Geotechnical Report for

Vlakfontein Site, Nr Bronkhorspruit, Gauteng

February 2017 REF: JT0026/100/2017/02/2703

Report to:

JCJ DEVELOPMENTS

SMEC REPORT
QUALITY ASSURANCE ISSUE DATA

Report Title:	Geotechnical Report for Vlakfontein Site, Nr Bronkhorstspruit, Gauteng
Client:	JCJ Developments (Pty) Ltd
Project Name:	Vlakfontein
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Revision History:

Date	Report Status	Written by	Reviewed/Approved by	Issued to	
				Name	Institution
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Written by: _____ **Signed** 2017/02/13 **Date**

Approved by: _____ **Signed** 2017/02/13 **Date**

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APPENDICES

1. INTRODUCTION AND TERMS OF REFERENCE

1.1 Introduction and Project Description

This report presents the findings of the geotechnical investigation for the proposed truck stop at Vlakfontein, near Bronkhorstspruit, Gauteng. It is understood that the development will comprise a refuelling area (concrete slab) and associated single storey brick buildings, parking and roads.

This evaluation was aimed at providing information on the subsurface conditions over the site and making recommendations for the proposed development.

1.2 Terms of Appointment

The work was carried out as part of ***SMEC South Africa (Pty) Ltd*** appointment by JCJ Developments (Pty) Ltd, dated 22nd November 2016, and in accordance with our quote no. Q117.

This report summarises the interpretation of the laboratory and site testing results done as part of this investigation and provides founding recommendations.

1.3 Aims and Methodology

The objectives of the study are:

- To analyse the geotechnical conditions present, assess the general suitability of the site and to make recommendations for site works for the proposed development.
- To establish whether the conditions on the site present any fatal flaws as regards to development of the site.
- To provide typical foundation recommendations for the proposed development.
- To identify relevant ground-related features and to determine the variability of ground conditions and the effect of such variability on the proposed development.

The following methodology was adopted to realise the aims of the study:

- Review of available geological records and site plans.
- Undertaking a geotechnical site investigation, including TLB excavated trial pits.
- Undertaking of in-situ and laboratory testing to confirm geotechnical and design parameters of the soils.

1.4 Codes of Practices and Standards

The investigation was carried according to standard practice codes and guidelines including:

- The 2010 SAICE Geotechnical Division Site Investigation Code of Practice.

1.5 Limitations of Assessment

The services performed by ***SMEC South Africa*** were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession practising under similar conditions in the locality of the project. Variations in what is reported here may become evident during construction and it is thus imperative that a Competent Person inspects all excavations to ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report.

This report has been prepared for the exclusive use of the client, with specific application to the proposed project.

2. SITE LOCATION AND DESCRIPTION

The site is located at the junction of the R25 and an undesignated road. The approximate site centre has WGS84 co-ordinates of S25.8958895^0 and E28.700087^0.

The site is bound by the R25 to the north, the undesignated road to the west, the Bronkhorstspruit to the east and neighbouring properties to the south. AT the time of the investigations construction for the concrete slab had commenced with the laying of an engineered fill platform.

The site location plan and aerial imagery are given hereunder as Diagrams 2.1 and 2.2 respectively:

Diagram 2.1: Site Location Plan

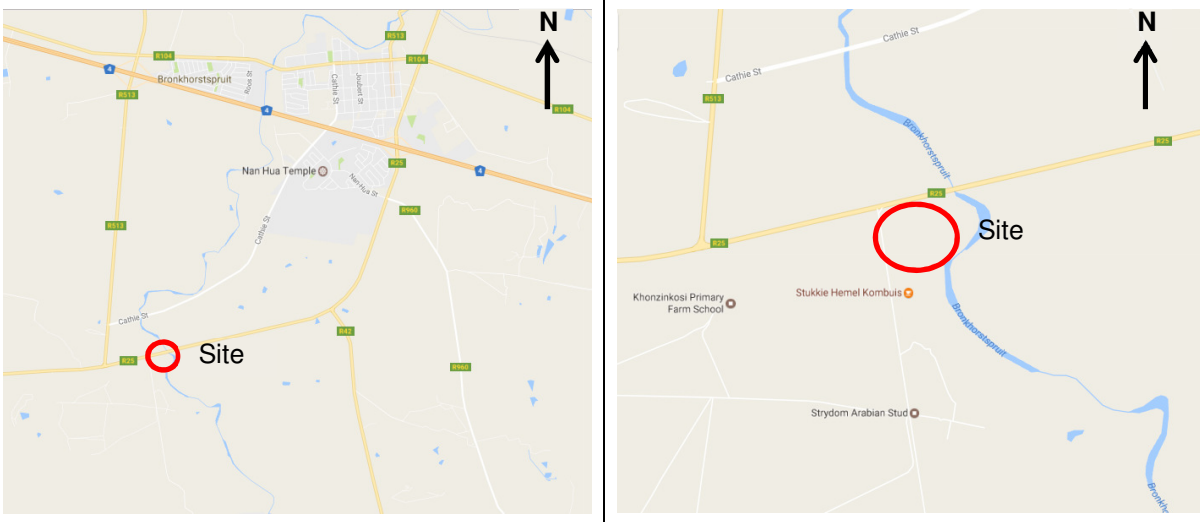
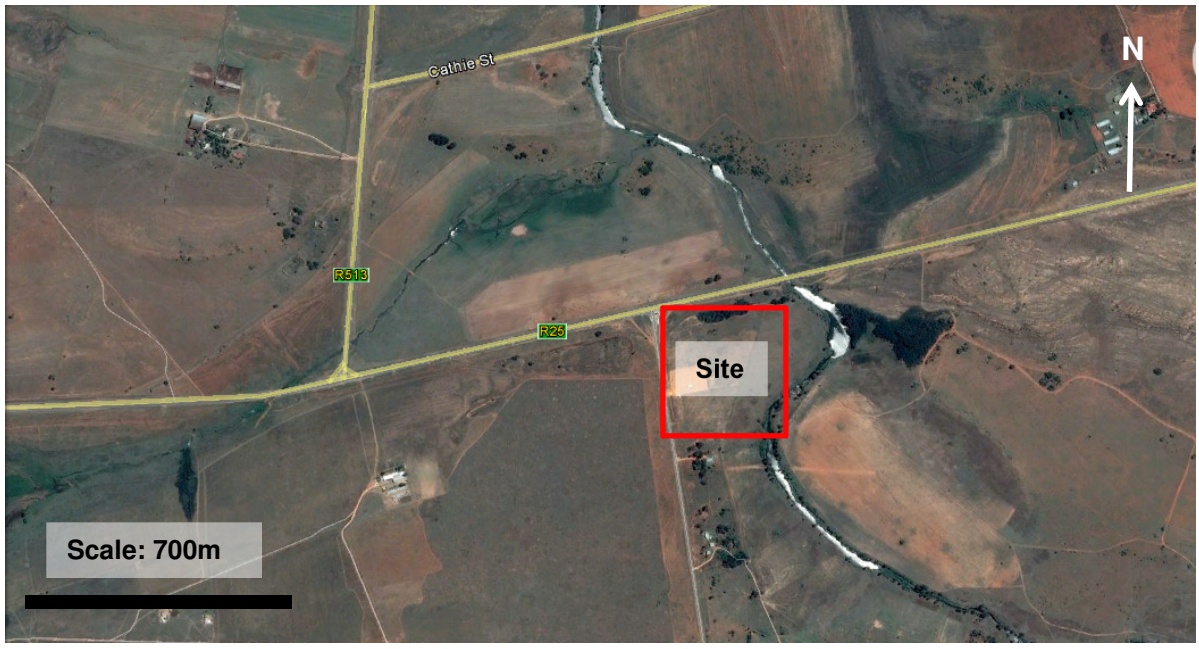


