



NKETOANA LOCAL
MUNICIPALITY

PROPOSED TOWNSHIP ESTABLISHMENT ON FARM MORGEN 542, REITZ

GEOTECHNICAL ENGINEERING REPORT

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EXECUTION SUMMARY

*This Geotechnical report was conducted for Morgen 542 to establish and determine the underlying geology and possible constraints pertaining to all of the engineering works that may have to be carried out on this particular site.

*Located South of Reitz' Central Business District, Morgen 542 is predominantly underlined by the Tarkastad and Normandien Formation.

*No groundwater was encountered in all of the test pits dug for this particular development.

*Various inspections and test were performed and the following design criteria were deduced:

-H, HI, C1, S1 and R Residential Classifications were recommended with the foundation depth expected to be no less than 1.0m.

*The Generic Specification Document (GFSH 2) was used as a guide in establishing various parameters highlighted in this report.

* The average slope of the site's topography is approximately 4.7%

*Out of all of the 6 regions investigated, one exhibited hard-rock at very shallow depths. This is located at the Northern Part of the property where there is a borrow pit. See sample **22/S4102**

*According to the soil sample test results that were carried out by Roadlab Laboratories (Pty) Ltd, all of the samples comprised of Silt, Clay and/or Clay-sized particles greater than 50%.

*Only one test pit recorded a higher-than-normal plasticity index **22/S4102**

while all of the samples from the other test pits within this region recorded low plasticity index. See *APPENDIX D: SOIL SAMPLE ANALYSIS AT THE LAB*

*On average, most regions on Morgen 542 possess hard rock and it is located deeper than 2.66m

1. INTRODUCTION AND TERMS OF REFERENCE

Batsumi Consulting Engineers were commissioned by Gert Tack Konstruksie to conduct a Geotechnical investigation in line with the Department of Housing's Generic Specification document (GFSH 2) directed at the relevant Provincial or National Housing Department for the proposed new township on Farm Morgen 542, in Reitz, in the Eastern Free State.

The purpose of this investigation was to provide information pertaining to the nature and geotechnical properties of the soil and substrata encountered in the identified land parcel.

The report presents i) information used in the study, ii) a site locality description, iii) the methodology applied, iv) identified Site Geology and Groundwater Conditions, v) the Geotechnical basis for a safe and appropriate land use, infrastructure and housing unit design, vi) the site classification in terms of the council's residential site class designation, vii) the foundation recommendations and solutions, viii) a site drainage prescription, ix) Identified potential hazards and formulate precautionary measures and risk management procedures necessary.

The information generated by this particular study aims to give a sense of guidance and to establish some design criteria for the engineering design team so as to produce accurate foundations and any other related structural designs in compliance with the National Building Regulations and Building Standards Act 103 of 1977 and possible enrollment with South Africa's National Home Builders Registration Council (NHBRC)

2. INFORMATION USED IN THE STUDY

The following methodologies were employed to accumulate the relevant information concerning this project:

*A desktop studies

- To identify the site and surrounding area to better understand the Morgen 542.
- Geological and soil information obtained from previous studies conducted.

* Field studies

- To corroborate the information obtained during the desktop study.

* Drilling

- To determine the soil profile and different soil forms for mapping purpose.

*Test pits dug up by use of a Tractor-Loader-Backhoe (TLB)

- To determine the characteristics of the sub strata and underlying geological formations where a total of 6 Test pits were investigated

* Sampling of soil profiles

- Sampling of the various soil profiles to the general prescribed methodologies.

*Soil Analysis

- Soil analysis was conducted by Roadlab Laboratories Pty (Ltd), an accredited soil laboratory.

*Reporting on findings

- Reporting follows the prescribed Generic Specification (GFSH 2) proforma

3. SITE DESCRIPTION

The Proposed New Township will be located South of the town Central Business District, geologically not far from the prominent Stompkop hill where Petsana is currently situated, with the R26 road leading to be CBD located North-East of the property under consideration. Figure 01 shows the land parcel on Satellite image with the following centroid:

Co-ordinate System: **Hartebeeshoek 1994: Lo27**

-56 522.080; -3 077 868.136

World coordinate System: **WGS 84**

-27.8131563° S; 28.4263578° E

The extent of the site is approximately= 8.5383 Ha. (1566m above sea level)

