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CIVIL DESIGN GEOTECHNICAL REPORT				
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1. LIST OF ABBREVIATIONS

Abbreviation	Meaning
AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing Materials
CBR	California Bearing Ratio
DCP	Dynamic Cone Penetrometer
EAP	Environmental Assessment Practitioner
EIT	Engineer-In-Training
EM	Electromagnetic
FDD	Field Dry Density
HSE	Health, safety and environment

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LL	Liquid Limit
Log	Logarithm base 10
MDD	Maximum Dry Density
NMC	Natural Moisture Content
OMC	Optimum Moisture Content
PI	Plasticity Index
PL	Plastic Limit
RMU	Ring Main Unit
S&BH	Stick and Bare Hand
ROC	Required Operational Capability
R²	Coefficient of determination
RS	Repeater Scada
RTU	Remote Terminal Unit
SE/F	Sensitive Earth Fault
SFRA	Sweep Frequency Response Analysis
SHEQ	Safety, Health, Environment and Quality
SI	Standards Implementation
SS	Substation
URS	United Registrar of System
VT	Voltage Transformer

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5. FOREWARD

This document is the Geotechnical Report for the **Maqhashiya Solar project Nkandla**.

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6. INTRODUCTION

Eskom's Distribution Division has begun preparing for a restructured electricity distribution industry and future energy markets. The business has identified the need to be agile, efficient, and accessible to customers. In addition, distribution's strategy objectives, goals, and initiatives have been aligned to Eskom's Just Energy Transition and to contribute to business success.

Part of the revised business strategy is to create a modernised distribution grid:

- 1) The distribution grid is to be flexible to accommodate bi-directional flow of energy.
- 2) The future grid needs to be an open grid enabling the integration of Distributed Energy Resources.
- 3) A key driver of the distribution business is to focus on technologies such as micro grids , service delivery, utilising the future development of smart grids and smart homes to meet the market needs.

Some of the focus areas for the new strategy will be:

- 1) Small-scale embedded generation (SSEG)
- 2) Battery energy storage systems (BESS)
- 3) Large-scale distributed energy resources
- 4) Containerised microgrid solutions
- 5) Other microgrids
- 6) Electric vehicles

Maqhashiya Village near Melmoth in KZN has been identified as a community that can benefit immensely from inclusion within Eskom's renewable energy endeavor. It has been identified that a mixture of Centralized Microgrid PV systems and Household PV Systems will be required to adequately meet the electrical demand of the village.

The NED Civil Design Team has been tasked with preparing a geotechnical study where the site's subsurface is evaluated for suitability as founding soils, and the results thereof are presented within this document.

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Therefore, this report documents the findings from the geotechnical investigations carried out on site and the following is discussed:

- The general site geology of the area and surroundings.
- Dynamic Cone Penetrometer Test results.

7. LOCALITY (MAPS)

A Google satellite graphic below provides an aerial view of the Maqhashiya Village. The individual households are also pin in yellow on the map.

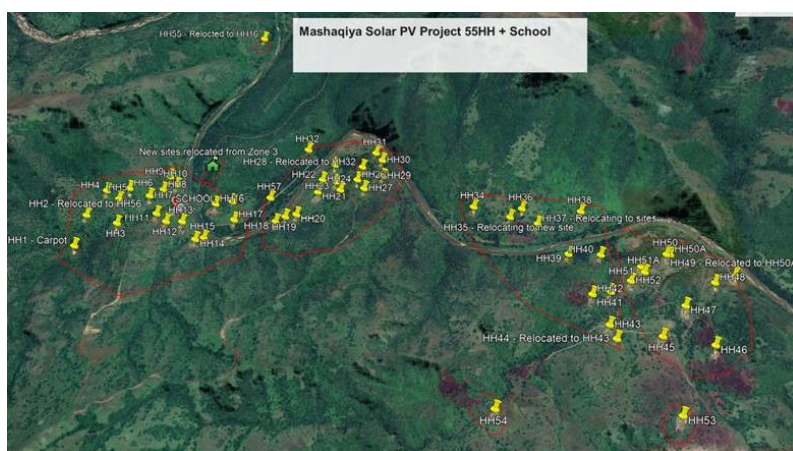


Figure 1: Aerial Satellite Graphic of Site (Google Maps)

Due to the informal setting of the settlements within the village, Maqhashiya Primary School was used as the main point of reference during site visits.

The coordinates of the Maqhashiya Primary School are:

28°43'00.4"S

31°16'21.6"E

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Access to the school is by means of a pedestrian bridge that crosses the Mhlatuze River. A Google Maps graphic is provided below showing an aerial view of the Maqhashiya Primary School.



Figure 2: Aerial Google Maps Graphic of Maqhashiya Primary School.

Provided below is a graphic of the access bridge to the Maqhashiya Primary School



Figure 3: Access bridge to the Maqhashiya Primary School

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8. SITE DESCRIPTION

Maqhashiya Village is a remote village about 20 km South of Melmoth Town. There are a total of 59 households and 1 primary school. When travelling to site there is a tarred road from the break-off from the R66 (south-bound from eMthonjaneni) and down P227, and into KwaMagwaza Town. Though the road is tarred, the condition of the road is in a dilapidated state. Past KwaMagwaza Town and towards Maqhashiya, the roads are made of gravel and dirt. The last roughly 9km travel before reaching the site, involves travel on such gravel & dirt roads that make their way down the mountain sides in a convoluted manner. Extra care is to be taken when traveling down these routes.

Once the main location of reference is reached (the Maqhashiya Primary School), the site(s) of interest are environments that are undeveloped mountain side terrain, rich with forestry and are mostly in close proximity to the Mhlathuzane River. The settlements in the village are informal dwellings that range from mud houses; house made of light wood and stones; and less than a handful of houses made of cinder blocks.