Diagram 2.2: Aerial Imagery



3. CLIMATE

The site is located within the Highveld region, which is characterised by hot summers and cool winters. The average maximum daily temperatures vary from 27ºC in January to 18ºC in July. Corresponding minimum temperatures for these months are 15ºC and 2ºC. Average annual rainfall in the area is 570mm, which can be expected to occur during the spring and summer months (October to March).

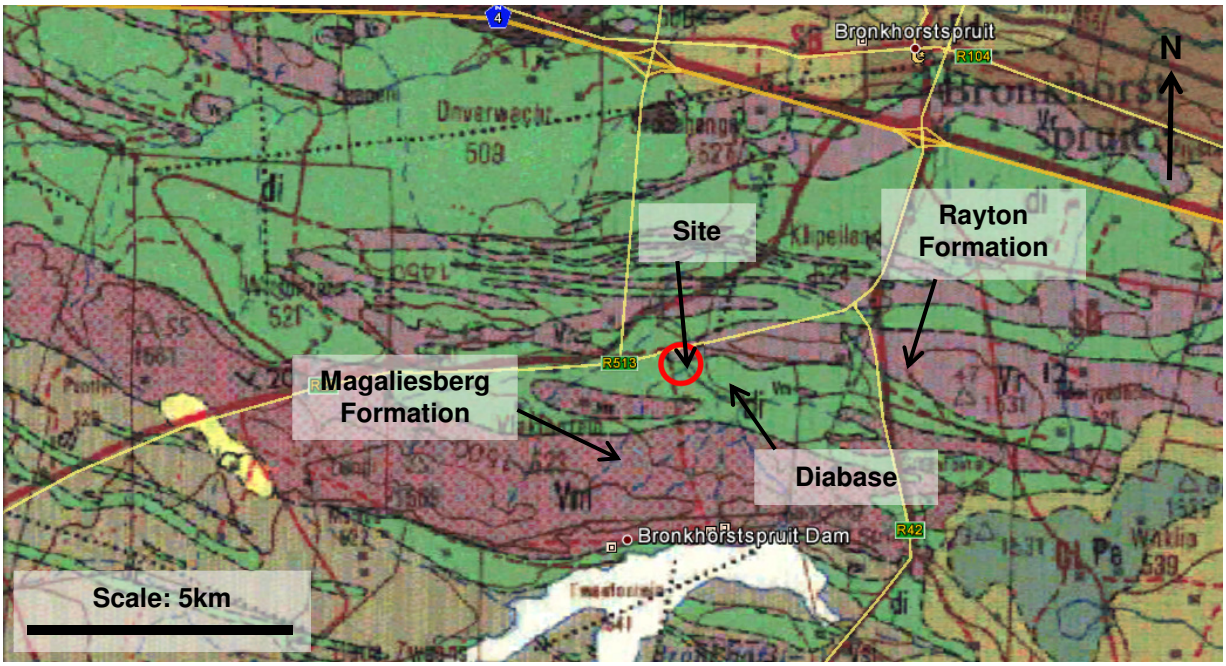
The local climate results in the area having a Weinert 'N' classification of approximately 2. The implication of the climatic N-value is twofold; firstly and in general, (for N<2 area) the soil profile is likely to be deep, and comprise chemically altered residual soils. Secondly, for imported gravelly materials such as those used for pavement layers consideration must be given to the origin and nature of the gravel to ensure that materials susceptible to chemical weathering are not used in the upper pavement layers.

4. GEOLOGY

The geological map of Pretoria (sheet no. 2528, scale 1:250 000) shows the northern half of the site to be underlain by quartzite, shale and subgreywacke of the Rayton Formation, Pretoria Group. The southern half is underlain by diabase.

An extract of the local geology is shown in Diagram 4.1.