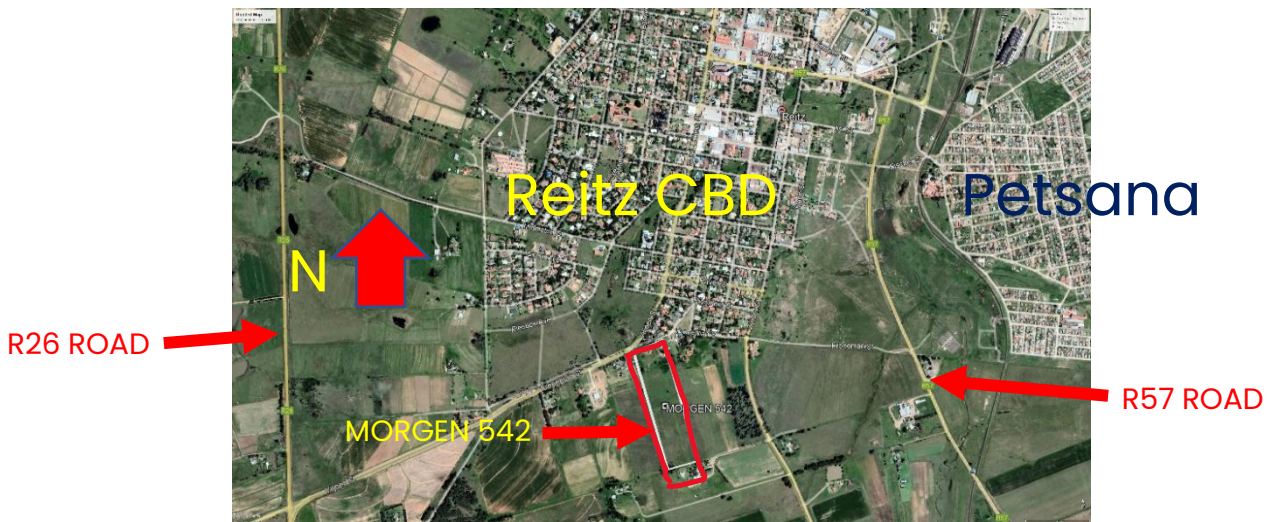


Figure 01: Site Locality

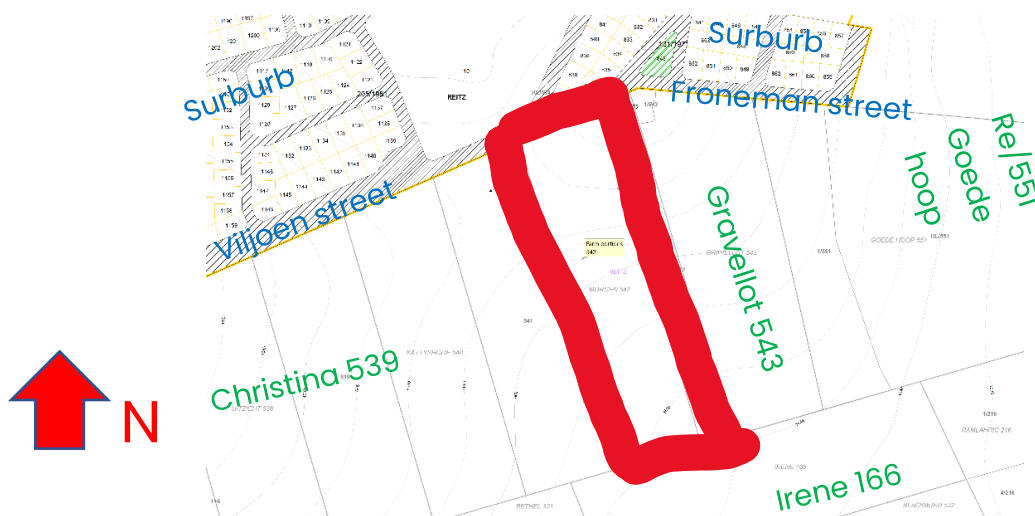


Figure 02: Site Extent

4. NATURE OF INVESTIGATION

The evaluation of data collected from a land survey followed by normal professional procedures of evaluation, starting with a critical assessment of the specific geological formation (SA Geological Map; 2728 Frankfort) and the lithology of the area were applied.

In addition to the abovementioned, using the information acquired from various literature studies together with the experience gained over the years, landforms, slopes and soil depth were recorded and mapped out.

Geological conditions and constraints investigated and included in the discussions where applicable, relevant of: i) ground conditions (outcrop, soil cover, etc.), ii) ground water conditions, iii) inundation/ flooding, iv) active soils (potentially expansive soils), v) excavation ability up to 3m, vi) slope instability, vii) sinkhole formation, viii) potential collapse, ix) subsidence/ consolidation, x) erodibility, xi) dispersity, xiii) acidic soils, xiii) groundwater table and xiv) permeable rate.

5. SITE GEOLOGY AND GROUNDWATER CONDITIONS

5.1 GENERAL

Morgen 542 is underlined by the Triassic Aged sediments of the Tarkastad subgroup of Beaufort group forming part of the Karoo Supergroup. The southern boundary is very close to the Permian aged rocks of the Normandien Formation that forms part of the Adelaide subgroup of Beaufort group forming part of the Karoo Supergroup. Jurassic Aged intrusive, igneous dolerite forms sills throughout the area as illustrated in Figure 03.

The Tarkastad Formations (Trt) consists mainly of fine to medium grained olive brown sandstones and reddish mudstones. The Normandien Formation (Pne) consists of olive green to grey mudstones with subordinate sandstones. Dolerite (Jd) comprises of dark metamorphic rocks, or if weathered, dark clay soils.

