

Geotechnical Investigation Report for Qwidlana Primary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province



For



By

ILZ Consulting

Geotechnical Investigation Report for Qwidlana Primary School as Part of the Implementation of Sanitation Programme at Various Schools in the Eastern Cape Province

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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 **Qwidlana Primary 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

Qwidlana Primary School is located in Bumbana, a village approximately 38km northwest of KwaBhaca (Mount Frere), under the Alfred Nzo District Municipality in the Eastern Cape Province, South Africa. Access is via R405 and gravel roads from KwaBhaca (Mount Frere). (see **Figure 3-1**). The school has 4 classroom blocks, an admin block, and 2 existing toilets for learners and teachers.

The approximate central coordinates are -30.808579° Lat and 28.709859° Long. The coordinates are WGS84.

Topographically, the site is located on a relatively flat terrain with grass cover.



Figure 3-1: Locality Map relative to KwaBhaca.

4 FIELD WORK

Geotechnical site investigation was undertaken on the 11th 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 Tarkastad Subgroup (TRt) sandstones and mudstones as shown in **Figure 5-1** below.

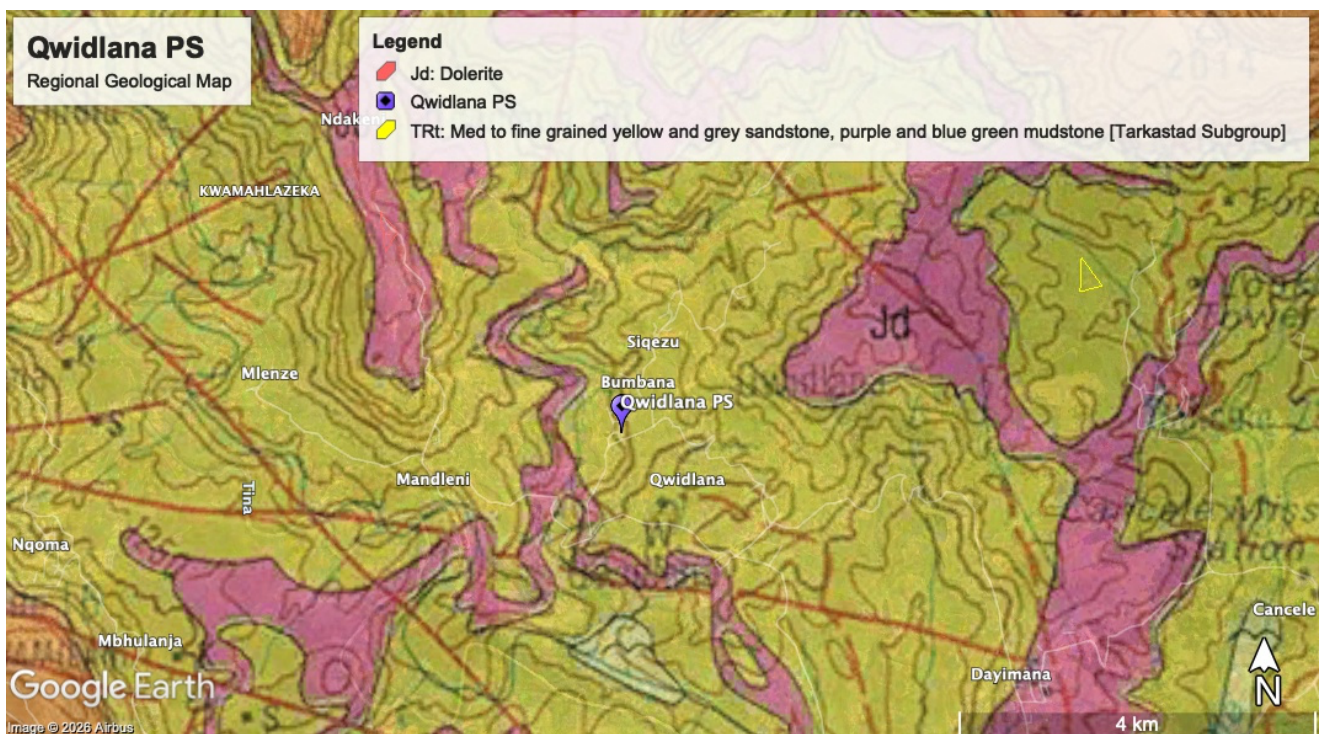


Figure 5-1: Regional geology of the site.

5.1 Local Geology

Field investigations show that the site is underlain by colluvial soils which overlie the residual sandstone and weathered sandstone 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 0.50m overlying the residual sandstone. It was described as slightly moist, grey, very loose, intact, fine to medium grained, silty sand with roots.

5.1.2 Residual Sandstone

These soils are derived from the complete weathering of the existing underlying bedrock. They were encountered underlying the colluvial soils in all pits at depths ranging from 0.20 to 1.50m below existing ground level. It was described as moist, pinkish red, medium dense, intact, fine to medium grained, slightly gravelly silty sand.

5.1.3 Weathered Sandstone (TRt)

The weathered bedrock was encountered in TP1 only occurring at 1.30m to 1.50m below existing ground level. It was described as pinkish dark red, completely weathered, completely fractured, fine grained to medium grained, very soft sandstone.

