Advisory and Consulting

GEOTECHNICAL INVESTIGATION REPORT FOR A PROPOSED NEW MAKHAZA POLICE STATION IN CAPE TOWN.

LC021-23. R01

30 November 2023

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Approval of Document		
Date:	**30 November 2023**	
Reference:	**LC021–23. R01**	
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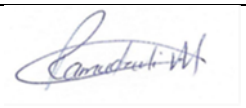
Mbulungeni Ramudzuli **BSc Hons Geology** **Geologist**	N/A	
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TABLE OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation
begl	Below existing ground level
CBR	California Bearing Ratio
DCP	Dynamic Cone Penetrometer Test
E	East
GM	Grading Modulus
IMC	Insitu moisture content
kN/m^2	Kilonewtons per metre square
kPa	Kilopascals
LL	Liquid Limit
LS	Linear Shrinkage
Luhlaza	Luhlaza Advisory and Consulting Pty Ltd
m	Metre (s)
MDD	Maximum Dry Density
mm	Millimetre
MPa	MegaPascal
mS/m	Millisiemens per meter
No.	Number
N	North
OMC	Optimum Moisture Content
PI	Plasticity Index
SANS	South African National Standards
S	South
TLB	Tractor Loader Backhoe
TP	Test Pits
TRH	Technical Recommendations for Highways (1985)

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1 TERMS OF AGREEMENT AND SCOPE OF SERVICES

Luhlaza Advisory and Consulting (Pty) Ltd was requested to carry out a Geotechnical investigation for the proposed new Makhaza Police Station in the Western Cape Province.

Luhlaza has carried out the following:

a) A site reconnaissance survey.
b) Excavation of inspection pits dug to 3.0m using hand tools.
c) Dynamic Cone Penetration (DCP) tests to 3.0m.
d) Laboratory testing of soil and rock samples.
e) Preparing a geotechnical report.

The geotechnical report referenced LC021-23. R01 provides the results of the site investigation as well as foundation, slope stability, excavatability, earthworks, groundwater seepage, stormwater drainage and material usage.

2 CODES OF PRACTICE AND STANDARDS

The field investigation and the report were carried out in accordance with the current level of geotechnical standards practiced by professionals in South Africa.

The document referenced for use is "*Site Investigation Code of Practice, 1st Edition, South African Institution of Civil Engineering – Geotechnical Division, January 2010*".

The nature of geotechnical engineering is such that variations in soil conditions may occur even where sites seem to be consistent. It is essential that all important development stages, including but not limited to excavations, be inspected by a competent person who is suitably skilled and experienced because construction may disclose deviations from what is detailed here. This is to ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report.

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It is possible that certain indications of ground stability, contamination, or groundwater levels were latent or otherwise not visible. Opinions are based on what was visible at the time the investigation was conducted.

3 INFORMATION SOURCES

The following maps, plans and shapefiles were available and used in the compilation of this report.

a) A regional geological map shapefiles titled 3318 Cape Town, prepared by the Council for Geoscience to a scale of 1:250 000.

b) Low-resolution satellite imagery sourced from Google Earth (2023).

4 DESCRIPTION OF THE STUDY AREA

The project area is located in Makhaza within the City of Cape Town Metropolitan Municipality in the Western Cape Province (Figure 1 and 2). The site comprises of an open field of land and the central coordinates of the site are 34.048346°S and 18.704592°E. The site can be accessed via the M9 Rd, Cekeca Rd and Dibana Road.

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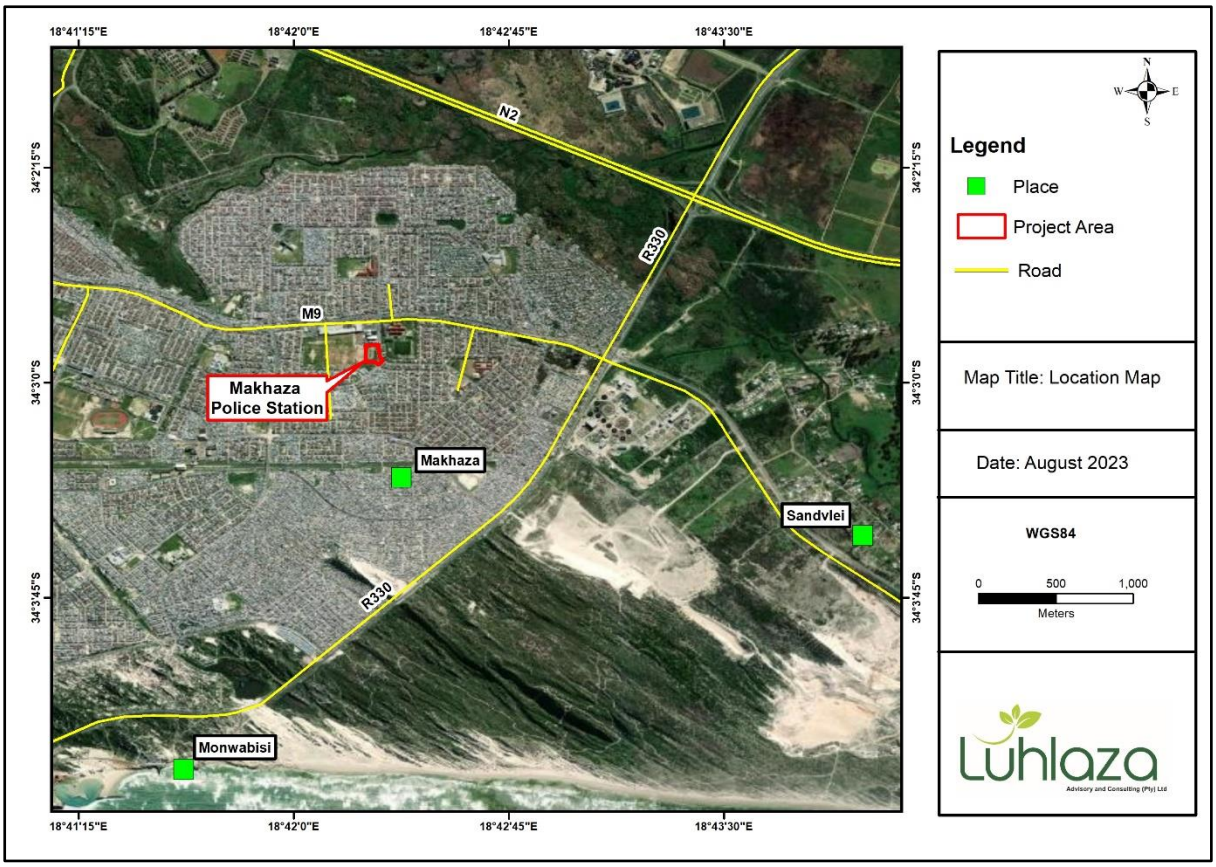

Figure 1: Location Map of the proposed Makhaza Police Station highlighted by the red color on the Map.

Figure 2: Overview of site conditions: picture A-B showing overview test pit site, C showing material encountered throughout the site.

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5 GENERAL GEOLOGY OF THE SITE

The geological map “3318 Cape Town” (1:250 000; Figure 3), illustrates that the project area is underlain by generally unconsolidated, calcareous dune sand of the Witzand Formation of the Sandveld Group.

Based on the geology map of the area, the project area is not subject to the formation of sinkholes and subsidence due to the presence of water-soluble rock types (such as dolomite or limestone). The project area is therefore classified as ‘non-dolomitic.

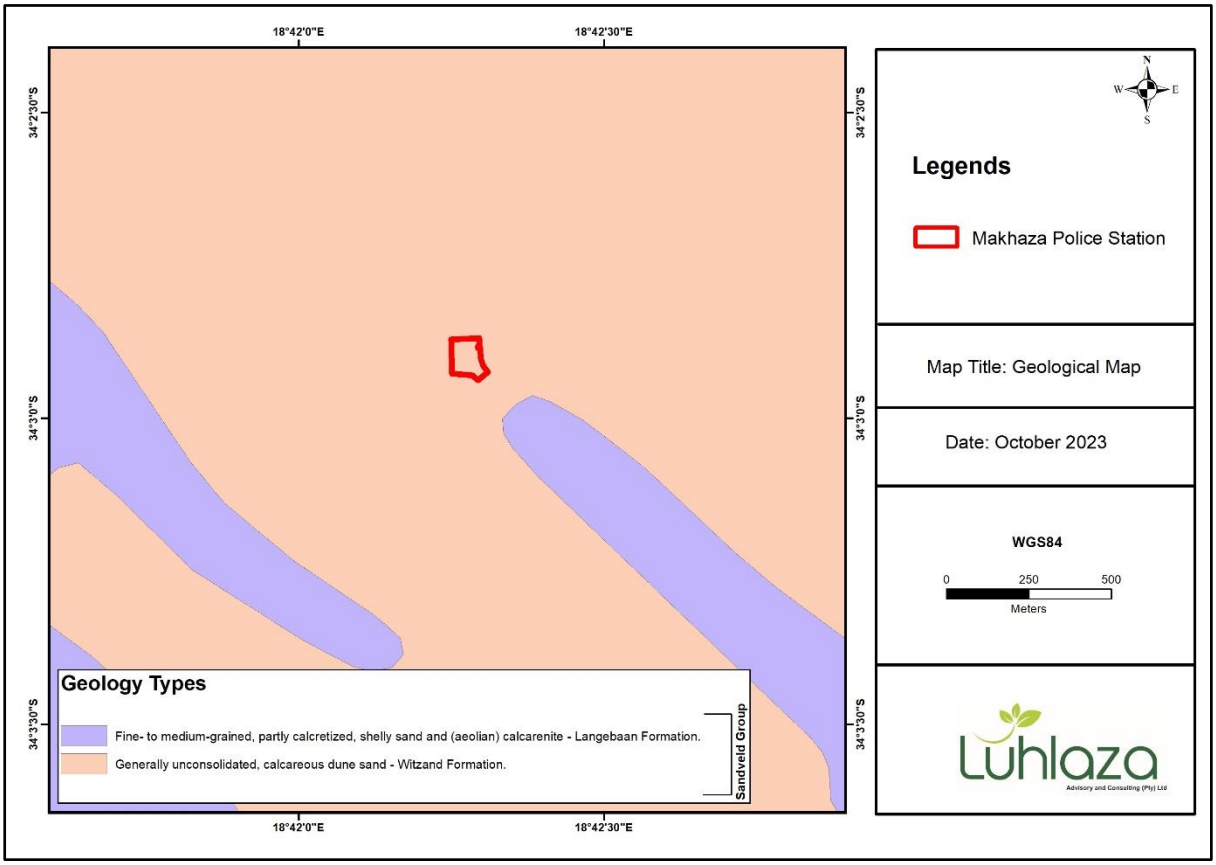

Figure 3: Geology Map of the area “3318 Cape Town” highlighted in red, Scale 1:250 000.

The available geological information does not indicate any geological structures (i.e., faults) in the immediate vicinity of the project area. As such there are no impact of any geological anomalies in the investigation area.

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6 INVESTIGATION ACTIVITIES

The site investigation was carried out on the 29th of September 2023, which included:

a) Excavation of test pits using hand tools.
b) Dynamic Cone Penetrometer (DCP) testing.
c) Collection of soil and rock samples for laboratory testing.

6.1 Test Pitting and Profiling

Twenty-two test pits (TP01 to TP22) were excavated at preselected points as indicated in Figure 4. The different soil horizons encountered in the test pits were described using moisture, color, consistency, structure, soil type and origin (MCCSSO classification system), standard descriptors. The test pits were excavated into the weathered bedrock to an approximate depth ranging from 2.5m to 3.0m below existing ground level (begl) (Table 1).

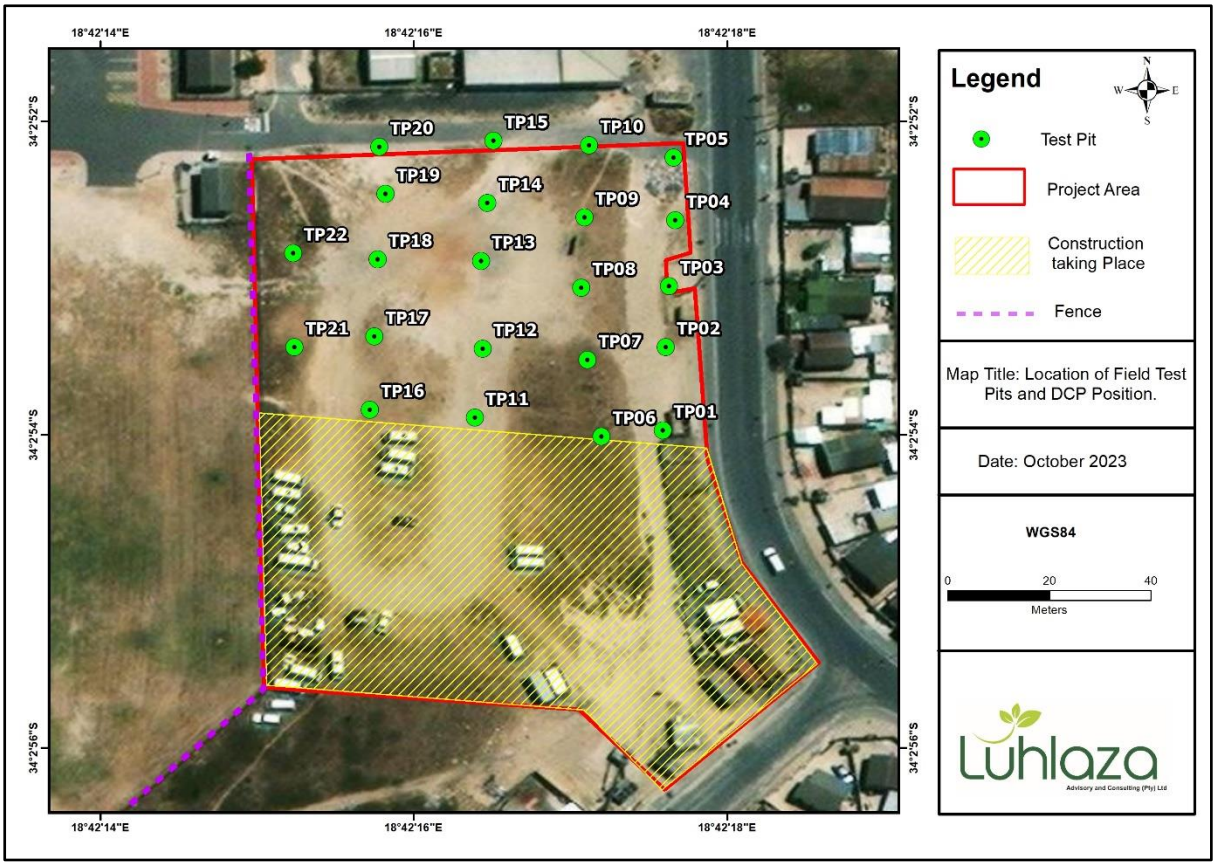

Figure 4: Location of the Field Test Pit and DCP relative to the site.

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Table 1: Summary of the Test Pit and DCP Positions.

TP	Latitude (South)	Longitude (East)	Elevation (mamsl)	Depth of TP (m begl)	Depth of DCP (m begl)
01(DCP01)	34°02'53.97"S	18°42'17.59"E	23	3.0	3.0
02(DCP02)	34°02'53.44"S	18°42'17.61"E	23	3.0	3.0
03(DCP03)	34°02'53.05"S	18°42'17.63"E	23	3.0	3.0
04(DCP04)	34°02'52.63"S	18°42'17.67"E	23	3.0	3.0
05(DCP05)	34°02'52.23"S	18°42'17.66"E	23	3.0	3.0
06(DCP06)	34°02'54.01"S	18°42'17.20"E	23	2.5	2.5
07(DCP07)	34°02'53.52"S	18°42'17.11"E	23	2.5	3.0
08(DCP08)	34°02'53.06"S	18°42'17.07"E	23	2.5	2.5
09(DCP09)	34°02'52.61"S	18°42'17.09"E	23	2.5	2.5
10(DCP10)	34°02'52.15"S	18°42'17.12"E	23	2.5	2.5
11(DCP11)	34°02'53.89"S	18°42'16.39"E	23	2.5	2.4
12(DCP12)	34°02'53.45"S	18°42'16.44"E	23	2.5	2.5
13(DCP13)	34°02'52.89"S	18°42'16.43"E	23	2.5	3.0
14(DCP14)	34°02'52.52"S	18°42'16.47"E	23	3.0	3.0
15(DCP15)	34°02'52.07"S	18°42'16.50"E	23	3.0	3.0
16(DCP16)	34°02'53.84"S	18°42'15.72"E	23	2.5	2.5
17(DCP17)	34°02'53.37"S	18°42'15.75"E	23	2.5	3.0
18(DCP18)	34°02'52.88"S	18°42'15.77"E	23	3.0	3.0
19(DCP19)	34°02'52.46"S	18°42'15.82"E	23	3.0	3.0
20(DCP20)	34°02'52.01"S	18°42'15.81"E	23	3.0	3.0
21(DCP21)	34°02'53.44"S	18°42'15.24"E	23	2.5	2.5
22(DCP22)	34°02'52.84"S	18°42'15.23"E	23	2.5	2.5

The test pits were profiled in accordance with the South African Geoterminology Guidelines (Brink and Bruin, 2002). The test pit profiles are provided in Appendix A.

6.2 DCP Testing

A DCP test was carried out in order to determine the consistency of the respective soil horizons (Figure 5). At each test pit a DCP test was conducted in proximity of the pit. In total twenty-two (22) DCP tests were conducted at preselected points (Table 1).

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Figure 5: DCP testing conducted on site.

The DCP tests extended to an approximate depth ranging from 2.4 to 3.0m. The DCP test results are provided in Appendix B.

The co-ordinates of the test pits and DCP were recorded using the handheld GPS device “Garmin GPS Map 62”. Table 1 above provides a summary of the test pit and DCP positions.

7 TOPOGRAPHY

The elevation of the investigated area (Figure 6) is generally characterised by a gentle slope with a minimum and maximum elevations of 22m and 23m above mean sea level (AMSL) respectively.

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Figure 6: A topographical cross section of the site from east to west direction Google Earth Maps.

8 INVESTIGATION RESULTS

8.1 Soil Profiles

The test pit positions investigated (Figure 4 and Table 1) comprised of transported material and alluvium. The material profiled is briefly discussed below and summarised in Table 2.

a) **Transported Material** - Material may be described as Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris. The transported material was encountered in all test pits and it extended to an approximate depth ranging from 0.3m to 0.4m begl. (Refer to test pit profiles for detailed descriptions in Appendix A).

b) **Alluvium –** Material may be described as slightly moist to wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris The sand material was

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encountered in all test pits and it extended to an approximate depth ranging from 2.5m to 3.0m begl. (Refer to test pit profiles for detailed descriptions in Appendix A).

Table 2: Summary of the depths of the various layers encountered during profiling.

Test Pit	Latitude (South)	Longitude (East)	Elevation (mamsl)	Transported	Alluvium (dry)	Alluvium (wet)
TP01	34°02'53.97"S	18°42'17.59"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP02	34°02'53.44"S	18°42'17.61"E	23	0 - 0.3	0.4 - 1.4	1.4 - 3.0
TP03	34°02'53.05"S	18°42'17.63"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP04	34°02'52.63"S	18°42'17.67"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP05	34°02'52.23"S	18°42'17.66"E	23	0 - 0.3	0.4 - 1.4	1.4 - 3.0
TP06	34°02'54.01"S	18°42'17.20"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP07	34°02'53.52"S	18°42'17.11"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP08	34°02'53.06"S	18°42'17.07"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP09	34°02'52.61"S	18°42'17.09"E	23	0 - 0.4	0.4 - 1.4	1.4 - 2.5
TP10	34°02'52.15"S	18°42'17.12"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP11	34°02'53.89"S	18°42'16.39"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP12	34°02'53.45"S	18°42'16.44"E	23	0 - 0.4	0.4 - 1.4	1.4 - 2.5
TP13	34°02'52.89"S	18°42'16.43"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP14	34°02'52.52"S	18°42'16.47"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP15	34°02'52.07"S	18°42'16.50"E	23	0 - 0.3	0.4 - 1.4	1.4 - 3.0
TP16	34°02'53.84"S	18°42'15.72"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP17	34°02'53.37"S	18°42'15.75"E	23	0 - 0.4	0.4 - 1.4	1.4 - 2.5
TP18	34°02'52.88"S	18°42'15.77"E	23	0 - 0.3	0.4 - 1.4	1.4 - 3.0
TP19	34°02'52.46"S	18°42'15.82"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP20	34°02'52.01"S	18°42'15.81"E	23	0 - 0.4	0.4 - 1.4	1.4 - 3.0
TP21	34°02'53.44"S	18°42'15.24"E	23	0 - 0.3	0.4 - 1.4	1.4 - 2.5
TP22	34°02'52.84"S	18°42'15.23"E	23	0 - 0.4	0.4 - 1.4	1.4 - 2.5

8.2 DCP Test Results

The results of the DCP tests are displayed graphically in Appendix B. DCP tests were planned but due to the stiffness of the materials, premature refusal was encountered.

The DCP test results have been summarized for the transported material and alluvial soil. There is no undrained strength for sandy material; however, this can be correlated to the friction angle of sand assuming a cohesion of zero (Table 3 and Table 4). The shear strength of the soil based on the results from the DCP are summarized in Table 4.

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Table 3: Preliminary Estimate of Bearing Capacity/Presumed Bearing Pressure (kN/m²). reference

Material	Description	Strength		Presumed Bearing Value
Clay	V. Soft	0–12 kPa		<25
	Soft	12–25 kPa		25–50
	Firm	25–50 kPa		50–100
	Stiff	50–100 kPa		100–200
	V. Stiff	100–200 kPa		200–400
	Hard	>200 kPa		>400
Sands*	V. Loose	$D_r < 15\%$	$\phi < 0°$	<50
	Loose	$D_r = 15–35\%$	$\phi = 30–35°$	50–100
	Med dense	$D_r = 35–65\%$	$\phi = 35–40°$	100–300
	Dense	$D_r = 65–85\%$	$\phi = 40–45°$	300–500
	V. dense	$D_r > 85\%$	$\phi > 45°$	>500

Table 4: Summary of DCP Results.

DCP	Soil Horizon	Depth of DCP (m begl)	mm per blow (min – max)	Inferred Consistency	Shear Strength Non- Cohesive Material (°)
DCP01	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	2 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3.0	11 - 20	Dense	36° - 38°
DCP02	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 8	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3.0	8 - 19	Medium dense to Dense	35° - 37°
DCP 03	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	3 - 7	Loose to Medium dense	30° - 34°
	Alluvial (Wet)	1.4 - 3.0	6 - 20	Medium dense to Dense	33° - 38°
DCP04	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	3 - 6	Loose to Medium dense	30° - 36°
	Alluvial (Wet)	1.4 - 3.0	6 - 20	Medium dense to Dense	33° - 38°

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DCP	Soil Horizon	Depth of DCP (m begl)	mm per blow (min – max)	Inferred Consistency	Shear Strength Non- Cohesive Material (°)
DCP05	Transported	0 - 0.3	6 - 8	Medium dense	33° - 35°
	Alluvial (Dry)	0.4 - 1.4	7 - 16	Medium dense - Dense	34° - 37°
	Alluvial (Wet)	1.4 - 3.0	19 - 28	Dense to Very dense	37° - 38°
DCP06	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	7 - 13	Medium dense to Dense	33° - 37°
DCP07	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	2 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	5 - 19	Medium dense to Dense	32° - 37°
DCP08	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	7 - 16	Medium dense - Dense	34° - 37°
DCP09	Transported	0 - 0.4	2 - 5	Loose to Medium dense	30° - 32°
	Alluvial (Dry)	0.4 - 1.4	3 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	7 - 16	Medium dense to Dense	34° - 37°
DCP10	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	7 - 14	Medium dense to Dense	34° - 37°
DCP11	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 2.5	9 - 17	Medium dense to Dense	35° - 37°

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DCP	Soil Horizon	Depth of DCP (m begl)	mm per blow (min – max)	Inferred Consistency	Shear Strength Non- Cohesive Material (°)
DCP12	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	2 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 2.5	9 - 18	Medium dense to Dense	35° - 37°
DCP13	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 6	Loose to Medium dense	30° - 33°
	Alluvial (Wet)	1.4 - 2.5	6 - 19	Medium dense to Dense	33° - 37°
DCP14	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	3 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3	9 - 20	Medium dense to Dense	35° - 38°
DCP15	Transported	0 - 0.3	3 - 4	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	3 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3	9 - 20	Medium dense to Dense	35° - 38°
DCP16	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 97	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 2.5	9 - 19	Medium dense to Dense	35° - 37°
DCP17	Transported	0 - 0.4	2 - 3	Loose	30°
	Alluvial (Dry)	0.4 - 1.4	3 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 2.5	9 - 20	Medium dense to Dense	35° - 38°
DCP18	Transported	0 - 0.3	2 - 4	Loose to Medium dense	30°
	Alluvial (Dry)	0.3 - 1.4	4 - 7	Loose to Medium dense	30° - 34°
	Alluvial (Wet)	1.4 - 3	7 - 21	Medium dense to Dense	34° - 38°

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DCP	Soil Horizon	Depth of DCP (m begl)	mm per blow (min – max)	Inferred Consistency	Shear Strength Non- Cohesive Material (°)
DCP19	Transported	0 - 0.3	2 - 4	Loose to Medium dense	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 7	Loose to Medium dense	30° - 32°
	Alluvial (Wet)	1.4 - 3	5 - 23	Medium dense to Dense	32° - 38°
DCP20	Transported	0 - 0.4	2 - 5	Loose to Medium dense	30°
	Alluvial (Dry)	0.4 - 1.4	3 - 8	Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3	8 - 19	Medium dense to Dense	36° - 37°
DCP21	Transported	0 - 0.3	2 - 3	Loose	30°
	Alluvial (Dry)	0.3 - 1.4	2 - 9	Loose to Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 2.5	9 - 19	Medium dense to Dense	35° - 37°
DCP22	Transported	0 - 0.4	3 - 5	Loose to Medium dense	30° - 32°
	Alluvial (Dry)	0.4 - 1.4	3 - 8	Medium dense	30° - 35°
	Alluvial (Wet)	1.4 - 3	8 - 19	Medium dense to Dense	36° - 37°

9 GROUNDWATER

During the investigation, groundwater seepage was encountered in all the test pits excavated on site. It must be noted that groundwater activity is generally expected across the entire site. This will need to be considered during construction.

There is a concern of an elevated groundwater condition and considering that the structures will be submerged in water, it is imperative that adequate construction measures are implemented to ensure the safety of site personnel. It is therefore recommended that the Engineer design appropriate measures for implementation to counteract the potential groundwater activity on site, i.e. subsurface drainage.

