Terra Geotechnical

Where Engineering Meets Earth

Engineering Geological Report

In support of the proposed

New Steel Structure

George Depot – George

Western Cape

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Terra Geotechnical

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The information presented in this document is based on the information supplied by the Consultant prior to the commencement of the investigation. All care and diligence have been taken in rendering services and preparing these documents.

Table of Contents

1. Introduction

This report describes the results of a geotechnical site investigation in support of the proposed construction of a new steel structure within a property of the George Municipality. This development will typically incorporate the construction of a large depot with storage facilities.

1.1. Terms of Reference

Terra Geotechnical was appointed in May 2024, by Mr Ruan Espach (representing Urban Engineering), to conduct this geotechnical investigation. The area of the investigation, was defined and approved by the consultant before the commencement of the investigation. The distribution of testing locations and the associated sampling were done where physically possible and to best model the geotechnical character of the site for this specific development. Testing frequency was discussed and approved by the engineer during the quotation phase.

The quantity and nature of samples were governed by the nature of the proposed development and the in-situ characteristics of the material excavated across the site.

1.2. Sources of Information

The following sources of information were utilized:

- Remote Sensing Information:
- Google Earth Pro TM
- Elevation Heat Map; Online Resource
- Planet GIS

1.3. Objectives

The investigation had the following aims:

- identify potential **geotechnical hazards**
- to determine and evaluate the **mechanical properties of the soil** material underlying the proposed structures.
- **define the ground conditions** and classify the conditions through detailed soil profile descriptions and groundwater occurrences **within the zone of influence of foundations**
- To assess **the in-situ mechanical properties** and the **re-usability of the natural material** underlying the development in question.
- To evaluate the **excavation characteristics** across the development in question.
- To **recommend** measures to be implemented during the design and development of the area in question.

TerraGeo was not contracted to provide an assessment of the existing platform, but rather to evaluate the conditions of the natural soils beneath the platform.

The development potential of the study area is assessed based on the following premises:

- Single level warehouse type structure.

It must be noted that this investigation was conducted to assist with the design and construction phase of the development.

2. General Location and Description of Site

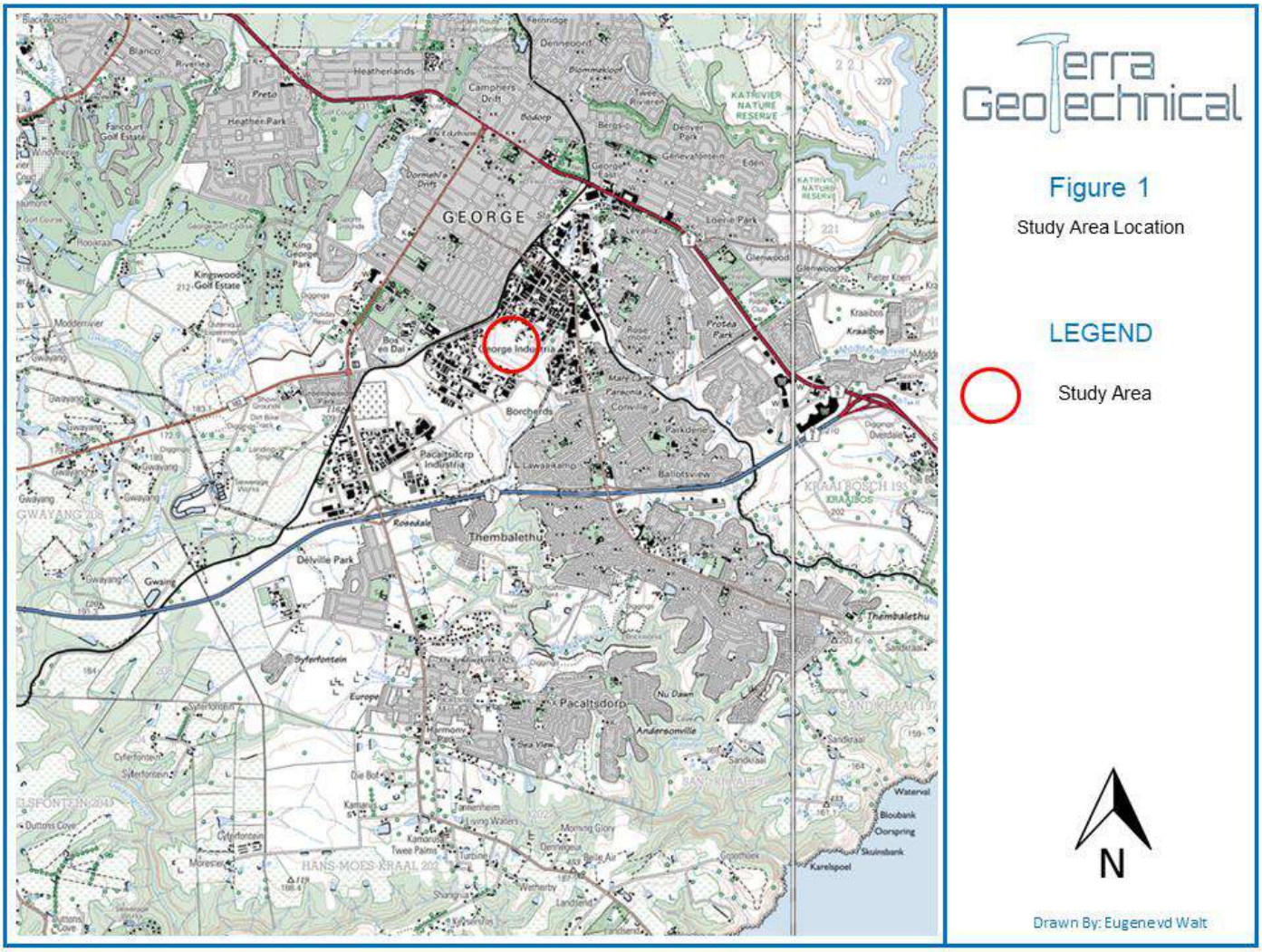
2.1. Location

The study area for this investigation is located within the central portion of the city of George, forming part of the George Local Municipality within the south eastern portion of the Western Cape Province.

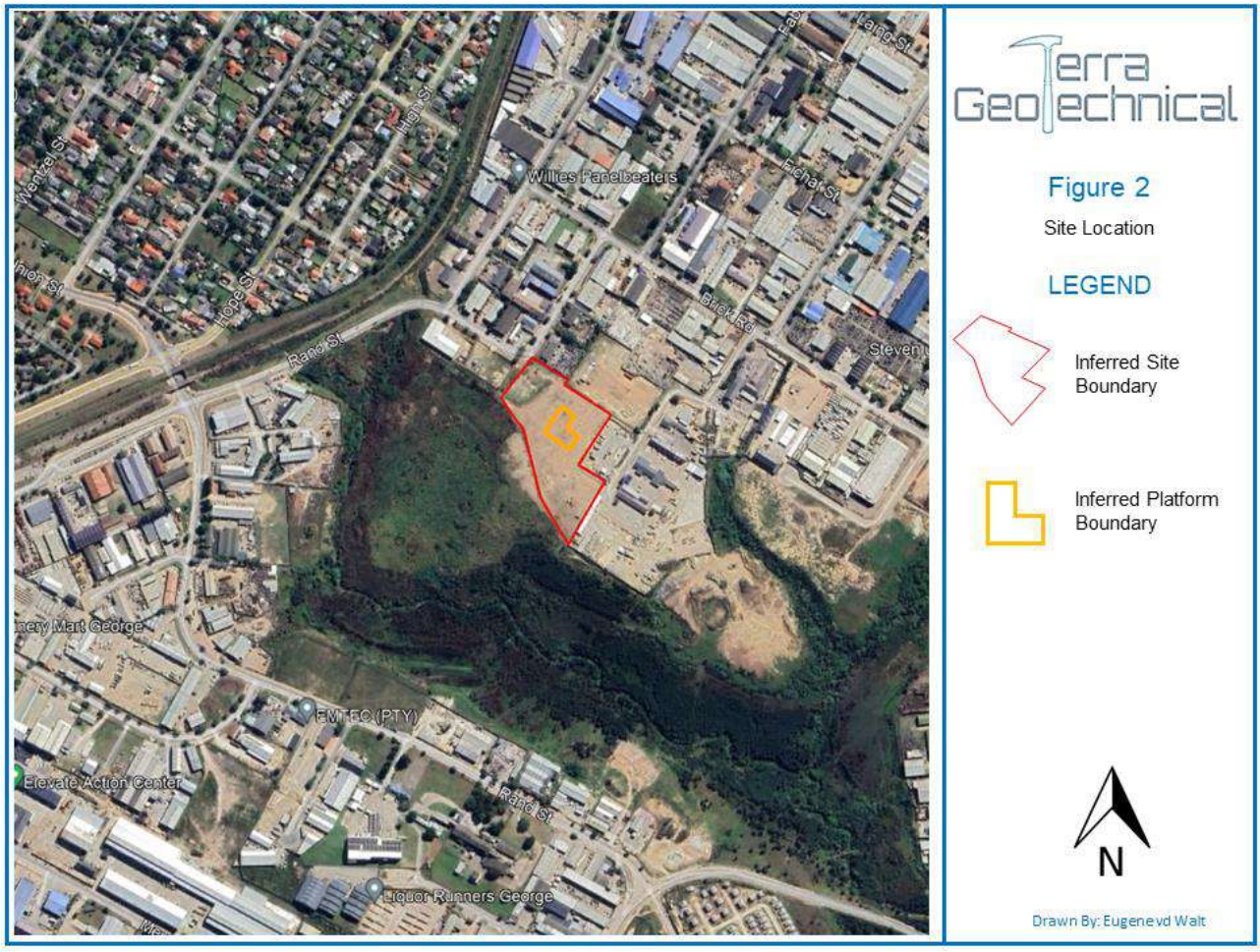
Figure 1 graphically depicts the location of the study area.

The site is located roughly at the following coordinates:

Latitude: 33.978444° S Longitude: 22.462745° E



The site is further located on an open parcel of land within the property of the George Municipality Department of Civil Engineering, within George Industria. Major earthworks had already been conducted in the form of site clearance and the construction of an engineered platform. Figure 2 below depicts the site boundary along with the inferred constructed platform boundary.



By **observing historical imagery**, the area earmarked for the placement of this steel structure was previously utilized as an uncontrolled dumping area.

Image 1 below visually depicts the **current site conditions**, the most prominent of which is the constructed platform designated to host the new steel structure. The remainder of the site has been changed from its natural state through site clearance and flattening.

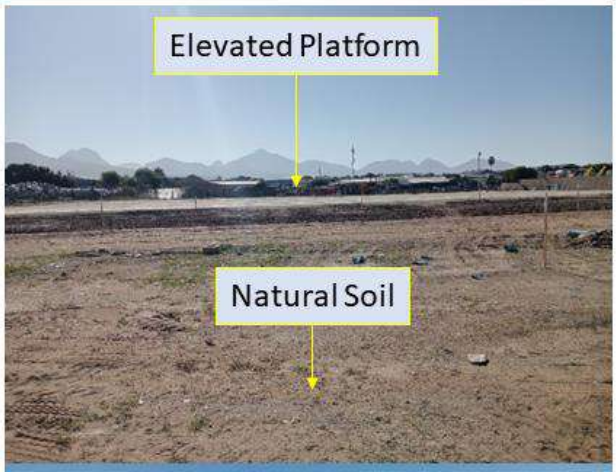


Image 1
Site Condition

2.2. Topography

The study area is characterized by prominent ridge type structures displaying finger-like limbs that gives rise to a highly variable topography with moderate and steeply sloping landscapes. The weaker strata are typically weathered and eroded to form incised valley features.