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

The laboratory test results are summarized in the table below and given in **Appendix C** of this report.

Table 6-1: Summary of laboratory test results

Pit No.	Depth (m)	Atterberg Limits %			GM	Modified AASHTO		CBR Values (%) Compaction				Classification and Activity
		LL	PI	LS		MDD (kgm ³)	OMC %	90	93	95	100	
TP2	0.2-1.50	37	13	7	0.55	1815	17.3	8.8	11	13	20	A-6(7), LOW, G9

LL - Liquid Limit

MDD – Maximum Dry Density

LS - Linear Shrinkage

OMC – Maximum Moisture Content

PI - Plasticity Index

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 mudstone	PI = 13 LS = 7 GM = 0.55 Classifying as A-6(7) to. It has low heave potential and classify as G9 according to TRH14	Poor subgrade quality Suitable for use as general subgrade.

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 below 0.60m ranges between 43kPa to 303kPa.

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 **C1**.

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	NEGLECTIBLE	-	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, residual sandstone and weathered sandstone. The residual soils comprised of silty sands with loose to medium dense consistencies. These may be classified as **C1** according to NHBRC. Based on the penetrometer tests, the structures should therefore be placed on the residual soils at depths greater than 0.6m using modified 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.
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 penetrometer tests.

Table 8-3: Excavation classification

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

9 CONCLUSION

This report contains the results of a geotechnical investigation carried out for the proposed new ablutions facilities at Qwidlana Primary 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 on site classify as G9 according to TRH14 and is suitable for use as general subgrade.

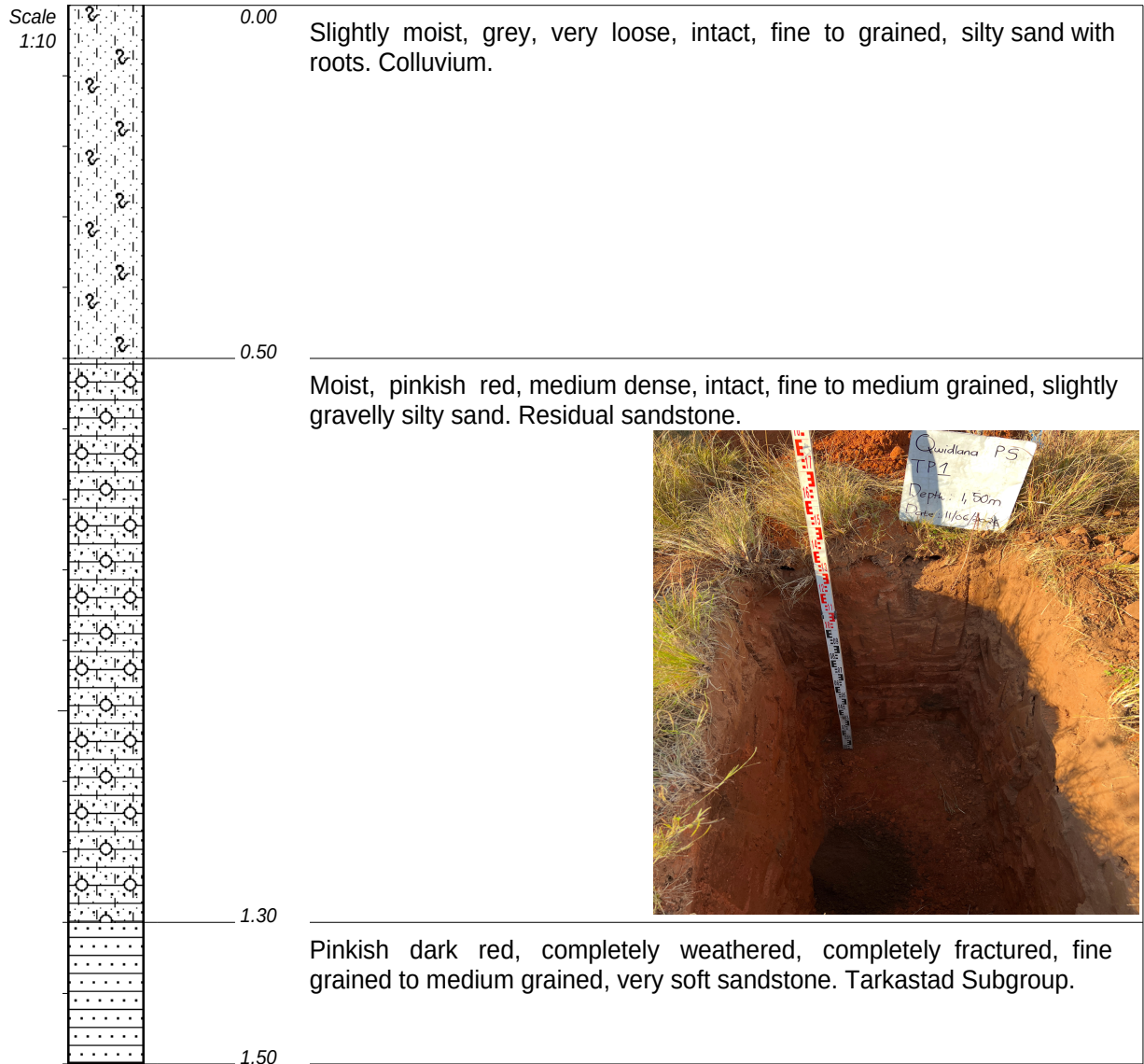
Finally, the ground conditions described in this report refer specifically to those encountered in the inspection pits and DCP test conducted on site.

