GEOTECHNICAL REPORT

GEOSCIENCE TESTING LABORATORY (PTY)LTD

REFERENCE: GTLE1086J

AN ENGINEERING GEOLOGICAL INVESTIGATION TO ESTABLISH THE GEOTECHNICAL CONDITIONS FOR PROJECT RM15876 PROPOSED NEW WATER TREATMENT WORKS FOR HESSEQUA LOCAL MUNICIPALITY IN HEIDELBERG IN THE WESTERN CAPE PROVINCE OF SOUTH AFRICA.

PREPARED FOR:

HESSEQUA MUNICIPALITY

Prepared by:
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REPORT REFERENCE	**:**	**GTL1086J**
DATE	**:**	**2024/06/25**

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1. INTRODUCTION & SCOPE OF WORKS

Geoscience Testing Laboratories (Pty) Ltd. was appointed to prepare the Geotechnical Report on behalf of Roadlab Laboratories (Pty) Ltd.

Roadlab Laboratories (Pty) Ltd was appointed to undertake a geotechnical investigation for Project RM15876 for the Proposed New Water Treatment Works at Hessequa Municipality in Heidelburg in the Western Cape. The investigation consisted of three (3) trial holes excavated to a depth of 2.0 meters. The trial holes will be profiled using “The Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa”.

From typical horizons, disturbed samples were extracted for two (2) Foundation Indicators Tests, eight (8) Road Indicator Tests and one (1) undisturbed sample were taken for Collapse Potential.

Three (3) Dynamic Cone Penetrometer readings were carried out from ground level to a depth of 2.0m.

INFORMATION FOR THE STUDY:

a) A Geological Map of the area published by the Council of Geosciences.
b) Profile logs and Photographic logs.
c) Roads Indicators, Foundation & California Bearing Ratio test results.
d) Dynamic Cone Penetrometer results.
e) Collapse Potential test results.

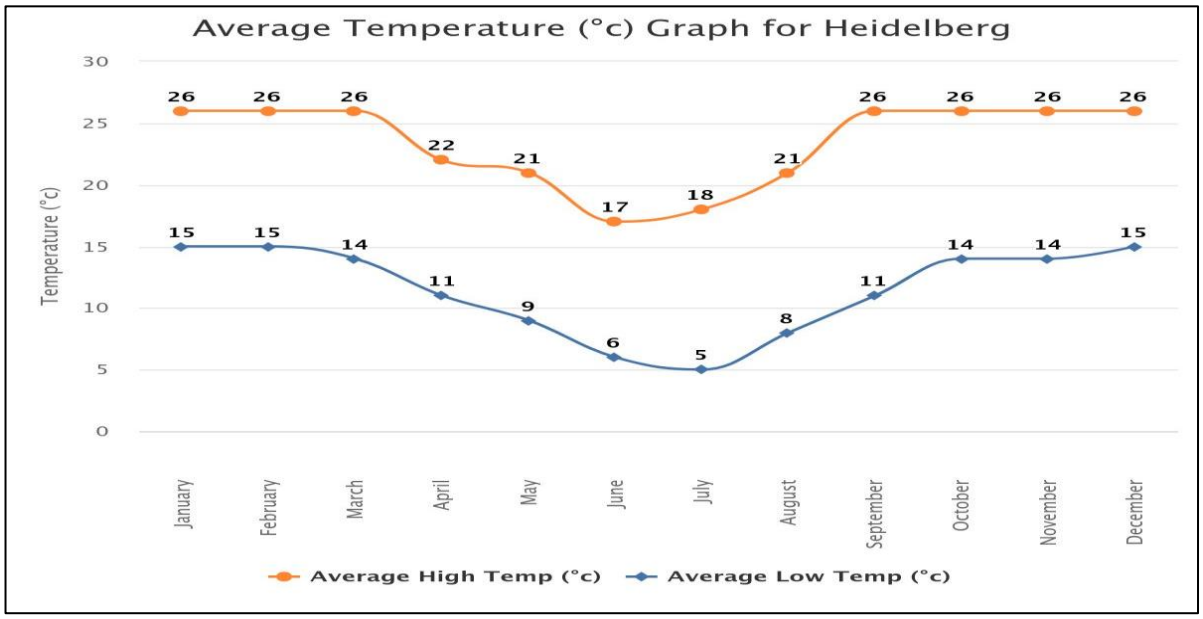
2. SITE DESCRIPTION

Nearest Town and access road:	This site is situated at the Hessequa Municipality in Muir Street, Heidelberg in the Western Cape Province.
WGS 84 Coordinates	
Latitude (S)	-34° 04' 54.0" South
Longitude (E)	20° 56' 58.0" East

Locality Map

3. WEATHER

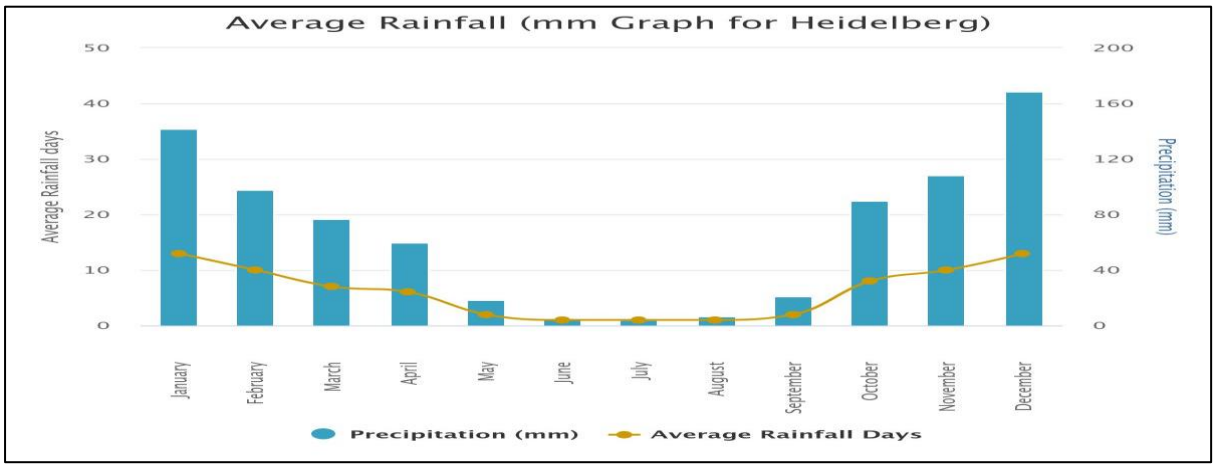
Temperature:



Average Monthly Temperature in the Heidelberg area

The weather averages for the month of June, temperature averages around 17°c and at night it feels like 6°c. In June, Heidelberg gets on average 5.54mm of rain and approximately 1 rainy day in the month. Humidity is close to 47%.

Rainfall:



Average Monthly Rainfall in the Heidelberg area

Heidelberg receives the highest rainfall (168.2mm) in December with the Average of 13 Rainfall days and the lowest (3,8mm) in July with the Average of 1 Rainfall days.

Weinert's Climatic Value

Weinert's climatic N number (Weinert, H 1980. The Natural Road Construction Materials of Southern Africa. Academia Cape Town) for the area is between 2 & 5, which indicates moderate region, and that the crystalline rocks would decompose or chemically weather.

The study area falls within the area with a Weinert value of between 2 & 5. Weinert N-value - is a climatic numerical value, which has become known as the N-value. It calculates by multiplying 12 times the computed evaporation of the warmest month, mostly January in Southern Africa, divided by the mean annual precipitation.

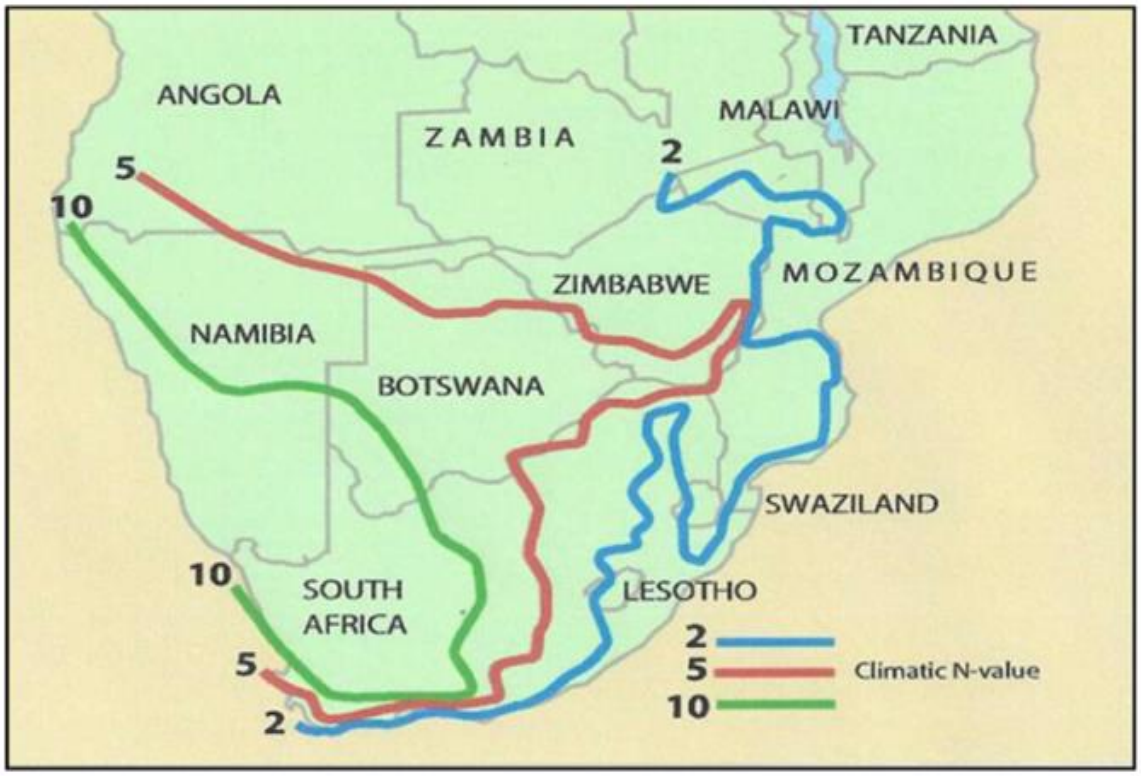
Four (4) N-values are significant:

- Where N is more than 10, no significant weathering profile develops, and only a thin layer of coarse gravel can generally be obtained from the disintegrating rock.

- Where N is between 10 and 5, disintegration or the physical breakdown of all rocks is the predominant form of weathering, and a deeper weathering profile is usually present.

- Where N is between 5 and 2, decomposition or chemical weathering or more specifically, the alteration of minerals, becomes the predominant form of weathering of crystalline rocks. The clay component is kaolinite when derived from an acid crystalline rock, and montmorillonite when derived from a basic crystalline rock, which is highly expansive.

- When N drops below two, decomposed basic crystalline rocks are still expansive. Decomposed acid crystalline rocks may become expansive as montmorillonite may have developed from the little biotite and amphibole present.



Weinert "N" Value Map
(Weinert, H 1980. The Natural Road Construction Materials of Southern Africa. Academia Cape Town)

4. SITE GEOLOGY AND GROUNDWATER CONDITIONS

The proposed site is located at **S 34° 4' 54 "E 20° 56' 58"**. The geology of study area is shown on the 1: 250 000 scale geological map Riversdale (3420) (Council for Geoscience).

The study area forms part of the Uitenhage Group – Kirkwood Formation.

Geology:

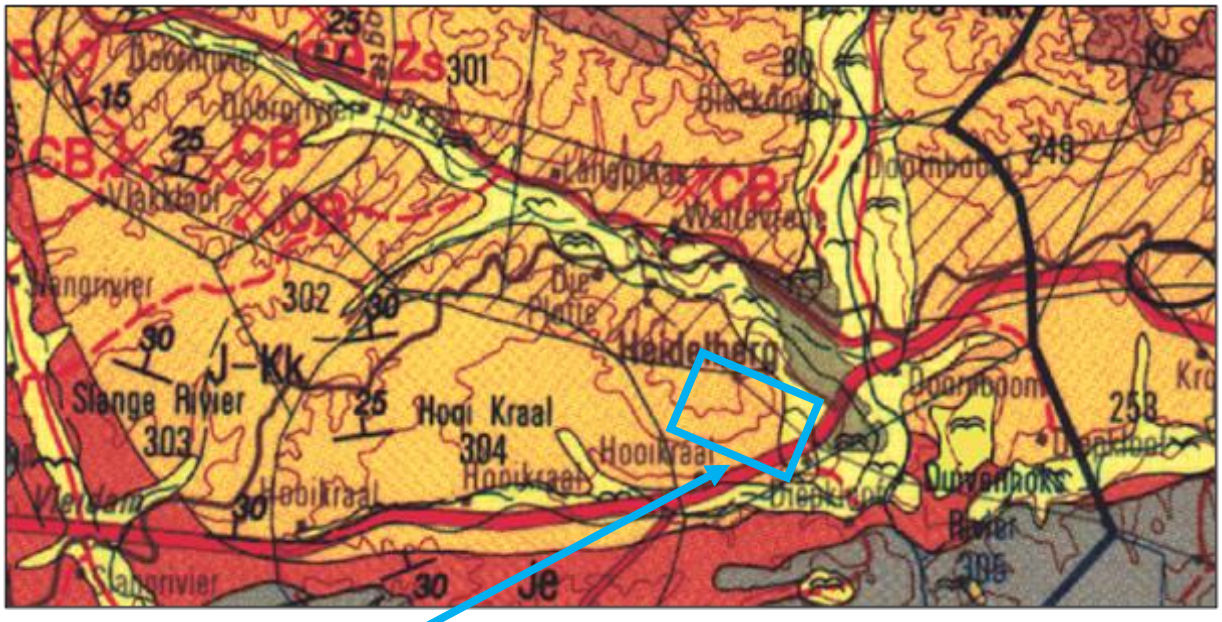
UITENHAGE GROUP - KIRKWOOD FORMATION

The Kirkwood is the second formation of the Uitenhage Group, positioned between the overlying Sundays River Formation and the underlying Enon Formation. Only three geological members have been described within it: the Swartkops Member which contains estuarine sandstone deposits and lacks fossils.