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10 SOIL LABORATORY RESULTS

The following tests were carried out on insitu soil samples to determine the engineering properties:

a) Foundation Indicator (Grading Analyses, Atterberg Limits Determination)
b) California Bearing Ratio (CBR)
c) Ph and Electric Conductivity
d) Double Oedometer
e) Moisture
f) Maximum Dry Density and Optimum Moisture Content (MDD)
g) Road Indicators

Table 5: Summary of Laboratory Testing Results

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits %			GM	Moisture (%)	Compaction			CBR						Classification				Consolidation						Ph-Value	Electrical Conductivity (mS/m)
																									NMC			Soaked				
			Clay	Silt	Sand	Gravel	LL	PI	LS			IMC(OMC) (%)	MDD (kg/m3)	%Swell	100	98	97	95	93	90	Expansive	USC	COLTO	H.R.B	DD (kg/m3)	MC (%)	Void Ratio (%)	DD (kg/m3)	MC (%)	Void Ratio (%)		
Alluvial Soils																																
TP1A	0.6-1.0	Alluvium	17.0	33.0	50.0	0.0	20.7	0.0	0.0	0.53	5.8	5.3	1503	0.0	4.0	4.0	3.0	2.0	2.0	1.0	LOW	SM	>G10	A-4	1405.0	3.0	0.9	1392.0	33.3	0.9	7.1	13.3
TP2B	2.0-2.4	Alluvium	14.0	30.0	56.0	0.0	23.4	0.0	0.0	0.6	4.5	5.1	1522	0.0	5.0	4.0	4.0	3.0	3.0	2.0	LOW	SM	>G10	A-4	1392.0	5.6	0.9	1386.0	28.8	0.9	7.7	15.1
TP3C	0.6-1.0	Alluvium	17.0	32.0	48.0	3.0	21.9	0.0	0.0	0.6	5.3	5.5	1555	0.0	4.0	3.0	3.0	2.0	1.0	1.0	LOW	SM	>G10	A-4							8.1	19.9
TP7D	2.0-2.4	Alluvium	12.0	28.0	60.0	0.0	20.7	0.0	0.0	0.8	5.6	5.4	1605	0.0	4.0	4.0	3.0	2.0	2.0	1.0	LOW	SM	>G10	A-4							7.3	20.2
TP8E	0.5-0.9	Alluvium	14.0	34.0	50.0	2.0	23.1	0.0	0.0	0.7	6.1	5.6	1586	0.0	4.0	4.0	3.0	2.0	1.0	1.0	LOW	SM	>G10	A-4							6.9	23.3
TP10F	0.5-0.9	Alluvium	19.0	33.0	48.0	0.0	19.9	0.0	0.0	0.5	6.4	6.1	1622	0.0	6.0	5.0	5.0	4.0	3.0	2.0	LOW	SM	G10	A-4							8.3	16.7
TP11G	1.8-2.2	Alluvium	9.0	18.0	72.0	1.0	23.7	0.0	0.0	0.8	5.9	6.1	1537	0.0	4.0	4.0	3.0	2.0	2.0	1.0	LOW	SM	>G10	A-2-7							7.4	15.5
TP12H	0.6-1.0	Alluvium	19.0	34.0	47.0	0.0	22.3	0.0	0.0	0.6	6.4	6.2	1566	0.0	5.0	4.0	3.0	3.0	2.0	1.0	LOW	SM	>G10	A-4							8.2	18.3
TP17I	1.8-2.0	Alluvium	15.0	28.0	56.0	1.0	19.9	0.0	0.0	0.8	4.8	4.9	1487	0.0	4.0	3.0	3.0	2.0	1.0	1.0	LOW	SM	>G10	A-4							7.8	16.2
TP18J	0.6-0.9	Alluvium	16.0	41.0	43.0	0.0	24.1	0.0	0.0	0.5	5.0	5.5	1582	0.0	5.0	4.0	3.0	2.0	2.0	1.0	LOW	SM	>G10	A-4							6.8	14.1
TP19K	1.6-2.0	Alluvium	16.0	28.0	55.0	1.0	20.6	0.0	0.0	0.6	7.1	6.6	1492	0.0	5.0	5.0	4.0	4.0	3.0	2.0	LOW	SM	G10	A-4							7.4	15.5

LL - Liquid Limit GM - Grading Modulus PI - Plasticity Index
>G10 - COLTO Classification LS - Linear Shrinkage A-2-4 - AASHTO Classification
USC - Unified Soil Classification CBR - California Bearing Ratio SM - Silty Sands.

Based on the Table 5 above, the results indicate the following:

For more accurate identification and classification purposes, Particle size distribution and Atterberg Limits tests were carried out. The results indicate that the sand in the area is non-plastic in nature and the potential expansiveness is therefore very low with a low grading modulus. The materials are therefore considered to be slightly to non-heaving in nature.

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The compaction test indicates that the material at site has a maximum dry density ranging between 1487 – 1622kg/m3 at an optimum moisture content ranging between 4.9 – 6.6% with no potential of swelling.

The Unified Soil Classification and AASHTO classification systems classified the material as silty sand (SM) (A-4 and A-2-7) which can be classified as fair to good subgrade material.

The material on site indicates a poor CBR with the value of 2 - 4% at 95% and 1- 3% at 93% MOD AASHTO. Hence, the COLTO classification system classified the material as >G10.

The electrical conductivity and the acidity of the soil influences the aggressiveness of the soil towards buried metallic and cementitious objects. Thus, the alluvial sand samples were collected to determine the aggressiveness of the soil which can affect buried services and concrete foundations. Therefore, the alluvial sands have pH values ranging between 6.8 – 8.3 and an electrical conductivity ranging between 13.3– 23.3 mS m-1. This indicates that the sands in the area are slightly acidic and corrosive. The materials in the area are regarded as aggressive and will corrode the metallic and cementitious objects even though the pH values are high. Guideline values for interpretation of soil conductivity are presented in Table 6 and Table 7.

Table 6: Guideline values for interpretation of soil conductivity (Duligal, E., 1996. Significance of Soil Resistivity on Corrosivity. Unpublished report compiled for Africon).

Soil Conductivity (mS/m)	Degree of Corrosiveness
More than 50	Extremely corrosive
25 - 50	Very corrosive
20 - 25	Corrosive
10 - 20	Mildly corrosive
Less than 10	Not generally corrosive

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Table 7: Interpretation of conductivity tests (Duligal, E., 1996. Significance of Soil Resistivity on Corrosivity. Unpublished report compiled for Africon).

pH	Degree of Acidity
< 4.0	Extremely acidic
4.0 - 5.4	Strongly acidic
5.5 - 6.4	Moderately Acidic
6.5 - 7.0	Slightly Acidic
7.1 - 7.4	Slightly Alkaline
7.5 - 8.5	Moderately Alkaline
>8.4	Strongly Alkaline

The laboratory results are included as Appendix C.

11 DISCUSSION

11.1 Proposed Development

Information supplied to Luhlaza indicates that a new Makhaza Police Station is proposed for site.

Detailed designs of the structures are not known at this stage and it is recommended that this be discussed with a geotechnical specialist once finalized.

11.2 Site Stability

During the site geotechnical investigation, the embankments of test pits were all stable until where ground water was encountered. Ground water seepage was observed in all test pits at the depth of 1.4m and any excavation deeper than 1.0m be battered back to a 1:2 grade slope or be shored.

There is a risk for an elevated groundwater condition on site and adequate engineering measures should be implemented to mitigate these hazards. It is strongly advised that subsurface drainage be implemented along weakly drained areas.

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To maintain the stability of the site, it is imperative that adequate site drainage measures are implemented.

The soils on site are considered susceptible to erosion/sloughing by uncontrolled stormwater runoff and it is important that adequate erosion prevention controls are implemented at the site.

It is imperative that all excavations are regularly (daily) inspected and approved by a geotechnical practitioner to detect any potentially unstable areas during the construction phase.

The recommendations given in this report should be followed for the stability assessment to be valid.

Precautionary measures are recommended to ensure that sound development practices appropriate to the site conditions anticipated are adhered to. The information available by the client on the proposed development was used at the time of preparation of this report.

11.3 General Earthworks

Earthwork activities will need to be carried out strictly in accordance with the current SANS 1200 guidelines to ensure safe working procedures and maintain stability of the site.
Where possible, the lowering of ground levels is to be avoided to reduce the risk of encountering problematic shallow groundwater seepage. Where this is not feasible, allowance is to be made for suitable subsoil drainage to engineer's detail.

Placement of fill layers should be undertaken in layers not exceeding 150mm thick. When placed loose, it has to be compacted using suitable compaction plant to achieve 93% of Modified AASHTO maximum dry density. (Engineer may opt for 95% or 98% Modified AASHTO, depending on the proposed designs). If natural ground slopes are steeper than 9 degrees, the fill must be benched into the slope.

Terraces should be graded to direct water away from the fill edges, and small earth bands should be constructed along the crests of fills, to prevent overtopping and erosion of fill embankment slopes.

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Acceptance and process density control testing of placed fill material should be undertaken at regular intervals during fill construction as part of process and acceptance quality assurance monitoring.

Regardless of the foundation solutions, an open excavation is likely to be formed to construct the proposed structure. Vertical sidewalls of this excavation are likely to be unstable and will need to be battered back to at least 26° or shored.

Steeper batters can be considered but will need to be inspected and approved by the geotechnical professional on site during construction. Alternatively, excavations will require shoring to engineer's detail particularly where there is groundwater seepage.

Cut and fill slopes should not exceed the recommended slope batters given in TRH9 and TRH10 i.e., cut and fill batters of 26° (1 Vertical in 2 horizontal) in soils.

Workers should not enter any excavations deeper than 1.5m that are not shored or battered back as described above, as sidewalls in the low strength soils resembling those encountered on site will be prone to collapse. All excavations must be inspected daily by a competent person and records must be kept. It remains the responsibility of the Contractor/Developer to comply with the current requirements of the Occupational Health and Safety Act.

11.4 The Trenchability/Excavatability on Site

The excavations have been assessed based on SANS 1200D (Refer to Table 10), DA and DB (Latest version). Based on the results of the field investigation, it is inferred that the subsurface material encountered in TP01 – TP22 classifies as soft excavation down to the final depths of the tests pits (Table 5). Machinery such as TLB can be used on soft excavation. (TP and DCP results, and Appendix D).

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Table 8: Classification of Material for Machinery Excavation (SANS 1200 D).

CLASSIFICATION	DESCRIPTION
Soft	Material which can be efficient removed by a back-acting excavator of fly wheel power > 0,10Kw for each mm of tined bucket width.
Intermediate	Material which can be removed by a back-acting excavator having fly wheel power > 0,10kW for each mm of tined-bucket width or with the use of pneumatic tools before removal by a machine capable of removing material.
Hard Rock	Material cannot be removed without blasting or wedging and splitting.

11.5 Classification of Material and Recommended Usage

The subgrade materials underlying the existing site have been classified in terms of their suitability for use in construction based on the field observations and laboratory testing in accordance with the proposed design.

The sand classifies as A-4 (fair) and A-2-7 (good) which can be classified as fair to good to subgrade material and poor subbase material and not suitable for use as base course in roads pavement layers.

CBR testing shows that the materials have poor properties, and the material has a COLTO classification of >G10.

However, it must be noted that limited samples were extracted for laboratory testing, hence it is recommended that additional testing be carried out on site during construction to confirm the material quality and volumes available.

The above should be used as a guideline only and should be confirmed by further testing on site during construction as part of process and acceptance control monitoring, prior to the material being considered for use in construction.

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11.6 General Subgrade layer works Guidelines.

The design of the pavement layer works has not been finalised at time of this report and should be discussed with Luhlaza Advisory and Consulting (Pty) Ltd when available.
The following is a general guideline:

- If materials that are considered to be poor in quality are encountered on site, the material will need to be undercut and replaced by suitable granular material meeting the design engineer's requirements.
- Soils that meet the design engineer's requirements maybe ripped to the specified depth and recompacted to 93% Modified AASHTO maximum dry density to ±2% Optimum Moisture Content (OMC).
- Should the subgrade comprise weathered bedrock, it is recommended that the weathered bedrock be ripped to a minimum depth as prescribed by the engineer and recompacted to at least 93 % Modified AASHTO dry density.
- The pavement formation layer for the proposed roads and parking areas should be designed taking into account anticipated traffic loads, volumes and design life of the parking area and roads.

The COLTO and SANRAL documents are good guidelines to assist with the design of pavements.

11.7 Founding Characteristics of the Site

According to the test pit excavations, the founding conditions encountered on site are inferred to comprise the following:

a) A variable thickness of silty sand overburden material down to approximate depths in the range 2.4m to 3.0m begl.

b) Soils that are potentially collapsible by nature.

c) Soils that are capable of compressional/consolidation movements which may result in significant differential settlements.

d) Groundwater seepage was encountered in all test pits.

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11.8 NHBRC Class Designation

The NHBRC classification for materials underlying the existing site could not be classified during the preparation of this preliminary report due to pending lab results.

The following Table extracted from the Home Building Manual (HBM) of the National Home Builders Registration Council (NHBRC) is used to guide the engineer with the soil properties and expected differential movements beneath the site.

According to guidelines provided in Part 1, Section 2, Table 1 of the HBM of the NHBRC, the following site classes are given for the site:

- **P (Colluvium/Fill)** – Areas underlain by colluvium.
- **C2**– Areas that are underlain by alluvium (silty sands)

Then the area is classified as **P/C2.**

Accordingly, the parameters as set down by the NHBRC are given in Table 9.

Table 9: Residential Site Class Designations (NHBRC HBM, Part 1, Section 2, Table 1).

TYPICAL FOUNDING MATERIAL	CHARACTER OF FOUNDING MATERIAL	EXPECTED RANGE OF TOTAL SOIL MOVEMENTS (mm)	ASSUMED DIFFERENTIAL MOVEMENT (% OF TOTAL)	SITE CLASS
Rock (excluding mudrocks which may exhibit swelling to some depth	STABLE	NEGLIGIBLE	-	R
Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	<7,5 7,5-15 15 - 30 >30	50% 50% 50% 50%	H H1 H2 H3
Silty sands, sands, sandy and gravely soils	**COMPRESSIBLE AND POTENTIALLY COLLAPSIBLE SOILS**	**<5 5-10 >10**	**75% 75% 75%**	**C C1 C2**
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravely soils	COMPRESSIBLE SOILS	<10 10-20 >20	50% 50% 50%	S S1 S2
Contaminated soils, Controlled fill, Dolomitic areas, Landslip, Landfill, Marshy areas Mine waste fill, mining subsidence Reclaimed areas, Uncontrolled fill, very soft silts/silty clays	VARIABLE	VARIABLE		P

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11.9 Foundation Recommendations for Structures

11.9.1 Reinforced Raft Foundation

Based on the results of the field investigation, no rock was encountered on site. The structure is to be placed on the alluvium soil. The DCP tests indicate that the alluvium soils from a depth of between 1.0m and 3.0m begl range from medium dense to dense which is considered as a suitable founding horizon.

The approximate bearing pressures for the site at a depth of between 1.0m and 3.0m begl indicate medium dense to dense soils and based on guidelines by Meyerhof (1956) (Table 6) the following bearing capacities are applicable.

Table 10: Allowable Bearing Capacity (Meyerhof, 1965 in Look, B, (2008))

<table>
<tr><td rowspan="3">Foundation width B (m)</td><td colspan="6">Allowable bearing capacity (kPa)</td></tr>
<tr><td colspan="2">Very loose</td><td>Loose</td><td>Medium dense</td><td colspan="2">Dense</td><td>Very dense</td></tr>
<tr><td colspan="2">N = 5</td><td>N = 10</td><td>N = 20</td><td>N = 30</td><td>N = 40</td><td>N = 50</td></tr>
<tr><td>1</td><td colspan="2" rowspan="2">50</td><td rowspan="2">100</td><td>225</td><td>350</td><td>475</td><td>600</td></tr>
<tr><td>2</td><td>200</td><td>300</td><td>425</td><td>525</td></tr>
<tr><td>3</td><td colspan="2" rowspan="3">25</td><td rowspan="3">75</td><td rowspan="3">175</td><td rowspan="2">275</td><td>375</td><td>475</td></tr>
<tr><td>4</td><td rowspan="2">350</td><td rowspan="2">450</td></tr>
<tr><td>5</td><td>250</td></tr>
</table>

The above table is to be used as a guideline. Based on experience in the past, medium dense to dense generally have bearing pressures of less than 100 kPa and medium dense soils have bearing pressures of between 50 kPa to 75 kPa, with dense material between 75kPa to 100kPa.

The following comments should be noted for table 6:

- It is assumed that foundations are not affected by water.
- If water is encountered, the bearing capacity should be halved.
- A factor of Safety (FS) of 3 was used to calculated settlements for not greater than 25mm.

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A reinforced raft foundation with a safe founding depth of 1 to 1.2m begl as well as compaction of the insitu soils below the individual footings is recommended. Avoid lowering the foundation deeper than 1.2m due to groundwater which was encountered at 1.4m throughout the site.

Also recommended is a well compacted (150mm) G5-G7 layer of engineering fill under any base and compacted 95% MOD AASHTO. This will allow a maximum bearing pressure of 150 to 200KN/m2 with minimum settlement.

Considering all of the above, the engineer will need to design foundations to take into consideration the bearing capacity, the settlements and the effects that the elevated groundwater condition will have on the foundations if it is available.

A provision for possible movements between floors and walls should be allowed for in the design e.g. provision of construction joints and use of appropriate softboard between walls and floors as per structural engineer's detail. All brickwork and foundations will need to be reinforced to resist heave. The use of movement joints should also be considered.

It is a requirement that prior to casting any concrete in the foundation trenches, all loose material needs to be removed.

It is a requirement that all foundations are inspected and approved by a geotechnical specialist such as Luhlaza Advisory and Consulting (Pty) Ltd.

All foundations will need to be designed strictly to engineer's detail and adequately reinforced taking into consideration the founding conditions of the site.

11.10 Drainage and Stormwater Guidelines

To maintain stability of the site, it is important to control the movement of both surface and groundwater. Adequate drainage measures need to be implemented to prevent any ponding occurring within the site during and post construction.

On all road curves, the outer shoulder should be lined with upright kerbs to deflect water run-off back into the road stormwater system. Experience with the erodible soils indicates that

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unlined dish (half round) drains adjacent to the roads are virtually ineffective and will soon give way to the formation of large and deep dongas (erosion gulley). Subsequent damage of road prisms may be expected.

The need for subsoil drainage will have to be assessed on site during construction in consultation with the geotechnical professional.

Owing to the highly erodible nature of the in-situ soils on-site if subject to poor stormwater runoff controls, due caution is permanently required to prevent slope damage and property maintenance arising from erosion due to uncontrolled runoff of surface water, particularly during periods of heavy rain.

All stormwater issues arising from the roof and paved areas are to be piped to either discharge off-site into a government stormwater connection facility, if available. If this is not available, the feasibility of piping all stormwater from the completed development into an on-site stormwater subsoil percolation disposal system to engineer's detail is to be confirmed in consultation with the geotechnical professional as part of a supplementary geotechnical investigation.

As good practice, to limit maintenance and to promote foundation stability, the finished ground surfaces should be graded away from the structures to facilitate drainage of surface water runoff rapidly and effectively away from the building perimeter.

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12 CONCLUDING COMMENTS

The ground conditions identified within the site are inferred based on actual field test positions and are likely to vary.

The subsurface soil profile comprises of transported material and alluvium soil.

Groundwater seepage was encountered in all the test pits excavated on site. Thus, it must be noted that groundwater activity is generally expected across the entire site. Therefore, it is advised that a contingency plan be developed to manage the groundwater risk at the site.

Earthwork activities will need to be carried out strictly in accordance with the current SANS 1200 guidelines to ensure safe working procedures and maintain stability of the site.

Trenchability and excavatability comments are provided in Section 11.4. In general, soft to intermediate excavations are possible down to final depths of the test pits.

Foundation solutions are discussed in Section 11.7 to 11.9.

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Appendix A: Test Pits

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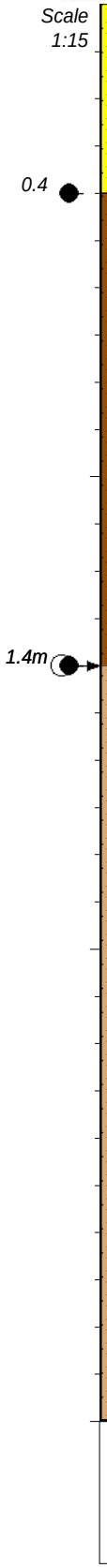
Ukuza
Makhaza Police Station

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3.0m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Disturbed samples taken at 0.4 -- 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'17.59"E
Y-COORD : 34˚02'53.97"S

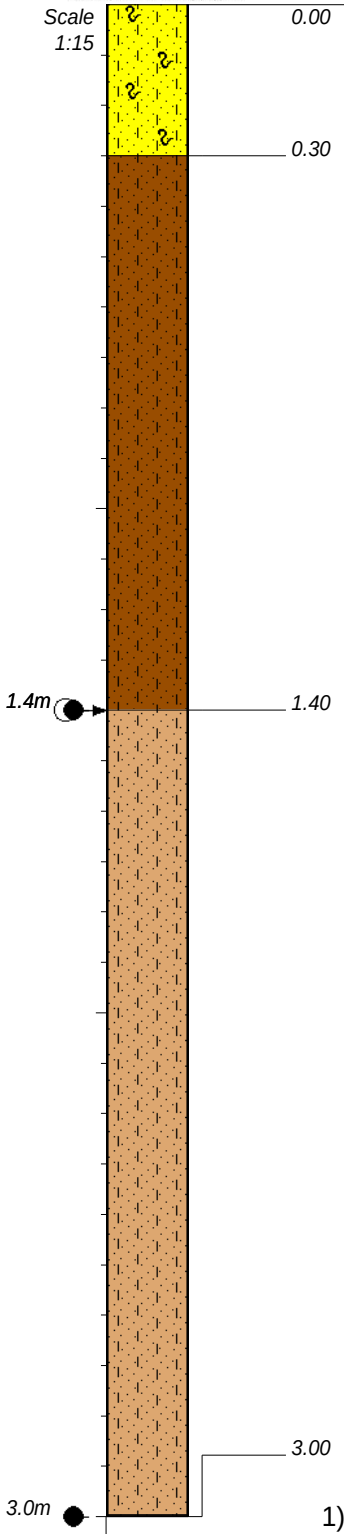
HOLE No: TP01

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP02
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 – 0.30: Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 – 1.40: Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 – 3.00: Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

NOTES

1) End of hole depth at 3.0m.
2) groundwater seepage encountered at 1.4m.
3) Disturbed samples taken at 1.4m -- 3.0m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.61"E
Y-COORD : 34´°02'53.44"S

HOLE No: TP02

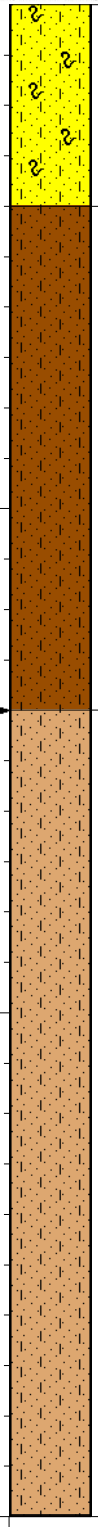
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) end of hole depth at 3.0m.

2) Groundwater seepage encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'17.63"E
Y-COORD : 34˚02'53.05"S

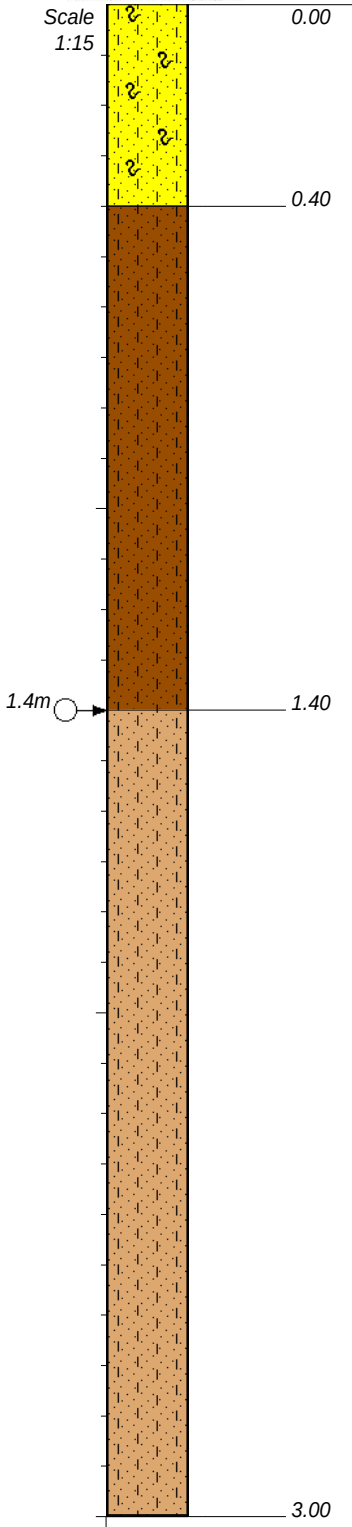
HOLE No: TP03

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: LC020-23



Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

NOTES

1) End of hole depth at 3.0m.

2) groundwater seepage encountered at 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'17.67"E
Y-COORD : 34˚02'52.63"S

HOLE No: TP04

Luhlaza
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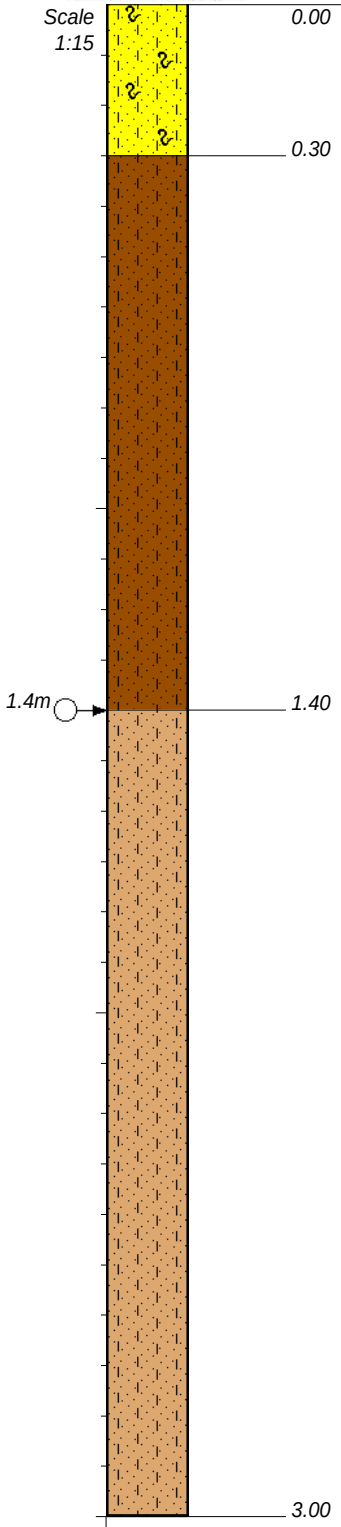
Ukuza
Makhaza Police Station

HOLE No: TP05
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIALSOIL .

3.00

NOTES

1) End of hole depth at 3.0m.

2) groundwater seepage encountered at 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.66"E
Y-COORD : 34´°02'52.23"S

HOLE No: TP05

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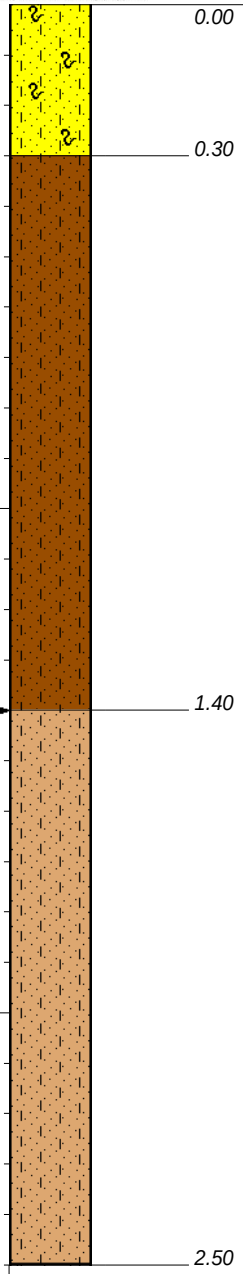
Ukuza
Makhaza Police Station

HOLE No: TP06
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.20"E
Y-COORD : 34´°02'54.01"S

HOLE No: TP06

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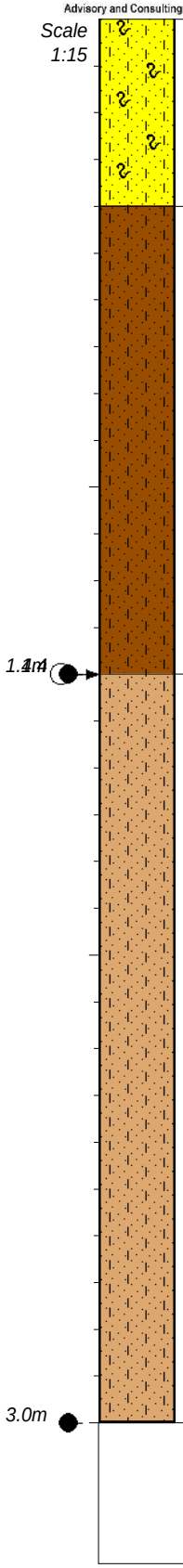
Ukuza
Makhaza Police Station

HOLE No: TP07
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose,fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIALSOIL .

3.00

NOTES

1) End of hole depth at 3.0m.
2) Groundwater seepage at 1.4m.
3) Disturbed samples collected at depth 1.4 -- 3.0m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.11"E
Y-COORD : 34´°02'53.52"S

HOLE No: TP07

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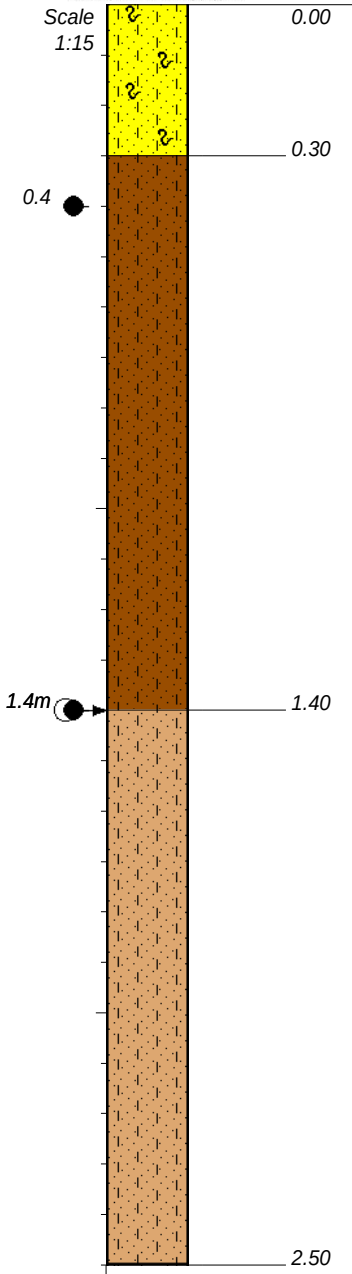
Ukuza
Makhaza Police Station

HOLE No: TP08
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL .

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth 2.5m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Dusturbed sample taken at 0.4 -- 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.07"E
Y-COORD : 34´°02'53.06"S

HOLE No: TP08

Luhlaza
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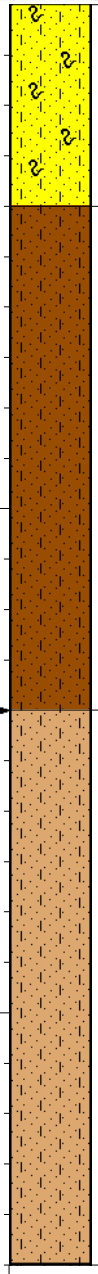
Ukuza
Makhaza Police Station

HOLE No: TP09
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIALSOIL .

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.09"E
Y-COORD : 34´°02'52.61"S

HOLE No: TP09

Luhlaza
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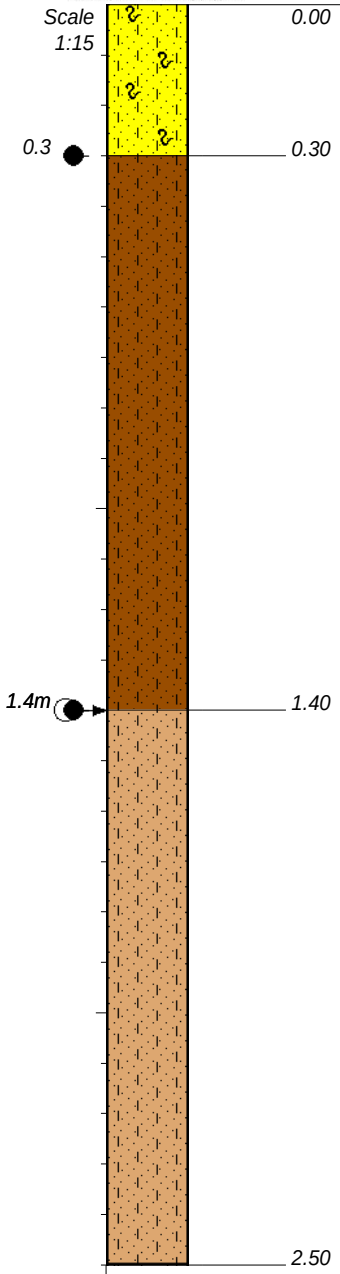
Ukuza
Makhaza Police Station

HOLE No: TP10
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Disturbed samples collected at depth 0.3 -- 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'17.12"E
Y-COORD : 34´°02'52.15"S

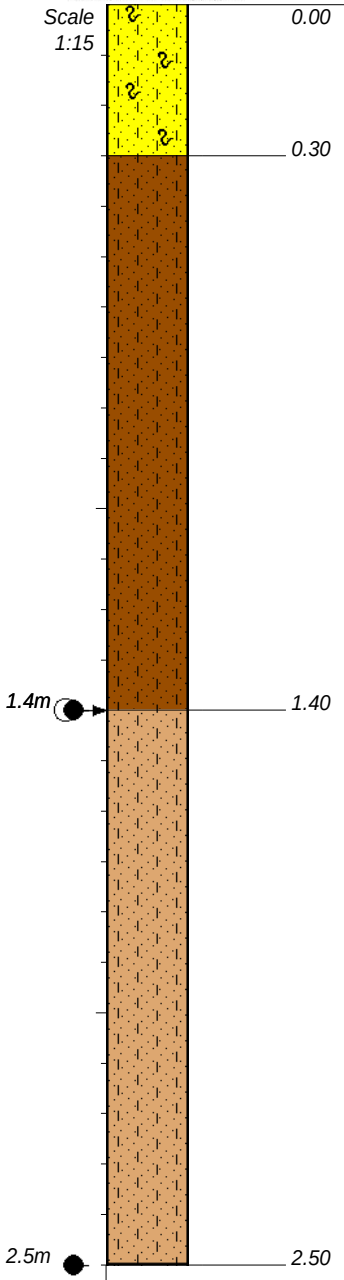
HOLE No: TP10

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP11
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 — Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 — Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 — Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIALSOIL .

2.50

NOTES

1) End of hole depth at 2.5m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Disturbed samples collected at depth 1.4m -- 2.5m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'16.39"E
Y-COORD : 34´°02'53.89"S

HOLE No: TP11

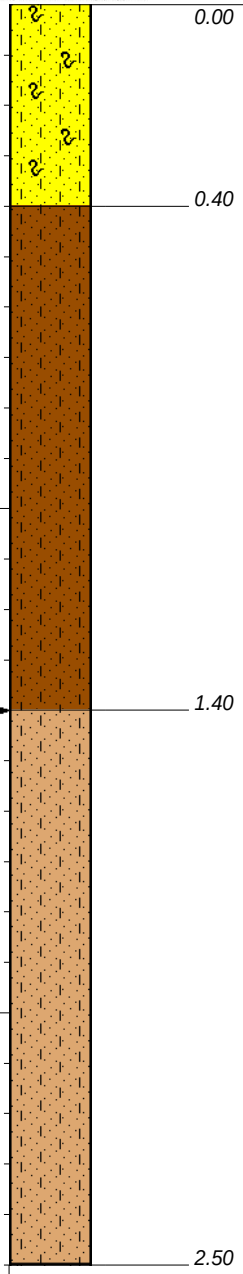
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP12
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Disturbed samples collected at depth 0.4 -- 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'16.44"E
Y-COORD : 34´°02'53.45"S

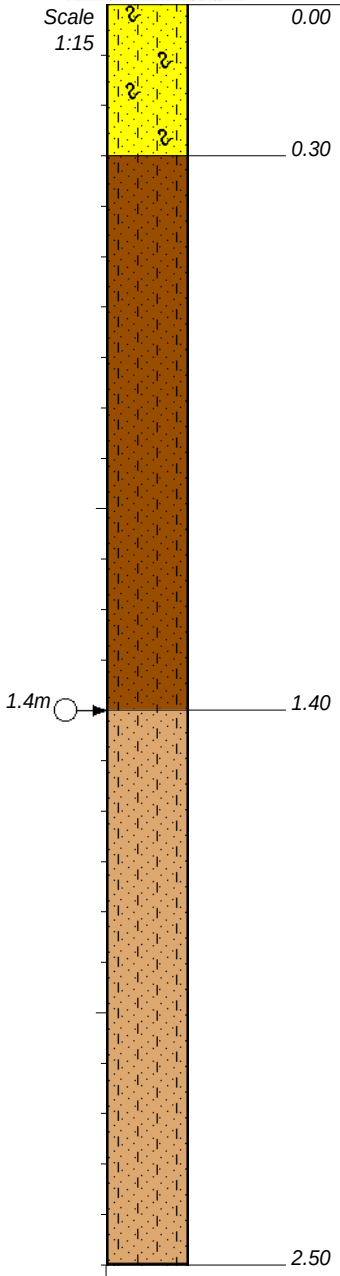
HOLE No: TP12

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP13
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'16.43"E
Y-COORD : 34˚02'52.89"S

HOLE No: TP13

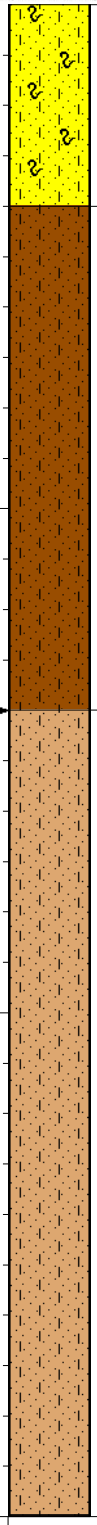
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP14
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3.0m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'16.47"E
Y-COORD : 34˚02'52.52"S

HOLE No: TP14

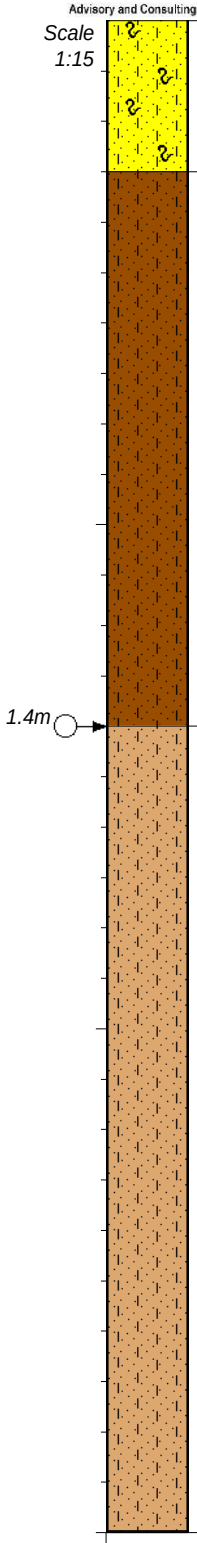
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP15
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3.0m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'16.50"E
Y-COORD : 34˚02'52.07"S

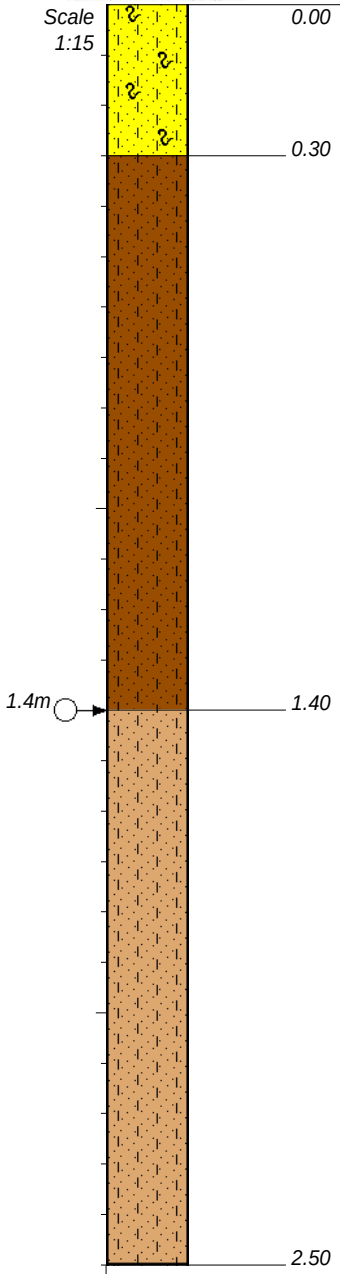
HOLE No: TP15

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP16
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.72"E
Y-COORD : 34˚02'53.84"S

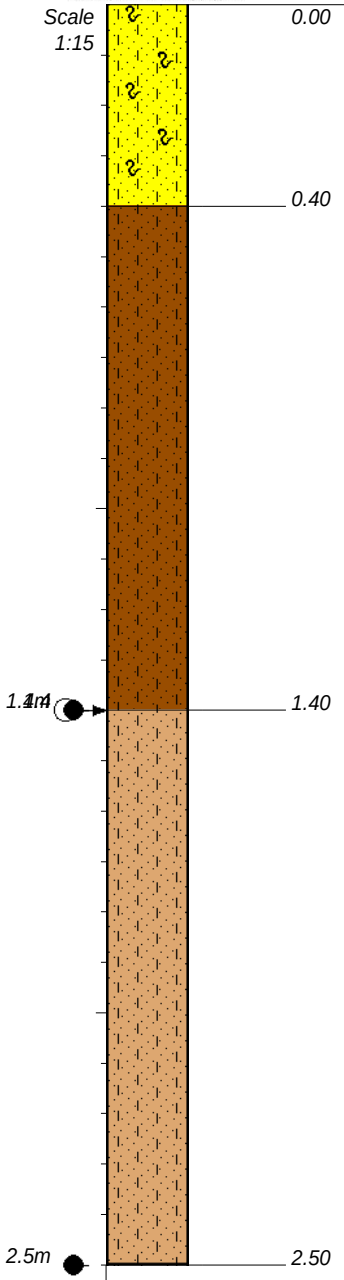
HOLE No: TP16

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP17
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 — Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 — Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 — Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Disturbed samples collected at depth 1.4 -- 2.5m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer
TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023
DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18´°42'15.75"E
Y-COORD : 34´°02'53.37"S

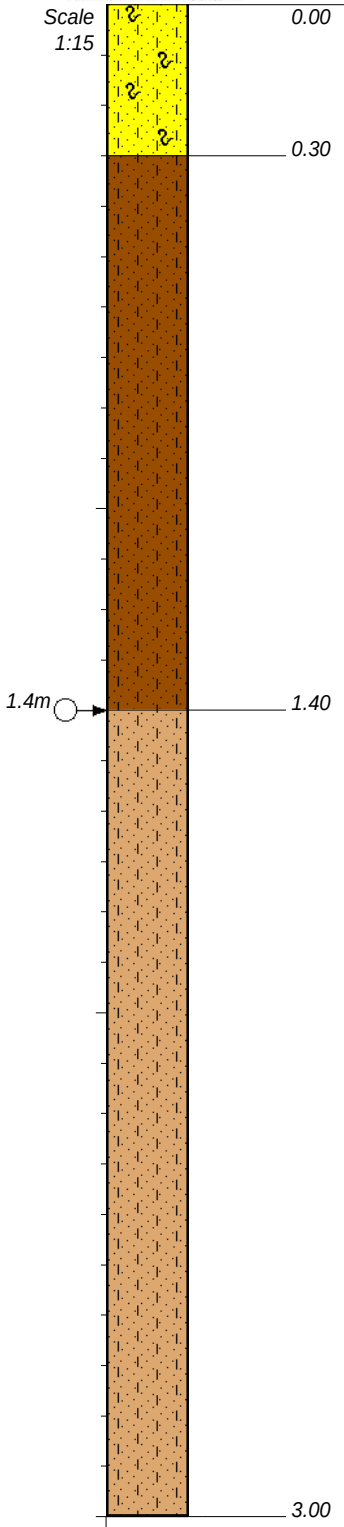
HOLE No: TP17

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP18
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 — Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 — Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 — Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3.0m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.77"E
Y-COORD : 34˚02'52.88"S

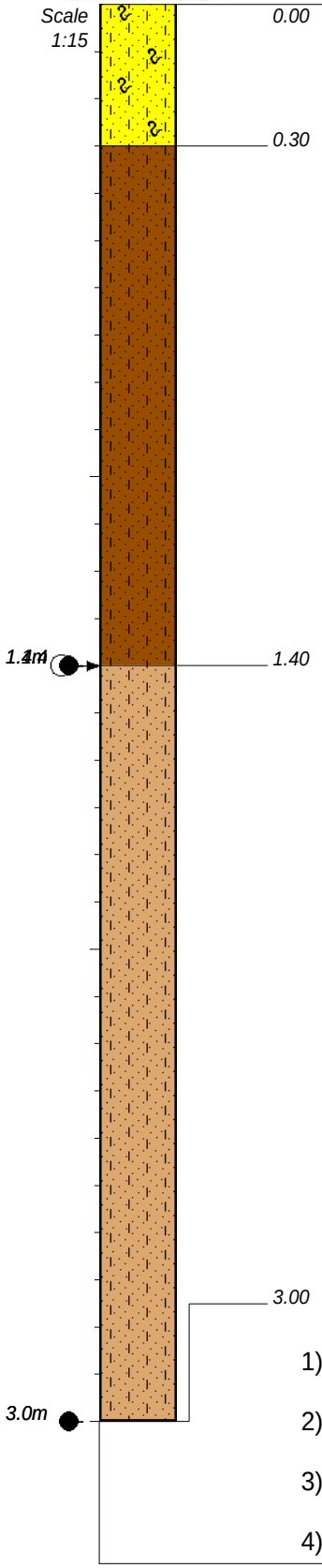
HOLE No: TP18

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP19
Sheet 1 of 1

JOB NUMBER: LC020-23



0.00 — Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 — Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 — Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3m.
2) Groundwater seepage was encountered at depth 1.4m.
3) Bulk Sample bag collected at depth 1.4m -- 3.0m
4) Samll Sample bag collected at depth 1.4 -- 3.0m

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.82"E
Y-COORD : 34˚02'52.46"S

HOLE No: TP19

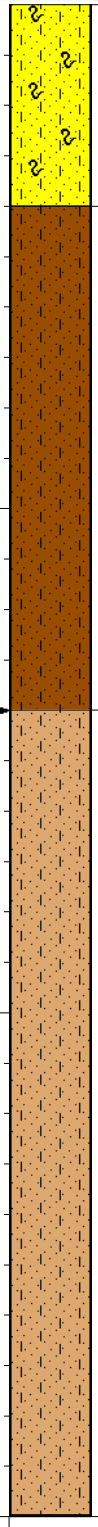
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP20
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, fine grained, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

3.00

NOTES

1) End of hole depth at 3.0m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.81"E
Y-COORD : 34˚02'52.01"S

HOLE No: TP20

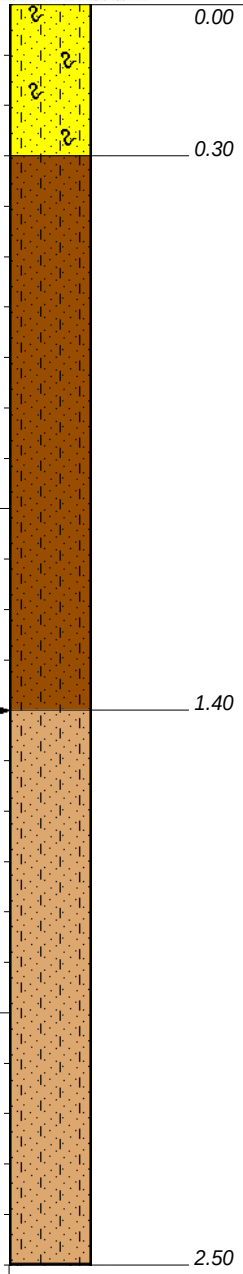
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP21
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.30 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.24"E
Y-COORD : 34˚02'53.44"S

HOLE No: TP21

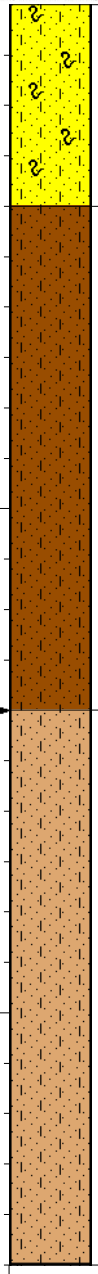
Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

HOLE No: TP22
Sheet 1 of 1

JOB NUMBER: LC020-23

Scale 1:15



0.00 Slightly moist, pale red brown, loose, silty SAND with fine grass roots, pebbles and sea debris - TRANSPORTED MATERIAL.

0.40 Slightly moist, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

1.40 Wet, light brown to white, fine grained, silty SAND with minor pebbles and sea debris - ALLUVIAL SOIL.

2.50

NOTES

1) End of hole depth at 2.5m.

2) Groundwater seepage was encountered at depth 1.4m.

CONTRACTOR :
MACHINE : Hand tools
DRILLED BY :
PROFILED BY : Zaheer

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM :
DATE :
DATE : 22 September 2023

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

ELEVATION : 23m
X-COORD : 18˚42'15.23"E
Y-COORD : 34˚02'52.84"S

HOLE No: TP22

Luhlaza
Advisory and Consulting (Pty) Ltd

Ukuza
Makhaza Police Station

LEGEND
Sheet 1 of 1

JOB NUMBER: LC020-23

	SAND	{SA04}
	SILTY	{SA07}
Name ●	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}
4.5 ○→	WATER SEEPAGE/water strike	{CH50}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : Tokoloho
SETUP FILE : STANDARD.SET

DATE : 13/10/2023 12:42
TEXT : ..zaPoliceStation\logs.txt

LEGEND
SUMMARY OF SYMBOLS

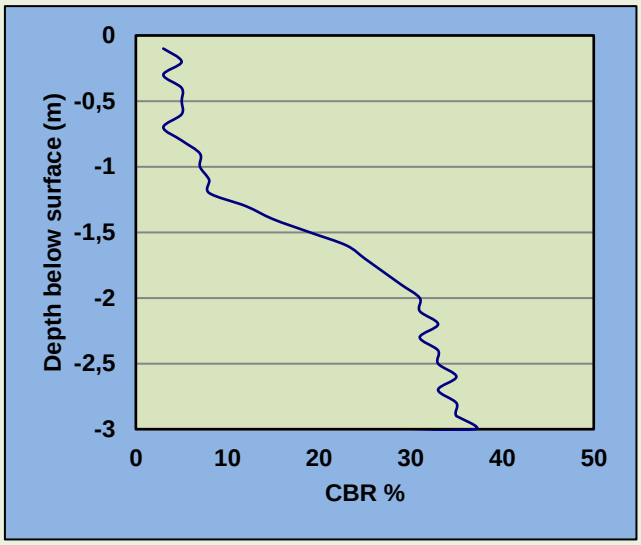
Appendix B: DCP

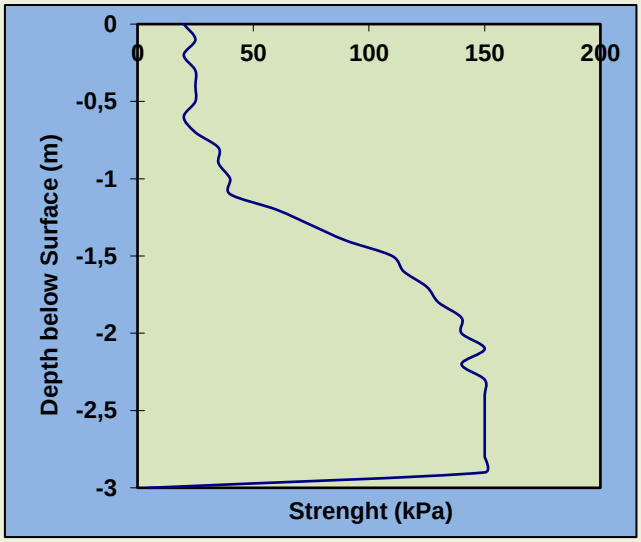
info@luhlazaconsulting.co.za
+27 63 769 4305
+27 63 769 4305
www.luhlazaconsulting.co.za

Luhlaza Advisory and Consulting (Pty) Ltd	**Client Name**	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 1
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	2	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	13	Dense	37 deg
1,7	14	Dense	37 deg
1,8	15	Dense	37 deg
1,9	16	Dense	37 deg
2	17	Dense	37 deg
2,1	17	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	18	Dense	37 deg
2,6	19	Dense	37 deg
2,7	18	Dense	37 deg
2,8	19	Dense	37 deg
2,9	19	Dense	37 deg
3	20	Dense	38 deg



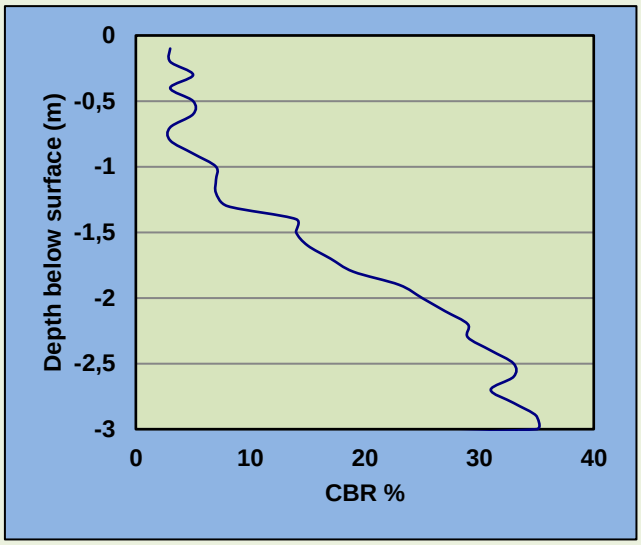


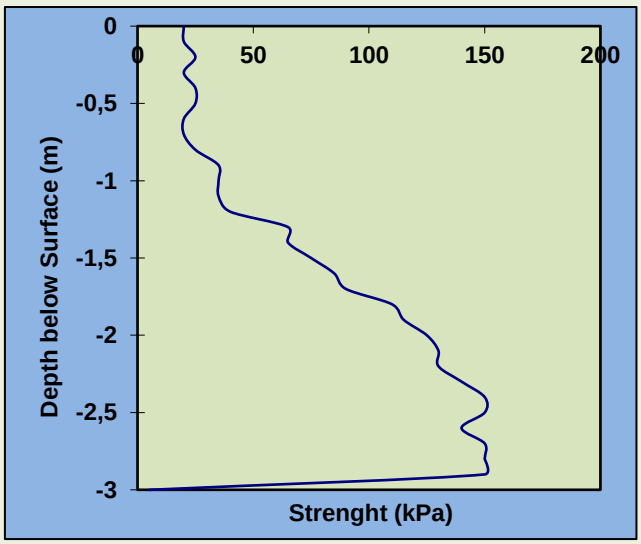
The results shown here are based on calculations using the DCP test. These are classified as indicative values and need to be verified by other testing methods.

Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 2
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	2	Loose	30 deg
0,3	3	Loose	30 deg
0,4	2	Loose	30 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	2	Loose	30 deg
0,8	2	Loose	30 deg
0,9	3	Loose	30 deg
1	4	Med.Dense	30 deg
1,1	4	Med.Dense	30 deg
1,2	4	Med.Dense	30 deg
1,3	5	Med.Dense	32 deg
1,4	8	Med.Dense	35 deg
1,5	8	Med.Dense	35 deg
1,6	9	Med.Dense	35 deg
1,7	10	Med.Dense	36 deg
1,8	11	Dense	36 deg
1,9	13	Dense	37 deg
2	14	Dense	37 deg
2,1	15	Dense	37 deg
2,2	16	Dense	37 deg
2,3	16	Dense	37 deg
2,4	17	Dense	37 deg
2,5	18	Dense	37 deg
2,6	18	Dense	37 deg
2,7	17	Dense	37 deg
2,8	18	Dense	37 deg
2,9	19	Dense	37 deg
3	19	Dense	37 deg



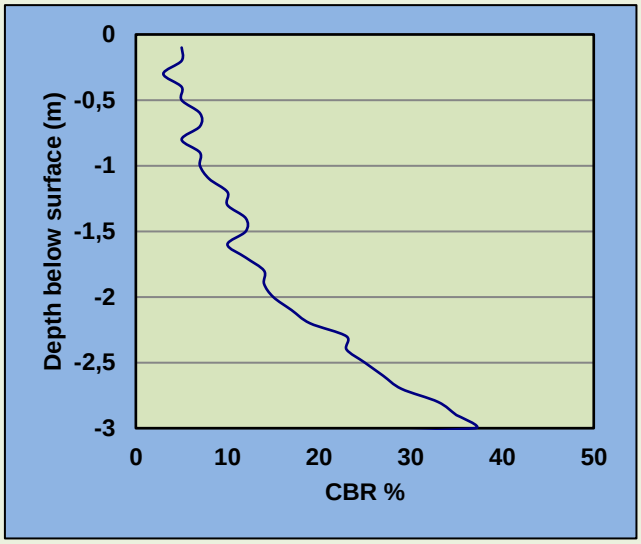


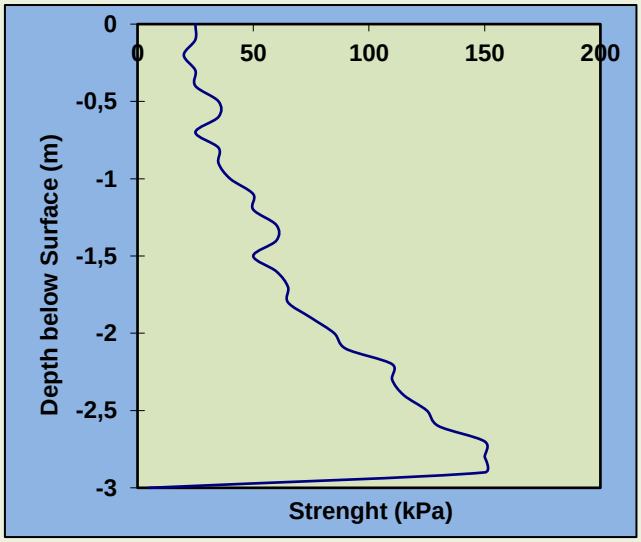
The results shown here are based on calculations using the DCP test. These are classified as indicative values and need to be verified by other testing methods.