The entire site was divided into 7 distinct zones that each contain settlements that are in close proximity to one another.

Zone 1 contains households HH1 → HH17 (including Maqhashiya Primary School)

Zone 2 contains households HH18 → HH32

Zone 3 contains households HH34 → HH44

Zone 4 contains households HH45 → HH52

Zone 5 contains households HH53

Zone 6 contains households HH54

Zone 7 contains households HH55

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A graphic below is provided depicting the Zones on a Google Earth aerial satellite view.

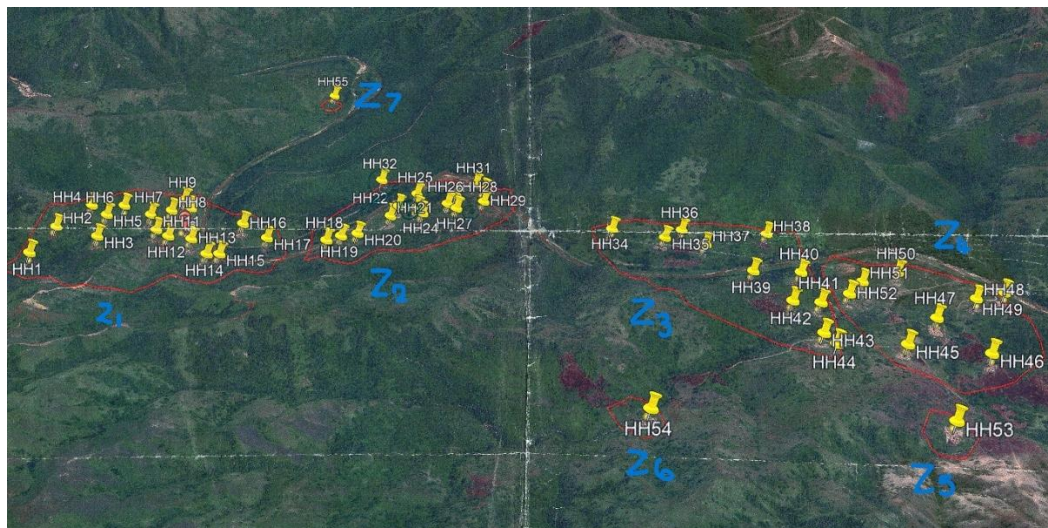


Figure 4: Graphic of Zoned Maqhashiya Map

The current proposed implementation of Solar PV technology across Maqhashiya Village is as follows.

Table 1: Maqhashiya Zones PV Tech. Configuration

Zone No.	Solar PV Technology	PV Tech. to Household configuration
Zone 1	Household Solar PV	1x Household Solar PV installed within each or outside the homestead property or an alternative Solar PV farm supplying a few Households strategically placed.
Zone 2	Household Solar PV	1x Household Solar PV installed within each or outside the homestead property or an alternative Solar PV farm supplying a few Households strategically placed.
Zone 3	Household Solar PV	1x Household Solar PV installed within each or outside the homestead property.
Zone 4	Household Solar PV	
Zone 5	Household Solar PV	
Zone 6	Household Solar PV	
Zone 7	Household Solar PV	

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9. DETAILED SITE GEOLOGY & GEOTECHNICAL CHARACTERISTICS

9.1. Prehistoric Geology

The geology of the Melmoth area in northern KwaZulu-Natal is exceptionally complex and significant, serving as a classic global example of a major geological crossroads. The region marks the structural transition zone where the ancient, stable Archaean core of southern Africa meets younger Mesoproterozoic mobile belts, all unconformably capped by upper Paleozoic to Mesozoic sedimentary and igneous sequences.

9.1.1. The Archaean Kaapvaal Craton Basement

Melmoth is structurally anchored on the southeastern margin of the Kaapvaal Craton, an ancient crustal block that stabilized over 3.0 billion years ago (Ga). This basement is exposed primarily along deep river valleys and structural windows eroded through younger cover rocks.

- **Granite-Gneiss Basement:** The underlying bedrock comprises deeply eroded Archaean granitoids, migmatites, and gneisses. These highly crystalline rocks represent the foundational continental crust of the region.
- **Greenstone Remnants:** Wedged within the granite-gneiss basement are highly altered fragments of ancient oceanic crust and volcano-sedimentary rocks. Notable local examples include the Ilangwe Greenstone Belt (located just south of Melmoth) and the Mfule Fault fragment. These packages contain structurally complex talc-tremolite schists, amphibolites, altered mafic volcanics, and banded cherts.

9.1.2. The Pongola Supergroup (Mesoarchaeon)

One of the most defining features of the Melmoth district is the presence of the Pongola Supergroup (~3.0 to 2.8 Ga). It is exposed in regional tectonic windows, such as the White Mfolozi and Mhlatuze inliers.

- **NSUZE GROUP (LOWER SUCCESSION):** The Nsuzi Group represents the initial rifting and development of the basin. It is characterized by thick, mature quartzites and sandstones representing ancient wave-dominated tidal and fluvial environments. These are heavily interlayered with massive sequences of continental basaltic to andesitic volcanic lavas (such as the Agatha Formation), signalling intense contemporaneous volcanic activity.

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- **MOZAAN GROUP (UPPER SUCCESSION):** The overlying Mozaan Group reflects a transition into alternating marine shelf and fluvial environments, comprising thick successions of shales, quartzites, and highly significant Banded Iron Formations (BIF).