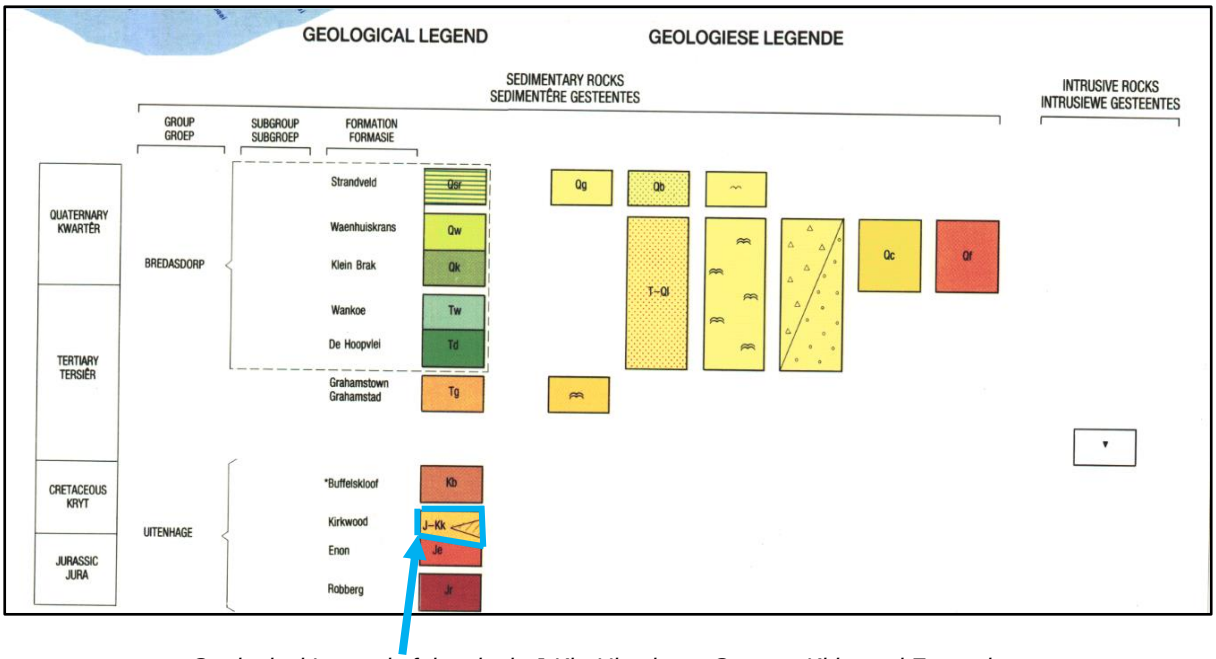
The Colchester Member is the most fossil-rich containing terrestrial and lacustrine fossils and is composed of dark grey shale, siltstones and sandstones. The third, the Bethelsdorp Member, resembles the Colchester in containing dark-grey shales and sandstone, and contains marine microfossils. The upper section of the member is overlain by mudstone and siltstone.

The Kirkwood Formation is composed of sedimentary rocks deposited under fluvial conditions at or near sea level, such as variegated mudstone (an iconic feature), medium-grained lithic sandstone (often being charcoal-rich), and sporadic conglobe-rates. At its base, the Kirkwood Formation includes a significant deposit of fine-to-medium grained, poorly sorted (often Quartzitic) estuarine sandstone with subordinate dark grey to brow shale layers. This deposit was described as the Swartkops Member. The lower portion of the remainder of the Formation is composed predominantly of siltstones but includes a smaller sandstone layer (described as part of the Bethelsdorp Member). The upper portion of the Formation is composed predominantly of fine, clay-rich mudstones, with multiple smaller layers of estuarine sandstone.

The Kirkwood is the second formation of the Uitenhage Group, positioned between the overlying Sundays River Formation and the underlying Enon Formation. Only three geological members have been described within it: the Swartkops Member which contains estuarine sandstone deposits and lacks fossils. The Colchester Member is the most fossil-rich containing terrestrial and lacustrine fossils and is composed of dark grey shale, siltstones and sandstones. The third, the Bethelsdorp Member, resembles the Colchester in containing dark-grey shales and sandstone, and contains marine microfossils. The upper section of the member is overlain by mudstone and siltstone.



Geological Map (3420) Riversdale Showing Study Site in the Geological Setting



Geological Legend of the site is J-Kk -Uitenhage Group – Kirkwood Formation

4.1 General

The area investigated is in Muir Street at proposed new Hessequa Municipality water treatment works within the Municipal District of Heidelberg.

4.2 Soil Profile

The material within the trial holes are as follows *(Appendix B for Profile Logs):*

POSITION	DEPTH (mm)	DESCRIPTION
TH 1	0-140mm(140)	Dark Brown, Slightly Moist, Firm, Sand. Intact,. In-Situ (Residual) (HCL-)
	140-520(380)	Light Brown, Slightly Moist, Firm, Clay. Intact. In-Situ (HCL+)
	520-1086(566)	Dark Brown, Firm, Clay. Intact. In-Situ (HCL+)

POSITION	DEPTH (mm)	DESCRIPTION
	1086-1400(314)	Light Brown/Reddish, Slightly Moist, Firm, Clay. Intact. In-Situ (Residual) (HCL+)
TH 2	0-180mm(180)	Slightly Moist, Sand.Intact. In-Situ (Residual) (HCL-)
	180-910(730)	Moist, Brown, Clayey / Silty / Calcareous sand. Intact. In-Situ (HCL+)
	910-1420(510)	Reddish Brown, Moist, Clay. Intact. In-Situ (HCL-)
	1420-2000(580)	Brown-Mottled-Reddish, Clay. Intact. In-Situ (Residual)(HCL-)
TH 3	0-250mm(250)	Moist, Topsoil.Intact. In-Situ (Residual)(HCL-)
	250-1260(1010)	Moist, Brown, Clayey / Silty / Calcareous sand Intact. In-Situ (HCL+)
	1260-2000(740)	Reddish Brown, Moist, Clay. Intact. In-Situ (HCL+)

The excavation depths were found as follows on the overleaf.

TRIAL HOLE POSITIONS	EXCAVATED DEPTH (mm)	GROUND WATER	REFUSAL DEPTH
TH 1	1400	No Ground water	Refusal @ 1400
TH 2	2000	No Ground water	No Refusal
TH 3	2000	No Ground water	No Refusal

4.3 Water Table

No Ground water seepage was encountered in any of the trial holes.

5. NATURE OF INVESTIGATION (APPENDIX A)

Field Investigation

The field investigation consisted of excavating three (3) trial holes, TH1 was excavated to 1400mm where refusal was encountered and TH2 & TH3 to 2000mm. These trial holes were profiled by a qualified Engineering Technician utilizing “The Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa” produced by Jennings, Brink, and Williams. From typical horizons, samples were extracted for Road Indicators, Foundation Indicators, California Bearing Tests and Collapse Potential tests.

The co-ordinates for the trial pit on the site was as follows:

Trail Hole Position	Latitude (S)	Longitude (E)
Trial Pit 1	34°04’54.0"S	20°56’58.0"E
Trial Pit 2	34°04’55.0"S	20°56’58.0"E
Trial Pit 3	34°04’55.0"S	20°56’58.0"E

The soil profiles are attached to the document in Appendix **A**.

Trial Hole Positions for the site

6. RESULT SUMMARY (APPENDIX B)

Laboratory Testing

Eight (8) disturbed soil samples were taken of typical horizons for Road Indicators and California Bearing Ratio and Two (2) disturbed samples for foundation Indicators.

The Road Indicator & California Bearing Ratio test results indicate that almost all the materials encountered in the trial holes have weathered to a clay and have a TRH14 materials classification of less than G10 (<G10) except for the silty clay & clayey sand encountered in TH1 & TH3 between the depths of 140mm to 520mm and 1260mm to 2000mm below ground level which have a TRH14 materials classification of G10.

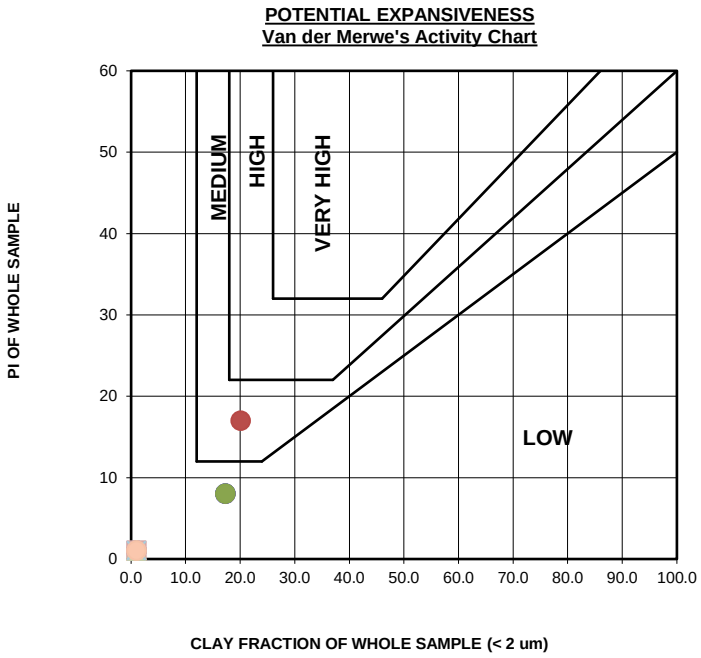
The summary for the Roads Indicator & CBR test data are found on the overleaf.

SAMPLE NUMBER	DEPTH (mm)	DESCRIPTION	GM	L L (%)	P I (%)	L S (%)	C.B.R. @ 100 %	C.B.R. @ 95 %	C.B.R. @ 93 %	C.B.R. @ 90 %	SWELL (%)	TRH14 CLASS
TH 1												
9909	140 - 520	dk G, dk Br, clay + silt	0.20	36	17	8.0	8	6	6	5	1.39	G10
9910	520 - 1086	dk, G, dk Br, clay	0.40	37	19	8.0	11	8	8	6	1.54	<G10
9911	1086 - 1400	dk, Br, mottled R, clay	0.30	33	16	7.5	11	8	6	5	1.69	<G10
TH 2												
9912	180 - 910	Br, Calcrete + clay	0.20	38	21	9.0	8	5	4	3	2.44	<G10
9913	910 - 1420	Br, R, clay	0.20	34	20	8.5	9	6	5	4	1.78	<G10
9914	1420 - 2000	Br, Mottled R, clay	0.20	45	25	11.5	6	4	3	2	2.52	<G10
TH 3												
9915	250 - 1260	dk, O, G clay	0.30	33	16	6.5	7	3	2	2	2.22	<G10
9916	1260 - 2000	dk, O, G clayey sand	1.30	32	16	6.5	9	7	6	6	1.38	G10

The Foundation Indicator tests results indicate that the materials tested have a low & medium potential expansiveness. The expansiveness classification is done in accordance with the Van der Merwe activity curves.

The summary for the Foundation Indicator test data is found below.

SAMPLE NUMBER	POSITION	DEPTH (mm)	DESCRIPTION	GM	L L (%)	P I (%)	L S (%)	PI WHOLKE SAMPLE	0.002mm (CLAY FRACTION)	POTENIAL EXPANSES
9927	TH 2	0 - 100	dk, Br, silty sand with Organic Roots + clayey moddled silty clayey sand.	0.66	23	9	3.6	17	45	LOW
9926	TH 3	0 - 100	dk, Br, silty sand,clayey Calcarious Gravel + clayey silty sand	0.25	33	18	7.9	20	79	MED



Potential Expansiveness Chart

Two (2) disturbed samples were tested to determine the risk associated with heave.

The expansiveness of the horizon tested was evaluated using Van der Merwe's method of classification.

The Plasticity Index of the whole sample was found to be on the overleaf.

SAMPLE NUMBER	CLAY 0.002 (mm) SIEVE	PLASTICITY INDEX (%)	POTENTIAL EXPANSIVENESS
9927	17.3	8	LOW
9926	20.1	17	MEDIUM

7. DCP RESULTS / BEARING CAPACITY (APPENDIX C)

Five (5) Dynamic Cone Penetrometer test was carried out next to the trial holes.

From the available DCP data, the following assessments can be made:

POSITION	Start Depth (mm) Below Ground Level	Depth (mm) of Dynamic Cone Penetrometer Refusal	Estimated Safe Bearing Pressure @ 500mm (kPa)	Estimated Safe Bearing Pressure @ Refusal (kPa)
Trail Hole 1	50	623	>200	>200
Trail Hole 2	40	640	200	>200
Trail Hole 3	2	496	>200	>200

As an indication, the following parameters can be assumed for cohesive materials (See Table 3.3.4 Guide to Practical Geotechnical Engineering in Southern Africa).

CONSISTENCY	UCS (kPa)
Very Loose / Very Soft	<40
Loose / Soft	40 to 80
Medium Dense / Firm	80 to 160
Dense / Stiff	160 to 320
Very Dense / Very Stiff	320 to 1000

The consistency of the materials therefore falls within the very stiff category.

Note that the DCP penetration rate will change with any changes to the moisture content or density of the material tested.

8. COLLAPSE POTENTIAL (APPENDIX E)

Three (3) Collapse test was carried out on undisturbed samples taken of the founding material.

The Collapse Potential tests data are follows:

- Sample number 9910, TH1 – was tested at depths of between 521mm to 1086mm dark Grey and dark Brown clay and gave a 0.07% collapse after saturation @ 200kPa

- Sample number 9912, TH2 – was tested at depths of between 910mm to 1420mm and the Brown, Red clay gave a 0.28% collapse after saturation @ 200kPa

- Sample number 9915, TH3 – was tested at depths of between 250mm to 1260mm and the, dk, Olive, Grey clay gave a 0.26% collapse after saturation @ 200Kpa.

A summary of the Consolidation test results can be found in the table below.

SAMPLE NUMBER	POSITION	DEPTH (mm)	DESCRIPTION	% COLLAPSE AFTER SATURATION @ 200 kPa
9910	TH 1	521 - 1086	dk, G, dk Br, clay	0.07
9912	TH 2	910 - 1420	Br, R, clay	0.28
9915	TH 3	250 - 1260	dk, O, G clay	0.26

9. GEOTECHNICAL EVALUATION

9.1 Engineering and Materials Characteristics

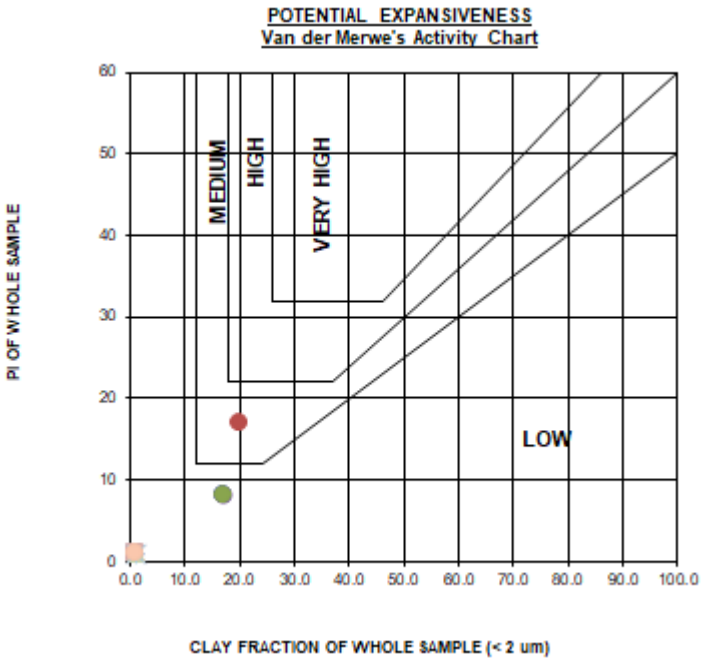
9.1.1 Ground Water

No Ground water seepage was recorded in all trail holes.

