

Final Geotechnical Investigation Report for Gumzana Senior Secondary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province



For



By

ILZ Consulting

Final Geotechnical Investigation Report for Gumzana Senior Secondary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province

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CONTENTS PAGE

1 INTRODUCTION.....	1
2 INFORMATION AVAILABLE	1
3 SITE LOCATION AND ACCESSIBILITY.....	1
4 FIELD WORK.....	2
4.1 SOIL/ROCK PROFILING	4
4.2 DYNAMIC CONE PENETROMETER (DCP) TEST	4
5 REGIONAL GEOLOGY.....	4
5.1 LOCAL GEOLOGY.....	4
5.1.1 Colluvium.....	5
5.1.2 Weathered Tillite (Pd).....	5
5.2 GROUNDWATER OCCURRENCE.....	5
6 LABORATORY TEST RESULTS.....	5
7 MATERIAL CLASSIFICATION AND USAGE	6
8 GEOTECHNICAL APPRAISAL.....	6
8.1 BEARING CAPACITY.....	6
8.2 SITE CLASSIFICATION.....	6
8.3 FOUNDATION RECOMMENDATIONS	7
8.4 EXCAVATIBILITY	7
9 CONCLUSION	8
10 REFERENCES.....	9

LIST OF FIGURES

Figure 3-1: Locality Map relative to Mbizana.....	2
Figure 4-1: Trial pit positions.	3
Figure 5-1: Regional geology of the site.....	4

LIST OF TABLES

Table 6-1: Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations, MOD AASHTO and CBR Tests.	5
Table 7-1: Material Classification and Usage.	6
Table 8-1: NHBRC Residential Site Classification.....	7
Table 8-2: SANS 1200D excavation class descriptions- restricted excavation.....	7
Table 8-3: Excavation classification	8

LIST OF APPENDICES

APPENDIX A: GEOLOGICAL PROFILES	10
APPENDIX B: PENETROMETER TEST RESULTS	11
APPENDIX C: LABORATORY TEST RESULTS	13



1 INTRODUCTION

iLZ Consulting (Pty) Ltd was appointed by The Mvula Trust to undertake geotechnical investigations at various schools for the Implementation of Sanitation Programme at Various schools in Eastern Cape Province (Sanitation 17).

The aim of the investigation was to:

- a. To assess the subsoil conditions pertaining to the site and their suitability for the proposed development,
- b. To provide foundation recommendation for the proposed development and to comment on the excavability of the site,
- c. To comment on any other geotechnical aspect of the site.

This report contains results of the geotechnical investigation carried out at **Gumzana Senior Secondary School**, highlighting the following

- General soil/rock profile on-site,
- Groundwater occurrence,
- Excavability classification,
- Recommendations for foundations.

Although considered unlikely, should significant variations from the inferred conditions become apparent during construction, the advice of a geotechnical professional must be sought.

2 INFORMATION AVAILABLE

Information made available to or sourced by iLZ at the time of investigation comprised of the following:

- Terms of reference
- Site Development Plan (Google Earth image with test positions)
- GPS Coordinates of the schools
- 1:250 000 Geological Map Sheets

3 SITE LOCATION AND ACCESSIBILITY

Gumzana Senior Secondary School is located in Gumzana, a village approximately 42km southeast of Mbizana, under the Alfred Nzo District Municipality in the Eastern Cape Province, South Africa. Access is via R61 and Mtentu Beach Road from Bizana. (see **Figure 3-1**). The school has 5

classroom blocks, an admin block, 4 park home classrooms and 3 existing toilets for learners and teachers. The proposed position is used to dump trash.

The approximate central coordinates are -31.016956° Lat and 29.980292° Long. The coordinates are WGS84.

Topographically, the site is located on a relatively gentle terrain towards the west.

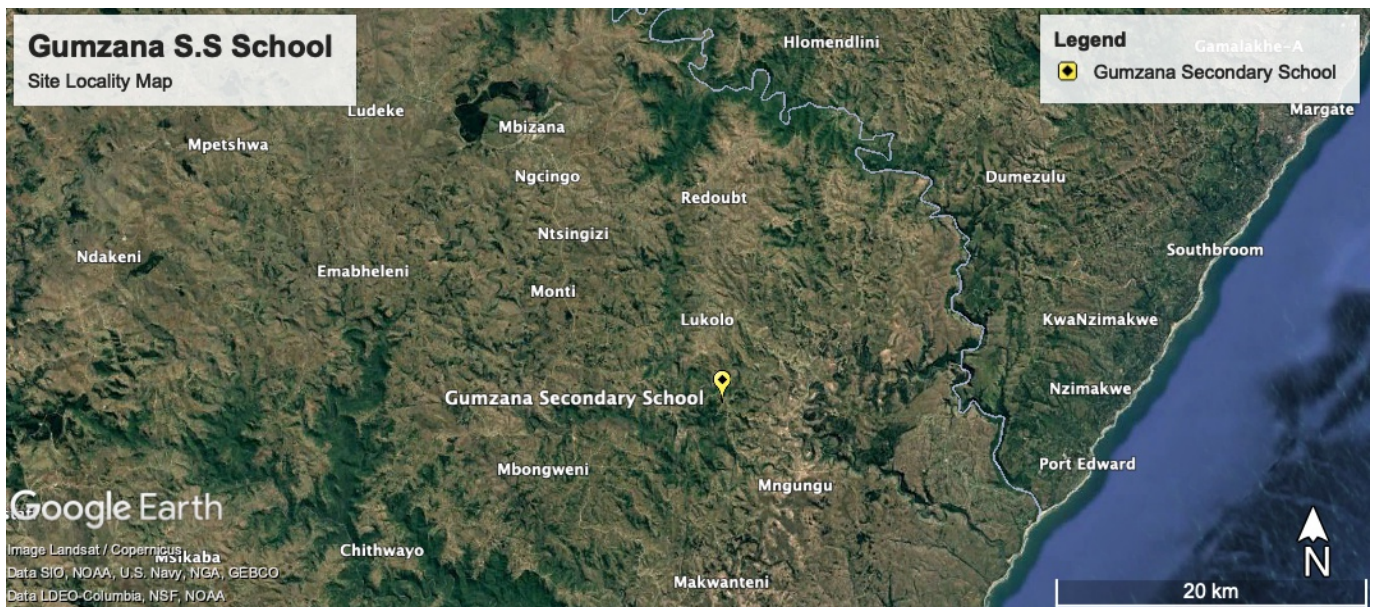


Figure 3-1: Locality Map relative to Mbizana.

4 FIELD WORK

Geotechnical site investigation was undertaken on the 10th of June 2026 and comprised of the following:

- Siting of 2 trial pits using SDP's of where the proposed structures positions:
 - New ablutions (boys, girls, and staff)
- Test pits were excavated using hand tools and profiled by an Engineering Geologist using SANS 633 guidelines.
- Penetrometer tests (DCP) tests were conducted adjacent to each trial pit

These positions are all marked in **Figure 4-1** below as per the provided SDP.



Figure 4-1: Trial pit positions.

4.1 Soil/rock Profiling

Two trial pits, labelled TP1 and TP2, were excavated manually with pick and shovel at locations designated for the proposed new ablutions, i.e. proposed positions as per SDP. The excavation focused on areas planned for boys, girls and staff. The trial pits were all excavated to a maximum depth of 1.50 meters below the existing ground level (mbgl).

