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HORN OF AFRICA GATEWAY DEVELOPMENT PROJECT (HOAGDP)

Consulting Services for Design and Works Supervision for the Proposed Extension of Meru Bypass (17.5 Km)

CONTRACT NO.: KeNHA/CS/D/4205/2024





FINAL REPORT

R4-09 – FACTUAL MATERIALS REPORT

OCTOBER 2025

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ABBREVIATIONS

AC	Asphalt Concrete
ACV	Aggregate Crushing Value
AASHTO	American Association of State Highway Transportation Officials
CBR	California Bearing Ratio
CESA	Cumulative Equivalent Standard Axles
DBM	Dense Bitumen Macadam
DD	Dry Density
DD#	Detailed Design Trial Pit No.
GCS	Graded Crushed Stone
GI	Group Index
GPS	Global Positioning System
km	Kilometre
LL	Liquid Limit
m	Metre
Max	Maximum
MDD	Maximum Dry Density
Min	Minimum
NMC	Natural Moisture Content
OMC	Optimum Moisture Content
PD#	Preliminary Design Trial Pit No.
PI	Plasticity Index (Product of PI and % passing 0.075 mm sieve)
PIw	Weighted Plasticity
PL	Plastic Limit
PM	Plasticity Modulus (Product of PI and % passing 0.425 mm sieve)
PSD	Particle Size Distribution
S1 to S6	Strength classes used to characterize the subgrade in pavement design
SG	Stabilised Gravel
SPT	Standard Penetration Test
SSS	Sodium Sulphate Soundness
ToR	Terms of Reference
WMAAT	Weighted Mean Annual Average Air Temperature
WMAPT	Weighted Mean Annual Pavement Temperature

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EXECUTIVE SUMMARY

0 EXECUTIVE SUMMARY

0.1 - Project and Report Details

The Contract

The Kenya National Highways Authority (KeNHA), Nairobi, Kenya, requested on 7th June 2024 selected companies to submit Technical and Financial Proposals for carrying out Consultancy Services for "***Design and Works Supervision for the Proposed Extension of Meru Bypass (17.5 Km)***".

On **14th June 2024,** a service contract was signed between the Kenya National Highways Authority (KeNHA) and Egis Kenya Limited (Kenya) in Joint Venture with Egis Villes Et Transport Limited (France) for carrying out these services.

The order to commence the services of the lump-sum contract was sent on the **1st August 2024** with the official commencement date of **15thAugust 2014** which is 29 calendar days after signing the Contract.

This Report

The Factual Materials Report is one of the deliverables for the **Draft Final Report of the Detailed Design phase** for Consulting Services for Design and Works Supervision for the Proposed Extension of Meru Bypass (17.5 Km).

This report covers the factual geotechnical site and laboratory investigations for subgrade, construction materials and footbridges.

Consultancy Services

The current assignment comprises Consultancy Services that are phased as follows:

- **Phase 1 – Feasibility Study, Preliminary Design and Detailed Engineering Design**
  - Phase 1a: Preliminary Design
  - Phase 1b: Detailed Engineering Design and Preparation of Tender Documents
  - Phase 1c: Assistance to the Client during Bidding for Works
- **Phase 2 – Construction Supervision**
  - Phase 2a: Preparatory Activities
  - Phase 2b: Construction Supervision
  - Phase 2c: Defects Liability Supervision

Principal components of the Services

Materials and pavement

Introduction

This executive summary presents the essential outcomes of the Materials Investigations and Pavement Design study for the Meru Bypass Extension (17.5 km). It summarizes the methodology, key findings, and recommended pavement and footbridge designs. The full details are contained in the Materials Investigations and Pavement Design Report (R4-03).

Investigations and Surveys Undertaken

The geotechnical investigations undertaken included excavation of trial pits and boreholes along the alignment, together with in-situ testing and sampling. Laboratory tests were carried out on representative samples for Atterberg limits, particle size distribution, compaction, soaked and unsoaked CBR, and swelling characteristics. Potential material sources were identified and tested, including borrow pits, quarries, sands, and water sources. Geotechnical drilling and testing were also carried out at the two proposed pedestrian footbridge sites at Kaaga Boys High School and Meru Polytechnic. Classified traffic counts and axle load surveys were conducted, and growth projections were established.

Key Findings:

1. **Subgrade Conditions**

   The subgrade soils along the alignment were found to be predominantly fine-grained clays and silts, with plasticity indices generally in the range of 22 to 30 percent. Weighted plasticity indices exceeded 2000 in several sections, indicating a tendency toward expansive behavior. Soaked CBR values typically ranged between 5 and 12 percent, with swelling potential categorized as moderate to high. Consequently, the native subgrade was classified mainly as Class S2 (CBR 5–10 percent), with some localized stretches achieving Class S3 (CBR 10–15 percent). Sections 1 and 3 roads were comparatively weaker, averaging about 9 to 11 percent and 8 to 9 percent CBR respectively, while Section 2 exhibited slightly better subgrade strength at 10 to 12 percent. Section 4 was variable, ranging between S2 and S3 classifications.

2. **Material Sources**

   Two principal borrow areas were identified as suitable for construction: Nkunga, located about 7.5 km from Meru, contains an estimated 750,000 cubic metres of brown volcanic gravel, while Rugusu, located approximately 20 km from Meru, contains about 2.25 million cubic metres of grey angular gravel. Both materials are non-plastic and, when treated with 3 to 4 percent cement, achieved soaked CBR values exceeding 200 percent, confirming their suitability for use as subbase or improved subgrade material.

   Hardstone for base and asphalt aggregate can be sourced from three tested quarries: Isico, Harikrushna, and Kicoh. Aggregate testing showed Los Angeles Abrasion values between 20 and 22 percent, Aggregate Crushing Values between 17 and 18 percent, and sodium sulphate soundness below 4 percent. These results are comfortably within specification limits, confirming their adequacy for medium to heavy traffic road construction.

   Quarry and river sands, including those from the Ewaso Ngiro River, satisfied grading and cleanliness requirements with silt contents below 3 percent, making them suitable for mortar and concrete works.

Water samples collected from the Kathita and Kanyuru Rivers were found to meet KEBS and WHO quality standards, with pH values between 6.9 and 7.2 and turbidity levels below 5 NTU, confirming their suitability for compaction and concrete use.

3. Footbridges

At the proposed footbridge sites, geotechnical drilling and testing confirmed the feasibility of shallow pad foundations.

At Meru Polytechnic, a pad footing measuring 3.5 by 3.0 metres at a depth of 3.0 metres was recommended, with an allowable bearing capacity of 388 kPa.

At Kaaga Boys High School, a larger pad of 5.0 by 3.5 metres at the same depth was advised, with an allowable bearing capacity of 202 kPa. Both sites present stable geotechnical conditions requiring conventional shallow foundations.

4. Traffic Loading

Traffic surveys and axle load measurements projected a cumulative loading of between 4.5 and 9.0 million Equivalent Standard Axles (CESA) over the 20-year design period. This level of loading corresponds to Traffic Class T3 under the Kenyan Roads Design Manual-Part 3, 1987 classification.

5. Pavement Design

Pavement design was undertaken using RDM Part 3 and mechanistic-empirical verification. Based on the subgrade conditions (S2/S3) and projected T3 traffic loading, the recommended solution is the RDM Type 8 flexible pavement structure with a stabilized subbase for enhanced durability.

For sections linking Three Steers, Kambakia, and KEMU, where the cumulative traffic is about 5.0 million CESAs, the recommended structure consists of a 50 mm asphalt concrete surfacing, a 150 mm graded crushed stone base, a 200 mm cement improved subbase, and a 350 mm compacted subgrade.

For the Runogone–Kaithe link, which carries about 4.5 million CESAs, the same layer thicknesses are recommended. The Hospital Road links, with about 7.0 million CESAs, require a slightly thicker 175 mm graded crushed stone base.

The Western Bypass links, which are projected to carry the heaviest traffic of about 9.0 million CESAs, require a 200 mm graded crushed stone base while retaining the same thicknesses of asphalt surfacing, stabilized subbase, and subgrade as the other sections.

Conclusions and Recommendations:

The investigations confirm the availability of adequate natural materials within reasonable haulage distances for the construction of the Meru Bypass Extension. The subgrade soils along the alignment are moderately expansive and require replacement up to 0.6m. Borrow and quarry sources are suitable but should be subjected to strict quality control during construction. Cement stabilization should be systematically applied in subbase layers to enhance performance. Adequate drainage is critical and has been addressed as part of the design review process, given the moisture sensitivity of the subgrade.

The recommended flexible pavement structures are adequate to sustain the projected traffic loading of 4.5 to 9.0 million CESAs over 20 years. The two proposed pedestrian footbridges can be supported on shallow pad foundations without the need for specialized ground improvement.

Finally, periodic maintenance aligned with traffic growth will be necessary to preserve the serviceability of the facility throughout its design life.

TABLE 0-1 : SUMMARY OF TRAFFIC CLASS AND PAVEMENT STRUCTURES

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA	Proposed Pavement Structures
1	1.1	Three Steers – Kambakia Road	2.47	5,000,000 Traffic Class T3	AC-50 GCS-150 C/L Imp.-200 Imp. Subgrade-350
	1.2	Kambakia – Kagotone/ KEMU C91 Rd	3.317		
	1.3	Kagotone - KEMU Link C91 Road	0.349		
	1.4 and 1.5	Kongoacheke Jct - Kwa Mukuru Jct (2.5 km) & Kongo gardens - Kambakia Link Rd (0.45 km)	2.941		
2	2	Runogone – Kaithe Road	1.76	4,500,000 Traffic Class T3	AC-50 GCS-150 C/L Imp.-200 Imp. Subgrade-350
3	3.1	Hospital Road – Kiramburine Jct	1.938	7,000,000 Traffic Class T3	AC-50 GCS-175 C/L Imp.-200 Imp. Subgrade-350
	3.1	Link 1 – Meru Bus Terminus	0.465		
	3.2	Link 2 – Gakoromone Market	0.642		
	3.3	Link 3 – MEWAS Jct	0.341		
4	4.1	Western Bypass – Link Road	0.706	9,000,000 Traffic Class T3	AC-50 GCS-200 C/L Imp.-200 Imp. Subgrade-350
	4.2	Western Bypass – Mate Road	2.597		
Total Length (km)			**17.526**		

CHAPTER 1 – PROJECT BACKGROUND

1 PROJECT BACKGROUND

1.1 - Project Background

The Road Corridor

The project roads are links to the just concluded construction of the Meru Eastern and Western bypasses in, Meru Town, Kenya (see Table 1-1 and Figure 1-1). The aim of the project roads is to create a link to the Meru Eastern and Western bypasses to ensure a seamless flow of traffic in and around Meru Town CBD.

The Government of the Republic of Kenya (GoK) has received a credit from the International Development Association (IDA) towards the cost of the HORN OF AFRICA GATEWAY DEVELOPMENT PROJECT (HOAGDP) and intends to apply a portion of proceeds from this credit to eligible payments under the separate design and works supervision consultancy contracts for Extension of Meru Bypass (approximately 17.526 Km). The Project will be implemented through the Kenya National Highways Authority, the implementing agency for HoAGDP on behalf of the beneficiary agency, Kenya Urban Roads Authority.

TABLE 1-1: Project Road Details

Contract Section			Design Section			Road Section Description
ID	**Section as Per Contract**	**Contract Length (Km)**	**ID**	**Design Sections**	**Design Section Length (Km)**	
001	Runogone - Kaithe Road	2.47	2.0	Runogone – Kaithe Road	2.47	Gravel road connecting to the ongoing construction of extension of Meru Eastern Bypass to Kaithe town.
002	KEMU – Kambakia Road	3.666	1.2	Kambakia – Kagotone/ KEMU C91 Rd	3.317	Gravel road from KEMU University connecting Meru-Maua Road (C91) and Meru – Nairobi Highway (B6) Road. Some section of Road abuts Upper Imenti Forest.
			1.3	Kagotone - KEMU Link C91 Road	0.349	
003	Three Steers- Kambakia Road	1.76	1.1	Three Steers – Kambakia Road	1.76	Gravel road with cabro paving of about 150m at Three steers.
004	KEMU/Kambakia Link to C91 Road	2.941	1.4	Kongoacheke Jct - Kwa Mukuru Jct	2.490	Gravel road connecting Kambakia and C91 Road
			1.5	Kongo gardens - Kambakia Link Rd	0.451	
005	Eastern Bypass - Hospital Road	3.386	3.1	Hospital Road – Kiramburine Jct	1.938	Gravel roads connecting Meru Teaching and Referral Hospital and Gakoromone Market
			3.2	Link 1 – Meru Bus Terminus	0.465	
			3.3	Link 2 – Gakoromone Market	0.642	
			3.4	Link 3 – MEWAS Jct	0.341	
006	Western Bypass - Mate Road	3.303	4.1	Western Bypass – Link Road (0.71 km)	0.706	Gravel road connecting Meru Western Bypass to Mate Road (C92)
			4.2	Western Bypass – Mate Road (3.79 km)	2.597	
007	Foot bridge 1 at Kaaga Boys High School			Foot bridge 1 at Kaaga Boys High School		To serve as a bridge between the classrooms and dormitories. Also, Kaaga school for the blind can access the bridge.
008	Foot bridge 2 at Meru National Polytechnic			Foot bridge 2 at Meru National Polytechnic		To serve as a connection for pedestrians especially from the polytechnic to accommodation areas due to the busy junction between Meru Western Bypass and Meru-Nairobi Highway (B6)
Total Length		**17.526**	**Total Length**		**17.526**	

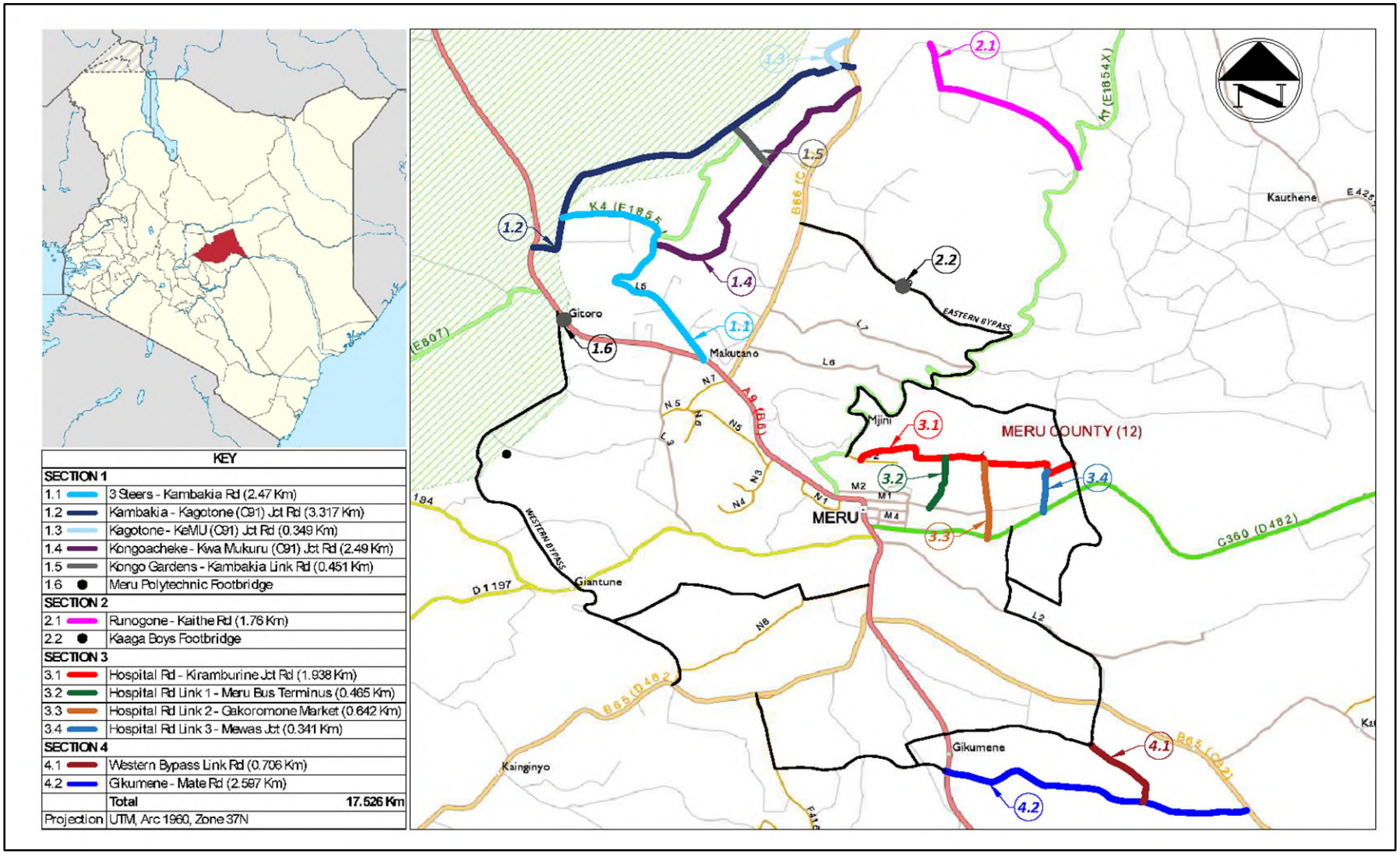


Figure 1-1 : Location Map of Meru Bypass Roads Extents (17.526km)

The main project objectives for the Design Phase of the project include;

i). To formulate the interventions necessary for upgrading to bitumen standards of the Extension of Meru Bypass (approximately 17.5 Km). These interventions may include but not limited to adequate traffic surveys, detailed geometric and pavement designs, storm water drainage design, bus bay designs;

ii). To design features for use by non-motorized traffic.

iii). To incorporate all the above improvements into a bid document which is fully compatible with current World Bank procurement guidelines;

iv). To prepare for the implementation of supervision activities and put in place a comprehensive, documented quality assurance framework.

v). To formulate a comprehensive, suitably documented project risk management framework.

Additional features include but are not limited to the following:

- Aerial surveys
- Improvement in drainage structures and drainage features as necessary.
- Improvements in road safety features and features for non-motorised traffic. Pedestrian footbridges accessible by disabled persons shall be provided at Kaaga Boys and Meru National Polytechnic.
- Drilling at footbridge sites to establish ground conditions
- Economic feasibility study establishing the B/C ratio, NPV and the EIRR of the project and the first-year rate of return, and sensitivity analysis.
- Junction analysis
- Land acquisition plans in relation to the design requirements for the works
- Provision of street lighting.
- Identification of material sources, quantities, qualities and potential use on the project.

The Detailed Design (including production of Tender Documents) is scheduled for completion on 31st August 2025.

1.2 – Overall Project Objectives and Scope of Services

Objective

The overall objective of the project is to improve the level of service and enhance the pavement strength of the road networks within Meru town which have plagued with traffic congestion and poor riding quality ensuing from backlog in rehabilitation of pavements, traffic enhancement and development of multimodal means of transporting goods and passengers across major towns.

This project focuses on linking the newly constructed Meru Eastern and Western Bypasses to Meru Town CBD through the design and construction of approximately 17.526km of link roads as part of the traffic capacity enhancement to ensure safe, cost-effective, and reliable traffic flow in and around Meru town.

The objective of design phase is to produce a preliminary design (Phase 1A of the Project). This phase aims to investigate appropriate design standards and design alternatives for the road and any related service roads, based essentially on the existing main road alignment, but incorporating improvements in the form of less steep slopes and larger diameter radii where desirable. From the alternatives selected the optimum design will be arrived at with the help of benefit/cost analyses and HDM4 software.

The second objective of this design phase is to produce a detailed design (Phase 1B – Current Stage) which will enable an economical upgrading of the existing road within Meru town. The detailed design will include the preparation of Tender Documents to enable International Competitive Bidding (ICB) to take place. Confidential Engineer's cost estimates will be provided to assist the Client with budgeting for the construction of the road.

The third objective of this design phase is to provide administrative and technical support to the Client during the bidding process and preparation of supervision phase (Phase 2).

Scope of Services

A summarised overview of required improvements for the detailed design and contract documentation and prepare reports are provided below:

- Geometric design (vertical & horizontal), Pavement design (requisite type and structure) and design of vehicular and pedestrian bridges (where it will be necessary and or as pre-identified by the client) as well as the necessary drainage structures designs. Geometric designs should be carried out using latest Civil 3D Engineering software;
- Traffic surveys and analysis (traffic characteristics, Origin, destination, and diverted traffic surveys and estimated generated traffic
- Hydrological survey data and analysis (hydrological characteristics and flood flows along and across the road network and drainage capacity requirement

- Geotechnical investigations for alignment soils and bridge foundations including materials testing and analysis of results;
- Survey and benchmarks (Topographical and cadastral surveys);
- Guidance on possible sources of construction materials (locations, estimated quantities and suitability for use in the project);
- Liaison and incorporation of outputs and recommendations from the independent Environmental, Social Safeguards and Gender Based Violence experts;
- Risk analysis and mitigation on the proposed construction works, with regard to the performance of similar projects constructed in the past within the project area;
- Identification of any additional data or documentation which, in the opinion of the consultant, is required for satisfactory implementation of the works contract
- Preparation of Engineer's Cost Estimate including breakdown by foreign and local inputs and an estimate of the percentage of inputs by key materials/equipment/labor that are normally included in the price adjustment formula, such as, bitumen, cement, steel, construction equipment, fuel and lubricants, explosives, local and foreign labour, etc.
- Economic feasibility study establishing the B/C ratio, NPV and the EIRR of the project and the first-year rate of return, and sensitivity analysis.
- Preparation of Bidding documents as per World Bank procurement regulations; and
- Training of 3 trainee engineers and 3 trainee inspectors nominated from KURA.

CHAPTER 2 –MATERIALS INVESTIGATIONS

2 MATERIALS INVESTIGATIONS AND PAVEMENT DESIGN

2.1 – Introduction

Project Objectives

The main objectives of the assignment at the design stage are as follows:

- To formulate the interventions necessary for upgrading to bitumen standards of the Extension of Meru Bypass (approximately 17.5 Km). These interventions may include but not limited to adequate traffic surveys, detailed geometric and pavement designs, storm water drainage design, bus bay designs.
- To design features for use by non-motorized traffic.
- To incorporate all the above improvements into a bid document which is fully compatible with current World Bank procurement guidelines.
- To prepare for implementation of supervision activities and put in place a comprehensive, documented quality assurance framework.
- To formulate a comprehensive, suitably documented project risk management framework.

Project Location and Scope

The assignment involves the design of roads totalling approximately 17.526 km and linking Meru bypasses to Meru town as listed below and also reflected in Figure 2-1, Figure 2-2, Figure 2-3 and Figure 2-4.

SECTION 1 Roads:

- Three Steers – Kambakia Road (2.47 km)
- Kambakia – Kagotone/ KEMU C91 Rd (3.317 km)
- Kagotone - KEMU Link C91 Road (0.349 km)
- Kongoacheke Jct - Kwa Mukuru Jct (2.49 km)
- Kongo gardens - Kambakia Link Rd (0.451 km)

SECTION 2 Roads:

- Runogone – Kaithe Road (1.76 km)

SECTION 3 Roads:

- Hospital Road – Kiramburine Jct (1.938 km)
- Link 1 Hospital Road – Meru Bus Terminus (0.465 km)
- Link 2 Hospital Road – Gakoromone Market (0.642 km)
- Link 3 Hospital Road – MEWAS Jct (0.341 km)

SECTION 4 Roads:

- Western Bypass – Link Road (0.706 km)
- Western Bypass – Mate Road (2.597 km

FOOTBRIDGES:

- Footbridge 1 at Kaaga Boys High School.
- Footbridge 2 at Meru National Polytechnic.



Figure 2-1 : Section 1 Roads



Figure 2-2 :Section 2 Roads

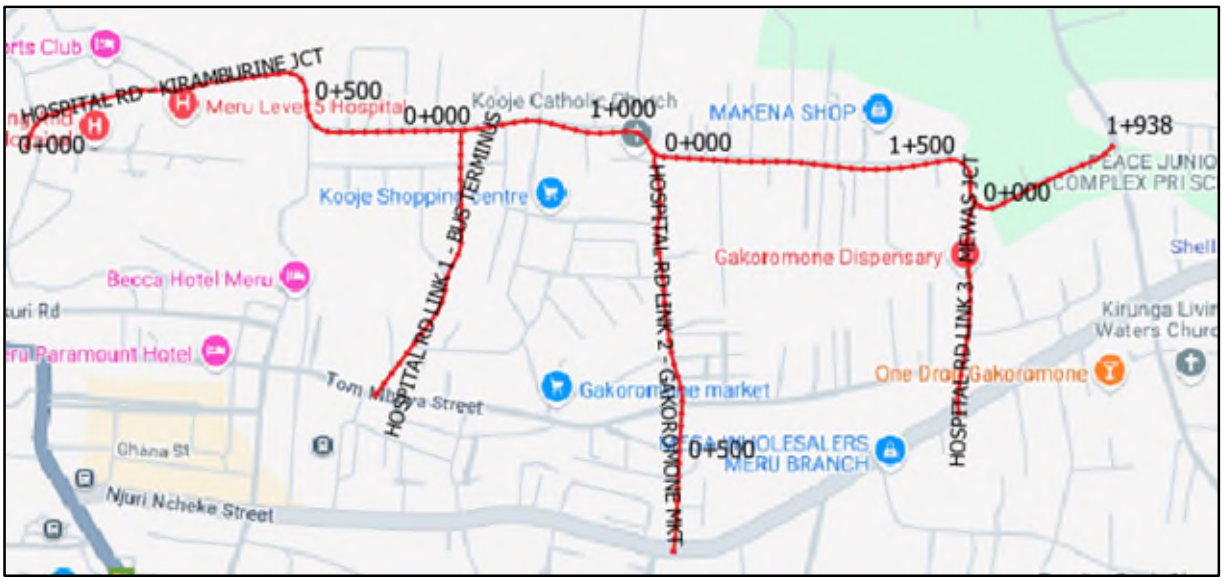


Figure 2-3 : Section 3 Roads

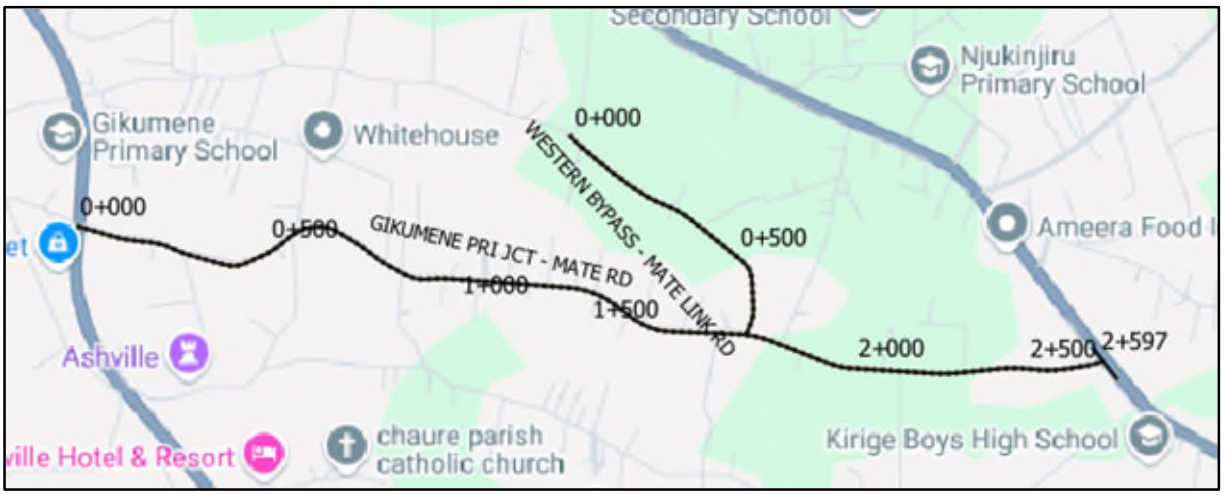


Figure 2-4 : Section 4 Roads

Content

This report covers geotechnical site and laboratory investigation of the following components:

- Subgrade soils along the Meru Link Roads.
- Material Sites:
  - Borrow area,
  - Hardstone areas and
  - Sand areas.
- Water Sources.
- Footbridge sites foundation investigations.

The Consultant carried out materials and geotechnical investigations for the Meru Link Roads listed in Section 1 of this report. The subgrade soils at these locations were carefully examined and sampled and tested. The sampling and testing programmes followed the methodology prescribed in the Road Design Manual, Part III, 1987.

These geotechnical related activities were carried out in compliance with the Terms of Reference for this project.

The Factual Materials Report contains the various sites laboratory test results, full descriptions of all trial pits (dug in the existing alignment), the presence of groundwater, the sampling and testing undertaken for each set of samples. Test results are presented with a brief summary tables and charts within the main text of this report.

The report includes:

- Brief description of solid geology, soil conditions and climate of Meru.
- Description of the methodology used in carrying out the soils and materials field investigations and associated laboratory testing.
- Tabulated and referenced summaries covering the data from the in-situ and laboratory tests.
- Trial pits dug on the existing road with descriptive and analytical details.
- Graphical presentation of summary laboratory test results.

2.2 – Geology and climatic Conditions

Geology

Geological context

Generally, the geological succession in the project area is as follows:

Recent: Soils

Sub-Miocene: Mount Kenya Volcanic Series

Geology around the project area

As presented in Figure 2-5, the project roads traverse the following geological formations:

- Basalts, tuffs and ashes of parasitic vents,
- Upper olivine basalts,
- Lower basalts, with kenyte and tuff.

The lowermost plains are basalt and olivine basalt and rest on the sub-Miocene bevel. Intercalated in this lower division near Mporiene, south-east of Meru, is a thin band of highly weathered and densely porphyritic kenyte, which indicates a minor alkaline phase. The entire division is thin, being not more than 150m in thickness.

The upper olivine basalts overlie the lower basalts west of the meridian passing through Kienduri and extend to the western boundary of the area. They appear to be much thicker than the lower basalts but owing to the fact that they probably overlie kenytes and phonolites, which reach a thickness of 1000m, further south, it would be unwise to estimate their thickness.

Many distinct features are formed on the lower north-eastern foothills of Mt. Kenya by the lavas and ashes of parasitic vents and craters. It is probable that some of the vents were contemporaneous with the eruption of the Upper basalts but judging from the fresh and comparatively uneroded condition of many of the craters, for example Matei, Njonivola, Kinyenjeli and Nkonga, sporadic vulcanicity, appears to have continued until quite recent times.

There is no evidence in the present area for the precise dating of the Mt. Kenya Volcanic Suite. Since, however, the lower basalts rest on the sub-Miocene bevel southeast of Merut they presumably erupted in Miocene or later times. The second episode of major faulting of the Rift Valley is considered to have occurred in the Upper Miocene, and it seems probable that such vast outpourings of lava as come from the Mt. Kenya vent would be closely associated with this major disturbance. From the geological memoir it is noted that stratigraphical evidence rift faulting, has repeatedly terminated periods of extrusion. It is not definitely known whether the major eruption of Mt. Kenya ceased before the actual rifting or continued during the disturbance, but it is probable that spasmodic and occasional outbursts, of vulcanicity on the slopes of Mt. Kenya continued after the rifting into Pliocene and even Pleistocene times.

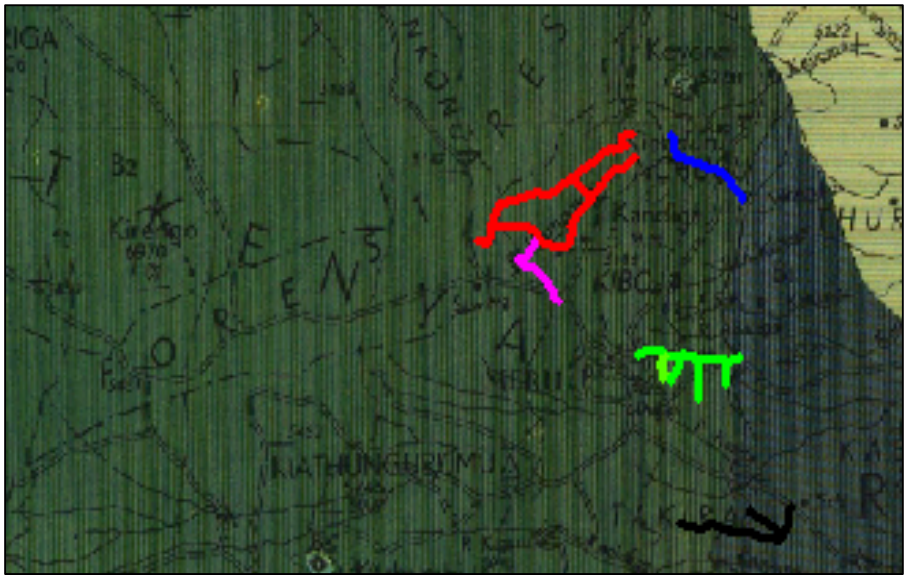


Figure 2-5 : Geological configuration in the vicinity of the project roads

B2 = Upper Kenya Basalt

B1= Lower Kenya Basalt

2.3 – Geotechnical Findings

Introduction

The existing Meru Link roads are mostly gravel and earth roads with the exception of some very small sections built with concrete blocks and bitumen surface. An assessment of the subgrade soil has been carried out by sampling the soils from excavated trial pits along the existing alignment and subjecting the samples to various laboratory tests, the results of which are presented below.

A search for potential construction material deposits has also been carried out. Hard stone for aggregates to be used in bituminous and concrete works; borrow area material to be used for the construction of the pavement layers (natural or cemented); sand for construction of concrete works, and if required, for mechanically stabilized layers; and, water for compaction and concrete works were prospected.

The geotechnical site investigations were performed in accordance with the methodology described in the Inception Report. Geotechnical technicians and non-skilled laborers carried out the various tasks under the close supervision of the Materials Engineer. The laboratory testing was performed by Apex Projects Ltd in its laboratory in Nairobi.

In order to assess the geotechnical properties of the subgrade soils and potential construction material sites samples were collected. The assessment consisted in carrying out a detailed description of the soils/rocks encountered and subjecting these samples to various laboratory tests.

Road Alignment

Along the Meru Link Roads (Section 1, Section 2, Section 3 and Section 4 Roads) trial pits were spaced at an interval of about 0.5km (Table 2-1).

The position of each test pit was recorded by a handheld Global Positioning System (GPS). The field identification of subgrade soils was based on color, texture, as well as on the assessment of their plasticity, fine content, and coarse fractions.

Representative samples of the subgrade were collected from the full depth of test pits in which the vertical soil profile exhibited a reasonable degree of uniformity. Where two or more layers were present it was appropriate to sample the layer that exhibited poor subgrade characteristics.

Test pits were dug to an approximate depth of 1.0 m from the surface, and in some instances, it was stopped when bedrock was encountered. Upon completion of the sampling, the vertical profile of each test pit was logged and the excavated material carefully backfilled and compacted.

Representative samples were collected from the full depth of test pits in which the vertical soil profile exhibits a reasonable degree of uniformity.

Table 2-1 : trial Pits Location

TP NO.	LONGITUDE	LATITUDE	CHAINAGE	SECTION	DESIGN SECTION	LOCATION
DD 1	37.62919	0.06712	0+105	1	1.2	[Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)]
DD 2	37.63615	0.0739	1+360	1	1.2	[Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)]
DD 3	37.65073	0.08091	3+230 / 0+000	1	1.2 & 1.3	[Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)] & [Kagotone - Kemu Link C91 Road (0.349 Km)]
DD 4	37.66817	0.07377	1+700	2	2.0	[Runogone – Kaithe Road (1.76 Km)]
DD 5	37.63979	0.05989	0+200	1	1.1	[Three Steers – Kambakia Road (2.47 Km)]
DD 6	37.6355	0.06377	0+870	1	1.1	[Three Steers – Kambakia Road (2.47Km)]
DD 7	37.63713	0.06739	1+540 / 0+010	1	1.1 & 1.4	[Three Steers – Kambakia Road (2.47a Km)] & [Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
DD 8	37.64112	0.06647	0+480	1	1.4	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
DD 9	37.64541	0.07331	1+440 / 0+000	1	1.4 & 1.5	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)] & [Kongo Gardens - Kambakia Link Rd (0.451 Km)]
DD 10	37.64825	0.07651	1+920	1	1.4	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
DD 11	37.64425	0.07477	0+210	1	1.5	[Kongo Gardens - Kambakia Link Rd (0.451 Km)]
DD 12	37.65269	0.05109	0+000	3	3.0	[Hospital Road – Kiramburine Jct (1.938 Km)]
DD 13	37.66363	0.05034	0+060	3	3.0	[Hospital Road – Kiramburine Jct (1.938Km)]
DD 14	37.66733	0.02573	0+740	4	4.2	[Western Bypass – Mate Road (2.597 Km)]
DD 15	37.67335	0.02457	1+720 / 0+700	4	4.2 & 4.1	[Western Bypass – Mate Road (2.597 Km)] & [Western Bypass – Link Road (0.706 Km)]
DD 16	37.68101	0.02394	0+060	4	4.2	[Western Bypass – Mate Road (2.597 Km)]
DD 17	37.6429	0.07636	2+190 / 0+440	1	1.2 & 1.5	[Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)] & & [Kongo Gardens - Kambakia Link Rd (0.451 Km)]
DD 18	37.6433	0.07057	1+050	1	1.4	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
DD 19	37.6582	0.05091	0+740	3	3.0	[Hospital Road – Kiramburine Jct (1.938Km)]
DD 20	37.66959	0.02888	0+010	4	4.1	[Western Bypass – Link Road (0.706 Km)]
PD 1	37.665939	0.047939	0+210	3	3.3	Link 3 Hospital Road – Mewas Jct (0.341 Km)
PD 2	37.658165	0.050907	0+740	3	3.0	[Hospital Road – Kiramburine Jct (1.938 Km)]
PD 3	37.668026	0.050662	1+935	3	3.0	[Hospital Road – Kiramburine Jct (1.938 Km)]
PD 4	37.661579	0.048445	0+230	3	3.2	[Link 2 Hospital Road – Gakoromone Market (0.642 Km)]

TP NO.	LONGITUDE	LATITUDE	CHAINAGE	SECTION	DESIGN SECTION	LOCATION
PD 5	37.658654	0.050434	0+050	3	3.1	[Link 1 Hospital Road – Meru Bus Terminus (0.465 Km)]
PD 9	37.630362	0.069375	0+450	1	1.1 / 1.2	[Three Steers – Kambakia Road (2.47 Km)] & [Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)]
PD 10	37.651947	0.079092	2+460	1	1.4	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
PD 11	37.643296	0.07057	1+050	1	1.4	[Kongoacheke Jct - Kwa Mukuru Jct (2.49 Km)]
PD 13	37.64292	0.076362	2+190 / 0+440	1	1.2 & 1.5	[Kambakia – Kagotone/ Kemu C91 Rd (3.317 Km)] & & [Kongo Gardens - Kambakia Link Rd (0.451 Km)]
PD 14	37.657976	0.080924	0+180	2	2.0	[Runogone – Kaithe Road (1.76 Km)]
PD 15	37.66527	0.076993	1+210	2	2.0	[Runogone – Kaithe Road (1.76 Km)]
PD 16	37.661105	0.026378	0+270	4	4.2	[Western Bypass – Mate Road (2.597 Km)]
PD 18	37.671159	0.027594	0+240	4	4.1	[Western Bypass – Link Road (0.706 Km)]

NB: DD ARE THE TRIAL PITS DUG DURING THE DETAILED DESIGN STAGE AND PD THOSE DUG DURING THE PRELIMINARY DESIGN STAGE





Picture 1 : Trial pits excavated for road alignment_DD-4 and DD-16



Figure 2-6 : Trial pit locations_Section 1 Roads

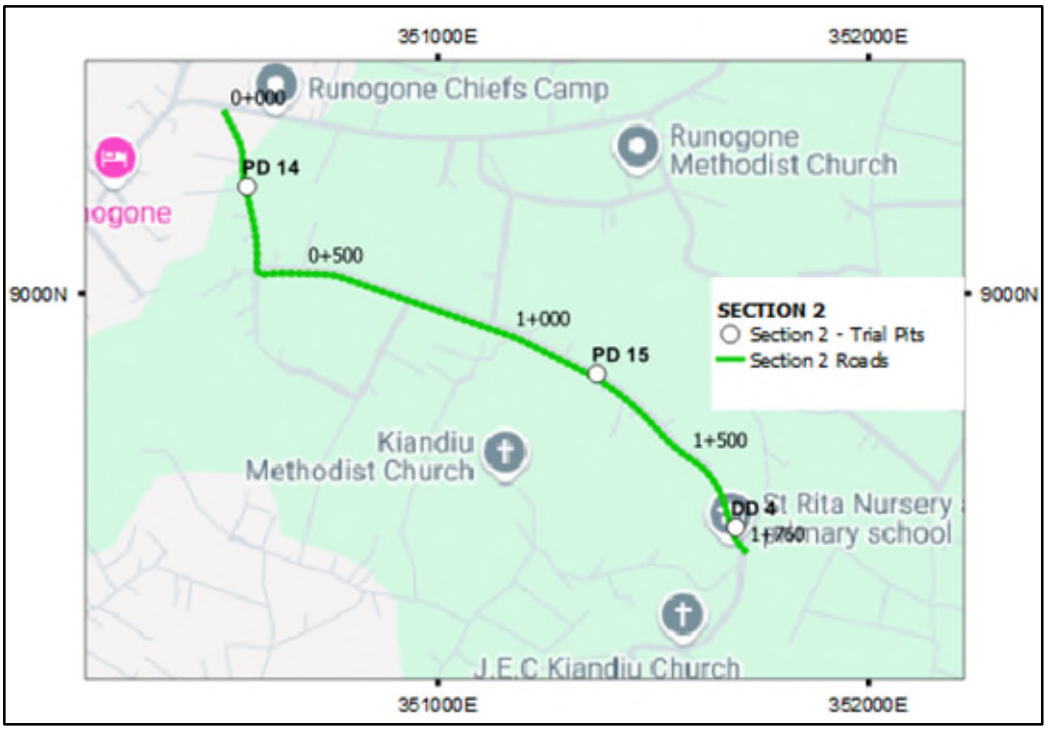


Figure 2-7 : Trial pit locations_Section 2 Roads

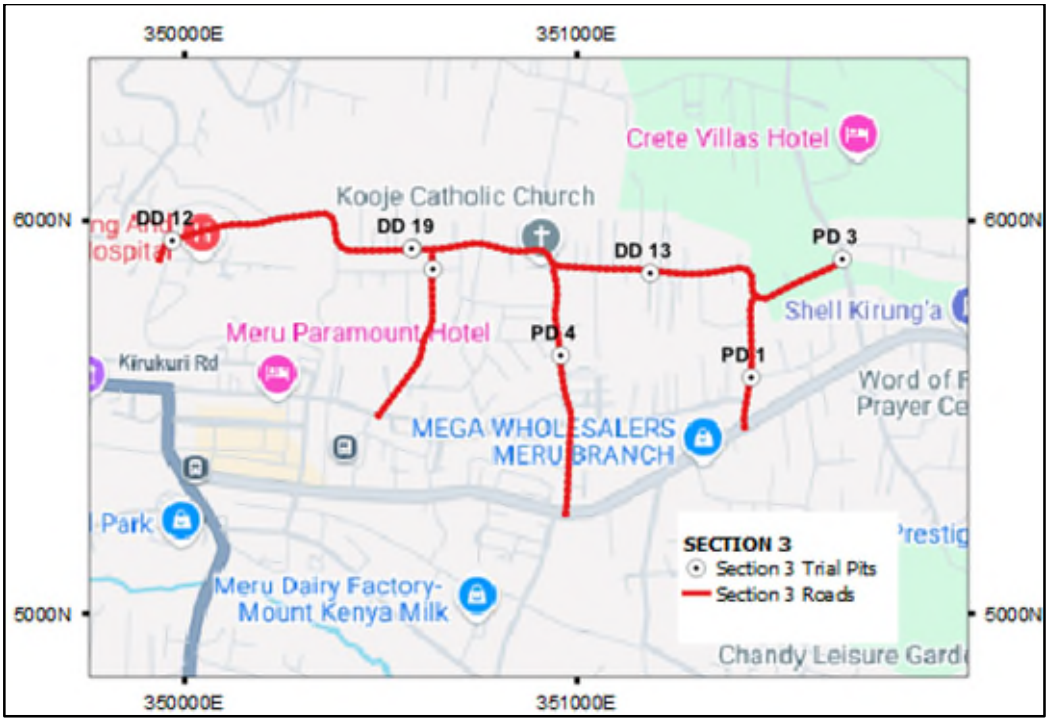


Figure 2-8 : Trial pit locations_Section 3 Roads



Figure 2-9 : Trial pit locations_Section 4 Roads

Laboratory Testing

The following tests were carried out on the bulk samples:

- Atterberg Limits - BS 1377 – Liquid and Plastic Limit
- Linear shrinkage - BS 1377
- Wet sieve analysis to 0.075mmm – BS1377
- Standard compaction (2.5kg) – AASHTO T99
- 1 point soaked CBR – AASHTO T193

On the small, disturbed samples the following test was carried out:

- Determination of moisture content – BS 1377

Table 2-2 : Summary of laboratory test results_road alignment soils

TP	Section	Depth	Particle Size Distribution (mm)						Atterberg Limits					Compaction		CBR 100% MDD	
			10	5	2	1.2	0.425	0.075	NMC %	LL %	PL %	PI %	LS %	OMC %	MDD kg/m^3	4-Day Soak	Swell %
DD 1	1	1.1	100	100	100	98.4	94.1	87.0	8.1	57.1	28.5	28.5	14.0	28.0	1257	9	1.22
DD 2	1	1.0	100	100	100	98.0	95.0	88.4	7.8	57.4	28.7	28.7	14.2	27.8	1269	9	1.20
DD 3	1	1.0	100	92.5	86.8	82.8	74.3	63.8	4.6	47.8	22.4	25.4	12.7	20.6	1430	11	1.14
DD 4	2	1.1	73.3	62.0	56.0	52.3	48.7	45.8	10.9	46.2	20.4	25.8	12.9	24.9	1489	12	1.12
DD 5	1	1.0	95.5	89.5	83.5	77.2	68.8	63.3	4.6	47.7	21.5	26.2	12.8	20.2	1424	12	1.18
DD 6	1	0.9	100	100	100	98.0	94.0	89.2	9.0	55.3	28.1	27.1	13.0	26.3	1312	11	1.19
DD 7	1	0.5	100	100	100	98.2	92.1	86.6	19.6	48.2	24.8	23.4	11.5	23.6	1495	12	1.18
DD 8	1	0.9	100	100	100	95.9	92.9	89.4	10.1	57.4	28.4	29.0	14.1	28.1	1287	11	1.23
DD 9	1	1.1	100	100	100	97.9	92.3	86.8	14.4	57.0	28.3	28.6	13.8	27.8	1273	10	1.21
DD 10	1	1.0	100	100	100	98.0	93.7	88.3	10.2	56.8	30.1	29.4	14.5	26.4	1290	11	1.22
DD 11	1	1.0	100	100	99.3	97.4	94.5	88.5	25.0	46.1	23.0	23.0	11.4	35.2	1133	6	1.17
DD 12	3	0.95	100	100	100	98.2	94.1	89.7	1.8	54.9	25.3	29.6	14.5	19.8	1322	8	1.24
DD 13	3	1.0	100	100	100	98.2	94.6	88.7	2.4	55.6	27.2	28.4	14.2	20.4	1328	8	1.20
DD 14	4	1.1	100	100	100	97.8	92.5	88.2	2.1	52.1	24.8	27.3	13.4	20.1	1310	8	1.18
DD 15	4	1.0	100	100	99.3	97.5	94.4	89.7	10.0	45.5	22.0	23.4	11.4	32.0	1203	7	1.15
DD 16	4	1.0	100	100	88.3	86.0	75.7	66.1	3.6	48.2	22.4	25.8	12.8	19.5	1407	12	1.16
DD 17	1	1.0	100	100	100	98.2	93.7	89.2	5.5	56.0	27.3	28.6	14.2	27.5	1276	10	1.19
DD 18	1	1.0	100	100	99.6	97.5	94.2	89.5	18.0	46.4	23.6	22.8	11.0	36.1	1120	6	1.16
DD 19	3	1.0	100	100	99.5	97.6	94.5	90.6	12.2	46.5	23.6	22.8	11.0	32.4	1224	7	1.18
DD 20	4	1.0	100	100	100	98.5	93.5	89.7	2.6	56.4	27.8	28.6	14.0	20.6	1339	8	1.22
PD 1	3	1.1	100	100	97	88	80	74	11	46.8	21.2	25.6	12.9	30.7	1312	9	0.85
PD 2	3	1.0	100	100	97	88	80	75	11	47.5	21.8	25.7	12.9	31.8	1333	10	0.76
PD 3	3	1.1	100	100	97	87	80	75	10	46.2	20.8	25.4	11.9	32.4	1324	9	0.80
PD 4	3	1.1	100	100	99	94	87	78	10	49.6	21.4	28.1	13.2	26.2	1307	10	0.90
PD 5	3	1.2	100	100	97	88	80	75	12	47.5	21.8	25.7	12.9	31.6	1303	9	0.80
PD 9	1	1.1	100	100	99	96	86	77	21	53.4	25.8	27.4	12.9	32.5	1226	5	0.94
PD 10	1	1.1	100	100	97	95	88	75	18	47.5	21.3	26.2	12.9	31.1	1259	6	0.98
PD 11	1	1.0	100	100	100	96.8	86.4	79.4	11.9	54.3	24.1	30.2	14.2	34.0	1291	8	0.91
PD 13	1	1.0	100	97.4	96.1	94.5	90.0	80.3	8.4	47.9	21.2	26.7	13.6	28.4	1280	8	0.86
PD 14	2	1.2	100	100	95.8	90.8	83.0	74.3	10.5	50.2	22.4	27.7	13.0	29.1	1296	10	0.78
PD 15	2	1.2	100	100	96.1	90.6	83.9	74.1	11.3	47.7	22.6	27.2	13.7	32.0	1308	11	0.80
PD 16	4	1.2	100	100	100	96.8	89.0	81.4	12.6	50.6	22.4	28.2	13.6	31.1	1299	10	0.86
PD 18	4	1.0	96.3	80.5	78.0	75.6	69.6	61.6	9.9	49.4	25.2	24.1	11.3	32.6	1282	10	0.80

NB: DD ARE THE TRIAL PITS DUG DURING THE DETAILED DESIGN STAGE AND PD THOSE DUG DURING THE PRELIMINARY DESIGN STAGE

Material Sites

Introduction

As an integral part of the soils and rock investigation, research has been conducted to locate suitable construction material sites in the vicinity of the project roads.

The search included:

- Gravel material for possible application as subbase – Borrow area.
- Material for embankments (fill and improved subgrade) – Borrow area.
- Quarry stone for production of crushed stone and concrete – Hard stone area.
- Water for compaction and concrete – Water zone.
- Sand for concrete and mortar works – Sand area.

Borrow Area

In temperate regions most soils are transported by water, glacial action and less by air where they tend to get overworked during this process. Due to this fact and because further weathering is slow, most soils have reached a "stable" state in physical and chemical terms. However, in the tropics most soils are residual i.e. they have been formed and are often still being formed over or in close proximity to the rocks from which they originate. Some of these soils are far from being stable and therefore their evaluation by physical tests might not suffice and should be supplemented by knowledge of their "unconventional behavior".

Three commercial borrow areas (Ngunga Ramji, Rugusu and Nchoroiboro) were identified and prospected (Table 2-3, Figure 2-10, Figure 2-11 and Figure 2-12). However, the Nchoroiboro borrow area contained cinder material, which is susceptible to crushing under compaction, and was therefore excluded from further consideration.

For each borrow area, 5 borrow pits were dug and at least 5 samples collected, i.e. a total of 10 samples.

Each sample was submitted to the following tests:

- Atterberg Limits - BS 1377 – Liquid and Plastic Limit
- Linear shrinkage - BS 1377
- Wet sieve analysis to 0.075mmm – BS1377
- Modified compaction (4.5kg) – AASHTO T180
- 3 points soaked CBR and swell at 4 days soak - AASHTO T193

A Summary of the laboratory test results is presented in Table 2-4 and Table 2-5 below. The geotechnical properties (CBR, Swell, Linear Shrinkage, Plasticity Index and Liquid Limit).

The materials excavated from the borrow area are intended to be used for subbase and for improved subgrade/capping layer where suitable

quantity of material to be obtained from cut section (where applicable) is insufficient.

Table 2-3 : Borrow areas location and details

S/No.	Site Name	Latitude	Longitude	Distance from Meru Town (km)	Material Description	Estimated Quantity (m^3)	Remarks
MS1	**Ngunga Material Site**	0.1231086	37.5983959	7.54	Brownish angular, volcanic GRAVEL, dry, non-plastic	750,000	Located 3 kilometres off the Meru – Nanyuki Highway. Site is privately owned and servers as a hardstone quarry site as well.
MS2	**Rugusu Material Site**	0.1418391	37.4913778	20	Greyish angular GRAVEL, dry, non-plastic	2,250,000	Adjacent to the Meru – Nanyuki Highway. Site is privately owned



Figure 2-10 : Borrow areas location map



Figure 2-11 : Ngunga borrow area



Figure 2-12 : Rugusu borrow area

Table 2-4: Borrow Area – Summary of laboratory test results – Nkunga

Trial Pit No.	Particle Size Distribution						Atterberg Limits					Compaction		CBR			Material Description
	% Passing Sieve Size (mm)						NMC	LL	PL	PI	LS	OMC	MDD	4 Day Soaked		Swell	
	20	10	5	2	0.425	0.075	%	%	%	%	%	%	kg/m^3	%	%	%	
TP1	100.0	86.5	64.5	43.1	14.7	9.6	NON-PLASTIC					11.6	1924	90	44	0.06	Brownish angular, volcanic GRAVEL, dry,non-plastic
														95	92	0.08	
														100	193	0.12	
TP2	100.0	86.0	66.7	45.6	17.8	12.5	NON-PLASTIC					12.4	1923	90	22	0.06	Brownish angular, volcanic GRAVEL, dry,non-plastic
														95	45	0.05	
														100	93	0.09	
TP3	100.0	87.0	68.1	49.4	24.1	19.3	NON-PLASTIC					10.5	1933	90	51	0.07	Brownish angular, volcanic GRAVEL, dry,non-plastic
														95	94	0.08	
														100	183	0.09	
TP4	100.0	83.1	61.1	40.2	10.8	4.7	NON-PLASTIC					12.2	1943	90	47	0.08	Brownish angular, volcanic GRAVEL, dry,non-plastic
														95	88	0.10	
														100	172	0.06	
TP5	100.0	86.4	65.6	45.7	18.9	13.4	NON-PLASTIC					13.4	1935	90	30	0.11	Brownish angular, volcanic GRAVEL, dry,non-plastic
														95	47	0.06	
														100	92	0.11	

Table 2-5 : Borrow Area – Summary of laboratory test results – Rugusu

Trial Pit No.	Particle Size Distribution						Atterberg Limits					Compaction		CBR			Material Description
	% Passing Sieve Size (mm)						NMC	LL	PL	PI	LS	OMC	MDD	4 Day Soaked		Swell	
	20	10	5	2	0.425	0.075	%	%	%	%	%	%	kg/m^3	%	%	%	
TP1	100.0	95.9	88.5	80.8	60.4	53.2	NON-PLASTIC					15.3	1623	90	23	0.09	Light grey angular GRAVEL, dry,non-plastic
														95	47	0.06	
														100	97	0.06	
TP2	100.0	96.1	88.6	80.8	59.0	51.9	NON-PLASTIC					14.5	1625	90	24	0.08	Light grey angular GRAVEL, dry,non-plastic
														95	49	0.11	
														100	101	0.08	
TP3	100.0	96.8	89.7	81.9	60.6	53.5	NON-PLASTIC					15.2	1638	90	25	0.06	Greyish angular GRAVEL, dry,non-plastic
														95	50	0.08	
														100	100	0.09	
TP4	100.0	95.9	89.7	83.1	63.6	58.2	NON-PLASTIC					15	1609	90	16	0.06	Light brown angular GRAVEL, dry,non-plastic
														95	33	0.06	
														100	67	0.06	
TP5	100.0	95.4	88.7	81.4	62.6	56.0	NON-PLASTIC					15.2	1625	90	24	0.07	Light grey angular GRAVEL, dry,non-plastic
														95	49	0.08	
														100	99	0.11	

Hard Stone Area

Identification of aggregate source materials has been carried out during the geotechnical site investigation.

Within tropical and sub-tropical areas, it is likely that the exposed rock directly beneath the overburden (known as "top rock") will be weathered to some extent. This can often preclude its use if high quality stone is needed, although it may still be selected for a less demanding purpose. Weaker layers such as these would normally be worked separately to avoid contamination of the better-quality material below.

A wide range of materials can be used as unbound base course including crushed quarried rock, crushed and screened, mechanically

stabilized, modified or naturally occurring 'as dug' or 'pit run' gravels. Their suitability for use depends primarily on the design of the traffic level of the pavement and climate. However, all base course materials must have (Kenyan Road Design Manual, Part 3, Chart B4) a particle size distribution and particle shape which provide high mechanical stability and should contain sufficient fines (amount of material passing the 0.425 mm sieve) to produce a dense material when compacted.

The use of graded crushed rock for the base course is recommended, given the abundant availability of high-quality rocks in the area (Table 2-6 and Table 2-7).

This material is produced by crushing fresh, quarried rock and may be an all-in product, usually termed a 'crusher-run', or alternatively the material may be separated by screening and recombined to produce a desired particle size distribution, as per the specifications (Kenyan Road Design Manual, Part 3, Chart B4). After crushing, the material should be angular in shape with an adequate Flakiness Index (British Standard 812, Part 105). If the amount of fine aggregate produced during the crushing operation is insufficient, non-plastic angular sand may be used to make up the deficiency. In constructing a crushed stone base course, the aim should be to achieve maximum impermeability compatible with good compaction and high stability under traffic.

To ensure that the materials are sufficiently durable, they should satisfy some criteria. These are Los Angeles Abrasion (LAA), Aggregate Crushing Value (ACV) and Sodium Sulphate Soundness (SSS) as tabulated in Table 2-7 .

The Los Angeles Abrasion (LAA) test measures the resistance of aggregate materials to wear and degradation when subjected to mechanical wear. In this test, aggregates are placed in a rotating drum along with steel balls, and the drum is rotated for a specified period. The degree of abrasion is then assessed by measuring the loss in weight of the aggregate. A lower loss indicates that the material is more resistant to wear, which is crucial for ensuring the longevity of the pavement under traffic loads.

The Aggregate Crushing Value (ACV) test assesses the strength and resistance of aggregates to crushing under a load. In this test, a sample of aggregate is subjected to a compressive load in a cylindrical steel mold. The crushing value is determined by the amount of fine material generated by the crushing process, with higher values indicating weaker aggregates. Aggregates with low crushing values are preferred for road construction because they are less likely to break under load, contributing to a more stable road structure.

The Sodium Sulphate Soundness (SSS) test evaluates the durability of aggregates when exposed to a cyclical wetting and drying process, simulating the effects of weathering and moisture variations. The aggregate is first immersed in a sodium sulfate solution and then dried, repeating this process multiple times. The loss of material due to the expansion and contraction of the aggregate particles during this cycle indicates its resistance to weathering. Aggregates that are more

resistant to this process are deemed suitable for use in road construction, particularly in areas subject to extreme weather conditions.

Together, these tests help in selecting the most durable and strong aggregates, ensuring that the road can withstand the expected traffic loads and environmental conditions over its lifespan.

Three (3) commercial hard stone areas were identified (Figure 2-13) and samples collected as presented in Table 2-6.

Table 2-6 : hardstone areas location and details

HS No.	Site Name	Latitude	Longitude	Location	Distance from Meru (km)	Estimated Quantity (m3)	Remarks
1	**Isico Quarry**	0.261750	37.598890	Located adjacent to the D490 Ruiri – Isiolo Road	23.0	3,000,000	Quarry Site owned and operated by Isico Holding Limited.
2	**HariKrushna Quarry**	0.283816	37.593924	Located 1 km off the D490 Ruiri – Isiolo Road	26.5	1,300,000	Quarry Site owned and operated by HariKrushna Concrete Limited.
3	**Kicoh Quarry**	0.266022	37.589072	Located 1.8 km off the D490 Ruiri – Isiolo Road	24.7	1,000,000	Quarry Site privately owned and operated

The following tests are planned to be carried out on samples that were collected:

- Los Angeles Abrasion (LAA) – AASHTO T96
- Plasticity on LAA fines – BS 1377
- Aggregate crushing value (ACV) – BS 812
- Sodium Sulphate Soundness (SSS) – AASHTO T104
- Specific gravity – BS 1377

- Water absorption – BS 1377

The test results are presented in Table 2-7.

Table 2-7: Summary of Test results – Hardstone area

Test	Commercial Quarry			Requirements (Chart S2a)	
	Isico	Hari Krushna	Kicoh	AC-Type 1 Traffic – T3	Graded Crushed Stone
				Surfacing	Base
L.A.A (%)	20.1	22.3	20.9	Max. 35	Max. 30
A.C.V (%)	16.9	18.0	17.6	Max. 28	Max. 25
S.S.S (%)	2.9	3.7	3.2	Max. 12	Max. 12



Figure 2-13 : Hardstone areas map

Sand Area

At this detailed stage, natural sand for use in mortar and cement concrete works was explored. Also, sand sourced from commercial quarries was sampled for potential use. Quarry sand, typically produced as a byproduct of rock crushing operations, is often considered as an alternative to natural sand in construction. Unlike natural sand, which is typically harvested from riverbeds quarry sand is more readily available and can offer consistent quality due to its controlled production process.

One key advantage of quarry sand is its suitability for meeting the specific requirements of concrete mixes, particularly in terms of particle size distribution and shape, which can be tailored during production. Additionally, quarry sand tends to have better durability and stability properties compared to natural sand, as it is less likely to contain impurities such as organic materials or clay particles. This makes it a viable choice, particularly in areas where the availability of natural sand is limited or where environmental concerns related to sand extraction from natural sources are present.

Incorporating quarry sand into construction projects can also help reduce the pressure on natural sand resources, which are often unsustainably sourced. As such, the use of quarry sand not only ensures more consistent and durable material for concrete works but also supports more sustainable construction practices.

Two (2) commercial sand areas from the hardstone areas and one (1) river sand area from the Ewaso Ngiro River near Archer's Post (after Isiolo) were also investigated. The estimated quantities from the commercial quarries are over 500,000 m^3 and that from Ewaso River may be estimated to some 10,000 m^3.

The samples were subjected to the following tests:

- Clay/silt/dust content – BS 1377
- Sieve analysis – BS 1377
- Sodium sulphate soundness (SSS) – AASHTO T104

The test results presented in Table 2-8 are available and reported.

Table 2-8 : Summary of Test results – Sand area

Test	Commercial Quarry		River Sand	Requirements
	ISICO	NGUNGA	ARCHER'S POST	
Silt & Clay Content	0.9	1.4	0.2	<3% [Standard Specifications for Roads Kenya 1987 Clause 1703(c)]
Grading Passing 5mm sieve	94.7	90.3	100	100% min [BS 882:1992-Table 4]
Grading Passing 0.075mm sieve	1.3	-	1.4	3% max [BS 882:1992-Table 4]

Water Sources

The upgrading of the Meru Link Roads will require substantial volumes of water. It is estimated that for construction purposes 1 to 2 cubic metres per metre length of road may be required. Various options have to be considered to satisfy this high demand of water. These options

include investigation of areas suitable for deep drillings, shallow wells, artificial aquifers and dams.

Water, as an important construction material both for compaction and concrete works, has been identified and investigated in the project area. During the field survey potential water sources, in the form of Perennial River, have been identified and sampled. Presence of salt in water such as chlorides etc. reduces initial strength of concrete and causes rust in the steel used as reinforcement bars. Therefore, testing of potential water sources was carried out and the summary of the results is presented in Table 2-9. From the test results all samples meet the standard for their use in construction.

Table 2-9 : Summary of chemical analyses on water samples

Parameters	Unit	Kathita River	Kanyuru/Mwiteria Village River Meru	WHO STANDARDS	KEBS 3rd EDITION (2007)
pH	pH scale	**7.17**	**6.90**	6.5-8.5	6.5-8.5
Colour	Hazen	**ND**	**ND**	Max 15	<15
Turbidity	N.T.U.	**ND**	**ND**	Max 5	<5.0 NTU
Alkalinity	mg/L	**48**	**56**	Max 500	<500
Conductivity	uS/cm	**119.55**	**157.68**	Max 2500	<2000
Iron	mg/L Fe	**0.09**	**0.07**	Max 0.3	<0.3
Calcium	mg/L CO3	**ND**	**8**	Max 100	<150
Magnesium	mg/L	**ND**	**1.95**	Max 100	<100
Total hardness	mg/L	**ND**	**28**	Max 500	<300
Chloride	mg/L Cl-	**7.998**	**12.996**	Max 250	<250
Fluoride	mg/L F-	**1.00**	**0.70**	Max 1.5	<1.5
Nitrite	mg/L NO2-	**0.44**	**2.42**	<0.3	<0.5
Sulphate	mg/L SO4-	**0.35**	**1.9**	Max 450	<400
Manganese	mg/L Mn	**0.003**	**0.001**	Max<0.1	<0.5
Total dissolved	mg/L Ions	**74.12**	**97.76**	Max 1500	<1000
Carbon dioxide	mg/L CO2	**19.36**	**21.12**	Max NS	N/S
Ammonia	mg/L NH3	**0.036**	**0.048**	Max<0.5	<0.5

Footbridges

Geotechnical investigations were conducted at two sites where footbridge construction had been proposed, with the objective of determining the properties of the existing soil to guide the design and construction of the bridge foundations. The sites included the Meru National Polytechnic location along the Meru–Nairobi highway and the Kaaga Boys High School location.

At each site, two boreholes were drilled to a depth of 10.00 meters. Soil and rock samples were collected and transported to the laboratory for analysis.

A total of Four (4 No.) Geotechnical Boreholes (BH) were sunk at the locations marked on the site maps as shown below. Two (2 No.) at The Meru National Polytechnic site and Two (2 No.) at the Kaaga Boys high School site. The depth and location are summarized in Table 2-10.

Drilling was conducted in accordance with BS 5930:1999- Code of Practice for Site Investigation and executed up to 10.00 meters from the ground level.

Rotary screw auguring was adopted for the soil layers at the top. At the hard strata, rotary drilling was adapted using the GY-150 drilling machine and the 85mm diameter barrel. The recovered rock samples were placed in well labelled wooden core boxes, preserved, and transported to the laboratory for rock bearing capacity tests. The geologist logged the recovered rock samples before testing and further laboratory analysis. The borehole logs are as shown in Appendix 7.

Detailed interpretation and analysis using the in-situ and laboratory test results will be presented in the final detailed design report.

Table 2-10 : Borehole Depths and Locations

Borehole No	Site Location	Latitude	Longitude	Depth (m)
BH 1	**Meru Polytechnic Site**	0.061780	37.63041	10.00
BH 2		0.061660	37.62993	10.00
BH 3	**Kaaga Boy's High School Site**	0.063550	37.65639	10.00
BH 4		0.063750	37.65659	10.00

Table 2-11 : SPT N values

BH No.	Depth (m)	N-Values Recorded on Site
BH 01	1.50-3.00	24
BH 02	1.50-3.00	15
BH 03	1.50-1.95	19
	3.00-3.45	16
	4.50-4.95	16
	6.00-6.45	19
	7.50-7.95	20
	9.00-10.00	24
BH 04	1.50-1.95	18
	3.00-3.45	17

	4.50-4.95	18
	6.00-6.45	18
	7.50-7.95	18
	9.00-10.00	20

2.4 – Pavement Design

Design Traffic

Introduction

It is understood that the structural deterioration of roads is due to primarily two main reasons:

- Traffic volumes and induced loading; and
- Environment (climate).

Traffic is regarded as the key parameter in road deterioration. It is therefore essential to know its composition in terms of:

- Total traffic volume (ADT & AADT).
- Magnitude of the loads (axle load).
- Axle configuration.
- Contact pressure from the loads (mainly from tyre pressure); and
- Number of load repetitions.

It is well known that pavement design and its performance are influenced by the traffic loading on the pavement. Light vehicles such as cars, pick-ups and delivery vans make a very small contribution to the structural damage of pavement in comparison to the heavy vehicles. Heavy vehicle wheel load, tyre pressure, frequency, and duration together with environmental factors are all important to the performance of the pavements. However, the most significant parameter is the axle load.

In order to estimate the magnitude of the loads and the design traffic over the selected design period the following surveys have been carried out (please refer to the Traffic Demand Analysis Chapter submission:

- Traffic count (classified).
- Origin – destination; and
- Axle load.

Axle Load Survey

The axle load survey was carried out at five (5) locations from November 11, 2024, to November 17, 2024, at the following locations:

- Kambakia along A9 Road (11/11/2024 – 60 vehicles weighed),
- Ruire Junction along B66 Road (12/11/2024 – 69 vehicles weighed),
- Gakoromone along Mikinduri Road along B66 Road (13/11/2024 – 60 vehicles weighed),

- Kerige along Mitunguu Road (14/11/2024 and 16/11/2024 – 179 vehicles weighed),
- Ngonyi along Meru-Embu A9 Road (15/11/2024 and 17/11/2024 – 191 vehicles weighed).

The site locations for the axle load surveys using the mobile weighbridges were selected so as to capture the spectrum of vehicles that are representative of the types that will predominantly circulate following the upgrade of the Meru Link Roads after ensuring that:

- The traffic safety aspects have been considered.
- There is minimum impact on the traffic flow while the axle load activities are underway.
- the weighing surface gradient/slope does not exceed 2%; and
- the local police and traffic management officers are informed of the survey's location and duration.

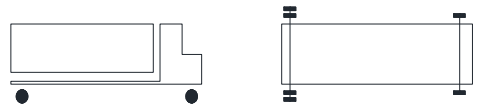
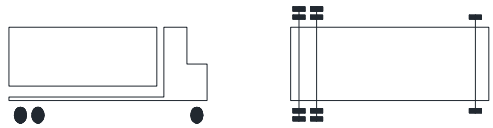
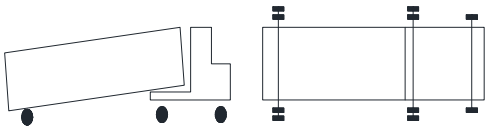
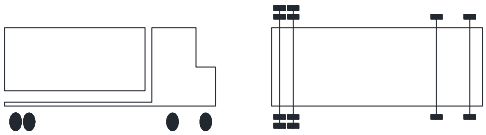
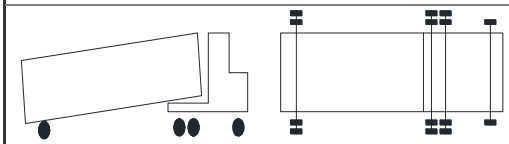
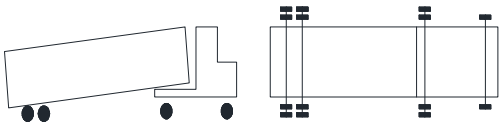
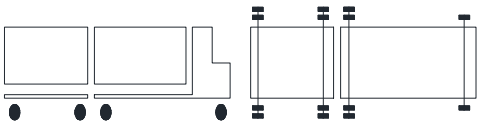
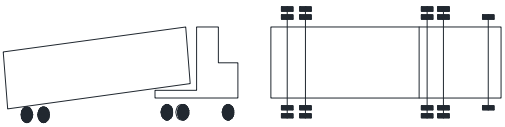
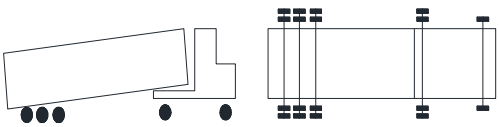
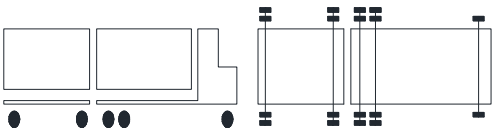
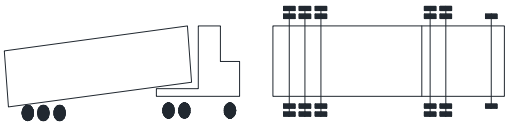
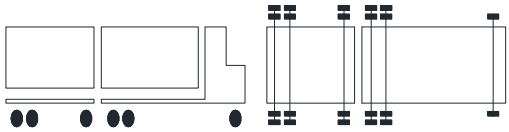
The axle load survey commenced on Monday, October 11, 2024, and ended on Sunday October 17, 2024 (total of 7-day survey-day time only mostly from 08:00 am to 06:00pm). Representative samples from each type of vehicle category were weighed as detailed further below. It is known that light vehicles cause minimal structural damage to road pavements, and therefore such vehicles are in most cases not included in axle load surveys of roads and are therefore not be weighed.

The axle load survey will provide, among other things, the average vehicle equivalent factors (VEF) for a specific vehicle category and the cumulative axle load distribution. Therefore, it was crucial to include fully loaded, partially loaded, and empty vehicles in the survey.

The loading device dealt only with static weighing and did not cover the weight of moving vehicles commonly termed Weigh - in – motion (WIM) thus it was important to ensure that the wheels were accurately placed on the platform. Each axle is dealt with separately in the axle load survey hence each axle is recorded separately on the pre-made survey form. After the front axle of the vehicle has been positioned accurately on the platform and the vehicle has come to a complete stop the left and right measurements were spelt out and recorded by the survey officers.

A total number of 559 vehicles were weighed in seven (7) days. Each vehicle was given an axle configuration code for ease of defining and processing the axle load data. Only commercial vehicles have been provided with a wheel configuration because of the varying axle arrangement as highlighted in Table 2-12 below.

Table 2-12 : Commercial vehicles' axle configuration

	Rigid Body Vehicle 2 Axles Wheel configuration 2:4
	Rigid Body Vehicle 3 Axles Wheel configuration 2:4:4
	Vehicle and Semi-Trailer 3 Axles Wheel configuration 2:4-4
	Rigid Body Vehicle 4 Axles Wheel configuration 2:2:4:4
	Vehicle and Semi-Trailer 4 Axles Wheel configuration 2:4:4-4
	Vehicle and Semi-Trailer 4 Axles Wheel configuration 2:4-4:4
	Vehicle and Drawbar Trailer 4 Axles Wheel configuration 2:4=4:4
	Vehicle and Semi-Trailer 5 Axles Wheel configuration 2:4:4-4:4
	Vehicle and Semi-Trailer 5 Axles Wheel configuration 2:4-4:4:4
	Vehicle and Drawbar Trailer 5 Axles Wheel configuration 2:4:4=4:4
	Vehicle and Semi-Trailer 6 Axles Wheel configuration 2:4:4-4:4:4
	Vehicle and Drawbar Trailer 2 Axles Wheel configuration 2:4:4=4:4:4

Axle Load Analysis

Independent single axle loads are converted into Equivalence Factors (EF) using the following expression:

$$EF = \left[\frac{L_s}{L_f} \right]^n$$

Where:

EF is the axle load equivalence factor
L_s is the load on the single axle load considered
L_f is the reference standard axle load
n is the damage exponent specific to the type of pavement structure

The reference axle load L_f is usually country specific. In Kenya, L_f is taken as 8,160kg (Road Design Manual, Part III, 1987). The value of 4.5 for the exponent n is often used, in line with early findings and the commonly cited "fourth and half-power damage effects" of heavy axle loads.

The relative damage to a pavement is the number of repetitions of a load that will result in pavement failure and increases very rapidly with increasing axle loads. This means, if the axle load is doubled the damage will not be merely doubled but will be increased sixteen-fold for n=4.5 (because the damage increases exponentially).

Table 2-13, presents a statistical analysis of the computation for the Vehicle Equivalence Factor (VEF).

Table 2-13 : Vehicle equivalence factors

Station	Vehicle Type	VEHICLE EQUIVALENCE FACTOR (VEF)									
		Count	Minimum	Maximum	Standard Deviation	Variance	Mean	Median	%ile 25	%ile 75	%ile 95
Kambakia	AHGV	1	8.96	8.96	.	.	8.96	8.96	8.96	8.96	8.96
	HGV	9	0.07	3.20	1.18	1.40	2.12	2.46	2.26	2.94	3.20
	LBUS	1	0.60	0.60	.	.	0.60	0.60	0.60	0.60	0.60
	LGV	10	0.00	1.93	0.60	0.36	0.21	0.00	0.00	0.04	1.93
	MGV	39	0.01	9.03	2.12	4.50	1.70	1.02	0.05	2.92	6.52
Kirige	AHGV	10	0.19	12.84	3.74	14.01	5.86	5.93	4.99	8.17	12.84
	HGV	8	0.04	3.75	1.20	1.44	2.25	2.58	1.52	3.01	3.75
	LBUS	4	0.06	1.60	0.00	0.42	0.73	0.64	0.29	1.18	1.60

	LGV	5	0.00	0.09	0.04	0.00	0.02	0.01	0.00	0.01	0.09
	MGV	152	0.00	26.56	5.03	25.29	4.34	2.98	0.22	6.30	13.32
Mikinduri	AHGV	1	4.44	4.44	.	.	4.44	4.44	4.44	4.44	4.44
	HGV	2	0.07	0.66	0.42	0.17	0.36	0.36	0.07	0.66	.66
	LBUS	1	3.00	3.00	.	.	3.00	3.00	3.00	3.00	3.00
	LGV	7	0.00	0.28	0.10	0.01	0.04	.00	0.00	0.03	0.28
	MGV	49	0.00	11.75	2.44	5.97	1.10	0.04	0.01	0.35	5.72
Ngonyi	AHGV	6	0.10	2.84	1.11	1.23	0.97	0.49	0.15	1.72	2.84
	HGV	8	0.01	4.98	1.67	2.79	1.11	.54	0.05	1.36	4.98
	LBUS	16	0.01	0.45	0.11	0.01	0.18	0.15	0.12	0.21	0.45
	LGV	16	0.00	0.07	0.02	0.00	0.01	0.00	0.00	0.02	0.07
	MGV	145	0.00	6.76	1.33	1.76	0.66	0.04	0.01	0.70	3.45
Ruire	AHGV	7	0.38	18.01	6.19	38.31	7.57	4.54	4.14	13.64	18.01
	HGV	1	4.39	4.39	.	.	4.39	4.39	4.39	4.39	4.39
	LBUS	2	0.42	0.69	0.19	0.04	.56	.56	.42	0.69	0.69
	LGV	9	0.00	0.08	0.02	0.00	0.01	.00	.00	0.01	0.08
	MGV	50	0.00	10.46	2.79	7.76	1.38	0.04	0.01	1.09	9.73

Traffic Forecast

The design traffic which has been harmonized with the carriageway width is presented as follows:

- Single Carriage Way Width (Vehicular Traffic Lanes) = 6.50 m in all cases.
- Commercial Traffic to be Considered for Design = TOTAL COMMERCIAL TRAFFIC IN BOTH DIRECTIONS (Kenya Road Design Manual, Part III, 1987).
- Design Traffic Class = T3.
- CESA Design Traffic Class of 10M.

Table 2-14: Homogeneous traffic road sections

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA
1	1.1	Three Steers – Kambakia Road	2.47	5,000,000
	1.2	Kambakia – Kagotone/ KEMU C91 Rd	3.317	5,000,000
	1.3	Kagotone - KEMU Link C91 Road	0.349	5,000,000
	1.4 and 1.5	Kongoacheke Jct - Kwa Mukuru Jct (2.49 km) & Kongo gardens - Kambakia Link Rd (0.451 km)	2.941	5,000,000
2	2	Runogone – Kaithe Road	1.96	4,500,000

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA
3	3.1	Hospital Road – Kiramburine Jct	1.938	7,000,000
	3.1	Link 1 – Meru Bus Terminus (0.46 km)]	0.465	7,000,000
	3.2	Link 2 – Gakoromone Market	0.642	7,000,000
	3.3	Link 3 – MEWAS Jct	0.341	7,000,000
4	4.1	Western Bypass – Link Road	0.706	9,000,000
	4.2	Western Bypass – Mate Road	2.597	9,000,000
		Total Length (km)	**17.526**	

Table 2-15 : Traffic forecast Scenarios for 20 years

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA
1	1.1	Three Steers – Kambakia Road	2.47	5,000,000 Traffic Class T3
	1.2	Kambakia – Kagotone/ KEMU C91 Rd	3.317	
	1.3	Kagotone - KEMU Link C91 Road	0.349	
	1.4 and 1.5	Kongoacheke Jct - Kwa Mukuru Jct (2.5 km) & Kongo gardens - Kambakia Link Rd (0.45 km)	2.941	
2	2	Runogone – Kaithe Road	1.76	4,500,000 Traffic Class T3
3	3.1	Hospital Road – Kiramburine Jct	1.938	7,000,000 Traffic Class T3
	3.1	Link 1 – Meru Bus Terminus (0.46 km)]	0.465	
	3.2	Link 2 – Gakoromone Market	0.642	
	3.3	Link 3 – MEWAS Jct	0.341	
4	4.1	Western Bypass – Link Road	0.706	9,000,000 Traffic Class T3
	4.2	Western Bypass – Mate Road	2.597	
		Total Length (km)	**17.526**	

2.5 – Pavement Structures

Proposed Pavement Structure for New Carriageway

For the Meru Link Roads, the homogeneous subgrade zones identified have been classified as follows:

- S2 class (CBR = 5% to 10%)

According to the Kenya Road Design Manual – Part 3: Materials and Pavement Design for New Roads, 1987, graded crushed stone (GCS) is commonly used as a base material in road construction. However, for roads subjected to medium and higher traffic loads, particularly Traffic Classes T1, T2 and higher levels of T3, GCS alone may not provide sufficient support due to its potential for excessive deformation and attrition. To enhance its performance and longevity, it is recommended to place GCS on a subbase made of cement or lime improved material of base quality.

As a result, the following pavement structures, also shown in Figure 2-14 are proposed:

PREFERRED PAVEMENT STRUCTURE OPTION – Type 8

- Surfacing: Asphalt Concrete (AC) _ Type I – 50mm
- Base: Graded Crushed Stone (GCS) – varying from 150 to 200mm
- Subbase: Cement/Lime Improved Gravel (C/L IG) – 200mm
- Improved Subgrade (Capping Layer): S4 quality - minimum CBR = 15% - 350mm

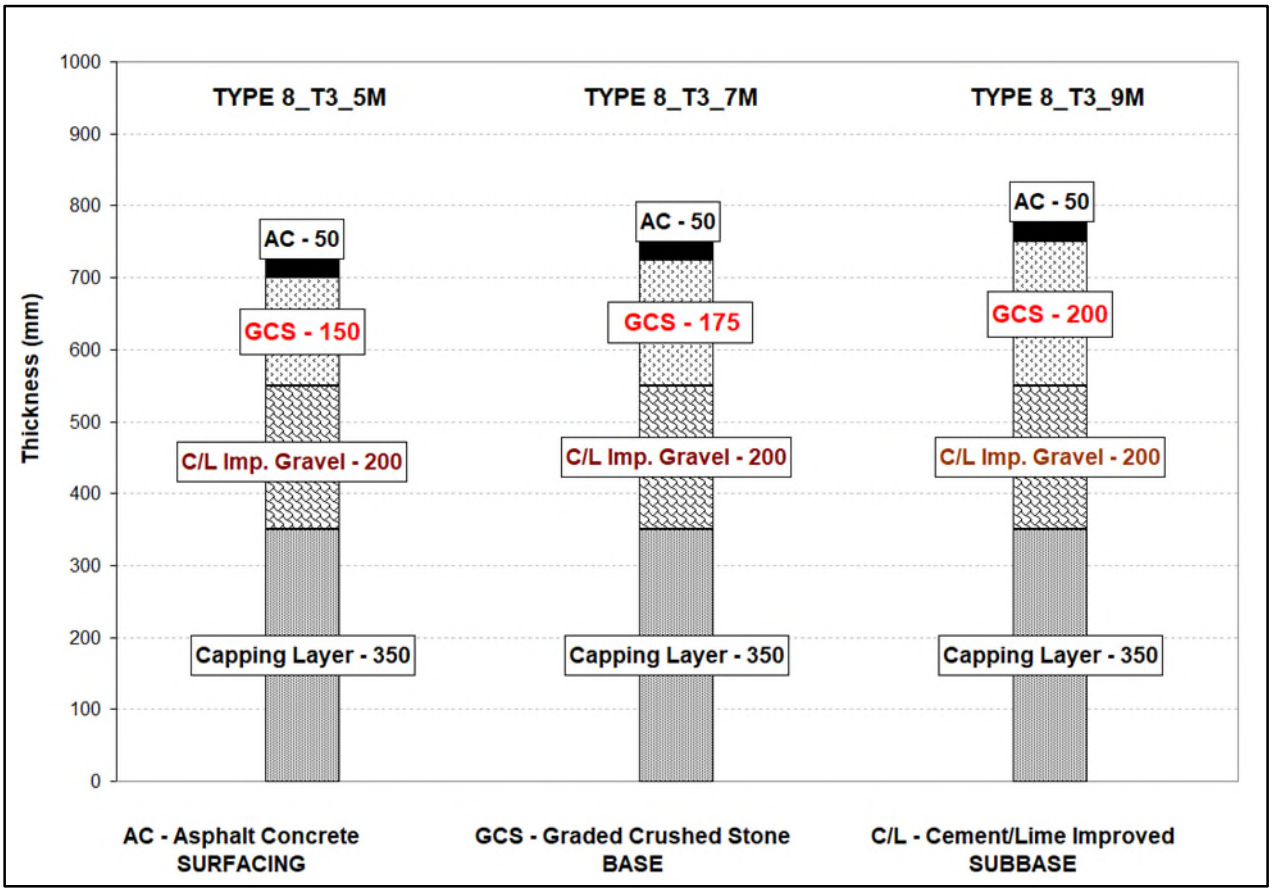


Figure 2-14 : Flexible pavement structure for a design traffic within T3

A summary of the project roads design traffic classes and proposed pavement structures is shown in Table 2 24.

TABLE 2-16: Summary of Traffic Class and Pavement Structures

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA	Proposed Pavement Structures
1	1.1	Three Steers – Kambakia Road	1.76	5,000,000 Traffic Class T3	AC-50 GCS-150 C/L Imp.-200 Imp. Subgrade-350
	1.2	Kambakia – Kagotone/ KEMU C91 Rd	3.317		
	1.3	Kagotone - KEMU Link C91 Road	0.349		
	1.4 and 1.5	Kongoacheke Jct - Kwa Mukuru Jct (2.5 km) & Kongo gardens - Kambakia Link Rd (0.45 km)	2.941		
2	2	Runogone – Kaithe Road	2.47	4,500,000 Traffic Class T3	AC-50 GCS-150 C/L Imp.-200 Imp. Subgrade-350
3	3.1	Hospital Road – Kiramburine Jct	1.938	7,000,000 Traffic Class T3	AC-50 GCS-175 C/L Imp.-200
	3.1	Link 1 – Meru Bus Terminus	0.465		
	3.2	Link 2 – Gakoromone Market	0.642		

Road Section	Design Section	Road Name	Length (Km)	Cumulative Equivalent Standard Axles (CESA	Proposed Pavement Structures
	3.3	Link 3 – MEWAS Jct	0.341		Imp. Subgrade-350
4	4.1	Western Bypass – Link Road	0.706	9,000,000 Traffic Class T3	AC-50 GCS-200 C/L Imp.-200 Imp. Subgrade-350
	4.2	Western Bypass – Mate Road	2.597		
Total Length (km)			**17.526**		

Walkways

Concrete blocks (Figure 2-15) will be referred to as blocks in this section. A block surface relies on the development of the mechanical interlock between blocks to provide shear resistance. A firm edge support is required to prevent ravelling at the edge of the surface. Supplementary drainage measures are necessary to prevent saturation of the underlying roadbed through the ingress of water. Block surfaces are suitable for pedestrian walkways and are not intended to be used by motorised traffic.



Figure 2-15 : Concrete blocks arrangements

PROPOSED PAVEMENT STRUCTURE FOR WALKWAYS

- Surfacing: Concrete Blocks (60mm)
- Bedding Layer: Sand (40mm)
- Subbase: Natural Gravel (200mm)
- Improved Subgrade (Capping Layer): S4 quality - minimum CBR = 15% - 350mm

APPENDICES:

APPENDIX 1: Design Traffic Forecast

APPENDIX 2: Road Alignment Results

APPENDIX 3: Material Sites Results

APPENDIX 4: Quarry Sites Results

APPENDIX 5: Water Results

APPENDIX 6: Trial Pits Geological Logs

APPENDIX 7: Boreholes Geological Logs

APPENDIX 8: Boreholes Soil Test Results

APPENDIX 9: Cement Treated Samples CBR Test Results

Appendix 1: Design Traffic Forecast

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

MEDIUM	GROWTH RATES												
	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068

WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S001	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	1693	3	476	137	26	18	0	1	0	20	4	0	0
Design Year 2	2025	1811	4	510	147	27	19	0	1	0	21	4	0	0
Construction Year 1	2026	1938	4	545	157	29	19	0	1	0	22	4	0	0
Construction Year 2 + DLP	2026	1938	4	545	157	29	19	0	1	0	22	4	0	0
1st Year Opening	2027	2075	4	590	168	33	21	0	1	5	23	52	15	7
	2028	2236	5	636	181	35	23	0	2	5	25	55	16	8
	2029	2411	5	685	195	37	24	0	2	6	26	58	17	8
	2030	2599	5	739	211	39	25	0	2	6	28	62	18	9
5th Year After Opening	2031	2802	6	796	227	41	27	0	2	6	29	66	20	9
	2032	3020	6	858	245	44	28	0	2	7	31	70	21	10
	2033	3256	7	925	264	47	30	0	2	7	33	74	22	10
	2034	3510	7	998	285	50	31	0	2	8	35	79	23	11
	2035	3783	8	1075	307	53	33	0	2	8	37	83	25	12
10th Year After Opening	2036	4079	8	1159	331	56	35	0	2	8	40	89	26	13
	2037	4397	9	1250	356	59	37	0	3	9	42	94	28	13
	2038	4740	10	1347	384	63	39	0	3	9	45	100	30	14
	2039	5109	10	1452	414	67	41	0	3	10	48	106	32	15
	2040	5508	11	1566	447	71	44	0	3	10	50	113	34	16
15th Year After Opening	2041	5938	12	1688	481	75	46	0	3	11	54	120	36	17
	2042	6401	13	1819	519	80	49	0	3	12	57	127	38	18
	2043	6900	14	1961	559	85	51	0	4	12	60	135	40	19
	2044	7438	15	2114	603	90	54	0	4	13	64	143	43	20
	2045	8018	16	2279	650	96	57	0	4	14	68	152	45	22
20th Year After Opening	2046	8644	17	2457	701	102	60	0	4	15	72	162	48	23
Start of Gr Per IV	2047	9318	19	2648	755	108	64	0	4	15	77	172	51	24
"	2048	10045	20	2855	814	115	67	0	5	16	82	183	54	26
"	2049	10828	22	3078	878	122	71	0	5	17	87	194	58	27
"	2050	11673	24	3318	946	130	75	0	5	18	92	206	61	29
"	2051	12583	25	3577	1020	138	79	0	6	19	98	219	65	31
"	2052	13565	27	3856	1100	146	84	0	6	20	104	232	69	33
"	2053	14623	30	4156	1185	155	88	0	6	21	110	247	74	35
"	2054	15763	32	4480	1278	165	93	0	6	22	117	262	78	37
"	2055	16993	34	4830	1378	175	99	0	7	24	124	278	83	39
30th Year After Opening	2056	18318	37	5207	1485	186	104	0	7	25	132	295	88	42
Total 15 years		**55461**	**112**	**15764**	**4496**	**768**	**484**	**0**	**34**	**117**	**546**	**1220**	**364**	**173**
Total 20 years		**92862**	**188**	**26394**	**7528**	**1222**	**756**	**0**	**53**	**182**	**868**	**1940**	**579**	**275**
Total 10 years		**29770**	**60**	**8462**	**2413**	**433**	**278**	**0**	**19**	**67**	**307**	**687**	**205**	**97**
Base Year-Design Year 1	2024	1,693	3	476	137	26	18	0	1	0	20	4	0	0
1st Year Opening	2027	2,075	4	590	168	33	21	0	1	5	23	52	15	7
5th Year After Opening	2031	2,802	6	796	227	41	27	0	2	6	29	66	20	9
10th Year After Opening	2036	4,079	8	1,159	331	56	35	0	2	8	40	89	26	13
15th Year after Opening	2041	5,938	12	1,688	481	75	46	0	3	11	54	120	36	17
20th Year After Opening	2046	8,644	17	2,457	701	102	60	0	4	15	72	162	48	23
30th Year After Opening	2056	18,318	37	5,207	1,485	186	104	0	7	25	132	295	88	42

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	53	182	434	12,220	2,541	3,750	**19,179**	**365**
													CESA	**7,000,361**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	53	182	434	8,418	2,541	2,463	**14,091**	**365**
													CESA	**5,143,144**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	53	182	434	4,209	1,053	1,438	**7,369**	**365**
													CESA	**2,689,651**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S002	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	621	26	349	33	56	8	0	0	0	13	0	0	0
Design Year 2	2025	664	27	373	35	59	8	0	0	0	14	0	0	0
Construction Year 1	2026	711	29	400	38	62	8	0	0	0	15	0	0	0
Construction Year 2 + DLP	2026	711	29	400	38	62	8	0	0	0	15	0	0	0
1st Year Opening	2027	762	31	428	40	66	9	0	0	5	15	52	16	7
	2028	821	34	461	43	70	9	0	0	6	16	55	17	8
	2029	885	36	497	47	74	10	0	0	6	17	58	18	8
	2030	954	39	536	50	79	10	0	0	6	18	62	20	9
5th Year After Opening	2031	1029	42	577	54	84	11	0	0	7	20	66	21	9
	2032	1109	46	622	58	89	11	0	0	7	21	70	22	10
	2033	1195	49	671	63	95	12	0	0	7	22	74	24	11
	2034	1289	53	723	68	100	13	0	0	8	23	79	25	11
	2035	1389	57	780	73	107	14	0	0	8	25	84	27	12
10th Year After Opening	2036	1498	62	841	79	113	14	0	0	9	26	89	28	13
	2037	1614	66	906	85	120	15	1	1	9	28	94	30	14
	2038	1740	72	977	92	128	16	1	1	10	30	100	32	14
	2039	1876	77	1053	99	136	17	1	1	10	32	106	34	15
	2040	2022	83	1135	107	144	18	1	1	11	34	113	36	16
15th Year After Opening	2041	2180	90	1224	115	153	19	1	1	11	36	120	38	17
	2042	2350	97	1319	124	162	20	1	1	12	38	128	40	18
	2043	2533	104	1422	133	172	21	1	1	13	40	135	43	19
	2044	2731	112	1533	144	183	22	1	1	13	43	144	46	21
	2045	2944	121	1652	155	195	23	1	1	14	45	153	48	22
20th Year After Opening	2046	3174	131	1781	167	207	25	1	1	15	48	162	51	23
Start of Gr Per IV	2047	3421	141	1920	180	219	26	1	1	16	51	172	55	25
"	2048	3688	152	2070	194	233	27	1	1	17	54	183	58	26
"	2049	3976	164	2232	209	247	29	1	1	18	58	194	62	28
"	2050	4286	176	2406	226	263	31	1	1	19	61	206	65	30
"	2051	4620	190	2593	243	279	32	1	1	20	65	219	69	32
"	2052	4980	205	2795	262	296	34	1	1	21	69	233	74	33
"	2053	5369	221	3014	283	315	36	1	1	22	73	247	78	36
"	2054	5788	238	3249	305	334	38	1	1	23	78	262	83	38
"	2055	6239	257	3502	329	355	40	1	1	24	83	279	88	40
30th Year After Opening	2056	6726	277	3775	354	377	42	1	1	26	88	296	94	43
Total 15 years		**20363**	**837**	**11430**	**1073**	**1557**	**197**	**7**	**7**	**119**	**363**	**1223**	**388**	**176**
Total 20 years		**34095**	**1402**	**19137**	**1796**	**2476**	**308**	**10**	**10**	**186**	**577**	**1944**	**616**	**280**
Total 10 years		**10931**	**450**	**6135**	**576**	**876**	**113**	**4**	**4**	**68**	**204**	**688**	**218**	**99**

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	621	26	349	33	56	8	0	0	0	13	0	0	0
1st Year Opening	2027	762	31	428	40	66	9	0	0	5	15	52	16	7
5th Year After Opening	2031	1,029	42	577	54	84	11	0	0	7	20	66	21	9
10th Year After Opening	2036	1,498	62	841	79	113	14	0	0	9	26	89	28	13
15th Year after Opening	2041	2,180	90	1,224	115	153	19	1	1	11	36	120	38	17
20th Year After Opening	2046	3,174	131	1,781	167	207	25	1	1	15	48	162	51	23
30th Year After Opening	2056	6,726	277	3,775	354	377	42	1	1	26	88	296	94	43

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	10	186	289	12,249	2,706	3,815	**19,256**	**365**
													CESA	**7,028,287**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	10	186	289	8,439	2,706	2,506	**14,136**	**365**
													CESA	**5,159,524**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	10	186	289	4,219	1,122	1,463	**7,289**	**365**
													CESA	**2,660,519**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S003	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	**2024**	**1723**	**18**	**656**	**75**	**50**	**31**	**1**	**2**	**1**	**30**	**4**	**0**	**0**
Design Year 2	**2025**	1844	19	702	80	53	32	1	2	1	31	4	0	0
Construction Year 1	**2026**	1973	20	752	86	56	34	1	2	1	33	4	0	0
Construction Year 2 + DLP	**2026**	1973	20	752	86	56	34	1	2	1	33	4	0	0
1st Year Opening	**2027**	2111	21	810	92	61	37	1	2	1	35	47	15	7
	2028	2276	23	873	99	65	39	2	2	1	37	50	16	8
	2029	2453	25	942	107	69	41	2	2	1	39	53	17	8
	2030	2644	27	1015	115	73	43	2	2	1	42	56	18	9
5th Year After Opening	**2031**	2851	29	1094	124	77	46	2	2	1	45	60	19	9
	2032	3073	31	1179	134	82	48	2	2	1	47	63	20	10
	2033	3313	34	1271	144	87	51	2	2	1	50	67	21	11
	2034	3571	36	1371	155	93	54	2	3	1	53	71	22	11
	2035	3850	39	1478	168	98	57	2	3	1	57	76	24	12
10th Year After Opening	**2036**	4150	42	1593	181	104	60	2	3	1	60	81	25	13
	2037	4474	46	1717	195	111	63	3	3	2	64	86	27	14
	2038	4822	49	1851	210	118	67	3	3	2	68	91	28	14
	2039	5199	53	1995	226	125	71	3	3	2	72	96	30	15
	2040	5604	57	2151	244	133	75	3	4	2	77	102	32	16
15th Year After Opening	**2041**	6041	62	2319	263	141	79	3	4	2	81	109	34	17
	2042	6512	66	2500	283	150	83	3	4	2	86	116	36	18
	2043	7020	72	2695	306	159	88	3	4	2	92	123	38	19
	2044	7568	77	2905	329	169	93	4	4	2	97	130	41	21
	2045	8158	83	3131	355	180	98	4	5	2	103	138	43	22
20th Year After Opening	**2046**	8795	90	3376	383	191	104	4	5	2	110	147	46	23
Start of Gr Per IV	**2047**	9481	97	3639	413	202	109	4	5	3	117	156	49	25
"	**2048**	10220	104	3923	445	215	116	5	5	3	124	166	52	26
"	**2049**	11017	112	4229	480	228	122	5	6	3	132	176	55	28
"	**2050**	11877	121	4559	517	242	129	5	6	3	140	187	59	30
"	**2051**	12803	130	4914	557	258	136	5	6	3	148	199	62	32
"	**2052**	13802	141	5297	601	273	144	6	7	3	158	211	66	33
"	**2053**	14878	152	5711	648	290	152	6	7	4	167	224	70	36
"	**2054**	16039	163	6156	698	308	160	6	8	4	178	238	75	38
"	**2055**	17290	176	6636	753	328	169	7	8	4	189	253	79	40
30th Year After Opening	**2056**	18638	190	7154	811	348	179	7	8	4	200	268	84	43
Total 15 years		**56431**	**575**	**21659**	**2456**	**1437**	**831**	**33**	**39**	**20**	**828**	**1108**	**347**	**176**
Total 20 years		**94485**	**962**	**36265**	**4113**	**2285**	**1297**	**51**	**62**	**31**	**1316**	**1761**	**552**	**280**
Total 10 years		**30291**	**309**	**11626**	**1319**	**809**	**476**	**19**	**23**	**11**	**466**	**624**	**196**	**99**

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	1,723	18	656	75	50	31	1	2	1	30	4	0	0
1st Year Opening	2027	2,111	21	810	92	61	37	1	2	1	35	47	15	7
5th Year After Opening	2031	2,851	29	1,094	124	77	46	2	2	1	45	60	19	9
10th Year After Opening	2036	4,150	42	1,593	181	104	60	2	3	1	60	81	25	13
15th Year after Opening	2041	6,041	62	2,319	263	141	79	3	4	2	81	109	34	17
20th Year After Opening	2046	8,795	90	3,376	383	191	104	4	5	2	110	147	46	23
30th Year After Opening	2056	18,638	190	7,154	811	348	179	7	8	4	200	268	84	43

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	62	31	658	11,097	2,425	3,815	**18,087**	**365**
													CESA	**6,601,752**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	62	31	658	7,645	2,425	2,506	**13,326**	**365**
													CESA	**4,863,850**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	62	31	658	3,822	1,005	1,463	**7,041**	**365**
													CESA	**2,569,834**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S004	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	1172	22	503	54	53	19	1	1	1	21	2	0	0
Design Year 2	2025	1254	23	538	58	56	20	1	1	1	23	2	0	0
Construction Year 1	2026	1342	25	576	62	59	21	1	1	1	24	2	0	0
Construction Year 2 + DLP	2026	1342	25	576	62	59	21	1	1	1	24	2	0	0
1st Year Opening	2027	1437	26	622	66	64	23	1	1	6	25	49	16	7
	2028	1549	28	670	71	68	25	1	1	6	27	52	17	8
	2029	1670	31	723	77	73	26	1	1	6	28	56	18	8
	2030	1800	33	779	83	77	27	1	1	7	30	59	19	9
5th Year After Opening	2031	1940	36	840	89	82	29	1	1	7	32	63	20	9
	2032	2092	38	905	96	87	31	1	1	7	34	67	21	10
	2033	2255	41	976	104	92	32	1	1	8	36	71	22	11
	2034	2431	45	1052	112	98	34	1	1	8	38	75	24	11
	2035	2620	48	1134	120	104	36	1	2	9	41	80	25	12
10th Year After Opening	2036	2825	52	1223	130	111	38	1	2	9	43	85	27	13
	2037	3045	56	1318	140	117	40	2	2	10	46	90	28	14
	2038	3282	60	1421	151	125	42	2	2	10	49	96	30	14
	2039	3539	65	1532	163	132	45	2	2	11	52	101	32	15
	2040	3815	70	1651	175	141	47	2	2	11	55	108	34	16
15th Year After Opening	2041	4112	76	1780	189	149	50	2	2	12	58	114	36	17
	2042	4433	81	1919	204	159	53	2	2	13	62	122	38	18
	2043	4779	88	2068	220	168	56	2	2	13	66	129	41	19
	2044	5151	95	2230	237	179	59	2	3	14	70	137	43	21
	2045	5553	102	2403	255	190	62	2	3	15	74	146	46	22
20th Year After Opening	2046	5986	110	2591	275	202	66	2	3	16	79	155	49	23
Start of Gr Per IV	2047	6453	119	2793	296	214	69	3	3	17	84	164	52	25
"	2048	6957	128	3011	320	228	73	3	3	18	89	174	55	26
"	2049	7499	138	3246	345	242	77	3	3	19	95	185	58	28
"	2050	8084	149	3499	371	257	81	3	4	20	100	197	62	30
"	2051	8715	160	3772	400	273	86	3	4	21	107	209	66	32
"	2052	9394	173	4066	432	289	91	3	4	22	113	222	70	33
"	2053	10127	186	4383	465	307	96	4	4	23	120	236	74	36
"	2054	10917	201	4725	502	326	101	4	4	24	128	250	79	38
"	2055	11769	216	5094	541	347	107	4	5	26	136	266	84	40
30th Year After Opening	2056	12687	233	5491	583	368	113	4	5	27	144	282	89	43
Total 15 years		**38410**	**706**	**16625**	**1765**	**1520**	**525**	**20**	**23**	**126**	**595**	**1165**	**367**	**176**
Total 20 years		**64312**	**1182**	**27836**	**2954**	**2418**	**820**	**31**	**36**	**197**	**947**	**1853**	**584**	**280**
Total 10 years		**20618**	**379**	**8924**	**947**	**856**	**301**	**11**	**13**	**72**	**335**	**656**	**207**	**99**

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	1,172	22	503	54	53	19	1	1	1	21	2	0	0
1st Year Opening	2027	1,437	26	622	66	64	23	1	1	6	25	49	16	7
5th Year After Opening	2031	1,940	36	840	89	82	29	1	1	7	32	63	20	9
10th Year After Opening	2036	2,825	52	1,223	130	111	38	1	2	9	43	85	27	13
15th Year after Opening	2041	4,112	76	1,780	189	149	50	2	2	12	58	114	36	17
20th Year After Opening	2046	5,986	110	2,591	275	202	66	2	3	16	79	155	49	23
30th Year After Opening	2056	12,687	233	5,491	583	368	113	4	5	27	144	282	89	43

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	36	197	473	11,673	2,565	3,815	**18,759**	**365**
													CESA	**6,847,178**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	36	197	473	8,042	2,565	2,506	**13,819**	**365**
													CESA	**5,043,846**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	36	197	473	4,021	1,063	1,463	**7,253**	**365**
													CESA	**2,647,335**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S004	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	424	1	262	13	37	4	1	0	0	4	0	0	0
Design Year 2	2025	453	1	280	14	39	5	1	0	0	4	0	0	0
Construction Year 1	2026	485	1	300	15	42	5	1	0	0	5	0	0	0
Construction Year 2 + DLP	2026	485	1	300	15	42	5	1	0	0	5	0	0	0
1st Year Opening	2027	519	1	326	16	48	7	1	1	0	5	39	18	7
	2028	560	1	351	18	51	8	1	1	0	5	41	20	8
	2029	603	1	379	19	54	8	1	1	0	5	44	21	8
	2030	650	1	408	20	57	8	1	1	0	6	47	22	9
5th Year After Opening	2031	701	1	440	22	61	9	1	1	0	6	50	23	9
	2032	756	1	474	24	65	9	1	1	0	7	53	25	10
	2033	815	2	511	26	69	10	1	1	0	7	56	26	10
	2034	878	2	551	28	73	11	1	1	0	7	59	28	11
	2035	947	2	594	30	78	11	1	2	0	8	63	30	12
10th Year After Opening	2036	1021	2	640	32	82	12	1	2	0	8	67	32	12
	2037	1100	2	690	35	88	12	1	2	0	9	71	34	13
	2038	1186	2	744	37	93	13	1	2	0	9	76	36	14
	2039	1279	3	802	40	99	14	1	2	0	10	80	38	15
	2040	1378	3	865	43	105	15	2	2	0	11	85	40	16
15th Year After Opening	2041	1486	3	932	47	111	15	2	2	0	11	91	43	17
	2042	1602	3	1005	50	118	16	2	2	0	12	96	45	18
	2043	1727	3	1083	54	126	17	2	2	0	13	102	48	19
	2044	1861	4	1168	59	133	18	2	3	0	13	109	51	20
	2045	2006	4	1259	63	142	19	2	3	0	14	115	54	21
20th Year After Opening	2046	2163	4	1357	68	150	20	2	3	0	15	122	58	22
Start of Gr Per IV	2047	2332	5	1463	73	160	21	2	3	0	16	130	61	24
"	2048	2513	5	1577	79	170	23	2	3	0	17	138	65	25
"	2049	2710	5	1700	85	180	24	3	3	0	18	147	69	27
"	2050	2921	6	1833	92	191	25	3	4	0	19	156	73	29
"	2051	3149	6	1976	99	203	27	3	4	0	20	165	78	30
"	2052	3394	7	2130	107	216	28	3	4	0	22	176	83	32
"	2053	3659	7	2296	115	229	30	3	4	0	23	186	88	34
"	2054	3944	8	2475	124	243	31	3	4	0	25	198	93	36
"	2055	4252	8	2668	134	258	33	4	5	0	26	210	99	39
30th Year After Opening	2056	4584	9	2876	144	274	35	4	5	0	28	223	105	41
Total 15 years		13878	27	8707	436	1133	162	18	23	0	114	922	435	169
Total 20 years		23237	46	14579	731	1803	253	27	35	0	182	1467	692	269
Total 10 years		7449	15	4674	234	638	93	10	13	0	64	519	245	95

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	424	1	262	13	37	4	1	0	0	4	0	0	0
1st Year Opening	2027	519	1	326	16	48	7	1	1	0	5	39	18	7
5th Year After Opening	2031	701	1	440	22	61	9	1	1	0	6	50	23	9
10th Year After Opening	2036	1,021	2	640	32	82	12	1	2	0	8	67	32	12
15th Year after Opening	2041	1,486	3	932	47	111	15	2	2	0	11	91	43	17
20th Year After Opening	2046	2,163	4	1,357	68	150	20	2	3	0	15	122	58	22
30th Year After Opening	2056	4,584	9	2,876	144	274	35	4	5	0	28	223	105	41

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	35	0	91	9,241	3,036	3,664	**16,067**	**365**
													CESA	**5,864,311**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	35	0	91	6,366	3,036	2,407	**11,935**	**365**
													CESA	**4,356,125**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	35	0	91	3,183	1,259	1,405	**5,972**	**365**
													CESA	**2,179,936**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