Diagram 4.1. Extract from Pretoria 2528 Geological Map

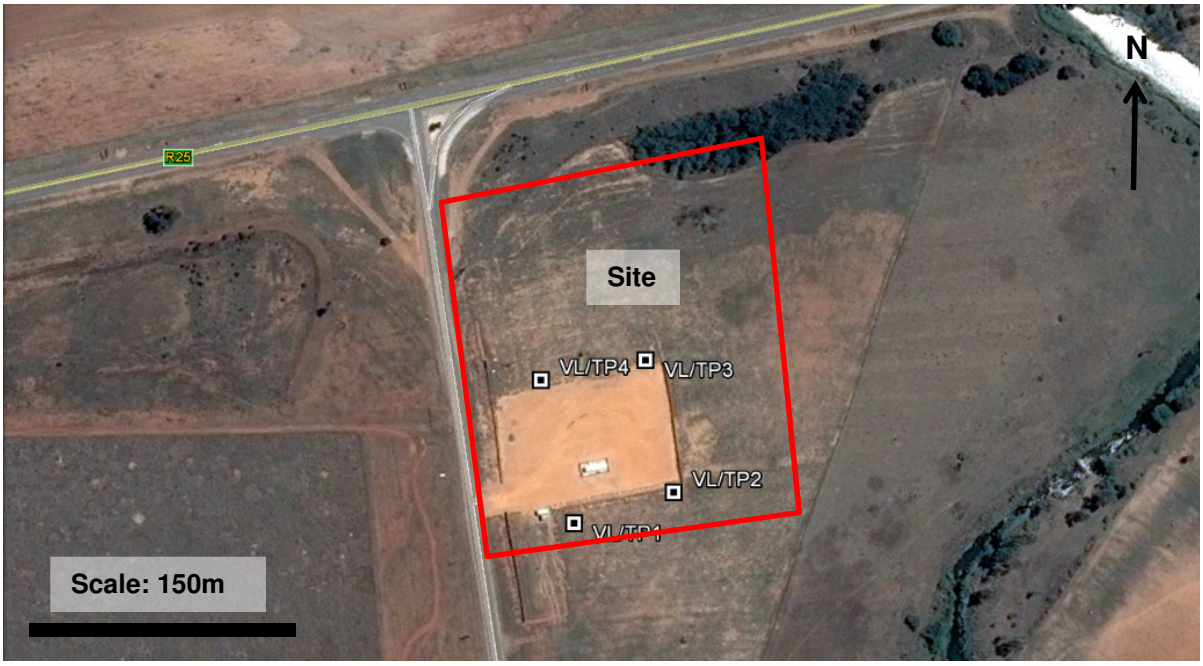


5. SITE INVESTIGATION

A total of 4 TLB excavated trial pits were undertaken on the site. The locations of the trial pits are given hereunder as Diagram 5.1. The TLB excavated trial pits were undertaken using a Terex 820 loader backhoe (TLB).

The materials in the trial pits were profiled, photographed and representative samples retrieved for laboratory testing. Laboratory tests included particle size distribution and Atterberg Limits tests.

Diagram 5.1: Investigation Layout



6. TRIAL PIT PROFILES

The trial pits were excavated to a maximum depth of 2.5m across the site.

The generalised profiles are as summarised in Table 6.1 hereunder. The detailed logs are provided in Appendix A, with the profiling and logging parameters provided in Appendix B.

Table 6.1: Summary of Trial Pits

Trial Pit No.	Co-ordinates (WGS084 Lo29)		Observations	Comments
	X	Y		
VL/TP1	2861287	30069	Loose slightly clayey sand to 1.5m, medium dense sand to 2.5m.	No groundwater
VL/TP2	2861270	30011	Loose sand to 1.4m, medium dense clayey sand to 2.3m.	No groundwater
VL/TP3	2861192	30028	Loose sand to 1.3m, medium dense clayey sand to 2.3m.	No groundwater
VL/TP4	2861204	30090	Loose sand to 2.0m, medium dense clayey sand to 2.3m.	No groundwater

The profiles generally comprised loose sand overlying medium dense clayey sand from between 1.3m and 2.0m.

7. LABORATORY TEST RESULTS

Laboratory tests were scheduled to confirm the on-site investigation and establish engineering parameters for the soils. Tests were undertaken by our associated SANAS accredited laboratory Soillab (Pty) Ltd in Pretoria. The various tests and pertinent information from these tests are highlighted below and the detailed test results are included as Appendix C. Tests undertaken include:

- 1 Foundation Indicator test (including full grading)
- 1 CBR and Modified AASHTO Density test

Particle size analyses (full grading) and indicator test was undertaken on a representative sample of the materials on site. The tests showed the soils to be of low plasticity.

The soils subsequently test as “Low” potential expansiveness according to the van der Merwe method.

The test results are summarised in Table 7.1 below:

Table 7.1: Foundation Indicator Results

Position	Depth of sample (m)	Material Type	Grading Modulus	Clay %	Silt %	Sand %	Gravel %	PI	LL	Expansiveness classification*
VL/TP4	0.0-2.0	Silty SAND	1.13	3	6	91	0	NP	-	Low

* According to the van der Merwe method

A California Bearing Ratio (CBR) test was undertaken on a sample of the materials encountered within the trial pits that were excavated. The results are summarised hereunder:

Table 7.2: California Bearing Ratio Test Results Summary

Trial Pit No	Depth of Sample (m)	Material Description from logs	Optimum Moisture Content %	Max. Dry Density	Swell at 100% c*	CBR for compaction		Classification: Colto group classification#
						at 93%	at 95%	
VL/TP4	0.0-2.0	Silty SAND	3.9	100.0	0.0	21	29	G7

c* Mod AASHTO compaction # Colto derivation

8. GEOTECHNICAL EVALUATION

8.1 Ground Conditions

The ground conditions across the site generally comprise loose to medium dense silty sand to between 1.3-2.0m, overlying medium dense to dense clayey sand. No groundwater was encoutered in the trial pits.

However, the main concern on this site is the presence of a termite nest encountered in VL/TP1.

8.2 Geotechnical Constraints to Development

Based on the investigations, conditions on the site are generally favourable and there appears to be no (geotechnical) reasons for the development of the site not to continue.

8.3 Foundations

It is understood the development will comprise a large concrete slab area around the existing fuel tank, with ancillary single storey brick buildings.

The presence of the termite nest presents a specific problem on this site as and will require suitable preparation prior to construction, as it must be assumed there is potential for termite nests across the site or for potential for the existing nest to extend significantly beyond what was observed within the trial pit.