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

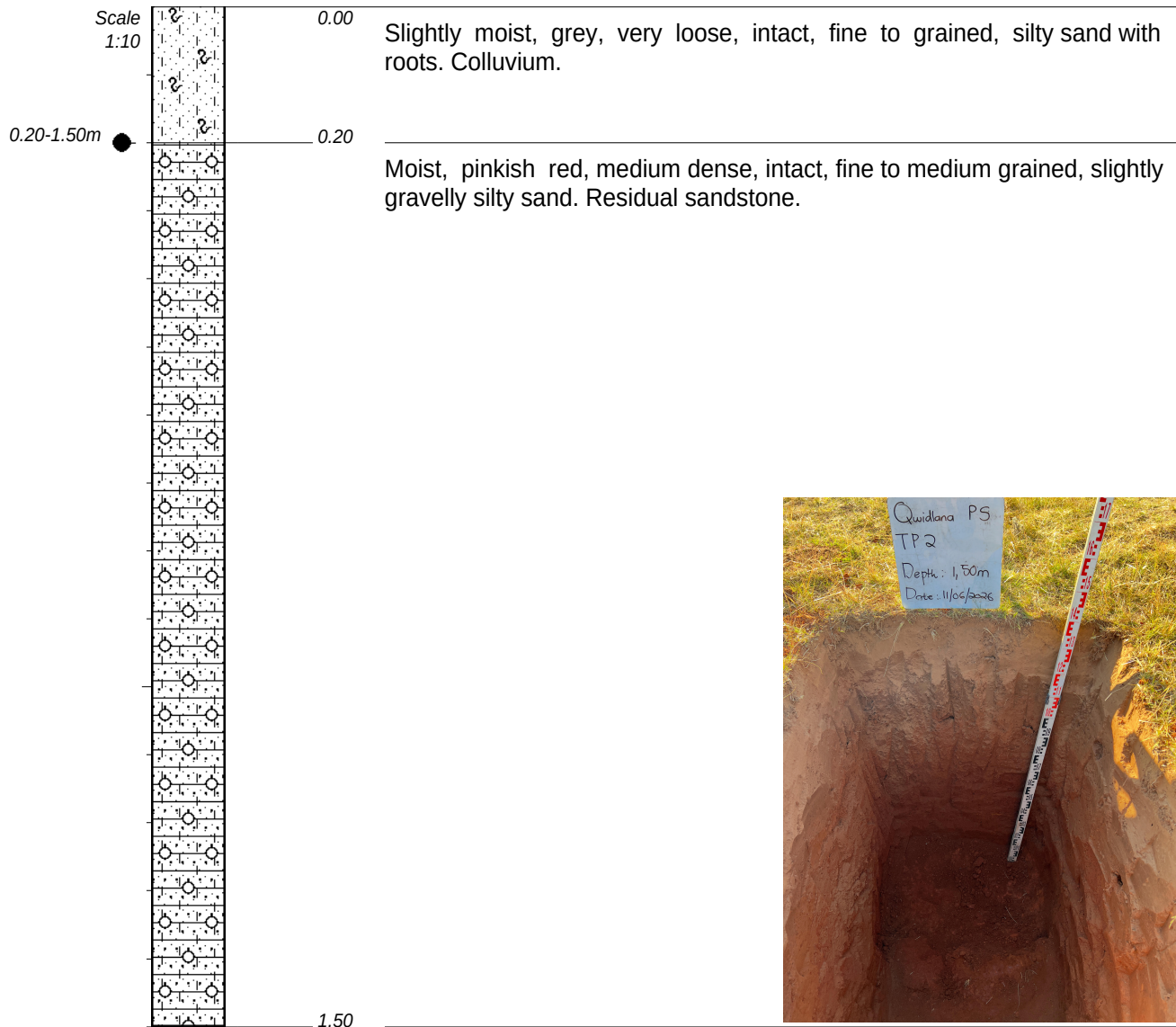
- 1) End of hole at 1.50m on weathered sandstone.
- 2) No groundwater seepage.
- 3) No sidewall collapse.

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

INCLINATION :
DIAM :
DATE :
DATE : 11/06/2026
DATE : 01/07/2026 11:17
TEXT : ..naPS\Logs\QwidlanaPS.txt

ELEVATION :
X-COORD : 28.709806°
Y-COORD : -30.809075°

HOLE No: TP1



NOTES

- 1) End of hole at 1.50m on residual sandstone.
- 2) No groundwater seepage.
- 3) No sidewall collapse.
- 4) MOD-CBR-ind sample at 0.20-1.50m.