GROWTH RATES

MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	**Generated (in Yr.)**	**Motor Cycle**	**Tuk Tuk**	**Small/Medium Car**	**Four Wheel Drive Vehicles (FWD)**	**Pick-Up/Utility Vehicles**	**Matatu (14 Seater)**	**Medium Bus (25-30 Pass)**	**Large Bus 2 Axle Bus**	**Large Bus 3 Axle Bus**	**2 Axle Truck**	**3 Axle Truck**	**4 Axle Truck**	**Articulated Truck (4+ Axle Truck**
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S004	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	1630	13	627	164	53	86	3	2	0	17	6	0	0
Design Year 2	2025	1744	13	671	175	56	91	3	2	0	18	6	0	0
Construction Year 1	2026	1866	14	718	187	59	95	3	2	0	19	6	0	0
Construction Year 2 + DLP	2026	1866	14	718	187	59	95	3	2	0	19	6	0	0
1st Year Opening	2027	2006	15	768	200	73	105	21	3	0	20	50	20	8
	2028	2163	17	828	216	78	111	23	3	0	21	53	22	9
	2029	2332	18	893	233	83	117	24	3	0	22	57	23	9
	2030	2514	19	963	251	88	124	25	4	0	24	60	24	10
5th Year After Opening	2031	2710	21	1038	271	93	131	27	4	0	25	64	26	10
	2032	2921	22	1119	292	99	138	28	4	0	27	68	28	11
	2033	3149	24	1206	315	105	146	30	4	0	29	72	29	12
	2034	3394	26	1300	339	111	154	31	4	0	30	77	31	12
	2035	3659	28	1401	366	118	163	33	5	0	32	81	33	13
10th Year After Opening	2036	3945	30	1511	394	126	172	35	5	0	34	86	35	14
	2037	4252	33	1629	425	134	181	37	5	1	36	92	37	15
	2038	4584	35	1756	458	142	191	39	6	1	39	97	40	16
	2039	4942	38	1892	494	151	202	41	6	1	41	103	42	17
	2040	5327	41	2040	532	160	214	44	6	1	43	110	45	18
15th Year After Opening	2041	5742	44	2199	574	170	225	46	7	1	46	117	47	19
	2042	6190	47	2371	619	180	238	49	7	1	49	124	50	20
	2043	6673	51	2556	667	192	251	51	7	1	52	131	53	21
	2044	7194	55	2755	719	203	266	54	8	1	55	140	57	23
	2045	7755	59	2970	775	216	280	57	8	1	59	148	60	24
20th Year After Opening	2046	8360	64	3202	835	229	296	61	9	1	62	158	64	26
Start of Gr Per IV	2047	9012	69	3451	900	244	313	64	9	1	66	167	68	27
"	2048	9715	74	3720	971	259	330	67	10	1	70	178	72	29
"	2049	10472	80	4011	1046	275	349	71	10	1	75	189	77	31
"	2050	11289	86	4324	1128	292	368	75	11	1	79	200	81	32
"	2051	12170	93	4661	1216	310	389	79	11	1	84	213	86	35
"	2052	13119	100	5024	1311	329	411	84	12	1	90	226	92	37
"	2053	14142	108	5416	1413	350	434	89	13	1	95	240	97	39
"	2054	15245	117	5839	1523	371	458	94	13	1	101	255	104	41
"	2055	16435	126	6294	1642	394	484	99	14	1	107	271	110	44
30th Year After Opening	2056	17717	136	6785	1770	419	511	104	15	1	114	287	117	47
Total 15 years		**53640**	**411**	**20543**	**5360**	**1729**	**2374**	**485**	**69**	**7**	**470**	**1187**	**482**	**193**
Total 20 years		**89811**	**687**	**34395**	**8974**	**2750**	**3706**	**757**	**107**	**10**	**748**	**1888**	**767**	**306**
Total 10 years		**28792**	**220**	**11027**	**2877**	**974**	**1360**	**278**	**39**	**4**	**265**	**668**	**271**	**108**

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	1,630	13	627	164	53	86	3	2	0	17	6	0	0
1st Year Opening	2027	2,006	15	768	200	73	105	21	3	0	20	50	20	8
5th Year After Opening	2031	2,710	21	1,038	271	93	131	27	4	0	25	64	26	10
10th Year After Opening	2036	3,945	30	1,511	394	126	172	35	5	0	34	86	35	14
15th Year after Opening	2041	5,742	44	2,199	574	170	225	46	7	1	46	117	47	19
20th Year After Opening	2046	8,360	64	3,202	835	229	296	61	9	1	62	158	64	26
30th Year After Opening	2056	17,717	136	6,785	1,770	419	511	104	15	1	114	287	117	47

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	107	10	374	11,893	3,366	4,176	**19,927**	**365**
													CESA	**7,273,214**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	107	10	374	8,193	3,366	2,743	**14,794**	**365**
													CESA	**5,399,664**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	107	10	374	4,097	1,395	1,601	**7,585**	**365**
													CESA	**2,768,361**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S007	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	1657	7	431	59	31	14	1	0	0	10	18	1	0
Design Year 2	2025	1773	7	462	63	33	15	1	0	0	10	19	1	0
Construction Year 1	2026	1897	7	494	67	35	16	1	0	0	11	20	1	0
Construction Year 2 + DLP	2026	1897	7	494	67	35	16	1	0	0	11	20	1	0
1st Year Opening	2027	2035	8	558	72	48	27	10	1	0	12	65	22	8
	2028	2193	9	602	78	51	29	10	1	0	12	69	24	8
	2029	2364	9	649	84	54	30	11	1	0	13	73	25	9
	2030	2549	10	700	90	58	32	11	1	0	14	78	27	9
5th Year After Opening	2031	2748	11	754	97	61	34	12	1	0	15	83	29	10
	2032	2962	12	813	105	65	36	13	1	0	16	88	30	10
	2033	3193	13	876	113	69	38	13	1	0	17	93	32	11
	2034	3442	14	945	122	73	40	14	1	0	18	99	34	12
	2035	3710	15	1018	131	78	42	15	2	0	19	105	36	12
10th Year After Opening	2036	4000	16	1098	142	83	45	16	2	0	20	112	39	13
	2037	4312	17	1184	153	88	47	17	2	0	21	118	41	14
	2038	4648	18	1276	165	93	50	17	2	0	23	126	44	15
	2039	5011	20	1375	178	99	52	18	2	0	24	134	46	16
	2040	5402	21	1483	191	105	55	19	2	0	25	142	49	17
15th Year After Opening	2041	5823	23	1598	206	112	59	21	2	0	27	151	52	18
	2042	6277	25	1723	222	119	62	22	2	0	29	160	55	19
	2043	6767	27	1857	240	126	65	23	2	0	30	170	59	20
	2044	7295	29	2002	258	134	69	24	3	0	32	180	63	21
	2045	7864	31	2158	279	142	73	26	3	0	34	192	66	23
20th Year After Opening	2046	8477	33	2327	300	151	77	27	3	0	36	204	71	24
Start of Gr Per IV	2047	9138	36	2508	324	160	81	28	3	0	39	216	75	25
"	2048	9851	39	2704	349	170	86	30	3	0	41	230	80	27
"	2049	10619	42	2915	376	181	91	32	3	0	44	244	84	29
"	2050	11448	45	3142	406	192	96	34	4	0	46	259	90	31
"	2051	12340	48	3387	437	204	101	35	4	0	49	275	95	32
"	2052	13303	52	3651	471	216	107	37	4	0	52	292	101	34
"	2053	14341	56	3936	508	230	113	40	4	0	55	310	107	37
"	2054	15459	61	4243	548	244	119	42	4	0	59	329	114	39
"	2055	16665	65	4574	590	259	126	44	5	0	63	350	121	41
30th Year After Opening	2056	17965	71	4931	637	275	133	47	5	0	66	371	129	44
Total 15 years		**54392**	**213**	**14930**	**1927**	**1136**	**616**	**216**	**23**	**0**	**274**	**1534**	**532**	**181**
Total 20 years		**91071**	**357**	**24997**	**3227**	**1807**	**962**	**338**	**35**	**0**	**436**	**2439**	**845**	**287**
Total 10 years		**29196**	**115**	**8014**	**1035**	**640**	**353**	**124**	**13**	**0**	**155**	**863**	**299**	**102**

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	1,657	7	431	59	31	14	1	0	0	10	18	1	0
1st Year Opening	2027	2,035	8	558	72	48	27	10	1	0	12	65	22	8
5th Year After Opening	2031	2,748	11	754	97	61	34	12	1	0	15	83	29	10
10th Year After Opening	2036	4,000	16	1,098	142	83	45	16	2	0	20	112	39	13
15th Year after Opening	2041	5,823	23	1,598	206	112	59	21	2	0	27	151	52	18
20th Year After Opening	2046	8,477	33	2,327	300	151	77	27	3	0	36	204	71	24
30th Year After Opening	2056	17,965	71	4,931	637	275	133	47	5	0	66	371	129	44

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	35	0	218	15,367	3,711	3,920	**23,252**	**365**
													CESA	**8,486,803**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	35	0	218	10,586	3,711	2,575	**17,126**	**365**
													CESA	**6,250,854**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	35	0	218	5,293	1,538	1,503	**8,588**	**365**
													CESA	**3,134,660**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

GROWTH RATES

MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	**Generated (in Yr.)**	**Motor Cycle**	**Tuk Tuk**	**Small/Medium Car**	**Four Wheel Drive Vehicles (FWD)**	**Pick-Up/Utility Vehicles**	**Matatu (14 Seater)**	**Medium Bus (25-30 Pass)**	**Large Bus 2 Axle Bus**	**Large Bus 3 Axle Bus**	**2 Axle Truck**	**3 Axle Truck**	**4 Axle Truck**	**Articulated Truck (4+ Axle Truck**
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S008	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	3897	90	1429	532	58	138	3	10	3	93	16	1	0
Design Year 2	2025	4170	96	1529	569	62	146	3	10	3	99	17	1	0
Construction Year 1	2026	4462	103	1636	609	65	153	3	11	3	104	18	1	0
Construction Year 2 + DLP	2026	4462	103	1636	609	65	153	3	11	3	104	18	1	0
1st Year Opening	2027	4774	110	1811	652	80	178	3	12	4	110	64	25	7
	2028	5146	119	1952	702	85	188	4	13	4	117	68	26	8
	2029	5548	128	2104	757	90	198	4	14	4	124	72	28	8
	2030	5980	138	2268	816	95	209	4	15	4	132	76	30	9
5th Year After Opening	2031	6447	149	2445	880	101	221	4	16	5	140	81	32	9
	2032	6950	161	2636	949	108	233	5	16	5	149	86	34	10
	2033	7492	173	2841	1022	114	246	5	17	5	158	91	36	10
	2034	8076	187	3063	1102	121	260	5	18	5	168	97	38	11
	2035	8706	201	3302	1188	129	275	5	19	6	178	103	40	12
10th Year After Opening	2036	9385	217	3559	1281	137	290	6	20	6	189	109	43	12
	2037	10117	234	3837	1381	145	306	6	22	6	201	116	45	13
	2038	10906	252	4136	1489	154	324	6	23	7	213	123	48	14
	2039	11757	272	4459	1605	164	342	7	24	7	227	131	51	15
	2040	12674	293	4807	1730	174	361	7	25	7	241	139	54	16
15th Year After Opening	2041	13663	316	5182	1865	185	381	7	27	8	256	148	58	17
	2042	14728	341	5586	2010	196	402	8	28	8	271	157	61	18
	2043	15877	367	6022	2167	208	425	8	30	9	288	167	65	19
	2044	17116	396	6491	2336	221	449	9	32	9	306	177	69	20
	2045	18451	427	6998	2518	235	474	9	33	10	325	188	73	21
20th Year After Opening	2046	19890	460	7544	2715	250	500	10	35	10	345	200	78	22
Start of Gr Per IV	2047	21441	496	8132	2926	265	528	10	37	11	367	212	83	24
"	2048	23114	535	8766	3155	282	558	11	39	11	389	225	88	25
"	2049	24917	576	9450	3401	299	589	12	41	12	413	239	93	27
"	2050	26860	621	10187	3666	318	622	12	44	13	439	254	99	29
"	2051	28955	670	10982	3952	337	657	13	46	13	466	270	105	30
"	2052	31214	722	11838	4260	358	694	14	49	14	495	286	112	32
"	2053	33648	778	12762	4592	380	733	14	52	15	526	304	119	34
"	2054	36273	839	13757	4951	404	774	15	54	16	559	323	126	36
"	2055	39102	904	14830	5337	429	817	16	57	17	593	343	134	39
30th Year After Opening	2056	42152	975	15987	5753	456	863	17	61	18	630	364	142	41
Total 15 years		127622	2952	48403	17418	1882	4013	79	282	82	2601	1504	588	169
Total 20 years		213684	4942	81043	29164	2993	6263	123	440	128	4137	2391	935	269
Total 10 years		68504	1584	25981	9349	1059	2299	45	162	47	1465	847	331	95

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	3,897	90	1,429	532	58	138	3	10	3	93	16	1	0
1st Year Opening	2027	4,774	110	1,811	652	80	178	3	12	4	110	64	25	7
5th Year After Opening	2031	6,447	149	2,445	880	101	221	4	16	5	140	81	32	9
10th Year After Opening	2036	9,385	217	3,559	1,281	137	290	6	20	6	189	109	43	12
15th Year after Opening	2041	13,663	316	5,182	1,865	185	381	7	27	8	256	148	58	17
20th Year After Opening	2046	19,890	460	7,544	2,715	250	500	10	35	10	345	200	78	22
30th Year After Opening	2056	42,152	975	15,987	5,753	456	863	17	61	18	630	364	142	41

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	440	128	2,069	15,066	4,104	3,664	**25,472**	**365**
													CESA	**9,297,100**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	440	128	2,069	10,379	4,104	2,407	**19,527**	**365**
													CESA	**7,127,440**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	440	128	2,069	5,189	1,702	1,405	**10,933**	**365**
													CESA	**3,990,568**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S009	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	6137	174	2427	1005	85	263	6	20	6	177	15	2	0
Design Year 2	2025	6567	186	2596	1075	90	276	6	21	7	187	15	2	0
Construction Year 1	2026	7026	199	2778	1150	95	290	6	22	7	197	16	2	0
Construction Year 2 + DLP	2026	7026	199	2778	1150	95	290	6	22	7	197	16	2	0
1st Year Opening	2027	7523	213	3003	1231	111	316	15	24	7	209	61	24	8
	2028	8110	229	3237	1327	118	334	16	25	8	221	65	26	8
	2029	8743	247	3489	1431	125	353	17	27	8	235	69	27	9
	2030	9425	267	3762	1542	133	372	18	28	9	250	73	29	9
5th Year After Opening	2031	10160	287	4055	1662	141	393	19	30	9	265	78	31	10
	2032	10952	310	4371	1792	150	415	20	32	10	282	83	33	10
	2033	11806	334	4712	1932	159	438	21	33	10	299	88	35	11
	2034	12727	360	5080	2083	169	463	23	35	11	318	93	37	12
	2035	13720	388	5476	2245	180	489	24	37	11	337	99	39	12
10th Year After Opening	2036	14790	418	5903	2420	191	516	25	39	12	358	105	42	13
	2037	15944	451	6364	2609	203	545	27	41	13	381	112	44	14
	2038	17187	486	6860	2812	215	576	28	44	13	404	119	47	15
	2039	18528	524	7395	3032	229	608	30	46	14	429	126	50	16
	2040	19973	565	7972	3268	243	642	31	49	15	456	134	53	17
15th Year After Opening	2041	21531	609	8594	3523	258	678	33	51	16	484	142	56	18
	2042	23211	657	9264	3798	274	716	35	54	16	514	151	60	19
	2043	25021	708	9986	4094	291	756	37	57	17	546	161	64	20
	2044	26973	763	10765	4413	309	798	39	61	18	580	171	67	21
	2045	29076	823	11605	4758	328	843	41	64	19	616	181	72	23
20th Year After Opening	2046	31344	887	12510	5129	349	890	43	68	20	654	192	76	24
Start of Gr Per IV	2047	33789	956	13486	5529	370	940	46	71	22	694	204	81	25
"	2048	36425	1031	14538	5960	393	993	48	75	23	738	217	86	27
"	2049	39266	1111	15672	6425	418	1048	51	80	24	783	230	91	29
"	2050	42329	1198	16894	6926	443	1107	54	84	25	832	245	97	31
"	2051	45630	1291	18212	7466	471	1169	57	89	27	883	260	103	32
"	2052	49190	1392	19633	8049	500	1234	60	94	28	938	276	109	34
"	2053	53026	1500	21164	8677	531	1304	64	99	30	996	293	116	37
"	2054	57162	1617	22815	9353	564	1377	67	104	32	1058	311	123	39
"	2055	61621	1743	24594	10083	599	1454	71	110	33	1124	331	131	41
30th Year After Opening	2056	66428	1879	26513	10869	636	1535	75	117	35	1193	351	139	44
Total 15 years		201120	5690	80272	32908	2627	7138	348	542	164	4928	1450	573	181
Total 20 years		336745	9527	134403	55100	4178	11142	543	846	256	7838	2306	912	287
Total 10 years		107956	3054	43088	17664	1479	4090	199	310	94	2775	816	323	102

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	6,137	174	2,427	1,005	85	263	6	20	6	177	15	2	0
1st Year Opening	2027	7,523	213	3,003	1,231	111	316	15	24	7	209	61	24	8
5th Year After Opening	2031	10,160	287	4,055	1,662	141	393	19	30	9	265	78	31	10
10th Year After Opening	2036	14,790	418	5,903	2,420	191	516	25	39	12	358	105	42	13
15th Year after Opening	2041	21,531	609	8,594	3,523	258	678	33	51	16	484	142	56	18
20th Year After Opening	2046	31,344	887	12,510	5,129	349	890	43	68	20	654	192	76	24
30th Year After Opening	2056	66,428	1,879	26,513	10,869	636	1,535	75	117	35	1,193	351	139	44

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	846	256	3,919	14,528	4,003	3,920	**27,472**	**365**
													CESA	**10,027,414**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	846	256	3,919	10,008	4,003	2,575	**21,607**	**365**
													CESA	**7,886,729**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	846	256	3,919	5,004	1,660	1,503	**13,188**	**365**
													CESA	**4,813,550**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S010	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	3069	87	1213	502	43	131	3	10	3	89	7	1	0
Design Year 2	2025	3283	93	1298	538	45	138	3	10	3	93	8	1	0
Construction Year 1	2026	3513	99	1389	575	47	145	3	11	3	99	8	1	0
Construction Year 2 + DLP	2026	3513	99	1389	575	47	145	3	11	3	99	8	1	0
1st Year Opening	2027	3764	106	1516	615	61	164	12	12	4	104	53	23	8
	2028	4058	115	1635	664	65	173	13	13	4	111	56	25	8
	2029	4374	124	1762	715	69	182	14	14	4	118	60	26	9
	2030	4715	133	1900	771	73	193	14	15	4	125	63	28	9
5th Year After Opening	2031	5083	144	2048	831	78	203	15	16	5	133	67	29	10
	2032	5480	155	2207	896	83	215	16	16	5	141	71	31	10
	2033	5907	167	2380	966	88	227	17	17	5	150	76	33	11
	2034	6368	180	2565	1041	93	240	18	18	5	159	80	35	12
	2035	6865	194	2765	1122	99	253	19	19	6	169	85	37	12
10th Year After Opening	2036	7400	209	2981	1210	105	267	20	20	6	179	91	40	13
	2037	7977	226	3214	1304	111	282	21	22	6	190	96	42	14
	2038	8599	243	3464	1406	118	298	22	23	7	202	102	45	15
	2039	9270	262	3734	1516	126	315	23	24	7	215	109	48	16
	2040	9993	283	4026	1634	134	332	25	25	7	228	115	50	17
15th Year After Opening	2041	10773	305	4340	1762	142	351	26	27	8	242	123	54	18
	2042	11613	328	4678	1899	151	370	28	28	8	257	130	57	19
	2043	12519	354	5043	2047	160	391	29	30	9	273	138	60	20
	2044	13495	382	5436	2207	170	413	31	32	9	290	147	64	21
	2045	14548	411	5861	2379	180	436	33	33	10	308	156	68	23
20th Year After Opening	2046	15683	443	6318	2564	192	461	34	35	10	327	166	72	24
Start of Gr Per IV	2047	16906	478	6810	2764	203	486	36	37	11	347	176	77	25
"	2048	18225	515	7342	2980	216	514	38	39	11	369	187	82	27
"	2049	19646	555	7914	3212	229	542	40	41	12	392	198	87	29
"	2050	21178	599	8532	3463	244	573	43	44	13	416	211	92	31
"	2051	22830	645	9197	3733	259	605	45	46	13	442	224	98	32
"	2052	24611	696	9914	4024	275	639	48	49	14	469	238	104	34
"	2053	26531	750	10688	4338	292	674	50	52	15	498	252	110	37
"	2054	28600	809	11521	4677	310	712	53	54	16	529	268	117	39
"	2055	30831	872	12420	5041	329	752	56	57	17	562	284	124	41
30th Year After Opening	2056	33236	940	13389	5435	350	794	59	61	18	597	302	132	44
Total 15 years		100627	2845	40537	16454	1444	3693	276	282	82	2464	1248	545	181
Total 20 years		168484	4764	67873	27550	2296	5765	430	440	128	3919	1984	867	287
Total 10 years		54014	1527	21759	8832	813	2116	158	162	47	1387	702	307	102

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	3,069	87	1,213	502	43	131	3	10	3	89	7	1	0
1st Year Opening	2027	3,764	106	1,516	615	61	164	12	12	4	104	53	23	8
5th Year After Opening	2031	5,083	144	2,048	831	78	203	15	16	5	133	67	29	10
10th Year After Opening	2036	7,400	209	2,981	1,210	105	267	20	20	6	179	91	40	13
15th Year after Opening	2041	10,773	305	4,340	1,762	142	351	26	27	8	242	123	54	18
20th Year After Opening	2046	15,683	443	6,318	2,564	192	461	34	35	10	327	166	72	24
30th Year After Opening	2056	33,236	940	13,389	5,435	350	794	59	61	18	597	302	132	44

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	440	128	1,959	12,501	3,808	3,920	**22,757**	**365**
													CESA	**8,306,394**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	440	128	1,959	8,612	3,808	2,575	**17,523**	**365**
													CESA	**6,395,932**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	440	128	1,959	4,306	1,579	1,503	**9,916**	**365**
													CESA	**3,619,280**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

		GROWTH RATES												
MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	Generated (in Yr.)	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S011	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	196	1	50	7	5	3	1	1	0	4	1	0	1
Design Year 2	2025	210	1	53	8	5	3	1	1	0	5	1	0	1
Construction Year 1	2026	225	1	57	8	5	3	1	1	0	5	1	0	1
Construction Year 2 + DLP	2026	225	1	57	8	5	3	1	1	0	5	1	0	1
1st Year Opening	2027	240	1	66	9	10	5	1	2	0	5	40	19	8
	2028	259	1	71	10	10	6	1	2	0	5	43	20	8
	2029	279	1	77	11	11	6	1	2	0	6	45	21	9
	2030	301	1	83	11	12	6	1	2	0	6	48	23	10
5th Year After Opening	2031	325	2	89	12	12	7	1	3	0	6	51	24	10
	2032	350	2	96	13	13	7	1	3	0	7	54	25	11
	2033	377	2	104	14	14	7	1	3	0	7	58	27	11
	2034	407	2	112	15	15	8	1	3	0	8	61	29	12
	2035	438	2	120	17	16	8	1	3	0	8	65	30	13
10th Year After Opening	2036	472	2	130	18	17	9	2	3	0	9	69	32	14
	2037	509	3	140	19	18	9	2	4	0	9	73	34	15
	2038	549	3	151	21	19	10	2	4	0	10	78	37	15
	2039	592	3	163	22	20	10	2	4	0	10	83	39	16
	2040	638	3	175	24	21	11	2	4	0	11	88	41	17
15th Year After Opening	2041	688	3	189	26	23	11	2	4	0	12	93	44	18
	2042	741	4	204	28	24	12	2	5	0	13	99	46	20
	2043	799	4	220	30	25	13	2	5	1	13	105	49	21
	2044	862	4	237	33	27	13	2	5	1	14	112	52	22
	2045	929	5	255	35	29	14	3	6	1	15	119	56	23
20th Year After Opening	2046	1001	5	275	38	31	15	3	6	1	16	126	59	25
Start of Gr Per IV	2047	1079	5	296	41	32	16	3	6	1	17	134	63	27
"	2048	1163	6	320	44	34	17	3	7	1	18	142	67	28
"	2049	1254	6	345	47	37	18	3	7	1	19	151	71	30
"	2050	1352	7	371	51	39	19	3	7	1	20	160	75	32
"	2051	1457	7	400	55	41	20	3	8	1	21	170	80	34
"	2052	1571	8	432	59	44	21	4	8	1	23	181	85	36
"	2053	1694	8	465	64	47	22	4	9	1	24	192	90	38
"	2054	1826	9	502	69	49	23	4	9	1	26	204	96	40
"	2055	1968	10	541	74	52	24	4	10	1	27	217	102	43
30th Year After Opening	2056	2122	11	583	80	56	26	5	10	1	29	230	108	46
Total 15 years		6424	32	1765	243	230	120	21	47	5	120	950	445	188
Total 20 years		10756	53	2955	407	366	187	33	74	8	191	1511	708	299
Total 10 years		3448	17	947	130	130	69	12	27	3	68	535	251	106

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	196	1	50	7	5	3	1	1	0	4	1	0	1
1st Year Opening	2027	240	1	66	9	10	5	1	2	0	5	40	19	8
5th Year After Opening	2031	325	2	89	12	12	7	1	3	0	6	51	24	10
10th Year After Opening	2036	472	2	130	18	17	9	2	3	0	9	69	32	14
15th Year after Opening	2041	688	3	189	26	23	11	2	4	0	12	93	44	18
20th Year After Opening	2046	1,001	5	275	38	31	15	3	6	1	16	126	59	25
30th Year After Opening	2056	2,122	11	583	80	56	26	5	10	1	29	230	108	46

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	74	8	95	9,521	3,109	4,080	**16,886**	**365**
													CESA	**6,163,498**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	74	8	95	6,559	3,109	2,680	**12,524**	**365**
													CESA	**4,571,429**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	74	8	95	3,279	1,289	1,564	**6,309**	**365**
													CESA	**2,302,922**

	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
2024-2027	7.0	7.0	7.0	7.0	5.6	5.1	5.1	5.1	5.1	5.6	5.6	5.6	5.6
2028-2037	7.8	7.8	7.8	7.8	6.2	5.6	5.6	5.6	5.6	6.2	6.2	6.2	6.2
2038 Onwards	8.5	8.5	8.5	8.5	6.8	6.2	6.2	6.2	6.2	6.8	6.8	6.8	6.8

GROWTH RATES

MEDIUM	Growth Period	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	Articulated Truck (4+ Axle Truck
GR. PER. I	2024-2027	1.070	1.070	1.070	1.070	1.056	1.051	1.051	1.051	1.051	1.056	1.056	1.056	1.056
GR. PER. II	2028-2037	1.078	1.078	1.078	1.078	1.062	1.056	1.056	1.056	1.056	1.062	1.062	1.062	1.062
GR. PER. III	2038 Onwards	1.085	1.085	1.085	1.085	1.068	1.062	1.062	1.062	1.062	1.068	1.068	1.068	1.068
WP	**Generated (in Yr.)**	**Motor Cycle**	**Tuk Tuk**	**Small/Medium Car**	**Four Wheel Drive Vehicles (FWD)**	**Pick-Up/Utility Vehicles**	**Matatu (14 Seater)**	**Medium Bus (25-30 Pass)**	**Large Bus 2 Axle Bus**	**Large Bus 3 Axle Bus**	**2 Axle Truck**	**3 Axle Truck**	**4 Axle Truck**	**Articulated Truck (4+ Axle Truck**
Gen. Tr. Factor	2025	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10

Meru Bypass -S012	YEAR	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	LGV 2 Axle	MGV (2-3 Axle)	HGV (3-4 Axle)	Articulated Truck (4+ Axle Truck
Base Year-Design Year 1	2024	1905	42	1014	151	135	24	9	4	3	69	4	2	0
Design Year 2	2025	2038	45	1085	162	142	25	9	4	3	72	4	2	0
Construction Year 1	2026	2181	48	1161	173	150	26	10	5	3	76	4	3	0
Construction Year 2 + DLP	2026	2181	48	1161	173	150	26	10	5	3	76	4	3	0
1st Year Opening	2027	2334	51	1272	185	158	33	10	5	3	81	84	25	14
	2028	2516	55	1371	200	168	34	11	5	3	86	89	27	15
	2029	2712	60	1478	216	179	36	11	6	3	91	95	28	16
	2030	2924	64	1593	232	190	38	12	6	3	97	101	30	17
5th Year After Opening	2031	3152	69	1717	250	201	40	13	6	4	103	107	32	18
	2032	3397	75	1851	270	214	43	13	6	4	109	114	34	20
	2033	3662	80	1996	291	227	45	14	7	4	116	121	36	21
	2034	3948	87	2152	314	241	48	15	7	4	123	128	38	22
	2035	4256	94	2319	338	256	50	16	8	5	131	136	41	23
10th Year After Opening	2036	4588	101	2500	365	272	53	17	8	5	139	145	43	25
	2037	4946	109	2695	393	289	56	18	9	5	147	154	46	26
	2038	5332	117	2905	424	307	59	19	9	5	156	163	49	28
	2039	5748	126	3132	457	326	63	20	10	6	166	173	52	30
	2040	6196	136	3376	492	346	66	21	10	6	177	184	55	32
15th Year After Opening	2041	6679	147	3640	531	368	70	22	11	6	187	195	58	34
	2042	7200	158	3924	572	390	74	23	11	7	199	207	62	36
	2043	7762	171	4230	617	415	78	24	12	7	211	220	66	38
	2044	8367	184	4560	665	440	82	26	12	7	225	234	70	40
	2045	9020	198	4915	717	468	87	27	13	8	238	249	74	43
20th Year After Opening	2046	9723	214	5299	773	497	92	29	14	8	253	264	79	45
Start of Gr Per IV	2047	10482	230	5712	833	528	97	30	15	9	269	280	83	48
"	2048	11299	248	6157	898	560	102	32	16	9	286	298	89	51
"	2049	12181	268	6638	968	595	108	34	16	10	303	316	94	54
"	2050	13131	289	7156	1043	632	114	36	17	10	322	336	100	58
"	2051	14155	311	7714	1125	671	120	38	18	11	342	357	106	61
"	2052	15259	335	8315	1213	713	127	40	19	11	363	379	113	65
"	2053	16449	362	8964	1307	757	134	42	20	12	386	402	120	69
"	2054	17732	390	9663	1409	804	142	44	22	13	410	427	127	73
"	2055	19115	420	10417	1519	854	149	47	23	13	435	454	135	78
30th Year After Opening	2056	20606	453	11229	1638	906	158	49	24	14	462	482	143	83
Total 15 years		62389	1371	33999	4958	3743	734	230	112	66	1908	1989	592	341
Total 20 years		104461	2296	56926	8301	5953	1146	359	174	103	3035	3163	942	543
Total 10 years		33489	736	18250	2661	2107	420	132	64	38	1074	1120	333	192

	Year	Motor Cycle	Tuk Tuk	Small/Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle Bus	Large Bus 3 Axle Bus	2 Axle Truck	3 Axle Truck	4 Axle Truck	4+ Axle Truck
Base Year-Design Year 1	2024	1,905	42	1,014	151	135	24	9	4	3	69	4	2	0
1st Year Opening	2027	2,334	51	1,272	185	158	33	10	5	3	81	84	25	14
5th Year After Opening	2031	3,152	69	1,717	250	201	40	13	6	4	103	107	32	18
10th Year After Opening	2036	4,588	101	2,500	365	272	53	17	8	5	139	145	43	25
15th Year after Opening	2041	6,679	147	3,640	531	368	70	22	11	6	187	195	58	34
20th Year After Opening	2046	9,723	214	5,299	773	497	92	29	14	8	253	264	79	45
30th Year After Opening	2056	20,606	453	11,229	1,638	906	158	49	24	14	462	482	143	83

MAX %ile 75 amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	6.3	4.39	13.64		
	ESA	0	0	0	0	0	174	103	1,517	19,928	4,134	7,404	**33,261**	**365**
													CESA	**12,140,223**

MAX Mean amongst 5 Stations

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	4.34	4.39	8.96		
	ESA	0	0	0	0	0	174	103	1,517	13,728	4,134	4,863	**24,521**	**365**
													CESA	**8,950,045**

Mean

Design Traffic FLEXIBLE PAVEMENTS 20 years	WP	Small Medium Car	Four Wheel Drive Vehicles (FWD)	Pick-Up/Utility Vehicles	Matatu (14 Seater)	Medium Bus (25-30 Pass)	Large Bus 2 Axle	Large Bus 3 Axle	2 Axle Truck	3 Axle Truck	4 Axle Truck	4 + Axle Truck	SUM	Days
	VEF	0	0	0	0	0	1	1	0.5	2.17	1.82	5.23		
	ESA	0	0	0	0	0	174	103	1,517	6,864	1,714	2,839	**13,212**	**365**
													CESA	**4,822,198**

Appendix 2: Road Alignment Results

APEX PROJECTS

A.S.K JAMUHURI SHOWGROUND
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SUMMARY SHEET DETAILED DESIGN

Trial Pit No.	Depth	Particle Size Distribution							Atterberg Limits						Compaction		CBR (100%) MDD		Material Description
		% Passing Sieve Size (mm)							NMC	LL	PL	PI	LS	PM	OMC	MDD	4-Day Soak	Swell	
	m	20	10	5	2	1.18	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	
DD 1	1.1	100.0	100.0	100.0	100.0	98.4	94.1	87.0	8.1	57.1	28.5	28.5	14.0	2682	28.0	1257	9	1.22	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
DD 2	1.0	100.0	100.0	100.0	100.0	98.0	95.0	88.4	7.8	57.4	28.7	28.7	14.2	2727	27.8	1269	9	1.20	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
DD 3	1.0	100.0	100.0	92.5	86.8	82.8	74.3	63.8	4.6	47.8	22.4	25.4	12.7	1887	20.6	1430	11	1.14	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
DD 4	1.1	100.0	73.3	62.0	56.0	52.3	48.7	45.8	10.9	46.2	20.4	25.8	12.9	1256	24.9	1489	12	1.12	Reddish Brown,loose,CLAY,intermediate plasticity,slightly moist,with occassional tuff
DD 5	1.0	100.0	95.5	89.5	83.5	77.2	68.8	63.3	4.6	47.7	21.5	26.2	12.8	1803	20.2	1424	12	1.18	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
DD 6	0.9	100.0	100.0	100.0	100.0	98.0	94.0	89.2	9.0	55.3	28.1	27.1	13.0	2547	26.3	1312	11	1.19	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
DD 7	0.5	100.0	100.0	100.0	100.0	98.2	92.1	86.6	19.6	48.2	24.8	23.4	11.5	2155	23.6	1495	12	1.18	Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
DD 8	0.9	100.0	100.0	100.0	98.3	95.9	92.9	89.4	10.1	57.4	28.4	29.0	14.1	2694	28.1	1287	11	1.23	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
DD 9	1.1	100.0	100.0	100.0	100.0	97.9	92.3	86.8	14.4	57.0	28.3	28.6	13.8	2640	27.8	1273	10	1.21	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
DD 10	1.0	100.0	100.0	100.0	100.0	98.0	93.7	88.3	10.2	56.8	30.1	29.4	14.5	2755	26.4	1290	11	1.22	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist

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The results contained herein apply only to the particular sample(s) tested whose sample submission form serial number is herein quoted, and to the specific tests carried out, as detailed in this test report. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, APEX PROJECTS LIMITED. If undelivered, please return to the address written above

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DD 11	1.0	100.0	100.0	100.0	99.3	97.4	94.5	88.5	25.0	46.1	23.0	23.0	11.4	2174	35.2	1133	**6**	1.17	Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
DD 12	0.95	100.0	100.0	100.0	100.0	98.2	94.1	89.7	1.8	54.9	25.3	29.6	14.5	2785	19.8	1322	**8**	1.24	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
DD 13	1.0	100.0	100.0	100.0	100.0	98.2	94.6	88.7	2.4	55.6	27.2	28.4	14.2	2687	20.4	1328	**8**	1.20	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
DD 14	1.1	100.0	100.0	100.0	100.0	97.8	92.5	88.2	2.1	52.1	24.8	27.3	13.4	2525	20.1	1310	**8**	1.18	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
DD 15	1.0	100.0	100.0	100.0	99.3	97.5	94.4	89.7	10.0	45.5	22.0	23.4	11.4	2209	32.0	1203	**7**	1.15	Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
DD 16	1.0	100.0	98.4	92.9	88.3	86.0	75.7	66.1	3.6	48.2	22.4	25.8	12.8	1953	19.5	1407	**12**	1.16	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
DD 17	1.0	100.0	100.0	100.0	100.0	98.2	93.7	89.2	5.5	56.0	27.3	28.6	14.2	2680	27.5	1276	**10**	1.19	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
DD 18	1.0	100.0	100.0	100.0	99.6	97.5	94.2	89.5	18.0	46.4	23.6	22.8	11.0	2148	36.1	1120	**6**	1.16	Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
DD 19	1.0	100.0	100.0	100.0	99.5	97.6	94.5	90.6	12.2	46.5	23.6	22.8	11.0	2155	32.4	1224	**7**	1.18	Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
DD 20	1.0	100.0	100.0	100.0	100.0	98.5	93.5	89.7	2.6	56.4	27.8	28.6	14.0	2674	20.6	1339	**8**	1.22	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.

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Specialists in Site Investigation, Quality Control and Material Testing

P.O. Box 10782-00100, Tel/Fax: 3871985 NAIROBI

SUMMARY OF SOIL TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

DATE: 29/4/2025

CLIENT:EGIS CONSULTANTS LIMITED

SHEET No.2025/01

ENGINEERS BOARD OF KENYA LICENSED CONSULTING ENGINEER E410

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SUMMARY SHEET PRELIMINARY DESIGN

Trial Pit No.	Depth	Particle Size Distribution							Atterberg Limits						Compaction		CBR (100%) MDD		Remarks
		% Passing Sieve Size (mm)							NMC	LL	PL	PI	LS	PM	OMC	MDD	4-Day Soak	Swell	
	m	20	10	5	2	1.18	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	
PD 1	1.1	100.0	100.0	100.0	97.0	88.3	79.6	74.4	11.4	46.8	21.2	25.6	12.9	2038	30.7	1312	**9**	0.85	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 2	1.0	100.0	100.0	100.0	96.8	88.2	80.0	75.2	10.9	47.5	21.8	25.7	12.9	2056	31.8	1333	**10**	0.76	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 3	1.1	100.0	100.0	100.0	96.8	87.3	79.8	74.6	9.5	46.2	20.8	25.4	11.9	2025	32.4	1324	**9**	0.80	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 4	1.1	100.0	100.0	100.0	98.6	93.6	86.7	78.2	9.6	49.6	21.4	28.1	13.2	2437	26.2	1307	**10**	0.90	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 5	1.2	100.0	100.0	100.0	96.7	87.6	80.0	75.2	12.0	47.5	21.8	25.7	12.9	2056	31.6	1303	**9**	0.80	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 8	0.8	100.0	100.0	100.0	100.0	96.8	86.3	79.4	9.6	54.3	24.1	30.2	14.9	2606	32.9	1279	**8**	0.91	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 9	1.1	100.0	100.0	100.0	98.8	96.2	86.1	77.2	20.5	53.4	25.8	27.4	12.9	2360	32.5	1226	**5**	0.94	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 10	1.1	100.0	100.0	100.0	96.8	94.9	88.4	74.7	18.1	47.5	21.3	26.2	12.9	2316	31.1	1259	**6**	0.98	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist

ENG. NJOROGE T. WAHARO
LICENSED CONSULTING ENGINEER
ENGINEERS BOARD OF KENYA

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PD 11	1.0	100.0	100.0	100.0	100.0	96.8	86.4	79.4	11.9	54.3	24.1	30.2	14.2	2608	34.0	1291	**8**	0.91	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
PD 13	1.0	100.0	100.0	97.4	96.1	94.5	90.0	80.3	8.4	47.9	21.2	26.7	13.6	2404	28.4	1280	**8**	0.86	Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
PD 14	1.2	100.0	100.0	100.0	95.8	90.8	83.0	74.3	10.5	50.2	22.4	27.7	13.0	2300	29.1	1296	**10**	0.78	Reddish Brown,loose,CLAY,intermediate plasticity,slightly moist,with occassional tuff
PD 15	1.2	100.0	100.0	100.0	96.1	90.6	83.9	74.1	11.3	47.7	22.6	27.2	13.7	2282	32.0	1308	**11**	0.80	Reddish Brown,loose,CLAY,intermediate plasticity,slightly moist,with occassional tuff
PD 16	1.2	100.0	100.0	100.0	100.0	96.8	89.0	81.4	12.6	50.6	22.4	28.2	13.6	2510	31.1	1299	**10**	0.86	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
PD 17	1.1	100.0	100.0	100.0	100.0	97.5	89.3	81.8	14.4	49.6	21.9	27.7	13.0	2472	32.2	1296	**9**	0.84	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
PD 18	1.0	100.0	96.3	80.5	78.0	75.6	69.6	61.6	9.9	49.4	25.2	24.1	11.3	1681	32.6	1282	**10**	0.80	Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff

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P.O. Box 10782-00100, Tel/Fax: 3871985 NAIROBI

SUMMARY OF SOIL TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

DATE: 20/9/2024

CLIENT:EGIS CONSULTANTS LIMITED

SHEET No.2024/01



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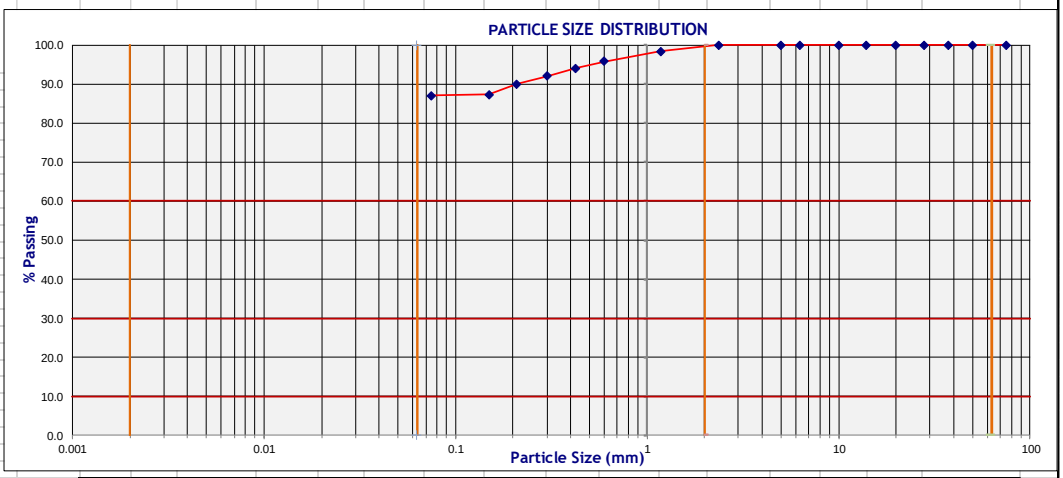
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GRADING AND ATTERBERG TEST RESULTS DETAILED DESIGN

TRIAL PIT NO. (DD 1)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD1	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	482.8 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	7.9	98.4
0.6	12.6	95.8
0.425	8.0	94.1
0.3	9.9	92.0
0.21	10.0	90.0
0.150	13.0	87.3
0.075	1.4	87.0

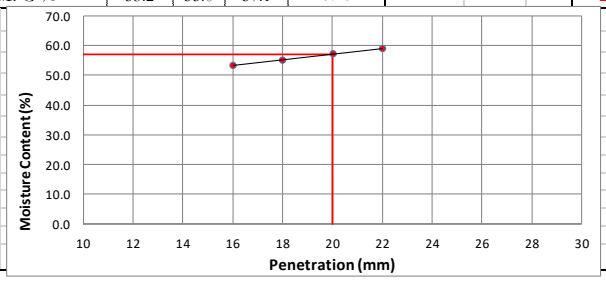


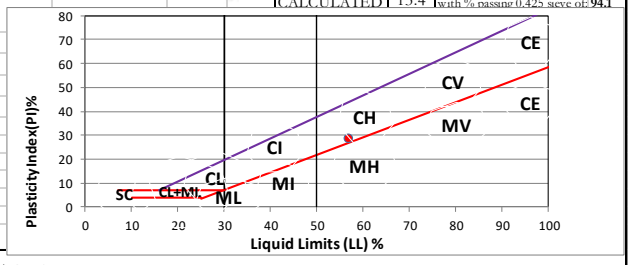
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						5.1	3.7	4.2	13.0					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.5	28.5	28.5
M. C %	53.2	55.0	57.1	59.0	28.5		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	14.0	
CALCULATED	13.4	with % passing 0.425 sieve of 94.1





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CH			C_U	C_C
DESCRIPTION:					
			Plasticity Modulus	2683	

USCS POSSIBLE CLASSIFICATION
ML/CL/MH/CI/CH

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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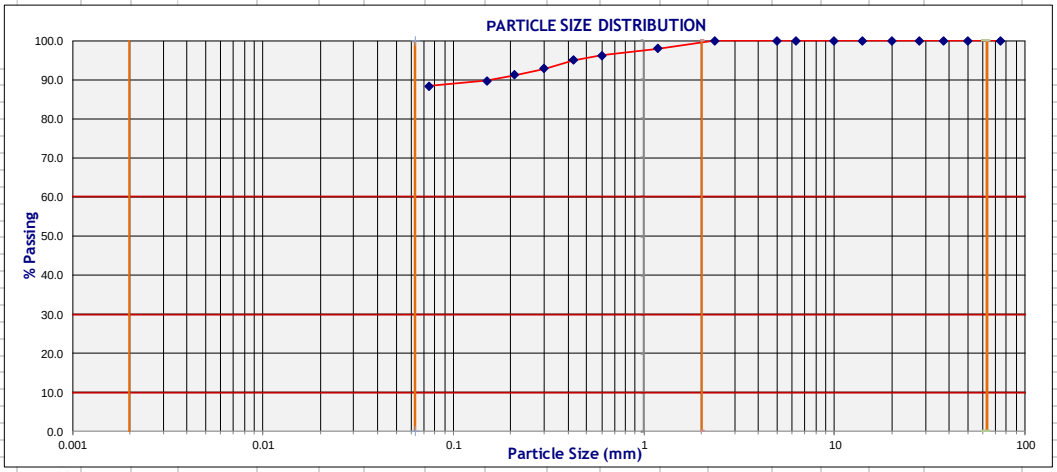
TRIAL PIT NO. (DD 2)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD2	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 604.5 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	12.0	98.0
0.6	11.1	96.2
0.425	7.0	95.0
0.3	13.0	92.9
0.21	10.0	91.2
0.150	9.0	89.7
0.075	8.0	88.4



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						4.5	3.3	3.8	11.6				
D60	CLAY					Slightly sandy							

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.7	28.7	28.7
M. C %	53.2	55.3	57.4	59.4	28.7		

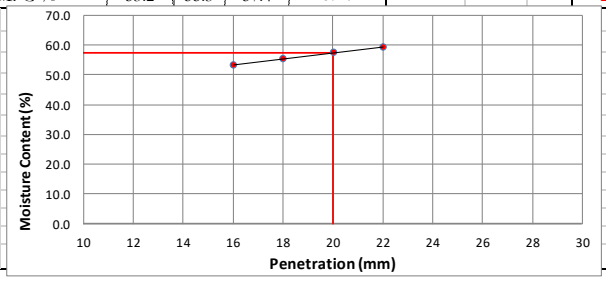
NMC

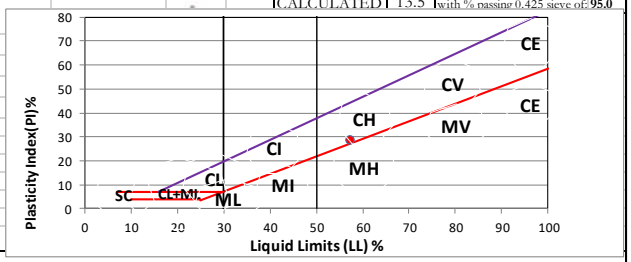
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.2
CALCULATED	13.5

with % passing 0.425 sieve of: 95.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				ML/CL/MH/CI	CH
		Plasticity Modulus	2723		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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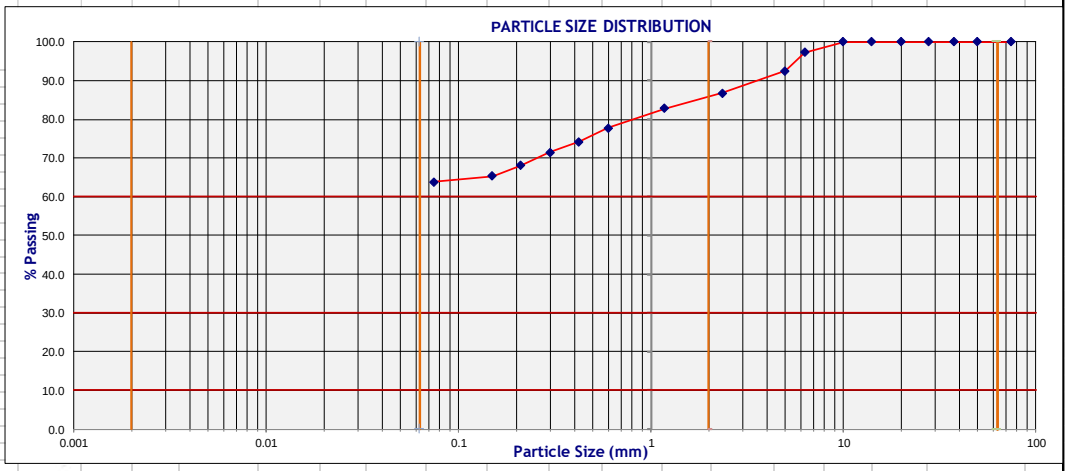
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TRIAL PIT NO. (DD 3)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location: DD3		Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
		TEST METHOD : BS 1377:Part 2			
Wt. of Dry Sample		583 g			

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3	16.0	97.3
5	28.0	92.5
2.36	33.0	86.8
1.18	23.0	82.8
0.6	30.0	77.7
0.425	20.0	74.3
0.3	16.0	71.5
0.21	20.0	68.1
0.150	16.0	65.4
0.075	9.0	63.8

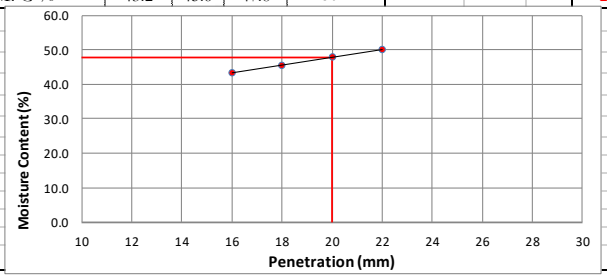


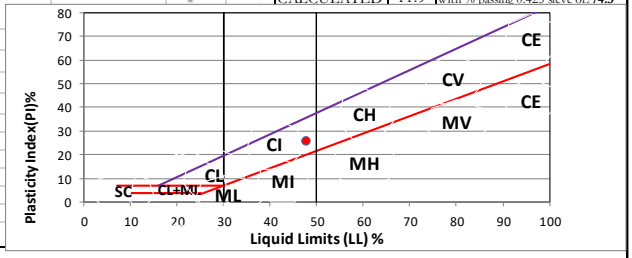
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						7.7	6.2	9.1	23.0	10.5	2.7		13.2	
D60	CLAY					very sandy				Slightly gravelly				

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.4	22.4	25.4
M. C %	43.2	45.6	47.8	50.1	22.4		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	12.7		
CALCULATED	11.9	with % passing 0.425 sieve of:	74.3





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	GM/GC/SM/SC CL
		Plasticity Modulus	1886	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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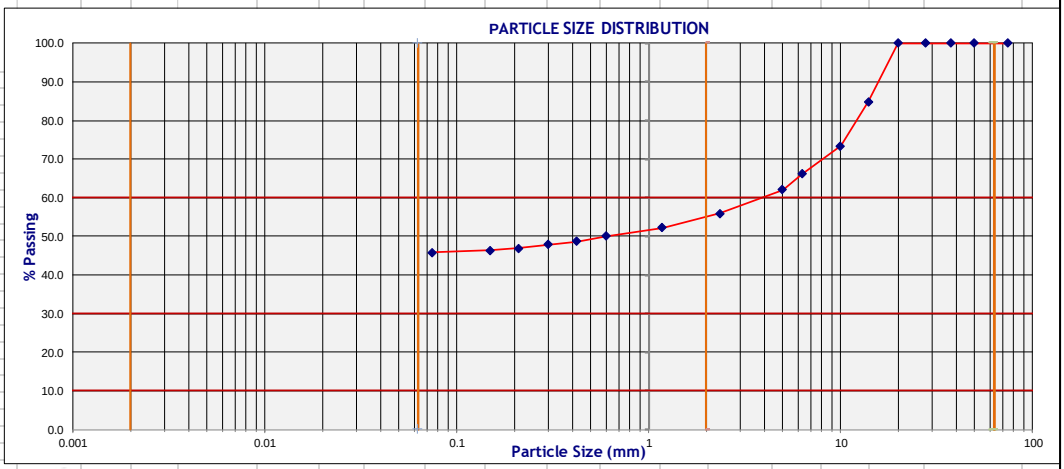
TRIAL PIT NO. (DD 4)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD4	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 621 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14	94.2	84.8
10	71.4	73.3
6.3	44.5	66.2
5	25.6	62.0
2.36	37.8	56.0
1.18	23.0	52.3
0.6	13.9	50.0
0.425	7.9	48.7
0.3	5.8	47.8
0.21	5.2	47.0
0.150	3.8	46.4
0.075	3.3	45.8



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.0	2.2	5.9	10.1	10.2	33.8		44.0	
D60	CLAY					Slightly sandy				very gravelly				

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	20.4	20.4	25.8
M. C %	42.5	44.1	46.2	48.2	20.4		

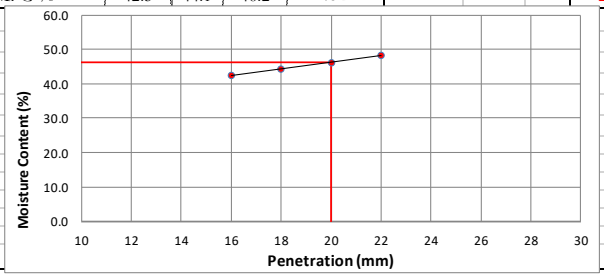
NMC

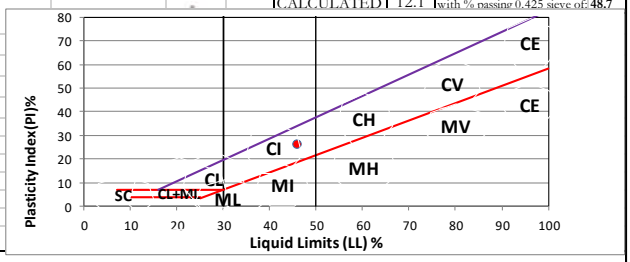
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	12.9
CALCULATED	12.1

with % passing 0.425 sieve of: 48.7





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3			
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL				USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:					GM/GC/SM/SC	CL
			Plasticity Modulus	1258		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

ENG. NJOROGE T. WAIHARE
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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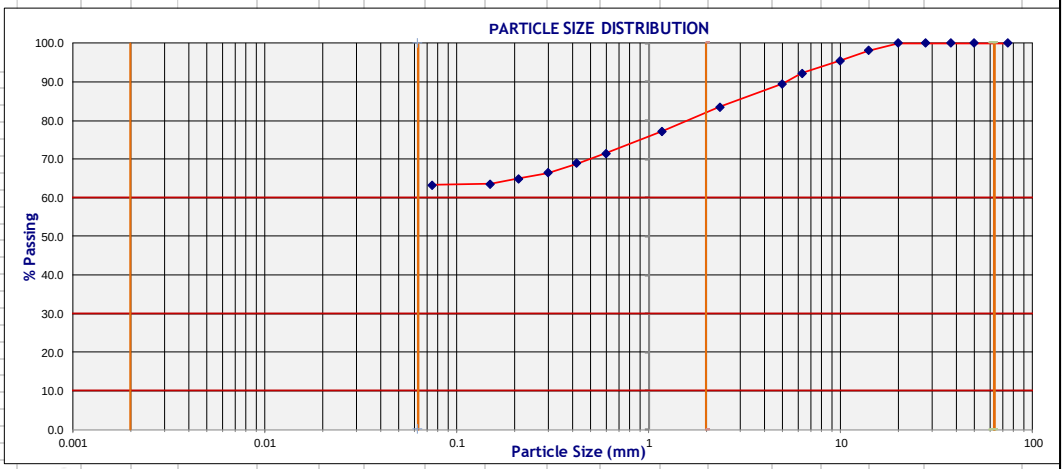
TRIAL PIT NO. (DD 5)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD5	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 777 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14	15.2	98.0
10	20.1	95.5
6.3	24.6	92.3
5	21.9	89.5
2.36	46.1	83.5
1.18	49.6	77.2
0.6	44.3	71.5
0.425	20.4	68.8
0.3	18.3	66.5
0.21	12.1	64.9
0.150	10.2	63.6
0.075	2.7	63.3



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.2	5.0	12.1	20.3	8.8	7.7		16.5	
D60	CLAY					very sandy				gravelly				

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.5	21.5	26.2
M. C %	43.5	45.5	47.7	49.8	21.5		

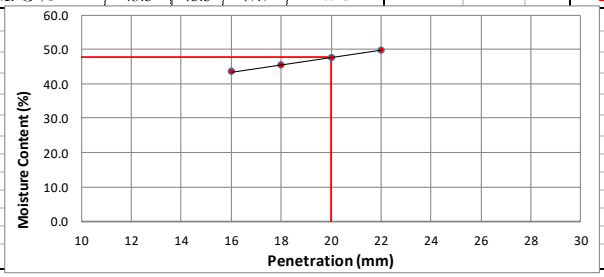
NMC

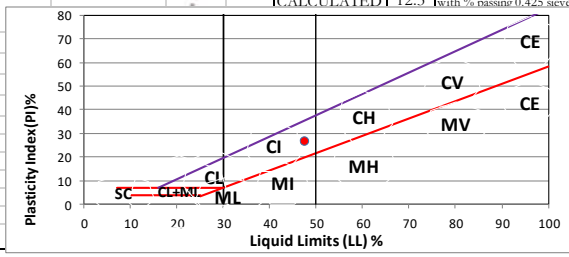
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	12.9
CALCULATED	12.3

with % passing 0.425 sieve of: 68.8





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3
SP	Not meeting all gradation requirements for SW				GP	Not meeting all gradation requirements for GW			
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.		
SC	Atterberg limits above "A" Line or P.I. greater than 7				GC	Atterberg limits above "A" Line or P.I. greater than 7			

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				GM/GC/SM/SC	CL
		Plasticity Modulus	1803		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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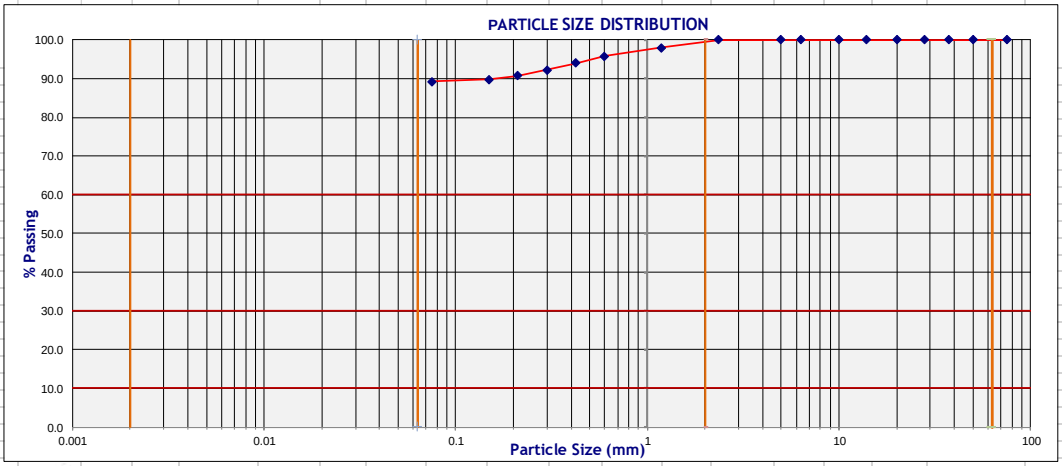
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TRIAL PIT NO. (DD 6)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location: DD6		Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
		TEST METHOD : BS 1377:Part 2			
Wt. of Dry Sample		834 g			

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	16.8	98.0
0.6	18.0	95.8
0.425	15.5	94.0
0.3	14.6	92.2
0.21	12.0	90.8
0.150	8.0	89.8
0.075	5.0	89.2

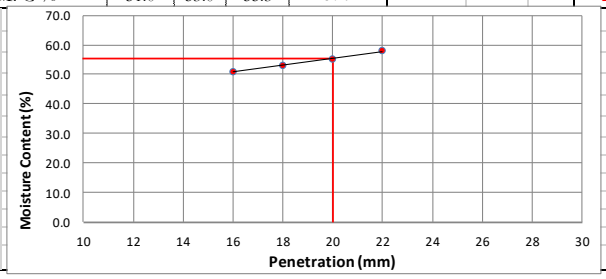


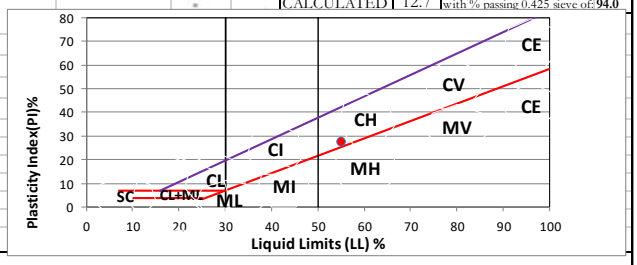
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.0	3.6	4.2	10.8					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.1	28.1	27.1
M. C %	51.0	53.0	55.3	57.9	28.1		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	13.0		
CALCULATED	12.7	with % passing 0.425 sieve of:	94.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CH
		Plasticity Modulus	2547	

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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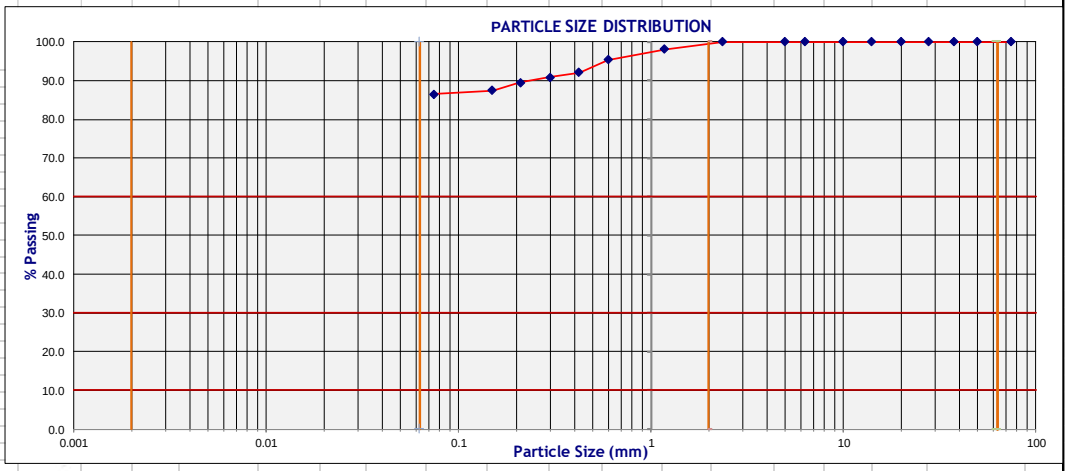
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TRIAL PIT NO. (DD 7)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD7	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	543 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.0	98.2
0.6	15.0	95.4
0.425	18.0	92.1
0.3	7.0	90.8
0.21	7.0	89.5
0.150	11.0	87.5
0.075	5.0	86.6

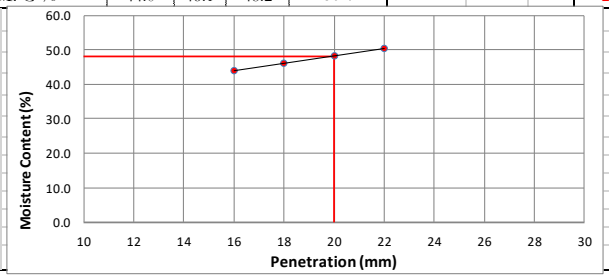


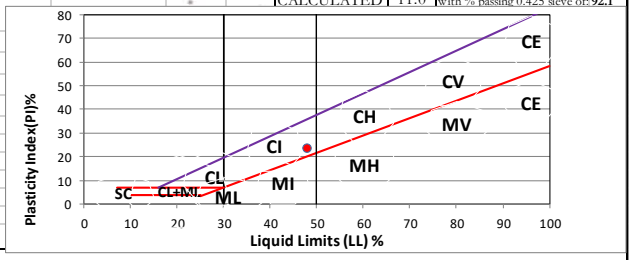
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						4.2	4.6	4.6	13.4					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	24.8	24.8	23.4
M. C %	44.0	46.1	48.2	50.4	24.8		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	11.5		
CALCULATED	11.0	with % passing 0.425 sieve of:	92.1





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CI CL
		Plasticity Modulus	2155	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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APEX PROJECTS

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TRIAL PIT NO. (DD 8)

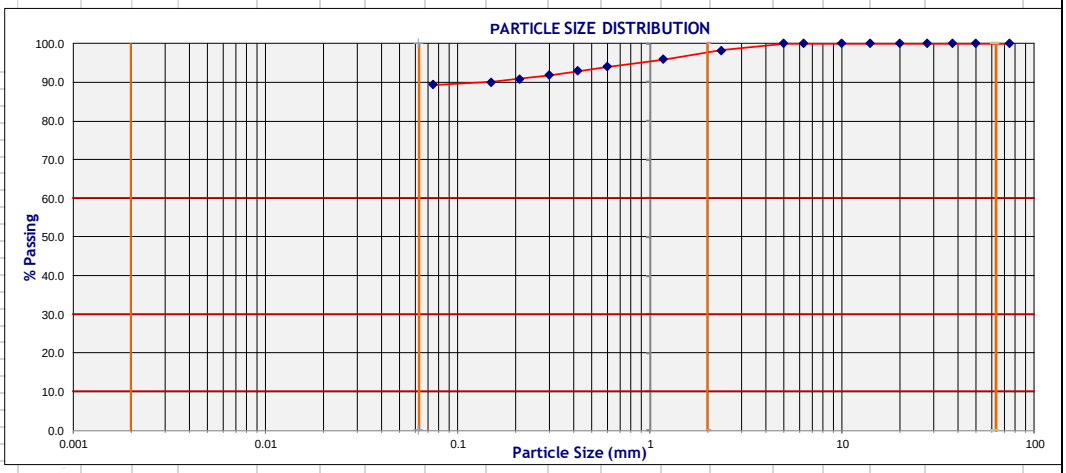
CLIENT:	EGIS CONSULTANTS LIMITED
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS

	Depth	Location: DD8	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 754 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	13.0	98.3
1.18	17.7	95.9
0.6	14.6	94.0
0.425	8.0	92.9
0.3	8.5	91.8
0.21	7.5	90.8
0.150	6.0	90.0
0.075	4.5	89.4



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.4	2.2	4.3	8.9	1.7			1.7	
D60	CLAY													

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.4	28.4	29.0
M. C %	53.4	55.5	57.4	59.6	28.4		

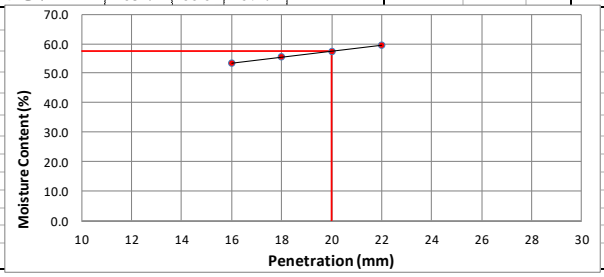
NMC

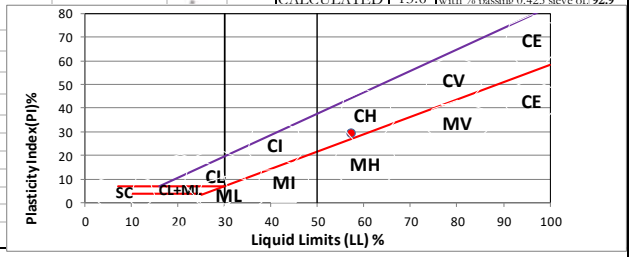
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.1
CALCULATED	13.6

with % passing 0.425 sieve of 92.9





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CH
		Plasticity Modulus	2695	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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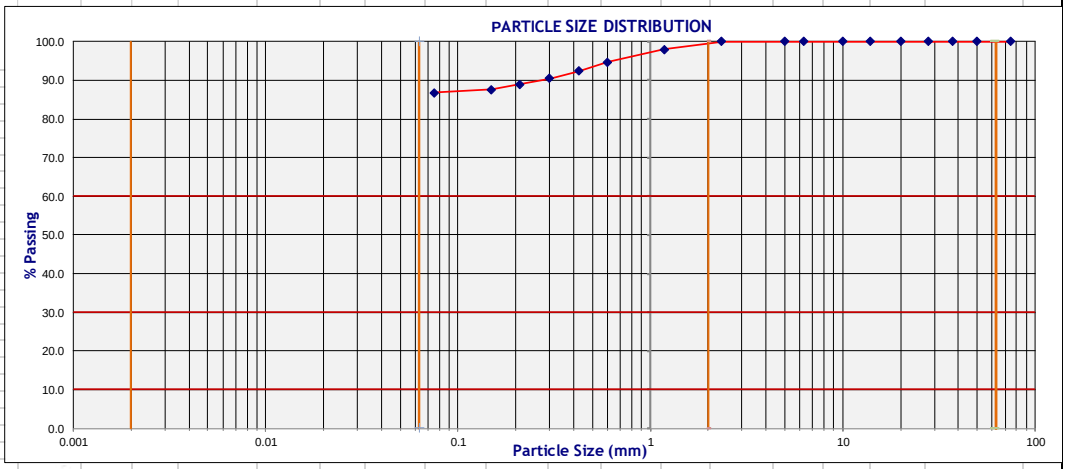
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TRIAL PIT NO. (DD 9)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD9	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	482.8 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.0	97.9
0.6	16.0	94.6
0.425	11.0	92.3
0.3	8.9	90.5
0.21	7.6	88.9
0.150	6.7	87.5
0.075	3.4	86.8

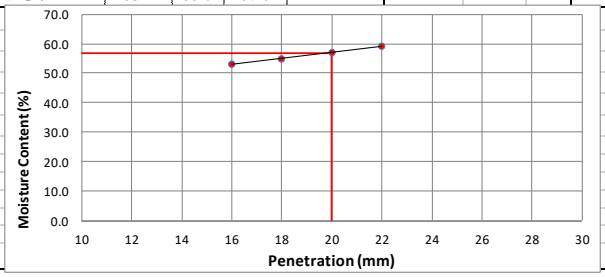


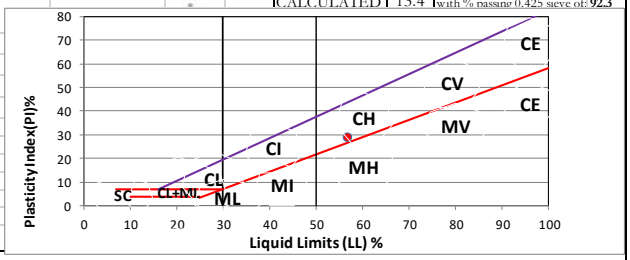
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.7	4.1	5.4	13.2					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.3	28.3	28.6
M. C %	53.1	55.0	57.0	59.3	28.3		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	13.8	
CALCULATED	13.4	with % passing 0.425 sieve of 92.3





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				ML/CL/MH/CH	CH
		C_U	C_C		
	Plasticity Modulus		2645		

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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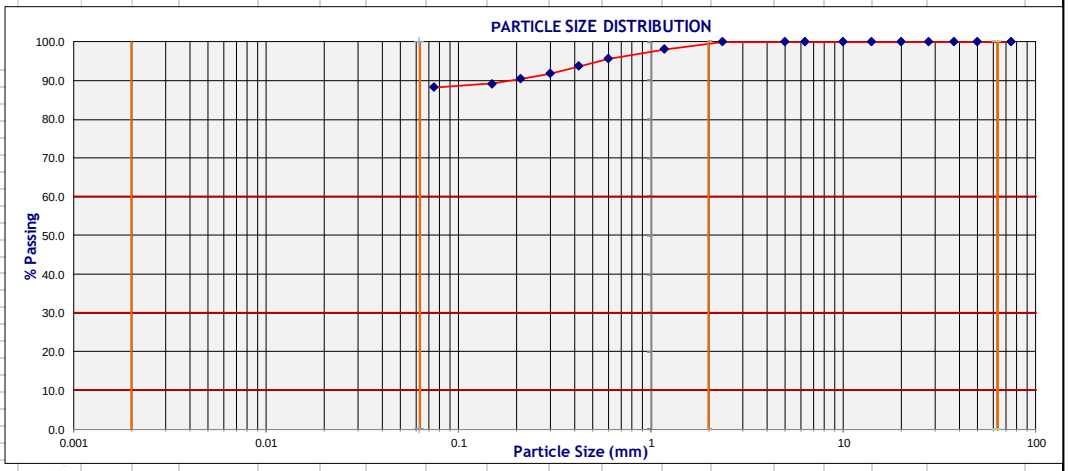
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TRIAL PIT NO. (DD 10)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD10	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
		TEST METHOD : BS 1377:Part 2			
Wt. of Dry Sample		509	g		

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.0	98.0
0.6	12.0	95.7
0.425	10.2	93.7
0.3	9.2	91.9
0.21	7.0	90.5
0.150	6.6	89.2
0.075	4.6	88.3

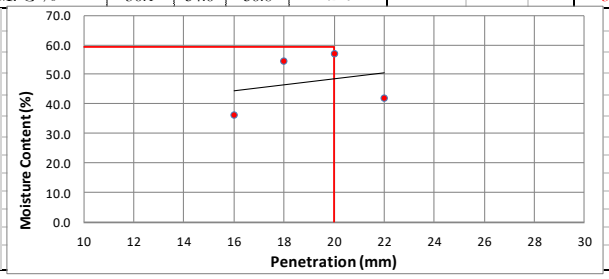


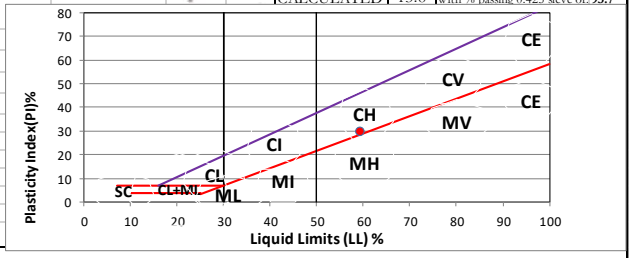
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.6	3.8	4.3	11.7					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	30.1	30.1	29.4
M. C %	36.1	54.6	56.8	42.0	30.1		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	14.5		
CALCULATED	13.8	with % passing 0.425 sieve of:	93.7





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH CH
		Plasticity Modulus	2750	

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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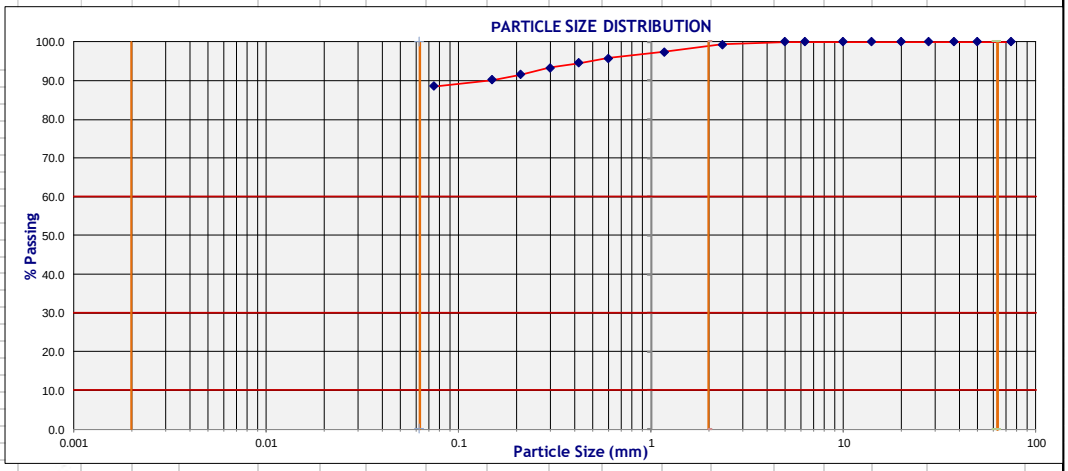
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TRIAL PIT NO. (DD 11)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD11	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
		TEST METHOD : BS 1377:Part 2			
Wt. of Dry Sample		899	g		

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	6.3	99.3
1.18	16.9	97.4
0.6	15.0	95.8
0.425	10.8	94.5
0.3	11.7	93.2
0.21	15.3	91.5
0.150	12.6	90.1
0.075	14.4	88.5

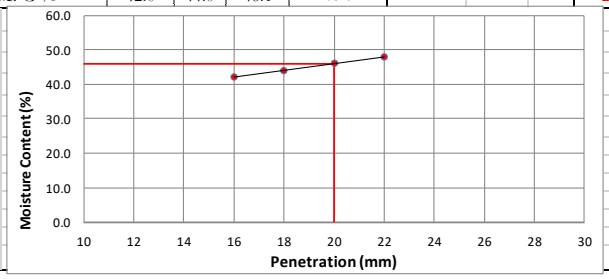


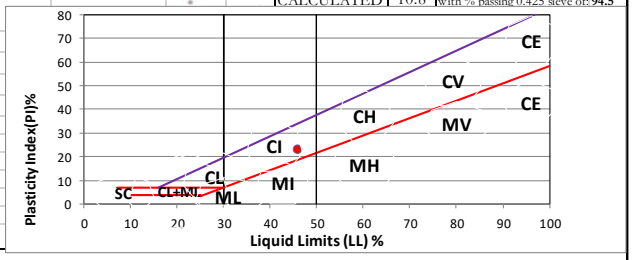
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						4.7	2.5	3.5	10.8	0.7			0.7	
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	23.0	23.0	23.0
M. C %	42.0	44.0	46.1	48.0	23.0		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	11.4		
CALCULATED	10.8	with % passing 0.425 sieve of:	94.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CI: CL
		Plasticity Modulus	2179	

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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APEX PROJECTS

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TRIAL PIT NO. (DD 12)

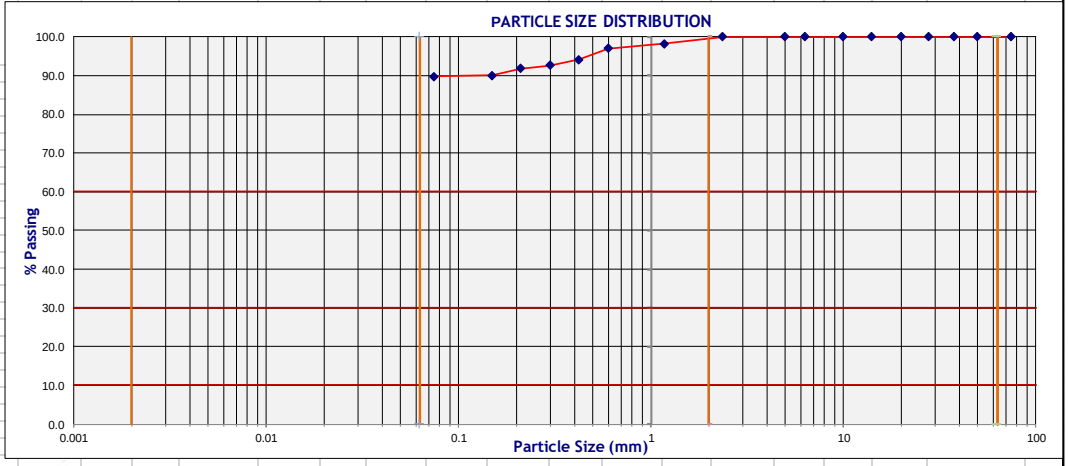
CLIENT:	EGIS CONSULTANTS LIMITED
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS

	Depth	Location: DD12	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By:	Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 340 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	6.0	98.2
0.6	4.0	97.1
0.425	10.0	94.1
0.3	5.0	92.6
0.21	3.0	91.8
0.150	6.0	90.0
0.075	1.0	89.7



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.9	4.4	2.9	10.3					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

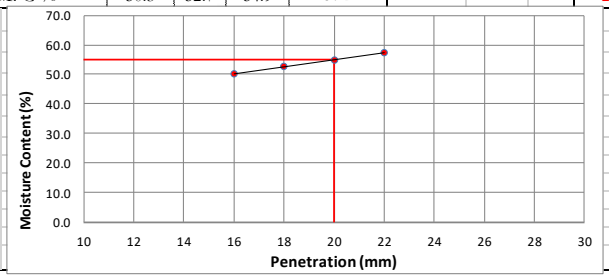
	LL				PL		PI
PENETRATION	16	18	20	22	25.3	25.3	29.6
M. C %	50.3	52.7	54.9	57.2	25.3		

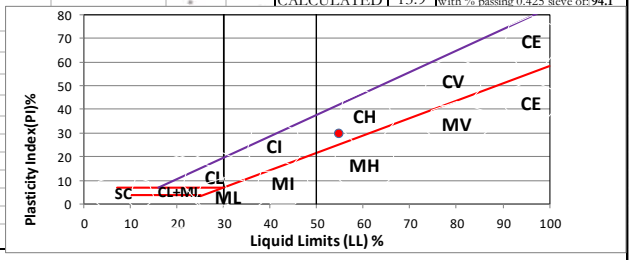
NMC

CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.5	
CALCULATED	13.9	with % passing 0.425 sieve of: 94.1





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH: CH
		Plasticity Modulus	2786	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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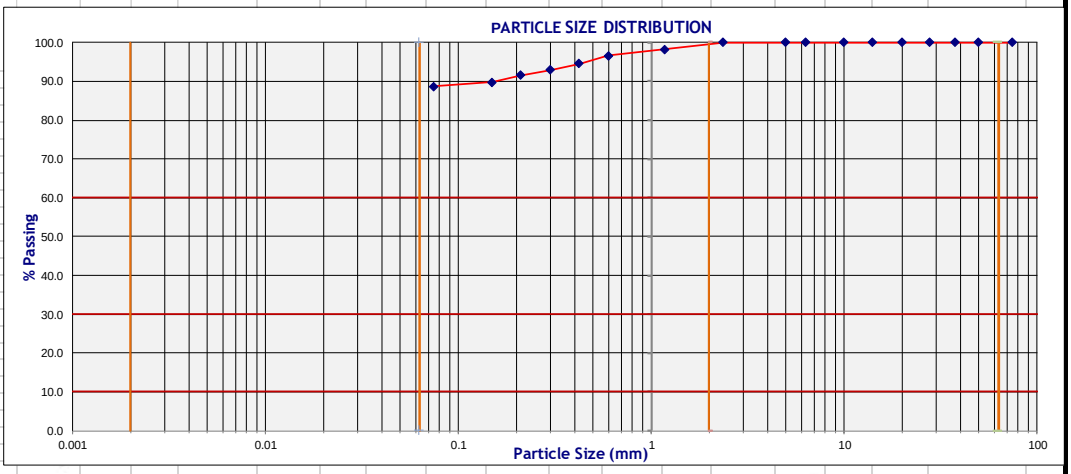
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TRIAL PIT NO. (DD 13)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD13	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	710 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	12.8	98.2
0.6	11.4	96.6
0.425	14.2	94.6
0.3	12.1	92.9
0.21	9.9	91.5
0.150	12.1	89.8
0.075	7.8	88.7

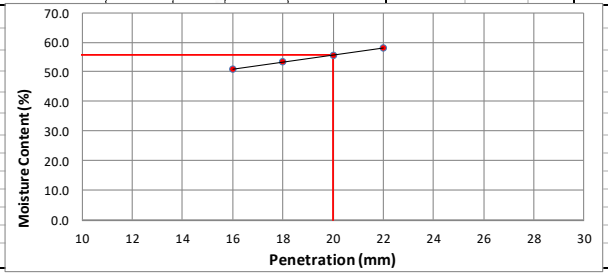


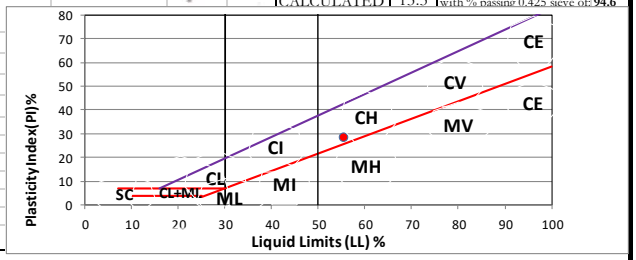
	% CLAY				% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10																	
D30						4.2	3.7	3.4	11.3								
D60	CLAY					Slightly sandy											

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	27.2	27.2	28.4
M. C %	51.0	53.4	55.6	57.9	27.2		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	14.2	
CALCULATED	13.3	with % passing 0.425 sieve of 94.6





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3					
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW								
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.							
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7								

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH: CH
		Plasticity Modulus	2686	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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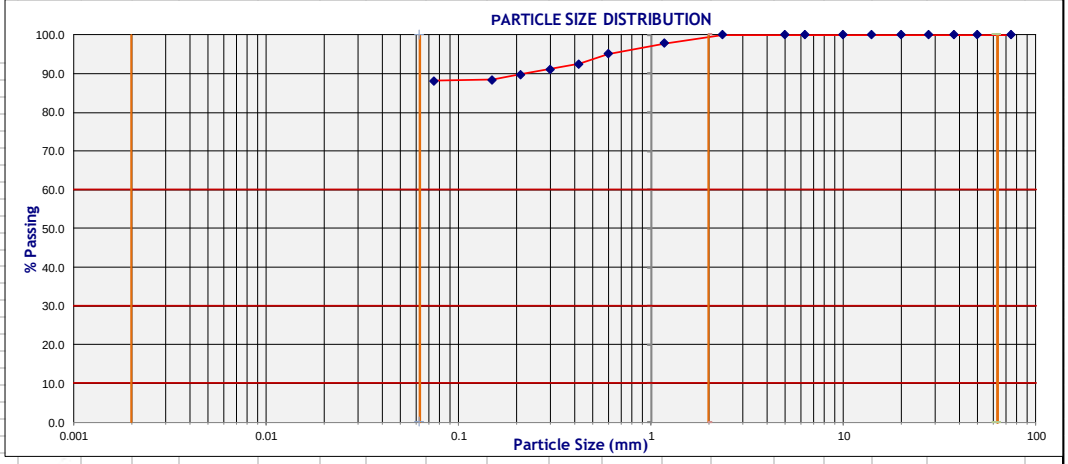
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TRIAL PIT NO. (DD 14)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD14	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	650 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	14.0	97.8
0.6	18.0	95.1
0.425	16.6	92.5
0.3	9.4	91.1
0.21	8.8	89.7
0.150	9.0	88.3
0.075	1.0	88.2

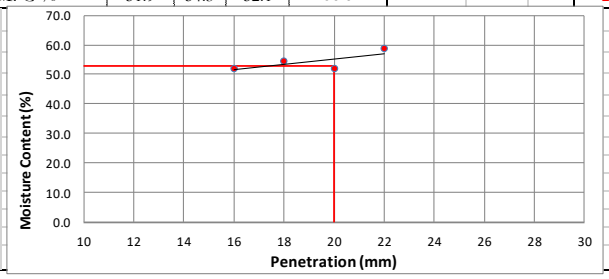


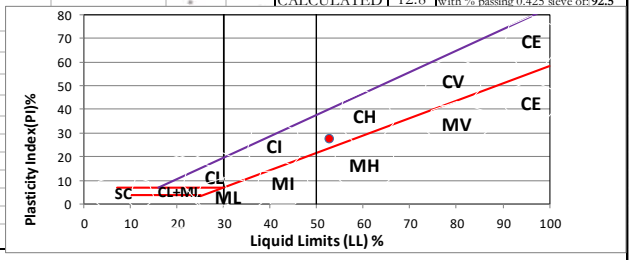
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.9	4.0	4.9	11.8					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	24.8	24.8	27.3
M. C %	51.9	54.3	52.1	58.8	24.8		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	13.4		
CALCULATED	12.8	with % passing 0.425 sieve of:	92.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH: CH
		Plasticity Modulus	2526	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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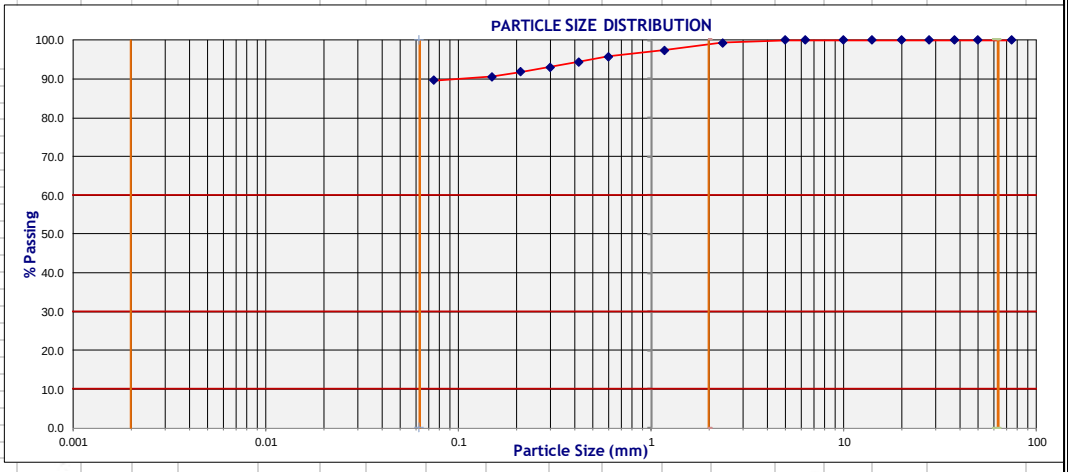
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TRIAL PIT NO. (DD 15)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD15	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	744 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	5.0	99.3
1.18	13.9	97.5
0.6	13.0	95.7
0.425	9.4	94.4
0.3	10.4	93.1
0.21	9.7	91.7
0.150	8.9	90.6
0.075	6.7	89.7

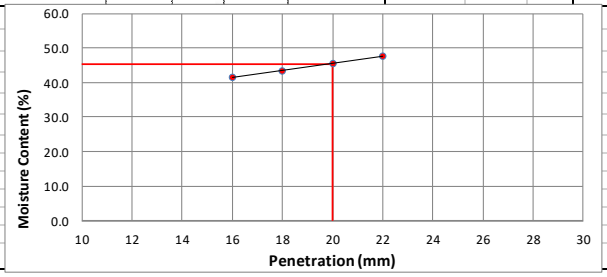


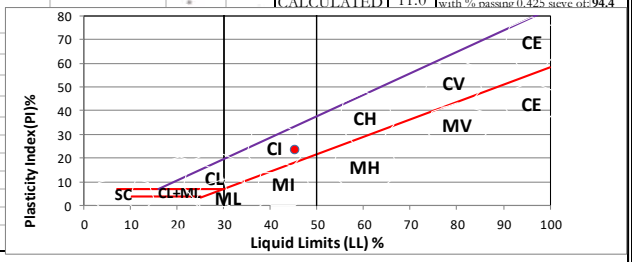
	% CLAY				% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10																	
D30						3.4	2.7	3.6	9.7	0.7			0.7				
D60	CLAY					Slightly sandy											

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.0	22.0	23.4
M. C %	41.5	43.4	45.5	47.7	22.0		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	11.4	
CALCULATED	11.0	with % passing 0.425 sieve of 94.4





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3			
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW								
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.						GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.							
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7								

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CI CL
		Plasticity Modulus	2213	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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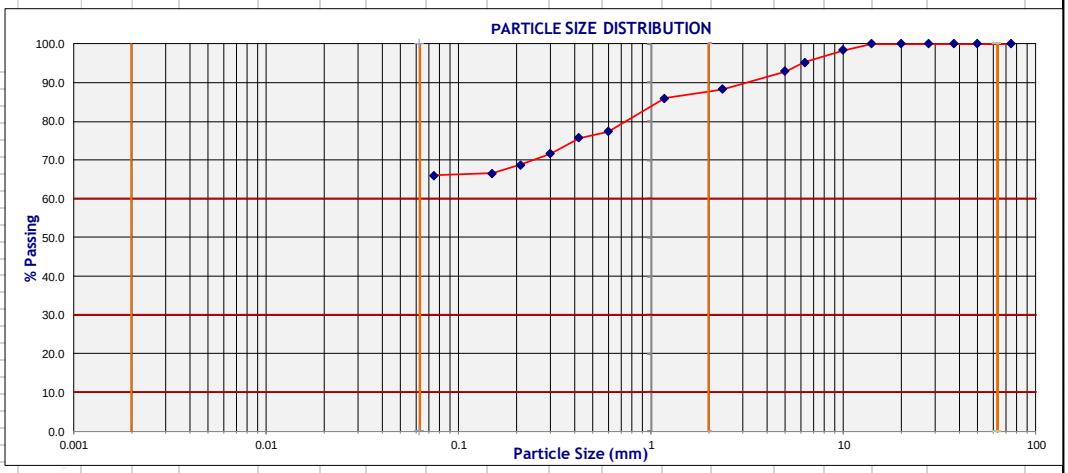
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TRIAL PIT NO. (DD 16)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD16	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	436 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10	7.0	98.4
6.3	14.0	95.2
5	10.0	92.9
2.36	20.0	88.3
1.18	10.0	86.0
0.6	38.0	77.3
0.425	7.0	75.7
0.3	18.0	71.6
0.21	12.0	68.8
0.150	10.0	66.5
0.075	2.0	66.1

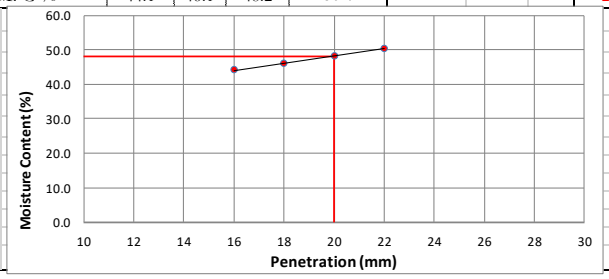


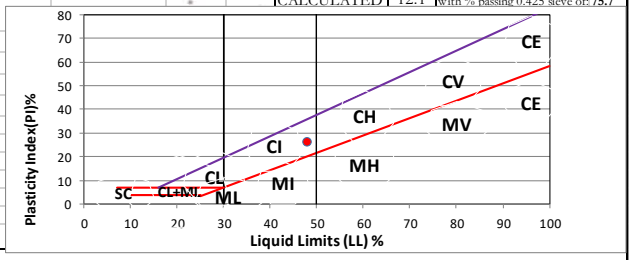
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						5.5	5.7	11.0	22.2	6.9	4.8		11.7
D60	CLAY					very sandy				Slightly gravelly			

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.4	22.4	25.8
M. C %	44.1	46.1	48.2	50.4	22.4		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	12.8		
CALCULATED	12.1	with % passing 0.425 sieve of:	75.7





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:		C_U	C_C	GM/GC/SM/SC	CL
		Plasticity Modulus	1953		

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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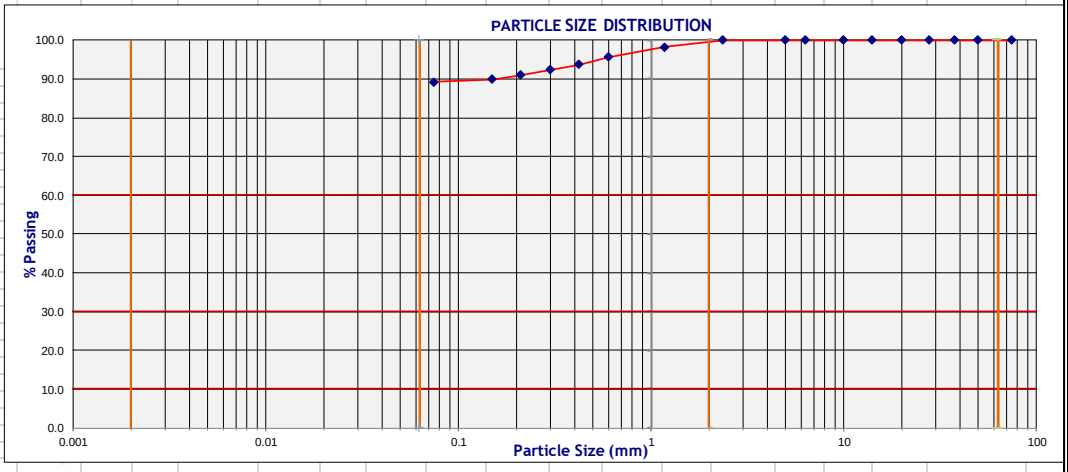
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TRIAL PIT NO. (DD 17)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD17	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	697 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	12.5	98.2
0.6	18.4	95.6
0.425	13.3	93.7
0.3	9.0	92.4
0.21	9.8	91.0
0.150	7.8	89.8
0.075	4.2	89.2



	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.1	3.2	4.4	10.8					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

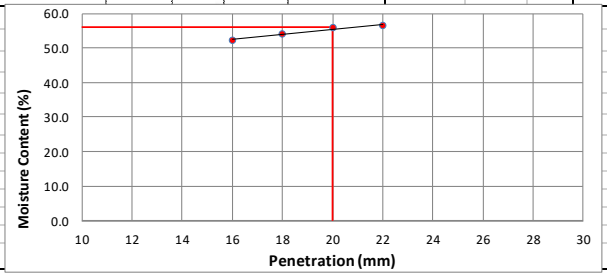
	LL				PL		PI
PENETRATION	16	18	20	22	27.3	27.3	28.6
M. C %	52.2	54.0	56.0	56.4	27.3		

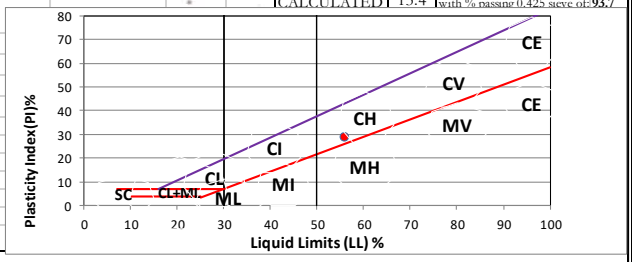
NMC		CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.2
CALCULATED	13.4

with % passing 0.425 sieve of 93.7





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4		Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CH
		Plasticity Modulus	2681	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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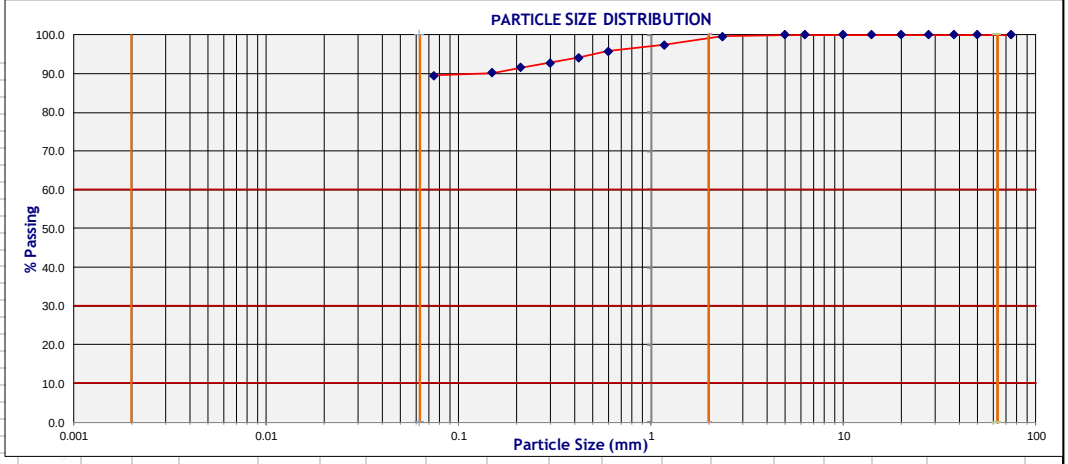
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TRIAL PIT NO. (DD 18)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	Depth	Location:	DD18	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
		TEST METHOD : BS 1377:Part 2			
Wt. of Dry Sample	681.3 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	2.7	99.6
1.18	14.5	97.5
0.6	11.4	95.8
0.425	11.0	94.2
0.3	9.5	92.8
0.21	8.7	91.5
0.150	9.0	90.2
0.075	4.8	89.5

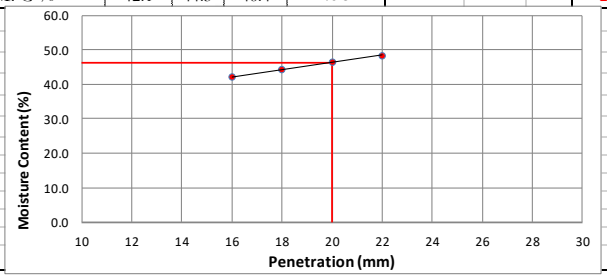


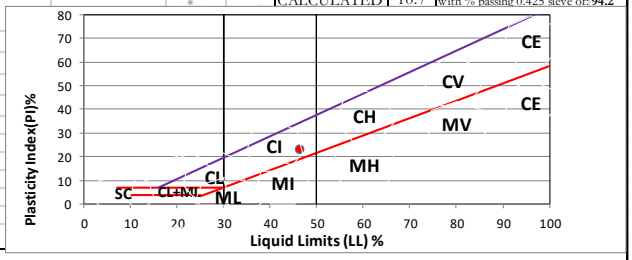
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						3.3	3.0	3.8	10.1	0.4			0.4	
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	23.6	23.6	22.8
M. C %	42.1	44.3	46.4	48.3	23.6		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	11.0		
CALCULATED	10.7	with % passing 0.425 sieve of:	94.2





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CI CL
		Plasticity Modulus	2145	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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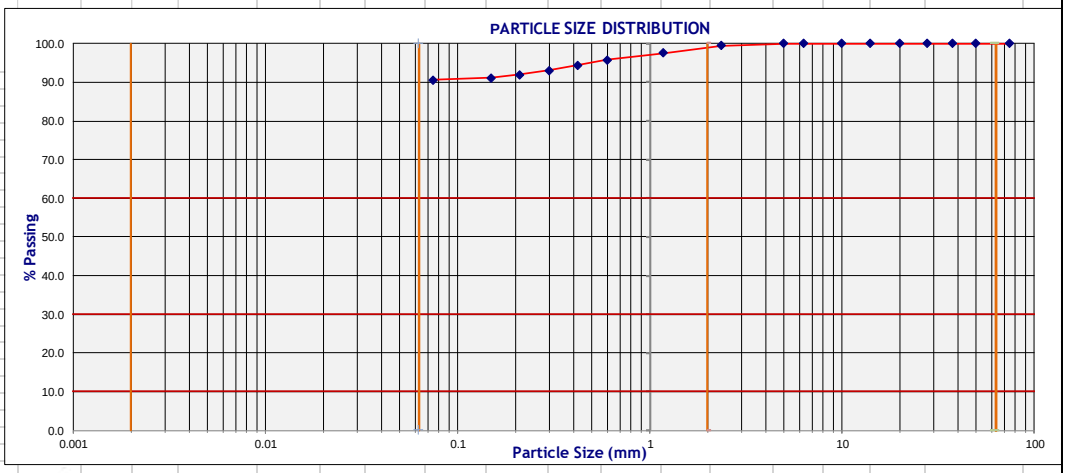
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TRIAL PIT NO. (DD 19)

CLIENT:	EGIS CONSULTANTS LIMITED			
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS			
	Depth	Location: DD19	Test Date:	24/04/2025
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By:	Austine
		TEST METHOD : BS 1377:Part 2		
Wt. of Dry Sample		885.9 g		

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	4.4	99.5
1.18	17.0	97.6
0.6	15.6	95.8
0.425	12.0	94.5
0.3	13.0	93.0
0.21	8.9	92.0
0.150	7.6	91.1
0.075	5.0	90.6



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.4	2.8	3.7	8.9	0.5			0.5	
D60	CLAY													

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	23.6	23.6	22.8
M. C %	42.0	44.2	46.5	48.9	23.6		

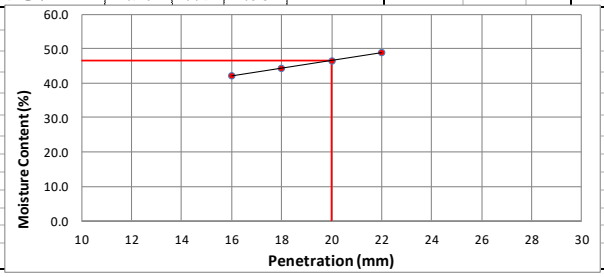
NMC

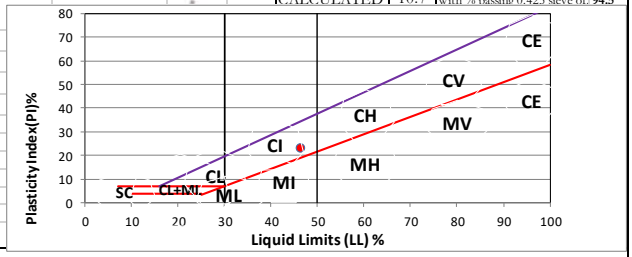
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	11.0
CALCULATED	10.7

with % passing 0.425 sieve of 94.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL		C_U	C_C
DESCRIPTION:		Plasticity Modulus		2158

USCS POSSIBLE CLASSIFICATION: ML/CL/MH/CI **CL**

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

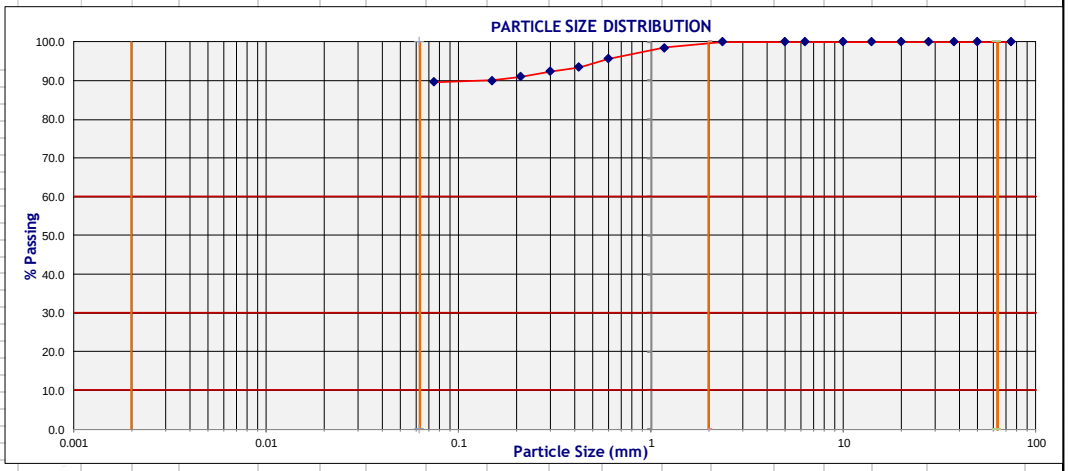
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TRIAL PIT NO. (DD 20)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS				
	Depth	Location:	DD20	Test Date:	24/4/2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	523 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	8.0	98.5
0.6	15.0	95.6
0.425	11.0	93.5
0.3	6.0	92.4
0.21	7.0	91.0
0.150	5.0	90.1
0.075	2.0	89.7

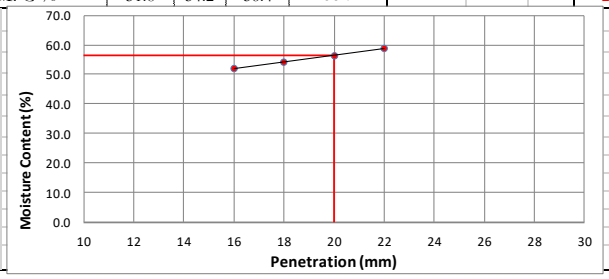


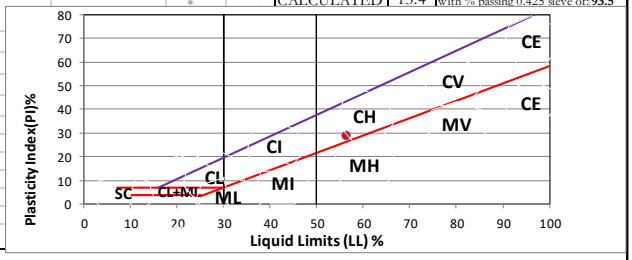
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.7	3.3	4.4	10.3					
D60	CLAY					Slightly sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	27.8	27.8	28.6
M. C %	51.8	54.2	56.4	58.7	27.8		

NMC		CLAY ACTIVITY (%)	
LINEAR SHRINKAGE			
FROM LAB.	14.0		
CALCULATED	13.4	with % passing 0.425 sieve of:	93.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH CH
		Plasticity Modulus	2674	