The site is located on the such a ridge feature and displays a gentle to moderately sloping morphology, decreasing in elevation towards the south, towards a non-perennial drainage feature.

Figure 3 below depicts the topographical features of the study area. Various valley type structures are identified by closely spaced contour lines and the presence of a drainage (non-perennial and perennial). The image depicts that no known drainage channels traverse the site.

Figure 3: Topographical Features

2.3. Drainage

The study area is drained mainly by means of surface run-off (i.e.: sheetwash), with storm water flowing south, towards the non-perennial drainage to the south of the site. The natural drainage across the site has been altered due to the earth works across the site.

2.4. Climate

The study area experiences rainfall throughout the year. The mean annual precipitation is approximately 797 mm. Mean monthly maximum and minimum temperatures are 12˚C in July and 20˚C in February.

The climatic N-value (Weinert, 1980) of the area is deemed to be less than 5; therefore, chemical decomposition rather than mechanical disintegration, of the parent rocks is deemed the principal mode of weathering.

2.5. Planned Development

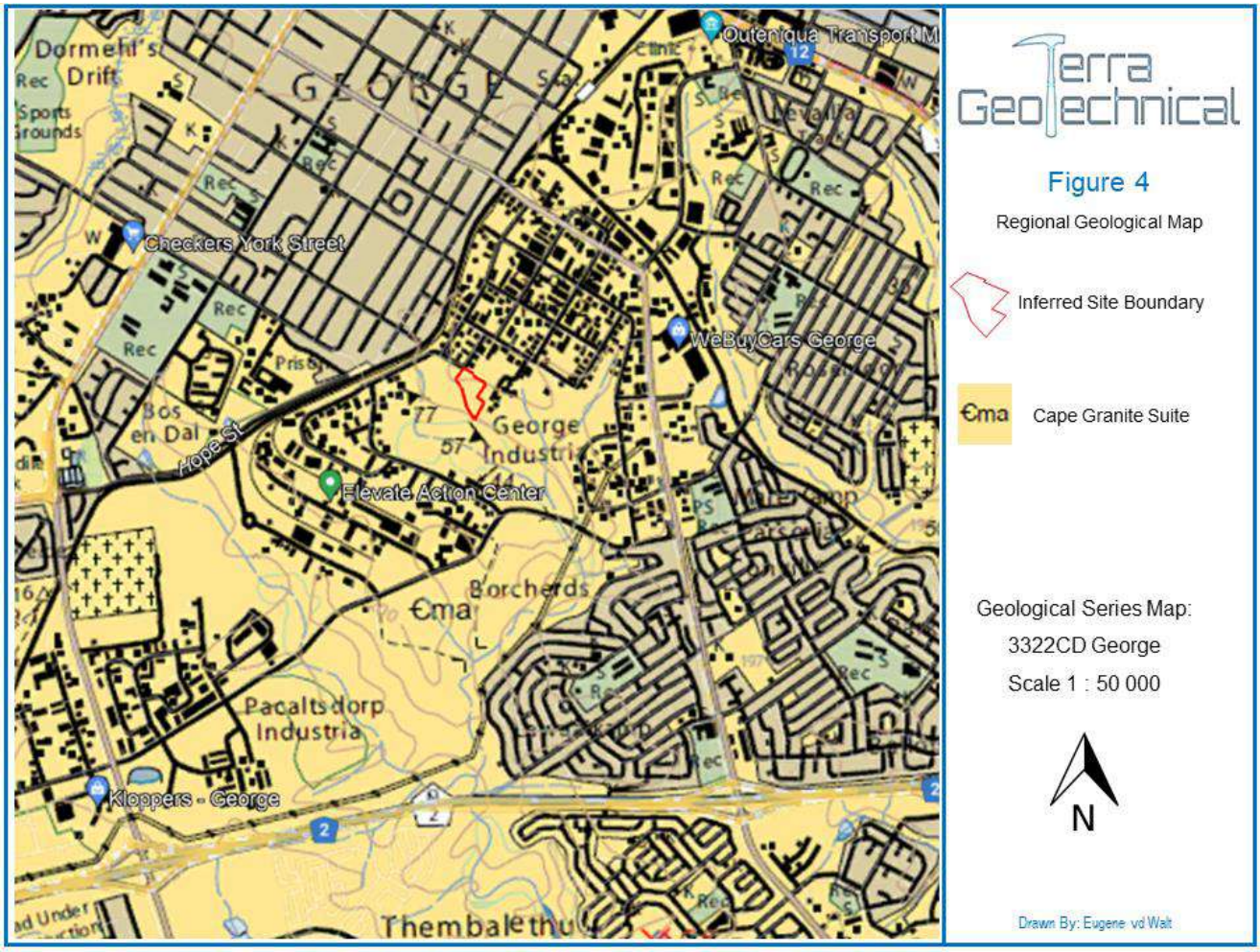
The site preparation for the proposed steel structure has involved the construction of an L-shaped engineered fill platform. This platform is constructed on the natural ground and is elevated from the existing ground level.

3. Geological Setting

3.1. Regional Geological Setting

According to the geology map 3322 CD George, the study area is underlain by Gneissic Granite of the Maalgaten Formation forming part of the George Pluton.

The regional geological setting of the study area (minus the surficial soil cover) is illustrated by Figure 3.



The study area does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks (dolomite or limestone), and as such is not deemed "dolomitic land

3.2. Prominent Geological Structures

The available geological information does not indicate the presence of any geological structures traversing the site.

4. Geotechnical Field Investigation and Laboratory Testing

4.1. Reconnaissance Study

The investigation commenced with the conducting of the following actions:

- The collation and evaluation of available geological and geotechnical information, with specific reference to previous geotechnical investigations undertaken within the vicinity.
- The compilation of a base map showing the regional geological setting

4.2. Site Investigation

The field work phase was conducted by Terra Geotechnical during May 2024. Test pits were placed at strategic positions as to accurately describe the general soil conditions occurring within the boundaries of the site. The succession of soil and rock layers exposed within the test pits were logged according to the industry-standard method proposed by Jennings et al (1973), and a series of detailed photographs were taken of the different soil layers, and samples were taken of the soil- and rock material deemed to be important to the proposed development.

4.3. Laboratory Testing

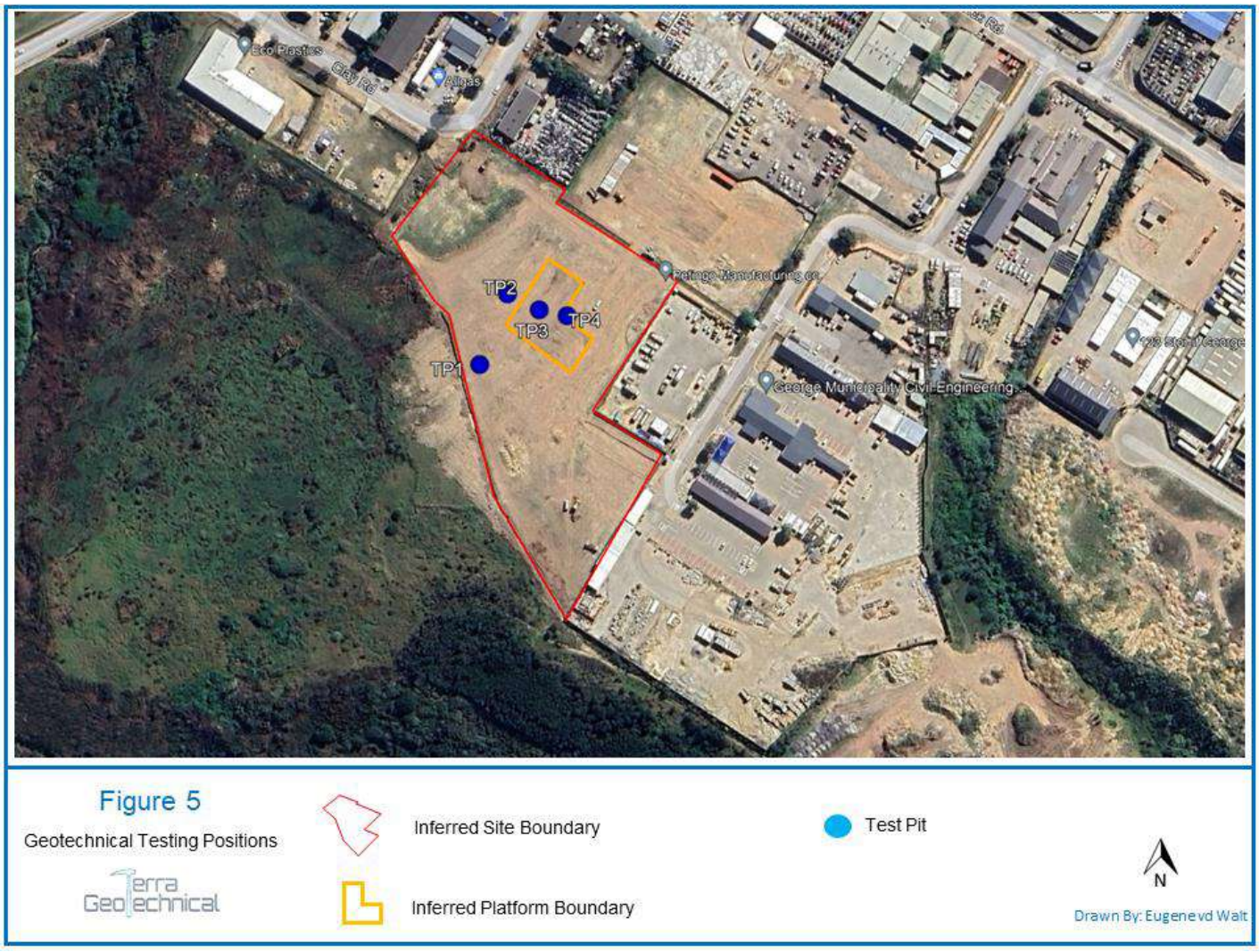
Due to the nature of the soils encountered across the site, no samples were extracted.

5. Geotechnical Setting

5.1. Trenching

5.1.1. Excavation of test pits

A total of 4 test pits, numbered TP1 to TP4 (Figure 5), were excavated across the site. The focus of these test pits were to assess the in-situ subsoils across the site and below the constructed platform. TerraGeo was not contracted to provide an assessment of the existing platform, but rather to evaluate the conditions of the natural soils beneath the platform.



5.1.2. Generalised engineering geological parameters

The following general engineering geological characteristics were noted:

- **Site Excavatability**

The TLB-type light mechanical excavator was generally able to excavate trial pits to depths of between 3.1 and 3.8 m with little or no difficulty, with the exception of TP1, where difficulty

in excavation was reached at 2.5 m within residual granite. For this reason, **no problems** are foreseen during the excavation of **shallow foundations** or **deep service trenches** to a depth of at least 2.5 m below the existing ground level, through the use of a TLB-type light mechanical excavator.

The excavation type to a depth of at least 2.5 m below the existing ground level is deemed to be **Soft Excavation**. (SANS 1200D).

- **Rock- and/or pedocrete outcrops**

Bedrock or pedocrete outcrops were not encountered within the investigated area.

- **Sidewall stability**

The sidewalls of all test pits generally remained stable for at least 1 hour, but due to the uncontrolled fill encountered across the site, the instability of excavation sidewalls could not be negated.

- **Groundwater seepage**

Groundwater seepage was not observed in any of the test pits across the site. It could however be expected that a perched groundwater table could form on the contact between the upper uncontrolled fill and the lower less permeable residual granite.