The subsoils were profiled by an Engineering Geologist following the SANS 633 guidelines.

4.2 Dynamic Cone Penetrometer (DCP) Test

Two Dynamic Cone Penetrometer tests (DCP), designated DCP1 and DCP2, were conducted adjacent to the test pits. The tests were all advanced to a maximum depth of 2.00 mbgl. The tests were done to primarily ascertain excavation classification and to estimate the bearing capacity of the local soils.

5 REGIONAL GEOLOGY

According to **3028 Kokstad** 1:250 000 Geological Map Series, the site is underlain by the Dwyka Formation tillites (Pd) as shown in **Figure 5-1** below.

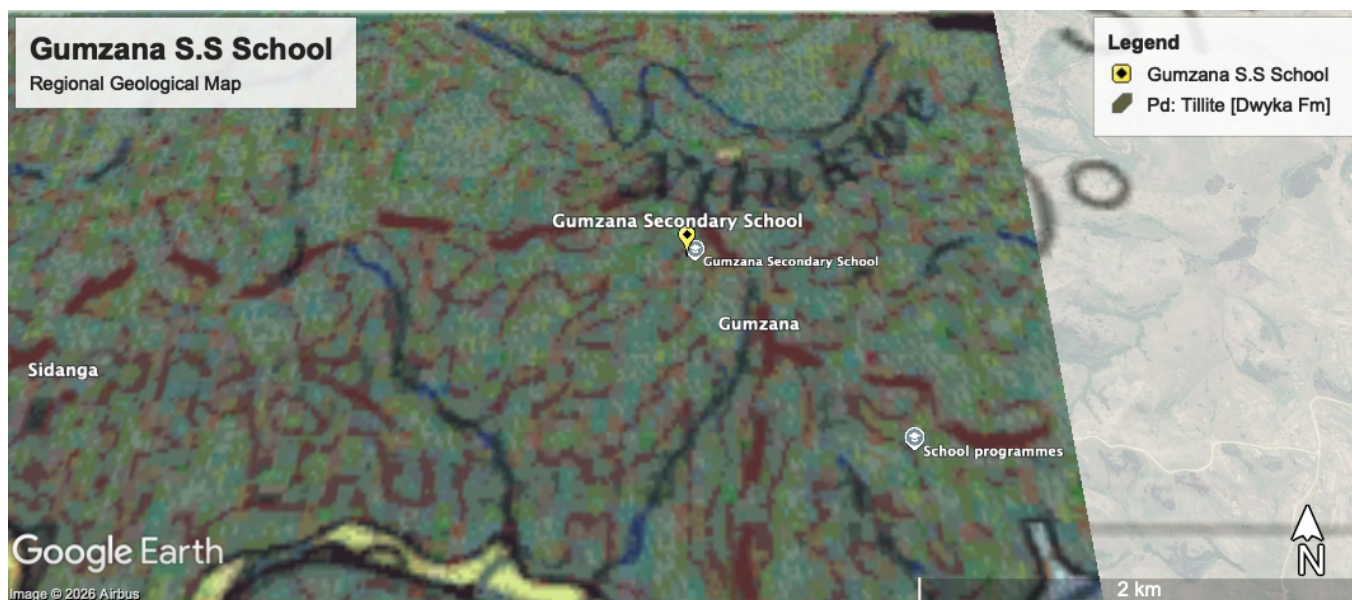


Figure 5-1: Regional geology of the site.

5.1 Local Geology

Field investigations show that the site is underlain by colluvial soils which overlie the weathered tillite bedrock in TP1 and TP2.

The detailed logs are attached in **Appendix A** of this report, while a description of each layer is given below.

5.1.1 Colluvium

This horizon was encountered throughout the site at depths ranging from surface to 0.60m overlying the weathered tillite. It was described as slightly moist, blackish grey, firm, intact, shattered, fine to medium grained, sandy silty clay with roots.

5.1.2 Weathered Tillite (Pd)

The weathered tillite was encountered underlying the colluvial soils in all pits at depths ranging from 0.40 to 1.50m below existing ground level. It was described as orangey brown, light brown, completely weathered, completely fractured, fine to medium grained, very soft tillite.

The rock strength is expected to increase with depth.

5.2 Groundwater Occurrence

No groundwater seepage was encountered during the investigation.

However, perched groundwater levels may be encountered at the soil/rock interface during rainy season. If encountered during construction, it will need to be removed from foundations through dewatering.

6 LABORATORY TEST RESULTS

In order to assess more accurately the engineering properties of the various materials encountered on site and their suitability for use for construction of road layers, the following materials classification tests were carried out on selected samples during the investigation:

- Atterberg Limit and Linear Shrinkage Determinations
- Mod AASHTO and California Bearing Ratio
- Hydrometer

A summary of the laboratory results is presented below in **Table 6-1** and the detailed results are included in **Appendix C**.

Table 6-1: Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations, MOD AASHTO and CBR Tests.

Pit No.	Depth (m)	Atterberg Limits %			GM	Modified AASHTO		CBR Values (%) Compaction MDD				Classification and Activity
		LL	PI	LS		MDD (kgm3)	OMC %	90	93	95	100	
TP1	0.60-1.50	30	11	6.0	0.58							A-6(4), LOW
TP1	0.60-1.50	30	11	6.0	0.58	1780	19.4	4.9	5.7	6.3	8.1	A-6(4), G10

LL - Liquid Limit
 LS - Linear Shrinkage
 PI - Plasticity Index

MDD – Maximum Dry Density
 OMC – Maximum Moisture Content
 GM – Grading Modulus

7 MATERIAL CLASSIFICATION AND USAGE

The laboratory test results, and the visual assessment conducted on-site have been used as an indication of suitability for use of the materials encountered on-site for the construction of pavement layers.

The classification and recommended usage are summarized in **Table 7-1** below.

Table 7-1: Material Classification and Usage.

Material Type	Classification Details	Recommended Use and Subgrade Treatment
Weathered Tillite (Pe)	PI = 11 LS = 6.0 GM = 0.58 Classify as, A-6(4) and G10 in terms of TRH14. It has low heave potential.	Fair to poor subgrade quality. Can be used as a general subgrade layer.

8 GEOTECHNICAL APPRAISAL

8.1 Bearing Capacity

Dynamic Cone Penetration can assist in determining the estimated allowable safe bearing pressures (EASBP) of the soils. **Appendix B** shows that EASBP on the weathered tillite (below 0.50mbgl) ranges between 77kPa to 332kPa.

8.2 Site Classification

The evaluation of the foundation soils and subsequent classification of the site into foundation classes has been carried along the guidelines as proposed by Watermayer and Tromp (1992) and the Structural Division of the SAICE as prescribed by the NHBRC. Based on the geology and the soil profiles encountered during investigation; the site class for is **R**.