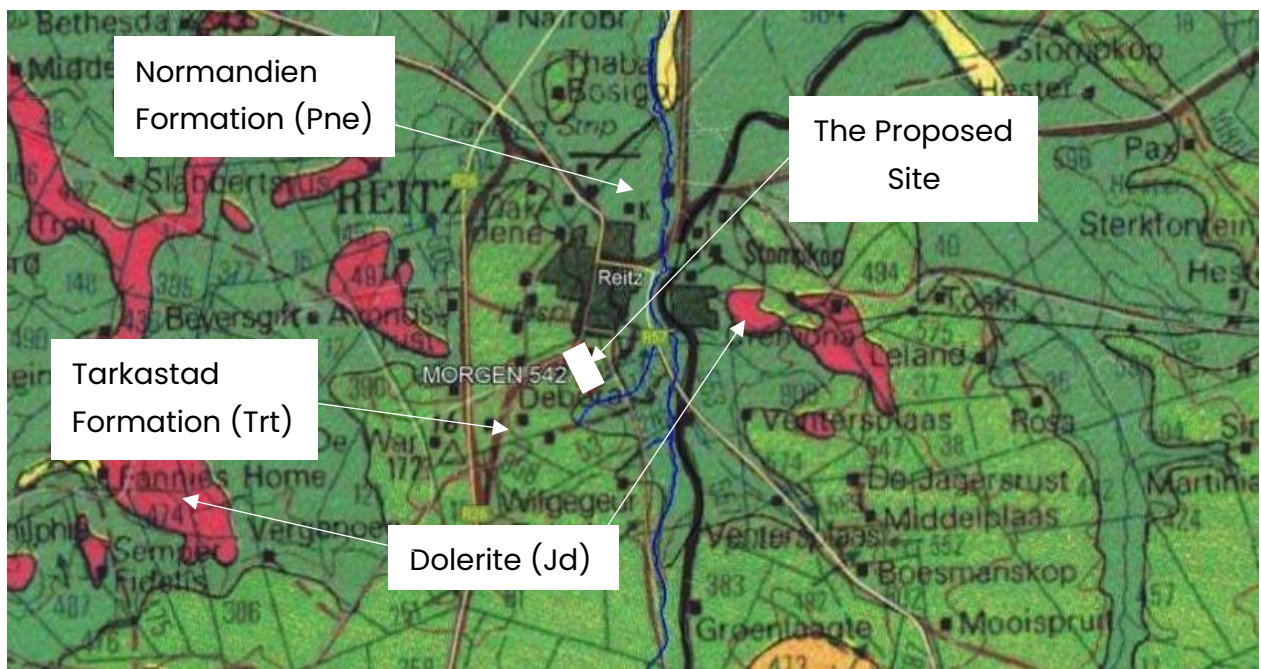


Figure 03: Farm Morgen 542 _SA Geological Map; 2728 Frankfort

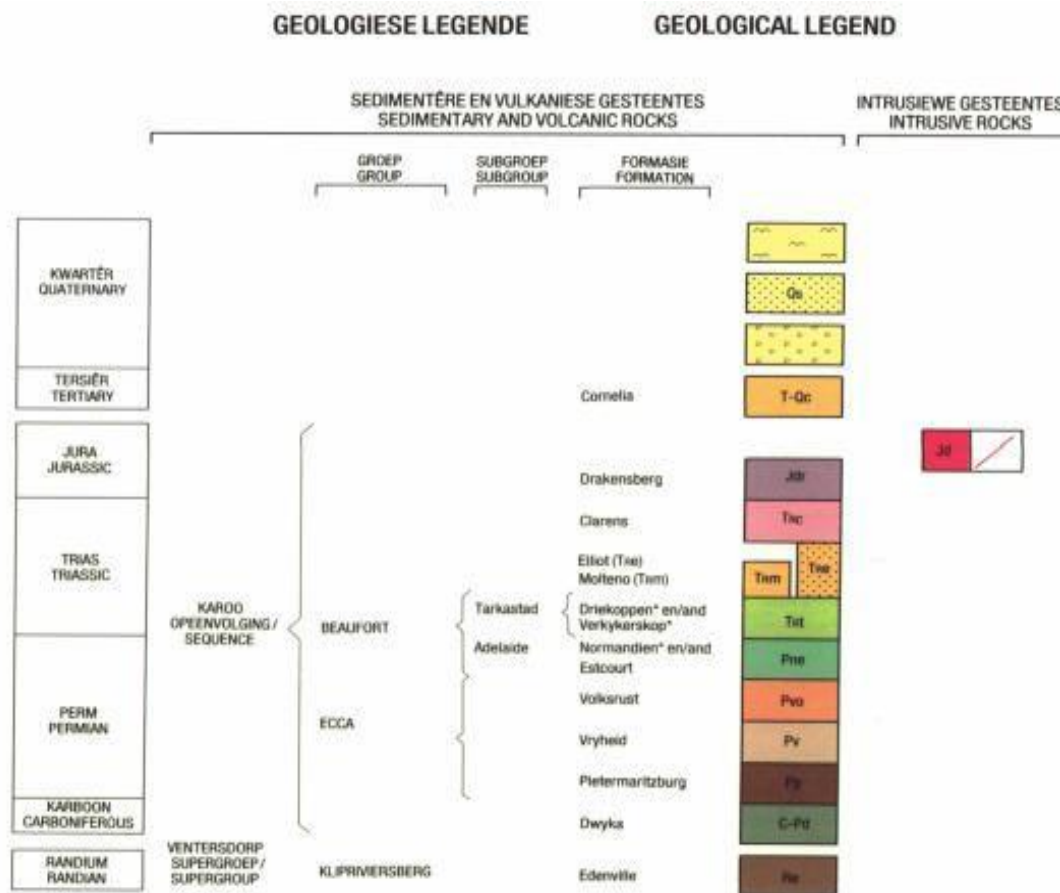


Figure 04: Legend _SA Geological Map; 2728 Frankfort

5.2 SOIL PROFILE

The detailed soil classification and analyses was completed by means of the following methodology:

- Aerial photograph investigation so to determine possible different soil forms
- Detailed soil profile analyses done by using a Tractor-Loader-Backhoe to dig 6 test pits (total test pits derived from NDoH (2002) Page 9, Figure 1b) in different major soil forms as illustrated in Appendix C.
- Soil analyses by soil sampling of different soil forms and different soil horizons, following standard soil sampling procedures (Jennings, et al. 1973). The detailed profile information is attached in Appendix 13.2 and 13.3. Pictures of all the test pits were taken and are represented in Appendix D.
- Soil samples of the different soil horizons and test pits were delivered to Roadlab Laboratories (Pty) Ltd for analyses of: i) sieve analyses, ii) soil mortar i.e., coarse sand, fine sand and material < 0,075mm, iii) grading modulus, iv) liquid limit, v) plasticity index, vi) linear shrinkage and vii) potential expansiveness. The results are attached in Appendix 13.5. Sample quantities derived from NDoH (2002) Page 10, Table 4. From the information gathered by the soil classification, a detailed soil map was compiled as illustrated in Figure 05.