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

INCLINATION :
DIAM :
DATE :
DATE : 11/06/2026
DATE : 01/07/2026 11:17
TEXT : ..naPS\Logs\QwidlanaPS.txt

ELEVATION :
X-COORD : 28.709278°
Y-COORD : -30.807946°

HOLE No: TP2

JOB NUMBER: 26_056_Qwidlana PS

Name ●

	GRAVELLY	{SA03}
	SAND	{SA04}
	SILTY	{SA07}
	SANDSTONE	{SA11}
	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}

CONTRACTOR :
 MACHINE :
 DRILLED BY :
 PROFILED BY :

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

INCLINATION :
 DIAM :
 DATE :
 DATE :

DATE : 01/07/2026 11:17
 TEXT : ..naPS\Logs\QwidlanaPS.txt

ELEVATION :
 X-COORD :
 Y-COORD :

LEGEND
 SUMMARY OF SYMBOLS

APPENDIX B: PENETROMETER TEST RESULTS



APPROXIMATE INSITU CBR FROM DCP

Project Name Qwidlana PS

Date 2026/06/11

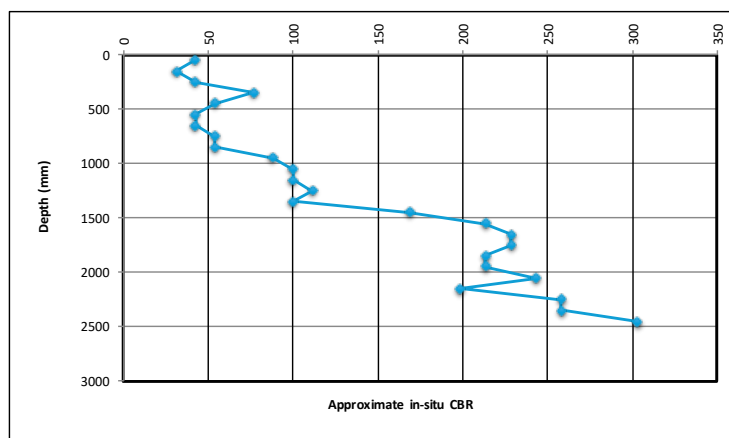
DCP No. 1

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 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	2	50	50	2	3	43
2	100	200	150	1	150	100	1	0	31
3	200	300	250	2	250	50	2	3	43
4	300	400	350	5	350	20	6	9	77
5	400	500	450	3	450	33	4	5	54
6	500	600	550	2	550	50	2	3	43
7	600	700	650	2	650	50	2	3	43
8	700	800	750	3	750	33	4	5	54
9	800	900	850	3	850	33	4	5	54
10	900	1000	950	6	950	17	7	12	88
11	1000	1100	1050	7	1050	14	8	14	100
12	1100	1200	1150	7	1150	14	8	14	100
13	1200	1300	1250	8	1250	13	10	17	111
14	1300	1400	1350	7	1350	14	8	14	100
15	1400	1500	1450	10	1450	10	12	23	169
16	1500	1600	1550	13	1550	8	16	32	213
17	1600	1700	1650	14	1650	7	17	110	228
18	1700	1800	1750	14	1750	7	17	35	228
19	1800	1900	1850	13	1850	8	16	32	213
20	1900	2000	1950	13	1950	8	16	32	213
21	2000	2100	2050	15	2050	7	18	39	243
22	2100	2200	2150	12	2150	8	14	29	199
23	2200	2300	2250	16	2250	6	19	111	258
24	2300	2400	2350	16	2350	6	19	42	258
25	2400	2500	2450	19	2450	5	23	53	303

APPROXIMATE INSITU CBR FROM DCP

Project Name Qwidlana PS

Date 2026/06/11

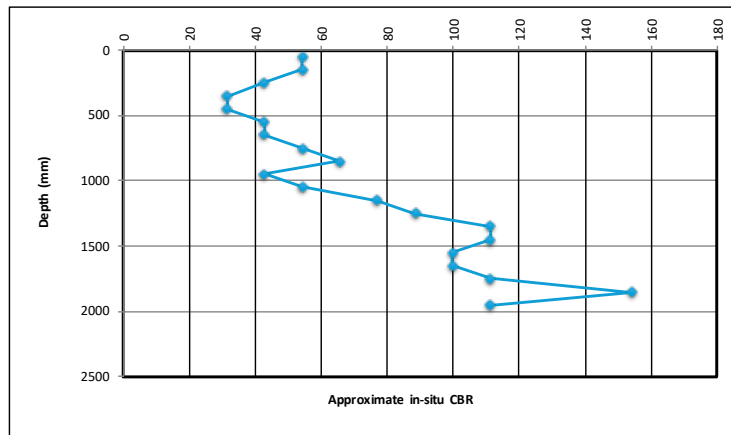
DCP No. 2

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	3	50	33	4	5	54
2	100	200	150	3	150	33	4	5	54
3	200	300	250	2	250	50	2	3	43
4	300	400	350	1	350	100	1	0	31
5	400	500	450	1	450	100	1	0	31
6	500	600	550	2	550	50	2	3	43
7	600	700	650	2	650	50	2	3	43
8	700	800	750	3	750	33	4	5	54
9	800	900	850	4	850	25	5	7	66
10	900	1000	950	2	950	50	2	3	43
11	1000	1100	1050	3	1050	33	4	5	54
12	1100	1200	1150	5	1150	20	6	9	77
13	1200	1300	1250	6	1250	17	7	12	88
14	1300	1400	1350	8	1350	13	10	17	111
15	1400	1500	1450	8	1450	13	10	17	111
16	1500	1600	1550	7	1550	14	8	14	100
17	1600	1700	1650	7	1650	14	8	110	100
18	1700	1800	1750	8	1750	13	10	17	111
19	1800	1900	1850	9	1850	11	11	20	154
20	1900	2000	1950	8	1950	13	10	17	111
21	2000	2100	2050	8	2050	13	10	17	111
22	2100	2200	2150	8	2150	13	10	17	111
23	2200	2300	2250	10	2250	10	12	111	169
24	2300	2400	2350	11	2350	9	13	26	184
25	2400	2500	2450	11	2450	9	13	113	184