9.1.3. The Tugela Front (Mesoproterozoic Suture)

Directly south of Melmoth lies the northern boundary of the Natal Metamorphic Province, specifically the Tugela Terrane. This boundary—known as the Tugela Front—is a major structural suture zone. Prehistorically, (during the Kibaran Orogeny), younger oceanic island arcs and marine volcano-sedimentary sequences were obducted and thrust intensely northward against the rigid, unyielding block of the ancient Kaapvaal Craton. This resulted in a heavily faulted, sheared, and folded landscape characterized by high-grade metamorphic rocks, including structural amphibolites, granulites, and highly sheared gneisses along the massive Tugela Fault system.

9.1.4. Phanerozoic Cover and Intrusions

The ancient Precambrian basement architecture is unconformably overlain by much younger sedimentary layers of the Karoo Supergroup (~300 to 250 million years old), which blanket the higher ridges and plateaus.

- **Dwyka Group:** The base of the Karoo sequence consists of thick tillite deposits, polymictic clasts, and minor sandstones. These were deposited by massive Permo-Carboniferous glaciers when southern Africa was positioned near the South Pole.
- **Ecca Group:** Overlying the glacial deposits are dark, carbonaceous shales and siltstones of the Pietermaritzburg Formation, transitioning upward into coarser sandstones deposited in post-glacial deltaic and shallow marine environments.
- **Karoo Dolerite Suite:** During the Jurassic period (~180 Ma), continental breakup triggered widespread igneous activity. The entire stratigraphic column in the Melmoth area was extensively intruded by highly resistant dolerite dykes and horizontal sills. Because dolerite resists chemical weathering far better than the surrounding shales and sandstones, these structures form the flat-topped caps, ridges, and rugged escarpments typical of the modern Zululand topography.

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A visual graphic is provided below depicting the geology that is detailed above.

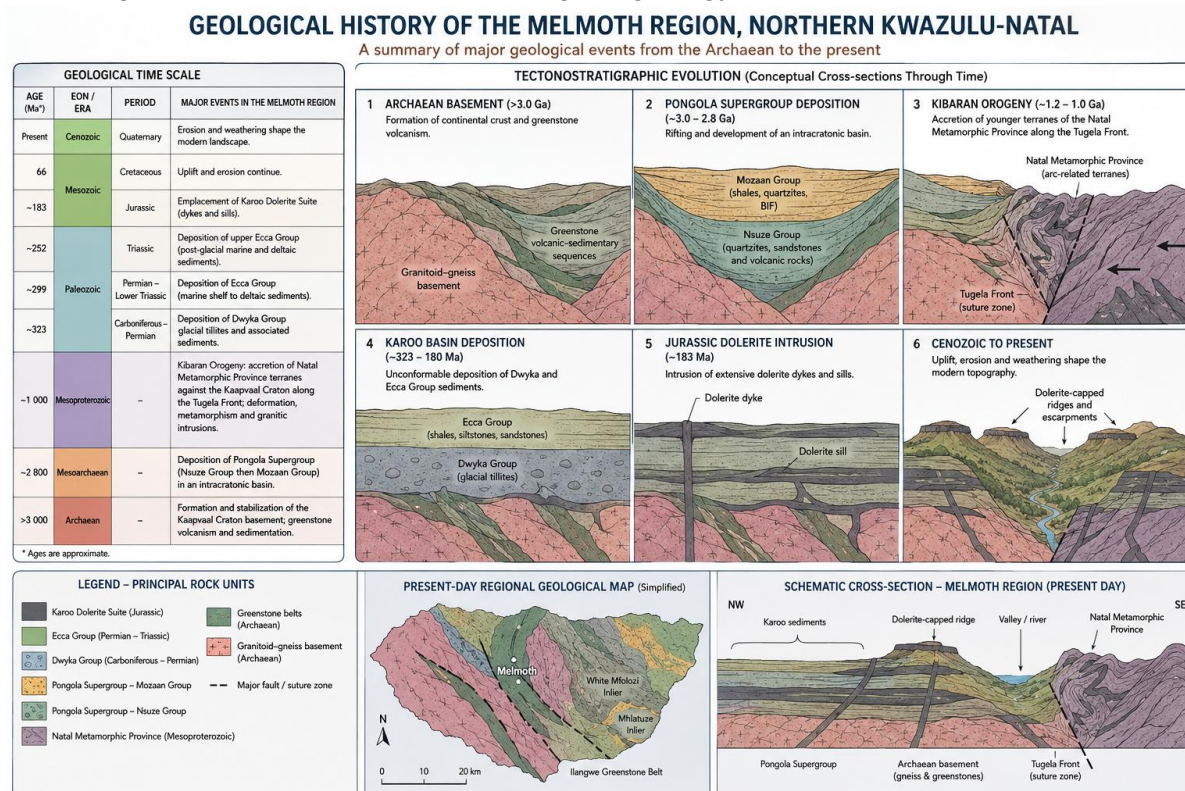


Figure 5: Graphic Depicting the Geological History of the Melmoth Region

9.2. Geotechnical Characteristics

9.2.1. Prelude to Geotechnical Conditions

Substantiated by the presented Geological History, the following key points are also admitted in support of the geotechnical position:

Weathering Environment Strongly Favours Clay Formation

Northern KZN experiences...

- warm subtropical temperatures,
- high seasonal rainfall,
- intense chemical weathering.

Karoo Ecca Shales Are Major Clay Producers'

These weather into:

- highly cohesive clayey soils,
- plastic silty clays,
- dispersive clays in some areas.

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Typical products include:

- grey clay,
- brown silty clay,
- highly plastic residual shale soils.