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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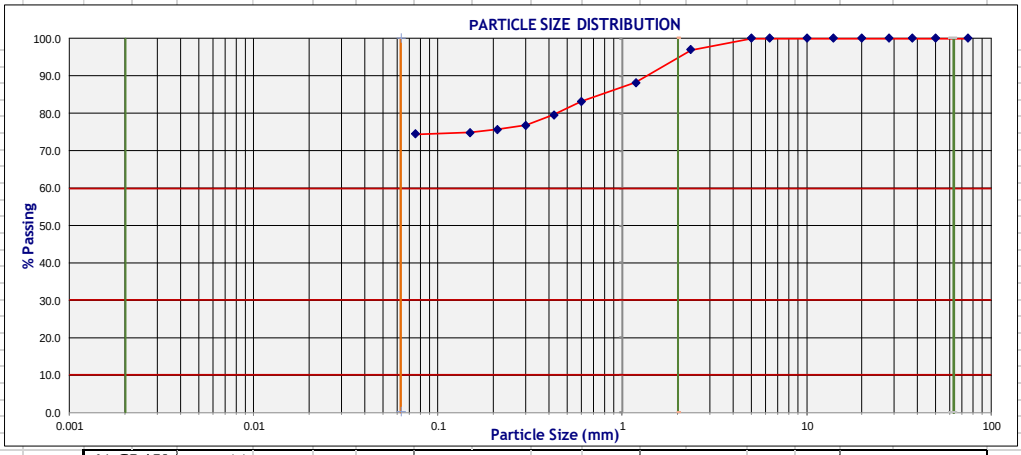
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GRADING AND ATTERBERG TEST RESULTS PRELIMINARY DESIGN

TRIAL PIT NO. (PD 1)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	9/9/2024
Alignment Samples	Depth 1.1 m	Location:	TP 1	Tested By:	Austine
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	435 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	13.0	97.0
1.18	38.0	88.3
0.6	22.1	83.2
0.425	15.7	79.6
0.3	12.2	76.8
0.21	5.0	75.6
0.150	3.3	74.9
0.075	2.0	74.4

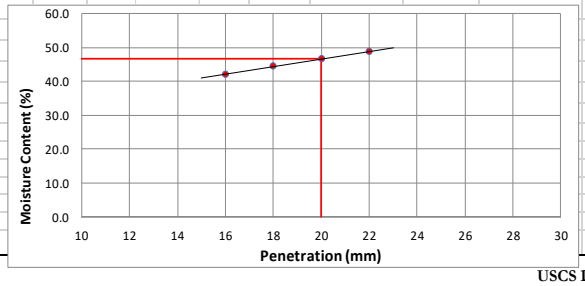


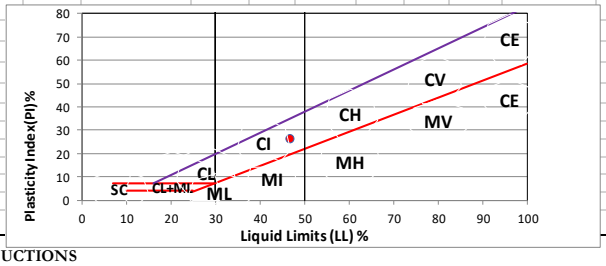
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.4	6.4	13.8	22.6	3.0			3.0	
D60	CLAY					very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.2	21.2	25.6
M. C %	42.2	44.6	46.8	49.1	21.2		

NMC		CLAY ACTIVITY (%)
15.7		
LINEAR SHRINKAGE		
FROM LAB.	12.9	
CALCULATED	12.0	with % passing 0.425 sieve of: 79.6





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				ML/CL/MH/CH	CL
		Plasticity Modulus	2037		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

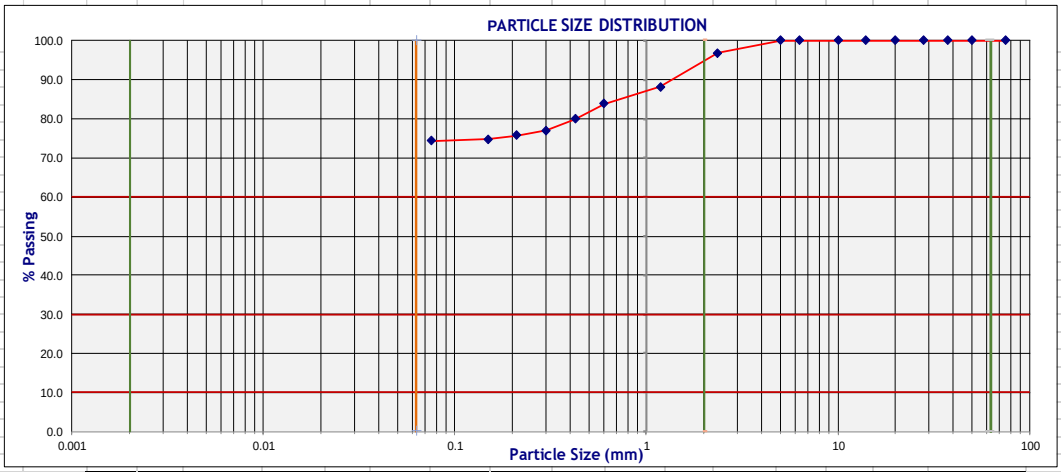
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TRIAL PIT NO. (PD 2)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	9/9/2024
	Depth 1.0 m	Location:	TP 2	Tested By:	Austine
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	456 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	14.6	96.8
1.18	39.2	88.2
0.6	20.0	83.8
0.425	17.6	80.0
0.3	13.4	77.0
0.21	6.0	75.7
0.150	4.3	74.8
0.075	1.8	74.4



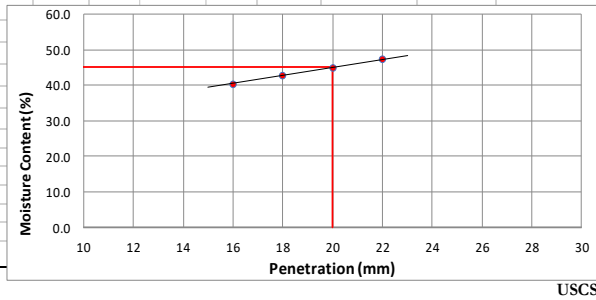
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.7	6.8	13.0	22.4	3.2			3.2	
D60	CLAY					very sandy								

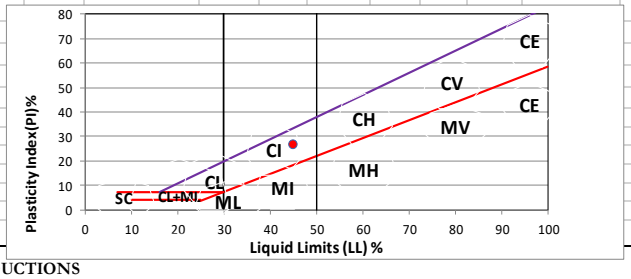
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	19.0	19.0	26.1
M. C %	40.5	42.9	45.1	47.4	19.0		

NMC		CLAY ACTIVITY (%)
15.7		

LINEAR SHRINKAGE		
FROM LAB.	12.9	
CALCULATED	12.2	with % passing 0.425 sieve of: 80.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL				USCS POSSIBLE CLASSIFICATION
DESCRIPTION:			C_U	C_C	ML/CL/MH/CH CL
		Plasticity Modulus	2086		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

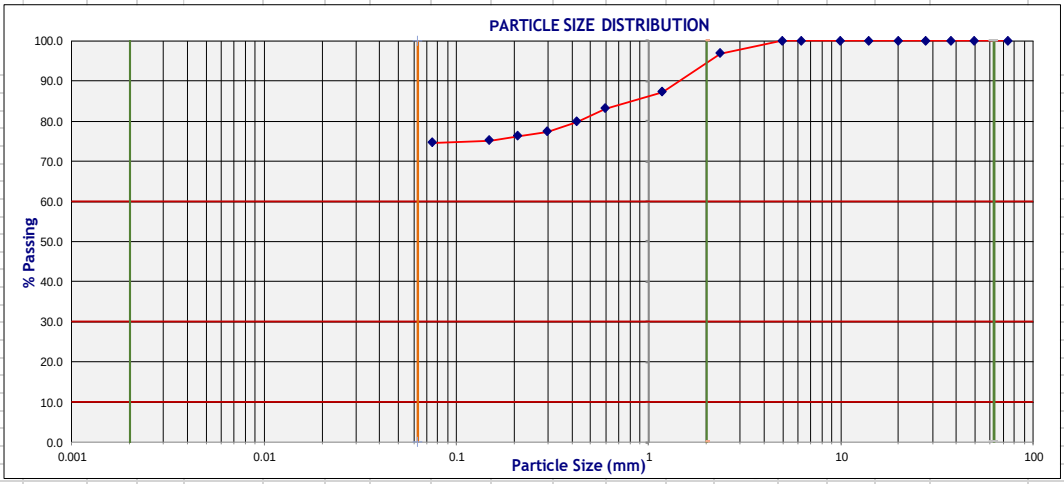
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TRIAL PIT NO. (PD 3)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
	Depth 1.1 m	Location:	TP 3	Test Date:	9/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	424 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	13.6	96.8
1.18	40.3	87.3
0.6	17.4	83.2
0.425	14.4	79.8
0.3	10.2	77.4
0.21	4.7	76.3
0.150	5.1	75.1
0.075	2.1	74.6



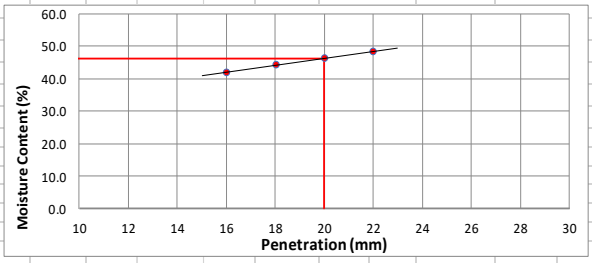
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.8	5.8	13.6	22.2	3.2			3.2	
D60	CLAY					very sandy								

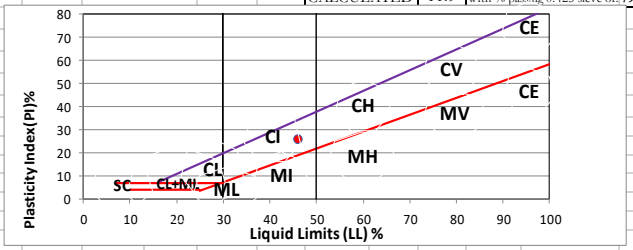
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	20.8	20.8	25.4
M. C %	41.9	44.1	46.2	48.4	20.8		

NMC		CLAY ACTIVITY (%)
15.7		

LINEAR SHRINKAGE		
FROM LAB.	12.9	
CALCULATED	11.9	with % passing 0.425 sieve of: 79.8





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH	CL
		Plasticity Modulus	2025		

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

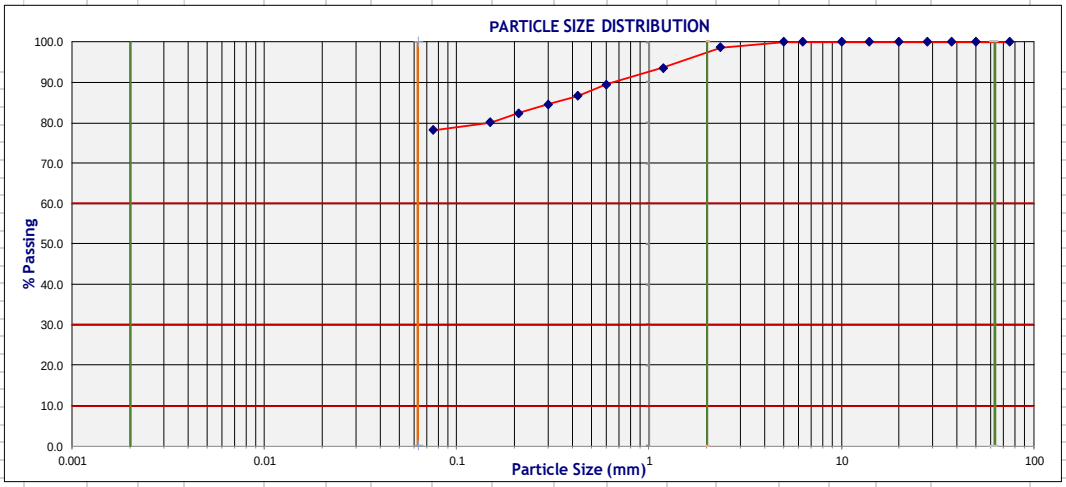
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TRIAL PIT NO. (PD 4)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
	Depth 1.1 m	Location:	TP 4	Test Date:	9/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	389 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	5.4	98.6
1.18	19.5	93.6
0.6	16.0	89.5
0.425	11.0	86.7
0.3	8.2	84.6
0.21	8.2	82.4
0.150	9.0	80.1
0.075	7.4	78.2



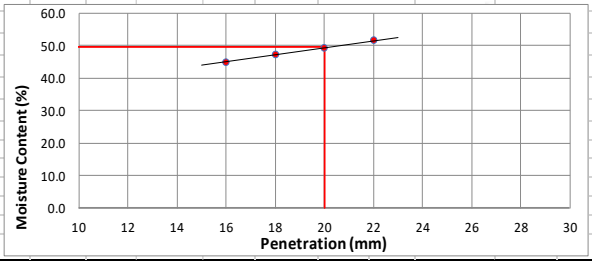
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						6.3	4.9	9.1	20.4	1.4			1.4
D60	CLAY					very sandy							

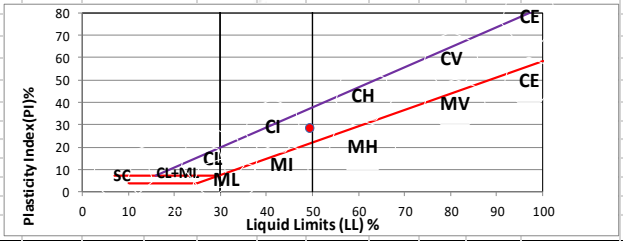
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.4	21.4	28.1
M. C %	45.2	47.3	49.6	51.8	21.4		

NMC		CLAY ACTIVITY (%)
15.7		

LINEAR SHRINKAGE		
FROM LAB.	14.3	
CALCULATED	13.2	with % passing 0.425 sieve of: 86.7





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.						GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CL
		Plasticity Modulus	2435	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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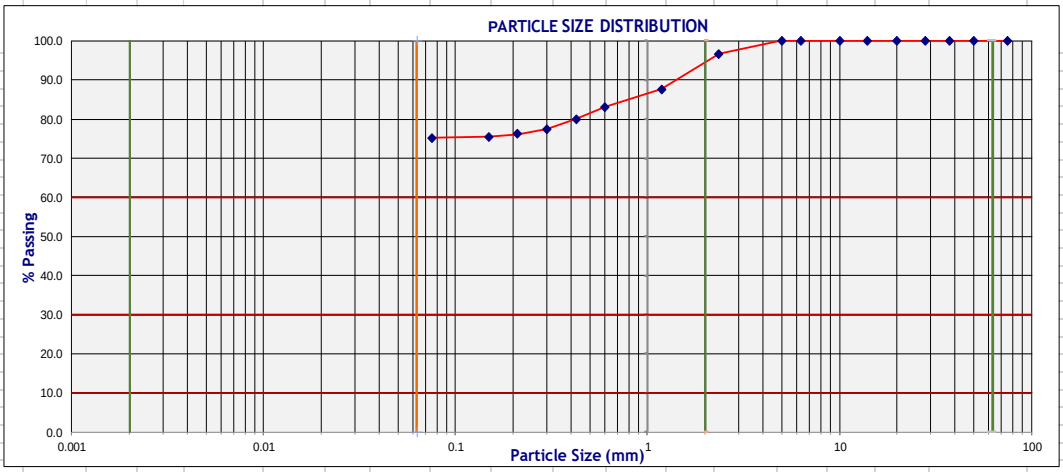
TRIAL PIT NO. (PD 5)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
Alignment Samples	Depth 1.2 m	Location:	TP 5	Test Date:	9/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 460 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	15.0	96.7
1.18	42.0	87.6
0.6	20.5	83.2
0.425	14.6	80.0
0.3	11.7	77.4
0.21	6.0	76.1
0.150	2.8	75.5
0.075	1.6	75.2



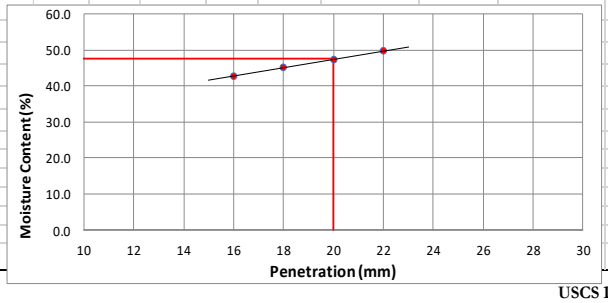
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						2.3	5.7	13.6	21.6	3.3			3.3	
D60	CLAY					very sandy								

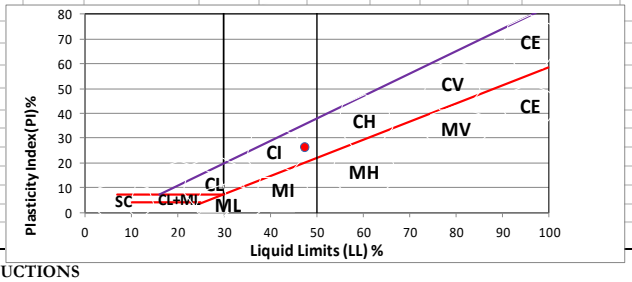
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.8	21.8	25.7
M. C %	42.9	45.3	47.5	49.8	21.8		

NMC		CLAY ACTIVITY (%)
15.7		

LINEAR SHRINKAGE		
FROM LAB.	12.9	
CALCULATED	12.1	with % passing 0.425 sieve of 80.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CI CL
		Plasticity Modulus	2055	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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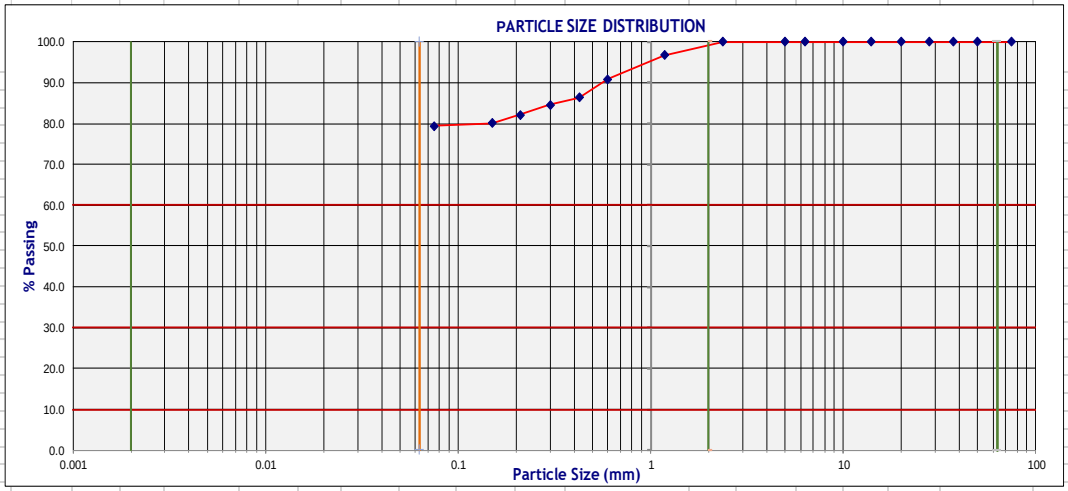
APEX PROJECTS

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TRIAL PIT NO. (PD 8)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	BEN
	Depth 0.8m	Location:	TP 8	Test Date:	9/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	402 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	13.0	96.8
0.6	24.0	90.8
0.425	18.0	86.3
0.3	7.0	84.6
0.21	10.0	82.1
0.150	8.0	80.1
0.075	3.0	79.4

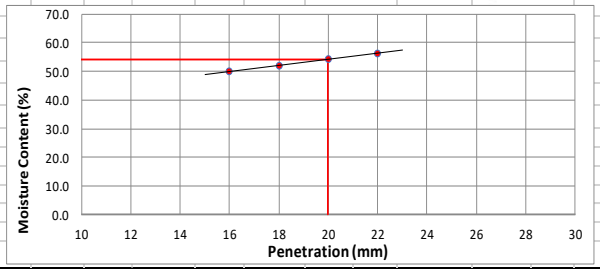


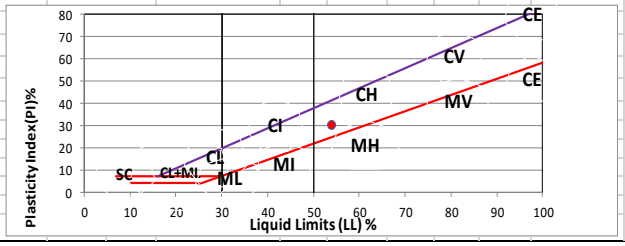
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						5.2	6.2	9.2	20.6					
D60	CLAY					very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	24.1	24.1	30.2
M. C %	49.9	52.1	54.3	56.4	24.1		

NMC		CLAY ACTIVITY (%)
15.7		
LINEAR SHRINKAGE		
FROM LAB.	14.9	
CALCULATED	14.2	with % passing 0.425 sieve of 86.3





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:					ML/CL/MH/CH CH
		Plasticity Modulus	2607		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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E410
CONSULTING ENGINEER

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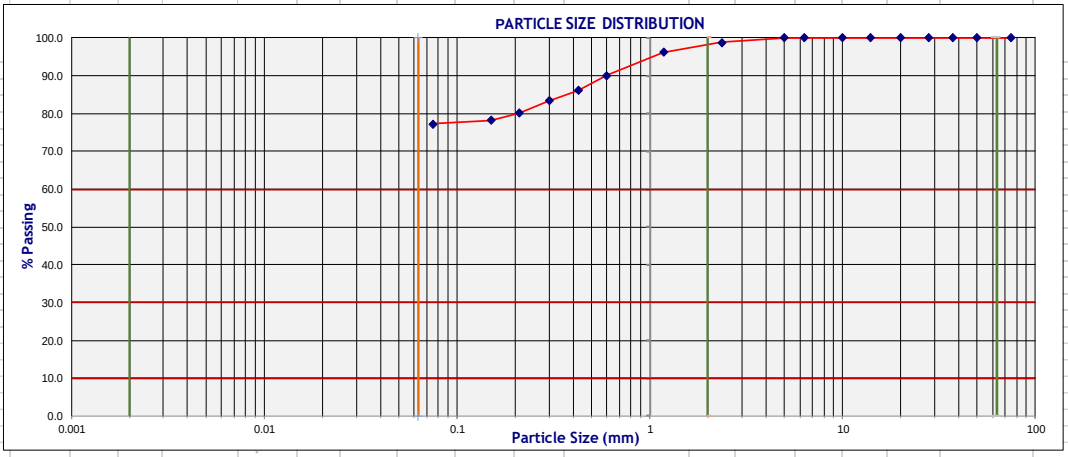
TRIAL PIT NO. (PD 9)

CLIENT:	EGIS CONSULTANTS LIMITED		
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS		
		Sampled By:	Ben
Alignment Samples	Depth 1.1m	Location: TP 9	Test Date: 10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By: Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 584 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	7.0	98.8
1.18	15.0	96.2
0.6	36.0	90.1
0.425	23.0	86.1
0.3	16.0	83.4
0.21	19.0	80.1
0.150	11.0	78.3
0.075	6.0	77.2

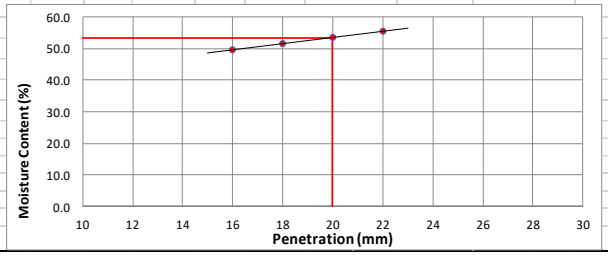


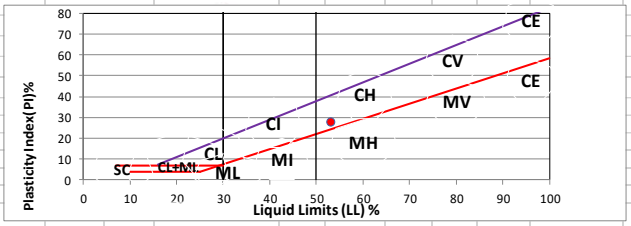
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						6.2	6.7	8.7	21.6	1.2			1.2
D60													
	CLAY				very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	25.8	25.8	27.4
M. C %	49.4	51.5	53.4	55.5	25.8		

NMC		CLAY ACTIVITY (%)
15.7		
LINEAR SHRINKAGE		
FROM LAB.	13.6	
CALCULATED	12.9	with % passing 0.425 sieve of: 86.1





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL		C_U	C_C
DESCRIPTION:		Plasticity Modulus	2360	

USCS POSSIBLE CLASSIFICATION: ML/CL/MH/CH CH

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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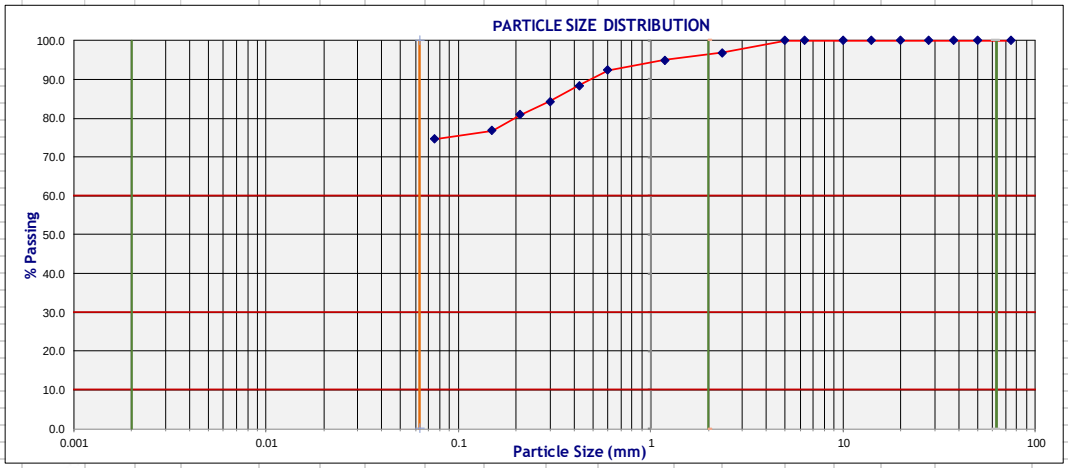
TRIAL PIT NO. (PD 10)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
Alignment samples	Depth 1.1m	Location:	TP 10	Test Date:	10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 401 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	12.8	96.8
1.18	7.6	94.9
0.6	10.4	92.3
0.425	15.6	88.4
0.3	16.4	84.3
0.21	13.6	80.9
0.150	16.8	76.8
0.075	8.4	74.7



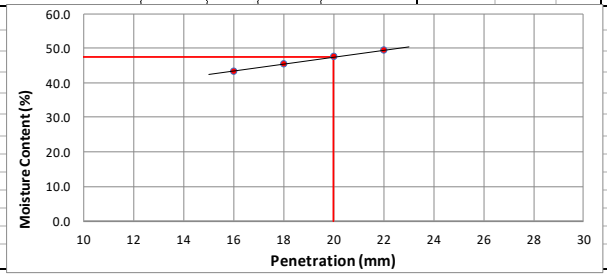
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						9.7	8.0	4.5	22.1	3.2			3.2	
D60	CLAY					very sandy								

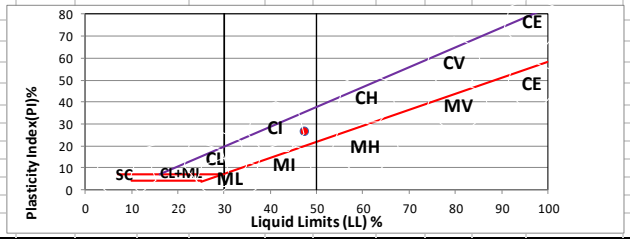
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.3	21.3	26.2
M. C %	43.3	45.5	47.5	49.6	21.3		

NMC		CLAY ACTIVITY (%)
18.1		

LINEAR SHRINKAGE		
FROM LAB.	12.9	
CALCULATED	12.3	with % passing 0.425 sieve of: 88.4





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.						GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH: CL
		Plasticity Modulus	2316	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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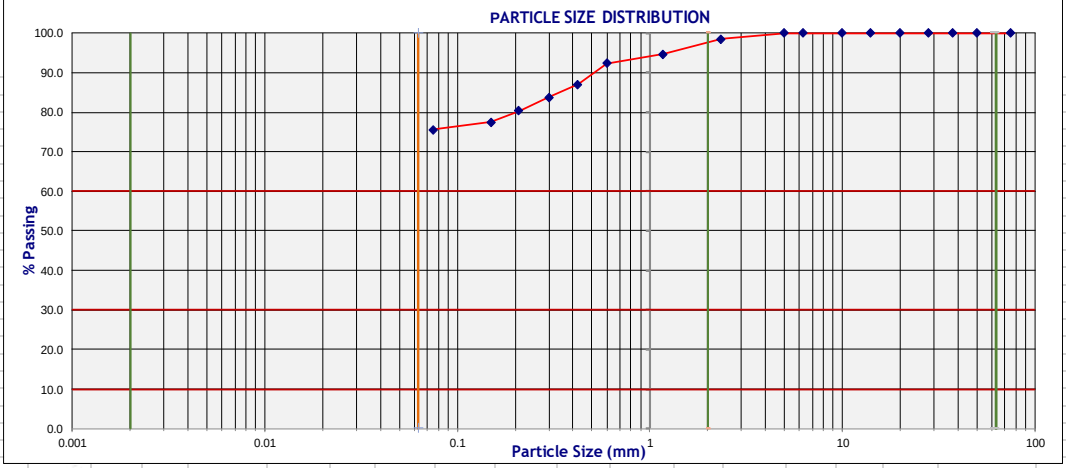
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TRIAL PIT NO. (PD 11)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
Alignment samples	Depth 1.0m	Location:	TP 11	Test Date:	10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	420 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	6.1	98.5
1.18	16.1	94.7
0.6	10.0	92.3
0.425	22.0	87.1
0.3	14.1	83.7
0.21	14.0	80.4
0.150	12.0	77.5
0.075	8.0	75.6

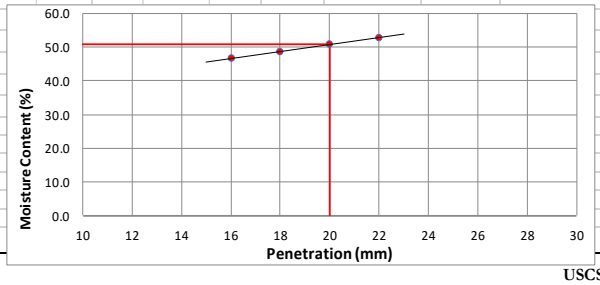


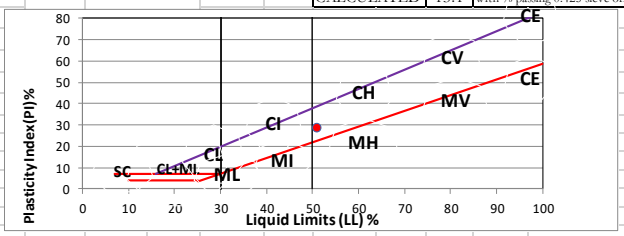
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10													
D30					8.1	8.6	6.2	22.9	1.5			1.5	
D60	CLAY				very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	23.0	23.0	28.0
M. C %	46.7	48.9	51.0	53.0	23.0		

NMC		CLAY ACTIVITY (%)
17.7		
LINEAR SHRINKAGE		
FROM LAB.	14.2	
CALCULATED	13.1	with % passing 0.425 sieve of: 87.1





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				ML/CL/MH/CL	CH
			Plasticity Modulus	2437	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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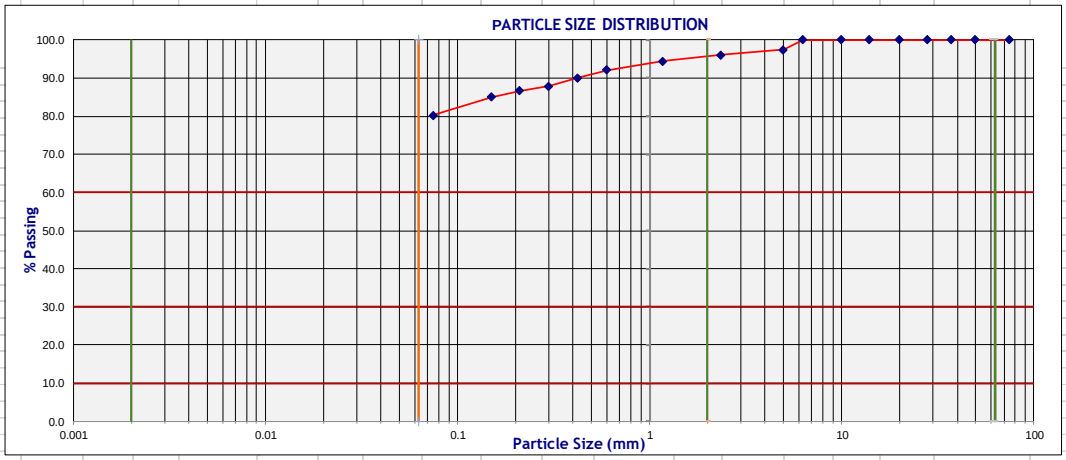
TRIAL PIT NO. (PD 13)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	10/9/2024
	Depth 1.0m	Location:	TP 13	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 380 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5	10.0	97.4
2.36	5.0	96.1
1.18	6.0	94.5
0.6	9.0	92.1
0.425	8.0	90.0
0.3	8.0	87.9
0.21	5.0	86.6
0.150	6.0	85.0
0.075	18.0	80.3



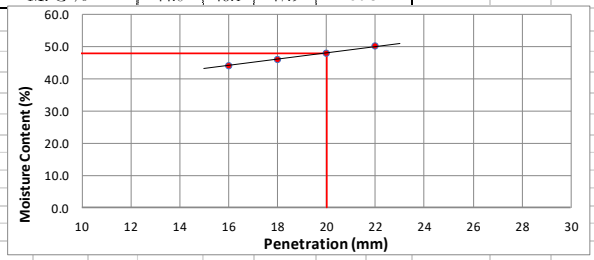
	% CLAY	% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						7.6	4.2	3.9	15.8	3.9			3.9	
D60	CLAY					sandy								

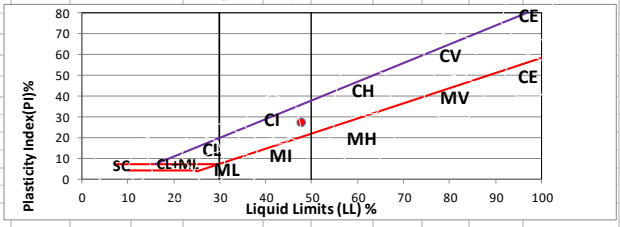
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.2	21.2	26.7
M. C %	44.0	46.1	47.9	50.3	21.2		

NMC		CLAY ACTIVITY (%)
8.4		

LINEAR SHRINKAGE		
FROM LAB.	13.6	
CALCULATED	12.5	with % passing 0.425 sieve of: 90.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH/CL
		Plasticity Modulus	2404	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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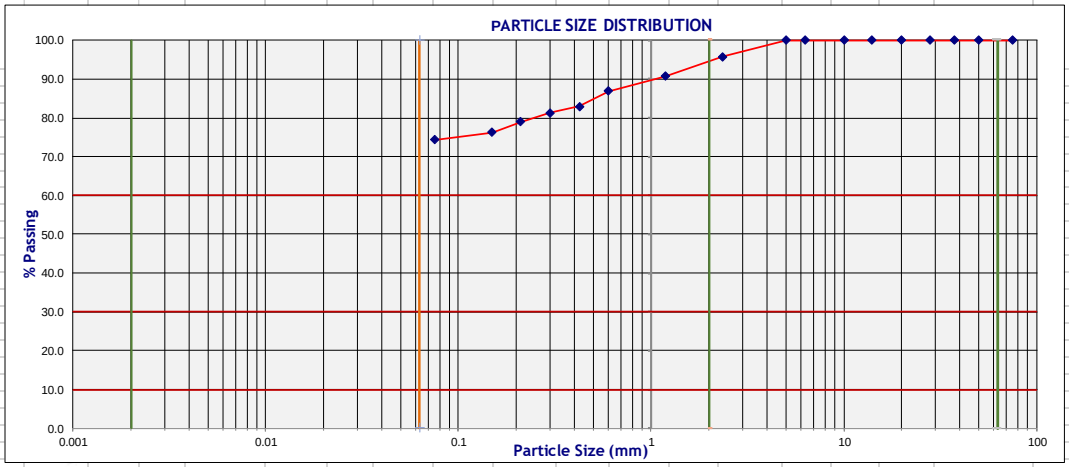
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TRIAL PIT NO. (PD 14)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	10/9/2024
Alignment samples	Depth 1.2 m	Location:	TP14	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				
Wt. of Dry Sample	358 g				

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	15.0	95.8
1.18	18.0	90.8
0.6	14.0	86.9
0.425	14.0	83.0
0.3	6.0	81.3
0.21	8.0	79.1
0.150	10.0	76.3
0.075	7.0	74.3

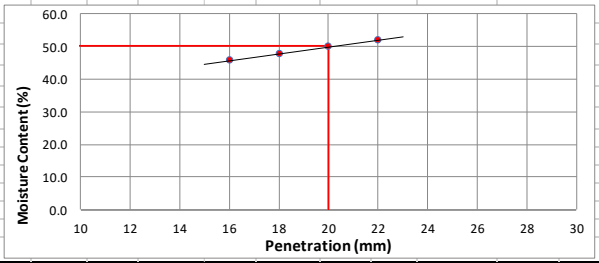


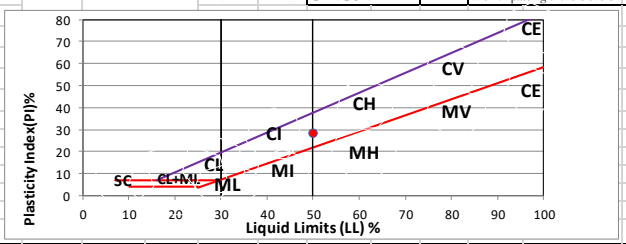
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						7.0	5.6	8.9	21.5	4.2			4.2	
D60	CLAY					very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.4	22.4	27.7
M. C %	45.8	47.9	50.2	52.1	22.4		

NMC		CLAY ACTIVITY (%)
10.5		
LINEAR SHRINKAGE		
FROM LAB.	13.7	
CALCULATED	13.0	with % passing 0.425 sieve of: 83.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3
SP	Not meeting all gradation requirements for SW						GP	Not meeting all gradation requirements for GW					
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				
SC	Atterberg limits above "A" Line or P.I. greater than 7						GC	Atterberg limits above "A" Line or P.I. greater than 7					

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:		C_U	C_C	ML/CL/MH/CI	CH
		Plasticity Modulus	2300		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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ENGINEERS BOARD OF KENYA

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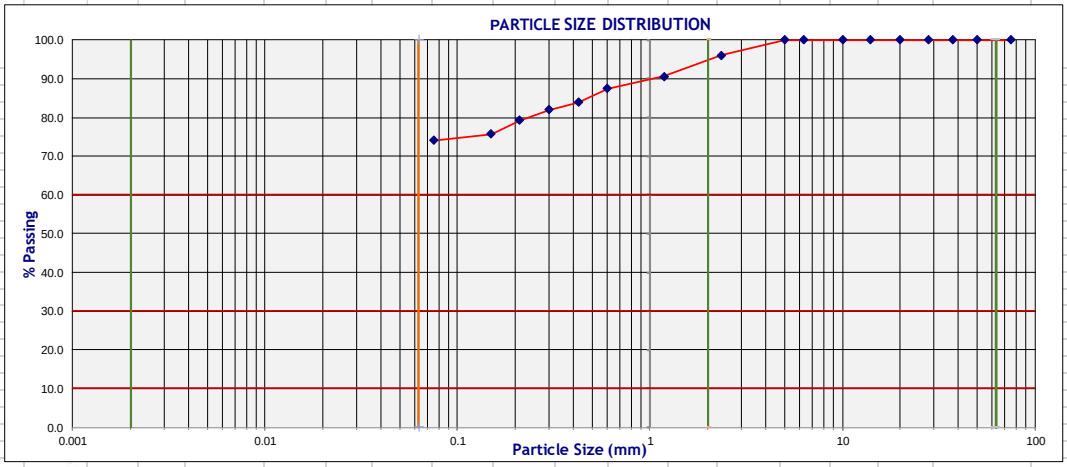
TRIAL PIT NO. (PD 15)

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	10/9/2024
Alignment samples	Depth 1.2 m	Location:	TP 15	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 365 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36	14.2	96.1
1.18	20.0	90.6
0.6	11.5	87.5
0.425	13.0	83.9
0.3	7.0	82.0
0.21	10.0	79.3
0.150	13.0	75.7
0.075	6.0	74.1



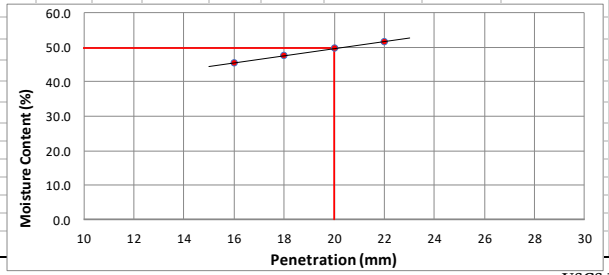
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						7.9	5.5	8.6	22.1	3.9			3.9	
D60														
	CLAY					very sandy								

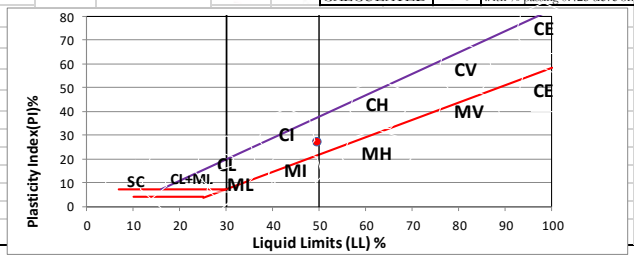
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.6	22.6	27.2
M. C %	45.5	47.7	49.8	51.8	22.6		

NMC		CLAY ACTIVITY (%)
10.5		

LINEAR SHRINKAGE		
FROM LAB.	13.7	
CALCULATED	12.8	with % passing 0.425 sieve of: 83.9





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4			Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4			Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CI: CL
		Plasticity Modulus	2281	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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ENGINEERS BOARD OF KENYA

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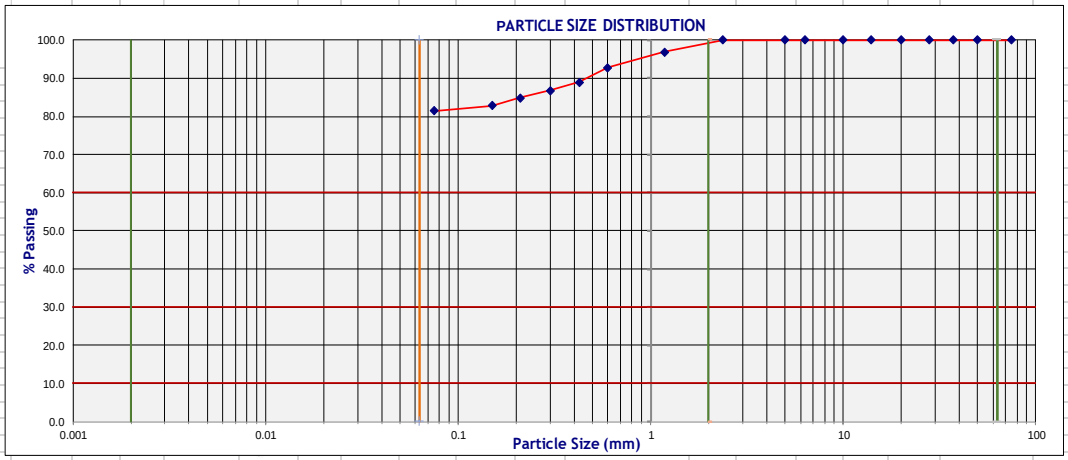
TRIAL PIT NO. (PD 16)

CLIENT:	EGIS CONSULTANTS LIMITED		
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS		
		Sampled By:	Ben
Alignment Samples	Depth	Location: TP 16	Test Date: 10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By: Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 440 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	14.0	96.8
0.6	18.0	92.7
0.425	16.6	89.0
0.3	9.4	86.8
0.21	8.8	84.8
0.150	9.0	82.8
0.075	6.0	81.4



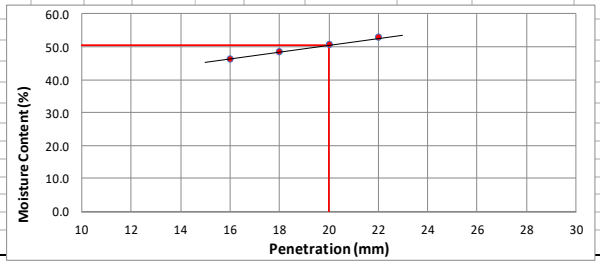
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						5.4	5.9	7.3	18.6				
D60	CLAY					sandy							

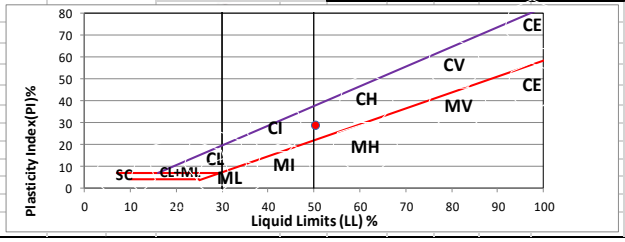
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	22.4	22.4	28.2
M. C %	46.3	48.5	50.6*	52.7	22.4		

NMC		CLAY ACTIVITY (%)
15.7		

LINEAR SHRINKAGE		
FROM LAB.	13.6	
CALCULATED	13.2	with % passing 0.425 sieve of: 89.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH CH
		Plasticity Modulus	2509	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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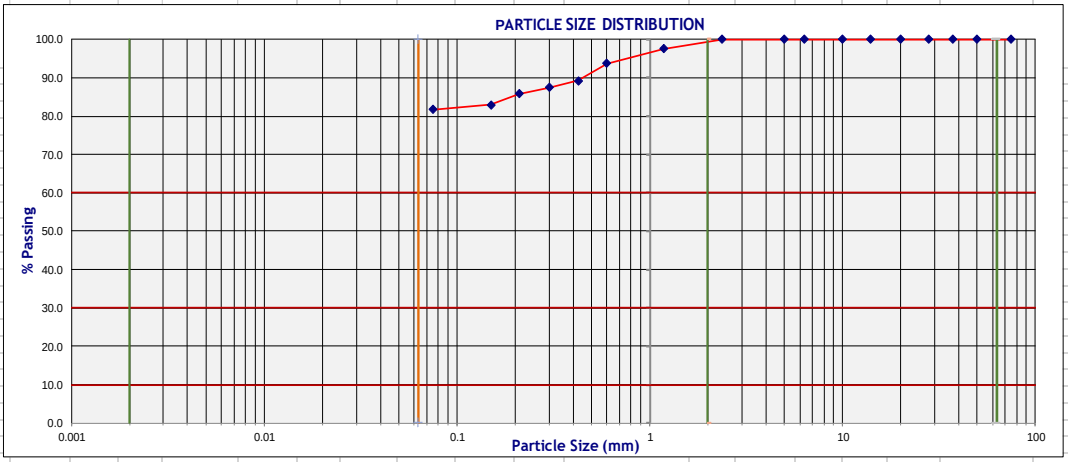
TRIAL PIT NO. (PD 17)

CLIENT:	EGIS CONSULTANTS LIMITED		
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS		
		Sampled By:	Ben
Depth	1.1m	Location: TP 17	Test Date: 10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION	Tested By: Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 400 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.0	97.5
0.6	15.0	93.8
0.425	18.0	89.3
0.3	7.0	87.5
0.21	7.0	85.8
0.150	11.0	83.0
0.075	5.0	81.8

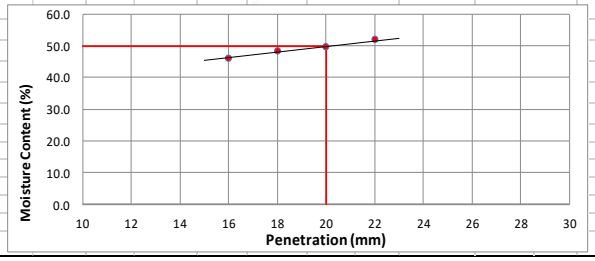


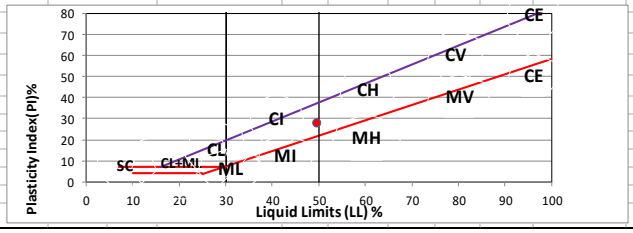
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						5.8	6.3	6.3	18.3					
D60	CLAY					sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	21.9	21.9	27.7
M. C %	46.0	48.3	49.6	51.9	21.9		

NMC		CLAY ACTIVITY (%)
15.7		
LINEAR SHRINKAGE		
FROM LAB.	13.6	
CALCULATED	13.0	with % passing 0.425 sieve of: 89.3





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW	GP	Not meeting all gradation requirements for GW
SM	Atterberg limits below "A" Line or P.I. Less than 4	GM	Atterberg limits below "A" Line or P.I. Less than 4
SC	Atterberg limits above "A" Line or P.I. greater than 7	GC	Atterberg limits above "A" Line or P.I. greater than 7

Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH: CL
		Plasticity Modulus	2472	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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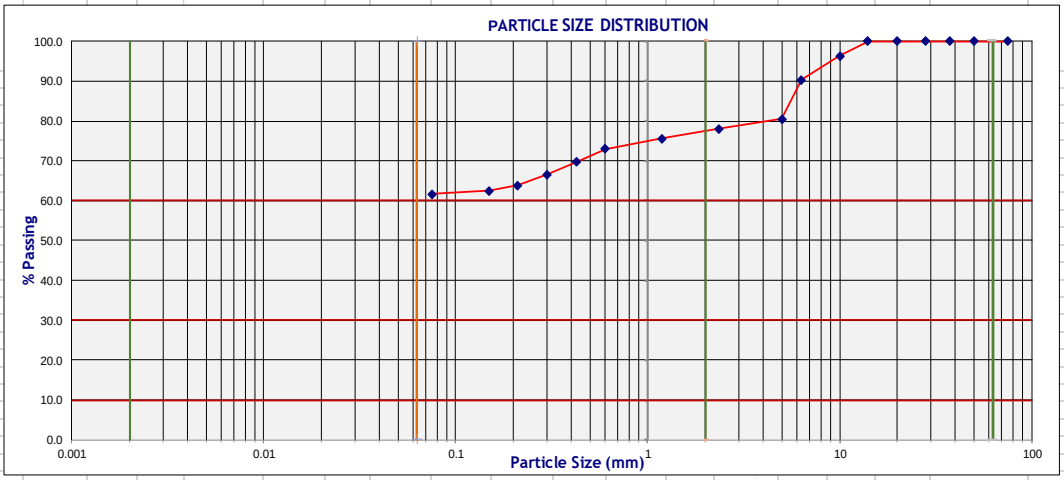
TRIAL PIT NO. (PD 18)

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
Alignment samples	Depth 1.0 m	Location:	TP18	Test Date:	10/9/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 511 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10	19.0	96.3
6.3	30.5	90.3
5	50.0	80.5
2.36	13.0	78.0
1.18	12.2	75.6
0.6	13.0	73.1
0.425	17.4	69.6
0.3	15.9	66.5
0.21	14.0	63.8
0.150	6.6	62.5
0.075	4.6	61.6



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10						4.9	6.5	4.9	16.4	12.3	9.7		22.0	
D30														
D60	CLAY					sandy				very gravelly				

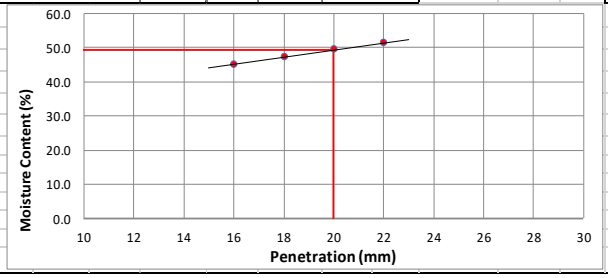
ATTERBERG LIMITS

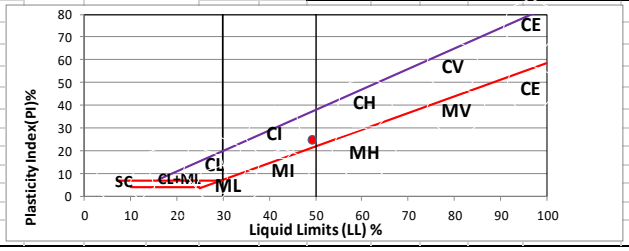
	LL				PL		PI
PENETRATION	16	18	20	22	25.2	25.2	24.1
M. C %	45.1	47.2	49.4	51.4	25.2		

NMC	
	9.9

CLAY ACTIVITY (%)	

LINEAR SHRINKAGE		
FROM LAB.	12.1	
CALCULATED	11.3	with % passing 0.425 sieve of: 69.6





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				GM/GC/SM/SC CL
		Plasticity Modulus	1681	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

ENGINEERS BOARD OF KENYA — LICENSED CONSULTING ENGINEER — E410

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COMPACTION TEST RESULTS DETAILED DESIGN

TRIAL PIT NO. (DD 1)

CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**

Depth Range:	**Location**	**DD1**		**Test Date:**	22/04/2025
Sampled By:		**Tested By**	Austine		

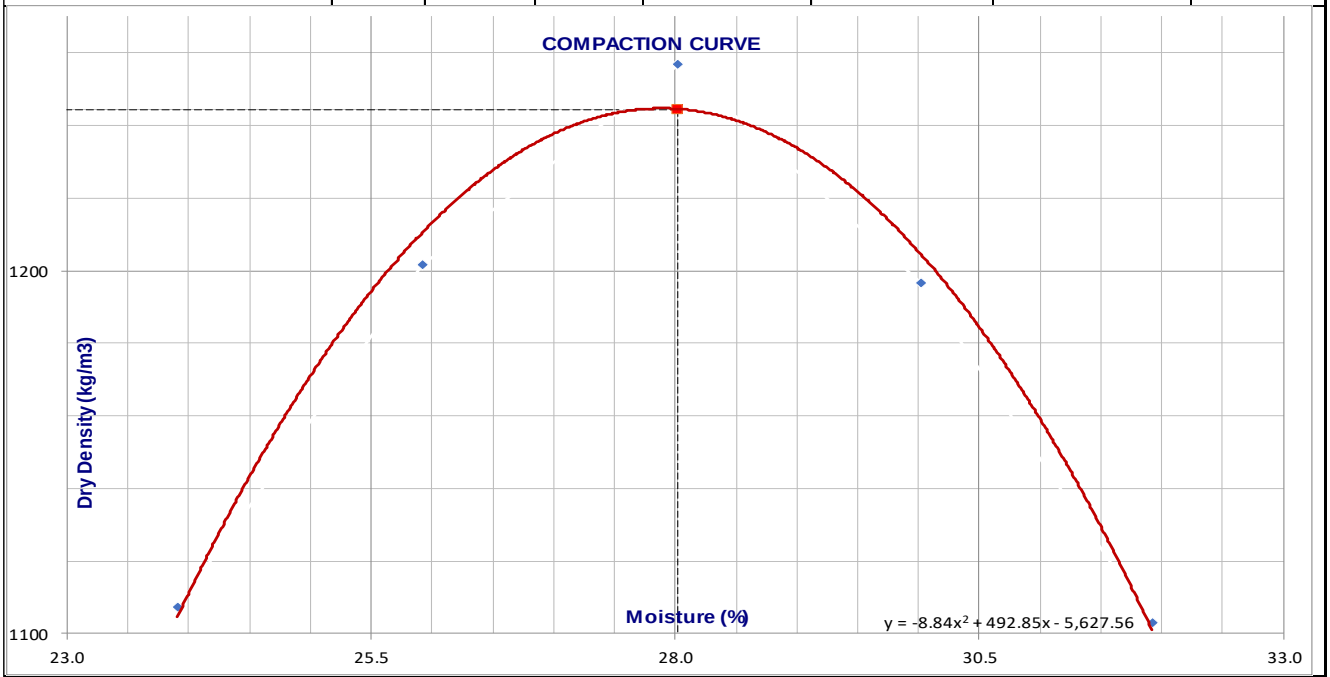
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**MC (FROM SITE)**	
Tin No.	K2	4	D	CC	KP	V2	
Weight of Wet Soil + Tin (g)	85.9	81.4	85.2	89.3	83.9	91.7	
Weight of Tin + Dry Soil (g)	73.3	69.4	71.3	74.2	68.1	86.7	
Weight of Tin(g)	20.6	23.1	21.7	23.9	18.6	25.0	
Weight of Moisture (g)	12.6	12.0	13.9	15.1	15.8	5.0	
Weight of Dry Soil (g)	52.7	46.3	49.6	50.3	49.5	61.7	
Moisture Content (%)	23.9	25.9	28.0	30.0	31.9	8.1	
Wt of Mould+base+specimen (g)	5073	5214	5310	5257	5156		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1372	1513	1609	1556	1455		
Bulk Density (kg/m^3)	1372	1513	1609	1556	1455		
Dry Density (kg/m^3)	1107	1202	1257	1197	1103		

Maximum Dry Density (kg/m^3	**1244**			**Optimum Moisture Content (%)=**		**28.0**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (DD 2)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Depth Range:		**Location**		**DD2**		**Test Date:**	22/04/2025
Sampled By:			**Tested By**	Austine			

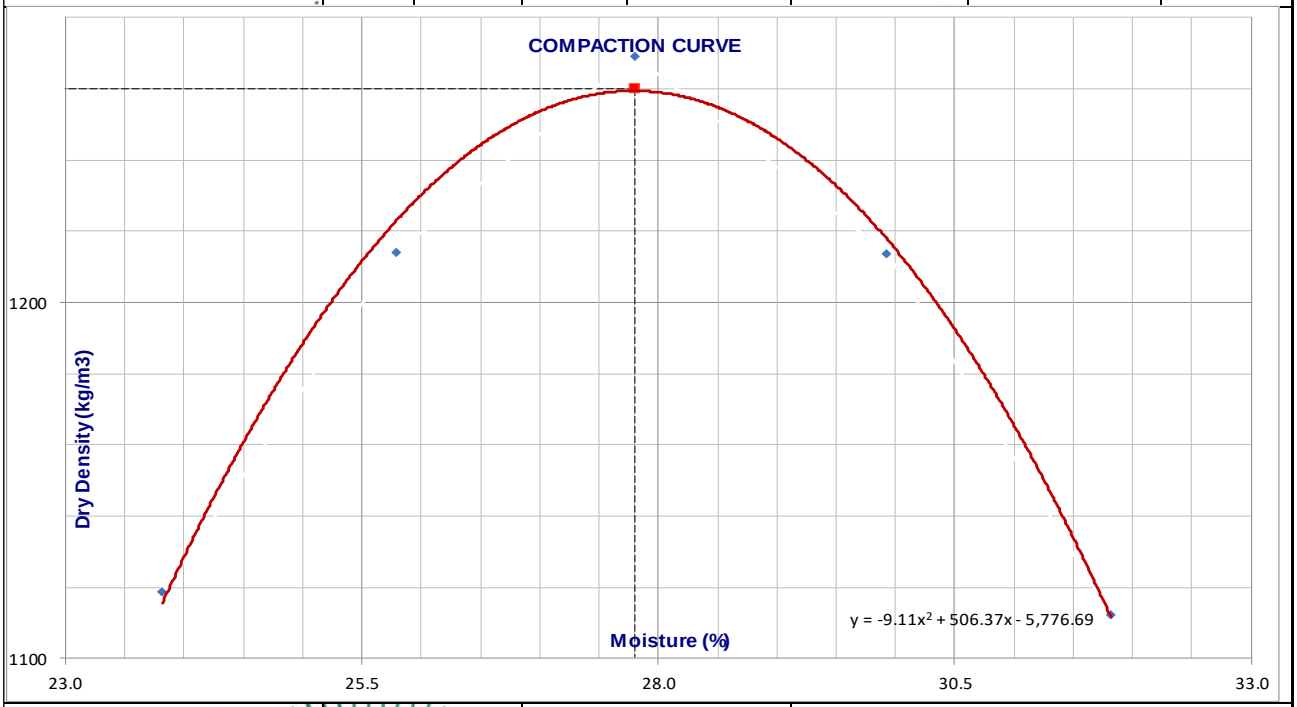
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**MC (FROM SITE)**	
Tin No.	E	F6	DQ	N0	MM	X3	
Weight of Wet Soil + Tin (g)	95.2	90.4	94.1	97.7	92.1	92.4	
Weight of Tin + Dry Soil (g)	81.6	77.4	79.2	81.6	75.3	87.0	
Weight of Tin(g)	24.5	27.0	25.6	27.8	22.5	17.8	
Weight of Moisture (g)	13.6	13.0	14.9	16.1	16.8	5.4	
Weight of Dry Soil (g)	57.1	50.4	53.6	53.8	52.8	69.2	
Moisture Content (%)	23.8	25.8	27.8	29.9	31.8	7.8	
Wt of Mould+base+specimen (g)	5086	5228	5323	5278	5167		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1385	1527	1622	1577	1466		
Bulk Density (kg/m^3)	1385	1527	1622	1577	1466		
Dry Density (kg/m^3)	1119	1214	1269	1214	1112		

Maximum Dry Density (kg/m^3	**1260**			**Optimum Moisture Content (%)=**		**27.8**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO
CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 3)

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Location:					
Depth Range:		**DD3**		**Test Date:**	22/04/2025
Sampled By:	BEN	**Tested By**	AUSTINE		

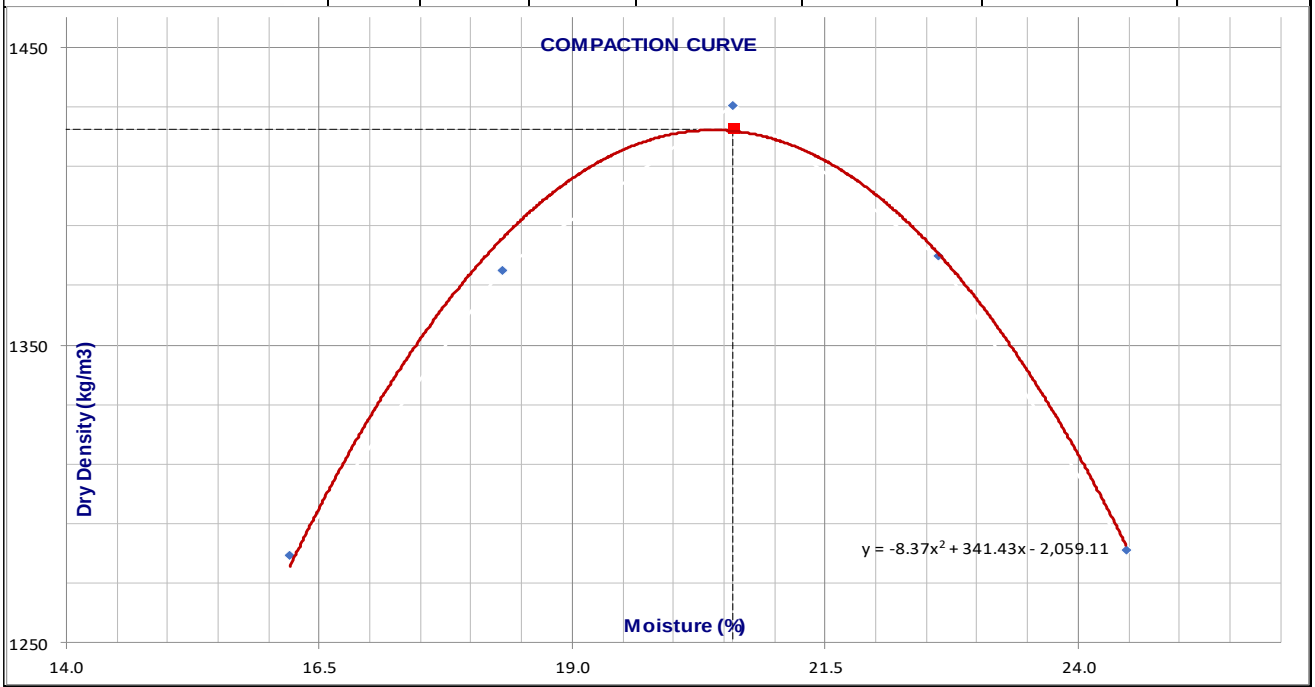
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**12**	**14**	**16**	**18**	**20**	**MC (FROM SITE)**	
Tin No.	M6	GH	GK	RK	KU	HB	
Weight of Wet Soil + Tin (g)	105.1	100.8	107.8	110.3	88.1	83.2	
Weight of Tin + Dry Soil (g)	93.9	88.7	93.8	94.9	76.4	80.7	
Weight of Tin(g)	24.8	22.6	25.8	26.8	28.6	26.4	
Weight of Moisture (g)	11.2	12.1	14.0	15.4	11.7	2.5	
Weight of Dry Soil (g)	69.1	66.1	68.0	68.1	47.8	54.3	
Moisture Content (%)	16.2	18.3	20.6	22.6	24.5	4.6	
Wt of Mould+base+specimen (g)	5207	5347	5445	5412	5315		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1487	1627	1725	1692	1595		
Bulk Density (kg/m^3)	1487	1627	1725	1692	1595		
Dry Density (kg/m^3)	1280	1375	1430	1380	1281		

Maximum Dry Density (kg/m^3	**1422**			**Optimum Moisture Content (%)=**		**20.6**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

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TRIAL PIT NO. (DD 4)

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Location:					
Depth Range:		**DD4**		**Test Date:**	22/04/2025
Sampled By:	BEN	**Tested By**	Austine		

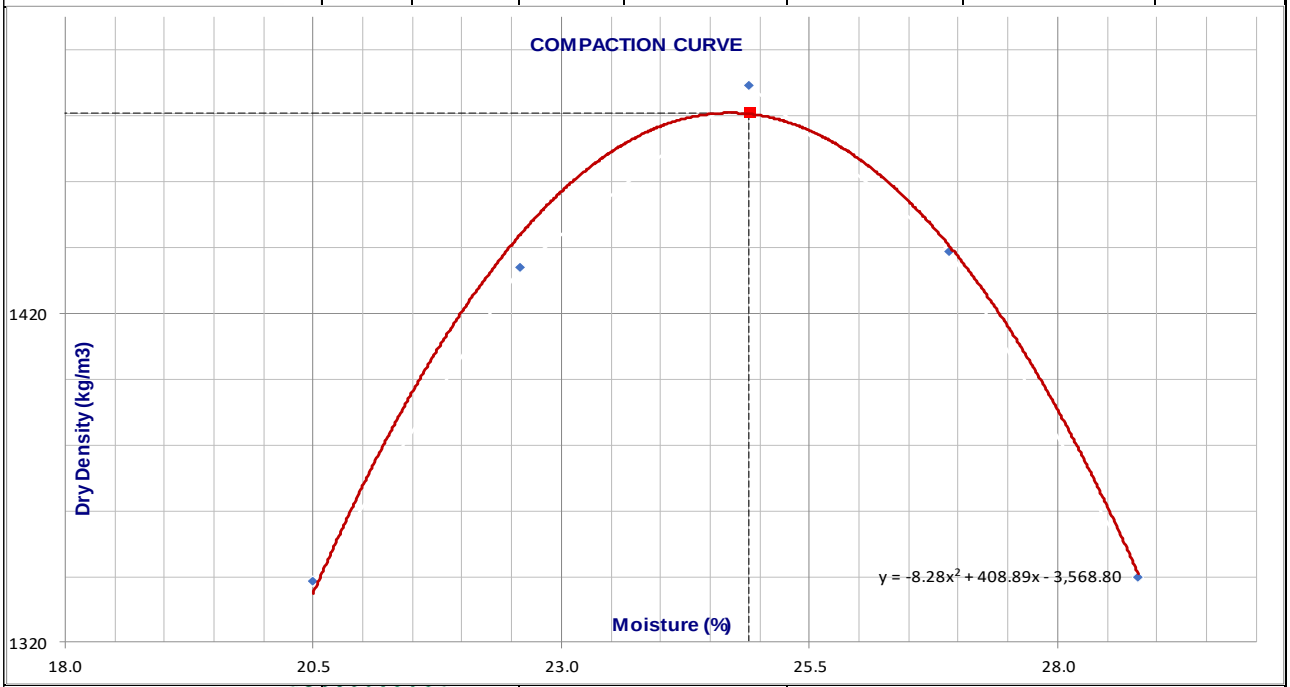
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**MC (FROM SITE)**	
Tin No.	D1	54	QC	BR	SD	JK	
Weight of Wet Soil + Tin (g)	105.6	101.6	107.9	110.2	90.8	89.2	
Weight of Tin + Dry Soil (g)	90.8	85.9	90.3	91.2	75.5	82.4	
Weight of Tin(g)	18.6	16.4	19.6	20.6	22.4	20.0	
Weight of Moisture (g)	14.8	15.7	17.6	19.0	15.3	6.8	
Weight of Dry Soil (g)	72.2	69.5	70.7	70.6	53.1	62.4	
Moisture Content (%)	20.5	22.6	24.9	26.9	28.8	10.9	
Wt of Mould+base+specimen (g)	5333	5478	5580	5546	5446		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1613	1758	1860	1826	1726		
Bulk Density (kg/m^3)	1613	1758	1860	1826	1726		
Dry Density (kg/m^3)	1339	1434	1489	1439	1340		

Maximum Dry Density (kg/m^3	**1481**			**Optimum Moisture Content (%)=**		**24.9**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

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TRIAL PIT NO. (DD 5)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Location:							
Depth Range:			**DD5**			**Test Date:**	22/04/2025
Sampled By:	BEN		**Tested By**	AUSTINE			

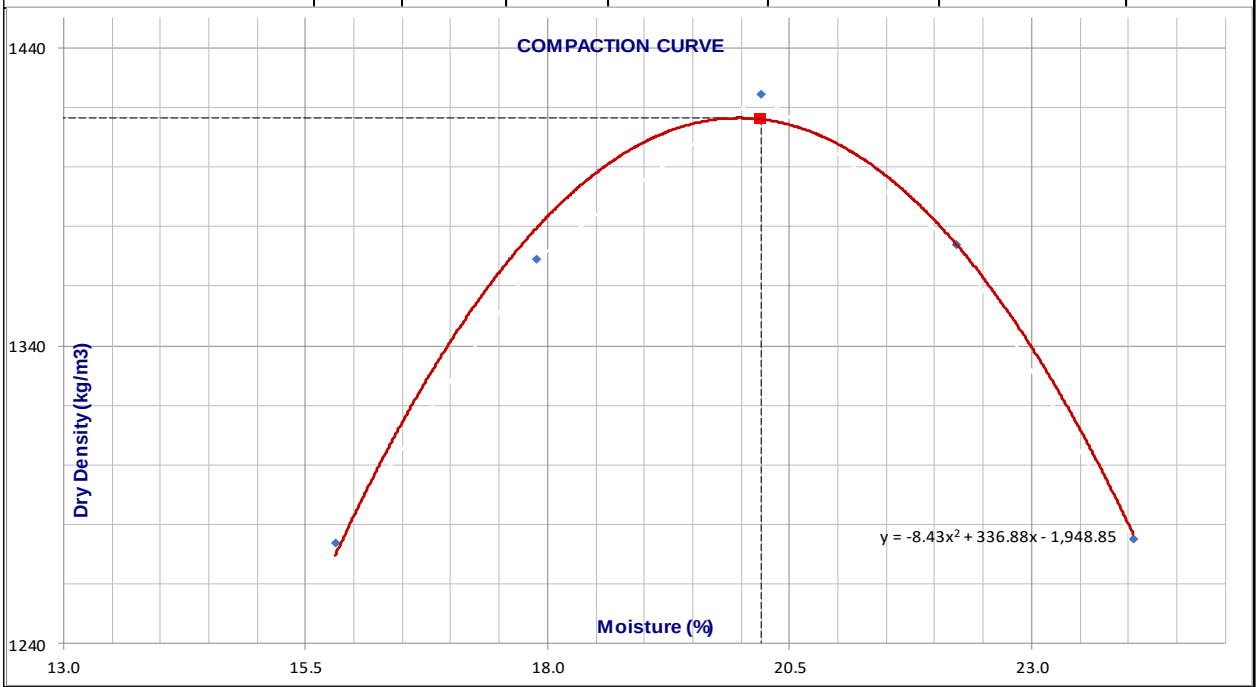
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**12**	**14**	**16**	**18**	**20**	**MC (FROM SITE)**	
Tin No.	M6	VF	GF	KR	96	DJ	
Weight of Wet Soil + Tin (g)	63.1	63.0	73.6	78.7	58.2	83.2	
Weight of Tin + Dry Soil (g)	57.9	56.9	65.6	69.3	52.5	80.7	
Weight of Tin(g)	25.0	22.8	26.0	27.0	28.8	26.4	
Weight of Moisture (g)	5.2	6.1	8.0	9.4	5.7	2.5	
Weight of Dry Soil (g)	32.9	34.1	39.6	42.3	23.7	54.3	
Moisture Content (%)	15.8	17.9	20.2	22.2	24.1	4.6	
Wt of Mould+base+specimen (g)	5195	5334	5432	5399	5302		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1475	1614	1712	1679	1582		
Bulk Density (kg/m^3)	1475	1614	1712	1679	1582		
Dry Density (kg/m^3)	1274	1369	1424	1374	1275		

Maximum Dry Density (kg/m^3	**1416**			**Optimum Moisture Content (%)=**	**20.2**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

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TRIAL PIT NO. (DD 6)

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:	**Location**	**DD6**		**Test Date:**	22/04/2025
Sampled By:		**Tested By**	Austine		

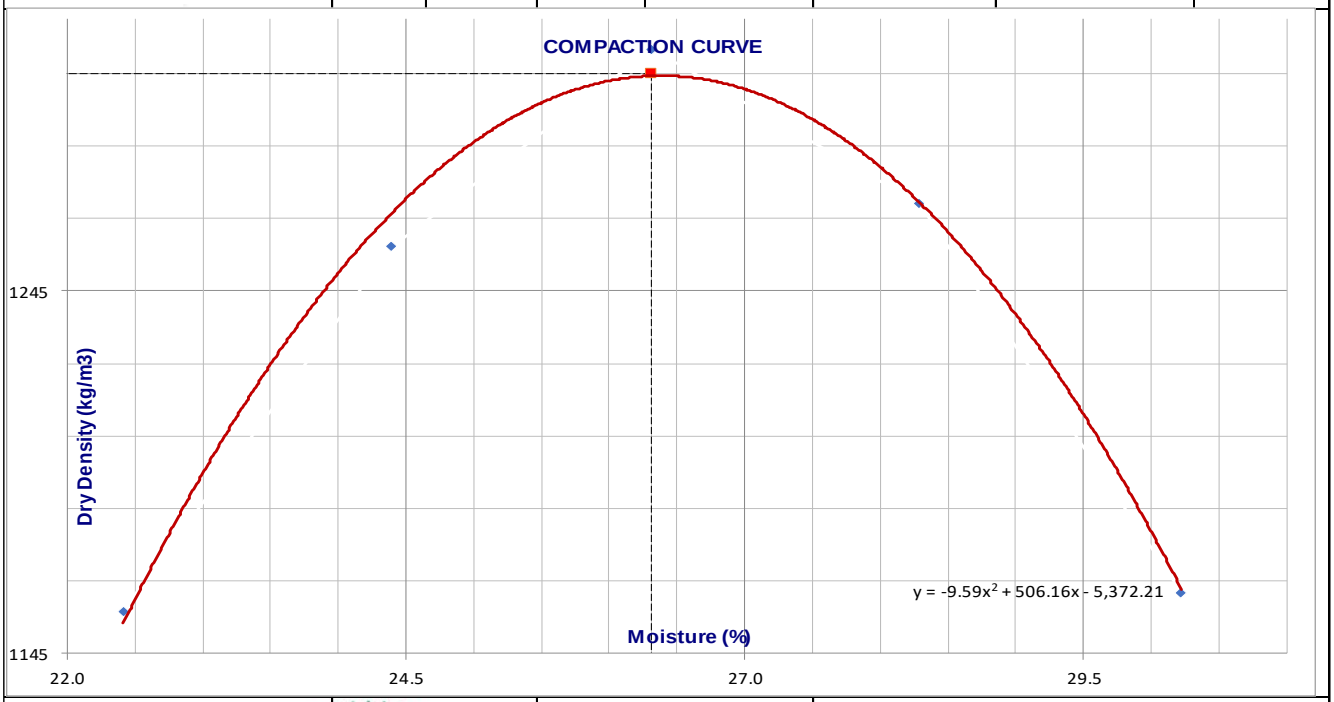
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	G9	CX	B	J0	M00	Q2	
Weight of Wet Soil + Tin (g)	89.8	85.0	89.4	93.6	88.1	95.9	
Weight of Tin + Dry Soil (g)	78.1	73.9	76.4	79.4	73.2	89.8	
Weight of Tin(g)	25.9	28.4	27.0	29.2	23.9	22.0	
Weight of Moisture (g)	11.7	11.1	13.0	14.2	14.9	6.1	
Weight of Dry Soil (g)	52.2	45.5	49.4	50.2	49.3	67.8	
Moisture Content (%)	22.4	24.4	26.3	28.3	30.2	9.0	
Wt of Mould+base+specimen (g)	5117	5265	5358	5329	5214		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1416	1564	1657	1628	1513		
Bulk Density (kg/m^3)	1416	1564	1657	1628	1513		
Dry Density (kg/m^3)	1157	1257	1312	1269	1162		

Maximum Dry Density (kg/m^3	**1305**			**Optimum Moisture Content (%)=**		**26.3**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (DD 7)

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Location:					
Depth Range:		**DD7**		**Test Date:**	22/04/2025
Sampled By:	BEN	**Tested By**	AUSTINE		

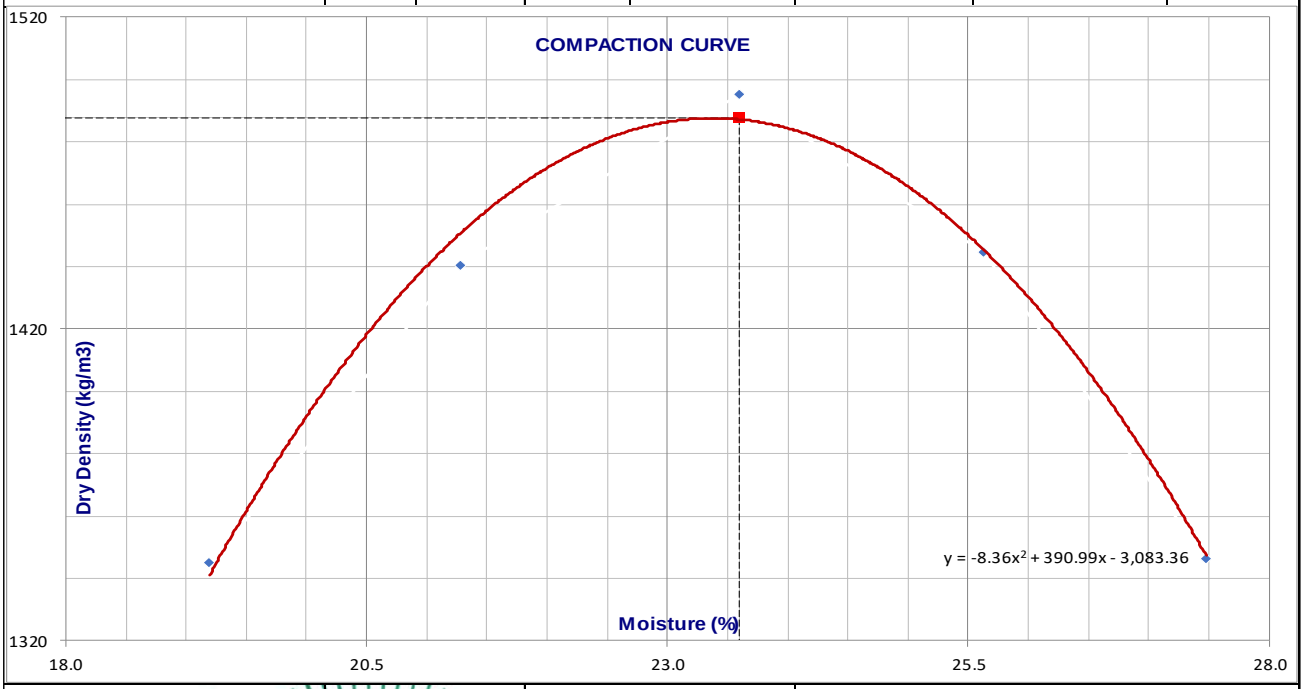
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**0**	**2**	**4**	**6**	**8**	**MC (FROM SITE)**	
Tin No.	Z3	TT	CV	K0	DS	R5	
Weight of Wet Soil + Tin (g)	76.2	75.0	84.0	88.2	69.6	61.5	
Weight of Tin + Dry Soil (g)	68.1	66.0	73.1	75.9	61.0	54.7	
Weight of Tin(g)	25.9	23.7	26.9	27.9	29.7	20.0	
Weight of Moisture (g)	8.1	9.0	10.9	12.3	8.6	6.8	
Weight of Dry Soil (g)	42.2	42.3	46.2	48.0	31.3	34.7	
Moisture Content (%)	19.2	21.3	23.6	25.6	27.5	19.6	
Wt of Mould+base+specimen (g)	5323	5467	5568	5535	5436		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1603	1747	1848	1815	1716		
Bulk Density (kg/m^3)	1603	1747	1848	1815	1716		
Dry Density (kg/m^3)	1345	1441	1495	1445	1346		

Maximum Dry Density (kg/m^3	**1488**			**Optimum Moisture Content (%)=**		**23.6**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

ENG. NJOROGE T. WAIHARO
CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 8)

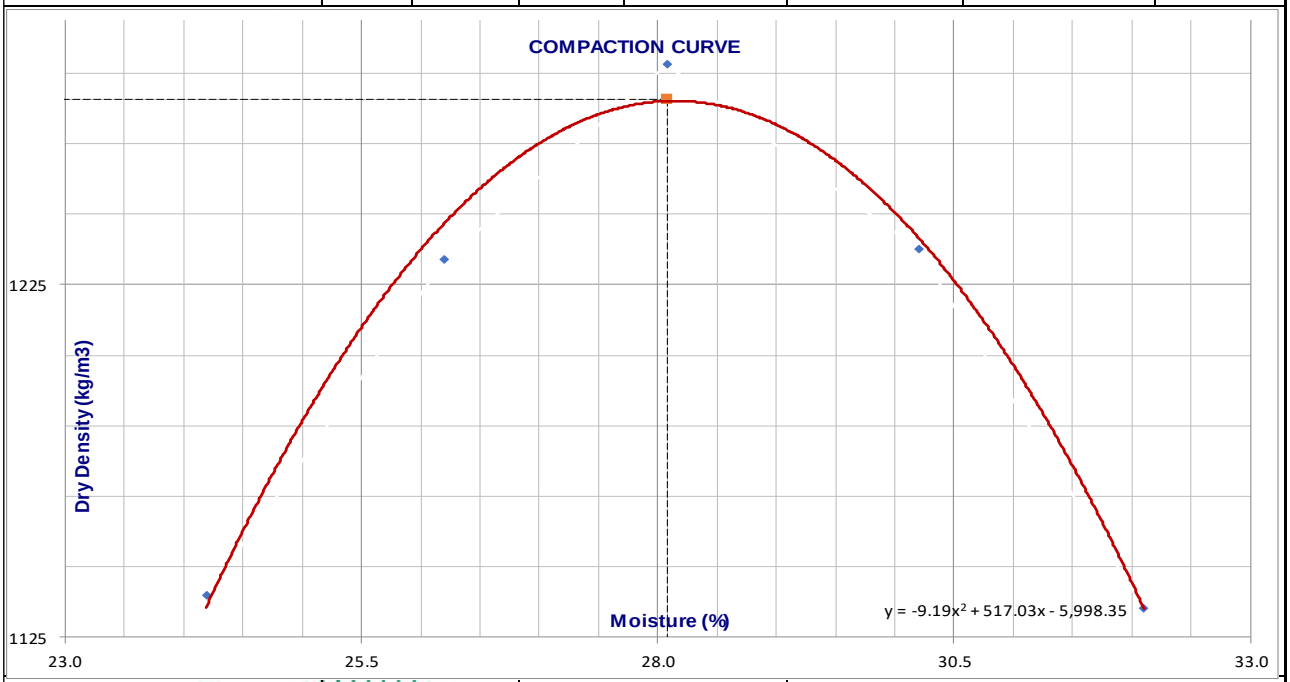
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:	**Location**	**DD8**		**Test Date:**	22/04/2025
Sampled By:		**Tested By**	Austine		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	M00	M09	K23	M13	QQ	M53	
Weight of Wet Soil + Tin (g)	95.3	90.4	94.2	97.7	92.0	92.7	
Weight of Tin + Dry Soil (g)	81.1	76.8	78.7	81.0	74.6	85.3	
Weight of Tin(g)	22.4	24.9	23.5	25.7	20.4	12.0	
Weight of Moisture (g)	14.2	13.6	15.5	16.7	17.4	7.4	
Weight of Dry Soil (g)	58.7	51.9	55.2	55.3	54.2	73.3	
Moisture Content (%)	24.2	26.2	28.1	30.2	32.1	10.1	
Wt of Mould+base+specimen (g)	5113	5256	5350	5309	5198		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1412	1555	1649	1608	1497		
Bulk Density (kg/m^3)	1412	1555	1649	1608	1497		
Dry Density (kg/m^3)	1137	1232	1287	1235	1133		
Maximum Dry Density (kg/m^3	**1278**			**Optimum Moisture Content (%)=**		**28.1**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 9)

CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**

Depth Range:	**Location**	**DD9**		**Test Date:**	22/04/2025
Sampled By:		**Tested By**	Austine		

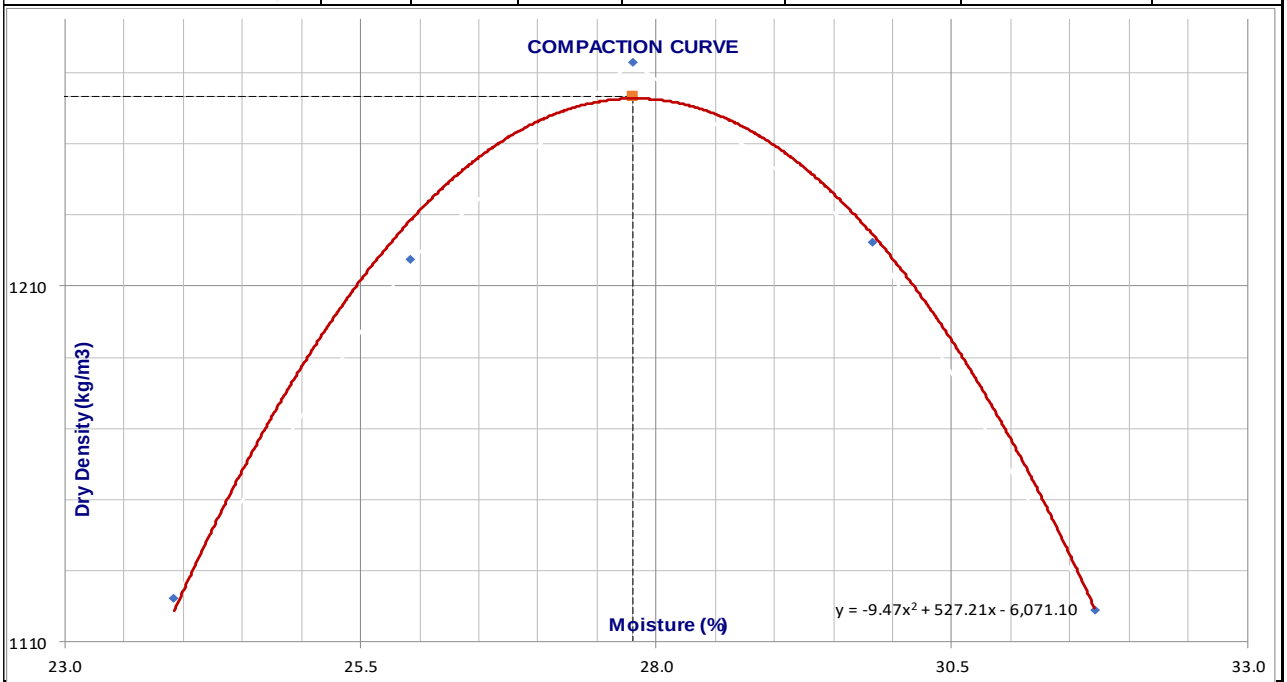
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**MC (FROM SITE)**	
Tin No.	W2	F4	J	PS	BB	M53	
Weight of Wet Soil + Tin (g)	84.4	80.4	85.0	89.4	84.3	97.1	
Weight of Tin + Dry Soil (g)	73.3	69.9	72.6	75.8	70.0	87.4	
Weight of Tin(g)	26.9	29.4	28.0	30.2	24.9	20.0	
Weight of Moisture (g)	11.1	10.5	12.4	13.6	14.3	9.7	
Weight of Dry Soil (g)	46.4	40.5	44.6	45.6	45.1	67.4	
Moisture Content (%)	23.9	25.9	27.8	29.8	31.7	14.4	
Wt of Mould+base+specimen (g)	5092	5234	5328	5288	5175		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1391	1533	1627	1587	1474		
Bulk Density (kg/m^3)	1391	1533	1627	1587	1474		
Dry Density (kg/m^3)	1122	1217	1273	1222	1119		

Maximum Dry Density (kg/m^3	**1263**			**Optimum Moisture Content (%)=**		**27.8**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (DD 10)

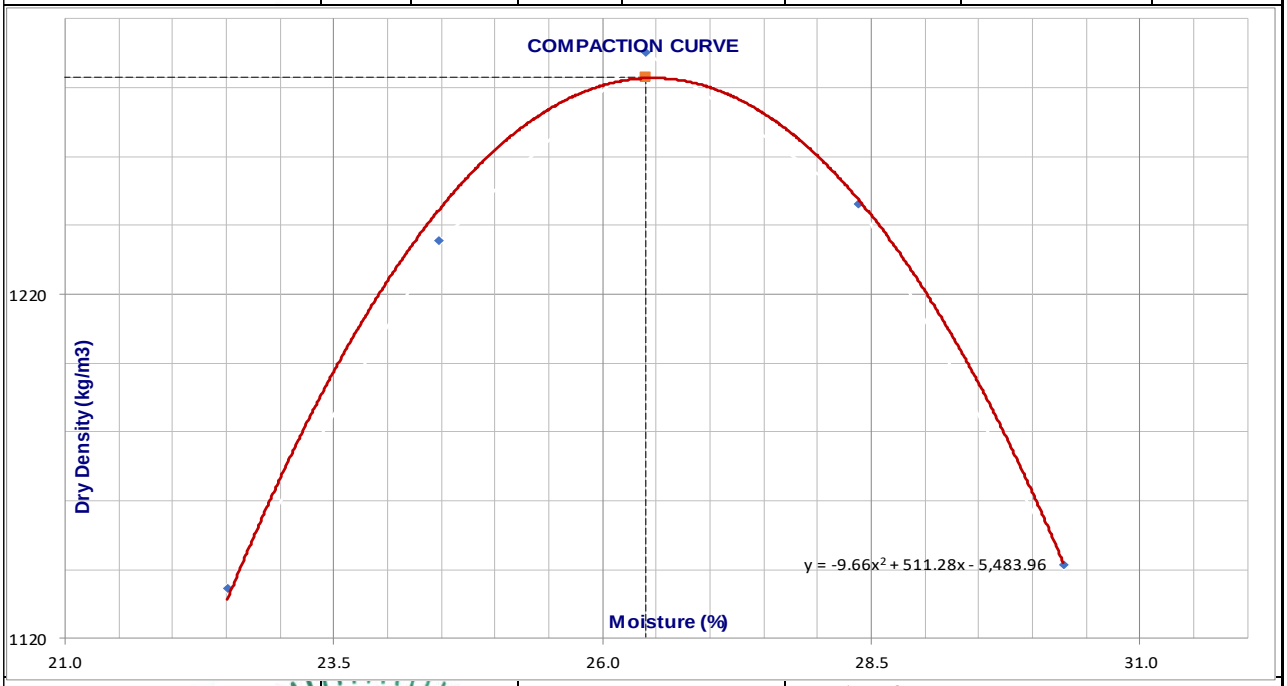
CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Depth Range:		**Location**		**DD10**		**Test Date:**	22/04/2025
Sampled By:				**Tested By**	Austine		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**12**	**14**	**16**	**18**	**20**	**MC (FROM SITE)**	
Tin No.	S2	A01	FL	N7	XX	M53	
Weight of Wet Soil + Tin (g)	103.2	97.4	100.9	104.3	98.2	101.0	
Weight of Tin + Dry Soil (g)	88.5	83.3	84.9	87.1	80.3	93.3	
Weight of Tin(g)	23.2	25.7	24.3	26.5	21.2	17.8	
Weight of Moisture (g)	14.7	14.1	16.0	17.2	17.9	7.7	
Weight of Dry Soil (g)	65.3	57.6	60.6	60.6	59.1	75.5	
Moisture Content (%)	22.5	24.5	26.4	28.4	30.3	10.2	
Wt of Mould+base+specimen (g)	5091	5239	5332	5301	5188		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1390	1538	1631	1600	1487		
Bulk Density (kg/m^3)	1390	1538	1631	1600	1487		
Dry Density (kg/m^3)	1135	1236	1290	1246	1141		
Maximum Dry Density (kg/m^3	**1283**			**Optimum Moisture Content (%)=**		**26.4**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

ENG. NJOROGE T. WAIHARO
REGISTERED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 11)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Depth Range:		**Location**		**DD11**		**Test Date:**	22/04/2025
Sampled By:				**Tested By**	Austine		

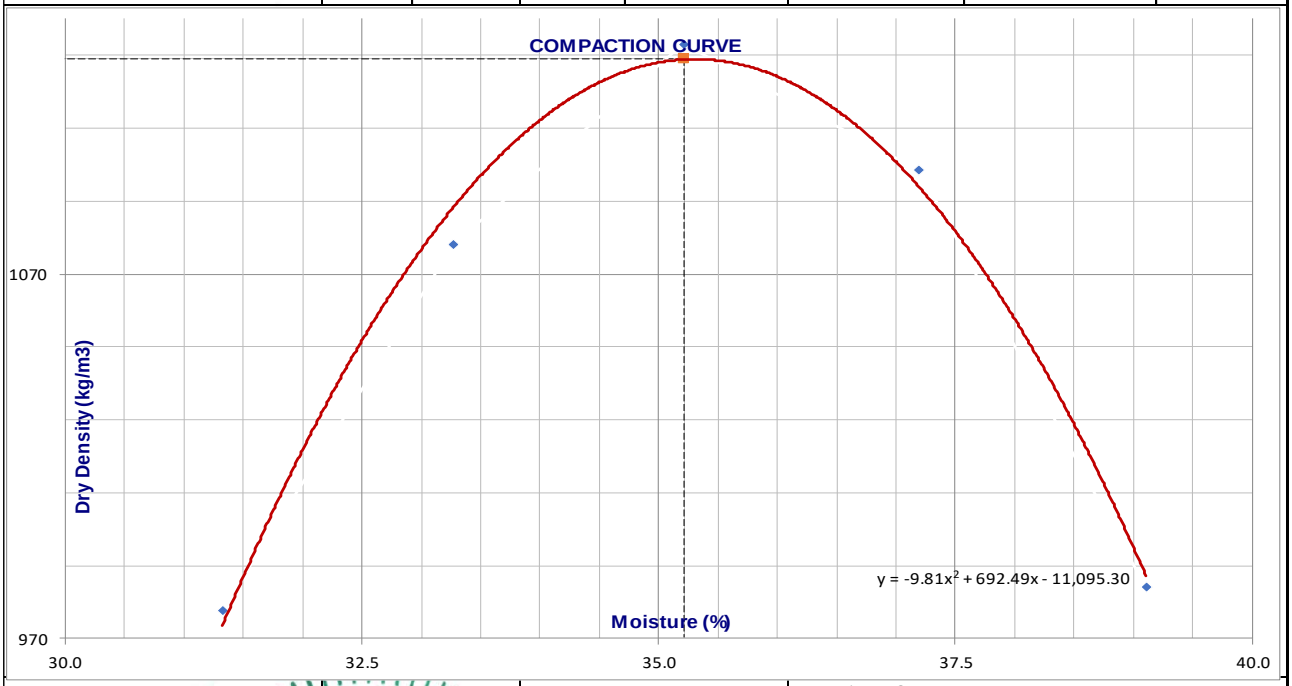
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**6**	**8**	**10**	**12**	**14**	**MC (FROM SITE)**	
Tin No.	C2	55	GH	M0	KR	M53	
Weight of Wet Soil + Tin (g)	99.7	96.3	99.2	102.8	97.2	88.5	
Weight of Tin + Dry Soil (g)	81.0	78.2	79.2	81.6	75.3	74.4	
Weight of Tin(g)	21.3	23.8	22.4	24.6	19.3	18.0	
Weight of Moisture (g)	18.7	18.1	20.0	21.2	21.9	14.1	
Weight of Dry Soil (g)	59.7	54.4	56.8	57.0	56.0	56.4	
Moisture Content (%)	31.3	33.3	35.2	37.2	39.1	25.0	
Wt of Mould+base+specimen (g)	4985	5138	5233	5208	5070		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1284	1437	1532	1507	1369		
Bulk Density (kg/m^3)	1284	1437	1532	1507	1369		
Dry Density (kg/m^3)	978	1078	1133	1098	984		

Maximum Dry Density (kg/m^3)	**1129**			**Optimum Moisture Content (%)=**		**35.2**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO
CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 12)

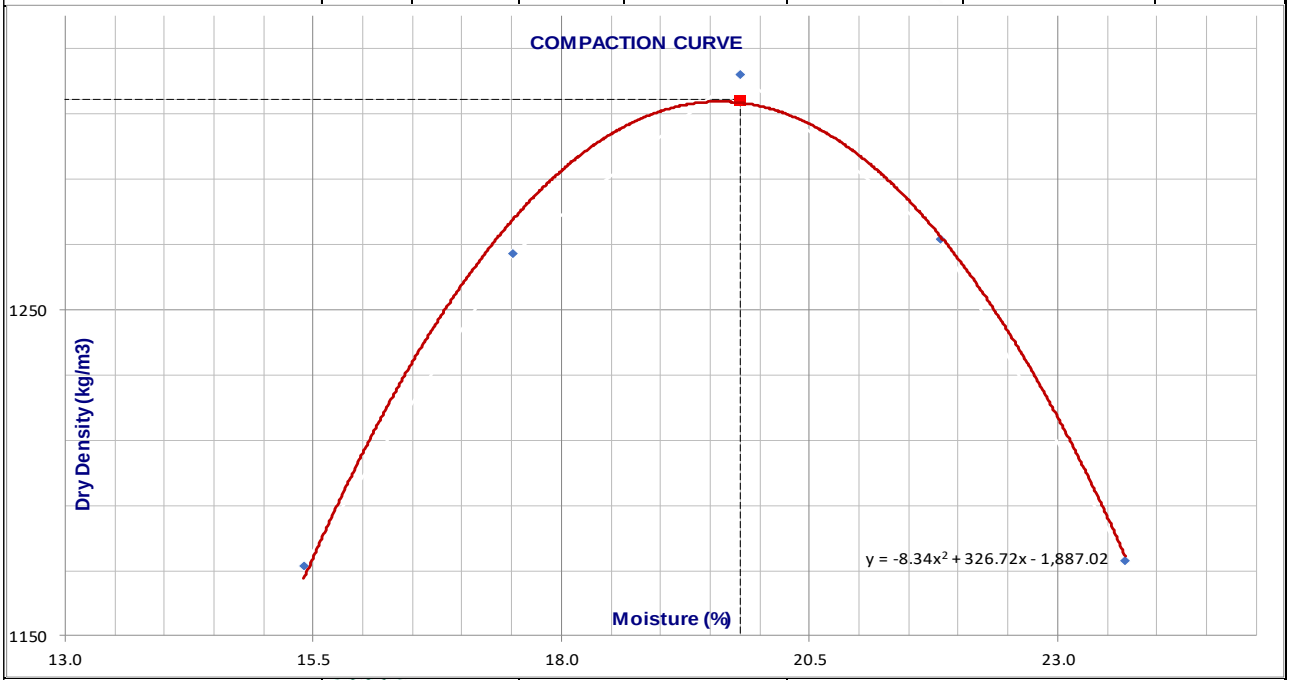
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
Location:						
Depth Range:			**DD12**		**Test Date:**	22/04/2025
Sampled By:	BEN		**Tested By**	AUSTINE		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	M6	VF	GF	KR	96	DJ	
Weight of Wet Soil + Tin (g)	101.4	96.5	103.2	105.5	82.4	115.2	
Weight of Tin + Dry Soil (g)	90.2	84.4	89.2	90.1	70.7	113.8	
Weight of Tin(g)	17.5	15.3	18.5	19.5	21.3	36.0	
Weight of Moisture (g)	11.2	12.1	14.0	15.4	11.7	1.4	
Weight of Dry Soil (g)	72.7	69.1	70.7	70.6	49.4	77.8	
Moisture Content (%)	15.4	17.5	19.8	21.8	23.7	1.8	
Wt of Mould+base+specimen (g)	5072	5209	5304	5269	5171		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1352	1489	1584	1549	1451		
Bulk Density (kg/m^3)	1352	1489	1584	1549	1451		
Dry Density (kg/m^3)	1172	1267	1322	1272	1173		
Maximum Dry Density (kg/m^3	**1314**			**Optimum Moisture Content (%)=**		**19.8**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Joy**		
APPROVED BY:	**Eng. Tom Waihato**	Signature:_____	

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TRIAL PIT NO. (DD 13)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Location:							
Depth Range:			**DD13**			**Test Date:**	22/04/2025
Sampled By:	BEN		**Tested By**	AUSTINE			

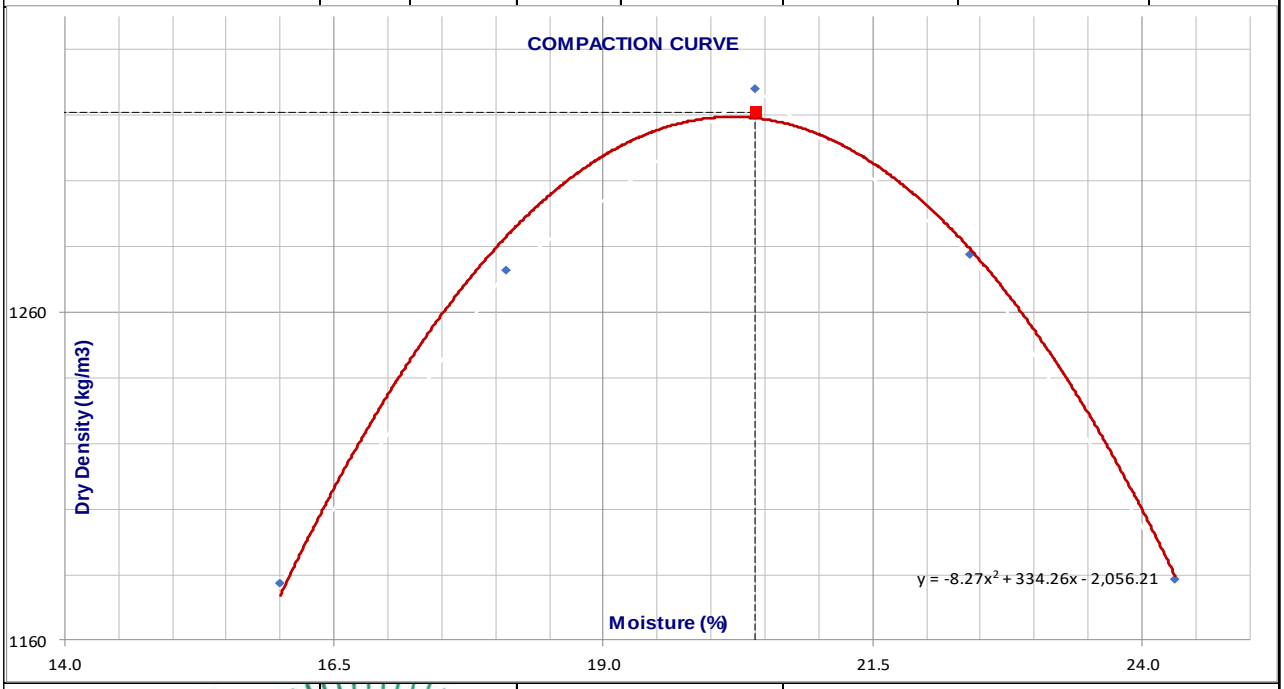
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	M3	R28	K9	M31	HH	M41	
Weight of Wet Soil + Tin (g)	91.7	88.7	96.8	100.2	78.4	94.3	
Weight of Tin + Dry Soil (g)	82.5	78.6	84.8	86.8	68.7	92.7	
Weight of Tin(g)	25.0	22.8	26.0	27.0	28.8	26.0	
Weight of Moisture (g)	9.2	10.1	12.0	13.4	9.7	1.6	
Weight of Dry Soil (g)	57.5	55.8	58.8	59.8	39.9	66.7	
Moisture Content (%)	16.0	18.1	20.4	22.4	24.3	2.4	
Wt of Mould+base+specimen (g)	5086	5223	5319	5284	5185		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1366	1503	1599	1564	1465		
Bulk Density (kg/m^3)	1366	1503	1599	1564	1465		
Dry Density (kg/m^3)	1178	1273	1328	1278	1178		

Maximum Dry Density (kg/m^3	**1321**			**Optimum Moisture Content (%)=**	**20.4**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

ENG. NJOROGE T. WAIHARO
REGISTERED CONSULTING ENGINEER
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TRIAL PIT NO. (DD 14)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
Location:						
Depth Range:			**DD14**		**Test Date:**	22/04/2025
Sampled By:	BEN		**Tested By**	AUSTINE		

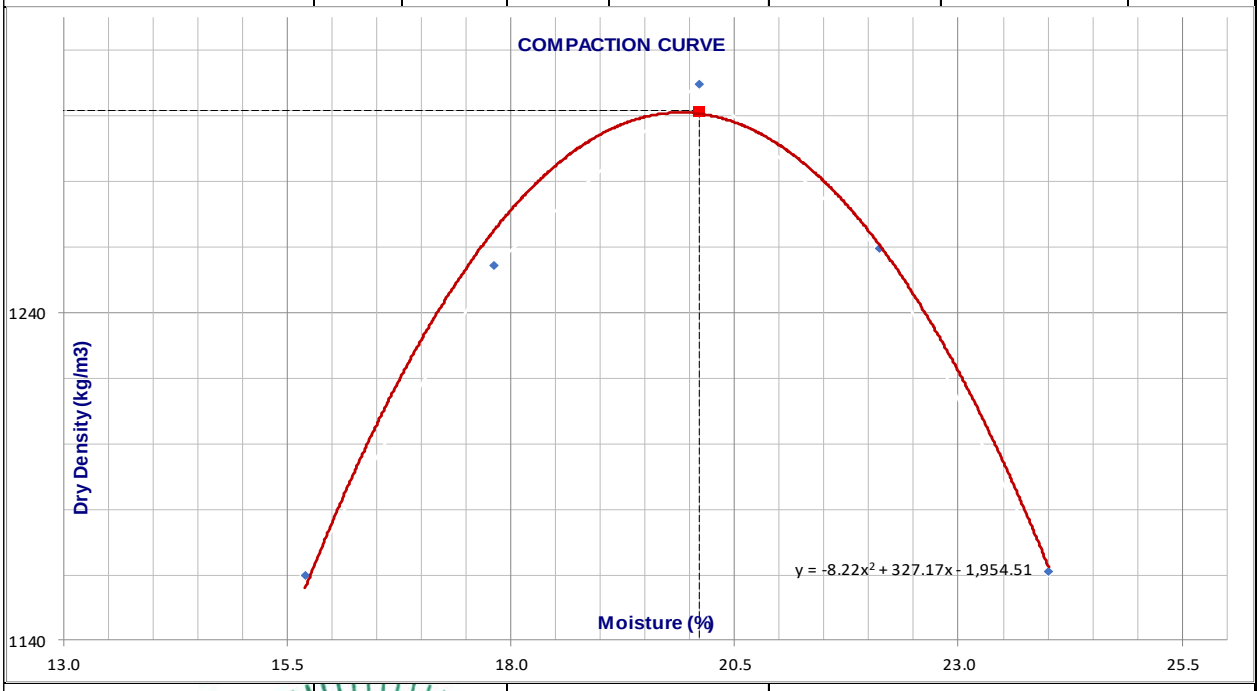
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	6M	FV	FG	RK	UK	JD	
Weight of Wet Soil + Tin (g)	93.2	90.0	98.1	101.4	79.3	103.3	
Weight of Tin + Dry Soil (g)	84.0	79.9	86.1	88.0	69.6	102.1	
Weight of Tin(g)	25.4	23.2	26.4	27.4	29.2	45.0	
Weight of Moisture (g)	9.2	10.1	12.0	13.4	9.7	1.2	
Weight of Dry Soil (g)	58.6	56.7	59.7	60.6	40.4	57.1	
Moisture Content (%)	15.7	17.8	20.1	22.1	24.0	2.1	
Wt of Mould+base+specimen (g)	5062	5198	5293	5258	5160		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1342	1478	1573	1538	1440		
Bulk Density (kg/m^3)	1342	1478	1573	1538	1440		
Dry Density (kg/m^3)	1160	1255	1310	1259	1161		

