

# MBSA HIGH SPEED PROVING GROUND

**Geotechnical Investigation Report** 



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## **EXECUTIVE SUMMARY**

ARQ (Pty) Ltd. was requested by WSP Parsons Brinckerhoff on behalf of IngenAix GmbH to conduct the geotechnical investigation for the proposed new proving ground development 40km north-east of Upington. The development consists of various components and the investigation entailed test pits excavated with an excavator or tractor loader backhoe (TLB) to maximum depths of 5m and 3m, respectively.

The investigation was conducted from 9 to 16 June 2015. The test pits were profiled according to Brink and Bruin (2002) and representative soil strata were sampled for laboratory testing at Roadlab in Germiston, a SANAS accredited soil testing laboratory.

The investigation also entailed laboratory tests on core samples from a previously conducted rotary core drilling investigation at a possible quarry area. The investigation was aimed at determining the material's suitability for use in the construction of road layerworks or possibly for engineered fill. Testing was conducted at a SANAS accredited rock/ aggregate testing laboratory.

Section 5 of this report discusses the centreline investigation for the oval and handling track and multifunctional area, Section 6 the investigation at the building area and Section 7 the investigation at the bridge area. Section 8 examines the quarry and Section 9 the borrow pit area. Recommendations for the various components of the development are given in Section 10.

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- APPENDIX B TEST PIT PROFILES
- **APPENDIX C TEST PIT LABORATORY RESULTS**
- APPENDIX D BOREHOLE LABORATORY RESULTS
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- APPENDIX F ROCLAB ANALYSIS RESULTS
- APPENDIX G SETTLEMENT CALCULATIONS

## LIST OF ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
Bd	Building area test pit
Br	Bridge test pit
CBR	California Bearing Ratio
FI	Foundation Indicator
GM	Grading Modulus
LL	Liquid Limit
LS	Linear Shrinkage
MAD	Mod AASHTO Density
MDD	Maximum Dry Density
Mod	Moisture-density relationship
MS	Max Swell
OMC	Optimum Moisture Content (%)
ОТР	Oval test pit*
RI	Road Indicator
ТРН	Test pit handling track
TPMF	Test pit multifunctional area
TPOV	Test pit oval*
XRD	X-ray Diffraction
XRF	X-ray Fluorescence

\*Note: Abbreviation for the oval test pits were changed during the investigation from OTP to TPOV

## **1. INTRODUCTION**

ARQ (Pty) Ltd. was requested by the client, WSP (Pty) Ltd., to conduct a geotechnical investigation for the proposed new proving ground development situated some 40km northeast of Upington in the Northern Cape Province, South Africa. The development will consist of various roadways, a 17km long oval track, handling track, bridge or track overpass, buildings and other infrastructure.

Various preliminary investigations were previously conducted in the area comprising test pits on the borrow pit area and rotary core drilling at a possible quarry area.

The investigation conducted by ARQ was aimed at supplying information regarding the following:

- Geology of the site,
- Nature and engineering properties of materials excavated,
- Bearing capacity and settlement of the in-situ material/ soft rock layers,
- Risks or challenges that may be encountered during the excavation/construction activities,
- Suitability of in-situ materials for use in anticipated roadways and infrastructure,
- Potential expansiveness/ collapsibility of the soils, and
- Design recommendations for the foundations, earthworks and materials utilisation.

The investigation was conducted from 9-16 June 2015 by two of ARQ's geotechnical engineers, Hannes Taljaard and Coert van Dyk, together with a team from Roadlab and a WSP representative, Emile van Zyl.

## **2. THE SITE**

The site is located some 40km northeast of Upington on portion 6 of the farm Steenkampspan number 419 in the Siyanda district, Northern Cape. Refer to Figure 1 overleaf for a Google Earth <sup>™</sup> locality image of the site.



Figure 1: Site locality - Google Earth ™

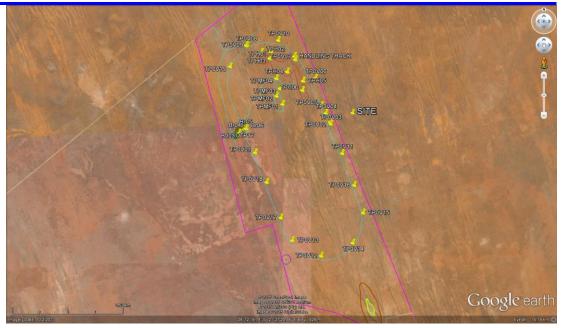
## **3. METHOD OF INVESTIGATION**

The investigation was planned according to the guidelines set out in SAICE's Site Investigation Code of Practice (SICOP, 2010), but conducted according to the client's requirements.

## 3.1. TEST PIT INVESTIGATION

The investigation comprised deep test pits excavated with a 28 ton excavator to depths of some 5.5m or effective refusal conditions at the building and bridge areas and in locations where deep cuttings are envisioned along the oval track. A tractor loader backhoe (TLB) was utilised to excavate the test pits for the latter part of the investigation, excavated to depths of some 3m or effective refusal conditions, as the TLB has greater mobility than the heavy excavator. Also, a maximum investigation depth of only 1.5m was required for the remainder of the test pits for the centreline investigation for the oval, handling track and multifunctional area.

47 test pits were conducted in total as part of the geotechnical investigation along the 17km oval, 7km handling track and the multifunctional, bridge and building area. The test pits were profiled according to the latest accepted standards (Brink and Bruin, 2002). The centreline investigation for the access and bad roads were not conducted, as the location and layout thereof was not finalised at the time of investigation. The co-ordinates of the test pits conducted on site are given in **Appendix A**, with Figure 2 overleaf showing the locations of these test pits.



#### Figure 2: Test pits conducted

As part of the centreline investigation for the oval track, the first test pit conducted was termed OTP17 (oval test pit #), after which it was decided to rather change the test pit names to TPOV (test pit oval #).

Samples were taken during the investigation of representative materials and sent for testing at Roadlab in Germiston, a SANAS accredited soil testing laboratory.

#### **3.2. DCP INVESTIGATION**

Dynamic Cone Penetrometer (DCP) testing was not conducted within the test pits as refusal conditions were encountered in most of the test pits and/ or the very loose to loose upper sand layer rendered the test pits unsafe with a high potential of sidewall collapse.

#### **3.3. ROTARY CORE DRILLING**

Rotary core drilling was not conducted at the area envisioned for the bridge/ track overpass, as relatively shallow refusal conditions with the excavator were encountered. These test pits were conducted at the planned locations of the bridge abutments and piers, as confirmed with the client on site.

Core samples were collected from the previously conducted rotary core drilling investigation at the granite outcrop to determine the material's suitability for use in the layerworks or engineered fill for the development.

## 4. **GEOLOGY**

## 4.1. **REGIONAL GEOLOGY**

The regional geology was determined by overlying the 1:250 000 geological map 2820 UPINGTON in Google Earth <sup>™</sup>, as shown in Figure 3 overleaf.



Figure 3: Google Earth overlay of the site geology ™

As seen in Figure 3, the site is underlain by:

- Mle- Metabasalt, felsic lavas, greenschist, conglomerate and ferruginous<br/>chert of the Leerkrans Formation, Wilgenhoutsdrif Group,
- T Calcrete,
- Mrp Conglomerate and sandstone of the Rusplaas Formation, Koras Group,
- **Nb** Granite porphyry of the Blouwbosch granites, and
- **Qg** Red-brown, wind-blown sand and dunes of the Gordonia Formation.

## 4.2. LOCAL GEOLOGY

Local geology was determined from the test pit investigation. Table 1 overleaf contains a summary of the samples collected from the test pit investigation (in chronological order) and the laboratory tests for which the samples were submitted.

A summary of the test pit profiles, depicting the local geology, are given in the subsequent sections of this report.

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Tab	Table 1: Summary of samples collected from test pit investigation					
No.	Test pit No.	Depth (m)	Laboratory tests requested	Material		
1		0.0-1.3	MOD and CBR, FI, pH and conductivity	Sand		
2	Bd01 1.3-2.2		MOD and CBR, FI	Pebble marker		
3		2.2-2.7	MOD and CBR, FI, pH and conductivity	Granite		
4	Bd06	1.4-2.9	MOD and CBR, FI	Granite (manifest as gravel)		
5	Bd05	1.1-2.5	MOD and CBR, FI, pH and conductivity	Metabasalt + calcrete		
6	Bd08	0.8-3.3	MOD and CBR, FI, pH and conductivity	Metabasalt		
7	Bd12	0.6-2.6	MOD and CBR, FI, pH and conductivity	Metabasalt + calcrete		
8	OTP17	0.3-1.0	MOD and CBR, Indicator	Pebble marker		
9	TDOV2	0.0-1.3	MOD and CBR, Indicator, pH and conductivity	Sand		
10	0 TPOV2 1.4-2.8		MOD and CBR, Indicator, pH and conductivity	Metabasalt		
11	0.0-1.4		MOD and CBR, Indicator	Sand		
12	TPOV4	1/21	MOD and CBR, Indicator, pH and	Metabasalt +		
12	1.4-3.1		conductivity	calcrete		
13	TPOV7	0.0-3.5	MOD and CBR, Indicator	Sand		
14	TPOV8	0.0-2.5	MOD and CBR, Indicator, pH and conductivity	Sand		
15	TPH02	0.0-2.7	MOD and CBR, Indicator	Sand		
16	TPH04	0.0-1.7	MOD and CBR, Indicator	Sand		
17	TPH05	0.0-0.7	MOD and CBR, Indicator	Sand		
18	TPMF01	0.0-2.6	MOD and CBR, Indicator	Sand		
19	TPOV11	0.0-0.8	MOD and CBR, Indicator	Sand		
20	TPOV12	0.0-0.8	MOD and CBR, Indicator, pH and conductivity	Sand		
21	TPOV13	0.0-1.4	MOD and CBR, Indicator	Sand		
22	TPOV15	0.0-1.0	MOD and CBR, Indicator	Sand		
23	TPOV16	0.1-0.8	MOD and CBR, Indicator, pH and conductivity	Metabasalt + calcrete		
24	TPOV18	0.0-0.6	MOD and CBR, Indicator, pH and conductivity	Sand		
25	TPOV19	0.5-1.9	MOD and CBR, Indicator, pH and conductivity	Metabasalt + calcrete		

In the subsequent sections of the report, the different components or areas of the investigation will be discussed separately i.e. the centre line investigation (oval track, handling track and multifunctional area), the buildings area, the bridge and the quarry area.

#### **4.2.1. CALCRETE**

Various forms of calcrete were encountered throughout the test pit investigation i.e. powder, nodular, honeycombed and hardpan calcrete, the difference originating from the degree or extent of the calcrete formation.

Calcrete is formed when the soil or parent material is replaced or cemented, to a lesser or greater extent, by the carbonate (via precipitation through a fluctuating water table or it may be transported downwards through the soil by rainwater).

Brink (1985) states that crushed hardpan calcretes are rarely used for surfacing chipping due to excessive binder absorption. This problem may be overcome by precoating the chippings. One of the main difficulties of using the calcrete material in construction of the layerworks is the variability of the material, both vertically and horizontally, in the possible borrow pit. This variability in the material quality, layer thickness and even type of calcrete (i.e. nodular or hardpan etc.) was noted during the test pit investigation. Further potential problems include those of alkali-silica, carbonate and alumina reactions. The main method of assessing the quality and suitability of the material is by means of soaked CBR (Brink 1985).

## **5. CENTRE LINE INVESTIGATION**

The centre line investigation comprises the oval track, handling track and multifunctional area investigations.

From the draft design requirements for the preliminary design of the roadways and developments on site, construction material of the following quality are required:

- G7 G10 as bulk fill material,
- G5 for subbase material,
- G3 for base material, and
- Likely G1 material for the envisaged asphalt surfacing layer.

## 5.1. OVAL TRACK

The oval track is some 17km in length and will be situated on sections with varying subsurface conditions i.e. shallow bedrock/calcrete or deep sand strata sections (such as dunes) that will require bulk earthworks. The positions of the 20 test pits conducted on the oval track are shown in Figure 4.

Various samples were collected from the centreline test pit investigation and submitted for laboratory testing.



Figure 4: Test pit positions - Oval track from Google Earth ™

#### 5.1.1. MATERIAL PROPERTIES

#### *a) Test pit profiles*

A summary of the test pit profiles are given in Table 2 below.

#### Table 2: Profile summary - Oval track

	Layer and depth (m)							
	So	oils		Rocks/Ped	logenic			
Test pit	Very loose	Quartz pebbles		Metabasalt		Granite	Refusal depth	
	to	in a	Metabasalt	with	Calcrete	with	(m)	
	loose	sand		calcrete		calcrete		
	sand	matrix						
TPOV01	0-0.1			0.1-0.5			0.5	
TPOV02	0-1.3	1.3-1.4	1.4-2.8				2.8	
TPOV03	0-1.4	1.4-1.8	1.8-2.8				2.8	
TPOV04	0-1.4			1.4-3.1			3.1	
TPOV05	0-1.0	1.0-1.3	1.3-2.0				2.0	
TPOV06	0-5.0						-	
TPOV07	0-3.5			3.5-3.6			3.6	
TPOV08	0-2.5						-	
TPOV09	0-0.9		0.9-1.8				1.8	
TPOV10	0-0.6	0.6-0.7	0.7-1.4				1.4	
TPOV11	0-0.8			0.8-0.9			0.9	
TPOV12	0-0.8	0.8-1.3	1.3-1.7				1.7	
TPOV13	0-1.4	1.4-1.7	1.7-2.0				2.0	
TPOV14	0-1.0				1.0-1.3		1.3	
TPOV15	0-1.0				1.0-1.1		1.1	
TPOV16	0-0.1			0.1-0.8			0.8	
TPOV17	0-1.0			1.0-1.8			1.8	
OTP17	0-1.0					1.0-3.1	-	

The detailed profiles of the centreline investigation for the oval track are given in **Appendix B.** 

#### b) Test pit samples

A summary of the laboratory results for the tests conducted on samples from the oval track centreline investigation are given in Table 4 and Table 5 overleaf. The detailed laboratory results are given in **Appendix C.** 

#### c) Expansive soils

No expansive soils were identified during the investigation.

#### d) Compressible soils

Compressible soils were identified during the investigation in the form of very loose to loose sand. This compressible characteristic will in all likelihood be mitigated upon compaction at the appropriate moisture condition (generally OMC +2%)

#### e) Collapsible soils

Collapsible soils were observed during the investigation in the form of a pinholed structure in the sand. The pinholed structure is likely to be destroyed upon compaction.

#### *f*) *pH* and conductivity

The corrosivity of the sand material for the oval track was classified as "non-corrosive" with a slightly basic pH that ranges from 7.6 to 8.1 (a pH of 7.0 indicates a completely neutral material). For the calcrete material, an average pH value of 8.4 and conductivities of 0.0 mS/m was determined, classifying the material as "non-corrosive" as well. The summarised pH and conductivity test results are provided in Table 4 and Table 5, with the comprehensive results contained in **Appendix C**.

According to the criteria in Table C7 of the CSIR Report No: BOU/R9705, a conductivity of >50 mS/m indicates a soil that is very corrosive while 50-20, 20-10 and <10 mS/m indicate corrosive, mildly corrosive and generally not corrosive conditions respectively.

In subclause 3602 (b) of COLTO, it is specified that crushed stone material with an electrical conductivity <150 mS/m and pH >6 may be used as for construction purposes and no further stabilisation is required (COLTO, 1998).

#### g) Salts

The soluble salt content of the sand layers were determined on the following samples, as given in Table 3.

Test pit No	TPOV7	TPOV8	TPOV11	TPOV15	TPOV18
Depth (m)	0.00-2.50	0.00-0.35	0.00-0.80	0.00-1.00	0.00-0.700
Soluble salt (%)	0.079	0.100	0.073	0.118	0.106

#### Table 3: Soluble salt content of sand

According to the guidelines in TRH14 (1985), the salt content should be <1% if the PI and -0.002mm fraction is <12% before treatment. Based on these guidelines and also

due to the pH and electrical conductivity values being within acceptable standards (COLTO, 1998), the salt content of the material is not envisaged to be problematic.

Sample No.	TPOV2	TPOV2	TPOV4	TPOV4	TPOV7	TPOV8	TPOV11	TPOV12
Depth (m)	0.0-1.3	1.4-2.8	0.0-1.4	1.4-3.1	0.0-3.5	0.0-2.5	0.0-0.8	0.0-0.8
LL	0	0	0	0	0	0	0	0
PI	NP	NP	NP	NP	NP	NP	NP	NP
LS	0	0	0	0	0	0	0	0
GM	0.98	2.44	1.02	2.48	0.96	1.17	1.01	1.09
% P0.425mm	95	24	95	19	99	88	94	84
% P0.075mm	7.2	6	5	5	5	6	7	9
Expansiveness	Low	Low	Low	Low	Low	Low	Low	Low
OMC (%)	6.1	7.3	5.0	5.7	5.2	6.1	7.9	6.5
MDD (kg/m <sup>3</sup> )	1 766	2 152	1 756	2 193	1 727	1 731	1 711	1 880
CBR @ 100%	32	116	22	101	16	18	22	32
CBR @ 95%	13	64	9	70	9	9	10	18
CBR @ 93%	11	54	8	62	8	7	9	15
Swell 100%	0.02	0.02	0.02	0.02	2.02	0.02	2.02	0.02
COLTO Class.	G8	G5	G9	G5	G9	G9	G9	G7
AASHTO Class.	A-3 (0)	A-1-a(0)	A-3 (0)	A-1-a(0)	A-3 (0)	A-3 (0)	A-3 (0)	A-3 (0)
рН				8.5	7.8	7.8	7.9	
Conductivity (mS/m)				0.00	0.02	0.03	0.03	

#### Table 4: Laboratory results - Oval track test pits (a)

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Та	ble 5: Laboı	atory resul	ts - Oval tra	ck test pits	(b)			
Sample No.	TPOV12	TPOV13	TPOV15	TPOV16	TPOV18	TPOV19	TPOV19	OTP17
Depth (m)	1.4 - 2.8	0.0-1.4	0.0-1.0	0.1-0.8	0.0-0.6	0.0-0.5	0.5-1.9	0.3-1.0
LL	0	0	0	0	0	0	0	0
PI	NP	NP	NP	NP	NP	NP	NP	NP
LS	0	0	0	0	0	0	0	0
GM	2.48	1.1	1.01	1.98	1.06	1.06	2.54	2.64
% P0.425mm	24	85	92	46	86	88	19	16
% P0.075mm	4	9	8	6	10	7	4	2
Expansiveness		Low	Low		Low	Low	Low	Low
OMC (%)	7.3	5.8	5.3	6.0	6.8	7.2	5.5	3.3
MDD (kg/m <sup>3</sup> )	2152	1880	1802	2067	1837	1873	2227	2176
CBR @ 100%	116	19	28	120	31	40	108	71
CBR @ 95%	64	12	18	76	21	26	64	26
CBR @ 93%	54	10	13	64	16	21	54	23
Swell 100%	0.02	2.00	0.02	0.02	0.82	0.02	0.08	0.03
COLTO Class.	G5	G9	G8	G5	G9	G7	G5	G7
AASHTO Class.	A-1-a(0)	A-3 (0)	A-3 (0)	A-1-b(0)	A-3 (0)	A-3 (0)	A-1-a(0)	A-1-a(0)
рН			8.1	8.3	7.6		8.4	
Conductivity (mS/m)			0.01	0.00	0.02		0.00	

## 5.1.2. GEOTECHNICAL EVALUATION

#### a) Groundwater

No groundwater was encountered during the centreline investigation.

#### *b) Excavation conditions*

#### Sand

Based on SABS 1200, soft excavation conditions can be expected for the sand using a 20 ton excavator. The sand depth varies across the site from 0.1m to >5m depending on the topography (i.e. on top of a dune). Refer to the profiles in **Appendix B** for an indication of the sand depth at various positions across the site or to Table 2 for a summary of the profiles.

#### **Calcrete and rock**

Based on SABS 1200, intermediate to hard excavation can be expected for the material below the sand i.e. calcrete and/or bedrock.

Blasting through calcrete material along the centreline of the oval, to lower the track, is not recommended due to the varying nature of the calcrete strata (thickness, uniformity etc.). This will most likely result in the material being blasted loose in large slabs that will further require pecking to reduce it to a useable size.

#### c) Use of in-situ material as construction material

#### Sand

Most of the sand classified as G9 material and can therefore be used as bulk fill material in the roadway layerwork construction. The sand material has the following particle distribution:

Material passing	Min	Max	Average
P425	84.0	99.0	90.1
P075	5.0	10.0	7.6

## Table 6: Sand particle distribution

According to Section 3302 in COLTO, sand with a particle size distribution of P075>20% should be compacted to 95% of the Mod AASHTO density. The material has P075<20% and should therefore be compacted to at least 100% of its Mod AASHTO density in 150mm layers at 0 to +2%. of the OMC with a vibratory smooth drum roller with a 300kN centrifugal force on high amplitude mode.

## Calcrete and rock

The calcrete and calcrete mixed with in-situ bedrock material classified as G5 material and it is therefore suited as subbase material for the roadways. The material will most likely have to be crushed to increase the homogeneity and workability of the material.

#### d) Cuttings

The oval track will traverse some undulating terrain, consisting of sand dunes of varying heights and widths. This will warrant the bulk excavation of such areas (as cuttings) to accommodate the planned profile of the oval track.

Table 7 shows the test pits which are in close proximity to the major cuttings on the oval track with the expected excavation conditions (estimates only). The expected cutting depths were extrapolated from the current layout and profile of the oval track as received from the client and are subject to change should the profile or founding depth be altered.

Chainage	Expected	Test pit	Excavati	on conditions ex	xpected
(km)	cutting depth (m)	No.	Soft	Intermediate	Hard
0.60 - 1.20	3.00	-	0.00 - 1.00		1.00 - 3.00
2.40	4.00	TPOV08	0.00 – 2.50	2.50 - 3.00	3.00 - 4.00
2.45	2.40	TPOV09	0.00 - 0.90		0.90 - 2.40
5.10 - 5.65	3.00	TPOV06	0.00 - 3.00		
6.00	3.00	TPOV05	0.00 – 1.20	1.20 - 2.00	2.00 - 3.00
6.30	8.00	TPOV04	0.00 - 1.40	1.40 - 3.10	3.10 - 8.00
6.62	3.50	TPOV02	0.00 - 1.40	1.40 - 3.50	
6.70	2.00	TPOV03	0.00 - 1.80	1.80 - 2.00	
15.90	1.50	TPOV01	0.00 - 0.10	0.10 - 0.30	0.30 - 1.50
16.75	2.00	OTP17	0.00 - 1.00	1.00 - 2.00	
16.80	2.00	BR02	0.00 - 0.10	0.10 - 0.50	0.50 – 2.00

#### e) Drainage conditions

The upper stratum of material on site was profiled as very loose to loose sand with the following grading characteristics:

#### Table 8: Oval track sand grading characteristics

Grading property	Min. sieve size (mm)	Max. sieve size (mm)	Average
D <sub>10</sub>	0.075	0.085	0.079

The material is expected to display average drainage characteristics with a rough indication of the permeability (according to Hazen from Craig, 2004) in the order of:

$$k = (D_{10})^2 / 100 = 6.24 \text{ E-5 m/s}$$

This indication of the average expected permeability is calculated based on the average  $D_{10} = 0.079$ mm (the effective sieve size at which 10% of the material passes) for the sand material.

The underlying calcrete and bedrock strata beneath the first layer of sand is expected to be less pervious than the sand layer and may act as small catchment basins in low-lying areas (i.e. between two closely spaced dunes) after heavy rainstorms. With an average rainfall of <200mm per annum, this is not deemed problematic.

Recommendations regarding the suitability of the material and the development of the oval track are given in Section 9 of this report.

## 5.2. HANDLING TRACK

The 5.5km long handling track is situated inside the north-eastern section of the oval track. A total of 6 test pits were conducted as part of the centreline investigation for the track.

The positions of the 6 test pits conducted on the handling track are shown in Figure 5.

Samples were collected from the test pit investigation and submitted for laboratory testing.



Figure 5: Test pit positions - Handling track

#### 5.2.1. MATERIAL PROPERTIES

#### a) Test pit profiles

A summary of the test pit profiles are given in Table 9. The detailed profiles are given in **Appendix B.** 

		L	ayer and depth	th (m)		
	Soils			Rocks/ Pedogenic		
Test pit	Very loose to loose sand	Quartz pebbles in a sand matrix	Gravelly sand	Metabasalt with calcrete	Refusal depth (m)	
TPH01	0.0 - 0.80			0.80 - 1.50	1.50	
TPH02	0.0 - 2.70				-	
TPH03	0.0 - 0.80	0.80 - 0.90		0.90 - 1.55	1.55	
TPH04	0.0 - 1.70		1.70 - 2.00	2.00 - 2.60	2.60	
TPH05	0.0 - 0.70			0.70 - 1.00	1.00	
TPH06	0.0 - 1.00	1.00 - 1.20		1.20 - 1.70	1.70	

#### Table 9: Profile summary - Handling track

#### b) Test pit samples

A summary of the laboratory results of the tests conducted on the samples from the handling track centreline investigation is given in Table 10. The detailed lab results are given in **Appendix C.** 

Table 10: Laboratory results summary – Handling track				
Sample No.	TPH02	TPH04	TPH05	
Depth (m)	0.0-2.7	0.0-1.7	0.0-0.7	
LL	0	0	0	
PI	NP	NP	NP	
LS	0	0	0	
GM	1.02	1.05	1.11	
% P0.425mm	93	92	87	
% P0.075mm	6	5	8	
Expansiveness rating	Low	Low	Low	
OMC (%)	5.0	6.3	6.7	
MDD (kg/m3)	1 803	1 823	1 843	
CBR @ 100% MAD (%)	18	22	16	
CBR @ 95% MAD (%)	13	8	9	
CBR @ 93% MAD (%)	10	7	7	
MS @ 100% MAD (%)	0.02	0.02	0.02	
COLTO Class.	G9	G9	G9	
AASHTO Class.	A-3(0)	A-3(0)	A-3(0)	

#### c) Expansive soils

No expansive soils were identified during the investigation.

*d) Compressible soils* 

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (d).

#### e) Collapsible soils

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (e).

#### f) Salts

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (f).

#### 5.2.2. GEOTECHNICAL EVALUATION

a) Groundwater

No groundwater was encountered during the investigation.

#### b) Excavation conditions

#### Sand

Based on SABS 1200, soft excavation conditions can be expected for the sand using a 20 ton excavator. The sand depth varies across the site from 0.7m to some 2.7m depending on the topography. Refer to the profiles in **Appendix B** for an indication of the sand depth at various positions across the site.

#### Calcrete and rock

Based on SABS 1200, intermediate to hard excavation can be expected for the material below the sand i.e. calcrete and rock.

#### c) Use of in-situ material as construction material

#### Sand

The sand classified as G9 material and can therefore be used as fill material for the road construction. The sand material has the following particle distribution:

Material passing	Min	Max	Average
P425	87.0	93.0	90.7
P075	5.0	8.0	6.3

Table 11: Handling t	rack sand gradin	g characteristics
Tuble III Humaning	a uch suna Si uum	5 chui acter istics

According to COLTO (1998), the sand should be compacted to at least 100% of its Mod AASHTO density (see Section 5.1.2). The sand should be compacted in 150mm layers at 0 to +2% of the OMC with a vibratory smooth drum roller with a 300kN centrifugal force on high amplitude mode.

#### **Calcrete and rock**

The calcrete and calcrete mixed with rock classified as G5 material and therefore it can be used as subbase material for the roads.

#### d) Cuttings

Table 12 shows the test pits which are in close proximity to the major cuttings on the handling track.

Chainage	Expected	Nearby	Excavation	Excavation conditions expected (m)		
(km)	cutting depth (m)	test pits	Soft	Intermediate	Hard	
0.58	1	-	0.00 - 0.50	0.50 – 1.00		
1.88	1	TPH03	0.00 - 0.90	0.90 - 1.00	1.00 - 3.00	
3.80	2	TPOV7	0.00 - 3.50			

Table 12: Major cuttings at handling track

#### e) Drainage

The upper stratum of material on site was profiled as very loose to loose sand with grading characteristics as shown in Table 13, which is similar to the material for the surrounding oval track.

Table 13: Handling tra	ck sand grading charac	cteristics

Grading property	Min. sieve size (mm)	Max. sieve size (mm)	Average
D <sub>10</sub>	0.078	0.082	0.080

The sand is expected to display similar drainage characteristics to the material from the oval track test pit investigation. Refer to Section 5.1.2 (e) for an indication of the expected permeability of the material.

## 5.3. MULTIFUNCTIONAL AREA

The multifunctional area is also situated within the oval track. It is located near the centre of the northern part of the oval track. The positions of the 4 test pits conducted on the multifunctional area are shown in Figure 6.

Samples were collected from the test pit investigation and submitted for laboratory testing.



Figure 6: Test pit positions - Multifunctional area

#### 5.3.1. MATERIAL PROPERTIES

a) Test pit profiles

A summary of the test pit profiles are given in Table 14. The detailed profiles are given in **Appendix B**.

	Soils	Rocks/Pedogenic		
Test pit	Very loose to loose sand	Metabasalt with Calcrete	Refusal depth (m)	
TPMF01	0.0 - 2.6	2.6-2.8	2.8	
TPMF02	0.0 - 2.0	-	-	
TPMF03	0.0 - 1.1	1.1 - 1.4	1.4	
TPMF04	0.0 - 1.1	1.1 - 1.4	1.4	

 Table 14: Profile summary - Multifunctional area

#### *b) Test pit samples*

A summary of the laboratory results of the tests conducted on the test pit samples taken from the multifunctional area is given in Table 15. The detailed laboratory results are given in **Appendix C**.

Table 15: Laboratory results summary – Multifunctional area		
Sample No.	TPMF01	
Depth (m)	0.0-2.6	
LL	0	
PI	NP	
LS	0	
GM	0.93	
% P0.425mm	93	
% P0.075mm	7	
Expansiveness rating	Low	
OMC (%)	6.2	
MDD (kg/m <sup>3</sup> )	1 781	
CBR @ 100% MAD (%)	23	
CBR @ 95% MAD (%)	15	
CBR @ 93% MAD (%)	12	
MS @ 100% MAD (%)	0.02	
COLTO Class.	G8	
AASHTO Class.	A-3(0)	

#### c) Expansive soils

No expansive soils were identified during the investigation.

d) Compressible soils

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (d).

#### e) Collapsible soils

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (e).

#### f) Salts

The same material regime was encountered as for the oval test pit investigation; refer to Section 5.1.1 (f).

#### 5.3.2. GEOTECHNICAL EVALUATION

a) Groundwater

No groundwater was encountered during the investigation.

#### b) Excavation conditions

#### Sand

Based on SABS 1200, soft excavation conditions can be expected for the sand using a 20 ton excavator. The sand depth varies across the site from 1.1m to >2.6m depending on topography. Refer to the profiles in **Appendix B** for an indication of the sand depth at various positions across the site.

#### Calcrete and rock

Based on SABS 1200, intermediate to hard excavation can be expected for the material below the sand i.e. calcrete and bedrock.

c) Use of in-situ material as construction material

#### Sand

The sand classified as G9 material and can therefore be used as fill material for the road construction. According to COLTO (1998), the sand should be compacted to at least 100% of its Mod AASHTO density (refer to Section 5.1.2).

#### **Calcrete and rock**

The calcrete and calcrete mixed with rock classified as G5 material and therefore it can be used as subbase material for the roads.

#### d) Cuttings

No major cuttings are envisioned for the multifunctional area. Should it be required, refer to the recommendations in Section 9.

#### e) Drainage

The material in the proposed multifunctional area exhibits characteristics similar to that at the oval and handling track. Refer to Section 5.1.2.

## **6. BUILDINGS AREA**

The buildings area will comprise a workshop, fuel station and various other small buildings. It is approximately 1.3ha in size and situated to the west of the oval track.

The shallow subsurface investigation for the buildings area was conducted with a 28 ton excavator to a maximum depth of 4.5m or effective refusal conditions. The test pits were profiled according to Brink and Bruin (2002) and the locations were recorded with a handheld GPS.

The positions of the 12 test pits conducted at the buildings area are shown in Figure 7.

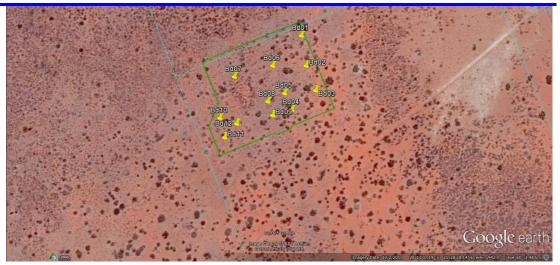


Figure 7: Test pit positions - Buildings area

Various samples were collected from the test pit investigation and submitted for laboratory testing at Roadlab in Germiston, a SANAS accredited soil testing laboratory.

## 6.1. MATERIAL PROPERTIES

#### 6.1.1. TEST PIT PROFILES

A summary of the test pit profiles are given in Table 16. The detailed profiles are given in **Appendix B**.

	Layer and depth (m)								
	Soils		Rocks/Pedogenic						
Test pit	Very loose to loose sand	Quartz pebbles in a sand matrix	Gravel	Meta- basalt	Meta- basalt with calcrete	Calcrete	Green schist	Soft rock granite	Refusal depth (m)
BD01	0-1.3	1.3-2.2						2.2-2.7	2.7
BD02	0-1.4	1.4-1.9		1.9-4.3					-
BD03	0-2.0	2.0-2.5		2.5-4.1					-
BD04	0-0.9	0.9-1.3	1.3-1.6				1.6-3.6		3.6
BD05	0-0.9	0.9-1.1			1.1-2.5				2.5
BD06	0-1.2	1.2-1.4	1.4-2.9						2.9
BD07	0-0.4	0.4-0.6			0.6-2.9				2.9
BD08	0-0.6	0.6-0.8	0.8-3.3						3.3
BD09	0-0.8	0.8-1.0			1.0-3.3				3.3
BD10	0-0.3					0.3-1.4			1.4
BD11	0-0.9	0.9-1.0			1.0-2.3				2.3
BD12	0-0.6				0.6-2.6				2.6

#### Table 16: Profile summary - Buildings area

Refusal conditions were encountered at an average depth of some 2.8m. The upper layers (sand and pebble marker) of the test pits in the area were observed to be fairly

similar with slight differences in the deeper material strata encountered i.e. different grades of bedrock weathering with varying forms and amounts of calcrete present.

#### 6.1.2. TEST PIT SAMPLES

A summary of the laboratory results for the buildings area test pit investigation is given in Table 17. The detailed laboratory results are given in **Appendix C**.

Sample No.	Bd01	Bd01	Bd01	Bd05	Bd06	Bd08	Bd12
Depth (m)	0.0-1.3	1.3-2.2	2.2-2.7	1.1-2.5	1.4-2.9	0.8-3.3	0.6-2.6
LL	0	0	0	0	0	23	0
PI	NP	NP	SP	SP	NP	5*	NP
LS	0	0	0.7	0.7	0	2.8	0
GM	1.05	2.67	2.38	2.52	2.63	2.65	2.42
% P0.425mm	91	13	21	16	13	11	21
% P0.075mm	5	5	8	6	4	5	7
Expansiveness	Low	Low	Low	Low	Low	Low	Low
OMC (%)	5.9	3.1	7.5	5.5	8	6.5	6.5
MDD (kg/m3)	1375	2189	2214	2153	2259	2193	2067
CBR @ 100%	19	141	39	96	104	72	94
CBR @ 95%	10	90	36	57	73	60	60
CBR @ 93%	8	62	29	51	59	51	53
Swell @ 100%	5.02	0.02	0.03	2.02	0.02	0.06	0.02
COLTO Class.	G9	G1	G7	G5	G5	G5	G5
AASHTO Class.	A-3(0)	A-1-a(0)	A-1-a(0)	A-1-a(0)	A-1-a(0)	A-1-a(0)	A-1-a(0)
рН				8.4			8.4
Conductivity (mS/m)				0.1			0.2

Table 17: Laboratory results summary - Buildings area
Table 1/, Laboratory results summary - Dunumes area

\*Note that for BD08 the PI is wrongly indicated as 18 on the laboratory test results instead of 5.

#### 6.1.3. EXPANSIVE SOILS

No expansive soils were identified during the investigation. The laboratory results show the sand, quartz pebble marker and the calcrete and/or metabasalt bedrock material to be non-plastic.

The exception to the aforementioned non-plasticity is the results for the metabasalt material from test pit BD08 with a PI =  $5^*$  (see note above), LS = 2.8% and LL = 23. These results are deemed unrealistic (i.e. an error was possibly made during the lab tests). It was requested that the sample from BD08 be re-tested as the PI and LL values do not correspond to the test results of other samples for the same type of material.

The re-test results confirmed the PI = 6, LL = 24 and LS = 2.9%. This is inexplicably higher than different test results for similar material. However, it is not deemed problematic as the material is not expansive, has good strength characteristics and the LL is within acceptable margins. The re-test results and original lab notes for BD08 are attached in **Appendix C**.

#### 6.1.5. COLLAPSIBLE SOILS

Collapsible soils were observed during the investigation in the form of a pinholed structure in the sand layer with an average thickness of some 0.95m. The collapsible structure is likely to be destroyed upon compaction, which renders the probability of collapse settlement occurring negligible.

#### 6.1.6. COMPACTION AND STRENGTH PROPERTIES

CBR tests were conducted on samples taken from the test pits, with the results as shown in Table 17. One sample of the sand material was collected and it classified as a G9 material. It is therefore suitable as a bulk fill material according to the client's requirements.

The calcrete and/or metabasalt bedrock material was sampled 5 times, with the material classifying as G5 material on average. Based on its strength properties, the material will be suitable to construct a subbase layer and depending on its conductivity values, it may even be stabilised with cement to a C4 layer for road layerworks.

A mixture of 50% sand and 50% crushed calcrete/bedrock material is envisioned as a suitable founding material for the buildings, although the laboratory test results (MOD, CBR and FI) are still outstanding for this material mixture. In the absence of the aforementioned founding material's test results, G5 quality calcrete material from the borrow pit should be used as a founding material.

#### 6.1.7. PH AND CONDUCTIVITY

The pH and conductivity of the calcrete material encountered in the building area was determined. As detailed in Table 17, two samples were sent for laboratory testing and the pH values of both samples were determined as 8.4 with a conductivity of 0.1 and 0.2 mS/m. The pH values indicate a slightly basic material which is considered more favourable than an acidic material.

The material's conductivity is sufficiently low (<10mS/m) and it is classified as "non-corrosive". Based on the material's pH and conductivity results, the material is suitable for use in the construction of engineered fill layers.

#### 6.2. **GEOTECHNICAL EVALUATION**

#### 6.2.1. GROUNDWATER

No groundwater was encountered during the investigation.

#### 6.2.2. EXCAVATION CONDITIONS

a) Sand

Based on SABS 1200, soft excavation conditions can be expected for the sand using a 20 ton excavator. The depth of the sand layer varies across the site from 0.1m to some 2m depending on the topography (i.e. sand layer is generally thicker on dunes). Refer to the profiles in **Appendix B** for an indication of the sand depth at various positions across the site or to the summary in Table 16.

#### b) Calcrete and rock

Based on SABS 1200, intermediate to hard excavation can be expected for the material below the sand i.e. calcrete and rock strata.

## 6.3. **POSSIBLE FOUNDING SOLUTION**

The thickness of the sand at the building area varies from 0.3-2.0m, with an average thickness of some 0.9m.

The workshop at the buildings area will be a single storey structure that is envisaged to be founded via 600mm wide by 250mm deep strip footings. From the laboratory tests conducted, the sand material is deemed unsuitable for founding purposes due to its low CBR strength and material grading, classifying as a G9 material or worse.

An engineered fill or composite material comprising a 50/50 mix between the sand and calcrete/crushed bedrock is envisaged to be a suitable founding material for the single storey structure.

The test results (MOD, CBR and FI) of the 50/50 material mixture is expected to show increased strength properties and based on this, a higher stiffness value for the material can be expected, which will decrease the expected initial settlement for the buildings.

## 6.4. BEARING CAPACITY AND SETTLEMENT

#### 6.4.1. FOUNDING ON 50/50 MATERIAL MIX

The bearing capacity and settlement calculations are subject to the laboratory test results of the envisaged 50/50 material mixture, which is still outstanding. This section will be updated when the results are received.

## 6.4.2. FOUNDING ON CALCRETE

The buildings may also be found on G5 quality calcrete material from the borrow pit. According to Theyse (1996), G5 material will generally exhibit the following strength characteristics at the 95% confidence interval:

Utilising the abovementioned shear strength parameters with a Young's Modulus E = 80MPa (Emery, 1987) for G5 material and Vesic's (1975) bearing capacity formulations, the ultimate bearing capacity may be calculated as 827kPa. The allowable bearing capacity may be used as 100kPa at an FoS = 8.2.

According to the settlement formulations by Christian and Carrier (1978) at a bearing pressure of 100kPa (maximum allowable), the calculated initial elastic settlement is  $\delta$ estimated = 2mm. For a strip footing spacing of >1m, the criteria to limit differential settlement of 1/500 (Craig, 2004) will be satisfied for an allowable bearing capacity of 100kPa.

The settlement calculations are included in Appendix G.

## 7. BRIDGE

The bridge is located on the western part of the oval track, close to the buildings area. The bridge will facilitate access over the track to the multifunctional area, handling track, grades and high speed oval from the access road leading toward the buildings area. The positions of the 6 test pits conducted at the bridge are shown in Figure 8, with their co-ordinates given in **Appendix A**.

It is evident from Figure 8 that the alignment of the bridge is not perpendicular to the oval track. This is due to the fact that the layout and size of the bridge was unknown at the time of investigation and the location of the test pits were therefore established on site. The client advised that the bridge will comprise four piers, with an envisaged pierto-pier and pier-to-abutment spacing of 12-16m.



Figure 8: Test pit positions - Bridge

The area on which the bridge will be founded shows a fairly uniform subsurface profile and it is envisaged that the skew alignment of the test pits will not adversely affect the founding of the structure.

## 7.1. MATERIAL PROPERTIES

## 7.1.1. TEST PIT PROFILES

A summary of the test pit profiles are given in Table 18. The detailed profiles are given in **Appendix B**.

#### Table 18: Profile summary - Bridge

	Layer and depth (m)					
	Soils	Rocks/Pedogenic				
Test pit	Very loose to loose sand	Metabasalt with calcrete	Refusal depth (m)			
BR01	0-0.1	0.1-2.0	2.0			
BR02	0-0.1	0.1-1.8	1.8			
BR03	0-0.1	0.1-2.5	2.5			
BR04	0-0.1	0.1-0.3	0.3			
BR05	0-0.1	0.1-0.9	0.9			
BR06	0-0.1	0.1-3.1	3.1			

#### 7.1.2. TEST PIT SAMPLES

No samples were taken from the test pits at the location of the proposed bridge, as the material encountered resembles the material from OTP17 and that which were encountered at the adjacent buildings area.

#### 7.1.3. EXPANSIVE SOILS

No expansive soils were identified during the investigation.

#### 7.1.4. COMPRESSIBLE SOILS

The thin layer of very loose to loose sand encountered on site will most likely be compressible. Founding is, however, not envisaged to take place on the thin sand layer and compressible soils will therefore not be problematic for the founding of the bridge.

#### 7.1.5. COLLAPSIBLE SOILS

The thin sand layer exhibits a collapsible structure and hence collapse settlement is predicted if the material is not densified (i.e. compacted) and the collapsible fabric destroyed. The bridge is, however, not envisaged to be founded on the thin sand layer.

#### 7.2. **GEOTECHNICAL EVALUATION**

#### 7.2.1. GROUNDWATER

No groundwater was encountered during the investigation.

#### 7.2.2. EXCAVATION CONDITIONS

a) Sand

Based on SABS 1200, soft excavation conditions can be expected for the sand layer using a 20 ton excavator. The thickness of the sand layer in the bridge area was found to be uniform at 0.1m. Refer to the profiles in **Appendix B** for an indication of the sand depth at various positions across the site or the summary in Table 18.

#### b) Calcrete and rock

Based on SABS 1200, intermediate to hard excavation can be expected for the material below the sand i.e. calcrete and rock.

## 7.3. BRIDGE FOUNDING RECOMMENDATIONS

The test pits showed some 0.1m of sand followed by calcrete and rock. The bridge is envisioned to be founded directly on the soft to medium hard calcrete/in-situ bedrock via pad footings.

## 7.3.1. STRENGTH OF CALCRETE/ BEDROCK

From the test pits, the in-situ calcrete/ bedrock material were classified as soft to medium hard rock. The material excavated as gravel with boulders and cobbles with great difficulty, owing to the hardness of the material.

The shear strength parameters of the material were calculated using RocScience's Roclab computer software, which is based on the formulations of Hoek and Diederichs (2006). The following input parameters were used for the soft to medium hard rock calcrete/ bedrock material on which founding is envisaged.

UCS	=	3MPa	(Unconfined Compressive Strength)
GSI	=	27	(Geological Strength Index)
mi	=	9	(Material constant)
d	=	0	(Disturbance factor for blasting)
Mr	=	450	(Modulus ratio)

From the RocLab analysis the following shear strength parameters were obtained for the founding material, based on a preliminary bearing capacity of 400kPa. The RocLab results are given in **Appendix F.** 

Cohesion (c)	= 40 kPa
Friction angle (φ)	= 32.9°
Deformation modulus (E)	= 182 MPa

To maintain a modicum of conservatism, a 95% confidence interval was applied to the above shear strength parameters. This was done by calculating a parameter at 1.64 standard deviations below the mean. A coefficient of variation of 40% was assumed for the cohesion and 10% for the internal friction angle as per Harr (1987), effectively reducing the parameters to:

Cohesion (c)	= 13.8 kPa
Friction angle ( $\phi$ )	= 27.5°

## 7.4. BEARING CAPACITY AND SETTLEMENT

Loads on the piers and abutments are still awaited from the client. It was however stated that a bearing pressure of some 360kPa is required. As a preliminary measure, loads were assumed for the piers and abutments.

#### 7.4.1. **PIERS**

The piers are envisaged to be founded on 2.5m square pad footings with an applied load of 3 000kN. According to Vesic's (1975) formulations utilised with the shear strength parameters in Section 7.3, the ultimate bearing capacity is calculated as 791kPa at the 95% confidence interval. At an allowable bearing capacity of 400kPa this generates an FoS = 1.97.

The stiffness of the calcrete/ bedrock material was determined to be E = 182MPa from the RocLab analysis. For an allowable bearing pressure of 400kPa and an influence depth of 7.5m below the founding level, the immediate elastic settlement for the pad footing was calculated to be some 3.0mm according to Christian and Carrier's (1978) formulations.

The projected differential settlement is calculated as  $3.0/12\ 000 = 1/4\ 000$  for the 12m bridge support (pier or abutment) spacing. This ratio is below the maximum preferred ratio of 1/500 for buildings where cracking is not permissible (Craig, 2004).

The settlement calculations are included in Appendix G.

## 7.4.2. ABUTMENTS

The abutments are envisaged to be founded via 2m x 6m spread footings on the in-situ calcrete/ bedrock material.

Utilising the formulations of Vesic (1975) and a preliminary vertical load of 3 000kN, the ultimate bearing capacity was calculated to be 703kPa for the shear strength parameters at the 95% confidence interval.

However, due to settlement considerations according to the formulations of Christian and Carrier (1978), the allowable bearing capacity is reduced to 400kPa with a settlement of 4.6mm calculated. The allowable bearing capacity is at a factor of safety of 1.75 against the ultimate.

With the closest support spacing (pier to abutment) assumed to be at least 12m, a differential settlement ratio (angular distortion) of <1/500 is calculated. This is deemed acceptable (Craig, 2004). The settlement calculations for the abutments are subject to the design of the bridge and its layout, and included in **Appendix G**.

## 8. QUARRY AREA

The proposed quarry area is situated south west of the oval track. A total of 4 rotary core boreholes were previously drilled to an average depth of some 16.5m. The positions of the boreholes are shown in Figure 9 below.

Core samples were sent to a SANAS accredited laboratory for various tests (see Section 8.1.1). The material of granitic origin's suitability was assessed for use as basecourse and surfacing aggregate (possibly asphalt).

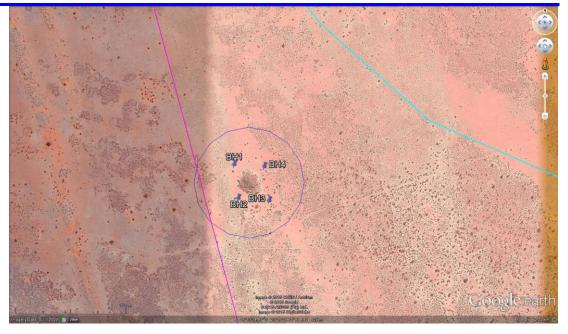


Figure 9: Borehole positions - Quarry area

#### 8.1. MATERIAL PROPERTIES

The following sections discuss tests conducted on cores from the quarry investigation. **Appendix D** contains the comprehensive laboratory results.

#### 8.1.1. BOREHOLE SAMPLES

The following tests were conducted on crushed core samples from the borehole investigation:

- 3x Methylene blue absorption (MBA),
- 3x Clay content,
- 3x Chloride content,
- 3x Organic impurities,
- 3x Presence of sugars,
- 3x Soluble deleterious impurities,
- 3x Ethylene glycol weathering,
- 2x XRD,
- 2x XRF, and
- 3x ACV

The following sections succinctly discuss the test results and the material's suitability.

a) Atterberg limits

Material tested showed low liquid limits and linear shrinkage values of zero and the material was determined to be non-plastic. According to the guidelines in SAPEM Chapter 4 (2013), the material possibly qualifies for use in basecourse construction if other conditions are satisfied.

#### b) Methylene blue absorption

The methylene blue test is used as a means of assessing the activeness of clay minerals in the material (usually conducted on fine aggregate). The material has an average methylene blue absorption value of 0.13ml/g with a maximum of 0.2ml/g and a minimum of 0.1ml/g. In general, the material is not deemed active as it is below the prescribed value of 0.7 ml/g (SAPEM, 2013).

#### c) Clay content

Three crushed core samples were submitted for hydrometer testing and the clay content for all three samples was determined to be zero. The test is, however, subject to the degree of crushing of the sample and some clay minerals may still be present in the material. The methylene blue test showed the activity of the material (and expected clay constituents) not to be problematic (i.e. non-deleterious).

#### d) Chloride content

Samples tested had a chloride content of 0.01% and the material is deemed suitable for use in a granular basecourse and in concrete when a maximum chloride content of 0.03% is specified (Chapter 4 of SAPEM, 2013).

#### e) Organic impurities

The six laboratory tests conducted according to TMH B6 showed no organic impurities to be present in the samples.

#### *f) Presence of sugars*

The presence of sugar was determined according to SANS 5833:2006 on 4 samples (one from each borehole) and no sugar was encountered in the material.

#### g) Ethylene glycol weathering

The material's durability was determined via ethylene glycol weathering tests and the material did not deteriorate during the 20 days of testing, neither by spalling, fracturing nor disintegrating. The material will therefore be well-suited for use as a surfacing aggregate or basecourse.

Furthermore, decomposition of the material is not expected to be the main weathering agent due to the dry climate (Weinert N>5). In wetter regions (N<5) the material is more likely to decompose to non-expansive kaolinite clay particles (TRH14, 1985).