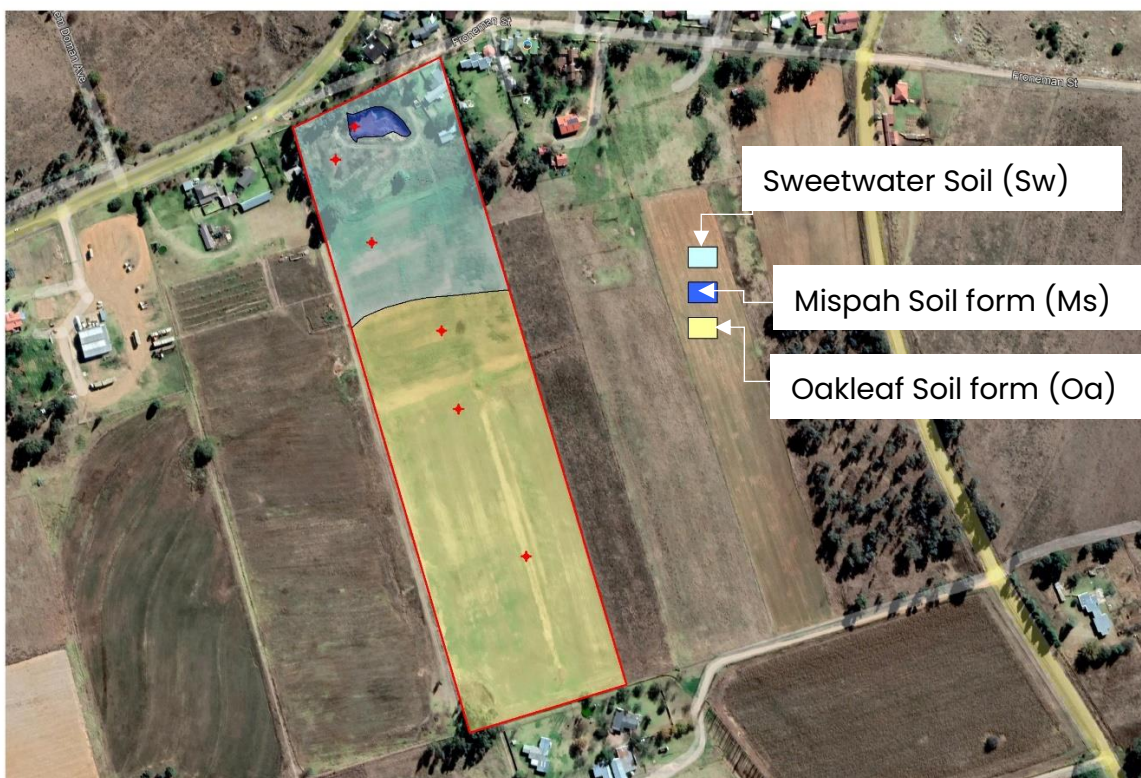


Figure 05: Soil Map of Morgen 542

The soil sensitivity was determined and mapped by logical comparison of the different soil factors as summarised in Table 1. The soil sensitivity map is illustrated in Figure 06. The soil properties of the various map units in figure 06 is summarised in Table 2.

Table 1 Soil Sensitivity Factors

Factor	Description			
Underlying Geology	Derived from ecological map symbols in figure 5.1			
Topography /landform elements	c – crest	m – middle	f – foot slope	
Slope	h1 – slope 0-2%	h2 – slope 2-4%	h3 – slope 4-8%	h4 – slope > 8%
Soil depth	d1 – 0-500mm	d2 – 500-1500mm	d3 – > 1500mm	
Soil form	Official South African soil form symbols according to Soil Classification Working Group (1991)			
Water table level	W1 – > 1500mm	W2 – 500 – 1500mm	W3 – 0 – 500mm Soil	



Figure 06: Soil Sensitivity Map for Morgen 542

Soil Formula Legend as Described in Table 1 above:			
01	Trtmh2d3Oa (W1)	04	Trtmh3d3Sw (W1)
02	Trtmh2d3Oa (W1)	05	Trtmh3d3Sw (W1)
03	Trtmh3d3Oa (W1)	06	Jdmh1d2Ms (W2)

Table 2: Soil properties of the Map unit in Figure 06:

Map No.	Formula	Soil Properties
01	Trtmh2d3Oa (W1)	Deep Oakleaf soil form on Tarkastad formation with Neocutanic Horizon B1, Weak to moderate structure, from saprolite
02	Trtmh2d3Oa (W1)	Deep Oakleaf soil form on Tarkastad formation with Neocutanic Horizon B1, Weak to moderate structure, from saprolite
03	Trtmh3d3Oa (W1)	Deep Oakleaf soil form on Tarkastad formation with Neocutanic Horizon B1, Weak to moderate structure, from saprolite
04	Trtmh3d3Sw (W1)	Sweetwater soil form on Tarkastad formation with Neocutanic Horizon B1, Weak to moderate structure, poor horizon differentiation
05	Trtmh3d3Sw (W1)	Sweetwater soil form on Tarkastad formation with Neocutanic Horizon B1, Weak to moderate structure, poor horizon differentiation
06	Jdmh1d2Ms (W2)	Shallow Mispah soils on dolerite outcrop with gentle slope

5.3 WATER TABLE

It was deduced that the liquid water that was encountered at test pit 06 during the inspection that was conducted was due to rainfall or other forms of precipitation and was not due to seepage and/ or infiltration.

Therefore, the water table at all of the test pits is well below 1500mm from the undisturbed surface and therefore not a limiting factor for this particular development.

However, in spite of the limited occurrence of groundwater, a perched groundwater table can probably be expected during and after periods of rainfall or during the wet season, particularly at the interface of the undetected colluvial and residual soils or at the soil-bedrocks.

6. GEOTECHNICAL EVALUATION

The primary geotechnical constrains and classification as described in Table 3, page 7 of the Generic Specifications GFSH-2 (NDoH, 2002) is summarised in Table 6.1. Only the intermediate and least favourable geotechnical constrains as defined by Generic Specifications GFSH-2 will be discussed. The most favourable geotechnical constrains i.e., seepage, highly compressible soil, undermined ground, stability (dolomite and limestone), unstable natural slopes and seismic activity were excluded as they will have no or very limited impact on the development.

Table 3: Geotechnical Constraints and Classification

Figure 06	Soil Classification & Description	Geotechnical Constraints
01	Deep Oakleaf soil on Tarkastad Formation on gentle slope	a) Less active soil- Expansive properties in BI-horizon b) Slope- Between 2-4%
02	Deep Oakleaf soil on Tarkastad Formation on gentle slope	a) Less active soil - Expansive properties in BI-horizon b) Slope- Between 2-4%
03	Deep Oakleaf soil on Tarkastad Formation on gentle slope	a) Less active soil - Expansive properties in BI-horizon b) Slope- Between 4-8%
04	Deep Sweetwater soil on Tarkastad Formation on gentle slope	c) Less active soil - Expansive properties in BI-horizon a) Slope- Between 4-8%
05	Deep Sweetwater soil on Tarkastad formation on steep slope	d) Less active soil - Expansive properties in BI-horizon a) Slope- Between 4-8%
06	Shallow Mispah soil on Dolerite stone with shallow slope	a) Excavation up to 1.3m- Saprolite is <1300mm deep (Active) b) Slope- Between 0-2% gradient

6.1 ENGINEERING AND MATERIAL CHARACTERISTICS

The primary geotechnical constrains and classification as described in Table 3, page 7 of the Generic Specifications GFSH-2 (NDoH, 2002) is summarised in Table 6.1. Only the intermediate and least favourable geotechnical constrains as defined by Generic Specifications GFSH-2 will be discussed. The most favourable geotechnical constrains i.e., seepage, highly compressible soil, undermined ground, stability (dolomite and limestone), unstable natural slopes and seismic

activity were excluded as they will have no or very limited impact on the development.