Maximum Dry Density (kg/m^3	**1302**			**Optimum Moisture Content (%)=**		**20.1**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
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TRIAL PIT NO. (DD 15)

CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**

Depth Range:	**Location**	**DD15**		**Test Date:**	22/04/2025
Sampled By:	Austine	**Tested By**	Austine		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**MC (FROM SITE)**	
Tin No.	KH	M45	M15	M77	K56	M04	
Weight of Wet Soil + Tin (g)	98.2	93.9	97.1	100.5	94.8	89.0	
Weight of Tin + Dry Soil (g)	80.7	77.0	78.3	80.5	74.1	83.0	
Weight of Tin(g)	18.4	20.9	19.5	21.7	16.4	23.0	
Weight of Moisture (g)	17.5	16.9	18.8	20.0	20.7	6.0	
Weight of Dry Soil (g)	62.3	56.1	58.8	58.8	57.7	60.0	
Moisture Content (%)	28.1	30.1	32.0	34.0	35.9	10.0	
Wt of Mould+base+specimen (g)	5046	5195	5289	5242	5135		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1345	1494	1588	1541	1434		
Bulk Density (kg/m^3)	1345	1494	1588	1541	1434		
Dry Density (kg/m^3)	1050	1148	1203	1150	1055		

Maximum Dry Density (kg/m^3	**1191**			**Optimum Moisture Content (%)=**		**32.0**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO — LICENSED CONSULTING ENGINEER — E410 — ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 16)

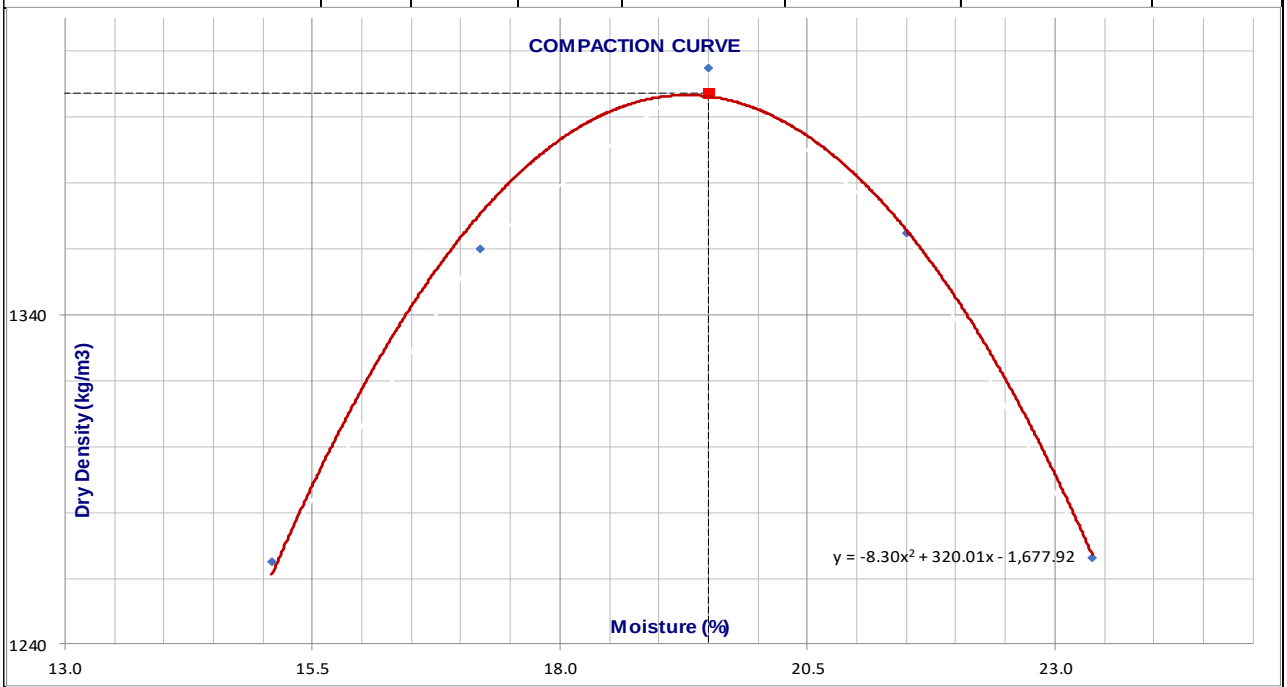
CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Location:							
Depth Range:				**DD16**		**Test Date:**	22/04/2025
Sampled By:		BEN		**Tested By**	AUSTINE		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**12**	**14**	**16**	**18**	**20**	**MC (FROM SITE)**	
Tin No.	M3	R28	K9	M31	HH	M41	
Weight of Wet Soil + Tin (g)	73.5	72.0	81.6	86.0	64.2	98.3	
Weight of Tin + Dry Soil (g)	66.8	64.4	72.1	75.1	57.0	95.8	
Weight of Tin(g)	22.4	20.2	23.4	24.4	26.2	26.0	
Weight of Moisture (g)	6.7	7.6	9.5	10.9	7.2	2.5	
Weight of Dry Soil (g)	44.4	44.2	48.7	50.7	30.8	69.8	
Moisture Content (%)	15.1	17.2	19.5	21.5	23.4	3.6	
Wt of Mould+base+specimen (g)	5176	5314	5411	5378	5282		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1456	1594	1691	1658	1562		
Bulk Density (kg/m^3)	1456	1594	1691	1658	1562		
Dry Density (kg/m^3)	1265	1360	1415	1365	1266		
Maximum Dry Density (kg/m^3	**1407**			**Optimum Moisture Content (%)=**		**19.5**	



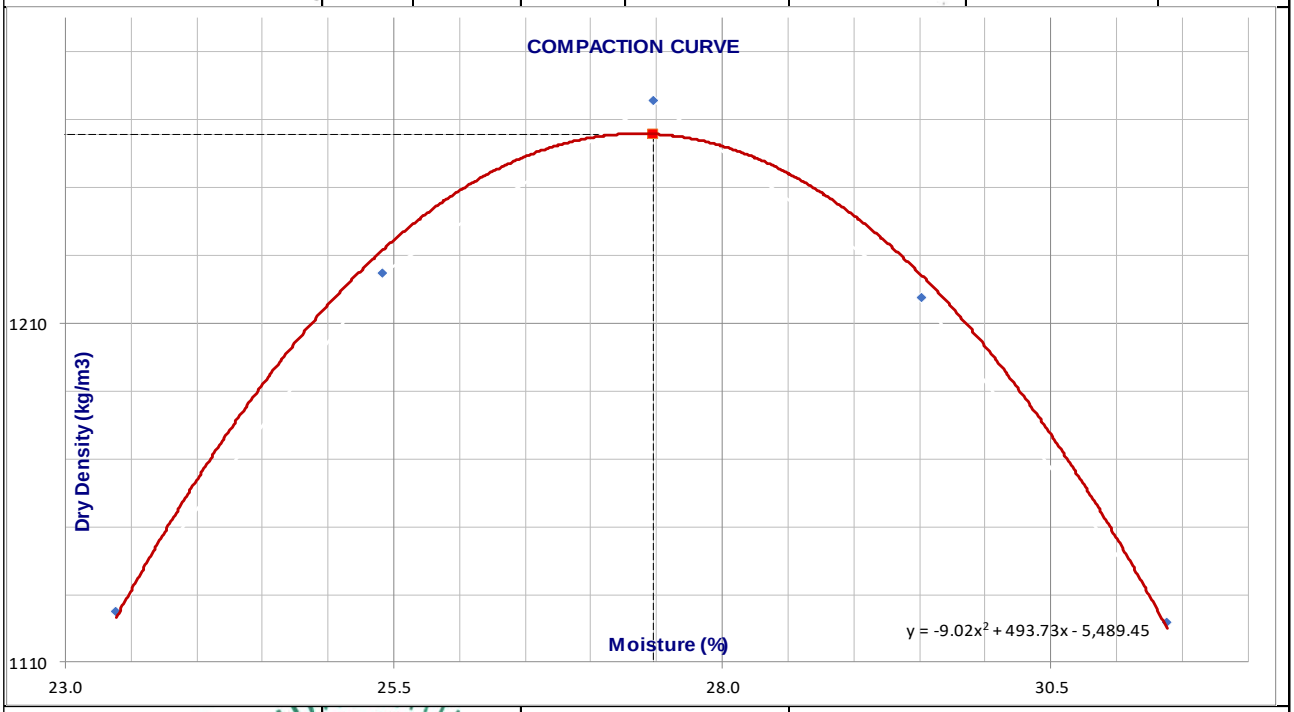
TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (DD 17)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Depth Range:		**Location**		**DD17**		**Test Date:**	22/04/2025
Sampled By:				**Tested By**			
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP							
TEST METHOD : BS 1377:Part 4							
MOISTURE CONTENT							
Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**MC (FROM SITE)**	
Tin No.	KH	M45	M15	M77	K56	M04	
Weight of Wet Soil + Tin (g)	98.2	92.8	96.1	99.6	93.8	83.2	
Weight of Tin + Dry Soil (g)	83.7	78.9	80.3	82.6	76.1	79.8	
Weight of Tin(g)	21.7	24.2	22.8	25.0	19.7	18.0	
Weight of Moisture (g)	14.5	13.9	15.8	17.0	17.7	3.4	
Weight of Dry Soil (g)	62.0	54.7	57.5	57.6	56.4	61.8	
Moisture Content (%)	23.4	25.4	27.5	29.5	31.4	5.5	
Wt of Mould+base+specimen (g)	5089	5237	5327	5278	5175		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1388	1536	1626	1577	1474		
Bulk Density (kg/m^3)	1388	1536	1626	1577	1474		
Dry Density (kg/m^3)	1125	1225	1276	1218	1122		
Maximum Dry Density (kg/m^3	**1265**			**Optimum Moisture Content (%)=**		**27.5**	



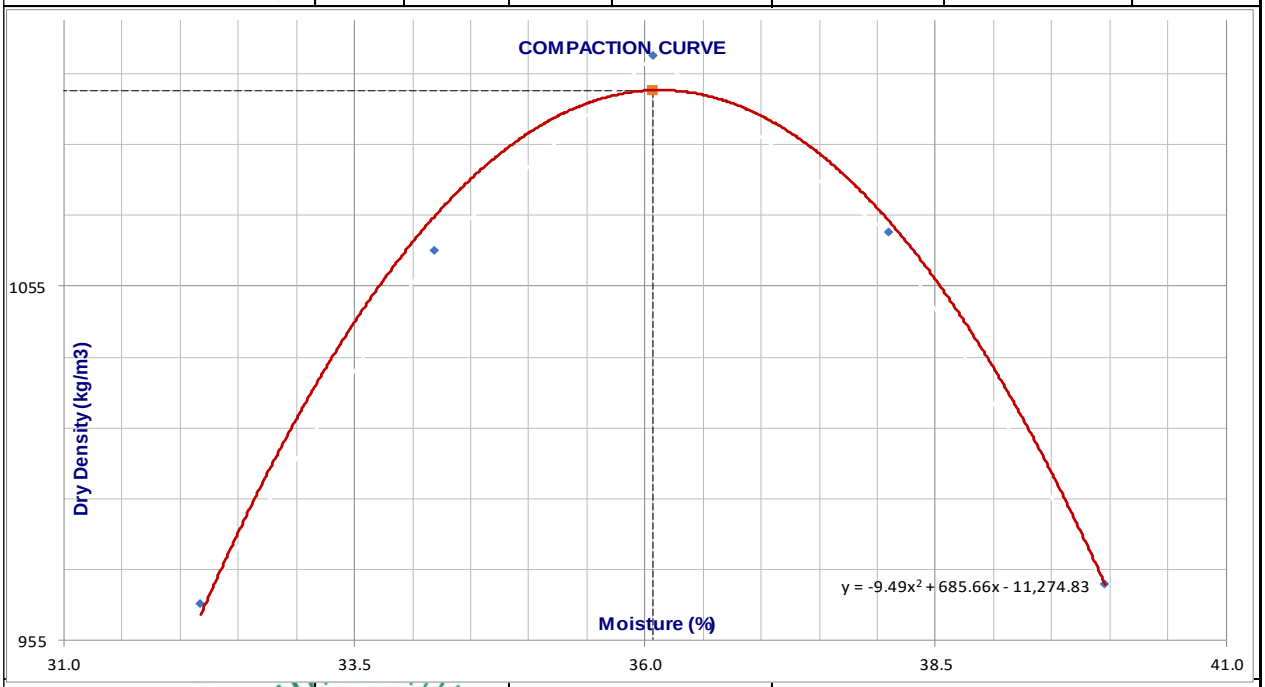
TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (DD 18)

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Depth Range:		**Location**		**DD18**		**Test Date:**	22/04/2025
Sampled By:				**Tested By**	Austine		
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP							
TEST METHOD : BS 1377:Part 4							
MOISTURE CONTENT							
Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	A3	DR	VG	Y	PL	M53	
Weight of Wet Soil + Tin (g)	92.6	89.7	93.0	96.9	91.7	99.7	
Weight of Tin + Dry Soil (g)	75.9	73.6	75.0	77.7	71.8	87.7	
Weight of Tin(g)	24.0	26.5	25.1	27.3	22.0	21.0	
Weight of Moisture (g)	16.7	16.1	18.0	19.2	19.9	12.0	
Weight of Dry Soil (g)	51.9	47.1	49.9	50.4	49.8	66.7	
Moisture Content (%)	32.2	34.2	36.1	38.1	40.0	18.0	
Wt of Mould+base+specimen (g)	4977	5130	5225	5179	5060		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1276	1429	1524	1478	1359		
Bulk Density (kg/m^3)	1276	1429	1524	1478	1359		
Dry Density (kg/m^3)	965	1065	1120	1070	971		
Maximum Dry Density (kg/m^3)	**1110**			**Optimum Moisture Content (%)=**		**36.1**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 19)

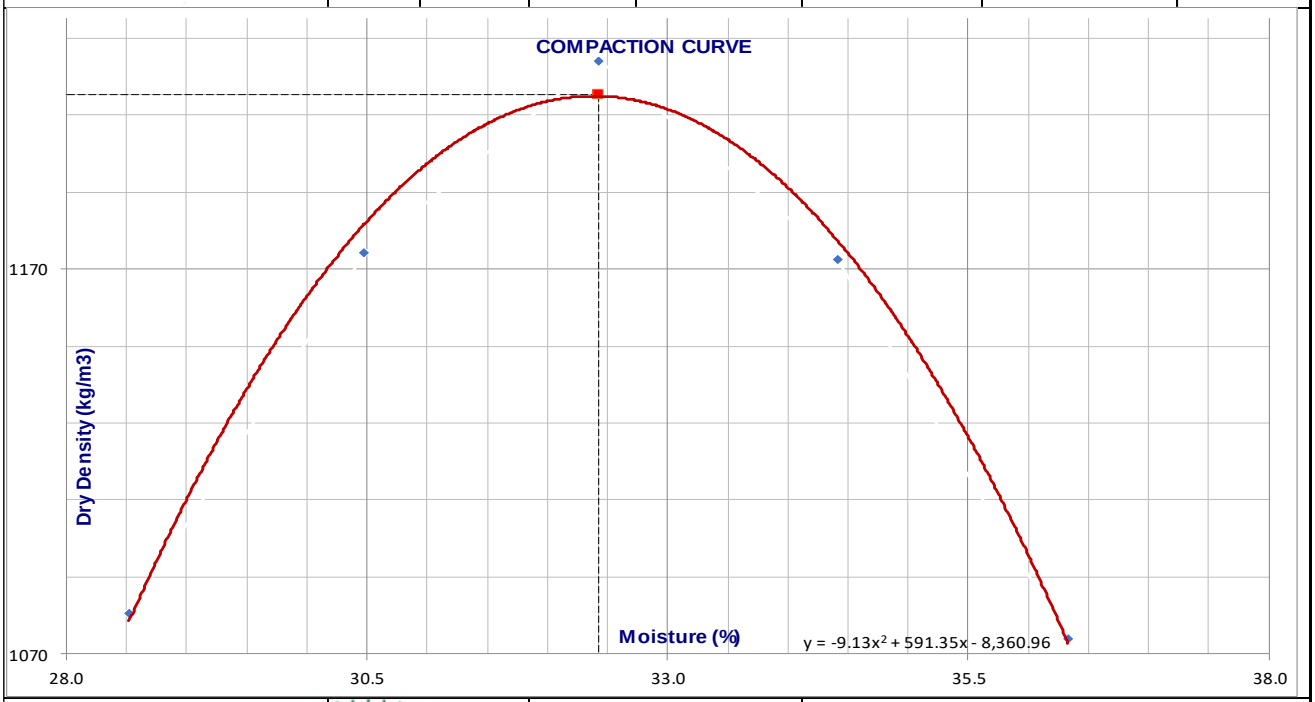
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:	**Location**	**DD19**		**Test Date:**	22/04/2025
Sampled By:		**Tested By**			

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**MC (FROM SITE)**	
Tin No.	K2	4	D	CC	KP	V2	
Weight of Wet Soil + Tin (g)	95.7	91.9	95.1	98.8	93.2	102.9	
Weight of Tin + Dry Soil (g)	79.1	75.9	77.2	79.7	73.4	94.0	
Weight of Tin(g)	20.9	23.4	22.0	24.2	18.9	21.0	
Weight of Moisture (g)	16.6	16.0	17.9	19.1	19.8	8.9	
Weight of Dry Soil (g)	58.2	52.5	55.2	55.5	54.5	73.0	
Moisture Content (%)	28.5	30.5	32.4	34.4	36.3	12.2	
Wt of Mould+base+specimen (g)	5090	5233	5322	5277	5165		
Wt of Mould+Base (g)	3701	3701	3701	3701	3701		
Wt of Specimen (g)	1389	1532	1621	1576	1464		
Bulk Density (kg/m^3)	1389	1532	1621	1576	1464		
Dry Density (kg/m^3)	1081	1174	1224	1172	1074		
Maximum Dry Density (kg/m^3	**1215**			**Optimum Moisture Content (%)=**		**32.4**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng. Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (DD 20)

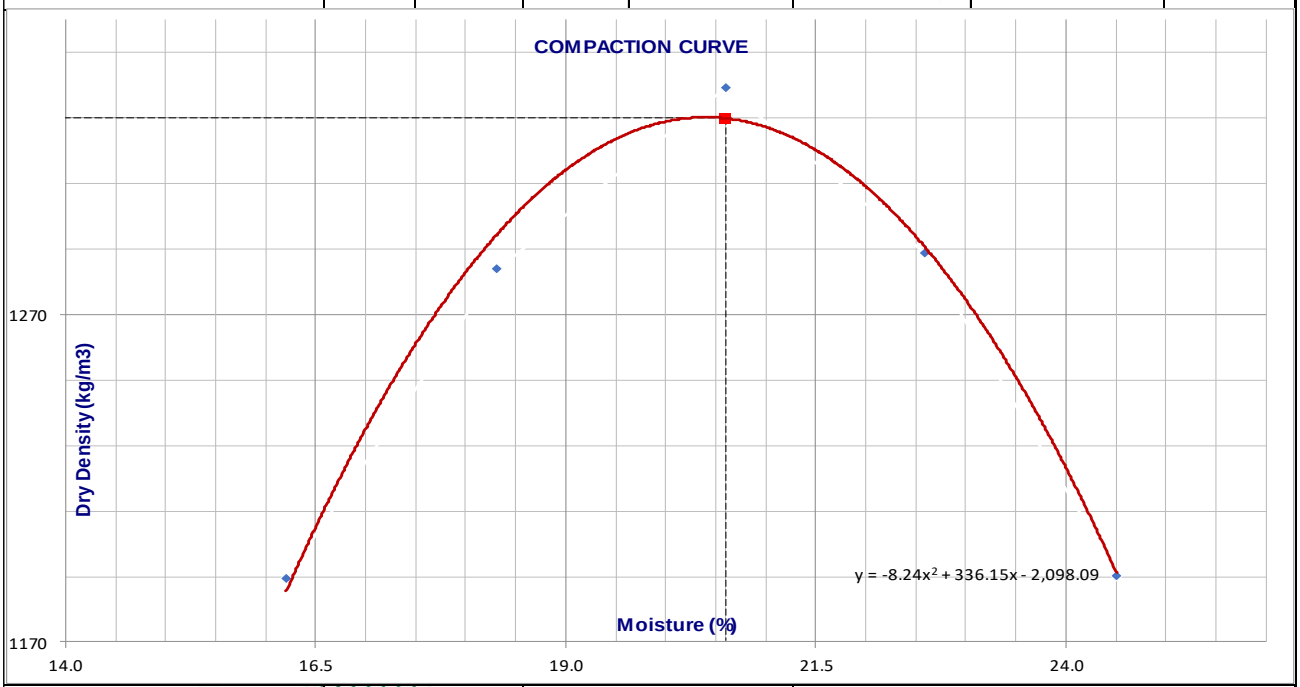
CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**						
Location:							
Depth Range:			**DD20**			**Test Date:**	22/04/2025
Sampled By:	BEN		**Tested By**	AUSTINE			

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**MC (FROM SITE)**	
Tin No.	XR	QQ	DC	39	MD	M8	
Weight of Wet Soil + Tin (g)	83.6	81.4	90.2	94.1	72.8	97.0	
Weight of Tin + Dry Soil (g)	75.4	72.3	79.2	81.7	64.1	95.2	
Weight of Tin(g)	24.8	22.6	25.8	26.8	28.6	26.0	
Weight of Moisture (g)	8.2	9.1	11.0	12.4	8.7	1.8	
Weight of Dry Soil (g)	50.6	49.7	53.4	54.9	35.5	69.2	
Moisture Content (%)	16.2	18.3	20.6	22.6	24.5	2.6	
Wt of Mould+base+specimen (g)	5102	5239	5335	5300	5202		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1382	1519	1615	1580	1482		
Bulk Density (kg/m^3)	1382	1519	1615	1580	1482		
Dry Density (kg/m^3)	1189	1284	1339	1289	1190		
Maximum Dry Density (kg/m^3	**1330**			**Optimum Moisture Content (%)=**		**20.6**	



TESTED BY:	Austine		REMARKS:
PREPARED BY:	Joy		
APPROVED BY:	Eng. Tom Waiharo	Signature:_____	

ENG. NJOROGE T. WAIHARO
REGISTERED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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COMPACTION TEST RESULTS PRELIMINARY DESIGN

TRIAL PIT NO. (PD 1)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.1m		**Location:**	**TP 1**	**Test Date**	11/9/2024
Sampled By:	Ben		**Tested By**	Ben		

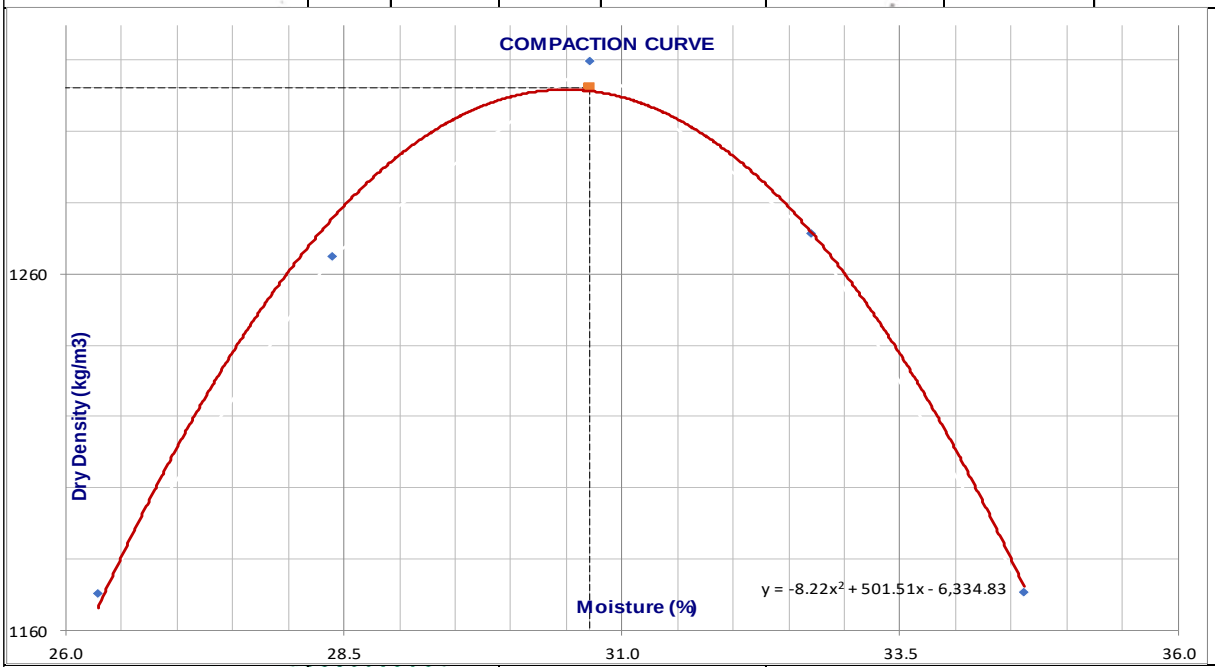
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**15**	**17**	**19**	**21**	**23**	**NMC (FROM SITE)**	
Tin No.							
Weight of Wet Soil + Tin (g)	89.7	87.4	94.5	97.7	81.9	86.4	
Weight of Tin + Dry Soil (g)	74.9	71.7	76.9	78.7	66.6	79.6	
Weight of Tin(g)	18.6	16.4	19.6	20.6	22.4	20.0	
Weight of Moisture (g)	14.8	15.7	17.6	19.0	15.3	6.8	
Weight of Dry Soil (g)	56.3	55.3	57.3	58.1	44.2	59.6	
Moisture Content (%)	26.3	28.4	30.7	32.7	34.6	11.4	
Wt of Mould+base+specimen (g)	5198	5344	5445	5407	5296		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1478	1624	1725	1687	1576		
Bulk Density (kg/m^3)	1478	1624	1725	1687	1576		
Dry Density (kg/m^3)	1170	1265	1320	1271	1171		

Maximum Dry Density (kg/m^3)=	**1312**			**Optimum Moisture Content (%)=**	**30.7**	



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG. T.W.	Signature:_____	

ENG. NJOROGE T. WAIHARO
REGISTERED CONSULTING ENGINEER
E410
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TRIAL PIT NO. (PD 2)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.0	m	**Location:**	TP 2	**Test Date**	11/9/2024
Sampled By:	Ben		**Tested By**	Ben		

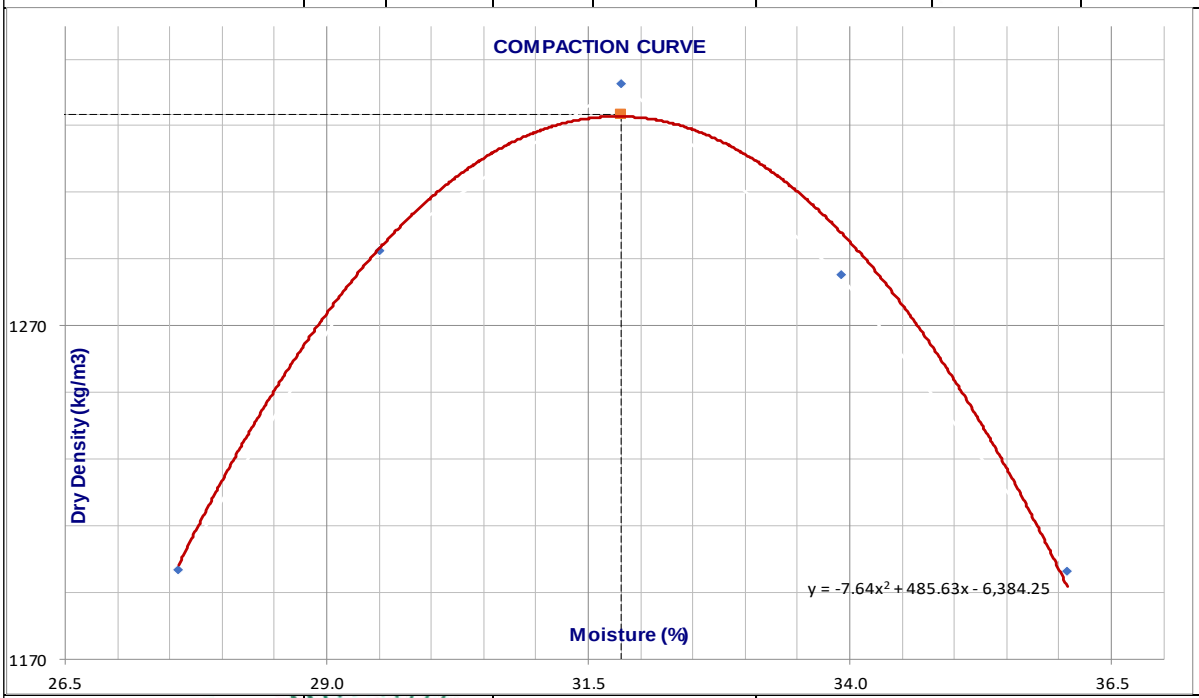
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**NMC (FROM SITE)**	
Tin No.							
Weight of Wet Soil + Tin (g)	90.4	87.2	93.9	98.8	98.1	102.6	
Weight of Tin + Dry Soil (g)	73.6	69.5	74.3	77.5	76.2	95.2	
Weight of Tin(g)	12.7	9.5	12.7	14.7	15.5	27.3	
Weight of Moisture (g)	16.8	17.7	19.6	21.3	21.9	7.4	
Weight of Dry Soil (g)	60.9	60.0	61.6	62.8	60.7	67.9	
Moisture Content (%)	27.6	29.5	31.8	33.9	36.1	10.9	
Wt of Mould+base+specimen (g)	5247	5394	5490	5441	5348		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1527	1674	1770	1721	1628		
Bulk Density (kg/m^3)	1527	1674	1770	1721	1628		
Dry Density (kg/m^3)	1197	1293	1343	1285	1196		

Maximum Dry Density (kg/m^3)=	**1333**	**Optimum Moisture Content (%)=**	**31.8**



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG.T.W	Signature:_____	

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TRIAL PIT NO. (PD 3)

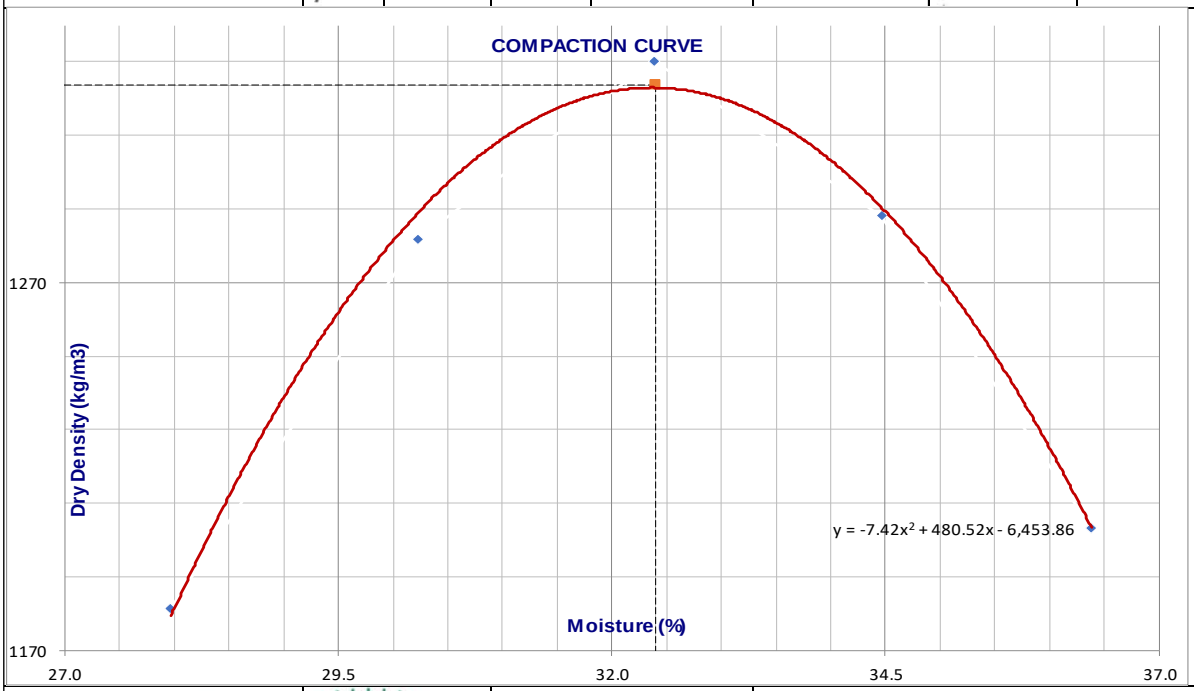
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.1m		**Location:**	TP3	**Test Date**	11/9/2024
Sampled By:	Ben		**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**NMC (FROM SITE)**	
Tin No.						**KO**	
Weight of Wet Soil + Tin (g)	92.2	67.9	64.1	74.3	80.7	106.6	
Weight of Tin + Dry Soil (g)	75.0	55.6	51.6	60.1	64.4	99.3	
Weight of Tin(g)	13.5	14.9	13.0	18.9	19.6	22.3	
Weight of Moisture (g)	17.2	12.3	12.5	14.2	16.3	7.3	
Weight of Dry Soil (g)	61.5	40.7	38.6	41.2	44.8	77.0	
Moisture Content (%)	28.0	30.2	32.4	34.5	36.4	9.5	
Wt of Mould+base+specimen (g)	5776	5933	6025	5996	5905		
Wt of Mould+Base (g)	4264	4264	4264	4264	4264		
Wt of Specimen (g)	1512	1669	1761	1732	1641		
Bulk Density (kg/m^3)	1512	1669	1761	1732	1641		
Dry Density (kg/m^3)	1182	1282	1330	1288	1203		
Maximum Dry Density (kg/m^3)=	**1324**			**Optimum Moisture Content (%)=**		**32.4**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

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TRIAL PIT NO. (PD 4)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.1m		**Location:**	TP 4	**Test Date**	11/9/2024
Sampled By:	Ben		**Tested By**	Ben		

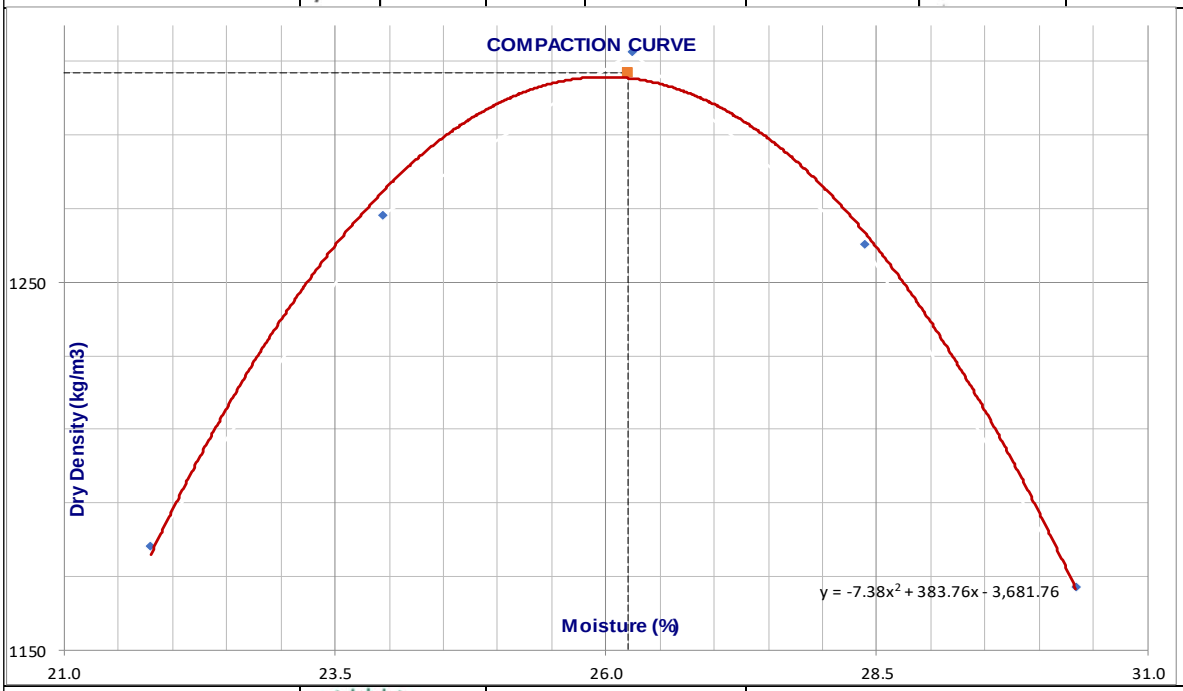
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**12**	**14**	**16**	**18**	**20**	**NMC (FROM SITE)**	
Tin No.						**A**	
Weight of Wet Soil + Tin (g)	84.2	97.0	89.0	110.8	89.5	107.6	
Weight of Tin + Dry Soil (g)	71.6	82.3	75.8	93.0	76.0	99.9	
Weight of Tin(g)	13.8	20.9	25.5	30.3	31.5	20.0	
Weight of Moisture (g)	12.6	14.7	13.2	17.8	13.5	7.7	
Weight of Dry Soil (g)	57.8	61.4	50.3	62.7	44.5	79.9	
Moisture Content (%)	21.8	23.9	26.2	28.4	30.3	9.6	
Wt of Mould+base+specimen (g)	5699	5836	5921	5882	5785		
Wt of Mould+Base (g)	4264	4264	4264	4264	4264		
Wt of Specimen (g)	1435	1572	1657	1618	1521		
Bulk Density (kg/m^3)	1435	1572	1657	1618	1521		
Dry Density (kg/m^3)	1178	1268	1313	1260	1167		

Maximum Dry Density (kg/m^3)=	**1307**			**Optimum Moisture Content (%)=**	**26.2**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. NJOROGE T. WAMARI LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 5)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:			**Location:**	TP 5	**Test Date**	11/9/2024
Sampled By:	Ben		**Tested By**	Ben		

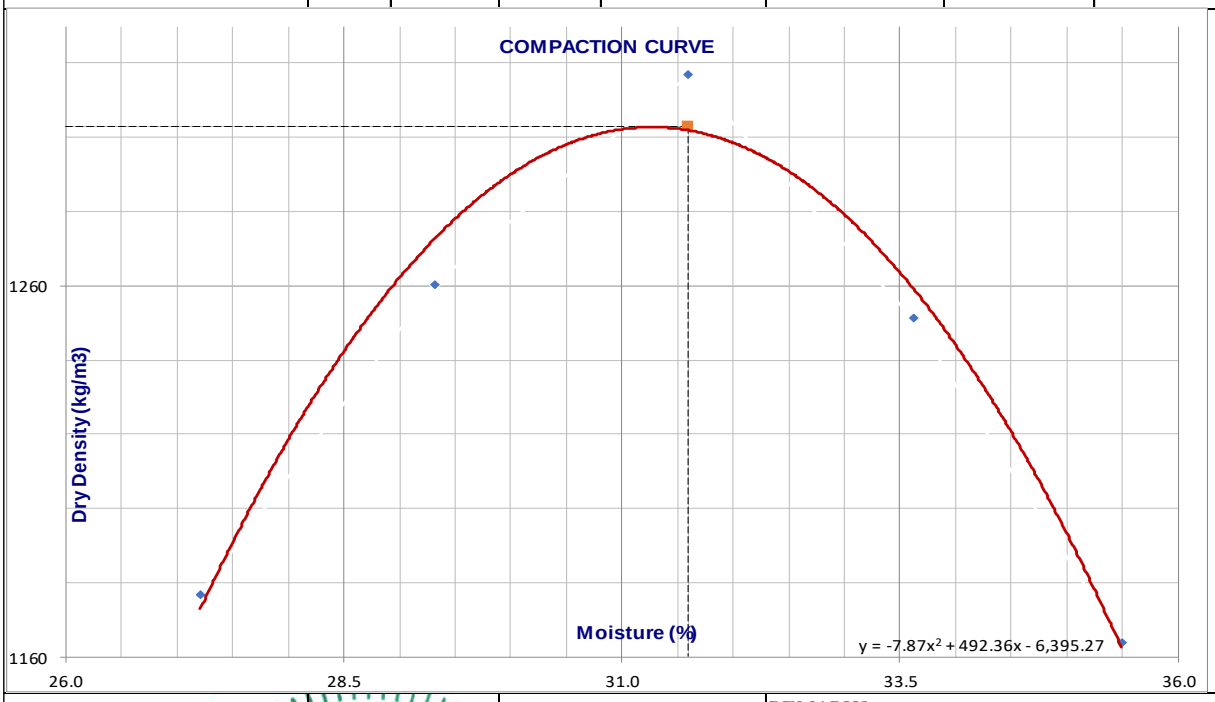
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**NMC (FROM SITE)**	
Tin No.							
Weight of Wet Soil + Tin (g)	90.0	87.7	94.8	97.9	82.5	82.7	
Weight of Tin + Dry Soil (g)	74.6	71.4	76.6	78.3	66.6	76.2	
Weight of Tin(g)	18.0	15.8	19.0	20.0	21.8	22.0	
Weight of Moisture (g)	15.4	16.3	18.2	19.6	15.9	6.5	
Weight of Dry Soil (g)	56.6	55.6	57.6	58.3	44.8	54.2	
Moisture Content (%)	27.2	29.3	31.6	33.6	35.5	12.0	
Wt of Mould+base+specimen (g)	5217	5350	5453	5392	5297		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1497	1630	1733	1672	1577		
Bulk Density (kg/m^3)	1497	1630	1733	1672	1577		
Dry Density (kg/m^3)	1177	1260	1317	1251	1164		

Maximum Dry Density (kg/m^3)=	**1303**			**Optimum Moisture Content (%)=**	**31.6**	



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG. T.W.	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 8)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	0.8	m	**Location:**	TP8	**Test Date**	12/9/2024
Sampled By:	Ben		**Tested By**	Ben		

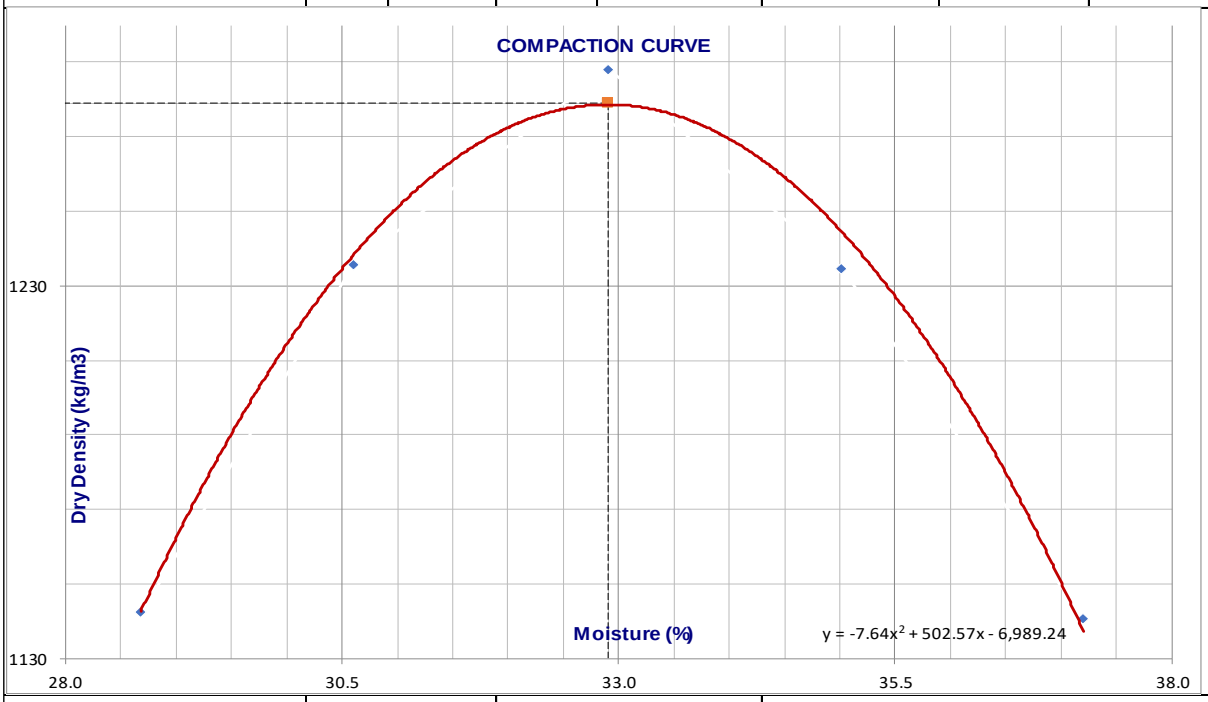
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**NMC (FROM SITE)**	
Tin No.							
Weight of Wet Soil + Tin (g)	88.9	87.2	94.4	97.5	82.4	93.4	
Weight of Tin + Dry Soil (g)	73.7	71.1	76.4	78.1	66.7	87.0	
Weight of Tin(g)	20.7	18.5	21.7	22.7	24.5	20.3	
Weight of Moisture (g)	15.2	16.1	18.0	19.4	15.7	6.4	
Weight of Dry Soil (g)	53.0	52.6	54.7	55.4	42.2	66.7	
Moisture Content (%)	28.7	30.6	32.9	35.0	37.2	9.6	
Wt of Mould+base+specimen (g)	5190	5334	5432	5387	5285		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1470	1614	1712	1667	1565		
Bulk Density (kg/m^3)	1470	1614	1712	1667	1565		
Dry Density (kg/m^3)	1142	1236	1288	1235	1141		

Maximum Dry Density (kg/m^3)=	**1279**			**Optimum Moisture Content (%)=**	**32.9**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
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TRIAL PIT NO. (PD 9)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.1m		**Location:**	TP 9	**Test Date**	12/9/2024
Sampled By:	Ben		**Tested By**	Ben		

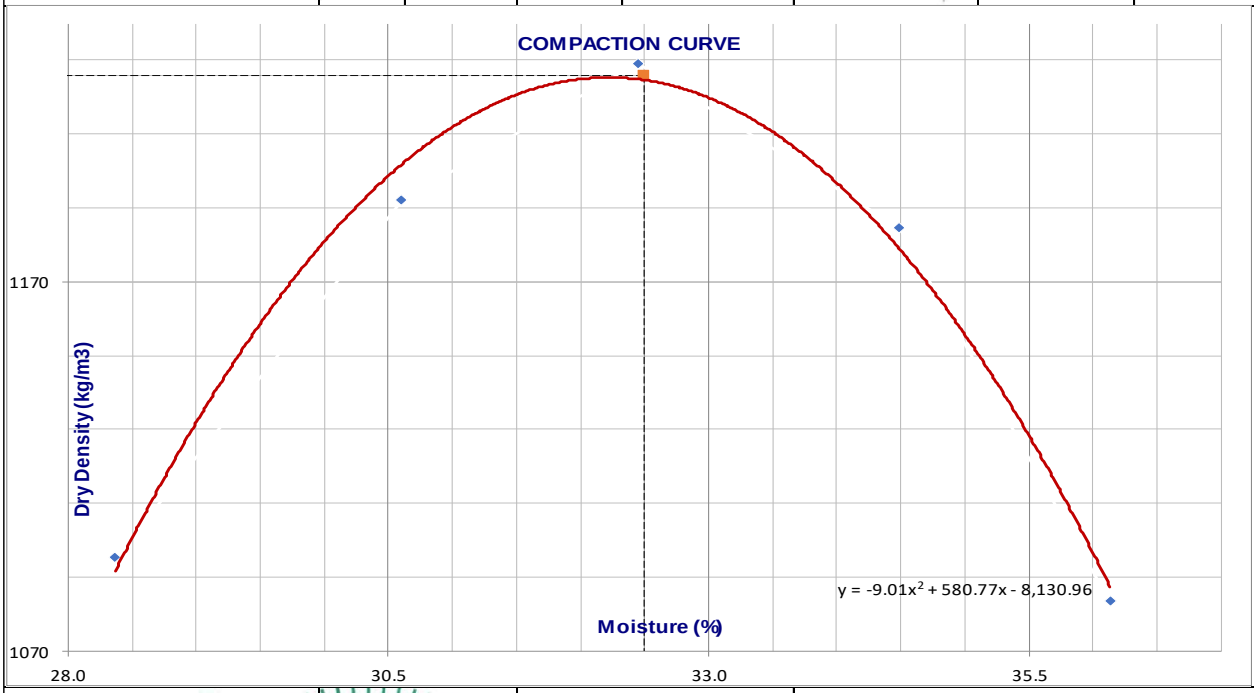
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**6**	**8**	**10**	**12**	**14**	**NMC (FROM SITE)**	
Tin No.						**M18**	
Weight of Wet Soil + Tin (g)	99.1	92.8	79.8	88.3	85.4	55.6	
Weight of Tin + Dry Soil (g)	81.2	75.6	65.2	70.4	68.2	49.3	
Weight of Tin(g)	18.1	19.4	20.2	18.5	20.6	18.6	
Weight of Moisture (g)	17.9	17.2	14.6	17.9	17.2	6.3	
Weight of Dry Soil (g)	63.1	56.2	45.0	51.9	47.6	30.7	
Moisture Content (%)	28.4	30.6	32.4	34.5	36.1	20.5	
Wt of Mould+base+specimen (g)	5128	5279	5350	5315	5197		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	1406	1557	1628	1593	1475		
Bulk Density (kg/m^3)	1406	1557	1628	1593	1475		
Dry Density (kg/m^3)	1095	1192	1229	1184	1083		

Maximum Dry Density (kg/m^3)=	**1226**			**Optimum Moisture Content (%)=**	**32.5**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 10)

PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
Depth Range:	1.1m		Location:	TP10	Test Date	12/9/2024	
Sampled By:	Ben		Tested By	Ben			

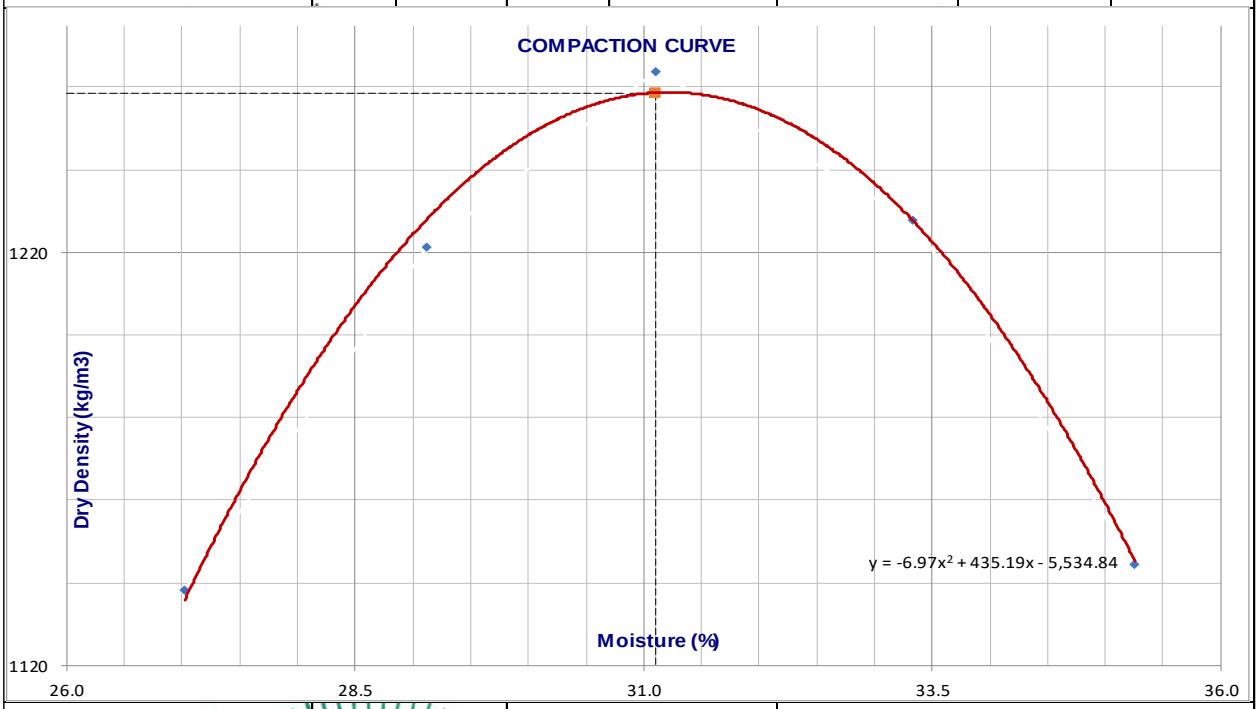
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	8	10	12	14	16	NMC (FROM SITE)	
Tin No.						M25	
Weight of Wet Soil + Tin (g)	98.7	117.2	92.0	124.2	108.2	87.1	
Weight of Tin + Dry Soil (g)	83.0	96.9	75.7	99.5	86.8	77.7	
Weight of Tin(g)	24.9	27.2	23.3	25.4	26.1	25.8	
Weight of Moisture (g)	15.7	20.3	16.3	24.7	21.4	9.4	
Weight of Dry Soil (g)	58.1	69.7	52.4	74.1	60.7	51.9	
Moisture Content (%)	27.0	29.1	31.1	33.3	35.3	18.1	
Wt of Mould+base+specimen (g)	5166	5297	5377	5357	5268		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1446	1577	1657	1637	1548		
Bulk Density (kg/m^3)	1446	1577	1657	1637	1548		
Dry Density (kg/m^3)	1138	1221	1264	1228	1145		

Maximum Dry Density (kg/m^3)=	1259			Optimum Moisture Content (%)=		31.1	



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG.T.W	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
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TRIAL PIT NO. (PD 11)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.0	m	**Location:**	TP11	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Austine		

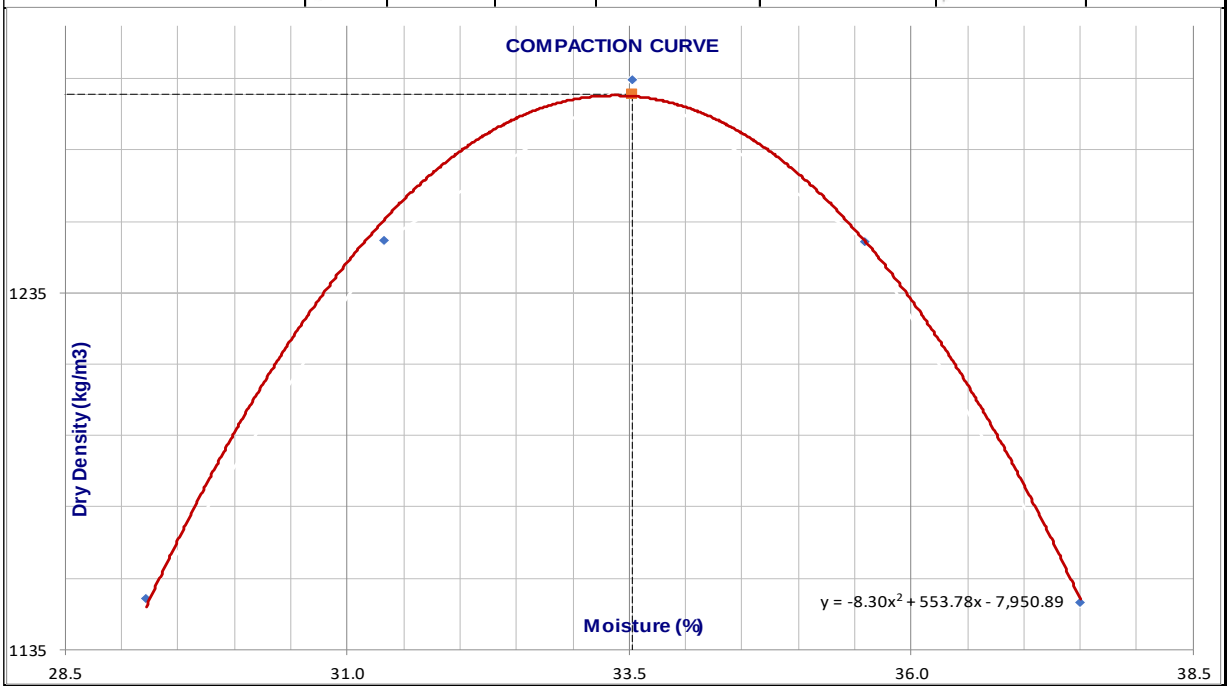
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**NMC (FROM SITE)**	
Tin No.							
Weight of Wet Soil + Tin (g)	84.2	82.5	90.1	93.5	79.1	96.5	
Weight of Tin + Dry Soil (g)	70.0	67.4	73.1	75.1	64.4	88.4	
Weight of Tin(g)	21.4	19.2	22.4	23.4	25.2	18.0	
Weight of Moisture (g)	14.2	15.1	17.0	18.4	14.7	8.1	
Weight of Dry Soil (g)	48.6	48.2	50.7	51.7	39.2	70.4	
Moisture Content (%)	29.2	31.3	33.5	35.6	37.5	11.5	
Wt of Mould+base+specimen (g)	5205	5361	5449	5414	5299		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1485	1641	1729	1694	1579		
Bulk Density (kg/m^3)	1485	1641	1729	1694	1579		
Dry Density (kg/m^3)	1149	1250	1295	1249	1148		

Maximum Dry Density (kg/m^3)=	**1291**			**Optimum Moisture Content (%)=**	**33.5**	



TESTED BY:	**Austine**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. ROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 13)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.0m		**Location:**	TP13	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Ben		

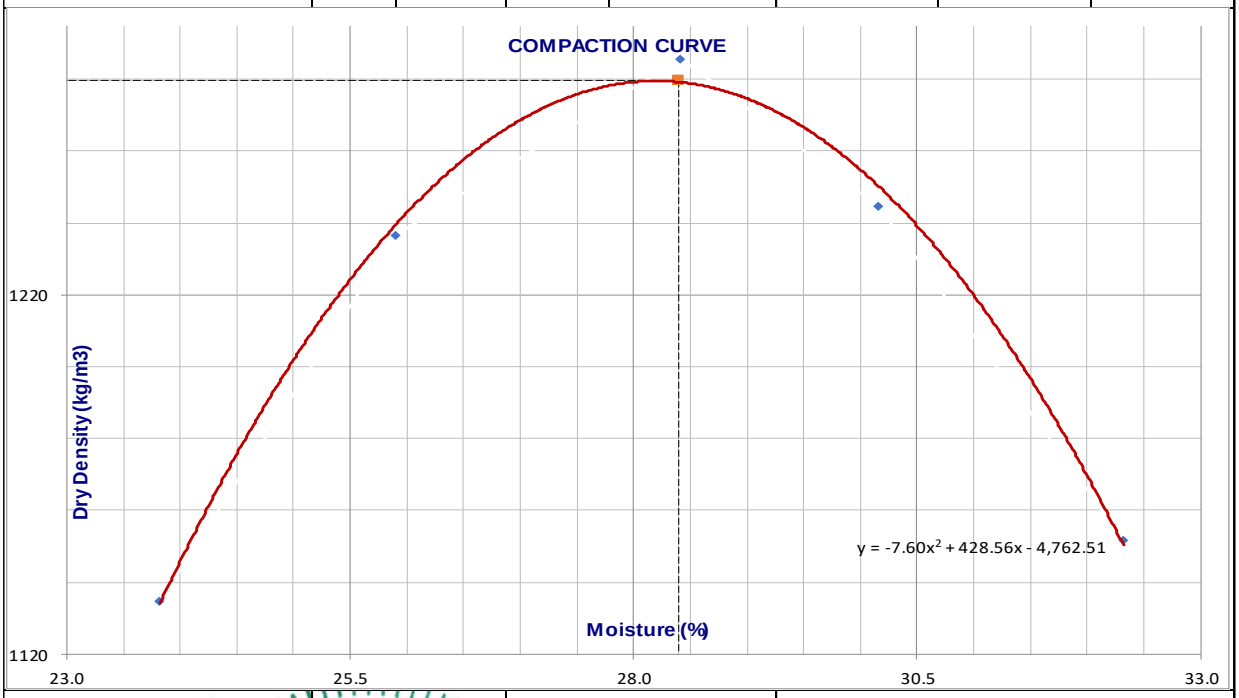
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**16**	**18**	**20**	**22**	**24**	**NMC (FROM SITE)**	
Tin No.						**M19**	
Weight of Wet Soil + Tin (g)	78.6	84.9	89.8	83.7	87.9	73.3	
Weight of Tin + Dry Soil (g)	69.0	72.7	74.2	72.3	73.0	69.5	
Weight of Tin(g)	28.7	25.6	19.3	34.5	26.9	24.5	
Weight of Moisture (g)	9.6	12.2	15.6	11.4	14.9	3.8	
Weight of Dry Soil (g)	40.3	47.1	54.9	37.8	46.1	45.0	
Moisture Content (%)	23.8	25.9	28.4	30.2	32.3	8.4	
Wt of Mould+base+specimen (g)	5145	5297	5391	5360	5264		
Wt of Mould+Base (g)	3740	3740	3740	3740	3740		
Wt of Specimen (g)	1405	1557	1651	1620	1524		
Bulk Density (kg/m^3)	1405	1557	1651	1620	1524		
Dry Density (kg/m^3)	1135	1237	1286	1245	1152		

Maximum Dry Density (kg/m^3)=	**1280**			**Optimum Moisture Content (%)=**	**28.4**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. NJOROGE T. WAIHARO — LICENSED CONSULTING ENGINEER — E410 — ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 14)

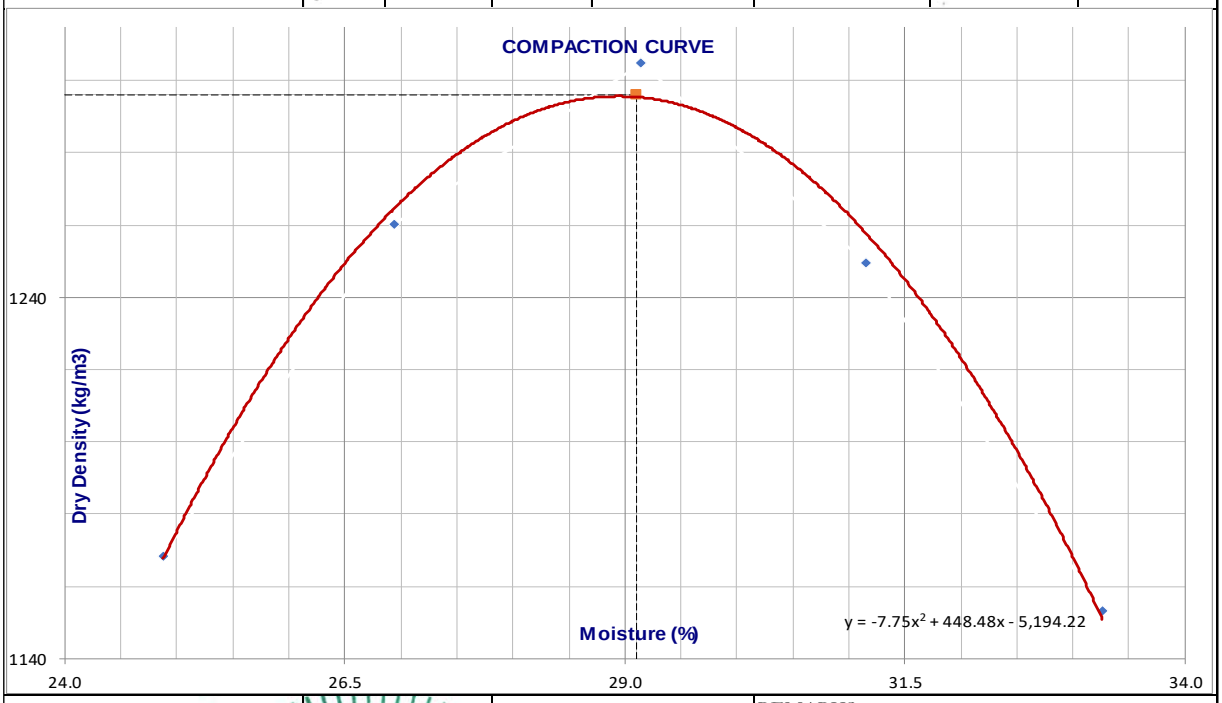
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.2m		**Location:**	TP 14	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**NMC (FROM SITE)**	
Tin No.						**M43**	
Weight of Wet Soil + Tin (g)	64.1	83.4	93.0	84.6	81.5	106.9	
Weight of Tin + Dry Soil (g)	54.0	68.5	76.3	68.9	65.5	99.6	
Weight of Tin(g)	13.4	13.2	19.0	18.5	17.4	30.3	
Weight of Moisture (g)	10.1	14.9	16.7	15.7	16.0	7.3	
Weight of Dry Soil (g)	40.6	55.3	57.3	50.4	48.1	69.3	
Moisture Content (%)	24.9	26.9	29.1	31.2	33.3	10.5	
Wt of Mould+base+specimen (g)	5723	5864	5949	5903	5801		
Wt of Mould+Base (g)	4264	4264	4264	4264	4264		
Wt of Specimen (g)	1459	1600	1685	1639	1537		
Bulk Density (kg/m^3)	1459	1600	1685	1639	1537		
Dry Density (kg/m^3)	1168	1260	1305	1250	1153		
Maximum Dry Density (kg/m^3)=	**1296**			**Optimum Moisture Content (%)=**		**29.1**	



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG.T.W	Signature:_____	

ENG. JOROGE T. WAINAINA
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TRIAL PIT NO. (PD 15)

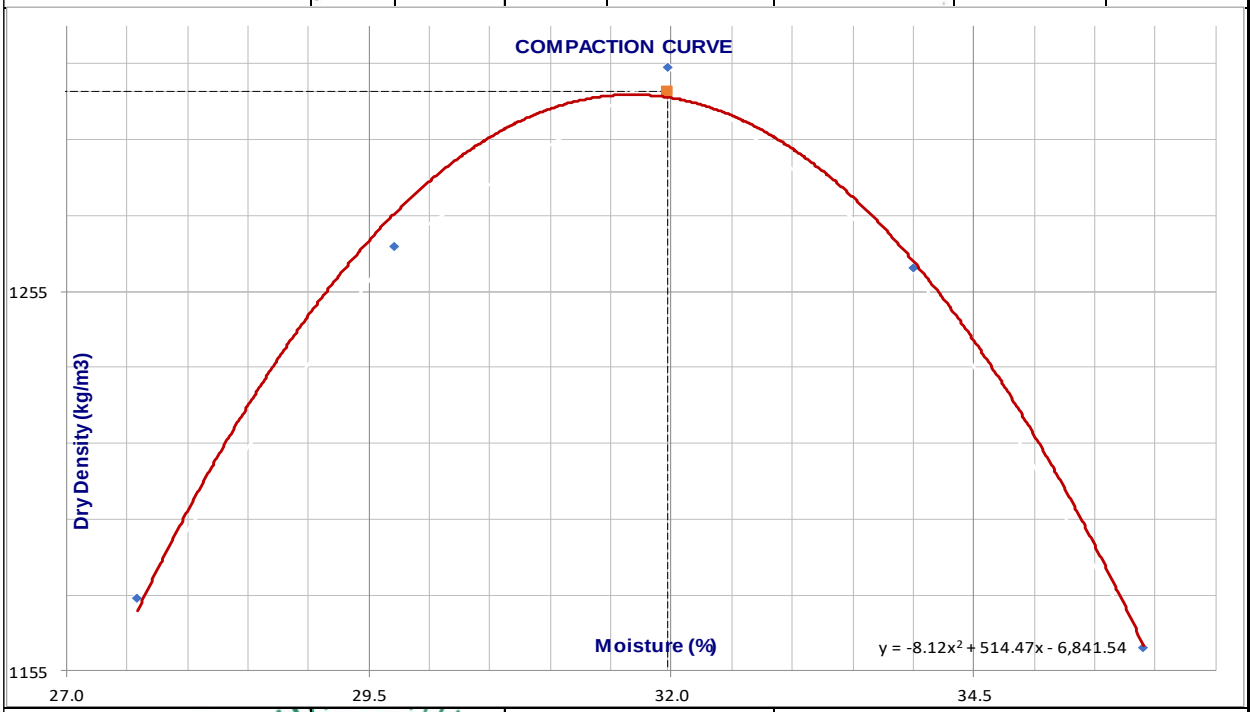
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:			**Location:**	TP 15	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**NMC (FROM SITE)**	
Tin No.						**M43**	
Weight of Wet Soil + Tin (g)	87.6	85.6	93.0	96.3	81.2	86.0	
Weight of Tin + Dry Soil (g)	73.2	70.3	75.8	77.7	66.3	79.5	
Weight of Tin(g)	21.0	18.8	22.0	23.0	24.8	22.0	
Weight of Moisture (g)	14.4	15.3	17.2	18.6	14.9	6.5	
Weight of Dry Soil (g)	52.2	51.5	53.8	54.7	41.5	57.5	
Moisture Content (%)	27.6	29.7	32.0	34.0	35.9	11.3	
Wt of Mould+base+specimen (g)	5218	5363	5454	5410	5298		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1498	1643	1734	1690	1578		
Bulk Density (kg/m^3)	1498	1643	1734	1690	1578		
Dry Density (kg/m^3)	1174	1267	1314	1261	1161		
Maximum Dry Density (kg/m^3)=	**1308**			**Optimum Moisture Content (%)=**		**32.0**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:	

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TRIAL PIT NO. (PD 16)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.2	m	**Location:**	TP16	**Test Date**	13/9/24
Sampled By:	Ben		**Tested By**	Ben		

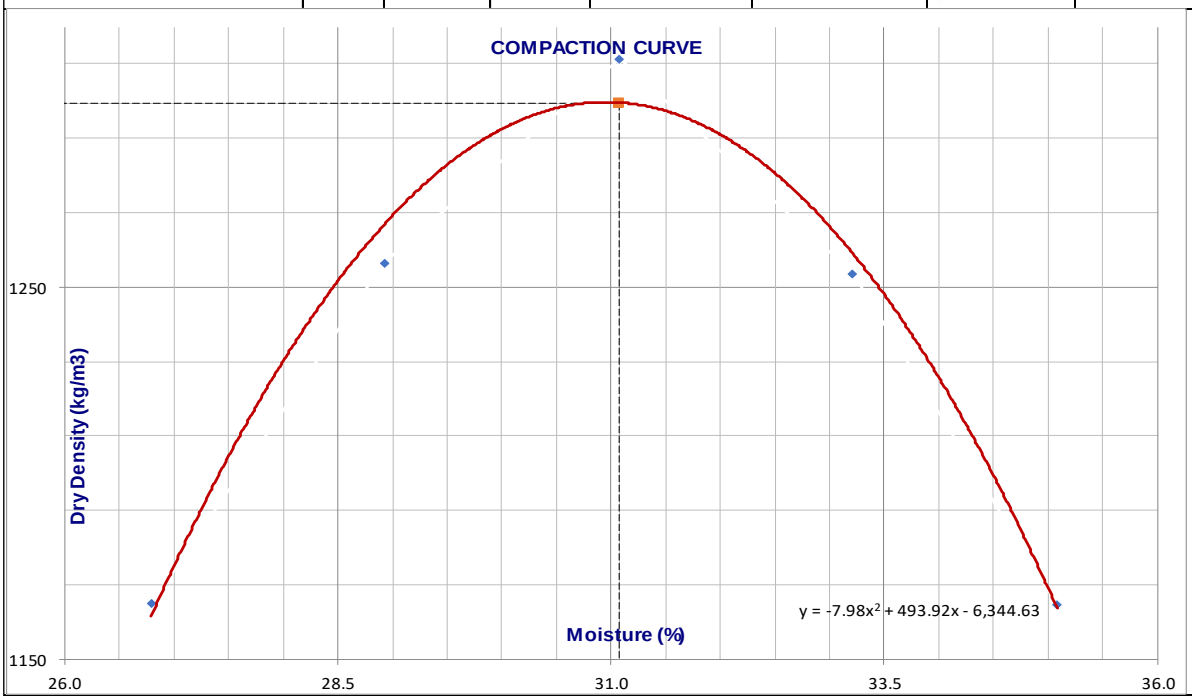
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**NMC (FROM SITE)**	
Tin No.						**M14**	
Weight of Wet Soil + Tin (g)	86.5	84.4	92.0	95.1	79.7	90.4	
Weight of Tin + Dry Soil (g)	72.3	69.3	75.0	76.7	65.0	82.3	
Weight of Tin(g)	19.3	17.1	20.3	21.3	23.1	18.0	
Weight of Moisture (g)	14.2	15.1	17.0	18.4	14.7	8.1	
Weight of Dry Soil (g)	53.0	52.2	54.7	55.4	41.9	64.3	
Moisture Content (%)	26.8	28.9	31.1	33.2	35.1	12.6	
Wt of Mould+base+specimen (g)	5197	5340	5439	5390	5293		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1477	1620	1719	1670	1573		
Bulk Density (kg/m^3)	1477	1620	1719	1670	1573		
Dry Density (kg/m^3)	1165	1257	1311	1254	1164		

Maximum Dry Density (kg/m^3)=	**1299**			**Optimum Moisture Content (%)=**	**31.1**	



TESTED BY:	Ben		REMARKS:
PREPARED BY:	Austine		
APPROVED BY:	ENG.T.W	Signature:_____	

ENG. NJOROGE T. WAIRIRU LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (PD 17)

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.1m		**Location:**	TP 17	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Ben		

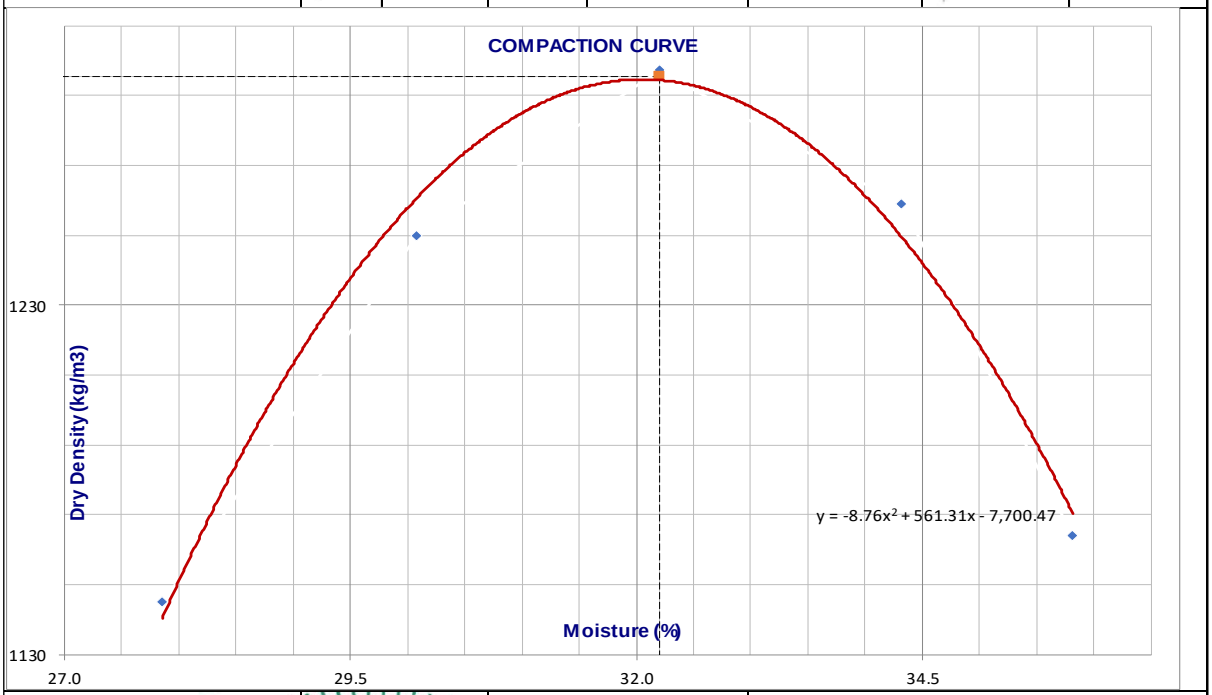
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**14**	**16**	**18**	**20**	**22**	**NMC (FROM SITE)**	
Tin No.						**M14**	
Weight of Wet Soil + Tin (g)	83.4	81.1	92.2	110.6	82.9	77.3	
Weight of Tin + Dry Soil (g)	71.2	70.0	73.3	88.6	65.6	70.8	
Weight of Tin(g)	27.4	33.1	14.6	24.5	17.3	25.8	
Weight of Moisture (g)	12.2	11.1	18.9	22.0	17.3	6.5	
Weight of Dry Soil (g)	43.8	36.9	58.7	64.1	48.3	45.0	
Moisture Content (%)	27.9	30.1	32.2	34.3	35.8	14.4	
Wt of Mould+base+specimen (g)	5204	5366	5455	5431	5321		
Wt of Mould+Base (g)	3740	3740	3740	3740	3740		
Wt of Specimen (g)	1464	1626	1715	1691	1581		
Bulk Density (kg/m^3)	1464	1626	1715	1691	1581		
Dry Density (kg/m^3)	1145	1250	1297	1259	1164		

Maximum Dry Density (kg/m^3)=	**1296**			**Optimum Moisture Content (%)=**	**32.2**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

ENG. JOROGE T. WAINAINA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 18)

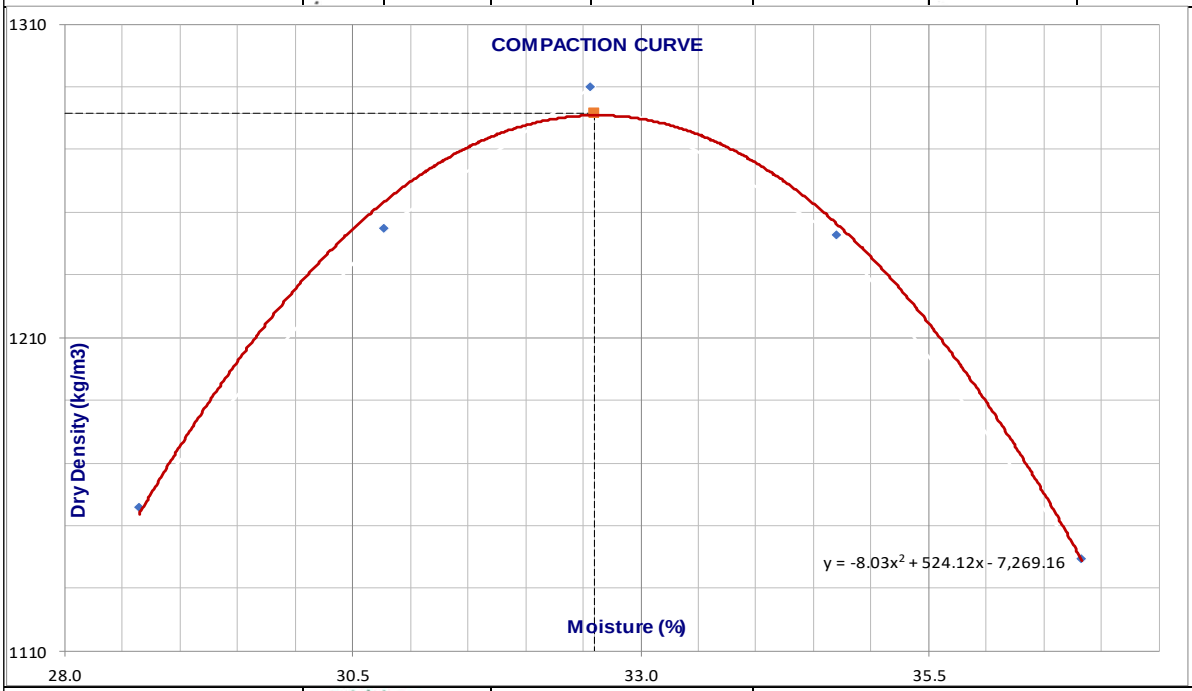
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**					
Depth Range:	1.0m		**Location:**	TP 18	**Test Date**	13/9/2024
Sampled By:	Ben		**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**18**	**20**	**22**	**24**	**26**	**NMC (FROM SITE)**	
Tin No.						**A**	
Weight of Wet Soil + Tin (g)	101.5	93.7	107.5	96.0	83.0	90.9	
Weight of Tin + Dry Soil (g)	84.8	78.1	87.7	76.6	67.2	84.0	
Weight of Tin(g)	26.5	27.4	26.9	20.7	24.3	14.3	
Weight of Moisture (g)	16.7	15.6	19.8	19.4	15.8	6.9	
Weight of Dry Soil (g)	58.3	50.7	60.8	55.9	42.9	69.7	
Moisture Content (%)	28.6	30.8	32.6	34.7	36.8	9.9	
Wt of Mould+base+specimen (g)	5751	5892	5974	5938	5823		
Wt of Mould+Base (g)	4264	4264	4264	4264	4264		
Wt of Specimen (g)	1487	1628	1710	1674	1559		
Bulk Density (kg/m^3)	1487	1628	1710	1674	1559		
Dry Density (kg/m^3)	1156	1245	1290	1243	1139		
Maximum Dry Density (kg/m^3)=	**1282**			**Optimum Moisture Content (%)=**		**32.6**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**ENG.T.W**	Signature:_____	

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CBR TEST RESULTS DETAILED DESIGN

TRIAL PIT NO. (DD 1)

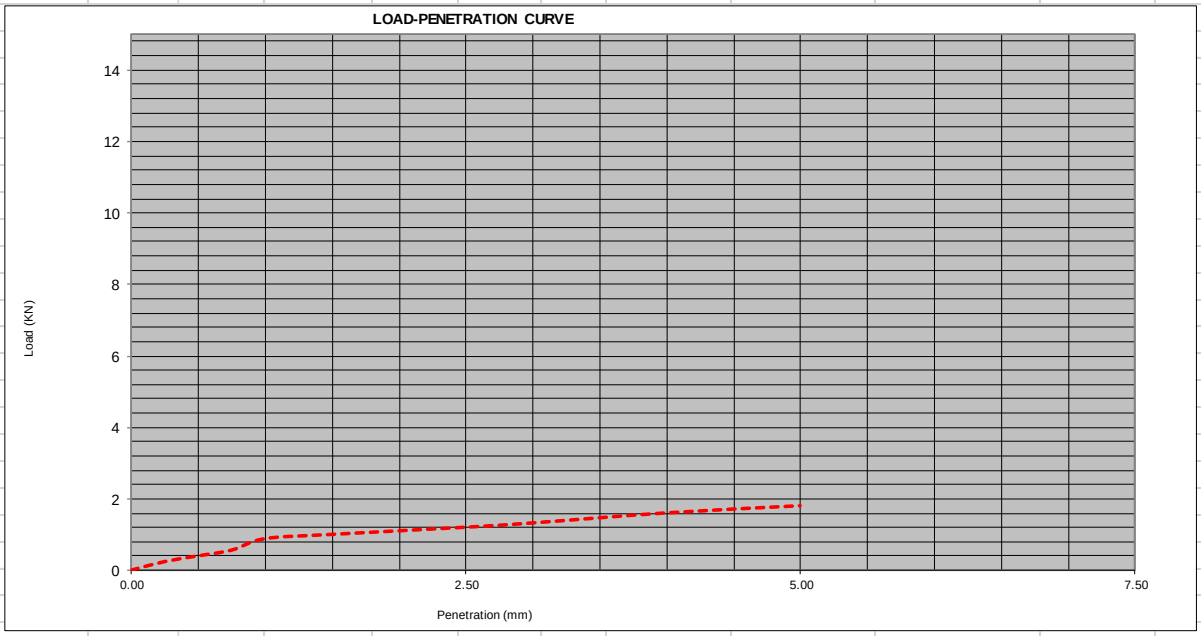
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD1**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.257
OMC (%) :	28.0

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.257	28.0		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.80	9	9	1.22

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.257	28.0	9	1.22
Parameters at 95% MDD	**1.194**	**26.6**	**9**	**1.16**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature: _____

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TRIAL PIT NO. (DD 2)

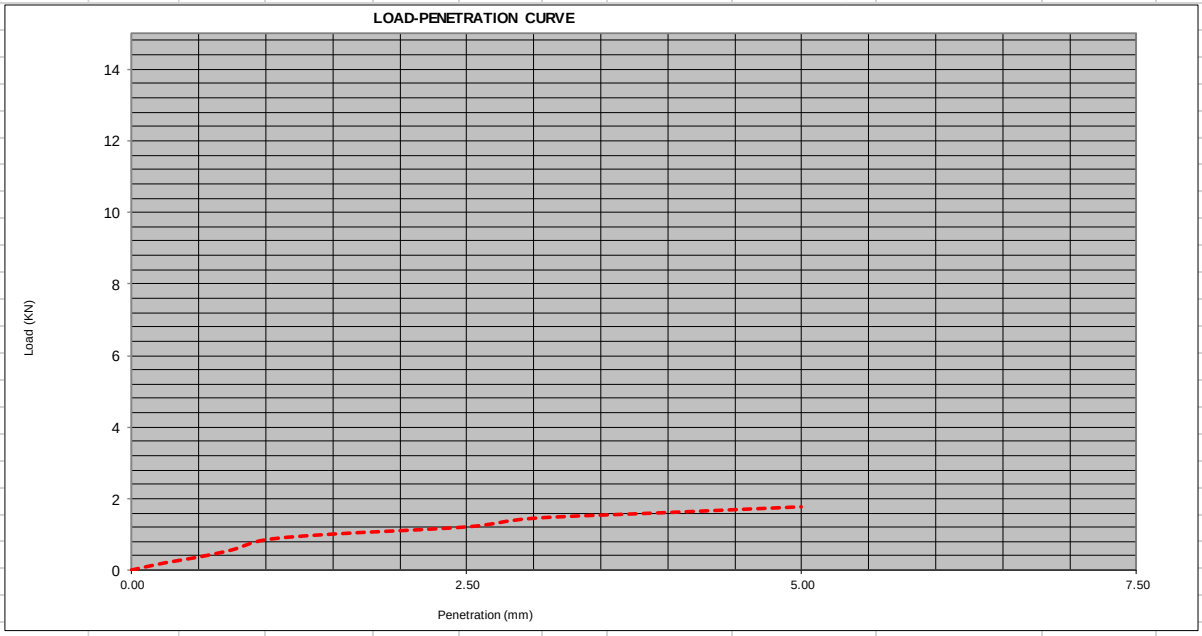
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
Depth Range:				**DD2**	**Test Date**	26/04/2025
Sampled By:	Austine			Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.269
OMC (%) :	27.8

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.269	27.8		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.76	9	9	1.20

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.269	27.8	9	1.20
Parameters at 95% MDD	**1.206**	**26.4**	**9**	**1.14**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 3)

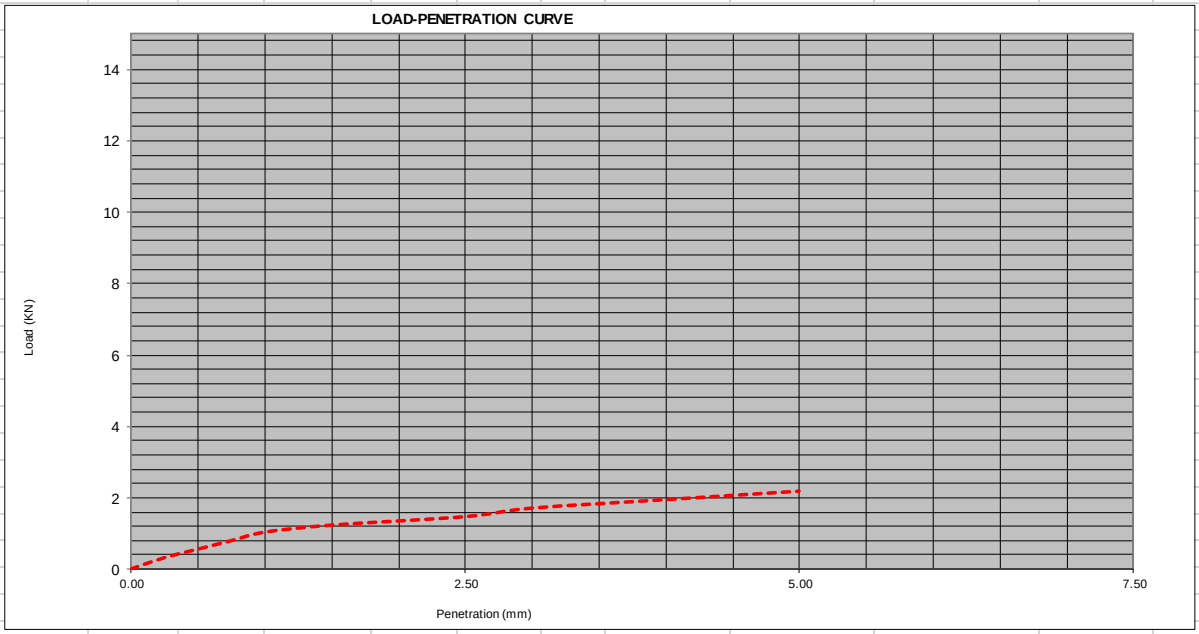
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD3**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.430
OMC (%) :	20.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.430	20.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.48	2.20	11	11	1.14

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.430	20.6	11	1.14
Parameters at 95% MDD	**1.359**	**19.6**	**11**	**1.08**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 4)

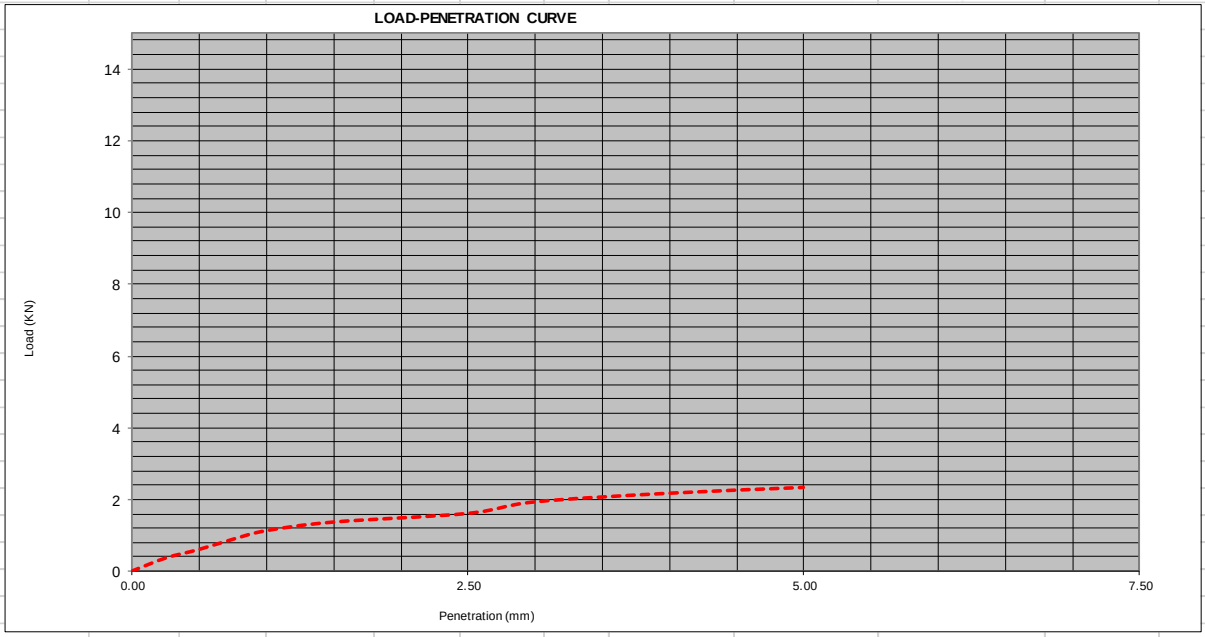
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD4**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.489
OMC (%) :	24.9

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.489	24.9		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.60	2.32	12	12	1.12

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.489	24.9	12	1.12
Parameters at 95% MDD	**1.415**	**23.6**	**11**	**1.06**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 5)

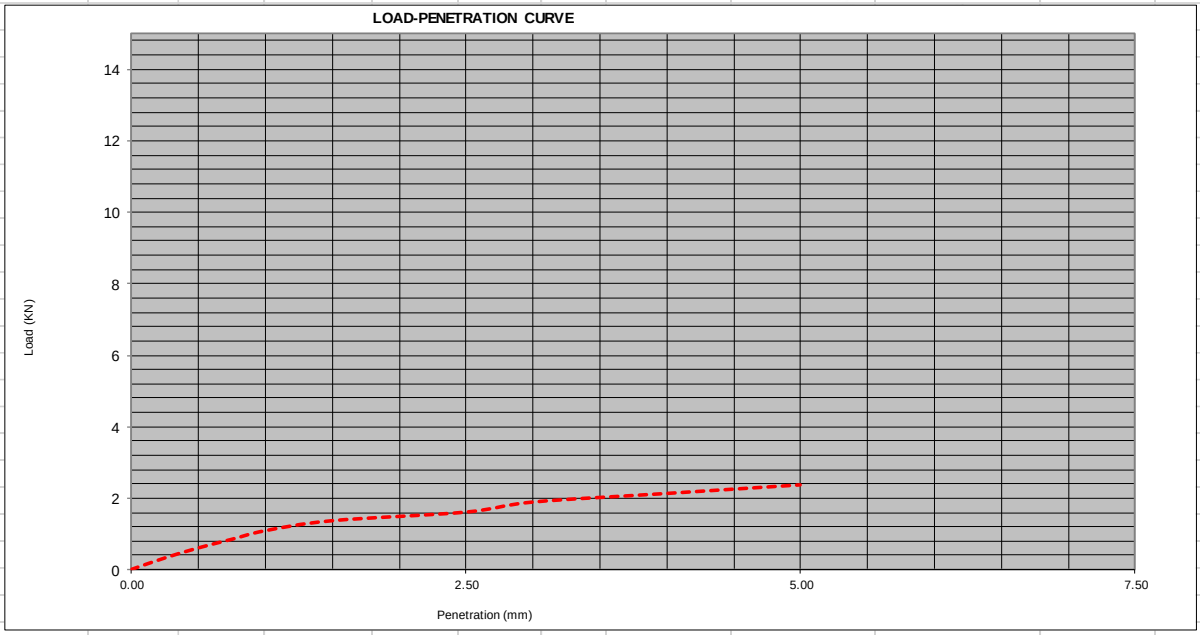
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location**	**DD5**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.424
OMC (%) :	20.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.424	20.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.60	2.36	12	12	1.18

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.424	20.2	12	1.18
Parameters at 95% MDD	**1.353**	**19.2**	**11**	**1.12**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 6)

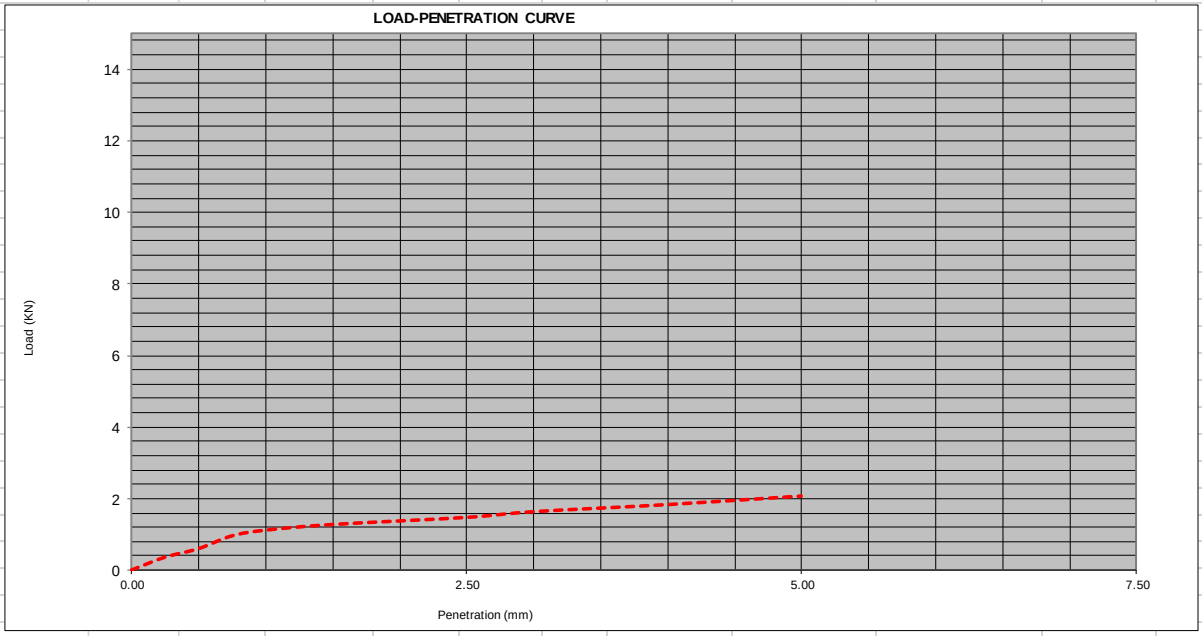
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD6**	**Test Date**	26/04/2025
Sampled By:	Austine	**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.312
OMC (%) :	26.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.312	26.3		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.48	2.08	11	10	1.19

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.312	26.3	11	1.19
Parameters at 95% MDD	**1.246**	**25.0**	**11**	**1.13**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 7)

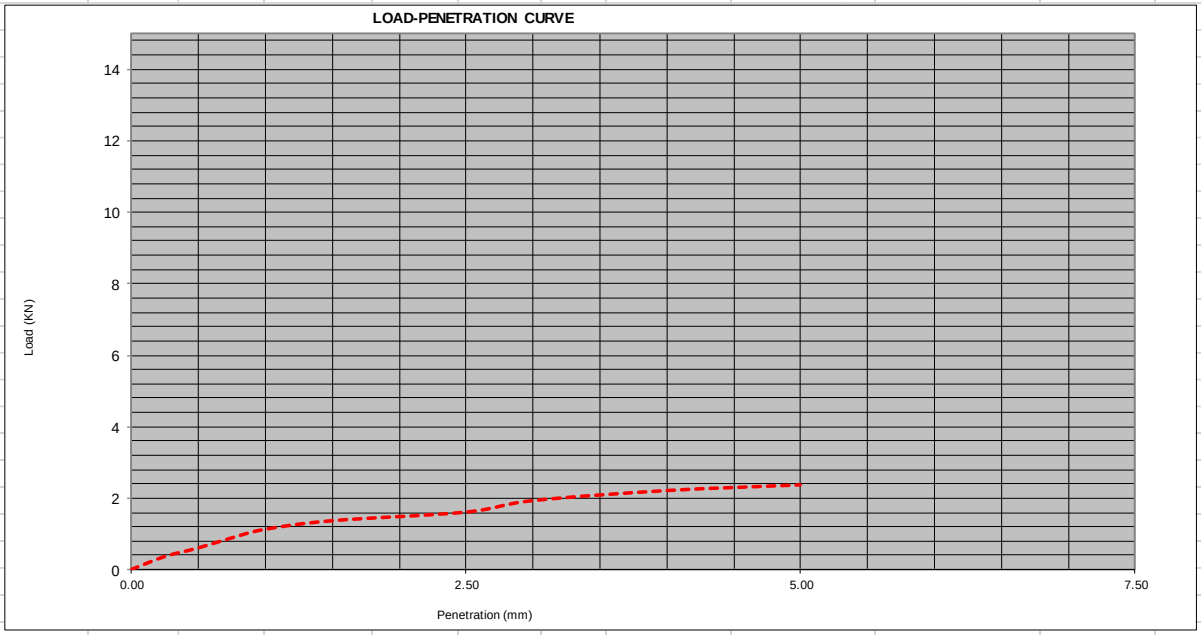
CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
Depth Range:				**DD7**	**Test Date**	26/04/2025
Sampled By:	Austine			Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.495
OMC (%) :	23.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.495	23.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.60	2.36	12	12	1.18

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.495	23.6	12	1.18
Parameters at 95% MDD	**1.420**	**22.4**	**11**	**1.12**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 8)

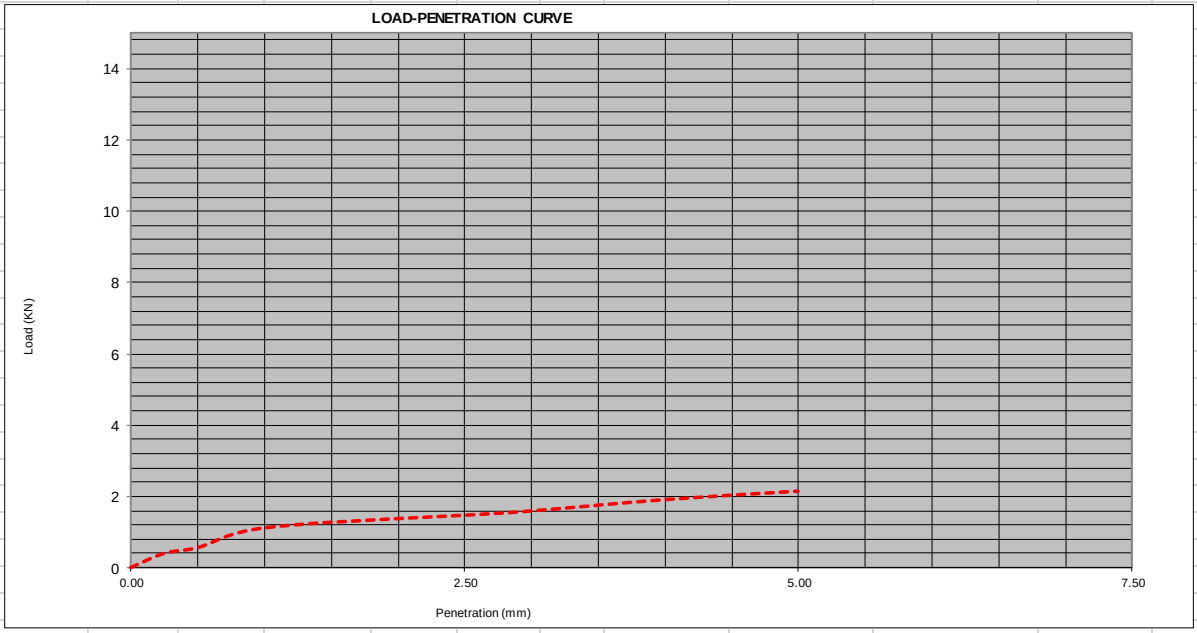
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD8**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.287
OMC (%) :	28.1

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.287	28.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.48	2.16	11	11	1.23

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.287	28.1	11	1.23
Parameters at 95% MDD	**1.223**	**26.7**	**11**	**1.17**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 9)

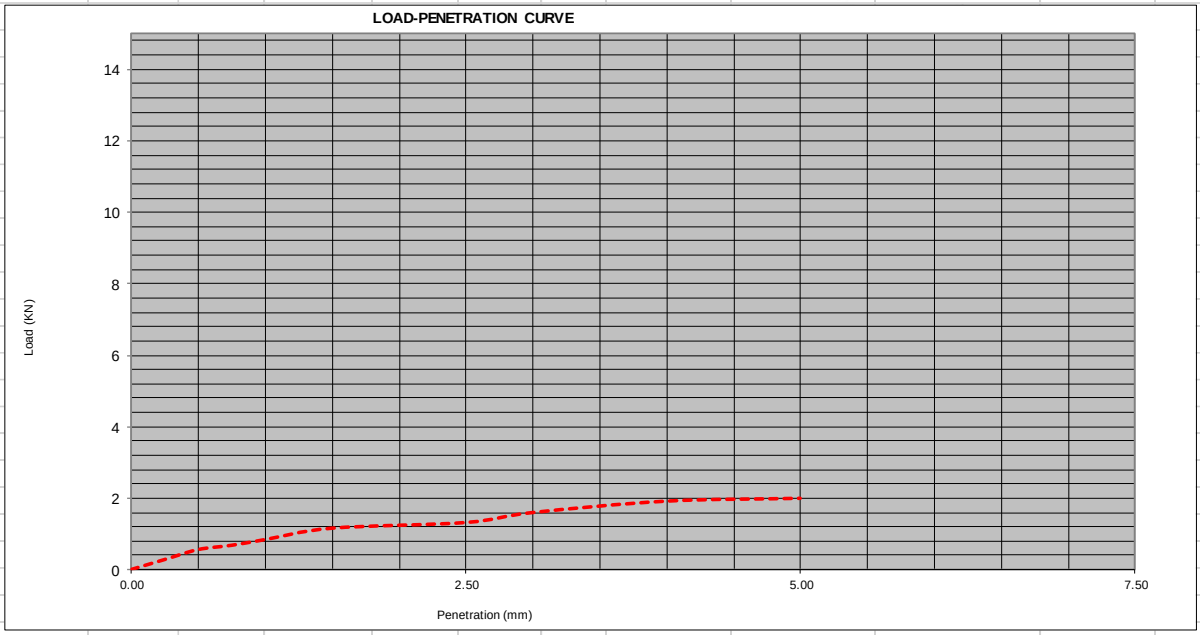
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**		**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.273
OMC (%) :	27.8

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.273	27.8		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	2.00	10	10	1.21

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.273	27.8	10	1.21
Parameters at 95% MDD	**1.209**	**26.4**	**9**	**1.15**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (DD 10)

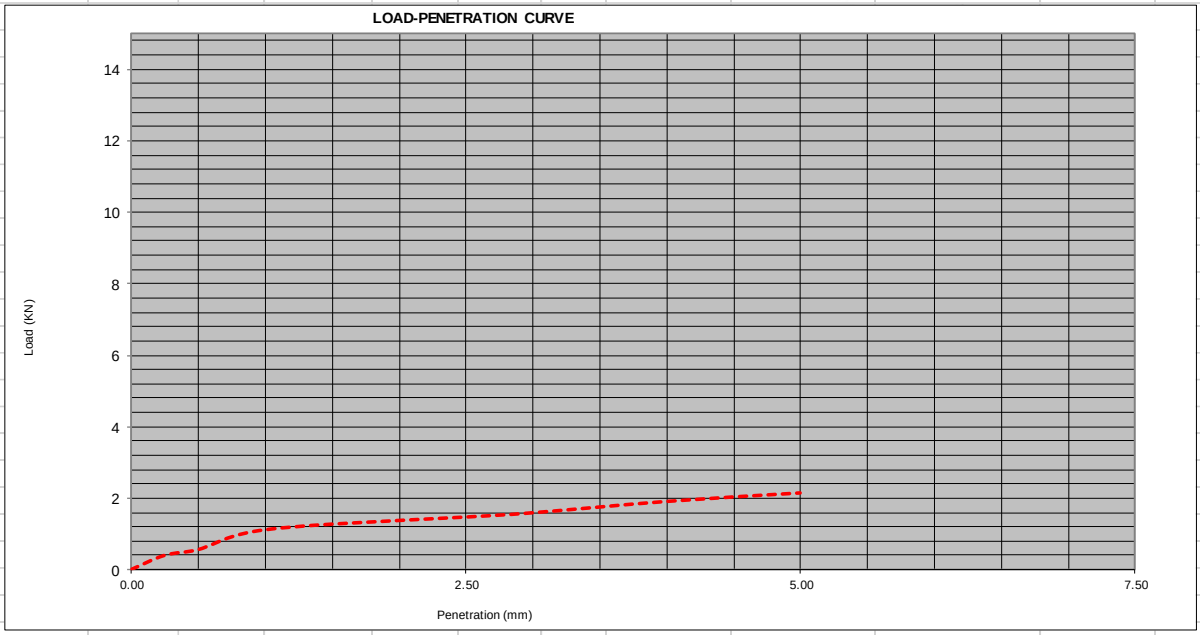
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD10**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.290
OMC (%) :	26.4

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.290	26.4		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.48	2.16	11	11	1.22

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.290	26.4	11	1.22
Parameters at 95% MDD	**1.226**	**25.1**	**11**	**1.16**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 11)

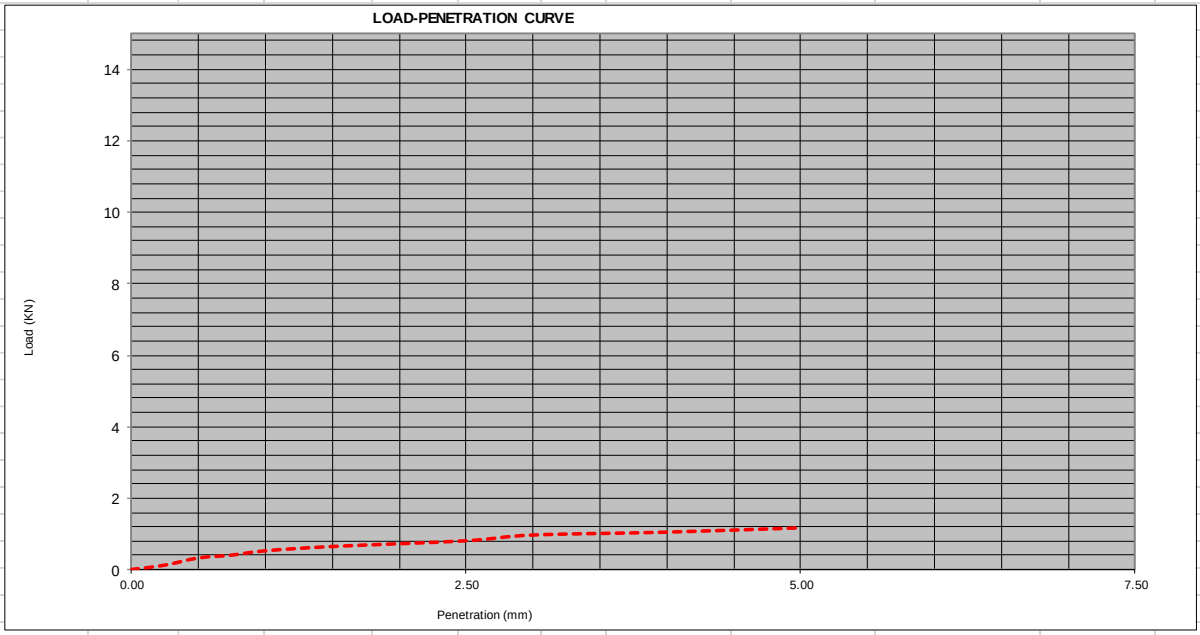
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD11**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.133
OMC (%) :	35.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.133	35.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.80	1.16	6	6	1.17