#### *h)* X-ray diffraction (XRD)

X-ray diffraction testing conducted on two core samples showed the material to consist of the following minerals and constituents:

Fable 19: Granite mineral composition (XRD)						
XRD	BH1	BH4				
Depth (m)	2.75 - 2.90	11.30 - 11.50				
Chlorite (%)	6.64	7.56				
Diopside (%)	3.81	3.75				
Microcline (%)	15.11	21.8				
Muscovite (%)	7.08	4.13				
Plagioclase (%)	28.94	24.83				
Quartz (%)	38.41	37.93				

XRD testing showed the presence of mica (muscovite) in sufficiently low quantities and problems are not envisioned.

## *i)* X-ray fluorescence (XRF)

X-ray fluorescence testing conducted on two samples showed the material to contain between 2.1 and 2.4% Na<sub>2</sub>O (sodium-oxide), which is an indication of the material's susceptibility for alkali-silica reaction (ASR), should it be used as concrete aggregate. The quantities are, however, below the limit of 4.0% and ASR is not expected (Fulton, 2009).

To counter ASR in general, the cement to be used must contain sufficient amounts of fly-ash (20%), or slag (40%), or silica fume (15%) by mass. The following types of concrete may be used to reduce the probability of ASR occurring:

- CEM II B-V 32.5 N, or
- CEM V A (S-V) 42.5 N

A silica (SiO<sub>2</sub>) content of 67% and 70% was determined for the material and poor adhesion with bituminous products may be expected, especially in the presence of moisture. According to SAPEM (2013), cationic emulsion is more suitable as a binder for the aggregate type.

## *j)* Aggregate crushing value (ACV)

Four ACV tests were conducted on samples and an average ACV = 17.9% was determined for the material. This is well below the minimum of ACV = 25% required for use as bituminous surfacing aggregate or an ACV = 29% for use as base material (TRH 14, 1986) (COLTO, 1998).

Based on these strength characteristics, the material is deemed suitable for use in the base layer and as surfacing aggregate.

## *k) Stone polishing value*

According to TRH 14 (1986) acid crystalline rocks (such as granite) do not polish much and these tests were not conducted. The aggregate is, however, envisaged to provide good resistance to skidding and the surfacing layer should have a high skid resistance value (SRV) when crushed.

## 8.2. CONCLUSION

Based on the laboratory tests conducted, granitic material from the proposed quarry area is deemed suitable for use in the construction of basecourse and surfacing layers according to the guidelines detailed in COLTO (1998) and SAPEM (2013).

# 9. **BORROW PIT AREA**

Information and test results from the borrow pit investigation that precedes ARQ's, was reviewed. The borrow pit is located in the south east corner of the site in an area expected to yield large quantities of calcrete material. Depending on its availability, calcrete is envisaged to be used in the construction of various layerworks. Locality of the borrow pit area on site is depicted in Figure 10 below.



Figure 10: Borrow area test pits

From the test pit profiles received, it is seen that some 96 test pits were conducted with a 20ton excavator to refusal depths. Refusal conditions were encountered in pedogenic material (calcretes) underlying the upper stratum of very loose to loose sand. The material was sampled and sent for CBR, Mod, indicator (sieve analysis and Atterberg limits) and pH and conductivity laboratory tests at Roadlab in Upington.

The test results indicate the calcrete material to generally classify as G5 quality. The pH and conductivity test results show the material to be "non-corrosive" with an average conductivity <10mS/m and a pH>7.0 (average of 8.1). Based on the test results and according to COLTO classifications, material from the borrow pit area is suitable for use as subbase and fill material for the development.

Refer to Appendix E for laboratory results from the borrow pit investigation.

## **10. Recommendations**

In this section, recommendations are made regarding the design and construction of the oval and handling track, multifunctional, bridge and buildings area.

## 10.1. ROADWAYS

For the oval and handling track and the multifunctional area accommodating light vehicles which may exert large horizontal forces in the surfacing layer due to braking, acceleration and turning at high speeds, the following is recommended:

- 1. \*Rip and re-compact in-situ material (subgrade) to 90% Mod AASHTO density at 0 to +2% of the OMC,
- 2. 150mm C4 subbase layer,
- 3. 150mm G3 basecourse,
- 4. Asphalt surfacing layer

\*Note that if the in-situ sand material comprises the subgrade, it should be compacted to 100% of the Mod AASHTO density.

A cemented C4 subbase layer should comply with the following requirements:

- A selected natural material equivalent to G5 or G6 quality meeting the density and strength requirements,
- The maximum size of the material after compaction in place should not exceed twothirds of the compacted thickness layer or 63mm, whichever is the smaller,
- After treatment the material should have a Plasticity Index not greater than 6,
- In regard to the crushing strength requirements of the cemented material, the laboratory design strength should be in accordance with the following values:
  - Minimum and maximum laboratory design, unconfined compressive strength at 7 days 100% Mod AASHTO density of 0.75 and 1.5MPa respectively,
- The grading modulus for the subbase material should not be less than 1.5,
- A CEM II B-V 32.5N cement may be utilised for stabilisation. A higher cement class may increase the pavement stiffness too much which may lead to a decrease in ductility of the layer and result in cracking.

According to the test results from the borrow pit investigation as received from the client, the calcrete material generally classified as a G5 material and will be suitable for use in the construction of the sub base layer. This material will in all likelihood require crushing to the abovementioned sizes to ensure its suitability.

Section 8 discussed the material from the quarry area's suitability for use in the basecourse layer as well as for surfacing aggregate (asphalt or bitumen).

## 10.2. CRUSHING

For the borrow pit and quarry operations, the following is recommended:

A permanent, multi-stage crusher with screens should be set up at the quarry to produce crushed stone basecourse and asphalt surfacing material.

A mobile, 2 stage crusher should suffice in the crushing requirements at the borrow pit area for the calcretes (generally sub base material of G5 quality). The nominal maximum size for a G5 crushed material is 53mm before compaction and 63mm for uncrushed material.

This strategy will allow various materials to be available for the consecutive construction of the layerworks.

## **10.3. BUILDING AREA**

## **10.3.1. FOUNDING OF STRUCTURES**

The following procedure is recommended in order to achieve proper site compaction and to reduce the risk of differential settlement beneath the strip footings:

- Excavate and stockpile in situ material on the footprint to a depth of 1.0m below the natural ground level (N.G.L),
- Remove all material > 100mm diameter from the stockpile,
- Mix the sand from the stockpile with the crushed calcrete gravel (< 53mm) from the borrow pit in a 1 to 1 mix ratio (50% sand, 50% calcrete),
- \*Compact subgrade material to 100% Mod AASHTO density at 0 to +2% of the optimum moisture content (OMC) using a vibratory roller with a 300kN centrifugal force (e.g. Bomag 219D or similar),
- \*\*Backfill the exposed area with the 50/50 mixture material (stockpiled sand and crushed calcrete), compacted in 150mm layers to 93% of the Mod AASHTO density at a moisture content of 0 to +2% of the OMC with the same vibratory roller,
- Found as shallow as possible (250mm below N.G.L) in the compacted strata at an allowable bearing pressure of 100kPa for the strip footings.

\*Note: If the sand comprises the subgrade material – compact to 100% of the Mod AASHTO density. If sand material does not comprise the subgrade material – compact to 93% of the Mod AASHTO density.

\*\*Calcrete material from the borrow pit may also be used as a founding material, compacted to 93% Mod AASHTO density.

## **10.3.2. EXCAVATIONS**

The sand layer with general thickness of 0.95m is considered problematic with regard to the safety of the temporary excavations deeper than 1.2m. The sand material in any excavation should be battered back to a safe angle of 22 degrees to allow for a factor of safety of 1.4 against instability. This is at a ratio of 1(V): 2.5(H).

For permanent excavations in the soft to medium hard calcrete/ bedrock layer, the slope may be battered back to 1(V): 2(H) or 60 degrees according to calculation on chart 1 (dry conditions) from Hoek and Bray (1981).

## 10.4. BRIDGE

## **10.4.1. FOUNDING OF BRIDGE STRUCTURE**

As mentioned in the preceding section, it is recommended that the bridge be founded via pad footings on the in-situ calcrete/ bedrock material. An allowable bearing capacity of 400kPa may be used when founding the piers and abutments via pad/spread footings.

The founding depths for the bridge components are detailed in Table 20.

Test pit no.	Bridge component	Founding depth (m)
Br06	Eastern abutment	1.5
Br05	Pier 1	1.0
Br04	Pier 2	1.0
Br01	Pier 3	1.5
Br02	Pier 4	1.5
Br03	Western abutment	1.5

## Table 20: Bridge founding depths

The excavation for the foundations should be inspected by a competent engineer before the contractor may cast the blinding layer for the footings. It is furthermore expected that groundwater seepage will not be encountered during the foundation excavations.

## **10.4.2. EXCAVATIONS**

The sand layer with general thickness of 0.1m in the bridge area is not considered to be problematic with regard to the safety of the temporary excavations.

For temporary excavations in the soft to medium hard calcrete/ bedrock layer, the slope may be battered back to 1(V): 0.5(H) or 60 degrees according to the first chart from Hoek and Bray (1981).

## **10.5. CUTTINGS - GENERAL**

The depth of the cuttings will vary according to the layout of the oval and handling track and the topography of the terrain. The battering angles given in Table 21 apply to the sand and in-situ calcrete or bedrock material for the dry case.

Material	Consistency/ hardness	Maximum cut depth (m)	Battering ratio	Battering angle	Factor of safety
Sand	Very loose to loose	2	1(V) : 2.5 (H)	22°	1.5
Calcrete/ bedrock	Soft to medium hard rock	3	1(V):1(H)	45°	>1.5
Calcrete/ bedrock	Soft to medium hard rock	6	1(V):2(H)	27°	>1.5

Table 21: Cutting slope stability recommendations

# **11. GENERAL**

The comments and recommendations contained within this report are based on a limited number of test pit excavations which we believe are representative of the site conditions. Therefore, conditions at variance with what is described herein should not be overlooked.

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# APPENDIX A TEST PIT CO-ORDINATES



#### Table 1: Oval track test pits

Oval	Latitude	Longitude
TPOV01	28°11'27.40"S	21°28'48.40"E
TPOV02	28°10'56.00"S	21°30'15.90"E
TPOV03	28°10'57.70"S	21°30'16.70"E
TPOV04	28°10'46.80"S	21°30'11.00"E
TPOV05	28°10'38.80"S	21°30'5.80"E
TPOV06	28°10'10.60"S	21°29'59.00"E
TPOV07	28° 9'51.60"S	21°29'35.40"E
TPOV08	28° 9'37.10"S	21°28'38.00"E
TPOV09	28° 9'36.80"S	21°28'39.30"E
TPOV10	28° 9'31.70"S	21°29'15.50"E
TPOV11	28°11'28.20"S	21°30'30.20"E
TPOV12	28°13'13.90"S	21°30'5.50"E
TPOV13	28°12'58.00"S	21°29'31.70"E
TPOV14	28°13'0.50"S	21°30'42.60"E
TPOV15	28°12'29.50"S	21°30'54.70"E
TPOV16	28°12'1.00"S	21°30'44.30"E
TPOV17	28°12'34.50"S	21°29'18.40"E
TPOV18	28°11'57.90"S	21°29'1.90"E
TPOV19	28° 9'58.70"S	21°28'19.20"E
OTP17	28°11'3.30"S	21°28'35.90"E

## Table 2: Handling track test pits

Handling track	Latitude	Longitude	
TPH01	28° 9'43.30"S	21°29'6.90"E	
ТРН02	28° 9'43.90"S	21°28'55.70"E	
ТРН03	28° 9'50.30"S	21°29'5.60"E	
ТРН04	28°10'4.10"S	21°29'26.00"E	
ТРН05	28°10'13.60"S	21°29'44.40"E	
ТРН06	28°10'23.20"S	21°29'43.60"E	











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Multifunctional area	Latitude	Longitude	
TPMF01	28°10'37.50"S	21°29'20.40"E	
TPMF02	28°10'29.10"S	21°29'13.40"E	
TPMF03	28°10'21.40"S	21°29'17.30"E	
TPMF04	28°10'11.00"S	21°29'13.30"E	

## Table 4: Building area test pits

Building area	Latitude	Longitude
BD01	28°11'5.40"S	21°28'29.00"E
BD02	28°11'6.50"S	21°28'29.20"E
BD03	28°11'7.40"S	21°28'29.60"E
BD04	28°11'8.10"S	21°28'28.60"E
BD05	28°11'7.50"S	21°28'28.30"E
BD06	28°11'6.50"S	21°28'27.80"E
BD07	28°11'6.90"S	21°28'26.20"E
BD08	28°11'7.80"S	21°28'27.60"E
BD09	28°11'8.30"S	21°28'27.80"E
BD10	28°11'8.40"S	21°28'25.60"E
BD11	28°11'9.10"S	21°28'25.80"E
BD12	28°11'8.60"S	21°28'26.30"E

## Table 5: Bridge area test pits

Bridge	Latitude	Longitude
BR01	28°11'2.10"S	21°28'36.20"E
BR02	28°11'2.00"S	21°28'35.70"E
BR03	28°11'1.90"S	21°28'35.10"E
BR04	28°11'2.20"S	21°28'36.80"E
BR05	28°11'2.40"S	21°28'37.20"E
BR06	28°11'2.50"S	21°28'37.70"E

APPENDIX B TEST PIT PROFILES

ARQ

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Test	est Pit: BD01							
			Client:	WSP Group				
Project:		Project:	MBSA High Speed Proving Ground - 7345					
	Date Profiled:		rofiled:	2015/06/09				
	Coordinates			28°11'06.5 "S, 21°28'27.8 "E				
	Elevation			Not specified				
		Profi	led By:	Hannes Taljaard				
		1						
		e						
Ê	D	Vai						
Depth (m)	nlqr	Ground Water	Symbol	Description				
Dep	Sampling	Gr	Syn					
		-	enser	VERY LOOSE TO LOOSE, SAND				
0.2 -			發展	Slightly moist, brownish red, very loose to loose, intact, sand				
			杨杨	Transported (Aeolian)				
0.4 -			杨振					
0.6 -		<u> </u>	54.55					
0.8	D		杨杨					
0.8 -			杨炳					
1.0 -	-	<u> </u>	杨振					
1.2 -			杨紫					
			1854183 QHOQH	(1.3 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND				
1.4 -			52.53	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly				
1.6 -		<u> </u>	52.53	moist, brownish red, very loose to loose, sand Transported				
1.8	D		杨振					
1.0			杨振					
2.0 -	-	<u> </u>	品版					
2.2 -				(2.2 m)				
			$\diamond$	VERY SOFT ROCK, GRANITE Purpleish grey, highly weathered to completely weathered, fine grained to medium grained, thinly laminated, very soft rock,				
2.4 -	D		$\diamond$	Granite				
2.6 -		<u> </u>	$\left  \right\rangle$	(2.7 m)				
2.8 -				Refused On: very soft rock granite				
3.0 -			-					
3.2 -			-					
3.4								
0.4								
3.6 -			-					
3.8 -			-					
10								
4.0 -								
4.2 -								
4.4								
4.6 -			1					
4.8 -			-					
	Excav	ation N	lethod:	EXCAVATOR				
	Unstable Sides			to 1.3 m				
		R	efusal:	2.7 m on very soft rock granite				
		Water	Table:	None				
-								



www.arq.co.za arq@arq.co.za P.O.Box 76379 Lynnwood Ridge 0040

Test	Pit: B	D02		
			Client:	WSP Group
		F	Project:	MBSA High Speed Proving Ground - 7345
Date Profiled			rofiled:	2015/06/10
Coordinates				28°11'06.5 "S, 21°28'29.2 "E
	Elevation			Not specified
		Profi	led By:	Hannes Taljaard & Coert van Dyk
Depth (m)	Sampling	Ground Water	Symbol	Description
			202	LOOSE TO VERY LOOSE, SAND
0.2 -			걸걸	Slightly moist, brownish red, loose to very loose, intact, sand Transported (Aeolian)
0.4				
0.4 -				
0.6 —				
0.8 —				
1.0 —			5.5	
1.2 -			5.5	
			品版	(1.4 m)
1.4 —			CHICK IS 183	MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND
1.6 —				Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly moist, brownish red, very loose to loose, intact, sand
1.8 -				Transported (Aeolian)
			0% (Ch	(1.9 m) VERY SOFT ROCK TO SOFT ROCK, METABASALT
2.0 -			V	Greyish green to white, highly weathered, medium grained to fine grained, very soft rock to soft rock, Metabasalt
2.2			v	
			VE	
2.4 -				
2.6 —			1	
2.8			<b>v</b> 2	
2.0			V	
3.0 -			V	
3.2 -				
3.4 –			-	
3.6 —			, <b>v</b> §	
3.8			V	
			VS	
4.0 -			V	
4.2 -				
			1 23	(4.3 m)
4.4 -			]	
4.6 —			-	
4.8 —				
	Excave	ation M	lethod:	EXCAVATOR
				to 1.4 m
	01		inated:	
			Table:	
		Tale	Table.	Page 2 of 48



2.0       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         2.2       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight moist, brownish red, very loose to loose, sand         2.4       Transported         2.6       SOFT ROCK, METABASALTIC         2.8       SOFT ROCK, METABASALTIC         3.0       Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.0       Notes: Excavates as gravel	lest	п. D		0	
Date Profiled       2015/06/10         Coordinates       281107.4*9.21/2829.8*E         Elevation       Not specified         Profiled By       Hannes Taljaard & Coert van Dyk         Image: Specified       Image: Specified         Profiled By       Hannes Taljaard & Coert van Dyk         Image: Specified       Image: Specified         Image: Specified					
Coordinates: 281107.4 'S, 212828.6 'E         Elevation: Not specified         Profiled By: Hannes Taijaard & Coert van Dyk	-		-		
Elevation: Not specified         Profiled by: Hannes Talgaard & Coert van Dyk         u <thu< th=""><th colspan="3"></th><th></th><th></th></thu<>					
Profiled By: Hannes Taljaard & Coet van Dyk           (i)         ii         iii         iii         iii         iii         iii         iii         iii         iii         iiii         iiii         iiii         iiii         iiii         iiii         iiiii         iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii					
00 00 00 00 00 00 00 00 00 00 00 00 00					
02       LOOSE TO VERY LOOSE, SAND         02       Slightly moist to moist, brownish red, loose to very loose, intact, sand         04       Transported (Aeolian)         05       MEDIUM HARD ROCK, QUARTZ PEBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         10       Pale while, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly mediatered. Transported (Very Loose to loose, sand)         22       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Transported         25       SOFT ROCK, METABASALTC         26       Cray, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Soft ROCK, METABASALTC         34       Soft ROCK         36       Soft ROCK		-	Profil	led By:	Hannes Taljaard & Coert van Dyk
02       LOOSE TO VERY LOOSE, SAND         03       Slightly moist to moist, brownish red, loose to very loose, intact, sand         04       Transported (Aeolian)         03       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         10       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         22       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       MEDIUM HARD ROCK, MUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Transported         25       SOFT ROCK, METABASALTC         26       Gray, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Soft ROCK, METABASALTC         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         39       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic <th></th> <th></th> <th></th> <th></th> <th></th>					
02       LOOSE TO VERY LOOSE, SAND         03       Slightly moist to moist, brownish red, loose to very loose, intact, sand         04       Transported (Aeolian)         03       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         10       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         22       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       MEDIUM HARD ROCK, MUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Transported         25       SOFT ROCK, METABASALTC         26       Gray, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Soft ROCK, METABASALTC         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         39       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic <th></th> <th></th> <th>/atei</th> <th></th> <th>c.</th>			/atei		c.
02       LOOSE TO VERY LOOSE, SAND         02       Slightly moist to moist, brownish red, loose to very loose, intact, sand         04       Transported (Aeolian)         05       MEDIUM HARD ROCK, QUARTZ PEBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         10       Pale while, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly mediatered. Transported (Very Loose to loose, sand)         22       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Transported         25       SOFT ROCK, METABASALTC         26       Cray, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Soft ROCK, METABASALTC         34       Soft ROCK         36       Soft ROCK	E)	ling	≯ ₽	<u> </u>	iptio
02       LOOSE TO VERY LOOSE, SAND         03       Slightly moist to moist, brownish red, loose to very loose, intact, sand         04       Transported (Aeolian)         03       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         10       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         22       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       MEDIUM HARD ROCK, MUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Transported         25       SOFT ROCK, METABASALTC         26       Gray, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Soft ROCK, METABASALTC         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, METABASALTC         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic         36       Soft ROCK, Metabasaltic         38       Soft ROCK, Metabasaltic         39       Soft ROCK, Metabasaltic         34       Soft ROCK, Metabasaltic <th>epth</th> <td>dme</td> <td>uno</td> <td>/mp</td> <td>esec</td>	epth	dme	uno	/mp	esec
02     Slightly moist to moist, brownish red, loose to very loose, intact, sand       04     Transported (Aeolian)       04     Image: Constraint of the state of th	ŏ	S	Ū	S	
02       Transported (Aeolian)         04       08         08       08         10       12         14       18         18       18         20       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly most, brownish red, very loces to loose, sand         24       Transported         25       SOFT ROCK, METABASALTIC         7 Grey, highly weathered, fine grained, soft rock, Metabasaltic         Notes: Excavates as gravel         30       4         34       4         44       4         44       4					LOOSE TO VERY LOOSE, SAND
0.4       0.4         0.8       0.8         1.0       1.2         1.4       1.4         1.6       1.8         2.0       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight moist, brownish red, very loose to loose, sand         2.4       Corey, hightly weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight moist, brownish red, very loose to loose, sand         2.4       Corey, hightly weathered, fine grained to medium grained, soft rock, Metabasaltic         2.8       SOFT ROCK, METABASALTIC         2.8       Corey, hightly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.0       Corey, hightly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.0       Corey, hightly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained, soft rock, Metabasaltic         3.4       Corey, hightly weathered, fine grained, soft rock, Metabasaltic	0.2 —				Transported (Aeolian)
0.8	0.4 —				
0.8					
1.0	0.6 —				
1.2	0.8 —				
12	10				
14       14         16       18         20       (2)         21       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of sligin moist, brownish red, very loose to loose, sand         24       Transported         26       SOFT ROCK, METABASALTIC         28       Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         Notes: Excavates as gravel       Notes: Excavates as gravel         30       (4)         40       (4)         42       (4)					
1.6	1.2 —				
1.8	1.4 —				
1.8	10				
2.0       (2         2.2       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         2.4       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight moist, torownish red, very loose to loose, sand         2.4       Transported         2.6       SOFT ROCK, METABASALTIC         2.8       Crey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic Notes: Excavates as gravel         3.0       X         3.2       X         3.4       X         3.6       X         3.8       X         4.4       (4.1)	1.6 -				
23       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND         24       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight moist, brownish red, very loose to loose, sand         24       Transported         26       SOFT ROCK, METABASALTIC         28       Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         30       Notes: Excavates as gravel         34       Soft ROCK is a gravel         40       (4.1)         42       (4.1)	1.8 —				
2.2       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of sligh moist, brownish red, very loose to loose, sand Transported         2.4       SOFT ROCK, METABASALTIC         2.6       Crey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic         3.0       Notes: Excavates as gravel         3.4       Soft ROCK         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft rock, Metabasaltic         3.4       Soft and the grained to medium grained, soft and the grained to medium grained, soft and the grained to medium grained,	2.0 —			것을	(2 m)
24       moist, brownish red, very loose to loose, sand         24       Transported         26       SOFT ROCK, METABASALTIC         28       Soft rock, Metabasaltic         30       Notes: Excavates as gravel         32       Soft rock, Metabasaltic         34       Soft rock, Metabasaltic         36       Soft rock, Metabasaltic         38       Soft rock, Metabasaltic         40       Soft rock         41       Soft rock         42       Soft rock         44       Soft rock         46       Soft rock				能能	MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, guartz pebbles in a matrix of slightly
2.4 (2.5   2.6 SOFT ROCK, METABASALTIC   2.8 Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.0 (2.5   3.1 (2.5   3.2 (2.5   3.4 (2.5   3.4 (2.5   3.4 (2.5   3.4 (2.5   3.4 (2.5   3.8 (2.5   4.0 (4.1   4.1 (4.1   4.6 (4.1)	2.2 –			机机	moist, brownish red, very loose to loose, sand
2.6 SOFT ROCK, METABASALTIC   2.8 Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic   3.0 Notes: Excavates as gravel     3.4 Soft   3.4 Soft   3.6 Soft   3.8 Soft   4.0 Soft     4.0   4.2   4.4   4.6     4.6     Soft ROCK, METABASALTIC   Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic     Notes: Excavates as gravel     (4.1	2.4 —			成成	I ransported (2.5 m)
2.8     Grey, nighty weathered, the graned to medium graned, soft rock, Metabasatic       3.0     Notes: Excavates as gravel       3.1     Image: Soft rock, Metabasatic       3.2     Image: Soft rock, Metabasatic       3.4     Image: Soft rock, Metabasatic       3.6     Image: Soft rock, Metabasatic       3.8     Image: Soft rock, Metabasatic       4.0     Image: Soft rock, Metabasatic       4.1     Image: Soft rock, Metabasatic       4.2     Image: Soft rock, Metabasatic       4.4     Image: Soft rock, Metabasatic       4.6     Image: Soft rock, Metabasatic	26-			+*+	SOFT ROCK, METABASALTIC
2.3 $3.0$ $3.2$ $3.4$ $3.6$ $3.6$ $4.0$ $4.2$ $4.4$ $4.6$ $(4.1)$				[ <b>+</b> ×+]	Grey, highly weathered, fine grained to medium grained, soft rock, Metabasaltic Notes: Excavates as gravel
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.8 —			• <b>č</b> •	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	3.0 —			Č.	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$				$\diamond$	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3.2 -			$\diamond$	
	3.4 —			<b>•</b>	
	3.6 —			<b>+</b> ×+	
				<b>•</b> ~••	
	3.8 -			ŏ	
	4.0 -			$\diamond$	(4.1 m)
4.4 4.6	4.2 -			<b>T</b> . <b>T</b>	(+.+.11)
4.6					
	4.4 -				
4.8	4.6 —				
	18-				
		<b>-</b>			
Excavation Method: EXCAVATOR					
Unstable Sides: to 2 m		Un			
Terminated: No					
Water Table:         None           Page 3 of 48         Page 3 of 48			water	l able:	



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lest	Pit: B			
			Client:	WSP Group
		P	roject:	MBSA High Speed Proving Ground - 7345
	I	Date Pi	rofiled:	2015/06/10
		Coord	inates:	28°11'08.1 "S, 21°28'28.6 "E
		Ele	vation:	Not specified
				Hannes Taljaard & Coert van Dyk
		Ground Water		
E)	ing	≥	_	bi di
Depth (m)	Sampling	nu	Symbol	Description
De	Sa	5 Ū	Syl	
			\$25.53	LOOSE TO VERY LOOSE, SAND
0.2 —				Slightly moist, brownish red, loose to very loose, intact, sand
0.2			机机	Transported (Aeolian)
0.4 -			机机	
0.6 —			起流	
0.0			A. 43	
0.8 -				(0.9 m
1.0 —				MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND
1.0				Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly moist, brownish red, very loose to loose, sand
1.2 –				Transported (1.3 m
1.4 -			í ní	MEDIUM DENSE, SANDY GRAVEL
1.4			്റ്	Slightly moist, dark grey, medium dense, matrix supported, sandy gravel Transported
1.6 —			<u>.</u>	VERY SOFT ROCK TO SOFT ROCK, GREEN SCHIST
1.8 —			$\diamond$	Greyish green, highly weathered, fine grained to medium grained, thinly laminated, very soft rock to soft rock, Green schist
1.0 -			$\diamond$	Notes: Also some medium hardrock quartzite and calcrete
2.0 -			• • •	
			•••	
2.2 –			<b>+</b> ^+	
2.4 –			<b>+</b> ^+	
26			[ <b>+</b> ×+]	
2.6 —			[+X+]	
2.8 -			•č•	
2.0			•č•	
3.0 -			۰ŏ	
3.2 –			• •	
3.4 –			$\diamond$	
5.4 -			$\diamond$	
3.6 —			<b>+</b> ^+	(3.6 n
3.8 —				
0.0 -				
4.0 -				
4.2 —				
<del>-</del> .2 —				
4.4 –				
16				
4.6 —				
4.8 –				
	Excave	ation M	ethod	EXCAVATOR
				to 0.9 m
	Un			
		Iorm	inated:	
			Table:	

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Test	PIT: B	5005		
			Client:	WSP Group
		F	Project:	MBSA High Speed Proving Ground - 7345
		Date P	rofiled:	2015/06/09
		Coord	inates:	28°11'07.5 "S, 21°28'28.3 "E
		Ele	vation:	Not specified
		Profi	led By:	Hannes Taljaard
		1		
		2		
E C	5	Vate		6
h (n	pling	/ pu	<u> </u>	in the second seco
Depth (m)	Sampling	Ground Water	Symbol	Description
	0	0	0	
				VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, intact, sand
0.2 -			成功	Transported (Aeolian)
0.4 -				
0.6			影影	
0.6 -				
0.8 -				(0.9 m)
1.0 -				MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF LOOSE TO VERY LOOSE, SAND
1.0 -			~~	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly moist, brownish red, loose to very loose, intact, sand
1.2 -	-		<u>ہ</u> ا	Transported (1.1 m)
1.4 -	_		_ <b>○</b> _	SOFT ROCK TO MEDIUM HARD ROCK, METABASALT WITH CALCRETE White with greenish grey, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Metabasalt with
			• <u></u> ••	calcrete
1.6 -			<b>+</b> ^+	
1.8 -	D	-	[ <b>+</b> ×+]	
2.0 -			• <b>`</b> `•	
2.0			Ŏ.	
2.2 -	-		<u>ہ</u>	
2.4 -	-		· <	
			ŏ.	(2.5 m) Refused On: soft rock to medium hard rock metabasalt with calcrete
2.6 -			1	
2.8 -				
3.0				
5.0				
3.2 –				
3.4 -				
3.6 -			1	
3.8 -				
4.0 -				
4.2 -				
4.4 -			-	
4.6 -			]	
4.8 -				
	Excav	ation N	lethod:	EXCAVATOR
	Uı	nstable	Sides:	to 0.9 m
		R	efusal:	2.5 m on soft rock to medium hard rock metabasalt with calcrete
		Water	Table:	None
				Dogo 5 of 49



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Test	Pit: B	5006			
			Client:	WSP Group	
		P	Project:	MBSA High Speed Proving Ground - 7345	Stat 1
		Date P	rofiled:	2015/06/09	the hard
		Coord	inates:	28°11'05.4 "S, 21°28'29.0 "E	P. C. C.
		Ele	vation:	Not specified	
		Profi	led By:	Hannes Taljaard	
		er			
Ē	5	Wat		Lo L	
u) y	pling	pu	lod		
Depth (m)	Sampling	Ground Water	Symbol	Description	5.1
	0,		0,	A 12 3	all's
				LOOSE TO VERY LOOSE, SAND Slightly moist, brownish red, loose to very loose, intact, sand	
0.2 -			机机	Transported (Aeolian)	
0.4 -			机机		
0.6			机机		
0.0					
0.8 -					
1.0 -			認認		
					(1.2 m)
1.2 -			×X <b>*</b> .	MEDIUM HARD ROCK, QUARTZ PEBBLES	(1.2 11)
1.4 -			<u>, Č</u>	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles VERY SOFT ROCK TO SOFT ROCK, GRANITE MANIFEST AS DENSE, GRAVEL	(1.4 m)
1.6			00	Purpleish grey, moderately weathered to highly weathered, medium grained, very soft rock to soft rock, granite manife	est as
1.6 —			00	slighly, purplish grey, dense, clast supported, gravel Residual	
1.8 -	-	-	00	Residual	
2.0 -	_		00		
			00		
2.2 -	D		00		
2.4 -	-		00		
2.6 -			CC COC :		
2.0 -			00		
2.8 -			00		(2.9 m)
3.0 -				Refused On: very soft rock to soft rock granite	
3.2 -					
3.4 -			-		
3.6 -					
5.0					
3.8 -			-		
4.0 -			_		
4.2 -			1		
4.4 -			-		
4.6 -					
4.8 -			-		
	Excav	ation M	lethod:	EXCAVATOR	
	Ur	nstable	Sides:	to 1.2 m	
		R	efusal:	2.9 m on very soft rock to soft rock granite	
			Table:		
				Page 6 of 48	

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105       molet, brownish red, very loose to loose, infact, sand       (0.6 m)         08       Imagented       (0.6 m)         10       Imagented       (0.6 m)         12       Imagented       (0.6 m)         14       Imagented       (0.6 m)         12       Imagented       (0.6 m)         14       Imagented       (0.6 m)         14       Imagented       (0.6 m)         18       Imagented       (0.6 m)         20       Imagented       (0.6 m)         21       Imagented       (0.6 m)         22       Imagented       (0.6 m)         24       Imagented       (0.6 m)         25       Imagented       (0.6 m)         26       Imagented       (0.6 m)         27       Imagented       (0.6 m)         28       Imagented       (0.6 m)         30       Imagented       (0.6 m)         31       Imagented       (0.6 m)         32       Imagented       (0.6 m)         34       Imagented       (0.6 m)         34       Imagented       (0.6 m)         34       Imagented       (0.6 m)         34	Test	Pit: B	D07		
Date Profiled       2017005/010         Coordinates       2017105 87 3, 2172/20 2 °E         Base Profiled       Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk         Image: State Profiled By: Hames Talgard & Coort van Dyk       Image: State Profiled By: Hames Talgard & Coort van Dyk				Client:	WSP Group
Coordinates:       2241106.9"S, 21/2626.2 "E         Biswation:       Not specified         Protective By:       Protective By:         Fig. 0       0         0       0 </th <th></th> <th></th> <th>P</th> <th>Project:</th> <th>MBSA High Speed Proving Ground - 7345</th>			P	Project:	MBSA High Speed Proving Ground - 7345
Elevation:       Not specified         0 </th <th></th> <th>I</th> <th>Date P</th> <th>rofiled:</th> <th>2015/06/10</th>		I	Date P	rofiled:	2015/06/10
Portlind By:       Hannes Taijaard & Coett van Dyk         000000000000000000000000000000000000			Coord	inates:	28°11'06.9 "S, 21°28'26.2 "E
Image: Second			Ele	vation:	Not specified
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi			Profi	led By:	Hannes Taljaard & Coert van Dyk
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi					
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi			e.		1 4 4 4 4 4 F 1 7 7
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi	<u>(</u>	5	Wat		
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi	ih (n	plin	pur	pol	print and a second s
12       VERY LOSE TO LOSE, SAND         13       Slighty most, brownish red, very loose to loose, inlact, sand         14       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         16       Paie white, slighty works, for graned, medium hard rock, quart pebbles in a mitrix of slighty most, brownish red, very loose to loose, inlact, sand         18       MEDUM HARD ROCK, METABASALT WITH CALCRETE         10       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         12       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fine grained, medium hard rock, Metabasalt with calcrete         14       Greenish grey, highty weathered, fi	Depi	Sam	Grot	Sym	Des
02       Slightly mish red, very loose to loose, intact, sand       0.4 m         04       WEDIUM HARD ROCK, QUART2 PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND       0.4 m         06       Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quart2 pebbles in a matrix of slightly       0.6 m         08       WEDIUM HARD ROCK, QUART2 PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND       0.6 m         09       WEDIUM HARD ROCK, METABASALT WITH CALCRETE       0.6 m         10       Greenish grey, highly weathered, fine grained, medium hard rock, Metabasalt with calcrete       0.8 m         20       Greenish grey, highly meathered, fine grained, medium hard rock, Metabasalt with calcrete       (2.9 m)         21       Greenish grey, highly meathered, fine grained, medium hard rock metabasalt with calcrete       (2.9 m)         22       Greenish grey, highly meathered, fine grained, medium hard rock metabasalt with calcrete       (2.9 m)         32       Greenish grey, highly meathered, fine grained, medium hard rock metabasalt with calcrete       (2.9 m)         34       Greenish grey, highly meathered, fine grained, medium hard rock metabasalt with calcrete       (2.9 m)         34       Greenish grey, highly meathered, fine grained, metabasalt with calcrete       (2.9 m)         34       Greenish grey, highly meathered, fine grained, metabasalt with calcrete       (2.9 m)         3		•		CANCER	
0.4       Interspone       (0.4 m)         0.4       Page white sightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of sightly methering to locs, finat, sand       (0.6 m)         0.6       Interspone       (0.6 m)       (0.6 m)         1.4       Interspone       (0.6 m)       (0.6 m)         1.2       Interspone       (0.6 m)       (0.6 m)         1.4       Interspone       (0.6 m)       (0.6 m)         2.2       Interspone       (0.6 m)       (0.6 m)         2.2       Interspone       (0.6 m)       (0.6 m)         3.3       Interspone       (0.6 m)       (0.6 m)         3.4       Interspone       (0.6 m)       (0.6 m)         3.4       Interspone       (0	0.0			机机	Slightly moist, brownish red, very loose to loose, intact, sand
03       MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOSES, SAND         06       06       06         08       06       06         08       06       06         08       06       06         08       06       06         08       06       06         08       06       06         08       06       06         10       06       06         12       06       06         12       06       06         12       06       06         14       06       06         15       07       06         16       07       06         17       08       06         18       08       06         29       08       06         20       08       06         22       08       06         24       08       06         25       08       06         26       08       06         27       08       06         28       08       06         29       08       06	0.2 -			机机	
0.6       Pele white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly inclusion to main the cycle cose to lose, intact, sand       (0.8 m)         0.8       0.8       (0.8 m)         1.0       0.8       (0.8 m)         1.2       0.8       (0.8 m)         1.4       0.8       (0.8 m)         2.2       0.8       (0.8 m)         2.4       0.8       (0.8 m)         2.5       0.8       (0.8 m)         2.6       0.8       (0.8 m)         2.7       0.8       (0.8 m)         2.8       0.8       (0.8 m)         3.9       0.8       (0.8 m)         3.1       0.8       (0.8 m)         3.2       0.8       (0.8 m)         3.4       0.8       (0.8 m)         3.5       0.8       (0.8 m)         3.6       0.8       (0.8 m)         <	0.4 -			ALC: NO	(0.4 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND
0.0       Image pointed inter, very fuelow in tools, interd. sand       (0.8 m)         10       Image pointed intervention       (0.8 m)         12       Image pointed intervention       (0.8 m)         12       Image pointed intervention       (0.8 m)         14       Image pointed intervention       (0.8 m)         15       Image pointervention       (0.8 m)         16       Image pointervention       (0.8 m)         17       Image pointervention       (0.8 m)         18       Image pointervention       (0.8 m)         19       Image pointervention       (0.8 m)         10       Image pointerventervention       (0.8 m)	0.6 -			56.56	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, guartz pebbles in a matrix of slightly
0.8       Image: Constraint of the second seco				~`6 <b>`</b> \	
10       10 <td< th=""><th>0.8 -</th><th></th><th></th><th>- Y 30 80</th><th>MEDIUM HARD ROCK, METABASALT WITH CALCRETE</th></td<>	0.8 -			- Y 30 80	MEDIUM HARD ROCK, METABASALT WITH CALCRETE
14	1.0 -			(JOJ)	Greenisn grey, highly weathered, fine grained, , medium hard rock, Metabasalt with calcrete
14	10			ÇQ)	
18       18       18       18       18       18       18       18       18       18       18       18       18       120	1.2 -			~ <b>^</b> ~	
1.8	1.4 -			(~ <b>?</b> ~)	
20       22         24       26         28       28         30       30         32       31         34       32         34       34         40       41         44       46         48       40         48       40         48       40         48       40         48       40         48       40         48       40         48       40         49       40         41       40         42       41         43       41         44       42         45       42         46       43         47       44         48       40         49       41         41       42         42       41         43       41         44       42         45       50.4 m         Refusa       20 m on medium hard rock metabasalt with calcrete         Water Table       None	1.6 -			(~XX	
20       22         24       26         28       28         30       30         32       31         34       32         34       34         40       41         44       46         48       40         48       40         48       40         48       40         48       40         48       40         48       40         48       40         49       40         41       40         42       41         43       41         44       42         45       42         46       43         47       44         48       40         49       41         41       42         42       41         43       41         44       42         45       50.4 m         Refusa       20 m on medium hard rock metabasalt with calcrete         Water Table       None				×83.	
22	1.8 -			~~~``	
24	2.0 -			~`ð <b>`</b> \	
24	22-			<u>čoš</u>	
2.6				(Q)	
2.8         (2.9 m)           3.0	2.4 –			~ <b>?</b> ~`	
30         30<	2.6 -			(~XX)	
30         30<	2.8 -			~~~~	
3.0       3.0         3.2       3.4         3.4       3.6         3.8       3.8         4.0       4.0         4.2       4.4         4.4       4.6         4.8       4.6         Unstable Sides:       to 0.4 m         Refusa:       2.9 m on medium hard rock metabasalt with calcrete         Water Table       None				~~~	
3.4       3.6         3.6       3.8         4.0       4.1         4.2       4.2         4.4       4.6         4.6       4.8         4.8       4	3.0 -				
3.6 3.8   4.0 4.2   4.4 4.6   4.8 5.6   5.6 5.6   5.7 5.7   5.8 5.6   5.9 6.0   4.8 5.6   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7	3.2 -				
3.6 3.8   4.0 4.2   4.4 4.6   4.8 5.6   5.6 5.6   5.7 5.7   5.8 5.6   5.9 6.0   4.8 5.6   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7   5.9 7.7	3.4				
3.8   4.0   4.2   4.4   4.6   4.8   4.8   4.8   Excavation Method:   EXCAVATOR   Unstable Sides:   to 0.4 m   Refusa:   2.9 m on medium hard rock metabasalt with calcrete   Water Table:   None					
4.0   4.2   4.4   4.6   4.8   4.8   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Unstable Sides:   to 0.4 m   Refusal:   2.9 m on medium hard rock metabasalt with calcrete   Water Table:   None	3.6 -				
4.2   4.4   4.6   4.8   A.8   Excavation Method:   Subscience   Material   Material   None	3.8 —				
4.2   4.4   4.6   4.8   A.8   Excavation Method:   Subscience   Material   Material   None	4.0 -				
4.4   4.6   4.8   4.8   A.8					
4.6   4.8   Excavation Method:   Excavation Method:   Unstable Sides:   to 0.4 m   Refusal:   2.9 m on medium hard rock metabasalt with calcrete   Water Table:   None	4.2 -				
4.8       Image: Constant of the state of t	4.4 -				
4.8       Image: Constant of the state of t	46-				
Excavation Method:       EXCAVATOR         Unstable Sides:       to 0.4 m         Refusal:       2.9 m on medium hard rock metabasalt with calcrete         Water Table:       None					
Unstable Sides: to 0.4 m Refusal: 2.9 m on medium hard rock metabasalt with calcrete Water Table: None	4.8 -				
Unstable Sides: to 0.4 m Refusal: 2.9 m on medium hard rock metabasalt with calcrete Water Table: None					
Refusal: 2.9 m on medium hard rock metabasalt with calcrete Water Table: None		Excava	ation M	lethod:	EXCAVATOR
Water Table: None		Ur	stable	Sides:	to 0.4 m
Dogo 7 of 49			Water	Table:	



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Test Pit: BD08		
		WSP Group
	Project:	MBSA High Speed Proving Ground - 7345
Date	Profiled:	: 2015/06/09
Coor	dinates:	28°11'07.8 "S, 21°28'27.6 "E
E	levation:	Not specified
Pro	filed By:	: Hannes Taljaard
e.		
g Wat		<u>5</u>
iplin (r	poq	di la constante de la constante
Depth (m) Sampling Ground Water	Symbol	Description
	eancean	VERY LOOSE TO LOOSE, SAND
		Slightly moist, brownish red, very loose to loose, intact, sand
0.2	机机	Transported (Aeolian)
0.4	-43.63	
0.6		(0.6 m)
		MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF LOOSE TO VERY LOOSE, SAND Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly
0.8		moist, brownish red, loose to very loose, sand
1.0 -	00	(0.8 m) (0.8 m) (0.8 m) (0.8 m) (0.8 m)
	00	Dark grey stained reddish brown, completely weathered, medium grained, closely jointed, very soft rock to soft rock,
1.2 -	00	metabasalt manifest as slightly moist, dark grey stained reddish brown, very dense, clast supported, gravel Residual
1.4 —	00	Residual
10	00	
1.6 -	00	
1.8 -	00	
2.0 -	00	
D	00	
2.2 -	00	
2.4 -	00	
	0.010.000	
2.6 -	0	
2.8 -	00	
2.0	00	
3.0 -	00	
3.2 -	00	(3.3 m)
3.4		Refused On: very soft rock to soft rock metabasalt
3.6	_	
3.8	_	
4.0		
4.2	-	
4.4	_	
4.6	_	
4.8	_	
Excavation	Method	EXCAVATOR
		to 0.6 m
	er Table:	3.3 m on very soft rock to soft rock metabasalt
vvat		Page 8 of 48



Test	lest Pit: BD09							
			Client:	WSP Group				
		F	Project:	MBSA High Speed Proving Ground - 7345				
		Date P	rofiled:	2015/06/09				
		Coord	linates:	28°11'08.3 "S, 21°28'27.8 "E				
				Not specified				
				Hannes Taljaard				
	1		ieu by.					
		Ground Water						
Ê	bu	Š	_	ption of the second				
Depth (m)	Sampling	nuc	Symbol	Description				
Dep	Sar	Gro	Syr					
			01001	VERY LOOSE TO LOOSE, SAND				
			机机	Slightly moist, brownish red, very loose to loose, intact, sand				
0.2 -			稿版	Transported (Aeolian)				
0.4 -			机机					
0.0								
0.6 -	-							
0.8 -				(0.8 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF LOOSE TO VERY LOOSE, SAND				
			机机	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly				
1.0 -			+*+	moist, brownish red, loose to very loose, intact, sand				
1.2 -			$\sim \sim \sim \sim \sim$	Transported (1 m) VERY SOFT ROCK TO MEDIUM HARD ROCK, METABASALT WITH CALCRETE (SOME PLACES WITH ROUNDED				
			[ <b>+</b> ×+]	PEBBLES)				
1.4 -			[•ێ•]	White with greenish grey, moderately weathered to highly weathered, fine grained to medium grained, very soft rock to				
1.6 -			[ <b>+</b> ×+]	medium hard rock, Metabasalt with calcrete (some places with rounded pebbles)				
			<b>•</b> č•]					
1.8 –			$\circ$ $\circ$ $\circ$ $\circ$					
2.0 -			۰ŏ					
			• •					
2.2 -			<u>ہ</u>					
2.4 -			Ò.					
			$\diamond$					
2.6 -			$\diamond$					
2.8 -			$\diamond$					
			$\diamond$					
3.0 -			$\diamond$					
3.2 -			$\diamond$					
0			0	(3.3 m) Refused On: very soft rock to medium hard metabasalt with calcrete (some places with rounded pebbles)				
3.4 -			-	Refused on. very sort fock to median hard metabasan with calorete (some places with founded pebbles)				
3.6 -								
0.0								
3.8 -								
4.0 -								
4.0 -								
4.2 -								
4.4 -								
4.4 -								
4.6 -								
4.8 -								
4.0 -								
	Excav	ation N	lethod:	EXCAVATOR				
	Ur	nstable	Sides:	to 0.8 m				
		R	efusal:	3.3 m on very soft rock to medium hard metabasalt with calcrete (some places with rounded pebbles)				
			Table:					
				Page 9 of 48				