5.1.3. Generalised soil profile

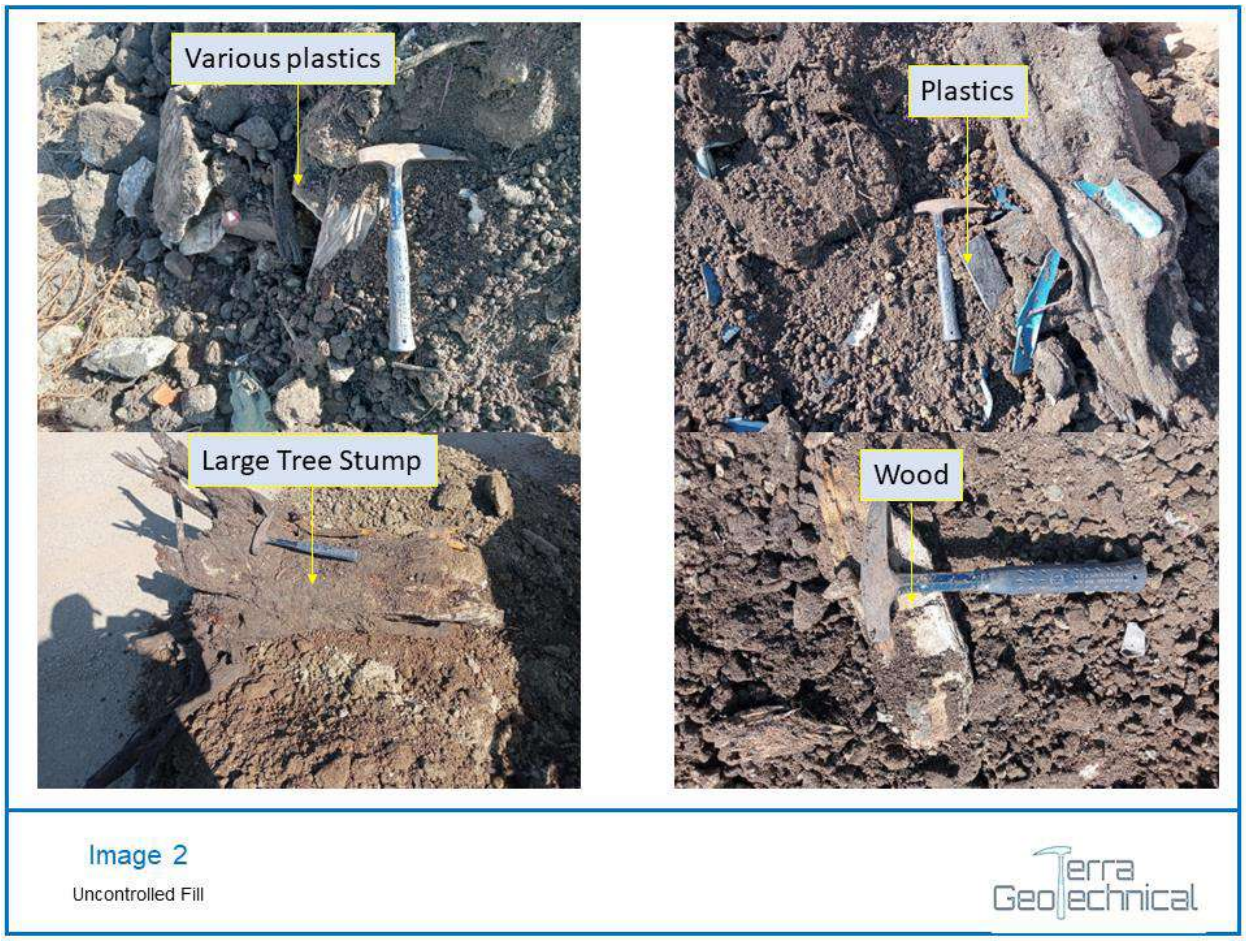
Note: this description is based on field observations, and does not reflect the results of any laboratory tests

The results of the trenching phase indicate that the whole site is covered by a relatively homogeneous succession of soil layers. Typically, the natural site (prior to the construction of an engineered platform) was covered by a prominent uncontrolled fill horizon, consisting of clayey/silty sand with abundant refuse (plastic, glass etc) and organic material (large tree stumps and other plant matter).

In only a single test pit (TP1), the natural soil (residual granite) was exposed at depth. This granitic layer was encountered at a depth of 2.4 m below natural ground level. Across the remainder of the site, uncontrolled fill was encountered for the entire depth of the test pits.

The constructed platform area consisted of at least 0.5 m of engineered fill. The engineered fill was placed on the uncontrolled fill, as such elevating the platform to the surrounding site.

Image 2 below depicts the nature of the uncontrolled fill.



Detailed test pit profiles are included in Appendix A.

6. Geotechnical Evaluation

TerraGeo was not contracted to provide an assessment of the existing platform, but rather to evaluate the conditions of the natural soils beneath the platform and across the remainder of the site.

6.1. Consolidation Character

Due to the uncontrolled placement and uncontrolled nature of the prominent fill horizon encountered throughout the site, this horizon is deemed to undergo large differential settlements. This layer is not deemed a suitable founding layer for any structures. The long-term decomposition of the refuse and/or organic matter will result in the risk of the formation of voids and subsequent long-term consolidation.

6.2. Material usage

Due to the variable nature of the uncontrolled fill, this material is not deemed suitable for re-use in any load bearing layer works and should be removed from site. It is recommended that this material rather be stockpiled and removed off-site.

It is recommended that material be imported for any engineered layer works in foundations or roads.

6.3. Bearing Capacity

The uncontrolled fill is not deemed suitable for the placement of any foundations. No suitable loadbearing founding horizon was encountered within shallow depth (2.0 m) during this investigation.

7. Geotechnical Site Classification

7.1. General

The results of this study reveal that the site exhibits geotechnical characteristics that may require the implementation of specific design and precautionary measures to reduce the risk of structural damage due to adverse geotechnical conditions.

The following constraints needs to be considered;

- The results of this investigation reveal that the soils covering the site may undergo variable degrees of **consolidation** (i.e. loss and gain of volume) under loading or when saturated.
- In its natural state, the site classifies as $P^{\text{Uncontrolled Fill}}$, according to the NHBRC Site Classification.
- Differential movements will be exaggerated due to the variability of the uncontrolled fill
- Neither foundations nor any structural loads should be imposed into the uncontrolled fill encountered across the site.

However, these characteristics do not disqualify the site from being used for the proposed development, but rather require the implementation of site-specific precautionary measures.

7.2. Groundwater Occurrence

Groundwater seepage was not observed in any of the excavated test pits. A perched groundwater table could however be expected at the contact between the more permeable upper uncontrolled fill and the lower less permeable residual granite.

7.3. Soil Excavatability

The TLB-type light mechanical excavator was generally able to excavate trial pits to depths of between 3.1 and 3.8 m with little or no difficulty, with the exception of TP1, where difficulty in excavation was reached at 2.5 m within residual granite. For this reason, **no problems** are foreseen during the excavation of **shallow foundations** or **deep service trenches** to a depth of at least 2.5 m below the existing ground level, through the use of a TLB-type light mechanical excavator.

The excavation type to a depth of at least 2.5 m below the existing ground level is deemed to be **Soft Excavation**. (SANS 1200D).

8. Foundation Recommendations and Solutions

TerraGeo was not contracted to provide an assessment of the existing platform, but rather to evaluate the conditions of the natural soils beneath the platform.

Due to the extensive and prominent occurrence of uncontrolled fill encountered across the site, the use of shallow foundations are not deemed a suitable solution for founding of any structures. Uncontrolled fills are likely to provide a variable bearing capacity and result in a nonuniform settlement. Bearing failure is a common problem when buildings are constructed on top of uncontrolled fill material. Fill material can settle significantly once the building's weight is added. The settlement can become much worse if the fill material becomes wet due to a leak, which leads to the consolidation of the fill material.

It is recommended that the uncontrolled fill be removed and replaced with a competent engineered backfill, which is designed to support the structural loads or the use of piled foundations (deep foundations) should be considered, placed within the weathered granite (end bearing piles) at depth. This depth was not established during the site investigation and is assumed to be at a depth of between 4 and 6 m below the top of platform level. The exact depth should be determined with a follow-up investigation.

The final foundation designs are the responsibility of the design engineer.

9. Delineation of Disturbed Ground & Additional Structure

In June 2024, and additional assessment was conducted in order to facilitate in the

- delineation of the extent of the previous disturbed ground and
- determination of founding conditions at an additional planned structure

As mentioned previously, the area under investigation was generally underlain by a prominent thickness of uncontrolled fill. This fill generally consisted of building rubble, tree stumps and other household refuse.

The additional assessment was facilitated by the excavation of 8 additional test pits across a generally soil covered area.

Two additional test pits were excavated at the area earmarked for an additional structure. The location of these test pits was determined by the Consultant, after which test pits were excavated, profiled and closed.

Figure 6 below depicts the location of these eight test pits.

9.1. Disturbed Ground Assessment

During the test pitting phase, the two prominent layers were encountered;

1. The uncontrolled fill and
2. Granite Residuum

The uncontrolled fill was encountered in all test pits, with the exception of TP7. The fill was generally between 1500 and 2900 mm thick and was encountered from the surface. In TP8, this layer was only 900 mm thick.

The granite residuum was encountered in TP2, TP4, TP7 and TP8. The residuum was generally encountered below the fill horizon, except for TP7, where the residuum was encountered from the surface.

Test pits were excavated to depths of between 2.0 m and 3.2 m.

The table below summarises the soil profiles and the corresponding layer thicknesses.

Test Pitting Summary

Test Pit	Fill	Residual Granite	Final Excavation Dept	Refusal by TLB Y/N	Water Seepage Y/N
TP1	2900	-	2900	N	N
TP2	2700	500	3200	N	N
TP3	2700	-	2700	N	N
TP4	1500	1000	2500	N	N
TP5	2000	-	2000	N	N
TP6	2000	-	2000	N	N
TP7	-	2000	2000	N	N
TP8	900	1300	2200	N	N

Layer Thickness in mm

From the test pitting, it can be noted that the surface of the original landscape had been drastically altered from the natural, as a prominent uncontrolled fill horizon, generally covers the majority of the site.

Observations of the surface features across the landscape indicate that ground disturbance is more widespread than in the tested area. Figure 7 on the following page depicts the site surface and inferred extent of the altered/disturbed ground.

Figure 7

Disturbed Ground

Terra Geotechnical

9.2. Additional Structure

Two test pits were excavated across the footprint of the proposed structure (as indicated by Figure 6.

The test pits revealed this area is generally covered in silty sandy transported soils to a depth of between 1.2 and 1.5 m below ground level. The transported soils exhibit a variable consistency, with DCP penetration rates of between 10 and 35 mm/blow.

This transported horizon is underlain by residual granitic soils consisting of clayey/silty sand with frequent gravels. This horizon is generally dense with DCP penetration rates of less than 15 mm per blow.

A sample of the residual soils were extracted and submitted for testing at a SANAS laboratory. The results of these tests reveal the following;

- The material has a fines fraction (passing 0.075 mm sieve) of 44%.
- The material has a clay fraction of 14%.
- The material has a Plasticity Index of 6
- The material has an in-situ moisture content of 3.4%
- The material is exhibits a Low potential for heave according to Van Der Merwe classification system
- The material is deemed to react poorly to compaction with a CBR of 4 at a compaction effort of 93% MOD AASHTO. The results in a classification of G9-type material according to the COLTO Classification System.
- This material is not deemed suitable for re-use as loadbearing layer works under any structures. Material should be imported for this purpose.

Based on the visual observations and the additional geotechnical testing, the natural soil across the site is not deemed suitable for the placement of any structures without modification.

The following foundation solution is recommended.

- Remove in-situ material below foundations to a depth and width of 1.5 times the foundation width and replace with competent material compacted to 93% MOD AASHTO density.
- Normal construction with lightly reinforced strip foundations and light reinforcement in masonry.