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.133	35.2	6	1.17
Parameters at 95% MDD	**1.076**	**33.5**	**6**	**1.11**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 12)

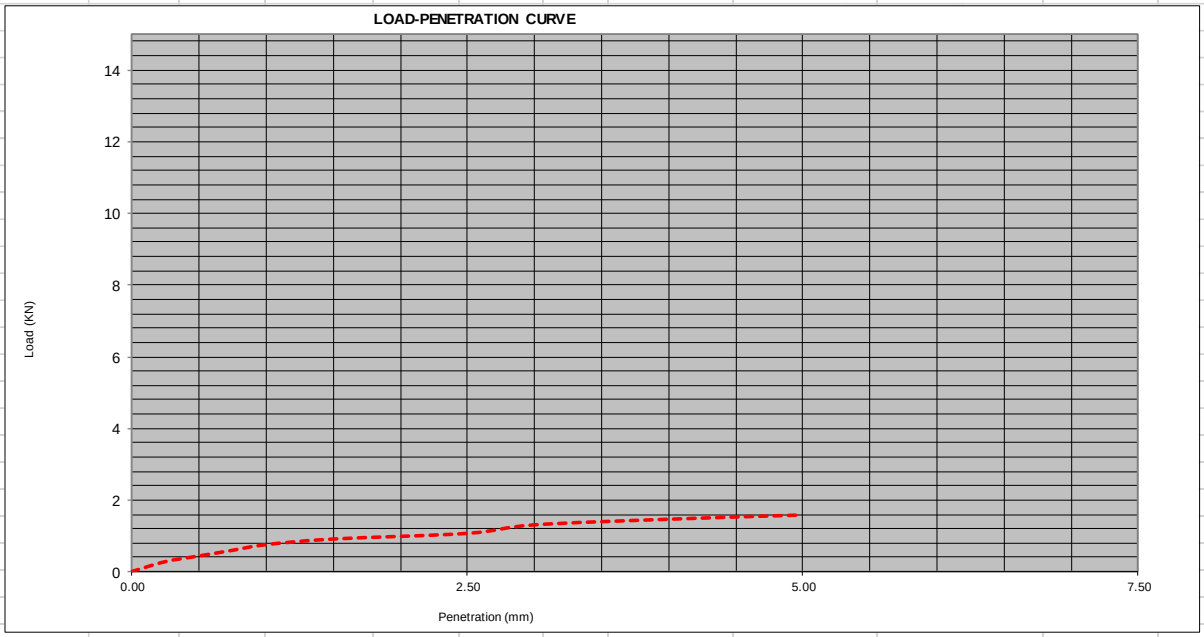
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD12**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.322
OMC (%) :	19.8

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.322	19.8		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.08	1.60	8	8	1.24

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.322	19.8	8	1.24
Parameters at 95% MDD	**1.256**	**18.8**	**8**	**1.18**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 14)

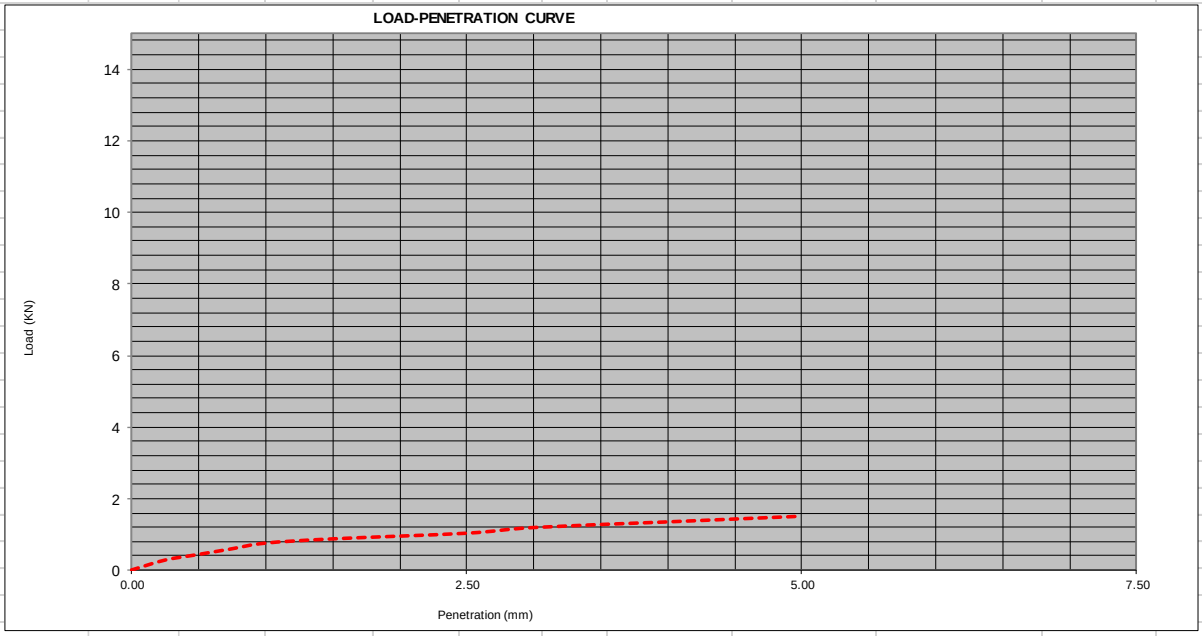
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD13**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.328
OMC (%) :	20.4

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.328	20.4		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.04	1.52	8	8	1.20

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.328	20.4	8	1.20
Parameters at 95% MDD	**1.262**	**19.4**	**7**	**1.14**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 14)

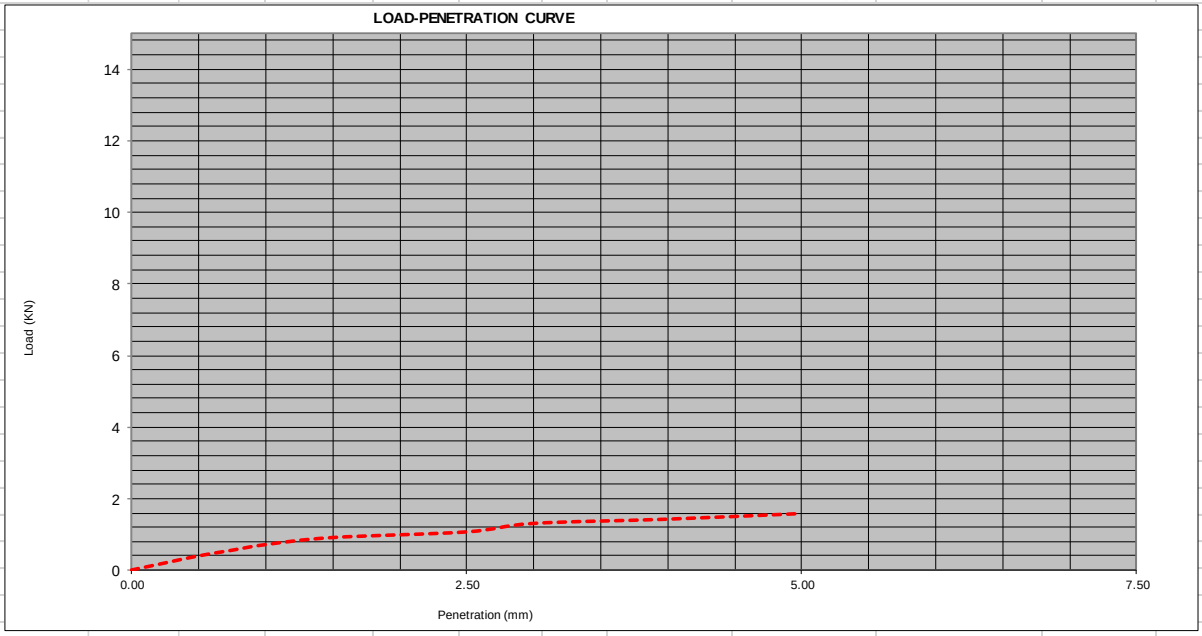
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD14**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.310
OMC (%) :	20.1

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.310	20.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.08	1.60	8	8	1.18

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.310	20.1	8	1.18
Parameters at 95% MDD	**1.244**	**19.1**	**8**	**1.12**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 15)

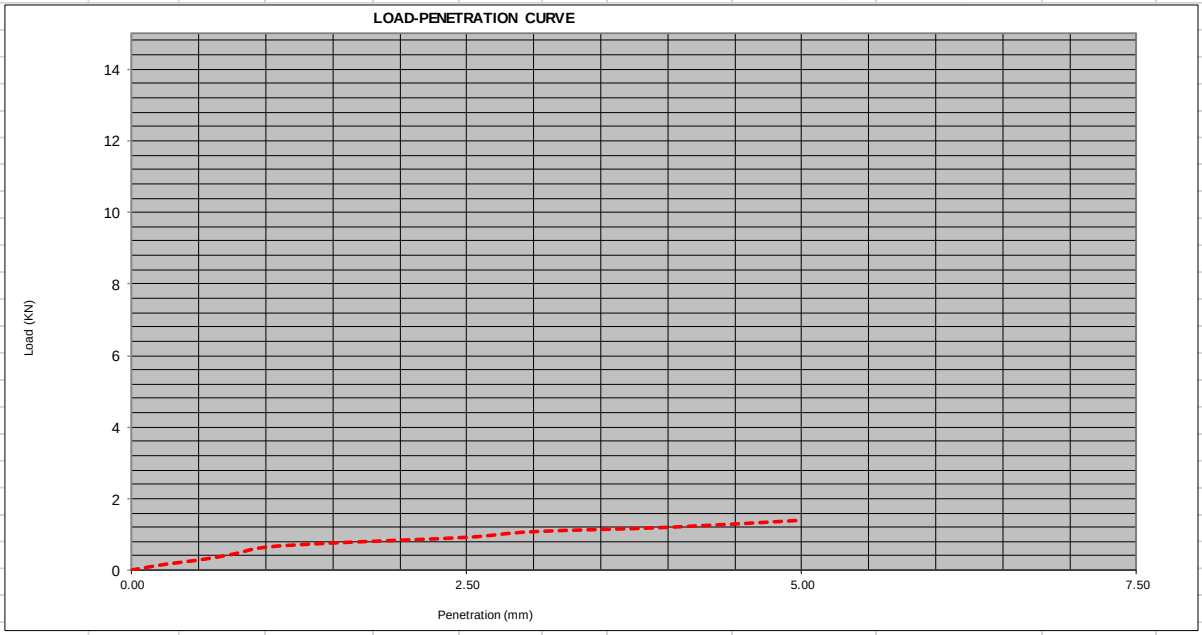
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD15**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.203
OMC (%) :	32.0

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.203	32.0		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.92	1.40	7	7	1.15

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.203	32.0	7	1.15
Parameters at 95% MDD	**1.143**	**30.4**	**7**	**1.09**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 16)

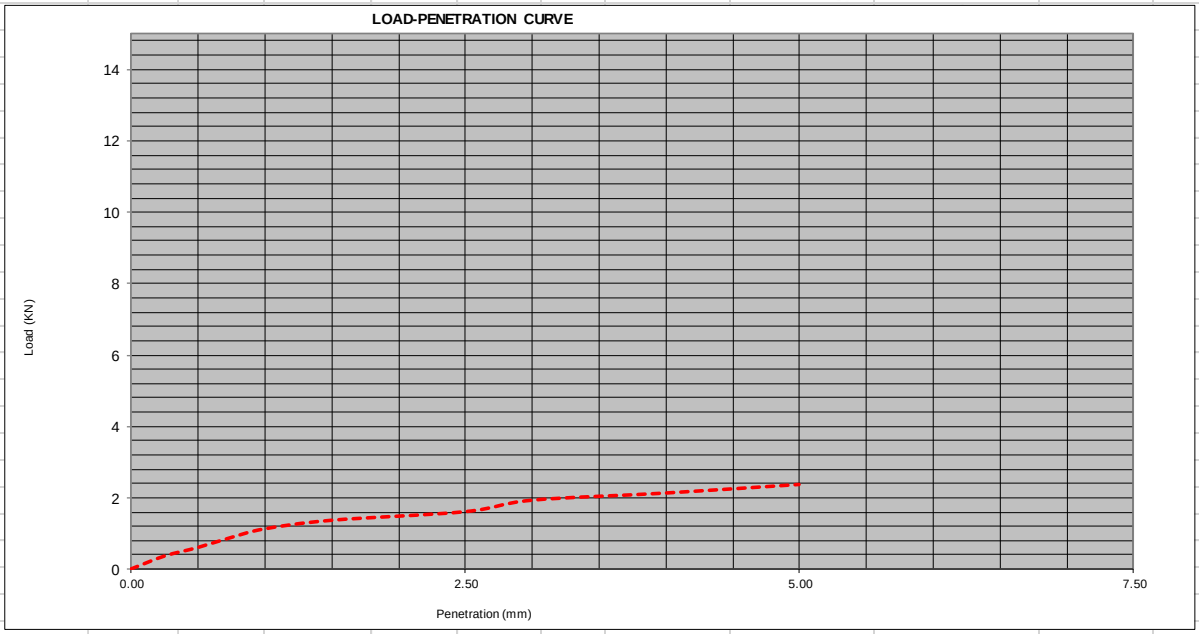
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD16**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.415
OMC (%) :	19.5

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.415	19.5		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.60	2.36	12	12	1.16

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.415	19.5	12	1.16
Parameters at 95% MDD	**1.344**	**18.5**	**11**	**1.10**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 17)

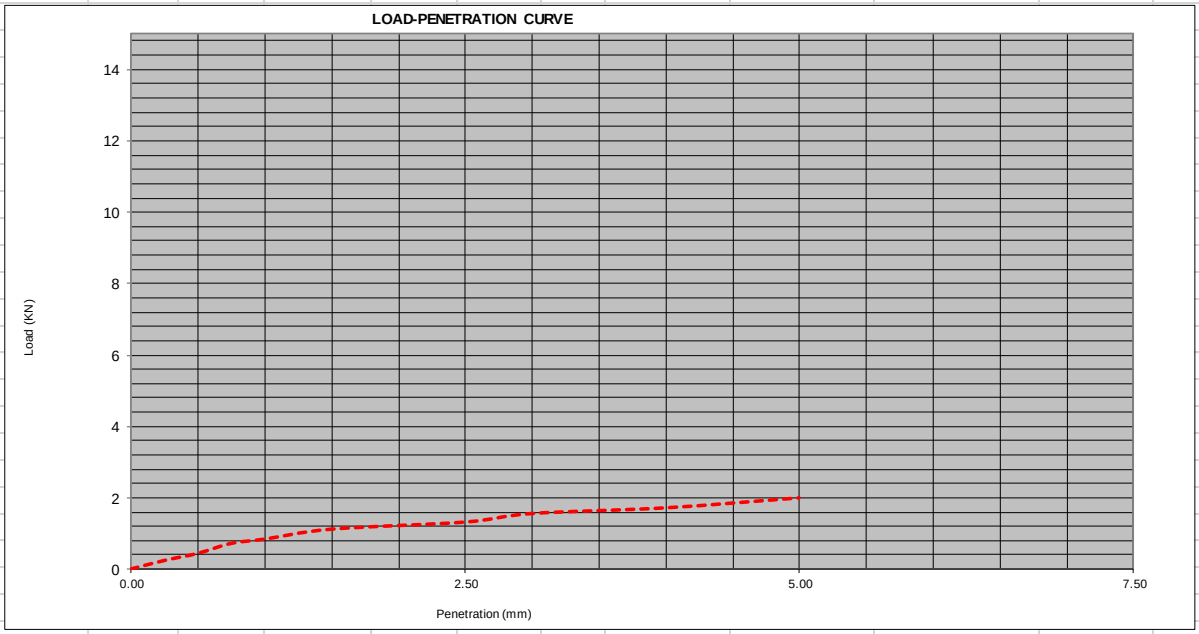
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD17**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.276
OMC (%) :	27.5

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.276	27.5		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	2.00	10	10	1.19

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.276	27.5	10	1.19
Parameters at 95% MDD	**1.212**	**26.1**	**9**	**1.13**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 18)

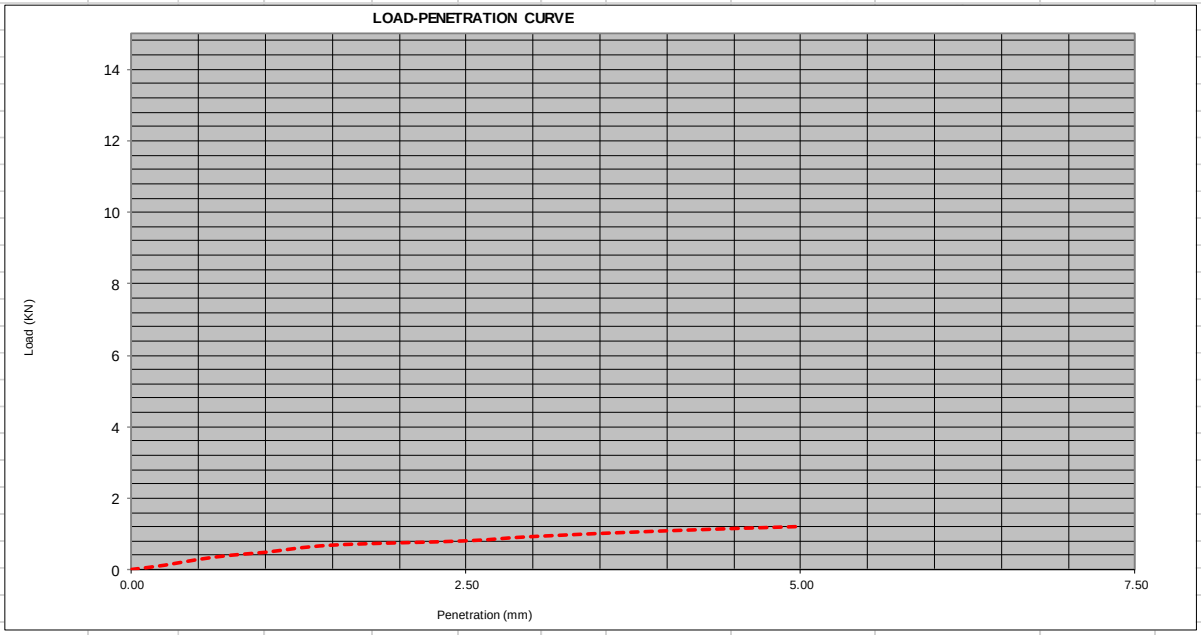
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD18**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.120
OMC (%) :	36.1

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.120	36.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.80	1.20	6	6	1.16

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.120	36.1	6	1.16
Parameters at 95% MDD	**1.064**	**34.3**	**6**	**1.10**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (DD 19)

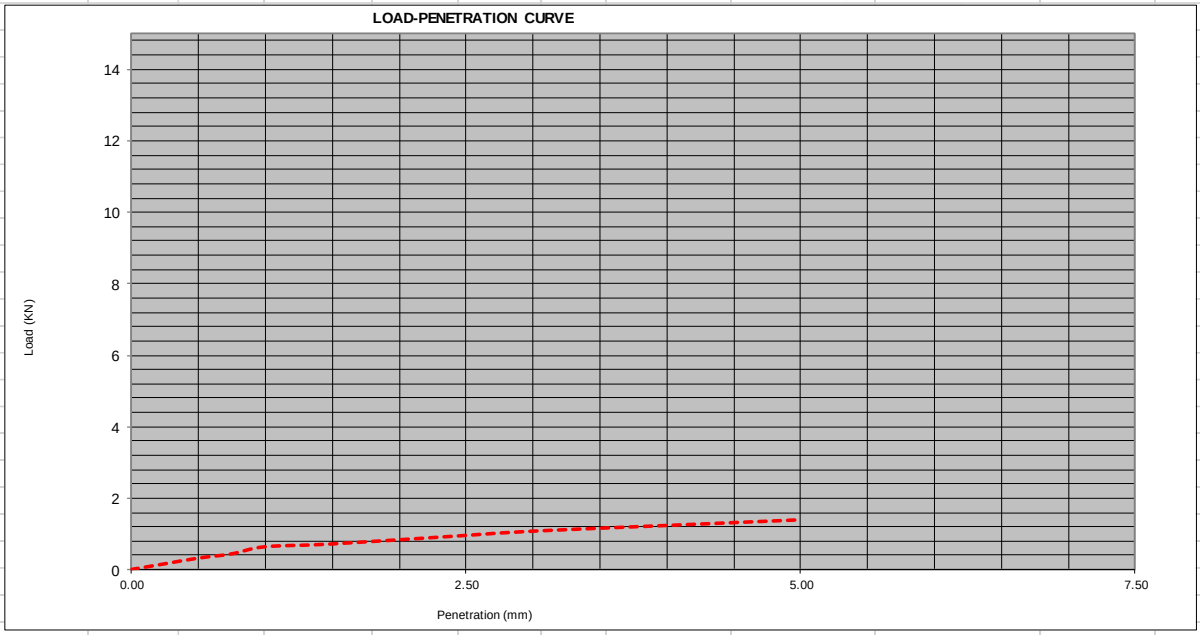
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD19**	**Test Date**	26/04/2025
Sampled By:		**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.224
OMC (%) :	32.4

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.224	32.4		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.96	1.40	7	7	1.18

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.224	32.4	7	1.18
Parameters at 95% MDD	**1.163**	**30.8**	**7**	**1.12**

TESTED BY: **Austine**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (DD 20)

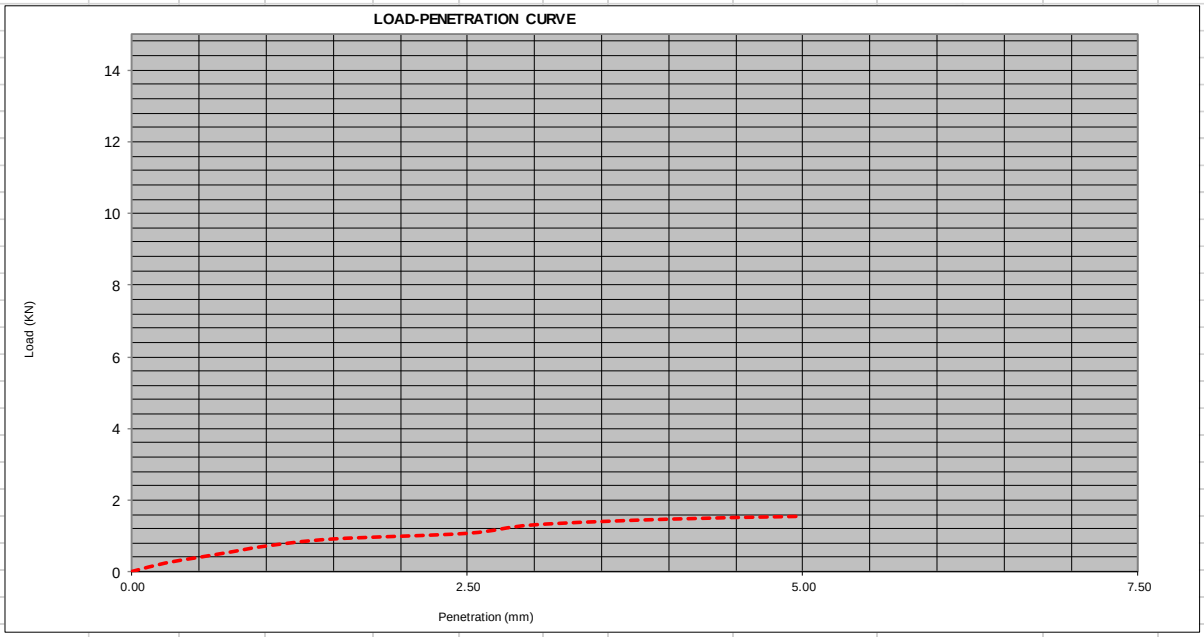
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**				
Depth Range:		**Location:**	**DD20**	**Test Date**	26/04/2025
Sampled By:	Ben	**Tested By**	Austine		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.339
OMC (%) :	20.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.339	20.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.08	1.56	8	8	1.22

Blow	Dry density	Moisture	CBR%	Swell
10				
30				
62	1.339	20.6	8	1.22
Parameters at 95% MDD	**2.000**	**19.6**	**8**	**1.16**

TESTED BY: **Austine**
PREPARED BY: **Joy**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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CBR TEST RESULTS PRELIMINARY DESIGN

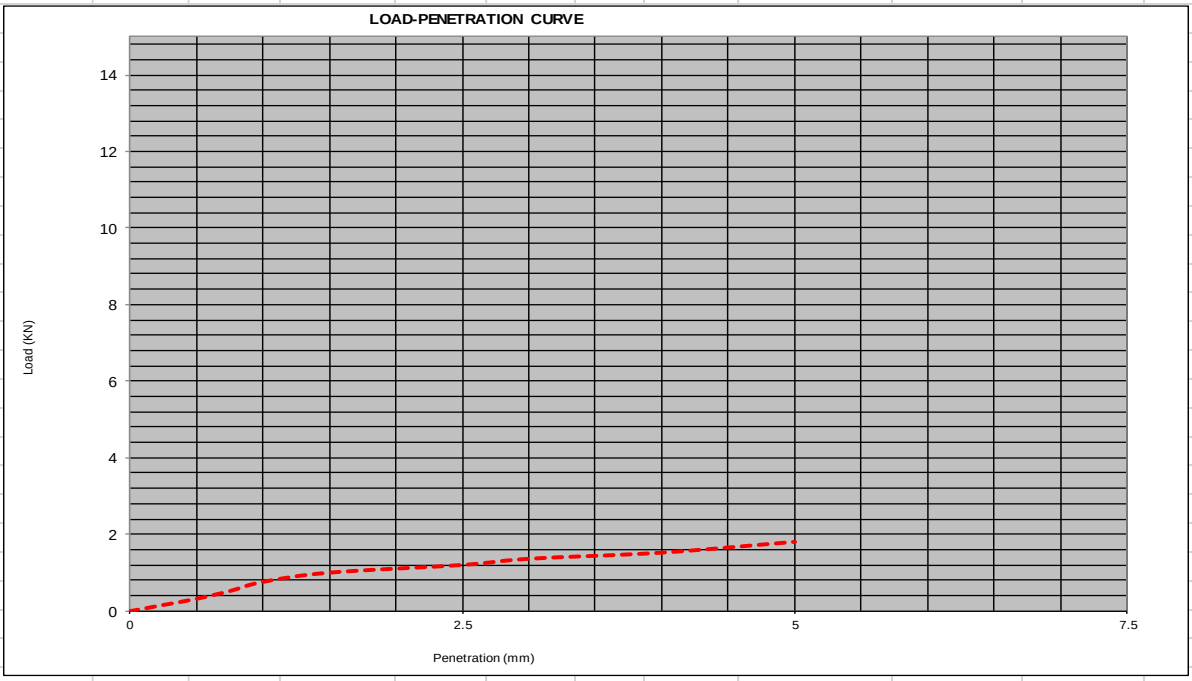
TRIAL PIT NO. (PD 1)

CLIENT:		**EGIS CONSULTANTS LIMITED**				
PROJECT:		**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.1	**m**	**Location:**	TP 1	**Test Date**	15/9/2024
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.320	30.7		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.80	9	9	0.85

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.320	30.7	9	0.85
CBR at 100% MDD		**29.2**	**9**	**0.81**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.TW Signature: _____

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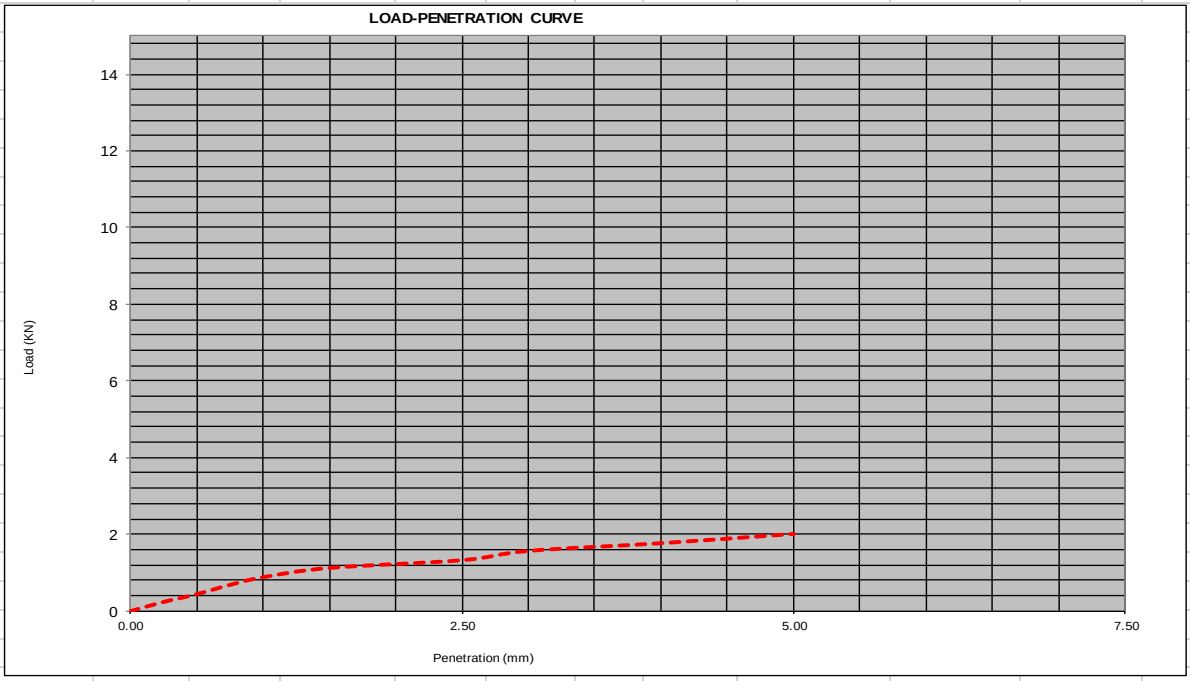
TRIAL PIT NO. (PD 2)

CLIENT:		**EGIS CONSULTANTS LIMITED**			
PROJECT:		**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**			
Depth Range:	1.0 **m**	**Location:**	TP 2	**Test Date**	15/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.343	31.8		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	2.00	10	10	0.76

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.343	31.8	10	0.76
CBR at 100% MDD		**30.2**	**9**	**0.73**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.T.W Signature: _____

ENG. NJOROGE T. WAIHARE
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 3)

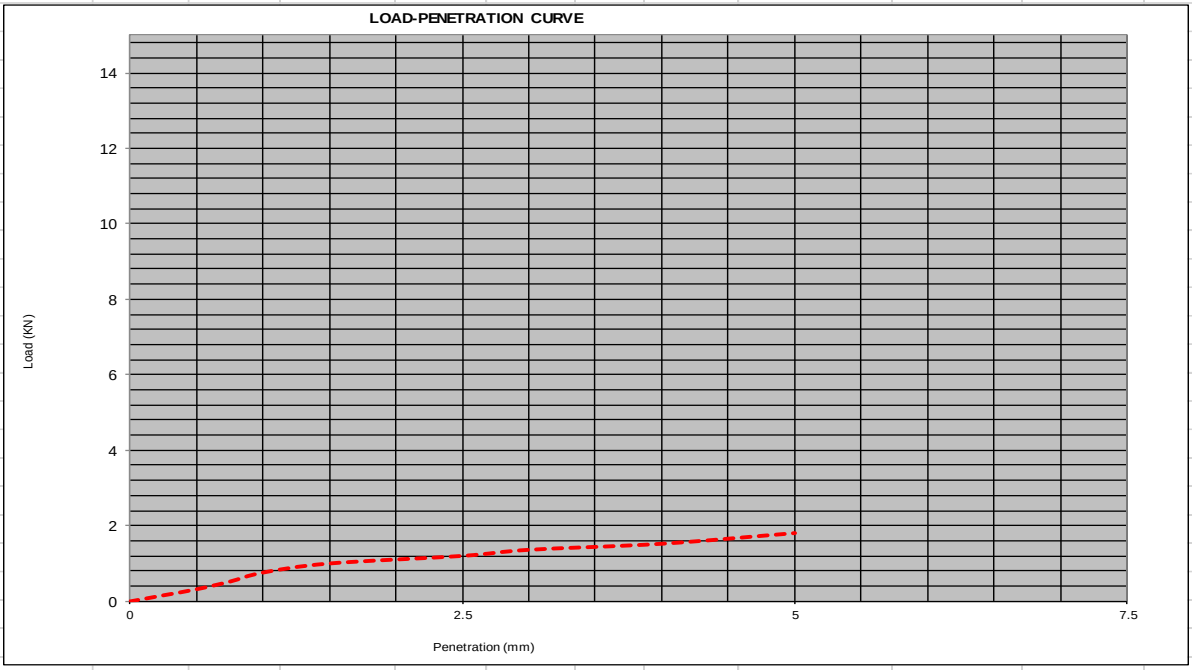
CLIENT:		**EGIS CONSULTANTS LIMITED**				
PROJECT:		**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Alignment (Mjini Road)						
Depth Range:	1.1	**m**	**Location:**	TP3	**Test Date**	15/9/24
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.330	32.4		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.80	9	9	0.80

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.330	32.4	9	0.80
CBR at 100% MDD		**30.8**	**9**	**0.76**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature:_____

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TRIAL PIT NO. (PD 4)

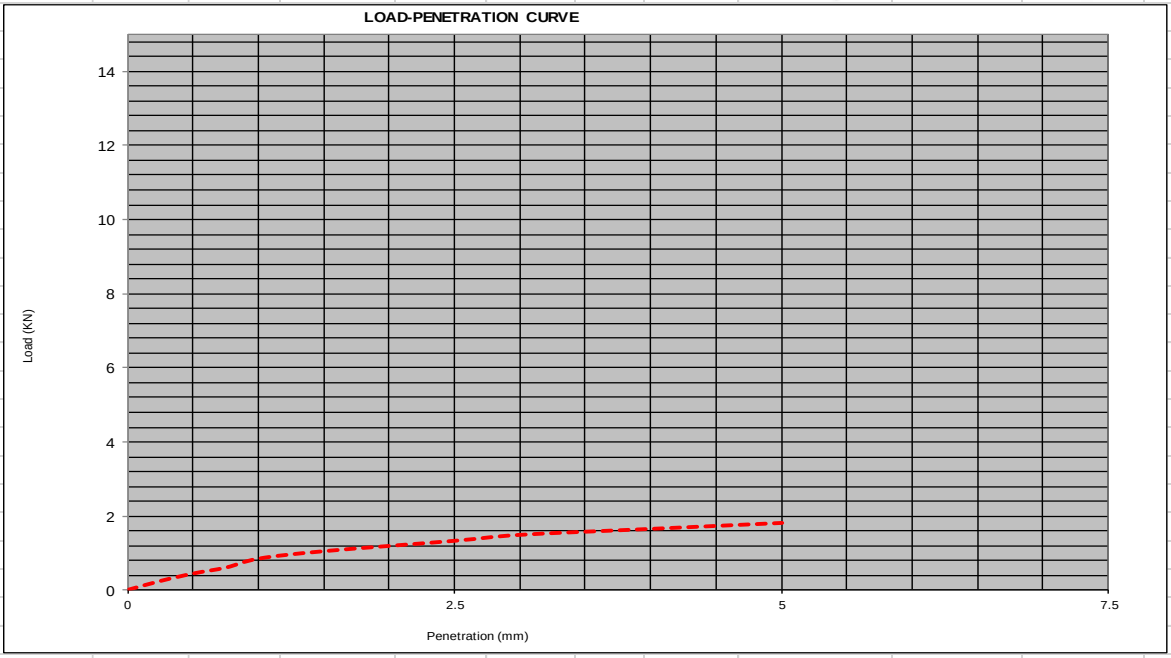
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.1 **m**	**Location:**	TP50	**Test Date**	15/9/24
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.313	26.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	1.80	10	9	0.90

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.313	26.2	10	0.90
CBR at 100% MDD		**24.9**	**9**	**0.85**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature:_____

ENG. NJOROGE T. WAIHARE
LICENSED CONSULTING ENGINEER
E410
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TRIAL PIT NO. (PD 5)

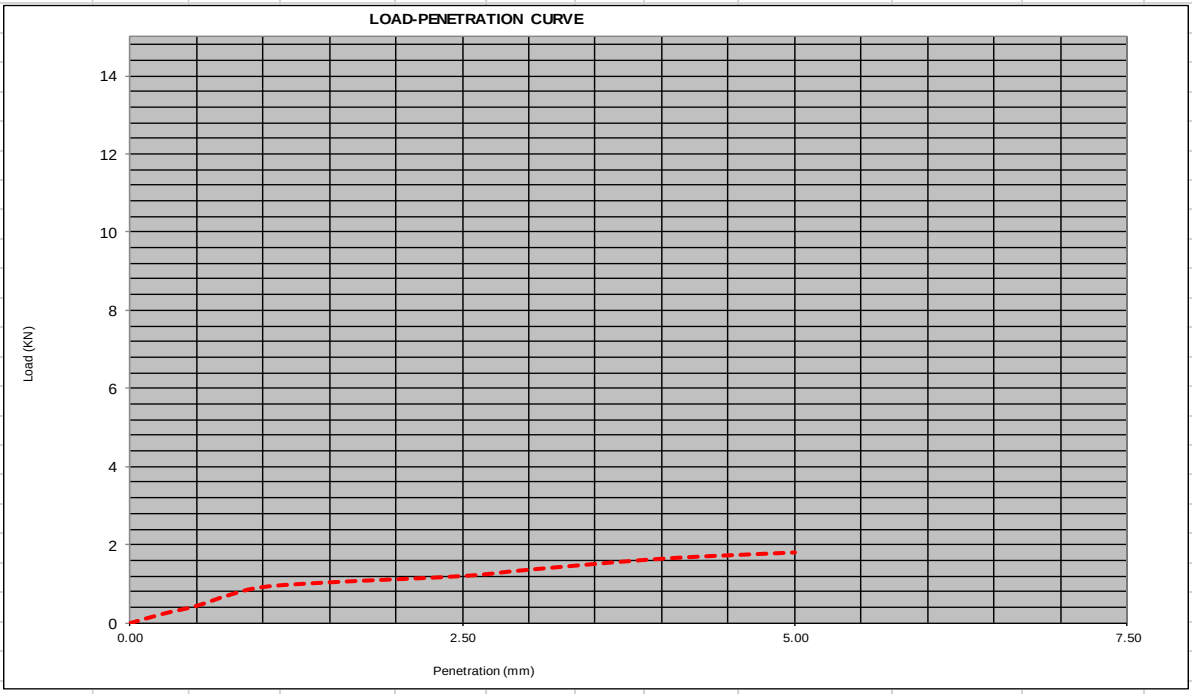
CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**

Depth Range:	1.2	**m**	**Location:**	TP 5	**Test Date**	15/9/2024
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.317	31.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.80	9	9	0.80

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.317	31.6	9	0.80
CBR at 100% MDD		**30.0**	**9**	**0.76**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature: _____

ENG. NJORGE WAHARA
LICENSED CONSULTING ENGINEER
E410
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TRIAL PIT NO. (PD 8)

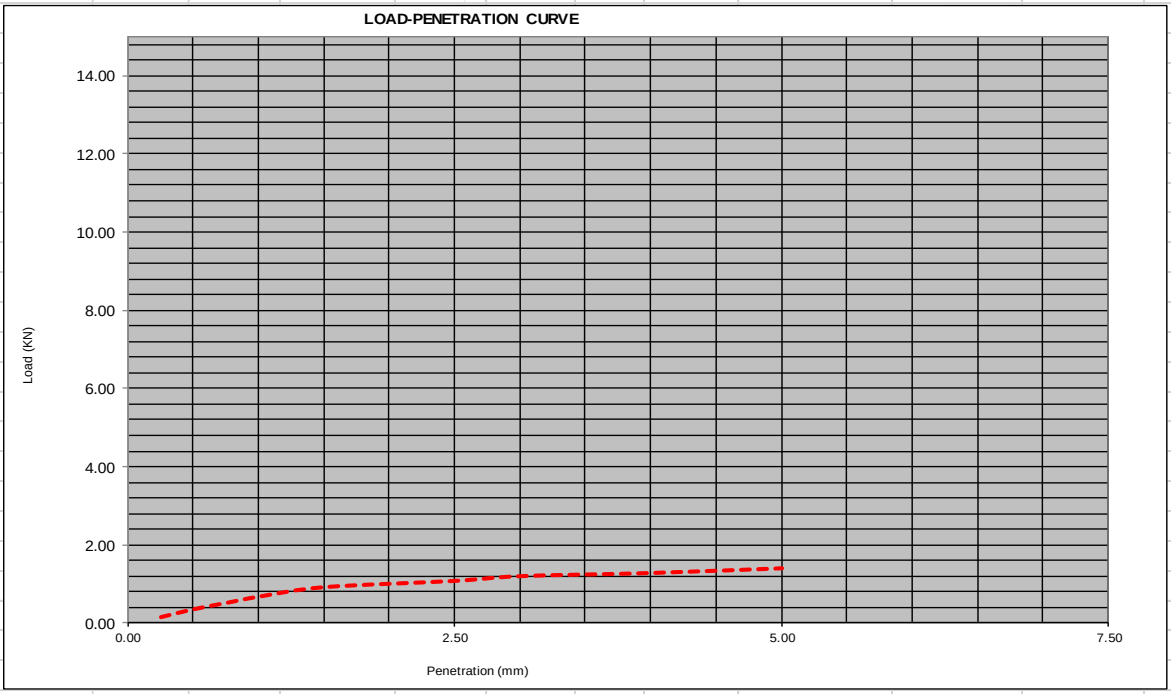
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	0.8 m	**Location:**	TP8	**Test Date**	16/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.296	34.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.40	8	7	0.91

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.296	34.2	8	0.91
CBR at 100% MDD		**32.5**	**8**	**0.86**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature: _____

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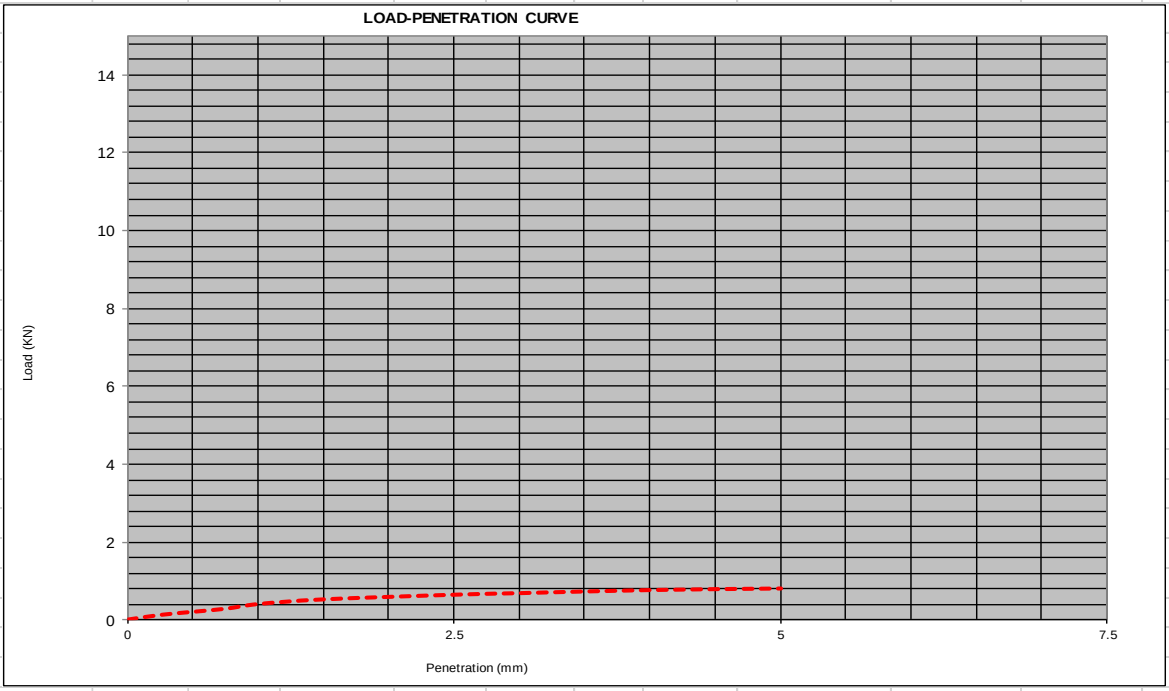
TRIAL PIT NO. (PD 9)

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.1 **m**	**Location:**	TP 9	**Test Date**	16/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.229	32.7		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.64	0.80	5	4	0.94

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.229	32.7	5	0.94
CBR at 100% MDD		**31.0**	**5**	**0.89**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.T.W Signature: _____

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TRIAL PIT NO. (PD 10)

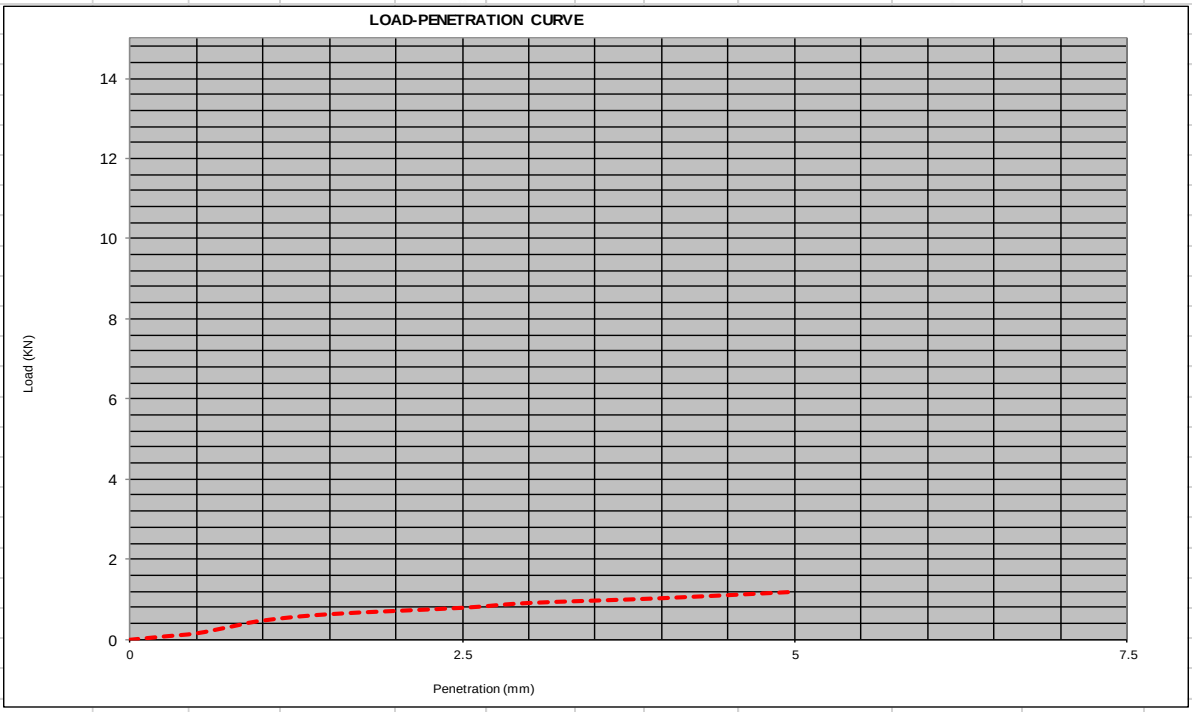
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.1 m	**Location:**	TP 10	**Test Date**	16/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.264	30.3		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.80	1.20	6	6	0.98

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.264	30.3	6	0.98
CBR at 100% MDD		**28.8**	**6**	**0.93**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.TW Signature: _____

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TRIAL PIT NO. (PD 11)

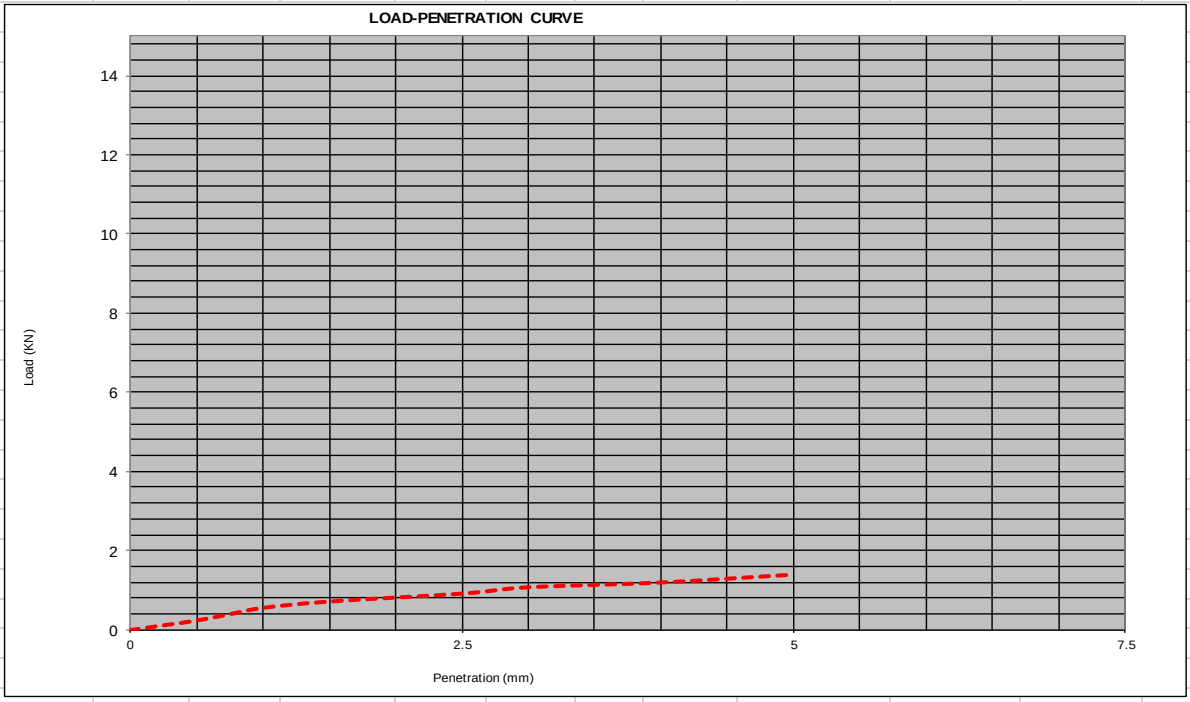
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.0 m	**Location:**	TP11	**Test Date**	17/9/24
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.295	33.5		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	0.92	1.40	7	7	0.90

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.295	33.5	7	0.90
CBR at 100% MDD		**31.9**	**7**	**0.85**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.T.W Signature: _____

ENG. NJOROGE T. WAIHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 13)

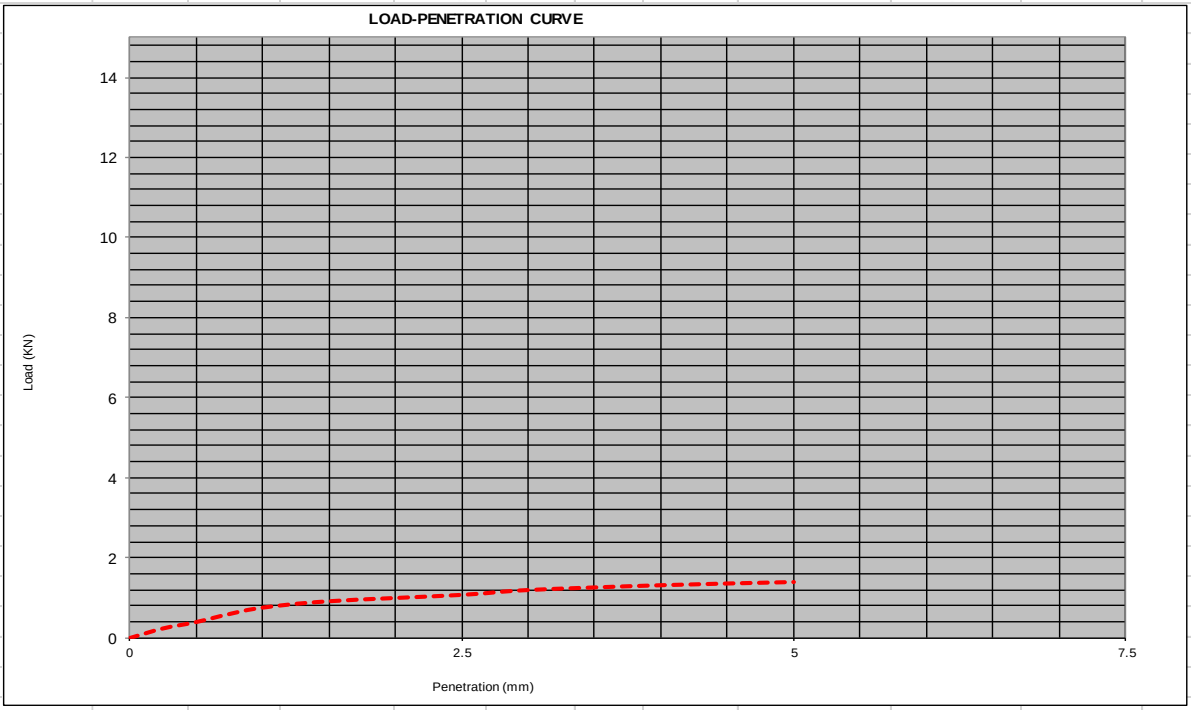
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.0 **m**	**Location:**	TP13	**Test Date**	17/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.286	28.4		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.08	1.40	8	7	0.86

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.286	28.4	8	0.86
CBR at 100% MDD		**27.0**	**8**	**0.82**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.TW Signature: _____

ENG. NJOROGE T. WAHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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APEX PROJECTS

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (PD 14)

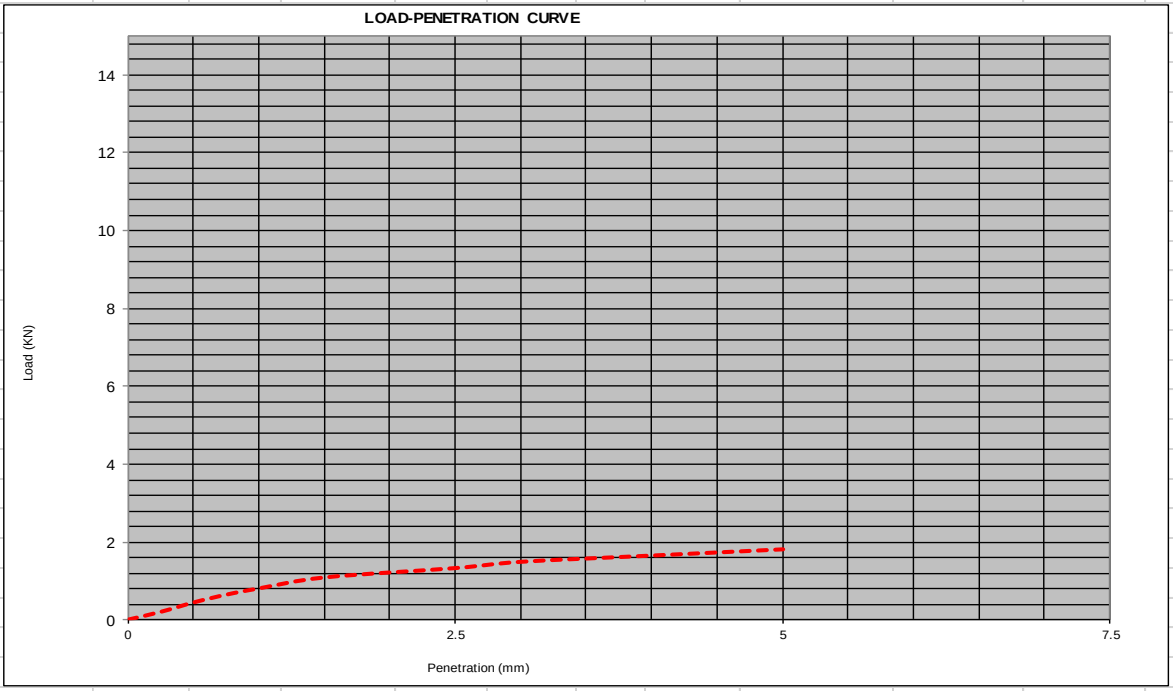
CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**

Depth Range:	1.2	m	**Location:**	TP 14	**Test Date**	17/9/2024
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.305	29.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	1.80	10	9	0.78

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.305	29.1	10	0.78
CBR at 100% MDD		**27.7**	**9**	**0.74**

TESTED BY: MLL
PREPARED BY: MLL
APPROVED BY ENG.T.W Signature: _____

ENG. NJOROGE T. WAIHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 15)

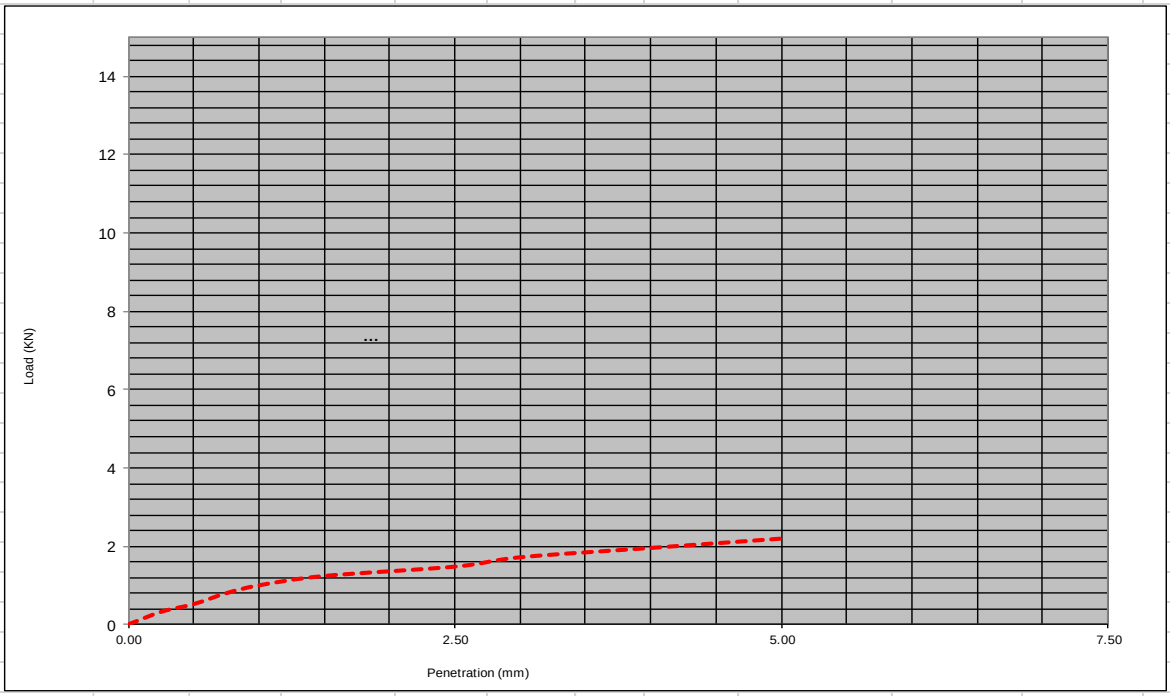
CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**

Depth Range:	1.2	**m**	**Location:**	TP15	**Test Date**	18/9/2024
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.314	32.0		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.48	2.20	11	11	0.80

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.314	32.0	11	0.80
CBR at 100% MDD		**30.4**	**11**	**0.76**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.TW Signature: _____

ENG. NJOROGE T. WAHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 16)

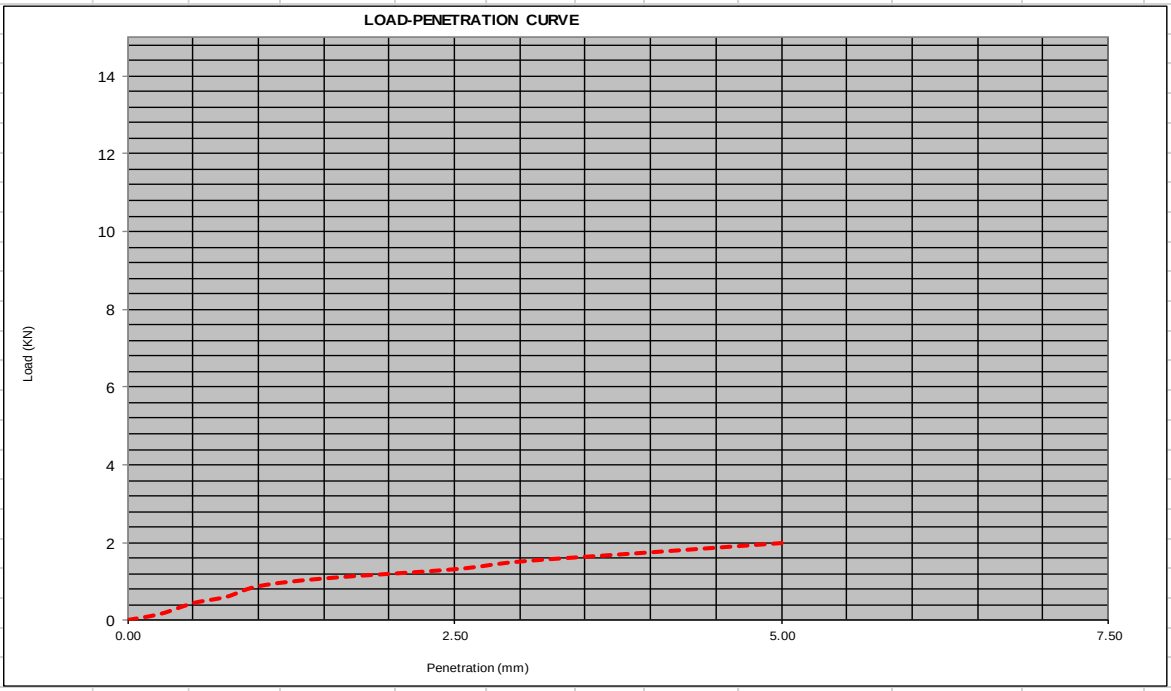
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	1.2 **m**	**Location:**	TP 16	**Test Date**	18/9/24
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.311	31.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	2.00	10	10	0.86

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.311	31.1	10	0.86
CBR at 100% MDD		**29.5**	**9**	**0.82**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature: _____

ENG. NJOROGE T. WAIHARE
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 17)

CLIENT:	EGIS CONSULTANTS LIMITED
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

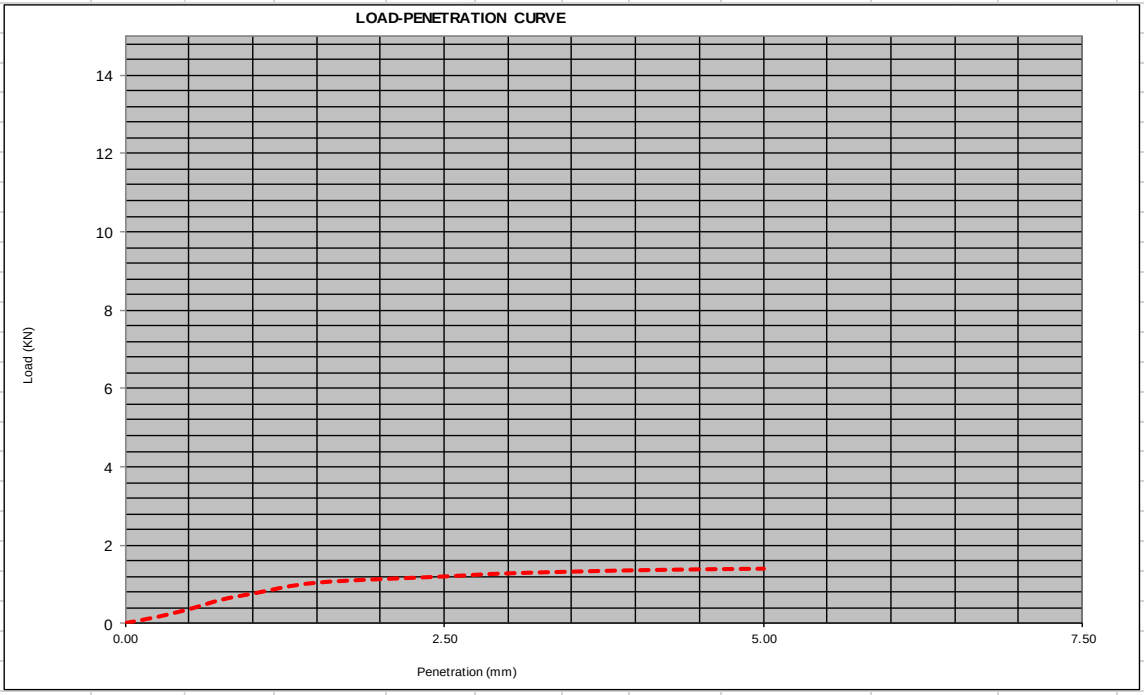
Depth Range:	1.1	m	**Location:**	TP 17	**Test Date**	18/9/2021
Sampled By:	Ben		**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.297	32.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.20	1.40	9	7	0.84

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.297	32.2	9	0.84
CBR at 100% MDD		**30.6**	**9**	**0.80**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY ENG.T.W Signature:_____

ENG. NJOROGE T. WAIHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (PD 18)

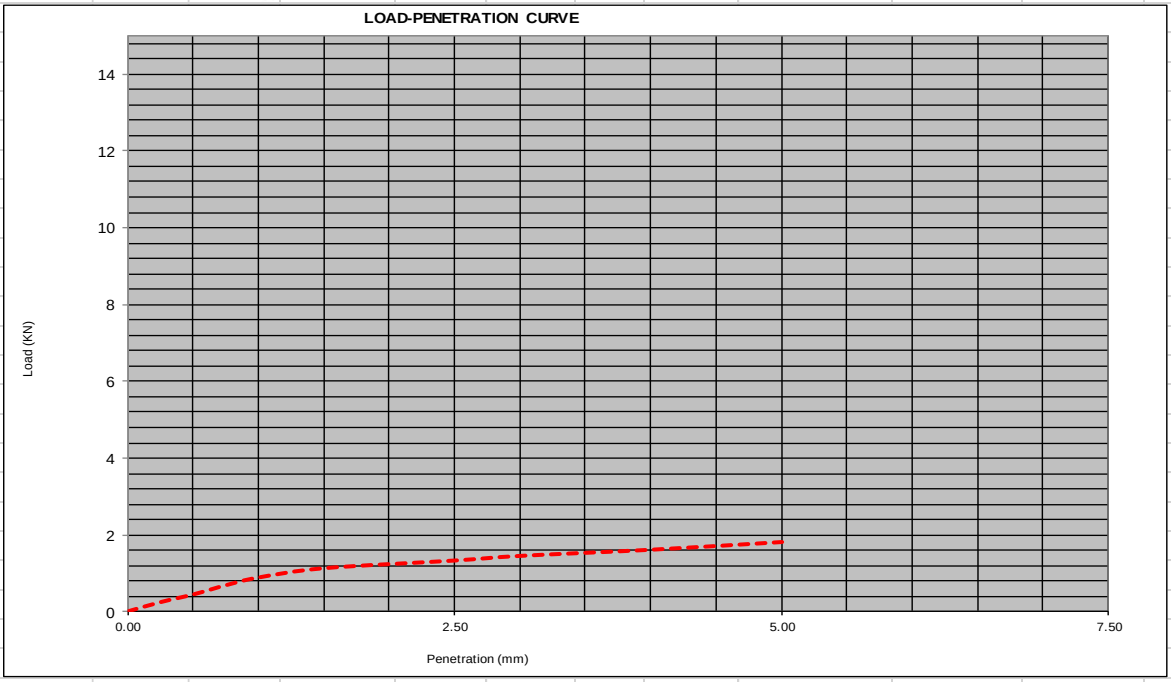
CLIENT:	**EGIS CONSULTANTS LIMITED**
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**

Depth Range:	1.0 **m**	**Location:**	TP 18	**Test Date**	18/9/2024
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/T99, METHOD D
MDD (g/cc) :	1.911
OMC (%) :	11.30

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.290	32.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	1.32	1.80	10	9	0.80

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.290	32.6	10	0.80
CBR at 100% MDD		**30.9**	**9**	**0.76**

TESTED BY: Ben
PREPARED BY: Austine
APPROVED BY: ENG.T.W Signature:_____

ENG. NJOROGE T. WAIHARE
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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Appendix 3: Material Sites Results

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

SUMMARY SHEET DETAILED DESIGN

Location	Particle Size Distribution						Atterberg Limits						Compaction		CBR			Material Description
	% Passing Sieve Size (mm)						NMC	LL	PL	PI	LS	PM	OMC	MDD	C.B.R	4-Day Soak	Swell	
	20	10	5	2	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	%	
MS 1 TP1 Nkunga Material Site															90	44	0.06	Brownish angular, volcanic GRAVEL, dry,non-plastic
															95	92	0.08	
	100.0	86.5	64.5	43.1	14.7	9.6	5.4	NON-PLASTIC					11.6	1924	100	193	0.12	
MS 1 TP2 Nkunga Material Site															90	22	0.06	Brownish angular, volcanic GRAVEL, dry,non-plastic
															95	45	0.05	
	100.0	86.0	66.7	45.6	17.8	12.5	4.4	NON-PLASTIC					12.4	1923	100	93	0.09	
MS 1 TP3 Nkunga Material Site															90	51	0.07	Brownish angular, volcanic GRAVEL, dry,non-plastic
															95	94	0.08	
	100.0	87.0	68.1	49.4	24.1	19.3	4.5	NON-PLASTIC					10.5	1933	100	183	0.09	
MS 1 TP4 Nkunga Material Site															90	47	0.08	Brownish angular, volcanic GRAVEL, dry,non-plastic
															95	88	0.10	
	100.0	83.1	61.1	40.2	10.8	4.7	6.2	NON-PLASTIC					12.2	1943	100	172	0.06	
MS 1 TP5 Nkunga Material Site															90	30	0.11	Brownish angular, volcanic GRAVEL, dry,non-plastic
															95	47	0.06	
	100.0	86.4	65.6	45.7	18.9	13.4	6.2	NON-PLASTIC					13.4	1935	100	92	0.11	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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MS 2 TP1															90	23	0.09	Light grey angular GRAVEL, dry,non-plastic
Rugusu															95	47	0.06	
Material Site	100.0	95.9	88.5	80.8	60.4	53.2	5.4	NON-PLASTIC					15.3	1623	100	97	0.06	
MS 2 TP2															90	24	0.08	Light grey angular GRAVEL, dry,non-plastic
Rugusu															95	49	0.11	
Material Site	100.0	96.1	88.6	80.8	59.0	51.9	5.0	NON-PLASTIC					14.5	1625	100	101	0.08	
MS 2 TP3															90	25	0.06	Greyish angular GRAVEL, dry,non-plastic
Rugusu															95	50	0.08	
Material Site	100.0	96.8	89.7	81.9	60.6	53.5	4.5	NON-PLASTIC					15.2	1638	100	100	0.09	
MS 2 TP4															90	16	0.06	Light brown angular GRAVEL, dry,non-plastic
Rugusu															95	33	0.06	
Material Site	100.0	95.9	89.7	83.1	63.6	58.2	9.0	NON-PLASTIC					15	1609	100	67	0.06	
MS 2 TP5															90	24	0.07	Light grey angular GRAVEL, dry,non-plastic
Rugusu															95	49	0.08	
Material Site	100.0	95.4	88.7	81.4	62.6	56.0	5.0	NON-PLASTIC					15.2	1625	100	99	0.11	

APEX PROJECTS LIMITED

Specialists in Site Investigation, Quality Control and Material Testing

P.O. Box 10782-00100, Tel/Fax: 3871985 NAIROBI

SUMMARY OF MATERIAL SITE SOIL TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

DATE: 29/4/2025

CLIENT:EGIS CONSULTANTS LIMITED

SHEET No.2025/02



The results contained herein apply only to the particular sample(s) tested whose sample submission form serial number is herein quoted, and to the specific tests carried out, as detailed in this test report. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, APEX PROJECTS LIMITED. If undelivered, please return to the address written above

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SUMMARY SHEET PRELIMINARY DESIGN

Location	Particle Size Distribution						Atterberg Limits						Compaction		CBR		Remarks
	% Passing Sieve Size (mm)						NMC	LL	PL	PI	LS	PM	OMC	MDD	4-Day Soak	Swell	
	20	10	5	2	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	
MS 1 TP1 Rugusu	100.0	93.8	86.1	74.2	48.9	31.4	13.5	NON-PLASTIC					19.5	1596	32	0.05	Light brown angular GRAVEL, dry,non-plastic
MS 1 TP2 Rugusu	100.0	96.1	91.6	80.9	66.1	56.0	9.4	NON-PLASTIC					17.8	1572	29	0.10	Greyish angular GRAVEL, dry,non-plastic
MS 1 TP3 Rugusu	100.0	92.7	83.3	70.8	38.7	27.7	9.8	NON-PLASTIC					18.2	1583	31	0.09	Light grey angular GRAVEL, dry,non-plastic
MS 1 TP4 Rugusu	100.0	88.4	77.3	69.3	44.5	31.6	15.9	NON-PLASTIC					21.9	1716	39	0.11	Light grey angular GRAVEL, dry,non-plastic
MS 1 TP5 Rugusu	100.0	89.9	76.1	60.7	40.4	29.8	10.2	NON-PLASTIC					18.3	1754	48	0.08	Light grey angular GRAVEL, dry,non-plastic

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ENGINEERS BOARD OF KENYA LICENSED CONSULTING ENGINEER E410

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

MS 2 TP1 Nchoroiboro	100.0	95.5	89.0	74.7	55.4	45.6	9.6	NON-PLASTIC					18.0	1812	53	0.05	Brownish grey angular, volcanic GRAVEL, dry,non-plastic
MS 2 TP2 Nchoroiboro	100.0	97.5	94.5	84.0	63.9	50.5	6.2	NON-PLASTIC					16.3	1934	57	0.04	Greyish angular, volcanic GRAVEL, dry,non-plastic
MS 2 TP3 Nchoroiboro	100.0	94.5	83.7	56.9	36.9	20.4	11.7	NON-PLASTIC					21.1	1699	36	0.10	Greyish angular, volcanic GRAVEL, dry,non-plastic
MS 2 TP4 Nchoroiboro	100.0	96.6	87.9	72.5	53.1	39.1	11.8	NON-PLASTIC					21.6	1785	34	0.14	Brownish grey angular, volcanic GRAVEL, dry,non-plastic
MS 2 TP5 Nchoroiboro	100.0	95.3	87.8	76.5	47.8	35.2	11.0	NON-PLASTIC					17.6	1791	36	0.08	Brownish grey angular, volcanic GRAVEL, dry,non-plastic

SUMMARY OF SOIL TEST RESULTS

APEX PROJECTS LIMITED

Specialists in Site Investigation, Quality Control and Material

P.O. Box 10782-00100, Tel/Fax: 3871985 NAIROBI

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED

DATE: 9/10/2024

SHEET No. 2024/02

ENG. NJOROGE WAHARO
LICENSED CONSULTING ENGINEER
F410
ENGINEERS BOARD OF KENYA

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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

GRADING AND ATTERBERG TEST RESULTS DETAILED DESIGN

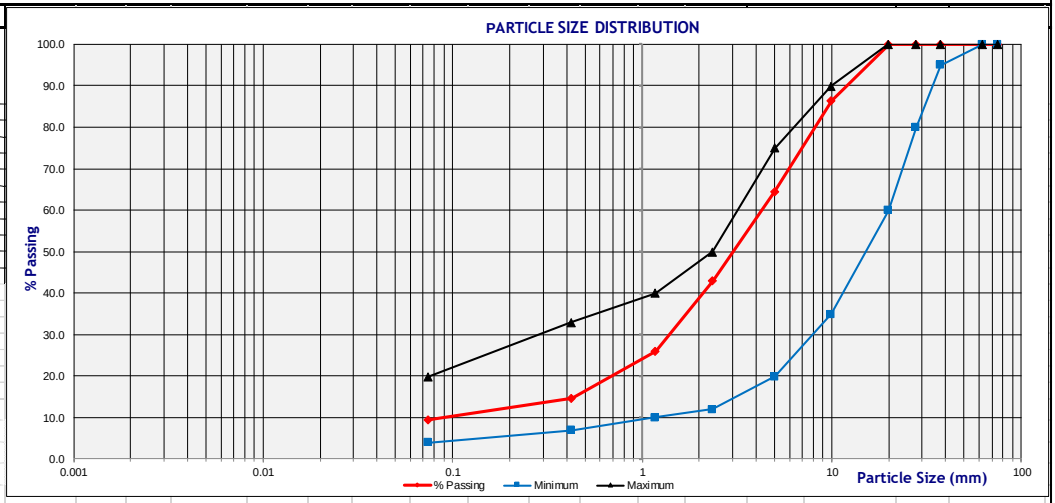
TRIAL PIT NO. (TP 1) NKUNGA MS 1

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS1 TP1 Nkunga Material Site	Test Date:	Tuesday, 22 April 2025	

PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

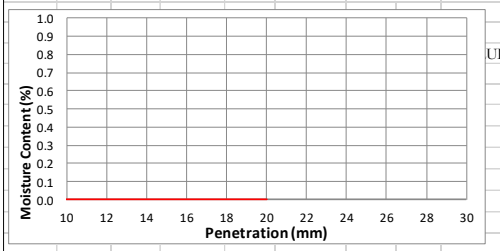
Wt. of Dry Sample		820.5	
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	110.5	86.5	35
5	180.5	64.5	20
2.36	175.6	43.1	12
1.18	140.5	26.0	10
0.425	92.6	14.7	7
0.075	42.4	9.6	4
		D10	
		D30	
		D60	



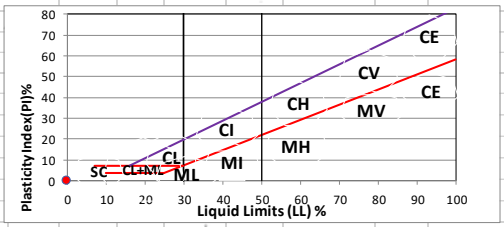
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%)
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s



UE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3				
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW							
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.						
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7							

USCS CLASSIFIED SOIL					USCS POSSIBLE CLASSIFICATION
DESCRIPTION:					#REF!
			Plasticity Modulus	###	

KEY							
CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 2) NKUNGA MS 1

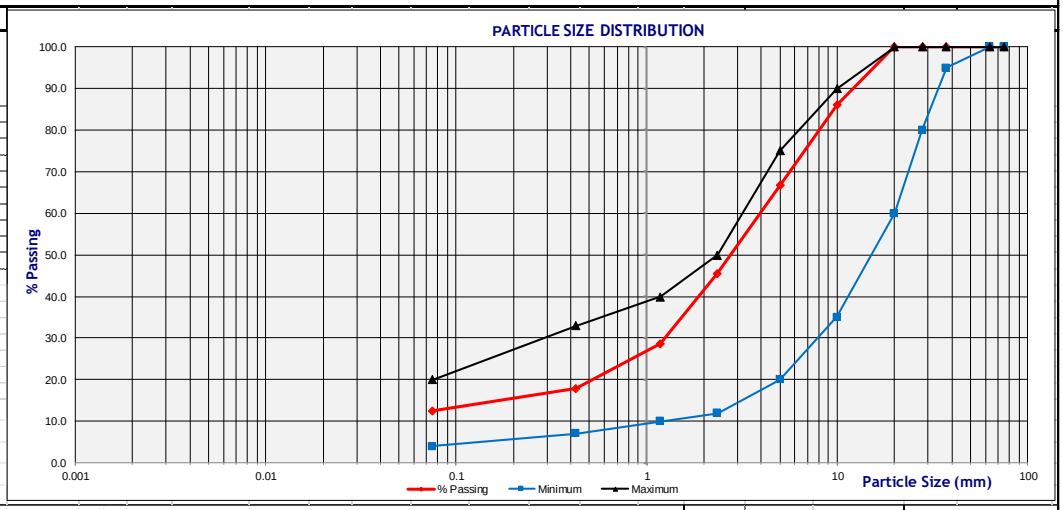
CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS1 TP2 Nkunga Material Site	Test Date:	Tuesday, 22 April 2025	

PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample: 855.2

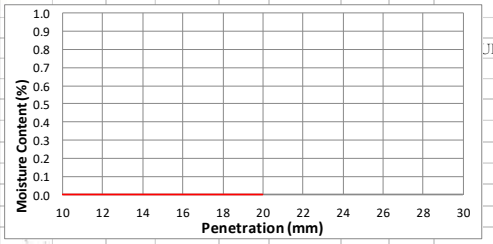
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	119.5	86.0	35
5	165.4	66.7	20
2.36	180.4	45.6	12
1.18	145.5	28.6	10
0.425	92.3	17.8	7
0.075	45.6	12.5	4
			D10
			D30
			D60

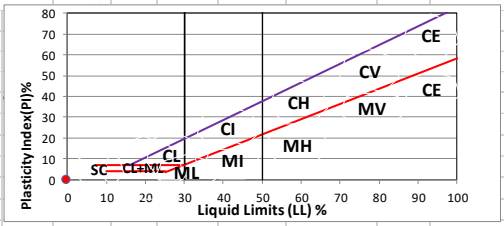


ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%)
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW	GP	Not meeting all gradation requirements for GW
SM	Atterberg limits below "A" Line or P.I. Less than 4	GM	Atterberg limits below "A" Line or P.I. Less than 4
SC	Atterberg limits above "A" Line or P.I. greater than 7	GC	Atterberg limits above "A" Line or P.I. greater than 7

Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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LICENSED CONSULTING ENGINEER
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ENGINEERS BOARD OF KENYA

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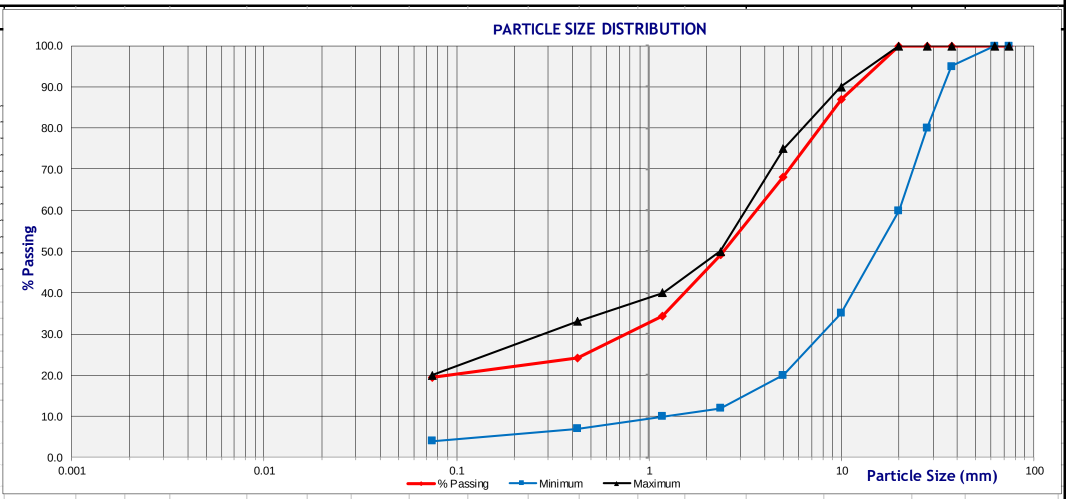
TRIAL PIT NO. (TP 3) NKUNGA MS 1

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
				Sampled By:	Ben	Tested By:	Ben
Depth Range	N/A	m	Location:	MS1 TP3 Nkunga Material Site	Test Date:	Tuesday, 22 April 2025	

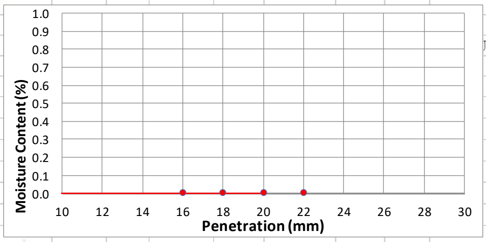
PARTICLE SIZE DISTRIBUTION

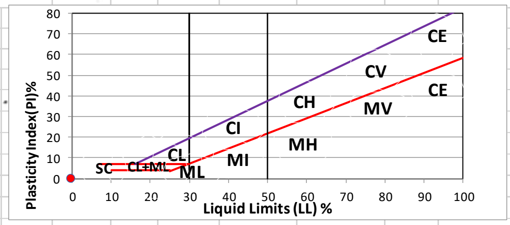
TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample	930.41		
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	120.8	87.0	35
5	176.2	68.1	20
2.36	174.2	49.4	12
1.18	140.6	34.2	10
0.425	94.3	24.1	7
0.075	44.3	19.3	4
			D10
			D30
			D60



ATTERBERG LIMITS								NMC		CLAY ACTIVITY (%)
	LL					PL	PI	11.0		
PENETRATION	16	18	20	22				LINEAR SHRINKAGE		
M. C %					#VALUE!	####	NON PLASTIC	FROM LAB.	6.9	
								CALCULATED		with % passing 0.425





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$ Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$ Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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TRIAL PIT NO. (TP 4) NKUNGA MS 1

CLIENT:	EGIS CONSULTANTS LIMITED		
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS		
Sampled By:	Ben	Tested By:	Ben
Depth Range	N/A m	Location:	MS1 TP4 Nkunga Material Site
Test Date:	Tuesday, 22 April 2025		

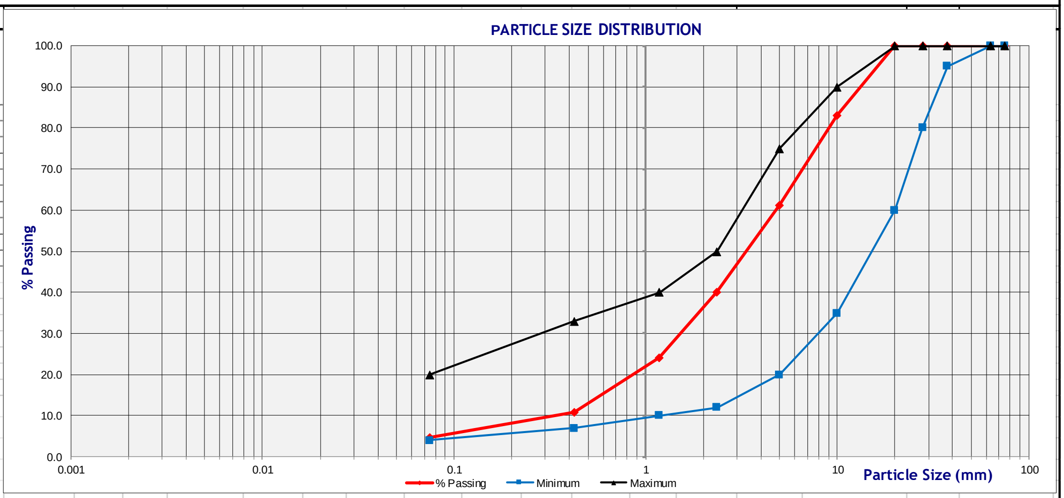
PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample: 750

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	126.5	83.1	35
5	165.4	61.1	20
2.36	156.7	40.2	12
1.18	120.5	24.1	10
0.425	100.2	10.8	7
0.075	45.1	4.7	4

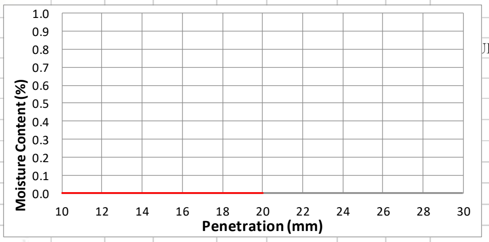
D10
D30
D60



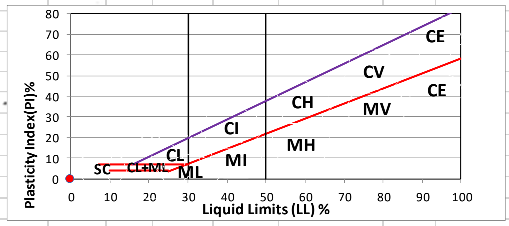
ATTERBERG LIMITS

	LL				PL	PI	NMC	CLAY ACTIVITY (%)
PENETRATION	16	18	20	22			11.0	
M. C %					#VALUE! ####	NON PLASTIC		

LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s



UE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	D_{60} / D_{10}	Greater than 4	C_C=	D_{30}^2 / D_{10} x D_{60}	Between 1 and 3			
GW	C_U=	D_{60} / D_{10}	Greater than 4	C_C=	D_{30}^2 / D_{10} x D_{60}	Between 1 and 3			
SP	Not meeting all gradation requirements for SW								
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.							
SC	Atterberg limits above "A" Line or P.I. greater than 7								
GP	Not meeting all gradation requirements for GW								
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.							
GC	Atterberg limits above "A" Line or P.I. greater than 7								

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
	Plasticity Modulus	###		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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TRIAL PIT NO. (TP 5) NKUNGA MS 1

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS1 TP5 Nkunga Material Site	Test Date:	Tuesday, 22 April 2025	

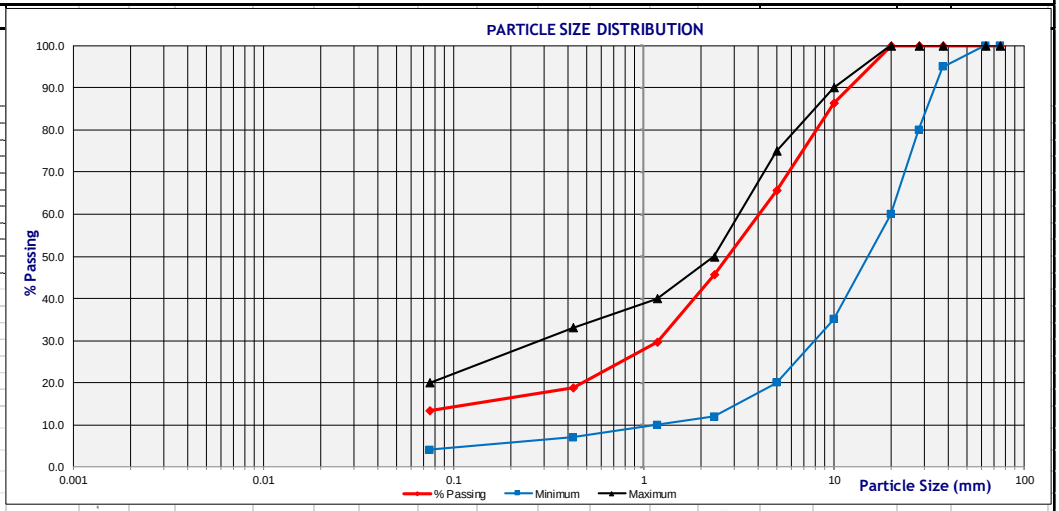
PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 850

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	115.6	86.4	35
5	176.4	65.6	20
2.36	169.2	45.7	12
1.18	135.8	29.8	10
0.425	92.5	18.9	7
0.075	46.8	13.4	4

D10
D30
D60



ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

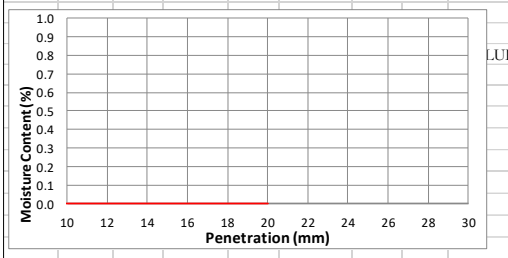
NMC 11.0

CLAY ACTIVITY (%

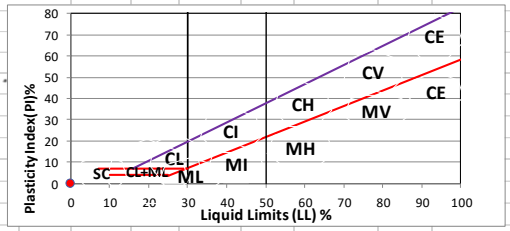
LINEAR SHRINKAGE

FROM LAB. 6.9

CALCULATED with % passing 0.425 s



LUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL			C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:					#REF!
		Plasticity Modulus		###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 1) RUGUSU MS 2

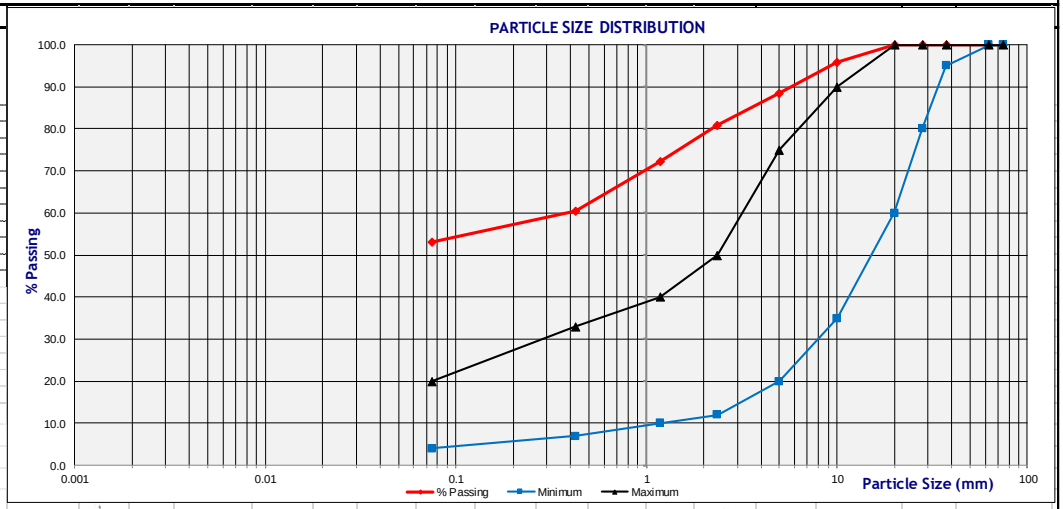
CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS2 TP3 Rugusu Material Site	Test Date:	Tuesday, 22 April 2025	

PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 750

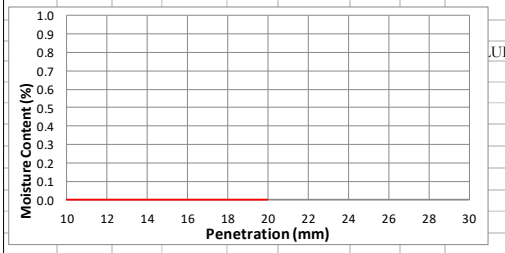
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	30.4	95.9	35
5	56.2	88.5	20
2.36	57.5	80.8	12
1.18	64.2	72.2	10
0.425	88.5	60.4	7
0.075	54.2	53.2	4
			D10
			D30
			D60

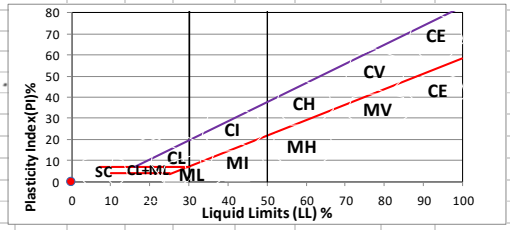


ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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TRIAL PIT NO. (TP 2) RUGUSU MS 2

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS2 TP3 Rugusu Material Site	Test Date:	Tuesday, 22 April 2025	

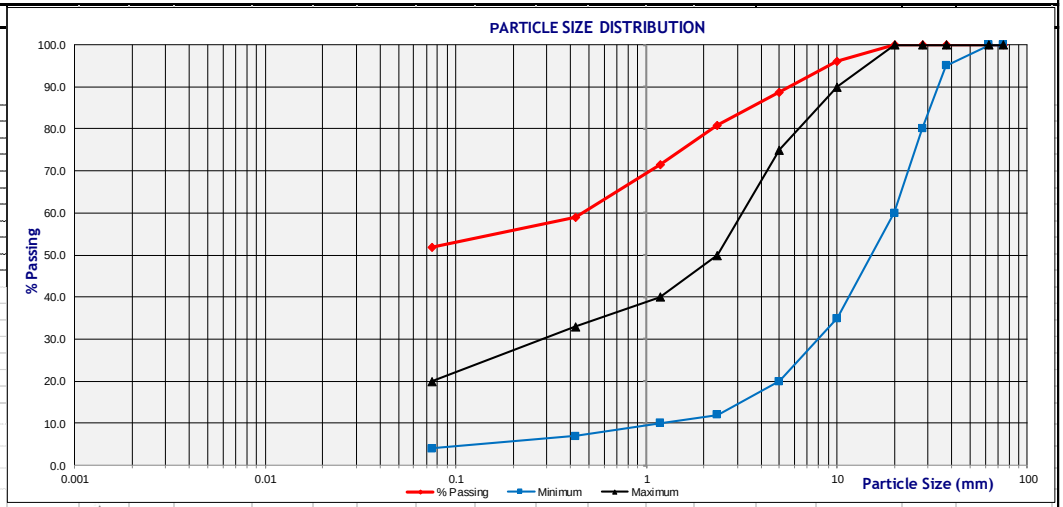
PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 650

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	25.4	96.1	35
5	48.5	88.6	20
2.36	50.6	80.8	12
1.18	60.5	71.5	10
0.425	81.5	59.0	7
0.075	45.9	51.9	4

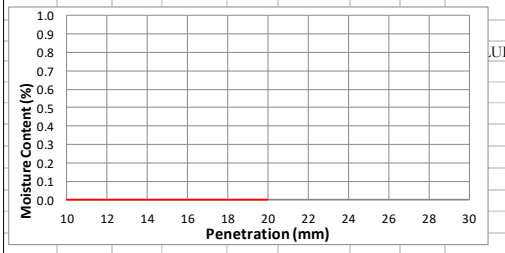
D10
D30
D60

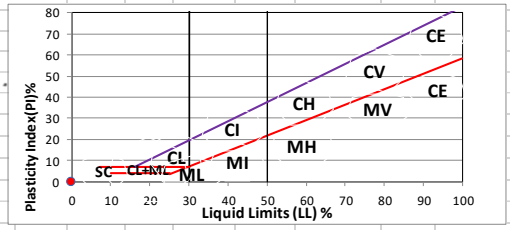


ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

ENG. NJOROGE T. WAIHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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Tel: +254 790943231, +254 722411826
Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (TP 3) RUGUSU MS 2

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS2 TP3 Rugusu Material Site	Test Date:	Tuesday, 22 April 2025	

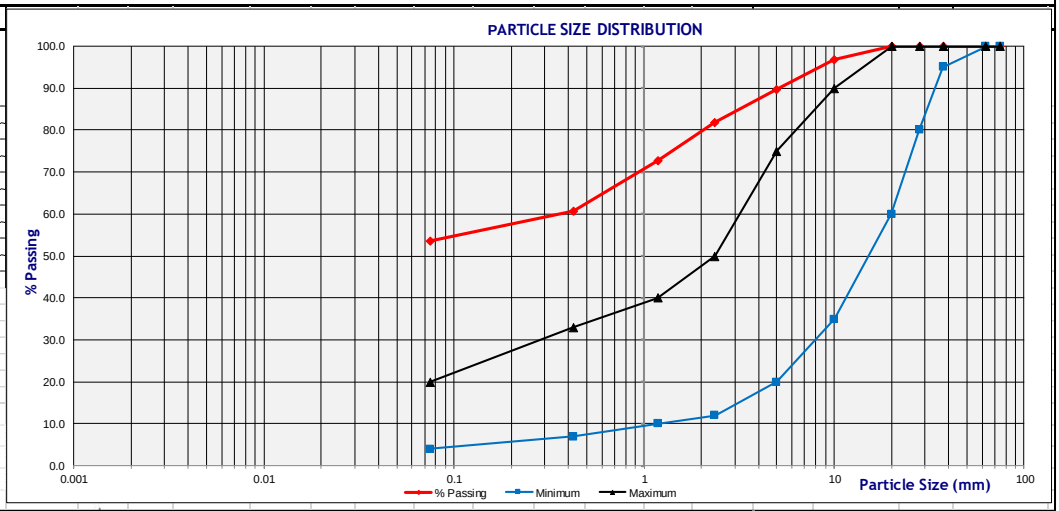
PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 632

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	20.1	96.8	35
5	45.1	89.7	20
2.36	48.9	81.9	12
1.18	57.8	72.8	10
0.425	76.8	60.6	7
0.075	44.9	53.5	4

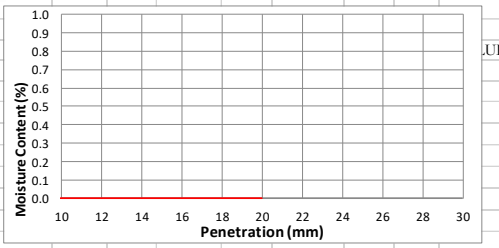
D10
D30
D60

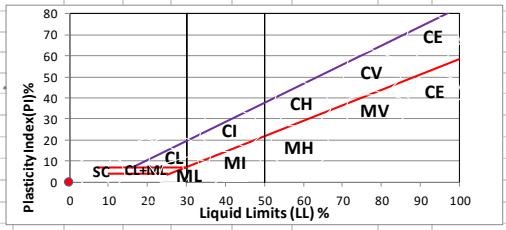


ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%)
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

ENG. NJOROGE T. WAIHARA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) RUGUSU MS 2

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS2 TP4 Rugusu Material Site	Test Date:	Tuesday, 22 April 2025	

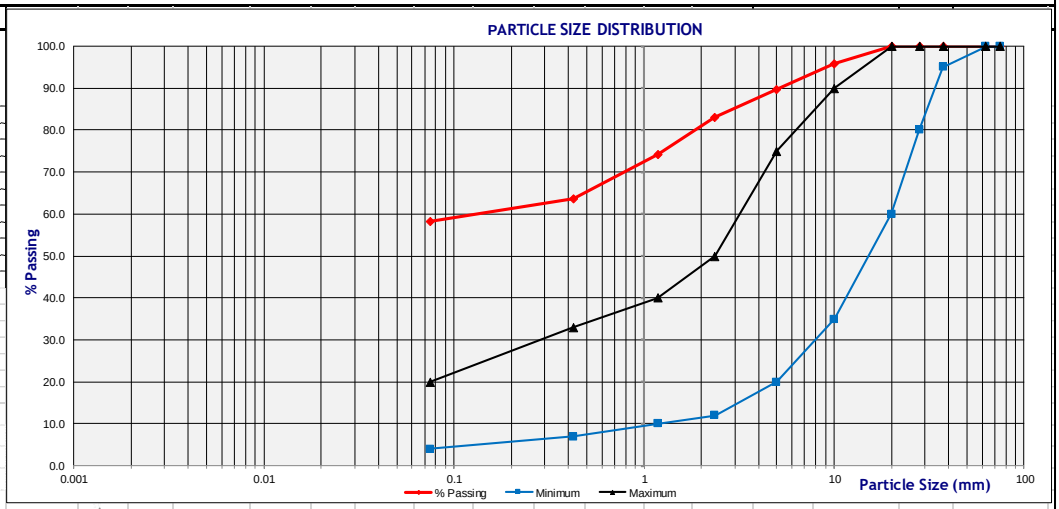
PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 897.5

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	36.5	95.9	35
5	55.6	89.7	20
2.36	59.4	83.1	12
1.18	79.0	74.3	10
0.425	96.4	63.6	7
0.075	48.0	58.2	4

D10
D30
D60



ATTERBERG LIMITS

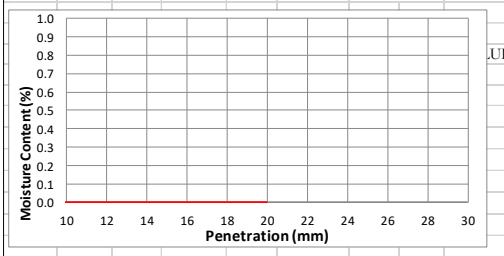
	LL				PL	PI
PENETRATION	16	18	20	22		
M. C %					NON PLASTIC	

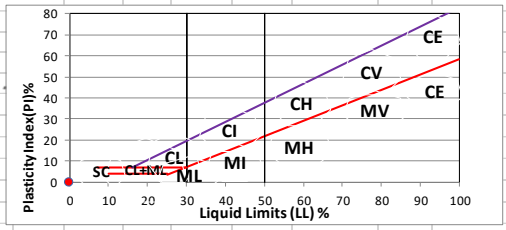
NMC 11.0

CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

ENG. NJOROGE T. WAIHARA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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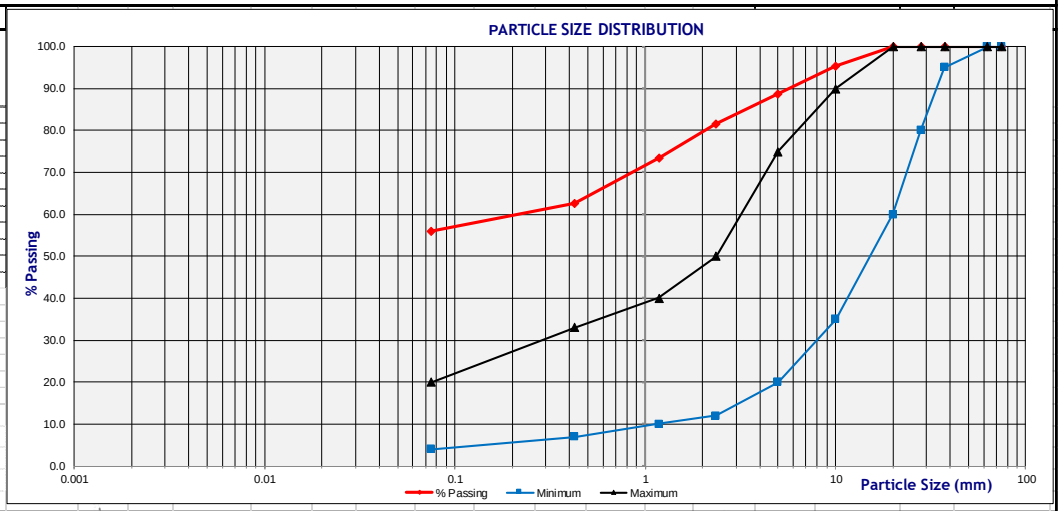
TRIAL PIT NO. (TP 5) RUGUSU MS 2

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
					Sampled By:	Ben	Tested By: Ben
	Depth Range	N/A	m	Location: MS2 TP3 Rugusu Material Site	Test Date:	Tuesday, 22 April 2025	

PARTICLE SIZE DISTRIBUTION

TEST METHOD : BS 1377:Part 2

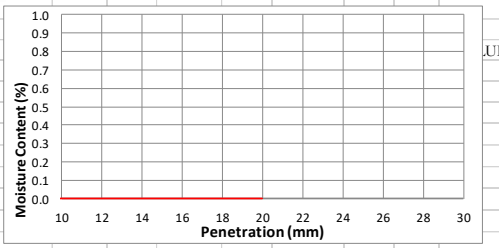
Wt. of Dry Sample		800	
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	36.5	95.4	35
5	53.6	88.7	20
2.36	58.4	81.4	12
1.18	64.2	73.4	10
0.425	86.2	62.6	7
0.075	53.5	56.0	4
			D10
			D30
			D60

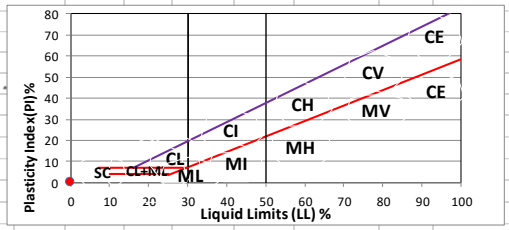


ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%
11.0		
LINEAR SHRINKAGE		
FROM LAB.	6.9	
CALCULATED		with % passing 0.425 s





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL		C_U	C_C	USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				#REF!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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E410
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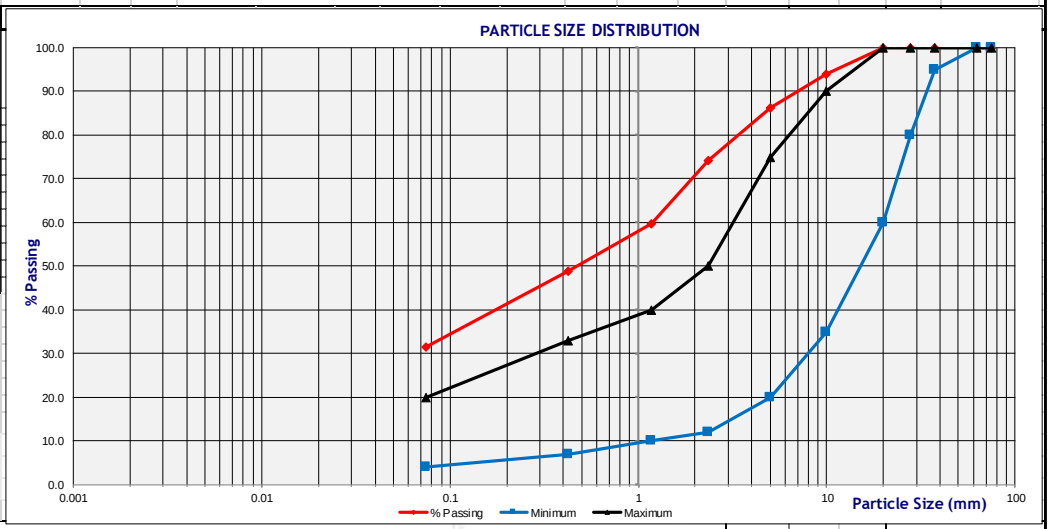
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GRADING AND ATTERBERG TEST RESULTS PRELIMINARY DESIGN

TRIAL PIT NO. (TP 1) RUGUSU MS 1

CLIENT:	EGIS CONSULTANTS LIMITED						
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS						
						Sampled By:	Ben
	Depth Range	N/A	m	Location:	MS1 TP1 Rugusu	Test Date:	30/10/2024
GRADING				PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
				TEST METHOD : BS 1377:Part 2			

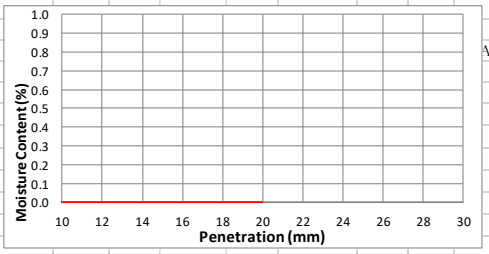
Wt. of Dry Sample		713	
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	44.0	93.8	35
5	55.0	86.1	20
2.36	85.0	74.2	12
1.18	103.0	59.7	10
0.425	77.0	48.9	7
0.075	125.0	31.4	4
		D10	
		D30	
		D60	



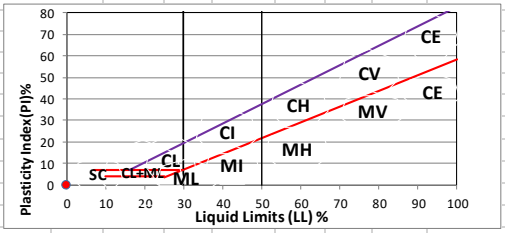
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22		N/P	N/P
M. C %					#VALUE! #VALUE!		