APPENDIX C: LABORATORY TEST RESULTS

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

TEST REPORT REFERENCE NUMBER: 101224

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	
☒	#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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Head Office 122 Intersite Avenue, Umgeni Business Park, Durban 4091, South Africa PO Box 1461, Westville, 3630, South Africa Tel.: +27 (0)861 GEOSURE / 0861 436 7873 Fax: +27 (0)86 689 5506 Mobile: +27 (0)82 784 0544 E-mail: geosure@iafrica.com	Civil Engineering Laboratory 122 Intersite Avenue, Umgeni Business Park, Durban, 4091, South Africa PO Box 1461, Westville, 3630, South Africa Tel: 031 701 9732 Fax: +27 (0) 86 684 9785 Mobile: 072 870 2621 E-mail: lab@geosure.co.za	Gauteng Branch P. O. Box 32381, Kyalami 1684 Tel.: 0861 GEOSURE / 0861 436 7873 Fax: 086 689 8327 Mobile: 083 377 6559 Email: gauteng@geosure.co.za
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LABORATORY AND HEAD OFFICE ADDRESS:	Reg.No.: 92/03145/07 122 Intersite Avenue, Umgeni Business Park, Durban, 4091		
LABORATORY CONTACT INFO.:	Tel.: +27(0) 31 701 9732	Fax: 086 684 9785	
	Mobile: +27(0) 72 870 2821	e-mail: lab@geosure.co.za	
HEAD OFFICE CONTACT INFO.:	Tel.: +27(0) 31 266 0458	Fax: 086 689 5506	
	Mobile: +27(0) 82 784 0544	e-mail: geosure@lafrica.com	
WEBSITE:	www.geosure.co.za		

Client : ILZ Consulting (Pty) Ltd Our Ref. : 101224
 Project : Qwidlana PS Your Ref. : 26_056_Qwidlana PS
 Date Tested : 19.06.2026 to 23.06.2026
 Attention : Mr A.I. Mdlalose Date Reported : 29.06.2026

Sample No.	T61901				
Field No.	TP2				
Position in Field	-				
Depth (m)	0.20-1.50				
Material Description	Light reddish orange slightly gravelly clayey sandy SILT. Residual Sandstone				

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

% Passing	100.0	mm	100			
	75.0	mm	100			
	63.0	mm	100			
	50.0	mm	100			
	37.5	mm	100			
	28.0	mm	100			
	20.0	mm	100			
	14.0	mm	100			
	5.00	mm	100			
	2.00	mm	92			
	0.425	mm	90			
	0.250	mm	86			
	0.150	mm	76			
	0.075	mm	63			

Hydrometer Analysis - ASTM - D422 - Percent Passing Particle Diameter (<0.425mm)

% Passing	0.080	mm	55			
	0.050	mm	50			
	0.040	mm	45			
	0.028	mm	37			
	0.015	mm	28			
	0.010	mm	23			
	0.0074	mm	21			
	0.0036	mm	16			
	0.0020	mm	14			
	0.0015	mm	12			

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

Coarse Sand	%	3			
Coarse Fine Sand	%	4			
Medium Fine Sand	%	11			
Fine Fine Sand	%	14			
Silt & Clay	%	69			
Grading Modulus		0.55			

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

Liquid Limit	%	37			
Plasticity Index	%	13			
Linear Shrinkage	%	7.0			
AASHTO Classification (Group Index)*		A-6 (7)			
Unified Classification*		CL			
Moisture Content	%				

Remarks:	Date Received: 17.06.2026
	Sampled by Client.
	*Opinions expressed herein fall outside the scope of SANAS accreditation.

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Reg.No.: 92/03145/07	
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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. : 101224