In accordance with the NHBRC Home Building Manual Part 3 and Clause 2.4.4 therein “The site shall be examined for termite workings and, if found, the building area shall be poisoned with an effective application of soil insecticides of the Aldrin and Chlordane types”. Following the extermination of the termites, dynamic compaction should be undertaken over the proposed construction areas (buildings, concrete slabs and roads) to ensure that any termite nests that are present are destroyed and will not pose a risk of collapse during or subsequent to construction. Should any areas exhibit excessive deflection during the dynamic compaction process then those areas should be filled with suitable soils (G7 or better), laid in 250mm thick compacted layers.

Following this site preparation, a bearing capacity of 50kPa may be used for foundations constructed at nominal depth and bearing on the compacted soils.

8.4 Excavatability

As discussed above, the site is generally characterised by sand overlying clayey sand.

The site thus generally classifies as “soft” according to the SABS 1200 D Earthworks classification, or as “Soft class 2” (materials which can be readily excavated with the aid of a pick) according to the Department of Works, (Watermeyer, 1997).

8.5 Stability of Trenches

The side walls of the trial pits remained stable during the investigations. In general, and where such trenches are dry and not below the water table, excavations to 1.2m depth can be excavated vertically. Excavations deeper than this will need to be shored or battered. It must however be noted that the trial pits excavated during the geotechnical investigation will give an optimistic indication of the stability of long trench excavations. It remains the responsibility of the contractor and engineer on site to ensure that excavations are safe.

8.6 Made Ground / Fill

Made ground/fill was not encountered over the site during the investigation and is not anticipated on the site.

8.7 Groundwater

Groundwater was not encountered in the on this site. Perched water tables can form particularly on the contact between the granular soils and underlying clayey soils after periods of heavy or continuous rain.

8.8 Geotechnical Evaluation: Other

1. *Supplementary Investigations.* The foundation conditions encountered during the investigation were generally consistent and correspond well to the anticipated and known ground conditions in the area. Further investigations are not considered necessary. Further investigations would be necessary if there are significant changes in the scope and type of development planned.
2. However, confirmatory investigations comprising inspection of foundations and trenches during construction are according to Codes and Best Practices, mandatory.
3. *Mining activity and undermining.* No evidence of mining was observed on site and there are no known occurrences of economic mineral deposits on the site.
4. *Dolomite.* The site is not a “dolomitic” site and none of the restrictions relating to development on dolomitic terrain are applicable.
5. *Flooding;* The 1:50 and 1:100 year floodlines were not determined as they fall outside the scope of this report, but it should be established as a matter of course. The development is however planned near a large watercourse, thus there is a potential that the floodlines will occur on the site.

9. CONCLUSION & RECOMMENDATIONS

Due to the presence of a termite nest, and in accordance with the NHBRC Home Building Manual Part 3 and Clause 2.4.4 therein “The site shall be examined for termite workings and, if found, the building area shall be poisoned with an effective application of soil insecticides of the Aldrin and Chlordane types”. Following the extermination of the termites, dynamic compaction should be undertaken over the proposed construction areas (buildings, concrete slabs and roads) to ensure that any termite nests that are present are destroyed and will not pose a risk of collapse during or subsequent to construction. Should any areas exhibit excessive deflection during the dynamic compaction process then those areas should be filled with suitable soils (G7 or better), laid in 250mm thick compacted layers.

Following this site preparation, a bearing capacity of 50kPa may be used for foundations constructed at nominal depth and bearing on the compacted soils.

Although no groundwater was encountered, perched water tables are anticipated following periods of heavy rainfall.

It is important to note that SMEC were appointed to undertake an investigation of the site and report on the geotechnical conditions encountered. We have provided generalised recommendations on feasible foundation options. However, the feasibility and appropriateness of the recommendations contained herein must be considered by the design engineers as they apply to the actual design and proposed infrastructure.

We trust that this report will be found to be complete and adequate for your consideration. Should further elaboration be required for any portion of this project, we would be pleased to provide assistance.

Respectfully submitted,
SMEC South Africa (Pty) Ltd

Appendix A

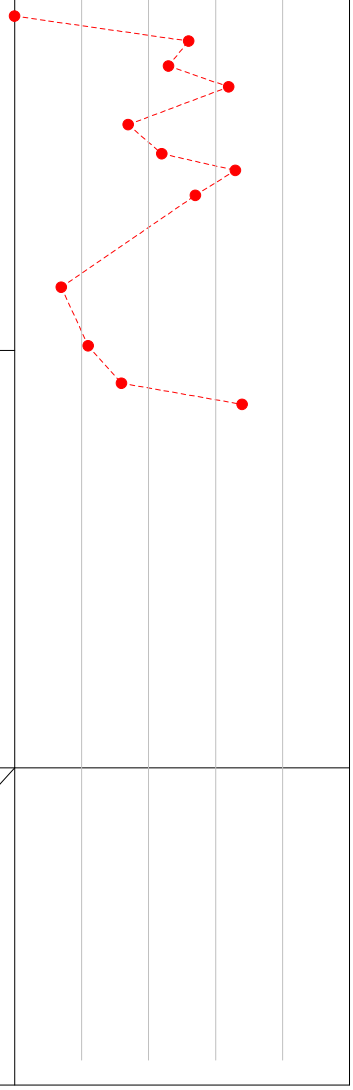
Trial Pit Profiles

TRIAL PIT LOG

CLIENT: JCJ Developments
PROJECT: Vlakfontein
PROJECT NO: JT0026
SITE: Vlakfontein

HOLE NO: VL/TP1
X COORD: 2,861,285
Y COORD: Lo29 30,076
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00 Ground Surface	
	Loose to medium dense, slightly clayey, silty SAND Moist, orange/brown, transported.	
1.5	1.50 **Medium dense to dense, silty SAND** Moist, light brown/white, transported.	
2.5	2.50 **Trial pit stopped at required depth**	
	End of Log	
3.0		



NOTES 1: Trial pit dry
2: No samples
3: Termite nest encountered
4:

MACHINE: Terex 820
DIAM: Trench
FILE REF: JT0026

DATE PROFILED: 6 Dec 2016
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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Template: SMEC TP04

TRIAL PIT LOG

CLIENT: JCJ Developments
PROJECT: Vlakfontein
PROJECT NO: JT0026
SITE: Vlakfontein