NMC		CLAY ACTIVITY (%
13.5		
LINEAR SHRINKAGE		
FROM LAB.	N/P	
CALCULATED		with % passing 0.425



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW	GP	Not meeting all gradation requirements for GW
SM	Atterberg limits below "A" Line or P.I. Less than 4	GM	Atterberg limits below "A" Line or P.I. Less than 4
SC	Atterberg limits above "A" Line or P.I. greater than 7	GC	Atterberg limits above "A" Line or P.I. greater than 7

Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.

USCS CLASSIFIED SOIL	CL				SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:		C_U	C_C	###	#VALUE!
		Plasticity Modulus	###		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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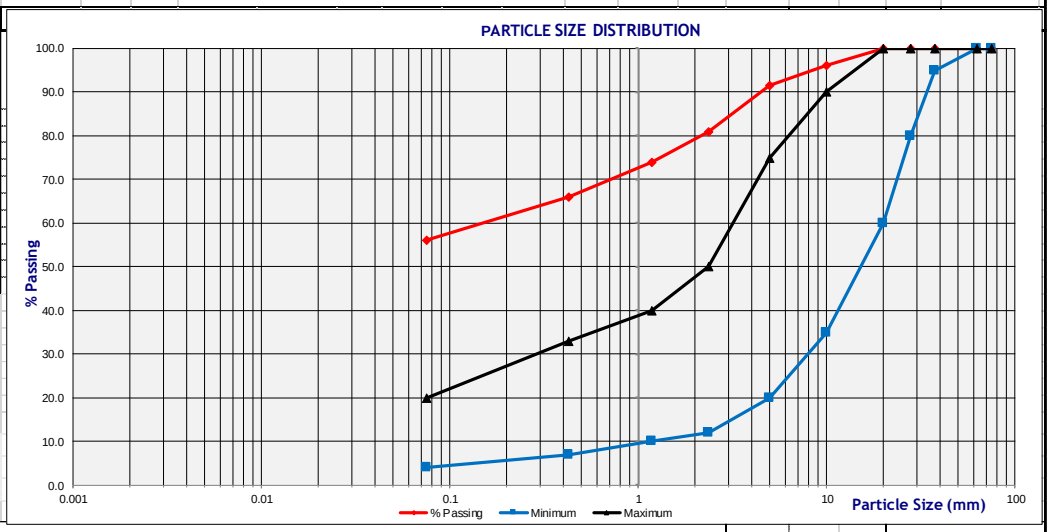
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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (TP 2) RUGUSU MS 1

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	30/10/2024
	Depth Range N/A m	Location:	MS1 TP2 Rugusu	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				

Wt. of Dry Sample 687

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	27.0	96.1	35
5	31.0	91.6	20
2.36	73.0	80.9	12
1.18	48.0	73.9	10
0.425	54.0	66.1	7
0.075	69.0	56.0	4
		D10	
		D30	
		D60	

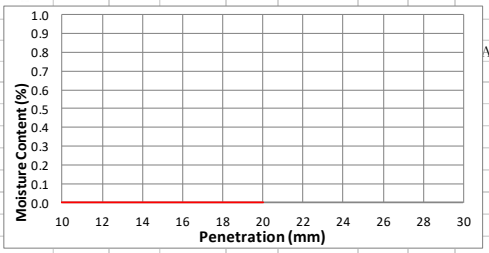


ATTERBERG LIMITS

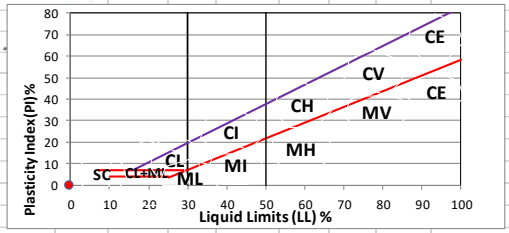
	LL				PL		PI
PENETRATION	16	18	20	22	N/P		N/P
M. C %					#VALUE!	#VALUE!	

NMC 9.4 CLAY ACTIVITY (%

LINEAR SHRINKAGE
FROM LAB. N/P
CALCULATED with % passing 0.425



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL		C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:					### #VALUE!
		Plasticity Modulus		###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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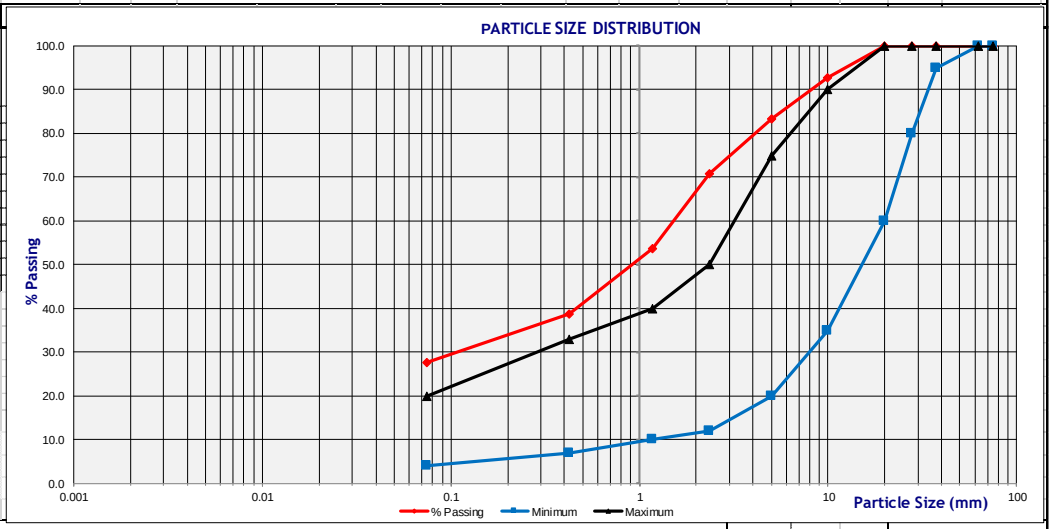
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TRIAL PIT NO. (TP 3) RUGUSU MS 1

CLIENT:	EGIS CONSULTANTS LIMITED					Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS					Test Date:	30/10/2024
	Depth Range	N/A	m	Location:	MS1 TP3 Rugusu	Tested By:	Ben
GRADING				PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2						

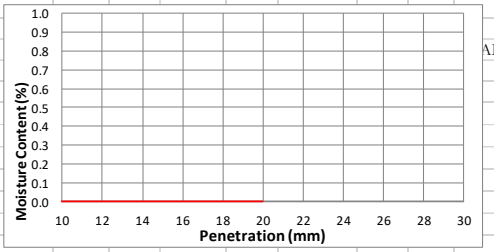
Wt. of Dry Sample	726		
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	53.0	92.7	35
5	68.0	83.3	20
2.36	91.0	70.8	12
1.18	124.0	53.7	10
0.425	109.0	38.7	7
0.075	80.0	27.7	4
			D10
			D30
			D60



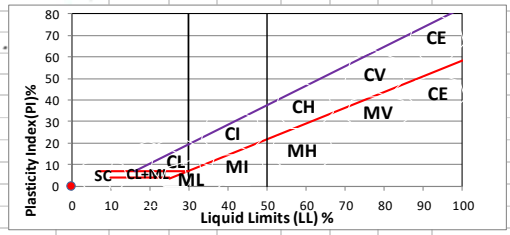
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	#VALUE!	N/P

NMC		CLAY ACTIVITY (%)
9.8		
LINEAR SHRINKAGE		
FROM LAB.	N/P	
CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL	C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:				### #VALUE!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

ENG. NJOROGE T. WAIHARA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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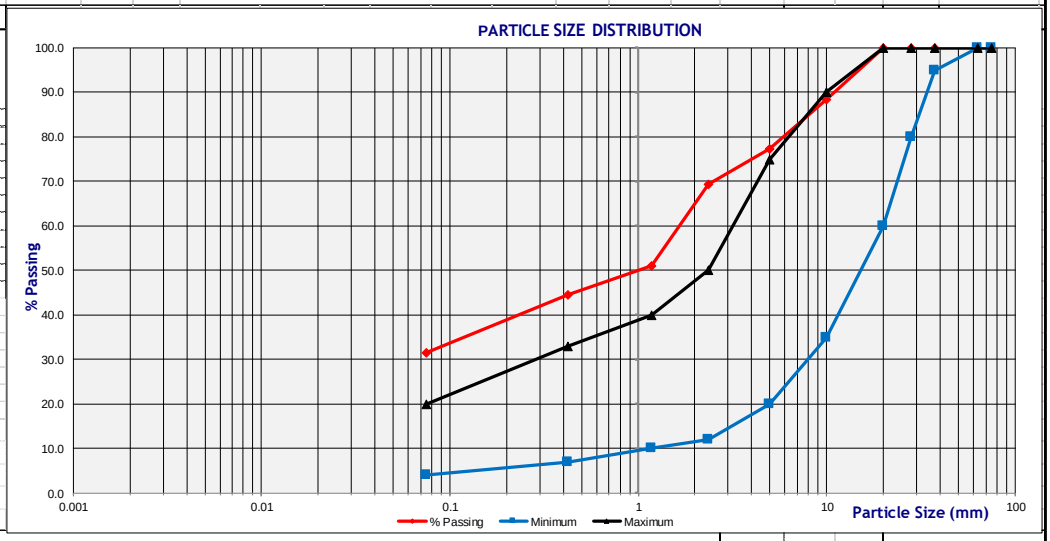
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TRIAL PIT NO. (TP 4) RUGUSU MS 1

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	30/10/2024
	Depth Range N/A m	Location:	MS1 TP4 Rugusu	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				

Wt. of Dry Sample 908

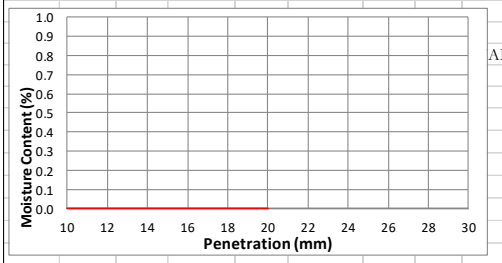
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	105.0	88.4	35
5	101.0	77.3	20
2.36	73.0	69.3	12
1.18	166.0	51.0	10
0.425	59.0	44.5	7
0.075	117.0	31.6	4
			D10
			D30
			D60



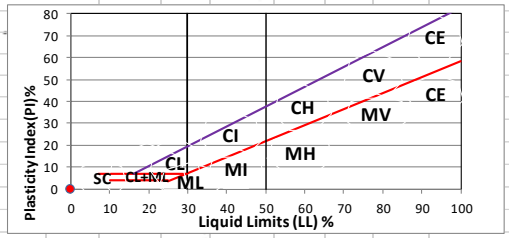
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	####	NON PLASTIC

NMC		CLAY ACTIVITY (%)
15.9		
LINEAR SHRINKAGE		
FROM LAB.	3.1	
CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3		GW	$C_U=\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CL			SCS POSSIBLE CLASSIFICATIO	
DESCRIPTION:				###	#VALUE!
		Plasticity Modulus	###		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

ENG. NJOROGE T. WAIHARA LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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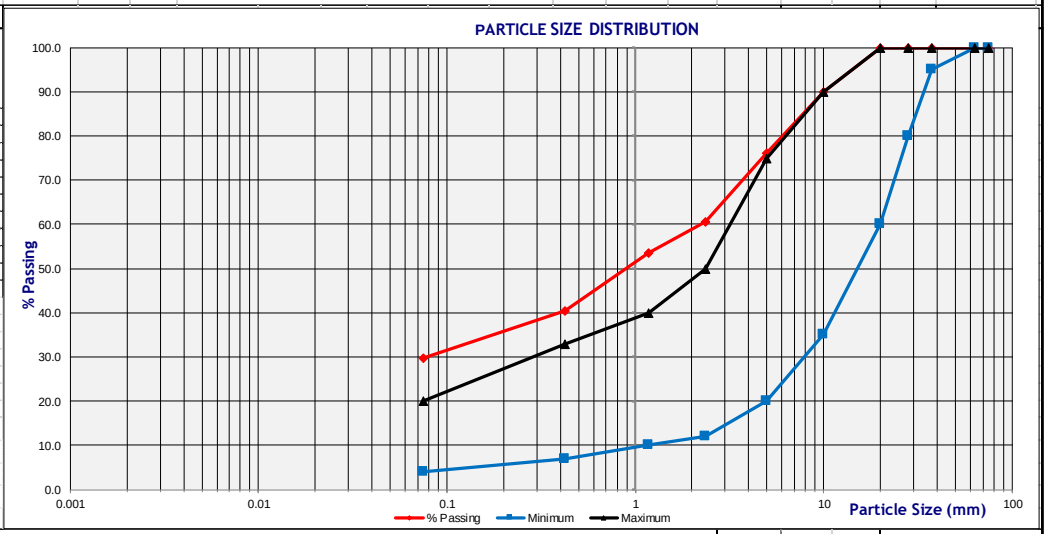
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TRIAL PIT NO. (TP 5) RUGUSU MS 1

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	30/10/2024
	Depth Range N/A m	Location:	MS1 TP5 Rugusu	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				

Wt. of Dry Sample 951

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	96.0	89.9	35
5	131.0	76.1	20
2.36	147.0	60.7	12
1.18	69.0	53.4	10
0.425	124.0	40.4	7
0.075	101.0	29.8	4
			D10
			D30
			D60

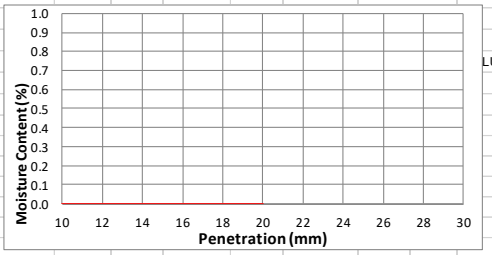


ATTERBERG LIMITS

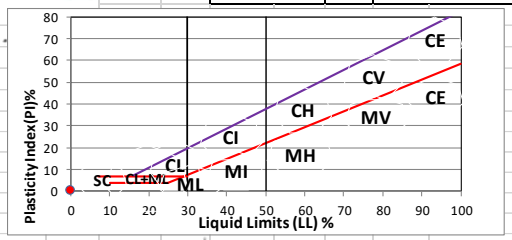
	LL				PL		PI
PENETRATION	16	18	20	22			
M. C %					#VALUE!	#VALUE!	NON PLASTIC

NMC		CLAY ACTIVITY (%)
10.2		

LINEAR SHRINKAGE		
FROM LAB.	5	
CALCULATED		with % passing 0.425 sieve



LUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3
SP	Not meeting all gradation requirements for SW						GP	Not meeting all gradation requirements for GW					
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				
SC	Atterberg limits above "A" Line or P.I. greater than 7						GC	Atterberg limits above "A" Line or P.I. greater than 7					

USCS CLASSIFIED SOIL	CL	C_U	C_C	USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				#REF!	#VALUE!
		Plasticity Modulus	#####		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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E410
ENGINEERS BOARD OF KENYA

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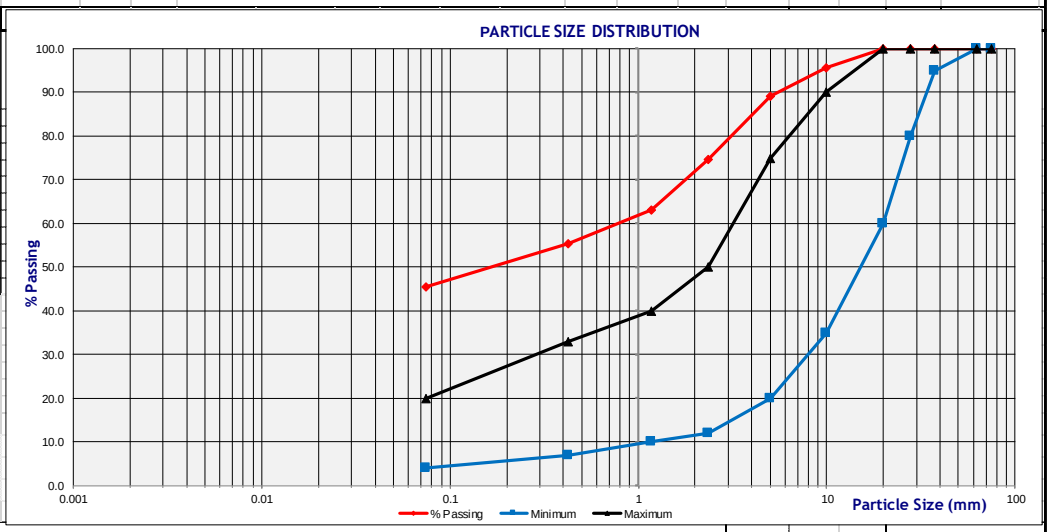
TRIAL PIT NO. (TP 1) NCHOROIBORO MS 2

CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	30/10/2024
	Depth Range N/A m	Location:	MS2 TP1 Nchoroiboro	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				

Wt. of Dry Sample 827

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	37.0	95.5	35
5	54.0	89.0	20
2.36	118.0	74.7	12
1.18	97.0	63.0	10
0.425	63.0	55.4	7
0.075	81.0	45.6	4

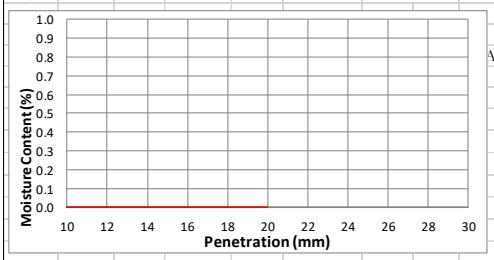
D10
D30
D60



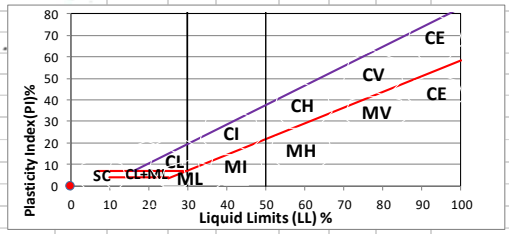
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			N/P
M. C %					#VALUE!	#VALUE!	N/P

NMC		CLAY ACTIVITY (%
9.6		
LINEAR SHRINKAGE		
FROM LAB.	N/P	
CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL		C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:					### #VALUE!
		Plasticity Modulus		###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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E410
ENGINEERS BOARD OF KENYA

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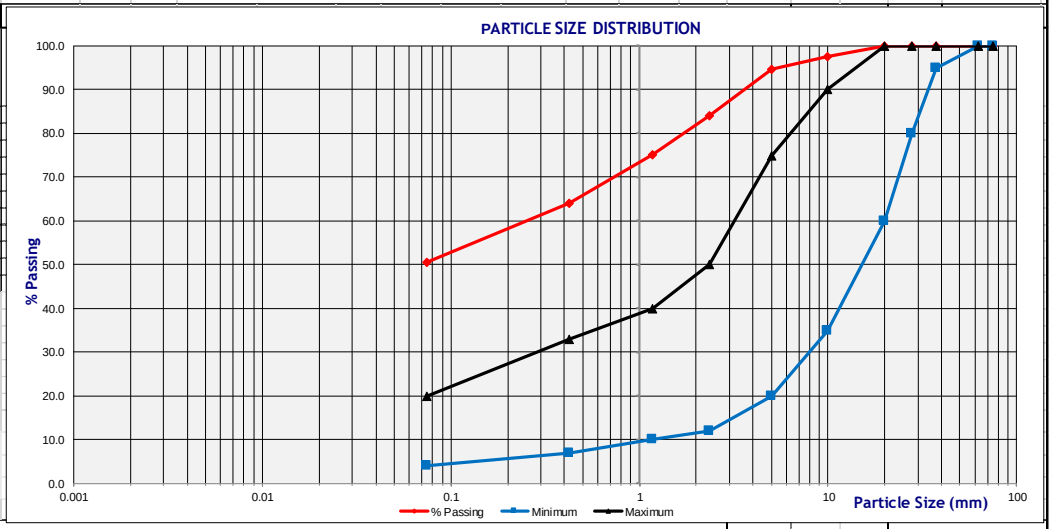
TRIAL PIT NO. (TP 2) NCHOROIBORO MS 2

CLIENT:	EGIS CONSULTANTS LIMITED					Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS					Test Date:	30/10/2024
	Depth Range	N/A	m	Location:	MS2 TP2 Nchoroiboro	Tested By:	Ben
GRADING				PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2						

Wt. of Dry Sample 768

Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	19.0	97.5	35
5	23.0	94.5	20
2.36	81.0	84.0	12
1.18	68.0	75.1	10
0.425	86.0	63.9	7
0.075	103.0	50.5	4

D10
D30
D60

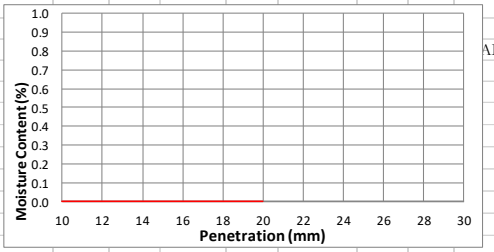


ATTERBERG LIMITS

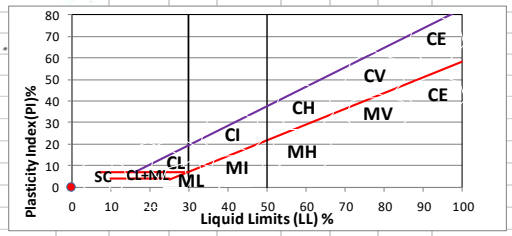
	LL				PL		PI
PENETRATION	16	18	20	22			N/P
M. C %					#VALUE!	#VALUE!	

NMC		CLAY ACTIVITY (%)
6.2		

LINEAR SHRINKAGE		
FROM LAB.	N/P	
CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CL	C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:				### #VALUE!
		Plasticity Modulus	###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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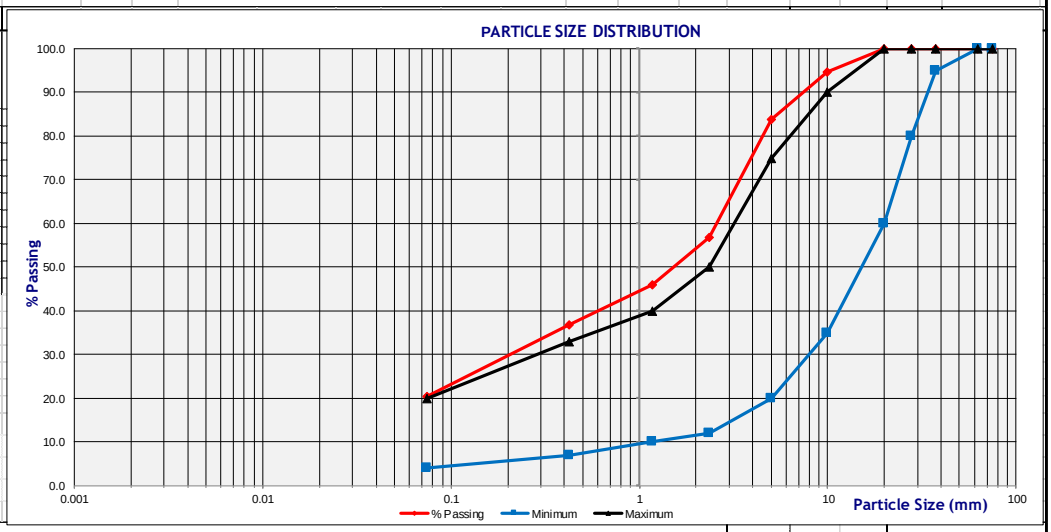
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TRIAL PIT NO. (TP 3) NCHOROIBORO MS 2

CLIENT:	EGIS CONSULTANTS LIMITED					Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS					Test Date:	30/10/2024
	Depth Range	N/A	m	Location:	MS2 TP3 Nchoroiboro	Tested By:	Ben
GRADING	PARTICLE SIZE DISTRIBUTION						
	TEST METHOD : BS 1377:Part 2						

Wt. of Dry Sample 1082

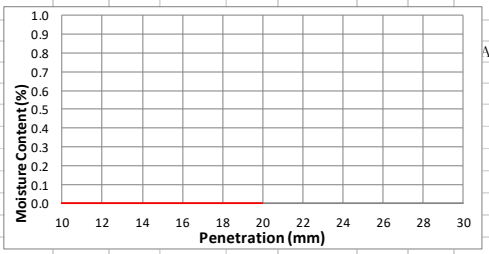
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	59.0	94.5	35
5	117.0	83.7	20
2.36	290.0	56.9	12
1.18	118.0	46.0	10
0.425	99.0	36.9	7
0.075	178.0	20.4	4
		D10	
		D30	
		D60	



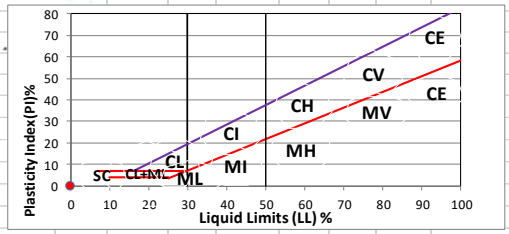
ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22			N/P
M. C %					#VALUE!	#VALUE!	N/P

NMC		CLAY ACTIVITY (%
11.7		
LINEAR SHRINKAGE		
FROM LAB.	N/P	
CALCULATED		with % passing 0.425



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL	C_U	C_C	SCS POSSIBLE CLASSIFICATIO	
DESCRIPTION:				###	#VALUE!
		Plasticity Modulus	###		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

ENG. NJOROGE T. WAIHARA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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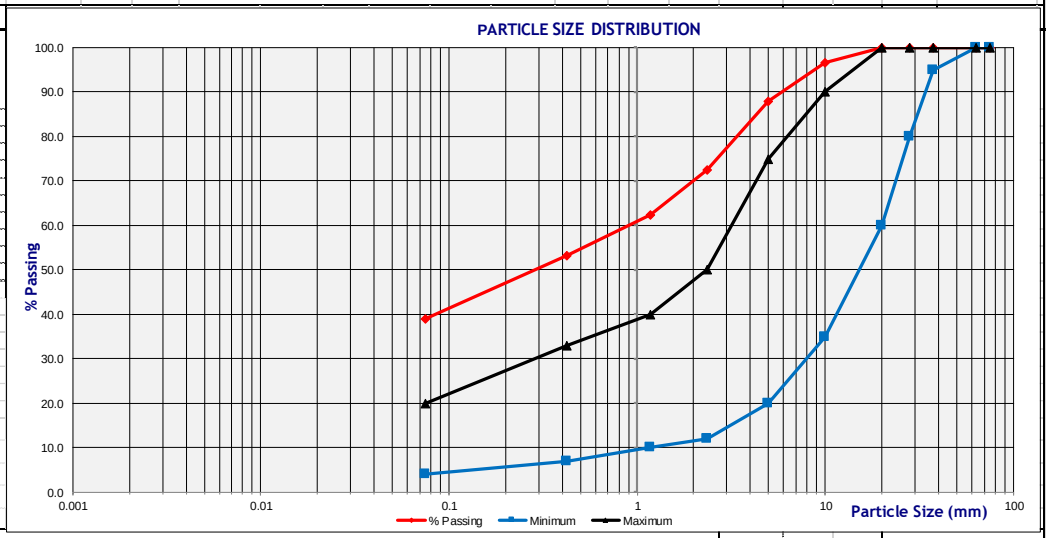
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Email: apexprojectslab@gmail.com, info@apexprojects.co.ke

TRIAL PIT NO. (TP 4) NCHOROIBORO MS 2

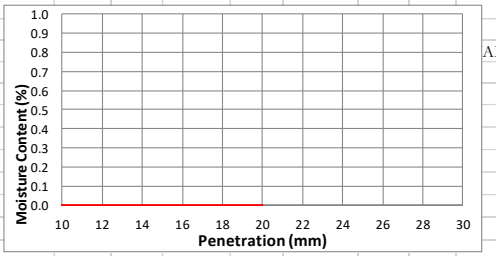
CLIENT:	EGIS CONSULTANTS LIMITED			Sampled By:	Ben
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS			Test Date:	30/10/2024
	Depth Range N/A m	Location:	MS2 TP4 Nchoroiboro	Tested By:	Ben
GRADING		PARTICLE SIZE DISTRIBUTION			
	TEST METHOD : BS 1377:Part 2				

Wt. of Dry Sample 821

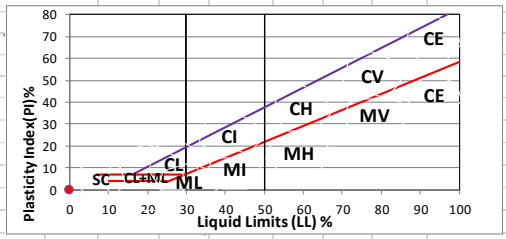
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	28.0	96.6	35
5	71.0	87.9	20
2.36	127.0	72.5	12
1.18	83.0	62.4	10
0.425	76.0	53.1	7
0.075	115.0	39.1	4
			D10
			D30
			D60



ATTERBERG LIMITS								NMC		CLAY ACTIVITY (%)
	LL				PL		PI	11.8		
PENETRATION	16	18	20	22				LINEAR SHRINKAGE		
M. C %					#VALUE!	####	NON PLASTIC	FROM LAB.	8.9	
								CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL			C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:						### #VALUE!
			Plasticity Modulus	###		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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E410
ENGINEERS BOARD OF KENYA

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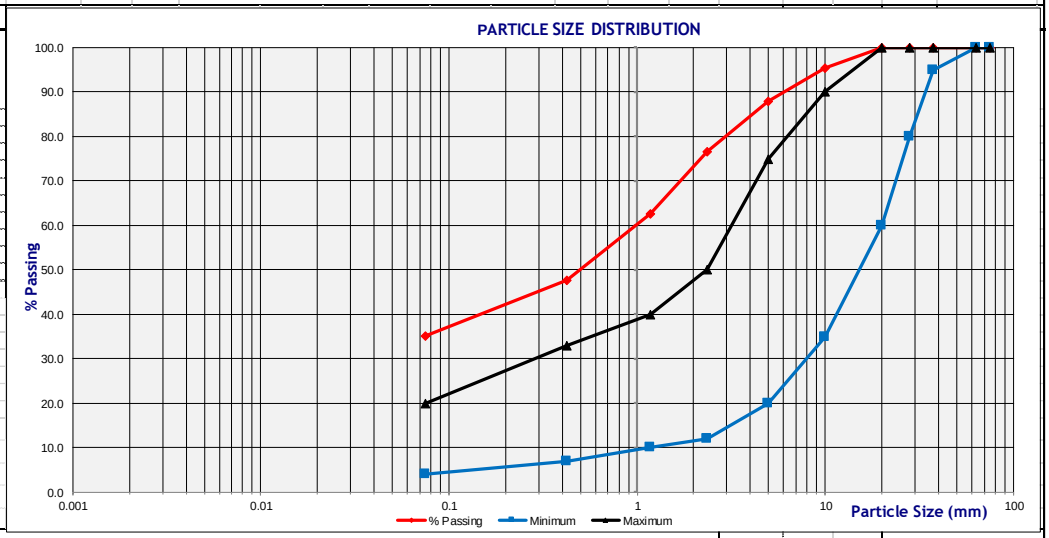
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TRIAL PIT NO. (TP 5) NCHOROIBORO MS 2

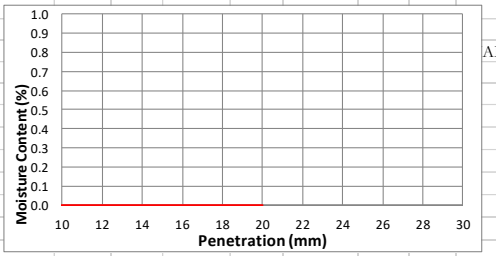
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS				
				Sampled By:	Ben
	Depth Range N/A m	Location:	MS2 TP5 Nchoroiboro	Test Date:	30/10/2024
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Ben
		TEST METHOD : BS 1377:Part 2			

Wt. of Dry Sample 697

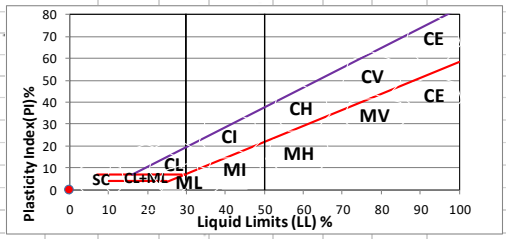
Sieve	Retained mass(g)	% Passing	% Minimum
75		100.0	100
63		100.0	100
37.5		100.0	95
28		100.0	80
20		100.0	60
10	33.0	95.3	35
5	52.0	87.8	20
2.36	79.0	76.5	12
1.18	96.0	62.7	10
0.425	104.0	47.8	7
0.075	88.0	35.2	4
			D10
			D30
			D60



ATTERBERG LIMITS								NMC		CLAY ACTIVITY (%)
	LL				PL		PI	11.0		
PENETRATION	16	18	20	22				LINEAR SHRINKAGE		
M. C %					#VALUE!	####	NON PLASTIC	FROM LAB.	6.9	
								CALCULATED		with % passing 0.425 s



ALUE!



USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3	GW	$C_U=$	$\frac{D_{60}}{D_{10}}$	Greater than 4	$C_C=$	$\frac{D_{30}^2}{D_{10}xD_{60}}$	Between 1 and 3

SP	Not meeting all gradation requirements for SW		
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
SC	Atterberg limits above "A" Line or P.I. greater than 7		

GP	Not meeting all gradation requirements for GW		
GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	
GC	Atterberg limits above "A" Line or P.I. greater than 7		

USCS CLASSIFIED SOIL	CL		C_U	C_C	SCS POSSIBLE CLASSIFICATIO
DESCRIPTION:					### #VALUE!
		Plasticity Modulus		###	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index				

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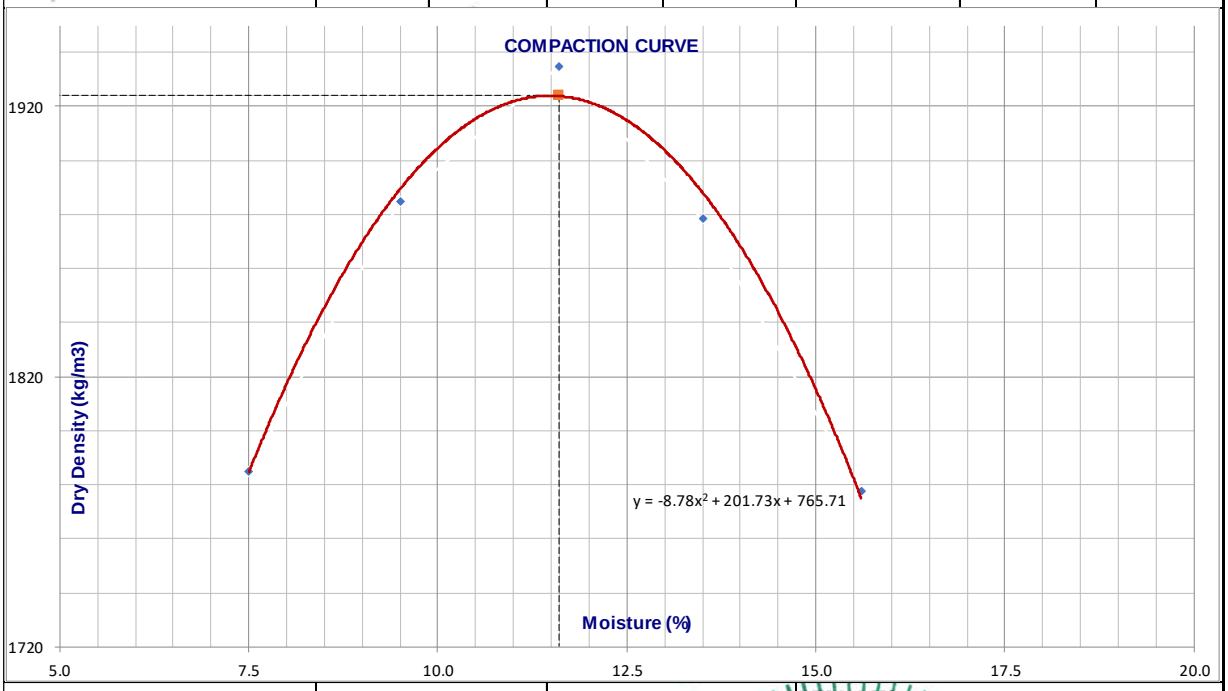
COMPACTION TEST RESULTS DETAILED DESIGN

TRIAL PIT NO. (TP 1) NKUNGA MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS1 TP 1 Nkunga Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP							
TEST METHOD : BS 1377:Part 4							
MOISTURE CONTENT							
Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	136.7	142.8	119.4	119.2	105.0	186.0	
Weight of Tin + Dry Soil (g)	128.3	131.8	108.8	106.9	93.0	177.3	
Weight of Tin(g)	16.3	16	17.4	15.8	16.1	16.2	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	112.0	115.8	91.4	91.1	76.9	161.1	
Moisture Content (%)	7.5	9.5	11.6	13.5	15.6	5.4	
Wt of Mould+base+specimen (g)	4969	5114	5209	5182	5105		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1919	2064	2159	2132	2055		
Bulk Density (kg/m^3)	1919	2064	2159	2132	2055		
Dry Density (kg/m^3)	1785	1885	1935	1878	1778		

Maximum Dry Density (kg/m^3)=	**1924**			**Optimum Moisture Content (%)**	**11.6**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (TP 2) NKUNGA MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS1 TP 2 Nkunga Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

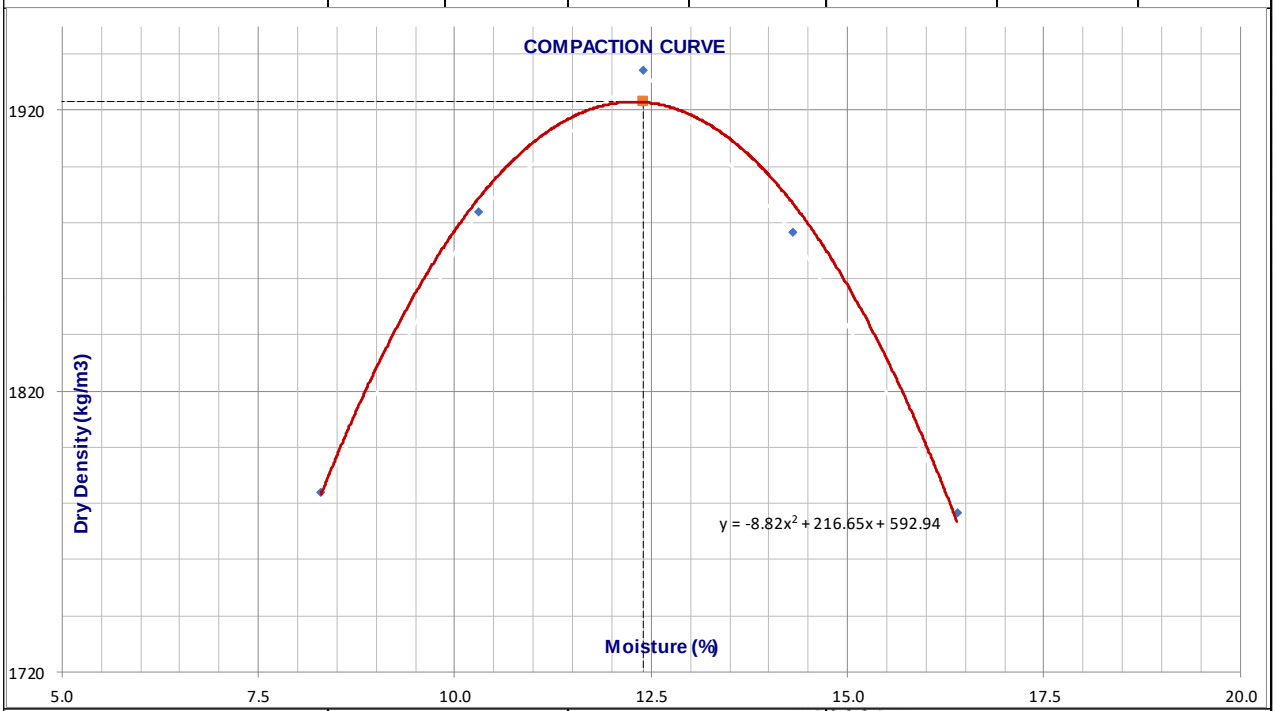
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	125.90	133.80	113.50	114.10	101.30	222.40	
Weight of Tin + Dry Soil (g)	117.50	122.80	102.90	101.80	89.30	213.70	
Weight of Tin(g)	16.3	16	17.4	15.8	16.1	16.2	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	101.2	106.8	85.5	86.0	73.2	197.5	
Moisture Content (%)	8.3	10.3	12.4	14.3	16.4	4.4	
Wt of Mould+base+specimen (g)	4982	5128	5224	5195	5118		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1932	2078	2174	2145	2068		
Bulk Density (kg/m^3)	1932	2078	2174	2145	2068		
Dry Density (kg/m^3)	1784	1884	1934	1877	1777		

Maximum Dry Density (kg/m^3)=	**1923**			**Optimum Moisture Content (%)**		**12.4**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (TP 3) NKUNGA MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS1 TP 3 Nkunga Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

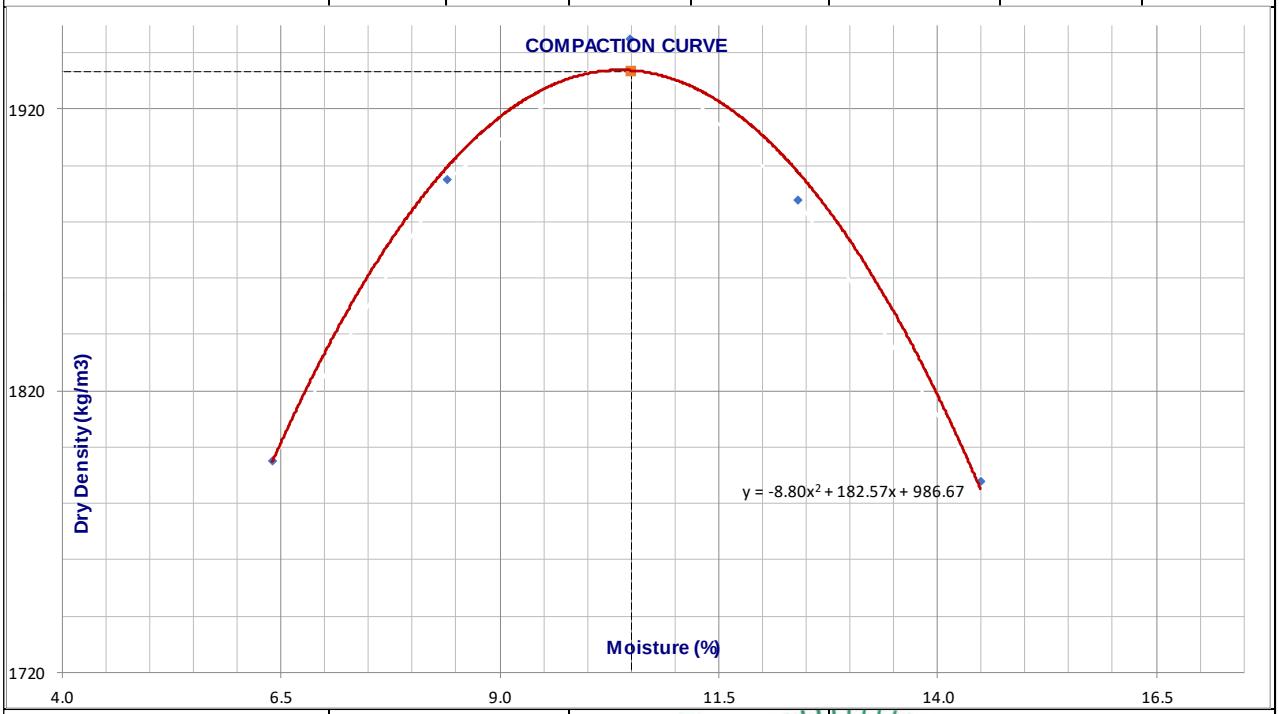
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	155.10	159.50	129.20	126.50	111.80	218.00	
Weight of Tin + Dry Soil (g)	146.70	148.50	118.60	114.20	99.80	209.30	
Weight of Tin(g)	15.4	17.5	17.6	15	17	16.2	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	131.3	131.0	101.0	99.2	82.8	193.1	
Moisture Content (%)	6.4	8.4	10.5	12.4	14.5	4.5	
Wt of Mould+base+specimen (g)	4960	5104	5199	5172	5097		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1910	2054	2149	2122	2047		
Bulk Density (kg/m^3)	1910	2054	2149	2122	2047		
Dry Density (kg/m^3)	1795	1895	1945	1888	1788		

Maximum Dry Density (kg/m^3)=	**1933**			**Optimum Moisture Content (%)**		**10.5**	



TESTED BY:	**Ben**	REMARKS:
PREPARED BY:	**Austine**	
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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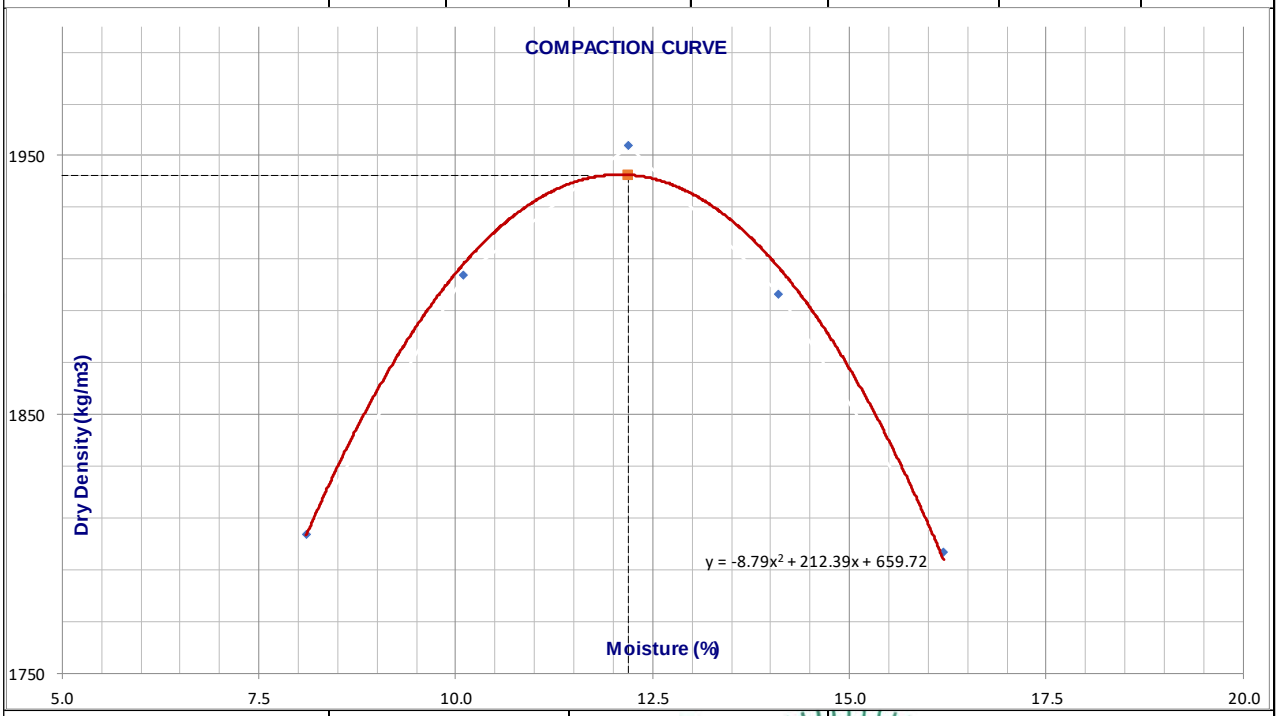
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TRIAL PIT NO. (TP 4) NKUNGA MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS1 TP 4 Nkunga Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP							
TEST METHOD : BS 1377:Part 4							
MOISTURE CONTENT							
Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	127.50	137.40	115.10	114.50	103.10	165.00	
Weight of Tin + Dry Soil (g)	119.10	126.40	104.50	102.20	91.10	156.30	
Weight of Tin(g)	15.4	17.5	17.6	15	17	16.2	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	103.7	108.9	86.9	87.2	74.1	140.1	
Moisture Content (%)	8.1	10.1	12.2	14.1	16.2	6.2	
Wt of Mould+base+specimen (g)	5000	5146	5242	5214	5138		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1950	2096	2192	2164	2088		
Bulk Density (kg/m^3)	1950	2096	2192	2164	2088		
Dry Density (kg/m^3)	1804	1904	1954	1896	1797		

Maximum Dry Density (kg/m^3)=	**1943**			**Optimum Moisture Content (%)**	**12.2**	



TESTED BY:	**Ben**	REMARKS:
PREPARED BY:	**Austine**	
APPROVED BY:	**Eng.Tom Waiharo**	Signature:

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 5) NKUNGA MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS1 TP 5 Nkunga Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

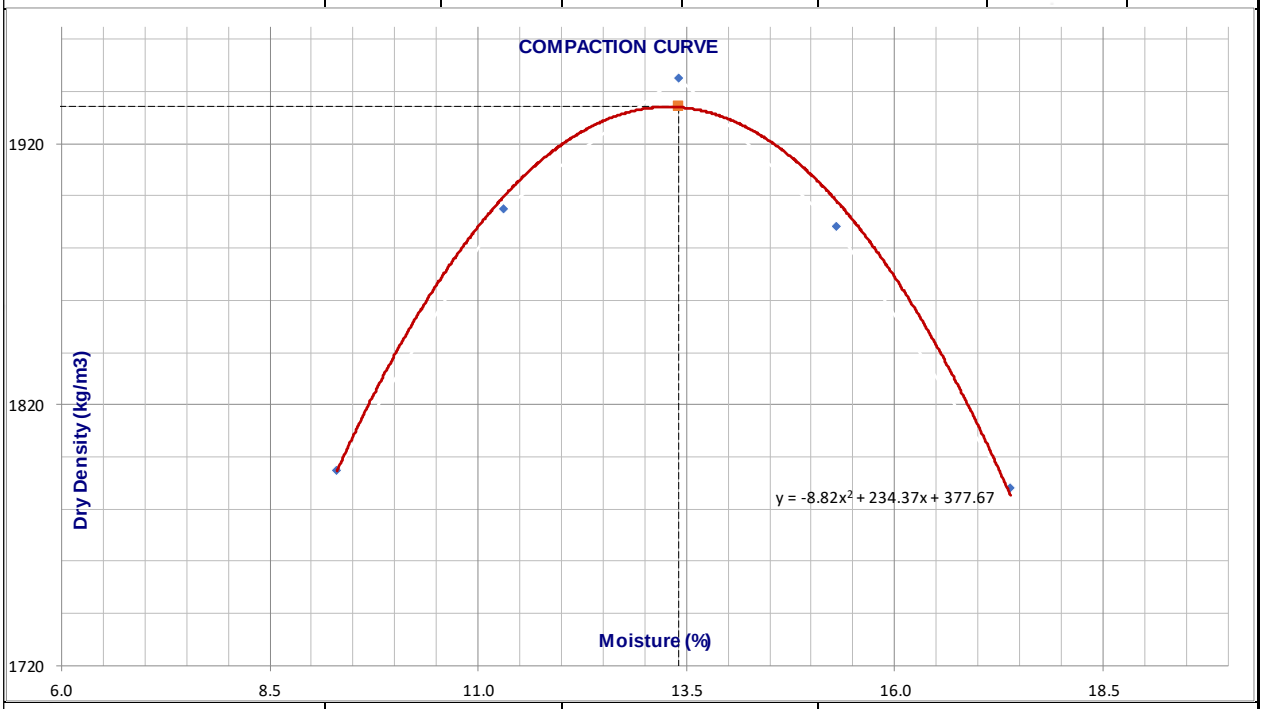
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	115.00	123.80	106.20	110.20	97.20	165.00	
Weight of Tin + Dry Soil (g)	106.60	112.80	95.60	97.90	85.20	156.30	
Weight of Tin(g)	16.3	15.5	16.5	17.5	16.2	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	90.3	97.3	79.1	80.4	69.0	140.3	
Moisture Content (%)	9.3	11.3	13.4	15.3	17.4	6.2	
Wt of Mould+base+specimen (g)	5012	5159	5256	5227	5149		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1962	2109	2206	2177	2099		
Bulk Density (kg/m^3)	1962	2109	2206	2177	2099		
Dry Density (kg/m^3)	1795	1895	1945	1888	1788		

Maximum Dry Density (kg/m^3)=	**1935**			**Optimum Moisture Content (%)**		**13.4**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 1) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS2 TP 1 Rugusu Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

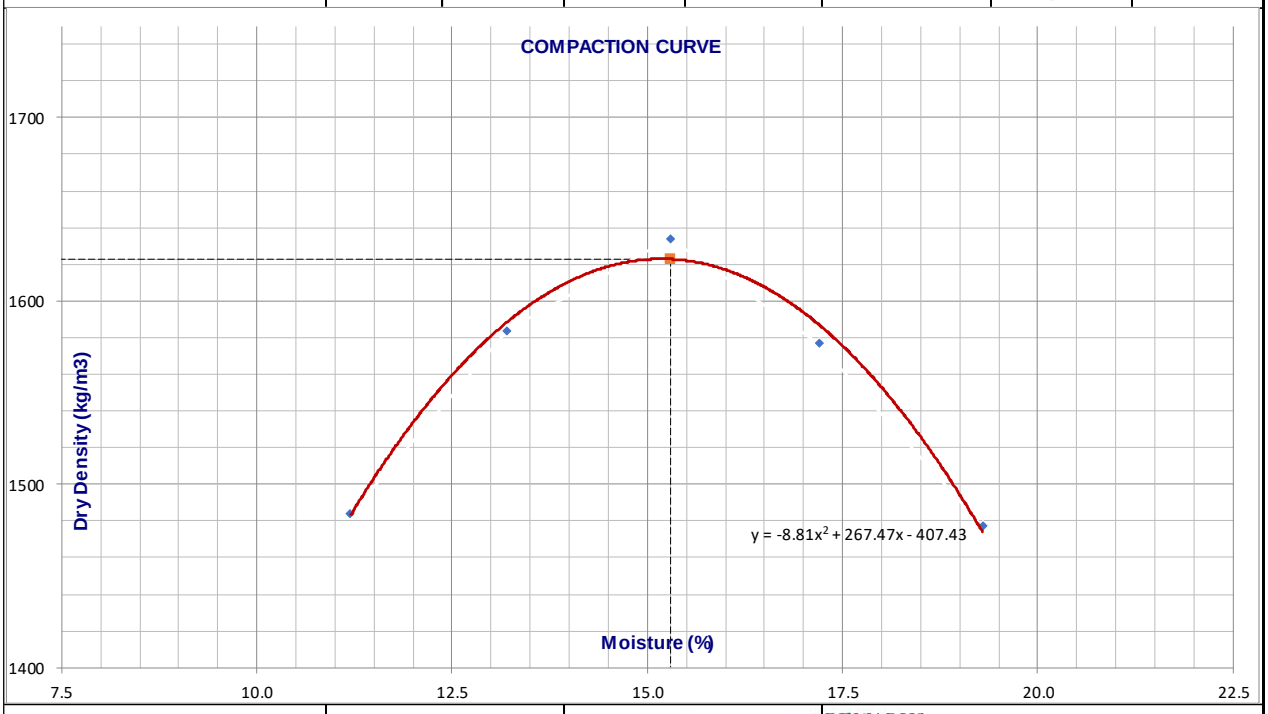
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	98.80	110.80	97.40	101.00	90.40	185.80	
Weight of Tin + Dry Soil (g)	90.40	99.80	86.80	88.70	78.40	177.10	
Weight of Tin(g)	15.4	16.5	17.5	17.2	16.2	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	75.0	83.3	69.3	71.5	62.2	161.1	
Moisture Content (%)	11.2	13.2	15.3	17.2	19.3	5.4	
Wt of Mould+base+specimen (g)	4700	4843	4934	4898	4812		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1650	1793	1884	1848	1762		
Bulk Density (kg/m^3)	1650	1793	1884	1848	1762		
Dry Density (kg/m^3)	1484	1584	1634	1577	1477		

Maximum Dry Density (kg/m^3)=	**1623**			**Optimum Moisture Content (%)**		**15.3**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 2) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS2 TP 2 Rugusu Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

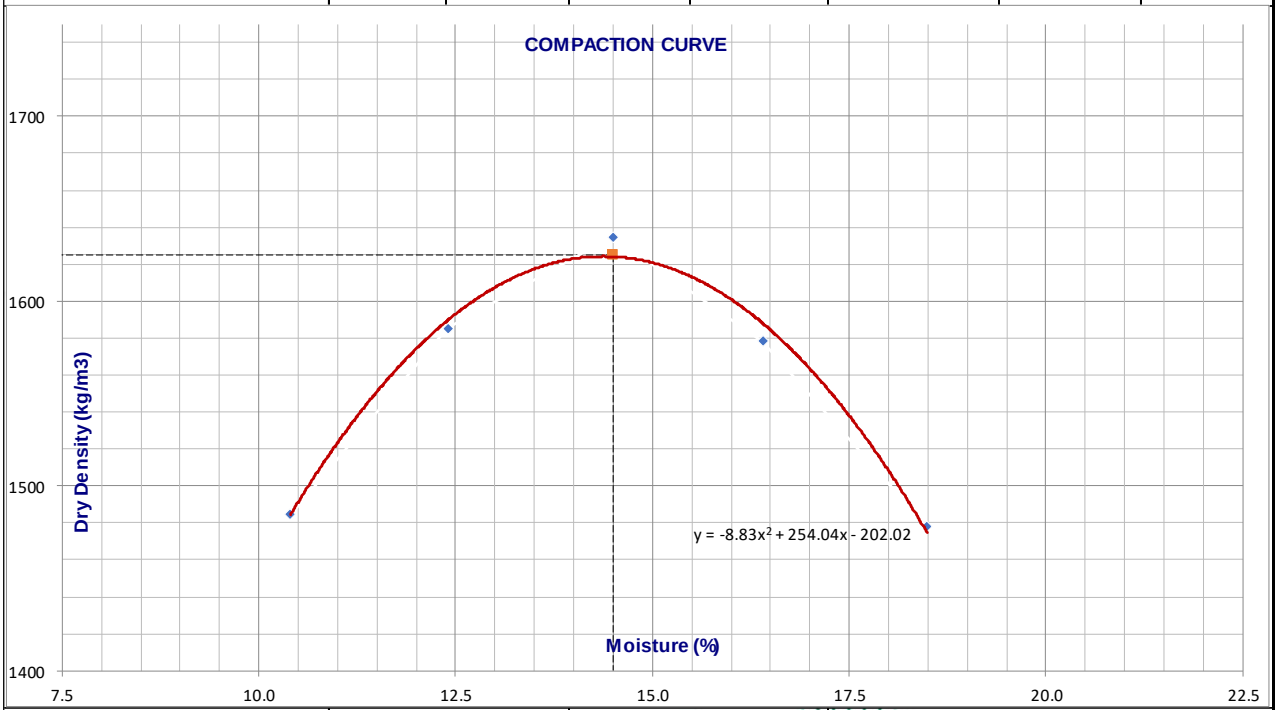
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	104.80	116.50	101.30	103.80	94.30	198.70	
Weight of Tin + Dry Soil (g)	96.40	105.50	90.70	91.50	82.30	190.00	
Weight of Tin(g)	15.6	16.8	17.6	16.5	17.4	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	80.8	88.7	73.1	75.0	64.9	174.0	
Moisture Content (%)	10.4	12.4	14.5	16.4	18.5	5.0	
Wt of Mould+base+specimen (g)	4689	4832	4922	4887	4801		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1639	1782	1872	1837	1751		
Bulk Density (kg/m^3)	1639	1782	1872	1837	1751		
Dry Density (kg/m^3)	1485	1585	1635	1578	1478		

Maximum Dry Density (kg/m^3)=	**1625**			**Optimum Moisture Content (%)**		**14.5**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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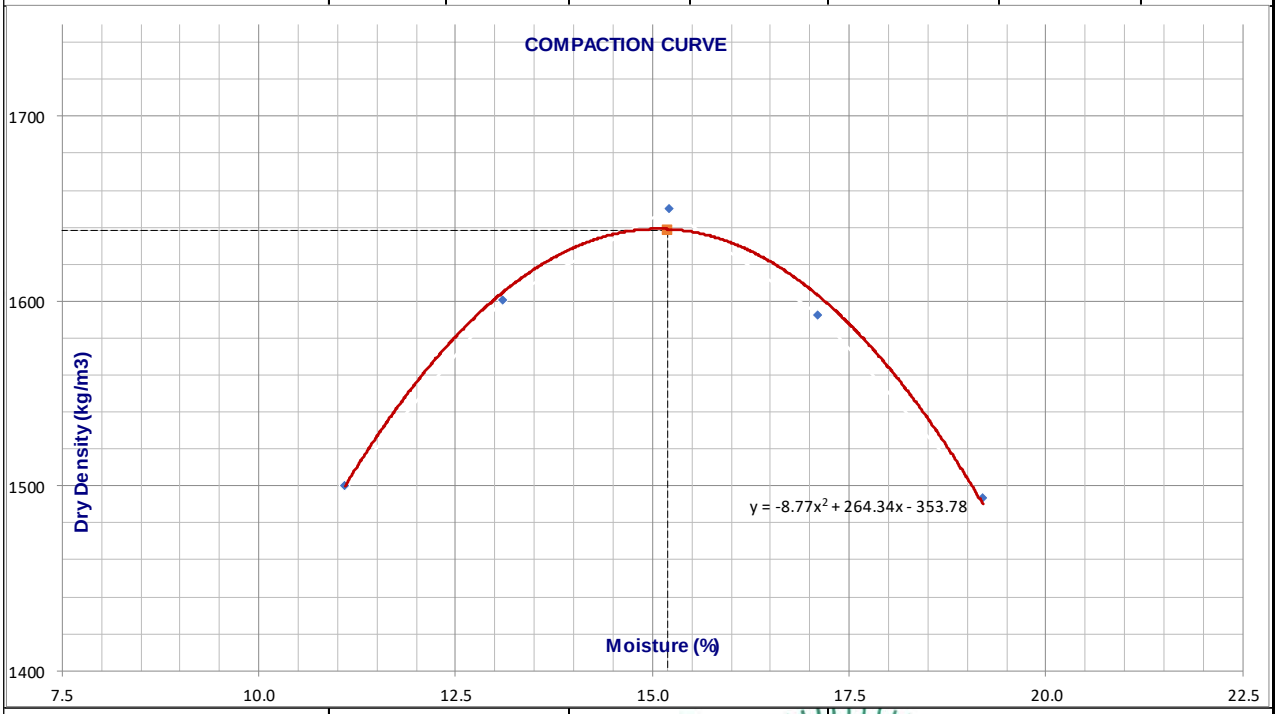
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TRIAL PIT NO. (TP 3) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS2 TP 3 Rugusu Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP							
TEST METHOD : BS 1377:Part 4							
MOISTURE CONTENT							
Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	101.70	112.50	96.10	99.50	91.90	218.00	
Weight of Tin + Dry Soil (g)	93.30	101.50	85.50	87.20	79.90	209.30	
Weight of Tin(g)	17.6	17.5	15.8	15.3	17.4	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	75.7	84.0	69.7	71.9	62.5	193.3	
Moisture Content (%)	11.1	13.1	15.2	17.1	19.2	4.5	
Wt of Mould+base+specimen (g)	4717	4860	4951	4915	4830		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1667	1810	1901	1865	1780		
Bulk Density (kg/m^3)	1667	1810	1901	1865	1780		
Dry Density (kg/m^3)	1500	1600	1650	1593	1493		

Maximum Dry Density (kg/m^3)=	**1638**			**Optimum Moisture Content (%)**	**15.2**	



TESTED BY:	**Ben**	REMARKS:
PREPARED BY:	**Austine**	
APPROVED BY:	**Eng.Tom Waiharo**	Signature:

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) RUGUSU MS 2

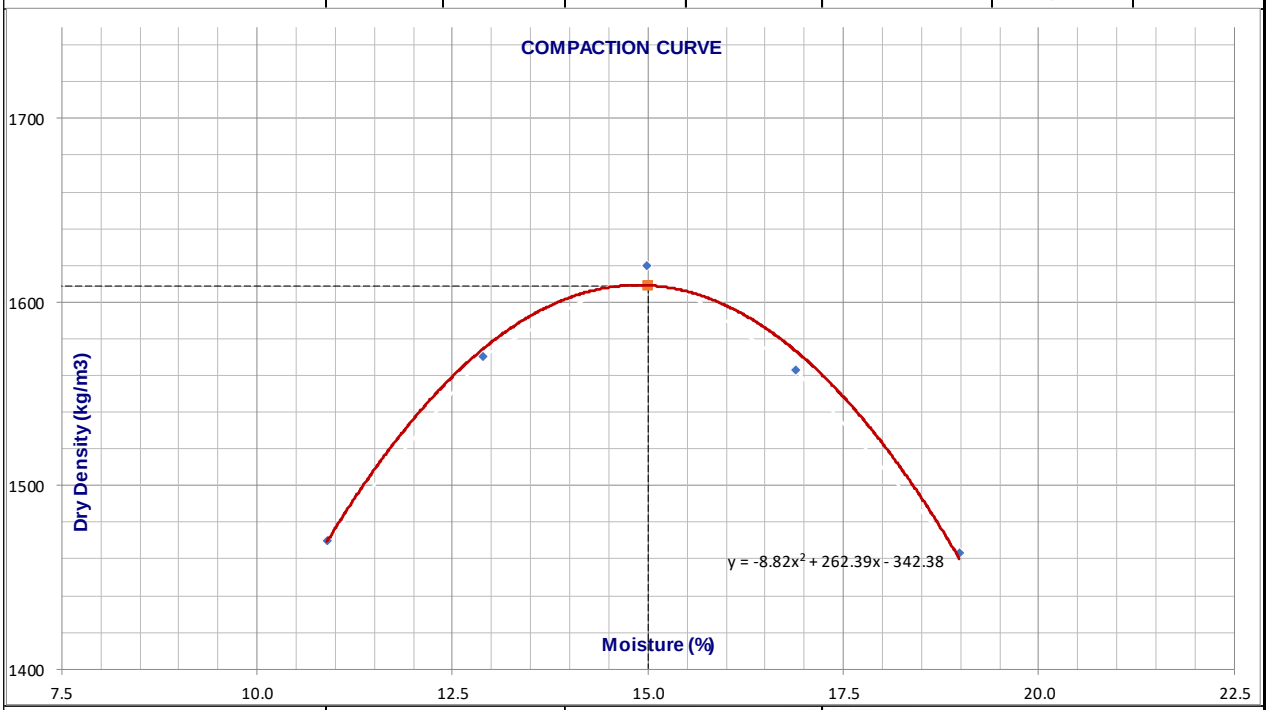
CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS2 TP 4 Rugusu Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	101.10	113.10	98.90	101.60	92.60	121.40	
Weight of Tin + Dry Soil (g)	92.70	102.10	88.30	89.30	80.60	112.70	
Weight of Tin(g)	15.6	16.8	17.6	16.5	17.4	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	77.1	85.3	70.7	72.8	63.2	96.7	
Moisture Content (%)	10.9	12.9	15.0	16.9	19.0	9.0	
Wt of Mould+base+specimen (g)	4680	4823	4913	4877	4791		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1630	1773	1863	1827	1741		
Bulk Density (kg/m^3)	1630	1773	1863	1827	1741		
Dry Density (kg/m^3)	1470	1570	1620	1563	1463		
Maximum Dry Density (kg/m^3)=	**1609**			**Optimum Moisture Content (%)**		**15.0**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:	

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TRIAL PIT NO. (TP 5) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**						
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**						
Depth Range:	N/A	**m**	**Location:**	**MS2 TP 5 Rugusu Material Site**		**Test Date:**	23 04 2025
Sampled By:	Ben			**Tested By:**	Ben		

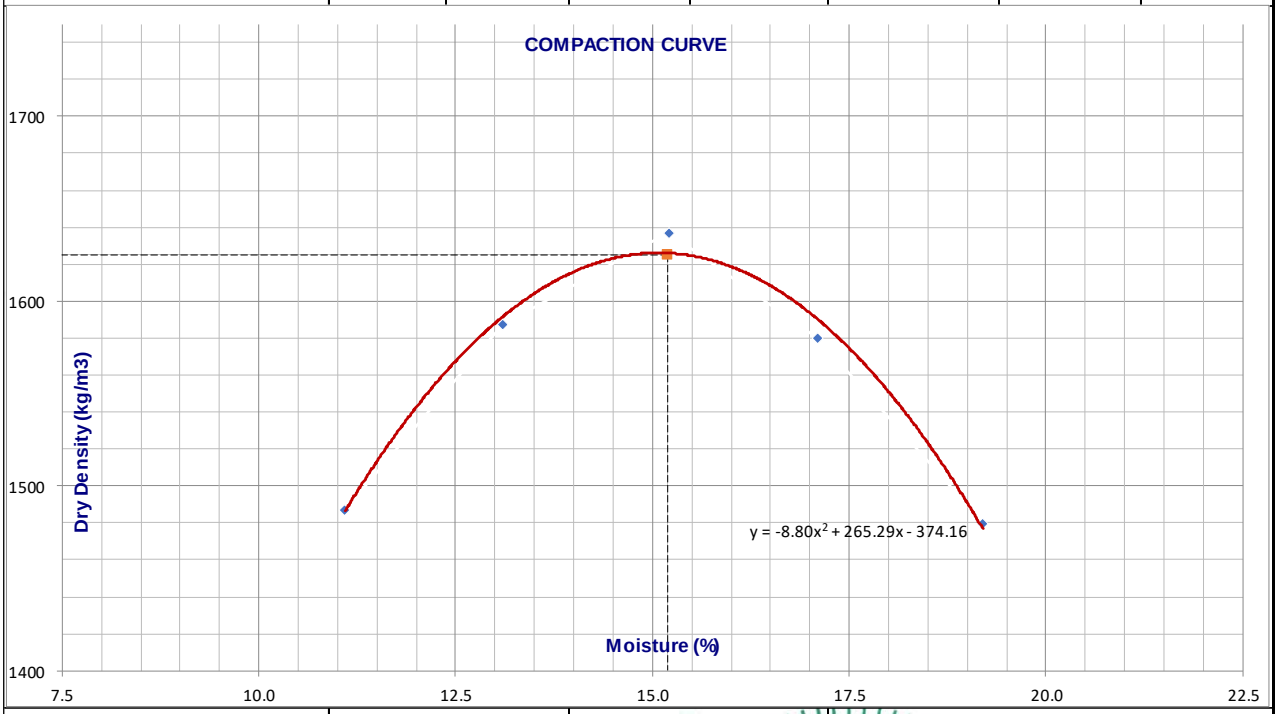
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**10**	**12**	**14**	**16**	**18**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	99.70	111.80	97.90	100.70	91.90	198.70	
Weight of Tin + Dry Soil (g)	91.30	100.80	87.30	88.40	79.90	190.00	
Weight of Tin(g)	15.6	16.8	17.6	16.5	17.4	16	
Weight of Moisture (g)	8.4	11.0	10.6	12.3	12.0	8.7	
Weight of Dry Soil (g)	75.7	84.0	69.7	71.9	62.5	174.0	
Moisture Content (%)	11.1	13.1	15.2	17.1	19.2	5.0	
Wt of Mould+base+specimen (g)	4702	4845	4936	4900	4814		
Wt of Mould+Base (g)	3050	3050	3050	3050	3050		
Wt of Specimen (g)	1652	1795	1886	1850	1764		
Bulk Density (kg/m^3)	1652	1795	1886	1850	1764		
Dry Density (kg/m^3)	1487	1587	1637	1580	1480		

Maximum Dry Density (kg/m^3)=	**1625**			**Optimum Moisture Content (%)**		**15.2**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:	

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COMPACTION TEST RESULTS PRELIMINARY DESIGN

TRIAL PIT NO. (TP 1) RUGUSU MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS1 TP1 Rugusu	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

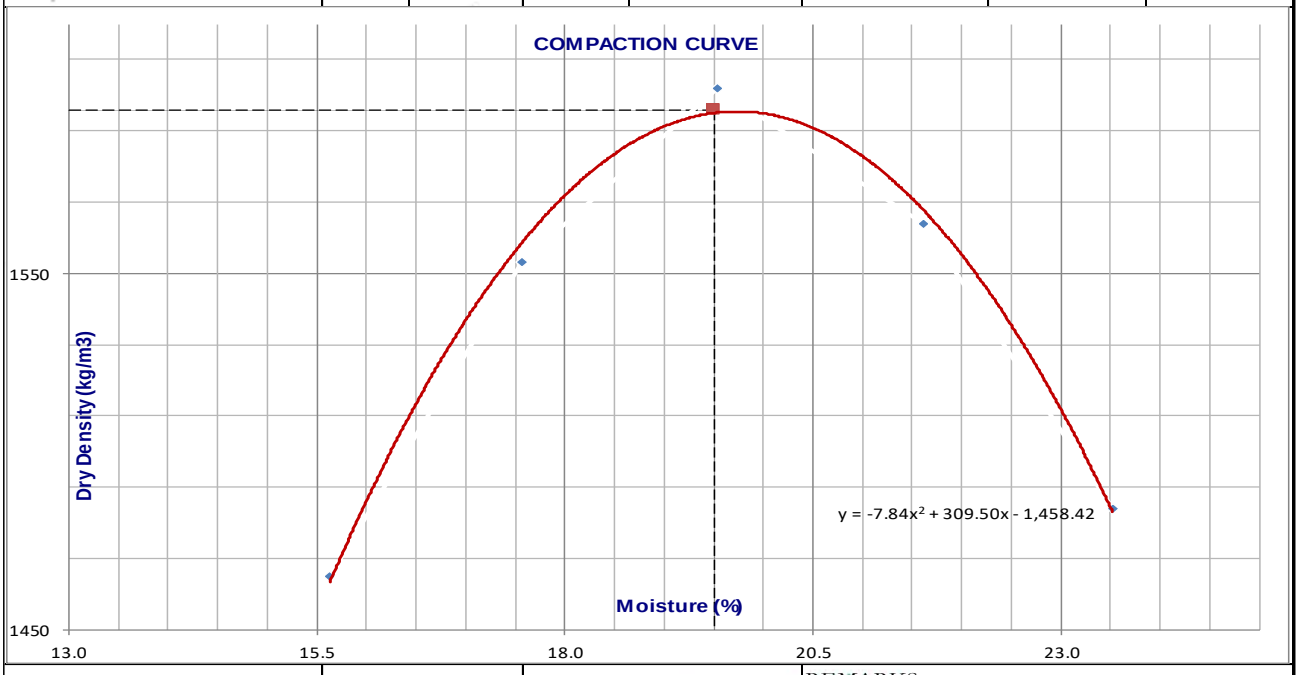
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**H13**	
Weight of Wet Soil + Tin (g)	92.5	99.8	95.1	105.8	93.2	99.0	
Weight of Tin + Dry Soil (g)	83.7	89.4	81.8	89.4	78.9	89.8	
Weight of Tin(g)	27.4	30.2	13.7	13.5	18.1	21.7	
Weight of Moisture (g)	8.8	10.4	13.3	16.4	14.3	9.2	
Weight of Dry Soil (g)	56.3	59.2	68.1	75.9	60.8	68.1	
Moisture Content (%)	15.6	17.6	19.5	21.6	23.5	13.5	
Wt of Mould+base+specimen (g	5956	6088	6177	6164	6095		
Wt of Mould+Base (g)	4262	4262	4262	4262	4262		
Wt of Specimen (g)	1694	1826	1915	1902	1833		
Bulk Density (kg/m^3)	1694	1826	1915	1902	1833		
Dry Density (kg/m^3)	1465	1553	1602	1564	1484		

Maximum Dry Density (kg/n	**1596**			**Optimum Moisture Content (%)=**		**19.5**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 2) RUGUSU MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS1 TP2 Rugusu	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

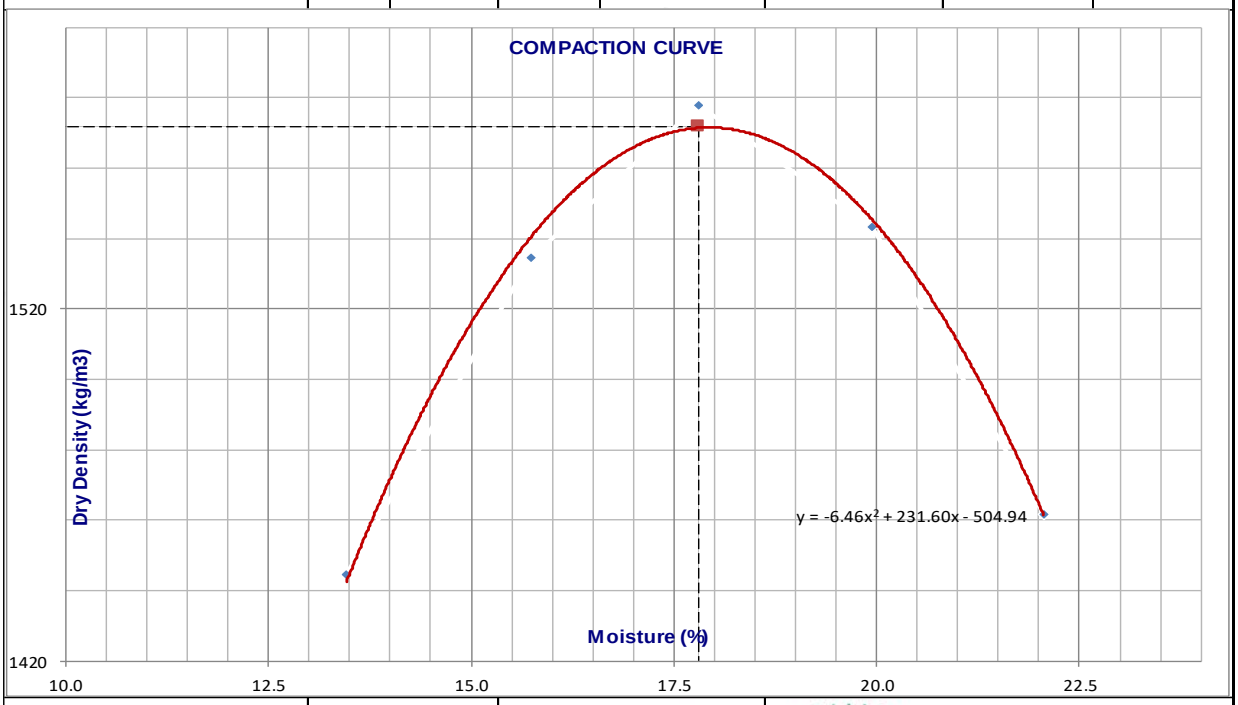
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**	
Tin No.						**M16**	
Weight of Wet Soil + Tin (g)	117.6	117.3	118.2	103.2	104.8	109.7	
Weight of Tin + Dry Soil (g)	106.6	104.8	102.4	90.5	88.3	102.5	
Weight of Tin(g)	24.9	25.4	13.7	26.8	13.5	26.3	
Weight of Moisture (g)	11.0	12.5	15.8	12.7	16.5	7.2	
Weight of Dry Soil (g)	81.7	79.4	88.7	63.7	74.8	76.2	
Moisture Content (%)	13.5	15.7	17.8	19.9	22.1	9.4	
Wt of Mould+base+specimen (g)	5359	5496	5579	5571	5504		
Wt of Mould+Base (g)	3720	3720	3720	3720	3720		
Wt of Specimen (g)	1639	1776	1859	1851	1784		
Bulk Density (kg/m^3)	1639	1776	1859	1851	1784		
Dry Density (kg/m^3)	1445	1534	1578	1543	1462		

Maximum Dry Density (kg/m	**1572**			**Optimum Moisture Content (%)=**		**17.8**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 3) RUGUSU MS 1

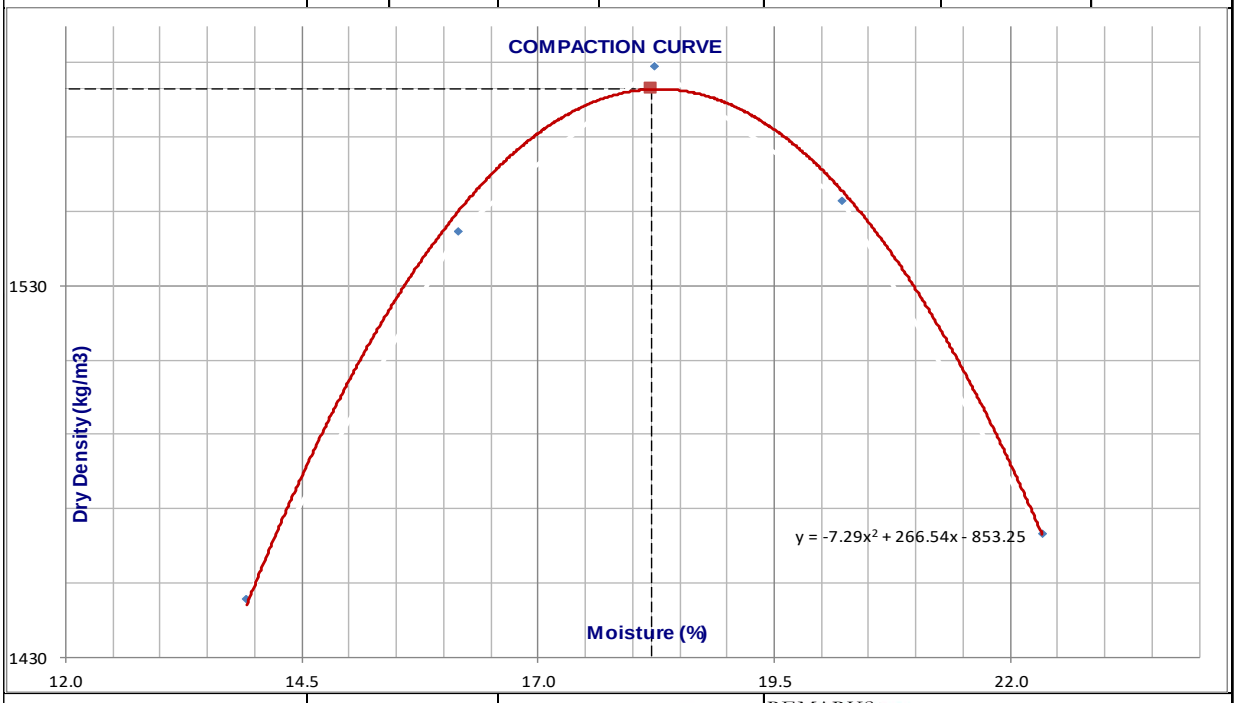
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP3 Rugusu	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**	
Tin No.						**M15**	
Weight of Wet Soil + Tin (g)	112.3	110.4	115.4	112.8	115.4	102.7	
Weight of Tin + Dry Soil (g)	101.0	98.3	99.7	96.1	98.0	95.9	
Weight of Tin(g)	19.8	23.4	13.6	13.5	20.1	26.3	
Weight of Moisture (g)	11.3	12.1	15.7	16.7	17.4	6.8	
Weight of Dry Soil (g)	81.2	74.9	86.1	82.6	77.9	69.6	
Moisture Content (%)	13.9	16.2	18.2	20.2	22.3	9.8	
Wt of Mould+base+specimen (g	5909	6056	6141	6129	6052		
Wt of Mould+Base (g)	4262	4262	4262	4262	4262		
Wt of Specimen (g)	1647	1794	1879	1867	1790		
Bulk Density (kg/m^3)	1647	1794	1879	1867	1790		
Dry Density (kg/m^3)	1446	1544	1589	1553	1463		
Maximum Dry Density (kg/n	**1583**			**Optimum Moisture Content (%)=**		**18.2**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) RUGUSU MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS1 TP4 Rugusu	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

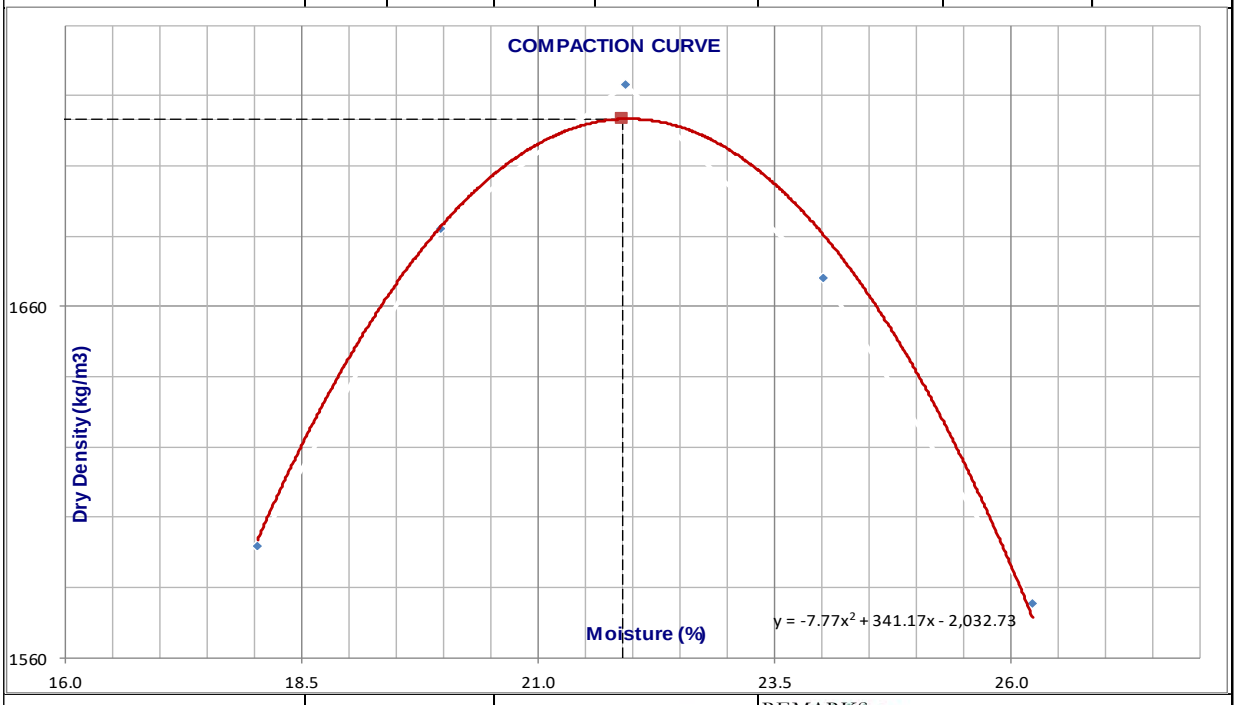
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**M56**	
Weight of Wet Soil + Tin (g)	107.1	95.7	94.9	93.2	105.8	91.5	
Weight of Tin + Dry Soil (g)	92.8	84.0	81.0	79.7	86.7	81.8	
Weight of Tin(g)	13.5	25.4	17.6	23.5	13.9	20.7	
Weight of Moisture (g)	14.3	11.7	13.9	13.5	19.1	9.7	
Weight of Dry Soil (g)	79.3	58.6	63.4	56.2	72.8	61.1	
Moisture Content (%)	18.0	20.0	21.9	24.0	26.2	15.9	
Wt of Mould+base+specimen (g	6141	6280	6363	6331	6251		
Wt of Mould+Base (g)	4262	4262	4262	4262	4262		
Wt of Specimen (g)	1879	2018	2101	2069	1989		
Bulk Density (kg/m^3)	1879	2018	2101	2069	1989		
Dry Density (kg/m^3)	1592	1682	1723	1668	1576		

Maximum Dry Density (kg/n	**1713**			**Optimum Moisture Content (%)=**		**21.9**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 5) RUGUSU MS 1

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS1 TP5 Rugusu	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

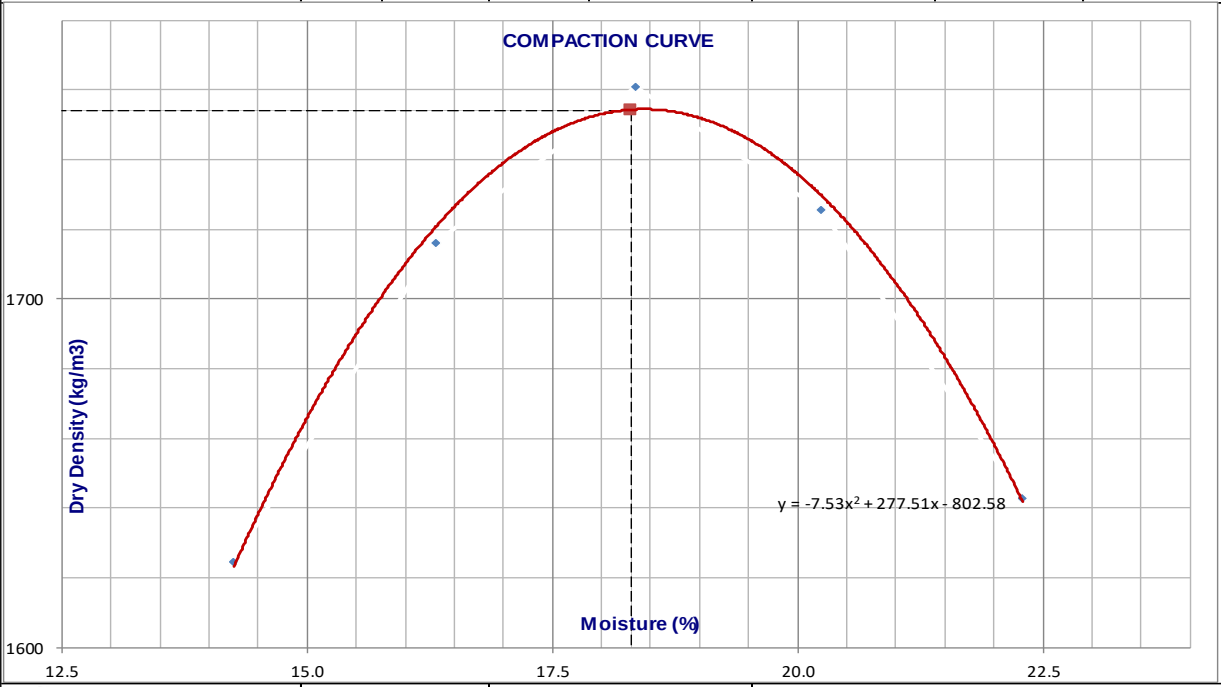
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**
Tin No.						**R17**
Weight of Wet Soil + Tin (g)	115.5	103.3	112.3	97.2	102.5	107.6
Weight of Tin + Dry Soil (g)	102.8	91.1	97.0	85.4	88.7	99.3
Weight of Tin(g)	13.7	16.3	13.6	27.1	26.8	18.0
Weight of Moisture (g)	12.7	12.2	15.3	11.8	13.8	8.3
Weight of Dry Soil (g)	89.1	74.8	83.4	58.3	61.9	81.3
Moisture Content (%)	14.3	16.3	18.3	20.2	22.3	10.2
Wt of Mould+base+specimen (g	6118	6258	6346	6337	6271	
Wt of Mould+Base (g)	4262	4262	4262	4262	4262	
Wt of Specimen (g)	1856	1996	2084	2075	2009	
Bulk Density (kg/m^3)	1856	1996	2084	2075	2009	
Dry Density (kg/m^3)	1624	1716	1761	1726	1643	

Maximum Dry Density (kg/n	**1754**			**Optimum Moisture Content (%)=**	**18.3**



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 1) NCOROIBORO MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP1 Nchoroiboro	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

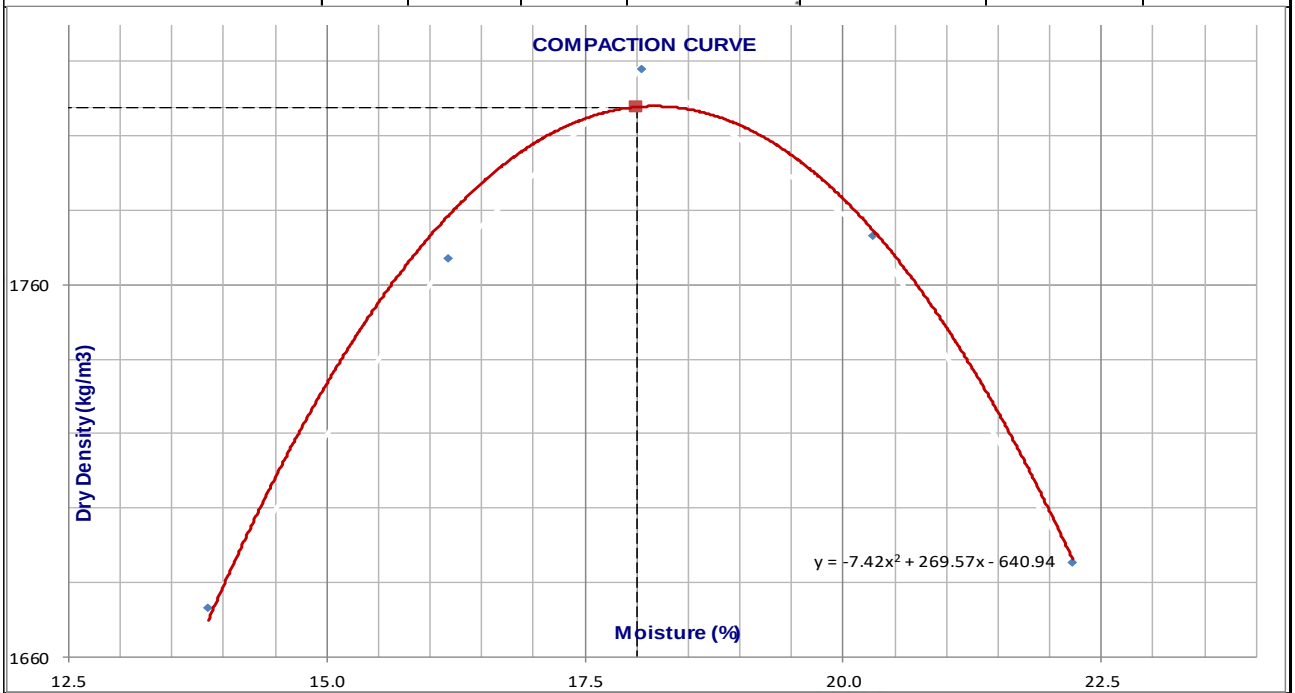
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**4**	**6**	**8**	**10**	**12**	**NMC (FROM SITE)**	
Tin No.						**R8**	
Weight of Wet Soil + Tin (g)	112.3	99.1	91.7	88.8	94.4	101.2	
Weight of Tin + Dry Soil (g)	102.7	89.3	82.3	78.8	81.2	93.5	
Weight of Tin(g)	33.4	28.7	30.2	29.5	21.8	13.7	
Weight of Moisture (g)	9.6	9.8	9.4	10.0	13.2	7.7	
Weight of Dry Soil (g)	69.3	60.6	52.1	49.3	59.4	79.8	
Moisture Content (%)	13.9	16.2	18.0	20.3	22.2	9.6	
Wt of Mould+base+specimen (g	5627	5775	5868	5855	5782		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	1905	2053	2146	2133	2060		
Bulk Density (kg/m^3)	1905	2053	2146	2133	2060		
Dry Density (kg/m^3)	1673	1767	1818	1773	1685		

Maximum Dry Density (kg/m	**1808**			**Optimum Moisture Content (%)=**	**18.0**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (TP 2) NCOROIBORO MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP2 Nchoroiboro	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

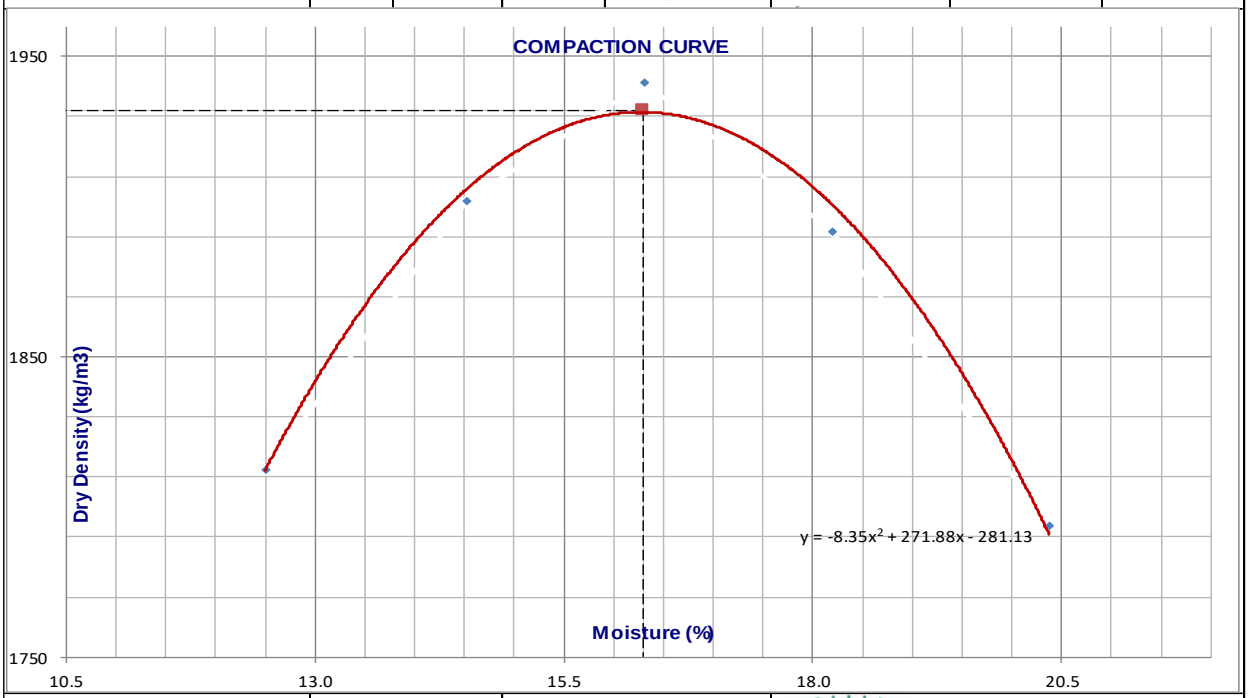
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**6**	**8**	**10**	**12**	**14**	**NMC (FROM SITE)**	
Tin No.						**M22**	
Weight of Wet Soil + Tin (g)	108.6	88.0	91.4	100.1	108.2	114.5	
Weight of Tin + Dry Soil (g)	98.7	79.1	81.5	89.2	95.2	109.5	
Weight of Tin(g)	19.5	17.8	20.8	29.3	31.4	29.4	
Weight of Moisture (g)	9.9	8.9	9.9	10.9	13.0	5.0	
Weight of Dry Soil (g)	79.2	61.3	60.7	59.9	63.8	80.1	
Moisture Content (%)	12.5	14.5	16.3	18.2	20.4	6.2	
Wt of Mould+base+specimen (g	5761	5900	5980	5958	5881		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	2039	2178	2258	2236	2159		
Bulk Density (kg/m^3)	2039	2178	2258	2236	2159		
Dry Density (kg/m^3)	1812	1902	1941	1892	1794		

Maximum Dry Density (kg/m	**1932**			**Optimum Moisture Content (%)=**		**16.3**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (TP 3) NCOROIBORO MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP3 Nchoroiboro	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

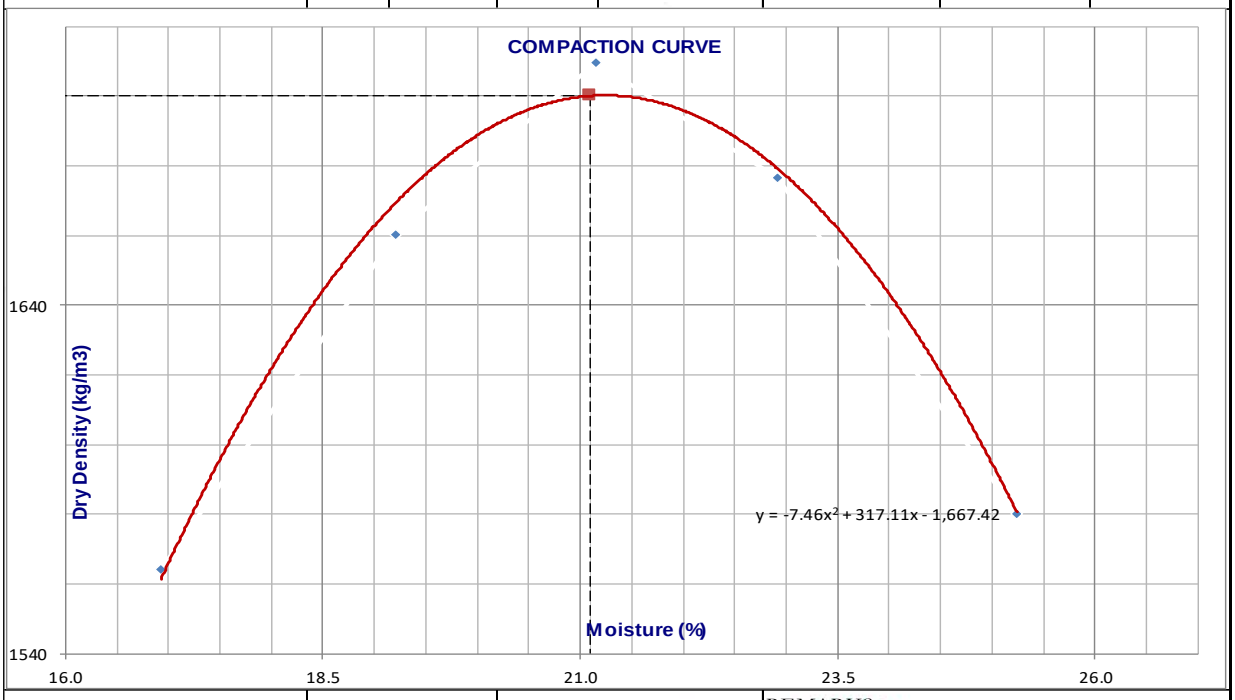
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**6**	**8**	**10**	**12**	**14**	**NMC (FROM SITE)**	
Tin No.						**R8**	
Weight of Wet Soil + Tin (g)	113.6	108.8	106.5	102.3	106.8	110.8	
Weight of Tin + Dry Soil (g)	101.7	95.7	91.4	88.5	91.2	100.6	
Weight of Tin(g)	31.4	27.5	20.0	28.3	29.4	13.4	
Weight of Moisture (g)	11.9	13.1	15.1	13.8	15.6	10.2	
Weight of Dry Soil (g)	70.3	68.2	71.4	60.2	61.8	87.2	
Moisture Content (%)	16.9	19.2	21.1	22.9	25.2	11.7	
Wt of Mould+base+specimen (g	5551	5701	5793	5783	5701		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	1829	1979	2071	2061	1979		
Bulk Density (kg/m^3)	1829	1979	2071	2061	1979		
Dry Density (kg/m^3)	1564	1660	1709	1677	1580		

Maximum Dry Density (kg/n	**1700**			**Optimum Moisture Content (%)=**		**21.1**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) NCOROIBORO MS 2

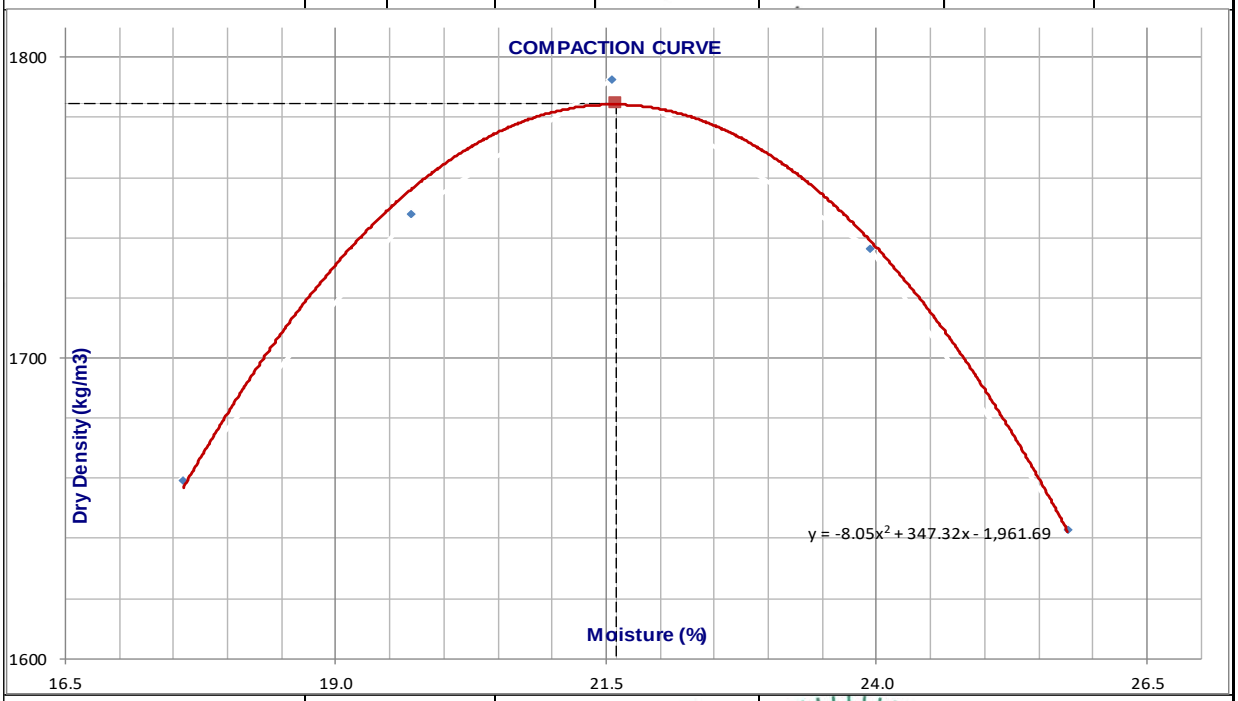
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP4 Nchoroiboro	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**6**	**8**	**10**	**12**	**14**	**NMC (FROM SITE)**	
Tin No.						**R8**	
Weight of Wet Soil + Tin (g)	91.7	83.2	98.8	92.5	103.5	96.5	
Weight of Tin + Dry Soil (g)	80.9	72.8	85.8	80.7	88.4	87.7	
Weight of Tin(g)	19.5	20.0	25.5	31.4	29.8	13.4	
Weight of Moisture (g)	10.8	10.4	13.0	11.8	15.1	8.8	
Weight of Dry Soil (g)	61.4	52.8	60.3	49.3	58.6	74.3	
Moisture Content (%)	17.6	19.7	21.6	23.9	25.8	11.8	
Wt of Mould+base+specimen (g	5673	5814	5901	5874	5788		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	1951	2092	2179	2152	2066		
Bulk Density (kg/m^3)	1951	2092	2179	2152	2066		
Dry Density (kg/m^3)	1659	1748	1793	1736	1643		
Maximum Dry Density (kg/m	**1785**			**Optimum Moisture Content (%)=**		**21.6**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

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TRIAL PIT NO. (TP 5) NCOROIBORO MS 2

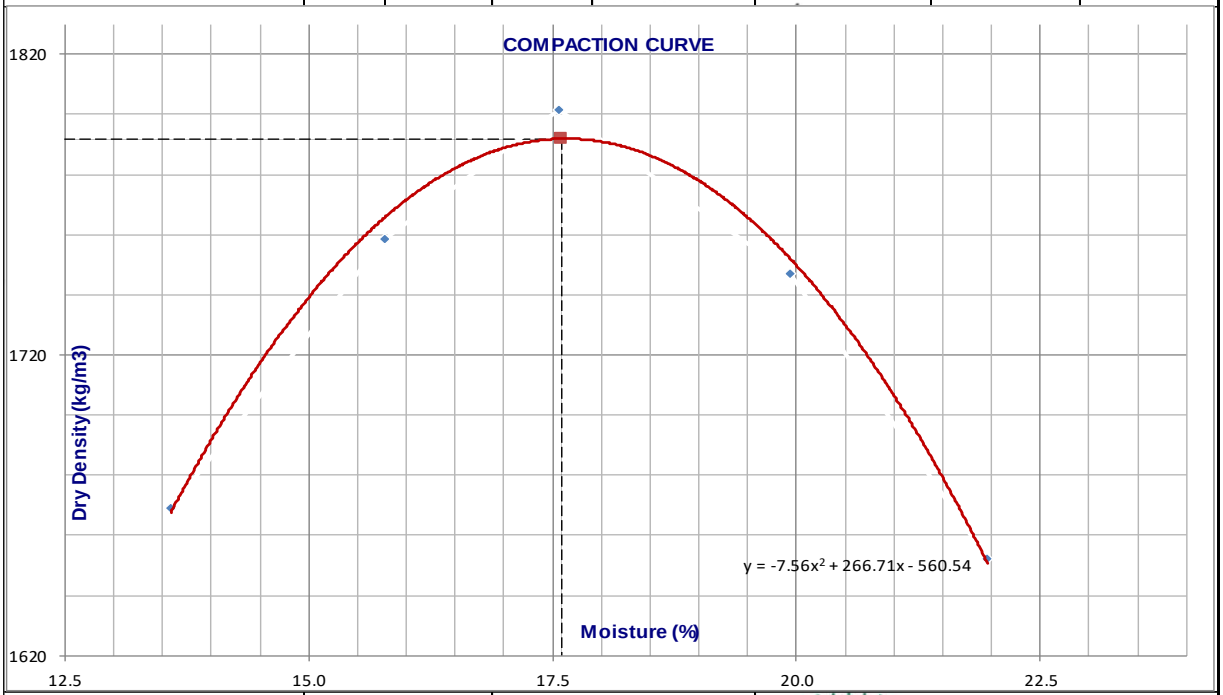
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
Depth Range:	N/A	**Location:**	MS2 TP5 Nchoroiboro	**Test Date**	1/10/2024
Sampled By:	Ben	**Tested By**	Ben		

DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**NMC (FROM SITE)**	
Tin No.						**M2**	
Weight of Wet Soil + Tin (g)	111.5	94.7	88.5	97.5	98.3	108.9	
Weight of Tin + Dry Soil (g)	101.8	85.5	77.8	86.1	83.3	100.3	
Weight of Tin(g)	30.4	27.2	16.9	28.9	15.0	22.3	
Weight of Moisture (g)	9.7	9.2	10.7	11.4	15.0	8.6	
Weight of Dry Soil (g)	71.4	58.3	60.9	57.2	68.3	78.0	
Moisture Content (%)	13.6	15.8	17.6	19.9	22.0	11.0	
Wt of Mould+base+specimen (g	5618	5758	5840	5817	5737		
Wt of Mould+Base (g)	3722	3722	3722	3722	3722		
Wt of Specimen (g)	1896	2036	2118	2095	2015		
Bulk Density (kg/m^3)	1896	2036	2118	2095	2015		
Dry Density (kg/m^3)	1669	1759	1801	1747	1652		
Maximum Dry Density (kg/n	**1792**			**Optimum Moisture Content (%)=**		**17.6**	



TESTED BY:	**Ben**		REMARKS:
PREPARED BY:	**Austine**		
APPROVED BY:	**Eng.Tom Waiharo**	Signature:_____	

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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CBR TEST RESULTS DETAILED DESIGN

TRIAL PIT NO. (TP 1) NKUNGA MS 1

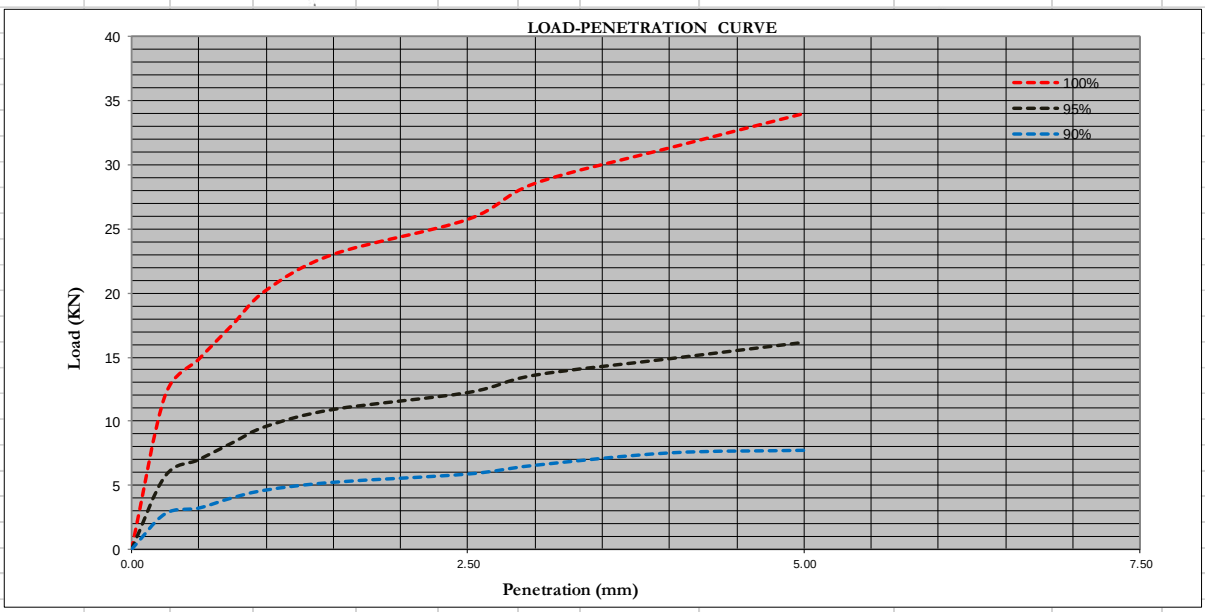
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 1 TP 1 Nkunga Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD
MDD (g/cc) :	1.935
OMC (%) :	11.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.935	11.6		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	5.85	7.69	44	39	0.06
30 (95%)	12.25	16.18	92	81	0.08
62 (100%)	25.71	33.95	193	170	0.12

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.833	10.4	44	0.06
30 (95%)	1.935	11.6	92	0.08
62 (100%)	2.037	12.2	193	0.12

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 2) NKUNGA MS 1

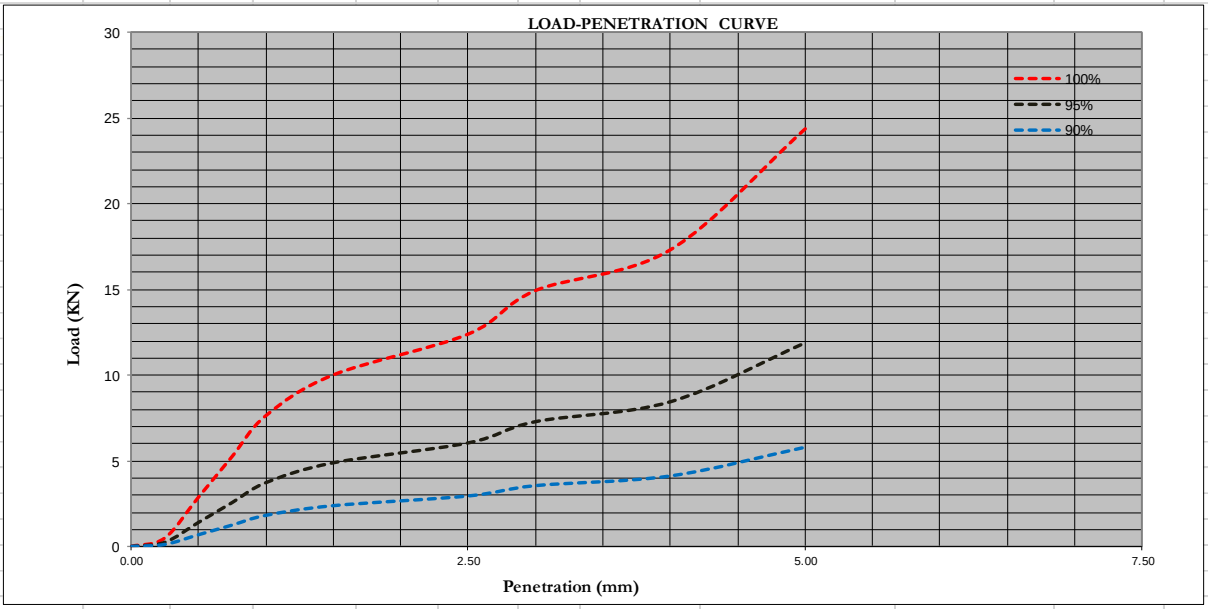
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 1 TP 2 Nkunga Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD
MDD (g/cc) :	1.934
OMC (%) :	12.4

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.934	12.4		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	2.95	5.80	22	29	0.06
30 (95%)	6.05	11.89	45	60	0.05
62 (100%)	12.39	24.38	93	122	0.09

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.833	11.2	22	0.06
30 (95%)	1.934	12.4	45	0.05
62 (100%)	2.037	13.1	93	0.09

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 3) NKUNGA MS 1

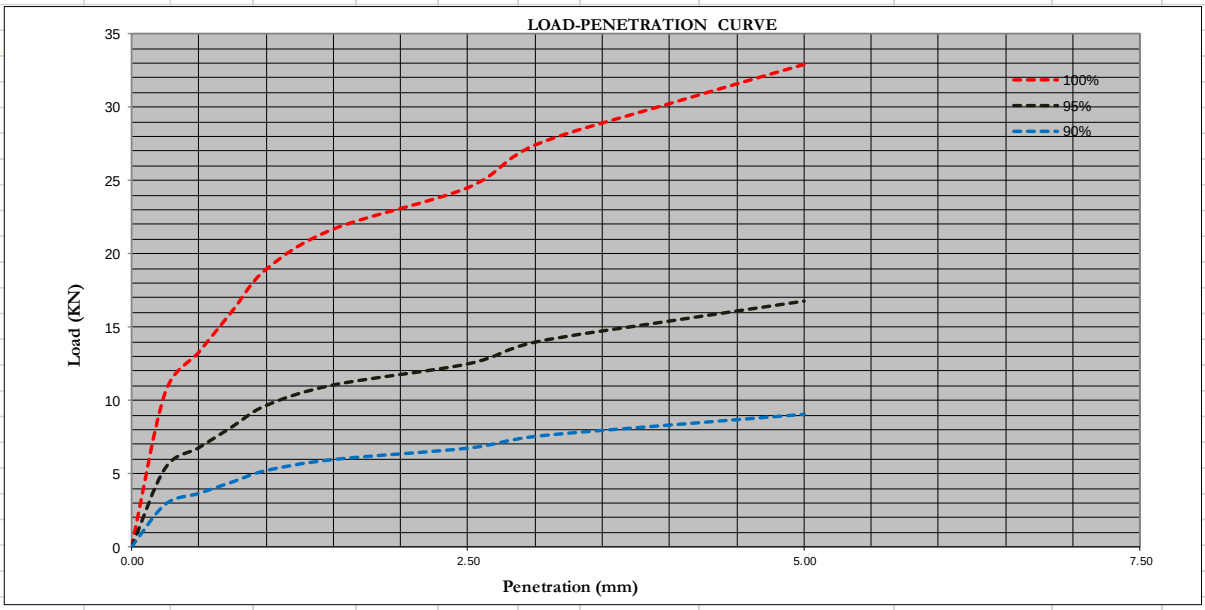
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS**				
Depth Range:	**N/A**	**Location:**	**MS 1 TP 3 Nkunga Material Site**	**Test Date**	23 04 2025
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~4.5~~, METHOD
MDD (g/cc) :	1.945
OMC (%) :	10.5

	Before Soaking		After Soaking	
Blows	DD	Moisture	DD	Moisture
	(g/cc)	(%)	(g/cc)	(%)
10				
30	1.945	10.5		
62				



Blow	LOAD (KN)		CBR(%)		Swell
	2.54mm	5.08mm	2.54mm	5.08mm	%
10 (90%)	6.75	9.07	51	46	0.07
30 (95%)	12.49	16.78	94	84	0.08
62 (100%)	24.49	32.88	183	165	0.09

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.843	9.4	51	0.07
30 (95%)	1.945	10.5	94	0.08
62 (100%)	2.048	11.1	183	0.09

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) NKUNGA MS 1

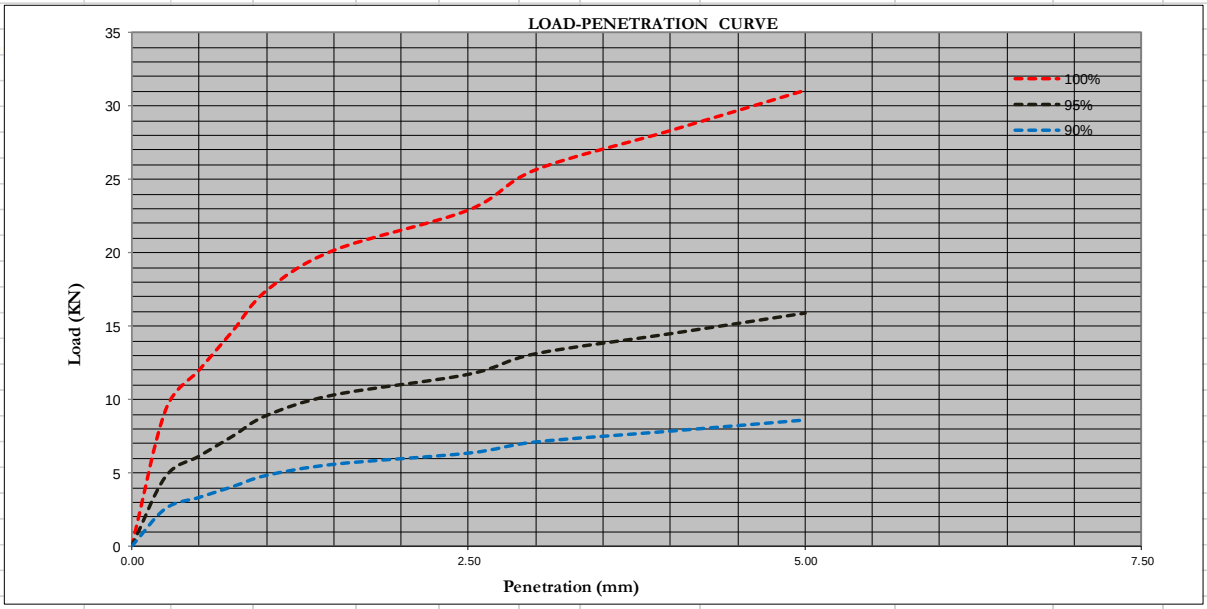
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 1 TP 4 Nkunga Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD
MDD (g/cc) :	1.954
OMC (%) :	12.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.954	12.2		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	6.32	8.57	47	43	0.08
30 (95%)	11.69	15.86	88	80	0.10
62 (100%)	22.92	31.08	172	156	0.06

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.852	11.0	47	0.08
30 (95%)	1.954	12.2	88	0.10
62 (100%)	2.057	12.8	172	0.06

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 5) NKUNGA MS 1

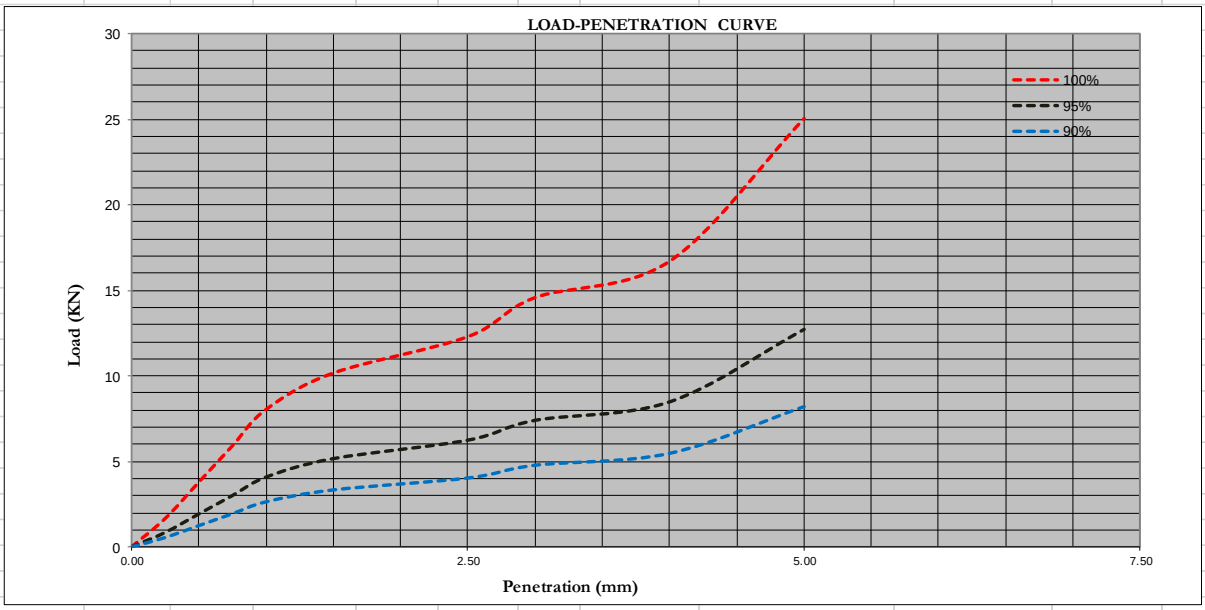
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS**				
Depth Range:	**N/A**	**Location:**	**MS 1 TP 5 Nkunga Material Site**	**Test Date**	23 04 2025
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~99~~, METHOD
MDD (g/cc) :	1.945
OMC (%) :	13.4

	Before Soaking		After Soaking	
Blows	DD	Moisture	DD	Moisture
	(g/cc)	(%)	(g/cc)	(%)
10				
30	1.945	13.4		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	4.03	8.21	30	41	0.11
30 (95%)	6.25	12.73	47	64	0.06
62 (100%)	12.31	25.08	92	126	0.11

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.844	12.1	30	0.11
30 (95%)	1.945	13.4	47	0.06
62 (100%)	2.048	14.1	92	0.11

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 1) RUGUSU MS 2

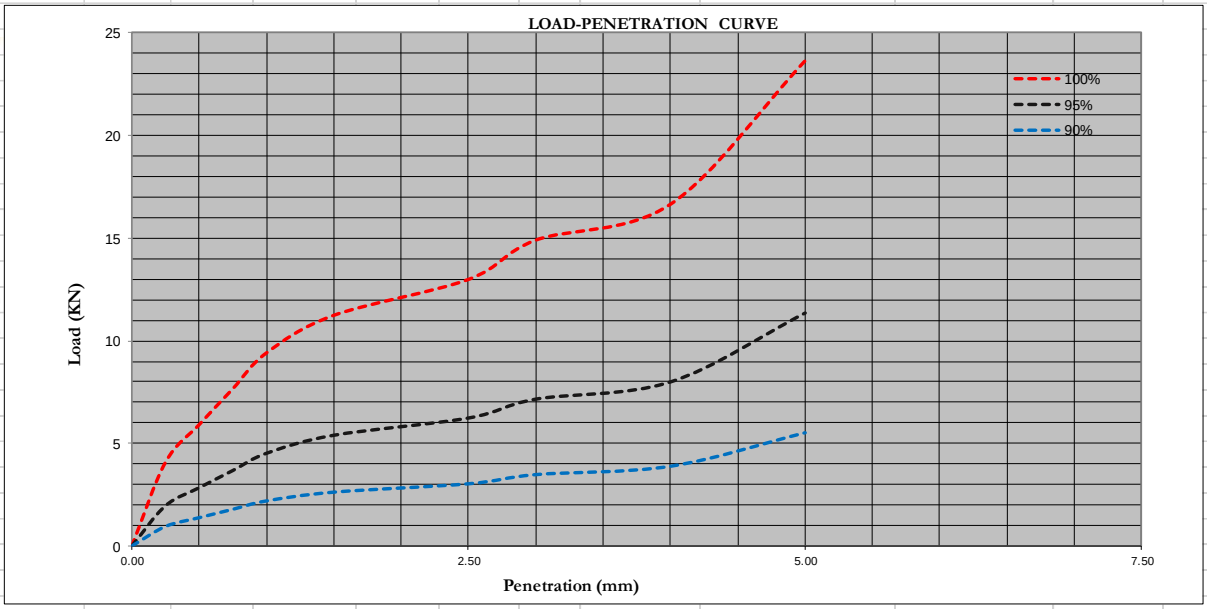
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 2 TP 1 Rugusu Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~4~~99, METHOD
MDD (g/cc) :	1.634
OMC (%) :	15.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.634	15.3		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	3.03	5.52	23	28	0.09
30 (95%)	6.25	11.37	47	57	0.06
62 (100%)	12.99	23.65	97	119	0.06

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.549	13.8	23	0.09
30 (95%)	1.634	15.3	47	0.06
62 (100%)	1.721	16.1	97	0.06

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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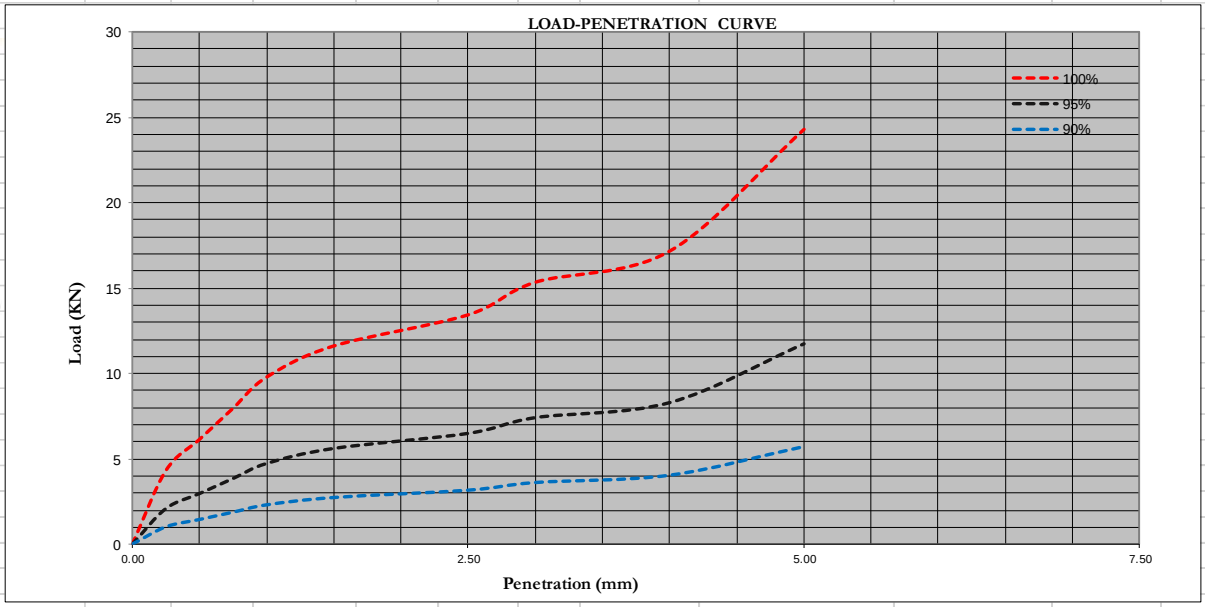
TRIAL PIT NO. (TP 2) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS**				
Depth Range:	**N/A**	**Location:**	**MS 2 TP 2 Rugusu Material Site**	**Test Date**	23 04 2025
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD
MDD (g/cc) :	1.635
OMC (%) :	14.5

	Before Soaking		After Soaking	
Blows	DD	Moisture	DD	Moisture
	(g/cc)	(%)	(g/cc)	(%)
10				
30	1.635	14.5		
62				



Blow	LOAD (KN)		CBR(%)		Swell
	2.54mm	5.08mm	2.54mm	5.08mm	%
10 (90%)	3.16	5.72	24	29	0.08
30 (95%)	6.49	11.73	49	59	0.11
62 (100%)	13.43	24.29	101	122	0.08

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.549	13.1	24	0.08
30 (95%)	1.635	14.5	49	0.11
62 (100%)	1.722	15.3	101	0.08

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 3) RUGUSU MS 2

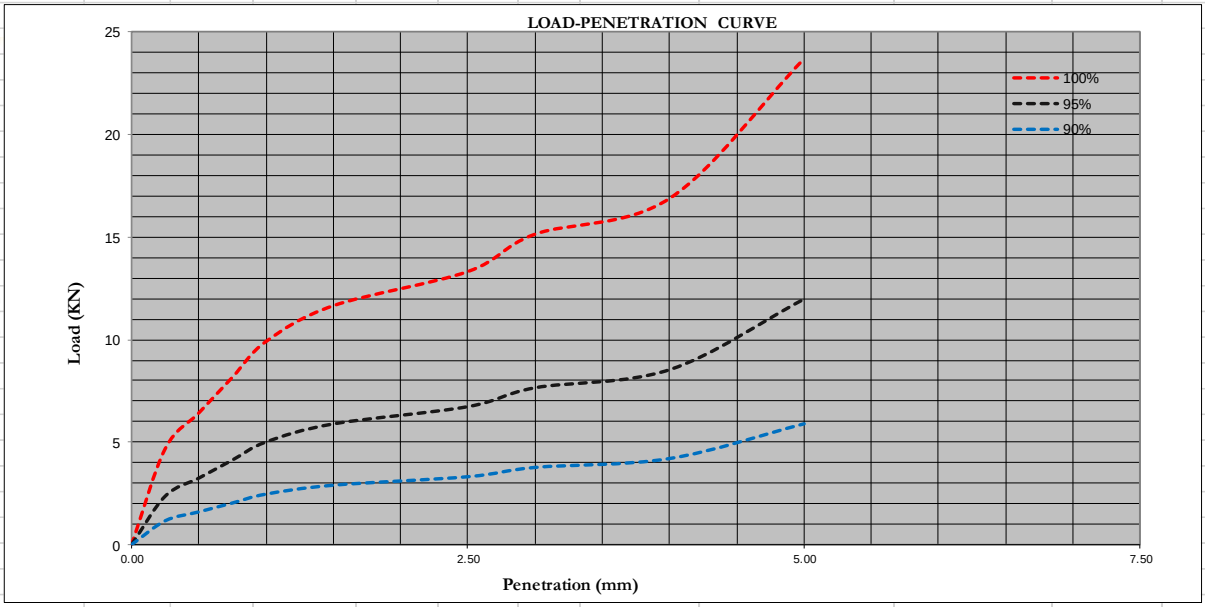
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 2 TP 3 Rugusu Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~4~~, METHOD
MDD (g/cc) :	1.650
OMC (%) :	15.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.650	15.2		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	3.30	5.87	25	29	0.06
30 (95%)	6.73	11.97	50	60	0.08
62 (100%)	13.32	23.71	100	119	0.09

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.564	13.7	25	0.06
30 (95%)	1.650	15.2	50	0.08
62 (100%)	1.738	16.0	100	0.09

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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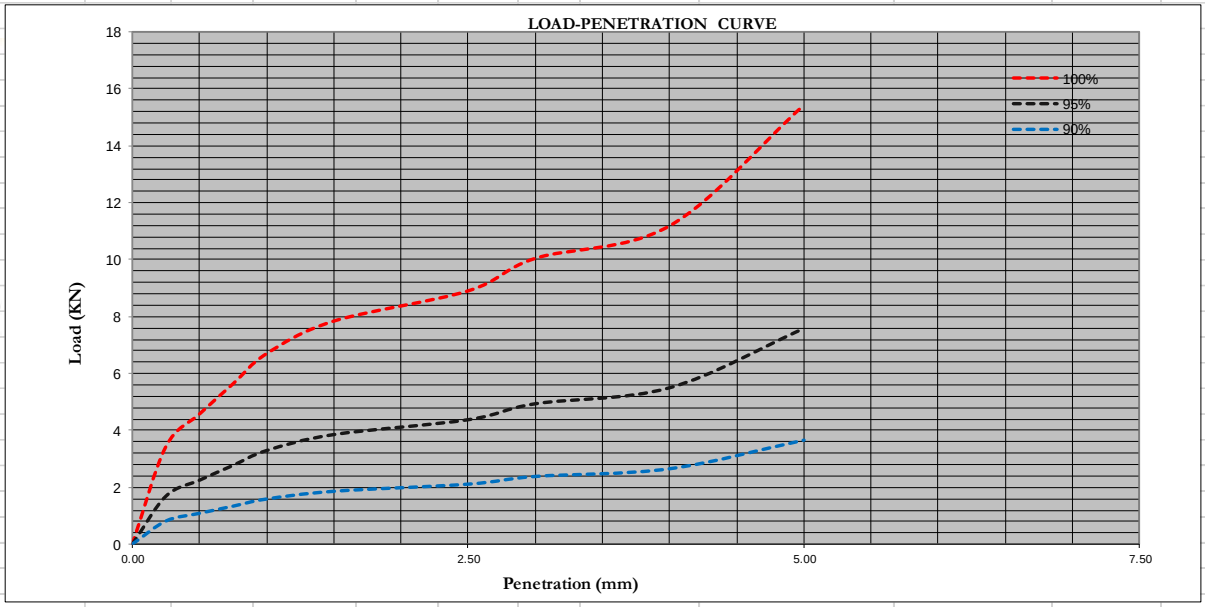
TRIAL PIT NO. (TP 4) RUGUSU MS 2

CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS**				
Depth Range:	**N/A**	**Location:**	**MS 2 TP 4 Rugusu Material Site**	**Test Date**	23 04 2025
Sampled By:	Ben	**Tested By**	Ben		

CALIFORNIA BEARING RATIO (CBR)
TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD
MDD (g/cc) :	1.622
OMC (%) :	14.9

	Before Soaking		After Soaking	
Blows	DD	Moisture	DD	Moisture
	(g/cc)	(%)	(g/cc)	(%)
10				
30	1.622	14.9		
62				



Blow	LOAD (KN)		CBR(%)		Swell
	2.54mm	5.08mm	2.54mm	5.08mm	%
10 (90%)	2.12	3.67	16	18	0.06
30 (95%)	4.36	7.57	33	38	0.06
62 (100%)	8.90	15.44	67	77	0.06

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.537	13.4	16	0.06
30 (95%)	1.622	14.9	33	0.06
62 (100%)	1.708	15.6	67	0.06

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 5) RUGUSU MS 2

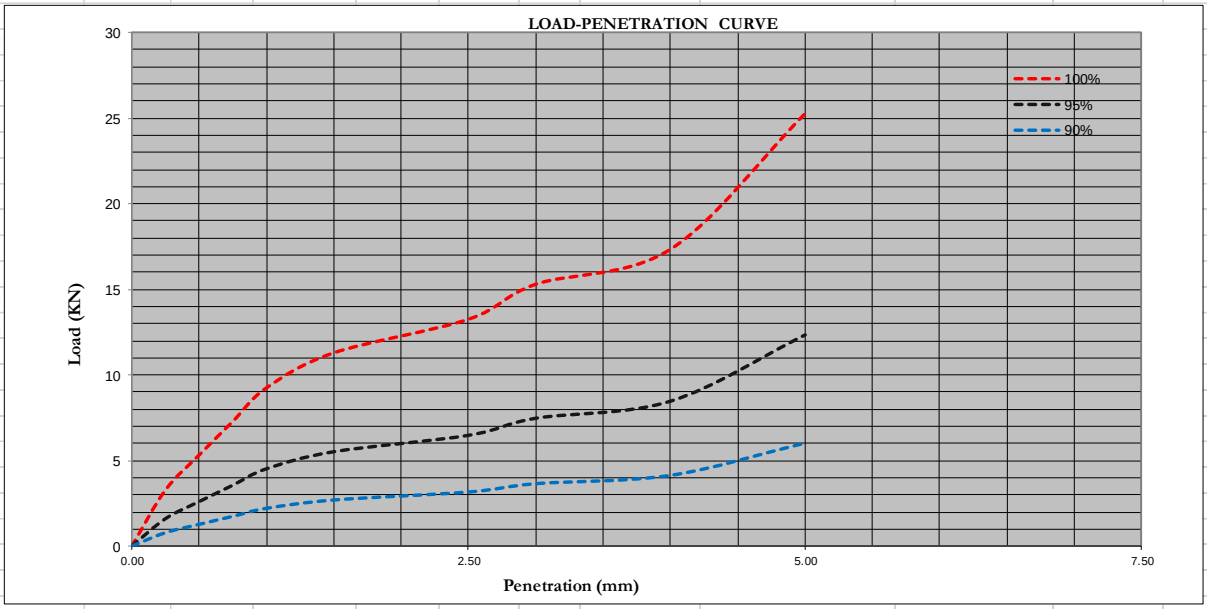
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
Depth Range:	N/A	Location:	MS 2 TP 5 Rugusu Material Site	Test Date	23 04 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~4~~99, METHOD
MDD (g/cc) :	1.637
OMC (%) :	15.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.637	15.2		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	3.15	6.01	24	30	0.07
30 (95%)	6.49	12.37	49	62	0.08
62 (100%)	13.23	25.24	99	127	0.11

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.551	13.7	24	0.07
30 (95%)	1.637	15.2	49	0.08
62 (100%)	1.724	16.0	99	0.11

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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CBR TEST RESULTS PRELIMINARY DESIGN

TRIAL PIT NO. (TP 1) RUGUSU MS 1

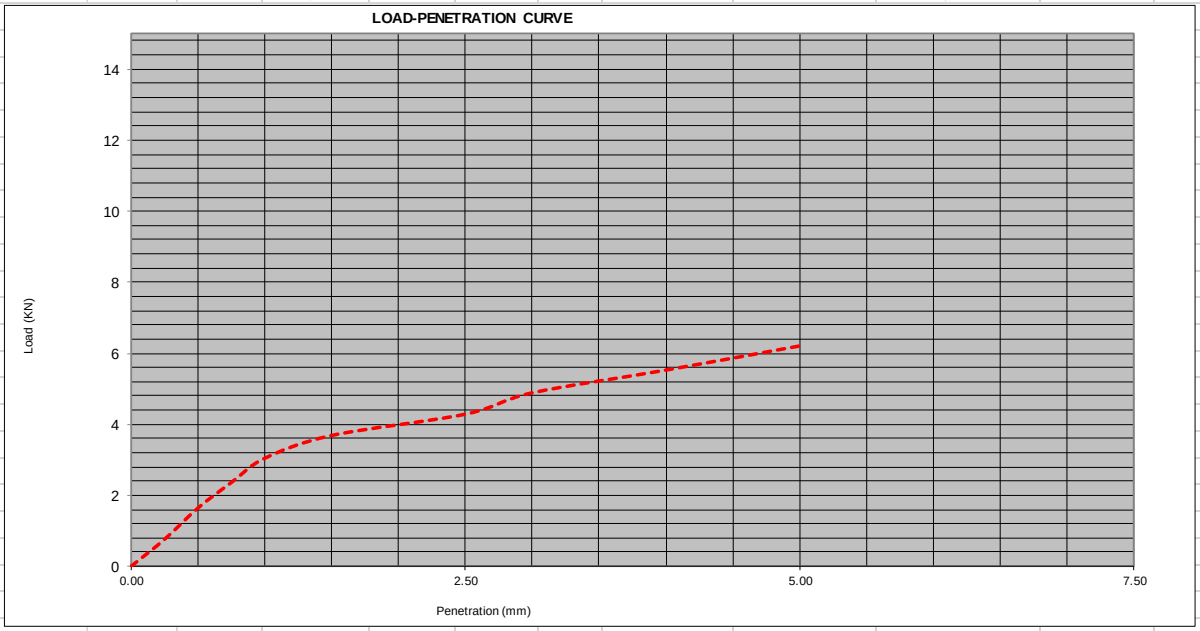
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
	MS1 TP1				
Depth Range:	**N/A**	**Location:**	**Rugusu**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.602
OMC (%) :	19.5

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.602	19.5		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	4.28	6.21	32	31	0.05

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.602	19.5	32	0.05
Parameters at 95% MDD	**1.522**	**18.6**	**30**	**0.04**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 2) RUGUSU MS 1

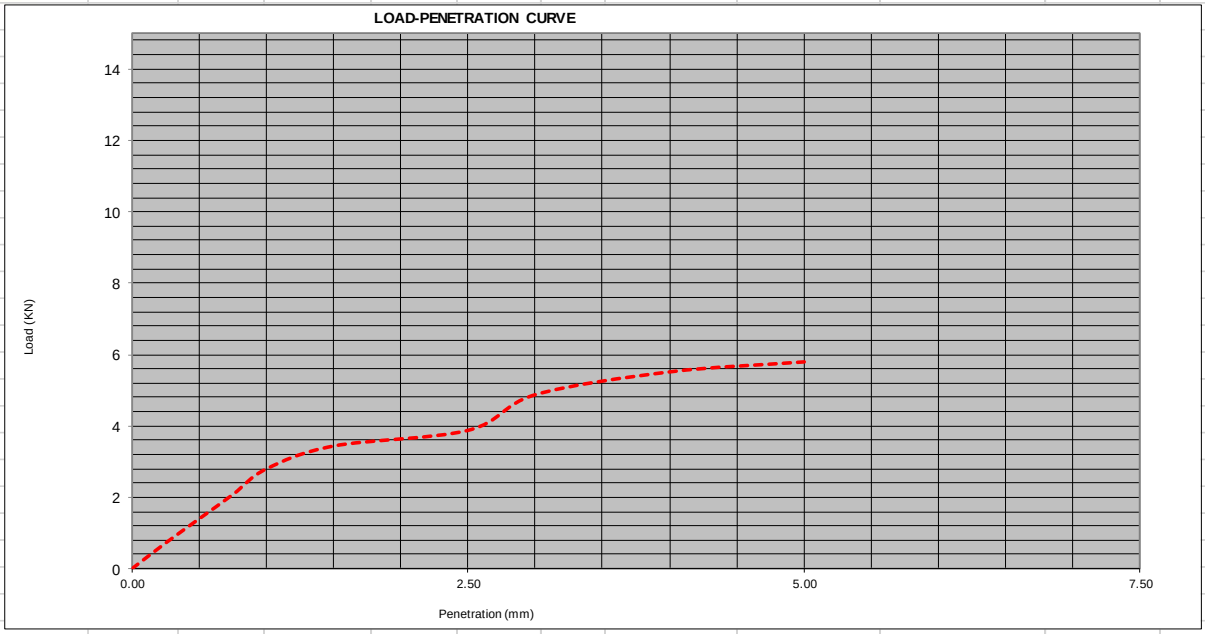
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
	MS1 TP2				
Depth Range:	**N/A**	**Location:**	**Rugusu**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.578
OMC (%) :	17.8

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.578	17.8		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	3.88	5.81	29	29	0.10

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.578	17.8	29	0.10
Parameters at 95% MDD	**1.499**	**16.9**	**28**	**0.10**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 3) RUGUSU MS 1

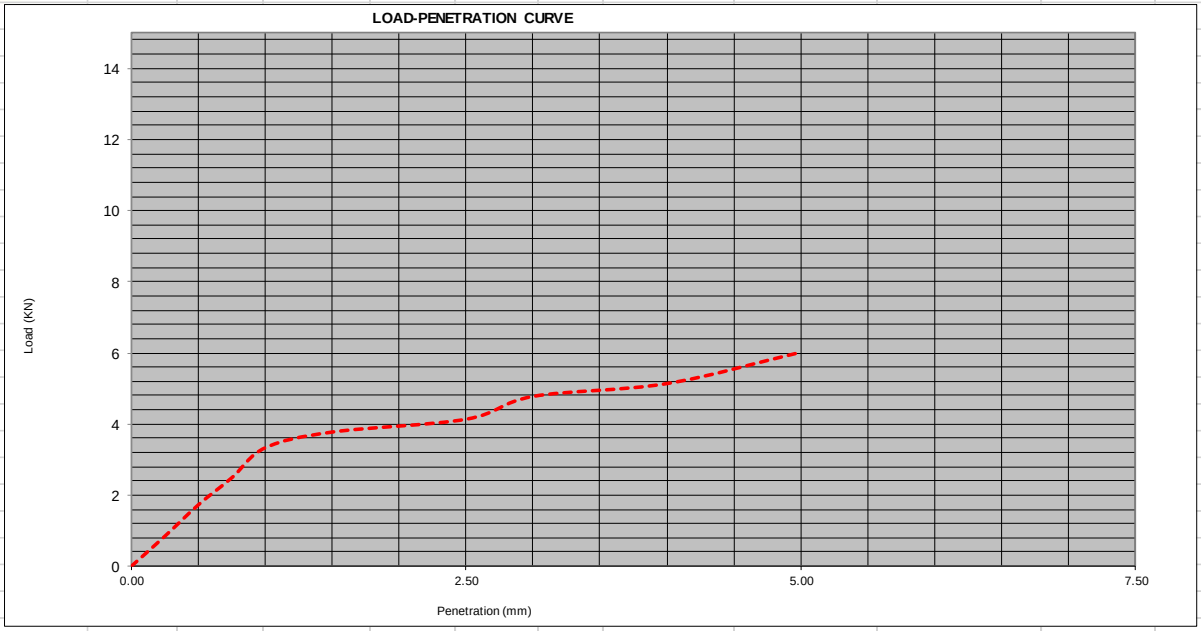
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
	MS1 TP3				
Depth Range:	**N/A**	**Location:**	**Rugusu**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.589
OMC (%) :	18.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.589	18.2		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	4.12	6.01	31	30	0.09

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.589	18.2	31	0.09
Parameters at 95% MDD	**1.510**	**17.3**	**29**	**0.09**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) RUGUSU MS 1

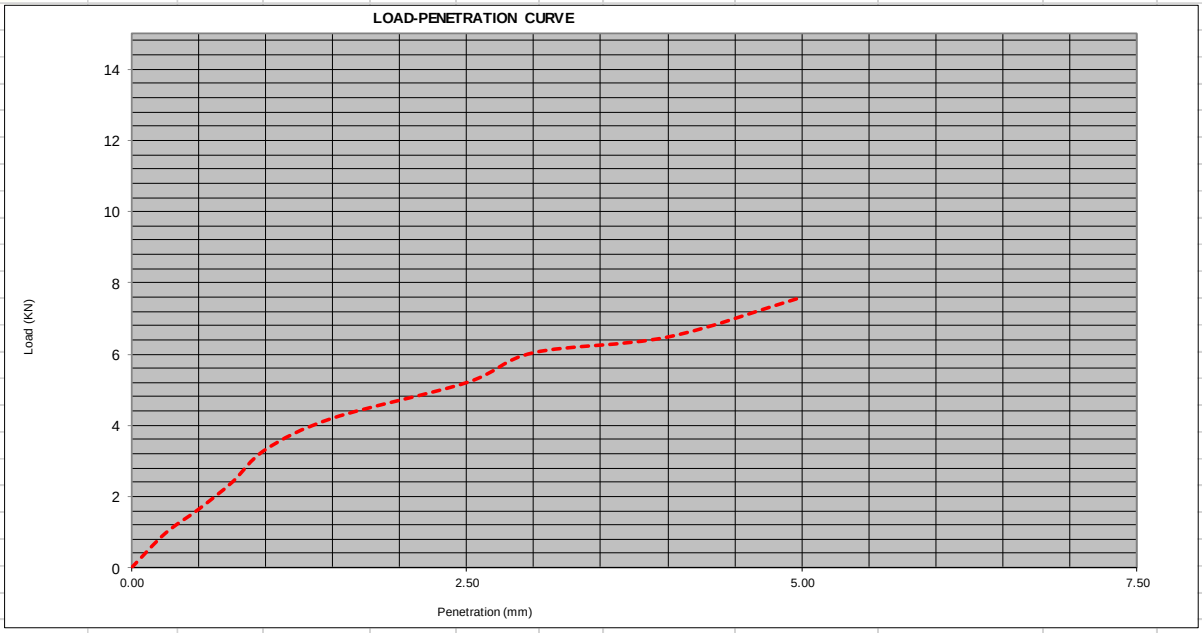
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
	MS1 TP4				
Depth Range:	**N/A**	**Location:**	**Rugusu**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.723
OMC (%) :	21.9

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.723	21.9		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	5.21	7.61	39	38	0.11

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.723	21.9	39	0.11
Parameters at 95% MDD	**1.637**	**20.8**	**37**	**0.10**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 5) RUGUSU MS 1

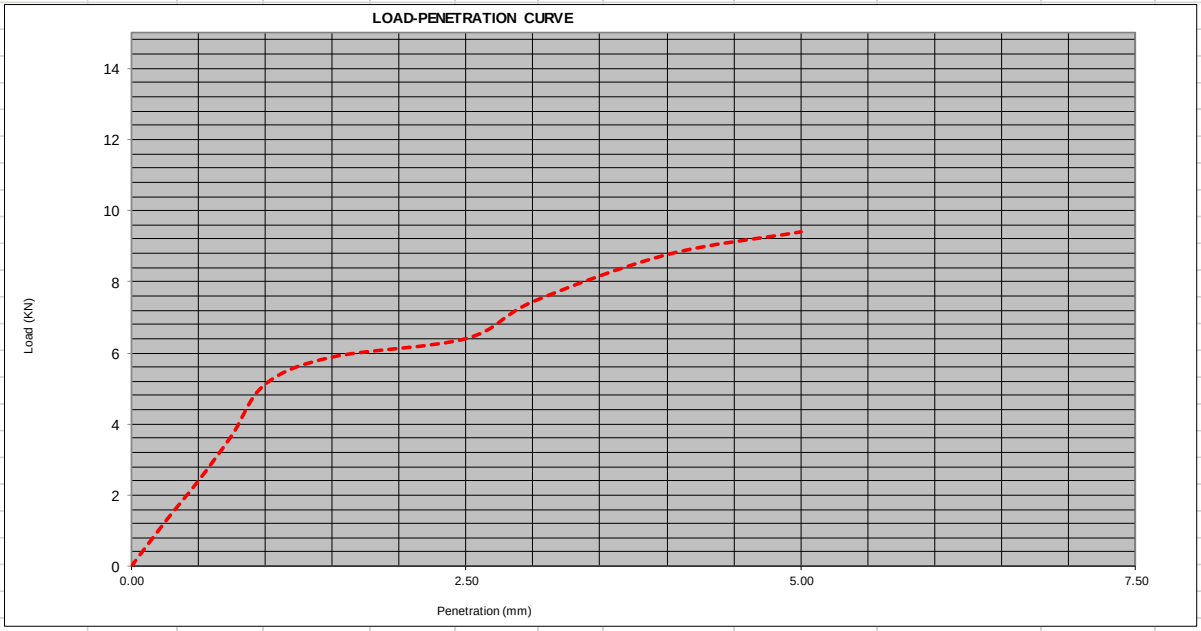
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
	MS1 TP5				
Depth Range:	**N/A**	**Location:**	**Rugusu**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.761
OMC (%) :	18.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.761	18.3		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	6.41	9.41	48	47	0.08

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.761	18.3	48	0.08
Parameters at 95% MDD	**1.673**	**17.4**	**46**	**0.07**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 1) NCHOROIBORO MS 2

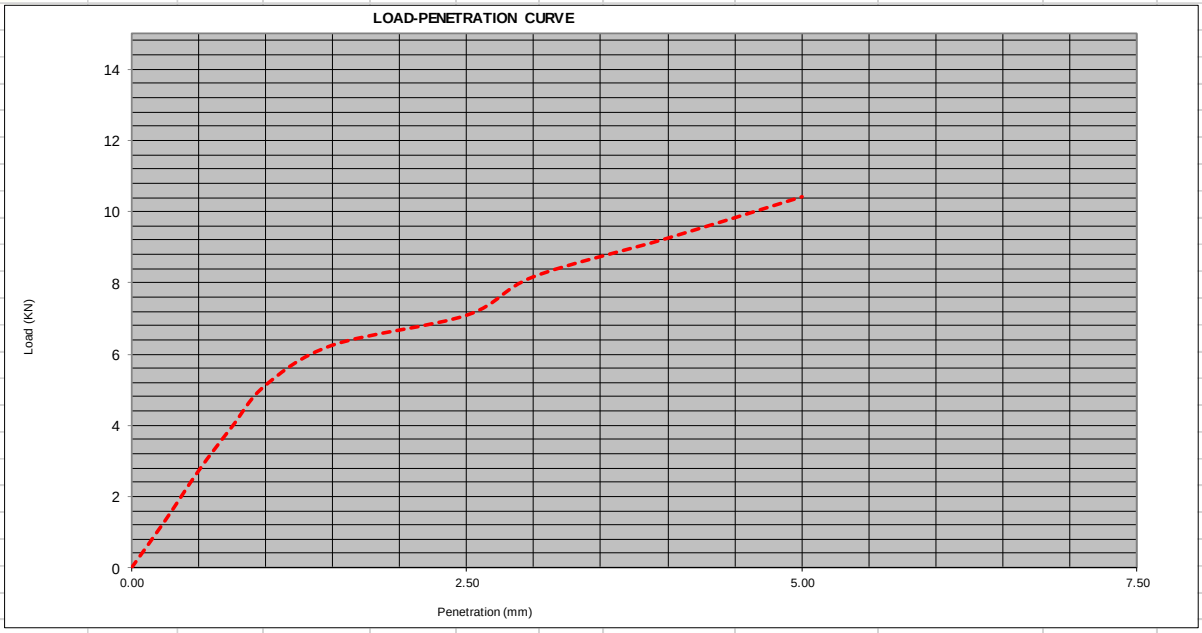
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
MS2 TP2					
Depth Range:	N/A	**Location:**	Nchoroiboro	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.818
OMC (%) :	18.0

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.818	18.0		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	7.09	10.41	53	52	0.05

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.818	18.0	53	0.05
Parameters at 95% MDD	**1.727**	**17.1**	**50**	**0.04**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 2) NCHOROIBORO MS 2

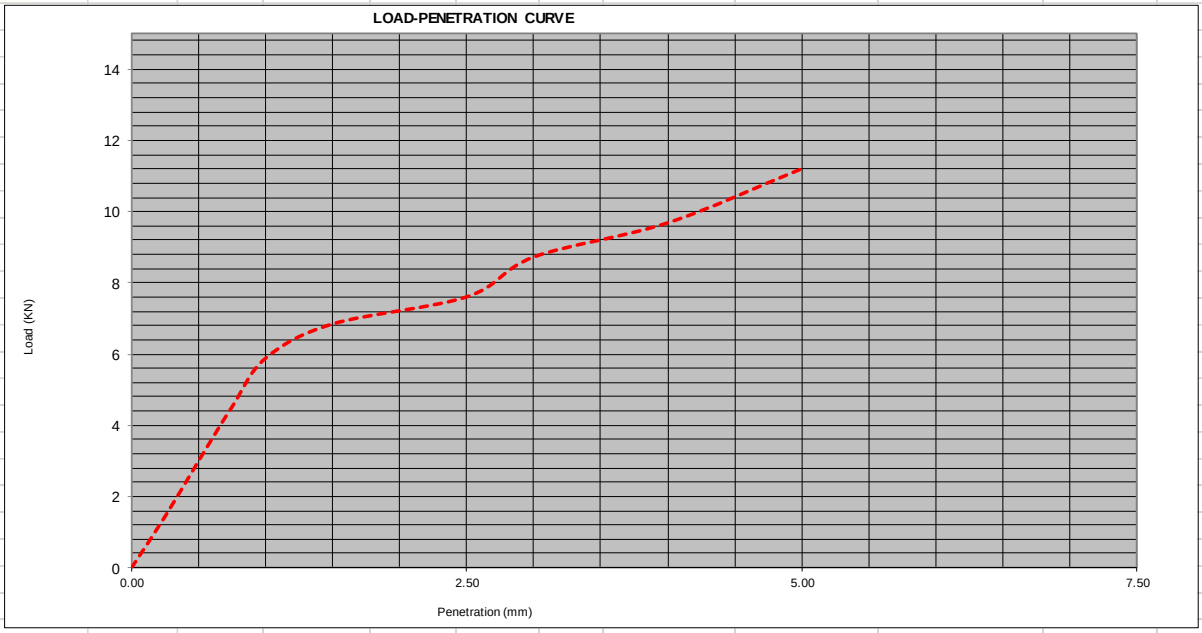
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
MS2 TP2					
Depth Range:	N/A	**Location:**	Nchoroiboro	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD D
MDD (g/cc) :	1.941
OMC (%) :	16.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.941	16.3		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	7.61	11.21	57	56	0.04

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.941	16.3	57	0.04
Parameters at 95% MDD	**1.844**	**15.5**	**54**	**0.04**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 3) NCHOROIBORO MS 2

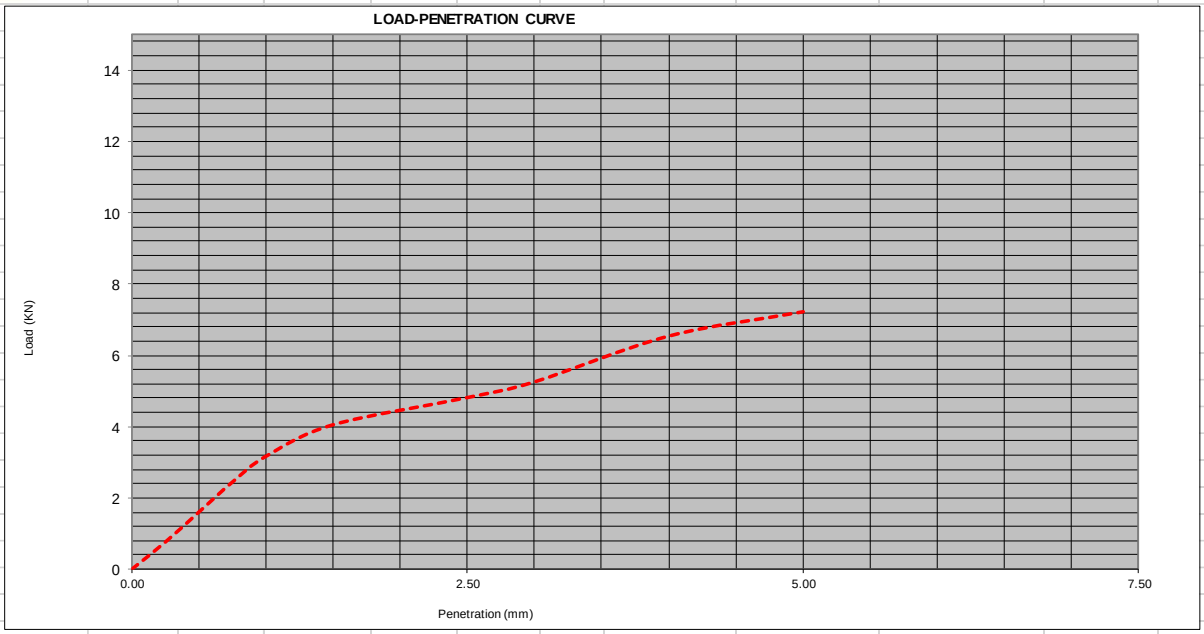
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
MS2 TP3					
Depth Range:	**N/A**	**Location:**	**Nchoroiboro**	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.709
OMC (%) :	21.1

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.709	21.1		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	4.80	7.21	36	36	0.10

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.709	21.1	36	0.10
Parameters at 95% MDD	**1.624**	**20.1**	**34**	**0.10**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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TRIAL PIT NO. (TP 4) NCHOROIBORO MS 2

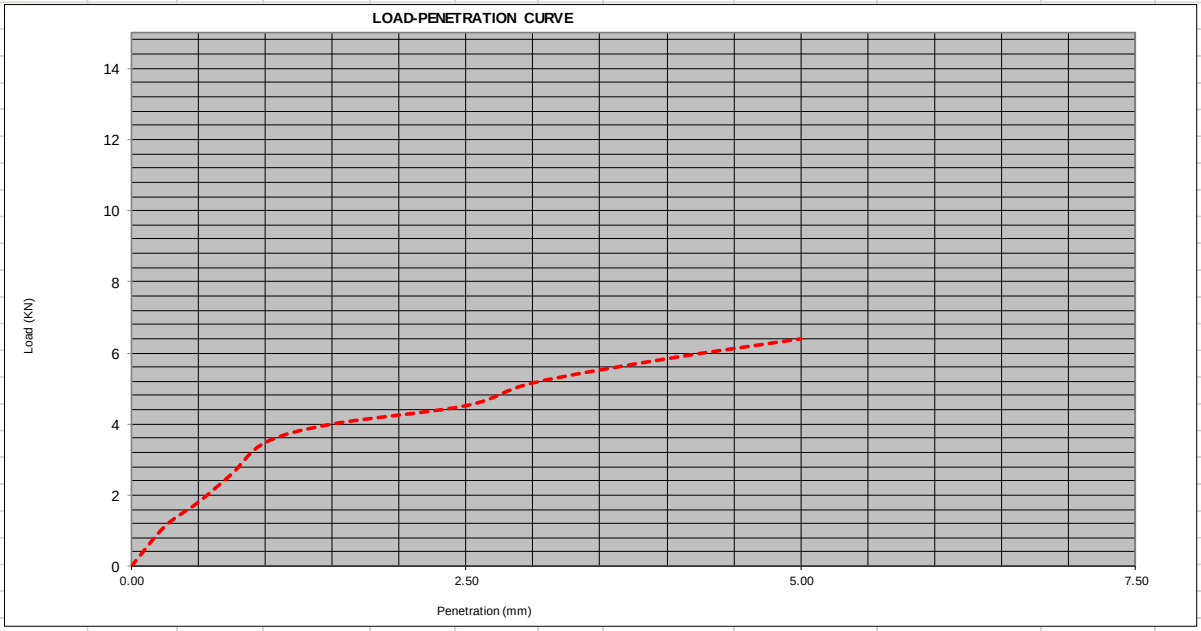
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
MS2 TP4					
Depth Range:	N/A	**Location:**	Nchoroiboro	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.793
OMC (%) :	21.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.793	21.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	4.52	6.41	34	32	0.14

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.793	21.6	34	0.14
Parameters at 95% MDD	**1.703**	**20.5**	**32**	**0.13**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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TRIAL PIT NO. (TP 5) NCHOROIBORO MS 2

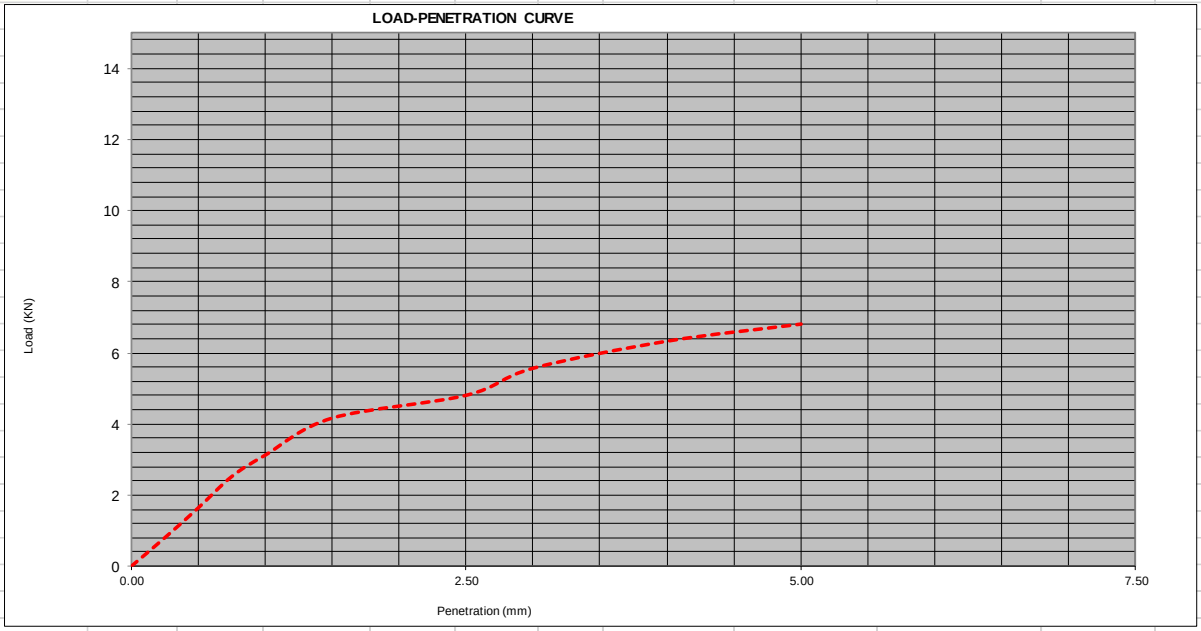
CLIENT:	**EGIS CONSULTANTS LIMITED**				
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS**				
MS2 TP5					
Depth Range:	N/A	**Location:**	Nchoroiboro	**Test Date**	7/10/2024
Sampled By:	Ben	**Tested By**	Ben	**Date Sampled**	

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD D
MDD (g/cc) :	1.801
OMC (%) :	17.6

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30				
62	1.801	17.6		



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10					
30					
62	4.80	6.81	36	34	0.08

Blow	Dry density	Moisture	CBR%	SWELL
10				
30				
62	1.801	17.6	36	0.08
Parameters at 95% MDD	**1.711**	**16.7**	**34**	**0.07**

TESTED BY: **Ben**
PREPARED BY: **Austine**
APPROVED BY: **Eng. Tom Waiharo** Signature:_____

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Appendix 4: Quarry Sites Results

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QUARRY SITE TEST RESULTS DETAILED DESIGN

ISIKO QUARRY- Q1

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Email: info@apexprojects.co.ke
Agricultural Society of Kenya (ASK),
Jamhuri Showground
Specialist in Site Investigation, Quality Control and Material Testing.

SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2025/03**

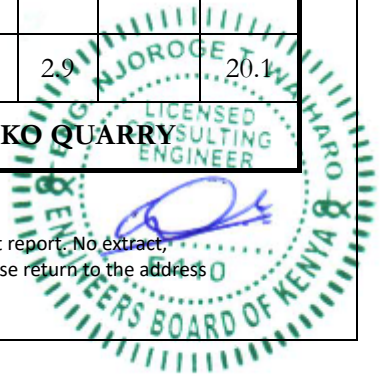
SAMPLE: ISIKO QUARRY- Q1 **DATE: 1/5/2025**

BS 8110 **TESTED BY: BEN**

Sample No	Aggregate Size mm	Grading: Percentage passing (%)											Combined A.C.V	Flakiness Index	SPECIFIC GRAVITY		Water ABS %	Combined S.S.S %	Organic Matter	Combined L.A.A
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			Bulk	APP				
1	20mm Single Size (14-20mm)	100	90.4	62.1	3.9	1.0	0						-	16.7	2.590	2.669	1.6			
2	14mm Single Size (10-14mm)		100	94.8	32.0	2.3	0						16.9	16.6	2.549	2.621	1.5			
3	10mm Single Size (6-10)			100	92.8	10.7	2.2	0					16.9	14.0	2.497	2.520	2.3			
4	Combined test												16.9					2.9		20.1

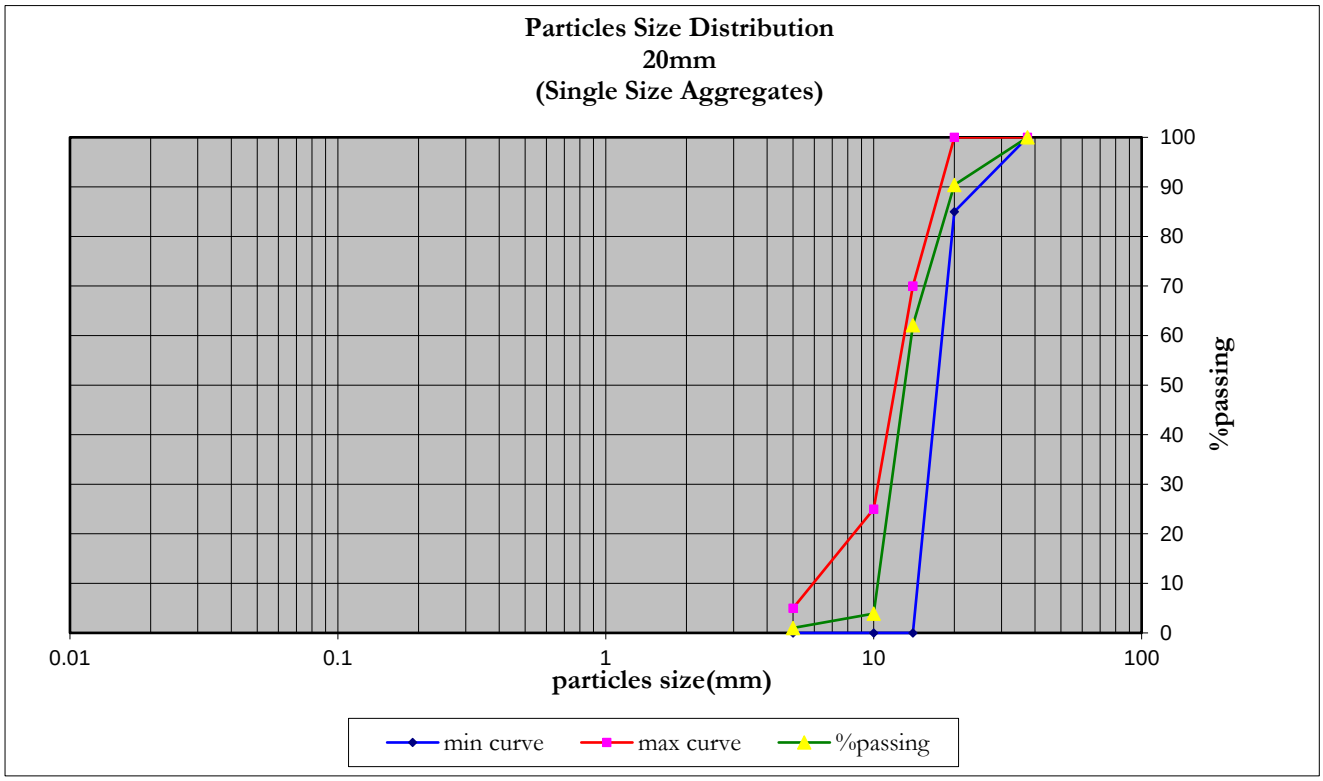
SOURCE: ISIKO QUARRY

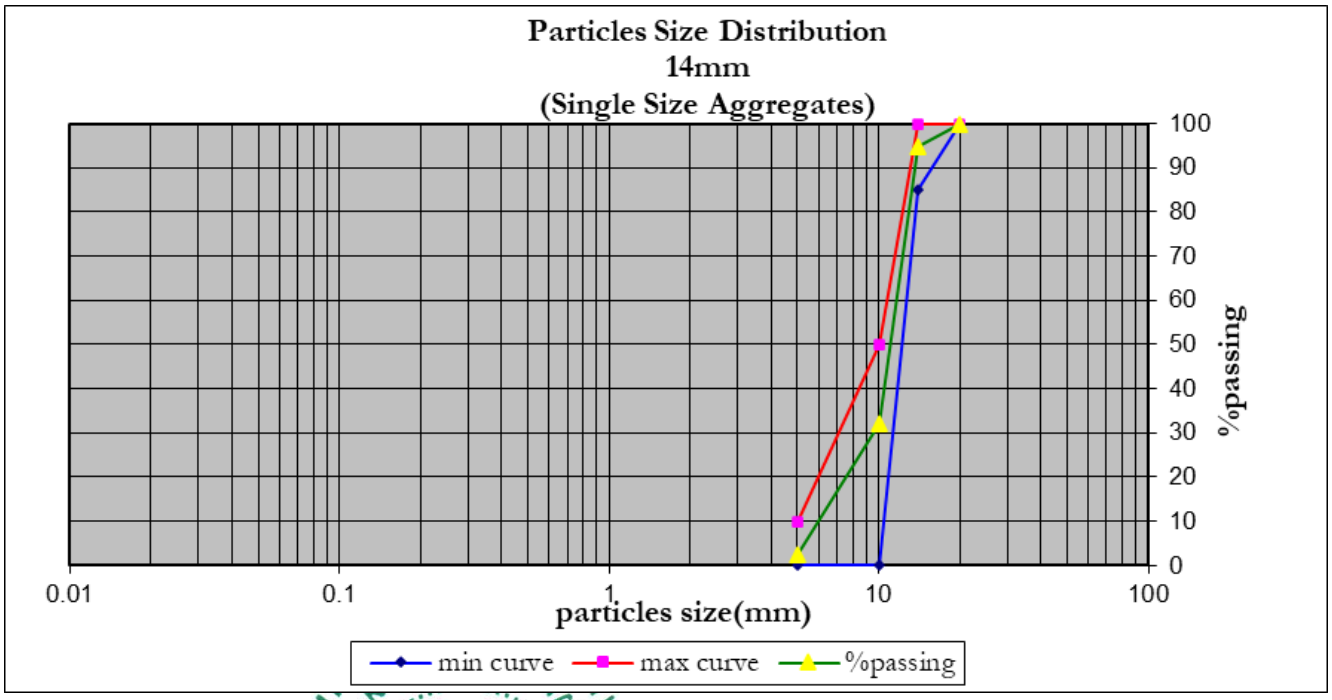
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ISIKO QUARRY-Q1

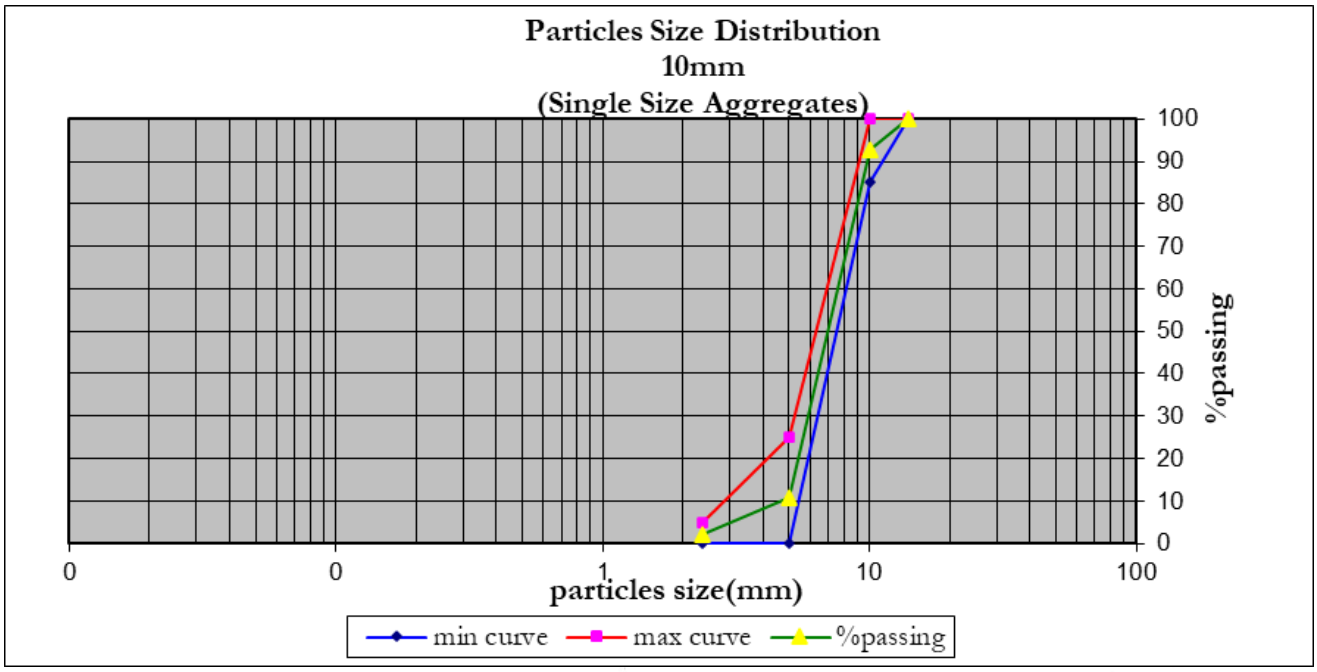




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ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
ENGINEERS BOARD OF KENYA

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HARIKRUSHNA CONCRETE-Q2

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Agricultural Society of Kenya (ASK),
Jamhuri Showground
Specialist in Site Investigation, Quality Control and Material Testing.

SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2025/02**

SAMPLE: HARIKRUSHNA CONCRETE-Q2 **DATE: 1/5/2025**

BS 8110 **TESTED BY: BEN**

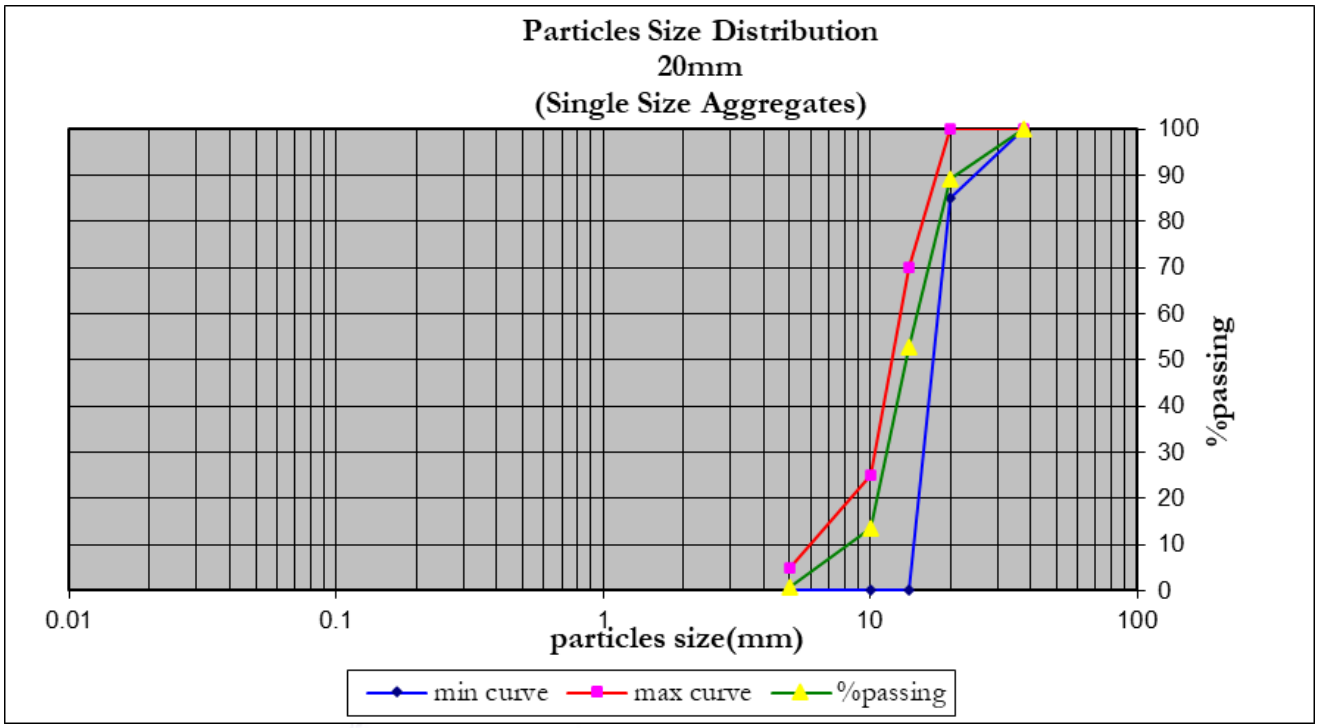
Sample No.	Aggregate Size mm	Grading: Percentage passing (%)											Combined A.C.V	Flakiness Index	SPECIFIC GRAVITY		Water ABS %	Combined S.S.S %	Organic Matter	Combined L.A.A
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			Bulk	APP				
1	20mm Single Size (14-20mm)	100	89.1	52.7	13.4	0.7	0						-	17.7	2.425	2.663	1.8			
2	14mm Single Size (10-14mm)		100	90.7	16.3	3.0	0						18.0	18.0	2.518	2.622	1.7			
3	10mm Single Size (6-10)			100	97.5	10.8	0.7	0					18.0	-	2.485	2.650	2.4			
4	Combined test												18.0					3.7		22.3

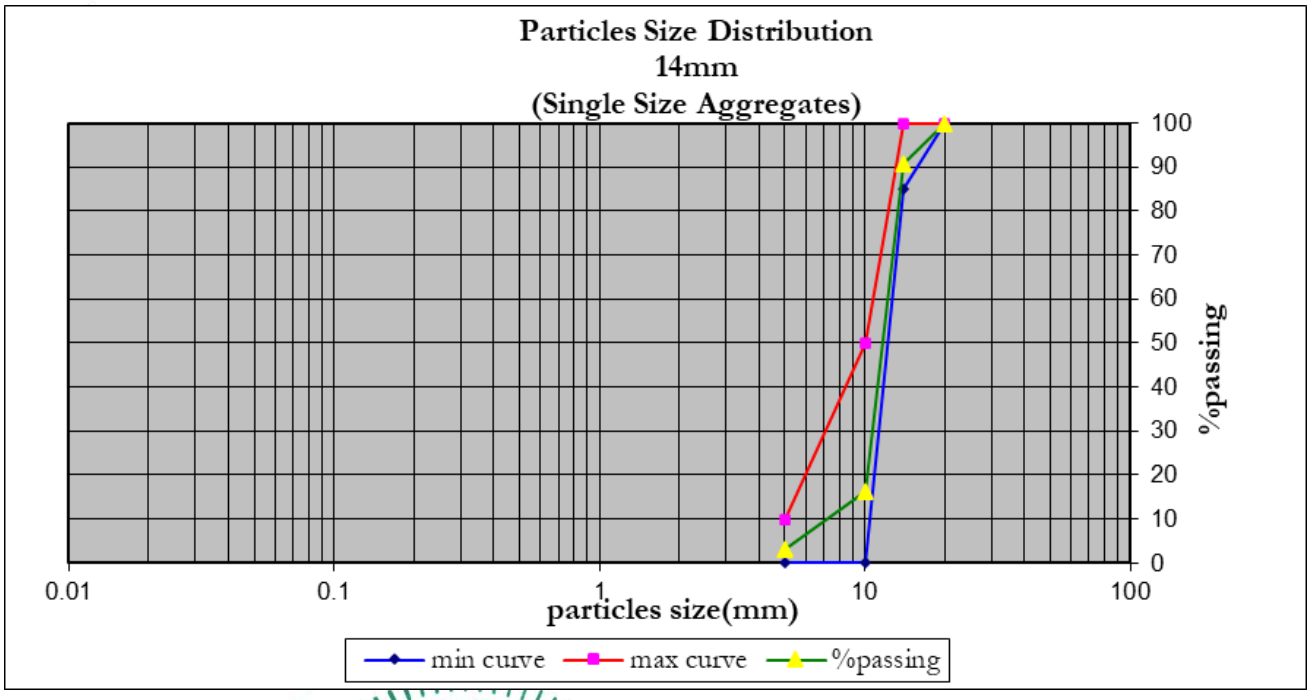
SOURCE: HARIKRUSHNA QUARRY

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HARIKRUSHNA CONCRETE-Q2

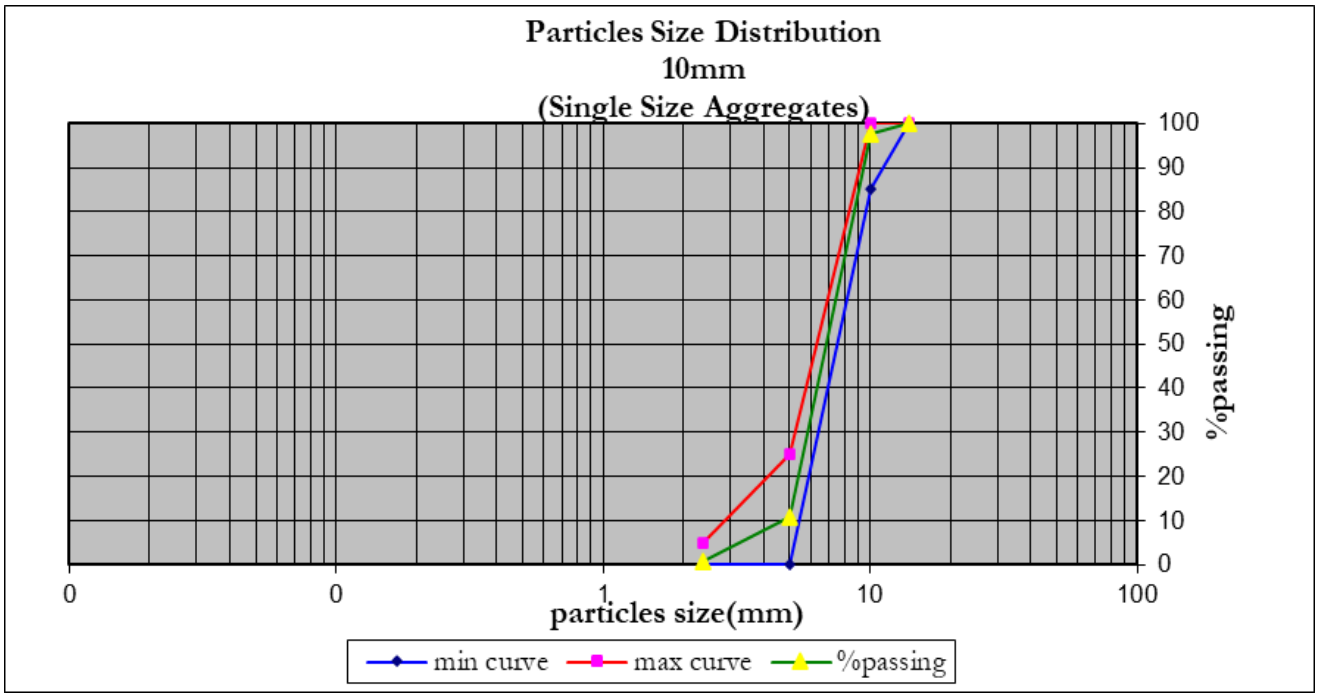




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ENGINEERS BOARD OF KENYA

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KICOH QUARRY -Q3

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SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2025/03**

SAMPLE: KICOH QUARRY -Q3 **DATE: 1/5/2025**

BS 8110 **TESTED BY: BEN**

Sample No.	Aggregate Size mm	Grading: Percentage passing (%)											Combined A.C.V	Flakiness Index	SPECIFIC GRAVITY		Water ABS %	Combined S.S.S %	Organic Matter	Combined L.A.A
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			Bulk	APP				
1	20mm Single Size (14-20mm)	100	92.9	51.7	10.1	1.3	0							17.6	2.520	2.657	2.0			
2	14mm Single Size (10-14mm)		100	94.5	23.9	2.4	0							17.3	2.576	2.632	1.6			
3	10mm Single Size (6-10)			100	98.3	14.9	2.1	0						17.6	2.493	2.652	2.7			
4	Combined test												17.6					3.2		20.9

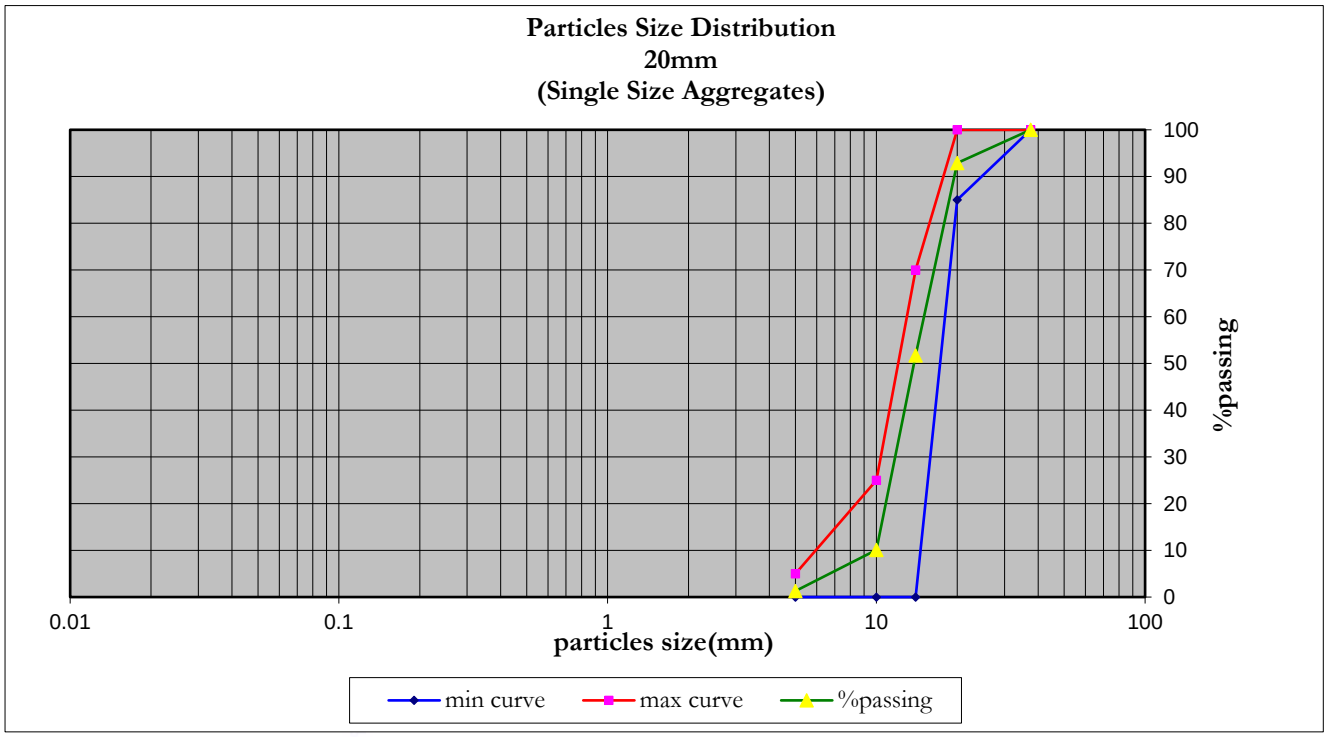
SOURCE: KICOH QUARRY

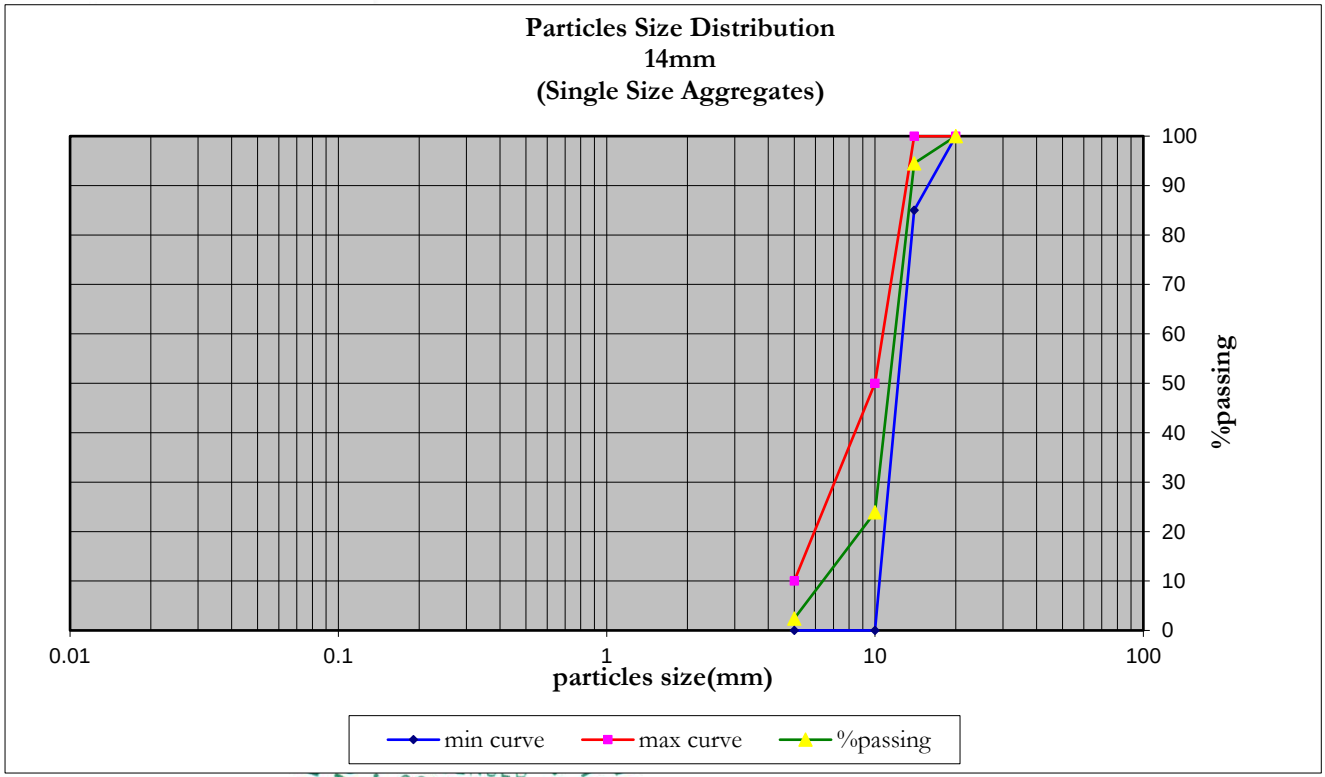
NJOROGE T. WAMARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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KICOH QUARRY-Q3

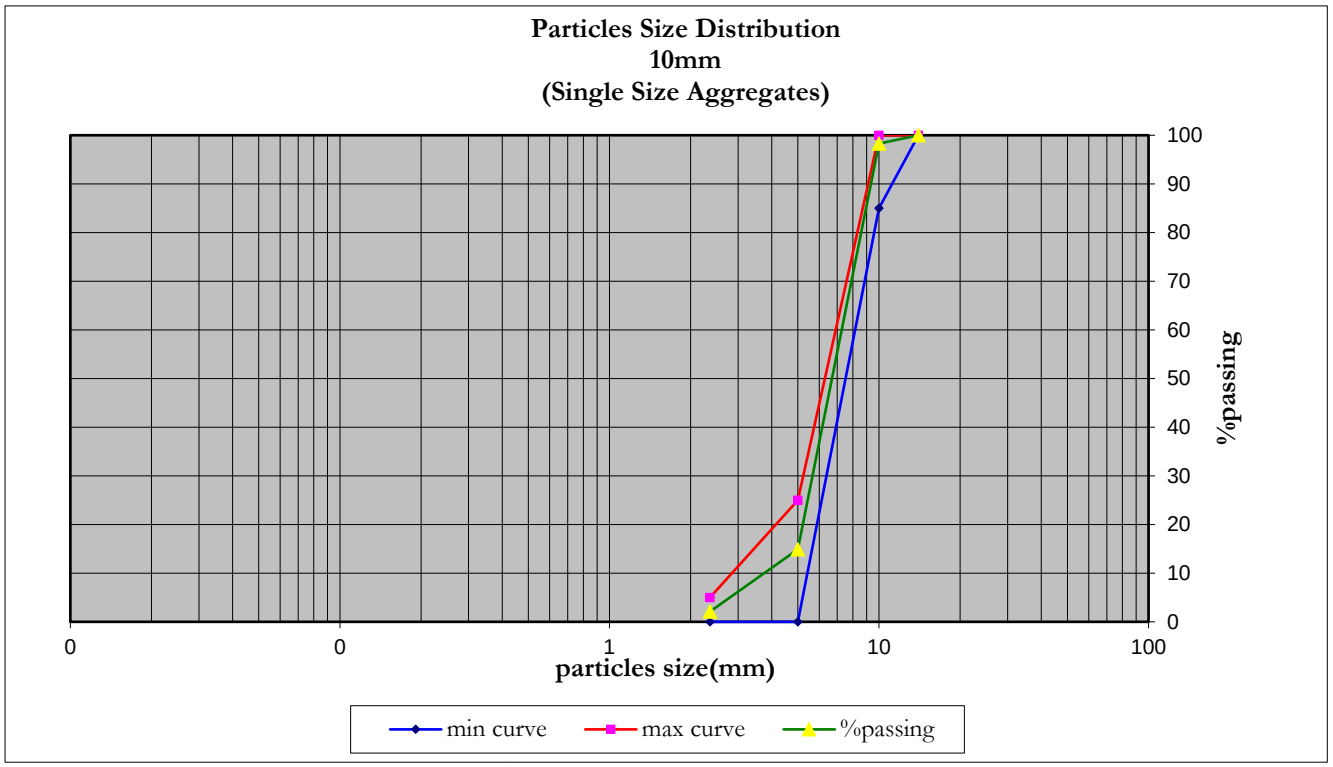




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QUARRY SITE TEST RESULTS (RIVER SAND)

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SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2025/03**

SAMPLE: ARCHER'S POST SITE **DATE: 1/5/2025**

BS 8110 **TESTED BY: BEN**

Sample No	Aggregate Size mm	Grading: Percentage passing (%)											A.C.V	Flakiness Index	SPECIFIC GRAVITY			Water ABS %	S.S.S %	Organic Matter	Silt Test %
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			O.D	S.S.D	APP				
1	River Sand Zone 3 Medium Coarse				100	100	96.0	79.3	54.9	31.6	7.1	1.4									0.2

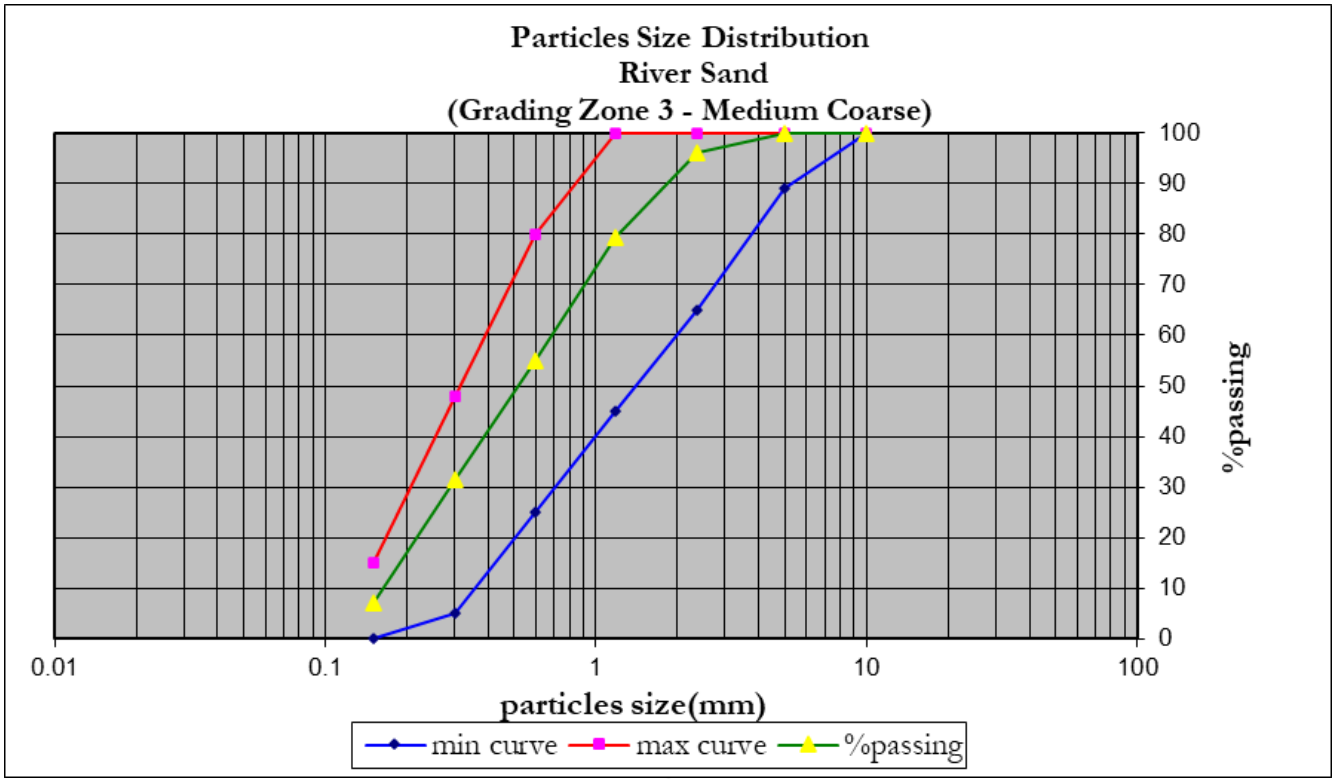
SOURCE: ARCHER'S POST SITE

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER 5410 ENGINEERS BOARD OF KENYA

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ARCHER'S POST RIVER SAND SAMPLE



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QUARRY SITE TEST RESULTS PRELIMINARY DESIGN

ISICO QUARRY Q1

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SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2024/03**

SAMPLE: ISICO QUARRY -Q1 **DATE: 31/10/2024**

BS 8110 **TESTED BY: BEN**

Sample No	Aggregate Size mm	Grading: Percentage passing (%)											A.C.V	Flakiness Index	SPECIFIC GRAVITY			Water ABS %	S.S.S %	L.A.A %	PI on L.A.A fines	Silt Test %	Bitumen Affinity
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			O.D	S.S.D	APP						
1	20mm Single Size Aggregate	100	88.5	55.6	2.5	0.8							16.9	20.8	2.598	2.627	2.675	1.105	1.9				Good
2	14mm Single Size Aggregate		100	99.1	28.7	1.1							17.2	21.3	2.544	2.572	2.617	1.097	1.6	19.5	N.P		Good
3	10 mm Single Size Aggregate			100	96.3	9.0	1.1						16.3	19.2	2.439	2.469	2.516	1.259	2.8	19.5	N.P		Good

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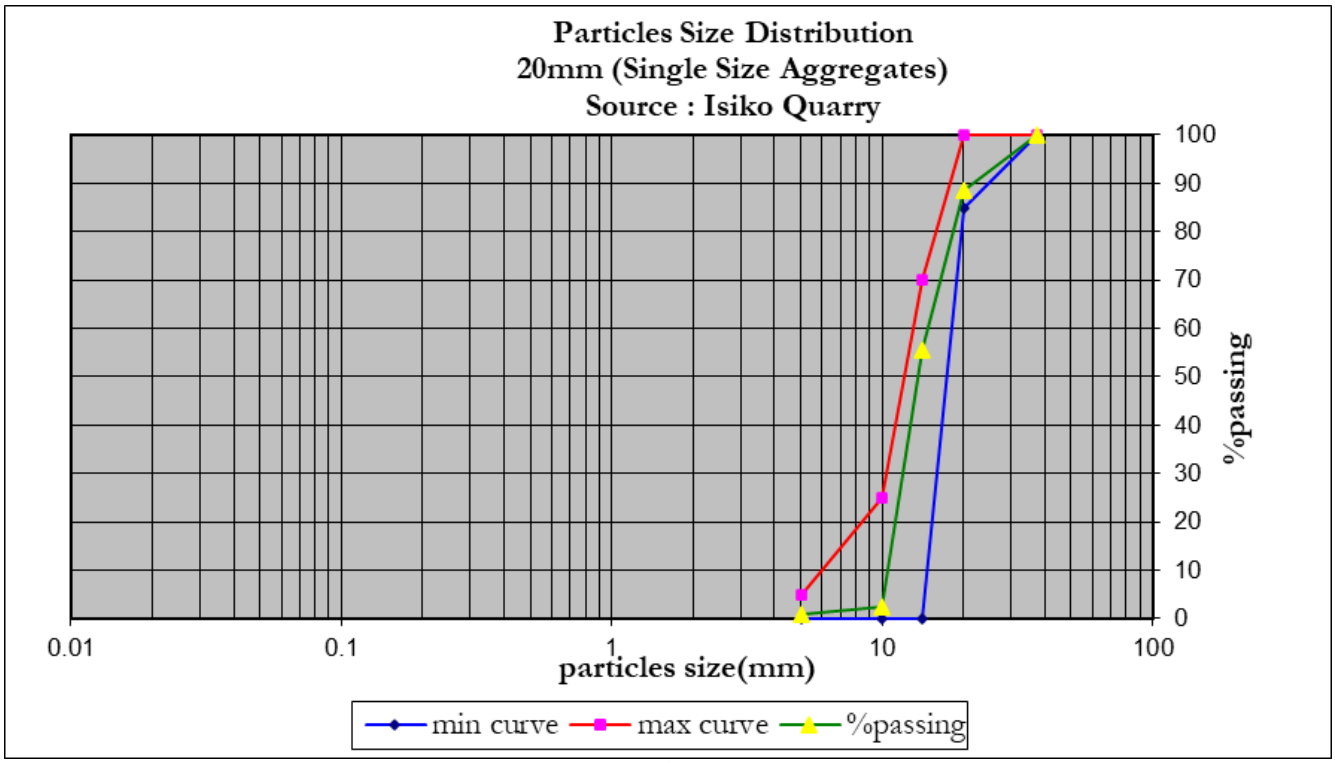
4	**5mm Single Size Aggregate**				100	89.3	9.7								2.578	2.607	2.654	1.103	3.4				Good
5	**Rock Sand (0-6mm) Grading Zone 3**				100	94.7	90.1	83.6	68.9	35.6	5.9	1.3							4.0			0.9	
															SOURCE: ISICO QUARRY								

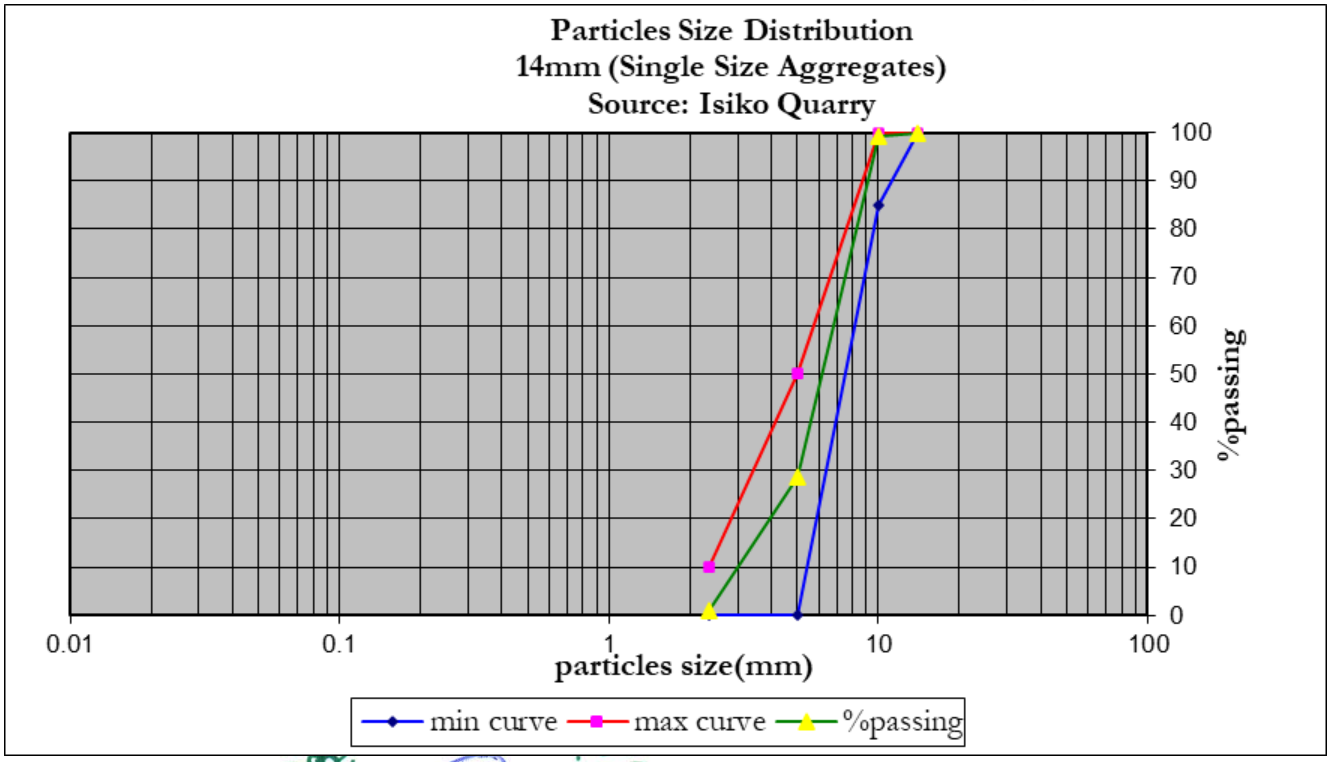
ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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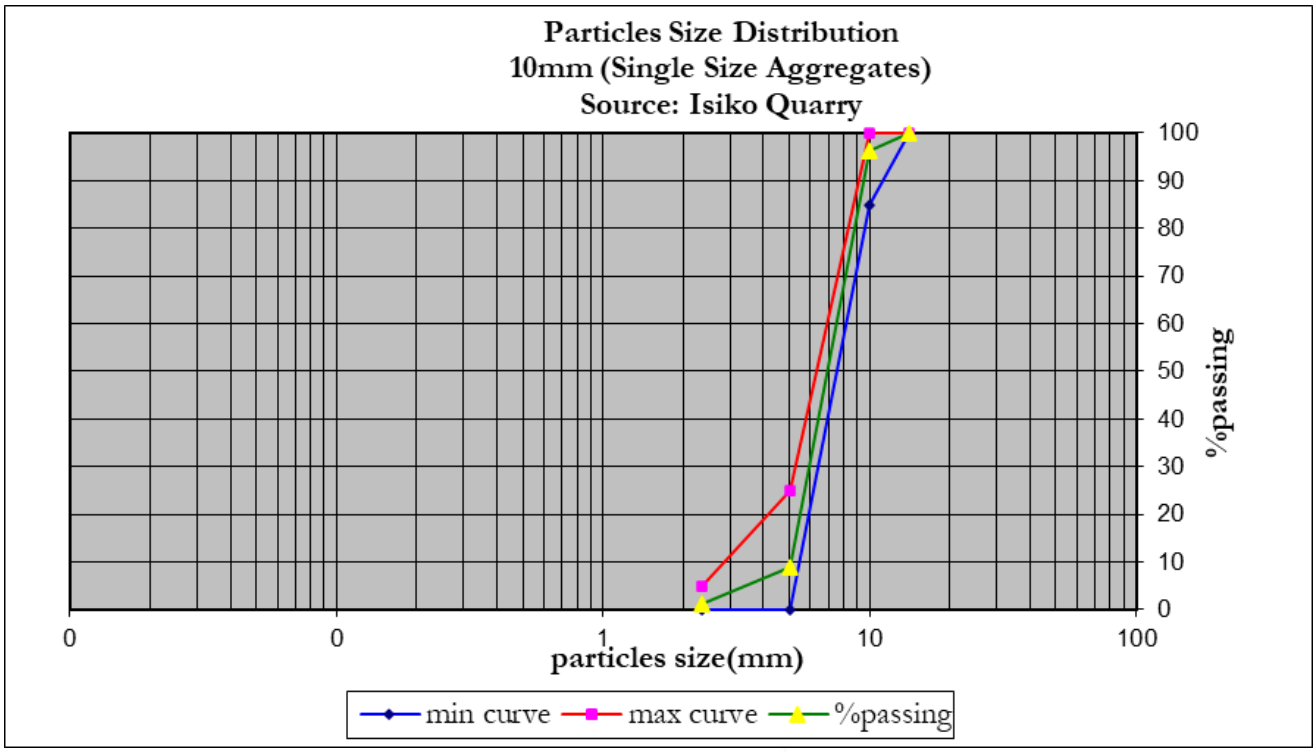
ISICO QUARRY Q1

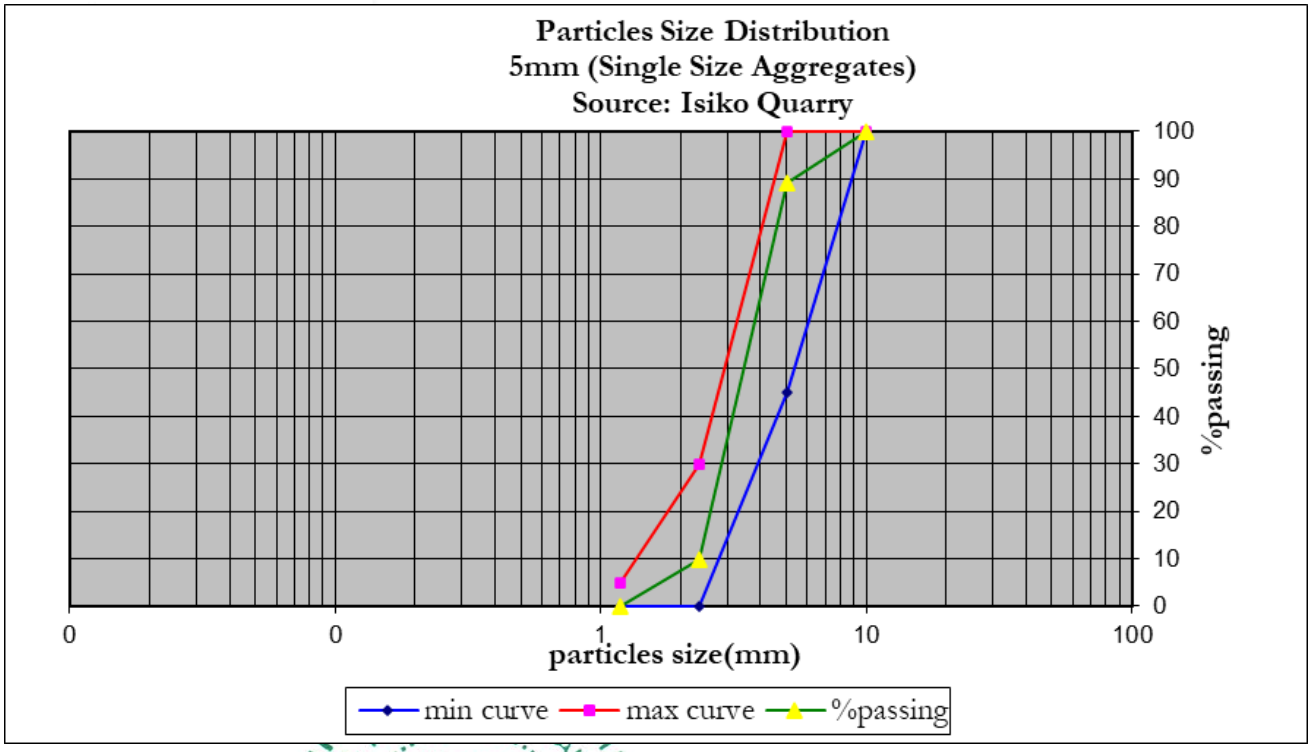




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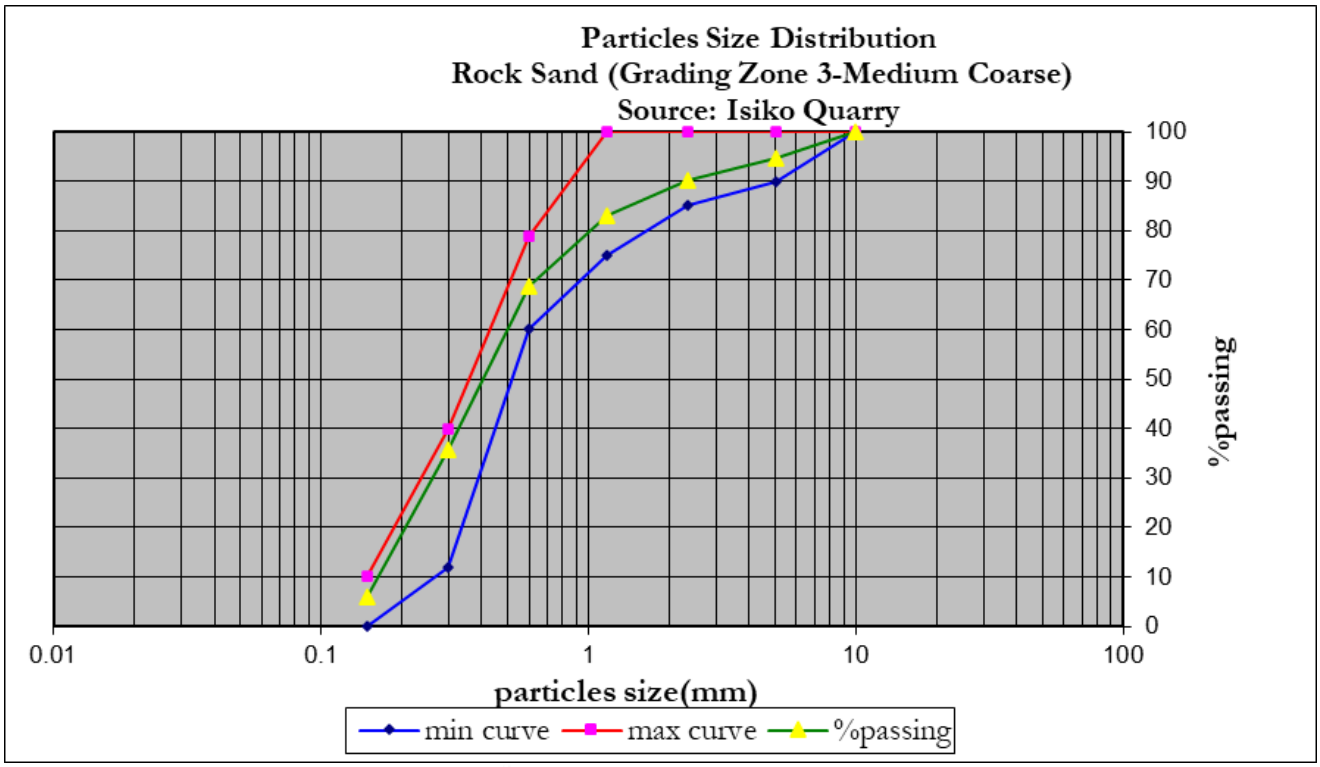




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NKUNGA QUARRY – Q2

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SUMMARY OF AGGREGATE/SAND TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS

CLIENT: EGIS CONSULTANTS LIMITED **JOB NO: 2024/03**

SAMPLE: NKUNGA QUARRY -Q2 **DATE: 31/10/2024**

BS 8110 **TESTED BY: BEN**

Sample No	Aggregate Size mm	Grading: Percentage passing (%)											A.C.V	Flakiness Index	SPECIFIC GRAVITY			Water ABS %	S.S.S %	L.A.A %	PI on L.A.A fines	Silt Test %	Bitu
		37.5 mm	20 mm	14 mm	10 mm	5 mm	2.36 mm	1.18 mm	600 MIC	300 MIC	150 MIC	75 MIC			O.D	S.S.D	APP						
1	40mm Single Size Aggregate	97.8	17.3	-	1.5								22.7	23.3	2.537	2.565	2.610	1.095	1.9	21.6	N.P		Good
2	14mm-5mm Graded Aggregate		100	100	78.1	4.6							23.1	22.0	2.528	2.565	2.624	1.434	2.3	21.6	N.P		Good
3	Rock Sand Grading Zone 3			100	98.7	90.3	79.1	63.0	45.7	24.2	10.5								3.8			1.4	

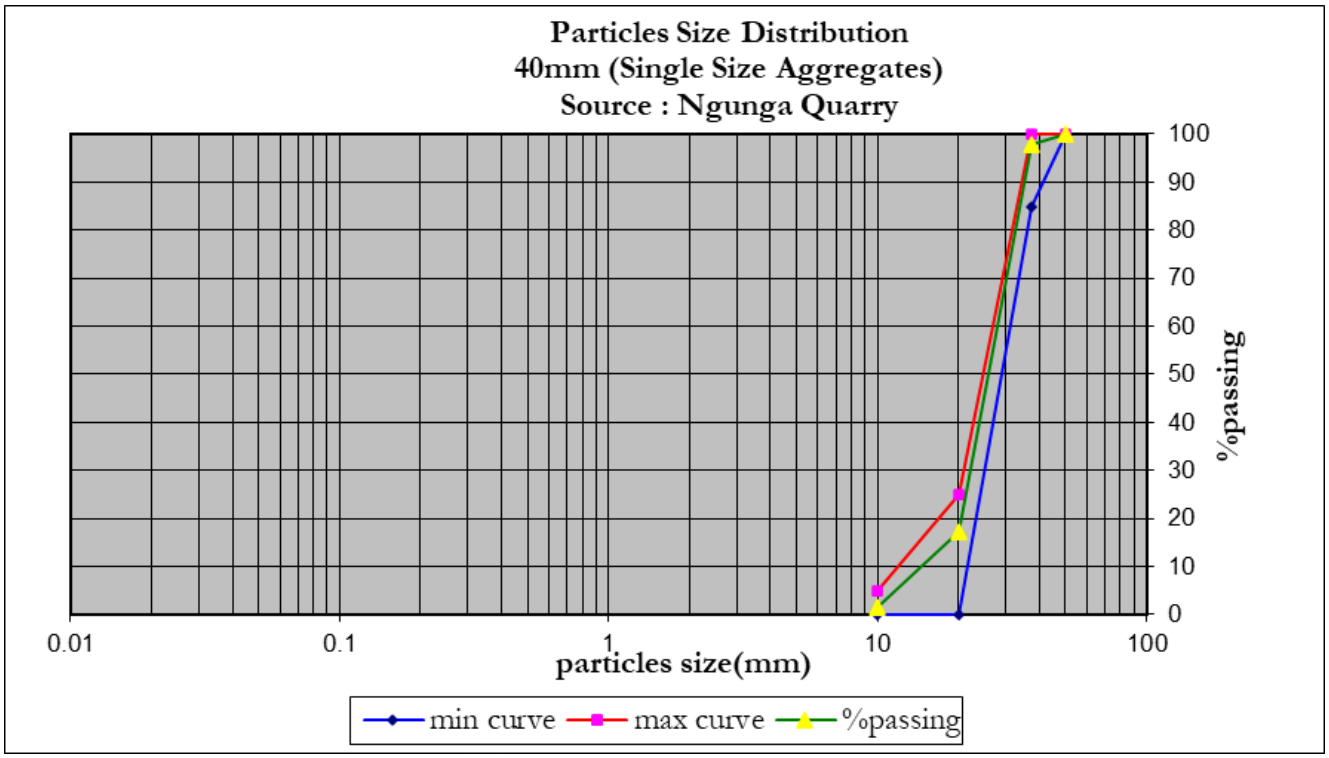
SOURCE: NKUNGA QUARRY

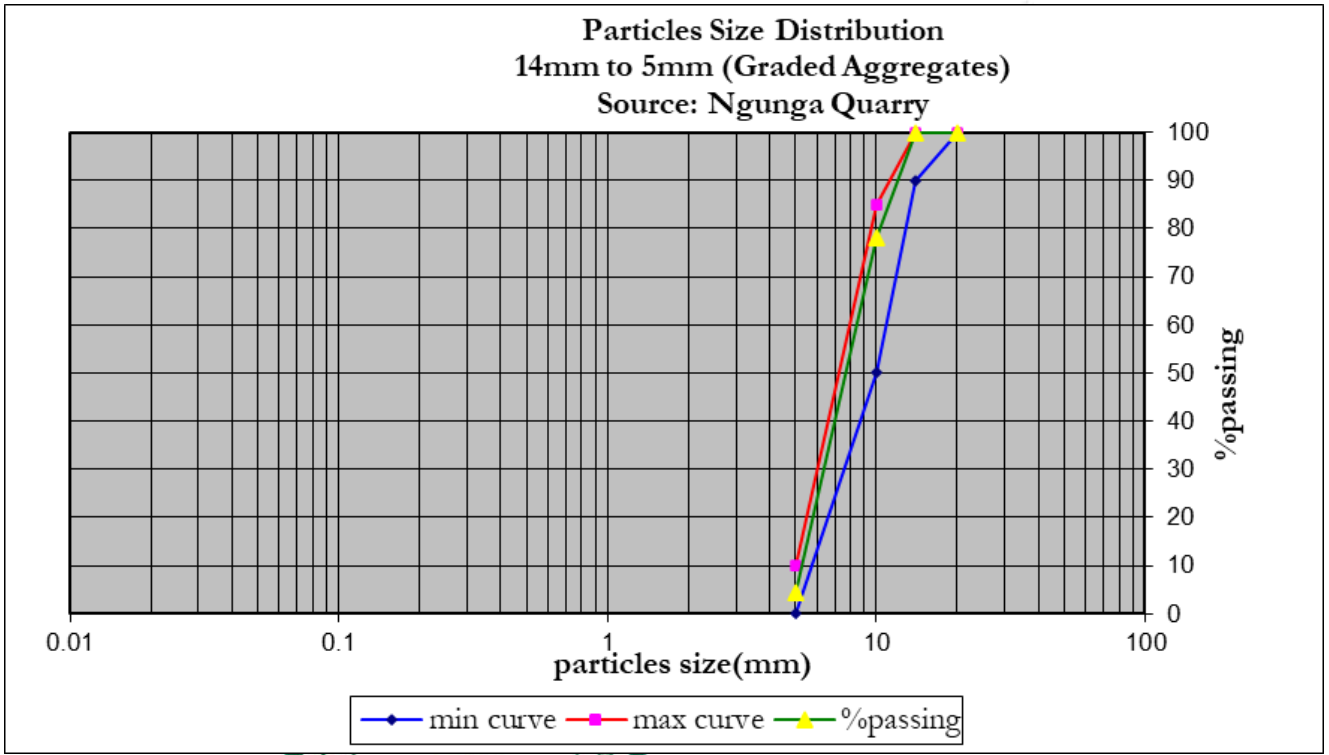
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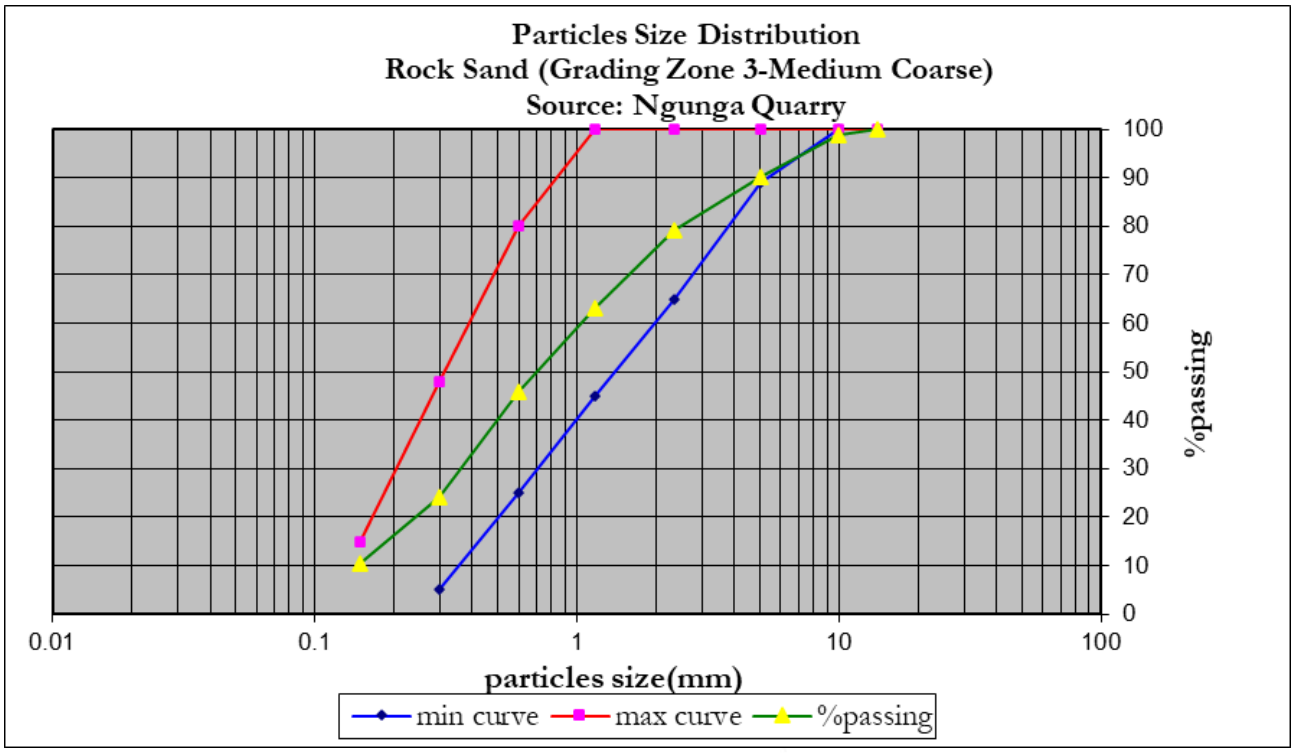
NKUNGA QUARRY – Q2





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Appendix 5: Water Results

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Apex Court, ASK Showground, Ngong' Road

PHYSICAL/CHEMICAL WATER ANALYSIS REPORT

DATE: 8/11/2024

PROJECT NAME: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

CLIENT NAME: EGIS CONSULTANTS LIMITED

SOURCE: Kanyuru/Mwiteria Village (River) Meru

PARAMETERS	UNIT	RESULTS	WHO STANDARDS	KEBS 3rd EDITION (2007)
pH	pH scale	6.90	6.5-8.5	**6.5-8.5**
Colour	Hazen	ND	Max 15	**<15**
Turbidity	N.T.U.	ND	Max 5	**<5.0 NTU**
Alkalinity	mg/L $CaCO_3$	56	Max 500	**<500**
Conductivity (25^{0}C)	uS/cm	157.68	Max 2500	**<2000**
Iron	mg/L Fe	0.07	Max 0.3	**<0.3**
Calcium	mg/L CO_3	8	Max 100	**<150**
Magnesium	mg/L $MgCO_3$	1.95	Max 100	**<100**
Total hardness	mg/L $CaCO_3$	28	Max 500	**<300**
Chloride	mg/L Cl^-	12.996	Max 250	**<250**
Fluoride	mg/L F^-	0.70	Max 1.5	**<1.5**
Nitrate	mg/L NO_2^-	2.42	<0.3	**<0.5**
Sulphate	mg/L SO_4^{-2}	1.9	Max 450	**<400**
Manganese	mg/L Mn	0.001	Max<0.1	**<0.5**
Total dissolved solids	mg/L Ions	97.76	Max 1500	**<1000**
Carbon dioxide	mg/L CO_2	21.12	Max NS	**N/S**
Ammonia	mg/L NH_3	0.048	Max<0.5	**<0.5**

ND: Not Detected

These test results are reported as delivered and all details given therein on the source of the said water are as indicated at the submission of the same to our laboratory.