10. Limitations

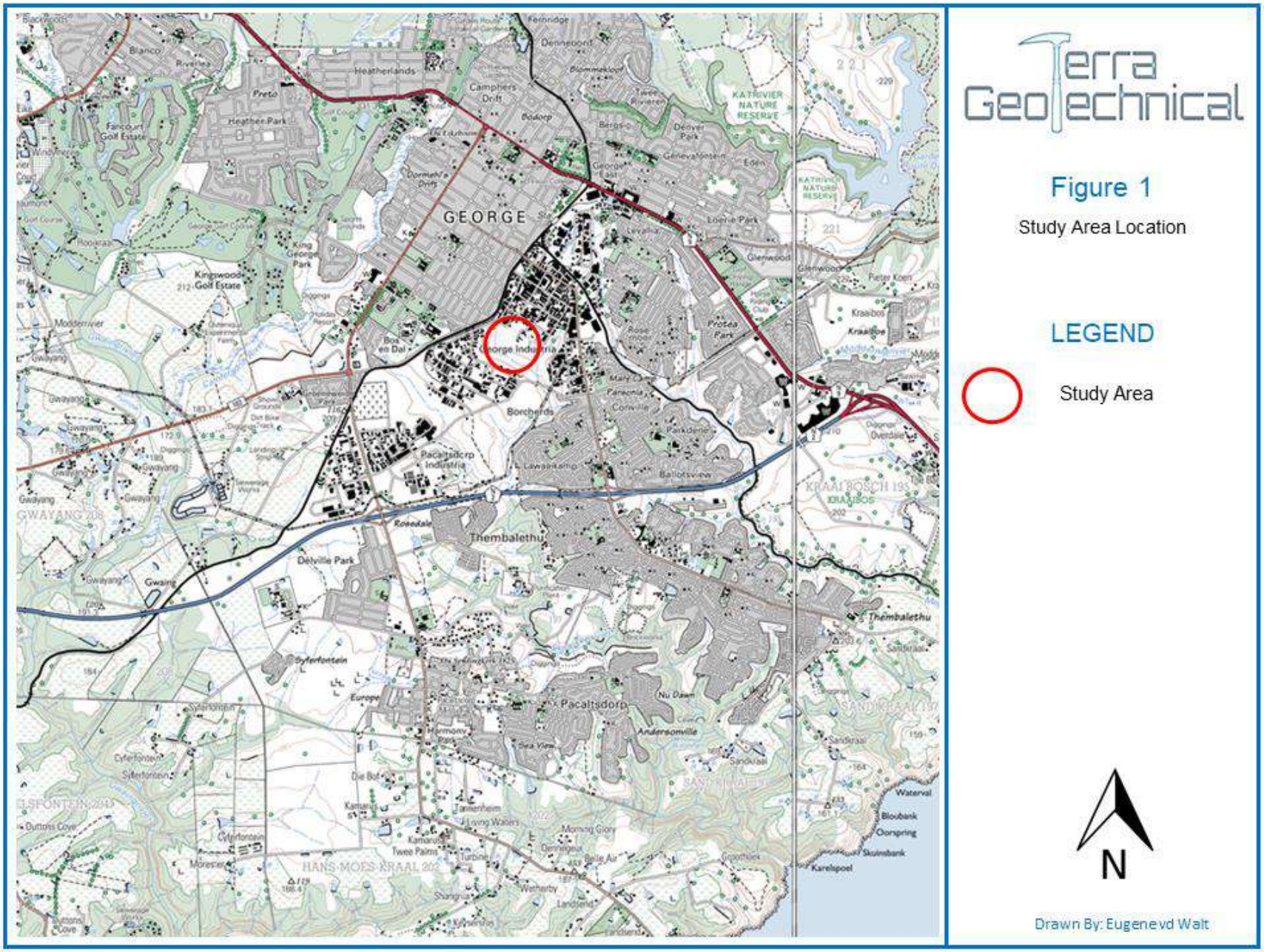
The extent of the investigations undertaken is deemed adequate, within the time and budget constraints, to present an overview of the geotechnical conditions across the investigation site.

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

It is recommended that a follow-up investigation be conducted to establish founding conditions for deep foundations (piles) in the areas with excessive uncontrolled fill.

Final designs are the responsibility of the design engineer.

MAPS


GEORGE
Thembalethu
Pacaltsdorp
Heatherlands
Blanco
Rivarlea
Pretoria
Heather Park
Fancourt Golf Estate
Camphers Drift
Bodorp
Denneoord
Blommekloof
Twee Rivieren
Denver Park
Genevadesen
Eden
KATRIVIER NATURE RESERVE
Dormehl's Drift
King George Park
Kingswood Golf Estate
Loerie Park
Glenwood
Pieter Koen
Kraaibos
Protea Park
Rose Wood
Parkdene
Conville
Ballotsview
Borcherds
Pacaltsdorp Industria
Lawaskamp
KRAAIBOSCH
KRAAIBOS
Modderrivier
Gwayang
GWAYANG 208
Gwaing
Rosedale
Delville Park
Syferfontein
Europe
Nu Dawn
Andersonville
Sea View
Sandvlei
Sandkraal
Waterval
Bloubank
Oorspring
Skuinsbank
Karelspoel
Tannenheim
Living Waters
Morning Glory
Twee Palms
Turbine
Bella Air
Wetherby
Landsend
HANS MOES KRAAL 202
ELSFONTEIN 204
Duttons Cove
Cyferfontein
Moreson
Groenhoek
Terra Geotechnical
Figure 1
Study Area Location
LEGEND
Study Area
N
Drawn By: Eugene vd Walt

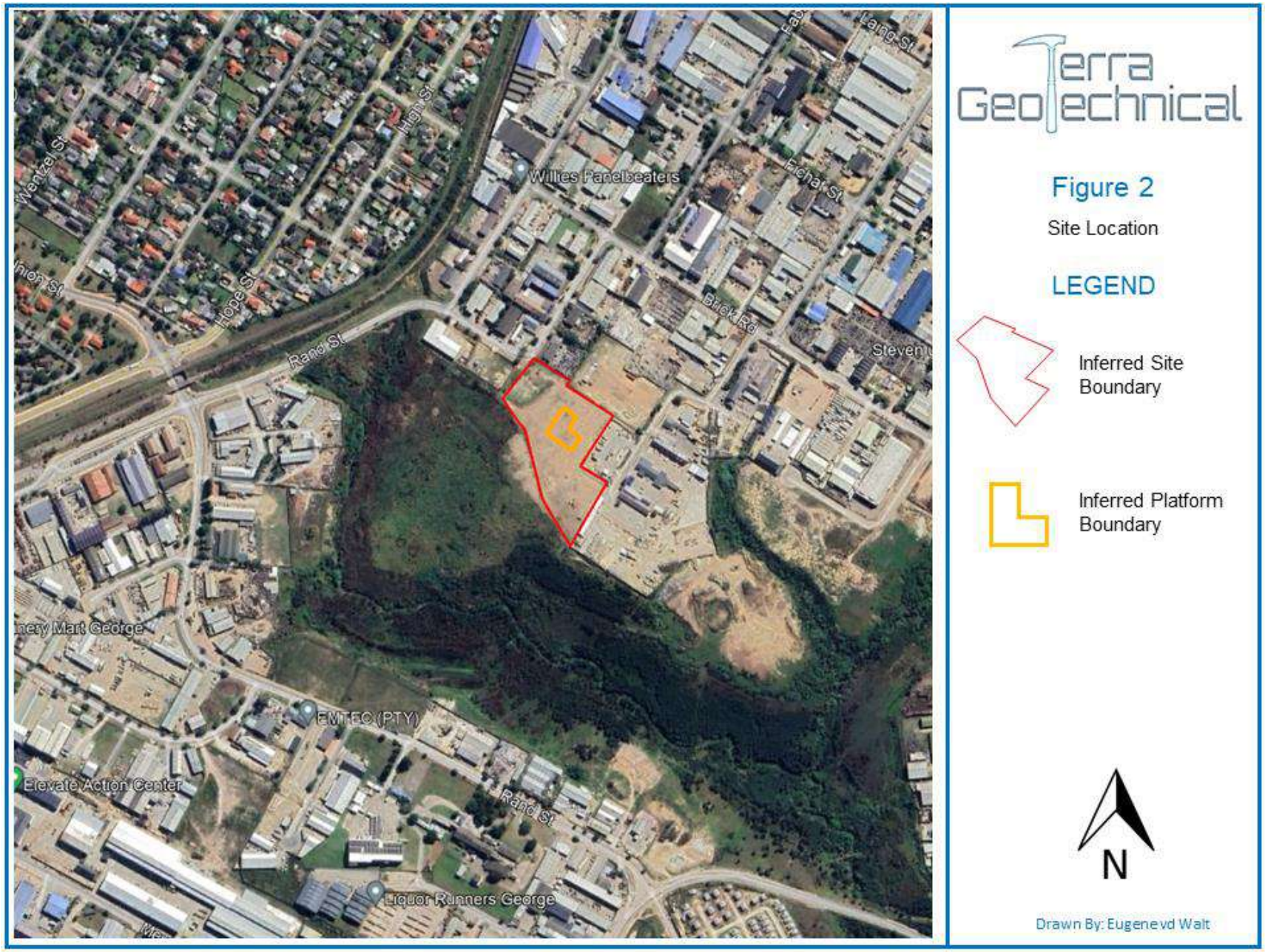

Terra Geotechnical
Figure 2
Site Location
LEGEND
Inferred Site Boundary
Inferred Platform Boundary
N
Drawn By: Eugene vd Walt
Willies Panelbeaters
Rand St
Hope St
High St
Wenzel St
Lang St
Brick Rd
Fichat St
EMTEC (PTY)
Elevate Action Center
Liquor Runners George