Table 8-1: NHBRC Residential Site Classification

TYPICAL FOUNDING MATERIAL	CHARACTER OF FOUNDING MATERIAL	EXPECTED RANGE OF TOTAL SOIL MOVEMENTS (mm)	ASSUMED DIFFERENTIAL MOVEMENT (% OF TOTAL)	SITE CLASS
Rock (excluding mud rocks 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 gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSABLE 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 gravelly 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

8.3 Foundation Recommendations

- Position TP1 and TP2
 - The proposed location is underlain by colluvial soils and weathered tillite. The weathered shallow tillite bedrock can be classified as **R** according to NHBRC. The structures should therefore be placed on the weathered bedrock using conventional strip footings.

Reinforcement of the foundations will be determined by the Structural Engineer based on the prevailing site conditions.

8.4 Excavatibility

SANS 1200 has been used to assess the excavatibility of the material underlying the site. The SANS 1200 excavation classification are shown in **Table 8-2** below.

Table 8-2: SANS 1200D excavation class descriptions- restricted excavation

Excavation Class	Description
Soft	Excavation in material that can be efficiently removed by a back-acting excavator of flywheel power approximately 0.10 kW per millimetre of tined-bucket width, without the use of pneumatic tools such as paving breakers
Intermediate	Excavation in material that requires a back-acting excavator of flywheel power exceeding 0.10 kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipment equivalent to that specified for soft excavation.
Hard	Hard rock excavation shall be excavation in material (excluding boulder excavation) that cannot be efficiently removed without blasting or wedging and splitting.

Excavation Class	Description
Boulder (excavation class A)	Excavation in material containing more than 40% by volume of boulders of size in the range of 0.03-20m ³ , in a matrix of soft or smaller boulders.

Based on the site investigation i.e. trial pit profile and penetrometer tests, the ease of excavation according to SANS 1200D can be expected as shown in **Table 8-3** below. Furthermore, the excavation classification for 1.5 to 2.5m has been inferred based on the rock strength which is anticipated to increase with depth.

Table 8-3: Excavation classification

Location	Excavation classification	
	0-1.5m	1.5-2.5m
Position TP1	Soft to intermediate	Intermediate
Position TP2	Soft to intermediate	Intermediate

9 CONCLUSION

This final report contains the results of a geotechnical investigation carried out for the proposed new ablutions facilities at Gumzana Senior Secondary School.

The site is considered suitable for the proposed development from a geotechnical perspective provided the recommendations given in this report are adhered to.

The material classifies as G10 according to TRH14, thus it is suitable for use as general subgrade.

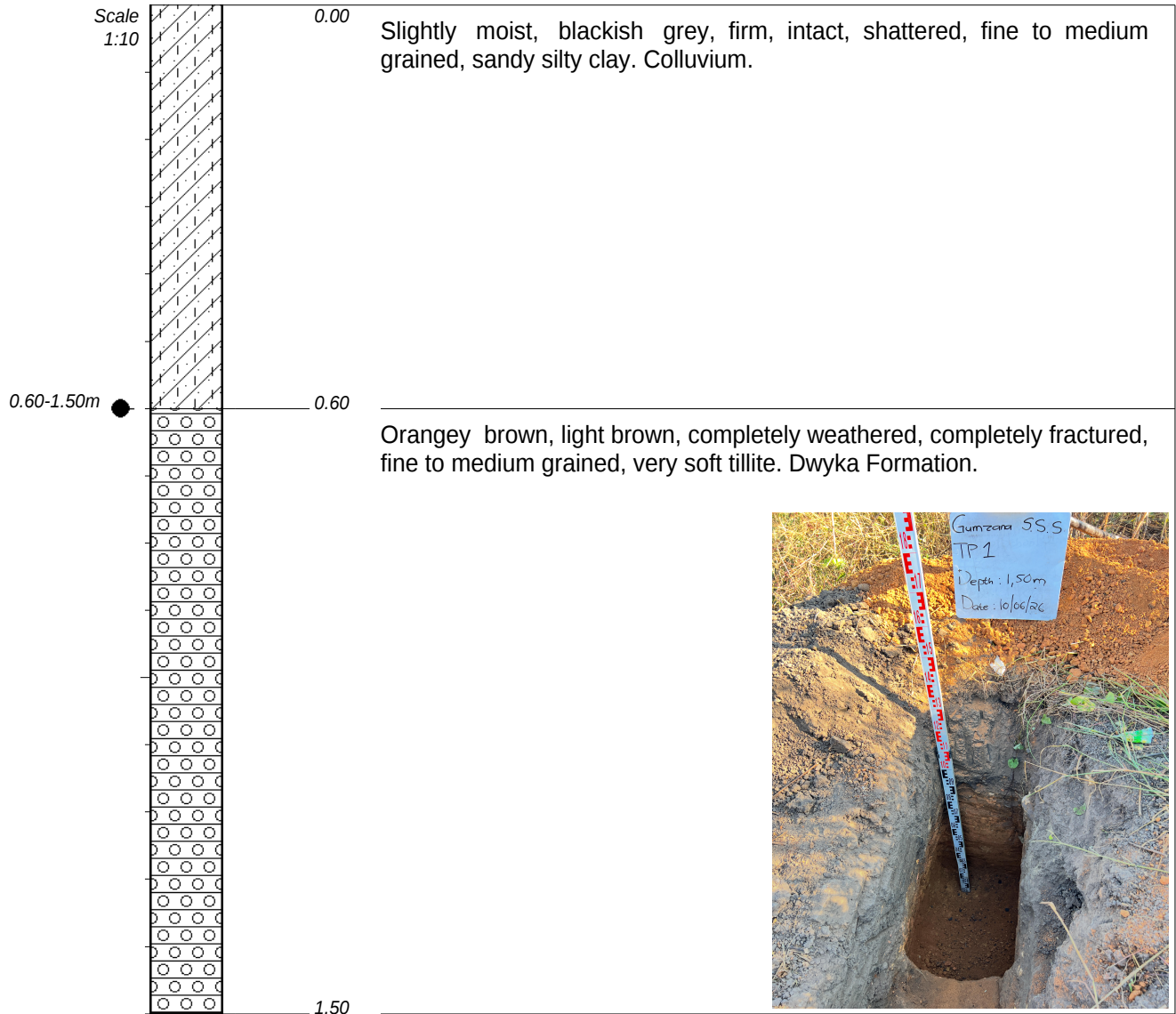
Finally, the ground conditions described in this report refer specifically to those encountered in the inspection pits and DCP test conducted on site.

It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is advised that a competent person be called to advise on the way forward should conditions at variance be encountered.