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Cleare       WSP Fromp         Date Profile       201508/10         Coordinates       23 1103 4"3, 212825.8 "E         Date Profile       21108 4"3, 212825.8 "E         Date Profile       Profiled By         Profiled By       Hames Taijaard & Cost van Dyk         Date Profiled By       Hames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date Profiled By       Bames Taijaard & Cost van Dyk         Date	Test I	Pit: B	D10		
Date Profiles       201509/10         Coordinates       2811108.4 5, 21/2825.6 °E         Elevation       Not specified         Profiled By:       Hannes Tajaard & Coet van Dyk         01       01         02       01         03       01         04       01         05       02         04       02         05       02         06       02         07       04         08       02         09       02         00       02         01       03         02       02         03       04         04       05         05       0500000000000000000000000000000000000				Client:	WSP Group
Coordinates       22*1108.4*8, 21*252.6 *E         Elevation:       Not specified         Provided by:       Humos Talgard & Coot van Dyk         0.1       0         0.2       0         0.3       0         0.4       0         0.5       DOOSE TO VERY LOOSE, SAND         0.4       0         0.4       0         0.4       0         0.5       DOOSE TO VERY LOOSE, SAND         0.6       Statute the with get, howe holes, intact, and Transported (Acolina)         0.4       0         0.4       0         0.5       DOOSE TO VERY LOOSE, SAND         0.6       DOOSE TO VERY LOOSE, SAND         1.0       0         0.4       0         0.5       DEVELOPED PARTS BETWEEN)         0.6       DEVELOPED PARTS BETWEEN)         1.0       0         1.1       0         1.2       0         1.3       0         1.4       0         1.5       DEVELOPED PARTS BETWEEN)         1.6       0         1.7       0         1.8       0         1.9       0			P	roject:	MBSA High Speed Proving Ground - 7345
Elevation:       Not specified         registric       page 1         0       pa		I	Date Pi	ofiled:	2015/06/10
Profind By         Hames Taijaard & Coert van Dyk           uige         big			Coord	inates:	28°11'08.4 "S, 21°28'25.6 "E
Image: Constraint of the second se			Ele	vation:	Not specified
12       LOOSE TO VERY LOOSE, SAND         Slightly mole, brownish red, loose to very loose, intact, sand       (0.3 m)         14       Image: state stat			Profi	ed By:	Hannes Taljaard & Coert van Dyk
12       LOOSE TO VERY LOOSE, SAND         Slightly mole, brownish red, loose to very loose, intact, sand       (0.3 m)         14       Image: state stat					
12       LOOSE TO VERY LOOSE, SAND         Slightly mole, brownish red, loose to very loose, intact, sand       (0.3 m)         14       Image: state stat			fer		
12       LOOSE TO VERY LOOSE, SAND         Slightly mole, brownish red, loose to very loose, intact, sand       (0.3 m)         14       Image: state stat	۲	D	Wat		uoi
12       LOOSE TO VERY LOOSE, SAND         Slightly mole, brownish red, loose to very loose, intact, sand       (0.3 m)         14       Image: state stat	th (r	uldu	pun	lodi	cript
02       Control       LOSE VLOSE SAND Transmitted, troubing ted, lose to very losse, intact, sand Transmitted, troubing ted, lose to very losse, intact, sand Transmitted, module to build the same set of t	Dep	San	Gro	Syn	Des
02       Slightly mish red, loose to very loose, intact, sand       (0.3 m)         04       MEDIUM HARD ROCK TO VERY HARD ROCK, CALCRETE (VERY HARD BOULDERS WITH SOFTER OR LESS         08       MEDIUM HARD ROCK TO VERY HARD ROCK, CALCRETE (VERY HARD BOULDERS WITH SOFTER OR LESS         08       MEDIUM HARD ROCK, Calcrete (very hard boulders with softer or less developed parts between)         08       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         10       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         12       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         14       (14 m)         18       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         20       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         21       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         22       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         22       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         24       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)         24       Medium Hard rock, Calcrete (very hard boulders with softer or less developed parts between)				attact	LOOSE TO VERY LOOSE SAND
04       Implifying a concernent of the provided and the provided an	02-			杨杨	Slightly moist, brownish red, loose to very loose, intact, sand
08       DEVELOPE PARTS BETWEEN)         08       Care more with wing regime of the parts between)         10       Care more with wing regime of the parts between)         12       Care more with wing regime of the parts between)         13       Care more with wing regime of the parts between)         14       Care more with wing regime of the parts between)         15       Care more with wing regime of the parts between)         14       Care more with wing regime of the parts between)         15       Care more with wing regime of the parts between)         16       Care more with wing regime of the parts between)         18       Care more with wing regime of the parts between)         19       Care more with wing regime of the parts between)         20       Care more with wing regime of the parts between)         21       Care more with wing regime of the parts between)         22       Care more with wing regime of the parts between)         23       Care more with wing regime of the parts between)         32       Care more with wing regime of the parts between)         33       Care more with wing regime of the parts between)         34       Care more with wing regime of the parts between)         35       Care more with wing regime of the parts between)         36       Ca				~~~	Transported (Aeolian) (0.3 m) MEDIUM HARD ROCK TO VERY HARD ROCK, CALCRETE (VERY HARD BOULDERS WITH SOFTER OR LESS
0.8       Image: Constraint of the second of t	0.4 -			(Q)	DEVELOPED PARTS BETWEEN)
0.8	0.6 -			$\langle Q \rangle$	Cream white with grey, moderately weathered to highly weathered, fine grained to medium grained, medium hard rock to very bard rock. Calcrete (very bard boulders with softer or less developed parts between)
10	0.0			$\sim 2$	
12	0.8 -			~~~~	
12       (14m)         14       (14m)         16       (14m)         18       (14m)         20       (14m)         22       (14m)         24       (14m)         25       (14m)         26       (14m)         28       (14m)         29       (14m)         20       (14m)         21       (14m)         22       (14m)         24       (14m)         25       (14m)         26       (14m)         28       (14m)         29       (14m)         30       (14m)         32       (14m)         34       (14m)         40       (14m)         42       (14m)         44       (14m)         48       (14m)         48       (14m)         49       (14m)         40       (14m)         41       (14m)         42       (14m)         43       (14m)         44       (14m)         45       (14m)         46       (14m)	1.0 —			2	
14       (14 m)         18       (14 m)         20       (14 m)         21       (14 m)         22       (14 m)         23       (14 m)         24       (14 m)         25       (14 m)         26       (14 m)         27       (14 m)         28       (14 m)         29       (14 m)         20       (14 m)         21       (14 m)         22       (14 m)         24       (14 m)         28       (14 m)         39       (14 m)         30       (14 m)         31       (14 m)         32       (14 m)         34       (14 m)         36       (14 m)         38       (14 m)         40       (14 m)         41       (14 m)         42       (14 m)         43       (14 m)         44       (14 m)         43       (14 m)         44       (14 m)         43       (14 m)         44       (14 m)         45       (14 m)         46	12-				
1-4       1-4         1-8       1-4         1-8       1-4         20       1-4         22       1-4         24       1-4         28       1-4         30       1-4         32       1-4         34       1-4         35       1-4         40       1-4         42       1-4         44       1-4         45       1-4         46       1-4         47       1-4         48       1-4         49       1-4         41       1-4         42       1-4         43       1-4         44       1-4         45       1-4         46       1-4         47       1-4         48       1-4         49       1-4         41       1-4         42       1-4         43       1-4         44       1-4         45       1-4         46       1-4         47       1-4         48       1-4					(1 4 m)
18	1.4 —				
20	1.6 —				
20	18-				
22					
24	2.0 -				
26       28         30       32         32       34         34       36         38       40         40       40         42       44         46       48         10       10         11       10         12       10         14       10         14       10         14       10         14       10         14       10         14       10         14       10         15       10         16       10         17       10         18       10         19       10         10       10         10       10         10       10         10       10         11       10         12       10         13       10         14       10         14       10         15       10         16       10         17       10         18       10         19       10	2.2 -				
26       28         30       32         32       34         34       36         38       40         40       40         42       44         46       48         10       10         11       10         12       10         14       10         14       10         14       10         14       10         14       10         14       10         14       10         15       10         16       10         17       10         18       10         19       10         10       10         10       10         10       10         10       10         11       10         12       10         13       10         14       10         14       10         15       10         16       10         17       10         18       10         19       10	2.4				
2.8	2.4				
30       31         32       34         34       36         38       38         40       42         44       46         48       48         Unstable Sides:       None         Terminated:       No         Water Table:       None	2.6 —				
32	2.8 -				
32					
3.4       3.6         3.6       3.8         4.0       4.2         4.4       4.6         4.6       4.8         4.8       Image: Constraint of the state of	3.0 -				
3.6       3.8         4.0       4.1         4.2       4.2         4.4       4.6         4.6       4.8         4.8       Image: Constant of the state of th	3.2 –				
3.8	3.4 —				
3.8					
4.0          4.2          4.4          4.6          4.8          Excavation Method:       EXCAVATOR         Unstable Sides:       None         Terminated:       No         Water Table:       None	3.6 -				
4.2   4.4   4.6   4.8   4.8   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Vinstable Sides:   None   Water Table:   None	3.8 —				
4.2   4.4   4.6   4.8   4.8   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Vinstable Sides:   None   Water Table:   None	4.0				
4.4   4.6   4.8   4.8   Excavation Method:   None   Water Table:   None					
4.6   4.8     Excavation Method:   Mone     Mater Table:     None	4.2 -				
4.8       Image: Constant of the second	4.4 -				
4.8       Image: Constant of the second	46-				
Excavation Method:       EXCAVATOR         Unstable Sides:       None         Terminated:       No         Water Table:       None					
Unstable Sides: None Terminated: No Water Table: None	4.8 -				
Unstable Sides: None Terminated: No Water Table: None					
Terminated: No Water Table: None	I				
Water Table: None		Un			
			Water	Table:	



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		P Date Pr Coord Ele	Project: rofiled: inates: vation:	WSP Group MBSA High Speed Proving Ground - 7345 2015/06/09 28°11'09.1 "S, 21°28'25.8 "E Not specified Hannes Taljaard
Depth (m)	Sampling	Ground Water	Symbol	Description
0.2 0.4 0.6				VERY LOOSE, SAND Slightly moist, brownish red, very loose, intact, sand Transported (Aeolian)
0.8 1.0 1.2 1.4				(0.9 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly moist, brownish red, very loose to loose, intact, sand Transported SOFT ROCK TO MEDIUM HARD ROCK, METABASALT WITH CALCRETE BOULDERS White with greenish grey, highly weathered, fine grained to medium grained, thinly laminated, soft rock to medium hard rock, Metabasalt with calcrete boulders
1.6 1.8 2.0 2.2			$\begin{array}{c} \diamond \\ \diamond $	(2.3 m)
2.4 - 2.6 - 2.8 - 3.0 -				Refused On: soft rock to medium hard rock metabasalt with calcrete boulders
3.2 - 3.4 - 3.6 -				
3.8 - 4.0 - 4.2 - 4.4 -				
4.6 -	Excav	ation M	lethod	EXCAVATOR
		nstable R	Sides:	to 0.9 m 2.3 m on soft rock to medium hard rock metabasalt with calcrete boulders



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Test	Pit: B	D12		
			Client:	WSP Group
		F	Project:	MBSA High Speed Proving Ground - 7345
		Date P	rofiled:	2015/06/09
		Coord	linates:	28°11'08.6 "S, 21°28'26.3 "E
		Ele	vation:	Not specified
		Profi	led By:	Hannes Taljaard
Depth (m)	Sampling	Ground Water		Description
Dep	Sam	Gro	Symbol	VERY LOOSE TO LOOSE, SAND
0.2			たった。	Slightly moist, brownish red, very loose to loose, intact, sand Transported (Aeolian)
				(0.6 m)
0.6 —			+*+	(0.6 m) SOFT ROCK TO MEDIUM HARD ROCK, METABASALT WITH CALCRETE
0.8 -			<b>+</b> ^+	White with greenish grey, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Metabasalt with calcrete
			• <b>č</b> •	
1.0 -			ŏ.	
1.2 —	-	<u> </u>	$\diamond$	
1.4	-		_ <b>_</b> _	
	_		• <u>`</u> •	
1.6 —	D		<b>+</b> ×+	
1.8 —	-		•č•	
2.0 -			Ŏ.	
			$\diamond$	
2.2 -			<b>`</b>	
2.4 -	-	<u> </u>	<b>+</b> ^+	
2.6 -			•^•	(2.6 m)
				Refused On: soft rock to medium hard rock metabasalt with calcrete
2.8 -			-	
3.0 -			-	
3.2				
3.4 —			1	
3.6 —			-	
3.8				
4.0 -			1	
4.2 -			-	
4.4				
4.6 -				
4.8 —			-	
	Excav	ation N	Iethod:	EXCAVATOR
				to 0.6 m
				2.6 m on soft rock to medium hard rock metabasalt with calcrete
			Table:	
				Page 12 of 48

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Test I	Pit: B	R01		
			Client:	WSP Group
		P	roject:	MBSA High Speed Proving Ground - 7345
		Date P	rofiled:	2015/06/10
		Coord	inates:	28°11'02.1 "S, 21°28'36.2 "E
		Ele	vation:	Not specified
		Profi	led By:	Hannes Taljaard & Coert van Dyk
		e		
(c	D	Wat		
Depth (m)	Sampling	Ground Water	Symbol	Description
Jepi	Sam	Grot	Sym	Des
	••		entreat	VERY LOOSE TO LOOSE, SAND
0.0				Slightly moist, brownish red, very loose to loose, intact, sand
0.2 -			1	Transported (Aeolian) (0.1 m) SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT
0.4 —			1×3	Pale white with grevish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock,
0.6 —			VS	Calcrete with metabasalt
			V	
0.8 —				
1.0 -				
1.2				
1.2 -			V.3	
1.4 —			V	
1.6 —			VS	
1.8 —				
2.0 -			V¥	(2 m) Refused On: soft rock to medium hard rock calcrete with metabasalt
2.2				
2.4 —				
2.6 -				
2.8				
2.0 -				
3.0 -				
3.2 -				
3.4 —				
3.6 —				
3.8 —				
4.0 -				
4.2 -				
4.4				
4.4				
4.6 —				
4.8 -				
	Fxcav	ation M	lethod:	EXCAVATOR
			Sides:	
	01			2 m on soft rock to medium hard rock calcrete with metabasalt
			Table:	
		Hatel	Table.	Page 13 of 48

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Citere         WSP Group           Date Profile         201500/10           Coordinate:         21102/07, 212828.7 °E           Image: State S	Test	Pit: B	R02		
Date Profiles         2011/02.07 S, 21/28/35.7 °E           Determine         2011/02.07 S, 21/28/35.7 °E           Determine         2011/02.07 S, 21/28/35.7 °E           Operating         2011/02.07 S, 21/28/35.7 °E           Operating         3000000000000000000000000000000000000				Client:	WSP Group
Concentration         2211102.01%, 21/28/36.7 %           Elevation         With specified           Profiled Bit         Halmers Tajaard & Cont van Dyk           Image: Specified Bit         Halmers Tajaard & Cont van Dyk           Image: Specified Bit         Halmers Tajaard & Cont van Dyk           Image: Specified Bit         Halmers Tajaard & Cont van Dyk           Image: Specified Bit         Profiled Bit         Profiled Bit         Profiled Bit         Image: Specified Bit           Image: Specified Bit         Profiled Bit         Profiled Bit         Profiled Bit         Profiled Bit         Image: Specified Bit			P	roject:	MBSA High Speed Proving Ground - 7345
Elevation       Not specified         0 <th></th> <th></th> <th></th> <th></th> <th></th>					
Ponied By:         Hannes Taijaard & Coert van Dyk           0					the second s
Image: Second					
2       2       2       3       2       3			Profi	led By:	Hannes Taljaard & Coert van Dyk
12       (Acidian)       <	Depth (m)	Sampling	Ground Water	Symbol	VERY LOOSE TO LOOSE, SAND
04       SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT         06       Calcrete with metabasait         08       Calcrete with metabasait         09       Calcrete with metabasait         10       Calcrete with metabasait         11       Calcrete with metabasait         12       Calcrete with metabasait         14       Calcrete with metabasait         18       Calcrete with metabasait         20       Calcrete with metabasait         21       Calcrete with metabasait         22       Calcrete with metabasait         23       Calcrete with metabasait         24       Calcrete with metabasait         25       Calcrete with metabasait         26       Calcrete with metabasait         27       Calcrete with metabasait         28       Calcrete with metabasait         38       Calcrete with metabasait         38       Calcrete with metabasait         38       Calcrete with metabasait         39       Calcrete with metabasait	0.2 -			20	Slightly moist, brownish red, very loose to loose, intact, sand Transported (Aeolian)
Calcrete with metabasalt  Calcrete with meta	04-			$\mathcal{Q}$	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT
0.8       0				$\leq 0$	Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasalt
10       10 <td< th=""><th>0.6 —</th><th></th><th></th><th>2</th><th></th></td<>	0.6 —			2	
12	0.8 -			00	
12	10-			5	
14				8	
18       18       (1.8 m)         20       10       Refused On: soft rock to medium hard rock calcrete with metabasalt         21       10       10         22       10       10         24       10       10         25       10       10         26       10       10         28       10       10         30       10       10         32       10       10         34       10       10         38       10       10         40       10       10         41       10       10         42       10       10         44       10       10         45       10       10         46       10       10         48       10       10         10       10       10         11       10       10         12       10       10         48       10       10         12       10       10         13       10       10         14       10       10         15       10       10	1.2 —			2	
1.8       Clim         20       Clim         21       Clim         22       Clim         24       Clim         25       Clim         26       Clim         28       Clim         30       Clim         32       Clim         34       Clim         38       Clim         40       Clim         41       Clim         42       Clim         43       Clim         44       Clim         45       Clim         46       Clim         47       Clim         48       Clim         10       Clim         11       Clim         12       Clim         43       Clim         44       Clim         45       Clim         46       Clim         47       Clim         48       Clim         49       Clim         41       Clim         42       Clim         43       Clim         44       Clim         45       C	1.4 -			20	
1.8       Clim         20       Clim         21       Clim         22       Clim         24       Clim         25       Clim         26       Clim         28       Clim         30       Clim         32       Clim         34       Clim         38       Clim         40       Clim         41       Clim         42       Clim         43       Clim         44       Clim         45       Clim         46       Clim         47       Clim         48       Clim         10       Clim         11       Clim         12       Clim         43       Clim         44       Clim         45       Clim         46       Clim         47       Clim         48       Clim         49       Clim         41       Clim         42       Clim         43       Clim         44       Clim         45       C	16-			$\leq 0$	
10       A       Refused On: soft rock to medium hard rock calcrete with metabasalt         20       A       A         22       A       A         24       A       A         26       A       A         28       A       A         30       A       A         32       A       A         34       A       A         36       A       A         38       A       A         4.4       A       A         4.5       A       A         4.6       A       A         4.7       A       A         4.8       A       A         4.9       A       A         4.9 <t< th=""><th></th><th></th><th></th><th>2</th><th>(1 8 m)</th></t<>				2	(1 8 m)
22	1.8 -				Refused On: soft rock to medium hard rock calcrete with metabasalt
2.4	2.0 -				
2.4	2.2 -				
2.6					
2.8	2.4				
3.0	2.6 -				
32       34         34       36         36       38         40       40         42       44         46       48         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         48       46         49       46         49       46         410       46         42       46         43       46         44       46         45       46         46       47         47       48         48       48         49       48         49       49         410       49         410       49         410       49     <	2.8 –				
3.4       3.6         3.6       3.8         4.0       4.1         4.2       4.2         4.4       4.6         4.6       4.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1.8         4.8       1	3.0 —				
36 38   38 40   40 42   4.4 4.6   4.8 4.8   Excavation Method: Excavation Method: Unstable Sides: None Refusal 1.8 m on soft rock to medium hard rock calcrete with metabasalt Water Table None	3.2 —				
3.8   4.0   4.2   4.4   4.6   4.8	3.4 —				
4.0   4.2   4.4   4.6   4.8	3.6 —				
4.2   4.4   4.6   4.8   4.8   A.8	3.8 -				
4.4 4.6   4.6 4.8   4.8 4.8 <b>Excavation Method</b> EXCAVATOR   Unstable Sides None   Refusal 1.8 m on soft rock to medium hard rock calcrete with metabasalt   Water Table None	4.0 -				
4.6   4.8     Excavation Method:   Excavation Method:   Unstable Sides:   None   Refusal:   1.8 m on soft rock to medium hard rock calcrete with metabasalt   Water Table:   None	4.2 -				
4.8       Image: Constant of the second	4.4 -				
4.8       Image: Constant of the second					
Excavation Method:       EXCAVATOR         Unstable Sides:       None         Refusal:       1.8 m on soft rock to medium hard rock calcrete with metabasalt         Water Table:       None	4.6 -				
Unstable Sides: None Refusal: 1.8 m on soft rock to medium hard rock calcrete with metabasalt Water Table: None	4.8 -				
Refusal: 1.8 m on soft rock to medium hard rock calcrete with metabasalt Water Table: None		Excava	ation M	lethod:	EXCAVATOR
Water Table: None		Un	stable	Sides:	None
			R	efusal:	1.8 m on soft rock to medium hard rock calcrete with metabasalt
			Water	Table:	

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Cleare       WP Group         Date Profile       201506/10         Coordinates       201101 9"S. 21/2251 1"E         Coordinates       21101 9"S. 21/2251 1"E         Profiled By       Hannos Talgard & Coort van Dyk         Image: State St	Test Pit: BR03							
Date Profiled:       20150610         Coordinates:       201101.9 S, 212335.1°E         Elevation:       Not specified         Profiled By:       Hannes Taljaard & Coert van Dyk         Image: Specified By:       Bighty most, howship red, very loopse to hoose, inflact, sand         0.4       Image: Specified By:         0.5       Image: Specified By:         0.6       Image: Specified By:         0.7       Pase while while systel By:         0.8       Image: Specified By:         0.9       Image: Specified By:         1.4       Image: Specified By:         1.5       Image: Specified By:         1.6       Image: Specified By:         1.7       Image: Specified By:         1.8       Image: Specified By:				Client:	WSP Group	1		
Coordinates:       22*1101.0*S, 21*293.1*E         Beratics:       Not specified         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert van Dyk         Image: Specified By: Humos Taipard & Coert Van Doese, Intel, sand         Image: Specified By: Humos Taipard & Coert Van Doese, Intel, sand         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coert Van Dyk         Image: Specified By: Humos Taipard & Coer			F	Project:	MBSA High Speed Proving Ground - 7345	and the second second		
Elevation       Not specified         Provided By       Hannes Taijaard & Ceet van Dyk.         0       9       90       <			Date P	rofiled:	2015/06/10	3		
Portified By       Hannes Taijaard & Coert van Dyk         0			Coord	inates:	28°11'01.9 "S, 21°28'35.1 "E			
Image: Second								
12       VERY LOSE TO LOSE, SAND         13       Signity moist, brownish red, very loose to loose, intact, sand       (0.1 m)         14       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasait       (0.1 m)         10       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasait       (0.1 m)         10       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasait       (2.5 m)         12       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasait       (2.5 m)         24       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock calcrete with metabasait       (2.5 m)         25       Paie white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock calcrete with metabasait       (2.5 m)         26       Paie white with greyish green, moderately weathered file       (2.5 m)         26       Paie with with greyish green, moderately weathered, file       (2.5 m)         27       Paie with with greyish green, moderately weathered, file       (2.5 m)         36       Paie with with greyish green, moderately weathered, file       (2.5 m) </th <th></th> <th></th> <th>Profi</th> <th>led By:</th> <th>Hannes Taljaard &amp; Coert van Dyk</th> <th>40</th>			Profi	led By:	Hannes Taljaard & Coert van Dyk	40		
02       Isinghty moish red, very losse to losse, intact, sand       (0.1 m)         04       Image: solution of the solut	Depth (m)	Sampling	Ground Water	Symbol				
Linstruction Method:     Excavation     Excavation     Excavation     Excavation     Excavation     Excavation     Excavation     Excavation     Excavation	0.2				Slightly moist, brownish red, very loose to loose, intact, sand			
04       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete pinnacles         08       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete pinnacles         10       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete pinnacles         12       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasalt         14       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, calcrete with metabasalt         24       Pale while with greysh green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock calcrete with metabasalt         28       Pale while with greysh green, moderately weathered to highly weathered to highly weathered.         28       Pale while with greysh green, moderately weathered to highly weathered.         28       Pale while with greysh green, moderately weathered.         29       Pale while with greysh green, moderately weathered.         29       Pale while with greysh green, moderately weathered.         29       Pale while with greysh green, moderately weathered.         20       Pale while with greysh green, moderately weathered.         20       Pale while with greysh green.	0.2 -			1	Transported (Aeolian)	0.1 m)		
08       Image: Calcrete pinnacles         10       Image: Calcrete pinnacles         11       Image: Calcrete pinnacles         12       Image: Calcrete pinnacles         14       Image: Calcrete pinnacles         15       Image: Calcrete pinnacles         22       Image: Calcrete pinnacles         24       Image: Calcrete pinnacles         25       Image: Calcrete pinnacles         26       Image: Calcrete pinnacles         27       Image: Calcrete pinnacles         28       Image: Calcrete pinnacles         28       Image: Calcrete pinnacles         29       Image: Calcrete pinnacles         20       Image: Calcrete pinnacles         22       Image: Calcrete pinnacles         24       Image: Calcrete pinnacles         25       Image: Calcrete pinnacles         26       Image: Calcrete pinnacles         27       Image: Calcrete pinnacles         28       Image: Calcrete pinnacles         29       Image: Calcrete pinnacles         20       Image: Calcrete pinnacles         21       Image: Calcrete pinnacles         22       Image: Calcrete pinnacles         28       Image: Calcrete pinnacles <t< th=""><th>0.4 -</th><th></th><th></th><th>14</th><th>Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock,</th><th></th></t<>	0.4 -			14	Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock,			
0.8       Image: Constraint of the second seco	0.6 -			Vž	Calcrete with metabasalt Notes: Calcrete pinnacles			
10       10       10         12       14       14         18       18       10         20       22       24         24       24       24         25       24       25         30       32       34         30       34       36         32       34       40         42       44       46         43       40       42         44       48       48         44       48       48         44       48       48         44       48       48         44       48       48         44       48       49         44       48       49         44       48       40         45       100       100         Excavation Method:       EXCAVATOR         Unstable Side:       None         Excavation Method:       2.5 m on soft rock to medium hard rock cacirete with metabasalt         Water Table:       None	0.8			V				
12       14         18       18         20       22         24       24         25       24         26       24         27       24         28       24         29       24         20       24         21       24         22       24         24       24         25       24         26       25         30       32         34       38         40       44         43       40         44       48         48       48         48       48         49       48         40       48         41       48         42       44         43       48         44       48         45       100         Excavation Method:       EXCAVATOR         Unstable Sides:       None         Extract Table:       None				v				
14       14       18       18       18       18       18       12         24       24       24       (2.5 m)       (2.5 m)       (2.5 m)         24       24       (2.5 m)       (2.5 m)       (2.5 m)         26       24       (2.5 m)       (2.5 m)       (2.5 m)         28       30       32       (3.6 m)       (3.6 m)       (3.6 m)         38       4.0 m)       4.0 m)       (4.6 m)       (4.6 m)       (4.6 m)         4.0       4.8 m)       (4.6 m)       (4.6 m)       (4.6 m)       (4.6 m)         4.4       (4.8 m)       (4.6 m)       (4.6 m)       (4.6 m)       (4.6 m)       (4.6 m)         4.4       (4.8 m)       (4.6 m)	1.0 -			V				
18         18         18         18         18         18         18         18         18         18         18         18         18         120 <td< th=""><th>1.2 -</th><th></th><th></th><th>V</th><th></th><th></th></td<>	1.2 -			V				
18	1.4 -			v				
20         22           24         (2.5 m)           26         28           30         32           34         34           36         38           40         44           44         46           48         40           Unstable Sides:         None           Excavation Method:         EXCAVATOR           Unstable Sides:         None           Refusal:         2.5 m on soft rock to medium hard rock cacirete with metabasalt	1.6 -			VS				
20         22           24         (2.5 m)           26         28           30         32           34         34           36         38           40         44           44         46           48         40           Unstable Sides:         None           Excavation Method:         EXCAVATOR           Unstable Sides:         None           Refusal:         2.5 m on soft rock to medium hard rock cacirete with metabasalt	1.8 —			V				
22       24       (2.5 m)         26       28       (2.5 m)         28       (2.5 m)       Refused On: soft rock to medium hard rock cacirete with metabasalt         30       (2.5 m)       (2.5 m)         32       (2.5 m)       (2.5 m)         34       (2.5 m)       (2.5 m)         44       (2.5 m)       (2.5 m)         44       (2.5 m)       (2.5 m)         45       (2.5 m)       (2.5 m)         46       (2.5 m)       (2.5 m)         47       (2.5 m)       (2.5 m)         48       (2.5 m)       (2.5 m)         49       (2.5 m)       (2.5 m)         40       (2.5 m)       (2.5 m)         41       (2.5 m)       (2.5 m)         42       (2.5 m)       (2.5 m)         43       (2.5 m)       (2.5 m)         44       (2.5 m)       (2.5 m)				v				
24       (2.5 m)         26       (2.5 m)         28       (2.5 m)         30       (2.5 m)         32       (2.5 m)         34       (2.5 m)         35       (2.5 m)         36       (2.5 m)         37       (2.5 m)         38       (2.5 m)         39       (2.5 m)         39       (2.5 m)         30       (2.5 m)         31       (2.5 m)         32       (2.5 m)         34       (2.5 m)         35       (2.5 m)				V				
(2.5 m (2.5 m))))))))))))))))))))))))))))))))))))	2.2 -			V				
28	2.4 -			v		2.5 m)		
30 32   34 36   38 38   40 42   44 46   4.6 4.8   4.8 4.8   4.9 4.8   4.8 <	2.6 -				Refused On: soft rock to medium hard rock cacIrete with metabasalt			
32       34         34       36         38       38         40       42         44       46         46       48         48       40         Excavation Method:       EXCAVATOR         Unstable Sides:       None         Refusa:       2.5 m on soft rock to medium hard rock cacirete with metabasalt         None       None	2.8 -							
3.4       3.6         3.6       3.8         4.0       4.2         4.4       4.6         4.6       4.8         4.8       4.6         4.8       1.0         None       2.5         None       2.5         None       2.5         None       2.5         None       2.5         None       2.5	3.0 -			-				
3.6   3.8   4.0   4.2   4.4   4.6   4.8   Excavation Method: EXCAVATOR Unstable Sides: None Refusal 2.5 m on soft rock to medium hard rock caclrete with metabasalt Water Table: None	3.2 -			-				
3.8   4.0   4.2   4.4   4.6   4.8   4.8   Excavation Method:   Unstable Sides:   Refusal:   2.5 m on soft rock to medium hard rock caclrete with metabasalt   Water Table:   None	3.4 -							
4.0   4.2   4.4   4.6   4.8   4.8   Excavation Method:   None   State   None   Vater Table:   None	3.6 -							
4.2   4.4   4.6   4.8     Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Excavation Method:   Vinstable Sides:   None   Refusal:   2.5 m on soft rock to medium hard rock caclrete with metabasalt   Water Table:   None	3.8 -							
4.4   4.6   4.8   Excavation Method: EXCAVATOR Unstable Sides: None Refusal: 2.5 m on soft rock to medium hard rock caclrete with metabasalt Water Table: None	4.0 -							
4.6       4.8         4.8       4.8         Excavation Method:       EXCAVATOR         Unstable Sides:       None         Refusal:       2.5 m on soft rock to medium hard rock caclrete with metabasalt         Water Table:       None	4.2 -							
4.6       4.8         4.8       4.8         Excavation Method:       EXCAVATOR         Unstable Sides:       None         Refusal:       2.5 m on soft rock to medium hard rock caclrete with metabasalt         Water Table:       None	4.4							
4.8								
Excavation Method:       EXCAVATOR         Unstable Sides:       None         Refusal:       2.5 m on soft rock to medium hard rock caclrete with metabasalt         Water Table:       None								
Unstable Sides:       None         Refusal:       2.5 m on soft rock to medium hard rock caclrete with metabasalt         Water Table:       None	4.8 -							
Unstable Sides:       None         Refusal:       2.5 m on soft rock to medium hard rock caclrete with metabasalt         Water Table:       None		Excava	ation N	lethod:	EXCAVATOR			
Water Table: None								
			R	efusal:	2.5 m on soft rock to medium hard rock caclrete with metabasalt			
Dage 15 of 49			Water	Table:				

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Test	Test Pit: BR04							
			Client:	WSP Group				
		P	roject:	MBSA High Speed Proving Ground - 7345				
	I	Date Pi	rofiled:	2015/06/10				
		Coord	inates:	28°11'02.2 "S, 21°28'36.8 "E				
		Ele	vation:	Not specified				
		Profi	led By:	Hannes Taljaard & Coert van Dyk				
		ater						
(u)	bu	Ň	_	btio				
Depth (m)	Sampling	Ground Water	Symbol	Description				
De	Sa	Ģ	Sy	De				
			99493	LOOSE TO VERY LOOSE, SAND				
0.2 -			V	Slightly moist, brownish red, loose to very loose, intact, sand Transported (Aeolian) (0.1 m)				
0.4 -				SOFT ROCK TO MEDIUM HARD ROCK, CALRETE WITH METABASALT				
				Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calrete with metabasalt (0.3 m)				
0.6 -				Refused On: soft rock to medium hard rock calcrete with metabasalt				
0.8 -								
1.0 -								
1.2 -								
1.4 -								
1.6 -								
1.8 —								
2.0 -								
2.2 -								
2.4 -								
2.6 -								
2.8 -								
3.0 -								
3.2 -								
3.4 -								
3.6 -								
3.8 -								
4.0 -								
4.2								
4.4 -								
4.6 -								
4.8								
	Execut	tion M	lother	EXCAVATOR				
			Sides:					
	U			0.3 m on soft rock to medium hard rock calcrete with metabasalt				
	Water Table:         None           Page 16 of 48         Page 16 of 48							

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lest	Test Pit: BR05							
			Client:	WSP Group				
		F	roject:	MBSA High Speed Proving Ground - 7345				
		Date P	rofiled:	2015/06/10				
		Coord	inates:	28°11'02.4 "S, 21°28'37.2 "E				
		Ele	vation:	Not specified				
		Profi	led By:	Hannes Taljaard & Coert van Dyk				
Depth (m)	Sampling	Ground Water	Symbol	Description				
				LOOSE TO MEDIUM DENSE, SAND Slightly moist, brownish red, loose to medium dense, intact, sand				
0.2 -			, <b>v</b> §	Transported (Aeolian) (0.1 m)				
0.4 -			V 2	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock,				
0.6			VS	Calcrete with metabasalt				
0.0 -			~					
0.8 -				(0.9 m)				
1.0 -				Refused On: soft rock to medium hard rock calcrete with metabasalt				
1.2 -								
1.4 -								
1.6 -								
1.8 -								
2.0 -								
2.2 -								
2.4 -								
2.6 -								
2.8 -								
3.0 -								
3.2 -								
3.4 -								
2.0								
3.6 -								
3.8 -								
4.0 -								
4.0								
4.2 -								
4.4 -								
4.6 -								
4.8 –								
	Execution	l ation M	lother	EXCAVATOR				
			Sides:					
	U			0.9 m on soft rock to medium hard rock calcrete with metabasalt				
	Water Table: None Page 17 of 48							

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Test	Test Pit: BR06							
			Client:	WSP Group				
		F	roject:	MBSA High Speed Proving Ground - 7345				
	I	Date P	rofiled:	2015/06/10				
		Coord	inates:	28°11'02.6 "S, 21°28'37.7 "E				
		Ele	vation:	Not specified				
		Profi	led By:	Hannes Taljaard & Coert van Dyk				
Depth (m)	Sampling	Ground Water	Symbol	Description				
	ŭ	U	ω.	LOOSE TO MEDIUM DENSE, SAND				
0.2 -			V	Slightly moist, brownish red, loose to medium dense, intact, sand Transported (Aeolian) (0.1 m)				
0.4			vS	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT				
				Pale white with greyish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock, Calcrete with metabasalt				
0.6 –								
0.8 —			v					
1.0 -			VS					
1.2 –								
			1					
1.4 -			V.3					
1.6 —			V					
1.8 –			V					
1.0								
2.0 -								
2.2 –			Y a					
			V.S					
2.4 –			V					
2.6 -			VS					
2.8 –			V					
3.0 -			v	(3.1 m)				
3.2 –				Refused On: soft rock to medium hard rock calcrete with metabasalt				
3.4 –								
3.6 —								
3.8 —								
4.0 -								
4.2 –								
4.4 -								
4.6 -								
4.8 –			-					
	Excave	ation M	lethod:	EXCAVATOR				
			Sides:					
	U			3.1 m on soft rock to medium hard rock calcrete with metabasalt				
	Water Table: None							



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Test Pit: OTP17							
			Client:	WSP Group	-		
		P	Project:	MBSA High Speed Proving Ground - 7345	4		
	I	Date P	rofiled:	2015/06/10	1 San		
		Coord	inates:	28°11'03.3 "S, 21°28'35.9 "E	A.S.		
		Ele	vation:	Not specified	and the second		
		Profi	led By:	Hannes Taljaard & Coert van Dyk			
					1		
Depth (m)	Sampling	Ground Water	Symbol	Description LOOSE TO VERY LOOSE, SAND			
0.2 —			机机	Slightly moist, brownish red, loose to very loose, intact, sand			
0.2			£3.1£3	Transported (Aeolian) LOOSE TO MEDIUM DENSE, SAND	(0.3 m)		
0.4 -			机机	Slightly moist, brownish red, loose to medium dense, clast supported sub-rounded pale white quartz pebbles, sand			
0.6			机机	Transported			
	D		机				
0.8			机抗				
1.0 —					(1 m)		
			Ŏ.	SOFT ROCK TO MEDIUM HARD ROCK, GRANITE WITH CALCRETE Pinkish white, highly weathered, medium grained, soft rock to medium hard rock, Granite with calcrete			
1.2 —			$\diamond$				
1.4 —			$\diamond$				
1.6 —			• <u></u> ••				
1.0			<b>+</b> ^+				
1.8 —			• <b>^</b> •				
2.0 —			•				
			•č•				
2.2 —			Ò.				
2.4 —			$\diamond$				
			$\sim$				
2.6 —			• • •				
2.8 —			<b>+</b> ^+				
3.0 —			ŏ				
			<b>+`+</b> `		(3.1 m)		
3.2 —							
3.4 —							
3.6 —			1				
3.8 —							
4.0							
4.2							
4.4							
4.6 —							
4.8 —							
E	Excava	ation M	lethod:	EXCAVATOR			
			Sides:				
			inated:				
			Table:				
				Page 19 of 48			

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lest	Test Pit: TPH01							
			Client:	WSP Group				
		Р	roject:	MBSA High Speed Proving Ground - 7345				
				2015/06/12				
				28°09'43.3 "S, 21°29'06.9 "E				
				Not specified				
		Profi	led By:	Hannes Taljaard & Coert van Dyk				
		er						
Ê	-	Ground Water		lo l				
Depth (m)	Sampling	∧ p∟	ō	Description				
epth	dmg	Ino	Symbol					
Õ	ű	G	Ś	Ő.				
			CN CON	VERY LOOSE TO LOOSE, SAND				
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand				
			5456	Transported (Aeolian)				
0.4 —			机机					
0.6 —			机机					
0.0			花花					
0.8 —			~~~	(0.8 m) SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT				
			(Q)	Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium				
1.0 —			00	hard rock, calcrete with metabasalt				
1.2 —			(Q)					
			$\dot{0}$					
1.4 —			ČŎŇ	(1.5 m)				
1.6 —				Refused On: soft rock to medium hard rock calcrete with metabasalt				
1.8 —								
2.0 —								
2.0								
2.2 —								
2.4 —								
2.6 —								
2.8 —								
3.0 —								
3.2 —								
3.4 —								
0.4								
3.6 —								
3.8 —								
3.0 -								
4.0 —								
4.2 —								
4.4 —								
4.6 —								
4.8 —								
	Excava	ation M	lethod:	EXCAVATOR				
	Un	stable	Sides:	to 0.8 m				
		R	efusal:	1.5 m on soft rock to medium hard rock calcrete with metabasalt				
	Water Table: None Page 20 of 48							



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		PH02		WSP Group
				MBSA High Speed Proving Ground - 7345
		Date Pr	ofiled:	2015/06/12
				28°09'43.9 "S, 21°28'55.7 "E
				Not specified
		Profil	ed By:	Hannes Taljaard & Coert van Dyk
		5		
Ê	5	Ground Water		
Depth (m)	Sampling	, pun	Symbol	Description
Dep	San	Gro	Syn	Des
			e March	VERY LOOSE TO LOOSE, SAND
0.2 —		<u> </u>		Slightly moist, brownish red, very loose to loose, intact, sand Transported
0.4 —				
0.6 —			電流	
			机机	
0.8 —			杨兆	
1.0 -			新发	
1.2 –		<u> </u>		
1.4	D			
1.6 -				
1.8 —				
2.0 -			杨亮	
2.2 –		<u> </u>		
2.4				
2.6 —				
			경험관망	(2.7 m)
2.8 —				
3.0 -				
3.2 —				
3.4 —				
3.6 —				
3.8 —				
4.0 -				
4.2 —				
4.4 —				
4.6 —				
4.8 -				
4.0 -				
	Excav	ation M	ethod:	EXCAVATOR
				to 2.7 m
			inated:	
		Water	Table:	
				Page 21 of 48

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Testr	est Pit: TPH03						
				WSP Group			
			-	MBSA High Speed Proving Ground - 7345			
				2015/06/11			
				28°09'50.3 "S, 21°29'05.6 "E			
				Not specified			
		Profi	led By:	Hannes Taljaard & Coert van Dyk			
		Ground Water					
Depth (m)	ing	≯ P	_	Description			
epth	Sampling	uno.	Symbol	securi			
ă	S	Ū	ŝ	ä			
				VERY LOOSE TO LOOSE, SAND			
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)			
0.4 —							
0.6 —							
0.8 —				(0.8 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND			
1.0 —			V	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly			
				moist, brownish red, very loose to loose, , sand Transported (0.9 m)			
1.2 —			1	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT			
1.4 —			V S	Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete with metabasalt			
1.6 —			VX	(1.55 m) Refused On: soft rock to medium hard rock calcrete with metabasalt			
1.8 —							
2.0 —			-				
2.2 —							
2.2							
2.4 —							
2.6 —							
2.8 —							
3.0 -							
3.2 —			-				
3.4 —							
3.6 —							
3.8 —							
4.0							
4.2							
4.4 —							
4.6 —							
4.8 —							
E				EXCAVATOR			
	Un			to 0.8 m			
				1.55 m on soft rock to medium hard rock calcrete with metabasalt			
		Water	Table:	None Page 22 of 48			

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lest	Test Pit: TPH04							
				WSP Group				
				MBSA High Speed Proving Ground - 7345				
				2015/06/11				
				28°10'04.1 "S, 21°29'26.0 "E				
				Not specified				
		Profil	led By:	Hannes Taljaard & Coert van Dyk				
		Ground Water						
Depth (m)	Sampling	ן א ב		Description				
epth	amp	Inoli	Symbol	Sector Sec				
	S	0	S					
			藏麗	VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand				
0.2 -	-		花花	Transported (Aeolian)				
0.4 -	-							
0.6 —	-		起来					
			稿苑					
0.8 —	D		杨素					
1.0 -			義素					
1.2			熱熱					
			稿系					
1.4	-							
1.6 —	-		杨杨	(1.7 m)				
1.8				DENSE, GRAVELLY SAND				
				Slightly moist, grey, dense, matrix supported, gravelly sand Transported (2 m)				
2.0 -			VE	SOFT ROCK TO MEDIUM HARD ROCK. CALCRETE WITH METABASALT				
2.2 -				Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete with metabasalt				
2.4								
			Y C	(2.6 m)				
2.6 —				Refused On: soft rock to medium hard rock calcrete metabasalt				
2.8 -								
3.0								
3.2								
3.2 -								
3.4								
3.6 —								
3.8 —								
0.0								
4.0 -								
4.2 -								
4.4								
4.6 —								
4.8 -								
	Excava	ation M	lethod:	EXCAVATOR				
	Ur	stable	Sides:	to 1.7 m				
		R	efusal:	2.6 m on soft rock to medium hard rock calcrete metabasalt				
		Water	Table:	None				
				Page 23 of 48				

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lest	Test Pit: TPH05							
			Client:	WSP Group				
		P	roject:	MBSA High Speed Proving Ground - 7345				
	1	Date Pi	ofiled:	2015/06/11				
		Coord	inates:	28°10'13.6 "S, 21°29'44.4 "E				
		Ele	vation:	Not specified				
		Profi	ed By:	Hannes Taljaard & Coert van Dyk				
			_					
		5						
e la c	-	Ground Water		u o				
h (n	pling	pu	lod	titi a second				
Depth (m)	Sampling	Brou	Symbol	Description				
	0)		0,					
			机机	VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand				
0.2 -			机机	Transported (Aeolian)				
0.4 -	D		私派					
0.6 —								
0.0				(0.7 m) SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT				
0.8 —				Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium				
1.0 -			r O's	hard rock, Calcrete with metabasalt (1 m)				
				Refused On: soft rock to medium hard rock calcrete metabasalt				
1.2 -								
1.4 -								
1.6								
1.0 -								
1.8 —								
2.0 -								
2.2 -								
2.4 -								
2.6 -								
2.8 —								
3.0 -								
3.2 -								
3.4 -								
3.6								
0.0								
3.8 —								
4.0 -								
4.0								
4.2 -								
4.4 -								
4.6 -								
4.8 —								
	Excava	ation M	ethod:	EXCAVATOR				
	Un	stable	Sides:	to 0.7 m				
		R	efusal:	1 m on soft rock to medium hard rock calcrete metabasalt				
		Water	Table:	None				
	Page 24 of 48							



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1000								
				WSP Group				
			-	MBSA High Speed Proving Ground - 7345				
				28°10'23.2 "S, 21°29'43.6 "E				
				Not specified				
	1	Profil	lea By:	Hannes Taljaard & Coert van Dyk				
		/ate						
ш,	oling	>   2						
Depth (m)	Sampling	Ground Water	Symbol	Description				
	S	0	S					
			机机	VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand				
0.2 -			机动	Transported (Aeolian)				
0.4 -			机动					
0.6 –			起来					
			能統					
0.8 –			机机					
1.0 -			898 900	(1 m MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND				
1.2 –			5635	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightl moist, brownish red, very loose to loose, sand				
			V	Transported (1.2 m				
1.4 –			V	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium				
1.6 -			1	hard rock, Calcrete with metabasalt (1.7 m				
1.8 –				Refused On: soft rock to medium hard rock calcrete with metabasalt				
2.0 –			1					
2.2 –								
2.4			-					
2.6								
2.0 -								
2.8 –								
3.0 -			-					
3.2 –								
5.2 -								
3.4 –								
3.6 –								
3.8 –								
4.0 -								
4.2 –								
4.4								
4.6 -								
4.8 –								
	Excav	ation M	lethod:	EXCAVATOR				
	Ur	nstable	Sides:	to 1 m				
		R	efusal:	1.7 m on soft rock to medium hard rock calcrete with metabasalt				
		Water	Table:	None				
	Page 25 of 48							

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#### Test Pit: TPMF01

restr	est Pit: TPMF01								
				WSP Group					
			-	MBSA High Speed Proving Ground - 7345					
				2015/06/13					
				28°10'37.5 "S, 21°29'20.4 "E					
				Not specified					
	-	Profi	ed By:	Hannes Taljaard & Coert van Dyk					
Depth (m)	Sampling	Ground Water	Symbol	Description VERY LOOSE TO LOOSE, SAND					
0.2 —		<u> </u>	結れ	Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)					
0.4 —		<u> </u>	龍虎						
0.6 —			義院						
			結成						
0.8 —			杨亮						
1.0 —		<u> </u>	杨松						
1.2 —			编编						
	D		55						
1.4 —									
1.6 —		<u> </u>							
1.8 —		<u> </u>							
2.0 —									
2.2 –									
2.4 –		<u> </u>							
2.6 —				(2.6 m)					
2.0			V.	MEDIUM HARD ROCK TO HARD ROCK, CALCRETE BOULDERS WITH METABASALT Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, medium hard rock to					
2.8 —				hard rock, Calcrete boulders with metabasalt (2.8 m) Refused On: medium hard rock to hard rock calcrete boulders with metabasalt					
3.0 —									
3.2 —									
3.4 —									
3.6 —									
3.8 —									
4.0 —									
4.2 —									
4.4 —									
4.6 —									
4.8 —									
Ŧ.0									
	Frcav	ation M	ethod:	EXCAVATOR					
				to 2.6 m					
				2.8 m on medium hard rock to hard rock calcrete boulders with metabasalt					
			Table:						
		Tratel	Tuble.	Page 26 of 48					

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## Test Pit: TPMF02

Test				
				WSP Group
				MBSA High Speed Proving Ground - 7345
				2015/06/13
				28°10'29.1 "S, 21°29'13.4 "E
				Not specified
	1	Profi	led By:	Hannes Taljaard & Coert van Dyk
Depth (m)	Sampling	Ground Water	Symbol	Description
	0)		0,	VERY LOOSE TO LOOSE, SAND
0.2 -			5.5	Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
			结构	Transported (Aeolian)
0.4 -			8.5	
0.6 -				
0.8 -				
1.0				
1.0 -				
1.2 -				
1.4 -				
1.6 -				
			机机	
1.8 —			机抗	
2.0 -			101100	(2 m)
2.2 -			-	
2.4 -				
2.6 -			1	
2.8 -			-	
3.0 -			-	
3.2 -			-	
3.4				
			1	
3.6 -				
3.8 -				
4.0 -				
4.2 -				
4.4 -				
4.6 -			-	
4.8 -				
	Excava	ation M	lethod:	EXCAVATOR
				to 2 m
			inated:	
		Water	Table:	None
				Page 27 of 48

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#### Test Pit: TPMF03

Test I	PIC: I			
				WSP Group
		P	roject:	MBSA High Speed Proving Ground - 7345
				2015/06/13
				28°10'21.4 "S, 21°29'17.3 "E
				Not specified
		Profi	led By:	Hannes Taljaard & Coert van Dyk
				and the second sec
		ater		
(m)	ing	Ground Water		Description
Depth (m)	Sampling	uno	Symbol	
ð	Š	Ū	S	
				VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand
0.2 -			起说	Transported (Aeolian)
0.4 —			認認	
0.6 —			認定	
			藏麗	
0.8 —			義派	
1.0 —				(1.1 m)
1.2 —			V	MEDIUM HARD ROCK, CALCRETE AND METABASALT
				White and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete and metabasalt (1.4 m)
1.4 —				Refused On: medium hard rock calcrete and metabasalt
1.6 —				
1.8 —				
2.0				
2.0 -				
2.2 -				
2.4 —				
2.6 -				
2.8 -				
3.0 -				
3.2 -				
2.4				
3.4				
3.6 -				
3.8 —				
4.0				
4.2				
4.4 -				
4.6				
4.8 -				
	<b>F</b> actor			
				EXCAVATOR
	Ur			to 1.1 m 1.4 m on medium hard rock calcrete and metabasalt
			Table:	
		water	Table:	Page 28 of 48

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#### Test Pit: TPMF04

Test	PIC: I					
				WSP Group		
				MBSA High Speed Proving Ground - 7345		
				2015/06/13		
				28°10'11.0 "S, 21°29'13.3 "E		
				Not specified		
	-	Profi	led By:	Hannes Taljaard & Coert van Dyk		
		ater				
E)	ing	× P				
Depth (m)	Sampling	Ground Water	Symbol	Description		
Ğ	Sa	δ	Sy			
				VERY LOOSE TO LOOSE, SAND		
0.2 -				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)		
0.4 -						
0.6 -						
0.8 -						
1.0 -						
				(1.1 m) MEDIUM HARD ROCK, CALCRETE AND METABASALT		
1.2 -			<b>V</b> \$	White and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete and metabasalt		
1.4 -			V3	(1.4 m) Refused On: medium hard rock calcrete and metabasalt		
1.6						
1.8 –						
2.0 -						
2.2						
2.2-						
2.4 -						
2.6 -			-			
2.8						
2.0						
3.0 -						
3.2 -			-			
3.4						
3.4 -						
3.6 -						
3.8 -						
4.0						
4.0 -						
4.2 -						
4.4 -						
4.6 -						
4.8 -						
	Excava	ation N	lethod:	EXCAVATOR		
	Ur	nstable	Sides:	to 1.1 m		
				1.4 m on medium hard rock calcrete and metabasalt		
		Water	Table:	None		
				Page 29 of 48		



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Test F	Test Pit: TPOV01						
			Client:	WSP Group			
		Р	roject:	MBSA High Speed Proving Ground - 7345			
	I	Date Pi	rofiled:	2015/06/10			
		Coord	inates:	28°11'27.4 "S, 21°28'48.4 "E			
		Ele	vation:	Not specified			
				Hannes Taljaard & Coert van Dyk			
	_						
Depth (m)	Sampling	Ground Water	Symbol	LOOSE TO VERY LOOSE, SAND			
0.2 —				Slightly moist, brownish red, loose to very loose, intact, sand			
0.2 -			1	Transported (Aeolian) (0.1 m) SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT			
0.4 —			V S	Pale white with grevish green, moderately weathered to highly weathered, fine grained, soft rock to medium hard rock,			
0.6 —				Calcrete with metabasalt			
				(0.5 m) Refused On: soft rock to medium hard rock calcrete with metabasalt			
0.8 —							
1.0 —							
10							
1.2 —							
1.4 —							
1.6 —							
1.8 —							
2.0 —							
2.2 —							
2.4 —							
2.6 —							
2.8 —							
3.0 —							
3.2 —							
3.4 —							
3.6 —							
3.8 —							
4.0 —							
4.2 —							
4.4 —							
4.6 —							
4.8 —							
1.0							
	-						
				EXCAVATOR			
	Un		Sides:				
				0.5 m on soft rock to medium hard rock calcrete with metabasalt			
		vvater	Table:	None Page 30 of 48			

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lest	Pit: T	POV0	2	
			Client:	WSP Group
		Р	roject:	MBSA High Speed Proving Ground - 7345
	I	Date Pr	rofiled:	2015/06/11
		Coord	inates:	28°10'56.0 "S, 21°30'15.9 "E
		Ele	vation:	Not specified
		Profil	led By:	Hannes Taljaard & Coert van Dyk
Depth (m)	Sampling	Ground Water	Symbol	Description
0.2 — 0.4 —			和れたの	VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
0.6 — 0.8 —	D		結婚に応	
1.0 — 1.2 —				(1.3 m)
1.4 —				MEDIUM HARD ROCK TO HARD ROCK, QUARTZ IN A MATRIX OF VERY LOOSE TO LOOSE, SAND Dark grey and white, moderately weathered, fine grained, medium hard rock to hard rock, quartz in a matrix of slightly moist,
1.6 —				red brown, very loose to loose, sand Transported (1.4 m)
1.8 —			1	VERY SOFT ROCK TO SOFT ROCK, METABASALT
2.0 -				Greyish green, highly weathered, fine grained, thinly bedded, very soft rock to soft rock, Metabasalt
2.2 -	D		V	
2.4 — 2.6 —			1	
2.8 —			V 2	(2.8 m) Refused On: very soft rock to soft rock metabasalt
3.0 -				
3.2 —				
3.4 -				
3.6 —				
3.8 -				
4.0 -				
4.2 -				
4.4 -				
4.6				
4.8 —				
	Excava	ation M	lethod:	EXCAVATOR
	Ur	stable	Sides:	to 1.3 m
				2.8 m on very soft rock to soft rock metabasalt
		Water	Table:	None Page 31 of 48