Dolerite Intrusions Produce Very Cohesive Expansive Clays

Where Jurassic dolerite sills or dykes occur, weathering commonly produces:

- dark red clays,
- black cotton-type clays,
- Montmorillonitic expansive soils,
- very plastic residual soils.

River Floodplains Naturally Accumulate Fine Sediments

Expected deposits include:

- silty clay alluvium,
- laminated clayey overbank deposits,
- organic silts,
- flood-basin muds.

Structural and Geomorphic Setting Encourages Fine Sediment Retention

This commonly creates:

- localized low-energy depositional pockets,
- flood benches
- terrace accumulations, where fine-grained cohesive material settles.

9.2.2. Soil Composition for various areas within the Mhlathuze River Corridor

Likely Soil Composition Along the Corridor Near Active River Margins

- recent alluvium,
- silty clay,
- sandy clay,
- soft floodplain deposits,
- occasionally loose sands/gravel bars.

Likely Soil Composition Along the Corridor Near Slightly elevated terraces

- stiff clay,
- residual shale soils,
- ferruginized clay,
- clayey colluvium

Likely Soil Composition Along That Corridor Near Slopes

- colluvial clayey soils,
- decomposed shale,
- residual doleritic clay,
- mixed gravel-clay soils.

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9.2.3. Overall and Prevailing Soil Composition Category

This report maintains that the most likely and dominant soil type to be found around Maqhashiya Village is **COHESIVE SOILS**.

A table below is presented relating the Regional Parent Lithology to the expected Soil Cohesion; typical Geotechnical Behaviour and Structural Risks.

Table 2: Table of Parent Lithology correlated to Geotechnical Behaviour

Parent Bedrock	Soil Cohesion	Dominant Soil Texture	Primary Engineering Risk
Karoo Dolerite	High to Very High	Plastic active clays (Red/Black)	Severe foundation heave & swelling
Ecca/Mozaan Shales	Moderate to High	Silty clays / Overconsolidated clays	Slope instability, creep, slide planes
Greenstones / Amphibolites	High	Heavy mafic residual clays	Low permeability, poor drainage
Archaean Granites	Low / Semi-Cohesive	Residual sandy granite saprolites	Highly variable density, scouring
Quartzites / Sandstones	None to Negligible	Residual silica sands / Arenites	Collapse grain fabric, settlement

10. METHODS OF INVESTIGATION

10.1. Fieldwork Overview

The fieldwork was carried out during a site visit to Maqhashiya Village, during the the 20th to the 22nd May 2026. The activities carried out were a total of 13 DCPs Tests on Zones 1 and Zones 2. The Zones 3 to 7 soil conditions were not tested due to site access limitations and time constraints. For all of the Zones, unfortunately, on-site excavations of the soil were not performed due to logistical challenges. These excavations are immensely insightful in directly ascertaining the subsurface soil conditions (especially in discerning groundwater proximity to founding depth) and classifying the soils using the CCMSSO system:

1. Colour

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2. Consistency
3. Moisture Condition
4. Structure
5. Soil Type
6. Origin

In the absence of the on-site excavations, assigning soil categories is predominantly motivated by consultation with available literature as presented in section 10.

A table of the performed DCP Tests per zone is presented below.

Table 3: Table of DCP Tests per Zone

<u>Area</u>	<u>No. of DCP Test Performed</u>
Zone 1	3
Zone 2	10
Zone 3	None
Zone 4	None
Zone 5	None
Zone 6	None
Zone 7	None

10.1.1. Map depiction of DCP Test Locations

Zone 1 Map of DCP Test Locations

In the graphic below, an aerial satellite view is provided of the DCP Test locations denoted as X_i in respective order.



Figure 6: Zone 1 Map of DCP Test Locations

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An image is provided below of DCP Test at position X₁



Figure 7: Image of DCP Test at position X₁

An image is provided below of DCP Test at position X₂

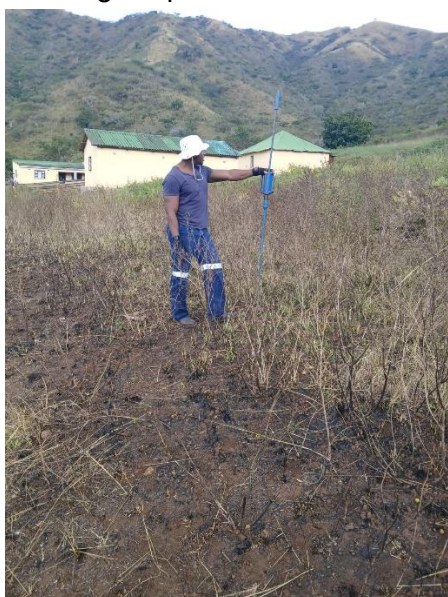


Figure 8: Image of DCP Test at position X₂

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An image is provided below of DCP Test at position X_3



Figure 9: Image of DCP Test at position X_3

Zone 2 Map of DCP Test Locations

In the graphic below, an aerial satellite view is provided of the DCP Test locations denoted as X_i in respective order.

It is to be noted that DCP Tests X_8 , X_9 , X_{10} , and X_{11} , indicated that a large subsurface rock was present at a depth of roughly 500-600mm below NGL.



Figure 10: Zone 2 Map of DCP Test Locations

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It is to be noted that DCP Tests X₈, X₉, X₁₀, and X₁₁, indicated that a large subsurface rock was present at a depth of roughly 500-600mm below NGL. If there no inclination to drill into the rock and anchor the would-be foundations there within, Positions A₁, A₂ and A₃ are alternatives for microgrid placement.