HOLE NO: VL/TP2
X COORD: 2,861,270
Y COORD: Lo29 30,011
ELEVATION:

Depth		Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
	0.00	Ground Surface	
0.0		**Loose to medium dense, slightly silty SAND** Moist, light brown, transported.	
0.5			
1.0			
	1.40		
1.5		**Medium dense, very clayey, silty SAND** Moist, light grey mottled orange/brown, residual.	
2.0			
	2.30	**Trial pit stopped at required depth**	
2.5		End of Log	
3.0			

NOTES 1: Trial pit dry
2: No samples
3:
4:

MACHINE: Terex 820
DIAM: Trench
FILE REF: JT0026

DATE PROFILED: 6 Dec 2016
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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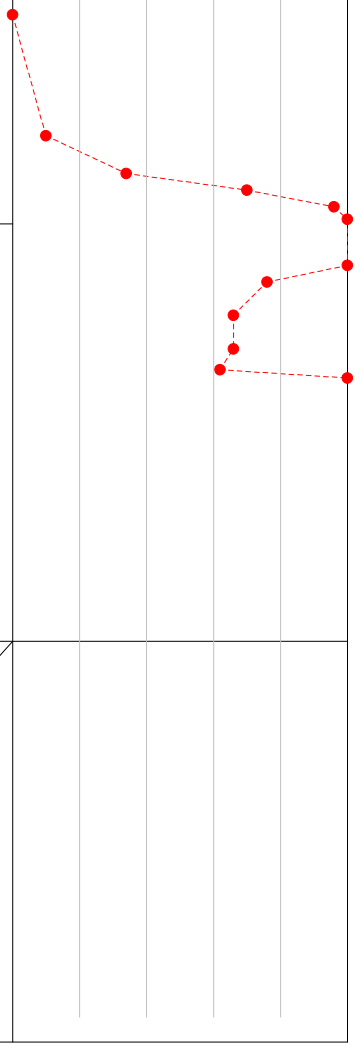
TRIAL PIT LOG

CLIENT: JCJ Developments
PROJECT: Vlakfontein
PROJECT NO: JT0026
SITE: Vlakfontein

HOLE NO: VL/TP3
X COORD: 2,861,192
Y COORD: Lo29 30,028
ELEVATION:

Depth	Description	Dynamic Probe Light Equivalent SPT-N (10 20 30 40)
0.0	0.00 Ground Surface	
	Loose to medium dense, silty SAND Moist, light brown, transported.	
1.30	**Medium dense to dense, clayey, silty SAND** Moist, light grey mottled orange/brown, residual. Becoming slightly cemented with depth.	
2.30	**Trial pit stopped at required depth**	
	End of Log	



NOTES 1: Trial pit dry
2: No samples
3:
4:

MACHINE: Terex 820
DIAM: Trench
FILE REF: JT0026

DATE PROFILED: 6 Dec 2016
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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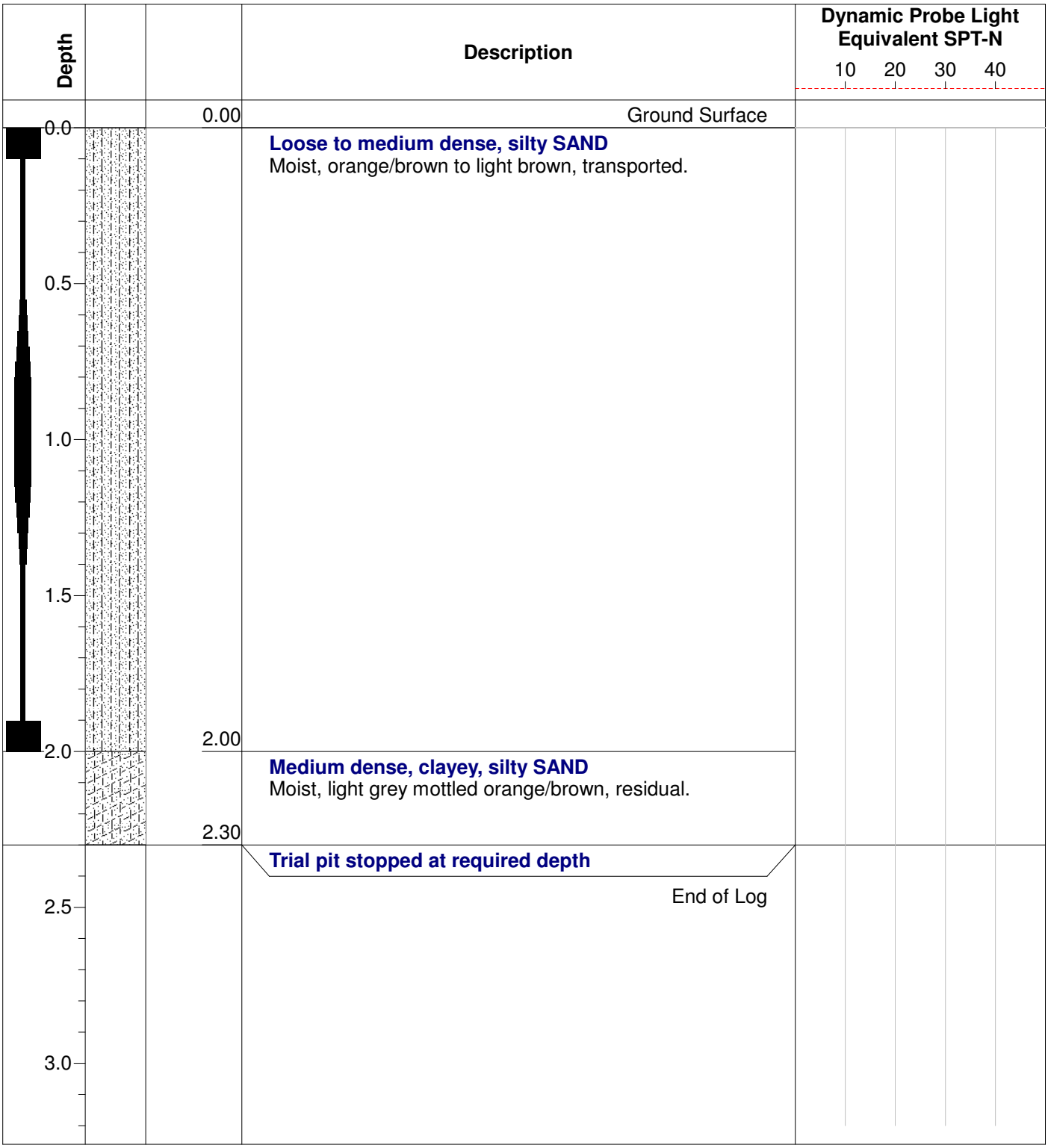
Template: SMEC TP04