Luhlaza Advisory and Consulting (Pty) Ltd	**Client Name**	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 3
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	6	Med.Dense	33 deg
1,3	6	Med.Dense	33 deg
1,4	7	Med.Dense	34 deg
1,5	7	Med.Dense	34 deg
1,6	6	Med.Dense	33 deg
1,7	7	Med.Dense	34 deg
1,8	8	Med.Dense	35 deg
1,9	8	Med.Dense	35 deg
2	9	Med.Dense	35 deg
2,1	10	Med.Dense	36 deg
2,2	11	Dense	36 deg
2,3	13	Dense	37 deg
2,4	13	Dense	37 deg
2,5	14	Dense	37 deg
2,6	15	Dense	37 deg
2,7	16	Dense	37 deg
2,8	18	Dense	37 deg
2,9	19	Dense	37 deg
3	20	Dense	38 deg



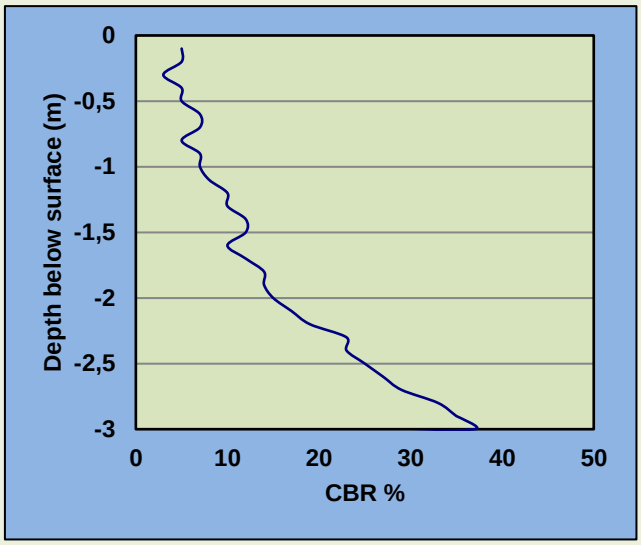


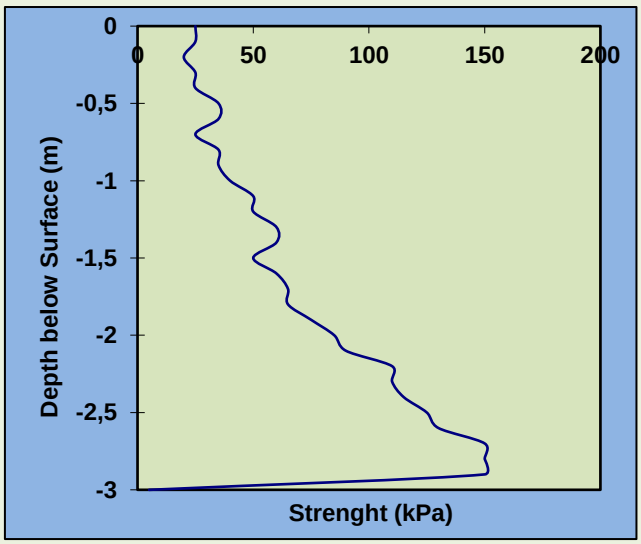
The results shown here are based on calculations using the DCP test. These are classified as indicative values and need to be verified by other testing methods.

Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 4
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	6	Med.Dense	33 deg
1,3	6	Med.Dense	33 deg
1,4	7	Med.Dense	34 deg
1,5	7	Med.Dense	34 deg
1,6	6	Med.Dense	33 deg
1,7	7	Med.Dense	34 deg
1,8	8	Med.Dense	35 deg
1,9	8	Med.Dense	35 deg
2	9	Med.Dense	35 deg
2,1	10	Med.Dense	36 deg
2,2	11	Dense	36 deg
2,3	13	Dense	37 deg
2,4	13	Dense	37 deg
2,5	14	Dense	37 deg
2,6	15	Dense	37 deg
2,7	16	Dense	37 deg
2,8	18	Dense	37 deg
2,9	19	Dense	37 deg
3	20	Dense	38 deg

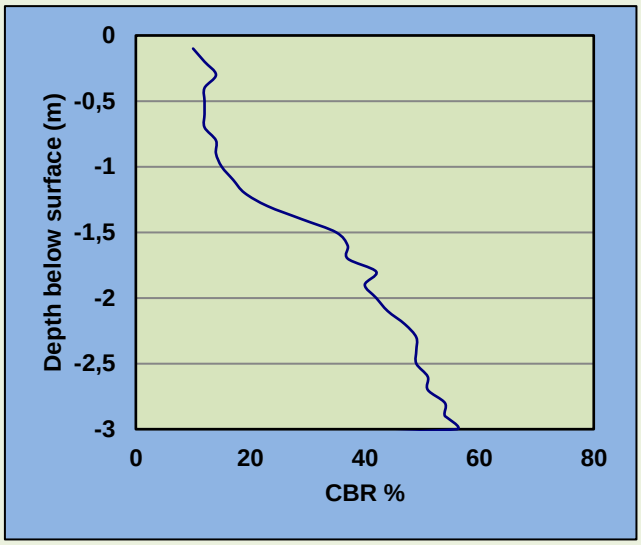


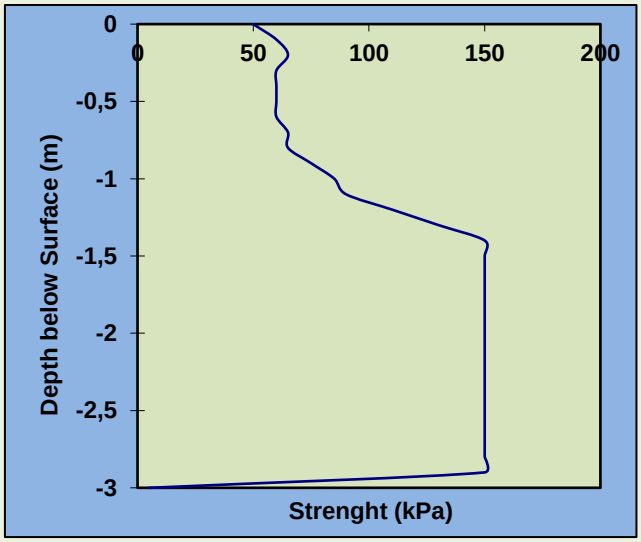


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 4
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	6	Med.Dense	33 deg
0,2	7	Med.Dense	34 deg
0,3	8	Med.Dense	35 deg
0,4	7	Med.Dense	34 deg
0,5	7	Med.Dense	34 deg
0,6	7	Med.Dense	34 deg
0,7	7	Med.Dense	34 deg
0,8	8	Med.Dense	35 deg
0,9	8	Med.Dense	35 deg
1	9	Med.Dense	35 deg
1,1	10	Med.Dense	36 deg
1,2	11	Dense	36 deg
1,3	13	Dense	37 deg
1,4	16	Dense	37 deg
1,5	19	Dense	37 deg
1,6	20	Dense	38 deg
1,7	20	Dense	38 deg
1,8	22	Dense	38 deg
1,9	21	Dense	38 deg
2	22	Dense	38 deg
2,1	23	Dense	38 deg
2,2	24	Dense	38 deg
2,3	25	Very Dense	38 deg
2,4	25	Dense	38 deg
2,5	25	Dense	38 deg
2,6	26	Very Dense	38 deg
2,7	26	Very Dense	38 deg
2,8	27	Very Dense	38 deg
2,9	27	Very Dense	38 deg
3	28	Very Dense	38 deg

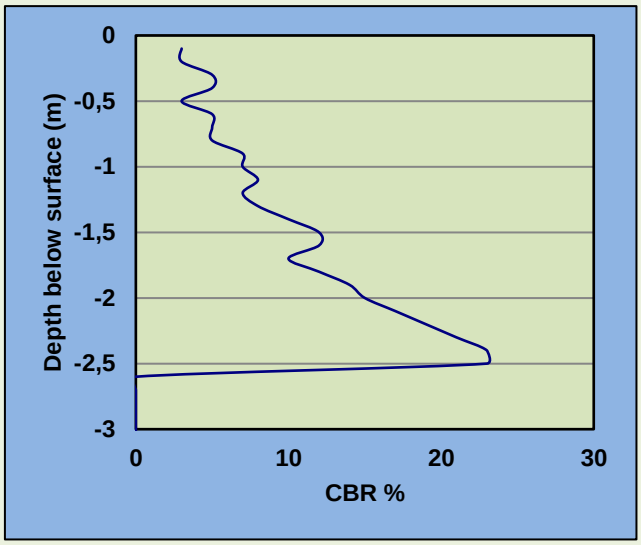


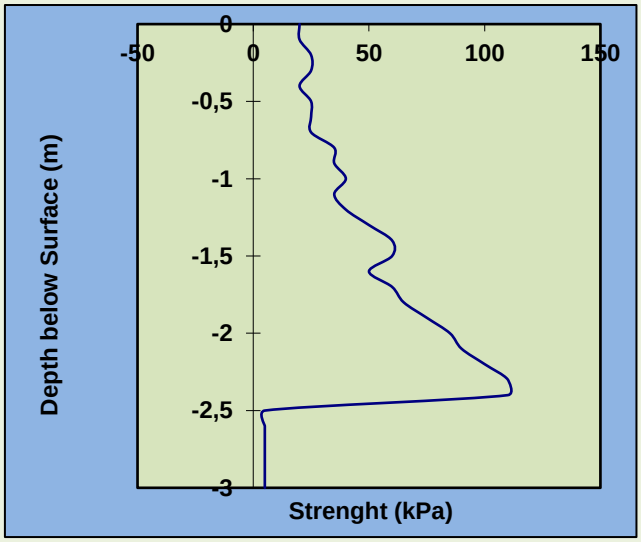


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 6
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	2	Loose	30 deg
0,3	3	Loose	30 deg
0,4	3	Loose	30 deg
0,5	2	Loose	30 deg
0,6	3	Loose	30 deg
0,7	3	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	4	Med.Dense	30 deg
1,3	5	Med.Dense	32 deg
1,4	6	Med.Dense	33 deg
1,5	7	Med.Dense	34 deg
1,6	7	Med.Dense	34 deg
1,7	6	Med.Dense	33 deg
1,8	7	Med.Dense	34 deg
1,9	8	Med.Dense	35 deg
2	9	Med.Dense	35 deg
2,1	10	Med.Dense	36 deg
2,2	11	Dense	36 deg
2,3	12	Dense	36 deg
2,4	13	Dense	37 deg
2,5	13	Dense	37 deg
	REF		

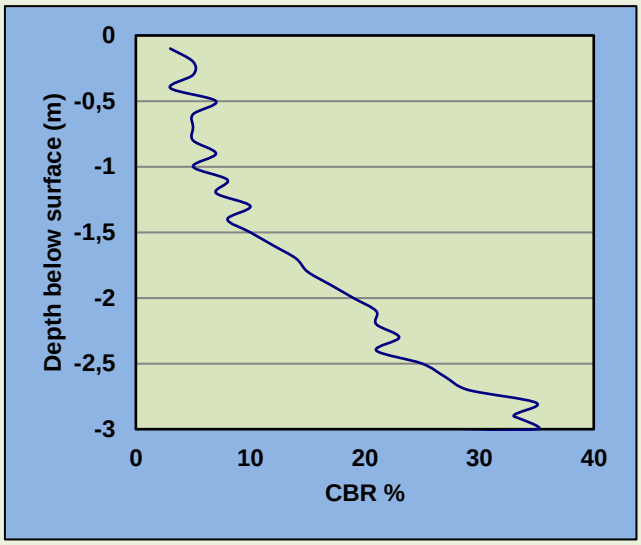


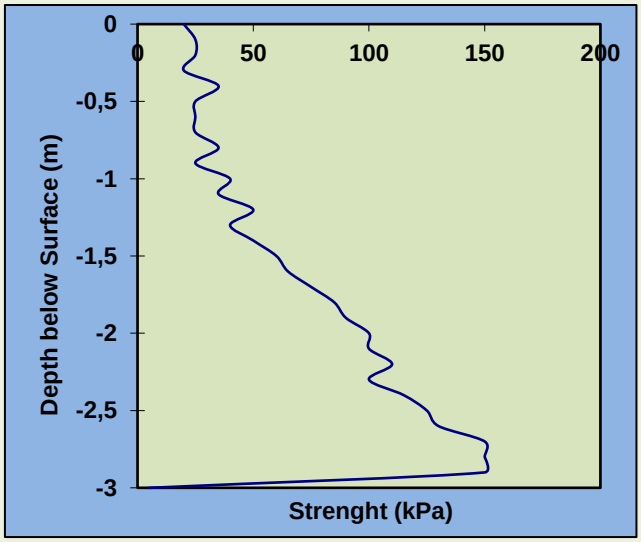


Luhlaza Advisory and Consulting (Pty) Ltd	**Client Name**	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 7
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	3	Loose	30 deg
0,4	2	Loose	30 deg
0,5	4	Med.Dense	30 deg
0,6	3	Loose	30 deg
0,7	3	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	3	Loose	30 deg
1,1	5	Med.Dense	32 deg
1,2	4	Med.Dense	30 deg
1,3	6	Med.Dense	33 deg
1,4	5	Med.Dense	32 deg
1,5	6	Med.Dense	33 deg
1,6	7	Med.Dense	34 deg
1,7	8	Med.Dense	35 deg
1,8	9	Med.Dense	35 deg
1,9	10	Med.Dense	36 deg
2	11	Dense	36 deg
2,1	12	Dense	36 deg
2,2	12	Dense	36 deg
2,3	13	Dense	37 deg
2,4	12	Dense	36 deg
2,5	14	Dense	37 deg
2,6	15	Dense	37 deg
2,7	16	Dense	37 deg
2,8	19	Dense	37 deg
2,9	18	Dense	37 deg
3	19	Dense	37 deg

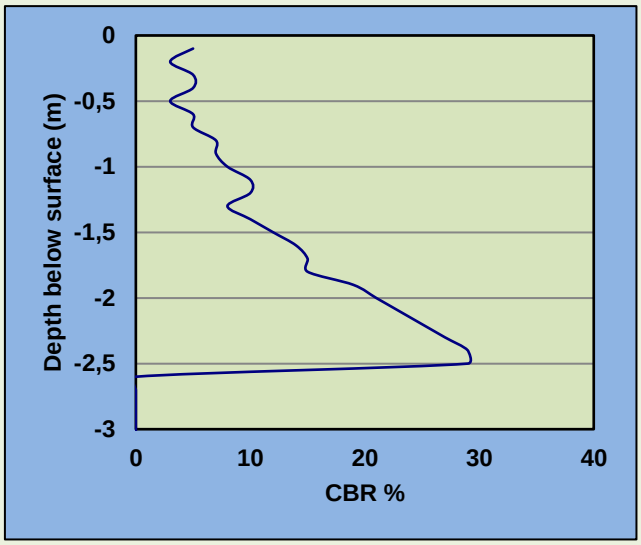


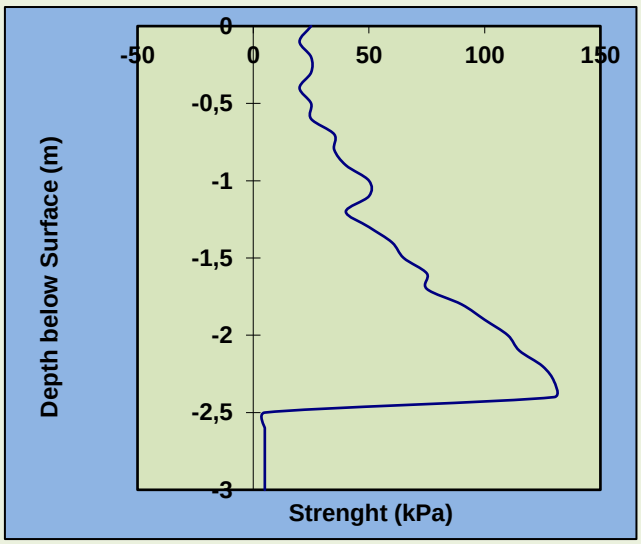


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 8
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	2	Loose	30 deg
0,3	3	Loose	30 deg
0,4	3	Loose	30 deg
0,5	2	Loose	30 deg
0,6	3	Loose	30 deg
0,7	3	Loose	30 deg
0,8	4	Med.Dense	30 deg
0,9	4	Med.Dense	30 deg
1	5	Med.Dense	32 deg
1,1	6	Med.Dense	33 deg
1,2	6	Med.Dense	33 deg
1,3	5	Med.Dense	32 deg
1,4	6	Med.Dense	33 deg
1,5	7	Med.Dense	34 deg
1,6	8	Med.Dense	35 deg
1,7	9	Med.Dense	35 deg
1,8	9	Med.Dense	35 deg
1,9	11	Dense	36 deg
2	12	Dense	36 deg
2,1	13	Dense	37 deg
2,2	14	Dense	37 deg
2,3	15	Dense	37 deg
2,4	16	Dense	37 deg
2,5	16	Dense	37 deg
	REF		

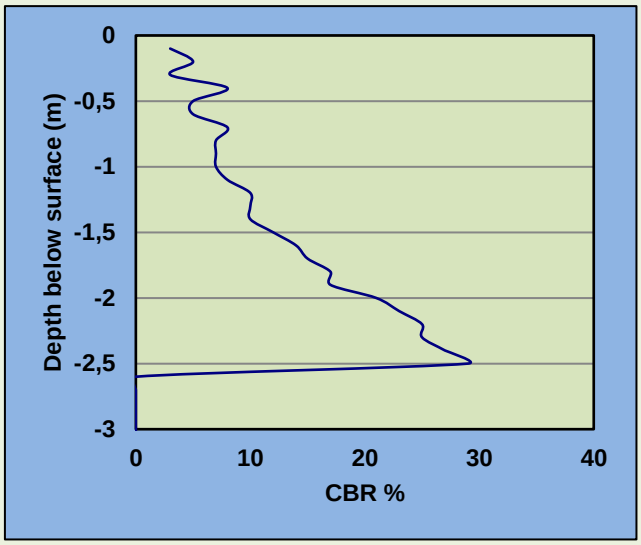


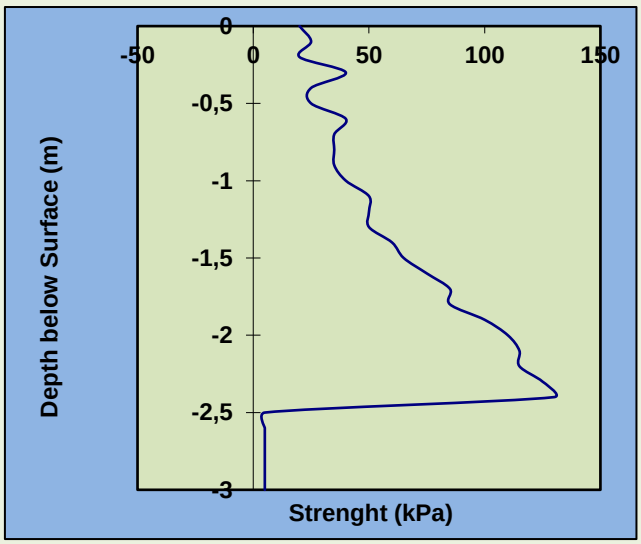


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 9
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	5	Med.Dense	32 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	5	Med.Dense	32 deg
0,8	4	Med.Dense	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	6	Med.Dense	33 deg
1,3	6	Med.Dense	33 deg
1,4	6	Med.Dense	33 deg
1,5	7	Med.Dense	34 deg
1,6	8	Med.Dense	35 deg
1,7	9	Med.Dense	35 deg
1,8	10	Med.Dense	36 deg
1,9	10	Med.Dense	36 deg
2	12	Dense	36 deg
2,1	13	Dense	37 deg
2,2	14	Dense	37 deg
2,3	14	Dense	37 deg
2,4	15	Dense	37 deg
2,5	16	Dense	37 deg
	REF		

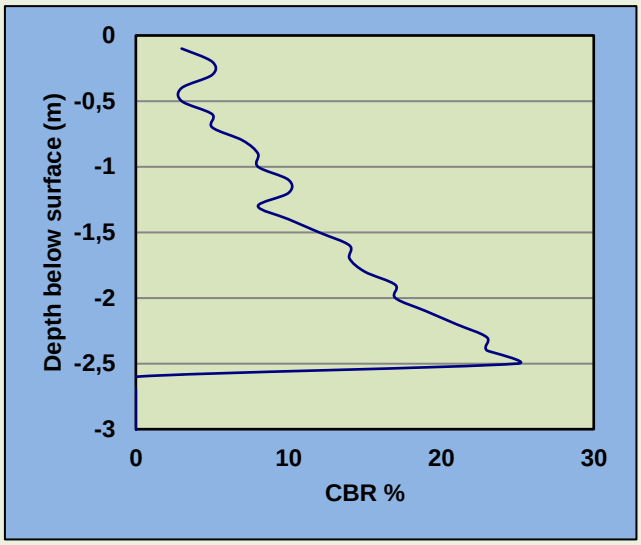


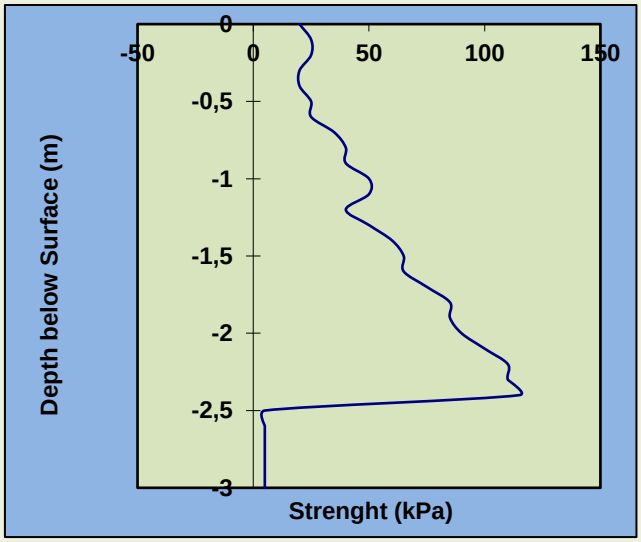


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 10
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	3	Loose	30 deg
0,4	2	Loose	30 deg
0,5	2	Loose	30 deg
0,6	3	Loose	30 deg
0,7	3	Loose	30 deg
0,8	4	Med.Dense	30 deg
0,9	5	Med.Dense	32 deg
1	5	Med.Dense	32 deg
1,1	6	Med.Dense	33 deg
1,2	6	Med.Dense	33 deg
1,3	5	Med.Dense	32 deg
1,4	6	Med.Dense	33 deg
1,5	7	Med.Dense	34 deg
1,6	8	Med.Dense	35 deg
1,7	8	Med.Dense	35 deg
1,8	9	Med.Dense	35 deg
1,9	10	Med.Dense	36 deg
2	10	Med.Dense	36 deg
2,1	11	Dense	36 deg
2,2	12	Dense	36 deg
2,3	13	Dense	37 deg
2,4	13	Dense	37 deg
2,5	14	Dense	37 deg
	REF		

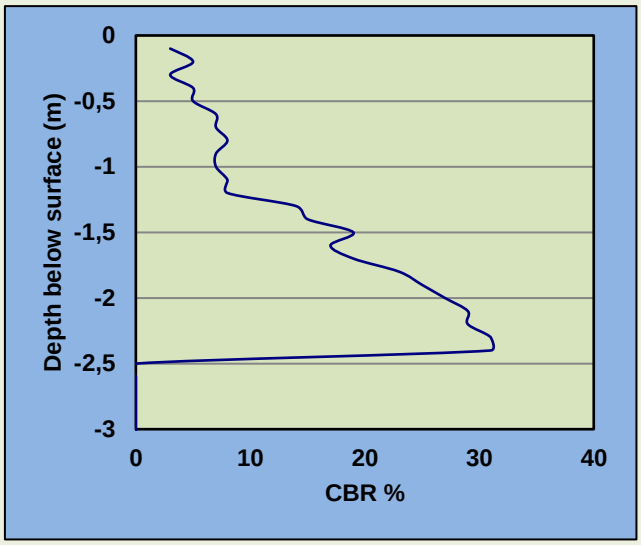


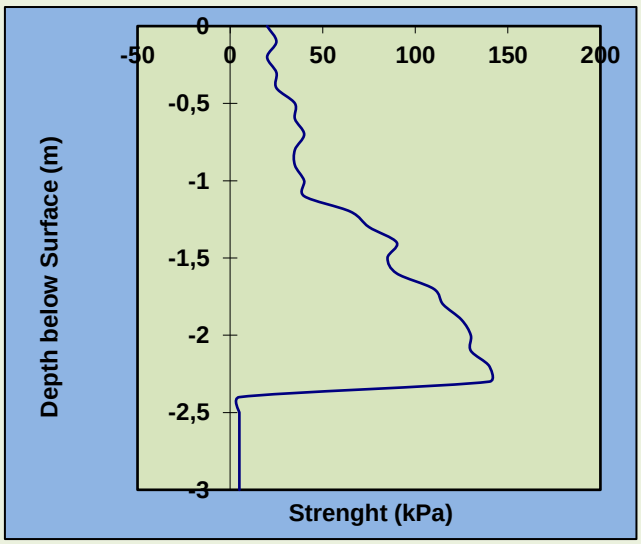


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 11
	Final Depth:	*2,4 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	8	Med.Dense	35 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	10	Med.Dense	36 deg
1,7	11	Dense	36 deg
1,8	13	Dense	37 deg
1,9	14	Dense	37 deg
2	15	Dense	37 deg
2,1	16	Dense	37 deg
2,2	16	Dense	37 deg
2,3	17	Dense	37 deg
2,4	17	Dense	37 deg
	REF		

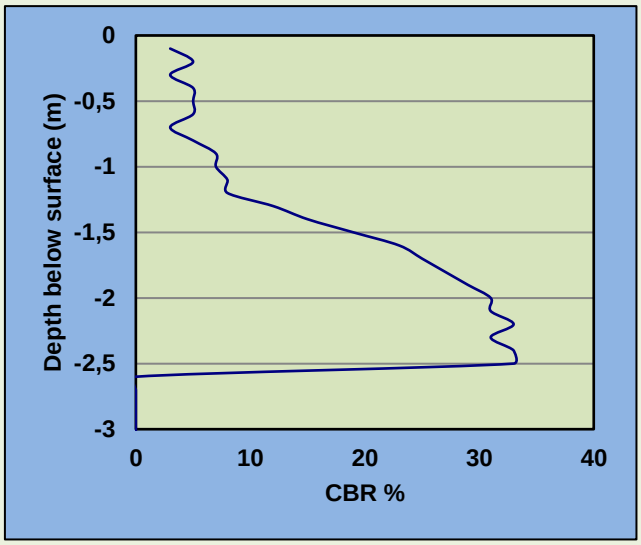


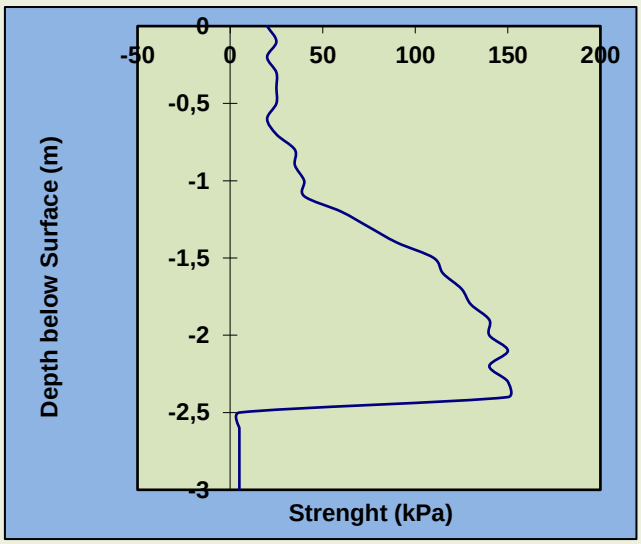


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 12
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	2	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	13	Dense	37 deg
1,7	14	Dense	37 deg
1,8	15	Dense	37 deg
1,9	16	Dense	37 deg
2	17	Dense	37 deg
2,1	17	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	18	Dense	37 deg
	REF		