An image is provided below of HH (Household) 32



Figure 11: Image of HH(Household)32

An image is provided below of DCP Test at position X₄



Figure 12: Image of DCP Test at position X₄

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An image is provided below of DCP Test at position X₅



Figure 13: Image of DCP Test at position X₅

An image is provided below of DCP Test at position X₆



Figure 14: Image of DCP Test at position X₆

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An image is provided below of the Mhlathuze River crossing, before accessing DCP position X₇

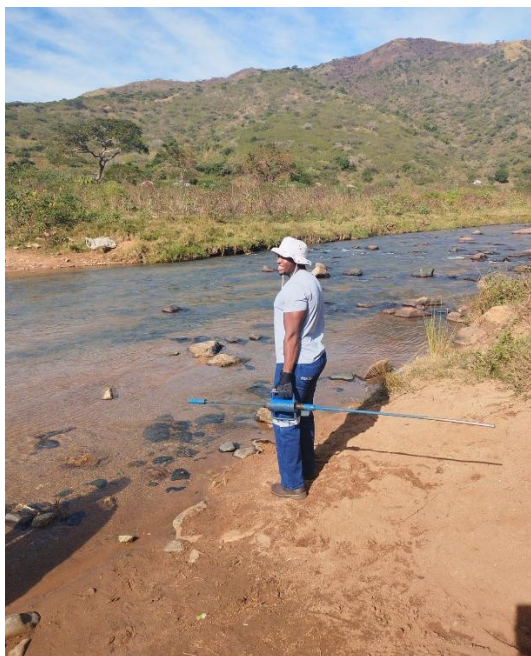


Figure 15: Image of Mhlathuze River crossing

An image is provided below of DCP Test at position X₇



Figure 16: Image of DCP Test at position X₇

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An image is provided below of DCP Test at position X₉



Figure 17: Image of DCP Test at position X₉

An image is provided below of DCP Test at position X₁₂



Figure 18: Image of DCP Test at position X₁₂

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An image is provided below of DCP Test at position X₁₃

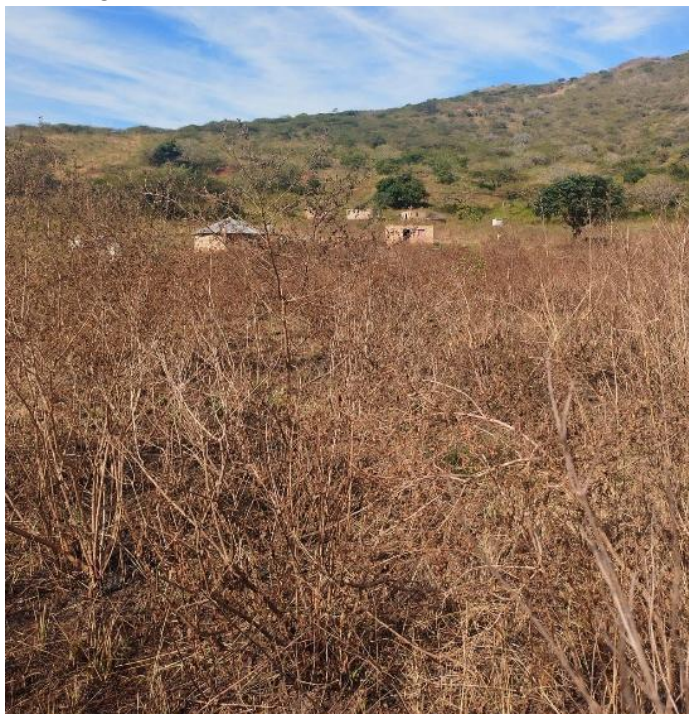


Figure 19: Image of DCP Test at position X₁₃

Zones 3 – 7 Map of DCP Test Locations

*No DCP Tests Performed

10.2. DCP Tests

10.2.1. Overview of Dynamic Cone Penetrometer Tests

The DCP test is a simple, cost-effective and quick method to use in measuring the strength of the underlying material to reasonable accuracy.

The basic principle involved in the operation of this apparatus is the measurement of the resistance offered by the soil layers to the penetration of a standard cone driven by a freely falling hammer through a height. The amount of penetration (in mm) of the cone is generally reported in terms of the average penetration per blow (mm/blow).

As the in-situ strength is directly and inversely proportional to the density and the moisture content, respectively (i.e., the in-situ strength increases with increasing density and decreases with increasing moisture content), it is essential, although difficult, that these relationships are considered during the design process (Paige-Green, 2011).

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11. DCP TEST RESULTS AND SUMMARY

11.1. California Bearing Ratio (CBR) Results

11.1.1. Zone 1 DCP-Correlated CBR(%) To Material Classification

Table 4: Zone 1 DCP-correlated CBR(%) to Material Classification

<u>ZONE 1 (near Maghashiya School)</u>			
DCP Test No.	CBR Value (%)	Likely Material Classification	Overall Material Classification
1	14	G8	Average CBR between the successful tests = 14.33 ∴ Accept site material as G8
2	17.38	G7	
3	11.59	G8	

11.1.2. Zone 2 DCP-Correlated CBR(%) To Material Classification

Table 5: Zone 2 DCP-correlated CBR(%) to Material Classification

ZONE 2 (directly on HH32)			
DCP Test No.	CBR Value (%)	Likely Material Classification	Overall Material Classification
4	10.78	G8	Average CBR between the successful tests = 14.02 ∴ Accept site material as G8
5	10.38	G8	
6	20.91	G7	
Zone 2 (South-East Side of River: HH18 – HH31)			
7	7.32	G9	Average CBR between the
8	No result (refusal at 500mm depth) 1.98 Average CBR @ refusal	G10	