6.2 SLOPE STABILITY AND EROSION

The site is considered to be for the most part stable, however, good stormwater management is essential to ensure long term stability. To this end, developmental practice to maintain stability includes:

- *Careful planning of the development in order to obviate large cuts and fills and ensure good site drainage;

- *Provision of stormwater control facilities such as retention structures, interceptors and similar such measures to reduce concentrated overland flows. Development is not recommended in seepage areas where shallow groundwater seepage and/or surface water activity is imminent, particularly after periods of heavy rain.

6.3 PRESENCE OF HARD ROCK AND BOULDERS

Excavation of soft to medium-hard rock that occur as outcrops and at shallow depths (generally <1.2m below existing ground level) will require the use of pneumatic rock hammers or a 'Woodpecker' excavator and possibly blasting. The use of these tools is labour intensive and costly, therefore an allowance for the provision of these excavation methods should be made.

7. SITE CLASSIFICATION

The residential site classification has been evaluated according to the Generic Specifications GFSH-2. The character of the founding material such as stability, expansibility, collapsibility and compressibility were used to determine the site classes. In general, the total area is classified as H, H1, C1, S1 and R where the foundation depth is expected to be within the sandstone / mudstone bedrock. The site classes for the various mapping units (Figure 5.3) are summarised in Table 7.1. Table 7.1 Generic Specifications GFSH-2 Site Classification.

Figure 06	Stable	Expandability	Collapsibility	Compressibility
01		H1	C1	S1
02		H	C1	S1
03		H1	C1	S1
04		H	C1	S1
05		H1	C1	S1
06	R	H		

8. FOUNDATION RECOMMENDATIONS AND SOLUTIONS

According to the National Home Builders Registration Council [NHBC] (NHBC, 1999) the following foundations are recommended as summarised in Table 8.1.

The houses will require foundation designs, building procedures and precautionary measures with associated cost. For the development the following solutions are recommended to overcome the geotechnical constrains. All the recommendations are made with respect to the erection of light loaded single story structures. Larger structures are unacceptable and require separate foundation recommendations and designs. The recommendations in this report cannot be used for greater structures such as shopping malls, churches or schools.

Figure 06	Site Classification	Recommended construction method (HNBC, 1999)
01	H1, C1, S1	Modified normal / compaction of in situ soil below individual footing / deep strip foundation / soil raft
02	H, C1, S1	Modified normal / compaction of in situ soil below individual footing / deep strip foundation / soil raft
03	H1, C1, S1	Modified normal / compaction of in situ soil below individual footing / deep strip foundation / soil raft
04	H, C1, S1	Modified normal / compaction of in situ soil below individual footing / deep strip foundation / soil raft
05	H1, C1, S1	Modified normal / compaction of in situ soil below individual footing / deep strip foundation / soil raft
06	R, H	Normal construction

The following guidelines were adopted from table 8: Foundation Design, Building Procedures and Precautionary Measures for Single Storey Residential Structures Founded on Expansive Soil Horizon (from NHBC Part 1, Section 2, Table 1)

*** Areas 01, 02, 03, 04 & 05** _ Modified Normal- Lightly reinforced strip foundation, Articulation joints at all internal/external doors and openings, Light reinforcement in masonry, Site drainage and plumbing/ service precautions.

Soil raft_ Remove all or necessary parts of expansive horizon to 1.0m beyond the perimeter of the building and replace with invert backfill compacted to 93% MOD AASHTO density at -1% to +2% of optimum moisture content, Normal construction with lightly reinforced strip footings and lightly reinforcement in masonry if residual movements are <7.5mm, or construction type appropriate to residual movement, Site drainage and plumbing/ service precautions.

** **Areas 06_ Normal- Normal construction (strip footing or slab-on-the-ground) foundation, Site drainage and plumbing/ service precautions.***

9. DRAINAGE

From information that was gathered through studies conducted and the contour map received, the following important characteristics were identified:

- * The development is situated on a gentle sloping area with an average slope of approximately 4.7%.
- * Any exposed soil on the site will be subjected to low-medium erosion if the storm water is not properly managed.
- * The area is well drained and the water table is generally greater than 1500mm below the surface and no drainage problems are envisage. The low-lying southern area (Area 01 and 02, Figure 06) has a possibility of flooding during high rainfall periods.

10. SPECIAL PRECAUTIONARY MEASURES

- *Where possible, areas of shallow soils and rock outcrops on the North side (Area 06, at borrow pit) should be avoided for development due to trenching difficulties. This is provided that there is no allowance for the provision of these excavations
- * The potential swell can be classified as low to high from the uppermost regions of the site down to the foot slope as the clay content may increase.
- * The low-lying southern areas have a possibility of flooding during high rainfall periods.

11. CONCLUSION

- * The resident site classification for most of the area is H, H1, C1, S1 and R where the foundation depth is expected to be no less than 1.0m. For this a modified normal construction type is recommended.
- * Fills for the proposed platforms may be constructed using the materials available. Placement of fill layers should be undertaken in layers not exceeding

200mm thick when placed loose and compacted using suitable compaction plant to achieve 90% to 93% Modified AASHTO maximum dry density.

* The pavement formation layer for the proposed roads and parking areas should be designed taking into account anticipated traffic loads, volumes and design life of the parking area and roads.

* All of the civil infrastructure will be performed with ease as hard rock (Tarkastad Formation) in regions 01 to 05 are relatively deep. As an added precaution, the bottom of the foundation excavation should be thoroughly compacted by means of a heavy rammer or similar to assist in minimising settlement. Total settlement is likely to be in the range 7 to 12mm with differential settlement taken as 50%.

12. DECLARATION

I, **MORNE DEYZEL**, hereby declare that the highest level of professionalism and diligence was exercised in compiling this report and that the above is true and accurate in every respect.