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			Client	WSP Group
				MBSA High Speed Proving Ground - 7345
			-	2015/06/11
				28°10'57.7 "S, 21°30'16.7 "E
				Not specified
		Profil	lea By:	Hannes Taljaard & Coert van Dyk
		Ground Water		
E)	ling	≯ ₽	<u> </u>	bi
Depth (m)	Sampling	uno	Symbol	Description
ă	Š	Ū	Ś	ă la caracteria de la cara
				VERY LOOSE TO LOOSE, SAND
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
0.4				
0.6 —				
0.8 —				
1.0 —				
1.2 —				
1.4				
			机机	MEDIUM HARD ROCK, METABASALT WITH CALCRETE PEBBLES IN A MATRIX OF LOOSE, SAND Dark grey and white, moderately weathered, fine grained, medium hard rock, metabasalt with calcrete pebbles in a matrix of
1.6 —			机成	slightly moist, brownish red, loose, matrix supported, sand Transported
1.8 —				VERY SOFT ROCK TO SOFT ROCK, METABASALT (1.8 m)
2.0			, <b>*</b>	Greyish green, highly weathered, fine grained, thinly bedded, very soft rock to soft rock, Metabasalt
			V2	
2.2 –			V	
2.4 -			VX	
2.6				
				(2.9 m)
2.8 —			Va	(2.8 m) Refused On: very soft rock to soft rock metabasalt
3.0 -			-	
3.2 —				
3.2 -				
3.4 —			-	
3.6			-	
3.8 —				
4.0 -				
4.2				
4.4 -			1	
4.6 -				
4.8 —				
4.0 -				
	_			
				EXCAVATOR
	Un			to 1.4 m
				2.8 m on very soft rock to soft rock metabasalt
		Water	Table:	None Page 32 of 48



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	11. 1	POV0		WSP Group
				MBSA High Speed Proving Ground - 7345
				2015/06/11
		Coord	inates:	28°18'46.8 "S, 21°30'11.0 "E
				Not specified
				Hannes Taljaard & Coert van Dyk
		e		
Ê	D	Ground Water		ig a second s
Depth (m)	Sampling	pun	Symbol	Description
Dep	San	Gro	Syn	Des
			92692	VERY LOOSE TO LOOSE, SAND
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
				Transported (Aeolian)
0.4 –				
0.6 —	_			
0.8 —	D			
10				
1.0 -				
1.2 –				
1.4 —			3635	(1.4 m
1.6			V S	SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE AND METABASALT White greyish green, highly weathered, fine grained, thinly bedded, soft rock to medium hard rock, Calcrete and metabasalt
1.6 –			V	
1.8 —			V	
2.0 —				
2.2 –	D			
2.4 –			V S	
2.6 —			V.S	
2.8 —			V 2	
2.0 -			VS	
3.0 —				(3.1 n
3.2 -			-	Refused On: very soft rock to soft rock metabasalt
3.4 —				
3.6 —			-	
3.8 —				
4.0 —				
4.2 —				
4.4 —				
4.6 —				
4.8 —				
E				EXCAVATOR
	Ur			to 1.4 m
				3.1 m on very soft rock to soft rock metabasalt
		Water	Table:	None Page 33 of 48

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		POV0		WSP Group
				MBSA High Speed Proving Ground - 7345
	I	Date P	rofiled:	2015/06/11
		Coord	inates:	28°10'38.8 "S, 21°30'05.8 "E
		Ele	vation:	Not specified
		Profi	led By:	Hannes Taljaard & Coert van Dyk
Depth (m)	Sampling	Ground Water	Symbol	Description
				VERY LOOSE TO LOOSE, SAND
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
0.4 -			認能	
0.6 —			認定	
			花花	
0.8 —				
1.0 -			No.	(1 MEDIUM HARD ROCK, METABASALT WITH CALCRETE PEBBLES IN A MATRIX OF LOOSE, SAND (WITH PEBBLE
1.2 —			53	5MM SEE ROCK DESCRIPTION)
				Dark grey and white, moderately weathered, fine grained, medium hard rock, metabasalt with calcrete pebbles in a matrix of slightly moist, brownish red, loose, matrix supported, sand (with pebbles 5mm see rock description)
1.4 —				Transported (1.3) VERY SOFT ROCK TO SOFT ROCK, METABASALT
1.6 —			1	Greyish green, highly weathered, fine grained, thinly bedded, very soft rock to soft rock, Metabasalt
1.8 —			VS	
2.0 —			V	(2)
				Refused On: very soft rock to soft rock metabasalt
2.2 –				
2.4 —				
2.6 -				
2.8 —				
3.0 —				
3.2 –				
3.4 –				
3.6 -				
3.8 —				
4.0 -				
4.2 —				
4.4				
4.6 —				
4.8 —				
	Excava	ation M	lethod:	EXCAVATOR
	Ur	stable	Sides:	None
		R	efusal:	2 m on very soft rock to soft rock metabasalt
		Water	Table:	None



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Test	<u>- II. I</u>		Client:	WSP Group	
				MBSA High Speed Proving Ground - 7345	
				2015/06/11	A State of the
				28°10'10.6 "S, 21°29'59.0 "E	
				Not specified	
	-	Profi	led By:	Hannes Taljaard & Coert van Dyk	
Depth (m)	Sampling	Ground Water	Symbol	Description	
De	Sa	Ū	Sy	De	
$\begin{array}{c} 0.2 - \\ 0.4 - \\ 0.6 - \\ 0.8 - \\ 1.0 - \\ 1.2 - \\ 1.4 - \\ 1.6 - \\ 1.8 - \\ 2.0 - \\ 2.2 - \\ 2.4 - \\ 2.6 - \\ 2.8 - \\ 3.0 - \\ 3.2 - \\ 3.4 - \\ 3.6 - \\ 3.8 - \\ 4.0 - \\ 4.2 - \end{array}$				VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)	
4.4 -			机机		
4.6 -			机机		
4.8 -			机机		
					(5 m)
	Excove	ation M	lethod	EXCAVATOR	(5 11)
				to 0.5 m	
	Ur				
			inated:		
		water	Table:	None Page 35 of 48	



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		000		WSP Group	in Film
				MBSA High Speed Proving Ground - 7345	C. MAR
			-	2015/06/11	
					JAN P
				28°09'51.6 "S, 21°29'35.4 "E	- Ale
				Not specified	
		Profil	ed By:	Hannes Taljaard & Coert van Dyk	Sill
		ater			
ш ш	ing	d V	-	btio	
Depth (m)	Sampling	Ground Water	Symbol	Description	N Mil
Ğ	Sa	G	Sy	ă	Y Se
				VERY LOOSE TO LOOSE, SAND	
0.2 –				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)	
0.4 —					
0.4			경양		
0.6 —					
0.8 –					
			말할		
1.0 -			걸칠		
1.2 –					
1.4 -					
1.6 –					
1.8 –	D				
2.0 —					
2.0					
2.2 –					
2.4 –					
26					
2.6 –					
2.8 –					
3.0 -					
3.2 –					
3.4 –					(3.5 m)
3.6 —				MEDIUM HARD ROCK, CALCRETE WITH METABASALT	
				Cream with green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasalt Refused On: medium hard rock calcrete	(3.6 m)
3.8 —					
4.0 —					
4.2 —					
4.4 —					
4.6 —					
4.8 —					
4.0 -					
	_				
E				EXCAVATOR	
	Un			to 3.5 m	
				3.6 m on medium hard rock calcrete	
		Water	Table:	None Page 36 of 48	

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Testi	11. 1	POV0		WSP Group
				MBSA High Speed Proving Ground - 7345
	1		-	2015/06/11
		Coord	inates:	28°09'37.1 "S, 21°28'38.0 "E
		Ele	vation:	Not specified
		Profil	led By:	Hannes Taljaard & Coert van Dyk
		/ater		
(m)	oling	∧ pu		riptio
Depth (m)	Sampling	Ground Water	Symbol	Description
	0)	<u> </u>	Cettoret	VERY LOOSE TO LOOSE, SAND
0.2 —			品质	Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
0.4 —				Transported (Aeolian)
0.6 —				
0.8 —			起来	
1.0 -			和花	
1.2 —	_		4.4	
1.4 —	D			
1.6 —				
1.8 —				
2.0 —			机机	
2.2 –				
2.4 —				
2.6 —			166256	(2.5 m)
2.8 -				
3.0 —				
3.2 —				
3.4 —				
3.6 —				
3.8 —				
4.0 —				
4.2 —				
4.4 —				
4.6 —				
4.8 —				
E			lethod:	
	Un			to 2.5 m
			inated:	
		water	Table:	None Page 37 of 48

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		POV0			V.
				WSP Group	和
				MBSA High Speed Proving Ground - 7345	obbe
				2015/06/11 28°09'36.8 "S, 21°28'39.3 "E	ALL ALL
				Not specified	
				Hannes Taljaard & Coert van Dyk	1
	<b>I</b>		leu by.		
		<u> </u>			
	_	Ground Water		a la	
ш) Г	oling	> pu		- ipti	
Depth (m)	Sampling	Brou	Symbol	Description	
	0)		00		
			机机	VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand	
0.2 -			起流	Transported (Aeolian)	
0.4 -			机成		
0.6 –			杨林		
0.0			和范		
0.8 -			42,463		9 m)
1.0 -			V.S	MEDIUM HARD ROCK, CALCRETE WITH METABASALT White with green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasalt	
1.2 –			V		
1 4			VS		
1.4 –			VE		
1.6 -					
1.8 –			. 3	(1.8 Refused On: medium hard rock calcrete with metabasalt	8 m)
2.0					
2.2 –					
2.4 –					
2.6 -					
2.8 –					
3.0 -					
3.2 -					
. <i>.</i>					
3.4 –					
3.6 -					
3.8 –					
4.0 -					
4.2 -					
4.4 -					
4.6 -					
4.8 –					
		ation M			
	Uı			to 0.9 m	
				1.8 m on medium hard rock calcrete with metabasalt	
		water	Table:	None Page 38 of 48	

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		POV1		
				WSP Group
			-	MBSA High Speed Proving Ground - 7345
				2015/06/11
				28°09'31.7 "S, 21°29'15.5 "E
				Not specified
	-	Profil	ed By:	Hannes Taljaard & Coert van Dyk
		ater		
(E	bu	Ground Water	_	Description
Depth (m)	Sampling	unc	Symbol	scri
De	Sa	Ğ	Sy	D
				VERY LOOSE TO LOOSE, SAND
0.2 -				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)
0.4 -				
0.6 -			rus Pul Shingh Extern	(0.6 m) MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND
0.8 -			V	Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slightly moist, brownish red, very loose to loose, sand
				Transported (0.7 m)
1.0 -				SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE WITH METABASALT Cream with greyish green, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium
1.2 –			YE	hard rock, Calcrete with metabasalt
1.4 -			V	(1.4 m)
				Refused On: soft rock to medium hard rock calcrete
1.6 -				
1.8 –				
2.0 -				
2.0 -				
2.2 -				
2.4 -				
2.6 -				
2.8 –				
3.0 -				
3.2 –				
3.4 -				
3.6 -				
3.8 –				
4.0 -				
4.2				
+.2 -				
4.4 -				
4.6 -				
4.0				
4.8 -				
		ation M		
	Ur			to 0.6 m
				1.4 m on soft rock to medium hard rock calcrete
		Water	Table:	None Page 39 of 48

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lest	Test Pit: TPOV11									
			Client:	WSP Group						
		P	Project:	MBSA High Speed Proving Ground - 7345						
	I	Date Pi	rofiled:	2015/06/13						
		Coord	inates:	28°10'28.2 "S, 21°30'30.2 "E						
		Ele	vation:	Not specified						
		Profi	led By:	Hannes Taljaard & Coert van Dyk						
				The The second of the second o						
		ter								
Ê	b	Ground Water		Description						
Depth (m)	Sampling	pun	Symbol	çı i						
Dep	Sar	O G	Syr	D						
			93932	VERY LOOSE TO LOOSE, SAND						
0.2 -				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)						
0.4	_									
0.4 -	D									
0.6 —										
0.8 —			36.35	(0.8 m) MEDIUM HARD ROCK, CALCRETE WITH METABASALT						
1.0				White and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation metabasation and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation metabasation and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation metabasation and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation metabasation and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation metabasation and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasation and greyish green, highly weather the state of the green and greyish green and green an						
1.0 -				Refused On: medium hard rock calcrete and metabasalt						
1.2 —										
1.4 -			-							
1.6 —										
1.0 -										
1.8 —										
2.0 -			-							
2.2										
2.4 -										
2.6 —										
2.8										
3.0 -			-							
3.2 -			-							
3.4			-							
3.6 —										
3.8 -										
4.0 -										
4.2										
4.4										
4.6 -										
4.8										
4.0 -										
	Excavation Method: TLB									
				to 0.8 m						
	Un			0.9 m on medium hard rock calcrete and metabasalt						
			Table:							
				Page 40 of 48						

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Test Pr	IT: 11				
				: WSP Group	
				: MBSA High Speed Proving Ground - 7345	
Elevation				2015/06/13	*
				: 28°13'13.9 "S, 21°30'05.5 "E	4
				Not specified	1
		Profil	ed By:	Hannes Taljaard & Coert van Dyk	
					-
		iter			1
Ê	βL	Na		tion of the second s	-
Depth (m)	Sampling	Ground Water	Symbol	Description	
Del	Sar	gr	Syr	Ö	1
			1000	VERY LOOSE TO LOOSE, SAND	
0.2 —				Slightly moist, brownish red, very loose to loose, pinholed with roots, sand Transported (Aeolian)	
0.4 -	D				
0.6 —					
0.8			3625		m)
			机机	MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND Pale white, slightly weathered to moderately weathered, fine grained, medium hard rock, quartz pebbles in a matrix of slight	ntly
1.0 —			起派	moist, brownish red, very loose to loose, intact, sand	,
1.2 —			起流	Transported (1.3	(m)
1.4 —			VE	MEDIUM HARD ROCK, CALCRETE AND METABASALT	
				White with greenish grey, highly weathered, fine grained to medium grained, medium hard rock, Calcrete and metabasalt	
1.6 —			1	(1.7	m)
1.8				Refused On: medium hard rock calcrete and metabasalt	
2.0 —					
2.0					
2.2					
2.4 —					
2.6					
2.8 —					
3.0					
3.2 —					
3.4 —					
3.6 —					
3.8 —					
4.0					
4.2					
4.2 —					
4.4					
4.6 —					
4.8 —					
Ex	xcava	ation M	ethod:	TLB	
	Un	stable	Sides:	to 0.8 m	
				1.7 m on medium hard rock calcrete and metabasalt	
				None	



				WSP Group					
-				MBSA High Speed Proving Ground - 7345					
				2015/06/13					
				28°12'58.0 "S, 21°29'31.7 "E					
				Not specified					
		Profi	led By:	Hannes Taljaard & Coert van Dyk					
		Ground Water		c c					
Ē	ing	≥ P	_	ptio					
Depth (m)	Sampling	uno.	Symbol	Description					
ă	Š	Ū	S	å					
				VERY LOOSE TO LOOSE, SAND Slightly moist, brownish red, very loose to loose, pinholed with roots, sand					
0.2 -	-			Transported (Aeolian)					
0.4 -	-								
0.6			電影						
	D		机机						
0.8 -									
1.0 -	-		机机						
1.2 -			机机						
			机动机	(1.4 m)					
1.4 -			2011-201 2011-2014 2015-2025	QUARTZ PEBBLES IN A MATRIX OF VERY LOOSE TO LOOSE, SAND					
1.6 -				Pale white, slightly weathered to moderately weathered, fine grained to medium grained, quartz pebbles in a matrix of slightly moist, brownish red, very loose to loose, sand					
1.8 –			~~~~	Transported (1.7 m)					
				SOFT ROCK TO MEDIUM HARD ROCK, METABASALT Dark grey, moderately weathered to highly weathered, fine grained to medium grained, soft rock to medium hard rock,					
2.0 -				Metabasalt (2 m)					
2.2 -				Refused On: soft rock to medium hard rock metabasalt					
2.4 -			-						
2.6 -									
2.0 -									
2.8 –									
3.0 -			-						
3.2 -									
3.4 –			-						
3.6 -									
3.8 -			_						
4.0 -									
4.2 -									
4.4 -									
4.6 -			1						
4.8 -									
	Excava	ation N	lethod:	TLB					
	Ur	nstable	Sides:	to 1.4 m					
				2 m on soft rock to medium hard rock metabasalt					
		Water	Table:						
				Page 42 of 48					

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14       Image: Control of	1631	Pit: I			WSD Crown	
Due Profiles         201508/13         201508/12         201300.6 ° 5, 21'3042.8 °E         Due Profiles         201300.6 °, 7, 21'30.8 °E         201300.6 °, 7, 21'30.8						Contractor
Vertice         22/130.0 5 ''S, 21'30'42.0 'E'         Wot specified         Image: Specifie						The Present of
Eventue:         Not specified         Hannes Talgard & Coet van Dyk           0						and Street
United and the set of th						A A MACK
Image: Second state in the second state is						A CONTRACT
Algo of the second se		1				-6 A mail !!
Algo of the second se			5			and the second
Algo of the second se	<u> </u>	-	Vate		5	AN A BRIDGE STATE
Algo of the second se	h (n	pling	/ pu			. 1/
Algo of the second se	Dept	Sam	Grot	) Sym		A Provide State
02       Signify moist, brownish red, losse, pinholed with roots, sand         03       1         04       1         05       1         06       1         07       1         10       1         11       1         12       1         14       1         16       1         17       1         18       1         19       1         10       1         11       1         12       1         14       1         15       1         16       1         17       1         18       1         19       1         10       1         11       1         12       1         13       1         14       1         15       1         16       1         17       1         18       1         19       1         10       1         11       1         12       1         13				C.H.C.H		
1       1	02-				Slightly moist, brownish red, loose, pinholed with roots, sand	
0       0					Transported (Aeolian)	
0       0	0.4 -			5.5		
10       Image: Constraint of the section of the sectin of the section of the section of the section	0.6 -			<u>場</u> 為		
10       Image: Constraint of the section of the sectin of the section of the section of the section	0.8 -					
No.       MEDIUM HARD ROCK, CALCRETE Cream and while, highly weathered, fine grained to medium grained, medium hard rock, Calcrete         14 <td></td> <td></td> <td></td> <td></td> <td></td> <td>(1 m)</td>						(1 m)
12       13         14       14         16       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         19       14         12       14         14       14         15       14         16       14         17       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14         18       14	1.0 -			V	MEDIUM HARD ROCK, CALCRETE	(111)
14       Image: Control of	1.2 –					(1.3 m)
1.8	1.4 -				Terminated: medium hard rock calcrete	
1.8	16-					
20						
22	1.8 –			-		
24	2.0 -			-		
24	22-					
2.6						
2.8	2.4 –					
3.0          3.2          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          3.4          4.0          4.1          4.2          4.3          4.4          4.5          4.6          4.7          4.8          1       I         bitstable Sides       to 1m         1.3m - medium hard rock calcrete         Noe	2.6 -					
32       32         34       36         36       38         40       48         42       49         44       49         45       49         46       49         47       49         48       49         49       49	2.8 -			-		
32       32         34       36         36       38         40       48         42       49         44       49         45       49         46       49         47       49         48       49         49       49	2.0					
3.4          3.6          3.8          4.0          4.2          4.4          4.5          4.6          4.8          Unstable Sides       TLB         Unstable Sides       1.3 m - medium hard rock calcrete         Nore       Nore						
3.6       3.8         3.8       4.0         4.0       4.1         4.2       4.1         4.4       4.1         4.6       4.1         4.8       5.1         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5.2         5.2       5	3.2 –					
38 38   4.0   4.2   4.4   4.6   4.8   4.6   4.8   1    1   1	3.4 -			-		
4.0   4.2   4.4   4.6   4.8   4.8   1   1   1   1   1.3 m - medium hard rock calcrete   Water Table   None	3.6 -			-		
4.0   4.2   4.4   4.6   4.8   4.8   1   1   1   1   1.3 m - medium hard rock calcrete   Water Table   None	2.0					
42   4.4   4.6   4.8   4.8   4.8   4.8   1   <	3.0 -					
4.4 -   4.6 -   4.8 -   4.8 - </td <td>4.0 -</td> <td></td> <td></td> <td></td> <td></td> <td></td>	4.0 -					
4.6 4.8   4.8 4.8 <b>Excavation Method Excavation Method Unstable Sides</b> to 1 m   Terminated   1.3 m - medium hard rock calcrete   Water Table   None	4.2 -					
4.6 4.8   4.8 4.8 <b>Excavation Method Excavation Method Unstable Sides</b> to 1 m   Terminated   1.3 m - medium hard rock calcrete   Water Table   None	44-					
4.8 Image: Second						
Excavation Method:   Unstable Sides:   to 1 m   Terminated:   None	4.6 -			1		
Unstable Sides:       to 1 m         Terminated:       1.3 m - medium hard rock calcrete         Water Table:       None	4.8 -					
Unstable Sides:       to 1 m         Terminated:       1.3 m - medium hard rock calcrete         Water Table:       None						
Terminated: 1.3 m - medium hard rock calcrete Water Table: None						
Water Table: None		Ur	nstable	Sides:	: to 1 m	
Page 43 of 48			Water	Table:		

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Soft ROCK TO MEDIUM HARD ROCK, CALCRETE (1.1) Soft ROCK TO MEDIUM HARD ROCK, CALCRETE (1.1) Soft ROCK to medium hard rock calcrete (1.1) Soft ROCK to medium	Test	Pit: I			
Date Profiles         2015/081/5         Coordinate:         2015/081/281.67/5           Elevation         Nappendix         2012/28.57,211/3954.71/5         Image: Coordinate:         Image: Coordinate: <th></th> <th></th> <th></th> <th></th> <th></th>					
Conclusion:       2217228 5%, 21*3054.7%         Elevation:       Not apacified         Pollied by       Hunnes Tajaard & Coert van Dyk         Image: Section of the sect					
Everytion       Not specified         refined by:       Hannes Talgard & Cost van Dyk.         refined by:       refined by:         refined by: <t< td=""><td></td><td></td><td></td><td></td><td>Share and a start of the start</td></t<>					Share and a start of the start
Freited By:         Hannes Talgard & Coet van Dyk           0					
Image: Second					
22       A       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       A         12       A       A         14       A       B         15       B       B         16       A       B         17       Cream and white, highty weathered, fine grained to medium rained, soft rock to medium hard rock, Calcrete       (1.1)         16       A       B       B       B         18       B       B       B       B       B         18       B       B       B       B       B         19       B       B       B       B       B       B         14       B			Profi	led By:	Hannes Taljaard & Coert van Dyk
22       A       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       A         12       A       A         14       A       B         15       B       B         16       A       B         17       Cream and white, highty weathered, fine grained to medium rained, soft rock to medium hard rock, Calcrete       (1.1)         16       A       B       B       B         18       B       B       B       B       B         18       B       B       B       B       B         19       B       B       B       B       B       B         14       B			.		
22       A       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       A         12       A       A         14       A       B         15       B       B         16       A       B         17       Cream and white, highty weathered, fine grained to medium rained, soft rock to medium hard rock, Calcrete       (1.1)         16       A       B       B       B         18       B       B       B       B       B         18       B       B       B       B       B         19       B       B       B       B       B       B         14       B			ater/		
22       A       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       A         12       A       A         14       A       B         15       B       B         16       A       B         17       Cream and white, highty weathered, fine grained to medium rained, soft rock to medium hard rock, Calcrete       (1.1)         16       A       B       B       B         18       B       B       B       B       B         18       B       B       B       B       B         19       B       B       B       B       B       B         14       B	(m)	ling	≥   2		bition in the second
22       A       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       Sightly most, brownish red, loose, pinholed with roots, sand         10       A       A         12       A       A         14       A       B         15       B       B         16       A       B         17       Cream and white, highty weathered, fine grained to medium rained, soft rock to medium hard rock, Calcrete       (1.1)         16       A       B       B       B         18       B       B       B       B       B         18       B       B       B       B       B         19       B       B       B       B       B       B         14       B	epth	amp	uno	/mp	
22       Signify mais, brownish red, loose, pinholed with roots, sand         10       Signify mais, brownish red, loose, pinholed with roots, sand         10       Signify mais, brownish red, loose, pinholed with roots, sand         10       Signify mais, brownish red, loose, pinholed with roots, sand         11       Signify mais, brownish red, loose, pinholed with roots, sand         12       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         14       Signify mais, brownish red, loose, pinholed with roots, sand         16       Signify mais, brownish red, loose, pinholed with roots, sand         22       Signify mais, brownish red, loose, pinholed with roots, sand         23       Signify mais, brownish red, loose, pinholed with roots, sand         24       Signify mais, brownish red, loose, pinholed with roots, sand         24       Signify mais, brownish red, loose, pinholed with roots, sand         24       Signify mais, brownish red, loose, loose, loose, loose, loose, loose, loose,	Ď	Š	Ū	S	the second s
10       Image: Constraint of the second of th				影影	LOOSE, SAND
00       00 <td< td=""><td>0.2 —</td><td>-</td><td><u> </u></td><td></td><td>Transported (Aeolian)</td></td<>	0.2 —	-	<u> </u>		Transported (Aeolian)
Sof POCK TO MEDIUM HARD POCK, CALCRETE (1) Cream and while, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete (1) Terminated: soft rock to medium hard rock calcrete Cream and while, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete (1) Terminated: soft rock to medium hard rock calcrete Cream and while, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete (1) Terminated: soft rock to medium hard rock calcrete Terminated: soft rock to medium hard rock calcrete Terminated: 11 m - soft rock to medium hard rock calcrete Water Tabe: None	0.4 —				
0       SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE       (1.1)         12       Cream and while, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete       (1.1)         14       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       (1.1)         14       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       (1.1)         14       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       (1.1)         24       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete         24       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete         24       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete         24       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete         25       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete       Image: Soft Rock to medium hard rock calcrete         26       Image: Soft Rock to medium hard rock calcrete       Imag	0.0	D			
10         SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE         (1)           12         Crean and white, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete         (1)           14	0.6 –				
Soft ROCK TO MEDIUM HARD ROCK, CALCRETE (1.1) Soft ROCK TO MEDIUM HARD ROCK, CALCRETE (1.1) Soft ROCK to medium hard rock calcrete (1.1) Soft ROCK to medium	0.8 —				
Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK, CALCHE TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK Calche TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK Calche TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK Calche TE       (11)         Image: Sol F ROCK TO MEDIUM HARD POCK Calche TE       (11)         Image: Sol F ROCK TO MEDIUM       (11)         Image	1.0 -			202	(1 m)
14       16         16       1         18       1         20       1         21       1         22       1         24       1         25       1         26       1         27       1         28       1         29       1         20       1         21       1         22       1         24       1         25       1         26       1         27       1         28       1         29       1         20       1         21       1         22       1         23       1         24       1         25       1         26       1         27       1         28       1         29       1         29       1         20       1         21       1         22       1         24       1         25       1         26 <t< td=""><td></td><td></td><td></td><td></td><td>SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE Cream and white, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete (1.1 m)</td></t<>					SOFT ROCK TO MEDIUM HARD ROCK, CALCRETE Cream and white, highly weathered, fine grained to medium grained, soft rock to medium hard rock, Calcrete (1.1 m)
10       10         18       10         20       10         21       10         22       10         24       10         25       10         26       10         27       10         28       10         29       10         20       10         24       10         25       10         26       10         27       10         28       10         29       10         20       10         21       10         22       10         24       10         25       10         26       10         27       10         28       10         29       10         20       10         21       10         24       10         25       10         26       10         27       10         28       10         29       10         20       10         20       10	1.2 –				Terminated: soft rock to medium hard rock calcrete
18       -	1.4 —				
18       -	16-				
20       1         22       1         24       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         26       1         27       1         28       1         29       1         20       1         20       1         21       1         22       1         24       1         24       1         24       1         24       1         24       1         24       1         24       1         24       1         25       1         26       1         27       1         28 <td< td=""><td></td><td></td><td></td><td></td><td></td></td<>					
22 24 24 26 28 30 30 32 34 40 42 44 46 48 40 42 44 46 48 40 40 42 44 46 48 40 40 40 40 40 40 40 40 40 40	1.8 —				
24 26 28 30 32 34 40 42 44 40 42 44 46 40 42 44 46 40 42 44 46 48 40 42 44 46 48 40 42 44 48 40 42 44 48 48 40 42 44 48 48 48 48 48 48 48 48 48	2.0 —				
24 26 28 30 32 34 40 42 44 40 42 44 46 40 42 44 46 40 42 44 46 48 40 42 44 46 48 40 42 44 48 40 42 44 48 48 40 42 44 48 48 48 48 48 48 48 48 48	22-				
26       -         28       -         30       -         32       -         34       -         36       -         38       -         40       -         42       -         44       -         45       -         10       -         11       -         12       -         13       -         14       -         14       -         14       -         15       -         10       -         11       -         11       -         12       -         12       -         13       -         14       -         15       -         16       -         17       -         18       -         19       -         11       -         12       -         13       -         14       -         15       -         16       -         17 <td< td=""><td></td><td></td><td></td><td></td><td></td></td<>					
2.8	2.4 –				
3.0          3.2          3.4          3.4          3.6          3.8          4.0          4.2          4.4          4.5          4.6          4.8          4.4          4.5          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          5.7          5.8          6.1          7.2          7.2          7.2          8	2.6 —				
3.0          3.2          3.4          3.4          3.6          3.8          4.0          4.2          4.4          4.5          4.6          4.8          4.4          4.5          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          4.6          5.7          5.8          6.1          7.2          7.2          7.2          8	2.8 -				
3.2					
3.4 3.8   3.8 3.8   4.0 4.2   4.2 4.4   4.6 4.8   4.8 4.8	3.0 -				
3.6 3.8   4.0 4.2   4.2 4.4   4.6 4.8   4.8 4.8 <b>Excavation Method</b> TLB   Unstable Sides to 1 m   to 1 m   Terminated 1.1 m - soft rock to medium hard rock calcrete   Water Table None	3.2 –				
3.6 3.8   4.0 4.2   4.2 4.4   4.6 4.8   4.8 4.8 <b>Excavation Method</b> TLB   Unstable Sides to 1 m   to 1 m   Terminated 1.1 m - soft rock to medium hard rock calcrete   Water Table None	34-				
3.8					
4.0   4.2   4.4   4.6   4.8   4.8   1    1 <t< td=""><td>3.6 —</td><td></td><td></td><td></td><td></td></t<>	3.6 —				
4.2   4.4   4.6   4.8   4.8   4.8   4.8   1	3.8 —				
4.2   4.4   4.6   4.8   4.8   4.8   4.8   1	40-				
4.4   4.6   4.8					
4.6   4.8   4.8 <b>Excavation Method:</b> TLB   Unstable Sides:   to 1 m   Terminated:   1.1 m - soft rock to medium hard rock calcrete   Water Table:   None	4.2 –				
4.8       Image: Constant of the second	4.4 —				
4.8       Image: Constant of the second	4.6				
Excavation Method:       TLB         Unstable Sides:       to 1 m         Terminated:       1.1 m - soft rock to medium hard rock calcrete         Water Table:       None					
Unstable Sides:       to 1 m         Terminated:       1.1 m - soft rock to medium hard rock calcrete         Water Table:       None	4.8 —				
Unstable Sides:       to 1 m         Terminated:       1.1 m - soft rock to medium hard rock calcrete         Water Table:       None					
Terminated: 1.1 m - soft rock to medium hard rock calcrete Water Table: None					
Water Table: None		Ur			
			Water	Table:	None Page 44 of 48

ARQ

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Test	PIC I	POV1		
				WSP Group
			-	MBSA High Speed Proving Ground - 7345
Date Profiled				
				28°12'01.0 "S, 21°30'44.3 "E
				Not specified
		Profi	led By:	Hannes Taljaard & Coert van Dyk
		er		
(m)	ling	Ground Water	0	Description
Depth (m)	Sampling	Grour	Symbol	Descr
				LOOSE, SAND Slightly moist, brownish red, loose, pinholed with roots, sand
0.2 -			1	Transported (Aeolian) (0.1 m)
0.4 — 0.6 —	D			MEDIUM HARD ROCK, CALCRETE WITH METABASALT White green and pinkish, moderately weathered to highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasalt
0.8 -			V	(0.8 m)
1.0 —				Terminated: medium hard rock calcrete with metabasalt
1.2 —				
1.4 —				
1.6 —				
1.8 —				
2.0 —				
2.2 -				
2.4 — 2.6 —				
2.8 -				
3.0 -				
3.2 –				
3.4 —				
3.6 —				
3.8 —				
4.0 —				
4.2 -				
4.4 4.6				
4.0 -				
	Excav	ation M	lethod:	TLB
	Ur	stable	Sides:	None
				0.8 m - medium hard rock calcrete with metabasalt
		water	Table:	None Page 45 of 48

ARQ

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Test	FIL. I			
				WSP Group
				MBSA High Speed Proving Ground - 7345
				2015/06/15
				28°12'34.3 "S, 21°29'18.4 "E
				Not specified
	-	Profi	led By:	Hannes Taljaard & Coert van Dyk
		Ground Water		
E)	ing	N N	_	btio
Depth (m)	Sampling	no	Symbol	Description
De	Sa	Ū	Sy	De
				LOOSE, SAND
0.2 -				Slightly moist, brownish red, loose, pinholed with roots, sand Transported (Aeolian)
0.4				
0.6 —				
0.8 -				
1.0				(1 m)
1.0 —			V	MEDIUM HARD ROCK, CALCRETE WITH METABASALT
1.2 —				White greyish green and pinkish, moderately weathered to highly weathered, fine grained to medium grained, medium hard rock, Calcrete with metabasalt
1.4 —				Notes: Boulders
10			Y S	
1.6 —			V.8	
1.8 —				(1.8 m) (1.8 m)
2.0 -			-	
2.2 -				
2.4 -			-	
2.6 -				
2.8 -				
3.0 -				
3.2				
3.4 —				
3.6 —				
3.8				
4.0 -				
4.2 -				
4.4				
4.6 —				
4.8 -			-	
	Excava	ation M	lethod:	TLB
				to 1 m
				1.8 m - medium hard rock calcrete with metabasalt
			Table:	
				Page 46 of 48



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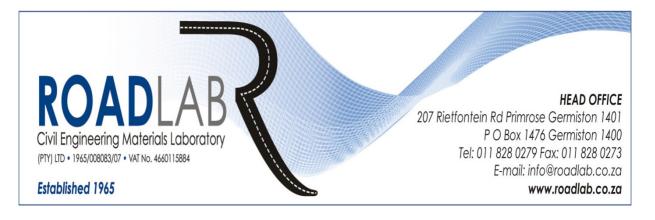
Test	Test Pit: TPOV18									
			Client:	WSP Group						
		Р	roject:	MBSA High Speed Proving Ground - 7345						
	I	Date Pr	ofiled:	2015/06/15						
		Coord	inates:	28°11'57.9 "S, 21°29' 1.9 "E						
		Elev	vation:	Not specified						
				Hannes Taljaard & Coert van Dyk						
		-	<b>-</b>							
(m)	ing	Ground Water		ption						
Depth (m)	Sampling	Groun	Symbol	LOOSE, GRAVELLY SAND						
				Slightly moist, brownish red, loose, pinholed, gravelly sand						
0.2 -	D		龍虎	Aeolian						
0.4 -	D		机机							
0.6 —			記記	(0.6 m)						
				MEDIUM HARD ROCK, QUARTZ PEBBLES IN A MATRIX OF LOOSE, SAND						
0.8 —				brownish red, loose, intact, sand						
1.0 -				(0.65 m)						
1.0 -				MEDIUM HARD ROCK, CALCRETE AND METABASALT White and grevish green, highly weathered, fine grained to medium grained, medium hard rock. Calcrete and metabasalt 7 m)						
1.2 –				White and greyish green, highly weathered, fine grained to medium grained, medium hard rock, Calcrete and metabasa(1.7 m) Refused On: medium hard rock calcrete and metabasalt						
1.4										
1.6 —										
1.8 —										
2.0 -										
2.2 –										
2.4 -										
2.6 -										
2.8 -										
3.0 -										
3.2 – 3.4 –										
3.6 -										
3.8 -										
4.0 -										
4.2 -										
4.4 —										
4.4 -										
4.8 -										
	Excava	ation M	ethod:	TLB						
				to 0.6 m						
				0.7 m on medium hard rock calcrete and metabasalt						
			Table:							
				Page 47 of 48						

ARQ

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Test	Test Pit: TPOV19								
			Client:	WSP Group					
		P	roject:	MBSA High Speed Proving Ground - 7345					
		Date Pi	rofiled:	2015/06/15					
		Coord	inates:	28°11'57.9 "S, 21°29' 1.9 "E					
		Ele	vation:	Not specified					
		Profi	led By:	Hannes Taljaard & Coert van Dyk					
		ter							
Ê	b	Va		tion					
Depth (m)	Sampling	Ground Water	Symbol	Description					
Dep	Sar	Gro	Syn						
			120122	LOOSE, GRAVELLY SAND					
0.2 -			545	Slightly moist, brownish red, loose, pinholed, gravelly sand					
			5.5	Aeolian					
0.4 -			545	(0.5 m)					
0.6 -		<u> </u>	V	VERY SOFT ROCK WITH MEDIUM HARD ROCK BOULDERS, CALCRETE AND METABASALT White and greyish green, highly weathered, fine grained to medium grained, very soft rock with medium hard rock boulders,					
0.8 -			v 3	Calcrete and metabasalt					
				Notes: Excavates as a gravel with a few boulders					
1.0 -		<u> </u>							
1.2 -	D	<u> </u>	× *						
1.4			1×3						
			V						
1.6 —		<u> </u>	V						
1.8 —				(4.0)					
2.0 -				(1.9 m) Refused On: very soft rock with medium hard rock boulders calcrete and metabasalt					
2.0									
2.2 -									
2.4 -									
2.6 -									
2.8 –									
3.0 -									
3.2 -									
5.2 -									
3.4 —									
3.6 -									
3.8									
0.0									
4.0 -									
4.2 -									
4.4									
4.6 -									
4.8 -									
	Excav	ation M	lethod:	TLB					
				to 0.5 m					
				1.9 m on very soft rock with medium hard rock boulders calcrete and metabasalt					
			Table:						
				Page 48 of 48					

# **APPENDIX C TEST PIT LABORATORY RESULTS**



91-0059-15

2015/07/23

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE 199 BRYANSTON DRIVE, BRYANSTON

#### ATTENTION: MR. E VAN ZYL

Dear Sir

#### **MBSA HIGH SPEED PROVING GROUND - SALTS & SULPHATES TEST RESULTS Test Report :**

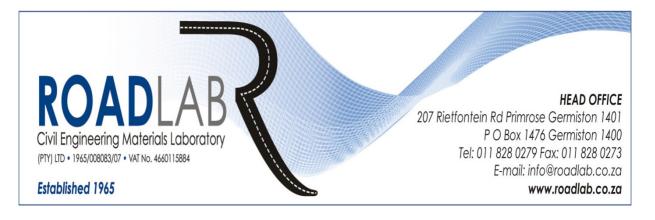
HOLE No. / Km.	TPOV8	TPOV7	TPOV11	TPOV15
LAYER TESTED	0-2500mm	0-350mm	0-800mm	0-1000mm
SAMPLE No.	U4285 (E3006)	U4284 (E3006)	U4290 (E3006)	U4293 (E3006)
DATE SAMPLED	2015/07/13	2015/07/13	2015/07/13	2015/07/13
DATE RECEIVED	2015/07/13	2015/07/13	2015/07/13	2015/07/13
CLIENTS MARKING	None	None	None	None
DESCRIPTION				
OF				
SAMPLE				

рН				
Conductivity (µS)				
Cl Content (%)				
Soluble Salts (%)	0.0787	0.1016	0.0729	0.1176
Soluble Sulphate (%)				
Acid Soluble Sulphate (SO <sub>3</sub> )				
Water Soluble Sulphate (SO <sub>3</sub> )				
Qualitative Sulphate				
CaO Content (%)				
Methylene Blue Adsorption				
Remarks	Not accredited tests	Not accredited tests	Not accredited tests	Not accredited tests

#### Remarks :

SANAS Accredited Laboratory No. T 0296 The samples were subjected to analysis according to SABS methods The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context

Compiled By Chanel van Biljon



91-0059-15

2015/07/23

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE 199 BRYANSTON DRIVE, BRYANSTON

#### ATTENTION: MR. E VAN ZYL

Dear Sir

#### Test Report : MBSA HIGH SPEED PROVING GROUND - SALTS & SULPHATES TEST RESULTS

HOLE No. / Km.	TPOV18		
LAYER TESTED	0-700mm		
SAMPLE No.	U4294 (E3006)		
DATE SAMPLED	2015/07/13		
DATE RECEIVED	2015/07/13		
CLIENTS MARKING	None		
DESCRIPTION			
OF			
SAMPLE			

рН			
Conductivity (µS)			
Cl Content (%)			
Soluble Salts (%)	0.1058		
Soluble Sulphate (%)			
Acid Soluble Sulphate (SO <sub>3</sub> )			
Water Soluble Sulphate (SO <sub>3</sub> )			
Qualitative Sulphate			
CaO Content (%)			
Methylene Blue Adsorption			
Remarks	Not accredited tests		

#### <u>Remarks :</u>

SANAS Accredited Laboratory No. T 0296 The samples were subjected to analysis according to SABS methods The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Compiled By Chanel van Biljon

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE WSP PARSONS BRINCKERHOFF

199 BRYANSTON DRIVE, BRYANSTON

SOIL/CBR,UCS

SAMPLE NO

MR. E VAN ZYL

DATE REPORTED :

2015/07/22

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

91-0059-15

			SAMPLE INFORMAT	ION & PROPERTIES		
	SAMPLE	No.	U4272 (E3006)	U4273 (E3006)	U4274 (E3006)	
CONTA	INER USED	FOR SAMPLING	Black Sampling Bags	Black Sampling Bags	Black Sampling Bags	
SIZ	E / WEIGHT	OF SAMPLE	±70kg's	±70kg's	±70kg's	
	IŚTURE CON		Clinkel Maint	Clipholes Mariat	Oli-Jahr Maiat	
5	SAMPLE ON A	ARRIVAL	Slightly Moist	Slightly Moist	Slightly Moist	
HOL	E No. / Km.	/ CHAINAGE	BD 01	BD 01	BD 01	
LAYER	TESTED / S	AMPLED FROM	0-1300mm	1300-2200mm	2200-2700mm	
	DATE SAM	IPLED	2015/06/10	2015/06/10	2015/06/10	
	DATE REC		2015/06/10	2015/06/10	2015/06/10	
	CLIENTS MA		None	None	None	
	DESCRIP	TION				
	OF					
	SAMPI	LE				
	(COLOUR &					
			DING ANALYSIS - % PASSING SIE	EVES (TMH1 1986 : METHOD A1 (		
		75.0	100	100	100	
SIEVE		63.0	100	100	100	
		53.0	100	80	93	
		37.5	100	70	93	
ANA -		26.5	100	59	93	
		19.0	100	45	91	
		13.2	100	35	85	
LYSIS		4.75	99	17	54	
(mm)		2.00	99	15	33	
(TMH A1a)		0.425	91	13	21	
		0.075	5.2	5	8	
		ATTERBERG L	MITS ANALYSIS (TMH1 1986 : M	1ETHOD A2 & A3 ; TMH1 1986, TI	MHA4 1974)	
ATTERBERG		LL%				
LIMITS		P.I.	NP	NP	SP	
(TMH A2&A3	)	LS%			0.7	
-	GM		10.48	2.67	2.38	
CLASSIFI -		H.R.B.*	A-2-4(0)	A-1-b(0)	A-1-b(0)	
CATION		COLTO*	G9	G1	G7	
CATION		T.R.H. 14*	G9	G1	G7	
	CALIFORN	IA BEARING RATIO (TMH1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (TM	H1 1986 : METHOD A7, A14) (II	rs A16T)
MOD AASHTO	1	OMC%	5.9	3.1	7.5	
(TMH A7)		MDD(KG/M <sup>3</sup> )	1375	2189	2214	
		COMP MC	5.9	3.1	7.4	
C.B.R.		% SWELL	5.02	0.02	0.03	
		100%	19	141	39	
U.C.S.		98%	15	121	38	
(TMH A13T)						
C.B.R.		97%	14	110	37	
		95%	10	90	36	
(TMH A8)		95% 93%	10 8	90 62	36 29	
		95% 93% 90%	10 8 5	90 62 19	36 29 19	
MOI	D ITS : DRY (I	95% 93% 90% «Pa) <b>(A16T)</b>	10 8 5 N/A	90 62 19 N/A	36 29 19 N/A	
MOI	D ITS : DRY (I OCTOR ITS :	95% 93% 90% «Pa) <b>(A16T)</b>	10 8 5	90 62 19	36 29 19	
MOI		95% 93% 90% «Pa) <b>(A16T)</b>	10 8 5 N/A	90 62 19 N/A	36 29 19 N/A	
MOI PR STABILISED		95% 93% 90% XPa) <b>(A16T)</b> DRY (kPa) IN LAB	10 8 5 N/A N/A	90 62 19 N/A N/A	36 29 19 N/A N/A	
MOI	OCTOR ITS :	95% 93% 90% RPa) <b>(A16T)</b> DRY (kPa) IN LAB ON SITE	10 8 5 N/A N/A Neat	90 62 19 N/A N/A N/A	36 29 19 N/A N/A N/A	
MOI PR STABILISED	OCTOR ITS :	95% 93% 90% (Pa) <b>(A16T)</b> DRY (kPa) IN LAB ON SITE (PE	10 8 5 N/A N/A N/A Neat CBR	90 62 19 N/A N/A Neat CBR	36 29 19 N/A N/A N/A Neat CBR	
MOI PR STABILISED	OCTOR ITS : TEST TY SAMPLE	95% 93% 90% DRY (kPa) IN LAB ON SITE OPE D BY	10 8 5 N/A N/A Neat CBR Roadlab	90 62 19 N/A N/A Neat CBR Roadlab	36 29 19 N/A N/A Neat CBR Roadlab	
MOI PR STABILISED WITH	TEST T SAMPLE DELIVERI	95% 93% 90% RPa) (A16T) DRY (kPa) IN LAB ON SITE PE ON SITE D BY 2D BY	10 8 5 N/A N/A Neat CBR Roadlab Roadlab	90 62 19 N/A N/A N/A Neat CBR Roadlab Roadlab	36 29 19 N/A N/A Neat CBR Roadlab Roadlab	
MOI PR STABILISED WITH SA	TEST TY SAMPLE DELIVERI MPLED ACCO	95% 93% 90% NPa) (A16T) DRY (kPa) IN LAB ON SITE PPE D BY SD BY SD DRY SDDING TO	10 8 5 N/A N/A Neat CBR Roadlab Roadlab Roadlab Clients Requirements	90 62 19 N/A N/A Neat CBR Roadlab Roadlab Clients Requirements	36 29 19 N/A N/A Keat CBR Roadlab Roadlab Clients Requirements	
MOI PR STABILISED WITH SA	TEST TY SAMPLE DELIVERI MPLED ACCO RONMENTA	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE VPE D BY D BY DRDING TO L CONDITION	10 8 5 N/A N/A Neat CBR Roadlab Roadlab	90 62 19 N/A N/A N/A Neat CBR Roadlab Roadlab	36 29 19 N/A N/A Neat CBR Roadlab Roadlab	
MOI PR STABILISED WITH SA ENVI	TEST TY SAMPLE DELIVERI MPLED ACCO RONMENTAI WHEN SAM	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE YPE D BY D BY DRDING TO L CONDITION APLED	10 8 5 N/A N/A Neat CBR Roadlab Roadlab Roadlab Clients Requirements	90 62 19 N/A N/A Neat CBR Roadlab Roadlab Clients Requirements	36 29 19 N/A N/A Keat CBR Roadlab Roadlab Clients Requirements	
MOI PR STABILISED WITH SA ENVI	TEST TY SAMPLE DELIVERI MPLED ACCO RONMENTA	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE YPE D BY D BY DRDING TO L CONDITION APLED	10 8 5 N/A N/A Neat CBR Roadlab Roadlab Roadlab Clients Requirements	90 62 19 N/A N/A Neat CBR Roadlab Roadlab Clients Requirements	36 29 19 N/A N/A Keat CBR Roadlab Roadlab Clients Requirements	
MOI PR STABILISED WITH SA ENVI	TEST TY SAMPLE DELIVERI MPLED ACCO RONMENTAI WHEN SAM	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE YPE D BY D BY DRDING TO L CONDITION APLED	10 8 5 N/A N/A Neat CBR Roadlab Roadlab Clients Requirements Sunny	90 62 19 N/A N/A CBR Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED :	36 29 19 N/A N/A Neat CBR Roadlab Roadlab Clients Requirements Sunny	
MOI PR STABILISED WITH SA SA ENVI TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:	TEST T SAMPLE DELIVERI MPLED ACCO RONMENTAI WHEN SAN REMARKS &	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE OB Y D BY DD BY DD BY DDDING TO L CONDITION APLED : NOTES	10 8 5 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None	90 62 19 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : DATE TESTED : WEATHER CONDITIONS:	36 29 19 N/A N/A CBR Roadlab Clients Requirements Sunny None	
MOI PR STABILISED WITH SA SA ENVI TESTED BY : ROAD / AREA TESTED : TRACK NO: TEST	DECTOR ITS : TEST T DELIVER MPLED ACCC RONMENTAI WHEN SAN REMARKS & DEPTH	95% 93% 90% RPa) (A16T) DRY (kPa) IN LAB ON SITE PE D BY D BY DRDING TO L CONDITION APLED NOTES FIELD DENSITY(kg/m3)	10 8 5 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None FIELD	90 62 19 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:	36 29 19 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None	
MOI PR STABILISED WITH SA SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	TEST T SAMPLE DELIVERI MPLED ACCO RONMENTAI WHEN SAN REMARKS &	95% 93% 90% kPa) (A16T) DRY (kPa) IN LAB ON SITE OB Y D BY DD BY DD BY DDDING TO L CONDITION APLED : NOTES	10 8 5 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None	90 62 19 N/A N/A Neat CBR Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : DATE TESTED : WEATHER CONDITIONS:	36 29 19 N/A N/A CBR Roadlab Clients Requirements Sunny None	

Accreditation No.: T0296

RL-S-150-01

CAMPLE INCODMATION & DRODEDTIES



HEAD OFFICE neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za





91-0059-15

DATE REPORTED :