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9	No result (refusal at 500mm depth) 1.49 Average CBR @ refusal	G10	successful tests = 9.8 ∴ Accept site material as G8
10	No result (refusal at 400mm depth) 0.75 Average CBR @ refusal	G10	
11	No result (refusal at 500mm depth) 3.59 Average CBR @ refusal	G10	
12	*16.06 (Highly dense material at 800mm depth, akin to rock and requiring >23+ blows	G7	
13	6.02	G10	

11.1.3. Zones 3-7 DCP-Correlated CBR(%) To Material Classification

*No DCP Tests Performed

11.2. Soil Type Nomination Results

11.2.1. Zone 1 DCP-Correlated Eskom Soil Type

Table 6: Zone 1 DCP-Correlated Eskom Soil Type

<u>ZONE 1 (near Maghashiya School)</u>			
DCP Test No.	Average DCP No.	Likely Soil Type	Overall Soil Type Classification
1	7	Soil Type 1	Average DCP no. between the successful tests = 7.1 → Soil Type 1 However, due to foundations being located on a floodplain... ∴ Accept site material as <u>Soil Type 2</u>
2	8.30	Soil Type 1	
3	6	Soil Type 2	

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11.2.2. Zone 2 DCP-Correlated Eskom Soil Type

Table 7: Zone 2 DCP-Correlated Eskom Soil Type

ZONE 2 (directly on HH32)			
DCP Test No.	Average DCP No.	Likely Soil Type	Overall Soil Type Classification
4	5.70	Soil Type 2	Average DCP no. between the successful tests = 6.93 → Soil Type 2 However, due to foundations being located on a floodplain... ∴ Accept site material as <u>Soil Type 3</u>
5	5.50	Soil Type 2	
6	9.60	Rock (accept Soil Type 1)	
Zone 2 (South-East Side of River: HH18 – HH31)			
7	4.20	Soil Type 3	Average DCP no. between the successful tests = 5.85 → Soil Type 2 However, due to foundations being located on a floodplain... ∴ Accept site material as <u>Soil Type 3</u>
8	No result (refusal at 500mm depth) 3.75 Average CBR @ refusal	Soil Type 3	
9	No result (refusal at 500mm depth) 2.40 Average CBR @ refusal	Soil Type 4	
10	No result (refusal at 400mm depth) 2.33 Average CBR @ refusal	Soil Type 4	
11	No result (refusal at 500mm depth) 4.80 Average CBR @ refusal	Soil Type 3	
12	*9.75 (Highly dense material at 800mm	Rock (accept Soil Type 1)	

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	depth, akin to rock and requiring >23+ blows		
13	3.60	Soil Type 3	

11.2.3. Zones 3-7 DCP-Correlated Eskom Soil Type

*No DCP Tests Performed

11.3. Discussion on Summary of Results

Soil Types

- Zone 1 → on field test result = Soil Type 1.
Accepted result (considering likely foundation flooding) → **Soil Type 2.**
- Zone 2 → on field test result = Soil Type 2
Accepted result (considering likely foundation flooding) → **Soil Type 3.**

Standard Classification of Natural Road Building Materials

- For the investigated Zones (Zones 1 and 2), the material type classification is largely consistently G8 material across all 13 DCP Tests.

Recommendations For Zone 3 to 7

- For soil type nomination and material classification in Zones 3 -7, it is highly recommended that tests are directly undertaken within each of the zone sites to determine such parameters. This report is unable to sensibly suggest that the results of Zones 1 and 2 can be accepted to be used as results for all the remaining Zones (especially Zones 5-7, since they are further up on the mountainside and may exhibit distinctly different geotechnical conditions).

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12. ESKOM CLASSIFICATION TABLES FOR DCP TEST CORRELATIONS

12.1. Soil Type

Table 8: Eskom Classification for DCP Test Correlations

Document Classification: Controlled Disclosure

CONVENTIONAL STAY PLANTING AND COMPACTION, POLE PLANTING AND COMPACTION
AND ROCK ANCHOR INSTALLATION AND TESTING STANDARD

Unique Identifier: 240-75883148

Revision: 2

Page: 22 of 24

Table A.3: Soil Nomination

DCP Soil Nominations						
DCP 'N' No. Penetrations (Blows/100mm)	Sandy Soils (Non Cohesive)	Gravel Soils (Non Cohesive)	Clay Soils (Cohesive)	Rock	Approx. Unconfined Compressive Strength kPa	Type Soil
1-2	Very loose	Very soft	Very soft	--	50 - 100	4
3-4	Loose to med dense	Loose to med dense	Soft to firm	--	100 - 150	3
5-6	Med Appendix A (Continued) dense to dense	Med dense to dense	Firm to stiff	Very soft rock	150 - 300	2
7-8	Dense to very dense	Dense to very dense	Stiff to hard	Soft rock	300 - 450	1
9+	Hard	Hard	Hard	Weathered to hard rock	800	Rock
No penetration				Hard rock	2000	Rock

Note: For dry clays or turf halve the 'N' Number.

12.2. Material Evaluation (CBR %)

Table 9: Material Evaluation

Test Density	CBR (%)	Possible Design Equivalent Material Class
98% Mod. AASHTO or In-Situ Density	>100 80 to 99	G1 G2, G3 or G4
95% Mod. AASHTO or In-Situ Density	45 to 79	G5
93% Mod. AASHTO or In-Situ Density	25 to 44 15 to 24	G6 G7
90% Mod. AASHTO or In-Situ Density	10 to 14 7 to 9 <7	G8 G9 G10

Note: Interpretation ranges are based mainly on TRH14 Guidelines

12.3. Excavation Requirements And Stability Of Excavations

As a general guideline of the likely excavation requirements in terms of SABS1200: DM (current version) for the creation of foundation excavations, the following is provided:

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ESKOM Type 1 to Type 3 Soil materials: Soft Excavation

ESKOM Type Soft Rock materials: Intermediate Excavation

ESKOM Type Hard Rock materials: Hard Excavation, with possible blasting

Loose/soft materials in upper 0.5 to 1 metres of the soil profile [1V:1.5H]

Medium dense/ firm materials below about 1 metre depth [1V:1H]

Dense/Stiff and very dense/ very stiff materials [Vertical].

