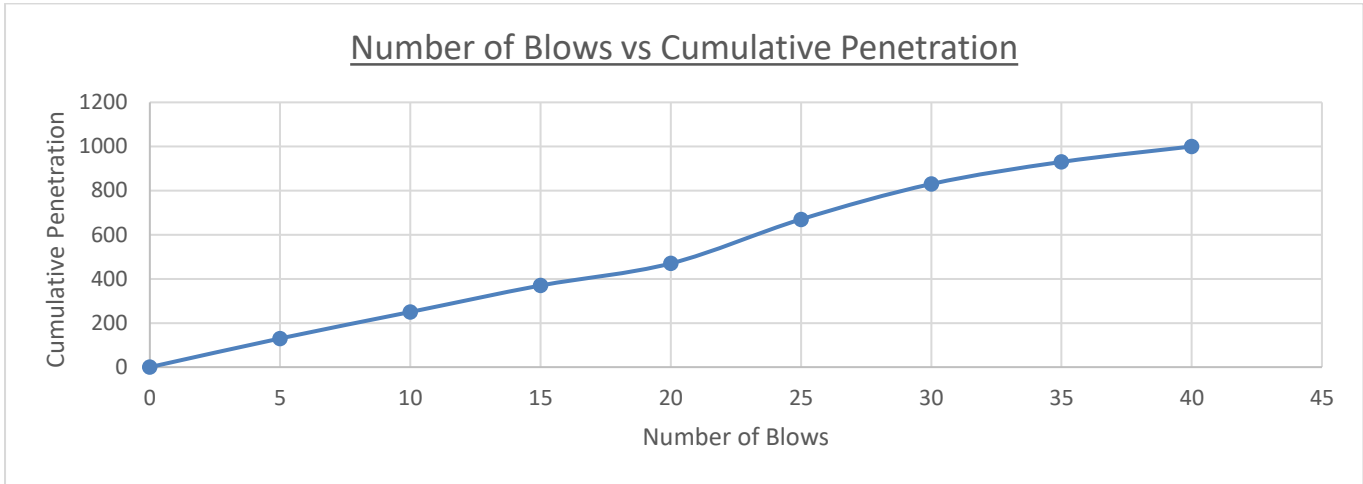
For Geopro: _____



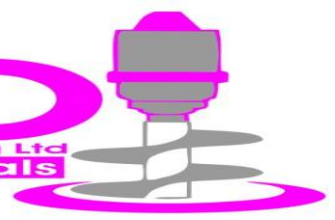
DYNAMIC CONE PENETROMETER (DCP)

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 2	Job Card No.	0600

Test Method TMH 6 – Method ST6



For Geopro:



DYNAMIC CONE PENETROMETER (DCP) TEST REPORT

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 3	Job Card No.	0600

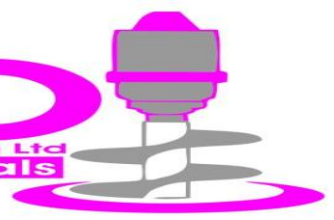
Test Method TMH6 – Method ST6

Number of blows	Penetration Readings (Fieldwork-mm)	Penetration (Depth- mm)	Cumulative Penetration (depth – mm)	Calculated Penetration (mm / blow)	In-situ CBR	kPa
					(Method ST6, Table 1)	
0	0	0	0	0,0	0	0
5	35	35	35	7,0	35	343
10	75	40	75	8,0	30	299
15	240	165	240	33,0	5	62
20	375	135	375	27,0	6	73
25	540	165	540	33,0	5	62
30	650	110	650	22,0	8	93
35	750	100	750	20,0	9	104
40	820	70	820	14,0	15	163
45	870	50	870	10,0	22	228
50	920	50	920	10,0	22	228
55	960	40	960	8,0	30	299
60	1000	40	1000	8,0	30	299

Remarks:

The above DCP test results show that, from the depth of 0mm – 75mm and 870mm – 1000mm, stiff clay material was encountered, this is shown by the average kPa readings obtained at these depths, above 200kPa. The kPa readings obtained from the depth of 240mm – 820mm decrease to below 200kPa's suggesting that the layers encountered at these depths are firm clay layers.

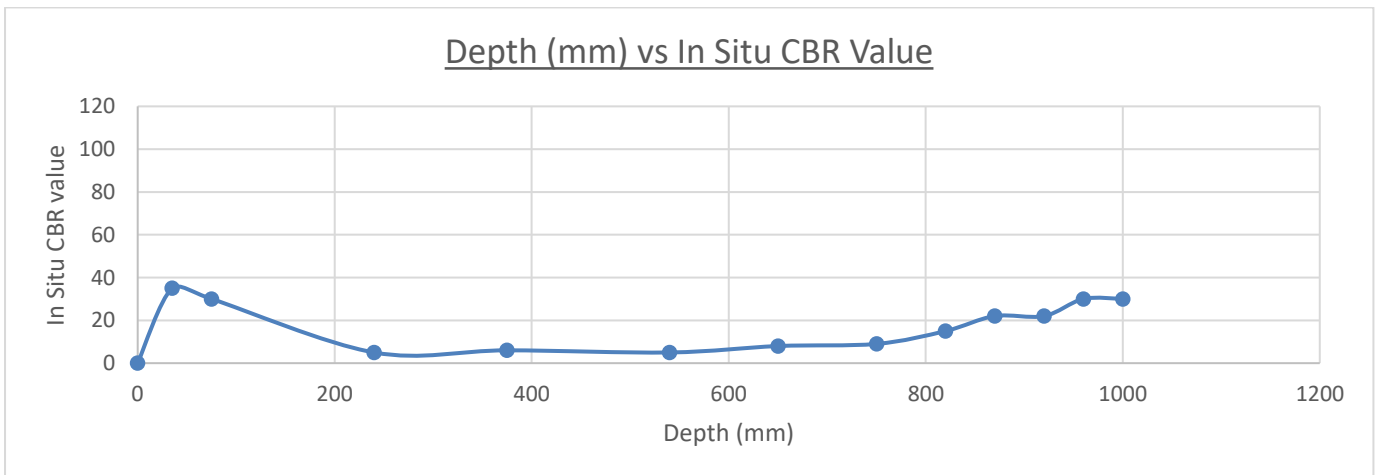
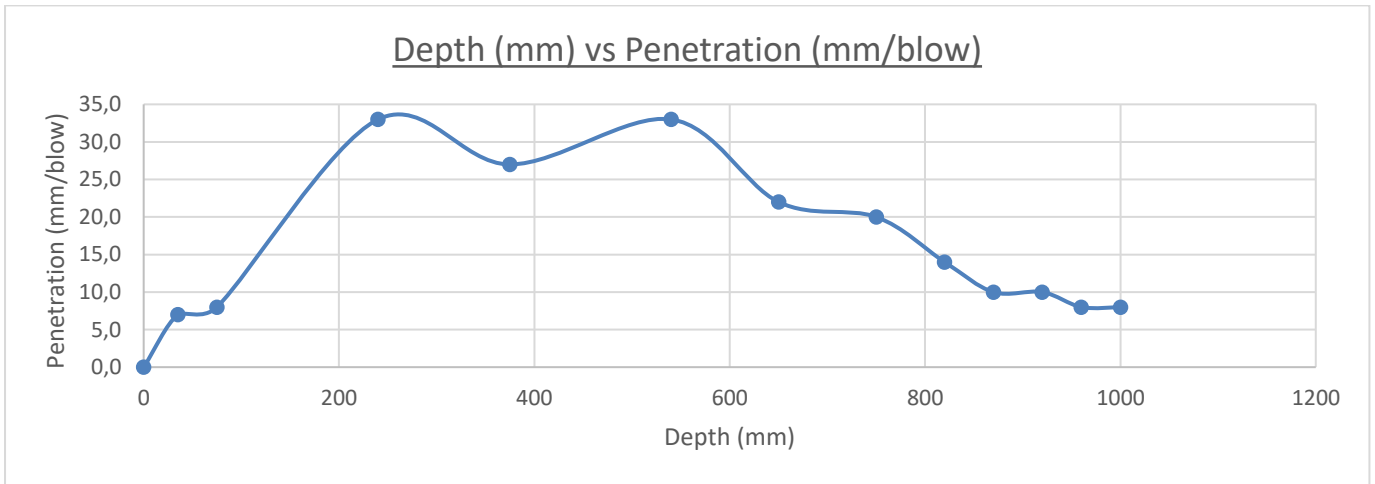
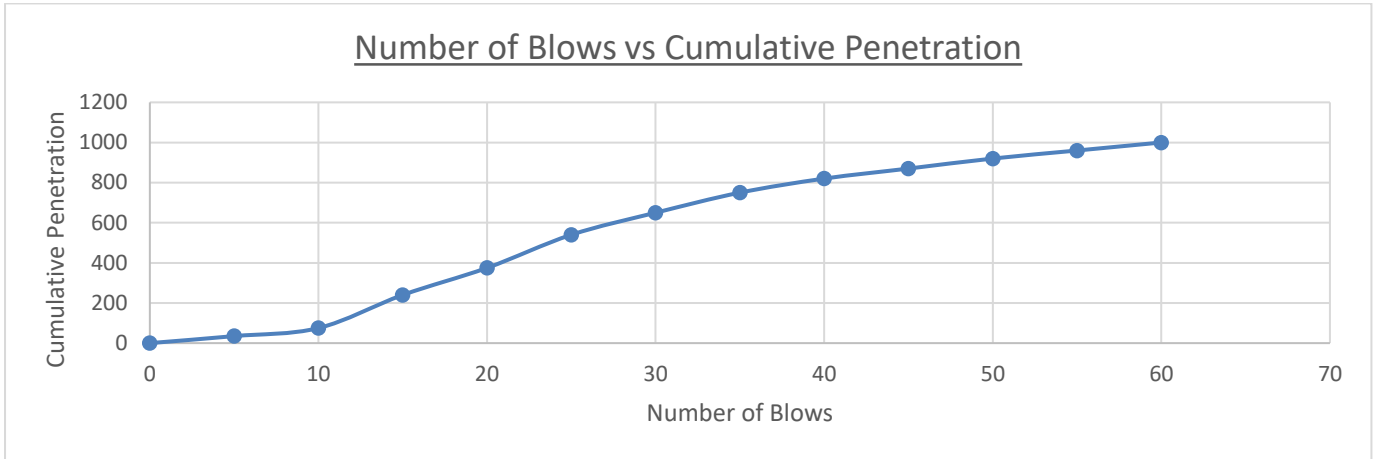
For Geopro:



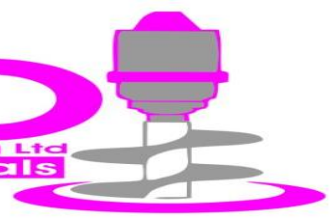
DYNAMIC CONE PENETROMETER (DCP)

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 3	Job Card No.	0600

Test Method TMH 6 – Method ST6



For Geopro:



DYNAMIC CONE PENETROMETER (DCP) TEST REPORT

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 4	Job Card No.	0600

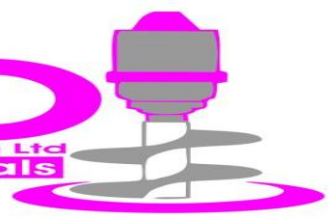
Test Method TMH6 – Method ST6

Number of blows	Penetration Readings (Fieldwork-mm)	Penetration (Depth- mm)	Cumulative Penetration (depth – mm)	Calculated Penetration (mm / blow)	In-situ CBR	kPa
					(Method ST6, Table 1)	
0	0	0	0	0,0	0	0
5	145	145	145	29,0	6	73
10	325	180	325	36,0	4	51
15	530	205	530	41,0	4	51
20	680	150	680	30,0	5	62
25	800	120	800	24,0	7	83
30	900	100	900	20,0	9	104
35	1000	100	1000	20,0	9	104

Remarks:

The above DCP test results show that, from the depth of 0mm – 1000mm, the kPa readings obtained are low, below 200kPa, this suggests that the layers encountered at these depths are firm clay layers.

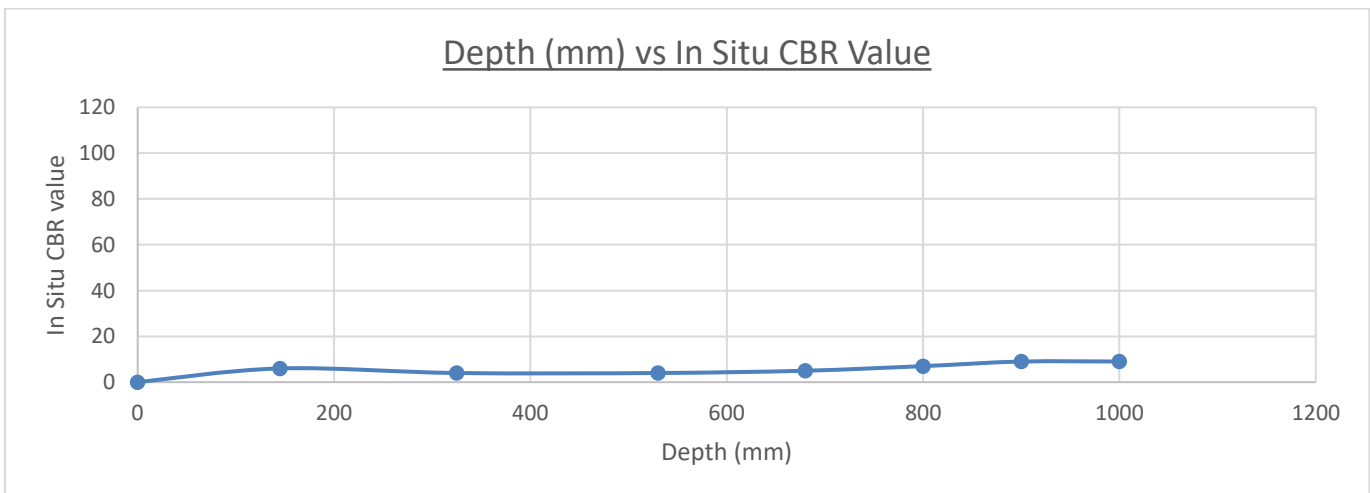
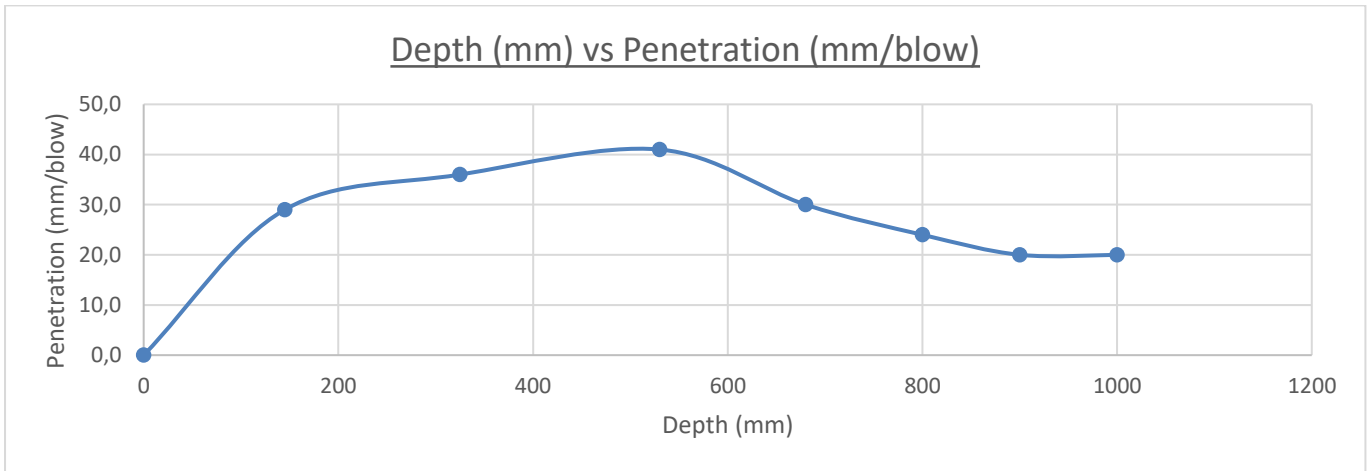
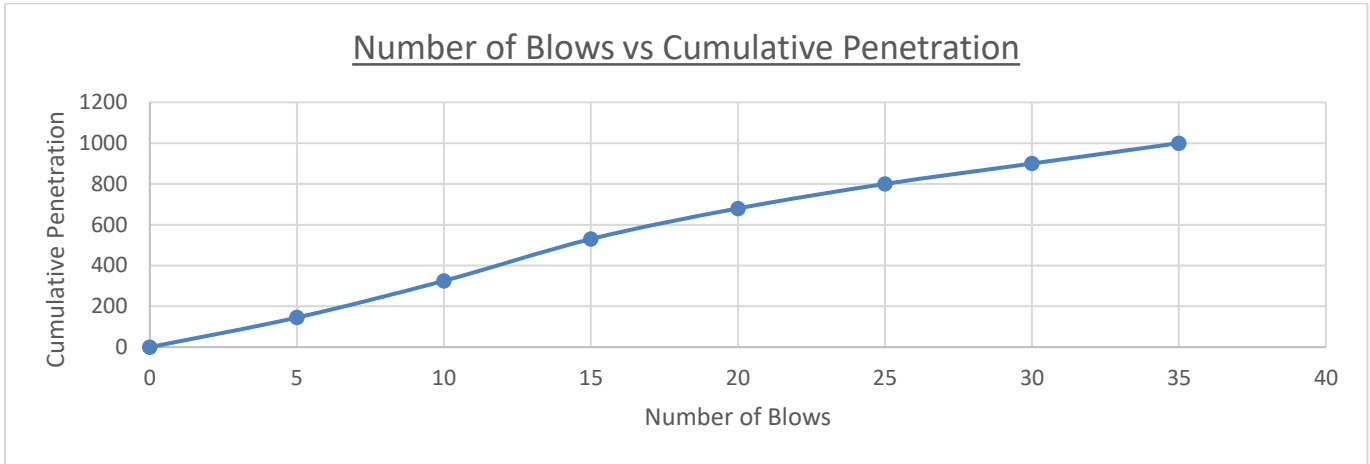
For Geopro:



DYNAMIC CONE PENETROMETER (DCP)

Client Name	Mondli Consulting Services	Date Tested	17.05.2021
Project Name	Bothas Hill Service Station	Date Reported	28.05.2021
Test Position	Test Spot 4	Job Card No.	0600

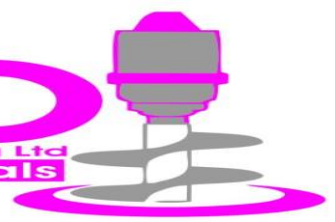
Test Method TMH 6 – Method ST6



For Geopro:

ANNEXURE C

LABORATORY SOIL TEST RESULTS




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0633
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 1 – Sample 1
Depth (mm)	0mm – 680mm
Material Description	Dark brown to black topsoil

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.0
5.0000 mm		99.5
2.0000 mm		95.4
0.4250 mm		63.5
<0.075 mm		21.0
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	33.4
Coarse – Fine Sand (%)	12.0
Medium – Fine Sand (%)	17.3
Fine – Fine Sand (%)	15.3
Silt and Clay (%)	22.0

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

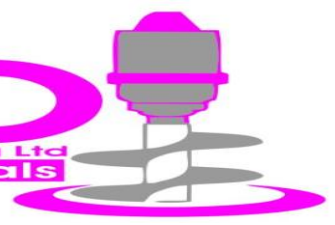
Liquid Limit (%)	40.5
Plasticity Index (%)	18.7
Linear Shrinkage (%)	9.5

Remarks:

For Geopro Civils:



The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0634
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 1 – Sample 2
Depth (mm)	680mm – 1050mm
Material Description	Light brown orange ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.1
5.0000 mm		99.7
2.0000 mm		92.3
0.4250 mm		56.5
<0.075 mm		15.3
Grading Modulus	SANS 3001 PR 5	1.36

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	35.8
Coarse – Fine Sand (%)	14.1
Medium – Fine Sand (%)	17.8
Fine – Fine Sand (%)	12.8
Silt and Clay (%)	16.6

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	45.0
Plasticity Index (%)	18.9
Linear Shrinkage (%)	9.9

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1544
Optimum Moisture Content	(%)	25.2

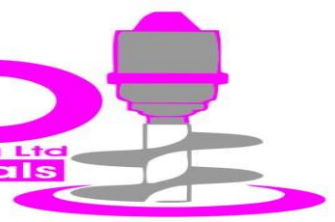
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	9
CBR @ 98% COMPACTION	7
CBR @ 95% COMPACTION	5
CBR @ 93% COMPACTION	4
CBR @ 90% COMPACTION	2
SWELL @ 100% COMPACTION	2.1

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

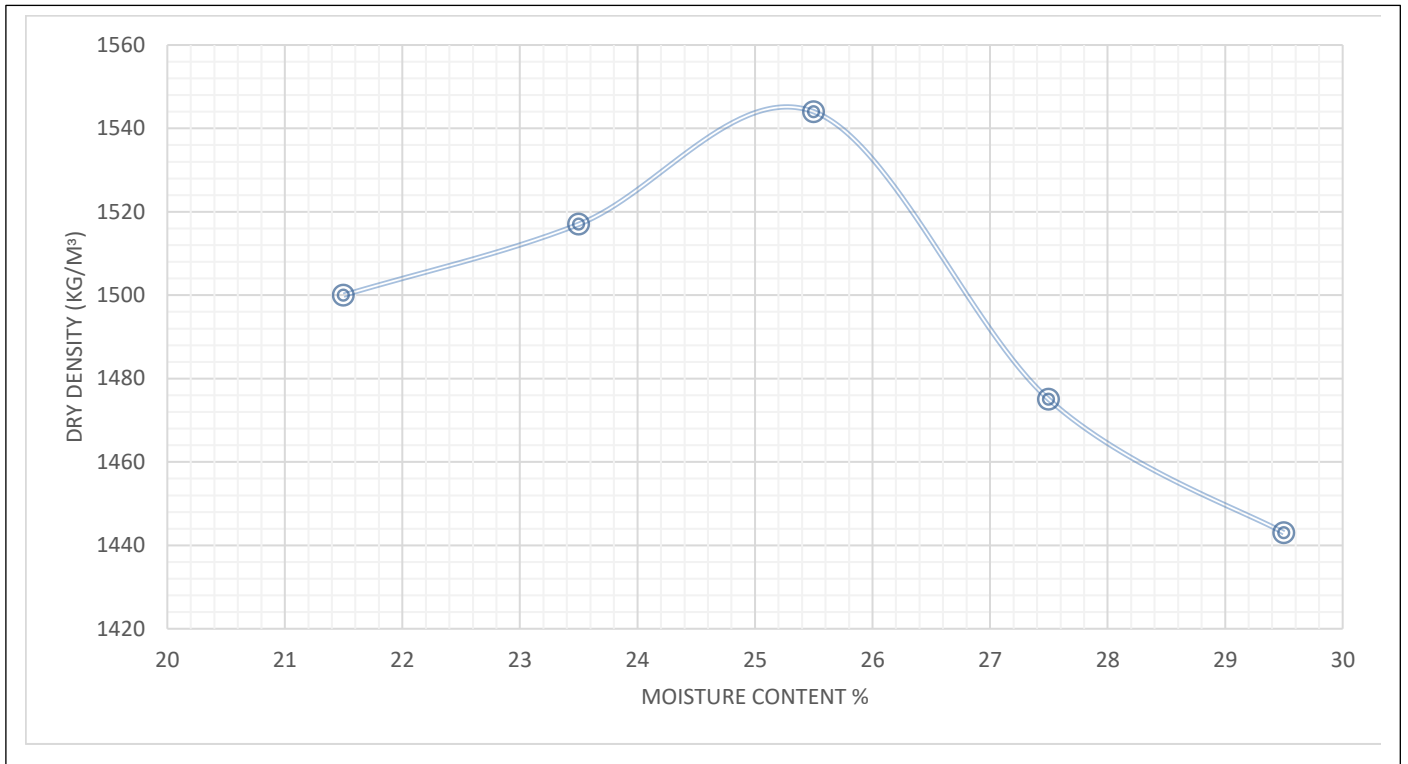
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0634
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 1 – Sample 2
Depth (mm)	680mm – 1050mm
Material Description	Light brown orange ferruginous sand with quartz minerals

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

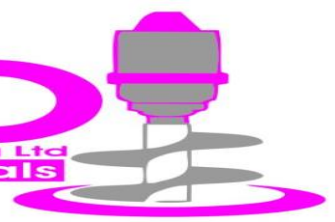
Moisture Content (%)	21.5	23.5	25.5	27.5	29.5		
Dry Density (kg/m³)	1500	1517	1544	1475	1443		



Maximum Dry Density (kg/m³)	1544
Optimum Moisture Content (%)	25.2

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0635
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 1 – Sample 3
Depth (mm)	1050mm – 1450mm
Material Description	Dark red ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-	-
75.000 mm		-	-
63.000 mm		-	-
50.000 mm		-	-
37.500 mm		-	-
28.000 mm		-	-
20.000 mm		-	-
14.000 mm		100.0	
5.0000 mm		99.1	
2.0000 mm		84.5	
0.4250 mm		62.8	
<0.075 mm		21.4	
Grading Modulus	SANS 3001 PR 5	1.31	

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	25.7
Coarse – Fine Sand (%)	10.4
Medium – Fine Sand (%)	20.8
Fine – Fine Sand (%)	17.8
Silt and Clay (%)	25.3

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	51.0
Plasticity Index (%)	18.0
Linear Shrinkage (%)	9.2

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1590
Optimum Moisture Content	(%)	23.7

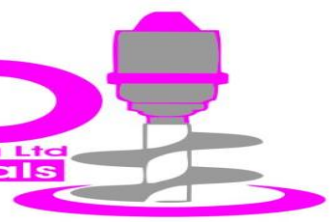
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	8
CBR @ 98% COMPACTION	7
CBR @ 95% COMPACTION	6
CBR @ 93% COMPACTION	4
CBR @ 90% COMPACTION	3
SWELL @ 100% COMPACTION	2.1