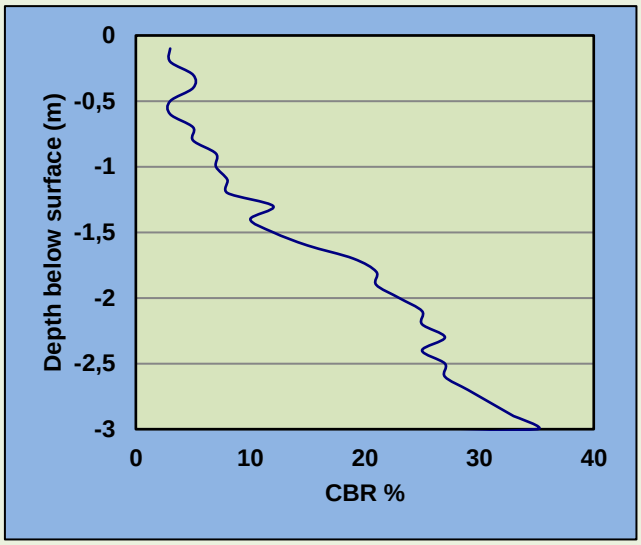


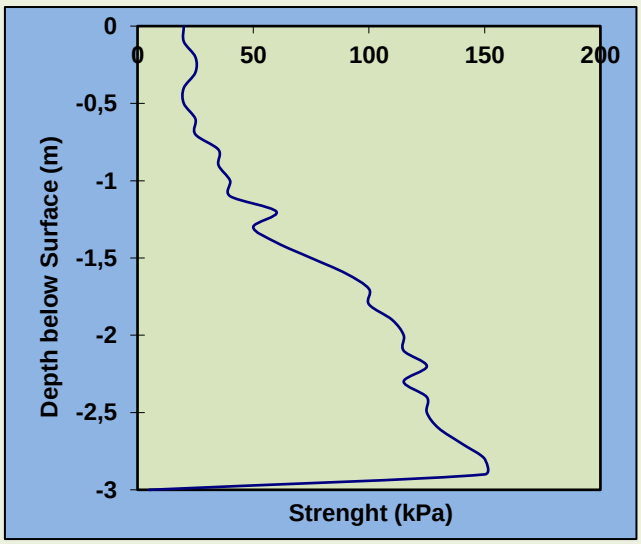


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 13
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	2	Loose	30 deg
0,3	3	Loose	30 deg
0,4	3	Loose	30 deg
0,5	2	Loose	30 deg
0,6	2	Loose	30 deg
0,7	3	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	6	Med.Dense	33 deg
1,5	7	Med.Dense	34 deg
1,6	9	Med.Dense	35 deg
1,7	11	Dense	36 deg
1,8	12	Dense	36 deg
1,9	12	Dense	36 deg
2	13	Dense	37 deg
2,1	14	Dense	37 deg
2,2	14	Dense	37 deg
2,3	15	Dense	37 deg
2,4	14	Dense	37 deg
2,5	15	Dense	37 deg
2,6	15	Dense	37 deg
2,7	16	Dense	37 deg
2,8	17	Dense	37 deg
2,9	18	Dense	37 deg
3	19	Dense	37 deg

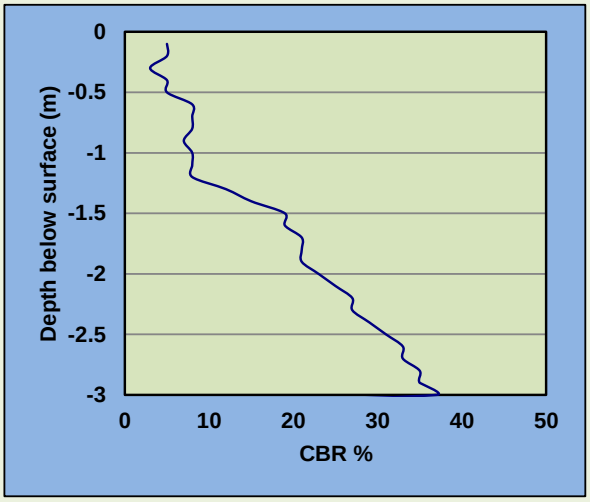


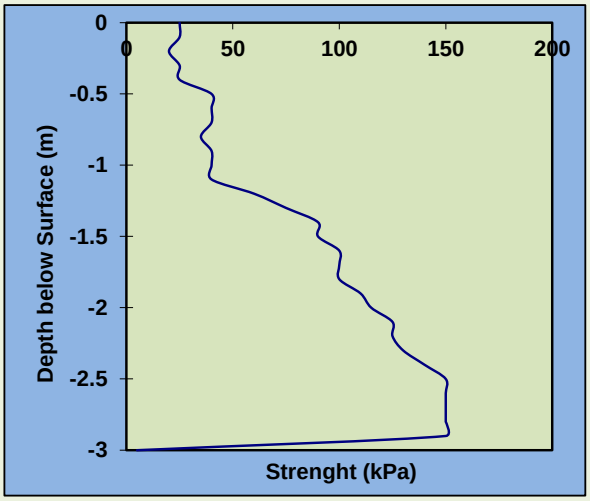


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 14
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0.1	3	Loose	30 deg
0.2	3	Loose	30 deg
0.3	2	Loose	30 deg
0.4	3	Loose	30 deg
0.5	3	Loose	30 deg
0.6	5	Med.Dense	32 deg
0.7	5	Med.Dense	32 deg
0.8	5	Med.Dense	32 deg
0.9	4	Med.Dense	30 deg
1	5	Med.Dense	32 deg
1.1	5	Med.Dense	32 deg
1.2	5	Med.Dense	32 deg
1.3	7	Med.Dense	34 deg
1.4	9	Med.Dense	35 deg
1.5	11	Dense	36 deg
1.6	11	Dense	36 deg
1.7	12	Dense	36 deg
1.8	12	Dense	36 deg
1.9	12	Dense	36 deg
2	13	Dense	37 deg
2.1	14	Dense	37 deg
2.2	15	Dense	37 deg
2.3	15	Dense	37 deg
2.4	16	Dense	37 deg
2.5	17	Dense	37 deg
2.6	18	Dense	37 deg
2.7	18	Dense	37 deg
2.8	19	Dense	37 deg
2.9	19	Dense	37 deg
3	20	Dense	38 deg

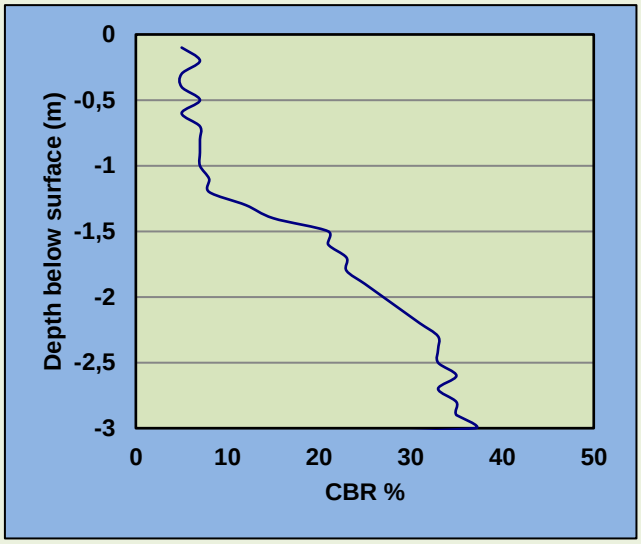


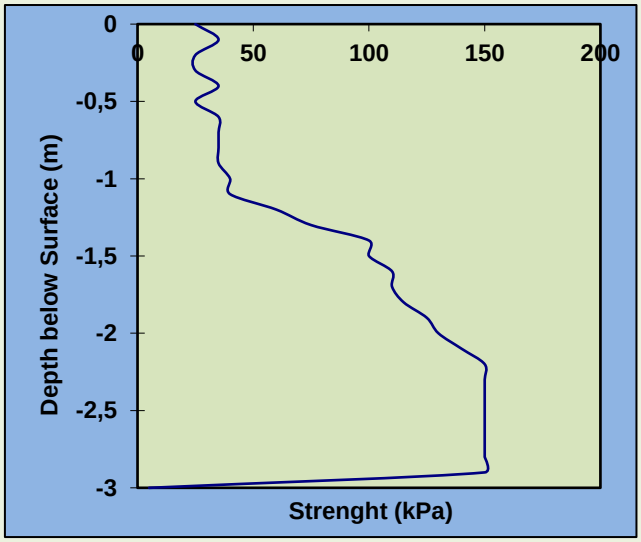


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 15
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	4	Med.Dense	30 deg
0,3	3	Loose	30 deg
0,4	3	Loose	30 deg
0,5	4	Med.Dense	30 deg
0,6	3	Loose	30 deg
0,7	4	Med.Dense	30 deg
0,8	4	Med.Dense	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	12	Dense	36 deg
1,6	12	Dense	36 deg
1,7	13	Dense	37 deg
1,8	13	Dense	37 deg
1,9	14	Dense	37 deg
2	15	Dense	37 deg
2,1	16	Dense	37 deg
2,2	17	Dense	37 deg
2,3	18	Dense	37 deg
2,4	18	Dense	37 deg
2,5	18	Dense	37 deg
2,6	19	Dense	37 deg
2,7	18	Dense	37 deg
2,8	19	Dense	37 deg
2,9	19	Dense	37 deg
3	20	Dense	38 deg

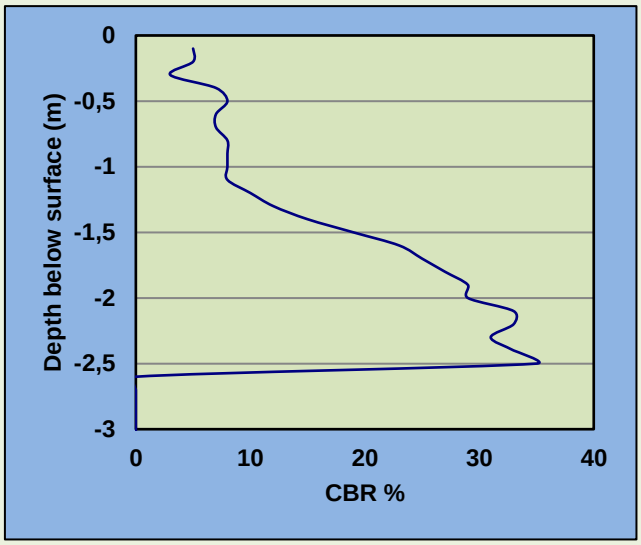


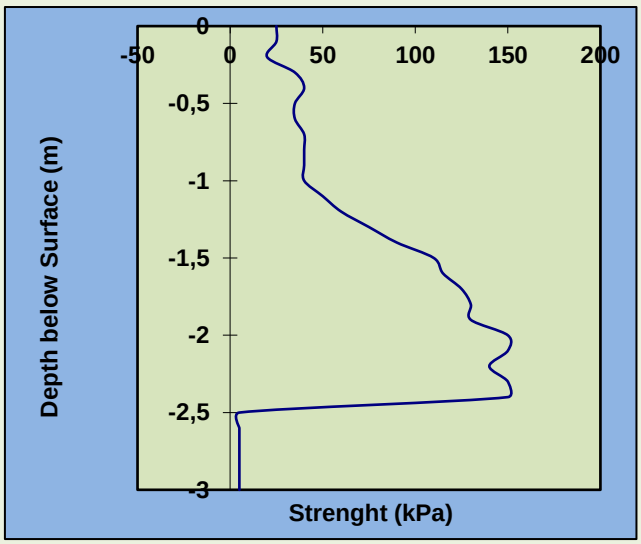


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 16
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	4	Med.Dense	30 deg
0,5	5	Med.Dense	32 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	5	Med.Dense	32 deg
1	5	Med.Dense	32 deg
1,1	5	Med.Dense	32 deg
1,2	6	Med.Dense	33 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	13	Dense	37 deg
1,7	14	Dense	37 deg
1,8	15	Dense	37 deg
1,9	16	Dense	37 deg
2	16	Dense	37 deg
2,1	18	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	19	Dense	37 deg
	REF		

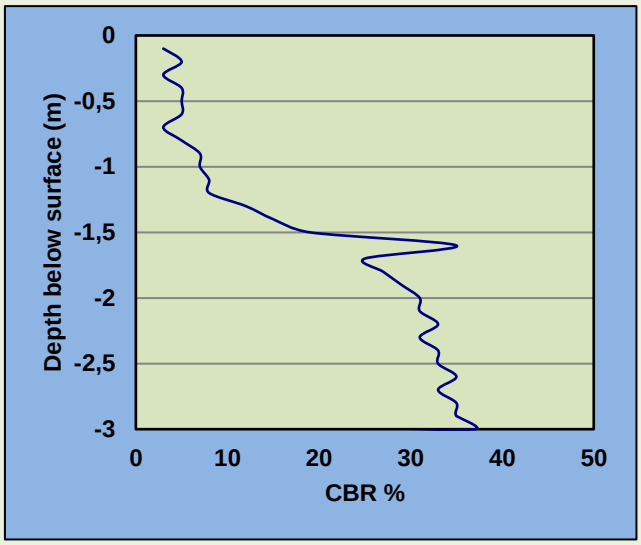


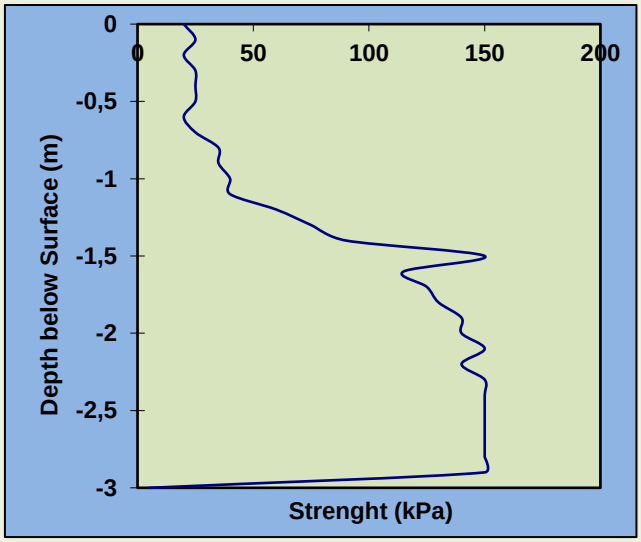


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 17
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	2	Loose	30 deg
0,8	3	Loose	30 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	19	Dense	37 deg
1,7	14	Dense	37 deg
1,8	15	Dense	37 deg
1,9	16	Dense	37 deg
2	17	Dense	37 deg
2,1	17	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	18	Dense	37 deg
2,6	19	Dense	37 deg
2,7	18	Dense	37 deg
2,8	19	Dense	37 deg
2,9	19	Dense	37 deg
3	20	Dense	38 deg

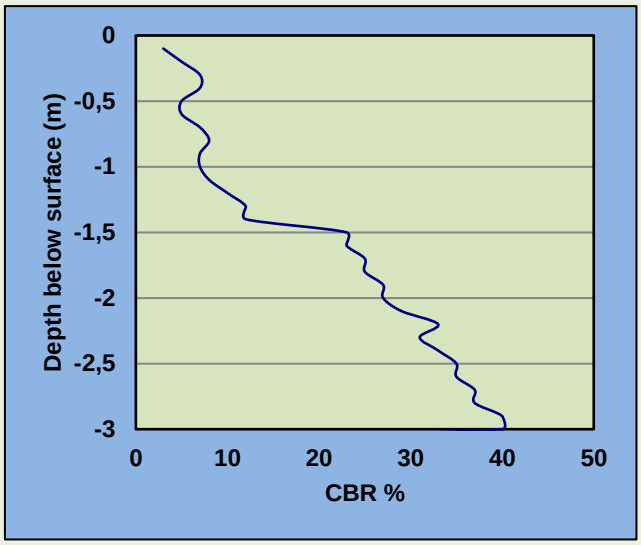


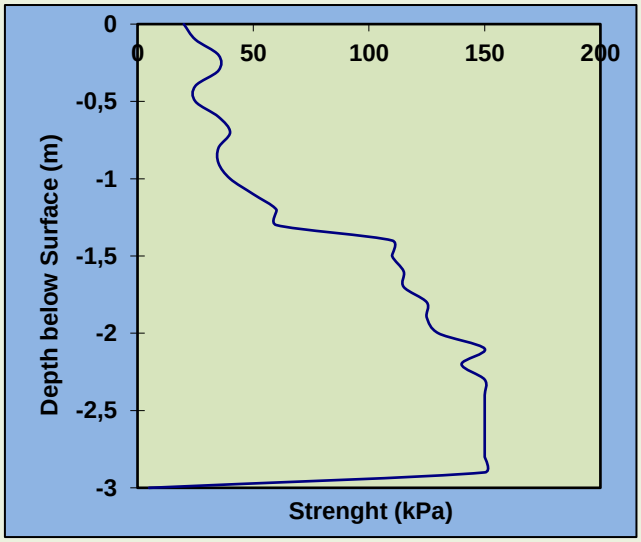


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 18
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	4	Med.Dense	30 deg
0,4	4	Med.Dense	30 deg
0,5	3	Loose	30 deg
0,6	3	Loose	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	4	Med.Dense	30 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	6	Med.Dense	33 deg
1,3	7	Med.Dense	34 deg
1,4	7	Med.Dense	34 deg
1,5	13	Dense	37 deg
1,6	13	Dense	37 deg
1,7	14	Dense	37 deg
1,8	14	Dense	37 deg
1,9	15	Dense	37 deg
2	15	Dense	37 deg
2,1	16	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	19	Dense	37 deg
2,6	19	Dense	37 deg
2,7	20	Dense	38 deg
2,8	20	Dense	38 deg
2,9	21	Dense	38 deg
3	21	Dense	38 deg

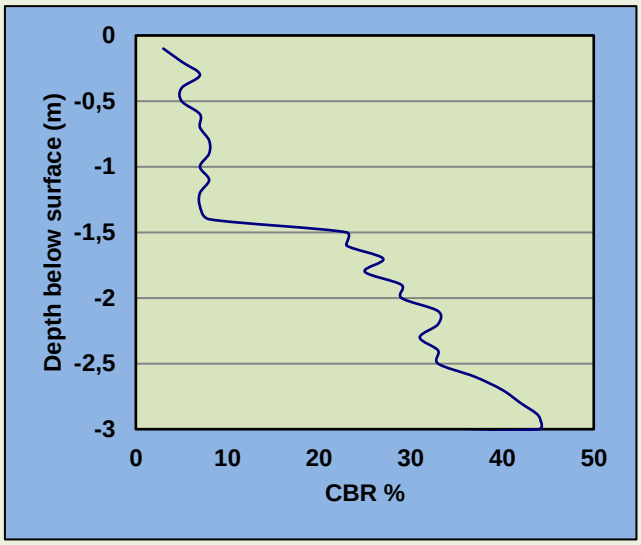


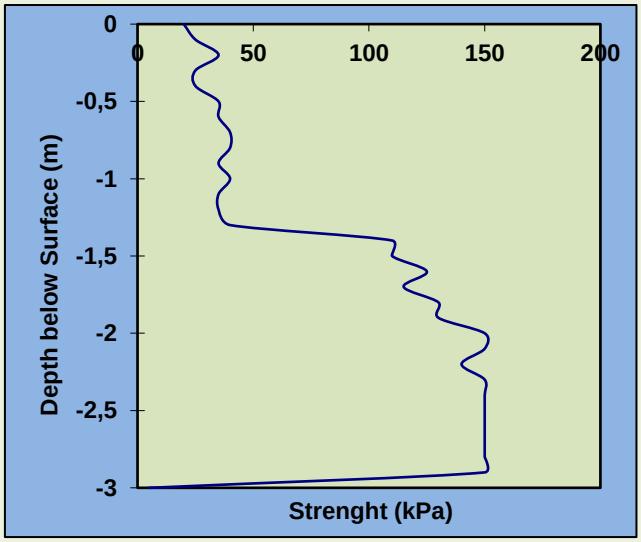


Luhlaza Advisory and Consulting (Pty) Ltd	**Client Name**	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 19
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	4	Med.Dense	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	5	Med.Dense	32 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	4	Med.Dense	30 deg
1,3	4	Med.Dense	30 deg
1,4	5	Med.Dense	32 deg
1,5	13	Dense	37 deg
1,6	13	Dense	37 deg
1,7	15	Dense	37 deg
1,8	14	Dense	37 deg
1,9	16	Dense	37 deg
2	16	Dense	37 deg
2,1	18	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	18	Dense	37 deg
2,6	20	Dense	38 deg
2,7	21	Dense	38 deg
2,8	22	Dense	38 deg
2,9	23	Dense	38 deg
3	23	Dense	38 deg

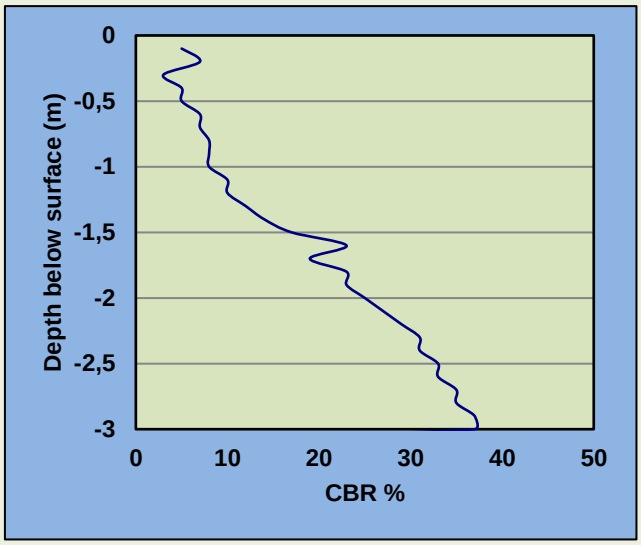


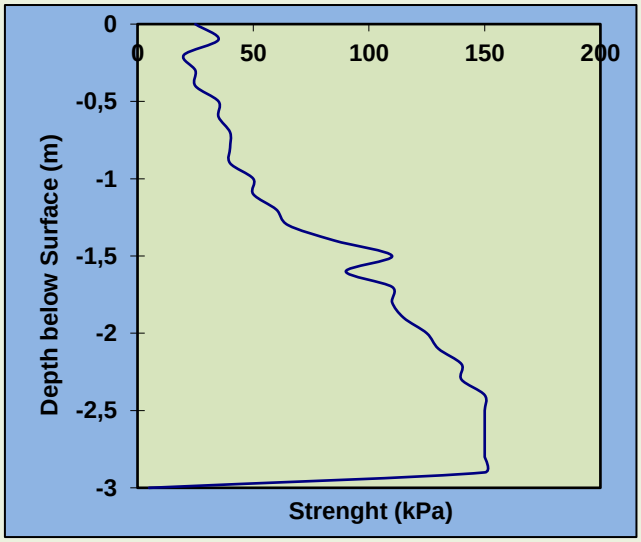


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 20
	Final Depth:	*3 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	4	Med.Dense	30 deg
0,3	2	Loose	30 deg
0,4	3	Loose	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	5	Med.Dense	32 deg
1	5	Med.Dense	32 deg
1,1	6	Med.Dense	33 deg
1,2	6	Med.Dense	33 deg
1,3	7	Med.Dense	34 deg
1,4	8	Med.Dense	35 deg
1,5	10	Med.Dense	36 deg
1,6	13	Dense	37 deg
1,7	11	Dense	36 deg
1,8	13	Dense	37 deg
1,9	13	Dense	37 deg
2	14	Dense	37 deg
2,1	15	Dense	37 deg
2,2	16	Dense	37 deg
2,3	17	Dense	37 deg
2,4	17	Dense	37 deg
2,5	18	Dense	37 deg
2,6	18	Dense	37 deg
2,7	19	Dense	37 deg
2,8	19	Dense	37 deg
2,9	20	Dense	38 deg
3	20	Dense	38 deg

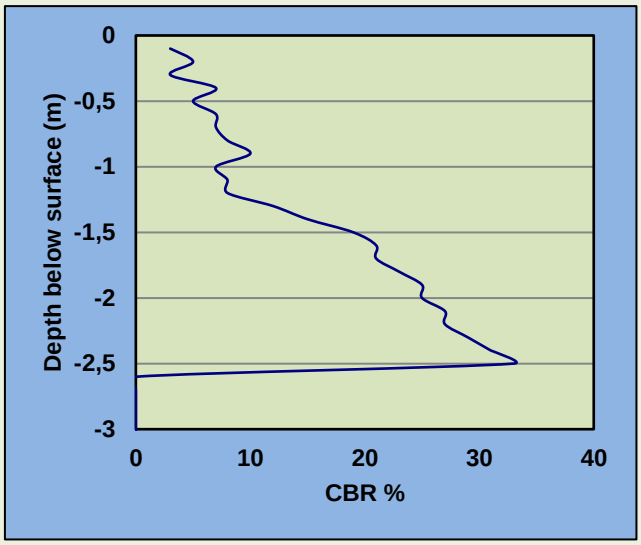


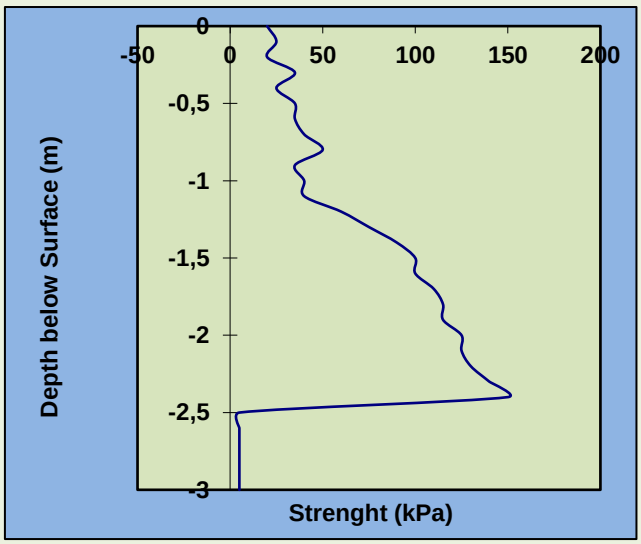


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 21
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	2	Loose	30 deg
0,2	3	Loose	30 deg
0,3	2	Loose	30 deg
0,4	4	Med.Dense	30 deg
0,5	3	Loose	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	5	Med.Dense	32 deg
0,9	6	Med.Dense	33 deg
1	4	Med.Dense	30 deg
1,1	5	Med.Dense	32 deg
1,2	5	Med.Dense	32 deg
1,3	7	Med.Dense	34 deg
1,4	9	Med.Dense	35 deg
1,5	11	Dense	36 deg
1,6	12	Dense	36 deg
1,7	12	Dense	36 deg
1,8	13	Dense	37 deg
1,9	14	Dense	37 deg
2	14	Dense	37 deg
2,1	15	Dense	37 deg
2,2	15	Dense	37 deg
2,3	16	Dense	37 deg
2,4	17	Dense	37 deg
2,5	18	Dense	37 deg
	REF		

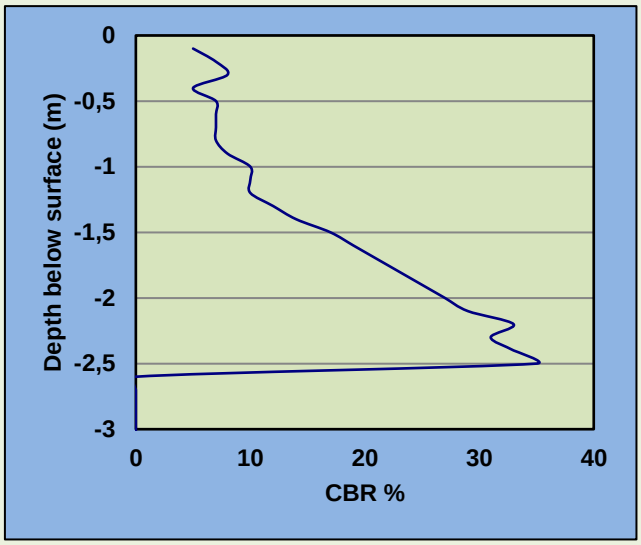


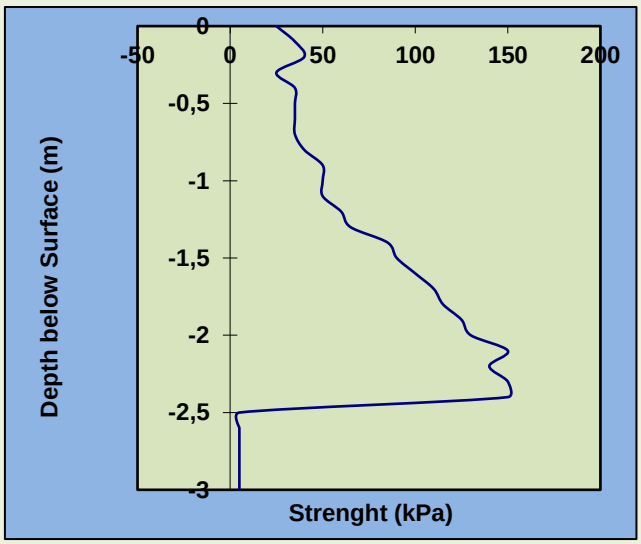


Luhlaza Advisory and Consulting (Pty) Ltd	Client Name	
	Reference:	LC020-23
	Project:	Makhaza Police Station
	Date:	22-09-2023
	DCP No.:	DCP 22
	Final Depth:	*2,5 m*