2015/07/22

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za

				SAMPLE INFORMATI	ION & PROPERTIES		
	SAMPLE	. No		U4275 (E3006)			
CONTAL	NED LICED	FOR SAMPLING		Black Sampling Bags			
CONTAI	INER USED I	OF CAMPLE		Diack Sampling Dags			
SIZE	/ WEIGHT	OF SAMPLE		±70kg's			
		IDITION OF		Slightly Moist			
	AMPLE ON A			Slightly Molse			
HOLE	No. / Km.	/ CHAINAGE		BD 05			
				1100-2500mm			
EATER	DATE SAM	AMPLED FROM IPLED		2015/06/10			
	DATE REC	EIVED		2015/06/10			
(	CLIENTS MA			None			
	DESCRIP	TION					
	OF						
	SAMPI	LE					
	(COLOUR &	TYPE)					
	(00100110		CD 4	DING ANALYONG AT DAGOING OF			
					EVES (TMH1 1986 : METHOD A1 (	aj	
			5.0	100			
SIEVE		63	3.0	100			
		53	3.0	100			
			7.5				
ANA -			5.5	79 75			
ANA -							
			9.0	70			
		13	3.2	61			
LYSIS			75	39			
(mm)		2.	00	26			
(TMH A1a)		0.4	25	16			
(Initial)		0.0	75	6			
		0.0					
				IMITS ANALYSIS (TMH1 1986 : M	4ETHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG		LL	.%				
LIMITS		Р	.I.	SP			
(TMH A2&A3)		LS		0.7			
(IMITA2&A3)	CM	D.	70	2.54			
	GM		D.¥	2.34			
CLASSIFI -		H.R		A-1-b(0)			
CATION		COL	.TO*	G5			
CATION		T.R.F	l. 14*	G5			
	CALIFORN	IA REARING RA	FIO (TMH1 1986	· METHOD 47 48) / UNCONFINE	ED COMPRESSIVE STRENGTH (TM	H1 1986 · METHOD 47 414) (IT	S 416T)
	CALIFORN				ED COMI RESSIVE STRENGTII (TM	III 1700 . METHOD A7, AI4) (II	SAIOIJ
MOD AASHTO		UM	C%	5.5			
(TMH A7)		MDD(F		2153			
		COM	P MC	5.6			
C.B.R.		% SV	VELL	2.02			
			0%	96			
U.C.S.		98		80			
(TMH A13T)		97	706	80 73			
C.B.R.		95	70	57			
(TMH A8)		93		51			
		90	9%	43			
MOD	ITS : DRY (	kPa) (A16T)		N/A			
PRO	OCTOR ITS :	DRY (kPa)		N/A			
STABILISED		IN					
WITH		ON :	SITE	Neat			
	TEST T	YPE		CBR			
	SAMPLE			Roadlab			
	DELIVERI			Roadlab			
CAN	DELIVERI			Roadiad			
		ORDING TO		Clients Requirements			
ENVIR	ONMENTA	L CONDITION		Cummer			
	WHEN SAM	MPLED		Sunny			
F	REMARKS &	NOTES		None			
TESTED BY :					SAMPLING METHOD :		
ROAD / AREA TESTED :					TEST METHOD :		
LAYER TESTED :					DATE TESTED :		
TRACK NO:					WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO	TMH A7	
					2		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m*)	OMC(%)	
1	1						
1	1						
1	1						
1	1				AVERAGE CO	MPACTION:	
	I	l			AVENAUE CO		1
1							
				MOISTURE	CONTENT		
							1
SAMPLE NO	HOLE	LAY	YER	% MOISTURE	TIN	NO	
-	1	1					l

SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

MR. E VAN ZYL

OIL CBR,UCS

199 BRYANSTON DRIVE, E		N		4	WSP	PARSON: BRINCKE	S RHOFF	Accreditation No.: T0296
	RHOFF DEV			AND INFRASTRUCTURE, AFRICA	۱.			Sanas Introductory
# MOD SAMPLE TAKEN A	T THIS PO	INT/ PREVIOUS	LAYER TESTED I	FOR MOD				
SAMPLE NO	HOLE	LA	YER	MOISTURE % MOISTURE	CONTENT	TIN NO		
	11	1		1				1
					AUDDA	GE COMPACTION:		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )		OMC(%)	
TEST	DEPTH		SITY(kg/m3)	FIELD	AA	SHTO TMH A7		
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:			
]	REMARKS 8			None				
		L CONDITION		Sunny				
CAN	SAMPLE DELIVER			Roadlab Roadlab Clients Requirements				
WITH	TEST T	YPE	SITE	Neat CBR Baadlab				
STABILISED	00104113	IN	LAB					
	O ITS : DRY ( OCTOR ITS :	kPa) (A16T)	<i>970</i>	N/A N/A				
(TMH A8)		93	3% 3% 0%	59 37				
(TMH A13T) C.B.R.		91	7% 5%	85 73				
C.B.R. U.C.S.		10	WELL 0% 3%	0.02 104 92				
(TMH A7)		COM	KG/M3) IP MC	2259 7.9				
MOD AASHTO	CALIFORN	OM	1C%	5 : METHOD A7, A8) / UNCONFIN 8.0 2250	ED COMPRESSIVE STRENGT	н (ТМН1 1986 : М	1ETHOD A7, A14) (II	S A16T)
CATION	CALIFORM	T.R.I	H. 14*	G5 G5	ED COMPRESSIVE CERRY OF	U (TMU1 4007 - N	4ETHOD 47 444) (7	C A16T)
CLASSIFI -	GM	H.F	R.B.* LTO*	2.64 A-1-a(0)				
LIMITS (TMH A2&A3)		L	9.1. 5%	NP				
ATTERBERG			L%	LIMITS ANALYSIS (TMH1 1986 : 1	METHOD A2 & A3 ; TMH1 19	86, TMHA4 1974)		
(TMH A1a)		0.4	425 075			0.0		
LYSIS (mm)		2.	.75 .00	28 20				
		1	9.0 3.2	61 49				
ANA -		31	7.5 6.5	81 76				
SIEVE		6 5	3.0 3.0	92 92				
			<b>GR</b> /	ADING ANALYSIS - % PASSING SI 92	EVES (TMH1 1986 : METHOI	O A1 (a)		
	(COLOUR 8							
	DESCRIP OF SAMP							
	DATE REC CLIENTS M	ARKING		2015/06/10 None				
	TESTED / S DATE SAM	AMPLED FROM		1400-2900mm 2015/06/10				
	AMPLE ON E No. / Km.	ARRIVAL / CHAINAGE		Slightly Moist BD 06				
SIZE	E / WEIGHT	OF SAMPLE NDITION OF		±70kg's				
CONTA	SAMPLE	E No. FOR SAMPLING		U4276 (E3006) Black Sampling Bags				

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

91-0059-15

JOB NO:

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

2015/07/22

DATE REPORTED :

SAMPLE INFORMATION & PROPERTIES U4276 (E3006) Black Sampling Bags ±70kg's

Established 1965

HEAD OFFICE

neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za

RL-S-150-01





91-0059-15

DATE REPORTED : 2015/07/22

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



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		SAMPLE INFORMAT	ION & PROPERTIES		
SAMPLE		U4277 (E3006)			
CONTAINER USED I		Black Sampling Bags			
SIZE / WEIGHT	OF SAMPLE	±70kg's			
MOISTURE CON SAMPLE ON A	ARRIVAL	Slightly Moist			
HOLE No. / Km. /		BD 08			
LAYER TESTED / SA		800-3300mm			
DATE SAM DATE REC		2015/06/10			
CLIENTS MA		2015/06/10 None			
DESCRIP		None			
OF	lion				
SAMPI	Æ				
(COLOUR &					
	GR. 75.0	100	EVES (TMH1 1986 : METHOD A1 (	<u>a)</u>	1
SIEVE	63.0	100			
SILVL	53.0	100			
	37.5	73			
ANA -	26.5	66			
	19.0	59			
	13.2	49			
LYSIS	4.75	28			
(mm)	2.00	19			
(TMH A1a)	0.425	11			
. ,	0.075	5			
		LIMITS ANALYSIS (TMH1 1986 : 1	METHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG	LL%				
LIMITS	P.I.	SP			
(TMH A2&A3)	LS%	0.45			
GM	U.P.P.*	2.67			
CLASSIFI -	H.R.B.* COLTO*	A-1-a(0)			
CATION	T.R.H. 14*	G5 G5			
CALIEODN			ED COMPRESSIVE STRENGTH (TM	111 1006 - METHOD 47 414) (IT	C A1(T)
MOD AASHTO	OMC%	6.5	ED COMPRESSIVE STRENGTH (TM	IIII 1980 . METHOD A7, A14J (II	34101)
(TMH A7)	MDD(KG/M <sup>3</sup> )	2193			
(	COMP MC	6.6			
C.B.R.	% SWELL	0.06			
	100%	72			
U.C.S.	98%	67			
(TMH A13T)	97%	65			
C.B.R.	95%	60			
(TMH A8)	93%	51			
MOD ITC DDV	90%	38			
MOD ITS : DRY (I		N/A			
PROCTOR ITS :		N/A			
STABILISED	IN LAB				
WITH	ON SITE	Neat			
TEST TYPE		CBR Roadlab			
	SAMPLED BY				
	DELIVERED BY SAMPLED ACCORDING TO				
ENVIRONMENTAI		Clients Requirements			
ENVIRONMENTAL WHEN SAM		Sunny			
REMARKS & NOTES		None			
		1		I	l
TESTED BY :			SAMPLING METHOD :		
ROAD / AREA TESTED :			TEST METHOD :		
LAYER TESTED :			DATE TESTED :		
MILLIN I BUILD .			DITE IESTED.		

LAYER TESTED :					DATE TESTED :		
TRACK NO:					WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO	TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>2</sup> )	OMC(%)	
					AVERAGE CO	OMPACTION:	
					•		
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LA	YER	% MOISTURE	TIN	NO	
1							

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/22

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za

				SAMPLE INFORMATI	ION & PROPERTIES		
CONTAU	SAMPLE	No.		U4278 (E3006)			
SIZE	/ WEIGHT	FOR SAMPLING OF SAMPLE		Black Sampling Bags ±70kg's			
		OF SAMPLE					
	MPLE ON A			Slightly Moist			
HOLE	No. / Km.	/ CHAINAGE AMPLED FROM		BD 12 600-2100mm			
LAYER I	DATE SAM	AMPLED FROM		2015/06/10			
	DATE REC	EIVED		2015/06/10			
(	CLIENTS M			None			
	DESCRIP OF	TION					
	SAMP	LE					
		TYDE					
	(COLOUR 8	2 IYPEJ	GRA	DING ANALYSIS - % PASSING SIE	EVES (TMH1 1986 : METHOD A1 (	a)	
		7.	5.0	100			
SIEVE		63	3.0	89			
			3.0	74			
ANA -			7.5 6.5	70 64			
		19	9.0	60			
			3.2	55			
LYSIS (mm)		4.	75 00	40 30			
(TMH A1a)			425	21			
(11.11.11.1)		0.0	)75	7			
				IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG		LI	2% 1.I.	NP			
LIMITS (TMH A2&A3)		P LS	5%	NP			
(TMIT M2013)	GM			2.45			
CLASSIFI -		H.F	R.B.*	A-1-b(0)			
CATION		COL	10* 1. 14*	G5 G5			
	CALIFORN				ED COMPRESSIVE STRENGTH (TM	IH1 1986 : METHOD A7. A14) (IT	(S A16T)
MOD AASHTO		OM	IC%	6.5	(		
(TMH A7)		MDD(1	KG/M°)	2067			
C.B.R.		COM % SV	P MC WELL	6.6 0.02			
C.D.R.		10	0%	94			
U.C.S.		98	3%	80			
(TMH A13T) C.B.R.			7% 5%	74 60			
(TMH A8)			3%	53			
		90	0%	53 42			
MOD	ITS : DRY (	kPa) <b>(A16T)</b>		N/A			
STABILISED	CTOR ITS :	DRY (kPa)	LAB	N/A			
WITH			SITE	Neat			
VVIIII	TEST T		3111	CBR			
	SAMPLE	D BY		Roadlab			
CAM	DELIVER			Roadlab			
		DRDING TO L CONDITION		Clients Requirements			
	WHEN SAM			Sunny			
	EMARKS 8			None			
ľ	LEMAKKS &	NOTES		None			
TESTED BY :					SAMPLING METHOD :		
ROAD / AREA TESTED :					TEST METHOD :		
LAYER TESTED :					DATE TESTED :		
TRACK NO:					WEATHER CONDITIONS:		
TEST	DEPTH	EIELD DENG	SITY(kg/m3)	FIELD	AASHTO	TMU 47	
POSITION	TESTED		DRY DENSITY	MOISTURE(%)		1	
PUSITION	IESTED	WEI DENSITY	DRIDENSIIY	MOISTUKE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE CO	OMPACTION:	
				MOISTURE	CONTENT		

			MOISTORE	CONTENT	
SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

MR. E VAN ZYL

JOB NO:

OIL CBR,UCS

SAMPLE N		I		
CONTAINER USED FO		Black Sampling Bags		
SIZE / WEIGHT O		±70kg's		
MOISTURE COND	ITION OF	Clinhaha Madat		
SAMPLE ON AF	RIVAL	Slightly Moist		
HOLE No. / Km. /	CHAINAGE			
LAYER TESTED / SAI				
DATE SAMP		2015/06/10		
DATE RECEI		2015/06/10		
CLIENTS MAR		None		
DESCRIPTI	ON			
OF				
SAMPLE	1			
(COLOUR & T	'YPE)			
		<b>GRADING ANALYSIS - % PASSING</b>	SIEVES (TMH1 1986 : METHOD A1	(a)
	75.0			
SIEVE	63.0			
	53.0			

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

91-0059-15

DATE REPORTED : 2015/07/22

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

nrose.

SAMPLE INFORMATION & PROPERTIES

ROADLAB Civil Engineering Materials Laboratory PMID: 14500000001 VMINa 44001309	2
Established 1965	

HEAD OFFICE HEAD OFFICE 207 Rietlantein Rd Primrase Germiston 1401 P O Box 1476 Germiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roodiab.co.zo www.roodiab.co.zo

D.		000		2010/00/10			
DA	ATE RECE	IVED		2015/06/10			
CLI	ENTS MAP	RKING		None			
				None			
L		ON					
	SAMPLE						
(0)		3/00)					
ູເປ	JLUUK & I	IPEJ					
				GRADING ANALYSIS - % PASSING	SIEVES (TMH1 1986 : METHOD)	A1 (a)	
		71	E 0			()	
		7:	5.0				
SIEVE							
		53	3.0				
A.N.A.							
ANA -							
		13	32				
IVEIC							
(TMH A1a)		0.4	425				
e .,		0.0	075				
		010					
				RG LIMITS ANALYSIS (TMH1 1980	5 : METHOD A2 & A3 ; TMH1 198	5, TMHA4 1974)	
ATTERBERG		LI	.%				
		r	.1.				
(TMH A2&A3)		LS	S%				
	GM						
	u.i	HR	2 B *				
CLASSIFI -							
CATION							
CATION		T.R.F	H. 14*				
	CALIFORN	IA DEADING D	ATIO (TMUI 1	006 METHOD 47 40) / UNCON	TIMED COMPRESSIVE STRENGTH	(TMUI 1006 METHOD 47 414)	(ITC A16T)
	LALIFURN			966 : METHOD A7, A6J / UNCON	TINED COMPRESSIVE STRENGTH	(IMHI 1960: MEIHUD A7, A14)	(115 A101)
		OM	1C%				
(TMH A7)		MDD(I	KG/M <sup>3</sup> )				
(							
( P P							
C.B.R.							
		10	0%				
UCS							
C.B.R.		95	5%				
(TMH 48)		93	20/				
(1							
			J%				
MOD ITS	s : DRY (kł	'a) (A16T)		N/A			
PROCT	OR ITS · D	RY (kPa)		N/A			
	0111010						
STABILISED		IN	LAB				
WITH		ON	SITE	Neat			
	TECT TW		0111				
	1631 111	Ъ.					
1	SAMPLED	ВХ		Roadlab			
D	ELIVERED	) BY		Roadlab			
				Clients Requirements			
DESCRIPTION GLUE         CRADING ANALYSIS - % PASSING SIEVES (TMHI 1986: METHOD AT (a)           SIEVE         GRADING ANALYSIS - % PASSING SIEVES (TMHI 1986: METHOD AT (a)           SIEVE         GRADING ANALYSIS - % PASSING SIEVES (TMHI 1986: METHOD AT (a)           ANA -         26.5           ANA -         26.5           13.2							
ENVIRON	MENTAL	CONDITION		C			
W	ΗΕΝ SAME	PLED		Sunny			
SAMPLE           CRADING ANALYSIS -% PASSING SIEVES (TMH1 1986: METHOD A1 (a)           CRADING ANALYSIS -% PASSING SIEVES (TMH1 1986: METHOD A1 (a)           SIEVE         63.0							
DEN	AARKS & N	IOTES		None			
KLN	initia di l	IOIL5		None			
2-							
TESTED BY :					SAMPLING METHOD :		
DOAD / ADEA TECTED					TECT METHOD		
RUAD / AREA TESTED :					TEST METHOD:		
LAVER TESTED ·					DATE TESTED .		
TRACK NO:					WEATHER CONDITIONS:		
	D D D D D D			BIBL D		TO THUL 15	
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASH	ГО ТМН А7	*RELATIVE
POSITION	TESTED	WET DENSITY	DRV DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	COMPACTION(%)
FUSITION	LESTED	WEI DENSIIY	DUI DENSII I	MOISTURE(%)	MDD(Kg/m )	0///0/	COMPACTION(%)
		1					
		1					
		1					

MOISTURE CONTENT										
SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO						

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



AVERAGE COMPACTION:



Accreditation No.: T0296

RL-S-150-01

91-0059-15

#### DATE REPORTED :

2015/07/07

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

					ION & DRODERTIES		
	SAMPLE	No		SAMPLE INFORMAT U4290 (E3006)	ION & PROPERTIES		
CONTAL		FOR SAMPLING		Black Sampling Bags			
SIZE	SIZE / WEIGHT OF SAMPLE			±70kg's			
	MOISTURE CONDITION OF			Slightly Moist			
SAMPLE ON ARRIVAL HOLE No. / Km. / CHAINAGE			TP-0V 11				
LAYER 1	LAYER TESTED / SAMPLED FROM						
	DATE SAN	IPLED		0-800mm 2015/06/17			
	DATE REC	EIVED		2015/06/17			
(	DESCRIP			None			
	OESCRIF						
	SAMP			Light Reddish Orange			
		(TVDF)		Sand			
	(COLOUR 8	a TYPEJ	CDA	DINC ANALVEIS 0/ DASSING SH	EVEC (TMUL 1006 - METHOD AL	(a)	
		70	<b>GRA</b>	DING ANALYSIS - % PASSING SIE 100	EVES (IMH1 1986 : METHOD AT	<u>(a)</u>	
SIEVE		63	3.0	100			
		53	3.0	100			
			7.5	100			
ANA -			5.5 9.0	100 100			
			3.2	100			
LYSIS		4.	75	99			
(mm)			00	98			
(TMH A1a)			125 )75	94			
		0.0		/ IMITS ANALYSIS (TMH1 1986 : N	/ ///////////////////////////////////	MHA4 1974)	
ATTERBERG		LI	ATTERDERG L	1900 : N	11100 A2 & A3 ; 1MILL 1900, 1		
LIMITS		P	.I.	NP			
(TMH A2&A3)			5%				
	GM	H.R	D*	1.01			
CLASSIFI -				G9			
CATION			I. 14*	G9			
	CALIFORN	IA BEARING RA	TIO (TMH1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTO		OM		7.9			
(TMH A7)		MDD(H		1711			
C.B.R.			P MC VELL	7.6 2.02			
C.B.K.			0%	22			
U.C.S.			3%	17			
(TMH A13T)			7%	14			
C.B.R.			5%	10			
(TMH A8)			3% 0%	7			
MOD	ITS : DRY (	kPa) (A16T)	770	Ń/A			
	OCTOR ITS			N/A			
STABILISED		IN	LAB	· · ·			
WITH		ON 3	SITE	Neat			
	TEST T	YPE					
	SAMPLE			Roadlab Roadlab			
SAM		ORDING TO		Clients Requirements			
		L CONDITION					
	WHEN SAI			Sunny			
	REMARKS 8			None			
Ч	LIMAKKS 8	E NOTES		Nolle			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS		FIELD		D TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE (	OMPACTION:	
		l.	1				
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	T AT	YER	% MOISTURE		N NO	
JAM'LE NU	HULE	LA		/0 MOISTORE	11		

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

	SAMPLE	No		SAMPLE INFORMAT U4281 (E3006)	U4281 (E3006)		
CONT		FOR SAMPLING		Black Sampling Bags	Plack Sampling Page		
SI7	F / WFIGHT	OF SAMPLING		±70kg's	Black Sampling Bags ±70kg's		
M	E / WEIGHT	DITION OF					
	SAMPLE ON A	ARRIVAL		Slightly Moist	Slightly Moist		
НО	LE No. / Km. /	/ CHAINAGE		TP-0V 12	TP-OV 12		
		AMPLED FROM		0-800mm	1400-2800mm		
				2015/06/17	2015/06/17		
	DATE REC			2015/06/17	2015/06/17		
	CLIENTS MA	ARKING		None	None		
	DESCRIP OF	TION			Light Reddish Brown		
	SAMPI	F		Light Red	Sand with Calcrete &		
	SAMIFI	56		Sand	Quartz		
	(COLOUR &	: TYPE)			-		
					EVES (TMH1 1986 : METHOD A1 (	a)	·
		75.0		100	100		
SIEVE		63.0		100	100		
		53.0	)	100	100		
A.N.A.		37.5		100	66		
ANA -		26.5 19.0	) )	100 100	62 53		
		19.0		100	45		
LYSIS		4.75		99	29		
(mm)		2.00	)	98	26		
(TMH A1a)		0.425	5	84	24		
(		0.075	5	9	4		
				IMITS ANALYSIS (TMH1 1986 : 1	METHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG		LL%					
LIMITS	-	P.I.		NP	NP		
(TMH A2&A3		LS%	)	1.00	2.40		
	GM	H.R.B	*	1.09	2.48		
CLASSIFI -		COLTO		G7	G5		
CATION		T.R.H. 1	14*	G7	G5		
	CALIFORN				ED COMPRESSIVE STRENGTH (TM	1H1 1986 · METHOD A7, A14) (	(ITS A16T)
MOD AASHTO		OMC		6.5	7.3		()
(TMH A7)	-	MDD(KG	/M2)	1880	2152		
		COMP	MC	6.6	7.4		
C.B.R.		COMP   % SWE	MC	6.6 0.02	7.4 0.02		
C.B.R.		COMP 1 % SWE 1009	MC ELL %	6.6 0.02 32	7.4 0.02 116		
C.B.R. U.C.S.		COMP 1 % SWE 100% 98%	MC ELL %	6.6 0.02 32 26	7.4 0.02 116 95		
C.B.R. U.C.S. (TMH A13T)	)	COMP 1 % SWE 100% 98% 97%	MC ELL %	6.6 0.02 32 26 23	7.4 0.02 116 95 85		
C.B.R. U.C.S. (TMH A13T) C.B.R.	)	COMP 1 % SWE 100% 98% 97% 95%	MC ELL %	6.6 0.02 32 26 23 18	$7.4 \\ 0.02 \\ 116 \\ 95 \\ 85 \\ 64$		
C.B.R. U.C.S. (TMH A13T)	)	COMP 1 % SWE 100% 98% 97% 95% 93%	MC GLL %	6.6 0.02 32 26 23 18 15	$7.4 \\ 0.02 \\ 116 \\ 95 \\ 85 \\ 64 \\ 54$		
C.B.R. U.C.S. (TMH A13T] C.B.R. (TMH A8)		COMP 1 % SWE 1009 98% 97% 95% 95% 93% 93%	MC GLL %	$\begin{array}{c} 6.6 \\ 0.02 \\ 32 \\ 26 \\ 23 \\ 18 \\ 15 \\ 9 \end{array}$	$7.4 \\ 0.02 \\ 116 \\ 95 \\ 85 \\ 64 \\ 54 \\ 39 \\ 95 \\ 85 \\ 64 \\ 54 \\ 39 \\ 85 \\ 64 \\ 54 \\ 39 \\ 85 \\ 64 \\ 54 \\ 39 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 8$		
C.B.R. U.C.S. (TMH A13T] C.B.R. (TMH A8)	D ITS : DRY (	COMP 1 % SWE 1009 98% 97% 95% 93% 90% kPa) (A16T)	MC GLL %	6.6 0.02 32 26 23 18 15 9 N/A	7.4 0.02 116 95 85 64 54 39 N/A		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A8) MO		COMP % SWE 1009 98% 97% 93% 93% 93% 90% kPa) (A16T) DRY (kPa)	MC 3LL % b b b b b b b b b b b	$ \begin{array}{r}     6.6 \\     0.02 \\     32 \\     26 \\     23 \\     18 \\     15 \\     9 \end{array} $	$7.4 \\ 0.02 \\ 116 \\ 95 \\ 85 \\ 64 \\ 54 \\ 39 \\ 95 \\ 85 \\ 64 \\ 54 \\ 39 \\ 85 \\ 64 \\ 54 \\ 39 \\ 85 \\ 64 \\ 54 \\ 39 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 80 \\ 8$		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A39) 000000000000000000000000000000000000	D ITS : DRY (	COMP) % SWE 1009 98% 97% 95% 93% 95% 93% 90% kPa) (A16T) DRY (kPa) IN LA	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A	7.4 0.02 116 95 85 64 54 39 N/A N/A		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A8) MO	D ITS : DRY ( ROCTOR ITS :	COMP) % SWE 1009 98% 97% 95% 93% (Al6T) DRY (kPa) IN LA ON SIT	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A	7.4 0.02 116 95 85 64 54 39 N/A		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A39) 000000000000000000000000000000000000	D ITS : DRY () ROCTOR ITS : TEST TY	COMP   % SWE 1009 98% 97% 95% 93% 93% 93% 93% 93% 93% 93% 93% 93% 93	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A N/A	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A N/A		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE	COMP   % SWE 1009 98% 97% 97% 95% 93% 93% 93% 93% 93% 93% 93% 93% 93% 93	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab	7.4 0.02 116 95 85 64 39 N/A N/A N/A Neat Roadlab		
C.B.R. U.C.S. (TMH A13T] C.B.R. (TMH A8) MO PI STABILISED WITH	D ITS : DRY () ROCTOR ITS : TEST TY	COMP   % SWE 1009 98% 97% 95% 93% (A16T) DRY (kPa) IN LA ON SI 7PE D BY D BY	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A N/A	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A N/A		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLEI DELIVERI MPLED ACCO	COMP   % SWE 1009 98% 97% 95% 93% (A16T) DRY (kPa) IN LA ON SI 7PE D BY D BY	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A N/A N/A Clients Requirements	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A NA NA Clients Requirements		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLEI DELIVERI MPLED ACCO IRONMENTAI	COMP   % SWE 1009 98% 97% 95% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OPE D D BY DD BY DD BY DDDING TO L CONDITION	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A N/A N/A Roadlab Roadlab	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A N/A Neat Roadlab Roadlab		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCO IRONMENTAI WHEN SAM	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4 0.02 116 95 85 64 39 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLEI DELIVERI MPLED ACCO IRONMENTAI	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A N/A N/A Clients Requirements	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A NA NA Clients Requirements		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A8) MO PI STABILISED WITH STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCO IRONMENTAI WHEN SAM	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCO IRONMENTAI WHEN SAM	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4 0.02 116 95 85 64 39 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCC IRONMENTAI WHEN SAM REMARKS &	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None		
C.B.R. U.C.S. (TMH A13T] C.B.R. (TMH A39) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCC IRONMENTAI WHEN SAM REMARKS &	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4 0.02 116 95 85 64 54 39 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD :		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A39) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH	D ITS : DRY ( ROCTOR ITS : TEST TY SAMPLE DELIVERI MPLED ACCC IRONMENTAI WHEN SAM REMARKS &	COMP   % SWE 1009 98% 97% 97% 93% 93% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OD SY DD BY DD BY DRDING TO L CONDITION 4PLED	MC SLL % b b b b b b b b b b b b b	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny	7.4         0.02         116         95         85         64         39         N/A         N/A         Clients Requirements         Sunny         None         SAMPLING METHOD :         TEST METHOD :         DATE TESTED :		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A39) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SACK NO:	D ITS : DRY ( ROCTOR ITS : SAMPLE) DELIVER IMPLED ACCC IRONMENTAI WHEN SAN REMARKS &	COMP   % SWE 1009 98% 97% 95% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OPE D BY DRUNG TO L CONDITION 4PLED : NOTES	MC 51L 66	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           N/A           NA           NA           NA           Sunny           None           SAMPLING METHOD :           TEST METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:	ТМН А7	
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A39) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SACK NO:	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 95% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT OPE D BY DRUNG TO L CONDITION 4PLED : NOTES	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           N/A           NA           NA           NA           Sunny           None           SAMPLING METHOD :           TEST METHOD :           DATE TESTED :           WEATHER CONDITIONS:	ТМН А7 ОМС(%)	
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:		
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4         0.02         116         95         64         54         39         N/A         Neat         Roadlab         Roadlab         Clients Requirements         Sunny         None         SAMPLING METHOD :         TEST METHOD :         DATE TESTED :         WEATHER CONDITIONS:	OMC(%)	
C.B.R. U.C.S. (TMH A13T) C.B.R. (TMH A3) MO PI STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SA ENV ENV ENV ENV ENV ENV ENV ENV ENV ENV	D ITS : DRY ( ROCTOR ITS : DELIVERI MPLED ACCO IRONMENTAI WHEN SAN REMARKS & DEPTH	COMP   % SWE 1009 98% 97% 97% 93% 93% 90% kPa) (A16T) DRY (kPa) IN LA ON SIT YPE D BY DD B	MC	6.6 0.02 32 26 23 18 15 9 N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	7.4           0.02           116           95           85           64           39           N/A           Neat           Roadlab           Roadlab           Clients Requirements           Sunny           None           SAMPLING METHOD :           DATE TESTED :           WEATHER CONDITIONS:	OMC(%)	

MOISTURE CONTENT									
SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO					

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

2004/01/28

91-0059-15

#### DATE REPORTED :

2015/07/07

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

	SAMPLE	. No		SAMPLE INFORMAT U4292 (E3006)	ION & PROPERTIES		
CONTAL		FOR SAMPLING		Black Sampling Bags			
SIZE	/ WEIGHT	OF SAMPLE		±70kg's			
	MOISTURE CONDITION OF			Slightly Moist			
	SAMPLE ON ARRIVAL HOLE No. / Km. / CHAINAGE						
				TP-OV 13			
LAYER	DATE SAM	AMPLED FROM		0-1400mm 2015/06/17			
	DATE REC	EIVED		2015/06/17			
(	CLIENTS M.	ARKING		None			
	DESCRIP	TION					
	OF			Light Reddish Orange			
	SAMP	LE		Sand			
	(COLOUR 8	TYPE)					
	(COLOON C		GRA	DING ANALYSIS - % PASSING SU	EVES (TMH1 1986 : METHOD A1	(a)	
		79	5.0	100			
SIEVE		63	3.0	100			
			3.0	100			
			7.5	100			
ANA -			5.5 9.0	100 100			
			3.2	100			
LYSIS			75	99			
(mm)			00	96			
(TMH A1a)			25	85		<u> </u>	
		0.0	175	9			
ATTENDEDC				IMITS ANALYSIS (TMH1 1986 : N	<b>IETHOD A2 &amp; A3 ; TMH1 1986,</b> 1	мна4 1974)	
ATTERBERG LIMITS		LL P	.% I	NP			
(TMH A2&A3)			 5%	iNF			
[1111112043]	GM			1.10			
CLASSIFI -		H.R					
CATION			.TO*	<u>G9</u>			
			1.14*	G9			
	CALIFORN				ED COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTO (TMH A7)		OM MDD(F		5.8 1880			
(IMIA/)			P MC	5.9			
C.B.R.			VELL	2.00			
			0%	19			
U.C.S.			3%	16			
(TMH A13T) C.B.R.			7% 5%	15			
(TMH A8)			1%	10			
(TMITIO)			1%	7			
MOD	ITS : DRY (	kPa) (A16T)		N/A			
PRO	OCTOR ITS :	: DRY (kPa)		N/A			
STABILISED		IN	LAB				
WITH		ON :	SITE	Neat			
	TEST T	YPE					
	SAMPLE			Roadlab			
SAM	DELIVER	ORDING TO		Roadlab Clients Requirements			
		L CONDITION				1	
	WHEN SAI			Sunny			
				N.		1	
I	REMARKS 8	NOTES		None			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:	DEDTU	FIELD DENS	VITV(lrg/m2)	FIELD	SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:	0.TMU 47	I
TEST	DEPTH			FIELD		O TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE (	OMPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LA	YER	% MOISTURE		N NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

	CAMDLE	7 N -		SAMPLE INFORMATI	ON & PROPERTIES		
CONTA	SAMPLE	FOR SAMPLING		U4293 <b>(E3006)</b> Black Sampling Bags			
		OF SAMPLE		±70kg's			
MO	STURE CON	NDITION OF					
S	AMPLE ON	ARRIVAL		Slightly Moist			
		/ CHAINAGE		TP-OV 15			
LAYER	TESTED / S	AMPLED FROM		0-1000mm			
	DATE SAM	APLED		2015/06/17			
	DATE REC			2015/06/17			
	CLIENTS M.	ARKING		None			
	DESCRIP						
	OF			Light Brown			
	SAMP	LE		Fine Sand & Occasional			
		TVDE		Calcrete			
	(COLOUR 8	e i i pe j	0.0	DING ANALYONG AL DAGONIG OF		``````````````````````````````````````	
					VES (TMH1 1986 : METHOD A1 (a	a)	
CIEVE		1	5.0	100			
SIEVE		6.	3.0 3.0	100 100			
			7.5	100			
ANA -			6.5	100			
ANA -			9.0	100			
			3.2	100			
LYSIS			75	99			
(mm)			00	99			
(TMH A1a)		0.4	125	92			
,		0.0	)75	8			
			ATTERBERG L	IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, TM	1HA4 1974)	
ATTERBERG			_%				
LIMITS		P	.I.	NP			
(TMH A2&A3)			5%				
	GM			1.01			
CLASSIFI -			R.B.*				
CATION		COL	LTO*	G8			
CATION			H. 14*	G8			
	CALIFORN				ED COMPRESSIVE STRENGTH (TM	H1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTO			IC%	5.3			
(TMH A7)			KG/M3)	1802			
CDD		COM	IP MC	5.2			
C.B.R.			WELL 0%	0.02 28			
U.C.S.			3%	20			
(TMH A13T)		97	7%	22			
C.B.R.			5%	18			
(TMH A8)			3%	13			
		90	0%	6			
MOE	ITS : DRY (	kPa) (A16T)		N/A			
PR	OCTOR ITS :	DRY (kPa)		N/A			
STABILISED			LAB	,			
WITH			SITE	Neat			
with	TEST T		5111	Neat			
	SAMPLE			Roadlab			
	DELIVER			Roadlab			
SAN		ORDING TO		Clients Requirements			
		L CONDITION					
	WHEN SAI			Sunny			
				N			
·	REMARKS 8	INUTES		None			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIFI D DEMO	SITY(kg/m3)	FIELD	AASHTO	ТМН 47	
					-		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>2</sup> )	OMC(%)	
					AVERAGE CC	MPACTION:	
	·	·	ı	MOISTURE			
SAMPLE NO	HOLE	LA	YER	% MOISTURE	TIN	NO	
		1					

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

#### DATE REPORTED :

2015/07/07

#### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				CAMPLE INFORMATI	ION & DRODEDTIES			
	SAMPLE	No		SAMPLE INFORMATI U4294 (E3006)	ION & PROPERTIES			
CONTAI		FOR SAMPLING		Black Sampling Bags				
SIZE	: / WEIGHT	OF SAMPLE		±70kg's				
MOI	STURE CON	DITION OF						
	AMPLE ON A			Slightly Moist				
		/ CHAINAGE		TP-OV 16				
LAYER		AMPLED FROM		100-800mm				
	DATE SAMPLED DATE RECEIVED			2015/06/17 2015/06/17				
	CLIENTS M			None				
	DESCRIP			Hone				
	OF			Light Brown				
	SAMP	LE		Sand with Calcrete Gravel				
		TVDP)		Salid with Calciete Graver				
	(COLOUR 8	a lipej	CDA	DING ANALVEIG OF DASSING CH	TUES (TMUL 100) METHOD 11	(-)		
			<b>GR</b> A	DING ANALYSIS - % PASSING SIE	EVES (TMH1 1986 : METHOD A1	(a)		
SIEVE			3.0	89 89				
SILVE			3.0	89				
			7.5	75				
ANA -			5.5	70				
			9.0	65				
LVCIC			3.2	60				
LYSIS (mm)			75 00	53 50		+		
(TMH A1a)		0.4	25	46				
(		0.0	075	6				
				IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, 1	MHA4 1974)		
ATTERBERG			.%					
LIMITS			.I.	NP				
(TMH A2&A3)	GM	LS	5%	1.98				
	GIVI	H.R	L.B.*	1.90				
CLASSIFI -		COL	.TO*	G5				
CATION		T.R.F	ł. 14*	G5				
	CALIFORN	IA BEARING RA	FIO (TMH1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14)	(ITS A16T)	
MOD AASHTO			IC%	6.0				
(TMH A7)		MDD(H	(G/M3)	2067				
C.B.R.		0/ CUM	P MC WELL	6.1 0.02				
G.D.R.			0%	120		1		
U.C.S.		98	3%	102				
(TMH A13T)		97	7%	94				
C.B.R.			5%	76				
(TMH A8)			3% 0%	64 47				
MOD	ITS : DRY (	90 kPa) (A16T)	//0	47 N/A				
	OCTOR ITS :			N/A				
STABILISED			LAB	/**				
WITH			SITE	Neat				
******	TEST T					1		
	SAMPLE	D BY		Roadlab				
	DELIVER			Roadlab				
		ORDING TO		Clients Requirements				
		L CONDITION		Sunny				
	WHEN SAM	APLED						
I	REMARKS 8	NOTES		None				
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:	TESTED BY :     SAMPLING METHOD :       ROAD / AREA TESTED :     TEST METHOD :       LAYER TESTED :     DATE TESTED :							
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO TMH A7			
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)		
						OMPACTION:		
	L	1	1		AVERAGE	JUMI AUTION.		
				MOISTURE	CONTENT			
SAMPLE NO	HOLE	LA	YER	% MOISTURE		N NO		

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				SAMPLE INFORMAT	ION & DDODEDTIES		
	SAMPLE	No.		U4295 (E3006)	ION & FROFERITES		
CONTAINER USED FOR SAMPLING			Black Sampling Bags				
SIZE / WEIGHT OF SAMPLE MOISTURE CONDITION OF			±70kg's				
SAMPLE ON ARRIVAL			Slightly Moist				
		/ CHAINAGE		TP-OV 18			
LAYER	TESTED / S	AMPLED FROM IPLED		0-700mm			
	DATE SAM	IPLED		2015/06/17			
	DATE REC CLIENTS M	EIVED		2015/06/17 None			
	DESCRIP	TION		None			
	OF	_		Dark Reddish Orange			
	SAMP	LE		Sand			
	(COLOUR 8	TYPE)					
	(	,	GRA	DING ANALYSIS - % PASSING SI	EVES (TMH1 1986 : METHOD A	(a)	
		75	5.0	100			
SIEVE		63		100			
		53 37		100 100			
ANA -			5.5	100			
		19	9.0	100			
LVCIC		13		100			
LYSIS (mm)		4. 2.		99 98		-	
(TMH A1a)		0.4	25	86			
(		0.0	175	10			
400000000000000				IMITS ANALYSIS (TMH1 1986 : N	1ETHOD A2 & A3 ; TMH1 1986,	TMHA4 1974)	
ATTERBERG LIMITS		LL P	.70 .I.	NP			
(TMH A2&A3)		LS					
	GM	H.R	D *	1.06			
CLASSIFI -		COL		69			
CATION		T.R.F		G9 G9			
	CALIFORN	IA BEARING RAT	ГІО (ТМН1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (1	MH1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTO OMC% (TMH A7) MDD(KG/M <sup>3</sup> )		6.8					
(TMH A7)		MDD(F COM		1837 6.9			
C.B.R.			VELL	0.82			
		10	0%	31			
U.C.S.		98		27			
(TMH A13T) C.B.R.		97	'% %	25 21			
(TMH A8)		93		16			
		90	1%	9			
		kPa) <b>(A16T)</b>		N/A			
	OCTOR ITS :		AD	N/A			
STABILISED WITH		IN I ON 1		Neat			
VVIIII	TEST T		5111	Neat			
	SAMPLE	D BY		Roadlab			
	DELIVER			Roadlab			
	APLED ACCO			Clients Requirements			
ENVIE	WHEN SAN	L CONDITION		Sunny			
				News			
	REMARKS &	NUTES		None			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASH	TO TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE	COMPACTION:	
							· ·
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LAY	/ER	% MOISTURE	Т	IN NO	
	-					-	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				SAMPLE INFORMAT	ION & DRODEDTIES		
	SAMPLE	No		U4297 (E3006)	U4297 (E3006)		
CONTA		FOR SAMPLING		Black Sampling Bags	Black Sampling Bags		
SIZE / WEIGHT OF SAMPLE			±70kg's	±70kg's			
MC	MOISTURE CONDITION OF SAMPLE ON ARRIVAL			Slightly Moist	Slightly Moist		
		/ CHAINAGE		TP-0V 19	TP-0V 19		
LAYER	TESTED / S	AMPLED FROM		0-500mm	500-1900mm		
		AMPLED FROM IPLED		2015/06/17	2015/06/17		
	DATE REC			2015/06/17	2015/06/17		
	CLIENTS M.	ARKING		None	None		
	DESCRIP	TION			T. L. D.		
	OF SAMP	LE		Light Reddish Orange Sand	Light Brown Sand		
	(COLOUR 8	ι TYPE)					
					EVES (TMH1 1986 : METHOD A1	(a)	I
SIEVE			5.0 3.0	100 100	76 76		
SIEVE		0.	3.0	100	76		
			7.5	100	76		
ANA -		2	6.5	100	72		
		19	9.0	100	63	1	
			3.2	100	56		
LYSIS		4.	.75	99	31		
(mm)			.00	98	23		
(TMH A1a)		0.4	425	88	19		
		0.0	075	8	4		
				IMITS ANALYSIS (TMH1 1986 : !	METHOD A2 & A3 ; TMH1 1986, T	'MHA4 1974)	
ATTERBERG			L% P.I.	NP	NP		
LIMITS (TMH A2&A3			5%	NP	NP		
[IMIT A2&A5	GM	ь.	370	1.06	2.55		
ar 1 aanm	GM	H.F	R.B.*	1.00	2.35		
CLASSIFI -			LTO*	G7	G5		
CATION			H. 14*	G7	G5		
	CALIFORN	IA BEARING RA	TIO (TMH1 1986	: METHOD A7, A8) / UNCONFIN	ED COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTC			1C%	7.2			
(TMH A7)		MDD()	KG/M°)	1873	5.5 2227		
		COM	IP MC	5.0	<b>5</b> 4		
1		LOM	IPMC	7.0	5.4		
C.B.R.		% SV	WELL	0.02	0.08		
		% SV 10	WELL 0%	0.02 40	0.08 108		
U.C.S.		% SV 10 98	WELL 0% 3%	0.02 40 34	0.08 108 90		
U.C.S. (TMH A13T)		% SV 10 98	WELL 10% 3% 7%	0.02 40 34 31	0.08 108 90 82		
U.C.S. (TMH A13T) C.B.R.		% SV 10 98 97 97	WELL 10% 3% 7% 5%	0.02 40 34 31 26	0.08 108 90 82 64		
U.C.S. (TMH A13T)		% SV 10 98 97 95 95	WELL 0% 3% 7% 5% 3%	0.02 40 34 31 26 21	$ \begin{array}{r} 0.08 \\ 108 \\ 90 \\ 82 \\ 64 \\ 54 \\ \end{array} $		
U.C.S. (TMH A13T) C.B.R. (TMH A8)		% SV 10 98 97 95 95 95 96	WELL 10% 3% 7% 5%	0.02 40 34 31 26 21 13	$\begin{array}{c} 0.08 \\ 108 \\ 90 \\ 82 \\ 64 \\ 54 \\ 40 \end{array}$		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI	D ITS : DRY (	% SV 10 97 97 95 95 95 97 87 97 87 97 87 97 87 97 87 97 87 97 87 97 87 97 87 97 97 97 97 97 97 97 97 97 97 97 97 97	WELL 0% 3% 7% 5% 3%	0.02 40 34 31 26 21 13 N/A	0.08 108 90 82 64 54 40 N/A		
U.C.S. (TMH A13T) C.B.R. (TMH A8) 		% SV 10 97 97 97 97 97 97 87 97 87 87 87 87 87 87 87 87 87 87 87 87 87	WELL 0% 3% 7% 5% 3% 0%	0.02 40 34 31 26 21 13	$\begin{array}{c} 0.08 \\ 108 \\ 90 \\ 82 \\ 64 \\ 54 \\ 40 \end{array}$		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PP STABILISED	D ITS : DRY (	% SI 100 98 97 99 99 97 97 87 87 87 87 87 87 87 87 87 87 87 87 87	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 26 21 13 N/A N/A N/A	0.08 108 90 82 64 54 40 N/A N/A		
U.C.S. (TMH A13T) C.B.R. (TMH A8) 	D ITS : DRY ( OCTOR ITS :	% SV 100 99 97 97 97 97 97 97 87 91 87 91 97 97 87 91 97 97 97 97 97 97 97 97 97 97 97 97 97	WELL 0% 3% 7% 5% 3% 0%	0.02 40 34 31 26 21 13 N/A	0.08 108 90 82 64 54 40 N/A		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PP STABILISED	D ITS : DRY ( COCTOR ITS : TEST T	% SI 10 99 97 95 99 87 90 87 91 87 91 87 91 87 91 91 91 91 91 91 91 91 91 91 91 91 91	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 26 21 13 N/A N/A N/A	0.08 108 90 82 64 54 40 N/A N/A N/A Neat		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PP STABILISED	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE	% ST 100 99 97 97 97 97 97 97 97 97 97 97 97 97	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab	0.08 108 90 82 64 54 40 N/A N/A N/A N/A N/A Roadlab		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PR STABILISED WITH	D ITS : DRY ( COCTOR ITS : TEST T	% ST 10 98 97 99 99 99 99 99 90 99 90 97 97 97 97 97 97 97 97 97 97	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 26 21 13 N/A N/A N/A	0.08 108 90 82 64 54 40 N/A N/A N/A Neat		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH	DITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA	% S1 100 98 99 99 99 90 90 90 90 90 90 90 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 26 21 13 N/A N/A N/A N/A Neat Roadlab Roadlab	0.08 108 90 82 64 54 40 N/A N/A N/A Neat Roadlab Roadlab		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA WHEN SAM	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA WHEN SAM	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny	0.08 108 90 82 64 54 40 N/A N/A N/A N/A NA Clients Requirements Sunny		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA WHEN SAM	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PP STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SAA ENVI ENVI	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA WHEN SAM	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD :		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PP STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SAA TESTED BY : ROAD / AREA TESTED :	D ITS : DRY ( COCTOR ITS : TEST T SAMPLE DELIVERI MPLED ACCO RONMENTA WHEN SAM	% S1 10 98 99 99 99 99 99 99 99 99 99 99 90 90 90	WELL 00% 39% 79% 55% 33% 00% LAB	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny	0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SAA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	DITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACC RONMENTA WHEN SAN REMARKS &	% S1 100 98 99 99 99 99 99 99 99 99 99	WELL 00% 3% 7% 5% 3% 0% LAB SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny None	0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG	D TMH A7	
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH SACK NO:	DITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACC RONMENTA WHEN SAN REMARKS &	% S1 100 98 99 99 99 99 99 99 99 99 99	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Clients Requirements Sunny None	0.08 0.08 0.08 0.08 0.08 0.08 0.08 0.08	) TMH A7	
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHTG		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHT( MDD(kg/m <sup>2</sup> )		
U.C.S. (TMH A13T) C.B.R. (TMH A8) MOI PF STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED WITH STABILISED SA ENVI ENVI ENVI ENVI ENVI ENVI ENVI ENVI	D ITS : DRY ( OCTOR ITS : TEST T SAMPLE DELIVER MPLED ACCC RONMENTA WHEN SAP REMARKS & DEPTH	% S1 10 99 99 99 99 99 99 99 99 99 99 00 00 10 10 10 10 10 10 10 10 10 10 10	WELL 0% 3% 7% 5% 3% 3% 9% LAB SITE SITE	0.02 40 34 31 26 21 13 N/A N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None	0.08 108 90 82 64 54 40 N/A N/A N/A N/A Neat Roadlab Roadlab Clients Requirements Sunny None SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS: AASHT( MDD(kg/m <sup>2</sup> )	OMC(%)	

	MOISTURE CONTENT								
SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN NO					

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

2004/01/28

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE 207 Riettontein Rid Primase Germiston 1401 P O Baru 1403 Germiston 1400 Tet: 011 888 0279 Fac: 011 888 0273 E-moit: info®roodab.co.za www.roodlab.co.za

				SAMPLE INFORMATI	ON & PROPERTIES		
	SAMPLE			U4283 (E006)			
CONTAIN	NER USED	FOR SAMPLING		Black Sampling Bags			
SIZE	/ WEIGHT	OF SAMPLE		±70kg's			
MOIS	STURE CON	IDITION OF					
SA	MPLE ON A	ARRIVAL		Slightly Moist			
		/ CHAINAGE		TP/OV 4			
				1400-3100mm			
LAIEKI	DATE SAM	AMPLED FROM					
				2015/06/17			
	DATE REC	EIVED		2015/06/17			
L L	CLIENTS M			None			
	DESCRIP	TION					
	OF			Light Reddish Brown			
	SAMP	LE		Calcrete & Quartz Gravel			
				calcrete a quarte draver			
	(COLOUR 8	2 TYPE)					
			GRA	DING ANALYSIS - % PASSING SIE	EVES (TMH1 1986 : METHOD A1 (	[a]	
		75	5.0	100			
SIEVE		63	3.0	100			
			3.0	79			
			7.5	76			
ANA -			5.5	75			
711111			9.0	68			
			3.2	58			
LYSIS				39			
			75	39			
(mm)			00	28			
(TMH A1a)		0.4	25	19			
		0.0	175	5			
				IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG		LL	.%				
LIMITS		P.	.I.	NP			
(TMH A2&A3)		LS	5%				
	GM	•		2.48			
CLASSIFI -		H.R	B.*				
		COL	T0*	G5			
CATION		T.R.H	I. 14*	G5			
	CALIFORN	IA BEARING RAT	ГІО (ТМН1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (TR	4H1 1986 : METHOD A7, A14) (IT	S A16T)
MOD AASHTO			C%	5.7		,,,,	,
(TMH A7)		MDD(F	(G/M <sup>3</sup> )	2193			
(1)		COM	P MC	5.7			
C.B.R.		04 61	VELL	0.02			
C.D.K.			0%	101			
11.0.0							
U.C.S.			8%	88			
(TMH A13T)			'%	82			
C.B.R.		95		70			
(TMH A8)		93		62			
			1%	51			
		kPa) <b>(A16T)</b>		N/A			
PRO	CTOR ITS :	DRY (kPa)		N/A			
STABILISED		IN I	AB	· ·			
				Neet			
WITH	mpom m		SITE	Neat			
	TEST T			CBR			
	SAMPLE			Roadlab			
	DELIVER			Roadlab			
		ORDING TO		Clients Requirements			
ENVIR	ONMENTA	L CONDITION		Cummer			
	WHEN SAM	<b>MPLED</b>		Sunny			
				News			
R	EMARKS 8	NOTES		None			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTC	TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
						0110(70)	
					AVERAGE C	OMPACTION:	
			L	1	in English S		
				MOISTURE			
SAMPLE NO	HOLE	LAY	YER	% MOISTURE	TIN	I NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