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

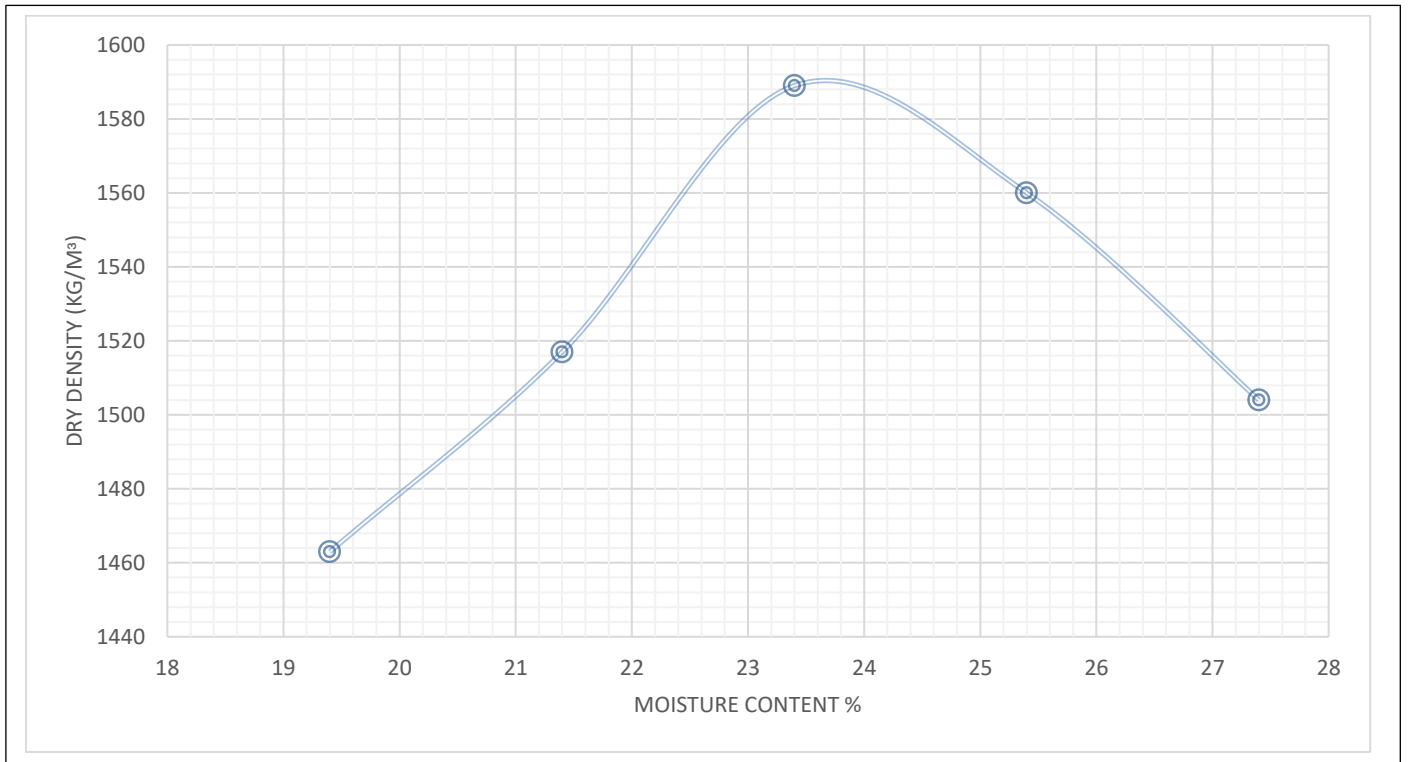
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0635
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 1 – Sample 3
Depth (mm)	1050mm – 1450mm
Material Description	Dark red ferruginous sand with quartz minerals

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Moisture Content (%)	19.4	21.4	23.4	25.4	27.4		
Dry Density (kg/m³)	1463	1517	1589	1560	1504		



Maximum Dry Density (kg/m³)	1590
Optimum Moisture Content (%)	23.7

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0638
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 2 – Sample 1
Depth (mm)	0mm – 690mm
Material Description	Dark brown to black topsoil

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		100.0
14.000 mm		98.9
5.0000 mm		95.5
2.0000 mm		81.8
0.4250 mm		48.9
<0.075 mm		14.7
Grading Modulus	SANS 3001 PR 5	1.55

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	40.2
Coarse – Fine Sand (%)	16.1
Medium – Fine Sand (%)	14.9
Fine – Fine Sand (%)	10.8
Silt and Clay (%)	18.0

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	40.8
Plasticity Index (%)	12.2
Linear Shrinkage (%)	6.8

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1591
Optimum Moisture Content	(%)	20.7

CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	8
CBR @ 98% COMPACTION	6
CBR @ 95% COMPACTION	5
CBR @ 93% COMPACTION	3
CBR @ 90% COMPACTION	2
SWELL @ 100% COMPACTION	2.0

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

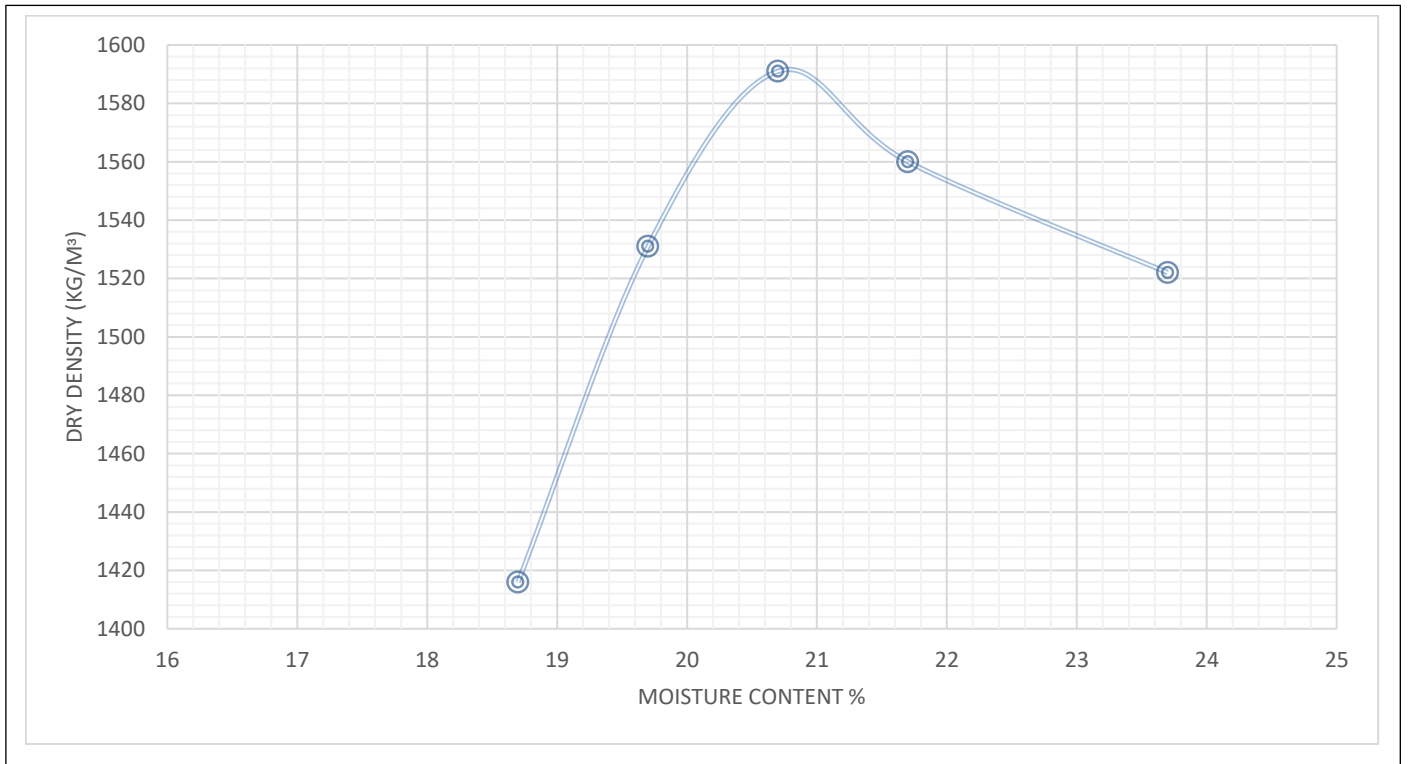
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0638
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 2 – Sample 1
Depth (mm)	0mm – 690mm
Material Description	Dark brown to black topsoil

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

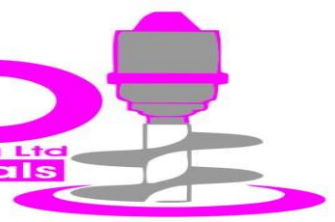
Moisture Content (%)	18.7	19.7	20.7	21.7	22.7		
Dry Density (kg/m³)	1416	1531	1591	1560	1522		



Maximum Dry Density (kg/m³)	1591
Optimum Moisture Content (%)	20.7

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



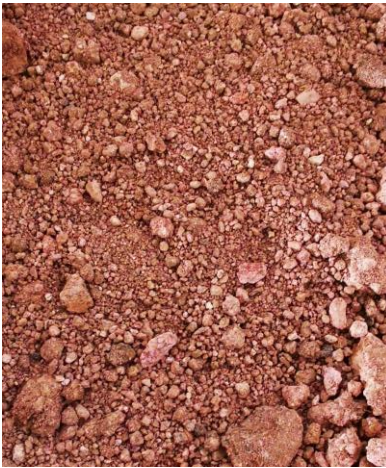
SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0637
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 2 – Sample 2
Depth (mm)	690mm – 1600mm
Material Description	Light brown orange ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.0
5.0000 mm		99.3
2.0000 mm		84.8
0.4250 mm		58.9
<0.075 mm		40.1
Grading Modulus	SANS 3001 PR 5	1.16