10 REFERENCES

- SANS 633: Soil profiling and rotary percussion borehole logging on dolomite land in Southern Africa for engineering purposes, 2012.
- 1: 250 000 Scale Geological Map. Sheet **3028 Kokstad**. Published by South African Council for Geoscience.
- Code of Practice _ the Safety of Persons Working in Small Diameter Shafts and Test Pits for Civil Engineering Purposes – Geotechnical Division of SAICE –2003.
- Draft TMH 6. Special Methods. Method ST6. Measurement of the In Situ Strength of Soils by the Dynamic Cone Penetrometer (DCP), (1984).
- SANS 10400-P (2010): The application of the National Building Regulations Part P: Drainage

APPENDIX A: GEOLOGICAL PROFILES



NOTES

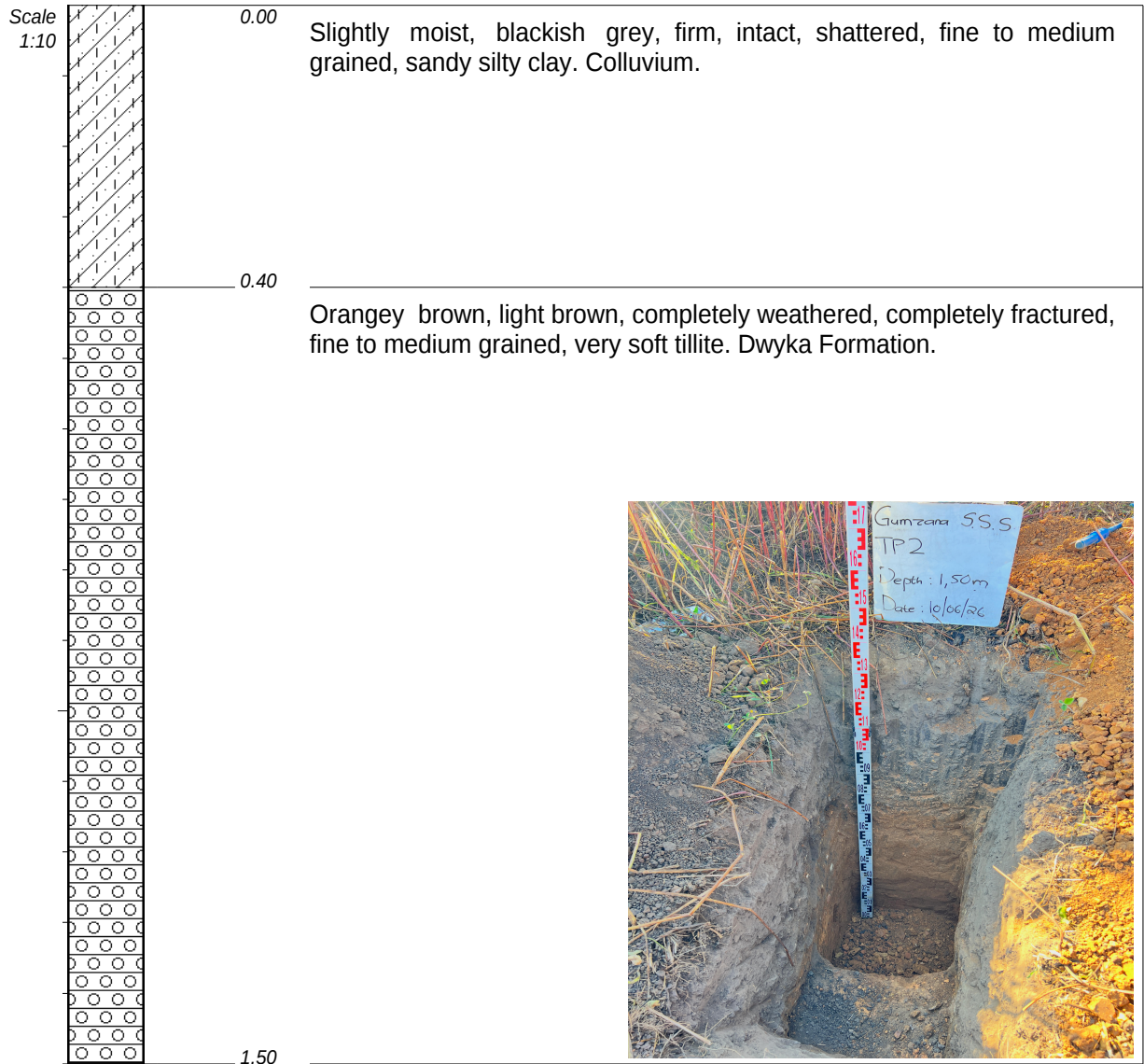
- 1) End of hole at 1.50m on weathered tillite.
- 2) No groundwater seepage.
- 3) No sidewall collapse.
- 4) MOD-CBR-ind sample at 0.60-1.50m.

CONTRACTOR :
MACHINE : Pick and Shovel
DRILLED BY :
PROFILED BY : A Mdlalose
TYPE SET BY : A Mdlalose
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 10/06/2026
DATE : 01/07/2026 11:10
TEXT : ..aSSS\Logs\GumzanaSSS.txt

ELEVATION :
X-COORD : 29.979886°
Y-COORD : -31.017230°

HOLE No: TP1



NOTES

- 1) End of hole at 1.50m on weathered tillite.
- 2) No groundwater seepage.
- 3) No sidewall collapse.

CONTRACTOR :
MACHINE : Pick and Shovel
DRILLED BY :
PROFILED BY : A Mdlalose
TYPE SET BY : A Mdlalose
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE : 10/06/2026
DATE : 01/07/2026 11:10
TEXT : ..aSSS\Logs\GumzanaSSS.txt

ELEVATION :
X-COORD : 29.980110°
Y-COORD : -31.017350°

HOLE No: TP2

JOB NUMBER: 26_056_Gumzana SSS

Name ●

	SANDY	{SA05}
	SILTY	{SA07}
	CLAY	{SA08}
	TILLITE	{SA10}
	DISTURBED SAMPLE	{SA38}

CONTRACTOR :
 MACHINE :
 DRILLED BY :
 PROFILED BY :

TYPE SET BY : A Mdlalose
 SETUP FILE : STANDARD.SET

INCLINATION :
 DIAM :
 DATE :
 DATE :

DATE : 01/07/2026 11:10
 TEXT : ..aSSS\Logs\GumzanaSSS.txt

ELEVATION :
 X-COORD :
 Y-COORD :

LEGEND
 SUMMARY OF SYMBOLS

APPENDIX B: PENETROMETER TEST RESULTS



APPROXIMATE INSITU CBR FROM DCP

Project Name Gumzana SSS

Date 2026/06/10

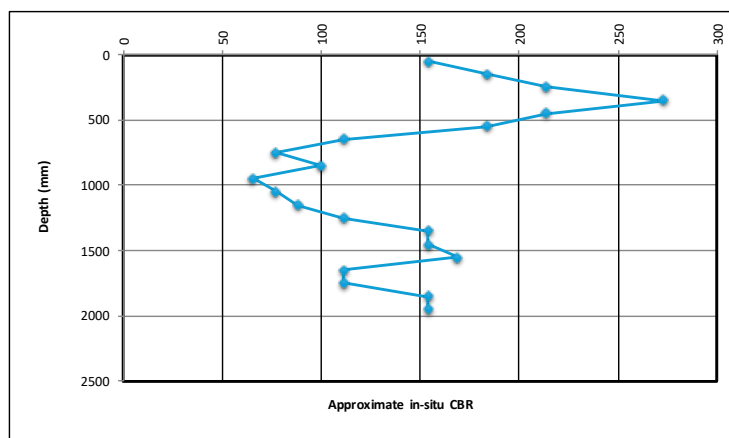
DCP No. 1

Hammer size 8kg with 20mm point

Applied Factor : 1 times Terzaghi's value

Applied Factor : 1 times Terzaghi's value

SPT = 1.2 DN



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
75 - 100	132-210	Very Dense
30 - 75	78-132	Dense
10 - 30	25-78	Med Dense
5 - 10	10 - 25	Loose
< 5	<10	Very Loose