9.1.2 Expansive Soil

The Foundation Indicator tests results indicate that all the materials tested have a low / medium potential expansiveness. The expansiveness classification was done in accordance with the Van der Merwe activity curves.

The expansiveness classification was done in accordance with the Van der Merwe activity curves. The Plasticity Index of the whole sample 8% & 17% respectively and with the clay fraction (0.002mm sieve) 17.3mm and 20.1mm.



Potential Expansiveness Van der Merve's Activity Chart

9.1.3 Bearing Capacity (Annexure C)

Dynamic Cone Penetrometer (DCP) tests were performed at all the trial hole positions. The estimated safe bearing pressure as determined with the DCP at a depth of 500mm below ground level ranged between 200kPa & >200kPa, at DCP refusal depth of the estimate safe bearing pressure exceed 200kPa (>200kPa).

9.1.4 Sinkholes/Dolomite Areas

The materials occurring on this site should not be susceptible to solution and the likelihood of sinkholes forming is remote.

9.1.5 Undermined Ground

No indication of the presence of undermined ground was found during the desk study.

9.1.6 Differential Settlement

Due to the material profiled not being homogeneous, differential settlement could pose problems on the project.

9.2 Slope Stability and Erosion

No indication of the presence of unstable natural slopes was found during the field investigation.

The USCS (Unified Soils Classification System) of the material tested is CL-ML, CL & ML. In accordance with the GFSH-2 document guidelines material that conforms to a “SP, SM, CL or CH” USCS classification have a risk of being erodible if the slope over the erven is more than 1:7, 5.

SAMPLE NUMBER	POSITION	DEPTH (mm)	DESCRIPTION	GM	L L (%)	P I (%)	L S (%)	% PASSING 5.0mm SIEVE	% PASSING 0.075mm SIEVE	UNIFIED SOIL CLASSIFICATION
9927	TH 2	0 - 100	dk, Br, silty sand with Organic Roots + clayey moddled silty clayey sand.	0.66	23	9	3.6	99	45	SC
9926	TH 3	0 - 100	dk, Br, silty sand,clayey Calcarious Gravel + clayey silty sand	0.25	33	18	7.9	99	79	CL

Therefore, some of the materials tested might be dispersive. It would be advisable to take the necessary precautions to prevent erosion within the study area.

9.3 Excavation Classification with Respect to Services

No Refusal was encountered in any of TH2 & TH3 which was excavated to depths of 2000mm, however in TH1 refusal was encountered at 1400mm on bedrock. The consistency of the materials falls within the firm, stiff & very stiff categories, there should not be any difficulty with excavations up to the depth

of the trial holes, however, should the excavation depth exceed 1400mm in TH1 there is a strong possibility that rock will be encountered that will require either the use of rock breaking equipment or blasting.

All the trial holes stood vertically for the duration that they were open. However, it must be noted that this is based on an assessment of the trial hole of limited length and probably does not give an accurate assessment of the stability of larger excavations. The trial hole profiles are attached to the document in the appendixes.

10. FOUNDATION ASSESSMENT DATA

The Foundation Indicator tests results indicate that all the materials tested have a low & medium potential expansiveness. The expansiveness classification was done in accordance with the Van der Merwe activity curves.

The expansiveness classification was done in accordance with the Van der Merwe activity curves. The Plasticity Index of the whole sample 8% & 17% respectively and with the clay fraction (0.002mm sieve) 17.3mm and 20.1mm.

Dynamic Cone Penetrometer (DCP) tests were performed at all the trial hole positions. The estimated safe bearing pressure as determined with the DCP at a depth of 500mm below ground level ranged between 200kPa & >200kPa, at DCP refusal depth of the estimate safe bearing pressure exceed 200kPa (>200kPa).

11. DRAINAGE

It would be recommended that storm water be addressed throughout the area to be developed including the internal road network during the construction phase.

12. DEVELOPMENT POTENTIAL & POSSIBLE MITIGATION MEASURES

From the available field data and laboratory test results, the following assessment can be made:

12.1 Roads & Parking areas

The Road Indicator & California Bearing Ratio test results indicate that almost all the materials encountered in the trial holes have weathered to a clay and have a TRH14 materials classification of less than G10 (<G10) except for the silty clay & clayey sand encountered in TH1 & TH3 between the depths of 140mm to 520mm and 1260mm to 2000mm below ground level which have a TRH14 materials classification of G10.

Therefore, apart from the silty clay & clayey sand encountered in TH1 & TH3 between the depths of 140mm to 520mm and 1260mm to 2000mm below ground level which have a TRH14 materials classification of G10 and is suitable for use as fill up to top of formation, none of the remainder of the materials are suitable for any phase of construction. We will also recommend undercutting and spoiling these poor-quality materials wherever they fall within the pavement structure up to a depth of 500mm below top of fill and replacing with a suitable material.

Materials for the remainder of the pavement layers and shortfall of will have to be imported from commercial or alternative sources.

12.2 Pipelines

None of the material encountered in the excavations met the criteria for bedding due to either the grading or the Plasticity Index (Selected Granular Material) as per the requirements of SABS 1200 LB paragraph 3.1 which requires the material to be granular, non-cohesive in nature that is singularly graded between 0.6mm and 19.0mm and is free draining. Therefore, material for bedding will have to be imported from suitable commercial or alternative sources.

The materials are also not suitable as selected fill material (Fill Blanket) due to the excessive Plasticity Index. SABS 1200 LB paragraph 3.2 require a material with a Plasticity Index not exceeding 6

There could be a problem with the compacion of these materials due to there fine grained nature and high Plasticity Index. The Grading Modulus of these materials range between 0.2 and 0.4.

12.3 Foundation Recommendations and Solutions

The Foundation Indicator tests results indicate that all the materials tested have a low & medium potential expansiveness. The expansiveness classification was done in accordance with the Van der Merwe activity curves.

The expansiveness classification was done in accordance with the Van der Merwe activity curves. The Plasticity Index of the whole sample 8% & 17% respectively and with the clay fraction (0.002mm sieve) 17.3mm and 20.1mm.

Dynamic Cone Penetrometer (DCP) tests were performed at all the trial hole positions. The estimated safe bearing pressure as determined with the DCP at a depth of 500mm below ground level ranged between 200kPa & >200kPa, at DCP refusal depth of the estimate safe bearing pressure exceed 200kPa (>200kPa).

Three (3) Collapse Potential tests were carried out on undisturbed samples taken of the founding material. Sample number 9910, TH1 – was tested at depths of between 521mm to 1086mm dark Grey and dark Brown clay and gave a 0.07% collapse after saturation @ 200kPa. Sample number 9912, TH2 – was tested at depths of between 910mm to 1420mm and the Brown, Red clay gave a 0.28% collapse after saturation @ 200kPa. Sample number 9915, TH3 – was tested at depths of between 250mm to 1260mm and the, dk, Olive, Grey clay gave a 0.26% collapse after saturation @ 200kPa. A Collapse Potential of 0.07%, 0.28% & 0.26% equates to a settlement of 0.7mm, 2.8mm & 2.6mm per meter profile.

The California Bearing Ratio test gave maximum swells of 1.39%, 1.54%, 1.69%, 2.44% 1.78%, 2.52%, 2.22% & 1.38% respectively this would roughly equate to a heave of 13.9mm, 15.4mm, 16.9mm, 24.4mm, 17.8mm, 25.2mm 22.2mm &13.8mm per meter profile.

With the available laboratory and field data and as per SANS 10400-H: The Application of The National Building Regulations – Part H: Foundation, Table1 - Site class designation of single-storey and double-storey structures type 1 masonry buildings, a designation of a H2 site class will be applicable.

Movements of between 15mm & 30mm can be expected.

The following foundation design & building procedures will apply for a H2 site classification:

- Stiffened or cellular raft of articulated lightly reinforced masonry. Site drainage and plumbing/service precautions.

- Piled foundations with suspended floor slabs with or without ground beams. Site drainage and plumbing/service precautions.

- Split Construction - Combination of reinforced masonry and full movement joints. Suspended floors or fabric reinforced ground slabs acting independently from the building. Site drainage and plumbing/service precautions.

- Soil Raft – Remove all or necessary parts of the expansive horizon to 1.0 meter beyond the perimeter of the building and replace with inert backfill compacted to 93% MOD AASHTO density at -1% to 2% of optimum moisture content. Normal

construction with lightly reinforced strip foundations and light reinforcement in masonry. Site drainage and plumbing/service precautions.

13. CONCLUSIONS

While every effort made during the fieldwork phase of this investigation to identify the various soil horizons, their problems and distribution, it is impossible to guarantee that isolated zones of poorer material have not been missed. The investigation was, however, thorough and conditions are not expected to vary from those described in this report.

The engineers are nevertheless strongly urged to inspect service trenches and foundations once opened to assure themselves that conditions are not at variance with those described in this report. Disparities in founding material type should be referred to an expert.

It must be borne in mind that the overall interpretation of geotechnical conditions is based upon point information derived from the respective test position and that conditions intermediate to these have been inferred by interpolation, extrapolation, and professional judgement.

14. CLOSURE

We have employed accepted geotechnical engineering and engineering geological procedures, and our opinions and conclusions are made in accordance with generally accepted principles and practices of these professions. The contents of this report are valid as of the date of preparation. However, changes in the condition of the site can occur over time as a result or either natural processes or human activity.

In addition, advancements in the practice of geotechnical engineering and engineering geology and changes in applicable practice codes may affect the validity of this report. Consequently, this report should not be relied upon after an eclipsed period of twelve months without a review by this firm for verification of validity. This warranty is in lieu of all other warranties, either expressed or implied.

Although not anticipated at this site, we should note that our investigation did not include the evaluation or assessment of any potential environmental hazards or groundwater contamination that may be present.

15. REFERENCES

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APPENDIX A: PROFILE LOGS AND PHOTOGRAPHIC LOGS

ROADLAB™

Roadlab Laboratories (Pty) Ltd

Civil Materials Testing
BBBEE Level 1 Contributor
Registration No: 2011/005423/07
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material Passion.
trusted Accuracy.
timeous Excellence.

JOB NO:	RM15876	Ref.	C964.02	DATE:	2024.02.20

Client:

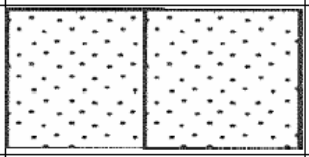
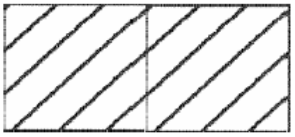
Hessequa Municipality
Civic Centre
Van Den Berg Street
Riversdale
6670
(+27)28 713 8019

Project:	RFQ 84465
Site / Road:	Muir Street
Test Hole No:	Test Pit 1
Side Walls	Stable
Excavation Method	TLB
Refusal	1400mm Rockbed
Water table	N/A
Coordinates	S 34°4'54" E20°56'58"
Date Tested:	2024.04.17
Technician	Mario Jackson

Sampling Method: TMH5

ENVIRONMENTAL CONDITION: Sunny

SOIL PROFILE

DEPTH (mm)	PROFILE	DESCRIPTION	
0-140mm (140)		Dark Brown, Slightly Moist, Firm, Sand. Intact, In-Situ (Residual) (HCL-)	Topsoil. Not Sampled
140-520 (380)		Light Brown, Slightly Moist, Firm, Clay Intact, In-Situ (HCL+)	MDD/CBR/IND
520-1086 (566)		Dark Brown, Firm, Clay Intact, In-Situ (HCL+)	MDD/CBR/IND
1086-1400 (314)		Light Brown/Reddish, Slightly Moist, Firm, Clay. Intact, In-Situ (Residual) (HCL+)	MDD/CBR/IND

PHOTOS

LAYER IDENTIFICATION PHOTOS

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JOB NO:	RM15876	Ref.	C964.02	DATE:	2024.02.20

Client:

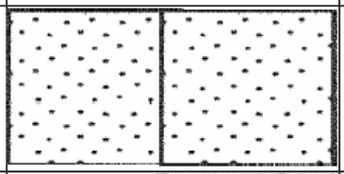
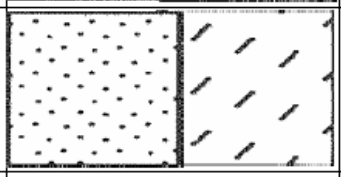
Hessequa Municipality
Civic Centre
Van Den Berg Street
Riversdale
6670
(+27)28 713 8019

Project:	RFQ 84465
Site / Road:	Muir Street
Test Hole No:	Test Pit 2
Side Walls	Stable
Excavation Method	TLB
Refusal	2000mm "Found a pipe"
Water table	N/A
Coordinates	S 34°4'55" E20°56'58"
Date Tested:	2024.04.17
Technician	Mario Jackson

Sampling Method: TMH5

ENVIRONMENTAL CONDITION: Sunny

SOIL PROFILE

DEPTH (mm)	PROFILE	DESCRIPTION	
0-180mm (180)		Slightly Moist, Sand. Intact, In-Situ (Residual) (HCL-)	(F-Ind) Topsoil.
180-910 (730)		Moist, Brown, Clayey / Silty / Calcareous sand Intact, In-Situ (HCL+)	MDD/CBR/IND
910-1420 (510)		Reddish Brown, Moist, Clay Intact, In-Situ (HCL-)	MDD/CBR/IND
1420-2000 (580)		Brown-Mottled-Reddish, Clay. Intact, In-Situ (Residual) (HCL-)	MDD/CBR/IND

PHOTOS

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Client:

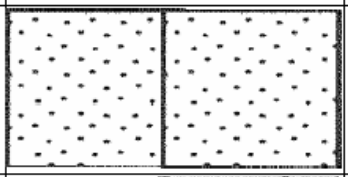
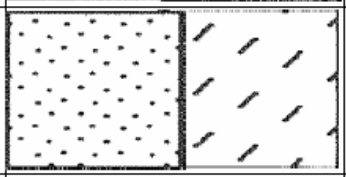
Hessequa Municipality
Civic Centre
Van Den Berg Street
Riversdale
6670
(+27)28 713 8019

Project:	RFQ 84465
Site / Road:	Muir Street
Test Hole No:	Test Pit 3
Side Walls	Stable
Excavation Method	TLB
Refusal	2000mm (Not Specified)
Water table	N/A
Coordinates	S 34°4'55" E20°56'58"
Date Tested:	2024.04.17
Technician	Marlo Jackson