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	30.5
Coarse – Fine Sand (%)	4.9
Medium – Fine Sand (%)	9.0
Fine – Fine Sand (%)	8.3
Silt and Clay (%)	47.3

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	41.7
Plasticity Index (%)	13.3
Linear Shrinkage (%)	7.3

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1792
Optimum Moisture Content	(%)	16.0

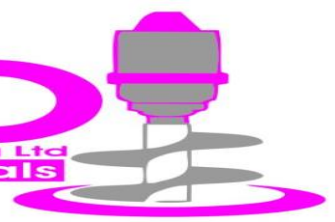
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	12
CBR @ 98% COMPACTION	11
CBR @ 95% COMPACTION	8
CBR @ 93% COMPACTION	6
CBR @ 90% COMPACTION	4
SWELL @ 100% COMPACTION	1.8

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

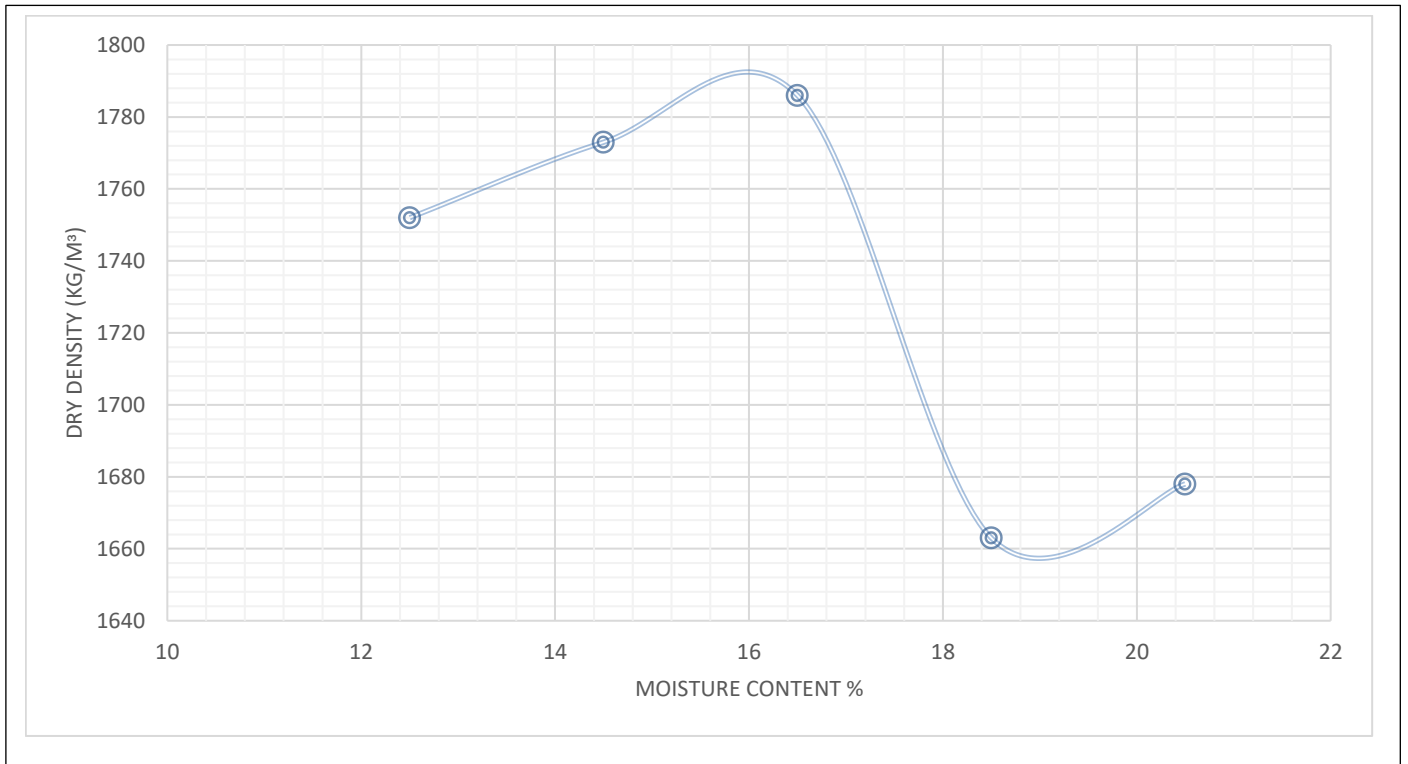
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0637
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 2 – Sample 2
Depth (mm)	690mm – 1600mm
Material Description	Light brown orange ferruginous sand with quartz minerals

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Moisture Content (%)	12.5	14.5	16.5	18.5	20.5		
Dry Density (kg/m³)	1752	1773	1786	1663	1678		



Maximum Dry Density (kg/m³)	1792
Optimum Moisture Content (%)	16.0

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



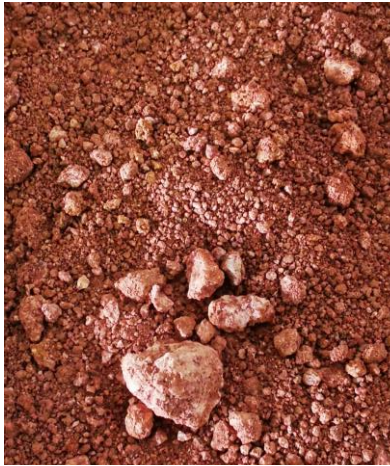
SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0638
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 2 – Sample 3
Depth (mm)	>1600mm
Material Description	Orange red ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-	-
75.000 mm		-	-
63.000 mm		-	-
50.000 mm		-	-
37.500 mm		-	-
28.000 mm		-	-
20.000 mm		-	-
14.000 mm		100.1	
5.0000 mm		99.0	
2.0000 mm		83.6	
0.4250 mm		57.9	
<0.075 mm		42.8	
Grading Modulus		SANS 3001 PR 5	1.16

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	30.7
Coarse – Fine Sand (%)	4.2
Medium – Fine Sand (%)	7.6
Fine – Fine Sand (%)	6.2
Silt and Clay (%)	51.2

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

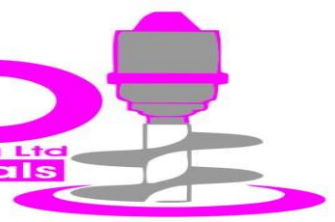
Liquid Limit (%)	41.8
Plasticity Index (%)	11.7
Linear Shrinkage (%)	6.1

Remarks:

For Geopro Civils:



The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0639
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 3 – Sample 1
Depth (mm)	0mm – 670mm
Material Description	Dark brown to black topsoil

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		100.0
14.000 mm		99.3
5.0000 mm		96.4
2.0000 mm		81.1
0.4250 mm		45.3
<0.075 mm		24.0
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	44.1
Coarse – Fine Sand (%)	10.6
Medium – Fine Sand (%)	8.9
Fine – Fine Sand (%)	6.7
Silt and Clay (%)	29.6

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	43.8
Plasticity Index (%)	17.4
Linear Shrinkage (%)	9.5

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1598
Optimum Moisture Content	(%)	20.3

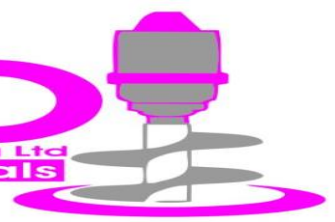
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	10
CBR @ 98% COMPACTION	7
CBR @ 95% COMPACTION	6
CBR @ 93% COMPACTION	4
CBR @ 90% COMPACTION	3
SWELL @ 100% COMPACTION	1.8