NOTE :
Stated consistencies
do not apply to
cohesive materials.
Describe using "stiff
or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL

note: EASBP from Terzaghi & Peck p491 for 25mm settlement

Reading No.	Layer From	Layer To	Average Depth	DCP DN Blows/100mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	9	50	11	11	20	154
2	100	200	150	11	150	9	13	26	184
3	200	300	250	13	250	8	16	32	213
4	300	400	350	17	350	6	20	46	273
5	400	500	450	13	450	8	16	32	213
6	500	600	550	11	550	9	13	26	184
7	600	700	650	8	650	13	10	17	111
8	700	800	750	5	750	20	6	9	77
9	800	900	850	7	850	14	8	14	100
10	900	1000	950	4	950	25	5	7	66
11	1000	1100	1050	5	1050	20	6	9	77
12	1100	1200	1150	6	1150	17	7	12	88
13	1200	1300	1250	8	1250	13	10	17	111
14	1300	1400	1350	9	1350	11	11	20	154
15	1400	1500	1450	9	1450	11	11	20	154
16	1500	1600	1550	10	1550	10	12	23	169
17	1600	1700	1650	8	1650	13	10	110	111
18	1700	1800	1750	8	1750	13	10	17	111
19	1800	1900	1850	9	1850	11	11	20	154
20	1900	2000	1950	9	1950	11	11	20	154
21	2000	2100	2050	8	2050	13	10	17	111
22	2100	2200	2150	8	2150	13	10	17	111
23	2200	2300	2250	8	2250	13	10	111	111
24	2300	2400	2350	10	2350	10	12	23	169
25	2400	2500	2450	10	2450	10	12	113	169

APPROXIMATE INSITU CBR FROM DCP

Project Name Gumzana SSS

Date 2026/06/10

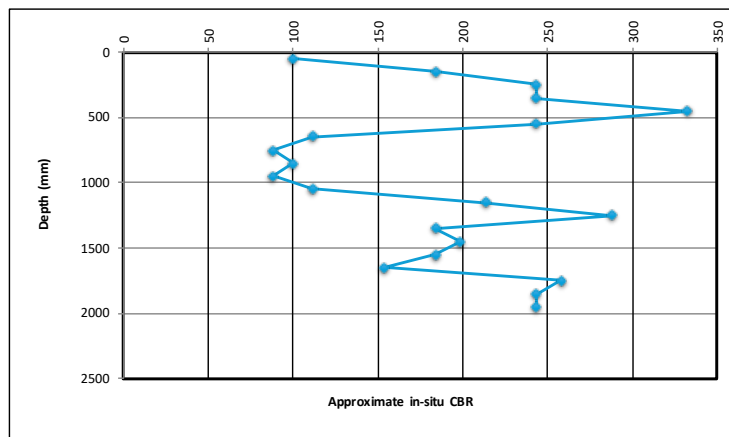
DCP No. 2

Hammer size 8kg with 20mm point

Applied Factor : 1 times Terzaghi's value

Applied Factor : 1 times Terzaghi's value

SPT = 1.2 DN



Penetration Guide		
SPT mm/blow	DCP DN	Consistency
75 - 100	132-210	Very Dense
30 - 75	78-132	Dense
10 - 30	25-78	Med Dense
5 - 10	10 - 25	Loose
< 5	<10	Very Loose

NOTE :
 Stated consistencies
 do not apply to
 cohesive materials.
 Describe using "stiff
 or firm or soft".

Depth of hole in which DCP was taken : 0 mm below NGL
note: EASBP from Terzaghi & Peck p491 for 25mm settlement

Reading No.	Layer From	Layer To	Average Layer Depth	DCP DN Blows/100mm	Level Below NGL mm	DCP penetration mm/blow	Equiv. SPT N Value	Approx In-situ CBR	Approx EASBP kPa
1	0	100	50	7	50	14	8	14	100
2	100	200	150	11	150	9	13	26	184
3	200	300	250	15	250	7	18	39	243
4	300	400	350	15	350	7	18	39	243
5	400	500	450	21	450	5	25	60	332
6	500	600	550	15	550	7	18	39	243
7	600	700	650	8	650	13	10	17	111
8	700	800	750	6	750	17	7	12	88
9	800	900	850	7	850	14	8	14	100
10	900	1000	950	6	950	17	7	12	88
11	1000	1100	1050	8	1050	13	10	17	111
12	1100	1200	1150	13	1150	8	16	32	213
13	1200	1300	1250	18	1250	6	22	49	288
14	1300	1400	1350	11	1350	9	13	26	184
15	1400	1500	1450	12	1450	8	14	29	199
16	1500	1600	1550	11	1550	9	13	26	184
17	1600	1700	1650	9	1650	11	11	110	154
18	1700	1800	1750	16	1750	6	19	42	258
19	1800	1900	1850	15	1850	7	18	39	243
20	1900	2000	1950	15	1950	7	18	39	243
21	2000	2100	2050	15	2050	7	18	39	243
22	2100	2200	2150	17	2150	6	20	46	273
23	2200	2300	2250	17	2250	6	20	111	273
24	2300	2400	2350	21	2350	5	25	60	332
25	2400	2500	2450	23	2450	4	28	113	362

APPENDIX C: LABORATORY TEST RESULTS

CLIENT : ILZ Consulting (Pty) Ltd
 PHYSICAL ADDRESS: Unit 4, 36 Alexander Road, Westmead, 3610
 ATTENTION : Mr A.I. Mdlalose
 PROJECT : Gumzana SSS

TEST REPORT REFERENCE NUMBER: 101231

Dear Sir/Madam,

Enclosed herewith, please find the original reports pertaining to the above-mentioned project.

Date Received	17.06.2026						
Date Tested	19.06.2026 to 27.06.2026						
Sample Location	Refer to report						
Sampling Method	Unknown						
Sample Condition	Good						
Sampling Environmental Condition	Unknown						
Sampler(s) Name	Client						
Total Number of Pages	6						
Test Carried Out							
SANS3001 GR1	☒	SANS3001 GR11		SANS3001 AS1		SANS3001 AS2	
SANS3001 GR10	☒	SANS3001 GR12	☒	SANS3001 AS10		SANS3001 AG11	
SANS3001 GR20		SANS3001 GR30	☒	SANS3001 AS20		SANS3001 AG1	
SANS3001 GR31		SANS3001 GR40	☒	SANS3001 AG2/3		SANS3001 AG4	
SANS3001 GR50		SANS3001 GR51		SANS3001 AG5		SANS3001 AG10	
SANS3001 GR52		SANS3001 GR53		SANS3001 AG14		SANS3001 AG13	
SANS3001 GR54		SANS3001 GR55		SANS3001 AG20		SANS3001 AG21	
SANS3001 GR57		SANS3001 GR58		SAN5833		SANS3001 AG23	
SANS3001 GR5		ASTM D422	☒	SABS 865:1994#		SANS5849	
SANS3001 GR60		SANS3001 GR61		SANS6243		SANS6245	
TMH6 ST6#		SANS5836		ASTM D5		ASTM D36	
SANS3001 C03-2		SANS5831		UCT Manual Part 3		TMH1 B9	
☒	- Tick denotes tests that were carried out.			#De-notes non-accredited test method			

We would like to take this opportunity of thanking you for your continued support.