	55.0	100			
	37.5	100			
ANA -	26.5	100			
	19.0	100			
	13.2	100			
LYSIS	4.75	100			
(mm)	2.00	99			
(TMH A1a)	0.425	95			
	0.075	7.2			
		IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG	LL%				
LIMITS	P.I.	NP			
(TMH A2&A3)	LS%				
GM		0.98			
CLASSIFI -	H.R.B.*	A-1-b(0)			
CATION	COLTO*	G8			
	T.R.H. 14*	G8			
		: METHOD A7, A8) / UNCONFINE	D COMPRESSIVE STRENGTH (TM	IH1 1986 : METHOD A7, A14) (IT	'S A16T)
MOD AASHTO	OMC%	6.1			
(TMH A7)	MDD(KG/M3)	1766			
	COMP MC	5.8			
C.B.R.	% SWELL	0.02			
	100%	32			
U.C.S.	98%	24			
(TMH A13T)	97%	21			
C.B.R.	95%	13			
(TMH A8)	93%	11			
	90%	7			
MOD ITS : DRY (		N/A			
PROCTOR ITS :		N/A			
STABILISED	IN LAB				
WITH	ON SITE	Neat			
TEST T		CBR			
SAMPLE		Roadlab			
DELIVERI		Roadlab			
SAMPLED ACCO		Clients Requirements			
ENVIRONMENTA		Sunny			
WHEN SAMPLED		Sumry			

TEST REPORT :	GEOTECHNICAL INVE

91-0059-15

JOB NO:

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

		SAMPLE INFORMAT	FION & PROPERTIES		
SAMPLE		U4280 (E3006)			
CONTAINER USED	FOR SAMPLING	Black Sampling Bags			
SIZE / WEIGHT		±70kg's			
MOISTURE CON	NDITION OF				
SAMPLE ON	ARRIVAL	Slightly Moist			
HOLE No. / Km.		TP-OV 2			
LAYER TESTED / S	AMPLED FROM	0-1300mm			
DATE SAM	APLED	2015/06/17			
DATE REC		2015/06/17			
CLIENTS M		None			
DESCRIP					
OF					
SAMP	LE				
(COLOUR &					
		ADING ANALYSIS - % PASSING S	IEVES (TMH1 1986 : METHOD A1	(a)	la de la companya de
	75.0	100			
SIEVE	63.0	100			
	53.0	100			
	37.5	100			
ANA -	26.5	100			
	19.0	100			
	13.2	100			
LYSIS	4.75	100			
(mm)	2.00	99			
(TMH A1a)	0.425	95			
	0.075	7.2			
	ATTERBERG	LIMITS ANALYSIS (TMH1 1986 :	METHOD A2 & A3 ; TMH1 1986, 7	ГМНА4 1974)	
ATTERBERG	LL%				
LIMITS	P.I.	NP			
(TMH A2&A3)	LS%				
GM		0.98			
CLASSIFI -	H.R.B.*	A-1-b(0)			
	COLTO*	G8			
CATION	T D H 1/1*	68			-

DATE REPORTED :

REMARKS & NOTES None TESTED BY : SAMPLING METHOD : ROAD / AREA TESTED : LAYER TESTED : **TEST METHOD :** DATE TESTED : TRACK NO: WEATHER CONDITIONS: DEPTH FIELD DENSITY(kg/m3) TESTED WET DENSITY DRY DENSITY FIELD AASHTO TMH A7 TEST

				AVERAGE C	OMPACTION:			
			MOISTURE	CONTENT				
SAMPLE NO	HOLE	LAYER	% MOISTURE	TIN	I NO			

MOISTURE(%)

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON

MR. E VAN ZYL

POSITION



 $MDD(kg/m^3)$ 

OMC(%)

Accreditation No.: T0296

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RL-S-150-01



Established 1965

HEAD OFFICE nc.wo orrice ettontein Rd Ptimrose Germiston 1401 P O Box 1476 Germiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info@roadlab.co.za www.roadlab.co.za 207 Rietfontein Rd Primrose Ge



HOLE No. / Km. / CHAINAGE LAYER TESTED / SAMPLED FROM DATE SAMPLED TP-OV 4 0-1400mm TP-OV 4 1400-3100mm 2015/06/17 2015/06/17 None 2015/06/17 2015/06/17 None DATE RECEIVED CLIENTS MARKING DESCRIPTION OF SAMPLE (COLOUR & TYPE) GRADING ANALYSIS - % PASSING SIEVES (TMH1 1986 : METHOD A1 (a) 75.0 63.0 53.0 37.5 26.5 19.0 100 100 100 100 100 100 100 100 SIEVE 76 ANA · 13.2 4.75 2.00 100 58 LYSIS <del>99</del> (mm) (TMH A1a) 0.425 0.075 95 19 ATTERBERG LIMITS ANALYSIS (TMH1 1986 : METHOD A2 & A3 ; TMH1 1986, TMHA4 1974) ATTERBERG LL% P.I. NP LIMITS NP (TMH A2&A3) LS% 1.01 2.49 GM H.R.B.\* CLASSIFI A-2-4(0) A-1-b(0) COLTO\* T.R.H. 14 G9 G9 G1 G1 CATION CALIFORNIA BEARING RATIO (TMH1 1986 : METHOD A7, A8) / UNCONFINED COMPRESSIVE STRENGTH (TMH1 1986 : METHOD A7, A14) (ITS A16T) MOD AASHTO OMC% MDD(KG/M3) COMP MC % SWELL 5.1 1756 (TMH A7) 2193 0.02 C.B.R 0.02 100% 22 100 U.C.S. (TMH A13T) C.B.R. (TMH A8) 98% 97% 95% 17 14 9 88 83 93% 93% 90% 8 63 50 MOD ITS : DRY (kPa) (A16T) PROCTOR ITS : DRY (kPa) N/A N/A N/A N/A STABILISED IN LAB WITH ON SITE Neat Neat TEST TYPE SAMPLED BY DELIVERED BY SAMPLED ACCORDING TO Roadlah Roadlab oadlab Clients Requirements Require ENVIRONMENTAL CONDITION Sunny Sunny WHEN SAMPLED REMARKS & NOTES None None

SAMPLE INFORMATION & PROPERTIES

TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO	TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>2</sup> )	OMC(%)	
					AVERAGE CO	MPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LA	YER	% MOISTURE	TIN	NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON

MR. E VAN ZYL



Accreditation No.: T0296

(sanas

RL-S-150-01

## TEST REPORT :

91-0059-15

SAMPLE No. CONTAINER USED FOR SAMPLING SIZE / WEIGHT OF SAMPLE MOISTURE CONDITION OF

SAMPLE ON ARRIVAL

JOB NO:

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

GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

U4283 (E3006) Black Sampling Bags ±70kg's

Slightly Moist



2015/07/07

U4283 (E3006) Black Sampling Bags ±70kg's

Slightly Moist

HEAD OFFICE 207 Rietfontein Rd Primrose Ge tfontein Rd Primrose Germiston 1401 P O Box 1476 Germiston 1400 Tel: 011 828 0279 Fax: 011 828 0273

E-mail: info@roadlab.co.za www.roadlab.co.za

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za

				SAMPLE INFORMATI	ON & PROPERTIES		
	SAMPLE	No.	I	U4284 (E3006)			
		FOR SAMPLING		Black Sampling Bags			
		OF SAMPLE NDITION OF		±70kg's			
	MPLE ON A			Slightly Moist			
		/ CHAINAGE	-	TP-OV7			
		AMPLED FROM		0-350mm			
	DATE SAM DATE REC			2015/06/17 2015/06/17			
	LIENTS MA			None			
	DESCRIP						
	OF SAMPI			Light Reddish Orange Sand			
	SAMPI	5E		Sanu			
(	COLOUR &	ι TYPE)					
					VES (TMH1 1986 : METHOD A1 (	a)	
CUEVE		75		100			
SIEVE		63 53		100 100			
		37		100			
ANA -		26		100			
		19 13		100 100			
LYSIS		4.7		100			
(mm)		2.0	00	100			
(TMH A1a)		0.4	:25	99 5			
		0.0			IETHOD A2 & A3 ; TMH1 1986, TI	MHAA 107A)	
ATTERBERG		LL		IMITS ANALISIS (IMITI 1900. M	ETHOD A2 & A5 , TMIT 1900, T	1114 1774)	
LIMITS		Р.	.I.	NP			
(TMH A2&A3)		LS	.%	0.96			
ar 1 agurr	GM	H.R.	.B.*	0.96			
CLASSIFI -		COL	.TO*	G9			
CATION	1.1.1.1.1.1			G9			
	CALIFORN				D COMPRESSIVE STRENGTH (TM	IH1 1986 : METHOD A7, A14) (IT	SA16T)
MOD AASHTO (TMH A7)		OM MDD(K	C% (G/M <sup>3</sup> )	5.2 1727			
(1.1117)		COM		5.3			
C.B.R.		% SW	VELL	2.02			
U.C.S.		100	0%	16 13			
(TMH A13T)		97	70 '%	13			
C.B.R.		95	5%	9			
(TMH A8)		93 90	%	8			
MOD I	TS : DRY (	90 kPa) <b>(A16T)</b>	70	6 N/A			
		DRY (kPa)		N/A			
STABILISED		IN I	LAB				
WITH		ON S	SITE	Neat			
	TEST T SAMPLE	YPE D PV		Roadlab			
	DELIVERI			Roadlab			
	PLED ACCO	ORDING TO	-	Clients Requirements			
		L CONDITION		Sunny			
	WHEN SAM	MPLED		Sumy			
R	EMARKS &	ι NOTES		None			
<u>l</u>							
TESTED BY :					SAMPLING METHOD :		
ROAD / AREA TESTED :					TEST METHOD :		
LAYER TESTED :					DATE TESTED :		
TRACK NO:					WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	GITY(kg/m3)	FIELD	AASHTO	TMH A7	
POSITION	TESTED	WET DENSITY		MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					MBB (Ng/ M )		
			I				
			I				
			I				
			I				
			I				
			,l		AVERAGE CO	JMPACTION:	
		1		MOISTURE			
SAMPLE NO	HOLE	LAY	YER	% MOISTURE	TIN	NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE neAU Office 207 Rietfontein Rd Primose Gemiston 1401 P O Bac 1476 Gemiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info®roadiab.co.za www.roadiab.co.za

		SAMPLE INFORMAT	ION & PROPERTIES		
SAMPLE	No.	U4285 (E3006)			
CONTAINER USED H	FOR SAMPLING	Black Sampling Bags			
SIZE / WEIGHT	OF SAMPLE	±70kg's			
MOISTURE CON					
SAMPLE ON A	ARRIVAL	Slightly Moist			
HOLE No. / Km. /		TP-OV8			
LAYER TESTED / SA		0-2500mm			
DATE SAM	PLED	2015/06/17			
DATE REC		2015/06/17			
CLIENTS MA		None			
DESCRIP	ΓΙΟΝ				
OF		Light Reddish Orange			
SAMPI	Æ	Fine Sand			
(COLOUR &					
			EVES (TMH1 1986 : METHOD A1 (	a)	
	75.0	100			
SIEVE	63.0	100			
	53.0	100			
	37.5	98			
ANA -	26.5	98			
	19.0	97			
L VOIO	13.2	95			
LYSIS	4.75 2.00	92 89			
(mm)	0.425	89			
(TMH A1a) 0.425 0.075		6			
		IMITS ANALYSIS (TMH1 1986 : N	1ETHOD A2 & A3 ; TMH1 1986, T	мна4 1974)	
ATTERBERG	LL%	ND			
LIMITS	P.I.	NP			
(TMH A2&A3)	LS%	1.17			
GM	H.R.B.*	1.17			
CLASSIFI -	COLTO*	G9			
CATION	T.R.H. 14*	G9 G9			
CALIFORN			ED COMPRESSIVE STRENGTH (TM	111 1006 METHOD 17 114) (17	C 44(T)
			D COMPRESSIVE STRENGTH (TM	IHI 1986 : METHOD A7, A14J (II	S A161 J
MOD AASHTO	OMC% MDD(KG/M <sup>3</sup> )	6.1 1731			
(TMH A7)	COMP MC				
C.B.R.	% SWELL	6.1 0.02			
C.D.K.	100%	18			
U.C.S.	98%	10			
(TMH A13T)	97%	13			
C.B.R.	95%	9			
(TMH A8)	93%	7			
(	90%	4			
MOD ITS : DRY (	(Pa) (A16T)	N/A			
PROCTOR ITS :		N/A			
STABILISED	IN LAB				
WITH	ON SITE	Neat			
TEST TY		ineat			
SAMPLEI		Roadlab			
DELIVERE		Roadlab			
SAMPLED ACCO		Clients Requirements			
ENVIRONMENTAI		chents requirements			
		Sunny			
WHEN SAM	IPLED				
REMARKS &	NOTES	None			
			1	1	1

TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO	TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>2</sup> )	OMC(%)	
					AVERAGE CC	MPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LAY	YER	% MOISTURE	TIN	NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				SAMPLE INFORMAT	ION & PROPERTIES		
	SAMPLE	No.		U4287 (E3006)			
		FOR SAMPLING OF SAMPLE		Black Sampling Bags ±70kg's			
		IDITION OF					-
	AMPLE ON A			Slightly Moist			
		/ CHAINAGE		TP 404			
LAYER T	TESTED / S	AMPLED FROM IPLED		0-1700mm			-
	DATE SAM	IPLED		2015/06/17			
	DATE REC			2015/06/17			
(	DESCRIP			None			
	OF	TION					
	SAMP	LE		Light Reddish Orange			
	0111-11			Fine Sand			
	(COLOUR 8	z TYPE)					
			GRA	DING ANALYSIS - % PASSING SI	EVES (TMH1 1986 : METHOD A1 (	a)	
		75		100			
SIEVE		63		100			
		53		100			
ANA -		37 26		100 100			
ANA -		19		100			-
		13		100			
LYSIS		4.		99			-
(mm)		2.		98			
(TMH A1a)		0.4	-25	92			
		0.0		5			
				IMITS ANALYSIS (TMH1 1986 : N	METHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG		LL P.		NP			
LIMITS (TMH A2&A3)		LS		NP			
[1MH A2&A3]	GM	L3	70	1.05			
CLASSIFI -	CIM	H.R	.B.*				
CATION		COL		G9			
		T.R.H		G9			
	CALIFORN				ED COMPRESSIVE STRENGTH (TM	IH1 1986 : METHOD A7, A14) (IT	'S A16T)
MOD AASHTO		OM		6.3			
(TMH A7)		MDD(K		1823			
C.B.R.		COM % SV		6.3 0.02			
C.D.R.			0%	22			
U.C.S.		98		16			
(TMH A13T)		97		13			
C.B.R.		95		8			
(TMH A8)		93	%	7			
MOD	ITS · DRV (	90 kPa) (A16T)	1%	5 N/A			
	OCTOR ITS :			N/A			
STABILISED		IN I	AP	МЛ			
WITH		ON S		Neat			
VVIIII	TEST T		DIL	Neat			-
	SAMPLE			Roadlab			
	DELIVER			Roadlab			-
SAM		ORDING TO		Clients Requirements			
ENVIR	ONMENTA	L CONDITION		C			
	WHEN SAM	MPLED		Sunny			
F	REMARKS 8	NOTES		None			
				Hone			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS		FIELD	AASHTO		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
							+
					AVERAGE CO	OMPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LAY	/FR	% MOISTURE	TIN	NO	
JAINI LE NU	HULL	LAI		/U MOISTURE	TIN	10	+

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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



HEAD OFFICE HEAD OHNEC 207 Rietfontein Rd Primrose Germiaton 1400 P O Bax 1476 Germiaton 1400 Tel: 011 828 0277 Fac 011 828 0273 E-mail: info@roadlab.co.za www.roadlab.co.za

		SAMPLE INFORMAT	ION & PROPERTIES		
SAMPLE	No.	U4279 (E3006)			
CONTAINER USED I	FOR SAMPLING	Black Sampling Bags			
SIZE / WEIGHT	OF SAMPLE	±70kg's			
MOISTURE CON SAMPLE ON A		Slightly Moist			
HOLE No. / Km.		OTP{ 17			
LAYER TESTED / SA		300-1000mm			
DATE SAM	IPLED	2015/06/10			
DATE REC		2015/06/10			
CLIENTS MA		None			
DESCRIP	TION				
OF SAMPI	F				
SAMPI	-E				
(COLOUR &	TYPE)				
	GRA	ADING ANALYSIS - % PASSING SI	EVES (TMH1 1986 : METHOD A1	(a)	
	75.0	100			
SIEVE	63.0	100			
	53.0	95			
	37.5	87			
ANA -	26.5	81			
	19.0 13.2	71 54			
LYSIS	4.75	21			
(mm)	2.00	18			
(TMH A1a)	0.425	16			
(	0.075	2.2			
	ATTERBERG I	LIMITS ANALYSIS (TMH1 1986 : M	METHOD A2 & A3 ; TMH1 1986, "	ГМНА4 1974)	
ATTERBERG	LL%			-	
LIMITS	P.I.	NP			
(TMH A2&A3)	LS%				
GM		3.63			
CLASSIFI -	H.R.B.*	A-1-b(0)			
CATION	COLTO* T.R.H. 14*	G7 G7			
			ED COMDRECEIVE CTRENCTIL (7	MH1 1986 : METHOD A7, A14) (I	FC 416T)
MOD AASHTO	OMC%	3.3	D COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14J (I	15 A161 J
(TMH A7)	MDD(KG/M <sup>3</sup> )	2176			
(IMITA/)	COMP MC	3.4			
C.B.R.	% SWELL	0.03			
	100%	71			
U.C.S.	98%	53			
(TMH A13T)	97%	44			
C.B.R.	95%	26			
(TMH A8)	93%	23			
MOD ITS : DRY (I	90%	19 N/A			
PROCTOR ITS :		N/A N/A			
		N/A			
STABILISED	IN LAB				
WITH	ON SITE	Neat			
TEST TY SAMPLE		CBR Roadlab			
DELIVERI		Roadlab			
SAMPLED ACCO		Clients Requirements		-	1
ENVIRONMENTAI				-	1
WHEN SAM		Sunny			
REMARKS &	NOTES	None			

TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS	SITY(kg/m3)	FIELD	AASHTO	TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE CO	OMPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LA	YER	% MOISTURE		NO	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON





Accreditation No.: T0296

RL-S-150-01

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				CAMPLE INFORM			
	SAMPLE	No		SAMPLE INFORMATI U4289 (E3006)	ION & PROPERTIES		
CONTAI		FOR SAMPLING		Black Sampling Bags			
SIZE	/ WEIGHT	OF SAMPLE		±70kg's			
		IDITION OF		Slightly Moist			
	AMPLE ON .						
HOLE LAVER	E NO. / KM.	/ CHAINAGE AMPLED FROM		TP-MF 01 0-2600mm			
LATER	DATE SAM	IPLED		2015/06/17			
	DATE REC	EIVED		2015/06/17			
	CLIENTS M			None			
	DESCRIP OF	TION					
	SAMP	LE		Light Reddish Orange			
				Fine Sand			
	(COLOUR 8	a TYPE)	CDA	DINC ANALVEIC OF DACEING CH	NEC (TMUL 1006 METHOD 11 (	-)	
		70		DING ANALYSIS - % PASSING SIE 100	EVES (TMH1 1986 : METHOD A1 (		
SIEVE		63	5.0 3.0	100			
		53	3.0	100			
			7.5	100			
ANA -			5.5 9.0	100 100			
			3.2	100			
LYSIS		4.	75	100			
(mm)			00	99			
(TMH A1a)		0.4 0.0		93 7			
		0.0		1	1ETHOD A2 & A3 ; TMH1 1986, TI	MHA4 1974)	
ATTERBERG		LI	ATTERDERG L	INTEL 200 : N	121100 A2 & A3 ; 19111 1700, 11	······································	
LIMITS		P	.I.	NP			
(TMH A2&A3)		LS	6%	0.02			
	GM	H.R	B*	0.93			
CLASSIFI -				G8			
CATION		T.R.F	I. 14*	G8			
	CALIFORN	IA BEARING RA	ГІО (ТМН1 1986	: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (TM	[H1 1986 : METHOD A7, A14]	) (ITS A16T)
MOD AASHTO			C%	6.2			
(TMH A7)		MDD(F	P MC	1781 6.3			
C.B.R.			VELL	0.02			
		10	0%	23			
U.C.S.		98		20			
(TMH A13T) C.B.R.		97	·% 5%	<u>19</u> 15			
(TMH A8)		93		13			
		90	1%	7			
		kPa) <b>(A16T)</b>		N/A			
	OCTOR ITS :			N/A			
STABILISED			LAB	N .			
WITH	TEST T	UN :	SITE	Neat			
	SAMPLE			Roadlab			
	DELIVER	ED BY		Roadlab			
		ORDING TO		Clients Requirements			
ENVIR		L CONDITION		Sunny			
	WHEN SAM						
I	REMARKS 8	NOTES		None			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:					SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS		FIELD	AASHTO		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE CO	MPACTION:	
	ı						
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	y	VED			NO	
SAMPLE NU	HOLE	LA	/ER	% MOISTURE	TIN	NU	

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

2004/01/28

91-0059-15

DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

	_						
	SAMPLE	No		SAMPLE INFORMATI U4286 (E3006)	ION & PROPERTIES		
CONTA		FOR SAMPLING		Black Sampling Bags			
SIZE	E / WEIGHT	OF SAMPLE		±70kg's			
	ISTURE CON			Slightly Moist			
	AMPLE ON A						
HOL	E NO. / Km.	/ CHAINAGE AMPLED FROM		TP-H02 0-2700mm			
LAYER	DATE SAM	AMPLED FROM		2015/06/17			
	DATE REC	EIVED		2015/06/17			
	CLIENTS M.	ARKING		None			
	DESCRIP	TION					
	OF SAMP	LF		Light Reddish Orange			
	SAMI	66		Sand			
	(COLOUR 8	z TYPE)					
					EVES (TMH1 1986 : METHOD A1 (	a)	
		75	5.0	100			
SIEVE		63	3.0 3.0	100 100			
			7.5	100			
ANA -			5.5	100			
			0.0	100			
			3.2	100			
LYSIS			75	100			
(mm) (TMH A1a)		2.	00	99 93			
(TMH A1a)		0.4		6	1		
		0.0			1ETHOD A2 & A3 ; TMH1 1986, TI	MHA4 1974)	
ATTERBERG		LI	ATTERDERGE				
LIMITS		P	.I.	NP			
(TMH A2&A3)		LS	\$%				
	GM	U.D.	D.*	1.02			
CLASSIFI -		H.R COL	в .TO*	G9			
CATION			I. 14*	<u> </u>			
	CALIFORN				ED COMPRESSIVE STRENGTH (TM	IH1 1986 : METHOD A7. A1-	4) (ITS A16T)
MOD AASHTO		OM		5.0		,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
(TMH A7)			(G/M3)	1803			
			P MC	4.9			
C.B.R.			VELL 0%	0.02			
U.C.S.		98		16			
(TMH A13T)			'%	15			
C.B.R.		95	5%	13			
(TMH A8)		93		10			
MOF		90	1%	6			
		kPa) (A16T)		N/A			
	OCTOR ITS :		(AD	N/A			
STABILISED			LAB	Neet			
WITH	TEST T	UN :	SITE	Neat			
	SAMPLE			Roadlab			
	DELIVER			Roadlab			
SAM	APLED ACCO			Clients Requirements			
ENVIE		L CONDITION		Sunny			
	WHEN SAM	MPLED		Suility			
	REMARKS &	NOTES		None			
					1		
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:	DEDWI			DIP 5	SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:	TM11 47	
TEST	DEPTH	FIELD DENS		FIELD	AASHTO		
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
	1				AVERAGE CO	JMPACTION:	
				MOISTURE	CONTENT		
SAMPLE NO	HOLE	LA	YER	% MOISTURE	TIN	NO	
					1		
1	1						

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01

91-0059-15

### DATE REPORTED :

2015/07/07

### TEST REPORT : GEOTECHNICAL INVESTIGATION FOR MBSA HIGH SPEED PROVING GROUND - CBR TEST RESULTS

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

				SAMPLE INFORMATI	ION & PROPERTIES		
	SAMPLE			U4288 (E3006)			
		FOR SAMPLING OF SAMPLE		Black Sampling Bags			
MOI	STURE CON	IDITION OF		±70kg's			
	AMPLE ON A			Slightly Moist			
		/ CHAINAGE		TP-H05			
LAYER	DATE SAM	AMPLED FROM		0-700mm 2015/06/17			
	DATE REC	EIVED		2015/06/17			
(	CLIENTS M			None			
	DESCRIP OF						
	SAMP	LE		Light Reddish Orange			
	(001 0110 0			Sand			
	(COLOUR 8	a TYPE)	CDA	DINC ANALVEIS 0/ DACCINC CIT	EVEC (TMUL 1006 - METHOD AL	(2)	
		79	<b>GR</b> A 5.0	DING ANALYSIS - % PASSING SIE 100	EVES (IMH1 1986 : METHOD AT	(a)	
SIEVE		63	3.0	100			
			3.0	100			
ANA -			7.5 5.5	100 100			
			9.0	98			
			3.2	96			
LYSIS (mm)		4.	75 00	95 94			
(TMH A1a)			425	87			
(			)75	8			
				IMITS ANALYSIS (TMH1 1986 : M	IETHOD A2 & A3 ; TMH1 1986, T	MHA4 1974)	
ATTERBERG LIMITS		LL P	-% 1	NP			
(TMH A2&A3)		LS	5%	111			
	GM			1.11			
CLASSIFI -			L.B.* LTO*	G9			
CATION			I. 14*	G9 G9			
	CALIFORN			: METHOD A7, A8) / UNCONFINE	ED COMPRESSIVE STRENGTH (T	MH1 1986 : METHOD A7, A14)	(ITS A16T)
MOD AASHTO		OM	IC%	6.7			
(TMH A7)		MDD(F	KG/M3) P MC	1843			
C.B.R.			VELL	6.8 0.02			
Gibita			0%	16			
U.C.S.			3%	13			
(TMH A13T) C.B.R.			7% 5%	9			
(TMH A8)			8%	7			
			)%	5			
		kPa) (A16T)		N/A			
STABILISED	JUTOR ITS :	DRY (kPa)	LAD	N/A			
WITH			LAB SITE	Neat			
with	TEST T		5111	Neut			
	SAMPLE	D BY		Roadlab			
CAN	DELIVER	ED BY		Roadlab			
		ORDING TO L CONDITION		Clients Requirements			
	WHEN SAN			Sunny			
	REMARKS 8			None			
F	CEMPRICS &	CINULES		NOTE			
TESTED BY : ROAD / AREA TESTED : LAYER TESTED : TRACK NO:	DEDMI				SAMPLING METHOD : TEST METHOD : DATE TESTED : WEATHER CONDITIONS:		
TEST	DEPTH	FIELD DENS		FIELD	2	) TMH A7	
POSITION	TESTED	WET DENSITY	DRY DENSITY	MOISTURE(%)	MDD(kg/m <sup>3</sup> )	OMC(%)	
					AVERAGE C	OMPACTION:	
	· · · · · · · · · · · · · · · · · · ·			MOISTURE	CONTENT		
SAMPLE NO	HOLE	LAY	YER	% MOISTURE	TIT	N NO	
1	1	1					

# MOD SAMPLE TAKEN AT THIS POINT/ PREVIOUS LAYER TESTED FOR MOD

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE

199 BRYANSTON DRIVE, BRYANSTON



RL-S-150-01



91-0059-15

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE 199 BRYANSTON DRIVE, BRYANSTON

## ATTENTION:

MR. E VAN ZYL

Test Report :

## MBSA HIGH SPEED PROVING GROUND - PH & CONDUCTIVITY TESTS

Clients Marking: None Sample Number: U4284 - U4295 Sample delivered to: Roadlab

Date Sampled: 2015/06/15

2015/07/22

Date Received: 2015/06/15

Sample Number	Layer / Road :	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) : pH	pH Value
U4284 (E3006)	0-3500mm	20.2	0.02	20.2	7.80
U4285 (E3006)	0-2500mm	23.0	0.03	23.0	7.8
U4290 (E3006)	0-800mm	20.0	0.03	20.0	7.90
U4293 (E3006)	0-1000mm	20.0	0.01	20.0	8.1
U4295 (E3006)	0-700mm	23.4	0.02	23.4	7.6
	I	1		1	PAGE 1/1

### Remarks :

The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Compiled By : Chanel van Biljon



91-0059-15

WSP PARSONS BRINCKERHOFF DEVELOPMENT, TRANSPORTATION AND INFRASTRUCTURE, AFRICA WSP HOUSE, BRYANSTON PLACE 199 BRYANSTON DRIVE, BRYANSTON

## ATTENTION:

MR. E VAN ZYL

Test Report :

## MBSA HIGH SPEED PROVING GROUND - PH & CONDUCTIVITY TESTS

Clients Marking: None Sample Number: U4275 - U4297 Sample delivered to: Roadlab

Date Sampled: 2015/06/10

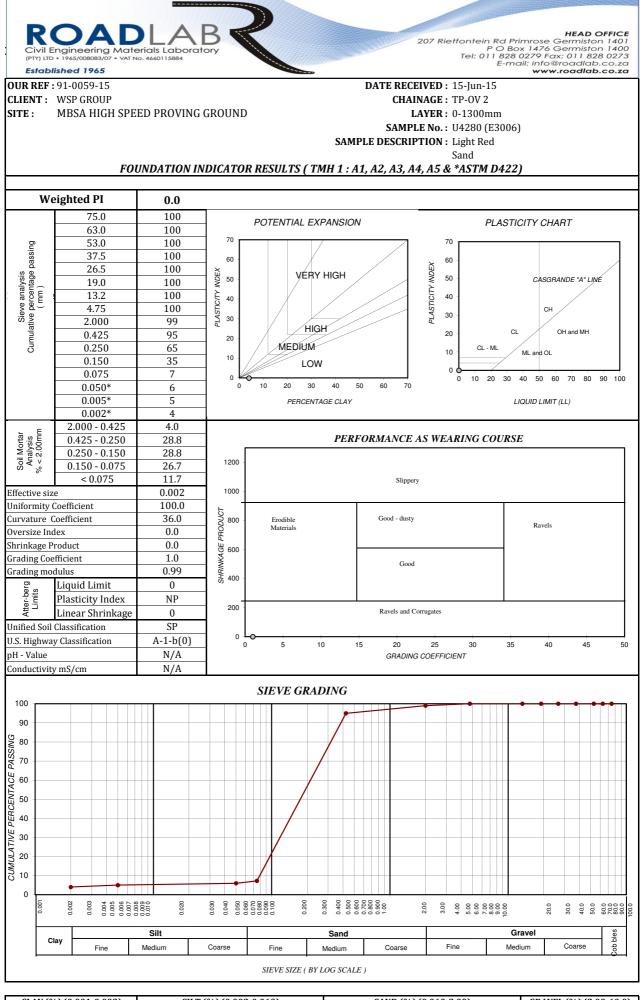
2015/08/06

Date Received: 2015/06/10

Sample Number	Layer / Road :	Temperature (°C) : Conductivity	Conductivity (ms/m)	Temperature (°C) : pH	pH Value
U4275 (E3006)	1100-2500mm	21.4	0.1	21.4	8.4
U44278 (E3006)	600-2600mm	20.4	0.2	20.4	8.4
U4283 (E3006)	1400-3100mm	22.0	0.0	22.0	8.5
U4294 (E3006)	100-800mm	20.5	0.0	20.5	8.3
U4297 (E3006)	500-1900mm	20.1	0.00	20.1	8.4
	1				PAGE 1/1

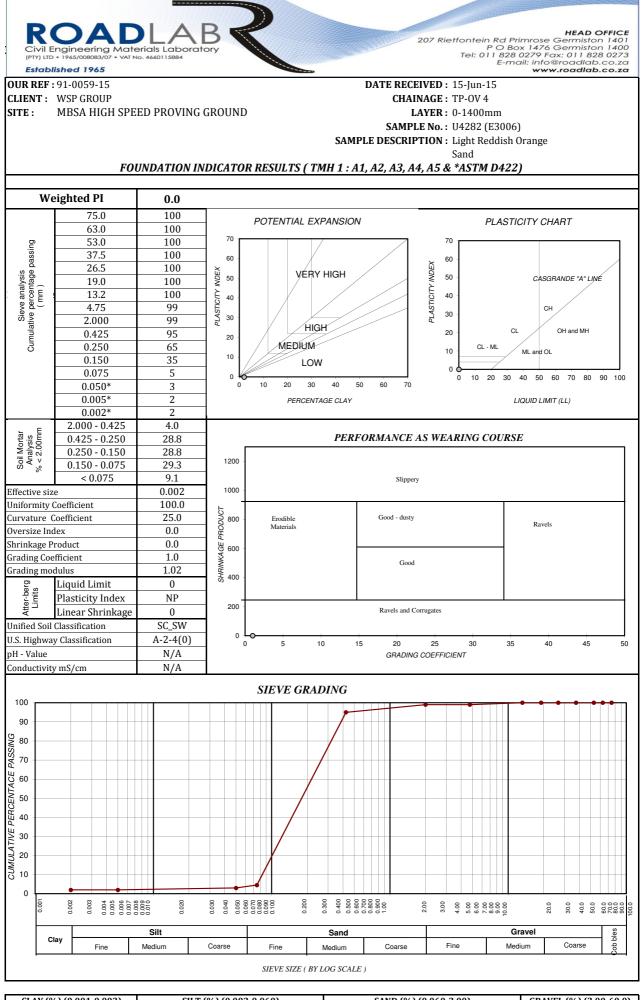
### Remarks :

The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Compiled By : Chanel van Biljon

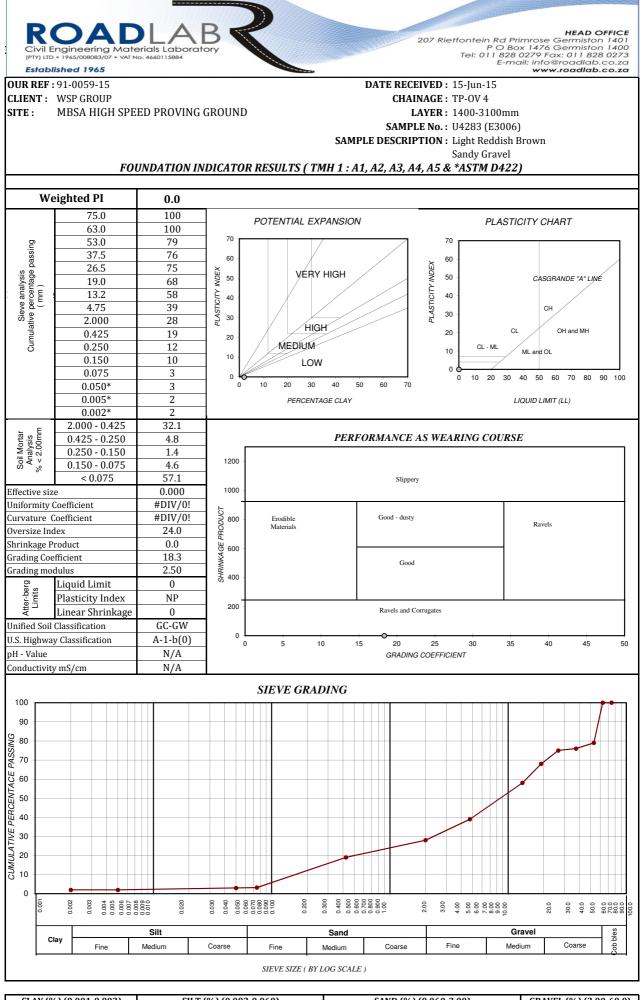


 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 4.0
 3.2
 91.8
 1.0

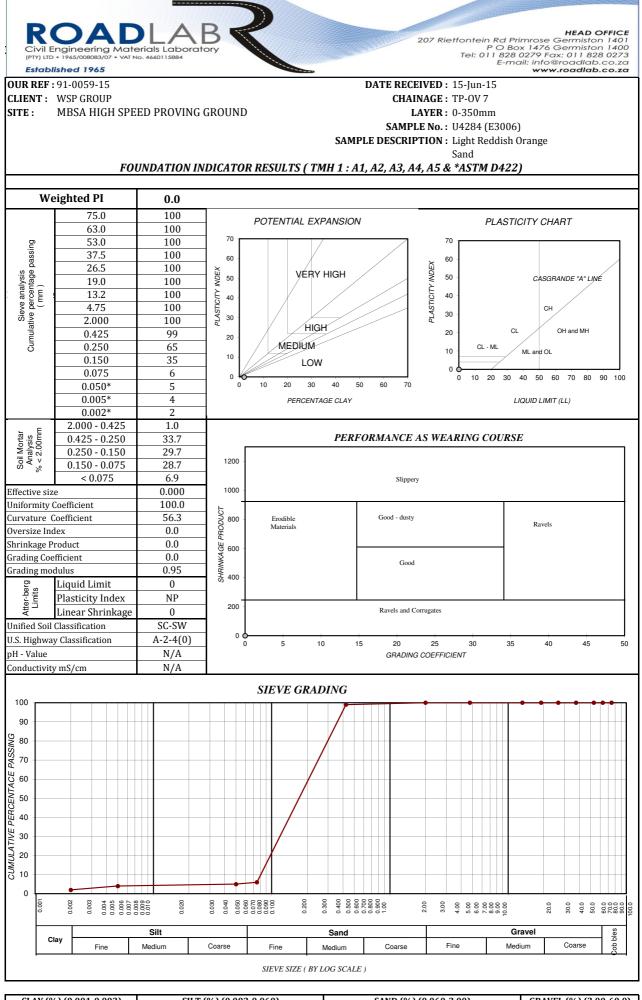


CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.0	2.5	94.5	1.0

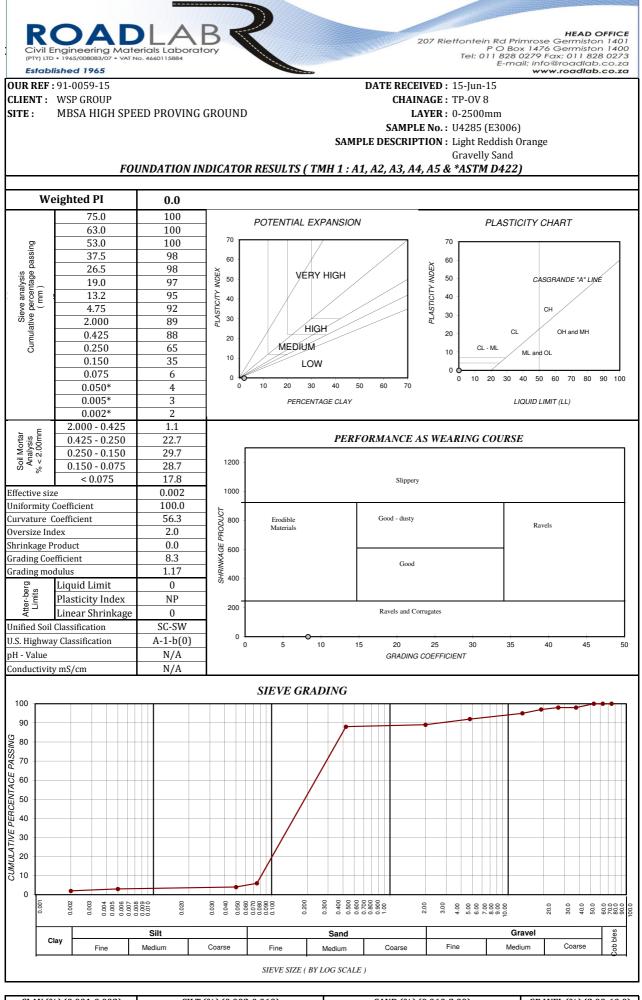


 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 2.0
 1.2
 24.8
 72.0

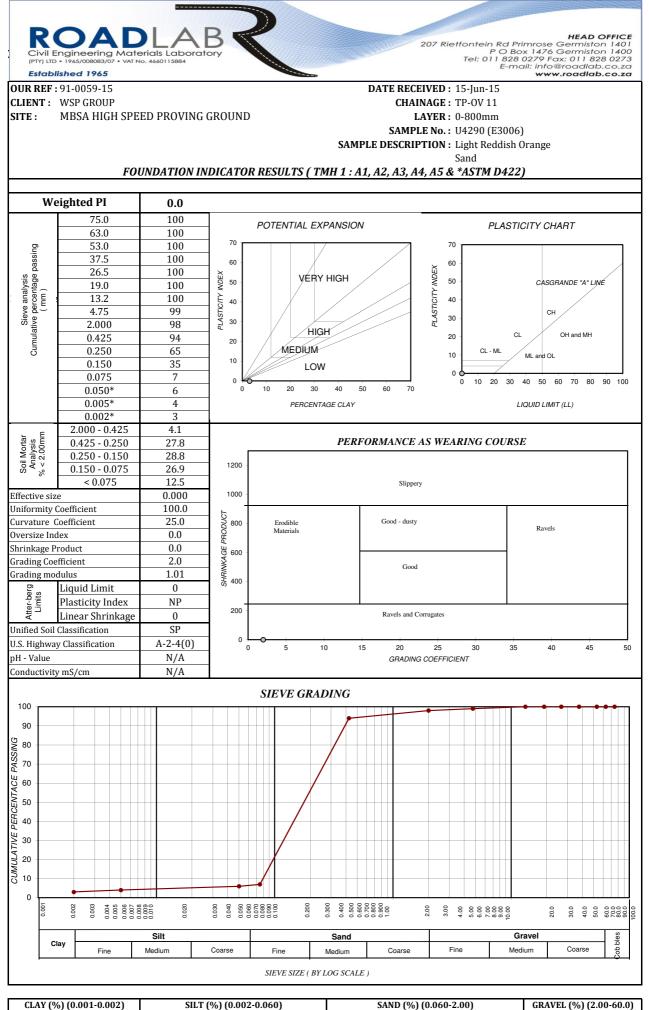


CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
2.0	4.0	94.0	0.0

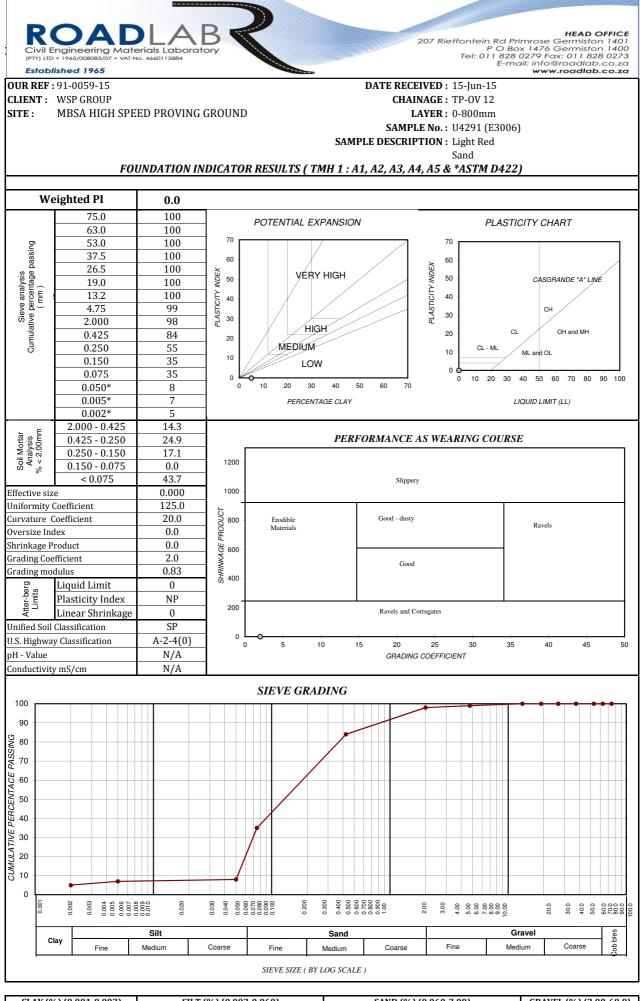


 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 2.0
 4.0
 83.0
 11.0

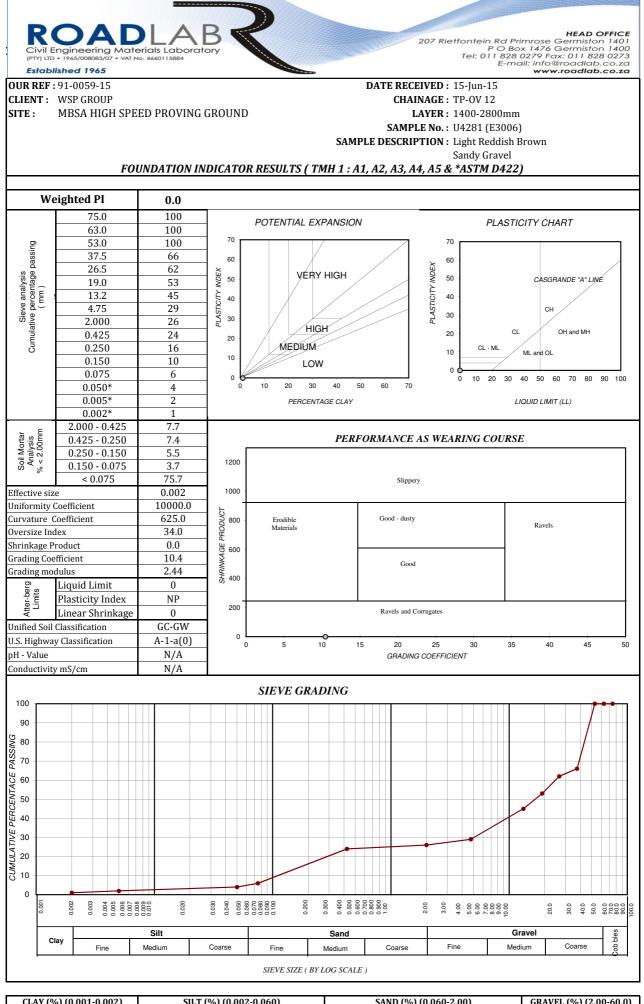


 3.0
 4.0
 91.0
 2.0

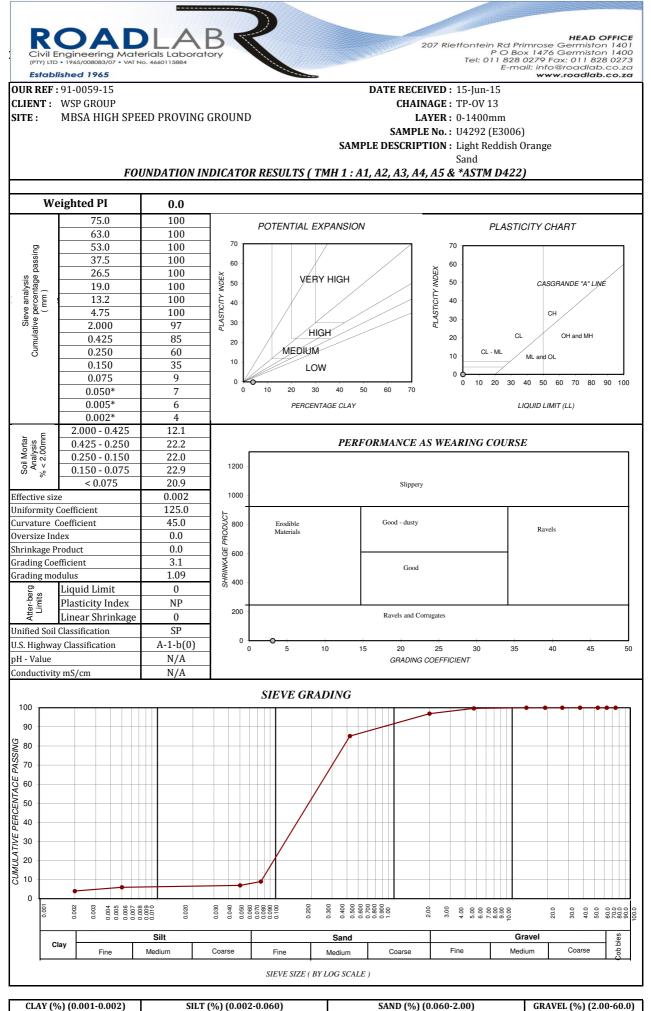


 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

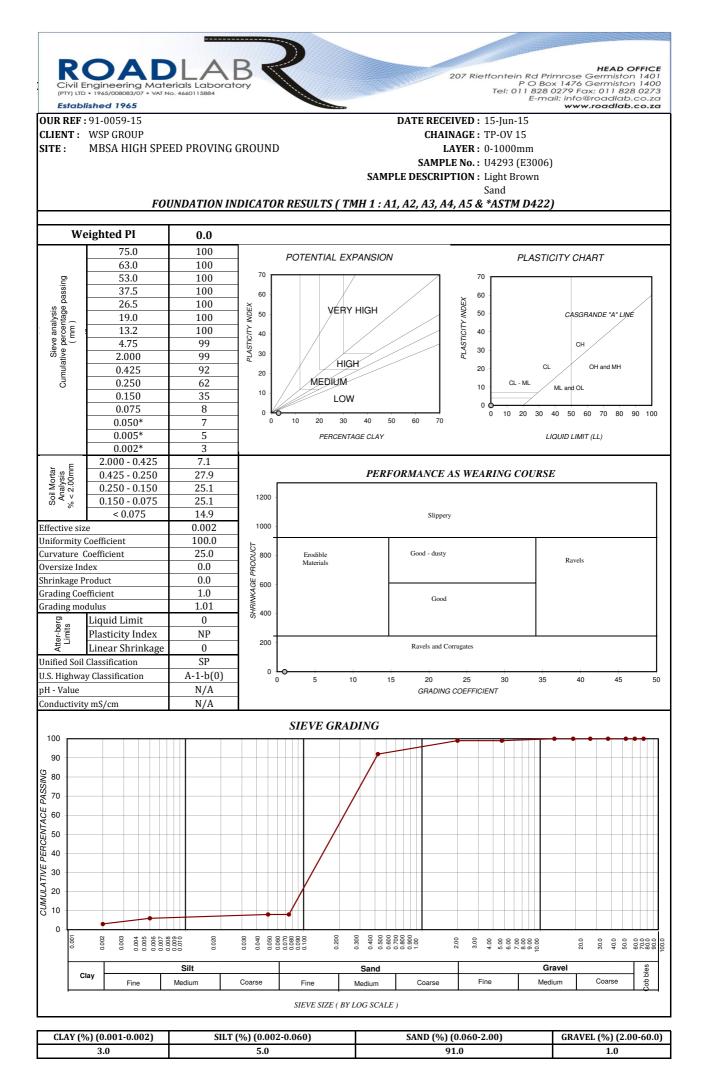
 5.0
 30.0
 63.0
 2.0

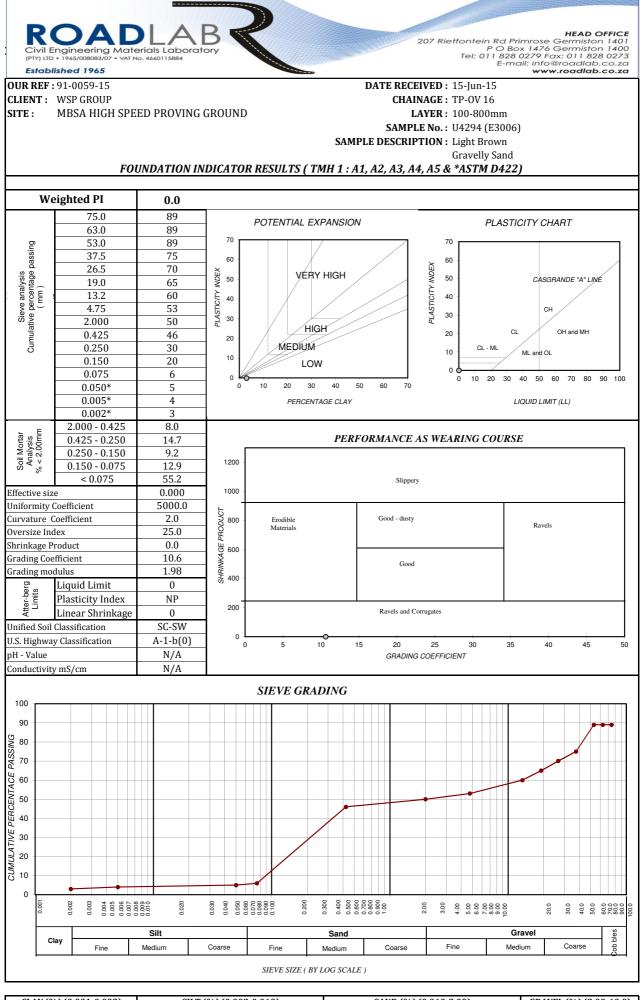


CLAT(%)(0.001-0.002)	SIL1 (%) (0.002-0.000)	SAND (%) (0.000-2.00)	GRAVEL (%) (2.00-00.0)	
1.0	5.0	20.0	74.0	



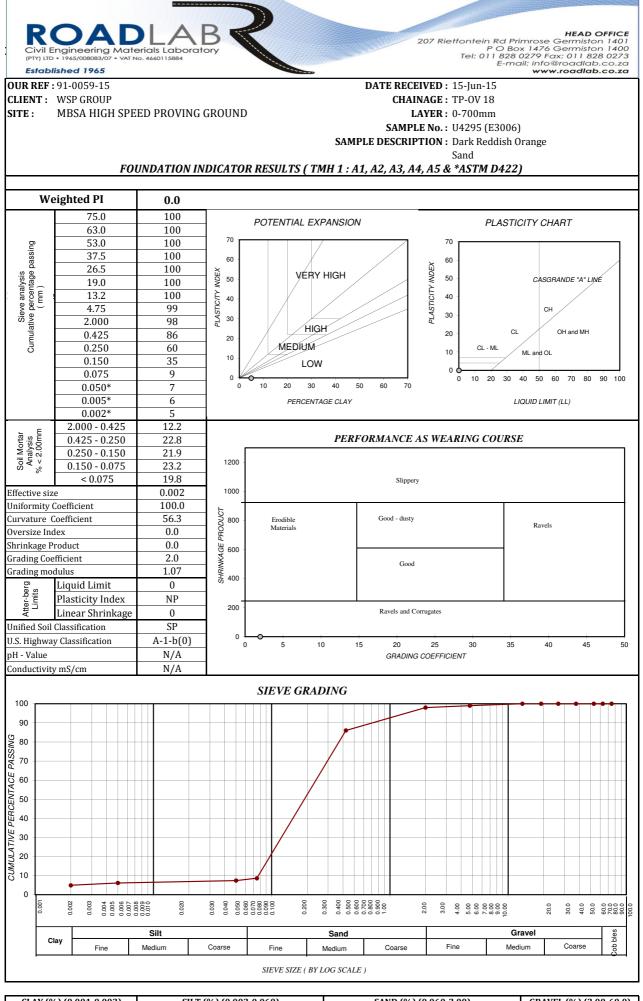
 4.0
 5.0
 87.9
 3.1





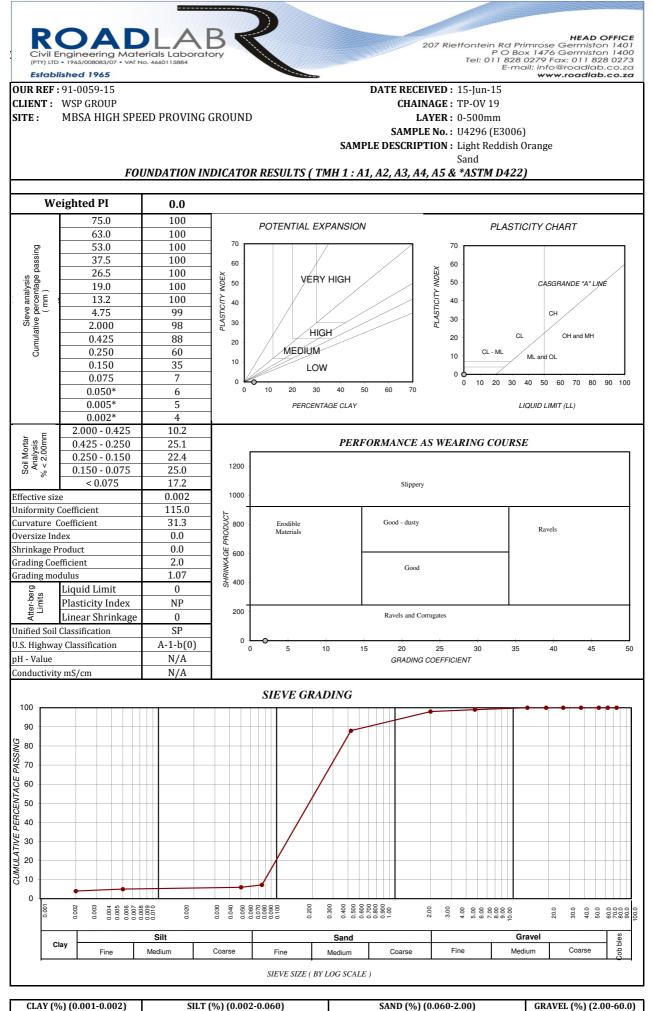
 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 3.0
 3.0
 44.0
 39.0