Health and safety regulations governing the formation of excavations and their requirements for shoring below a certain depth must be taken into consideration.

Extra care should be exercised when dealing with the excavation of this nature.

13. GEOTECHNICAL RECOMMENDATIONS

13.1.1. Excavation Requirements

It is anticipated that soft excavations will be required at approx. depth of 0-1000mm.

13.1.2. General Terrace Layer Works

Cut and spoil 150mm of topsoil. Rip and compact in-situ material, Import G8 or better commercial material and fill (in layer works) to achieve the required terrace levels.

13.1.3. Foundations

The DCP Results suggest that the soils that are to support the foundations are of type 1. This means that the soils are expected to provide a **maximum of 300kPa bearing capacity**, at foundation depth.

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14. APPENDIX A: DCP RESULTS

14.1. Zone 1 DCP Tests

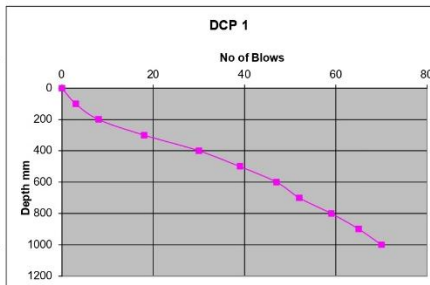
DCP 1

Rod length (mm)
constant

1000
-1.27 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
3	3	900	100	100	3
5	8	800	100	200	5
10	18	700	100	300	10
12	30	600	100	400	12
9	39	500	100	500	9
8	47	400	100	600	8
5	52	300	100	700	5
7	59	200	100	800	7
6	65	100	100	900	6
5	70	0	100	1000	5
70			1000		

DN mm/blow 14.29
Average DCP No 7.00
CBR (%) 14.00



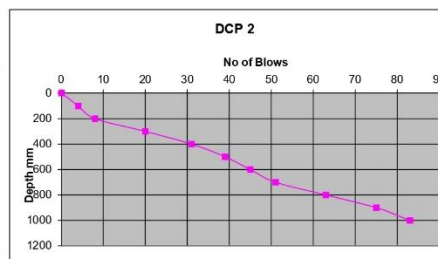
DCP 2

Rod length (mm)
constant

1000
-1.27 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
4	4	900	100	100	4
4	8	800	100	200	4
12	20	700	100	300	12
11	31	600	100	400	11
8	39	500	100	500	8
6	45	400	100	600	6
6	51	300	100	700	6
12	63	200	100	800	12
12	75	100	100	900	12
8	83	0	100	1000	8
83			1000		

ND mm/blow 12.05
Average DCP No 8.30
CBR (%) 17.38



DCP 3

Rod length (mm)
constant

1000
-1.27 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
2	2	900	100	100	2
2	4	800	100	200	2
6	10	700	100	300	6
7	17	600	100	400	7
6	23	500	100	500	6
5	28	400	100	600	5
6	34	300	100	700	6
7	41	200	100	800	7
10	51	100	100	900	10
9	60	0	100	1000	9
60			1000		

DN mm/blow 16.67
Average DCP No 6.00
CBR (%) 11.51

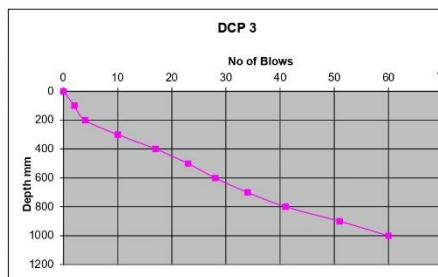


Figure 20: Appendix Zone 1 DCP Test Detailed Results

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14.2. Zone 2 (directly on HH32) DCP Tests

DCP 4

Rod length (mm)
constant -1.27 1000 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
3	3	900	100	100	3
2	5	800	100	200	2
4	9	700	100	300	4
7	16	600	100	400	7
7	23	500	100	500	7
9	32	400	100	600	9
6	40	300	100	700	6
6	46	200	100	800	6
5	51	100	100	900	5
6	57	0	100	1000	6
57			1000		

DN mm/blow 17.54
Average DCP No 5.70
CBR (%) 10.78



DCP 5

Rod length (mm)
constant -1.27 1000 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
3	3	900	100	100	3
2	5	800	100	200	2
3	8	700	100	300	3
5	13	600	100	400	5
7	20	500	100	500	7
6	29	400	100	600	6
9	37	300	100	700	9
6	43	200	100	800	6
8	51	100	100	900	8
4	55	0	100	1000	4
55			1000		

ND mm/blow 18.18
Average DCP No 5.50
CBR (%) 10.30



DCP 6

Rod length (mm)
constant -1.27 1000 410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth(mm)	blows/100mm
0	0	1000	0	0	
4	4	900	100	100	4
3	7	800	100	200	3
9	16	700	100	300	9
15	31	600	100	400	15
14	45	500	100	500	14
10	55	400	100	600	10
13	68	300	100	700	13
10	78	200	100	800	10
8	86	100	100	900	8
10	96	0	100	1000	10
96			1000		