Figure 3

Site Topographical Features

Aerial View

Terra GeoTechnical

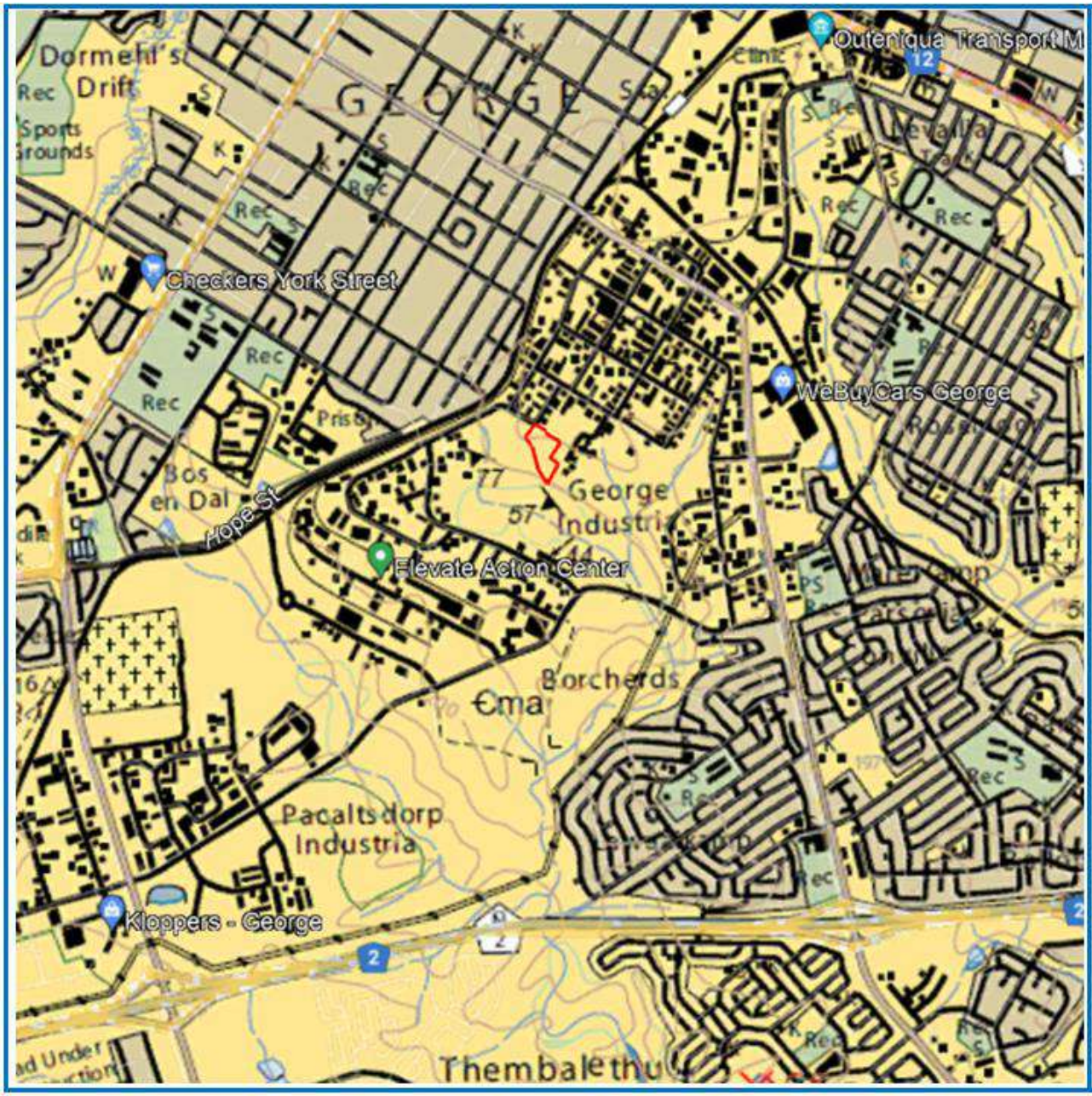
Inferred Site Boundary

5m Contour Line

Non-perennial River

N

Drawn By: Eugene vd Walt



Terra Geotechnical

Figure 4

Regional Geological Map

Inferred Site Boundary

Ema Cape Granite Suite

Geological Series Map:
3322CD George
Scale 1 : 50 000

N

Drawn By: Eugene vd Walt


Eco Plastics
Clay Rd
Afgas
TP2
TP3
TP4
TP1
George Municipality Civil Engineering...
Figure 5
Geotechnical Testing Positions
Terra Geotechnical
Inferred Site Boundary
Inferred Platform Boundary
Test Pit
N
Drawn By: Eugene vd Walt

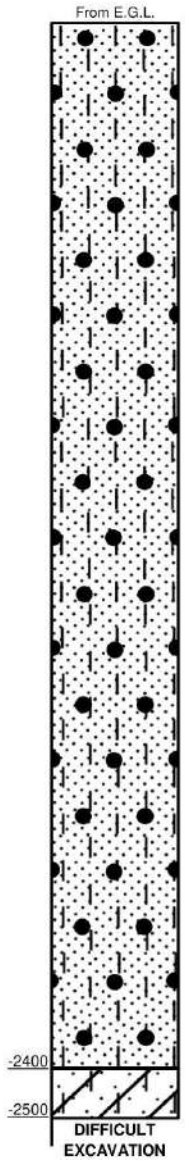

TP8
TP7
TP1
TP2
TP6
TP5
TP4
TP1
TP3
TP2
Figure 6
Geotechnical Testing Positions
Terra Geotechnical
Inferred Site Boundary
Test Pit – Disturbed Ground Assessment
Test Pit – Planned Structure
N
Drawn By: Eugene vd Walt

APPENDIX A

A.1
Steel Structure
Test Pit Profiles

Site:	George depot
Location:	George
Client:	Urban Engineering

Soil Profile for Test Pit TP1



slightly moist; dark brown; medium dense; intact; silty sand; Fill; dump site materials with dead plants and tree branches; Not Sampled.

slightly moist; orange mottled creamy white; medium dense to loose; intact; clay silty sand; Residual granite; Not Sampled.

Test Pit Notes

Coordinates:	33,978436°S 22,462211°E
Method of Excavation:	TLB Type Light Mechanical Excavator- CAT
Excavation Character:	Difficult Excavation on Bedrock at 2,5 m below existing ground level
Date Excavated:	2024/05/09
Date Profiled:	2024/05/09
Groundwater Seepage:	
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George depot

Soil Profile Photo of Test Pit TP1

Terra Geotechnical George depot

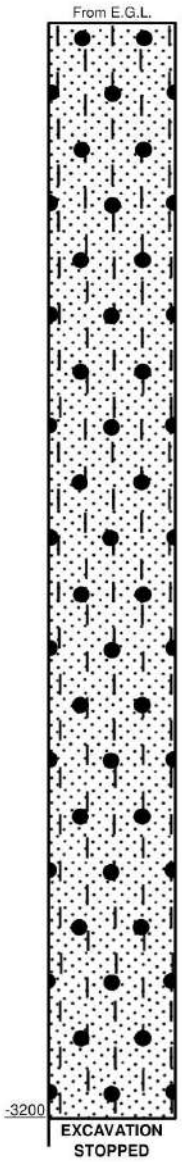
Material Present in Test Pit TP1

Terra Geotechnical George depot

Surroundings of Test Pit TP1

Site:	George Depot
Location:	George
Client:	Urban Engineering

Soil Profile for Test Pit TP2



slightly moist; dark brown; medium dense; intact; silty sand; Fill; Dump site materials with dead plants and tree branches; Not Sampled.

Test Pit Notes

Coordinates:	33,978119°S 22,462362°E
Method of Excavation:	TLB Type Light Mechanical Excavator- CAT
Excavation Character:	Excavation Stopped
Date Excavated:	2024/05/09
Date Profiled:	2024/05/09
Groundwater Seepage:	
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP2

Terra Geotechnical George Depot

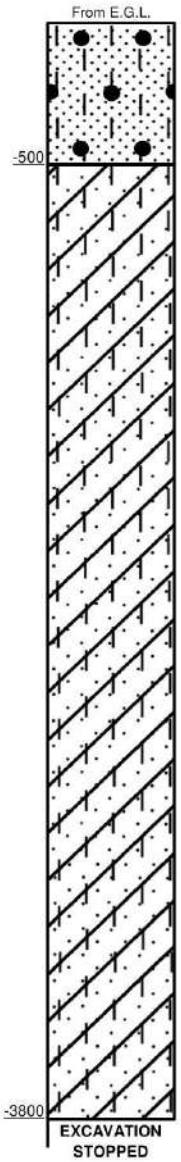
Material Present in Test Pit TP2

Terra Geotechnical George Depot

Surroundings of Test Pit TP2

Site:	George Depot
Location:	George
Client:	Urban Engineering

Soil Profile for Test Pit TP3



slightly moist; dark brown; dense; intact; clayey/silty sand; Controlled Fill; Not Sampled.

slightly moist; dark brown; medium dense; intact; silty sand; Fill;; Refuse and other fill including large tree stumps and branches; Not Sampled.

Test Pit Notes

Coordinates:	33,97819°S 22,462534°E
Method of Excavation:	TLB Type Light Mechanical Excavator- CAT
Excavation Character:	Excavation Stopped
Date Excavated:	2023/11/23
Date Profiled:	2023/11/23
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP3

Terra Geotechnical George Depot

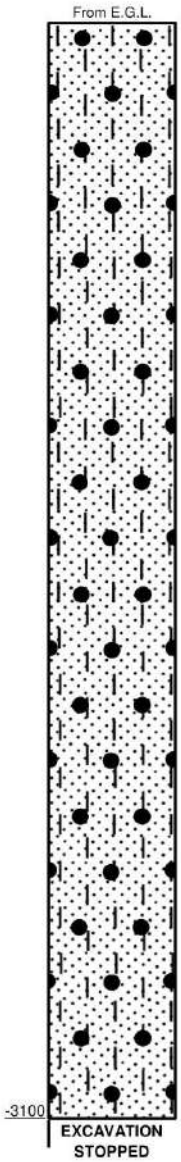
Material Present in Test Pit TP3

Terra Geotechnical George Depot

Surroundings of Test Pit TP3

Site:	George Depot
Location:	George
Client:	Urban Engineering

Soil Profile for Test Pit TP4



slightly moist; dark brown; medium dense; intact; silty sand; Fill; Dump site materials with dead plants and tree branches; Not Sampled.

Test Pit Notes

Coordinates:	33,978217°S 22,462685°E
Method of Excavation:	TLB Type Light Mechanical Excavator- CAT
Excavation Character:	Excavation Stopped
Date Excavated:	2024/05/09
Date Profiled:	2024/05/09
Groundwater Seepage:	
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP4

Terra Geotechnical George Depot

Material Present in Test Pit TP4

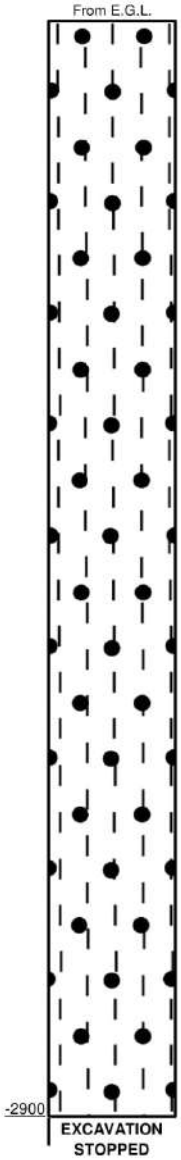
APPENDIX A

A.2
Disturbed Ground

Test Pit Profiles

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP1



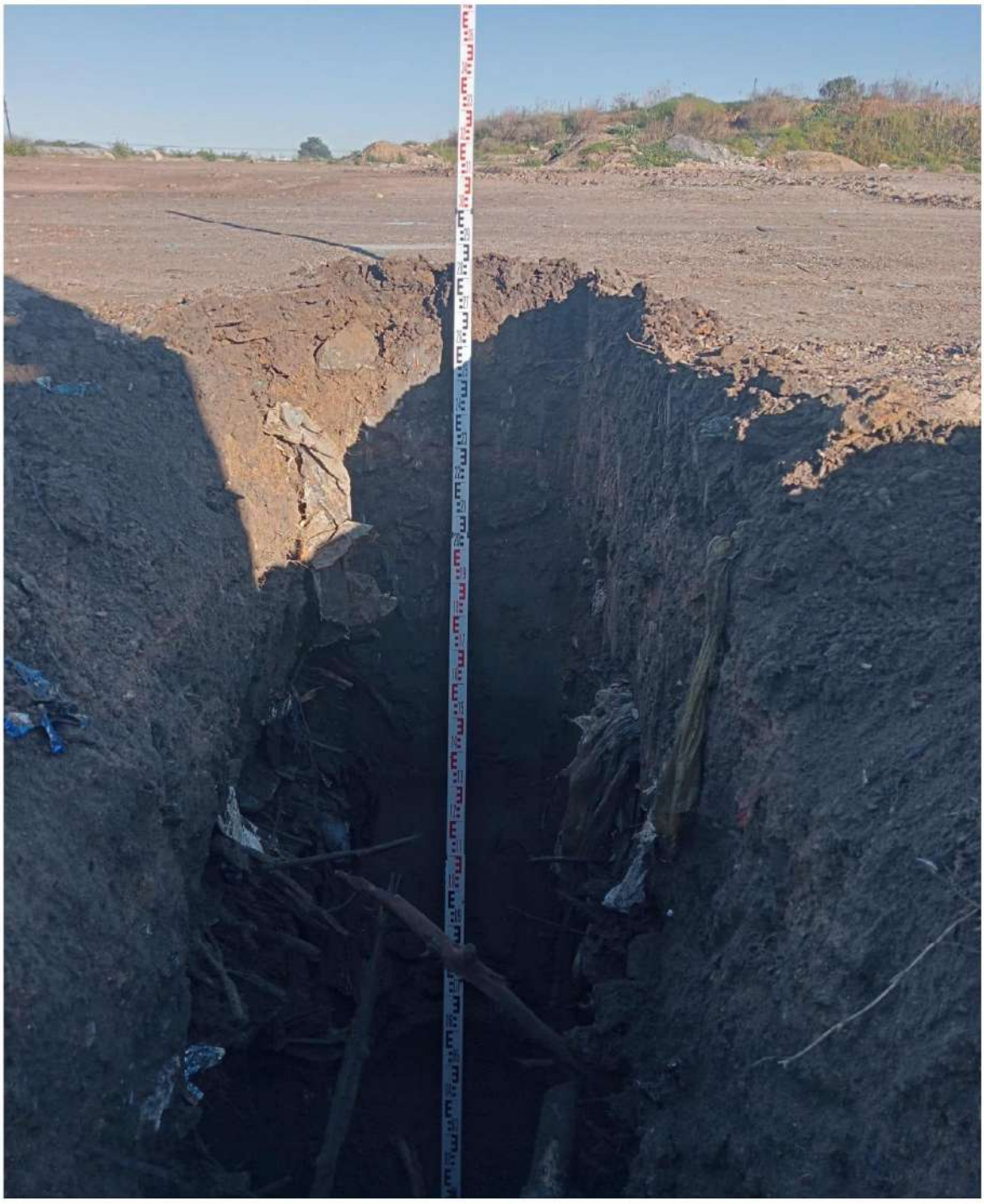
slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Test Pit Notes