Should you have any queries please do not hesitate to contact me.

Refer to Appendix A for Uncertainty of Measurement and notes on the Decision Rule

Yours faithfully

**Technical Signatory,
Darren Samuel for Geosure (Pty) Ltd.**

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Client	: ILZ Consulting (Pty) Ltd	Our Ref. : 101231
Project	: Gumzana SSS	Your Ref. : 26_056_Gumzana SSS
		Date Tested : 19.06.2026 to 24.06.2026
Attention	: Mr A.I. Mdhlalose	Date Reported : 29.06.2026

Sieve Analysis (Wet Preparation) - SANS3001 GR 1 - Percent Passing Sieve Size

Hydrometer Analysis - ASTM - D422 - Percent Passing Particle Diameter ($<0.425\text{mm}$)

Mechanical analysis - SANS3001 GR1 - Percent of Soil Mortar (<2 mm) for Grain Size range

Atterberg Limits - SANS3001 GR10, GR12 (<0.425mm)

Remarks:	Date Received: 17.06.2026
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Sampled by Client.	
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LABORATORY CONTACT INFO.:	Tel.: +27(0) 31 701 9732 Mobile: +27(0) 72 870 2621	Fax: 086 684 9785 e-mail: lab@geosure.co.za
HEAD OFFICE CONTACT INFO.:	Tel.: +27(0) 31 266 0458 Mobile: +27(0) 82 784 0544	Fax: 086 689 5506 e-mail: geosure@lafrica.com
WEBSITE:	www.geosure.co.za	

Client : ILZ Consulting (Pty) Ltd

Job No. : 101231

Project : Gumzana SSS

Your Ref.No. : 26_056_Gumzana SSS

Date Tested : 19.06.2026 to 24.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

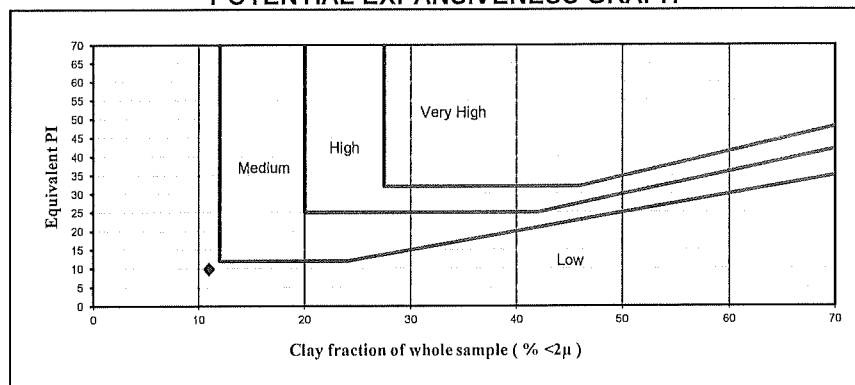
Sample Number : T61904

Field No. : TP1

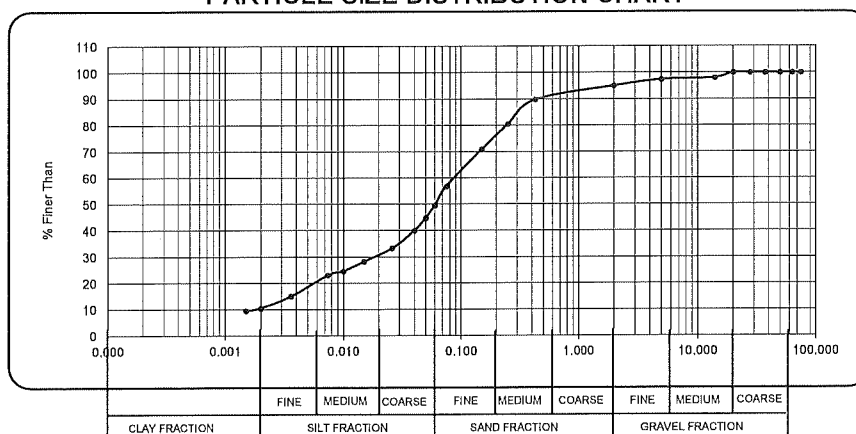
Sample Description : Light yellowish orange slightly gravelly clayey silty SAND. Weathered Tillite

Equivalent PI : 10 Clay fraction of whole sample (% <2 μ) : 11

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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LABORATORY: 122 Intersite Avenue, Umgeni Business Park, Durban, 4091 P.O. Box 1461, Westville 3630 Mobile: +27(0)72 870 2621 Tel.: +27 (0)31 701 9732	Reg. No. : 92/03145/07 Fax: 086 684 9785 email: lab@geosure.co.za	HEAD OFFICE: 122 Intersite Avenue, Umgeni Business Park, Durban, 4091, KwaZulu Natal, South Africa. Tel: +27 (0)31 266 0458 Fax: 086 689 5506 email: geosure@lafrica.com www.geosure.co.za
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Client : ILZ Consulting (Pty) Ltd
 Project : Gymzana SSS
 Attention : Mr A.I. Mdalose

Your Ref No. : 26_056_Gumza
 Our Ref No. : 101231
 Date Reported : 01/07/2026

Test Report - SANS 3001

Sample No.	T61904				
Field No.	TP1				
Position	-				
Depth (m)	0.60-1.50				
Method of Preparation	N/A				
Material Description	Light yellowish orange slightly gravelly clayey silty SAND. Weathered Tillite				

Sieve Analysis - Percent Passing Sieve Size						
Sieve Aperture (mm)	100.00					
	75.00					
	63.00					
	53.00					
	50.00					
	37.50					
	28.00					
	26.50					
	20.00					
	19.00	100				
	14.00	98				
	13.20	98				
	5.00	97				
	4.750	97				
	2.000	95				
	0.425	90				
	0.075	57				
Grading Modulus	0.58					
Mechanical analysis - Percent of Soil Mortar (<2 mm) for Grain Size range						
Coarse Sand	2.000 - 0.425	6				
Coarse-Fine Sand	0.425 - 0.250	10				
Medium-Fine Sand	0.250 - 0.150	10				
Fine-Fine Sand	0.150 - 0.075	15				
Silt and Clay	< 0.075	60				
Atterberg Limits SANS 3001 on <0.425 mm fraction						
Liquid Limit	% or symbol	30				
Plasticity Index	% or symbol	11				
Linear Shrinkage	%	6.0				
Maximum Dry Density and Optimum Moisture Content						
Maximum Dry Density (kg/m³)		1780				
Optimum moisture content (%)		19.4				
California Bearing Ratio						
CBR @100% Compaction	%	8.1				
CBR @ 98% Compaction	%	7.3				
CBR @ 97% Compaction	%	7.0				
CBR @ 95% Compaction	%	6.3				
CBR @ 93% Compaction	%	5.7				
CBR @ 90% Compaction	%	4.9				
Swell @100% Compaction	%	0.9				
COLTO Classification (1998)*		Cannot be Determined				
TRH 14 Classification (1985)*		G10				
AASHTO Classification (Group Index)**		A-6 (4)				
Unified Classification **		CL				

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Remarks: *Subject to further testing as required by TRH14.