Sampling Method: TMH5

ENVIRONMENTAL CONDITION: Sunny

SOIL PROFILE

DEPTH (mm)	PROFILE	DESCRIPTION	
0-250mm (250)		Moist, Topsoil. Intact, In-Situ (Residual) (HCL-)	(F-Ind) Topsoil.
250-1260 (1010)		Moist, Brown, Clayey / Silty / Calcareous sand Intact, In-Situ (HCL+)	MDD/CBR/IND
1260-2000 (740)		Reddish Brown, Moist, Clay Intact, In-Situ (HCL+)	MDD/CBR/IND

PHOTOS

LAYER IDENTIFICATION PHOTOS

APPENDIX B: ROAD, FOUNDATION INDICATORS & CBR TESTS RESULTS

ROADLAB

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Job Request No.: RM15876
Hessequa Local Municipality
PO Box 20
Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 84465

Test Report: Full Classification SANS 3001 - G1,GR10,GR40

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.		9910	9909	9911	
HOLE NO./ Km / CHAINAGE		Test Pit 1	Test Pit 1	Test Pit 1	
ROAD NO./ NAME Line 1 ROAD NO./ NAME Line 2		Niekerk Straat	Niekerk Straat	Niekerk Straat	
LAYER TESTED/SAMPLED		Layer 3	Layer 2	Layer 4	
SAMPLE DEPTH		520-1086mm	140-520mm	1086-1400mm	
DATE SAMPLED		2024/04/17	2024/04/17	2024/04/17	
COLOUR OF SAMPLE		Dr Grey Dr Brown	Drk Greyish,Drk Br	Dr Br Mottled Reddis	
TYPE OF SAMPLE		Clay	Clay with Silt	Clay with Silt	
SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)					
SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm				
	63.0 mm				
	50.0 mm				
	37.5 mm				
	28.0 mm				
	20.0 mm				
	14.0 mm	100		100	
	5.0 mm	99		99	
	2.0 mm	92		99	
	0.425 mm	85	100	98	
	0.075 mm	79	84	78	
GM %		0.40	0.20	0.30	
SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)					
COARSE SAND	2.000 - 0.425	8	0	1	
COARSE FINE SAND	0.425 - 0.250	1	3	5	
MEDIUM FINE SAND	0.250 - 0.150	2	5	7	
FINE FINE SAND	0.150 - 0.075	4	8	8	
SILT CLAY	0.075	86	84	79	
ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)					
ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	37	36	33	
	PLASTICITY INDEX	19	17	16	
	LINEAR SHRINKAGE	8.0	8.0	7.5	
CLASSIFICATION	H.R.B.	A-6(12)	A-4(8)	A-6(10)	
	COLTO	-	-	-	
	TRH 14	G10	G10	G10	
CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)					
SANS GR30 MAX. DRY DENSITY	OMC %	14.2	13.9	13.5	
	MDD (kg/m³)	1941	1950	1979	
	COMP MC %	14.3	13.7	13.2	
SWELL % @	MOD | NRB | PRO	1.06 | 1.20 | 1.54	0.87 | 1.14 | 1.39	1.17 | 1.49 | 1.69	
C.B.R. SANS GR40	100 %	11	8	11	
	98 %	10	7	10	
	97 %	9	7	9	
	95 %	8	6	8	
	93 %	8	6	6	
	90 %	6	5	5	
STABILISER IN LAB					
TEST TYPE		CBR	CBR	CBR	
SAMPLING METHOD		TMH5	TMH5	TMH5	
WEATHER WHEN SAMPLED		Sunny	Sunny	Sunny	

Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
The samples were subjected to analysis accoeding to (SANS)(TMH5)(ASTM)
The test results reported only relates to the sample tested.
Further use of thr above information is not the responsibility or liability of Roadlab.
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Report compiled by : Jessica Le Roux

sanas Testing Laboratory
Accreditation No. T0947
Prog.ver 10.7 (2019/11/07)

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2

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PO Box 20
Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

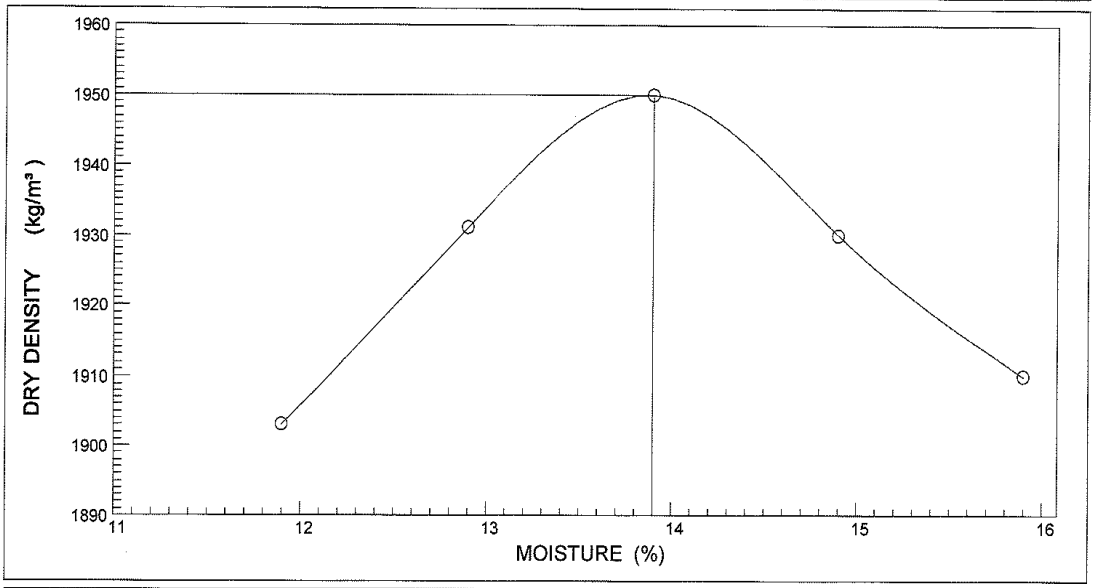
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9909
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	69844g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 2 - 140-520mm
MATERIAL DESCRIPTION	Clay with Silt
HOLE NO./ km / CHAINAGE	Test Pit 1
ROAD NO.	Niekerk Straat
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Dark Greyish, Dark Brown

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1903	1931	1950	1930	1910			
MOISTURE (%)	11.9	12.9	13.9	14.9	15.9			

MAXIMUM DRY DENSITY (kg/m³) : 1950	OPTIMUM MOISTURE CONTENT (%) : 13.9



Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
The samples were subjected to analysis accoeding to (SANS)(TMH5)(ASTM)
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PO Box 20
Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

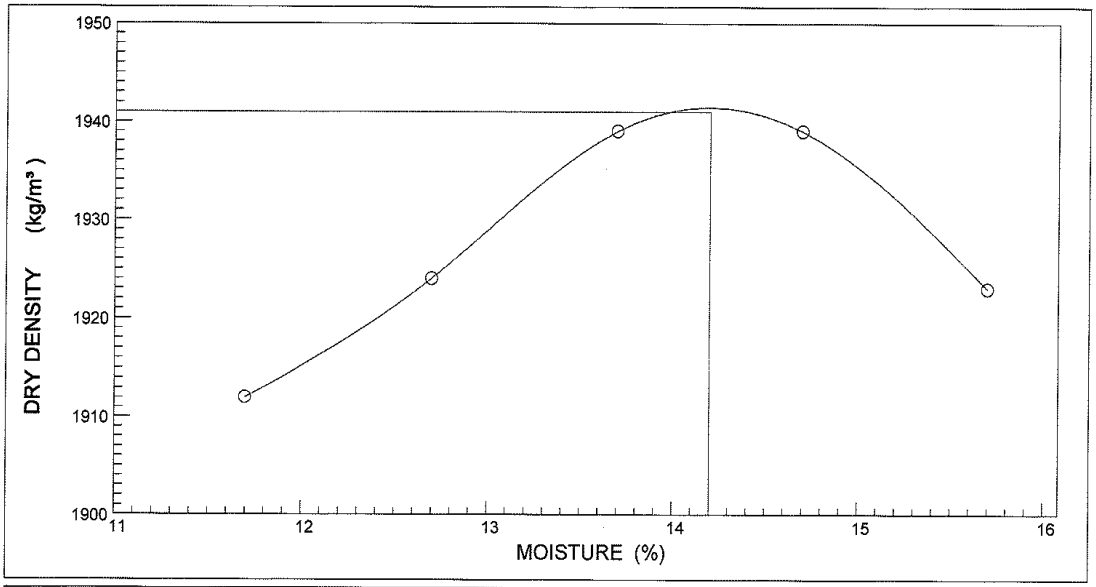
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9910
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	68700g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 3 - 520-1080mm
MATERIAL DESCRIPTION	Clay
HOLE NO./ km / CHAINAGE	Test Pit 1
ROAD NO.	Niekerk Straat
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Dark Grey, Dark Brown

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1912	1924	1939	1939	1923			
MOISTURE (%)	11.7	12.7	13.7	14.7	15.7			

MAXIMUM DRY DENSITY (kg/m³) : 1941	OPTIMUM MOISTURE CONTENT (%) : 14.2



Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
The samples were subjected to analysis accoeding to (SANS)(TMH5)(ASTM)
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Date Reported : 2024/04/27

Project : RFQ 284465

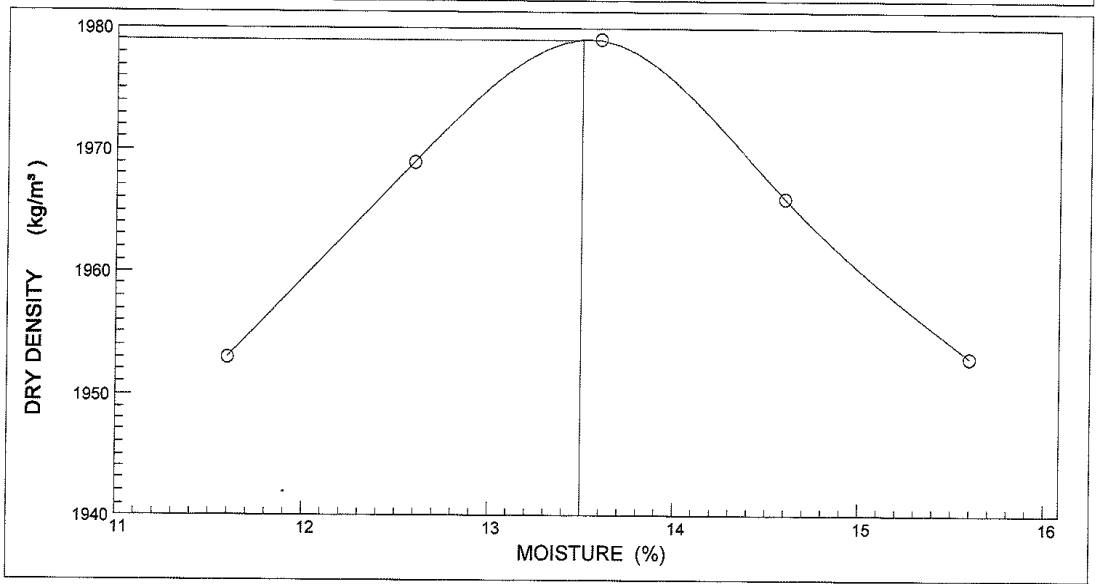
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9911
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	68974g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	layer 4 - 1086-1400mm
MATERIAL DESCRIPTION	Clay with Silt
HOLE NO./ km / CHAINAGE	Test Pit 1
ROAD NO.	Niekerk Straat
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Dark Brown Mottled Reddish

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1953	1969	1979	1966	1953			
MOISTURE (%)	11.6	12.6	13.6	14.6	15.6			

MAXIMUM DRY DENSITY (kg/m³) : 1979	OPTIMUM MOISTURE CONTENT (%) : 13.5



Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
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Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 84465

Test Report: Full Classification SANS 3001 - G1,GR10,GR40

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.		9912	9913	9914	
HOLE NO./ Km / CHAINAGE		Test Pit 2	Test Pit 2	Test Pit 2	
ROAD NO./ NAME Line 1 ROAD NO./ NAME Line 2		Not Specified	Not Specified	Not Specified	
LAYER TESTED/SAMPLED		Layer 2	Layer 3	Layer 4	
SAMPLE DEPTH		180-910mm	910-1420mm	1420-2000mm	
DATE SAMPLED		2024/04/17	2024/04/17	2024/04/17	
COLOUR OF SAMPLE		Brown	Br Reddish	Br Mottled Reddish	
TYPE OF SAMPLE		Clayey Silty Calc	Clay	Clay	
SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)					
SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm				
	63.0 mm				
	50.0 mm				
	37.5 mm				
	28.0 mm				
	20.0 mm	100			
	14.0 mm	99	100	100	
	5.0 mm	98	99	99	
	2.0 mm	98	99	98	
	0.425 mm	97	98	97	
	0.075 mm	84	80	85	
GM %		0.20	0.20	0.20	
SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)					
COARSE SAND	2.000 - 0.425	1	1	1	
COARSE FINE SAND	0.425 - 0.250	2	2	1	
MEDIUM FINE SAND	0.250 - 0.150	4	6	3	
FINE FINE SAND	0.150 - 0.075	9	10	9	
SILT CLAY	0.075	86	81	87	
ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)					
ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	38	34	45	
	PLASTICITY INDEX	21	20	25	
	LINEAR SHRINKAGE	9.0	8.5	11.5	
CLASSIFICATION	H.R.B.	A-6(12)	A-6(12)	A-7-6(15)	
	COLTO	-	-	-	
	TRH 14	G10	G10	-	
CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)					
SANS GR30 MAX. DRY DENSITY	OMC %	14.9	15.2	16.7	
	MDD (kg/m³)	1753	1760	1736	
	COMP MC %	14.7	14.9	16.5	
SWELL % @	MOD | NRB | PRO	1.43 | 1.88 | 2.44	1.06 | 1.38 | 1.78	1.18 | 1.86 | 2.52	
C.B.R. SANS GR40	100 %	8	9	6	
	98 %	6	8	5	
	97 %	6	7	5	
	95 %	5	6	4	
	93 %	4	5	3	
	90 %	3	4	2	
STABILISER IN LAB					
TEST TYPE		CBR	CBR	CBR	
SAMPLING METHOD		TMH5	TMH5	TMH5	
WEATHER WHEN SAMPLED		Sunny	Sunny	Sunny	

Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
The samples were subjected to analysis accoeding to (SANS)(TMH5)(ASTM)
The test results reported only relates to the sample tested.
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Hessequa Local Municipality
PO Box 20
Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