The shear strength values are based on empirical calculations and should be used as a guide only

Depth (m)	Blows/ 0.1m	Inferred Consistency	Shear Strength
0			
0,1	3	Loose	30 deg
0,2	4	Med.Dense	30 deg
0,3	5	Med.Dense	32 deg
0,4	3	Loose	30 deg
0,5	4	Med.Dense	30 deg
0,6	4	Med.Dense	30 deg
0,7	4	Med.Dense	30 deg
0,8	4	Med.Dense	30 deg
0,9	5	Med.Dense	32 deg
1	6	Med.Dense	33 deg
1,1	6	Med.Dense	33 deg
1,2	6	Med.Dense	33 deg
1,3	7	Med.Dense	34 deg
1,4	8	Med.Dense	35 deg
1,5	10	Med.Dense	36 deg
1,6	11	Dense	36 deg
1,7	12	Dense	36 deg
1,8	13	Dense	37 deg
1,9	14	Dense	37 deg
2	15	Dense	37 deg
2,1	16	Dense	37 deg
2,2	18	Dense	37 deg
2,3	17	Dense	37 deg
2,4	18	Dense	37 deg
2,5	19	Dense	37 deg
	REF		





Appendix C: Laboratory Results

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Luhlaza Advisory and Consulting (Pty) Ltd
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Randburg
2194 – Tel - +27813154288

TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP1A	
Depth of Sample Taken (m):		0,6-1,0	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	99.80	
	0.43	97.80	
	0.25	66.60	
	0.15	51.60	
	0.075	49.60	
Hydrometer Analysis (mm)	**0.060**	17.26	
	0.050	16.36	
	0.004	10.08	
	0.002	9.20	
Classification		**RAW**	**%**
CLAY		16.362	17
SILT		33.238	32
SAND		50.200	50
GRAVEL		0.200	0
Atterberg Limit	**LL%**	22.1	
	P.I.	0.0	
	LS%	0.0	
	GM	0.53	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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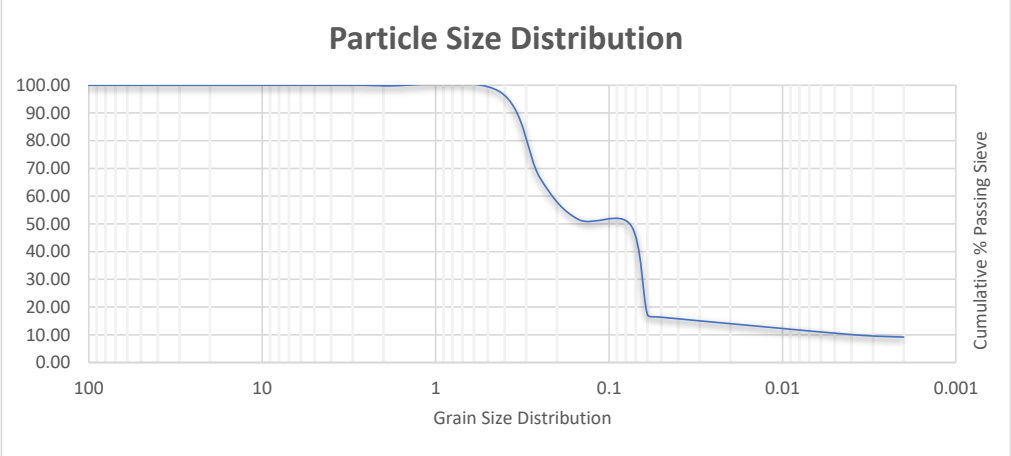
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP1A
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)

AI = LL-PL	
Clay (%)	0.00

Natural Moisture Content

Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	622
	Moisture %	5.8

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.1	**Low**	X
EC (µS/cm)	133	**Medium**	
TDS (ppm)	81	**High**	
Temp (°C)	21.1	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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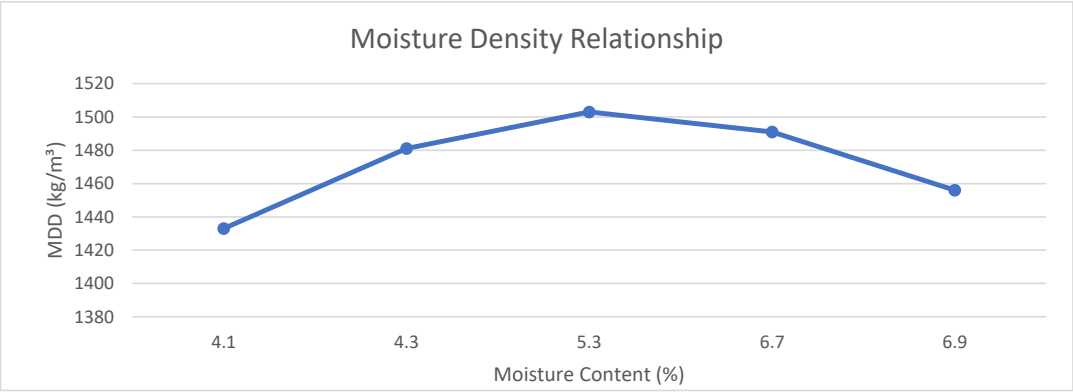
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station		
Attention:	0	**Technical Signatory**	Richard Malungani

Excavation No.	TP1A
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	4.1	1433
2	4.3	1481
3	5.3	1503
4	6.7	1491
5	6.9	1456

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.3	1503



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP1A
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	2
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP2B	
Depth of Sample Taken (m):		2,0-2,4	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	100.00	
	0.43	97.20	
	0.25	77.40	
	0.15	48.40	
	0.075	43.80	
Hydrometer Analysis (mm)	**0.060**	13.49	
	0.050	13.49	
	0.004	10.67	
	0.002	9.88	
Classification		**RAW**	**%**
CLAY		13.490	13
SILT		30.310	30
SAND		56.200	56
GRAVEL		0.000	0
Atterberg Limit	**LL%**	23.4	
	P.I.	0.0	
	LS%	0.0	
	GM	0.59	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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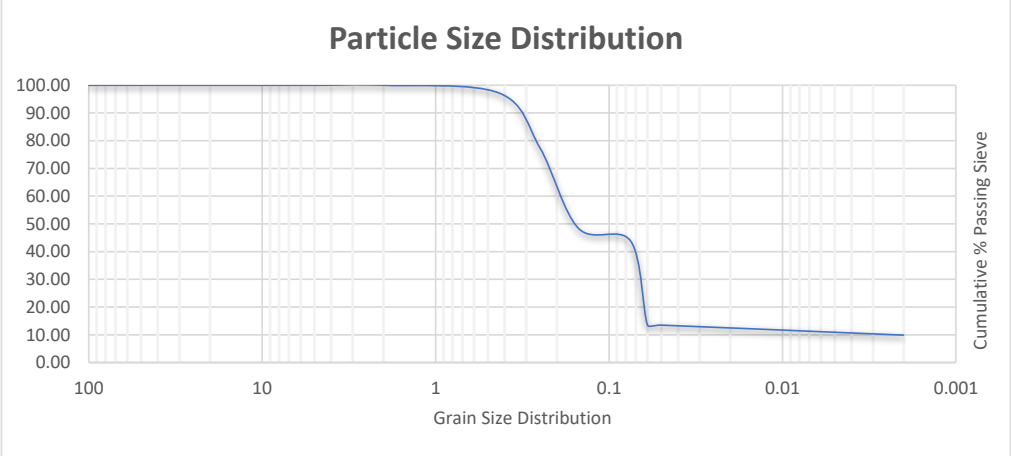
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP2B
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / **Clay (%)**	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	630
	Moisture %	4.5

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.7	**Low**	X
EC (µS/cm)	151	**Medium**	
TDS (ppm)	45	**High**	
Temp (°C)	21.5	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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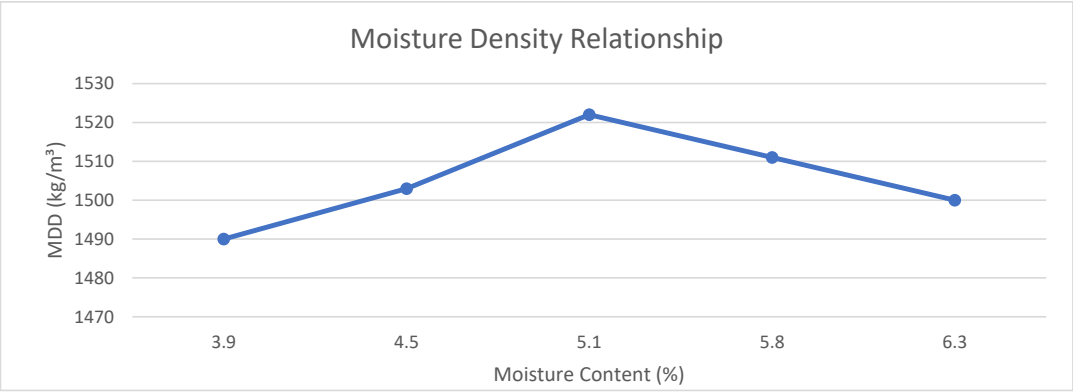
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP2B
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	3.9	1490
2	4.5	1503
3	5.1	1522
4	5.8	1511
5	6.3	1500

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.1	1522



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP2B
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	5
CBR @ 98% Compaction	4
CBR @ 97% Compaction	4
CBR @ 95% Compaction	3
CBR @ 93% Compaction	2
CBR @ 90% Compaction	2
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP3C	
Depth of Sample Taken (m):		0,6-1,0	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	97.40	
	0.43	93.00	
	0.25	66.80	
	0.15	53.60	
	0.075	49.00	
Hydrometer Analysis (mm)	**0.060**	17.05	
	0.050	16.16	
	0.004	12.92	
	0.002	12.04	
Classification		**RAW**	**%**
CLAY		16.164	17
SILT		32.836	32
SAND		48.400	48
GRAVEL		2.600	3
Atterberg Limit	**LL%**	21.9	
	P.I.	0.0	
	LS%	0.0	
	GM	0.61	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

Luhlaza Advisory and Consulting (Pty) Ltd
Blairgowrie Plaza Office Park,
Cnr Conrad & Susman Street,
Office 128 & 126, Level One,
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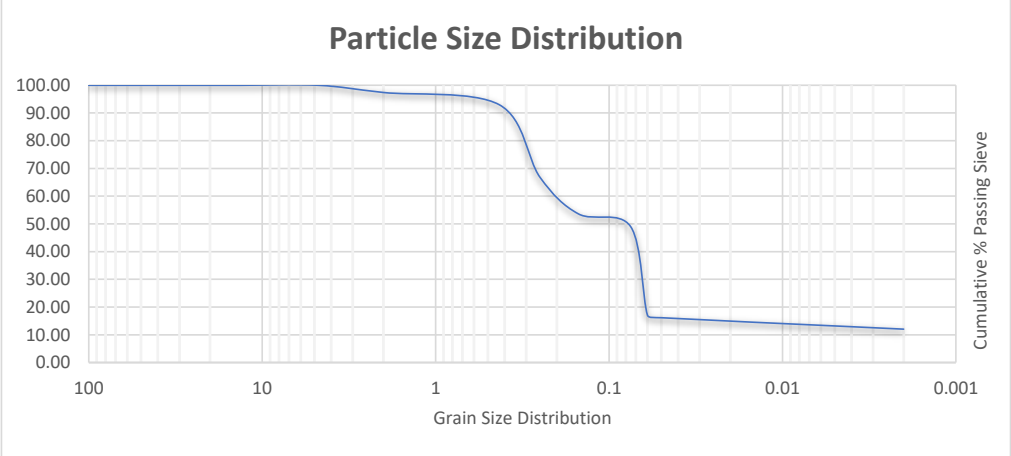
2194 – Tel - +27813154288

TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP3C
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	625
	Moisture %	5.3

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	8.1	**Low**	X
EC (µS/cm)	199	**Medium**	
TDS (ppm)	69	**High**	
Temp (°C)	22.1	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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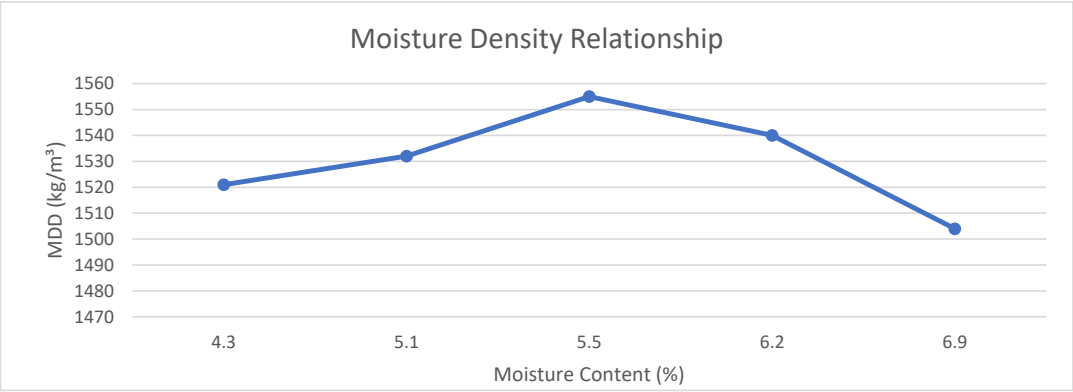
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station		
Attention:	0	**Technical Signatory**	Richard Malungani

Excavation No.	TP3C
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	4.3	1521
2	5.1	1532
3	5.5	1555
4	6.2	1540
5	6.9	1504

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.5	1555



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP3C
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	3
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	1
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP7D	
Depth of Sample Taken (m):		2,0-2,4	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	100.00	
	0.43	84.80	
	0.25	45.60	
	0.15	40.80	
	0.075	39.80	
Hydrometer Analysis (mm)	**0.060**	12.26	
	0.050	11.51	
	0.004	7.48	
	0.002	7.48	
Classification		**RAW**	**%**
CLAY		11.513	12
SILT		28.287	28
SAND		60.200	60
GRAVEL		0.000	0
Atterberg Limit	**LL%**	20.7	
	P.I.	0.0	
	LS%	0.0	
	GM	0.75	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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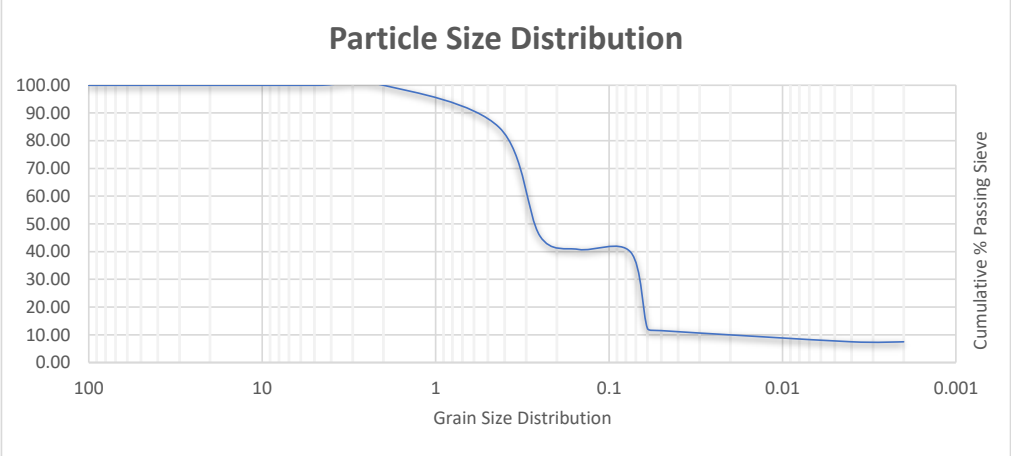
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP7D
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	623
	Moisture %	5.6

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.3	**Low**	X
EC (µS/cm)	202	**Medium**	
TDS (ppm)	101	**High**	
Temp (°C)	21.8	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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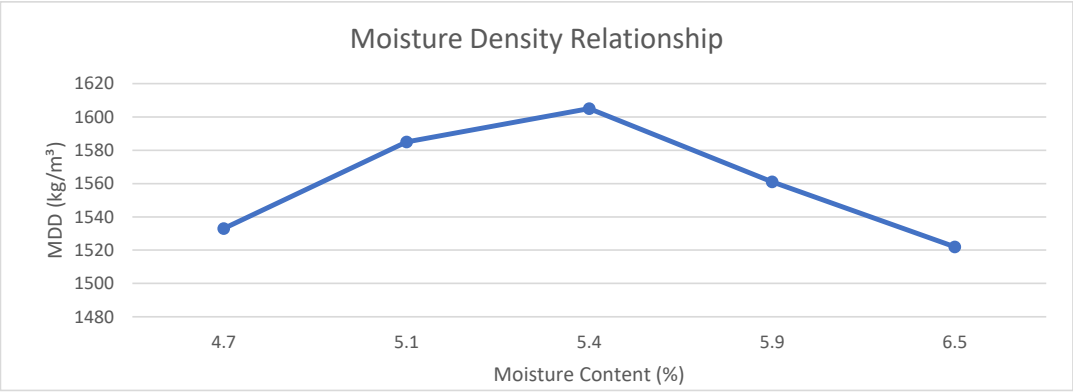
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station		
Attention:	0	**Technical Signatory**	Richard Malungani

Excavation No.	TP7D
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	4.7	1533
2	5.1	1585
3	5.4	1605
4	5.9	1561
5	6.5	1522

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.4	1605



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP7D
Depth of Sample Taken:	2,0-2,4
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	2
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP8E	
Depth of Sample Taken (m):		0,5-0,9	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	97.80	
	0.43	86.60	
	0.25	59.40	
	0.15	48.60	
	0.075	47.40	
Hydrometer Analysis (mm)	**0.060**	13.65	
	0.050	13.65	
	0.004	10.59	
	0.002	9.74	

Classification	**RAW**	**%**
CLAY	13.651	14
SILT	33.749	34
SAND	50.400	50
GRAVEL	2.200	2

Atterberg Limit	**LL%**	23.1	
	P.I.	0.0	
	LS%	0.0	
	GM	0.68	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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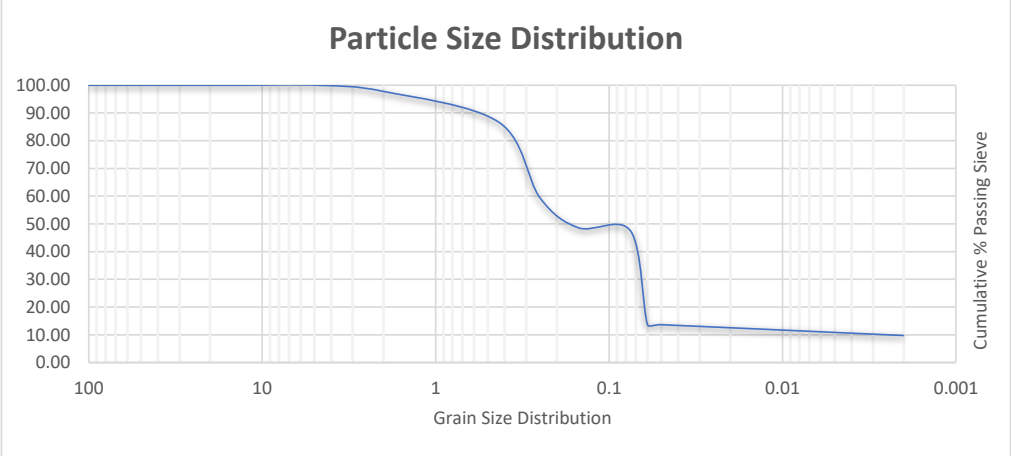
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP8E
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	620
	Moisture %	6.1

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	6.9	**Low**	X
EC (µS/cm)	233	**Medium**	
TDS (ppm)	121	**High**	
Temp (°C)	22.5	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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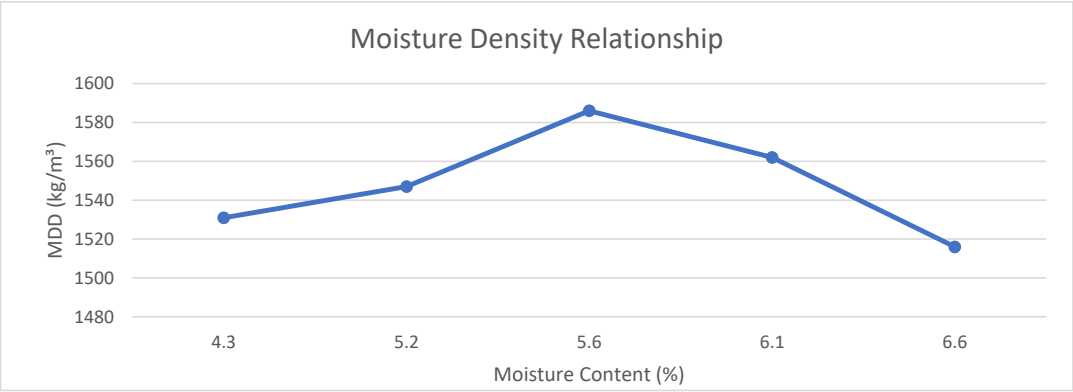
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP8E
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	4.3	1531
2	5.2	1547
3	5.6	1586
4	6.1	1562
5	6.6	1516

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.6	1586



Notes: Data Reported above relates to sample tested.

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2194 – Tel - +27813154288

TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP8E
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	1
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

Luhlaza Advisory and Consulting (Pty) Ltd
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2194 – Tel - +27813154288

TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP10F	
Depth of Sample Taken (m):		0,5-0,9	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	100.00	
	0.43	95.60	
	0.25	62.20	
	0.15	54.00	
	0.075	52.40	
Hydrometer Analysis (mm)	**0.060**	19.28	
	0.050	18.35	
	0.004	14.04	
	0.002	14.04	
Classification		**RAW**	**%**
CLAY		18.350	19
SILT		34.050	33
SAND		47.600	48
GRAVEL		0.000	0
Atterberg Limit	**LL%**	19.9	
	P.I.	0.0	
	LS%	0.0	
	GM	0.52	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	G10

Notes: Data Reported above relates to sample tested.

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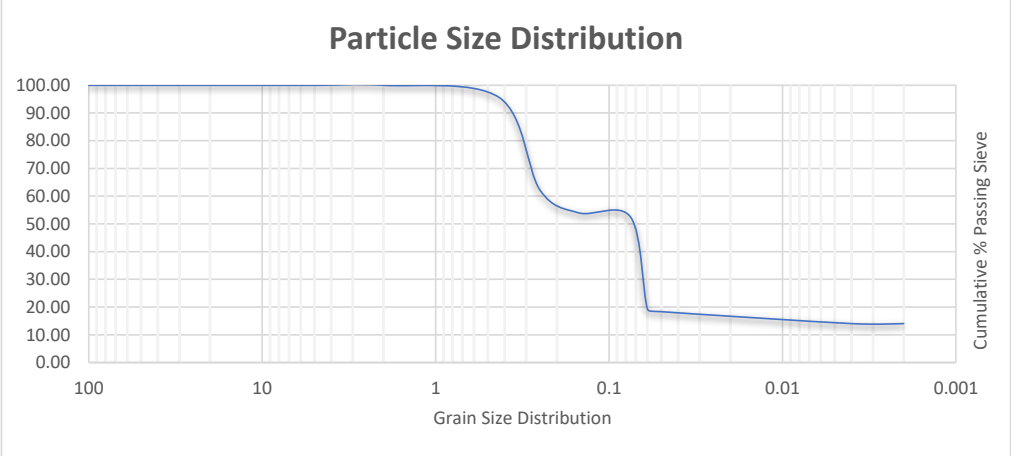
Office 128 & 126, Level One,
Randburg
2194 – Tel - +27813154288

TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP10F
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	618
	Moisture %	6.4

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	8.3	**Low**	X
EC (µS/cm)	167	**Medium**	
TDS (ppm)	92	**High**	
Temp (°C)	22.5	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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Office 128 & 126, Level One,
Randburg
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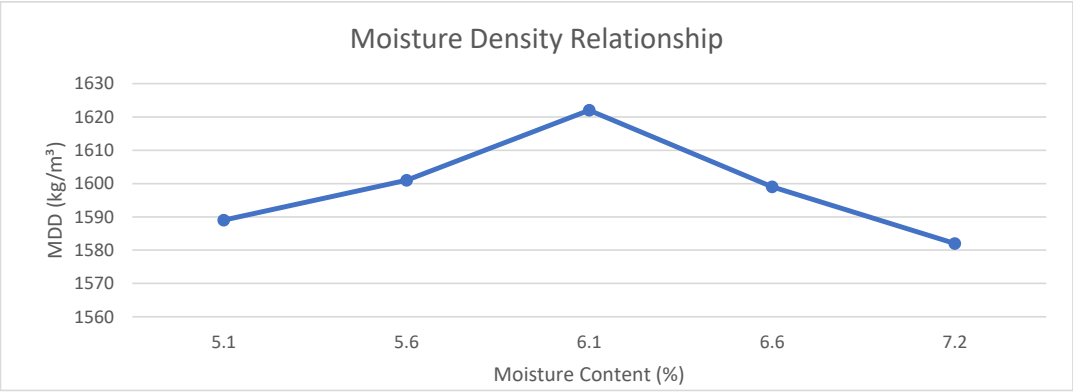
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP10F
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	5.1	1589
2	5.6	1601
3	6.1	1622
4	6.6	1599
5	7.2	1582

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
6.1	1622



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP10F
Depth of Sample Taken:	0,5-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	6
CBR @ 98% Compaction	5
CBR @ 97% Compaction	5
CBR @ 95% Compaction	4
CBR @ 93% Compaction	3
CBR @ 90% Compaction	2
Swell @ 100% Compaction	0

Classification	**TRH14**	**G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP11G	
Depth of Sample Taken (m):		1,8-2,2	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	99.00	
	0.43	92.80	
	0.25	32.20	
	0.15	28.60	
	0.075	27.00	
Hydrometer Analysis (mm)	**0.060**	8.86	
	0.050	8.36	
	0.004	5.62	
	0.002	5.62	
Classification		**RAW**	**%**
CLAY		8.359	9
SILT		18.641	18
SAND		72.000	72
GRAVEL		1.000	1
Atterberg Limit	**LL%**	23.7	
	P.I.	0.0	
	LS%	0.0	
	GM	0.81	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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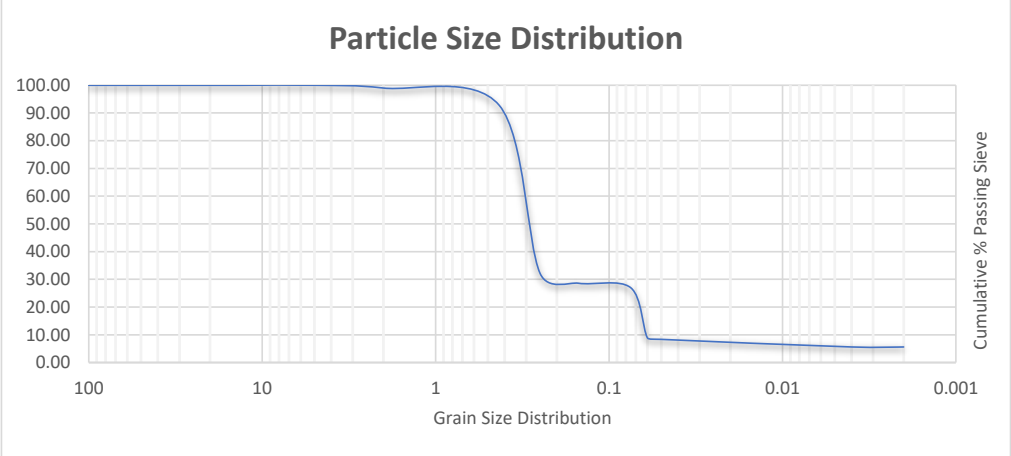
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP11G
Depth of Sample Taken:	1,8-2,2
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	621
	Moisture %	5.9