† Subject to further testing as required by COLTO. COLTO above uses only: Atterberg Limits (<0.425 mm fraction; not arithmetic mean), Nominal Max Size, Grading Curve, Coarse Sand Ratio, Grading Modulus, Strength (CBR), and Swell.

* Check that Max Size <= 2/3 of compacted layer thickness.

** Opinions and interpretations expressed herein are outside the scope of SANAS accreditation
Version 5.05 - 14 February 2018



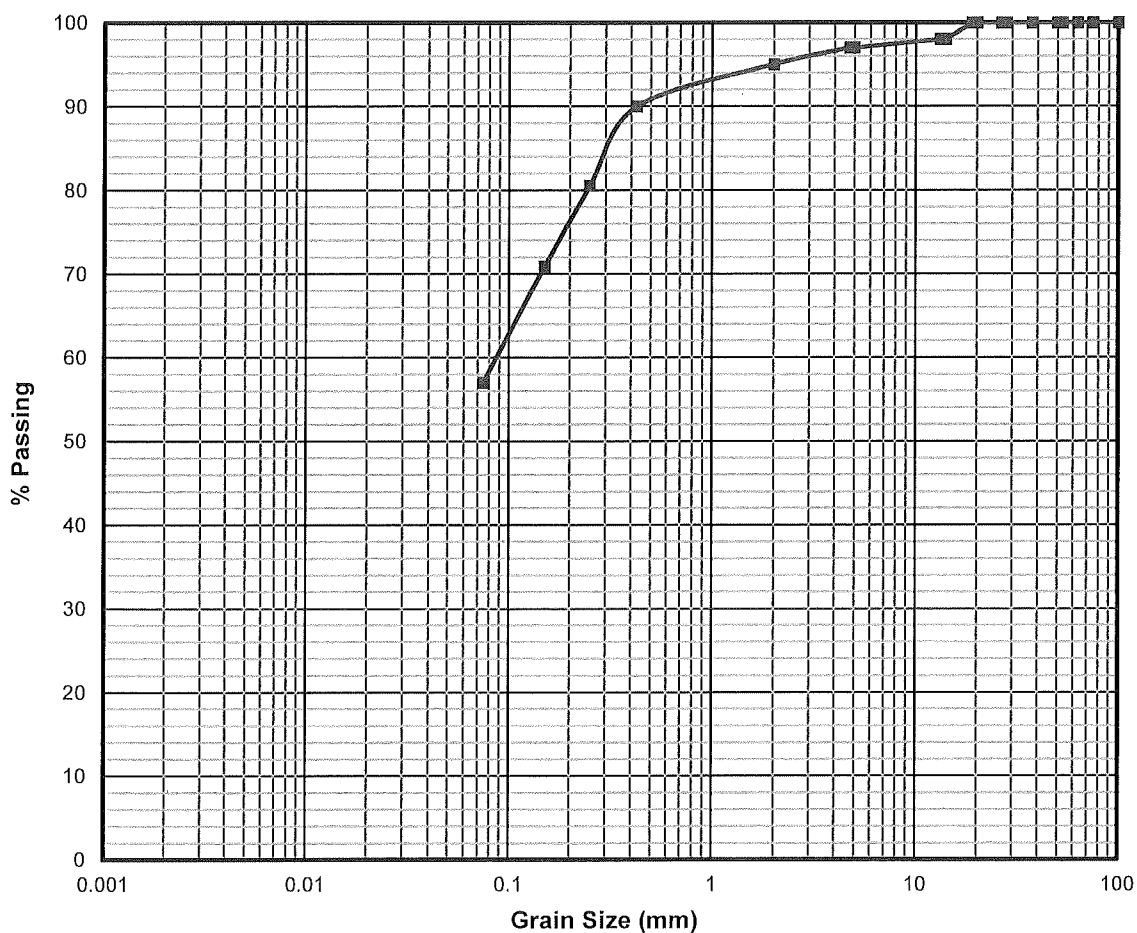
LABORATORY:
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Client : ILZ Consulting (Pty) Ltd
 Project : Gymzana SSS
 Attention : Mr A.I. Mdlalose

Your Ref No.: 26_056_Gumza
 Our Ref No. : 101231
 Date Reported : 01/07/2026

Grading Curve for Sample T61904 – SANS 3001



Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse
	Silt			Sand			Gravel		

Thick Red Line is the Grading Curve (COLTO Classification = Cannot be Determined) (TRH 14 Classification = G10)

Sieve Aperture Size	0.075	0.150	0.250	0.425	2.00	4.75	5.00	13.20	14.00	19.00	20.00	26.50	28.0	37.5	50.0	53.0	63	75	100
Percentage Passing	57%	71%	81%	90%	95%	97%	97%	98%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%



LABORATORY:	Reg. No. : 92/03145/07	HEAD OFFICE:
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P.O. Box 1461, Westville 3630		Durban, 4091, KwaZulu Natal, South Africa.
Mobile: +27(0)72 870 2621	Fax: 086 684 9785	Tel: +27 (0)31 266 0458 Fax: 086 689 5506
Tel.: +27 (0)31 701 9732	email: lab@geosure.co.za	email: geosure@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd	Your Ref No. : 26_056_Gymzana
Project : Gymzana SSS	Our Ref No. : 101231
Attention : Mr A.I. Mdalose	Date Reported : 23.06.2026