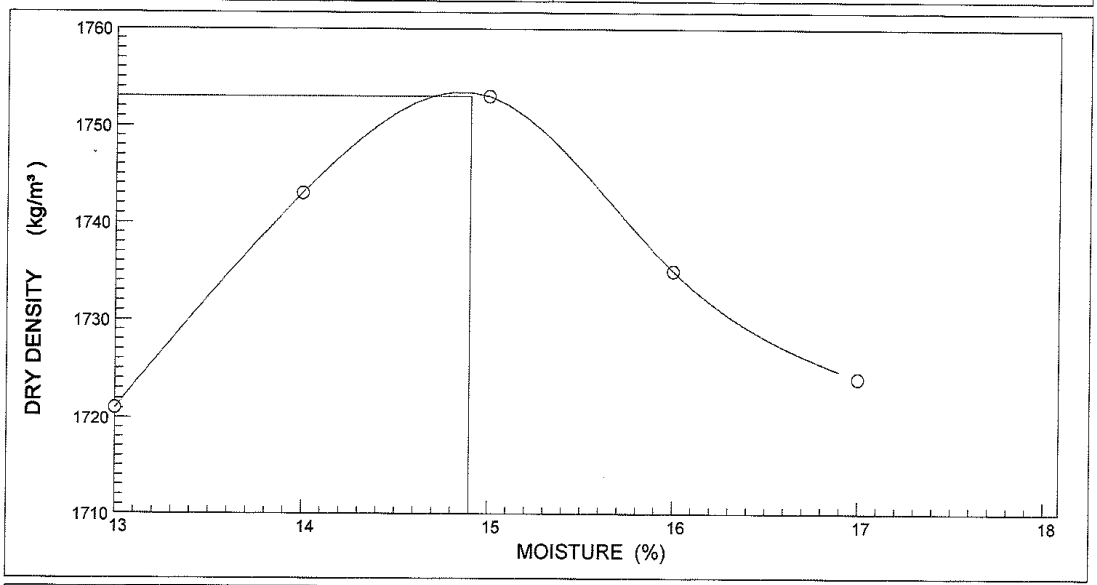
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9912
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	68790g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 2 - 180-910mm
MATERIAL DESCRIPTION	Clayey Silty Calcrarious Sand
HOLE NO./ km / CHAINAGE	Test Pit 2
ROAD NO.	Not Specified
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Brown

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1721	1743	1753	1735	1724			
MOISTURE (%)	13.0	14.0	15.0	16.0	17.0			

MAXIMUM DRY DENSITY (kg/m³) : 1753	OPTIMUM MOISTURE CONTENT (%) : 14.9



Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
The samples were subjected to analysis accoeding to (SANS)(TMH5)(ASTM)
The test results reported only relates to the sample tested.
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Report compiled by : Jessica Le Roux

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Elizabeth Roux
Technical Signatory

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ROADLAB

Roadlab Laboratories (PTY) Ltd
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Email: elizabeth@roadlab.co.za
Web:

Job Request No.: RM15876
Hessequa Local Municipality
PO Box 20
Riversdale
6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

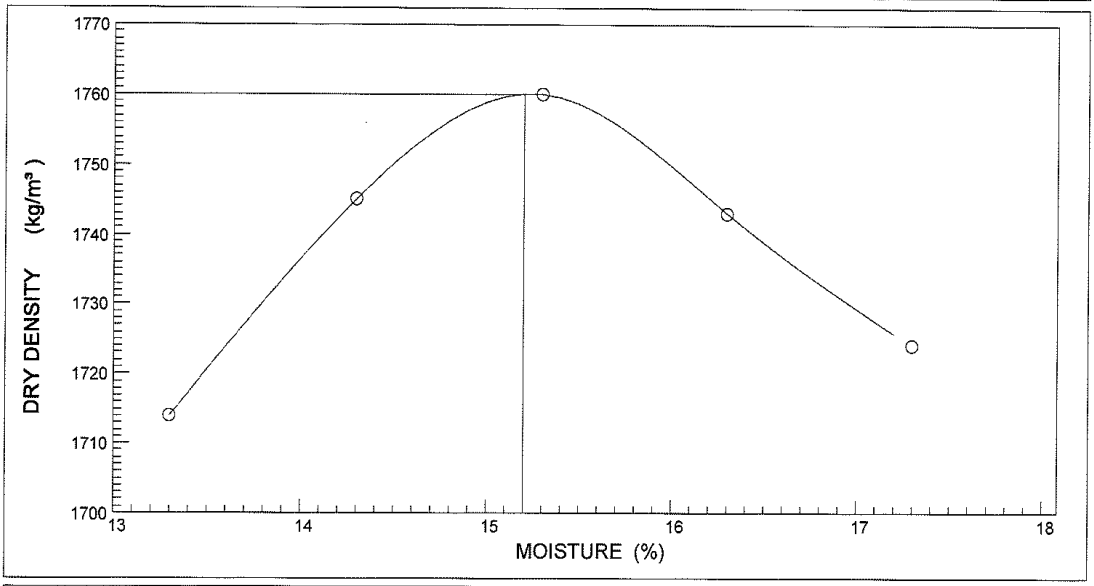
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9913
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	78740g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 3 - 910-1420mm
MATERIAL DESCRIPTION	Clay
HOLE NO./ km / CHAINAGE	Test Pit 2
ROAD NO.	Not Specified
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Brown Reddish

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1714	1745	1760	1743	1724			
MOISTURE (%)	13.3	14.3	15.3	16.3	17.3			

MAXIMUM DRY DENSITY (kg/m³) : 1760	OPTIMUM MOISTURE CONTENT (%) : 15.2



Deviation from Test Method : None
Remarks and Notes : None

Opinions and interpretation are not included in our schedule of accreditation.
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Date Reported : 2024/04/27

Project : RFQ 284465

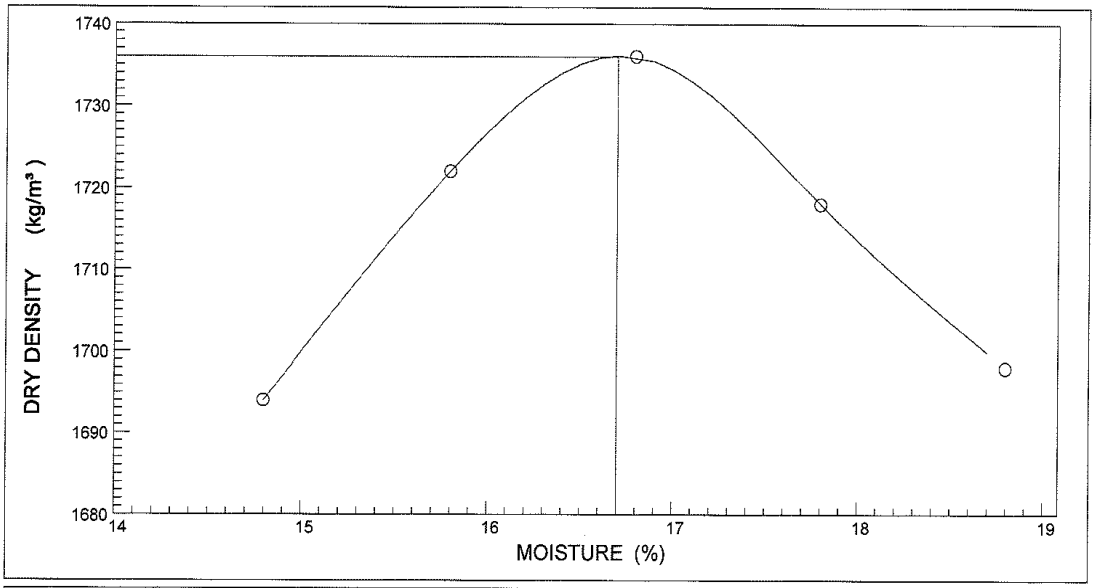
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9914
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	68170g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 4 - 1420-2000mm
MATERIAL DESCRIPTION	Clay
HOLE NO./ km / CHAINAGE	Test Pit 2
ROAD NO.	Not Specified
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Brown Mottled Reddish

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1694	1722	1736	1718	1698			
MOISTURE (%)	14.8	15.8	16.8	17.8	18.8			

MAXIMUM DRY DENSITY (kg/m³) : 1736	OPTIMUM MOISTURE CONTENT (%) : 16.7



Deviation from Test Method : None
Remarks and Notes : None

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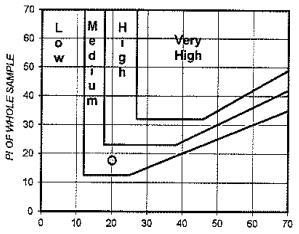
OUR REF : RM15876
CLIENT : Hessequa Local Municipality
PROJECT : RFQ 84465

DATE RECEIVED : 2024.04.17
POSITION : Test Pit 3
LAYER : Not Specified
SAMPLE No. : 9926
SAMPLE DESCRIPTION : Dark brown Silty Sandy Clayey Calcarious Gravel Clayey Silty Sand

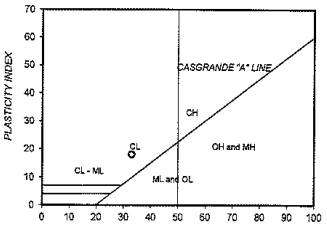
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI		**17.5**
Sieve analysis Cumulative percentage passing (mm)	100.0	100
	75.0	100
	63.0	100
	50.0	100
	37.5	100
	28.0	100
	20.0	100
	14.0	100
	5.00	99
	2.000	98
	0.425	97
	0.250	96
	0.150	89
	0.075	79
	50 µm	31
	5 µm	26
	2 µm	20.1
Soil Mortar Analysis % < 2.00mm	2.000 - 0.425	1
	0.425 - 0.250	2
	0.250 - 0.150	6
	0.150 - 0.075	10
	< 0.075	80
Effective size		0.002
Uniformity Coefficient		32.5
Curvature Coefficient		11.4
Oversize Index		0.0
Shrinkage Product		764.2
Grading Coefficient		1.6
Grading modulus		0.26
Atter-berg Limits	Liquid Limit	33
	Plasticity Index	18
	Linear Shrinkage	7.9
	PI < 0.075	-
Unified Soil Classification		CL
U.S. Highway Classification		A-6 (12)

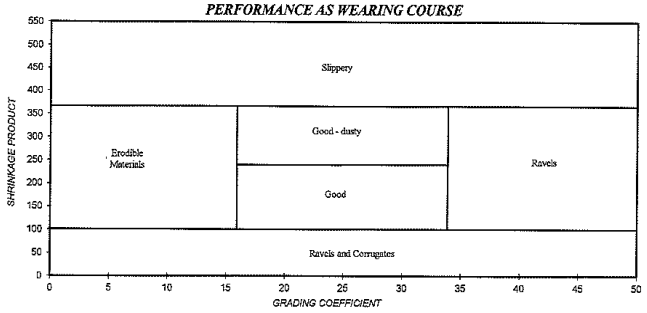
POTENTIAL EXPANSIVENES



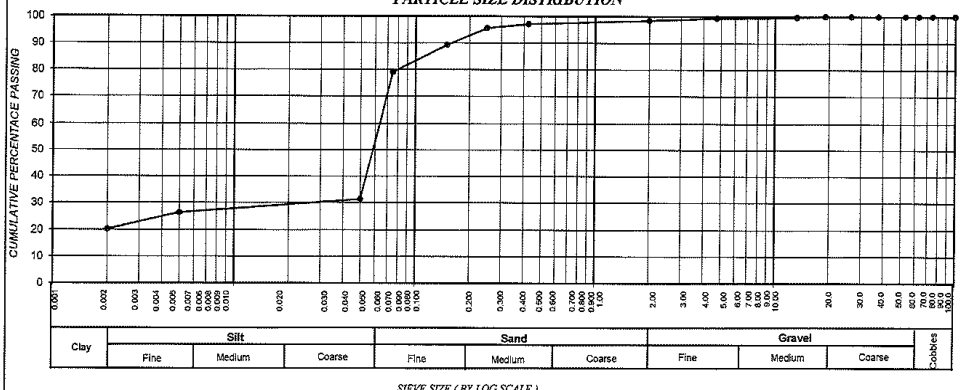
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
20.1	25.5	52.8	1.6

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6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 84465

Test Report: Full Classification SANS 3001 - G1,GR10,GR40

SAMPLE INFORMATION AND PROPERTIES

SAMPLE NO.		9915	9916		
HOLE NO./ Km / CHAINAGE		Test Pit 3	Test Pit 3		
ROAD NO./ NAME Line 1 ROAD NO./ NAME Line 2		Not Specified	Not Specified		
LAYER TESTED/SAMPLED		Layer 2	Layer 3		
SAMPLE DEPTH		250-1260mm	1260-2000mm		
DATE SAMPLED		2024/04/17	2024/04/17		
COLOUR OF SAMPLE		Dark Olive Greyish	Dr Olive Greyish		
TYPE OF SAMPLE		Clay	Clay		
SIEVE ANALYSIS - % PASSING SIEVES *(SANS 3001-GR1:2010, SANS 3001-GR2:2010)					
SIEVE ANALYSIS (GR 1) % PASSING	100.0 mm				
	75.0 mm				
	63.0 mm				
	50.0 mm				
	37.5 mm				
	28.0 mm				
	20.0 mm		100		
	14.0 mm	100	99		
	5.0 mm	99	87		
	2.0 mm	98	71		
	0.425 mm	97	56		
	0.075 mm	77	44		
GM %		0.30	1.3		
SOIL MORTAR ANALYSIS (SANS 3001-PR5:2011)					
COARSE SAND	2.000 - 0.425	1	22		
COARSE FINE SAND	0.425 - 0.250	5	2		
MEDIUM FINE SAND	0.250 - 0.150	6	6		
FINE FINE SAND	0.150 - 0.075	9	9		
SILT CLAY	0.075	79	62		
ATTERBERG LIMITS ANALYSIS - *(SANS 3001-GR10:2010)					
ATTERBERG LIMITS (%) SANS GR10,GR11	LIQUID LIMIT	33	32		
	PLASTICITY INDEX	16	16		
	LINEAR SHRINKAGE	6.5	6.5		
CLASSIFICATION	H.R.B.	A-6(10)	A-6(4)		
	COLTO	-	-		
	TRH 14	-	G10		
CALIFORNIA BEARING RATIO - *(SANS 3001-GR30:2010, SANS 3001-GR40:2010)					
SANS GR30 MAX. DRY DENSITY	OMC %	13.6	12.7		
	MDD (kg/m³)	1961	1806		
	COMP MC %	13.8	12.6		
SWELL % @	MOD | NRB | PRO	0.90 | 1.56 | 2.22	0.74 | 1.06 | 1.38		
C.B.R. SANS GR40	100 %	7	9		
	98 %	5	8		
	97 %	4	8		
	95 %	3	7		
	93 %	2	6		
	90 %	2	6		
STABILISER IN LAB					
TEST TYPE		CBR	CBR		
SAMPLING METHOD		TMH5	TMH5		
WEATHER WHEN SAMPLED		Sunny	Sunny		