TRIAL PIT LOG

CLIENT: JCJ Developments
PROJECT: Vlakfontein
PROJECT NO: JT0026
SITE: Vlakfontein

HOLE NO: VL/TP4
X COORD: 2,861,204
Y COORD: Lo29 30,090
ELEVATION:



NOTES 1: Trial pit dry
2: Sample VL/TP4/1 at 0-2.0m
3:
4:

MACHINE: Terex 820
DIAM: Trench
FILE REF: JT0026

DATE PROFILED: 6 Dec 2016
PROFILED BY: R Roberts Prof Reg:
CHECKED BY: Prof Reg:

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Appendix B

Profiling and Logging Parameters

1. SOIL DESCRIPTIVE TERMS

DESCRIPTIVE ORDER:
1. CONSISTENCY 2. SOIL TYPE 3. MOISTURE CONDITION 4. COLOUR 5. SOIL STRUCTURE 6. ORIGIN

1.(a) CONSISTENCY: GRANULAR SOILS

S P T "N"	GRAVELS & SANDS Generally free draining soils		TYPICAL DRY DENSITY (kg/m^3)
< 4	VERY LOOSE	Crumbles very easily when scraped with geological pick	< 1450
4-10	LOOSE	Small resistance to penetration by sharp pick point	1450-1600
10-30	MEDIUM DENSE	Considerable resistance to penetration by sharp pick point	1600-1750
30-50	DENSE	Very high resistance to penetration by sharp pick point. Requires many blows of pick for excavation	1750-1925
> 50	VERY DENSE	High resistance to repeated blows of geological pick. Requires power tools for excavation	> 1925

1(b) CONSISTENCY: COHESIVE SOILS

S P T "N"	SILTS & CLAYS and combination with SANDS Generally slow draining soils		UCS (kPa)
< 2	VERY SOFT	Pick point easily pushed in 100mm. Easily moulded by fingers	< 50
2-4	SOFT	Pick point easily pushed in 30-40mm. Moulded by fingers with some pressure. Easily penetrated by thumb.	50-125
4-8	FIRM	Pick point penetrates up to 10mm. Very difficult to mould with fingers. Indented by thumb with effort. Spade just penetrates.	125-500
8-15	STIFF	Slight indentation by pushing in pick point. Cannot be moulded by fingers. Penetrated by thumbnail. Pick necessary to excavate.	250-500
15-30	VERY STIFF	Slight indentation by blow of pick point.. Requires power tools for excavation.	500-1000

2. SOIL TYPE

SOIL TYPE	PARTICLE SIZE (mm)
CLAY	< 0,002
SILT	0,002 – 0,06
SAND	0,06 – 2
GRAVEL	2 – 60*
COBBLES	60 – 200*
BOULDERS	> 200*

* Specify aver/max sizes, hardness, shape and proportion

3. MOISTURE CONDITION

DRY	No water detectable
SLIGHTLY MOIST	Water just discernable
MOIST	Water easily discernable
VERY MOIST	Water can be squeezed out
WET	Generally below the water table

4. COLOUR

Described at natural moisture content, as seen in profile (unless otherwise specified).

SPECKLED	Very small patches of colour < 2 mm
MOTTLED	Irregular patches of colour 2 – 6 mm
BLOTCHED	Large irregular patches 6 – 20 mm
BANDED	Approximately parallel bands of varying colour
STREAKED	Randomly orientated streaks of colour
STAINED	Local colour variations: associated with discontinuity surfaces
Described using bedding thickness criteria. (e.g. thickly banded, thinly streaked, etc.)	

5. SOIL STRUCTURE

INTACT	No structure present
FISSURED	Presence of discontinuities, possibly cemented
SLICKENSIDED	Very smooth, glossy, often striated discontinuity planes
SHATTERED	Presence of open fissures. Soil breaks into gravel size blocks
MICRO-SHATTERED	Small scale shattering, very closely spaced open fissures. Soil breaks into sand size crumbs
RESIDUAL STRUCTURES	Relict bedding, lamination, foliation, etc.

6. ORIGIN

TRANSPORTED	Alluvium, hillwash, talus, etc.
RESIDUAL	Weathered from parent rock e.g. residual granite
PEDOCRETES	Ferricrete, laterite, silcrete, calcrete, etc.

DEGREE OF CEMENTATION OF PEDOCRETES		UCS (MPa)
VERY WEAKLY CEMENTED	Some material can be crumbled between finger and thumb. Disintegrates under knife blade to a friable state.	0,1 – 0,5
WEAKLY CEMENTED	Cannot be crumbled between strong fingers. Some material can be crumbled by strong pressure between thumb and hard surface. Under light hammer blows disintegrates to friable state.	0,5 – 2
CEMENTED	Material crumbles under firm blows of sharp pick point. Grains can be dislodged with some difficulty by a knife blade.	2 – 5
STRONGLY CEMENTED	Firm blows of sharp pick point on hand-held specimen show 1-3mm indentations. Grains cannot be dislodged by knife blade.	5 – 10
VERY STRONGLY CEMENTED	Hand-held specimen can be broken by single firm blow of hammerhead. Similar appearance to concrete.	10 - 25

REFERENCE: Guidelines for Soil and Rock Logging (SAIEG – AEG – SAICE) (1990)