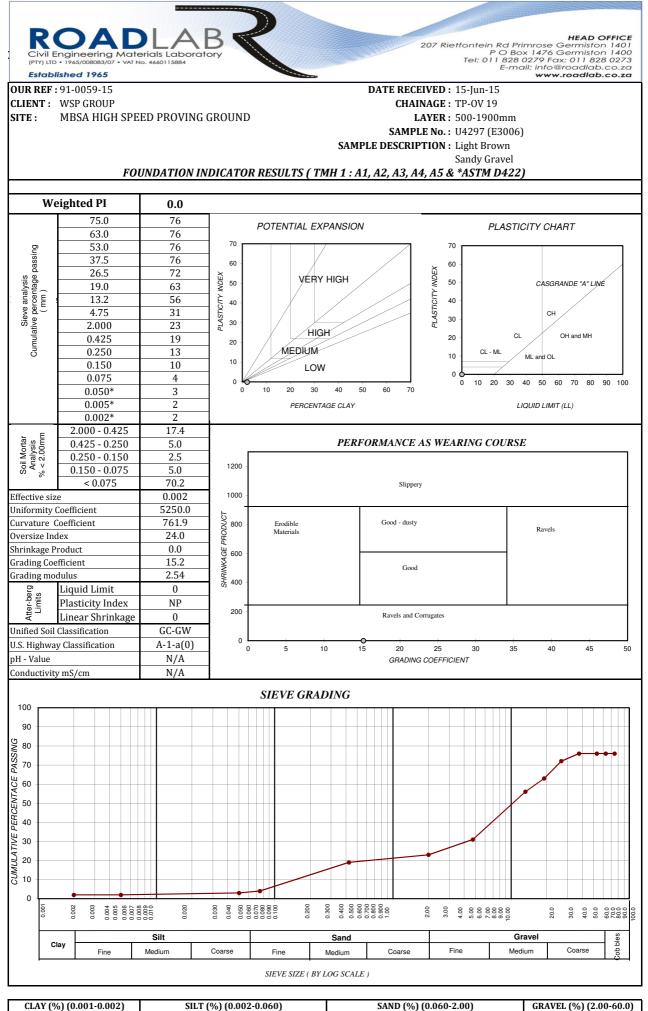


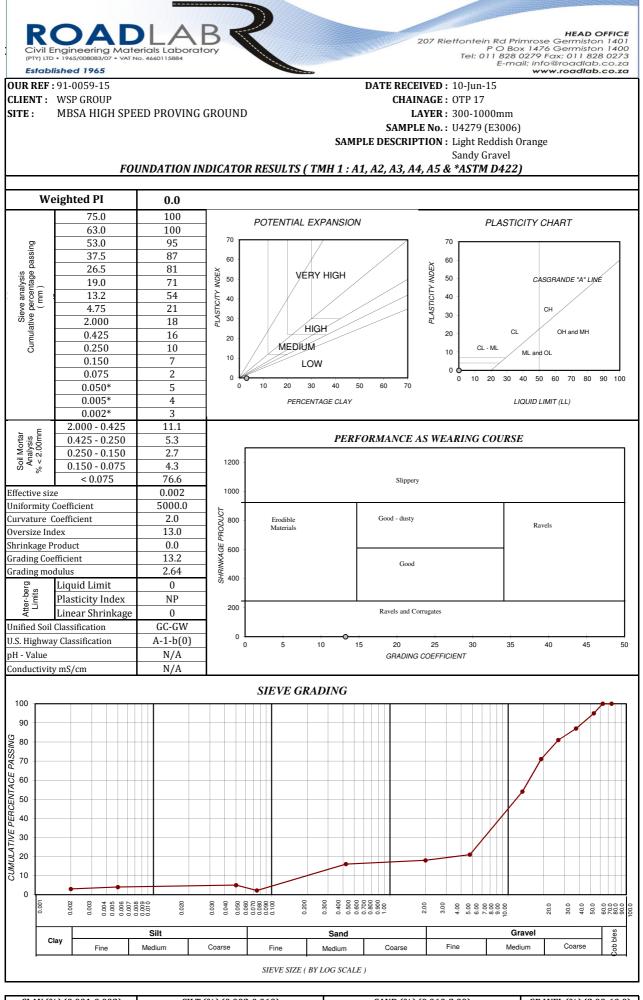
 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 4.9
 3.7
 89.4
 2.0



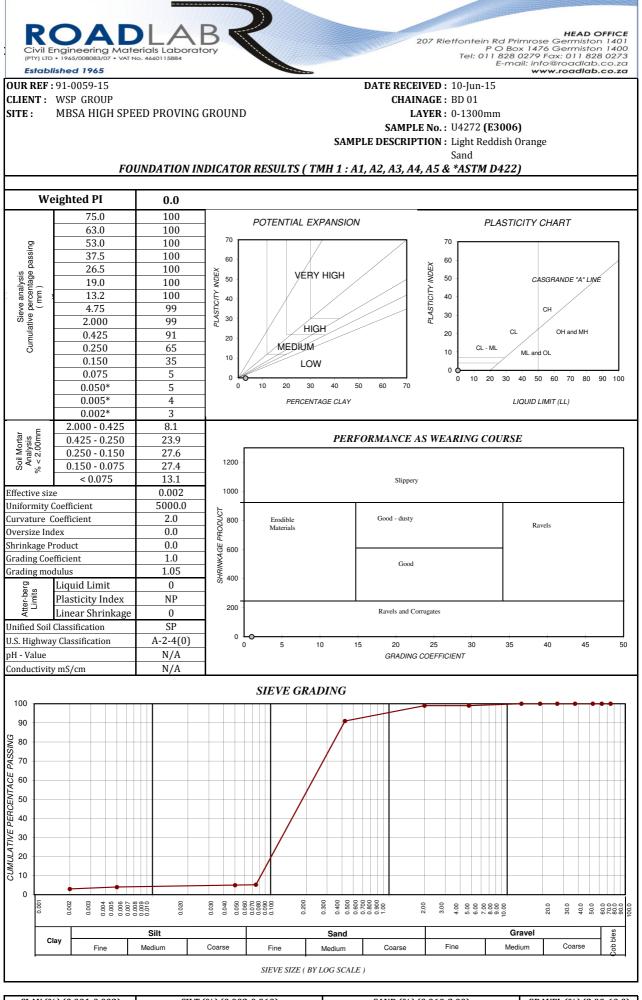
 4.0
 3.2
 90.8
 2.0



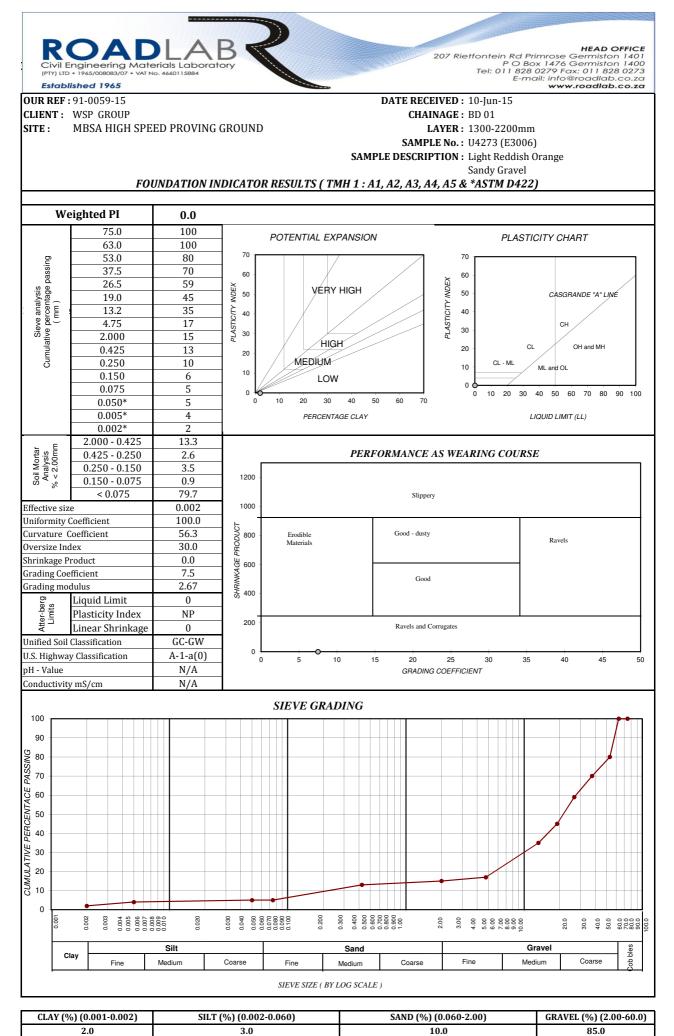


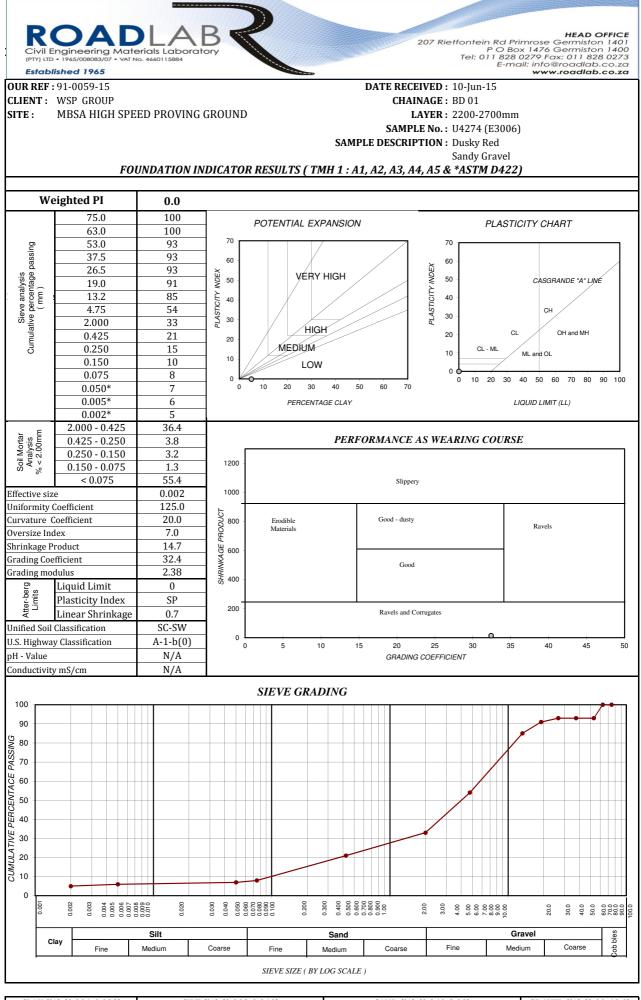
 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 3.0
 -0.8
 15.8
 82.0

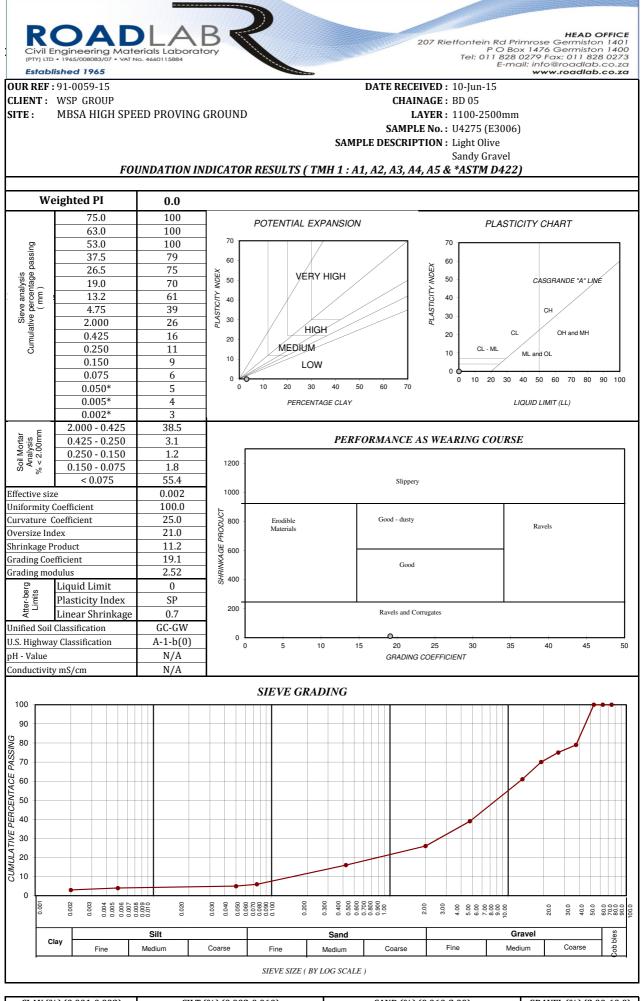


CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.0	2.2	93.8	1.0

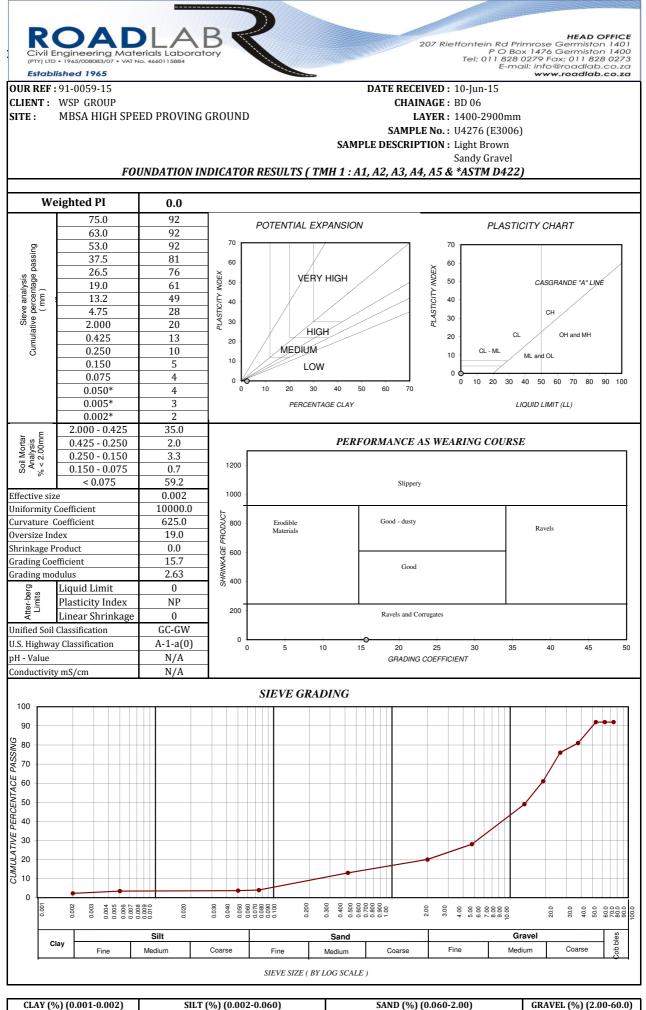


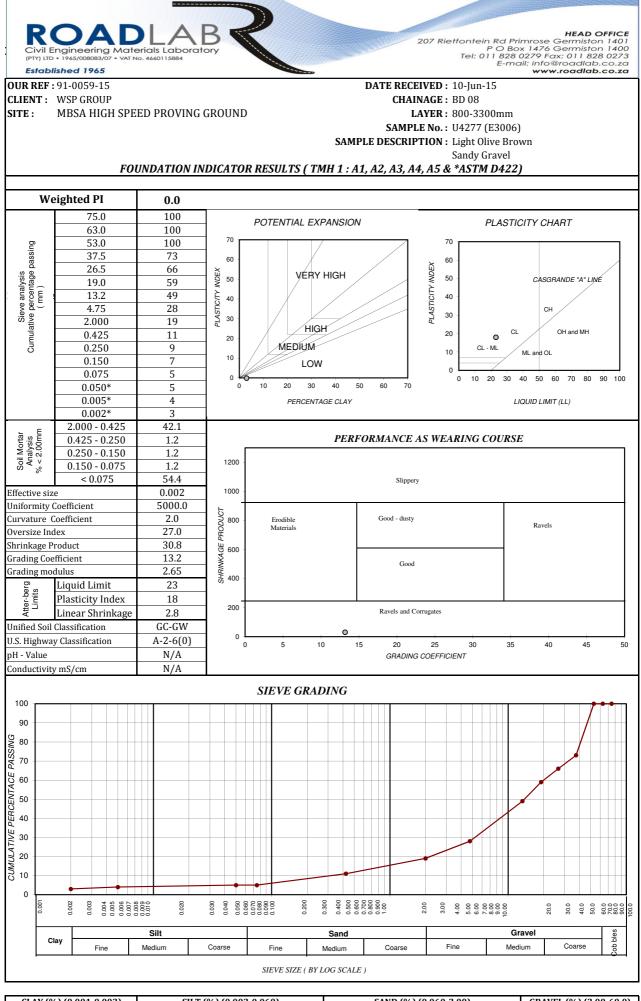


CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
5.0	3.0	25.0	67.0



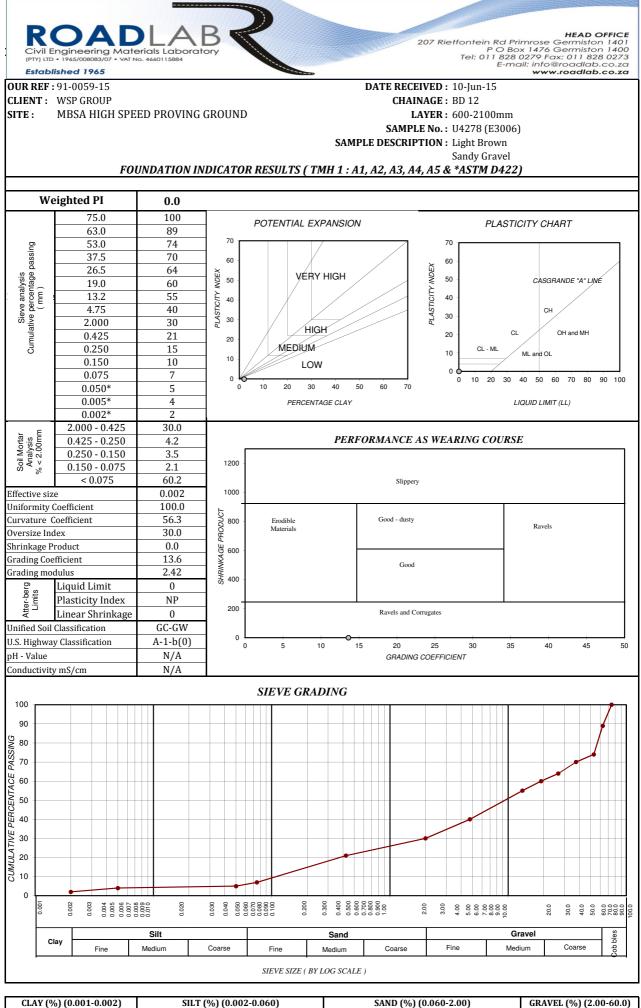
CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
3.0	3.0	20.0	74.0

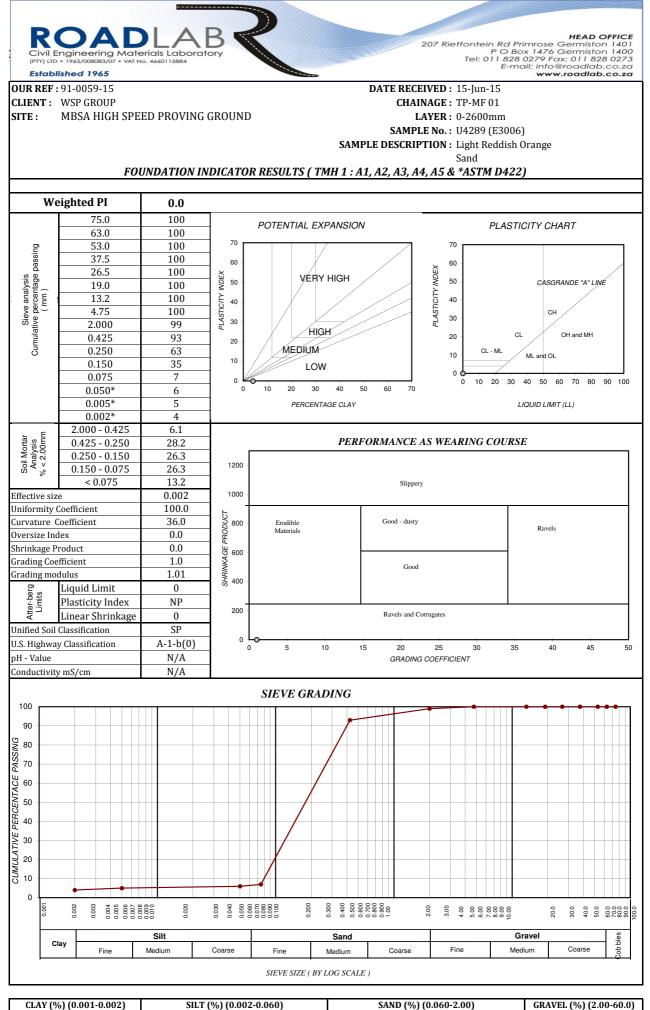




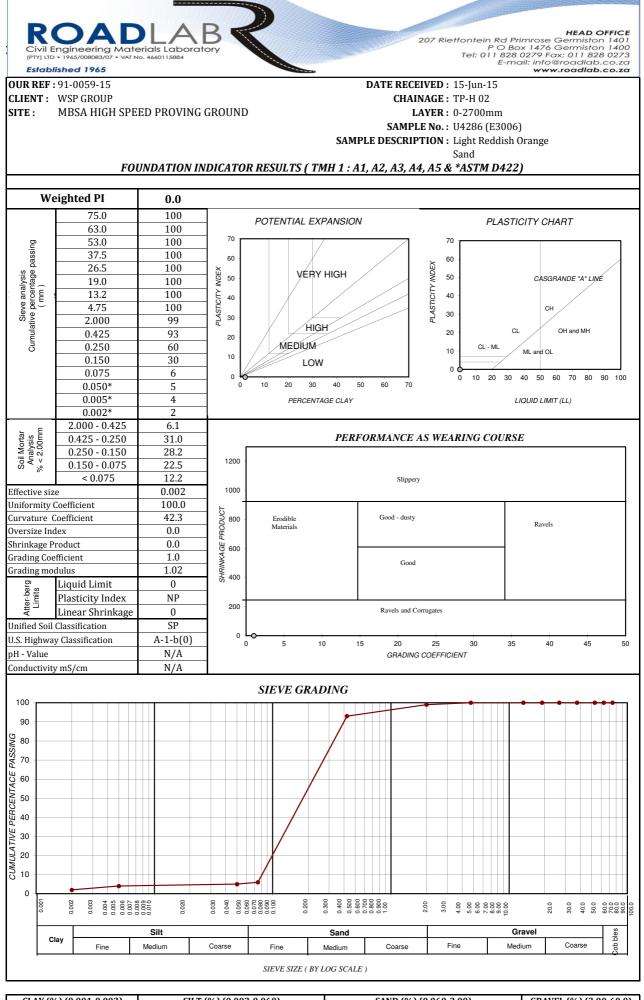
 CLAY (%) (0.001-0.002)
 SILT (%) (0.002-0.060)
 SAND (%) (0.060-2.00)
 GRAVEL (%) (2.00-60.0)

 3.0
 2.0
 14.0
 81.0

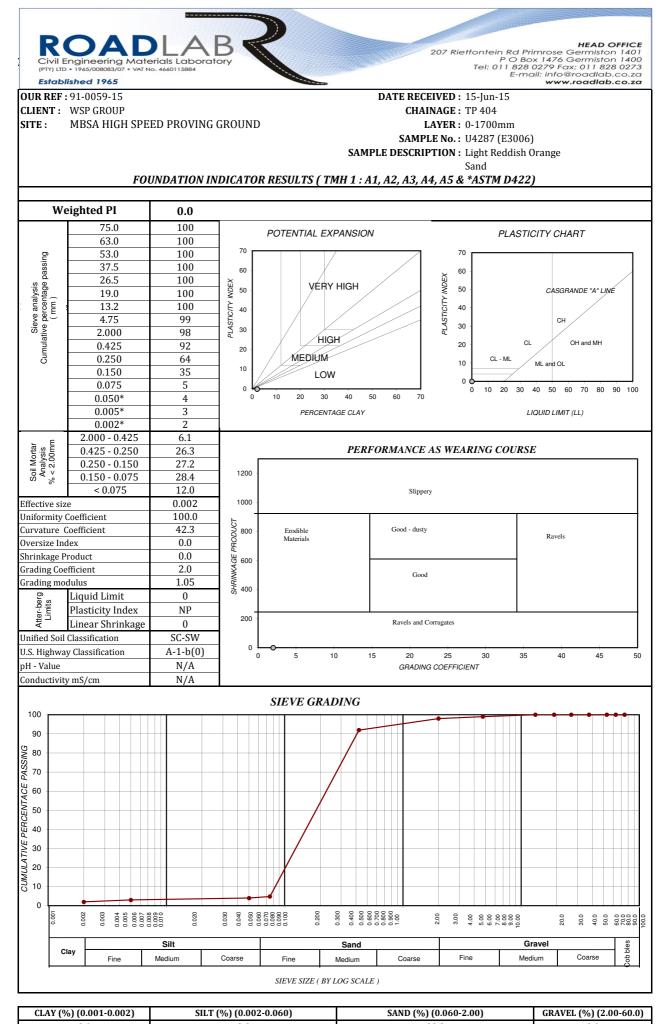


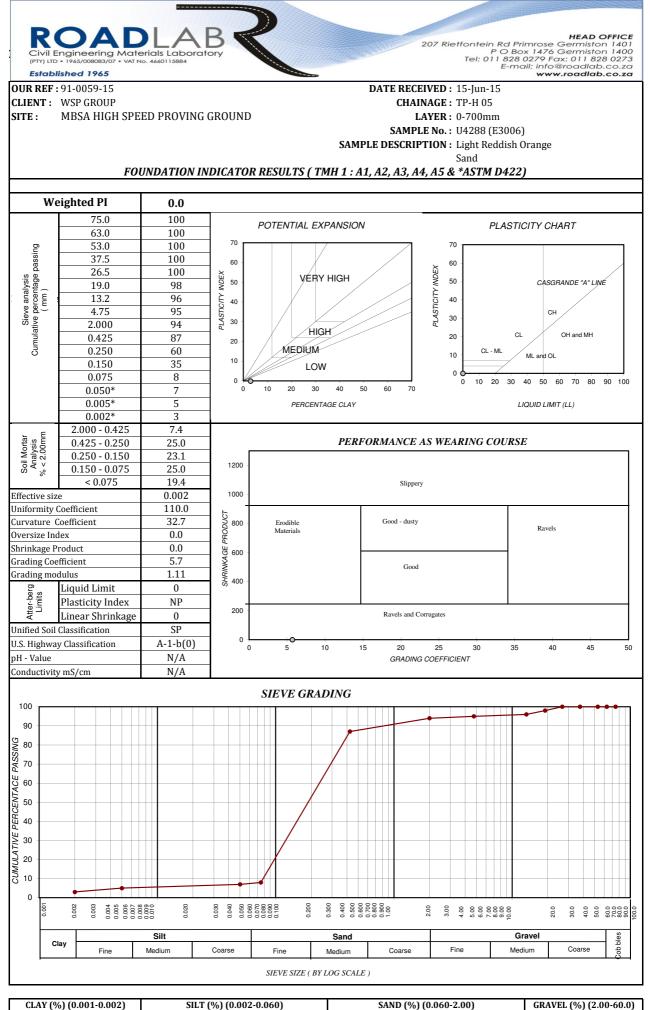


 4.0
 3.0
 92.0
 1.0



2.0 4.0 93.0 1.0	CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
	2.0	4.0	93.0	1.0





 3.0
 5.0
 86.0
 6.0

# **BD08** TEST AND RE-TEST RESULTS

			<u>F</u>	<u> Rev - 01</u>		Benc	h Form - RLPHU - 2	
	ABJV BJV - Upington		TTERBERG 1 Method A	LIMITS			Premíses 105 Olyvenhoudtsdri Upington 880 Tel: 054 334 083	
CLIENT	WSP		JOB NO	······································		3006		
PROJECT	Engenar	<u></u>		IMBER		+277		
DATE RECEIVED	10/06/15	· · · · · · · · · · · · · · · · · · ·		m. / CHAINAGE		08.		
DATE REPORTED	16/06/15.	anna Maria Pierra Madan	– ROAD No. C	R NAME		idg Åre	 ?O	
MATERIAL DESCRIPT	TON deartsitic	STONE	- LAYER TESTI	ED / SAMPLED		0.8-3		
TECHNICIAN		MBER MASS (	DF SOIL FINES	CASEGRAND	EMACHINE	GROVING		
Nours	Sci - 10		50g	731		C151	01-03	
				Checked: Mar	iti	Checked Quiu	Checked: UGutu	
SOIL CONS	STANTS		LIQUID LIMIT			PLASTIC L	IMIT	
CONTAINER	NUMBER	6	7	8	9		10	
MASS OF WET	MATERIAL	16.42	17.18	17.93	:24	, વ્યુ	23.29	
MASS OF DRY	MATERIAL	15.98	16.62	17.20	23	. 28	21.89	
MASS OF CO	NTAINER	13.99	14.19	14.07	ių.	12	14-10	
MASS OF MO	DISTURE	0.48	0-6	0. 73	1-6	5	1.40	
MASS OF DRY	MATERIAL	1.09	2.43	3.13.	۹.:	16	7.79	
MASS OF W	ATER MŁ	12.3	13.5	13.8				
% MOIST	URE	æ	23	23	<u> </u>	8	18	
NUMBER O	F TAPS	34	26	ઞ			*	
MEAI	۷ 		ļ					
LIQUID LIM		Pl	ASTIC LIMIT ( P	上)		PLASTIC INDE	X ( PI )	
			18			5	(1.07.0)	
TROUGH N	umber T <sub>i</sub> S		SHRINKAGE mm	1		INEAR SHRINI	AGE %	
5	10 15	Number 200			30			
Checked By Sr. Materiak	s Technician			pproved By Mana	ger	· ·		
Compiled By: M.Steyn		Ap	proved By: J.Steyn				Page 1 of	

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T.

JUI-14				Re	<u>ev-01</u> R	etojt	Benc	<u>h Form - RLPI</u>
			TERBERG Method At	LIMITS	JU 20	•	Premise Olyvenhou Upingto Tel: 054 33 on@prehab	
CLIENT	Wep	<u> </u>		JOB NO		Ē	2300b	
PROJECT	Engenaux	-		- SAMPLE NU	MBER	J	14277	
DATE RECEIVED	10/06/15			- HOLE No. / Kn	n./CHAINAGE	- F	30/08	
DATE REPORTED.	16/05/15.			ROAD No. O	R NAME	Bla	de Are	q
MATERIAL DESCRIF	PTION Trant Olise	50	tone	LAYER TESTE	D / SAMPLED F	ROM	0.8-3	3:3
TECHNICIAN		/BER		F SOIL FINES	CASEGRANDE	EMACHINE	GROVING	G OVE
Mantu	5(1-10			509	(3)	,,	ai I	OV.
	1 0-				Checked Ma	ty.	Checked: Mant	Checked:
SOIL CO	NSTANTS	 	<b></b>	LIQUID LIMIT			PLASTIC	
CONTAINE	ER NUMBER		16	in	18	i9	; ;	20
MASS OF W	ET MATERIAL		.80	16.08	16.55	26	5.50	26.15
MASS OF DI	RYMATERIAL	15.	. 4j6	is-68	16.13	24	61	24.21
MASS OF	CONTAINER	13	. 91	14-20	14.44	14	01 _	13.90
MASS OF	MOISTURE	0	). 34	0.40	0.42	1.89		1-80
MASS OF D	RY MATERIAL	1	1.55	1.67	1.68	. i0.51		10.2
MASS OF	WATER ML	1	2-4	14.0	15.0			
% MO	% MOISTURE		22	24	25		18	18 *
NUMBER	R OF TAPS		34	24	22			
M	EAN				-			
LIQUID	LIMП (LL_)		PI	LASTIC LIMIT ( F	<u>،</u> L)		PLASTIC INC	
	24			13		<u></u>	6-0 LINEAR SHRI	
TROUG				SHRINKAGE MI	<u>n</u>			.9
	51.9			47.1				
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3 3						╞╼┥┊╼┥╌╴╽		
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						<del>╎╸╸┥╸┥╹╺┥</del>		
Ž iù					<u>─</u> ┟──┴──┼──┤──	<u>i</u>		
5    5	10, 15	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	umber <sup>2</sup>	Equit and	25 .	30	35	
MISI								
1 11/1/1/ Delu	<u> 10/14</u>			· · · · · · · · · · · · · · · · · · ·	Approved By Mar	lager	<b>-</b> .	
Checked By Sr. Mate	snais recinician			pproved By: J.Steyn	-			F
Complete by Moleyn								
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i i				'				

# APPENDIX D BOREHOLE LABORATORY RESULTS



### Established 1965

95/WSP003/08/0001/15

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

### ATTENTION: Mr. Willem Du Toit

Dear Sir

### Test Report: UPINGTON : AGGREGATE TEST RESULTS

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

	SAMPLE NO		15/A520	15/A520	15/A521		XRD	
(	CONTAINER USED FOR S		Plastic Sampling Bag	Plastic Sampling Bag	Plastic Sampling Bag			
	MOISTURE CONDITIO SAMPLE ON ARRIV		Dry	Dry	Dry			
	DEPTH (M) / KM OR CHA		3.90 - 4.20 & 4.75 - 5.30	7.70 - 7.90,11.75 - 12.00	2.55 - 3.20 & 5.50 - 5.60			nilling the
			5.50 - 4.20 & 4.75 - 5.50	& 13.00 - 13.4	2.00 - 0.20 & 0.00 - 0.00			red for XRD ackloading
	ROAD NO OR NAM		Upington	Upington	Upington			nod.lt was
	LAYER TESTED / SAMPLE		Not Specified	Not Specified	Not Specified	analysed	with a P	ANalytical
	DATE SAMPLED DATE RECEIVED		N/A	N/A 08/07/2015	N/A	Empyrean	diffracto	ometer with
C	LIENTS MARKING / BORE		08/07/2015 BH 1-A (Top)	08/07/2015 BH 1-B (Bottom)	08/07/2015 BH2 A (Top)		erctor ar e filterec	d fixed slits
0	REQUEST NO.		F-64	F-64	F-64			ases were
	DESCRIPTION						ed using	
	OF					Highscore	plus so	ftware.The
	SAMPLE (COLOR & TYPE)		Light Grey Crushed Core	Light Grey Crushed Core	Light Grey Crushed Core		ative ph	
	(COLOR & ITPE)		Crushed Core	Crushed Core	Crushed Core			1%)were ne Reitveld
								e on the 3
								column to
						the right	of the a	mount (in
						wei	ght per o	cent)
							CIFICA	
	NOMINAL SIZE OF ST	UNE	ACCUMULATIVE % PASSING	ACCUMULATIVE % PASSING	ACCUMULATIVE % PASSING	MIN	-	MAX
	75.0		ACCONDLATIVE % FASSING	ACCOMULATIVE /0 FASSING	ACCOMULATIVE /0 FASSING	1	-	
	53.0						-	
	37.5						-	
	26.5						-	
0 4	19.0						-	<sup> </sup>
1 B,	13.2 9.5						-	<u> </u>
Sieve size (mm) TMH 1 B4	6.7						-	
,≊ ⊂ Si	4.75						-	
	2.36						-	
	1.18						-	
	0.600						-	
	0.150						-	
Dust %	6 0.075						-	
			<u>_</u>					
FM ACV (%)-	- DRY #	[B13] [SANS 5841:2008]			15.7%		-	-
	(kN)-DRY #	[SANS 5841:2008] [SANS 5841:2008]			64 kN		-	
ACV (%)-	- WET	[B2]					-	
	( kN ) - WET	[B2]					-	
	ycol Durability Index #	[B8105]					-	
Flakiness In Organic Mat	idex(%) terial(Y/N) #	[B3] [B6]	No - Lighter	No - Lighter	No - Lighter		-	
	Blue Adsorption #	[SABS SM 1243*]	0.1 ml/g	0.1 ml/g	0.2 ml/g		-	
Loose Bulk	Density Kg/m3 #	[B9]	5.1 m/g	5.1 m/g	5. <u>–</u> 1110g		-	
Compacted	Bulk Density Kg/#	[B9]					-	
Bulking Fac							-	
Shrinkage (		[B10]					-	
Expansion ( Del. Subs (		[B10] [B12]					-	
Soluble salt		[B16]					-	1
Binder Abso	orption % #						-	
	Dimension:(mm)	[B18(a)]					-	
Sand Equiva	alent (%) # elative density Kc#	[B19]					-	
pH	elative density K <u>¢</u> #	COLTO 8108b [A20]					-	<u> </u>
Conductivity		[A21T]					-	
Chloride Co		[SANS 202:2006]		0.01%	0.01%		-	
Presence of	f Sugar *#	[SANS 5833:2006]	No Sugar		No Sugar		-	
ARD (-4.75r		[B15]					-	
BRD (-4.75r Water absor		[B15]					-	
	rption (%) imm) Kg/m3	[B15] [B14]					-	1
	imm) Kg/m3	[B14]					-	
Water absor	rption (%)	[B14]					-	
Mg2SO4 Sc	oundness #	[839]					-	
Polished Sto	one Value #						-	
XRD Chlorite *#			6.64 - 1.38				-	
Diopside *#			3.81 - 0.84				-	<u> </u>
Microcline *			15.11 - 0.96				-	
Muscovite *	#		7.08 - 1.08				-	
Plagioclase	*#		28.94 - 1.08				-	
Quartz *#	thed used	TMH 5 #	38.41 - 1.11	NI/A	N1/A		-	
Sample Met	thod used ot a accredited test	IMH 5#	N/A	N/A	N/A	1	-	Page 1/3
	טו ע מטטו כעווכע וכטו							I aye I/J

 Sample Metriclo Sedu
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Kind Regards

Epes.

Mr Deon Juckers Technical Signatory



Remarks : Remarks : \* Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 Sanas Accredited Laboratory - T 0236 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Complied By : Miss Zandle Mokoena

RL-as-76-03

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## Established 1965

95/WSP003/08/0001/15

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

### ATTENTION: Mr. Willem Du Toit

Dear Sir

### Test Report: UPINGTON : AGGREGATE TEST RESULTS

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

	SAMPI			15/A521	15/A522	15/A522	REMA	RKS & I	NOTES
CO	NTAINER USE			Plastic Sampling Bag	Plastic Sampling Bag	Plastic Sampling Bag			
	MOISTURE CO SAMPLE ON			Dry	Dry	Dry			
D	DEPTH (M) / KM			6.30 - 7.45 & 8.68 - 8.85	2.03 - 2.65 , 4.70 - 5.22	6.40 - 6.95 & 12.25 - 12.45			
					& 4.45 - 4.70				
1.43	ROAD NO			Upington	Upington	Upington			
LA	DATE SA			Not Specified N/A	Not Specified N/A	Not Specified N/A			
	DATE RE			08/07/2015	08/07/2015	08/07/2015			
CLIE	ENTS MARKING	/ BORE		BH2 B (Bottom)	BH3 A (Top)	BH3 B (Bottom)			
	REQUE			F-64	F-64				
	DESCR								
	O SAM			Light Grey	Light Grey	Light Grey			
	(COLOR		E)	Crushed Core	Crushed Core	Crushed Core	SPF	CIFICAT	ΓΙΟΝ
	NOMINAL SIZ						MIN	-	MAX
	-			ACCUMULATIVE % PASSING	ACCUMULATIVE % PASSING	ACCUMULATIVE % PASSING			
	75.0							-	
	53.0 37.5							-	
	26.5							-	1
	19.0							-	
B4 E	13.2							-	
Sieve size (mm) TMH 1 B4	9.5							-	
MH (T	6.7							-	
s⊢	4.75 2.36							-	
	1.18							-	
	0.600							-	
	0.300							-	
	0.150							-	
Dust %	0.075							-	I
M		TMH 1	[B13]					-	
ACV (%)-	DRY #		[SANS 5841:2008]	19.6%	18.0%	18.3%		-	
10 % FACT	( kN ) - DRY	#	[SANS 5841:2008]	53 kN	56 kN	56 kN		-	
ACV (%)-			[B2]					-	
	(kN) - WET	dav #	[B2]					-	
-thylene Gly Flakiness Ind	ycol Durability In	uex #	[B8105] [B3]					-	<u> </u>
		#	[B6]	No - Lighter	No - Lighter	No - Lighter		-	
	Blue Adsorption #		[SABS SM 1243*]	0.15 ml/g	0.15 ml/g	0.1 ml/g		-	
oose Bulk	Density Kg/m3	#	[B9]	-		-		-	
	Bulk Density Kg		[B9]					-	
Bulking Fact		#	[D40]					-	
Shrinkage ( 9 Expansion ( 1		# #	[B10] [B10]					-	
Del. Subs ( %		#	[B12]					-	
Soluble salt	(%)	#	[B16]					-	
Binder Absor	rption %	#						-	
	imension:(mm)	4	[B18(a)]					-	
Sand Equiva	alent ( % ) elative density K	#	[B19] COLTO 8108b					-	
аррагент ке оН		#	[A20]					-	1
Conductivity	/ (ms/m)	#	[A21T]					-	
Chloride Cor	ntent *#		[SANS 202:2006]		0.01%			-	
Presence of			[SANS 5833:2006]		No Sugar			-	
RD (-4.75m RD (-4.75m	nm) Kg/m3		[B15]					-	
Vater absor			[B15] [B15]					-	<u> </u>
ARD (+4.75n			[B13]					-	1
BRD (+4.75n			[B14]					-	
Vater absor	rption (%)		[B14]					-	
	undness	#	[839]					-	
				1	1			-	1
Mg2SO4 Sou Polished Sto		#							
	ve (Y/N)	#	TMH 5 #	N/A	N/A	N/A		-	

# - Sanas method & TMH procedures used. Kind Regards

Q 6

Mr Deon Juckers Technical Signatory



Laboratory Manager

Remarks :

\* Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 Sanas Accredited Laboratory - T 0296 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Compiled By : Miss Zandile Mokoena

HEAD OFFICE 207 Rietfontein Rd Primrose Germiston 1401 P O Box 1476 Germiston 1400 Tel: 011 828 0279 Fax: 011 828 0273 E-mail: info@roadlab.co.za www.roadlab.co.za

30/07/2015



95/WSP003/08/0001/15

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

Dear Sir

### Test Report: UPINGTON : AGGREGATE TEST RESULTS

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

SAMPLE NO	15/A523	15/A523		XRD	
CONTAINER USED FOR SAMPLING	Plastic Sampling Bag	Plastic Sampling Bag	 		
MOISTURE CONDITION OF SAMPLE ON ARRIVAL	Dry	Dry	After split	tting & n	nilling the
DEPTH (M) / KM OR CHAINAGE	8.75 - 9.00 & 10.90 - 11.10	11.30 - 11.50			red for XRD
ROAD NO OR NAME	Upington	Upington	 preparati		ackloading
LAYER TESTED / SAMPLED FROM	Not Specified	Not Specified	analysed		
DATE SAMPLED	N/A	N/A	Empyrean	diffracto	meter with
DATE RECEIVED CLIENTS MARKING / BORE HOLE NO.	08/07/2015	08/07/2015	PIXcel dete	erctor an	d fixed slits
REQUEST NO.	BH 4-A (Top) F-64	BH 4-B (Bottom) F-64	with Fe radiation.	filtered	
DESCRIPTION	1 04	1 07		ed using	
OF			Highscore	plus so	ftware.The
SAMPLE	Light Grey	Light Grey	rela	ative pha	ase
(COLOR & TYPE)	Crushed Core	Crushed Core	amount	s(weigh	%)were
					e Reitveld
			method.E sigma leve		
			the right	of the ar	mount (in
			weig	ght per c	ent)
			SPE	CIFICAT	TION
NOMINAL SIZE OF STONE			MIN	-	MAX
	ACCUMULATIVE % PASSING	ACCUMULATIVE % PASSING			
75.0				-	
53.0 37.5				-	
26.5				-	
19.0				-	
13.2 N				-	
9.5			 	-	
8 E H 6.7 1 A 75				-	
io ⊨ <u>4.75</u> 2.36				-	
1.18				-	
0.600				-	
0.300				-	
0.150				-	
Dust % 0.075				-	
FM TMH 1 [B13]				-	
ACV (%) - DRY [B1]				-	
10 % FACT ( kN ) - DRY [B2]				-	
ACV (%)-WET [B2]				-	
10 % FACT ( kN ) - WET [B2]				-	
Ethylene Glycol Durability Index # [B8105]				-	
Flakiness Index (%)         [B3]           Organic Material (Y / N)         #         [B6]				-	
Methylene Blue Adsorption # [SABS SM 1243*]				-	
Loose Bulk Density Kg/m3 # [B9]				-	
Compacted Bulk Density Kg/# [B9]				-	
Bulking Factor #				-	
Shrinkage (%) # [B10]				-	
Expansion (%) # [B10] Del. Subs (%) # [B12]				-	
Del. Subs (%)         #         [B12]           Soluble salt (%)         #         [B16]				-	
Binder Absorption % #				-	
Ave.Least Dimension:(mm) [B18(a)]				-	
Sand Equivalent (%) # [B19]				-	
Apparent Relative density Kc# COLTO 8108b				-	
pH # [A20] Conductivity (ms/m) # [A21T]				-	
Conductivity (ms/m) # [A211] Chloride Content *# [SANS 202:2006]	0.01%			-	
Presence of Sugar *# [SANS 5833:2006]	No Sugar			-	
ARD (-4.75mm) Kg/m3 [B15]				-	
BRD (-4.75mm) Kg/m3 [B15]			 	-	
Water absorption (%) [B15]				-	
ARD (+4.75mm) Kg/m3 [B14]				-	
BRD (+4.75mm) Kg/m3 [B14] Water absorption (%) [B14]				-	
Mg2SO4 Soundness # [839]				-	
Polished Stone Value #				-	
XRD				-	
Chlorite *#		7.56 - 1.41		-	
Diopside *#		3.75 - 0.9		-	
Microcline *#		21.8 - 1.17		-	
Muscovite *#		4.13 - 1.2		-	
Plagioclase *#		24.83 - 1.23 37.93 - 1.29		-	
	N/A	24.83 - 1.23 37.93 - 1.29 N/A		-	

TMH 5 #1
 This is not a accredited test
 "# - This is not a accredited test
 "# - This test was performed at an outsource facility & reported by Roadlab.
 Comments - Mineral names may not reflect the actual composition of minerals identified but rather the mineral group.
 -Due to the preferred orientation and crystallite size effects results may not be as accurate as shown.
 -Traces of additional phases such as smectite and kaolinite may be present,Amorphous phases if present were not taken into account in the quantification.