Coordinates:	33.980445°S 22.465424°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP1



Terra Geotechnical George Depot

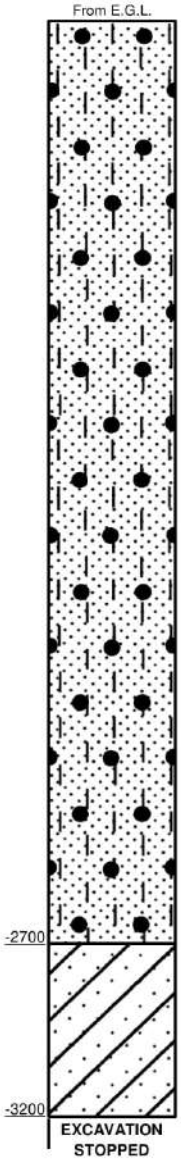
Material Present in Test Pit TP1

Terra Geotechnical George Depot

Surroundings of Test Pit TP1

Terra Geotechnical	**Site:**	George Depot
	Location:	George
	Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP2



slightly moist; dark brown; loose; intact; silty sand with scattered boulders; Fill; Refuse materials; Not Sampled.

Moist; orange patched grey mottled black; firm; Slickensided; clayey/silty sand with frequent gravels; Reworked residual; Not Sampled.

Test Pit Notes

Coordinates:	33.98114°S 22.46514°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP2

Terra Geotechnical George Depot

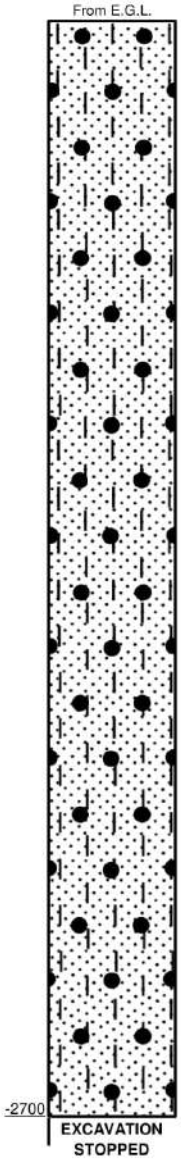
Material Present in Test Pit TP2

Terra Geotechnical George Depot

Surroundings of Test Pit TP2

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP3



slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Test Pit Notes

Coordinates:	33.98087°S 22.46450°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP3

Terra Geotechnical George Depot

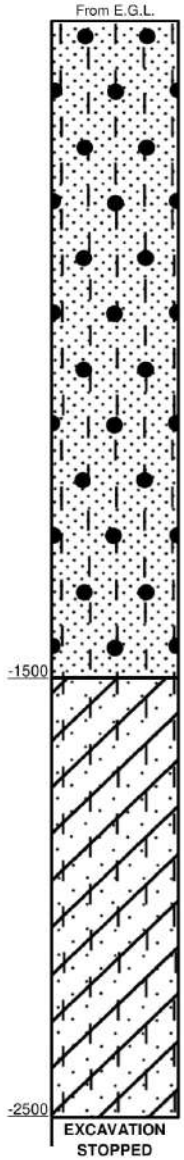
Material Present in Test Pit TP3

Terra Geotechnical George Depot

Surroundings of Test Pit TP3

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP4



slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Moist; orange patched grey mottled black; firm; Slickensided; clayey/silty sand with frequent gravels; Reworked residual; Not Sampled.

Test Pit Notes

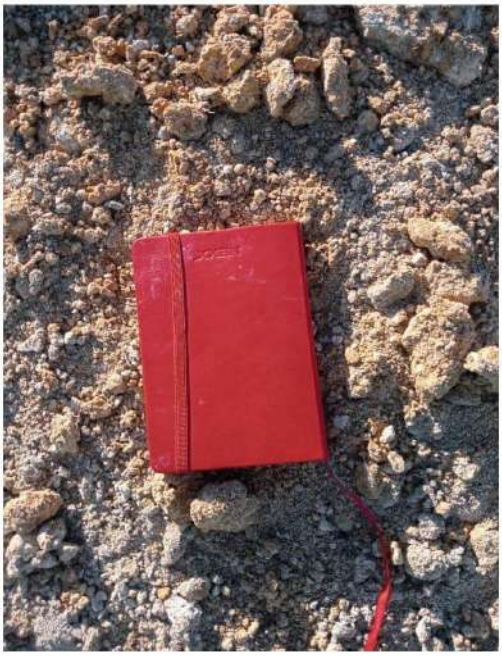
Coordinates:	33.98050°S 22.46407°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP4

Terra Geotechnical George Depot

Material Present in Test Pit TP4

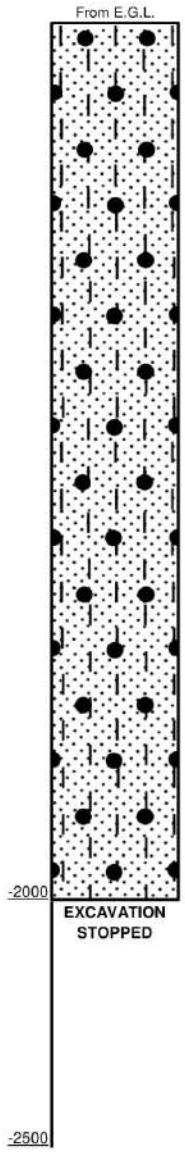


Terra Geotechnical George Depot

Surroundings of Test Pit TP4

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP5



slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Test Pit Notes

Coordinates:	33.97943°S 22.46232°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP5

Terra Geotechnical George Depot

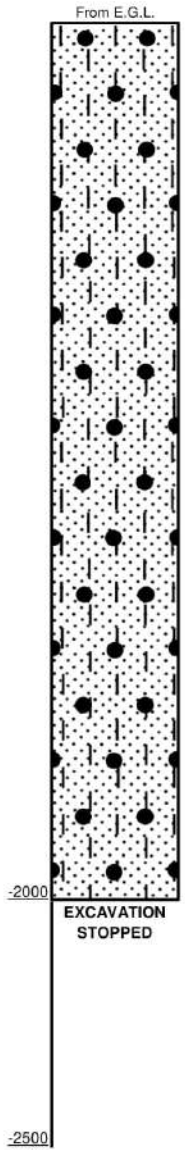
Material Present in Test Pit TP5

Terra Geotechnical George Depot

Surroundings of Test Pit TP5

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP6



slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Test Pit Notes

Coordinates:	33.97938°S 22.46173°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP6

Terra Geotechnical George Depot

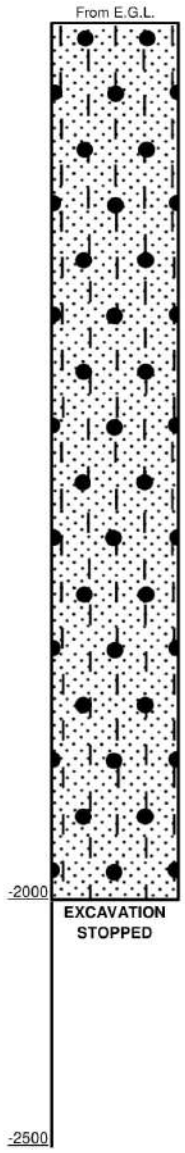
Material Present in Test Pit TP6

Terra Geotechnical George Depot

Surroundings of Test Pit TP6

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP7



slightly moist; orange patched grey mottled black; firm; voided; clayey/silty sand with highly weathered gravels; completely weathered granite; Not Sampled.

Test Pit Notes

Coordinates:	33.97839°S 22.46160°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP7

Terra Geotechnical George Depot

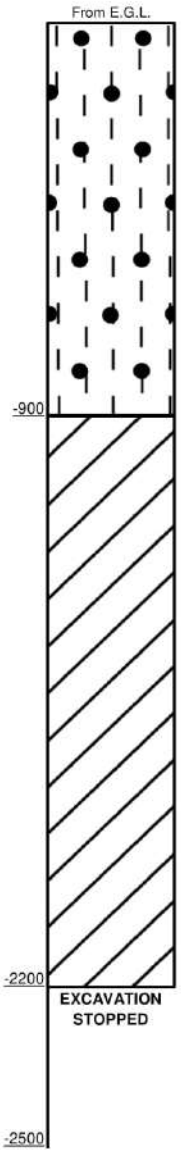
Material Present in Test Pit TP7

Terra Geotechnical George Depot

Surroundings of Test Pit TP7

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP8



slightly moist; dark brown; loose; intact; silty sand; Fill; Not Sampled.

Moist; orange patched grey mottled black; medium dense; voided; clayey/silty sand with frequent gravels; completely weathered granite; Not Sampled.