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

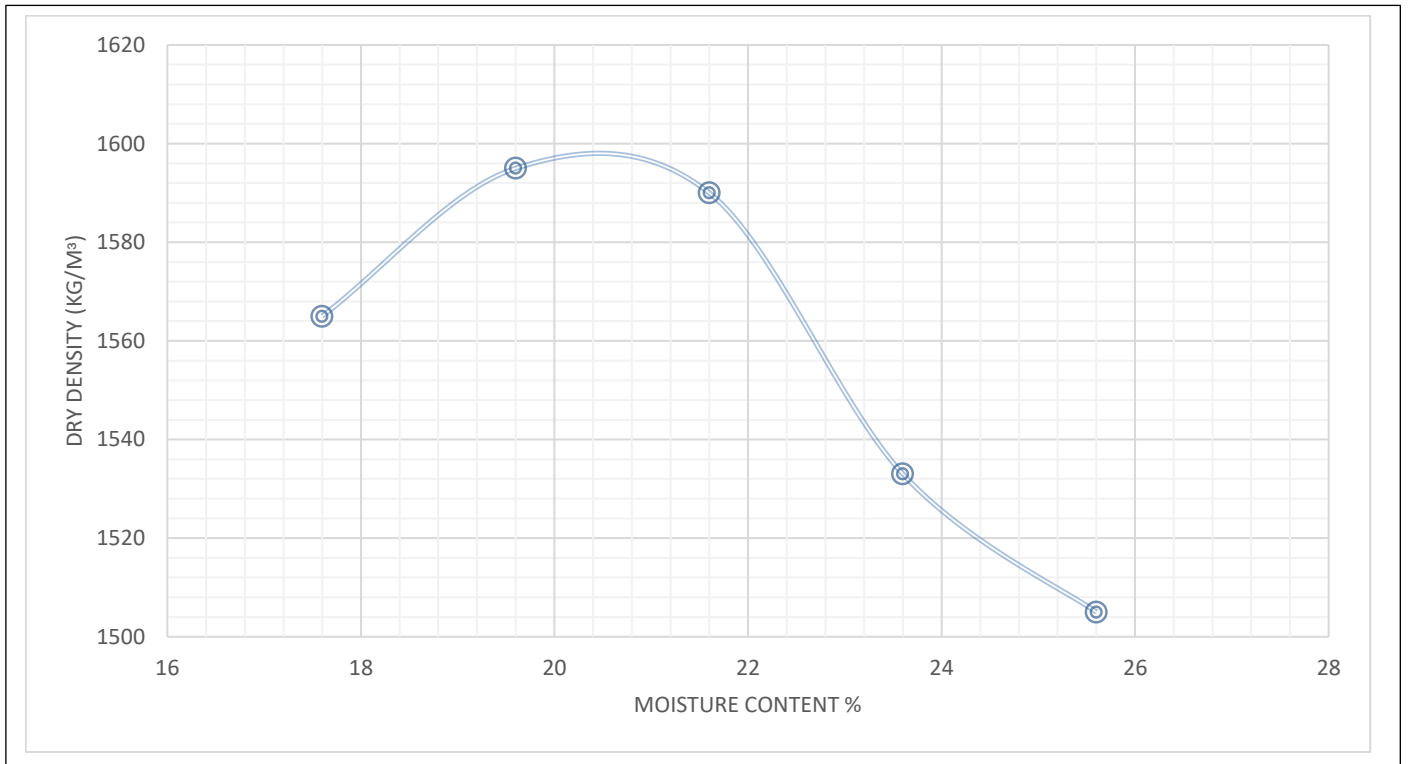
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0639
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 3 – Sample 1
Depth (mm)	0mm – 670mm
Material Description	Dark brown to black topsoil

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

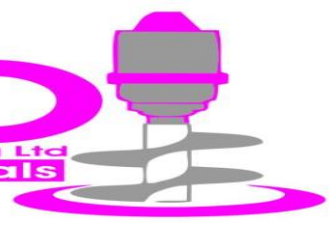
Moisture Content (%)	17.6	19.6	21.6	23.6	25.6		
Dry Density (kg/m³)	1565	1595	1590	1533	1505		



Maximum Dry Density (kg/m³)	1598
Optimum Moisture Content (%)	20.3

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



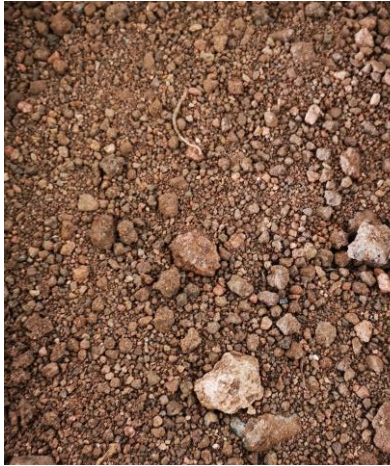
SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0640
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 3 – Sample 2
Depth (mm)	670mm – 1090mm
Material Description	Light brown orange ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		100.0
14.000 mm		99.2
5.0000 mm		96.7
2.0000 mm		79.4
0.4250 mm		45.5
<0.075 mm		25.9
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	42.7
Coarse – Fine Sand (%)	7.4
Medium – Fine Sand (%)	8.6
Fine – Fine Sand (%)	8.6
Silt and Clay (%)	32.6

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	40.3
Plasticity Index (%)	13.5
Linear Shrinkage (%)	7.9

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1664
Optimum Moisture Content	(%)	18.1

CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	9
CBR @ 98% COMPACTION	8
CBR @ 95% COMPACTION	6
CBR @ 93% COMPACTION	5
CBR @ 90% COMPACTION	3
SWELL @ 100% COMPACTION	1.6

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

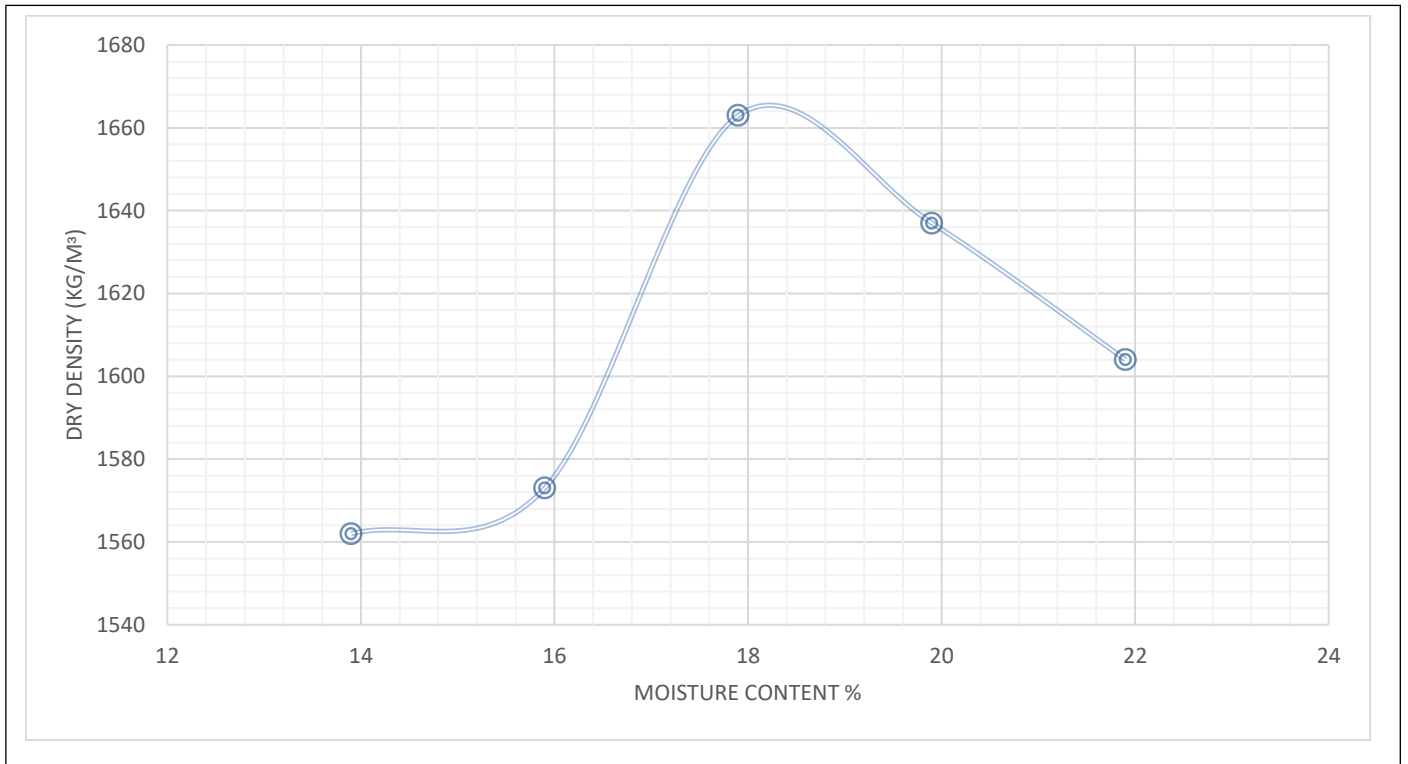
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0640
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 3 – Sample 2
Depth (mm)	670mm – 1090mm
Material Description	Light brown orange ferruginous sand with quartz minerals

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Moisture Content (%)	13.9	15.9	17.9	19.9	21.9		
Dry Density (kg/m³)	1562	1573	1663	1637	1604		



Maximum Dry Density (kg/m³)	1664
Optimum Moisture Content (%)	18.1

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0641
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 3 – Sample 3
Depth (mm)	1090mm – 1500mm
Material Description	Pinkish ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		100.0
28.000 mm		96.9
20.000 mm		96.9
14.000 mm		96.9
5.0000 mm		94.4
2.0000 mm		78.3
0.4250 mm		52.6
<0.075 mm		37.3
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	32.8
Coarse – Fine Sand (%)	6.8
Medium – Fine Sand (%)	6.0
Fine – Fine Sand (%)	6.8
Silt and Clay (%)	47.6

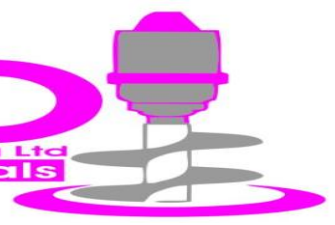
ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	38.8
Plasticity Index (%)	11.5
Linear Shrinkage (%)	6.8

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0642
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 4 – Sample 1
Depth (mm)	0mm – 530mm
Material Description	Dark brown to black topsoil