Deviation from Test Method : None
Remarks and Notes : None

Report compiled by : Jessica Le Roux

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Elizabeth Roux
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Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

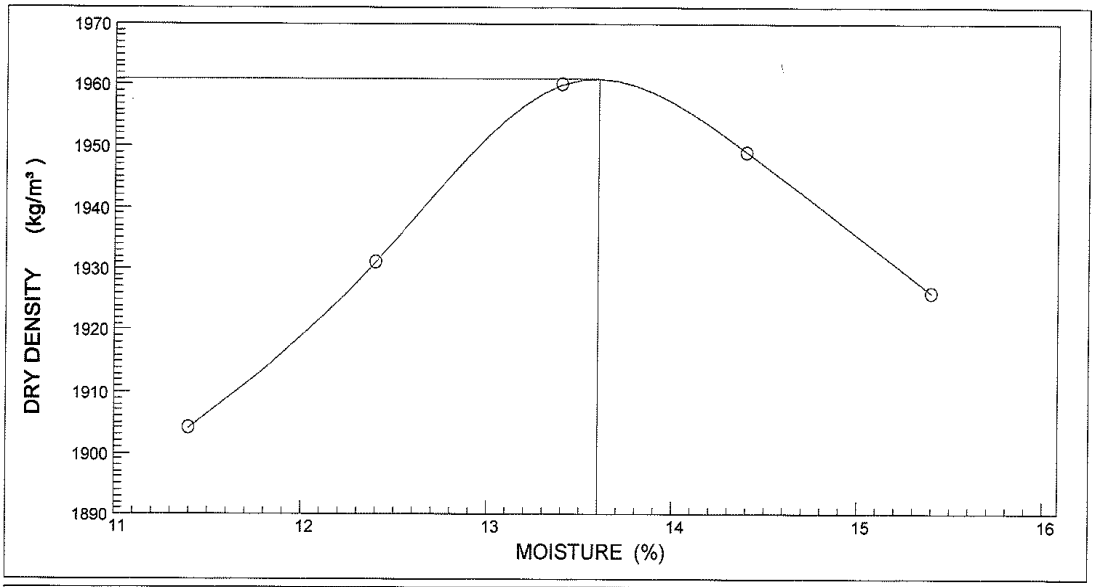
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9915
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	68770g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 2 - 250-1260mm
MATERIAL DESCRIPTION	Clay
HOLE NO./ km / CHAINAGE	Test Pit 3
ROAD NO.	Not Specified
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Dark Olive Greyish

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1904	1931	1960	1949	1926			
MOISTURE (%)	11.4	12.4	13.4	14.4	15.4			

MAXIMUM DRY DENSITY (kg/m³) : 1961	OPTIMUM MOISTURE CONTENT (%) : 13.6



Deviation from Test Method : None
Remarks and Notes : None

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6670
Attention : Clayton Frendse

Date Reported : 2024/04/27

Project : RFQ 284465

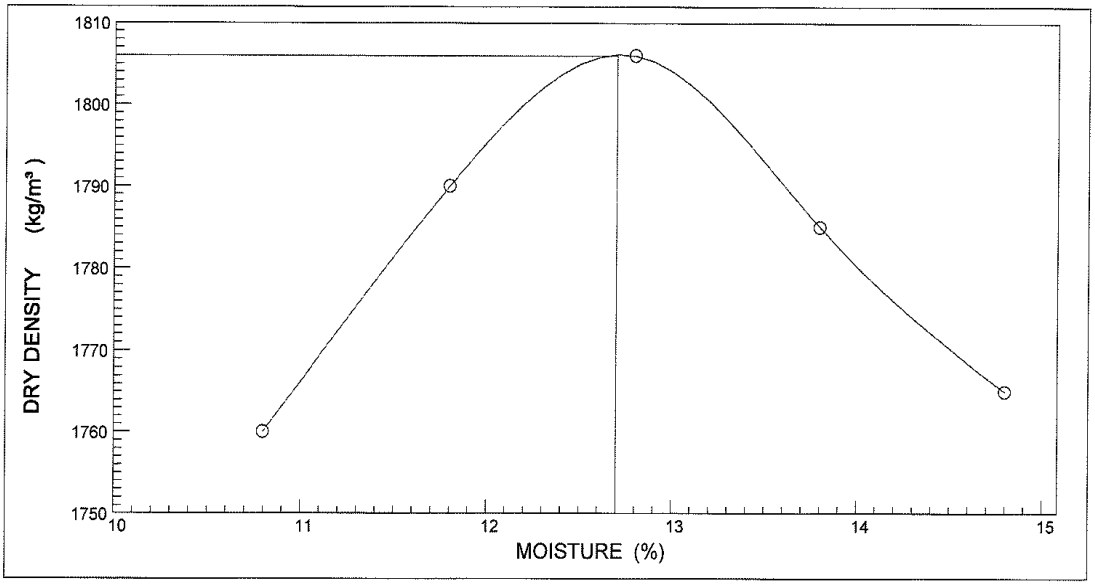
Test Report : MDD & OMC

SANS 3001 - GR30

SAMPLE NO.	9916
CONTAINER FOR SAMPLING	Sampling Bag
SIZE / APPROX. MASS OF SAMPLE	63870g
MOISTURE CONDITION OF SAMPLE	Slightly Moist
LAYER TESTED / SAMPLED FROM	Layer 3 - 1260-2000mm
MATERIAL DESCRIPTION	Clay
HOLE NO./ km / CHAINAGE	Test Pit 3
ROAD NO.	Not Specified
DATE RECEIVED	2024/04/17
DATE SAMPLED	2024/04/17
CLIENT MARKING	
COLOUR AND TYPE	Dark Olive Greyish

POINT NO.	1	2	3	4	5			
DRY DENSITY (kg/m³)	1760	1790	1806	1785	1765			
MOISTURE (%)	10.8	11.8	12.8	13.8	14.8			

MAXIMUM DRY DENSITY (kg/m³) : 1806	OPTIMUM MOISTURE CONTENT (%) : 12.7



Deviation from Test Method : None
Remarks and Notes : None

Report compiled by : Jessica Le Roux

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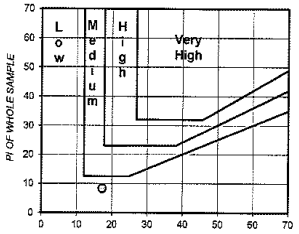
OUR REF : RM15876
CLIENT : Hessequa Local Municipality
PROJECT : RFQ 84465

DATE RECEIVED : 2024.04.17
POSITION : Test Pit 2
LAYER : Not Specified
SAMPLE No. : 9927
SAMPLE DESCRIPTION : Dark brown Silty Sand qith Organic Roots + Clayey Ma
Silty Clayey Sand

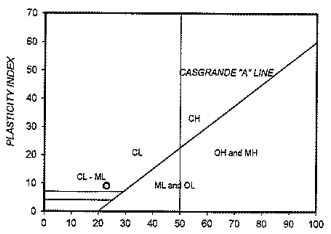
FOUNDATION INDICATOR - (SANS 3001-GR1, SANS 3001-GR10) & (ASTM Method D422)

Weighted PI		**8.2**
Sieve analysis Cumulative percentage passing (mm)	100.0	100
	75.0	100
	63.0	100
	50.0	100
	37.5	100
	28.0	100
	20.0	100
	14.0	100
	5.00	99
	2.000	98
	0.425	92
	0.250	78
	0.150	58
	0.075	45
	50 µm	24
	5 µm	21
	2 µm	17.3
Soil Mortar Analysis % < 2.36mm	2.000 - 0.425	6
	0.425 - 0.250	14
	0.250 - 0.150	20
	0.150 - 0.075	13
	< 0.075	46
Effective size		0.002
Uniformity Coefficient		80.2
Curvature Coefficient		10.0
Oversize Index		0.0
Shrinkage Product		326.2
Grading Coefficient		2.2
Grading modulus		0.66
Atter-berg Limits	Liquid Limit	23
	Plasticity Index	9
	Linear Shrinkage	3.6
	PI < 0.075	-
Unified Soil Classification		SC
U.S. Highway Classification		A-4 (1)

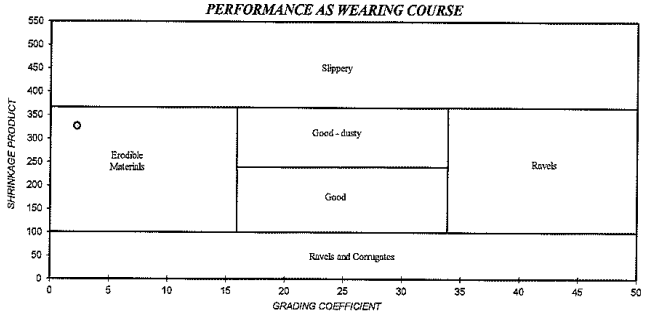
POTENTIAL EXPANSIVENES



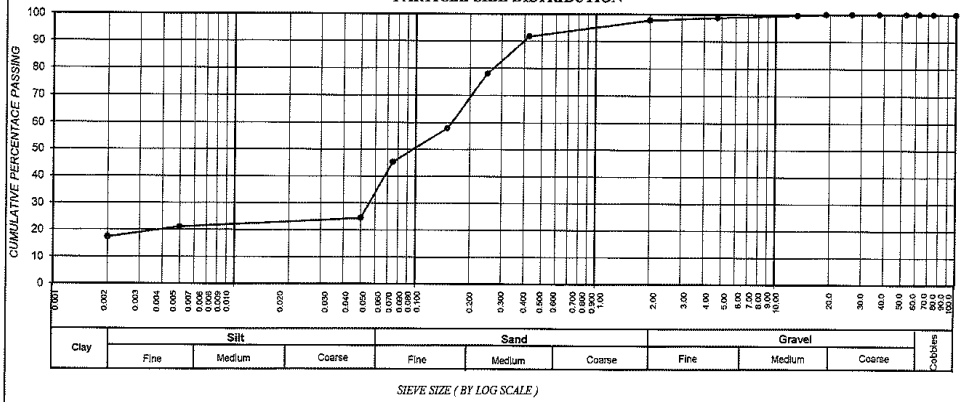
PLASTICITY CHART



PERFORMANCE AS WEARING COURSE



PARTICLE SIZE DISTRIBUTION



SIEVE SIZE (BY LOG SCALE)

CLAY (%) (0.001-0.002)	SILT (%) (0.002-0.060)	SAND (%) (0.060-2.00)	GRAVEL (%) (2.00-60.0)
17.3	13.1	67.3	2.3

APPENDIX C: DYNAMIC CONE PENETROMETER

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Req No: **RM15876**

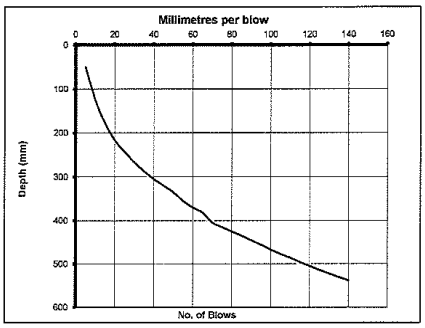
CLIENT:	Hessiqua Local Municipality PO Box 29 Riversdale	**DATE:**	2024.04.27
		Tracing No:	89281
TEST REPORT:	RFQ 84465	**JOB NUMBER:**	RM15876
OPERATOR:	Mario Jackson	**DATE TESTED:**	2024.04.17
TEST POSITION:	**Test Pit 1**	**STARTING DEPTH:**	50mm
MATERIAL TYPE:	Clayey Materials	**INSTRUMENT USED:**	2m DCP
CONSTRUCTION TYPE:	Structural	**NOTE:**	Refuse @ 623mm

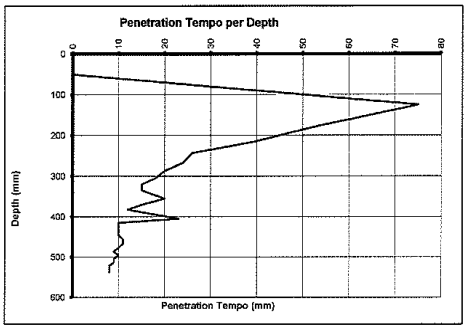
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	Estimate Bearing Ratio (kPa)	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
5	135	50mm	0	0					
10	210	125mm	75	15.0	Very Stiff	78	13	14	152
15	263	178mm	53	10.6	Very Stiff	100	20	21	221
20	302	217mm	39	7.8	Very Stiff	125	30	32	309
25	328	243mm	26	5.2	Very Stiff	169	51	53	481
30	352	267mm	24	4.8	Very Stiff	179	56	59	525
35	372	287mm	20	4.0	Very Stiff	200	70	75	640
40	390	305mm	18	3.6	Very Stiff	>200	81	86	718
45	405	320mm	15	3.0	Very Stiff	>200	102	108	876
50	420	335mm	15	3.0	Very Stiff	>200	102	108	876
55	440	355mm	20	4.0	Very Stiff	200	70	75	640
60	455	370mm	15	3.0	Very Stiff	>200	102	108	876
65	467	382mm	12	2.4	Very Stiff	>200	135	>110	1117
70	490	405mm	23	4.6	Very Stiff	184	59	62	550
75	500	415mm	10	2.0	Very Stiff	>200	170	>110	1362
80	510	425mm	10	2.0	Very Stiff	>200	170	>110	1362
85	520	435mm	10	2.0	Very Stiff	>200	170	>110	1362
90	530	445mm	10	2.0	Very Stiff	>200	170	>110	1362
95	541	456mm	11	2.2	Very Stiff	>200	151	>110	1228
100	552	467mm	11	2.2	Very Stiff	>200	151	>110	1228
105	562	477mm	10	2.0	Very Stiff	>200	170	>110	1362
110	571	486mm	9	1.8	Very Stiff	>200	185	>110	1528
115	581	496mm	10	2.0	Very Stiff	>200	170	>110	1362
120	590	505mm	9	1.8	Very Stiff	>200	185	>110	1528
125	599	514mm	9	1.8	Very Stiff	>200	185	>110	1528
130	607	522mm	8	1.6	Very Stiff	>200	206	>110	1737
135	615	530mm	8	1.6	Very Stiff	>200	206	>110	1737
140	623	538mm	8	1.6	Very Stiff	>200	206	>110	1737

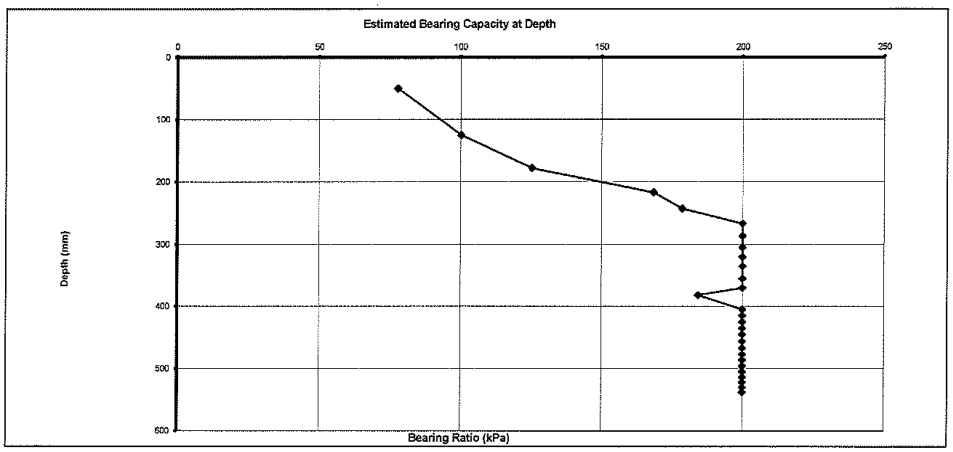
DCP GRAPHICAL REPRESENTATION

PROJECT: RFQ 84465
CLIENT: Hessiqua Local Municipality
TEST POSITION: Test Pit 1
MATERIAL TYPE: Clayey Materials
CONSTRUCTION TYPE: Structural

DATE TESTED: 2024.04.17
OPERATOR: Mario Jackson
STARTING DEPTH: 50mm
INSTRUMENT USED: 2m DCP
NOTE: Refuse @ 623mm







Remarks:

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Measuring equipment is traceable to national standards (Where applicable).