DN mm/blow 10.42
Average DCP No 9.60
CBR (%) 20.94

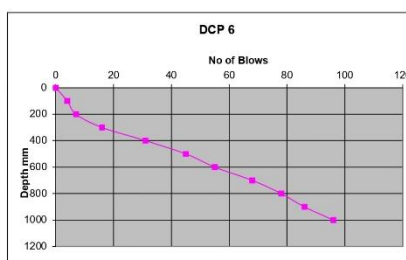


Figure 21: Appendix Zone 2 (HH32) DCP Test Detailed Results

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14.3. Zone 2 (South-East Side of River: HH18 – HH31) DCP Tests

DCP 7

Rod length (mm)
constant

-1.27 1000
410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth (mm)	blows/100mm
0	0	1000	0	0	
3	3	900	100	100	3
2	5	800	100	200	2
4	9	700	100	300	4
4	13	600	100	400	4
2	15	500	100	500	2
3	18	400	100	600	3
3	21	300	100	700	3
4	25	200	100	800	4
4	29	100	100	900	4
13	42	0	100	1000	13
42			1000		

DN mm/blow
Average DCP No
CBR (%)

23.81
4.20
7.32



DCP 8

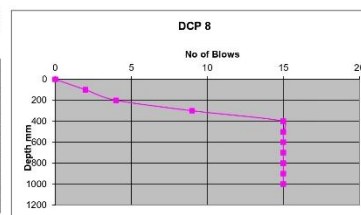
Rod length (mm)
constant

-1.27 1000
410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth (mm)	blows/100mm
0	0	1000	0	0	
2	2	900	100	100	2
2	4	800	100	200	2
5	9	700	100	300	5
6	15	600	100	400	6
	15	500	100	500	0
	15	400	100	600	0
	15	300	100	700	0
	15	200	100	800	0
	15	100	100	900	0
	15	0	100	1000	0
15			1000		

ND mm/blow
Average DCP No
CBR (%)

66.67
3.75
1.98



DCP 9

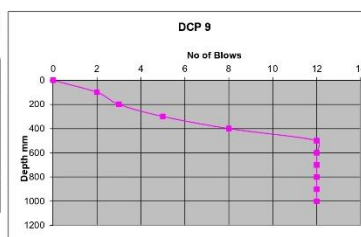
Rod length (mm)
constant

-1.27 1000
410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth (mm)	blows/100mm
0	0	1000	0	0	
2	2	900	100	100	2
1	3	800	100	200	1
2	5	700	100	300	2
3	8	600	100	400	3
4	12	500	100	500	4
	12	400	100	600	0
	12	300	100	700	0
	12	200	100	800	0
	12	100	100	900	0
	12	0	100	1000	0
12			1000		

DN mm/blow
Average DCP No
CBR (%)

83.33
2.40
1.49



DCP 10

Rod length (mm)
constant

-1.27 1000
410

No Blows	Acc Blows	Actual Reading	Depth (mm)	Acc. Depth (mm)	blows/100mm
0	0	1000	0	0	
2	2	900	100	100	2
1	3	800	100	200	1
4	7	700	100	300	4
	7	600	100	400	0
	7	500	100	500	0
	7	400	100	600	0

DN mm/blow
Average DCP No
CBR (%)

83.33
2.40
1.49

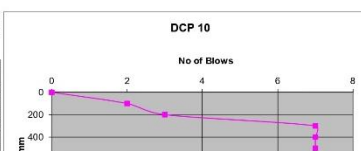


Figure 22: Appendix Zone 2 (HH18-HH31) DCP Test Detailed Results (a)

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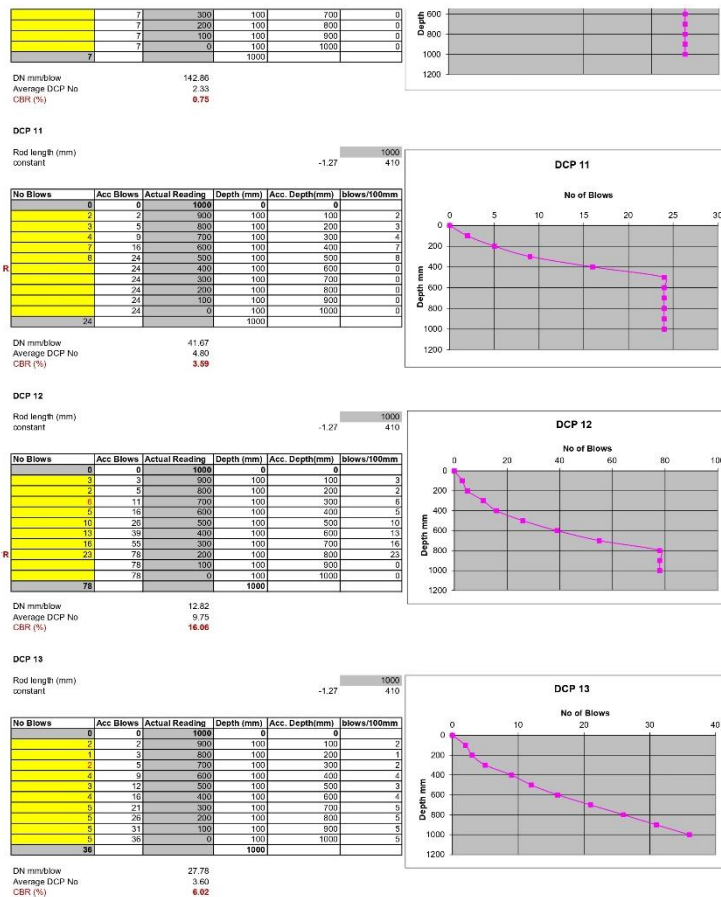


Figure 23: Appendix Zone 2 (HH18-HH31) DCP Test Detailed Results (b)

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