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.1
5.0000 mm		99.7
2.0000 mm		88.5
0.4250 mm		49.9
<0.075 mm		20.5
Grading Modulus	SANS 3001 PR 5	1.41

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	43.6
Coarse – Fine Sand (%)	13.5
Medium – Fine Sand (%)	11.3
Fine – Fine Sand (%)	8.5
Silt and Clay (%)	23.2

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	39.7
Plasticity Index (%)	14.0
Linear Shrinkage (%)	8.6

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density	(kg/m ³)	1594
Optimum Moisture Content	(%)	20.3

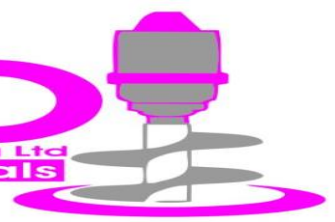
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	7
CBR @ 98% COMPACTION	6
CBR @ 95% COMPACTION	5
CBR @ 93% COMPACTION	3
CBR @ 90% COMPACTION	2
SWELL @ 100% COMPACTION	2.0

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

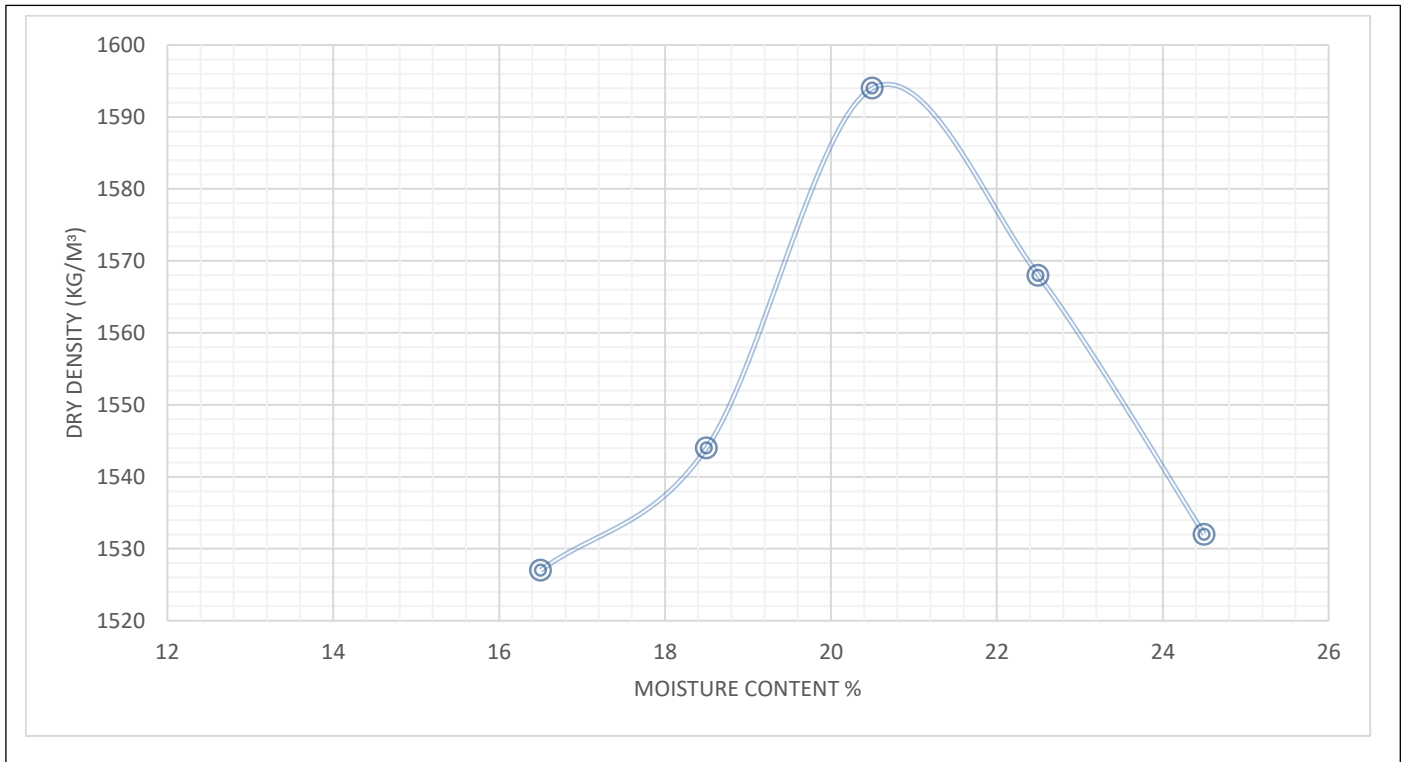
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0642
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 4 – Sample 1
Depth (mm)	0mm – 530mm
Material Description	Dark brown to black topsoil

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Moisture Content (%)	16.5	18.5	20.5	22.5	24.5		
Dry Density (kg/m³)	1527	1544	1594	1568	1532		



Maximum Dry Density (kg/m³)	1594
Optimum Moisture Content (%)	20.3

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.




SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0643
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 4 – Sample 2
Depth (mm)	530mm – 1500mm
Material Description	Light brown orange ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.0
5.0000 mm		98.2
2.0000 mm		77.1
0.4250 mm		51.1
<0.075 mm		30.1
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	33.7
Coarse – Fine Sand (%)	8.0
Medium – Fine Sand (%)	10.6
Fine – Fine Sand (%)	8.6
Silt and Clay (%)	39.0

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	46.3
Plasticity Index (%)	18.9
Linear Shrinkage (%)	10.2

CLASSIFICATION

TRH 14 Classification (1985)	#	G10
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MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

Maximum Dry Density (kg/m ³)	1788
Optimum Moisture Content (%)	15.1

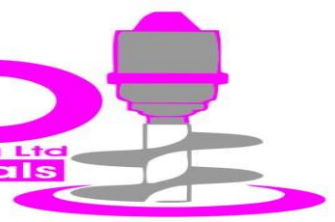
CALIFORNIA BEARING RATIO – SANS 3001 – GR40

CBR @ 100% COMPACTION	12
CBR @ 98% COMPACTION	9
CBR @ 95% COMPACTION	7
CBR @ 93% COMPACTION	6
CBR @ 90% COMPACTION	4
SWELL @ 100% COMPACTION	1.6

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



Customer : Mondli Consulting Services
Project : Bothas Hill Service Station & Retail Centre
Sampling Process : Sampled & delivered by Geopro Civils

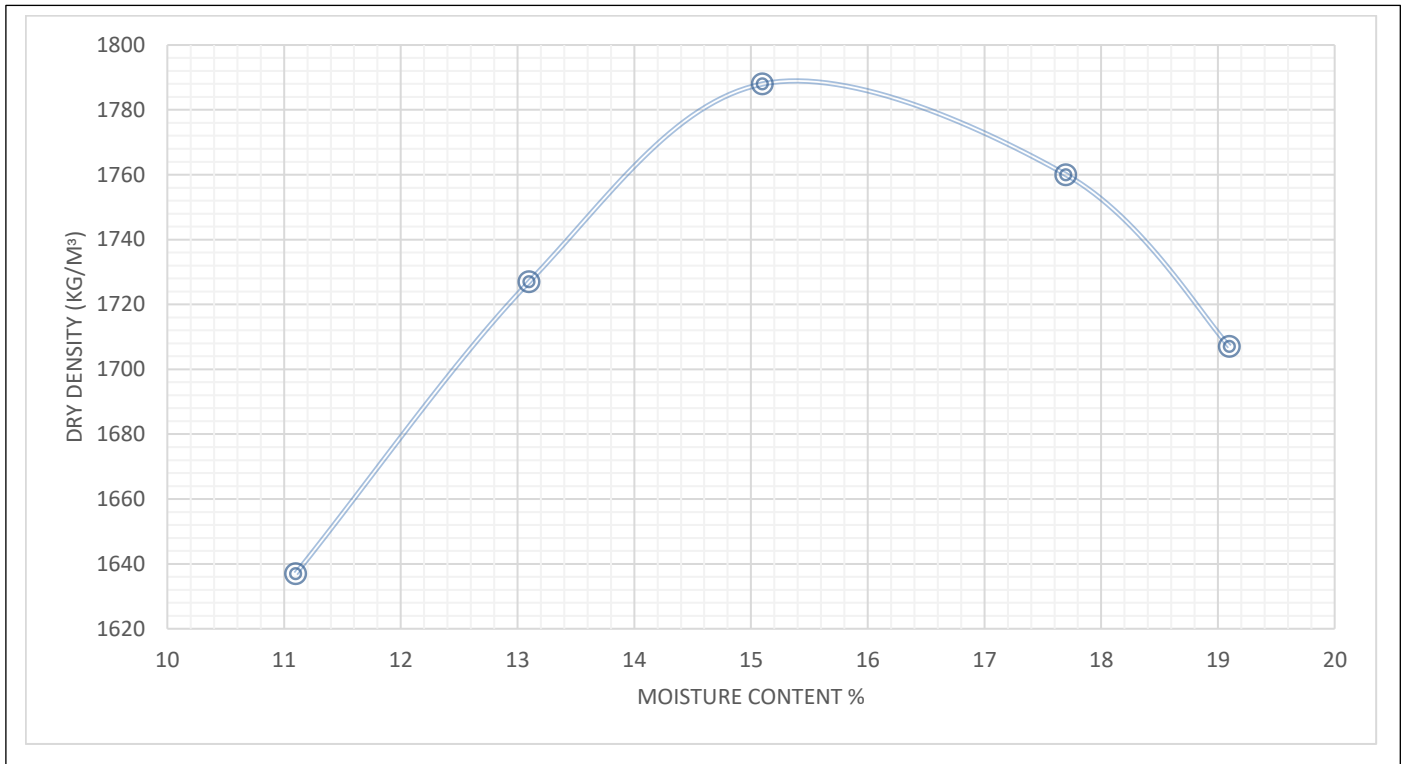
Date Received : 17.05.2021
Date Reported : 28.05.2021
Job Card No. : 0600