Elizabeth Roux
Technical Signatory

ROADLAB™

Roadlab Laboratories (Pty) Ltd

Civil Materials Testing
SSEG Level 1 Contributor
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> material Passion.
> trusted Accuracy.
> timeous Excellence.

Req No: RM15876

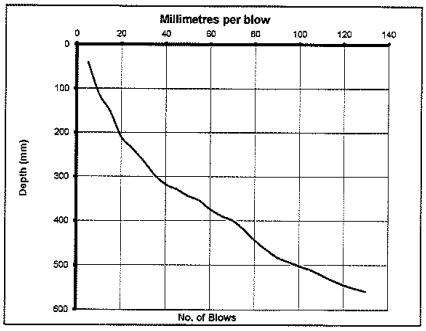
CLIENT:	Hessiqua Local Municipality	**DATE:**	2024.04.27
	PO Box 29	**Tracing No:**	89281
	Riversdale		
TEST REPORT:	RFQ 84465	**JOB NUMBER:**	RM15876
OPERATOR:	Mario Jackson	**DATE TESTED:**	2024.04.17
TEST POSITION:	**Test Pit 2**	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Clayey Materials	**INSTRUMENT USED:**	2m DCP
CONSTRUCTION TYPE:	Structural	**NOTE:**	Refuse @ 640mm

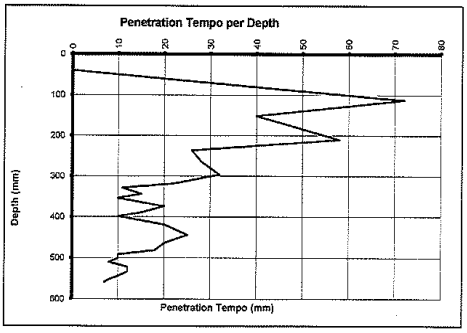
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	Estimate Bearing Ratio (kPa)	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
5	121	40mm	0	0					
10	193	112mm	72	14.4	Very Stiff	80	14	14	158
15	233	152mm	40	8.0	Very Stiff	123	29	31	301
20	291	210mm	58	11.6	Very Stiff	94	18	19	201
25	317	236mm	26	5.2	Very Stiff	169	51	53	481
30	345	264mm	28	5.6	Very Stiff	160	46	48	443
35	377	296mm	32	6.4	Very Stiff	145	39	41	383
40	399	318mm	22	4.4	Very Stiff	190	62	66	577
45	410	329mm	11	2.2	Very Stiff	>200	151	>110	1228
50	425	344mm	15	3.0	Very Stiff	>200	102	108	876
55	435	354mm	10	2.0	Very Stiff	>200	170	>110	1362
60	455	374mm	20	4.0	Very Stiff	200	70	75	640
65	470	389mm	15	3.0	Very Stiff	>200	102	108	876
70	480	399mm	10	2.0	Very Stiff	>200	170	>110	1362
75	500	419mm	20	4.0	Very Stiff	200	70	75	640
80	525	444mm	25	5.0	Very Stiff	173	53	56	502
85	545	464mm	20	4.0	Very Stiff	200	70	75	640
90	563	482mm	18	3.6	Very Stiff	>200	81	86	718
95	573	492mm	10	2.0	Very Stiff	>200	170	>110	1362
100	583	502mm	10	2.0	Very Stiff	>200	170	>110	1362
105	591	510mm	8	1.6	Very Stiff	>200	206	>110	1737
110	603	522mm	12	2.4	Very Stiff	>200	135	>110	1117
115	615	534mm	12	2.4	Very Stiff	>200	135	>110	1117
120	625	544mm	10	2.0	Very Stiff	>200	170	>110	1362
125	633	552mm	8	1.6	Very Stiff	>200	206	>110	1737
130	640	559mm	7	1.4	Very Stiff	>200	232	>110	2010

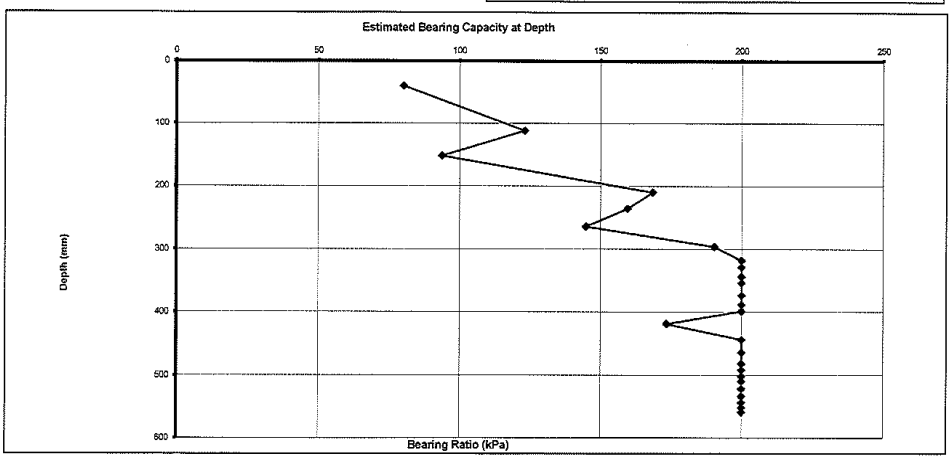
DCP GRAPHICAL REPRESENTATION

PROJECT: RFQ 84465
CLIENT: Hessiqua Local Municipality
TEST POSITION: Test Pit 2
MATERIAL TYPE: Clayey Materials
CONSTRUCTION TYPE: Structural

DATE TESTED: 2024.04.17
OPERATOR: Mario Jackson
STARTING DEPTH: 40mm
INSTRUMENT USED: 2m DCP
NOTE: Refuse @ 640mm







Remarks:

The samples where subjected and analysed according to TMH 6
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Req No: RM15876

CLIENT: Hessiqua Local Municipality
PO Box 29
Riversdale

DATE: 2024.04.27
Tracing No: 89281

TEST REPORT: RFQ 84465
OPERATOR: Mario Jackson
TEST POSITION: **LHS**
MATERIAL TYPE: Clayey Materials
CONSTRUCTION TYPE: Structural

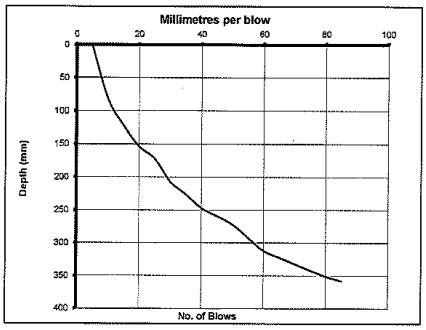
JOB NUMBER: RM15876
DATE TESTED: 2024.04.17
STARTING DEPTH: 2mm
INSTRUMENT USED: 2m DCP
NOTE: Refuse @ 496mm

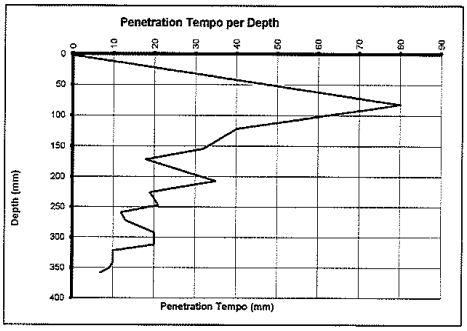
Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	Estimate Bearing Ratio (kPa)	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
5	140	2mm	0	0					
10	220	82mm	80	16.0	Stiff	74	12	12	141
15	260	122mm	40	8.0	Very Stiff	123	29	31	301
20	292	154mm	32	6.4	Very Stiff	145	39	41	383
25	310	172mm	18	3.6	Very Stiff	>200	81	86	718
30	345	207mm	35	7.0	Very Stiff	136	35	36	348
35	364	226mm	19	3.8	Very Stiff	>200	75	80	677
40	385	247mm	21	4.2	Very Stiff	197	66	70	607
45	397	259mm	12	2.4	Very Stiff	>200	135	>110	1117
50	410	272mm	13	2.6	Very Stiff	>200	122	>110	1023
55	430	292mm	20	4.0	Very Stiff	200	70	75	640
60	450	312mm	20	4.0	Very Stiff	200	70	75	640
65	460	322mm	10	2.0	Very Stiff	>200	170	>110	1362
70	470	332mm	10	2.0	Very Stiff	>200	170	>110	1362
75	480	342mm	10	2.0	Very Stiff	>200	170	>110	1362
80	489	351mm	9	1.8	Very Stiff	>200	185	>110	1528
85	496	358mm	7	1.4	Very Stiff	>200	232	>110	2010

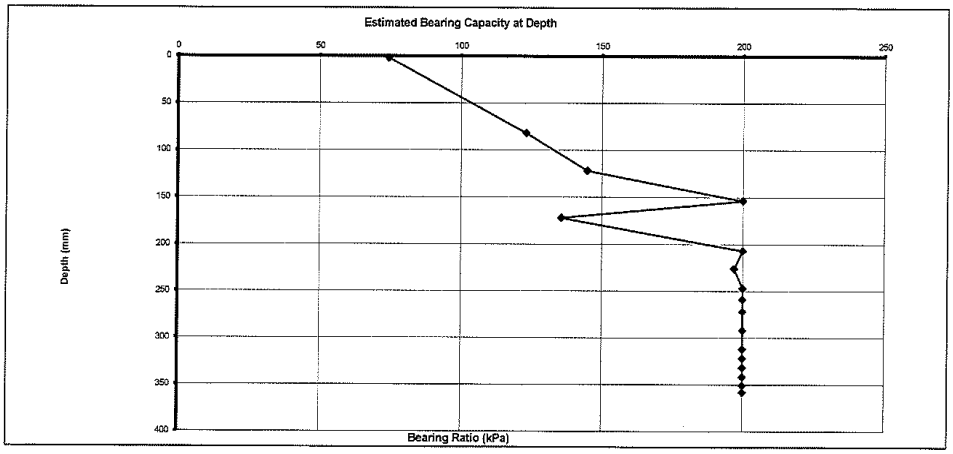
DCP GRAPHICAL REPRESENTATION

PROJECT: RFQ 84465
CLIENT: Hessiqua Local Municipality
TEST POSITION: LHS
MATERIAL TYPE: Clayey Materials
CONSTRUCTION TYPE: Structural

DATE TESTED: 2024.04.17
OPERATOR: Mario Jackson
STARTING DEPTH: 2mm
INSTRUMENT USED: 2m DCP
NOTE: Refuse @ 496mm







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APPENDIX D: COLLAPSE POTENTIAL TESTS

Specialised Testing Laboratory (Pty) Ltd
Asphalt | Aggregate | Bitumen | Geotechnical
Quality | Excellence | On Time

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
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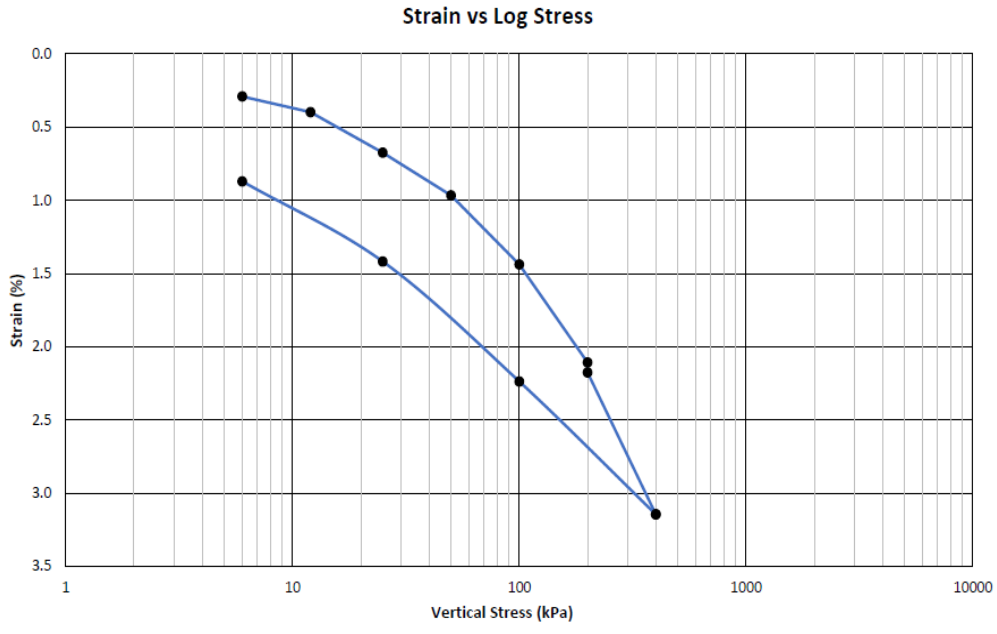
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name:	Wiltrade 32 (Pty) Ltd	**Job Number:**	WLT-758
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2098
Sample:	TP1	**Method:**	BS 1377 Part 5
Depth: (m)	0.90	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.07 %
Moisture Content	Initial	%	9.9			
	Final	%	16.5			
Dry Density		kg/m³	1866			
Void Ratio		-	0.420			
Degree of Saturation		%	62.2			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.33	25.30	25.23	25.15	25.03	24.86	24.85	24.60	24.83	25.04	25.18		
Total Strain	%	0.29	0.40	0.67	0.97	1.44	2.11	2.18	3.15	2.24	1.42	0.87		
Void Ratio	-	0.416	0.415	0.411	0.406	0.400	0.390	0.389	0.375	0.388	0.400	0.408		
Mv (1/Mpa)	-	-	0.178	0.214	0.117	0.095	0.068	-	0.050	0.031	0.112	0.293		