Project : Qwidlana PS

Your Ref.No. : 26_056_Qwidlana PS

Date Tested : 19.06.2026 to 23.06.2026

Attention : Mr A.I. Mdlalose

Date Reported : 29.06.2026

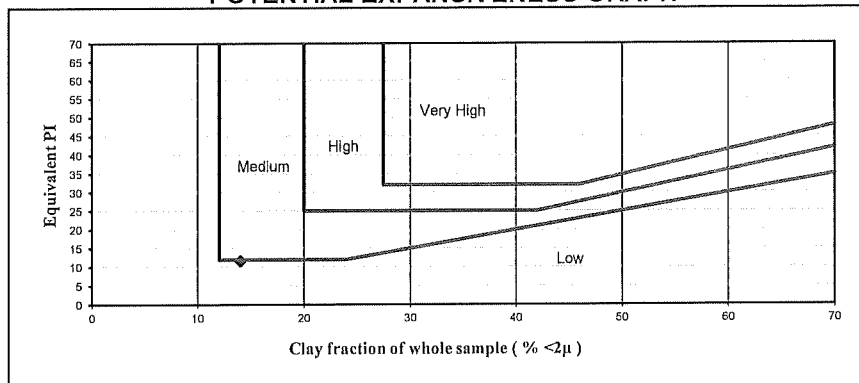
Sample Number : T61901

Field No. : TP2

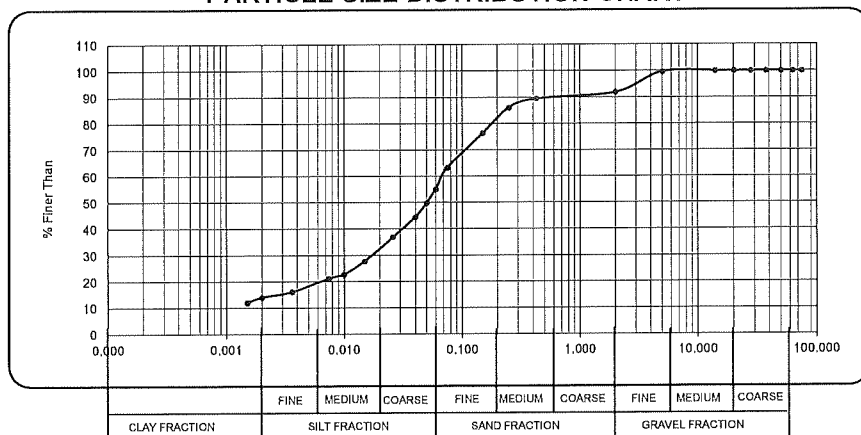
Sample Description : Light reddish orange slightly gravelly clayey sandy SILT. Residual Sandstone

Equivalent PI : 12 Clay fraction of whole sample (% <2 μ) : 14

POTENTIAL EXPANSIVENESS GRAPH



PARTICLE SIZE DISTRIBUTION CHART



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Client : ILZ Consulting (Pty) Ltd
 Project : Qwidlana PS
 Attention : Mr A.I. Mdalose

Your Ref No. : 26_056_Qwidla
 Our Ref No. : 101224
 Date Reported : 01/07/2026

Test Report - SANS 3001

Sample No.	T61901				
Field No.	TP2				
Position	-				
Depth (m)	0.20-1.50				
Method of Preparation	N/A				
Material Description	Light reddish orange slightly gravelly clayey sandy SILT. Residual Sandstone				

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					
	14.00					
	13.20					
	5.00					
	4.750	100				
	2.000	92				
	0.425	90				
	0.075	63				
Grading Modulus		0.55				
Mechanical analysis - Percent of Soil Mortar (<2 mm) for Grain Size range						
Coarse Sand	2.000 - 0.425	3				
Coarse-Fine Sand	0.425 - 0.250	4				
Medium-Fine Sand	0.250 - 0.150	11				
Fine-Fine Sand	0.150 - 0.075	14				
Silt and Clay	< 0.075	69				
Atterberg Limits SANS 3001 on <0.425 mm fraction						
Liquid Limit	% or symbol	37				
Plasticity Index	% or symbol	13				
Linear Shrinkage	%	7.0				
Maximum Dry Density and Optimum Moisture Content						
Maximum Dry Density (kg/m³)		1815				
Optimum moisture content (%)		17.3				
California Bearing Ratio						
CBR @100% Compaction	%	20				
CBR @ 98% Compaction	%	17				
CBR @ 97% Compaction	%	16				
CBR @ 95% Compaction	%	13				
CBR @ 93% Compaction	%	11				
CBR @ 90% Compaction	%	8.8				
Swell @100% Compaction	%	0.2				
COLTO Classification (1998)†		Cannot be Determined				
TRH 14 Classification (1985)†		G9				
AASHTO Classification (Group Index)††		A-6 (7)				
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 6.01 25 March 2024