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2. ROCK DESCRIPTIVE TERMS

DESCRIPTIVE ORDER: 1. HARDNESS 2. ROCK TYPE 3. WEATHERING 4. COLOUR 5. FRACTURE SPACING 6. DISCONTINUITY SURFACE DESCRIPTION 7. GRAIN SIZE 8. ROCK FORMATION NAME

1. ROCK HARDNESS

HARDNESS	DESCRIPTION	UCS (MPa)
VERY SOFT	Material crumbles under firm blows of pick point. Can be peeled with a knife. SPT refusal. Too hard to cut triaxial sample by hand	1 – 3
SOFT ROCK	Firm blows with pick point: 2-4mm indents. Can just be scraped with a knife	3 - 10
MEDIUM HARD ROCK	Firm blows of pick head will break hand-held specimen. Cannot be scraped or peeled with a knife.	10 - 25

HARDNESS	DESCRIPTION	UCS (MPa)
HARD ROCK	Breaks with difficulty, rings when struck Point load or laboratory test results necessary to distinguish between categories	25 – 70
VERY HARD ROCK		70 – 200
VERY VERY HARD ROCK		> 200

2. ROCK TYPE

Quartzite, sandstone, granite, limestone, etc.

4. COLOUR

Described in the dry state unless otherwise indicated

3. WEATHERING

DEGREE OF WEATHERING	EXTENT OF DISCOLOURATION	FRACTURE CONDITION	SURFACE CHARACTERISTICS	ORIGINAL FABRIC	GRAIN BOUNDARY CONDITION
UNWEATHERED	None	Closed or stained	Unchanged	Preserved	Tight
SLIGHTLY WEATHERED	< 20% of fracture spacing on both sides of fracture	Discoloured, may contain thin filling	Partial discolouration. Often unweathered rock colour	Preserved	Tight
MODERATELY WEATHERED	>20% of fracture spacing on both side of fracture	Discoloured, may contain thick filling	Partial to complete discolouration. Not friable except poorly cemented rocks	Preserved	Partial opening
HIGHLY WEATHERED	Throughout	-	Friable, possibly pitted	Mainly preserved	Partial separation. Not easily indented with knife. Does not slake
COMPLETELY WEATHERED	Throughout	-	Resembles a soil	Partially preserved	Complete separation. Easily indented with knife. Slakes

5. DISCONTINUITY SPACING

SEPARATION (mm)	SPACING (foliation, cleavage, bedding, etc.)	SPACING (fractures, joints, etc.)
< 6	very intensely	very highly
6 – 20	intensely	
20 – 60	very thinly	highly
60 – 200	thinly	
200 – 600	medium	moderately
600 – 2000	thickly	slightly
> 2000	very thickly	very slightly

6. DISCONTINUITY SURFACE DESCRIPTION

6.1 JOINT FILLING

JOINT FILL TYPE	DEFINITION (wall separation specified in mm)
CLEAN	No fracture filling
STAINED	Colouration of rock only. No recognisable filling material
FILLED	Fracture filled with finite thickness filling material

6.2 DISCONTINUITY ORIENTATION

Discontinuity inclinations (i.e. of joints, bedding, faults

6.3 ROUGHNESS OF DISCONTINUITY PLANES

CLASSIFICATION	DESCRIPTION
SMOOTH	Appears smooth and is essentially smooth to the touch. May be slickensided *
SLIGHTLY ROUGH	Asperities on the fracture surface are visible and can be distinctly felt
MEDIUM ROUGH	Asperities are clearly visible and fracture surface feels abrasive
ROUGH	Large angular asperities can be seen. Some ridge and high side angle steps evident
VERY ROUGH	Near vertical steps and ridges occur on the fracture surface

* Where slickensides occur the direction of the slickensides should be recorded

7. GRAIN SIZE

CLASSIFICATION	SIZE (mm)	RECOGNITION
VERY FINE GRAINED	< 0.2	Individual grains cannot be seen with a hand lens
FINE GRAINED	0.2 – 0.6	Just visible as individual grains under hand lens
MEDIUM GRAINED	0.6 – 2	Grains clearly visible under hand lens, just visible to the naked eye
COARSE GRAINED	2 – 6	Grains clearly visible to the naked eye
VERY COARSE GRAINED	> 6	Grains measurable

8. ROCK FORMATION

Brixton Formation, Halfway House Granite Dome etc.

REFERENCE: Guidelines for Soil and Rock Logging (SAIEG – AEG – SAICE) (1990)