Test Pit Notes

Coordinates:	33.97808°S 22.46140°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP8

Terra Geotechnical George Depot

Material Present in Test Pit TP8

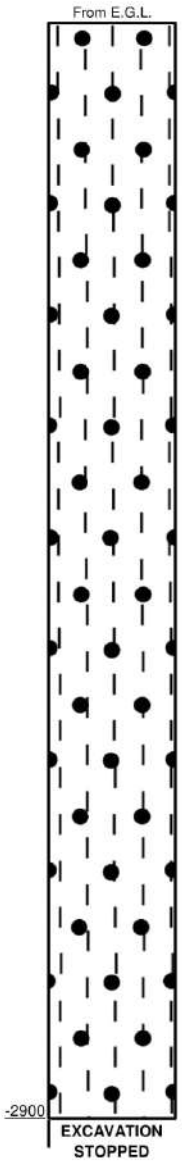
Terra Geotechnical George Depot

Surroundings of Test Pit TP8

APPENDIX A
A.3
Additional Structure
Test Pit Profiles

Site:	George Depot
Location:	George
Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP1



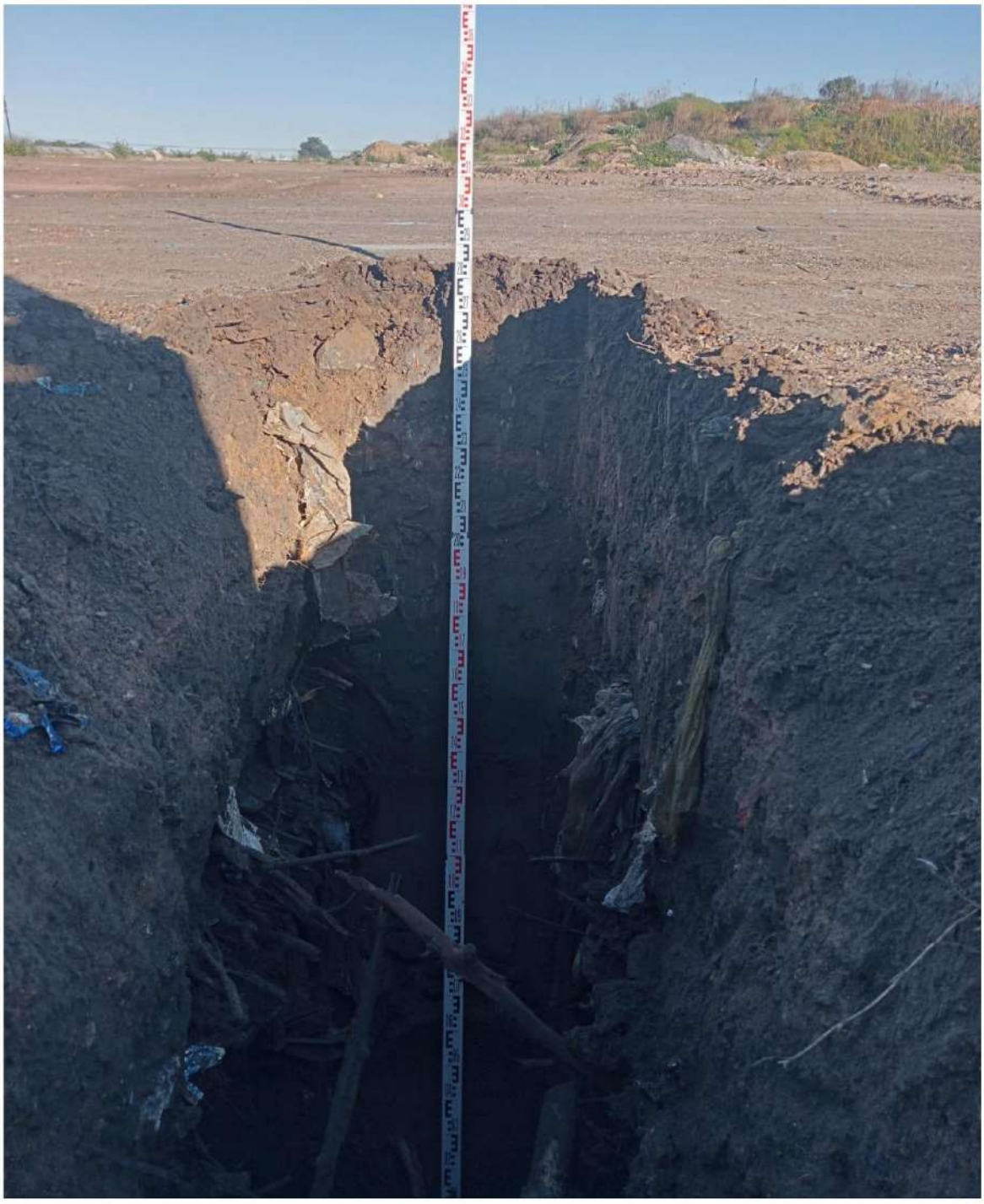
slightly moist; dark brown; loose; intact; silty sand; Fill; Refuse materials; Not Sampled.

Test Pit Notes

Coordinates:	33.980445°S 22.465424°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP1



Terra Geotechnical George Depot

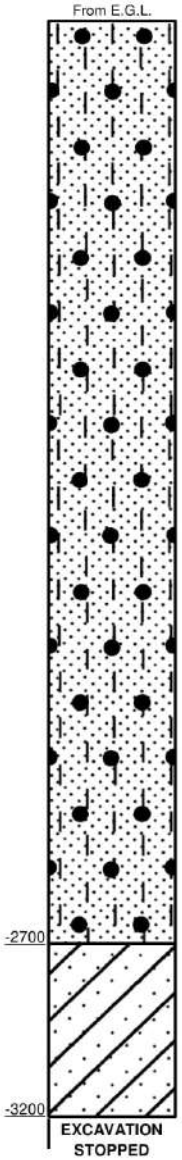
Material Present in Test Pit TP1

Terra Geotechnical George Depot

Surroundings of Test Pit TP1

Terra Geotechnical	**Site:**	George Depot
	Location:	George
	Client:	Urban Engineering (PTY) LTD

Soil Profile for Test Pit TP2



slightly moist; dark brown; loose; intact; silty sand with scattered boulders; Fill; Refuse materials; Not Sampled.

Moist; orange patched grey mottled black; firm; Slickensided; clayey/silty sand with frequent gravels; Reworked residual; Not Sampled.

Test Pit Notes

Coordinates:	33.98114°S 22.46514°E
Method of Excavation:	TLB Type Light Mechanical Excavator- JCB
Excavation Character:	Excavation Stopped
Date Excavated:	2024/06/14
Date Profiled:	2024/06/14
Groundwater Seepage:	N/A
Samples Extracted:	N/A
Notes:	N/A
Profiled by:	Eugene van der Walt (Pri.Sci.Nat)

Terra Geotechnical George Depot

Soil Profile Photo of Test Pit TP2

Terra Geotechnical George Depot

Material Present in Test Pit TP2

Terra Geotechnical George Depot

Surroundings of Test Pit TP2

APPENDIX B
B.1
Lab Results

OUTENIQUA LAB (Pty) Ltd.

Registration No. 95/07742/07
Materials Testing Laboratory
6 Mirrorball Street, George : PO Box 3186, George Industria, 6536
Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za

R-CBR-1-9 Jun-23

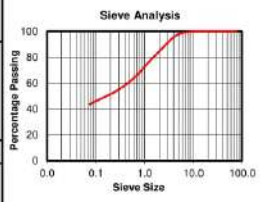
T0347

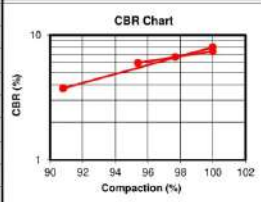
Customer :	Terra Geotechnical 7 Albatros Street Still Bay 6674	Project :	George Depot Additional Structure
		Date Received :	18/06/2024
		Date Reported :	04/07/2024
		Req. Number :	2147/24 - A1
Attention :	Eugene van der Walt	No. of Pages :	1 of 1

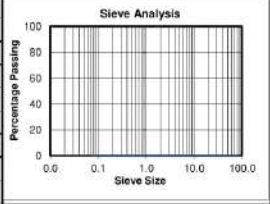
TEST REPORT
CALIFORNIA BEARING RATIO

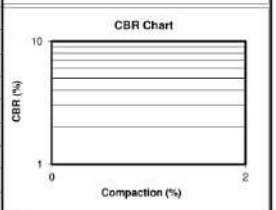
Sample Position (SV)		TP02	COTO DS:				
Depth (mm)		1200-2700	G9				
Sample No		88716	Subgrade				
Materials Description	Source	In-situ					
	Colour	Light Yellowish					
	Soil Type	Weathered Granite					
	Classification	Existing					
Material Indicators - (SANS 3001 Method GR1)							
Percentage Passing	75 mm	100		Opinion			
	63 mm	100					
	50 mm	100					
	37.5 mm	100					
	28 mm	100					
	20 mm	100					
	14 mm	100					
	5 mm	98					
	2 mm	85					
	0.425 mm	59					
	0.075 mm	43.5					
Material Indicators - (SANS 3001 Method PR5)							
Grading Modulus *		1.13	0.75 - 2.70	✓			
Coarse Sand Soil-Mortar (%)		30					
Atterberg Limits - (SANS 3001 Method GR10)							
Liquid Limit (%)		29					
Plasticity Index (%)		11	≤ 13	✓			
Linear Shrinkage (%)		5.5					
Material Strength - (SANS 3001 Method GR30,GR40 - SCALPED)							
MDD	Max Dry Density (kg/m³)	1974					
	Optimum Moisture Content (%)	12.3					
	Mould Moisture Content (%)	12.2					
A	Relative Compaction (%)	100.0					
	Swell (%)	1.3	≤ 1.5	✓			
B	Relative Compaction (%)	95.4					
	Swell (%)	1.4					
C	Relative Compaction (%)	90.8					
	Swell (%)	1.5					
CBR	@100% Max Dry Density	8					
	@98% Max Dry Density	7					
	@95% Max Dry Density	5					
	@93% Max Dry Density	4	≥ 7	*			
	@90% Max Dry Density	3					
Material Condition							
Insitu Moisture Content (%)							
Soil Classification Of The Material Based Only On The Tests Results Above							
COTO DS Specification:		G9 Subgrade					
AASHTO System		A-6					
Unified System		SC					

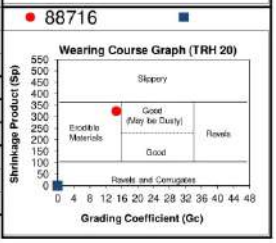
88716











- **Tests marked with a (*) are NOT SANAS Accredited results.**
- **Specimens delivered to Outeniqua Lab in good order.**

Ruaan Lesch
Technical Signatory
For Outeniqua Lab (Pty) Ltd.

1. The opinion column is an interpretation of the direct comparison between the quoted specification and the single test sample results obtained. The compliant (✓), non compliant (×) and uncertain (*) opinion indicators are based on an approximate 95% level of confidence with reference to SAMM GUIDANCE 1, Issue 2 : 20 June 2007 Section 2.
2. The uncertain (*) indicates that the test result is either equal to or is above / below the specified limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliant (✓) or non compliant (×) based on a 95% level of confidence with reference to SAMM GUIDANCE 1, Issue 2 : 20 June 2007 Section 2.
3. This report (with attachments) is the correct record of all measurements made, and may not be reproduced other than with full written approval from the Director of Outeniqua Lab (Pty) Ltd.
4. Measuring Equipment, traceable to National Standards is used where applicable. Results reported in this Test Report relate only to the items tested and are an indication only of the sample provided and/or taken.
5. While every care is taken to ensure the correctness of all tests and reports, neither Outeniqua Lab (Pty) Ltd nor its employees shall be liable in any way whatever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequence thereof.

Director: L Heathcote B-Tech. (Civil Eng.) & BSc Hons (Transport)

OUTENIQUA LAB (Pty) Ltd.