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.4	**Low**	X
EC (µS/cm)	155	**Medium**	
TDS (ppm)	56	**High**	
Temp (°C)	22.5	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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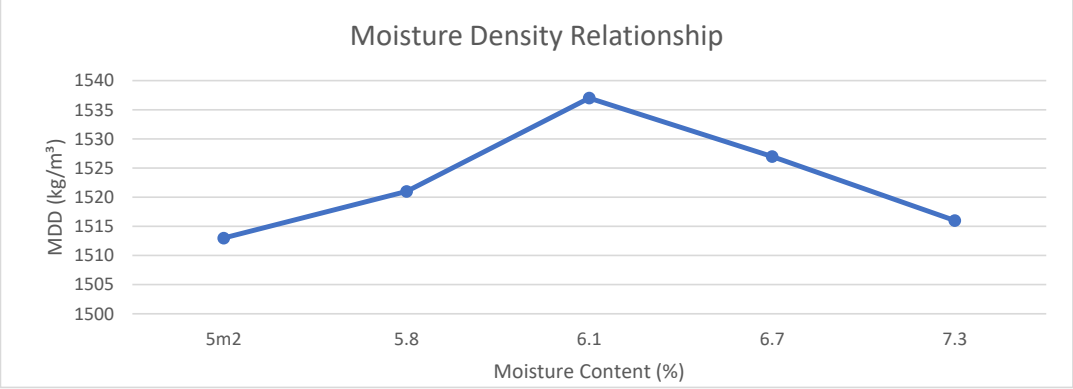
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP11G
Depth of Sample Taken:	1,8-2,2
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	5m2	1513
2	5.8	1521
3	6.1	1537
4	6.7	1527
5	7.3	1516

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
6.1	1537



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP11G
Depth of Sample Taken:	1,8-2,2
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	2
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP12H
Depth of Sample Taken (m):		0,6-1,0
Material Class:		Soils and Gravels
Date Received.		22/09/2023
Description of Sample		Light Brown to White Silty Sand
Sieve Analysis (mm)	**100.00**	100.00
	75.00	100.00
	37.50	100.00
	26.50	100.00
	19.00	100.00
	13.20	100.00
	4.75	100.00
	2.00	99.80
	0.43	90.00
	0.25	59.60
	0.15	55.00
	0.075	52.60
Hydrometer Analysis (mm)	**0.060**	19.36
	0.050	18.42
	0.004	14.94
	0.002	13.98

Classification	**RAW**	**%**
CLAY	18.420	19
SILT	34.180	33
SAND	47.200	47
GRAVEL	0.200	0

Atterberg Limit	**LL%**	22.3	
	P.I.	0.0	
	LS%	0.0	
	GM	0.58	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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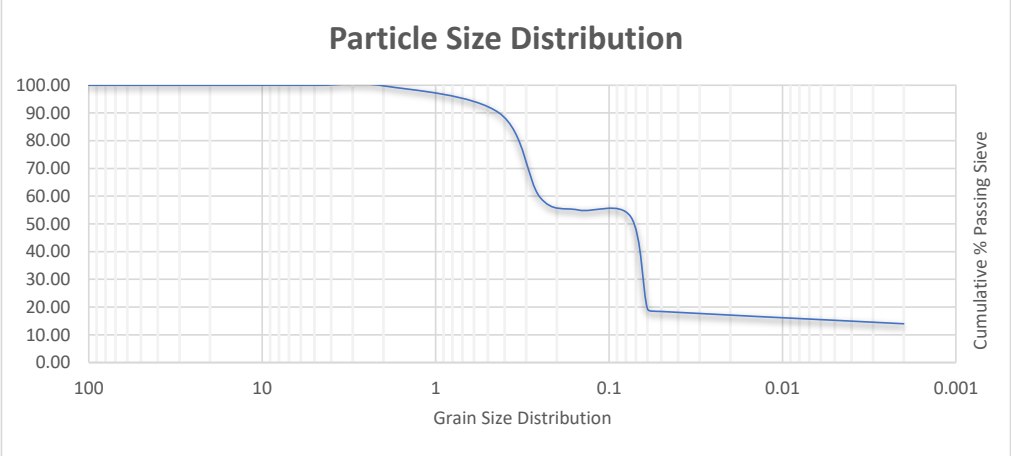
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP12H
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	618
	Moisture %	6.4

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	8.2	**Low**	X
EC (µS/cm)	183	**Medium**	
TDS (ppm)	62	**High**	
Temp (°C)	22.9	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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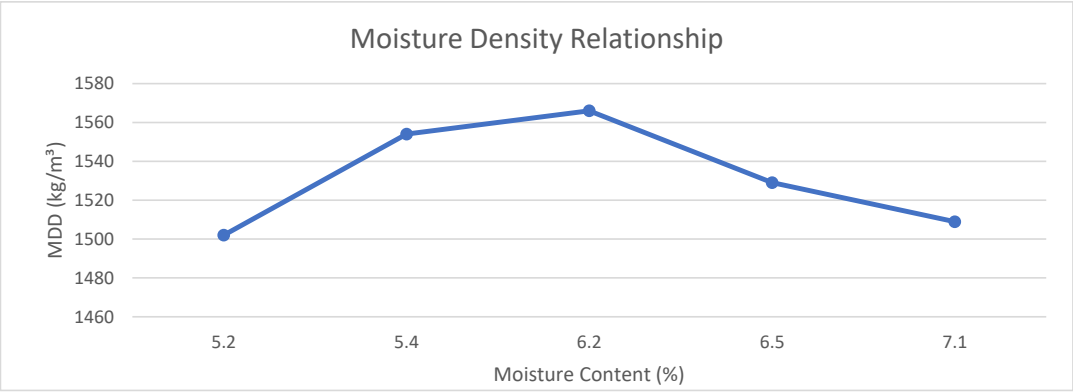
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station		
Attention:	0	**Technical Signatory**	Richard Malungani

Excavation No.	TP12H
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	5.2	1502
2	5.4	1554
3	6.2	1566
4	6.5	1529
5	7.1	1509

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
6.2	1566



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP12H
Depth of Sample Taken:	0,6-1,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	5
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	3
CBR @ 93% Compaction	2
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP17I	
Depth of Sample Taken (m):		1,8-2,0	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	99.00	
	0.43	82.80	
	0.25	51.40	
	0.15	44.60	
	0.075	42.80	
Hydrometer Analysis (mm)	**0.060**	14.89	
	0.050	14.12	
	0.004	10.61	
	0.002	10.61	
Classification		**RAW**	**%**
CLAY		14.119	15
SILT		28.681	28
SAND		56.200	56
GRAVEL		1.000	1
Atterberg Limit	**LL%**	19.9	
	P.I.	0.0	
	LS%	0.0	
	GM	0.75	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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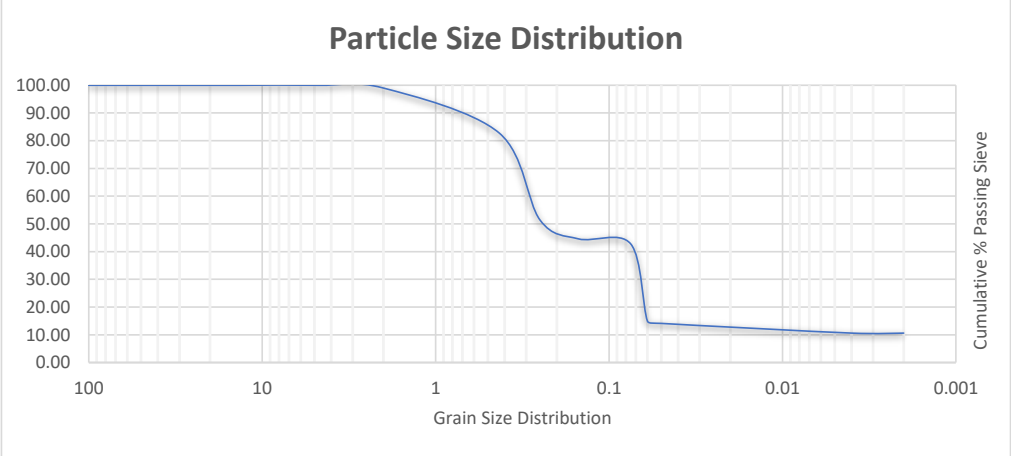
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP17I
Depth of Sample Taken:	1,8-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	628
	Moisture %	4.8

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.8	**Low**	X
EC (µS/cm)	162	**Medium**	
TDS (ppm)	39	**High**	
Temp (°C)	22.3	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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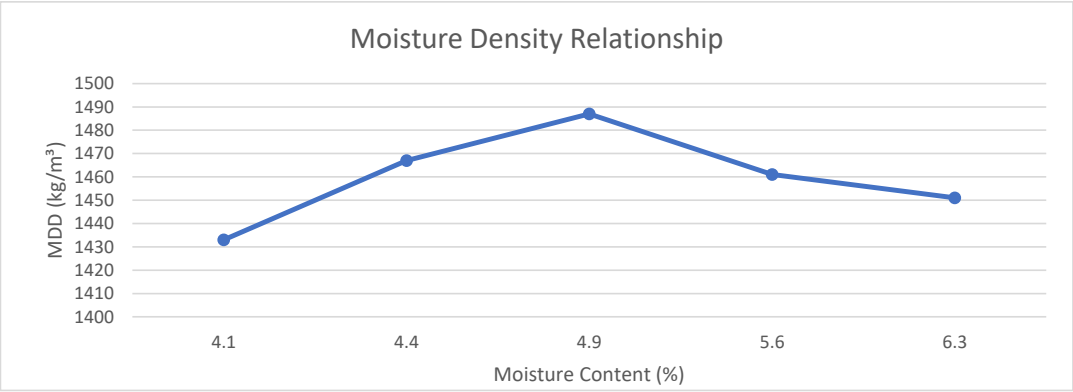
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP17I
Depth of Sample Taken:	1,8-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	4.1	1433
2	4.4	1467
3	4.9	1487
4	5.6	1461
5	6.3	1451

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
4.9	1487



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP17I
Depth of Sample Taken:	1,8-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	4
CBR @ 98% Compaction	3
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	1
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

Luhlaza Advisory and Consulting (Pty) Ltd
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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP18J	
Depth of Sample Taken (m):		0,6-0,9	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	100.00	
	0.43	95.60	
	0.25	65.40	
	0.15	59.00	
	0.075	56.80	
Hydrometer Analysis (mm)	**0.060**	16.36	
	0.050	16.36	
	0.004	10.39	
	0.002	9.39	
Classification		**RAW**	**%**
CLAY		16.358	16
SILT		40.442	40
SAND		43.200	43
GRAVEL		0.000	0
Atterberg Limit	**LL%**	24.1	
	P.I.	0.0	
	LS%	0.0	
	GM	0.48	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	>G10

Notes: Data Reported above relates to sample tested.

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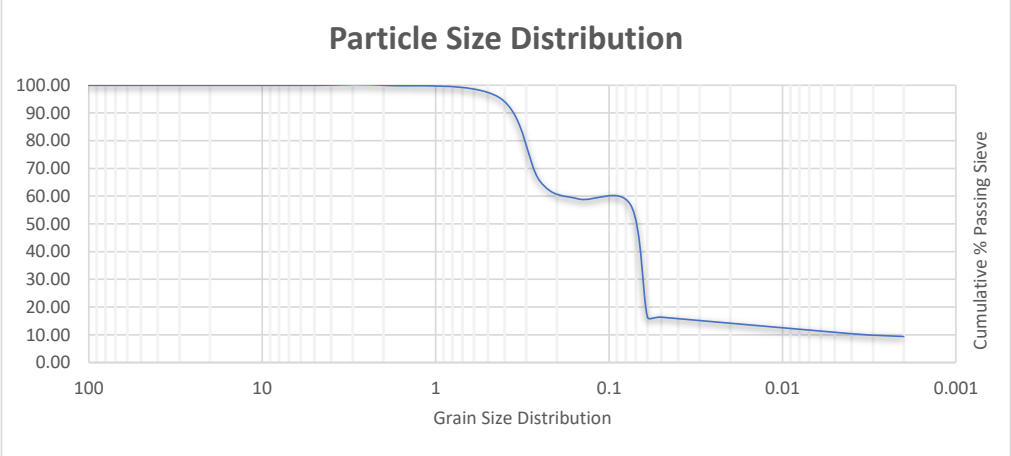
TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP18J
Depth of Sample Taken:	0,6-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	627
	Moisture %	5.0

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	6.8	**Low**	X
EC (µS/cm)	141	**Medium**	
TDS (ppm)	32	**High**	
Temp (°C)	21.1	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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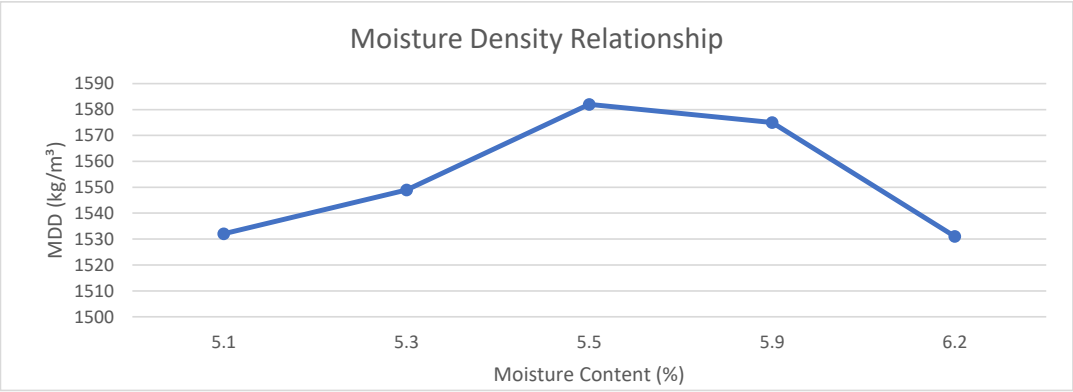
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP18J
Depth of Sample Taken:	0,6-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	5.1	1532
2	5.3	1549
3	5.5	1582
4	5.9	1575
5	6.2	1531

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
5.5	1582



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP18J
Depth of Sample Taken:	0,6-0,9
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	5
CBR @ 98% Compaction	4
CBR @ 97% Compaction	3
CBR @ 95% Compaction	2
CBR @ 93% Compaction	2
CBR @ 90% Compaction	1
Swell @ 100% Compaction	0

Classification	**TRH14**	**>G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

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TEST REPORT: SANS 3001- GR1 - GR12

Client Name:		**Luhlaza Ref:**	
Area:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:			

Sample No:		TP19K	
Depth of Sample Taken (m):		1,6-2,0	
Material Class:		Soils and Gravels	
Date Received.		22/09/2023	
Description of Sample		Light Brown to White Silty Sand	
Sieve Analysis (mm)	**100.00**	100.00	
	75.00	100.00	
	37.50	100.00	
	26.50	100.00	
	19.00	100.00	
	13.20	100.00	
	4.75	100.00	
	2.00	99.40	
	0.43	95.80	
	0.25	63.00	
	0.15	47.80	
	0.075	44.00	
Hydrometer Analysis (mm)	**0.060**	16.19	
	0.050	15.41	
	0.004	9.83	
	0.002	9.04	
Classification		**RAW**	**%**
CLAY		15.408	16
SILT		28.592	28
SAND		55.400	55
GRAVEL		0.600	1
Atterberg Limit	**LL%**	20.6	
	P.I.	0.0	
	LS%	0.0	
	GM	0.61	
Classification	**AASHTO**	A-4 - Silty Soils	**TRH14**
	USCS	SM - Silty Sand	G10

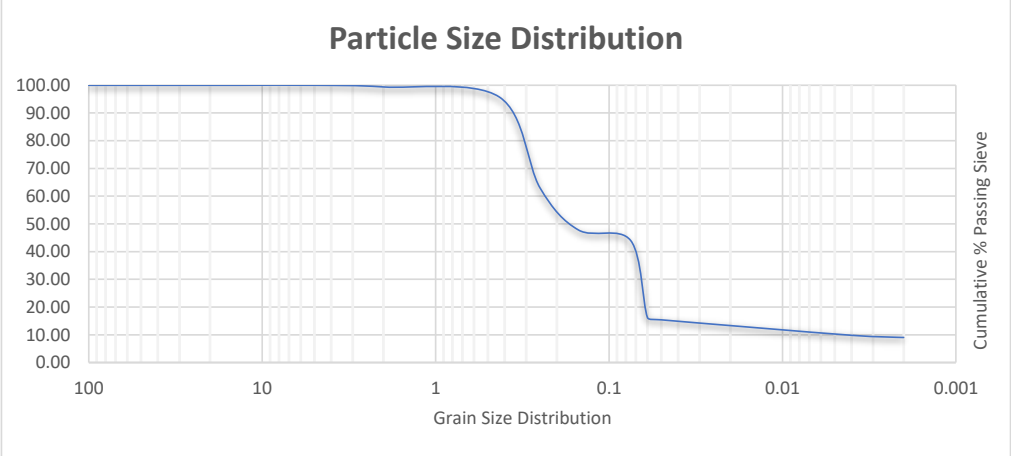
Notes: Data Reported above relates to sample tested.

Luhlaza Advisory and Consulting (Pty) Ltd
Blairgowrie Plaza Office Park,
Cnr Conrad & Susman Street,
Office 128 & 126, Level One,
Randburg
2194 – Tel - +27813154288

TEST REPORT: SANS 3001- GR1 - GR12

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP19K
Depth of Sample Taken:	1,6-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand



Clay Activity Index (AI)		
AI = LL-PL / Clay (%)	0.00	

Natural Moisture Content		
Dry Sample: 500g	**Container + Sample (Wet)**	660
	Container + Sample (Dry)	613
	Moisture %	7.1

PH - EC - TDS - Temp (°C)		**Potential Expansivity**	
pH	7.4	**Low**	X
EC (µS/cm)	155	**Medium**	
TDS (ppm)	57	**High**	
Temp (°C)	23.1	**Organic or Waste**	

Notes: Data Reported above relates to sample tested.

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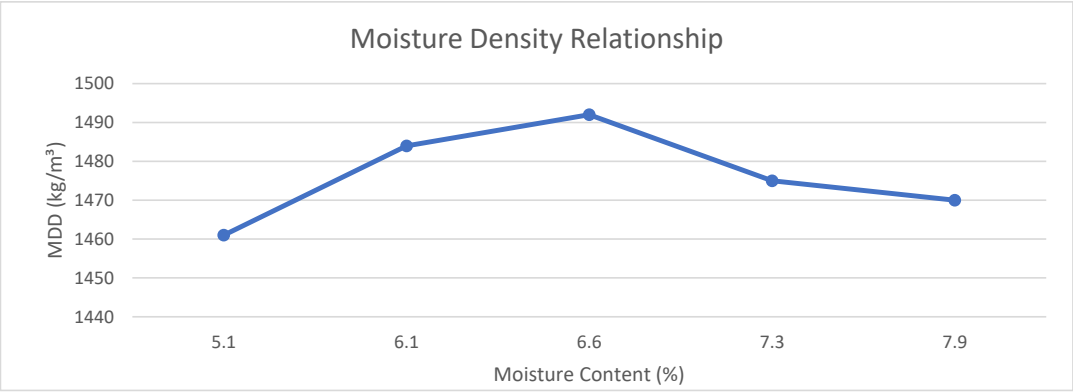
TEST REPORT: MOD AASHTO - SANS 3001 - GR31

Client Name:	0	**Luhlaza Ref:**	Jan-00
Client Address:	Khayelitsha, WC	**Date Analysed:**	19/11/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP19K
Depth of Sample Taken:	1,6-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

TEST METHOD		**MOD AASHTO**
Mould No.	**Moisture (%)**	**Dry Density (kg/m³)**
1	5.1	1461
2	6.1	1484
3	6.6	1492
4	7.3	1475
5	7.9	1470

Optimum Moisture Content (%) (OMC)	**Maximum Dry density (kg/m³) (MDD)**
6.6	1492



Notes: Data Reported above relates to sample tested.

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TEST REPORT: CBR - SANS 3001 - GR40

Client Name:	0	**Luhlaza Ref:**	0
Client Address:	Khayelitsha, WC	**Date Analysed:**	8/5/2023
Project Name:	Makhaza Police Station	**Technical Signatory**	Richard Malungani
Attention:	0		

Excavation No.	TP19K
Depth of Sample Taken:	1,6-2,0
Material Class:	Soils and Gravels
Date Received.	22/09/2023
Description of Sample	Light Brown to White Silty Sand

Material Utilization - Earthworks Classification	
Group A - Granular Soils	X
Group B - Low Plasticity Soils	
Group C - High Plasticity Soils	
Group D - Durable Rock	
Group E - Degradable Rock	
Group F - Topsoil	
Group G - Organic Soils	

CBR Final Results	**CBR %**
CBR @ 100% Compaction	5
CBR @ 98% Compaction	5
CBR @ 97% Compaction	4
CBR @ 95% Compaction	4
CBR @ 93% Compaction	3
CBR @ 90% Compaction	2
Swell @ 100% Compaction	0

Classification	**TRH14**	**G10**

Swell

$$S = \frac{(k - l)}{127} \; x \; 100$$

Where:
S = swell expressed as a percentage of the height of the moulded material before soaking i.e. 127mm
K = dial gauge reading after four days of soaking
L = dial gauge reading before soaking

NB: The swell is reported to the nearest first decimal point.

Notes: Data Reported above relates to sample tested.

SGS MATROLAB (PTY) LTD
- CIVIL ENGINEERING SERVICES -
Reg.No.: 2003/021980/07 - VAT. Reg.No.: 4040210587
a SANAS Accredited Testing Laboratory, No. T0025

256 Brander Street,Jan Niemand Park,Pretoria.
P.O Box 912387,Silverton,0127
Tel. : (012) 800 1299
Fax :
Email : stephan.husselman@sgs.com

T0025

TEST RESULTS

LUHLAZA ADVISORY & CONSULTING (PTY)LTD
41 VREDE AVENUE
RISIDALE,RANDBURG
JOHANNESBURG 2194
Attention: Atish Keerath

Project : Makhaza

Your Ref : G23-0750
Our Ref : PL/63932
Date Reported : 10.11.2023

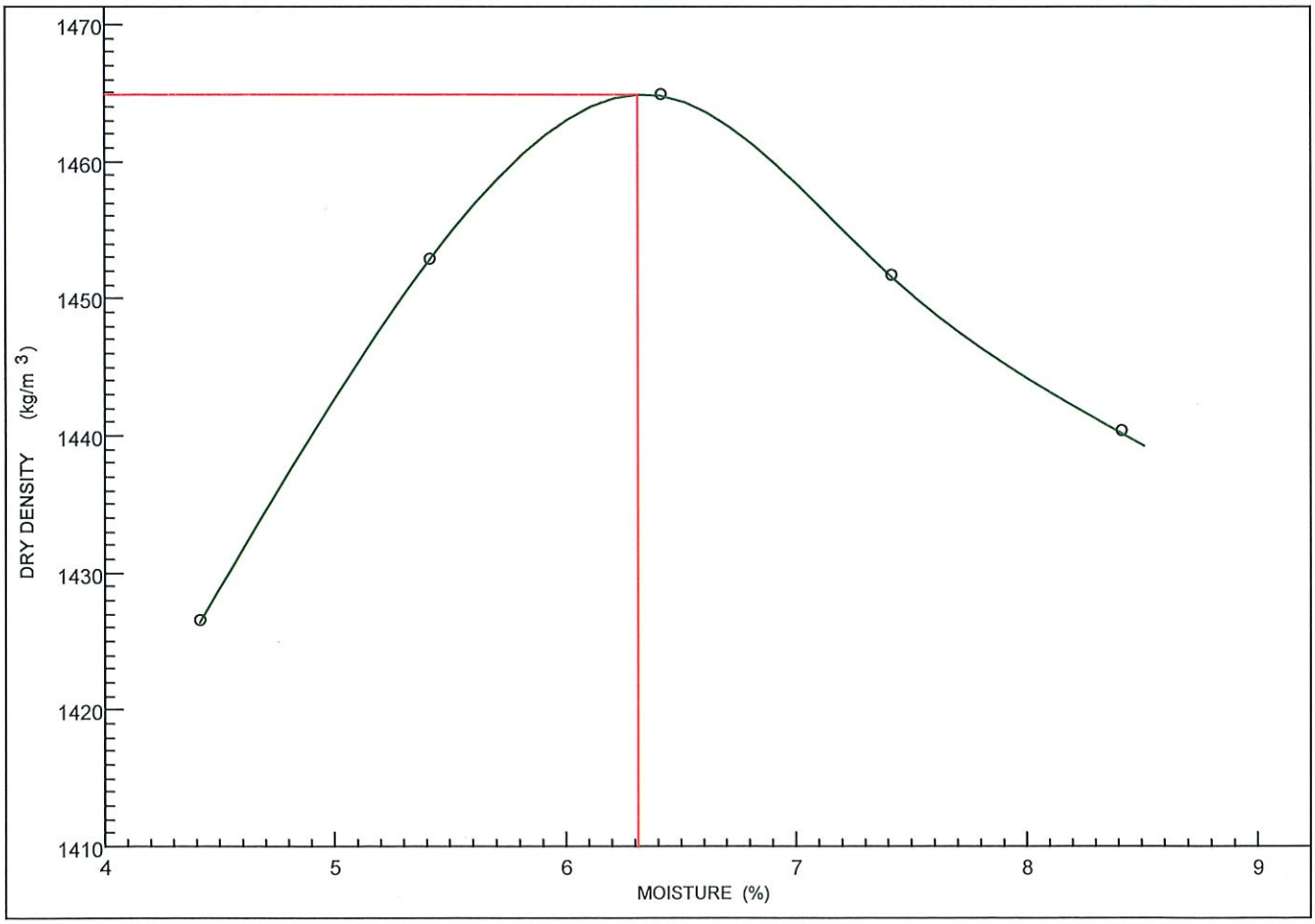
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No: A23/2525	Hole No. : TP02	Depth (mm) : 1.0-1.3
Origin :	Stabilized With : Natural	Compaction Energy : PROCTOR
Material Description :		

Maximum Dry Density (kg/m^3): 1465

Optimum Moisture Content (%) : 6.3

Point No.	1	2	3	4	5			
Moisture (%)	4.4	5.4	6.4	7.4	8.4			
Density (kg/m^3)	1426	1453	1465	1452	1440			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

Technical Signatory : Stephan Husselman

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T0025

TEST RESULTS

LUHLAZA ADVISORY & CONSULTING (PTY)LTD
41 VREDE AVENUE
RISIDALE,RANDBURG
JOHANNESBURG 2194
Attention: Atish Keerath

Project : Makhaza

Your Ref : G23-0749
Our Ref : PL/63932
Date Reported : 10.11.2023

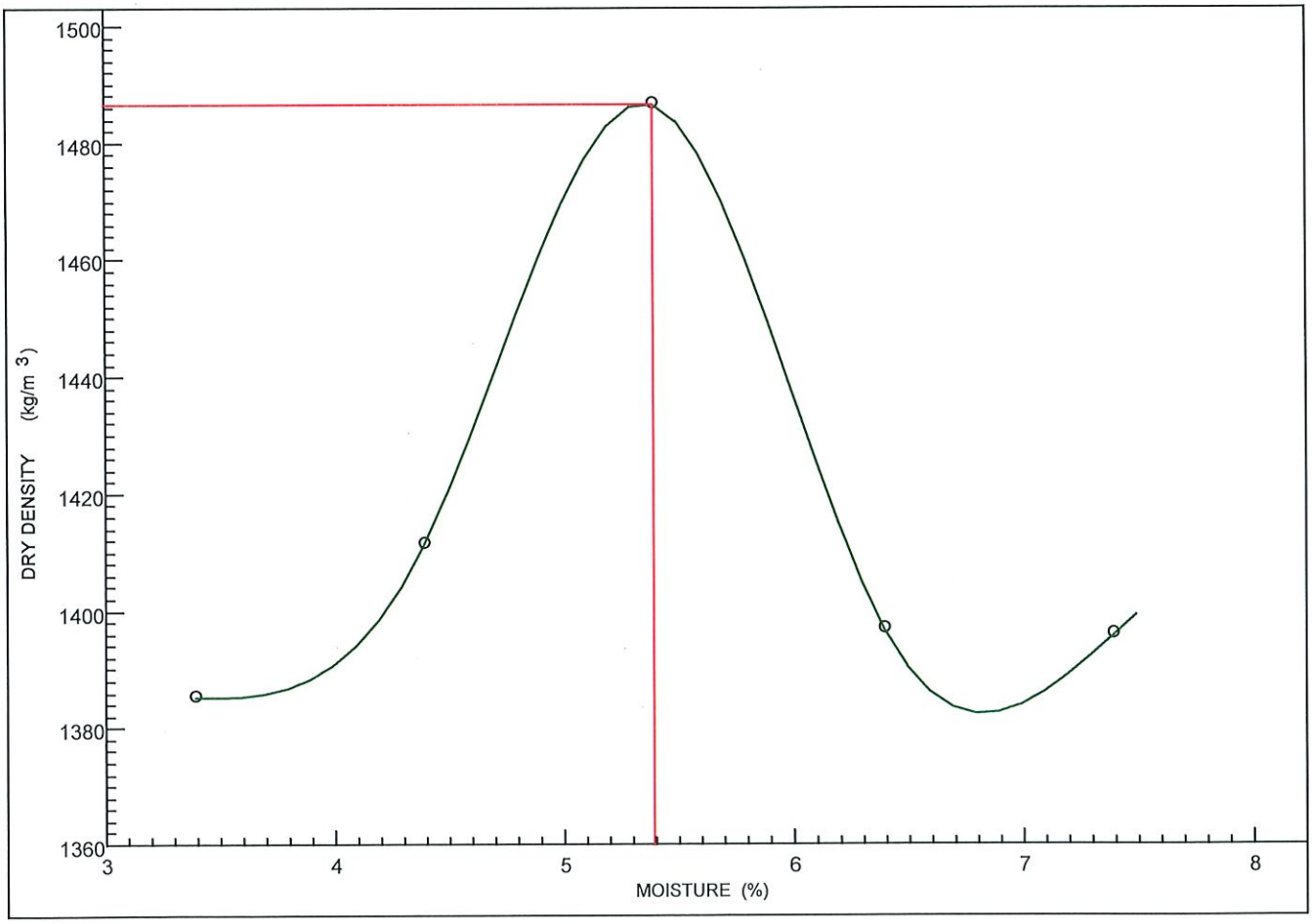
MOISTURE / DENSITY RELATIONSHIP(SANS 3001: GR30)