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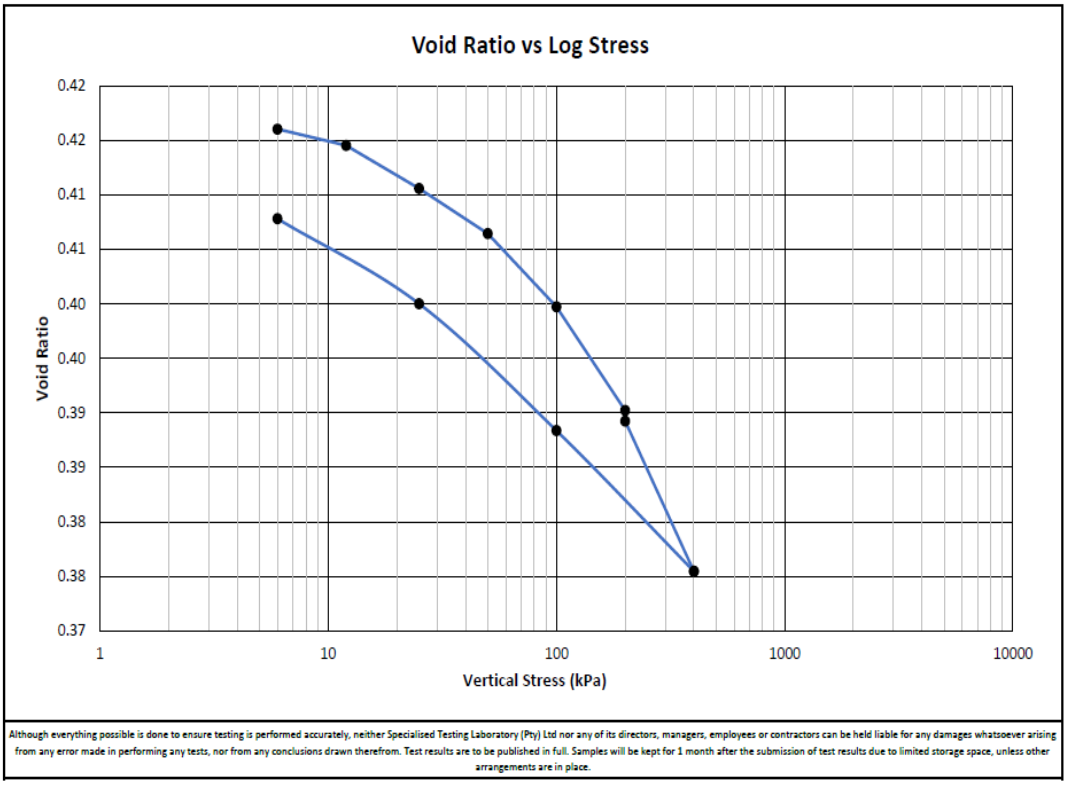
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2098
Sample:	TP1	**Method:**	BS 1377 Part 5
Depth: (m)	0.90	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.07 %
Moisture Content	Initial	%	9.9			
	Final	%	16.5			
Dry Density		kg/m^3	1866			
Void Ratio		-	0.420			
Degree of Saturation		%	62.2			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.33	25.30	25.23	25.15	25.03	24.86	24.85	24.60	24.83	25.04	25.18		
Total Strain	%	0.29	0.40	0.67	0.97	1.44	2.11	2.18	3.15	2.24	1.42	0.87		
Void Ratio	-	0.416	0.415	0.411	0.406	0.400	0.390	0.389	0.375	0.388	0.400	0.408		
Mv (1/Mpa)	-	-	0.178	0.214	0.117	0.095	0.068	-	0.050	0.031	0.112	0.293		



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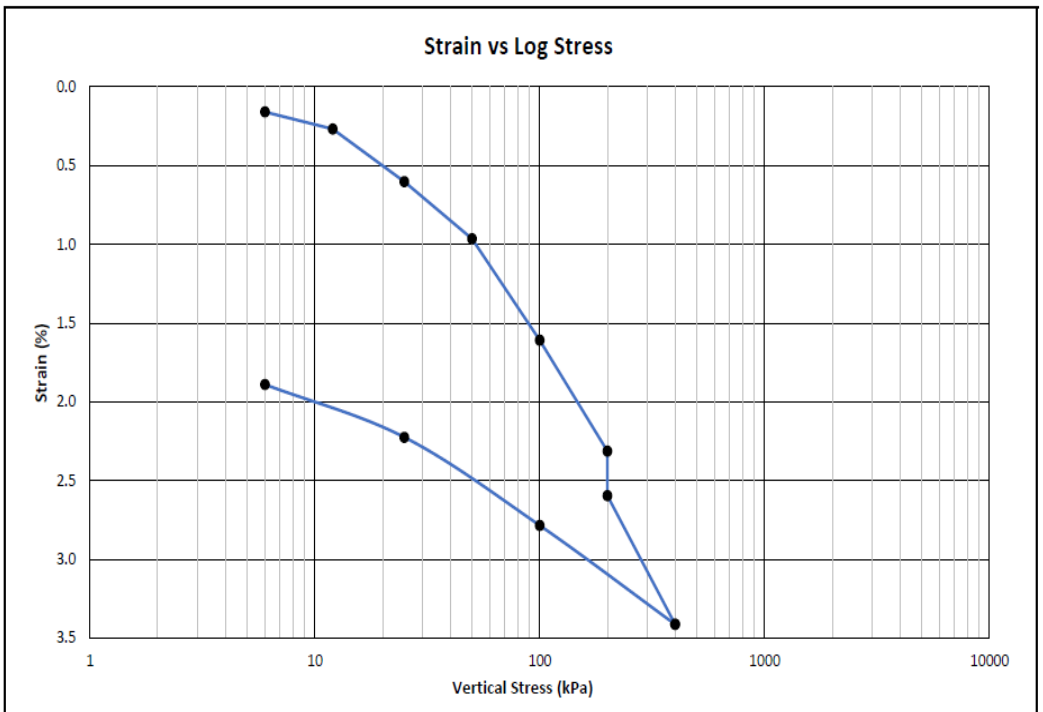
Client Name:	Wiltrade 32 (Pty) Ltd	**Job Number:**	WLT-758
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2099
Sample:	TP2	**Method:**	BS 1377 Part 5
Depth: (m)	1.30	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.28 %
Moisture Content	Initial	%	4.4			
	Final	%	12.0			
Dry Density		kg/m³	1962			
Void Ratio		-	0.351			
Degree of Saturation		%	33.0			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.36	25.33	25.25	25.16	24.99	24.81	24.74	24.53	24.69	24.83	24.92		
Total Strain	%	0.16	0.27	0.60	0.96	1.61	2.31	2.60	3.41	2.79	2.23	1.89		
Void Ratio	-	0.349	0.347	0.343	0.338	0.329	0.320	0.316	0.305	0.313	0.321	0.325		
Mv (1/Mpa)	-	-	0.181	0.258	0.146	0.130	0.072	-	0.042	0.022	0.077	0.180		



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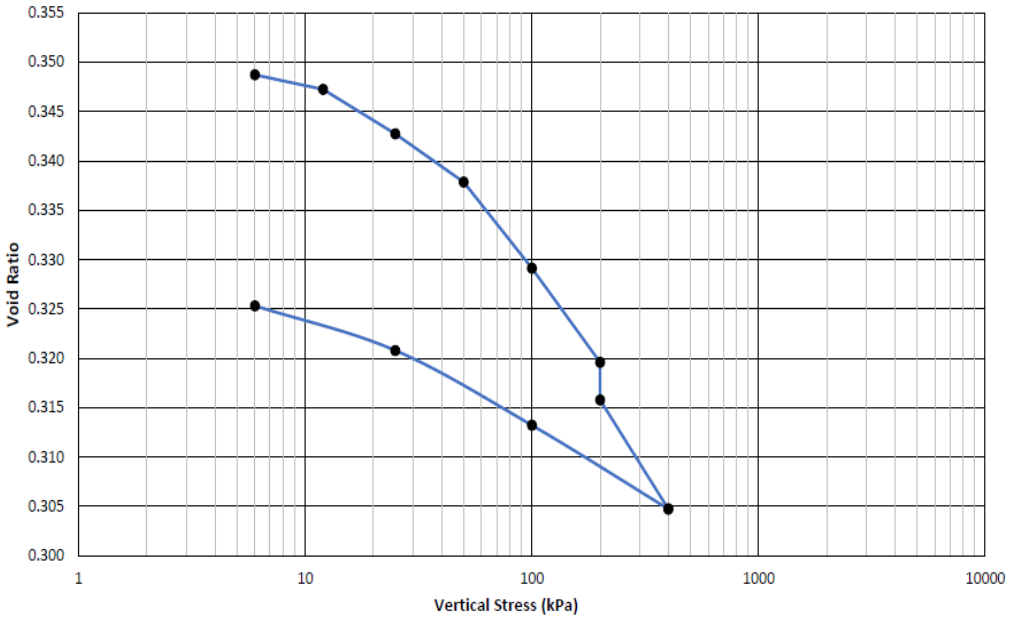
Client Name:	Wiltrade 32 (Pty) Ltd	**Job Number:**	WLT-758
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2099
Sample:	TP2	**Method:**	BS 1377 Part 5
Depth: (m)	1.30	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.28 %
Moisture Content	Initial	%	4.4			
	Final	%	12.0			
Dry Density		kg/m³	1962			
Void Ratio		-	0.351			
Degree of Saturation		%	33.0			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.36	25.33	25.25	25.16	24.99	24.81	24.74	24.53	24.69	24.83	24.92		
Total Strain	%	0.16	0.27	0.60	0.96	1.61	2.31	2.60	3.41	2.79	2.23	1.89		
Void Ratio	-	0.349	0.347	0.343	0.338	0.329	0.320	0.316	0.305	0.313	0.321	0.325		
Mv (1/Mpa)	-	-	0.181	0.258	0.146	0.130	0.072	-	0.042	0.022	0.077	0.180		



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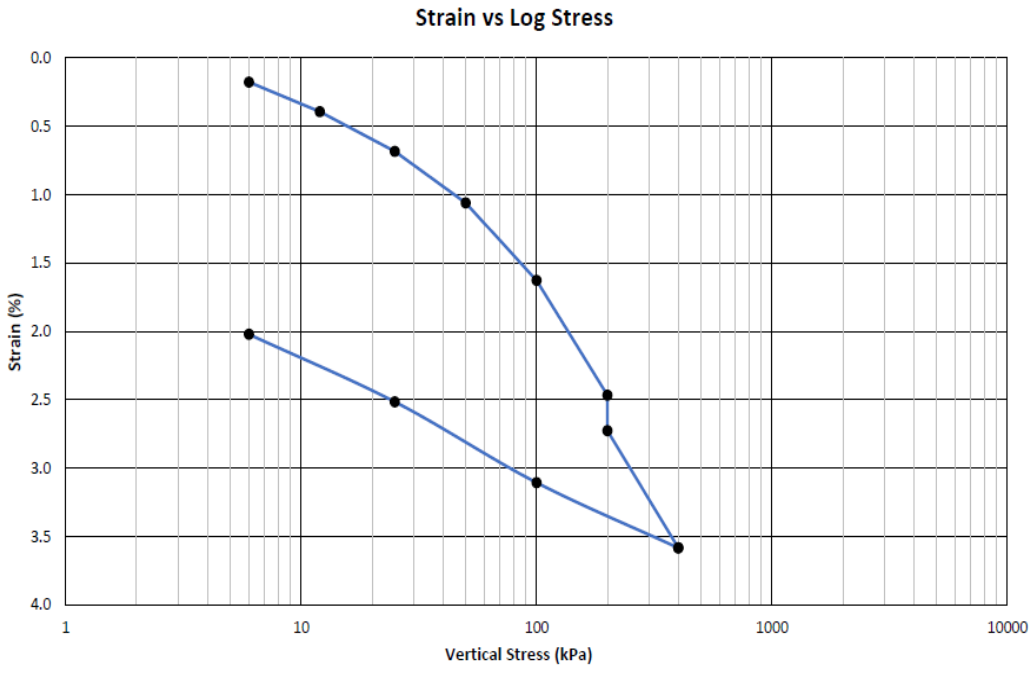
Client Name:	Wiltrade 32 (Pty) Ltd	**Job Number:**	WLT-758
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2100
Sample:	TP3	**Method:**	BS 1377 Part 5
Depth: (m)	1.10	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.26 %
Moisture Content	Initial	%	5.1			
	Final	%	12.8			
Dry Density		kg/m³	1939			
Void Ratio		-	0.366			
Degree of Saturation		%	37.1			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.36	25.30	25.23	25.13	24.99	24.77	24.71	24.49	24.61	24.76	24.89		
Total Strain	%	0.18	0.39	0.68	1.06	1.63	2.47	2.73	3.58	3.11	2.51	2.02		
Void Ratio	-	0.364	0.361	0.357	0.352	0.344	0.333	0.329	0.317	0.324	0.332	0.339		
Mv (1/Mpa)	-	-	0.362	0.223	0.152	0.114	0.086	-	0.044	0.017	0.081	0.267		



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Client Name:	Wiltrade 32 (Pty) Ltd	**Job Number:**	WLT-758
Project Name:	Hessequa Municipality: Heidelberg Geotechnical Investigation	**Lab Number:**	WLT-758-2100
Sample:	TP3	**Method:**	BS 1377 Part 5
Depth: (m)	1.10	**Date:**	03-Jun-24

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:		
Test Specimen Height		mm	25.4	Undisturbed	**Collapse Potential:**	0.26 %
Moisture Content	Initial	%	5.1			
	Final	%	12.8			
Dry Density		kg/m³	1939			
Void Ratio		-	0.366			
Degree of Saturation		%	37.1			
Relative Density (SG)		-	2.650	Assumed		

Vertical Stress Applied:	kPa	6	12	25	50	100	200	200	400	100	25	6		
Load applied for:	Hrs	1	1	1	1	1	1	16	1	1	1	1		
Height after increment	mm	25.36	25.30	25.23	25.13	24.99	24.77	24.71	24.49	24.61	24.76	24.89		
Total Strain	%	0.18	0.39	0.68	1.06	1.63	2.47	2.73	3.58	3.11	2.51	2.02		
Void Ratio	-	0.364	0.361	0.357	0.352	0.344	0.333	0.329	0.317	0.324	0.332	0.339		
Mv (1/Mpa)	-	-	0.362	0.223	0.152	0.114	0.086	-	0.044	0.017	0.081	0.267