Signature:

Date: 13/12/2022

13. REFERENCES

* National Department of Housing (Republic of South Africa), Geotechnical Site investigations for housing developments, Generic Specification, GFSH-2, September 2002.

* National Home Builders Registration Council (NHBC). Home Building Manual, Parts 1 and 2, Revision 1, February 1999.

* National Home Builders Registration Council (NHBC). Home Building Manual, Parts 3, Revision 1, February 1999.

* South African Institute of Engineering Geologists (SAIEG) – Guidelines for Urban Engineering Geological Investigations – First Issue, 1997

* Brink, A.B.A and Bruin R.M.H. (1990), 'Guidelines for soil and rock logging in South Africa. 2nd Impression 2022'. SAICE, SAIEG and AEGSA: South Africa

APPENDIX A: DETAILED SOIL CLASSIFICATION FOR MORGEN 542

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	
				Content	GPS Co-ordinates
01	A Horizon	Orthic	0-220mm	15	27°48'52"S
	B1 Horizon	Neocutanic	220-660mm	25	28°25'37.2"E
	B2 Horizon	Unspecified	660-2400mm	35	
	C Horizon	Hardrock	2400mm+		
Soil form		Oakleaf			

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	
				Content	GPS Co-ordinates
02	A Horizon	Orthic	0-150mm	15	27°48'47.7"S
	B1 Horizon	Neocutanic	150-650mm	25	28°25'35"E
	B2 Horizon	Unspecified	650-2500mm	35	
	C Horizon	Hardrock	2500mm+		
Soil form		Oakleaf			

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	
				Content	GPS Co-ordinates
03	A Horizon	Orthic	0-280mm	15	27°48'45.4"S
	B1 Horizon	Neocutanic	280-1200mm	25	28°25'34.4"E
	B2 Horizon	Unspecified	1200-2800mm	35	
	C Horizon	Hardrock	2800mm+		
Soil form		Oakleaf			

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	
				Content	GPS Co-ordinates
04	A Horizon	Humic	0-200mm	15	27°48'42.8"S
	B1 Horizon	Neocutanic	200-2100mm	25	27°48'32.1"E
	B2 Horizon	Neocutanic	2100-3000mm	35	
	C Horizon	Hardrock	3000mm+		
Soil form		Sweetwater			

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	GPS Co-ordinates
				Content	
05	A Horizon	Humic	0-180mm	15	27°48'40.4"S
	B1 Horizon	Neocuratic	180-1880mm	25	28°25'31.0"E
	B2 Horizon	Neocuratic	1880-2600mm	35	
	C Horizon	Hardrock	2600mm+		
Soil form		Sweetwater			

Pit no.	Horizons	Type of Horizon	Depth	Estimated Clay	GPS Co-ordinates
				Content	
06	A Horizon	Orthic	0-1300mm	35	27°48'39.3"S
	B1 Horizon	Hardrock	1300mm+	25	28°25'31.6"E
Soil form		Mispah			

SOIL PROFILE



19 Scholtz Street
Bethlehem
Free State 9700
Bethlehem Office
Tel: 058 303 9309
Cell: Mome' 083 630 8860

CLIENT: GERT TARK KONSTRUKSIE	TEST PIT: 01
PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542	DATE: 24_10_2022
DESCRIPTION: GEO- TECHNICAL SOIL PROFILE	PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00	Moist, Brown, Dense, Fine-grained Sand, with Roots ORTHIC	(Low)
			0.22	Moist, Light Grey, Dense, Fine-grained Sand NEOCUTANIC	(Low)
			0.66	Moist, Orange_Grey, Dense, Fine-grained Mudstone UNSPECIFIED	(Low)
			1m		
			2m		
			2.40	Sandstone HARDROCK	
			3m		
			4m		
				NOTES: 1. Excavations done by Tractor-Loader Backhoe Machine. 2. No Ground water encountered below NGL. 3. No Pebble Marker encountered. 4. No Pedogenic material encountered.	

SOIL PROFILE



19 Scholtz Street
Bethlehem
Free State 9700
Bethlehem Office
Tel: 058 303 9309
Cell: Mome' 083 630 8860

CLIENT: GERT TARK KONSTRUKSIE

TEST PIT: 02

PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542

DATE: 24_10_2022

DESCRIPTION: GEO- TECHNICAL SOIL PROFILE

PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00	Moist, Brown, Dense, Fine-grained Sand, with Roots ORTHIC	(Low)
			0.15	Moist, Light Grey, Dense, Fine-grained Sand NEOCUTANIC	(Low)
			0.65	Moist, Orange_Black, Dense, Fine-grained Shale Mudstone UNSPECIFIED	(Low)
			2.50	Sandstone HARDROCK	
			4m		
				NOTES: 1. Excavations done by Tractor-Loader Backerhoe Machine. 2. No Ground water encountered below NGL. 3. No Pebble Marker encountered. 4. No Pedogenic material encountered.	

SOIL PROFILE



19 Scholtz Street
Bethlehem
Free State 9700
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Tel: 058 303 9309
Cell: Morne' 083 630 8860

CLIENT: GERT TARK KONSTRUKSIE	TEST PIT: 03
PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542	DATE: 24_10_2022
DESCRIPTION: GEO- TECHNICAL SOIL PROFILE	PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00	Moist, Dark Brown, Dense, Fine-grained Sand, with roots ORTHIC	(Low)
			0.28	Moist, Reddish Brown, Dense, Fine-grained Sand NEOCUTANIC	(Low)
			1.20	Moist, Reddish Brown-Grey, Dense, Clayey Sand UNSPECIFIED	(Low)
			2.80	Light-Brown, Dense, Clayey Sand UNSPECIFIED	(Low)
			3.40	Sandstone HARDROCK	
				NOTES: 1. Excavations done by Tractor-Loader Backhoe Machine. 2. No Ground water encountered below NGL. 3. No Pebble Marker encountered. 4. No Pedogenic material encountered.	