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Appendix C

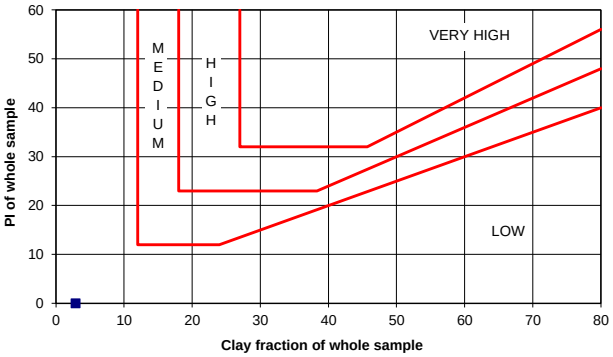
Laboratory Test Results

PARTICLE SIZE ANALYSIS

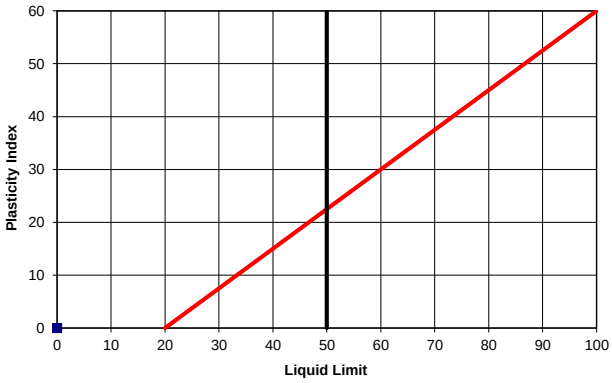
Sample No.	1	
Soillab Sample No.	2016-S-1905-01	
Depth (m)	0-2.0	
Position	VL/TP4/1	
Material Description	LIGHT REDDISH BROWN SILTY SAND	
Organic Material		
Moisture (%) / Dispersion (%)		
SCREEN ANALYSIS (% PASSING) **(TMH 1 A1(a) & A5)**		
63.0 mm	100	
53.0 mm	100	
37.5 mm	100	
26.5 mm	100	
19.0 mm	100	
13.2 mm	100	
4.75 mm	100	
2.00 mm	100	
0.425 mm	72	
0.075 mm	15	
HYDROMETER ANALYSIS (% PASSING) **(TMH 1 A6)**		
0.040 mm	9	
0.027 mm	6	
0.013 mm	4	
0.005 mm	3	
0.002 mm	3	
% Clay	3	
% Silt	6	
% Sand	91	
% Gravel	0	
ATTERBERG LIMITS **(TMH 1 A2 - A4)**		
Liquid Limit		
Plasticity Index	NP	
Linear Shrinkage (%)	0.0	
Grading Modulus	1.13	
Classification	A-2-4 (0)	
Unified Classification	SM	
Chart Reference		

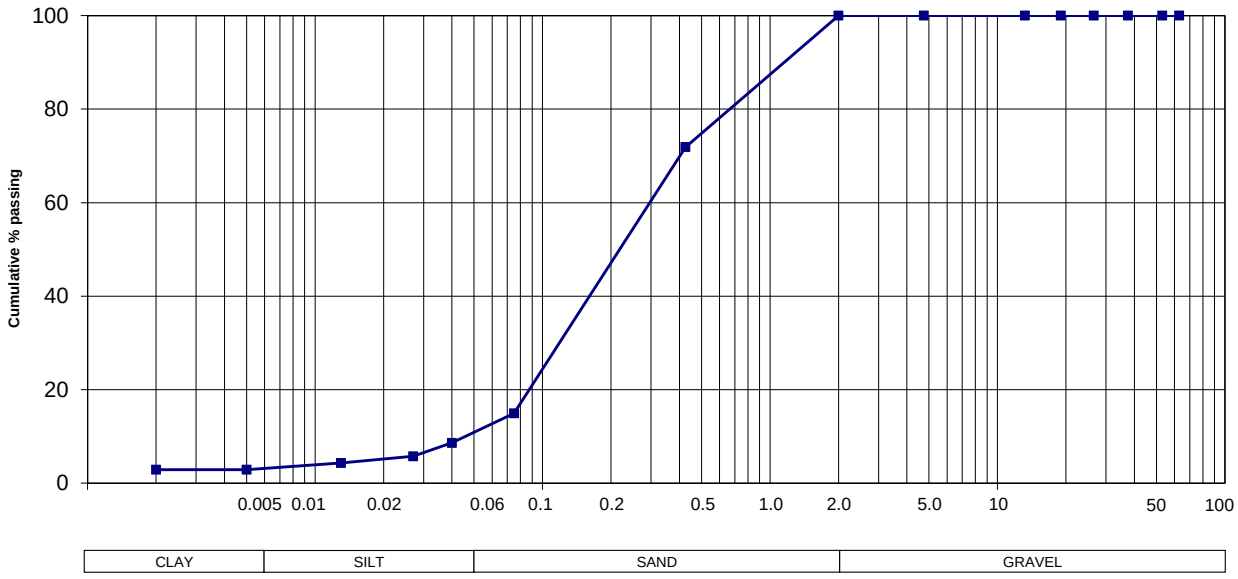
PROJECT : VLAKFONTEIN DEPOT
JOB No. : 2016-S-1905
DATE : 2016/12/05

POTENTIAL EXPANSIVENESS



PLASTICITY CHART





HIDROMETER/1905-01.xls

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SOIL ANALYSIS BY ..... : SOILLAB (Pty) Ltd
Lab reference No. ..... : 2016-S-1905

Date Printed : 2017-01-26

Customer ..... : SMEC
Job Description ..... : VLAKFONTEIN DEPOT
Road Number ..... :

Job Number ..... : 2016-S-1905
Contract Number .... :
Date ..... : 2016-12-06

SAMPLE DESCRIPTION						
Sample Number	57696					
Sample Position	VL/TP4/1					
Sample Depth (mm)	0-2000					
Material Description	LIGHT REDDISH BROWN SILTY SAND					
Max size of boulder (mm)	-					
SCREEN ANALYSIS (% PASS)						
75,00 mm	100					
63,00 mm	100					
53,00 mm	100					
37,50 mm	100					
26,50 mm	100					
19,00 mm	100					
13,20 mm	100					
4,750 mm	100					
2,000 mm	100					
0,425 mm	72					
0,075 mm	15					
SOIL MORTAR						
Coarse Sand 2,000-0,425	28					
Coarse Fine Sd 0,425-0,250	25					
Medium Fine Sd 0,250-0,150	20					
Fine Fine Sand 0,150-0,075	12					
Material <0,075	15					
CONSTANTS						
Grading Modulus	1.13					
Liquid Limit						
Plasticity Index	NP					
Linear Shrinkage (%)	0.0					
Sand Equivalent						
Classification - TRB	A-2-4 (0)					
Classification - COLTO	G7					
CBR / UCS VALUES	CBR					
MOD. AASHTO						
Max Dry Density (kg/m³)	1964					
Optimum Moisture Cont (%) ...	3.9					
Moulding Moisture Cont (%) ...	4.1					
Dry Density (kg/m³)	1964					
% of Max Dry Density	100.0					
100% Mod CBR/UCS	50					
% Swell	0.0					
NRB						
Dry Density (kg/m³)	1852					
% of Max Dry Density	94.3					
100% NRB CBR/UCS.....	27					
% Swell	0.0					
PROCTOR						
Dry Density (kg/m³)	1758					
% of Max Dry Density	89.5					
100% Proc CBR/UCS	11					
% Swell	0.0					
CBR / UCS VALUES						
100% Mod AASHTO	50					
98% Mod AASHTO	40					
97% Mod AASHTO	36					
95% Mod AASHTO	29					
93% Mod AASHTO	21					
90% Mod AASHTO	12					
SOILLAB NR	16-S-1905-01					