MATERIALS TEST REPORT

Laboratory No.	GP0643
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 4 – Sample 2
Depth (mm)	530mm – 1500mm
Material Description	Light brown orange ferruginous sand with quartz minerals

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT – SANS 3001 – GR30

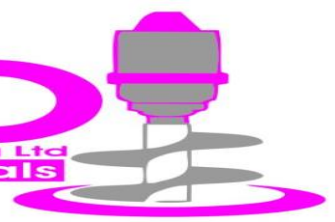
Moisture Content (%)	11.1	13.1	15.1	17.1	19.1		
Dry Density (kg/m³)	1637	1727	1888	1760	1707		



Maximum Dry Density (kg/m³)	1788
Optimum Moisture Content (%)	15.1

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.



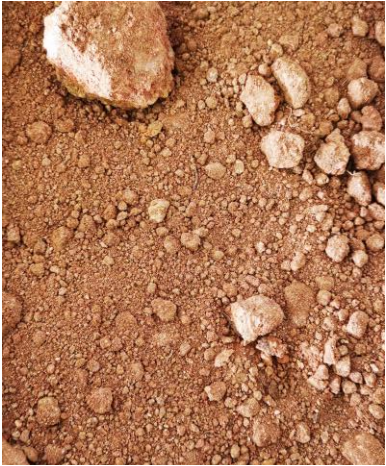
SOIL CLASSIFICATION TEST REPORT

Customer	: Mondli Consulting Services	Date Received	: 17.05.2021
Project	: Bothas Hill Service Station & Retail Centre	Date Reported	: 28.05.2021
Sampling Process	: Sampled & delivered by Geopro Civils	Job Card No.	: 0600

MATERIALS TEST REPORT

Laboratory No.	GP0644
Field No.	ERF363 Bothas Hill
Position in Field	Test Pit 4 – Sample 3
Depth (mm)	>1500mm
Material Description	Orange yellowish ferruginous sand with quartz minerals

SIEVE ANALYSIS (% PASSING) – SANS 3001 – GR1

100.00 mm		-
75.000 mm		-
63.000 mm		-
50.000 mm		-
37.500 mm		-
28.000 mm		-
20.000 mm		-
14.000 mm		100.0
5.0000 mm		98.5
2.0000 mm		85.0
0.4250 mm		64.8
<0.075 mm		41.5
Grading Modulus		SANS 3001 PR 5

MECHANICAL ANALYSIS – SANS 3001 – GR1

Coarse Sand (%)	23.8
Coarse – Fine Sand (%)	5.3
Medium – Fine Sand (%)	10.7
Fine – Fine Sand (%)	11.4
Silt and Clay (%)	48.8

ATTERBERG LIMITS – SANS 3001 – GR10 & GR12

Liquid Limit (%)	43.0
Plasticity Index (%)	11.3
Linear Shrinkage (%)	6.7

Remarks:

For Geopro Civils:

The above test results are pertinent only to the samples received and tested at the laboratory. Compaction of CBR specimens were done using Optimum Nominal Moisture Content and Maximum Wet Density, referred to as “the wet curve method”. This report shall not be reproduced, except in full, without The prior consent of Geopro Civils (Pty) Ltd.

ANNEXURE D

MEDIA - TRIAL PITS

ADDITIONAL IMAGES

ERF363 – BOTHAS HILL SERVICE STATION & RETAIL CENTRE

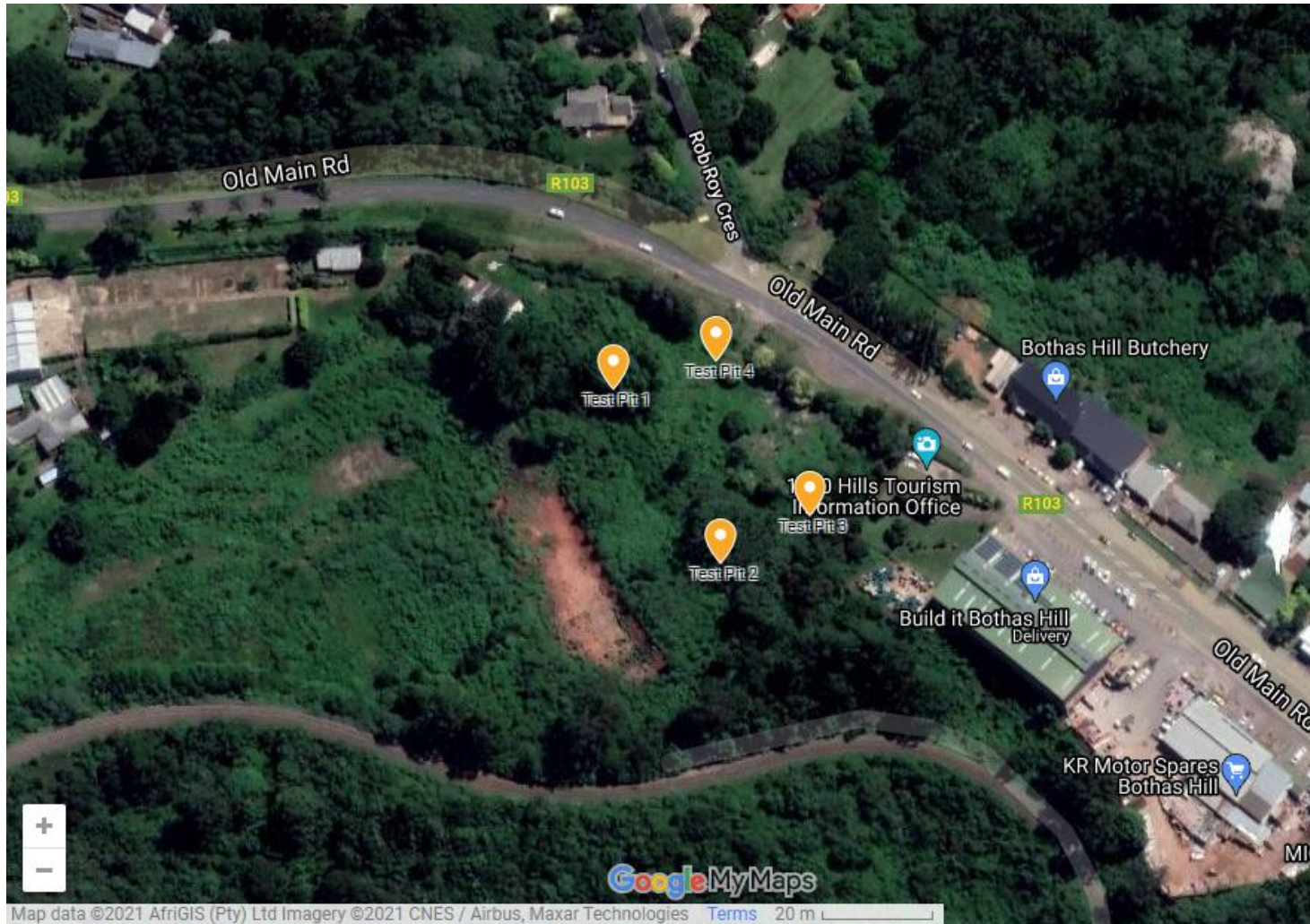


ANNEXURE E

TOPOGRAPHY

MONDLI CONSULTING SERVICES

ERF363 – BOTHAS HILL SERVICE STATION & RETAIL CENTRE



PROJECT: ERF363 Bothas Hill	
CLIENT: Mondli Consulting Services	
DATE: 17 May 2021	FIGURE: 5/5
DRAWN: S Binda	REVISION: 00
CHECKED: M Msibi	NOTE: n/a

Image sources from Google Maps	
Latitude	: S 29° 45' 5.695"
Longitude	: E 30° 44' 24.1"

Figure 4: Image showing the Test Pit (TP) location for the proposed Service Station & Retail Centre Development on ERF363, Bothas Hill, Durban , Kwa-Zulu Natal

MONDLI CONSULTING SERVICES

ERF363 – BOTHAS HILL SERVICE STATION & RETAIL CENTRE



ANNEXURE F

GEOLOGICAL MAP

KZN GEOLOGICAL MAP