Kind Regards

Eps.

Mr Deon Juckers Technical Signatory



Mr Charel van Biljon Laboratory Manager

Remarks : Remarks : \* Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 Sanas Accredited Laboratory - T 0296 The results reported relate only to the sample tested Further use of the adove information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Complied By : Miss Zandile Mokoena

**REV 002** 

RL-as-76-03

HEAD OFFICE

30/07/2015

www.roadlab.co.za

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30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A521 - BH2 A - 3.55 - 3.75 (Top)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested Further use of the above information is not the responsibility or liability of Roadlab

Documents may only be reproduced or published in their full context

Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A521 - BH2 B - 3.55 - 3.75 (Bottom)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested

Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context

Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A522 - BH3 A - 4.05 - 4.45 (Top)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested Further use of the above information is not the responsibility or liability of Roadlab

Documents may only be reproduced or published in their full context

Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A522 - BH3 B - 4.05 - 4.45 (Bottom)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested Further use of the above information is not the responsibility or liability of Roadlab

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Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A523 - BH4 A - 9.00 - 9.30 (Top)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested

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Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



30/07/2015

95/WSP003/08/0001

WSP Group Africa (Pty) Ltd P.O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem Du Toit

## Test Report: UPINGTON : AGGREGATE TEST RESULTS

Sample identification: Sample # 15/A523 - BH4 B - 9.00 - 9.30 (Bottom)

## TEST METHOD USED: SANS 3001-AG14:2013

1	2	3	4	5	6	7	8
Day	Spalled <sup>a</sup>	Ds	Fractured <sup>b</sup>	Df	Disintegrated <sup>c</sup>	Dd	Durability index
1	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0
а	Weighting	Factor	0.5		Start Date:		09/07/2015
b	Weighting	Factor	1		Completion date:		29/07/2015
с	Weighting	Factor	2.5				

5 day mEGDI	20 day mEGDI	1.5 x 5 day mEGDI
0	0	0

## Classification of aggregate deterioration

1	2
Type of deterioration	Definition
Spalled (Ds)	Shedding of small fragments from aggregate edges
Fractured (Df)	Splitting into two or three pieces
Disintegrated (Dd)	Splitting into more than three pieces

NOTE: This test was done by using only 32 pieces of stone and not the prescribed 40 pieces as per the test method.

Deon Juckers Technical Signatory

my docs/charel

Remarks :

The results reported relate only to the samples tested

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Compiled By: Miss Zandile Mokoena

Charel van Biljon Asphalt Lab Manager



(+27) 21 418 0325 (+27) 21 418 0325 sci-ba www.sci-ba.co.za

## Test Certificate

	Pro	ject Information	
Project number	Report number	Report date	Pages
851	851_1	16 July 2015	3

Customer Information						
Customer XRD Analytical & Consulting cc	, Contact person Sabine Verryn					
Address 75 Kafue Street	Email sabine.verryn@xrd.co.za					
Lynnwood Glen Pretoria	Telephone (+27) 83 548 0586					
0001	Fax					
	Order number					
	none					

## Contents

1	Sample List1
2	XRF01 - Major Analysis by XRF
3	XRF02 - Trace Element Analysis by XRF

## 1 Sample List

Sci-Ba Sample ID	Customer Sample ID	Comment
851:1	15/A522	Sample arrived milled. Integrity is good.
851:2	15/A521	Sample arrived milled. Integrity is good.

.10	Test Certificate		Page number 2 of 3	
SCI-BA	Project number 851	Report number 851_1	Report date 16 July 2015	

## 2 XRF01 - Major Analysis by XRF

Determinand	Analyte	Unit	15/A522	15/A521		
Silica	SiO <sub>2</sub>	% g/g	67.71	70.11		
Titanium	TiO <sub>2</sub>	% g/g	0.85	0.81		
Aluminium	Al <sub>2</sub> O <sub>3</sub>	%g/g	13.70	13.38		
Iron	Fe <sub>z</sub> O <sub>3</sub>	% g/g	6.23	6.22		 
Manganese	MnO	%g/g	0.08	0.08		
Magnesium	MgO	% g/g	0.91	0.83		
Calcium	CaO	%g/g	2.49	2,23	-	
Sodium	Na <sub>2</sub> O	%g/g	2.10	2.44		
Potassium	K <sub>2</sub> O	% g/g	4.05	3.95		_
Phosphorous	P2O5	% g/g	0.13	0.12		
Chromium	Cr <sub>2</sub> O <sub>3</sub>	% g/g	0.03	0.03		1
Sulphur	SO <sub>3</sub>	% g/g	0.09	0.09		
Loss on Ignition (1000 °C)	LOI	% g/g	0.60	0.67		
Total	Total	% g/g	99.11	101.05		
Loss of Moisture (105 °C)	H2O-	% a/a	0.12	0.10	_	

Notes: % g/g is equivalent to wt %; mg/kg is equivalent to ppm; n.d. = not determined; bold italicised font represents semi-quantitative data; \* represents measurements reported in % g/g or wt%.

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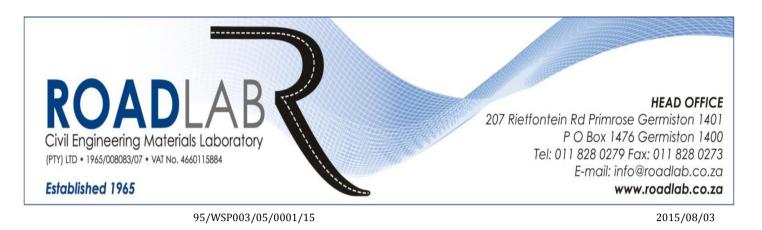
.11	Test Certificate		Page number 3 of 3
SCI-BA	Project number	Report number	Report date
	851	851_1	16 July 2015

## 3 XRF02 - Trace Element Analysis by XRF

Determinand	Analyte	Unit	15/A522	15/A521		A State of the	
Arsenic	As	mg/kg	<0.43	< 0.43			
Barium	Ba	mg/kg	750	685			
Bismuth	Bi	mg/kg	1.37	1.61			
Cadmium	Cd	mg/kg	6.68	4.63			
Cerium	Ce	mg/kg	83.3	117			
Chlorine	CI	mg/kg	145	147			
Cobalt	Со	mg/kg	<0.56	<0.56			
Caesium	Cs	mg/kg	1.38	4.18			
Copper	Cu	mg/kg	19.0	26.8			
Galium	Ga	mg/kg	17.4	16.9			
Germanium	Ge	mg/kg	<0.50	<0.50			
Hafnium	Hf	mg/kg	6.10	1.49			
Mercury	Hg	mg/kg	<1.00	<1.00			
Lanthanum	La	mg/kg	30.0	32.6			
Lutetium	Lu	mg/kg	2.57	2.52			
Molybdenum	Mo	mg/kg	5.87	5.63			
Niobium	Nb	mg/kg	19.8	18.2			
Neodymium	Nd	mg/kg	18.3	48.5			
Nickel	Ni	mg/kg	24.4	20.0			
Lead	Pb	mg/kg	<2.03	<2.03			
Rubidium	Rb	mg/kg	146	159			
Antimony	Sb	mg/kg	<1.48	<1.48			
Scandium	Sc	mg/kg	28.1	25.2			
Selenium	Se	mg/kg	<0.36	<0.36			
Samarium	Sm	mg/kg	33.4	23.6			
Tin	Sn	mg/kg	5.26	5.63	×		
Strontium	Sr	mg/kg	143	132	5 B B B B B B B B B B B B B B B B B B B		
Tantalum	Та	mg/kg	1.75	1.5,5			
Tellurium	Те	mg/kg	<0.16	<0.16	1		
Thorium	Th	mg/kg	25.0	26.8	1		
Thallium	TI	mg/kg	0.47	0.62			
Uranium	U	mg/kg	5.81	5.09			
Vanadium	V	mg/kg	, <7.60	<7.60			
Tungsten	W	mg/kg	1.22	1.25			
Yttrium	Y	mg/kg	44.1	44.5			_
Ytterbium	Yb	mg/kg	8.90	9.82		-	
Zinc	Zn	mg/kg	66.6	59.7			
Zirconium ·	Zr	mg/kg	257	264			

Notes: % g/g is equivalent to wt %; mg/kg is equivalent to ppm; n.d. = not determined; bold italicised font represents semi-quantitative data; \* represents measurements reported in % g/g or wt%.

Results relate to the items tested. All rights are reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Sci-Ba.



WSP Group Africa (Pty) Ltd P. O. Box 98867 Sloane Park 2152

ATTENTION: Mr. Willem du Toit

Dear Sir

Test Report : Upington - Foundation Indicator Test Results

Herewith the laboratory foundation indicator test results for above mentioned project, as requested by you.

3x Samples were Delivered to Roadlab.

\* Non accredited tests

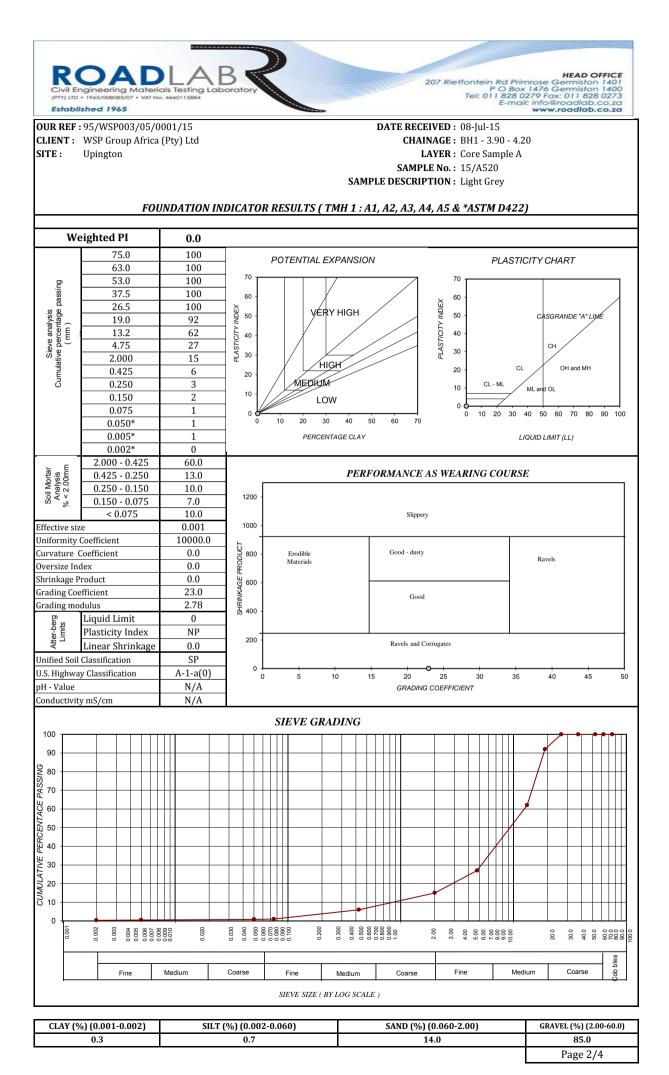
Kind Regards

Mr D Juckers TECHNICAL SIGNATORY

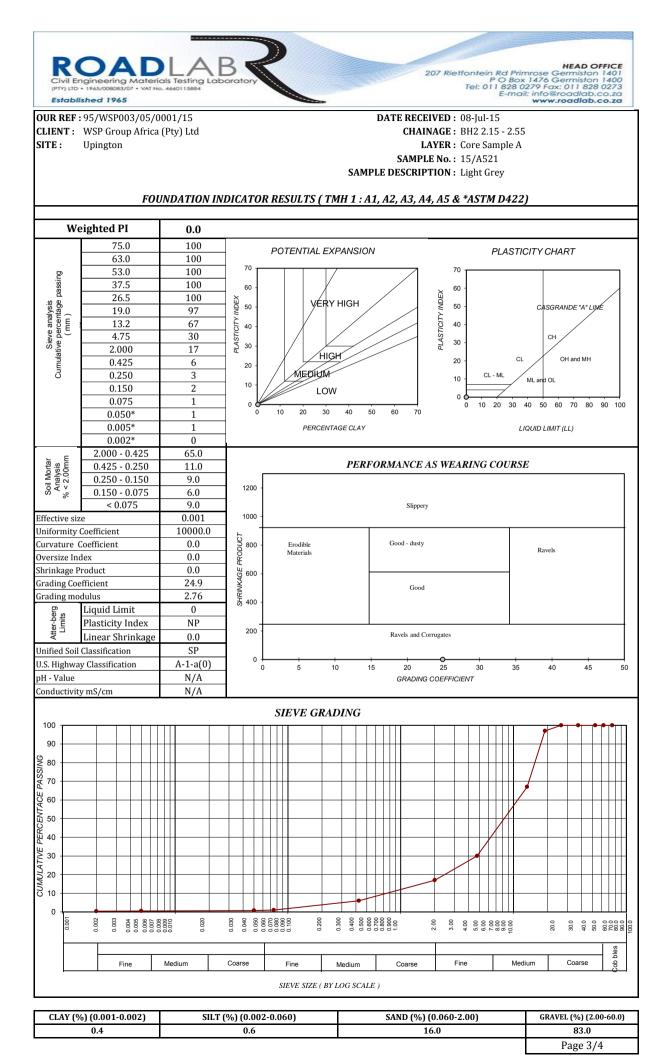
Remarks :

The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Documents may only be reproduced or published in their full context Compiled By : Laaiqa Stenekamp

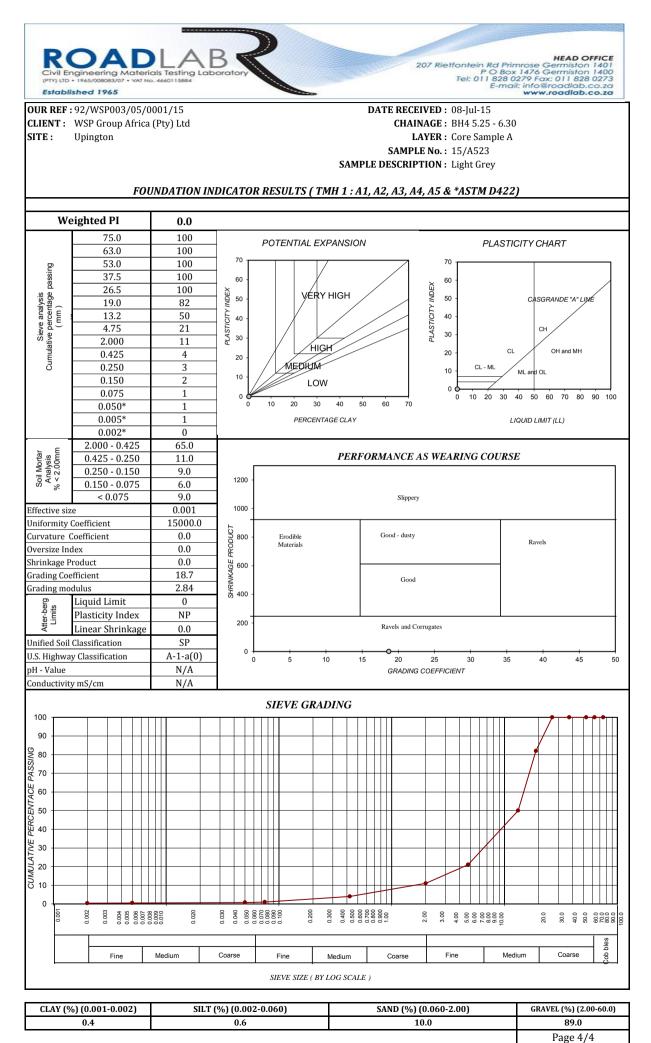
Page 1/4



FIND / Core Sample A / 15/A520 / 5.11



FIND / Core Sample A / 15/A521 / 5.11



FIND / Core Sample A / 15/A523 / 5.11

APPENDIX E BORROW PIT LABORATORY RESULTS



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+49 (0) 24189491849

E-mail: Marc.Schmits-Lapainer@ingenaix.de

Upington 8801

CLIENT: ADDRESS: IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Germany

ATTENTION: Marc Schmits-Lapainer

### TEST REPORT

PROJECT CLIENT REFERENCE JOB No: ORDER No: DATE

Sampled By Date Sampled Date Received Sampling Method Test Method

Road / Structure Section Layer TEST TYPE TEST TYPE Sampled By Delivered By Temp. 'C inside Laboratory Laboratory Tester Environmental Condition REMARKS & NOTES by Lab Number of pages

Steenkampspan Project 2381 Steenkampspan 08/10/2014

Tel:

Fax:

Cell:

Petrus Burger 22/09/2014 22/09/2014 TMH5 TMH1

MoD CBR IND pH EC Roadlab Prehab JV Upington Roadlab Prehab JV Upington

Puma Twalo Warm

2

**Client Instructions** 

NONE SPECIFIED

Accreditaion No: Test Method not Accredited

### Remarks :

\*Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd. Documents may only be reproduced or published in their full context Dry density reported to 1kg/m<sup>3</sup> Compiled by: Mareze Lategan

Yategan

Roelof Lategan Technical Signatory



Premisses 1050 De Drift Plaza Upington 8801 054 334 0838 054 334 0837 082 774 4240 / 082 781 1255 Roelof Lategan upington@prehab.co.za

CLIENT:

ATTENTION

IngenAIX GmbH Schurzelter Str 27, 52074 Aachen

Marc Schmits-Lapainer

Germany

DATE TESTED: 22/09/2014

PROJECT:

Upington · Kimberley · Springbok

Steenkampspan Project

#### MoD CBR IND pH EC SAMPLE No U3843 U3844 U3845 U3846 CONTAINER USED FOR SAMPLING Plastic Sampling Bags Plastic Sampling Bags Plastic Sampling Bags Plastic Sampling Bags SIZE / WEIGHT OF SAMPLE ±70ka ±70kg ±70kg ±70ka MOISTURE CONDITION OFSAMPLE ON ARRIVAL Moist Moist Moist Moist HOLE No. / Km. / CHAINAGE TP 1 TP 2 TP 3 TP 4 ROAD No. OR NAME Borrow Pit Borrow Pit Borrow Pit Borrow Pit LAYER TESTED / SAMPLED FROM 0-400 0-300 0-400 0-400 DATE SAMPLED 22/09/2014 22/09/2014 22/09/2014 22/09/2014 DATE RECEIVED 22/09/2014 22/09/2014 22/09/2014 22/09/2014 CLIENTS MARKING DESCRIPTION Light Brown Silty Sand Mix OF Light Brown Silty Sand Mix Light Brown Silty Sand Mix Light Reddish Orange Silty Sand Mix Calcrete SAMPLE Calcrete Stone Calcrete Stone Calcrete Stone (COLOUR & TYPE) GRADING ANALYSIS - % PASSING SIEVES (TMH1 1986 : METHOD A1 (a)) 75.0 100 100 88 SIEVE 79 63.0 91 91 67 75 53,0 100 91 37,5 66 86 77 70 ANA -26.5 56 67 68 59 19,0 50 57 58 54 13,2 46 48 50 49 LYSIS 4,75 40 35 35 44 (mm) 2.00 39 33 31 42 (TMH A1a) 0.425 36 30 27 39 0,075 5.6 7.5 5.3 3.1 pH & Conductivity (TMH1 1986 : METHOD A20 & A21T) (A20) 8,20 8,20 pН Conductivity # (A21 T) 0,03 0,03 ATTERBERG LIMITS ANALYSIS (TMH1 1986 : METHOD A2 & A3 ; TMH1 1986; TMHA4 1974) ATTERBERG LL% 0 0 0 LIMITS P.I. 0 0 (TMH A2&A3) LS% 0,0 0,0 0,0 0,0 GM 2,19 2.30 2.37 2.16 A-1-b A-1-a A-1-b H.R.B A-1-a CLASSIFI CATION COLTO T.R.H. 14 G5 G5 G5 MDD AASHTO & OMC%; CALIFORNIA BEARING RATIO (TMH1 1986 : METHOD A7 & A8) MOD AASHTO OMC% 6,5 62 5.3 8.4 (TMH A7) 2053 2030 1971 195 MDD(KG/M3) COMP MC 6,3 0,02 5,3 0,03 84 66 C.B.R. % SWELL 0.03 0.03 100% 117 128 130 99 U.C.S. 98% 91 95 100 81 (TMH A13T) 97% 78 78 84 72 C.B.R. 95% 56 46 57 56 93% 51 31 47 (TMH A8) 44 90% 44 24 9 COMPACTION (100%) : ITS (kPa) Ave Ave: Ave: Ave: COMPACTION (100%) : ITS (kPa) IN LAB STABILISED WITH ON SITE TEST TYPE MoD CBR IND pH EC SAMPLED BY Roadlab Prehab JV Upington Roadlab Prehab JV Upingtor Roadlab Prehab JV Upington Roadlab Prehab JV Upington DELIVERED BY Roadlab Prehab JV Upington Roadlab Prehab JV Upington Roadlab Prehab JV Upington Roadlab Prehab JV Upington SAMPLED ACCORDING TO TMH5 TMH5 TMH5 TMH5 ENVIRONMENTAL CONDITION Warm Warm Warm Warm WHEN SAMPLED REMARKS & NOTES

Kind Regards

lategan

Remarks :

The samples were subjected to analysis according to TMH 1

The results reported relate only to the sample tested

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Roelof Lategan Technical Signatory



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E-mail: Marc.Schmits-Lapainer@ingenaix.de

Upington 8801

CLIENT: ADDRESS: IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Germany

ATTENTION: Marc Schmits-Lapainer

### TEST REPORT

PROJECT CLIENT REFERENCE JOB No: ORDER No: DATE

Sampled By Date Sampled Date Received Sampling Method Test Method

Road / Structure Section Layer TEST TYPE TEST TYPE Sampled By Delivered By Temp. 'C inside Laboratory Laboratory Tester Environmental Condition REMARKS & NOTES by Lab Number of pages

Steenkampspan Project 2381 Steenkampspan 08/10/2014

Tel:

Fax:

Cell:

Petrus Burger 22/09/2014 22/09/2014 TMH5 TMH1

MoD CBR IND pH EC Roadlab Prehab JV Upington Roadlab Prehab JV Upington

Puma Twalo Warm

2

**Client Instructions** 

NONE SPECIFIED

Accreditaion No: Test Method not Accredited

### Remarks :

\*Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd. Documents may only be reproduced or published in their full context Dry density reported to 1kg/m<sup>3</sup> Compiled by: Mareze Lategan

Yategan

Roelof Lategan Technical Signatory



CLIENT:

IngenAIX GmbH Schurzelter Str 27, 52074 Aachen

PROJECT:

Germany

### Marc Schmits-Lapainer ATTENTION:

DATE TESTED: 22/09/2014

Upington · Kimberley · Springbok

Steenkampspan Project

ATTENTION:	Marc Schmits-La	punci	Mo	D CBR IND pH EC		
1			10040	U3850	110050	10054
CONTAIN	SAMPLE No. IER USED FOR S		U3848		U3852	U3854
	/ WEIGHT OF SA		Plastic Sampling Bags ±70kg	Plastic Sampling Bags ±70kg	Plastic Sampling Bags ±70kg	Plastic Sampling Bags ±70kg
MOISTURE CON			Moist	Moist	Moist	Moist
	No. / Km. / CHAI		TP 6	TP 8	TP 10	TP 12
	OAD No. OR NAM		Borrow Pit	Borrow Pit	Borrow Pit	Borrow Pit
	ESTED / SAMPLE		0-300	0-600	0-500	0-400
	DATE SAMPLED		22/09/2014	22/09/2014	22/09/2014	22/09/2014
	DATE RECEIVED	)	22/09/2014	22/09/2014	22/09/2014	22/09/2014
	LIENTS MARKIN		22.00.2011	22.00.2011	22,00,2011	22100/2011
	DESCRIPTION					
	OF		Light Brown Silty Sand Mix			
	SAMPLE		Calcrete Stone	Calcrete	Calcrete Stone	Calcrete Stone
((	COLOUR & TYPE	)				
		,	GRAD	ING ANALYSIS - % PASSING S	SIEVES (TMH1 1986 : METHOD	A1 (a))
		75,0			100	
SIE	VE	63,0	100	100	90	100
		53,0	84	94	81	91
		37,5	69	74	71	76
AN	IA -	26,5	61	63	65	70
		19,0	54	55	59	64
		13,2	47	49	55	59
LYS	SIS	4,75	42	40	48	51
(mi		2,00	40	39	46	47
(TMH	A1a)	0,425	38	36	44	43
		0,075	7,3	3,8	6,2	7,0
				pH & Conductivity (TMH1 1	986 : METHOD A20 & A21T)	
	рН # <b>(А20)</b>				8,10	
Conduct	tivity #	(A21 T)			0,03	
				`	METHOD A2 & A3 ; TMH1 198	. ,
ATTER		LL%	0	0	0	0
LIM		P.I.	0	0	0	0
(TMH A		LS%	0,0	0,0	0,0	0,0
	GM		2,15	2,21	2,04	2,03
CLASSIFI -		R.B.	A-1-b	A-1-b	A-1-b	A-1-b
CATION		DLTO				
	T.R.	.H. 14	G5	G5	G5	G5
					RING RATIO (TMH1 1986 : MET	,
MOD A/		OMC%	6,8	6,6	8,1	6,4
(TMH	,	MDD(KG/M <sup>3</sup> )	2045	2044	2023	2008
L	COMP MC		7,4	6,8	8,2	6,6
C.B	3.R.	% SWELL	0,02	0,02	0,02	0,02
		100%	171	103	66	84
U.C		98%	150	89	61	74
(тмн.		97%	140	83	59	70
C.B		95%	119	69	54	61
(TMH	1 48)	93% 90%	96 61	51 26	50 44	54 45
COMPACTION (10	00%) • ITO (40-2)	90%	01	20	44	45
COMPACTION (10 COMPACTION (10			Ave:	Ave:	Ave:	Ave:
STABI		IN LAB				
STABIL		ON SITE				
TEST TYPE		ONOTE	MoD CBR IND pH EC			
SAMPLED BY			Roadlab Prehab JV Upington			
DELIVERED BY			Roadlab Prehab JV Upington			
SAMPLED ACCOR			TMH5	TMH5	TMH5	TMH5
ENVIRONMENTAL						
WHEN SAMPLED			Warm	Warm	Warm	Warm
RE	REMARKS & NOTES					

Kind Regards

Relategan

Remarks :

The samples were subjected to analysis according to TMH 1

The results reported relate only to the sample tested

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Compiled by: Mareze Lategan

Roelof Lategan Technical Signatory



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+49 (0) 24189491849

E-mail: Marc.Schmits-Lapainer@ingenaix.de

Upington 8801

CLIENT: ADDRESS: IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Germany

ATTENTION: Marc Schmits-Lapainer

### TEST REPORT

PROJECT CLIENT REFERENCE JOB No: ORDER No: DATE

Sampled By Date Sampled Date Received Sampling Method Test Method

Road / Structure Section Layer TEST TYPE TEST TYPE Sampled By Delivered By Temp. 'C inside Laboratory Laboratory Tester Environmental Condition REMARKS & NOTES by Lab Number of pages

Steenkampspan Project 2381 Steenkampspan 08/10/2014

Tel:

Fax:

Cell:

Petrus Burger 22/09/2014 22/09/2014 TMH5 TMH1

MoD CBR IND pH EC Roadlab Prehab JV Upington Roadlab Prehab JV Upington

Puma Twalo Warm

2

**Client Instructions** 

NONE SPECIFIED

Accreditaion No: Test Method not Accredited

### Remarks :

\*Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd. Documents may only be reproduced or published in their full context Dry density reported to 1kg/m<sup>3</sup> Compiled by: Mareze Lategan

Yategan

Roelof Lategan Technical Signatory



Premisses 1050 De Drift Plaza Upington 8801 054 334 0838 054 334 0837 082 774 4240 / 082 781 1255 Roelof Lategan upington@prehab.co.za

CLIENT:

ATTENTION

IngenAIX GmbH Schurzelter Str 27, 52074 Aachen

Marc Schmits-Lapainer

Germany

DATE TESTED: 22/09/2014

PROJECT:

Upington · Kimberley · Springbok

Steenkampspan Project

MoD CBR IND pH EC SAMPLE No U3854 U3856 U3857 U3858 CONTAINER USED FOR SAMPLING Plastic Sampling Bags Plastic Sampling Bags Plastic Sampling Bags Plastic Sampling Bags SIZE / WEIGHT OF SAMPLE ±70ka ±70ka ±70kg +70ka MOISTURE CONDITION OFSAMPLE ON ARRIVAL Moist Moist Moist Moist HOLE No. / Km. / CHAINAGE TP 13 TP 14 TP 15 TP 16 ROAD No. OR NAME Borrow Pit Borrow Pit Borrow Pit Borrow Pit LAYER TESTED / SAMPLED FROM 0-600 0-600 0-400 100-600 DATE SAMPLED 22/09/2014 22/09/2014 22/09/2014 22/09/2014 DATE RECEIVED 22/09/2014 22/09/2014 22/09/2014 22/09/2014 CLIENTS MARKING DESCRIPTION OF Light Brown Silty Sand Mix Light Brown Silty Sand Mix Light Brown Silty Sand Mix Calcrete Stone Light Brown Silty Sand Mix SAMPLE Calcrete Stone Calcrete Stone Calcrete Stone (COLOUR & TYPE) GRADING ANALYSIS - % PASSING SIEVES (TMH1 1986 : METHOD A1 (a)) 75.0 89 SIEVE 100 89 63.0 100 53,0 94 85 100 37,5 82 73 91 83 ANA -26.5 71 67 86 64 19,0 66 61 78 54 13,2 61 70 50 54 LYSIS 4,75 56 48 45 62 (mm) 2.00 54 46 61 44 (TMH A1a) 0.425 51 43 58 41 0,075 7.7 9.1 8.2 8.6 pH & Conductivity (TMH1 1986 : METHOD A20 & A21T) (A20) pН Conductivity # (A21 T) ATTERBERG LIMITS ANALYSIS (TMH1 1986 : METHOD A2 & A3 ; TMH1 1986; TMHA4 1974) ATTERBERG LL% 0 0 0 0 LIMITS P.I. 0 0 0 (TMH A2&A3) LS% 0,0 0,0 0,0 0,0 GM 1.87 2.02 1,73 2.06 A-3 A-1-b A-3 A-1-b H.R.B CLASSIFI CATION COLTO T.R.H. 14 G5 G5 G5 MDD AASHTO & OMC%; CALIFORNIA BEARING RATIO (TMH1 1986 : METHOD A7 & A8) MOD AASHTO OMC% 7.3 73 (TMH A7) 2088 2084 1996 1952 MDD(KG/M3) COMP MC 5,9 0,03 7,2 0,03 74 72 C.B.R. % SWELL 0,03 0,03 100% 103 108 75 101 U.C.S. 98% 82 71 85 100 (TMH A13T) 97% 72 95 69 78 C.B.R. 95% 53 87 62 64 93% 37 72 47 57 (TMH A8) 90% 13 49 24 48 COMPACTION (100%) : ITS (kPa) Ave Ave: Ave: Ave: COMPACTION (100%) : ITS (kPa) IN LAB STABILISED WITH ON SITE TEST TYPE MoD CBR IND pH EC Roadlab Prehab JV Upington SAMPLED BY Roadlab Prehab JV Upingtor Roadlab Prehab JV Upington Roadlab Prehab JV Upington DELIVERED BY Roadlab Prehab JV Upington Roadlab Prehab JV Upington Roadlab Prehab JV Upington Roadlab Prehab JV Upington SAMPLED ACCORDING TO TMH5 TMH5 TMH5 TMH5 ENVIRONMENTAL CONDITION Warm Warm Warm Warm WHEN SAMPLED REMARKS & NOTES

Kind Regards

lategan

Remarks :

The samples were subjected to analysis according to TMH 1

The results reported relate only to the sample tested

Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd.

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Compiled by: Mareze Lategan

Roelof Lategan Technical Signatory



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+49 (0) 24189491849

E-mail: Marc.Schmits-Lapainer@ingenaix.de

Upington 8801

CLIENT: ADDRESS: IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Germany

ATTENTION: Marc Schmits-Lapainer

### TEST REPORT

PROJECT CLIENT REFERENCE JOB No: ORDER No: DATE

Sampled By Date Sampled Date Received Sampling Method Test Method

Road / Structure Section Layer TEST TYPE TEST TYPE Sampled By Delivered By Temp. 'C inside Laboratory Laboratory Tester Environmental Condition REMARKS & NOTES by Lab Number of pages

Steenkampspan Project 2381 Steenkampspan 08/10/2014

Tel:

Fax:

Cell:

Petrus Burger 22/09/2014 22/09/2014 TMH5 TMH1

MoD CBR IND pH EC Roadlab Prehab JV Upington Roadlab Prehab JV Upington

Puma Twalo Warm

2

**Client Instructions** 

NONE SPECIFIED

Accreditaion No: Test Method not Accredited

### Remarks :

\*Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd. Documents may only be reproduced or published in their full context Dry density reported to 1kg/m<sup>3</sup> Compiled by: Mareze Lategan

Yategan

Roelof Lategan Technical Signatory



CLIENT:

ATTENTION:

IngenAIX GmbH Schurzelter Str 27, 52074 Aachen

Marc Schmits-Lapainer

Germany

DATE TESTED: 22/09/2014

PROJECT:

Upington · Kimberley · Springbok

Steenkampspan Project

	MoD CBR IND pH EC								
I									
	SAMPLE No.		U3859	U3861	U3864	U3866			
	NER USED FOR S		Plastic Sampling Bags	Plastic Sampling Bags	Plastic Sampling Bags	Plastic Sampling Bags			
	/ WEIGHT OF SAI		±70kg	±70kg	±70kg	±70kg			
	DITION OFSAMPL		Moist	Moist	Moist	Moist			
-	No. / Km. / CHAI	-	TP 17	TP 19	TP 22	TP 24			
	OAD No. OR NAM		Borrow Pit	Borrow Pit	Borrow Pit	Borrow Pit			
	ESTED / SAMPLE	D FROM	600-1100	0-400	100-800	0-400			
	DATE SAMPLED		22/09/2014	22/09/2014	22/09/2014	22/09/2014			
	DATE RECEIVED		22/09/2014	22/09/2014	22/09/2014	22/09/2014			
C	CLIENTS MARKIN	G							
	DESCRIPTION								
	OF		Light Reddish Brown Silty	Light Brown Silty Sand Mix	Light Brown Silty Sand Mix	Light Reddish Orange Silty			
	SAMPLE		Sand Mix Calcrete	Calcrete Stone	Calcrete Stone	Sand Mix Calcrete			
(	COLOUR & TYPE	)	0.004						
		75.0		DING ANALYSIS - % PASSING S	SIEVES (TMH1 1986 : METHOD				
		75,0	90	100	100	100			
SIE	EVE	63,0	90	100	100	84			
		53,0	90	90	86	75			
	14	37,5	81	77	77	71			
AN	IA -	26,5	71	67	65	62			
		19,0	68	60	60	55 47			
		13,2	66	54	56				
LYS		4,75	64	44	51	34			
	nm)	2,00	63	43	50	31			
(IMH	I A1a)	0,425	59	41	48	28			
	0,075		2,4	8,4	5,5	5,0			
					986 : METHOD A20 & A21T)				
pH				7,80					
Conduc	Conductivity # (A21 T)			0,03					
				LIMITS ANALYSIS (TMH1 1986	•	, ,			
	RBERG	LL%	0	0	0	0			
	IITS	P.I.	0	0	0	0			
(TMH A	,	LS%	0,0	0,0	0,0	0,0			
	GM		1,76	2,08	1,97	2,36			
CLASSIFI -		R.B.	A-3	A-1-b	A-1-b	A-1-a			
CATION		LTO							
	T.R.	H. 14	G9	G5	G5	G5			
			MDD AASH1	O & OMC%; CALIFORNIA BEAR	RING RATIO (TMH1 1986 : MET	HOD A7 & A8)			
MOD A	ASHTO	OMC%	6,6	7,2	7,5	8,3			
(TMF	H A7)	MDD(KG/M <sup>3</sup> )	1994	2021	2001	2091			
	COMP MC		6,8	7,2	7,6	8,1			
C.E	3.R.	% SWELL	0,03	0,02	0,02	0,03			
		100%	61	123	107	143			
U.C		98%	41	109	94	122			
	A13T)	97%	31	101	87	112			
C.E	3.R.	95%	14	88	75	93			
(TMF	H A8)	93%	12	78	70	92			
		90%	9	62	63	90			
COMPACTION (10	00%) : ITS (kPa)		Ave:	Ave:	Ave:	Ave:			
COMPACTION (10	00%) : ITS (kPa)		Avc.	Ave.	Ave.	Ave.			
STABI		IN LAB							
WI	WITH ON SITE								
TEST TYPE	TEST TYPE		MoD CBR IND pH EC	MoD CBR IND pH EC	MoD CBR IND pH EC	MoD CBR IND pH EC			
SAMPLED BY	SAMPLED BY		Roadlab Prehab JV Upington	Roadlab Prehab JV Upington	Roadlab Prehab JV Upington	Roadlab Prehab JV Upington			
DELIVERED BY			Roadlab Prehab JV Upington	Roadlab Prehab JV Upington	Roadlab Prehab JV Upington	Roadlab Prehab JV Upington			
SAMPLED ACCO			TMH5	TMH5	TMH5	TMH5			
ENVIRONMENTA			Warm	Warm	Warm	Warm			
WHEN SAMPLED	)			···uiiii	, , , , , , , , , , , , , , , , , , ,				
RI	REMARKS & NOTES								

Kind Regards

Ryategan

Remarks :

The samples were subjected to analysis according to TMH 1

The results reported relate only to the sample tested

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Compiled by: Mareze Lategan

Roelof Lategan Technical Signatory



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+49 (0) 24189491849

E-mail: Marc.Schmits-Lapainer@ingenaix.de

Upington 8801

CLIENT: ADDRESS: IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Germany

ATTENTION: Marc Schmits-Lapainer

### TEST REPORT

PROJECT CLIENT REFERENCE JOB No: ORDER No: DATE

Sampled By Date Sampled Date Received Sampling Method Test Method

Road / Structure Section Layer TEST TYPE TEST TYPE Sampled By Delivered By Temp. 'C inside Laboratory Laboratory Tester Environmental Condition REMARKS & NOTES by Lab Number of pages

Steenkampspan Project 2381 Steenkampspan 08/10/2014

Tel:

Fax:

Cell:

Petrus Burger 22/09/2014 22/09/2014 TMH5 TMH1

MoD CBR IND pH EC Roadlab Prehab JV Upington Roadlab Prehab JV Upington

Puma Twalo Warm

2

**Client Instructions** 

NONE SPECIFIED

Accreditaion No: Test Method not Accredited

### Remarks :

\*Opinions & Interpretations are not included in our schedule of Accreditation The samples were subjected to analysis according to TMH 1 The results reported relate only to the sample tested Further use of the above information is not the responsibility or liability of Roadlab Prehab JV (Pty)Ltd. Documents may only be reproduced or published in their full context Dry density reported to 1kg/m<sup>3</sup> Compiled by: Mareze Lategan

Yategan

Roelof Lategan Technical Signatory



CLIENT:

IngenAIX GmbH Schurzelter Str 27, 52074 Aachen Upington · Kimberley ·

PROJECT:

### Germany Marc Schmits-Lapainer ATTENTION:

DATE TESTED: 22/09/2014

Springbok

Steenkampspan Project

ATTENTION:	Marc Schmits-La	paniei			Мо	D CBR IND pl	HEC											
L																		
	SAMPLE No.		U38				895											
	ER USED FOR S. WEIGHT OF SAI		Plastic Sam		Bags		Plastic Sampling Bags ±70kg											
MOISTURE COND			±70kg Moist			Jkg bist												
	No. / Km. / CHAI		TP				95											
	DAD No. OR NAM		Borro				w Pit											
	ESTED / SAMPLE		0-4				100											
	DATE SAMPLED	-	22/09				/2014											
0	DATE RECEIVED		22/09				/2014											
C	LIENTS MARKIN	G																
	DESCRIPTION																	
	OF		Light Brown S		nd Mix	Light Reddish												
	SAMPLE		Calc	rete		Sand Mix	Calcret	е										
(0	COLOUR & TYPE	)			0040					1000 14	TUOD							
		75,0	10	0	GRAL	DING ANALYSIS	- % PAS	SINGS	SIEVES (IMH1	1986 : MI	THOD	A1 (a))						
SIE		63,0	10			1	00											
SIE	VE	53,0	8				6											
		37,5	7				6											
AN	A -	26,5	7	-			2											
		19,0	6		_		8											
		13,2	5				6											
LYS	SIS	4,75	5	1		6	1											
(mr	m)	2,00	4	-		6	0											
(ТМН	A1a)	0,425	4			5												
		0,075	7,	7			,0											
								TMH1 1	986 : METHO	D A20 & A2	21T)							
pH	# tivity #	(A20)			8,30 0,02 mS/cm													
Conduct	tivity #	(A21 T)				IMITS ANALYSIS (TMH1 1986 :			0.40 TH			<u>`</u>						
					BERGL		•	1 1986 :	METHOD A2	& A3 ; TM	H1 198	6; IMHA4 1974	·)					
ATTER		LL%	0		0													
LIMI (TMH A		P.I. LS%	0			0,0												
	GM	L3%	0,0 1,97		1,85													
		R.B.					A-1-b				00							
CLASSIFI -		LTO					A-3											
CATION	T.R.	H. 14	G	6		G6												
				MDD	AASHT	O & OMC%; CALIFORNIA BEAF		RING RATIO (1	FMH1 198	3 : MET	HOD A7 & A8)							
MOD AA	ASHTO	OMC%	7,	1		7	,6											
(TMH	I A7)	MDD(KG/M <sup>3</sup> )	19	68		1939												
	COMP MC		6,	9		7,7												
C.B	.R.	% SWELL	0,0			0,												
	-	100%	7			71												
U.C		98%	6				8	_										
(TMH / C.B		97% 95%	5				2 9											
(тмн		95%	2		_		0				_							
(1001		90%	1				6											
COMPACTION (10	00%) : ITS (kPa)	0070		-														
COMPACTION (10				Ave:			Ave:			Ave:			Ave:					
	STABILISED IN LAB																	
	WITH ON SITE																	
TEST TYPE			MoD CBR I			MoD CBR												
SAMPLED BY			Roadlab Preha			Roadlab Preha				-			-					
	DELIVERED BY		Roadlab Preha		ington	Roadlab Preha		ngton										
SAMPLED ACCORDING TO		TM	H5		TN	IH5												
ENVIRONMENTAL WHEN SAMPLED			Wa	ırm		Wa	arm											
RE	REMARKS & NOTES																	

Kind Regards

Hategan

Remarks :

The samples were subjected to analysis according to TMH 1

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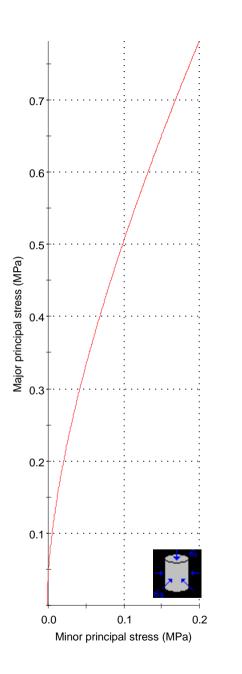
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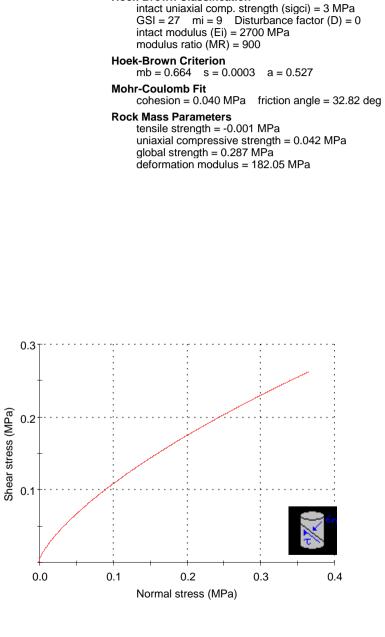
Compiled by: Mareze Lategan

Roelof Lategan Technical Signatory

# **APPENDIX F**

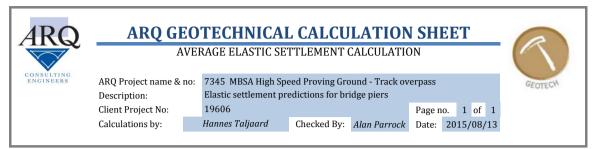
# **ROCLAB ANALYSIS RESULTS**





Hoek-Brown Classification

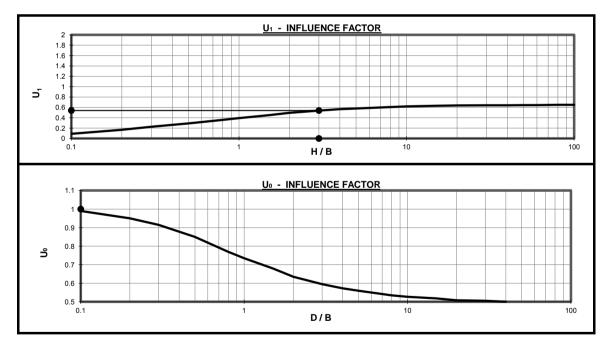
# **APPENDIX G SETTLEMENT CALCULATIONS**

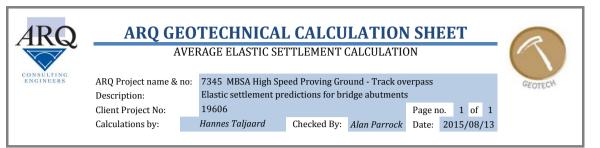


### PREDICTION OF THE AVERAGE ELASTIC SETTLEMENT OF A SQUARE FOOTING

INPUT PARAMETER	LAYER 1	LAYER 2	UNIT	]
FOUNDING DEPTH (D)	0.0	-	m	q
WIDTH OF THE FOOTING (B)	2.50	-	m	
DEPTH OF LAYER (H1, H2)	8	-	m	
STIFFNESS OF COMPRESSIBLE STRATUM	182	-	MPa	
FOUNDATION PRESSURE (q)	400.0	-	kPa	H2 H1 B LAYER 1
Н / В	3.00	-		
D / B	0.00	-		LAYER 2
U <sub>1</sub> - INFLUENCE FACTOR	0.54	-		
U <sub>0</sub> - INFLUENCE FACTOR	1.00	-		INCOMPRESSIBLE STRATUM
	2.97	-		
TOTAL IMMEDIATE SETTLEMENT PREDIC	TED	3.0	mm	

\*\*\* - After Janbu, Bjerrum and Kjaernsli

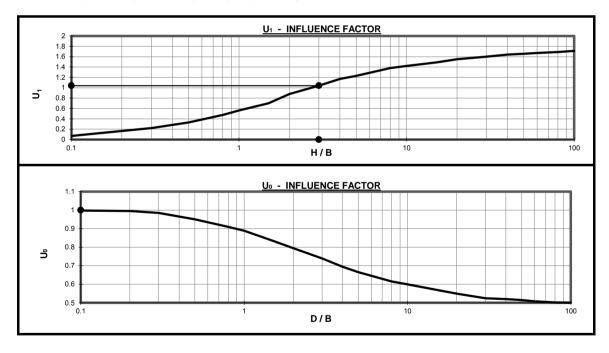


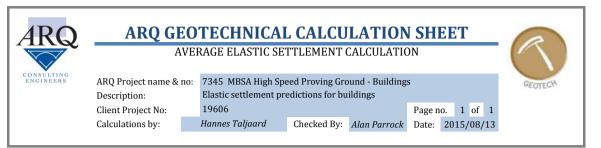


### PREDICTION OF THE AVERAGE ELASTIC SETTLEMENT OF A STRIP FOOTING

INPUT PARAMETER	LAYER 1	LAYER 2	UNIT	
FOUNDING DEPTH (D)	0.0	-	m	q
WIDTH OF THE FOOTING (B)	2.00	-	m	D H2 H1 LAYER 1 LAYER 2
DEPTH OF LAYER (H <sub>1</sub> , H <sub>2</sub> )	6	-	m	
STIFFNESS OF COMPRESSIBLE STRATUM	182	-	MPa	
FOUNDATION PRESSURE (q)	400.0	-	kPa	
Н / В	3.00	-		
D / B	0.00	-		
U <sub>1</sub> - INFLUENCE FACTOR	1.04	-		
U <sub>0</sub> - INFLUENCE FACTOR	1.00	-		INCOMPRESSIBLE STRATUM
	4.57	-		
TOTAL IMMEDIATE SETTLEMENT PREDICTED 4.6 mm			mm	

\*\*\* - After Janbu, Bjerrum and Kjaernsli for L/D <10 only

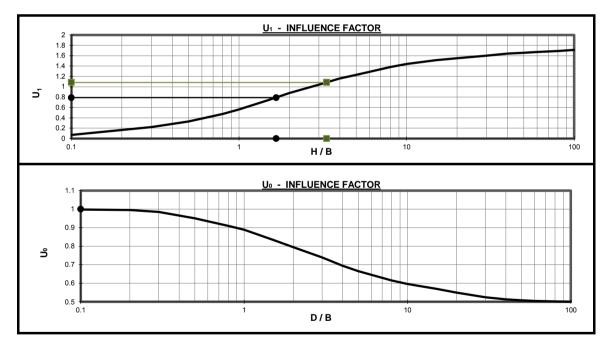




### PREDICTION OF THE AVERAGE ELASTIC SETTLEMENT OF A STRIP FOOTING

INPUT PARAMETER	LAYER 1	LAYER 2	UNIT	]
FOUNDING DEPTH (D)	0.0	0.0	m	q
WIDTH OF THE FOOTING (B)	0.60	0.6	m	
DEPTH OF LAYER (H <sub>1</sub> , H <sub>2</sub> )	1	2	m	
STIFFNESS OF COMPRESSIBLE STRATUM	50	15	MPa	
FOUNDATION PRESSURE (q)	100.0	100.0	kPa	
Н / В	1.67	3.33		
D / B	0.00	0.00		
U <sub>1</sub> - INFLUENCE FACTOR	0.79	1.08		↓
U <sub>0</sub> - INFLUENCE FACTOR	1.00	1.00		INCOMPRESSIBLE STRATUM
	1.00	1.00		
TOTAL IMMEDIATE SETTLEMENT PREDICTED 2.00 mm				1

\*\*\* - After Janbu, Bjerrum and Kjaernsli









## ARQ (Pty) Ltd.

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