SOIL PROFILE



19 Scholtz Street
Bethlehem
Free State 9700
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Tel: 058 303 9309
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CLIENT: GERT TARK KONSTRUKSIE	TEST PIT: 04
PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542	DATE: 24_10_2022
DESCRIPTION: GEO- TECHNICAL SOIL PROFILE	PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00	Moist, Dark Brown, Dense, Fine-grained Sand, with roots HUMIC	(Low)
			0.20	Moist, Reddish Brown, Dense, Fine-grained Sand NEOCUTANIC	(Low)
			2.10	Moist, Light Grey, Shale NEOCUTANIC	(Low)
			3.00	Sandstone HARDROCK	
<p>NOTES:</p> <ol style="list-style-type: none"> Excavations done by Tractor-Loader Backhoe Machine. No Ground water encountered below NGL. No Pebble Marker encountered. No Pedogenic material encountered. 					

SOIL PROFILE



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Tel: 058 303 9309
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CLIENT: GERT TARK KONSTRUKSIE

TEST PIT: 05

PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542

DATE: 24_10_2022

DESCRIPTION: GEO- TECHNICAL SOIL PROFILE

PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00	Moist, Dark Brown, Dense, Fine-grained HUMIC Sand, with roots	(Low)
			0.18	NEOCUTANIC	
			1m	Moist, Reddish Brown, Dense, Fine-grained Sand	(Low)
			1.88 2m	NEOCUTANIC Moist, Light Brown, Fine-grained Sandstone	(Low)
			2.60	HARDROCK Sandstone	
			3m		
			4m		
				NOTES: 1. Excavations done by Tractor-Loader Backhoe Machine. 2. No Ground water encountered below NGL. 3. No Pebble Marker encountered. 4. No Pedogenic material encountered.	

SOIL PROFILE



19 Scholtz Street
Bethlehem
Free State 9700
Bethlehem Office
Tel: 058 303 9309
Cell: Mome' 083 630 8860

CLIENT: GERT TARK KONSTRUKSIE	TEST PIT: 06
PROJECT: PROPOSED TOWNSHIP ESTABLISHMENT ON MORGEN 542	DATE: 24_10_2022
DESCRIPTION: GEO- TECHNICAL SOIL PROFILE	PROFILED BY: M_DEYZEL

UNIFIED/ TRB CLASS	SAMPLE NO.	LEGEND	DEPTH (m)	DESCRIPTION	POTENTIAL EXPANSIVENESS
			0.00 1m	Moist, Dark Yellow, Soft Rock ORTHIC	(High)
			1.30 2m 3m 4m	Dolerite Rock HARDROCK	
				NOTES: 1. Excavations done by Tractor-Loader Backhoe Machine. 2. No Ground water encountered below NGL. 3. No Pebble Marker encountered. 4. No Pedogenic material encountered.	

APPENDIX C: PICTURES OF THE TEST PITS



Test Pit 01



Test Pit 02



Test Pit 03



Test Pit 04



Test Pit 05



Test Pit 06



Batsumi Consulting Engineers
19 Schlotz Street
Bethlehem
9700

Report No: BLM3825 (final)
Date: 08th December 2022

TEST REPORT

The work reported herein is not included in the SANAS schedule of accreditation for the Beton-Lab laboratory No. T0128

1. Sample description:

1. The following samples was received on the 23rd November 2022 for testing.

- Toetsgat 1
- Toetsgat 2
- Toetsgat 3
- Toetsgat 4
- Toetsgat 5
- Toetsgat 6

The Project and Source of the sample is unknown to the lab.

The sample was received in plastic bags and deemed suitable for testing.

2. Test required and test method:

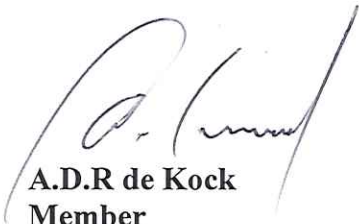
Determination (CBR) **Outsourced**

Determination (MDD & OMC) – Neat Material **Outsourced**

Road Indicator Test **Outsourced**

3. Results:

3.1 **See Attached Reports**



A.D.R de Kock
Member



C de Kock
Report compiled by:

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Roadlab Laboratories Pty Ltd

- Materials Testing
- Geotechnical & Road Investigations
- Mobile Lab Services
- Specialised Concrete & Forensic Investigations

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 Germiston, JHB, 1400

92/BET001-01-0002/22

RG 21761 A

2022/12/02

Beton - Lab cc
 P.O Box 10583
 Aston Manor
 1630

Attention: Mr Ronel de Lange

Dear Sir

Test Report: ASTON MANOR - CBR TEST RESULTS (TRACK NO 20930)

Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
 The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES					
SAMPLE No.	22/S4097	22/S4098	22/S4099	22/S4100	
CONTAINER USED FOR SAMPLING	Plastic Bags	Plastic Bags	Plastic Bags	Plastic Bags	
SIZE / WEIGHT OF SAMPLE	+105kg's	+105kg's	+105kg's	+105kg's	
MOISTURE CONDITION OF SAMPLE ON ARRIVAL	Slightly Moist	Slightly Moist	Slightly Moist	Slightly Moist	
HOLE No. / Km. / CHAINAGE	BLM 3825/01	BLM 3825/02	BLM 3825/04	BLM 3825/05	
ROAD NO OR NAME	N/A	N/A	N/A	N/A	
LAYER TESTED / SAMPLED FROM	N/A	N/A	N/A	N/A	
DATE SAMPLED	2022/11/24	2022/11/24	2022/11/24	2022/11/24	
DATE RECEIVED	2022/11/24	2022/11/24	2022/11/24	2022/11/24	
CLIENTS MARKING	None	None	None	None	
DESCRIPTION OF SAMPLE (COLOUR & TYPE)	Dark Yellow Ferricrete	Light Red Brown Ferricrete & Quartzitic Sand	Light Red Orange Ferricrete Nodules & Quartzitic Sand	Light Yellow Orange Shale	
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)					
SIEVE ANALYSIS (SANS GR1:2010)	100.0	100	100	100	100
	75.0	100	100	100	91
	63.0	100	100	100	87
	50.0	100	100	100	82
	37.5	100	100	100	79
	28.0	100	100	100	71
	20.0	100	100	100	66
	14.0	100	100	100	66
	5.0	93	99	100	66
	2.00	89	98	99	65
	0.425	85	95	97	58
	0.075	61	53	54	35
	SANS 3001 - PR5				
Soil Mortar	89	98	99	65	
Coarse Sand	4.6	4.0	2	10.9	
Fine Sand	27	43	44	35	
Coarse Fine Sand	8	7	14	7	
Medium Fine Sand	10	16	12	13	
Fine Fine Sand	8	20	18	15	
Silt & Clay	69	53	54	54	
Coarse Sand Ratio	0.05	0.04	0.02	0.11	
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)					
ATTERBERG LIMITS (SANS GR10;GR11)	LL%	28	16	29	27
	P.I.	10	2	12	6
	LS%	5	1	6	3
GM	0.65	0.54	0.50	1.42	
CLASSIFI - CATION	H.R.B.*	A-4(5)	A-4(4)	A-6(4)	A-2-4(0)
	COLTO*				
	T.R.H. 14*				
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)					
MOD AASHTO (SANS GR30)	OMC%				
	MDD(KG/M ³)				
C.B.R.	COMP MC				
	% SWELL				
C.B.R. (SANS GR40)	100%				
	98%				
	97%				
	95%				
	93%				
90%					
MOD ITS : DRY (kPa) (GR54)	N/A	N/A	N/A	N/A	
PROCTOR ITS : DRY (kPa)	N/A	N/A	N/A	N/A	
STABILISED WITH	IN LAB				
	ON SITE	Neat	Neat	Neat	Neat
TEST TYPE	IND	IND	IND	IND	
SAMPLED BY	Client	Client	Client	Client	
DELIVERED BY	Client	Client	Client	Client	
SAMPLING METHOD	TMH 5 - MB1	TMH 5 - MB1	TMH 5 - MB1	TMH 5 - MB1	
ENVIRONMENTAL CONDITION WHEN SAMPLED	Hot	Hot	Hot	Hot	
REMARKS & NOTES	None	None	None	None	

Kind Regards

Mr N Herbst / Mr J Potgieter
 Technical Secretary / Manager
 Z:9220 (2022)/Beton Lab cc/BET001-01-0002 CBR (2022/11/24) RG 21761 A

Remarks:

*Opinions & Interpretations are not included in our schedule of Accreditation
 SANAS Accredited Laboratory No. T 0296

The samples were subjected to analysis according to SANS 3001

The results reported relate only to the sample tested

Further use of the above information is not the responsibility or liability of Roadlab

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Compiled By : Keyuri Govender



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Please find the attached test results for the sample/s as submitted to and tested by Roadlab (Pty)Ltd
 The unambiguous description of the sample/s as received are as follows :

SAMPLE INFORMATION & PROPERTIES				
SAMPLE No.	22/S4101	22/S4102		
CONTAINER USED FOR SAMPLING	Plastic Bags	Plastic Bags		
SIZE / WEIGHT OF SAMPLE	+105kg's	+105kg's		
MOISTURE CONDITION OF SAMPLE ON ARRIVAL	Slightly Moist	Slightly Moist		
HOLE No. / Km. / CHAINAGE	BLM 3825/03	BLM 3825/06		
ROAD NO OR NAME	N/A	N/A		
LAYER TESTED / SAMPLED FROM	N/A	N/A		
DATE SAMPLED	2022/11/24	2022/11/24		
DATE RECEIVED	2022/11/24	2022/11/24		
CLIENTS MARKING	None	None		
DESCRIPTION OF SAMPLE (COLOUR & TYPE)	Dark Red Orange Ferricrete Nodules	Dark Yellow Dolerite		
GRADING ANALYSIS - % PASSING SIEVES (SANS 3001-GR1:2010;SANS 3001-GR2:2010)				
SIEVE ANALYSIS (SANS GR1:2010)	100.0	100	100	
	75.0	100	100	
	63.0	100	100	
	50.0	100	100	
	37.5	100	100	
	28.0	100	92	
	20.0	100	80	
	14.0	100	75	
	5.0	100	59	
	2.00	99	49	
	0.425	97	39	
	0.075	55	26	
SANS 3001 - PR5				
Soil Mortar	99	49		
Coarse Sand	2.7	20.8		
Fine Sand	42	26		
Coarse Fine Sand	10	10		
Medium Fine Sand	11	7		
Fine Fine Sand	21	9		
Silt & Clay	55	53		
Coarse Sand Ratio	0.03	0.21		
ATTERBERG LIMITS ANALYSIS (SANS 3001-GR10:2010;SANS 3001-GR11:2010)				
ATTERBERG LIMITS (SANS GR10;GR11)	LL%	30	51	
	P.I.	12	23	
	LS%	6	10	
GM		0.49	1.85	
CLASSIFICATION	H.R.B.*	A-6(5)	A-2-7(1)	
	COLTO*	<G9	<G9	
	T.R.H. 14*	<G10	G10	
CALIFORNIA BEARING RATIO (SANS 3001-GR30:2010;SANS 3001-GR40:2010)				
MOD AASHTO (SANS GR30)	OMC%	13.7	15.2	
	MDD(KG/M ³)	1804	1871	
C.B.R.	COMP MC	13.7	15.2	
	% SWELL	0.48	0.74	
C.B.R. (SANS GR40)	100%	21	33	
	98%	12	21	
	97%	10	17	
	95%	6	11	
	93%	4	7	
	90%	2	3	
MOD ITS : DRY (kPa) (GR54)	N/A	N/A		
PROCTOR ITS : DRY (kPa)	N/A	N/A		
STABILISED WITH	IN LAB	Neat	Neat	
	ON SITE			
TEST TYPE	IND	IND		
SAMPLED BY	Client	Client		
DELIVERED BY	Client	Client		
SAMPLING METHOD	TMH 5 - MB1	TMH 5 - MB1		
ENVIRONMENTAL CONDITION WHEN SAMPLED	Hot	Hot		
REMARKS & NOTES	None	None		

Kind Regards

Mr N Herbst / Mr J Potgieter
 Technical Signatory / Manager

Remarks:

*Opinions & Interpretations are not included in our schedule of Accreditation
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The samples were subjected to analysis according to SANS 3001

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