For and on behalf of Apex Projects Ltd
Yours Faithfully,

ENG. NJOROGE T. WAIHARO
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

Eng. Tom Waiharo, Reg. C.E
Managing Director

APEX PROJECTS LTD

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Phone 3861614 Fax +254-20-3865 048, Mobile 0722-411 826
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Apex Court, ASK Showground, Ngong' Road

PHYSICAL/CHEMICAL WATER ANALYSIS REPORT

DATE: 8/11/2024

PROJECT NAME: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

CLIENT NAME: EGIS CONSULTANTS LIMITED

SOURCE: Kathita (River) Meru

PARAMETERS	UNIT	RESULTS	WHO STANDARDS	KEBS 3rd EDITION (2007)
pH	pH scale	7.17	6.5-8.5	**6.5-8.5**
Colour	Hazen	ND	Max 15	**<15**
Turbidity	N.T.U.	ND	Max 5	**<5.0 NTU**
Alkalinity	mg/L $CaCO_3$	48	Max 500	**<500**
Conductivity (25^{0}C)	uS/cm	119.55	Max 2500	**<2000**
Iron	mg/L Fe	0.09	Max 0.3	**<0.3**
Calcium	mg/L CO_3	ND	Max 100	**<150**
Magnesium	mg/L $MgCO_3$	ND	Max 100	**<100**
Total hardness	mg/L $CaCO_3$	ND	Max 500	**<300**
Chloride	mg/L Cl^-	7.998	Max 250	**<250**
Fluoride	mg/L F^-	1.00	Max 1.5	**<1.5**
Nitrate	mg/L NO_2^-	0.44	<0.3	**<0.5**
Sulphate	mg/L SO_4^{-2}	0.35	Max 450	**<400**
Manganese	mg/L Mn	0.003	Max<0.1	**<0.5**
Total dissolved solids	mg/L Ions	74.12	Max 1500	**<1000**
Carbon dioxide	mg/L CO_2	19.36	Max NS	**N/S**
Ammonia	mg/L NH_3	0.036	Max<0.5	**<0.5**

ND: Not Detected

These test results are reported as delivered and all details given therein on the source of the said water are as indicated at the submission of the same to our laboratory.

For and on behalf of Apex Projects Ltd
Yours Faithfully,

ENG. NJOROGE T. WAIHARO
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Eng. Tom Waiharo, Reg. C.E
Managing Director

Appendix 6: Trial Pits Geological Logs

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GEOLOGICAL LOGS

DD 1

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 1	SITE PHOTO
CO-ORDINATES		0.06712 , 37.62919		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.1		0.1	Reddish Brown soil with vegetational roots	
0.3		0.9	Red Coffee Loamy Soil	
0.5				
0.8				
1.0				

DD 2

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 2	SITE PHOTO
CO-ORDINATES		0.07390 , 37.63615		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.2		0.2	Dark brown loamy soil with vegetational roots	
0.5		0.8	Reddish brown loamy soil, moist	
0.6				
0.8				
1.0				

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DD 3

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 3	SITE PHOTO
CO-ORDINATES		0.08091 , 37.65073		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.20		0.2	Reddish brown loamy soil with vegetational roots	
0.50		0.8	Dark brown loamy soil	
0.8				
1.0				



DD 4

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 4	SITE PHOTO
CO-ORDINATES		0.07377 , 37.66817		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.3		0.3	Reddish brown loamy soil with vegetational roots	
0.6		0.8	Dark brown loamy soil with traces of weathered tuff	
0.8				
1.1				



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DD 5

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 5	SITE PHOTO
CO-ORDINATES		0.05989 , 37.63979		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Dark brown clayey soil	
0.2		0.1	Blackish backfill material	
0.5		0.8	Reddish brown soil with weathered tuff	
0.8				
1.1				

DD 6

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 6	SITE PHOTO
CO-ORDINATES		0.06377 , 37.63550		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Reddish brown soil with vegetational roots	
0.2		0.8	Reddish brown loamy soil	
0.5				
0.7				
0.9				

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DD 7

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 7	SITE PHOTO
CO-ORDINATES		0.06739 , 37.63713		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Dark grey gravelly soil	
0.30		0.4	Dark brown gravelly material	
0.50				
0.80		0.5	Dark brown rock	
1.00				

DD 8

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 8	SITE PHOTO
CO-ORDINATES		0.06647 , 37.64112		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.20		0.2	Reddish brown loamy soil with vegetational roots	
0.30		0.3	Dark brown gravelly material	
0.50				
0.70		0.4	Dark brown rock	
0.90				

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DD 9

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 9	SITE PHOTO
CO-ORDINATES		0.07331 , 37.64541		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.2		0.2	Reddish brown loamy soil with vegetational roots	
0.50 0.80 1.1		0.9	Dark brown loamy soil	

DD 10

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 10	SITE PHOTO
CO-ORDINATES		0.07651 , 37.64825		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.2		0.2	Dark brown loamy soil with vegetational roots	
0.50 0.80 1.0		0.8	Dark brown loamy soil, moist	

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DD 11

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 11	SITE PHOTO
CO-ORDINATES		0.07477 , 37.64425		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.3		0.3	Dark brown loamy soil with vegetational roots	
0.50		0.2	Light brown boulders	
1.1		0.9	Dark brown loamy soil, moist	

DD 12

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 12	SITE PHOTO
CO-ORDINATES		0.05109 , 37.65269		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.2		0.2	Light grey boulders (backfill)	
0.95		0.75	Dark brown loamy soil, moist	

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DD 13

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 13	SITE PHOTO
CO-ORDINATES		0.05034 , 37.66363		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.3		0.3	Dark brown loamy soil with vegetational roots	
0.40		0.1	Dark grey clayey soil	
0.70		0.6	Reddish brown loamy soil	
1.0				

DD 14

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 14	SITE PHOTO
CO-ORDINATES		0.02573 , 37.66733		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.3		0.3	Yellowish boulders (backfill)	
0.50		0.8	Reddish brown loamy soil	
0.80				
1.10				

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DD 15

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 15	SITE PHOTO
CO-ORDINATES		0.02457 , 37.67335		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Yellowish backfill material	
0.50		0.9	Dark brown loamy soil, moist	
0.80				
1.0				



DD 16

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 16	SITE PHOTO
CO-ORDINATES		0.02394 , 37.68101		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Dark brown loamy soil with vegetational roots	
0.50		0.9	Reddish brown soil with traces of weathered tuff	
0.80				
1.0				



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DD 17

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 17	SITE PHOTO
CO-ORDINATES		0.076362 , 37.6429		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.20		0.2	Dark brown loamy soil with vegetational roots	
0.50		0.8	Reddish brown soil, moist	
0.80				
1.0				

DD 18

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 18	SITE PHOTO
CO-ORDINATES		0.07057 , 37.6433		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Reddish brown gravelly material	
0.40		0.3	Greyish boulders	
0.80		0.6	Dark brown loamy soil	
1.0				

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DD 19

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 19	SITE PHOTO
CO-ORDINATES		0.050907 , 37.6582		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.3		0.3	Reddish lateritic gravel	
0.50		0.7	Dark brown loamy soil	
0.80				
1.0				

DD 20

SAMPLE ID:		GEOTECHNICAL INVESTIGATION FOR THE MERU TOWN ROADS	DD 20	SITE PHOTO
CO-ORDINATES		0.028882 , 37.669586		
DEPTH (m)	LEGEND	THICKNESS (m)	SAMPLE DESCRIPTION	
0				
0.10		0.1	Dark brown loamy soil with vegetational roots	
0.50		0.9	Reddish brown loamy soil, moist	
0.80				
1.0				

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Appendix 7: Boreholes Geological Logs

PROJECT: MERU NATIONAL POLYTECHNIC

CLIENT : EGIS CONSULTANTS LIMITED

LOCATION	BH/POINT	ELEVATION	CO-ORDINATES	0.061780	TOTAL BH DEPTH (m) From OGL	Field Date:	Friday, 2 May 2025
MERU	BH 1	1600M		37.63041	10.00		

BOREHOLE LOG

Depth Scale (m)	RUN (m)	WeatheringGrade	Fracture Index	N- VALUE	LEGEND	SAMPLE DEPTH FROM (m)	SAMPLE DEPTH TO (m)	%TCR	%RQD	MATERIAL DESCRIPTION
1598.50	1.50	V	-	A		1.00	1.50	-	-	Darkish brown soil, fine grained, stiff
1597.00	1.50	V	-	24		1.50	3.00	-	-	Darkish brown soil, fine grained, stiff
1595.50	1.50	V	-	R		3.00	4.50	-	-	Greyish brown basalt rock (cobbles).
1594.00	1.50	V	-	R		4.50	6.00	-	-	Greyish brown basalt rock.(cobbles).
1592.50	1.50	V	-	R		6.00	7.50	-	-	Greyish brown basalt rock.(cobbles).
1591.00	1.50	V	-	R		7.50	9.00	-	-	Greyish brown basalt rock.(cobbles).
1590.00	1.00	III	7	R		9.00	10.00	35%	10.0	Greyish rock, moderately to slightly weathered, hard with high to medium strength, fructured.

WEATHERING GRADES
I: Fresh and Hard
II: Slightly Weathered
III: Moderately Weathered
IV: Highly Weathered
V: Completely Weathered

COHESIONLESS SOILS	
Relative Density	N – Value
Very Loose	< 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	> 50

COHESIVE SOILS		
Consistency	Undrained Shear Strength, kpa	N –Value
Very Soft	< 12	<2
Soft	12 – 25	2 – 4
Firm	25 – 50	4 – 8
Stiff	50 - 100	8 – 16
Very Stiff	100 – 200	16 – 32
Hard	> 200	> 32

PROJECT: MERU NATIONAL POLYTECHNIC

CLIENT : EGIS CONSULTANTS LIMITED

LOCATION	BH/POINT	ELEVATION	CO-ORDINATES	0.061660	TOTAL BH DEPTH (m) From OGL	Field Date:	Thursday, 1 May 2025
MERU	BH 2	1600M		37.62993	10.00		

BOREHOLE LOG

Depth Scale (m)	RUN (m)	WeatheringGrade	Fracture Index	N- VALUE	LEGEND	SAMPLE DEPTH FROM (m)	SAMPLE DEPTH TO (m)	%TCR	%RQD	MATERIAL DESCRIPTION
1598.50	1.50	V	-	A		1.00	1.50	-	-	Darkish brown soil, fine grained, stiff
1597.00	1.50	V	-	15		1.50	3.00	-	-	Darkish brown soil, fine grained, stiff
1595.50	1.50	V	-	R		3.00	4.50	-	-	Greyish brown basalt rock, hard (cobbles)
1594.00	1.50	III	8	R		4.50	6.00	20%	10.00	Greyish basalt rock, moderately to slightly weathered, hard with high to medium strength, fructured.
1592.50	1.50	III	8	R		6.00	7.50	-	-	Greyish basalt rock, moderately to slightly weathered, hard with high to medium strength, fructured.
1591.00	1.00	III	4	R		7.50	8.50	42%	35.0	Greyish basalt rock, moderately to slightly weathered, hard with high to medium strength, fructured.
1591.00	1.00	III	5	R		8.50	9.50	86%	64.00	Greyish basalt rock, moderately to slightly weathered, hard with high to medium strength, fructured.
1590.00	1.00	III	4	R		9.50	10.00	88%	28.0	Greyish basalt rock, moderately to slightly weathered, hard with high to medium strength, fructured.

WEATHERING GRADES
I: Fresh and Hard
II: Slightly Weathered
III: Moderately Weathered
IV: Highly Weathered
V: Completely Weathered

COHESIONLESS SOILS	
Relative Density	N – Value
Very Loose	< 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	> 50

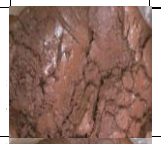
COHESIVE SOILS		
Consistency	Undrained Shear Strength, kpa	N –Value
Very Soft	< 12	<2
Soft	12 – 25	2 – 4
Firm	25 – 50	4 – 8
Stiff	50 - 100	8 – 16
Very Stiff	100 – 200	16 – 32
Hard	> 200	> 32

PROJECT: KAAGA BOYS FOOT BRIDGE

CLIENT; EGIS CONSULTANTS LIMITED

BH TEST LOCATION	BH/POINT	ELEVATION	CO-ORDINATES	0.063550	TOTAL BH DEPTH (m) From OGL	Field Date:	Wednesday, 30 April 2025
MERU	BH 3	1600M		37.65639	10.00		

BOREHOLE LOG

Depth Scale (m)	RUN (m)	WeatheringGrade	Fracture Index	N- VALUE	LEGEND	SAMPLE DEPTH FROM (m)	SAMPLE DEPTH TO (m)	%TCR	%RQD	MATERIAL DESCRIPTION
1598.50	1.50	-	-			0.00	1.50	NIL	-	Reddish soil, stiff, moist.
1597.00	1.50	-	-	19		1.50	3.00	NIL	-	Reddish soil, stiff, moist.
1595.50	1.50	-	-	16		3.00	4.50	NIL	-	Reddish soil, stiff, moist.
1594.00	1.50	-	-	16		4.50	6.00	NIL	-	Reddish soil, stiff, moist.
1592.50	1.50	-	-	19		6.00	7.50	NIL	-	Reddish soil, fine grained, firm.
1591.00	1.50	-	-	20		7.50	9.00	NIL	-	Reddish soil, fine grained, firm.
1589.50	1.00	-	-	24		9.00	10.00	NIL	-	Reddish soil, fine grained, firm.

WEATHERING GRADES
I: Fresh and Hard
II: Slightly Weathered
III: Moderately Weathered
IV: Highly Weathered
V: Completely Weathered

COHESIONLESS SOILS	
Relative Density	N — Value
Very Loose	< 4
Loose	4 — 10
Medium Dense	10 — 30
Dense	30 — 50
Very Dense	> 50

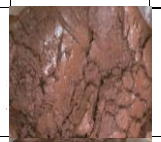
COHESIVE SOILS		
Consistency	Undrained Shear Strength, kpa	N —Value
Very Soft	< 12	<2
Soft	12 — 25	2 — 4
Firm	25 — 50	4 — 8
Stiff	50 - 100	8 — 16
Very Stiff	100 — 200	16 — 32
Hard	> 200	> 32

PROJECT: KAAGA BOYS FOOT BRIDGE

CLIENT; EGIS CONSULTANTS LIMITED

BH TEST LOCATION	BH/POINT	ELEVATION	CO-ORDINATES	0.063750	TOTAL BH DEPTH (m) From OGL	Field Date:	Wednesday, 30 April 2025
MERU	BH 4	1600M		37.65659	10.00		

BOREHOLE LOG

Depth Scale (m)	RUN (m)	WeatheringGrade	Fracture Index	N- VALUE	LEGEND	SAMPLE DEPTH FROM (m)	SAMPLE DEPTH TO (m)	%TCR	%RQD	MATERIAL DESCRIPTION
1598.50	1.50	-	-			0.00	1.50	NIL	-	Reddish soil, stiff, moist.
1597.00	1.50	-	-	18		1.50	3.00	NIL	-	Reddish soil, fine grained, firm.
1595.50	1.50	-	-	17		3.00	4.50	NIL	-	Reddish soil, fine grained, firm.
1594.00	1.50	-	-	18		4.50	6.00	NIL	-	Reddish soil, fine grained, firm.
1592.50	1.50	-	-	18		6.00	7.50	NIL	-	Reddish soil, fine grained, firm.
1591.00	1.50	-	-	18		7.50	9.00	NIL	-	Reddish soil, fine grained, firm.
1589.50	1.00	-	-	20		9.00	10.00	NIL	-	Reddish soil, fine grained, firm.

WEATHERING GRADES
I: Fresh and Hard
II: Slightly Weathered
III: Moderately Weathered
IV: Highly Weathered
V: Completely Weathered

COHESIONLESS SOILS	
Relative Density	N — Value
Very Loose	< 4
Loose	4 — 10
Medium Dense	10 — 30
Dense	30 — 50
Very Dense	> 50

COHESIVE SOILS		
Consistency	Undrained Shear Strength, kpa	N —Value
Very Soft	< 12	<2
Soft	12 — 25	2 — 4
Firm	25 — 50	4 — 8
Stiff	50 - 100	8 — 16
Very Stiff	100 — 200	16 — 32
Hard	> 200	> 32

Appendix 8: Boreholes Soils Test Results

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BOREHOLE SOIL SAMPLES SUMMARY SHEET

BH No.	Depth	Particle Size Distribution							Atterberg Limits						Compaction		CBR (100%) MDD		Material Description
		% Passing Sieve Size (mm)							NMC	LL	PL	PI	LS	PM	OMC	MDD	4-Day Soak	Swell	
	m	20	10	5	2	1.18	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	
BH 01	3.00	100.0	100.0	100.0	100.0	98.4	94.1	87.0	8.1	57.1	28.5	28.5	14.0	2682					Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
BH 02	3.00	100.0	100.0	100.0	100.0	98.0	95.0	88.4	7.8	57.4	28.7	28.7	14.2	2727					Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist
BH 03	1.95	100.0	100.0	92.5	86.8	82.8	74.3	63.8	4.6	47.8	22.4	25.4	12.7	1887					Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
	3.45	100.0	73.3	62.0	56.0	52.3	48.7	45.8	10.9	46.2	20.4	25.8	12.9	1256					Reddish Brown,loose,CLAY,intermediate plasticity,slightly moist,with occassional tuff
	4.95	100.0	95.5	89.5	83.5	77.2	68.8	63.3	4.6	47.7	21.5	26.2	12.8	1803					Dark Brown,loose,CLAY,intermediate plasticity,slightly moist,with some tuff
BH 04	1.95	100.0	100.0	100.0	100.0	98.0	94.0	89.2	9.0	55.3	28.1	27.1	13.0	2547					Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.
	3.45	100.0	100.0	100.0	100.0	98.2	92.1	86.6	19.6	48.2	24.8	23.4	11.5	2155					Dark Grey,loose,CLAY,intermediate plasticity,slighly moist
	4.95	100.0	100.0	100.0	98.3	95.9	92.9	89.4	10.1	57.4	28.4	29.0	14.1	2694					Reddish Brown ,loose,CLAY,intermediate plasticity,slightly moist.

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Specialists in Site Investigation, Quality Control and Material Testing

P.O. Box 10782-00100, Tel/Fax: 3871985 NAIROBI

SUMMARY OF SOIL TEST RESULTS

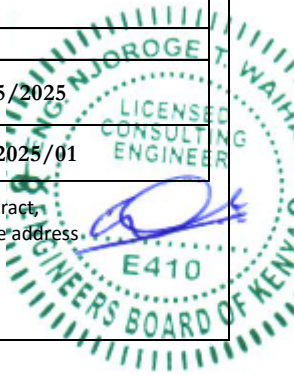
PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

DATE: 29/5/2025

CLIENT:EGIS CONSULTANTS LIMITED

SHEET No.2025/01

The results contained herein apply only to the particular sample(s) tested whose sample submission form serial number is herein quoted, and to the specific tests carried out, as detailed in this test report. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, APEX PROJECTS LIMITED. If undelivered, please return to the address written above



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GRADING AND ATTERBERG TEST RESULTS

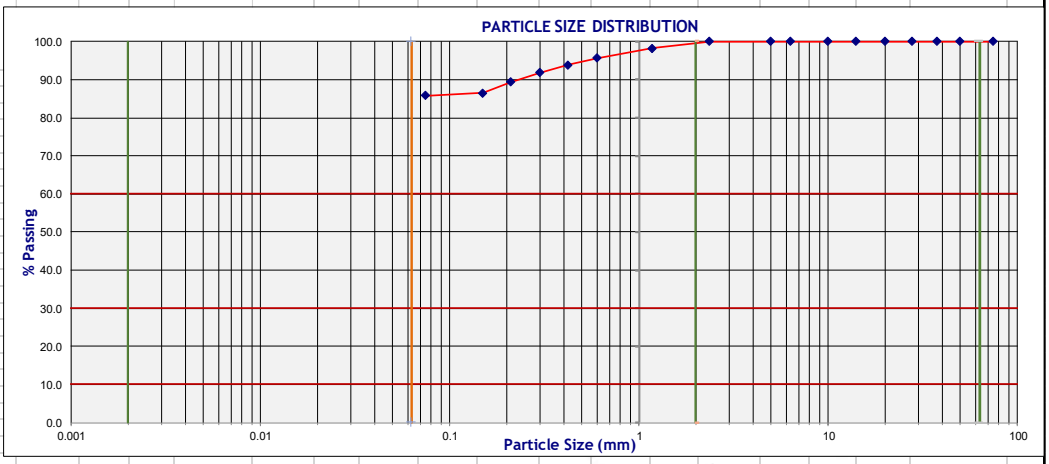
BH 01 1.50 – 3.00 M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 3.00 m	Location: BH 01		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 580 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.2	98.2
0.6	15.4	95.6
0.425	9.8	93.9
0.3	12.4	91.8
0.21	13.6	89.4
0.150	16.7	86.5
0.075	4.1	85.8

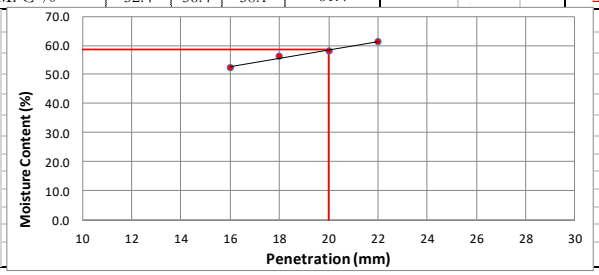


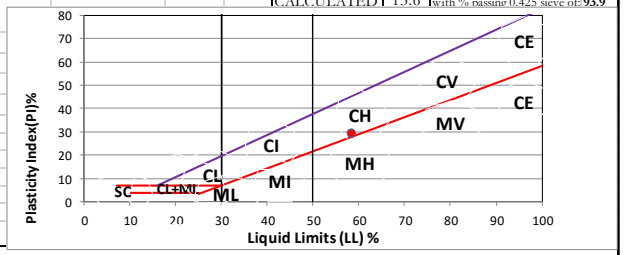
	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						5.9	3.8	4.4	14.2					
D60	CLAY					Slighty sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	29.5	29.5	28.9
M. C %	52.4	56.4	58.1	61.4	29.5		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	14.0	
CALCULATED	13.6	with % passing 0.425 sieve of 93.9





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW						
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.						GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7						

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:		C_U	C_C	ML/CL/MH/CH	CH
		Plasticity Modulus	2718		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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REGISTERED CONSULTING ENGINEER

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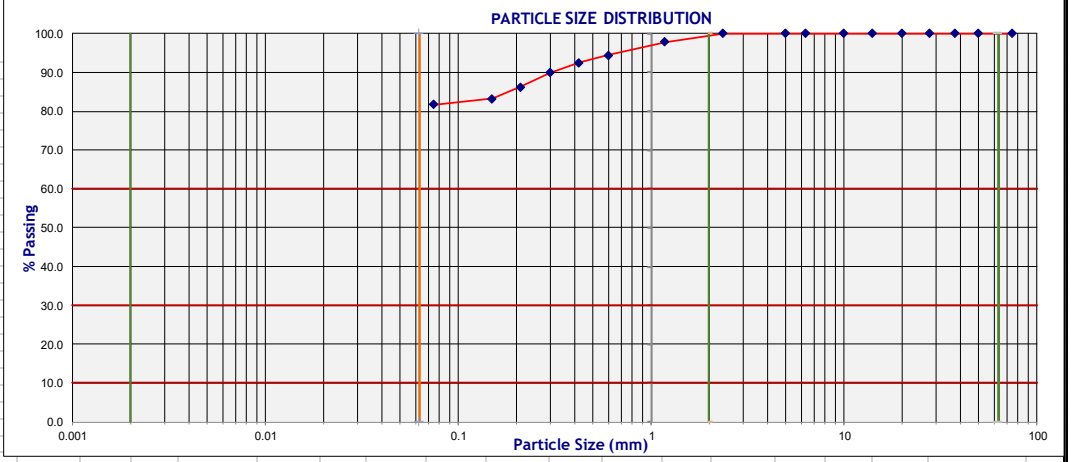
BH 02 1.50 – 3.00 M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 3.00 m	Location: BH 02		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 435 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	9.6	97.8
0.6	14.8	94.4
0.425	8.2	92.5
0.3	11.6	89.8
0.21	15.6	86.3
0.150	13.2	83.2
0.075	6.4	81.7



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10													
D30						8.1	4.6	5.6	18.3				
D60	CLAY					sandy							

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	27.8	27.8	28.2
M. C %	48.6	52.4	56.1	58.4	27.8		

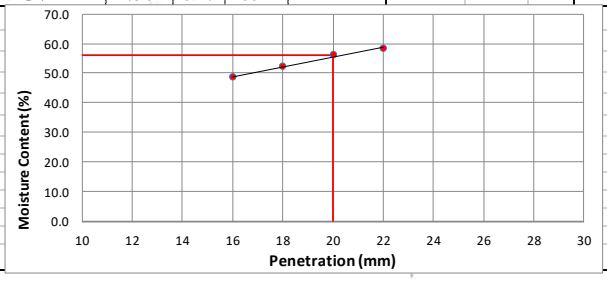
NMC

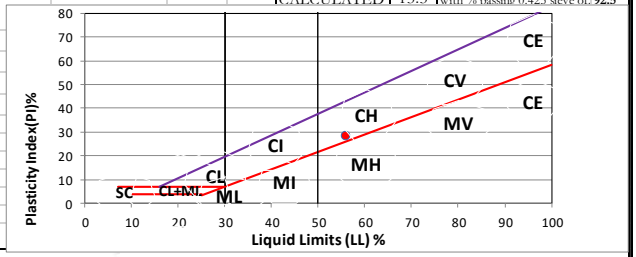
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	13.9
CALCULATED	13.3

with % passing 0.425 sieve of: 92.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:				ML/CL/MH/CH	CH
		Plasticity Modulus	2613		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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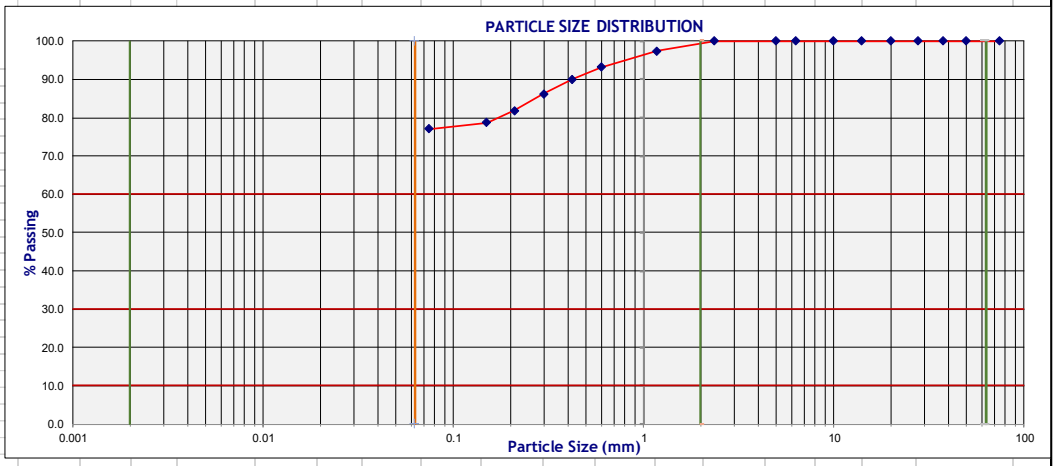
BH 03 1.50 – 1.95 M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 1.95 m	Location: BH 02		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 395 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.4	97.4
0.6	16.8	93.1
0.425	12.2	90.0
0.3	14.9	86.3
0.21	17.6	81.8
0.150	12.1	78.7
0.075	6.4	77.1



	% CLAY		% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						9.1	6.9	6.9	22.9					
D60	CLAY					very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	28.2	28.2	28.8
M. C %	50.1	54.3	56.8	60.1	28.2		

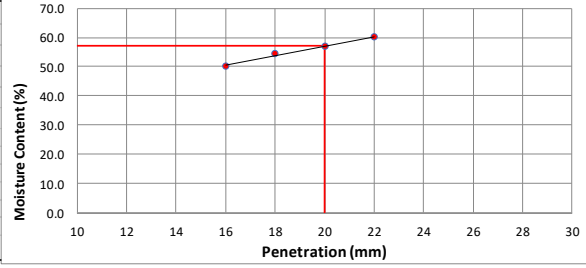
NMC

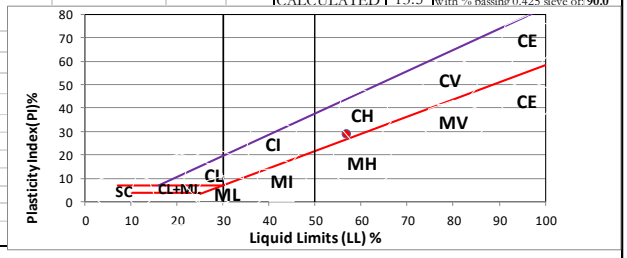
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.1
CALCULATED	13.5

with % passing 0.425 sieve of: 90.0





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CH
		Plasticity Modulus	2596	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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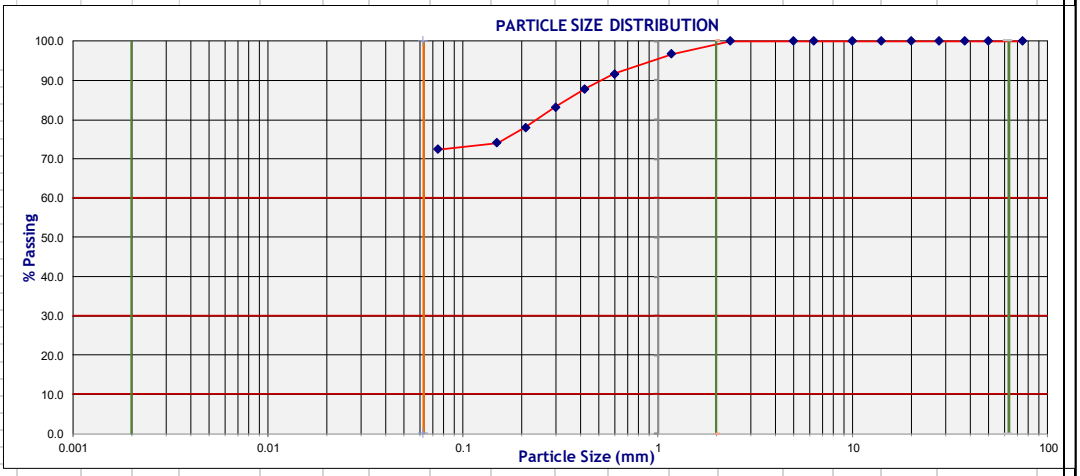
BH 03 3.00 – 3.45M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 3.45 m	Location: BH 03		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 350 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	11.5	96.7
0.6	17.6	91.7
0.425	13.6	87.8
0.3	15.9	83.3
0.21	18.4	78.0
0.150	13.7	74.1
0.075	5.8	72.4

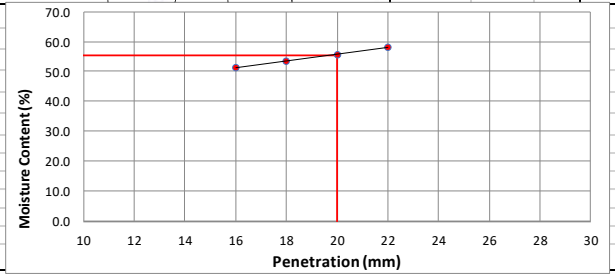


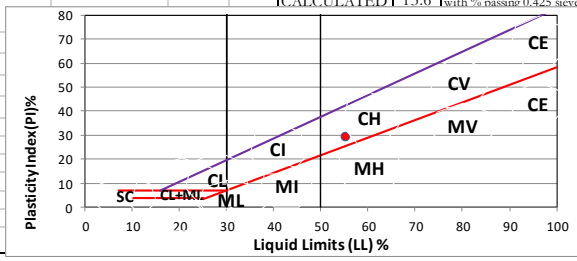
	% CLAY				% SILT				% SAND				% GRAVEL				BOULDERS
	Total				Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10																	
D30									10.8	8.4	8.3	27.6					
D60	CLAY								very sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	26.4	26.4	29.0
M. C %	51.2	53.5	55.4	58.2	26.4		

NMC		CLAY ACTIVITY (%)
LINEAR SHRINKAGE		
FROM LAB.	14.5	
CALCULATED	13.6	with % passing 0.425 sieve of 87.8





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	C_U =	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C =	$\frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	

SP	Not meeting all gradation requirements for SW		GP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.	GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" Line or P.I. greater than 7		GC	Atterberg limits above "A" Line or P.I. greater than 7	

USCS CLASSIFIED SOIL	CH					USCS POSSIBLE CLASSIFICATION
DESCRIPTION:						ML/CL/MH/CH CH
			Plasticity Modulus	2549		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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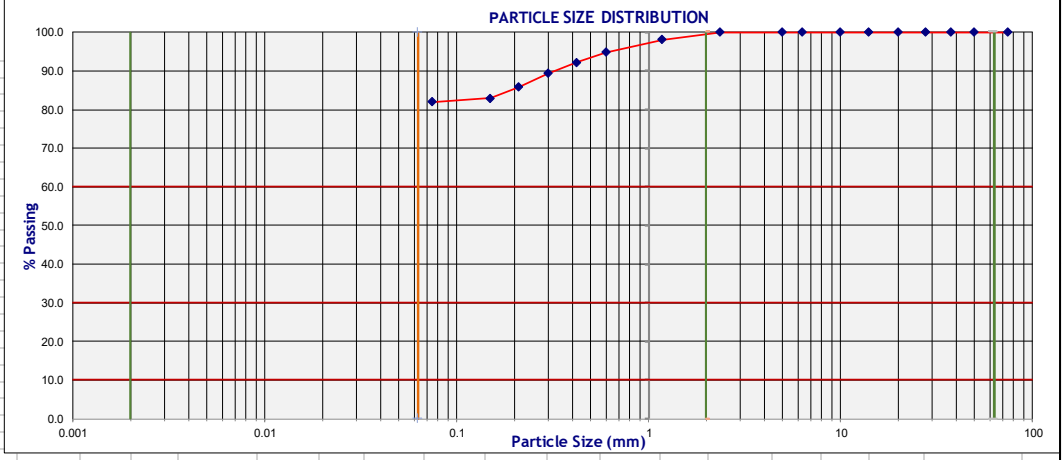
BH 04 1.50 – 1.95M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 1.95 m	Location: BH 04		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 545 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	10.6	98.1
0.6	17.9	94.8
0.425	14.2	92.2
0.3	15.5	89.3
0.21	19.2	85.8
0.150	15.4	83.0
0.075	5.0	82.1



	% CLAY	% SILT			% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Total
D10														
D30						7.3	5.4	5.2	17.9					
D60	CLAY					sandy								

ATTERBERG LIMITS

	LL				PL		PI
PENETRATION	16	18	20	22	26.4	26.4	28.4
M. C %	51.5	53.2	54.8	56.2	26.4		

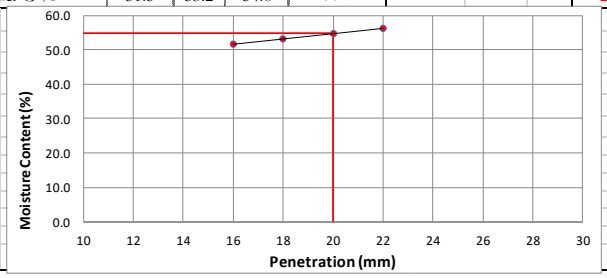
NMC

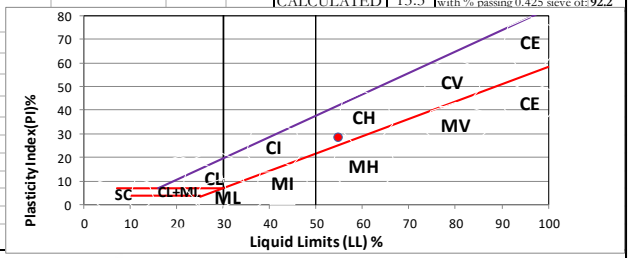
CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.3
CALCULATED	13.3

with % passing 0.425 sieve of: 92.2





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3		GW	$C_U = \frac{D_{60}}{D_{10}}$	Greater than 4	$C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$	Between 1 and 3	
SP	Not meeting all gradation requirements for SW					GP	Not meeting all gradation requirements for GW				
SM	Atterberg limits below "A" Line or P.I. Less than 4	Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.				GM	Atterberg limits below "A" Line or P.I. Less than 4	Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7					GC	Atterberg limits above "A" Line or P.I. greater than 7				

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION
DESCRIPTION:				ML/CL/MH/CH CH
		Plasticity Modulus	2616	

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

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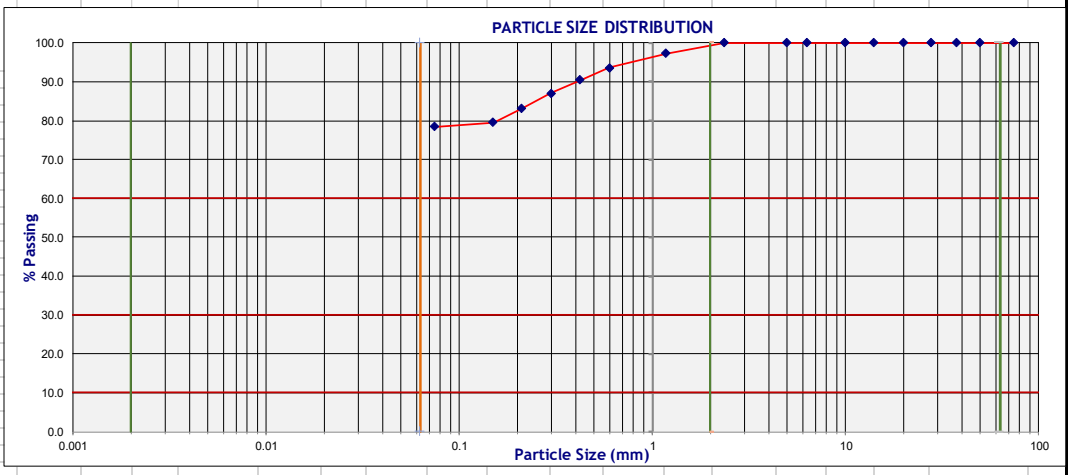
BH 04 3.00 – 3.45M

CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS				
	BOREHOLE SAMPLES				
	Depth 3.45 m	Location: BH 04		Test Date:	Monday, 19 May 2025
GRADING		PARTICLE SIZE DISTRIBUTION		Tested By:	Austine

TEST METHOD : BS 1377:Part 2

Wt. of Dry Sample 545 g

Sieve	Retained mass(g)	% Passing
75		100.0
50		100.0
37.5		100.0
28		100.0
20		100.0
14		100.0
10		100.0
6.3		100.0
5		100.0
2.36		100.0
1.18	14.5	97.3
0.6	20.4	93.6
0.425	17.0	90.5
0.3	18.5	87.1
0.21	22.1	83.0
0.150	18.7	79.6
0.075	6.2	78.5



	% CLAY				% SILT				% SAND				% GRAVEL				BOULDERS
	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total	Fine	Medium	Coarse	Total
D10																	
D30							8.6	6.5	6.4	21.5							
D60	CLAY						very sandy										

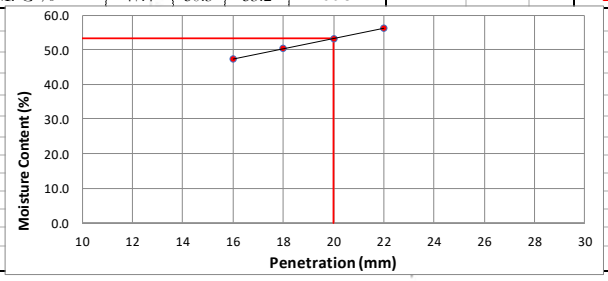
ATTERBERG LIMITS

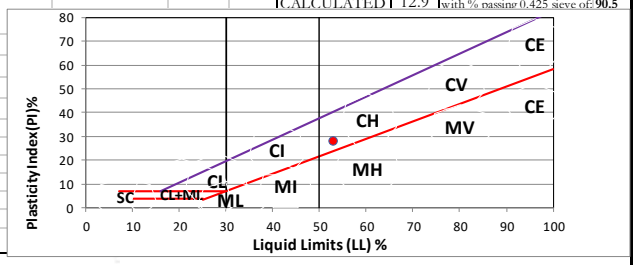
	LL				PL		PI
PENETRATION	16	18	20	22	25.6	25.6	27.5
M. C %	47.4	50.3	53.2	56.3	25.6		

NMC | CLAY ACTIVITY (%)

LINEAR SHRINKAGE

FROM LAB.	14.3	
CALCULATED	12.9	with % passing 0.425 sieve of: 90.5





USCS DEDUCTIONS

KEY TO LABORATORY CLASSIFICATION CRITERIA

SW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3		GW	C_U=	$\frac{D_{60}}{D_{10}}$	Greater than 4	C_C=	$\frac{D_{30}^2}{D_{10} x D_{60}}$	Between 1 and 3
SP	Not meeting all gradation requirements for SW							GP	Not meeting all gradation requirements for GW					
SM	Atterberg limits below "A" Line or P.I. Less than 4		Limits plotting in shaded zone with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.					GM	Atterberg limits below "A" Line or P.I. Less than 4		Above "A" Line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols.			
SC	Atterberg limits above "A" Line or P.I. greater than 7							GC	Atterberg limits above "A" Line or P.I. greater than 7					

USCS CLASSIFIED SOIL	CH			USCS POSSIBLE CLASSIFICATION	
DESCRIPTION:		C_U	C_C		ML/CL/MH/CH CH
		Plasticity Modulus	2492		

KEY

CC=	Coefficient of Curvature	CU=	Coefficient of Uniformity	MC=	Moisture content	PL=	Plastic Limit	LL=	Liquid Limit
NMC =	Natural Moisture Content	PI=	Plastic Index						

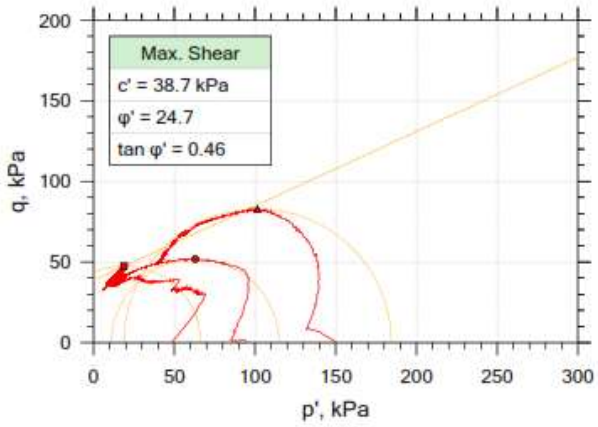
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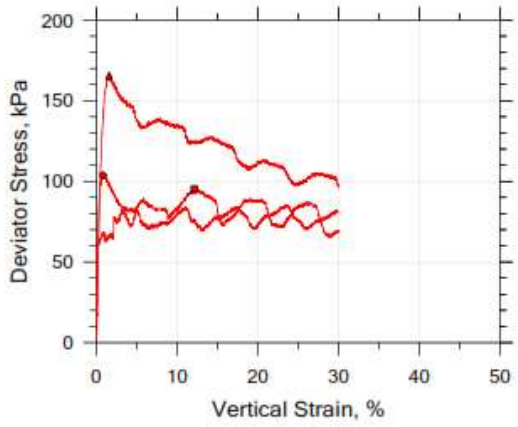


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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

BH 01 1.50 – 3.00 M





Symbol		■	●	▲
Sample ID				
Depth, ft		1.50-3.00m	1.50-3.00m	1.50-3.00m
Test Number		UU_50 kPa	UU_100 kPa	UU_150 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	29.4	29.4	29.4
	Dry Density, N/m³	1.34e+04	1.34e+04	1.34e+04
	Saturation (Wet Method), %	81.9	81.9	81.9
	Void Ratio	0.962	0.962	0.962
Final	Moisture Content, %	36.1	35.9	34.7
	Dry Density, N/m³	1.34e+04	1.34e+04	1.36e+04
	Cross-Sectional Area (Method A), mm²	1967.	1960.	1936.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.968	0.962	0.930
	Back Pressure, %	449.9	547.3	544.5
Vertical Effective Consolidation Stress, kPa		48.03	94.89	150.5
Horizontal Effective Consolidation Stress, kPa		48.31	96.08	150.0
Vertical Strain after Consolidation, %		0.01337	0.003645	0.2094
Volumetric Strain after Consolidation, %		0.04873	0.5174	1.489
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		47.59	51.82	82.84
Strain at Failure, %		12.2	0.841	1.61
Strain Rate, %/min		0.1670	0.1670	0.1670
Deviator Stress at Failure, kPa		95.17	103.6	165.7
Effective Minor Principal Stress at Failure, kPa		-28.78	11.12	18.70
Effective Major Principal Stress at Failure, kPa		66.39	114.8	184.4
B-Value		0.41	0.48	0.51

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

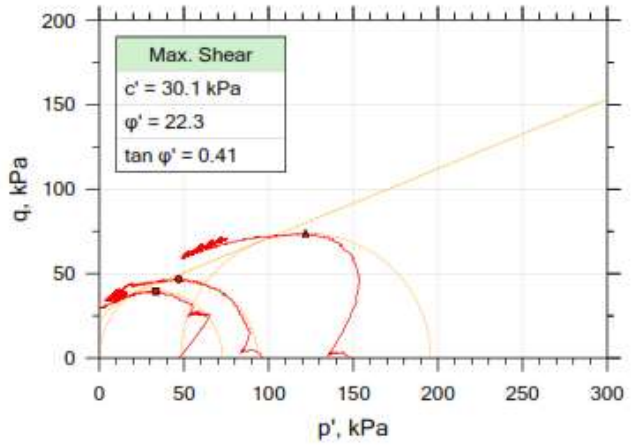
	Project: Meru Town Link Roads	Location: Meru Polytechnic	Project No.: 019
	Boring No.: BH 01	Tested By: JM	Checked By: PW
	Sample No.:	Test Date: 03/6/2025	Depth: 1.50-3.00m
	Test No.: UU_50 kPa	Sample Type: Remoulded sample	Elevation:
	Description: Reddish brown, soft to hard clayey silt		
	Remarks: Tests conducted at Mod. AASHTO MDD at OMC. Saturation & void ratios computed from assumed Gs		

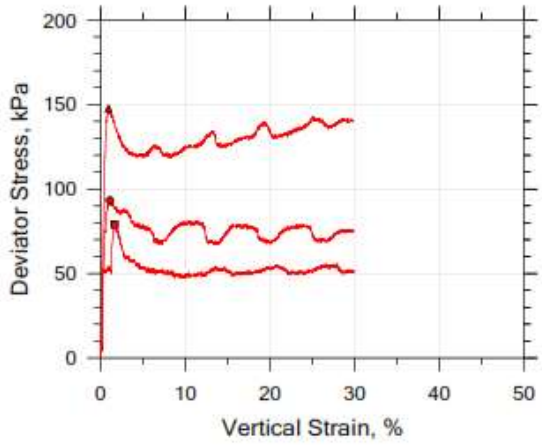
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BH 01 1.50 – 3.00 M





Symbol		■	●	▲
Sample ID				
Depth, ft		1.50 - 3.00m	1.50 - 3.00m	1.50-3.00m
Test Number		UU_50 kPa	UU_100 kPa	UU_150 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	30.0	30.0	30.0
	Dry Density, N/m³	1.31e+04	1.31e+04	1.31e+04
	Saturation (Wet Method), %	79.4	79.4	79.4
	Void Ratio	1.01	1.01	1.01
Final	Moisture Content, %	38.2	38.0	38.6
	Dry Density, N/m³	1.30e+04	1.30e+04	1.29e+04
	Cross-Sectional Area (Method A), mm²	1971.	1962.	1972.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.02	1.02	1.03
	Back Pressure, %	503.8	504.3	461.0
Vertical Effective Consolidation Stress, kPa		41.94	96.41	148.2
Horizontal Effective Consolidation Stress, kPa		47.64	97.32	148.3
Vertical Strain after Consolidation, %		0.002428	0.01819	0.009670
Volumetric Strain after Consolidation, %		0.09983	0.7912	0.9020
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		39.49	46.70	73.85
Strain at Failure, %		1.68	1.11	0.934
Strain Rate, %/min		0.1670	0.1670	0.1670
Deviator Stress at Failure, kPa		78.98	93.39	147.7
Effective Minor Principal Stress at Failure, kPa		-6.255	0.1583	47.97
Effective Major Principal Stress at Failure, kPa		72.72	93.55	195.7
B-Value		0.44	0.47	0.45

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

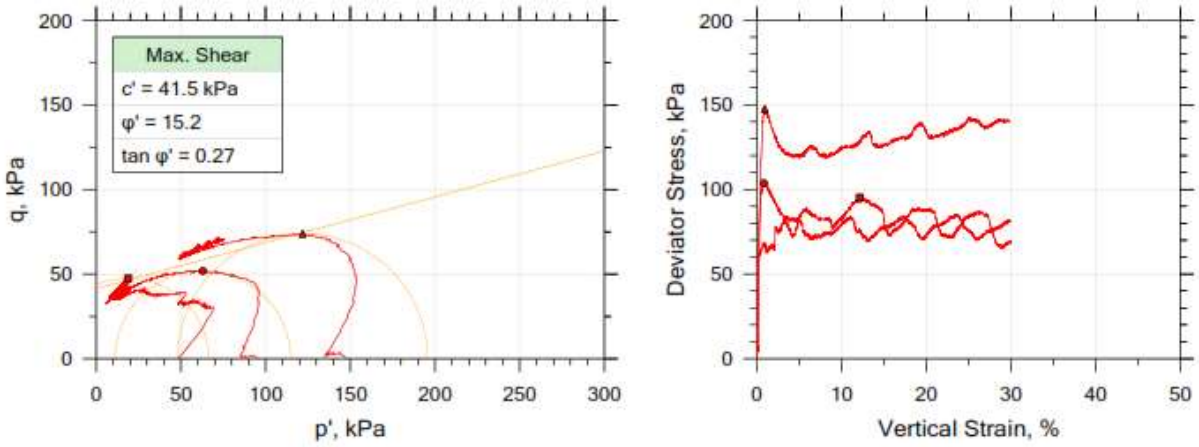
	Project: Meru Town Link Roads	Location: Meru Polytechnic	Project No.: 019
	Boring No.: BH 02	Tested By: JM	Checked By: PW
	Sample No.:	Test Date: 07/6/2025	Depth: 1.50 - 3.00m
	Test No.: UU_50 kPa	Sample Type: Remoulded sample	Elevation:
	Description: Dark brown, soft to hard clayey with pebbles		
	Remarks: Tests conducted at Mod. AASHTO MDD at OMC. Saturation & void ratios computed from assumed Gs		

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BH 03 1.50 – 1.95 M



Symbol		■	●	▲
Sample ID				
Depth, ft		1.50-1.95m	1.50-3.00m	1.50 -3.00m
Test Number		UU_50 kPa	UU_100 kPa	UU_150 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	33.9	33.9	33.9
	Dry Density, N/m³	1.29e+04	1.29e+04	1.29e+04
	Saturation (Wet Method), %	88.2	88.2	88.2
	Void Ratio	1.03	1.03	1.03
Final	Moisture Content, %	38.7	38.5	39.3
	Dry Density, N/m³	1.29e+04	1.29e+04	1.28e+04
	Cross-Sectional Area (Method A), mm²	1967.	1960.	1972.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.04	1.03	1.05
	Back Pressure, %	449.9	547.3	461.0
Vertical Effective Consolidation Stress, kPa		48.03	94.89	148.2
Horizontal Effective Consolidation Stress, kPa		48.31	96.08	148.3
Vertical Strain after Consolidation, %		0.01337	0.003645	0.009670
Volumetric Strain after Consolidation, %		0.04873	0.5174	0.9020
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		47.59	51.82	73.85
Strain at Failure, %		12.2	0.841	0.934
Strain Rate, %/min		0.1670	0.1670	0.1670
Deviator Stress at Failure, kPa		95.17	103.6	147.7
Effective Minor Principal Stress at Failure, kPa		-28.78	11.12	47.97
Effective Major Principal Stress at Failure, kPa		66.39	114.8	195.7
B-Value		0.41	0.48	0.45

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

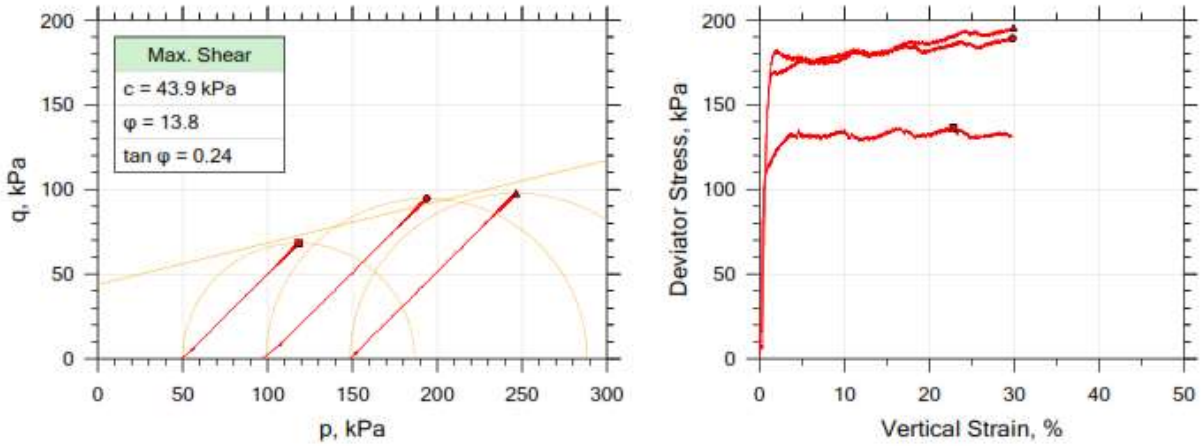
	Project: Meru Town Link Roads	Location: Kaaga Boys School	Project No.: 019
	Boring No.: BH 03	Tested By: JM	Checked By: PW
	Sample No.:	Test Date: 03/6/2025	Depth: 1.50-1.95m
	Test No.: UU_50 kPa	Sample Type: Remoulded sample	Elevation:
	Description: Reddish brown, soft to hard clayey silt		
	Remarks: Tests conducted at Mod. AASHTO MDD at OMC. Saturation & void ratios computed from assumed Gs		

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BH 03 3.00 – 3.45 M



Symbol		■	●	▲
Sample ID				
Depth, ft		3.00 - 3.45m	3.00 - 3.45m	3.00m - 3.45m
Test Number		UU_50kPa	UU_100 kPa	UU_150 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	33.5	33.5	33.5
	Dry Density, N/m³	1.32e+04	1.32e+04	1.32e+04
	Saturation (Wet Method), %	90.2	90.2	90.2
	Void Ratio	0.996	0.996	0.996
Final	Moisture Content, %	37.1	37.1	36.5
	Dry Density, N/m³	1.32e+04	1.32e+04	1.33e+04
	Cross-Sectional Area (Method A), mm²	1961.	1961.	1950.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.993	0.995	0.977
	Back Pressure, %	544.7	545.6	546.0
Vertical Effective Consolidation Stress, kPa		45.48	97.12	144.9
Horizontal Effective Consolidation Stress, kPa		48.63	96.79	148.7
Vertical Strain after Consolidation, %		0.001217	-0.01094	0.2653
Volumetric Strain after Consolidation, %		0.05686	0.3024	0.9533
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		68.32	94.65	97.73
Strain at Failure, %		22.8	29.8	29.9
Strain Rate, %/min		0.1670	0.1670	0.1670
Deviator Stress at Failure, kPa		136.6	189.3	195.5
Effective Minor Principal Stress at Failure, kPa		-3.322	0.1354	20.54
Effective Major Principal Stress at Failure, kPa		133.3	189.4	216.0
B-Value		0.46	0.57	0.46

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

	Project: Meru Town Link Roads	Location: Kaaga Boys School	Project No.: 019
	Boring No.: BH 03	Tested By: JM	Checked By: F.O
	Sample No.:	Test Date: 8/5/2025	Depth: 3.00 - 3.45m
	Test No.: UU_50kPa	Sample Type: Remoulded sample	Elevation:
	Description: Reddish brown, soft to hard clayey silt		
	Remarks: Tests conducted at Mod. AASHTO at 95% MDD - OMC. Saturation & void ratios computed from assumed Gs		

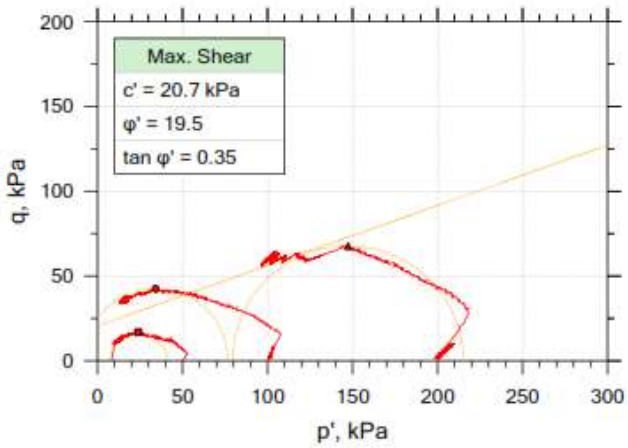
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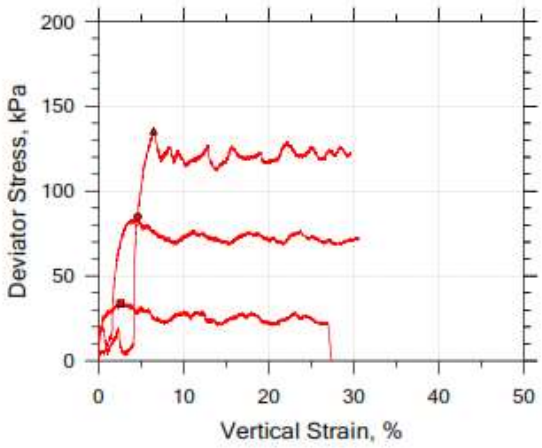
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BH 04 1.50 – 1.95 M





Symbol		■	●	▲
Sample ID				
Depth, ft		1.50m-1.95m	1.50m-1.95m	1.50m - 1.95m
Test Number		UU_50 kPa	UU_100 kPa	UU_200 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	28.1	28.1	28.1
	Dry Density, N/m³	1.35e+04	1.35e+04	1.35e+04
	Saturation (Wet Method), %	79.0	79.0	79.0
	Void Ratio	0.954	0.954	0.954
Final	Moisture Content, %	33.2	29.7	27.8
	Dry Density, N/m³	1.39e+04	1.46e+04	1.51e+04
	Cross-Sectional Area (Method A), mm²	1918.	1842.	1736.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.890	0.796	0.745
	Back Pressure, %	544.7	544.7	544.6
Vertical Effective Consolidation Stress, kPa		49.06	98.21	199.8
Horizontal Effective Consolidation Stress, kPa		49.93	100.0	200.0
Vertical Strain after Consolidation, %		0.8376	0.7298	-0.03735
Volumetric Strain after Consolidation, %		2.757	4.416	13.30
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		16.92	42.50	67.78
Strain at Failure, %		2.62	4.59	6.47
Strain Rate, %/min		0.3330	0.3330	0.3330
Deviator Stress at Failure, kPa		33.83	85.00	135.6
Effective Minor Principal Stress at Failure, kPa		7.106	-8.340	79.53
Effective Major Principal Stress at Failure, kPa		40.94	76.66	215.1
B-Value		0.70	0.50	0.71

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

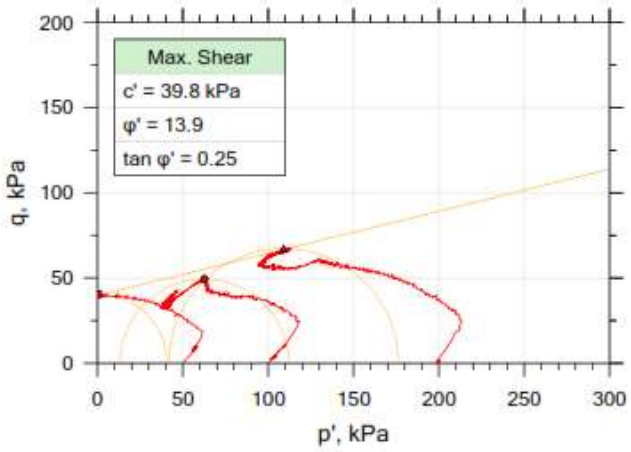
	Project: Meru Town Link Road	Location: Kaaga Boys School	Project No.: 019
	Boring No.: BH 04	Tested By: J.M	Checked By: P.M
	Sample No.:	Test Date: 23/06/2025	Depth: 1.50m-1.95m
	Test No.: UU_50 kPa	Sample Type: Remoulded sample	Elevation:
	Description: Reddish brown firm clayey		
	Remarks: Tests conducted at Mod. AASHTO MDD at OMC. Saturation & void ratios computed from assumed Gs		

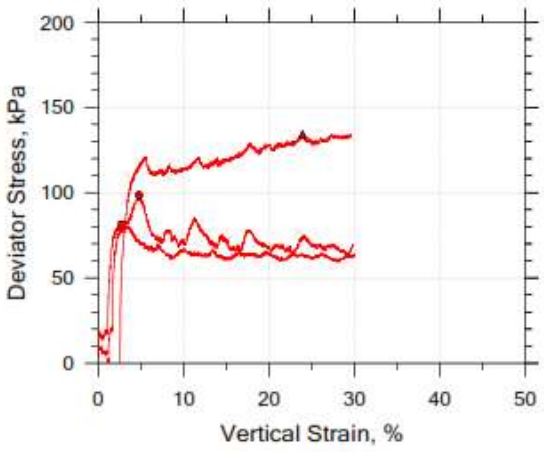
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BH 03 3.00 – 3.45 M





Symbol		■	●	▲
Sample ID				
Depth, ft		3.00m-3.45m	3.00m-3.45m	3.00m-3.45m
Test Number		UU_50 kPa	UU_100 kPa	UU_200 kPa
Initial	Height, mm	100.0	100.0	100.0
	Diameter, mm	50.00	50.00	50.00
	Moisture Content (from Cuttings), %	28.6	28.6	28.6
	Dry Density, N/m³	1.29e+04	1.29e+04	1.29e+04
	Saturation (Wet Method), %	73.8	73.8	73.8
	Void Ratio	1.04	1.04	1.04
Final	Moisture Content, %	37.8	34.8	32.5
	Dry Density, N/m³	1.30e+04	1.36e+04	1.40e+04
	Cross-Sectional Area (Method A), mm²	1946.	1853.	1780.
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.01	0.932	0.872
	Back Pressure, %	544.7	544.7	482.7
Vertical Effective Consolidation Stress, kPa		49.61	98.65	198.5
Horizontal Effective Consolidation Stress, kPa		49.98	100.0	199.9
Vertical Strain after Consolidation, %		-0.001221	-0.004848	-0.05890
Volumetric Strain after Consolidation, %		0.2176	6.373	11.48
Time to 50% Consolidation, min		0.0000	0.0000	0.0000
Shear Strength, kPa		40.50	49.33	67.22
Strain at Failure, %		2.78	4.77	23.9
Strain Rate, %/min		0.3330	0.3330	0.3330
Deviator Stress at Failure, kPa		81.00	98.65	134.4
Effective Minor Principal Stress at Failure, kPa		-40.29	13.30	41.82
Effective Major Principal Stress at Failure, kPa		40.71	111.9	176.3
B-Value		0.45	0.72	0.71

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

	Project: Meru Town Link Road	Location: Kaaga Boys School	Project No.: 019
	Boring No.: BH 04	Tested By: JM	Checked By: P.M
	Sample No.:	Test Date: 25/06/2025	Depth: 3.00m-3.45m
	Test No.: UU_50 kPa	Sample Type: Remoulded sample	Elevation:
	Description: Reddish brown firm clayey		
	Remarks: Tests conducted at Mod. AASHTO MDD at OMC. Saturation & void ratios computed from assumed Gs		

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Appendix 9: Stabilized Samples CBR Test Results

APEX PROJECTS

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LARGE SAMPLES-MATERIAL SITES IMPROVED WITH CEMENT (Compaction at 3% Cement)

Location	Particle Size Distribution						Atterberg Limits						Compaction		CBR			Material Description
	% Passing Sieve Size (mm)						NMC	LL	PL	PI	LS	PM	OMC	MDD	C.B.R	7-Days Soak,7 days cure	Swell	
	20	10	5	2	0.425	0.075	%	%	%	%	%		%	kg/m^3	%	%	%	
MS 1 2% Nkunga Material Site															90	47	0.00	Brownish angular, volcanic GRAVEL, dry,non-plastic
													12.3	1932	95	95	0.00	
								NON-PLASTIC							100	204	0.00	
MS 1 3% Nkunga Material Site															90	56	0.00	Brownish angular, volcanic GRAVEL, dry,non-plastic
													12.3	1932	95	119	0.00	
								NON-PLASTIC							100	255	0.00	
MS 1 4% Nkunga Material Site															90	58	0.00	Brownish angular, volcanic GRAVEL, dry,non-plastic
													12.3	1932	95	116	0.00	
								NON-PLASTIC							100	250	0.00	
MS 2 2% Rugusu Material Site															90	56	0.00	Light grey angular GRAVEL, dry,non-plastic
													15.2	1624	95	121	0.00	
								NON-PLASTIC							100	243	0.00	
MS 2 3% Rugusu Material Site															90	69	0.00	Light grey angular GRAVEL, dry,non-plastic
													15.2	1624	95	138	0.00	
								NON-PLASTIC							100	297	0.00	
MS 2 4% Rugusu Material Site															90	88	0.00	Light grey angular GRAVEL, dry,non-plastic
													15.2	1624	95	185	0.00	
								NON-PLASTIC							100	386	0.00	

APEX PROJECTS LIMITED

Specialists in Site Investigation, Quality Control and Material Testing

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SUMMARY OF MATERIAL SITE SOIL TEST RESULTS

PROJECT: GEOTECHNICAL INVESTIGATIONS FOR THE MERU BYPASS LINK ROADS

DATE: 25/6/2025

CLIENT:EGIS CONSULTANTS LIMITED

SHEET No.2025/02

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ENGINEERS BOARD OF KENYA LICENSED CONSULTING ENGINEER E410

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COMPACTION TEST RESULTS AT 3% CEMENT

MS 1 NKUNGA MATERIAL SITE

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
MS1 NKUNGA 3% CEMENT						
Depth Range:		**Location**	**MS1 Nkunga 3% Cement**		**Test Date:**	20 06 2025
Sampled By:			**Tested By**	Austine		

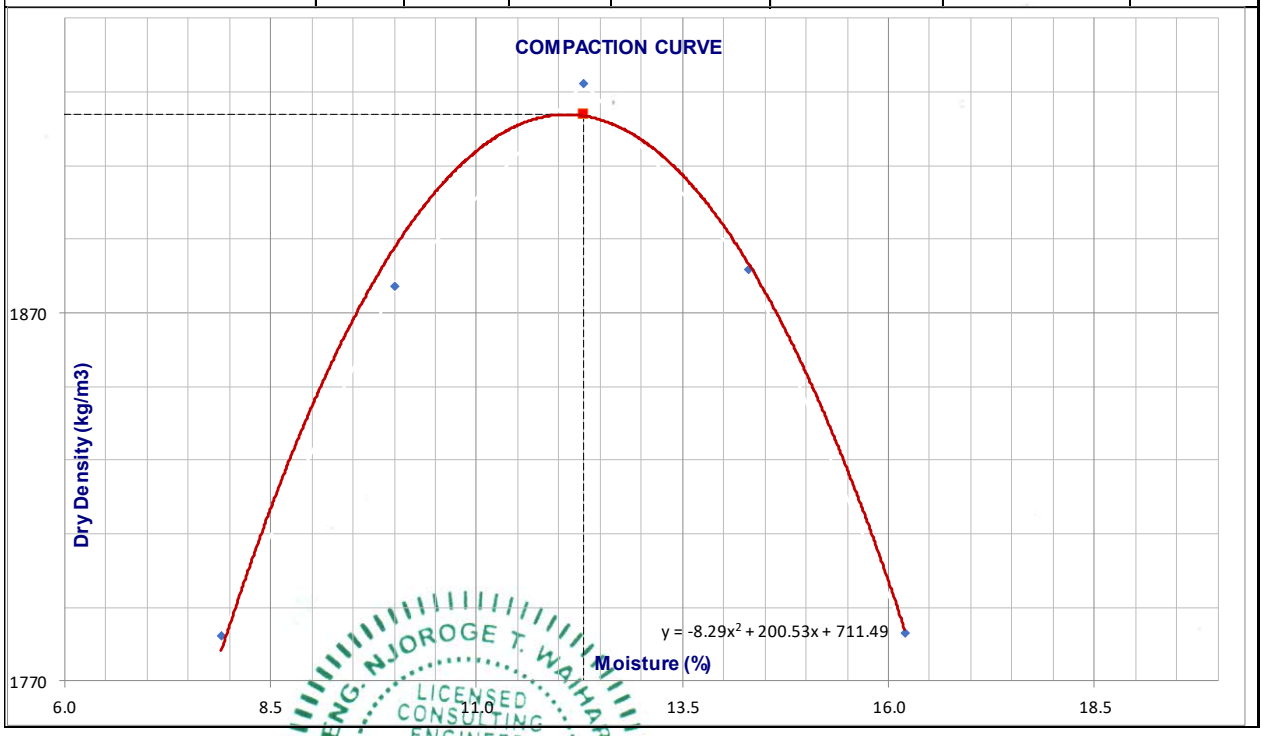
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**MC (FROM SITE)**	
Tin No.	K2	4	D	CC	KP	V2	
Weight of Wet Soil + Tin (g)	97.8	90.1	98.1	100.5	67.6	97.4	
Weight of Tin + Dry Soil (g)	92.0	83.4	89.5	90.5	61.3	93.1	
Weight of Tin(g)	18.6	16.4	19.6	20.6	22.4	12.0	
Weight of Moisture (g)	5.8	6.7	8.6	10.0	6.3	4.3	
Weight of Dry Soil (g)	73.4	67.0	69.9	69.9	38.9	81.1	
Moisture Content (%)	7.9	10.0	12.3	14.3	16.2	5.3	
Wt of Mould+base+specimen (g)	5628	5770	5875	5856	5777		
Wt of Mould+Base (g)	3705	3705	3705	3705	3705		
Wt of Specimen (g)	1923	2065	2170	2151	2072		
Bulk Density (kg/m^3)	1923	2065	2170	2151	2072		
Dry Density (kg/m^3)	1782	1877	1932	1882	1783		

Maximum Dry Density (kg/m^3	**1924**			**Optimum Moisture Content (%)=**		**12.3**	



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MS 2 R RUGUSU MATERIAL SITE

CLIENT:	**EGIS CONSULTANTS LIMITED**					
PROJECT:	**GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN ROADS**					
MS2 RUGUSU 3% CEMENT						
Depth Range:		**Location**	**MS2 Rugusu 3% Cement**		**Test Date:**	20 06 2025
Sampled By:			**Tested By**	Austine		

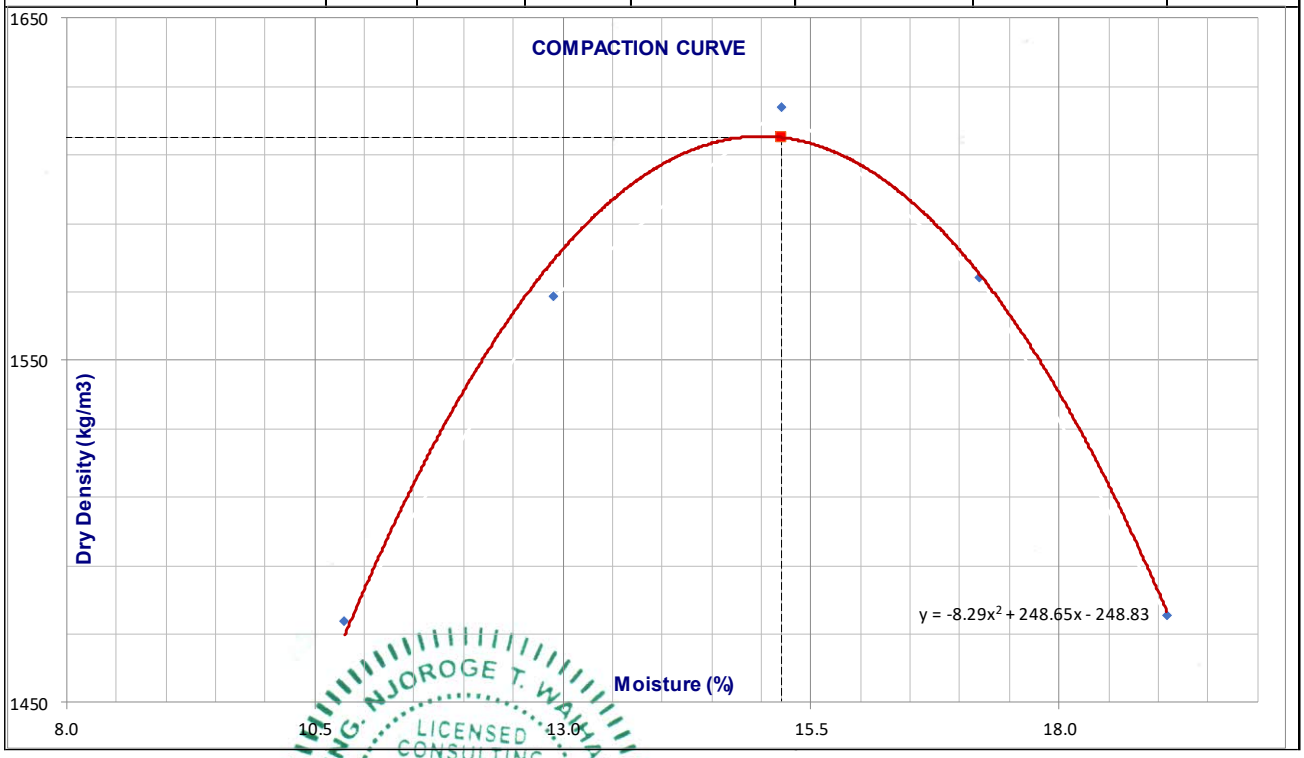
DRY DENSITY/ OPTIMUM MOISTURE CONTENT RELATIONSHIP

TEST METHOD : BS 1377:Part 4

MOISTURE CONTENT

Moisture Addition (%)	**2**	**4**	**6**	**8**	**10**	**MC (FROM SITE)**	
Tin No.	E	F6	DQ	N0	MM	X3	
Weight of Wet Soil + Tin (g)	86.3	82.0	90.8	94.2	66.7	90.4	
Weight of Tin + Dry Soil (g)	79.7	74.5	81.4	83.4	59.6	86.1	
Weight of Tin(g)	18.6	16.4	19.6	20.6	22.4	12.0	
Weight of Moisture (g)	6.6	7.5	9.4	10.8	7.1	4.3	
Weight of Dry Soil (g)	61.1	58.1	61.8	62.8	37.2	74.1	
Moisture Content (%)	10.8	12.9	15.2	17.2	19.1	5.8	
Wt of Mould+base+specimen (g)	5338	5476	5576	5550	5462		
Wt of Mould+Base (g)	3705	3705	3705	3705	3705		
Wt of Specimen (g)	1633	1771	1871	1845	1757		
Bulk Density (kg/m^3)	1633	1771	1871	1845	1757		
Dry Density (kg/m^3)	1474	1569	1624	1574	1475		

Maximum Dry Density (kg/m^3)	**1615**			**Optimum Moisture Content (%)=**		**15.2**	



ENG. NJOROGE T. WAHARA
LICENSED CONSULTING ENGINEER
E410
ENGINEERS BOARD OF KENYA

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STABILIZED CBR TEST RESULTS

MS 1 NKUNGA 2%

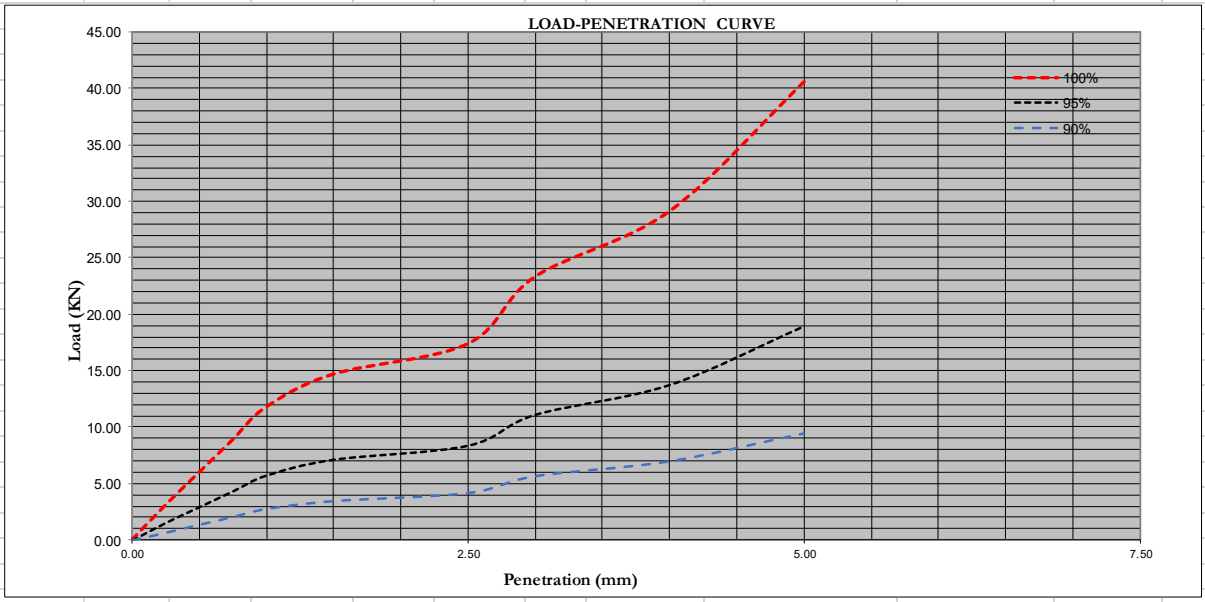
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
2 % CEMENT STABILIZATION					
Depth Range:	N/A	Location:	MS 1 2% Nkunga Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~T99~~, METHOD
MDD (g/cc) :	1.932
OMC (%) :	12.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.932	12.3		
62				



Blow	LOAD (KN)		CBR(%)		Swell
	2.54mm	5.08mm	2.54mm	5.08mm	%
10 (90%)	4.18	9.45	32	47	0.00
30 (95%)	8.36	18.89	63	95	0.00
62 (100%)	17.40	40.62	131	204	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.831	11.1	47	0.00
30 (95%)	1.932	12.3	95	0.00
62 (100%)	2.035	13.0	204	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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MS 1 NKUNGA 3%

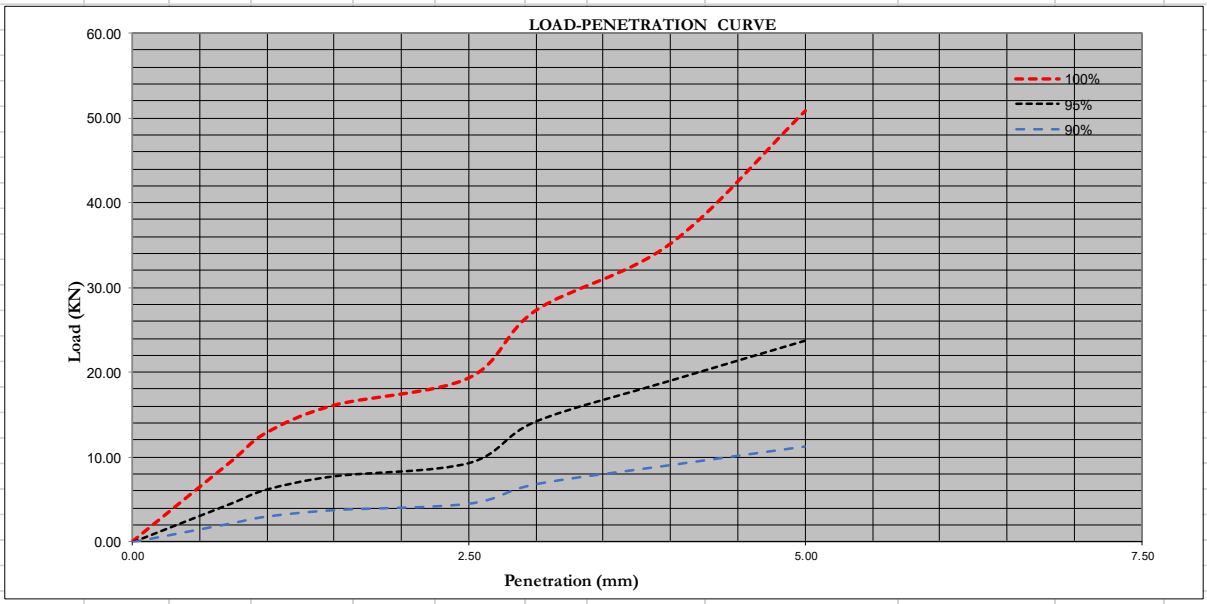
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
	3 % CEMENT STABILIZATION				
Depth Range:	N/A	Location:	MS 1 3% Nkunga Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~1999~~, METHOD
MDD (g/cc) :	1.932
OMC (%) :	12.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.932	12.3		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	4.51	11.22	34	56	0.00
30 (95%)	9.29	23.66	70	119	0.00
62 (100%)	19.33	50.88	146	255	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.831	11.1	56	0.00
30 (95%)	1.932	12.3	119	0.00
62 (100%)	2.035	13.0	255	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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MS 1 NKUNGA 4%

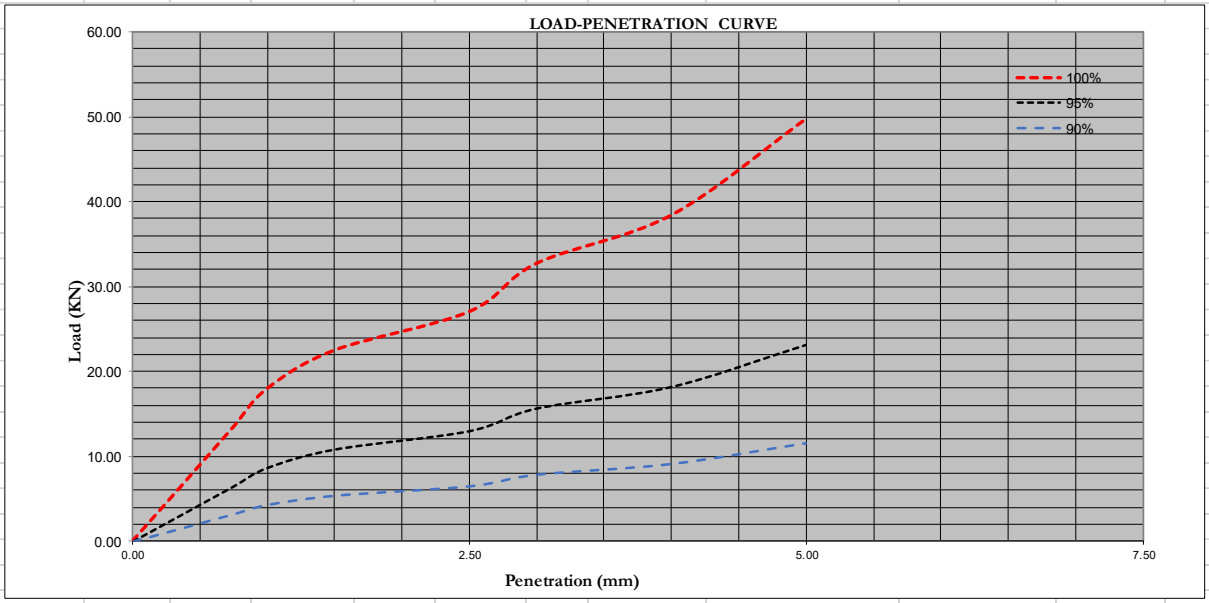
CLIENT:	EGIS CONSULTANTS LIMITED					
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS					
4 % CEMENT STABILIZATION						
Depth Range:	N/A	Location:		MS 1 4% Nkunga Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By		Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~1999~~, METHOD
MDD (g/cc) :	1.932
OMC (%) :	12.3

	Before Soaking		After Soaking	
Blows	DD	Moisture	DD	Moisture
	(g/cc)	(%)	(g/cc)	(%)
10				
30	1.932	12.3		
62				



Blow	LOAD (KN)		CBR(%)		Swell
	2.54mm	5.08mm	2.54mm	5.08mm	%
10 (90%)	6.50	11.58	49	58	0.00
30 (95%)	13.01	23.17	98	116	0.00
62 (100%)	27.06	49.81	204	250	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.831	11.1	58	0.00
30 (95%)	1.932	12.3	116	0.00
62 (100%)	2.035	13.0	250	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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MS 2 RUGUSU 2%

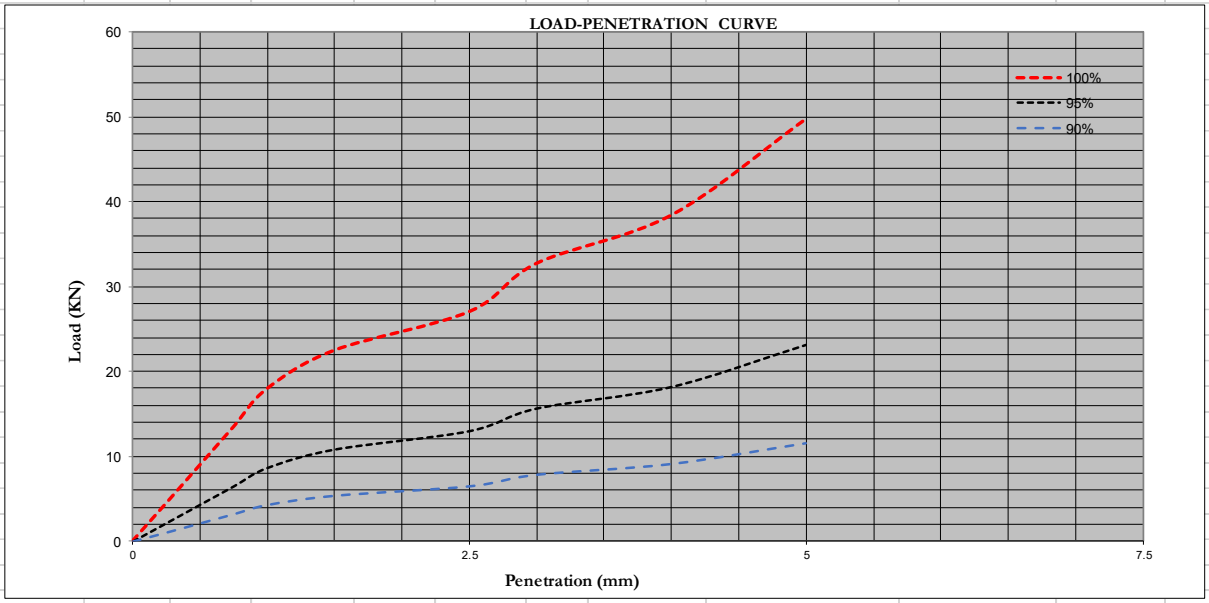
CLIENT:	EGIS CONSULTANTS LIMITED					
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS					
2 % CEMENT STABILIZATION						
Depth Range:	N/A	Location:		MS 2 2% Rugusu Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By		Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~1999~~, METHOD
MDD (g/cc) :	1.932
OMC (%) :	12.3

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.932	12.3		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	6.50	11.58	49	58	0.00
30 (95%)	13.01	23.17	98	116	0.00
62 (100%)	26.93	47.73	203	239	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.831	11.1	56	0.00
30 (95%)	1.932	12.3	121	0.00
62 (100%)	2.035	13.0	243	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

ENG. NJOROGE T. WAIHARO LICENSED CONSULTING ENGINEER E410 ENGINEERS BOARD OF KENYA

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MS 2 RUGUSU 3%

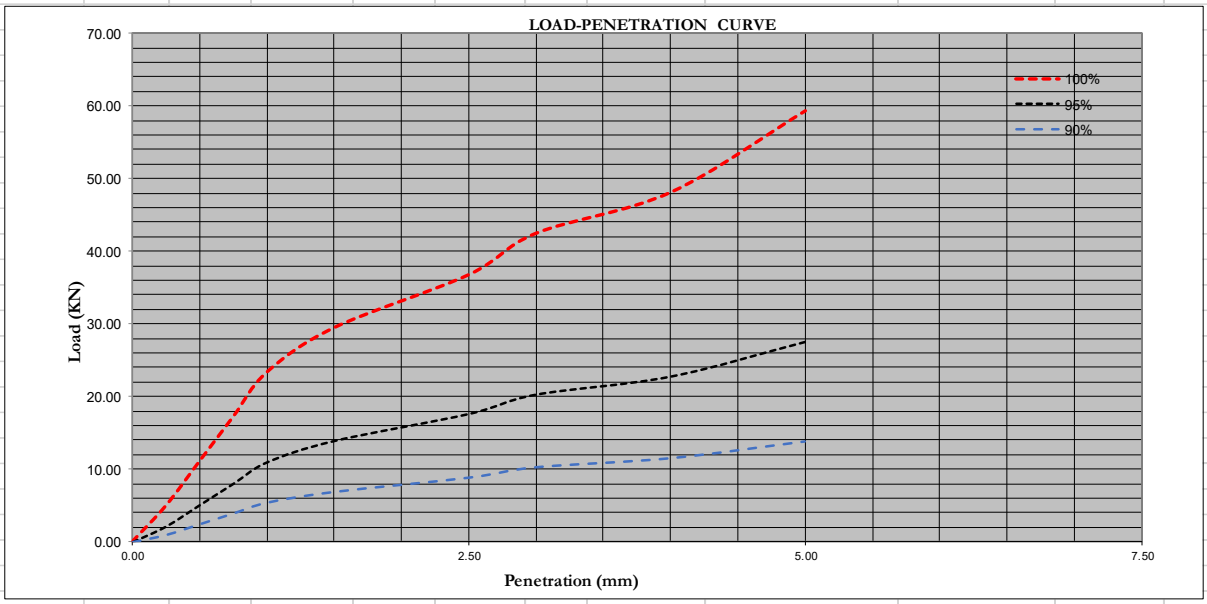
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
	3 % CEMENT STABILIZATION				
Depth Range:	N/A	Location:	MS 2 3% Rugusu Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD
MDD (g/cc) :	1.624
OMC (%) :	15.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.624	15.2		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	8.83	13.78	67	69	0.00
30 (95%)	17.66	27.57	133	138	0.00
62 (100%)	36.72	59.27	277	297	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.539	13.7	69	0.00
30 (95%)	1.624	15.2	138	0.00
62 (100%)	1.710	16.0	297	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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MS 2 RUGUSU 4%

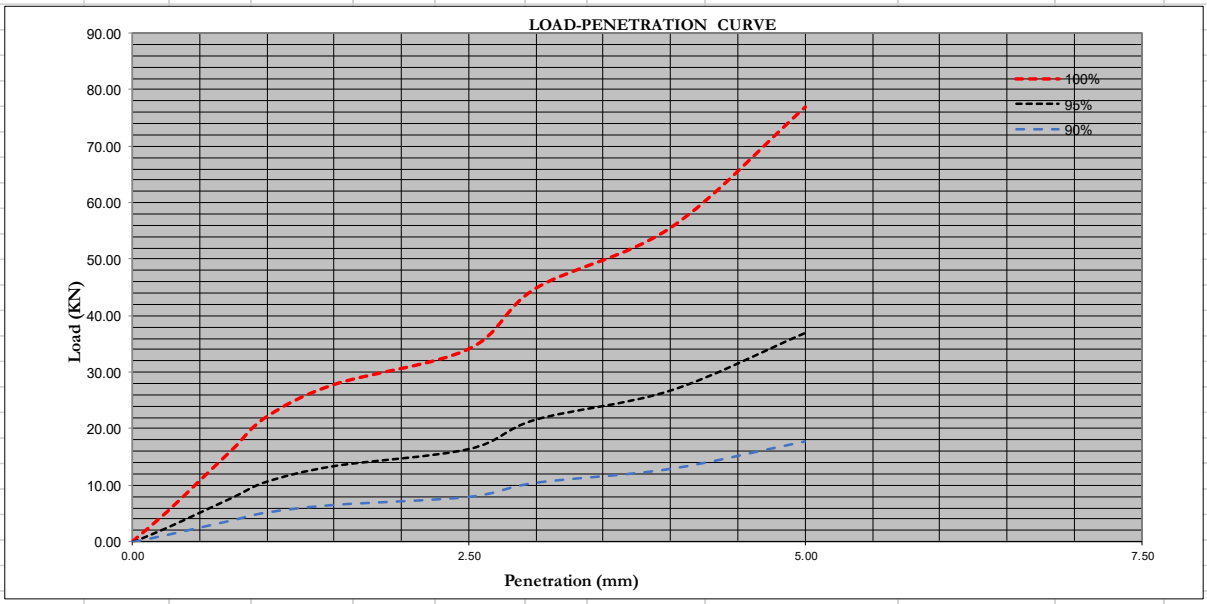
CLIENT:	EGIS CONSULTANTS LIMITED				
PROJECT:	GEOTECHNICAL INVESTIGATIONS FOR THE MERU TOWN LINK ROADS				
	4 % CEMENT STABILIZATION				
Depth Range:	N/A	Location:	MS 2 4% Rugusu Material Site	Test Date	25 06 2025
Sampled By:	Ben	Tested By	Ben		

CALIFORNIA BEARING RATIO (CBR)

TEST METHOD : BS 1377:Part 4

MODIFIED PROCTOR :	T 180/~~199~~, METHOD
MDD (g/cc) :	1.624
OMC (%) :	15.2

	Before Soaking		After Soaking	
Blows	DD (g/cc)	Moisture (%)	DD (g/cc)	Moisture (%)
10				
30	1.624	15.2		
62				



Blow	LOAD (KN)		CBR(%)		Swell %
	2.54mm	5.08mm	2.54mm	5.08mm	
10 (90%)	7.93	17.64	60	88	0.00
30 (95%)	16.42	36.86	124	185	0.00
62 (100%)	34.15	77.04	258	386	0.00

Blow	Dry Density	Moisture	CBR%	Swell
10 (90%)	1.539	13.7	88	0.00
30 (95%)	1.624	15.2	185	0.00
62 (100%)	1.710	16.0	386	0.00

TESTED BY: **Ben**
PREPARED BY: **Joy**
APPROVED BY **Eng. Tom Waiharo** Signature:_____

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