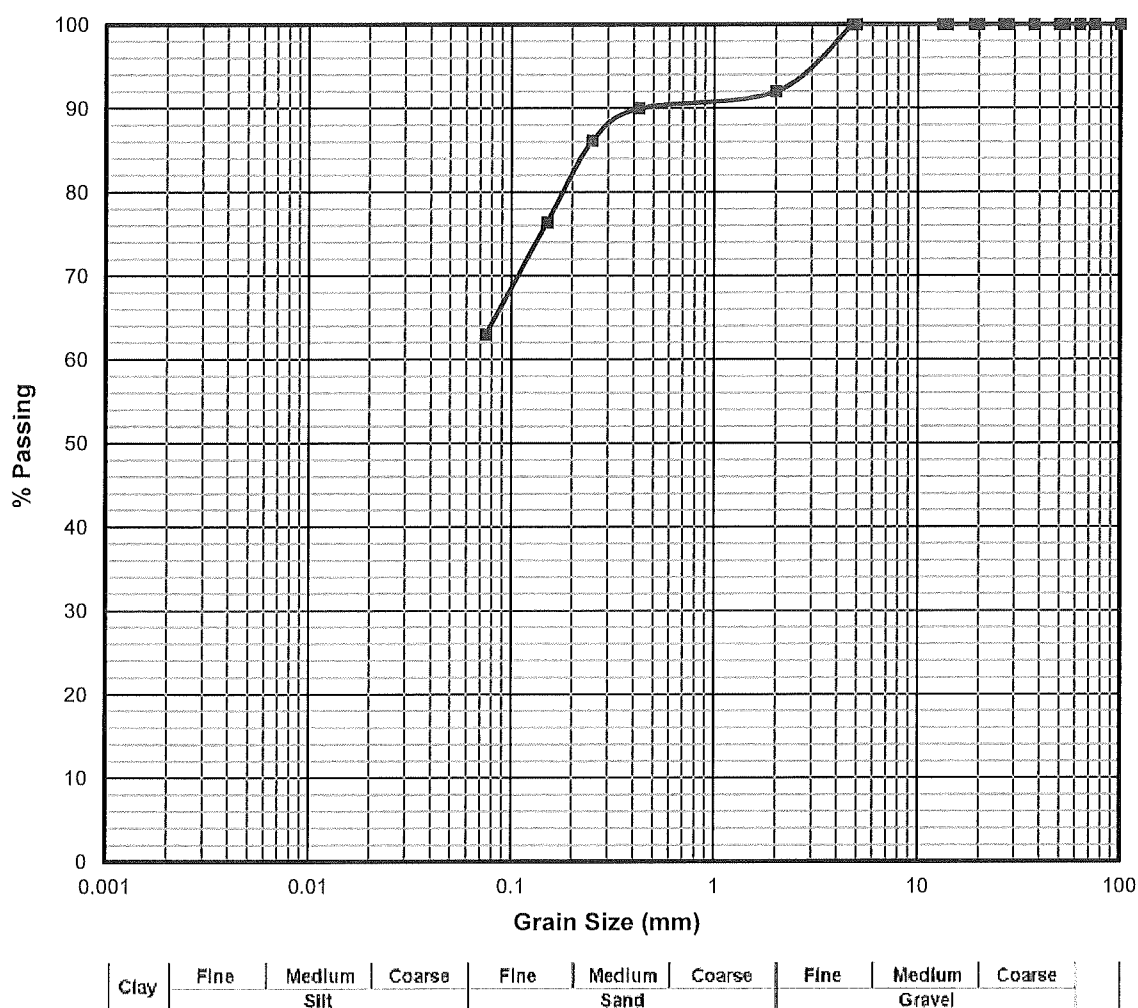
LABORATORY:
 122 Intersite Avenue, Umgeni Business Park, Durban, 4091
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Client : ILZ Consulting (Pty) Ltd
 Project : Qwidlana PS
 Attention : Mr A.I. Mdalose

Your Ref No.: 26_056_Qwidlana
 Our Ref No. : 101224
 Date Reported : 01/07/2026

Grading Curve for Sample T61901 – SANS 3001



Thick Red Line is the Grading Curve (COLTO Classification = Cannot be Determined) (TRH 14 Classification = G9)

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	63%	76%	86%	90%	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%


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email: geosure@iafrica.com www.geosure.co.za

Client : ILZ Consulting (Pty) Ltd

Project : Qwidlana PS

Attention : Mr A.I. Mdlaose

Your Ref No. : 26_056_Qwidlana

Our Ref No. : 101224

Date Reported : 23.06.2026

SANS 3001 Moisture/Density Relationship

Sample No. : T61901

Method of preparation : N/A

Natural/Stabilised : Natural

Material Description : Lt.Rd.Or.Sl.Gravelly clayey sandy SILT. Residual ϵ Compaction Effort : Mod AASHTO