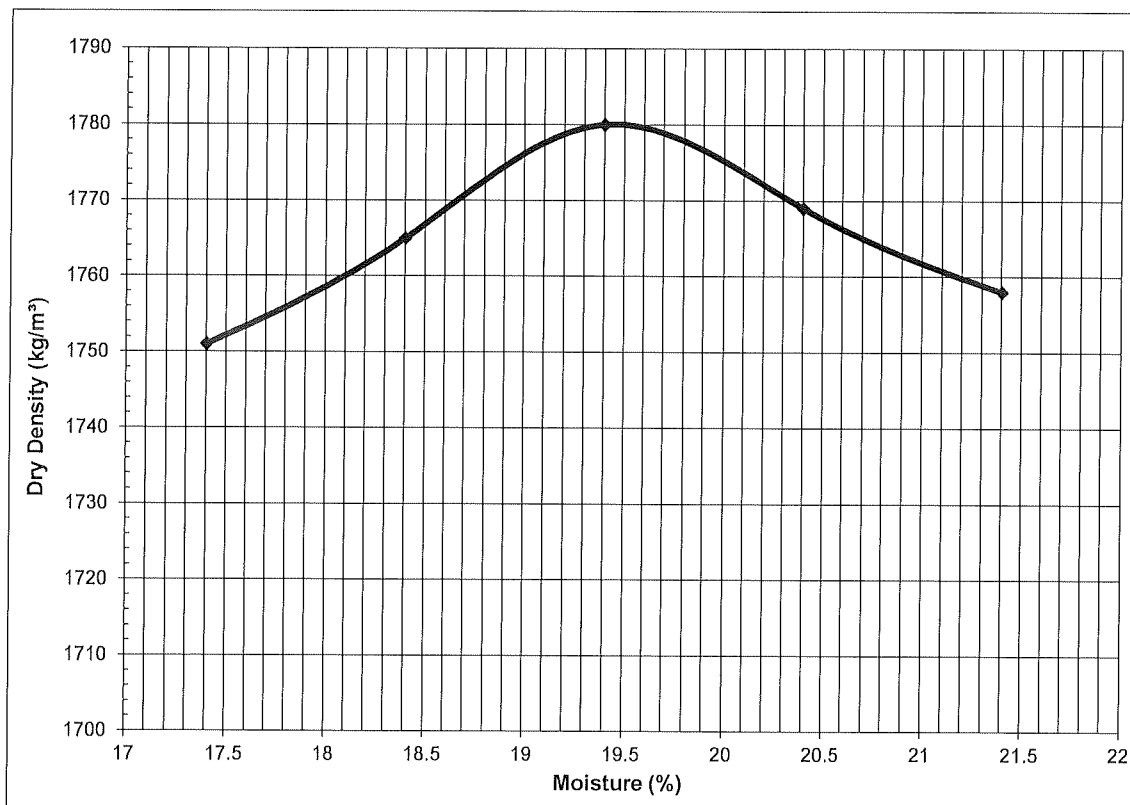
SANS 3001 Moisture/Density Relationship

Sample No. : T61904	Field No. : TP1
Method of preparation : N/A	Depth (m) : 0.60-1.50
Natural/Stabilised : Natural	Origin : -
Material Description : Lt.Yel.Or.Sl.Gravelly clayey silty SAND. Weathered Compaction Effort : Mod AASHTO	

Maximum Dry Density (kg/m ³)	1780	Optimum Moisture Content (%)	19.4
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Plotted Values:

Moisture (%)	17.4	18.4	19.4	20.4	21.4
Dry Density (kg/m ³)	1751	1765	1780	1769	1758



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APPENDIX A

UNCERTAINTY OF MEASUREMENT AND DECISION RULE

Notes on Uncertainty:

1. ABBREVIATIONS: UoM = Uncertainty of Measurement; E.UoM = Expanded Uncertainty of Measurement
2. UoM for gravels, sands, cohesive materials and asphalt was determined from a reproducibility study
2. UoM for aggregates and concrete was determined from a repeatability study

Notes on Decision Rule:

1. The decision rule employed by this laboratory is based on ILAC-G9:03/2009
2. Decision rules are only applicable to classification of gravels, sands and cohesive materials
3. Contact GEOSURE for further information related to the decision rule

MATERIAL TYPE		GRAVELS AND CRUSHED STONE (G1 - G5)	SANDS (G8-G9)	COHESIVE MATERIALS (G5 - G9)
PROPERTY		E.UoM (K=2)	E.UoM (K=2)	E.UoM (K=2)
% Passing Sieve Aperture	100.0 mm	0.00	0.00	0.00
	75.0 mm	0.00	0.00	2.56
	63.0 mm	0.00	0.00	1.48
	50.0 mm	0.00	0.00	1.56
	37.5 mm	0.36	0.00	1.32
	28.0 mm	2.08	0.00	0.98
	20.0 mm	0.78	0.00	0.98
	14.0 mm	0.38	0.00	1.82
	5.00 mm	1.94	0.44	1.10
	2.00 mm	2.44	0.56	0.90
	0.425 mm	1.42	1.40	1.42
	0.075 mm	0.38	0.72	0.98
Mechanical Analysis (%)	CS	1.32	1.08	0.98
	CFS	1.32	0.66	0.00
	MFS	0.00	1.56	0.00
	FFS	0.74	0.92	1.02
Grading Modulus		0.04	0.02	0.06
Atterberg Limits (%)	LL	0.00	0.00	1.60
	PI	0.00	0.00	0.64
	LS	0.00	0.00	0.22
CBR (%)	100% Comp.	18.36	8.24	2.70
	98% Comp.	9.24	7.50	1.10
	97% Comp	5.84	6.82	0.62
	95% Comp	1.32	3.04	0.40
	93% Comp.	1.94	2.44	0.66
	90% Comp.	3.54	1.50	0.66
	Swell @ 100%	0.04	0.00	0.92
MOD	MDD (kg/m ³)	5.74	3.42	7.76
	O.M.C (%)	0.08	0.12	0.50
Atterberg Limits (%) GR11	LL	0.55		
	PI	0.57		
	LS	0.13		
Nuclear Density				
Property		E.UoM (K=2)		
Wet Density (kg/m ³)		8.88		
Dry Density (kg/m ³)		11.36		
Moisture Content (%)		0.38		

AGGREGATE (SINGLE SIZED CRUSHED STONE)		
PROPERTY		E.UoM (K=2)
% Passing Sieve Aperture	100.0 mm	0.00
	75.0 mm	0.00
	63.0 mm	0.00
	50.0 mm	0.00
	37.5 mm	0.00
	28.0 mm	0.00
	20.0 mm	0.16
	14.0 mm	0.14
	10.0 mm	0.32
	7.1 mm	0.18
	5.0 mm	0.20
	2.0 mm	0.08
	1.0 mm	0.18
	0.600 mm	0.20
	0.425 mm	0.20
	0.300 mm	0.16
	0.150 mm	0.04
	0.075 mm	0.12
	Fineness Mod.	0.00
Flak. Index	%	0.22
ALD	mm	0.12
ALD Comp.	mm	0.10
Sand Equiv		0.54
ACV (AG10)	%	0.10
10% FACT(AG10)	kN	1.08
ACV (AG15)	%	0.00
10% FACT(AG15)	kN	1.00
BD (AG20)	kg/m ³	0.38
AD (AG20)	kg/m ³	0.44
WA (AG20)	%	0.00
BD (AG21)	kg/m ³	22.76
AG (AG21)	kg/m ³	27.04
WA (AG21)	%	0.00
ARD (AG22)	kg/m ³	1.92
RD (AG23)	kg/m ³	2.04
PD (AG23)	kg/m ³	0.00
Eth. Glyc. (AG14)	EGDI	0.8
Water Soluble Salts (5849)	%	0.05
Meth. Blue (6243)	%	0.04
PSV	Friction Value	0.1
EC (GR60)	s/m	0.002
pH	pH	0.199

ASPHALT		
PROPERTY		E.UoM (K=2)
% Passing Sieve Aperture	37.5 mm	0.00
	28.0 mm	0.00
	20.0 mm	0.00
	14.0 mm	0.13
	10.0 mm	0.46
	7.1 mm	1.53
	5.00 mm	1.31
	2.00 mm	1.08
	1.00 mm	0.76
	0.600 mm	0.53
	0.425 mm	0.51
	0.300 mm	0.48
	0.150 mm	0.36
	0.075 mm	0.41
Binder Cont.	%	0.15
Fineness Mod		0.04
BD	kg/m ³	4.22
Stability	kN	0.74
Flow	mm	0.09
MVD	kg/m ³	4.84

CONCRETE		
AGE		E.UoM (K=2)
7 Day Results		
Strength(MPa)		2.30
28 Day Results		
Strength(MPa)		1.26
Chloride Conductivity (ms/cm) C03-3		0.034
Porosity (%) C03-3		0.406
Oxygen Permeability (OPI)		0.068
Water Sorptivity UCT Manual Part 3 (0.5mm/hr)		0.218
Water Sorptivity - Porosity UCT Manual Part 3 (0.5mm/hr)		1.169
Alkali Reactivity (%)		0.002