Sample No.: A23/2524	Hole No. : TP01	Depth (mm) : 1.0-1.3
Origin :	Stabilized With : Natural	Compaction Energy : PROCTOR
Material Description :		

Maximum Dry Density (kg/m^3): 1487

Optimum Moisture Content (%) : 5.4

Point No.	1	2	3	4	5			
Moisture (%)	3.4	4.4	5.4	6.4	7.4			
Density (kg/m^3)	1385	1411	1487	1397	1396			



Remarks :

FORM: GR30

4.4.1(SGS)(2019.12.04)

Technical Signatory : Stephan Husselman

SGS MATROLAB

CONSOLIDATION TESTS: DOUBLE OEDOMETER

BS 1377 Part 5

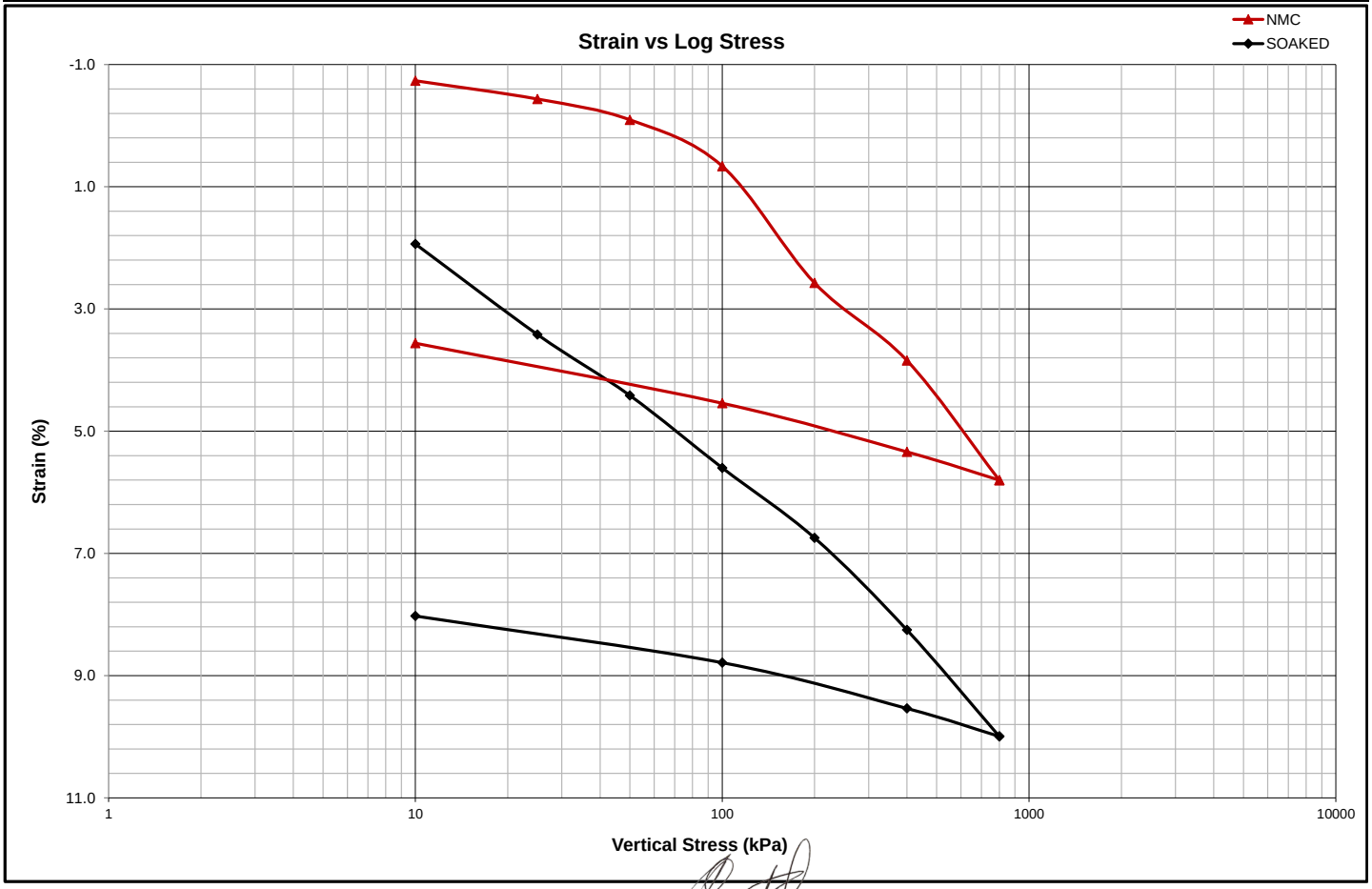
Client: LUHLAZA ADVISORY AND CONSULTING **Project:** MAKHAZA **Job no:** 63775

Sample no: TP01 **Depth (m):** 1.0-1.3 **Date:** 27/11/2023

Lab no: G23-0749

Sample Parameters		Unit	NMC	Soaked	Remarks
Moisture Content	Before Test	%	5.8	6.8	REMOULDED SAMPLE
	After Test	%	3.0	33.3	Complete test specimen
Dry Density		kg/m³	1405	1392	
Void Ratio		-	0.877	0.894	
Degree of Saturation		%	17.5	20.1	
Initial Specimen Height		mm	24.9	25.0	
Relative Density (SG)		-	2.637		Determined

Test Parameters															
Vertical Stress		kPa	10	25	50	100	200	400	800	400	100	10			
Time Elapsed NMC		hr	20	24	24	24	22	8	24	3	3	3			
Time Elapsed Soaked		hr	20	24	24	24	24	24	8	3	3	3			
H_{100}	NMC	mm	25.053	24.978	24.894	24.705	24.230	23.914	23.427	23.542	23.740	23.985			
	Soaked	mm	24.555	24.184	23.935	23.638	23.351	22.974	22.538	22.652	22.840	23.031			
Strain	NMC	%	-0.735	-0.435	-0.095	0.663	2.575	3.843	5.801	5.339	4.542	3.561			
	Soaked	%	1.937	3.419	4.415	5.600	6.746	8.252	9.994	9.537	8.788	8.024			
Void Ratio	NMC	-	0.891	0.885	0.879	0.865	0.829	0.805	0.768	0.777	0.792	0.810			
	Soaked	-	0.857	0.829	0.810	0.788	0.766	0.737	0.704	0.713	0.727	0.742			
Mv (1/Mpa)	NMC	-	-	0.198	0.135	0.151	0.192	0.065	0.051	0.012	0.028	0.114			
	Soaked	-	-	1.008	0.413	0.248	0.121	0.081	0.047	0.013	0.028	0.093			



TECHNICAL SIGNATORY : SUNIL DEWNATH

SGS MATROLAB

CONSOLIDATION TESTS: DOUBLE OEDOMETER

BS 1377 Part 5

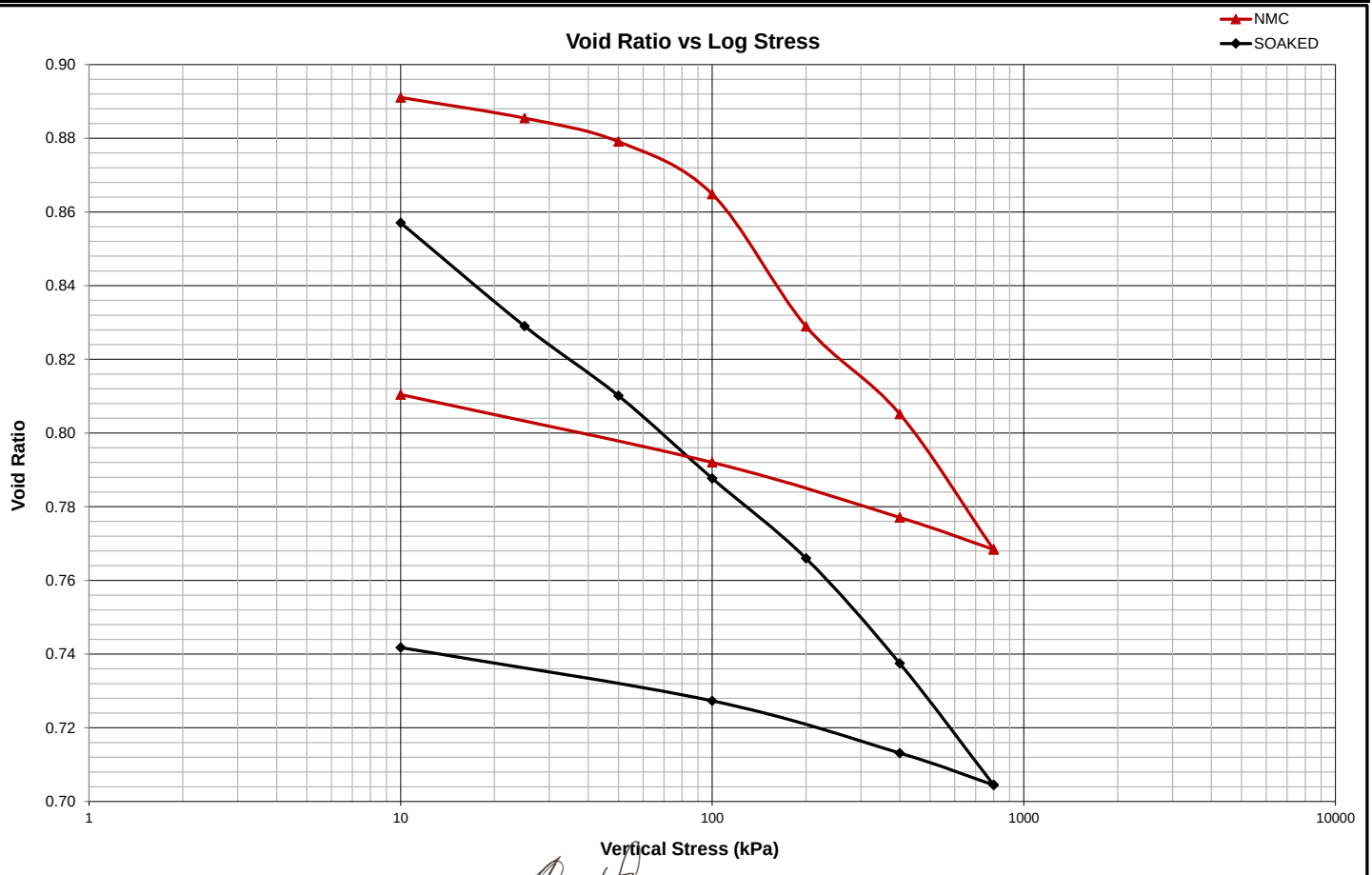
Client: LUHLAZA ADVISORY AND CONSULTING **Project:** MAKHAZA **Job no:** 63775

Sample no: TP01 **Depth (m):** 1.0-1.3 **Date:** 27/11/2023

Lab no: G23-0749

Sample Parameters		Unit	NMC	Soaked	Remarks
Moisture Content	Before Test	%	5.8	6.8	REMOULDED SAMPLE
	After Test	%	3.0	33.3	Complete test specimen
Dry Density		kg/m³	1405	1392	
Void Ratio		-	0.877	0.894	
Degree of Saturation		%	17.5	20.1	
Initial Specimen Height		mm	24.9	25.0	
Relative Density (SG)		-	2.637		Determined

Test Parameters															
Vertical Stress		kPa	10	25	50	100	200	400	800	400	100	10			
Time Elapsed NMC		hr	20	24	24	24	22	8	24	3	3	3			
Time Elapsed Soaked		hr	20	24	24	24	24	24	8	3	3	3			
H_{100}	NMC	mm	25.053	24.978	24.894	24.705	24.230	23.914	23.427	23.542	23.740	23.985			
	Soaked	mm	24.555	24.184	23.935	23.638	23.351	22.974	22.538	22.652	22.840	23.031			
Strain	NMC	%	-0.735	-0.435	-0.095	0.663	2.575	3.843	5.801	5.339	4.542	3.561			
	Soaked	%	1.937	3.419	4.415	5.600	6.746	8.252	9.994	9.537	8.788	8.024			
Void Ratio	NMC	-	0.891	0.885	0.879	0.865	0.829	0.805	0.768	0.777	0.792	0.810			
	Soaked	-	0.857	0.829	0.810	0.788	0.766	0.737	0.704	0.713	0.727	0.742			
Mv	NMC	1/MPa	-	0.198	0.135	0.151	0.192	0.065	0.051	0.012	0.028	0.114			
	Soaked	1/MPa	-	1.008	0.413	0.248	0.121	0.081	0.047	0.013	0.028	0.093			



TECHNICAL SIGNATORY : SUNIL DEWNATH

CONSOLIDATION TESTS: DOUBLE OEDOMETER

BS 1377 Part 5

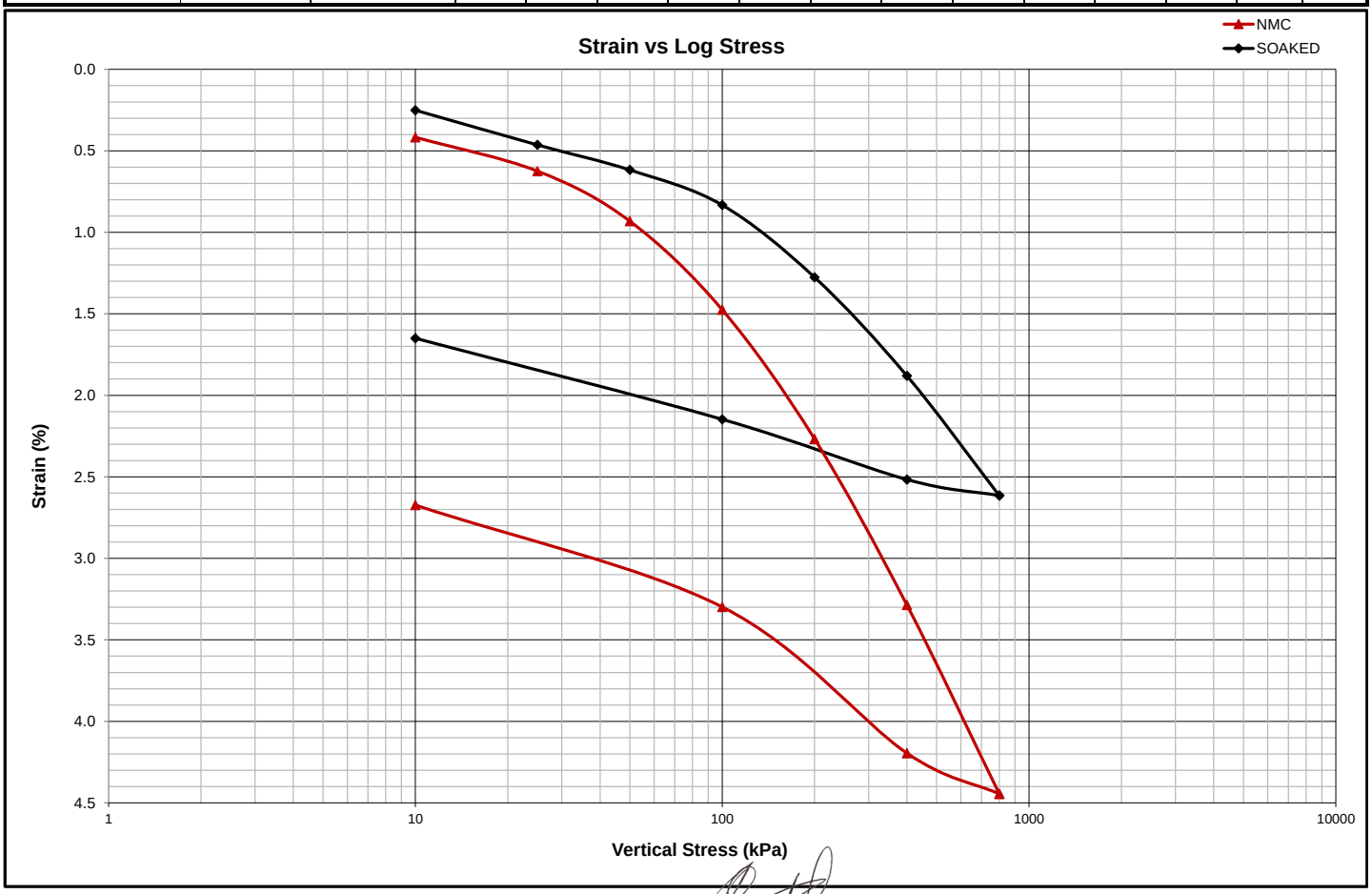
Client: LUHLAZA ADVISORY AND CONSULTING **Project:** MAKHAZA **Job no:** 63775

Sample no: TP2 **Depth (m):** 1.0-1.3 **Date:** 23/11/2023

Lab no: G23-0750

Sample Parameters		Unit	NMC	Soaked	Remarks
Moisture Content	Before Test	%	5.9	6.0	REMOULDED SAMPLE
	After Test	%	5.6	28.8	Complete test specimen
Dry Density		kg/m³	1392	1386	
Void Ratio		-	0.903	0.913	
Degree of Saturation		%	17.4	17.3	
Initial Specimen Height		mm	19.2	19.7	
Relative Density (SG)		-	2.650		Determined

Test Parameters															
Vertical Stress		kPa	10	25	50	100	200	400	800	400	100	10			
Time Elapsed NMC		hr	2	2	2	3	3	3	2	2	2	3			
Time Elapsed Soaked		hr	2	2	2	2	2	2	2	2	2	3			
H_{100}	NMC	mm	19.070	19.030	18.972	18.867	18.716	18.521	18.299	18.347	18.518	18.638			
	Soaked	mm	19.651	19.609	19.578	19.536	19.449	19.330	19.185	19.204	19.277	19.375			
Strain	NMC	%	0.417	0.625	0.932	1.475	2.268	3.286	4.445	4.195	3.298	2.673			
	Soaked	%	0.251	0.464	0.618	0.833	1.276	1.880	2.615	2.517	2.147	1.650			
Void Ratio	NMC	-	0.895	0.891	0.886	0.875	0.860	0.841	0.819	0.824	0.841	0.852			
	Soaked	-	0.908	0.904	0.901	0.897	0.888	0.877	0.863	0.864	0.871	0.881			
Mv (1/Mpa)	NMC	-	-	0.139	0.124	0.110	0.080	0.052	0.030	0.007	0.031	0.072			
	Soaked	-	-	0.142	0.062	0.043	0.045	0.031	0.019	0.003	0.013	0.056			



TECHNICAL SIGNATORY : SUNIL DEWNATH

SGS MATROLAB

CONSOLIDATION TESTS: DOUBLE OEDOMETER

BS 1377 Part 5

Client: LUHLAZA ADVISORY AND CONSULTING **Project:** MAKHAZA **Job no:** 63775

Sample no: TP2 **Depth (m):** 1.0-1.3 **Date:** 23/11/2023

Lab no: G23-0750

Sample Parameters		Unit	NMC	Soaked	Remarks
Moisture Content	Before Test	%	5.9	6.0	REMOULDED SAMPLE
	After Test	%	5.6	28.8	Complete test specimen
Dry Density		kg/m³	1392	1386	
Void Ratio		-	0.903	0.913	
Degree of Saturation		%	17.4	17.3	
Initial Specimen Height		mm	19.2	19.7	
Relative Density (SG)		-	2.650		Determined

Test Parameters															
Vertical Stress		kPa	10	25	50	100	200	400	800	400	100	10			
Time Elapsed NMC		hr	2	2	2	3	3	3	2	2	2	3			
Time Elapsed Soaked		hr	2	2	2	2	2	2	2	2	2	3			
H_{100}	NMC	mm	19.070	19.030	18.972	18.867	18.716	18.521	18.299	18.347	18.518	18.638			
	Soaked	mm	19.651	19.609	19.578	19.536	19.449	19.330	19.185	19.204	19.277	19.375			
Strain	NMC	%	0.417	0.625	0.932	1.475	2.268	3.286	4.445	4.195	3.298	2.673			
	Soaked	%	0.251	0.464	0.618	0.833	1.276	1.880	2.615	2.517	2.147	1.650			
Void Ratio	NMC	-	0.895	0.891	0.886	0.875	0.860	0.841	0.819	0.824	0.841	0.852			
	Soaked	-	0.908	0.904	0.901	0.897	0.888	0.877	0.863	0.864	0.871	0.881			
Mv	NMC	1/MPa	-	0.139	0.124	0.110	0.080	0.052	0.030	0.007	0.031	0.072			
	Soaked	1/MPa	-	0.142	0.062	0.043	0.045	0.031	0.019	0.003	0.013	0.056			

TECHNICAL SIGNATORY : SUNIL DEWNATH

Appendix D: Field Test Pit Photographs

info@luhlazaconsulting.co.za
+27 63 769 4305
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www.luhlazaconsulting.co.za

TP01

TP02

TP03

TP04

TP05

TP06

TP07

TP08

TP09

TP10

TP11

TP12

TP13

TP14

TP15

TP16

TP17

TP18

TP19

TP20

TP21

TP22

Appendix E: Summary of Standard Soil and Rock Profile Description Terminology

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SUMMARY OF SOIL STANDARD AND ROCK PROFILE DESCRIPTION

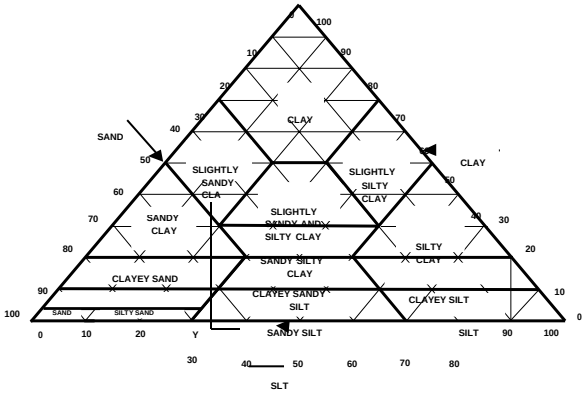
TERMINOLOGY

STANDARD DESCRIPTIONS USED IN SOIL PROFILING

1. MOISTURE CONDITION		2. COLOUR
Term	Description	The Predominant colours or colour combinations are described including secondary coloration described as banded, streaked, blotched, mottled, speckled or stained.
Dry		
Slightly moist	Requires addition of water to reach optimum moisture content for compaction	
Moist	Near optimum content	
Very Moist	Requires drying to attain optimum content	
Wet	Fully saturated and generally below water table	

3. CONSISTENCY			
3.1 Non-Cohesive Soils		3.2 Cohesive Soils	
Term	Description	Term	Description
Very Loose	Crumbles very easily when scraped with geological pick	Very soft	Easily penetrated by thumb. Sharp end of pick can be pushed in 30 - 40mm. Easily moulded by fingers.
Loose	Small resistance to penetration by sharp end of geological pick	Soft	Pick head can easily be pushed into the shaft of handle. Moulded by fingers with some pressure.
Medium Dense	Considerable resistance to penetration by sharp end of geological pick	Firm	Indented by thumb with effort. Sharp end of pick can be pushed in up to 10mm. Can just be penetrated with an ordinary spade.
Dense	Very high resistance to penetration to sharp end of geological pick. Requires many blows of hand pick for excavation.	Stiff	Penetrated by thumbnail. Slight indentation produced by pushing pick point into soil. Cannot be moulded by fingers. Requires hand pick for excavation.
Very Dense	High resistance to repeated blows of geological pick. Requires power tools for excavation	Very Stiff	Indented by thumbnail. Slight indentation produced by blow of pick point. Requires power tools for excavation.

4. STRUCTURE		**5. SOIL TYPE**	
		5.1 Particle Size	
Term	Description	Term	Size (mm)
Intact	Absence of fissures or joints	Boulder	>200
Fissured	Presence of closed joints	Pebbles	60 – 200
Shattered	Presence of closely spaced air filled joints giving cubical fragments	Gravel	60 – 2
Micro shattered	Small scale shattering with shattered fragments the size of sand grains	Sand	2 – 0,06
Slickensided	Polished planar surfaces representing shear movement in soil	Silt	0,06 – 0,002
Bedded Foliated	Many residual soils show structures of parent rock.	Clay	<0,002

6. ORIGIN		5.2 Soil Classification
6.1 Transported Soils		
Term	Agency of Transportation	
Colluvium	Gravity deposits	
Talus	Scree or coarse colluvium	
Hillwash	Fine colluvium	
Alluvial	River deposits	
Aeolian	Wind deposits	
Littoral	Beach deposits	
Estuarine	Tidal – river deposits	
Lacustrine	Lake deposits	
6.2 Residual soils		
These are products of in situ weathering of rocks and are described as e.g. Residual Shale		
6.3 Pedocretes		
Formed in transported and residual soils etc. calcrete, silcrete, manganocrete and ferricrete.		

SUMMARY OF DESCRIPTIONS USED IN ROCK CORE LOGGING

1. WEATHERING

Term	Symbol	Diagnostic Features
Residual Soil	W5	Rock is discoloured and completely changed to a soil in which original rock fabric is completely destroyed. There is a large change in volume.
Completely Weathered	W5	Rock is discoloured and changed to a soil but original fabric is mainly preserved. There may be occasional small corestones.
Highly Weathered	W4	Rock is discoloured, discontinuities may be open and have discoloured surfaces, and the original fabric of the rock near the discontinuities may be altered; alternation penetrates deeply inwards, but corestones are still present.
Moderately Weathered	W3	Rock is discoloured, discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards, intact rock is noticeably weaker than the fresh rock.
Slightly Weathered	W2	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces, the intact rock is not noticeably weaker than the fresh rock.
Unweathered	W1	Parent rock showing no discolouration, loss of strength or any other weathering effects.

2. HARDNESS

Classification	Field Test	Compressive Strength Range MPa
Extremely Soft Rock	Easily peeled with a knife	<1
Very Soft Rock	Can be peeled with a knife. Material crumbles under firm blows with the sharp end of a geological pick.	1 to 3
Soft Rock	Can be scraped with a knife, indentation of 2 to 4 mm with firm blows of the pick point.	3 to 10
edium Hard Rock	Cannot be scraped or peeled with a knife. Hand held specimen breaks with firm blows of the pick.	10 to 25
Hard Rock	Point load tests must be carried out in order to distinguish between these classifications	25 - 70
ery Hard Rock	These results may be verified by uniaxial compressive strength tests on selected samples.	70 - 200
Extremely Hard Rock		>200

3. COLOUR

The predominant colours or colour combination are described including secondary colouration described as banded, streaked, blotched, mottled,

4. FABRIC

4.1 Grain Size

Term	Size (mm)
Very Coarse	>2,0

4.2 Discontinuity Spacing

Description for: Bedding, foliation, laminations	Spacing (mm)	Descriptions for joints, faults, etc.
Very Thickly Bedded	> 2000	Very Widely

Coarse	0,6 – 2,0	Thickly Bedded	600 – 2000	Widely
Medium	0,2 – 0,6	Medium Bedded	200 – 600	Medium
Fine	0,06 – 0,2	Thinly Bedded	60 – 200	Closely
Very Fine	< 0,06	Laminated	3 – 60	Very closely
		Thinly Laminated	<3	

5. ROCK NAME		6. STRATIGRAPHIC LAYER
Classified in terms of origin:		Identification of rock type in terms of stratigraphic layers.
IGNEOUS	Granite, Diorite, Gabbro, Syenite, , Dolerite, Trachyte, Andesite, Basalt.	
METAMORPHIC	Slate, Felsite, Gneiss, Schist, Quartzite	
SEDIMENTARY	Shale, Siltstone, Siltstone, Sandstone, Dolomite, Conglomerate, Tillite, Limestone.	