Field No. : TP2

Depth (m) : 0.20-1.50

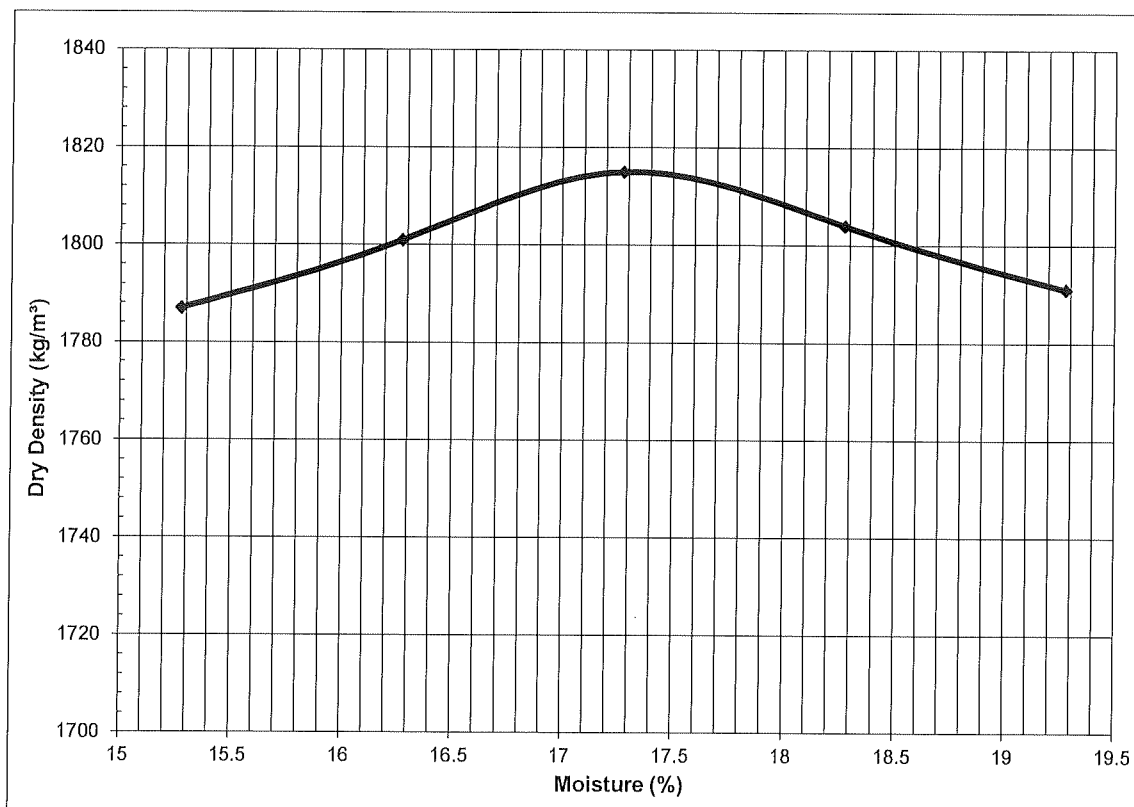
Origin : -

Maximum Dry Density (kg/m^3) 1815

Optimum Moisture Content (%) 17.3

Plotted Values:

Moisture (%)	15.3	16.3	17.3	18.3	19.3
Dry Density (kg/m^3)	1787	1801	1815	1804	1791



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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)	AGGREGATE (SINGLE SIZED CRUSHED STONE)		ASPHALT	
PROPERTY		E.UoM (K=2)	E.UoM (K=2)	E.UoM (K=2)	PROPERTY	E.UoM (K=2)	PROPERTY	E.UoM (K=2)
% Passing Sieve Aperture	100.0 mm	0.00	0.00	0.00	% Passing Sieve Aperture	100.0 mm	37.5 mm	0.00
	75.0 mm	0.00	0.00	2.56		75.0 mm	28.0 mm	0.00
	63.0 mm	0.00	0.00	1.48		63.0 mm	20.0 mm	0.00
	50.0 mm	0.00	0.00	1.56		50.0 mm	14.0 mm	0.13
	37.5 mm	0.36	0.00	1.32		37.5 mm	10.0 mm	0.46
	28.0 mm	2.08	0.00	0.98		28.0 mm	7.1 mm	1.53
	20.0 mm	0.78	0.00	0.98		20.0 mm	5.00 mm	1.31
	14.0 mm	0.38	0.00	1.82		14.0 mm	2.00 mm	1.08
	5.00 mm	1.94	0.44	1.10		10.0 mm	1.00 mm	0.76
	2.00 mm	2.44	0.56	0.90		7.1 mm	0.800 mm	0.53
Mechanical Analysis (%)	0.425 mm	1.42	1.40	1.42		5.0 mm	0.425 mm	0.51
	0.075 mm	0.38	0.72	0.98		2.0 mm	0.300 mm	0.48
	CS	1.32	1.08	0.98		1.0 mm	0.150 mm	0.36
	CFS	1.32	0.66	0.00		0.600 mm	0.075 mm	0.41
	MFS	0.00	1.56	0.00		0.425 mm	Binder Cont.	%
Grading Modulus	FFS	0.74	0.92	1.02	Flak. Index	0.300 mm	%	0.15
	S+C	1.36	0.36	0.00		0.150 mm	Fineness Mod	0.04
						0.075 mm	BD	kg/m³
Atterberg Limits (%)	LL	0.00	0.00	1.60		Fineness Mod.	Stability	kN
	PI	0.00	0.00	0.64			Flow	mm
	LS	0.00	0.00	0.22			MVD	kg/m³
CBR (%)	100% Comp.	18.36	8.24	2.70	ALD	mm		4.84
	98% Comp.	9.24	7.50	1.10	ALD Comp.	mm		
	97% Comp.	5.84	6.82	0.62	Sand Equiv			
	95% Comp.	1.32	3.04	0.40	ACV (AG10)	%		
	93% Comp.	1.94	2.44	0.66	10% FACT(AG10)	kN		
	90% Comp.	3.54	1.50	0.66	ACV (AG15)	%		
	Swell @ 100%	0.04	0.00	0.92	10% FACT(AG15)	kN		
	MDD (kg/m³)	5.74	3.42	7.76	BD (AG20)	kg/m³		
MOD	O.M.C (%)	0.08	0.12	0.50	AD (AG20)	kg/m³		
					WA (AG20)	%		
Atterberg Limits (%) GR11	LL	0.55			BD (AG21)	kg/m³		
	PI	0.57			AG (AG21)	kg/m³		
	LS	0.13			WA (AG21)	%		
Nuclear Density					ARD (AG22)	kg/m³		
Property		E.UoM (K=2)			RD (AG23)	kg/m³		
Wet Density (kg/m³)		8.88			PD (AG23)	kg/m³		
Dry Density (kg/m³)		11.36			Eth. Glyc. (AG14)	EGDI		
Moisture Content (%)		0.38			Water Soluble Salts (5849)	%		
					Meth. Blue (6243)	%		
					PSV	Friction Value		
					EC (GR60)	s/m		
					pH	pH		

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