R-FIND-1-6 Jan-22

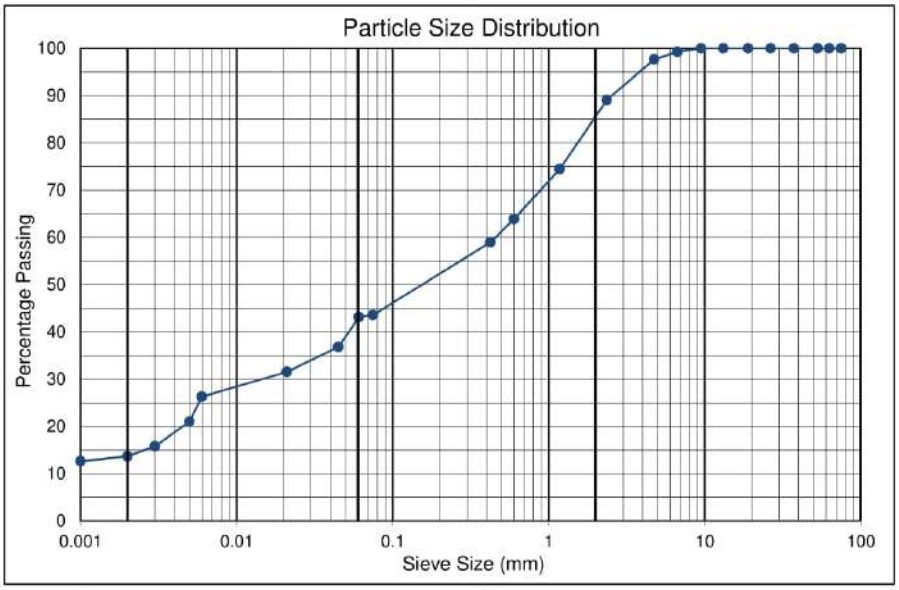
Registration No. 95/07742/07
Materials Testing Laboratory
6 Mirrorball Street, George : PO Box 3186, George Industria, 6536
Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za
T0347

Customer :	Terra Geotechnical 7 Albatros Street Still Bay 6674	Project :	George Depot Additional Structure
		Date Received :	18/06/2024
		Date Reported :	04/07/2024
		Req. Number :	2147/24 - A1
Attention :	Eugene van der Walt	No. of Pages :	1 of 1

TEST REPORT
FOUNDATION INDICATOR - (ASTM Method D422)

Sample Position (SV)		TP02
Depth (mm):		1200-2700
Sample No.:		88716
Materials Description	Source	In-situ
	Colour	Light Yellowish
	Soil Type	Clayey Sand
	Classification	Existing

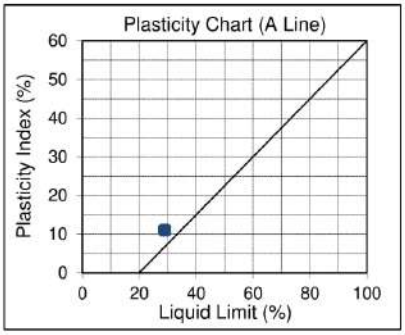
Percentage Passing	
75.0mm	100
63.0mm	100
53.0mm	100
37.5mm	100
26.5mm	100
19mm	100
13.2mm	100
9.5mm	100
6.7mm	99
4.75mm	98
2.36mm	89
1.18mm	75
0.6mm	64
0.425mm	59
0.075mm	44
0.061mm	43
0.045mm	37
0.021mm	32
0.006mm	26
0.005mm	21
0.003mm	16
0.002mm	14
0.001mm	13

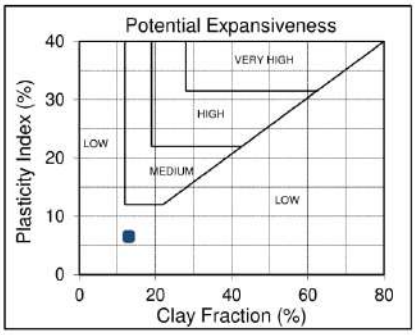


Liquid Limit (%)	29
Plasticity Index (%)	11
Linear Shrinkage (%)	6
Moisture Content (%)	3.4

% Clay	13
% Silt	30
% Sand	42
% Gravel	15

Unified Soil Classification	SC
AASHTO Soil Classification	A-6





- **Specimen delivered to Outeniqua Lab in good order.**

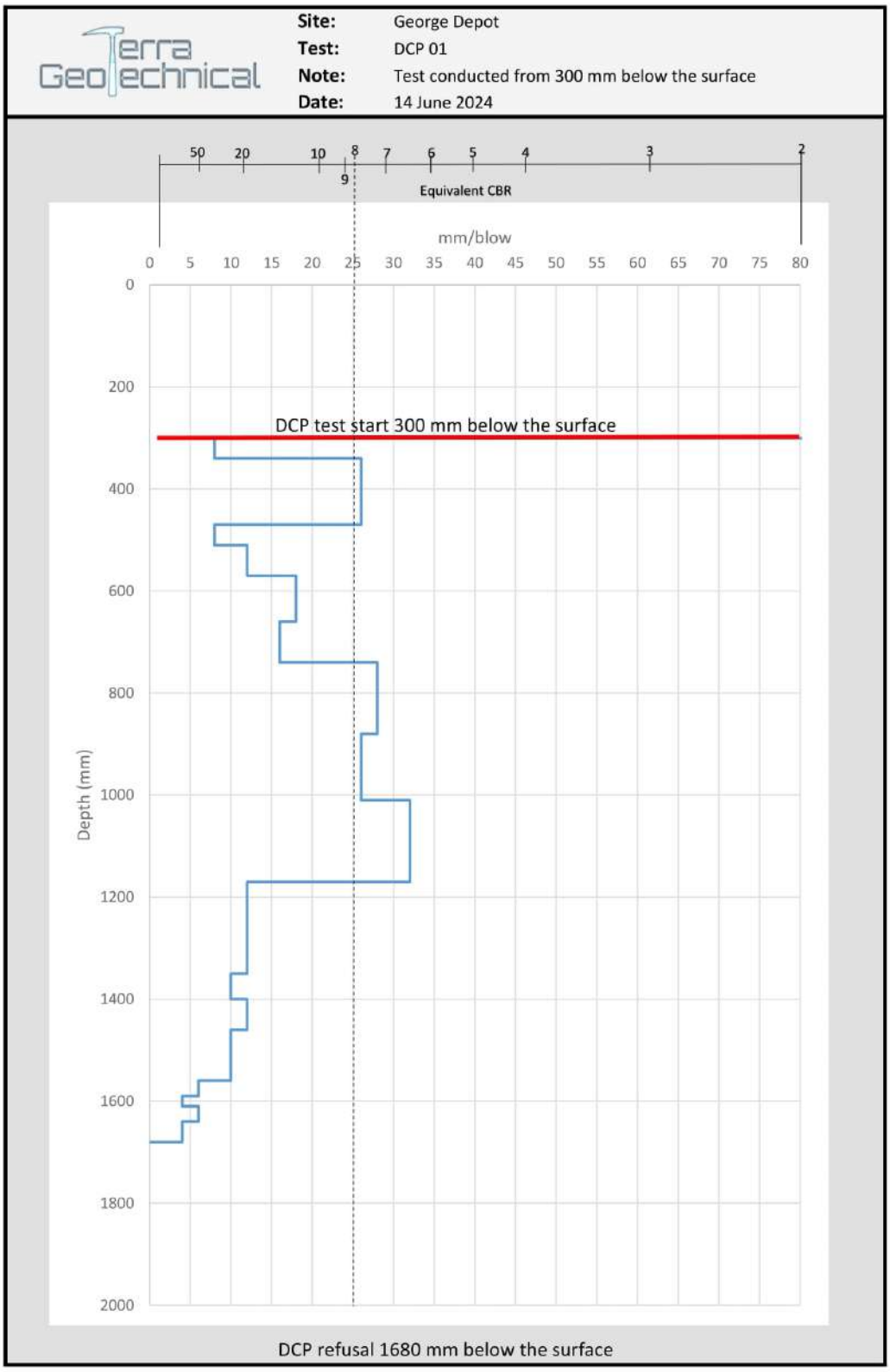
Ruaan Lesch
Technical Signatory
For Outeniqua Lab (Pty) Ltd.

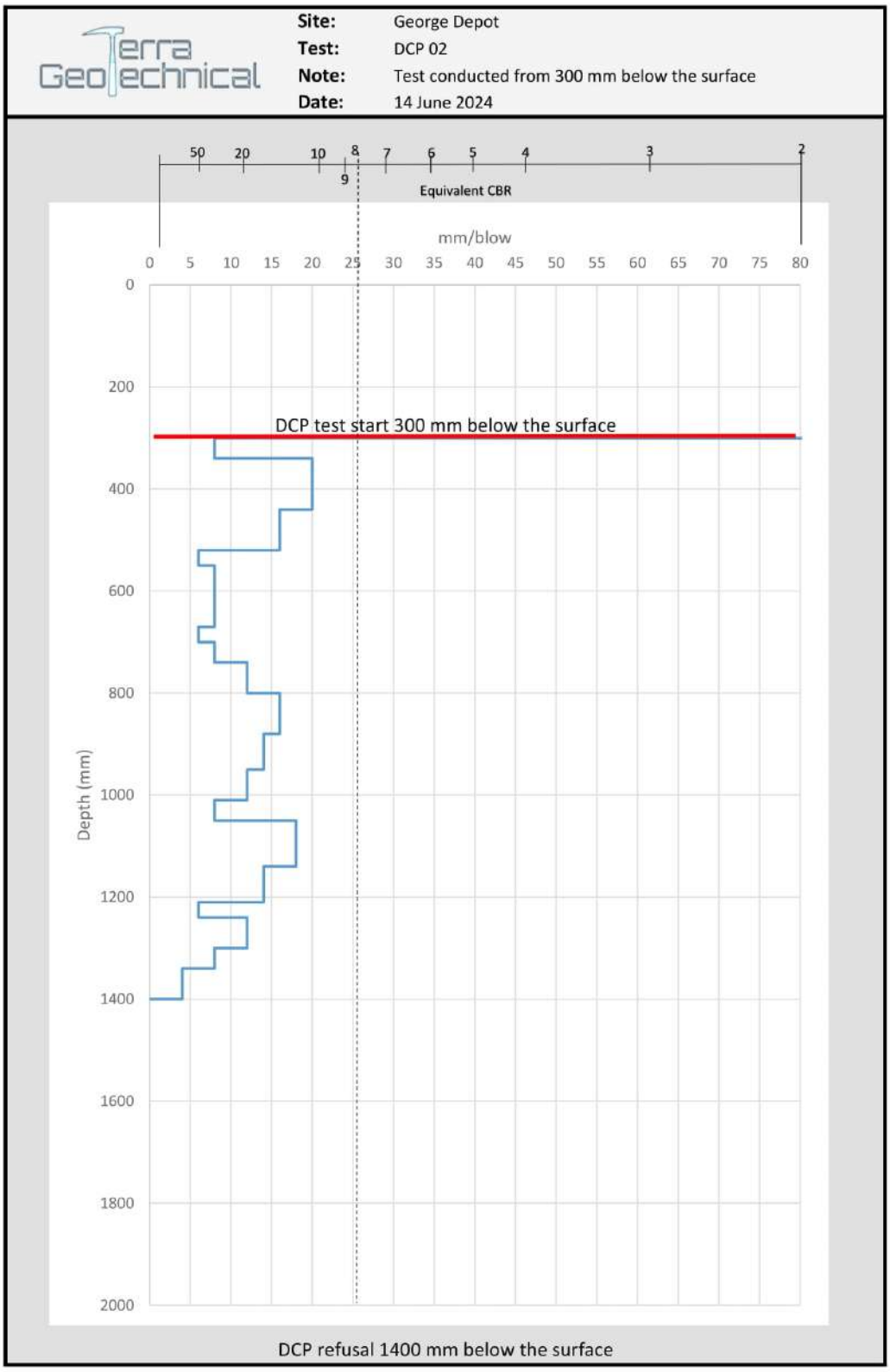
Director: L Heathcote B-Tech. (Civil Eng.) & BSc Hons (Transport)

APPENDIX C

C.1

DCP Results


Site: George Depot
Test: DCP 01
Note: Test conducted from 300 mm below the surface
Date: 14 June 2024
Equivalent CBR
50 20 10 9 8 7 6 5 4 3 2
mm/blow
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Depth (mm)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
DCP test start 300 mm below the surface
DCP refusal 1680 mm below the surface


Site: George Depot
Test: DCP 02
Note: Test conducted from 300 mm below the surface
Date: 14 June 2024
Equivalent CBR
50 20 10 9 8 7 6 5 4 3 2
mm/blow
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Depth (mm)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
DCP test start 300 mm below the surface
DCP refusal 1400 mm below the surface